



MONITORING YEAR 1 ANNUAL REPORT

Final

KEY MILL MITIGATION SITE

Surry County, NC
NCDEQ Contract No. 7180
DMS Project No. 100025
USACE Action ID No. SAW-2017-01504
NCDEQ DWR Certification No. 17-1045
RFP #: 16-006993

Yadkin River Basin
HUC 03040101

Data Collection Period: October 2020 – December 2020
Final Submission Date: March 25, 2021

PREPARED FOR:



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

Mitigation Project Name	Key Mill Site	USACE Action ID	2017-01504
DMS ID	100025	DWR Permit	2017-1045
River Basin	Yadkin	Date Project Instituted	5/25/2017
Cataloging Unit	03040101	Stream/Wet. Service	Yadkin 03040101
County	Surry	Date Printed	10/9/2020

BROWNING.KIMBERLY.DANIELLE.1527683510 Digitally signed by BROWNING.KIMBERLY.DANIELLE.1527683510
Date: 2020.11.13 14:06:35 -05'00'

Signature of Official Approving Credit Release

- 1 - For NCDMS, no credits are released during the first milestone
- 2 - For NCDMS projects, the initial credit release milestone occurs when the as-built report (baseline monitoring report) has been approved by the NCIRT and posted to the NCDMS Portal, provided the following criteria have been met:
- 1) Approved of Final Mitigation Plan
 - 2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
 - 3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan.
 - 4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.
- 3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met.

Credit Release Milestone	Cool Stream Credits						
	Scheduled Releases %	Estimated Scheduled Release #	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	1,832.190	1,832.190	0.000	1,832.190	2020	10/9/2020
3 - Year 1 Monitoring	10.00%	610.730				2021	
4 - Year 2 Monitoring	10.00%	610.730				2022	
5 - Year 3 Monitoring	10.00%	610.730				2023	
6 - Year 4 Monitoring	5.00%	305.365				2024	
7 - Year 5 Monitoring	10.00%	610.730				2025	
8 - Year 6 Monitoring	5.00%	305.365				2026	
9 - Year 7 Monitoring	10.00%	610.730				2027	
Stream Bankfull Standard	10.00%	610.730				2022	
			Totals		1,832.190		

Total Gross Credits	6,107.300
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	1,832.190
Total Percentage Released	30.00%
Remaining Unreleased Credits	4,275.110

Notes

Contingencies (if any)

Project Quantities

Mitigation Type	Restoration Type	Physical Quantity
Cool Stream	Restoration	5,535.000
Cool Stream	Enhancement II	1,260.000
Cool Stream	Preservation	683.000

Mitigation Project Name
DMS ID
River Basin
Cataloging Unit
County

Key Mill Site
100025
Yadkin
03040101
Surry

USACE Action ID
DWR Permit
Date Project Instituted
Stream/Wet. Service
Date Printed

2017-01504
2017-1045
5/25/2017
Yadkin 03040101
10/9/2020

Debits

							Cool Stream Restoration Credits	Cool Stream Restoration Equivalent Credits
Beginning Balance (mitigation credits)							6,039.000	68.300
Released Credits							1,811.700	20.490
Unrealized Credits							0.000	0.000
Converted Credits							0.000	0.000
Owning Program	Req. Id	TIP #	Project Name	USACE	DWR	DCM		
Remaining Balance (Released credits)							1,811.700	20.490
Remaining Balance (Unreleased credits)							4,227.300	47.810
Total Remaining Balance (Released and Unreleased credits)							6,039.000	68.300



March 25, 2021

Mr. Matthew Reid
Project Manager
NCDEQ – Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

RE: Draft MY1 Report Review
Key Mill Mitigation Site, Surry County
Yadkin River Basin – HUC 03040101
DMS Project ID No. 100025 / DEQ Contract #7180

Dear Mr. Reid:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft MY1 Monitoring report for the Key Mill Mitigation Site. The report has been updated to reflect those comments. The Final As-built Baseline Monitoring Document and Record Drawings are included. Wildlands' responses to DMS' report comments are noted below in *italics*.

DMS comment: Due to the fact that a large portion of the site has undergone or will receive extensive repairs and replanting, there is a potential that the site may not have credit released for MY1. Please be prepared to discuss the site repairs at the 2021 Credit Release Meeting with the IRT.

Wildlands' response: Wildlands will be prepared to discuss site repairs completed for both the West and East side of the project during the 2021 Credit Release Meeting with the IRT.

DMS comment: The extent and level of repairs warrant notifying the IRT, and they may require an adaptive management plan to review. Was there an adaptive management plan discussed with the IRT?

Wildlands' response: Wildlands has not discussed an adaptive management plan with the IRT for Key Mill; however, an adaptive management plan is being prepared for their review.

DMS comment: Recommend adding a section describing the damage and repairs that have occurred to date. Please add a discussion that describes the site repairs that occurred on the west side in detail. Please include date of storm damage, quantify what was repaired and discuss any deviations from the original design.

Wildlands' response: Wildlands has included discussions describing the storm event, the damage, and repairs that have occurred through the end of MY1 on the Site. These discussions will also be included as part of the Adaptive Management Plan. Additional discussions that describe and quantify repairs, as well as deviations from the original design, will be included in the Adaptive Management Plan.

DMS comment: Due to the level of repairs, DMS recommends including a map/figure that shows what was repaired on the west side. Pre and post repair photos would be beneficial as well. This could be added into an appendix.

Wildlands' response: Wildlands is preparing an Adaptive Management Plan which will include a map that shows the repairs conducted on the west side of the Site, as well as pre and post repair photos if available.



DMS comment: The site is scheduled to have the east side repaired in winter 2021. It would be beneficial to include the proposed repairs for this section on a map/figure as well.

Wildlands' response: Wildlands will outline repairs for the east side of the project in an Adaptive Management Plan. A map depicting the repair areas will be included.

DMS comment: The site is scheduled to be replanted in 2021. IRT approval will be needed if different species are used than what was listed in the approved Mitigation Plan. Please update the MY1 report with species, quantities and replant locations on the repair map/figure.

Wildlands' response: A supplemental planting plan will be outlined in the Adaptive Management Plan for the Site. This plan will outline the proposed species, quantities, and locations, as well as if the species were included on the approved Mitigation Plan or Baseline Conditions Report.

DMS comment: The photos are from November 2020. Were these taken before the repair? UT1 photos show culvert damage as well as other stream damage areas. Was UT1 part of the west repair? Please include this repair info when addressing the comments above. Recommend updating with post-repair photos.

Wildlands' response: Yes, the photos from November 2020 were taken before the repairs on the west side of the Site were complete. Repairs on the west side of the Site did include UT1. A discussion about the repairs is included in the Final MY1 report and post-repair photos have been added to Appendix 2. Text has been added to Section 2.

As requested, Wildlands has included one hard copy of the Final Monitoring Year 1 Annual Report, with copy of our comment response letter inserted after the report's cover page. In addition, a USB drive with the full final electronic copy of the report, our response letter, and all the electronic support files has been included.

Sincerely,

A handwritten signature in blue ink that reads "Kristi Suggs".

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

PREPARED BY:



Wildlands Engineering, Inc.

1430 South Mint Street, Suite 104
Charlotte, NC 28203

Phone: 704.332.7754

Fax: 704.332.3306

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full-delivery stream mitigation project at the Key Mill Mitigation Site (Site) for the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS). The project restored, enhanced, and preserved a total of 7,437 linear feet (LF) of perennial and intermittent stream in Surry County, NC. The Site is located within the DMS targeted watershed for the Yadkin River Basin Hydrologic Unit Code (HUC) 03040101110040 and the NC Division of Water Resources (NCDWR) Sub-basin 03-07-03. The project is providing 6,107.300 cool stream mitigation units (SMUs) for the Yadkin River Basin HUC 03040101 (Yadkin 01).

The Site has a long history of agricultural activity and most of the stressors to stream functions are related to this historic and current land use practices. The major stream stressors for the Site were concentrated agricultural runoff inputs, degraded instream habitat, active stream incision, lack of stabilizing streamside vegetation, bank erosion and failure, and the lack of bedform diversity. The effects of these stressors resulted in degraded water quality and habitat throughout the Site when compared to reference conditions. The project approach for the Site focused on evaluating the Site's existing functional condition and evaluating its potential for recovery and need for intervention.

The project goals defined in the mitigation plan (Wildlands, 2019) were established with careful consideration of 2009 Upper Yadkin Pee Dee River Basin Restoration Priorities (RBRP) goals and objectives to address stressors identified in the watershed. The established project goals include:

- Improve stream channel stability,
- Stabilize eroding stream banks,
- Exclude livestock from stream channels,
- Reconnect channels with historic floodplains,
- Improve instream habitat,
- Reduce sediment and nutrient input from adjacent farm fields,
- Restore and enhance native floodplain vegetation, and
- Permanently protect the project site from degradational impacts.

The Site construction and as-built surveys were completed between April and July 2020. Monitoring Year (MY) 1 assessments and site visits were completed between October and December 2020 to assess the conditions of the project. Overall, the Site has met the required stream, hydrology, and vegetation success criteria for MY1, and much of the Site is performing as intended.

Herbaceous vegetation is well established throughout much of the Site. For MY1, the overall average planted stem density for the Site is 439 stems per acre and is on track to meet the MY3 requirement of 320 stems per acre. In early 2021, supplemental planting of woody species will be conducted in areas noted for low stem density to allow the Site to stay on track and meet the MY3 requirement of 320 stems per acre.

Due to multiple large rain events which occurred throughout the first year of monitoring, the Site experienced at least four bankfull events on all reaches since construction was completed, and 256 days of consecutive baseflow has been recorded on UT2 since the completion of construction. One of the storm events was equivalent to the precipitation frequencies incurred between a 25-year and a 50-yr storm for Mt. Airy, NC (NOAA, 2020). Though many of the on-site reaches remained stable, this event led to damage along Bull Creek Reach 1B through Reach 3 and UT1 Reach 1B and 1C. Some repairs were conducted in late November 2020 along reaches west of Key Road, prior to the MY1 geomorphic survey and visual assessment, but after photos were taken.

Geomorphic surveys show that cross-section bankfull dimensions closely match the baseline monitoring with only minor adjustments. The MY1 visual assessment identified a few areas of concern including one



area of bare ground on Bull Creek Reach 3, a few isolated areas of bed and bank scour and aggradation, and areas of low stem density. The majority of these areas were located reaches east of Key Road. An adaptive management plan (AMP) is being prepared for implementation on the Site and includes the repairs conducted in late November 2020, west of Key Road.

No areas of encroachment or invasive species were noted in MY1. Wildlands will continue to monitor these areas throughout the seven-year monitoring period. If necessary, adaptive management measures will be implemented to benefit the ecological health of the Site.



KEY MILL MITIGATION SITE
Monitoring Year 1 Annual Report

TABLE OF CONTENTS

Section 1: PROJECT OVERVIEW 1-1

1.1 Project Goals and Objectives..... 1-1

Section 2: MONITORING YEAR 1 DATA ASSESSMENT 2-1

2.1 Vegetation Assessment..... 2-1

2.2 Vegetation Areas of Concern and Management Activity..... 2-2

2.3 Stream Assessment..... 2-2

2.4 Stream Hydrology Assessment 2-3

2.5 Stream Areas of Concern and Management Activity 2-3

Section 3: METHODOLOGY 3-1

Section 4: REFERENCES 4-1

APPENDICES

Appendix 1 General Figures and Tables

Figure 1 Project Vicinity Map

Figure 2 Project Component/Asset Map

Table 1 Mitigation Assets and Components

Table 2 Project Activity and Reporting History

Table 3 Project Contact Table

Table 4 Project Information and Attributes

Table 5a-b Monitoring Component Summary

Appendix 2 Visual Assessment Data

Figure 3.0 – 3.3 Current Condition Plan View Map

Table 6a-l Visual Stream Morphology Stability Assessment Table

Table 7 Vegetation Condition Assessment Table

Stream Photographs

Permanent and Mobile Vegetation Plot Photographs

Area of Concern Photographs

Crest and Stream Gage Photographs

Appendix 3 Vegetation Plot Data

Table 8 Vegetation Plot Criteria Attainment

Table 9 CVS Permanent Vegetation Plot Metadata

Table 10a-c Planted and Total Stem Counts

Appendix 4 Morphological Summary Data and Plots

Table 11a-b Baseline Stream Data Summary

Table 11c Reference Reach Data Summary

Table 12 Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)



APPENDICES Cont.

Table 13a-k	Monitoring Data – Stream Reach Data Summary Cross-Section Plots Reachwide Pebble Count Plots
Appendix 5	Hydrology Summary Data and Plots
Table 14	Verification of Bankfull Events Recorded Bankfull Events Recorded In-Stream Flow Events Monthly Rainfall Data
Appendix 6	Response to IRT Comments (MY0) IRT Review Comments: 15-Day Record Drawing Review
Appendix 7	Response to DMS Comments (MY0) Task 6 – Final As-built Baseline Monitoring Report

LIST OF ACRONYMS

Best Management Practice (BMP)
Current Condition Plan View (CCPV)
Cross-section (XS)
Department of Environmental Quality (DEQ)
Division of Mitigation Services (DMS)
Division of Water Resources (DWR)
Hydrologic Unit Code (HUC)
Interagency Review Team (IRT)
Monitoring Year (MY)
North Carolina Division of Water Resources (NCDWR)
Stream Mitigation Unit (SMU)
Step Pool Stormwater Conveyance (SPSC)
United States Army Corps of Engineers (USACE)
Unnamed Tributary (UT)
Yadkin Pee Dee River Basin Priorities (RBRP)



Section 1: PROJECT OVERVIEW

The Key Mill Mitigation Site (Site) is located in Surry County approximately 7.2 miles south of City of Mount Airy, NC in the Yadkin River Basin HUC 03040101110040 and NCDWR Sub-basin 03-07-03 (Figure 1). Located in the Smith River Allochthon of the Piedmont physiographic province (NCGS, 1985), the project watershed is predominately forested land with some areas of agriculture including the Site.

The Site is located on one parcel, bisected by Key Road creating a western side and an eastern side (herein referenced as the West side and the East side) to the project. The Site is predominantly actively grazed pasture with the downstream extent of the Site forested. Bull Creek is the primary stream, which flows southeast through the center of the Site. There are five unnamed tributaries (UT1, UT2, UT2A-C, UT3, and UT3A-C) that join Bull Creek within the Site limits (Figure 2). Valleys throughout the Site have moderately steep walls with alluvial bottoms, whereas valleys along the upstream extents of the project's East side tributaries are narrow with colluvial bottoms.

The West side of the project contains the upstream portion of Bull Creek (Reaches 1A, 1B, and 2), as well as UT1A, UT1B, and UT1C. UT1C joins Bull Creek Reach 2 near the bottom of the West Side of the Site and flows through a culvert under Key Road into the eastern side of the Site. The East Side of the site contains the downstream portion of Bull Creek (Reach 3 and 4), as well as UT2, UT2A-C, UT3, UT3A-C. The Site drains approximately 2.15 square miles of rural land. Downstream of the Site, Bull Creek continues southeast to join the Ararat River near the Cedar Hill community.

Prior to construction, the Site had been primarily used for agriculture. Lands upstream and downstream of the Site are predominantly forested though there are some areas of agricultural lands and small residential areas within the watershed. Agricultural activities within the Site had led to streams in various stages of impairment. Most of the streams on the Site were impaired from limited to non-existent buffers, concentrated agricultural runoff inputs, degraded instream habitat, active stream incision, bank erosion and failure, and the lack of bedform diversity. Pre-construction conditions are outlined in Table 4 of Appendix 1 and Table 11 of Appendix 4.

The final mitigation plan was submitted and accepted by DMS in October of 2018 and the IRT in January of 2019. Construction activities were completed in April 2020 by Carolina Environmental Contracting, Inc. Kee Mapping & Surveying, PLLC. completed the as-built survey in June 2020. Planting was completed following construction in April 2020 by Bruton Natural Systems, Inc. A conservation easement has been recorded and is in place on 20.8 acres.

The project is providing 6,107.300 cool stream mitigation units (SMUs) in the Yadkin River Basin Hydrologic Unit Code (HUC) 03040101110040 (Yadkin 01). Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2027 given the success criteria are met.

Directions and a map of the Site are provided in Figure 1 and project components are illustrated for the Site in Figure 2.

1.1 Project Goals and Objectives

The Site is providing numerous ecological benefits within the Yadkin Valley Basin. The project goals were established with careful consideration to address stressors that were identified in the RBRP (EEP, 2009). The project has improved stream functions through stream restoration and the conversion of maintained agricultural fields into riparian buffer within the Yadkin Valley River Basin, while creating a functional riparian corridor at the Site.

The following project specific goals and objectives outlined in the Mitigation Plan (Wildlands, 2019) include:



Goals	Objectives
Improve stream channel stability.	Restore stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions. Create stable tie-ins for tributaries joining restored channels. Add bank revetments and in-stream structures to protect restored streams.
Stabilize eroding stream banks.	Reconstruct stream channels slated for restoration with stable dimensions. Add bank revetments and in-stream structures to reaches to protect restored/enhanced streams.
Exclude livestock from stream channels.	Install livestock fencing and watering systems as needed to exclude livestock from stream channels and riparian areas.
Reconnect channels with historic floodplains.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the floodplain.
Improve instream habitat.	Remove man-made impoundments and culvert crossings within easement. Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.
Reduce sediment and nutrient input from adjacent farm fields.	Restore the streams' riparian buffers. Construct a BMP to slow and treat runoff from farm fields before entering Site streams.
Restore and enhance native floodplain vegetation.	Plant native tree species in riparian zone where currently insufficient.
Permanently protect the project site from degradational impacts.	Record a conservation easement on the Site and install livestock exclusion fencing.



Section 2: MONITORING YEAR 1 DATA ASSESSMENT

Annual monitoring for MY1 was conducted between October and December 2020, with hydrology data collected between mid-April to December 2020, to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Key Mill Mitigation Plan (Wildlands, 2019). Monitoring features and locations are shown in Figures 3.0 - 3.3. Refer to Table 2 for the project's activity and reporting history.

After the completion and final submittal of the Site's As-built Baseline Monitoring Report (October 5, 2020), the Site incurred multiple large storm events between October and December 2020. According to discussions with the property owner and subsequently confirmed by a NOAA weather station in Mt. Airy (2W, NC USC003315890), one of these events was exceeding large. It occurred on the night of October 29, 2020 into the morning of October 30, 2020. During this timeframe, the Site received 3.4-inches of rain in less than 3 hours. Based on precipitation frequency estimates for Mount Airy, this is equivalent to a 25- to 50-year storm event. During this event, the Site incurred damage along Bull Creek Reach 1B, 2, and 3, downstream of the culvert crossing on UT1 Reach 1C, and the open and newly planted areas of the floodplain. These areas along are discussed in further detail in Sections 2.2 and 2.5. An adaptive management plan (AMP) is being prepared, as a separate document, for implementation on the Site and includes the repairs conducted in late November 2020, west of Key Road.

2.1 Vegetation Assessment

Vegetation plot monitoring is being conducted in post-construction monitoring years 1, 2, 3, 5, and 7. Permanent plots are monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008) and the 2016 USACE Stream and Wetland Mitigation Guidance to assess the vegetation success. A total of 8 permanent vegetation plots were established within the project easement area using either a 10-meter by 10-meter square plot or a 5-meter by 20-meter rectangular plot. In addition, 5 mobile vegetation plots were established in MY1 throughout the planted conservation easement to evaluate the random vegetation performance for the Site. These plots will be subsequently reestablished in different random locations in monitoring years 2, 3, 5, and 7. Mobile vegetation plot assessments will document stems, species, and height using 100-meter² circular, square, or rectangular plots. The final vegetative performance standard will be the survival of 210 planted stems per acre in the planted riparian areas at the end of the required seven-year monitoring period. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of MY3 and at least 260 stems per acre at the end of MY5.

The MY1 vegetation survey was completed in October 2020, resulting in an average planted stem density of 439 stems per acre for all monitored permanent and mobile vegetation plots. The Site is on track to meet the interim MY3 requirement of 320 planted stems per acre, with 10 plots individually exceeding this requirement with densities ranging from 324 to 809. Out of the 8 permanent vegetation plots six are on track to meet the interim MY3 requirement of 320 planted stems per acre with densities ranging from 324 to 648 planted stems per acre. Out of the 5 mobile vegetation plots, 4 are exceeding the MY3 requirements by more than 10% with stem densities ranging from 405 to 809 stems per acre. In the permanent vegetation plots, the majority of the surviving stems appear to be thriving with a vigor of 3 or greater indicating a plant health of good or better. Please refer to Appendix 2 for vegetation plot photographs and Appendix 3 for vegetation data tables.

Though much of the Site is on track to meet the vegetative success criteria for MY3, some areas of low stem density were noted during the Site assessment field walk in December 2020. To address this issue, approximately five acres of the Site (excluding UT2 and UT2A – UT2C) will be replanted during the

winter in early 2021, so that the Site stays on track and meets its interim and final vegetative success criteria. See Section 2.2 for a discussion about areas of low stem density and the Site’s AMP for details about supplemental planting and soil amendment applications. Results from the implementation of the AMP will be reported at the end of MY2.

2.2 Vegetation Areas of Concern and Management Activity

Overall, herbaceous ground cover is starting to establish throughout the site and wetland vegetation has started to fill in the wet seeps, stabilizing the soil. There were no areas of encroachment within the conservation easement boundary nor were there any emerging populations of invasive species. Approximately 5 acres of the Site, as evaluated during the site walk and through the vegetation plot assessments, had a low planted-stem density; however, only 1.5 acres of this area exhibited bare or poor herbaceous cover. These areas of limited vegetation coverage were likely due to a combination of factors such as:

- Delays in construction from multiple storm events and subsequent repairs pushed the planting date into early April after the on-set of the growing season,
- Topsoil that was harvested and reapplied during construction to promote woody growth was washed downstream during large post-construction storm events leaving poor soil conditions in graded areas, and
- Construction access and bank grading conducted to repair storm damaged areas along Bull Creek Reach 1A – 2 and UT1B – 1C in late November 2020 further damaged the planted vegetation and compacted floodplain soils.

These factors, in addition to less-than-ideal woody vegetation survival rates from the MY1 assessment, led to the decision to replant and reamend the soil in these areas of the Site before March 30, 2021. This effort including planting density, planting type and species, and amendment composition is outlined in the Adaptive Management Plan. In Appendix 2, see Table 7 and Figures 3.0 – 3.3 for documentation of the Site’s vegetation condition and a depiction of the areas of low stem density and/or poor/bare herbaceous cover. Wildlands does not anticipate any difference in performance among the replanted areas in comparison to those planted after construction and assumes that the site will continue to meet future vegetation monitoring success criteria in MY3, MY5, and MY7.

2.3 Stream Assessment

Morphological surveys and reach-wide pebble counts will be performed on each restoration reach for monitoring years 1, 2, 3, 5 and 7 and will follow the 2016 USACE Stream and Wetland Mitigation Guidance. Riffle cross-sections on the restoration reaches should be stable and show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. All riffle cross-sections should fall within the parameters defined for the designated stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg and/or eroding channel banks. Remedial action would not be taken if channel changes indicate a movement toward stability. Substrate materials should indicate a progression towards or the maintenance of coarser materials in the riffle features and smaller particles in the pool features.

Fifteen permanent cross-sections were installed to assess channel dimensions over time. Morphological surveys for MY1 were conducted in December 2020 after repairs were completed on Bull Creek Reach 1B and Reach 2 and UT1B and C. (See the AMP for a discussion about stream repairs.) Overall, cross-section survey results indicate that most of the channels’ dimensions are stable and functioning as designed with minimal adjustments. Changes occurring within some cross-sections include slight variations in cross-sectional areas and widths, as well as mean depths; however, width to depth ratios



have remained consistent. Bank height ratios (BHR) at surveyed cross-sections were at or near 1.0 for all reaches, except for cross-section 10 (XS10) on UT1C and cross-section 14 (XS14) on UT3B. Though there was an increase in the BHR for XS10 and XS14, cross-section plots and photos do not depict any instability along the stream banks. Therefore, the increase in BHR is likely due to the displacement of bed material within the riffle. Minor changes in cross-sectional profiles are normal for newly restored streams and are examples of how a channel adjusts to maintain stability from natural processes like rain events, a lack of mature woody vegetation along the stream bank, herbaceous growth along the banks, and/or sediment transport processes or to grading of repair areas. These minor changes do not indicate channel instability. See Section 2.5 for further discussion about stream areas of concern.

Reachwide pebble counts along the restoration reaches continue to indicate the maintenance of coarser materials in riffle features and finer particles in the pool features. This shows that the stream is able to move sediment through its system and access its floodplain; thereby negating most aggradational and degradational stressors incurred during storm events.

Please refer to Appendix 2 for the visual stability assessment tables, CCPV Figures 3.0 – 3.3, and stream photographs, and Appendix 4 for the morphological tables and plots.

2.4 Stream Hydrology Assessment

Six automated pressure transducers were installed to document stream hydrology throughout the seven-year monitoring period. Henceforth, these devices are referred to as “crest gages (CG)” for those recording bankfull events and “stream gages (SG)” for those documenting consecutive days of baseflow. At the end of the seven-year monitoring period, four or more bankfull flow events must have occurred in separate years on each of the restoration reaches. At as-built, the pressure transducers were programmed to record data every 2 hours and captured many high flow events throughout the first year of monitoring.

In MY1, multiple bankfull events were recorded on all monitored reaches (Bull Creek R2, UT1C, UT2C, UT3C, and Bull Creek R3), as well as, 256 days of consecutive baseflow was recorded from Stream Gage #1 on UT2. Please refer to Appendix 5 for hydrology summary data and gage plots.

2.5 Stream Areas of Concern and Management Activity

MY1 stream and visual assessments revealed that over 96% of the Site’s reaches are stable and performing as intended. Stream areas of concern include localized instances of bank scour, bed scour, and aggradation, as well as three areas of structure piping. Bank scour noted on Bull Creek Reach 2 and Reach 3 are slated for repairs in early 2021. See the Site’s AMP for a discussion of repair areas. It is anticipated that the remainder of the areas will repair themselves as vegetation becomes established and natural channel processes move sediment through the system; however, Wildlands will continue to monitor these areas and adaptive measures will be implemented if needed. Please refer to Appendix 2 for stream stability tables and Current Conditions Plan View Maps.

As briefly mentioned in Section 2.3, some repair work was conducted west of Key Road in November of 2020. Cross-section 2, 3, and 4 were included in the repair areas. Work conducted in these areas consisted of bank repair using available material and resulted in the slight shift of the cross-section alignment of XS2 and an enlargement of the cross-sectional areas, bankfull widths, and mean depths of XS3 and XS4. See Table 12 and morphological plots in Appendix 4 for MY0/MY1 geomorphic comparisons.

Areas of concern noted in Figures 3.0-3.3 are based on data collected during the Site assessment walk that was conducted on December 30, 2020 after repairs had been conducted on-site west of Key Road. However, the photos included in the photo log in Appendix 2 were taken on November 3 – 4, 2020,



which was prior to the completion of the repairs conducted on November 18 – 23, 2020 and may not reflect the Site’s condition during the assessment walk. Repair photos are included the Site’s AMP document.

A small section of fence line that was inadvertently installed inside the easement along the upper extent of UT1A and reported in the As-built Baseline Monitoring Report (Wildlands, 2020) was relocated outside the easement during MY1. Monitoring Year 1 Summary

Overall, the Site has met the required stream, hydrology, and vegetation success criteria for MY1. Herbaceous ground cover is well established throughout most of the Site, and the overall average planted stem density for the Site is 439 stems per acre, which is exceeding the MY3 requirement of 320 stems per acre by more than 10%. Overall, geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring with some minor adjustments, and the streams are functioning as intended. With multiple bankfull events have been documented on all the monitored reaches since the completion of construction, the Site has met the first of four bankfull criteria events, and baseflow on UT2 exceeded the 30-day requirement for intermittent streams. The MY1 visual assessment identified a few areas of concern including a few isolated areas of bank scour, aggradation, and structure piping. No areas of encroachment or invasive species were noted during MY1. An adaptive management plan for stream repairs and supplemental planting is being prepared so that the Site remains on track to meet the MY3, MY5, and MY7 requirements. Wildlands will continue to monitor the Site, and adaptive measures will be implemented as necessary throughout the seven-year monitoring period to benefit the ecological health and geomorphic stability of the Site.



