MONITORING YEAR 1 ANNUAL REPORT
FINAL

HUNTSMAN MITIGATION SITE
Wilkes County, NC
Yadkin River Basin
HUC 03040102

DMS Project No. 100123
DMS Contract No. 7891
DMS RFP No. 16-007728; Date of Issue: 11/13/2018
USACE Action ID No. SAW-2019-00836
DWR Project No. 20190866
Data Collection Dates: June - December 2022
Final Submission Date: February 2023

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

PREPARED BY:

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February 2, 2023

Mr. Matthew Reid
Western Project Manager
NCDEQ – Division of Mitigation Services
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211

RE: Huntsman Draft MY1 Report Review
Yadkin River Basin – CU# 03040102
Wilkes County
DMS Project ID No. 100123
Contract # 7891

Dear Mr. Reid:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments and observations from the Huntsman MY1 Draft Report, received on January 30, 2023. The report text has been revised for the final submittal to reflect the most current condition of the site. Your comments and observations from the report are noted below in **Bold**. Wildlands' response to those comments are noted in *Italics*.

DMS' Comment: In an effort to identify and resolve property issues early during the monitoring period, please verify that the conservation easement boundary has been walked, marking and signage is up to spec, fencing is intact, and no encroachments have been identified.
Wildlands' Response: Visual assessments revealed that there are no easement boundary areas of concern in MY1. Refer to Section 2.2 Vegetation Areas of Concern and Management Activities in the MY1 monitoring report.

DMS' Comment: Numerous site repairs are scheduled to occur during MY2. Thank you for proactively addressing the repairs early in the project monitoring period. Please include an update of the repairs conducted in 2023 in the MY2 report. Recommend including additional photos to document repairs as WEI did with the MY1 repairs.
Wildlands' Response: Noted

DMS' Comment: 2.2 Vegetation Areas of Concern: Supplemental planting is scheduled for winter 2022/2023. Recommend revising to say winter 2023 if work has not occurred at the time of this report. Please include species list and quantities in MY2 report.
Wildlands' Response: The report has been updated accordingly, and a Supplemental Planting Species List was added to Appendix B.

DMS' Comment: 2.4 Stream Areas of Concern: Section indicates repairs to stabilized swales will occur in winter 2022/2023. Recommend revising to say winter 2023 since work has not been completed at the time of this report.

Wildlands' Response: The report has been updated accordingly.

DMS' Comment: Table 4B - UT1 Reach 1: One grade control structure is noted as not performing as intended. Please include this on the CCPV.

Wildlands' Response: The grade control structure noted on UT1 Reach 1 in Table 4B was incorrectly reported, as it was referring to the degraded riffle at station 211+00. Table 4B has been updated accordingly.

DMS' Comment: Cross Section 1 and 2 Plots: Recommend adding note that these two cross sections are located in an area that was repaired in MY1.

Wildlands' Response: Cross-sections 1 and 2 have been updated accordingly.

DMS' Comment: Table 12: There is an asterisk by the Annual Precipitation Total and an asterisk in the MY1 Normal cell. Recommend using "yes" or "normal" for the Normal cell.

Wildlands' Response: Table 12 has been updated accordingly.

Enclosed please find two (2) hard copies of the Year 7 Final Monitoring Report and one (1) USB with all the final corrected electronic files for DMS distribution. Please contact me at 704-332-7754 x101 if you have any questions.

Sincerely,

Kristi Suggs
ksuggs@wildlandseng.com

HUNTSMAN MITIGATION SITE

Monitoring Year 1 Annual Report

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APPENDICES

Section 1: Section 1: Project Overview

The Huntsman Mitigation Site (Site) is located in Wilkes County approximately 5 miles south of Ronda and 8 miles southwest of Jonesville, North Carolina. The Site is located within the North Little Hunting Creek targeted local watershed (TLW) Hydrologic Unit Code (HUC) 03040102020030 and will provide warm stream credits in the South Yadkin 03040102 (Yadkin 02) Cataloging Unit (CU). North Little Hunting Creek and its tributaries are classified as Water Supply III (WS-III) with additional protections for Class C uses. Table 3 presents information related to the project attributes.

1.1 Project Quantities and Credits

Mitigation work within the Site included restoration and enhancement II of perennial stream channels. Table 1 below shows 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							
North Little Hunting Creek Reach 1	722.905	717.000	Warm	R	1.0	722.905	Restoring dimension, pattern, and profile, reconnecting channels with floodplains and wetlands, riparian planting, fencing out livestock, invasive species treatment, and protecting with conservation easement
North Little Hunting Creek Reach 2	1,027.718	1,033.000	Warm	R	1.0	1,027.718	Restoring dimension, pattern, and profile, reconnecting channels with floodplains and wetlands, riparian planting, fencing out livestock, invasive species treatment, protecting with conservation easement, and bridge crossing
UT1 Reach 1	1,432.561	1,433.000	Warm	R	1.0	1,432.561	Restoring dimension, pattern, and profile, reconnecting channels with floodplains and wetlands, riparian planting, fencing out livestock, invasive species treatment, protecting with conservation easement, and bridge crossing

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**
UT1 Reach 2	244.166	244.000	Warm	R	1.0	244.166	Restoring dimension, pattern, and profile, reconnecting channels with floodplains and wetlands, riparian planting, fencing out livestock, invasive species treatment, protecting with conservation easement, and road crossing
UT1 Reach 3	217.715	217.000	Warm	R	1.0	217.715	Restoring dimension, pattern, and profile, reconnecting channels with floodplains and wetlands, riparian planting, fencing out livestock, invasive species treatment, and protecting with conservation easement
UT2 Reach 1	299.853	300.000	Warm	EII	2.5	119.941	Partial channel restoration, riparian planting, fencing out livestock, protecting with a conservation easement, and bridge crossing
UT2 Reach 2	286.763	287.000	Warm	R	1.0	286.763	Restoring dimension, pattern, and profile, reconnecting channels with floodplains and wetlands, riparian planting, invasive species treatment, fencing out livestock, and protecting with conservation easement
UT2 Reach 3	568.949	569.000	Warm	R	1.0	568.949	
UT2 Reach 4	522.002	522.000	Warm	R	1.0	522.002	
Barn Branch	287.612	289.000	Warm	R	1.0	287.612	
Old Bus Branch	87.471	88.000	Warm	R	1.0	87.471	Restoring dimension, pattern, and profile, stormwater BMP implementation, reconnecting channels with floodplains and wetlands, riparian planting, fencing out livestock, protecting with conservation easement
Rifle Tributary	252.855	245.000	Warm	EII	2.5	101.142	Stormwater BMP implementation, partial channel restoration, riparian planting, fencing out livestock, and protecting with conservation easement

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**
Trapper Tributary	40.718	41.000	Warm	EII	2.5	16.287	Partial channel restoration, riparian planting, fencing out livestock, and protecting with conservation easement
Net Credit Gain for buffers wider than 30-ft.:						181.720	
Total:						**5,816.952**	

Restoration Level	**Stream**		
	Warm	**Cool**	**Cold**
Restoration	5,397.862		
Enhancement I	--		
Enhancement II	237.370		
Preservation	--		
Credit Gain: Buffers > 30-feet[3]	181.720		
Totals	**5,816.952**		
Total Stream Credit	**5,816.952**		

1. Crossing lengths have been removed from restoration footage
2. No direct credit for BMPs.

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes expected outcomes to water quality and ecological processes and provides project goals and objectives.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve the stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary.	ER over 1.4 for B-type and 2.2 for C-type channels and BHR below 1.2 with visual assessments showing progression towards stability.	16 Cross-sections will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually.	Most cross-sections (XS) show streams are stable and functioning as designed. All riffle XS BHRs are below 1.2.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Reconnect channels with floodplains and to allow a natural flooding regime.	Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data. Remove pond above T2.	Allow more frequent flood flows to disperse on the floodplain.	Four bankfull events in separate years within the 7-year monitoring period.	Three automated pressure transducers were installed on restoration reaches and will record flow elevations and durations.	Reaches meeting bankfull criteria: MY1: Bankfull events recorded on NLHC Reach 2 and UT2 Reach 4, none recorded on UT1 Reach 1 due to gage malfunction.
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zones and plant native shrub and herbaceous species on streambanks.	Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5 and a height of 6 ft., and 210 stems per acre at MY7 with a height of 8 ft.	13 permanent and 4 mobile one hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored during MY1, MY2, MY3, MY5, and MY7.	MY1: 16/17 vegetation plots have a planted stem density greater than 320 stems per acre.
Improve instream habitat.	Install habitat features such as constructed riffles, lunker logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.	Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time.	There is no required performance standard for this metric.	Visual assessment.	N/A
Diffuse concentrated agricultural runoff.	Install stormwater BMPs in areas of concentrated agricultural runoff to diffuse and provide vegetated infiltration for runoff before it enters the stream channel.	Reduce agricultural and sediment inputs to the project, which will reduce likelihood of accumulated fines and excessive algal blooms from nutrients.	There is no required performance standard for this metric.	N/A	N/A

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments.

1.3 Project Attributes

North Little Hunting Creek originates offsite to the west in the steep, forested Brushy Mountains. The stream gradually widens and flattens in slope as it travels downstream out of the mountains and flows through several agricultural parcels before it enters the Site. UT1 originates within the Site limits, north of Ingle Hollow Road, and flows under Ingle Hollow Road to join North Little Hunting Creek. Land use in the drainage area of UT1 includes agricultural fields and chicken houses. UT2 begins in steep woods offsite, enters the Site from the south, and joins North Little Hunting Creek within the project area. Old Bus Branch, Rifle Tributary, Trapper Tributary, and Barn Branch all originate within Site limits and are tributaries to UT2. Within Site limits, North Little Hunting Creek, UT2, and the UT2 tributaries all flow through actively grazed pastures.

Table 3: Project Attributes

PROJECT INFORMATION	
Project Name	Huntsman Mitigation Site
Project Area (acres)	17.7
County	Wilkes County
Project Coordinates	36.140689, - 80.932189
PROJECT WATERSHED SUMMARY INFORMATION	
Physiographic Province	Piedmont
USGS HUC 8-digit	03040102
USGS HUC 14-digit	03040102020030
River Basin	Yadkin River
DWR Sub-basin	03-07-06
Land Use Classification	74% forested, 22% agriculture, 2% shrubland, 1% developed, 1% open water
Project Drainage Area (acres)	1,416
Percentage of Impervious Area	0.23%

Table 3: Project Attributes

RESTORATION TRIBUTARY SUMMARY INFORMATION					
Parameters	**North Little Hunting Creek**	**UT1**	**UT2**	**Barn Branch**	**Old Bus Branch**
Pre-project length (feet)	1,646	996	1,707	247	90
Post-project (feet)	1,750	1,894	1,678	289	88
Valley confinement (Confined, moderately confined, unconfined)	Unconfined	Moderately Confined	Confined to Unconfined	Moderately Confined	Confined
Drainage area (acres)	1,274	70	43	10	5.2
Perennial, Intermittent, Ephemeral	Perennial				
DWR Water Quality Classification	WS-III				
Dominant Stream Classification (existing)	G4	C4/B4	A6, E5b	B5a	G5
Dominant Stream Classification (proposed)	C4	B4a/C4b/C4	B5a, B5, C5	B5a	A5
Dominant Evolutionary class (Simon) if applicable	Stage IV-V	Stage II-III	Stage III	Stage IV	Stage III-IV

REGULATORY CONSIDERATIONS			
Parameters	**Applicable?**	**Resolved?**	**Supporting Documentation**
Water of the United States - Section 404	Yes	Yes	USACE Action ID No. SAW-2019-00836
Water of the United States - Section 401	Yes	Yes	DWR # 2019-0866
Endangered Species Act	Yes	Yes	Categorical Exclusion in Mitigation Plan (Wildlands, 2021)
Historic Preservation Act	Yes	Yes	
Coastal Zone Management Act (CZMA or CAMA)	N/A	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	Wilkes County – No Rise Certification
Essential Fisheries Habitat	N/A	N/A	N/A

Section 2: Monitoring Year 1 Data Assessment

The MY1 data collection was conducted between June and December 2022 to assess the condition of the project. The vegetation, stream, and hydrology success criteria for the Site follow the approved Mitigation Plan (Wildlands, 2021). Performance criteria for vegetation, stream, and hydrologic assessments are located in Section 1.2 Table 3: Goals, Performance Criteria, and Functional Improvements. The Site will be monitored for a total of seven years, with the final monitoring activities scheduled for 2028.

2.1 Vegetative Assessment

A total of sixteen vegetation plots (twelve permanent and four mobile) were established within the planted buffer during the MY0 As-Built installation. Due to the narrow floodplain on UT1, the locations of mobile vegetation plot (MP) 2 and permanent vegetation plot (VP) 6 were switched. However, during the 15-Day As-Built/MY0 review, the IRT requested an additional VP be added to the downstream portion of UT1 Reach 1 near the filled pond. VP 13 was installed and surveyed in December 2022 and will continue to be monitored in subsequent monitoring years. Refer to the Current Condition Plan View's (CCPV) in Appendix A for the location of the additional vegetation plot.

The MY1 vegetative survey was completed between October and December 2022. The average stem density for the Site is 440 stems per acre. In MY1, 16 out of the 17 vegetation plots are on track to individually meet the MY3 interim density requirement of 320 stems per acre. Within the permanent vegetation plots there was approximately an 80% survival rate among the planted stems. The tree/shrubs species with the lowest survival rates include flowering dogwood (*Cornus florida*), eastern sweetshrub (*Calycanthus floridus*) and American beech (*Fagus grandifolia*). The vegetation plot not meeting criteria (MP1) is representative of larger areas of low stem density on Site. Areas of low stem density are discussed in Section 2.2. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

2.2 Vegetation Areas of Concern and Management Activities

MY1 visual assessments reveal that a majority of the conservation easement is unaffected by invasive species. Localized patches of Chinese privet (*Ligustrum sinense*), tree of heaven (*Ailanthus altissima*), multiflora rose (*Rosa multiflora*), and Japanese honeysuckle (*Lonicera japonica*) were treated with herbicidal applications in July and September 2022. Treatments were successful in reducing invasive species areas and are presently below the mapping threshold, therefore they are not shown on the CCPV figures. Invasive species will continue to be monitored and treated as necessary throughout the monitoring period.

Several areas of low stem density and bare areas were identified and mapped in MY1, as native woody and herbaceous vegetation has not yet become established throughout the Site. Bare areas located on North Little Hunting Creek Reach 1 and UT1 Reach 1 are associated with stream repairs that occurred along these reaches in October 2022. Additional bare areas on North Little Hunting Reach 2 are a result of standing water at the toe of slope causing inundation of planted stems and herbaceous vegetation. Poor soil conditions and moderately steeps slopes on UT1 have hindered the successful establishment of vegetation, resulting in low stem densities along this reach. Other areas of low stem density were observed in isolated areas on North Little Hunting Creek Reach 2 where storms stripped the floodplain of topsoil. Areas of low stem density and bare areas have a combined total of approximately 1.6 acres or 10% of the total planted acreage. Management activities are planned for winter 2023 and will include reseeding bare areas, adding soil amendments, and supplementally planting mapped areas of low stem density with approved species from the project's Final Mitigation Plan (Wildlands, 2021). Refer to

Appendix A for the CCPV figures 1.0 – 1.2, Vegetation Condition Assessment Table and the Areas of Concern Photolog.

MY1 Visual assessments reveal that there were no easement boundary areas of concern. Wildlands staff walked the easement boundary and determined that signage and easement markers are sufficient and visible, the fencing is intact, and no encroachments have been identified. Wildlands will continue to monitor the easement boundary in MY3.

2.3 Stream Assessment

Morphological surveys for MY1 were conducted in November 2022. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration and enhancement I reaches with minimal adjustments. All 16 cross-sections are stable, with bank height ratios at or near 1.0, and bankfull dimensions within an acceptable range of the design parameters. Changes occurring within some cross-sections include slight variations in cross-sectional areas and bankfull widths due to natural channel processes, such as vegetation growth along the banks.

While riffle cross-sections largely remained undisturbed in MY1, several pool cross-sections exhibited minor adjustments in bankfull dimensions. Cross-section 12, located on UT2 Reach 3, exhibited an increase in pool depth. While this increase in depth is just outside design parameters, increases in pool depth are beneficial for aquatic habitat and are not indicative of instability. Cross-section 2 located on North Little Hunting Creek Reach 1 exhibited a slight reduction in depth and bankfull cross-sectional area, likely due to the stream scour that occurred directly upstream. Wildlands expects the aggradational sediment to be mobilized in subsequent storms. Cross-section 9 along UT1 Reach 2 exhibited isolated right bank scour resulting in a moderate decrease in width-to-depth ratio from as-built. Wildlands will continue to monitor these cross-sections for signs of accelerated instability. Refer to Appendix A for the visual stability assessment tables, CCPV Figures 1.0 – 1.2, and reference photographs, and Appendix C for the morphological tables and plots.

Reachwide and 100-count riffle pebble counts were conducted in April of 2022 to establish stream classification at baseline conditions and characterize pavement at as-built. Based on a DMS Technical Workgroup memo from 10/19/21 and concurrence received on 10/27/2021 from the DMS project manager for the Site, pebble counts will not be conducted during the remaining monitoring years unless requested by the IRT or deemed necessary by best professional judgement. A copy of the DMS Technical Workgroup Memo (2021) and the email confirmation from the DMS project manager (Reid, 2021) are located in Appendix F.

2.4 Stream Areas of Concern and Management Activities

In the MY0 As-Built report, Wildlands documented several areas of concern that required repairs in MY1. These areas included bank scour on several segments of North Little Hunting Creek Reach 1 as well as displaced riffle substrate on UT1 Reach 1. In September 2022, repairs were completed on approximately 60 feet of stream bank on North Little Hunting Creek Reach 1, in which vulnerable banks were re-graded, riffle material was added, and the banks and floodplain were re-seeded and matted. Cross-sections 1 and 2 are located within this repair area, hence the slight adjustments to the cross-sectional areas at both cross-sections. Additional repairs were completed on approximately 200 feet of stream bed on UT1 Reach 1. Wildlands added and embedded riffle material on several degraded riffles, removed displaced riffle material from the pools, planted supplemental live stakes and herbaceous seed, and installed sod mats on the banks. Refer to Appendix A for repair photographs.

While the Site was largely resilient against several large storm events in 2022, MY1 visual assessments revealed several areas of concern including instances of scour and structure issues. On UT1 Reach 1, riffle material was washed out of one of the repaired riffles resulting in some minor bed scour.

Wildlands plans to reposition and embed the riffle stone in the degraded riffle, add a log sill at 211+40, and install livestakes to the entire length of UT1. Other areas of concern on Site include the piping rock sill on UT1 Reach 3, downstream of the culvert under Ingle Hollow Road. The sill was designed and installed six inches higher than the culvert invert but resulted in a perched culvert. Repairs will include replacing the rock sill so that water backs up into the culvert. Additionally, on UT2 Reach 3, wetland hydrology is abutting the stream which has caused approximately 40 feet of stream bank to slump and scour. Wildlands will repair and stabilize the areas by re-grading both banks and reinforcing them with clay soil and brushtoe. Repairs will be completed on these areas in winter 2023.

During the MY0 2022 IRT Site Walk, the IRT expressed concerns about the rip-rap stabilized swales on UT1 Reach 1. While they were not approved in the project's Final Mitigation Plan (Wildlands, 2020), Wildlands deemed them to be necessary during construction, as there are four concentrated flow areas along the chicken houses, resulting in runoff flowing directly into the project. Wildlands plans on working with the landowner to add stone ford type crossings on each of the swales above the fence line in winter 2023. Nine additional photo points (PP 1a-9a) were added along the swales to better monitor and visually assess these areas.

Wildlands will continue to monitor all areas of concern for signs of accelerated instability and will document repair activities in the MY2 report. Refer to Appendix A for the CCPV figures 1.0-1.2, Stream Condition Assessment Table and the photologs.

