

Annual Monitoring Report

Monitoring Year 7 of 7

FINAL

601 East Stream Restoration Project
NCDMS Contract No.: 004925
NCDMS Project No.: 95756
USACE Permit Action ID: 2013-00265
DWR Project No.: 14-0547

Union County, NC
Data Collected: June & October 2021
Date Submitted: December 2021



Submitted to:

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December 14, 2021

Paul Wiesner
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RE: 601 East Stream Restoration Site: MY7 Monitoring Report (NCDMS ID 95756)

Listed below are comments provided by DMS on November 9, 2021 regarding the 601 East Stream Restoration Site: Year 7 Monitoring Report and RES' responses.

On November 5, 2021, the NCDEQ – Division of Mitigation Services (DMS) received the Draft Monitoring Year 7/ closeout report for the 601 East Stream Restoration project from Resource Environmental Solutions (RES). The report establishes the year 7 monitoring and proposed closeout conditions at the project site. Anticipated mitigation on the site includes 3,372 linear feet of stream restoration; 400 linear feet of stream enhancement (Level I); 215 linear feet of buffer establishment and BMP sediment import reduction (5:1) for a total of 3,638.667 Stream Mitigation Units (SMUs) (R) and 43.000 SMUs (RE). Total project credits are 3,681.667 SMUs (warm). The following are our comments on the draft report:

Section 1.3. Project Setting and Background: In this section, please also note that RES has reverted back to the Mitigation Plan (Proposed) SMUs for the project. Total project assets are 3,681.667 SMUs (warm). The slight credit difference (1.667 SMUs) is due to minor rounding errors in the approved mitigation plan.

[Done.](#)

Section 1.4.1 Vegetation: DMS recommends continued invasive species/ parrot feather treatment and beaver/ beaver dam removal within the conservation easement through project closeout in 2022.

[Done.](#)

Section 1.4.2. Stream Geomorphology: *"None of the riffle cross sections exceeded a BHR."* Please review and correct.

[Done.](#)



Section 1.4.2. Stream Geomorphology: *"The channel substrate will be monitored in future years for shifts in particle size distributions."* Please update as 2021 is the final year of project monitoring and project closeout is proposed in 2022.

Done.

Table 1: In the table, please report Total Mitigation Credits as: 3,681.667 (R) & 43.000 (RE) to be consistent with the DMS credit ledger and final closeout request. Total project credits are 3,681.667 SMUs (warm).

The table was updated to display 3,638.667 (R) & 43.000 (RE).

CCPV Maps: If possible, please update the aerial imagery to the most recent available. As noted on the maps, current aerial imagery is from 2019.

The most recent NC OneMap aerial for this region is from 2019. Additionally, the most recent Google Maps Satellite imagery is also from 2019.

Table 5 - Vegetation Condition Assessment: Please include the date that the project was visually assessed at the top of the table. This was an IRT request at the 2021 credit release meeting. DMS did not observe any current conservation easement encroachment during a 9/30/2021 site visit. Please confirm that no invasive areas of concern were noted, or minor areas are beneath the established mapping threshold. This has been a previous IRT question on projects reporting 0% at MY7/ project closeout.

The assessment date has been added to Table 5 and RES confirms 0% vegetation problem areas.

Table 6 - Visual Stream Morphology Stability Assessment: Please include the date that the project was visually assessed at the top of the table. This was an IRT request at the 2021 credit release meeting. The Visual Stream Morphology Stability Assessment reports that 100% of the project is stable and performing as intended. Please review and confirm that this is correct or minor areas are beneath the mapping threshold. This has been a previous IRT question on projects reporting 100% at MY7/ project closeout.

The assessment date has been added to Table 6 and RES confirms 100% stream stability.

MY7 2021 Project Station Photos: Please provide dates for all project photos. If exact dates cannot be provided, please include the month and year for each photo.

Done.

Appendix E – Flow Gauge Graph: DMS recommends showing the start and end points of the 146 days of consecutive flow reported.

Done.



Digital Support File Comments:

- Please review the cross-section calculations. The points above the specified low bank height were not excluded using the Omit Bkf boxes, which causes the bankfull elevation that achieves the MY0 bankfull area to be artificially low. The points above the current monitoring year's low bank height should be omitted from both the BHR and LTOB spreadsheet because these points affect multiple metrics (e.g. cross sectional area, BHR, etc.).

Done.

- Please consistently specify the calculated BHR value or use <1 in the cross-section figures and Table 11a.

Done.

Prepared by:



3600 Glenwood Avenue, Suite 100
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1.0 PROJECT SUMMARY

1.1. Goals and Objectives

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

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

The project goals are addressed through the following project objectives:

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

1.2. Success Criteria

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

1.2.1. Stream Restoration

Morphologic Parameters and Channel Stability – Restored and enhanced streams should demonstrate morphologic stability to be considered successful. Stability does not equate to an absence of change, but rather to sustainable rates of change or stable patterns of variation. Restored streams often demonstrate some level of initial adjustment in the period that follows construction and some subsequent change/variation is also to be expected. However, the observed change should not be unidirectional such that it represents a robust trend. If some trend is evident, it should be modest or indicate migration to another stable form. Annual variation is to be expected, but over time this should demonstrate equilibrium on the reach scale with the maintenance of or even a reduction in the amplitude of variation. Lastly, all of this must be evaluated in the context of hydrologic events to which the system is exposed and the design type/intent (i.e. threshold versus free form alluvial channels).

Dimension – General maintenance of a stable cross-section and hydrologic access to the floodplain features over the course of the monitoring period will generally represent success in dimensional stability. However, some change is natural and expected and can even indicate that the design was

successful and appropriate for the hydrologic and sediment regime. Examples include depositional processes resulting in the development of constructive features on the banks and floodplain such as an inner berm, a slightly narrower channel, modest natural levees, and general floodplain deposition.

For stream dimension, cross-sectional overlays and key parameters such as cross-sectional area, and the channel's width to depth ratios should demonstrate modest overall change and patterns of variation.

Significant widening of the channel cross-section or trends of increase in the cross-sectional area generally represent concern, although some adjustment in this direction is acceptable if the process is arrested after a period of modest adjustment. In the case of riffle cross sections, maintenance of depths that represent small changes to target competence (e.g. consistently low BHRs <1.2) would also reflect stability. Although a pool cross-section may experience periodic infilling due to watershed activity and the timing of events relative to monitoring, the majority of pools within a project stream reach/component should demonstrate maintenance of greater depths and low water surface slopes over time. Rates of lateral migration need to be moderate. Bank pins will be installed to monitor rates of erosion.

Pattern and Profile – Pool depths may vary from year to year, however the majority of pools should maintain depths that are distinct in the profile and are readily observed. Pattern measurement will not be collected unless observations indicate a detectable change based on observations and/or dimension measurements.

Substrate – Generally it is anticipated that the bed materials will coarsen over time. The majority of riffle pebble counts should indicate maintenance or coarsening of the substrate. The D50 and D84 of the substrate should show a coarser distribution of bed materials in riffles and finer size class distribution in pools.

Sediment Transport – Depositional features should be consistent with a stable stream that is effectively managing its sediment load. Point Bar and inner berm features should develop without excessive encroachment of the restored channel. Trends in the development of systemic robust mid-channel or alternating bar features will be considered a destabilizing condition and may require intervention.

The tributaries outside of the conservation easement will be observed yearly and the monitoring report will document the function of the upstream basins in capturing excess sediment produced by observed degradation in the narrative. A specific performance standard has not been added.

1.2.2. Surface Water Hydrology

Monitoring of stream water stages through a staff gauge should show recurrence of bankfull flow on average every 1 to 2 years. Throughout the monitoring period, the surface water stage should achieve bankfull or greater elevations at least twice. The bankfull events must occur during separate monitoring years.

1.2.3. Vegetation

The vegetation monitoring will be conducted according to the Carolina Vegetation Survey (CVS) – EEP protocol Version 4.2 (Lee et al 2008). Vegetation monitoring plots will be 100 square meters in size and will be conducted according to the Level I protocol which has a focus on planted stems only. The purpose of this level of monitoring is to determine the pattern of installation of plant material with respect to species, spacing, density, and to monitor the survival and growth of those installed species. The success criteria for the preferred species in the restoration areas will be based on annual and cumulative survival and growth over seven (7) years. Survival on preferred species must be at a minimum 320 stems/acre at the end of the three years of monitoring and 260 stems/acre after five years. At year 7, density must be no less than 210 seven-year-old planted stems/acre. Level II of the CVS protocol, which includes natural stems and planted stems, will be followed for the monitoring year 2 and subsequent years until the project close out year.

1.3. Project Setting and Background

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

Following 2016 monitoring the NCIRT requested a review of the differential between the Approved Mitigation Plan and Baseline Monitoring Report. The table below details the discrepancies by reach. The primary cause of increased baseline SMUs is survey methodology (thalweg vs. centerline). The Mitigation Plan lengths were based on centerline. Additionally, there were likely minor field adjustments during construction. RES has reverted back to Mitigation Plan (Proposed) SMUs for this project. Total project assets are 3,681.667 Warm SMUs. The slight credit difference (1.667 SMUs) is due to minor rounding errors in the approved mitigation plan.

Reach	Mitigation Type*	Proposed Length (LF)	Mitigation Ratio	Proposed SMUs	Baseline SMUs
Reach A	Buffer Establishment	215	5:1	43	43
Reach 1a	P1 Restoration	350	1:1	350	350
Reach 1b	Enhancement I	85	1.5:1	56	57
Reach 1c	Enhancement I	155	1.5:1	103	103
Reach 1d	P1 Restoration	800	1:1	800	803
Reach 2a	Enhancement I	40	1.5:1	26	30
Reach 2b	Enhancement I	120	1.5:1	80	85
Reach 2c	P1 Restoration	724	1:1	724	730
Reach 3a	P1 Restoration	368	1:1	368	369
Reach 3b	P1 Restoration	650	1:1	650	649
Reach 3c	P3 Restoration	480	1:1	480	495
Total		3,987		3,680	3,714

*P1=Priority 1, P3=Priority 3

**The contracted amount of credits for this Site was 3,576 SMUs

1.4. Project Performance

Monitoring Year 7 (MY7) data was collected in June and October 2021. Year 7 monitoring activities included cross sections, vegetation plots, hydrology data, visual assessment of all reaches and the surrounding easement, and permanent photo stations. The Site has met all stream and vegetation success criteria and is recommended for closeout.

Summary information and data related to the occurrence of items such as beaver activity or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. A visual overview of the site can be seen in the Current Conditions Plan View Maps (**Figure 2**). Photographs taken at permanent stations throughout the project site also display general site conditions (**Figure 3**). Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly Restoration Plan) documents available on the NCDMS website. All raw data supporting the tables and figures in the appendices is available from DMS upon request.

1.4.1. Vegetation

Visual assessment of the easement (**Table 5; Figure 2**) indicates vegetation is well established throughout the easement. One area of encroachment was observed and repaired in June 2020. The encroachment repair included installing t-posts, horse tape, and easement signage along the easement boundary as well as planting 60 three-gallon container trees. The planting was done in June 2020 and species included sycamore, river birch, and willow oak. In January and September 2021, RES inspected the entire easement boundary and replaced all missing easement signage. Invasive species including parrotfeather were treated in September 2021. The kill on parrotfeather appeared very effective when observed in October 2021. The areas of cattails are still present but only in localized wetland areas and are not considered problem areas. RES will continue to treat invasive species, as needed, prior to closeout.

Monitoring of the 10 permanent vegetation plots was completed during October 2021. Summary tables and photographs associated with MY7 monitoring are located in **Appendix C**. Stem densities for MY7 ranged from 364 to 931 stems per acre with a mean of 587 stems per acre across all plots. When volunteer stems are included, the annual mean increases to 1012 stems per acre. A total of 19 species were documented within the monitoring plots. The average planted stem height observed in the plots was 15.7 feet.

1.4.2. Stream Geomorphology

Visual assessment of the stream was performed to document signs of instability, such as eroding banks, structural instability, or excessive sedimentation (**Table 6**). The erosional feature noted in the right buffer of Reach 1 was addressed by stabilizing the headcut with rock and adding coir logs along the feature. RES also removed remnant beaver dam on Reach 2 in June 2020 and on Reach 3 and 4 in November 2020. Between October and December 2021, four beaver dams were built on Reach 4. The dams were removed, and beavers were trapped in December 2021. RES will continue to manage beavers, as needed, prior to closeout.

Geomorphic data for MY7 was collected during June 2021. Summary tables and cross-section plots related to stream morphology are located in **Appendix D**. Baseline stream summary data for reference can be found in **Table 10**. Cross-sectional overlays showed minimal dimensional change between MY5 and MY7 data collection efforts (**Table 11a; Figure 6**), as well as minimal change in overall reach dimensions (**Table 11b**). None of the riffle cross sections exceeded a BHR of 1.2.

Substrate monitoring was performed during MY7. Pebble count D₅₀ was fine gravel for Reach 1, medium gravel for Reach 2, medium gravel for Reach 3, and medium gravel for Reach 4 (**Table 12; Charts 1-5**).

The bank pin arrays indicate that no erosion is taking place in the pools at cross-sections (**Table 13**).

1.4.3. Stream Hydrology

In MY7, seven bankfull events were recorded on Reach 2 and 11 on Reach 3. Project site precipitation data can be found in **Table 15**. A flow gauge was installed on April 30, 2020 and moved on June 3, 2020 upstream on Reach 1 per IRT request. The flow gauge recorded 146 days of consecutive flow and 219 total days of flow in MY7. Photo documentation of the stream is in **Appendix B**.

Summary information/data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly Restoration Plan) documents available on NCDMS' website. All raw data supporting the tables and figures in the appendices is available from NCDMS upon request.

2.0 METHODS

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

Geomorphic measurements (MY0, MY1, MY2, MY3, MY5, MY7) were taken during low flow conditions using a Topcon GTS-312 Total Station. Three-dimensional coordinates associated with cross-section and profile data were collected in the field and geo-referenced (NAD83 State Plane feet FIPS 3200). Morphological data was limited to 18 cross-sections. Survey data was imported into CAD, ArcGIS, and Excel for data processing and analysis. Channel substrate was characterized using a Wolman Pebble Count as outlined in Harrelson et al. (1994) and processed using Microsoft Excel.

Vegetation success (MY0, MY1, MY2, MY3, MY5, MY7) is being monitored using 10 permanent monitoring plots. Vegetation monitoring followed CVS-EEP Level 1 Protocol for MY1 and is following Level 2 Protocol Version 4.2 for monitoring years 2-7 (Lee et al. 2008). Level 2 Protocol includes analysis of species composition and density of planted species. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with rebar and photos of each plot taken from the origin each monitoring year. The locations of the three temporary plots surveyed in Years 2 and 3 were randomly selected within the replant areas. The plots were surveyed by pulling tapes to form 10 x 10 meter plots then counting all woody stems within the plots.

Precipitation data was reported from the NCCRONOS station number 315771 in Monroe, NC. Two crest gauges were installed on the mainstem channel, one upstream of Lansford Road in Reach 2 and another downstream of Lansford Road in Reach 3. During quarterly visits to the site, the height of the cork-line was recorded. In MY6, RES replaced the cork-line crest gauges with HOB0 stage recorders.

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.

Appendix A

General Tables and Figures

Appendix A – General Tables and Figures

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	3638.667	43,000							
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	56.7
Reach 1c Perennial	11+95 – 13+50		136		Enhancement	E1	155	1 : 1.5	103.3
Reach 1d Perennial	14+00 - 22+00		790		P1	R	800	1 : 1	800
Reach 2a Perennial	22+00 - 22+40		40		Enhancement	E1	40	1 : 1.5	26.7
Reach 2b Perennial	22+80 - 24+00		125		Enhancement	E1	120	1 : 1.5	80
Reach 2c Perennial	24+00 - 31+24		669		P1	R	724	1 : 1	724
Reach 3a Perennial	43+06 - 46+60		80' active channel 112' relic channel		P1	R	368	1 : 1	368
Reach 3b Perennial	47+20 - 53+70		502' relic channel		P1	R	650	1 : 1	650
Reach 4 Perennial	53+70 – 58+50		470' relic channel		P3	R	480	1 : 1	480
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	3372								3372
Enhancement	400								266.6
Enhancement I									
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									
Note: Stream credit calculations were originally calculated along the as-built thalweg. Based on the April 3, 2017 IRT Credit Release Meeting, these stream credits have been reverted back to the amounts in the IRT approved mitigation plan.									

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
Supplemental Planting (Entire Site)	-	Apr 2016
Year 2 Monitoring	Sept 2016	Oct 2016
Year 3 Monitoring	Stream - July 2017 Vegetation - Oct 2017	Jan 2018
Supplemental Planting, Encroachment Blocking, Beaver Removal, Invasive Treatment	-	Mar 2018
Invasive Treatment	-	Sept 2018
Year 4 Monitoring	Nov 2018	Jan 2019
Year 5 Monitoring	Stream - July 2019 Vegetation - Oct 2019	Jan 2020
Beaver Dam Removal, Encroachment Repair, Erosional Rill Repair	-	June 2020
Invasive Treatment and Beaver Dam Removal	-	Nov 2020
Year 6 Monitoring	Nov 2020	Dec 2020
Easement Sign Repair and Invasive Treatment	-	Sept 2021
Year 7 Monitoring	Stream - June 2021 Vegetation - Oct 2021	Oct 2021
Beaver Dam Removal (Reach 4)	-	Dec 2021

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 x213
Nursery Stock Suppliers	Arbor Gen - Blenheim, SC (800) 222-1290
	NC Forest Service Nursery - Goldsboro, NC (888) 628-7337
[Baseline] Monitoring Performers Stream Monitoring POC	Ward Consulting Engineers, P.C. 4805 Green Road, Suite 100, Raleigh, NC 27616 Rachael Zigler - WCE - (919) 870-0526
Vegetation Monitoring POC	Chris Sheats - The Cantena Group - (919) 732-1300
Monitoring Performers (MY1-MY2) 2015-2016	Equinox 37 Haywood Street, Suite 100 Asheville, NC 28801
Stream Monitoring POC	Drew Alderman (828) 253-6856
Vegetation Monitoring POC	Drew Alderman (828) 253-6856
Monitoring Performers (MY3+)	Resource Environmental Solutions (RES) 3600 Glenwood Ave, Suite 100 Raleigh, NC 27610
Stream Monitoring POC	Ryan Medric (919) 741-6268
Vegetation Monitoring POC	Ryan Medric (919) 741-6268

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)	1,418; 1,393 LF Restored	906; 902 LF Restored	1,080; 1,018 LF Restored	Relic Channel, 495 LF Restored
Valley Classification	II	II	VIII	VIII
Drainage area (acres)	109	135	333	359
NCDWQ stream identification score	Intermittent: 19.5 Perennial: 33.5	33.5	33.5	33.5
NCDWQ Water Quality Classification	13-17-40-(1)	13-17-40-(1)	13-17-40-(1)	13-17-40-(1)
Morphological Description (stream type)	G4/B4/C4b	C4/E4/DA	C4/G4	G4
Evolutionary trend (reference channel evolution model used)	G	C/DA	G	G
Underlying mapped soils	Intermittent: Tatum gravelly silty Perennial: Cid channery silt loam	Cid channery silt loam, Tatum gravelly silt loam	Chewacla silt loam	Chewacla silt loam
Drainage class	Well Drained	Moderately Well Drained	Somewhat Poorly Drained	Somewhat Poorly Drained
Soil Hydric status	Non Hydric	Non Hydric	Non Hydric	Non Hydric
Slope	2%	0.84%	0.67%	1.25%
FEMA classification	N/A	N/A	N/A	N/A
Native vegetation community	Agriculture along upstream The remaining stream buffer within this reach is composed of Willow Oak, Red Maple, River Birch, Black Willow, Elderberry, and Blackberry.	Canopy species include Willow Red Maple, Sweetgum, Eastern Wetland A is composed of Cattails, spike rush arrow-arum, and duckweed.	Canopy species include Red Maple, Hackberry, Willow Oak, and Sweetgum. The presence of Chinese privet outcompete any shrub and herb layer.	Canopy species include Red Maple, Hackberry, Willow oak, and Sweetgum. The presence of Chinese privet outcompete any shrub and herb layer.
Percent composition of exotic invasive vegetation	0%	50% of Parrot feather	5% of Japanese stilt grass, 80% Chinese privet, and kudzu	80% Chinese privet

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 dominated by herbaceous vegetation such as Cattail (<i>Typha latifolia</i>), Bulrush (<i>Scirpus cyperinus</i>), Common Rush (<i>Juncus effuses</i>). Some tree species such as Black Willow (<i>Salix nigra</i>), and Red Maple (<i>Acer rubrum</i>) are present in the wetland margins.		
Percent composition of exotic invasive vegetation	95% -The invasive Parrot Feather (<i>Miriophyllum aquaticum</i>) 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	

Driving Directions: From Monroe drive south on Hwy. 601. Turn left on Landsford Road. Site is located on the left and right .25 miles down and accessed from a parking area on the south side of Landsford Road.

