# MONITORING YEAR 3 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 (September 16, 2016)

Yadkin River Basin
HUC 03040101

Data Collection Period: January 2022 – October 2022
Submission: December 2022

**PREPARED FOR:**

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

**PREPARED BY:**

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December 28, 2022

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

RE: Final MY3 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 MY3 Monitoring Report for the Key Mill Mitigation Site. The report has been updated accordingly. The Final MY3 Monitoring Report and the digital are included. Wildlands' responses to DMS' report comments are noted below in *italics*.

**DMS comment: Please ensure the Monitoring Phase Performance Bond has been updated and approved by Kristie Corson before invoicing for Task 9.**

*Wildlands' response: Wildlands received an email confirmation from Kristie Corson on November 11, 2022, stating that she had received the updated bond for Task 9 (MY4) and that it has been approved. Wildlands is requesting an email confirmation from DMS that we may invoice for Task 9 upon the receipt of the Final Monitoring Year 3 Annual Report for the Key Mill Mitigation Site.*

**DMS comment: In an effort to identify and resolve property issues early during the monitoring period, please verify that the conservation easement boundary has been walked, marking and signage is up to spec, fencing is intact, and no encroachments have been identified.**

*Wildlands' response: The entire conservation easement (CE) boundary was walked in July of 2022, and multiple CE violations were documented. The landowner was contacted and asked to address the issues. A follow up site walk was conducted in September of 2022. The issues had been resolved and there were no additional CE issues noted at that time. A brief discussion is included in Section 2.2.*

**DMS comment: 2.1 Vegetation Assessment: Please add discussion regarding 2022 replant. Include plant species, type (gallon or bare root), dates and quantity. Please also include the replant areas on the CCPV.**

*Wildlands' response: A discussion about the replanting areas, as well as the species, size, quantity, and the wetland indicator status are listed in a table located in Section 2.2. Locations are included on the CCPV figures. Woody stem plantings are depicted as polygons and the live stake plantings are depicted as polylines.*

**DMS comment: 2.2 Vegetation Areas of Concern: Please include that invasive species treatment occurred across the site in MY3 between July 2022 and October 2022. Include short discussion regarding species that were treated.**

*Wildlands' response: Wildlands conducted herbicidal applications on the following species: Marsh dewflower (Murdannia keisak) and cattails (Typha latifolia) in July, tree of heaven (Ailanthus altissima) in September and October, and Chinese privet (Ligustrum sinese) and multiflora rose (Rosa multiflora) in October. None of the invasive population pockets exceeded the mapping threshold; therefore, none were mapped. See Section 2.3 for additional information.*

**DMS comment: 2.4 Stream Areas of Concern: Does WEI have plans to repair the piping structure?**

*Wildlands' response: Yes, we plan to repair it in early 2023.*

**DMS comment: CCPV: Figure shows the fence line within the conservation easement in numerous locations. Please verify no fence is installed within the conservation easement and revise layer, as necessary.**

*Wildlands' response: Wildlands verified that no fencing has been installed within the conservation easement (CE). The issue is with the GIS symbol used to reflect the placement of the fence. The symbol has been corrected and updated, and it now correctly reflects that the alignment of the fence is not within the CE boundary.*

**DMS comment: CCPV: Please include the piping structures on Bull Creek R3 on CCPV. Currently, an area of erosion is shown in the general location.**

*Wildlands' response: The CCPV figures depicted the issue on Bull Creek Reach 3 as scour within the riffle since the piping and the displacement of each log is part of a single riffle structure; however, after a brief discussion with DMS, it was decided to document the issue as part of a single engineered structure. Therefore, the symbol within the CCPV figure has been changed to depict it as a structure issue and recorded on Table 4d. under the channel sub-category as a piping and overall integrity issue, rather than a bed stability degradational issue. Both Table 4d and Figures 1a – 1c have been updated to reflect this change.*

**DMS comment: Table 4d Bull Creek R3: Table does not account for the piping structures under 3. Engineered Structures. Please revise.**

*Wildlands' response: See Wildlands previous response about the structure issue on Bull Creek Reach 3.*

**DMS comment: Table 14: Please add the 2022 supplemental planting to the table.**

*Wildlands' response: It has been added to Table 14 as requested.*

<u>Digital Deliverable Comments:</u>

**DMS comment: The database file submitted contains a file labeled "AOC MY2" which matches the visual assessment table for MY3 and MY CCPV, please verify DMS can report this as MY3.**

*Wildlands' response: This naming convention was used in error. Wildlands has updated this layer's name to correctly report it for MY3.*

**DMS comment: The same database file contains gauges previously submitted, please clarify the need to include this in the Year 3 data or verify this file may be deleted from the database.**

*Wildlands' response: Wildlands has updated this layer to contain only the gages that were added to the project in MY3, and this layer will need to be included in the Year 3 data.*

As requested, Wildlands has included two hard copies of the Final Monitoring Year 3 Annual Report, with a 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,

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

## 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.

Monitoring year (MY) 3 assessments and site visits were completed between January and October 2022 to assess the conditions of the project. All Sitewide measures that were implemented in late July of 2021 to address issues identified during the MY1 IRT Credit Release Site Walk on July 13, 2021 are still functioning as expected. Areas that were disturbed during the construction/implementation of these measures were replanted in 2022.

Overall, the Site has met the required stream, hydrology, and vegetation success criteria for MY3 and is performing as intended. Herbaceous vegetation has become well established throughout the Site. The MY3 vegetation surveys show an average planted stem density of 454 stems per acre, and the Site is on track to meet the MY5 requirement of 260 stems per acre. Geomorphic surveys show that cross-sectional dimensions closely match baseline conditions with only minor adjustments. The MY3 visual assessment did not identify any areas of low stem density, bare ground, or new stream areas of concern.

All monitored reaches received at least one bankfull event in MY3. The in-stream flow gage located on UT2 recorded 261 days of consecutive baseflow in 2022 or 100% of the monitored period for MY3. A few small areas of invasive species were noted and treated. Encroachment issues have been resolved, and no other issues were observed during the Site assessment field walk in September 2022. Wildlands will continue to monitor these areas throughout the seven-year monitoring period. If necessary, adaptive maintenance measures will be implemented to benefit the ecological health of the Site.

**KEY MILL MITIGATION SITE**

Monitoring Year 3 Annual Report

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# Section 1: PROJECT OVERVIEW

## 1.1 Project Quantities and Credits

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. 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. 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. 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 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 (CE) has been recorded and is in place on 20.8 acres.

Please refer to Table 1 for the project's stream credits and the credit summary table. Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2027 given the success criteria are met.

**Table 1: Project Quantities and Credits**

| Project Reach | Mitigation Plan Footage | As-Built Footage | Mitigation Category | Restoration Level | Mitigation Ratio (X:1) | Notes/Comments |
|---|---|---|---|---|---|---|
| Bull Creek Reach 1A | 444 | 421 | Cool | R | 1.000 | Priority 1 channel restoration, fence installation for cattle exclusion, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |
| Bull Creek Reach 1B | 722 | 722 | Cool | R | 1.000 | |
| Bull Creek Reach 2 | 418 | 418 | Cool | R | 1.000 | Priority 1 channel restoration with priority 2 restoration used when transitioning the restored channel to the existing channel bed elevation, fence installation for cattle exclusion, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |

**Table 1: Project Quantities and Credits**

| Project Reach | Mitigation Plan Footage | As-Built Footage | Mitigation Category | Restoration Level | Mitigation Ratio (X:1) | Notes/Comments |
|---|---|---|---|---|---|---|
| Bull Creek Reach 3 | 1,674 | 1,676 | Cool | R | 1.000 | Priority 2 restoration, fence installation for cattle exclusion, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |
| Bull Creek Reach 4 | 683 | 683 | Cool | P | 10.000 | The implementation of a conservation easement for protection in perpetuity. |
| UT1A | 829 | 832 | Cool | EII | 2.500 | Enhancement II implementation included isolated pockets of bank grading, fence installation for cattle exclusion, replacement of a collapsed culvert with an appropriately sized culverted crossing, profile adjustments where needed, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |
| UT1B | 212 | 212 | Cool | R | 1.000 | Priority 2 restoration, fence installation for cattle exclusion, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |
| UT1C | 257 | 257 | Cool | R | 1.000 | |
| UT2 | 42 | 42 | Cool | R | 1.000 | Priority 2 restoration, fence installation for cattle exclusion, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |
| UT2A | 315 | 315 | Cool | R | 1.000 | |
| UT2B | 263 | 263 | Cool | R | 1.000 | |
| UT2C | 469 | 469 | Cool | R | 1.000 | |
| UT3 | 18 | 18 | Cool | EII | 2.500 | Enhancement II implementation included isolated pockets of bank grading, fence installation for cattle exclusion, profile adjustments where needed, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |
| UT3A | 413 | 390 | Cool | EII | 2.500 | |

**Table 1: Project Quantities and Credits**

| Project Reach | Mitigation Plan Footage | As-Built Footage | Mitigation Category | Restoration Level | Mitigation Ratio (X:1) | Notes/Comments |
|---|---|---|---|---|---|---|
| UT3B | 307 | 307 | Cool | R | 1.000 | Priority 2 restoration, fence installation for cattle exclusion, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |
| UT3C | 412 | 412 | Cool | R | 1.000 | Priority 1 channel restoration with priority 2 restoration used when transitioning the restored channel to the existing channel bed elevation, fence installation for cattle exclusion, invasive species removal/treatment, riparian plantings, and the implementation of a conservation easement for protection in perpetuity. |

**Credit Summary Table**

| Restoration Level | Stream | | |
|---|---|---|---|
| | Warm | Cool | Cold |
| Restoration | N/A | 5,535.000 | N/A |
| Enhancement I | N/A | N/A | N/A |
| Enhancement II | N/A | 504.000 | N/A |
| Preservation | N/A | 68.300 | N/A |
| **Total Stream Credit** | **6,107.300** | | |

## 1.2 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:

**Table 2: Goals, Performance Criteria, and Functional Improvements**

| Goal | Objective/ Treatment | Likely Functional Uplift | Performance Criteria | Measurement | Cumulative Monitoring Results |
|---|---|---|---|---|---|
| Improve the stability of stream channels. | Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time. | Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. | BHR to remain below 1.2 and entrenchment ratio (ER) to remain above 2.2 for C/E type channels over the monitoring period with visual assessments showing progression towards stability. | 15 Cross-sections will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually. | All cross sections, except for XS9 on UT1B and XS10 on UT1C have a BHR <1.2. XS9 has a BHR of 1.2, but the channel incision is minimal. It is the aggradation within the floodplain that has raised bank heights and contributing to a higher BHR. XS10 has a BHR of 1.2; however, the bed scour at this cross-section occurred in MY1. Since then, no additional bed scour has occurred. Overall, all channels are stable and have maintained the constructed riffle and pool sequence. ER results are greater than 2.2 for all measured cross-sections. |
| Reconnect channels with historic floodplains. | Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data. | Allow more frequent flood flows to disperse on the floodplain. | Four bankfull events in separate years within the 7-year monitoring period. Continuous baseflow must occur every year for at least 30 days of consecutive days during the monitoring year. This 30-day period can occur at any point during the year. | 6 automated crest gages, 1 manual crest gage, and 1 automated stream gage were installed on restoration reaches and will record flow elevations and durations. | In MY3, at least one bankfull event was recorded with an automated crest gage on Bull Creek Reach 1B and Reach 2, UT1C, UT2C, and UT3C and with a manual crest gage on Bull Creek Reach 3. The stream gage on UT2 recorded 261 days of consecutive flow or 100% of the monitoring period. |

**Table 2: Goals, Performance Criteria, and Functional Improvements**

| Goal | Objective/ Treatment | Likely Functional Uplift | Performance Criteria | Measurement | Cumulative Monitoring Results |
|---|---|---|---|---|---|
| Restore and enhance native floodplain and streambank vegetation. | Plant native tree and understory species in riparian zones and plant native shrub and herbaceous species on streambanks. | Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream. | Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Additionally, trees in each plot must average 7 feet in height by MY5 and 10 feet by MY7. | Eight (8) permanent and Five (5) mobile one hundred square meter vegetation plots are monitored during MY1, MY2, MY3, MY5, and MY7. | 85% or 11 of the 13 vegetation plots (6 permanent and 5 mobile) have met the MY3 success criteria of 320 stems per acre. |
| 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. | Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time. | There is no required performance standard for this metric. | Visual assessment. | N/A |
| Diffuse concentrated agricultural runoff. | Install stormwater BMPs in areas of concentrated agricultural runoff to diffuse and provide vegetated infiltration for runoff before it enters the stream channel. | Reduce agricultural and sediment inputs to the project, which will reduce likelihood of accumulated fines and excessive algal blooms from nutrients. | There is no required performance standard for this metric. | N/A | N/A |

**Table 2: Goals, Performance Criteria, and Functional Improvements**

| Goal | Objective/ Treatment | Likely Functional Uplift | Performance Criteria | Measurement | Cumulative Monitoring Results |
|---|---|---|---|---|---|
| Permanently protect the project Site from harmful uses. | Establish conservation easements on the Site. | Protect Site from encroachment on the riparian corridor and direct impact to streams and wetlands. | Prevent easement encroachment. | Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring. | No easement encroachments observed. |
| Exclude livestock from stream channels. | Install livestock fencing and watering systems as needed to exclude livestock from stream channels and riparian areas. | Reduced agricultural runoff and cattle trampling in streams. | There is no required performance standard for this metric. | Visually monitor fenced portions of the site to ensure no cattle are entering the easement. | No cattle observed in easement. |
| 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. | Reduce sedimentation , improve instream habitat, and bedform diversity. | Cross-sections should be stable and show little change in bankfull area, and width-to-depth ratio. | Cross-section monitoring and visual assessment. | Overall, all channels are stable and bank erosion is minimal. Reaches have maintained the constructed riffle and pool sequence. |

## 1.3 Project Attributes

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 3 and in Table 9 of Appendix C.

The Site drains approximately 2.15 square miles of rural land, predominantly actively grazed pasture with the downstream extent of the Site forested. Valleys throughout the West side 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. Downstream of the Site, Bull Creek continues southeast to join the Ararat River near the Cedar Hill community.

**Table 3: Project Attributes**

| Project Information | | | |
|---|---|---|---|
| **Project Name** | Key Mill Mitigation Site | **County** | Surry County |
| **Project Area (acres)** | 20.8 | **Project Coordinates** | 36° 23' 57.4794"N<br>-80° 36' 11.88"W |

**Table 3: Project Attributes**

| Project Information | | | |
|---|---|---|---|
| **Planted Acreage** | 9.8 acres (full planting) plus supplemental planting | | |
| **Project Watershed Summary Information** | | | |
| **Physiographic Province** | Piedmont | **River Basin** | Yadkin River |
| **USGS Hydrologic Unit 8-digit** | 3040101 | **USGS Hydrologic Unit 14-digit** | 3040101110040 |
| **Project Watershed Summary Information** | | | |
| **DWR Sub-basin** | 03-07-03 | **Project Drainage Area Percentage of Impervious Area** | 1% |
| **Project Drainage Area (acres)** | Bull Creek Reach 1A, 1B, & 2: (1,146);<br>Bull Creek Reach 3 & 4: (1,293);<br>UT1A-C: (102);<br>UT2A-C: (32);<br>UT2: (6);<br>UT3 & UT3-C: (45) | **2011 NLCD Land Use Classification** | Bull Creek- Forest (58%), Cultivated (33%), Urban (9%)<br>UT1A-C - Forest (70%), Cultivated (21%), Urban (9%)<br>UT2A-C - Forest (32%), Cultivated (49%), Urban (19%)<br>UT2 - Forest (55%), Cultivated (45%), Urban (0%)<br>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 | | |
| **Parameters** | **UT2** | **UT2A** | **UT2B** | **UT2C** | **UT3** | **UT3A** | **UT3B** | **UT3C** |
| Length of reach (linear feet) - Post-Restoration | 42 | 315 | 263 | 469 | 18 | 390 | 307 | 412 |

**Table 3: Project Attributes**

| Project Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 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 | | | | | | | |

| 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 |

# Section 2: MONITORING YEAR 3 DATA ASSESSMENT

Annual monitoring for MY3 was conducted between January and October 2022 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 1 – 1c. Refer to Table 14 for the project's activity and reporting history.

All the areas that were previously repaired in July 2021, as outlined in the Site's Adaptive Management Plan, were successfully re-planted in early 2022 and are doing well. Wildlands will continue assessing these areas throughout the seven-year monitoring period for the project.

## 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 relocated in MY3 throughout the planted conservation easement, as described in the Site's Baseline Conditions Report (Wildlands, 2020). To evaluate the random vegetation performance for the Site, mobile plots will continue to be reestablished in different random locations in monitoring years 5 and 7. Mobile vegetation plot assessments will document stems, species, and height using 100-meter$^2$ circular, square, or rectangular plots. The final vegetative performance standard for all plots is the survival of 210 planted stems per acre, with an average height of 10-ft, 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, with an average height of 7-ft, at the end of MY5.

The MY3 vegetation survey was completed in August 2022 and resulted in an average planted stem density of 454 stems per acre for all monitored permanent and mobile vegetation plots. Eleven out of the 13 plots individually exceeded the MY3 interim requirement with densities ranging from 364 to 567. The two plots that slightly missed the MY3 target density criteria were permanent vegetation plots 2 and 5, both of which had an average of 283 planted stems per acre. The majority of the surviving stems throughout the monitored plots appear to be thriving with a vigor of 3 or greater (a plant health indicator of good or better). The average MY3 stem height for all monitored plots is 4.4 feet, which is 1.8 feet taller than the average height in MY2. All plots are on track to meet the stem density and height performance criteria for both MY5 and MY7.

Please refer to Appendix A for vegetation plot photographs and Appendix B for vegetation data tables.

## 2.2 Vegetation Areas of Concern and Management Activity

Overall, herbaceous ground cover continues to become well established throughout the Site and wetland vegetation continues to fill in the wet seeps, stabilizing the soil. Areas of low stem density and/or of bare or poor herbaceous cover, noted during MY1, were supplementally planted and seeded in early MY2. These areas continue to thrive and are no longer of concern. There were no areas of bare ground or low stem density noted in MY3.

Additional supplemental planting of woody vegetation and live stakes occurred in 2022 to revegetate disturbed areas created when earthwork was conducted to address issues identified during the MY1 IRT Credit Release Site Walk on July 13,2021. Though these areas were supposed be replanted in early 2022,

miscommunication inadvertently caused the dormant window in early 2022 to pass. Though unfortunate, the areas had been stabilized with both temporary and permanent riparian seed and were not experiencing any bare or erosional areas. In hopes to offset this oversight, on December 1st and 2nd, 2022, Wildlands installed 100, 1- and 2-gallon woody container plants and approximately 60 live stake cuttings that were harvested on-site. The type of planted woody species, number of species, and container size are included in the table below. All of the species, except for spicebush (*Lindera benzoin*), had been previously approved; however, due to extremely limited nursery stock, Wildlands determined that spicebush was the best choice since we commonly use the species on our projects, it has a high wildlife value, and is appropriate for the plant community. Wildlands is requesting approval for the inclusion of spicebush into the Site's planting list. If for some reason spicebush isn't approved, Wildlands will refrain from counting the species as part of the planted stem densities for vegetative performance. See the Key Mill Mitigation Site As-built Baseline Monitoring Report Record Drawings (Wildlands, 2020) for live stake species. Locations of the replanting areas are depicted on the Current Condition Plan View (CCPV) figures.

| Woody Vegetation | | | | |
|---|---|---|---|---|
| **Scientific Name** | **Common Name** | **Container Size** | **Wetland Indicator Status** | **Number of Plants** |
| *Quercus rubra* | Northern red oak | 2 - Gallon | FACU | 20 |
| *Betula nigra* | River birch | 1 - Gallon | FACW | 15 |
| *Platanus occidentalis* | Sycamore | 1 - Gallon | FACW | 15 |
| *Lindera benzoin* | Spicebush | 1 - Gallon | FAC | 15 |
| *Fagus grandifolia* | American beech | 1 - Gallon | FACU | 15 |
| *Viburnum dentatum* | Southern arrowwood | 1 - Gallon | FAC | 10 |
| *Hamamelis virginiana* | Witchhazel | 1 - Gallon | FACU | 10 |
| | | | **Total** | 100 |

During MY3, the project Site was assessed for invasive species populations. As in previous monitoring years, invasive populations continue to remain in small, isolated pockets throughout the easement. In effort to keep invasives to a minimum, Wildlands conducted herbicidal applications on the following species: Marsh dewflower (*Murdannia keisak*) and cattails (*Typha latifolia*) in July, tree of heaven (*Ailanthus altissima*) in September and October, and Chinese privet (*Ligustrum sinese*) and multiflora rose (*Rosa multiflora*) in October. None of the invasive population pockets exceeded the mapping threshold; therefore, none were included on the CCPV figures.

In July of 2022, the entire Site CE boundary was walked, and multiple violations were documented. The landowner was contacted and asked to address the issues. A follow up Site walk was conducted in September of 2022. All issues had been resolved and there were no additional CE issues noted at that time.

## 2.3 Stream Assessment

Morphological surveys 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 MY3 were conducted in July 2022. Overall, cross-section survey results indicate that most of the channels' dimensions are stable and functioning as designed with minimal adjustments. Changes occurring within a few cross-sections include slight variations in cross-sectional areas and widths, as well as mean depths. Bank height ratios (BHR) at surveyed cross-sections were less than 1.2 for all reaches, except for cross-section 9 (XS9) on UT1B and XS10 on UT1C. XS9 has a BHR of 1.2, but the channel incision is minimal. It is the aggradation within the floodplain that has raised bank heights and is contributing to the higher BHR. XS10 also has a BHR of 1.2; however, the bed scour at this cross-section occurred in MY1. Since then, no additional bed scour has occurred. Overall, all channels are stable and have maintained the constructed riffle and pool sequence. ER results are greater than 2.2 for all measured cross-sections. Minor changes in cross-sectional profiles are normal for a restored stream 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 2.4 for further discussion about stream areas of concern.

Please refer to CCPV Figures 1 – 1c for cross-section locations, Appendix A for the visual stability assessment tables and stream photographs, and Appendix C for the morphological tables and plots.

## 2.4 Stream Areas of Concern and Management Activity

MY3 stream and visual assessments revealed that over 98% of the Site's reaches are stable and performing as intended. There were no new stream areas of concern (AOC) noted in MY3. Existing AOCs that were noted MY2, include localized instances of aggradation (Bull Creek Reach 1A and UT3C) and the displacement and piping of logs within a log roller riffle on Bull Creek Reach 3. Maintenance with the use of hand tools is scheduled to occur in early 2023 to repair the piping log within the riffle; however, Wildlands does not plan to reset the dislocated log since it is not currently causing any issues of instability. No maintenance is scheduled for the areas of localized aggradation, either. Sediment accumulation has ceased, and stream processes are starting to move it through the system. Areas of concern are noted in Figures 1a - 1c. See Appendix A for pictures pertaining to the Areas of Concern.

## 2.5 Stream Hydrology Assessment

Five automated pressure transducers were installed in MY0 to document stream hydrology throughout the seven-year monitoring period. In MY3, an additional transducer and manual crest gage were installed along Bull Creek Reach 1B and Reach 3, respectively, to serve as back up gages and/or checks on Bull Creek Reach 1A and Reach 3, since neither recorded a bankfull event in MY2. Henceforth, these devices are referred to as "crest gages (CG)" and "manual crest gage (MCG)" 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 and intermittent channels have maintained 30 consecutive days of baseflow in each monitoring year. Pressure transducers are programmed to record data every 2 hours and have captured many high flow events since monitoring commenced in MY1.

Average rainfall in MY3 exceeded the amount recorded in MY2. Automated crest gages (CG)1 – 4 recorded at least one bankfull event on each of the restoration reaches in MY3. Though the manual crest gage, 1, and the automated CG6 were added in MY3, each recorded at least one bankfull event. At the beginning of MY3, each gage was checked for accuracy and replaced if needed to ensure accurate readings. Crest gages 2 and 4 both experienced malfunctions during the first 2 months of the year

possibly due to below freezing temperatures. Additionally, UT2, which is monitored to confirm the continuation of intermittent baseflow conditions on the restored channel, recorded 261 days of consecutive flow, exceeding the 30-day consecutive flow requirement. Please refer to Figures 1 – 1c for gage locations and Appendix D for hydrology summary data and gage plots.

