MONITORING YEAR 5 ANNUAL REPORT

Final

HENRY FORK MITIGATION SITE

Catawba County, NC
DEQ Contract No. 005782
DMS Project No. 96306
USACE No. 2014-00538
DWR No. 20140193

Catawba River Basin
HUC 03050103 Expanded Service Area

Data Collection Period: January – November 2020
Draft Submission Date: November 30, 2020
Final Submission Date: January 8, 2021

PREPARED FOR:

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

Mitigation Project Name	**Henry Fork Stream and Wetland Mitigation Project**	**USACE Action ID**	**2014-00538**
DMS ID	**96306**	**DWR Permit**	**2014-0193**
River Basin	**Catawba**	**Date Project Instituted**	**3/27/2020**
Cataloging Unit	**03050102**	**Date Prepared**	**4/20/2020**
County	**Catawba**	**Stream/Wet. Service Area**	**Catawba 03050102**

Signature & Date of Official Approving Credit Release

1 - For NCDMS, no credits are released during the first milestone

2 - For NCDMS projects, the initial credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the IRT by posting it to the DMS portal, provided the following have been met:

1) Approved of Final Mitigation Plan
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan.
4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met.

Credit Release Milestone	**Cool Stream Credits**						
Project Credits	**Scheduled Releases %**	**Proposed Releases %**	**Proposed Released #**	**Not Approved # Releases**	**Approved Credits**	**Anticipated Release Year**	**Actual Release Date**
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	1,451.500	0.000	1,451.500	2016	6/24/2016
3 - Year 1 Monitoring	10.00%	10.00%	480.767	9.200	471.567	2017	10/20/2017
4 - Year 2 Monitoring	10.00%	10.00%	480.767	0.000	480.767	2018	4/25/2018
5 - Year 3 Monitoring	10.00%	10.00%	480.767	0.000	480.767	2019	4/26/2019
6 - Year 4 Monitoring	5.00%	5.00%	240.383	0.000	240.383	2020	4/20/2020
7 - Year 5 Monitoring	10.00%					2021	
8 - Year 6 Monitoring	5.00%					2022	
9 - Year 7 Monitoring	10.00%					2023	
Stream Bankfull Standard	10.00%	10.00%	480.767	0.000	480.767	2018	4/25/2018
			Totals	0.000	3,605.751		

Total Gross Credits	4,807.667
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	3,605.751
Total Percentage Released	85.00%
Remaining Unreleased Credits	1,201.916

Credit Release Milestone	**Riparian Credits**						
Project Credits	**Scheduled Releases %**	**Proposed Releases %**	**Proposed Released #**	**Not Approved # Releases**	**Approved Credits**	**Anticipated Release Year**	**Actual Release Date**
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	1.265	0.000	1.265	2016	6/24/2016
3 - Year 1 Monitoring	10.00%	10.00%	0.422	0.000	0.422	2017	10/20/2017
4 - Year 2 Monitoring	10.00%	10.00%	0.422	0.000	0.422	2018	4/25/2018
5 - Year 3 Monitoring	15.00%	15.00%	0.633	0.000	0.633	2019	4/26/2019
6 - Year 4 Monitoring	5.00%	5.00%	0.211	0.000	0.211	2020	4/20/2020
7 - Year 5 Monitoring	15.00%					2021	
8 - Year 6 Monitoring	5.00%					2022	
9 - Year 7 Monitoring	10.00%					2023	
Stream Bankfull Standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Totals	0.000	2.953		

Total Gross Credits	4.222
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	2.953
Total Percentage Released	69.94%
Remaining Unreleased Credits	1.269

Notes

10/20/2017: Adjustment required due to IRT concerns on how the as-built credits were calculcated

Contingencies (if any)

Project Quantities

Mitigation Type	Restoration Type	Physical Quantity
Cool Stream	Restoration	3,057.000
Cool Stream	Enhancement I	2,626.000
Riparian	Restoration	3.965
Riparian	Enhancement	0.681

Debits

							Stream Restoration Credits	Riparian Restoration	Riparian Restoration Equivalent Credits
Beginning Balance (mitigation credits)							**4,807.667**	**3.880**	**0.342**
Released Credits							**3,605.751**	**2.714**	**0.239**
Unrealized Credits							**0.000**	**0.000**	**0.000**
Owning Program	**Req. Id**	**TIP #**	**Project Name**	**USACE Permit #**	**DWR Permit #**	**DCM Permit #**			
NCDOT Stream & Wetland ILF Program	REQ-006006		SR 1922 - Bridge 119 - Division 13	2014-00081			124.000		
NCDOT Stream & Wetland ILF Program	REQ-007286	B-5398	Bridge 21 on SR 1803	2016-01344			62.000		
Statewide Stream & Wetland ILF Program	REQ-003097		US 521 Landfill (Foxhole)	2005-31884	2005-0893			0.608	
Statewide Stream & Wetland ILF Program	REQ-003217		Bromley	2006-41599-390	2006-1849			0.039	
Statewide Stream & Wetland ILF Program	REQ-003783		Midwood Phase II (Firth Court Redevelopment)	2005-30123	2004-1615			0.345	
Statewide Stream & Wetland ILF Program	REQ-004107		Johnston Road Widening/Ballentine Road	2000-30479	2000-0162			0.110	
Statewide Stream & Wetland ILF Program	REQ-005039		Wilkinson Blvd Parking Decks	2009-03090	2000-1195			0.031	
Statewide Stream & Wetland ILF Program	REQ-005039		Wilkinson Blvd Parking Decks	2009-03090	2000-1195			1.014	
Statewide Stream & Wetland ILF Program	REQ-005039		Wilkinson Blvd Parking Decks	2009-03090	2000-1195			0.345	
Statewide Stream & Wetland ILF Program	REQ-003217		Bromley	2006-41599-390	2006-1849				0.013
Statewide Stream & Wetland ILF Program	REQ-004107		Johnston Road Widening/Ballentine Road	2000-30479	2000-0162				0.100
Statewide Stream & Wetland ILF Program	REQ-005039		Wilkinson Blvd Parking Decks	2009-03090	2000-1195				0.034
Statewide Stream & Wetland ILF Program	REQ-005075		Silverlanding	2009-00940	2009-0544				0.038
Statewide Stream & Wetland ILF Program	REQ-005075		Silverlanding	2009-00940	2009-0544				0.036
Total Credits Debited							**186.000**	**2.492**	**0.221**
Remaining Available balance (Released credits)							**3,419.751**	**0.222**	**0.018**
Remaining balance (Unreleased credits)							**1,201.916**	**1.166**	**0.103**

January 8, 2021

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

RE: **Response to MY5 Draft Report Comments**
Henry Fork Mitigation Project
DMS Project # 96306
Contract Number 005782
RFP Number 16-005298
Catawba River Basin – CU# 03050103 Expanded Service Area
Catawba County, North Carolina

Dear Mr. Reid:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft Monitoring Year 5 report for the Henry Fork Mitigation Project. DMS's comments are noted below in **bold**. Wildlands' responses to those comments are noted in *italics*.

DMS comment: Please add the following information to the title page:
- **USACE # 2014-00538**
- **DWR # 20140193**

Wildlands response: The USACE and DWR numbers have been added to the title page.

DMS comment: Executive Summary: Please update the WMUs from 4.221 to 4.222. This is the official WMU total used on the debit ledgers.

Wildlands response: The WMUs have been updated from 4.221 and 4.222 in the Executive Summary and Project Overview. Table 1 was also updated with the official WMU total used on the debit ledgers.

DMS comment: Vegetation Areas of Concern: The report indicates a supplemental planting occurred in March 2020. Please include a brief description of the supplemental planting effort. Include approximate number of bare roots, live stakes, or containerized plants that were installed and the approximate acreage of the replant area.

Wildlands response: Text was added to section 1.2.5 to describe the supplemental planting effort that occurred in March 2020.

DMS comment: Wetlands: GWG 8 has failed to meet success criteria for five monitoring years. Please update the report with the acreage of wetland re-establishment that is at risk of not meeting success criteria. Please be prepared to discuss this area during the 2020 credit release meeting.

Wildlands response: Text has been added to section 1.2.5 indicating the acreage of wetland re-establishment that is at risk of not meeting criteria. A map figure showing this at risk area has been included in Appendix 6. Wildlands will be prepared to discuss this area during the 2020 credit release meeting.

DMS comment: The report discusses the wetland addendum letter submitted to DMS on October 6, 2020 and includes the letter in the appendix. Please also include that the IRT responded on October 28, 2020 with several concerns regarding the addendum and include the IRT email in the appendix. Please also note that the wetland addendum request is not resolved at this point.

Wildlands response: The IRT comments from October 28, 2020 and the subsequent email responses from Wildlands have been included in Appendix 6. It is noted in the report text that the wetland addendum request has not been resolved at the time of the annual monitoring report submittal.

DMS comment: Groundwater Gage Plots: The note at the bottom of the graphs regarding the barotroll malfunction is unclear. It says the data collected during the February and April 16-17 malfunctions were omitted, but then then says the readings conducted during April 16-22 was verified and included. Is the April 16 date in the verified statement supposed to be April 21? Please review and revise as necessary.

Wildlands response: The note at the bottom of the groundwater gage plots has been revised and simplified to indicate that the data collected during the February and April malfunctions was omitted from the reported data.

DMS comment: All but GWG 8 are meeting success criteria; however, most are meeting the success criteria using the barotroll from another site. Are any of the gages meeting the 8.5% or 20 consecutive day success criteria earlier in the growing season before the barotroll failure? Please be prepared to discuss how the barotroll is used to calibrate data and the effects of using one from offsite during the credit release meeting.

Wildlands response: All the GWGs, except GWG 8, had additional intervals of meeting the 20 consecutive day success criteria earlier in the growing season before the onsite barotroll failure on August 1, 2020:

GWG 1: 3/20 to 4/8 (20 consecutive days)
GWG 2: 3/20 to 4/10 (22 consecutive days)
GWG 3: 3/20 to 4/10 (22 consecutive days)
GWG 4: 4/23 to 6/7 (45 consecutive days)
GWG 5: 4/23 to 8/1 (100 consecutive days)
GWG 6: 4/23 to 7/17 (85 consecutive days)
GWG 7: 4/23 to 5/15 (22 consecutive days)
GWG 9: 4/23 to 7/2 (70 consecutive days)
GWG 10: 4/23 to 8/1 (100 consecutive days)
GWG 11: 4/23 to 6/7 (45 consecutive days)
GWG 12: 3/20 to 4/16 (28 consecutive days)
GWG 13: 4/23 to 8/1 (100 consecutive days)
GWG 14: 4/23 to 5/16 (23 consecutive days)
GWG 15: 4/23 to 5/15 (22 consecutive days)

Wildlands will be prepared at the 2020 credit release meeting to discuss that the barotroll is used to calibrate the groundwater gage pressure based on the local atmospheric pressure. The positive pressure difference is then used to calculate the depth of water above the groundwater gage sensor. In addition, the offsite barotroll data (Owl's Den Mitigation Site) that was used after 8/1/2020 was plotted against the onsite barotroll data available earlier in the year with the sites' elevation difference taken into account to verify that the offsite barotroll was an appropriate substitution to use.

Digital Files Review

DMS comment: The stream gauge data excel spreadsheet will not open, which is likely caused by macros. Please resubmit these data in excel, ensuring that the spreadsheet can be open.

Wildlands response: Wildlands is able to open the stream gage data spreadsheet that was provided to DMS in the electronic support files. There is a large amount of data associated with the stream gages since they are programmed to collect measurements every 30 minutes. Therefore, the stream gage spreadsheet usually requires more time than a typical excel file to fully open.

Enclosed please find one (1) hard copies and one (1) electronic copy on CD of the Final Monitoring Report. Please contact me at 828-545-3865 if you have any questions.

Sincerely,

Jake McLean
Project Manager
jmclean@wildlandseng.com

PREPARED BY:

1430 South Mint Street, Suite 104
Charlotte, NC 28203

Phone: 704.332.7754
Fax: 704.332.3306

EXECUTIVE SUMMARY

Wildlands Engineering Inc. (Wildlands) implemented a full delivery project at the Henry Fork Mitigation Site (Site) for the North Carolina Division of Mitigation Services (DMS) to restore 3,057 linear feet (LF) of perennial streams and enhance 2,626 LF of intermittent streams, enhance 0.68 acres of existing wetlands, rehabilitate 0.25 acres of existing wetlands, and re-establish 3.71 acres of wetlands in Catawba County, NC. The Site is expected to generate 4,807.667 stream mitigation units (SMUs) and 4.222 wetland mitigation units (WMUs) (Table 1). The Site is located near the City of Hickory in Catawba County, NC, in the Catawba River Basin eight-digit Cataloging Unit (CU) 03050102 and the 14-digit Hydrologic Unit Code (HUC) 03050102010030 (Figure 1).

The project's compensatory mitigation credits will be used in accordance with the In-Lieu Fee (ILF) Program Instrument dated July 28, 2010, the expanded service area as defined under the September 12, 2006 PACG memorandum, and/or DMS acceptance and regulatory permit conditions associated with DMS ILF requirements. Hydrologic Unit Code (HUC) 03050102010030, Lower Henry Fork, was identified as a Targeted Local Watershed (TLW) in DMS' 2007 Catawba River Basin Restoration Priority (RBRP) Plan. The project streams consist of four unnamed tributaries (UTs) to the Henry Fork River on the site of a former golf course, referred to herein as UT1, UT2, UT1A, and UT1B (Figure 2). The project also consists of several wetland restoration components, as well as buffer planting along Henry Fork. The project watershed consists of agricultural, forested, and residential land uses.

The project goals established in the Mitigation Plan (Wildlands, 2015) were completed with careful consideration of goals and objectives that were described in the RBRP and to meet DMS mitigation needs while maximizing the ecological and water quality uplift within the watershed. The established project goals include:

- Permanently protect the project site from harmful uses;
- Correct modifications to streams, wetlands, and buffers;
- Improve and re-establish hydrology and function of previously cleared wetlands;
- Reduce current erosion and sedimentation;
- Reduce nutrient inputs to streams and wetlands and downstream water bodies;
- Improve instream habitat; and
- Provide and improve terrestrial habitat and native floodplain forest.

The Site construction and as-built surveys were completed between November 2015 and March 2016. Monitoring Year (MY) 5 assessments and site visits were completed between January and November 2020.

Overall, the Site has met the required stream and vegetation success criteria for MY5. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline with minor deviations due to natural sediment transport processes, and streams are functioning as intended. All project streams recorded at least one bankfull event or greater in MY5. The bankfull performance standard had been met for the Site in MY4. The vegetation assessment resulted in an average planted stem density of 564 stems per acre and is exceeding the interim success criterion of 260 stems per acre for MY5 and on track to meet the performance criteria of 210 stems per acre in MY7. In addition, all fifteen vegetation plots exceeded this requirement. Fourteen of the fifteen groundwater monitoring gages installed on the Site met or exceeded the hydrologic success criteria for MY5. The MY5 visual assessment revealed a few areas of concern including pockets of invasive plant species and areas of low stem growth. Areas of concern will continue to be monitored and adaptive management will be performed as needed.

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APPENDICES

Appendix 6 **Wetland Addendum**

Wetland Addendum Letter – October 6, 2020
Response to IRT comments from October 28, 2020

Section 1: PROJECT OVERVIEW

The Site is located near the City of Hickory in Catawba County, NC, in the Catawba River Basin eight-digit CU 03050102 and the 14-digit HUC 03050102010030 (Figure 1). Access to the Site is via Mountain View Road, approximately one mile southwest of Hickory, North Carolina. Situated in the Inner Piedmont Belt of the Piedmont Physiographic Province (USGS, 1998), the project watershed consists of agricultural, forested, and residential land uses. The drainage area for the Site is 178 acres (0.28 square miles).

The project streams consist of four unnamed tributaries (UTs) to the Henry Fork River on the site of a former golf course, referred to herein as UT1, UT2, UT1A, and UT1B. Stream restoration reaches included UT1 (Reach 1 and 2) and UT1B, together comprising 3,057 LF of perennial stream channel. Stream enhancement reaches included UT1A and UT2, together totaling 2,626 LF. Stream enhancement activities for UT1A and UT2 were the same as for restoration reaches; however, the tributaries are intermittent and were credited as enhancement. The riparian areas of the tributaries, as well as a 100-foot wide buffer along the project side of Henry Fork, were planted with native vegetation to improve habitat and protect water quality. Wetland components included enhancement of 0.68 acres of existing wetlands, rehabilitation of 0.25 acres of existing wetlands and re-establishment of 3.71 acres of wetlands.

Construction activities were completed by Land Mechanic Designs, Inc. in March 2016. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in March 2016. A conservation easement has been recorded and is in place on 48.06 acres (Deed Book 03247, Page Number 0476-0488) within a tract owned by WEI-Henry Fork, LLC. The project is expected to generate 4,807.667 SMUs and 4.222 WMUs. Annual monitoring will be conducted for seven years. Close-out is anticipated to commence in 2023 given the success criteria are met. Appendix 1 provides more detailed project activity, history, contact information, and watershed/site background information for this project.

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

1.1 Project Goals and Objectives

This Site is intended to provide numerous ecological benefits within the Catawba River Basin. The Site will help meet the goals for the watershed outlined in the RBRP and provide numerous ecological benefits within the Catawba River Basin. While many of these benefits are limited to the Henry Fork project area, others, such as pollutant removal, reduced sediment loading, and improved aquatic and terrestrial habitat, have farther-reaching effects. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. These project goals established were completed with careful consideration of goals and objectives that were described in the RBRP and to meet the DMS mitigation needs while maximizing the ecological and water quality uplift within the watershed.

The following project specific goals established in the Mitigation Plan (Wildlands, 2015) include:

- Permanently protect the project site from harmful uses; and
- Correct modifications to streams, wetlands and buffers;
- Improve and re-establish hydrology and function of previously cleared wetlands;
- Reduce current erosion and sedimentation;
- Reduce nutrient inputs to streams and wetlands, and to downstream water bodies;
- Improve instream habitat; and
- Provide and improve terrestrial habitat and native floodplain forest.

The project goals were addressed through the following project objectives:

- Decommissioning the existing golf course and establishing a conservation easement on the Site will eliminate direct chemical fertilizer, pesticide, and herbicide inputs;
- Resizing and realigning channels to address stream dredging and ditching. Planting native woody species in riparian zones which have been maintained through mowing. By correcting these prior modifications, the channels and floodplains will provide a suite of hydrologic and biological function;
- Restoring appropriate stream dimensions and juxtaposition of streams and wetlands on the landscape. Wetlands will be enhanced through more frequent overbank flooding, and by reducing the drawdown effect that current ditched channels have on wetland hydrology; thereby, enhancing wetland connectivity to the local water table. The project will extend existing wetland zones into adjacent areas and support wetland functions;
- Removing historic overburden to uncover relic hydric soils. Roughen wetland re-establishment. Restore streams for wetland benefit. Each of these will bring local water table elevations closer to the ground surface. Create overbank flooding and depressional storage for overland and overbank flow retention. Decrease direct runoff, and increase infiltration;
- Planting a native vegetation community on the Site to revegetate the riparian buffers and wetlands. Conduct soil restoration through topsoil harvesting and reapplication and leaf litter harvesting and application from adjacent forested areas. This will return functions associated with buffers and forested floodplains, as well as enhance soil productivity and bring native biological activity and seed into the disturbed areas;
- Constructing diverse and stable channel form with varied stream bedform and installing habitat features, along with removing culverts. These will allow aquatic habitat quality and connectivity enhancement; and
- Placing a portion of the right bank Henry Fork floodplain under a conservation easement, and planting all stream buffers and wetlands with native species. Creating a 100-foot wide corridor of wooded riparian buffer along that top right bank area and re-establishing native plant communities and habitat connectivity within Site to adjoining natural areas along the river corridor.

1.2 Monitoring Year 5 Data Assessment

Annual monitoring was conducted between January and November 2020 to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Henry Fork Mitigation Plan (Wildlands, 2015).

1.2.1 Stream Assessment

Morphological surveys for MY5 were conducted in April and June 2020. Throughout the Site, the cross-section survey results indicate that channel dimensions are stable and continuing to function with minimal adjustments. Along UT1 Reach 1 and Reach 2, the establishment of juncus/herbaceous vegetation along the edge of water (XS1, XS4, and XS5 riffles) is causing the channel to narrow somewhat; however, this is not an indicator of instability. The pool max depth has decreased since as-built for the XS2 along UT1 Reach 1 but does not seem to be representative to the pools in this reach. Cross-sections along UT1A display some deposition with decreased cross-sectional areas but have maintained max depths and are still functioning as a single thread channel. Similarly, along UT1B, cross-sections show some deposition but to a lesser extent than UT1A with minimal change in cross-sectional areas compared to as-built. The cross-sections along UT2 have retained stable dimensions throughout the monitoring period thus far.

In general, MY5 pebble counts in UT1 and UT1B indicate a maintenance of coarser material in the riffle features and finer particles in the pool features. Please refer to Appendix 4 for the cross-section plots, pebble count plots, and morphology summary tables.

1.2.2 Stream Hydrology Assessment

At the end of the seven-year monitoring period, two or more bankfull events must have occurred in separate years within the restoration reaches. The success criteria were met for the project after MY4. During MY5, all stream reaches recorded at least one additional bankfull event.

In addition to monitoring bankfull events, intermittent streams must be monitored to demonstrate a minimum of 30 consecutive days of flow during periods of normal rainfall. Stream gages installed on intermittent channels (UT1A and UT2) indicated each stream recorded at least 117 consecutive days of baseflow. The number of consecutive days was likely longer than what is reported due to a malfunction with the on-site barotroll. A new barotroll will be installed on the Site before the start of MY6. The presence of baseflow was also observed in UT1, UT1A, UT1B, and UT2 during each site visit; thereby, confirming recorded stream gage data. Refer to Appendix 5 for hydrology summary data and plots.

1.2.3 Vegetative Assessment

A total of 15 vegetation plots (VPs) were established during baseline monitoring within the project easement area using standard 10 by 10 meter plots. Vegetation plots are monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008). The final vegetative performance standard will be the survival of 210 planted stems per acre in the planted riparian and wetland corridor at the end of the required seven-year monitoring period. The interim measure of vegetative success for the Site is the survival of at least 260 stems per acre at the end of MY5.

The MY5 vegetative survey was completed in July 2020 and resulted in an average stem density of 564 planted stems per acre for the Site with a range of 445 – 648 planted stems per acre per plot. The Site, as well as all 15 vegetation plots (100%) are exceeding the MY5 density of 260 planted stems per acre. The MY5 average stem height for all plots is about 6 feet. The vegetation plots with the lowest average heights and vigor (health scores) included VP 6, 7, and 11. These vegetation plots are located within or near the wetland re-establishment areas and saturated soil conditions are deterring some stem growth. Please refer to section 1.2.5 for further discussion about areas of low stem vigor/height.

Approximately 81% of the planted stems monitored in vegetation plots are thriving with a health score of 3 or greater. The planted tree species with the highest health scores included willow oak (*Quercus phellos*), river birch (*Betula nigra*), persimmon (*Diospyros virginiana*), and sycamore (*Platanus occidentalis*). About 15% of the stems have a vigor of 2 or less indicating some damage is present, and about 1% of the monitored stems were missing in MY5. The poor tree health is a result of suffocation from herbaceous plants or vines, insects, deer, wet or dry soil conditions, or other unknown factors. There was only a stem mortality of 3% between MY3 and MY5 vegetation assessments. Please refer to Appendix 2 for vegetation plot photographs, Current Condition Plant View (CCPV) Figures for vegetation plot locations, and Appendix 3 for vegetation data tables.

1.2.4 Wetland Assessment

Following construction, groundwater gages (GWGs) were distributed so that the data collected would provide a reasonable indication of groundwater levels throughout the wetland components on the Site. Additional gages have been added to further refine this data. A gage was established in an adjacent reference wetland and is being utilized to compare with the hydrologic response within the restored wetland areas at the Site. A barotroll logger to measure barometric pressure used in the calculations of

groundwater levels with gage transducer data was installed on the Site. The onsite barotroll quit working on 8/1/2020 so the remaining data was calibrated using the barotroll from a nearby mitigation site (Owl's Den Mitigation Site) which is located in Lincoln, County approximately 15 miles from the Site. A new barotroll will be installed at the beginning of MY6 (2021). The rainfall data is collected from an existing NC CRONOS station (Hickory 4.8 SW, NC). All monitoring gages were downloaded on a quarterly basis and maintained on an as needed basis. A soil temperature gage was also installed on Site in October 2016. Wildlands is using the soil temperature probe data to confirm the dates defined in the WETS table for Burke County, NC, as needed. The WETS growing season is not available for Catawba County; however, a growing season is defined for historic weather data collected at the Hickory Regional Airport in Burke County, which is approximately 3 miles as the crow flies from the Site. The growing season from Burke County, which runs from March 20th to November 11th (237 days in 2020), is being used for hydrologic success. The final performance standard established for wetland hydrology will be a free groundwater surface within 12 inches of the ground surface for 20 consecutive days (8.5%) of the defined growing season under typical precipitation conditions.

In total, there are fifteen GWGs currently installed on the Site. Seven of the groundwater hydrology gages (GWGs) were established during the baseline monitoring within the wetland rehabilitation and re-establishment zones (GWGs 1 – 4 and 6 – 8). During the initial GWG installation, GWG 3 was installed in a seep where hydrology was much stronger than the surrounded area; therefore, Wildlands relocated GWG 3 in January 2017 (MY2) to an area that was more representative of the surrounding wetlands. Wildlands also installed two additional gages (GWG 5 and 9) within the wetland re-establishment areas during 2017 (MY2) in order to further assess wetland performance near where GWGs were not meeting criteria. The transducer for GWG 5 was replaced at the beginning of MY4 due to abnormal data in MY3 and to ensure accurate water level data is being reported. In February and March 2019 (MY4), six additional GWG were added to the Site. Three of the gages (GWG 10 – 12) were installed to better define the wetland re-establishment area within the right floodplain of UT1 Reach 2. The remaining three gages (GWG 13 – 15) were installed in locations adjacent to wetland enhancement areas to provide groundwater data to support the potential expansion of these wetland areas.

Of the fifteen GWGs, fourteen met the success criteria for MY5. Of the gages that met, the percentage of consecutive days of the growing season with ground water levels within the first 12 inches of the ground surface ranged from 11% to 89%. GWG 8 did not meet the success criteria for MY5 with a measured maximum 14 consecutive days during the growing season or four days short of the success criteria. GWGs 5, 10, and 13 achieved the success criteria for at least 89% of the growing season with plots showing similar hydroperiods to one another and indicating comparable groundwater hydrology in those areas. The remainder of the GWG's hydroperiods were like that of the reference gage. Monthly rainfall data in 2020 indicated higher than normal rainfall amounts occurred during the months of January, April, May, June, August, September, and October. Lower than normal rainfall amounts occurred only during the month of March. Please refer to the CCPV Figures 3.0-3.2 in Appendix 2 for the groundwater gage locations and Appendix 5 for groundwater hydrology summary data and plots.

1.2.5 Areas of Concern and Adaptive Management Plan

Vegetation

In MY5, minor areas of invasive plant populations were found within the conservation easement. These species include Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), Chinese privet (*Ligustrum sinense*), Creeping primrose (*Ludwigia peploides*), Asian spiderwort (*Murdannia keisak*) and kudzu (*Pueraria montana*). Invasive treatments occurred in July and September 2020, particularly focusing on small areas of kudzu and in-stream vegetation and have hindered establishment of those species within the Site. Areas of dense sweet gum (*Liquidambar styraciflua*) populations that were

treated in November 2019 have reduced monocultures of the species and allowed desirable tree species to become established.

Visual and vegetation assessments in MY5 continue to reveal some areas of low stem vigor/height on the lower portion of the Site (UT2 and UT1 Reach 2 floodplains) that are represented by vegetation plots 6, 7, and 11 where plots are exceeding the density performance standard but some of the planted stems display lower vigor and/or stunted heights. However, these areas are showing signs of improvement with desired volunteer species including river birch, sycamore, tag alder (*Alnus serrulata*), and cottonwood (*Populus deltoides*) naturally starting to develop and herbaceous vegetation filling in previously observed bare areas. In March 2020, a supplemental planting effort installed 100 bare roots and 150 1-gallon container plants in approximately 1.5 acres of the Site where low stem vigor/height had been noted.

Streams

Isolated areas of bank scour along UT1 (near stations 106+00 and 124+75), that were first noted in MY4, were repaired in the August 2019 and January 2020 by regrading and replanting the banks with live stakes and established vegetation transplanted from the floodplain. The repairs have remained stable and effective, even after several large precipitation events in 2020.

The on-site intermittent streams (UT1A and UT2) that received full restoration approach but are credited at a reduced enhancement ratio, have continued to maintain single channel morphology. In previous years, low flow and some vegetation within the channel had been noted along these reaches. Flow was observed during each site visit in MY5. Some deposition was noted along UT1A as observed within the cross-sections, but the stream continues to retain dimensions with minor changes. Similar minor localized aggradation was noted along UT1 Reach 1 downstream of the wetland enhancement area in the footprint of the old pond bed. In March 2020, additional live stakes were planted along the few bank areas that were lacking woody vegetation to improve stream shading. As the woody vegetation continues to become established, the baseflow channel is expected to become stronger and less vegetated.

A few beaver dams were removed at the beginning of MY5 throughout the lower portion of UT1 Reach 2. No beaver dams were observed during the fall 2020 site walk. Though their presence continues to occur, they are less frequent and their effects less severe on the Site. The less frequent impounding of the streams has benefitted the Site by allowing the floodplain vegetation to become established and not backing up flow from tributaries to UT1 (UT1A and UT2). Beaver activity will continue to be monitored and managed until closeout.

Wetlands

Wetland hydrology continues to be weak in the wetland rehabilitation area at the head of UT2 (GWG 8). As discussed in section 1.2.4, all GWGs except for GWG 8 met or exceeded the success criteria indicating that groundwater levels have continued to recharge in MY5, bolstered by strong winter rainfall totals, as well as above average growing season rainfall. To ensure adequate representation of the hydrology in the wetland re-establishment area upslope of UT1 Reach 2, three additional gages (GWGs 10 – 12) were installed at the beginning of MY4. In addition, GWGs 13 – 15 were added in MY4 adjacent to wetland enhancement areas to provide hydrology data to support the potential expansion of these areas to offset any loss of wetland re-establishment areas where GWGs (GWG 8) are not meeting success criteria.

In September 2020, Wildlands staff determined that approximately 0.051 acres of the wetland re-establishment area, represented by GWG 8, is at risk of not meeting success criteria for wetland hydrology. A wetland addendum letter was submitted to DMS on October 6, 2020 to identify additional

wetland areas that have been created by the project and formally request the inclusion of these created wetland areas for credit in order to offset those identified as at risk. Currently, at the submittal of the Final Henry Fork Mitigation Site's MY5 annual report, the wetland addendum request has not been resolved. A copy of the wetland addendum letter, the 15-day review period comments received from the IRT on October 28, 2020, and Wildlands' responses to the IRT's comments from the 15-day review period, and follow-up response from the IRT are included in Appendix 6.

Conservation Easement

There is an approved narrow footpath through the easement near vegetation plot 5 for the purpose of frisbee golf that Wildlands has allowed on a conditional basis and to discontinue by the time of closeout. This has continued to be monitored to ensure that it does not violate easement terms or threaten stream assets.

The minor mowing encroachments that were observed in MY1 and MY2 along the floodplain of UT1 Reach 1 have been resolved. While there has been a stop to the encroachment issues, the Site boundary and prior problem areas will continue to be monitored for easement enforcement.

Quarterly site visits will continue to be conducted to monitor and address any areas of concern. If necessary, future adaptive management will be implemented to improve herbaceous cover, treat and control invasive plants, and address hydrology issues. Please refer to Appendix 2 for CCPV Figures 3.0-3.2 for mapped areas of concern.

1.3 Monitoring Year 5 Summary

Overall, the Site has met the required stream and vegetation success criteria for MY5. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline with minor deviations due to natural sediment transport processes, and streams are functioning as intended. All project streams recorded at least one bankfull event or greater in MY5. The bankfull performance standard had been met for the Site in MY4. The vegetation assessment resulted in an average planted stem density of 564 stems per acre and is exceeding the interim success criterion of 260 stems per acre for MY5 and on track to meet the performance criteria of 210 stems per acre in MY7. In addition, all fifteen vegetation plots exceeded this requirement. Fourteen of the fifteen groundwater monitoring gages installed on the Site met or exceeded the hydrologic success criteria for MY5. The MY5 visual assessment revealed a few areas of concern including pockets of invasive plant species and areas of low stem growth. Areas of concern will continue to be monitored and adaptive management will be performed as needed.

Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Mitigation Plan documents available on DMS's website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 2: METHODOLOGY

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

Section 3: REFERENCES

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

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

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

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United States Geological Survey. 1998. North Carolina Geology. http://www.geology.enr.state.nc.us/usgs/carolina.htm

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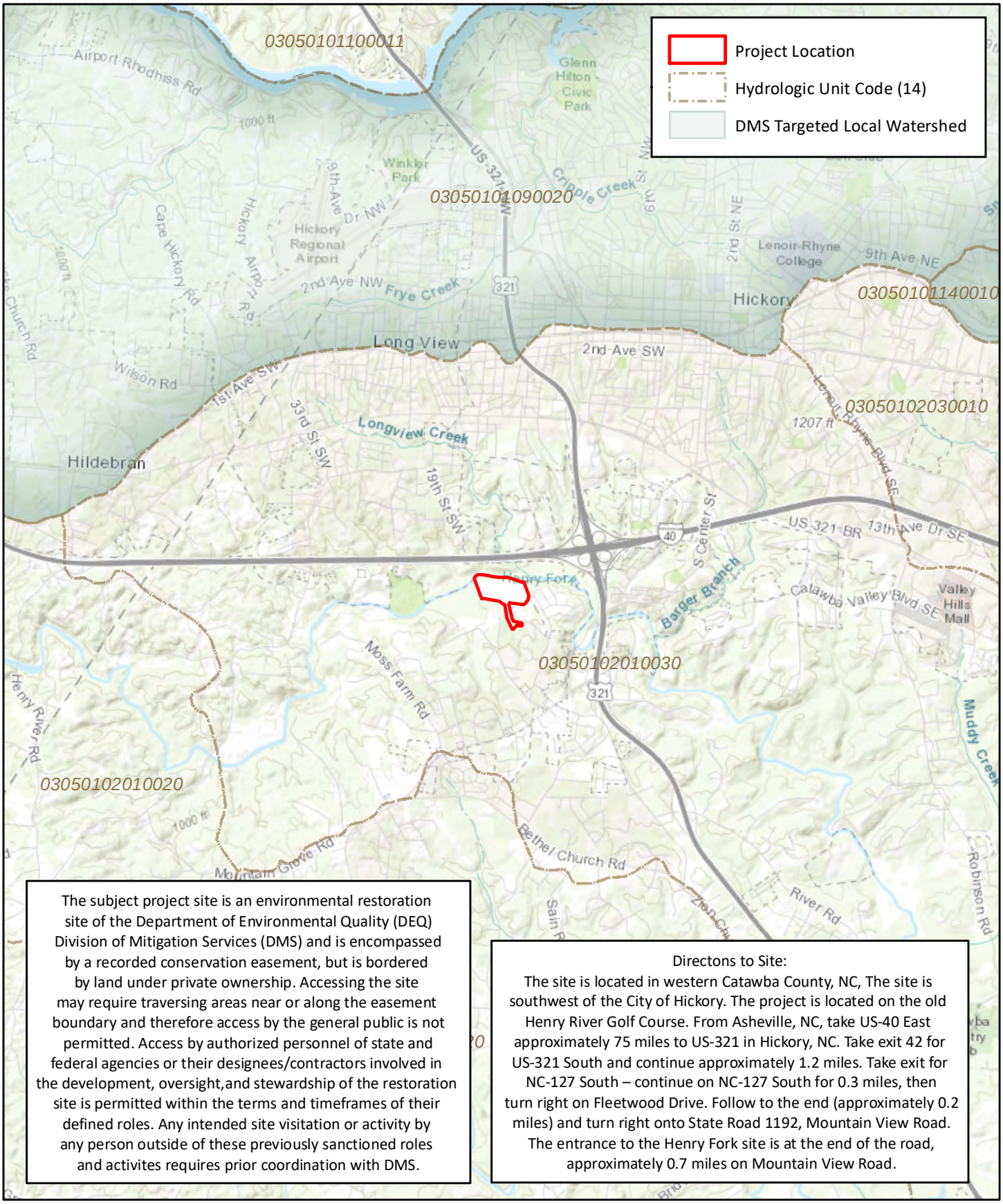
Wildlands Engineering, Inc (2016). Henry Fork Mitigation Site Baseline Monitoring Document and As-Built Baseline Report. NCEEP, Raleigh, NC.

APPENDIX 1. General Figures and Tables



The subject project site is an environmental restoration site of the Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight,and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activites requires prior coordination with DMS.

Directons to Site:
The site is located in western Catawba County, NC, The site is southwest of the City of Hickory. The project is located on the old Henry River Golf Course. From Asheville, NC, take US-40 East approximately 75 miles to US-321 in Hickory, NC. Take exit 42 for US-321 South and continue approximately 1.2 miles. Take exit for NC-127 South – continue on NC-127 South for 0.3 miles, then turn right on Fleetwood Drive. Follow to the end (approximately 0.2 miles) and turn right onto State Road 1192, Mountain View Road. The entrance to the Henry Fork site is at the end of the road, approximately 0.7 miles on Mountain View Road.