Section 3: METHODOLOGY

Geomorphic data were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Crest gages and groundwater gages are monitored quarterly. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

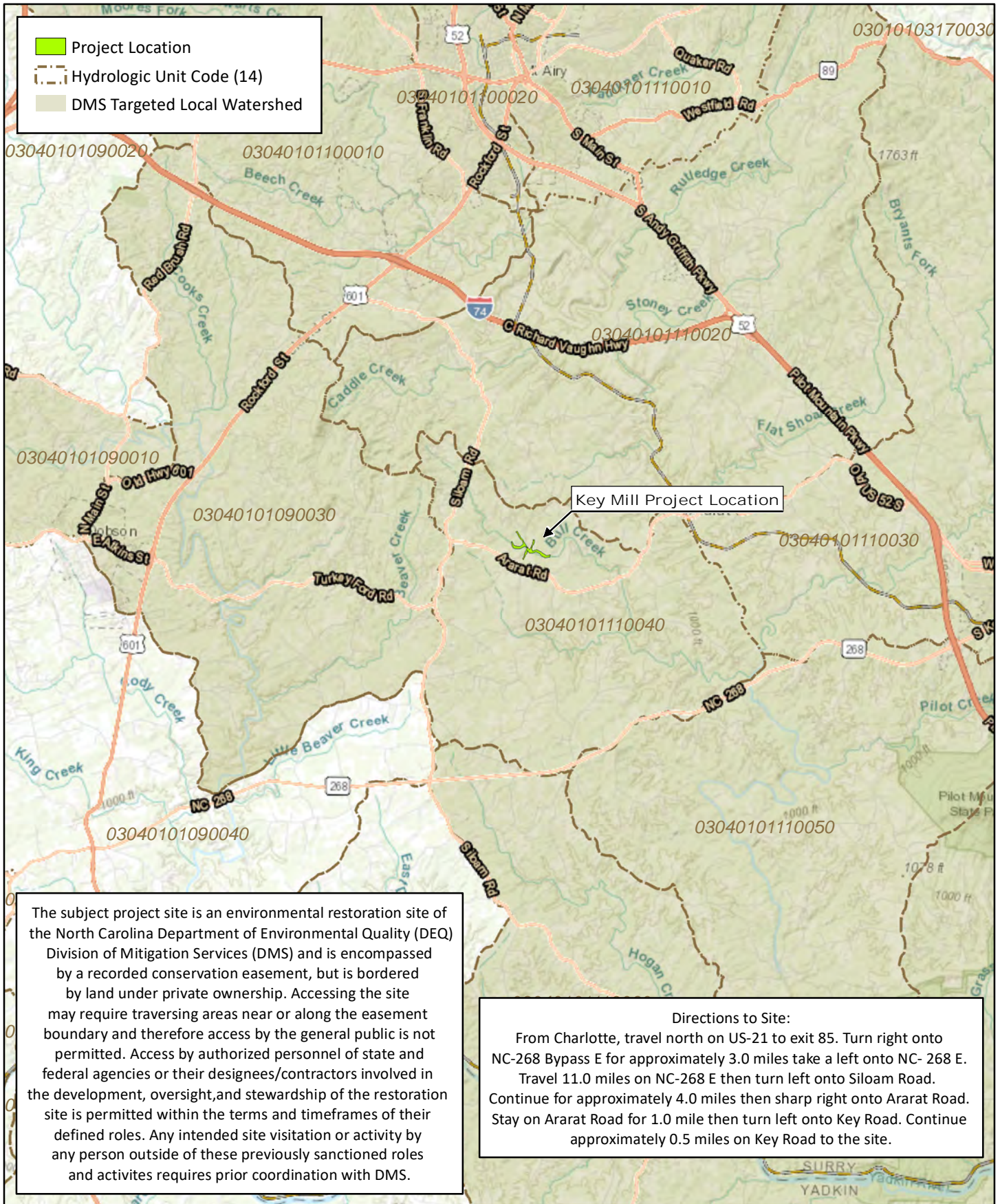


Section 4: REFERENCES

- 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, Cheryl C; Rawlins, C.L.; Potyondy, John 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 from: <http://cvs.bio.unc.edu/protocol/cvs-eeep-protocol-v4.2-lev1-2.pdf>.
- National Oceanic and Atmospheric Association (NOAA).2021. Precipitation Data from October 2020. Mount Airy 2 W, NC US USC00315890. <https://www.ncdc.noaa.gov/cdo-web/datasets/GHCND/stations/GHCND:USC00315890/detail>
- North Carolina Climate Retrieval and Observations Network of the Southeast Database (NCCRONOS). 2020. State Climate Office of North Carolina. Version 2.7.2. Station ID Mt Airy 2 W, NC. Accessed December 2020.
- North Carolina Ecosystem Enhancement Program (EEP), February 2009. Upper Yadkin Pee-Dee River Basin Restoration Priorities.
- North Carolina Division of Mitigation Services (DMS), October 2015. DMS Stream and Wetland Mitigation Plan Template and Guidance.
- North Carolina DMS, April 2015. DMS Annual Monitoring and Closeout Reporting Template.
- North Carolina Division of Water Resources (NCDWR), 2015. Surface Water Classifications. <https://deq.nc.gov/about/divisions/water-resources/planning/classification-standards>.
- North Carolina Geological Survey (NCGS), 1985. Geologic Map of North Carolina: North Carolina Survey, General Geologic Map, scale 1:500,000. <https://deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/ncgs-maps/1985-geologic-map-of-nc4>.
- 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.
- Simon, A. 1989. A model of channel response in disturbed alluvial channels. *Earth Surface Processes and Landforms* 14(1):11-26.
- United States Geological Survey (USGS). 2020. National Water Information System. Station ID USGS 362416080334345 Ararat, NC. Accessed December 2020.
- USACE, October 2016. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.
- Wildlands Engineering, Inc (Wildlands), 2019. Key Mill Mitigation Site Mitigation Plan. DMS, Raleigh, NC.
- Wildlands, 2020. Key Mill Mitigation Site As-built Baseline Monitoring Report. DMS, Raleigh, NC.



APPENDIX 1. General Figures and Tables



0 1 2 Mile



Figure 1 Project Vicinity Map
 Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020
 Surry County, NC

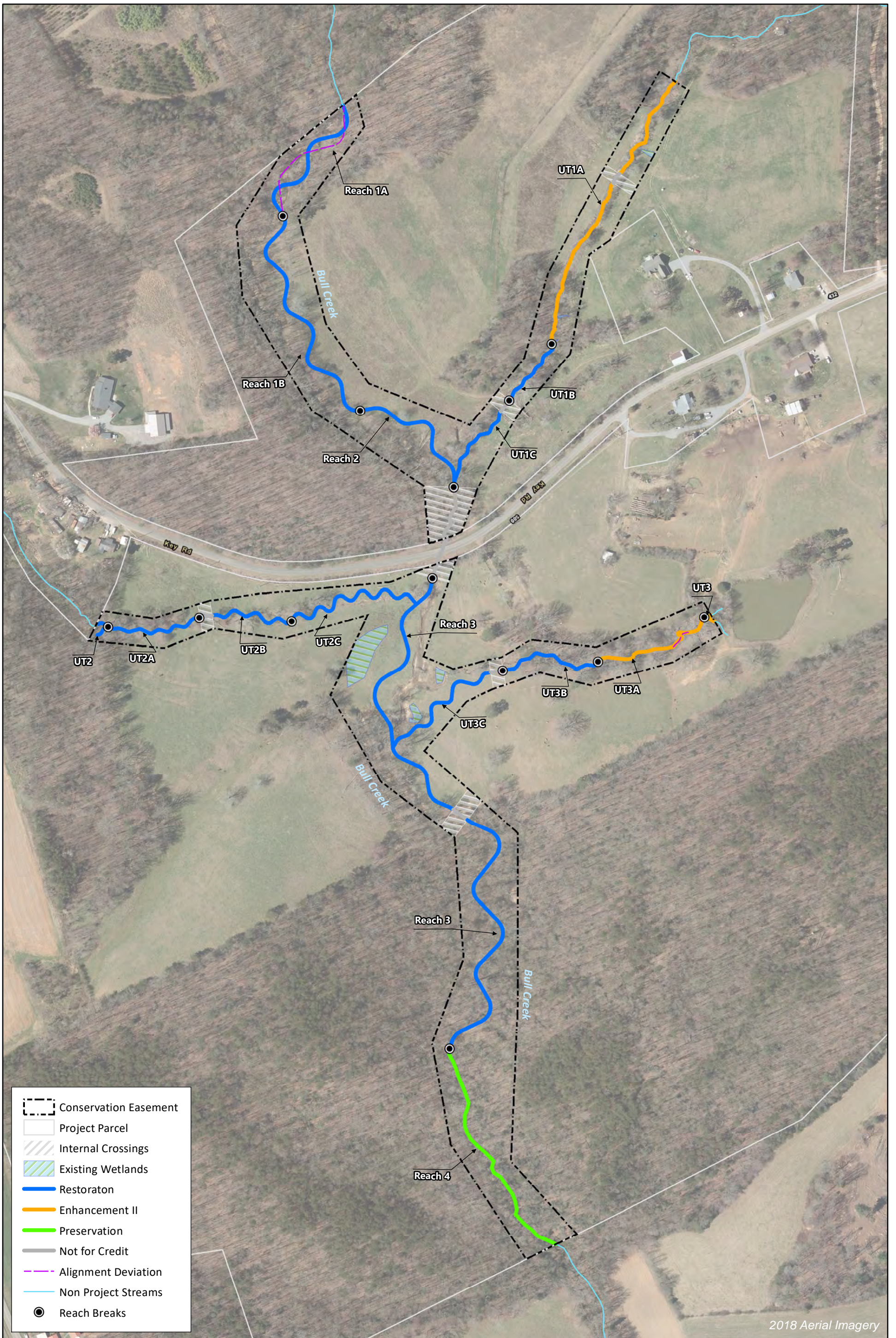


Table 1. Mitigation Assets and Components

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Project	Existing Footage (LF) or Acreage	Mitigation Plan Footage/ Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	As-Built Footage/ Acreage	Notes/Comments
Bull Creek Reach 1A	435	444	Cool	Restoration	P1	1.000	421	N/A
Bull Creek Reach 1B	876	722	Cool	Restoration	P1	1.000	722	N/A
Bull Creek Reach 2	403	418	Cool	Restoration	P2	1.000	418	N/A
Bull Creek Reach 3	2,291	1,674	Cool	Restoration	P2	1.000	1,676	N/A
Bull Creek Reach 4	683	683	Cool	Preservation	N/A	10.000	683	N/A
UT1A	866	829	Cool	Enhancement II	N/A	2.500	832	N/A
UT1B	188	212	Cool	Restoration	P2	1.000	212	N/A
UT1C	332	257	Cool	Restoration	P2	1.000	257	N/A
UT2	61	42	Cool	Restoration	P2	1.000	42	N/A
UT2A	349	315	Cool	Restoration	P2	1.000	315	N/A
UT2B	299	263	Cool	Restoration	P2	1.000	263	N/A
UT2C	223	469	Cool	Restoration	P2	1.000	469	N/A
UT3	21	18	Cool	Enhancement II	N/A	2.500	18	N/A
UT3A	249	413	Cool	Enhancement II	N/A	2.500	390	N/A
UT3B	414	307	Cool	Restoration	P2	1.000	307	N/A
UT3C	296	412	Cool	Restoration	P1, P2	1.000	412	N/A

Project Credits							
Restoration Level	Stream			Riparian Wetland		Non-Riparian Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riv		
Restoration	N/A	5,535.000	N/A	N/A	N/A	N/A	N/A
Re-establishment				N/A	N/A	N/A	N/A
Rehabilitation				N/A	N/A	N/A	N/A
Enhancement				N/A	N/A	N/A	N/A
Enhancement I	N/A		N/A				
Enhancement II	N/A	504.000	N/A				
Creation				N/A	N/A	N/A	N/A
Preservation	N/A	68.300	N/A	N/A	N/A	N/A	N/A
Totals	N/A	6,107.300	N/A	N/A	N/A	N/A	N/A

Table 2. Project Activity and Reporting History

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Activity or Report		Data Collection Complete	Completion or Delivery
404 Permit		May 2019	May 2019
Mitigation Plan		January 2017 - January 2019	January 2019
Final Design - Construction Plans		May 2019	May 2019
Construction		June 2019 - April 2020	April 2020
Temporary S&E mix applied to entire project area ¹		June 2019 - April 2020	April 2020
Permanent seed mix applied to reach/segments ¹		April 2020	April 2020
Bare root and live stake plantings for reach/segments		April 2020	April 2020
Baseline Monitoring Document (Year 0)		July 2020	October 2020
Year 1 Monitoring	Invasive Treatment	August 2020	August 2020
	Stream Repairs (West Side)	November 2020	November 2020
	Stream Survey	December 2020	February 2021
	Vegetation Survey	October 2020	
Year 2 Monitoring	Stream Survey		
	Vegetation Survey		
Year 3 Monitoring	Stream Survey		
	Vegetation Survey		
Year 4 Monitoring	Stream Survey		
	Vegetation Survey		
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 6 Monitoring	Stream Survey		
	Vegetation Survey		
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

¹Seed and mulch is added as each section of construction is completed.**Table 3. Project Contact Table**

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Designers Aaron Earley, PE, CFM	Wildlands Engineering, Inc. 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractors	Carolina Environmental Contracting, Inc. 150 Pine Ridge Rd Mt Airy, NC 27030
Planting Contractor	Bruton Natural Systems, Inc. PO Box 1197 Fremont, NC 27830
Seeding Contractor	Carolina Environmental Contracting, Inc. 150 Pine Ridge Rd Mt Airy, NC 27030
Seed Mix Sources	Carolina Environmental Contracting, Inc.
Nursery Stock Suppliers Bare Roots Live Stakes	Bruton Natural Systems, Inc.
Herbaceous Plugs	Wetland Plants, Inc.
Monitoring Performers	Wildlands Engineering, Inc.
Monitoring, POC	Kristi Suggs (704) 332.7754 x.110

Table 4. Project Information and Attributes

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Project Information								
Project Name	Key Mill Mitigation Site							
	Surry County							
Project Area (acres)	20.8							
Project Coordinates (latitude and longitude)	36° 23' 57.4794"N -80° 36' 11.88"W							
Planted Acreage (Acre of Woody Stems Planted)	9.8							
Project Watershed Summary Information								
Physiographic Province	Piedmont Physiographic Province							
River Basin	Yadkin River							
USGS Hydrologic Unit 8-digit	3040101							
USGS Hydrologic Unit 14-digit	3040101110040							
DWR Sub-basin	03-07-03							
Project Drainage Area (acres)	Bull Creek Reach 1A, 1B, & 2: (1,146); Bull Creek Reach 3 & 4: (1,293); UT1A-C: (102); UT2A-C: (32); UT2: (6); UT3 & UT3-C: (45)							
Project Drainage Area Percentage of Impervious Area	1%							
2011 NLCD Land Use Classification	Bull Creek- Forest (58%), Cultivated (33%), Urban (9%) UT1A-C - Forest (70%), Cultivated (21%), Urban (9%) UT2A-C - Forest (32%), Cultivated (49%), Urban (19%) UT2 - Forest (55%), Cultivated (45%), Urban (0%) UT3/UT3A-C - Forest (22%), Cultivated (74%), Urban (4%)							
Reach Summary Information								
Parameters	Bull Creek Reach 1A	Bull Creek Reach 1B	Bull Creek Reach 2	Bull Creek Reach 3	Bull Creek Reach 4	UT1A	UT1B	UT1C
Length of reach (linear feet) - Post-Restoration	421	722	418	1,676	683	832	212	257
Valley confinement (Confined, moderately confined, unconfined)	Confined to Moderately Confined			Moderately Confined		Confined		
Drainage area (acres)	1,146			1,293		102		
Perennial, Intermittent, Ephemeral	P	P	P	P	P	P	P	P
NCDWR Water Quality Classification	C							
Morphological Description (stream type) - Pre-Restoration	F3		F3/G3c		---	---	G4c	G4
Morphological Description (stream type) - Post-Restoration	C3		C3b	C3	---	---	B4	B4a
Evolutionary trend (Simon's Model) - Pre-Restoration	IV/V			VI		III/IV		
FEMA classification	Outside SFHA							
Parameters	UT2	UT2A	UT2B	UT2C	UT3	UT3A	UT3B	UT3C
Length of reach (linear feet) - Post-Restoration	42	315	263	469	18	390	307	412
Valley confinement (Confined, moderately confined, unconfined)	Confined		Moderately Confined		Confined		Moderately Confined	
Drainage area (acres)	6	32		45				
Perennial, Intermittent, Ephemeral	I	P	P	P	I	I/P	P	P
NCDWR Water Quality Classification	C							
Morphological Description (stream type) - Pre-Restoration	G4	G5	G5c	G5	---	---	G5	G5c
Morphological Description (stream type) - Post-Restoration	B4	B4	C4b	C4	---	---	B4	C4
Evolutionary trend (Simon's Model) - Pre-Restoration	III/IV							
FEMA classification	Outside SFHA							
Regulatory Considerations								
Regulation	Applicable?	Resolved?	Supporting Documentation					
Waters of the United States - Section 404	Yes	Yes	USACE Action ID# SAW-2017-01504					
Waters of the United States - Section 401	Yes	Yes	DWR# 17-1045					
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	NPDES Construction Stormwater General Permit NCG010000					
Endangered Species Act	Yes	Yes	Categorical Exclusion Document in Mitigation Plan					
Historic Preservation Act	Yes	Yes	Categorical Exclusion Document in Mitigation Plan					
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A					
FEMA Floodplain Compliance	Yes	N/A	Not located in a Special Flood Hazard Area					
Essential Fisheries Habitat	No	N/A	N/A					

Table 5a. Monitoring Component Summary

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Parameter	Monitoring Feature	Quantity / Length by Reach						Frequency	Notes
		Bull Creek Reach 1A	Bull Creek Reach 1B	Bull Creek Reach 2	Bull Creek Reach 3	UT1B	UT1C		
Dimension	Riffle Cross-Section	1	1	1	2	1	1	Year 1, 2, 3, 5, and 7	1
	Pool Cross-Section	---	1	---	2	---	---		
Pattern	Pattern	N/A						N/A	2
Profile	Longitudinal Profile	N/A						N/A	
Substrate	Reach Wide (RW) Pebble Count	1 RW	1 RW	1 RW	1 RW	1 RW	1 RW	Year 1, 2, 3, 5, and 7	3
Hydrology	Crest Gage (CG) and/or Stream Flow Gage (SG)	1 CG			1 CG	1 CG		Quarterly	4
Vegetation	CVS Level 2	8 (5 permanent, 3 mobile)						Year 1, 2, 3, 5, and 7	5
Visual Assessment		Yes						Semi-Annually	
Exotic and Nuisance Vegetation								Semi-Annually	6
Project Boundary								Annually	7
Reference Photos	Photographs	12						Annually	

Parameter	Monitoring Feature	Quantity / Length by Reach						Frequency	Notes
		UT2	UT2A	UT2B	UT2C	UT3B	UT3C		
Dimension	Riffle Cross-Section	---	1	1	1	1	1	Year 1, 2, 3, 5, and 7	1
	Pool Cross-Section	---	---	---	---	---	---		
Pattern	Pattern	N/A						N/A	2
Profile	Longitudinal Profile	N/A						N/A	
Substrate	Reach Wide (RW) Pebble Count	---	1 RW	1 RW	1 RW	1 RW	1 RW	Year 1, 2, 3, 5, and 7	3
Hydrology	Crest Gage (CG) and/or Stream Flow Gage (SG)	1 SG	1 CG			1 CG		Quarterly	4
Vegetation	CVS Level 2	3 (1 permanent, 2 mobile)						Year 1, 2, 3, 5, and 7	5
Visual Assessment		Yes						Semi-Annually	
Exotic and Nuisance Vegetation								Semi-Annually	6
Project Boundary								Annually	7
Reference Photos	Photographs	9						Annually	

Notes:

1. Cross-sections have been permanently marked with rebar to establish location. Surveys include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.
2. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile data was collected during as-built baseline monitoring survey only, unless observations indicate widespread lack of vertical stability (greater than 10% of reach is affected) and profile survey is warranted in additional years to monitor adjustments or survey repair work.
3. Reach wide pebble counts will be conducted each year a monitoring report is submitted. Riffle (100) pebble counts have been conducted during as -built baseline monitoring only unless observations indicate otherwise during post-construction monitoring.
4. Crest gages and/or stream gages (pressure transducers) will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. The stream gage (pressure transducer) has been set to record stage once every 2 hours.
5. Both mobile and permanent vegetation plots will be utilized to evaluate the vegetation performance for the areas planted. Permanent vegetation monitoring plot assessments will follow CVS Level 2 protocols. Mobile vegetation monitoring plot assessments will document number of planted stems and species using a circular or 100 m2 square/rectangular plot.
6. Locations of exotic and nuisance vegetation will be mapped.
7. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

Table 5b. Monitoring Component Summary

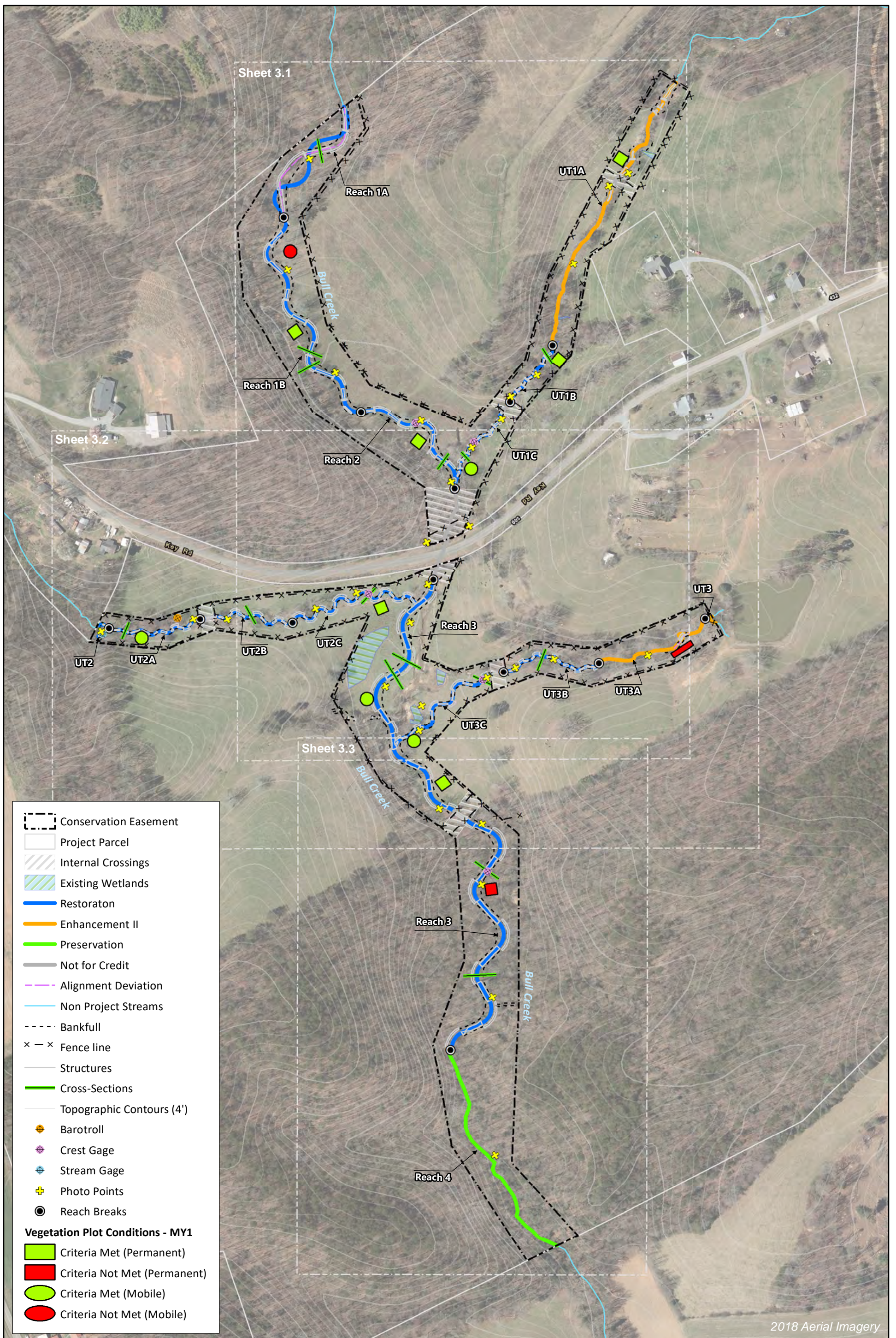
Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Parameter	Monitoring Feature	Quantity / Length by Reach				Frequency	Notes
		UT1A	UT3	UT3A	Bull Creek Reach 4		
Dimension	Riffle Cross-Section	---	---	---	---	Year 1, 2, 3, 5, and 7	
	Pool Cross-Section	---	---	---	---		
Pattern	Pattern	N/A				N/A	
Profile	Longitudinal Profile	N/A				N/A	
Substrate	Reach Wide (RW) Pebble Count	---	---	---	---	Year 1, 2, 3, 5, and 7	
Hydrology	Crest Gage (CG) and/or Stream Flow Gage (SG)	---	---	---	---	Quarterly	
Vegetation	CVS Level 2	2 (2 permanent)			---	Year 1, 2, 3, 5, and 7	1
Visual Assessment		Yes				Semi-Annually	
Exotic and Nuisance Vegetation						Semi-Annually	2
Project Boundary						Annually	3
Reference Photos	Photographs	4				Annually	

Notes:

- Both mobile and permanent vegetation plots will be utilized to evaluate the vegetation performance for the areas planted. Permanent vegetation monitoring plot assessments will follow CVS Level 2 protocols. Mobile vegetation monitoring plot assessments will document number of planted stems and species using a circular or 100 m2 square/rectangular plot.
- Locations of exotic and nuisance vegetation will be mapped.
- Locations of vegetation damage, boundary encroachments, etc. will be mapped.

APPENDIX 2. Visual Assessment Data



	Conservation Easement
	Project Parcel
	Internal Crossings
	Existing Wetlands
	Restoration
	Enhancement II
	Preservation
	Not for Credit
	Alignment Deviation
	Non Project Streams
	Bankfull
	Fence line
	Structures
	Cross-Sections
	Topographic Contours (4')
	Barotroll
	Crest Gage
	Stream Gage
	Photo Points
	Reach Breaks
Vegetation Plot Conditions - MY1	
	Criteria Met (Permanent)
	Criteria Not Met (Permanent)
	Criteria Met (Mobile)
	Criteria Not Met (Mobile)

2018 Aerial Imagery

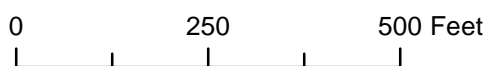


Figure 3.0 Current Conditions Plan View Map (Key)
 Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020
 Surry County, NC

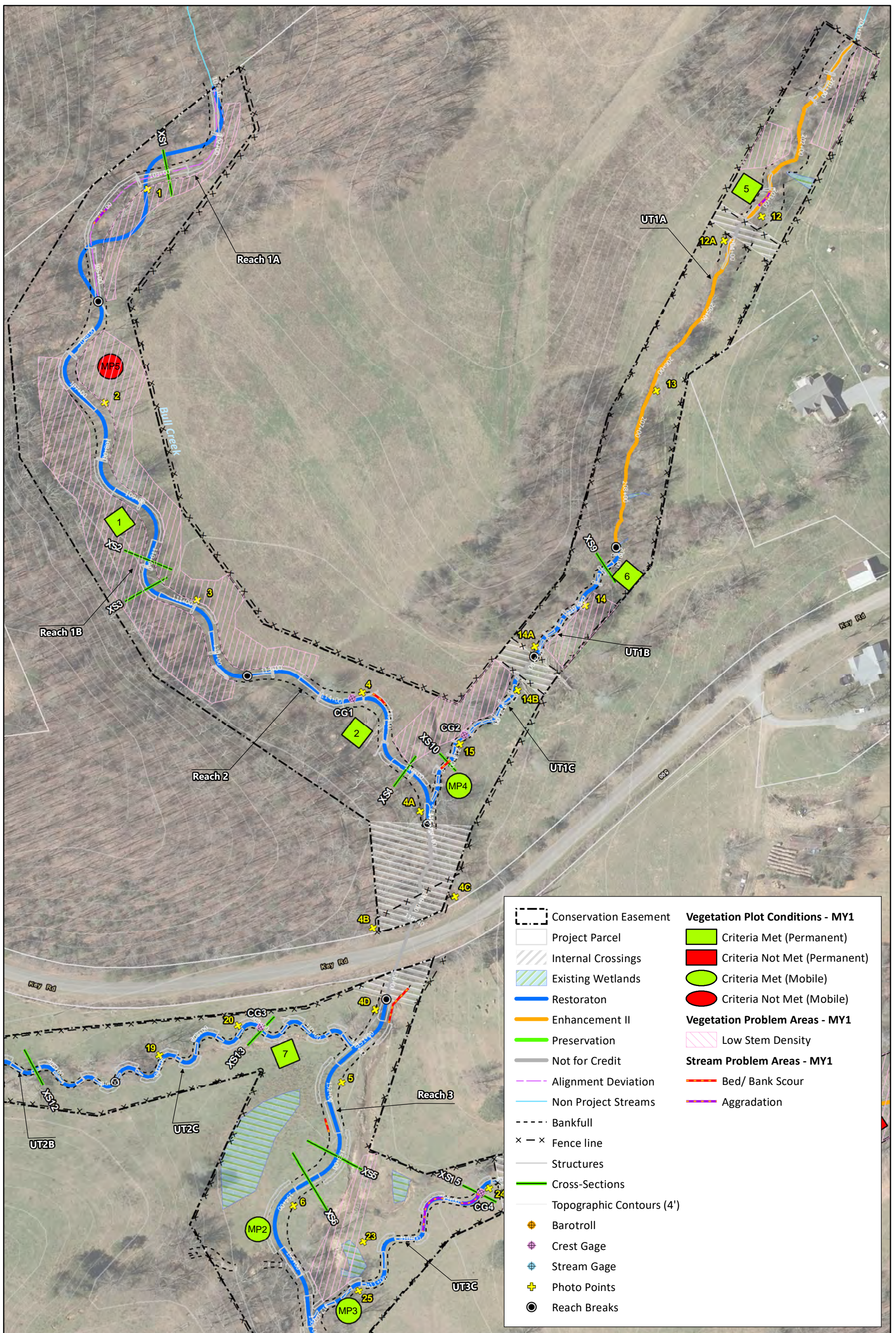
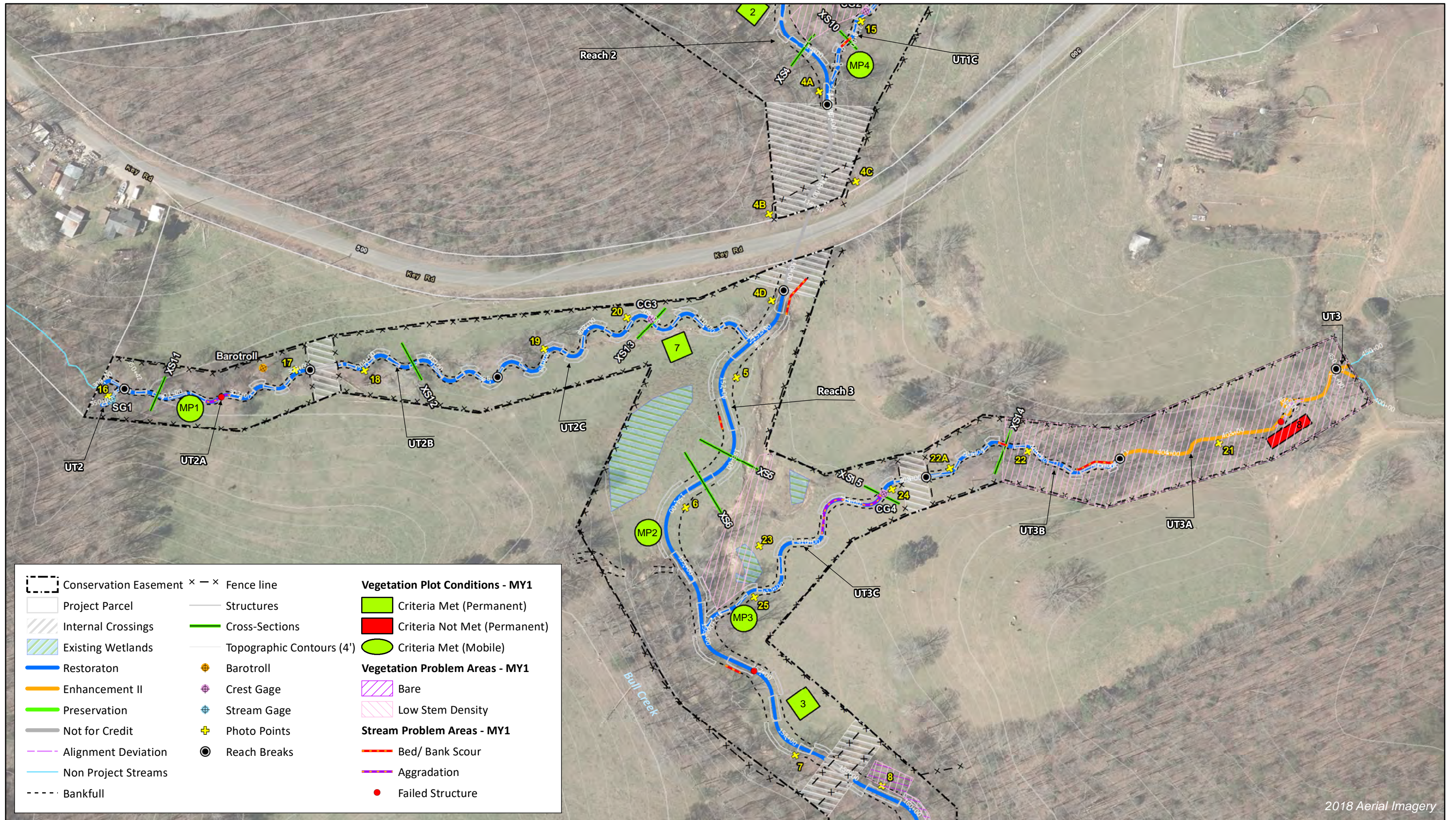


