UT to Rush Fork Stream Mitigation Project
Year 2 (2023) Monitoring Report FINAL

DMS Project ID No. 100068, DEQ Contract No. 7535

RFP# 16-007335 (Issued 9/8/17)

USACE Action ID No. SAW-2018-01171, DWR# 2018-1034

Haywood County, North Carolina, French Broad River Basin: 06010106

MY2 Data Collection Period: May – November 2023

Submitted to/Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services (DMS)
1652 Mail Service Center
Raleigh, North Carolina 27699-1652

Michael Baker
INTERNATIONAL

Submission Date: January 2024

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January 19, 2023

Paul Wiesner, PM
NCDEQ, Division of Mitigation Services
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

Subject:
Response to DMS Comments (January 3, 2024) for DRAFT Monitoring Year 2 Report.
UT to Rush Fork Stream Mitigation Project
French Broad River Basin: 06010106
DMS Project #100068
DEQ Contract #7535

Dear Mr. Wiesner,

Please find below our responses to the NC Division of Mitigation Services (DMS) review comments dated January 3, 2024, in reference to the UT to Rush Fork Stream Mitigation Project's DRAFT Monitoring Year 2 Report. We have revised the Draft document in response to review comments as outlined below.

- General: Feral hog damage was reported in MY1 (2022). Was any additional feral hog damage noted in MY2 (2023)? Please update the report text accordingly.
  RESPONSE: No feral hog damage was noted during MY2 (2023). The report text has been updated as requested.

- During the April 19, 2023, IRT Credit Release meeting, Baker reported that some supplemental planting was conducted on the site and would be reported in MY2 (2023). Please report any supplemental planting efforts completed in MY2 (2023) in the report text and Table 2 (Project Activity and Reporting History). Please also include a map of the supplementally planted area/s and a species list as an Appendix in the final MY2 (2023) report. The planting list should include a wetness tolerance column for each species planted (FACW; FAC; FACU; etc.).
  RESPONSE: A small number of stems were planted in March 2023. This information has been added to the report text and Table 2. A shapefile showing the approximate extent of the planted area has been added to the CCPV's and the electronic submittal and a planting list including a wetness tolerance has been added to Table 7 Vegetation Plot Data in Appendix C as requested.

- Section 1.4 Monitoring Results and Project Performance: *"Baker will send an email and letter to the property owner to notify the farmer who leases the field that this is in violation of the terms of the conservation easement. Baker will work with the property owner and farmer to create a path for equipment, so this violation does not occur in the future."* Please include a copy of the email and a signed copy of the landowner notification letter in an Appendix of the revised MY2 (2023) report.
  RESPONSE: A copy of the email and I signed copy of the landowner notification letter has been added in Appendix F *Correspondence* as requested.

- Section 1.4 Monitoring Results and Project Performance: "*These VPAs and other areas observed low density will be supplementally planted before the growing season begins in April of 2024 (MY3) at a rate of 200 stems per acre.*" What supplemental plant species are

proposed? Please consider planted stem diversity when selecting species for the MY3 (2024) supplemental planting effort. If the proposed species vary from the planting list in the IRT approved mitigation plan, the IRT should be consulted through DMS. Table 6 indicates that the low stem density areas represent 5.5% of the site, so an Adaptive Management Plan (AMP) does not appear to be warranted. Please include a map of the supplementally planted area/s and a species list as an Appendix in next year's MY3 (2024) report. The planting list should include a wetness tolerance column for each species planted (FACW; FAC; FACU; etc.).
RESPONSE: Species selected for planting in MY3 (2024) will partially depend on nursery availability; however, and effort will be made to procure a diverse group of species which are also included from the planting list on the approved mitigation plan. Planted areas will be mapped and reported on in the MY3 report as requested.

- Current Condition Plan View (CCPV) Maps: Since the VPAs reported are all low stem density areas, DMS recommends updating the map legend to Low Stem Density Areas.
  RESPONSE: The map legend has been updated as requested.

- Table 5 & Table 6: Please include the assessment date/s at the top of each table. The date is provided for some reaches but not all.
  RESPONSE: The assessment dates have been added to each reach as requested.

- Bankfull Events & Crest Gauge graphs: Please review and confirm that the graphs and data presented are accurate. It is difficult to determine how the provided crest gauge data correlates with the provided rainfall data; no rain gauge data is provided for the one (1) bankfull event reported in MY3 (2023). Many times, the crest gauge data falls well below the stream bed elevation. Please consider using a different color for the streambed elevation line. Lastly, Gauge is misspelled in the legend for Crest Gauge #2.
  RESPONSE: After further evaluation we believe that the bankfull event reported on 12-23-2022 was an erroneous reading as there is no corroborating rain or flow data. This has been called out on the graph and deleted as an event in Table 10. Crest gauge data prior to the relocation of the gauges to in-stream should be disregarded as there were no events recorded and the graph is inaccurate prior to 5-10-2023 based on streambed and bankfull elevation lines. We also believe there may have been a malfunction with the site BARO as both the crest gauges and the flow gauges data takes the same sharp downward trend in late June 2023. This trend falls well below the streambed elevation in most cases which is not possible in reality. Baker staff will download and replace the BARO if necessary, early in MY3. Lastly, the spelling error and the streambed elevation line have been revised as requested.

- Table 11: Please update the report so the table and CCPV maps are synonymous. The CCPV maps report FL-1; FL-2; FL-3. Table 11 reports RF1; RF2; RF3.
  RESPONSE: The CCPV maps have been changed to be consistent as requested.

Digital Support File Comments:

- Please include stream survey station IDs in the revised files and in all future submissions; station ID examples are TLB, THW etc.
  RESPONSE: Stream survey station IDs have been added to the 04 Geomorphology Data folder in the eSubmission Files (Reference_Reach_Survey_DL_MY2_UT Rush Fork - Normal Method_REV and Rush Fork_Yearly Xsecs_AnnualSummary) as requested.

As requested, Michael Baker has provided an electronic response letter addressing the DMS comments received and two (2) hardcopies of the FINAL report, and the updated e-submission digital files will be sent via secure ftp link. A full final electronic copy with electronic support files have been included on a USB drive. Please do not hesitate to contact me (Jason.york@mbakerintl.com 828-412-6101) should you have any questions regarding our response submittal.

Sincerely,

Jason York
Environmental Scientist

Jason York

Digitally signed by Jason York
DN: C=US, E=jason.york@mbakerintl.com, O=Michael Baker Intl., CN=Jason York
Date: 2024.01.18 17:39:30-05'00'

Enclosure: Final MY2 Report UT to Rush Fork Stream Mitigation Project

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APPENDICES

1.0 PROJECT SUMMARY

1.1 Project Description

Michael Baker Engineering, Inc. (Michael Baker) restored approximately 2,843.58 linear feet and enhanced an additional 1,179.54 linear feet of stream along seven reaches on unnamed tributaries (UT) to Rush Fork Creek. Additionally, 0.996 uncredited acres of adjacent riparian wetlands will be enhanced and protected within the project conservation easement. The project lies within the French Broad River Basin, Hydrologic Unit Code (HUC) 06010106-020010 (Pigeon River/Crabtree Creek Watershed), which is identified as a Targeted Local Watershed (TLW) in the NC Division of Mitigation Services' (DMS 2009) *French Broad River Basin Restoration Priorities* (RBRP) report. The project is located in the Blue Ridge Physiographic Region, within the Southern Crystalline and Mountains Level IV ecoregion. The project watershed drains into Rush Fork Creek, which flows for approximately 2.8 miles to its confluence with Crabtree Creek and then continues for approximately 0.7 miles to the Pigeon River. These streams are designated as Class C waters by the surface water classification system of the NC Division of Water Resources (DWR).

The UT to Rush Fork Stream Mitigation Project (project) is located on two adjacent parcels of an active cattle farm in Haywood County, North Carolina, halfway between the unincorporated communities of Crabtree and Fines Creek as shown on the Project Vicinity Map (Figure 1). The project site entrance is 5.9 miles north on Route 209 from exit 24 off of I-40, on the right at 9503 Rush Fork Road. Coordinates for the approximate center of the project are 35.644607 N Latitude, -82.940170 W Longitude. Current agricultural use on the project site is predominantly livestock pasture; however, other current uses include forest and hay production. Past uses may have included row crops and apple production. These activities negatively impacted both water quality and streambank stability along the project stream reaches. The observed functional stressors include streambank erosion, sedimentation, excess nutrient input, channel modification, and the loss of riparian buffers.

The project is being conducted as part of the DMS Full Delivery In-Lieu Fee Program and is anticipated to generate a total of 3,533.610 cold-water stream mitigation credits and the site is protected by an 8.26-acre permanent conservation easement (Appendix B).

1.2 Goals and Objectives

The goals of this project are identified below:

- Reconnect stream reaches to their floodplains,
- Improve stream stability,
- Improve aquatic habitat,
- Reestablish forested riparian buffers, and
- Permanently protect the project in a conservation easement.

To accomplish these goals, the following objectives were identified:

- To restore appropriate bankfull dimensions, and/or raise channel beds, by utilizing either a Priority I Restoration approach or an Enhancement Level I approach.
- Stabilize eroding channel banks and arrest incision by utilizing an Enhancement Level II approach.

- To construct streams of appropriate dimensions, pattern, and profile in restored reaches, slope stream banks and provide bankfull benches on enhanced reaches and utilize bio-engineering to provide long-term stability.
- Construct the correct channel morphology along all stream channels, increasing the number and depth of pools utilizing structures including geo-lifts with brush toe, log vanes/weirs, root wads, and/or J-hooks.
- Establish riparian buffers at a 30-foot minimum width along all stream reaches, planted with native tree and shrub species.
- Establish a permanent conservation easement restricting land use in perpetuity. This will prevent site disturbance and allow the project to mature and stabilize.

1.3 Project Success Criteria

The success criteria and performance standards for the project will follow the NCDMS's template As-Built Baseline Monitoring Report Format, Data Requirements, and Content Guidance (October 2020), and the Annual Monitoring Report Format, Data Requirements, and Content Guidance (October 2020), and as described in Section 7 of the approved Mitigation Plan. All specific monitoring activities will follow those outlined in detail in Section 8 of the approved Mitigation Plan and will be conducted for a period of 7 years.

1.4 Monitoring Results and Project Performance

The Year 2 monitoring survey data from the eighteen permanent cross-sections indicates that these stream transects are geomorphically stable, both laterally and vertically, and in-stream structures are performing as designed. All reaches are stable and performing as designed and are rated at 100 percent for all the parameters evaluated (Table 5 in Appendix B). There were no Stream Problem Areas (SPAs) identified.

A minor Encroachment Area was observed during the completion of MY2 monitoring where a piece of farm equipment was driven through an unfenced portion of the easement on the right floodplain of UT1-R4 (shown on CCPV Figure 3C). It appears the equipment could not fit between the Conservation Easement boundary and the tree line. The area was not mowed and did not sustain any permanent damage. Baker has sent email and letter to the property owner to notify the farmer who leases the field that this is in violation of the terms of the conservation easement. This correspondence is included in Appendix F. Baker will work with the property owner and farmer to create a path for equipment, so this violation does not occur in the future.

Approximately 30 1-gallon stems were planted prior to the growing season during MY2 on the right floodplain of UT3 (CCPV Figure 3A). All planted species were included on the planting list from the approved mitigation plan. During Year 2 monitoring, the planted acreage showed low stem density in many parts of the project. The average density of total planted stems, based on data collected from the 6 permanent and 1 random monitoring plots for the Year 2 monitoring conducted in October 2023 was 294 stems per acre (Table 7 in Appendix C). Thus, the Year 2 vegetation data demonstrate that the Site is not on track to meet the minimum success interim criteria of 320 trees per acre by the end of Year 3. Four vegetation problem areas (VPAs) were identified due to low stem density, although only one exceeds the reportable mapping threshold of 0.1 acres. These VPAs and other areas of observed low density will be supplementally planted before the growing season begins in April of 2024 (MY3) at a rate of 200 stems per acre. Areas with low stem density have a high density of fescue which was treated with herbicide during MY2. Additional herbicide treatment of fescue will continue during the spring of 2024. Apparent feral hog damage that was reported during MY1 did not continue to be an issue during MY2 so no further action was taken.

During Year 2 monitoring, no post-construction bankfull events were observed (see Table 10 in Appendix E).

As the observed monthly rainfall data for the project presented in Figure 6, (Appendix E) demonstrates the total monthly rainfall has varied widely from the historic average precipitation. In an annual comparison the site experienced similar average annual rainfall during the monitoring year at 50.58 inches observed for the project site comparable to the county's 49.72 inches of rainfall. Observed project rainfall was collected from the North Carolina Climate Office Weather Climate Database Legacy system. This system uses a Multi-Sensor Precipitation Estimate (MPE) to combine radar-based precipitation values with surface gauges to generate site specific data based on project coordinates. The closest weather station (WAYN) is located approximately 11.4 miles southwest of the project at the Mountain Research Station on Test Farm Rd. in Waynesville, NC. Three automated channel flow gauges exceeded the minimum 30-day performance criteria during MY2. Summary information/data related to the Site and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report Appendices.

Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report and in the Mitigation Plan available on the DMS website. Any raw data supporting the tables and figures in the Appendices is available from DMS upon request.

This report documents the successful completion of the Year 2 monitoring activities for the post-construction monitoring period.

1.5 Technical and Methodological Descriptions

Stream survey data was collected to a minimum of Class C Vertical and Class A Horizontal Accuracy using a Leica TS06 Total Station and was georeferenced to the NAD83 State Plane Coordinate System, FIPS3200 in US Survey Feet, which was derived from the As-built Survey. The survey data from the permanent project cross-sections were collected and classified using the Rosgen Stream Classification System to confirm design stream type (Rosgen 1994).

The six permanent vegetation-monitoring quadrants (plots) were installed across the site in accordance with the CVS-DMS Protocol for Recording Vegetation, Version 4.1 (Lee 2007) and the data collected from each was input into the DMS Veg Table Production Tool (2021).

All of the crest gauges and flow gauges are Van Essen brand Baro-Diver data loggers.

All observed project rainfall was collected from the North Carolina Climate Office Weather Climate Database Legacy system.

The specific locations of monitoring features, such as vegetation plots, permanent cross-sections, reference photograph stations, and crest gauges, are shown on the CCPV map found in Appendix B.

1.6 References

Carolina Vegetation Survey (CVS) and NC Division of Mitigation Services (DMS). CVS-DMS Protocol for Recording Vegetation, Version 4.1 (Lee 2007), DMS Veg Table Production Tool (2021)

Lee, M., Peet R., Roberts, S., Wentworth, T. 2007. CVS-DMS Protocol for Recording Vegetation, Version 4.1.

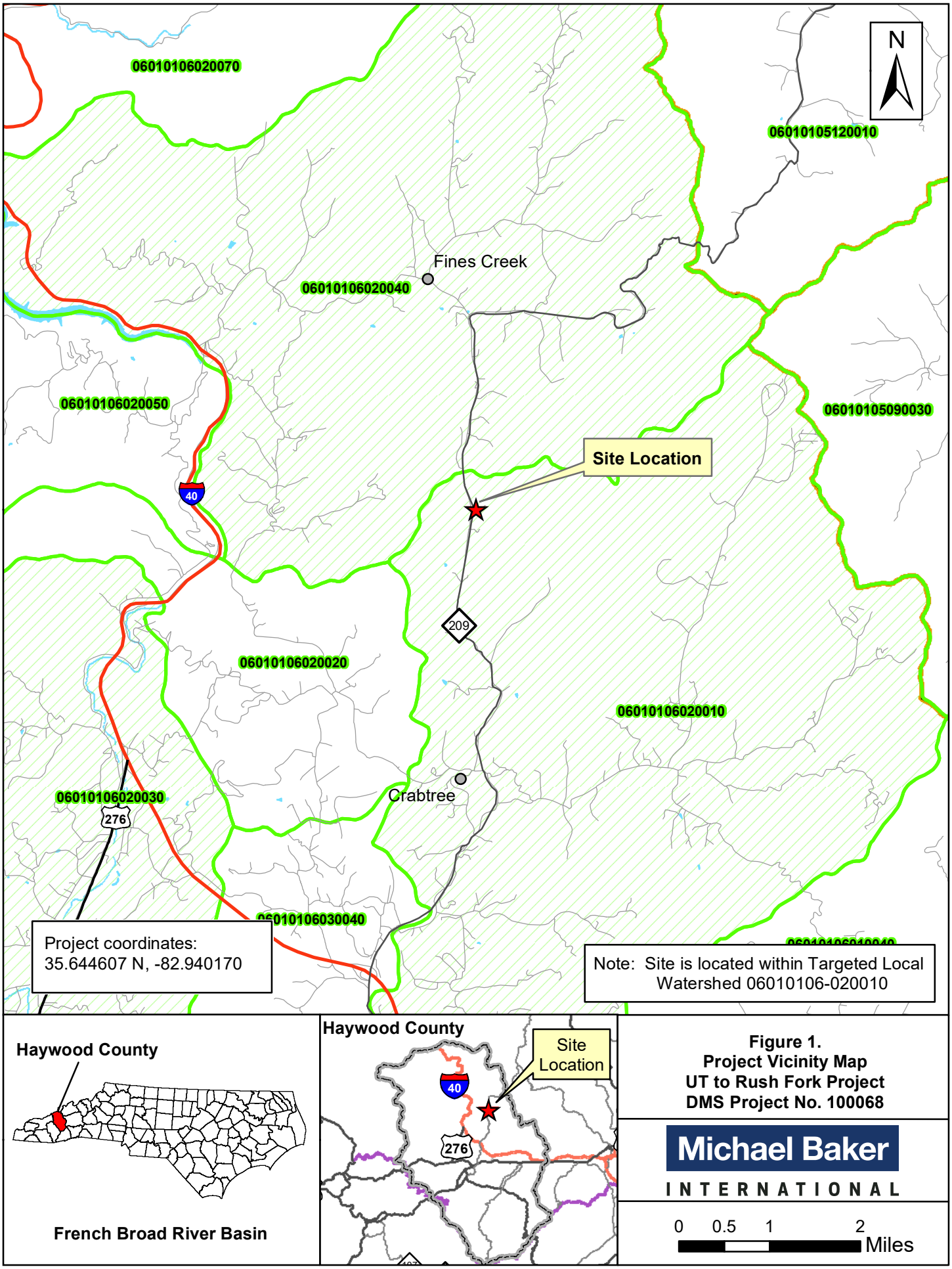
North Carolina Division of Mitigation Services. 2020. *Annual Monitoring Report Format, Data Requirements, and Content Guidance October 2020.* NC Department of Environmental Quality. Raleigh, NC.

North Carolina Interagency Review Team (NCIRT). 2020. Guidance document "*Wilmington District Stream and Wetland Compensatory Mitigation Update".* October 24, 2016

Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena 22:169-199.