WILDLANDS ENGINEERING

0 0.5 1 Miles

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Figure 1 Vicinity Map
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020
Catawba County, NC

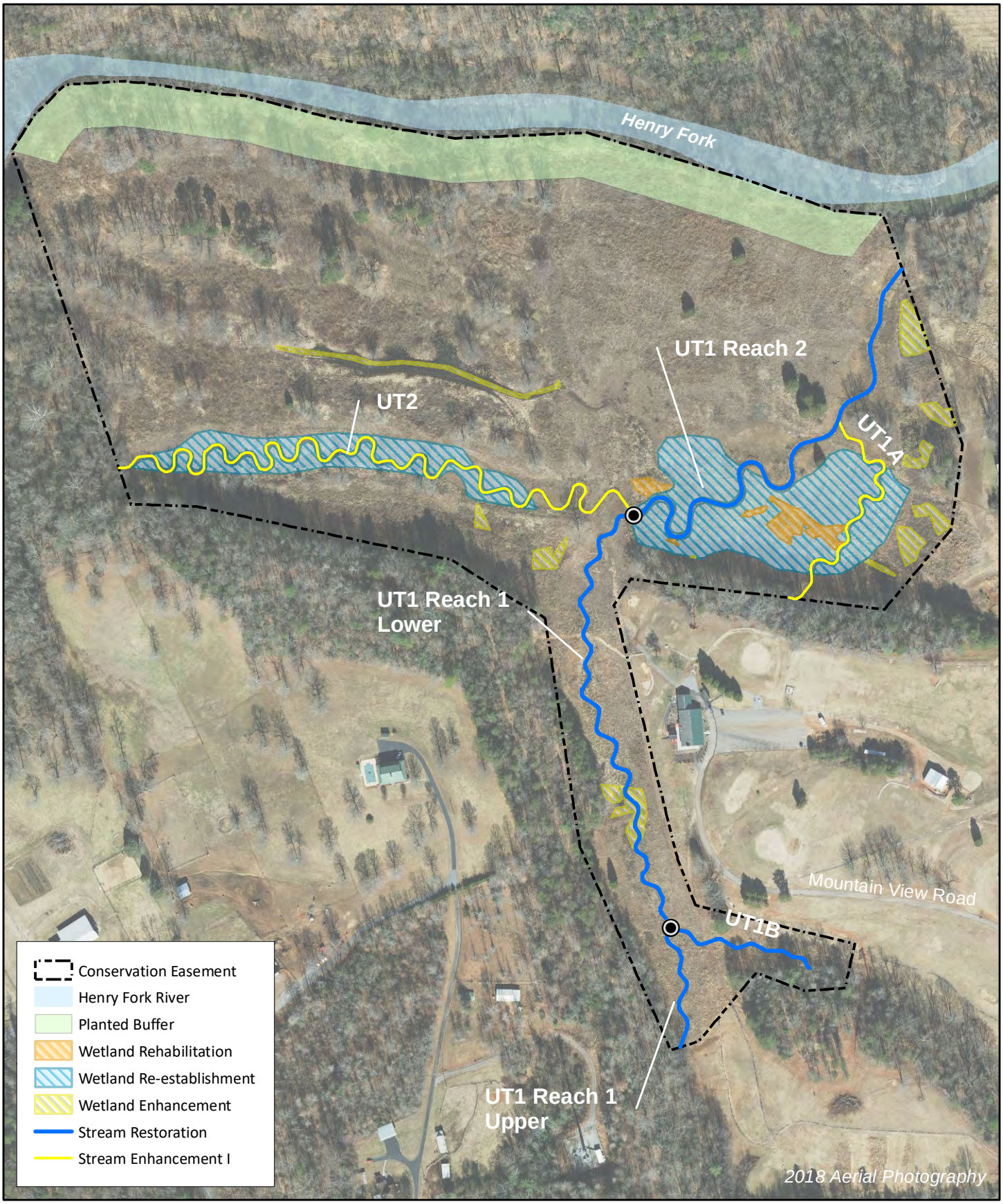


Figure 2 Project Component/Asset Map
Henry fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

Catawba County, NC

Table 1. Project Components and Mitigation Credits

Henry Fork Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

MITIGATION CREDITS									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	4,807.667	N/A	3.880	0.342	N/A	N/A	N/A	N/A	N/A

PROJECT COMPONENTS							
Reach ID	Proposed Stationing/ Location*	Existing Footage/ Acreage	Approach	Restoration (R) or Restoration Equivalent	Restoration Footage/Acreage*	Mitigation Ratio	Credits (SMU/WMU)*
STREAMS							
UT1 Reach 1 Upper	100+00 to 103+02	1,392	P1	Restoration	302	1:1	302.000
UT1 Reach 1 Lower	103+02 to 114+71		P1	Restoration	1,169	1:1	1,169.000
UT1 Reach 2	114+71 to 126+99	1,499	P1/P2	Restoration	1,228	1:1	1,228.000
UT1A	180+00 to 186+57	353	P1	Enhancement	657	1.5:1	438.000
UT1B	150+00 to 153+58	478	P1	Restoration	358	1:1	358.000
UT2	200+00 to 219+69	1,915	P1	Enhancement	1,969	1.5:1	1,312.667
WETLANDS							
Wetland 1	Floodplain near UT1 Reach 2	N/A	Planting, hydrologic improvement	Re-establishment	2.48	1:1	2.480
Wetland 2	Floodplain near UT2	N/A	Planting, hydrologic improvement	Re-establishment	1.23	1:1	1.230
Wetland A	Floodplain between UT1 Reach 2 and UT1A	0.18	Planting, hydrologic improvement	Rehabilitation	0.18	1.5:1	0.120
Wetland B	Floodplain between UT1 Reach 2 and UT1A	0.01	Planting, hydrologic improvement	Rehabilitation	0.013	1.5:1	0.009
Wetland C	Floodplain between UT1 Reach 2 and UT1A	0.003	Planting, hydrologic improvement	Rehabilitation	0.003	1.5:1	0.002
Wetland G	Floodplain near UT1A	0.02	Planting	Enhancement	0.02	2:1	0.009
Wetland H	East hillslope near UT1A	0.06	Planting	Enhancement	0.06	2:1	0.028
Wetland I	East hillslope near UT1A	0.08	Planting	Enhancement	0.08	2:1	0.039
Wetland J	East hillslope near UT1 Reach 2	0.04	Planting	Enhancement	0.04	2:1	0.018
Wetland K	East hillslope near UT1 Reach 2	0.06	Planting	Enhancement	0.06	2:1	0.028
Wetland M	East hillslope near UT1 Reach 2	0.13	Planting	Enhancement	0.13	2:1	0.065
Wetland N	Floodplain towards river from UT2	0.08	Planting	Enhancement	0.08	2:1	0.042
Wetland P	Floodplain upslope of UT2	0.02	Planting	Enhancement	0.02	2:1	0.012
Wetland Q	Floodplain upslope of UT2	0.07	Planting	Enhancement	0.07	2:1	0.035
Wetland R	Floodplain in footprint of Pond 3 near head of UT1 Reach 2	0.06	Significant improvement to wetland functions	Rehabilitation	0.06	1.5:1	0.039
Wetland S	UT1 Reach 1 Valley (Pond 1)	0.16	Planting	Enhancement	0.13	2:1	0.066

COMPONENT SUMMATION					
Restoration Level	Stream (LF)	Riparian Wetland (acres)	Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
Restoration	3,057	N/A	N/A	N/A	N/A
Enhancement I	2,626	N/A	N/A	N/A	N/A
Wetland Re-Establishment	N/A	3.71	N/A	N/A	N/A
Wetland Rehabilitation	N/A	0.25	N/A	N/A	N/A
Wetland Enhancement	N/A	0.68	N/A	N/A	N/A
Preservation	N/A	N/A	N/A	N/A	N/A

* Stream credit calculations were originally calculated along the as-built thalweg and updated to be calculated along stream ceneterlines for Monitoring Year 2 after discussions with NC IRT.

Table 2. Project Activity and Reporting History

Henry Fork Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

Activity or Report		Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan		August 2015	September 2015
Final Design - Construction Plans		October 2015	October 2015
Construction		November 2015 - March 2016	March 2016
Temporary S&E mix applied to entire project area[1]		March 2016	March 2016
Permanent seed mix applied to reach/segments[1]		March 2016	March 2016
Bare root and live stake plantings for reach/segments		March 2016	March 2016
Baseline Monitoring Document (Year 0)	Stream Survey	March 2016	May 2016
	Vegetation Survey	March 2016	
Year 1 Monitoring	Stream Survey	October 2016	December 2016
	Vegetation Survey	September 2016	
Year 1 Beaver dam removal on UT1 Reach 2		May-September 2016	
Year 1 Invasive Species Treatment		June & July 2016	
Year 2 Monitoring	Stream Survey	April 2017	December 2017
	Vegetation Survey	July 2017	
Year 2 Invasive Species Treatment		August 2017	
Year 3 Monitoring	Stream Survey	April 2018	November 2018
	Vegetation Survey	September 2018	
Year 3 Invasive Species Treatment		June & August 2018	
Year 4 Monitoring	Stream Survey	N/A	November 2019
	Vegetation Survey	N/A	
Year 4 Beaver dam removal on UT1 Reach 2		March 2019 - November 2019	
Year 4 Bank Repair on UT1 Reach 1		August 2019	
Year 4 Invasive Species Treatment		October 2019	
Year 5 Bank Repair on UT1 Reach 2		January 2020	November 2020
Year 5 Beaver Maintenance		February 2020	
Year 5 Supplemental Planting		March 2020	
Year 5 Monitoring	Stream Survey	June 2020	
	Vegetation Survey	July 2020	
Year 5 Invasive Species Treatment		July & September 2020	
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.
N/A - Not applicable

Table 3. Project Contact Table

Henry Fork Stream Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

Designer Jake McLean, PE	**Wildlands Engineering, Inc.** 167-B Haywood Rd. Asheville, NC 28806 828.774.5547
Construction Contractor	**Land Mechanics Designs, Inc.** 780 Landmark road Willow Spring, NC 27592
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**Land Mechanics Designs, Inc.** 780 Landmark road Willow Spring, NC 27592
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers **Bare Roots** **Live Stakes** **Plugs**	 **Dykes and Son Nursery** **Bruton Natural Systems, Inc** **Wetland Plants, Inc.**
Monitoring Performers	**Wildlands Engineering, Inc.**
Monitoring, POC	Kristi Suggs 704.332.7754, ext. 110

Table 4. Project Information and Attributes

Henry Fork Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

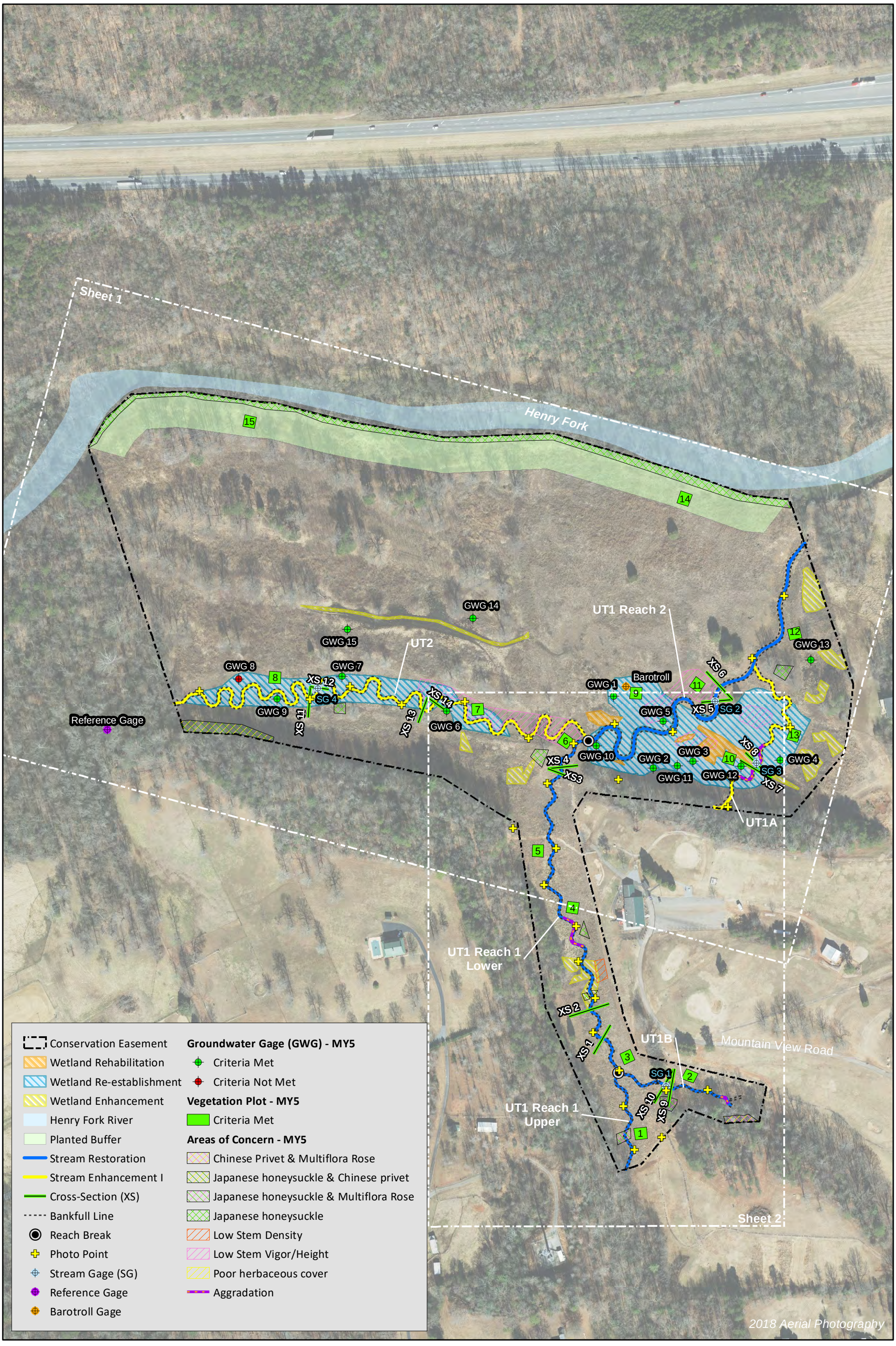
PROJECT INFORMATION	
Project Name	Henry Fork Mitigation Site
County	Catawba County
Project Area (acres)	48.06
Project Coordinates (latitude and longitude)	35°42'12.98"N, 81°21'53.20"W
PROJECT WATERSHED SUMMARY INFORMATION	
Physiographic Province	Inner Piedmont
River Basin	Catawba
USGS Hydrologic Unit 8-digit	03050102 (Expanded Service Area for 03050103)
USGS Hydrologic Unit 14-digit	03050102010030
DWR Sub-basin	03-08-35
Project Drainage Area (acres)	178
Project Drainage Area Percentage of Impervious Area	5%
CGIA Land Use Classification	39% - Herbaceous/Pasture, 36% - Forested, 25% - Developed, >1% - Water

REACH SUMMARY INFORMATION					
Parameters	**UT1 Reach 1**	**UT1 Reach 2**	**UT1A**	**UT1B**	**UT2**
Length of Reach (linear feet) - Post-Restoration	1,497	1,232	658	358	1,969
Drainage Area (acres)	106	129	23	31	49
NCDWR Stream Identification Score	39.5	32.5	27.25	31.25	27
NCDWR Water Quality Classification	C				
Morphological Desription (stream type)	P	P	I	P	I
Evolutionary Trend (Simon's Model) - Pre-Restoration	III	IV/V	IV/V	III	IV/V
Underlying Mapped Soils	Codorus loam, Dan River loam, Hatboro Loam, Poplar Forest gravelly sandy loam 2-6% slopes, and Woolwine-Fairview complex				
Drainage Class	---	---	---	---	---
Soil Hydric Status	---	---	---	---	---
Slope	0.024-0.056	0.0043-0.017	0.0095-0.016	0.015-0.077	0.0032
FEMA Classification	N/A*				
Native Vegetation Community	Piedmont Alluvial Forest				
Percent Composition Exotic Invasive Vegetation -Post-Restoration	0%				

REGULATORY CONSIDERATIONS			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	Yes	PCN prepared	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885.
Waters of the United States - Section 401	Yes	PCN prepared	
Division of Land Quality (Dam Safety)	N/A	N/A	N/A
Endangered Species Act	Yes	Yes	Henry Fork Mitigation Plan; Wildlands determined "no effect" on Catawba County listed endangered species. June 5, 2015 email correspondence from USFWS stated "not likely to adversely affect" northern long-eared bat.
Historic Preservation Act	Yes	Yes	No historic resources were found to be impacted (letter from SHPO dated 3/24/2014)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes*	No impact application was prepared for local review. No post-project activities required.	Floodplain development permit issued by Catawba County.
Essential Fisheries Habitat	No	N/A	N/A

*The project site reaches do not have regulated floodplain mapping, but are located within the Henry Fork floodplain.

APPENDIX 2. Visual Assessment Data



WILDLANDS ENGINEERING

0 250 500 Feet

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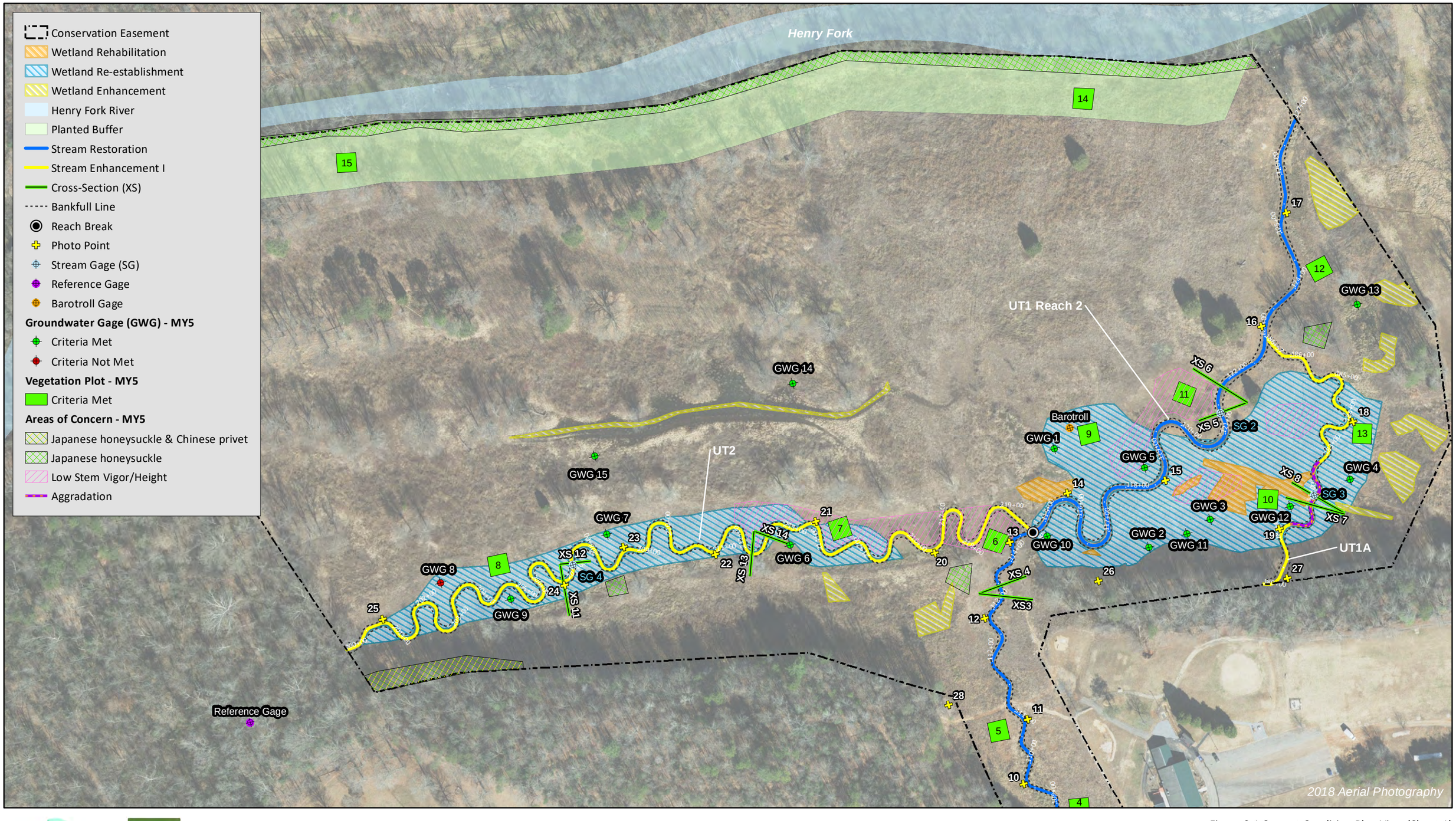
Figure 3.0 Current Condition Plan View (KEY)
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

Catawba County, NC



WILDLANDS ENGINEERING

0 150 300 Feet

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Figure 3.1 Current Condition Plan View (Sheet 1)
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

Catawba County, NC

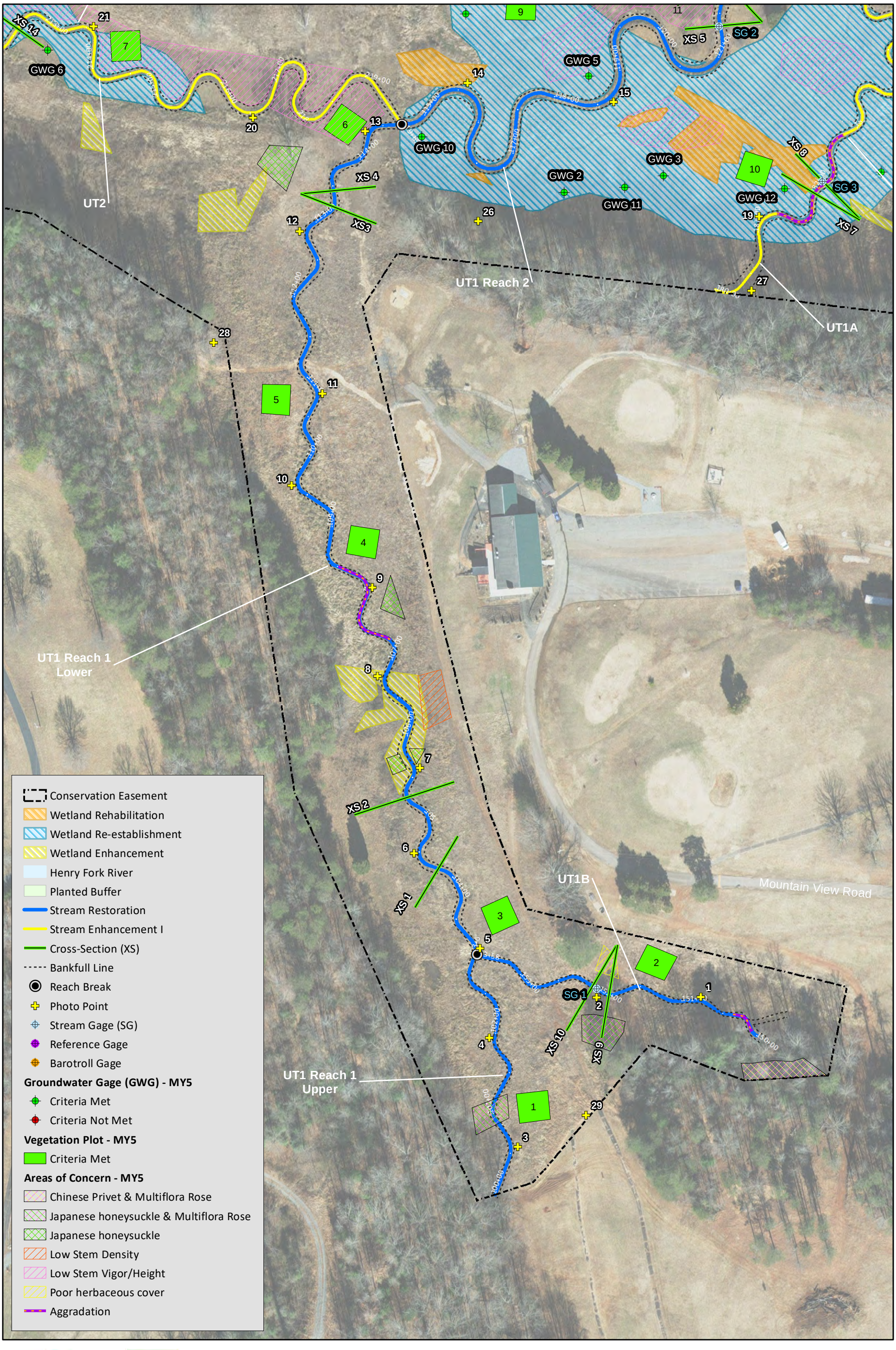


Figure 3.2 Current Condition Plan View (Sheet 2)
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

Catawba County, NC

Table 5a. Visual Stream Morphology Stability Assessment Table
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

UT1 Reach 1 **1,497 LF**

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	125	92%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	36	39			92%			
	3. Meander Pool Condition	Depth Sufficient	31	33			94%			
		Length Appropriate	33	33			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	33	33			100%			
		Thalweg centering at downstream of meander bend (Glide)	33	33			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	n/a	n/a	n/a
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	81	81			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	70	70			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	81	81			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	81	81			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	46	46			100%			

[1]Excludes constructed shallows since they are evaluated in section 1.

Table 5b. Visual Stream Morphology Stability Assessment Table
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

UT1 Reach 2 **1,232 LF**

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	14	14			100%			
	3. Meander Pool Condition	Depth Sufficient	15	15			100%			
		Length Appropriate	15	15			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		Thalweg centering at downstream of meander bend (Glide)	15	15			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	n/a	n/a	n/a
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
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.	9	9			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	9	9			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	6	6			100%			

[1]Excludes constructed shallows since they are evaluated in section 1.

Table 5c. Visual Stream Morphology Stability Assessment Table
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

UT1A **658 LF**

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	150	77%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	11	14			79%			
	3. Meander Pool Condition	Depth Sufficient	10	13			77%			
		Length Appropriate	13	13			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		Thalweg centering at downstream of meander bend (Glide)	13	13			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	n/a	n/a	n/a
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
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.	3	3			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%.	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	6	6			100%			

[1]Excludes constructed shallows since they are evaluated in section 1.

Table 5d. Visual Stream Morphology Stability Assessment Table
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

UT1B **358 LF**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			1	30	92%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	11			91%			
	3. Meander Pool Condition	Depth Sufficient	7	8			88%			
		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%	n/a	n/a	n/a
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	27	27			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	24	24			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	27	27			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	27	27			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 shallows since they are evaluated in section 1.

Table 5e. Visual Stream Morphology Stability Assessment Table
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

UT2 **1,969 LF**

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	35	35			100%			
	3. Meander Pool Condition	Depth Sufficient	32	32			100%			
		Length Appropriate	32	32			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	32	32			100%			
		Thalweg centering at downstream of meander bend (Glide)	32	32			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	n/a	n/a	n/a
	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%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	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.	3	3			100%			

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

Table 6. Vegetation Condition Assessment Table
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

Planted Acreage **15**

Vegetation Category	Definitions	Mapping Threshold (Ac)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.01	1	0.01	0.07%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.01	1	0.03	0.18%
		Total	**2**	**0.04**	**0.3%**
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	6	0.90	6.16%
		Cumulative Total	**8**	**0.94**	**6.4%**

Easement Acreage **48**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1,000	11	1.25	2.6%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0.0%

Stream Photographs

	
Photo Point 1 – view upstream UT1B *(4/15/2020)*	**Photo Point 1** – view downstream UT1B *(4/15/2020)*
	
Photo Point 2 – view upstream UT1B *(4/15/2020)*	**Photo Point 2** – view downstream UT1B *(4/15/2020)*
	
Photo Point 3 – view upstream UT1 R1 Upper *(4/15/2020)*	**Photo Point 3** – view downstream UT1 R1 Upper (*4/15/2020)*

Photo Point 4 – view upstream UT1 R1 Upper *(4/15/2020)*

Photo Point 4 – view downstream UT1 R1 Upper *(4/15/2020)*

Photo Point 5 – view upstream UT1 R1 Lower *(4/15/2020)*

Photo Point 5 – view downstream UT1 R1 Lower *(4/15/2020)*

Photo Point 5 – view upstream of UT1B *(4/15/2020)*

	
Photo Point 6 – view upstream UT1 R1 Lower *(4/15/2020)*	**Photo Point 6** – view downstream UT1 R1 Lower *(4/15/2020)*
	
Photo Point 7 – view upstream UT1 R1 Lower *(4/15/2020)*	**Photo Point 7** – view downstream UT1 R1 Lower *(4/15/2020)*
	
Photo Point 8 – view upstream UT1 R1 Lower *(4/15/2020)*	**Photo Point 8** – view downstream UT1 R1 Lower *(4/15/2020)*

	
Photo Point 9 – view upstream UT1 R1 Lower *(4/15/2020)*	**Photo Point 9** – view downstream UT1 R1 Lower *(4/15/2020)*
	
Photo Point 10 – view upstream UT1 R1 Lower *(4/15/2020)*	**Photo Point 10** –view downstream UT1 R1 Lower *(4/15/2020)*
	
Photo Point 11 – view upstream UT1 R1 Lower *(4/15/2020)*	**Photo Point 11** –view downstream UT1 R1 Lower *(4/15/2020)*

	
Photo Point 12 – view upstream UT1 R1 Lower *(4/15/2020)*	**Photo Point 12** –view downstream UT1 R1 Lower *(4/15/2020)*
	
Photo Point 13 – view upstream UT1 R1 Lower *(4/15/2020)*	**Photo Point 13** –view downstream UT1 R1 Lower *(4/15/2020)*
	
Photo Point 14 – view upstream UT1 R2 *(4/15/2020)*	**Photo Point 14** – view downstream UT1 R2 *(4/15/2020)*

	
Photo Point 15 – view upstream UT1 R2 *(4/15/2020)*	**Photo Point 15** – view downstream UT1 R2 *(4/15/2020)*
	
Photo Point 16 – view upstream UT1 R2 *(4/15/2020)*	**Photo Point 16** – view downstream UT1 R2 *(4/15/2020)*
	
Photo Point 17 – view upstream UT1 R2 *(4/15/2020)*	**Photo Point 17** – view downstream UT1 R2 *(4/15/2020)*

	
Photo Point 18 – view upstream UT1A *(4/15/2020)*	**Photo Point 18** – view downstream UT1A *(4/15/2020)*
	
Photo Point 19 – view upstream UT1A *(4/15/2020)*	**Photo Point 19** – view downstream UT1A *(4/15/2020)*
	
Photo Point 20 – view upstream UT2 *(4/15/2020)*	**Photo Point 20** – view downstream UT2 *(4/15/2020)*

	
Photo Point 21 – view upstream UT2 *(4/15/2020)*	**Photo Point 21** – view downstream UT2 *(4/15/2020)*
	
Photo Point 22 – view upstream UT2 *(4/15/2020)*	**Photo Point 22** – view downstream UT2 *(4/15/2020)*
	
Photo Point 23 – view upstream UT2 *(4/15/2020)*	**Photo Point 23** – view downstream UT2 *(4/15/2020)*

	
Photo Point 24 – view upstream UT2 *(4/15/2020)*	**Photo Point 24** – view downstream UT2 *(4/15/2020)*
	
Photo Point 25 – view upstream UT2 *(4/15/2020)*	**Photo Point 25** – view downstream UT2 *(4/15/2020)*
	
Photo Point 26 – view upstream UT1 R2 *(4/15/2020)*	**Photo Point 26** – view downstream UT1 R2 *(4/15/2020)*

Photo Point 26 – UT1 R2 floodplain overview *(4/15/2020)*

Photo Point 27 – view upstream UT1 R2 floodplain *(4/15/2020)*

Photo Point 27 – view downstream UT1 R2 floodplain*(4/15/2020)*

Photo Point 28 – UT1 R1 Lower floodplain overview *(4/15/2020)*

Photo Point 28 – UT2 floodplain overview *(4/15/2020)*

Photo Point 29 – UT1 R1 Upper floodplain overview *(4/15/2020)*

Vegetation Photographs

Vegetation Plot 1 - *(07/30/2020)*

Vegetation Plot 2 - *(07/30/2020)*

Vegetation Plot 3 - *(07/30/2020)*

Vegetation Plot 4 - *(07/30/2020)*

Vegetation Plot 5 - *(07/30/2020)*

Vegetation Plot 6 - *(07/29/2020)*

Vegetation Plot 7 - *(07/29/2020)*

Vegetation Plot 8 - *(07/29/2020)*

Vegetation Plot 9 - *(07/29/2020)*

Vegetation Plot 10 - *(07/29/2020)*

Vegetation Plot 11 - *(07/29/2020)*

Vegetation Plot 12 - *(07/30/2020)*

Vegetation Plot 13 - *(07/30/2020)*

Vegetation Plot 14 - *(07/29/2020)*

Vegetation Plot 15 - *(07/29/2020)*

APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

Plot	MY5 Success Criteria	Tract Mean
1	Y	
2	Y	
3	Y	
4	Y	
5	Y	
6	Y	
7	Y	
8	Y	100%
9	Y	
10	Y	
11	Y	
12	Y	
13	Y	
14	Y	
15	Y	

Table 8. CVS Vegetation Plot Metadata
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

Report Prepared By	Mimi Caddell
Date Prepared	10/5/2020
Database Name	cvs-eep-entrytool-v2.5.0 HENRY FORK MY5.mdb
Database Location	L:\Active Projects\005-02143 Henry Fork AVL\Monitoring\Monitoring Year 5-2020\Vegetation Assessment
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Project Planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Project 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	96306
project Name	Henry Fork Mitigation Site
Description	Stream and Wetland Mitigation
Required Plots (calculated)	15
Sampled Plots	15

Table 9a. Planted and Total Stem Counts

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020

Current Plot Data (MY5 2020)																				
Scientific Name	**Common Name**	**Species Type**	**96306-WEI-0001**			**96306-WEI-0002**			**96306-WEI-0003**			**96306-WEI-0004**			**96306-WEI-0005**			**96306-WEI-0006**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree																		
Acer rubrum	Red Maple	Tree															15	3	3	3
Alnus serrulata	Tag Alder	Shrub Tree																		
Betula nigra	River Birch	Tree	1	1	1				4	4	4	4	4	4	4	4	4	1	1	1
Celtis laevigata	Sugarberry	Shrub Tree																		
Diospyros virginiana	American Persimmon	Tree	6	6	6	4	4	4	1	1	1	2	2	2	2	2	2			
Fraxinus pennsylvanica	Green Ash	Tree	1	1	1	7	7	7	3	3	3	6	6	6	1	1	1	3	3	3
Juglans nigra	Black Walnut	Tree																		
Liquidambar styraciflua	Sweet Gum	Tree						3			4			5						
Liriodendron tulipifera	Tulip Poplar	Tree																		
Nyssa sylvatica	Black Gum	Tree																		
Pinus rigida	Pitch Pine	Tree									4			1						
Platanus occidentalis	Sycamore	Tree	1	1	1	1	1	1	2	2	2	4	4	8	3	3	22	3	3	10
Populus deltoides	Cottonwood	Tree																		
Quercus lyrata	Overcup Oak	Tree																		
Quercus michauxii	Swamp Chestnut Oak	Tree																3	3	3
Quercus phellos	Willow Oak	Tree	5	5	5	4	4	4	5	5	5				1	1	1			1
Rhus aromatica	Sumac	Shrub			2			5												
Salix	Willow	Shrub Tree						3												
Salix nigra	Black Willow	Tree																		
Salix sericea	Silky Willow	Shrub Tree																		
Ulmus americana	American Elm	Tree																		
		Stem count	14	14	16	16	16	27	15	15	23	16	16	26	11	11	45	13	13	21
		size (ares)	1			1			1			1			1			1		
		size (ACRES)	0.02471			0.02471			0.02471			0.02471			0.02471			0.02471		
		Species count	5	5	6	4	4	7	5	5	7	4	4	6	5	5	6	5	5	6
		Stems per ACRE	567	567	648	648	648	1093	607	607	931	648	648	1052	445	445	1821	526	526	850

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

Table 9b. Planted and Total Stem Counts

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020

Current Plot Data (MY5 2020)																				
Scientific Name	**Common Name**	**Species Type**	**96306-WEI-0007**			**96306-WEI-0008**			**96306-WEI-0009**			**96306-WEI-0010**			**96306-WEI-0011**			**96306-WEI-0012**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree																		
Acer rubrum	Red Maple	Tree							4	4	4			8	3	3	3			
Alnus serrulata	Tag Alder	Shrub Tree									5									3
Betula nigra	River Birch	Tree	2	2	9	2	2	2	3	3	6	4	4	4	2	2	2	2	2	31
Celtis laevigata	Sugarberry	Shrub Tree																		
Diospyros virginiana	American Persimmon	Tree				1	1	1				1	1	1	1	1	1	3	3	3
Fraxinus pennsylvanica	Green Ash	Tree	6	6	6	6	6	6				3	3	3	1	1	1	5	5	5
Juglans nigra	Black Walnut	Tree																		
Liquidambar styraciflua	Sweet Gum	Tree						2												2
Liriodendron tulipifera	Tulip Poplar	Tree																		
Nyssa sylvatica	Black Gum	Tree																		
Pinus rigida	Pitch Pine	Tree																		
Platanus occidentalis	Sycamore	Tree	2	2	2	2	2	47	3	3	26	2	2	13	1	1	1	5	5	11
Populus deltoides	Cottonwood	Tree									11									
Quercus lyrata	Overcup Oak	Tree																		
Quercus michauxii	Swamp Chestnut Oak	Tree	3	3	3	1	1	1	3	3	3	4	4	4	3	3	3			
Quercus phellos	Willow Oak	Tree	1	1	1	2	2	2	2	2	2	2	2	2				1	1	1
Rhus aromatica	Sumac	Shrub																		
Salix	Willow	Shrub Tree																		
Salix nigra	Black Willow	Tree																		
Salix sericea	Silky Willow	Shrub Tree																		
Ulmus americana	American Elm	Tree																		
		Stem count	14	14	21	14	14	61	15	15	57	16	16	35	11	11	11	16	16	56
		size (ares)	1			1			1			1			1			1		
		size (ACRES)	0.02471			0.02471			0.02471			0.02471			0.02471			0.02471		
		Species count	5	5	5	6	6	7	5	5	7	6	6	7	6	6	6	5	5	7
		Stems per ACRE	567	567	850	567	567	2469	607	607	2307	648	648	1416	445	445	445	648	648	2266

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

Table 9c. Planted and Total Stem Counts

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020

Current Plot Data (MY5 2020)											Annual Means														
Scientific Name	**Common Name**	**Species Type**	**96306-WEI-0013**			**96306-WEI-0014**			**96306-WEI-0015**			**MY5 (8/2020)**			**MY3 (9/2018)**			**MY2 (7/2017)**			**MY1 (9/2016)**			**MY0 (3/2016)**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree									14			14			16			19			20			12
Acer rubrum	Red Maple	Tree				1	1	1				11	11	34	12	12	17	12	12	100	12	12	22	13	13	13
Alnus serrulata	Tag Alder	Shrub Tree												8			7			8			1			
Betula nigra	River Birch	Tree	1	1	1	2	2	2	2	2	2	34	34	73	34	34	45	34	34	52	35	35	35	37	37	37
Celtis laevigata	Sugarberry	Shrub Tree																					1			
Diospyros virginiana	American Persimmon	Tree	5	5	5	1	1	1	4	4	4	31	31	31	32	32	32	32	32	32	32	32	32	32	32	32
Fraxinus pennsylvanica	Green Ash	Tree	1	1	1	3	3	3				46	46	46	49	49	49	51	51	51	52	52	52	57	57	57
Juglans nigra	Black Walnut	Tree															3			1						
Liquidambar styraciflua	Sweet Gum	Tree									10			26			31			10			17			5
Liriodendron tulipifera	Tulip Poplar	Tree						3			13			16			30			2			7			2
Nyssa sylvatica	Black Gum	Tree																								2
Pinus rigida	Pitch Pine	Tree												5												
Platanus occidentalis	Sycamore	Tree	1	1	1	5	5	8	7	7	7	42	42	160	43	43	271	44	44	460	44	44	108	57	57	57
Populus deltoides	Cottonwood	Tree												11			10			19			7			
Quercus lyrata	Overcup Oak	Tree															1									
Quercus michauxii	Swamp Chestnut Oak	Tree	1	1	1	1	1	1				19	19	19	20	20	20	20	20	21	20	20	20	20	20	20
Quercus phellos	Willow Oak	Tree	3	3	3							26	26	27	27	27	27	27	27	27	27	27	27	27	27	27
Rhus aromatica	Sumac	Shrub												7			8									
Salix	Willow	Shrub Tree												3												
Salix nigra	Black Willow	Tree																					1			
Salix sericea	Silky Willow	Shrub Tree																		1						
Ulmus americana	American Elm	Tree									1			1												
		Stem count	12	12	12	13	13	19	13	13	51	209	209	481	217	217	567	220	220	803	222	222	350	243	243	264
		size (ares)	1			1			1			15			15			15			15			15		
		size (ACRES)	0.02471			0.02471			0.02471			0.3707			0.3707			0.3707			0.3707			0.3707		
		Species count	6	6	6	6	6	7	3	3	7	7	7	16	7	7	15	7	7	14	7	7	14	7	7	11
		Stems per ACRE	486	486	486	526	526	769	526	526	2064	564	564	1298	585	585	1530	594	594	2166	599	599	944	656	656	712