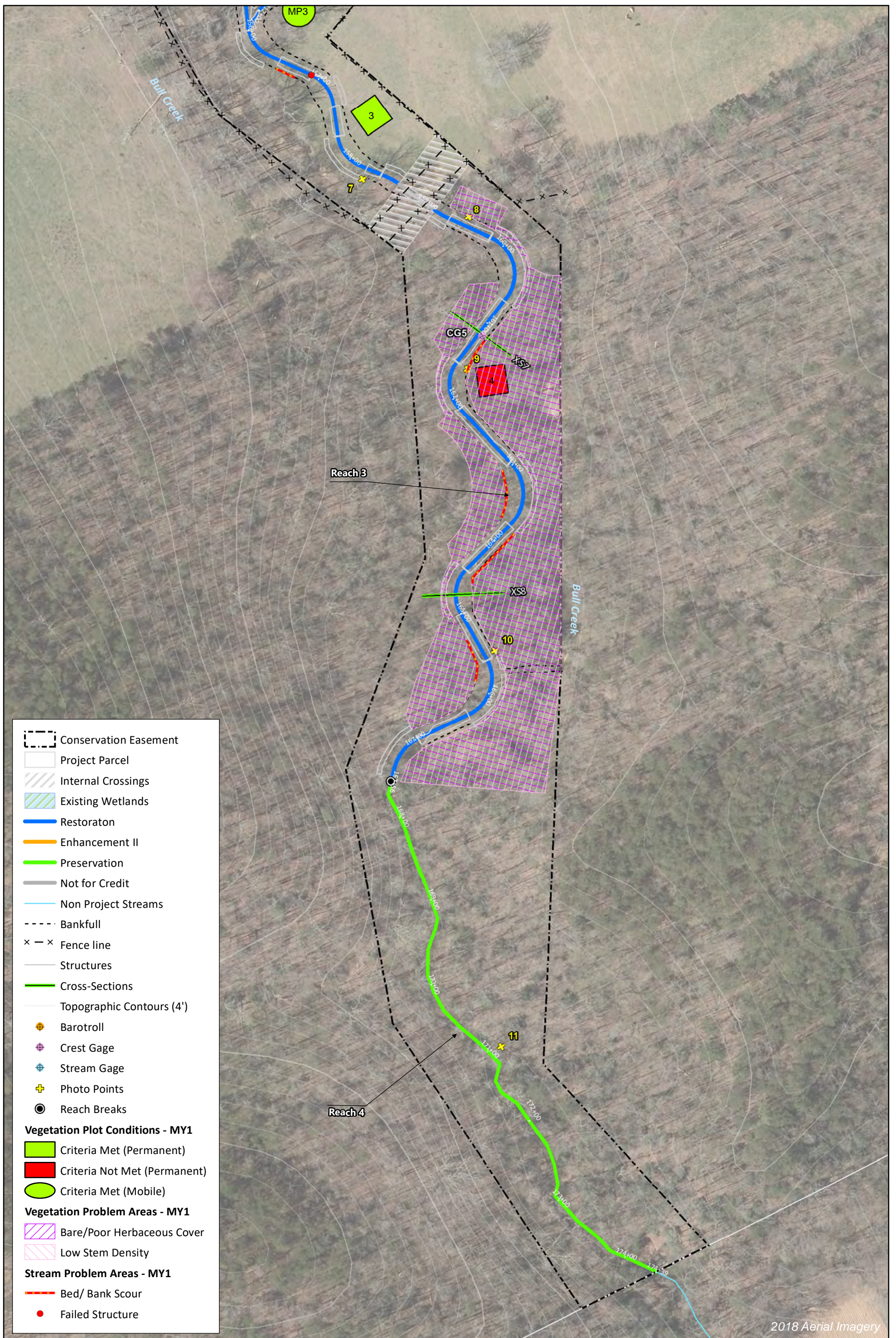
Figure 3.1 Current Condition Plan View Map
 Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020
 Surry County, NC



2018 Aerial Imagery



Figure 3.2 Current Conditions Plan View Map
 Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020
 Surry County, NC



2018 Aerial Imagery

Table 6a. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: Bull Creek Reach 1A

Assessed Length: 421

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			1	30	93%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	3	3		100%				
	3. Meander Pool Condition	Depth Sufficient	1	2		50%				
		Length Appropriate	2	2		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	2	2		100%				
Thalweg centering at downstream of meander bend (Glide)		2	2	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	5	5			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6b. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: Bull Creek Reach 1B

Assessed Length: 722

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	7	7		100%				
	3. Meander Pool Condition	Depth Sufficient	8	8		100%				
		Length Appropriate	8	8		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	8	8		100%				
Thalweg centering at downstream of meander bend (Glide)		8	8	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6c. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: Bull Creek Reach 2

Assessed Length: 418

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	6	6		100%				
	3. Meander Pool Condition	Depth Sufficient	5	5		100%				
		Length Appropriate	5	5		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	5	5		100%				
Thalweg centering at downstream of meander bend (Glide)		5	5	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	25	97%	0	0	97%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					1	25	97%	0	0	97%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	10	10			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6d. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Reach: Bull Creek Reach 3

Assessed Length: 1,676

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	15	15		100%				
	3. Meander Pool Condition	Depth Sufficient	16	16		100%				
		Length Appropriate	16	16		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15		100%				
Thalweg centering at downstream of meander bend (Glide)		16	16	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			7	327	80%	0	0	80%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					7	327	80%	0	0	80%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	28	28			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	11	11			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	11			91%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	17	17			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	28	28			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6e. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: UT1B

Assessed Length: 212

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	9	9		100%				
	3. Meander Pool Condition	Depth Sufficient	9	9		100%				
		Length Appropriate	9	9		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	9	9		100%				
Thalweg centering at downstream of meander bend (Glide)		9	9	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	0	0			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	8	8			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6f. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: UT1C

Assessed Length: 257

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			1	19	93%			
	2. Riffle Condition	Texture/Substrate	9	9		100%				
	3. Meander Pool Condition	Depth Sufficient	10	10		100%				
		Length Appropriate	10	10		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	9	9		100%				
Thalweg centering at downstream of meander bend (Glide)		10	10	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	11	11		100%				
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	8	8		100%				
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8		100%				
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	3	3		100%				
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	11	11		100%				

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6g. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: UT2

Assessed Length: 42

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	3	3		100%				
	3. Meander Pool Condition	Depth Sufficient	2	2		100%				
		Length Appropriate	2	2		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	2	2		100%				
Thalweg centering at downstream of meander bend (Glide)		2	2	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	0	0			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6h. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: UT2A

Assessed Length: 315

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			1	36	89%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	11		91%				
	3. Meander Pool Condition	Depth Sufficient	9	11		82%				
		Length Appropriate	11	11		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	10	10		100%				
Thalweg centering at downstream of meander bend (Glide)		11	11	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	9	10			90%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	10	12			83%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6i. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: UT2B

Assessed Length: 263

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	8	8		100%				
	3. Meander Pool Condition	Depth Sufficient	8	8		100%				
		Length Appropriate	8	8		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	8	8		100%				
Thalweg centering at downstream of meander bend (Glide)		8	8	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	4	4			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6j. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: UT2C

Assessed Length: 469

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	12	12		100%				
	3. Meander Pool Condition	Depth Sufficient	11	11		100%				
		Length Appropriate	11	11		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	11	11		100%				
Thalweg centering at downstream of meander bend (Glide)		11	11	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	13	13			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	11	11			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	13	13			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6k. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: UT3B

Assessed Length: 307

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			1	15	95%			
	2. Riffle Condition	Texture/Substrate	12	12		100%				
	3. Meander Pool Condition	Depth Sufficient	11	11		100%				
		Length Appropriate	11	11		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	9	9		100%				
Thalweg centering at downstream of meander bend (Glide)		11	11	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	54	82%	0	0	82%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					1	54	82%	0	0	82%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	16	16			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	11	11			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	11	11			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	16	16			100%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 6I. Visual Stream Morphology Stability Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Reach: UT3C

Assessed Length: 412

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			2	102	75%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	8	10		80%				
	3. Meander Pool Condition	Depth Sufficient	7	9		78%				
		Length Appropriate	9	9		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	9	9		100%				
Thalweg centering at downstream of meander bend (Glide)		9	9	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	7	7			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	13	15			87%			

¹Excludes constructed riffles since they are evaluated in Section 1.

Table 7. Vegetation Condition Assessment Table

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Planted Acreage 9.8

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas ¹	Very limited cover of both woody and herbaceous material	0.1	2	1.5	15.3%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 5, or 7 stem count criteria.	0.1	9	3.5	35.7%
Total			11	5.0	51.0%
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.1	0	0.0	0.0%
Cumulative Total			11	5.0	51.0%

¹All Bare Areas along Bull Creek Reach 3 include areas of Low stem density, however these areas will only be counted once under the Bare Areas Vegetation Category.

Easement Acreage 20.8

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1,000	0	0.00	0.0%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0.00	0.0%

STREAM PHOTOGRAPHS
Bull Creek
Monitoring Year 1



Photo Point 1 – looking upstream (11/03/2020)



Photo Point 1 – look downstream (11/03/2020)



Photo Point 2 – looking upstream (11/03/2020)



Photo Point 2 – looking downstream (11/03/2020)



Photo Point 3 – looking upstream (11/03/2020)



Photo Point 3 – looking downstream (11/03/2020)





Photo Point 4 – looking upstream (11/03/2020)



Photo Point 4 – looking downstream (11/03/2020)



Photo Point 4A – looking upstream (11/03/2020)



Photo Point 4A – looking downstream (11/03/2020)



Photo Point 4B – looking north (11/03/2020)



Photo Point 4C – looking west (11/03/2020)





Photo Point 4D – looking upstream (11/04/2020)



Photo Point 4D – looking downstream (11/04/2020)



Photo Point 5 – looking upstream (11/04/2020)



Photo Point 5 – looking downstream (11/04/2020)



Photo Point 6 – looking upstream (11/04/2020)



Photo Point 6 – looking downstream (11/04/2020)





Photo Point 7 – looking upstream (11/04/2020)



Photo Point 7 – looking downstream (11/04/2020)



Photo Point 8 – looking upstream (11/04/2020)



Photo Point 8 – looking downstream (11/04/2020)



Photo Point 9 – looking upstream (11/04/2020)



Photo Point 9 – looking downstream (11/04/2020)





Photo Point 10 – looking upstream (11/04/2020)



Photo Point 10 – looking downstream (11/04/2020)



Photo Point 11 – looking upstream (11/04/2020)



Photo Point 11 – looking downstream (11/04/2020)



STREAM PHOTOGRAPHS
UT1
Monitoring Year 1



Photo Point 12 – looking upstream (11/04/2020)



Photo Point 12 – looking downstream (11/04/2020)



Photo Point 12A – looking upstream (11/04/2020)



Photo Point 12A – looking downstream (11/04/2020)



Photo Point 13 – looking upstream (11/04/2020)



Photo Point 13 – looking downstream (11/04/2020)





Photo Point 14 – looking upstream (11/04/2020)



Photo Point 14 – looking downstream (11/04/2020)



Photo Point 14A – looking upstream (11/04/2020)



Photo Point 14A – looking downstream (11/04/2020)



Photo Point 14B – looking upstream (11/04/2020)



Photo Point 14B – looking downstream (11/04/2020)





Photo Point 15 – looking upstream (11/04/2020)



Photo Point 15 – looking downstream (11/04/2020)



STREAM PHOTOGRAPHS
UT2
Monitoring Year 1



Photo Point 16 – looking upstream (11/04/2020)



Photo Point 16 – looking downstream (11/04/2020)



Photo Point 17 – looking upstream (11/04/2020)



Photo Point 17 – looking downstream (11/04/2020)



Photo Point 18 – looking upstream (11/04/2020)



Photo Point 18 – looking downstream (11/04/2020)





Photo Point 19 – looking upstream (11/04/2020)

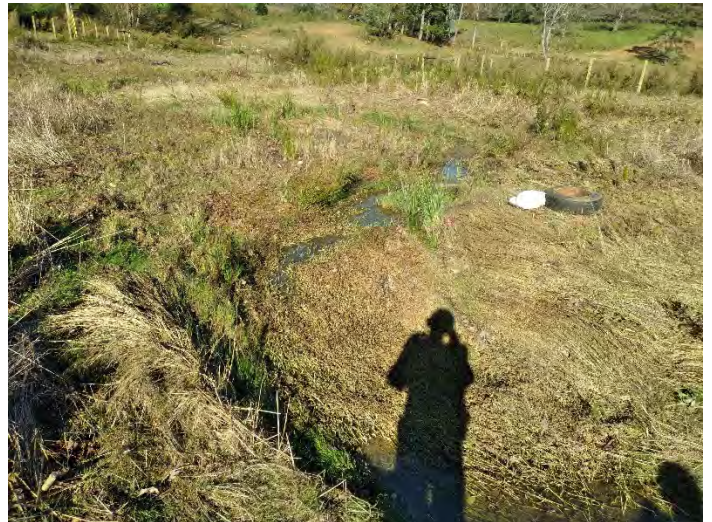


Photo Point 19 – looking downstream (11/04/2020)



Photo Point 20 – looking upstream (11/04/2020)



Photo Point 20 – looking downstream (11/04/2020)



STREAM PHOTOGRAPHS
UT3
Monitoring Year 1



Photo Point 21 – looking upstream (11/04/2020)



Photo Point 21 – looking downstream (11/04/2020)



Photo Point 22 – looking upstream (11/04/2020)



Photo Point 22 – looking downstream (11/04/2020)



Photo Point 22A – looking upstream (11/04/2020)



Photo Point 22A – looking downstream (11/04/2020)





Photo Point 23 – Wetland looking North (11/04/2020)



Photo Point 23 – Wetland looking East (11/04/2020)



Photo Point 23 – Wetland looking South (11/04/2020)



Photo Point 23 – Wetland looking West (11/04/2020)



Photo Point 24 – looking upstream (11/04/2020)



Photo Point 24 – looking downstream (11/04/2020)





Photo Point 25 – looking upstream (11/04/2020)



Photo Point 25 – looking downstream (11/04/2020)



VEGETATION PHOTOGRAPHS
Monitoring Year 1



Permanent Vegetation Plot 1 (10/27/2020)



Permanent Vegetation Plot 2 (10/27/2020)



Permanent Vegetation Plot 3 (10/26/2020)



Permanent Vegetation Plot 4 (10/26/2020)



Permanent Vegetation Plot 5 (10/27/2020)



Permanent Vegetation Plot 6 (10/27/2020)





Permanent Vegetation Plot 7 (10/26/2020)



Permanent Vegetation Plot 8 (10/27/2020)





Mobile Vegetation Plot 1 (North) (10/26/2020)



Mobile Vegetation Plot 2 (North) (10/26/2020)



Mobile Vegetation Plot 3 (North) (10/26/2020)



Mobile Vegetation Plot 4 (North) (10/27/2020)



Mobile Vegetation Plot 5 (North) (10/27/2020)



AREA OF CONCERN PHOTOGRAPHS
Monitoring Year 1



Bull Creek R2 Left Bank Scour/ Eroded at PP4 – looking downstream (12/30/2020)



Bull Creek R3 Structure Failure at Station 157+00 – Looking from Right bank (12/30/2020)



Bull Creek R3 Right Bank Scour at Station 165+50 – looking downstream (12/30/2020)



UTC3 Aggradation at Station 408+52 – looking upstream (12/30/2020)



CREST & STREAM GAGE PHOTOGRAPHS
Monitoring Year 1



Crest Gage 1 - (12/31/2020)



Crest Gage 2 - (12/31/2020)



Crest Gage 3 - (12/31/2020)



Crest Gage 4 - (12/31/2020)



Crest Gage 5 - (12/31/2020)



Stream Gage 1 - (12/31/2020)



APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Permanent Vegetation Plot	MY3 Success Criteria Met (Y/N)	Tract Mean (MY1 - 2020)	
1	Y	75%	77%
2	Y		
3	Y		
4	N		
5	Y		
6	Y		
7	Y		
8	N		
Mobile Vegetation Plot	MY3 Success Criteria Met (Y/N)		
1	Y	80%	
2	Y		
3	Y		
4	Y		
5	N		

Table 9. CVS Permanent Vegetation Plot Metadata

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Report Prepared By	Henry Reed
Date Prepared	11/11/2020 16:05
Database Name	cvs-eep-entrytool-v2.5.0 Key Mill MY1.mdb
Database Location	Q:\ActiveProjects\005-02165 Key Mill\Monitoring\Monitoring Year 1; 2020\Vegetation Assessment
Computer Name	HENRY
File Size	72605696
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	100025
Project Name	Key Mill Mitigation Site
Description	Full delivery mitigation project in Surry County, NC.
Sampled Plots	8

Table 10a. Planted and Total Stem Counts

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Current Permanent Vegetation Plot Data (MY1 2020)														
Scientific Name	Common Name	Species Type	Permanent Plot 1			Permanent Plot 2			Permanent Plot 3			Permanent Plot 4		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	Red Maple	Tree			1			1						
<i>Acer saccharinum</i>	Silver Maple, Soft Maple	Tree												
<i>Asimina triloba</i>	Common Pawpaw, Indian-banana	Shrub Tree				1	1	1						
<i>Betula nigra</i>	River Birch, Red Birch	Tree	3	3	6	3	3	3	6	6	6			
<i>Carpinus caroliniana</i>	Ironwood	Shrub Tree	1	1	1									
<i>Fagus grandifolia</i>	American Beech	Tree	2	2	2									
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	1	1	1	2	2	2						
<i>Ilex opaca</i>	American Holly, Christmas Holly	Shrub Tree												
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree			3			2						
<i>Nyssa sylvatica</i>	Sour Gum, Black Gum, Pepperidge	Tree							5	5	5			
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree			50			50	3	3	3	1	1	1
<i>Quercus falcata</i>	Spanish Oak, Southern Red Oak	Tree							1	1	1			
<i>Quercus rubra</i>	Northern Red Oak	Tree	3	3	3	2	2	2	1	1	1			
<i>Salix nigra</i>	Black Willow	Tree						1						
<i>Viburnum dentatum</i>	Arrow-wood	Shrub Tree	1	1	1	1	1	1						
Stem count			11	11	68	9	9	63	16	16	16	1	1	1
size (ares)			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247		
Species count			6	6	9	5	5	9	5	5	5	1	1	1
Stems per ACRE			445	445	2,753	364	364	2,551	648	648	648	41	41	41

Current Permanent Vegetation Plot Data (MY1 2020)														
Scientific Name	Common Name	Species Type	Permanent Plot 5			Permanent Plot 6			Permanent Plot 7			Permanent Plot 8		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	Red Maple	Tree			10			12			5			1
<i>Acer saccharinum</i>	Silver Maple, Soft Maple	Tree							2	2	2			
<i>Asimina triloba</i>	Common Pawpaw, Indian-banana	Shrub Tree												
<i>Betula nigra</i>	River Birch, Red Birch	Tree	3	3	4	2	2	2				2	2	2
<i>Carpinus caroliniana</i>	Ironwood	Shrub Tree												
<i>Fagus grandifolia</i>	American Beech	Tree												
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree				2	2	2	2	2	2	2	2	2
<i>Ilex opaca</i>	American Holly, Christmas Holly	Shrub Tree										1	1	1
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree						1			3			
<i>Nyssa sylvatica</i>	Sour Gum, Black Gum, Pepperidge	Tree	2	2	2				1	1	1			
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	4	4	5	4	4	5	1	1	6			
<i>Quercus falcata</i>	Spanish Oak, Southern Red Oak	Tree	1	1	1	2	2	2	1	1	1			
<i>Quercus rubra</i>	Northern Red Oak	Tree				2	2	2	1	1	1	2	2	2
<i>Salix nigra</i>	Black Willow	Tree												
<i>Viburnum dentatum</i>	Arrow-wood	Shrub Tree	1	1	1	3	3	3						
Stem count			11	11	23	15	15	29	8	8	21	7	7	8
size (ares)			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247		
Species count			5	5	6	6	6	8	6	6	8	4	4	5
Stems per ACRE			445	445	931	607	607	1,174	324	324	850	283	283	324

Color for Density

- Exceeds requirements by 10%
- Exceeds requirements, but by less than 10%
- Fails to meet requirements, by less than 10%
- Fails to meet requirements by more than 10%
- Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

Table 10b. Planted and Total Stem Counts

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Permanent Vegetation Plot Annual Mean								
Scientific Name	Common Name	Species Type	MY1 (10/2020)			MY0 (4/2020)		
			PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer rubrum</i>	Red Maple	Tree			30			
<i>Acer saccharinum</i>	Silver Maple, Soft Maple	Tree	2	2	2	2	2	2
<i>Asimina triloba</i>	Common Pawpaw, Indian-banana	Shrub Tree	1	1	1	5	5	5
<i>Betula nigra</i>	River Birch, Red Birch	Tree	19	19	23	16	16	16
<i>Carpinus caroliniana</i>	Ironwood	Shrub Tree	1	1	1	4	4	4
<i>Fagus grandifolia</i>	American Beech	Tree	2	2	2	4	4	4
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	9	9	9	12	12	12
<i>Ilex opaca</i>	American Holly, Christmas Holly	Shrub Tree	1	1	1	6	6	6
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree			9			
<i>Nyssa sylvatica</i>	Sour Gum, Black Gum, Pepperidge	Tree	8	8	8	6	6	6
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	13	13	120	16	16	16
<i>Quercus falcata</i>	Spanish Oak, Southern Red Oak	Tree	5	5	5	7	7	7
<i>Quercus rubra</i>	Northern Red Oak	Tree	11	11	11	16	16	16
<i>Salix nigra</i>	Black Willow	Tree			1			
<i>Viburnum dentatum</i>	Arrow-wood	Shrub Tree	6	6	6	15	15	15
Stem count			78	78	229	109	109	109
size (ares)			8			8		
size (ACRES)			0.1977			0.1977		
Species count			12	12	15	12	12	12
Stems per ACRE			395	395	1,158	551	551	551

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

Table 10c. Planted and Total Stem Counts

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Current Mobile Vegetation Plot (MP) Data (MY1 2020)							Annual Means		
Scientific Name	Common Name	Species Type	MP1	MP2	MP3	MP4	MVP5	MY1 (10/2020)	MY0 (4/2020)
			PnoLS	PnoLS	PnoLS	PnoLS	PnoLS	PnoLS	PnoLS
<i>Acer saccharinum</i>	Silver Maple, Soft Maple	Tree				3		3	1
<i>Asimina triloba</i>	Common Pawpaw, Indian-banana	Shrub Tree				1		1	4
<i>Betula nigra</i>	River Birch, Red Birch	Tree	3	2	6	3		14	15
<i>Carpinus caroliniana</i>	Ironwood	Shrub Tree							5
<i>Fagus grandifolia</i>	American Beech	Tree							4
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	3		2		1	6	7
<i>Ilex opaca</i>	American Holly, Christmas Holly	Shrub Tree							4
<i>Nyssa sylvatica</i>	Sour Gum, Black Gum, Pepperidge	Tree		3	3			6	4
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	5	4	8		2	19	4
<i>Quercus falcata</i>	Spanish Oak, Southern Red Oak	Tree	1	1	1	1	1	5	1
<i>Quercus rubra</i>	Northern Red Oak	Tree	2	3		2	2	9	16
<i>Viburnum dentatum</i>	Arrow-wood	Shrub Tree							5
Stem count			14	13	20	10	6	63	70
size (ares)			1	1	1	1	1	5	5
size (ACRES)			0.0247	0.0247	0.0247	0.0247	0.0247	0.1236	0.1236
Species count			5	5	5	5	4	8	12
Stems per ACRE			567	526	809	405	243	510	567

Overall Site Annual Mean				
Scientific Name	Common Name	Species Type	MY1 (10/2020)	MY0 (4/2020)
			PnoLS	PnoLS
<i>Acer saccharinum</i>	Silver Maple, Soft Maple	Tree	5	3
<i>Asimina triloba</i>	Common Pawpaw, Indian-banana	Shrub Tree	2	9
<i>Betula nigra</i>	River Birch, Red Birch	Tree	33	31
<i>Carpinus caroliniana</i>	Ironwood	Shrub Tree	1	9
<i>Fagus grandifolia</i>	American Beech	Tree	2	8
<i>Fraxinus pennsylvanica</i>	Green Ash, Red Ash	Tree	15	19
<i>Ilex opaca</i>	American Holly, Christmas Holly	Shrub Tree	1	10
<i>Nyssa sylvatica</i>	Sour Gum, Black Gum, Pepperidge	Tree	14	10
<i>Platanus occidentalis</i>	Sycamore, Plane-tree	Tree	32	20
<i>Quercus falcata</i>	Spanish Oak, Southern Red Oak	Tree	10	8
<i>Quercus rubra</i>	Northern Red Oak	Tree	20	32
<i>Viburnum dentatum</i>	Arrow-wood	Shrub Tree	6	20
Stem count			141	179
size (ares)			13	13
size (ACRES)			0.3212	0.3212
Species count			12	12
Stems per ACRE			439	557

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%
Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

APPENDIX 4. Morphological Summary Data and Plots

Table 11c. Reference Reach Data Summary

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Reference Reach Data																		
Parameter	Gage	UT to Catawba R1		UT to Catawba R2		UT to Sandy Run		Box Creek		UT to Kelly Branch		UT to Gap Branch		UT to South Fork Catawba		Timber Tributary		
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
Dimension and Substrate - Riffle																		
Bankfull Width (ft)	N/A	9.7	12.4	12.3	7.3	7.8	23.5	7.9	6.2	8.2	11.2	8.9						
Floodprone Width (ft)		52.0	79.0	53.0	12.2	15.6	76.3	9.1	20.9	14.7	18.5	13.6						
Bankfull Mean Depth		1.2	1.4	1.1	0.7	0.8	1.2	0.7	0.6	1.0	1.4	0.5						
Bankfull Max Depth		1.7	1.7	1.1	1.4	1.9	1.1	1.0	1.5	1.6	0.7							
Bankfull Cross-sectional Area (ft ²)		11.4	17.5	13.2	5.7	6.2	28.9	5.7	3.8	10.7	11.1	4.6						
Width/Depth Ratio		8.1	8.9	11.5	6.6	9.8	19.1	10.9	10.1	6.0	11.7	17.0	17.5					
Entrenchment Ratio		5.4	6.4	4.3	1.6	2.1	3.3	1.2	3.4	1.5	1.9	1.5						
Bank Height Ratio		0.9	1.4	0.8	1.3	1.7	2.6	1.5	2.5	1.0	2.1	1.0	2.4					
D50 (mm)		1.8	75.9	19.0	22	N/A	19.0	38.0	6.5									
Profile																		
Riffle Length (ft)	N/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
Riffle Slope (ft/ft)		0.0114	0.0605	0.0142	0.3451	0.0036	0.0420	0.0063	0.0770	N/A	0.0110	0.1400	0.0120	0.0320	0.0230	0.1700		
Pool Length (ft)		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Pool Max Depth (ft)		2.5	N/A	1.3	1.5	4.4	N/A	1.5	2.4	N/A								
Pool Spacing (ft)		31	60	19	46	9	55	29	88	N/A	18	27	36	149	13	49		
Pool Volume (ft ³)		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Pattern																		
Channel Beltwidth (ft)	N/A	55	23	24	60	62	88	18	34	N/A	25	56	N/A					
Radius of Curvature (ft)		31	56	29	52	14	29	7	38	8	26	N/A	9	28	N/A			
Rc/Bankfull Width		2.8	5.1	2.4	4.2	1.9	3.8	0.3	1.6	N/A	N/A	0.9	2.9	N/A				
Meander Length (ft)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				
Meander Width Ratio		4.4	5.7	1.8	3.3	7.6	2.6	3.7	2.3	4.3	N/A	2.6	5.8	N/A				
Substrate, Bed and Transport Parameters																		
Ri%/Ru%/P%/G%/S%	N/A																	
SC%/Sa%/G%/C%/B%/Be%																		
d16/d35/d50/d84/d95/d100		0.3/0.4/1.8/12.8/25.2/90.0	0.5/29.8/75.9/170.8/332.0/2048.0	0.062/1/19/76/150	4.1/11/22/50/78	N/A	0.37/8/19.02/102.3/256/>2048	8.9/27/38/71/150	0.49/3.5/6.5/48.0/83.0/128.0									
Reach Shear Stress (Competency) lb/ft ²																		
Max part size (mm) mobilized at bankfull																		
Stream Power (Capacity) W/m ²																		
Additional Reach Parameters																		
Drainage Area (SM)	N/A	1.6	1.6	0.2	2.1	0.1	0.0	0.2	0.1									
Watershed Impervious Cover Estimate (%)		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Rosgen Classification		E5	E3b/ C3b	E4	C4	B4/ B4a	B4a or A4	B4c	B4									
Bankfull Velocity (fps)		5.5	6.1	3.4	3.4	5.9	5.0	2.7	3.7									
Bankfull Discharge (cfs)		80	80	20	99	23	19	26	32	17								
Q-NFF regression (2-yr)																		
Q-USGS extrapolation (1.2-yr)																		
Q-Mannings																		
Valley Length (ft)		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Channel Thalweg Length (ft)		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Sinuosity		1.1	1.1	1.6	1.3	1.2	---	1.3	N/A									
Water Surface Slope (ft/ft)		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bankfull/Channel Slope (ft/ft)		0.0046	0.0270	0.0150	0.0084	0.0300	0.0650	0.0680	0.0067									