The subject project site is an environmental restoration site of the NCDMS and encompassed by a recorded conservation easement, but is bordered by land with private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access to the general public is not permitted. Access by authorized personnel of state and federal agencies or their designee/contractors involved in the development, oversight, and stewardship of the restoration site is permitted within the terms and timeframes of their defined role. Any intended site visitation or activity by any person outside these previously sanctioned roles and activities requires prior coordination with NCDMS.

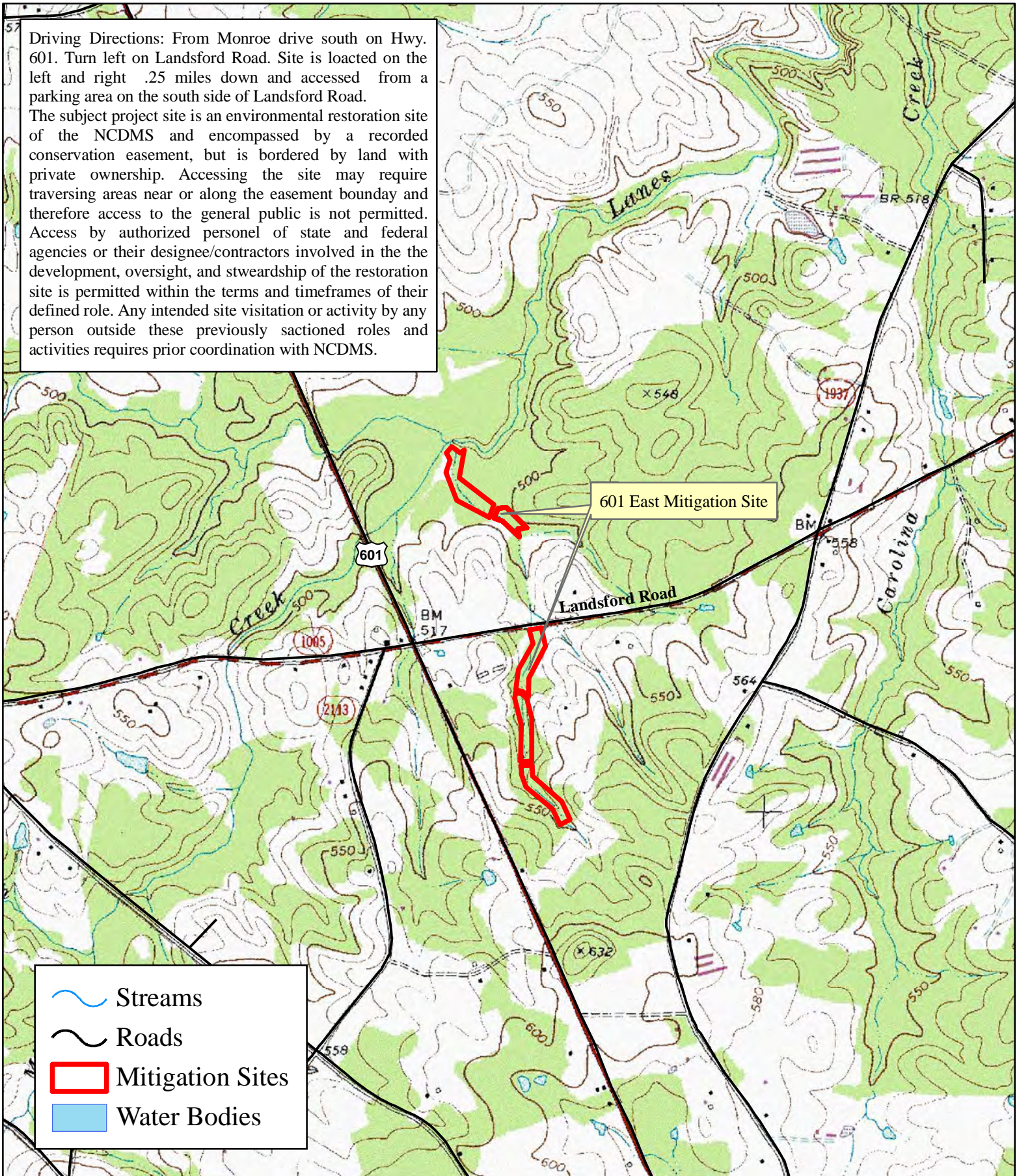
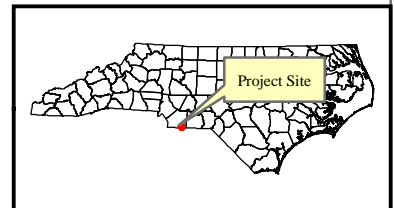
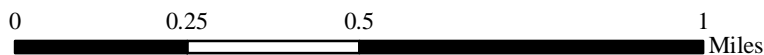
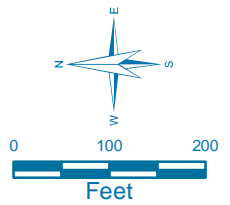


Figure 1
601 East Mitigation Site
Project Vicinity Map





1 inch = 200 feet

Figure 2a

**601 East Stream Restoration Project
MY7 2021**

**Current Conditions
Plan View**

Date: 10/29/2021

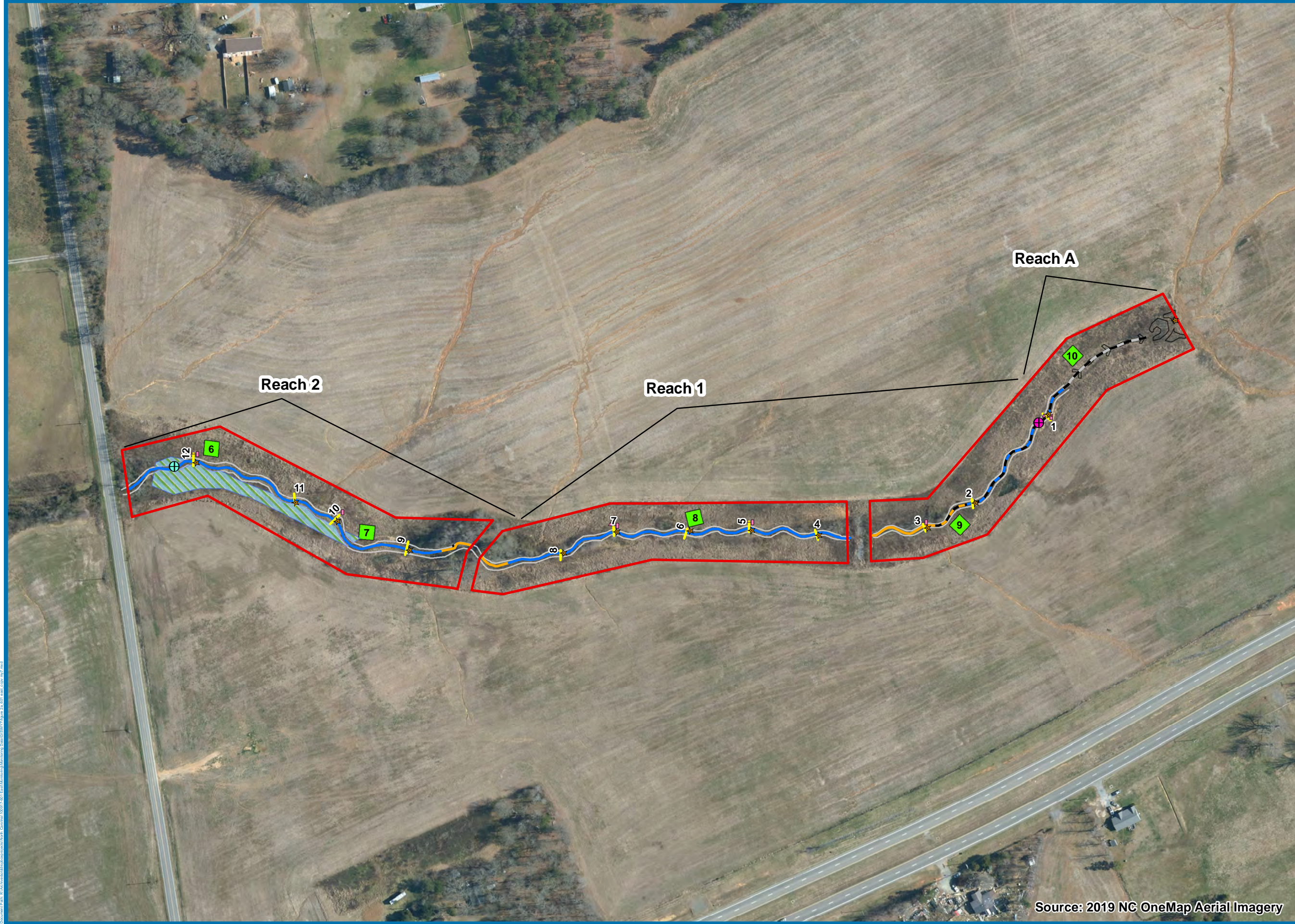
Drawn by: RTM

LEGEND

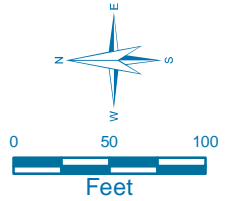
- Conservation Easement
- Existing Wetland
- Vegetation Plot
- Structure
- Stream Treatment**
- BMP (Ephemeral)
- Restoration (Intermittent)
- EI (Intermittent)
- Restoration (Perennial)
- EI (Perennial)
- Cross Section
- Structure
- Top of Bank
- Bankpin Array
- ★ Photo Station
- ⊕ Stage Recorder
- ⊕ Flow Gauge

Vegetation Condition Assessment

Invasive Species	Target Community		
	No Fill	Marginal	Absent
Absent			
Present			



Source: 2019 NC OneMap Aerial Imagery



1 inch = 100 feet

Figure 2b

**601 East Stream
Restoration Project
MY7 2021**

**Current Conditions
Plan View**

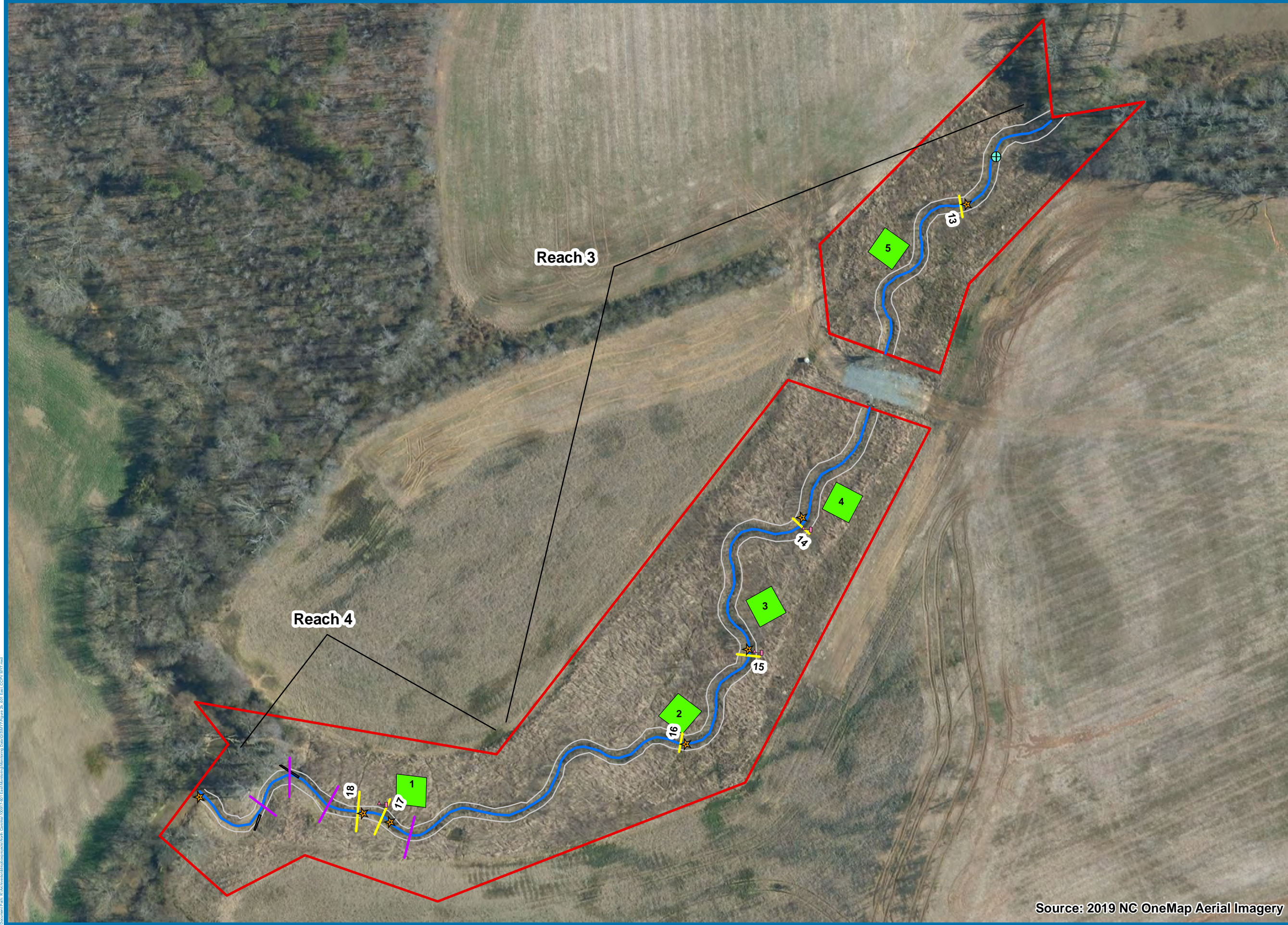
Date: 12/14/2021 Drawn by: RTM

LEGEND

- ▭ Conservation Easement
- ▭ Vegetation Plot
- Beaver Dam (Removed 12/2021)
- Stream Treatment**
- BMP (Ephemeral)
- Restoration (Intermittent)
- EI (Intermittent)
- Restoration (Perennial)
- EI (Perennial)
- Cross Section
- Structure
- Top of Bank
- ▭ Bankpin Array
- ★ Photo Station
- ⊕ Stage Recorder
- ⊕ Flow Gauge

Vegetation Condition Assessment

		Target Community		
		Present	Marginal	Absent
Invasive Species	Absent	No Fill	▨	▨
	Present	▨	▨	▨



Source: 2019 NC OneMap Aerial Imagery

Document Path: B:\Projects\601 East Stream\Monitoring Data\02\06\2021\Figure_2b_601_East_Stream_MY7.mxd

Appendix B

Visual Assessment Data

Table 5. Vegetation Condition Assessment

601 East Stream Restoration Site

Planted Acreage 12.8

Easement Acreage 12.8

Date Assessed: 10/13/2021

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.	Red Simple Hatch	0	0.00	0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	Orange Simple Hatch	0	0.00	0%
Totals			0	0.00	0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	Orange Simple Hatch	0	0.00	0%
Cumulative Totals			0	0.00	0%
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).	Yellow Crosshatch	0	0.00	0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	Red Simple Hatch	0	0.00	0%

N/A - Item does not apply.