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Volunteer species included in total

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

APPENDIX 4. Morphological Summary Data and Plots

Table 10a. Baseline Stream Data Summary

Henry Fork Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

Henry Fork-UT1 Reach 2, UT1A and UT2

	PRE-RESTORATION CONDITION						DESIGN						AS-BUILT/BASELINE					
Parameter	**UT1 Reach 2**		**UT1A**		**UT2**		**UT1 Reach 2**		**UT1A**		**UT2**		**UT1 Reach 2**		**UT1A**		**UT2**	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Upper**	**Lower**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Reference Cross Section Number	**XS9**		**XS8**		**XS5,XS6**													
Dimension and Substrate - Riffle																		
Bankfull Width (ft)	9.4		12.5		15.2	16.3	10.1		6.2		7.5		10.5		6.6		5.65	
Floodprone Width (ft)	17.9		23.1		18	19.8	23	46	150	200	60	110	96.7+		31.4		81.3	149.8+
Bankfull Mean Depth	0.7		0.2		0.5	0.5	0.82		0.51		0.58		0.9		0.40		0.85	
Bankfull Max Depth	1.4		0.7		0.6	0.6	1.30		0.85		0.95		1.5		0.80		1.2	
Bankfull Cross-sectional Area (ft^2)	6.1		2.8		7.5	7.8	8.3		3.2		4.4		9.7		2.5		4.6	
Width/Depth Ratio	14.4		56.0		30.7	34.4	12.3		12.1		12.9		11.4		17.0		7.2	
Entrenchment Ratio	1.9		1.8		1.2	1.2	2.3	4.6	24.2	32.37	8.0	14.7	9.2+		4.8		15.9	20.3
Bank Height Ratio	2.7		1.9		2.9	7.5	1.0		1.0		1.0		1.0		1.0		1.1	
D50 (mm)	5.3/N/A		0.28/0.34		SC/0.04		N/A		0.34		0.04		Silt/Clay					
Riffle Length (ft)							---		---		---		23.3	51.9	10.8	32.9	3.45	52.3
Riffle Slope (ft/ft)	0.4	1.7	6.7		N/A^2		0.002	0.0080	0.005	0.0210	0.0020	0.0080	0.0000	0.0230	0.0010	0.0395	0.0000	0.0144
Pool Length (ft)							---		---		---		15.4	83.1	10.2	47.5	10.28	60.9
Pool Max Depth (ft)	N/A^2		N/A^2		N/A^2		1.3	2.5	0.8	1.5	0.0	1.8	2.2	3.5	0.9	2.6	1.6	2.6
Pool Spacing (ft)	38.1		N/A^2		N/A^2		20	86	12	53	15	68	49	136	29	53	28	87
Pool Volume (ft^3)																		
Pattern																		
Channel Beltwidth (ft)	N/A^2		N/A^2		N/A^2		8	83	8	37	9	58	7	84	7	36	8	59
Radius of Curvature (ft)	N/A^2		N/A^2		N/A^2		25	51	13	25	14	24	25	58	9	25	13	24
Rc:Bankfull Width (ft/ft)	N/A^2		N/A^2		N/A^2		19.2	39.2	15.3	29.4	14.7	25.3	2.4	5.5	1.4	3.8	2.3	4.2
Meander Length (ft)	N/A^2		N/A^2		N/A^2		120	210	63	100	65	156	123	210	61	100	63	158
Meander Width Ratio	N/A^2		N/A^2		N/A^2		92.3	161.5	74.1	117.6	68.4	164.2	11.7	20.0	9.2	15.2	11.2	28.0
Substrate, Bed and Transport Parameters																		
Ri%/Ru%/P%/G%/S%																		
SC%/Sa%/G%/C%/B%/Be%																		
d16/d35/d50/d84/d95/d100	SC/0.18/2.8/38/62/128-180		SC/SC/SC/SC/0.25/4.0/11.3-16		SC/SC/SC/SC/SC/8.0/45-64													
Reach Shear Stress (Competency) lb/ft^2	0.8-1.6		0.7		0.18-0.25+[4]		0.06		0.13		0.05		0.00	0.11	0.13		0.07	0.07
Max part size (mm) mobilized at bankfull																		
Stream Power (Capacity) W/m^2																		
Additional Reach Parameters																		
Drainage Area (SM)	0.2		0.036		0.077		0.24-0.28		0.04		0.08		0.24-0.28		0.04		0.08	
Watershed Impervious Cover Estimate (%)	5.3%		6.1%		2.4%		5.3%		6.1%		2.4%		5.3%		6.1%		2.4%	
Rosgen Classification	Modified B4c[3]		Modified B6c[3]		Modified F6[3]		C6		C6		C6		C6		C6		C6	
Bankfull Velocity (fps)	3.0		2.2		1.3	1.5	1.7		2.0		1.2		1		1.4		0.8	1.0
Bankfull Discharge (cfs)	18.3		6.1		10.2		14		6		5		13		4		4.0	6.7
Q-NFF regression (2-yr)	---		---		---													
Q-USGS extrapolation (1.2-yr)	61		19		29													
Q-Mannings	18.3		6.1		10.2		14		6		5		13		4		4.0	6.7
Valley Length (ft)	---		---		---		---		---		---		922		415		1,174	
Channel Thalweg Length (ft)	1,499*		353		1,915		1,228		657		1,969		1,232		658		1,969	
Sinuosity	1.5[5]		1.05		1.03		1.39		1.06		1.65		1.3		1.6		1.7	
Water Surface Slope ($ft/ft)^2$	---		---		---		0.0016	0.0018	0.0037	0.0043	0.0016	0.0019	0.0023		0.0063		0.0018	
Bankfull Slope (ft/ft)	---		---		---		0.0016	0.0018	0.0037	0.0043	0.0016	0.0019	0.0037		0.0060		0.0015	

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

[1] Min and max values may appear backwards for ratios. When this is the case, ratio values have been left in the column associated with a particular cross section.

[2] Due to the highly manipulated condition of the streams resulting in ditched streams with little profile diversity, no profile or pattern data was assessed on UT1A, UT2, UT1 Reach 2, and UT1B.

[3] The Rosgen classification system is for natural streams and project streams have been heavily manipulated. These classifications are for illustrative purposes only.

[4] The 25-year event was the largest event modeled; it does not fill the channel

[5] Sinuosity on UT1 Reach 2 is calculated by drawing a valley length line that follows the proposed valley; the existing valley is poorly defined

*Does not include last 150' to tie-in to Henry Fork.

Table 10b. Baseline Stream Data Summary

Henry Fork Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

Henry Fork-UT1 Reach 1 and UT1B

	PRE-RESTORATION CONDITION				DESIGN				AS-BUILT/BASELINE			
Parameter	**UT1 Reach 1**		**UT1B**		**UT1 Reach 1**		**UT1B**		**UT1 Reach 1**		**UT1B**	
	Min	**Max**	**Min**	**Max**	**Upper**	**Lower**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Reference Cross Section Number	**XS3,XS4**		**XS1,XS2**									
Dimension and Substrate - Riffle												
Bankfull Width (ft)	3.2	3.3	2.7	3.1	6.0	7.0	5.5		6.9	7.3	5.4	
Floodprone Width (ft)	6.7	11.4	17.5	19.8	15	20(40[3])	10	15	51.3	118.3+	13.2	
Bankfull Mean Depth	0.6	0.7	0.6	0.7	0.40	0.49	0.4		0.4	0.5	0.4	
Bankfull Max Depth	0.7	1.0	0.7	0.9	1.3		0.55		0.75		0.6	
Bankfull Cross-sectional Area (ft^2)	1.8	2.1	1.9	2	2.4	3.4	2.1		2.9	3.5	2.2	
Width/Depth Ratio	5.1	5.7	3.7	5.1	12.3		14.7		15.8		37.7	
Entrenchment Ratio	2.0	3.6	1.7	2.5	2.5	2.9 (5.7[3])	1.8	2.7	7.0	17.1+	6.9	
Bank Height Ratio	1.0	3.1	1.7	2.2	1.0		1.0		1.0		1.0	
D50 (mm)	16/8.3		6.9/5.3		8.3		5.3		17.1		11.0	
Profile												
Riffle Length (ft)					---		---		8.0	47.3	11.3	41.2
Riffle Slope (ft/ft)	0.041	0.21	N/A[2]		0.056	0.092	0.067	0.110	0.0142	0.0987	0.0259	0.0978
Pool Length (ft)					---		---		4.3	33.4	5.6	20.0
Pool Max Depth (ft)	N/A[2]		N/A[2]		0.6	1.5	0.7	1.3	0.9	2.8	0.5	2.2
Pool Spacing (ft)	10.4	20.5	N/A[2]		12	35	11	28	10	60	7	43
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	N/A[2]		N/A[2]		6	28	5	21	10	26	4	19
Radius of Curvature (ft)	N/A[2]		N/A[2]		14	30	10	18	8	31	8	32
Rc:Bankfull Width (ft/ft)	N/A[2]		N/A[2]		2.3	4.3	1.8	3.3	1.2	4.5	1.5	5.9
Meander Length (ft)	N/A[2]		N/A[2]		52	104	46	92	56	104	48	90
Meander Width Ratio	N/A[2]		N/A[2]		9	15	8	17	8	15	9	17
Substrate, Bed and Transport Parameters												
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/0.18/2.80/38/62/128-180		FS/SC/SC/0.14/8.9/45/128-180									
Reach Shear Stress (Competency) lb/ft^2	2.3-3.1		1.3-2.4		1.0-1.2		0.91		0.87		1.32	
Max part size (mm) mobilized at bankfull												
Stream Power (Capacity) W/m^2												
Additional Reach Parameters												
Drainage Area (SM)	0.17		0.048		0.07-0.17		0.048		0.07-0.17		0.048	
Watershed Impervious Cover Estimate (%)	5.9%		7.9%		5.9%		7.9%		5.9%		7.9%	
Rosgen Classification	Modified Low W/D B4a / E4b[4]		Modified B5a / E5b[4]		B4a	B4a (C4b[5])	B4a[6]		B4a		B4a	
Bankfull Velocity (fps)	4.8	5.3	3.8	4.1	4.6	4.1	4.3		2.6	3.9	3.9	
Bankfull Discharge (cfs)	8.5	11.4	8		10	15	9		7.6	12.6	8.7	
Q-NFF regression (2-yr)	---		---									
Q-USGS extrapolation (1.2-yr)	30		24									
Q-Mannings	8.5	11.4	8		10	15	9		7.6	12.6	8.7	
Valley Length (ft)	---		---		---		---		1,271		338	
Channel Thalweg Length (ft)	1,392		478		1,471		358		1,497		358	
Sinuosity	1.0		1.1		1.11	1.16	1.30		1.2		1.1	
Water Surface Slope (ft/ft)[2]	---		---		0.0477	0.0527	0.0500	0.0565	0.0369		0.0598	
Bankfull Slope (ft/ft)	---		---		0.0477	0.0527	0.0500	0.0565	0.0241	0.0612	0.0602	

SC: Silt/Clay <0.062 mm diameter particles
FS: Fine Sand 0.125-0.250mm diameter particles
(---): Data was not provided
N/A: Not Applicable

[1] Min and max values may appear backwards for ratios. When this is the case, ratio values have been left in the column associated with a particular cross section.

[2] Due to the highly manipulated condition of the streams resulting in ditched streams with little profile diversity, no profile or pattern data was assessed on UT1A, UT2, UT1 Reach 2, and UT1B.

[3] UT1 Reach 1 (Lower) is a hybrid reach that goes through what is presently a pond and then drops rapidly down what is presently a dam embankment and drop to master stream floodplain. Through the pond, slopes and floodprone width is more typical of a C.

[4]The Rosgen classification system is for natural streams and project streams have been heavily manipulated. These classifications are for illustrative purposes only.

[5]UT1 Reach 1 (Lower) is a hybrid reach that goes through what is presently a pond and then drops rapidly down what is presently a dam embankment and drop to master stream floodplain. Through the pond, slopes and floodprone width is more typical of a C.

[6]UT1B is classified in existing conditions as a sand bed stream. This is thought to be reflective of manipulation (impoundment and channelization resulting in a less steep stream). The restored stream, with slopes exceeding 2% grade throughout the reach, will be a gravel dominated stream, and is classified as such.

Table 10c. Baseline Stream Data Summary

Henry Fork Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

	REFERENCE REACH DATA																	
Parameter	**UT to Catawba River Reach 1**		**UT to Catawba River Reach 2**		**UT to Lyle Creek**		**Vile Preserve**		**UT to South Crowders**		**Group Camp Tributary**		**UT to Gap Branch**		**Upstream UT1 to Henry Fork**	
	Min[1]	**Max[1]**	**Min[1]**	**Max[1]**	**Min[1]**	**Max[1]**	**Min[1]**	**Max[1]**	**Min[1]**	**Max[1]**	**Min[1]**	**Max[1]**	**Min[1]**	**Max[1]**	**Min[1]**	**Max[1]**
Reference Cross Section Number	**XS2**	**XS3**	**XS4**		**XS1**	**XS3**	**XS1**	**XS3**	**XS1**	**XS2**	**XS3**	**XS4**	**XS2**		**XS1**	**XS2**
Dimension and Substrate - Riffle																
Bankfull Width (ft)	12.4	9.7	12.3		8.6	7.0	6.2	5.7	6.1	8.4	4.4	4.2	6.2		3.2	7.7
Floodprone Width (ft)	79	52	53		48.9	45.2	200+	200+	25.5	31.2	8.6	10.6	20.9		6.3	13
Bankfull Mean Depth	1.4	1.2	1.1		0.5	0.5	0.8	0.8	1.1	1.0	0.8	0.8	0.6		0.6	0.5
Bankfull Max Depth	1.7	1.7	1.7		1.1	1.0	1.3	1.4	1.4	1.4	1.0	1.2	1.0		0.8	0.7
Bankfull Cross-sectional Area (ft^2)	17.6	11.4	13.2		4.1	3.5	5.3	4.5	6.4	8.7	3.6	3.4	3.8		1.9	3.6
Width/Depth Ratio	8.7	8.2	11.5		18.3	13.9	7.4	7.2	5.7	8.2	5.5	5.2	10.1		5.2	16.4
Entrenchment Ratio	5.8+		5.8+		2.5+		30+		4.2	3.7	1.9	2.5	3.4		2.0	1.7
Bank Height Ratio	1.0		1.0		1.0		1.0		1.6	1.0	1.0	1.0	1.0		1.0	1.3
D50 (mm)	1.8		75.9		0.2		0.4		19.7		0.3		19.0		34.0	
Profile																
Riffle Length (ft)	---		---		---		---		---		---		---		---	
Riffle Slope (ft/ft)	0.0114	0.0605	0.0142	0.3451	0.0055	0.0597	0.0063		0.0202	0.0664	0.0105	0.1218	0.0110	0.1400	0.0500	0.0700
Pool Length (ft)	---		---		---		---		---		---		---		---	
Pool Max Depth (ft)	2.5		N/A		1.3		1.4		1.3	3.0	1.8	2.8	1.5		N/A	
Pool Spacing (ft)	31	60	19	46	15	28	44.8		28	63	9	58	18	27	14	25
Pool Volume (ft^3)	---		---		----		----		----		----		----		----	
Pattern																
Channel Beltwidth (ft)	55		23		21		19		81		15.5	16.5	N/A		N/A	
Radius of Curvature (ft)	31	56	29	52	19	32	27	50	9	20	8.0	11.8	N/A		N/A	
Rc:Bankfull Width (ft/ft)	2.8	5.1	2.4	4.2	2.2	4.6	4.4	8.8	1.5	2.4	1.9	2.7	N/A		N/A	
Meander Length (ft)	65	107	52	79	39	44	29	45	45	72	31	34	N/A		N/A	
Meander Width Ratio	4.4	5.7	1.8		2.4	3.0	3.1	4.2	9.6	13.3	3.6	3.8	N/A		N/A	
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100	0.3/0.4/1.8/12.8/25/90		.5/29.8/75.9/170.8/332.0/>2048.		-/0.1/0.2/0.5/4.0/8.0		0.2/0.3/0.4/0.9/2/-		0.8/12.1/19.7/49.5/75.9/180.0		SC/0.1/0.3/16.0/55.6/128.0		0.4/8/19.0/102.3/256.0/>2048		2.8/16/34/64/101/128-180	
Reach Shear Stress (Competency) lb/ft^2																
Max part size (mm) mobilized at bankfull																
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	1.60		1.60		0.25		1.09		0.22		0.10		0.04		0.05	
Watershed Impervious Cover Estimate (%)	---		---		---		---		---		---		---		---	
Rosgen Classification	E5		E3b/C3b		C5		E5		E4		E5b		Slightly entrenched B4a/A4		B4a	
Bankfull Velocity (fps)	3.9	3.5	6.3		2	2.1	3.3	3.2	3.3	4.4	3.6	3.4	5.0		5.4	3.8
Bankfull Discharge (cfs)	58		83		8		16		25		12		19		12	
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Q-Mannings																
Valley Length (ft)	---		---		---		---		---		---		---		---	
Channel Thalweg Length (ft)	---		---		---		---		---		---		---		---	
Sinuosity	1.2		1.1		1.1		1.1		2.2		1.6		N/A		1.1	
Water Surface Slope $(ft/ft)^2$	---		---		---		---		---		---		---		---	
Bankfull Slope (ft/ft)	---		---		---		---		---		---		---		---	

SC: Silt/Clay <0.062 mm diameter particles
FS: Fine Sand 0.125-0.250mm diameter particles
(---): Data was not provided
N/A: Not Applicable

[1] Min and max values may appear backwards for ratios. When this is the case, ratio values have been left in the column associated with a particular cross section.

Table 11a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Henry Fork Mitigation Site

DMS Project No.96306

Monitoring Year 5 - 2020

UT1 Reach 1 & UT1 Reach 2

	Cross-Section 1, UT1 Reach 1 (Riffle)								Cross-Section 2, UT1 Reach 1 (Pool)								Cross-Section 3, UT1 Reach 1 (Pool)							
Dimension and Substrate[1]	**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 (ft)[1]	906.1	906.1	906.1	906.1		906.2			901.9	901.9	901.9	901.9		901.8			878.3	878.3	878.3	878.2		878.1		
Low Bank Elevation	906.1	906.1	906.1	906.2		906.2			901.9	901.9	901.9	901.9		901.8			878.3	878.3	878.3	878.2		878.1		
Bankfull Width (ft)	7.3	6.8	7.1	7.8		5.5			8.8	9.6	10.9	11.3		12.2			7.8	7.7	9.6	10.0		8.8		
Floodprone Width (ft)[2]	51	51	52	55		55			---	---	---	---		---			---	---	---	---		---		
Bankfull Mean Depth (ft)	0.5	0.4	0.5	0.5	N/A	0.6			1.2	1.0	0.9	0.7	N/A	0.4			1.2	1.0	0.9	0.9	N/A	0.9		
Bankfull Max Depth (ft)	0.7	0.7	0.8	1.1		1.2			2.2	1.7	1.8	1.5		1.1			2.2	1.8	1.8	2.0		2.4		
Bankfull Cross-Sectional Area (ft^2)	3.5	2.9	3.3	4.3		3.4			10.7	9.5	10.0	8.0		5.1			9.1	8.1	8.8	9.0		8.1		
Bankfull Width/Depth Ratio	15.4	15.7	15.0	14.3		8.8			---	---	---	---		---			---	---	---	---		---		
Bankfull Entrenchment Ratio	7.0	7.5	7.3	7.0		10.1			---	---	---	---		---			---	---	---	---		---		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.1		1.0			---	---	---	---		---			---	---	---	---		---		
	Cross-Section 4, UT1 Reach 1 (Riffle)								**Cross-Section 5, UT1 Reach 2 (Riffle)**								**Cross-Section 6, UT1 Reach 2 (Pool)**							
Dimension and Substrate[1]	**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 (ft)[1]	877.6	877.6	877.6	877.5		877.7			873.5	873.5	873.5	873.4		873.6			872.7	872.7	872.7	872.8		872.8		
Low Bank Elevation	877.6	877.6	877.6	877.5		877.6			873.5	873.5	873.5	873.5		873.5			872.7	872.7	872.7	872.8		872.8		
Bankfull Width (ft)	6.9	7.4	7.6	6.9		4.9			10.5	11.1	10.9	11.2		10.6			8.8	8.8	9.2	10.7		9.8		
Floodprone Width (ft)[2]	118+	118+	118+	60+		60+			97+	97+	97+	75+		73+			---	---	---	---		---		
Bankfull Mean Depth (ft)	0.4	0.4	0.4	0.4	N/A	0.4			0.9	0.9	0.9	0.9	N/A	0.8			1.0	0.8	0.7	0.8	N/A	0.8		
Bankfull Max Depth (ft)	0.8	0.7	0.7	0.7		0.8			1.5	1.5	1.5	1.6		1.6			1.8	1.4	1.3	1.5		1.3		
Bankfull Cross-Sectional Area (ft^2)	2.9	3.2	3.1	2.8		1.9			9.7	10.1	9.3	10.1		8.7			8.8	7.2	6.8	8.4		7.8		
Bankfull Width/Depth Ratio	16.2	17.1	18.7	16.8		12.7			11.4	12.1	12.7	12.4		12.8			---	---	---	---		---		
Bankfull Entrenchment Ratio	17.1+	16.0+	15.5+	8.6+		12.2+			9.2+	8.7+	8.9+	6.7+		6.9+			---	---	---	---		---		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0		0.8			1.0	1.0	1.0	1.0		0.9			---	---	---	---		---		

[1]Prior to MY3, bankfull dimensions were calculated using a fixed bankfull elevation. For MY3 through MY7 bankfull elevation and channel cross-section dimensions are calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (9/2018).

[2] Floodprone width in MY3 through MY7 is based on the width of the cross-section, in lieu of assuming the width across the floodplain as was done in previous monitoring years.

Table 11b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Henry Fork Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

UT1A, UT1B, & UT2

	Cross-Section 7, UT1A (Pool)								Cross-Section 8, UT1A (Riffle)								Cross-Section 9, UT1B (Pool)								Cross-Section 10, UT1B (Riffle)							
Dimension and Substrate[1]	**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 (ft)[1]	874.9	874.9	874.9	874.8		875.2			875.0	875.0	875.0	874.9		875.2			922.9	922.9	922.9	923.1		923.0			922.1	922.1	922.1	922.2		922.3		
Low Bank Elevation	874.9	874.9	874.9	874.8		875.2			875.0	875.0	875.0	874.9		875.0			922.9	922.9	922.9	923.1		923.0			922.1	922.1	922.1	922.2		922.3		
Bankfull Width (ft)	5.6	5.8	4.5	4.2		5.0			6.6	6.3	7.7	6.5		4.9			5.5	5.9	6.9	8.3		6.9			5.4	5.9	4.3	6.5		5.7		
Floodprone Width (ft)[2]	---	---	---	---		---			31+	81+	79+	85+		86+			---	---	---	---		---			38	56	54	56		60		
Bankfull Mean Depth (ft)	0.4	0.4	0.3	0.4	N/A	0.3			0.4	0.4	0.3	0.4	N/A	0.3			0.9	0.7	0.6	0.7	N/A	0.7			0.4	0.3	0.2	0.4	N/A	0.3		
Bankfull Max Depth (ft)	0.7	1.0	0.7	0.8		0.8			0.8	0.6	0.6	0.8		0.8			1.4	1.2	1.0	1.4		1.3			0.6	0.5	0.3	0.6		0.6		
Bankfull Cross-Sectional Area (ft^2)	2.0	2.3	1.5	1.7		1.6			2.5	2.3	2.4	2.4		1.6			5.0	4.2	4.0	5.6		4.5			2.2	2.0	1.0	2.5		2.0		
Bankfull Width/Depth Ratio	---	---	---	---		---			17.0	17.3	24.9	17.9		15.4			---	---	---	---		---			13.2	17.3	19.6	17.0		16.3		
Bankfull Entrenchment Ratio	---	---	---	---		---			4.8+	12.8+	10.3+	13.1+		17.5+			---	---	---	---		---			6.9	9.4	12.5	8.6		10.6		
Bankfull Bank Height Ratio	---	---	---	---		---			1.0	1.0	1.0	1.0		0.8			---	---	---	---		---			1.0	1.0	1.0	1.1		0.9		
	Cross-Section 11, UT2 (Pool)								**Cross-Section 12, UT2 (Riffle)**								**Cross-Section 13, UT2 (Pool)**								**Cross-Section 14, UT2 (Riffle)**							
Dimension and Substrate[1]	**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 (ft)[1]	876.0	876.0	876.0	876.0		876.0			876.0	876.0	876.0	876.0		876.1			875.1	875.1	875.1	875.0		875.0			875.2	875.2	875.2	875.2		875.2		
Low Bank Elevation	876.0	876.0	876.0	876.0		876.0			876.0	876.0	876.0	876.0		876.0			875.1	875.1	875.1	875.0		875.0			875.2	875.2	875.2	875.3		875.1		
Bankfull Width (ft)	10.2	11.5	11.1	10.8		10.9			8.1	9.1	8.6	8.0		8.3			7.8	8.2	10.0	12.0		10.9			7.4	6.9	7.5	8.5		8.0		
Floodprone Width (ft)[2]	---	---	---	---		---			81+	51+	51+	51+		51+			---	---	---	---		---			150+	150+	150+	59+		59+		
Bankfull Mean Depth (ft)	0.8	0.8	0.9	0.8	N/A	0.7			0.7	0.6	0.7	0.7	N/A	0.6			1.1	1.0	0.9	0.8	N/A	0.7			0.6	0.5	0.6	0.6	N/A	0.4		
Bankfull Max Depth (ft)	1.9	1.6	1.7	1.7		1.6			1.4	1.4	1.5	1.3		1.3			1.9	1.6	1.7	1.8		1.5			1.0	1.0	1.1	1.2		0.9		
Bankfull Cross-Sectional Area (ft^2)	8.6	9.5	9.7	8.5		8.0			5.7	5.5	6.0	5.3		4.9			8.8	8.1	9.4	8.0		8.0			4.2	3.8	4.4	4.8		3.1		
Bankfull Width/Depth Ratio	---	---	---	---		---			11.5	15.0	12.3	12.1		14.2			---	---	---	---		---			12.9	12.7	12.6	14.8		20.4		
Bankfull Entrenchment Ratio	---	---	---	---		---			10.1+	5.6+	5.9+	6.3+		6.1+			---	---	---	---		---			20.3+	21.8+	20.1+	7.0+		7.4+		
Bankfull Bank Height Ratio	---	---	---	---		---			1.0	1.0	1.0	1.0		0.9			---	---	---	---		---			1.0	1.0	0.9	1.1		0.9		

[1]Prior to MY3, bankfull dimensions were calculated using a fixed bankfull elevation. For MY3 through MY7 bankfull elevation and channel cross-section dimensions are calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (9/2018).

[2] Floodprone width in MY3 through MY7 is based on the width of the cross-section, in lieu of assuming the width across the floodplain as was done in previous monitoring years.

Table 12a. Monitoring - Stream Reach Data Summary

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020

UT1 Reach 1

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																
Bankfull Width (ft)	6.9	7.3	6.8	7.4	7.1	7.6	6.9	7.8			4.9	5.5				
Floodprone Width (ft)	51	118+	51	118+	52	118+	55	60+			55	60+				
Bankfull Mean Depth	0.4	0.5	0.4	0.4	0.4	0.5	0.4	0.5			0.4	0.6				
Bankfull Max Depth	0.75		0.7		0.7	0.8	0.7	1.1			0.8	1.2				
Bankfull Cross Sectional Area (ft^2)	2.9	3.5	2.9	3.2	3.1	3.3	2.8	4.3	N/A		1.9	3.4				
Width/Depth Ratio	15.8		15.7	17.1	15.0	18.7	14.3	16.8			8.8	12.7				
Entrenchment Ratio	7.0	17.1+	7.5+	16.0+	7.3+	15.5+	7.0	8.6+			10.1	12.2+				
Bank Height Ratio	1.0		1.0		1.0		1.0	1.1			0.8	1.0				
D50 (mm)	35.9	37.9	56.1	87.0	87.3	93.6	73.0	104.7	66.2	88.3	47.7	68.5				
Profile																
Shallow Length (ft)	8.0	47.3														
Shallow Slope (ft/ft)	0.0142	0.0987														
Pool Length (ft)	4.3	33.4														
Pool Max Depth (ft)	0.9	2.8														
Pool Spacing (ft)	10	60														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	10	26														
Radius of Curvature (ft)	8	31														
Rc:Bankfull Width (ft/ft)	1.2	4.5														
Meander Wave Length (ft)	56	104														
Meander Width Ratio	8	15														
Additional Reach Parameters																
Rosgen Classification	B4a															
Channel Thalweg Length (ft)	1,497															
Sinuosity (ft)	1.2															
Water Surface Slope (ft/ft)	0.0369															
Bankfull Slope (ft/ft)	0.0241	0.0612														
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		N/A		0%					

Table 12b. Monitoring - Stream Reach Data Summary

Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

UT1 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																
Bankfull Width (ft)	10.5		11.1		10.9		11.2				10.6					
Floodprone Width (ft)	97+		97+		97+		75+				73+					
Bankfull Mean Depth	0.9		0.9		0.9		0.9				0.8					
Bankfull Max Depth	1.5		1.5		1.5		1.6				1.6					
Bankfull Cross Sectional Area (ft^2)	9.7		10.1		9.3		10.1		N/A		8.7					
Width/Depth Ratio	11.4		12.1		12.7		12.4				12.8					
Entrenchment Ratio	9.2+		8.7+		8.9+		6.7+				6.9+					
Bank Height Ratio	1.0		1.0		1.0		1.0				0.9					
D50 (mm)	Silt/Clay															
Profile																
Riffle Length (ft)	23.3	51.9														
Riffle Slope (ft/ft)	0.0000	0.0230														
Pool Length (ft)	15.4	83.1														
Pool Max Depth (ft)	2.2	3.5														
Pool Spacing (ft)	49	136														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	7	84														
Radius of Curvature (ft)	25	58														
Rc:Bankfull Width (ft/ft)	2.4	5.5														
Meander Wave Length (ft)	123	210														
Meander Width Ratio	11.7	20.0														
Additional Reach Parameters																
Rosgen Classification	C6															
Channel Thalweg Length (ft)	1,232															
Sinuosity (ft)	1.3															
Water Surface Slope (ft/ft)	0.0023															
Bankfull Slope (ft/ft)	0.0037															
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		N/A		0%					

Table 12c. Monitoring - Stream Reach Data Summary
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

UT1A

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																
Bankfull Width (ft)	6.6		6.3		7.7		6.5				4.9					
Floodprone Width (ft)	31+		81+		79+		85+				86+					
Bankfull Mean Depth	0.4		0.4		0.3		0.4				0.3					
Bankfull Max Depth	0.8		0.6		0.6		0.8				0.8					
Bankfull Cross Sectional Area (ft^2)	2.5		2.3		2.4		2.4		N/A		1.6					
Width/Depth Ratio	17.0		17.3		24.9		17.9				15.4					
Entrenchment Ratio	4.8		31.9+		10.3+		13.1+				17.5+					
Bank Height Ratio	1.0		1.0		1.0		1.0				0.8					
D50 (mm)																
Profile																
Riffle Length (ft)	10.8	32.9														
Riffle Slope (ft/ft)	0.0010	0.0395														
Pool Length (ft)	10.2	47.5														
Pool Max Depth (ft)	0.9	2.6														
Pool Spacing (ft)	29	53														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	7	36														
Radius of Curvature (ft)	9	25														
Rc:Bankfull Width (ft/ft)	1.4	3.8														
Meander Wave Length (ft)	61	100														
Meander Width Ratio	9.2	15.2														
Additional Reach Parameters																
Rosgen Classification	C6															
Channel Thalweg Length (ft)	658															
Sinuosity (ft)	1.6															
Water Surface Slope (ft/ft)	0.0063															
Bankfull Slope (ft/ft)	0.0060															
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		N/A		0%					

Table 12d. Monitoring - Stream Reach Data Summary

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020

UT1B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																
Bankfull Width (ft)	5.4		5.9		4.3		6.5		N/A		5.7					
Floodprone Width (ft)	38		56		54		56				60					
Bankfull Mean Depth	0.4		0.3		0.2		0.4				0.3					
Bankfull Max Depth	0.6		0.5		0.3		0.6				0.6					
Bankfull Cross Sectional Area (ft^2)	2.2		2.0		1.0		2.5				2.0					
Width/Depth Ratio	13.2		17.3		19.6		17.0				16.3					
Entrenchment Ratio	6.9		9.4		12.5		8.6				10.6					
Bank Height Ratio	1.0		1.0		1.0		1.1				0.9					
D50 (mm)	11.0		40.2		69.0		68.5		23.3		47.7					
Profile																
Shallow Length (ft)	11.3	41.2														
Shallow Slope (ft/ft)	0.0259	0.0978														
Pool Length (ft)	5.6	20.0														
Pool Max Depth (ft)	0.5	2.2														
Pool Spacing (ft)	7	43														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	4	19														
Radius of Curvature (ft)	8	32														
Rc:Bankfull Width (ft/ft)	1.5	5.9														
Meander Wave Length (ft)	48	90														
Meander Width Ratio	9	17														
Additional Reach Parameters																
Rosgen Classification	B4a															
Channel Thalweg Length (ft)	358															
Sinuosity (ft)	1.1															
Water Surface Slope (ft/ft)	0.0598															
Bankfull Slope (ft/ft)	0.0602															
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		N/A		0%					

Table 12e. Monitoring - Stream Reach Data Summary

Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

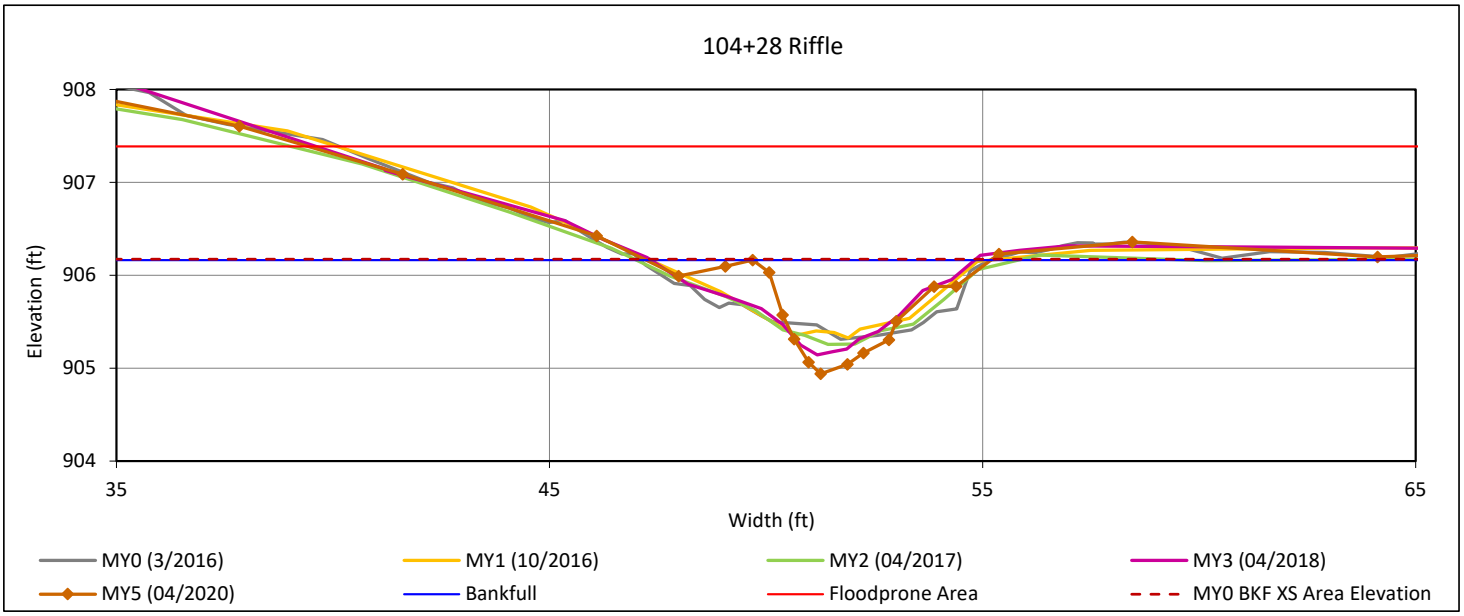
UT2

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																
Bankfull Width (ft)	7.4	8.1	6.9	9.1	7.5	8.6	8.0	8.5			8.0	8.3				
Floodprone Width (ft)	81	150+	51+	150+	51+	150+	51+	59+			51+	59+				
Bankfull Mean Depth	0.6	0.7	0.5	0.6	0.6	0.7	0.6	0.7			0.4	0.6				
Bankfull Max Depth	1.0	1.4	1.0	1.4	1.1	1.5	1.2	1.3			0.9	1.3				
Bankfull Cross Sectional Area (ft^2)	4.2	5.7	3.8	5.5	4.4	6.0	4.8	5.3	N/A		3.1	4.9				
Width/Depth Ratio	11.5	12.9	12.7	15.0	12.3	12.6	12.1	14.8			14.2	20.4				
Entrenchment Ratio	10.1	29.0+	5.6+	21.8+	5.9+	20.1+	6.3+	7.0+			6.1+	7.4+				
Bank Height Ratio	1.0		1.0		0.9	1.0	1.0	1.1			0.9					
D50 (mm)																
Profile																
Riffle Length (ft)	3.45	52.29														
Riffle Slope (ft/ft)	0.0000	0.0144														
Pool Length (ft)	10.28	60.9														
Pool Max Depth (ft)	1.6	2.6														
Pool Spacing (ft)	28	87														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	8	59														
Radius of Curvature (ft)	13	24														
Rc:Bankfull Width (ft/ft)	2.3	4.2														
Meander Wave Length (ft)	63	158														
Meander Width Ratio	11.2	28.0														
Additional Reach Parameters																
Rosgen Classification	C6															
Channel Thalweg Length (ft)	1,969															
Sinuosity (ft)	1.7															
Water Surface Slope (ft/ft)	0.0018															
Bankfull Slope (ft/ft)	0.0015															
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
d16/d35/d50/d84/d95/d100																
% of Reach with Eroding Banks			0%		0%		0%		N/A		0%					

