MONITORING YEAR 3 ANNUAL REPORT

FINAL

December 2023

PERRY HILL MITIGATION SITE

Orange County, NC
Neuse River Basin
HUC 03020201

DMS Project No. 100093
DMS Contract No. 7744
DMS RFP No. 16-007576
USACE Action ID No. 2019-00125
DWR Project No. 2019-0157 v1

Data Collection Period: January - October 2023

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PERRY HILL MITIGATION SITE

Monitoring Year 3 Annual Report

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Section 1: PROJECT OVERVIEW

The Perry Hill Mitigation Site (Site) is located in Orange County, approximately three miles northwest of Hillsborough, NC. The Site drains to Corporation Lake on the Eno River, which then flows to Falls Lake. Corporation Lake is a water supply reservoir on the Eno River, which is classified as Water Supply Waters (WS-II) and Nutrient Sensitive Waters (NSW). Falls Lake is classified as Water Supply Waters (WS-IV), as well as Nutrient Sensitive Waters (NSW). Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

The Site is located on one parcel and a conservation easement was recorded on 26.88 acres. Mitigation work within the Site included restoration and enhancement I and II of perennial and intermittent stream channels (Figures 1-1b). Approximately 20 feet (or a total of 0.19 acres) was added alongside both internal crossings as a maintenance area in Monitoring Year 2. No credit is claimed in the maintenance area and project credits were reduced accordingly. The credits associated with the stretch of inadequate stream flow on UT1 Reach 1 have been put "at-risk" and are listed in red, for more information refer to Sections 2.4 and 2.5. Table 1 below shows updated stream credits by reach and the total amount of stream credits expected at closeout.

Table 1: Project Quantities and Credits

PROJECT MITIGATION QUANTITIES							
Project Segment	**Mitigation Plan Footage**	**As-Built Footage**	**Mitigation Category**	**Restoration Level**	**Mitigation Ratio (X:1)**	**Credits**	**Comments**
Stream							
Perry Branch Reach 1	321	323	Warm	R	1.0	321.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
Perry Branch Reach 2	344	342	Warm	EII	3.5	98.286	Grade Control Structures, Invasive Control, Planted Buffer, Livestock Exclusion
	20	20	N/A	N/A	0.0	N/A	Maintenance Area
	60	60	N/A	N/A	0.0	N/A	Culvert Crossing
Perry Branch Reach 3	691	694	Warm	R	1.0	691.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
Perry Branch Reach 4	634	642	Warm	R	1.0	634.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
	20	20	N/A	N/A	0.0	N/A	Maintenance Area
	60	60	N/A	N/A	0.0	N/A	Culvert Crossing
	1,284	1,297	Warm	R	1.0	1,284.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion

PROJECT MITIGATION QUANTITIES							
Project Segment	**Mitigation Plan Footage**	**As-Built Footage**	**Mitigation Category**	**Restoration Level**	**Mitigation Ratio (X:1)**	**Credits**	**Comments**
Stream							
UT1 Reach 1	222	222	Warm	R	1.5	148.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
	63	63	Warm	R	1.5	42.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT1 Reach 2	291	293	Warm	R	1.5	194.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT2 Reach 1	221	223	Warm	EII	2.5	88.400	Bank Stabilization, Planted Buffer, Livestock Exclusion
UT2 Reach 2	947	941	Warm	EI	2.5	378.800	Grade Control Structures, Bank Stabilization, Planted Buffer, Livestock Exclusion
UT3	343	319	Warm	EII	2.5	137.200	Grade Control Structures, Bank Stabilization, Planted Buffer, Livestock Exclusion
					Total:	**4,016.686**	

*Credits updated in Monitoring Year 2 to reflect the addition of the maintenance areas and resulting reduction in credits. Twenty LF of stream fall within each of the maintenance areas, reducing credits on Perry Branch Reach 2 by 5.714 credits and Perry Branch Reach 4 by 20 credits.

Blue = **Restoration**	Restoration Credits at Risk	Yellow = **Enhancement I**	Orange = **Enhancement II**

Restoration Level	**Stream**		
	Warm	**Cool**	**Cold**
Restoration	3,166.000		
Restoration at Risk	148.000		
Enhancement I	378.800		
Enhancement II	323.886		
Preservation	--		
Totals	**4,016.686**		
Total Stream Credit	**4,016.686**		

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes the project goals and objectives along with the expected outcomes to water quality and ecological processes. Additionally, performance criteria for project objectives and a summary of the related monitoring data results for Monitoring Year 3 (MY3) are included.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Exclude livestock (i.e. cattle) from project streams and adjacent riparian areas.	Exclude livestock from streams and riparian areas by installing fencing around project area and/or removing livestock from the Site.	Reduce and control sediment inputs; reduce and manage nutrient inputs; contribute to protection of or improvement to a Water Supply Waterbody.	Exclusion fencing is installed and maintained. Livestock remain excluded from the project area.	Visually inspect the perimeter, as well as interior, of the Site to ensure there are no signs of livestock entering the Site.	Cattle are excluded from project streams.
Improve the stability of stream channels.	Construct and enhance stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions.	Reduce sediment inputs; contribute to protection of or improvement to a Water Supply Waterbody.	Entrenchment ratio over 2.2 and bank height ratios below 1.2 with visual assessments showing stability.	Cross-section monitoring will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually.	Cross-sections show streams are stable and functioning as designed. ERs are over 2.2 and BHRs are below 1.2.
Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes on restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Improve aquatic communities in project streams.	There is no performance standard for this metric.	N/A	N/A
Reconnect channels with floodplains.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.	Reduce and control sediment inputs; reduce and manage nutrient inputs; contribute to protection of or improvement to a Water Supply Waterbody.	Four bankfull events in separate years within monitoring period. 30-days of continuous surface water flow will be documented annually along intermittent restoration or enhancement I reaches.	Pressure transducers recording flow elevations.	No bankfull events were documented on project streams in MY3. Greater than 30 days of consecutive flow was recorded on UT2 and on UT1 Reach 2 but not UT1 Reach 1.

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Restore and enhance native floodplain vegetation.	Convert active livestock pasture to forested riparian buffers along all Site streams. Protect and enhance existing forested riparian buffers. Treat invasive species during monitoring period to permit establishment of native plantings.	Reduce sediment inputs; provide a canopy to shade streams and reduce thermal loadings; contribute to protection of or improvement to a Water Supply Waterbody.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Vegetation plots will average 7-ft in height in MY5 and 10-ft in height in MY7.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored annually.	Thirteen of the fourteen vegetation plots have a planted stem density greater than 320 stems per acre.
Permanently protect the Site from harmful uses.	Establish a conservation easement on the Site.	Ensure that development and agricultural uses that would damage the Site or reduce the benefits of the project are prevented.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments have been observed in MY3.

1.3 Project Attributes

The project includes one parcel that has been managed as pasture and/or crop production, as indicated by aerial photographs from 1938 to 2017. Portions of the upper watershed historically have been forested. The stream crossings which existed prior to construction on Perry Branch were installed before 1938. Forested areas within the headwaters of UT2 and UT3 were cleared between 1938 and 1950. The high-voltage utility transmission line that crosses the downstream extent of Perry Branch was constructed between 1938 and 1950. Between 1950 and 1955, two ponds were constructed on the project parcel, including one within the headwaters of Perry Branch Reach 1 and the other an offline pond adjacent to Perry Branch Reach 4 within the lower portion of the watershed. Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions. Project Activity and Reporting History, as well as the Project Contact Table are included in Appendix E.

Table 3: Project Attributes

PROJECT INFORMATION			
Project Name	Perry Hill Mitigation Site	County	Orange County
Project Area (acres)	26.88	Project Coordinates	36° 06’ 25.81” N, 79° 07’46.66” W
PROJECT WATERSHED SUMMARY INFORMATION			
Physiographic Province	Carolina Slate Belt of the Piedmont	River Basin	Neuse River
USGS HUC 8-digit	03020201	USGS HUC 14-digit	03020201030020
DWR Sub-basin	03-04-01	Land Use Classification	68% managed herbaceous cover/pasture; 22% forested; 5% shrub; 3% grassland/herbaceous; 2% residential area; <1% impervious
Project Drainage Area (acres)	174	Percentage of Impervious Area	<1%

RESTORATION TRIBUTARY SUMMARY INFORMATION									
Parameters	**Perry Branch**				**UT1**		**UT2**		**UT3**
	Reach 1	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 1**	**Reach 2**	**Reach 1**	**Reach 2**	
Pre-project length (feet)	326	417	732	2,061	388	213	266	974	357
Post-project length (feet)*	323	422	694	2,166	285	293	223	941	319
Valley confinement (Confined, moderately confined, unconfined)	Unconfined		Moderately Confined		Confined to Moderately Confined	Moderately Confined	Confined	Moderately Confined	Unconfined
Drainage area (acres)	58	66	117	175	9	10	15	23	20
Perennial, Intermittent, Ephemeral	Perennial				Intermittent				
DWR Water Quality Classification	WS-II/HQW/NSW								
Dominant Stream Classification (existing)	G4c	C4	G4c	F4	E6b	F4b	C6	E4	C4

*Includes No Credit Project Stream lengths in internal crossings, the maintenance area, and the downstream end of Perry Branch Reach 4.

RESTORATION TRIBUTARY SUMMARY INFORMATION									
Parameters	**Perry Branch**				**UT1**		**UT2**		**UT3**
	Reach 1	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 1**	**Reach 2**	**Reach 1**	**Reach 2**	
Dominant Stream Classification (proposed)	C4	C4	C4	C4	B4	C4b	C6	C4	C4
Dominant Evolutionary class (Simon) if applicable	III	V	IV	III/IV	III/IV	III/IV	V	III/IV	III/IV

REGULATORY CONSIDERATIONS			
Parameters	**Applicable?**	**Resolved?**	**Supporting Documentation**
Water of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134.
Water of the United States - Section 401	Yes	Yes	
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2020)
Historic Preservation Act	Yes	Yes	
Coastal Zone Management Act (CZMA or CAMA)	N/A	N/A	N/A
Essential Fisheries Habitat	N/A	N/A	N/A

Section 2: MONITORING YEAR 3 DATA ASSESSMENT

Annual monitoring and site visits were conducted during MY3 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved performance standards presented in the Mitigation Plan (Wildlands Engineering, 2020). Performance criteria for vegetation, stream, and hydrologic assessment are located above in Section 1.2 Table 3: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is described in the MY0 As-Built Baseline Report (Wildlands, 2021).

2.1 Vegetative Assessment

The MY3 vegetative survey was completed in September 2023. Vegetation monitoring resulted in an average density of 526 stems per acre of project planting list species across all vegetation plots, which is well above the interim success criteria of 320 stems per acre required at MY3. Thirteen of the fourteen vegetation plots individually met the success criteria and planting list stem densities for each plot range from 202 to 769 stems per acre. While vegetation plot 10 does not meet the stem density success criteria, it is not representative of the area surrounding it. There are healthy planted trees around the plot that seem to be on par with density and growth across the rest of the site. We do not believe it is currently a concern. Herbaceous vegetation is growing well and other desirable tree species such as common hackberry (*Celtis occidentalis*) and hickory (*Carya spp*.) species are establishing themselves.

Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data and Vegetation Performance Standards Summary Table.

2.2 Vegetation Areas of Concern and Management

Wildlands does not believe the area around vegetation plot 10 has low stem density or needs replanting at this point. As mentioned above, there are healthy planted stems with density and growth that resemble the rest of the site around the vegetation plot boundary. However, Wildlands will continue to observe the area to confirm that tree health and density stays at an appropriate level.

As in the previous year, planted trees are growing well but pasture grasses are still dense in areas. To ensure planted trees remain competitive, herbicide ring sprays were applied around the base of trees where necessary in April 2023.

Areas where patches of blackberry (*Rubus spp*.) were competing with trees along UT2 were treated via mechanical removal or a foliar spray application of triclopyr. Wildlands plans to continue to treat aggressive blackberry growth as needed in spring of 2024.

Additionally, follow up treatments were done on a few stems of Chinese privet (*Ligustrum sinense*) along the west side of UT2 using a cut stump application of triclopyr in May 2023. In 2024, Wildlands plans to target scattered resprouts of Chinese privet in the wooded area along Perry Branch Reaches 1 and 2 that was previously treated in 2020. Wildlands will continue to monitor for invasive species and treatments will be applied as necessary.

While the vegetation across the maintenance areas is no longer a concern, Wildlands is still working to mark the area appropriately. At the beginning of November, the surveyor was finally able to move the corners of the Perry Hill II bank conservation easement that shares a boundary with the DMS easement, and in doing so, marked the edge of the maintenance area as well. Wildlands would like to order appropriate signs to differentiate the maintenance area from the rest of the conservation easement and will install them in MY4.

2.3 Stream Assessment

Morphological surveys for MY3 were conducted in April 2023. All streams within the Site are stable and functioning as designed. Cross-sections show minimal change in max depth and bankfull cross-sectional area. Bank height ratios are less than 1.2 and entrenchment ratios are over 2.2. Specific entrenchment ratio numbers are not included in this report template but are available upon request. Cross-sections show slight deviations from as-built due to sediment deposition and establishment of vegetation. Some sediment deposition in pools is natural and expected. Pebble count data is no longer required per the September 29, 2021 Technical Work Group Meeting and is not included in this report. The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period. Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table, Current Condition Plan View maps, Stream Photographs, and Culvert Crossing Photographs. Refer to Appendix C for the morphological data and cross-section plots.

2.4 Stream Areas of Concern and Management

Wildlands continued to observe flow in the upper part of UT1 Reach 1 after the rock sill repair in September 2022. Repairs did not have the desired effect and stream flow is similar to previous years. The credits associated with the stretch of inadequate stream flow have been put “at-risk”, as seen in Table 1 and Figure 1b. Wildlands will continue to monitor flow on UT1 Reach 1 through flow gauges and visual observation and reevaluate the “at-risk” credits in MY4.

2.5 Hydrology Assessment

By the end of MY7, four bankfull events must have occurred in separate years within the restoration and enhancement I reaches. While there were significant flow events, flow does not seem to have crested top of bank. No bankfull events were recorded on Site during MY3.

In addition, the presence of baseflow must be documented on restored or enhanced intermittent reaches (UT1 Reach 1 and UT2 Reach 2) for a minimum of 30 consecutive days during a normal precipitation year. UT2 Reach 2 exceeded baseflow criterion with 154 consecutive and 176 total days of baseflow. UT1 Reach 1 did not meet baseflow criteria. The original UT1 Reach 1 flow gauge recorded one consecutive and six cumulative days of flow. UT1 Reach 1 flow gauge B shows four consecutive and 16 total days of flow. However, the crest gauge on UT1 Reach 2 is installed in such a way that it can also record flow. It shows 54 days of consecutive and 72 total days of flow. Refer to Appendix D for Hydrology Summary Data.