**Table 6. Visual Stream Morphology Stability Assessment
601 East Stream Restoration Site - Reach 1
Assessed Length 1,393 feet | Date Assessed: 10/13/2021**

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. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	32	32			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6).	33	33			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	33	33			100%			
	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.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	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
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	45	45			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	35	35			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	35	35			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	10	10			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio \geq 1.6. Rootwads/logs providing some cover at base-flow.	10	10			100%			

Table 6 cont'd. Visual Stream Morphology Stability Assessment

601 East Stream Restoration Site - Reach 2

Assessed Length 902 feet | Date Assessed: 10/13/2021

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. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	16	16			100%			
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	17	17					
	2. <u>Length</u> 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
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	4	4			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	4	4			100%			

**Table 6 cont'd. Visual Stream Morphology Stability Assessment
601 East Stream Restoration Site - Reach 3
Assessed Length 1,018 feet | Date Assessed: 10/13/2021**

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. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	18	18			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	18	18			100%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).	18	18			100%			
	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 <u>NOT</u> 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
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	17	17			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	12	12			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	12	12			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	5	5			100%			

Table 6 cont'd. Visual Stream Morphology Stability Assessment
601 East Stream Restoration Site - Reach 4
Assessed Length 495 feet | Date Assessed: 10/13/2021

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. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	9	9			100%			
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6).	9	9					
	2. <u>Length</u> 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 <u>NOT</u> 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
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	14	14			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	6	6			100%			

Figure 3. 2021 Photo Station Photos (6/8/2021)



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



Reach 1 – Permanent Photo Station 2
Cross Section 1 – Looking Upstream



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



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



Reach 1 – Permanent Photo Station 5
Cross Section 4 – Looking Upstream



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



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



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



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



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



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



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



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



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



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



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



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



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



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



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

Appendix C

Vegetation Plot Data

Table 7. MY5 Vegetation Plot Criteria Attainment

Wetland/Stream Vegetation Totals					
(per acre)					
Plot #	Planted Stems/Acre	Volunteer Stems/Acre	Total Stems/Acre	Success Criteria Met?	Average Planted Stem Height (ft)
1	567	2428	2995	Yes	26.3
2	931	121	1052	Yes	11.1
3	567	324	1174	Yes	17.9
4	486	40	526	Yes	12.4
5	526	567	1093	Yes	14.8
6	567	121	688	Yes	18
7	364	121	486	Yes	16.5
8	486	40	526	Yes	10.1
9	647	121	769	Yes	12.9
10	728	81	809	Yes	17.9
Project Avg	587	397	1012	Yes	15.7

Table 8. CVS Vegetation Plot Metadata

Table 8: CVS Vegetation Plot Metadata 601 East Stream and Wetland Restoration Site	
Report Prepared By	Ryan Medic
Date Prepared	10/21/2019 15:14
database name	RES-MYS_2019-601East.mdb
database location	C:\Users\medric\Dropbox (RES)\@RES Projects\North Carolina\601 East\Monitoring\Monitoring Data\MYS_2019\Vegetation Data
computer name	D4VOKGH2
file size	48533504
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj. planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj. total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
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. Total Planted Stem Counts

EEP Project Code 1. Project Name: 601 East

			Current Plot Data (MYS 2021)																													
Scientific Name	Common Name	Species Type	001-01-0001			001-01-0002			001-01-0003			001-01-0004			001-01-0005			001-01-0006			001-01-0007			001-01-0008			001-01-0009			001-01-0010		
			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
Acer negundo	boxelder	Tree			50					1																						
Asimina triloba	pawpaw	Tree																														
Betula nigra	river birch	Tree	2	2	2	1	1	1				4	4	4	1	1	1	5	5	5	1	1	1	2	2	2	6	6	6			
Celtis laevigata	sugarberry	Tree								2		1																				
Celtis occidentalis	common hackberry	Tree																														
Cephalanthus occidentalis	common buttonbush	Shrub															1	1	1	1	1	1							1	1	1	
Cercis canadensis var. canadensis	eastern redbud	Tree																														
Fraxinus pennsylvanica	green ash	Tree			5							3	3	3	2	2	16	4	4	6	3	3	3	5	5	5	8	8	8	2	2	2
Gleditsia triacanthos	honeylocust	Tree						1																								
Liquidambar styraciflua	sweetgum	Tree			5		1			3																				2		
Liriodendron tulipifera var. tulipifera	Tulip-tree, Yellow Poplar, Whitewood	Tree	1	1	1	1	1	1	2	2	2																		4	4	4	
Nyssa sylvatica	blackgum	Tree												1	1	1																
Pinus taeda	loblolly pine	Tree								2																						
Platanus occidentalis	American sycamore	Tree					1																		1							
Platanus occidentalis var. occidentalis	Sycamore, Plane-tree	Tree	8	8	8	14	14	14	10	10	10	4	4	4	5	5	5	2	2	2				3	3	3	1	1	1	8	8	8
Populus deltoides var. deltoides	eastern cottonwood									1	1																					
Quercus	oak	Tree																														
Quercus lyrata	overcup oak	Tree	1	1	1	2	2	2													1	1	1									
Quercus michauxii	swamp chestnut oak	Tree				4	4	4	1	1	1				1	1	1	2	2	2	1	1	1	1	1	1			2	2	2	
Quercus nigra	water oak	Tree																														
Quercus phellos	willow oak	Tree	2	2	2	1	1	1	1	1	1	1	1	1	3	3	3			1	2	2	2	1	1	1			1	1	1	
Quercus rubra	northern red oak	Tree																														
Quercus stellata	post oak	Tree																														
Quercus velutina	black oak	Tree																														
Rhus copallinum	flameleaf sumac	shrub																												1		
Rhus copallinum var. copallinum	flameleaf sumac	shrub																														
Salix nigra	black willow	Tree								6	6															1	1	3				
Ulmus alata	winged elm	Tree																														
Ulmus americana	American elm	Tree																												3		
Ulmus rubra	slippery elm	Tree																														
	Stem count		14	14	74	23	23	26	14	21	29	12	12	13	13	13	27	14	14	17	9	9	12	12	12	13	16	16	19	18	18	20
	size (ares)		1			1			1			1			1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		5	5	8	6	6	9	4	6	10	4	4	5	6	6	6	5	5	6	6	6	7	5	5	6	4	4	5	6	6	7
	Stems per ACRE		567	567	2995	931	931	1052	567	850	1174	486	486	526	526	526	1093	567	567	688	364	364	486	486	486	526	647	647	769	728	728	809

Scientific Name	Common Name	Species Type	Annual Means																	
			MY7 (2021)			MY5 (2019)			MY3 (2017)			MY2 (2016)			MY1 (2015)			MY0 (2015)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree			51			16			26			33						
Asimina triloba	pawpaw	Tree										2	2	2	1	1	1	2	2	2
Betula nigra	river birch	Tree	22	22	22	23	23	23	24	24	26	33	33	33	14	14	14	24	24	24
Celtis laevigata	sugarberry	Tree			3			2												
Celtis occidentalis	common hackberry	Tree									6									
Cephalanthus occidentalis	common buttonbush	Shrub	3	3	3	3	3	3	4	4	4	5	5	5	4	4	4	6	6	6
Cercis canadensis var. canadensis	eastern redbud	Tree									2									
Fraxinus pennsylvanica	green ash	Tree	27	27	48	28	28	39	29	29	29	27	27	29	3	3	3	3	3	3
Gleditsia triacanthos	honeylocust	Tree			1															
Liquidambar styraciflua	sweetgum	Tree			11			15			20			19						
Liriodendron tulipifera var. tulipifera	Tulip-tree, Yellow Poplar, Whitewood	Tree	8	8	8	8	8	8	12	12	14	20	20	22	16	16	16	30	30	30
Nyssa sylvatica	blackgum	Tree	1	1	1	2	2	2	3	3	3	3	3	3	3	3	3	18	18	18
Pinus taeda	loblolly pine	Tree			2			4												
Platanus occidentalis	American sycamore	Tree			2			2												
Platanus occidentalis var. occidentalis	Sycamore, Plane-tree	Tree	55	55	55	55	55	55	55	55	59	59	59	59	47	47	47	58	58	58
Populus deltoides var. deltoides	eastern cottonwood			1	1		1	1	1	2	2	1	2	2	1	3	3	1	8	8
Quercus	oak	Tree													9	9	9	12	12	12
Quercus lyrata	overcup oak	Tree	4	4	4	4	4	4	4	4	4									
Quercus michauxii	swamp chestnut oak	Tree	12	12	12	13	13	13	14	14	14	14	14	14	10	10	10	20	20	20
Quercus nigra	water oak	Tree										2	2	2	1	1	1			
Quercus phellos	willow oak	Tree	12	12	13	13	13	13	10	10	10	8	8	8	5	5	5	26	26	26
Quercus rubra	northern red oak	Tree										1	1	1						
Quercus stellata	post oak	Tree										1	1	1						
Quercus velutina	black oak	Tree										1	1	1	2	2	2			
Rhus copallinum	flameleaf sumac	shrub			1			7												
Rhus copallinum var. copallinum	flameleaf sumac	shrub									12			11						
Salix nigra	black willow	Tree	1	7	9	1	7	8	1	7	10	1	6	16		5	5			
Ulmus alata	winged elm	Tree						1												
Ulmus americana	American elm	Tree			3						2									
Ulmus rubra	slippery elm	Tree												2						
		Stem count	145	152	250	150	157	216	157	164	243	178	184	263	116	123	123	200	207	207
		size (ares)	10			10			10			10			10			10		
		size (ACRES)	0.25			0.25			0.25			0.25			0.25			0.25		
		Species count	10	11	19	10	11	18	11	11	17	15	15	19	13	14	14	11	11	11
		Stems per ACRE	587	615	1012	607	635	874	635	664	983	720	745	1064	469	498	498	800	828	828

Figure 5. Vegetation Plot Photos MY7.



Vegetation Monitoring Plot 1 (10/14/2021)



Vegetation Monitoring Plot 2 (10/14/2021)



Vegetation Monitoring Plot 3 (10/14/2021)



Vegetation Monitoring Plot 4 (10/14/2021)



Vegetation Monitoring Plot 5 (10/14/2021)



Vegetation Monitoring Plot 6 (10/14/2021)



Vegetation Monitoring Plot 7 (10/14/2021)



Vegetation Monitoring Plot 8 (10/14/2021)



Vegetation Monitoring Plot 9 (10/14/2021)



Vegetation Monitoring Plot 10 (10/14/2021)

601 East (95756)
 Stems Per Plot Across All Years

Plot	MY7 - 2021			MY5 - 2019			MY3 - 2017			MY2 - 2016			MY1 - 2015			MY0 - 2015		
	Planted Stems	Total Stems	Total Stems/Ac	Planted Stems	Total Stems	Total Stems/Ac	Planted Stems	Total Stems	Total Stems/Ac	Planted Stems	Total Stems	Total Stems/Ac	Planted Stems	Total Stems	Total Stems/Ac	Planted Stems	Total Stems	Total Stems/Ac
1	14	74	2995	15	31	1255	15	50	2023	21	55	2226	12	12	486	20	20	809
2	23	26	1052	24	32	1295	25	32	1295	24	37	1497	21	21	850	22	22	890
3	14	29	1174	14	33	1335	13	31	1255	15	31	1255	14	21	850	19	26	1052
4	12	13	526	13	15	607	15	17	688	16	16	647	9	9	364	19	19	769
5	13	27	1093	13	19	769	14	14	567	19	19	769	9	9	364	19	19	769
6	14	17	688	14	19	769	14	14	567	13	18	728	7	7	283	21	21	850
7	9	12	486	9	12	486	10	10	405	7	8	324	11	11	445	23	23	931
8	12	13	526	13	14	567	13	14	567	18	18	728	8	8	324	18	18	728
9	16	19	769	17	21	850	17	21	850	20	21	850	9	9	364	16	16	648
10	18	20	809	18	20	809	21	24	971	25	27	1093	16	16	647	23	23	931

Appendix D

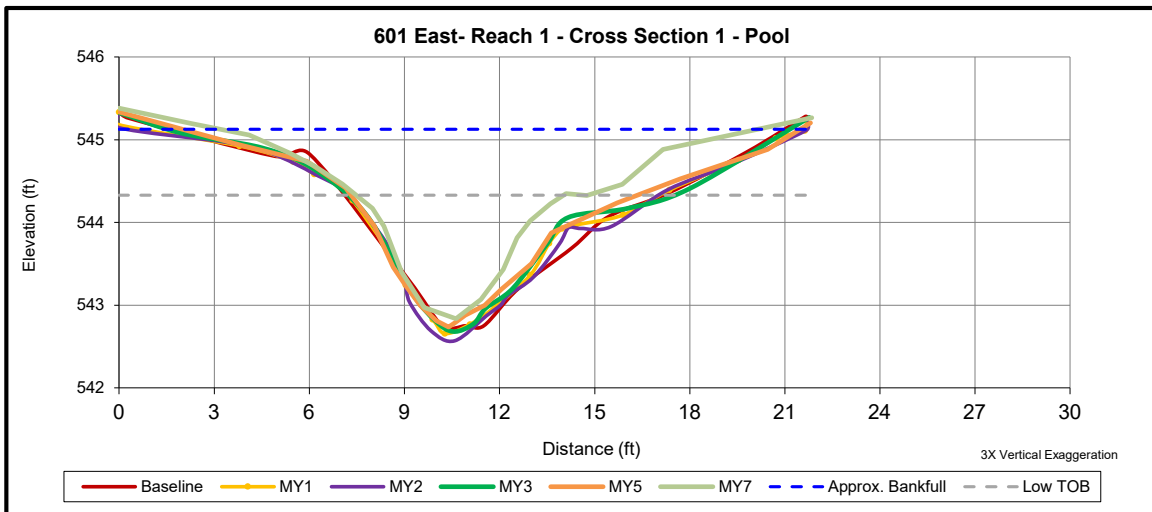
Stream Geomorphology Data



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	13.6	15.1	15.1	14.7	-	N/A	-	-
Floodprone Width (ft) ¹	45.0	45.0	45.0	45.0	-	N/A	-	-
Bankfull Mean Depth (ft)	1.0	0.9	0.9	0.9	-	---	-	-
Bankfull Max Depth (ft) ²	2.1	2.2	2.2	2.1	-	1.1	-	1.5
Bankfull Cross-Sectional Area (ft ²) ²	14.1	13.7	14.3	13.4	-	3.7	-	5.2
Width/Depth Ratio	13.2	16.6	15.9	16.2	-	---	-	-
Entrenchment Ratio ¹	10.3	3.0	3.0	N/A	-	N/A	-	-
Bank Height Ratio ¹	1.0	1.0	1.0	N/A	-	N/A	-	-

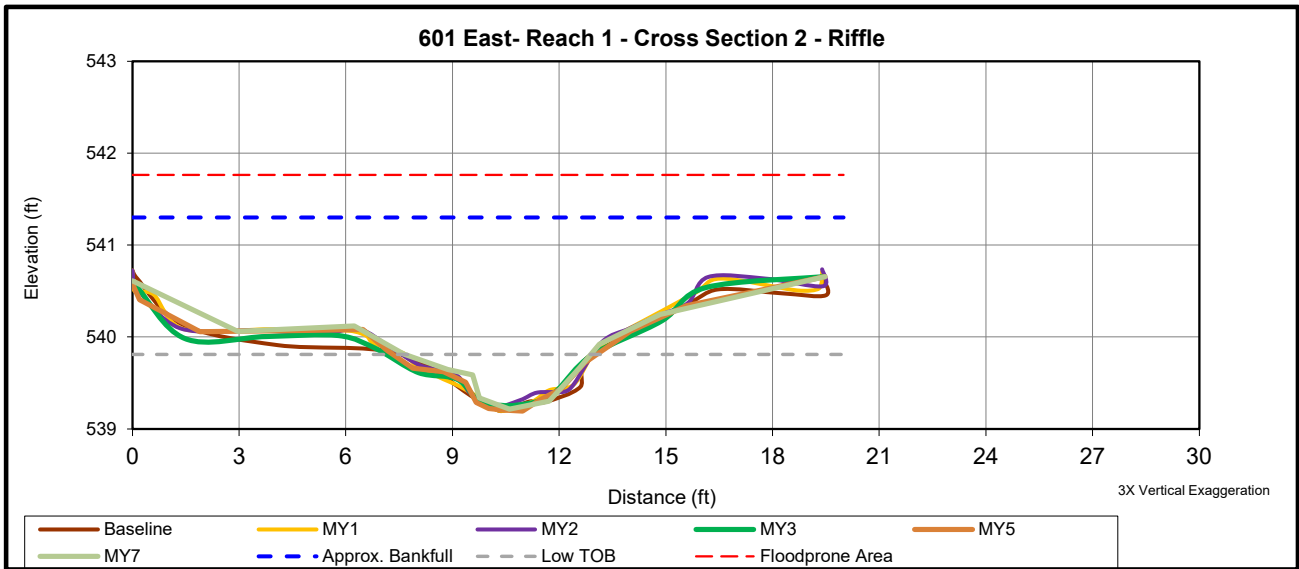
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	15.1	14.7	15.2	15.2	-	5.6	-	4.9
Floodprone Width (ft) ¹	77.0	77.0	77.0	77.0	-	>19.5	-	>19.5
Bankfull Mean Depth (ft)	0.6	0.5	0.5	0.6	-	---	-	N/A
Bankfull Max Depth (ft) ²	1.2	1.2	1.2	1.1	-	0.9	-	0.6
Bankfull Cross-Sectional Area (ft ²) ²	9.0	8.0	8.0	8.8	-	3.4	-	1.7
Width/Depth Ratio	25.3	27.0	28.9	26.2	-	---	-	N/A
Entrenchment Ratio ¹	9.3	5.2	5.1	5.1	-	>3.5	-	>3.9
Bank Height Ratio ¹	1.0	1.0	1.0	0.7	-	<1	-	<1

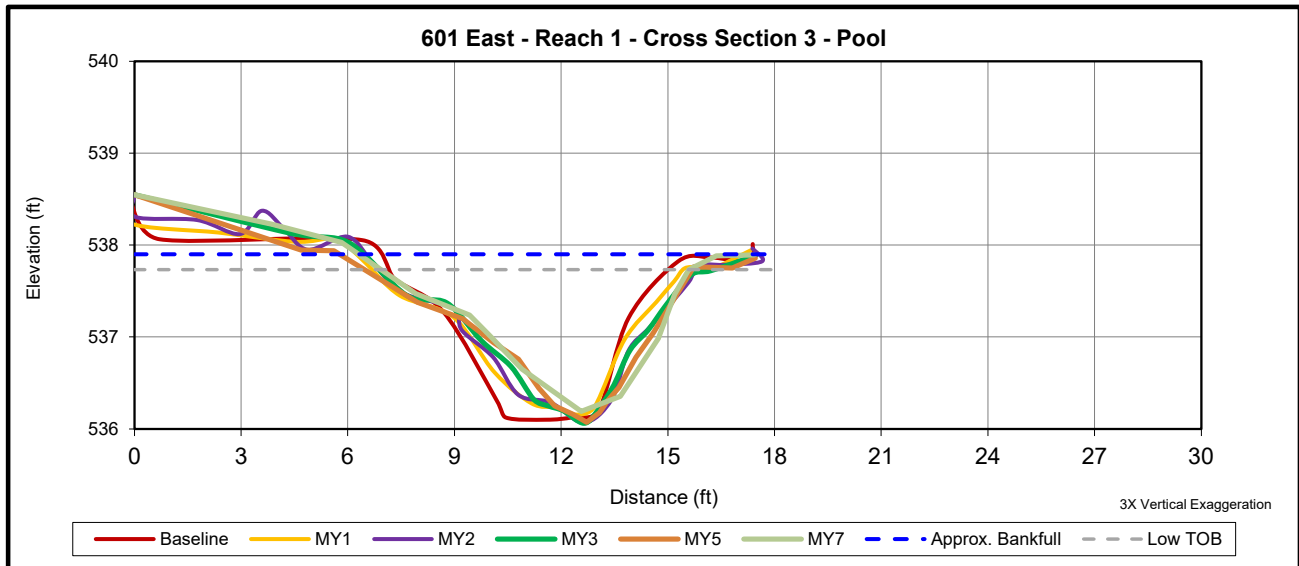
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft) ¹	9.4	9.5	9.3	9.2	-	N/A	-	N/A
Floodprone Width (ft) ¹	154.0	154.0	154.0	154.0	-	N/A	-	N/A
Bankfull Mean Depth (ft)	0.9	0.9	0.9	0.9	-	---	-	N/A
Bankfull Max Depth (ft) ²	1.8	1.7	1.8	1.8	-	1.1	-	1.5
Bankfull Cross-Sectional Area (ft ²) ²	8.7	8.5	8.8	8.5	-	3.3	-	7.1
Width/Depth Ratio	10.2	10.7	9.8	9.9	-	---	-	N/A
Entrenchment Ratio ¹	14.9	14.6	16.6	N/A	-	N/A	-	N/A
Bank Height Ratio ¹	1.0	1.0	1.0	N/A	-	N/A	-	N/A