APPENDIX A

Background Tables and Figures


N
06010106020070
06010105120010
Fines Creek
06010106020040
06010106020050
06010105090030
Site Location
40
209
06010106020020
06010106020010
Crabtree
06010106020030
276
06010106030040
Project coordinates:
35.644607 N, -82.940170
Note: Site is located within Targeted Local Watershed 06010106-020010
Haywood County
French Broad River Basin
Haywood County
Site Location
40
276
Figure 1.
Project Vicinity Map
UT to Rush Fork Project
DMS Project No. 100068
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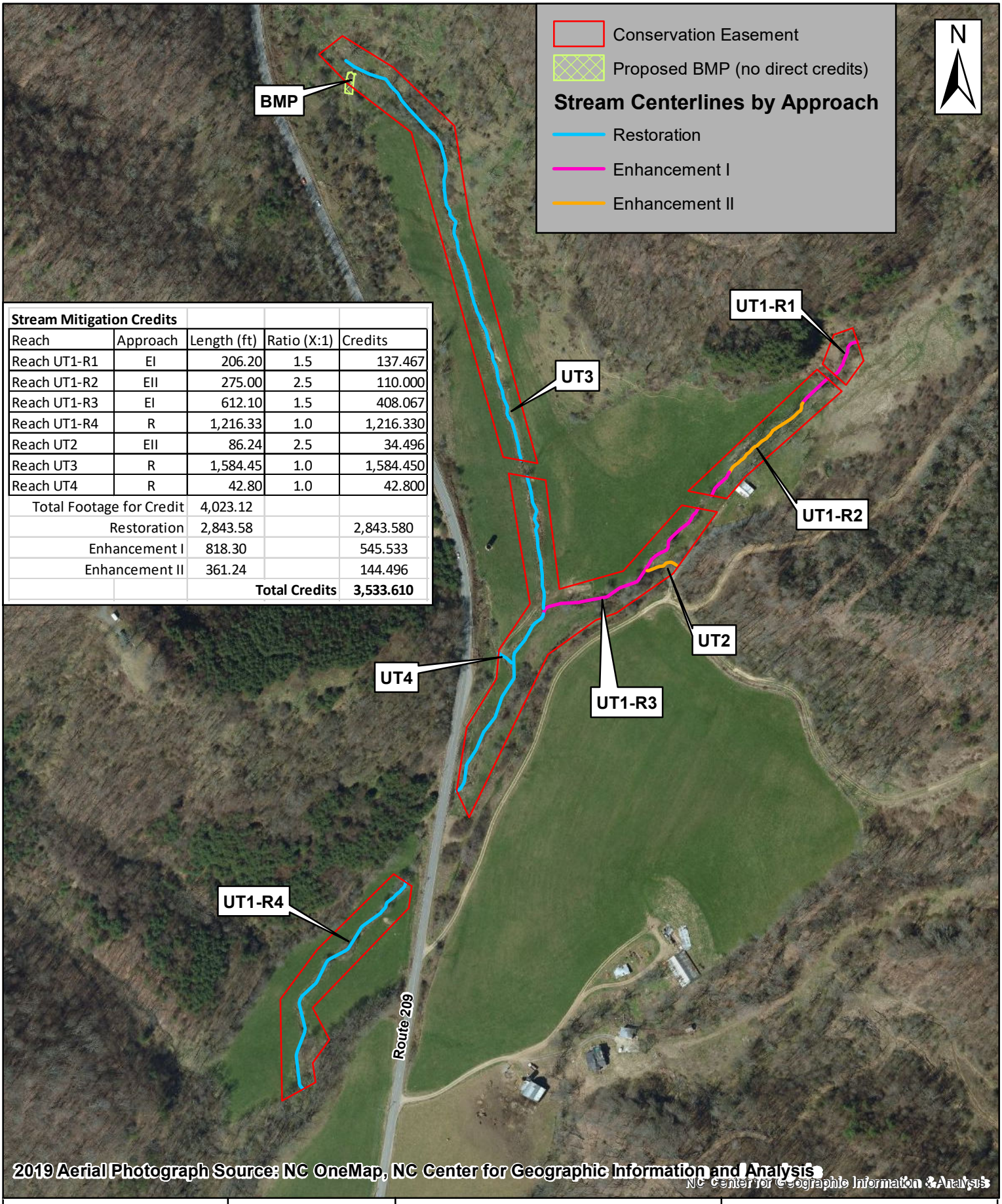

Stream Mitigation Credits				
Reach	Approach	Length (ft)	Ratio (X:1)	Credits
Reach UT1-R1	EI	206.20	1.5	137.467
Reach UT1-R2	EII	275.00	2.5	110.000
Reach UT1-R3	EI	612.10	1.5	408.067
Reach UT1-R4	R	1,216.33	1.0	1,216.330
Reach UT2	EII	86.24	2.5	34.496
Reach UT3	R	1,584.45	1.0	1,584.450
Reach UT4	R	42.80	1.0	42.800
Total Footage for Credit		4,023.12		
Restoration		2,843.58		2,843.580
Enhancement I		818.30		545.533
Enhancement II		361.24		144.496
			Total Credits	**3,533.610**

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0 125 250 500 Feet

Figure 2. Project Asset and Credit Map
UT to Rush Fork Project
Haywood County

Table 1. Project Mitigation Quantities and Credits

UT to Rush Fork Stream Mitigation Project - NCDMS Project No. 100068

Project Segment	Original Mitigation Plan* Ft/Ac	As-Built Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits
Stream						
Reach UT1-R1	206.20	206.410	Cold	EI	1.5	137.467
Reach UT1-R2	275.00	275.000	Cold	EII	2.5	110.000
Reach UT1-R3	612.10	600.860	Cold	EI	1.5	408.067
Reach UT1-R4	1,216.33	1,224.370	Cold	R	1.0	1,216.330
Reach UT2	86.24	78.160	Cold	EII	2.5	34.496
Reach UT3	1,584.45	1,577.530	Cold	R	1.0	1,584.450
Reach UT4	42.80	41.900	Cold	R	1.0	42.800
					Total:	**3,533.610**
Wetland						
N/A	0.996	0.996	-	E	-	-
					Total:	**N/A**

Project Credits

Restoration Level	Stream			Riparian	Non-Rip	Coastal
	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	-	-	2,843.580	-	-	-
Re-establishment				-	-	-
Rehabilitation				-	-	-
Enhancement				-	-	-
Enhancement I	-	-	545.534			
Enhancement II	-	-	144.496			
Creation				-	-	-
Preservation	-	-	-	-	-	
Totals			**3,533.610**			

Table 2. Project Activity and Reporting History
UT to Rush Fork Stream Mitigation Project - NCDMS Project No. 100068

Grading Completed in	**Feb-22**
Elapsed Time Since grading complete:	**23 months**
All Planting Completed in	**Feb-22**
Elapsed Time Since planting complete:	**23 months**
Number of Reporting Years[1]:	**2**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Institution date	N/A	April 2018
404 permit date	N/A	April 2021
Mitigation Plan	N/A	April 2021
Final Design – Construction Plans	N/A	February 2022
Construction Grading Completed	N/A	February 2022
As-Built Survey	March 2022	August 2022
Livestake and Bareroot Planting Completed	February 2022	N/A
As-Built Stream Survey	March 2022	N/A
As-Built Vegetation Monitoring	March 2022	N/A
As-Built Baseline Monitoring Report (MY0)	March 2022	August 2022
Year 1 Monitoring		
Year 1 Stream Survey	November 2022	N/A
Year 1 Vegetation Monitoring	November 2022	N/A
Monitoring Year 1 Report (MY1)	December 2022	January 2023
Year 2 Monitoring	Novemberr 2023	December 2023
Supplemental Planting	N/A	March 2023
Invasive Vegetation Treatment	N/A	May 2023
Year 2 Stream Survey	November 2023	N/A
Year 2 Vegetation Monitoring	October 2023	N/A
Year 3 Monitoring (anticipated)	December 2024	December 2024
Year 4 Monitoring (anticipated)	December 2025	December 2025
Year 5 Monitoring (anticipated)	December 2026	December 2026
Year 6 Monitoring (anticipoated)	December 2027	December 2027
Year 7 Monitoring (anticipated)	December 2028	December 2028

[1] = The number of monitoring reports excluding the as-built/baseline report

Table 3. Project Contacts
UT to Rush Fork Stream Mitigation Project - NCDMS Project No. 100068

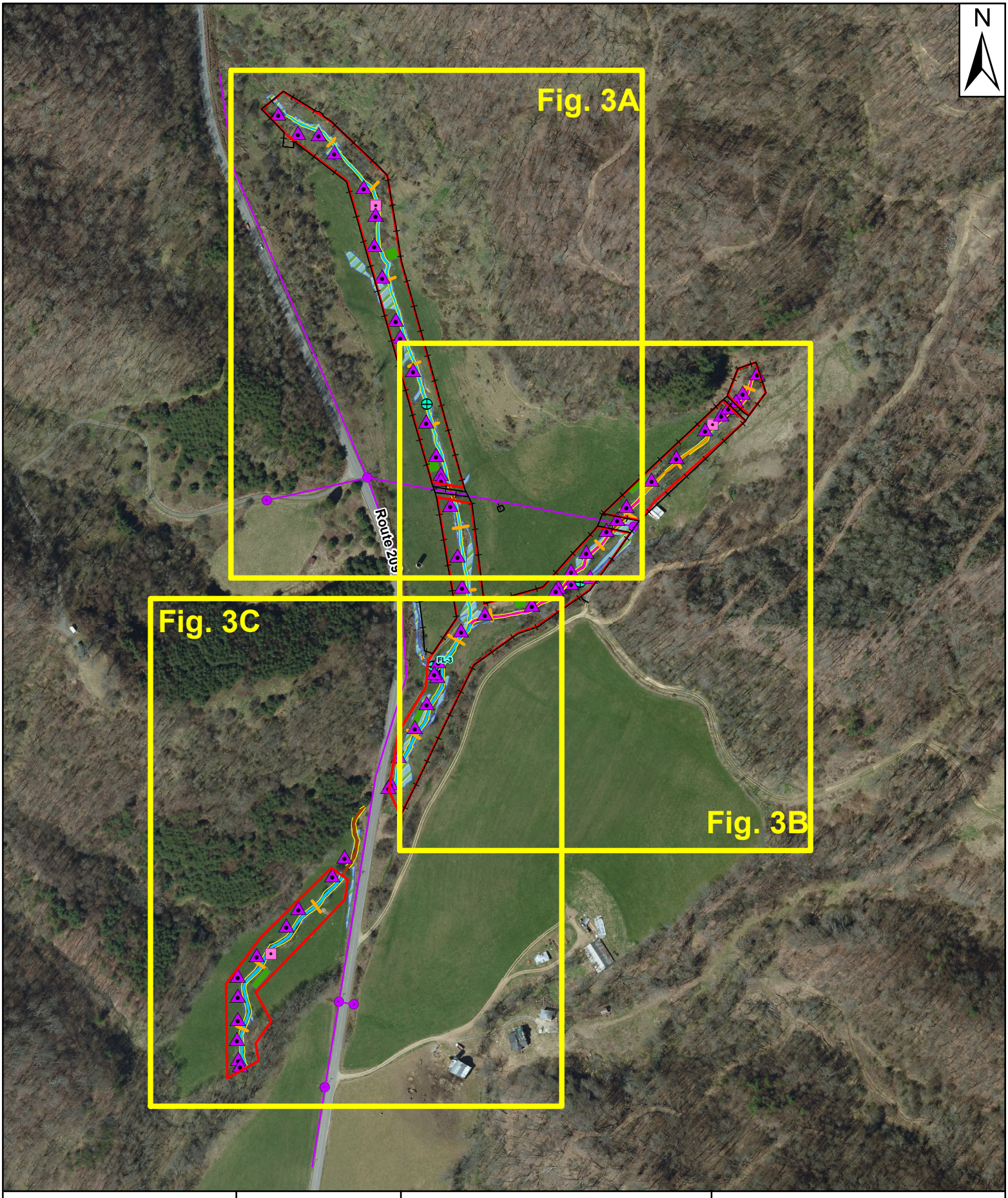
Designer	
Michael Baker Engineering, Inc.	8000 Regency Parkway, Suite 600 Cary, NC 27518 Contact: Katie McKeithan, Tel. 919-481-5703
Construction Contractor	
Baker Grading & Landscaping, Inc.	1000 Bat Cave Road, Old Fort, NC 28762 Contact: Charles Baker, Tel. 828-668-5060 x. 11
Survey Contractor	
Kee Mapping and Surveying	88 Central Avenue Asheville, NC 28801 Contact: Brad Kee, Tel. 828-575-9021
Planting Contractor	
Baker Grading & Landscaping, Inc.	1000 Bat Cave Road, Old Fort, NC 28762 Contact: Charles Baker, Tel. 828-668-5060 x. 11
Seeding Contractor	
Baker Grading & Landscaping, Inc.	1000 Bat Cave Road, Old Fort, NC 28762 Contact: Charles Baker, Tel. 828-668-5060 x. 11
Seed Mix Sources	
Roundstone Native Seed, LLC	9764 Raider Hollow Road, Upton, KY 42784 Telephone: 270-531-3034
Nursery Stock Suppliers	
Foggy Mountain Nursery (livestakes)	797 Helton Creek Road, Lansing, NC 28643 Telephone: 336-384-5323
Dykes and Son Nursery	825 Maude Etter Road, McMinnville, TN 37110 Telephone: 843-528-3204
Monitoring Performers	
Michael Baker Engineering, Inc.	797 Haywood Rd. Suite 201 Asheville, NC 28806
Stream Monitoring POC	Jason York, Tel. 828-380-0118
Vegetation Monitoring POC	Jason York, Tel. 828-380-0118

Table 4. Project Baseline Information and Attributes
UT to Rush Fork Stream Mitigation Project - NCDMS Project No. 100068

Table 4. Project Background Information					
Project Name	UT to Rush Fork Stream Mitigation Project				
County	Haywood County				
Project Area (acres)	8.26				
Project Coordinates (latitude and longitude)	35.644607 N, -82.940170 W				
Planted Acreage (Acres of Woody Stems Planted)	7.3				
Thermal Regime	COLD				
Project Watershed Summary Information					
Physiographic Province	Blue Ridge				
River Basin	French Broad				
USGS Hydrologic Unit 8-digit	6010106	USGS Hydrologic Unit 14-digit	06010106-020010		
DWR Sub-basin	04-03-05				
Project Drainage Area (Acres and Square Miles)	308 acres/0.48 square miles (at downstream end of UT1)				
Project Drainage Area Percentage of Impervious Area	0.18% impervious area				
CGIA Land Use Classification	79,8% forested, 17.1% hay/pasture, and 2.9% developed (open space).				
Reach Summary Information					
Parameters	**UT1**	**UT2**	**UT3**	**UT4**	
Length of reach (linear feet)	2,464	99	1,618	18	
Valley confinement (Confined, moderately confined, unconfined)	Moderately Confined	Unconfined	Moderately Confined	Unconfined	
Drainage area (Acres)	308	24	98	27	
Perennial, Intermittent, Ephemeral	Perennial	Intermittent	Perennial	Intermittent	
NCDWR Water Quality Classification	C	C	C	C	
Stream Classification (existing)	B4a	B	A to B4	B	
Stream Classification (proposed)	B4a	B	A to B4	Cb	
Evolutionary trend (Simon)	IV – Degradation and Widening	III – Degrading	IV – Degradation and Widening	III – Degrading	
FEMA classification	Zone X	Zone X	Zone X	Zone X	
Regulatory Considerations					
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**		
Water of the United States - Section 404	Yes	No	PCN		
Water of the United States - Section 401	Yes	No	PCN		
Endangered Species Act	Yes	Yes	Categorical Exclusion		
Historic Preservation Act	Yes	Yes	Categorical Exclusion		
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A		
FEMA Floodplain Compliance	No	N/A	N/A		
Essential Fisheries Habitat	No	N/A	N/A		
Notes:					
[1] Source: USGS National Land Cover Database (NLCD) for 2016					

APPENDIX B

Visual Assessment Data



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DMS Proj. No. 100068

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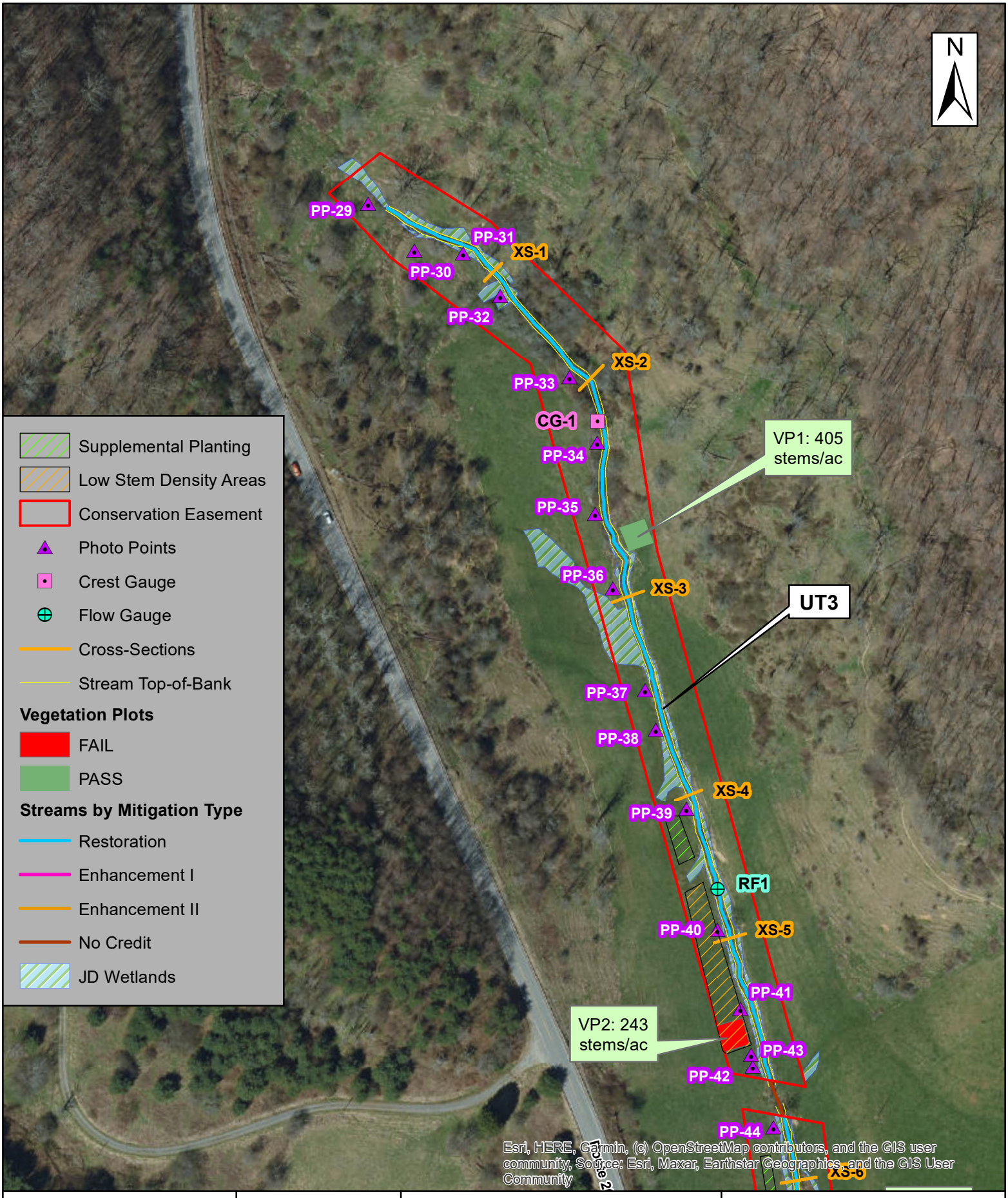
Figure 3. Current Condition Plan View (CCPV) Overview MY2 UT to Rush Fork Project Haywood County



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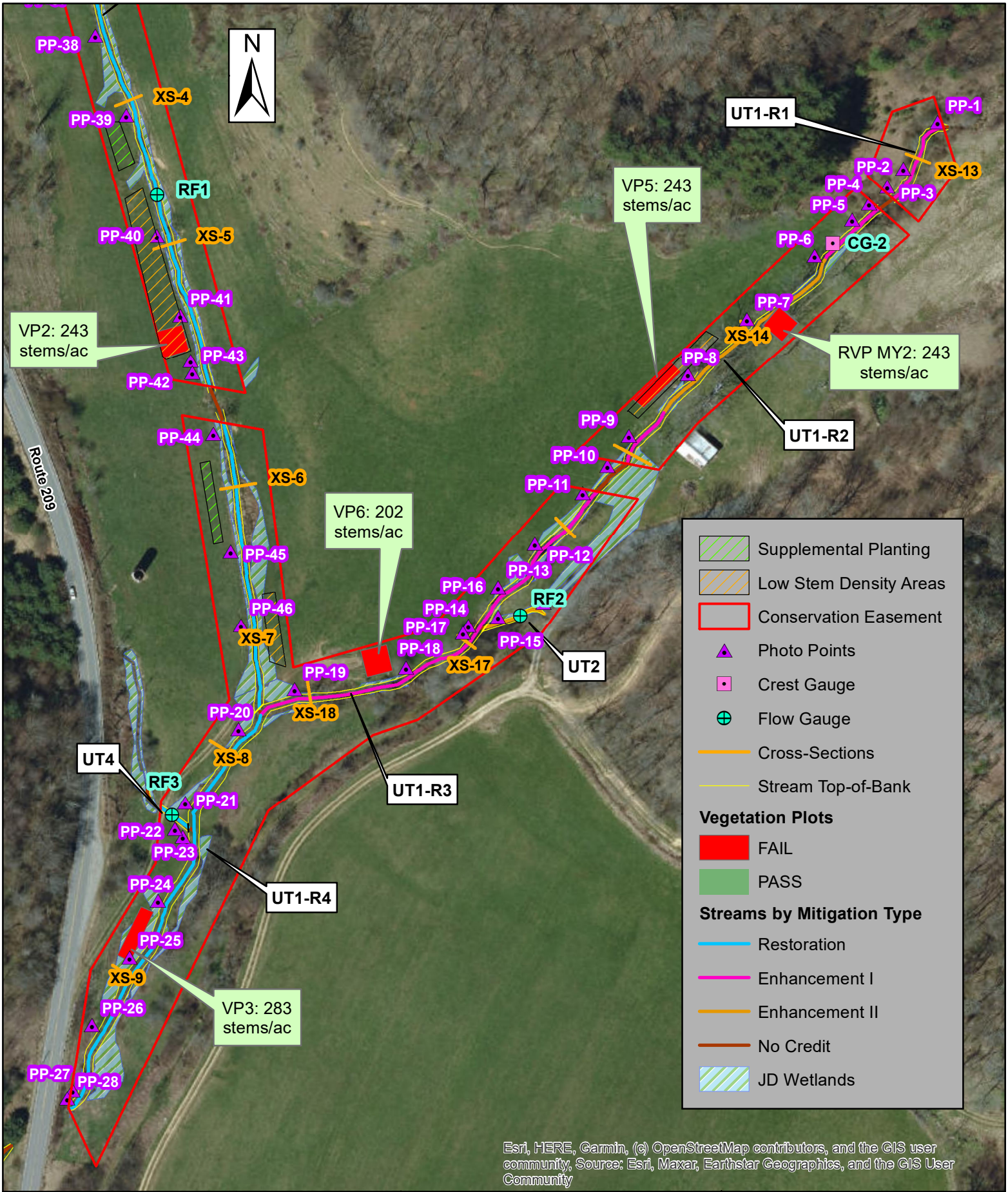
North Carolina Division of Mitigation Services
DMS Proj. No. 100068