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided N/A: Not Applicable

Table 13a. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Bull Creek Reach 1A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	19.4		20.6													
Floodprone Width (ft)	70		70													
Bankfull Mean Depth (ft)	1.5		1.3													
Bankfull Max Depth (ft)	2.8		2.8													
Bankfull Cross-sectional Area (ft ²)	28.2		26.7													
Width/Depth Ratio	13.4		16.0													
Entrenchment Ratio	3.6		3.4													
Bank Height Ratio	1.0		1.0													
D ₅₀ (mm)	107.3															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.005	0.014														
Pool Length (ft)																
Pool Max Depth (ft)	4.3	5.0														
Pool Spacing (ft)	230.4															
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	68.8	89.4														
Radius of Curvature (ft)	35.0	50.0														
Rc/Bankfull Width (ft/ft)	1.8	2.6														
Meander Length (ft)	192.2	207.2														
Meander Width Ratio	3.5	4.6														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.1/5.6/20.7/113.8/171.4/362.0		0.1/0.2/11.0/120.1/174.0/512.0													
Reach Shear Stress (Competency) lb/ft ²	0.66															
Max part size (mm) mobilized at bankfull	29.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	1.63															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C3															
Bankfull Velocity (fps)	3.8															
Bankfull Discharge (cfs)	107.0															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	421															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0071															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13b. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Bull Creek Reach 1B

Parameter	As-Built/Baseline		MY1 ²		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	17.3		17.2													
Floodprone Width (ft)	68		68													
Bankfull Mean Depth (ft)	1.7		1.6													
Bankfull Max Depth (ft)	2.9		2.7													
Bankfull Cross-sectional Area (ft ²)	29.7		27.3													
Width/Depth Ratio	10.1		10.8													
Entrenchment Ratio	3.9		3.9													
Bank Height Ratio	1.0		1.0													
D ₅₀ (mm)	82.2															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.013	0.026														
Pool Length (ft)																
Pool Max Depth (ft)	3.1	4.6														
Pool Spacing (ft)	76.6	110.1														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	53.4	81.3														
Radius of Curvature (ft)	32.0	50.0														
Rc/Bankfull Width (ft/ft)	1.8	2.9														
Meander Length (ft)	179.2	199.8														
Meander Width Ratio	3.1	4.6														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.1/5.6/28.5/ 151.8/256.0/ 362.0		0.1/0.3/37.9/168.1/304.4 /512.0													
Reach Shear Stress (Competency) lb/ft ²	1.32															
Max part size (mm) mobilized at bankfull	60.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	1.68															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C3															
Bankfull Velocity (fps)	5.6															
Bankfull Discharge (cfs)	166															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	722															
Sinuosity	1.22															
Bankfull/Channel Slope (ft/ft)	0.0124															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

²Repairs conducted during MY1 resulted in a slight shift in the cross-section alignment between the cross-section pins; therefore the plot was adjusted so that cross-sectional areas lined up for easier comparison.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13c. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Bull Creek Reach 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	16.4		17.9													
Floodprone Width (ft)	56		56													
Bankfull Mean Depth (ft)	1.4		1.6													
Bankfull Max Depth (ft)	2.5		2.9													
Bankfull Cross-sectional Area (ft ²)	22.9		29.0													
Width/Depth Ratio	11.8		11.0													
Entrenchment Ratio	3.4		3.1													
Bank Height Ratio	1.0		1.1													
D ₅₀ (mm)	135.9															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.027	0.038														
Pool Length (ft)																
Pool Max Depth (ft)	3.3	4.2														
Pool Spacing (ft)	59.3	99.2														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	45.0	69.2														
Radius of Curvature (ft)	30.0	50.5														
Rc/Bankfull Width (ft/ft)	1.9	3.2														
Meander Length (ft)	149.3	171.4														
Meander Width Ratio	2.8	4.3														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/0.3/11.0/ 222.4/346.7/ 512.0		SC/0.4/32.0/118.0/256.0 /1024.0													
Reach Shear Stress (Competency) lb/ft ²	2.17															
Max part size (mm) mobilized at bankfull	89.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	1.79															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C3b															
Bankfull Velocity (fps)	6.6															
Bankfull Discharge (cfs)	151															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	418															
Sinuosity	1.22															
Bankfull/Channel Slope (ft/ft)	0.0249															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13d. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Bull Creek Reach 3

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	19.6	21.2	21.4	23.5												
Floodprone Width (ft)	94	99	84	99												
Bankfull Mean Depth (ft)	1.6	1.8	1.2	1.5												
Bankfull Max Depth (ft)	2.7	3.0	2.4	2.5												
Bankfull Cross-sectional Area (ft ²)	33.5	36.0	29.2	31.7												
Width/Depth Ratio	10.7	13.4	14.5	18.9												
Entrenchment Ratio	4.3	4.7	3.6	4.6												
Bank Height Ratio	1.0	1.0	0.9	1.0												
D ₅₀ (mm)	56.4	56.9														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.004	0.020														
Pool Length (ft)																
Pool Max Depth (ft)	3.0	5.4														
Pool Spacing (ft)	60.8	187.8														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	39.0	108.4														
Radius of Curvature (ft)	36.0	85.6														
Rc/Bankfull Width (ft/ft)	1.7	4.1														
Meander Length (ft)	177.0	312.4														
Meander Width Ratio	1.9	5.2														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.2/0.5/19.0/96.0/146.7/ 362.0		0.1/0.2/22.6/143.4/256.0/512.0													
Reach Shear Stress (Competency) lb/ft ²	0.92															
Max part size (mm) mobilized at bankfull	42.0	47.0														
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	2.02															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C3															
Bankfull Velocity (fps)	4.7	5.1														
Bankfull Discharge (cfs)	157	184														
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,676															
Sinuosity	1.28															
Bankfull/Channel Slope (ft/ft)	0.0092															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13e. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

UT1B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle²																
Bankfull Width (ft)	6.8		6.3													
Floodprone Width (ft)	24		27													
Bankfull Mean Depth (ft)	0.6		0.6													
Bankfull Max Depth (ft)	0.9		1.2													
Bankfull Cross-sectional Area (ft ²)	3.9		3.7													
Width/Depth Ratio	11.7		10.8													
Entrenchment Ratio	3.5		4.3													
Bank Height Ratio	1.0		1.0													
D ₅₀ (mm)	33.9															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.029	0.060														
Pool Length (ft)																
Pool Max Depth (ft)	0.9	2.0														
Pool Spacing (ft)	19.9	63.0														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	N/A ¹	N/A ¹														
Radius of Curvature (ft)	N/A ¹	N/A ¹														
Rc/Bankfull Width (ft/ft)	N/A ¹	N/A ¹														
Meander Length (ft)	N/A ¹	N/A ¹														
Meander Width Ratio	N/A ¹	N/A ¹														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.3/6.4/12.8/45.0/101.2		0.3/8.0/22.6/69.0/113.8													
	/ 256.0		/180.0													
Reach Shear Stress (Competency) lb/ft ²	1.31															
Max part size (mm) mobilized at bankfull	53.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.16															
Watershed Impervious Cover Estimate (%)	<1%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	4.4															
Bankfull Discharge (cfs)	17															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	212															
Sinuosity	1.10															
Bankfull/Channel Slope (ft/ft)	0.0349															

¹Pattern data is not applicable for A-type and B-type channels

²MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13f. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

UT1C

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle²																
Bankfull Width (ft)	6.9		6.4													
Floodprone Width (ft)	34		35													
Bankfull Mean Depth (ft)	0.8		1.2													
Bankfull Max Depth (ft)	1.3		1.9													
Bankfull Cross-sectional Area (ft ²)	5.7		8.0													
Width/Depth Ratio	8.3		5.2													
Entrenchment Ratio	4.9		5.5													
Bank Height Ratio	1.0		1.3													
D ₅₀ (mm)	56.2															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.011	0.053														
Pool Length (ft)																
Pool Max Depth (ft)	1.2	2.4														
Pool Spacing (ft)	18.2	51.5														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	N/A ¹	N/A ¹														
Radius of Curvature (ft)	N/A ¹	N/A ¹														
Rc/Bankfull Width (ft/ft)	N/A ¹	N/A ¹														
Meander Length (ft)	N/A ¹	N/A ¹														
Meander Width Ratio	N/A ¹	N/A ¹														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.3/1.8/8.9/ 87.3/137.0/ 1024.0		0.3/2.0/17.7/83.2/128.0 /180.0													
Reach Shear Stress (Competency) lb/ft ²	2.03															
Max part size (mm) mobilized at bankfull	94.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.16															
Watershed Impervious Cover Estimate (%)	<1%															
Rosgen Classification	B4a															
Bankfull Velocity (fps)	6.2															
Bankfull Discharge (cfs)	35															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	257															
Sinuosity	1.10															
Bankfull/Channel Slope (ft/ft)	0.0407															

¹Pattern data is not applicable for A-type and B-type channels

²MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13g. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

UT2A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle²																
Bankfull Width (ft)	6.8		7.3													
Floodprone Width (ft)	30		31													
Bankfull Mean Depth (ft)	0.5		0.4													
Bankfull Max Depth (ft)	0.8		0.7													
Bankfull Cross-sectional Area (ft ²)	3.4		3.1													
Width/Depth Ratio	13.9		17.3													
Entrenchment Ratio	4.4		4.3													
Bank Height Ratio	1.0		0.9													
D ₅₀ (mm)	58.6															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.005	0.035														
Pool Length (ft)																
Pool Max Depth (ft)	1.4	2.2														
Pool Spacing (ft)	18.6	39.9														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	N/A ¹	N/A ¹														
Radius of Curvature (ft)	N/A ¹	N/A ¹														
Rc/Bankfull Width (ft/ft)	N/A ¹	N/A ¹														
Meander Length (ft)	N/A ¹	N/A ¹														
Meander Width Ratio	N/A ¹	N/A ¹														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/0.1/0.8/ 64.0/ 85.4/128.0		0.2/0.4/11.0/62.0/111.2 /180.0													
Reach Shear Stress (Competency) lb/ft ²	0.74															
Max part size (mm) mobilized at bankfull	36.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.04															
Watershed Impervious Cover Estimate (%)	<1%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	3.6															
Bankfull Discharge (cfs)	12															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	315															
Sinuosity	1.10															
Bankfull/Channel Slope (ft/ft)	0.0237															

¹Pattern data is not applicable for A-type and B-type channels

²MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13h. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

UT2B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	8.1		8.8													
Floodprone Width (ft)	32		31													
Bankfull Mean Depth (ft)	0.6		0.5													
Bankfull Max Depth (ft)	1.1		1.0													
Bankfull Cross-sectional Area (ft ²)	4.8		4.5													
Width/Depth Ratio	11.7		17.1													
Entrenchment Ratio	3.5		3.5													
Bank Height Ratio	1.0		1.0													
D ₅₀ (mm)	69.3															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.005	0.037														
Pool Length (ft)																
Pool Max Depth (ft)	1.6	2.2														
Pool Spacing (ft)	20.5	44.1														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	19.0	26.0														
Radius of Curvature (ft)	12.0	15.0														
Rc/Bankfull Width (ft/ft)	2.0	2.5														
Meander Length (ft)	56.0	76.0														
Meander Width Ratio	3.2	4.3														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/0.1/1.3/ 85.4/137.0/256.0		SC/0.1/0.4/77.1/121.7/ 180.0													
Reach Shear Stress (Competency) lb/ft ²	0.69															
Max part size (mm) mobilized at bankfull	35.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.05															
Watershed Impervious Cover Estimate (%)	<1%															
Rosgen Classification	C4b															
Bankfull Velocity (fps)	3.7															
Bankfull Discharge (cfs)	18															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	263															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0184															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(--): Data was not provided

N/A: Not Applicable

Table 13i. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

UT2C

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	7.8		8.2													
Floodprone Width (ft)	48		50													
Bankfull Mean Depth (ft)	0.7		0.7													
Bankfull Max Depth (ft)	1.1		1.2													
Bankfull Cross-sectional Area (ft ²)	5.8		5.8													
Width/Depth Ratio	10.5		11.6													
Entrenchment Ratio	6.2		6.1													
Bank Height Ratio	1.0		1.0													
D ₅₀ (mm)	49.0															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.013	0.051														
Pool Length (ft)																
Pool Max Depth (ft)	1.4	2.1														
Pool Spacing (ft)	26.1	55.9														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	23.0	34.0														
Radius of Curvature (ft)	13.0	17.0														
Rc/Bankfull Width (ft/ft)	1.9	2.5														
Meander Length (ft)	73.0	90.0														
Meander Width Ratio	3.3	4.9														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₀ /D ₂₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/0.1/8.9/92.5/124.6/256.0		SC/11.0/24.2/79.2/119.3/256.0													
Reach Shear Stress (Competency) lb/ft ²		0.59														
Max part size (mm) mobilized at bankfull		28.0														
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)		0.05														
Watershed Impervious Cover Estimate (%)		<1%														
Rosgen Classification		C4														
Bankfull Velocity (fps)		3.3														
Bankfull Discharge (cfs)		19														
Valley Slope (ft/ft)		---														
Channel Thalweg Length (ft)		469														
Sinuosity		1.30														
Bankfull/Channel Slope (ft/ft)		0.0134														

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13j. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

UT3B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle²																
Bankfull Width (ft)	6.9		7.4													
Floodprone Width (ft)	21		61													
Bankfull Mean Depth (ft)	0.5		0.8													
Bankfull Max Depth (ft)	0.8		1.7													
Bankfull Cross-sectional Area (ft ²)	3.5		6.1													
Width/Depth Ratio	13.4		8.9													
Entrenchment Ratio	3.1		8.3													
Bank Height Ratio	1.0		1.4													
D ₅₀ (mm)	21.1															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.011	0.053														
Pool Length (ft)																
Pool Max Depth (ft)	0.9	2.6														
Pool Spacing (ft)	19.5	30.4														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	N/A ¹	N/A ¹														
Radius of Curvature (ft)	N/A ¹	N/A ¹														
Rc/Bankfull Width (ft/ft)	N/A ¹	N/A ¹														
Meander Length (ft)	N/A ¹	N/A ¹														
Meander Width Ratio	N/A ¹	N/A ¹														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.8/4.2/9.4/64.0/165.3/362.0		0.7/13.3/27.3/81.3/146.7/256.0													
Reach Shear Stress (Competency) lb/ft ²	0.99															
Max part size (mm) mobilized at bankfull	50.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.07															
Watershed Impervious Cover Estimate (%)	<1%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	4.2															
Bankfull Discharge (cfs)	15															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	307															
Sinuosity	1.10															
Bankfull/Channel Slope (ft/ft)	0.0317															

¹Pattern data is not applicable for A-type and B-type channels

²MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13k. Monitoring Data - Stream Reach Data Summary

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

UT3C

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	8.8		8.4													
Floodprone Width (ft)	56		56													
Bankfull Mean Depth (ft)	0.8		0.8													
Bankfull Max Depth (ft)	1.3		1.4													
Bankfull Cross-sectional Area (ft ²)	6.8		6.4													
Width/Depth Ratio	11.3		11.1													
Entrenchment Ratio	6.3		6.6													
Bank Height Ratio	1.0		1.0													
D ₅₀ (mm)	28.2															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.008	0.025														
Pool Length (ft)																
Pool Max Depth (ft)	1.8	2.5														
Pool Spacing (ft)	17.4	79.9														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	17.2	44.8														
Radius of Curvature (ft)	12.0	22.0														
Rc/Bankfull Width (ft/ft)	1.6	2.9														
Meander Length (ft)	65.2	118.0														
Meander Width Ratio	2.2	6.0														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₀ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.1/0.3/4.0/73.4/148.1/256.0		0.1/0.5/19.5/84.6/151.8/1024.0													
Reach Shear Stress (Competency) lb/ft ²	0.66															
Max part size (mm) mobilized at bankfull	28.0															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.07															
Watershed Impervious Cover Estimate (%)	<1%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	3.4															
Bankfull Discharge (cfs)	23															
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	412															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0132															

¹MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

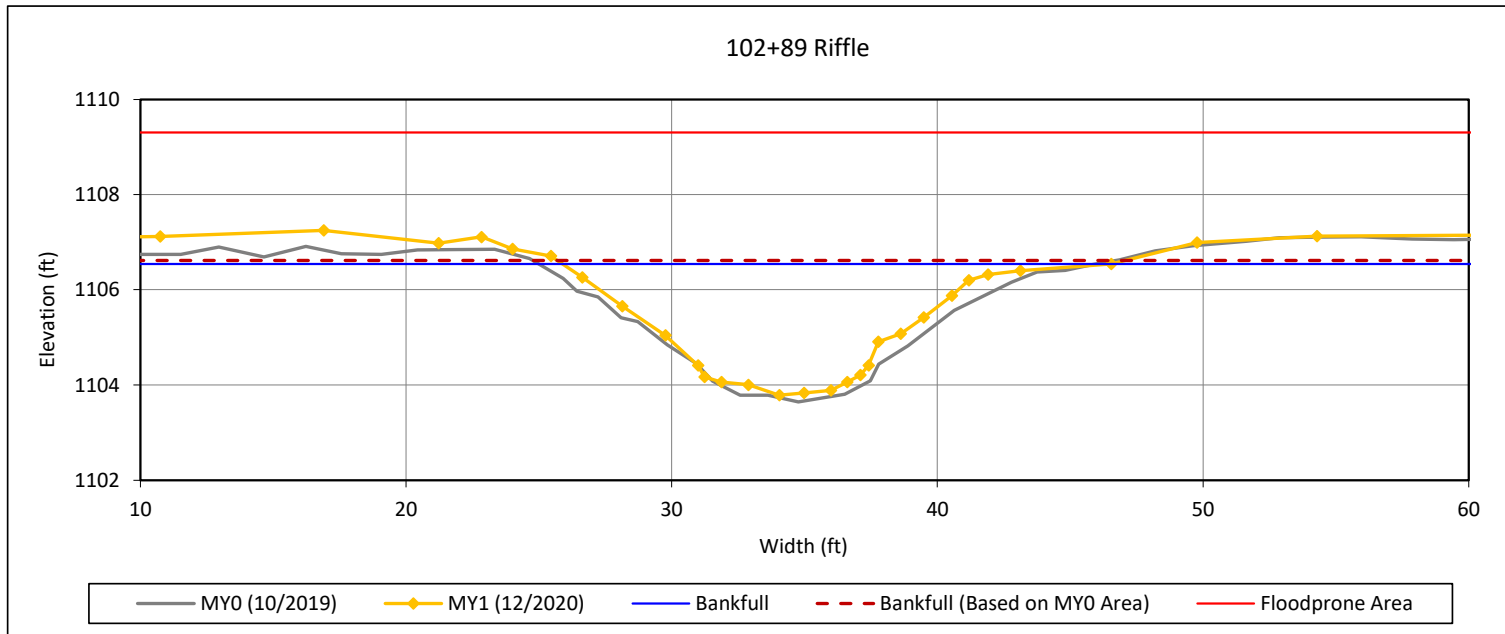
(---): Data was not provided

N/A: Not Applicable

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 1-Bull Creek Reach 1A



Bankfull Dimensions

26.7	x-section area (ft.sq.)
20.6	width (ft)
1.3	mean depth (ft)
2.8	max depth (ft)
21.8	wetted perimeter (ft)
1.2	hydraulic radius (ft)
16.0	width-depth ratio
70.0	W flood prone area (ft)
3.4	entrenchment ratio
1.0	low bank height ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering



View Downstream

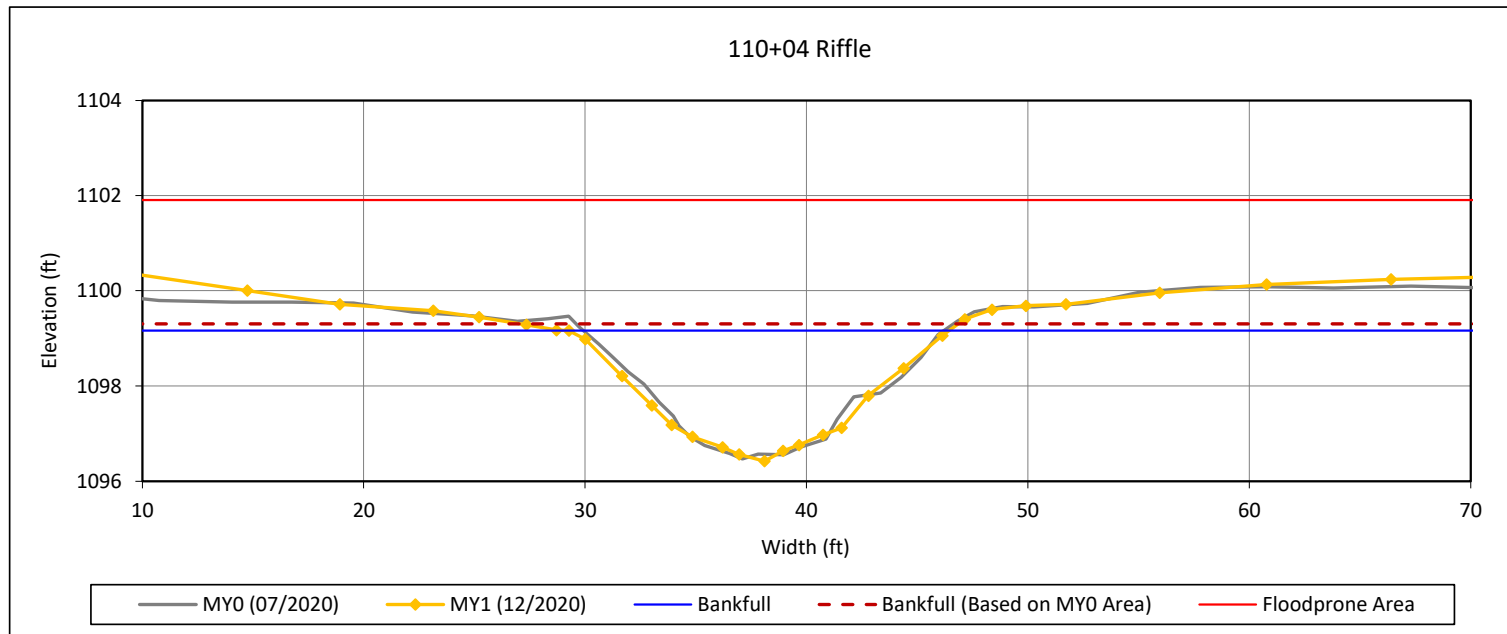
Cross-Section Plots

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Cross-Section 2-Bull Creek Reach 1B



Bankfull Dimensions

27.3	x-section area (ft.sq.)
17.2	width (ft)
1.6	mean depth (ft)
2.7	max depth (ft)
18.2	wetted perimeter (ft)
1.5	hydraulic radius (ft)
10.8	width-depth ratio
67.6	W flood prone area (ft)
3.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 12/2020

Field Crew: Wildlands Engineering

*Repairs conducted during MY1 resulted in a slight shift in the cross-section alignment between the MY0 and MY1 cross-section pin locations; therefore the plot was adjusted so that the cross-sections lined up for easier comparison.



View Downstream

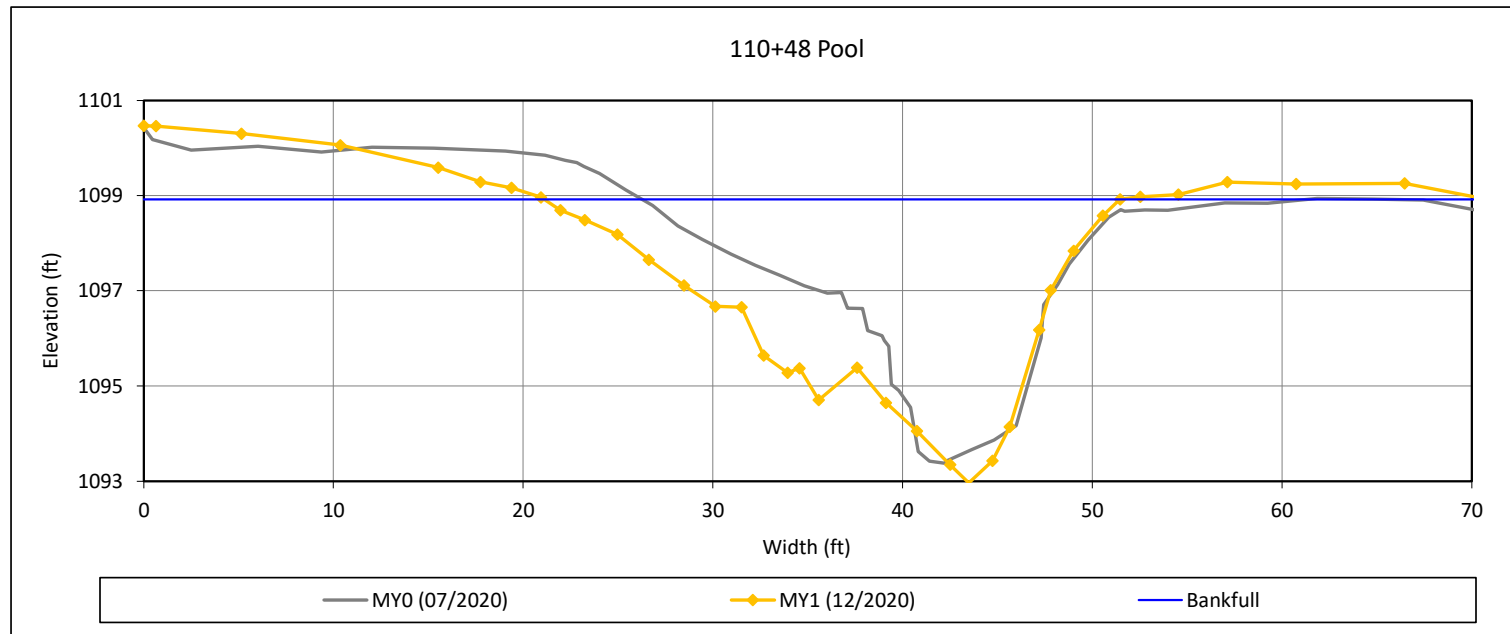
Cross-Section Plots

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Cross-Section 3-Bull Creek Reach 1B



Bankfull Dimensions

84.5	x-section area (ft.sq.)
30.4	width (ft)
2.8	mean depth (ft)
6.0	max depth (ft)
34.1	wetted perimeter (ft)
2.5	hydraulic radius (ft)
10.9	width-depth ratio

Survey Date: 12/2020

Field Crew: Wildlands Engineering

*Repairs were conducted on the left bank of XS3 during MY1 prior to the collection of the MY1 cross-section data and photos. The MY1 plot line shows the repaired cross-sectional profile. Also the station number for XS3 was incorrectly reported on the MY0 cross-section plot, it should have been reported as Station 110+48 as shown in the above plot.