## 2.6 MY3 Summary

Overall, the Site has met the required stream, hydrology, and vegetation success criteria for MY3. Herbaceous ground cover is well established throughout most of the Site, and the overall average planted stem density for the Site is 454 stems per acre, which is exceeds the MY3 requirement of 320 stems per acre by more than 10% for 11 out of 13 plots. Overall, geomorphic surveys indicate that cross-sectional dimensions closely match baseline conditions with some minor adjustments, and the streams are functioning as intended. At least one bankfull event was documented on each of the 5 monitored reaches in MY3, and UT2's baseflow exceeded the 30-day requirement for intermittent streams, with a total of 261 days of consecutive flow. The MY3 visual assessment identified no new areas of concern. A few isolated areas of aggradation on Bull Creek Reach 1A and UT3C, as well as structure issues within a log roller riffle on Bull Creek Reach 3 were noted in the Site's MY2 report. No areas of encroachment were noted during MY3, and only a few small areas of invasive species populations were treated. Supplement planting to re-vegetate construction access areas from the Site's AMP has been completed. Wildlands will continue to monitor the Site, and adaptive maintenance 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 was 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 ArcGIS. Crest gages, stream gages, and groundwater gages are monitored quarterly. Monitoring instrument installation and methods are in accordance with the 2016 NC IRT Stream and Wetland Compensatory Mitigation Update and NC DMS Annual Monitoring and Closeout Template (2015). Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

# Section 4: REFERENCES


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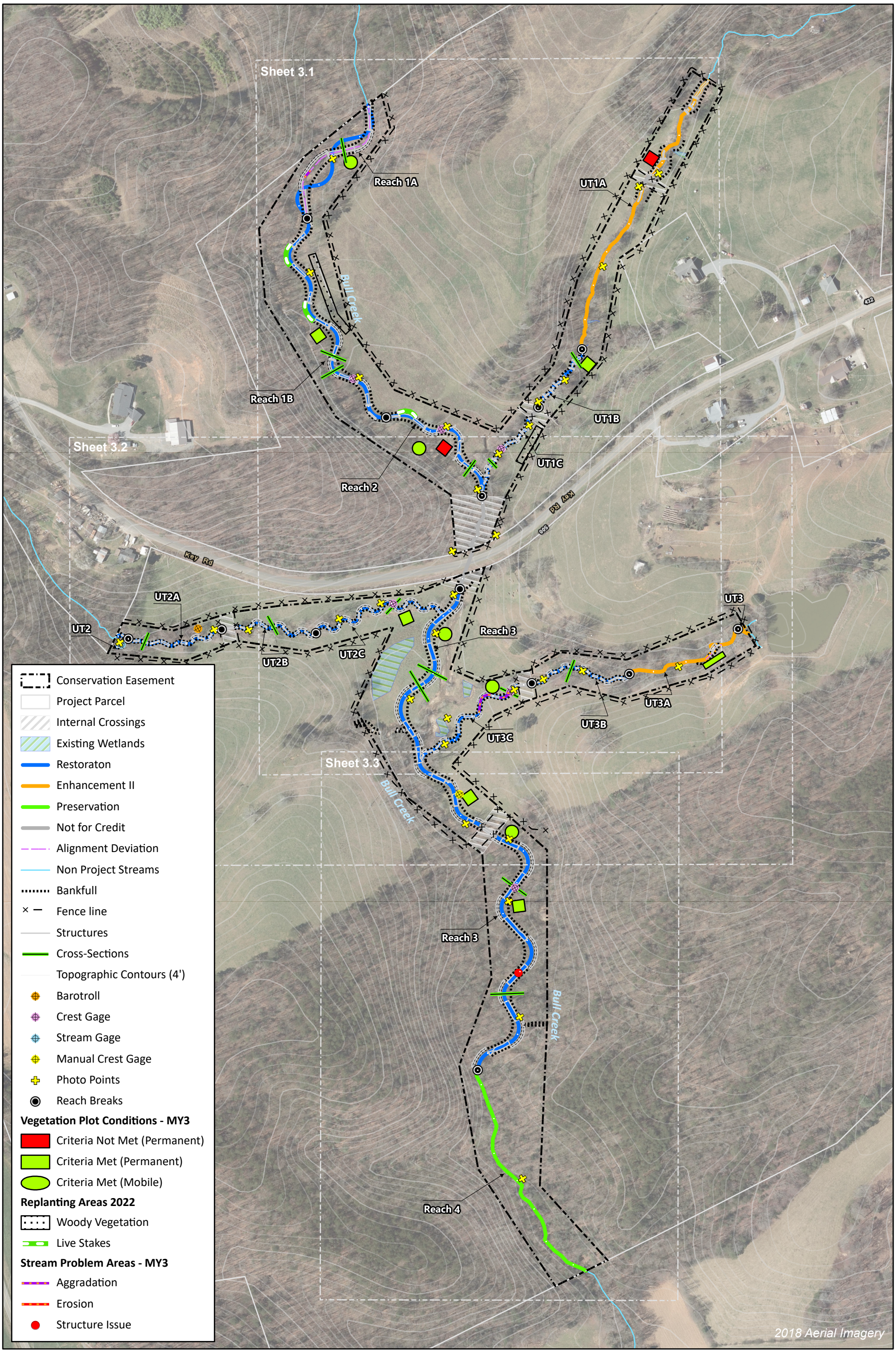
# FIGURES




WILDLANDS ENGINEERING

0 250 500 Feet

Figure 1. Current Conditions Plan View Map (Key)
Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 3 - 2022
*Surry County, NC*

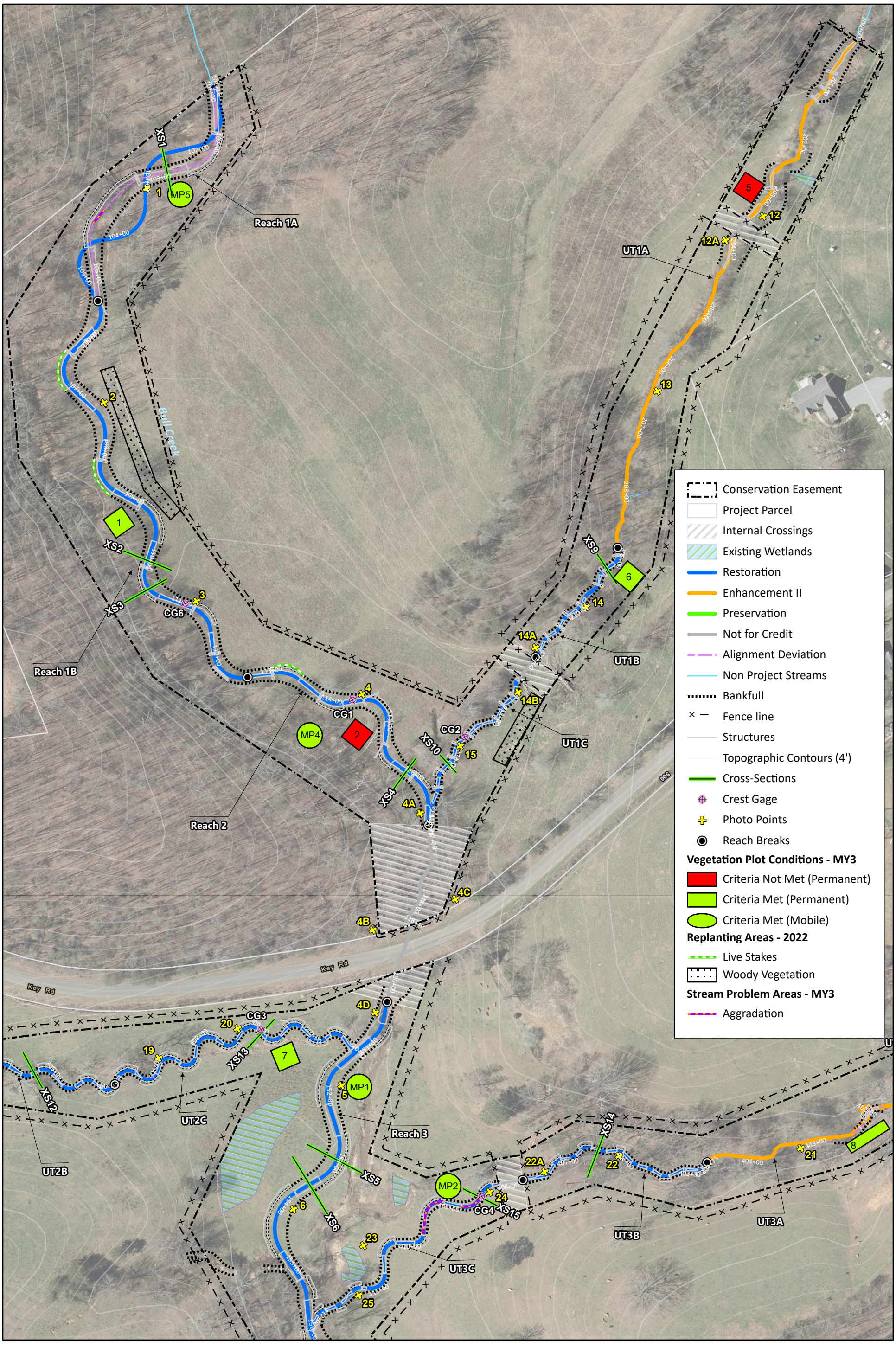
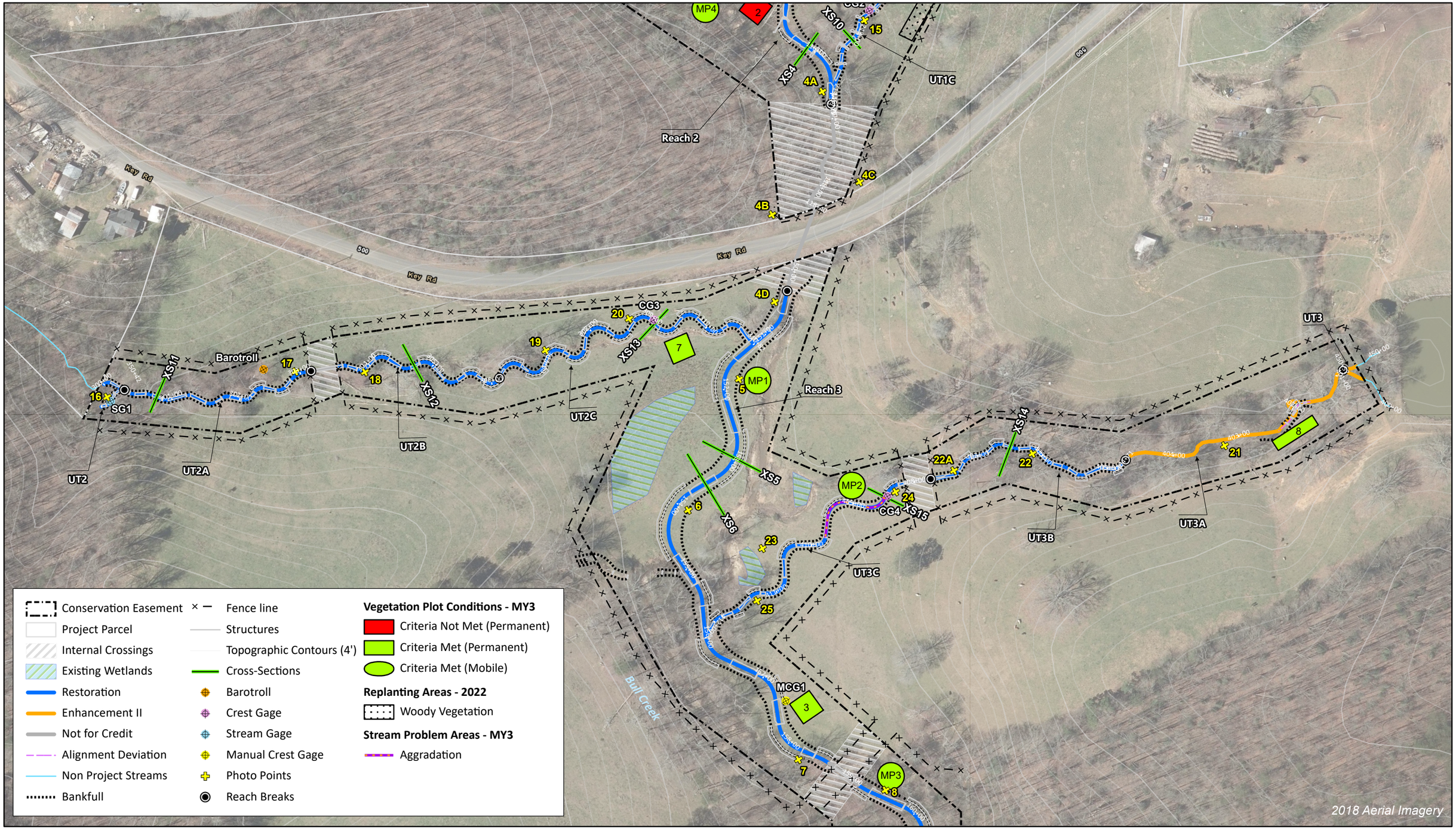



Figure 1a. Current Condition Plan View Map
Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 3 - 2022
*Surry County, NC*

WILDLANDS ENGINEERING




Conservation Easement
Project Parcel
Internal Crossings
Existing Wetlands
Restoration
Enhancement II
Not for Credit
Alignment Deviation
Non Project Streams
Bankfull

Fence line
Structures
Topographic Contours (4')
Cross-Sections
Barotroll
Crest Gage
Stream Gage
Manual Crest Gage
Photo Points
Reach Breaks

**Vegetation Plot Conditions - MY3**
Criteria Not Met (Permanent)
Criteria Met (Permanent)
Criteria Met (Mobile)

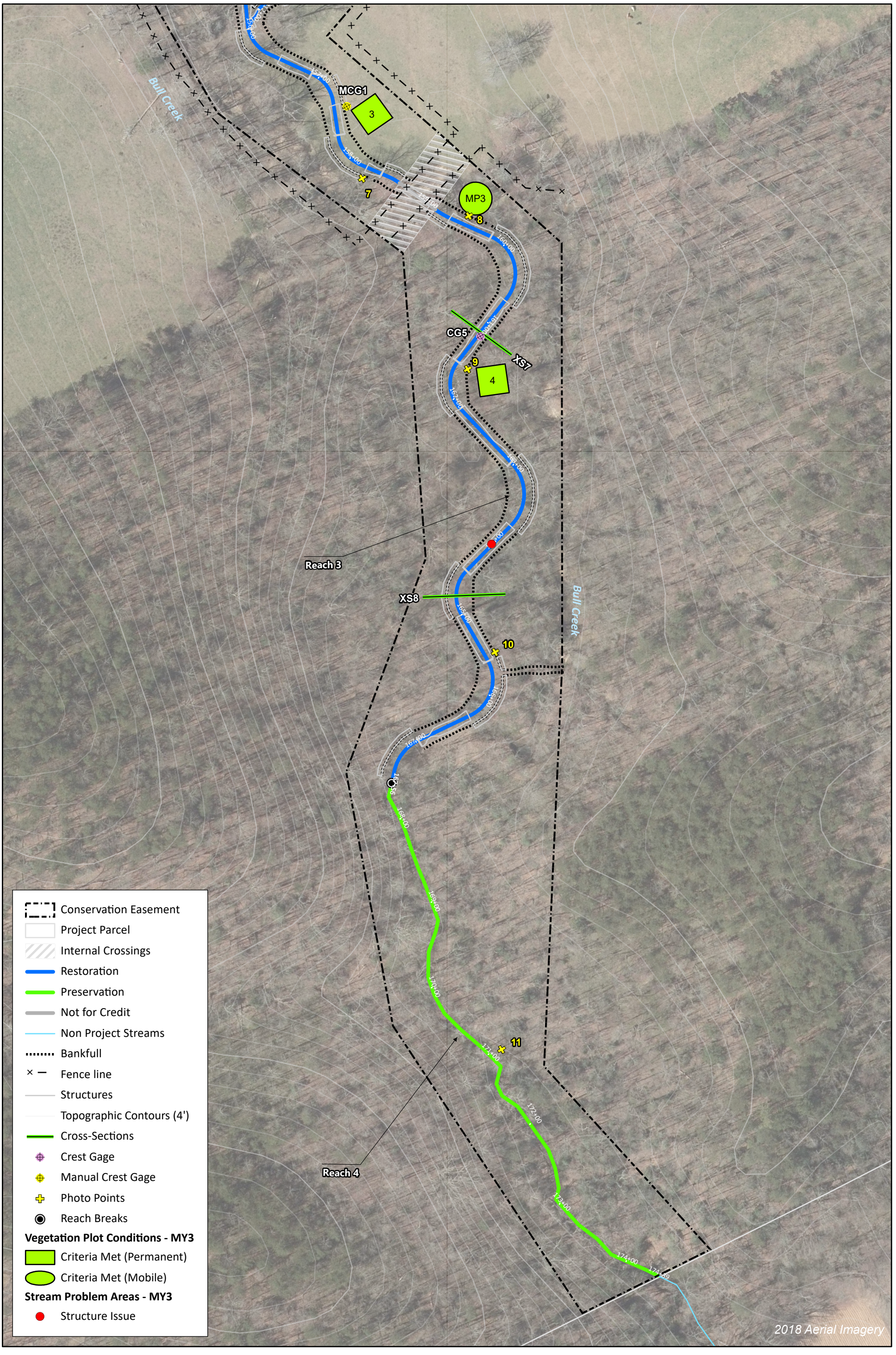
**Replanting Areas - 2022**
Woody Vegetation

**Stream Problem Areas - MY3**
Aggradation

WILDLANDS ENGINEERING

0 125 250 Feet

Figure 1b. Current Conditions Plan View Map
Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 3 - 2022
*Surry County, NC*




WILDLANDS ENGINEERING

0 100 200 Feet

Figure 1c. Current Conditions Plan View Map
Key Mill Mitigation Site
DMS Project No. 100025
Monitoring Year 3 - 2022
*Surry County, NC*

# APPENDIX A. Visual Assessment Data

**Table 4a. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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 | 25.5 | 94% | | | |
| | | 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% | | | |

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

**Table 4b. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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% | | | |

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

**Table 4c. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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 | | | 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. | 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% | | | |

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

**Table 4d. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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 | | | 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. | 27 | 28 | | | 96% | | | |
| | 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% | | | |

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

**Table 4e. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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% | | | |

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

**Table 4f. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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 | | | 0 | 0 | 100% | | | |
| | 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% | | | |

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

**Table 4g. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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% | | | |

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

**Table 4h. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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 | | | 0 | 0 | 100% | | | |
| | | Degradation | | | 0 | 0 | 100% | | | |
| | 2. Riffle Condition | Texture/Substrate | 11 | 11 | | | 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) | 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. | 10 | 10 | | | 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. | 12 | 12 | | | 100% | | | |

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

**Table 4i. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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% | | | |

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

**Table 4j. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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% | | | |

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

**Table 4k. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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 | | | 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) | 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 | | | 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. | 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% | | | |

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

**Table 4l. Visual Stream Morphology Stability Assessment Table**

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**
**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% | | | |

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

**Table 5. Vegetation Condition Assessment Table**

Key Mill Mitigation Site

DMS Project No. 100025

**Monitoring Year 3 - 2022**

**Date of visual assessment: September 19, 2022**

**Planted Acreage** **9.8**

| Vegetation Category | Definitions | Mapping Threshold (acres) | Number of Polygons | Combined Acreage | % of Planted Acreage |
|---|---|---|---|---|---|
| **Bare Areas** | Very limited cover of both woody and herbaceous material | 0.1 | 0 | 0.0 | 0.0% |
| **Low Stem Density Areas** | Woody stem densities clearly below target levels based on MY3, 5, or 7 stem count criteria. | 0.1 | 0 | 0.0 | 0.0% |
| | | **Total** | **0** | **0.0** | **0.0%** |
| **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** | **0** | **0.0** | **0.0%** |

**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 Reach 1A – Reach 4**

**Monitoring Year 3**

| | |
|---|---|
|  |  |
| **Photo Point 1** – looking upstream (04/14/2022) | **Photo Point 1** – look downstream (04/14/2022) |
|  |  |
| **Photo Point 2** – looking upstream (04/14/2022) | **Photo Point 2** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 3** – looking upstream (04/14/2022) | **Photo Point 3** – looking downstream (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 4** – looking upstream (04/14/2022) | **Photo Point 4** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 4A** – looking upstream (04/14/2022) | **Photo Point 4A** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 4B** – looking north (04/14/2022) | **Photo Point 4C** – looking west (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 4D** – looking upstream (04/14/2022) | **Photo Point 4D** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 5** – looking upstream (04/14/2022) | **Photo Point 5** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 6** – looking upstream (04/14/2022) | **Photo Point 6** – looking downstream (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 7** – looking upstream (04/14/2022) | **Photo Point 7** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 8** – looking upstream (04/14/2022) | **Photo Point 8** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 9** – looking upstream (04/14/2022) | **Photo Point 9** – looking downstream (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 10** – looking upstream (04/14/2022) | **Photo Point 10** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 11** – looking upstream (04/14/2022) | **Photo Point 11** – looking downstream (04/14/2022) |

# STREAM PHOTOGRAPHS

**UT1A – UT1C**

**Monitoring Year 3**

| | |
|---|---|
|  |  |
| **Photo Point 12** – looking upstream (04/14/2022) | **Photo Point 12** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 12A** – looking upstream (04/14/2022) | **Photo Point 12A** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 13** – looking upstream (04/14/2022) | **Photo Point 13** – looking downstream (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 14** – looking upstream (04/14/2022) | **Photo Point 14** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 14A** – looking upstream (04/14/2022) | **Photo Point 14A** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 14B** – looking upstream (04/14/2022) | **Photo Point 14B** – looking downstream (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 15** – looking upstream (04/14/2022) | **Photo Point 15** – looking downstream (04/14/2022) |

# STREAM PHOTOGRAPHS

**UT2 – UT2C**

**Monitoring Year 3**

| | |
|---|---|
|  |  |
| **Photo Point 16** – looking upstream (04/14/2022) | **Photo Point 16** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 17** – looking upstream (04/14/2022) | **Photo Point 17** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 18** – looking upstream (04/14/2022) | **Photo Point 18** – looking downstream (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 19** – looking upstream (04/14/2022) | **Photo Point 19** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 20** – looking upstream (04/14/2022) | **Photo Point 20** – looking downstream (04/14/2022) |

# STREAM PHOTOGRAPHS

**UT3A – UT3C**

**Monitoring Year 3**

| | |
|---|---|
|  |  |
| **Photo Point 21** – looking upstream (04/14/2022) | **Photo Point 21** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 22** – looking upstream (04/14/2022) | **Photo Point 22** – looking downstream (04/14/2022) |
|  |  |
| **Photo Point 22A** – looking upstream (04/14/2022) | **Photo Point 22A** – looking downstream (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 23** – wetland looking north (04/14/2022) | **Photo Point 23** – wetland looking east (04/14/2022) |
|  |  |
| **Photo Point 23** – wetland looking south (04/14/2022) | **Photo Point 23** – wetland looking west (04/14/2022) |
|  |  |
| **Photo Point 24** – looking upstream (04/14/2022) | **Photo Point 24** – looking downstream (04/14/2022) |

| | |
|---|---|
|  |  |
| **Photo Point 25** – looking upstream (04/14/2022) | **Photo Point 25** – looking downstream (04/14/2022) |

# VEGETATION PLOT PHOTOGRAPHS

**Monitoring Year 3**

| | |
|---|---|
|  |  |
| **Permanent Vegetation Plot 1** (08/11/2022) | **Permanent Vegetation Plot 2** (08/11/2022) |
|  |  |
| **Permanent Vegetation Plot 3** (08/11/2022) | **Permanent Vegetation Plot 4** (08/11/2022) |
|  |  |
| **Permanent Vegetation Plot 5** (08/11/2022) | **Permanent Vegetation Plot 6** (08/11/2022) |

| | |
|---|---|
|  |  |
| **Permanent Vegetation Plot 7** (08/11/2022) | **Permanent Vegetation Plot 8** (08/11/2022) |

**Mobile Vegetation Plot 1 (North)** (08/11/2022)

**Mobile Vegetation Plot 2 (North)** (08/11/2022)

**Mobile Vegetation Plot 3 (North)** (08/11/2022)

**Mobile Vegetation Plot 4 (North)** (08/11/2022)

**Mobile Vegetation Plot 5 (North)** (08/11/2022)

# AREA OF CONCERN PHOTOGRAPHS

**Monitoring Year 3**

Bull Creek Reach 1A: aggradation at station 104+00 – 104+25 – looking upstream (09/19/2022)

Bull Creek Reach 3: log roller riffle at station 164+00 with piping under one of the structure's logs – looking upstream (09/19/2022)

Bull Creek Reach 3: log roller riffle at station 164+00 with one of its header logs dislocated from its footer log (09/19/2022)

UT3C: aggradation at stations 408+52 – 408+87 & 409+08 – 409+75 – looking upstream (09/19/2022)

# APPENDIX B. Vegetation Plot Data

## Table 6. Vegetation Plot Criteria Attainment

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| Permanent Vegetation Plot | MY3 Success Criteria Met (Y/N) | Tract Mean (MY3 - 2022) | |
|---|---|---|---|
| 1 | Y | 75% | 85% |
| 2 | N | | |
| 3 | Y | | |
| 4 | Y | | |
| 5 | N | | |
| 6 | Y | | |
| 7 | Y | | |
| 8 | Y | | |
| **Mobile Vegetation Plot** | **MY3 Success Criteria Met (Y/N)** | | |
| 1 | Y | 100% | |
| 2 | Y | | |
| 3 | Y | | |
| 4 | Y | | |
| 5 | Y | | |

**Table 7. CVS Permanent Vegetation Plot Metadata**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| | |
|---|---|
| **Report Prepared By** | Freddy Ortega |
| **Date Prepared** | 9/2/2022 11:11 |
| **Database Name** | cvs-eep-entrytool-v2.5.0 Key Mill MY3.mdb |
| **Database Location** | C:\Users\fortega\OneDrive - Wildlands Engineering Inc\Desktop\Microsoft Access Veg Data - Work in this folder & return to original location when finished\Key Mill MY3 Veg |
| **Computer Name** | FREDDY2022 |
| **File Size** | 74149888 |
| **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** | 13 |