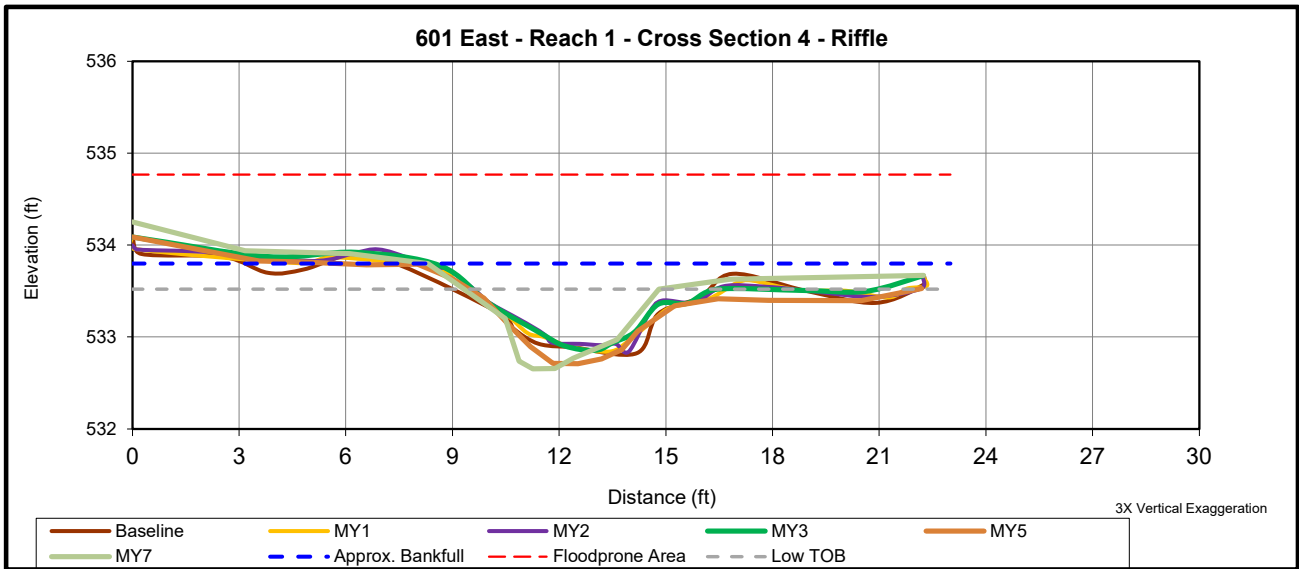
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft) ¹	8.8	9.1	9.4	9.2	-	12.9	-	6.5
Floodprone Width (ft) ¹	75.0	75.0	75.0	75.0	-	>22.2	-	>22.2
Bankfull Mean Depth (ft)	0.5	0.5	0.6	0.6	-	---	-	N/A
Bankfull Max Depth (ft) ²	0.9	0.9	1.1	1.0	-	0.7	-	0.9
Bankfull Cross-Sectional Area (ft ²) ²	4.5	4.8	5.8	5.1	-	2.6	-	2.8
Width/Depth Ratio	17.5	17.1	15.3	16.7	-	---	-	N/A
Entrenchment Ratio ¹	15.9	8.3	8.0	8.2	-	1.7	-	>3.4
Bank Height Ratio ¹	1.0	1.0	1.0	0.7	-	<1	-	<1

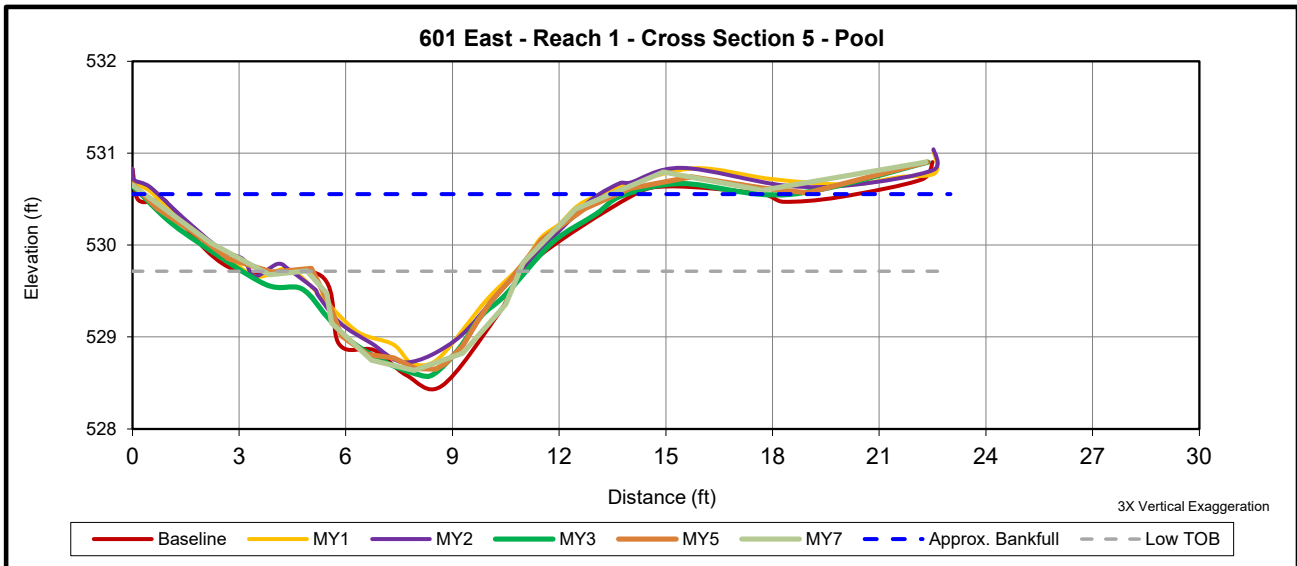
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft) ¹	12.9	12.1	12.0	13.2	-	N/A	-	N/A
Floodprone Width (ft) ¹	61.0	61.0	61.0	61.0	-	N/A	-	N/A
Bankfull Mean Depth (ft)	1.0	0.9	0.9	1.0	-	---	-	N/A
Bankfull Max Depth (ft) ²	2.0	1.8	1.8	1.9	-	1.1	-	1.1
Bankfull Cross-Sectional Area (ft ²) ²	12.8	11.0	11.2	12.8	-	4.2	-	4.4
Width/Depth Ratio	13.0	13.2	12.9	13.6	-	---	-	N/A
Entrenchment Ratio ¹	17.4	5.1	5.1	N/A	-	N/A	-	N/A
Bank Height Ratio ¹	1.0	1.0	1.0	N/A	-	N/A	-	N/A

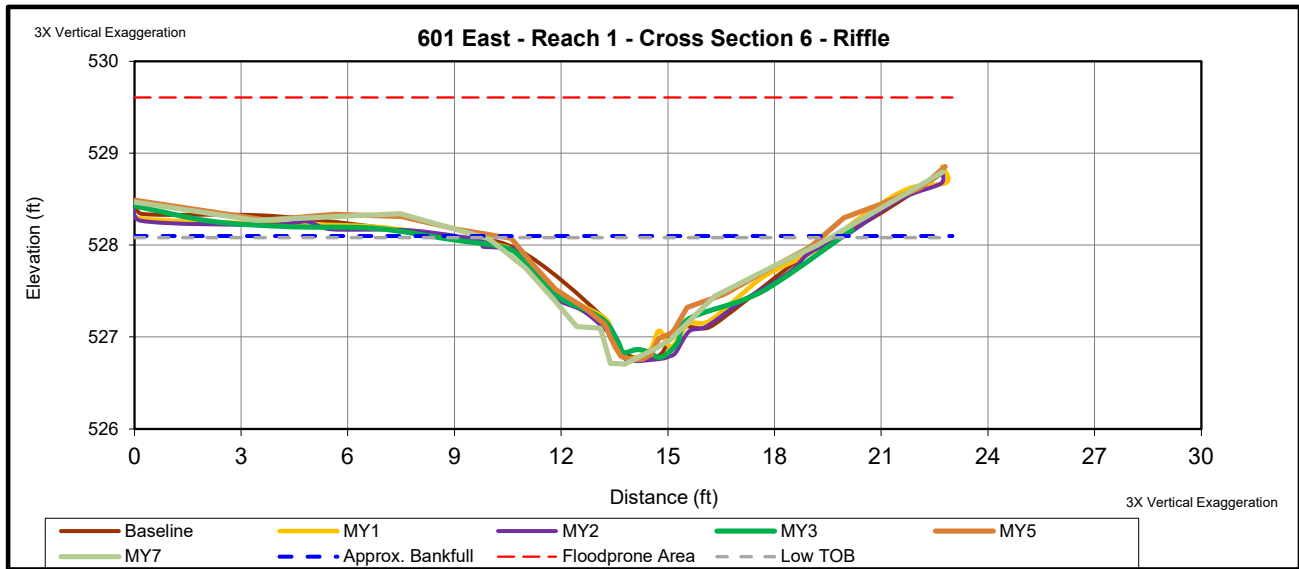
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	11.3	11.3	11.3	11.1	-	10.5	-	10.0
Floodprone Width (ft) ¹	80.0	80.0	80.0	80.0	-	>22.8	-	>22.7
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.6	-	---	-	N/A
Bankfull Max Depth (ft) ²	1.3	1.3	1.4	1.3	-	1.3	-	1.3
Bankfull Cross-Sectional Area (ft ²) ²	6.6	6.6	7.2	6.9	-	5.6	-	5.6
Width/Depth Ratio	19.3	19.5	17.9	17.9	-	---	-	N/A
Entrenchment Ratio ¹	9.7	7.1	7.1	7.2	-	>2.2	-	>2.3
Bank Height Ratio ¹	1.0	1.0	1.0	0.9	-	<1	-	<1

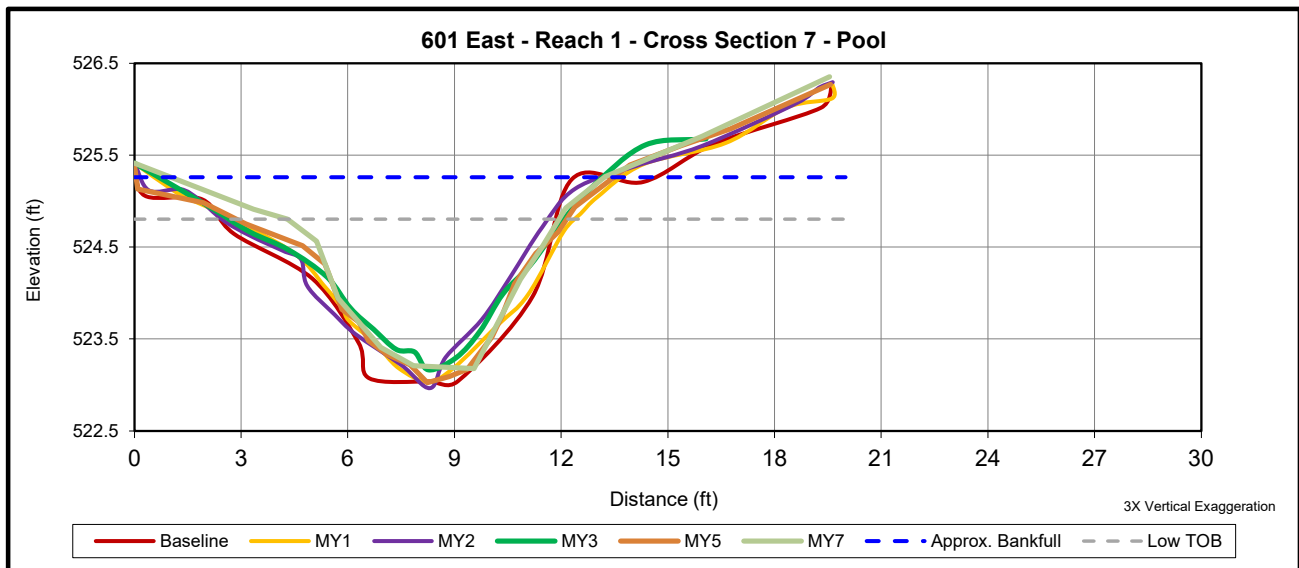
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft) ¹	10.3	11.4	10.3	10.8	-	N/A	-	-
Floodprone Width (ft) ¹	63.0	63.0	63.0	63.0	-	N/A	-	-
Bankfull Mean Depth (ft)	1.2	1.0	1.0	1.0	-	---	-	-
Bankfull Max Depth (ft) ²	2.0	2.0	2.1	1.9	-	1.3	-	1.3
Bankfull Cross-Sectional Area (ft ²) ²	12.3	11.2	10.4	9.9	-	4.7	-	4.7
Width/Depth Ratio	8.6	11.5	10.3	11.8	-	---	-	-
Entrenchment Ratio ¹	10.7	5.5	6.1	N/A	-	N/A	-	-
Bank Height Ratio ¹	1.0	1.0	1.0	N/A	-	N/A	-	-

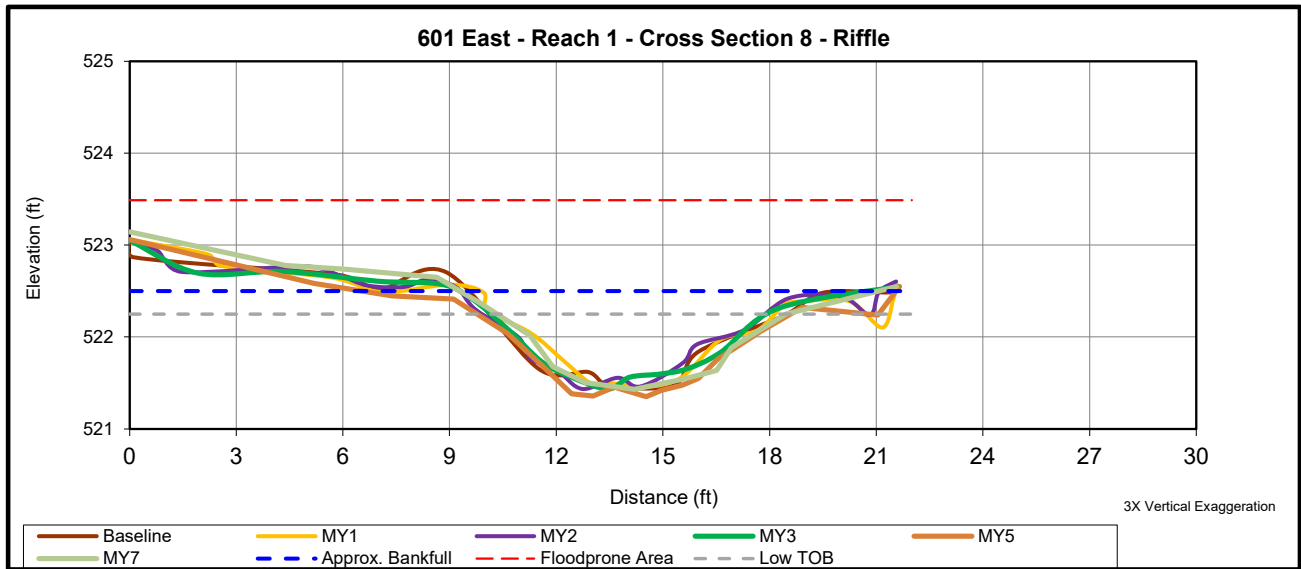
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream

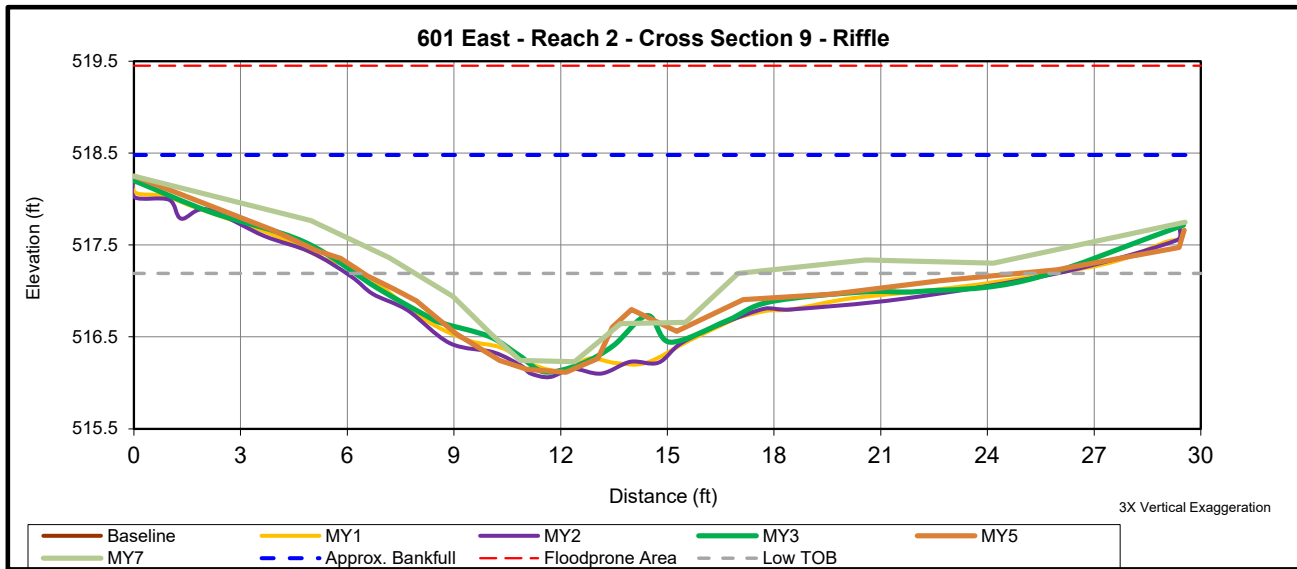


Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	10.1	8.8	9.2	9.0	-	9.5	-	9.1
Floodprone Width (ft) ¹	40.0	40.0	40.0	40.0	-	>21.6	-	>21.6
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.7	-	---	-	N/A
Bankfull Max Depth (ft) ²	1.0	1.0	1.0	1.0	-	0.8	-	0.8
Bankfull Cross-Sectional Area (ft ²) ²	6.2	5.6	5.8	5.9	-	4.6	-	4.2
Width/Depth Ratio	16.6	13.9	14.7	13.7	-	---	-	N/A
Entrenchment Ratio ¹	10.9	4.5	4.3	4.5	-	>2.3	-	>2.4
Bank Height Ratio ¹	1.0	1.0	1.0	0.8	-	<1	-	<1