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 1-UT1 R1



Bankfull Dimensions	
3.4	x-section area (ft.sq.)
5.5	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
6.2	wetted perimeter (ft)
0.6	hydraulic radius (ft)
8.8	width-depth ratio
55.4	W flood prone area (ft)
10.1	entrenchment ratio
1.0	low bank height ratio

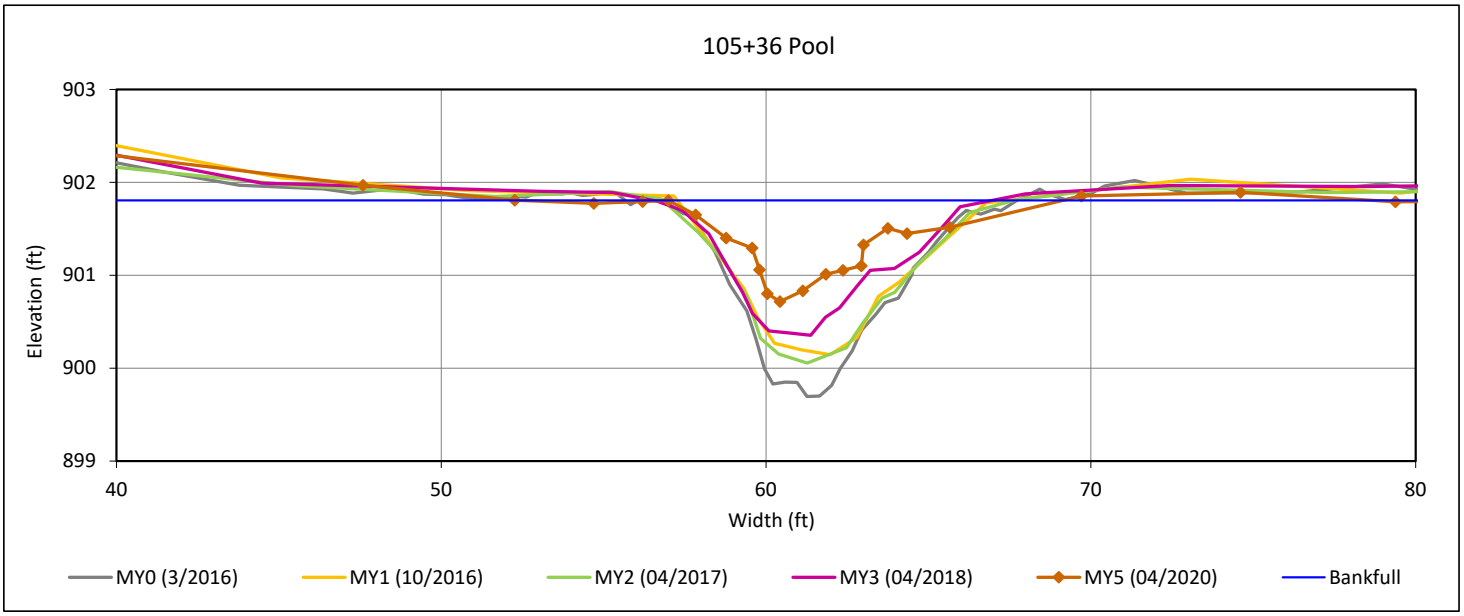
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 2-UT1 R1



Bankfull Dimensions	
5.1	x-section area (ft.sq.)
12.2	width (ft)
0.4	mean depth (ft)
1.1	max depth (ft)
12.7	wetted perimeter (ft)
0.4	hydraulic radius (ft)
29.0	width-depth ratio

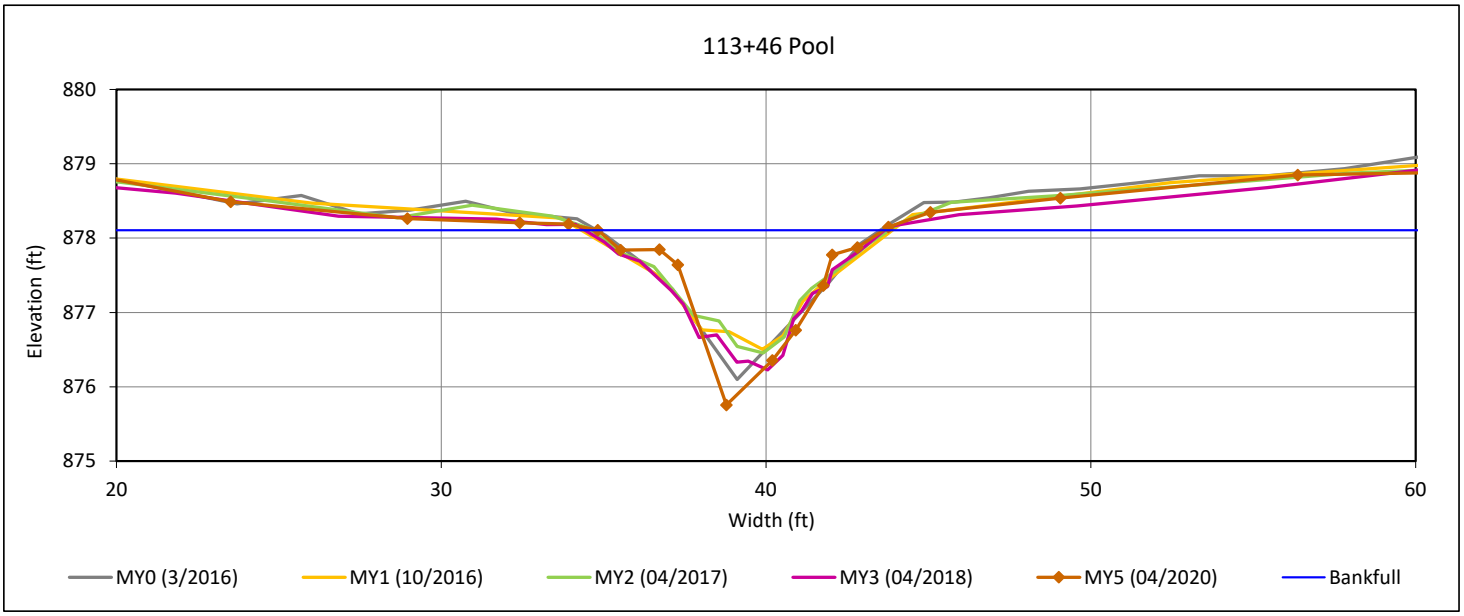
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 3-UT1 R1



Bankfull Dimensions	
8.1	x-section area (ft.sq.)
8.8	width (ft)
0.9	mean depth (ft)
2.4	max depth (ft)
10.5	wetted perimeter (ft)
0.8	hydraulic radius (ft)
9.6	width-depth ratio

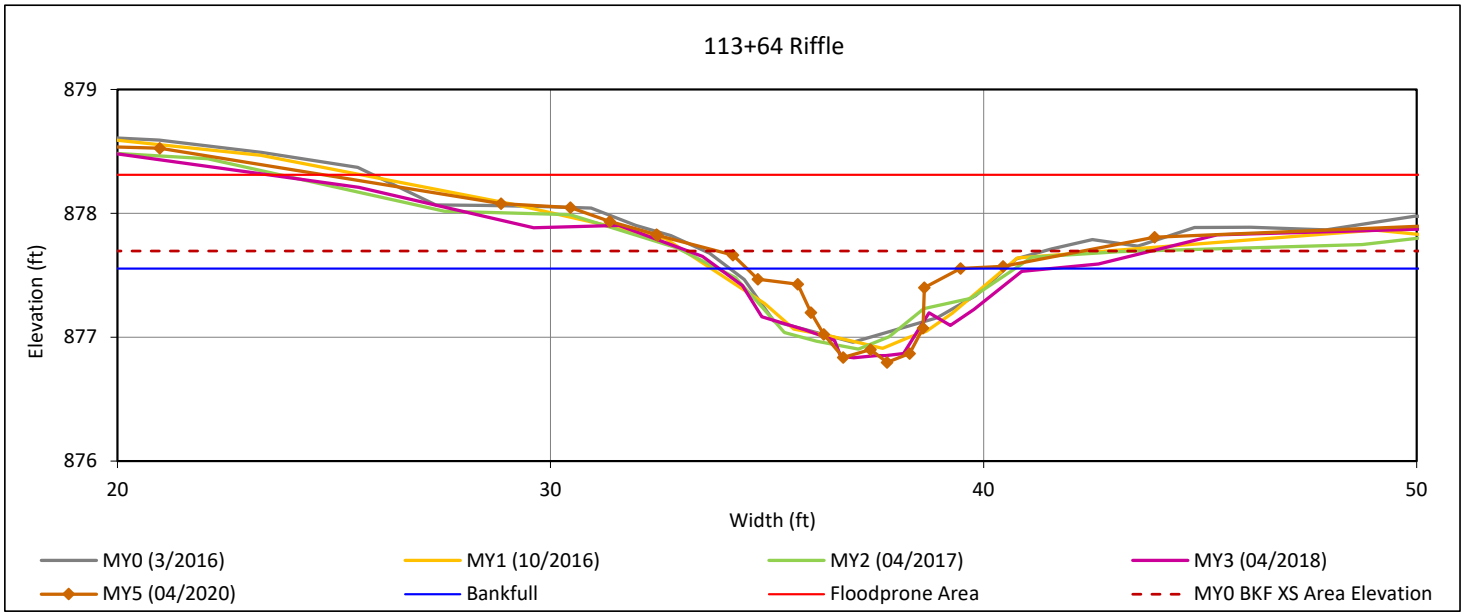
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2019

Cross-Section 4-UT1 R1



Bankfull Dimensions	
1.9	x-section area (ft.sq.)
4.9	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
5.5	wetted perimeter (ft)
0.3	hydraulic radius (ft)
12.7	width-depth ratio
60.0	W flood prone area (ft)
12.2	entrenchment ratio
0.8	low bank height ratio

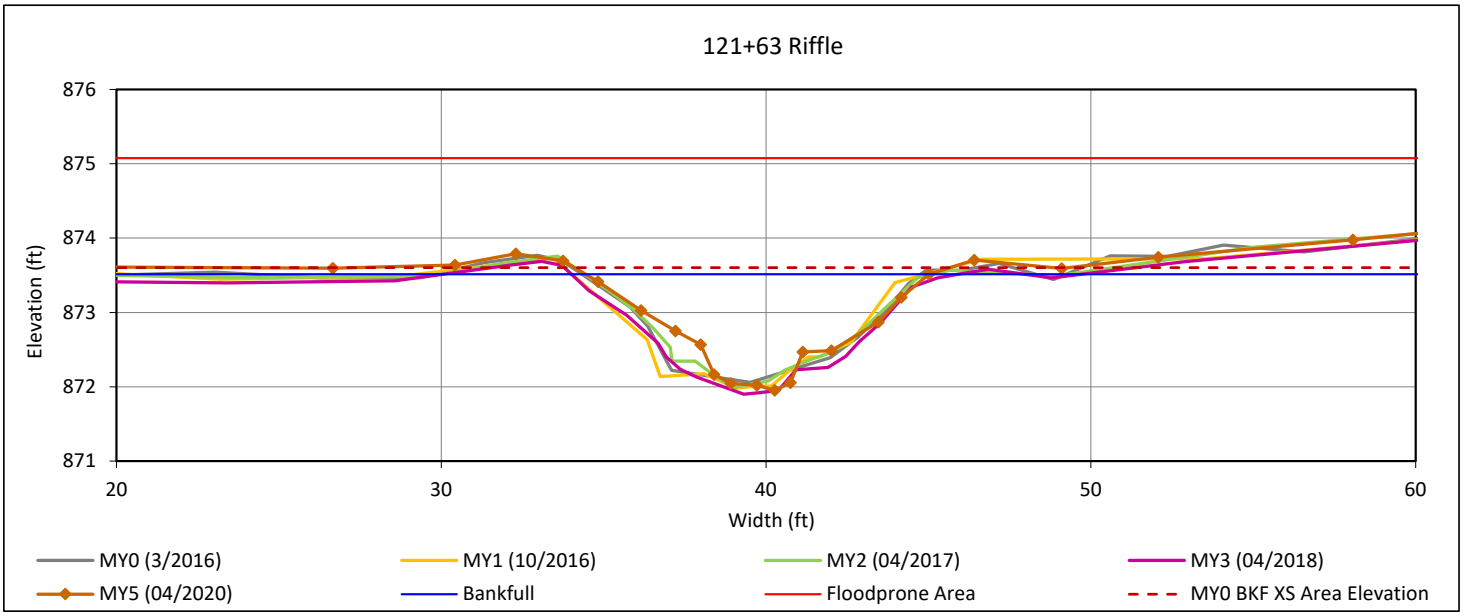
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 5-UT1 R2



Bankfull Dimensions	
8.7	x-section area (ft.sq.)
10.6	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
11.2	wetted perimeter (ft)
0.8	hydraulic radius (ft)
12.8	width-depth ratio
73.1	W flood prone area (ft)
6.9	entrenchment ratio
0.9	low bank height ratio

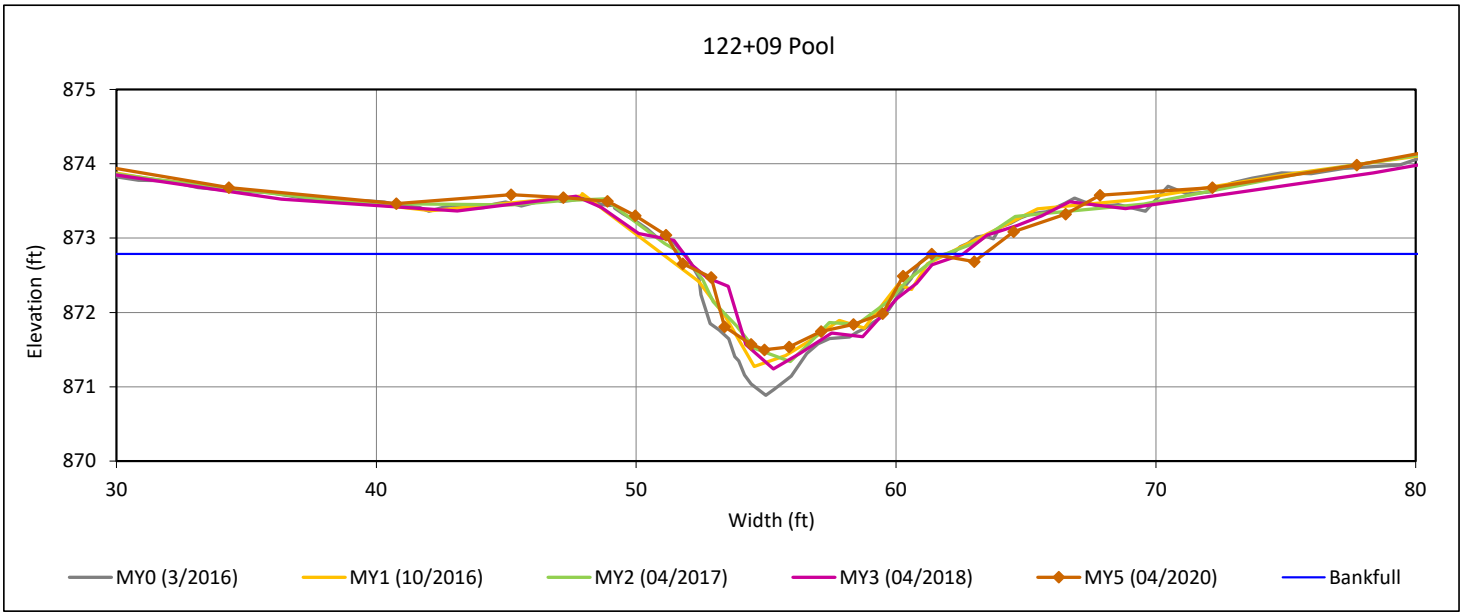
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 6-UT1 R2



Bankfull Dimensions	
7.8	x-section area (ft.sq.)
9.8	width (ft)
0.8	mean depth (ft)
1.3	max depth (ft)
10.4	wetted perimeter (ft)
0.7	hydraulic radius (ft)
12.3	width-depth ratio

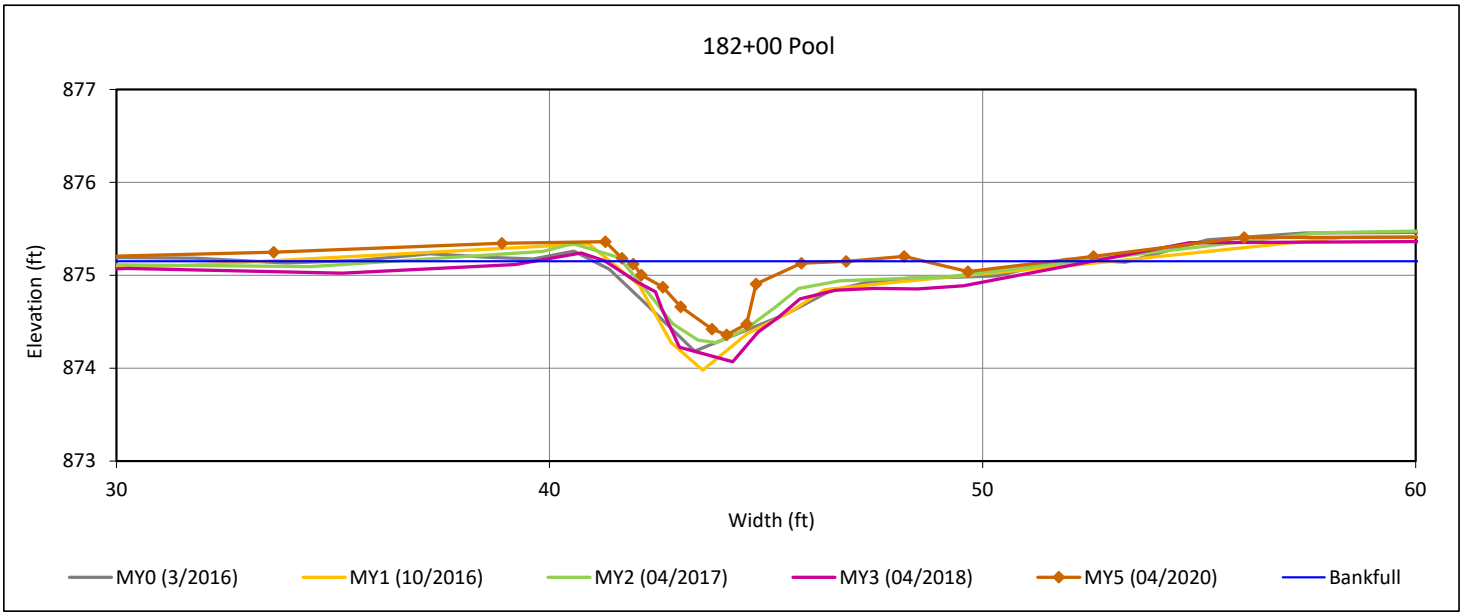
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 7-UT1A



Bankfull Dimensions	
1.6	x-section area (ft.sq.)
5.0	width (ft)
0.3	mean depth (ft)
0.8	max depth (ft)
5.5	wetted perimeter (ft)
0.3	hydraulic radius (ft)
16.2	width-depth ratio

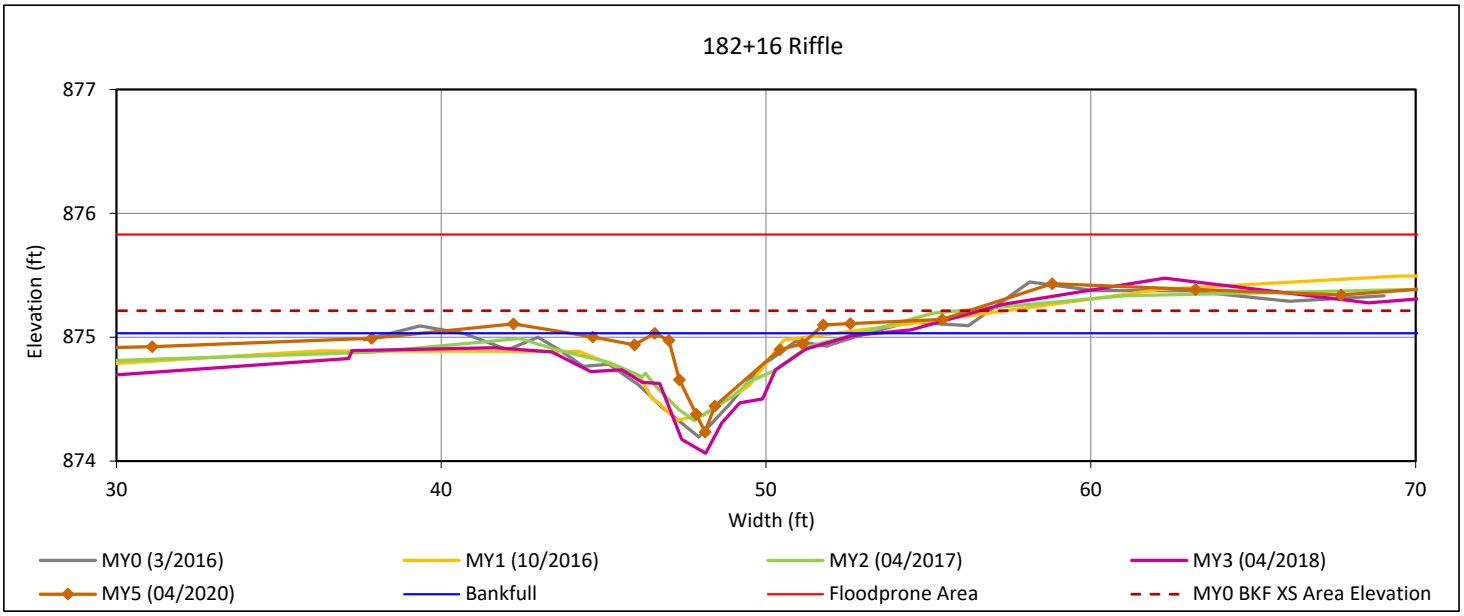
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 8-UT1A



Bankfull Dimensions	
1.6	x-section area (ft.sq.)
4.9	width (ft)
0.3	mean depth (ft)
0.8	max depth (ft)
5.3	wetted perimeter (ft)
0.3	hydraulic radius (ft)
15.4	width-depth ratio
86.0	W flood prone area (ft)
17.5	entrenchment ratio
0.8	low bank height ratio

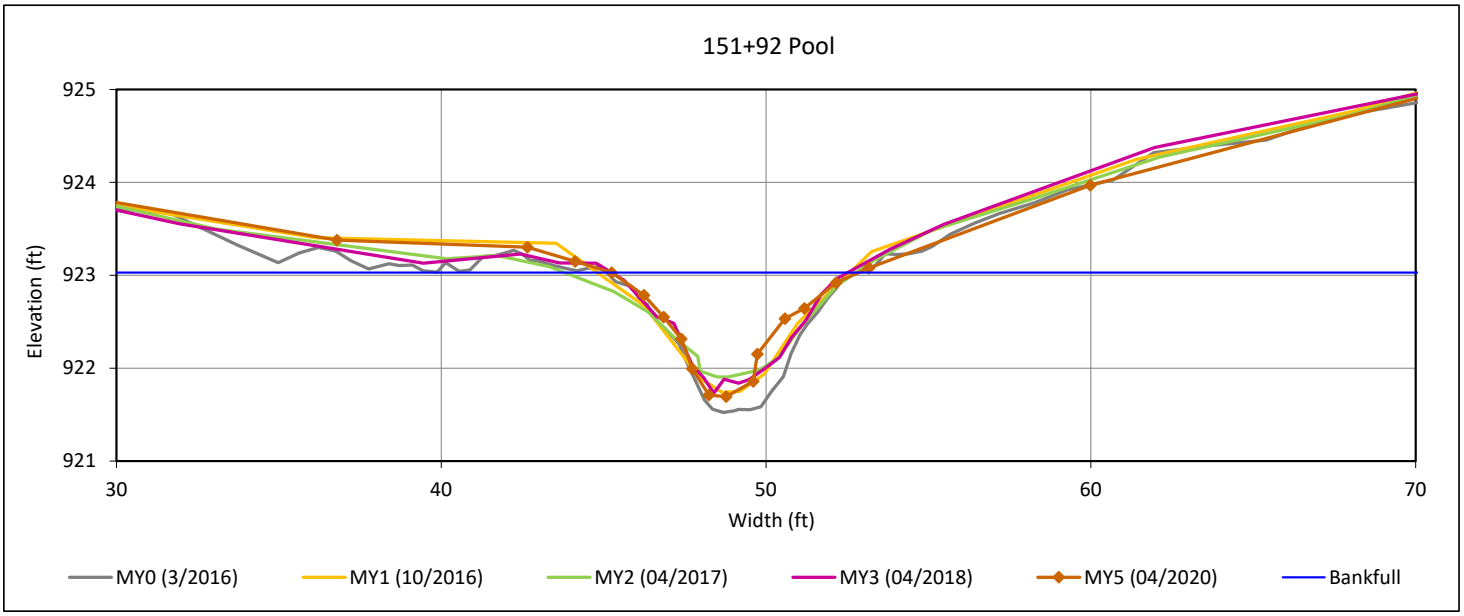
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 9-UT1B



Bankfull Dimensions	
4.5	x-section area (ft.sq.)
6.9	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
7.6	wetted perimeter (ft)
0.6	hydraulic radius (ft)
10.6	width-depth ratio

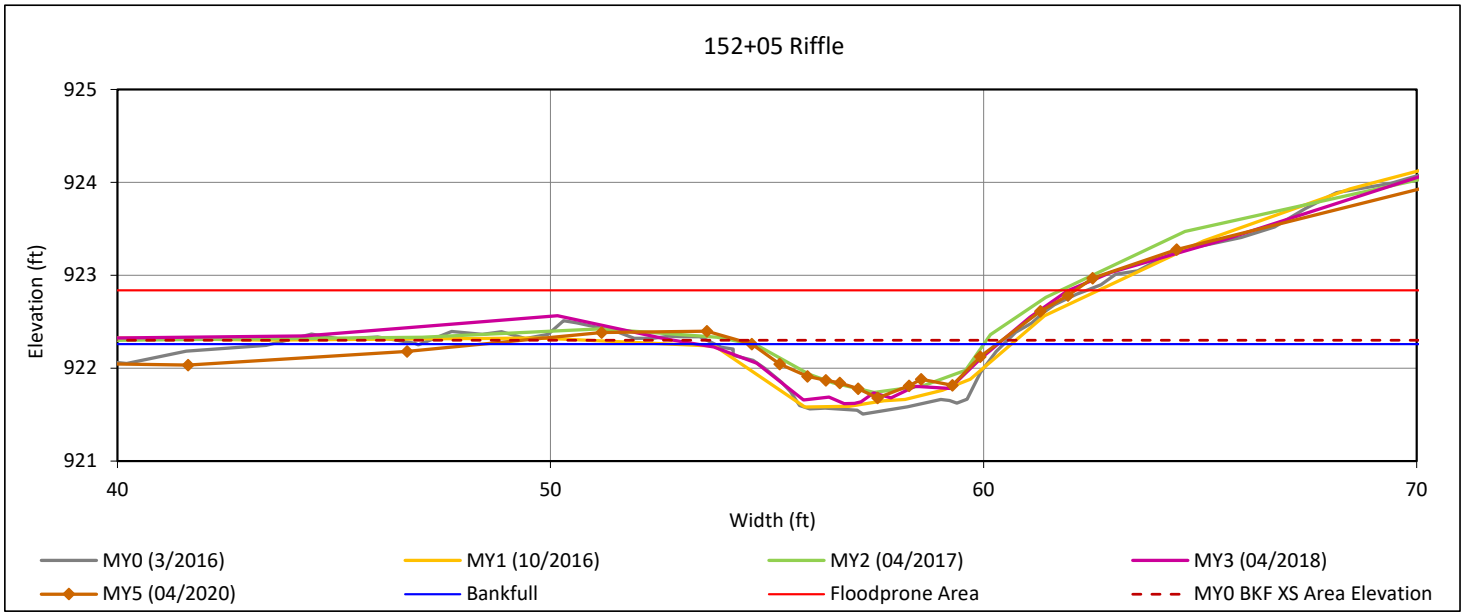
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 10-UT1B



Bankfull Dimensions	
2.0	x-section area (ft.sq.)
5.7	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
5.8	wetted perimeter (ft)
0.3	hydraulic radius (ft)
16.3	width-depth ratio
60.1	W flood prone area (ft)
10.6	entrenchment ratio
0.9	low bank height ratio

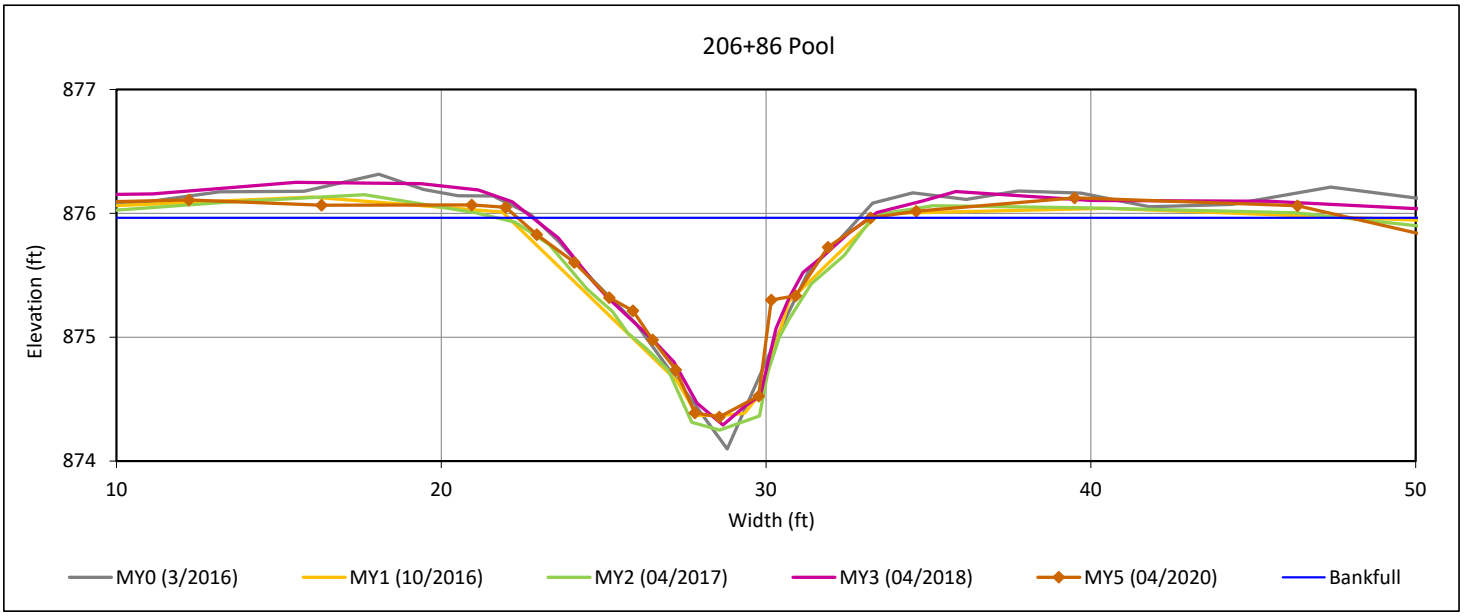
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 11-UT2



Bankfull Dimensions	
8.0	x-section area (ft.sq.)
10.9	width (ft)
0.7	mean depth (ft)
1.6	max depth (ft)
11.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.7	width-depth ratio

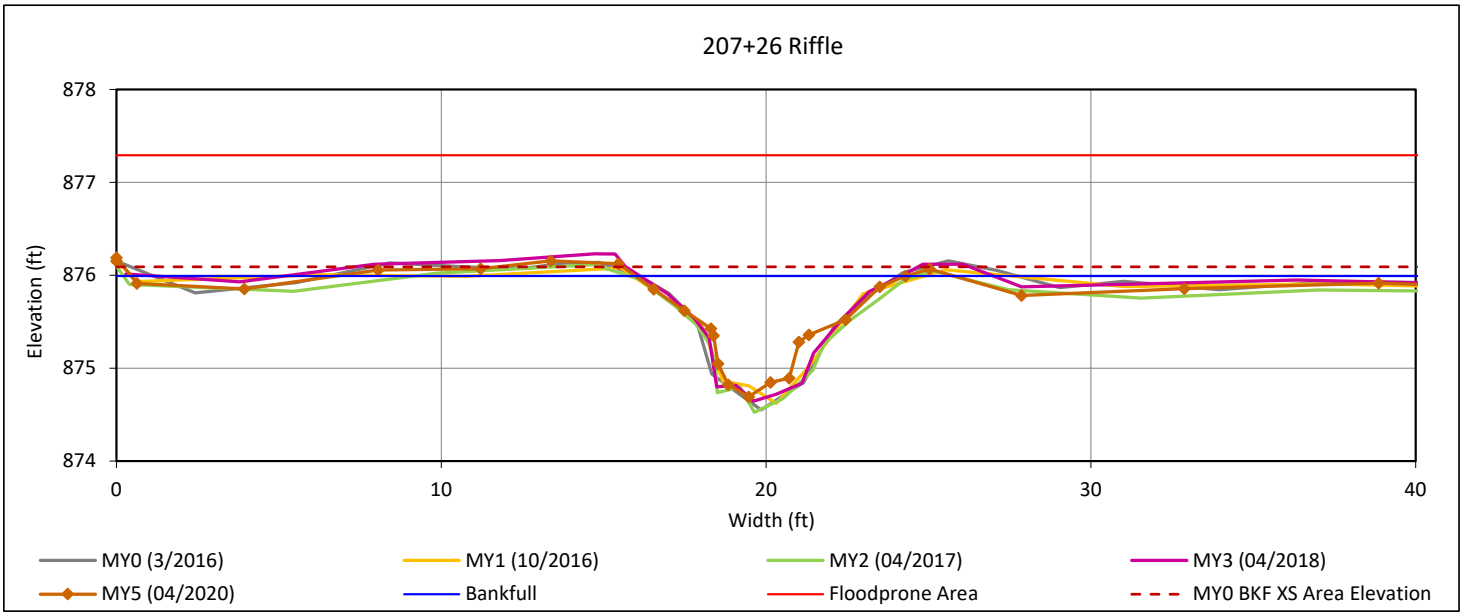
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 12-UT2



Bankfull Dimensions	
4.9	x-section area (ft.sq.)
8.3	width (ft)
0.6	mean depth (ft)
1.3	max depth (ft)
9.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
14.2	width-depth ratio
51.0	W flood prone area (ft)
6.1	entrenchment ratio
0.9	low bank height ratio

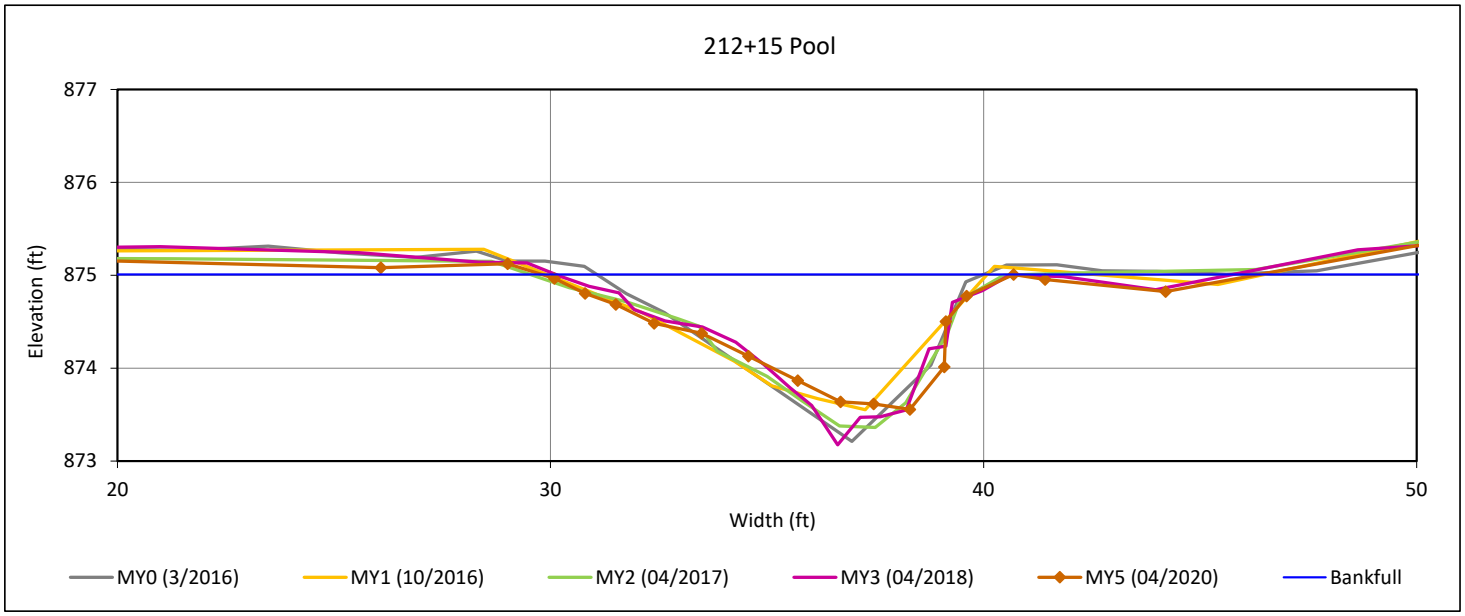
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 13-UT2



Bankfull Dimensions	
8.0	x-section area (ft.sq.)
10.9	width (ft)
0.7	mean depth (ft)
1.5	max depth (ft)
11.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.7	width-depth ratio

