Monitoring Report

FINAL

Harrell Stream and Wetland Mitigation Site
Monitoring Year 3 (2022)
NCDMS Project No. 100005
NCDMS Contract No. 007006
DWR# 20161077
USACE Action ID: SAW-2016-02202
Jackson County, North Carolina
Data Collected: March 2022 thru Nov 2022
Date Submitted: February 2023

Submitted to:

NCDEQ-Division of Mitigation Services
1652 Mail Service Center Raleigh N C 27699-1652

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Paul Wiesner
Project Manager
NCDEQ-DMS
Asheville Regional Office
2090 U.S. 70 Highway

Subject: RE: Draft Monitoring Year 3 (MY3) Report for
the Harrell Stream and Wetland Site
Little Tennessee River Basin – CU# 06010203– Jackson County
DMS Project ID No. 100005
Contract # 007006

Mr. Wiesner,

On January 12, 2023 EWS received comments on the Draft Monitoring report for Harrell Stream and Wetland Site. Below are the original DMS comments and the EWS responses (**in RED**).

General: DMS notes from the April 20, 2022 IRT credit release meeting are as follows: *Kim Isenhour (USACE) requested culvert photos of the inlets and outlets on the site in future monitoring reports. Kim also asked about Reach 1D and the performance of the cross sections. The concern is that the reach may transition into wetlands rather than stream. EW Solutions (EWS) believes the reach is continuing the maintain bed and bank features and will not develop into a wetland feature. The IRT asked about the supplemental planting on the site. EWS has conducted 2 supplemental plantings on the site with the most recent in early 2022. EWS noted that they planted in all low stem densities along the main stream from Reach 1B to Reach 1C. Wetland gauges 1, 5, and 7 did not meet the established success criteria in the wetland reestablishment areas. EWS is currently looking at potentially adding wells to the site but is constrained due to the Cherokee cultural resource boundary. Invasives on the site were discussed. Privet and multiflora rose treatments have been effective and will be completed through project closeout. The drop area at the crossing above Reach 1B was discussed. EWS will continue to provide the crossing photo of the area in future monitoring reports. The IRT noted that cross section 5 had a BHR increase. The IRT requested that cross section 5 be monitored in detail in the MY3(2022) report.*

Please review the notes and confirm that all the requests, IRT questions and full delivery provider commitments from the 2022 credit release meeting have been addressed and included in the final MY3 (2022) report. **To the best of the Providers understanding, IRT requests and concerns have been addressed.**

General: During the August 31, 2021 IRT site visit, the IRT suggested that soil profiles be provided in and around the groundwater wells which were not meeting the success criteria as part of the project's monitoring effort. The IRT noted that documentation of soil profile characteristics (i.e. redoximorphic features) could potentially provide additional support for groundwater data and should be included in future monitoring reports.

Why was only one soil boring provided in the draft MY3 (2022) report? DMS recommends including detailed soil borings near all of the failed MY3 (2022) groundwater monitoring gauges in the revised MY3 report. As requested by the IRT, this should also be completed in MY5 (2024) & MY7 (2026). **Additional soil core evaluations have been provided for MY3 underperforming wells.**

General: During the August 31, 2021 IRT site visit, the IRT requested photo documentation in the non-growing season to provide additional evidence of channel stability and continuity. EWS noted that they collect photos in the spring but have not previously included them in the monitoring reports. EWS committed to providing non-growing season photo documentation of stream features as part of the yearly monitoring reports. DMS recommends including additional dormant season photos in the final MY3 (2022) report to satisfy this IRT request. **Added, with the exception of Photopoints 7b and 8a due to ongoing beaver management efforts.**

General: As noted in the report text, beaver and beaver dams should be removed from the site through project closeout. Invasives species should also be treated on the site through project closeout. **Noted.**

General: Please ensure that project monitoring equipment is checked prior to the start of the growing season and at least quarterly thereafter to confirm that it is functioning properly and collecting data through the full growing season/ monitoring year. **Noted**

Section 1.5 Project Performance: This section reports three (3) random vegetation plots; however, there are four (4). Please QA/QC and update the report text as necessary. **Updated**

Section 1.5.1. Vegetation: *"A map and summary of the supplemental plantings can be found in Appendix F."* Only the supplemental planting summary is available in Appendix F. Please review and update the report accordingly. DMS recommends including a 2022 supplemental planting map in the appendix and additionally showing the area/s on the MY3 (2022) CCPV Map. **Added to Appendix F.**

Section 1.5.1. Vegetation: In the report text, please discuss the project vegetation plots that did not meet the MY3 interim success criteria of 320 stems per acre. Does EWS consider these failing vegetation plots to be a project issue? **At this time, EWS does not consider the plot failures to be an issue. Two of the four random plots were targeted within a known problem area. Stems in permanent Veg plot 4 are anticipated to struggle with inundated conditions and competition with herbaceous vegetation.** Will additional supplemental planting be conducted in 2023 or will soil amendments be added to the failing areas or the reported low stem density area? **Supplemental planting will be conducted in in the spring of 2023 and will be focused on the Encroachment areas. Organic soil amendments will be used as needed by location. No chemical fertilizers will be used due to the proximity to wetlands.** In the report text, please also discuss the landowner interaction, additional marking installed and the proposed schedule for replanting the three (3) areas of encroachment reported. **Text added.**

Section 1.5.2. Stream Geomorphology: In the report text, DMS recommends referencing MY3 report photos that show Reach 1D as cross sections 5 and 6 are discussed and have been an IRT concern. **Text Added**

Section 1.5.3. Hydrology: In the report text, please discuss the data influenced by beaveractivity as shown in Appendix E. It appears that there were four (4) hydrologic events outside of the unused beaver activity hydrologic data. Please review and update the final MY3 (2022) report as necessary. **Reviewed stage**

recorder data, revised stage recorder graphic, and update table 11.