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	24.2	24.3	24.4	23.0	-	25.4	-	9.8
Floodprone Width (ft) ¹	62.0	62.0	62.0	62.0	-	>29.5	-	>29.6
Bankfull Mean Depth (ft)	0.7	0.7	0.7	0.7	-	---	-	-
Bankfull Max Depth (ft) ²	1.5	1.4	1.4	1.4	-	0.8	-	1.0
Bankfull Cross-Sectional Area (ft ²) ²	17.7	16.5	17.5	15.2	-	3.8	-	5.1
Width/Depth Ratio	33.1	35.6	34.2	34.8	-	---	-	-
Entrenchment Ratio ¹	5.8	2.6	2.5	2.7	-	>1.2	-	>3.0
Bank Height Ratio ¹	1.0	1.0	1.0	1.0	-	<1	-	<1

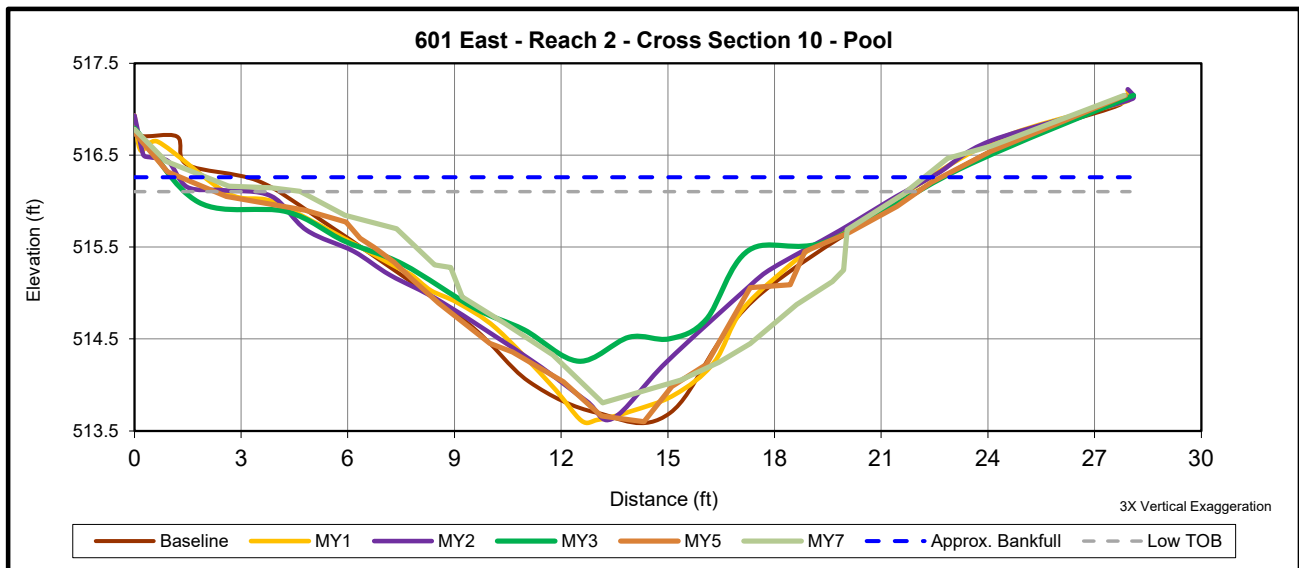
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft) ¹	19.2	19.7	19.7	20.8	-	N/A	-	N/A
Floodprone Width (ft) ¹	132.0	132.0	132.0	132.0	-	N/A	-	N/A
Bankfull Mean Depth (ft)	1.3	1.2	1.2	1.0	-	---	-	-
Bankfull Max Depth (ft) ²	2.5	2.6	2.6	2.0	-	1.9	-	2.3
Bankfull Cross-Sectional Area (ft ²) ²	25.3	24.4	23.1	20.1	-	12.1	-	20.7
Width/Depth Ratio	14.6	16.0	16.8	21.5	-	---	-	-
Entrenchment Ratio ¹	11.7	6.7	6.7	N/A	-	N/A	-	N/A
Bank Height Ratio ¹	1.0	1.0	1.0	N/A	-	N/A	-	N/A

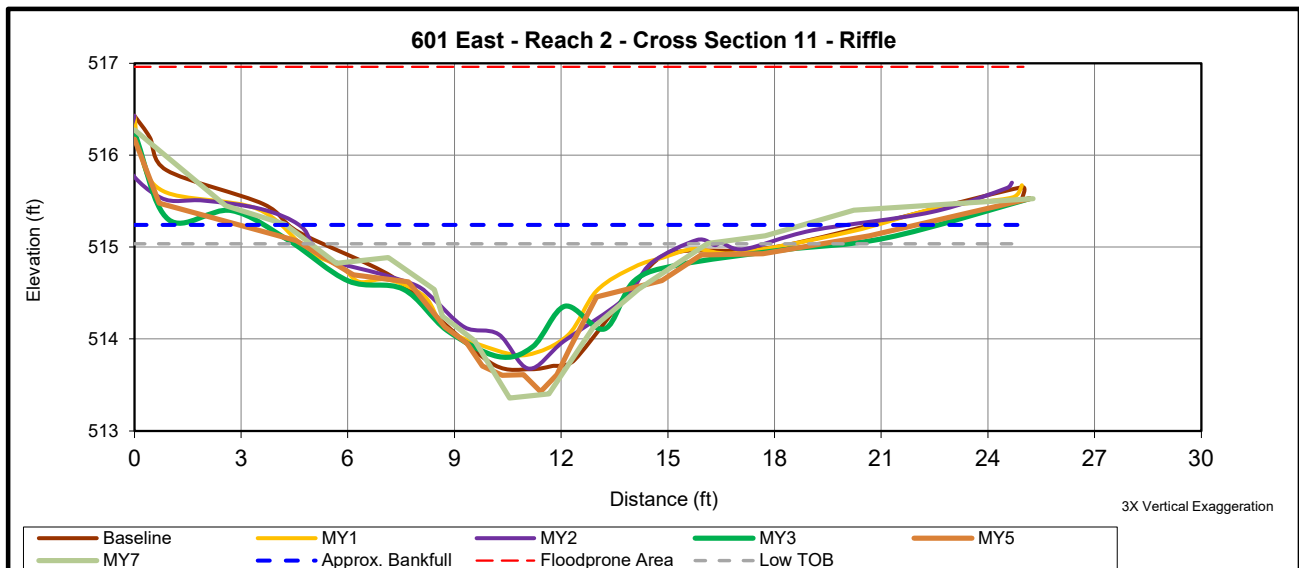
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	15.5	15.8	14.1	17.3	-	16.3	-	9.0
Floodprone Width (ft) ¹	73.0	73.0	73.0	73.0	-	>25.2	-	>25.3
Bankfull Mean Depth (ft)	0.6	0.5	0.6	0.6	-	---	-	-
Bankfull Max Depth (ft) ²	1.5	1.3	1.5	1.3	-	1.5	-	1.7
Bankfull Cross-Sectional Area (ft ²) ²	9.4	8.6	8.3	9.8	-	6.7	-	7.5
Width/Depth Ratio	25.5	28.9	23.8	30.5	-	---	-	-
Entrenchment Ratio ¹	7.1	4.6	5.2	4.2	-	>1.5	-	>2.8
Bank Height Ratio ¹	0.9	1.0	1.0	0.7	-	<1	-	<1

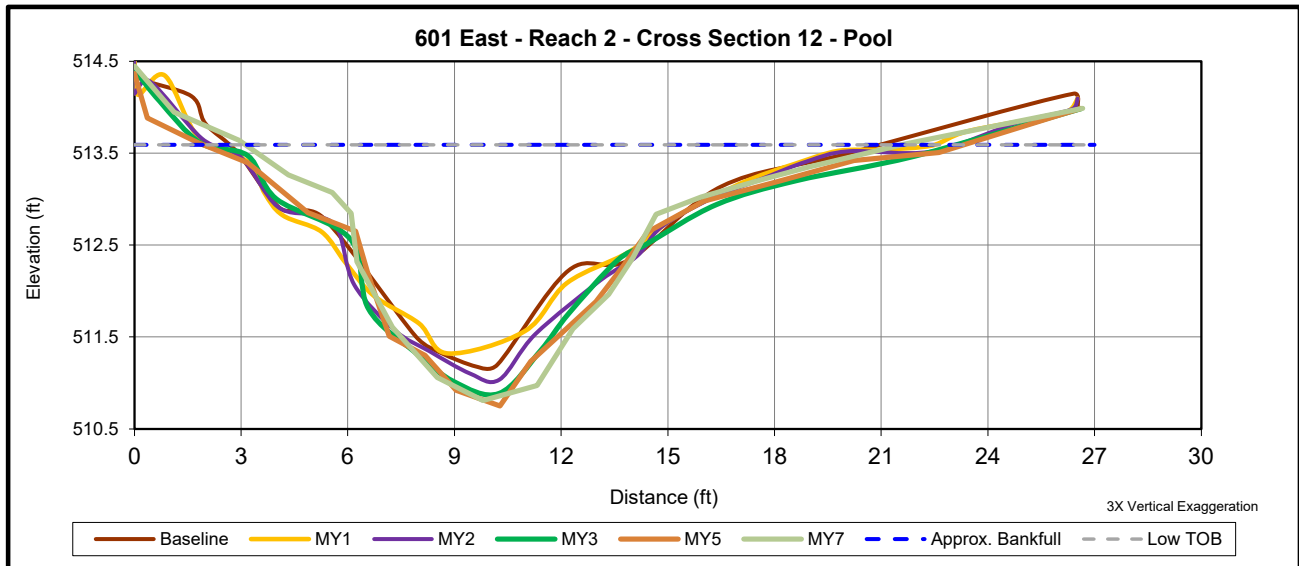
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft) ¹	20.0	20.6	20.6	20.7	-	N/A	-	-
Floodprone Width (ft) ¹	168.0	168.0	168.0	168.0	-	N/A	-	-
Bankfull Mean Depth (ft)	1.1	1.0	1.1	1.2	-	---	-	-
Bankfull Max Depth (ft) ²	2.5	2.4	2.6	2.8	-	1.9	-	2.8
Bankfull Cross-Sectional Area (ft ²) ²	21.3	21.4	23.1	24.5	-	9.4	-	18.3
Width/Depth Ratio	18.8	19.9	18.4	17.4	-	---	-	-
Entrenchment Ratio ¹	7.0	8.1	8.2	N/A	-	N/A	-	-
Bank Height Ratio ¹	0.9	1.0	1.0	N/A	-	N/A	-	-

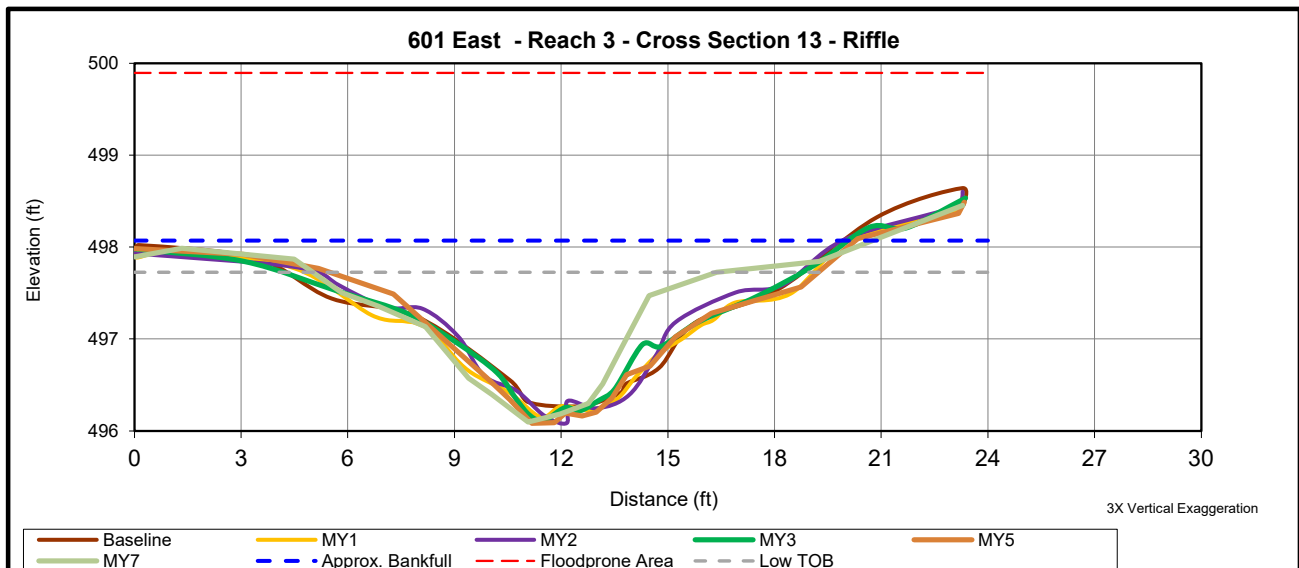
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	15.9	16.9	17.5	17.1	-	16.0	-	11.9
Floodprone Width (ft) ¹	75.0	75.0	75.0	75.0	-	>23.3	-	>23.3
Bankfull Mean Depth (ft)	0.8	0.8	0.7	0.7	-	---	-	-
Bankfull Max Depth (ft) ²	1.6	1.7	1.8	1.8	-	1.2	-	1.6
Bankfull Cross-Sectional Area (ft ²) ²	12.8	13.6	12.2	12.6	-	5.6	-	8.8
Width/Depth Ratio	19.6	21.0	25.0	23.1	-	---	-	-
Entrenchment Ratio ¹	8.8	4.4	4.3	4.4	-	>1.5	-	>2.0
Bank Height Ratio ¹	1.0	1.0	1.0	1.0	-	<1	-	<1

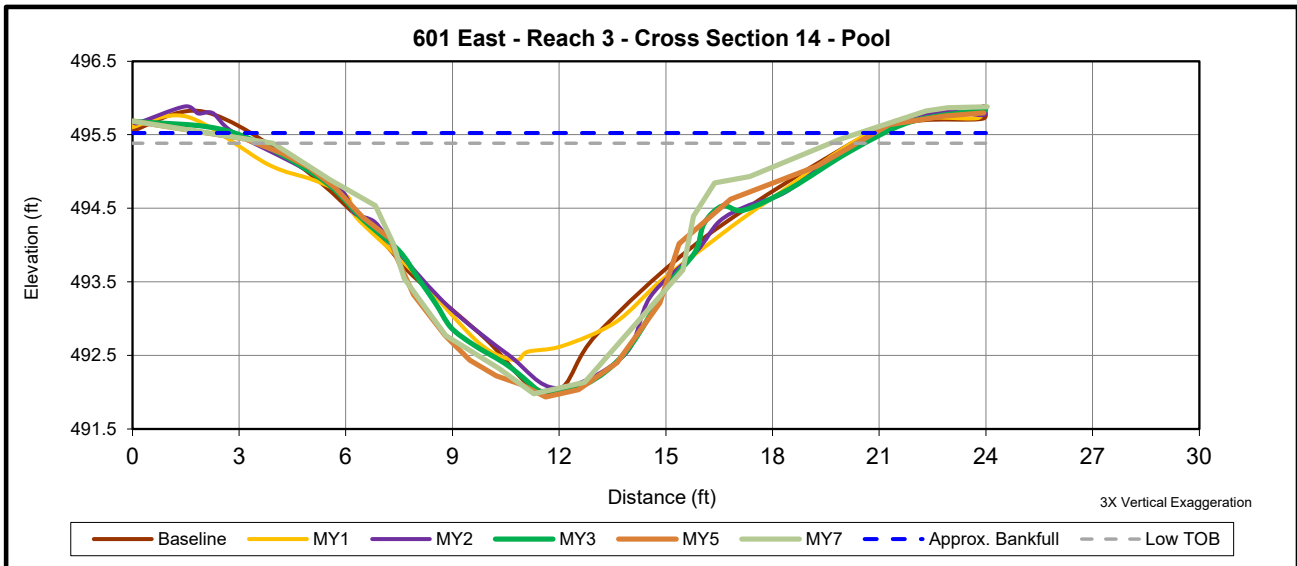
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	17.5	18.4	17.9	18.2	-	N/A	-	-
Floodprone Width (ft) ¹	350.0	350.0	350.0	350.0	-	N/A	-	-
Bankfull Mean Depth (ft)	1.6	1.5	1.6	1.6	-	---	-	-
Bankfull Max Depth (ft) ²	3.4	3.1	3.4	3.5	-	2.1	-	3.4
Bankfull Cross-Sectional Area (ft ²) ²	28.2	28.0	28.7	29.7	-	11.5	-	25.8
Width/Depth Ratio	11.0	12.0	11.2	11.2	-	---	-	-
Entrenchment Ratio ¹	12.8	19.1	19.6	N/A	-	N/A	-	-
Bank Height Ratio ¹	1.0	1.0	1.0	N/A	-	N/A	-	-