0 125 250 Feet

Figure 3A. Current Condition Plan View (CCPV) MY2
UT to Rush Fork Project
Haywood County



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North Carolina Division of Mitigation Services
DMS Proj. No. 100068

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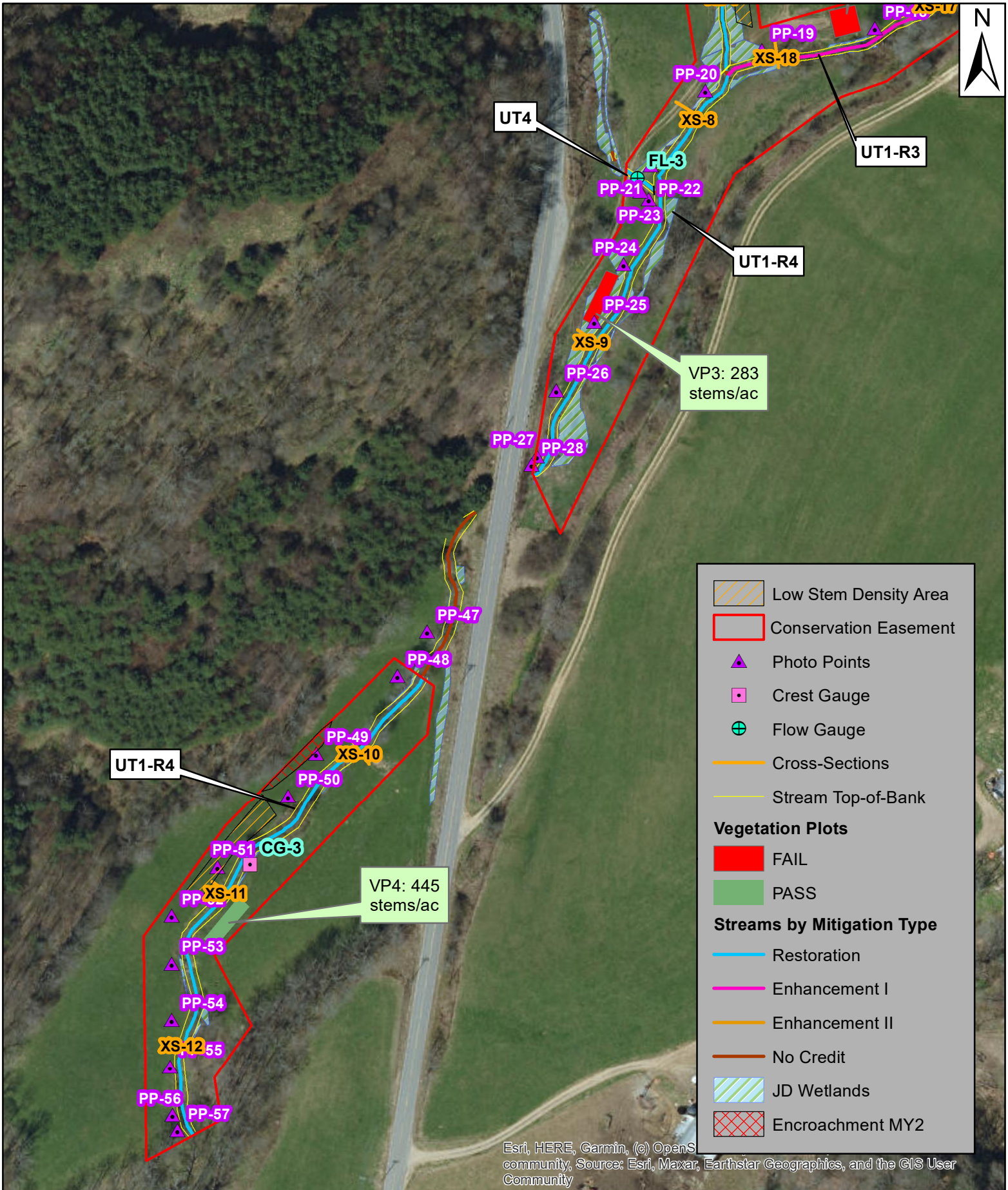
Figure 3B. Current Condition Plan View (CCPV) MY2
UT to Rush Fork Project
Haywood County



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DMS Proj. No. 100068

0 125 250 Feet

Figure 3C. Current Condition Plan View (CCPV) MY2
UT to Rush Fork Project
Haywood County

Table 5. Visual Stream Morphology Stability Assessment - Assessed November 2023
UT to Rush Fork Stream Mitigation Project – NCDMS Project No. 100068

Reach ID: Reach UT1-R1

Assessed Length (LF): 206.41

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	10	10			100%
	3. Meander Pool Condition	1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) **(Plunge Pools)**	9	9			100%
		2. Length - Sufficent (>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)	N/A	N/A			100%
		2. Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			100%
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	10	10			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	10	10			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	10	10			100%
	3. Bank Position	Bank erosion within the structures extent of influence **does not** exceed 15%	10	10			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow	10	10			100%

Reach ID: Reach UT1-R2 (EI)

Assessed Length (LF): 275.00

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	2	2			100%
	3. Meander Pool Condition	1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) **(Plunge Pools)**	2	2			100%
		2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	2	2			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			100%
		2. Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			100%
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	2	2			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	2	2			100%
	3. Bank Position	Bank erosion within the structures extent of influence **does not** exceed 15%	2	2			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow	2	2			100%

Table 5. Visual Stream Morphology Stability Assessment - Assessed November 2023

Reach ID: Reach UT1-R3 (EII)

Assessed Length (LF): 600.86

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	20	20			100%
	3. Meander Pool Condition	1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) **(Plunge Pools)**	19	19			100%
		2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	19	19			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			100%
		2. Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			100%
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	19	19			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	19	19			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	19	19			100%
	3. Bank Position	Bank erosion within the structures extent of influence **does not** exceed 15%	19	19			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow	19	19			100%

Reach ID: Reach UT1-R4

Assessed Length (LF): 1,224.37

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	36	36			100%
	3. Meander Pool Condition	1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) **(Plunge Pools)**	36	36			100%
		2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	36	36			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			100%
		2. Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			100%
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	36	36			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	36	36			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	36	36			100%
	3. Bank Position	Bank erosion within the structures extent of influence **does not** exceed 15%	N/A	N/A			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow	N/A	N/A			100%

Table 5: Visible Stream Morphology Assessment. Reach ID: Reach UT2 - Assessed November 2023							
Assessed Length (LF): 78.16							
Major Channel Category	**Channel Sub-Category**	**Metric**	**Number Stable, Performing as Intended**	**Total Number per As-built**	**Number of Unstable Segments**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
1. Bed	**1.Vertical Stability**	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	1	1	0	0	100%
	3. Meander Pool Condition	1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) **(Plunge Pools)**	0	0	0	0	100%
		2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	N/A	N/A			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			100%
		2. Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			100%
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	0	0			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	0	0			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	0	0			100%
	3. Bank Position	Bank erosion within the structures extent of influence **does not** exceed 15%	0	0			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow	0	0			100%

Reach ID: Reach UT3							
Assessed Length (LF): 1,577.53							
Major Channel Category	**Channel Sub-Category**	**Metric**	**Number Stable, Performing as Intended**	**Total Number per As-built**	**Number of Unstable Segments**	**Amount of Unstable Footage**	**% Stable, Performing as Intended**
1. Bed	**1.Vertical Stability**	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	44	44	0	0	100%
	3. Meander Pool Condition	1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) **(Plunge Pools)**	43	43	0	0	100%
		2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	43	43			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			100%
		2. Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			100%
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs	43	43			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	43	43			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	43	43			100%
	3. Bank Position	Bank erosion within the structures extent of influence **does not** exceed 15%	43	43			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow	43	43			100%

Table 5: Visible Stream Morphology Assessment. Reach ID: Reach UT2 - Assessed November 2023

Reach ID: Reach UT4

Assessed Length (LF): 41.90

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1.Vertical Stability	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture Substrate - Riffle maintains coarser substrate	1	1	0	0	100%
	3. Meander Pool Condition	1. Depth - Sufficent (Max Pool Depth/Mean Bkf Depth ≥ 1.5) **(Plunge Pools)**	0	0	0	0	100%
		2. Length - Sufficent (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	0	0			100%
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	N/A	N/A			100%
		2. Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			100%
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover due to active scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting is expected			0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%
				Totals	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	0	0			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	0	0			100%
	2a. Piping	Structures lacking any substantial flow underneath or around sills or arms	0	0			100%
	3. Bank Position	Bank erosion within the structures extent of influence **does not** exceed 15%	0	0			100%
	4. Habitat	Pool forming structures maintaining - Max Pool Depth/Mean Bankfull Depth ratio ≥ 1.5. Rootwads/logs providing some cover at low flow	0	0			100%

Table 6. Vegetation Conditions Assessment - Assessed November 2023
UT to Rush Fork Stream Mitigation Project - NCDMS Project No. 100068

Planted Acreage: 7.3						
Vegetation Category	**Defintions**	**Mapping Threshold (acres)**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover both woody and herbaceous material.	0.1 acres	N/A	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Orange Hatch	4	0.30	5.5%
			Total			
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems or a size class that are obviously small given the monitoring year.	0.25 acres	N/A	0	0.00	0.0%
			Cumulative Total			
Easement Acreage: 8.26						
Vegetation Category	**Defintions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Points**	**Combined Acreage**	**% of Planted Acreage**
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale)	1000 ft²	N/A	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	577 ft²	Red Hatch	1	0.03	0.4%

MY2 Stream Station Photo-Points
NCDMS Project No. #100068

PP-1: UT1, R 1, Station 11+00. Upstream. May 10, 2023

PP-2: UT1, R 1, Station 11+80. Upstream. May 10, 2023

PP-3: UT1, R 1, Station 12+10 Culvert. Downstream. May 10, 2023

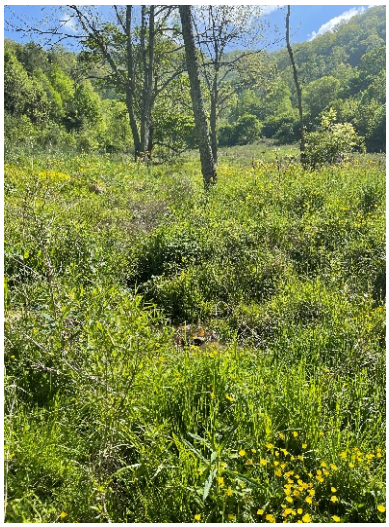
PP-4: UT1, R 1, Station 12+33 Culvert. Upstream. May 10, 2023

PP-5: UT1, R 2, Station 13+25. Facing Downstream. May 10, 2023

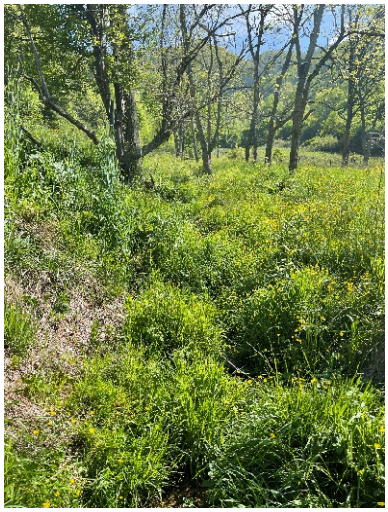
PP-6: UT1, R 2, Station 14+00. Upstream. May 10, 2023

MY2 Stream Station Photo-Points
NCDMS Project No. #100068

PP-7: UT1, R 2, Station 14+60.
Upstream. May 10, 2023



PP-8 UT1, R 2, Station 15+50.
Upstream. May 10, 2023



PP-9: UT1, R 3, Station 16+50.
Upstream. May 10, 2023

PP-10: UT1, R 3, 16+80.
Upstream. May 10, 2023

P-11: UT1, R 3, Station 17+35.
Upstream. May 10, 2023

PP-12: UT1, R 3, Station 18+25.
Upstream. May 10, 2023

PP-13: UT1, R 3, Station 18+90.
Upstream. May 10, 2023

PP-14: UT1 R 3, Station 19+55.
Upstream. May 10, 2023

PP-15: UT2, Station 10+15.
Upstream. May 10, 2023

PP-16: UT2, Station 10+85.
Upstream. May 10, 2023

PP-17: UT1, R3, Station 19+70.
Upstream. May 10, 2023

PP-18: UT1, R 3, Station 20+60.
Upstream. May 10, 2023

PP-19: UT1, R 3, Station 22+00.
Upstream. May 10, 2023

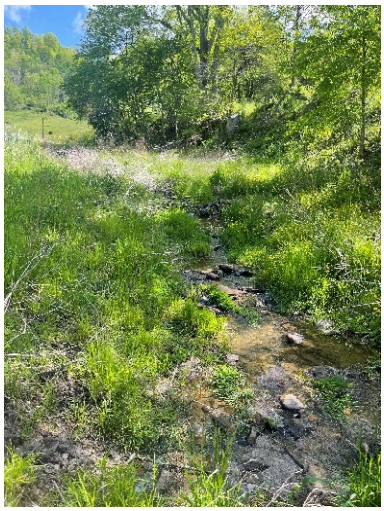
PP-20: UT1, R 4, Station 22+75.
Upstream. May 10, 2023

PP-21: UT1, R 4, Station 23+90.
Upstream. May 10, 2023

PP-22: UT1, R 4, Station 24+20.
Upstream. May 10, 2023

PP-23: UT4, Station 10+50.
Upstream. May 10, 2023

PP-24: UT1, R 4, Station 25+25.
Upstream. May 10, 2023



PP-25: UT1, R 4, Station 26+00. Upstream. May 10, 2023

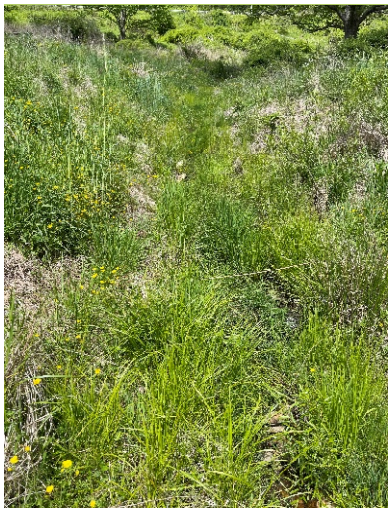
PP-26: UT1, R 4, Station 27+00. Upstream. May 10, 2023

PP-27: UT1, R 4, Station 27+75. Upstream. May 10, 2023

PP-28: UT1, R 4, Station 27+90. Downstream. May 10, 2023

PP-29: UT3. Upstream. Station 10+15. May 10, 2023

PP-30: UT3, Station 10+30. Upstream. May 10, 2023



PP-31: UT3, Station 11+10.
Upstream. May 10, 2023

PP-32: UT3, Station 11+75.
Upstream. May 10, 2023

PP-33: UT3, Station 13+15.
Upstream. May 10, 2023

PP-34: UT3, Station 14+15.
Upstream. May 10, 2023

PP-35: UT3, Station 14+85.
Upstream. May 10, 2023

PP-36: UT3, Station 15+95.
Upstream. May 10, 2023

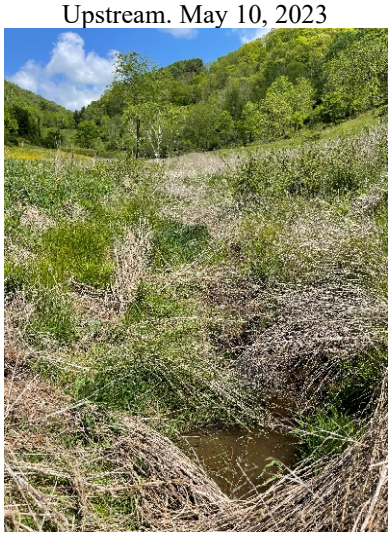
PP-37: UT3, Station 17+35.
Upstream. May 10, 2023

PP-38: UT3, Station 17+65.
Upstream. May 10, 2023

PP-39: UT3, Station 18+75.
Upstream. May 10, 2023

PP-40: UT3, Station 20+40.
Upstream. May 10, 2023

PP-41: UT3, Station 21+20.
Upstream. May 10, 2023



PP-42: UT3, Station 22+10.
Upstream. May 10, 2023

PP-43: UT3, Station 22+15. Downstream. May 10, 2023

PP-44: UT3, Station 23+15. Upstream. May 10, 2023

PP-45: UT3, Station 24+40. Upstream. May 10, 2023

PP-46: UT3, Station 25+35. Upstream. May 10, 2023

PP-47: UT3, Station 26+30. Upstream at confluence. May 10, 2023

PP-48: UT1, R 4, Station 30+50. Downstream. May 17, 2023

PP-49: UT1, R 4, Station 31+20.
Upstream. May 17, 2023

PP-50: UT1, R 4, Station 32+50.
Upstream. May 17, 2023

PP-51: UT1, R 4, Station 33+10.
Upstream. May 17, 2023

PP-52: UT1, R 4, Station 34+30.
Upstream. May 17, 2023

PP-53: UT1, R 4, Station 35+00.
Upstream. May 17, 2023

PP-54: UT1, R 4, Station 35+60.
Upstream. May 17, 2023

PP-55: UT1, R 4, Station 36+15. Upstream. May 17, 2023

PP-56: UT1, R 4, Station 37+00. Upstream. May 17, 2023

PP-57: UT1, R 4, Station 37+50. Upstream. May 17, 2023

PP-58: UT1, R 4, Station 37+60. Downstream. End of Project. May 17, 2023

Vegetation Plot Photographs
NCDMS Project No. 100068

Vegetation Plot #1: Photo taken October 3, 2023

Vegetation Plot #2: Photo taken August 31, 2023

Vegetation Plot #3: Photo taken August 31, 2023

Vegetation Plot #4: Photo taken August 14, 2023

Vegetation Plot #5: Photo taken October 3, 2023

Vegetation Plot #6: Photo taken August 31, 2023

Random Vegetation Plot #3 MY2:
Photo taken October 3, 2023

Monitoring Gauges and Overbank Photographs. Photos taken November 8, 2023.

Flow Gauge 1. UT3.

Flow Gauge 2. UT2.

Flow Gauge 3. UT4.

Crest Gauge 1. UT3.

Crest Gauge 2 UT1 R1.

Crest Gauge 3 UT1 R4.