**Table 8a. Planted and Total Stem Counts**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| Current Permanent Vegetation Plot Data (MY3 2022) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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** |
| *Acer negundo* | Boxelder | Tree | 2 | 2 | 2 | | | | | | | 3 | 3 | 4 |
| *Acer rubrum* | Red Maple | Tree | | | | | | | | | 10 | | | |
| *Acer saccharinum* | Silver Maple, Soft Maple | Tree | | | | | | | | | | | | |
| *Alnus serrulata* | Tag Alder, Smooth Alder, Hazel Alder | Shrub Tree | | | | | | | | | | | | |
| *Asimina triloba* | Common Pawpaw, Indian-banana | Shrub Tree | | | | | | | | | | | | |
| *Betula nigra* | River Birch, Red Birch | Tree | 4 | 4 | 4 | 3 | 3 | 3 | 6 | 6 | 6 | 2 | 2 | 3 |
| *Carpinus caroliniana* | Ironwood | Shrub Tree | 1 | 1 | 1 | | | | | | | | | |
| *Diospyros virginiana* | American Persimmon | Tree | | | | | | | | | | | | |
| *Fagus grandifolia* | American Beech | Tree | | | | | | | | | | | | |
| *Fraxinus pennsylvanica* | Green Ash, Red Ash | Tree | 1 | 1 | 1 | 2 | 2 | 2 | | | | | | |
| *Hamamelis virginiana* | Witch-hazel | Shrub Tree | 2 | 2 | 2 | | | | | | | | | |
| *Ilex opaca* | American Holly, Christmas Holly | Shrub Tree | | | | | | | | | | | | |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | | | 4 | | | | | | | | | |
| *Morus rubra* | Red Mulberry | Tree | | | | | | | | | | 1 | 1 | 1 |
| *Nyssa sylvatica* | Sour Gum, Black Gum, Pepperidge | Tree | | | | | | | 4 | 4 | 5 | | | |
| *Platanus occidentalis* | Sycamore, Plane-tree | Tree | 1 | 1 | 51 | 1 | 1 | 17 | 3 | 3 | 21 | 2 | 2 | 2 |
| *Quercus falcata* | Spanish Oak, Southern Red Oak | Tree | | | | | | | | | | | | |
| *Quercus rubra* | Northern Red Oak | Tree | 3 | 3 | 3 | | | | | | | | | |
| *Salix nigra* | Black Willow | Tree | | | | | | | | | | | | |
| *Viburnum dentatum* | Arrow-wood | Shrub Tree | 1 | 1 | 1 | 1 | 1 | 1 | | | | 2 | 2 | 2 |
| | | **Stem count** | 15 | 15 | 69 | 7 | 7 | 23 | 13 | 13 | 42 | 10 | 10 | 12 |
| | | **size (ares)** | | 1 | | | 1 | | | 1 | | | 1 | |
| | | **size (ACRES)** | | 0.0247 | | | 0.0247 | | | 0.0247 | | | 0.0247 | |
| | | **Species count** | 8 | 8 | 9 | 4 | 4 | 4 | 3 | 3 | 4 | 5 | 5 | 5 |
| | | **Stems per ACRE** | 607 | 607 | 2,792 | 283 | 283 | 931 | 526 | 526 | 1,700 | 405 | 405 | 486 |

| Current Permanent Vegetation Plot Data (MY3 2022) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Scientific Name** | **Common Name** | **Species Type** | **Permanent Plot 5** | | | **Permanent Plot 6[1]** | | | **Permanent Plot 7[2]** | | | **Permanent Plot 8[3,4,5]** | | |
| | | | **PnoLS** | **P-all** | **T** | **PnoLS** | **P-all** | **T** | **PnoLS** | **P-all** | **T** | **PnoLS** | **P-all** | **T** |
| *Acer negundo* [4] | Boxelder | Tree | | | | | | | | | | 1 | 1 | 1 |
| *Acer rubrum* [5] | Red Maple | Tree | | | 37 | | | 4 | | | 13 | | | |
| *Acer saccharinum* [2,5] | Silver Maple, Soft Maple | Tree | | | | | | | 1 | 1 | 1 | 2 | 2 | 2 |
| *Alnus serrulata* | Tag Alder, Smooth Alder, Hazel Alder | Shrub Tree | | | | | | | | | | | | |
| *Asimina triloba* | Common Pawpaw, Indian-banana | Shrub Tree | | | | | | | | | | | | |
| *Betula nigra* [4] | River Birch, Red Birch | Tree | 2 | 2 | 2 | 2 | 2 | 2 | | | | 2 | 2 | 2 |
| *Carpinus caroliniana* | Ironwood | Shrub Tree | | | | | | | | | | | | |
| *Diospyros virginiana* [3] | American Persimmon | Tree | | | | | | | | | | | | |
| *Fagus grandifolia* | American Beech | Tree | | | | | | | | | | 1 | 1 | 1 |
| *Fraxinus pennsylvanica* [1,2] | Green Ash, Red Ash | Tree | | | | 1 | 1 | 1 | 3 | 3 | 3 | 2 | 2 | 2 |
| *Hamamelis virginiana* | Witch-hazel | Shrub Tree | | | | | | | | | | 1 | 1 | 1 |
| *Ilex opaca* | American Holly, Christmas Holly | Shrub Tree | | | | | | | | | | | | |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | | | 1 | | | | | | | | | |
| *Morus rubra* [3] | Red Mulberry | Tree | | | | | | | | | | 1 | 1 | 1 |
| *Nyssa sylvatica* | Sour Gum, Black Gum, Pepperidge | Tree | | | | | | | 1 | 1 | 1 | | | |
| *Platanus occidentalis* | Sycamore, Plane-tree | Tree | 3 | 4 | 13 | 4 | 4 | 4 | 1 | 1 | 1 | 1 | 1 | 6 |
| *Quercus falcata* | Spanish Oak, Southern Red Oak | Tree | | | | 1 | 1 | 1 | 2 | 2 | 2 | | | |
| *Quercus rubra* [1] | Northern Red Oak | Tree | | | | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Salix nigra* | Black Willow | Tree | | | | | | | | | | | | |
| *Viburnum dentatum* | Arrow-wood | Shrub Tree | 1 | 1 | 2 | 1 | 1 | 1 | | | | | | |
| | | **Stem count** | 6 | 7 | 55 | 12 | 12 | 16 | 9 | 9 | 22 | 12 | 12 | 17 |
| | | **size (ares)** | | 1 | | | 1 | | | 1 | | | 1 | |
| | | **size (ACRES)** | | 0.0247 | | | 0.0247 | | | 0.0247 | | | 0.0247 | |
| | | **Species count** | 3 | 3 | 5 | 6 | 6 | 7 | 6 | 6 | 7 | 9 | 9 | 9 |
| | | **Stems per ACRE** | 243 | 283 | 2,226 | 486 | 486 | 647 | 364 | 364 | 890 | 486 | 486 | 688 |

[1]In Permanent Plot 6, a planted stem previously mislabeled as *Fraxinus pennsylvanica* was identified as *Quercus rubra* in MY3.

[2]In Permanent Plot 7, a planted stem previously mislabeled as *Acer saccharinum* was identified as *Fraxinus pennsylvanica* in MY3.

[3]In Permanent Plot 8, a planted stem previously mislabeled as *Diospyros virginiana* was identified as *Morus rubra* in MY3.

[4]In Permanent Plot 8, a planted stem previously mislabeled as *Betula nigra* was identified as *Acer negundo* in MY3.

[5]In Permanent Plot 8, two planted stems previously mislabeled as Acer rubrum were identified as *Acer saccharinum* in MY3.

**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 and the planted stems over the 50% rule.
P-all: Number of planted stems including live stakes and the planted stems over the 50% rule.
T: Total stems (All planted stems, live stakes, and volunteers)

**Table 8b. Planted and Total Stem Counts**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| Permanent Vegetation Plot Annual Mean | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Scientific Name** | **Common Name** | **Species Type** | **MY3 (08/2022)** | | | **MY2 (08/2021)** | | | **MY1 (10/2020)** | | | **MY0 (4/2020)** | | |
| | | | **PnoLS** | **P-all** | **T** | **PnoLS** | **P-all** | **T** | **PnoLS** | **P-all** | **T** | **PnoLS** | **P-all** | **T** |
| *Acer negundo* | Boxelder | Tree | 6 | 6 | 7 | 5 | 5 | 5 | | | | | | |
| *Acer rubrum* | Red Maple | Tree | | | 64 | 2 | 2 | 13 | | | 30 | | | |
| *Acer saccharinum* | Silver Maple, Soft Maple | Tree | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| *Alnus serrulata* | Tag Alder, Smooth Alder, Hazel Alder | Shrub Tree | | | | | | 2 | | | | | | |
| *Asimina triloba* | Common Pawpaw, Indian-banana | Shrub Tree | | | | | | | 1 | 1 | 1 | 5 | 5 | 5 |
| *Betula nigra* | River Birch, Red Birch | Tree | 21 | 21 | 22 | 22 | 22 | 22 | 19 | 19 | 23 | 16 | 16 | 16 |
| *Carpinus caroliniana* | Ironwood | Shrub Tree | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 | 4 | 4 |
| *Diospyros virginiana* | American Persimmon | Tree | | | | 1 | 1 | 1 | | | | | | |
| *Fagus grandifolia* | American Beech | Tree | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 4 | 4 | 4 |
| *Fraxinus pennsylvanica* | Green Ash, Red Ash | Tree | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 12 | 12 | 12 |
| *Hamamelis virginiana* | Witch-hazel | Shrub Tree | 3 | 3 | 3 | 3 | 3 | 3 | | | | | | |
| *Ilex opaca* | American Holly, Christmas Holly | Shrub Tree | | | | | | | 1 | 1 | 1 | 6 | 6 | 6 |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | | | 5 | | | 4 | | | 9 | | | |
| *Morus rubra* | Red Mulberry | Tree | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | |
| *Nyssa sylvatica* | Sour Gum, Black Gum, Pepperidge | Tree | 5 | 5 | 6 | 5 | 5 | 5 | 8 | 8 | 8 | 6 | 6 | 6 |
| *Platanus occidentalis* | Sycamore, Plane-tree | Tree | 16 | 17 | 115 | 17 | 17 | 137 | 13 | 13 | 120 | 16 | 16 | 16 |
| *Quercus falcata* | Spanish Oak, Southern Red Oak | Tree | 3 | 3 | 3 | 3 | 3 | 3 | 5 | 5 | 5 | 7 | 7 | 7 |
| *Quercus rubra* | Northern Red Oak | Tree | 8 | 8 | 8 | 8 | 8 | 8 | 11 | 11 | 11 | 16 | 16 | 16 |
| *Salix nigra* | Black Willow | Tree | | | | | | | | | 1 | | | |
| *Viburnum dentatum* | Arrow-wood | Shrub Tree | 6 | 6 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 15 | 15 | 15 |
| | | **Stem count** | 84 | 85 | 256 | 87 | 87 | 224 | 78 | 78 | 229 | 109 | 109 | 109 |
| | | **size (ares)** | | 8 | | | 8 | | | 8 | | | 8 | |
| | | **size (ACRES)** | | 0.1977 | | | 0.1977 | | | 0.1977 | | | 0.1977 | |
| | | **Species count** | 13 | 13 | 15 | 15 | 15 | 17 | 12 | 12 | 15 | 12 | 12 | 12 |
| | | **Stems per ACRE** | 425 | 430 | 1,295 | 440 | 440 | 1,133 | 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 and the planted stems over the 50% rule.
P-all: Number of planted stems including live stakes and the planted stems over the 50% rule.
T: Total stems (All planted stems, live stakes, and volunteers)

**Table 8c. Planted and Total Stem Counts**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| Current Mobile Vegetation Plot (MP) Data (MY3 2022) | | | | | | | | Annual Means | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Scientific Name** | **Common Name** | **Species Type** | **MP1** | **MP2** | **MP3** | **MP4** | **MP5** | **MY3 (08/2022)** | **MY2 (08/2021)** | **MY1 (10/2020)** | **MY0 (4/2020)** |
| | | | **PnoLS** | **PnoLS** | **PnoLS** | **PnoLS** | **PnoLS** | **PnoLS** | **PnoLS** | **PnoLS** | **PnoLS** |
| *Acer negundo* | Boxelder | Tree | | | 1 | | | 1 | 4 | | |
| *Acer rubrum* | Red Maple | Tree | | | | | | | 4 | | |
| *Acer saccharinum* | Silver Maple, Soft Maple | Tree | 2 | 4 | | | | 6 | | 3 | 1 |
| *Alnus serrulata* | Tag Alder, Smooth Alder, Hazel Alder | Shrub Tree | | | | | | | | | |
| *Asimina triloba* | Common Pawpaw, Indian-banana | Shrub Tree | | | | | | | 3 | 1 | 4 |
| *Betula nigra* | River Birch, Red Birch | Tree | 3 | 1 | | 1 | 2 | 7 | 11 | 14 | 15 |
| *Carpinus caroliniana* | Ironwood | Shrub Tree | | | | 2 | | 2 | | | 5 |
| *Diospyros virginiana* | American Persimmon | Tree | | | | | | | 3 | | |
| *Fagus grandifolia* | American Beech | Tree | | | | | | | | | 4 |
| *Fraxinus pennsylvanica* | Green Ash, Red Ash | Tree | 2 | 5 | 1 | 4 | 5 | 17 | 5 | 6 | 7 |
| *Hamamelis virginiana* | Witch-hazel | Shrub Tree | | | | | | | | | |
| *Ilex opaca* | American Holly, Christmas Holly | Shrub Tree | | | | | | | | | 4 |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | | | | | | | | | |
| *Morus rubra* | Red Mulberry | Tree | | | 3 | | | 3 | 1 | | |
| *Nyssa sylvatica* | Sour Gum, Black Gum, Pepperidge | Tree | | | 1 | | | 1 | | 6 | 4 |
| *Platanus occidentalis* | Sycamore, Plane-tree | Tree | 5 | 3 | 2 | 3 | 4 | 17 | 18 | 19 | 4 |
| *Quercus falcata* | Spanish Oak, Southern Red Oak | Tree | | | | | | | | 5 | 1 |
| *Quercus rubra* | Northern Red Oak | Tree | | | 5 | | 1 | 6 | 7 | 9 | 16 |
| *Salix nigra* | Black Willow | Tree | | | | | | | 4 | | |
| *Viburnum dentatum* | Arrow-wood | Shrub Tree | | | 1 | | 1 | 2 | 1 | | 5 |
| | | **Stem count** | 12 | 13 | 14 | 10 | 13 | 62 | 61 | 63 | 70 |
| | | **size (ares)** | 1 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 |
| | | **size (ACRES)** | 0.0247 | 0.0247 | 0.0247 | 0.0247 | 0.0247 | 0.1236 | 0.1236 | 0.1236 | 0.1236 |
| | | **Species count** | 4 | 4 | 7 | 4 | 5 | 10 | 11 | 8 | 12 |
| | | **Stems per ACRE** | 486 | 526 | 567 | 405 | 526 | 502 | 494 | 510 | 567 |

| Overall Site Annual Mean | | | | | | |
|---|---|---|---|---|---|---|
| **Scientific Name** | **Common Name** | **Species Type** | **MY3 (08/2022)** | **MY2 (08/2021)** | **MY1 (10/2020)** | **MY0 (4/2020)** |
| | | | **PnoLS** | **PnoLS** | **PnoLS** | **PnoLS** |
| *Acer negundo* | Boxelder | Tree | 7 | 9 | | |
| *Acer rubrum* | Red Maple | Tree | | 6 | | |
| *Acer saccharinum* | Silver Maple, Soft Maple | Tree | 9 | 2 | 5 | 3 |
| *Alnus serrulata* | Tag Alder, Smooth Alder, Hazel Alder | Shrub Tree | | | | |
| *Asimina triloba* | Common Pawpaw, Indian-banana | Shrub Tree | | 3 | 2 | 9 |
| *Betula nigra* | River Birch, Red Birch | Tree | 28 | 33 | 33 | 31 |
| *Carpinus caroliniana* | Ironwood | Shrub Tree | 3 | 1 | 1 | 9 |
| *Diospyros virginiana* | American Persimmon | Tree | | 4 | | |
| *Fagus grandifolia* | American Beech | Tree | 1 | 1 | 2 | 8 |
| *Fraxinus pennsylvanica* | Green Ash, Red Ash | Tree | 26 | 14 | 15 | 19 |
| *Hamamelis virginiana* | Witch-hazel | Shrub Tree | 3 | 3 | | |
| *Ilex opaca* | American Holly, Christmas Holly | Shrub Tree | | | 1 | 10 |
| *Liriodendron tulipifera* | Tulip Poplar | Tree | | | | |
| *Morus rubra* | Red Mulberry | Tree | 5 | 3 | | |
| *Nyssa sylvatica* | Sour Gum, Black Gum, Pepperidge | Tree | 6 | 5 | 14 | 10 |
| *Platanus occidentalis* | Sycamore, Plane-tree | Tree | 33 | 35 | 32 | 20 |
| *Quercus falcata* | Spanish Oak, Southern Red Oak | Tree | 3 | 3 | 10 | 8 |
| *Quercus rubra* | Northern Red Oak | Tree | 14 | 15 | 20 | 32 |
| *Salix nigra* | Black Willow | Tree | | 4 | | |
| *Viburnum dentatum* | Arrow-wood | Shrub Tree | 8 | 7 | 6 | 20 |
| | | **Stem count** | 146 | 148 | 141 | 179 |
| | | **size (ares)** | 13 | 13 | 13 | 13 |
| | | **size (ACRES)** | 0.3212 | 0.3212 | 0.3212 | 0.3212 |
| | | **Species count** | 13 | 17 | 12 | 12 |
| | | **Stems per ACRE** | 454 | 461 | 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 and the planted stems over the 50% rule.
P-all: Number of planted stems including live stakes and the planted stems over the 50% rule.
T: Total stems (All planted stems, live stakes, and volunteers)

# APPENDIX C. Stream Geomorphology Data

**Table 9a. Baseline Stream Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| | | Pre-Restoration Condition | | | | | | | | | | | | Design | | | | | | | | | | | | As-Built/Baseline | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Gage | Bull Creek R1A | | Bull Creek R1B | | Bull Creek R2 | | Bull Creek R3 | | UT1B | | UT1C | | Bull Creek R1A | | Bull Creek R1B | | Bull Creek R2 | | Bull Creek R3 | | UT1B | | UT1C | | Bull Creek R1A | | Bull Creek R1B | | Bull Creek R2 | | Bull Creek R3 | | UT1B | | UT1C | |
| | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| **Dimension and Substrate - Riffle** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | | 16.2 | 19.1 | 16.2 | 19.1 | 16.2 | 19.1 | 18.0 | 25.4 | 5.6 | 7.0 | 5.6 | 7.0 | 19.5 | | 17.5 | | 16.0 | | 21.0 | | 8.5 | | 8.3 | | 19.4 | | 17.3 | | 16.4 | | 19.6 | 21.2 | 6.8 | | 6.9 | |
| Floodprone Width[2] (ft) | | 21 | 25 | 21 | 25 | 21 | 25 | 27 | 53 | 14 | 17 | 14 | 17 | 42.9 | 97.5 | 38.5 | 87.5 | 35.2 | 80.0 | 46.2 | 105.0 | 12.0 | 19.0 | 12.0 | 18.0 | 70.1 | | 67.6 | | 55.7 | | 94.0 | 99.0 | 23.6 | | 34.0 | |
| Bankfull Mean Depth (ft) | | 1.1 | | 1.1 | | 1.1 | | 1.1 | 2.1 | 0.7 | 1.0 | 0.7 | 1.0 | 1.6 | | 1.3 | | 1.2 | | 1.5 | | 0.6 | | 0.6 | | 1.5 | | 1.7 | | 1.4 | | 1.6 | 1.8 | 0.6 | | 0.8 | |
| Bankfull Max Depth (ft) | | 1.8 | 2.1 | 1.8 | 2.1 | 1.8 | 2.1 | 1.6 | 2.7 | 1.0 | 1.5 | 1.0 | 1.5 | 2.0 | 2.8 | 1.7 | 2.4 | 1.4 | 1.9 | 1.8 | 2.4 | 0.7 | 1.0 | 0.7 | 1.1 | 2.8 | | 2.9 | | 2.5 | | 2.7 | 3.0 | 0.9 | | 1.3 | |
| Bankfull Cross-sectional Area (ft[2]) | N/A | 18.7 | 21.6 | 18.7 | 21.6 | 18.7 | 21.6 | 26.2 | 39.5 | 3.9 | 6.8 | 3.9 | 6.8 | 30.2 | | 23.2 | | 19.3 | | 31.1 | | 5.3 | | 4.8 | | 28.2 | | 29.7 | | 22.9 | | 33.5 | 36.0 | 3.9 | | 5.7 | |
| Width/Depth Ratio | | 14.1 | 16.8 | 14.1 | 16.8 | 14.1 | 16.2 | 8.5 | 22.5 | 7.3 | 8.1 | 7.3 | 8.1 | 12.6 | | 13.2 | | 13.3 | | 14.2 | | 13.8 | | 14.5 | | 13.4 | | 10.1 | | 11.8 | | 10.7 | 13.4 | 11.7 | | 8.3 | |
| Entrenchment Ratio[2] | | 1.3 | | 1.3 | | 1.3 | | 1.3 | 2.9 | 2.4 | 2.5 | 2.4 | 2.5 | 2.2 | 4.6 | >2.2 | | 6.3 | 7.8 | >2.2 | | 2.8 | 3.3 | 2.7 | 2.9 | 3.6 | | 3.9 | | 3.4 | | 4.3 | 4.7 | 3.5 | | 4.9 | |
| Bank Height Ratio | | 3.7 | 4.1 | 3.7 | 4.1 | 3.7 | 4.1 | 1.9 | 2.8 | 5.0 | 7.9 | 5.0 | 7.9 | 1.0 | | | | | | | | | | | | 1.0 | | 1.0 | | 1.0 | | 1.0 | 1.0 | 1.0 | | 1.0 | |
| $D_{50}$ (mm) | | 91.6 | 96.6 | 91.6 | 96.6 | 25.8 | 37.2 | 64.0 | | 17.7 | 24.2 | 17.7 | 24.2 | | | | | | | | | | | | | 107.3 | | 82.2 | | 135.9 | | 56.4 | 56.9 | 33.9 | | 56.2 | |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | | | | | | | | | | | | | | 0.0100 | 0.0148 | 0.0162 | 0.0203 | 0.0172 | 0.0318 | 0.0103 | 0.0171 | 0.0314 | 0.0801 | 0.0080 | 0.0526 | 0.0050 | 0.0140 | 0.0133 | 0.0258 | 0.0274 | 0.0377 | 0.0037 | 0.0197 | 0.0285 | 0.0604 | 0.0108 | 0.0527 |
| Pool Length (ft) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Max Depth (ft) | | 4.9 | | 4.9 | | 4.9 | | 1.5 | 2.3 | 2.6 | | 2.6 | | 4.0 | 5.6 | 3.5 | 4.8 | 3.2 | | 3.9 | 6.5 | 1.3 | 1.8 | 1.7 | | 4.3 | 5.0 | 3.1 | 4.6 | 3.3 | 4.2 | 3.0 | 5.4 | 0.9 | 2.0 | 1.2 | 2.4 |
| Pool Spacing (ft) | | 52.0 | | 52.0 | | 52.0 | | N/A | | 48.0 | 262.0 | 48.0 | 262.0 | 96.0 | 111.0 | 80.0 | 101.0 | 74.6 | 76.7 | 55.8 | 149.0 | 20.0 | 54.0 | 20.0 | 27.0 | 230.4 | | 76.6 | 110.1 | 59.3 | 99.2 | 60.8 | 187.8 | 19.9 | 63.0 | 18.2 | 51.5 |
| Pool Volume (ft[3]) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | --- | | --- | | --- | | --- | | --- | | --- | | 68.8 | 89.4 | 53.4 | 81.3 | 45.0 | 69.2 | 39.0 | 108.4 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 68.8 | 89.4 | 53.4 | 81.3 | 45.0 | 69.2 | 39.0 | 108.4 | N/A[1] | N/A[1] | N/A[1] | N/A[1] |
| Radius of Curvature (ft) | | --- | | --- | | --- | | --- | | --- | | --- | | 35.0 | 50.0 | 32.0 | 50.0 | 30.0 | 50.5 | 36.0 | 85.6 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 35.0 | 50.0 | 32.0 | 50.0 | 30.0 | 50.5 | 36.0 | 85.6 | N/A[1] | N/A[1] | N/A[1] | N/A[1] |
| Rc/Bankfull Width | N/A | --- | | --- | | --- | | --- | | --- | | --- | | 1.8 | 2.6 | 1.8 | 2.9 | 1.9 | 3.2 | 1.7 | 4.1 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 1.8 | 2.6 | 1.8 | 2.9 | 1.9 | 3.2 | 1.7 | 4.1 | N/A[1] | N/A[1] | N/A[1] | N/A[1] |
| Meander Length (ft) | | --- | | --- | | --- | | --- | | --- | | --- | | 192.2 | 207.2 | 179.2 | 199.8 | 149.3 | 171.4 | 177.0 | 312.4 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 192.2 | 207.2 | 179.2 | 199.8 | 149.3 | 171.4 | 177.0 | 312.4 | N/A[1] | N/A[1] | N/A[1] | N/A[1] |
| Meander Width Ratio | | --- | | --- | | --- | | --- | | --- | | --- | | 3.5 | 4.6 | 3.1 | 4.6 | 2.8 | 4.3 | 1.9 | 5.2 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 3.5 | 4.6 | 3.1 | 4.6 | 2.8 | 4.3 | 1.9 | 5.2 | N/A[1] | N/A[1] | N/A[1] | N/A[1] |
| **Substrate, Bed and Transport Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$ | N/A | 0.3/2.8/34.3/167.3/287.3/ >2048 | | | | 0.5/9.2/13.7/ 100.0/180.0/ 362.0 | | 0.5/3.4/13.3/ 109.5/166.9/ 256.0 | | 0.3/8.0/13.5/33.6/75.9/ 180.0 | | | | | | | | | | | | | | | | | | 0.1/5.6/20.7/ 113.8/171.4/ 362.0 | | 0.1/5.6/28.5/ 151.8/256.0/ 362.0 | | SC/0.3/11.0/ 222.4/346.7/ 512.0 | | 0.2/0.5/19.0/ 96.0/146.7/ 362.0 | | 0.3/6.4/12.8/45.0 /101.2/ 256.0 | | 0.3/1.8/8.9/ 87.3/137.0/ 1024.0 | |
| Reach Shear Stress (Competency) lb/ft[2] | | | | | | | | | | | | | | 0.64 | | 0.98 | | 1.76 | | 1.02 | | 1.19 | | 1.50 | | 0.66 | | 1.32 | | 2.17 | | 0.92 | | 1.31 | | 2.03 | |
| Max part size (mm) mobilized at bankfull | | | | | | | | | | | | | | 49 | | 77 | | 140 | | 80 | | 94 | | 119 | | 29.0 | | 60.0 | | 89.0 | | 42.0 | 47.0 | 53.0 | | 94.0 | |
| Stream Power (Capacity) W/m[2] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drainage Area (SM) | | 1.63 | | 1.68 | | 1.79 | | 2.02 | | 0.16 | | 0.16 | | 1.63 | | 1.68 | | 1.79 | | 2.02 | | 0.16 | | 0.16 | | 1.63 | | 1.68 | | 1.79 | | 2.02 | | 0.16 | | 0.16 | |
| Watershed Impervious Cover Estimate (%) | | 1% | | | | | | | | <1% | | | | 1% | | | | | | | | <1% | | | | 1% | | | | | | | | <1% | | | |
| Rosgen Classification | | F3 | | F3 | | F3 | | F3/G3c | | G4c | | G4 | | C3 | | C3 | | C3b | | C3 | | B4 | | B4a | | C3 | | C3 | | C3b | | C3 | | B4 | | B4a | |
| Bankfull Velocity (fps) | | 4.8 | 4.9 | 4.8 | 4.9 | 4.8 | 4.9 | 4.2 | 4.3 | 3.5 | 5.0 | 3.5 | 5.0 | 3.2 | | 3.9 | | 5.2 | | 3.9 | | 3.8 | | 4.1 | | 3.8 | | 5.6 | | 6.6 | | 4.7 | 5.1 | 4.4 | | 6.2 | |
| Bankfull Discharge (cfs) | | 90.0 | | 90.0 | | 99.0 | | 116.0 | | 19.0 | | 19.0 | | 90.0 | | 90.0 | | 99.0 | | 116.0 | | 19.0 | | 19.00 | | 107 | | 166 | | 151 | | 157 | 184 | 17 | | 35 | |
| Q-NFF regression (2-yr) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Q-USGS extrapolation (1.2-yr) | N/A | | | | | | | | | | | | | 111 | | | | 119 | | 130 | | 20 | | 20 | | | | | | | | | | | | | |
| Max Q-Mannings | | | | | | | | | | | | | | 1,484 | | | | N/A | | 922 | | 1,159 | | | | | | | | | | | | | | | |
| Valley Slope (ft/ft) | | 0.0100 | | 0.0120 | | 0.0270 | | 0.0080 | | 0.0240 | | 0.0370 | | 0.0086 | | 0.0150 | | 0.0295 | | 0.0118 | | 0.0335 | | 0.0458 | | --- | | --- | | --- | | --- | | --- | | --- | | --- | |
| Channel Thalweg Length (ft) | | 435 | | 876 | | 403 | | 2,291 | | 188 | | 332 | | 444 | | 722 | | 418 | | 1,674 | | 212 | | 257 | | 421 | | 722 | | 418 | | 1,676 | | 212 | | 257 | |
| Sinuosity | | 1.2 | | 1.2 | | 1.2 | | 1.2 | | 1.1 | | 1.3 | | 1.3 | | 1.2 | | 1.2 | | 1.3 | | 1.1 | | 1.1 | | 1.2 | | 1.2 | | 1.2 | | 1.3 | | 1.1 | | 1.1 | |
| Bankfull/Channel Slope (ft/ft) | | 0.0130 | | 0.0090 | | 0.0160 | | 0.0190 | | 0.0140 | | 0.0440 | | 0.0069 | | 0.0123 | | 0.0242 | | 0.0076 | 0.0114 | 0.0316 | | 0.0425 | | 0.0071 | | 0.0124 | | 0.0249 | | 0.0092 | | 0.0349 | | 0.0407 | |