Section 1.5.3. Hydrology: Based on the monitoring information provided in MY3 (2022) and the failed wetland gauges reported, does EWS consider any the wetland credits on the site "at risk"? Please discuss in the revised report. If possible, provide an approximate acreage and wetland credit amount (WMUs) of the potential "at-risk" wetland credits. Are any additional groundwater monitoring gauges proposed to be installed prior to MY4 (2023) to collect additional groundwater data to further delineate wetland areas of concern? **Based on past performance of groundwater gages 0.75 WMUs may be "at risk". Yes, supplemental groundwater gages are to be added to MW4 features.**

Table 2: Please include the November 2022 beaver management effort in the table. Please also QA/QC the table and confirm that all MY3 (2022) maintenance on the site has been documented. **Added**

CCPV Map: Please show/ identify vegetation plots in the CCPV map legend. In the CCPV map legend, please also indicate successful/ failing vegetation plots and successful/ failing groundwater gauges. **Legend reformatted.**

Table 5 - Visual Stream Morphology Stability Assessment: Please confirm that the project streams, banks and engineered structures are 100% stable and 100% preforming as intended as reported in the Table 5. **Text added and confirmed.**

Table 6. Vegetation Condition Assessment: A 0.09-acre Low Stem Density Area is reported in the Table, but it is not shown on the CCPV map. Please update the table and CCVP map accordingly and confirm that they are consistent. A callout on the CCPV map can be utilized if the area noted is slightly below the established mapping threshold. **Layer activated in the CCPV.**

Table 6. Vegetation Condition Assessment: Why are there two (2) rows for Invasive Areas of Concern? These should be consolidated into one (1) row, or the definitions should be updated to explain the difference in the rows. One of the colors shown in the "CCPV description" does not correspond with the CCPV map. Please update the table and CCVP map accordingly and confirm that they are consistent. **Table 6 represented two levels of density of invasives (High and Low). The high-density symbology has been removed as there are no longer high-density areas of invasive species currently present within the site.**

Table 6. Vegetation Condition Assessment: The table notes two (2) Easement Encroachment Areas; however, the report text and CCPV map show three (3) encroachment areas. Please review, update, and confirm the table and CCPV map are consistent in the final MY3 (2022) report. **Updated table 6.**

Table 7a; Table 7b; CCPV Map; and Report Text: Table 7a identifies the random vegetation plots as Veg Plot 6 R; Veg Plot 7 R; Veg Plot 8 R; & Veg Plot 9 R. Table 7b identifies the random vegetation plots as Veg Plot Group 1 R; Veg Plot Group 2 R; Veg Plot Group 3 R; & Veg Plot Group 4 R. The report text and CCPV map identify the random vegetation plots as RVP 1; RVP2; RVP 3; RVP 4. Please update the report text, tables, CCPV maps, etc. so the vegetation plots are named consistently in the final MY3 (2022) report. **The DMS Veg tool default output naming differs between table 7A and Table 7b. This was confirmed by rerunning the raw data set. The CCPV has been labeled per DMS Veg tool output from Table 7b (Summary table).**

Problem Area Photos: Please include an additional photo of the third encroachment area along the residential fence line as reported in the report text and observed on-site. **Added.**

Appendix F: Please also include the wetland indicator status for the species in the MY3 (2022) supplemental planting summary list. **Added column for wetland indicator status.**

Digital Support File Comments:

- **None**

Please provide an electronic comment response letter addressing the DMS comments received. This comment response letter should also be included in the FINAL MY3 (2022) report after the report cover.

Please submit two (2) final report hard copies and an electronic copy on a USB drive to my attention at the address below (DEQ Asheville Regional Office). Please include all updated MY3 (2022) digital support files on the USB drive. The final electronic monitoring report with all attachments should be named: ***Harrell_100005_MY3_2022.pdf***

Sincerely,

David Tuch
Managing Partner
EW Solutions
37 Haywood Street, Suite 100
Asheville, NC 28801

Prepared for:

EW SOLUTIONS

37 Haywood Street, Suite 100
Asheville, NC 28801

Prepared by:

EQUINOX

balance through proper planning

37 Haywood Street, Suite 100
Asheville, NC 28801

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1.0 PROJECT SUMMARY

1.1. Project Setting and Background

The Harrell Stream and Wetland Mitigation Site (Harrell Mitigation Site) is located in the Little Tennessee River (CU 06010203). The Harrell Mitigation Site also lies within the lower portion of the Eastern Little Tennessee River Basin (HUC 06010203010060) watershed which is identified as a Targeted Local Watershed (TLW) according to the 2008 Little Tennessee River Basin Restoration Priorities (RBRP) Plan. Project work at the Harrell Site was completed in early September 2019, and included construction, monitoring feature installation, and boundary marking; bare root and live stake installation occurred in mid-January 2020. Through the project work, a total of 1,756 linear feet of stream were restored, 640 linear feet were preserved, 0.22 acre of wetland were rehabilitated, and 3.31 acres of wetland were re-established. The Harrell Mitigation Site is expected to generate a total of 1,854 SMU's and 3.53 WMU's. Refer to Table 1 for the project components and mitigation credit information and Figure 2 for the Project Asset Map.