2.6 Monitoring Year 3 Summary

Vegetation across the Site has exceeded the MY3 interim requirement of 320 planted stems per acre. Monitoring Year 3 data shows an average density of 526 stems per acre of project planting list species across all plots. Aggressive vegetation and resprouts of invasive vegetation were treated in MY3 and additional follow up treatments will be scheduled as necessary. Wildlands is working to mark the maintenance area with appropriate signage. Project streams are stable and functioning. Cross-sections show limited deviations from as-built due to sediment deposition and vegetation establishment. No bankfull events were documented in MY3. UT2 and UT1 Reach 2 achieved more than 30 consecutive days of baseflow, and while UT1 Reach 1. Rock sill repairs in September 2022 do not seem to have had the desired effect and stream credits have been put “at-risk” accordingly. Wildlands will continue to observe this stretch of channel and “at-risk” credits will be reevaluated in MY4. No easement encroachment or stream crossing issues have been identified in MY3.

Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 3: REFERENCES

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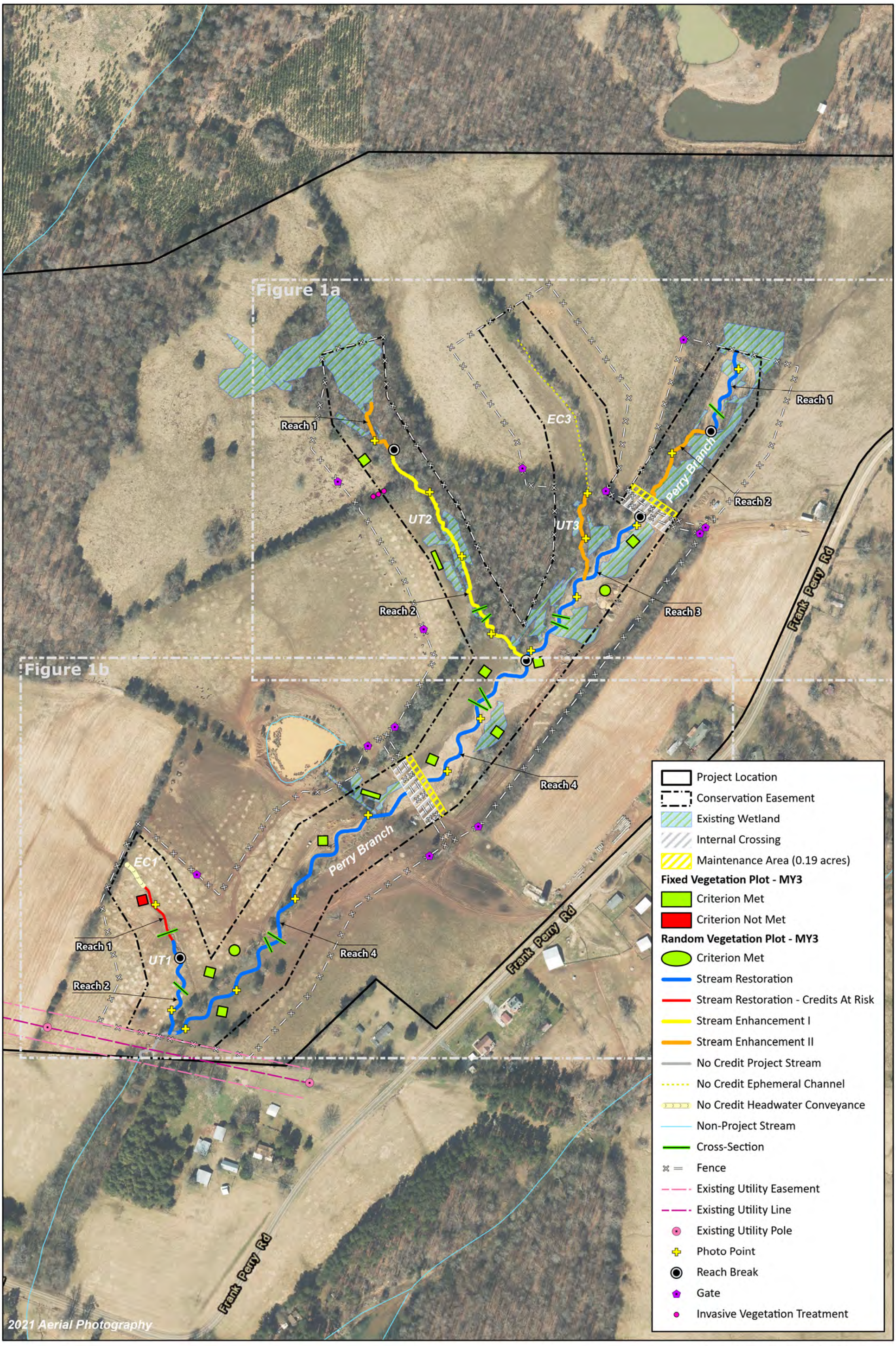


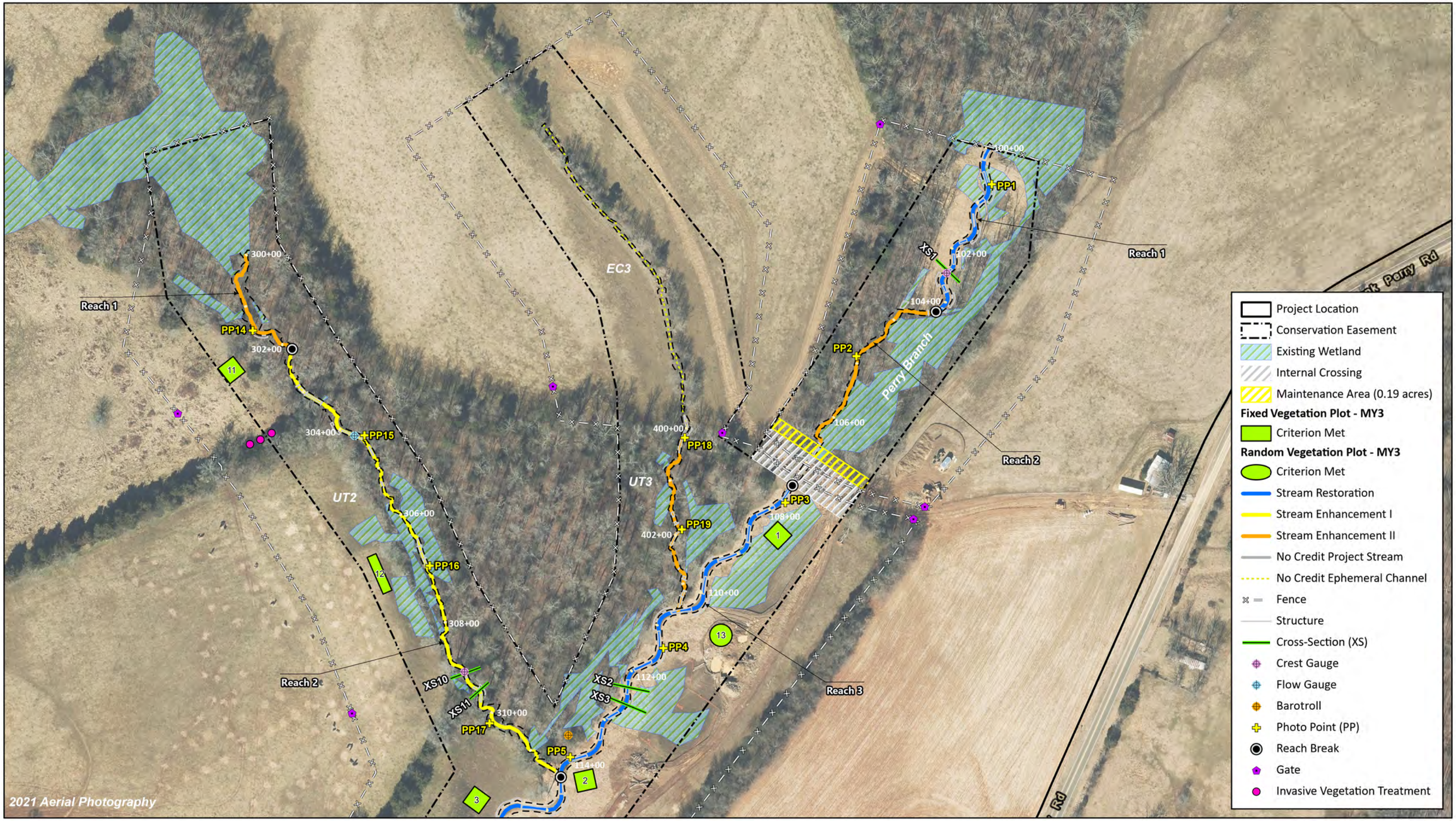
WILDLANDS ENGINEERING

0 300 600 Feet

N

Figure 1. Current Condition Plan View
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

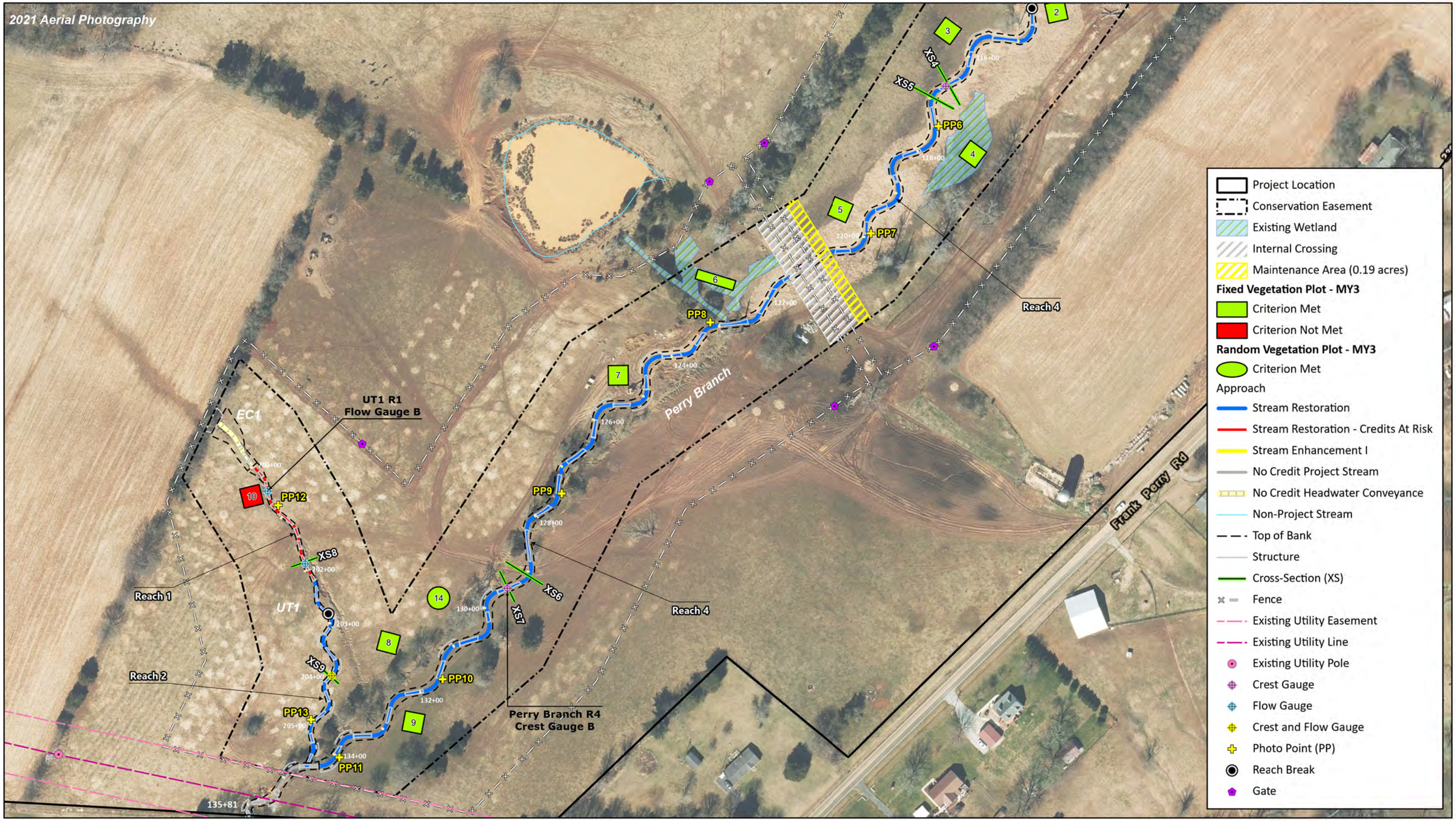
Orange County, NC



WILDLANDS ENGINEERING

Figure 1a. Current Condition Plan View
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Orange County, NC



WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 1b. Current Condition Plan View
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Orange County, NC

APPENDIX A. Visual Assessment Data

Table 4. Visual Stream Morphology Stability Assessment Table

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Perry Branch Reach 1

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	323
					Assessed Bank Length	646
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	2	2		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	4	4		100%

Visual assessment was completed October 18, 2023.

Perry Branch Reach 3 and Reach 4

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	2,653
					Assessed Bank Length	5,306
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	18	18		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	17	17		100%

Visual assessment was completed October 18, 2023.

Table 4. Visual Stream Morphology Stability Assessment Table

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

UT1 Reach 1 and Reach 2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	578
					Assessed Bank Length	1,156
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	18	18		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	7	7		100%

Visual assessment was completed October 18, 2023.

UT2 Reach 2

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-Built	Amount of Unstable Footage	% Stable, Performing as Intended
					Assessed Stream Length	941
					Assessed Bank Length	1,882
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse.			0	100%
				Totals:	**0**	**100%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	8	8		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2		100%

Visual assessment was completed October 18, 2023.

Table 5. Vegetation Condition Assessment Table
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Planted Acreage **20.53**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	0	0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0	0%
		Total	**0**	**0%**
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0	0%
		Cumulative Total	**0.0**	**0%**

Visual assessment was completed October 18, 2023.

Easement Acreage **26.88**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary.	0.10	0	0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	0 Encroachments Noted / 0 ac	

Visual assessment was completed October 18, 2023.