View Downstream

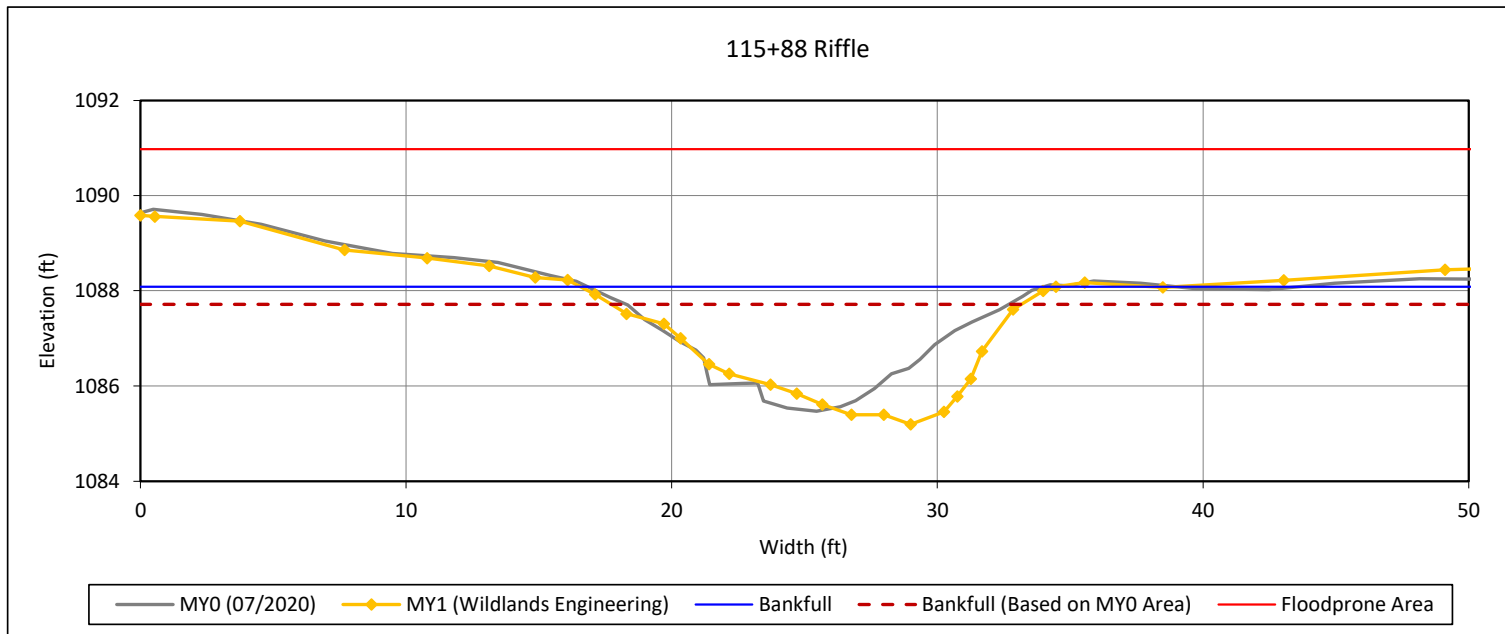
Cross-Section Plots

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Cross-Section 4-Bull Creek Reach 2



Bankfull Dimensions

29.0	x-section area (ft.sq.)
17.9	width (ft)
1.6	mean depth (ft)
2.9	max depth (ft)
19.2	wetted perimeter (ft)
1.5	hydraulic radius (ft)
11.0	width-depth ratio
55.6	W flood prone area (ft)
3.1	entrenchment ratio
1.1	low bank height ratio

Survey Date: 12/2020

Field Crew: Wildlands Engineering

*Repairs were conducted on the right bank of XS4 during MY1 prior to the collection of the MY1 cross-section data and photos. The MY1 plot line shows the repaired cross-sectional profile. Also the station number for XS4 was incorrectly reported on the MY0 cross-section plot, it should have been reported as Station 115+88 as shown in the above plot.

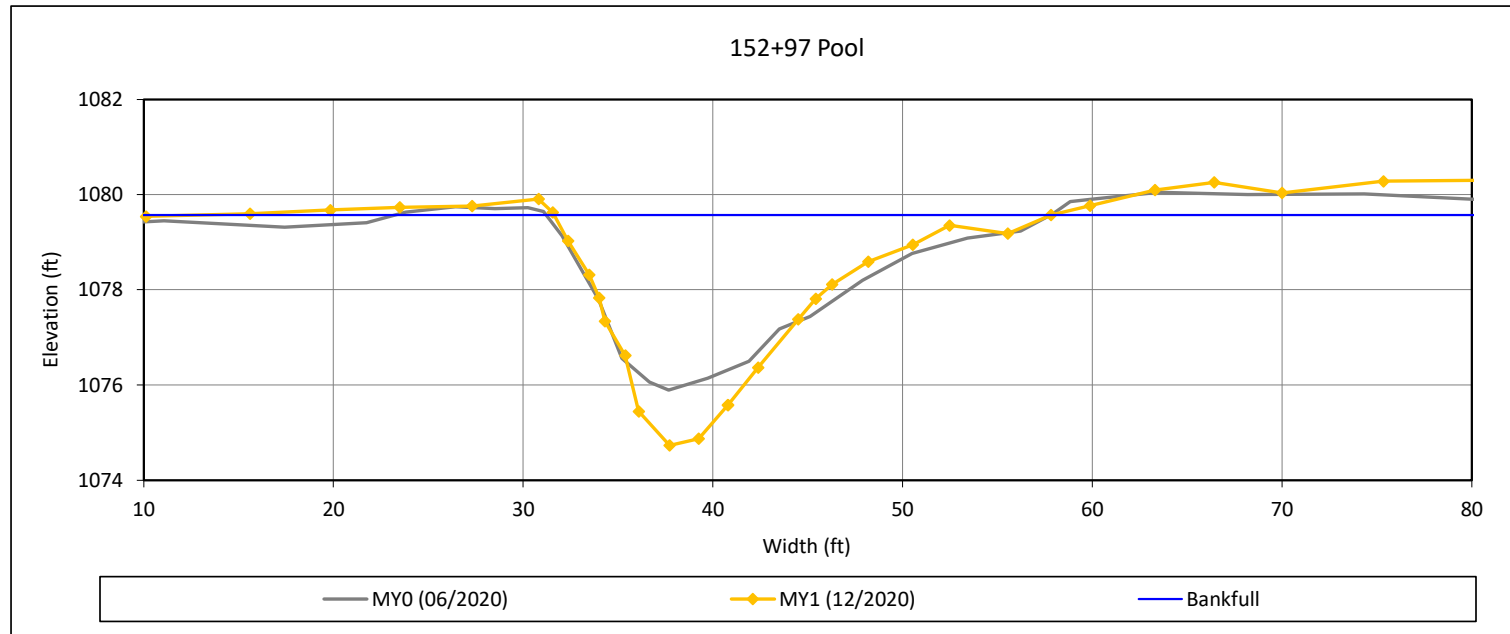


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 5-Bull Creek Reach 3



Bankfull Dimensions

50.3	x-section area (ft.sq.)
26.2	width (ft)
1.9	mean depth (ft)
4.8	max depth (ft)
29.0	wetted perimeter (ft)
1.7	hydraulic radius (ft)
13.6	width-depth ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering

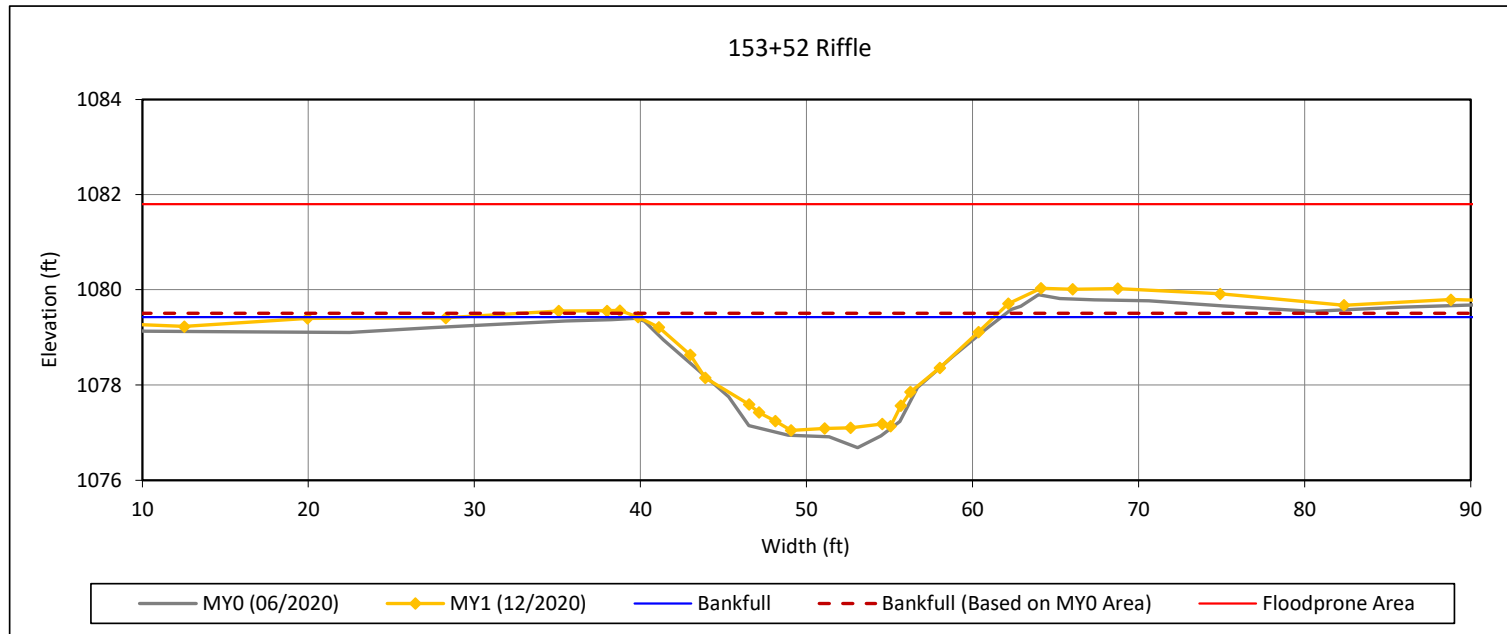


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Cross-Section 6-Bull Creek Reach 3



Bankfull Dimensions

31.7	x-section area (ft.sq.)
21.4	width (ft)
1.5	mean depth (ft)
2.4	max depth (ft)
22.2	wetted perimeter (ft)
1.4	hydraulic radius (ft)
14.5	width-depth ratio
99.0	W flood prone area (ft)
4.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 12/2020
 Field Crew: Wildlands Engineering

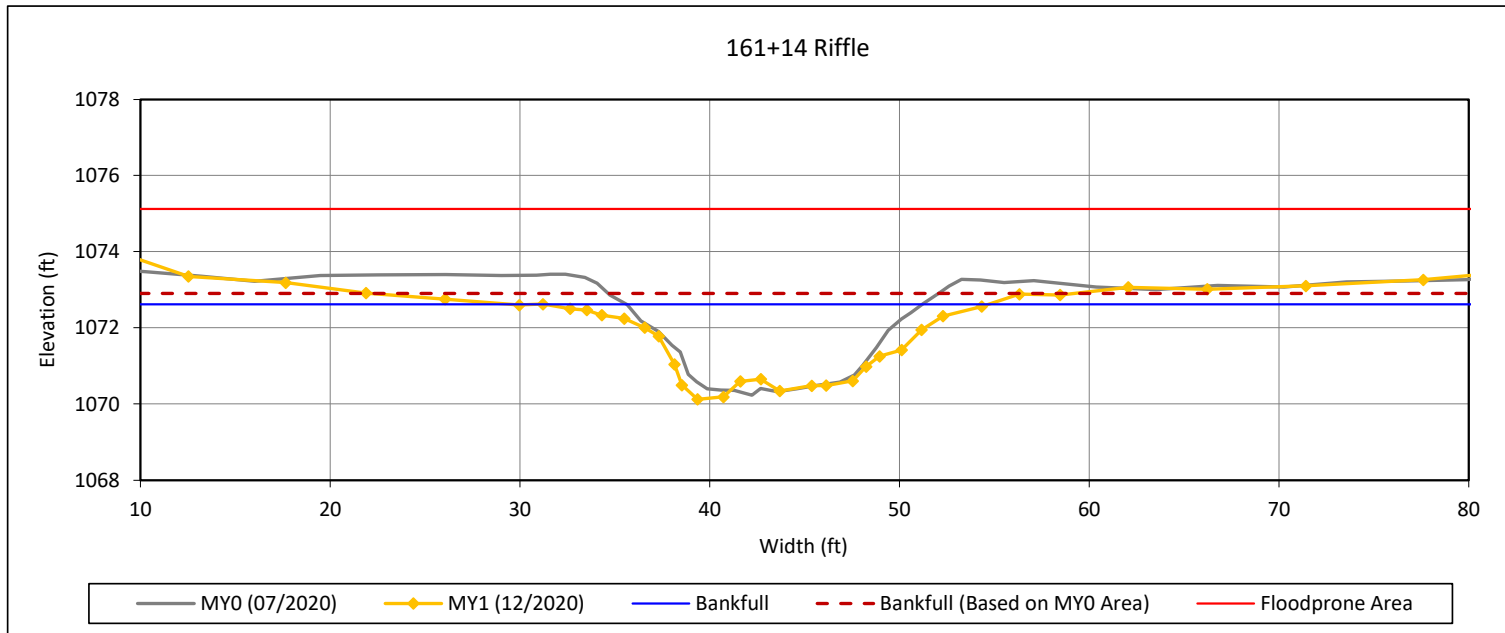


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 7-Bull Creek Reach 3



Bankfull Dimensions

29.2	x-section area (ft.sq.)
23.5	width (ft)
1.2	mean depth (ft)
2.5	max depth (ft)
24.7	wetted perimeter (ft)
1.2	hydraulic radius (ft)
18.9	width-depth ratio
84.0	W flood prone area (ft)
3.6	entrenchment ratio
0.9	low bank height ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering

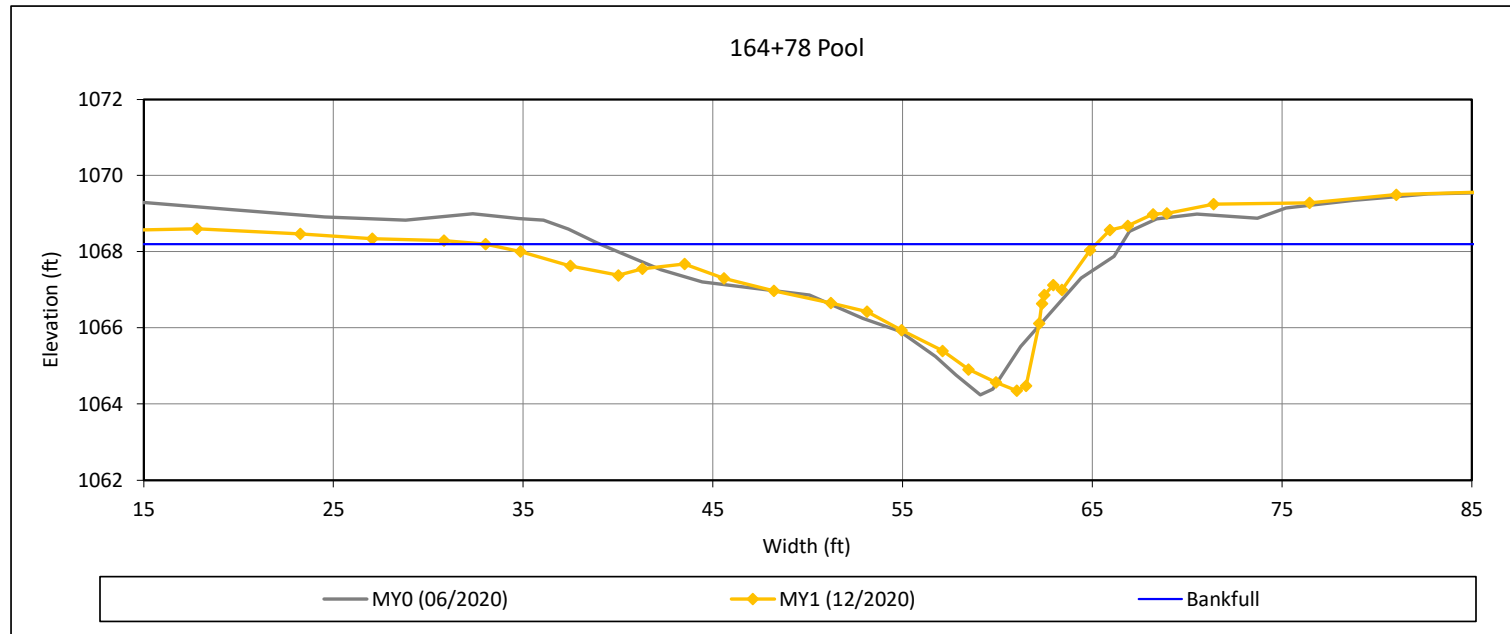


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 8-Bull Creek Reach 3



Bankfull Dimensions

45.7	x-section area (ft.sq.)
32.2	width (ft)
1.4	mean depth (ft)
3.8	max depth (ft)
34.7	wetted perimeter (ft)
1.3	hydraulic radius (ft)
22.7	width-depth ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering

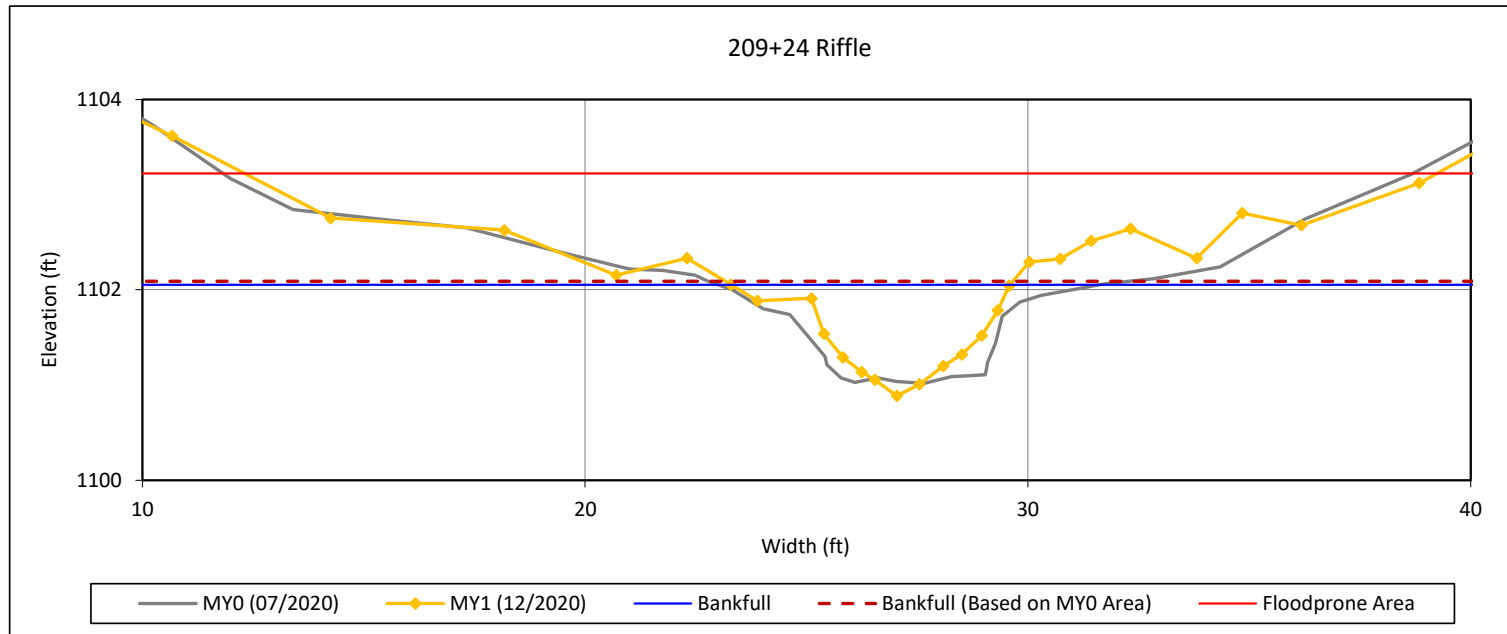


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 9-UT1B



Bankfull Dimensions

3.7	x-section area (ft.sq.)
6.3	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
7.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
10.8	width-depth ratio
26.9	W flood prone area (ft)
4.3	entrenchment ratio
1.0	low bank height ratio

Survey Date: 12/2020

Field Crew: Wildlands Engineering

*The station number for XS9 was incorrectly reported on the MY0 cross-section plot, it should have been reported as Station 209+24 as shown in the above plot.

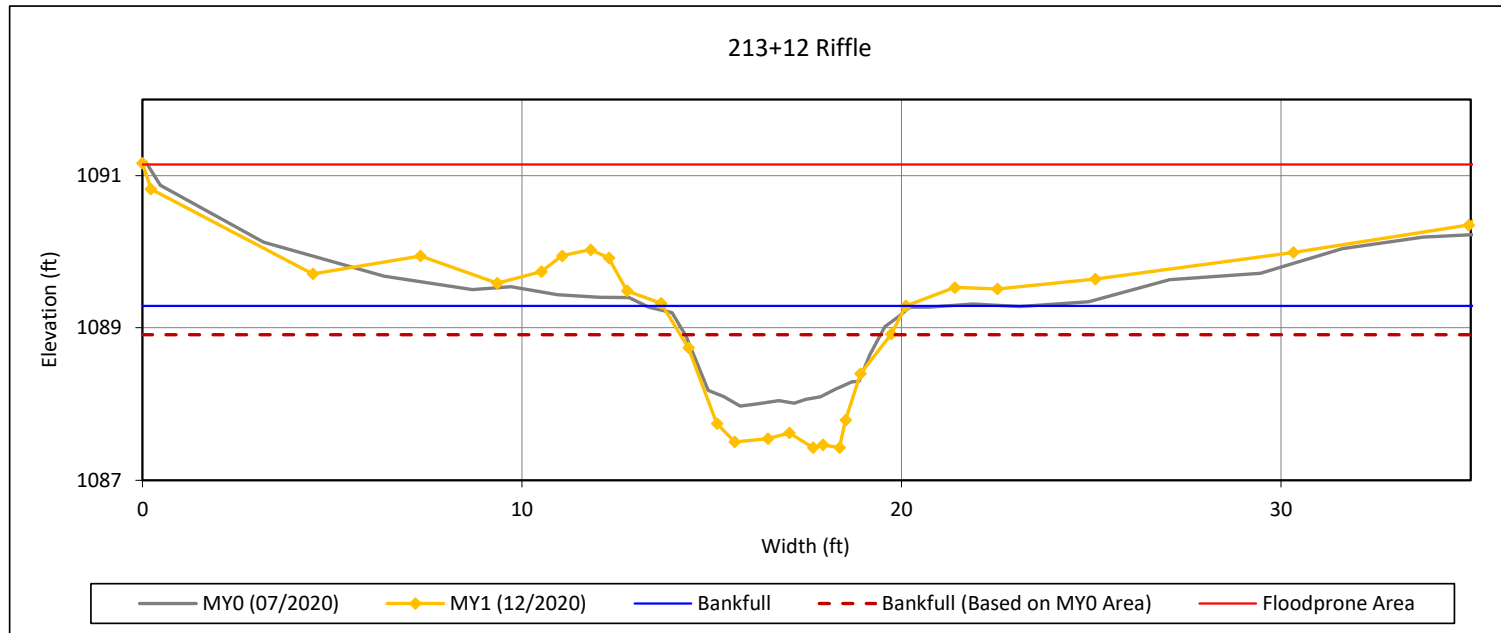


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 10-UT1C



Bankfull Dimensions

8.0	x-section area (ft.sq.)
6.4	width (ft)
1.2	mean depth (ft)
1.9	max depth (ft)
8.1	wetted perimeter (ft)
1.0	hydraulic radius (ft)
5.2	width-depth ratio
35.4	W flood prone area (ft)
5.5	entrenchment ratio
1.3	low bank height ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering

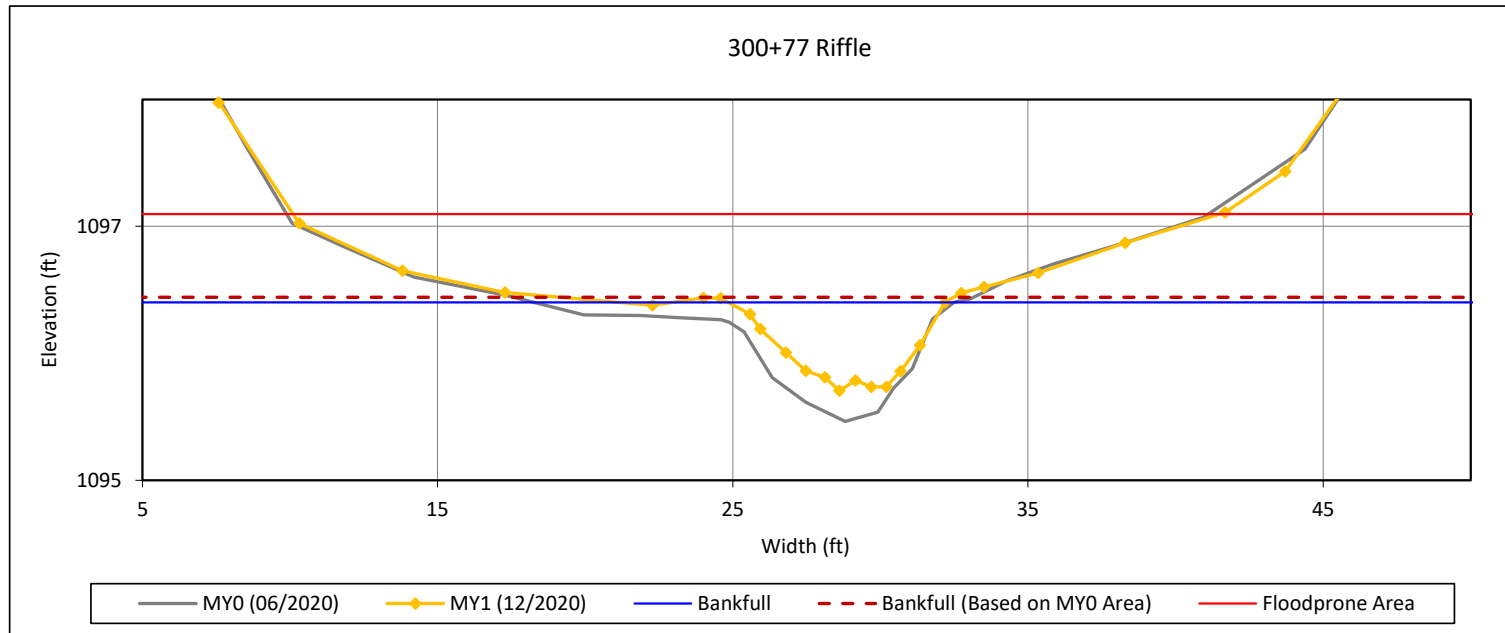


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 11-UT2A



Bankfull Dimensions

3.1	x-section area (ft.sq.)
7.3	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
7.5	wetted perimeter (ft)
0.4	hydraulic radius (ft)
17.3	width-depth ratio
31.4	W flood prone area (ft)
4.3	entrenchment ratio
0.9	low bank height ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering

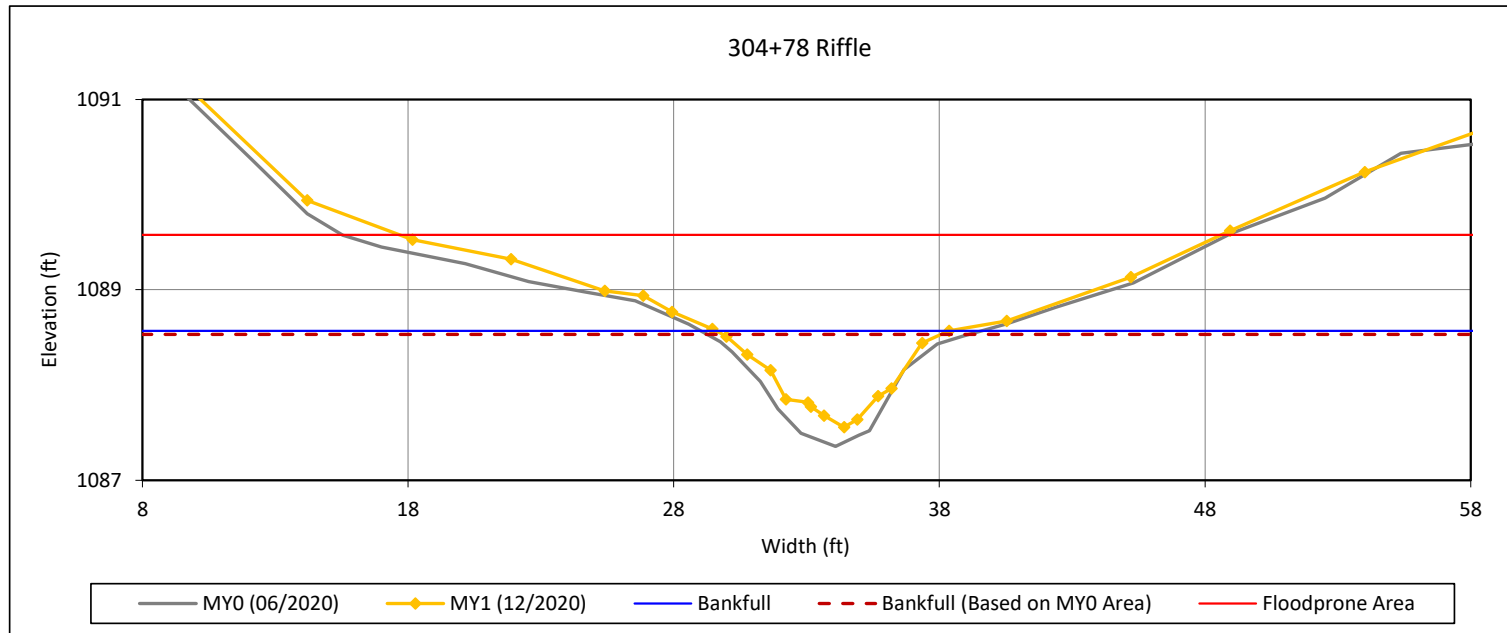


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

Cross-Section 12-UT2B



Bankfull Dimensions

4.5	x-section area (ft.sq.)
8.8	width (ft)
0.5	mean depth (ft)
1.0	max depth (ft)
9.1	wetted perimeter (ft)
0.5	hydraulic radius (ft)
17.1	width-depth ratio
30.9	W flood prone area (ft)
3.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 12/2020
 Field Crew: Wildlands Engineering