Historic land use at the Harrell Mitigation Site consisted of silvicultural logging and agricultural use for at least 40 years, according to historic aerial photos. Historic agricultural practices, relocation of the channel, and berm construction along the right descending bank of Harrell Creek had functionally removed the stream's connectivity with the floodplain and adjacent wetlands, resulting in highly degraded wetland function. Two poorly functioning culverts have also degraded the ecological connectivity of the stream at the headwaters of the Harrell Mitigation Site. The lack of deep-rooted vegetation and unstable channel characteristics have contributed to the degradation of the streambanks on both sides of the project. Ecological function has been restored to the existing streams, wetlands, and riparian corridor by returning the existing stream and wetlands to a stable condition. The relocation of Harrell Creek to the historic floodplain and removal of the berm has restored proper floodplain connectivity and improved wetland hydrology. The restoration of the upper reach addressed a perched culvert, removed a second pipe crossing, and corrected erosion issues from an existing logging road through the installation of stormwater control devices. At the downstream end of Harrell Creek, the profile of the channel was raised, and proper channel dimensions were restored. Additional measures that promoted functional uplift included stabilizing and revegetating stream banks and adjacent disturbed areas, restoring floodplain connectivity and wetland hydrology, reestablishing wooded riparian areas. These measures contribute to reduced downstream sediment and nutrient loads, as well as improving aquatic and terrestrial habitat.

This project is protected by an 8.45-acre conservation easement and is located approximately 2.8 miles southeast of Cullowhee, NC in Jackson County at 35.300553° N, -83.133689° W. The Harrell Mitigation Site is bounded by agricultural land and mountainous woodlands.

1.2. Project Goals and Objectives

The project goals address stressors identified in the TLW and priority sub-watershed, as outlined in the Final Mitigation Plan, and include:

- Provide a network of streams with natural, stable forms that support proper stream functions;
- Improve groundwater hydrology to support recovery of native riparian vegetation;
- Reduce sediment inputs from eroding stream banks to reduce fine sediment loads and percentage of fines in the bed-material load;
- Restore proper sediment transport to support channel stability and bedform diversity;
- Improve substrate quality to facilitate hyporheic flow and support aquatic communities;
- Improve quantity, quality, and diversity of habitats to support healthy aquatic communities;

- Reduce pollutant inputs to the project streams (fecal coliform, nitrogen, phosphorus) to restore a balance to proper nutrient cycles;
- Improve riparian vegetation community to provide temperature regulation of the stream, provide a future source of organic inputs, and aid in long-term channel bank stability;
- Restore areas of former riparian wetlands so that the hydrology and soils will support wetland vegetative communities and wildlife;
- Improve landscape connectivity that allows space for biotic and abiotic processes and provides a source and sink for natural populations; and,
- Prevent the site from future impacts of development and agricultural issues.

The following objectives are proposed for accomplishing the above listed goals as outlined in the Final Mitigation Plan:

- Construct stream channels that will maintain proper dimension, pattern, and profile;
- Construct streams with proper bankfull to floodplain relationship;
- Construct streams that provide naturally stable dimensions and stabilize constructed banks with appropriate bioengineering;
- Construct streams that maintain an appropriate sediment transport balance with the sediment that is supplied by the watershed so that the overall stream profile neither aggrades nor degrades over time;
- Create and improve stream bedform diversity by constructing pools of varied depths and riffles of varied slopes;
- Construct stable riffles that provide an improved diversity of bed material clast and a reduction in fines relative to existing conditions;
- Construct in-stream habitat features from native material to provide diversity of habitat;
- Provide a buffer from agricultural activities and row crops;
- Plant native climax tree species and understory species in the riparian zone;
- Reconstruct stream channels that are properly connected to the riparian wetlands;
- Re-grade topography to eliminate ditches and drainage features;
- Plant native wetland tree and shrub species; and,
- Establish a conservation easement that provides a minimum buffer from future activities in the adjacent watershed and ensure aquatic organism passage by correcting perched culverts or removing other barriers within the easement.

1.3. Project Performance Standards

The stream restoration performance standards for the project will follow accepted and approved criteria based on the Final Mitigation Plan for the Harrell Mitigation Site (2019). Performance standards conform with the performance criteria provided in The Harrell Site Mitigation Plan which references the DMS Stream and Wetland Mitigation Plan Template and Guidance (October 2015), the Annual Monitoring Template (April 2015), and the Closeout Report Template (v2.1 March 2015). Performance criteria will be evaluated throughout the seven-year monitoring period.

Harrell Mitigation Site Performance Standards		
Objective	**Performance Standard**	**Monitoring Approach**
Construct stream channels that will maintain proper dimension, pattern and profile	· Riffle section W/D ratios should remain within the range of the appropriate stream type. · BHR should not exceed 1.2. BHR should not change more than 10% in any given monitoring interval. Changes that do occur should indicate a trend toward stability. · Entrenchment Ratios should be ≥ 2.2 for C/E channels and ≥ 1.4 for B Channels. · Document continuous surface flow in tributaries for at least 30 consecutive days in each year	Survey of select cross sections and visual assessment. Continuous stage recorders
Construct streams with proper bankfull to floodplain relationship	Four bankfull events or greater, in separate years, will be documented during the monitoring period	Crest gauges, continuous stage recorders, and debris lines.
Construct streams that provide naturally stable dimensions and stabilize constructed banks with appropriate bioengineering	Channel banks should generally remain stable. Where bank migration does occur, it should not exceed 20% of the bankfull width.	Visual assessment and bank pin monitoring as necessary.
Construct streams that maintain an appropriate sediment transport balance with the sediment that is supplied by the watershed so that the overall stream profile neither aggrades nor degrades over time.	Profile adjustments should not indicate significant aggradation or degradation. BHR requirements as stated above.	Resurvey of longitudinal profile if visual assessment indicates potential instability.
Create and improve stream bedform diversity by constructing pools of varied depths and riffles of varied slopes	Profile should maintain a diversity of depths expressed in riffle/pool forms.	Visual assessment
Construct stable riffles that provide an improved diversity of bed material clast and a reduction in fines relative to existing conditions	Substrate material should progress towards or maintain coarser material in riffles and runs with finer material present in pools and glides.	Pebble count measurements at surveyed cross sections
Construct in-stream habitat features from native material to provide a diversity of habitats	In-stream habitat structures should remain intact and functional.	Visual assessment
Provide a buffer from agricultural activities and row crops	Record conservation easement prior to implementation.	None
Plant native climax tree species and understory species in the riparian zone	Minimum of 320 stems/ac present at MY-3. Minimum of 260 stems/ac present at MY-5. Minimum of 210 stems/ac present at MY-7.	Vegetation plots