2.5 Hydrology Assessment

In total, 3 automated transducer type crest gages (CG) were installed on North Little Hunting Creek Reach 2, UT1 Reach 2, and UT2 Reach 4 to monitor bankfull events. In MY1, at least one bankfull event was documented on North Little Hunting Creek Reach 2 and UT2 Reach 4. Therefore, the hydrologic success criteria of four bankfull events in separate years has been partially met. The CG transducer on UT1 Reach 2 malfunctioned and recorded unreliable data throughout the duration of the monitoring year. Wildlands will replace this CG in winter 2023. Wildlands will continue to collect stream hydrology data in subsequent monitoring years. Please refer to Appendix 5 for hydrology summary and data plots.

2.6 Monitoring Year 1 Summary

Overall, the Site is performing as intended, and is on track to meet most of the required stream, vegetation, and hydrology success criteria for MY1. The average stem density for the Site is 440 stems per acre and is on track to meet the MY3 requirement of 320 planted stems per acre. The Site is largely unaffected by invasive species, and streams on Site are mostly stable and functioning as designed. Geomorphic surveys indicate that cross-section bankfull dimensions generally match the baseline monitoring, with some minor adjustments. At least one bankfull event was documented on two out of three project reaches in MY1. Several stream repairs were completed in October 2022 on North Little Hunting Creek Reach 1 and UT1 Reach 1. The MY1 visual assessment revealed isolated areas of concern including bare areas, areas of low stem density, as well as instances of scour and minor structure issues. Wildlands will continue to monitor these areas and management actions will be implemented as necessary throughout the seven-year monitoring period to maintain the ecological health of the Site.

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: Methodology

Annual monitoring will consist of collecting morphologic, vegetative, and hydrologic data to assess project success based on the goals outlined in the Site's Mitigation Plan (Wildlands, 2021). Monitoring requirements will follow guidelines outlined in the NC IRT Stream and Wetland Mitigation Guidance Update (2016). Installed monitoring devices and plot locations closely mimic the locations of those proposed in the Site's Mitigation Plan. Deviations from these locations were made when professional judgement deemed them necessary to better represent as-built field conditions or when installation of the device in the proposed location was not physically feasible.

Geomorphic data was collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was collected by either a professional licensed surveyor or an Arrow 100® Submeter GNSS Receiver and processed using ArcPro. Crest gages, using automated pressure transducers, were installed in riffle cross-sections to monitor stream hydrology throughout the year. Stream hydrology and vegetation monitoring protocols followed the Wilmington District Stream and Wetland Compensatory Mitigation Update (NCIRT, 2016). Vegetation installation data collection follow the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008); however, vegetation data processing follows the NC DMS Vegetation Data Entry Tool and Vegetation Plot Data Table (NCDMS, 2020).

Section 4: REFERENCES

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E. 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, C.C., Rawlins, C.L., Potyondy, J.P. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Lee, Michael T., Peet, Robert K., Steven D., Wentworth, Thomas R. 2008. CVS-EEP Protocol for Recording Vegetation Version 4.2. Retrieved: http://cvs.bio.unc.edu/protocol/cvs-eep-protocol-v4.2-lev1-5.pdf.

North Carolina Division of Mitigation Services (NCDMS). 2009 Upper Yadkin Pee-Dee River Basin Restoration Priorities (RBRP), accessed at: https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Yadkin_River_Basin/2009%20Upper%20Yadkin%20RBRP_Final%20Final%2C%2026feb%2709.pdf

NC DMS. 2020. Vegetation Data Entry Tool and Vegetation Plot Data Table. Raleigh, NC. https://ncdms.shinyapps.io/Veg_Table_Tool/

NC DMS and Interagency Review Team (IRT) Technical Workgroup. 2018. Standard Measurement of the BHR Monitoring Parameter. Raleigh, NC.

NC DMS and IRT Technical Workgroup. 2021. Pebble Count Data Requirements. Raleigh, NC. October 19, 2021.

North Carolina Climate Retrieval and Observations Network of the Southeast Database (NCCRONOS). 2021. State Climate Office of North Carolina. Version 2.7.2. Station ID North Wilkesboro 5.5 SE, NC. Accessed December 2022.

North Carolina Climate Retrieval and Observations Network of the Southeast Database (NCCRONOS). 2020. State Climate Office of North Carolina. Version 2.7.2. WETS Station ID North Wilkesboro, NC. WETS Data Years 1992 – 2022.

North Carolina Division of Water Resources (NCDWR) 2008 Yadkin-Pee Dee River Basinwide Water Quality Plan, accessed at: https://files.nc.gov/ncdeq/Water%20Quality/Planning/BPU/BPU/Yadkin/Yadkin%20Plans/2010%20Plan/Yadkin%202008%20Plan%20with%20IR%20and%20Bio%20Appendice.pdf

North Carolina Division of Water Quality (NCDWQ). 2011. Surface Water Classifications. http://deq.nc.gov/about/divisions/water-resources/planning/classification-standards/classifications

North Carolina Geological Survey (NCGS). 2017. NCGS Publications. https://deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/interactive-geologic-maps

NCGS. 1985. Geologic Map of North Carolina: Raleigh, North Carolina Department of Natural Resources and Community Development, Geological Survey Section, scale 1:500,00, in color.

North Carolina Interagency Review Team (NCIRT). 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. Accessed at: https://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

Reid, M. 2021. Email Correspondence, Pebble Count Data Requirements. October 28, 2021.

Rosgen, D. L. 1994. A classification of natural rivers. Catena 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

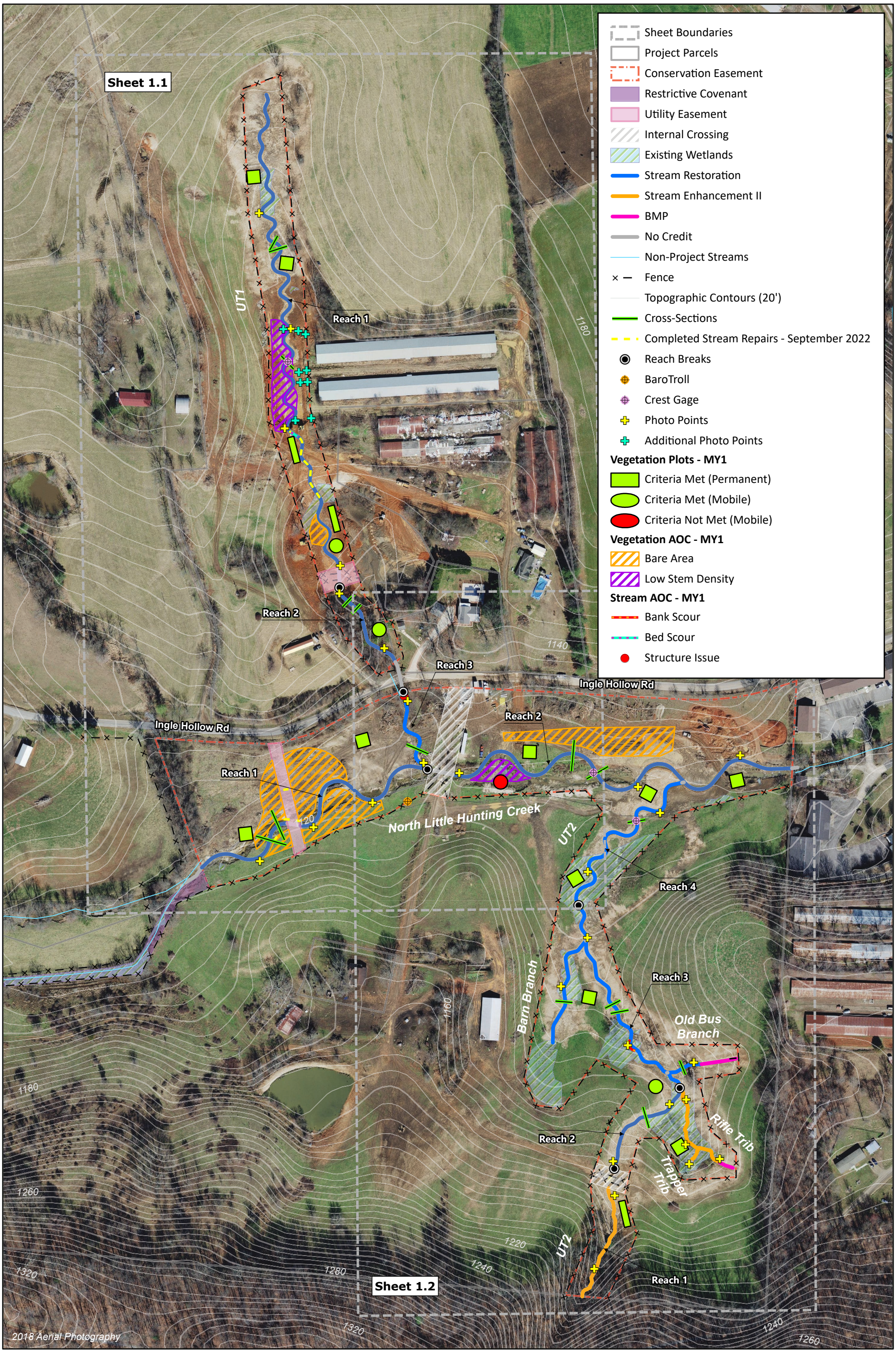
Schafale, M.P. 2012. Classification of the Natural Communities of North Carolina, Fourth Approximation. North Carolina Natural Heritage Program, Raleigh, North Carolina.

Simon, A. 1989. A model of channel response in disturbed alluvial channels. Earth Surface Processes and Landforms 14(1):11-26.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. 2019. http://websoilsurvey.sc.egov.usda.gov/. Accessed August 2019.

Wildlands Engineering, Inc. (2021). Huntsman Mitigation Site Final Mitigation Plan. DMS, Raleigh, NC.

Figures – MY1



WILDLANDS ENGINEERING

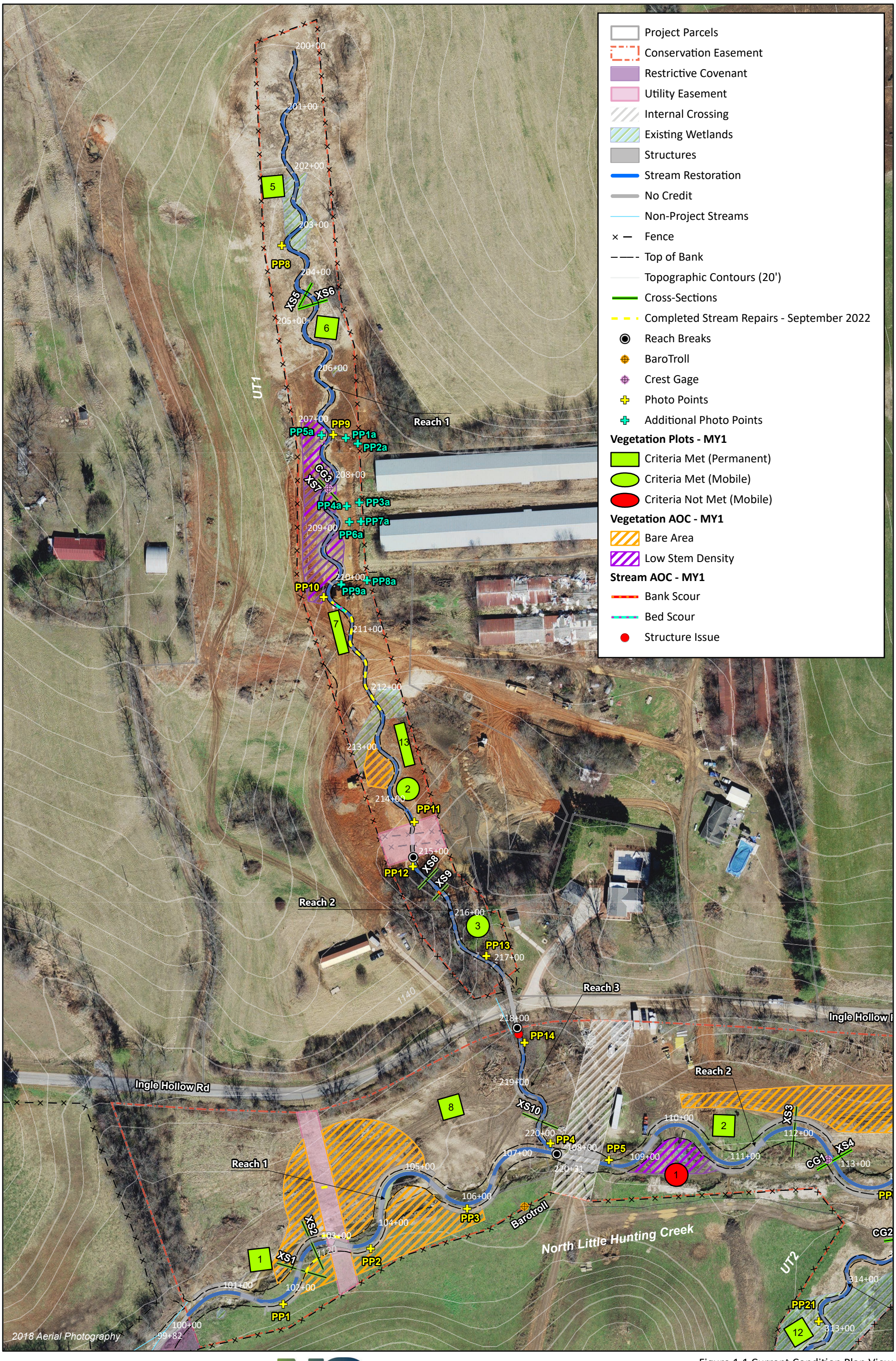
Environmental Quality

0 110 220 Feet

N

Figure 1.0 (Key) Current Condition Plan View
Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1

Wilkes County, NC



WILDLANDS ENGINEERING

Environmental Quality

0 100 200 Feet

N

Figure 1.1 Current Condition Plan View
Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1
Wilkes County, NC

Project Parcels
Conservation Easement
Utility Easement
Internal Crossing
Existing Wetlands
Structures
Stream Restoration
Stream Enhancement II
BMP
No Credit
Non-Project Streams
Fence
Top of Bank
Topographic Contours (20')
Cross-Sections
Reach Breaks
BaroTroll
Crest Gage
Photo Points

Vegetation Plots - MY1

Criteria Met (Permanent)
Criteria Met (Mobile)
Criteria Not Met (Mobile)

Vegetation AOC - MY1

Bare Area
Low Stem Density

Stream AOC - MY1

Bank Scour
Structure Issue

Ingle Hollow Rd
North Little Hunting Creek
Barn Branch
Old Bus Branch
Rifle Trib
Trapper Trib
UT2
Reach 1
Reach 2
Reach 3
Reach 4
Barotroll
CG1
CG2
XS3
XS4
XS8
XS9
XS10
XS11
XS12
XS13
XS14
XS15
XS16
PP3
PP4
PP5
PP6
PP7
PP11
PP13
PP14
PP15
PP16
PP17
PP18
PP19
PP20
PP21
PP22
PP23
PP24
PP25
PP26
PP27
PP28
106+00
107+00
108+00
109+00
110+00
111+00
112+00
113+00
114+00
115+00
116+00
117+00
118+00
118+94
215+00
216+00
217+00
218+00
219+00
220+00
220+31
260+00
261+00
261+77
280+00
281+00
282+00
282+91
300+00
301+00
302+00
303+00
304+00
305+00
306+00
307+00
308+00
309+00
310+00
311+00
312+00
313+00
314+00
315+00
316+00
317+00
317+34
250+00
251+00
252+00
1120
1140
1180
1220
1240
1260
1280
2018 Aerial Photography

WILDLANDS ENGINEERING

Environmental Quality

0 100 200 Feet

N

Figure 1.2 Current Condition Plan View
Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1
Wilkes County, NC

APPENDIX A. Visual Assessment Data

Table 4a. Visual Stream Morphology Stability Assessment Table

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

North Little Hunting Creek Reach 1 Date Last Assessed: 12/08/2022

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	717
					Assessed Bank Length	1,434
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.	1	1		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	8	8		100%

North Little Hunting Creek Reach 2 Date Last Assessed: 12/08/2022

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	1,033
					Assessed Bank Length	2,066
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%.	10	10		100%

Table 4b. Visual Stream Morphology Stability Assessment Table
Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

UT1 Reach 1 Date Last Assessed: 12/08/2022

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	1,433
					Assessed Bank Length	2,866
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.	27	27		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	8	8		100%

UT1 Reach 2 Date Last Assessed: 12/08/2022

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	244
					Assessed Bank Length	488
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			6	99%
	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:	**6**	**99%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	5	5		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2		100%

Table 4c. Visual Stream Morphology Stability Assessment Table
Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

UT1 Reach 3 Date Last Assessed: 12/08/2022

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	217
					Assessed Bank Length	434
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.	4	5		80%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1		100%

UT2 Reach 2 Date Last Assessed: 12/08/2022

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	287
					Assessed Bank Length	573
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.	14	14		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	0	0		N/A

Table 4d. Visual Stream Morphology Stability Assessment Table
Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

UT2 Reach 3 Date Last Assessed: 12/08/2022

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	569
					Assessed Bank Length	1,138
Bank	**Surface Scour/ Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour.			36	97%
	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:	**36**	**97%**
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	12	12		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1		100%

UT2 Reach 4 Date Last Assessed: 12/08/2022

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	522
					Assessed Bank Length	1,044
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.	3	3		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	0	0		N/A

Table 4e. Visual Stream Morphology Stability Assessment Table

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Old Bus Branch Date Last Assessed: 12/08/2022

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		88
				Assessed Bank Length		176
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.	13	13		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	0	0		N/A

Barn Branch Date Last Assessed: 12/08/2022

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		289
				Assessed Bank Length		578
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%.	1	1		100%

Table 5. Vegetation Condition Assessment Table

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Planted Acreage within Easement **16.00** Date Last Assessed: 12/08/2022

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.10	1.28	8%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.10	0.36	2%
		Total	**2**	**10%**
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.10	0	0%
		Cumulative Total	**1.6**	**10%**

Easement Acreage **17.66** Date Last Assessed: 12/08/2022

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	

Stream Photographs

Monitoring Year 1

	
Photo Point 1 – NL Hunting R1, view upstream *(10/11/2022)*	**Photo Point 1** – NL Hunting R1, view downstream *(10/11/2022)*
	
Photo Point 2 – NL Hunting R1, view upstream *(10/11/2022)*	**Photo Point 2** – NL Hunting R1, view downstream *(10/11/2022)*
	
Photo Point 3 – NL Hunting R1, view upstream *(10/11/2022)*	**Photo Point 3** – NL Hunting R1, view downstream *(10/11/2022)*

Photo Point 4 – NL Hunting R1, view upstream *(10/11/2022)*

Photo Point 4 – NL Hunting R1, view downstream *(10/11/2022)*

Photo Point 4 – UT1 Reach 3 view upstream *(10/11/2022)*

Photo Point 5 – NL Hunting R2, view upstream *(10/11/2022)*

Photo Point 5 – NL Hunting R2, view downstream *(10/11/2022)*

	
Photo Point 6 – NL Hunting R2, view upstream *(10/11/2022)*	**Photo Point 6** – NL Hunting R2, view downstream *(10/11/2022)*
	
Photo Point 7 – NL Hunting R2, view upstream *(10/11/2022)*	**Photo Point 7** – NL Hunting R2, view downstream *(10/11/2022)*
	
Photo Point 8 – UT1 Reach 1, view upstream *(10/11/2022)*	**Photo Point 8** – UT1 Reach 1, view downstream *(10/11/2022)*

	
Photo Point 9 – UT1 Reach 1, view upstream *(10/11/2022)*	**Photo Point 9** – UT1 Reach 1, view downstream *(10/11/2022)*
	
Photo Point 10 – UT1 Reach 1, view upstream *(10/11/2022)*	**Photo Point 10** – UT1 Reach 1, view downstream *(10/11/2022)*
	