APPENDIX C

Vegetation Plot Data

Table 7. Vegetation Plot Data

Planted Acreage	7.3
Date of Initial Plant	2022-02-23
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	2023-10-03
Date of Current Survey	2023-10-03
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 F		Veg Plot 3 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC													1
	Aesculus flava	yellow buckeye	Tree	FACU							1	1			1	1	
	Aronia arbutifolia	red chokeberry	Shrub	FACW			2	2									3
	Betula lenta	sweet birch	Tree	FACU	1	1											
	Betula nigra	river birch	Tree	FACW	2	2					1	1					
	Carpinus caroliniana	American hornbeam	Tree	FAC					2	2	2	2					
	Cephalanthus occidentalis	common buttonbush	Shrub	OBL					1	1							
	Cornus amomum	silky dogwood	Shrub	FACW					1	1	1	1					
	Fraxinus americana	white ash	Tree	FACU	1	1	1	1									
	Fraxinus pennsylvanica	green ash	Tree	FACW	4	4											1
	Liriodendron tulipifera	tuliptree	Tree	FACU			1	1			2	2	1	1			
	Liriodendron tulipifera var. tulipifera	tuliptree	Tree	FACU	1	1											
	Platanus occidentalis	American sycamore	Tree	FACW			1	1			2	2	1	1	2	2	
	Quercus alba	white oak	Tree	FACU					1	1			2	2	2	2	1
	Quercus imbricaria	shingle oak	Tree	FAC	1	1			2	2	2	2					
	Sambucus canadensis	American black elderberry	Tree				1	1									
	Tilia americana	American basswood	Tree	FACU									2	2			
Sum	Performance Standard				10	10	6	6	7	7	11	11	6	6	5	5	6
Post Mitigation Plan Species	*Acer rubrum*	*red maple*	*Tree*	*FAC*				*2*									
	Acer saccharinum	*silver maple*	*Tree*	*FACW*								*1*					
	Juglans nigra	*black walnut*	*Tree*	*FACU*													*4*
Sum	Proposed Standard				10	10	6	6	7	7	11	11	6	6	5	5	6
Mitigation Plan Performance Standard	Current Year Stem Count					10		6		7		11		6		5	6
	Stems/Acre					405		243		283		445		243		202	243
	Species Count					6		5		5		7		4		3	4
	Dominant Species Composition (%)					40		25		29		17		33		40	40
	Average Plot Height (ft.)					4		3		2		2		2		4	4
	% Invasives					0		0		0		0		0		0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					10		6		7		11		6		5	6
	Stems/Acre					405		243		283		445		243		202	243
	Species Count					6		5		5		7		4		3	4
	Dominant Species Composition (%)					40		25		29		17		33		40	40
	Average Plot Height (ft.)					4		3		2		2		2		4	4
	% Invasives					0		0		0		0		0		0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 7. Vegetation Plot Data

Vegetation Performance Standards Summary Table												
	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	405		6	0	243		5	0	283		5	0
Monitoring Year 1	324		5	0	283		6	0	364		5	0
Monitoring Year 0	729		9	0	607		11	0	729		9	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	445		7	0	243		4	0	202		3	0
Monitoring Year 1	445		8	0	567		10	0	364		7	0
Monitoring Year 0	810		10	0	972		13	0	648		8	0
	Veg Plot Group 1 R											
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives								
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3												
Monitoring Year 2	243		4	0								
Monitoring Year 1	364		6	0								
Monitoring Year 0	567		10	0								

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

Table 7. Supplemental Planting Data

	Scientific Name	Common Name	Indicator Status	# of Stems
Monitoring Year 2	Platanus occidentalis	American sycamore	FACW	12
	Acer negundo	boxelder	FAC	5
	Betula nigra	river birch	FACW	5
	Liriodendron tulipifera	tuliptree	FACU	4
	Carpinus caroliniana	American hornbeam	FAC	4

APPENDIX D

Stream Geomorphology Data

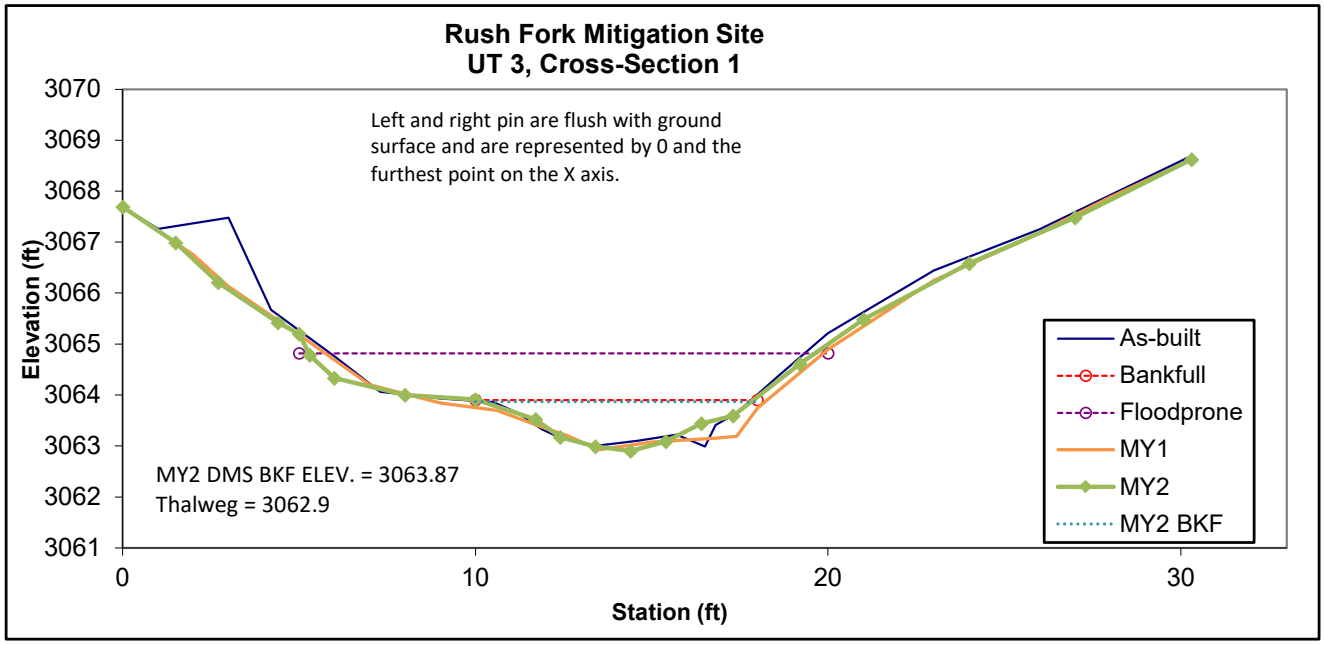
Permanent Cross-section 1

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	4.1	7.6	0.5	1	13.9	1.0	1.9	3063.86	3063.86



Note: Per DMS/IRT request, bank height ratio for MY2 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

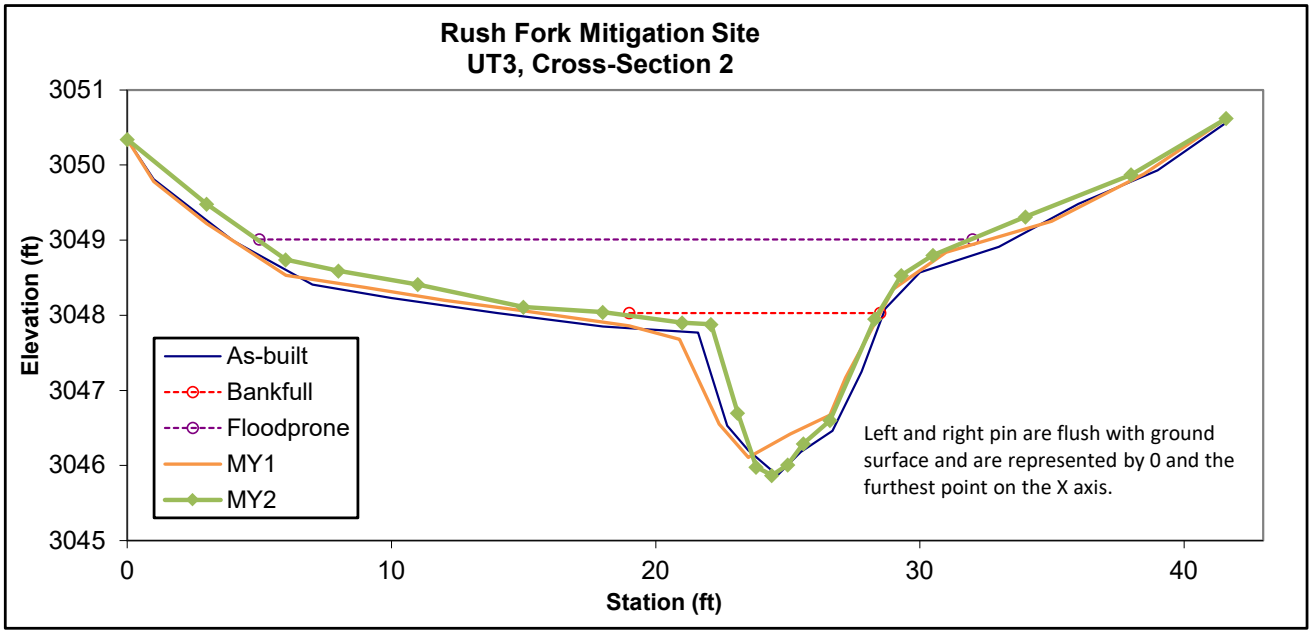
Permanent Cross-section 2

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	C	8.8	10.2	9	2.2	11.9	1.0	1.9	3048.03	3048.03

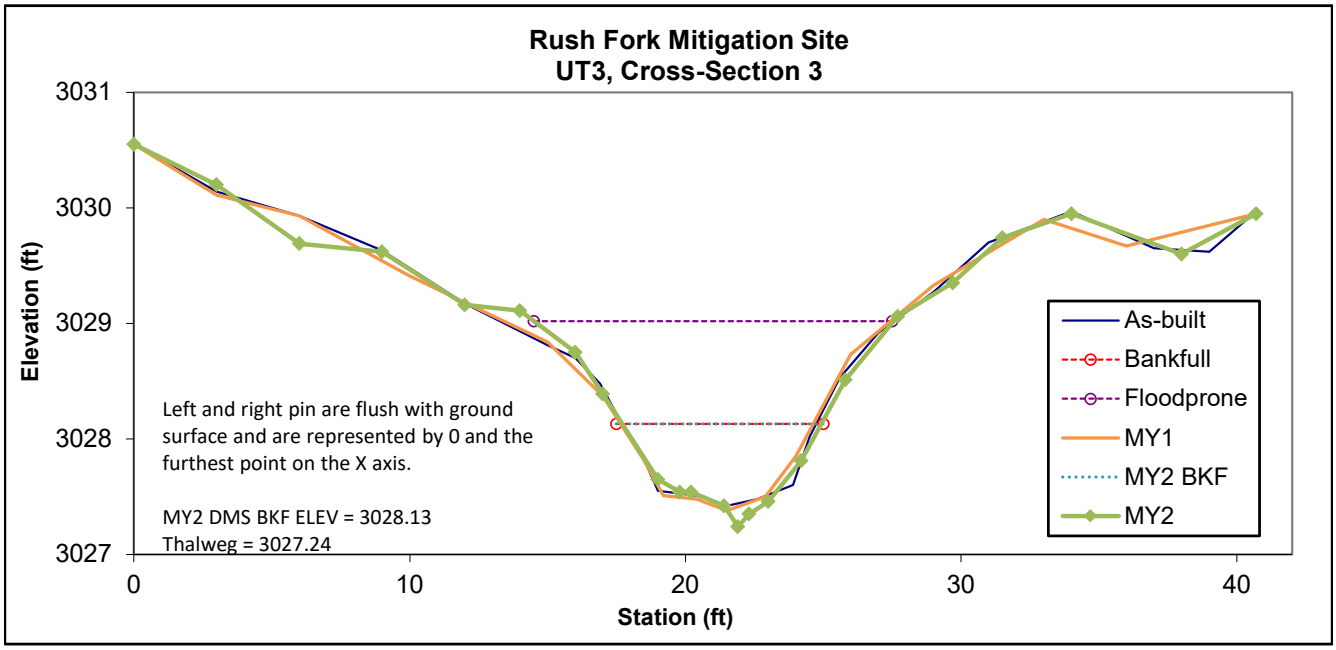


Permanent Cross-section 3
Year 1 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	3.7	7.2	0.5	0.9	14.1	1.0	1.9	3028.13	3028.13



Note: Per DMS/IRT request, bank height ratio for MY2 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

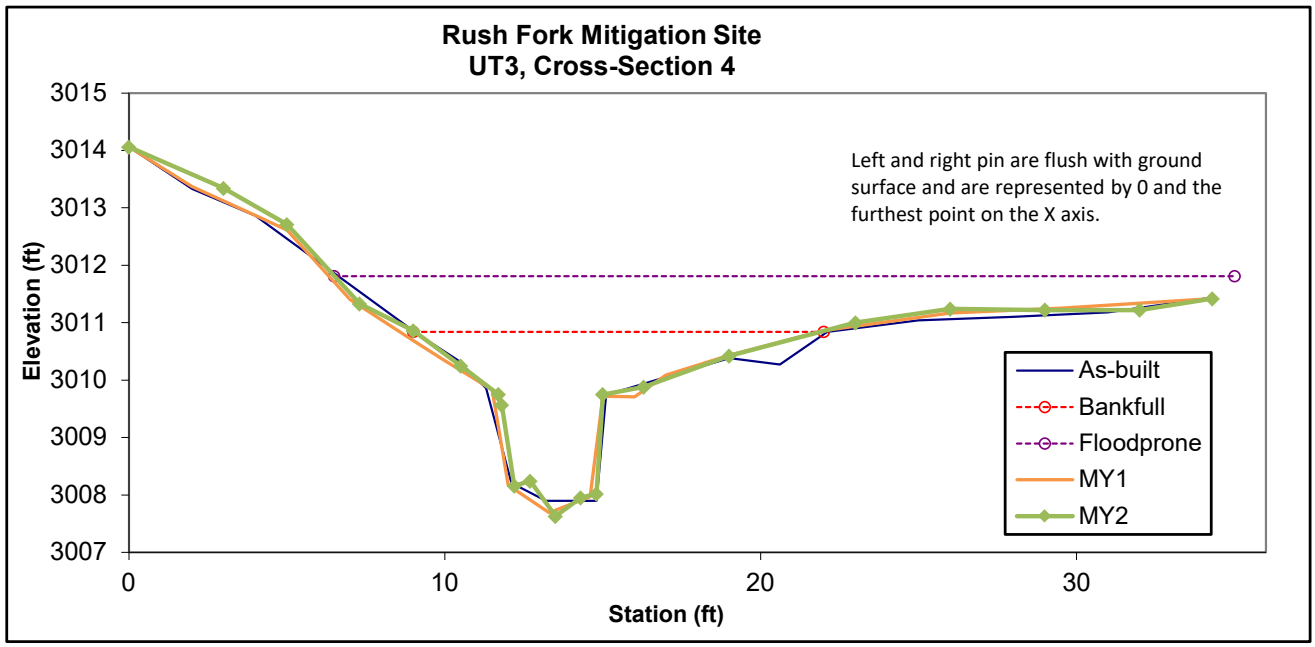
Permanent Cross-section 4

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	E	14.1	12.8	1.1	3.2	11.7	1.0	1.9	3010.84	3010.84



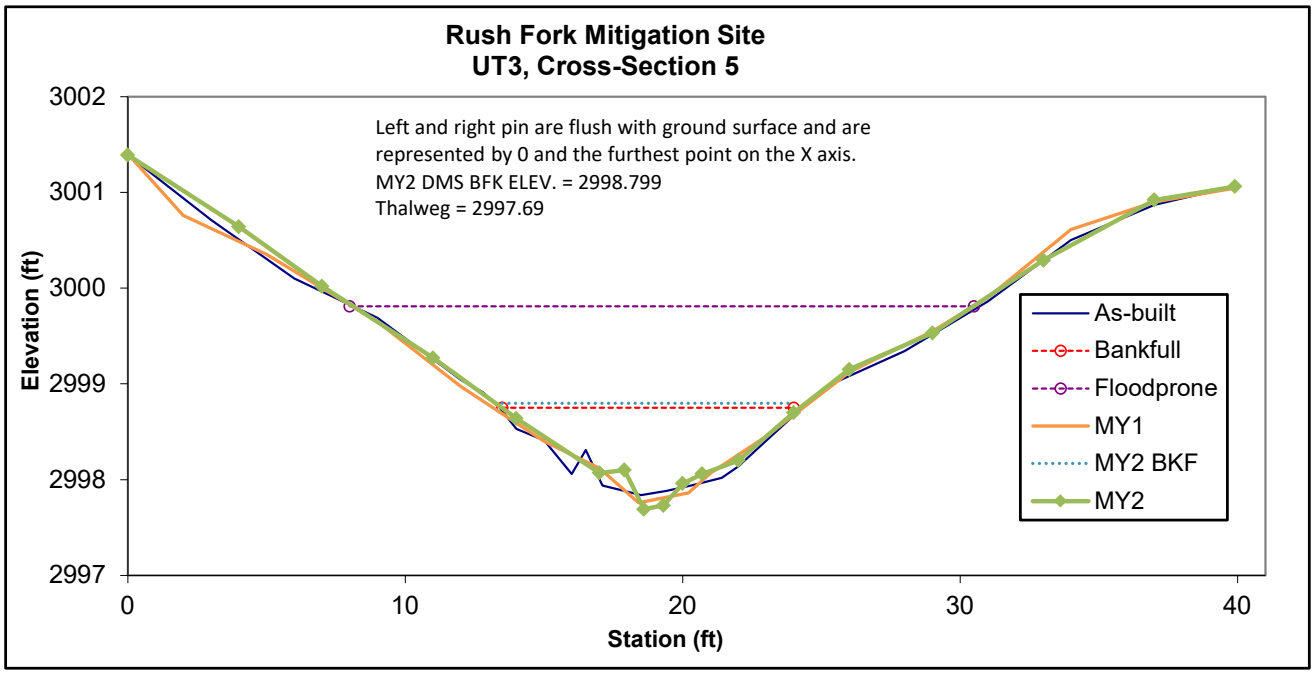
Permanent Cross-section 5

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	5.7	10.7	0.5	1.1	20.3	1.0	1.9	2998.75	2998.75



Note: Per DMS/IRT request, bank height ratio for MY2 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

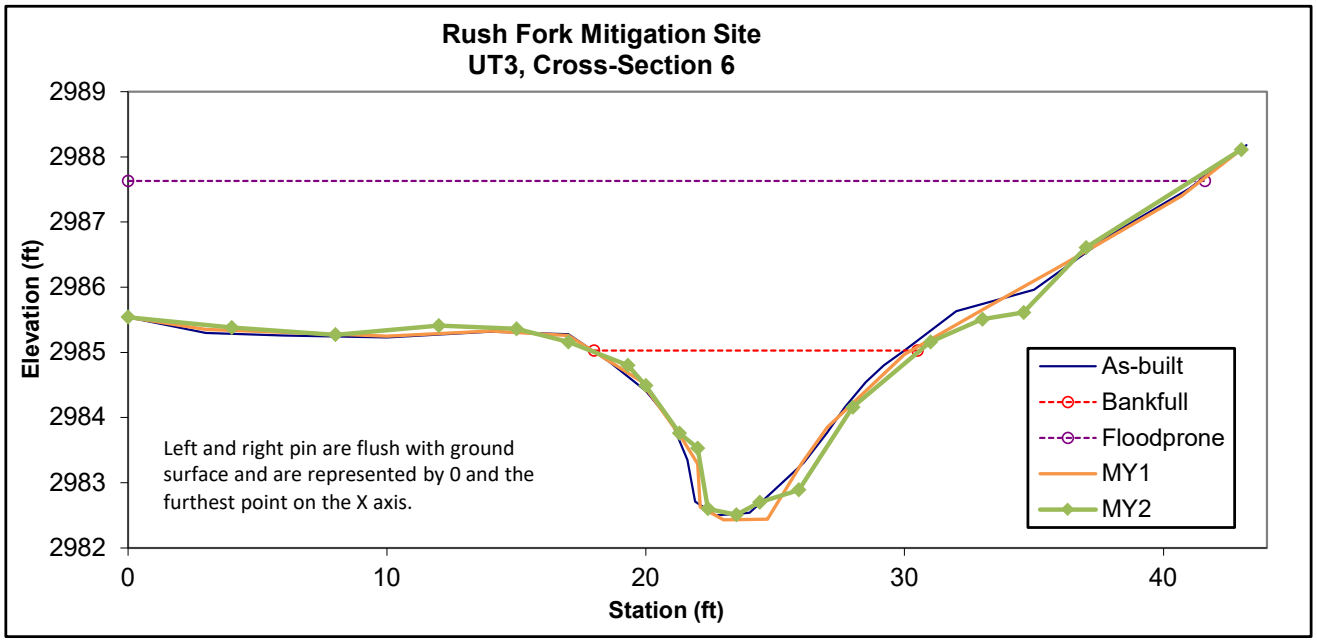
Permanent Cross-section 6

Year 1 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	E	15.9	12.8	1.2	2.5	10.3	1.0	1.9	2985.03	2984.8



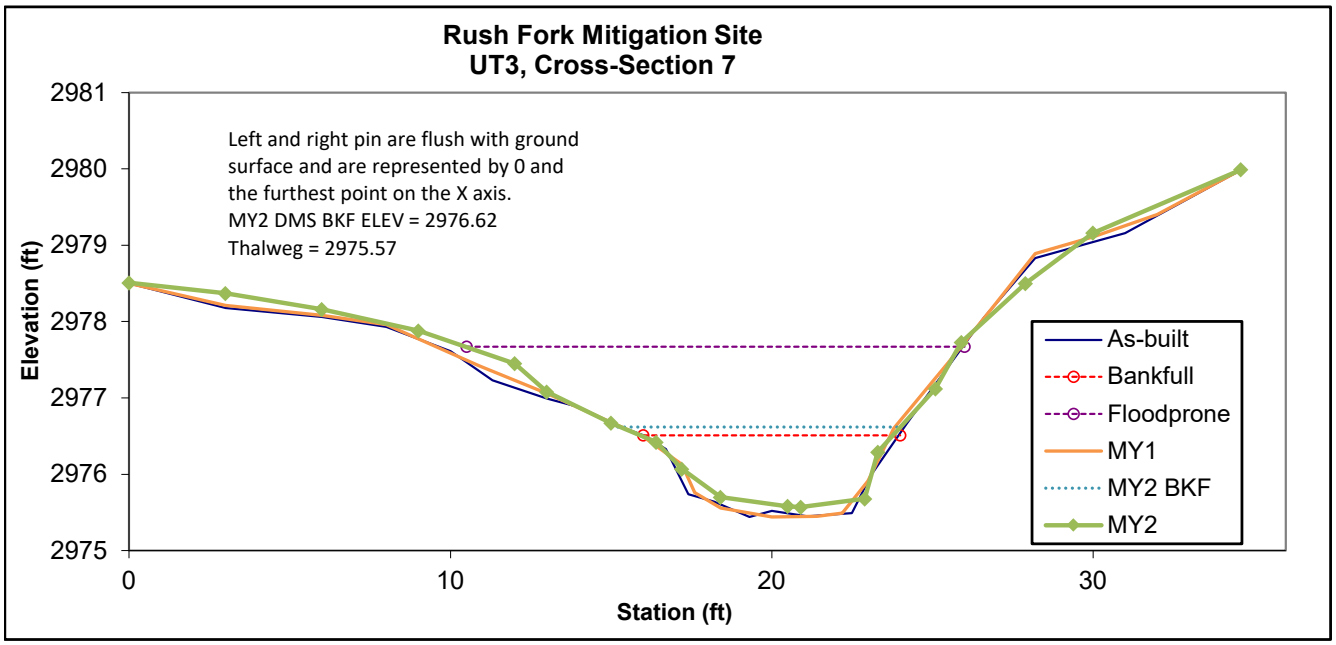
Permanent Cross-section 7

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	5.2	7.9	0.7	0.9	11.9	1.0	1.9	2976.51	2976.51