Objective	Performance Standard	Monitoring Approach
Reconstruct stream channels that are properly connected to the riparian wetlands	Groundwater elevation within 12 inches of the ground surface for 12% of the growing season.	Groundwater monitoring gauges
Re-grade topography to eliminate ditches and drainage features	Groundwater elevation within 12 inches of the ground surface for 12% of the growing season.	Groundwater monitoring gauges
Plant native wetland tree and shrub species	Minimum of 320 stems/ac present at MY-3. Minimum of 260 stems/ac present at MY-5. Minimum of 210 stems/ac present at MY-7.	Vegetation plots
Establish a conservation easement that provides a minimum buffer from future activities in the adjacent watershed.	Record conservation easement prior to implementation.	None

1.4. Mitigation Components

The Harrell Mitigation Site is anticipated to generate 1,854 SMUs and 3.53 WMUs. Refer to Figure 2 for the project component/ asset map for a visual description of the project assets and Table 1 for project components and mitigation credit information for the Harrell Site. These credits are based on the IRT approved Harrell Mitigation Plan.

1.5. Project Performance

Monitoring data was collected from March 29th, 2022, to October 19th, 2022. Monitoring activities included visual assessment of Harrell Creek, the conservation easement, collection of images at eight permanent photo stations, inventory of five permanent vegetation monitoring plots, four random vegetation plots, surveying of six cross-sections, maintenance of nine groundwater monitoring wells, and one continuous stage recorder.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information can be found in the Baseline Monitoring Report and in the Mitigation Plan documents available on the NCDMS website (https://deq.nc.gov/about/divisions/mitigation-services/dms-project-documents-table). All raw data supporting the tables and figures in the appendices is available from DMS upon request.

The MY3 Boundary Inspection was completed on November 30, 2022. The boundary inspection report, results, and responses to action items can be found in Appendix F.

1.5.1. Vegetation

A supplemental planting was conducted along a 1.45-acre portion of the easement on February 24, 2022. Additional livestakes were installed along Harrell Reach 1B, 1C, and 1D in areas of poor streamside woody stem recruitment. Bare root plantings were installed along the right descending bank of Reaches 1B and 1C in areas identified as low stem density in MY2. Plantings were installed to augment existing planted stems and return the density to approximately 6-foot centers (~1000 stems per acre). Refer to Appendix A, CCPV for the supplemental planting area. A table of species and material type can be found in Appendix F.

Visual assessment of vegetation outside of the monitoring plots (Appendix B – Table 6) indicates that both the herbaceous vegetation and planted stems were becoming established throughout much of the project. Supplemental planting during MY2 along Reach D and in the area surrounding Vegetation Plot #4 have shown growth and appear to be thriving. Supplemental planting conducted in early 2022 along the right-descending bank of Reach 1C have seen poorer growth and survival. This area has been slow to establish vegetation overall and will continue to be monitored.

Monitoring of the permanent vegetation plots (n = 5) and random vegetation plots (n=4) was completed in September 2022. Summary tables and photographs associated with MY3 vegetation monitoring are located in Appendix B and Appendix C. A total of eleven (11) species of planted stems were documented within the plots. Planted stem densities among the five plots ranged from 243 to 648 planted stems per acre. Woody stems continue to struggle within Vegetation plot #4 due to the level of saturation and herbaceous competition. With the exception of areas previously identified as low stem density, the remainder of the site is performing adequately.

Supplemental planting of low stem density areas identified in MY2 was conducted along the right descending bank of Reaches B and C on February 24, 2022. One to 2-year-old bare root silky dogwood (*Cornus amomum*), tag alder (*Alnus serrulata*), and tulip poplar (*Liriodenron tulipifera*) were planted to bring the woody stem distribution back to approximately 6-foot centers. Supplemental planting of silky willow (*Salix sericea*) and black willow (*Salix nigra*) live stakes was conducted along banks of Harrell Creek to address gaps in the immediate riparian zone. Growth of these willows is expected to arrest the growth of herbaceous vegetation in the streambed. A map and summary of the supplemental plantings can be found in Appendix F.

Four Random Vegetation Plots (RVP) were sampled during MY3. Random plots were located along Reach 1B and Reach 1C. RVP 1 and 2 were targeted within areas previously identified as having low stem density and both contained 243 stems/acre. This has been an area of concern for having historically shown poor stem survival and slow herbaceous establishment. The remaining two Random plots were located in Reach 1B and the downstream extent of Reach 1C. Stem densities among these random plots were 445 and 567 stems per acre. (Table 7a and 7b, Appendix C). Stem densities and survival will continue to be monitored in future years.

Invasive species have been documented at the site, with overall low abundance. These areas were initially treated during MY1 and MY2 with a follow-up treatment occurring on June 28, 2022. The primary species documented at the Harrell Site include Chinese Privet (*Ligustrum sinensis*), Multiflora Rose (*Rosa multiflora*), Oriental bittersweet (*Celastrus orbiculatus*), and Japanese Honeysuckle (*Lonicera japonica*) along the fringes. Treatment of these invasive species populations will be continued throughout subsequent monitoring years. Details on invasive species density and area can be found in Table 6, the CCPV, Appendix B, Table 7a and 7b, Appendix C). Treatment logs and can be found in Appendix F.