Photo Point 11 – UT1 Reach 1, view upstream *(10/11/2022)*	**Photo Point 11** – UT1 Reach 1, view downstream *(10/11/2022)*

	
Photo Point 12 – UT1 Reach 2, view upstream *(10/11/2022)*	**Photo Point 12** – UT1 Reach 2, view downstream *(10/11/2022)*
	
Photo Point 13 – UT1 Reach 2, view upstream *(10/11/2022)*	**Photo Point 13** – UT1 Reach 2, view downstream *(10/11/2022)*
	
Photo Point 14 – UT1 Reach 3, view upstream *(10/11/2022)*	**Photo Point 14** – UT1 Reach 2, view downstream *(10/11/2022)*

Photo Point 15 – UT2 Reach 1, view upstream *(10/11/2022)*

Photo Point 15 – UT2 Reach 1, view downstream *(10/11/2022)*

Photo Point 16 – UT2 Reach 1, view upstream *(10/11/2022)*

Photo Point 16 – UT2 Reach 1, view downstream *(10/11/2022)*

Photo Point 17 – UT2 Reach 2, view upstream *(11/23/2022)*

Photo Point 17 – UT2 Reach 2, view downstream *(11/23/2022)*

	
Photo Point 18 – UT2 Reach 2, view upstream *(10/11/2022)*	**Photo Point 18** – UT2 Reach 2, view downstream *(10/11/2022)*
	
Photo Point 19 – UT2 Reach 3, view upstream *(10/11/2022)*	**Photo Point 19** – UT2 Reach 3, view downstream *(10/11/2022)*
	
Photo Point 20 – UT2 Reach 3, view upstream *(10/10/2022)*	**Photo Point 20 –** UT2 Reach 3, view downstream *(10/10/2022)*

	
Photo Point 21 – UT2 Reach 4, view upstream *(10/11/2022)*	**Photo Point 21 –** UT2 Reach 4, view downstream *(10/11/2022)*
	
Photo Point 22 – UT2 Reach 4, view upstream *(10/11/2022)*	**Photo Point 22 –** UT2 Reach 4, view downstream *(10/11/2022)*
	
Photo Point 23 – Rifle Trib, view upstream *(10/11/2022)*	**Photo Point 23** – Rifle Trib, view downstream *(10/11/2022)*

Photo Point 24 – Rifle Trib, view upstream *(10/11/2022)*

Photo Point 24 – Rifle Trib, view downstream *(10/11/2022)*

Photo Point 25 – Rifle Trib, view upstream *(10/11/2022)*

Photo Point 25 – Rifle Trib, view downstream *(10/11/2022)*

Photo Point 26 – Trapper Trib, view upstream *(10/11/2022)*

Photo Point 26 – Trapper Trib, view downstream *(10/11/2022)*

	
Photo Point 27 – Old Bus Branch, view upstream *(10/11/2022)*	**Photo Point 27 –** Old Bus Branch, view downstream *(10/11/2022)*
	
Photo Point 28 – Barn Branch, view upstream *(10/10/2022)*	**Photo Point 28** – Barn Branch, view downstream *(10/10/2022)*

Additional Swale Photographs

Monitoring Year 1

	
Photo Point 1a – Stabilized swale, view up valley *(12/09/2022)*	**Photo Point 1a** – Stabilized swale, view down valley *(12/09/2022)*
	
Photo Point 2a – Stabilized swale, view up valley *(12/09/2022)*	**Photo Point 2a** – Stabilized swale, view down valley *(12/09/2022)*
	
Photo Point 3a – Stabilized swale, view up valley *(12/09/2022)*	**Photo Point 3a** – Stabilized swale, view down valley *(12/09/2022)*

Photo Point 4a – Stabilized swale, view up valley *(12/09/2022)*

Photo Point 4a – UT1 Reach 1, view down ditch *(12/09/2022)*

Photo Point 5a – Stabilized swale, view up valley *(12/09/2022)*

Photo Point 6a – Stabilized swale, view up valley *(12/09/2022)*

Photo Point 6a – Stabilized swale, view down valley *(12/09/2022)*

	
Photo Point 7a – Stabilized swale, view up valley *(12/09/2022)*	**Photo Point 7a** – Stabilized swale, view down valley *(12/09/2022)*
	
Photo Point 8a – Stabilized swale, view up valley *(12/09/2022)*	**Photo Point 8a** – Stabilized swale, view down valley *(12/09/2022)*
	
Photo Point 9a – Stabilized swale, view up valley *(12/09/2022)*	**Photo Point 9a** – Stabilized swale, view down valley *(12/09/2022)*

Vegetation Plot Photographs

Monitoring Year 1

PERMANENT VEGETATION PLOT 1 *(10/11/2022)*

PERMANENT VEGETATION PLOT 2 *(10/11/2022)*

PERMANENT VEGETATION PLOT 3 *(10/11/2022)*

PERMANENT VEGETATION PLOT 4 *(10/11/2022)*

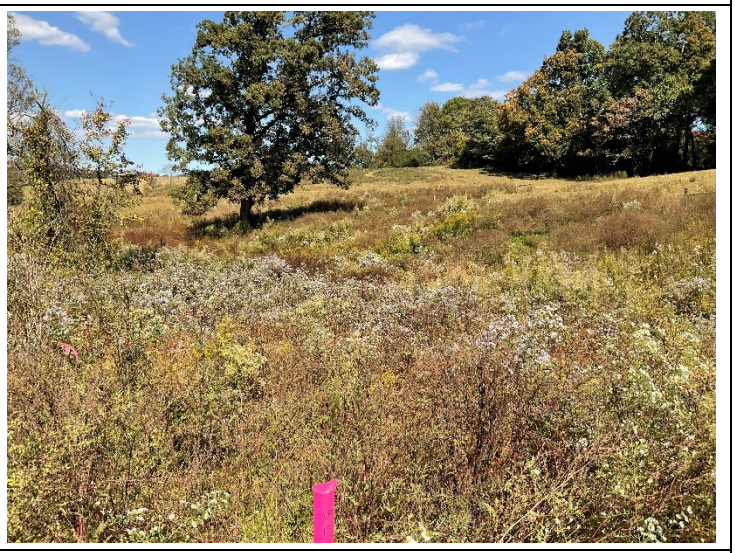
PERMANENT VEGETATION PLOT 5 *(10/10/2022)*

PERMANET VEGETATION PLOT 6 *(10/10/2022)*

PERMANENT VEGETATION PLOT 7 *(10/11/2022)*

PERMANENT VEGETATION PLOT 8 *(10/11/2022)*

PERMANENT VEGETATION PLOT 9 *(10/10/2022)*



PERMANENT VEGETATION PLOT 10 *(10/10/2022)*

PERMANENT VEGETATION PLOT 11 *(10/10/2022)*

PERMANENT VEGETATION PLOT 12 *(10/11/2022)*

PERMANENT VEGETATION PLOT 13 *(12/08/2022)*

MOBILE VEGETATION PLOT 1 *(10/11/2022)*

MOBILE VEGETATION PLOT 2 *(10/10/2022)*

MOBILE VEGETATION PLOT 3 *(10/10/2022)*

MOBILE VEGETATION PLOT 4 *(10/10/2022)*

Repair Photographs

Monitoring Year 1

NL Hunting Reach 1, station 102+50 – Bank scour before repairs *(6/1/2022)*

NL Hunting Reach 1, station 102+50 – Restabilized bank after repairs *(9/26/2022)*

NL Hunting Reach 1, station 102+50 – Floodplain scour before repairs *(5/24/2022)*

NL Hunting Reach 1, station 102+50 – Restabilized floodplain and bank after repairs *(9/26/2022)*

	
UT1 Reach 1, station 210+50 to 212+00 – Riffle scour before repairs (6/1/2022)	**UT1 Reach 1, station 210+50 to 212+00** – Restabilized riffle after repairs *(12/8/2022)*

Areas of Concern Photographs

Monitoring Year 1

	
UT1 Reach 1, station 207+00 to 210+50 – Low stem Density *(12/8/22)*	**UT1 Reach 1, station 213+00 to 214+00** - Bare areas *(12/8/22)*
	
UT1 Reach 3, station 210+50 - Bed scour *(12/8/22)*	**UT1 Reach 3, station 218+15** - Structure piping *(10/5/22)*

NLHC Reach 1, station 102+00 to 103+00 - Bare areas *(12/8/22)*

NLHC Reach 1, station 103+00 to 105+00 - Bare areas *(12/8/22)*

NLHC Reach 2, station 112+50 to 117+00 - Bare areas *(12/8/22)*

NLHC Reach 2, station 112+20 to 117+50 - Bare Areas *(12/8/22)*

UT2 Reach 3, station 308+00 - Bank scour *(12/8/22)*

APPENDIX B. Vegetation Plot Data

Table 6a. Vegetation Plot Data

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Planted Acreage	16
Date of Initial Plant	2022-04-07
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-10-11, 2022-12-8
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 7 F		Veg Plot 8 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC	2	2	1	1	1	1	3	3	2	2	1	1			1	1
	Asimina triloba	pawpaw	Tree	FAC							1	1					1	1		
	Betula nigra	river birch	Tree	FACW	3	3	3	3	2	2	3	3	2	2	2	2			4	4
	Calycanthus floridus	eastern sweetshrub	Shrub	FACU																
	Cornus florida	flowering dogwood	Tree	FACU																
	Diospyros virginiana	common persimmon	Tree	FAC	1	1	1	1	3	3			2	2	2	2	1	1		
	Fagus grandifolia	American beech	Tree	FACU															1	1
	Lindera benzoin	northern spicebush	Tree	FAC															1	1
	Nyssa sylvatica	blackgum	Tree	FAC	2	2									2	2			2	2
	Platanus occidentalis	American sycamore	Tree	FACW	3	3	3	3	4	4	3	3	3	3	1	1	2	2	3	3
	Quercus alba	white oak	Tree	FACU	1	1	1	1	1	1					1	1	1	1	2	2
	Quercus rubra	northern red oak	Tree	FACU	1	1							1	1						
	Ulmus americana	American elm	Tree	FACW			1	1			1	1	1	1			2	2		
	Ulmus rubra	slippery elm	Tree	FAC	1	1	2	2			1	1					2	2	2	2
Sum	Performance Standard				14	14	12	12	11	11	12	12	11	11	9	9	9	9	16	16
Mitigation Plan Performance Standard	Current Year Stem Count					14		12		11		12		11		9		9		16
	Stems/Acre					567		486		445		486		445		364		364		648
	Species Count					8		7		5		6		6		6		6		8
	Dominant Species Composition (%)					21		25		36		25		27		22		22		25
	Average Plot Height (ft.)					2		2		2		3		3		2		2		2
	% Invasives					0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					14		12		11		12		11		9		9		16
	Stems/Acre					567		486		445		486		445		364		364		648
	Species Count					8		7		5		6		6		6		6		8
	Dominant Species Composition (%)					21		25		36		25		27		22		22		25
	Average Plot Height (ft.)					2		2		2		3		3		2		2		2
	% Invasives					0		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 6b. Vegetation Plot Data

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Planted Acreage	16
Date of Initial Plant	2022-04-07
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	2022-10-11, 2022-12-8
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 9 F		Veg Plot 10 F		Veg Plot 11 F		Veg Plot 12 F		Veg Plot 13 F		Veg Plot 1 R	Veg Plot 2 R	Veg Plot 3 R	Veg Plot 4 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Acer negundo	boxelder	Tree	FAC			1	1			1	1	4	4		1	3	2
	Asimina triloba	pawpaw	Tree	FAC	2	2			1	1	1	1						
	Betula nigra	river birch	Tree	FACW	2	2	2	2	2	2	1	1			2	1	2	1
	Calycanthus floridus	eastern sweetshrub	Shrub	FACU	1	1										1		
	Cornus florida	flowering dogwood	Tree	FACU					1	1						1		
	Diospyros virginiana	common persimmon	Tree	FAC	1	1	2	2	3	3	2	2			1	1	1	
	Fagus grandifolia	American beech	Tree	FACU			1	1					1	1			1	
	Lindera benzoin	northern spicebush	Tree	FAC	2	2					1	1			1	1		
	Nyssa sylvatica	blackgum	Tree	FAC					1	1	1	1	2	2	1		1	1
	Platanus occidentalis	American sycamore	Tree	FACW	2	2	2	2	3	3	1	1			1		3	3
	Quercus alba	white oak	Tree	FACU	1	1									1	2		
	Quercus rubra	northern red oak	Tree	FACU			1	1	2	2	1	1	2	2				1
	Ulmus americana	American elm	Tree	FACW			1	1			1	1	1	1		1		
	Ulmus rubra	slippery elm	Tree	FAC							1	1						1
Sum	Performance Standard				11	11	10	10	13	13	11	11	10	10	7	9	11	9
Mitigation Plan Performance Standard	Current Year Stem Count					11		10		13		11		10	7	9	11	9
	Stems/Acre					445		405		526		445		405	283	364	445	364
	Species Count					7		7		7		10		5	6	8	6	6
	Dominant Species Composition (%)					18		20		23		18		40	29	22	27	33
	Average Plot Height (ft.)					2		2		3		2		2	2	2	2	2
	% Invasives					0		0		0		0		0	0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					11		10		13		11		10	7	8	11	9
	Stems/Acre					445		405		526		445		405	283	364	445	364
	Species Count					7		7		7		10		5	6	8	6	6
	Dominant Species Composition (%)					18		20		23		18		40	29	22	27	33
	Average Plot Height (ft.)					2		2		3		2		2	2	2	2	2
	% Invasives					0		0		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
Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1- 2022

	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												
Monitoring Year 1	567	2	8	0	486	2	7	0	445	2	5	0
Monitoring Year 0	607	2	9	0	607	2	10	0	567	2	8	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												
Monitoring Year 1	486	3	6	0	445	3	6	0	364	2	6	0
Monitoring Year 0	607	2	9	0	567	2	9	0	567	2	9	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot 9 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												
Monitoring Year 1	364	2	6	0	648	2	8	0	445	2	7	0
Monitoring Year 0	607	2	10	0	648	2	8	0	567	2	9	0
	Veg Plot 10 F				Veg Plot 11 F				Veg Plot 12 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												
Monitoring Year 1	405	2	7	0	526	3	7	0	445	2	10	0
Monitoring Year 0	567	2	10	0	607	2	8	0	607	2	11	0
	Veg Plot 13 F				Veg Plot Group 1 R				Veg Plot Group 2 R			
	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												
Monitoring Year 1	405	2	5	0	283	2	6	0	364	2	8	0
Monitoring Year 0					567	2	9	0	607	2	11	0
	Veg Plot Group 3 R				Veg Plot Group 4 R							
	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												
Monitoring Year 1	445	2	6	0	364	2	6	0				
Monitoring Year 0	526	2	7	0	526	2	9	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.

Supplemental Planting Species List

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Open Riparian Buffer Planting Zone			
Scientific Name	**Common Name**	**Planting Type**	**Quantity**
Acer negundo	Boxelder Maple	Gallon	10
Cornus Florida	Flowering Dogwood	Gallon	10
Quercus rubra	Northern Red Oak	Gallon	10
Ulmus americana	American Elm	Gallon	10
		Total	40

Streambank Planting Zone			
Scientific Name	**Common Name**	**Planting Type**	**Quantity**
Salix nigra	Black Willow	Livestake	95
Salix sericea	Silky Willow	Livestake	210
Cornus amomum	Silky Dogwood	Livestake	210
Sambusus canadensis	Elderberry	Livestake	115
		Total	630

APPENDIX C. Stream Geomorphology Data

Table 8a. Baseline Stream Data Summary

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**North Little Hunting Creek Reach 1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	12.4	16.3	2	22.0		22.1		1
Floodprone Width (ft)	17.0	44.0	2	48.0	220.0	78.1		1
Bankfull Mean Depth	1.6	1.7	2	1.3		1.3		1
Bankfull Max Depth	2.1	2.3	2	2.0		2.2		1
Bankfull Cross Sectional Area (ft^2)	20.6	25.8	2	29.2		28.6		1
Width/Depth Ratio	7.5	10.3	2	16.6		17.1		1
Entrenchment Ratio	1.4	2.7	2	2.2	10.0	3.5		1
Bank Height Ratio	2.0	2.3	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	15.00			--		64.0		1
Rosgen Classification	G4			C4		C4		
Bankfull Discharge (cfs)	100-110			100.0		90.6		
Sinuosity	1.1			1.3		1.3		
Water Surface Slope ($ft/ft)^2$	0.0073			0.0049		0.0053		
Other	--			--		--		
Parameter	**North Little Hunting Creek Reach 2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	12.4	16.3	2	23.0		27.9		1
Floodprone Width (ft)	17.0	44.0	2	51.0	230.0	61.2		1
Bankfull Mean Depth	1.6	1.7	2	1.4		1.4		1
Bankfull Max Depth	2.1	2.3	2	2.0		2.3		1
Bankfull Cross Sectional Area (ft^2)	20.6	25.8	2	31.1		37.8		1
Width/Depth Ratio	7.5	10.3	2	17.0		20.5		1
Entrenchment Ratio	1.4	2.7	2	2.2	10.0	2.2		1
Bank Height Ratio	2.0	2.3	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	15.00			--		105		1
Rosgen Classification	G4			C4		C3		
Bankfull Discharge (cfs)	100-110			110.0		114.8		
Sinuosity	1.1			1.2		1.2		
Water Surface Slope ($ft/ft)^2$	0.0073			0.0066		0.0061		
Other	--			--		--		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

(---): Data was not provided, N/A: Not Applicable

Table 8b. Baseline Stream Data Summary

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT1 Reach 1**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	10.2	13.7	2	4.5	5.7	4.8	5.2	2
Floodprone Width (ft)	23.0	35.0	2	10.0	57.0	41.3	43.8	2
Bankfull Mean Depth	0.7	0.8	2	0.3	0.4	0.3	0.4	2
Bankfull Max Depth	1.3	1.7	2	0.5	0.6	0.6		2
Bankfull Cross Sectional Area (ft^2)	8.2	9.8	2	1.5	2.3	1.4	1.9	2
Width/Depth Ratio	12.7	19.1	2	13.5	13.9	12.3	18.8	2
Entrenchment Ratio	2.2	2.5	2	>1.4	>2.2	8.0	9.1	2
Bank Height Ratio	1.0	1.8	2	1.0	1.1	1.0		2
Max part size (mm) mobilized at bankfull	27.00			--		39.5	43.2	2
Rosgen Classification	E4/C4			C4 & B4		C4b		
Bankfull Discharge (cfs)	7-11			7.0		3.4		
Sinuosity	1.1			1.1	1.3	1.2		
Water Surface Slope ($ft/ft)^2$	0.0296			0.0190	0.0595	0.0243		
Other	--			--		--		
Parameter	**UT1 Reach 2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	10.2	13.7	2	6.2		6.2		1
Floodprone Width (ft)	23.0	35.0	2	11.0	25.0	42.3		1
Bankfull Mean Depth	0.7	0.8	2	0.4		0.8		1
Bankfull Max Depth	1.3	1.7	2	0.6		1.5		1
Bankfull Cross Sectional Area (ft^2)	8.2	9.8	2	2.6		5.2		1
Width/Depth Ratio	12.7	19.1	2	14.6		7.4		1
Entrenchment Ratio	2.2	2.5	2	1.8	4.0	6.8		1
Bank Height Ratio	1.0	1.8	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	27.00			--		39		1
Rosgen Classification	E4/C4			C4b		C4b		
Bankfull Discharge (cfs)	7-11			10.0		31.8		
Sinuosity	1.1			1.2		1.2		
Water Surface Slope ($ft/ft)^2$	0.0296			0.0380		0.0399		
Other	--			--		--		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