1. Pattern data is not applicable for A-type and B-type channels
2. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.
SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

**Table 9b. Baseline Stream Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| | | Pre-Restoration Condition | | | | | | | | | | | | Design | | | | | | | | | | | | As-Built/Baseline | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Gage** | **UT2** | | **UT2A** | | **UT2B** | | **UT2C** | | **UT3B** | | **UT3C** | | **UT2** | | **UT2A** | | **UT2B** | | **UT2C** | | **UT3B** | | **UT3C** | | **UT2** | | **UT2A** | | **UT2B** | | **UT2C** | | **UT3B** | | **UT3C** | |
| | | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** |
| **Dimension and Substrate - Riffle** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | | 5.3 | | 5.3 | | 5.3 | | 5.3 | | 3.9 | 5.7 | 3.9 | 5.7 | 3.5 | | 6.0 | | 6.0 | | 6.8 | | 7.0 | | 7.5 | | N/A | | 6.8 | | 8.1 | | 7.8 | | 6.9 | | 8.8 | |
| Floodprone Width[2] (ft) | | 84 | 112 | 84 | 112 | 84 | 112 | 84 | 112 | 9 | 14 | 9 | 14 | 5.0 | 8.0 | 8.0 | 13.0 | 13.0 | 30.0 | 15.0 | 34.0 | 10.0 | 15.0 | 16.5 | 37.5 | N/A | | 30.3 | | 32.0 | | 48.2 | | 21.4 | | 55.8 | |
| Bankfull Mean Depth (ft) | | 1.1 | 1.4 | 1.1 | 1.4 | 1.1 | 1.4 | 1.1 | 1.4 | 0.7 | | 0.7 | | 0.2 | | 0.5 | | 0.5 | | 0.5 | | 0.5 | | 0.6 | | N/A | | 0.5 | | 0.6 | | 0.7 | | 0.5 | | 0.8 | |
| Bankfull Max Depth (ft) | | 1.9 | 2.0 | 1.9 | 2.0 | 1.9 | 2.0 | 1.9 | 2.0 | 0.8 | 1.2 | 0.8 | 1.2 | 0.3 | 0.4 | 0.5 | 0.7 | 0.5 | 0.7 | 0.6 | 0.8 | 0.6 | 0.8 | 0.8 | 1.0 | N/A | | 0.8 | | 1.1 | | 1.1 | | 0.8 | | 1.3 | |
| Bankfull Cross-sectional Area (ft$^2$) | N/A | 5.7 | 7.4 | 5.7 | 7.4 | 5.7 | 7.4 | 5.7 | 7.4 | 2.8 | 4.1 | 2.8 | 4.1 | 0.9 | | 2.7 | | 2.6 | | 3.2 | | 3.6 | | 4.7 | | N/A | | 3.4 | | 4.8 | | 5.8 | | 3.5 | | 6.8 | |
| Width/Depth Ratio | | 3.7 | 4.8 | 3.7 | 4.8 | 3.7 | 4.8 | 3.7 | 4.8 | 5.4 | 7.8 | 5.4 | 7.8 | 14.2 | | 13.3 | | 13.3 | | 12.9 | | 13.7 | | 12.0 | | N/A | | 13.9 | | 11.7 | | 10.5 | | 13.4 | | 11.3 | |
| Entrenchment Ratio[2] | | 16.0 | 21.2 | 16.0 | 21.2 | 16.0 | 21.2 | 16.0 | 21.2 | 1.6 | 3.5 | 1.6 | 3.5 | 1.4 | 2.2 | 2.8 | 5.7 | 5.0 | 7.5 | 5.1 | 6.6 | 3.1 | 6.0 | >2.2 | | N/A | | 4.4 | | 3.5 | | 6.2 | | 3.1 | | 6.3 | |
| Bank Height Ratio | | 1.4 | 1.9 | 1.4 | 1.9 | 1.4 | 1.9 | 1.4 | 1.9 | 2.7 | 3.8 | 2.7 | 3.8 | 1.0 | | | | | | | | | | | | N/A | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| $D_{50}$ (mm) | | SC | 0.1 | SC | 1.1 | SC | 2.1 | SC | 3.1 | 3.6 | 6.4 | 3.6 | 6.4 | | | | | | | | | | | | | N/A | | 58.6 | | 69.3 | | 49.0 | | 21.1 | | 28.2 | |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Slope (ft/ft) | | | | | | | | | | | | | | 0.0457 | 0.0681 | 0.0287 | 0.0414 | 0.0135 | 0.0409 | 0.0135 | 0.0449 | 0.0385 | 0.0488 | 0.0198 | 0.0266 | N/A | | 0.0046 | 0.0347 | 0.0054 | 0.0371 | 0.0132 | 0.0510 | 0.0113 | 0.0530 | 0.0081 | 0.0249 |
| Pool Length (ft) | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Max Depth (ft) | | --- | | --- | | --- | | --- | | --- | | --- | | 1.6 | | 1.3 | | 1.4 | | 1.5 | | 1.6 | | 1.9 | | N/A | | 1.4 | 2.2 | 1.6 | 2.2 | 1.4 | 2.1 | 0.9 | 2.6 | 1.8 | 2.5 |
| Pool Spacing (ft) | | --- | | --- | | --- | | --- | | --- | | --- | | 21.0 | | 22.0 | 33.0 | 23.0 | 44.0 | 30.0 | 47.0 | 24.0 | 29.0 | 31.0 | 58.0 | N/A | | 18.6 | 39.9 | 20.5 | 44.1 | 26.1 | 55.9 | 19.5 | 30.4 | 17.4 | 79.9 |
| Pool Volume (ft$^3$) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | --- | | --- | | --- | | --- | | --- | | --- | | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 19.0 | 26.0 | 23.0 | 34.0 | N/A[1] | N/A[1] | 17.2 | 44.8 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 19.0 | 26 | 23.0 | 34.0 | N/A[1] | N/A[1] | 17.2 | 44.8 |
| Radius of Curvature (ft) | | --- | | --- | | --- | | --- | | --- | | --- | | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 12.0 | 15.0 | 13.0 | 17.0 | N/A[1] | N/A[1] | 12.0 | 22.0 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 12.0 | 15.0 | 13.0 | 17.0 | N/A[1] | N/A[1] | 12.0 | 22.0 |
| Rc/Bankfull Width | N/A | --- | | --- | | --- | | --- | | --- | | --- | | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 2.0 | 2.5 | 1.9 | 2.5 | N/A[1] | N/A[1] | 1.6 | 2.9 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 2.0 | 2.5 | 1.9 | 2.5 | N/A[1] | N/A[1] | 1.6 | 2.9 |
| Meander Length (ft) | | --- | | --- | | --- | | --- | | --- | | --- | | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 56.0 | 76.0 | 73.0 | 90.0 | N/A[1] | N/A[1] | 65.2 | 118.0 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 56.0 | 76.0 | 73.0 | 90.0 | N/A[1] | N/A[1] | 65.2 | 118.0 |
| Meander Width Ratio | | --- | | --- | | --- | | --- | | --- | | --- | | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 3.2 | 4.3 | 3.3 | 4.9 | N/A[1] | N/A[1] | 2.2 | 6.0 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | 3.2 | 4.3 | 3.3 | 4.9 | N/A[1] | N/A[1] | 2.2 | 6.0 |
| **Substrate, Bed and Transport Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ri%/Ru%/P%/G%/S% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SC%/Sa%/G%/C%/B%/Be% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$ | N/A | N/A | | SC/0.1/0.2/8.4/12.5/32.0 | | | | | | SC/0.5/5.9/21.0/100.0/256.0 | | | | | | | | | | | | | | | | N/A | | SC/0.1/0.8/ 64.0/ 85.4/128.0 | | SC/0.1/1.3/ 85.4/137.0/256.0 | | SC/0.1/8.9/92.5/ 124.6/256.0 | | 0.8/4.2/9.4/ 64.0/165.3/362.0 | | 0.1/0.3/4.0/73.4/ 148.1/256.0 | |
| Reach Shear Stress (Competency) lb/ft$^2$ | | | | | | | | | | | | | | 1.06 | | 1.05 | | 0.52 | | 0.38 | | 1.13 | | 0.55 | | N/A | | 0.74 | | 0.69 | | 0.59 | | 0.99 | | 0.66 | |
| Max part size (mm) mobilized at bankfull | | | | | | | | | | | | | | 84 | | 83 | | 40 | | 29 | | 89 | | 42 | | N/A | | 36.0 | | 35.0 | | 28.0 | | 50.0 | | 28.0 | |
| Stream Power (Capacity) W/m$^2$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Drainage Area (SM) | | 0.01 | | 0.05 | | 0.05 | | 0.05 | | 0.07 | | 0.07 | | 0.01 | | 0.04 | | 0.05 | | 0.05 | | 0.07 | | 0.07 | | 0.01 | | 0.04 | | 0.05 | | 0.05 | | 0.07 | | 0.07 | |
| Watershed Impervious Cover Estimate (%) | | <1% | | | | | | | | | | | | <1% | | | | | | | | | | | | <1% | | | | | | | | | | | |
| Rosgen Classification | | G4 | | G5 | | G5c | | G5 | | G5 | | G5c | | B4 | | B4 | | C4b | | C4 | | B4 | | C4 | | B4 | | B4 | | C4b | | C4 | | B4 | | C4 | |
| Bankfull Velocity (fps) | | 1.9 | 2.2 | 1.9 | 2.2 | 1.9 | 2.2 | 1.9 | 2.2 | 4.0 | 4.2 | 4.0 | 4.2 | 3.0 | | 2.7 | | 2.4 | | 2.2 | | 3.3 | | 2.4 | | N/A | | 3.6 | | 3.7 | | 3.3 | | 4.2 | | 3.4 | |
| Bankfull Discharge (cfs) | | 3.0 | | 7.0 | | 7.0 | | 7.0 | | 12.0 | | 12.0 | | 3.0 | | 7.0 | | 7.0 | | 7.0 | | 12.0 | | 12.0 | | N/A | | 12 | | 18 | | 19 | | 15 | | 23 | |
| Q-NFF regression (2-yr) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Q-USGS extrapolation (1.2-yr) | N/A | | | | | | | | | | | | | 3 | | 9 | | | | | | 11 | | | | | | | | | | | | | | | |
| Max Q-Mannings | | | | | | | | | | | | | | N/A | | 62 | | | | | | 102 | | | | | | | | | | | | | | | |
| Valley Slope (ft/ft) | | 0.0640 | | 0.0290 | | 0.0310 | | 0.0190 | | 0.0360 | | 0.0160 | | 0.0731 | | 0.0272 | | 0.0234 | | 0.0179 | | 0.0329 | | 0.0153 | | --- | | --- | | --- | | --- | | --- | | --- | | --- | |
| Channel Thalweg Length (ft) | | 61 | | 349 | | 299 | | 223 | | 414 | | 296 | | 42 | | 315 | | 263 | | 469 | | 307 | | 412 | | 42 | | 315 | | 263 | | 469 | | 307 | | 412 | |
| Sinuosity | | 1.1 | | 1.1 | | 1.2 | | 1.1 | | 1.5 | | 1.2 | | N/A | | 1.1 | | 1.2 | | 1.3 | | 1.1 | | 1.2 | | N/A | | 1.1 | | 1.2 | | 1.3 | | 1.1 | | 1.2 | |
| Bankfull/Channel Slope (ft/ft) | | 0.0470 | | 0.0220 | | 0.0170 | | 0.0200 | | 0.0230 | | 0.0170 | | 0.0580 | | 0.0229 | 0.0387 | 0.0200 | | 0.0135 | | 0.0304 | 0.0363 | 0.0121 | 0.0146 | N/A | | 0.0237 | | 0.0184 | | 0.0134 | | 0.0317 | | 0.0132 | |

1. Pattern data is not applicable for A-type and B-type channels
2. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.
SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

**Table 10. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| | Bull Creek Reach 1A Cross-Section 1, Riffle | | | | | | | | Bull Creek Reach 1B Cross-Section 2, Riffle[4] | | | | | | | | Bull Creek Reach 1B Cross-Section 3, Pool | | | | | | | | Bull Creek Reach 2 Cross-Section 4, Riffle | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** |
| Bankfull Elevation[1] | 1106.41 | 1106.62 | 1106.65 | 1106.62 | | | | | 1099.36 | 1099.30 | 1099.26 | 1099.37 | | | | | 1098.70 | 1098.92 | 1098.83 | 1098.85 | | | | | 1088.01 | 1087.72 | 1087.70 | 1087.78 | | | | |
| Low Bank Elevation | 1106.41 | 1106.54 | 1106.31 | 1106.23 | | | | | 1099.36 | 1099.16 | 1099.24 | 1099.06 | | | | | 1098.70 | 1098.92 | 1098.83 | 1098.85 | | | | | 1088.01 | 1088.08 | 1087.60 | 1087.90 | | | | |
| Bankfull Width (ft) | 19.4 | 20.6 | 16.1 | 15.4 | | | | | 17.3 | 17.2 | 18.4 | 16.3 | | | | | 24.4 | 30.4 | 30.1 | 30.4 | | | | | 16.4 | 17.9 | 15.6 | 16.3 | | | | |
| Floodprone Width (ft)[2] | 70.1 | 70.0 | 69.5 | 69.5 | | | | | 67.6 | 67.6 | 66.2 | 67.5 | | | | | - | - | - | - | | | | | 55.7 | 55.6 | 55.6 | 55.6 | | | | |
| Bankfull Mean Depth (ft) | 1.5 | 1.3 | 1.4 | 1.4 | | | | | 1.7 | 1.6 | 1.6 | 1.5 | | | | | 2.3 | 2.8 | 2.7 | 2.7 | | | | | 1.4 | 1.6 | 1.4 | 1.5 | | | | |
| Bankfull Max Depth (ft) | 2.8 | 2.8 | 2.5 | 2.6 | | | | | 2.9 | 2.7 | 3.0 | 2.6 | | | | | 5.3 | 6.0 | 5.9 | 5.7 | | | | | 2.5 | 2.9 | 2.3 | 2.6 | | | | |
| Bankfull Cross-Sectional Area ($ft^2$) | 28.2 | 26.7 | 22.6 | 22.0 | | | | | 29.7 | 27.3 | 29.3 | 24.4 | | | | | 56.8 | 84.5 | 79.9 | 83.0 | | | | | 22.9 | 29.0 | 21.3 | 25.1 | | | | |
| Bankfull Width/Depth Ratio | 13.4 | 16.0 | 11.5 | 10.8 | | | | | 10.1 | 10.8 | 11.6 | 11.0 | | | | | 10.5 | 10.9 | 11.3 | 11.2 | | | | | 11.8 | 11.0 | 11.4 | 10.6 | | | | |
| Bankfull Entrenchment Ratio[3] | 3.6 | 3.4 | 4.3 | 4.5 | | | | | 3.9 | 3.9 | 3.6 | 4.1 | | | | | - | - | - | - | | | | | 3.4 | 3.1 | 3.6 | 3.4 | | | | |
| Bankfull Bank Height Ratio[1] | 1.0 | 1.0 | 0.9 | 0.9 | | | | | 1.0 | 1.0 | 1.0 | 0.9 | | | | | - | - | - | - | | | | | 1.0 | 1.1 | 1.0 | 1.0 | | | | |

| | Bull Creek Reach 3 Cross-Section 5, Pool | | | | | | | | Bull Creek Reach 3 Cross-Section 6, Riffle | | | | | | | | Bull Creek Reach 3 Cross-Section 7, Riffle | | | | | | | | Bull Creek Reach 3 Cross-Section 8, Pool | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** |
| Bankfull Elevation[1] | 1079.64 | 1079.57 | 1079.48 | 1079.60 | | | | | 1079.35 | 1079.51 | 1079.46 | 1079.53 | | | | | 1073.27 | 1072.90 | 1072.76 | 1072.88 | | | | | 1068.53 | 1068.20 | 1067.99 | 1067.45 | | | | |
| Low Bank Elevation | 1079.64 | 1079.57 | 1079.48 | 1079.60 | | | | | 1079.35 | 1079.42 | 1079.33 | 1079.42 | | | | | 1073.27 | 1072.62 | 1072.37 | 1072.36 | | | | | 1068.53 | 1068.20 | 1067.99 | 1067.45 | | | | |
| Bankfull Width (ft) | 27.0 | 26.2 | 26.7 | 27.5 | | | | | 21.2 | 21.4 | 20.9 | 21.0 | | | | | 19.6 | 23.5 | 21.3 | 18.4 | | | | | 29.3 | 32.2 | 22.2 | 20.1 | | | | |
| Floodprone Width (ft)[2] | - | - | - | - | | | | | 99.0 | 99.0 | 98.9 | 98.6 | | | | | 84.0 | 84.0 | 84.0 | 83.9 | | | | | - | - | - | - | | | | |
| Bankfull Mean Depth (ft) | 1.8 | 1.9 | 1.8 | 1.9 | | | | | 1.6 | 1.5 | 1.5 | 1.5 | | | | | 1.8 | 1.2 | 1.3 | 1.4 | | | | | 1.9 | 1.4 | 1.9 | 1.5 | | | | |
| Bankfull Max Depth (ft) | 3.7 | 4.8 | 4.8 | 5.0 | | | | | 2.7 | 2.4 | 2.3 | 2.4 | | | | | 3.0 | 2.5 | 2.5 | 2.3 | | | | | 4.3 | 3.8 | 3.9 | 3.2 | | | | |
| Bankfull Cross-Sectional Area ($ft^2$) | 49.0 | 50.3 | 48.8 | 51.3 | | | | | 33.5 | 31.7 | 30.7 | 31.1 | | | | | 36.0 | 29.2 | 27.7 | 25.8 | | | | | 55.1 | 45.7 | 42.3 | 30.6 | | | | |
| Bankfull Width/Depth Ratio | 14.9 | 13.6 | 14.6 | 14.8 | | | | | 13.4 | 14.5 | 14.3 | 14.2 | | | | | 10.7 | 18.9 | 16.5 | 13.1 | | | | | 15.6 | 22.7 | 11.6 | 13.2 | | | | |
| Bankfull Entrenchment Ratio[3] | - | - | - | - | | | | | 4.7 | 4.6 | 4.7 | 4.7 | | | | | 4.3 | 3.6 | 3.9 | 4.6 | | | | | - | - | - | - | | | | |
| Bankfull Bank Height Ratio[1] | - | - | - | - | | | | | 1.0 | 1.0 | 0.9 | 1.0 | | | | | 1.0 | 0.9 | 0.9 | 0.8 | | | | | - | - | - | - | | | | |

| | UT1B Cross-Section 9, Riffle | | | | | | | | UT1C Cross-Section 10, Riffle | | | | | | | | UT2A Cross-Section 11, Riffle | | | | | | | | UT2B Cross-Section 12, Riffle | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** |
| Bankfull Elevation[1] | 1101.94 | 1102.09 | 1102.13 | 1102.01 | | | | | 1089.27 | 1088.91 | 1088.90 | 1088.97 | | | | | 1096.25 | 1096.44 | 1096.48 | 1096.43 | | | | | 1088.43 | 1088.53 | 1088.49 | 1088.51 | | | | |
| Low Bank Elevation | 1101.94 | 1102.05 | 1101.93 | 1102.29 | | | | | 1089.27 | 1089.29 | 1089.21 | 1089.27 | | | | | 1096.25 | 1096.40 | 1096.43 | 1096.36 | | | | | 1088.43 | 1088.57 | 1088.45 | 1088.46 | | | | |
| Bankfull Width (ft) | 6.8 | 6.3 | 5.8 | 7.4 | | | | | 6.9 | 6.4 | 7.3 | 6.6 | | | | | 6.8 | 7.3 | 8.2 | 7.3 | | | | | 8.1 | 8.8 | 8.5 | 7.8 | | | | |
| Floodprone Width (ft)[2] | 23.6 | 26.9 | 18.8 | 33.7 | | | | | 34.0 | 35.4 | 34.9 | 35.2 | | | | | 30.3 | 31.4 | 30.0 | 29.0 | | | | | 32.0 | 30.9 | 28.0 | 29.8 | | | | |
| Bankfull Mean Depth (ft) | 0.6 | 0.6 | 0.5 | 0.8 | | | | | 0.8 | 1.2 | 1.1 | 1.1 | | | | | 0.5 | 0.4 | 0.4 | 0.4 | | | | | 0.6 | 0.5 | 0.5 | 0.5 | | | | |
| Bankfull Max Depth (ft) | 0.9 | 1.2 | 0.9 | 1.5 | | | | | 1.3 | 1.9 | 1.9 | 1.9 | | | | | 0.8 | 0.7 | 0.6 | 0.7 | | | | | 1.1 | 1.0 | 0.9 | 1.0 | | | | |
| Bankfull Cross-Sectional Area ($ft^2$) | 3.9 | 3.7 | 2.6 | 5.8 | | | | | 5.7 | 8.0 | 7.7 | 7.5 | | | | | 3.4 | 3.1 | 3.0 | 2.9 | | | | | 4.8 | 4.5 | 3.9 | 3.8 | | | | |
| Bankfull Width/Depth Ratio | 11.7 | 10.8 | 12.8 | 9.5 | | | | | 8.3 | 5.2 | 6.9 | 5.8 | | | | | 13.9 | 17.3 | 22.5 | 18.6 | | | | | 13.4 | 17.1 | 18.6 | 15.8 | | | | |
| Bankfull Entrenchment Ratio[3] | 3.5 | 4.3 | 3.2 | 4.6 | | | | | 4.9 | 5.5 | 4.8 | 5.3 | | | | | 4.4 | 4.3 | 3.6 | 4.0 | | | | | 4.0 | 3.5 | 3.3 | 3.8 | | | | |
| Bankfull Bank Height Ratio[1] | 1.0 | 1.0 | 0.8 | 1.2 | | | | | 1.0 | 1.3 | 1.2 | 1.2 | | | | | 1.0 | 0.9 | 0.9 | 0.9 | | | | | 1.0 | 1.0 | 1.0 | 1.0 | | | | |