Three areas of easement encroachment were documented during MY3. Brush clearing and bushhogging was conducted along a northern boundary of the easement. These activities inadvertently impacted two areas within the easement both at the uppermost and lowermost extents of Reach C along the northern edge of the easement. The third area was located along the fence line south of the private residence. In this area a ~6 ft width of grassy buffer has been maintained along the fence line and has impacted a narrow swath of the easement (Table 6, the CCPV, Problem area photos, Appendix B). Following the encroachments additional signage was installed. Replanting of the easement violations and residual bare areas is planned for late winter 2023.

The property is currently for sale and the current owner and realtor have been advised to expressly state the conditions and restrictions of the property with respect to the conservation easement and any potential buyers.

1.5.2. Stream Geomorphology

Visual assessment of the stream channel was performed to document signs of instability, such as beaver activity, eroding banks, structural instability, or excessive sedimentation. No areas of instability were identified during MY3. Monitoring of the NCDOT culvert at the bottom of the project area will be ongoing and has been conducted by both NCDOT and Equinox Staff.

Geomorphic data for MY3 was collected in late September 2022. Summary tables and cross-section data plots related to stream morphology are located in Appendix D. Overall, cross-sectional dimensions have remained stable between baseline conditions and the MY3 monitoring efforts. Some shifts in depth and bankfull width were noted within the cross-sections. Starting in MY1 changes in the floodprone area of two of the six cross-sections was observed (Cross-section 2 and 5, Appendix D). In cross section 2, overbank deposition has resulted in some bank building and has resulted in continued filling of a floodplain depression present in MY0. This depression entrained a log and debris which was transported into the cross-section during MY1. This area of deposition has stabilized over time resulting in a homogenous floodplain topography. Movement of debris has caused a similar change in the dimension noted at Cross-section 5. Bank building and deposition has resulted in a more distinct channel profile in MY3. Additionally, in MY2 the pool at Cross-section 6 migrated downstream and toward the left-descending bank resulting in a slightly oblique angle to the profile along the cross-section. The MY2 profile was nearly unchanged during MY3, indicating a move towards stability. Similarly, Cross-section 5 has undergone similar adjustment between MY2 and MY3 evident from a more distinct bed and bank in cross-section noted during MY3 (Cross-sections, Appendix D, and Photo points, Appendix B). A concern was raised with an increase in BHR during MY2. This coincides with a slight migration of the thalweg toward the right-descending bank resulting in an intermittent overly-wide channel and resulting increase in BHR. Both cross-sections in Reach 1D have been impacted by the effects of the undersized culvert at the bottom of the reach. Routine maintenance of this culvert has allowed for increased transport of materials out of the reach during high flows and resulted in dimensional trends toward stable channel profile (Appendix D, Table 9a & b). Stream dimension will continue to be monitored for changes.

One beaver dam was identified during MY3. This dam was located just outside of the easement at the Caney Fork Rd culvert. This dam was removed following a trapping effort in June 2022, and again in November 2022. Beaver have been an intermittent problem in Reach D since project completion. Aphis is actively working the site. The site will continue to be monitored for beaver activity. No other areas of instability were noted in MY3.

1.5.3.Hydrology

Since project construction completion, 20 bankfull events have been documented at the Harrell Mitigation Site. The suspected dates and associated precipitation records can be found in Table 10, Appendix E.

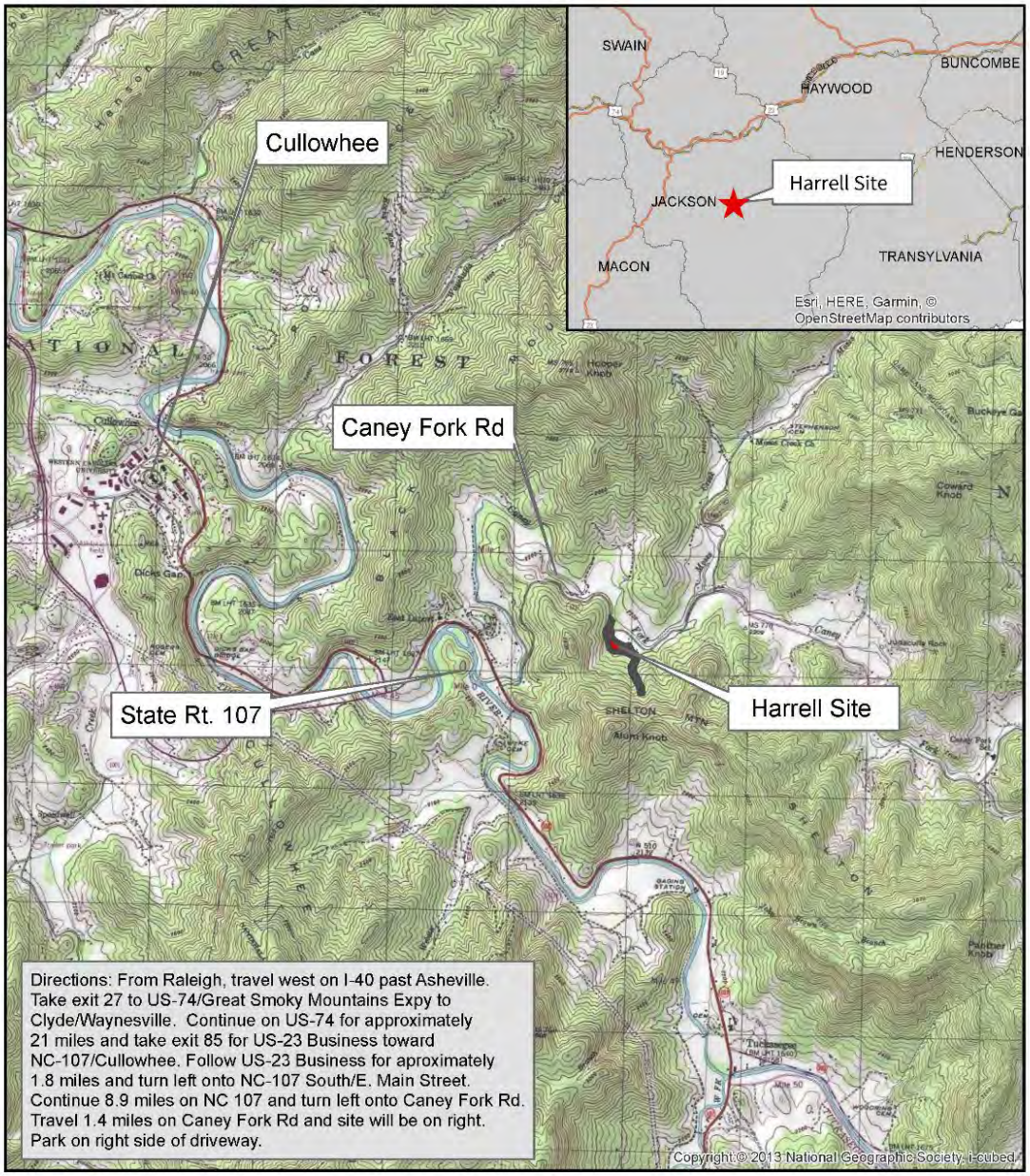
Four groundwater wells, #1, 2, 5, and 7, failed to meet the success criteria during MY3. Monitoring well #1 fell short of the performance criteria at 10%. Monitoring well #2 was similarly short of performance thresholds at 9%. The region had been experiencing intermittent level of drought conditions during MY3 (Drought.gov). Based upon the past performance of groundwater wells 5 and 7