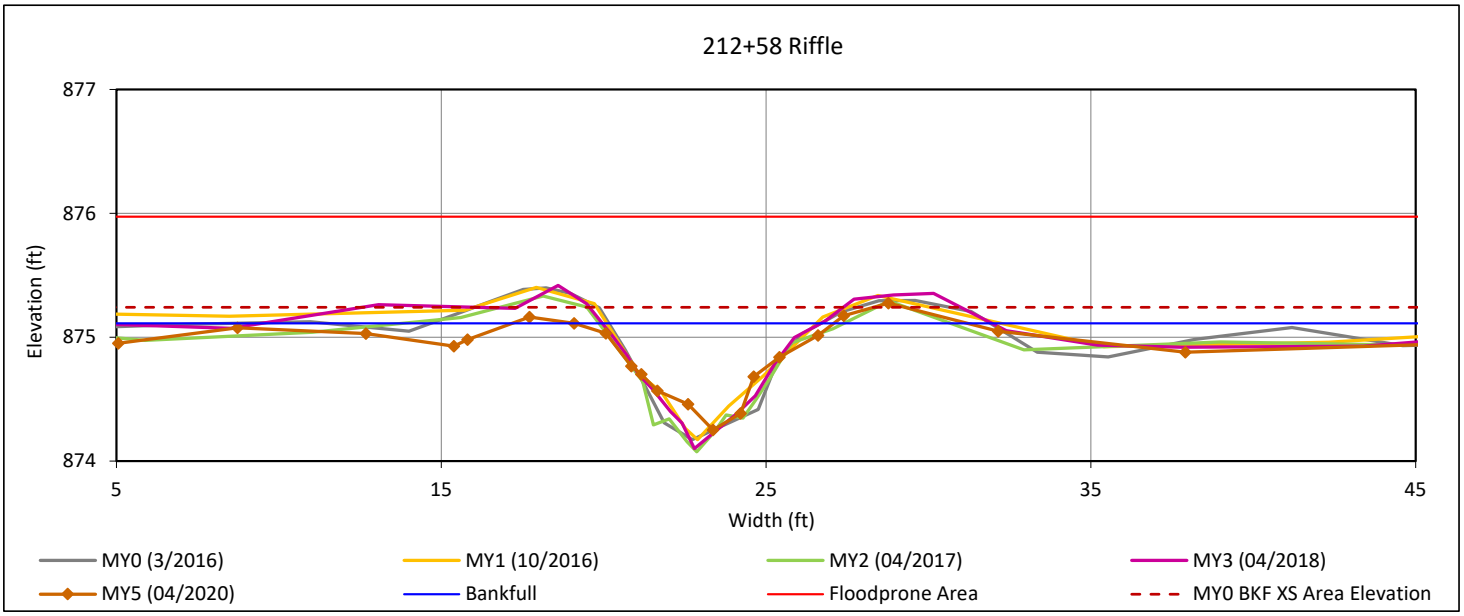
Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Henry Fork Mitigation Site
NCDMS Project No. 96306
Monitoring Year 5 - 2020

Cross-Section 14-UT2



Bankfull Dimensions	
3.1	x-section area (ft.sq.)
8.0	width (ft)
0.4	mean depth (ft)
0.9	max depth (ft)
8.2	wetted perimeter (ft)
0.4	hydraulic radius (ft)
20.4	width-depth ratio
59.0	W flood prone area (ft)
7.4	entrenchment ratio
0.9	low bank height ratio

Survey Date: 04/2020
Field Crew: Wildlands Engineering

View Downstream

Reachwide and Cross-Section Pebble Count Plots

Henry Fork Stream Mitigation

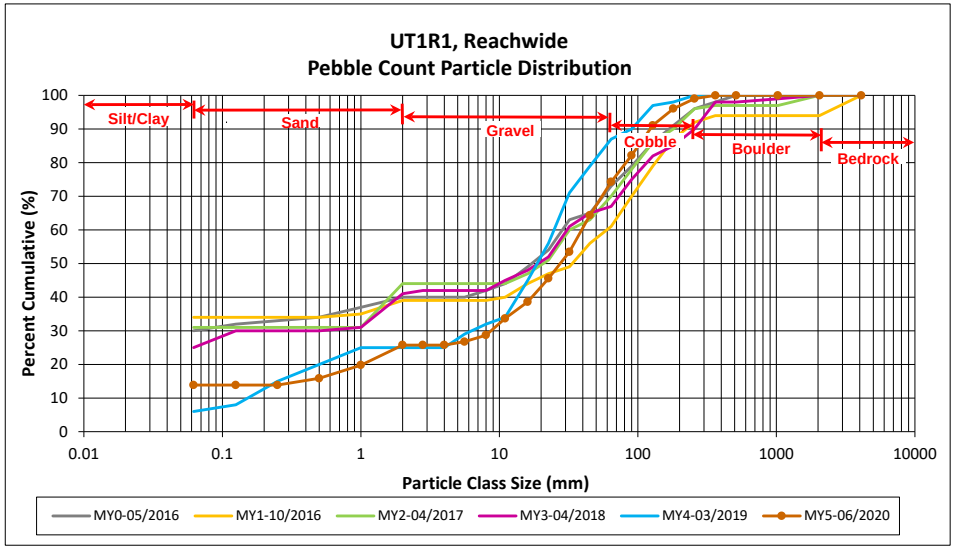
DMS Project No. 96306

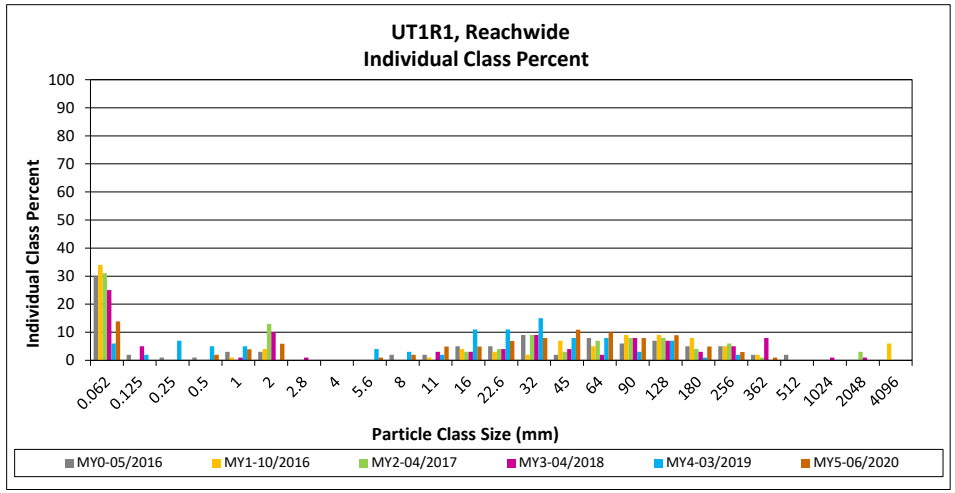
Monitoring Year 5 - 2020

UT1R1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		14	14	14	14
SAND	Very fine	0.062	0.125					14
	Fine	0.125	0.250					14
	Medium	0.25	0.50		2	2	2	16
	Coarse	0.5	1.0		4	4	4	20
	Very Coarse	1.0	2.0	2	4	6	6	26
GRAVEL	Very Fine	2.0	2.8					26
	Very Fine	2.8	4.0					26
	Fine	4.0	5.6		1	1	1	27
	Fine	5.6	8.0	1	1	2	2	29
	Medium	8.0	11.0	2	3	5	5	34
	Medium	11.0	16.0	1	4	5	5	39
	Coarse	16.0	22.6	4	3	7	7	46
	Coarse	22.6	32	5	3	8	8	53
	Very Coarse	32	45	6	5	11	11	64
	Very Coarse	45	64	7	3	10	10	74
COBBLE	Small	64	90	7	1	8	8	82
	Small	90	128	7	2	9	9	91
	Large	128	180	4	1	5	5	96
	Large	180	256	3		3	3	99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**51**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.5
D_{35} =	12.2
D_{50} =	27.5
D_{84} =	96.7
D_{95} =	167.6
D_{100} =	362.0





Reachwide and Cross-Section Pebble Count Plots

Henry Fork Stream Mitigation

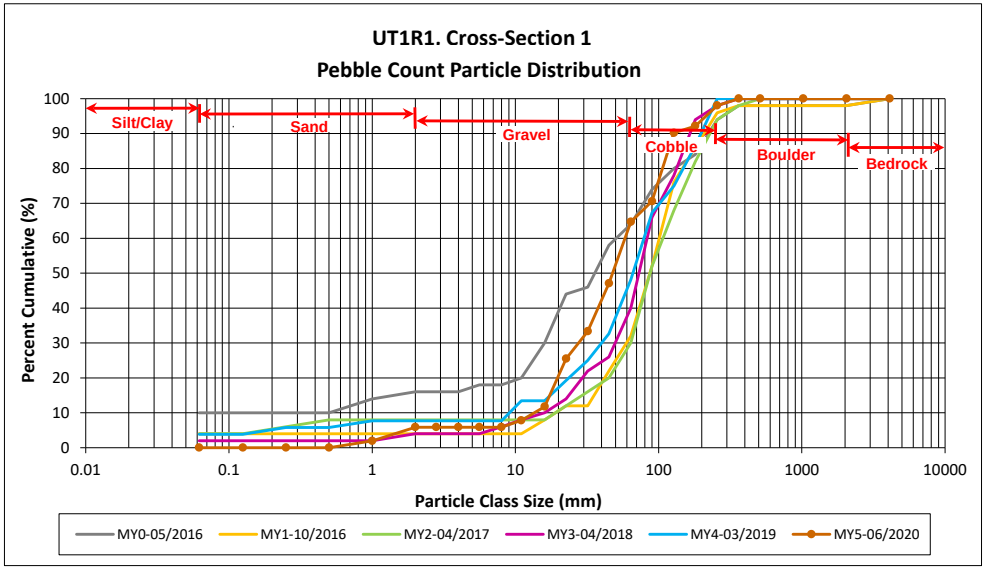
DMS Project No. 96306

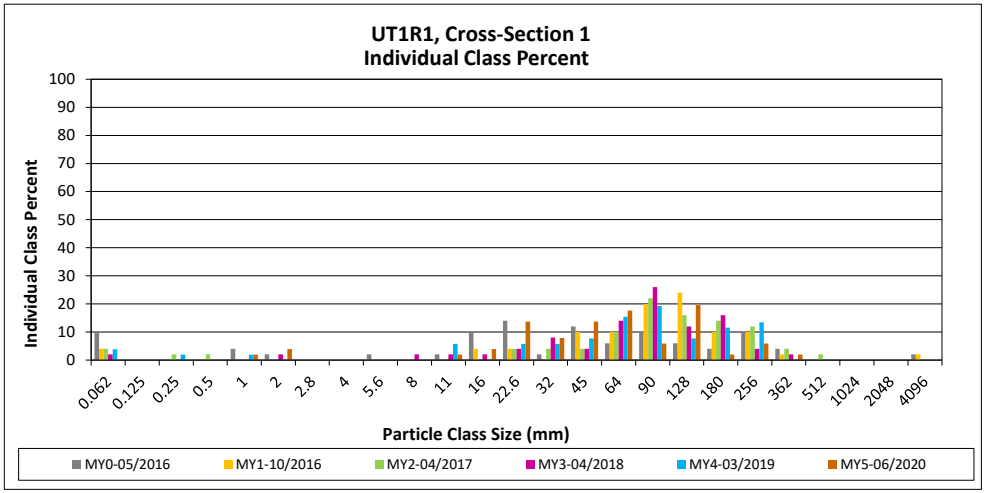
Monitoring Year 5 - 2020

UT1R1, Cross-Section 1

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0	2	2	2
	Very Coarse	1.0	2.0	4	4	6
GRAVEL	Very Fine	2.0	2.8			6
	Very Fine	2.8	4.0			6
	Fine	4.0	5.6			6
	Fine	5.6	8.0			6
	Medium	8.0	11.0	2	2	8
	Medium	11.0	16.0	4	4	12
	Coarse	16.0	22.6	14	14	25
	Coarse	22.6	32	8	8	33
	Very Coarse	32	45	14	14	47
	Very Coarse	45	64	18	18	65
COBBLE	Small	64	90	6	6	71
	Small	90	128	20	20	90
	Large	128	180	2	2	92
	Large	180	256	6	6	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**102**	**100**	**100**

Cross-Section 1	
Channel materials (mm)	
D_{16} =	17.8
D_{35} =	33.4
D_{50} =	47.7
D_{84} =	114.5
D_{95} =	213.4
D_{100} =	362.0





Reachwide and Cross-Section Pebble Count Plots

Henry Fork Stream Mitigation

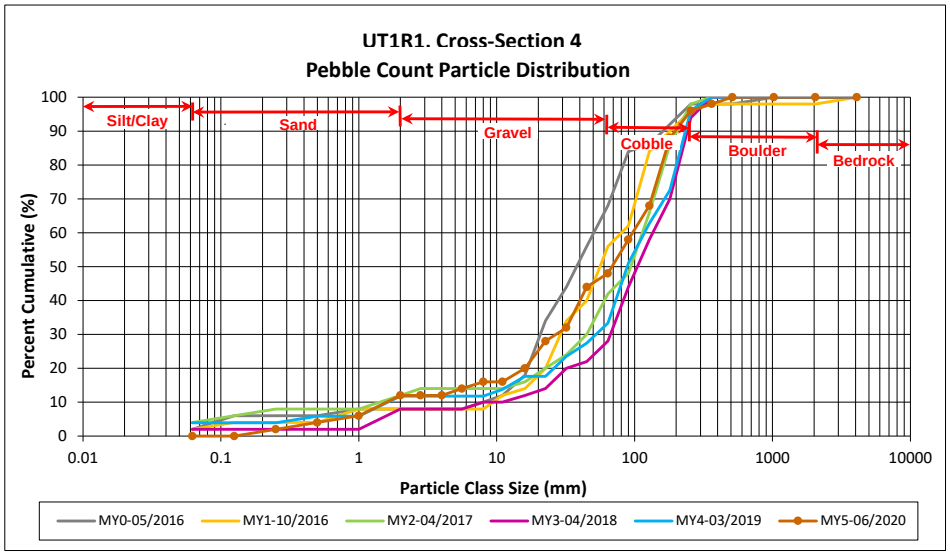
DMS Project No. 96306

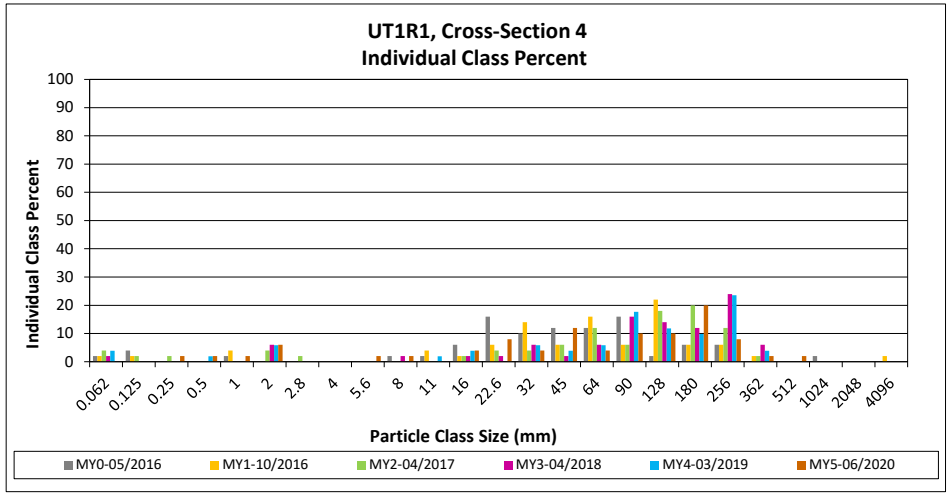
Monitoring Year 5 - 2020

UT1R1, Cross-Section 4

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	2	2	2
	Medium	0.25	0.50	2	2	4
	Coarse	0.5	1.0	2	2	6
	Very Coarse	1.0	2.0	6	6	12
GRAVEL	Very Fine	2.0	2.8			12
	Very Fine	2.8	4.0			12
	Fine	4.0	5.6	2	2	14
	Fine	5.6	8.0	2	2	16
	Medium	8.0	11.0			16
	Medium	11.0	16.0	4	4	20
	Coarse	16.0	22.6	8	8	28
	Coarse	22.6	32	4	4	32
	Very Coarse	32	45	12	12	44
	Very Coarse	45	64	4	4	48
COBBLE	Small	64	90	10	10	58
	Small	90	128	10	10	68
	Large	128	180	20	20	88
	Large	180	256	8	8	96
BOULDER	Small	256	362	2	2	98
	Small	362	512	2	2	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 4	
Channel materials (mm)	
D_{16} =	8.0
D_{35} =	34.8
D_{50} =	68.5
D_{84} =	168.1
D_{95} =	245.0
D_{100} =	512.0





Reachwide and Cross-Section Pebble Count Plots

Henry Fork Stream Mitigation

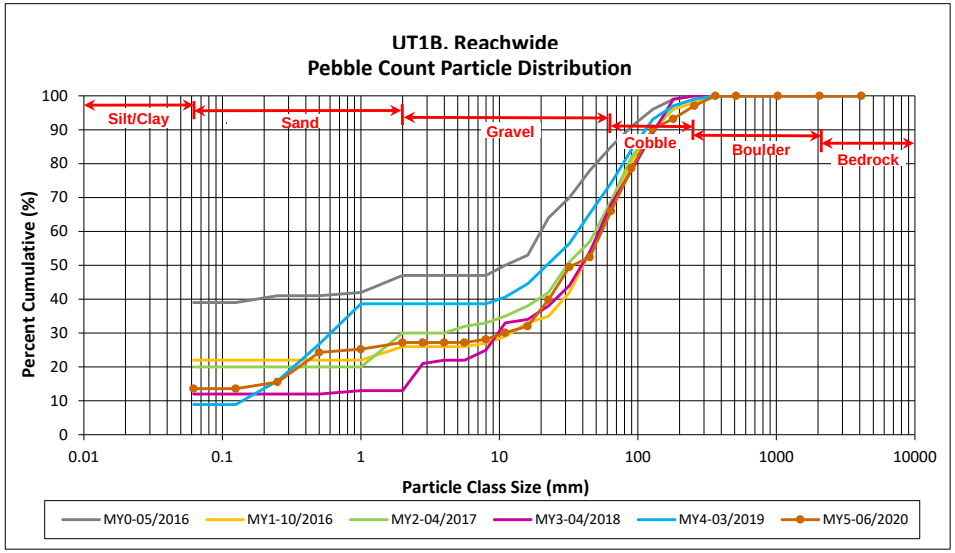
DMS Project No. 96306

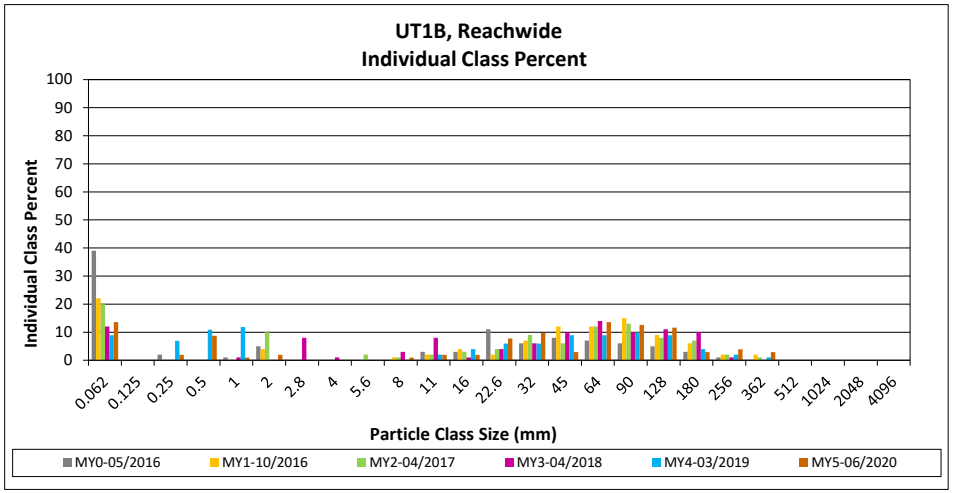
Monitoring Year 5 - 2020

UT1B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	3	11	14	14	14
SAND	Very fine	0.062	0.125					14
	Fine	0.125	0.250		2	2	2	16
	Medium	0.25	0.50	3	6	9	9	24
	Coarse	0.5	1.0	1		1	1	25
	Very Coarse	1.0	2.0		2	2	2	27
GRAVEL	Very Fine	2.0	2.8					27
	Very Fine	2.8	4.0					27
	Fine	4.0	5.6					27
	Fine	5.6	8.0		1	1	1	28
	Medium	8.0	11.0	1	1	2	2	30
	Medium	11.0	16.0	1	1	2	2	32
	Coarse	16.0	22.6	4	4	8	8	40
	Coarse	22.6	32	5	5	10	10	50
	Very Coarse	32	45	2	1	3	3	52
	Very Coarse	45	64	11	3	14	14	66
COBBLE	Small	64	90	9	4	13	13	79
	Small	90	128	3	9	12	12	90
	Large	128	180	2	1	3	3	93
	Large	180	256	4		4	4	97
BOULDER	Small	256	362	3		3	3	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**52**	**51**	**103**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.3
D_{35} =	18.3
D_{50} =	33.9
D_{84} =	105.8
D_{95} =	211.8
D_{100} =	362.0





Reachwide and Cross-Section Pebble Count Plots

Henry Fork Stream Mitigation

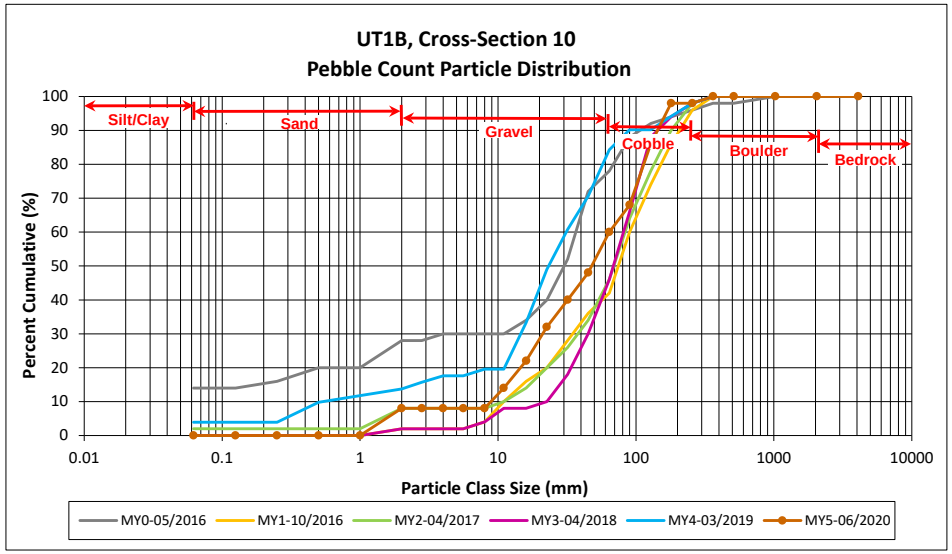
DMS Project No. 96306

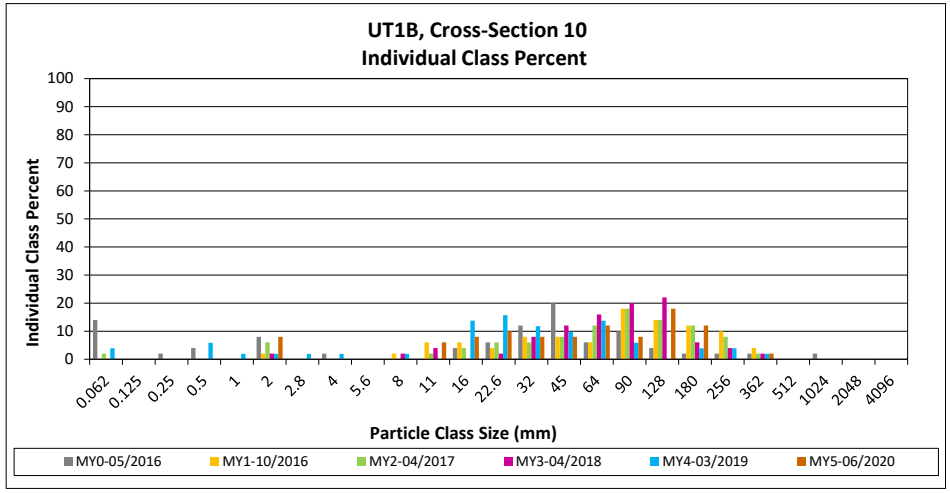
Monitoring Year 5 - 2020

UT1B, Cross-Section 10

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0	8	8	8
GRAVEL	Very Fine	2.0	2.8			8
	Very Fine	2.8	4.0			8
	Fine	4.0	5.6			8
	Fine	5.6	8.0			8
	Medium	8.0	11.0	6	6	14
	Medium	11.0	16.0	8	8	22
	Coarse	16.0	22.6	10	10	32
	Coarse	22.6	32	8	8	40
	Very Coarse	32	45	8	8	48
	Very Coarse	45	64	12	12	60
COBBLE	Small	64	90	8	8	68
	Small	90	128	18	18	86
	Large	128	180	12	12	98
	Large	180	256			98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section	
Channel materials (mm)	
D_{16} =	12.1
D_{35} =	25.7
D_{50} =	47.7
D_{84} =	123.1
D_{95} =	165.3
D_{100} =	362.0





APPENDIX 5. Hydrology Summary Data and Plots

Table 13. Verification of Bankfull Events
Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020

Reach	MY	Date of Occurrence	Method
UT1 Reach 2	MY1	N/A	Crest Gage
	MY2	4/24/2017	Crest & Stream Gage
		10/8/2017	Crest & Stream Gage
	MY3	2/7/2018	Stream Gage
		4/25/2018	
		5/29/2018	
		9/16/2018	
		10/11/2018	
		10/26/2018	
	MY4	6/9/2019	
		10/31/2019	
	MY5	5/21/2020	
		6/19/2020	
		8/15/2020	
		9/2/2020	
		9/17/2020	
		9/25/2020	
		10/11/2020	
		11/12/2020	
UT1A	MY1	Unknown	Crest Gage
	MY2	4/24/2017	Crest & Stream Gage
		10/8/2017	Crest & Stream Gage
	MY3	10/11/2018	Stream Gage
	MY4	6/9/2019	
		10/31/2019	
	MY5	4/13/2020	
		6/19/2020	
		8/15/2020	
		11/12/2020	
UT1B	MY1	N/A	Crest Gage
	MY2	10/8/2017	Crest & Stream Gage
	MY4	6/9/2019	Stream Gage
		8/24/2019	
		10/31/2019	
	MY5	6/19/2020	
		8/15/2020	
		11/12/2020	
UT2	MY1	N/A	Crest Gage
	MY2	4/24/2017	Crest & Stream Gage
	MY3	2/7/2018	Stream Gage
		5/29/2018	
	MY4	6/9/2019	
		10/31/2019	
	MY5	1/12/2020	
		1/24/2020	
		3/25/2020	
		4/30/2020	
		5/21/2020	
		6/19/2020	
		8/15/2020	
		9/2/2020	
		9/18/2020	
		9/25/2020	
		10/11/2020	
		11/12/2020	

* N/A, no bankfull events recorded.

Table 14. Wetland Gage Attainment Summary

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020

Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Success Criteria Achieved[2]/Max Consecutive Days During Growing Season[1] (Percentage)						
	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)	Year 6 (2021)	Year 7 (2022)
Reference	No/18 Days (8%)	Yes/59 Days (25%)	Yes/79 Days (34%)	Yes/61 Days (26%)	Yes/63 Days (27%)		
GWG 1	No/0 Days (0%)	Yes/23 Days (10%)	Yes/48 Days (20%)	Yes/42 Days (18%)	Yes/27 Days (11%)		
GWG 2	Yes/ 29 Days (12.3%)	No/7 Days (3%)	No/12 Days (5%)	Yes/39 Days (17%)	Yes/49 Days (21%)		
GWG 3 [4]	Yes/236 Days (100%)	No/3 Days (1%)	No/5 Days (2%)	Yes/35 Days (15%)	Yes/49 Days (21%)		
GWG 4	No/3 Days (1.3%)	Yes/25 Days (11%)	Yes/46 Days (20%)	Yes/68 Days (29%)	Yes/64 Days (27%)		
GWG 5 [3]	N/A	Yes/189 Days (80%)	Yes/102 Days (43%)	Yes/236 Days (100%)	Yes/202 Days (85%)		
GWG 6	Yes/79 Days (33.5%)	Yes/89 Days (38%)	Yes/96 Days (41%)	Yes/76 Days (32%)	Yes/116 Days (49%)		
GWG 7	No/7 Days (3.0%)	Yes/21 Days (9%)	Yes/44 Days (19%)	Yes/44 Days (19%)	Yes/89 Days (38%)		
GWG 8	No/1 Days (0.4%)	No/14 Days (6%)	No/11 Days (5%)	No/19 Days (8%)	No/14 Days (6%)		
GWG 9 [3]	N/A	No/13 Days (6%)	Yes/20 Days (9%)	Yes/68 Days (29%)	Yes/90 Days (38%)		
GWG 10 [5]	N/A	N/A	N/A	Yes/236 Days (100%)	Yes/202 Days (85%)		
GWG 11 [5]	N/A	N/A	N/A	Yes/61 Days (26%)	Yes/113 Days (48%)		
GWG 12 [5]	N/A	N/A	N/A	Yes/36 Days (15%)	Yes/61 Days (26%)		
GWG 13 [5]	N/A	N/A	N/A	Yes/236 Days (100%)	Yes/202 Days (85%)		
GWG 14 [6]	N/A	N/A	N/A	Yes/67 Days (28%)	Yes/89 Days (38%)		
GWG 15 [6]	N/A	N/A	N/A	Yes/45 Days (19%)	Yes/89 Days (38%)		

N/A, not applicable

[1]Growing season dates March 20 - November 11

[2]Success criteria is 20 consecutive days (8.5%) of the growing season.

[3]GWGs 5 and 9 were installed on April 7, 2017.

[4]GWG 3 was relocated in January 2017.

[5]GWGs 10 -13 were installed on February 20, 2019.

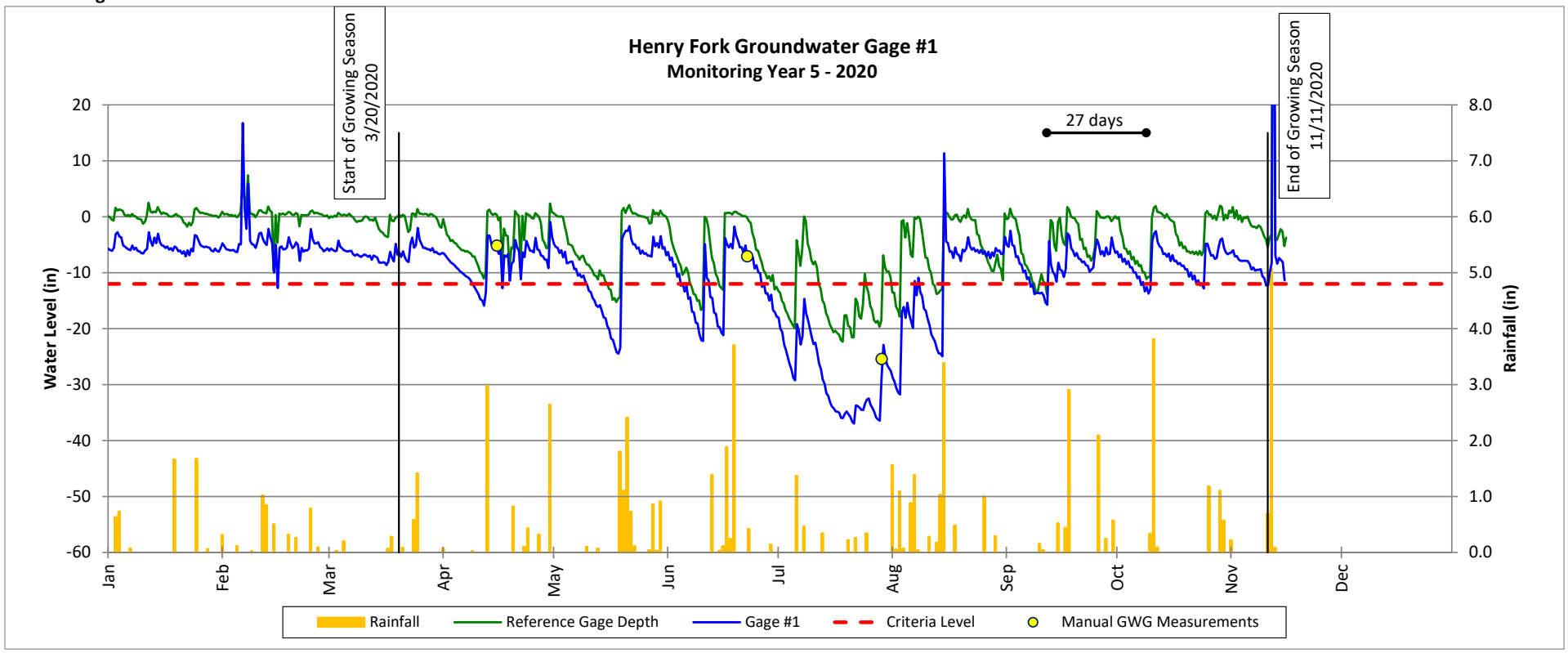
[6]GWGs 14-15 were installed on March 7, 2019.

Groundwater Gage Plots

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020



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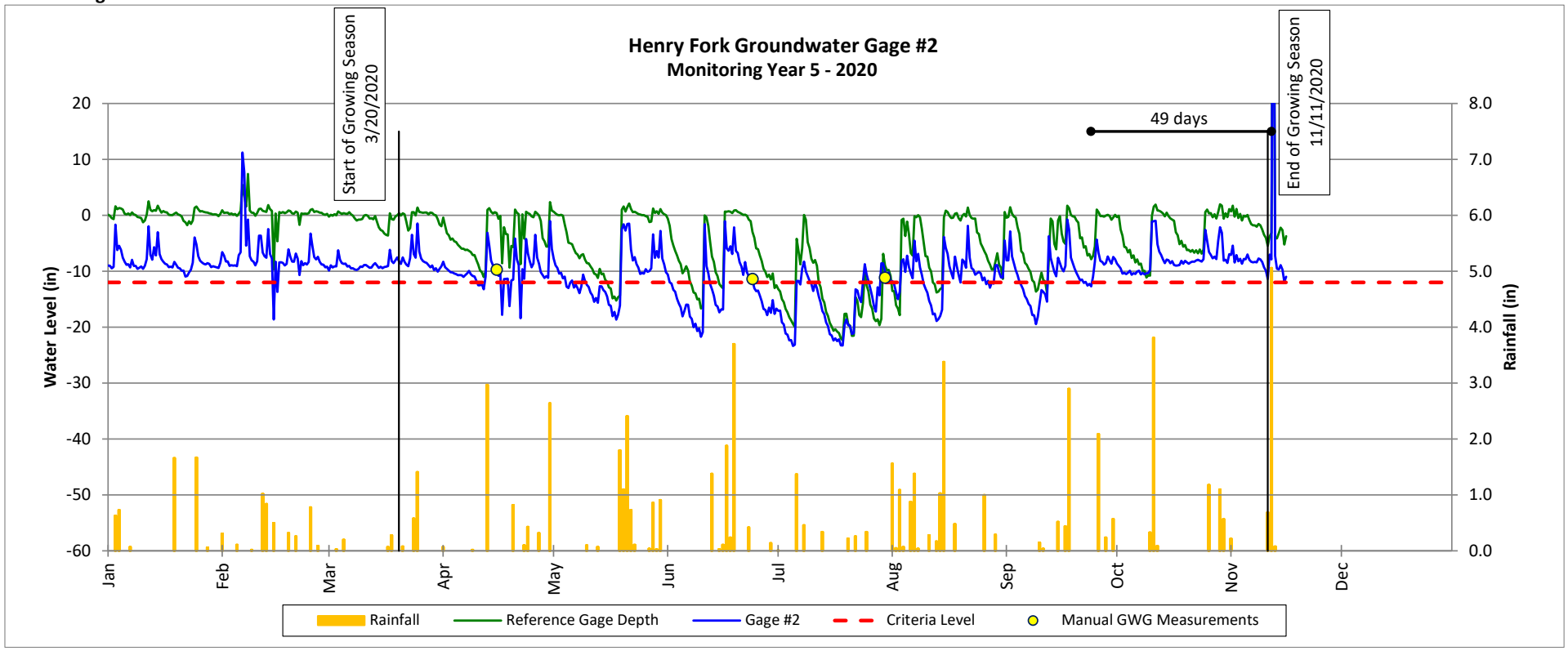
Groundwater Gage Plots

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020



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Henry Fork Mitigation Site

DMS Project No. 96306

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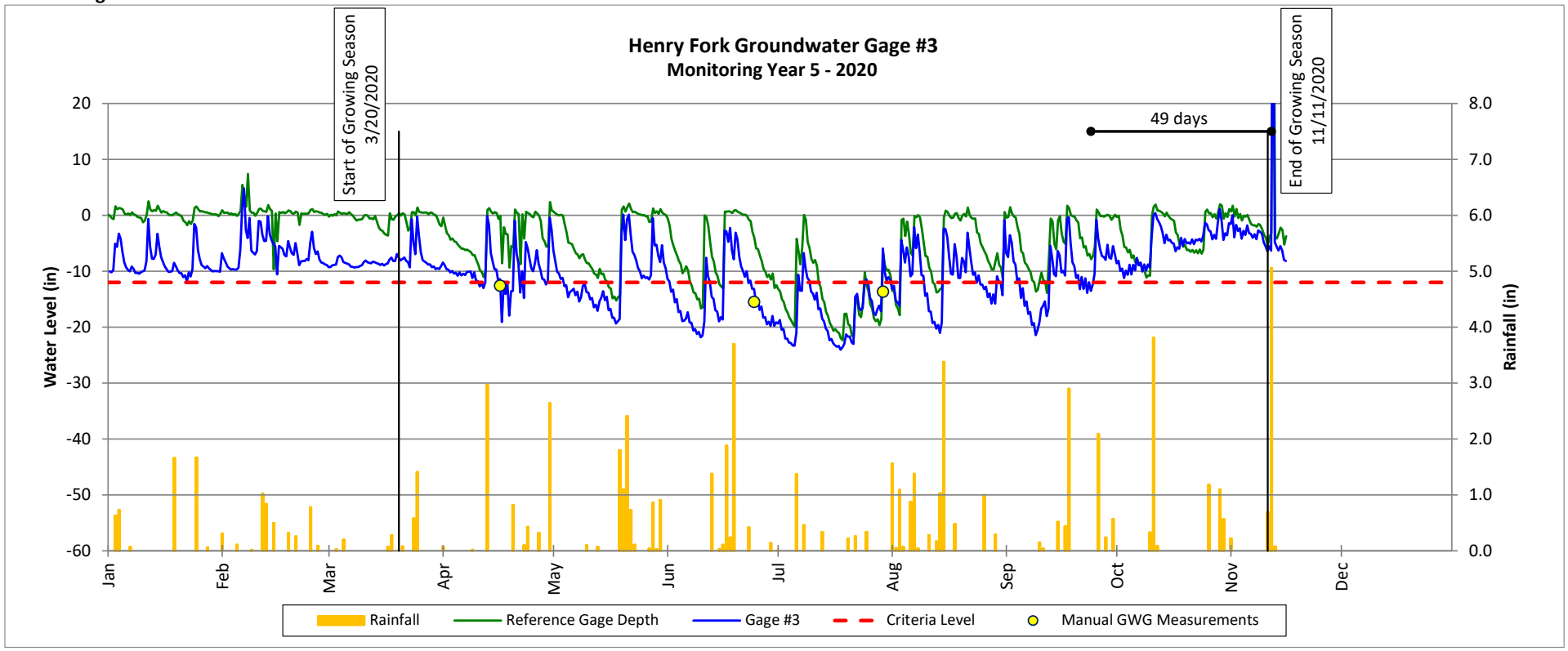