2. Channel slope for UT1 Reach 1 is calculated from the surface of the channel bed rather than water surface.

(---): Data was not provided, N/A: Not Applicable

Table 8c. Baseline Stream Data Summary

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT1 Reach 3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	10.2	13.7	2	6.6		6.3		1
Floodprone Width (ft)	23.0	35.0	2	12.0	26.0	18.4		1
Bankfull Mean Depth	0.7	0.8	2	0.5		0.5		1
Bankfull Max Depth	1.3	1.7	2	0.8		0.9		1
Bankfull Cross Sectional Area (ft^2)	8.2	9.8	2	3.0		3.4		1
Width/Depth Ratio	12.7	19.1	2	14.3		11.7		1
Entrenchment Ratio	2.2	2.5	2	1.8	4.0	2.9		1
Bank Height Ratio	1.0	1.8	2	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	27.00			--		53.7		1
Rosgen Classification	E4/C4			C4b		C4b		
Bankfull Discharge (cfs)	7-11			11.0		15.3		
Sinuosity	1.1			1.1		1.1		
Water Surface Slope ($ft/ft)^2$	0.0296			0.0310		0.0366		
Other	--			--		--		
Parameter	**UT2 Reach 2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.5		1	5.0		5.1		1
Floodprone Width (ft)	5.0		1	7.0	12.0	18.2		1
Bankfull Mean Depth	0.8		1	0.3		0.3		1
Bankfull Max Depth	1.0		1	0.5		0.5		1
Bankfull Cross Sectional Area (ft^2)	2.6		1	1.6		1.4		1
Width/Depth Ratio	4.7		1	15.4		18.0		1
Entrenchment Ratio	1.3		1	1.4	2.4	3.6		1
Bank Height Ratio	2.8		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	0.90			--		44		1
Rosgen Classification	A6			B5a		B4a		
Bankfull Discharge (cfs)	7.0			7.0		6.7		
Sinuosity	1.1			1.1		1.1		
Water Surface Slope ($ft/ft)^2$	0.0791			0.0830		0.0856		
Other	--			--		--		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

2. Channel slope is calculated from the surface of the channel bed rather than water surface.

(---): Data was not provided, N/A: Not Applicable

Table 8d. Baseline Stream Data Summary

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT2 Reach 3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.0		1	6.6		7.5		1
Floodprone Width (ft)	10.0		1	9.0	16.0	23.0		1
Bankfull Mean Depth	1.1		1	0.4		0.5		1
Bankfull Max Depth	1.4		1	0.5		0.8		1
Bankfull Cross Sectional Area (ft^2)	3.2		1	2.6		3.4		1
Width/Depth Ratio	2.9		1	17.1		16.3		1
Entrenchment Ratio	3.2		1	1.4	2.4	3.1		1
Bank Height Ratio	2.3		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	0.90			--		33.7		1
Rosgen Classification	E5b			B5		C4b		
Bankfull Discharge (cfs)	9.0			9.0		13.3		
Sinuosity	1.1			1.1		1.1		
Water Surface Slope ($ft/ft)^2$	0.0254			0.0300		0.0319		
Other	--			--		--		
Parameter	**UT2 Reach 4**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.0		1	8.4		6.0		1
Floodprone Width (ft)	10.0		1	18.0	84.0	21.3		1
Bankfull Mean Depth	1.1		1	0.5		0.4		1
Bankfull Max Depth	1.4		1	0.8		0.6		1
Bankfull Cross Sectional Area (ft^2)	3.2		1	4.5		2.2		1
Width/Depth Ratio	2.9		1	15.8		16.3		1
Entrenchment Ratio	3.2		1	2.2	10.0	3.6		1
Bank Height Ratio	2.3		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	0.90			--		31		1
Rosgen Classification	E5b			C5		C4		
Bankfull Discharge (cfs)	9.0			9.0		4.7		
Sinuosity	1.1			1.3		1.3		
Water Surface Slope ($ft/ft)^2$	0.0254			0.0700		0.0128		
Other	--			--		--		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

2. Channel slope for UT2 Reach 3 is calculated from the surface of the channel bed rather than water surface.

(---): Data was not provided, N/A: Not Applicable

Table 8e. Baseline Stream Data Summary

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Old Bus Branch**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	4.1		1	3.0		3.7		1
Floodprone Width (ft)	7.0		1	4.0	7.0	6.4		1
Bankfull Mean Depth	0.8		1	0.3		0.3		1
Bankfull Max Depth	1.2		1	0.5		0.4		1
Bankfull Cross Sectional Area (ft^2)	3.4		1	0.9		1.0		1
Width/Depth Ratio	4.9		1	10.3		13.7		1
Entrenchment Ratio	1.7		1	1.4	2.4	1.7		1
Bank Height Ratio	6.3		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	0.10			--		47.3		1
Rosgen Classification	G5			A5		B4a		
Bankfull Discharge (cfs)	4.0			4.0		4.9		
Sinuosity	1.1			1.0		1.0		
Water Surface Slope ($ft/ft)^2$	0.0284			0.0900		0.1030		
Other	--			--		--		
Parameter	**Barn Branch**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	3.8		1	4.3		8.4		1
Floodprone Width (ft)	9.0		1	6.0	10.0	40.1		1
Bankfull Mean Depth	0.9		1	0.3		0.7		1
Bankfull Max Depth	1.2		1	0.5		1.1		1
Bankfull Cross Sectional Area (ft^2)	3.3		1	1.4		5.6		1
Width/Depth Ratio	4.3		1	13.2		12.7		1
Entrenchment Ratio	2.5		1	1.4	2.4	4.8		1
Bank Height Ratio	2.5		1	1.0	1.1	1.0		1
Max part size (mm) mobilized at bankfull	0.10			--		52		1
Rosgen Classification	B5a			B5a		B4a		
Bankfull Discharge (cfs)	6.0			6.0		30.2		
Sinuosity	1.0			1.1		1.1		
Water Surface Slope ($ft/ft)^2$	0.0435			0.0520		0.0388		
Other	--			--		--		

1. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

2. Channel slope for Old Bus Branch is calculated from the surface of the channel bed rather than water surface.

(---): Data was not provided, N/A: Not Applicable

Table 9. Cross-Section Morphology Monitoring Summary

Huntsman Mitigation Site

DMS Project No. 100123

Monitoring Year 1 - 2022

	North Little Hunting Creek Reach 1												North Little Hunting Creek Reach 2											
	Cross-Section 1 (Riffle)						Cross-Section 2 (Pool)						Cross-Section 3 (Pool)						Cross-Section 4 (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	1119.0	1118.8					--	--					--	--					1113.1	1113.0				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.0	0.9					--	--					--	--					1.0	1.0				
Thalweg Elevation	1116.9	1116.8					1113.5	1116.2					1107.9	1108.8					1110.8	1110.4				
LTOB[2] Elevation	1119.0	1118.6					1118.7	1118.5					1113.4	1113.4					1113.1	1112.9				
LTOB[2] Max Depth (ft)	2.2	1.9					5.2	2.3					5.5	4.7					2.3	2.4				
LTOB[2] Cross Sectional Area (ft^2)	28.6	24.4					74.9	36.2					78.6	69.2					37.8	34.7				
	UT1 Reach 1												UT1 Reach 2											
	Cross-Section 5 (Riffle)						Cross-Section 6 (Pool)						Cross-Section 7 (Riffle)						Cross-Section 8 (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	1158.4	1158.4					--	--					1152.8	1152.8					1134.0	1133.9				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.0	1.0					--	--					1.0	1.1					1.0	1.0				
Thalweg Elevation	1157.7	1157.9					1156.4	1156.0					1152.1	1152.2					1132.5	1132.4				
LTOB[2] Elevation	1158.4	1158.4					1157.9	1157.8					1152.8	1152.9					1134.0	1134.0				
LTOB[2] Max Depth (ft)	0.6	0.5					1.5	1.8					0.6	0.7					1.5	1.6				
LTOB[2] Cross Sectional Area (ft^2)	1.4	1.3					7.5	7.9					1.9	2.3					5.2	5.6				
	UT1 Reach 2						UT1 Reach 3						UT2 Reach 2						UT2 Reach 3					
	Cross-Section 9 (Pool)						Cross-Section 10 (Riffle)						Cross-Section 11 (Riffle)						Cross-Section 12 (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	--	--					1117.8	1117.9					1144.9	1145.0					--	--				
Bank Height Ratio - Based on AB Bankfull[1] Area	--	--					1.0	0.9					1.0	1.1					--	--				
Thalweg Elevation	1132.0	1131.8					1116.9	1116.8					1144.3	1144.5					1125.0	1123.9				
LTOB[2] Elevation	1133.2	1133.1					1117.8	1117.7					1144.9	1145.0					1126.9	1126.8				
LTOB[2] Max Depth (ft)	1.2	1.3					0.9	0.9					0.5	0.6					1.9	2.9				
LTOB[2] Cross Sectional Area (ft^2)	5.3	6.7					3.4	2.6					1.4	1.6					8.8	12.3				
	UT2 Reach 3						UT2 Reach 4						Old Bus Branch						Barn Branch					
	Cross-Section 13 (Riffle)						Cross-Section 14 (Riffle)						Cross-Section 15 (Riffle)						Cross-Section 16 (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	1125.7	1125.6					1113.8	1113.8					1137.1	1137.1					1126.6	1126.7				
Bank Height Ratio - Based on AB Bankfull[1] Area	1.0	1.1					1.0	1.0					1.0	0.8					1.0	1.1				
Thalweg Elevation	1124.9	1124.4					1113.2	1113.0					1136.7	1136.6					1125.5	1125.7				
LTOB[2] Elevation	1125.7	1125.8					1113.8	1113.8					1137.1	1137.0					1126.6	1126.8				
LTOB[2] Max Depth (ft)	0.8	1.4					0.6	0.8					0.4	0.4					1.1	1.2				
LTOB[2] Cross Sectional Area (ft^2)	3.4	4.6					2.2	2.3					1.0	0.7					5.6	6.6				

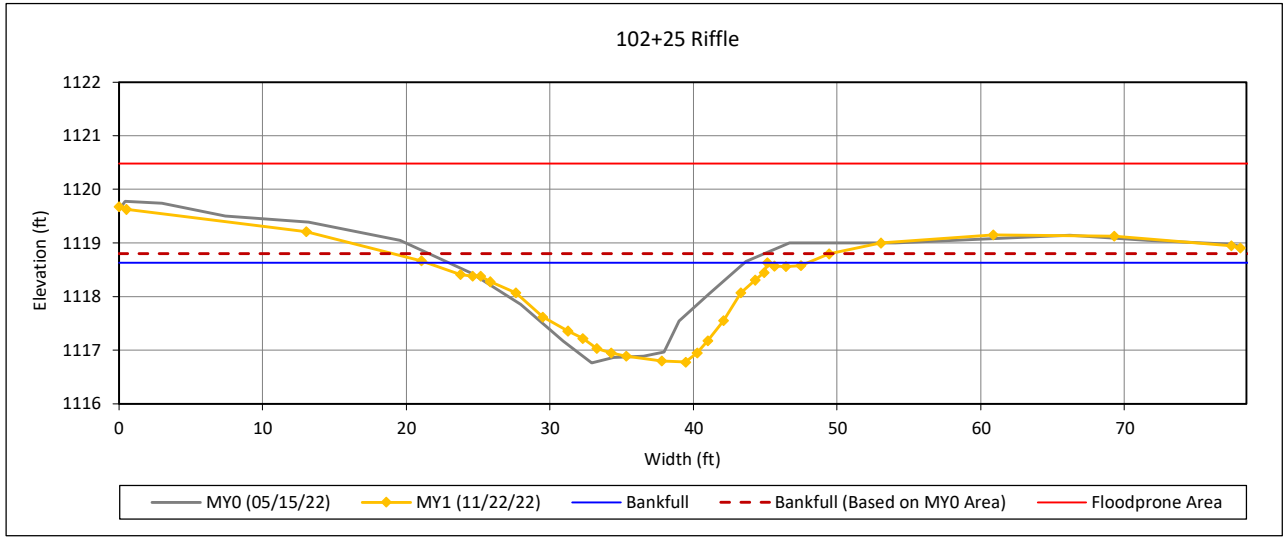
[1]Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation.

[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.

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 1 - North Little Hunting Creek Reach 1



Bankfull Dimensions	
24.4	x-section area (ft.sq.)
23.7	width (ft)
1.0	mean depth (ft)
1.9	max depth (ft)
24.1	wetted perimeter (ft)
1.0	hydraulic radius (ft)
22.9	width-depth ratio
78.1	W flood prone area (ft)
3.3	entrenchment ratio
0.9	low bank height ratio

Survey Date: 11/22/22
Field Crew: Wildlands Engineering

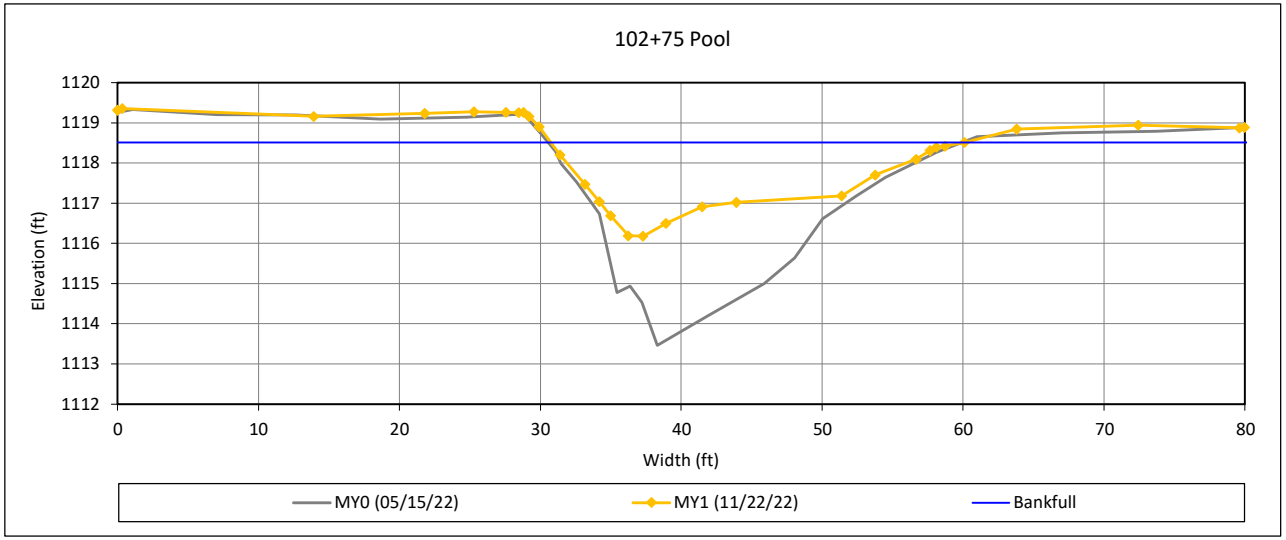
View Downstream

XS 1 is located in an area that was repaired in MY1.

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 2 - North Little Hunting Creek Reach 1



Bankfull Dimensions	
36.2	x-section area (ft.sq.)
29.4	width (ft)
1.2	mean depth (ft)
2.3	max depth (ft)
30.0	wetted perimeter (ft)
1.2	hydraulic radius (ft)
23.8	width-depth ratio

Survey Date: 11/22/22
Field Crew: Wildlands Engineering

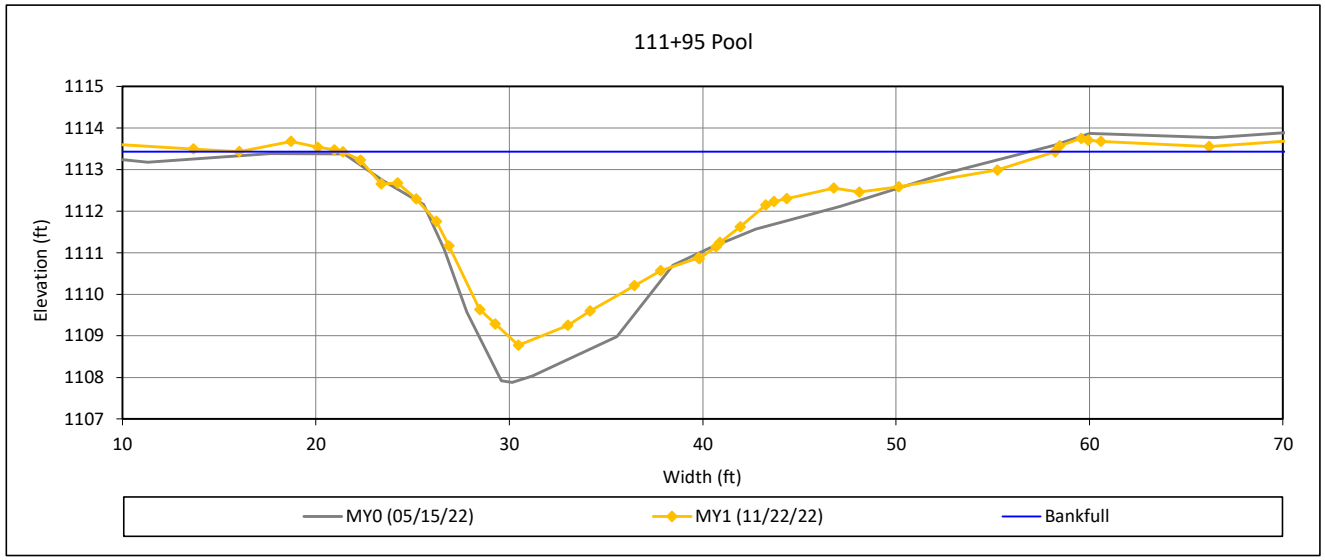
View Downstream

XS 2 is located in an area that was repaired in MY1.