| | UT2C Cross-Section 13, Riffle | | | | | | | | UT3B Cross-Section 14, Riffle | | | | | | | | UT3C Cross-Section 15, Riffle | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension and Substrate** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** | **Base** | **MY1** | **MY2** | **MY3** | **MY4** | **MY5** | **MY6** | **MY7** |
| Bankfull Elevation[1] | 1081.59 | 1081.67 | 1081.59 | 1081.67 | | | | | 1084.57 | 1084.34 | 1084.52 | 1084.68 | | | | | 1081.13 | 1081.26 | 1081.24 | 1081.33 | | | | |
| Low Bank Elevation | 1081.59 | 1081.68 | 1081.48 | 1081.61 | | | | | 1084.57 | 1084.80 | 1084.74 | 1084.73 | | | | | 1081.13 | 1081.21 | 1081.07 | 1081.20 | | | | |
| Bankfull Width (ft) | 7.8 | 8.2 | 7.7 | 7.8 | | | | | 6.9 | 7.4 | 6.9 | 6.8 | | | | | 8.8 | 8.4 | 7.9 | 8.0 | | | | |
| Floodprone Width (ft)[2] | 48.2 | 50.0 | 46.1 | 48.4 | | | | | 21.4 | 61.3 | 43.6 | 29.7 | | | | | 55.8 | 55.8 | 55.4 | 55.6 | | | | |
| Bankfull Mean Depth (ft) | 0.7 | 0.7 | 0.6 | 0.7 | | | | | 0.5 | 0.8 | 0.7 | 0.6 | | | | | 0.8 | 0.8 | 0.7 | 0.7 | | | | |
| Bankfull Max Depth (ft) | 1.1 | 1.2 | 1.1 | 1.1 | | | | | 0.8 | 1.7 | 1.3 | 1.0 | | | | | 1.3 | 1.4 | 1.3 | 1.4 | | | | |
| Bankfull Cross-Sectional Area ($ft^2$) | 5.8 | 5.8 | 5.0 | 5.3 | | | | | 3.5 | 6.1 | 4.8 | 3.8 | | | | | 6.8 | 6.4 | 5.4 | 5.7 | | | | |
| Bankfull Width/Depth Ratio | 10.5 | 11.6 | 12.0 | 11.5 | | | | | 13.4 | 8.9 | 9.9 | 12.1 | | | | | 11.3 | 11.1 | 11.5 | 11.1 | | | | |
| Bankfull Entrenchment Ratio[3] | 6.2 | 6.1 | 6.0 | 6.2 | | | | | 3.1 | 8.3 | 6.3 | 4.4 | | | | | 6.3 | 6.6 | 7.0 | 7.0 | | | | |
| Bankfull Bank Height Ratio[1] | 1.0 | 1.0 | 0.9 | 1.0 | | | | | 1.0 | 1.4 | 1.2 | 1.0 | | | | | 1.0 | 1.0 | 0.9 | 0.9 | | | | |

[1]Bankfull elevation for riffles are based on the MY0 cross-sectional area. MY1-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.
[2]Floodprone width is calculated from the width of cross-section but valley width may extend further.
[3]ER for the baseline/monitoring parameters is based on the width of the cross-section, in lieu of assuming the width across the floodplain.
[4]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 cross-sections lined up for easier comparison.

**Table 11a. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[1]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 19.4 | | 20.6 | | 16.1 | | 15.4 | | | | | | | | | |
| Floodprone Width (ft) | 70 | | 70 | | 70 | | 70 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 1.5 | | 1.3 | | 1.4 | | 1.4 | | | | | | | | | |
| Bankfull Max Depth (ft) | 2.8 | | 2.8 | | 2.5 | | 2.6 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 28.2 | | 26.7 | | 22.6 | | 22.0 | | | | | | | | | |
| Width/Depth Ratio | 13.4 | | 16.0 | | 11.5 | | 10.8 | | | | | | | | | |
| Entrenchment Ratio | 3.6 | | 3.4 | | 4.3 | | 4.5 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 0.9 | | 0.9 | | | | | | | | | |
| $D_{50}$ (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 | | SC/0.2/1.0/114.7/171.4/362.0 | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | |

[1]MY1-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 11b. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[1]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 17.3 | | 17.2 | | 18.4 | | 16.3 | | | | | | | | | |
| Floodprone Width (ft) | 68 | | 68 | | 66 | | 68 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 1.7 | | 1.6 | | 1.6 | | 1.5 | | | | | | | | | |
| Bankfull Max Depth (ft) | 2.9 | | 2.7 | | 3.0 | | 2.6 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 29.7 | | 27.3 | | 29.3 | | 24.4 | | | | | | | | | |
| Width/Depth Ratio | 10.1 | | 10.8 | | 11.6 | | 11.0 | | | | | | | | | |
| Entrenchment Ratio | 3.9 | | 3.9 | | 3.6 | | 4.1 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 1.0 | | 0.9 | | | | | | | | | |
| $D_{50}$ (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 | | 0.1/0.4/2.0/148.1/234.4/ 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 | | | | | | | | | | | | | | | |

[1]MY1-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.

[2]Repairs 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 11c. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[1]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 16.4 | | 17.9 | | 15.6 | | 16.3 | | | | | | | | | |
| Floodprone Width (ft) | 56 | | 56 | | 56 | | 56 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 1.4 | | 1.6 | | 1.4 | | 1.5 | | | | | | | | | |
| Bankfull Max Depth (ft) | 2.5 | | 2.9 | | 2.3 | | 2.6 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 22.9 | | 29.0 | | 21.3 | | 25.1 | | | | | | | | | |
| Width/Depth Ratio | 11.8 | | 11.0 | | 11.4 | | 10.6 | | | | | | | | | |
| Entrenchment Ratio | 3.4 | | 3.1 | | 3.6 | | 3.4 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.1 | | 1.0 | | 1.0 | | | | | | | | | |
| $D_{50}$ (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 | | 0.1/0.5/1.8/222.4/326.3 /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 | | | | | | | | | | | | | | | |

[1]MY1-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 11d. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[1]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 19.6 | 21.2 | 21.4 | 23.5 | 20.9 | 21.3 | 18.4 | 21.0 | | | | | | | | |
| Floodprone Width (ft) | 94 | 99 | 84 | 99 | 84 | 99 | 84 | 99 | | | | | | | | |
| Bankfull Mean Depth (ft) | 1.6 | 1.8 | 1.2 | 1.5 | 1.3 | 1.5 | 1.4 | 1.5 | | | | | | | | |
| Bankfull Max Depth (ft) | 2.7 | 3.0 | 2.4 | 2.5 | 2.3 | 2.5 | 2.3 | 2.4 | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 33.5 | 36.0 | 29.2 | 31.7 | 27.7 | 30.7 | 25.8 | 31.1 | | | | | | | | |
| Width/Depth Ratio | 10.7 | 13.4 | 14.5 | 18.9 | 14.3 | 16.5 | 13.1 | 14.2 | | | | | | | | |
| Entrenchment Ratio | 4.3 | 4.7 | 3.6 | 4.6 | 3.9 | 4.7 | 4.6 | 4.7 | | | | | | | | |
| Bank Height Ratio | 1.0 | 1.0 | 0.9 | 1.0 | 0.9 | 0.9 | 0.8 | 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 | | 0.2/0.5/26.9/125.2/180.0 /362.0 | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | |

[1]MY1-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 11e. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[2]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 6.8 | | 6.3 | | 5.8 | | 7.4 | | | | | | | | | |
| Floodprone Width (ft) | 24 | | 27 | | 19 | | 34 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.6 | | 0.6 | | 0.5 | | 0.8 | | | | | | | | | |
| Bankfull Max Depth (ft) | 0.9 | | 1.2 | | 0.9 | | 1.5 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 3.9 | | 3.7 | | 2.6 | | 5.8 | | | | | | | | | |
| Width/Depth Ratio | 11.7 | | 10.8 | | 12.8 | | 9.5 | | | | | | | | | |
| Entrenchment Ratio | 3.5 | | 4.3 | | 3.2 | | 4.6 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 0.8 | | 1.2 | | | | | | | | | |
| $D_{50}$ (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 / 256.0 | | 0.3/8.0/22.6/69.0/113.8 /180.0 | | 0.4/1.7/16.7/65.7/87.7/ 256.0 | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | |

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

[2]MY1-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 11f. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[2]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 6.9 | | 6.4 | | 7.3 | | 6.6 | | | | | | | | | |
| Floodprone Width (ft) | 34 | | 35 | | 35 | | 35 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.8 | | 1.2 | | 1.1 | | 1.1 | | | | | | | | | |
| Bankfull Max Depth (ft) | 1.3 | | 1.9 | | 1.9 | | 1.9 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 5.7 | | 8.0 | | 7.7 | | 7.5 | | | | | | | | | |
| Width/Depth Ratio | 8.3 | | 5.2 | | 6.9 | | 5.8 | | | | | | | | | |
| Entrenchment Ratio | 4.9 | | 5.5 | | 4.8 | | 5.3 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.3 | | 1.2 | | 1.2 | | | | | | | | | |
| $D_{50}$ (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 | | 0.1/1.8/14.4/84.1/137.0/ 362.0 | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | |

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

[2]MY1-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 11g. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[2]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 6.8 | | 7.3 | | 8.2 | | 7.3 | | | | | | | | | |
| Floodprone Width (ft) | 30 | | 31 | | 30 | | 29 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.5 | | 0.4 | | 0.4 | | 0.4 | | | | | | | | | |
| Bankfull Max Depth (ft) | 0.8 | | 0.7 | | 0.6 | | 0.7 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 3.4 | | 3.1 | | 3.0 | | 2.9 | | | | | | | | | |
| Width/Depth Ratio | 13.9 | | 17.3 | | 22.5 | | 18.6 | | | | | | | | | |
| Entrenchment Ratio | 4.4 | | 4.3 | | 3.6 | | 4.0 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 0.9 | | 0.9 | | 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 | | SC/0.2/8.0/94.6/124.8/ 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 | | | | | | | | | | | | | | | |

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

[2]MY1-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 11h. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[1]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 8.1 | | 8.8 | | 8.5 | | 7.8 | | | | | | | | | |
| Floodprone Width (ft) | 32 | | 31 | | 28 | | 30 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.6 | | 0.5 | | 0.5 | | 0.5 | | | | | | | | | |
| Bankfull Max Depth (ft) | 1.1 | | 1.0 | | 0.9 | | 1.0 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 4.8 | | 4.5 | | 3.9 | | 3.8 | | | | | | | | | |
| Width/Depth Ratio | 11.7 | | 17.1 | | 18.6 | | 15.8 | | | | | | | | | |
| Entrenchment Ratio | 3.5 | | 3.5 | | 3.3 | | 3.8 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 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 | | SC/1.1/4.7/59.6/137.0/ 256.0 | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | |

[1]MY1-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 11i. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle**[1] | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 7.8 | | 8.2 | | 7.7 | | 7.8 | | | | | | | | | |
| Floodprone Width (ft) | 48 | | 50 | | 46 | | 48 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.7 | | 0.7 | | 0.6 | | 0.7 | | | | | | | | | |
| Bankfull Max Depth (ft) | 1.1 | | 1.2 | | 1.1 | | 1.1 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 5.8 | | 5.8 | | 5.0 | | 5.3 | | | | | | | | | |
| Width/Depth Ratio | 10.5 | | 11.6 | | 12.0 | | 11.5 | | | | | | | | | |
| Entrenchment Ratio | 6.2 | | 6.1 | | 6.0 | | 6.2 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 0.9 | | 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% | | | | | | | | | | | | | | | | |
| $D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$ | SC/0.1/8.9/92.5/124.6/256.0 | | SC/11.0/24.2/79.2/119.3/256.0 | | SC/0.2/12.1/75.9/115.2/180.0 | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | |

[1]MY1-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 11j. Monitoring Data - Stream Reach Data Summary**
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**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 - Riffle[2]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 6.9 | | 7.4 | | 6.9 | | 6.8 | | | | | | | | | |
| Floodprone Width (ft) | 21 | | 61 | | 44 | | 30 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.5 | | 0.8 | | 0.7 | | 0.6 | | | | | | | | | |
| Bankfull Max Depth (ft) | 0.8 | | 1.7 | | 1.3 | | 1.0 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 3.5 | | 6.1 | | 4.8 | | 3.8 | | | | | | | | | |
| Width/Depth Ratio | 13.4 | | 8.9 | | 9.9 | | 12.1 | | | | | | | | | |
| Entrenchment Ratio | 3.1 | | 8.3 | | 6.3 | | 4.4 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.4 | | 1.2 | | 1.0 | | | | | | | | | |
| $D_{50}$ (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 | | SC/1.8/22.6/124.3/202.4 /362.0 | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | |

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

[2]MY1-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 11k. Monitoring Data - Stream Reach Data Summary**

Key Mill Mitigation Site

DMS Project No. 100025

**Monitoring Year 3 - 2022**

**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 - Riffle[1]** | | | | | | | | | | | | | | | | |
| Bankfull Width (ft) | 8.8 | | 8.4 | | 7.9 | | 8.0 | | | | | | | | | |
| Floodprone Width (ft) | 56 | | 56 | | 55 | | 56 | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.8 | | 0.8 | | 0.7 | | 0.7 | | | | | | | | | |
| Bankfull Max Depth (ft) | 1.3 | | 1.4 | | 1.3 | | 1.4 | | | | | | | | | |
| Bankfull Cross-sectional Area ($ft^2$) | 6.8 | | 6.4 | | 5.4 | | 5.7 | | | | | | | | | |
| Width/Depth Ratio | 11.3 | | 11.1 | | 11.5 | | 11.1 | | | | | | | | | |
| Entrenchment Ratio | 6.3 | | 6.6 | | 7.0 | | 7.0 | | | | | | | | | |
| Bank Height Ratio | 1.0 | | 1.0 | | 0.9 | | 0.9 | | | | | | | | | |
| $D_{50}$ (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% | | | | | | | | | | | | | | | | |
| $D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$ | 0.1/0.3/4.0/73.4/148.1/256.0 | | 0.1/0.5/19.5/84.6/151.8/1024.0 | | SC/0.3/0.5/72.7/128.0/180.0 | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | |

[1]MY1-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

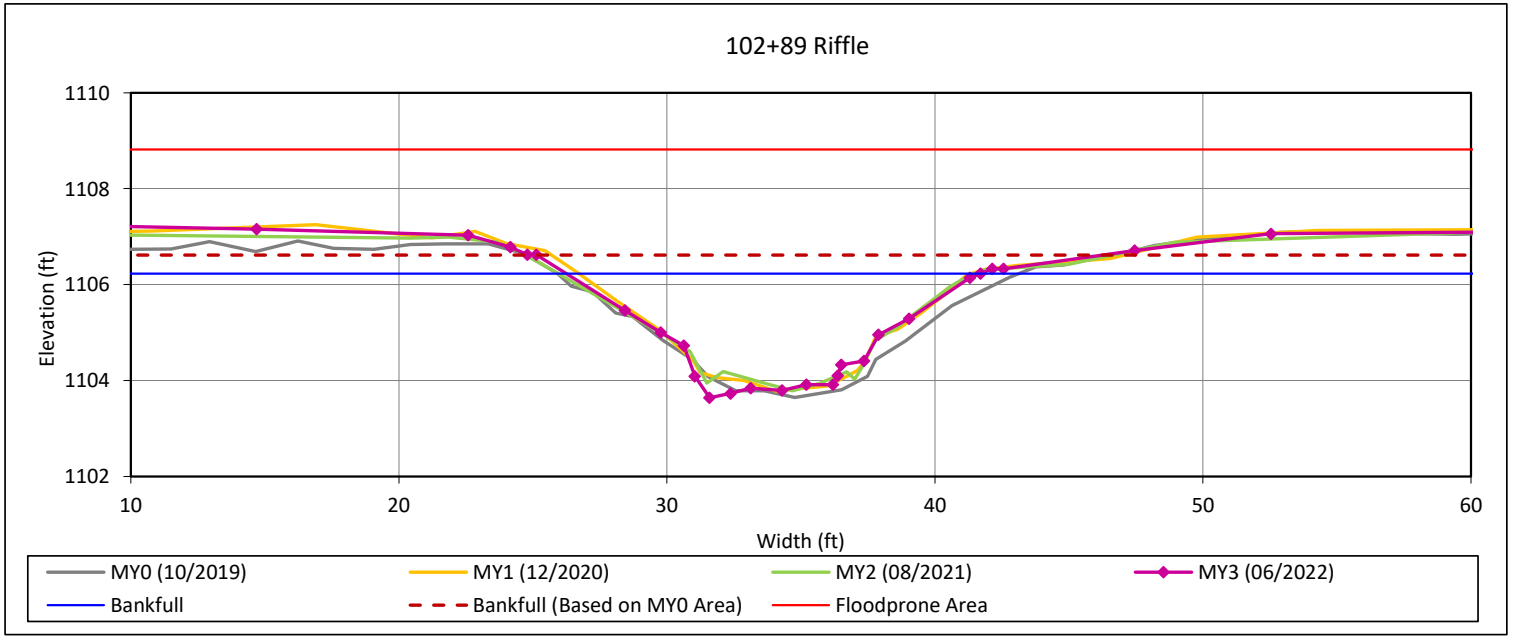
(---): Data was not provided

N/A: Not Applicable

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 1-Bull Creek Reach 1A**




| Bankfull Dimensions | |
|---|---|
| 22.0 | x-section area (ft.sq.) |
| 15.4 | width (ft) |
| 1.4 | mean depth (ft) |
| 2.6 | max depth (ft) |
| 16.9 | wetted perimeter (ft) |
| 1.3 | hydraulic radius (ft) |
| 10.8 | width-depth ratio |
| 69.5 | W flood prone area (ft) |
| 4.5 | entrenchment ratio |
| 0.9 | low bank height ratio |

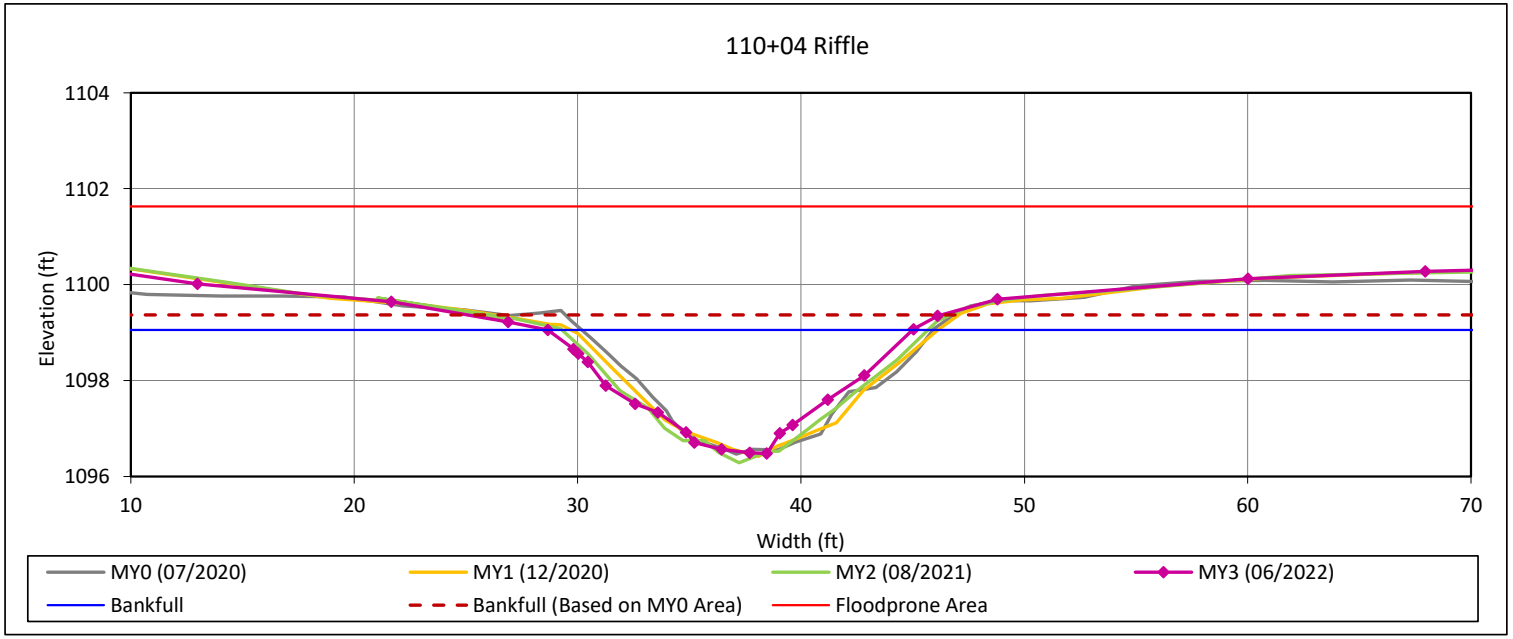
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 2-Bull Creek Reach 1B**




| Bankfull Dimensions | |
|---|---|
| 24.4 | x-section area (ft.sq.) |
| 16.3 | width (ft) |
| 1.5 | mean depth (ft) |
| 2.6 | max depth (ft) |
| 17.3 | wetted perimeter (ft) |
| 1.4 | hydraulic radius (ft) |
| 11.0 | width-depth ratio |
| 67.5 | W flood prone area (ft) |
| 4.1 | entrenchment ratio |
| 0.9 | low bank height ratio |

Survey Date: 06/2022
Field Crew: Wildlands Engineering

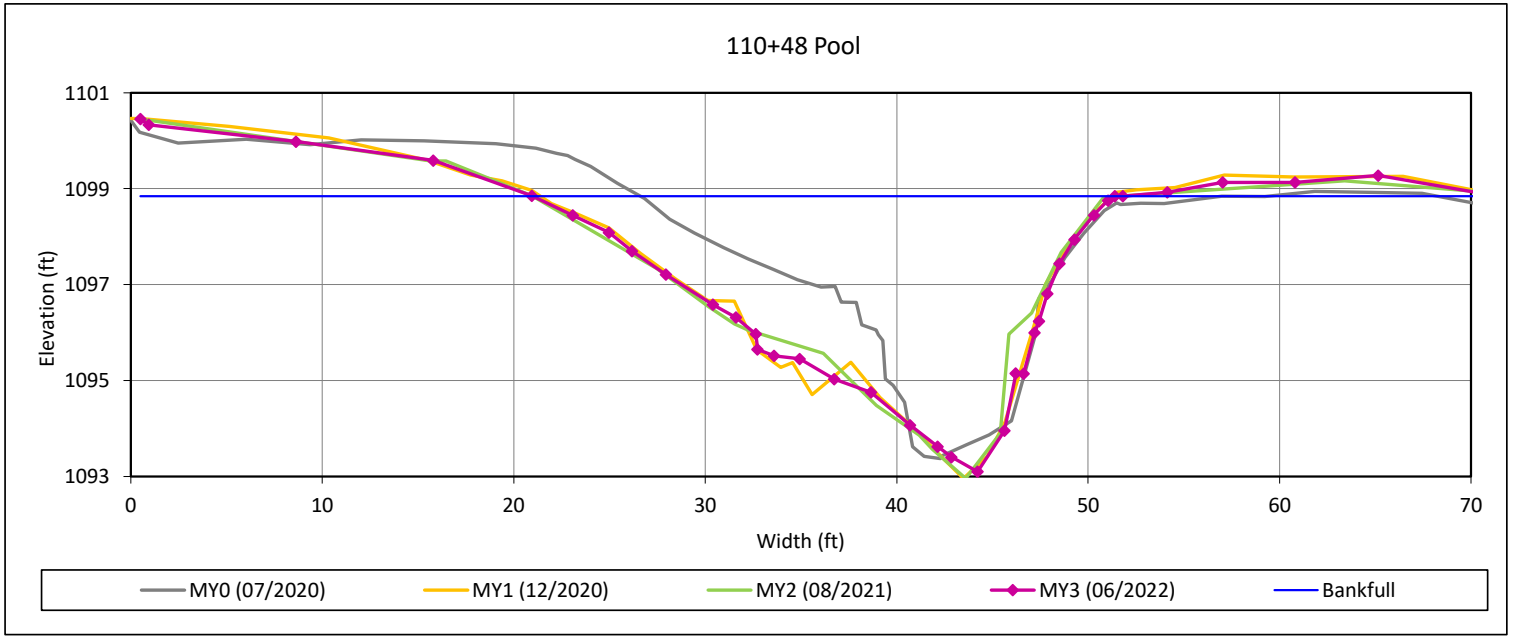
*Repairs conducted during MY1 resulted in a slight shift in the cross-section alignment between the MY0 and MY1 cross-section pin locations; therefore the plot was adjusted so that the cross-sections lined up for easier comparison.