STREAM PHOTOGRAPHS

PHOTO POINT 1 Perry Branch R1 – upstream *(03/14/2023)*

PHOTO POINT 1 Perry Branch R1 – downstream *(03/14/2023)*

PHOTO POINT 2 Perry Branch R2 – upstream *(03/14/2023)*

PHOTO POINT 2 Perry Branch R2 – downstream *(03/14/2023)*

PHOTO POINT 3 Perry Branch R3 – upstream *(03/14/2023)*

PHOTO POINT 3 Perry Branch R3 – downstream *(03/14/2023)*

PHOTO POINT 4 Perry Branch R3 – upstream *(03/14/2023)*

PHOTO POINT 4 Perry Branch R3 – downstream *(03/14/2023)*

PHOTO POINT 5 Perry Branch R3 – upstream *(03/14/2023)*

PHOTO POINT 5 Perry Branch R3 – downstream *(03/14/2023)*

PHOTO POINT 6 Perry Branch R4 – upstream *(03/14/2023)*

PHOTO POINT 6 Perry Branch R4 – downstream *(03/14/2023)*

	
PHOTO POINT 7 Perry Branch R4 – upstream *(03/14/2023)*	**PHOTO POINT 7 Perry Branch R4 – downstream *(03/14/2023)***
	
PHOTO POINT 8 Perry Branch R4 – upstream *(03/14/2023)*	**PHOTO POINT 8 Perry Branch R4 – downstream *(03/14/2023)***
	
PHOTO POINT 9 Perry Branch R4 – upstream *(03/14/2023)*	**PHOTO POINT 9 Perry Branch R4 – downstream *(03/14/2023)***

PHOTO POINT 10 Perry Branch R4 – upstream *(03/14/2023)*

PHOTO POINT 10 Perry Branch R4 – downstream *(03/14/2023)*

PHOTO POINT 11 Perry Branch R4 – upstream *(03/14/2023)*

PHOTO POINT 11 Perry Branch R4 – downstream *(03/14/2023)*

PHOTO POINT 12 UT1 R1 – upstream *(03/14/2023)*

PHOTO POINT 12 UT1 R1 – downstream *(03/14/2023)*

	
PHOTO POINT 13 UT1 R2 – upstream *(03/14/2023)*	**PHOTO POINT 13 UT1 R2 – downstream *(03/14/2023)***
	
PHOTO POINT 14 UT2 R1 – upstream *(03/14/2023)*	**PHOTO POINT 14 UT2 R1 – downstream *(03/14/2023)***
	
PHOTO POINT 15 UT2 R2 – upstream *(03/14/2023)*	**PHOTO POINT 15 UT2 R2 – downstream *(03/14/2023)***

	
PHOTO POINT 16 UT2 R2 – upstream *(03/14/2023)*	**PHOTO POINT 16 UT2 R2 – downstream *(03/14/2023)***
	
PHOTO POINT 17 UT2 R2 – upstream *(03/14/2023)*	**PHOTO POINT 17 UT2 R2 – downstream *(03/14/2023)***
	
PHOTO POINT 18 UT3 – upstream *(03/14/2023)*	**PHOTO POINT 18 UT3 – downstream *(03/14/2023)***

	
PHOTO POINT 19 UT3 – upstream *(03/14/2023)*	**PHOTO POINT 19 UT3 – downstream *(03/14/2023)***

CULVERT CROSSING PHOTOGRAPHS

	
Perry Branch R2 – Looking Upstream *(03/14/2023)*	**Perry Branch R2 – Looking Downstream *(03/14/2023)***
	
Perry Branch R4 – Looking Upstream *(03/14/2023)*	**Perry Branch R4 – Looking Downstream *(03/14/2023)***

VEGETATION PLOT PHOTOGRAPHS

FIXED VEG PLOT 1 *(09/07/2023)*

FIXED VEG PLOT 2 *(09/07/2023)*

FIXED VEG PLOT 3 *(09/07/2023)*

FIXED VEG PLOT 4 *(09/07/2023)*

FIXED VEG PLOT 5 *(09/07/2023)*

FIXED VEG PLOT 6 *(09/07/2023)*

FIXED VEG PLOT 7 *(09/07/2023)*

FIXED VEG PLOT 8 *(09/07/2023)*

FIXED VEG PLOT 9 *(09/07/2023)*

FIXED VEG PLOT 10 *(09/07/2023)*

FIXED VEG PLOT 11 *(09/07/2023)*

FIXED VEG PLOT 12 *(09/07/2023)*

	
RANDOM VEG PLOT 13 *(09/07/2023)*	**RANDOM VEG PLOT 14** *(09/07/2023)*

APPENDIX B. Vegetation Plot Data

Table 6. Vegetation Plot Data
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Planted Acreage	20.53
Date of Initial Plant	2021-04-04
Date of Current Survey	2023-09-07
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	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo[1]	boxelder	Tree	FAC	1	1	1	1	1	1				
	Asimina triloba[1]	pawpaw	Tree	FAC										
	Betula nigra	river birch	Tree	FACW	3	3	2	2	1	1	4	4	2	2
	Cornus amomum[1]	silky dogwood	Shrub	FACW	1	1								
	Diospyros virginiana	common persimmon	Tree	FAC					2	3			1	1
	Nyssa sylvatica	blackgum	Tree	FAC										
	Platanus occidentalis	American sycamore	Tree	FACW	2	2	4	4	1	1	2	2	2	2
	Populus deltoides	eastern cottonwood	Tree	FAC			2	2	1	1			1	1
	Quercus alba	white oak	Tree	FACU										
	Quercus falcata	southern red oak	Tree	FACU										
	Quercus lyrata	overcup oak	Tree	OBL	2	2					2	2		
	Quercus pagoda	cherrybark oak	Tree	FACW	1	1			1	1	1	1	2	2
	Quercus phellos	willow oak	Tree	FAC									1	1
	Quercus rubra	northern red oak	Tree	FACU			2	2						
	Ulmus alata	winged elm	Tree	FACU										
	Ulmus americana	American elm	Tree	FACW					2	2	1	1	1	1
	Viburnum prunifolium[1]	blackhaw	Tree	FACU									1	1
Sum				Performance Standard	10	10	11	11	9	10	10	10	11	11
Post Mitigation Plan Species	**Carya glabra**	**pignut hickory**	**Tree**	**FACU**										
	Carya tomentosa	**mockernut hickory**	**Tree**					**1**						
	Celtis occidentalis	**common hackberry**	**Tree**	**FACU**				**1**						
	Fraxinus caroliniana	**Carolina ash**	**Tree**	**OBL**										
	Fraxinus pennsylvanica	**green ash**	**Tree**	**FACW**		**4**								
	Juglans nigra	*black walnut*	*Tree*	*FACU*										
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*						*2*				*1*
	Ulmus sp.							**1**						
Sum				Proposed Standard	10	14	11	14	9	10	10	10	11	11
Mitigation Plan Performance Standard				Current Year Stem Count		10		11		10		10		11
				Stems/Acre		405		445		405		405		445
				Species Count		6		5		7		5		8
				Dominant Species Composition (%)		30		36		25		40		17
				Average Plot Height (ft.)[2]		5		8		4		6		6
				% Invasives		0		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		14		14		10		10		11
				Stems/Acre		567		567		405		405		445
				Species Count		7		8		7		5		8
				Dominant Species Composition (%)		30		36		25		40		17
				Average Plot Height (ft.)[2]		7		7		4		6		6
				% Invasives		0		0		0		0		0

[1]Species not subject to monitoring height requirement due to species growth habit.

[2]Subcanopy tree species not subject to the height requirement have been removed from average height calculations.

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 6. Vegetation Plot Data
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Planted Acreage	20.53
Date of Initial Plant	2021-04-04
Date of Current Survey	2023-09-07
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F		Veg Plot 9 F		Veg Plot 10 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo[1]	boxelder	Tree	FAC	1	1	1	1	1	1	3	3		
	Asimina triloba[1]	pawpaw	Tree	FAC										
	Betula nigra	river birch	Tree	FACW	3	3	1	1	3	3	2	2		
	Cornus amomum[1]	silky dogwood	Shrub	FACW										
	Diospyros virginiana	common persimmon	Tree	FAC			1	1	3	3	1	1	1	1
	Nyssa sylvatica	blackgum	Tree	FAC										
	Platanus occidentalis	American sycamore	Tree	FACW	6	6	2	3	2	2	3	4	2	2
	Populus deltoides	eastern cottonwood	Tree	FAC			1	1	2	2	1	2	1	1
	Quercus alba	white oak	Tree	FACU										
	Quercus falcata	southern red oak	Tree	FACU										
	Quercus lyrata	overcup oak	Tree	OBL	2	2								
	Quercus pagoda	cherrybark oak	Tree	FACW	1	1	1	1	2	2	1	1	1	1
	Quercus phellos	willow oak	Tree	FAC			1	1						
	Quercus rubra	northern red oak	Tree	FACU			2	2						
	Ulmus alata	winged elm	Tree	FACU						2				
	Ulmus americana	American elm	Tree	FACW	2	2			4	4	1	1		
	Viburnum prunifolium[1]	blackhaw	Tree	FACU			1	1			1	1		
Sum				Performance Standard	15	15	11	12	17	19	13	15	5	5
Post Mitigation Plan Species	**Carya glabra**	**pignut hickory**	**Tree**	**FACU**						**1**				
	Carya tomentosa	**mockernut hickory**	**Tree**											
	Celtis occidentalis	**common hackberry**	**Tree**	**FACU**										
	Fraxinus caroliniana	**Carolina ash**	**Tree**	**OBL**										
	Fraxinus pennsylvanica	**green ash**	**Tree**	**FACW**										
	Juglans nigra	*black walnut*	*Tree*	*FACU*										
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*						*1*				
	Ulmus sp.							**2**						
Sum				Proposed Standard	15	15	11	14	17	20	13	15	5	5
Mitigation Plan Performance Standard				Current Year Stem Count		15		12		19		15		5
				Stems/Acre		607		486		769		607		202
				Species Count		6		9		8		8		4
				Dominant Species Composition (%)		40		25		20		27		40
				Average Plot Height (ft.)[2]		11		5		7		7		9
				% Invasives		0		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		15		14		20		15		5
				Stems/Acre		607		567		810		607		202
				Species Count		6		10		9		8		4
				Dominant Species Composition (%)		40		25		20		27		40
				Average Plot Height (ft.)[2]		11		4		7		7		9
				% Invasives		0		0		0		0		0

[1]Species not subject to monitoring height requirement due to species growth habit.

[2]Subcanopy tree species not subject to the height requirement have been removed from average height calculations.

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 6. Vegetation Plot Data
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Planted Acreage	20.53
Date of Initial Plant	2021-04-04
Date of Current Survey	2023-09-07
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 11 F		Veg Plot 12 F		Veg Plot 13 R	Veg Plot 14 R
					Planted	Total	Planted	Total	Total	Total
Species Included in Approved Mitigation Plan	Acer negundo[1]	boxelder	Tree	FAC			1	1		
	Asimina triloba[1]	pawpaw	Tree	FAC			1	1		
	Betula nigra	river birch	Tree	FACW	2	2	2	2	3	1
	Cornus amomum[1]	silky dogwood	Shrub	FACW						
	Diospyros virginiana	common persimmon	Tree	FAC	3	4	2	4	1	5
	Nyssa sylvatica	blackgum	Tree	FAC	1	1				
	Platanus occidentalis	American sycamore	Tree	FACW	4	4	4	4	1	3
	Populus deltoides	eastern cottonwood	Tree	FAC			1	1	2	2
	Quercus alba	white oak	Tree	FACU	1	1				
	Quercus falcata	southern red oak	Tree	FACU					3	
	Quercus lyrata	overcup oak	Tree	OBL						
	Quercus pagoda	cherrybark oak	Tree	FACW			1	1		4
	Quercus phellos	willow oak	Tree	FAC						
	Quercus rubra	northern red oak	Tree	FACU	1	1	1	1	2	
	Ulmus alata	winged elm	Tree	FACU	1	1			6	2
	Ulmus americana	American elm	Tree	FACW						
	Viburnum prunifolium[1]	blackhaw	Tree	FACU						
Sum				Performance Standard	13	14	13	15	18	17
Post Mitigation Plan Species	**Carya glabra**	**pignut hickory**	**Tree**	**FACU**						**1**
	Carya tomentosa	**mockernut hickory**	**Tree**			**2**				
	Celtis occidentalis	**common hackberry**	**Tree**	**FACU**		**3**				
	Fraxinus caroliniana	**Carolina ash**	**Tree**	**OBL**		**1**				
	Fraxinus pennsylvanica	**green ash**	**Tree**	**FACW**						
	Juglans nigra	*black walnut*	*Tree*	*FACU*		*1*				
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*				*2*		
	Ulmus sp.									
Sum				Proposed Standard	13	20	13	15	18	18
Mitigation Plan Performance Standard				Current Year Stem Count		14		15	18	17
				Stems/Acre		567		607	729	688
				Species Count		7		8	7	6
				Dominant Species Composition (%)		27		24	33	29
				Average Plot Height (ft.)[2]		5		7	4	6
				% Invasives		0		0	0	0
Post Mitigation Plan Performance Standard				Current Year Stem Count		20		15	18	18
				Stems/Acre		810		607	729	729
				Species Count		10		8	7	7
				Dominant Species Composition (%)		27		24	33	29
				Average Plot Height (ft.)[2]		4		7	4	6
				% Invasives		0		0	0	0

[1]Species not subject to monitoring height requirement due to species growth habit.

[2]Subcanopy tree species not subject to the height requirement have been removed from average height calculations.