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 3 - North Little Hunting Creek Reach 2



Bankfull Dimensions	
69.2	x-section area (ft.sq.)
36.8	width (ft)
1.9	mean depth (ft)
4.7	max depth (ft)
38.8	wetted perimeter (ft)
1.8	hydraulic radius (ft)
19.6	width-depth ratio

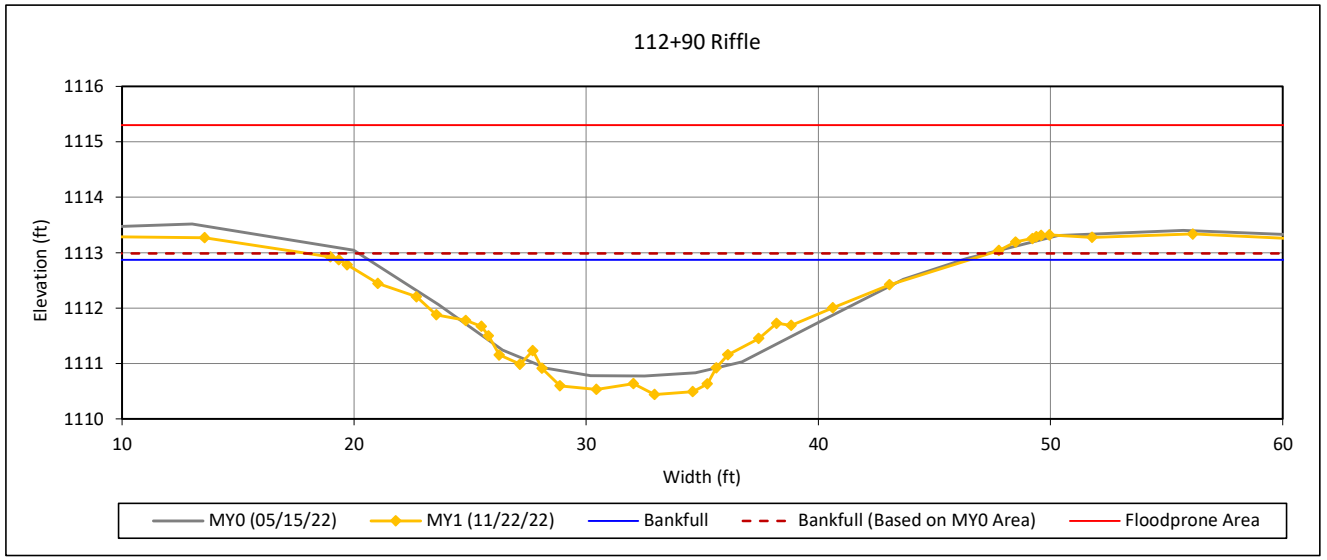
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 4 - North Little Hunting Creek Reach 2



Bankfull Dimensions	
34.7	x-section area (ft.sq.)
27.2	width (ft)
1.3	mean depth (ft)
2.4	max depth (ft)
28.1	wetted perimeter (ft)
1.2	hydraulic radius (ft)
21.3	width-depth ratio
61.2	W flood prone area (ft)
2.3	entrenchment ratio
1.0	low bank height ratio

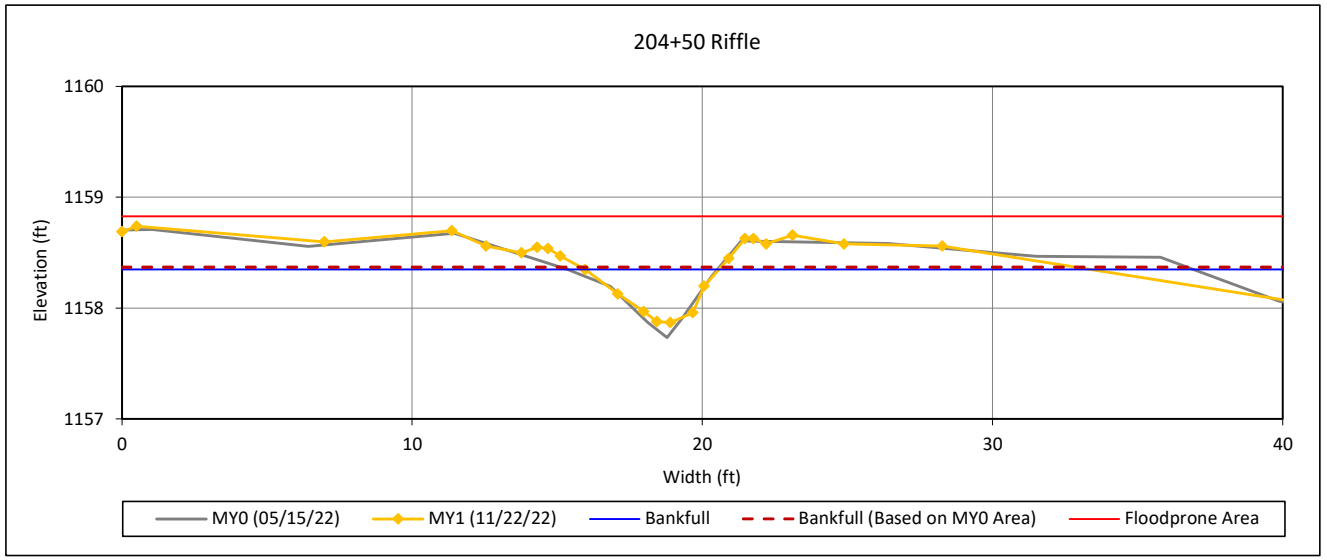
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 5 - UT1 Reach 1



Bankfull Dimensions	
1.3	x-section area (ft.sq.)
4.6	width (ft)
0.3	mean depth (ft)
0.5	max depth (ft)
4.8	wetted perimeter (ft)
0.3	hydraulic radius (ft)
16.6	width-depth ratio
41.4	W flood prone area (ft)
9.0	entrenchment ratio
1.0	low bank height ratio

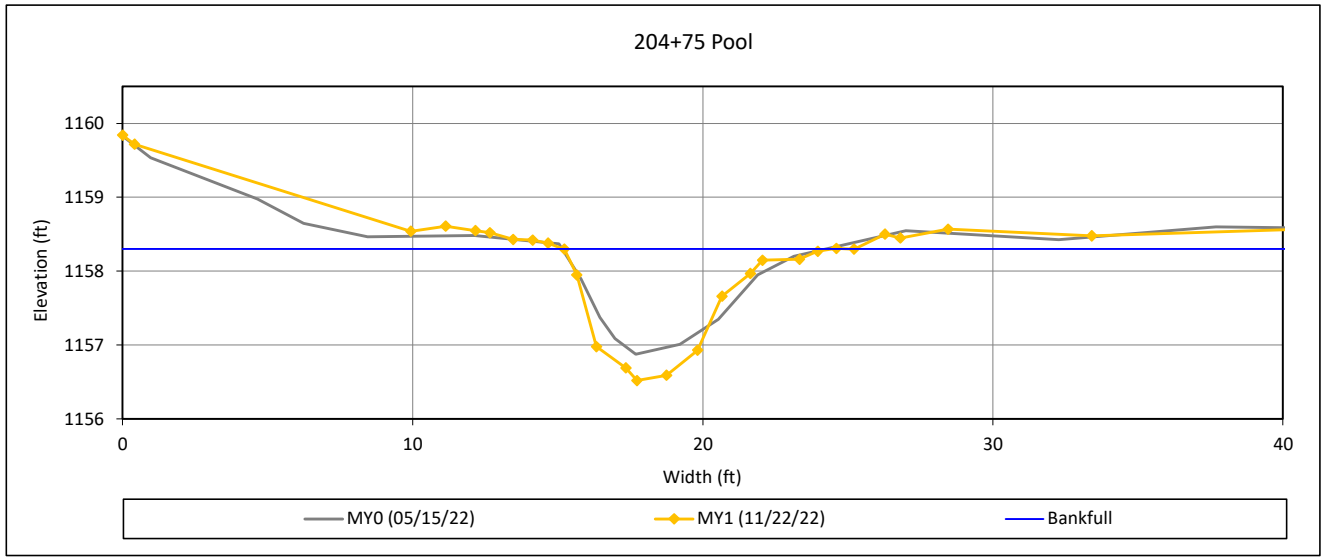
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 6 - UT1 Reach 1



Bankfull Dimensions	
7.9	x-section area (ft.sq.)
9.2	width (ft)
0.9	mean depth (ft)
1.8	max depth (ft)
10.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
10.8	width-depth ratio

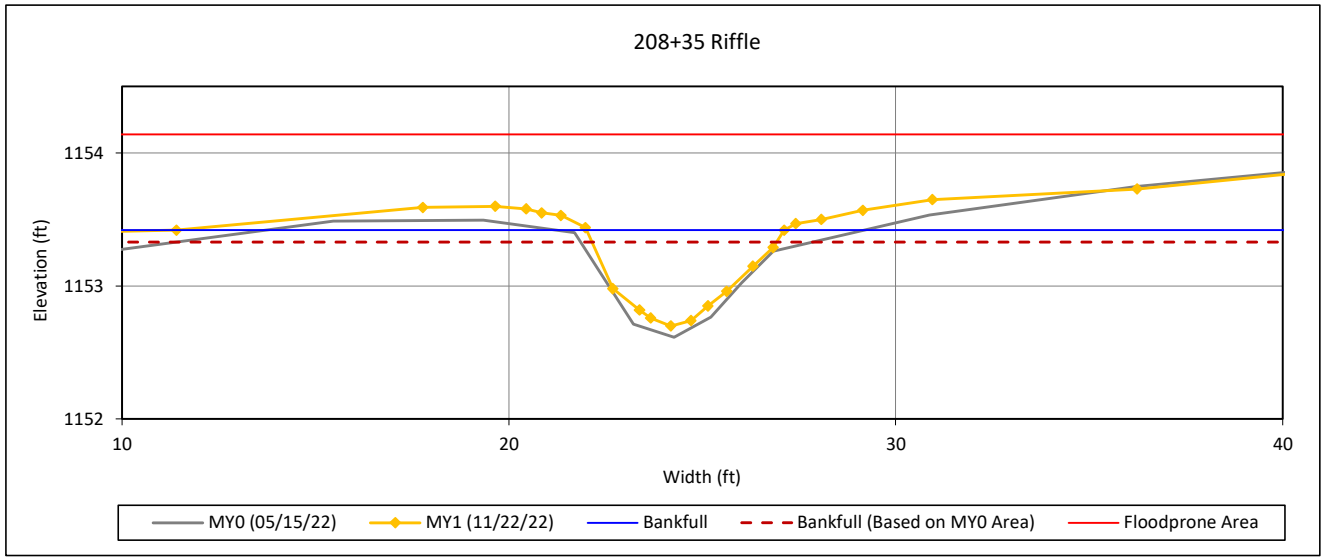
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 7 - UT1 Reach 1



Bankfull Dimensions	
2.3	x-section area (ft.sq.)
5.1	width (ft)
0.5	mean depth (ft)
0.7	max depth (ft)
5.4	wetted perimeter (ft)
0.4	hydraulic radius (ft)
11.3	width-depth ratio
44.2	W flood prone area (ft)
8.7	entrenchment ratio
1.1	low bank height ratio

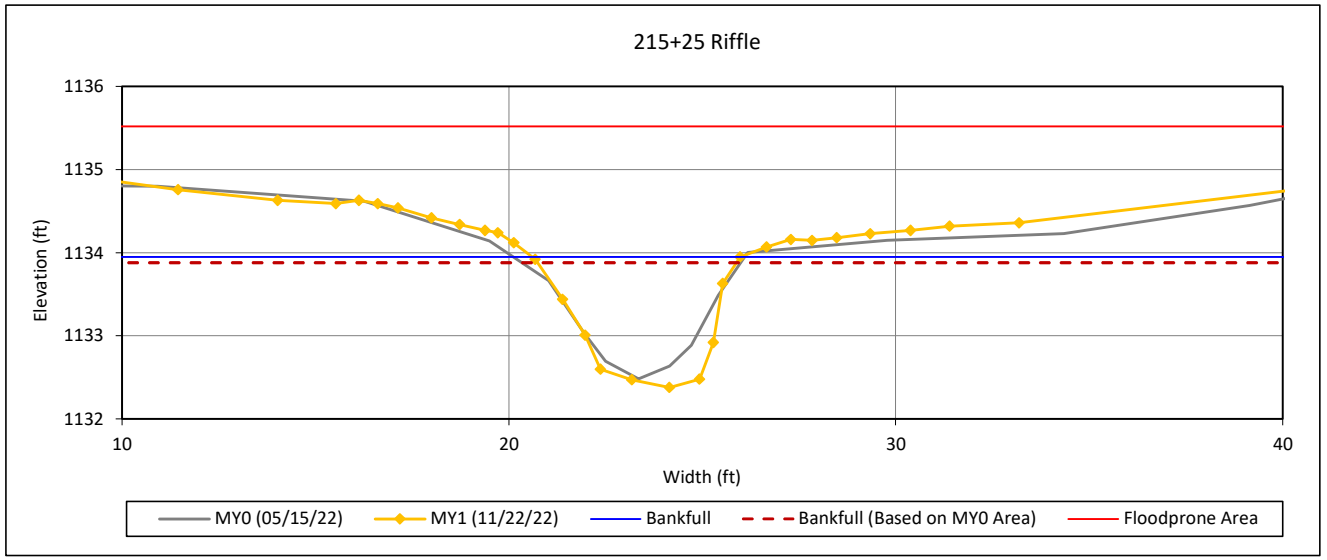
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 8 - UT1 Reach 2



Bankfull Dimensions	
5.6	x-section area (ft.sq.)
5.4	width (ft)
1.0	mean depth (ft)
1.6	max depth (ft)
6.7	wetted perimeter (ft)
0.8	hydraulic radius (ft)
5.2	width-depth ratio
42.3	W flood prone area (ft)
7.9	entrenchment ratio
1.0	low bank height ratio

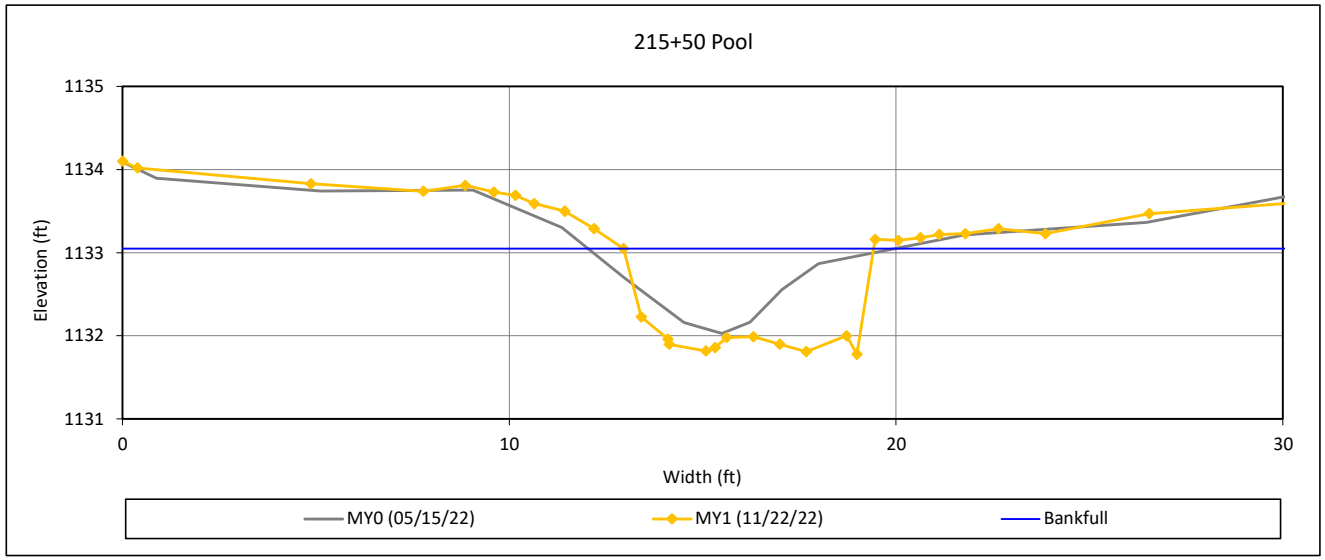
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 9 - UT1 Reach 2



Bankfull Dimensions	
6.7	x-section area (ft.sq.)
6.5	width (ft)
1.0	mean depth (ft)
1.3	max depth (ft)
8.1	wetted perimeter (ft)
0.8	hydraulic radius (ft)
6.2	width-depth ratio

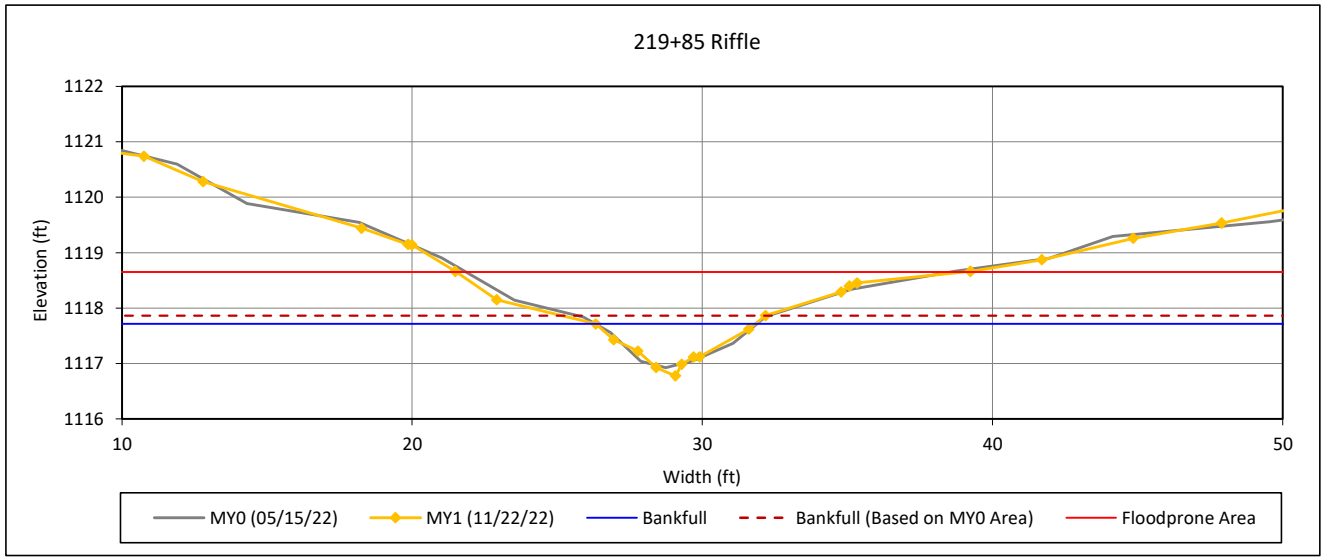
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 10 - UT1 Reach 3



Bankfull Dimensions	
2.6	x-section area (ft.sq.)
5.5	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
5.9	wetted perimeter (ft)
0.4	hydraulic radius (ft)
11.8	width-depth ratio
17.5	W flood prone area (ft)
3.2	entrenchment ratio
0.9	low bank height ratio

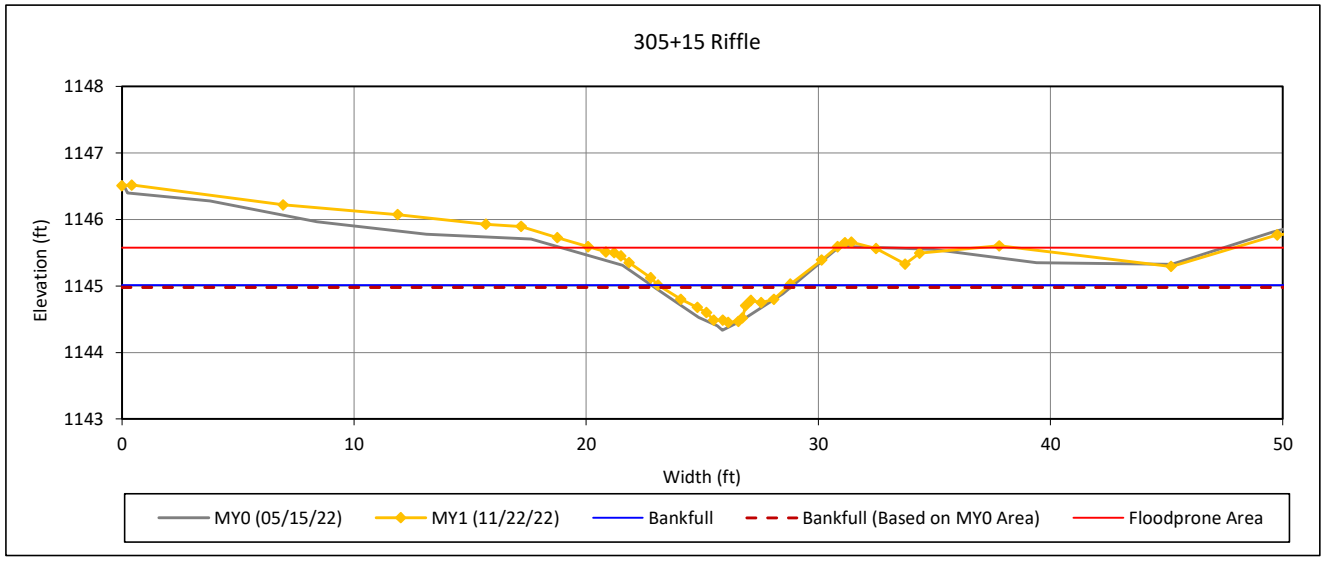
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 11 - UT2 Reach 2



Bankfull Dimensions	
1.6	x-section area (ft.sq.)
5.0	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
5.2	wetted perimeter (ft)
0.3	hydraulic radius (ft)
15.3	width-depth ratio
24.5	W flood prone area (ft)
4.9	entrenchment ratio
1.1	low bank height ratio