Note: Per DMS/IRT request, bank height ratio for MY2 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

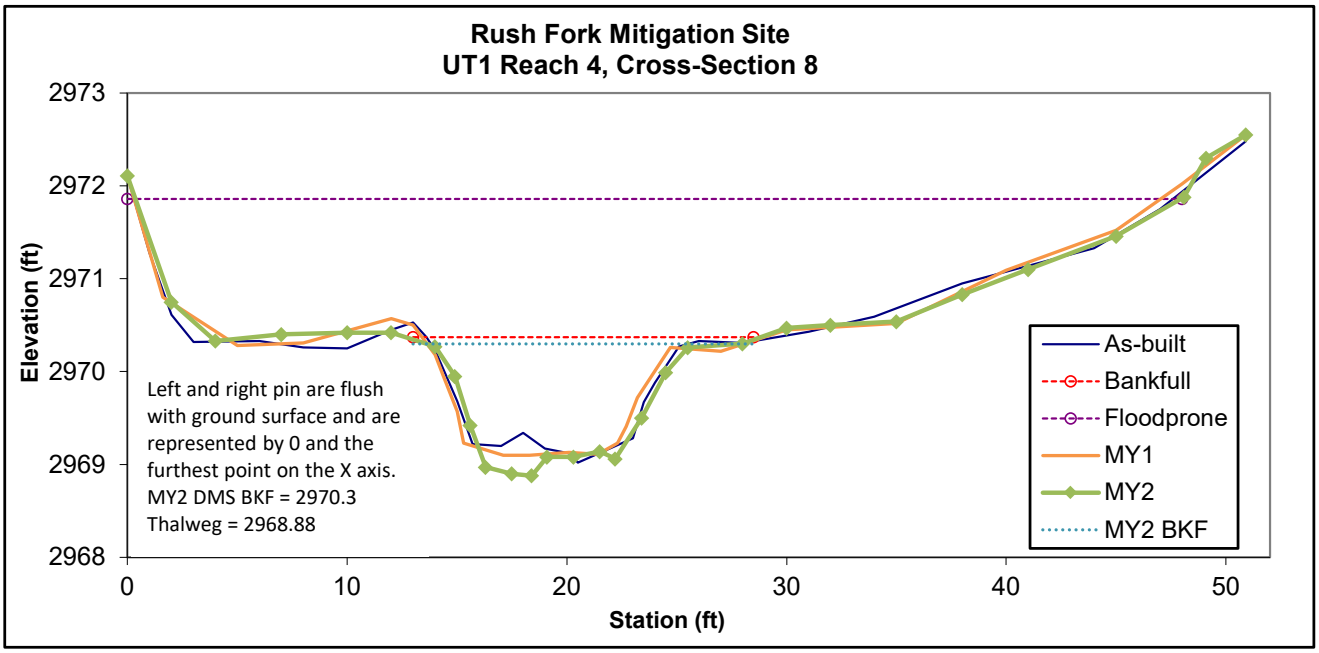
Permanent Cross-section 8

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	12.1	18.1	0.7	1.5	26.9	1.0	1.9	2970.37	2970.26



Note: Per DMS/IRT request, bank height ratio for MY2 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

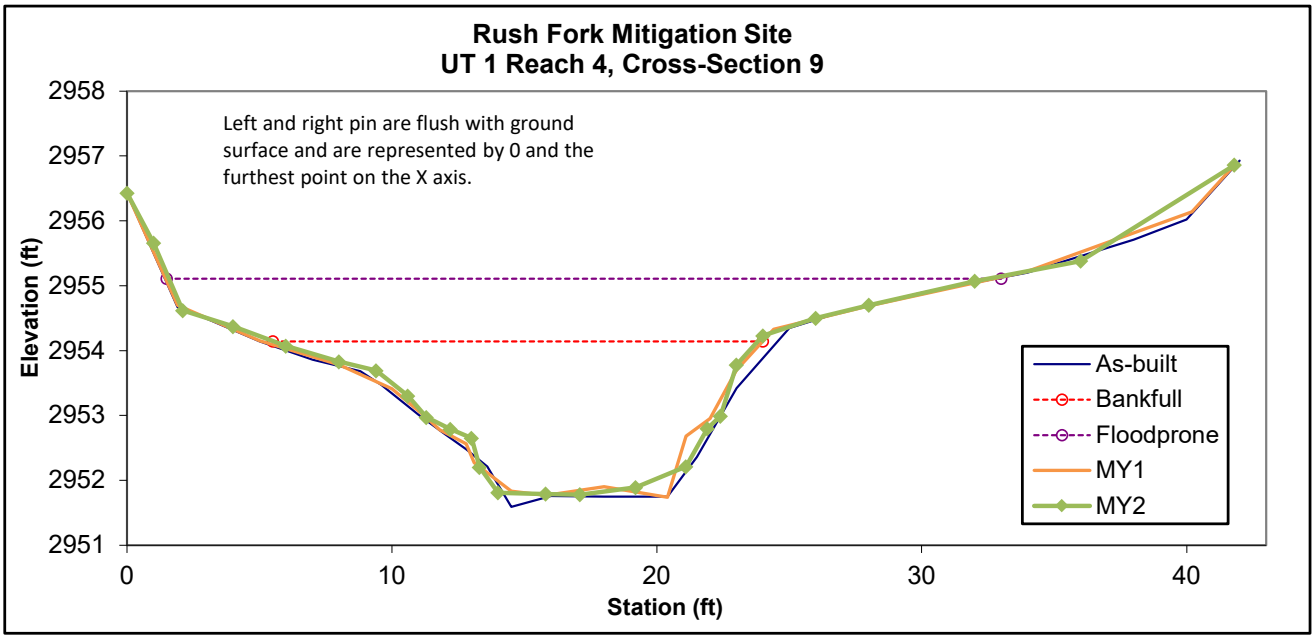
Permanent Cross-section 9

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	B	25.3	18.3	1.4	2.4	13.2	1.0	1.9	2954.14	2954.07



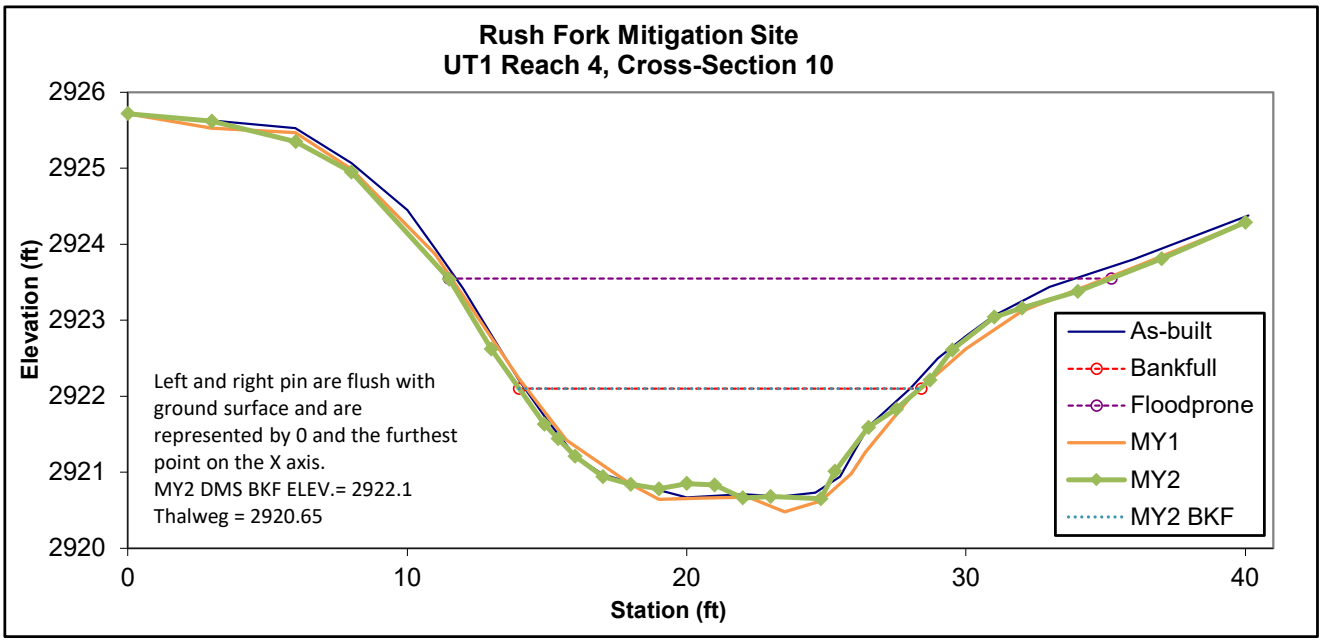
Permanent Cross-section 10

Year 2 Survey Collected: August 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	14.5	14.4	1	1.4	14.2	1.0	1.9	2922.1	2922.1



Note: Per DMS/IRT request, bank height ratio for MY2 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

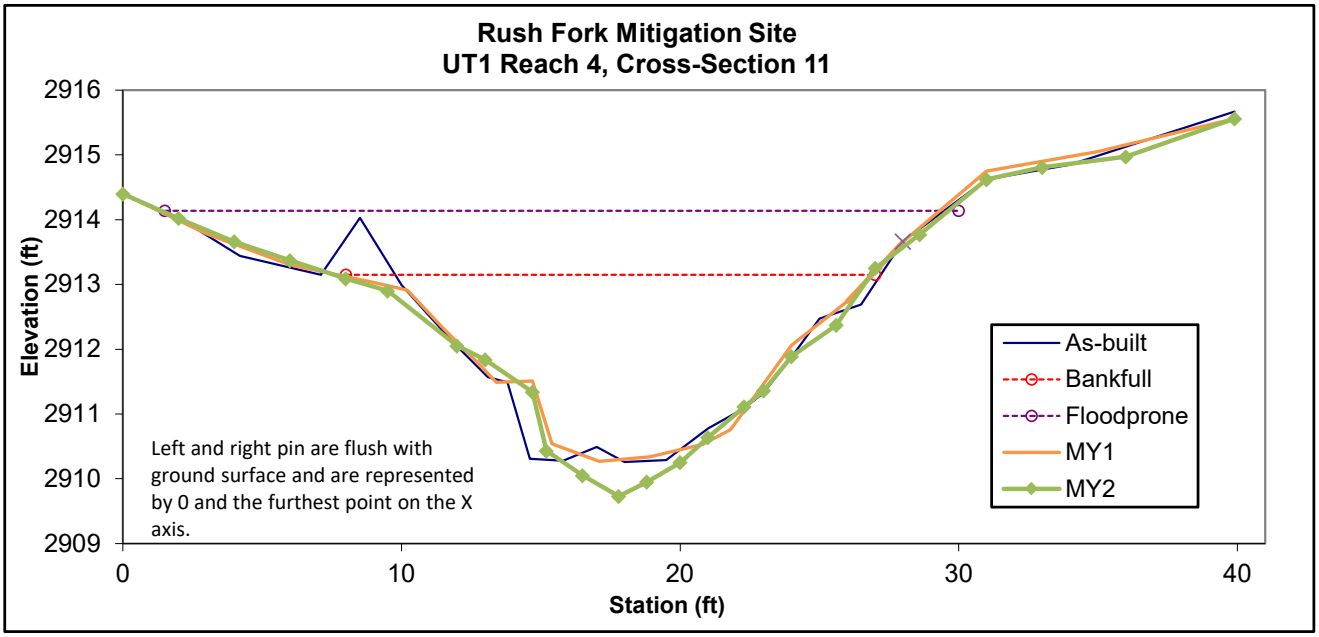
Permanent Cross-section 11

Year 2 Survey Collected: August 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	E	32.6	19.3	1.7	3.4	11.4	1.0	1.9	2913.15	2913.09



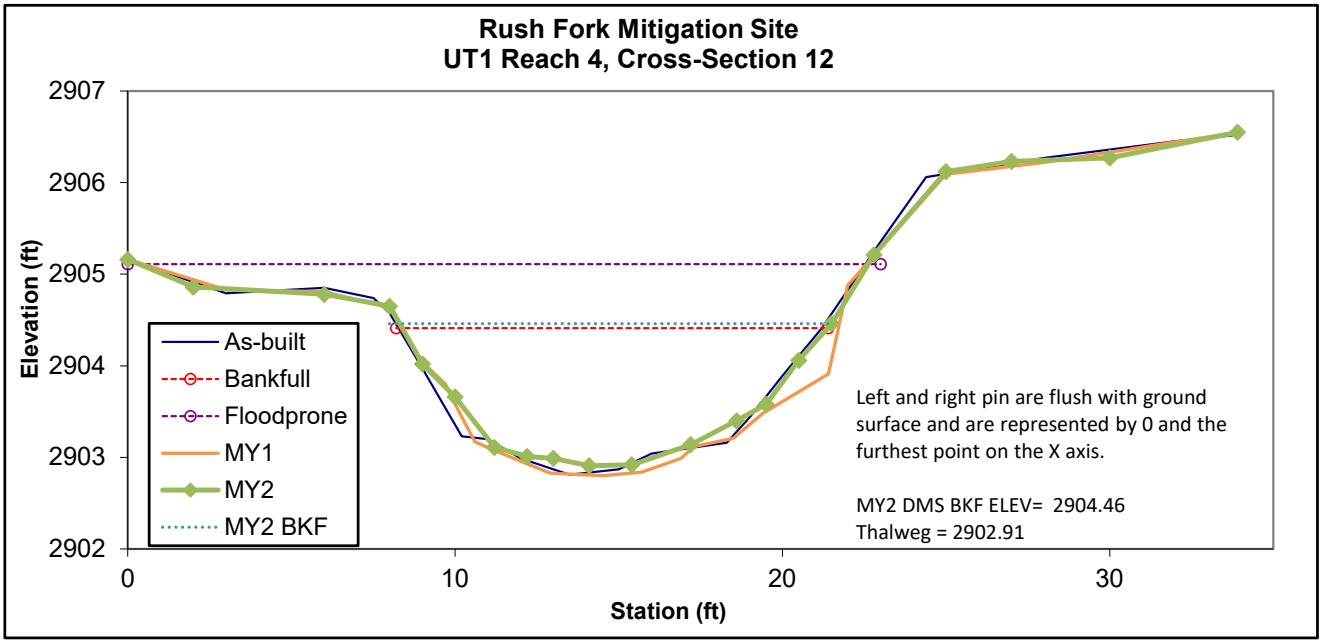
Permanent Cross-section 12

Year 2 Survey Collected: August 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	13.6	13	1	1.5	12.4	1.0	1.9	2904.41	2904.65



Note: Per DMS/IRT request, bank height ratio for MY2 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

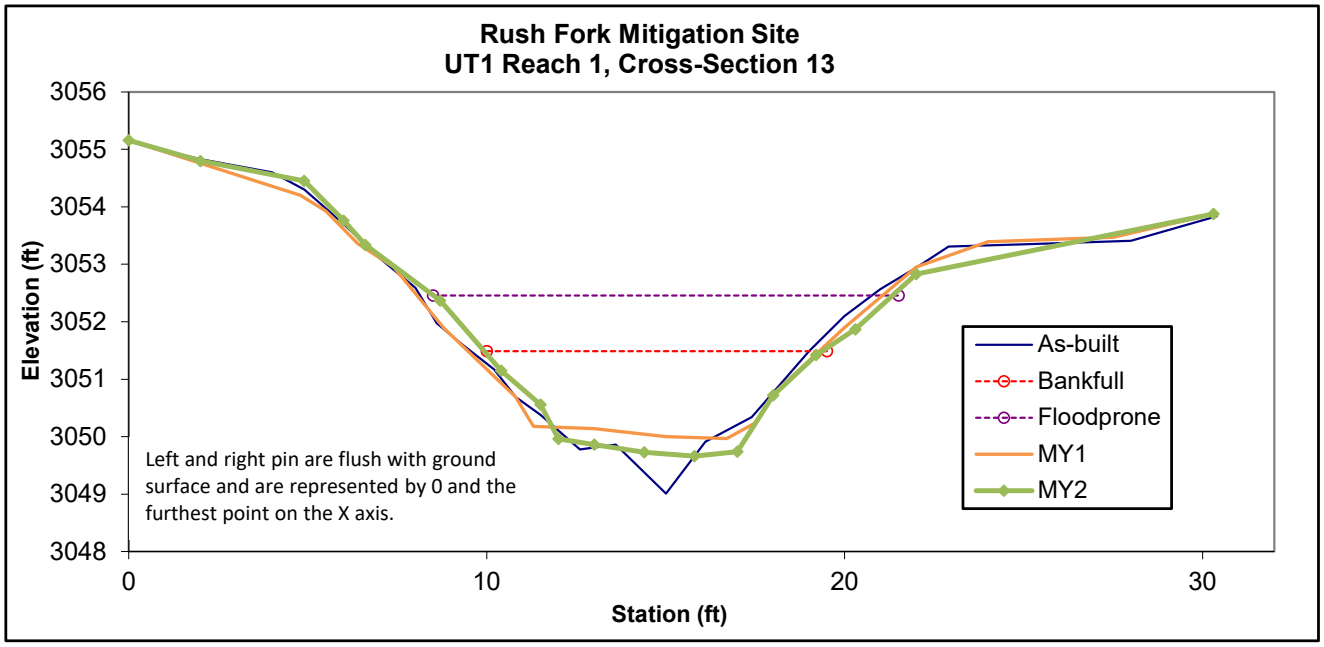
Permanent Cross-section 13

Year 2 Survey Collected November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	E	11.78	9.4	1.2	1.8	7.6	1.0	1.9	3051.49	3051.49



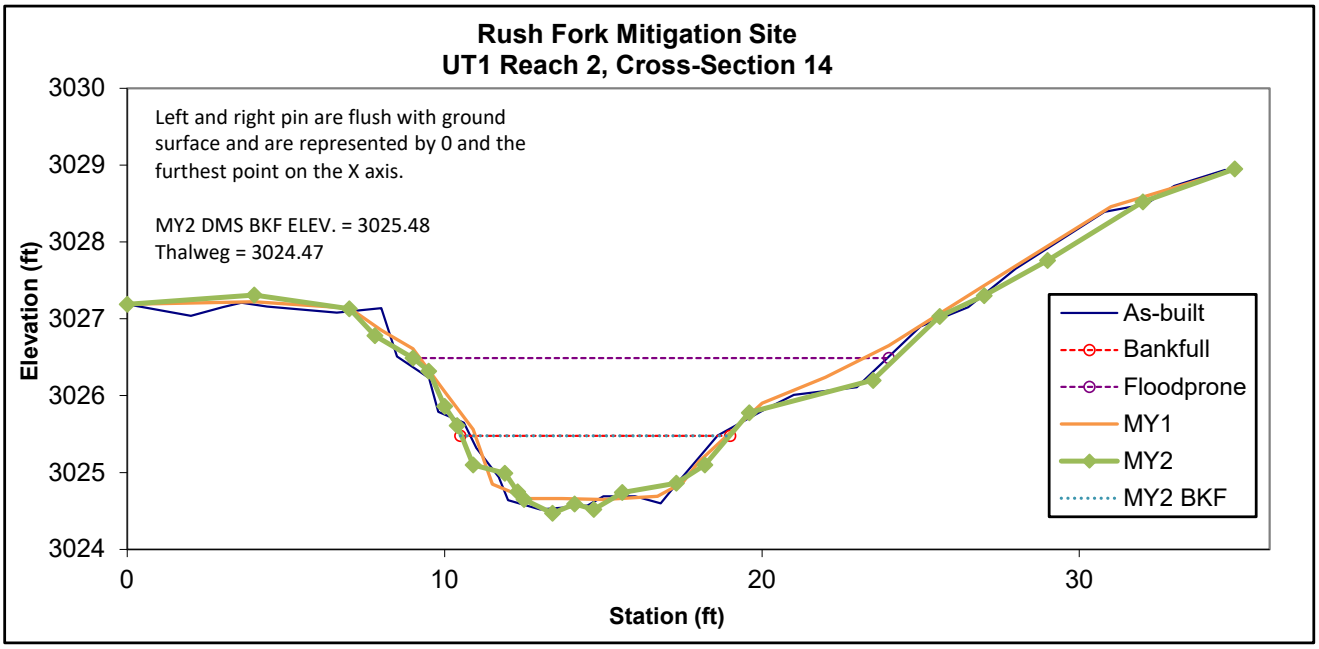
Permanent Cross-section 14

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B	5.5	8.5	0.6	1	13.1	1.0	1.9	3025.48	3025.48