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 Performance Standards Summary Table

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 3 - 2023

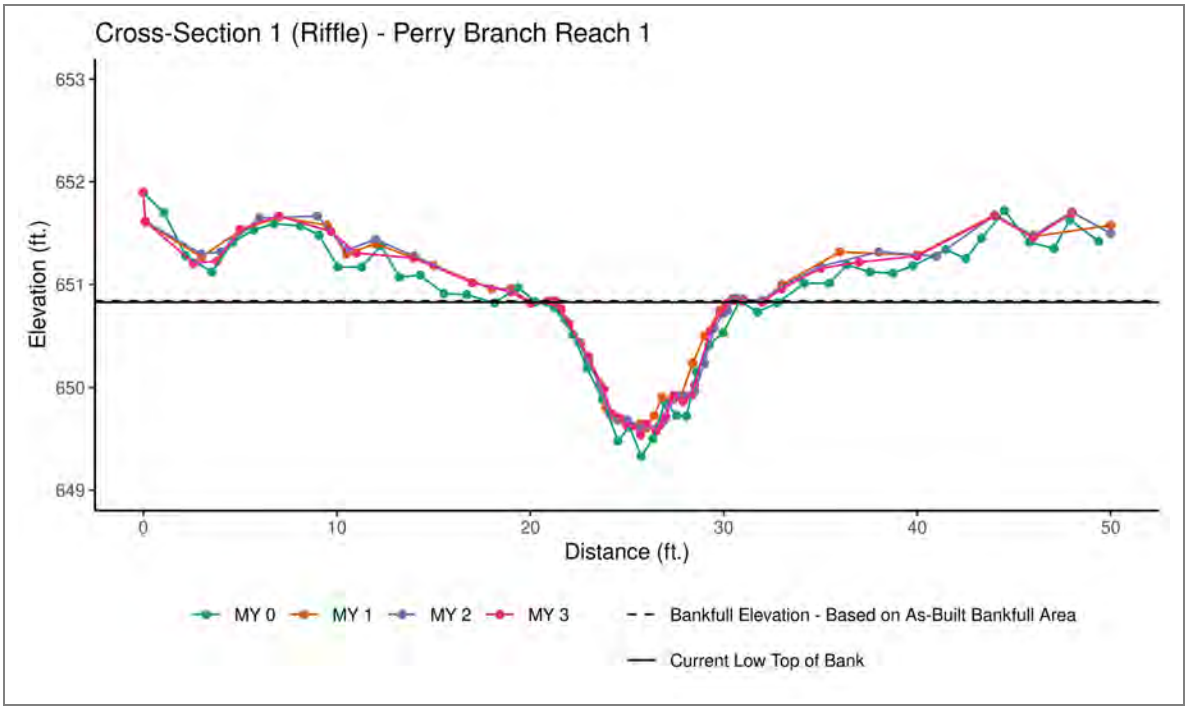
	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	405	5	6	0	445	8	5	0	405	4	7	0
Monitoring Year 2	364	5	6	0	445	6	5	0	364	4	7	0
Monitoring Year 1	607	2	6	0	486	3	6	0	405	3	7	0
Monitoring Year 0	607	2	6	0	486	2	6	0	486	2	8	0
	Veg Plot 4 F				Veg Plot 5 F				Veg Plot 6 F			
	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	405	6	5	0	445	5	8	0	607	11	6	0
Monitoring Year 2	364	4	4	0	445	4	8	0	648	6	6	0
Monitoring Year 1	567	2	6	0	445	3	8	0	648	4	6	0
Monitoring Year 0	607	2	6	0	486	2	9	0	688	2	6	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 F			
	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	486	5	9	0	769	7	8	0	607	7	8	0
Monitoring Year 2	486	3	9	0	769	5	9	0	526	4	8	0
Monitoring Year 1	486	2	9	0	729	3	8	0	526	3	8	0
Monitoring Year 0	486	2	9	0	729	2	8	0	526	2	8	0
	Veg Plot 10 F				Veg Plot 11 F				Veg Plot 12 F			
	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	202	9	4	0	567	5	7	0	607	7	8	0
Monitoring Year 2	324	4	6	0	567	4	7	0	607	5	8	0
Monitoring Year 1	567	2	8	0	567	3	7	0	607	3	8	0
Monitoring Year 0	648	2	8	0	607	2	7	0	607	2	8	0
	Veg Plot Group 13 R				Veg Plot Group 14 R							
	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)[1]	# Species	% Invasives				
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	729	4	7	0	688	6	6	0				
Monitoring Year 2	405	4	6	0	567	7	6	0				
Monitoring Year 1	364	3	4	0	445	3	6	0				
Monitoring Year 0	567	2	7	0	445	2	8	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.

[1]Subcanopy tree species not subject to the height requirement have been removed from average height calculations.

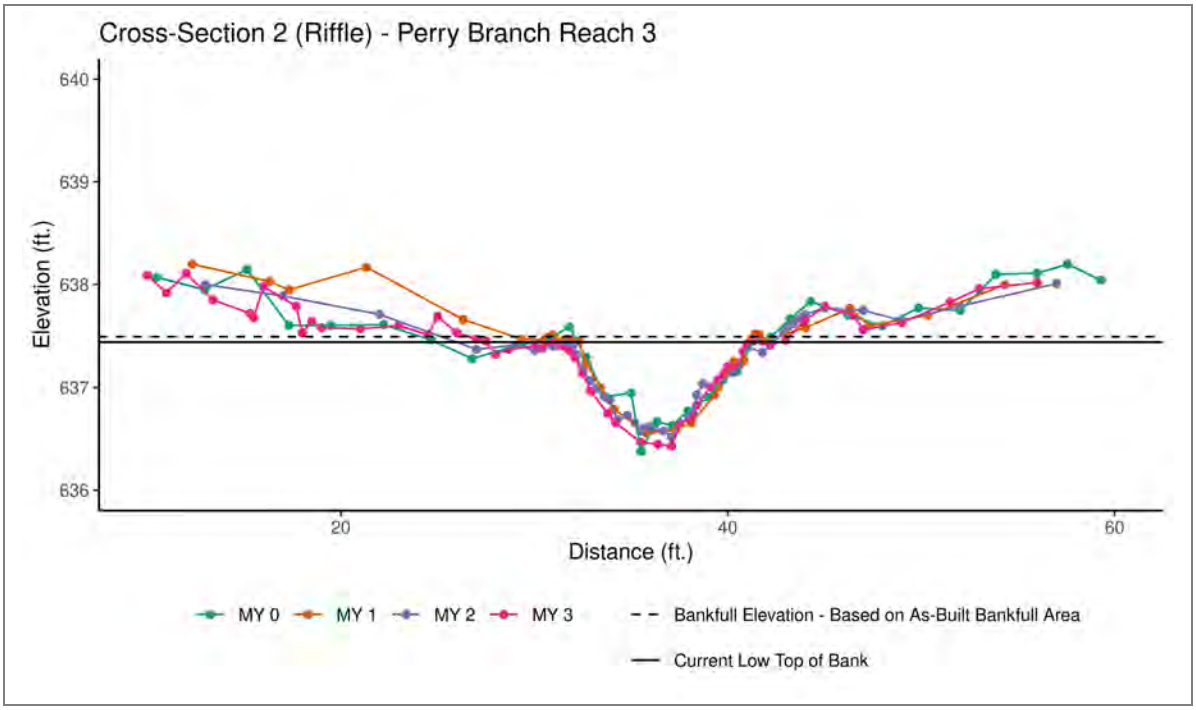
APPENDIX C. Stream Geomorphology Data

Cross-Section Plots



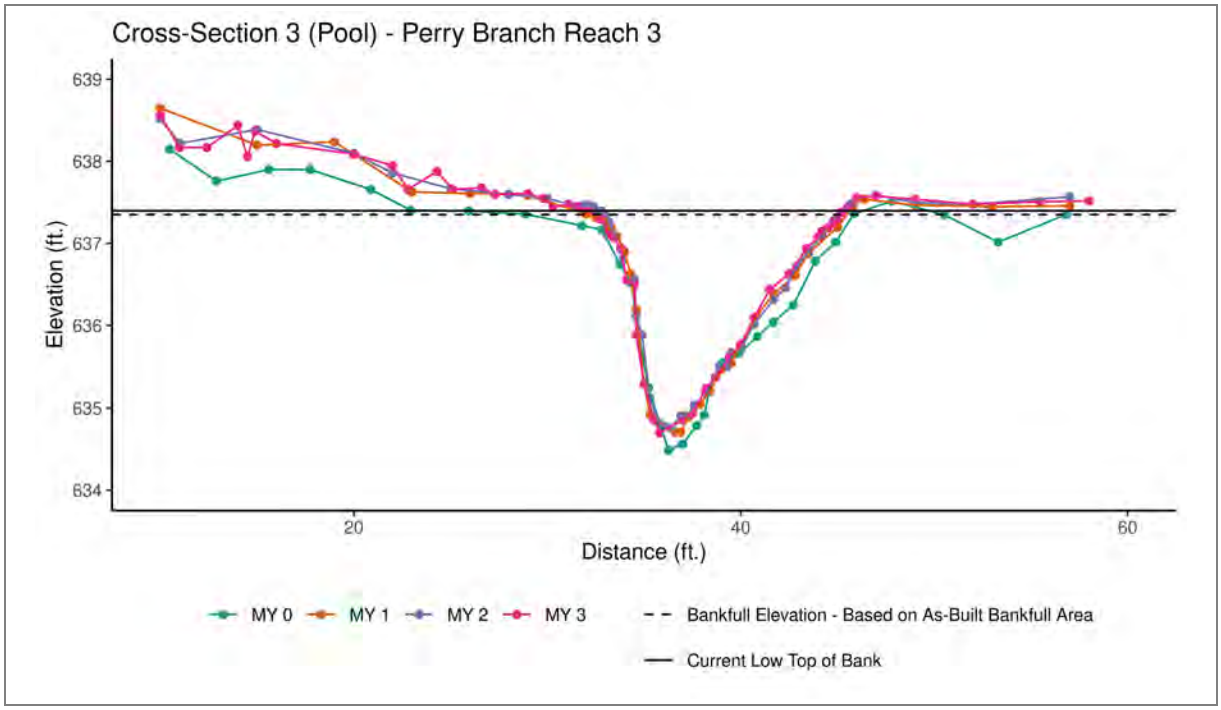
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	650.73	650.88	650.81	650.84		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.96	1.01	0.99		
Thalweg Elevation	649.33	649.61	649.60	649.63		
LTOB Elevation	650.73	650.83	650.83	650.83		
LTOB Max Depth	1.44	1.22	1.23	1.20		
LTOB Cross-Sectional Area	6.71	6.24	6.83	6.61		

Downstream *(04/04/2023)*



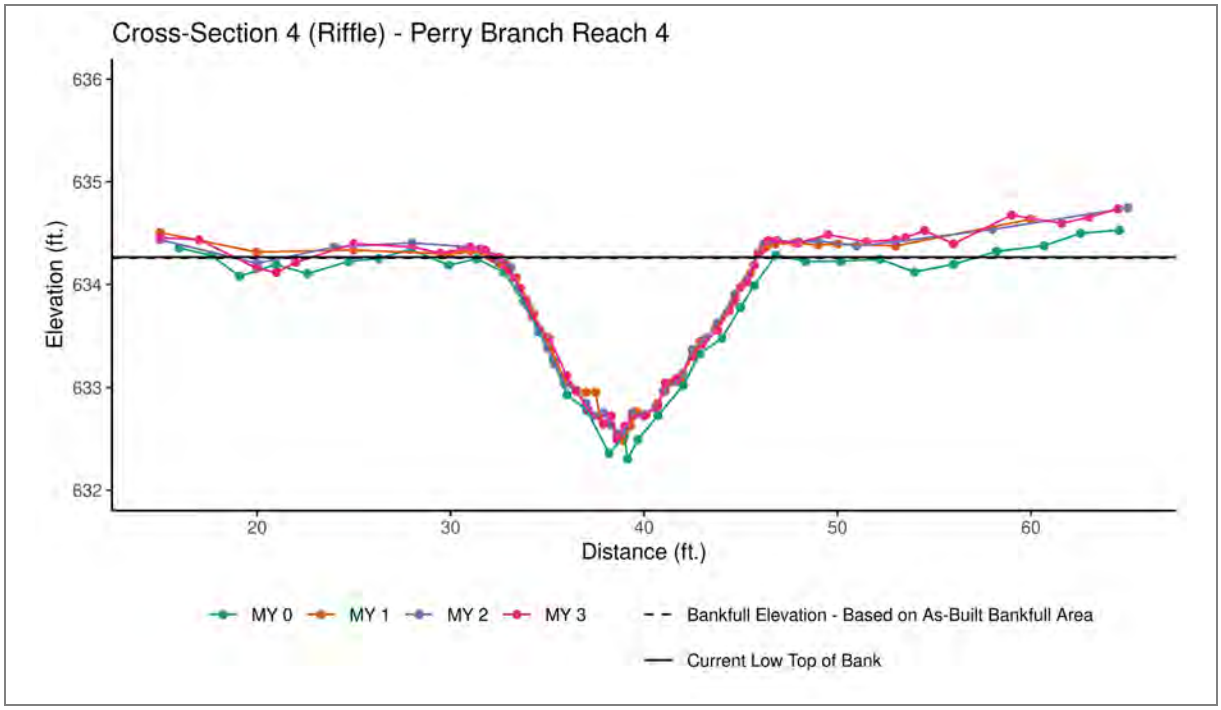
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	637.59	637.57	637.54	637.49		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.88	0.89	0.95		
Thalweg Elevation	636.38	636.56	636.52	636.43		
LTOB Elevation	637.59	637.45	637.43	637.44		
LTOB Max Depth	1.21	0.89	0.91	1.01		
LTOB Cross-Sectional Area	6.27	5.22	5.06	5.73		

Downstream *(04/04/2023)*



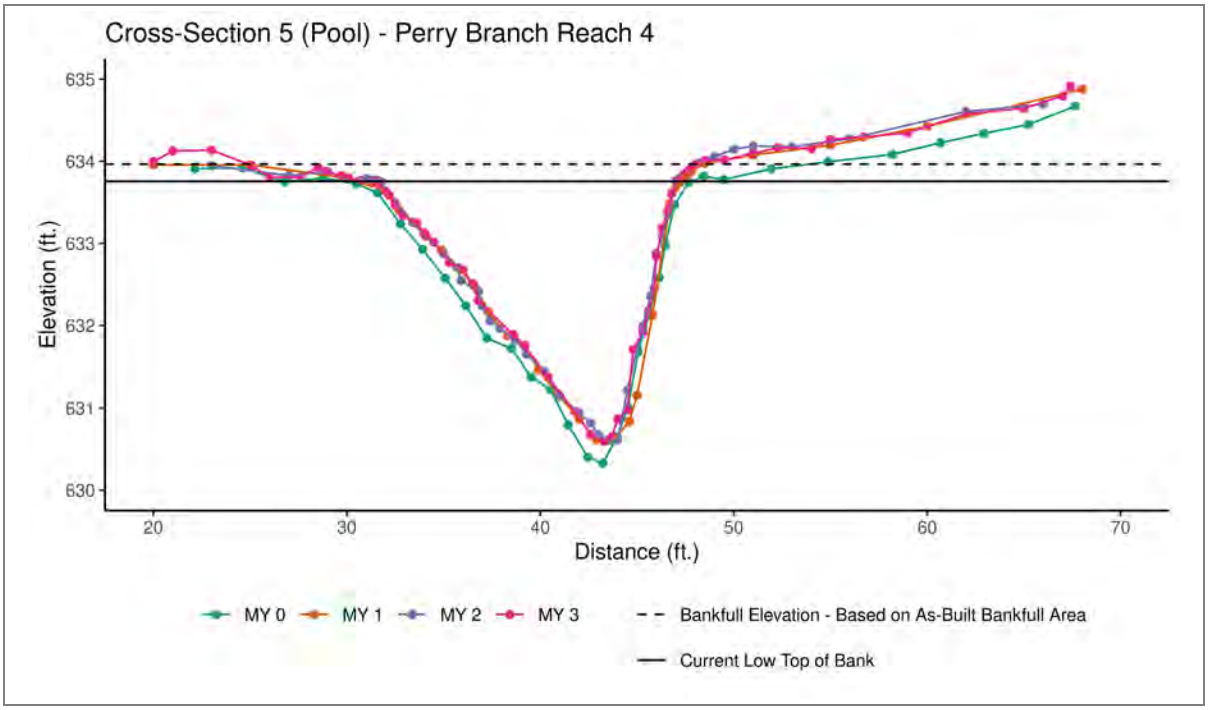
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Thalweg Elevation	634.49	634.71	634.76	634.70		
LTOB Elevation	637.17	637.32	637.40	637.40		
LTOB Max Depth	2.68	2.61	2.64	2.70		
LTOB Cross-Sectional Area	16.26	16.24	16.79	16.87		