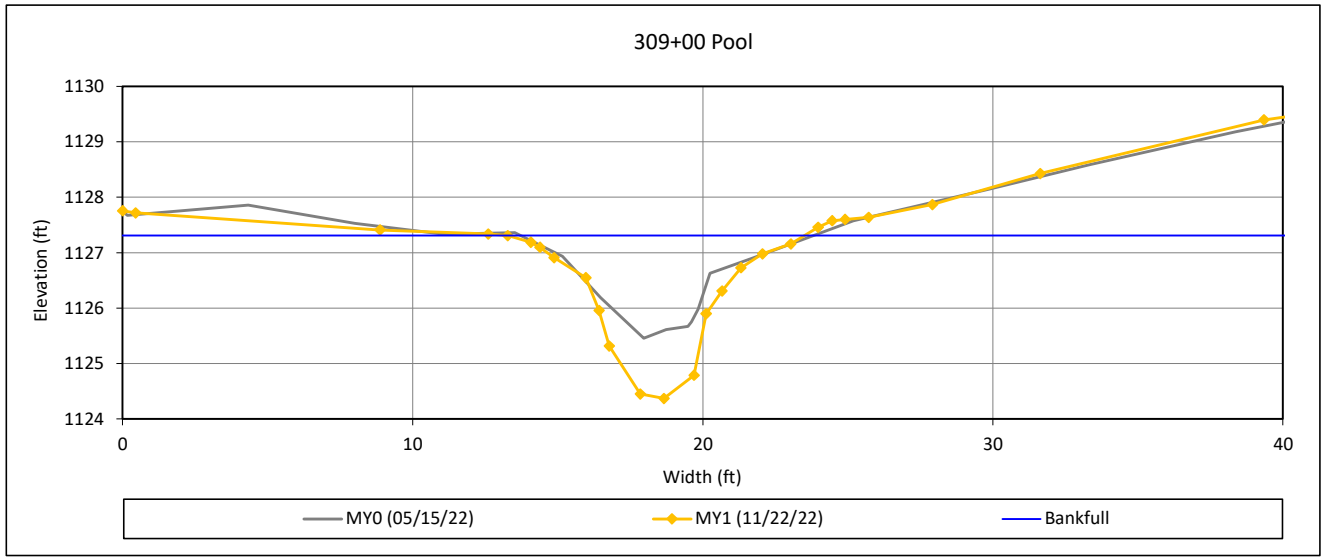
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 12 - UT2 Reach 3



Bankfull Dimensions	
12.3	x-section area (ft.sq.)
10.2	width (ft)
1.2	mean depth (ft)
2.9	max depth (ft)
12.5	wetted perimeter (ft)
1.0	hydraulic radius (ft)
8.5	width-depth ratio

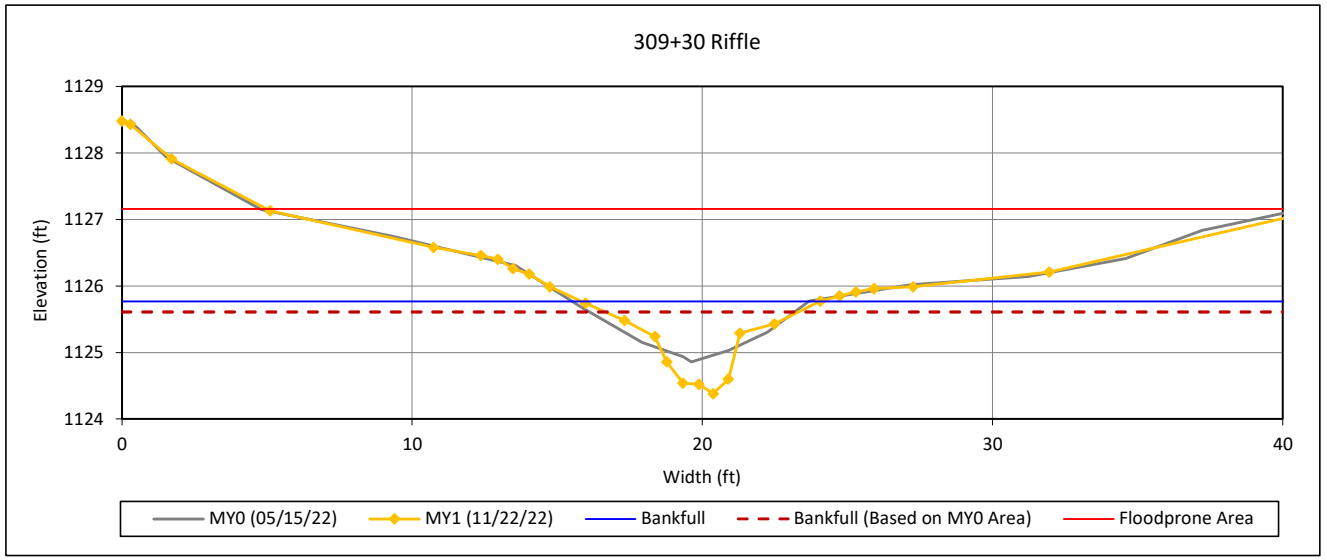
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 13 - UT2 Reach 3



Bankfull Dimensions	
4.6	x-section area (ft.sq.)
8.2	width (ft)
0.6	mean depth (ft)
1.4	max depth (ft)
9.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
14.7	width-depth ratio
36.5	W flood prone area (ft)
4.4	entrenchment ratio
1.1	low bank height ratio

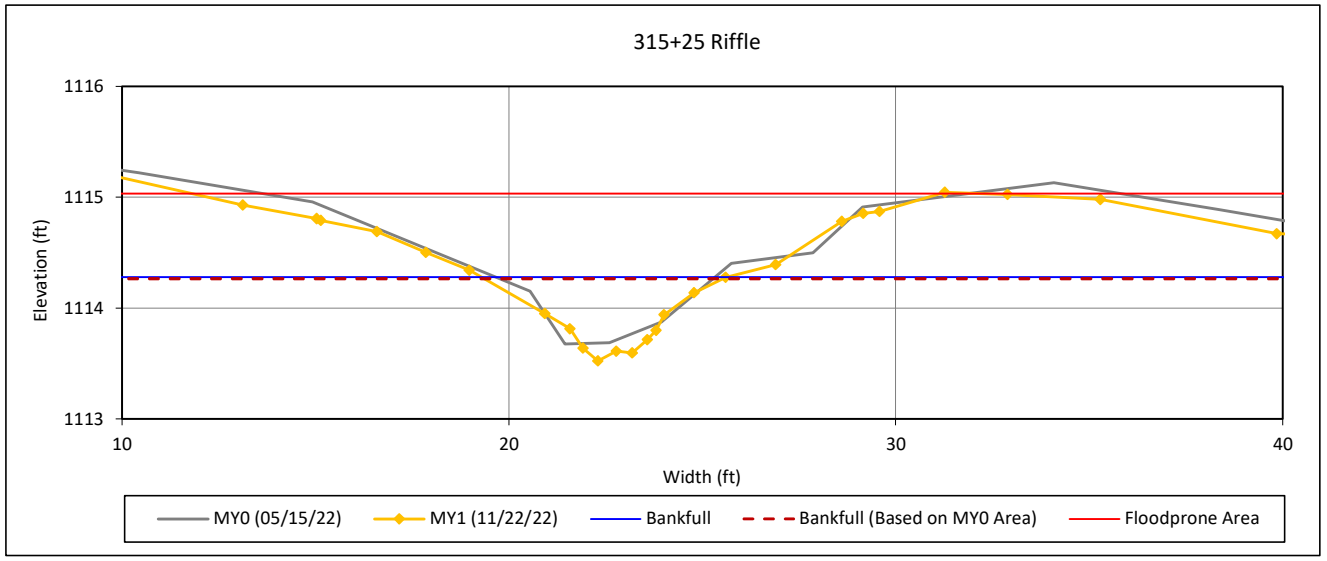
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 14 - UT2 Reach 4



Bankfull Dimensions	
2.3	x-section area (ft.sq.)
6.3	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
6.5	wetted perimeter (ft)
0.3	hydraulic radius (ft)
17.4	width-depth ratio
30.8	W flood prone area (ft)
4.9	entrenchment ratio
1.0	low bank height ratio

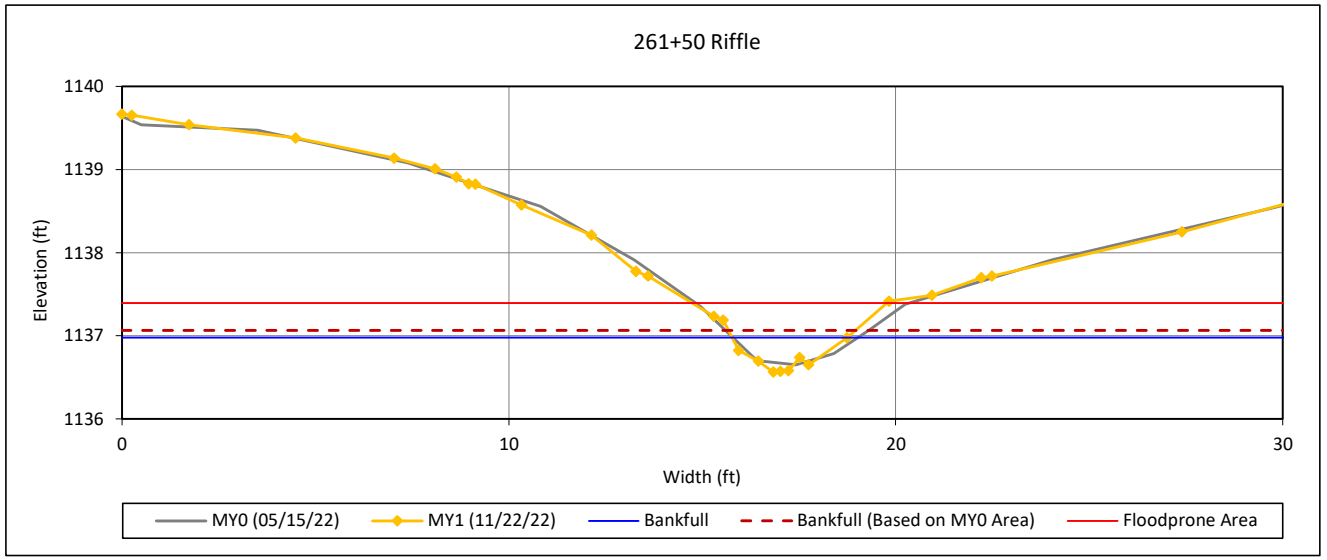
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 15 - Old Bus Branch



Bankfull Dimensions	
0.7	x-section area (ft.sq.)
3.0	width (ft)
0.2	mean depth (ft)
0.4	max depth (ft)
3.2	wetted perimeter (ft)
0.2	hydraulic radius (ft)
12.0	width-depth ratio
5.0	W flood prone area (ft)
1.7	entrenchment ratio
0.8	low bank height ratio

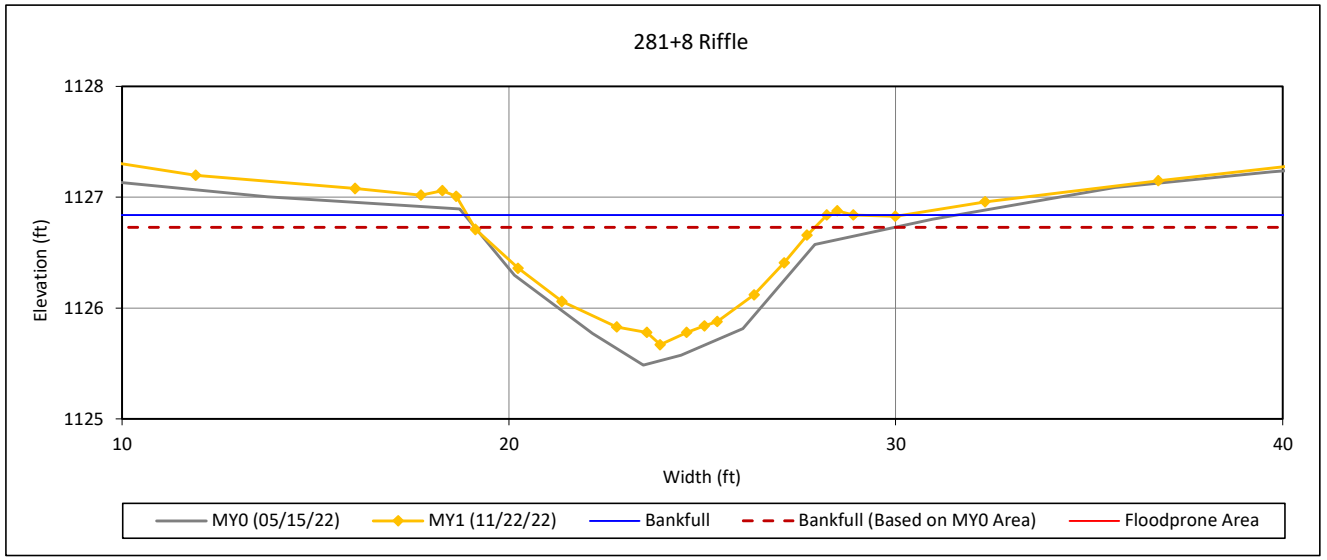
Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Cross-Section 16 - Barn Branch



Bankfull Dimensions	
6.6	x-section area (ft.sq.)
9.3	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
9.6	wetted perimeter (ft)
0.7	hydraulic radius (ft)
13.2	width-depth ratio
42.0	W flood prone area (ft)
4.5	entrenchment ratio
1.1	low bank height ratio

Survey Date: 11/22/22
Field Crew: Wildlands Engineering

View Downstream

APPENDIX D. Hydrology Data

Table 10. Bankfull Events Summary

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Reach	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
North Little Hunting Creek Reach 2 - CG1	7/10/2022						
UT2 Reach 4 - CG2	5/26/2022 6/16/2022 7/11/2022 8/6/2022 8/30/2022 9/5/2022 11/11/2022 11/21/2022						
UT1 Reach 1 - CG3	Gage Malfuction - No Data Collected						

Table 11. Verfication of Consecutive Flow Days

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Reach	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
North Little Hunting Creek Reach 2 - CG1	4/7/2022 - 12/8/2022 245 Days						
UT2 Reach 4 - CG2	4/7/2022 - 12/8/2022 245 Days						
UT1 Reach 1 - CG3	Gage Malfuction - No Data Collected						

Table 12. Rainfall Summary

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

	MY1 (2022)	MY2 (2023)	MY3 (2024)	MY4 (2025)	MY5 (2026)	MY6 (2027)	MY7 (2028)
Annual Precip Total[1]	59.16						
WETS 30th Percentile[2]	33.41						
WETS 70th Percentile[2]	60.93						
Normal	Yes						

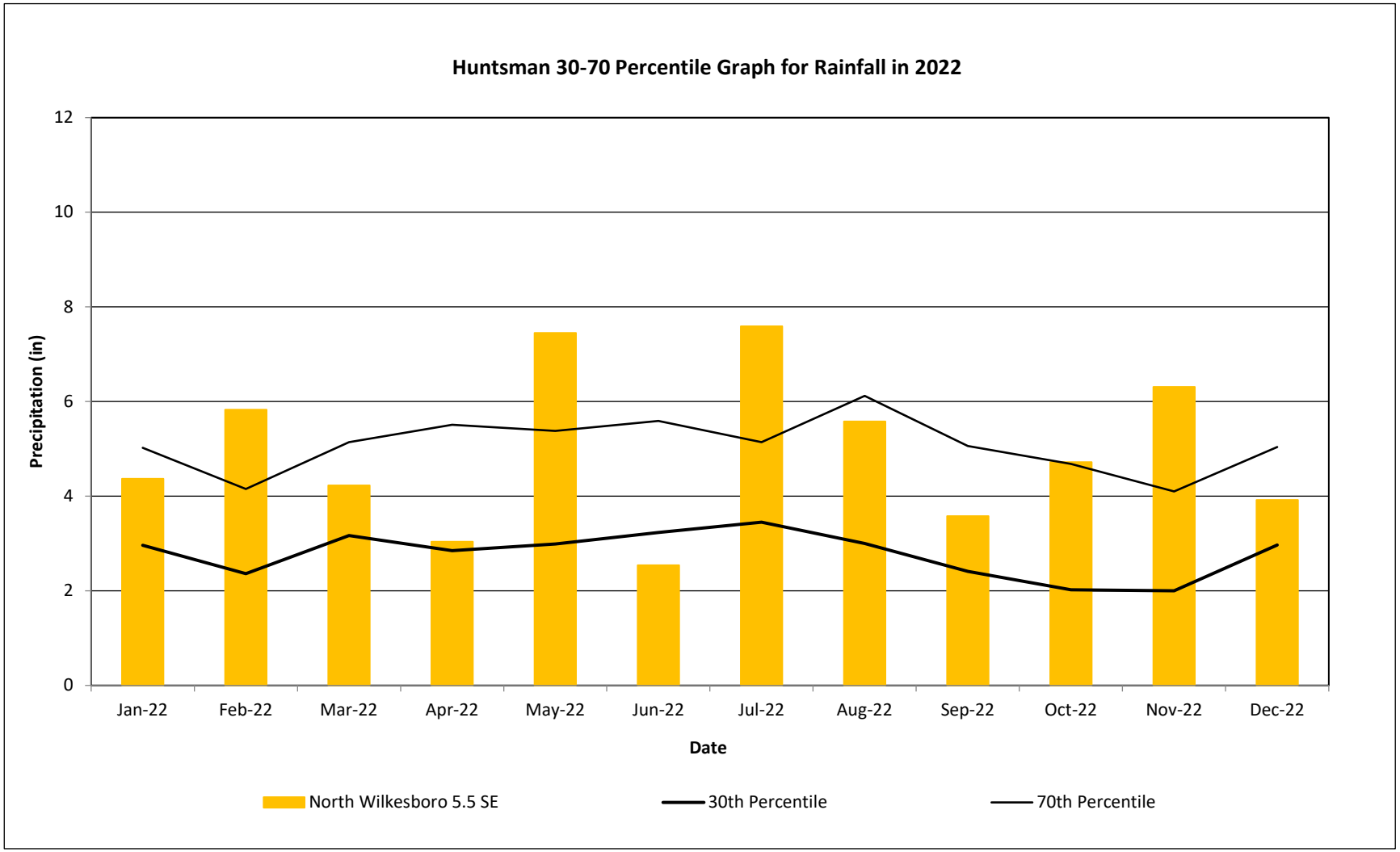
[1]Annual precipitation data was collected from 1-1-22 to 12-27-22 and is derived from the ACIS weather station North Wilkesboro 5.5 SE, NC.
[2]30th and 70th percentile precipitation data derived from NC CRONOS WETS station North Wilkesboro, NC.

Monthly Rainfall Data

Huntsman Mitigation Site

DMS Project No. 100123

Monitoring Year 1 - 2022

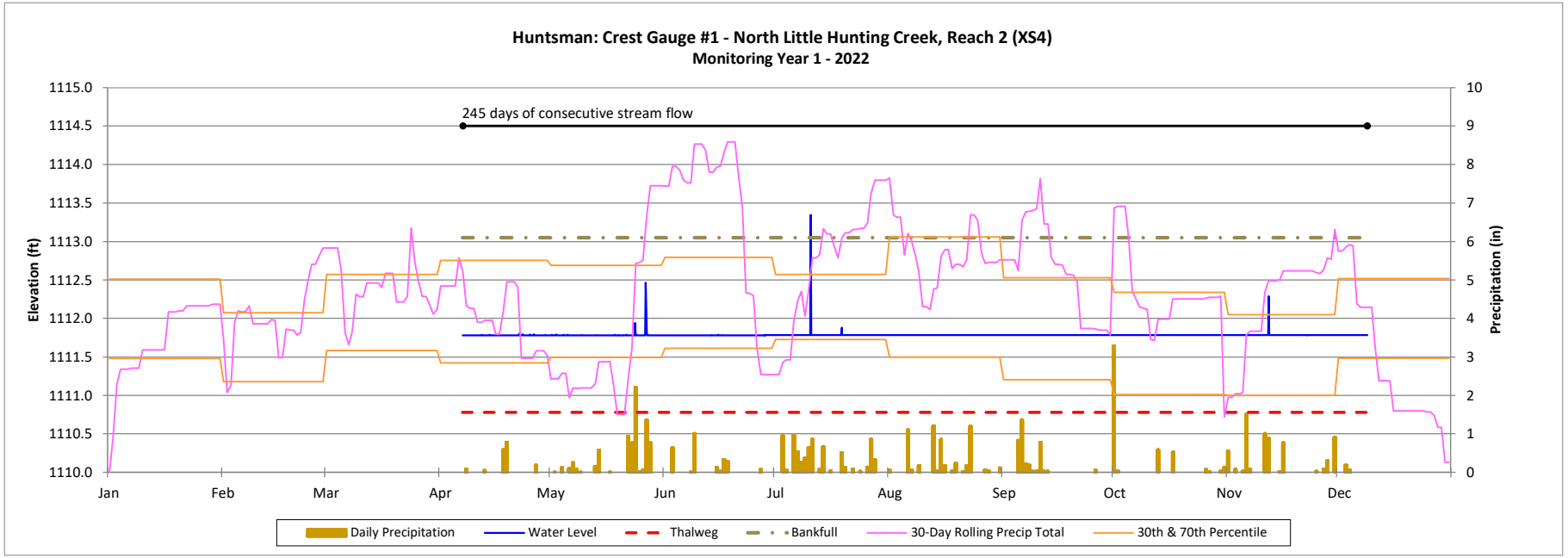


Annual precipitation data was collected from 1-1-22 to 12-27-22 and is derived from the ACIS weather station North Wilkesboro 5.5 SE, NC.