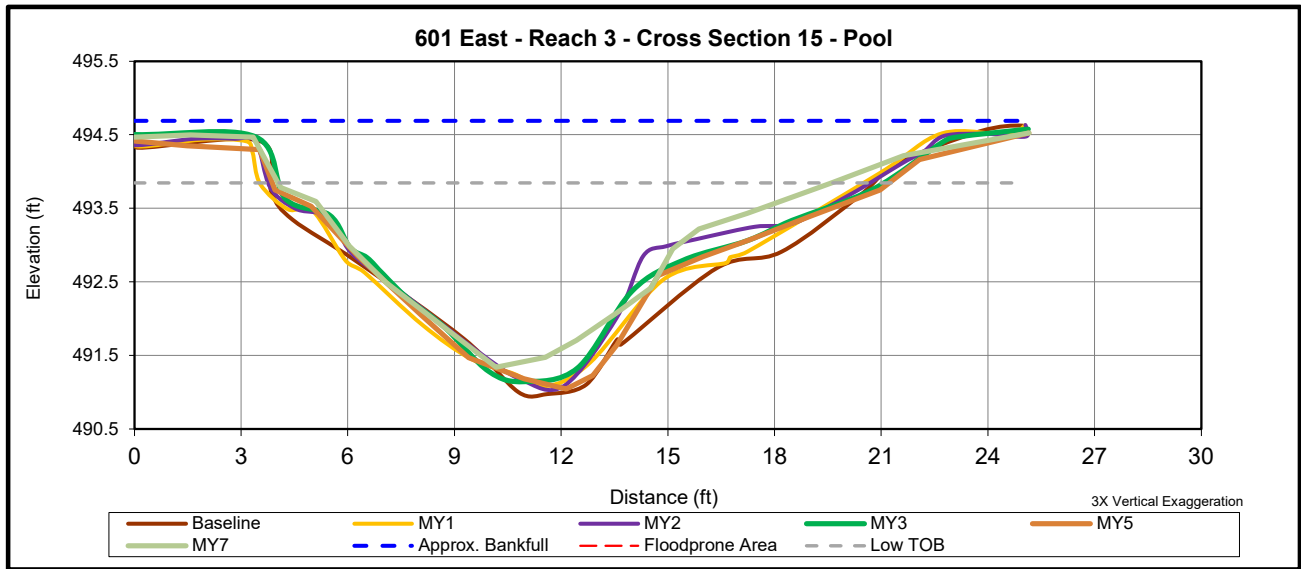
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	19.6	21.1	20.5	19.4	-	N/A	-	-
Floodprone Width (ft) ¹	350.0	350.0	350.0	350.0	-	N/A	-	-
Bankfull Mean Depth (ft)	1.8	1.6	1.5	1.7	-	---	-	-
Bankfull Max Depth (ft) ²	3.4	3.3	3.3	3.3	-	3.1	-	2.5
Bankfull Cross-Sectional Area (ft ²) ²	36.1	34.4	31.5	32.4	-	29.0	-	18.2
Width/Depth Ratio	10.6	13.0	13.3	11.6	-	---	-	-
Entrenchment Ratio ¹	5.6	16.6	17.1	N/A	-	N/A	-	-
Bank Height Ratio ¹	1.0	1.0	1.0	N/A	-	N/A	-	-

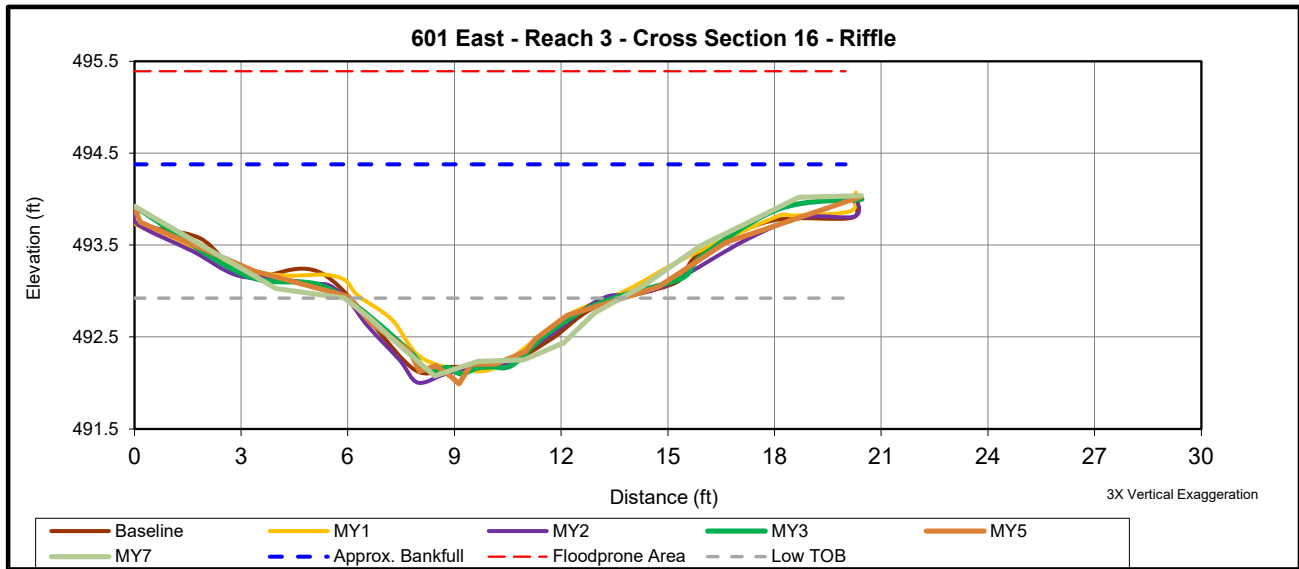
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Width (ft) ¹	17.7	17.5	18.3	16.7	-	17.9	-	7.0
Floodprone Width (ft) ¹	150.0	150.0	150.0	150.0	-	>20.4	-	>20.4
Bankfull Mean Depth (ft)	0.8	0.7	0.8	0.8	-	---	-	-
Bankfull Max Depth (ft) ²	1.6	1.6	1.7	1.6	-	0.9	-	0.8
Bankfull Cross-Sectional Area (ft ²) ²	14.1	12.9	14.8	14.0	-	3.7	-	3.8
Width/Depth Ratio	22.4	23.8	22.5	19.8	-	---	-	-
Entrenchment Ratio ¹	7.9	8.5	8.2	9.0	-	>1.1	-	>2.9
Bank Height Ratio ¹	1.0	1.0	1.0	0.8	-	<1	-	<1

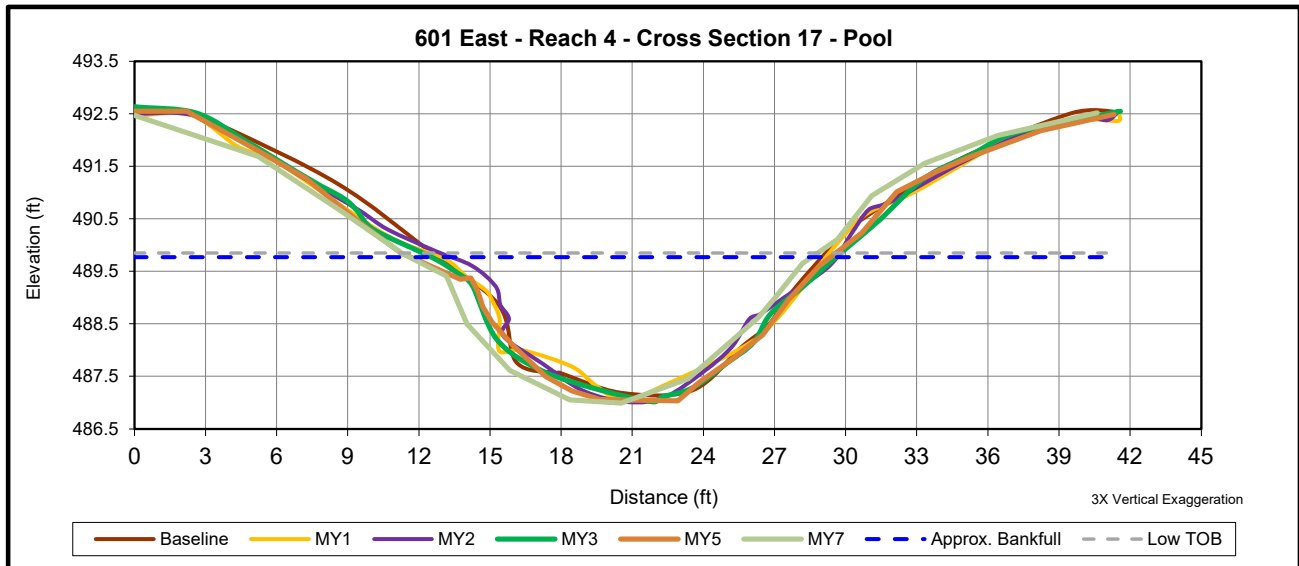
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	16.9	17.2	17.2	18.1	-	N/A	-	-
Floodprone Width (ft) ¹	42.0	42.0	42.0	42.0	-	N/A	-	-
Bankfull Mean Depth (ft)	1.8	1.7	1.7	1.7	-	---	-	-
Bankfull Max Depth (ft) ²	2.7	2.9	2.9	2.9	-	2.3	-	2.9
Bankfull Cross-Sectional Area (ft ²) ²	29.8	29.1	28.7	31.3	-	22.8	-	31.1
Width/Depth Ratio	9.6	10.2	10.3	10.4	-	---	-	-
Entrenchment Ratio ¹	2.5	2.4	2.4	N/A	-	N/A	-	-
Bank Height Ratio ¹	1.2	1.1	1.1	N/A	-	N/A	-	-

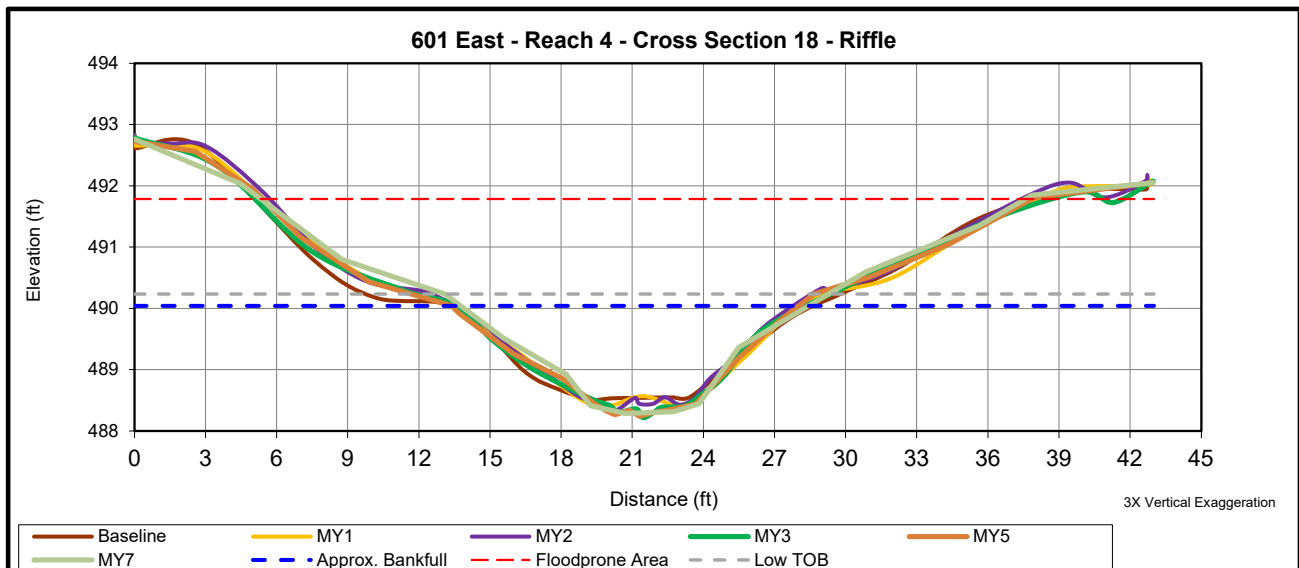
Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.



Upstream



Downstream



DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft) ¹	14.9	14.6	14.1	14.6	-	14.3	-	14.6
Floodprone Width (ft) ¹	30.4	31.0	31.0	31.0	-	>32.1	-	>32.2
Bankfull Mean Depth (ft)	1.0	1.0	1.0	1.0	-	---	-	-
Bankfull Max Depth (ft) ²	1.5	1.6	1.7	1.8	-	1.7	-	1.9
Bankfull Cross-Sectional Area (ft ²) ²	14.7	14.5	14.0	15.0	-	13.7	-	17.8
Width/Depth Ratio	15.2	14.6	14.2	14.3	-	---	-	-
Entrenchment Ratio ¹	2.1	2.1	2.2	2.1	-	>2.2	-	>2.2
Bank Height Ratio ¹	1.0	1.0	1.0	0.8	-	1.0	-	1.1

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.

Table 10. Baseline Stream Data Summary 601 East Stream Restoration Site - Reach 2 (902 feet)																										
Parameter	Gauge	Regional Curve			Pre- Existing Conditions						Reference Reach(es) Data						Design			As-built / Baseline						
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Med	Max	Min	Mean	Med	Max	SD	n	
Dimension and Substrate - Riffle																										
Bankfull Width (ft)					7	19		21			10	12.2		14.3			15.50	12	135	15.50	19.73	19.63	24.18	3.56	4	
Floodprone Width (ft)					40	214		60			42	77		11			48	91.5	135	62.00	108.75	102.50	168.00	50.05	4	
Bankfull Mean Depth (ft)					0.5	1.33		0.5			0.92	1.12		1.34				0.9		0.61	0.93	0.90	1.31	0.32	4	
Bankfull Max Depth (ft)					0.7	1.9		1			1.2	1.6		2.2				1.5		1.49	2.01	2.02	2.53	0.58	4	
Bankfull Cross Sectional Area (ft ²)					6	21		1			12.2	13		13.4				10.7		9.43	18.42	19.49	25.26	6.75	4	
Width/Depth Ratio					6.1	38		27			7.7	11.3		15.6				13.3		14.64	23.00	22.13	33.10	8.07	4	
Entrenchment Ratio					2.2	10		2.4			2.9	6.5		8.6			3.6	7.6	10	2.56	5.63	5.79	8.39	2.54	4	
Bank Height Ratio					0.9	1.7		0.34			1.1	1.5		1.7				1		0.90	0.96	0.96	1.00	0.05	4	
d50 (mm)																										
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 ^{sp} /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)					1,479						440						945			945						
Sinuosity (ft)					1.01						1.1						1.34			1.34						
Water Surface Slope (Channel) (ft/ft)																	0.0069			0.0069						
BF slope (ft/ft)																	0.0069			0.0069						
Bankfull Floodplain Area (acres)																										
Proportion over wide (%)																										
Entrenchment Class (ER Range)																										
Incision Class (BHR Range)																										
BEHI VL%/L%/M%/H%/VH%/E%																										
Channel Stability or Habitat Metric																										
Biological or Other																										

**Table 11a. 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
Bankfull Elevation (ft) - Based on AB-XSA ¹	544.82	544.82	544.82	544.82		N/A		N/A	540.40	540.40	540.40	540.40		541.09		541.3	537.87	537.87	537.87	537.87		N/A		N/A	533.69	533.69	533.69	533.69		533.58		533.8
Bankfull Width (ft) ¹	13.6	15.1	15.1	14.7		N/A		N/A	15.1	14.7	15.2	15.2		5.6		4.9	9.4	9.5	9.3	9.2		N/A		N/A	8.8	9.1	9.4	9.2		12.9		6.5
Floodprone Width (ft) ¹	45.0	>45.0	>45.0	>45.0		N/A		N/A	77.0	>77.0	>77.0	>77.0		>19.5		>19.5	154.0	>154.0	>154.0	>154.0		N/A		N/A	75.0	>75.0	>75.0	>75.0		>22.2		>22.2
Bankfull Mean Depth (ft)	1.0	0.9	0.9	0.9		---		---	0.6	0.5	0.5	0.6		---		---	0.9	0.9	0.9	0.9		---		---	0.5	0.5	0.6	0.6		---		---
Bankfull Max Depth (ft) ²	2.1	2.2	2.2	2.1		1.1		1.5	1.2	1.2	1.2	1.1		0.9		0.6	1.8	1.7	1.8	1.8		1.1		1.5	0.9	0.9	1.1	1.0		0.7		0.9
Bankfull Cross Sectional Area (ft ²) ²	14.1	13.7	14.3	13.4		3.7		5.2	9.0	8.0	8.0	8.8		3.4		1.7	8.7	8.5	8.8	8.5		3.3		7.1	4.5	4.8	5.8	5.1		2.6		2.8
Bankfull Width/Depth Ratio	13.2	16.6	15.9	16.2		---		---	25.3	27.0	28.9	26.2		---		---	10.2	10.7	9.8	9.9		---		---	17.5	17.1	15.3	16.7		---		---
Bankfull Entrenchment Ratio ¹	10.3	>3.0	>3.0	N/A		N/A		N/A	9.3	>5.2	>5.1	>5.1		>3.5		>3.9	14.9	>14.6	>16.6	N/A		N/A		N/A	15.9	>8.3	>8.0	>8.2		1.7		>3.4
Bankfull Bank Height Ratio ¹	1.0	1.0	1.0	N/A		N/A		0.7	1.0	1.0	1.0	0.7		<1		<1	1.0	1.0	1.0	N/A		N/A		0.9	0.9	1.0	1.0	0.7		<1		<1
d50 (mm)	N/A	N/A	N/A	N/A		N/A		N/A	N/A	8.3	0.062	0.062		0.062		0.062	N/A	N/A	N/A	N/A		N/A		N/A	N/A	22.0	17.0	28.0		22.0		11
	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
Bankfull Elevation (ft) - Based on AB-XSA ¹	530.49	530.49	530.49	530.49		N/A		N/A	528.11	528.11	528.11	528.11		528.18		528.1	525.02	525.02	525.02	525.02		N/A		N/A	522.48	522.48	522.48	522.48		522.33		522.5
Bankfull Width (ft) ¹	12.9	12.1	12.0	13.2		N/A		N/A	11.3	11.3	11.3	11.1		10.5		10.0	10.3	11.4	10.3	10.8		N/A		N/A	10.1	8.8	9.2	9.0		9.5		9.1
Floodprone Width (ft) ¹	61.0	>61.0	>61.0	>61.0		N/A		N/A	80.0	>80.0	>80.0	>80.0		>22.8		>22.7	63.0	>63.0	>63.0	>63.0		N/A		N/A	40.0	>40.0	>40.0	>40.0		>21.6		>21.6
Bankfull Mean Depth (ft)	1.0	0.9	0.9	1.0		---		---	0.6	0.6	0.6	0.6		---		---	1.2	1.0	1.0	1.0		---		---	0.6	0.6	0.6	0.7		---		---
Bankfull Max Depth (ft) ²	2.0	1.8	1.8	1.9		1.1		1.1	1.3	1.3	1.4	1.3		1.3		1.3	2.0	2.0	2.1	1.9		1.3		1.6	1.0	1.0	1.0	1.0		0.8		0.8
Bankfull Cross Sectional Area (ft ²) ²	12.8	11.0	11.2	12.8		4.2		4.4	6.6	6.6	7.2	6.9		5.6		5.6	12.3	11.2	10.4	9.9		4.7		7.8	6.2	5.6	5.8	5.9		4.6		4.2
Bankfull Width/Depth Ratio	13.0	13.2	12.9	13.6		---		---	19.3	19.5	17.9	17.9		---		---	8.6	11.5	10.3	11.8		---		---	16.6	13.9	14.7	13.7		---		---
Bankfull Entrenchment Ratio ¹	17.4	>5.1	>5.1	N/A		N/A		N/A	9.7	>7.1	>7.1	>7.2		>2.2		>2.3	10.7	>5.5	>6.1	N/A		N/A		N/A	10.9	>4.5	>4.3	>4.5		>2.3		>2.4
Bankfull Bank Height Ratio ¹	0.9	1.0	1.0	N/A		N/A		0.6	1.0	1.0	1.0	0.9		<1		<1	1.0	1.0	1.0	N/A		N/A		N/A	1.0	1.0	1.0	0.8		<1		<1
d50 (mm)	N/A	N/A	N/A	N/A		N/A		N/A	N/A	26.0	2.6	4.0		4.300			N/A	N/A	N/A	N/A		N/A		N/A	N/A	0.062	0.062	70.0		26.0		