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

### Cross-Section 3-Bull Creek Reach 1B




| Bankfull Dimensions | |
|---|---|
| 83.0 | x-section area (ft.sq.) |
| 30.4 | width (ft) |
| 2.7 | mean depth (ft) |
| 5.7 | max depth (ft) |
| 33.8 | wetted perimeter (ft) |
| 2.5 | hydraulic radius (ft) |
| 11.2 | width-depth ratio |

Survey Date: 06/2022
Field Crew: Wildlands Engineering

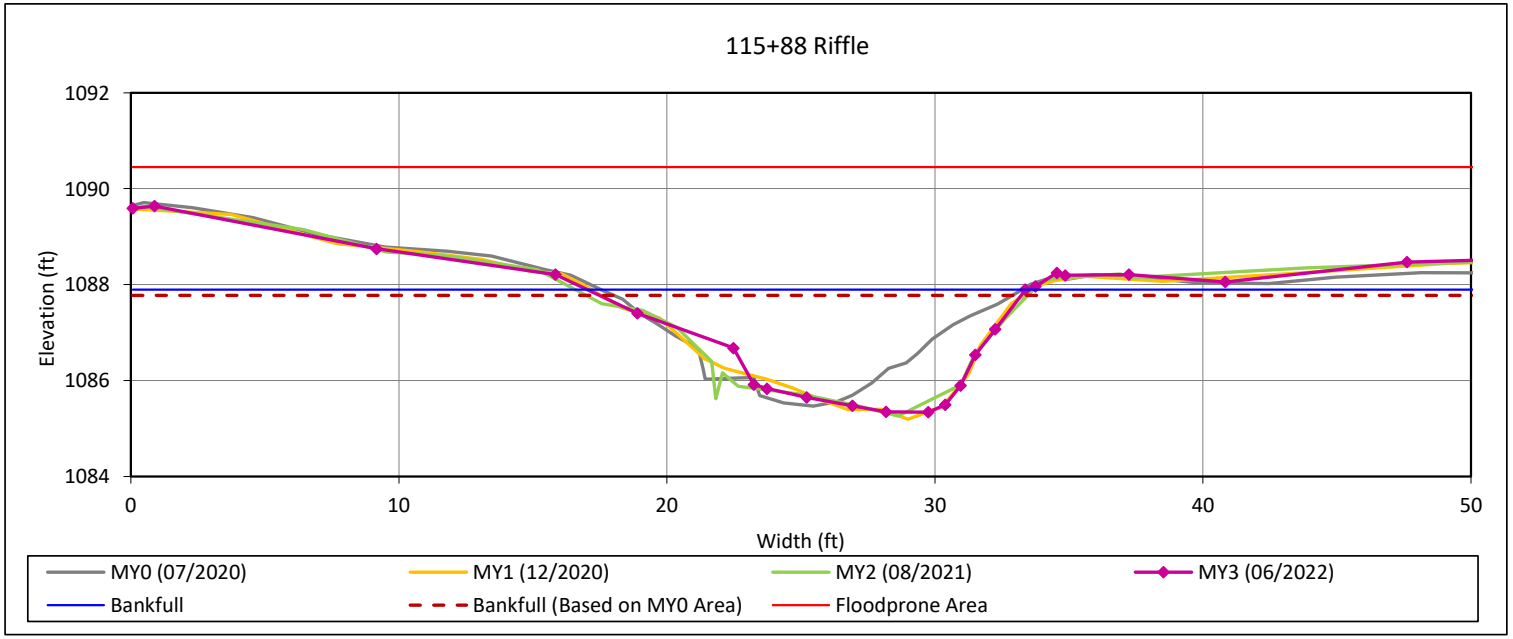
*Repairs were conducted on the left bank of XS3 during MY1 prior to the collection of the MY1 cross-section data and photos. The MY1 plot line shows the repaired cross -sectional profile. Also the station number for XS3 was incorrectly reported on the MY0 cross-section plot, it should have been reported 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 3 - 2022**

**Cross-Section 4-Bull Creek Reach 2**




| Bankfull Dimensions | |
|---|---|
| 25.1 | x-section area (ft.sq.) |
| 16.3 | width (ft) |
| 1.5 | mean depth (ft) |
| 2.6 | max depth (ft) |
| 17.7 | wetted perimeter (ft) |
| 1.4 | hydraulic radius (ft) |
| 10.6 | width-depth ratio |
| 55.6 | W flood prone area (ft) |
| 3.4 | entrenchment ratio |
| 1.0 | low bank height ratio |
| Survey Date: | 06/2022 |
| Field Crew: | Wildlands Engineering |

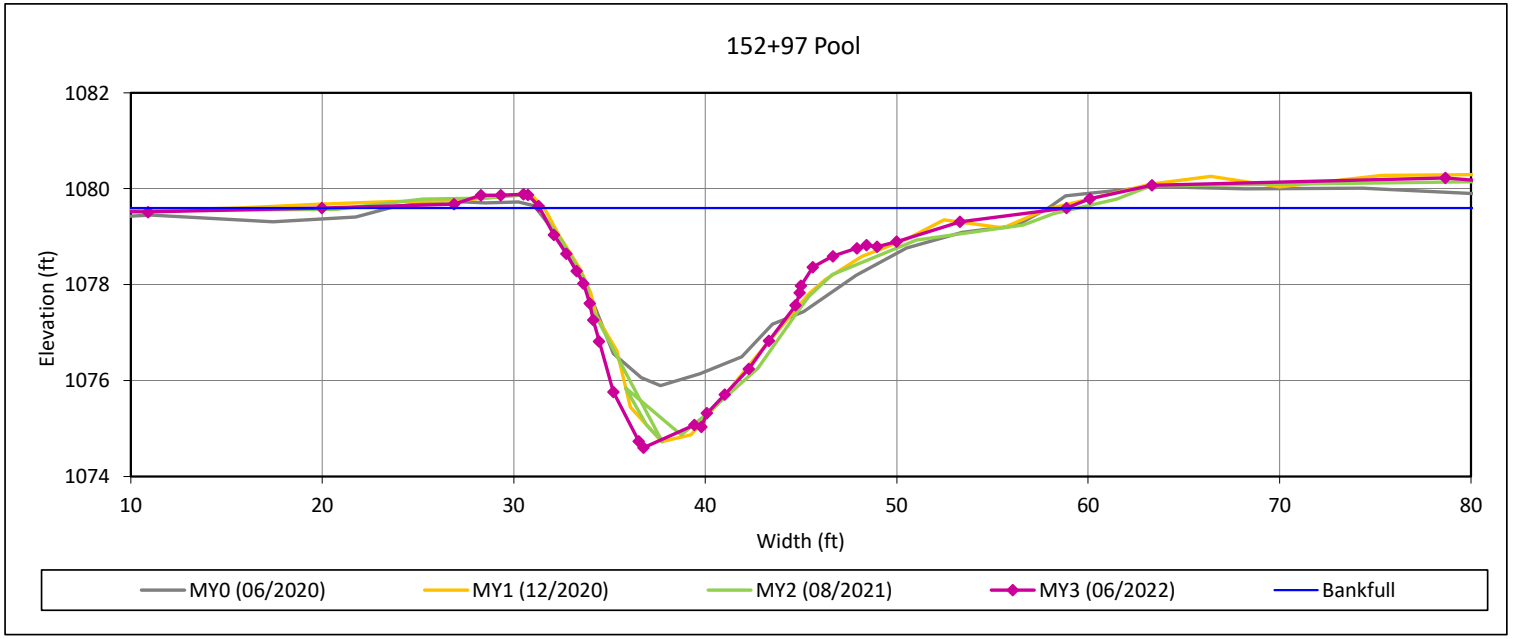
*Repairs were conducted on the right bank of XS4 during MY1 prior to the collection of the MY1 cross-section data and photos. The MY1 plot line shows the repaired cross-sectional profile. Also the station number for XS4 was incorrectly reported on the MY0 cross-section plot, it should have been reported 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 3 - 2022**

**Cross-Section 5-Bull Creek Reach 3**




| Bankfull Dimensions | |
|---|---|
| 51.3 | x-section area (ft.sq.) |
| 27.5 | width (ft) |
| 1.9 | mean depth (ft) |
| 5.0 | max depth (ft) |
| 30.7 | wetted perimeter (ft) |
| 1.7 | hydraulic radius (ft) |
| 14.8 | width-depth ratio |

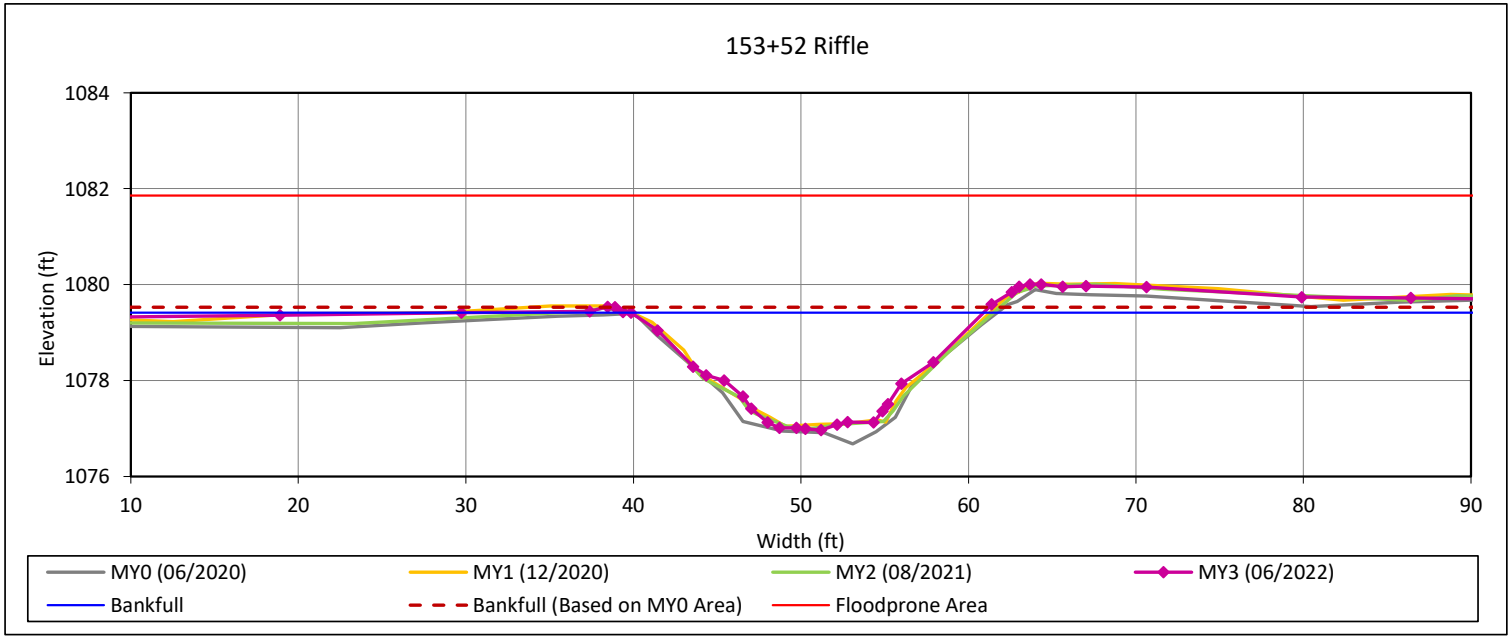
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 6-Bull Creek Reach 3**




| Bankfull Dimensions | |
|---|---|
| 31.1 | x-section area (ft.sq.) |
| 21.0 | width (ft) |
| 1.5 | mean depth (ft) |
| 2.4 | max depth (ft) |
| 21.8 | wetted perimeter (ft) |
| 1.4 | hydraulic radius (ft) |
| 14.2 | width-depth ratio |
| 98.6 | W flood prone area (ft) |
| 4.7 | entrenchment ratio |
| 1.0 | low bank height ratio |

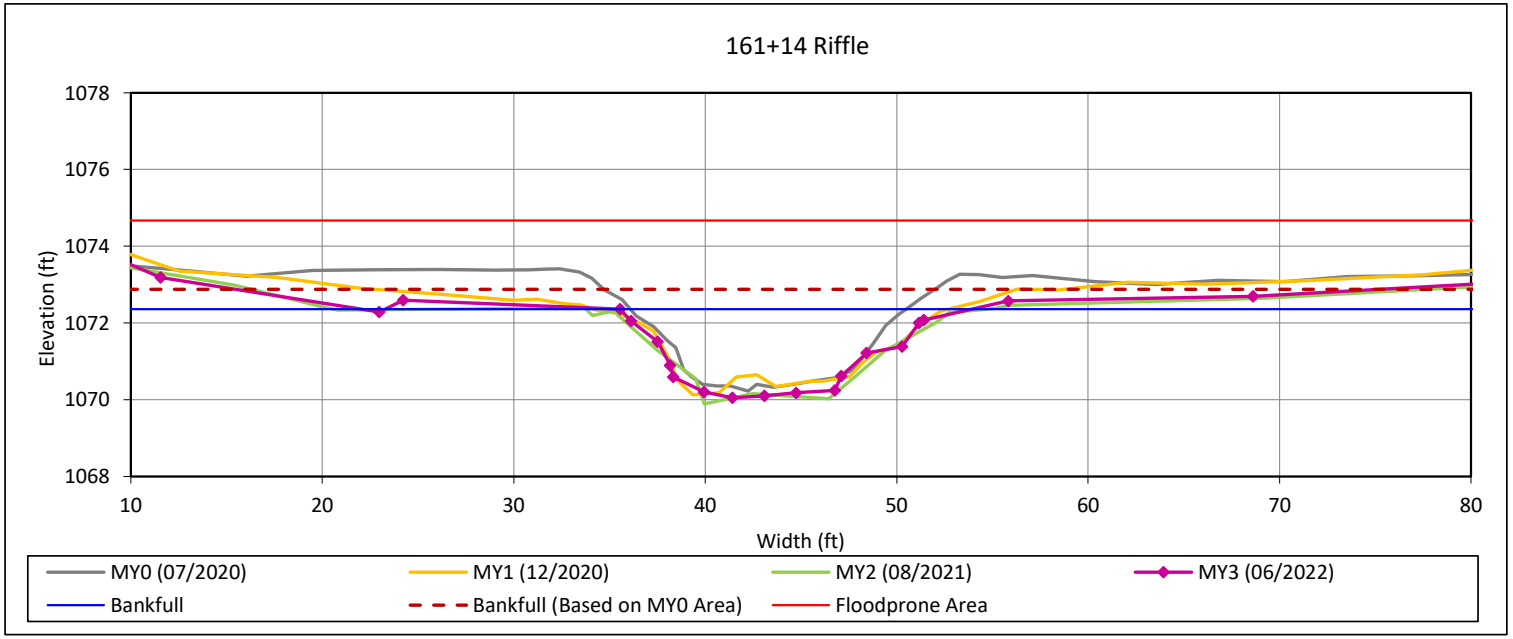
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 7-Bull Creek Reach 3**




| Bankfull Dimensions | |
|---|---|
| 25.8 | x-section area (ft.sq.) |
| 18.4 | width (ft) |
| 1.4 | mean depth (ft) |
| 2.3 | max depth (ft) |
| 19.6 | wetted perimeter (ft) |
| 1.3 | hydraulic radius (ft) |
| 13.1 | width-depth ratio |
| 83.9 | W flood prone area (ft) |
| 4.6 | entrenchment ratio |
| 0.8 | low bank height ratio |

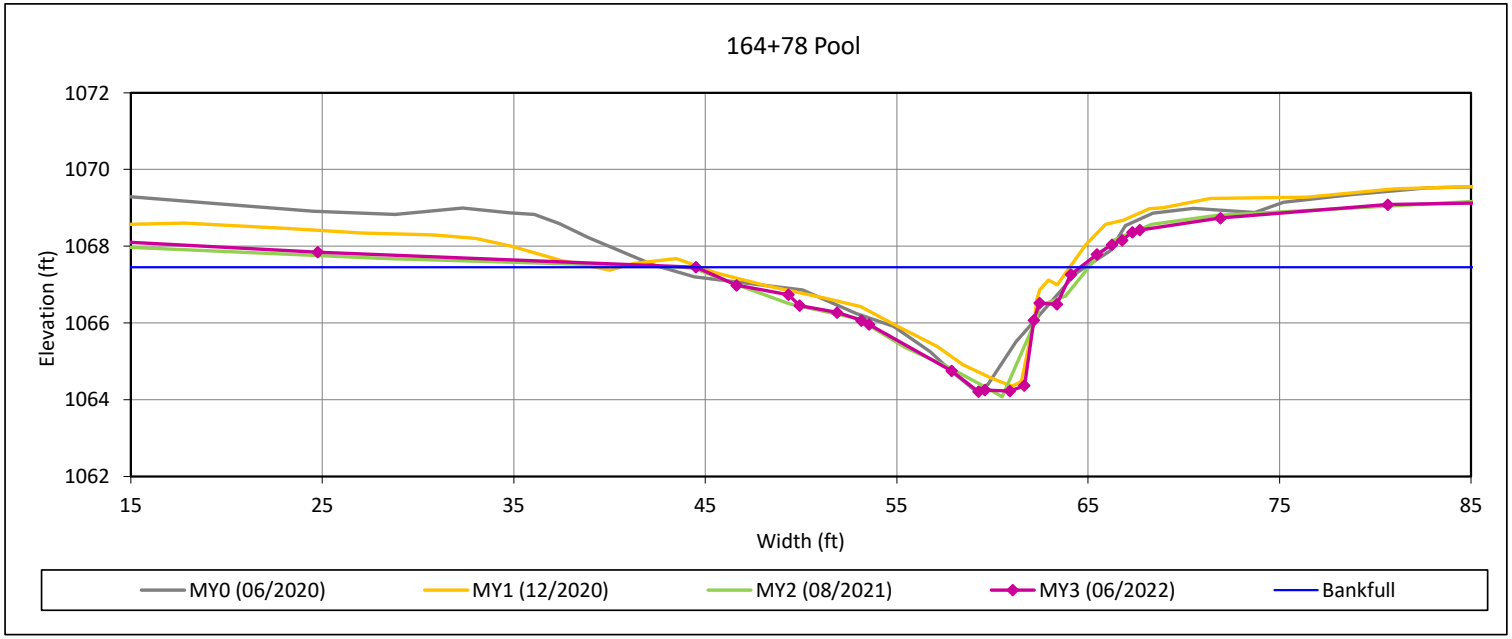
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 8-Bull Creek Reach 3**




| Bankfull Dimensions | |
|---|---|
| 30.6 | x-section area (ft.sq.) |
| 20.1 | width (ft) |
| 1.5 | mean depth (ft) |
| 3.2 | max depth (ft) |
| 22.4 | wetted perimeter (ft) |
| 1.4 | hydraulic radius (ft) |
| 13.2 | width-depth ratio |

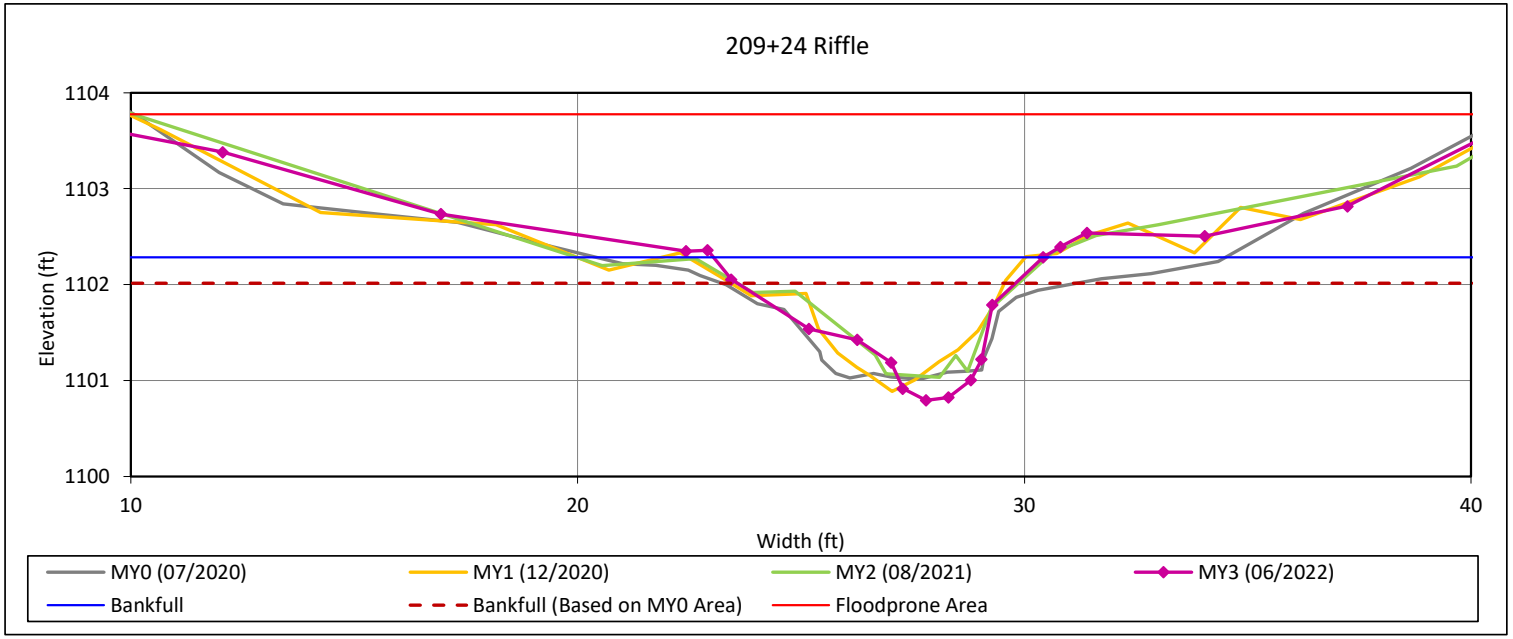
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 9-UT1B**




| Bankfull Dimensions | |
|---|---|
| 5.8 | x-section area (ft.sq.) |
| 7.4 | width (ft) |
| 0.8 | mean depth (ft) |
| 1.5 | max depth (ft) |
| 8.3 | wetted perimeter (ft) |
| 0.7 | hydraulic radius (ft) |
| 9.5 | width-depth ratio |
| 33.7 | W flood prone area (ft) |
| 4.6 | entrenchment ratio |
| 1.2 | low bank height ratio |

Survey Date: 06/2022
Field Crew: Wildlands Engineering

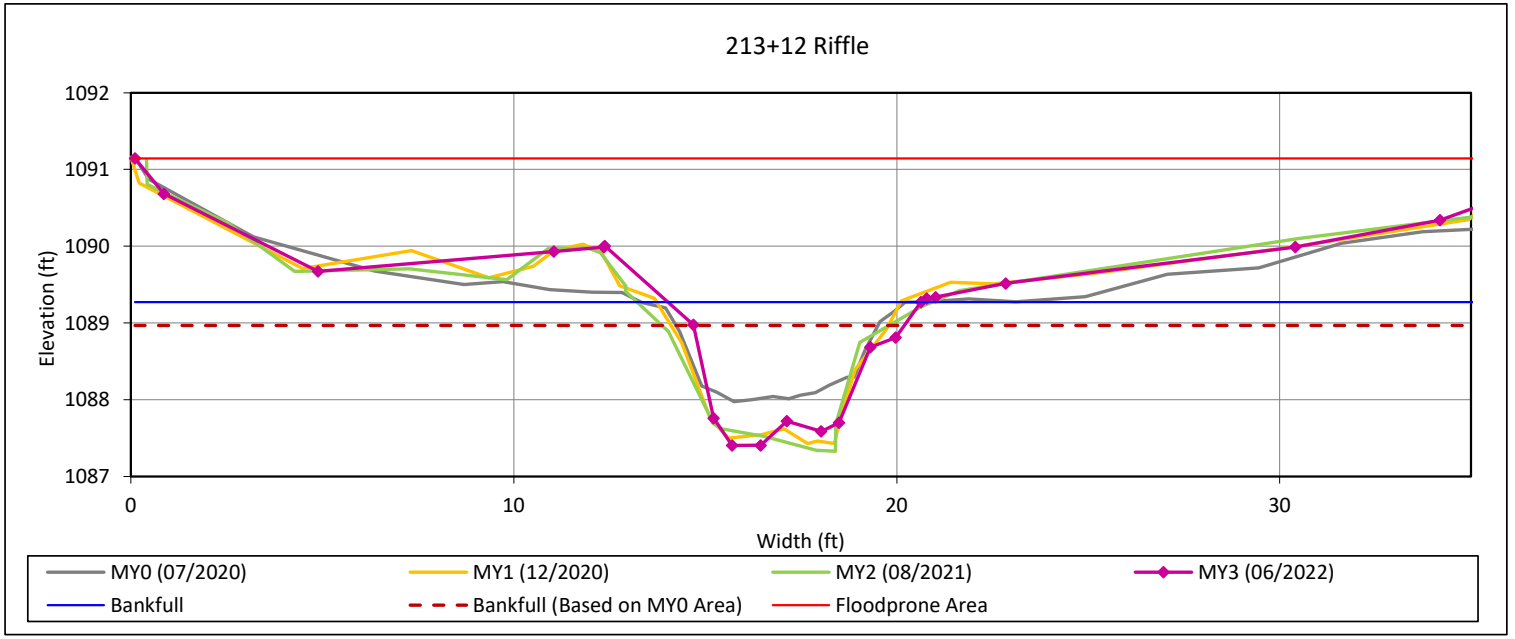
*The station number for XS9 was incorrectly reported on the MY0 cross-section plot, it should have been reported as Station 209+24 as shown in the above plot.