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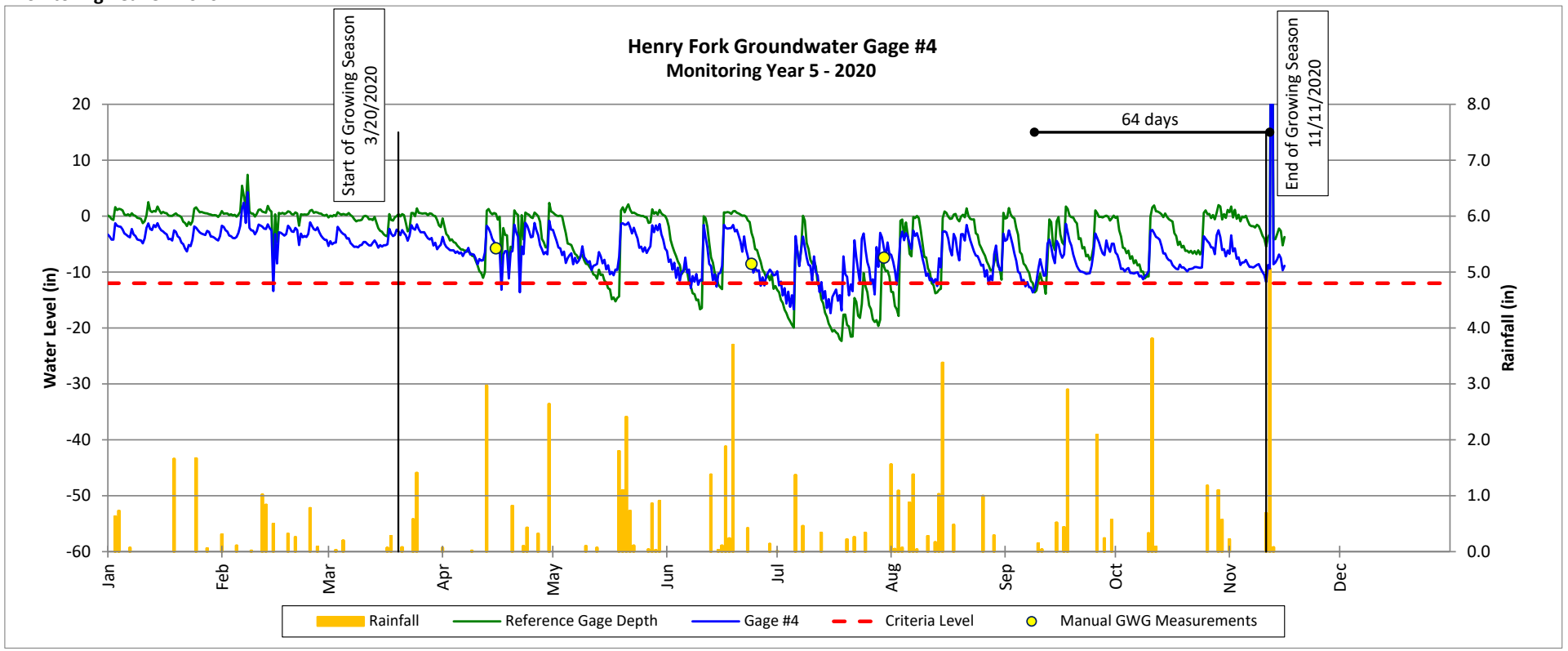

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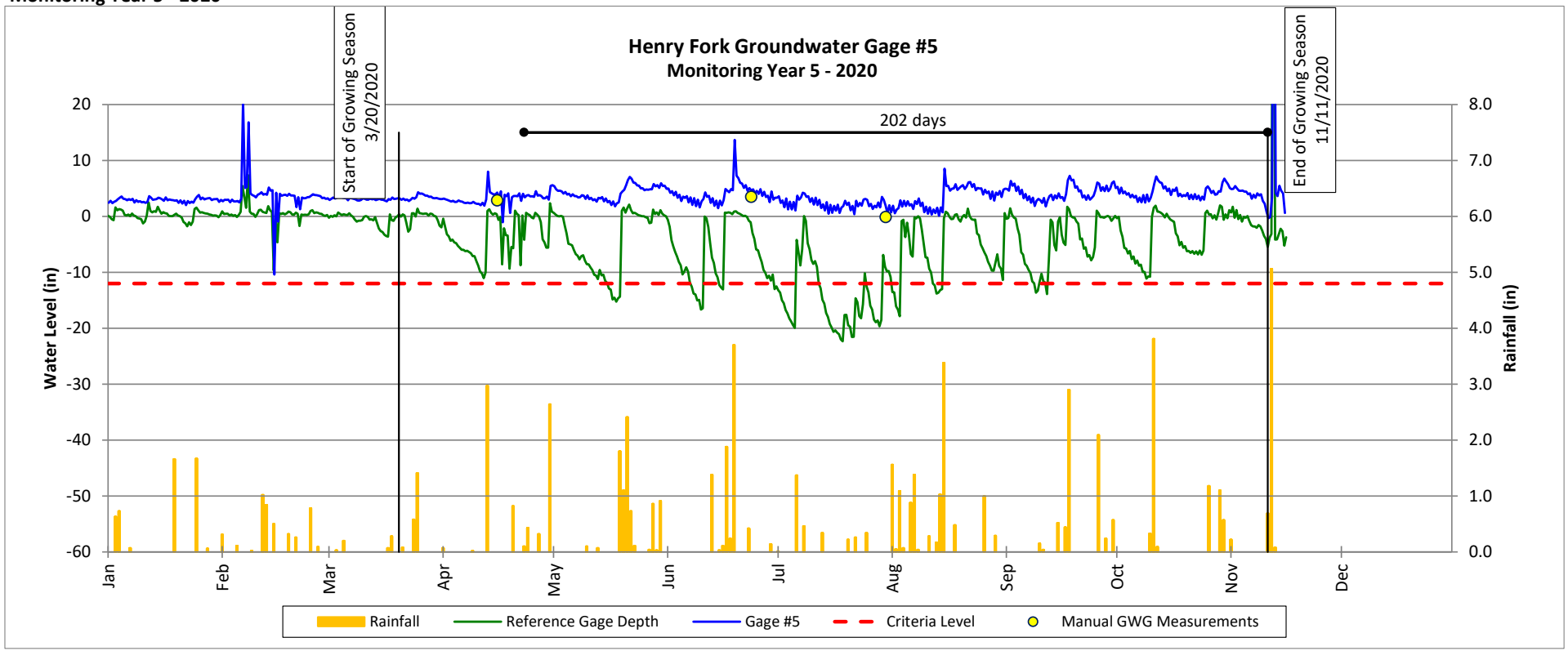
Groundwater Gage Plots

Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020



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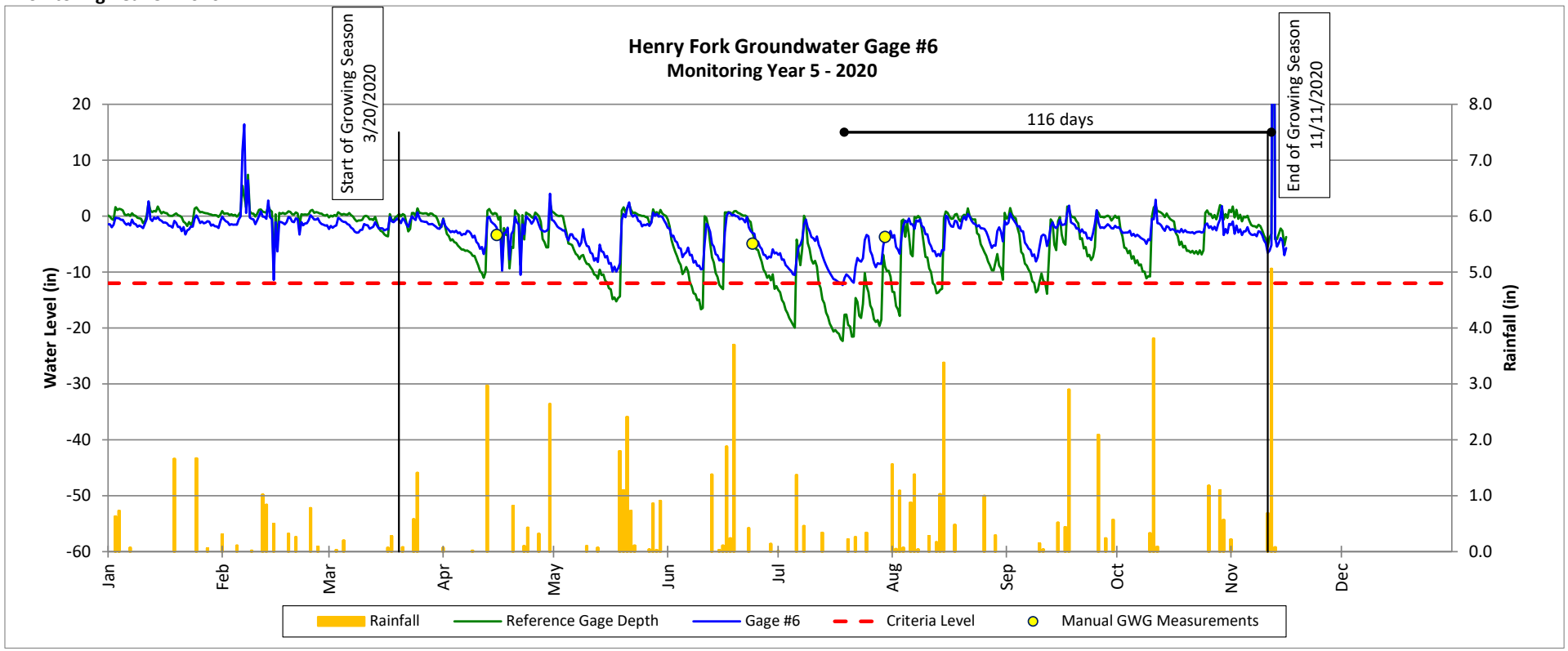
Henry Fork Mitigation Site

DMS Project No. 96306

Monitoring Year 5 - 2020



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Groundwater Gage Plots

Henry Fork Mitigation Site

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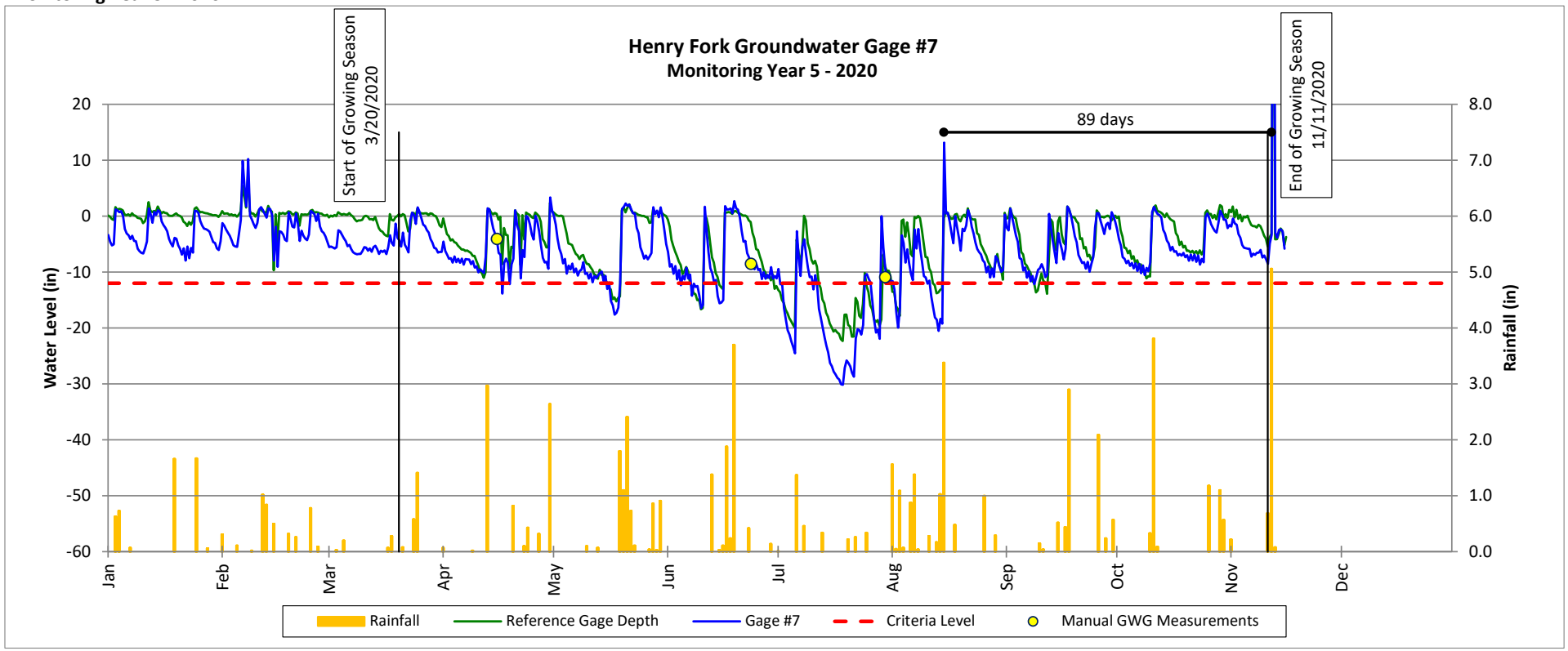

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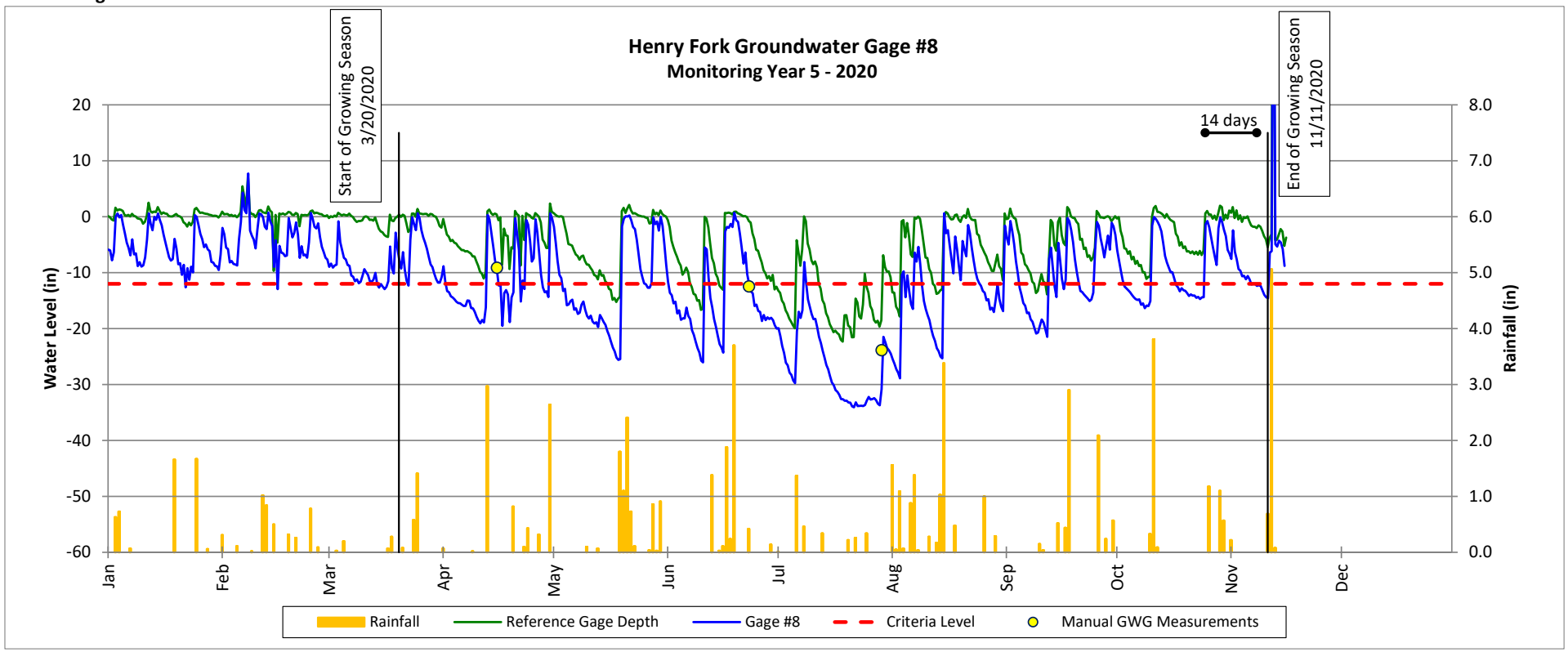

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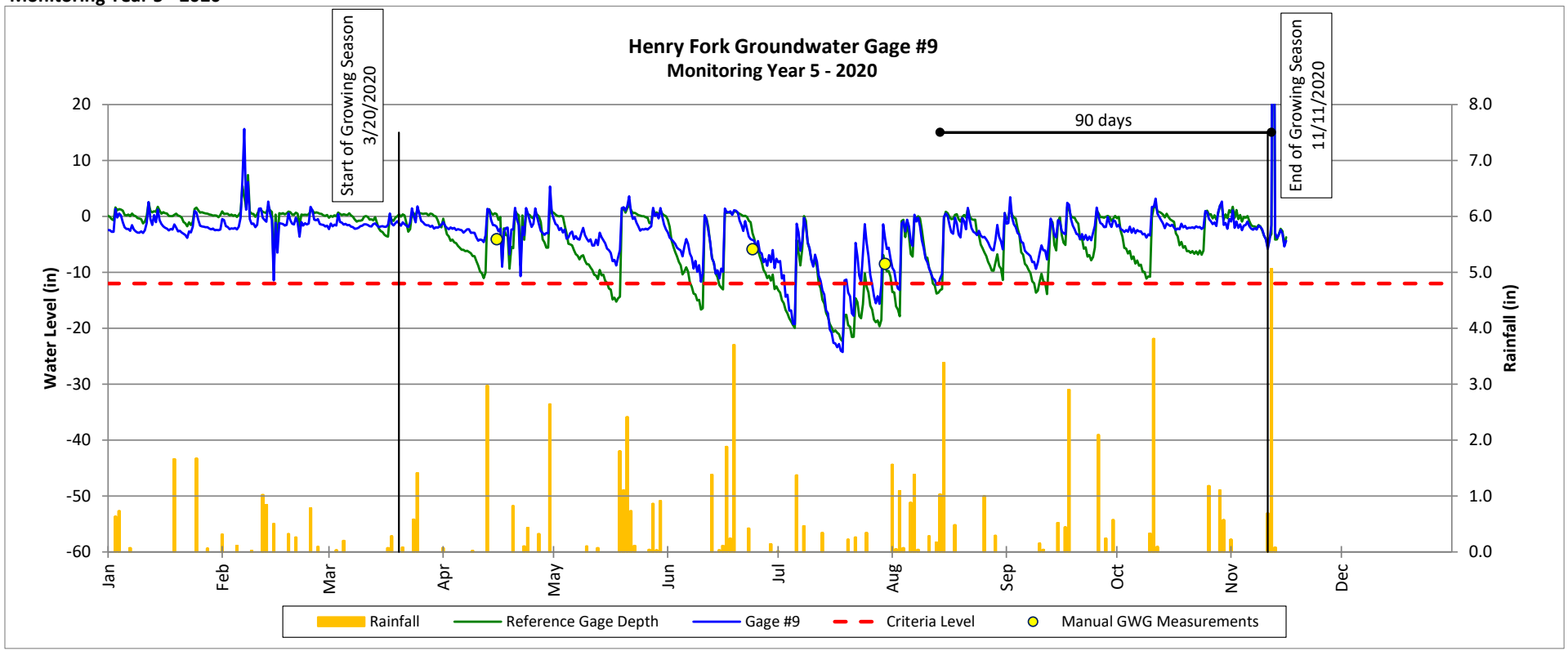

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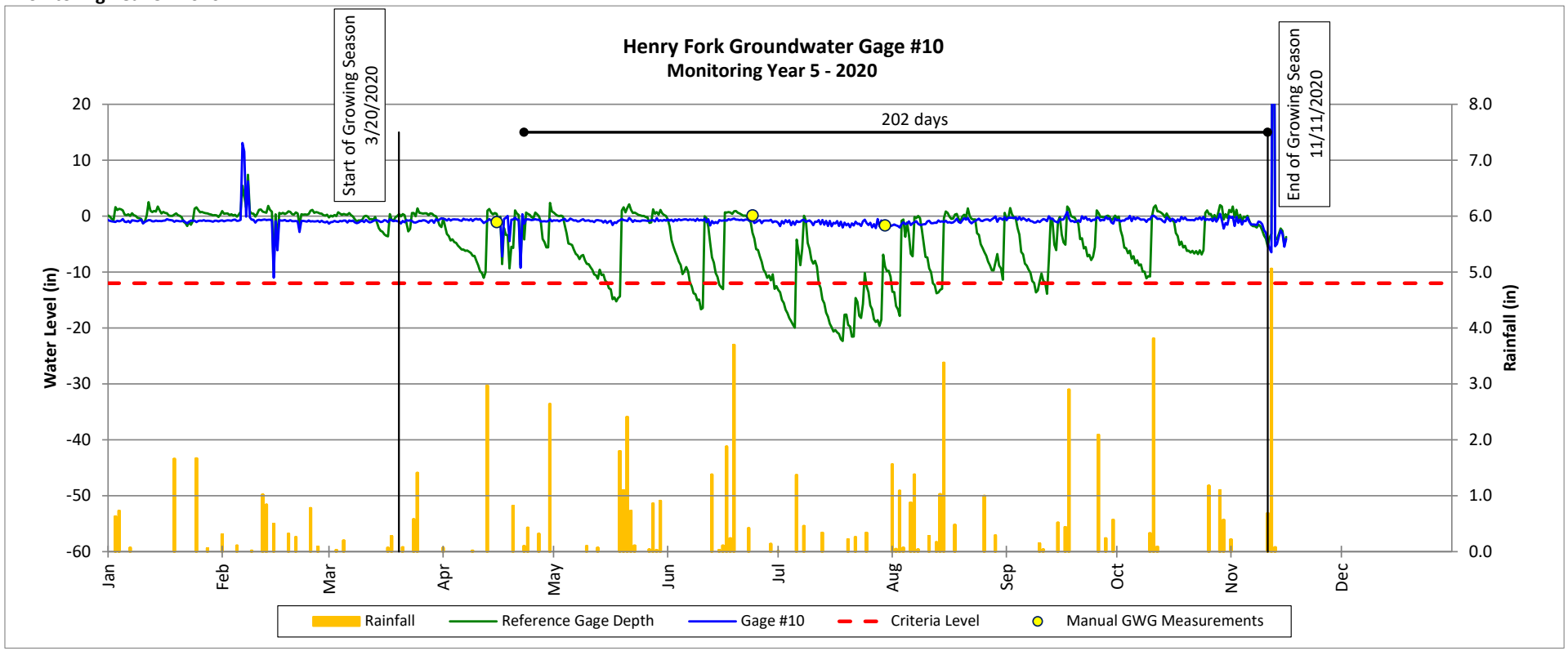

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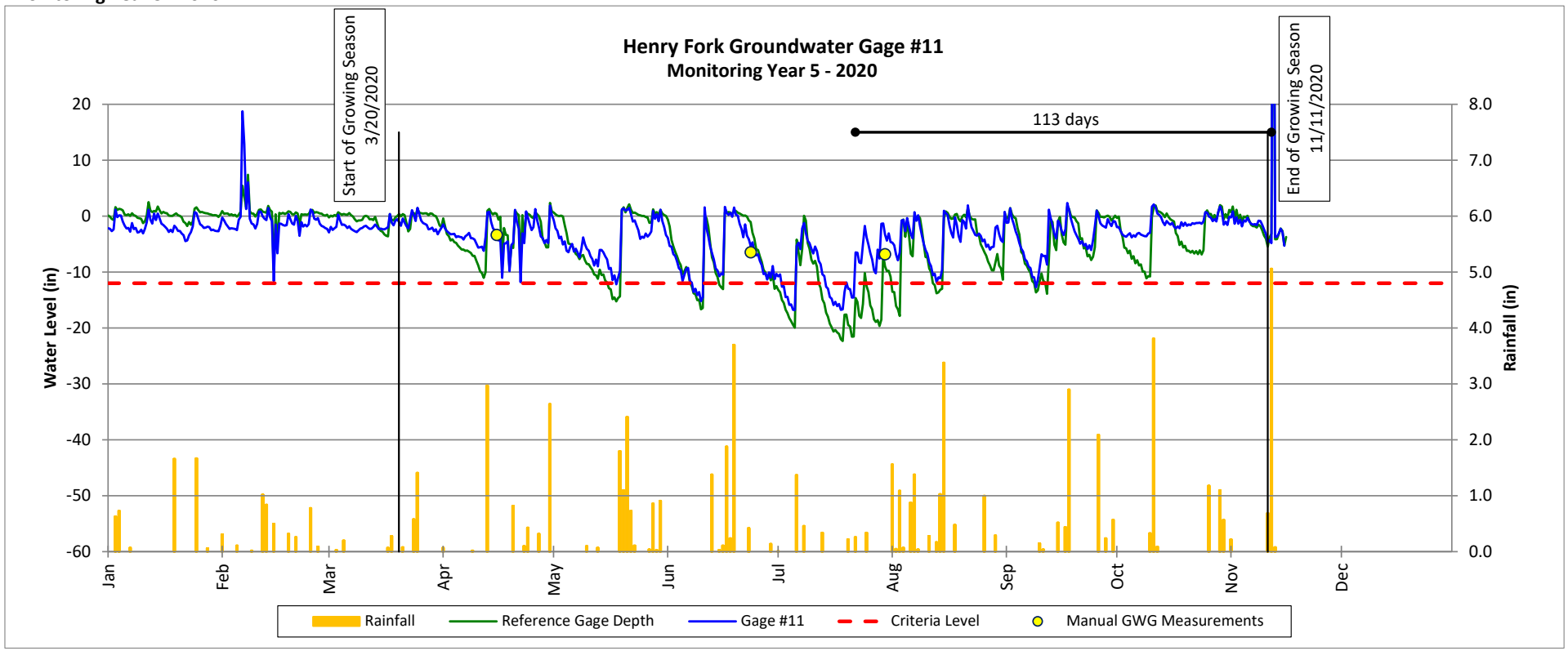

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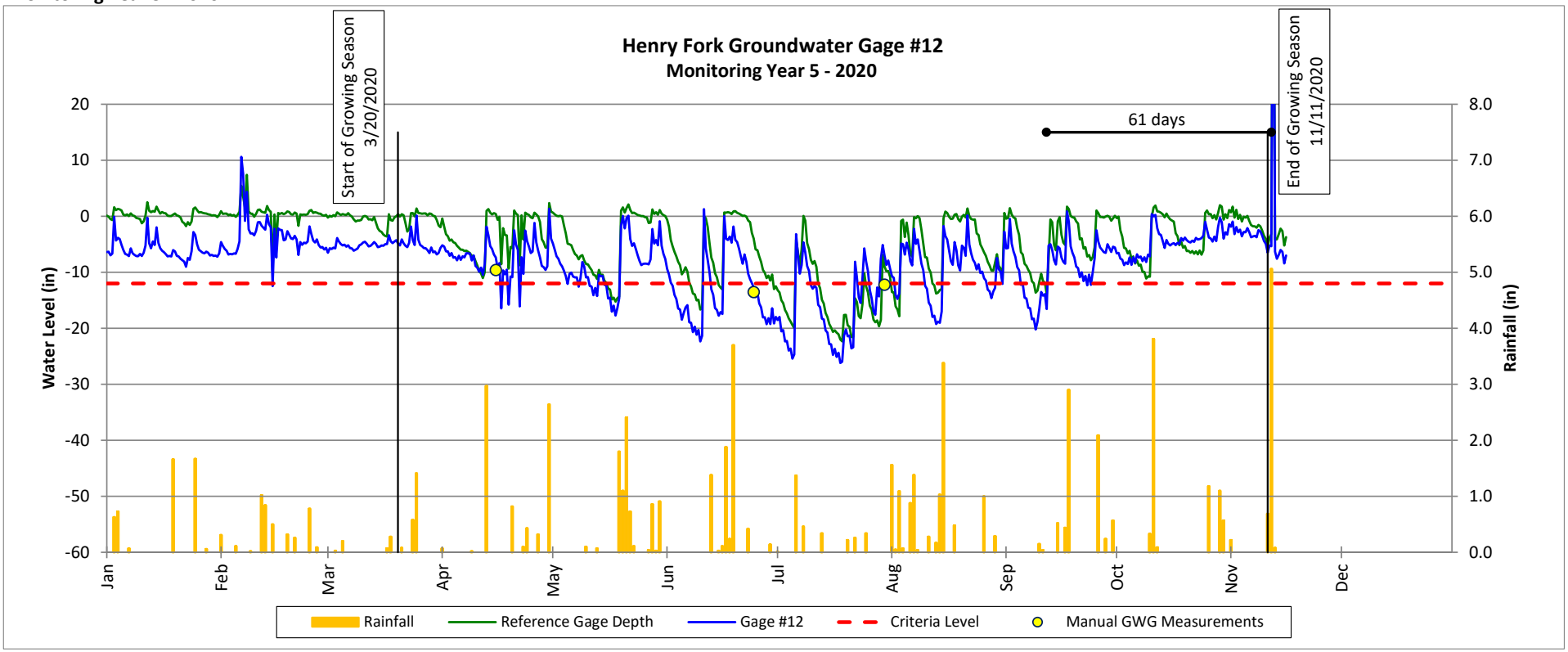

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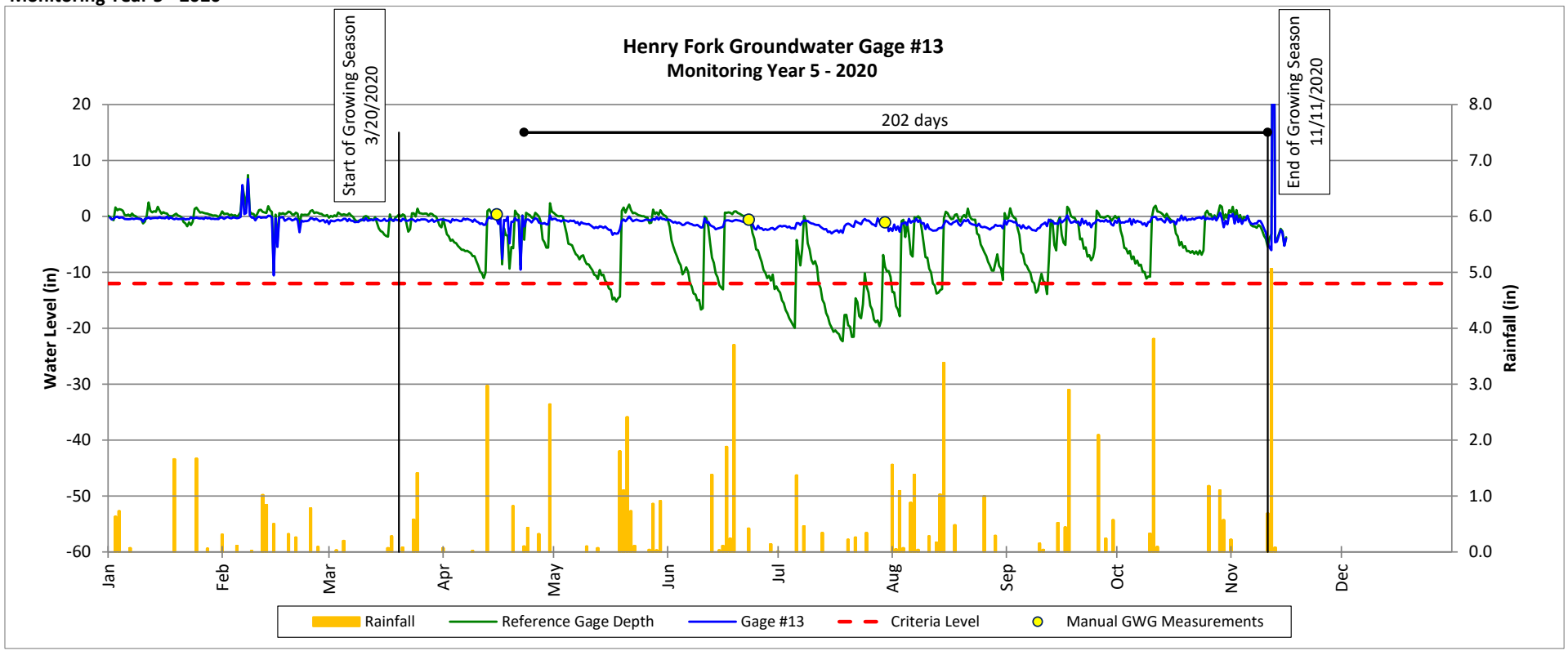

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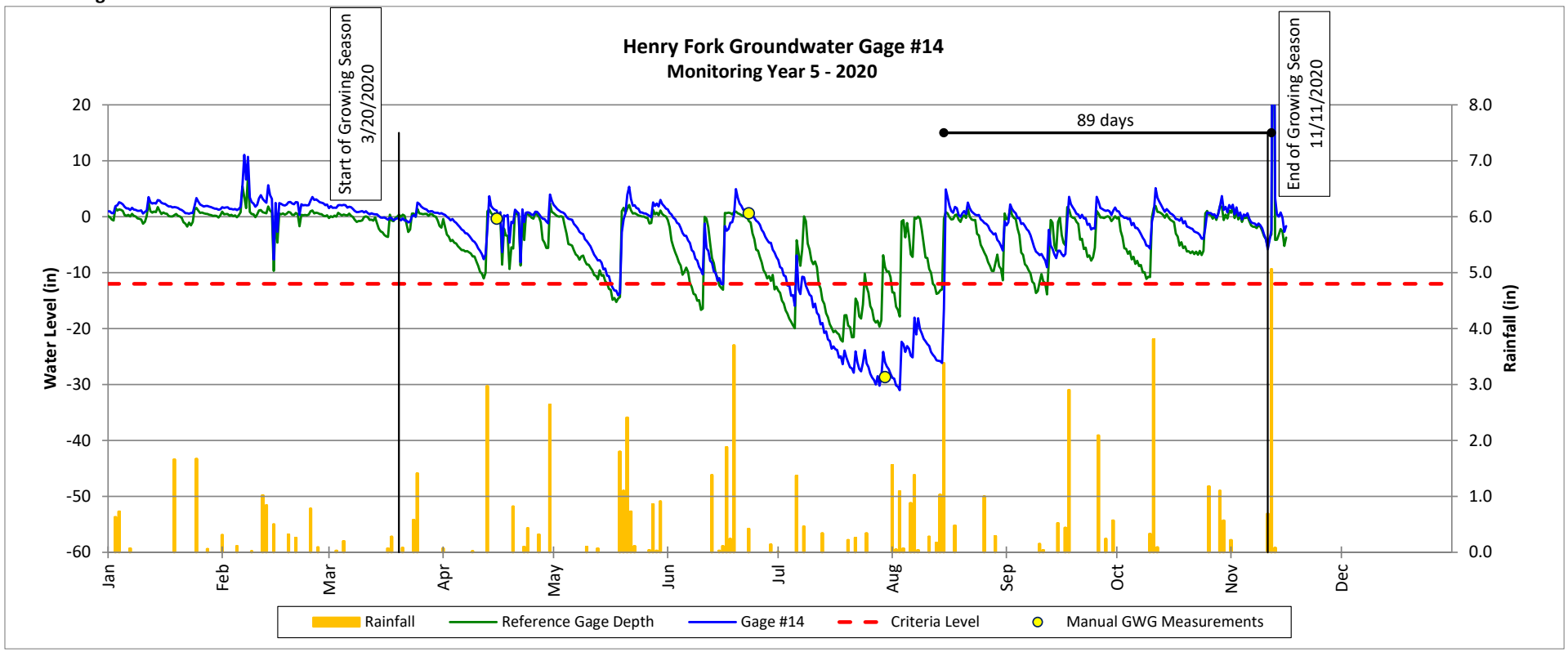

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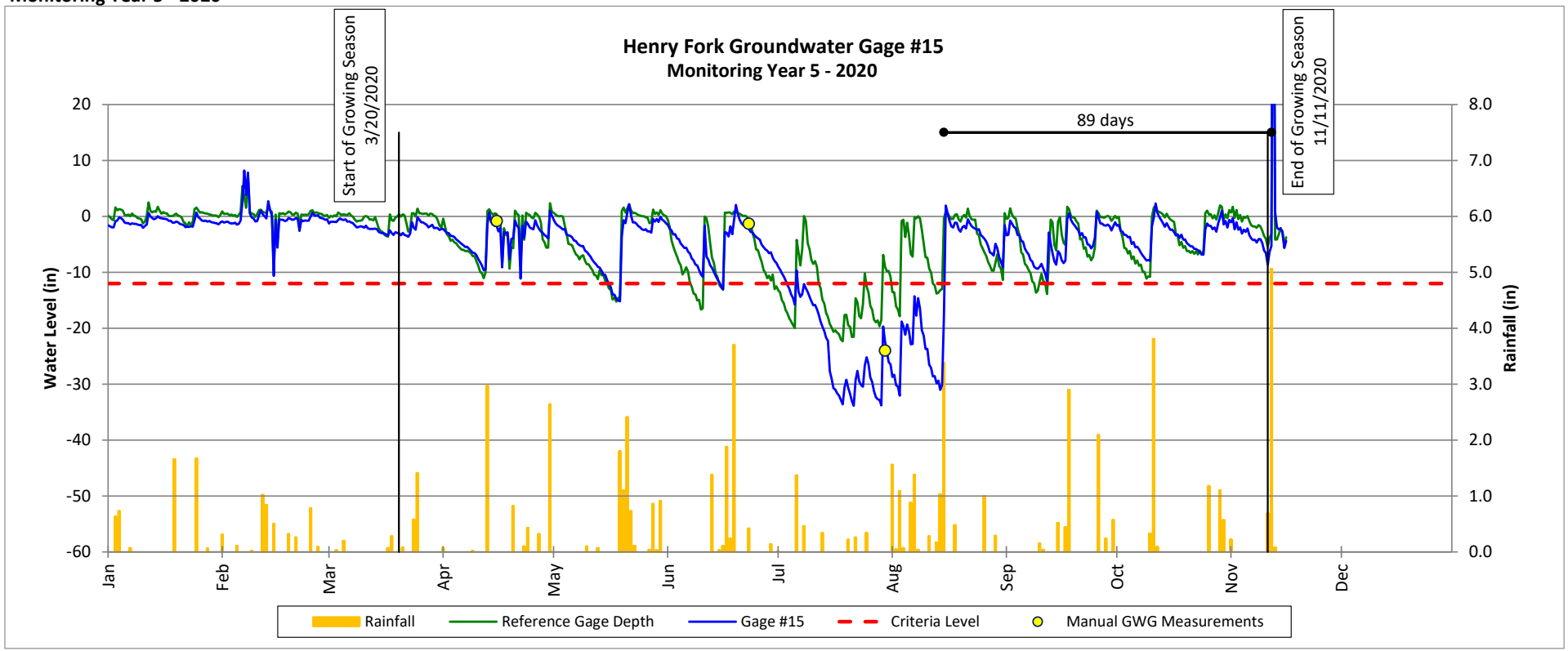