Downstream *(04/04/2023)*



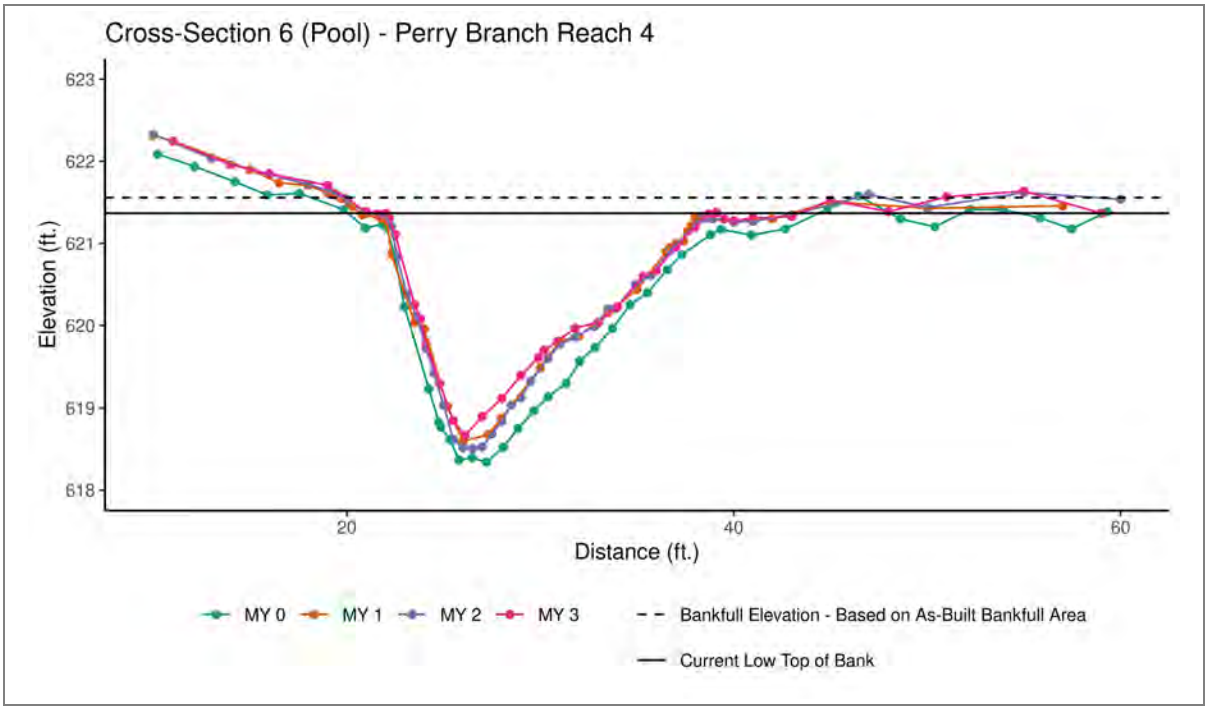
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	634.12	634.27	634.26	634.26		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.96	0.97	1.00		
Thalweg Elevation	632.30	632.49	632.56	632.50		
LTOB Elevation	634.12	634.20	634.21	634.27		
LTOB Max Depth	1.81	1.71	1.65	1.77		
LTOB Cross-Sectional Area	12.85	11.91	12.18	12.96		

Downstream *(04/04/2023)*



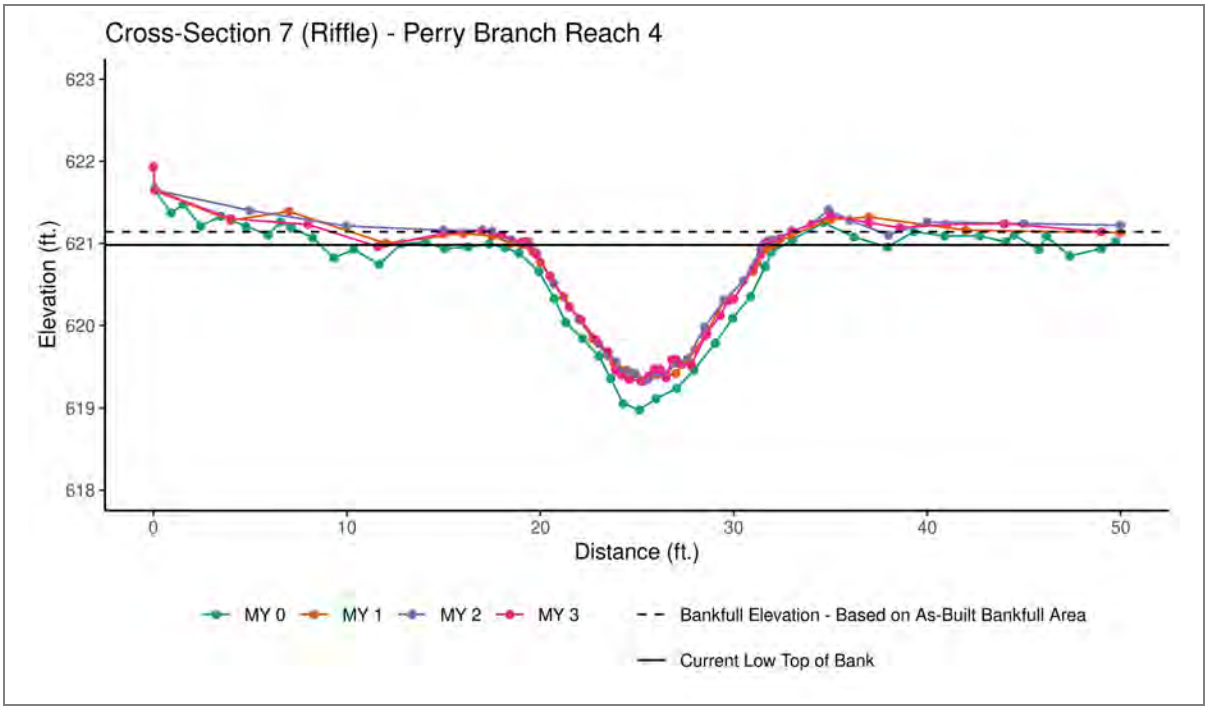
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Thalweg Elevation	630.33	630.62	630.61	630.60		
LTOB Elevation	633.73	633.76	633.77	633.76		
LTOB Max Depth	3.40	3.14	3.16	3.16		
LTOB Cross-Sectional Area	28.55	26.42	25.56	25.26		

Downstream *(04/04/2023)*



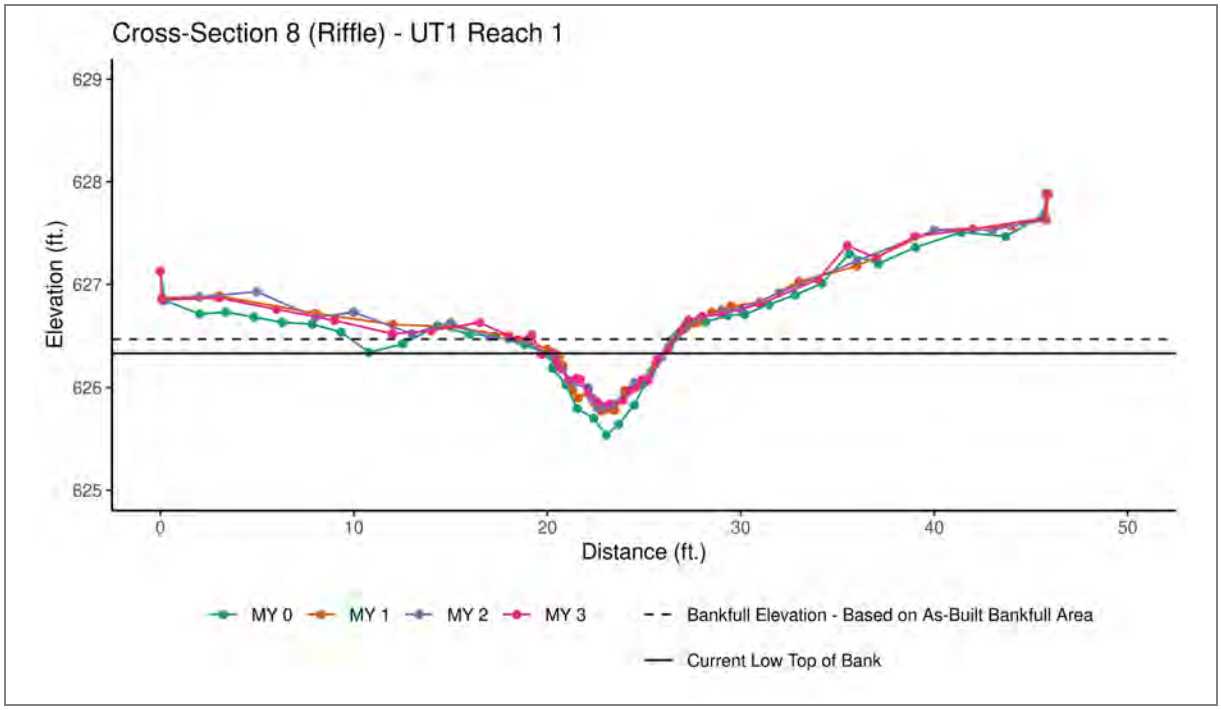
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Thalweg Elevation	618.34	618.60	618.51	618.85		
LTOB Elevation	621.17	621.28	621.32	621.37		
LTOB Max Depth	2.83	2.68	2.81	2.52		
LTOB Cross-Sectional Area	26.08	22.86	23.88	22.83		

Downstream *(04/04/2023)*



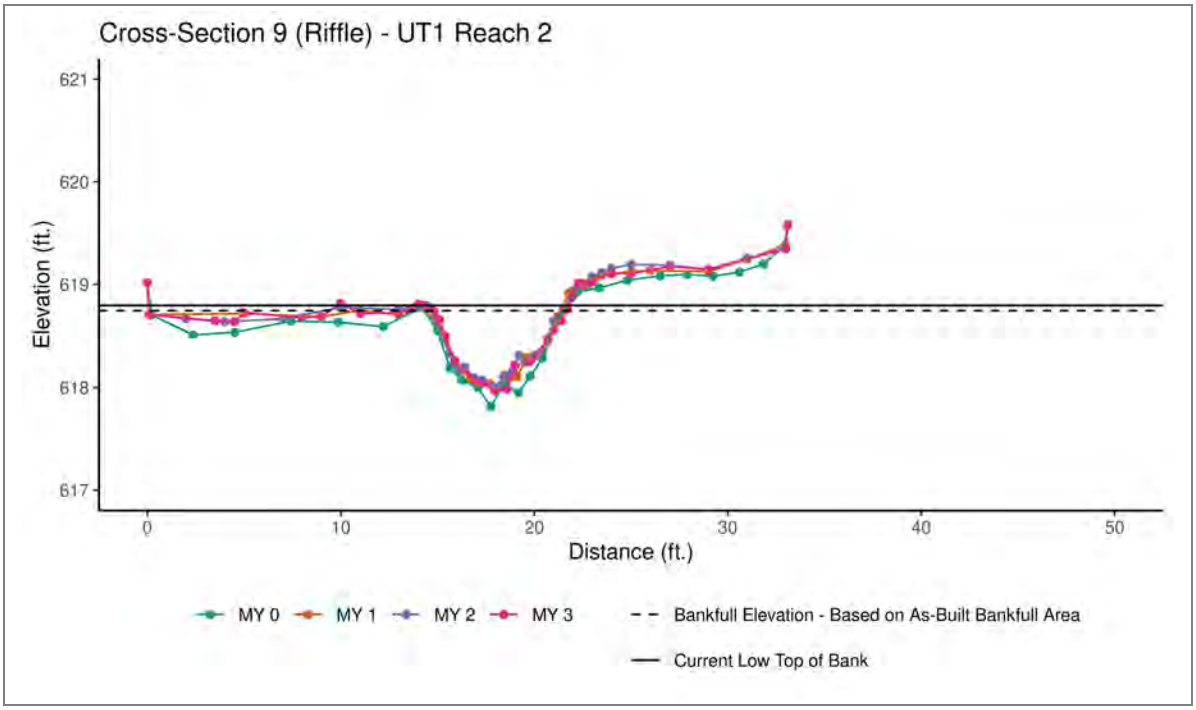
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	620.89	621.15	621.17	621.14		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.87	0.91	0.91		
Thalweg Elevation	618.98	619.35	619.33	619.33		
LTOB Elevation	620.89	620.92	621.01	620.98		
LTOB Max Depth	1.91	1.57	1.68	1.65		
LTOB Cross-Sectional Area	14.13	11.34	12.15	12.17		

Downstream *(04/04/2023)*



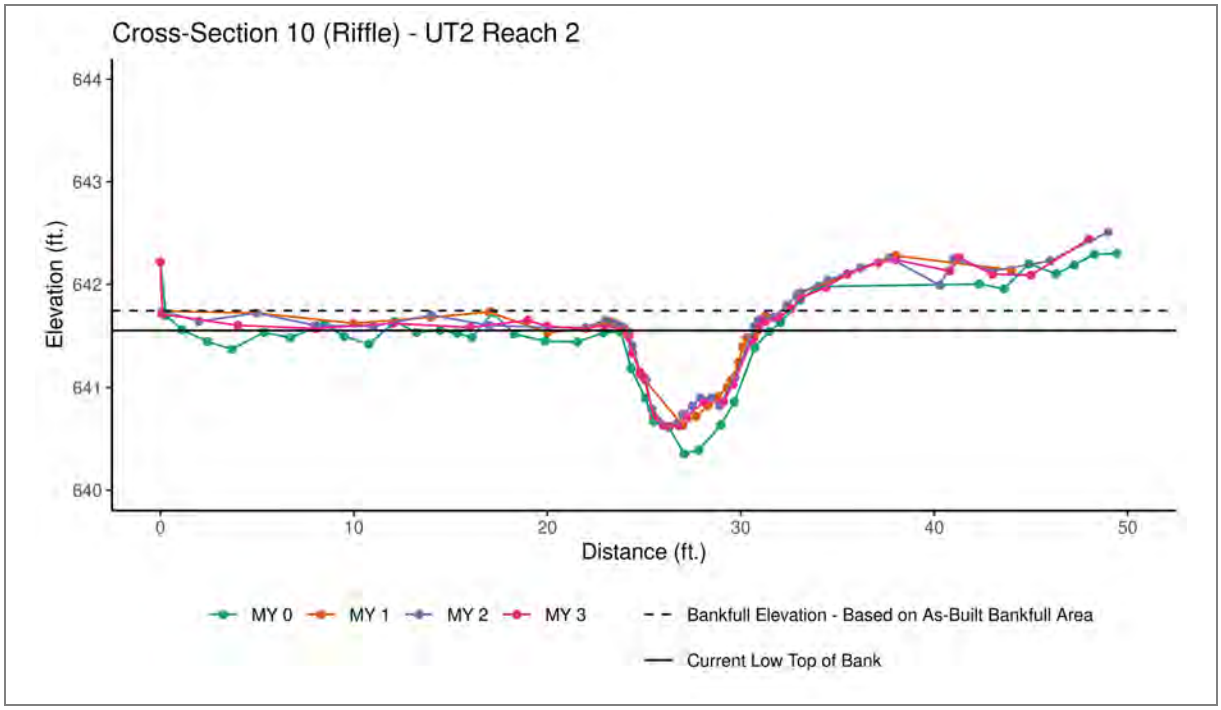
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	626.30	626.45	626.46	626.47		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.82	0.79	0.78		
Thalweg Elevation	625.54	625.77	625.80	625.84		
LTOB Elevation	626.30	626.33	626.32	626.33		
LTOB Max Depth	0.77	0.56	0.52	0.49		
LTOB Cross-Sectional Area	2.52	1.86	1.72	1.72		