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 10-UT1C**




| Bankfull Dimensions | |
|---|---|
| 7.5 | x-section area (ft.sq.) |
| 6.6 | width (ft) |
| 1.1 | mean depth (ft) |
| 1.9 | max depth (ft) |
| 8.3 | wetted perimeter (ft) |
| 0.9 | hydraulic radius (ft) |
| 5.8 | width-depth ratio |
| 35.2 | W flood prone area (ft) |
| 5.3 | entrenchment ratio |
| 1.2 | low bank height ratio |

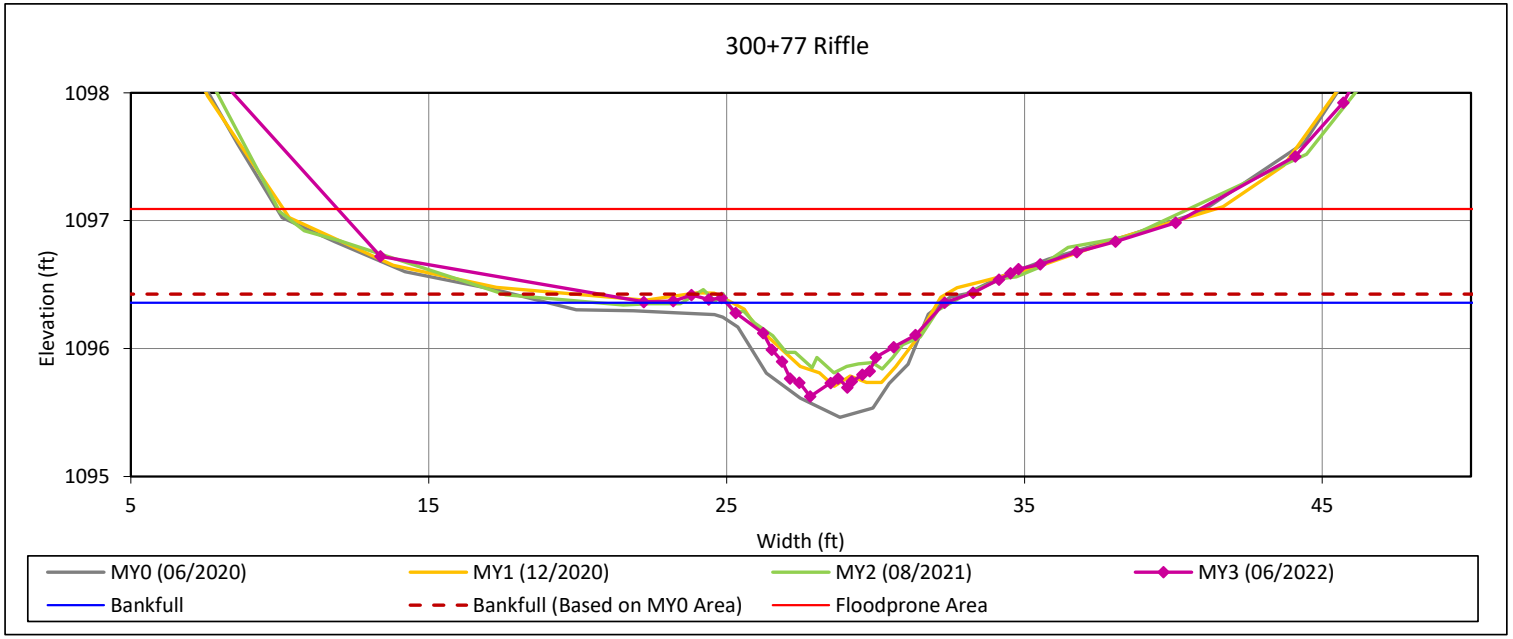
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 11-UT2A**




| Bankfull Dimensions | |
|---|---|
| 2.9 | 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) |
| 18.6 | width-depth ratio |
| 29.0 | W flood prone area (ft) |
| 4.0 | entrenchment ratio |
| 0.9 | low bank height ratio |

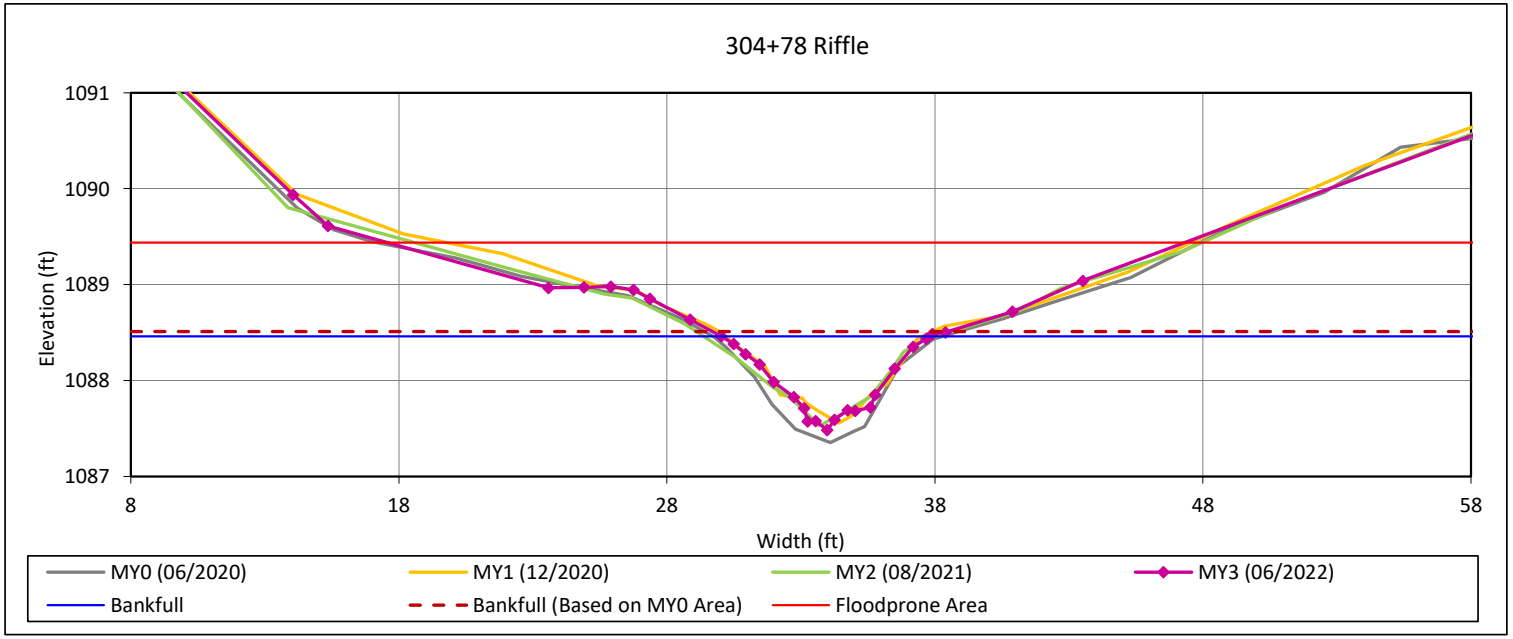
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 12-UT2B**




| Bankfull Dimensions | |
|---|---|
| 3.8 | x-section area (ft.sq.) |
| 7.8 | width (ft) |
| 0.5 | mean depth (ft) |
| 1.0 | max depth (ft) |
| 8.1 | wetted perimeter (ft) |
| 0.5 | hydraulic radius (ft) |
| 15.8 | width-depth ratio |
| 29.8 | W flood prone area (ft) |
| 3.8 | entrenchment ratio |
| 1.0 | low bank height ratio |

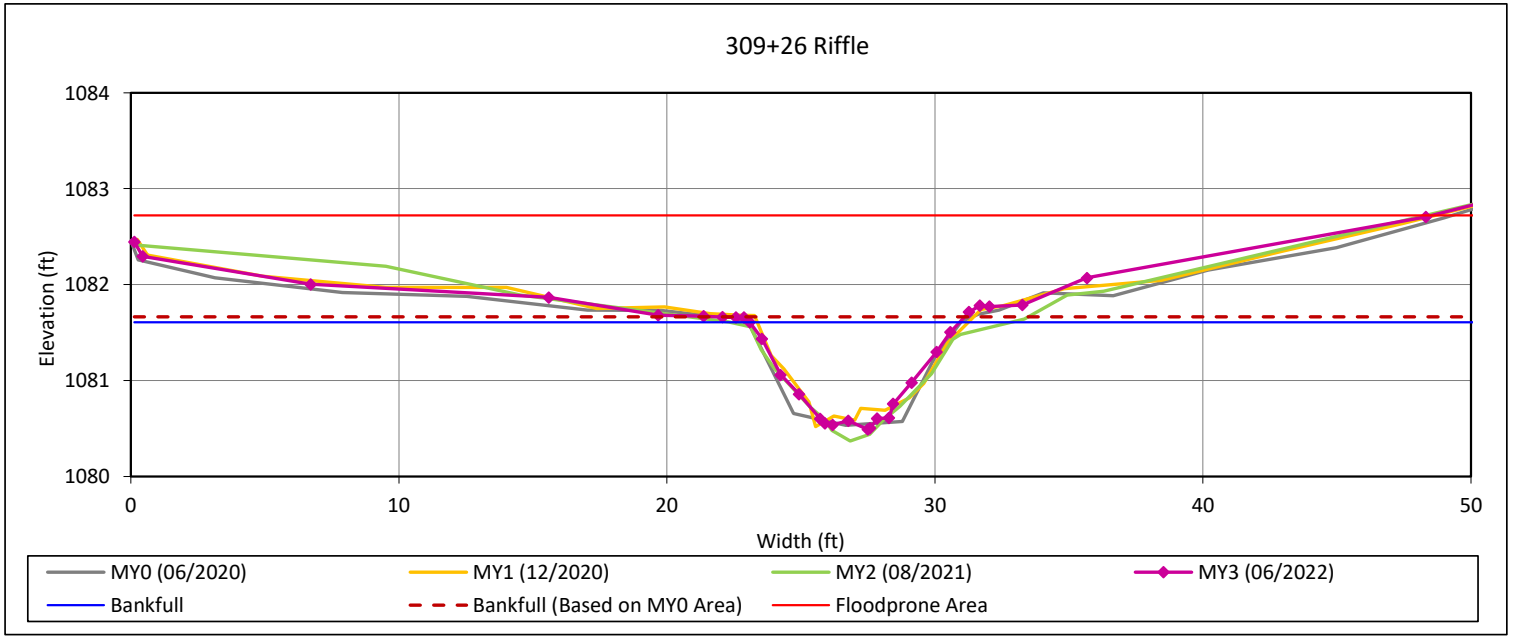
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 13-UT2C**




| Bankfull Dimensions | |
|---|---|
| 5.3 | x-section area (ft.sq.) |
| 7.8 | width (ft) |
| 0.7 | mean depth (ft) |
| 1.1 | max depth (ft) |
| 8.3 | wetted perimeter (ft) |
| 0.6 | hydraulic radius (ft) |
| 11.5 | width-depth ratio |
| 48.4 | W flood prone area (ft) |
| 6.2 | entrenchment ratio |
| 1.0 | low bank height ratio |

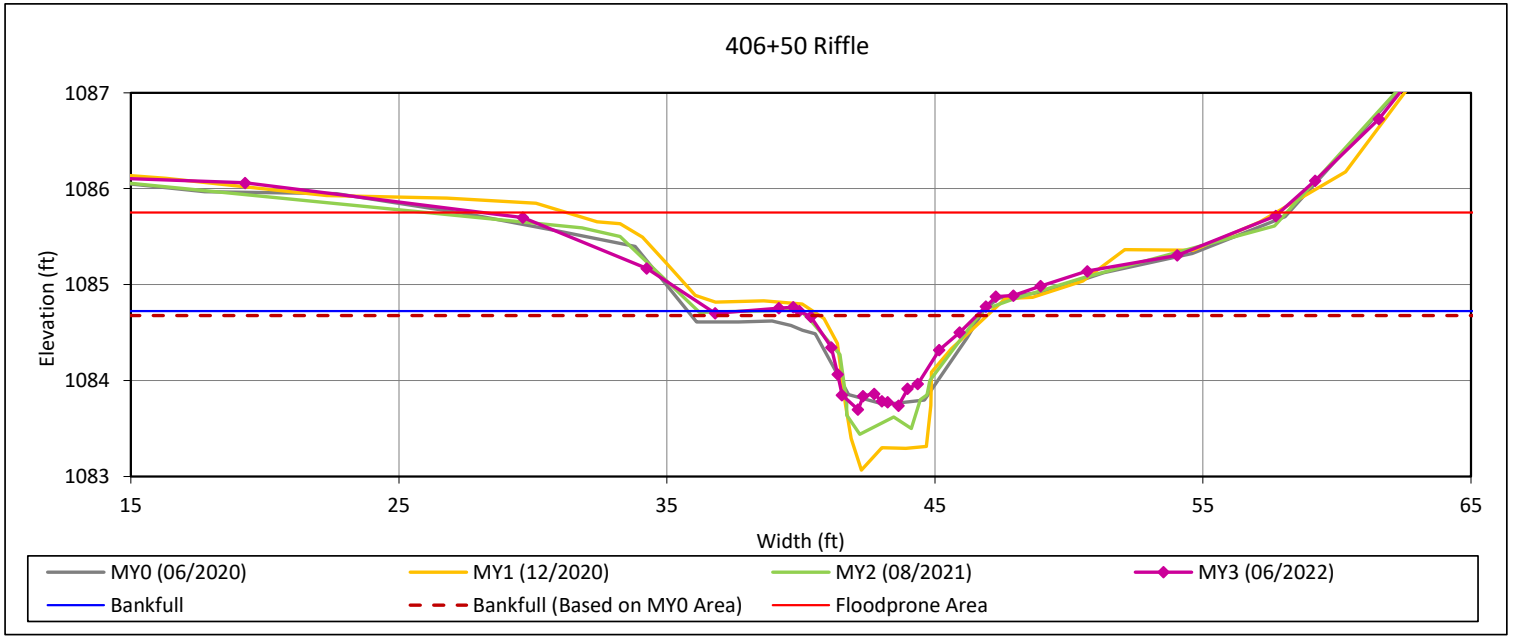
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 14-UT3B**




| Bankfull Dimensions | |
|---|---|
| 3.8 | x-section area (ft.sq.) |
| 6.8 | width (ft) |
| 0.6 | mean depth (ft) |
| 1.0 | max depth (ft) |
| 7.3 | wetted perimeter (ft) |
| 0.5 | hydraulic radius (ft) |
| 12.1 | width-depth ratio |
| 29.7 | W flood prone area (ft) |
| 4.4 | entrenchment ratio |
| 1.0 | low bank height ratio |

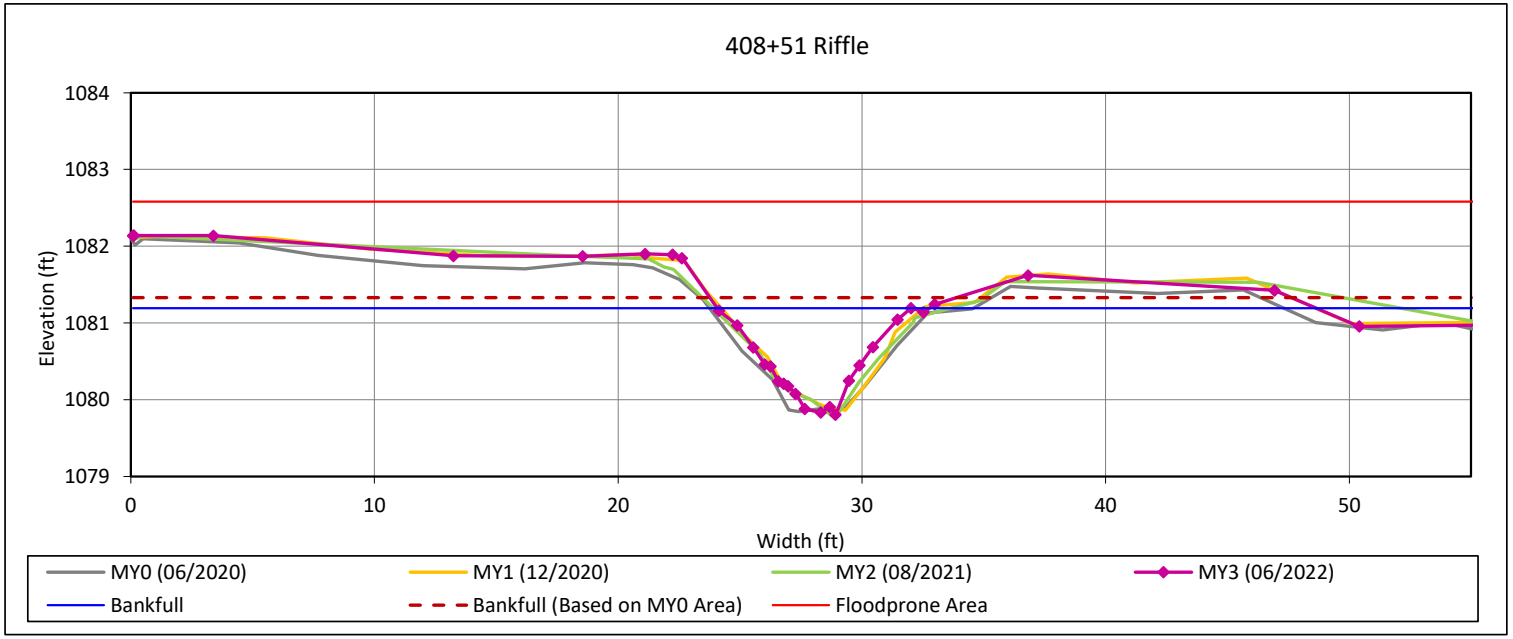
Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

## Cross-Section Plots

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

**Cross-Section 15-UT3C**




| Bankfull Dimensions | |
|---|---|
| 5.7 | x-section area (ft.sq.) |
| 8.0 | width (ft) |
| 0.7 | mean depth (ft) |
| 1.4 | max depth (ft) |
| 8.6 | wetted perimeter (ft) |
| 0.7 | hydraulic radius (ft) |
| 11.1 | width-depth ratio |
| 55.6 | W flood prone area (ft) |
| 7.0 | entrenchment ratio |
| 0.9 | low bank height ratio |

Survey Date: 06/2022
Field Crew: Wildlands Engineering

View Downstream

# APPENDIX D. Hydrology Data

### Table 12. Verification of Bankfull Events

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

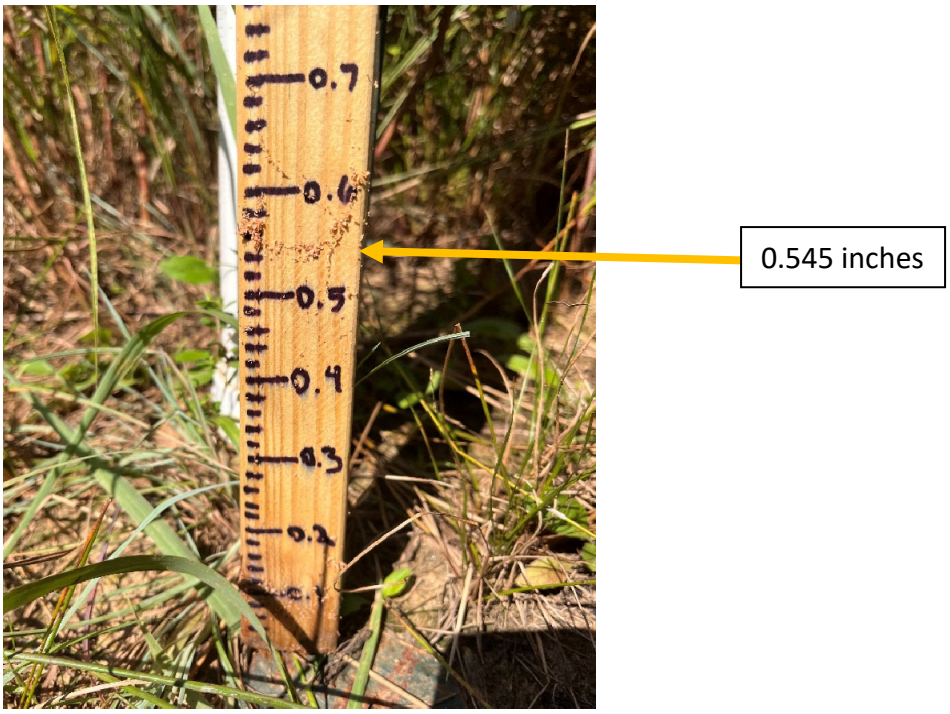
| Reach | Monitoring Year | Date of Occurrence | Method |
|---|---|---|---|
| Bull Creek Reach 2 (Crest Gage #1) | MY1 | 5/28/2020 | Automated Crest Gage |
| | | 8/5/2020 | |
| | | 11/12/2020 | |
| | | 12/26-27/2020 | |
| | MY2 | --- | --- |
| | MY3 | 7/9/2022 | Automated Crest Gage |
| UT1C (Crest Gage #2) | MY1 | 8/5/2020 | Automated Crest Gage |
| | | 8/15/2020 | |
| | | 10/29/2020 | |
| | | 11/11-12/2020 | |
| | | 12/3/2020 | |
| | | 12/19/2020 | |
| | | 12/25-27/2020 | |
| | MY2 | 9/21-22/2021 | Automated Crest Gage |
| | MY3 | 6/19/2022 | Automated Crest Gage |
| UT2C (Crest Gage #3) | MY1 | 8/15/2020 | Automated Crest Gage |
| | | 10/29/2020 | |
| | | 11/12/2020 | |
| | | 12/30/2020 | |
| | MY2 | 9/21-22/2021 | Automated Crest Gage |
| | MY3 | 1/16/2022 | Automated Crest Gage |
| | | 2/5/2022 | |
| | | 2/7/2022 | |
| UT3C (Crest Gage #4) | MY1 | 8/5/2020 | Automated Crest Gage |
| | | 8/15/2020 | |
| | | 8/21/2020 | |
| | | 10/29/2020 | |
| | | 12/25-26/2020 | |
| | MY2 | 9/21-22/2021 | Automated Crest Gage |
| | MY3 | 7/9/2022 | Automated Crest Gage |
| Bull Creek Reach 3 (Crest Gage #5) | MY1 | 5/28/2020 | Automated Crest Gage |
| | | 8/5/2020 | |
| | | 8/15/2020 | |
| | | 11/12/2020 | |
| | MY2 | --- | --- |
| | MY3 | --- | --- |
| Bull Creek Reach 3 (Manual Crest Gage #1)* | MY3 | 5/25/2022 - 9/19/2022 | Manual Crest Gage |
| Bull Creek Reach 1B (Crest Gage #6)** | MY3 | 7/9/2022 | Automated Crest Gage |

*Manual Crest Gage #1 was installed in MY3 on 5/25/2022.
**Crest Gage #6 was installed in MY3 on 4/14/2022

### Table 13. Verification of 30 Days Consecutive Flow

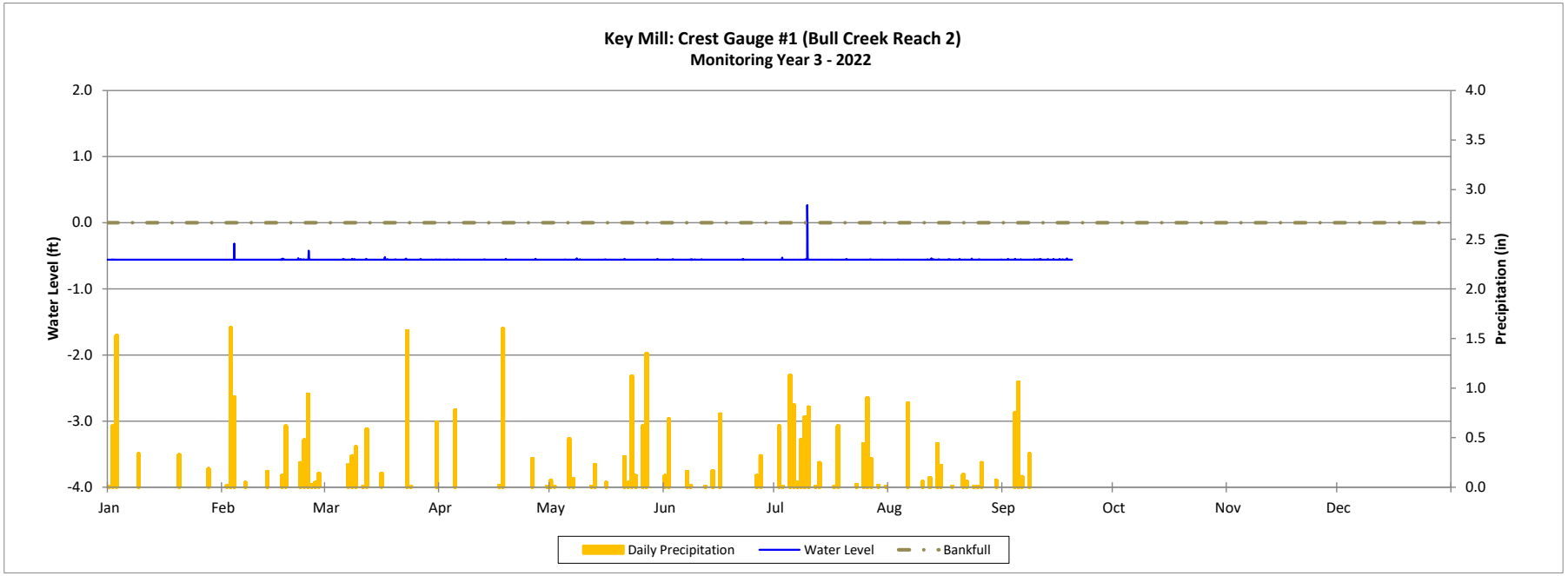
Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| Summary of In-Stream Gage Results for Monitoring Years 1 through 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Gage | Success Criteria Achieved/Max Consecutive Days (Percentage) | | | | | | |
| | MY1 | MY2 | MY3 | MY4 | MY5 | MY6 | MY7 |
| UT2 SG#1 | Yes/256 days (100%) | Yes/351 days (100%) | Yes/261 days (100%) | | | | |