approximately 0.75 WMU's may be "At Risk" within the project. Supplemental wells will be added to the MY4 monitoring features to further address wetland performance.

The well casing at groundwater monitoring well #6 was damaged in late September. The damage required a complete reinstallation of the casing and logger. The well was reinstalled on October 19, 2022.

Groundwater gage graphics and supporting tables can be found in Appendix E. At the suggestion of the IRT and DMS, supplemental soil profiles were conducted in MY3 near all failing monitoring wells (1, 2, 5, and 7). A summary of these profiles and accompanying photos can be found in Appendix F. Additional profiles will be conducted in MY5 and MY7 to capture any changes in wetland soil indicators.

1.6. Vicinity Map



2.0 REFERENCES

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NCDENR. 2021. DMS Veg Table Production Tool, Version 8/23/2021. Retrieved from https://ncdms.shinyapps.io/Veg_Table_Tool/.

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Appendix A
Background Tables

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Table 1. Project Mitigation Assets and Components
Harrell Mitigation Site

Project Segment	Existing Footage or Acreage	Mitigation Plan Footage or Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)		As-Built Centerline Footage or Acreage^	Comments
Reach 1A	654	640	Cold	P	NA	10.0		640	
Reach 1B	286	273	Cold	R	PI	1.0		273	Less 38' for crossing and outlet protection. Less than 30' buffer for 41 LF
Reach 1C	1,265	1,268	Cold	R	PI	1.0		1,189	0.026 ac impact to Wetland B
Reach 1D	223	249	Cold	R	P1	1.0		294	Less 13' for ROW Less than 30' buffer for 32 LF 0.008 ac impact to Wetland A
Wetland A	1.59	1.58	RNR	Re (Pres)		0.0		1.58	Existing wetland will be protected 0.008 ac impact to Wetland A for stream construction
Wetland A	1.59	0.26	RNR	R(Re-est)		1.0		0.26	Area of the existing channel within the wetland was filled and replanted
Wetland B	0.24	0.22	RNR	R (Rehab)		1.0		0.22	0.026 ac impact to Wetland B for stream construction
Wetland C	-	3.05	RNR	R (Re-Est)		1.0		3.05	

^ Based on centerline calculations from the as-built survey, accounts for breaks in conservation easement and utility right-of-ways.

Project Credits

	Stream			Riparian Wetland		Non-Rip	Coastal
Restoration Level	Warm	Cool	Cold	Riverine	Non-Riv	Wetland	Marsh
Restoration	-	-	1790	-	-	-	-
Re-establishment				-	3.31	-	-
Rehabilitation				-	0.22	-	-
Enhancement				-	-	-	-
Enhancement I	-	-	-				
Enhancement II	-	-	-				
Creation				-	-	-	-
Preservation	-	-	64	-	-	-	
Total Credits [%]	-	-	**1,854**	-	**3.53**	-	-

[%] Project credits reflect the sum of credits outlined in the IRT approved mitigation plan. Mitigation plan credits account for breaks in conservation easements and are based on centerline design stream stationing and taken from the IRT approved mitigation plan. Mitigation plan credits are the same as the IRT approved mitigation plan.

* Wetland A will be protected but is not generating wetland credit due to the 100% Restoration credit requirement in RFP 16-008611

Table 2. Project Activity and Reporting History Harrell Mitigation Site		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	Dec - 2018	Jan - 2019
Mitigation Plan Addendum	-	-
Final Design - Construction Plans	-	June - 2019
Construction	-	Aug - 2019
Temporary S&E Mix Applied	-	Aug - 2019
Permanent Seed Mix Applied	-	Aug - 2019
Bare Root and Live Stake Plantings	-	Jan - 2020
Baseline Monitoring Document (Year 0 Monitoring - Baseline)	Jan - 2020	Feb - 2020
Stream Assessment	Jan - 2020	
Vegetation Assessment	Jan - 2020	
Year 1 Monitoring	-	Dec-2020
Initial Site Assessment	April-2020	
Stream Assessment	Sept - 2020	
Vegetation Assessment	Sept - 2020	
Invasive Vegetation Treatments		Nov-2020
Year 2 Monitoring	-	Dec-2021
Supplemental vegetation planting	Feb-2021	
Initial Site Assessment	April-2021	
Stream Assessment	Sept - 2021	
Vegetation Assessment	Oct - 2021	
Invasive Vegetation Treatments	-	June - 2021
Year 3 Monitoring		
Supplemental vegetation planting	Feb - 2022	-
Initial Site Assessment	Mar - 2022	April - 2022
Invasive Vegetation Treatments	-	June - 2022
Stream Assessment	Sept - 2022	Jan - 2023
Vegetation Assessment	Sept - 2022	
Beaver Management	-	Jun - 2022
	-	Nov - 2022