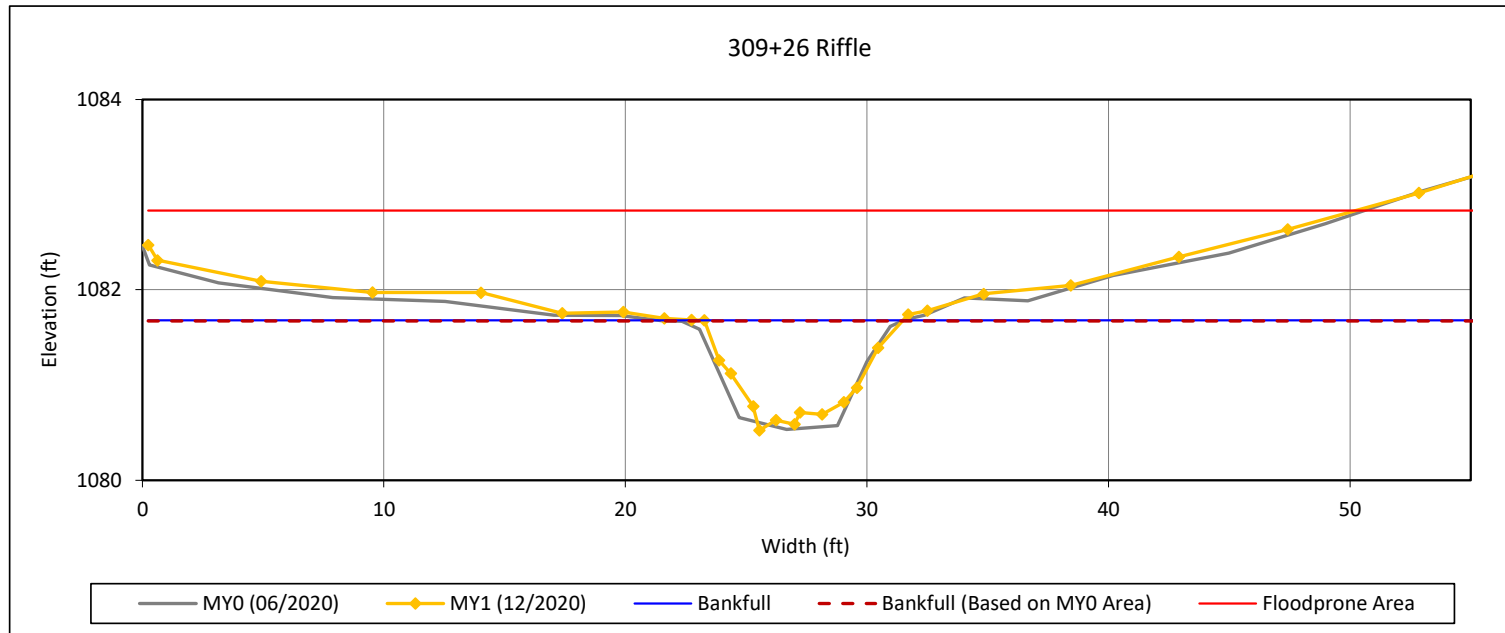


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 13-UT2C



Bankfull Dimensions

5.8	x-section area (ft.sq.)
8.2	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
8.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
11.6	width-depth ratio
50.0	W flood prone area (ft)
6.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering

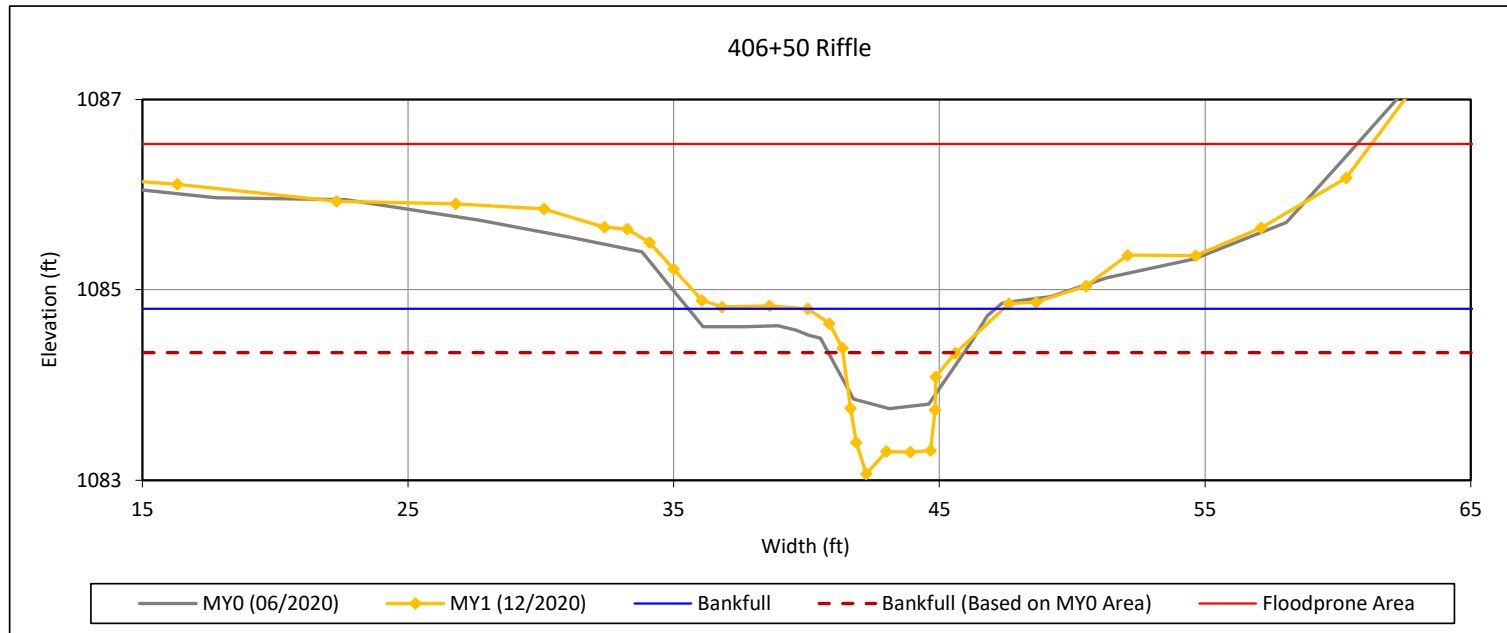


View Downstream

Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 1 - 2020

Cross-Section 14-UT3B



Bankfull Dimensions

6.1	x-section area (ft.sq.)
7.4	width (ft)
0.8	mean depth (ft)
1.7	max depth (ft)
8.9	wetted perimeter (ft)
0.7	hydraulic radius (ft)
8.9	width-depth ratio
61.3	W flood prone area (ft)
8.3	entrenchment ratio
1.4	low bank height ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering



View Downstream

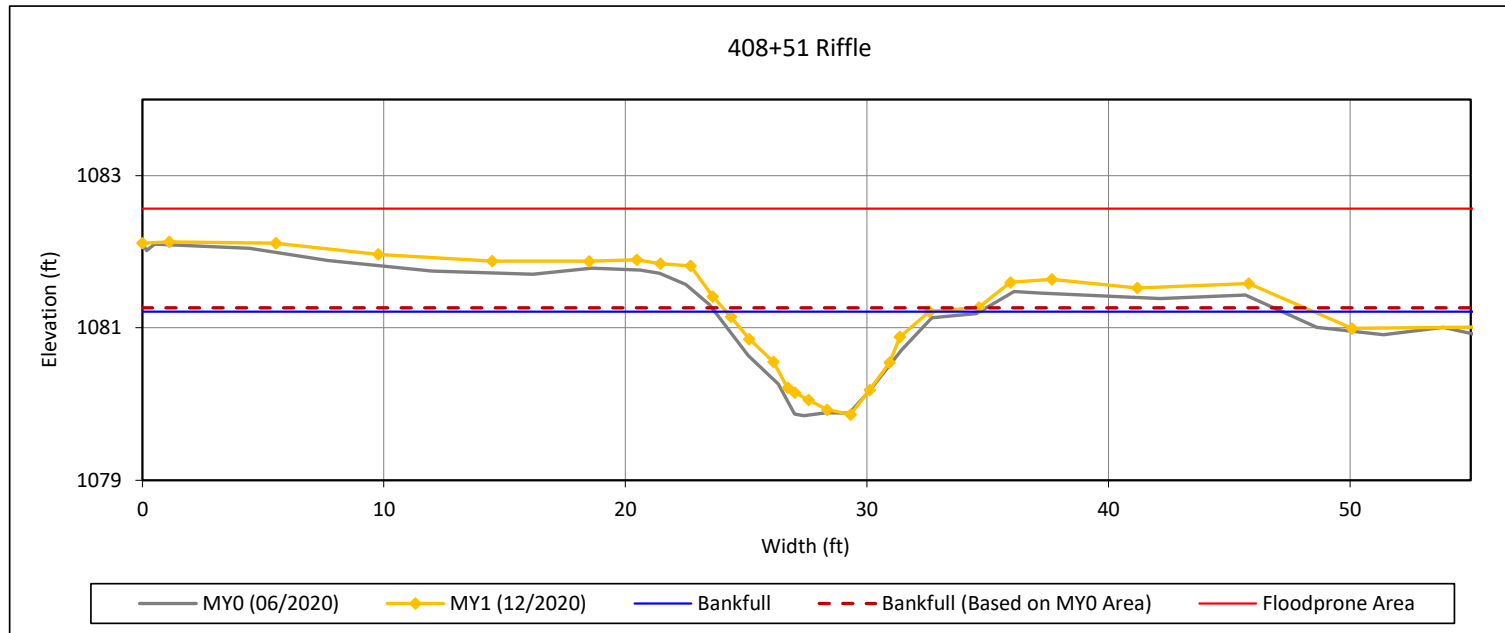
Cross-Section Plots

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

Cross-Section 15-UT3C



Bankfull Dimensions

6.4	x-section area (ft.sq.)
8.4	width (ft)
0.8	mean depth (ft)
1.4	max depth (ft)
9.0	wetted perimeter (ft)
0.7	hydraulic radius (ft)
11.1	width-depth ratio
55.8	W flood prone area (ft)
6.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 12/2020

Field Crew: Wildlands Engineering



View Downstream

Reachwide Pebble Count Plots

Key Mill Mitigation Site

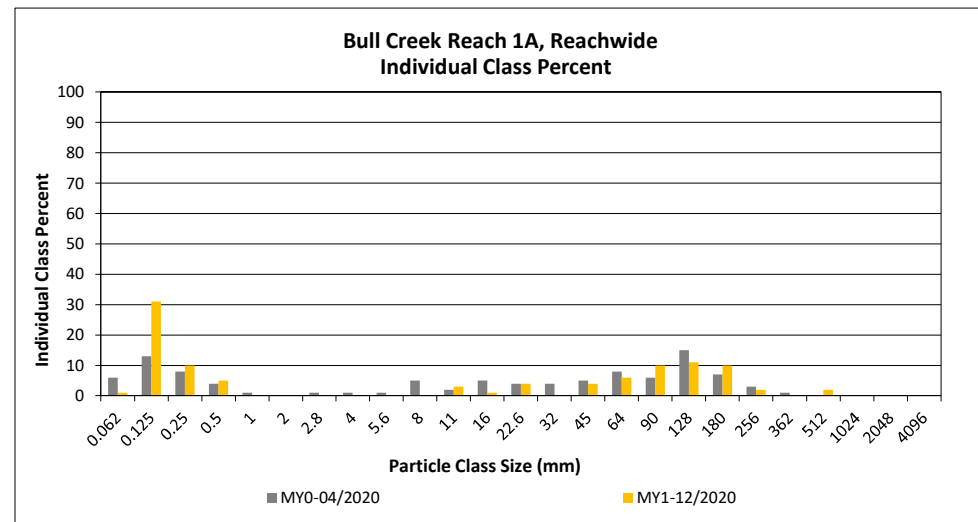
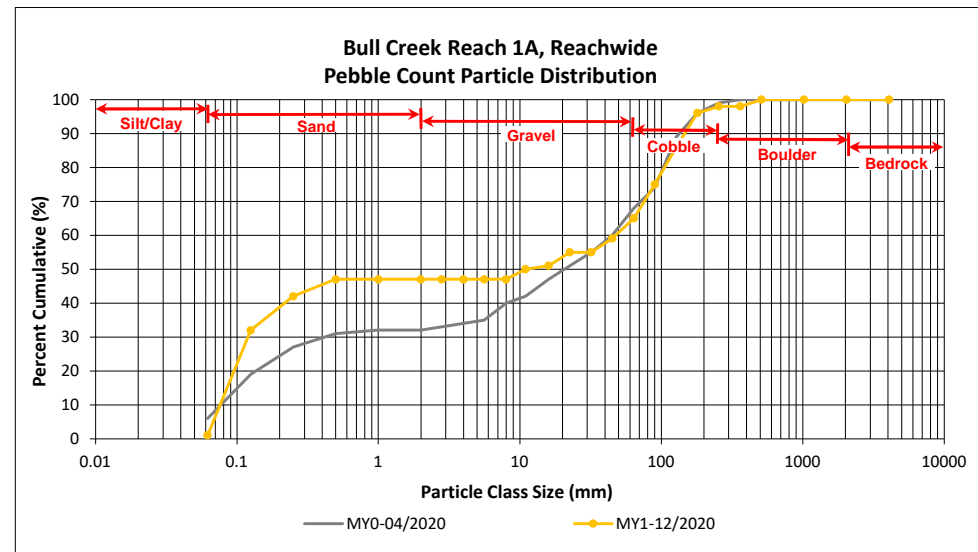
DMS Project No. 100025

Monitoring Year 1 - 2020

Bull Creek Reach 1A, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		1	1	1	1
SAND	Very fine	0.062	0.125		31	31	31	32
	Fine	0.125	0.250		10	10	10	42
	Medium	0.25	0.50		5	5	5	47
	Coarse	0.5	1.0					47
	Very Coarse	1.0	2.0					47
GRAVEL	Very Fine	2.0	2.8					47
	Very Fine	2.8	4.0					47
	Fine	4.0	5.6					47
	Fine	5.6	8.0					47
	Medium	8.0	11.0	1	2	3	3	50
	Medium	11.0	16.0	1		1	1	51
	Coarse	16.0	22.6	3	1	4	4	55
	Coarse	22.6	32					55
	Very Coarse	32	45	4		4	4	59
	Very Coarse	45	64	6		6	6	65
COBBLE	Small	64	90	10		10	10	75
	Small	90	128	11		11	11	86
	Large	128	180	10		10	10	96
	Large	180	256	2		2	2	98
BOULDER	Small	256	362					98
	Small	362	512	2		2	2	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	0.2
D ₅₀ =	11.0
D ₈₄ =	120.1
D ₉₅ =	174.0
D ₁₀₀ =	512.0



Reachwide Pebble Count Plots

Key Mill Mitigation Site

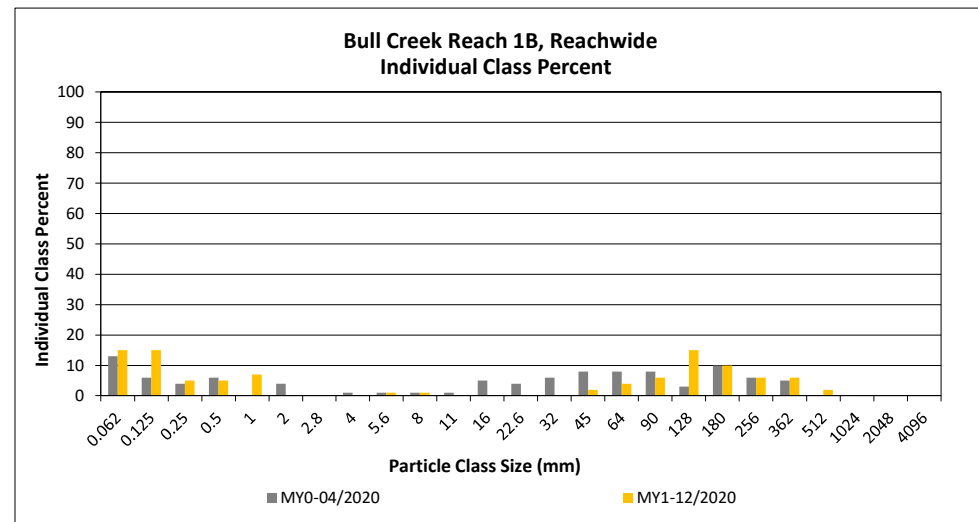
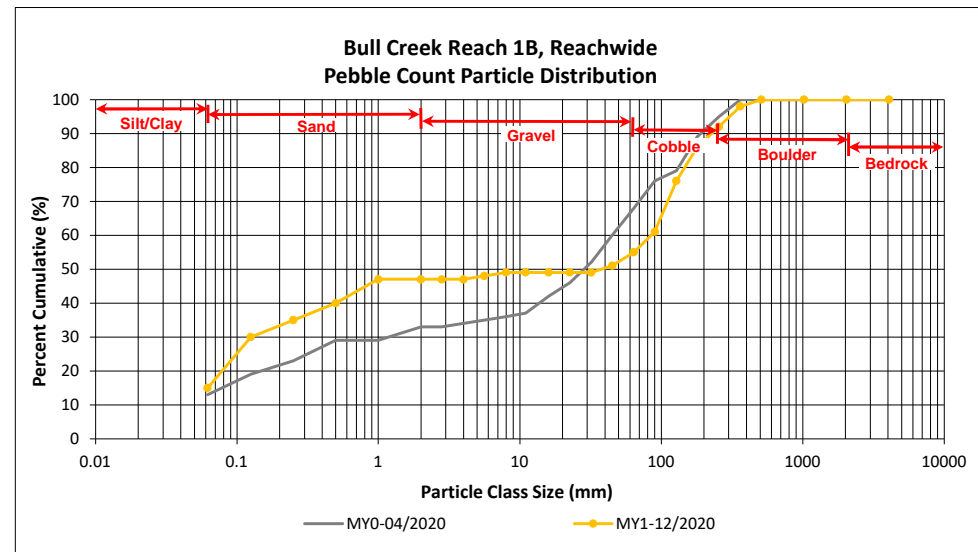
DMS Project No. 100025

Monitoring Year 1 - 2020

Bull Creek Reach 1B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		15	15	15	15
SAND	Very fine	0.062	0.125		15	15	15	30
	Fine	0.125	0.250		5	5	5	35
	Medium	0.25	0.50		5	5	5	40
	Coarse	0.5	1.0		7	7	7	47
	Very Coarse	1.0	2.0					47
GRAVEL	Very Fine	2.0	2.8					47
	Very Fine	2.8	4.0					47
	Fine	4.0	5.6		1	1	1	48
	Fine	5.6	8.0		1	1	1	49
	Medium	8.0	11.0					49
	Medium	11.0	16.0					49
	Coarse	16.0	22.6					49
	Coarse	22.6	32					49
	Very Coarse	32	45	1	1	2	2	51
	Very Coarse	45	64	4		4	4	55
COBBLE	Small	64	90	6		6	6	61
	Small	90	128	15		15	15	76
	Large	128	180	10		10	10	86
	Large	180	256	6		6	6	92
BOULDER	Small	256	362	6		6	6	98
	Small	362	512	2		2	2	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	0.3
D ₅₀ =	37.9
D ₈₄ =	168.1
D ₉₅ =	304.4
D ₁₀₀ =	512.0



Reachwide Pebble Count Plots

Key Mill Mitigation Site

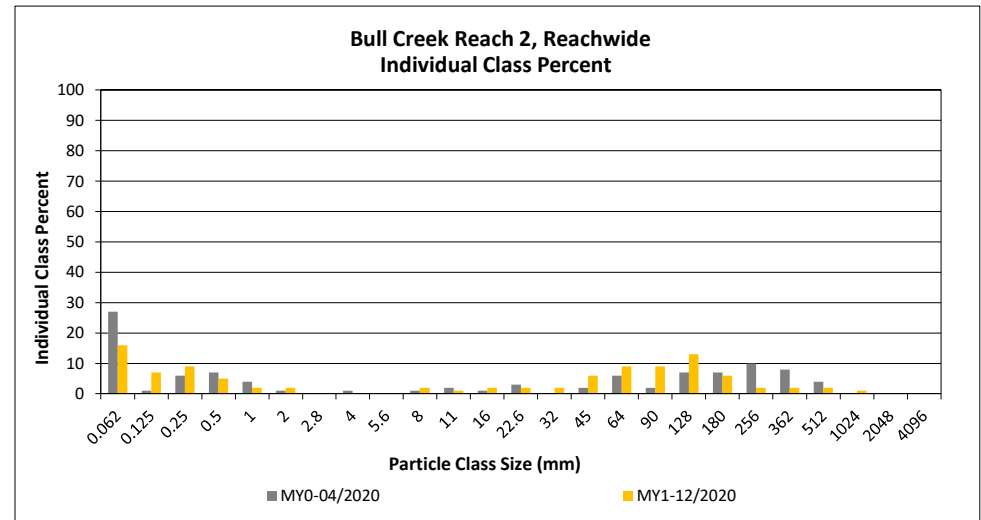
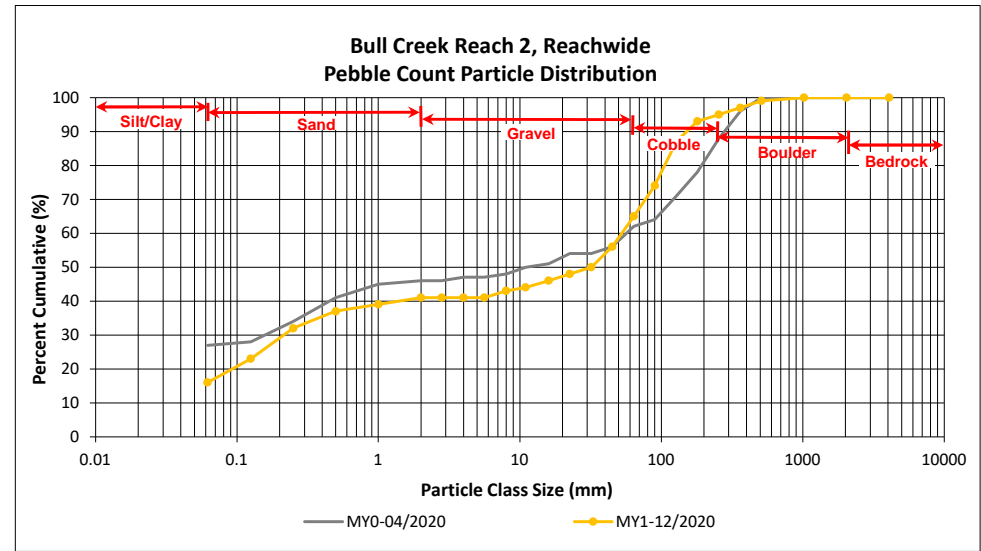
DMS Project No. 100025

Monitoring Year 1 - 2020

Bull Creek Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	15	16	16	16
SAND	Very fine	0.062	0.125		7	7	7	23
	Fine	0.125	0.250		9	9	9	32
	Medium	0.25	0.50		5	5	5	37
	Coarse	0.5	1.0		2	2	2	39
	Very Coarse	1.0	2.0		2	2	2	41
GRAVEL	Very Fine	2.0	2.8					41
	Very Fine	2.8	4.0					41
	Fine	4.0	5.6					41
	Fine	5.6	8.0	2	2	2	2	43
	Medium	8.0	11.0	1	1	1	1	44
	Medium	11.0	16.0	2	2	2	2	46
	Coarse	16.0	22.6		2	2	2	48
	Coarse	22.6	32	1	1	2	2	50
	Very Coarse	32	45	4	2	6	6	56
	Very Coarse	45	64	9		9	9	65
COBBLE	Small	64	90	9		9	9	74
	Small	90	128	13		13	13	87
	Large	128	180	6		6	6	93
	Large	180	256	2		2	2	95
BOULDER	Small	256	362	2		2	2	97
	Small	362	512	2		2	2	99
	Medium	512	1024	1		1	1	100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.4
D ₅₀ =	32.0
D ₈₄ =	118.0
D ₉₅ =	256.0
D ₁₀₀ =	1024.0



Reachwide Pebble Count Plots

Key Mill Mitigation Site

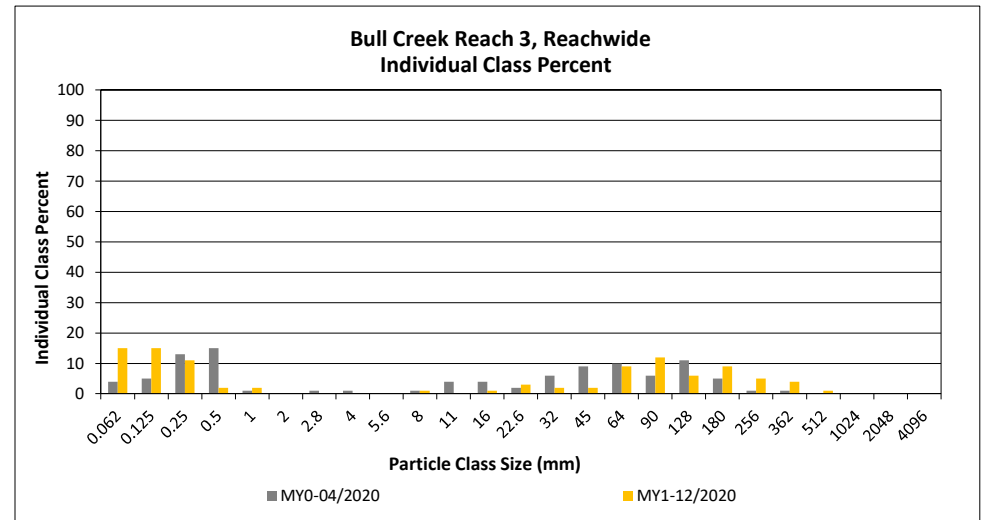
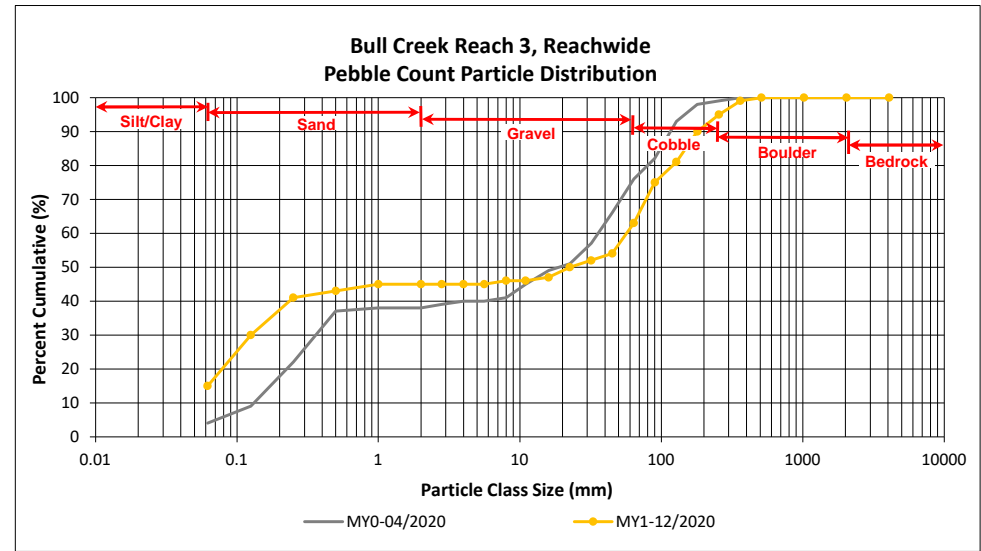
DMS Project No. 100025

Monitoring Year 1 - 2020

Bull Creek Reach 3, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	14	15	15	15
SAND	Very fine	0.062	0.125		15	15	15	30
	Fine	0.125	0.250		11	11	11	41
	Medium	0.25	0.50		2	2	2	43
	Coarse	0.5	1.0		2	2	2	45
	Very Coarse	1.0	2.0					45
GRAVEL	Very Fine	2.0	2.8					45
	Very Fine	2.8	4.0					45
	Fine	4.0	5.6					45
	Fine	5.6	8.0	1	1	1	1	46
	Medium	8.0	11.0					46
	Medium	11.0	16.0	1	1	1	1	47
	Coarse	16.0	22.6	1	2	3	3	50
	Coarse	22.6	32	1	1	2	2	52
	Very Coarse	32	45	2	2	2	2	54
	Very Coarse	45	64	9	9	9	9	63
COBBLE	Small	64	90	11	1	12	12	75
	Small	90	128	6	6	6	6	81
	Large	128	180	9	9	9	9	90
	Large	180	256	5	5	5	5	95
BOULDER	Small	256	362	4	4	4	4	99
	Small	362	512	1	1	1	1	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	0.2
D ₅₀ =	22.6
D ₈₄ =	143.4
D ₉₅ =	256.0
D ₁₀₀ =	512.0



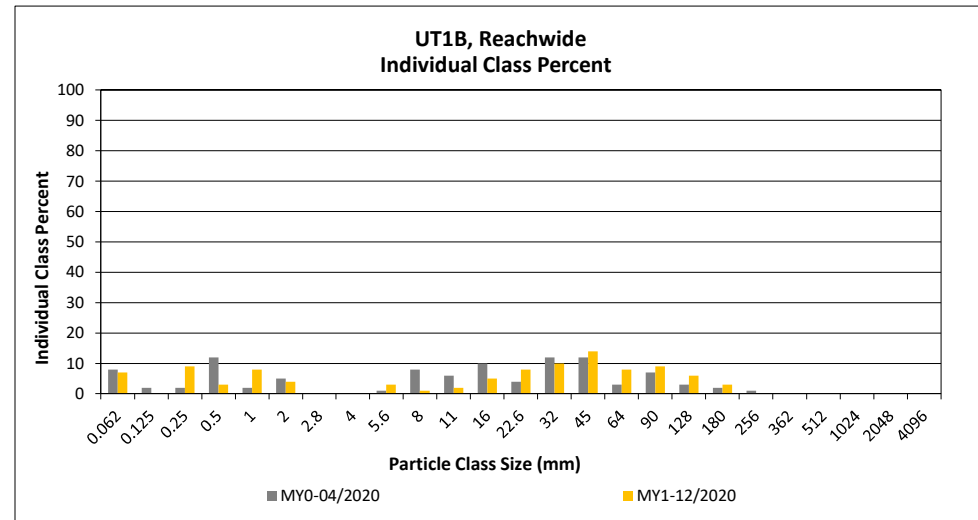
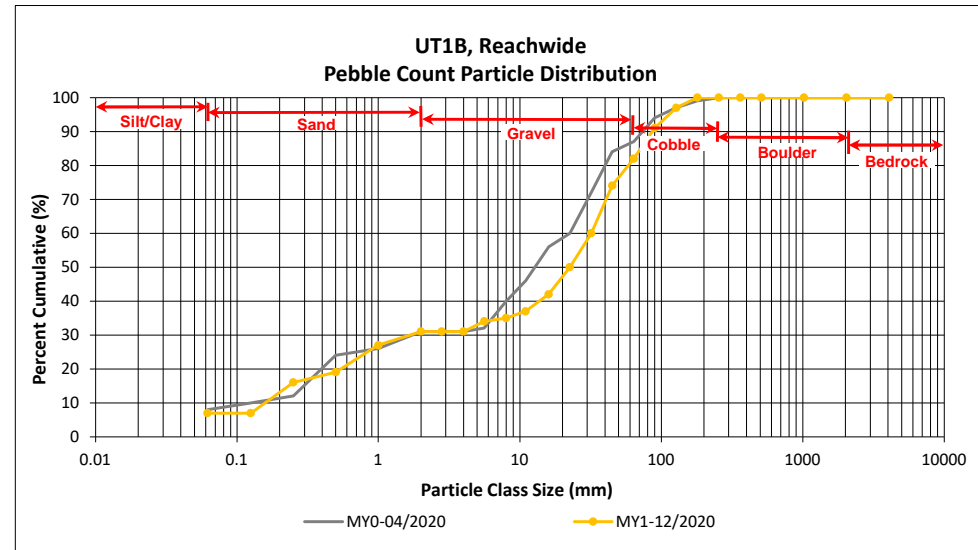
Reachwide Pebble Count Plots