Note: Per DMS/IRT request, bank height ratio for MY2 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

FIGURE 4. CROSS SECTIONS WITH ANNUAL OVERLAY

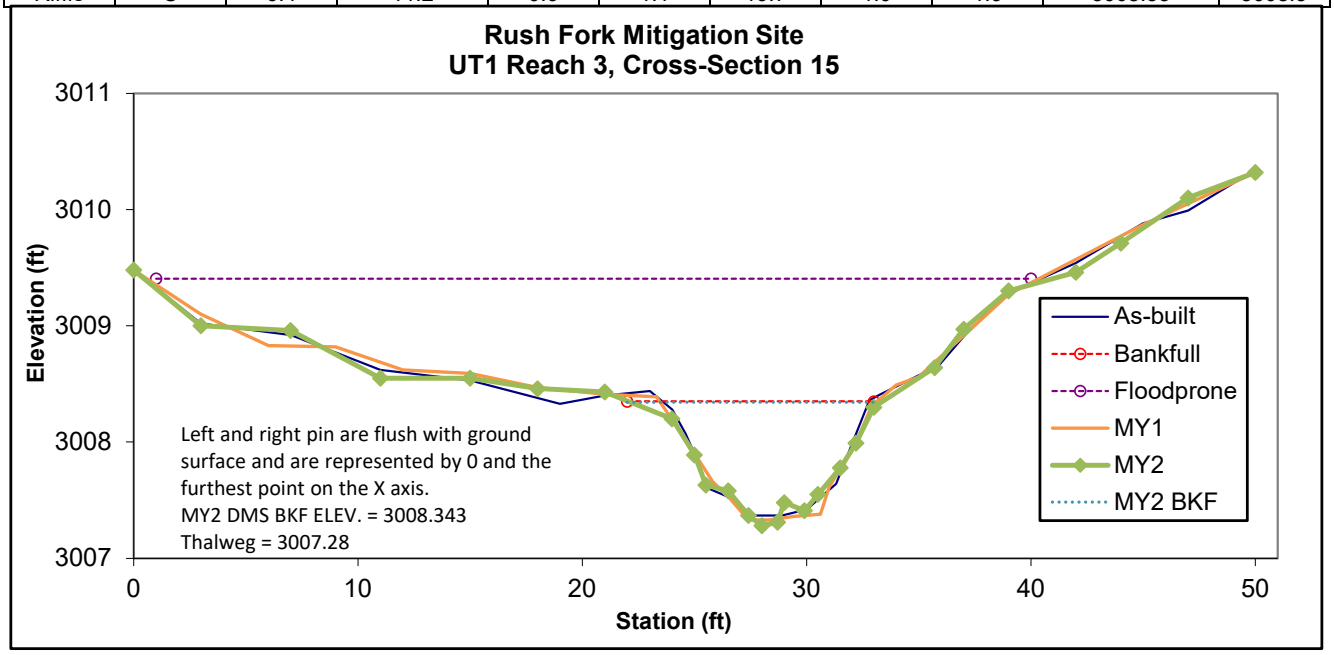
Permanent Cross-section 15

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	6.4	11.2	0.6	1.1	19.7	1.0	1.9	3008.35	3008.3



Note: Per DMS/IRT request, bank height ratio for MY1 has been calculated using the bankfull elevation as determined from the as-built bankfull area. All other values were calculated using the as-built bankfull elevation.

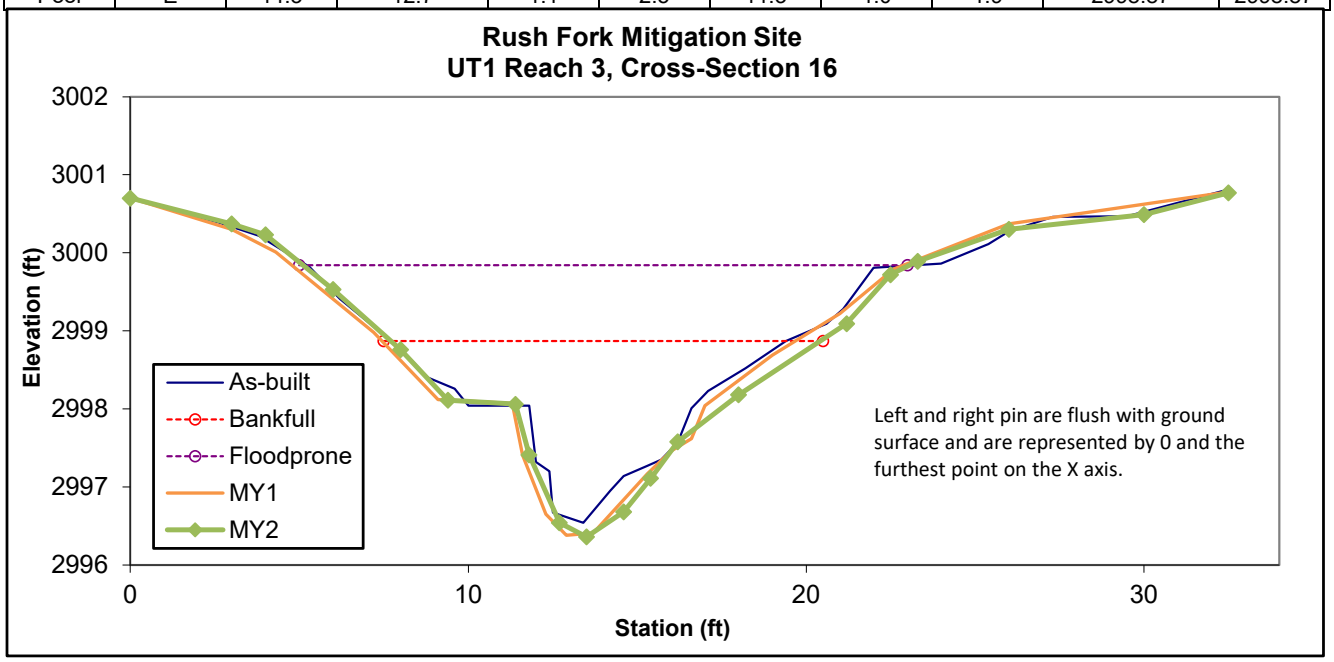
Permanent Cross-section 16

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	E	14.3	12.7	1.1	2.5	11.3	1.0	1.9	2998.87	2998.87



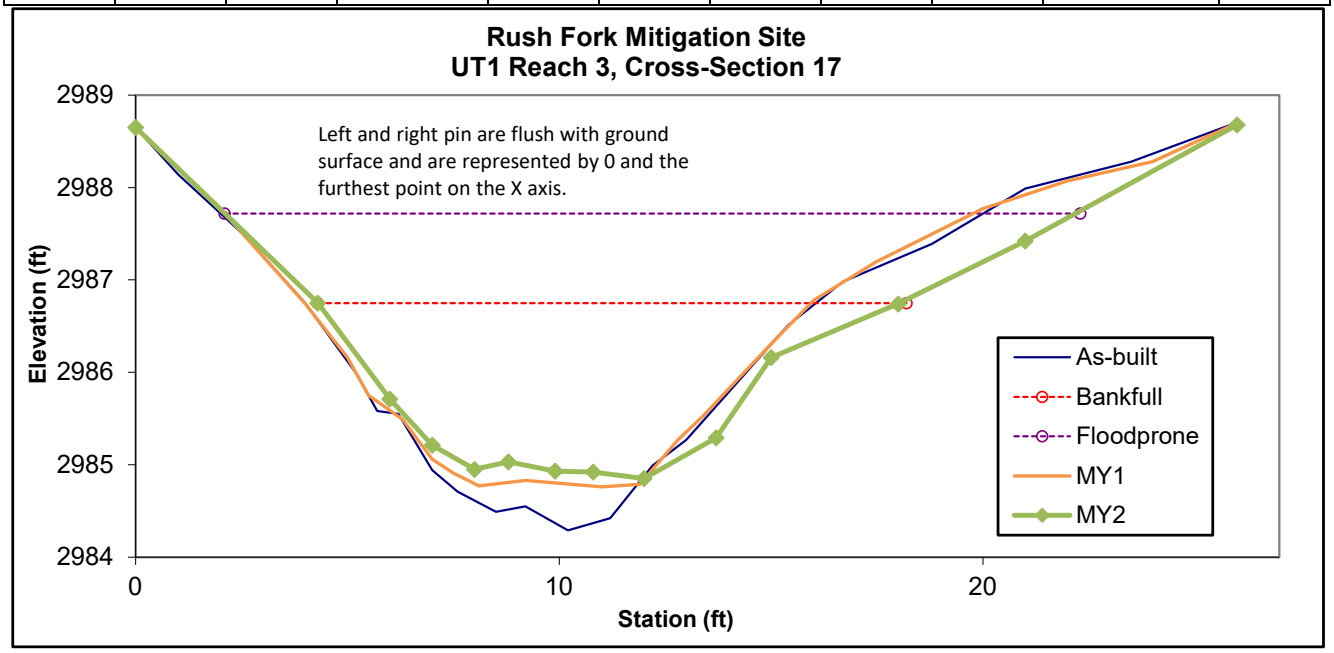
Permanent Cross-section 17

Year 2 Survey Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	B	19.1	15	1.3	1.9	11.8	--	--	2986.75	2986.74



Permanent Cross-section 18

Year 2 Data Collected: November 2023

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	B	16.5	14.3	1.2	2.5	12.4	1.0	1.9	2976.03	2976.03

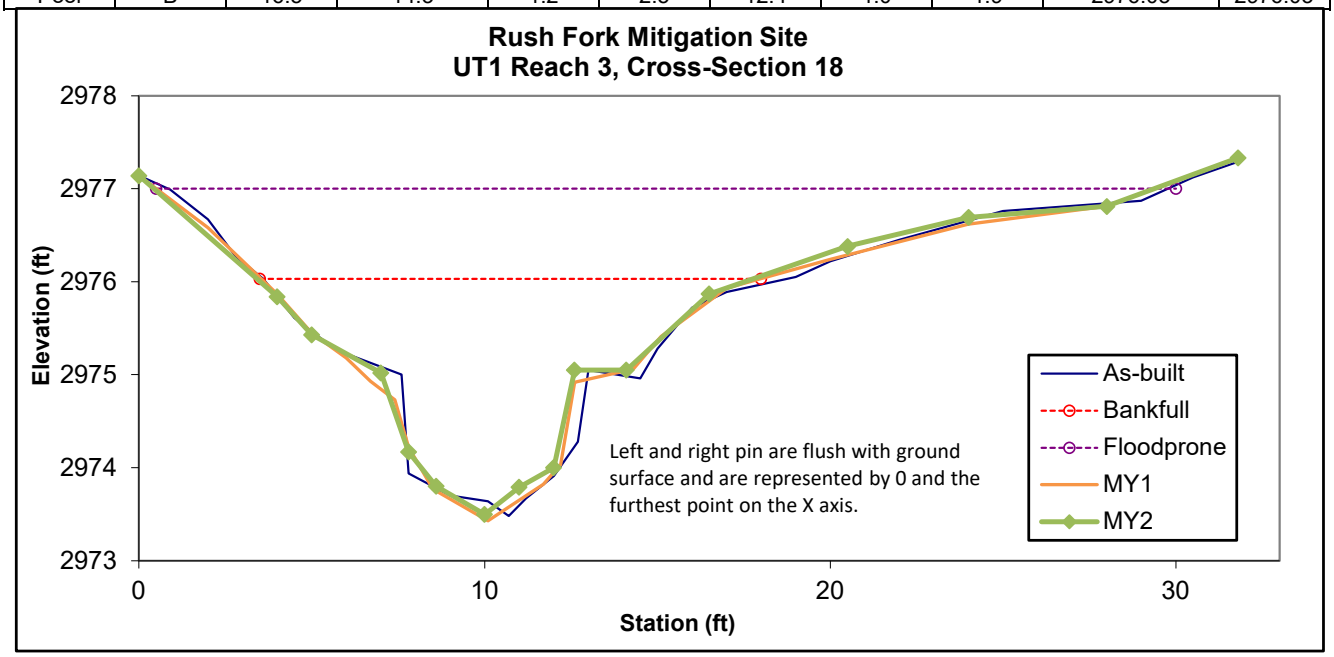


Table 8. Baseline Stream Data Summary
Rush Fork Stream Mitigation Project: DMS Project No ID. 100068
UT1 - Reach 1-3 (Enhancement)

Parameter	Pre-Existing Condition				Reference Reach(es) Data				Design				As-built			
					Composite											
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	7.1000	9.65	-----	12.2000	9.90	11.39	-----	12.88	9.00	9.50	-----	10.00	7.79	9.28	9.28	10.76
Floodprone Width (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	15.09	27.03	15.09	38.96
BF Mean Depth (ft)	0.2700	0.58	-----	0.8900	0.55	0.86	-----	1.16	0.65	0.68	-----	0.70	0.59	0.65	0.65	0.70
BF Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	0.80	0.90	-----	1.00	0.96	0.98	0.98	0.99
BF Cross-sectional Area (ft²)	3.3300	4.85	-----	6.4	5.4	8.76	-----	12.1	5.9	6.45	-----	7.00	5.44	5.90	5.90	6.36
Width/Depth Ratio	7.9800	26.62	-----	45.2600	8.97	13.49	-----	18.00	13.80	14.05	-----	14.30	11.13	14.69	14.69	18.24
Entrenchment Ratio	1.1500	1.43	-----	1.7100	1.70	1.67	-----	1.63	1.40	-----	-----	2.20	1.94	2.78	2.78	3.62
Bank Height Ratio	1.0000	1.43	-----	1.8600	1.00	1.19	-----	1.38	1.10		-----	1.10	1.00	1.00	1.00	1.00
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Meander Width Ratio	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.30	14.60	15.40	20.50
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-0.0950	-0.0680	-0.0630	-0.0400
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.00	9.50	10.00	14.00
Pool to Pool Spacing (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	14.00	42.10	35.00	240.00
Pool Max Depth (ft)	----	----	----	----	-----	-----	-----	-----	1.50	1.75	-----	2.00	2.33	2.46	2.47	2.55
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	168.14/256/80	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.21	-----	-----	0.15	0.32	-----	0.49	0.15	-----	-----	0.21	0.15	----	----	0.21
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	B4a	-----	-----		B4a - B4 - Ba	-----	-----	-----	B4a	-----	-----	----	B	----	----
BF Velocity (fps)	3.00	3.82	-----	4.64	3.42	5.11	-----	6.80	2.15	3.58	-----	5.00	----	----	----	----
BF Discharge (cfs)	10.00	19.75	-----	29.50	23.90	31.16	-----	38.41	12.60	14.95	-----	17.30	----	----	----	----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Length (ft)	-----	1,164	-----	-----	-----	-----	-----	-----	-----	1,093.30	-----	-----	----	1,082.27	----	----
Sinuosity	1.06	1.07	-----	1.07	1.02	1.08	-----	1.14	-----	1.05	-----	-----	----	----	----	----

Table 8. Baseline Stream Data Summary
Rush Fork Stream Mitigation Project: DMS Project No ID. 100068

UT1 - Reach 4 (Restoration)																
Parameter	**Pre-Existing Condition**				**Reference Reach(es) Data**				**Design**				**As-built**			
					Composite											
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	8.7300	11.07	-----	13.4000	9.90	11.39	-----	12.88	12.50	12.75	-----	13.00	12.93	14.21	13.36	15.90
Floodprone Width (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	21.96	30.86	24.30	46.32
BF Mean Depth (ft)	0.7300	1.01	-----	1.2800	0.55	0.86	-----	1.16	0.90	0.93	-----	0.95	0.69	0.71	0.87	1.11
BF Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	1.20	1.25	-----	1.30	1.35	1.46	1.43	1.60
BF Cross-sectional Area (ft²)	9.8600	10.48	-----	11.1	5.4	8.76	-----	12.1	11.3	11.70	-----	12.10	11.01	13.27	14.33	14.48
Width/Depth Ratio	6.8200	12.59	-----	18.3600	8.97	13.49	-----	18.00	12.00	15.00	-----	18.00	11.65	15.94	13.13	13.13
Entrenchment Ratio	1.4800	2.45	-----	3.4200	1.70	1.67	-----	1.63	1.40	1.80	-----	2.20	1.59	2.13	1.88	1.88
Bank Height Ratio	1.0000	1.31	-----	1.6200	1.00	1.19	-----	1.38	1.00	----	-----	1.62	1.00	1.00	1.00	1.00
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Meander Width Ratio	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	12.30	19.30	17.70	19.30
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	----	-----	-----	----	-0.5800	-0.0220	-0.0377	-0.0790
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	----	-----	-----	----	2.00	13.40	14.00	22.00
Pool to Pool Spacing (ft)	-----	-----	-----	-----	-----	-----	-----	-----	----	-----	-----	----	18.00	44.80	40.00	117.00
Pool Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.50	-----	-----	2.55	2.72	2.72	2.89
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	156/180/100.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.48	-----	-----	0.15	0.32	-----	0.49			-----		----	----		----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	B4	-----	-----		B4a - B4 - Ba	-----	-----	-----	B4	-----	-----	----	B4	----	----
BF Velocity (fps)	3.17	3.61	-----	4.04	3.42	5.11	-----	6.80	4.00	5.00	-----	6.00	----	----	----	----
BF Discharge (cfs)	31.24	38.03	-----	44.81	23.90	-----	-----	38.41	37.88	38.13	-----	38.37	----	----	----	----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Length (ft)	-----	1,300.00	-----	-----	-----	-----	-----	-----	-----	1,216.33	-----	-----	----	1,224.37	----	----
Sinuosity	1.08	1.11	-----	1.14	1.02	1.08	-----	1.14	1.10	1.15	-----	1.20	----	----	----	----

Table 8. Baseline Stream Data Summary

Rush Fork Stream Mitigation Project: DMS Project No ID. 100068

UT3 - Restoration

Parameter	Pre-Existing Condition				Reference Reach(es) Data				Design				As-built			
					Composite											
Dimension and Substrate - Riffle	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max	Min	Mean	Med	Max
BF Width (ft)	-----	6.58	-----	-----	9.90	11.39	-----	12.88	7.50	8.00	-----	8.50	7.04	8.29	7.60	10.92
Floodprone Width (ft)	-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	11.96	15.37	14.41	20.71
BF Mean Depth (ft)	-----	0.82	-----	-----	0.55	0.86	-----	1.16	0.57	0.61	-----	0.65	0.52	0.61	0.58	0.77
BF Max Depth (ft)	-----		-----	-----	-----	-----	-----	-----	0.70	0.78	-----	0.85	0.71	0.89	0.89	1.07
BF Cross-sectional Area (ft²)	-----	5.4	-----	-----	5.4	8.76	-----	12.1	4.6	5.30	-----	6.00	3.64	5.05	5.16	6.23
Width/Depth Ratio	-----	8.02	-----	-----	8.97	13.49	-----	18.00	-----	13.10	-----	-----	10.32	13.88	13.02	19.16
Entrenchment Ratio	-----	2.17	-----	-----	1.70	1.67	-----	1.63	1.40	1.80	-----	2.20	1.70	1.85	1.86	1.97
Bank Height Ratio	-----	1.83	-----	-----	1.00	1.19	-----	1.38	-----	1.00	-----	-----	1.00	1.00	1.00	1.00
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Pattern																
Channel Beltwidth (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Radius of Curvature (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Rc/Bankfull width (ft/ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Meander Wavelength (ft)	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Meander Width Ratio	-----	N/A	-----	-----	-----	N/A	-----	-----	-----	N/A	-----	-----	----	N/A	----	----
Profile																
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	10.20	18.70	16.90	37.20
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-0.1400	-0.0660	-0.0649	-0.0330
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.00	5.70	6.00	12.00
Pool to Pool Spacing (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	10.00	37.00	34.00	70.00
Pool Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	1.70	1.75	-----	1.80	2.16	2.54	2.53	2.94
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / Bo%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Additional Reach Parameters																
Drainage Area (SM)	-----	0.15	-----	-----	0.15	0.32	-----	0.49	-----	0.15	-----	-----	----	0.15	----	----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Rosgen Classification	-----	Ba	-----	-----		B4a - B4 - Ba	-----	-----	-----	Ba	-----	-----	----	B4	----	----
BF Velocity (fps)	-----	3.48	-----	-----	3.42	5.11	-----	6.80	4.42	4.71	-----	5.00	----	----	----	----
BF Discharge (cfs)	-----	18.8	-----	-----	23.90	31.16	-----	38.41	19.00	24.50	-----	30.00	----	----	----	----
Valley Length	-----	1,541	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	----	----	----	----
Channel Length (ft)	-----	1,618	-----	-----	-----	-----	-----	-----	-----	1,584.45	-----	-----	----	1,577.53	----	----
Sinuosity	-----	1.05	-----	-----	1.02	1.08	-----	1.14	-----	1.02	-----	-----	----	----	----	----