Table 3. Project Contacts Harrell Mitigation Site	
Prime Contractor	EW Solutions 37 Haywood Street, Suite 100 Asheville, NC 28801 David Tuch (828) 253-6856
Designer	Stantec Consulting, Inc 56 College Street, Suite 201 Asheville, North Carolina 28801 Grant Ginn (828) 449-1930
Construction Contractor	Penland Contracting, Inc 300 NP&L Loop Franklin, NC 28734 Lewis Penland (828) 421-1753
Seeding Contractor	Penland Contracting, Inc 300 NP&L Loop Franklin, NC 28734 Lewis Penland (828) 421-1753
Planting Contractor	Equinox 37 Haywood St. Asheville, North Carolina 28801 Owen Carson (828) 253-6856
As-built Surveys	Kee Mapping 88 Central Ave. Asheville, NC 28801 Brad Kee (828) 575-9021
Seeding Mix Source	Hancock Farm & Seed 18724 Hancock Farm Rd Dade City, Fl 333523 (352) 567-6971
Live Stakes	Mellow Marsh Farms 1312 Woody Store Road Siler City, NC 27344 (919) 742-1200
Monitoring Performers (MY1-MY3)- 2020-2022	Equinox 37 Haywood St. Asheville, North Carolina 28801 Owen Carson (828) 253-6856 ext. 204 Danvey Walsh (828) 253-6856 ext.201

Table 4. Project Baseline Information and Attributes

Project Information

Project Name	Harrell Stream and Wetland Mitigation Site
County	Jackson
Project Area (acres)	8.45
Project Coordinates (latitude and longitude)	35.300533° N, -83.133689° W
Project Thermal Regime	Cold

Project Watershed Summary Information

Physiographic Province		Blue Ridge Mountains	
River Basin		Little Tennessee	
USGS Hydrologic Unit 8-digit	6010203	USGS Hydrologic Unit 14-digit	06010203010060
DWR Sub-basin		04-04-02	
Project Drainage Area (acres)		102.0	
Project Drainage Area Percentage of Impervious Area		< 1%	
CGIA Land Use Classification		Agricultural	

Reach Summary Information

Parameters	Reach 1A	Reach 1B	Reach 1C	Reach 1D
Length of Reach (linear feet)	640	273	1,268	249
Valley Confinement (Rosgen)	II	II	VII	VII
Drainage area (miles^2)	0.05	0.07	0.16	0.17
Perrenial, Intermittent, Ephemeral	Perrenial	Perrenial	Perrenial	Perrenial
NCDWR Water Quality Classification	C	C	C	C
Stream Classification (existing)	A & B	G	E & F	E
Stream Classification (proposed)	A	B4	E4	E4
FEMA classification	-	-	-	-

Wetland Summary Information

Parameters	Wetland A	Wetland B	Wetland C
Size of Wetland (acres)	1.58	0.22	3.05
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Riparian	Riparian	Riparian
Mapped Soil Series	NkA	NkA	NkA
Drainage class	poorly	poorly	poorly
Soil Hydric Status	Hydric	Hydric	Hydric
Source of Hydrology	Groundwater	Groundwater	Groundwater
Hydrologic Impairment	Agriculture/ Ditching	Agriculture/ Ditching	Agriculture/ Ditching
Native vegetation community	Swamp-Forest Bog	Swamp-Forest Bog	Swamp-Forest Bog
Percent composition of exotic invasive vegetation	15%	15%	1%

Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States – Section 404	Yes	Yes	404 Permit #SAW-2016-02202
Waters of the United States – Section 401	Yes	Yes	401 Permit #20161077
Endangered Species Act	Yes	Yes	FFHWA Categorical Exclusion (CE)/ERTR
Historic Preservation Act	No	N/A	FFHWA Categorical Exclusion (CE)/ERTR
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	FEMA Floodplain Requirements Checklist (Jan-2019) Jackson County, NC Floodplain Development Permit #2019-F187
Essential Fisheries Habitat	No	N/A	N/A

Appendix B
Visual Assessment Data

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Mitigation Services
ENVIRONMENTAL QUALITY