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

UT1B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		7	7	7	7
SAND	Very fine	0.062	0.125					7
	Fine	0.125	0.250		9	9	9	16
	Medium	0.25	0.50		3	3	3	19
	Coarse	0.5	1.0	2	6	8	8	27
	Very Coarse	1.0	2.0		4	4	4	31
GRAVEL	Very Fine	2.0	2.8					31
	Very Fine	2.8	4.0					31
	Fine	4.0	5.6		3	3	3	34
	Fine	5.6	8.0		1	1	1	35
	Medium	8.0	11.0	1	1	2	2	37
	Medium	11.0	16.0		5	5	5	42
	Coarse	16.0	22.6	3	5	8	8	50
	Coarse	22.6	32	6	4	10	10	60
	Very Coarse	32	45	13	1	14	14	74
	Very Coarse	45	64	7	1	8	8	82
COBBLE	Small	64	90	9		9	9	91
	Small	90	128	6		6	6	97
	Large	128	180	3		3	3	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.3
D ₃₅ =	8.0
D ₅₀ =	22.6
D ₈₄ =	69.0
D ₉₅ =	113.8
D ₁₀₀ =	180.0



Reachwide Pebble Count Plots

Key Mill Mitigation Site

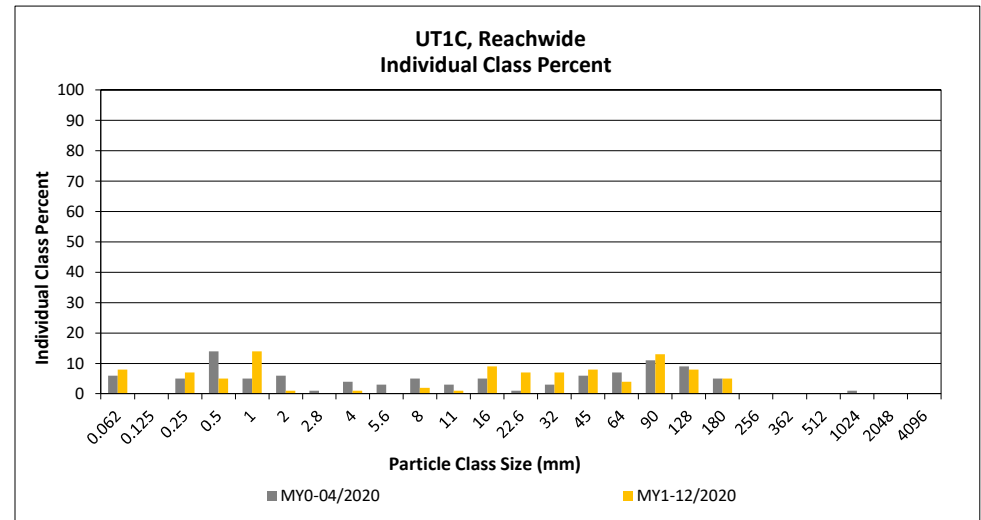
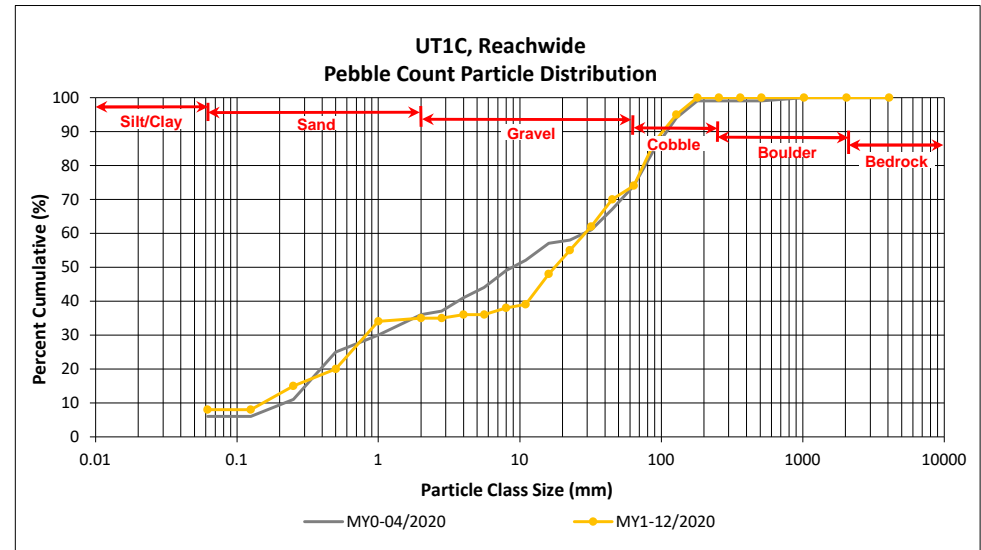
DMS Project No. 100025

Monitoring Year 1 - 2020

UT1C, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	6	8	8	8
SAND	Very fine	0.062	0.125					8
	Fine	0.125	0.250		7	7	7	15
	Medium	0.25	0.50		5	5	5	20
	Coarse	0.5	1.0		14	14	14	34
	Very Coarse	1.0	2.0		1	1	1	35
GRAVEL	Very Fine	2.0	2.8					35
	Very Fine	2.8	4.0		1	1	1	36
	Fine	4.0	5.6					36
	Fine	5.6	8.0		2	2	2	38
	Medium	8.0	11.0		1	1	1	39
	Medium	11.0	16.0	3	6	9	9	48
	Coarse	16.0	22.6	5	2	7	7	55
	Coarse	22.6	32	5	2	7	7	62
	Very Coarse	32	45	8		8	8	70
	Very Coarse	45	64	3	1	4	4	74
COBBLE	Small	64	90	12	1	13	13	87
	Small	90	128	8		8	8	95
	Large	128	180	4	1	5	5	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.3
D ₃₅ =	2.0
D ₅₀ =	17.7
D ₈₄ =	83.2
D ₉₅ =	128.0
D ₁₀₀ =	180.0



Reachwide Pebble Count Plots

Key Mill Mitigation Site

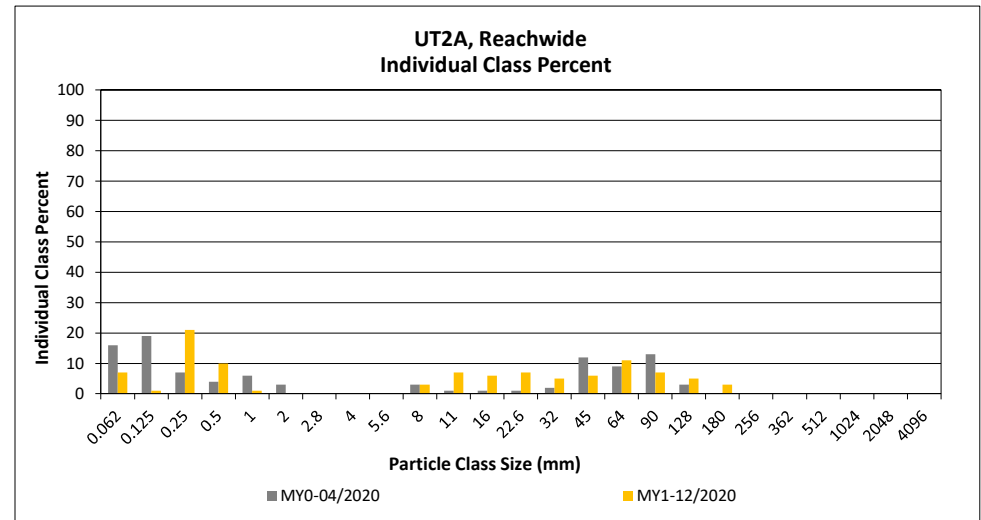
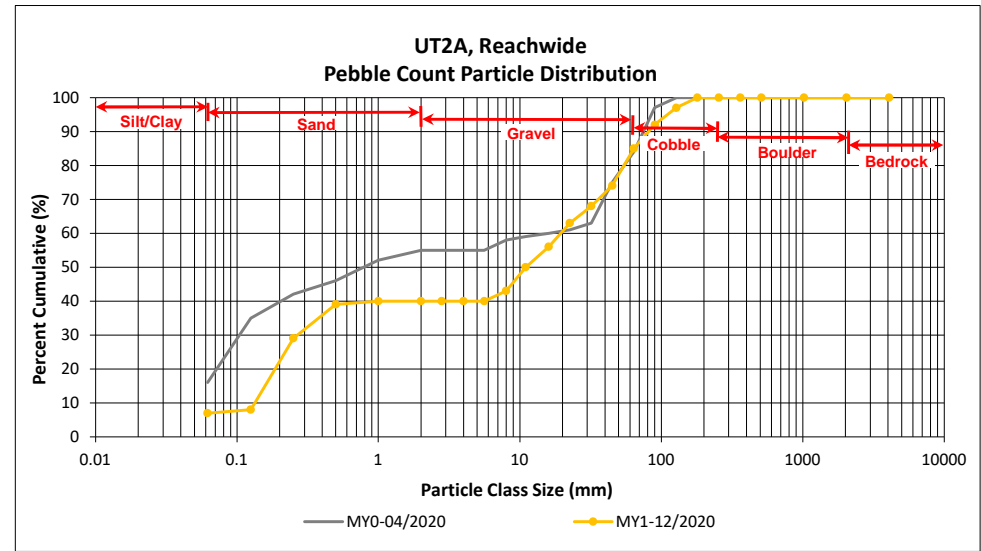
DMS Project No. 100025

Monitoring Year 1 - 2020

UT2A, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	6	7	7	7
SAND	Very fine	0.062	0.125		1	1	1	8
	Fine	0.125	0.250	12	9	21	21	29
	Medium	0.25	0.50	6	4	10	10	39
	Coarse	0.5	1.0		1	1	1	40
	Very Coarse	1.0	2.0					40
GRAVEL	Very Fine	2.0	2.8					40
	Very Fine	2.8	4.0					40
	Fine	4.0	5.6					40
	Fine	5.6	8.0	1	2	3	3	43
	Medium	8.0	11.0		7	7	7	50
	Medium	11.0	16.0	3	3	6	6	56
	Coarse	16.0	22.6	1	6	7	7	63
	Coarse	22.6	32	2	3	5	5	68
	Very Coarse	32	45	3	3	6	6	74
	Very Coarse	45	64	10	1	11	11	85
COBBLE	Small	64	90	5	2	7	7	92
	Small	90	128	4	1	5	5	97
	Large	128	180	2	1	3	3	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.2
D ₃₅ =	0.4
D ₅₀ =	11.0
D ₈₄ =	62.0
D ₉₅ =	111.2
D ₁₀₀ =	180.0



Reachwide Pebble Count Plots

Key Mill Mitigation Site

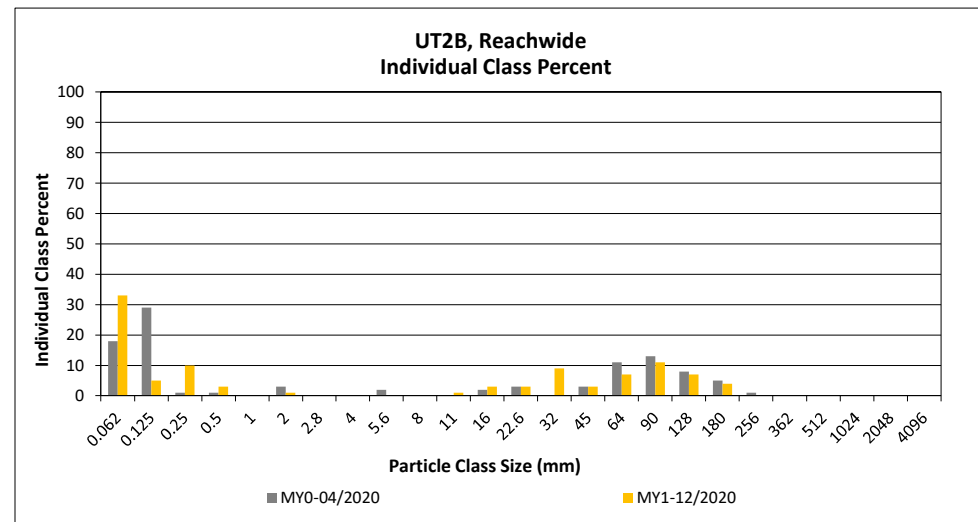
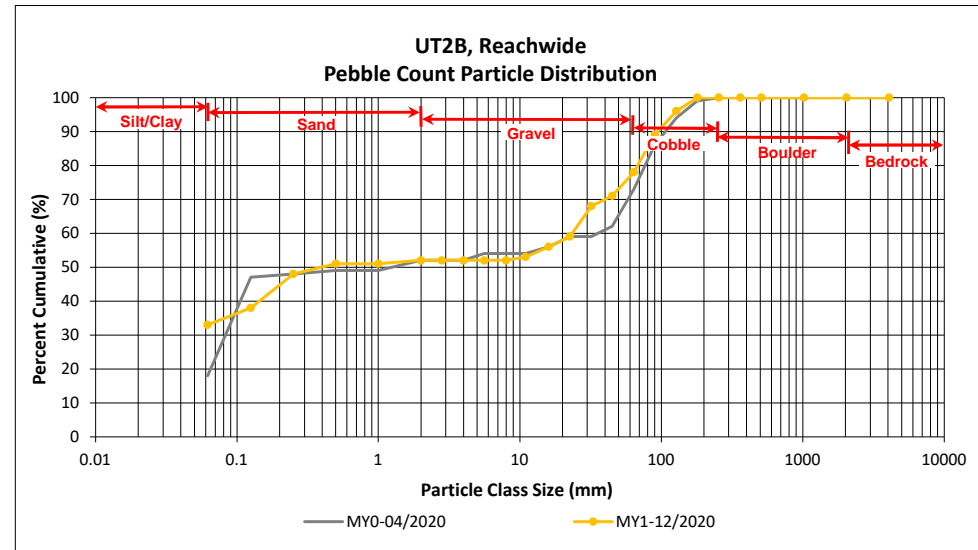
DMS Project No. 100025

Monitoring Year 1 - 2020

UT2B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		33	33	33	33
SAND	Very fine	0.062	0.125		5	5	5	38
	Fine	0.125	0.250	2	8	10	10	48
	Medium	0.25	0.50		3	3	3	51
	Coarse	0.5	1.0					51
	Very Coarse	1.0	2.0	1		1	1	52
GRAVEL	Very Fine	2.0	2.8					52
	Very Fine	2.8	4.0					52
	Fine	4.0	5.6					52
	Fine	5.6	8.0					52
	Medium	8.0	11.0		1	1	1	53
	Medium	11.0	16.0	3		3	3	56
	Coarse	16.0	22.6	3		3	3	59
	Coarse	22.6	32	9		9	9	68
	Very Coarse	32	45	3		3	3	71
	Very Coarse	45	64	7		7	7	78
COBBLE	Small	64	90	11		11	11	89
	Small	90	128	7		7	7	96
	Large	128	180	4		4	4	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.1
D ₅₀ =	0.4
D ₈₄ =	77.1
D ₉₅ =	121.7
D ₁₀₀ =	180.0



Reachwide Pebble Count Plots

Key Mill Mitigation Site

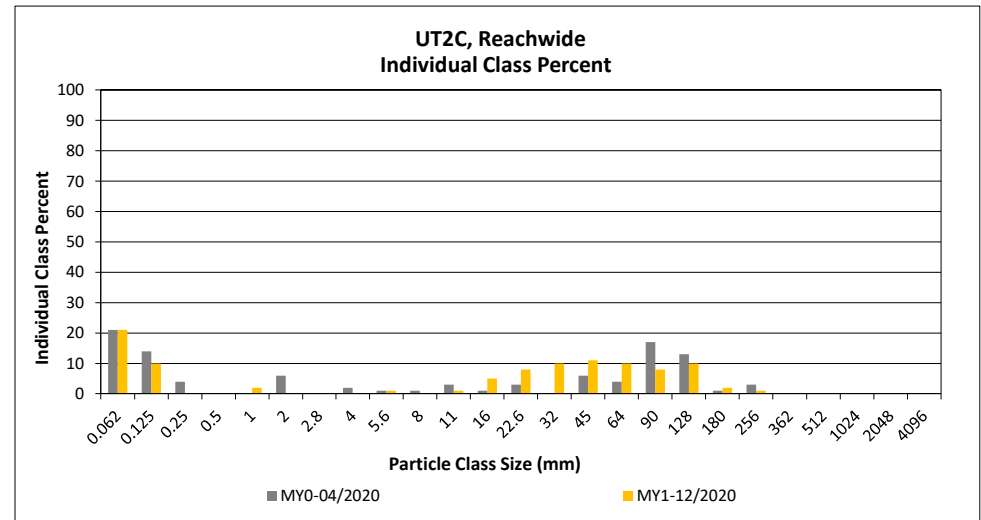
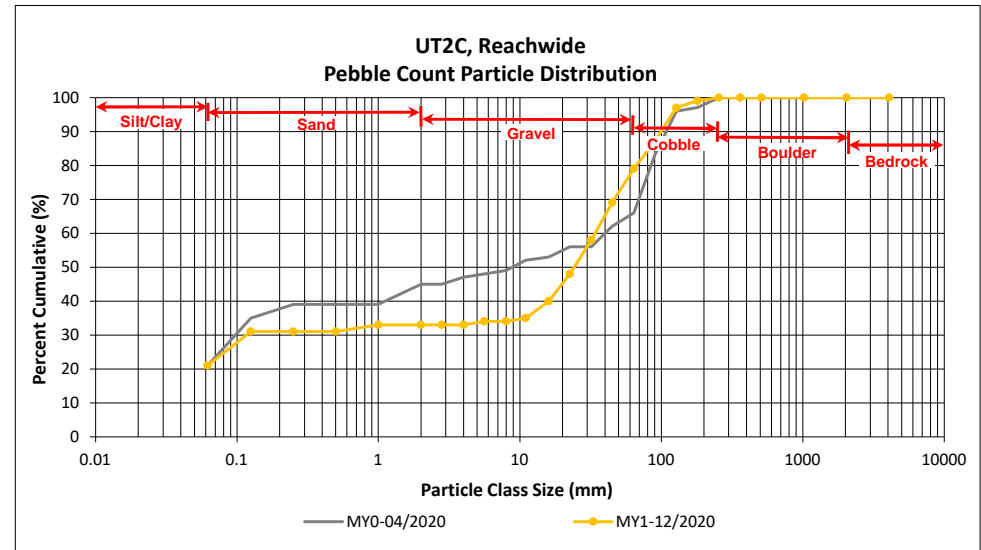
DMS Project No. 100025

Monitoring Year 1 - 2020

UT2C, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	20	21	21	21
SAND	Very fine	0.062	0.125		10	10	10	31
	Fine	0.125	0.250					31
	Medium	0.25	0.50					31
	Coarse	0.5	1.0	2		2	2	33
	Very Coarse	1.0	2.0					33
GRAVEL	Very Fine	2.0	2.8					33
	Very Fine	2.8	4.0					33
	Fine	4.0	5.6		1	1	1	34
	Fine	5.6	8.0					34
	Medium	8.0	11.0		1	1	1	35
	Medium	11.0	16.0		5	5	5	40
	Coarse	16.0	22.6	5	3	8	8	48
	Coarse	22.6	32	5	5	10	10	58
	Very Coarse	32	45	8	3	11	11	69
	Very Coarse	45	64	8	2	10	10	79
COBBLE	Small	64	90	8		8	8	87
	Small	90	128	10		10	10	97
	Large	128	180	2		2	2	99
	Large	180	256	1		1	1	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	11.0
D ₅₀ =	24.2
D ₈₄ =	79.2
D ₉₅ =	119.3
D ₁₀₀ =	256.0



Reachwide Pebble Count Plots

Key Mill Mitigation Site

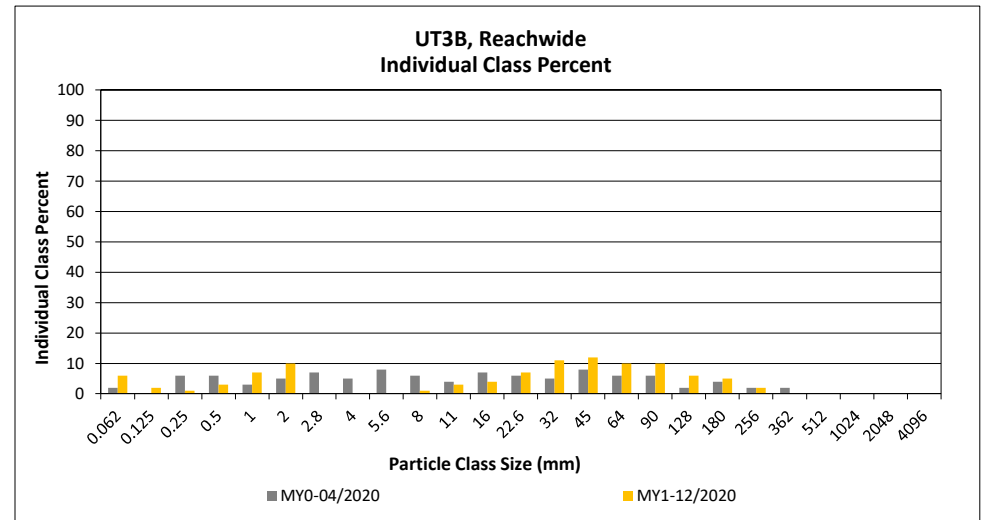
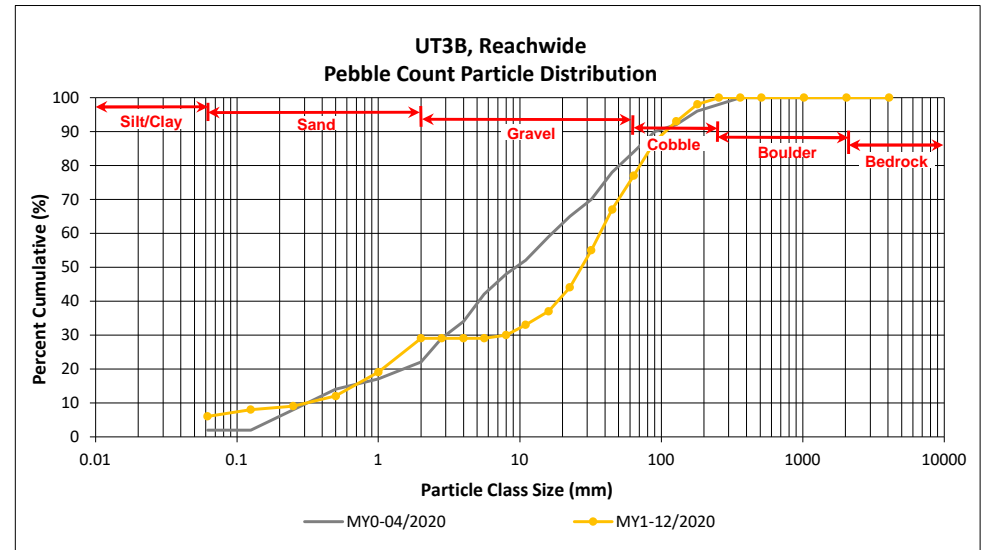
DMS Project No. 100025

Monitoring Year 1 - 2020

UT3B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		6	6	6	6
SAND	Very fine	0.062	0.125		2	2	2	8
	Fine	0.125	0.250		1	1	1	9
	Medium	0.25	0.50		3	3	3	12
	Coarse	0.5	1.0		7	7	7	19
	Very Coarse	1.0	2.0		10	10	10	29
GRAVEL	Very Fine	2.0	2.8					29
	Very Fine	2.8	4.0					29
	Fine	4.0	5.6					29
	Fine	5.6	8.0		1	1	1	30
	Medium	8.0	11.0		3	3	3	33
	Medium	11.0	16.0	2	2	4	4	37
	Coarse	16.0	22.6	3	4	7	7	44
	Coarse	22.6	32	8	3	11	11	55
	Very Coarse	32	45	10	2	12	12	67
	Very Coarse	45	64	9	1	10	10	77
COBBLE	Small	64	90	6	4	10	10	87
	Small	90	128	6		6	6	93
	Large	128	180	4	1	5	5	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.7
D ₃₅ =	13.3
D ₅₀ =	27.3
D ₈₄ =	81.3
D ₉₅ =	146.7
D ₁₀₀ =	256.0



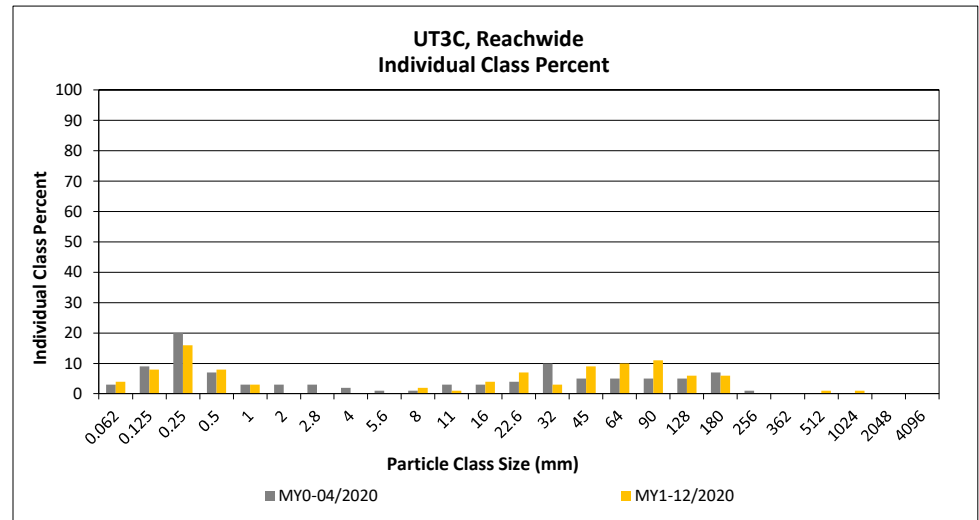
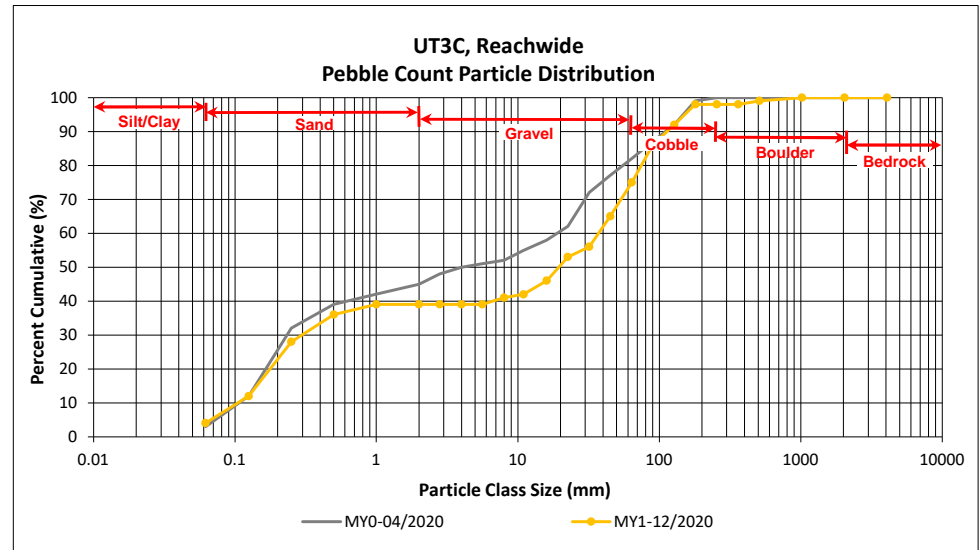
Reachwide Pebble Count Plots

Key Mill Mitigation Site
 DMS Project No. 100025
 Monitoring Year 1 - 2020

UT3C, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		4	4	4	4
SAND	Very fine	0.062	0.125		8	8	8	12
	Fine	0.125	0.250		16	16	16	28
	Medium	0.25	0.50	4	4	8	8	36
	Coarse	0.5	1.0		3	3	3	39
	Very Coarse	1.0	2.0					39
GRAVEL	Very Fine	2.0	2.8					39
	Very Fine	2.8	4.0					39
	Fine	4.0	5.6					39
	Fine	5.6	8.0		2	2	2	41
	Medium	8.0	11.0		1	1	1	42
	Medium	11.0	16.0		4	4	4	46
	Coarse	16.0	22.6	3	4	7	7	53
	Coarse	22.6	32		3	3	3	56
	Very Coarse	32	45	9		9	9	65
	Very Coarse	45	64	9	1	10	10	75
COBBLE	Small	64	90	11		11	11	86
	Small	90	128	6		6	6	92
	Large	128	180	6		6	6	98
	Large	180	256					98
BOULDER	Small	256	362					98
	Small	362	512	1		1	1	99
	Medium	512	1024	1		1	1	100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	0.5
D ₅₀ =	19.5
D ₈₄ =	84.6
D ₉₅ =	151.8
D ₁₀₀ =	1024.0