30th and 70th percentile precipitation data derived from NC CRONOS WETS station North Wilkesboro, NC.

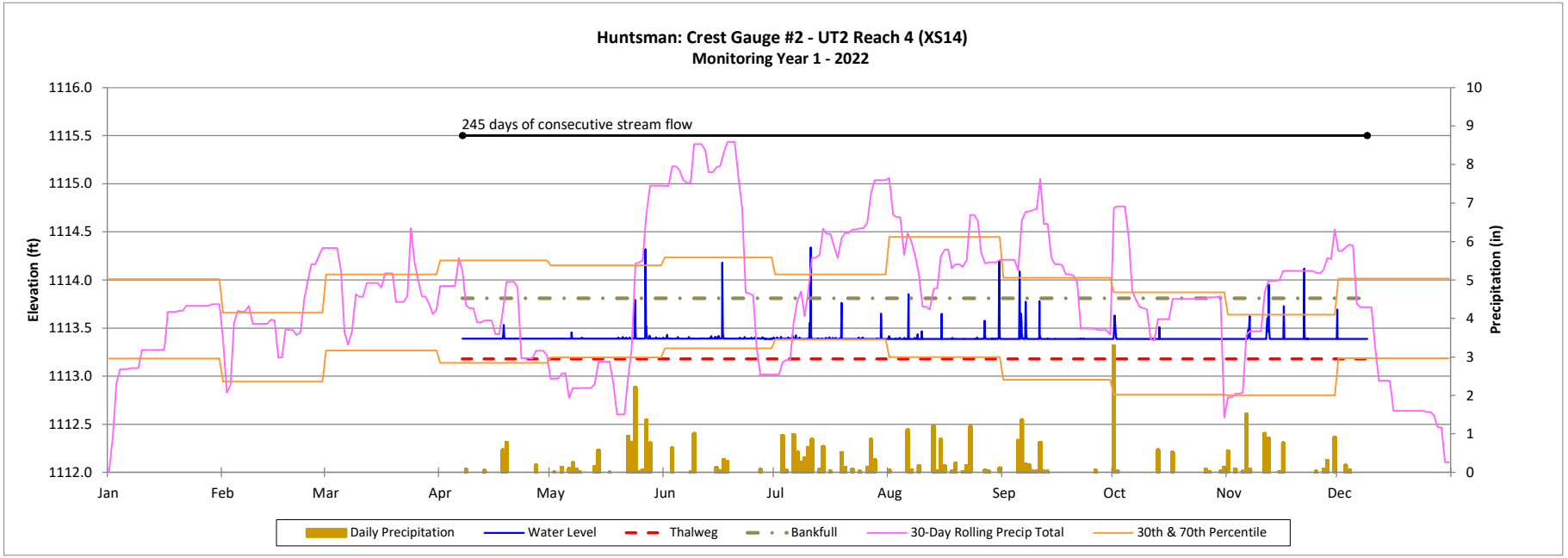
Crest Gage Plot

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022



Crest Gage Plot

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022



APPENDIX E. Project Timeline and Contact Information

Table 13. Project Activity and Reporting History

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Activity or Deliverable		Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted		N/A	May 21, 2019
Mitigation Plan Approved		June 2019	June 2021
Construction (Grading) Completed		N/A	April 2022
Planting Completed		N/A	April 2022
As-Built Survey Completed		May 2022	May 2022
Baseline Monitoring Document (Year 0)	Stream Survey	May 2022	June 2022
	Vegetation Survey	April 2022	
Year 1 Monitoring	Stream Survey	November 2022	January 2023
	Invasive Species Treatments	July, September 2022	
	Stream Repairs	September 2022	
	Vegetation Survey	October - December 2022	
Year 2 Monitoring	Stream Survey		
	Vegetation Survey		
Year 3 Monitoring	Stream Survey		
	Vegetation Survey		
Year 4 Monitoring			
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 6 Monitoring			
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

Table 14. Project Contact Table

Huntsman Mitigation Site
DMS Project No. 100123
Monitoring Year 1 - 2022

Designer Aaron Earley, PE	**Wildlands Engineering, Inc.** 1430 S. Mint St., Suite 104 Charlotte, NC 28203
	704.819.0848
Construction Contractor	**Wildlands Construction, Inc.** 1430 S. Mint St., Suite 104 Charlotte, NC 28203
Planting Contractor	**Bruton Natural Systems, Inc.** PO Box 1197 Fremont, NC 27830
Seeding Contractor	**Wildlands Construction, Inc.**
Nursery Stock Supplies	**Bruton Natural Systems, Inc.**
Herbaceous Plugs	**Bruton Natural Systems, Inc.**
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Kristi Suggs 704.332.7754

APPENDIX F. Agency Correspondence

To: DMS Technical Workgroup, DMS operations staff

From: Periann Russell, Division of Mitigation Services (DMS)

RE: Pebble count data requirements

Date: October 19, 2021

The DMS Technical Work Group met September 29, 2021 to discuss Interagency Review Team (IRT) and DMS requirements for collecting pebble count data as part of monitoring (MY0-MYx). Agreement was reached between all attending parties that pebble count data will not be required during the monitoring period for all future projects.

Sediment data and particle distribution will still be required for the mitigation plan as part of the proposed design explanation and justification.

Pebble counts and/or particle distributions currently being conducted by providers for annual monitoring may be discontinued at the discretion of the DMS project manager. If particle distribution was listed as a performance standard in the project mitigation plan, the provider is required to communicate the intent to cease data collection with the DMS project manager. The absence of pebble count data in future monitoring reports where pebble count data was listed as part of monitoring in the mitigation plan must be documented in the monitoring report. The September 29, 2021 Technical Work Group meeting may be cited as the source of the new policy.

The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period.

Kristi Suggs

From: Reid, Matthew <matthew.reid@ncdenr.gov>
Sent: Wednesday, October 27, 2021 1:26 PM
To: Kristi Suggs
Cc: Mimi Caddell
Subject: RE: [External] FW: Pebble Count Data Requirements

I am absolutely OK with not doing pebble counts anymore!

As stated in the memo, please add a statement in the monitoring reports citing the policy.

Thanks!

Matthew Reid
Project Manager – Western Region
North Carolina Department of Environmental Quality
Division of Mitigation Services

828-231-7912 Mobile
matthew.reid@ncdenr.gov

Western DMS Field Office
5 Ravenscroft Dr
Suite 102
Asheville, NC 28801

From: Kristi Suggs [mailto:ksuggs@wildlandseng.com]
Sent: Wednesday, October 27, 2021 1:24 PM
To: Reid, Matthew <matthew.reid@ncdenr.gov>
Cc: Mimi Caddell <mcaddell@wildlandseng.com>
Subject: [External] FW: Pebble Count Data Requirements

Matthew,

Jason Lorch in our Raleigh Office forwarded this meeting memo to me. It says that conducting pebble counts for DMS monitoring (MY0 – MY7) projects is no longer needed as long as it has been okayed by the DMS PM. Moving forward, are you going to allow us to stop doing them on your projects? If so, will DBB projects be treated the same? Please let me know. Thank you!

Kristi

Kristi Suggs | *Senior Environmental Scientist*
O: 704.332.7754 x110 **M**: 704.579.4828

Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

From: Jason Lorch <jlorch@wildlandseng.com>
Sent: Monday, October 25, 2021 9:05 AM
To: Kristi Suggs <ksuggs@wildlandseng.com>
Subject: FW: Pebble Count Data Requirements

FYI!

Jason Lorch, GISP | *Senior Environmental Scientist*
O: 919.851.9986 x107 **M**: 919.413.1214

Wildlands Engineering, Inc.
312 West Millbrook Road, Suite 225
Raleigh, NC 27609

From: Russell, Periann <periann.russell@ncdenr.gov>
Sent: Thursday, October 21, 2021 10:05 AM
To: King, Scott <Scott.King@mbakerintl.com>; Catherine Manner <catherine@waterlandsolutions.com>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; adam.spiller@kci.com; Brad Breslow <bbreslow@res.us>; Davis, Erin B <erin.davis@ncdenr.gov>; gginn@wolfcreekeng.com; grant lewis <glewis@axiomenvironmental.org>; Jeff Keaton <jkeaton@wildlandseng.com>; katie mckeithan <Katie.McKeithan@mbakerintl.com>; Kayne Van Stell <kayne@waterlandsolutions.com>; Kevin Tweedy <ktweedy@eprusa.net>; Reid, Matthew <matthew.reid@ncdenr.gov>; Ryan Smith <rsmith@lmgroup.net>; Melia, Gregory <gregory.melia@ncdenr.gov>; Allen, Melonie <melonie.allen@ncdenr.gov>; Famularo, Joseph T <Joseph.Famularo@ncdenr.gov>; Rich@mogmit.com; Bryan Dick <Bryan.Dick@freese.com>; Ryan Medric <rmedric@res.us>; Kim Browning <Kimberly.D.Browning@usace.army.mil>; Kayne Van Stell <kayne@waterlandsolutions.com>; Worth Creech <worth@restorationsystems.com>; Jason Lorch <jlorch@wildlandseng.com>
Cc: Crocker, Lindsay <Lindsay.Crocker@ncdenr.gov>; Wiesner, Paul <paul.wiesner@ncdenr.gov>; Tsomides, Harry <harry.tsomides@ncdenr.gov>; Reid, Matthew <matthew.reid@ncdenr.gov>; Dow, Jeremiah J <jeremiah.dow@ncdenr.gov>; Horton, Jeffrey <jeffrey.horton@ncdenr.gov>; Ullman, Kirsten J <Kirsten.Ullman@NCDENR.gov>; Ackerman, Anjie <anjie.ackerman@ncdenr.gov>; Blackwell, Jamie D <james.blackwell@ncdenr.gov>; Xu, Lin <lin.xu@ncdenr.gov>; Mir, Danielle <Danielle.Mir@ncdenr.gov>; Corson, Kristie <kristie.corson@ncdenr.gov>; Russell, Periann <periann.russell@ncdenr.gov>; Sparks, Kimberly L <Kim.sparks@ncdenr.gov>
Subject: Pebble Count Data Requirements

Please review the attached memo documenting the agreed upon policy for pebble count data requirements.
Please reply (me only) to this email if accept that this memo represents (or misrepresents) our discussion on Sept 29.
Thank you.

Periann Russell
Geomorphologist
Division of Mitigation Services, Science and Analysis
NC Department of Environmental Quality

919 707 8306 office
919 208 1426 mobile
periann.russell@ncdenr.gov

Mailing: 1652 Mail Service Center Raleigh, NC 27699-1652
Physical: 217 West Jones Street Raleigh, NC 27603

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MEETING NOTES

MEETING: MY0/MY1 (2022) IRT Site Walk
HUNTSMAN Mitigation Site
Yadkin 03040102; Wilkes County, NC
DEQ Contract No. 7891
DMS Project No. 100123
USACE Action ID No. SAW-2019-00836
DWR Project No. 20190866
Wildlands Project No. 005-02183

DATE: Thursday, October 13, 2022

LOCATION: Ingle Hollow Road
Ronda, NC

Attendees

Kim Isenhour, USACE	Melonie Allen, DMS	Aaron Earley, Wildlands
Erin Davis, DWR	Shawn Wilkerson, Wildlands	
Paul Wiesner, DMS	Kristi Suggs, Wildlands	
Matthew Reid, DMS	Emily Israel, Wildlands	

The meeting began at 9:30 AM. Attendees discussed the site conditions and issues noted in the MY0 report as well as the IRT comments and Wildlands responses. From there, the group walked up UT1, down to the repair section on North Little Hunting Creek, over to Old Bus Branch, Rifle Trib, and UT2 headwaters, and ended along Barn Branch. The meeting concluded at 11:30 AM.

1) Meeting Notes

a) Attendees viewed the sill on UT1 downstream of the culvert under Ingle Hollow Road. Aaron explained that the sill was designed and installed 6" higher than the culvert invert but has failed since construction. Water is piping around the end of the sill, which lowered the baseflow elevation. Wildlands plans on repairing the sill to the design elevation.

b) On the UT1 riffles within the old pond bed, Kim noted that the riffle material could be embedded more to encourage baseflow over the stone instead of under. Kim also suggested that the saprolite riffle near the chicken houses be repaired with stone and grade control. Wildlands agreed that the section through the pond needs work. Wildlands plans on adding and embedding riffle material, planting supplemental live stakes and herbaceous seed, and installing sod mats on the stream banks to get that section back to restored conditions. Kim pointed out that the hillside slope used for repair access should be stabilized.

c) Attendees observed the riprap ditches on the terrace slope near the chicken houses, which were not included in the approved mitigation plan. Aaron explained that the riprap ditches were added during construction once Wildlands saw the amount of runoff coming from the chicken houses during storm events. Kim and Erin said they weren't opposed to using riprap in those situations but suggested that the riprap be embedded and planted. They also suggested to end the riprap and the base of the terrace slope to allow water to flow through the planted buffer before entering the stream. Erin asked that a narrative of justification for adding riprap stabilization measures be included in the MY1 report. Wildlands agreed with Kim and Erin's suggestions and will take them into consideration for future projects.

d) Kim asked that photos of the riprap ditches and BMPs be included in future MY reports. Wildlands agreed.

e) Paul and Kim asked about supplemental live stake planting on the upstream section of UT1 and suggested using willow whips to establish shade quicker. Wildlands plans to supplementally plant live stakes along most of UT1.

f) Kim asked if there are plans for in-stream vegetation treatment on UT1. Emily replied that in-stream treatment was done this past summer and will occur again next year.

g) Outside of the easement near the chicken houses, Erin suggested that riprap be added to the concentrated flow areas along the farm passageway. Wildlands plans on working with landowner to add stone ford type crossings on each of the ditches along the fence line. Wildlands will add a permanent photo point at each ditch.

h) Near the repaired section on North Little Hunting Creek, Erin suggested that flatter terrace slopes be used to avoid the formation of rills. Wildlands agreed that flatter slopes are better, but earthwork and topsoil impacts must be considered during design.

i) Kim questioned the placement of VP1 along North Little Hunting Creek. She was wondering about the performance and level of saturation of the plot because on the aerial map it looks like the plot is located where the old channel used to be. Kristi visited the veg plot during the meeting and said that plot looked good overall. There were a few saturated areas, but it was mostly just damp from the recent rainfall, and all 15 planted stems were viable and doing well.

j) Kim asked whether the overhead electric line crossing North Little Hunting Creek was an internal or external break. Wildlands confirmed that it is an internal crossing with no credit.

k) Erin asked if this was a site where wetland gages were requested. Aaron replied that wetland gages were not installed nor required on this site. Since there were no wetland gages on the site, Kim requested that site's wetlands be re-verified before close-out. Wildlands agreed.

l) Attendees viewed the BMPs at the top of Old Bus and Rifle Trib. Kim and Erin inquired about the deviation in BMP type, on Rifle Trib, from the approved mitigation plan. Aaron explained that the steep slope at the upstream end of Rifle Trib was not conducive to a pocket pool with rock outlet weir so a step pool conveyance was installed instead. The step pool conveyance appeared stable with no sedimentation issues.

m) Kim requested that a mobile veg plot be added in the wetland at the headwaters of Barn Branch and near photo point 19. Wildlands will relocate one mobile veg plot in each requested wetland and will report the collected vegetation data MY2.

n) Kim requested that a discussion be included in the MY1 report about the maintenance work that has been completed and will be completed, as well as mapping their locations on the CCPV maps.

o) Kim and Paul stated that MY0 credits have already been released.

These meeting minutes were prepared by Aaron Earley on October 18, 2022, and represent the authors' interpretation of events. Please report and discrepancies or corrections within 5 business days of receipt of these minutes.

Melonie Allen <melonie.allen@ncdenr.gov>; Shawn Wilkerson <swilkerson@wildlandseng.com>; Aaron Earley <aearley@wildlandseng.com>; Crumbley, Tyler A CIV USARMY CESAW (USA) <Tyler.A.Crumbley2@usace.army.mil>
Subject: Notice of Initial Credit Release/ NCDMS Huntsman Mitigation Site/ SAW-2019-00836/ Wilkes County

Good afternoon,

The 15-Day As-Built/MY0 review for the Huntsman Mitigation Site (SAW-2019-00836) ended September 9, 2022. Per Section 332.8(o)(9) of the 2008 Mitigation Rule, this review followed the streamlined review process. All comments received from the NCIRT are incorporated in the email below. There were no objections to issuing the initial 30% credit release of 1,745.082 warm stream mitigation units; however, we are requesting a written response to IRT comments prior to the site visit scheduled for October 13, 2022. Please send a georeferenced CCPV map along with your responses. Please find attached the current signed ledger.

The site visit will be held October 13, 2022, 10:30 am, Wilkes County (36.140626, -80.932103)

Kim Isenhour, USACE:

1. In addition to DWR's concerns, please confirm what size rock was used in the constructed riffles on UT1. As I recall, there was degradation on a steep section near STA 210+50 (?). DWR expressed concerns about the size of the material used; and questioned whether using larger rock in these riffles and embedding some Class I and only top dressing with any remaining on-site smaller material may have been more appropriate. Please provide more detail on this repair.

Erin Davis, NCDWR:

1. The PP14 photo shows the Ingle Hollow Road culvert. In response to WRC's draft mit plan review comment regarding the perched culvert being an aquatic passage barrier, a sill was to be added downstream setting the elevation to submerge the pipe outlet six inches. Based on the photo it's difficult to see if water is being backed up into the culvert. Please confirm that the structure was installed as noted and the barrier has been abated.
2. The photo of veg plot 2 appears to show exposed soil with no signs of germination or straw cover, unlike the other veg plot photos. Has cover/stabilization of this area been addressed? Additionally, please watch for rill formation and sediment migration along graded slopes that were not matted (e.g., PP8 and PP9). Between working with pond bottom sediments, areas of priority 2 and very steep side slopes, DWR is concerned about sediment movement within and adjacent to the site becoming a stream pollutant risk beyond initial construction.
3. The step pool conveyance BMP photos for Old Bus Branch (PP27) and Rifle Trib. (PP23) appear very different, with Rifle Trib. having significantly more riprap. What facilitated the Rifle Trib. BMP design change from a vegetated BMP to a riprap step pool conveyance channel? It seems the vegetated BMP would offer more water quality benefits.
4. Since a permanent veg plot was shown in the UT1 lower pond bottom in both draft and final mitigation plan monitoring figures, DWR did not require one in our review comments. However, since that veg plot has been changed to a mobile plot, DWR is now requiring a permanent veg plot within the UT 1 lower pond bottom.
5. IRT members expressed concerns about the proposed buffer widths during the mitigation plan review. One reason DWR was concerned about narrower buffers along UT1 was that it meant steeper side slopes, which as the redline shows resulted in multiple riprap lined ditches not planned for in the initial design. Of particular concern is that four of the riprap ditches are in the vicinity of existing chicken houses. Please provide more information on the necessity of adding the riprap ditches. How does this affect the mitigation plan Section 3.4 functional uplift to "diffuse overland non-point source pollutants from adjacent land use"? Additionally, Sheet 1.1.5 shows added riprap covering an existing wetland area. If this was/is a jurisdictional feature, why wasn't a non-hardened stabilization option applied?
6. Section 3.3 noted a couple riffle cross sections were larger than designed. Are these areas shown on the redline drawings? If not, can you please identify the locations.
7. Please add stream and reach labels to the CCPV Figures 3.1 and 3.2.