¹calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ²

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

Dimension	Cross-Section 9 Riffle								Cross-Section 10 Pool								Cross-Section 11 Riffle								Cross-Section 12 Pool							
	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
Bankfull Elevation (ft) - Based on AB-XSA ¹	517.50	517.50	517.50	517.50		517.63		518.48	516.22	516.22	516.22	516.22		N/A		N/A	515.16	515.16	515.16	515.16		514.92		515.24	513.68	513.68	513.68	513.68		N/A		N/A
Bankfull Width (ft) ¹	24.2	24.3	24.4	23.0		25.4		9.8	19.2	19.7	19.7	20.8		N/A		N/A	15.5	15.8	14.1	17.3		16.3		9	20.0	20.6	20.6	20.7		N/A		N/A
Floodprone Width (ft) ¹	62.0	>62.0	>62.0	>62.0		>29.5		>29.6	132.0	>132.0	>132.0	>132.0		N/A		N/A	73.0	>73.0	>73.0	>73.0		>25.2		>25.3	168.0	>168.0	>168.0	>168.0		N/A		N/A
Bankfull Mean Depth (ft)	0.7	0.7	0.7	0.7		---		---	1.3	1.2	1.2	1.0		---		---	0.6	0.5	0.6	0.6		---		---	1.1	1.0	1.1	1.2		---		---
Bankfull Max Depth (ft) ²	1.5	1.4	1.4	1.4		0.8		1	2.5	2.6	2.6	2.0		1.9		2.3	1.5	1.3	1.5	1.3		1.5		1.7	2.5	2.4	2.6	2.8		1.9		2.8
Bankfull Cross Sectional Area (ft ²) ²	17.7	16.5	17.5	15.2		3.8		5.1	25.3	24.4	23.1	20.1		12.1		20.7	9.4	8.6	8.3	9.8		6.7		7.5	21.3	21.4	23.1	24.5		9.4		18.3
Bankfull Width/Depth Ratio	33.1	35.6	34.2	34.8		---		---	14.6	16.0	16.8	21.5		---		---	25.5	28.9	23.8	30.5		---		---	18.8	19.9	18.4	17.4		---		---
Bankfull Entrenchment Ratio ¹	5.8	>2.6	>2.5	>2.7		>1.2		>3.0	11.7	>6.7	>6.7	N/A		N/A		N/A	7.1	>4.6	>5.2	>4.2		>1.5		>2.8	7.0	>8.1	>8.2	N/A		N/A		N/A
Bankfull Bank Height Ratio ¹	1.0	1.0	1.0	1.0		<1		<1	1.0	1.0	1.0	N/A		N/A		0.9	0.9	1.0	1.0	0.7		<1		<1	0.9	1.0	1.0	N/A		N/A		N/A
d50 (mm)	N/A	0.062	5.8	2.3		N/A		12	N/A	N/A	N/A	N/A		N/A		N/A	N/A	0.062	0.062	17		16.0		7.8	N/A	N/A	N/A	N/A		N/A		N/A

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.

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

Dimension	Cross-Section 13 Riffle								Cross-Section 14 Pool								Cross-Section 15 Pool								Cross-Section 16 Riffle							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation (ft) - Based on AB-XSA ¹	497.88	497.88	497.88	497.88		497.88		498.07	495.50	495.50	495.50	495.50		N/A		N/A	494.42	494.42	494.42	494.42		N/A		N/A	493.73	493.73	493.73	493.73		493.73		494.38
Bankfull Width (ft) ¹	15.9	16.9	17.5	17.1		16		11.9	17.6	18.4	17.9	18.2		N/A		N/A	19.6	21.1	20.5	19.4		N/A		N/A	17.7	17.5	18.3	16.7		17.9		7
Floodprone Width (ft) ¹	75.0	>75.0	>75.0	>75.0		>23.3		>23.3	350.0	>350.0	>350.0	>350		N/A		N/A	350.0	>350.0	>350.0	>350.0		N/A		N/A	150.0	>150.0	150.0	>150.0		>20.4		>20.4
Bankfull Mean Depth (ft)	0.8	0.8	0.7	0.7		---		---	1.6	1.5	1.6	1.6		---		---	1.8	1.6	1.5	1.7		---		---	0.8	0.7	0.8	0.8		---		---
Bankfull Max Depth (ft) ²	1.6	1.7	1.8	1.8		1.2		1.6	3.4	3.1	3.4	3.5		2.1		3.4	3.4	3.3	3.3	3.3		3.1		2.5	1.6	1.6	1.7	1.6		0.9		0.8
Bankfull Cross Sectional Area (ft ²) ²	12.8	13.6	12.2	12.6		5.6		8.8	28.2	28.0	28.7	29.7		11.5		25.8	36.1	34.4	31.5	32.4		29		18.2	14.1	12.9	14.8	14.0		3.7		3.8
Bankfull Width/Depth Ratio	19.6	21.0	25.0	23.1		---		---	11.0	12.0	11.2	11.2		---		---	10.6	13.0	13.3	11.6		---		---	22.4	23.8	22.5	19.8		---		---
Bankfull Entrenchment Ratio ¹	8.8	>4.4	>4.3	>4.4		>1.5		>2.0	12.8	>19.1	>19.6	N/A		N/A		N/A	5.6	>16.6	>17.1	N/A		N/A		N/A	7.9	>8.5	>8.2	>9.0		>1.1		>2.9
Bankfull Bank Height Ratio ¹	1.0	1.0	1.0	1.0		<1		<1	1.0	1.0	1.0	N/A		N/A		n/a	1.0	1.0	1.0	N/A		N/A		N/A	1.0	1.0	1.0	0.8		<1		<1
d50 (mm)	N/A	20	9.1	85.0		10.0		5.4	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	N/A		N/A		N/A	N/A	31.0	3.3	62.0		9.4		22

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.

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

Dimension	Cross-Section 17 Pool								Cross-Section 18 Riffle							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation (ft) - Based on AB-XSA ¹	489.11	489.11	489.11	489.11		N/A		N/A	490.01	490.01	490.01	490.01		489.99		490.04
Bankfull Width (ft) ¹	16.9	17.2	17.2	18.1		N/A		N/A	14.9	14.6	14.1	14.6		14.3		14.6
Floodprone Width (ft) ¹	42.0	>42.0	>42.0	>42.0		N/A		N/A	30.4	>31.0	>31.0	>31.0		>32.1		>32.2
Bankfull Mean Depth (ft)	1.8	1.7	1.7	1.7		---		---	1.0	1.0	1.0	1		---		---
Bankfull Max Depth (ft) ²	2.7	2.9	2.9	2.9		2.3		2.9	1.5	1.6	1.7	1.8		1.7		1.9
Bankfull Cross Sectional Area (ft ²) ²	29.8	29.1	28.7	31.3		22.8		31.1	14.7	14.5	14.0	15		13.7		17.8
Bankfull Width/Depth Ratio	9.6	10.2	10.3	10.4		---		---	15.2	14.6	14.2	14.3		---		---
Bankfull Entrenchment Ratio ¹	2.5	>2.4	>2.4	N/A		N/A		N/A	2.0	>2.1	>2.2	>2.1		>2.2		>2.2
Bankfull Bank Height Ratio ¹	1.2	1.1	1.1	N/A		N/A		N/A	1.0	1.0	1.0	0.8		1.0		1.1
d50 (mm)	N/A	N/A	N/A	N/A		N/A		N/A	N/A	47	4.2	12.0		17.0		13

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.

**Table 11b. Monitoring Data - Stream Reach Data Summary
601 East - Reach 1 (1393 feet) XS 2, 4, 6, 8**

Parameter	Baseline					MY - 1					MY - 2					MY - 3					MY - 4					MY - 5					MY - 6					MY - 7												
	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						
Dimension & Substrate - Riffle																																																
Bankfull Width (ft) ¹	8.8	11.4	10.8	15.1	2.2	8	9.1	11.3	10.8	14.7	2.4	4	9.2	11.3	10.4	15.2	2.8	4	9.0	11.1	10.2	15.2	2.9	4							5.6	9.6	10.0	12.9	3.0	4							10.00	12.95	12.40	17.00	3.09	4.00
Floodprone Width (ft) ¹	40.0	74.4	69.0	154.0	35.3	8	40.0	68.0	76.0	80.0	18.8	4	40.0	68.0	76.0	80.0	18.8	4	40.0	68.0	76.0	80.0	18.8	4							19.5	21.5	21.9	22.8	1.4	4							19.50	21.50	21.90	22.70	1.41	4.00
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	0.5	0.6	0.6	0.6	0.0	4	0.6	0.6	0.6	0.7	0.1	4							-	-	-	-	-	-							-	-	-	-	-	-
Bankfull Max Depth (ft) ²	0.9	1.5	1.5	2.1	0.5	8	0.9	1.1	1.1	1.3	0.2	4	1.0	1.2	1.1	1.4	0.1	4	1.0	1.1	1.1	1.3	0.1	4							0.7	0.9	0.9	1.3	0.3	4							0.60	0.90	0.85	1.30	0.29	4.00
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	5.8	6.7	6.5	8.0	1.1	4	5.1	6.7	6.4	8.8	1.6	4							2.6	4.1	4.0	5.6	1.3	4							1.70	3.58	3.50	5.60	1.69	4.00
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	14.7	19.2	16.6	28.9	6.6	4	9.9	18.6	17.3	26.2	5.4	4							-	-	-	-	-	-							-	-	-	-	-	-
Entrenchment Ratio ³	3.3	6.9	5.6	16.4	4.2	8	3.9	6.1	6.2	8.3	2.0	4	4.3	6.1	6.1	8.0	1.7	4	4.5	6.3	6.2	8.2	1.7	4							1.7	2.4	2.3	3.5	0.8	4							1.20	1.75	1.75	2.30	0.47	4.00
Bank Height Ratio ⁴	0.9	1.0	1.0	1.0	0.0	8	1.0	1.0	1.0	1.0	0.0	4	1.0	1.0	1.0	1.0	0.0	4	0.7	0.8	0.8	0.9	0.1	4							1.0	1.0	1.0	1.0	0.0	4							0.50	0.75	0.80	0.90	0.17	4.00
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

Baseline based on riffle and pool dimensions - MY1-7 based solely on riffle dimensions

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.

**Table 11b cont'd. Monitoring Data - Stream Reach Data Summary
601 East - Reach 2 (902 feet) XS 9, 10**

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5						MY - 6						MY - 7					
	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) ¹	15.5	19.7	19.6	24.2	3.6	4	15.8	20.1	20.1	24.3	6.0	2	14.1	19.2	19.2	24.4	7.3	2	17.3	20.2	20.2	23.0	4.0	2							16.3	20.9	20.9	25.4	6.4	2							21.00	23.20	23.20	25.40	3.11	2.00
Floodprone Width (ft) ¹	62.0	108.8	102.5	168.0	50.0	4	62.0	67.5	67.5	73.0	7.8	2	62.0	67.5	67.5	73.0	7.8	2	62.0	67.5	67.5	73.0	7.8	2							25.2	27.4	27.4	29.5	3.0	2							29.50	29.50	29.50	29.50	-	1.00
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	0.6	0.7	0.7	0.7	0.1	2	0.6	0.7	0.7	0.7	0.1	2							-	-	-	-	-	-							-	-	-	-	-	-
Bankfull Max Depth (ft) ²	1.5	2.0	2.0	2.5	0.6	4	1.3	1.4	1.4	1.4	0.1	2	1.4	1.5	1.5	1.5	0.0	2	1.3	1.4	1.4	1.4	0.1	2							0.8	1.2	1.2	1.5	0.5	2							0.80	0.80	0.80	0.80	-	1.00
Bankfull Cross-Sectional Area (ft ²) ²	9.4	18.4	19.5	25.3	6.7	4	8.6	12.6	12.6	16.5	5.6	2	8.3	12.9	12.9	17.5	6.5	2	9.8	12.5	12.5	15.2	3.8	2							3.8	5.3	5.3	6.7	2.1	2							3.80	7.95	7.95	12.10	5.87	2.00
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	23.8	29.0	29.0	34.2	7.4	2	30.5	32.7	32.7	34.8	3.0	2							-	-	-	-	-	-							-	-	-	-	-	-
Entrenchment Ratio ¹	2.6	5.6	5.8	8.4	2.5	4	2.6	3.6	3.6	4.6	1.4	2	2.5	3.9	3.9	5.2	1.9	2	2.7	3.5	3.5	4.2	1.1	2							1.2	1.4	1.4	1.5	0.2	2							1.20	1.20	1.20	1.20	-	1.00
Bank Height Ratio ¹	0.9	1.0	1.0	1.0	0.0	4	1.0	1.0	1.0	1.0	0.0	2	1.0	1.0	1.0	1.0	0.0	2	0.7	0.9	0.9	1.0	0.2	2							1.0	1.0	1.0	1.0	0.0	2							1.00	1.00	1.00	1.00	-	1.00
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

Baseline based on riffle and pool dimensions - MY1-7 based solely on riffle dimensions

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.

**Table 11b cont'd. Monitoring Data - Stream Reach Data Summary
601 East - Reach 3 (1018 feet) XS 13, 16**

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5						MY - 6						MY - 7											
	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) ¹	15.9	17.7	17.7	19.6	1.5	4	16.9	17.2	17.2	17.5	0.4	2	17.5	17.9	17.9	18.3	0.6	2	16.7	16.9	16.9	17.1	0.3	2							16.0	17.0	17.0	17.9	1.3	2													16.40	17.65	17.65	18.90	1.77	2.00
Floodprone Width (ft) ¹	75.0	231.3	250.0	350.0	140.5	4	75.0	112.5	112.5	150.0	53.0	2	75.0	112.5	112.5	150.0	53.0	2	75.0	112.5	112.5	150.0	53.0	2							20.4	21.9	21.9	23.3	2.1	2							20.40	126.35	126.35	232.30	149.84	2.00						
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	0.7	0.8	0.8	0.8	0.1	2	0.7	0.8	0.8	0.8	0.1	2							-	-	-	-	-	-							-	-	-	-	-	-						
Bankfull Max Depth (ft) ²	1.6	2.5	2.5	3.4	1.1	4	0.7	0.8	0.8	0.8	0.1	2	1.7	1.8	1.8	1.8	0.0	2	1.6	1.7	1.7	1.8	0.1	2							0.9	1.1	1.1	1.2	0.2	2							0.80	1.20	1.20	1.60	0.57	2.00						
Bankfull Cross-Sectional Area (ft ²) ²	12.8	22.8	21.1	36.1	11.3	4	12.9	13.3	13.3	13.6	0.5	2	12.2	13.5	13.5	14.8	1.8	2	12.6	13.3	13.3	14.0	1.0	2							3.7	4.7	4.7	5.6	1.3	2							3.90	6.35	6.35	8.80	3.46	2.00						
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	22.5	23.8	23.8	25.0	1.8	2	19.8	21.5	21.5	23.1	2.3	2							-	-	-	-	-	-							-	-	-	-	-	-						
Entrenchment Ratio ¹	4.7	12.7	13.2	19.9	7.3	4	4.4	6.5	6.5	8.5	2.9	2	4.3	6.3	6.3	8.2	2.8	2	4.4	6.7	6.7	9.0	3.3	2							1.1	1.3	1.3	1.5	0.3	2							1.20	1.20	1.20	1.20	0.00	2.00						
Bank Height Ratio ¹	1.0	1.0	1.0	1.0	0.0	4	1.0	1.0	1.0	1.0	0.0	2	1.0	1.0	1.0	1.0	0.0	2	0.8	0.9	0.9	1.0	0.1	2							1.0	1.0	1.0	1.0	0.0	2							0.50	0.70	0.70	0.90	0.28	2.00						
Profile																																																						
Rifle Length (ft)	10.1	24.1	16.8	110.3	22.1	19																																																
Rifle 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 = Rifle / Ru = Run / P = Pool / G = Glide / S = Step

Baseline based on rifle and pool dimensions - MY1-7 based solely on rifle dimensions

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.

**Table 11b cont'd. Monitoring Data - Stream Reach Data Summary
601 East - Reach 4 (495 feet) XS 18**

Parameter	Baseline						MY - 1					MY - 2					MY - 3					MY - 4					MY - 5					MY - 6					MY - 7											
	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						
Dimension & Substrate - Riffle																																																
Bankfull Width (ft) ¹	14.9	15.9	15.9	16.9	1.4	2	-	14.6	-	-	N/A	1	-	14.1	-	-	N/A	1	-	14.6	-	-	N/A	1							-	14.3	-	-	N/A	1.0							14.60	14.60	14.60	14.60	N/A	1.00
Floodprone Width (ft) ¹	30.4	36.2	36.2	42.0	8.2	2	-	31.0	-	-	N/A	1	-	31.0	-	-	N/A	1	-	31.0	-	-	N/A	1							-	>32.1	-	-	N/A	1.0							32.20	32.20	32.20	32.20	N/A	1.00
Bankfull Mean Depth (ft)	1.0	1.4	1.4	1.8	0.5	2	-	1.0	-	-	N/A	1	-	1.0	-	-	N/A	1	-	1.0	-	-	N/A	1							-	-	-	-	N/A	1.0							-	-	-	-	N/A	-
Bankfull Max Depth (ft) ²	1.5	2.1	2.1	2.7	0.9	2	-	1.6	-	-	N/A	1	-	1.7	-	-	N/A	1	-	1.8	-	-	N/A	1							-	1.70	-	-	N/A	1.0							1.90	1.90	1.90	1.90	N/A	1.00
Bankfull Cross-Sectional Area (ft ²) ²	14.7	22.3	22.3	29.8	10.7	2	-	14.5	-	-	N/A	1	-	14.0	-	-	N/A	1	-	15.0	-	-	N/A	1							-	13.7	-	-	N/A	1.0							17.80	17.80	17.80	17.80	N/A	1.00
Width/Depth Ratio	9.6	12.4	12.4	15.2	3.9	2	-	15.6	-	-	N/A	1	-	14.2	-	-	N/A	1	-	14.3	-	-	N/A	1							-	-	-	-	N/A	1.0							-	-	-	-	N/A	-
Entrenchment Ratio ¹	2.0	2.3	2.3	2.5	0.3	2	-	2.1	-	-	N/A	1	-	2.2	-	-	N/A	1	-	2.1	-	-	N/A	1							-	>2.2	-	-	N/A	1.0							2.20	2.20	2.20	2.20	N/A	1.00
Bank Height Ratio ¹	1.0	1.1	1.1	1.2	0.1	2	-	1.0	-	-	N/A	1	-	1.0	-	-	N/A	1	-	0.8	-	-	N/A	1							-	1.00	-	-	N/A	1.0							1.10	1.10	1.10	1.10	N/A	1.00
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

Baseline based on riffle and pool dimensions - MY1-7 based solely on riffle dimensions

Note: Starting in MY5, the parameters denoted with ¹ were calculated using the as-built cross sectional area as the basis for adjusting the bankfull elevation and the parameters denoted with ² were calculated using the current years low top of bank as the bankfull elevation. These changes reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT, and industry mitigation providers.