APPENDIX 5. Hydrology Summary Data and Plots

Table 14. Verification of Bankfull Events

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020

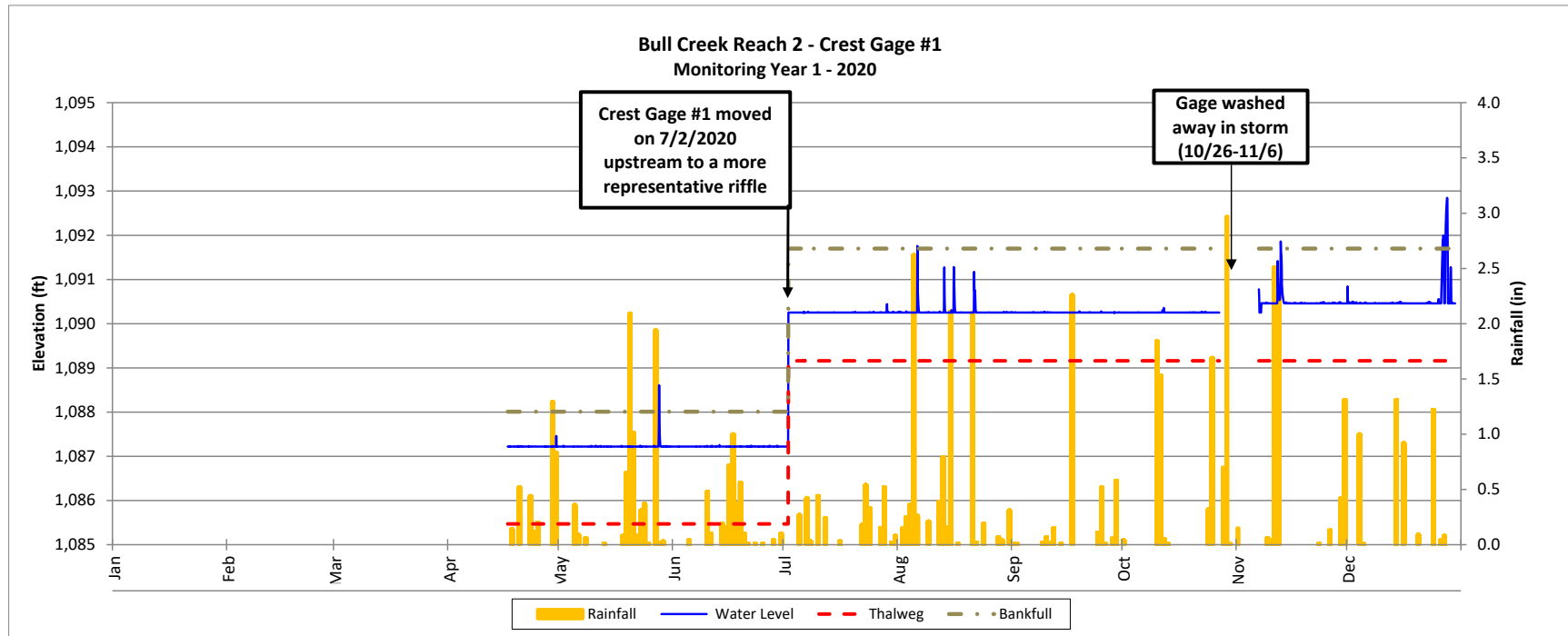
Reach	Monitoring Year	Date of Occurrence	Method
Bull Creek Reach 2 (Crest Gage #1)	MY1	5/28/2020	Automated Crest Gage
		8/5/2020	
		11/12/2020	
		12/26-27/2020	
UT1C (Crest Gage #2)	MY1	8/5/2020	Automated Crest Gage
		8/15/2020	
		10/29/2020	
		11/11-12/2020	
		12/3/2020	
		12/19/2020	
UT2C (Crest Gage #3)	MY1	8/15/2020	Automated Crest Gage
		10/29/2020	
		11/12/2020	
		12/30/2020	
UT3C (Crest Gage #4)	MY1	8/5/2020	Automated Crest Gage
		8/15/2020	
		8/21/2020	
		10/29/2020	
		12/25-26/2020	
Bull Creek Reach 3 (Crest Gage #5)	MY1	5/28/2020	Automated Crest Gage
		8/5/2020	
		8/15/2020	
		11/12/2020	

Recorded Bankfull Events

Key Mill Mitigation Bank

DMS Project No. 100025

Monitoring Year 1 - 2020

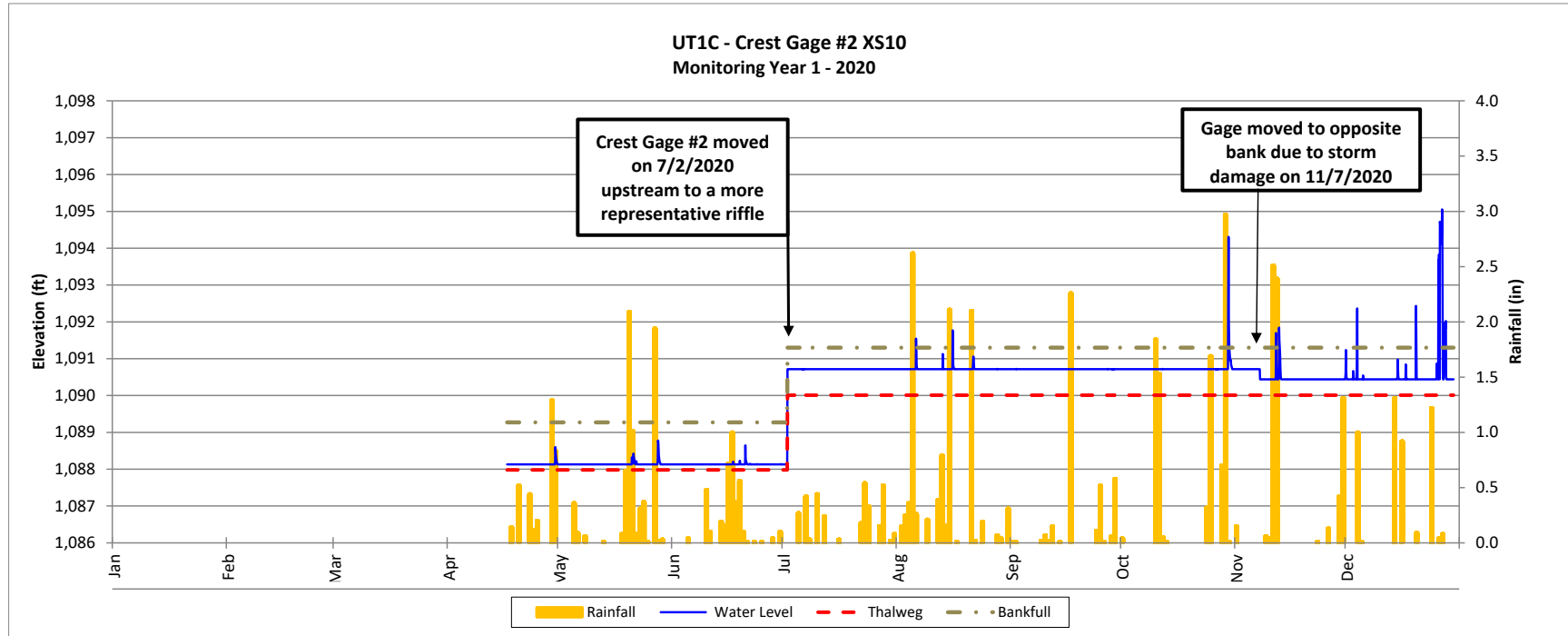


Recorded Bankfull Events

Key Mill Mitigation Bank

DMS Project No. 100025

Monitoring Year 1 - 2020

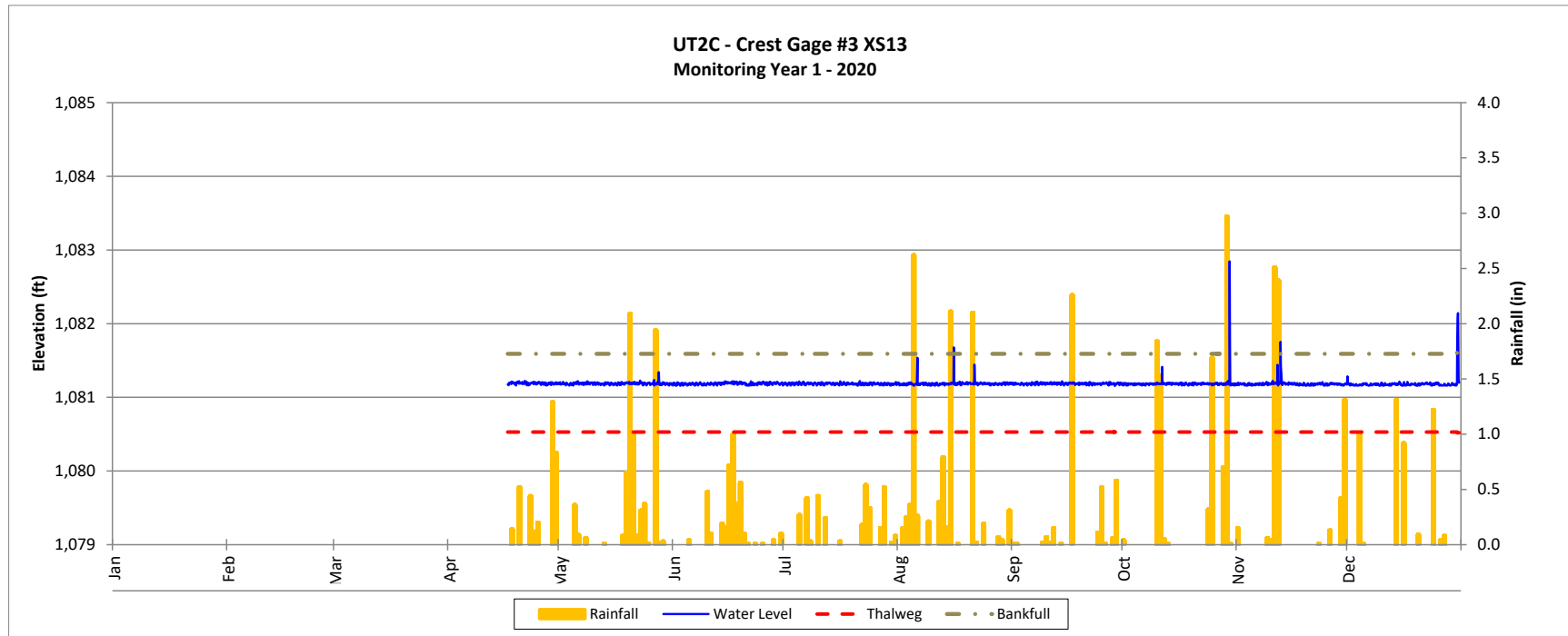


Recorded Bankfull Events

Key Mill Mitigation Bank

DMS Project No. 100025

Monitoring Year 1 - 2020

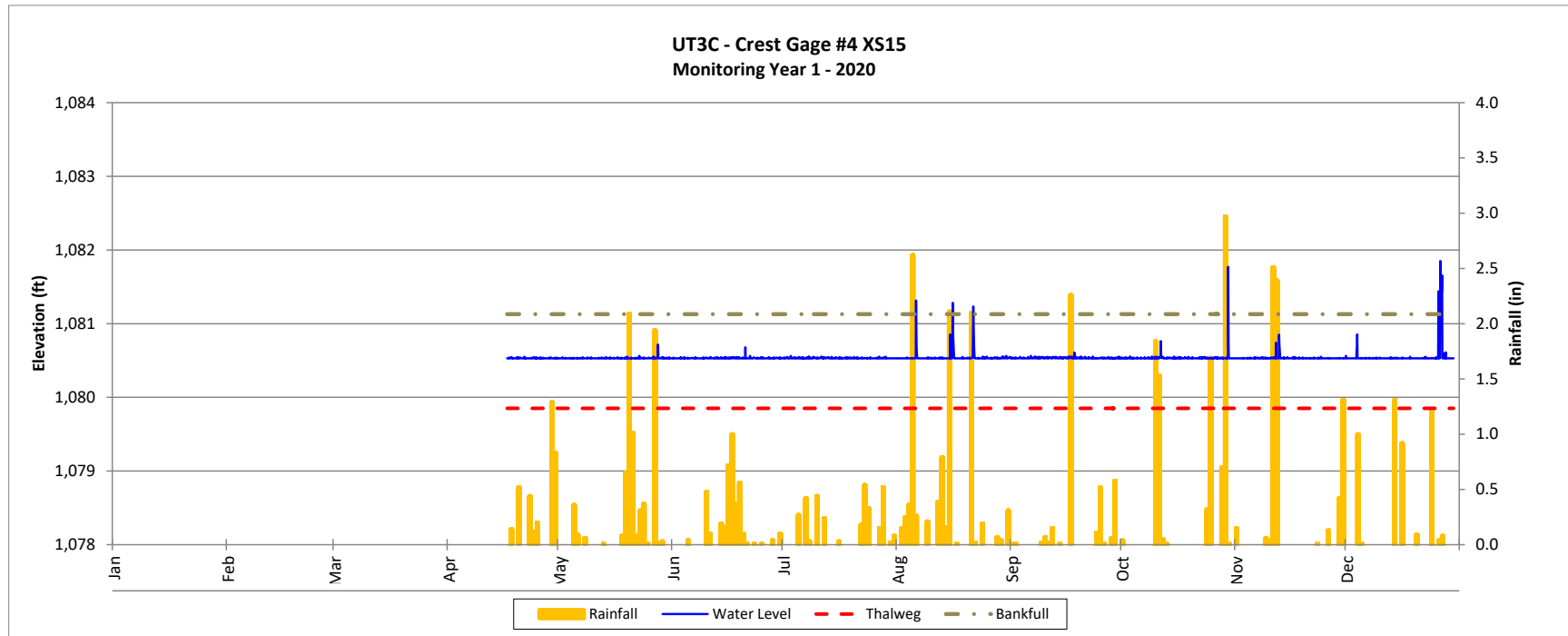


Recorded Bankfull Events

Key Mill Mitigation Bank

DMS Project No. 100025

Monitoring Year 1 - 2020

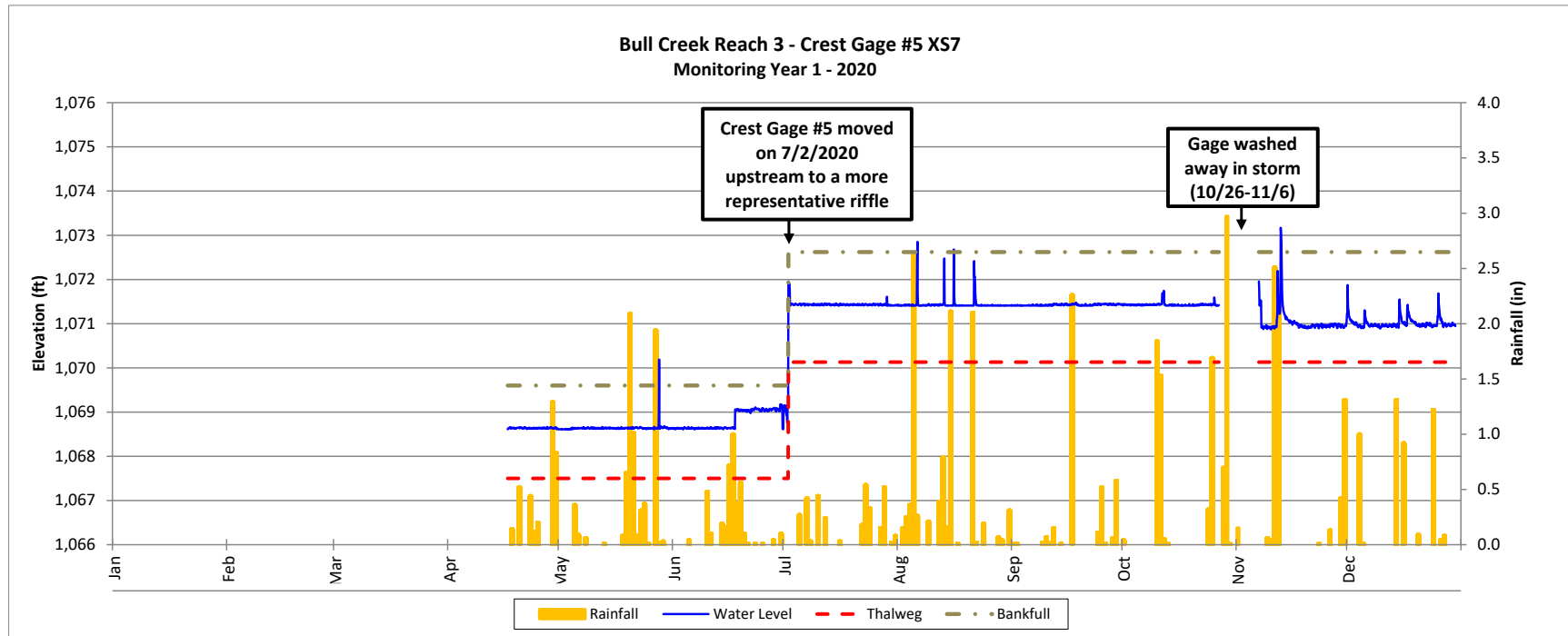


Recorded Bankfull Events

Key Mill Mitigation Bank

DMS Project No. 100025

Monitoring Year 1 - 2020

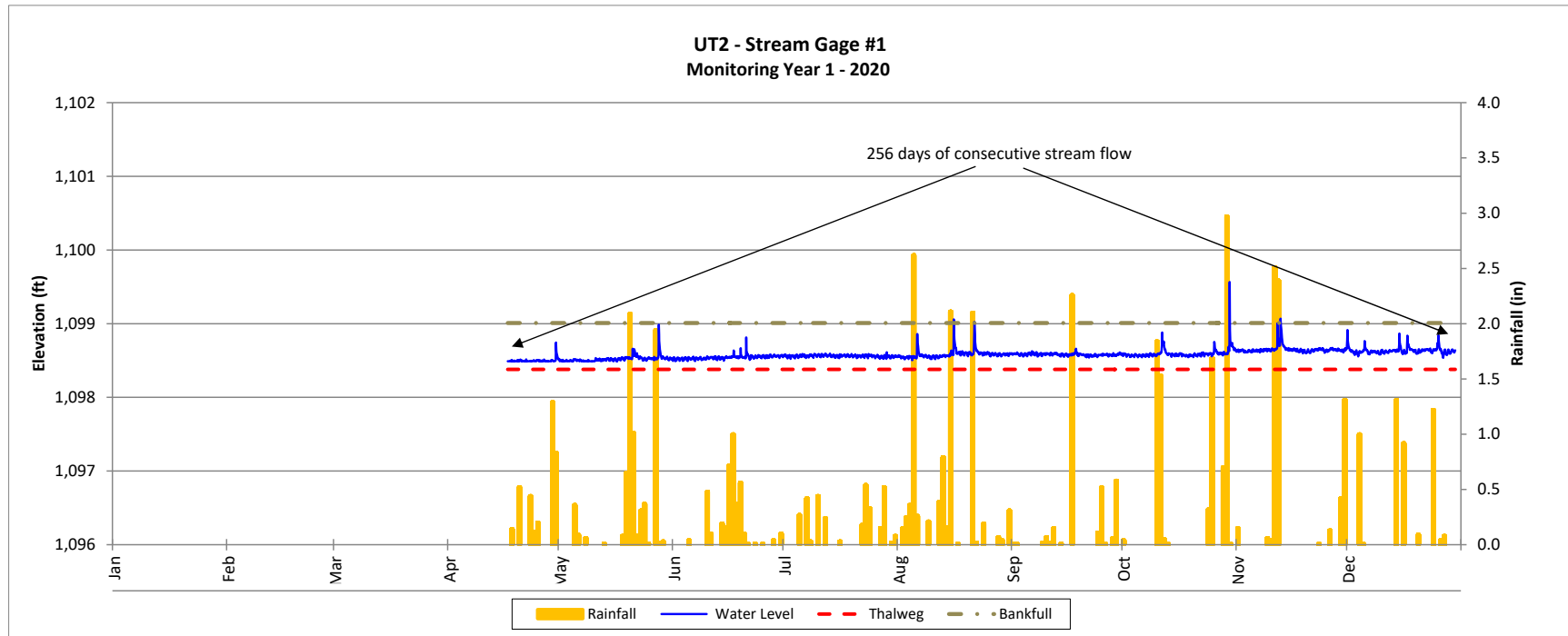


Recorded In-stream Flow Events

Key Mill Mitigation Site

DMS Project No. 100025

Monitoring Year 1 - 2020



APPENDIX 6. Response to IRT Comments (MY0)



February 2, 2021

Kim Browning
Mitigation Project Manager
Regulatory Division, U.S. Army Corp of Engineers
Kimberly.D.Browning@usace.army.mil

Subject: IRT Review Comments: 15-Day Record Drawing Review
Key Mill Mitigation Site, Surry County
Yadkin River Basin – HUC 03040101
DMS Project ID No. 100025 / DEQ Contract #7180

Dear Ms. Browning:

Wildlands Engineering, Inc. (Wildlands) has reviewed the 15-Day Record Drawing review comments from the NC Interagency Review Team (IRT) regarding the Key Mill Mitigation Site. As requested, we have included a copy of our responses and the IRT's original email, that was received on November 13, 2020 along with the project's "Notice of Initial Credit Release", in the appendix of the Year 1 Monitoring Report. All of the IRT's comments are noted below in **bold**, while Wildlands' responses to those comments are noted in *italics*.

Email received from NCIRT on 11/13/2020

NCDWR, Erin Davis

DWR Comment: In the IRT mitigation plan review, Mac echoed DMS' comment regarding the usage of log sills on steeper gradient tributaries with consideration for long term channel stability. WEI's response was to revise construction plans to incorporate more boulder sills. Given the high number of substitutions back to log sills, DWR's concern still stands. These areas should be closely inspected during monitoring for signs of instability.

Wildlands response: Wildlands acknowledges DWR's concern about the use of log sills rather than boulder sills on steeper gradient tributaries and will closely inspect these areas throughout the monitoring period for signs of instability. Proper measures will be implemented to rectify areas of instability, if necessary.

DWR Comment: DWR is ok with the planted material species and quantity substitutions, except for green ash. If green ash dominated areas establish during monitoring (based on plot data and site visit observations), DWR may request supplemental planting based on long term canopy closure concerns due to the emerald ash borer.

Wildlands response: Wildlands acknowledges DWR's concern about the quantity of green ash used and recognizes that supplemental planting may be necessary to ensure the buffer canopy in areas dominated by green ash. Additionally, Wildlands will refrain from using green ash for any additional supplemental planting on-site.



DWR Comment: DWR does not believe the change in planted area warrants a reduction in ratio of credits. However, if construction equipment used for the restoration reach entered the forested buffer, then the area should be monitored for signs of woody vegetation stress/death and supplemental planted as necessary.

Wildlands response: Construction equipment access was limited to areas within the limits of disturbance. Any forested buffer area inside the limits of disturbance that was entered was planted.

DWR Comment: There appears to be multiple riprap swales/outlets shown on the record drawings but not the approved mitigation plan design drawings: Sheet 1.6 – BMP outlet near 155+00 and floodplain riprap near 155+75, Sheet 1.7 – vernal pool/BMP outlet near 159+75, and Sheet 1.9 – outlet near 165+75. Please call these areas out on future redline drawings and provide a justification for the hardening measure in the baseline report.

Wildlands response: Wildlands acknowledges the oversight. Due to the potential of instability in these areas, riprap was placed within the swales to provide additional stability. These areas should have been included as part of the red lined features in the record drawings and justification should have been included in the baseline report. This omission was an error.

Please contact me at 704-332-7754 if you have any questions.

Sincerely,

A handwritten signature in black ink that reads "Aaron S. Earley".

Aaron Earley, PE, CFM
Project Manager
aearley@wildlandseng.com

APPENDIX 7. Response to DMS Comments (MY0)



October 5, 2020

Mr. Matthew Reid
Project Manager
NCDEQ – Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

RE: Task 6 – Final As-built Baseline Monitoring Report
Key Mill Mitigation Site, Surry County
Yadkin River Basin – HUC 03040101
DMS Project ID No. 100025 / DEQ Contract #7180

Dear Mr. Reid:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft As-built Baseline Monitoring report for the Key Mill Mitigation Site. The report has been updated to reflect those comments. The Final As-built Baseline Monitoring Document and Record Drawings are included. Wildlands' responses to DMS' report comments are noted below in *italics*.

DMS comment: There was considerable storm damage caused to the site during the winter/spring 2020. Please include a brief discussion regarding the impact and changes to the timeline this had on construction, repairs and asbuilt/MY0 data collection that followed.

Wildlands response: The site received approximately 4.2" of rain on February 6, 2020. This equated to an event between a 25-yr and 50-yr recurrence interval based on NOAA precipitation frequency for Mount Airy. Due to critical areas being graded just the day before, considerable damage was sustained throughout the site. Repair efforts added approximately 4 weeks to the completion of earthwork, which consequentially delayed planting and as-built survey. In addition, some monitoring features had to be re-installed after the repairs were completed.

DMS comment: Bull Creek Reach 3: Section discusses BMP installed at Station 115+10. According to the asbuilt sheets, this stationing may be a mistake. The correct station appears to be 155+10.

Wildlands response: The stationing text has been revised to 155+10 to correctly reflect the location of the BMPs' confluence with Bull Creek Reach 3.

DMS comment: There were several instances where cross-section locations were moved after the as-built survey was completed. For clarification, do the cross-section plots shown in the report represent the relocated cross-sections that will be used for the overlays in future monitoring years?

Wildlands response: Yes, the cross-section plots represented in the report are of the relocated cross-sections that will be used for the overlays in subsequent monitoring years.

DMS comment: Thank you for identifying the 127 LF of fence inadvertently installed inside the conservation easement and relocating this before MY1 is completed.

Wildlands response: You are welcome.



DMS comment: Numerous rock sills were replaced with logs sills due to local material availability. Were there more trees removed during construction than originally anticipated? Or, was this design decision based on other factors?

Wildlands response: We spec our sills to be interchangeable between boulders and logs. The functionality does not change. We removed a small number of additional trees during construction, which allowed us to use more logs and on-site materials as opposed to hauling in boulders.

DMS comment: Please modify existing photo point locations or add additional photo points to capture crossings/CE breaks for MY1. Please include cattle crossing area under Key Rd.

Wildlands response: Photo point locations have been either modified or added, as needed, to capture both an upstream and downstream representative photo of each culvert crossing/CE break, as well as both a northern and southern view of the cattle crossing at Key Mill Rd. These photo locations have been updated in the As-built Monitoring Plan View Maps (Figures 3.0 – 3.3), as well as in the Record Drawings. These location changes are depicted in red on the Record Drawings where they differ from those collected during the baseline survey. In addition, photos were collected in these locations during MY0, included in the MY0 photo log to serve as a baseline depiction of the revised location for comparison throughout the monitoring period, and recorded as changes in Section 5.1 Record Drawings of the As-built Baseline Monitoring Report.

DMS comment: The planting list shown in the Record Drawing differs from the planting list shown on the planting plan sheets provided in the approved Mitigation Plan. For the Record Drawing, please call out in Red the species that were not in the approved mitigation plan. For example, Black Gum, Silver Maple, Green Ash, Paw Paw, Southern Red Oak, Northern Red Oak, American Holly and American Beech were planted, but not in the approved mitigation plan.

Wildlands response: The record drawing planting list has been updated to reference the approved planting list from the Mitigation Plan. Species that were not listed on the approved planting list are shown in red as are changes in the planted densities. In addition, these updates have been revised in Section 5.1.17 Planting List of the As-built Baseline Monitoring Report.

DMS Comment: The IRT has requested that Green Ash not make up more than 5% of the planted stems on site. The planting plan shows that Green Ash comprises 12.5% of the planted stems. If a replant is required in the future, please exclude Green Ash from the list.

Wildlands response: Wildlands acknowledges that the planting density is higher than the IRT's recommended density for green ash and will refrain from using green ash if supplemental replanting is needed in the future.

DMS Comment: Are the green hatched areas that were not planted shown on the planting plan existing undisturbed forested areas? There is considerable area that was slated for planting that did not occur. Likewise, there are numerous areas that were planted that was not planned. Briefly explain this change to the planting plan.

Wildlands response: The green hatched areas that represent areas not planted per plan are mature forested areas. It was determined during construction that the density of trees and understory species were sufficient and met the stem count criteria. The red hatched areas represent areas that were planted but were not planned or the planting area was altered. There are two primary sections where this occurs: Bull Creek Reach 1A (Sheet 2.2) and near the confluence of Bull Creek and UT3 (Sheets 2.4 and 2.9). Bull Creek Reach 1A was due to the realignment of the stream to avoid a bedrock outcropping. The area near



UT3 confluence was where construction staging was expanded and where dirt was harvested to backfill the old channel. Planting in this area consisted of pasture seeding only.

Electronic Deliverables:

DMS Comment: Please include the zero credit connecting feature that spans the easement break.

Wildlands response: As requested the connecting feature has been included as a "Not for credit" polyline as part of the Project Stream feature class in the electronic geodatabase submittal.

DMS Comment: Before resubmitting, please isolate the stream features contained in "AlignmentDeviations_new.shp" and consolidate with "StreamPH_new.shp" for clarity. Please remove any old or irrelevant features from "StreamsPH_new.shp."

Wildlands response: As requested the two stream feature classes have been consolidated into one feature class, which is named "Project_Streams_AB". Additionally, old and/or irrelevant data have been removed.

Wildlands acknowledges that 180 days must separate MY0 versus MY1 data. Therefore, MY1 data collection will commence in late fall and/or early winter, and delivery of the MY1 report will be delayed until January 31st to account for this requirement.

As requested, Wildlands has included one hard copy of the Final Key Mill Mitigation Site As-built Baseline Monitoring Report and Record Drawings, as well as a USB drive that includes the full final electronic copy with the electronic support files of the report, and a PDF of our written responses to comments. Additionally, a copy of our response letter has been included after the report cover page of the revised report.

Sincerely,

A handwritten signature in blue ink that reads "Kristi Suggs".

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com