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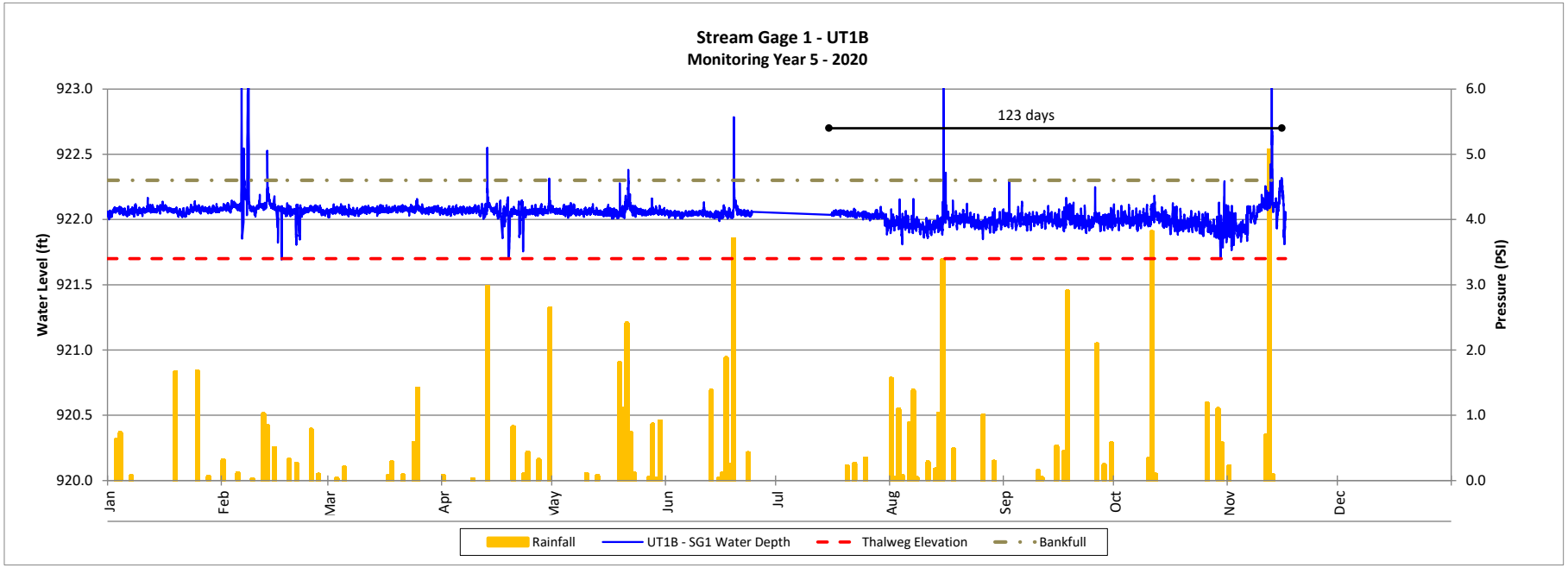
Stream Gage Plots

Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020



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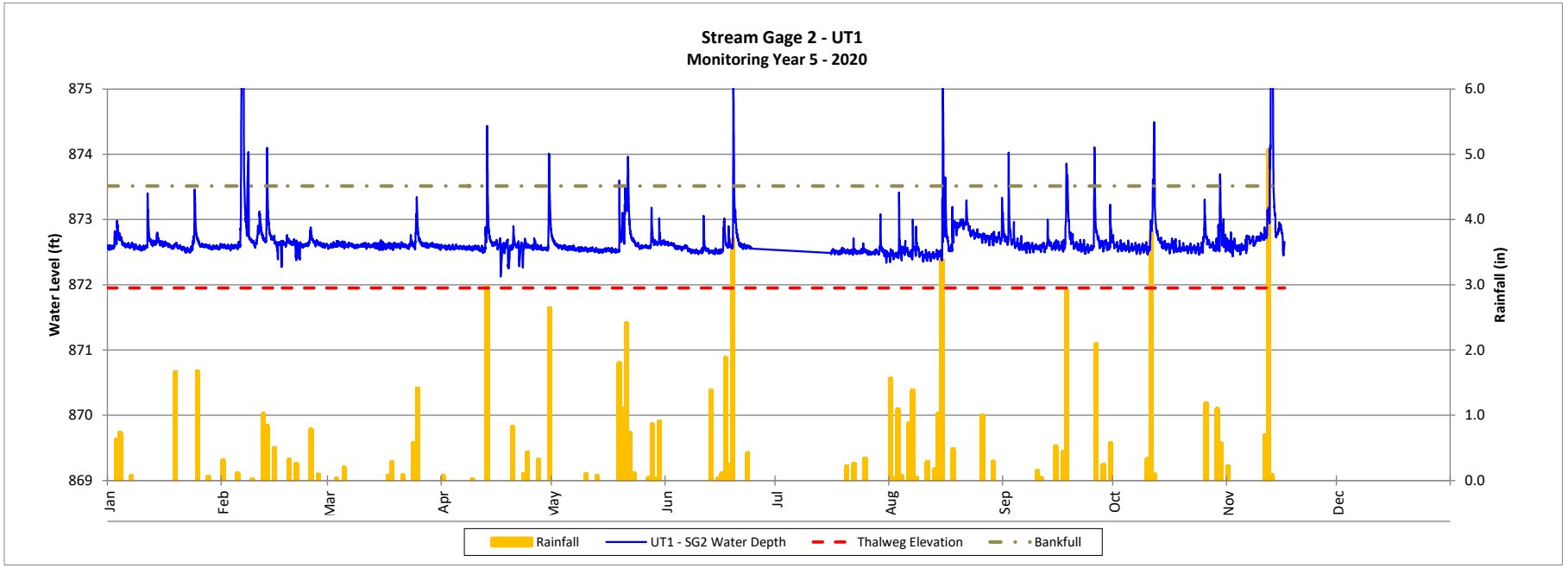

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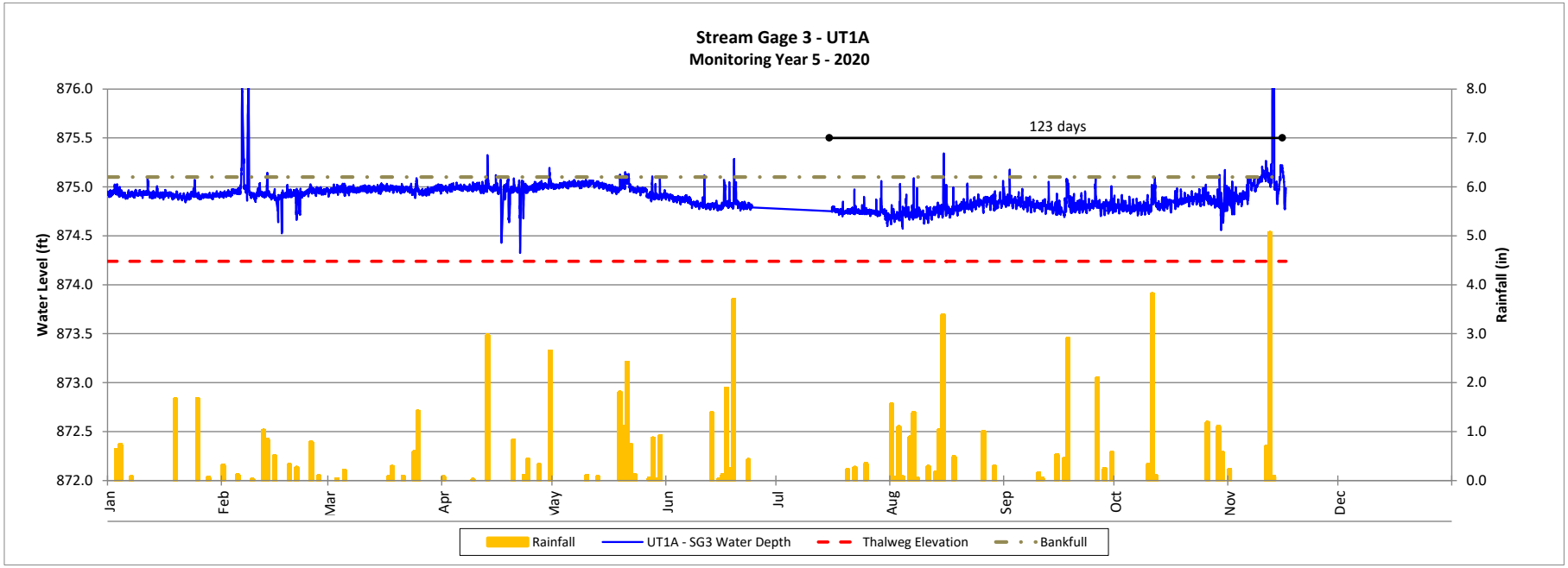

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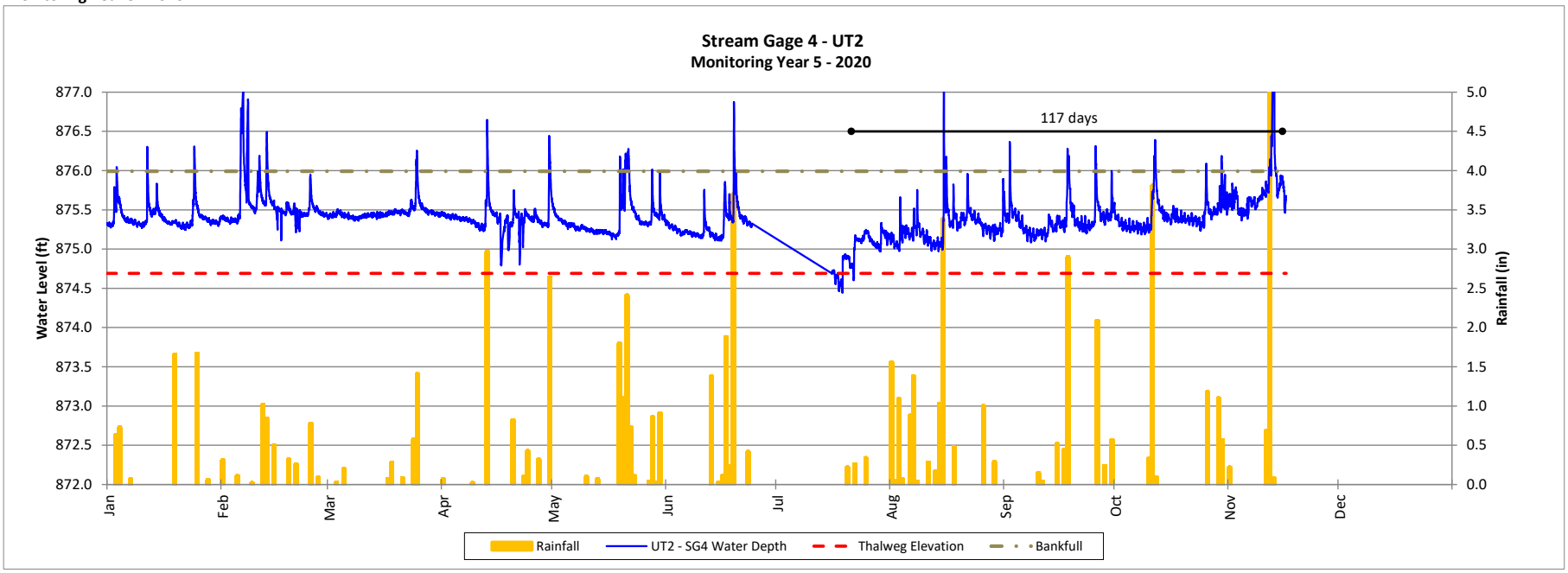

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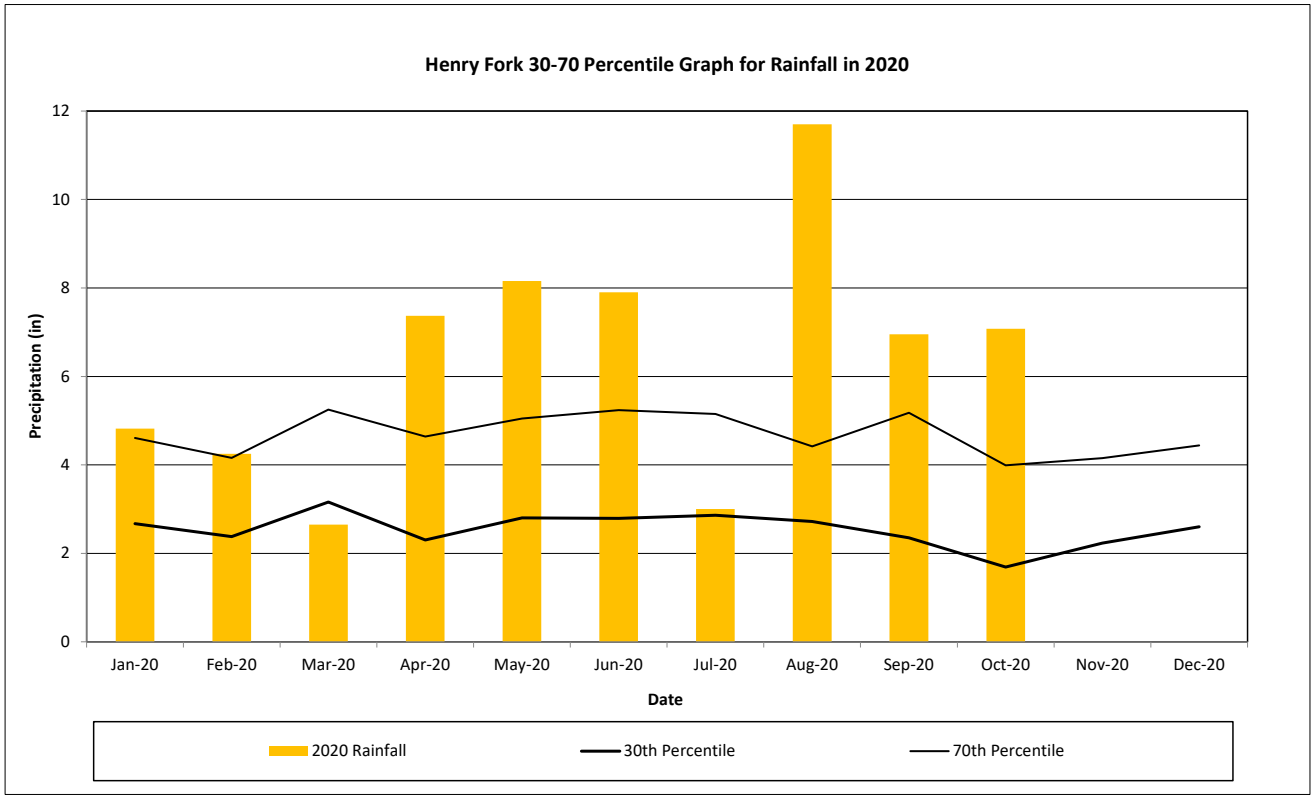
Monthly Rainfall Data

Henry Fork Mitigation Site
DMS Project No. 96306
Monitoring Year 5 - 2020



[1] 2020 rainfall collected by NC CRONOS Station Hickory 4.8 SW, NC

[2] 30th and 70th percentile rainfall data collected from WETS station Conover Oxford Shoal, NC

APPENDIX 6. Wetland Addendum

October 6, 2020

Mr. Matthew Reid
NCDEQ Division of Mitigation Services
5 Ravenscroft Drive
Suite 102
Asheville, NC 28801

Subject: Wetland Addendum
Henry Fork Mitigation Site
DMS Project No. 96303
DEQ Contract No. 005782
Catawba River Basin – HUC 03050103 Expanded Service Area
Catawba County, North Carolina

Dear Mr. Reid,

Wildlands Engineering, Inc. (Wildlands) conducted a wetland assessment in 2020, Monitoring Year (MY) 5 of 7, to identify additional potential wetland areas on the Henry Fork Mitigation Site (Site) that have been created by this project. Additional supplemental data including a potential wetland area table, map figure, groundwater gage plots, photo log, and wetland data sheets have been included with this addendum letter.

Background

In anticipation of additional wetlands created on the Site after construction, section 8.2 (Wetland Mitigation Credits) of the Henry Fork Mitigation Plan states: "DMS reserves the right to request additional wetland credits created by the project. Wetland credits will be proposed based upon additional gauge data and/or wetland delineation." Therefore, in February and March 2019 (MY4), three groundwater gages were installed in locations adjacent to credited wetland areas to provide groundwater data to support the potential expansion of wetland areas on the Site. The purpose of delineating these extra areas is to offset any wetland credits that may be at risk of losing credit. Wildlands is not, however, seeking additional wetland credit above the original asset table amount.

Wildlands defends and maintains a 7.2% (17 consecutive day) success criteria in the IRT approved Mitigation Plan but the USACE commented that a 8.5% (20 consecutive day) success criteria would be required. Wildlands updated the success criteria in the MY0 report. The final performance standard established for wetland hydrology will be a free groundwater surface within 12 inches of the ground surface for 20 consecutive days (8.5%) of the 236 day growing season (March 20 through November 11) under typical precipitation conditions.

Data Collection and Analysis

As stated above, three additional groundwater gages (GWG 13 – 15) were installed in February and March 2019 before the start of MY4 growing season, for the purpose of providing groundwater data to

document additional wetland areas. On June 23, 2020, Wildlands personnel performed a Site investigation to identify additional potential wetland areas on the Site. Five areas (Wetlands AA through EE) were delineated and mapped using global positioning system (GPS) data collection and three wetland data points (DP1 – 3) were collected. Please refer to the attached hydrologic data for groundwater gage plots and summary table of the success criteria for each gage on Site.

Wetlands AA, BB, and CC are located south of Wetland N enhancement area. Before construction and as a former golf course, this area was identified as a ditch with a linear wetland that fed into intermittent stream channel UT2. During construction, the outlet of the ditch was plugged thus raising the groundwater level and creating conditions for anaerobic wetland processes to occur. GWG 15 was installed in MY4 to be representative of the low area and to document hydrologic conditions for the proposed wetland areas south of wetland N. For two consecutive years, GWG 15 has achieved the wetland hydrologic success criteria established for the Site. Wetland data point 1 (DP1) documents the hydrology, vegetation, and soil conditions representative of Wetlands AA, BB, and CC.

Wetland DD is located in the footprint of a former golf course inline pond bed (pond 3) that was filled during construction. Before construction, UT1 flowed through pond 3 before making its way to the Henry Fork river. The restoration of UT1 realigned the stream channel and took pond 3 offline. The restored hydrology of UT1 has allowed for frequent overbank flooding of riparian wetland areas, thus expanding the hydrologic function into this area. GWG 1 was installed during the MY0 baseline data collection and is in close proximity to Wetland DD. GWG 1 has achieved the wetland hydrologic success criteria for the Site in MY2 through MY5 thus far. Wetland data point 2 (DP2) documents the hydrology, vegetation, and soil conditions representative of Wetland DD.

Wetland EE is located in and around the pre-construction footprint of UT1 near the previous UT1A confluence, adjacent to Wetlands J and K enhancement areas. The restoration of UT1A has increased the floodplain access from overbank flooding and resulted in a gain in wetland function well beyond the mapped wetland re-establishment area (Wetland 1). GWG 13 was installed in MY4 and has achieved wetland hydrologic success criteria for the past two years. Wetland data point 3 (DP3) was collected near GWG 13 and details the conditions of Wetland EE.

Wetland Credits

The combined area from Wetland AA through EE totals 0.661 acres. Pre-construction, these five areas were not wetlands and were not identified as such in the approved Jurisdictional Determination for the Site. Also, the additional wetland areas (AA – EE) were not identified as having hydric soils in the LSS soil report from the Mitigation Plan. Therefore, a creation credit ratio of 3:1 is proposed for all five wetland areas where a rise in groundwater elevations have created conditions necessary to support wetland conditions and promote wetland functions. In total, an additional 0.220 riparian wetland mitigation units (WMUs) are available to offset any wetland credits that may be determined to be at risk of losing credit. Please refer to the attached summary table of the additional wetland areas on the Site.

Conclusion

This wetland addendum summarizes the data collection and analysis of five proposed wetlands (Wetland AA – EE) that have been identified on the Site after construction was complete. Following DMS and IRT approval of this wetland addendum, Wildland's will document the additional wetland areas in

this year's annual monitoring report. It will be stated in the report that these additional areas are only to be used as offset if any existing wetland credits are found to be at risk.

Feel free to contact me at 828-545-3865 if you have any questions.

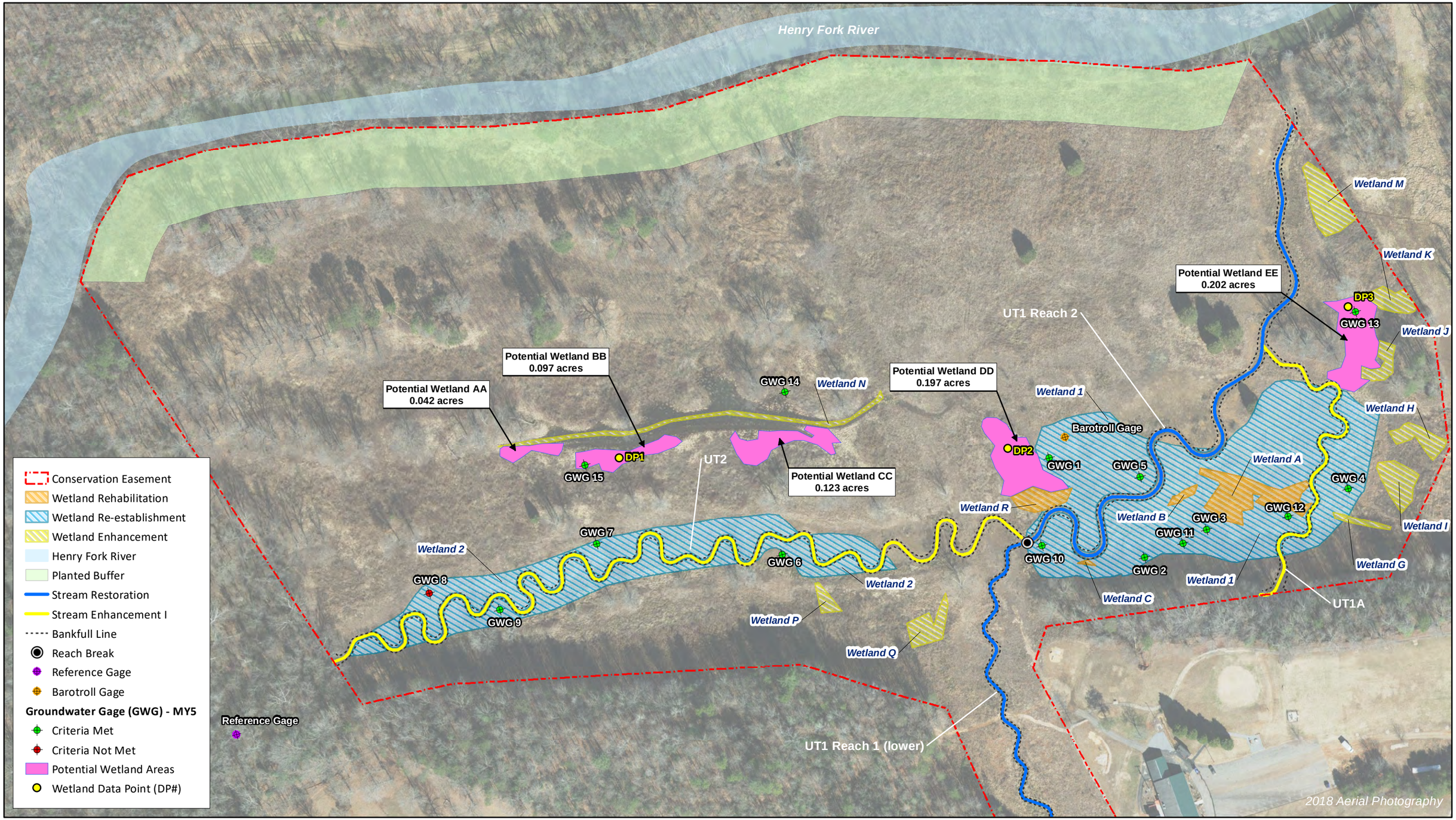
Thank you,

Jake McLean
Project Manager
jmclean@wildlandseng.com

Additional Potential Wetland Areas
Henry Fork Mitigation Site
DMS Project No.96306
Monitoring Year 5 - 2020

Wetland ID	Location	Existing Acreage	Approach	Restoration (R) or Restoration Equivalent (RE)	Restoration Acreage	Mitigation Ratio	Credits (WMU)
Wetland AA	Floodplain towards river from UT2	N/A	Creation of wetland functions that support hydrologic, vegetative, and wetland soils	Creation	0.042	3:1	0.014
Wetland BB	Floodplain towards river from UT2	N/A		Creation	0.097	3:1	0.032
Wetland CC	Floodplain towards river from UT2	N/A		Creation	0.123	3:1	0.041
Wetland DD	Floodplain in footprint of Pond 3 near head of UT1 Reach 2	N/A		Creation	0.197	3:1	0.066
Wetland EE	East hillslope near UT1 Reach 2	N/A		Creation	0.202	3:1	0.067
				Total	**0.661**		**0.220**

Map Figure



WILDLANDS ENGINEERING

0 150 300 Feet

Henry Fork Mitigation Site
Wetland Addendum
DMS Project No. 96306
Monitoring Year 5 - 2020

Catawba County, NC

Wetland Data Sheets

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Henry Fork Mitigation Site City/County: Catawba County Sampling Date: 6-23-20

Applicant/Owner: Wildlands Engineering, Inc State: NC Sampling Point: DP1

Investigator(s): Jordan Hessler & Mimi Caddell Section, Township, Range: N/A

Landform (hillside, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 35.703299 Long: -81.366247 Datum: NAD83

Soil Map Unit Name: Codorus Loam (CsA) & Hatboro Loam (HaA) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Vegetation and Hydrology indicators are strong in this area.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- x Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- x Inundation Visible on Aerial Imagery (B7)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes x	No ____	Depth (inches): 0
Water Table Present?	Yes x	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Ground water gage #15 is near data point 1. See gage data attached.

Remarks:
2.25" rain event 4 days prior to site visit.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP1

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Liquidambar styraciflua*	20	Yes	FAC
2. *Acer negundo*	10	Yes	FAC
3. *Acer rubrum*	5	No	FAC
4. *Betula nigra*	5	No	FACW
5.			
6.			
7.			
	40	=Total Cover	
50% of total cover: 20		20% of total cover:	8
Sapling/Shrub Stratum (Plot size: 15)			
1. *Acer rubrum*	5	Yes	FAC
2. *Acer negundo*	5	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
	10	=Total Cover	
50% of total cover: 5		20% of total cover:	2
Herb Stratum (Plot size: 5)			
1. *Juncus effusus*	30	Yes	FACW
2. *Carex longii*	30	Yes	OBL
3. *Carex lupulina*	30	Yes	OBL
4. *Solidago spp.*	5	No	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95	=Total Cover	
50% of total cover: 48		20% of total cover:	19
Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	35	x 2 =	70
FAC species	45	x 3 =	135
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	140 (A)		265 (B)

Prevalence Index = B/A = 1.89

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	7.5YR 4/3	80	10YR 5/2	20	D	M	Loamy/Clayey	
8-14	7.5YR 4/3	50	10YR 5/2	50	D	M	Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- X Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Soils look to be transitioning to wetland soils.

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Henry Fork Mitigation Site City/County: Catawba County Sampling Date: 6-23-20

Applicant/Owner: Wildlands Engineering, Inc State: NC Sampling Point: DP2

Investigator(s): Jordan Hessler & Mimi Caddell Section, Township, Range: N/A

Landform (hillside, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 35.702921 Long: -81.364125 Datum: NAD83

Soil Map Unit Name: Codorus Loam (CsA) & Hatboro Loam (HaA) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes x	No ____	Depth (inches): 5
Water Table Present?	Yes x	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Ground water gage #1 is near data point 2. See gage data attached

Remarks:
2.25" rain event 4 days prior to site visit.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP2

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus serrulata*	10	Yes	OBL
2. *Betula nigra*	5	Yes	FACW
3. *Platanus occidentalis*	5	Yes	FACW
4.			
5.			
6.			
7.			
	20	=Total Cover	

50% of total cover: 10 20% of total cover: 4

Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	

50% of total cover: 20% of total cover:

Herb Stratum (Plot size: 5)			
1. *Leersia oryzoides*	60	Yes	OBL
2. *Carex lupulina*	10	No	OBL
3. *Juncus effusus*	10	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80	=Total Cover	

50% of total cover: 40 20% of total cover: 16

Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	

50% of total cover: 20% of total cover:

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	80	x 1 =	80
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		120 (B)

Prevalence Index = B/A = 1.20

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/3	70	7.5YR 4/6	30	C	M	Loamy/Clayey	Prominent redox concentrations
6-14	7.5YR 3/4	90	10YR 4/2	10	D	M	Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- x Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Abrupt change in soil color at 6".

U.S. Army Corps of Engineers

WETLAND DETERMINATION DATA SHEET – Eastern Mountains and Piedmont Region

See ERDC/EL TR-07-24; the proponent agency is CECW-CO-R

OMB Control #: 0710-xxxx, Exp: Pending
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Henry Fork Mitigation Site City/County: Catawba County Sampling Date: 6-23-20

Applicant/Owner: Wildlands Engineering, Inc State: NC Sampling Point: DP3

Investigator(s): Jordan Hessler & Mimi Caddell Section, Township, Range: N/A

Landform (hillside, terrace, etc.): floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1

Subregion (LRR or MLRA): LRR P, MLRA 136 Lat: 35.703183 Long: -81.362086 Datum: NAD83

Soil Map Unit Name: Hatboro Loam (HaA) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X	No ____	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water-Stained Leaves (B9)
- ____ Aquatic Fauna (B13)
- ____ True Aquatic Plants (B14)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres on Living Roots (C3)
- X Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Thin Muck Surface (C7)
- ____ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ____ Surface Soil Cracks (B6)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Drainage Patterns (B10)
- ____ Moss Trim Lines (B16)
- ____ Dry-Season Water Table (C2)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes x	No ____	Depth (inches): 2
Water Table Present?	Yes x	No ____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes x	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
Ground water gage #13 is near data point 3. See gage data attached

Remarks:
2.25" rain event 4 days prior to site visit.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP3

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix nigra*	10	Yes	OBL
2. *Betula nigra*	5	Yes	FACW
3. *Alnus serrulata*	5	Yes	FACW
4. *Platanus occidentalis*	5	Yes	FACW
5.			
6.			
7.			
	25	=Total Cover	
50% of total cover: 13		20% of total cover: 5	

Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 5)			
1. *Juncus effusus*	60	Yes	FACW
2. *Carex lupulina*	10	No	OBL
3. *Sagittaria latifolia*	10	No	OBL
4. *Typha latifolia*	10	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90	=Total Cover	
50% of total cover: 45		20% of total cover: 18	

Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
		=Total Cover	
50% of total cover:		20% of total cover:	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	75	x 2 =	150
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	115 (A)		190 (B)

Prevalence Index = B/A = 1.65

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: DP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/1	95	7.5YR 4/6	5	RM	M	Loamy/Clayey	Mica flakes mixed in
8-14	2.5YR 3/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Mucky Mineral (F1) **(MLRA 136)**
- ___ Loamy Gleyed Matrix (F2)
- x Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 122, 136)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147, 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (F21) **(outside MLRA 127, 147, 148)**
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Wetland Photographs

Potential Wetland AA – northern view *(6/23/2020)*

DP1/Potential Wetland BB – eastern view *(6/23/2020)*

Potential Wetland CC – western view (*6/23/2020)*

DP2/Potential Wetland DD – northern view *(6/23/2020)*

Potential Wetland DD – southern view *(6/23/2020)*

DP3/GWG 13/Potential Wetland EE – southwest view

Potential Wetland EE – southern view *(6/23/2020)*

From Mitigation Plan:

Jurisdictional Determination

Hydric Soil Evaluation September 9, 2013 (Proposal Phase)

Hydric Soil Investigation May 13, 2014 (Design Phase)

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action ID: 2014-00538 County: Catawba U.S.G.S. Quad: Hickory

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: WEI – Henry Fork, LLC / Attn.: Shawn Wilkerson
Address: 1430 South Mint Street, Suite 104
Charlotte, NC 28203
Telephone Number: 704-332-3306

Size (acres): 48 Nearest Town: Hickory
Nearest Waterway: UTs to Henry Fork and Henry Fork Coordinates: 35.703751 N, 81.364880 W
River Basin/ HUC: South Fork Catawba (03050102)

Location description: The site is located on a tract of land (parcel ID 279108883819) which was a part of the former Henry River Golf Course at 2575 Mountain View Road in Hickory, Catawba County North Carolina.

Indicate Which of the Following Apply:

A. Preliminary Determination

_ Based on preliminary information, there may be wetlands on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X There are waters of the U.S. including wetlands on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

X The waters of the U.S. including wetlands on your property have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on _____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described project area which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management to determine their requirements.

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://regulatory.usacesurvey.com/.

Copy furnished:
Wildlands Engineering, Inc., Attn.: Ian Eckardt, 1430 South Mint Street, Suite 104, Charlotte, NC 28203

NCDENR – Ecosystem Enhancement Program, Attn.: Paul Wiesner, 5 Ravenscroft Drive, Suite 102, Asheville, NC 28801

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division,** **Attn: David Brown** **828-271-7980**	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

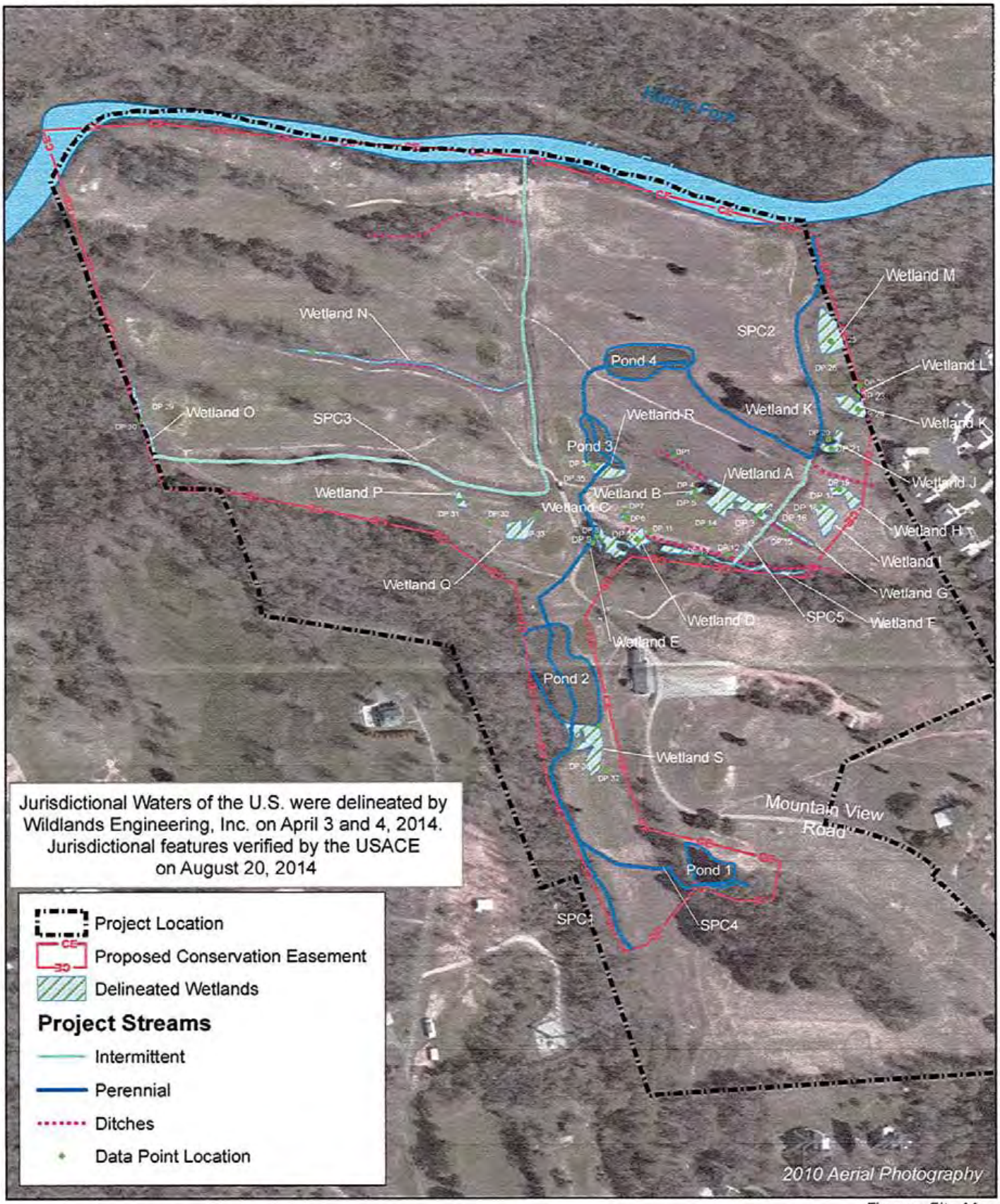
_____ Signature of appellant or agent.	Date:	Telephone number:

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, Attn.: David Brown, 69 Darlington Avenue, Wilmington, North Carolina 28403

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Jason Steele, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801 Phone: (404) 562-5137



WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3 Site Map
Henry Fork Stream & Wetland Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

Table 1. Henry Fork Stream and Wetland Mitigation Project

Summary of On-Site Jurisdictional Waters

Jurisdictional Feature	Classification	Length (LF)*	Acreage	Watershed (ac)	NCDWQ Stream Scores	USACE Stream Scores
UT1	Perennial RPW	3,071	-	130	39.5/32.5	54/44
UT1A	Intermittent RPW	353	-	23	27.25	49
UT1B	Perennial RPW	491	-	31	31.25	49
UT2	Intermittent RPW	1,945	-	66	27	43
Wetland A	Headwater Forest	-	0.182	-	-	-
Wetland B	Headwater Forest	-	0.013	-	-	-
Wetland C	Headwater Forest	-	0.003	-	-	-
Wetland D	Headwater Forest	-	0.094	-	-	-
Wetland E	Headwater Forest	-	0.004	-	-	-
Wetland F	Headwater Forest	-	0.067	-	-	-
Wetland G	Headwater Forest	-	0.021	-	-	-
Wetland H	Headwater Forest	-	0.056	-	-	-
Wetland I	Headwater Forest	-	0.078	-	-	-
Wetland J	Headwater Forest	-	0.036	-	-	-
Wetland K	Headwater Forest	-	0.062	-	-	-
Wetland L	Headwater Forest	-	0.003	-	-	-
Wetland M	Headwater Forest	-	0.131	-	-	-
Wetland N	Headwater Forest	-	0.084	-	-	-
Wetland O	Headwater Forest	-	0.028	-	-	-
Wetland P	Headwater Forest	-	0.023	-	-	-
Wetland Q	Headwater Forest	-	0.069	-	-	-
Wetland R	Non-tidal Freshwater Marsh	-	0.059	-	-	-
Wetland S	Non-tidal Freshwater Marsh	-	0.159	-	-	-
Pond 1**	-	-	0.20	-	-	-
Pond 2**	-	-	0.81	-	-	-
Pond 3**	-	-	0.20	-	-	-
Pond 4**	-	-	0.37	-	-	-

*Linear footage includes stream length through ponds.