Table 9. Cross-Section Morphology Data Summary
UT to Rush Fork Restoration Project: DMS Project No ID. 100068

Stream Reach	UT3																									
	Cross-section X-1 (Riffle)							Cross-section X-2 (Pool)							Cross-section X-3 (Riffle)							Cross-section X-4 (Pool)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	3063.86	3063.77	3063.87					--	--	--					3028.13	3028.14	3028.13					--	--	--				
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.10	1.00					--	--	--					1.00	1.00	1.00					--	--	--				
Thalweg Elevation	3062.99	3062.93	3062.90					3045.87	3046.11	3048.03					3027.42	3027.38	3027.24					3007.90	3007.69	3007.63				
LTOB[2] Elevation	3063.86	3063.86	3063.86					3048.03	3048.03	3045.9					3028.13	3028.13	3028.13					3010.84	3010.84	3010.84				
LTOB[2] Max Depth (ft)	0.87	0.90	1.0					2.16	1.92	2.2					0.71	0.75	0.90					2.94	3.15	3.20				
LTOB[2] Cross Sectional Area (ft^2)	4.20	4.96	4.10					11.12	10.36	8.8					3.64	3.66	3.70					15.11	14.74	14.10				

Stream Reach	UT3																					UT 1 Reach 4						
	Cross-section X-5 (Riffle)							Cross-section X-6 (Pool)							Cross-section X-7 (Riffle)							Cross-section X-8 (Riffle)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	2998.75	2998.78	2998.75					--	--	--					2976.51	2976.50	2976.51					2970.37	2970.34	2970.37				
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00	1.00	1.00					--	--	--					1.00	1.00	1.00					1.00	1.00	1.00				
Thalweg Elevation	2997.84	2997.76	2997.69					2982.50	2982.43	2982.51					2975.44	2975.44	2975.57					2969.02	2969.10	2968.88				
LTOB[2] Elevation	2998.75	2998.75	2998.75					2985.03	2985.03	2984.80					2976.51	2976.51	2976.51					2970.37	2970.37	2970.26				
LTOB[2] Max Depth (ft)	0.91	0.99	1.10					2.53	2.60	2.50					1.07	1.07	0.90					1.35	1.27	1.50				
LTOB[2] Cross Sectional Area (ft^2)	6.23	6.14	5.70					15.51	15.74	15.90					6.11	5.93	5.20					11.01	11.34	12.10				

Stream Reach	UT1 Reach 4																									
	Cross-section X-9 (Pool)							Cross-section X-10 (Riffle)							Cross-section X-11 (Pool)							Cross-section X-12 (Riffle)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	--	--	--					2922.10	2922.01	2922.10					--	--	--					2904.41	2904.34	2904.41				
Bank Height Ratio_Based on AB Bankfull[1] Area	--	--	--					1.00	1.00	1.00					--	--	--					1.00	1.00	1.00				
Thalweg Elevation	2951.59	2951.74	2951.78					2920.67	2920.48	2920.65					2910.26	2910.27	2909.73					2902.81	2902.80	2902.91				
LTOB[2] Elevation	2954.14	2954.14	2954.07					2922.10	2922.10	2922.10					2913.15	2913.15	2913.09					2904.41	2904.41	2904.65				
LTOB[2] Max Depth (ft)	2.55	2.40	2.40					1.43	1.62	1.40					2.89	2.88	3.40					1.60	1.61	1.50				
LTOB[2] Cross Sectional Area (ft^2)	27.56	25.75	25.30					14.50	15.28	14.50					31.24	30.05	32.60					14.33	15.37	13.60				

Table 9. Cross-Section Morphology Data Summary
UT to Rush Fork Restoration Project: DMS Project No ID. 100068

Stream Reach	UT1 Reach 1							UT1 Reach 2							UT1 Reach 3													
	Cross-section X-13 (Pool)							Cross-section X-14 (Riffle)							Cross-section X-15 (Riffle)							Cross-section X-16 (Pool)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation																												
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	--	--	--					3025.48	3025.50	3025.48					3008.35	3008.34	3008.35					--	--	--				
Bank Height Ratio_Based on AB Bankfull[1] Area	--	--	--					1.00	1.00	1.00					1.00	1.00	1.00					--	--	--				
Thalweg Elevation	3049.01	3049.97	3049.66					3024.52	3024.65	3024.47					3007.37	3007.33	3007.28					2996.54	2996.38	2996.36				
LTOB[2] Elevation	3051.49	3051.49	3051.49					3025.48	3025.48	3025.48					3008.35	3008.35	3005.35					2998.87	2998.87	2998.87				
LTOB[2] Max Depth (ft)	2.48	1.52	1.80					0.96	0.83	1.00					0.98	1.02	1.10					2.33	2.49	2.50				
LTOB[2] Cross Sectional Area (ft^2)	12.13	10.64	11.78					5.44	5.29	5.50					6.36	6.48	6.40					12.06	14.14	14.30				

Stream Reach	UT1 Reach 3													
	Cross-section X-17 (Pool)							Cross-section X-18 (Pool)						
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Based on fixed baseline bankfull elevation														
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	--	--	--					--	--	--				
Bank Height Ratio_Based on AB Bankfull[1] Area	--	--	--					--	--	--				
Thalweg Elevation	2984.29	2984.76	2984.85					2973.48	2973.43	2973.50				
LTOB[2] Elevation	2986.75	2986.75	2986.74					2976.03	2976.03	2976.03				
LTOB[2] Max Depth (ft)	2.46	1.99	1.90					2.55	2.60	2.50				
LTOB[2] Cross Sectional Area (ft^2)	17.60	15.99	19.10					17.29	17.10	16.50				

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:

1 - **Bank Height Ratio (BHR)** takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.

2 - **LTOB Area and Max depth -** These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

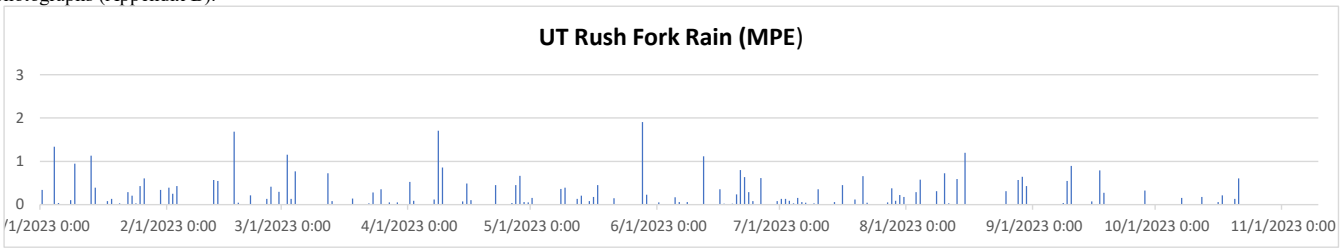
APPENDIX E

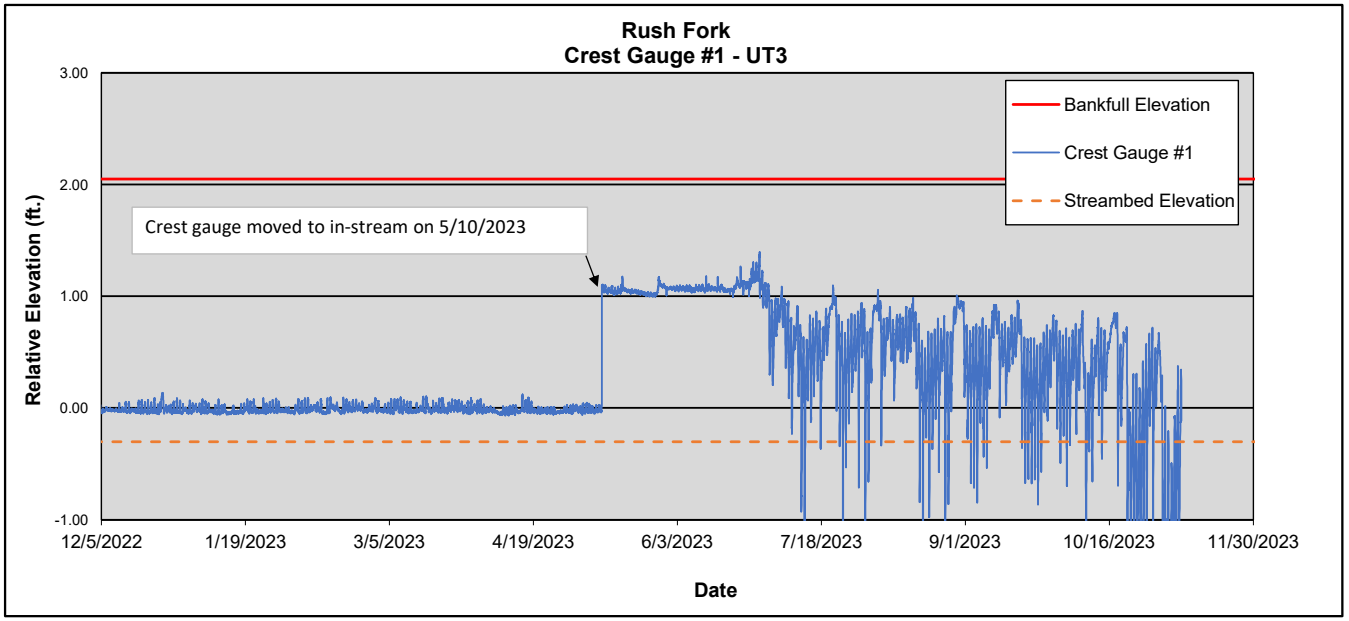
Hydrologic Data

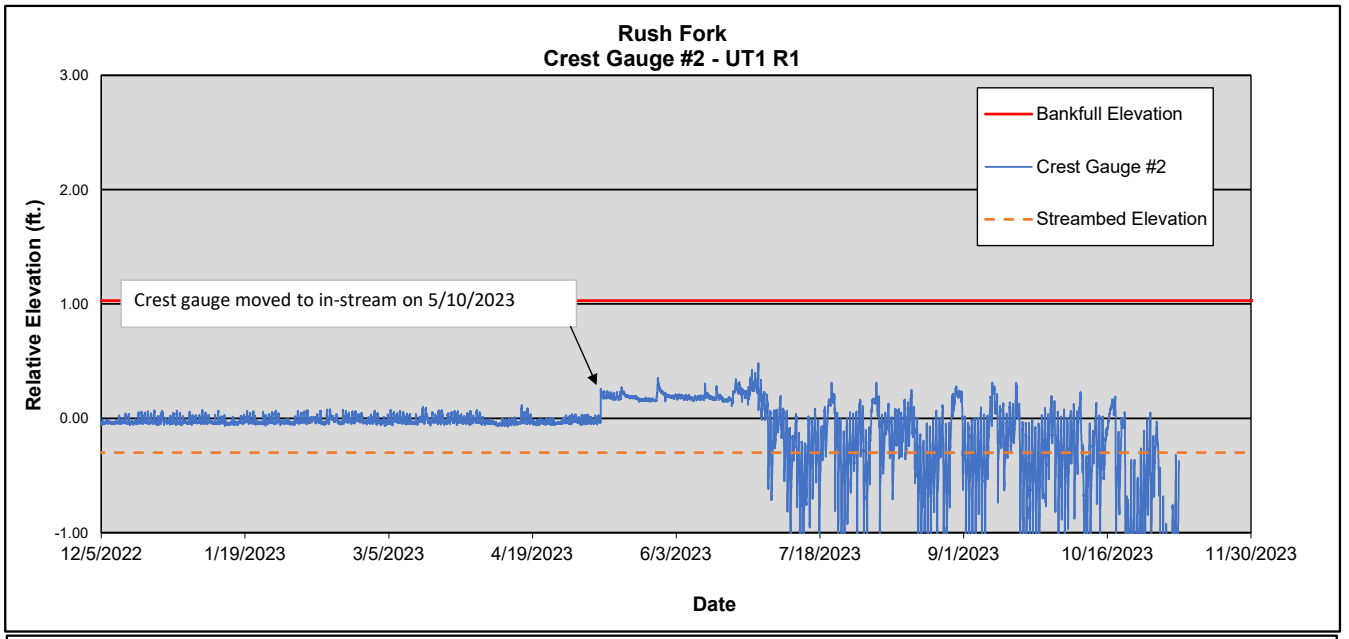
Table 10. Verification of Bankfull Events
UT to Rush Fork Stream Mitigation Project - NCDMS Project No. 100068

Date of Data Collection	UT3 Crest Gauge #1	UT1 R1 Crest Gauge #2	UT1 R4 Crest Gauge #3	Date of Bankfull Event Occurrence	Method of Data Collection
Year 1 Monitoring (2022)					
11/29/2022	NA	NA	NA	NA	Continuous Stage Recorder
Year 2 Monitoring (2023)					
5/10/2023	NA	NA	NA	NA	Continuous Stage Recorder

Note: Crest gauge readings were corroborated with associated spikes in the automated Continuous Stage Recorder (see graph in Appendix E) and/or with photographs (Appendix B).






Rush Fork
Crest Gauge #2 - UT1 R1
Relative Elevation (ft.)
3.00
2.00
1.00
0.00
-1.00
Bankfull Elevation
Crest Gauge #2
Streambed Elevation
Crest gauge moved to in-stream on 5/10/2023
12/5/2022
1/19/2023
3/5/2023
4/19/2023
6/3/2023
7/18/2023
9/1/2023
10/16/2023
11/30/2023
Date

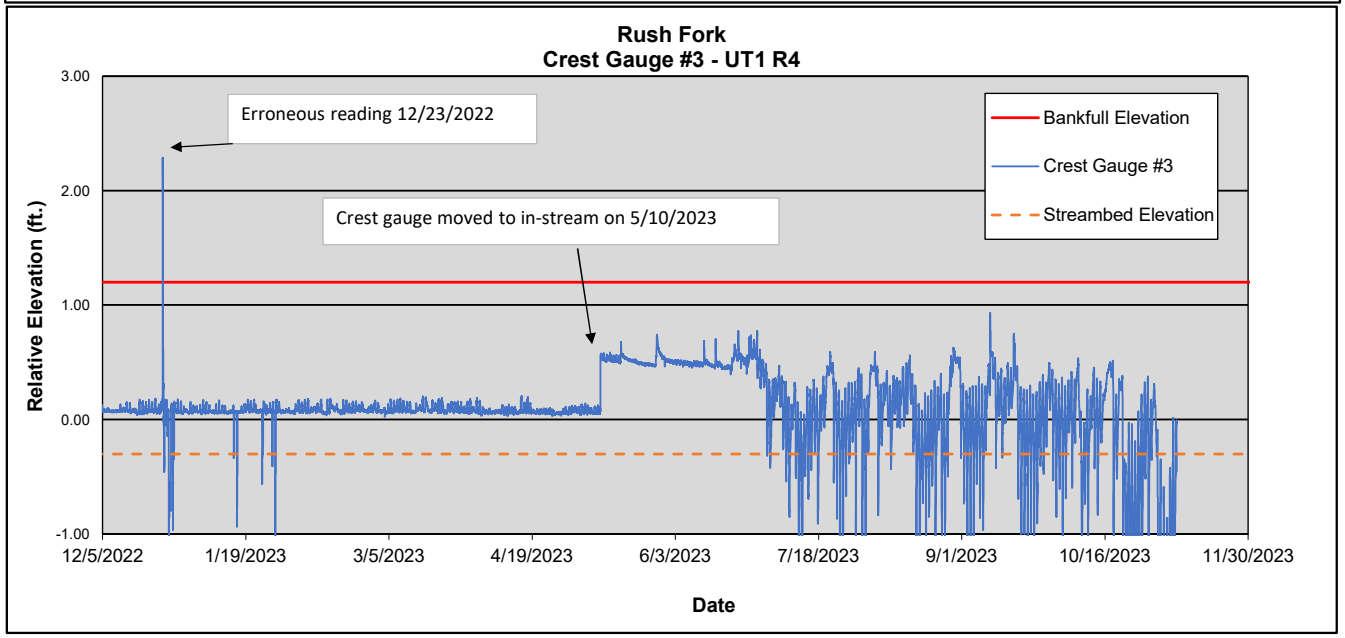
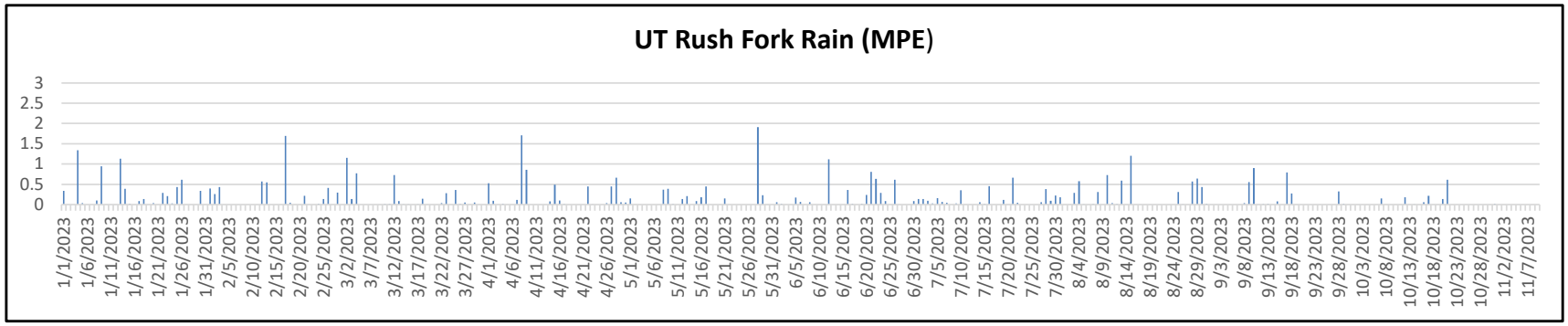
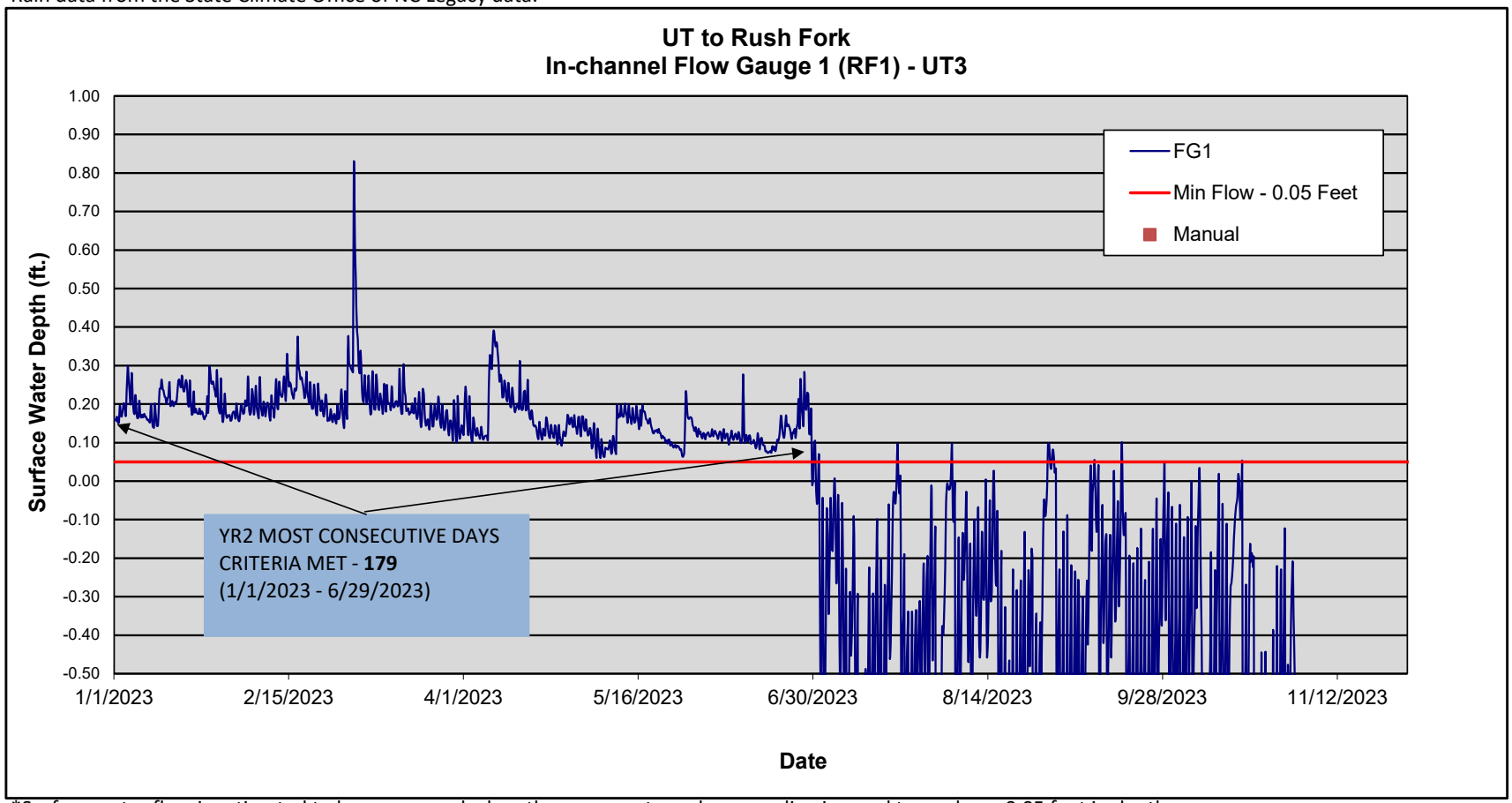