Downstream *(04/04/2023)*



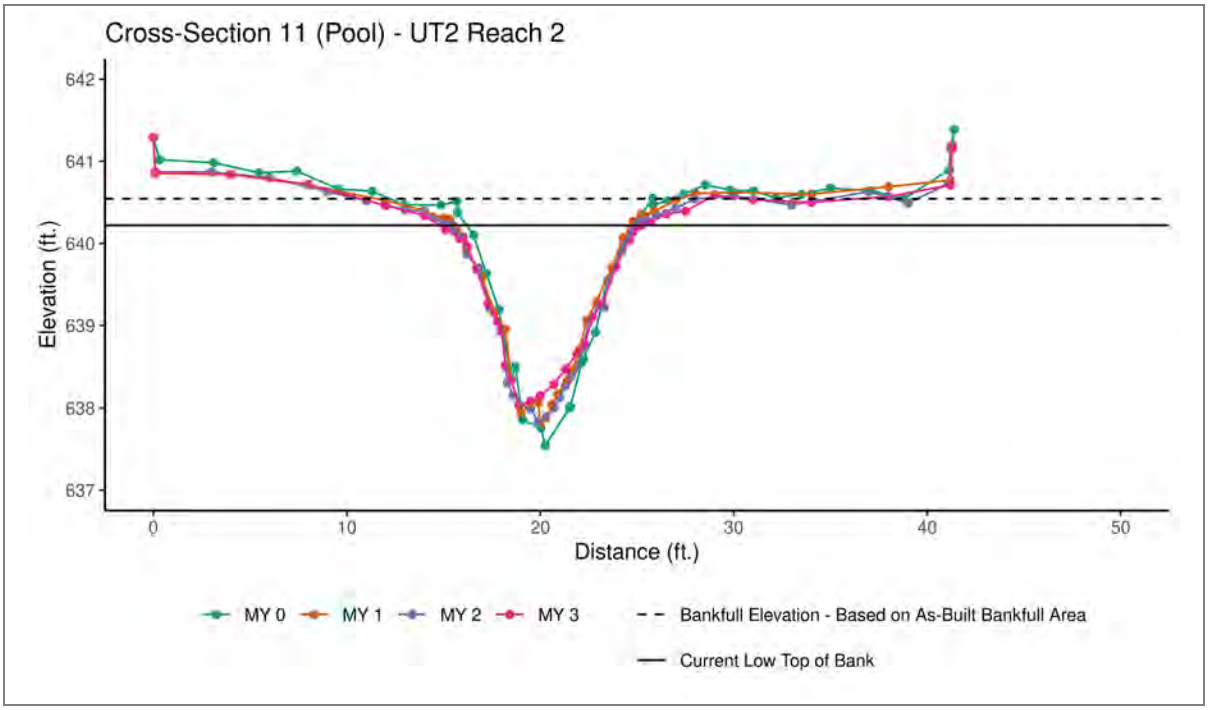
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	618.63	618.74	618.76	618.74		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	1.02	1.05	1.07		
Thalweg Elevation	617.81	617.99	618.01	617.97		
LTOB Elevation	618.63	618.76	618.80	618.80		
LTOB Max Depth	0.82	0.77	0.79	0.83		
LTOB Cross-Sectional Area	3.23	3.32	3.49	3.60		

Downstream *(04/04/2023)*



	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	641.54	641.78	641.80	641.74		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.82	0.73	0.83		
Thalweg Elevation	640.35	640.63	640.62	640.62		
LTOB Elevation	641.54	641.58	641.48	641.55		
LTOB Max Depth	1.18	0.95	0.86	0.93		
LTOB Cross-Sectional Area	5.39	3.93	3.42	4.08		

Downstream *(04/04/2023)*



	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Thalweg Elevation	637.54	637.81	637.83	638.03		
LTOB Elevation	640.51	640.30	640.24	640.22		
LTOB Max Depth	2.97	2.49	2.41	2.19		
LTOB Cross-Sectional Area	14.86	12.04	12.15	11.50		

Downstream *(04/04/2023)*

Table 8. Baseline Stream Data Summary
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

	PRE-EXISTING CONDITIONS					DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Perry Branch Reach 1**									
Riffle Only	**Min**	**Mean**	**Med**	**Max**	**n**	**Min**	**Max**	**Max**	**Min**	**n**
Bankfull Width (ft)	2.7	2.9	2.9	3.1	2	8.0		9.2		1
Floodprone Width (ft)	4	4	4	4	2	61		80		1
Bankfull Mean Depth (ft)	0.4	0.5	0.5	0.6	2	0.6		0.7		1
Bankfull Max Depth (ft)	0.6	0.7	0.7	0.8	2	1.0		1.4		1
Bankfull Cross Sectional Area (ft^2)	1.1	1.6	1.6	2.0	2	5.0		6.8		1
Width/Depth Ratio	5.2	6.0	6.0	6.8	2	12.8		12.6		1
Entrenchment Ratio	1.3	1.4	1.4	1.4	2	7.6		8.7		1
Bank Height Ratio	2.1	2.4	2.4	2.7	2	1.0	1.1	1.0		1
Max particle size (mm) mobilized at bankfull	29					36		39		
Rosgen Classification	G4c					C4		C4		
Bankfull Discharge (cfs)	2.8	4.4	4.4	5.9	2	14.9		22.0		1
Sinuosity	1.10					1.16		1.13		
Water Surface Slope (ft/ft)	0.0129					0.0127		0.0128		
Other	---					---		---		
Parameter	**Perry Branch Reach 3**									
Riffle Only	**Min**	**Mean**	**Med**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	5.3	5.7	5.7	6.1	2	9.6		11.0		1
Floodprone Width (ft)	11.0	12.5	12.5	14.0	2	156		100		1
Bankfull Mean Depth (ft)	0.6	0.7	0.7	0.7	2	0.8		0.6		1
Bankfull Max Depth (ft)	0.7	0.8	0.8	0.8	2	1.2		1.2		1
Bankfull Cross Sectional Area (ft^2)	3.4	3.5	3.5	3.6	2	7.2		6.3		1
Width/Depth Ratio	8.7	8.8	8.8	8.8	2	12.8		19.2		1
Entrenchment Ratio	2.1	2.2	2.2	2.2	2	16.3		9.1		1
Bank Height Ratio	1.9	2.1	2.1	2.3	2	1.0	1.1	1.0		1
Max particle size (mm) mobilized at bankfull	35					46		32		
Rosgen Classification	G4c					C4		C4		
Bankfull Discharge (cfs)	9.1	9.7	9.7	10.2	2	25.1		17.9		1
Sinuosity	1.15					1.12		1.12		
Water Surface Slope (ft/ft)	0.0155					0.0135		0.0130		
Other	---					---		---		
Parameter	**Perry Branch Reach 4**									
Riffle Only	**Min**	**Mean**	**Med**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	5.7	6.7	6.0	9.3	4	11.4		13.0	13.1	2
Floodprone Width (ft)	9	12	12	17	4	123		125	175	2
Bankfull Mean Depth (ft)	0.6	0.8	0.8	1.0	4	0.9		1.0	1.1	2
Bankfull Max Depth (ft)	0.9	1.2	1.2	1.4	4	1.4		1.8	1.9	2
Bankfull Cross Sectional Area (ft^2)	4.0	5.1	5.2	5.9	4	10.1		12.8	14.1	2
Width/Depth Ratio	6.3	9.2	7.9	14.6	4	12.9		12.1	13.1	2
Entrenchment Ratio	1.4	1.9	1.8	2.7	4	10.8		9.6	13.5	1
Bank Height Ratio	1.2	2.2	2.3	3.0	4	1.0	1.1	1.0		2
Max particle size (mm) mobilized at bankfull	33					46		48		
Rosgen Classification	F4					C4		C4		
Bankfull Discharge (cfs)	10.8	15.1	14.4	20.7	4	35.5		48.3	56.4	2
Sinuosity	1.11					1.14		1.15		
Water Surface Slope (ft/ft)	0.0109					0.0111		0.0110		
Other	---					---		---		

Table 8. Baseline Stream Data Summary
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

	PRE-EXISTING CONDITIONS					DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT1 Reach 1**									
Riffle Only	**Min**	**Mean**	**Med**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	1.7		1.7	1.7	1	6.0		5.8		1
Floodprone Width (ft)	6		6.0	6.0	1	11		50		1
Bankfull Mean Depth (ft)	0.8		0.8	0.8	1	0.4		0.4		1
Bankfull Max Depth (ft)	1.1		1.1	1.1	1	0.6		0.8		1
Bankfull Cross Sectional Area (ft^2)	1.4		1.4	1.4	1	2.5		2.5		1
Width/Depth Ratio	2.1		2.1	2.1	1	14.3		13.2		1
Entrenchment Ratio	3.3		3.3	3.3	1	1.8		8.7		1
Bank Height Ratio	1.9		1.9	1.9	1	1.0	1.1	1.0		1
Max particle size (mm) mobilized at bankfull	22					111		94		
Rosgen Classification	E6b					B4		B4		
Bankfull Discharge (cfs)	7.5		7.5	7.5	1	9.4		11.7		1
Sinuosity	1.04					1.06		1.04		
Water Surface Slope (ft/ft)	0.0473					0.0522		0.0508		
Other	---					---		---		
Parameter	**UT1 Reach 2**									
Riffle Only	**Min**	**Mean**	**Med**	**Max**	**n**	**Min**	**Max**	**Max**	**Min**	**n**
Bankfull Width (ft)	3.7	4.6	4.6	5.4	2	6.0		6.4		1
Floodprone Width (ft)	7	8	8	9	2	113		175		1
Bankfull Mean Depth (ft)	0.3	0.4	0.4	0.4	2	0.5		0.5		1
Bankfull Max Depth (ft)	0.6	0.7	0.7	0.7	2	0.8		0.8		1
Bankfull Cross Sectional Area (ft^2)	1.4	1.5	1.5	1.6	2	2.9		3.2		1
Width/Depth Ratio	9.3	14.0	14.0	18.7	2	12.5		13.0		1
Entrenchment Ratio	1.6	1.8	1.8	2.0	2	18.8		27.2		1
Bank Height Ratio	2.6	2.8	2.8	3.0	2	1.0	1.1	1.0		1
Max particle size (mm) mobilized at bankfull	22					51		48		
Rosgen Classification	F4b					C4b		C4b		
Bankfull Discharge (cfs)	3.2	3.5	3.5	3.7	2	7.6		11.0		
Sinuosity	1.14					1.15		1.14		
Water Surface Slope (ft/ft)	0.0204					0.0221		0.0233		
Other	---					---		---		
Parameter	**UT2 Reach 2**									
Riffle Only	**Min**	**Mean**	**Med**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.2	3.8	4.0	4.0	3	6.0		7.7		1
Floodprone Width (ft)	20	44	42	69	3	44		100		1
Bankfull Mean Depth (ft)	0.6	0.7	0.7	0.8	3	0.5		0.7		1
Bankfull Max Depth (ft)	1.0	1.1	1.0	1.2	3	0.7		1.2		1
Bankfull Cross Sectional Area (ft^2)	2.0	2.7	2.7	3.0	3	2.7		5.4		1
Width/Depth Ratio	5.0	5.4	5.2	5.9	3	13.2		10.8		1
Entrenchment Ratio	6.2	11.3	10.3	17.3	3	7.3		13.0		1
Bank Height Ratio	1.2	1.4	1.3	1.6	3	1.0	1.1	1.0		1
Max particle size (mm) mobilized at bankfull	52					37		51		
Rosgen Classification	E4					C4		C4		
Bankfull Discharge (cfs)	6.2	8.7	9.0	10.9	3	8.2		20.7		1
Sinuosity	1.13					1.11		1.11		
Water Surface Slope (ft/ft)	0.0187					0.0177		0.0179		
Other	---					---		---		

Table 9. Cross-Section Morphology Monitoring Summary

Perry Hill Mitigation Site

DMS Project No. 100093

Monitoring Year 3 - 2023

	Perry Branch Reach 1						Perry Branch Reach 3											
	Cross-Section 1 (Riffle)						Cross-Section 2 (Riffle)						Cross-Section 3 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	650.73	650.88	650.81	650.84			637.59	637.57	637.54	637.49			N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	0.96	1.01	0.99			1.00	0.88	0.89	0.95			N/A	N/A	N/A	N/A		
Thalweg Elevation	649.33	649.61	649.60	649.63			636.38	636.56	636.52	636.43			634.49	634.71	634.76	634.70		
LTOB[2] Elevation	650.73	650.83	650.83	650.83			637.59	637.45	637.43	637.44			637.17	637.32	637.40	637.40		
LTOB[2] Max Depth (ft)	1.44	1.22	1.23	1.20			1.21	0.89	0.91	1.01			2.68	2.61	2.64	2.70		
LTOB[2] Cross-Sectional Area (ft^2)	6.71	6.24	6.83	6.61			6.27	5.22	5.06	5.73			16.26	16.24	16.79	16.87		

	Perry Branch Reach 4																					
	Cross-Section 4 (Riffle)						Cross-Section 5 (Pool)						Cross-Section 6 (Pool)						Cross-Section 7 (Riffle)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	634.12	634.27	634.26	634.26			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A			620.89	621.15	621.17	621.14		
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	0.96	0.97	1.00			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A			1.00	0.87	0.91	0.91		
Thalweg Elevation	632.30	632.49	632.56	632.50			630.33	630.62	630.61	630.60			618.34	618.60	618.51	618.85			618.98	619.35	619.33	619.33		
LTOB[2] Elevation	634.12	634.20	634.21	634.27			633.73	633.76	633.77	633.76			621.17	621.28	621.32	621.37			620.89	620.92	621.01	620.98		
LTOB[2] Max Depth (ft)	1.81	1.71	1.65	1.77			3.40	3.14	3.16	3.16			2.83	2.68	2.81	2.52			1.91	1.57	1.68	1.65		
LTOB[2] Cross-Sectional Area (ft^2)	12.85	11.91	12.18	12.96			28.55	26.42	25.56	25.26			26.08	22.86	23.88	22.83			14.13	11.34	12.15	12.17		

	UT1 Reach 1						UT1 Reach 2						UT2 Reach 2											
	Cross-Section 8 (Riffle)						Cross-Section 9 (Riffle)						Cross-Section 10 (Riffle)						Cross-Section 11 (Pool)					
	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	626.30	626.45	626.46	626.47			618.63	618.74	618.76	618.74			641.54	641.78	641.80	641.74			N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	0.82	0.79	0.78			1.00	1.02	1.05	1.07			1.00	0.82	0.73	0.83			N/A	N/A	N/A	N/A		
Thalweg Elevation	625.54	625.77	625.80	625.84			617.81	617.99	618.01	617.97			640.35	640.63	640.62	640.62			637.54	637.81	637.83	638.03		
LTOB[2] Elevation	626.30	626.33	626.32	626.33			618.63	618.76	618.80	618.80			641.54	641.58	641.48	641.55			640.51	640.30	640.24	640.22		
LTOB[2] Max Depth (ft)	0.77	0.56	0.52	0.49			0.82	0.77	0.79	0.83			1.18	0.95	0.86	0.93			2.97	2.49	2.41	2.19		
LTOB[2] Cross-Sectional Area (ft^2)	2.52	1.86	1.72	1.72			3.23	3.32	3.49	3.60			5.39	3.93	3.42	4.08			14.86	12.04	12.15	11.50		

[1]Bank Height Ratio (BHR) takes the As-Built bankfull area as the basis for adjusting each subsequent years bankfull elevation.