Please reach out with any questions.
Thanks,

Kim

Kim Isenhour
Mitigation Project Manager, Regulatory Division I U.S. Army Corps of Engineers l 919.946.5107

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October 6, 2022

ATTN: Ms. Kim Isenhour
Mitigation Project Manager, Regulatory Division
U.S. Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403-1343

RE: Huntsman Mitigation Site - MY0 Report Comments
Yadkin River Basin – CU# 03040102, Wilkes County
USACE Action ID No. SAW-2019-00836
NCDWR Project No. 20190866
DMS Project ID No. 100123, Contract # 7891

Dear Ms. Kim Isenhour,

Thank you for your comments in the email dated September 14, 2022 referencing the Huntsman Mitigation Site Monitoring Year 0 (MY0) Report. Wildlands Engineering, Inc. (Wildlands) has reviewed these comments and our responses are noted below. A georeferenced CCPV map has been included with our responses as requested. A photolog has also been included to aid your review.

Kim Isenhour, USACE:

1. *In addition to DWR's concerns, please confirm what size rock was used in the constructed riffles on UT1. As I recall, there was degradation on a steep section near STA 210+50 (?). DWR expressed concerns about the size of the material used; and questioned whether using larger rock in these riffles and embedding some Class I and only top dressing with any remaining on-site smaller material may have been more appropriate. Please provide more detail on this repair.*

   Wildlands Response: Displaced riffle material was removed from pools and larger stone was embedded into the affected riffles. Furthermore, Wildlands plans on installing larger sized stone as a coarse base with smaller stone used to cap and fill in the voids of the larger stone.

Erin Davis, NCDWR:

1. *The PP14 photo shows the Ingle Hollow Road culvert. In response to WRC's draft mit plan review comment regarding the perched culvert being an aquatic passage barrier, a sill was to be added downstream setting the elevation to submerge the pipe outlet six inches. Based on the photo it's difficult to see if water is being backed up into the culvert. Please confirm that the structure was installed as noted and the barrier has been abated.*

Wildlands Response: The downstream sill was installed at the correct elevation; however, the stream flow is piping around the sill and lowering the water surface elevation at the culvert's outlet. Wildlands will repair this issue but since construction equipment will be needed, the repair may be delayed until late 2022 or early 2023. Photos are included in the attached photolog.

2. *The photo of veg plot 2 appears to show exposed soil with no signs of germination or straw cover, unlike the other veg plot photos. Has cover/stabilization of this area been addressed? Additionally, please watch for rill formation and sediment migration along graded slopes that were not matted (e.g., PP8 and PP9). Between working with pond bottom sediments, areas of priority 2 and very steep side slopes, DWR is concerned about sediment movement within and adjacent to the site becoming a stream pollutant risk beyond initial construction.*

   Wildlands Response: As shown in the photo for VP2 on the attached photo log, herbaceous cover has become established. Wildlands acknowledges the IRT's concern about rill formation and potential sediment loading and will make sure to inspect these areas during site visits. Currently, rill formation in P2 areas is of little concern and photos of the well vegetated hillslopes in the vicinity of PP8 & PP9 are included in the attached photolog.

3. *The step pool conveyance BMP photos for Old Bus Branch (PP27) and Rifle Trib. (PP23) appear very different, with Rifle Trib. having significantly more riprap. What facilitated the Rifle Trib. BMP design change from a vegetated BMP to a riprap step pool conveyance channel? It seems the vegetated BMP would offer more water quality benefits.*

   Wildlands Response: The approved Mitigation Plan showed the BMP on Rifle Tributary as a BMP with a rock weir and a rip rap outlined channel rather than a "vegetated BMP". The BMP was changed to a Step Pool conveyance channel in the final design stage. A copy of the BMP detail from the Mitigation Plan is included for your review.

4. *Since a permanent veg plot was shown in the UT1 lower pond bottom in both draft and final mitigation plan monitoring figures, DWR did not require one in our review comments. However, since that veg plot has been changed to a mobile plot, DWR is now requiring a permanent veg plot within the UT 1 lower pond bottom.*

   Wildlands Response: A permanent vegetation plot (VP13) has been added along UT1 in the lower pond bottom, and vegetation data will be collected with MY1 monitoring. See Figure 3.1 for the location of the added permanent vegetation plot.

5. *IRT members expressed concerns about the proposed buffer widths during the mitigation plan review. One reason DWR was concerned about narrower buffers along UT1 was that it meant steeper side slopes, which as the redline shows resulted in multiple riprap lined ditches not planned for in the initial design. Of particular concern is that four of the riprap ditches are in the vicinity of existing chicken houses. Please provide more information on the necessity of adding the riprap ditches. How does this affect the mitigation plan Section 3.4 functional uplift to "diffuse overland non-point source pollutants from adjacent land use"? Additionally, Sheet 1.1.5 shows added riprap covering an existing wetland area. If this was/is a jurisdictional feature, why wasn't a non-hardened stabilization option applied?*

Wildlands Response: Initially the terrace slopes in the left floodplain of UT1 were implemented as designed. (It was the intent that the run-off between the chicken houses would rise and sheet flow down the hillslope from the ridgeline.) Unfortunately, after a few rain events it was evident that the run-off was forming drainage features of concentrated flow and leading to stability issues; therefore, the implementation of the riprapped swales was necessary for terrace slope stability. In order to maintain functional uplift, most of the swales end at the toe of slope to encourage diffuse flow before entering the stream. In addition, based on previous experience, it is anticipated that herbaceous vegetation will become established within the drainage swales over time and provide an additional measure to diffuse run-off.

The wetland discharging into North Little Hunting Creek Reach 2 had been permitted for permanent impacts. Based on past experience, it was anticipated that fill measures may need to include some hardening material to stabilize the area of concentrated discharge from the wetland. Riprap was chosen to provide a long-term stabilization measure that would prevent bank erosion along the main channel and subsequent headcut migration across the floodplain.

6. *Section 3.3 noted a couple riffle cross sections were larger than designed. Are these areas shown on the redline drawings? If not, can you please identify the locations.*

   Wildlands Response: None of the noted cross-sections (XS) were shown as red lines on the record drawings. The two cross-sections were XS4 on North Little Hunting Creek Reach 2 and XS16 on Barn Branch.

7. *Please add stream and reach labels to the CCPV Figures 3.1 and 3.2.*

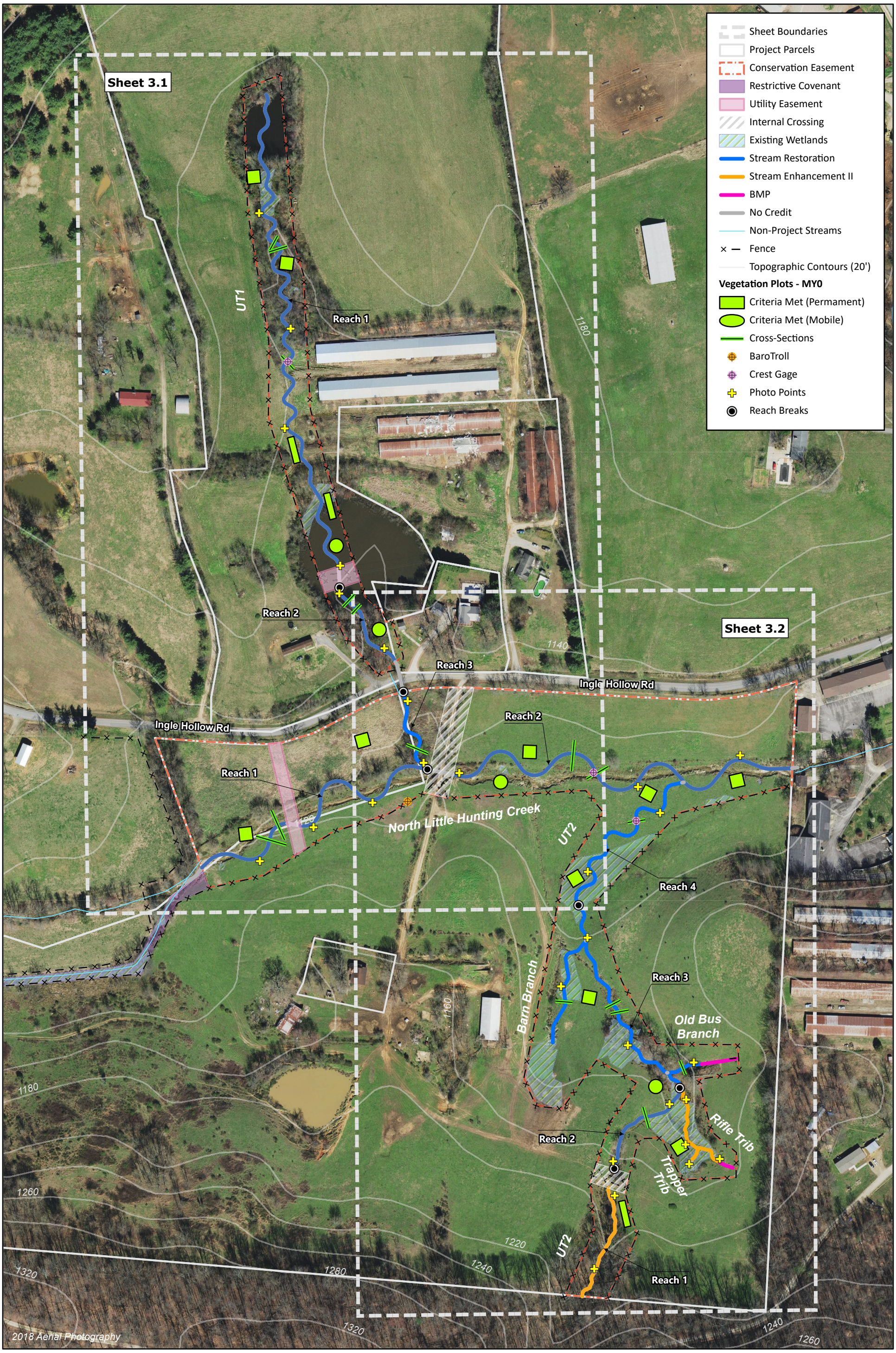
   Wildlands Response: Stream and reach labels have been added to the CCPV Figures 3.1 & 3.2. Copies of the revised figures are attached.

As requested, Wildlands has provided written response to the IRT's comments, as well as georeferenced figures, prior to the site visit on October 13th. We have also included a photolog for additional information. A copy of this comment/response letter and associated documentation will be included in the Appendix of the MY1 Report. If you have any questions, please feel free to contact me. Thank you!

Sincerely,

Aaron Earley

Project Manager
aearley@wildlandseng.com



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0 110 220 Feet

N

Figure 3.0 (Key) Current Condition Plan View
Huntsman Mitigation Site
Yadkin River Basin (03040102)

Wilkes County, NC

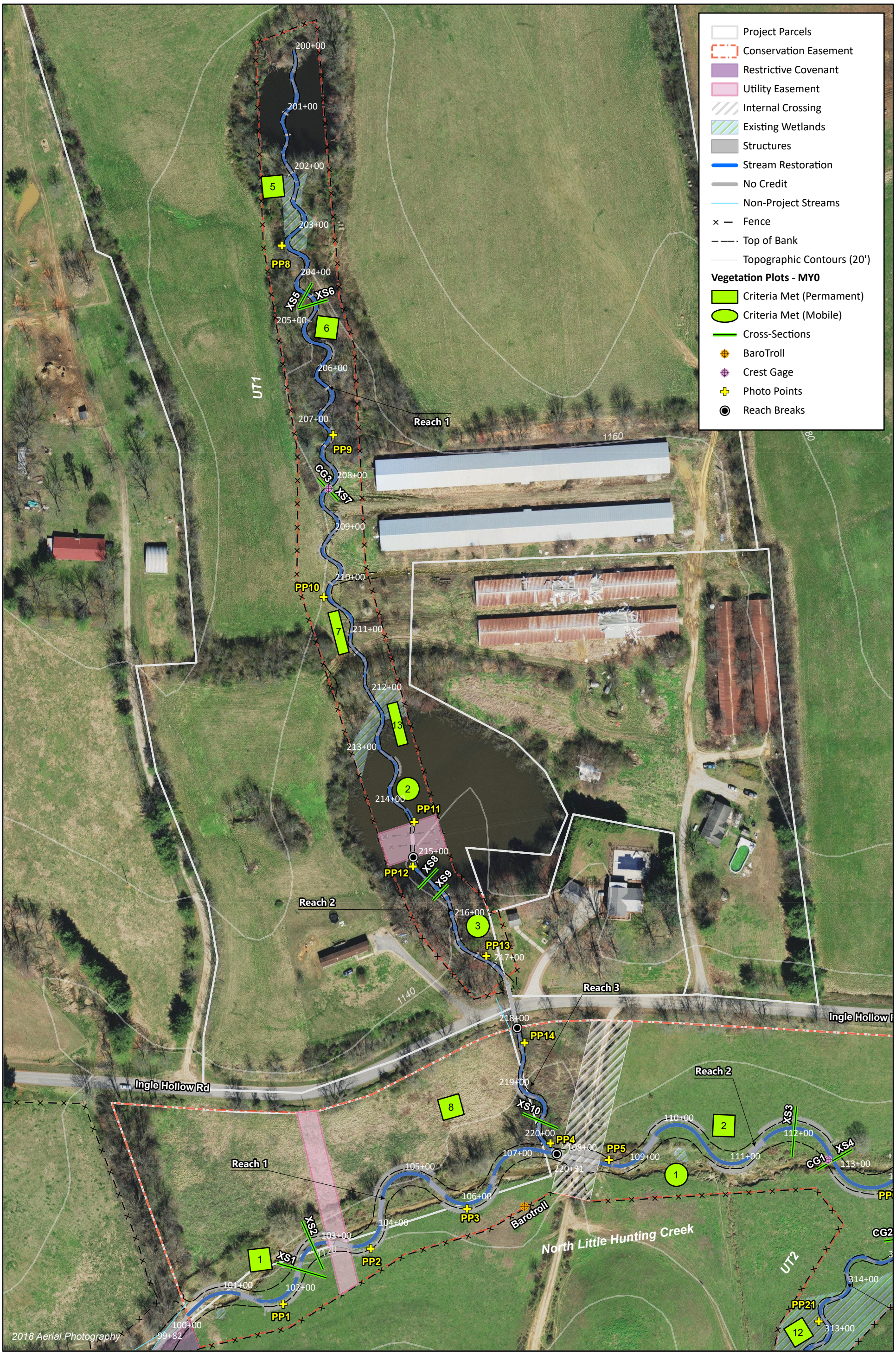

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Figure 3.1 Current Condition Plan View
Huntsman Mitigation Site
Yadkin River Basin (03040102)

Wilkes County, NC

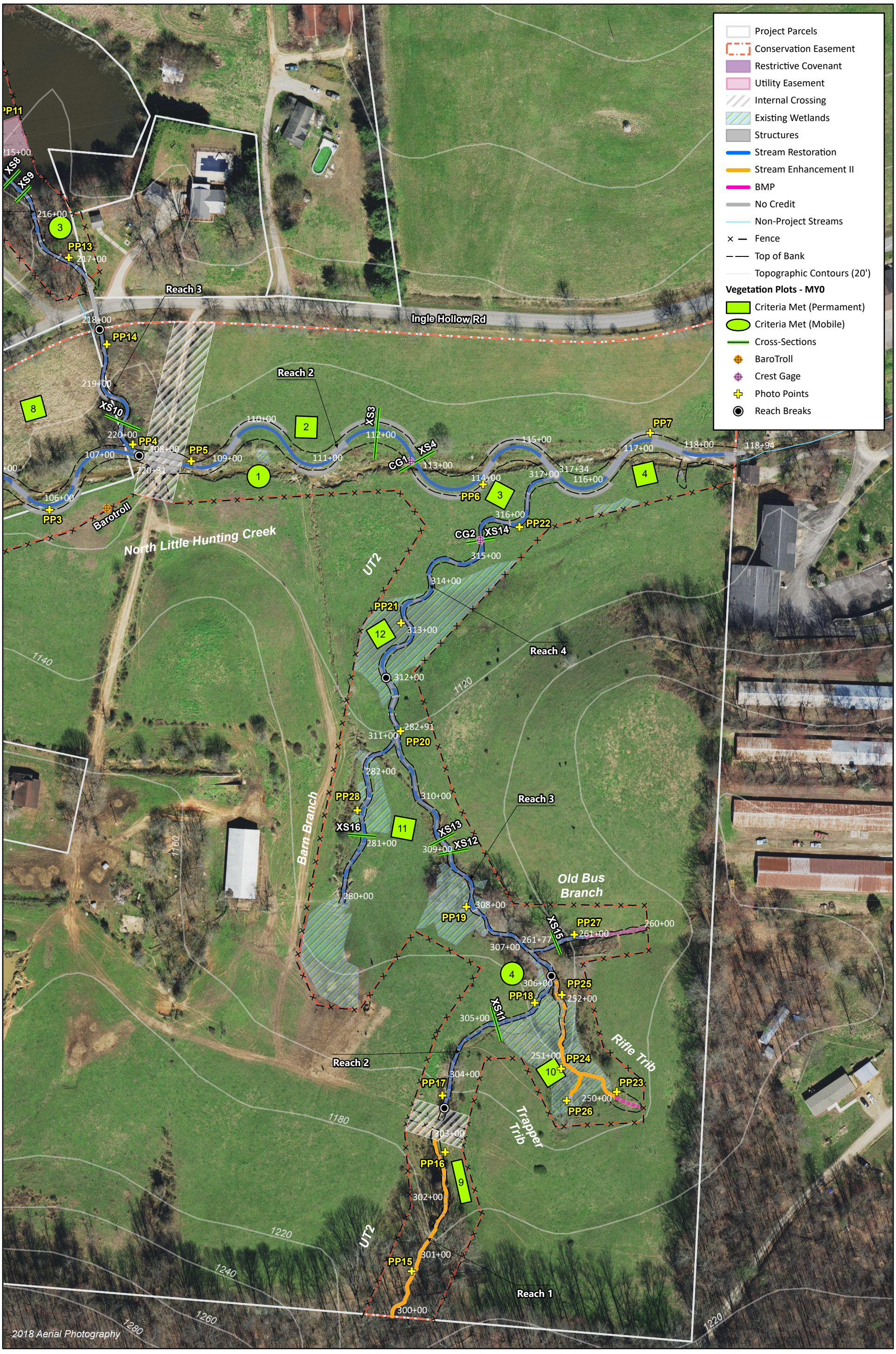

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Figure 3.2 Current Condition Plan View
Huntsman Mitigation Site
Yadkin River Basin (03040102)

Wilkes County, NC

IRT MY0 Comments Photolog

NCDWR Comment 1 (Erin Davis) – Ingle Hollow Road Culvert – Stream flow is piping around the sill and lowering the water surface elevation at the culvert's outlet (09/27/2022).

NCDWR Comment 2 (Erin Davis) – UT1 Reach 1 PP8 & PP9 – Herbaceous cover has become well established on the hillsides of UT1 (09/27/2022).

NCDWR Comment 2 (Erin Davis) – VP2, North Little Hunting Creek Reach 2 – Herbaceous cover has become well established in this area (10/03/2022).