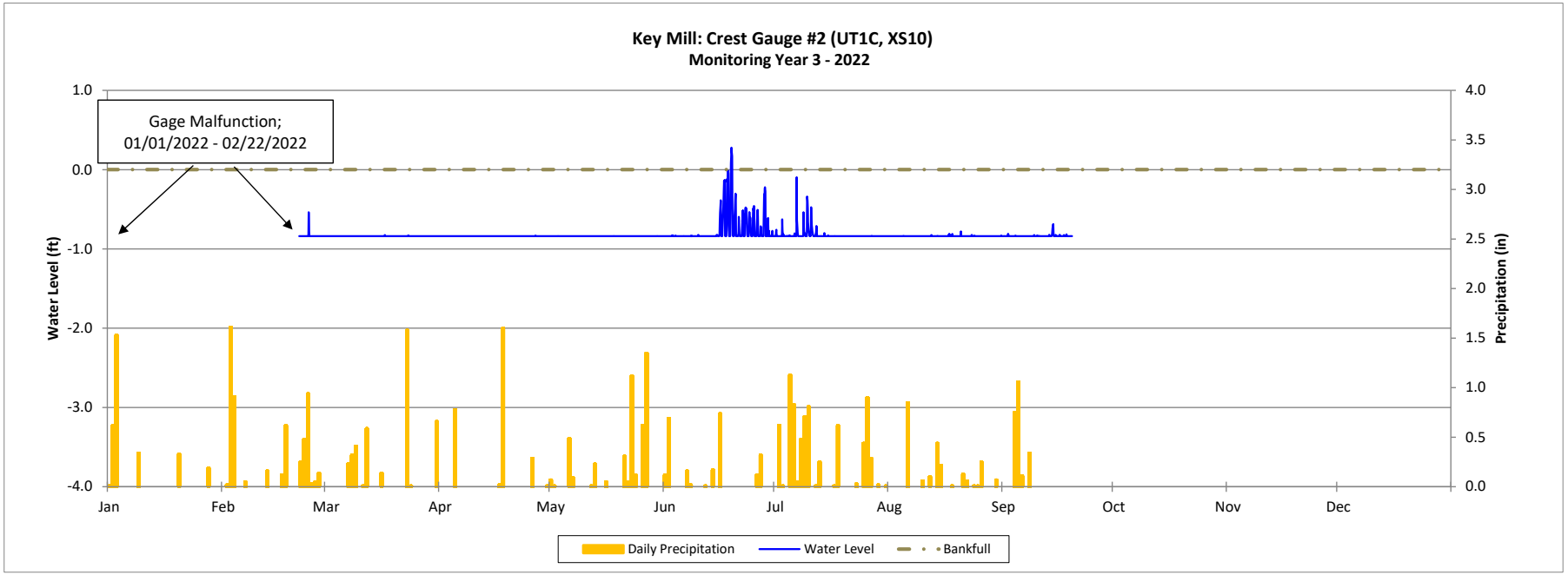



Bull Creek Reach 3: Manual Crest Gage #1 Bankfull Documentation (9/19/2022)

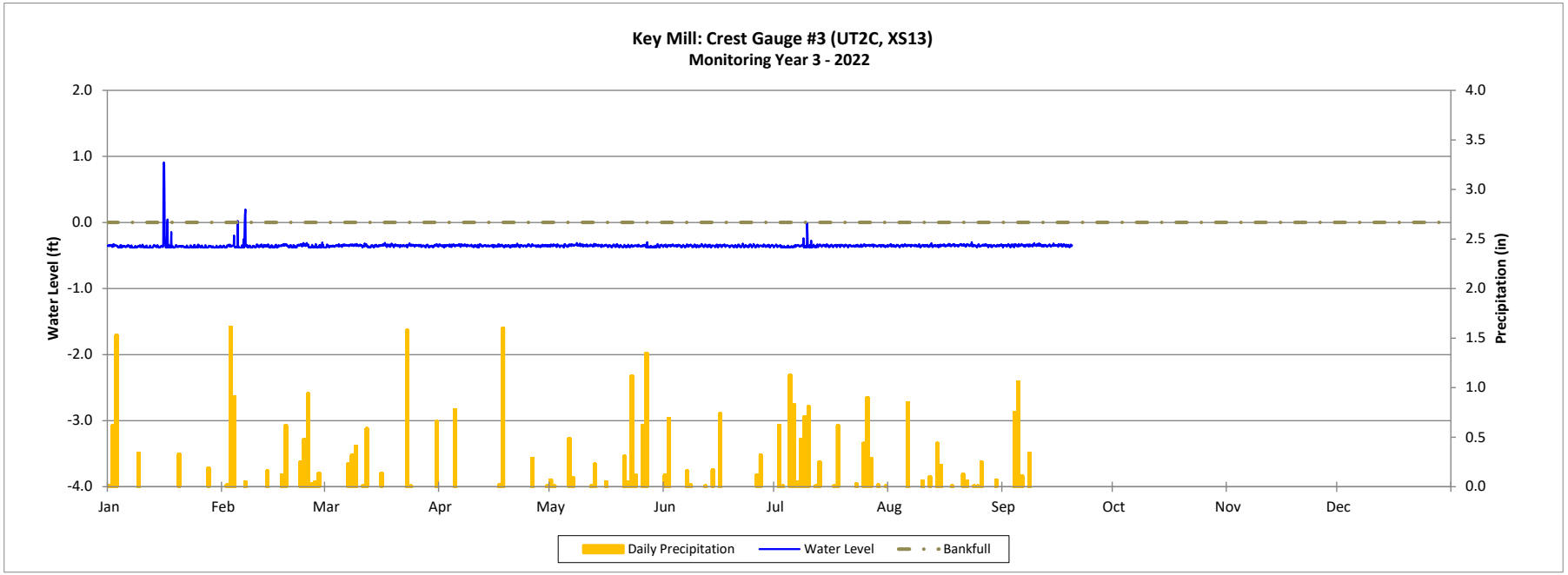
**Recorded Bankfull Events Plot**
Key Mill Mitigation Bank
DMS Project No. 100025
**Monitoring Year 3 - 2022**



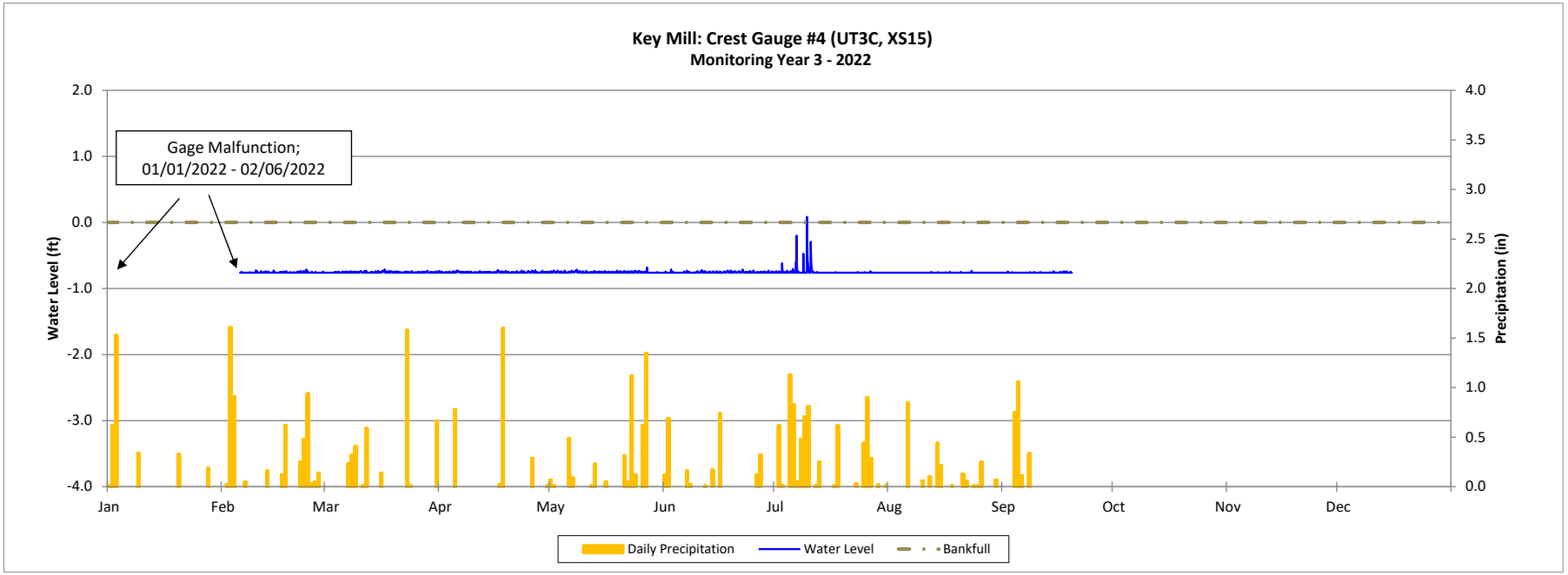
**Recorded Bankfull Events Plot**
Key Mill Mitigation Bank
DMS Project No. 100025
**Monitoring Year 3 - 2022**



**Recorded Bankfull Events Plot**
Key Mill Mitigation Bank
DMS Project No. 100025
**Monitoring Year 3 - 2022**

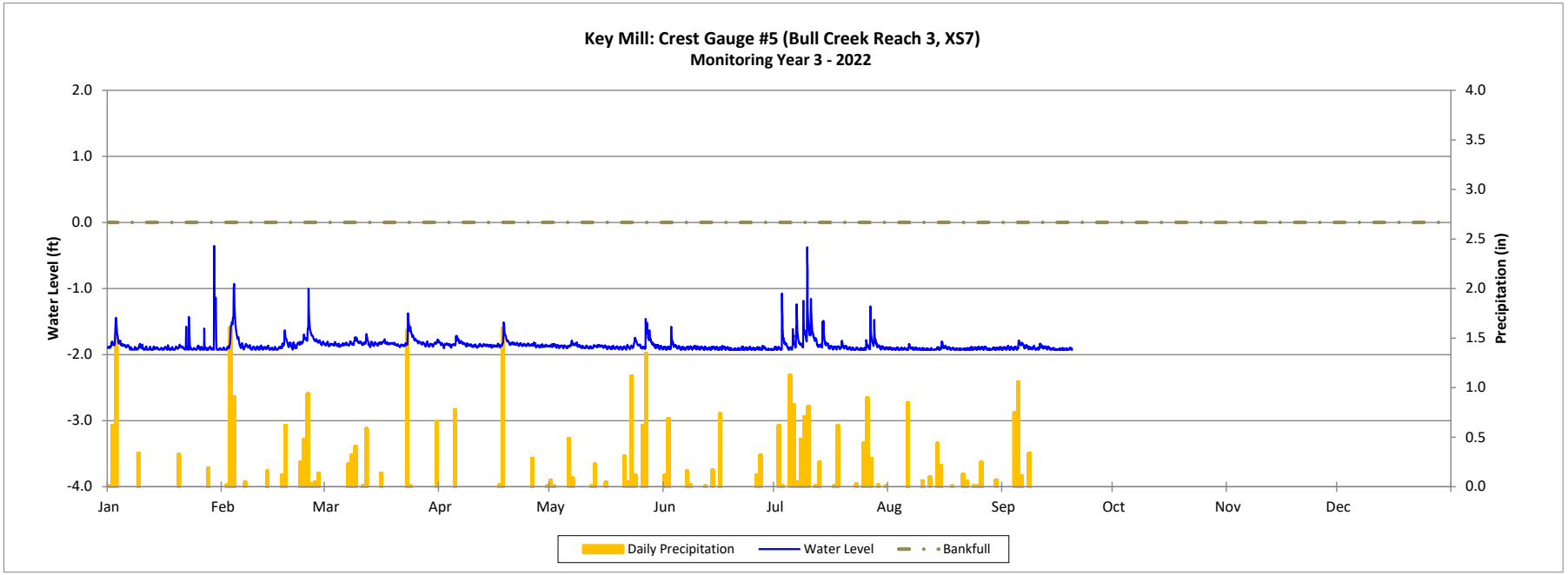


**Recorded Bankfull Events Plot**
Key Mill Mitigation Bank
DMS Project No. 100025
**Monitoring Year 3 - 2022**

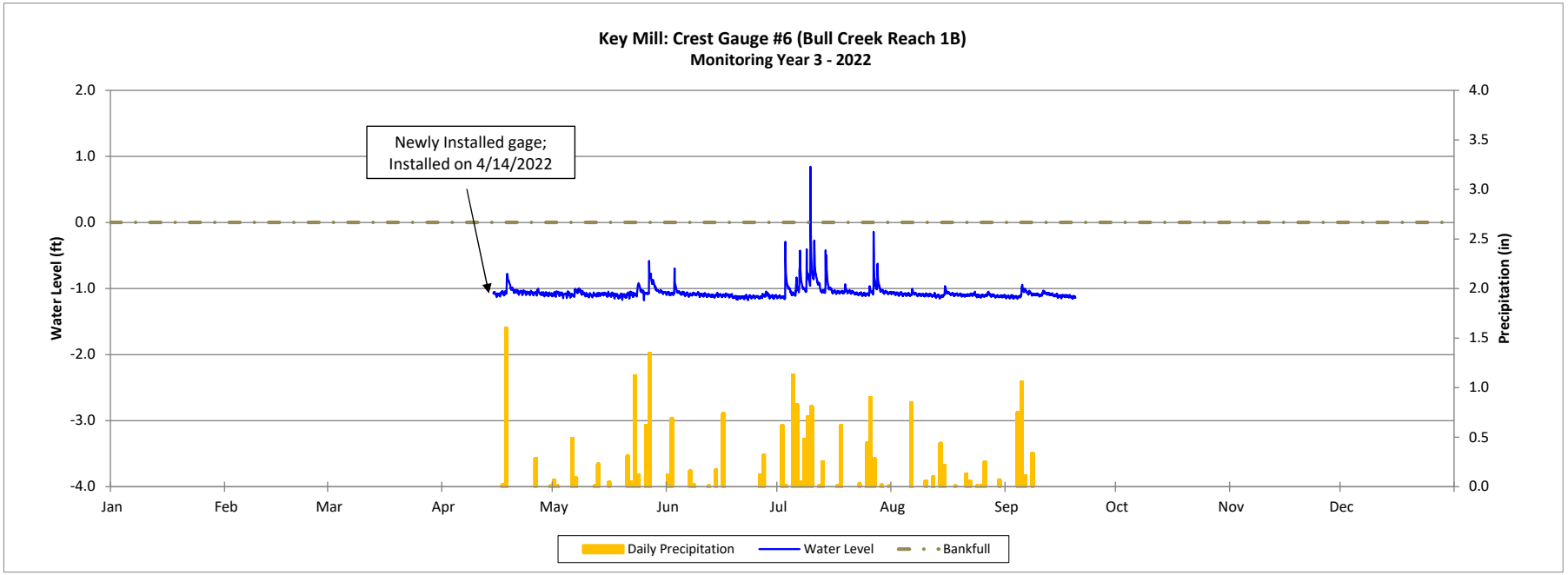


## Recorded Bankfull Events Plot

Key Mill Mitigation Bank
DMS Project No. 100025
**Monitoring Year 3 - 2022**



**Recorded Bankfull Events Plot**
Key Mill Mitigation Bank
DMS Project No. 100025
**Monitoring Year 3 - 2022**

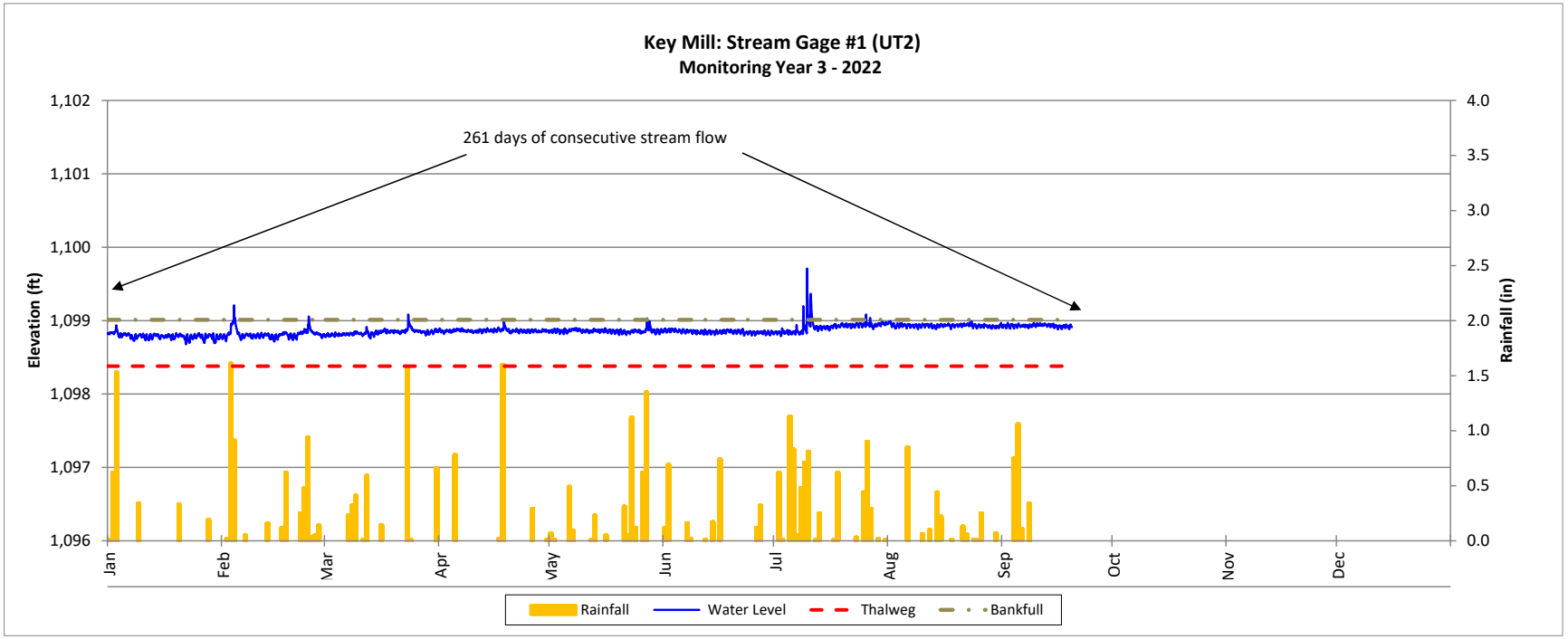


## Recorded In-stream Flow Events

Key Mill Mitigation Site

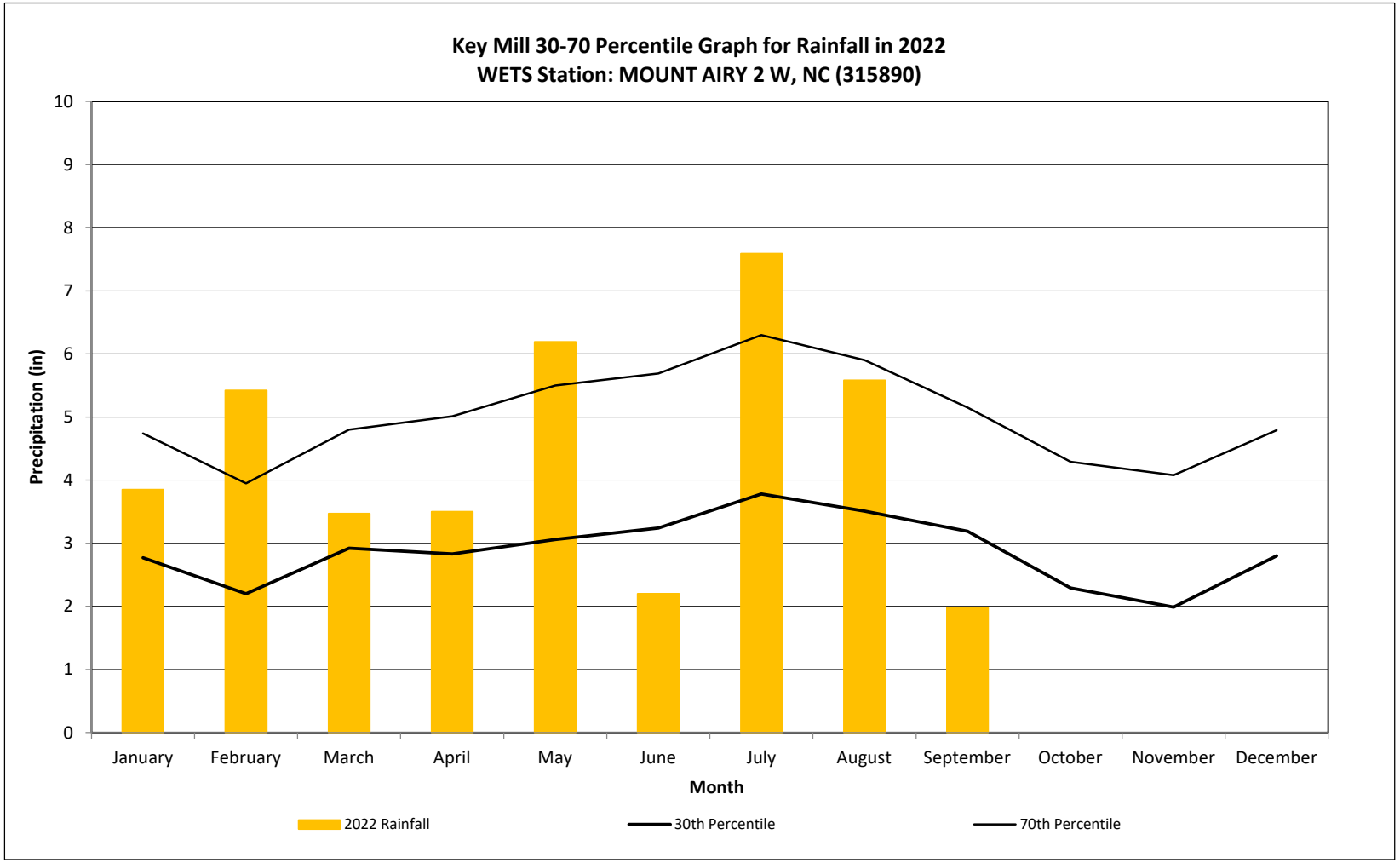
DMS Project No. 100025

**Monitoring Year 3 - 2022**



## Monthly Rainfall Data

Key Mill Mitigation Bank
DMS Project No. 100025
**Monitoring Year 3 - 2022**




Annual Rainfall collected from WETS Station: MOUNT AIRY 2 W, NC (315890)

30th and 70th percentile rainfall data collected from WETS Station: MOUNT AIRY 2 W, NC (315890); percentiles based on 30-yr climate normal (1992-2022)

# APPENDIX E. Project Timeline and Contact Information

### Table 14. Project Activity and Reporting History

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

| 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 | Seeding (Sitewide) | February 2021 | February 2021 |
| | Soil Amendments | March 2021 | March 2021 |
| | Stream Repairs (East Side) | | |
| | Supplemental Plantings | | |
| | Live Stake Install | | |
| | Invasive Treatments (Sitewide) | June 2021 | November 2021 |
| | Implementation of the IRT Credit Release Site Action Plan | July 2021 | August 2021 |
| | Stream Survey | August 2021 | November 2021 |
| | Vegetation Survey | | |
| Year 3 Monitoring | Soil Amendments (Restoration portions: Bull Creek R3 & UT3) | June 2022 | June 2022 |
| | Stream Survey | | November 2022 |
| | Invasive Treatments (Sitewide) | July 2022 - October 2022 | October 2022 |
| | Vegetation Survey | August 2022 | November 2022 |
| | Supplemental Plantings | December 2022 | December 2022 |
| 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 | | |

[1]Seed and mulch is added as each section of construction is completed.

### Table 15. Project Contact Table

Key Mill Mitigation Site
DMS Project No. 100025
**Monitoring Year 3 - 2022**

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