[2]LTOB Cross-Sectional Area and Max depth 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 recorded and tracked above as LTOB max depth.

*Entrenchment Ratios for each cross-section available upon request.

APPENDIX D. Hydrology Data

Table 10. Bankfull Events

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Reach	MY1 (2021)[1]	MY2 (2022)	MY3 (2023)[2]	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Perry Branch Reach 1	N/A	N/A	N/A				
Perry Branch Reach 4	N/A	N/A	N/A				
Perry Branch Reach 4 (Gauge B)	Installed January 2022	5/24/2022	N/A				
UT1 Reach 2	7/19/2021	5/23/2022	N/A				
UT2 Reach 2	7/19/2021	3/9/2022 5/23-24/2022	N/A				

[1]Gauges were installed mid-March 2021.

[2]Data was collected 1/1/2023 to 10/18/2023. Data from the remainder of MY3 will be updated in MY4.

Table 11. Rainfall Summary

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
Annual Precipitation Total	40.10 in^	48.4 in	39.26*				
30 Year Average Precip WETS 30th Percentile	43.75 in	43.52 in	44.06 in				
30 Year Average Precip WETS 70th Percentile	51.13 in	51.01 in	51.44 in				
Annual Precipitation Compared to Normal	Low	Normal	*				

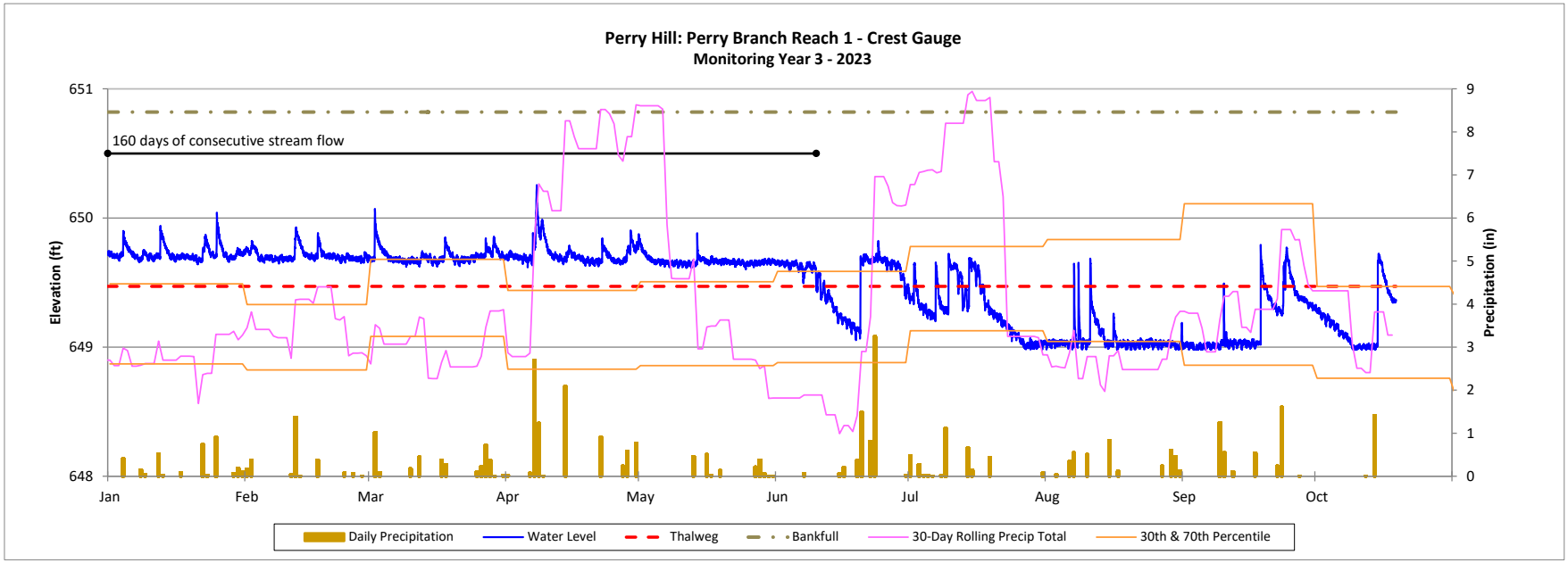
Annual Precipitation Source: **Durham 11 W** Station, Orange County, NC, State Climate Office (Approximately 9.5 miles from Site)

30 Year Average Precipitation Source: **Chapel Hill 2 W** Station, Orange County, NC, AgACIS (Approximately 16 miles from Site)

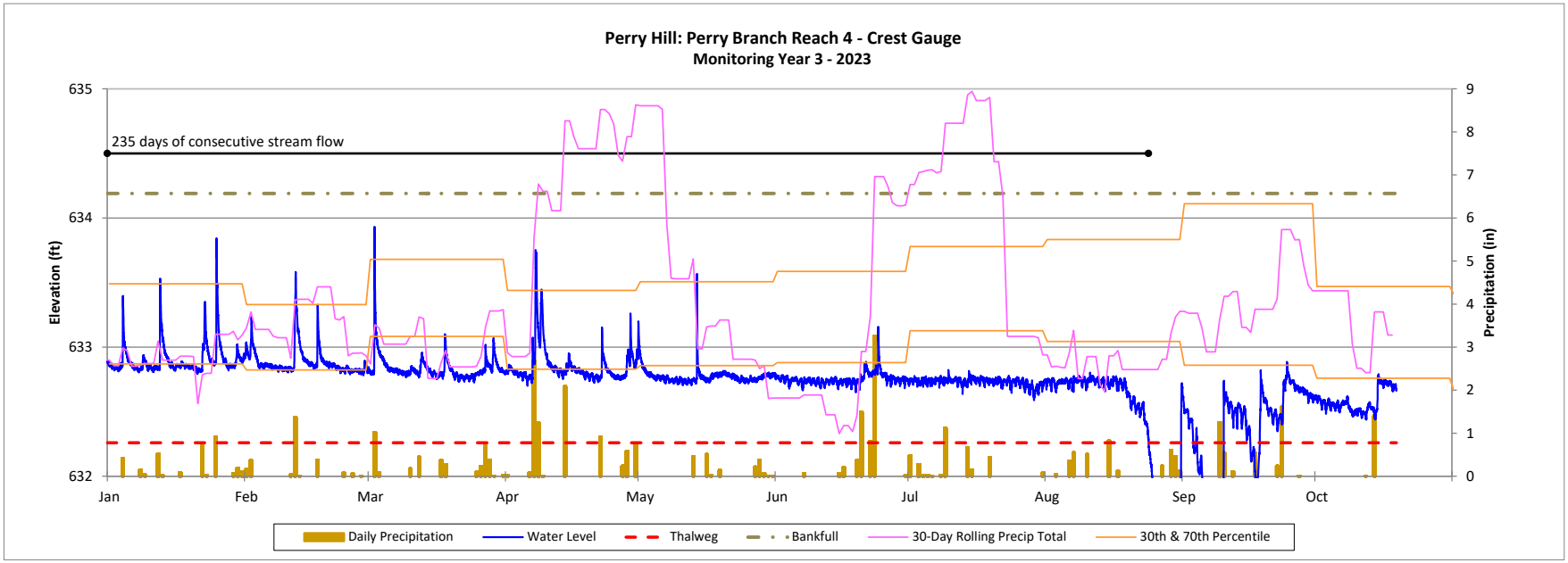
^MY1 Report calculation erroneously included December 2020 daily rainfall data.

*Annual precipitation total includes data from 1/1/2023 to 10/18/2023. Data from the remainder of MY3 will be updated in MY4.

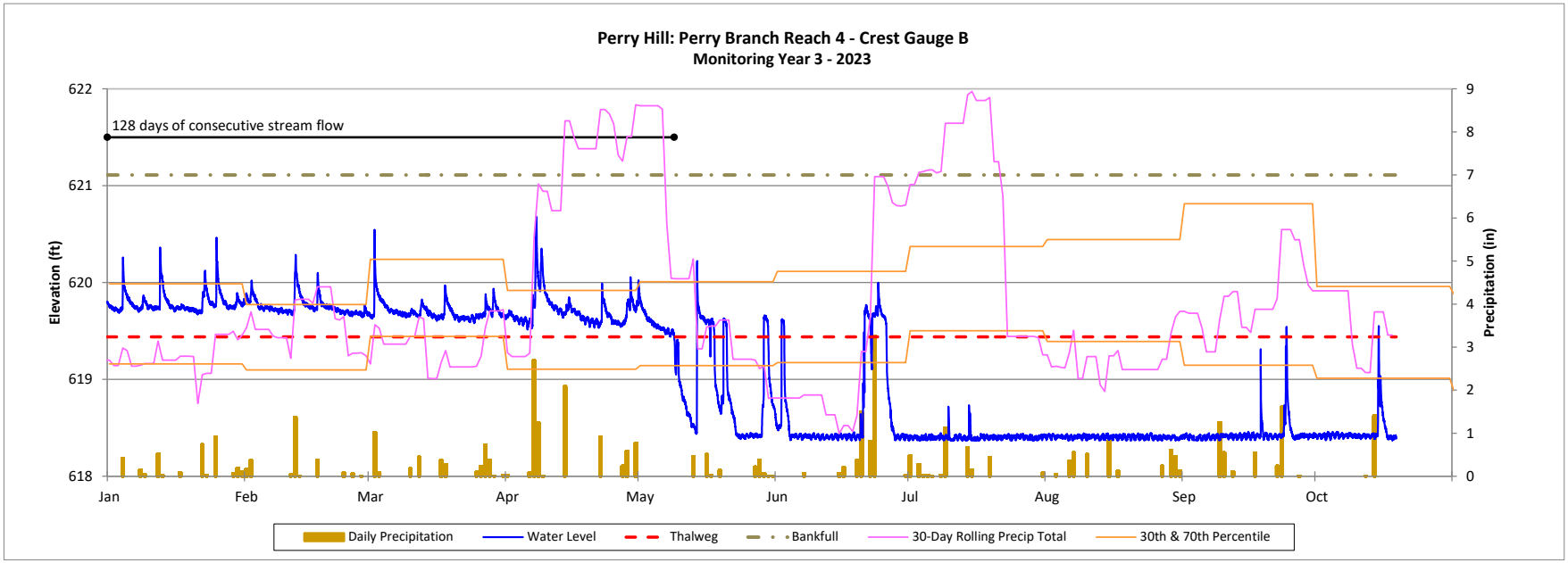
Recorded Bankfull Events Plot
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023



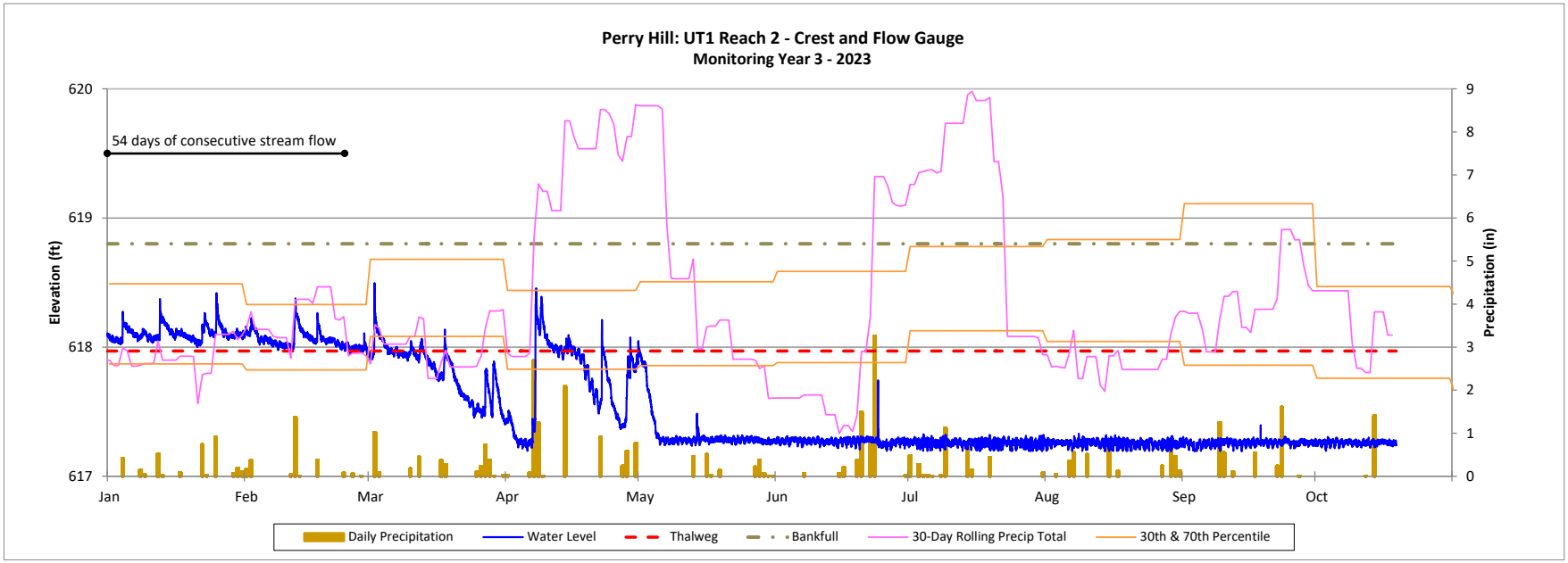
Recorded Bankfull Events Plot
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023