Table 12. Pebble County Data Summary

Table 12. Pebble Count Data Summary 601 East														
Stream Reach	MY1 - 2015		MY2 - 2016		MY3 - 2017		MY4 - 2018		MY5 - 2019		MY6 - 2020		MY7 - 2021	
	Pebble Count		Pebble Count		Pebble Count		Pebble Count		Pebble Count		Pebble Count		Pebble Count	
	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)	D ₅₀ (mm)	D ₈₄ (mm)
Reach 1	14.1	48.8	4.9	25.6	25.5	87.3	4.8	48.3	12.0	28.8	-	-	5.44	40.01
Reach 2	0.062	61	2.9	34.1	9.7	20	5.5	30.9	16.0	58.0	-	-	9.9	46.5
Reach 3	27	79.5	6.2	39.5	73.5	140	26.5	72.0	9.7	70.5	-	-	13.7	51.5
Reach 4	47	110	4.2	66	12	95	12.0	95.0	17.0	63.0	-	-	13	120

Charts 1-5. MY5 Stream Reach Substrate Composition Charts

Chart 1.

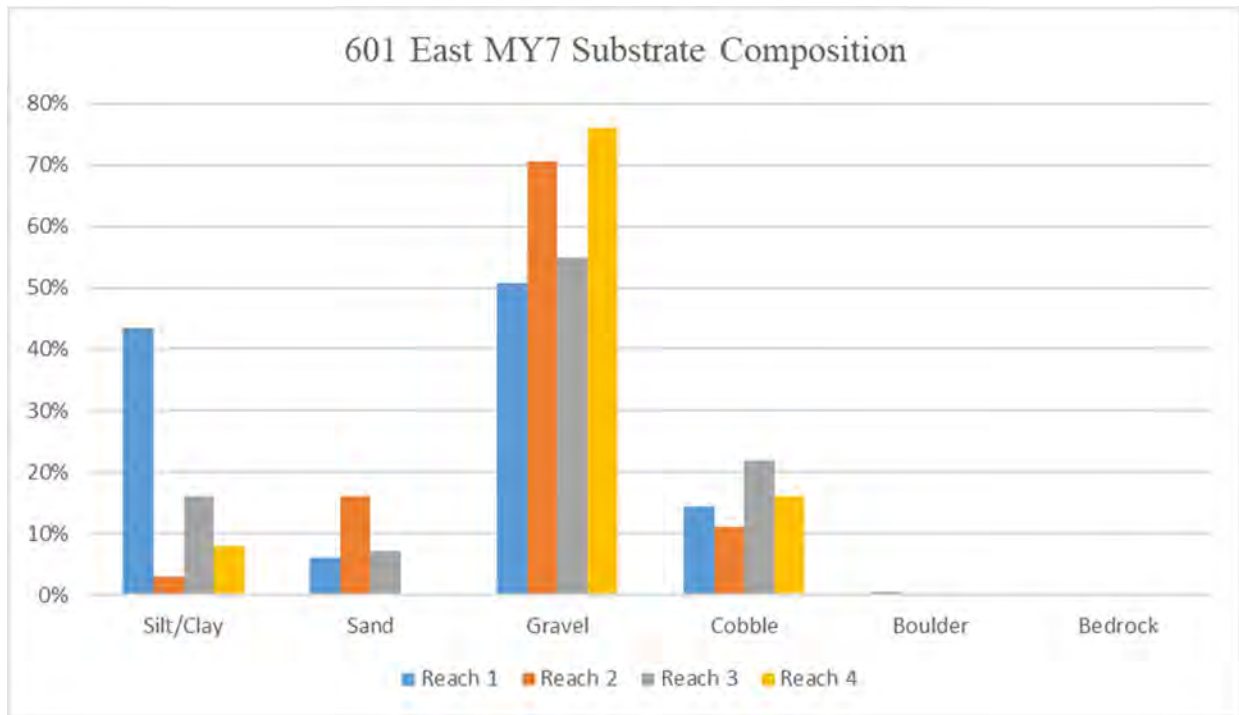


Chart 2.

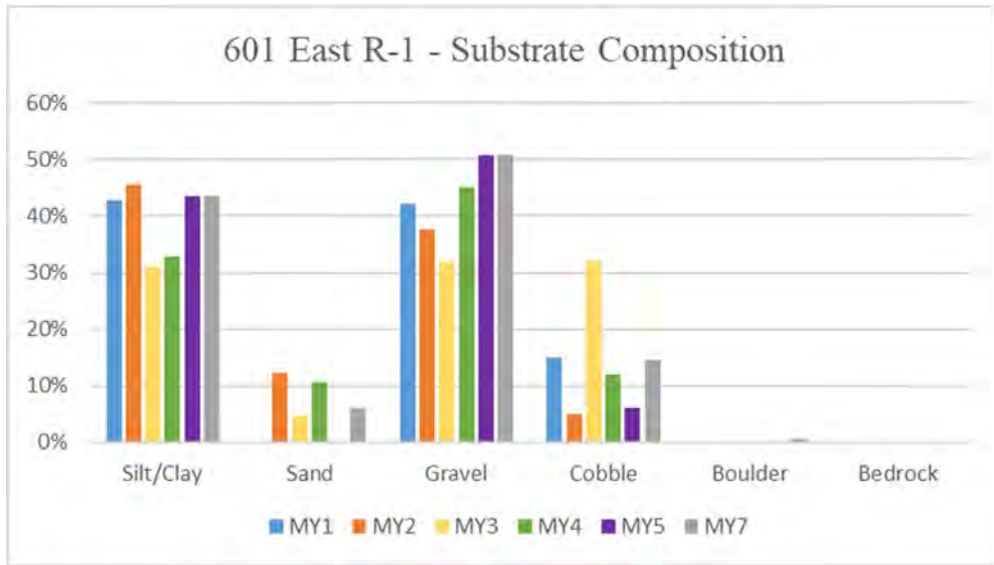


Chart 3.

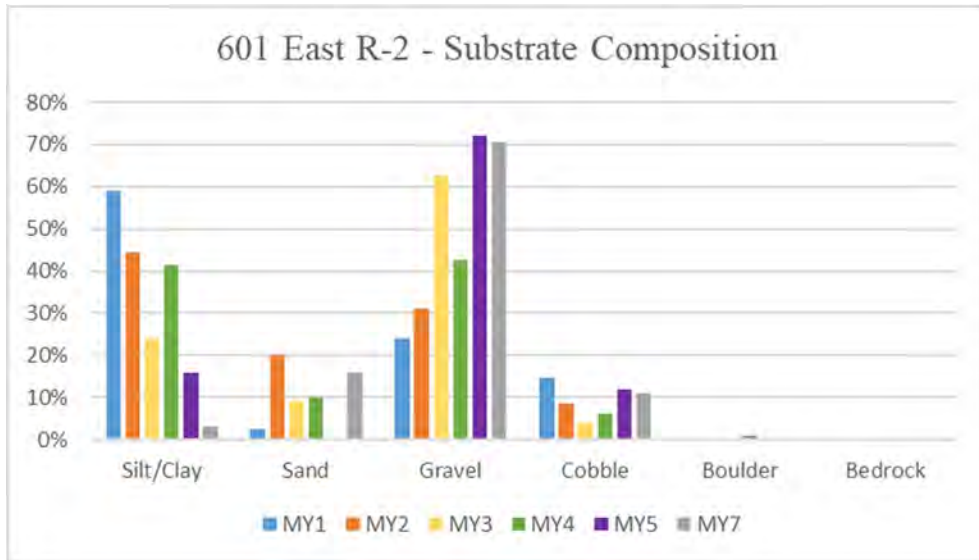


Chart 4.

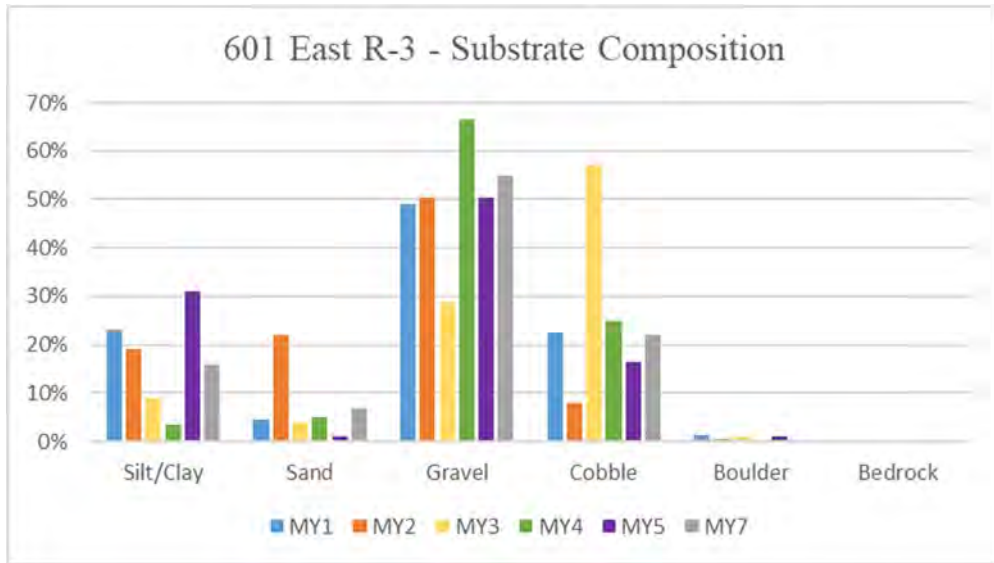
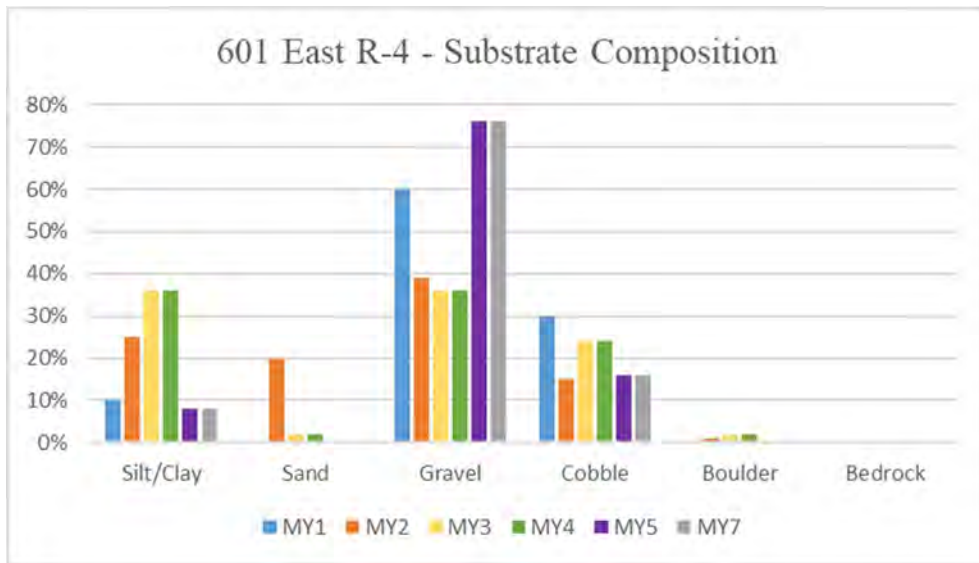


Chart 5.



**Table 13. Bank Pin Array Summary
601 E Stream Mitigation Site**

Bank Pin Location	Position	Year 1 Reading (mm)	Year 2 Reading (mm)	Year 3 Reading (mm)	Year 4 Reading (mm)	Year 5 Reading (mm)	Year 6 Reading (mm)	Year 7 Reading (mm)
XS-1	Upstream	0.0	35.6	0.0	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XS-3	Upstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XS-5	Upstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XS-7	Upstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	12.7	0.0	0.0	0.0	0.0	0.0	0.0
XS-10	Upstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XS-12	Upstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XS-14	Upstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XS-15	Upstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	0.0	0.0	0.0	0.0	0.0	0.0	0.0
XS-17	Upstream	0.0	0.0	50.8*	0.0	0.0	0.0	0.0
	At Cross-Section	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Downstream	0.0	0.0	177.8*	0.0	0.0	0.0	0.0

*A beaver dam directly downstream caused unusually high water and localized bank erosion.

Appendix E

Hydrology Data

Table 14. Verification of Bankfull and Stream Flow Events

Year	Number of Bankfull Events	Maximum Bankfull Height (ft)	Date of Occurrence
SR Reach 2			
MY1 2015	1	Unknown	9/30/2015
MY2 2016	1	1.40	2/16/2016
MY3 2017	3	2.50	4/24/2017
MY4 2018	1	0.66	9/16/2018
MY5 2019	NA	NA	NA
MY6 2020	5	1.82	5/27/2020
MY7 2021	7	1.89	6/6/2021
SR Reach 3			
MY1 2015	0	---	---
MY2 2016	1	0.20	Unknown
MY3 2017	3	1.40	6/20/2017
MY4 2018	1	0.79	9/16/2018
MY5 2019	NA	NA	NA
MY6 2020	8	0.95	5/27/2020
MY7 2021	11	1.17	8/18/2021

MY5 gauges failed due to ant infestations

MY6 HOBOS were installed and used in place of cork gauges

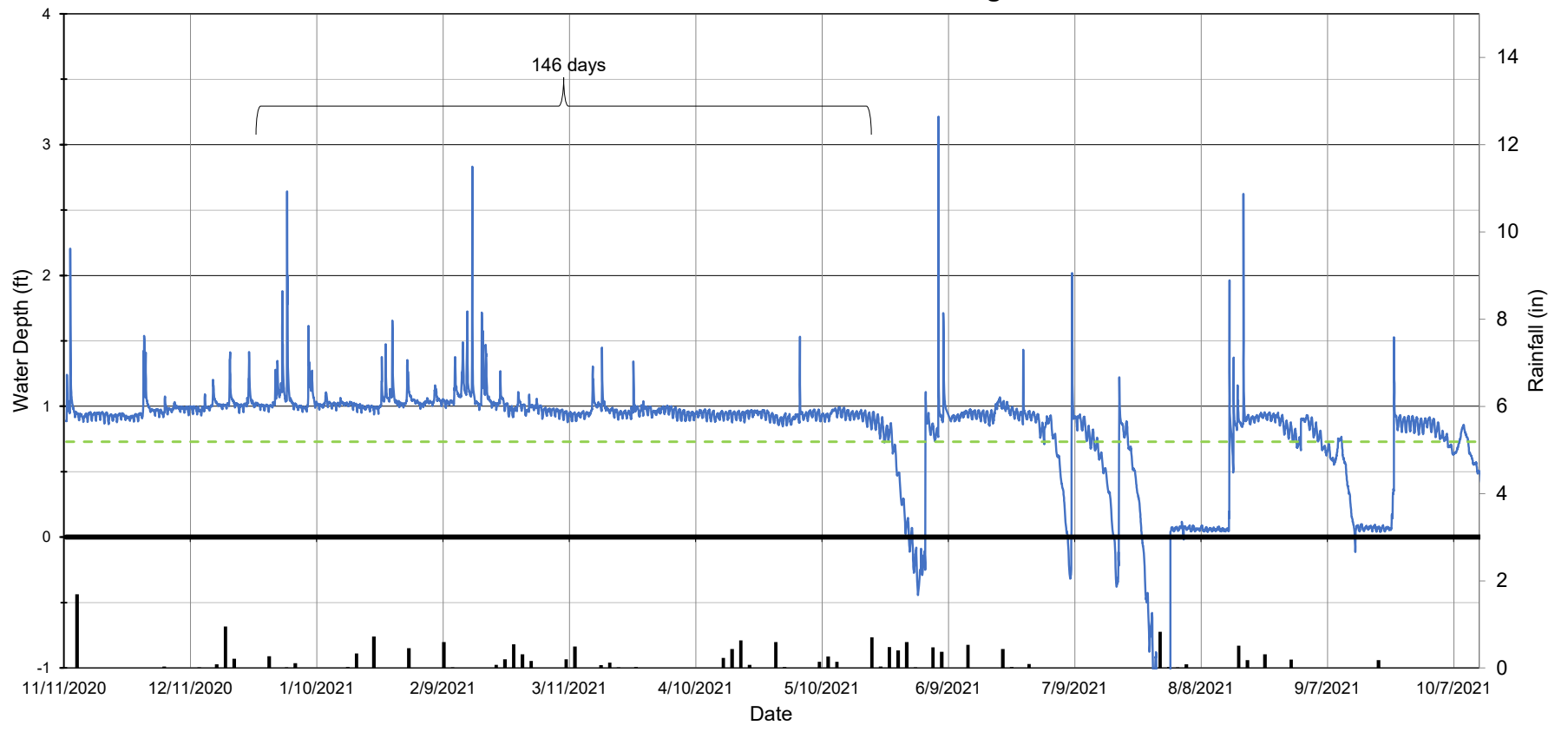
Year	Consecutive Flow Days	Total Flow Days	Number of Flow Events	Maximum Flow Day Date Range
FG Reach 1				
MY6 2020	58	113	7	---
MY7 2021	146	219	7	1/1/2021 - 5/26/2021

FG installed on 6/3/2020

Table 15. Rainfall Summary

Month	Average	Normal Limits		Pageland Station Precipitation
		30 Percent	70 Percent	
January	4.07	2.74	4.87	3.87
February	3.49	2.39	4.17	4.59
March	4.45	3.10	5.29	2.23
April	3.07	1.82	3.72	0.62
May	3.47	2.22	4.18	1.77
June	4.57	2.91	5.50	4.84
July	4.50	2.90	5.42	2.33
August	4.71	2.78	5.18	3.39
September	4.24	2.02	5.18	2.09
October	3.81	2.00	4.57	0.41
November	3.33	1.90	4.05	---
December	3.85	2.56	4.62	---
Total	47.56	29.34	56.75	26.14
Above Normal Limits		Below Normal Limits		

MY7 2021 601 East Reach 1 Flow Gauge



Legend: Rainfall (black bar), Reach 1 (blue line), Bed (solid black line), DS Riffle Elevation (dashed green line)