Rush Fork
Crest Gauge #3 - UT1 R4
Relative Elevation (ft.)
3.00
2.00
1.00
0.00
-1.00
Bankfull Elevation
Crest Gauge #3
Streambed Elevation
Erroneous reading 12/23/2022
Crest gauge moved to in-stream on 5/10/2023
12/5/2022
1/19/2023
3/5/2023
4/19/2023
6/3/2023
7/18/2023
9/1/2023
10/16/2023
11/30/2023
Date

Figure 5 Flow Gauge Graphs

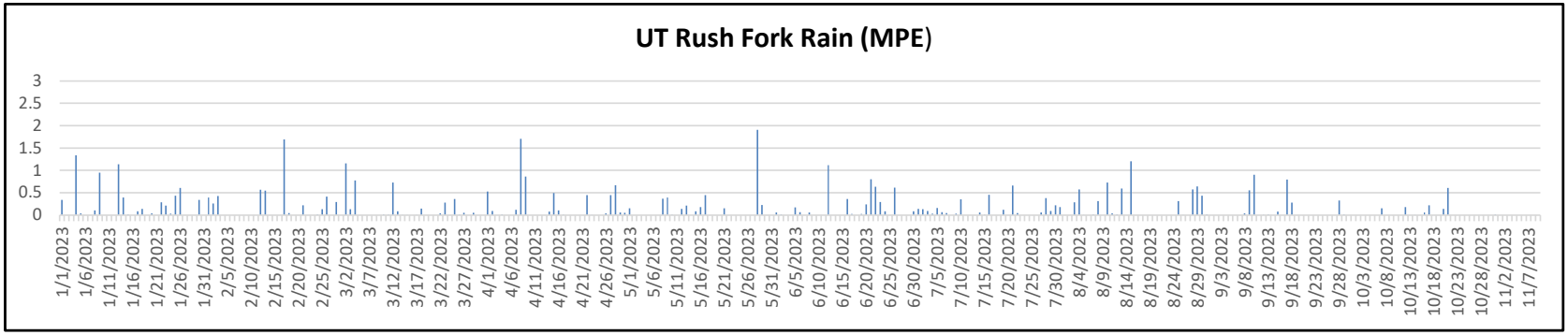


Rain data from the State Climate Office of NC Legacy data.

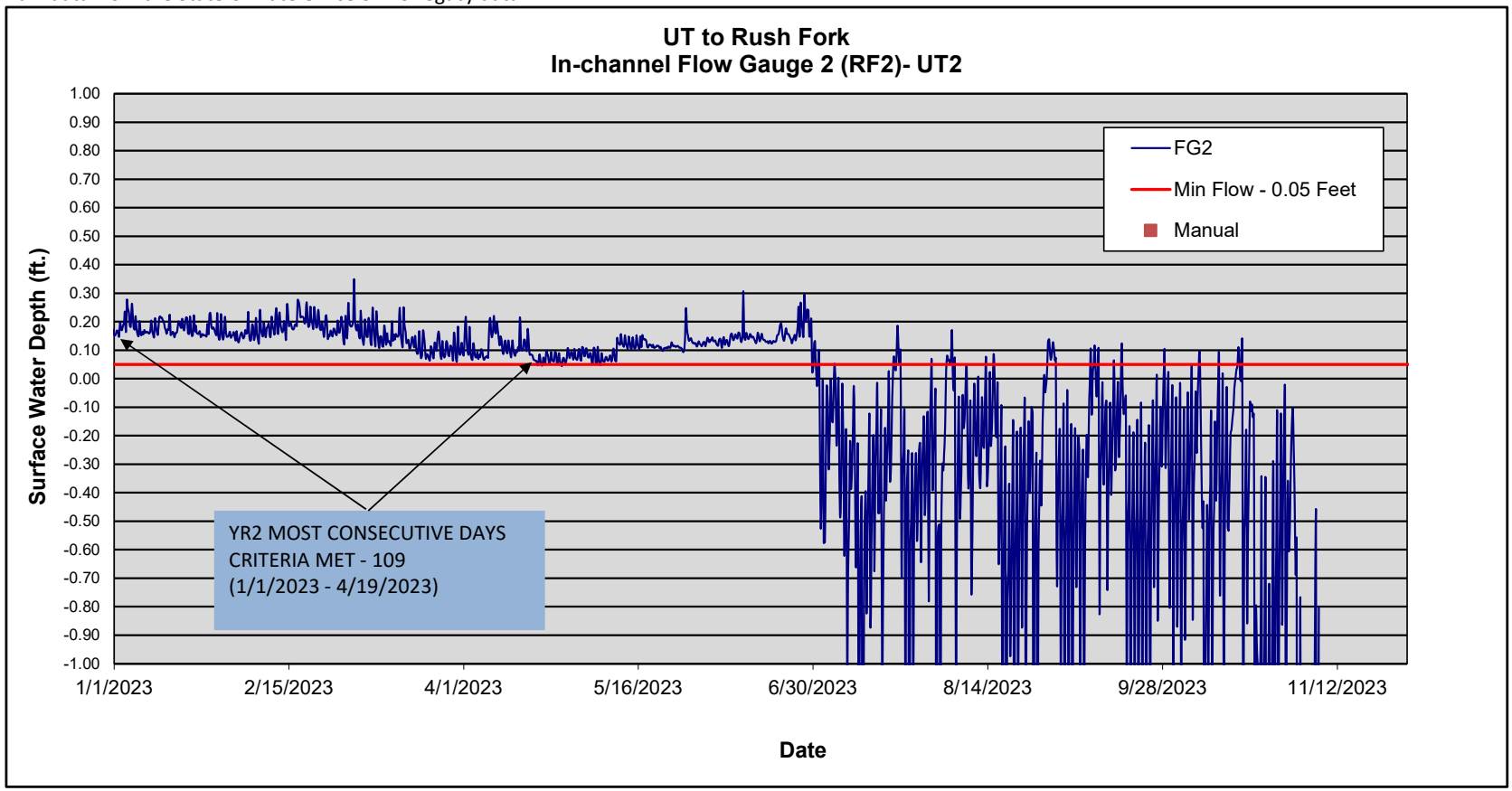


*Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 5 Flow Gauge Graphs

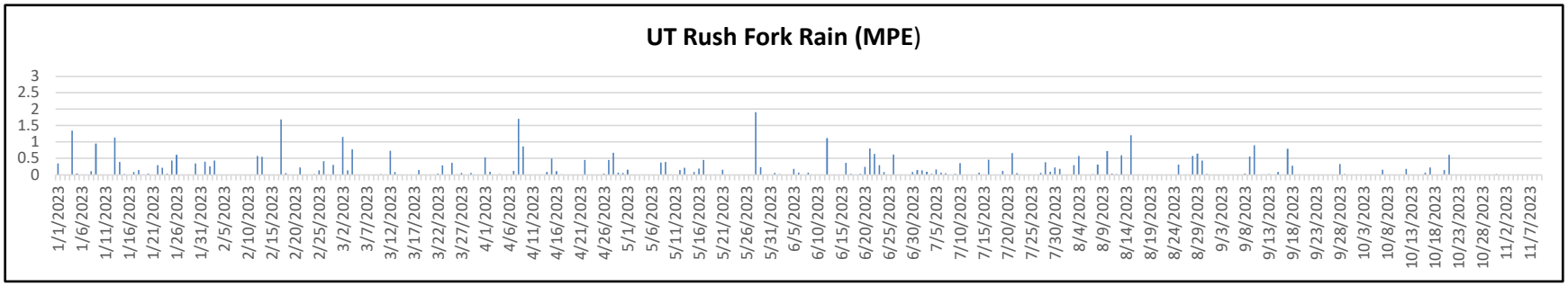


Rain data from the State Climate Office of NC Legacy data.

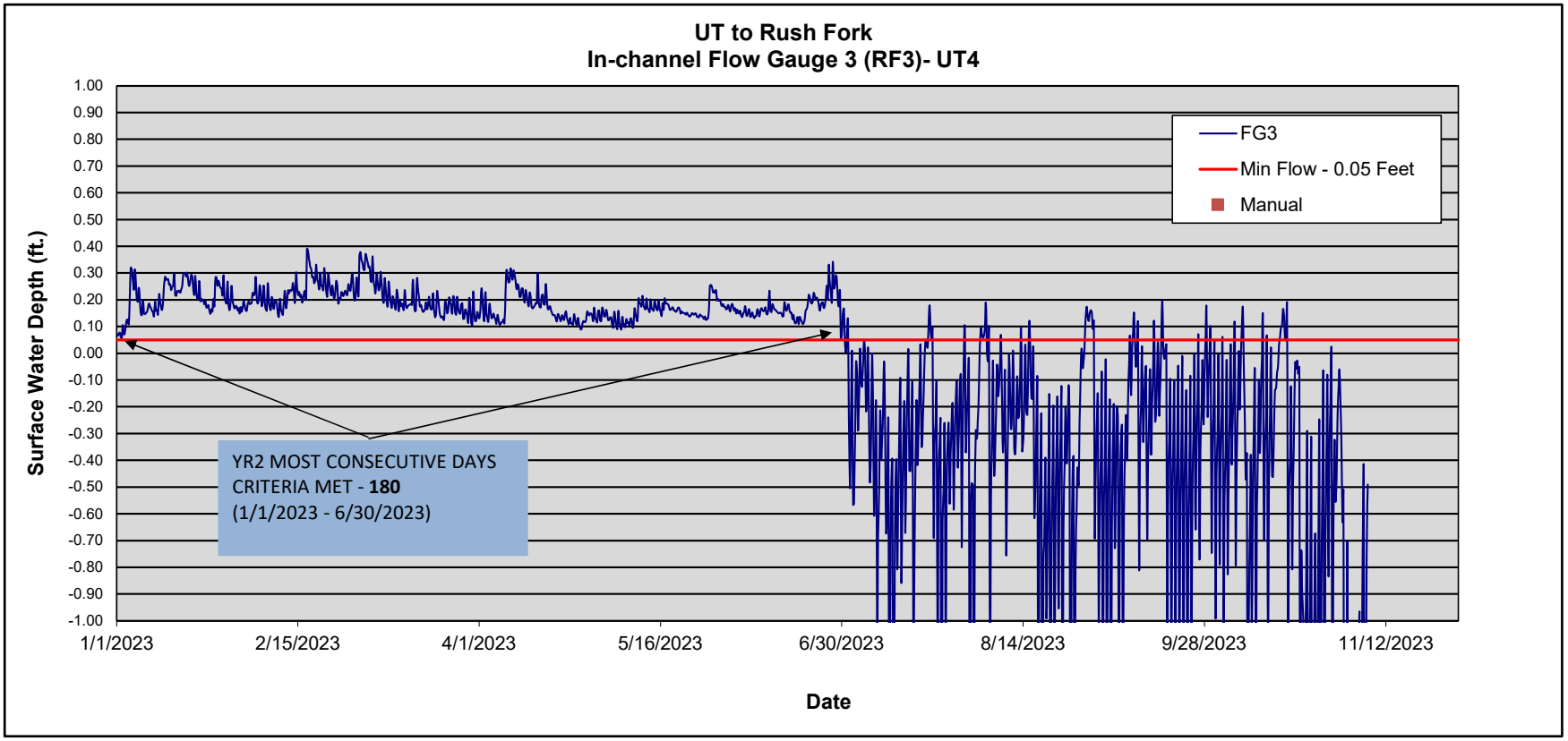


*Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 5 Flow Gauge Graphs



Rain data from the State Climate Office of NC Legacy data.



*Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

Figure 6. Observed Rainfall Versus Historic Averages

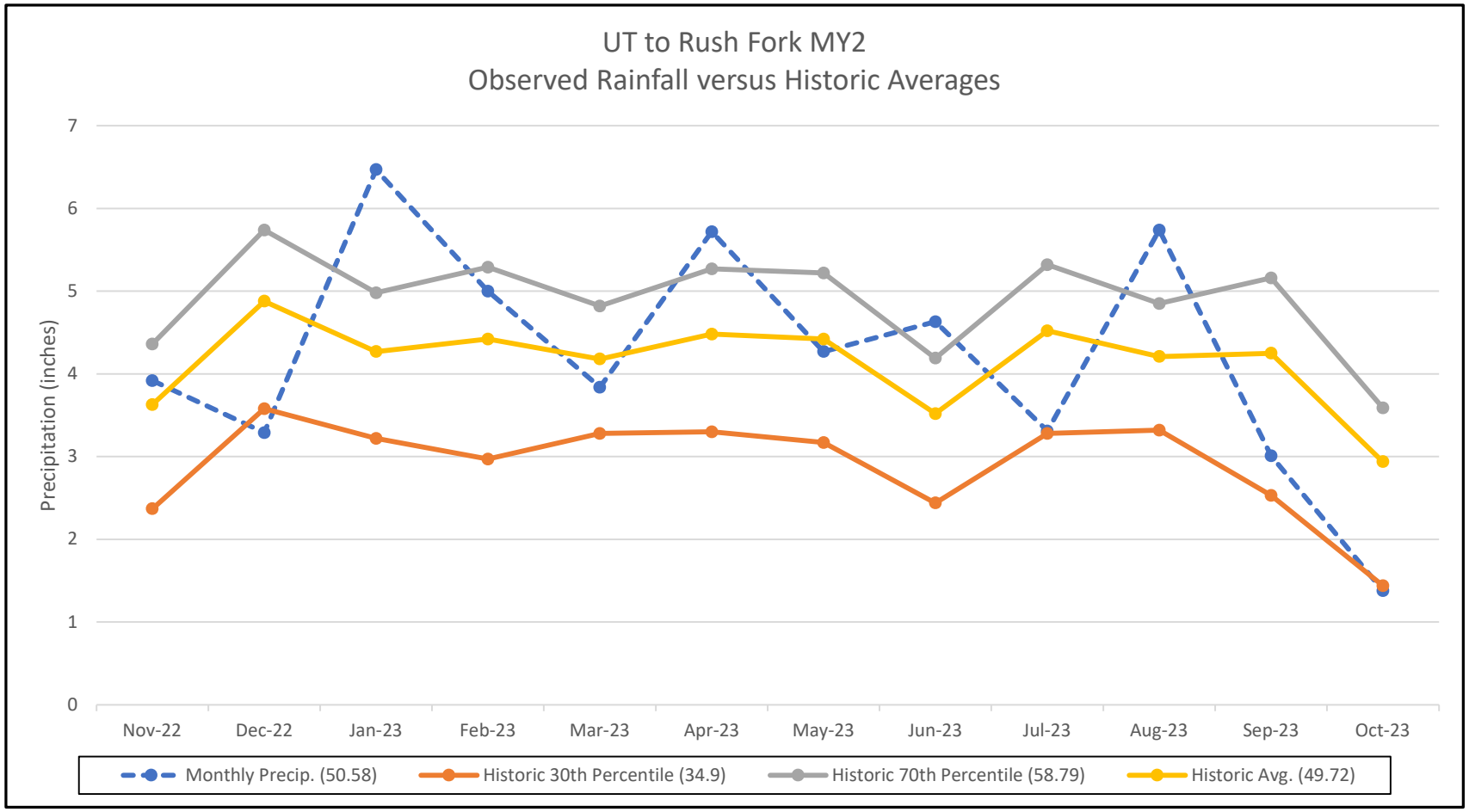


Table 11. All Years Flow Gauge Success
UT to Rush Fork Stream Restoration Project: DMS Project ID No. 100068

Flow Gauge ID	Most Consecutive Days Meeting Criteria[1]							Cumulative Days Meeting Criteria[2]						
	Year 1 (2022)	Year 2 (2023)	Year 3 (2024)	Year 4 (2025)	Year 5 (2026)	Year 6 (2027)	Year 7 (2028)	Year 1 (2022)	Year 2 (2023)	Year 3 (2024)	Year 4 (2025)	Year 5 (2026)	Year 6 (2027)	Year 7 (2028)
Flow Gauges (Installed March, 2022)														
RF1	152.0	179.0						219.0	179.0					
RF2	266.0	109.0						266.0	177.0					
RF3	104.0	180.0						116.0	183.0					

Notes:

[1]Indicates the number of consecutive days within the monitoring year where flow was measured.

[2]Indicates the number of cumulative days within the monitoring year where flow was measured.

Success criteria will include 30 days of consecutive baseflow for monitoring gauges during a normal rainfall year.

Surface water flow is estimated to have occurred when the pressure transducer reading is equal to or above 0.05 feet in depth.

DATA IN THIS SHEET IS ENTERED MANUALLY TO AVOID YEAR TO YEAR TYPOS

APPENDIX F

Correspondence

From: York, Jason
Sent: Wednesday, December 20, 2023 3:33 PM
To: annecollier@bellsouth.net
Subject: UT to Rush Fork Mitigation Project, Haywood County NC

To Anne Collier,

My name is Jason York. I work with Michael Baker Intl. and Micky Clemmons. I am responsible for monitoring the stream mitigation project, UT to Rush Fork, on your property in Haywood County, NC. I hope you are enjoying this holiday season. I am writing to inform you of a small encroachment of the agreed upon conservation easement boundary on this project. I understand that you lease farming rights on this property to a farmer who runs cattle and cuts hay. There is a small area on the western portion of the property where the conservation easement boundary runs close to the tree line, making it difficult to drive a tractor around the easement boundary. It is obvious that a tractor or other machine has been driven through the conservation easement in violation of the agreement. We will need to come up with a solution so that the farmer can drive the equipment around the easement without going over the boundaries of the project. My suggestion is that we remove a few trees, 2 or 3, which would allow them to drive around the boundary and still allow them to do their work. I am happy to discuss this option with the farmer and would be happy to help them with the labor to make this happen. I am also open to any other suggestions you may have. If you have questions or would like to discuss this in more detail please contact me at 828-380-0118 or respond to this email. This is not a big issue and it can be easily resolved. Thank you for participating in this project with us.

The black line represents the path of the tractor.

Sincerely,
Jason York

Jason York | Environmental Scientist, Macroinvertebrate Lab Supervisor
797 Haywood Road, Suite 201 | Asheville, NC 28806 | [O] 828-412-6101 | [M] 828-380-0118

jason.york@mbakerintl.com | www.MBakerintl.com

Michael Baker
INTERNATIONAL

We Make a Difference

Michael Baker Intl.
797 Haywood Rd. Suite 201
Asheville, NC 28806

January 8, 2024

To Anne Collier,

My name is Jason York. I work with Michael Baker Intl. and Micky Clemmons. I am responsible for monitoring the stream mitigation project, UT to Rush Fork, on your property in Haywood County, NC. I hope you enjoyed the holiday season. I am writing to inform you of a small encroachment of the agreed upon conservation easement boundary on this project. I understand that you lease farming rights on this property to a farmer who runs cattle and cuts hay. There is a small area on the western portion of the property where the conservation easement boundary runs close to the tree line, making it difficult to drive a tractor around the easement boundary. It is obvious that a tractor or other machine has been driven through the conservation easement in violation of the agreement. We will need to come up with a solution so that the farmer can drive the equipment around the easement without going over the boundaries of the project. My suggestion is that we remove a few trees, 2 or 3, which would allow them to drive around the boundary and still allow them to do their work. I am happy to discuss this option with the farmer and would be happy to help them with the labor to make this happen. I am also open to any other suggestions you may have. If you have questions or would like to discuss this in more detail please contact me at 828-380-0118 or respond to this letter. This is not a big issue and it can be easily resolved. Thank you for participating in this project with us.

The black line represents the path of the tractor.

Michael Baker
INTERNATIONAL

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Sincerely,

Jason York

Jason York