Recorded Bankfull Events Plot
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023



Recorded Bankfull Events Plot
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023



Recorded Bankfull Events Plot
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

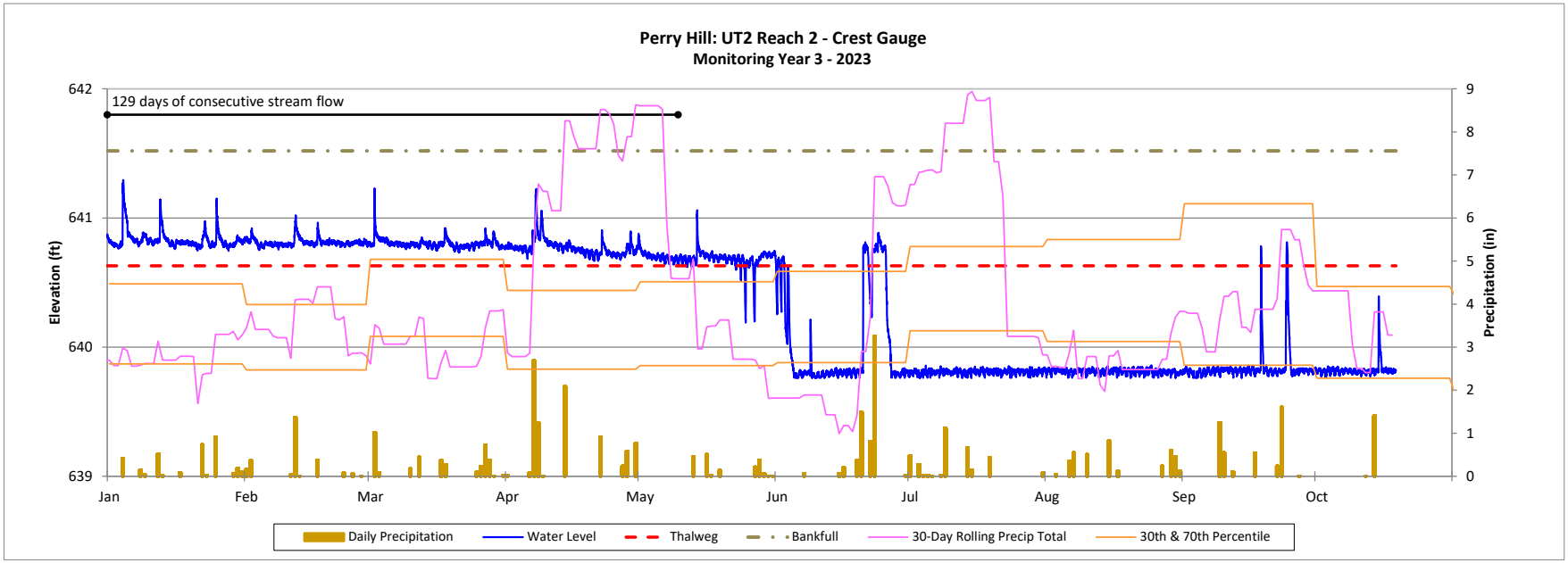


Table 12. Recorded In-Stream Flow Events Summary

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

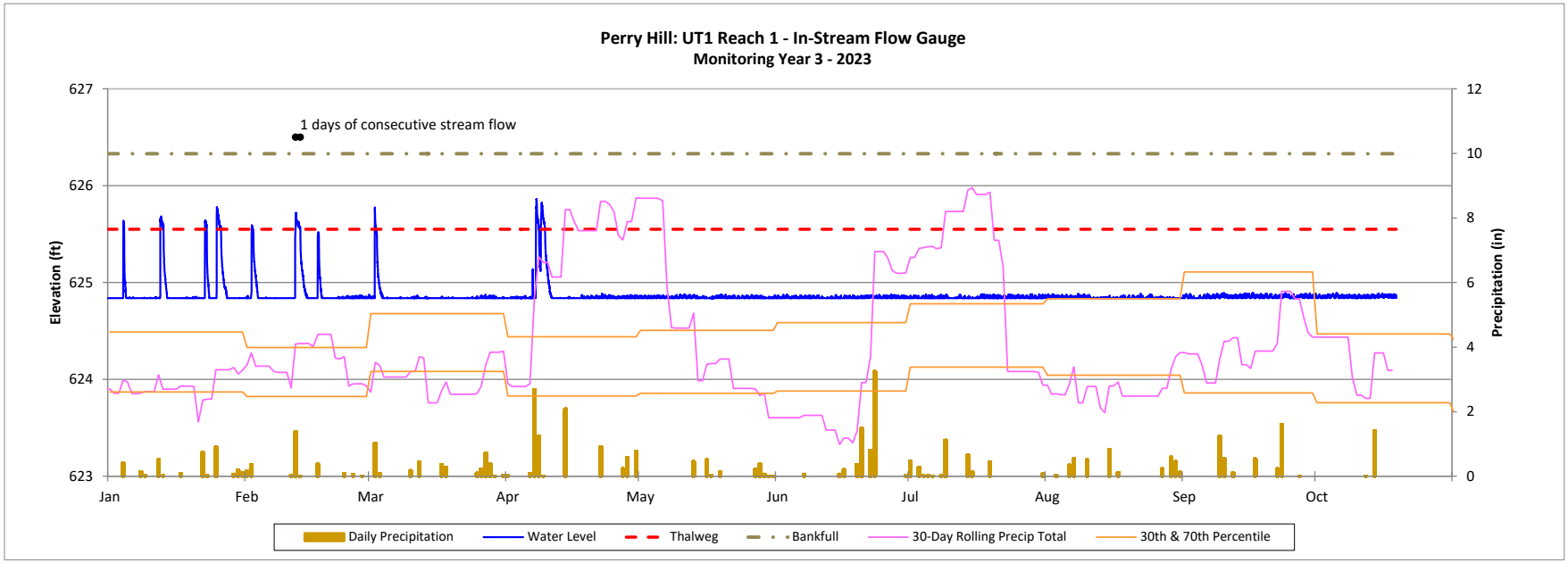
Reach	Max Consecutive Days/Total Days of Baseflow*						
	MY1 (2021)[1]	MY2 (2022)	MY3 (2023)[2]	MY4 (2024)	MY5 (2025)	MY6 (2026)	MY7 (2027)
UT1 Reach 1	1 Day/ 1 Day	1 Day/ 10 Days	1 Day/ 6 Days				
UT1 Reach 1 (Gauge B)	Not Installed until December 2021	20 Days/ 123 Days	4 Days/ 16 Days				
UT2 Reach 2	98 Days/ 154 Days	164 Days/ 212 Days	154 Days/ 176 Days				

*Success criterion is presence of baseflow for a minimum of 30 consecutive days.

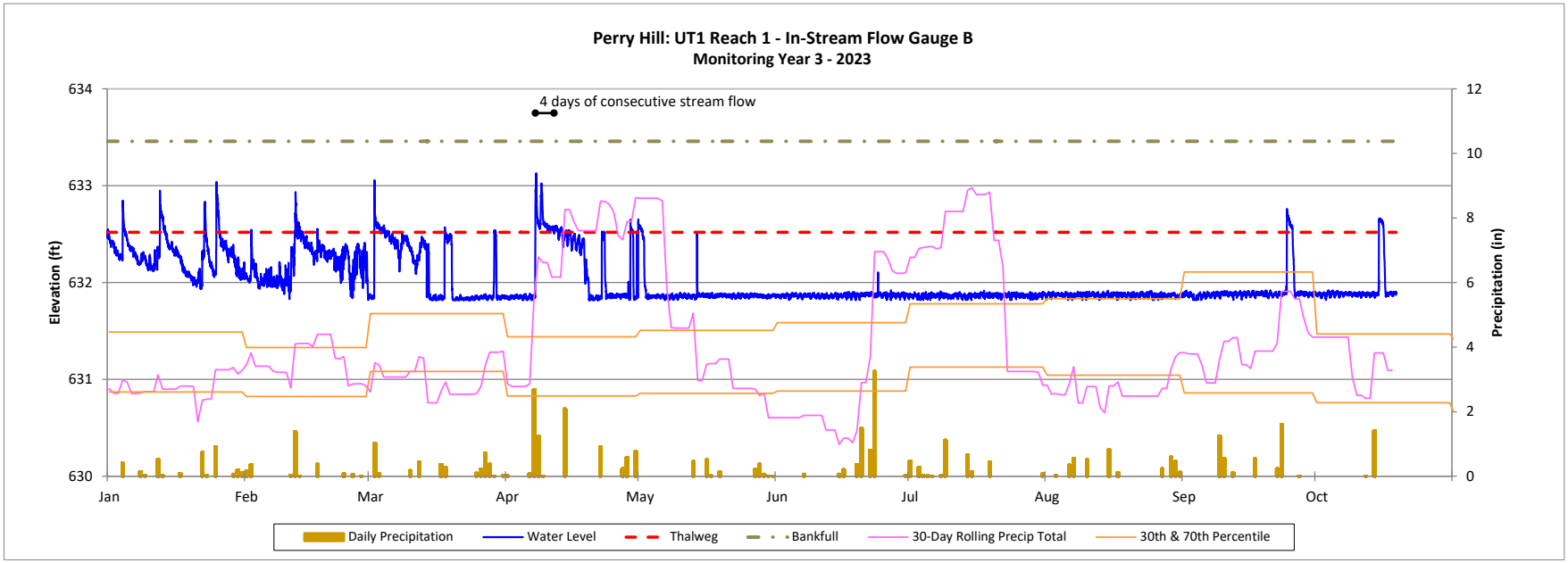
[1]Gauges were installed mid-March 2021.

[2]Data was collected 1/1/2023 to 10/18/2023. Data from the remainder of MY3 will be updated in MY4.

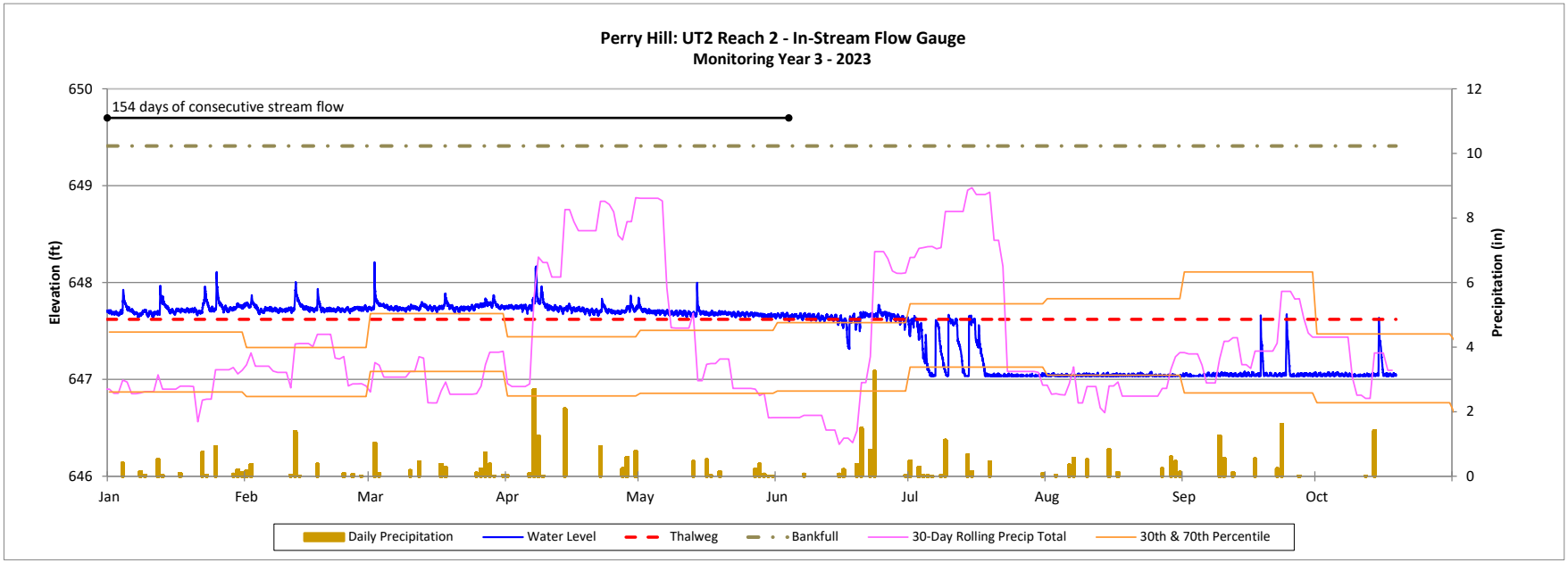
Recorded In-stream Flow Events Plot
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023



Recorded In-stream Flow Events Plot
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023



Recorded In-stream Flow Events Plot
Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023



APPENDIX E. Project Timeline and Contact Info

Table 13. Project Activity and Reporting History

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Activity or Report		Data Collection Complete	Completion or Scheduled Delivery
Project Instituted		NA	December 2018
Mitigation Plan Approved		July 2020	July 2020
Invasive Vegetation Treatment			November 2020
Construction (Grading) Completed		NA	March 2021
As-Built Survey Completed		April 2021	April 2021
Competitive Vegetation Treatment[1]			April 2021
Baseline Monitoring Document (Year 0)	Stream Survey	March 2021	May 2021
	Vegetation Survey	April 2021	
Year 1 Monitoring	Invasive Vegetation Treatment		October 2021
	Easement Encroachment		October 2021
	Stream Survey	October 2021	December 2021
	Vegetation Survey	October 2021	
Year 2 Monitoring	Competitive Vegetation Treatment[1]		April 2022
	Invasive Vegetation Treatment		March and August 2022
	In-Stream Vegetation Treatment		August 2022
	UT1 Channel Repair		September 2022
	Stream Survey	April 2022	December 2022
	Vegetation Survey	September 2022	
Year 3 Monitoring	Competitive Vegetation Treatment[1]		April 2023
	Invasive Vegetation Treatment		May 2023
	Stream Survey	April 2023	December 2023
	Vegetation Survey	September 2023	
Year 4 Monitoring		2024	December 2024
Year 5 Monitoring	Stream Survey	2025	December 2025
	Vegetation Survey	2025	
Year 6 Monitoring		2026	December 2026
Year 7 Monitoring	Stream Survey	2027	December 2027
	Vegetation Survey	2027	

[1]Herbicide ring sprays around the base of planted stems.

Table 14. Project Contact Table

Perry Hill Mitigation Site
DMS Project No. 100093
Monitoring Year 3 - 2023

Designer Geoff Smith, PE	**Wildlands Engineering, Inc.** 497 Bramson Ct, Suite 104 Mt. Pleasant, SC 29464 843.277.6221
Construction Contractor	**Main Stream Earthwork, Inc.** 631 Camp Dan Valley Rd Reidsville, NC 27320
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Jason Lorch 919.851.9986