**Ponds are manmade impoundments and prior discussion with Corps indicates that they will be treated as streams for quantification of impacts.

HYDRIC SOIL EVALUATION

FOR THE PROPOSED HENRY RIVER MITIGATION SITE

CATAWBA COUNTY, NORTH CAROLINA

Prepared for:

Wildlands Engineering, Inc.

Prepared by:

Jason A. Payne
NC Licensed Soil Scientist #1308

September 9, 2013

TABLE OF CONTENTS

PURPOSE OF REPORT

This report has been prepared to assist Wildlands Engineering during planning and design for the proposed mitigation site located at the Henry River Golf Course in Catawba County, NC. A detailed evaluation was conducted to characterize soils across the site, with a focus on identifying hydric soils.

SITE LOCATION

The site is located on an approximately 90-acre property, southwest of the intersection of Highway 321 and Interstate 40, at 2575 Mountain View Road (Parcel# 279108883819), in Hickory, NC. The evaluation area is situated in the floodplain of, and south of the Henry Fork River, north of the terminus of Mountain View Road.

METHODOLOGY

The hydric soil evaluation began with a cursory review of NRCS soils maps, recent aerial photos and a USGS topographic map for the area. The site analysis was performed on July 25, 2013. Soil auger borings were advanced throughout the study area. The hydric soil status at each location was noted, and is based upon the NRCS Field Indicators of Hydric Soils in the United States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010). During the site evaluation, each soil boring was assigned to one of four different soil types or units:

- Soil Unit 1 (S1) – Hydric, relatively undisturbed
- Soil Unit 2 (S2) – Hydric soil that has been buried, with hydric indicators in the fill material
- Soil Unit 3 (S3) – Hydric soil that has been buried. Fill material is non-hydric
- Soil Unit 4 (S4) – Non-hydric soil (no evidence of buried hydric soil)

Following the site investigation, field data were compiled to prepare the hydric soil map for the project.

FINDINGS

Evidence of anthropogenic site manipulation is abundant throughout the study area. One finds much evidence of ditching and/or channelization of streams across the site. Additionally, fill material has been placed over a majority of the floodplain area during past construction for the golf course. The soil beneath is generally undisturbed.

The Soil Units are briefly discussed below and representative soil profile descriptions using the USDA‐NRCS standard nomenclature are appended for hydric soil areas S1, S2 & S3. The attached "Henry River Project Hydric Soils Evaluation" map illustrates the approximate location of soil borings and soil map units across the site. Two, separate hydric soil areas were mapped during the evaluation. The western hydric soil area occupies approximately 1.49-acres, and consists only of S2

and S3 borings. The eastern hydric soil area occupies 3.03-acres, and consists of S1, S2 and S3 borings.

Soil Unit 1 (S1) – Hydric Soil

Soils in this area had no fill material and generally had typical diagnostic soil horizons. While several hydric soil indicators were present, indicator F3 was the most common.

Indicator F3 - Depleted Matrix. A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or

b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.

This soil typically had a silt loam textured surface horizon that ranged from 4 to 8 inches with oxidized rhizoshperes present. The subsurface textures were generally clay loam, grading to silty clay, with a matrix color of chroma 2 or less.

Soil Unit 2 (S2) – Hydric Fill Over Hydric Soil

Soil Unit 2 had fill material deposited during construction of the golf course. The soil beneath the fill was relatively undisturbed. Depth of fill was variable, but ranged from 6-to-12-inches. The buried soil had a loam textured surface horizon underlain by either loam, clay loam, or sandy clay loam subsurface horizons and met hydric indicator F3 Depleted Matrix.

Here, the affects of hydrologic manipulation on the site are less pronounced and fill material has been on-site long enough to develop hydric indicators. While some of the fill material may have been hydric in origin (deposited from adjoining wetland or dredge from the ditches), most fill material was sourced from upland areas. There was evidence of active reduction and oxidation reactions in all borings. The soil either met indicator F3 Depleted Matrix or F6;

Indicator F6 - Redox Dark Surface. A layer that is at least 10 cm (4 inches) thick, is entirely within the upper 30 cm (12 inches) of the mineral soil, and has:

a. Matrix value of 3 or less and chroma of 1 or less and 2 percent or more distinct or prominent redox concentration occurring as soft masses or pore lining, or

b. Matrix value of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

Soil Unit 3 (S3) – Non-Hydric Fill Over Hydric Soil

Soil Unit 3 clearly had fill material deposited during construction of the golf course. The soil beneath the fill was relatively undisturbed. Depth of fill was quite variable, but ranges from 12-to-26-inches. The buried soil had a silty clay loam surface horizon underlain by clay, silty clay or clay loam subsurface horizons. These areas met hydric indicator F3 - Depleted Matrix. While there was some evidence of recent reduction and oxidations reactions within some fill, it did not meet any of the hydric indicators.

Soil Unit 4 (S4) – No Evidence of Buried Hydric Soil

Most of Soil Unit 4 evidenced fill material, but in all cases neither the fill material nor the original soil met any hydric soil indicators within a depth reasonable for remediation. For example, some borings exhibited fill depths of greater than 36-inches, and were terminated. Since these areas contained mostly fill material without hydric soil indicators, a representative soil profile description was omitted.

CONCLUSION

This report presents information that may be used as reference for planning and design for the proposed work at the Henry River Mitigation site. Specifically, soil borings provide evidence of areas where hydric soils are either present or present below fill material. Soil units for each of these areas were delineated on the attached map. The site hydrology has been altered by ditching and/or channelization of streams and the addition of the fill material. Subsequently, opportunities exist for wetland restoration. These findings represent a professional opinion based on Hydric Soil Investigation and knowledge of the current regulations regarding wetland mitigation in North Carolina and national criteria for determining hydric soil.

Henry River Project
Hydric Soils Evaluation
Catawba County, NC

Unique Places

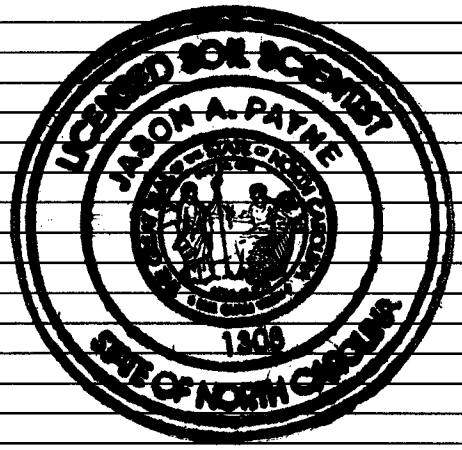
September 9, 2013

State Plane North Carolina, NAD 1983; This map is for informational purposes and was not prepared for, and is not suitable for legal, engineering, or surveying purposes.Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This is not a survey.

Prepared by: Jason A. Payne, RF, LSS

Henry River Mit Site 7/25/13

Profile	Horizon	Horizon Depth (in)	Structure / Texture	Consistence	Matrix Color	Mottle Colors (Quantity, Size, Contrast, Color)
S3	A	2	gr/SiCl	fr	10YR 3/4	
	B	10	SBK/Clay	fi	7.5YR 3/4	7.5YR 5/2, large, Distinct, many
	A_b	14	gr/SiCl	fr	7.5YR 3/4	7.5 YR 3/1, large, Distinct, many
	B_{gb_1}	18	SBK/Clay	fi	7.5YR 7/1	——
	B_{gb_2}	24	SBK/SiCl	fi	7.5 YR 4/2	——
S2	A	4	SBK/CL	fi	10YR 4/2	
	A_{bg}	10	gr/Sil loam	fr	10 YR 4/2	Common mica flakes
	B_{g_1}	16	SBK/SiCl	fi	10 YR 5/1	Common mica flakes
	B_{g_2}	20	SBK/SiCl Lo	fi	7.5 YR 5/2	
S1	A	6	gr/Sil Lo	fr	10 YR 4/2	Common mica flakes
	B_{g_1}	14	SBK/Sil Lo	fi	7.5YR 3/2	Common mica flakes
	B_{g_2}	24	SBK/Sicl Lo	fi	7.5 YR 5/1	



HYDRIC SOIL INVESTIGATION

Henry Fork Mitigation Site

Catawba County, North Carolina

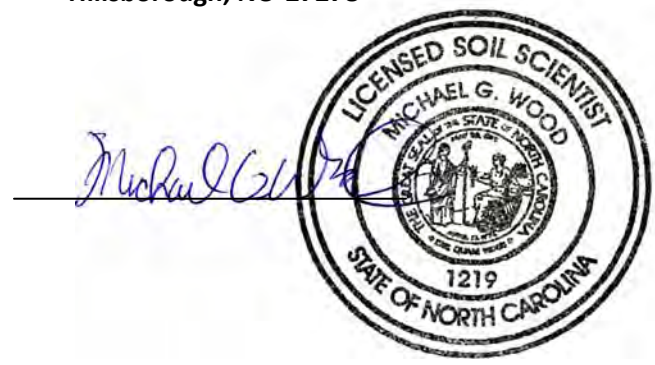
Prepared for:

Wildlands Engineering, Inc.
5605 Chapel Hill Road, Suite 122
Raleigh, NC 27607

Prepared by:

The Catena Group

410-B Millstone Drive
Hillsborough, NC 27278



May 13, 2014

INTRODUCTION

Wildlands Engineering, Inc. is considering mitigating a section of the Henry Fork project site in the Catawba River Basin (03050101). The site is accessed off Mountain View Road (SR 1192) in Hickory, Catawba County, NC. The Catena Group, Inc. (Catena) was retained to perform a detailed soil investigation that would, in part, determine the depth of fill material that was previously observed during a preliminary soil and site.

METHODOLOGY

The field investigation was performed on April 29, 2014. Seventy-two (72) hand-turned auger borings were advanced throughout the study area on a seventy-five ft by seventy-five ft grid (Figure 1). Each soil boring was marked in the field with a red pin flag noting the boring number, soil unit number, and either depth of fill material or depth boring was terminated. Hydric soil status was based upon the NRCS Field Indicators of Hydric Soils in the Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010).

RESULTS

There is clear evidence of human manipulation throughout the study area. In addition to ditching and/or channelization of streams, fill material has been placed over the majority of the study area. Six Soil Units were created based on data collected from soil borings and are described below and summarized in Table 1. Table 2 lists the classification and fill depth when applicable for each soil boring (appended).

Soil Unit 1. Soil Unit 1 had a typical surface diagnostic horizon that met hydric soil indicator F3.

F3 Depleted Matrix. A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:
a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or 5 cm (6 inches), or
b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.

Soil Unit 2. Soil Unit 2 consists of non-hydric soil that appeared to be undisturbed.

Soil Unit 3. Soil Unit 3 clearly has overburden material deposited as a result of human manipulation. The soil material below the overburden was relatively undisturbed and met hydric indicator F3 Depleted Matrix. The overburden was classified as hydric and met hydric indicator F3 Depleted Matrix.

Soil Unit 4. Soil Unit 4 clearly has overburden material deposited as a result of human manipulation. The soil material below the overburden was relatively undisturbed other than a compressed soil structure and a truncated profile, remnants of past surface manipulations. This material still appeared to be hydric and met indicator F3 Depleted Matrix. The overburden did not meet any hydric soil

indicator. A typical soil profile for Soil Unit 4 is appended. Soil Unit 4 comprised the majority of the study site.

Soil Unit 5. Soil Unit 5 clearly has overburden material deposited as a result of human manipulation. The overburden material and the soil beneath did not meet any hydric soil indicator.

Soil Unit 6. Soil Unit 6 clear has overburden material deposited as a result of human manipulation. The surface of the overburden material currently meets hydric indicator F3 Depleted Matrix. The material below the surface did not currently meet any hydric soil indicator.

Table 1. Summary of Soil Boring Classification and Hydric Indicator (if applicable).

Soil Unit	Classification	Hydric Indicator
1	Undisturbed Hydric Soil	F3
2	Undisturbed Non-Hydric Soil	n/a
3	Hydric Overburden/Buried Hydric Soil	F3
4	Non-Hydric Overburden/Buried Hydric Soil	F3
5	Non-Hydric Overburden/Buried Non-Hydric Soil	n/a
6	Hydric Overburden/Non-Hydric Soil	F3

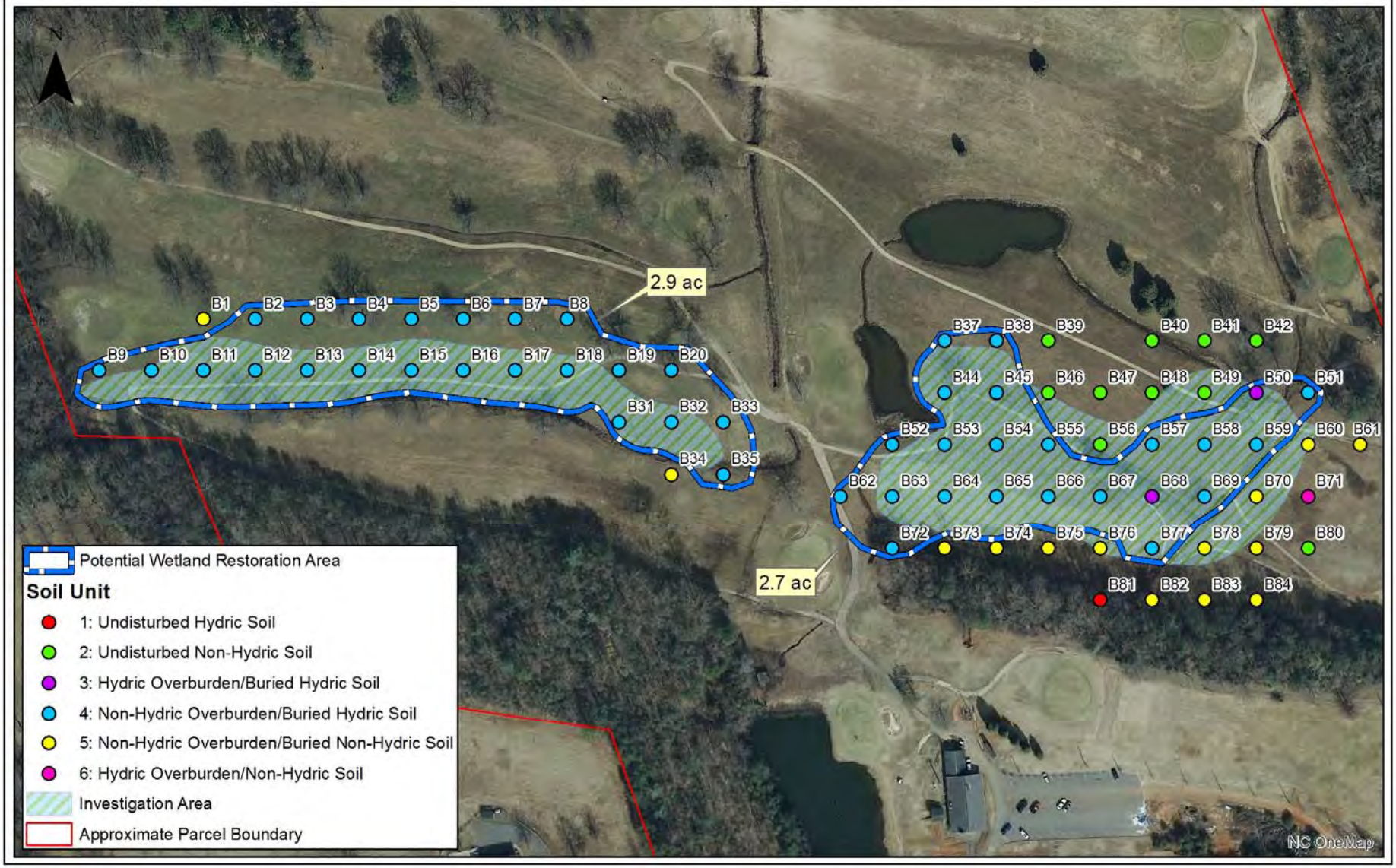
CONCLUSION

Seventy-two (72) soil borings were advanced throughout the study area. Borings were placed into one of six Soil Units. The depth of fill material was noted at each boring when applicable. It is anticipated that Priority 1 stream restoration, combined with limited soil manipulation, has the potential to re-establish approximately 5.6 acres of wetlands (Figure 1).

The findings presented herein represent Catena's professional opinion based on our Hydric Soil Investigation and knowledge of the current regulations regarding wetland mitigation in North Carolina and national criteria for determining hydric soil.

Table 2. Classification of Each Soil Boring and Depth of Fill Material (if applicable).

Boring No.	Soil Unit	Depth of Fill	Boring No.	Soil Unit	Depth of Fill
1	5	N/A	49	2	N/A
2	4	34	50	3	22
3	4	24	51	4	14
4	4	26	52	4	38
5	4	24	53	4	36
6	4	34	54	4	31
7	4	32	55	4	32
8	4	34	56	2	N/A
9	4	27	57	4	27
10	4	13	58	4	15
11	4	18	59	4	8
12	4	16	60	5	N/A
13	4	20	61	5	N/A
14	4	18	62	4	28
15	4	19	63	4	25
16	4	19	64	4	17
17	4	13	65	4	27
18	4	21	66	4	30
19	4	27	67	4	20
20	4	23	68	3	17
31	4	16	69	4	12
32	4	15	70	5	N/A
33	4	24	71	6	N/A
34	5	40	72	4	28
35	4	24	73	5	N/A
37	4	45	74	5	N/A
38	4	29	75	5	N/A
39	2	N/A	76	5	N/A
40	2	N/A	77	4	22
41	2	N/A	78	5	N/A
42	2	N/A	79	5	N/A
44	4	38	80	2	N/A
45	4	38	81	1	N/A
46	2	N/A	82	5	N/A
47	2	N/A	83	5	N/A
48	2	N/A	84	5	N/A



The Catena Group

Client: WILDLANDS ENGINEERING

Proposed Henry Fork Mitigation Site

Hydric Soil Investigation

Catawba County, North Carolina

Date: May 2014

Scale: 0 50 100 Feet

Job No.: 4172

Figure 1

SOIL EVALUATION FORM

The Catena Group, Inc
410-B Millstone Drive
Hillsborough, NC 27278
919.732.1300

Catena Job: 4172 Henry Fork Hyd. Soil Inv.
County: Catawba
Date: 4/29/14
Sheet: 1 of 1

Profile #	*Horizon*	*Horizon Depth (In)*	*Structure / Texture*	*Consistence / Mineralogy*	*Matrix Color*	*Mottle Colors (Quantity, Size, Contrast, Color)*
1	Fill	13	O,M parting to 1,M,SBK / C, CL	FI / S, P	Variegated	
	Ab	18	1,M, SBK parting to 1,M,GR / SL	FR / SS, SP	10YR 3/1	m,2,D 7.5YR 4/4
	Bt	28	1,M,SBK / CL	FI / SS, SP	2.5Y 4/1	m,2,P 10YR 4/4; m,2,P 7.5YR 5/6
	BC	36	1,CO,SBK / C	FI / SS,SP	2.5Y 5/2	m,2,P 10YR 4/6; m,2,P 2.5Y 4/6

Evaluated by: MW JR

Jake McLean

To: Browning, Kimberly D CIV USARMY CESAW (USA); Wiesner, Paul
Cc: Reid, Matthew; Eric Neuhaus; Shawn Wilkerson; Allen, Melonie; Haywood, Casey M CIV (USA); Tugwell, Todd J CIV USARMY CESAW (USA); Davis, Erin B; Bowers, Todd; Wilson, Travis W.; Munzer, Olivia; Mimi Caddell; Kristi Suggs
Subject: RE: Request for more information/ DMS Mitigation Plan Addendum Request: Henry Fork Stream and Wetland Mitigation Project/ SAW- 2014-00538/Catawba County
Attachments: Supplemental Data - at risk wetland assets.pdf; Henry Fork - Wetland Supplement WLE 12.10.20 Response to IRT Comments from 10.30.20.pdf

Hi Everyone,

I apologize for the delay in getting this response out. Please find our responses below in red text, and a copy of this email response attached in pdf for your files. We will require additional time to collect vegetation data and do planting to supplement these areas, but I'm hoping that based on this response we can get some feedback on our proposed approach to guide us in moving forward with this. Although our perceived wetland credit risk is low based on current data (see attached pdf), we understand that the IRT has viewed prior credit establishment on the site through a holistic lens based on the unique nature of this site. Furthermore, we understand that in order to agree to additional crediting on this site, this should include just effort to enhance ecological uplift and provide associated documentation. If you feel that the efforts proposed below are not commensurate with the credit being requested, we are amenable to revisit the ratio requested or the efforts proposed.

Thanks,
Jake

From: Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Sent: Friday, October 30, 2020 1:59 PM
To: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Cc: Jake McLean <jmclean@wildlandseng.com>; Reid, Matthew <matthew.reid@ncdenr.gov>; Eric Neuhaus <eneuhaus@wildlandseng.com>; Shawn Wilkerson <swilkerson@wildlandseng.com>; Allen, Melonie <melonie.allen@ncdenr.gov>; Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>; Tugwell, Todd J CIV USARMY CESAW (USA) <Todd.J.Tugwell@usace.army.mil>; Davis, Erin B <erin.davis@ncdenr.gov>; Bowers, Todd <bowers.todd@epa.gov>; Wilson, Travis W. <travis.wilson@ncwildlife.org>; Munzer, Olivia <olivia.munzer@ncwildlife.org>
Subject: Request for more information/ DMS Mitigation Plan Addendum Request: Henry Fork Stream and Wetland Mitigation Project/ SAW- 2014-00538/Catawba County

Good afternoon Paul,
The 15-day comment review period for the NCDMS Henry Fork Mitigation Plan Addendum (SAW-2014-00538) closed on October 28, 2020. Per Section 332.8(o)(9) of the 2008 Mitigation Rule, this review followed the streamlined review process. All comments received during the review process are below.

USACE Comments, Todd Tugwell and Kim Browning:
The Corps requests vegetation data for these proposed wetland areas prior to approving their addition to the wetland assets.Some areas have woody stems (both planted and volunteer) while some do not. We propose to map areas of existing high and low density stem counts within the proposed wetlands, and to plant areas of low density during this dormant season at a rate of 600 stems/acre. We propose to set up 3 vegetation plots to track density and vigor in the proposed wetlands over the remaining monitoring term - we will do this in a way that includes representation of both existing and new stems. We also propose to visually monitor the success of new plantings. New plantings are proposed

to consist of wetland and deer-tolerant livestakes which will limit diversity (and transplants from adjacent areas where available to supplement and diversify species). We have observations of low success with planting bareroot or potted trees that have already been rooted in a drier hydrologic regime and we have had significant vegetation setbacks and losses from deer on this site. If deemed acceptable, vegetation data will be provided prior to the credit release meeting in April, 2021.

Only two of the five areas proposed have gauges in them. This is concerning because the IRT requested these gauges back in March 2016 if WEI thought the wetland boundaries were going to be different from the approved mitigation plan. We understand these were requested early on and have no response to counter this concern - gages13, 14, and 15 were installed as soon as we determined we desired to make this request. We feel that GWG1 is representative of Wetland DD and that GWG's 14 & 15 are representative of Wetlands AA, BB, and CC.

Wetland EE appears to be relatively permanently impounded according to the gauge data, which raises concern whether this area may be too wet to support trees.

The hydrologic regime of Wetland EE in 2019 was impacted by beaver impoundments - beaver were subsequently trapped and removed. Related to tree growth - it is true that the variation in topography in all of these wetlands influences the type of vegetation and habitat supported in each of these areas - some being old irrigation ponds or having ditch remnants that are emergent in character. Intermittent impoundment by beaver and riverine flooding have also influenced current vegetation. We proposed to attempt to establish woody vegetation in all of the wetlands, but recognize that some of the areas may not support this. We can accept that no credit may be offered for wetlands that do not support woody vegetation.

Prior to approving this addendum we request veg data for the proposed areas, and we would like a map that shows the areas that are at-risk/not meeting success. Vegetation data will be collected and provided along with other data specified above. The map showing at-risk areas determined by gage analysis and wetland delineation is attached.

EPA, Todd Bowers:

At this time I have no specific comments on the proposed addendum for the site to provide 0.220 riparian wetland mitigation units to only be used if proposed wetlands at the mitigation site do not meet the thresholds or performance standards for success in the current mitigation plan. The created potential wetlands appear to be providing the appropriate function based on the groundwater gauge data (GWG 13 and 15) and the vigorous vegetation growth shown in the attached photos.

As stated, the WMUs generated by this supplemental request would only be used to offset credits approved in the mitigation plan that are not granted due to failure to meet performance.

WRC, Travis Wilson:

Looking at the mapped locations as well at the photos it looks like the vegetation is comprised of emergent and pioneering species. All wetlands on this site were classified as Headwater forest. If these wetlands are going to be classified the same they should follow the same planting plan and vegetative success criteria.

As discussed above, there are pockets of deeper water with prolonged inundation. We propose to plant woody species from the livestake planting plan this winter in areas that have not already revegetated with desired species (river birch, box elder, alders). Refer to proposed vegetative success monitoring in the response to Corps comments. Further, we have treatment of cattails visible in the photos scheduled for next year. We request that vegetation criteria be relaxed to the point of demonstrating successful establishment and progression of woody species in these areas rather than achieving full term criteria by the currently scheduled close-out date.

DWR, Erin Davis:

Are all of the proposed wetland creation areas outside of the original planted project area? I question whether they would meet the standard veg density performance standard. One of the areas is sweetgum dominated.

Yes, most of the areas are outside of the planted area. We propose to perform the monitoring as stated above. There are dense riverbirch and alder thickets in some of the proposed wetland areas, but I don't believe that any areas are sweetgum monocultures. We have treated some such monocultures on the site within and adjacent to planted areas and will consider the same treatment in these creations areas where warranted. We do feel that with the difficulty of deer browsing on this site that establishment of canopy through pioneering species with an eye towards later forest succession may be better than no canopy.

Please reach out if you have any questions.
Thanks
Kim

Kim Browning
Mitigation Project Manager, Regulatory Division I U.S. Army Corps of Engineers

-----Original Message-----
From: Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>
Sent: Tuesday, October 13, 2020 12:34 PM
To: Tugwell, Todd J CIV USARMY CESAW (USA) <Todd.J.Tugwell@usace.army.mil>; Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>; Davis, Erin B <erin.davis@ncdenr.gov>; Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>; Smith, Ronnie D CIV USARMY CESAW (USA) <Ronnie.D.Smith@usace.army.mil>; McLendon, C S CIV USARMY CESAW (USA) <Scott.C.McLendon@usace.army.mil>; Bowers, Todd <bowers.todd@epa.gov>; Wilson, Travis W. <travis.wilson@ncwildlife.org>; Munzer, Olivia <olivia.munzer@ncwildlife.org>; Byron Hamstead <byron_Hamstead@fws.gov>
Cc: Jake McLean <jmclean@wildlandseng.com>; Reid, Matthew <matthew.reid@ncdenr.gov>; Wiesner, Paul <paul.wiesner@ncdenr.gov>; Eric Neuhaus <eneuhaus@wildlandseng.com>; Shawn Wilkerson <swilkerson@wildlandseng.com>; Allen, Melonie <melonie.allen@ncdenr.gov>
Subject: Notice of NCDEQ - DMS Mitigation Plan Addendum Request: Henry Fork Stream and Wetland Mitigation Project (DMS# 96306) - (SAW- 2014-00538) (DWR#20140193) - Catawba 03050102_Catawba County

Good afternoon IRT,

The below referenced Mitigation Plan Addendum Request review has been requested by NCDMS. Per Section 332.8(o)(9) of the 2008 Mitigation Rule, this review follows the streamlined review process, which requires an IRT review period of 15 calendar days from this email notification. Please provide any comments by 5 PM on the 15-day comment deadline shown below. Comments provided after the 15-day comment deadline (shown below) may not be considered.

At the conclusion of this comment period, a copy of all comments will be provided to NCDMS and the NCIRT along with District Engineer's intent to approve or disapprove this AMP.

Wildlands Engineering, Inc. (WEI) has prepared a Mitigation Plan Addendum for the Henry Fork Mitigation Site (DMS# 96306). WEI has identified five additional wetland areas that have developed following site construction. These five wetland areas were not identified in the approved Jurisdictional Determination (USACE) and they were not identified as having hydric soils in the LSS soils report from the IRT approved Mitigation Plan. As a result, WEI is proposing a creation credit ratio of 3:1 for the additional 0.661 acres for a total of 0.220 Riparian WMUs.

WEI is not seeking additional wetland credit above the approved Mitigation Plan and the DMS credit ledger will not be updated. The purpose of proposing these additional areas for credit is to offset any wetland credits that may be at risk of losing credit at project closeout. These additional areas have been monitored since March 2019 (MY4) and will continue to be monitored through project closeout. Upon IRT review and approval of this wetland addendum, Wildland's will document the additional wetland areas in this year's annual monitoring report (MY5) and through project closeout.

The site is currently in MY5 (2020) and is scheduled to close in 2023.

Digital copies were uploaded to the IRT SharePoint page (10/6/2020) and DWR's Laser Fiche system (10/6/2020) for IRT review. A copy is also attached.

15-Day Comment Start: October 13, 2020

15-Day Comment Deadline: October 28, 2020 45-Day DE Decision: November 27, 2020

Project information is as follows:

Henry Fork Mitigation Site

DMS Project # 96306

Institution Date: 2/15/2014

RFP 16-005298 (Issued: 6/6/2013)

Catawba River Basin

Cataloging Unit 03050103 Expanded Service Area

Catawba County, North Carolina

USACE Action ID: SAW- 2014-00538

DWR#: 20140193

Proposed Mitigation Project Credits:

4,807.667 SMU (cool)

4.222 WMU (riparian)

Full Delivery Provider: Wildlands Engineering Inc. – Contact: Jake McLean, jmclean@wildlandseng.com <mailto:jmclean@wildlandseng.com> , (828) 774-5547

NCDEQ - DMS Project Manager: Matthew Reid, matthew.reid@ncdenr.gov <mailto:matthew.reid@ncdenr.gov> , (828) 231-7912

The Mitigation Plan Addendum has been uploaded to the IRT/ NCDEQ SharePoint Mitigation Plan Review page and can be accessed here:

IRT SharePoint page:

Blockedhttps://ncconnect.sharepoint.com/sites/IRT-DMS/SitePages/Home.aspx

HenryFrk_96306_MPAddendum_2020.pdf

Blockedhttps://ncconnect.sharepoint.com/sites/IRT-DMS/IRT%20Upload%20Documents%20Here/Forms/AllItems.aspx?id=%2Fsites%2FIRT%2DDMS%2FIRT%20Upload%20Documents%20Here%2FHenry%20Fork%20%2896306%29%2FHenryFrk%5F96306%5FMPAddendum%5F2020%2Epdf&parent=%2Fsites%2FIRT%2DDMS%2FIRT%20Upload%20Documents%20Here%2FHenry%20Fork%20%2896306%29 <Blockedhttps://ncconnect.sharepoint.com/sites/IRT-DMS/IRT%20Upload%20Documents%20Here/Forms/AllItems.aspx?id=%2Fsites%2FIRT%2DDMS%2FIRT%20Upload%20Documents%20Here%2FHenry%20Fork%20%2896306%29%2FHenryFrk%5F96306%5FMPAddendum%5F2020%2Epdf&parent=%2Fsites%2FIRT%2DDMS%2FIRT%20Upload%20Documents%20Here%2FHenry%20Fork%20%2896306%29>

Please contact the Mitigation Office if you have questions.

V/r,

Casey Haywood

Mitigation Specialist, Regulatory Division I U.S. Army Corps of Engineers

3331 Heritage Trade Dr, Ste. 105 I Wake Forest, NC 27587 I

BUILDING STRONG ®

Jake McLean

From: Jake McLean
Sent: Friday, December 18, 2020 8:41 AM
To: 'Browning, Kimberly D CIV USARMY CESAW (USA)'
Cc: Mimi Caddell
Subject: RE: DMS Mitigation Plan Addendum Request: Henry Fork Stream and Wetland Mitigation Project/ SAW- 2014-00538/Catawba County

Ok, thanks.

-----Original Message-----
From: Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Sent: Friday, December 18, 2020 8:38 AM
To: Jake McLean <jmclean@wildlandseng.com>
Subject: RE: DMS Mitigation Plan Addendum Request: Henry Fork Stream and Wetland Mitigation Project/ SAW- 2014-00538/Catawba County

Good morning Jake,
The IRT agrees that Wildlands should be held to the vigor standard that is expected at close-out; so 10' high by MY7. It looks like you plan to replant livestakes, which might make it harder, but that is your choice; to earn full credit, this seems like a reasonable requirement. It also looked like there were a lot of pioneer species there already (like sweetgum and red maple) but it was hard to tell from the pictures. We'd like to review the veg data when it's available.
Feel free to reach out if you have questions, Kim

Kim Browning
Mitigation Project Manager, Regulatory Division I U.S. Army Corps of Engineers

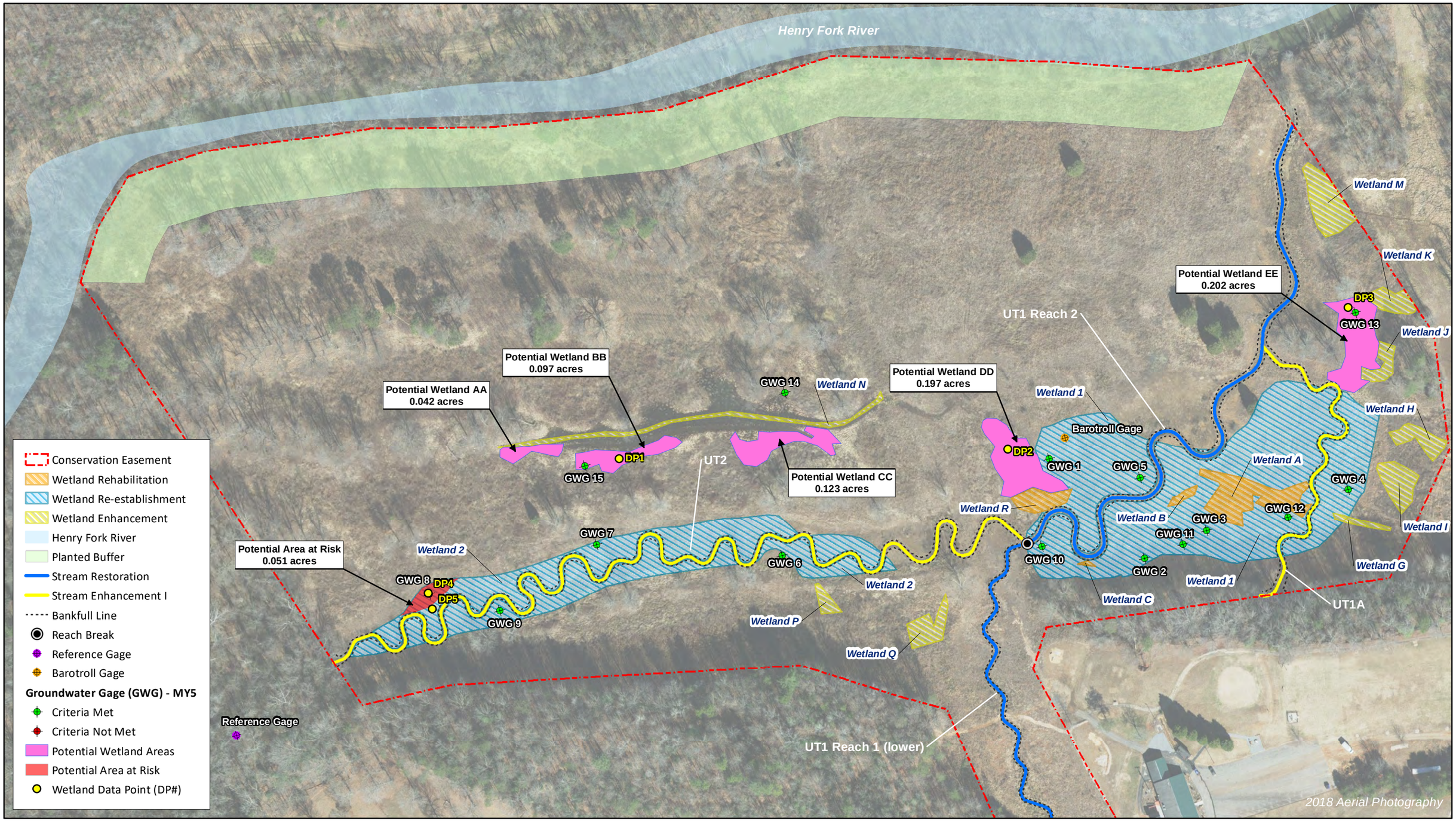
-----Original Message-----
From: Jake McLean <jmclean@wildlandseng.com>
Sent: Friday, December 18, 2020 8:10 AM
To: Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Subject: [Non-DoD Source] RE: DMS Mitigation Plan Addendum Request: Henry Fork Stream and Wetland Mitigation Project/ SAW- 2014-00538/Catawba County

Thanks Kim. We intended below to request that vigor be compared against year 1 & 2 standards ("successful...progression" of the proposed plantings). Is the IRT allowing for this to be the standard, or are you indicating that year 6 & 7 vigor standards must be met for full credit? Just wanting to clarify.

From response:
"We request that vegetation criteria be relaxed to the point of demonstrating successful establishment and progression of woody species in these areas rather than achieving full term criteria by the currently scheduled close-out date."

Best,
Jake

-----Original Message-----
From: Browning, Kimberly D CIV USARMY CESAW (USA) <Kimberly.D.Browning@usace.army.mil>
Sent: Thursday, December 17, 2020 3:29 PM
To: Jake McLean <jmclean@wildlandseng.com>; Wiesner, Paul <paul.wiesner@ncdenr.gov>



WILDLANDS ENGINEERING

0 150 300 Feet

Henry Fork Mitigation Site
Wetland Addendum
DMS Project No. 96306
Monitoring Year 5 - 2020

Catawba County, NC