Project Assets
Harrell Mitigation Site
Jackson County, NC

0 30 60 120 180 240 300
Feet

Conservation Easement Boundary

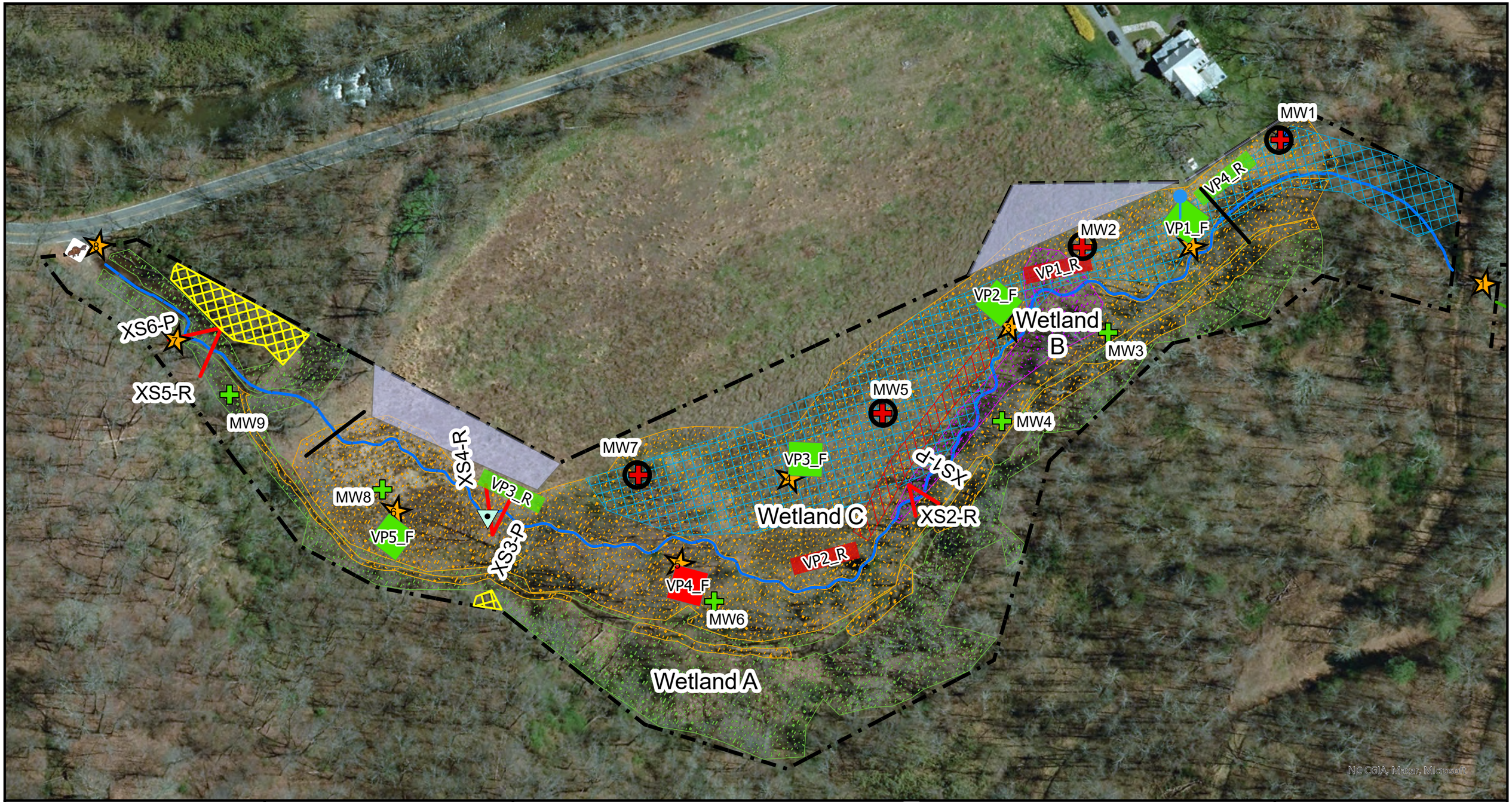
Wetlands

- Reestablishment
- Rehabilitation
- Preservation (No Credit)

Streams

- Preservation
- Restoration
- Reach Breaks

EQUINOX



Mitigation Services
ENVIRONMENTAL QUALITY

MY3 CCPV
Harrell Mitigation Site
Jackson County, NC
December 2022

0 15 30 60 90 120 150
Feet

- Conservation Easement Boundary
- Monitoring
- Random Vegetation Plot
  - Not Meeting
  - Meeting
- Fixed Vegetation Plot
  - Not Meeting
  - Meeting
  - Continuous Stage Recorder
  - Cross-Section
- Groundwater Gauge
  - Not Meeting Criteria
  - Meeting Criteria
- Photopoints
- Rain Gauge
- BeaverDam
- Low Stem Density
- Invasive Vegetation
- Supplemental_Planting
- Encroachment Areas
- Wetlands
  - Reestablishment
  - Rehabilitation
  - Preservation (No Credit)
- Streams
  - Preservation
  - Restoration
  - Reach Breaks
- Soil Profiles

EQUINOX

Table 5. Visual Stream Morphology Stability Assessment
Harrell Mitigation Site - Harrell Reach 1A - Preservation
Assessed Length 640 feet (March 29th and September 16, 2022)

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	Adjusted % for Stabilizing Woody Vegetation
1. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	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. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.					100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.					100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.					100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.					100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.					100%			

N/A - Item does not apply.

Table 5 Visual Stream Morphology Stability Assessment
Harrell Mitigation Site - Harrell Reach 1B - Restoration P1
Assessed Length 286 feet (March 29th and September 16, 2022)

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	Adjusted % for Stabilizing Woody Vegetation
1. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	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
2. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does NOT exceed 15%.	15	15			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	15	15			100%			

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment
Harrell Mitigation Site - Harrell Reach 1C - Restoration P1
Assessed Length 1268 feet (March 29th and September 16, 2022)

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	Adjusted % for Stabilizing Woody Vegetation
1. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	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
2. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	9	9			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%.	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	9	9			100%			

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment
Harrell Mitigation Site - Harrell Reach 1D - Restoration P1
Assessed Length 223 feet (March 29th and September 16, 2022)

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	Adjusted % for Stabilizing Woody Vegetation
1. Bank	**1. Scoured / Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	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
2. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.					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%.	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio ≥ 1.6. Rootwads/logs providing some cover at base-flow.	3	3			100%			

N/A - Item does not apply.

Table 6. Vegetation Condition Assessment Harrell Mitigation Site						
Planted Acreage: 4.46 (Assessed March 29th and Sept 16, 2022)						
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	n/a	0	0	0.00%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres		1	0.09	2.02%
			Total	1	0.09	2.02%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	n/a	0	0	0.00%
			Cumulative Total	1	0.09	2.02%
Easement Acreage:	**8.43**					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale). Low Density	1000 SF		2	0.11	1.27%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none		3	0.34	4.03%

Vegetation Plot Photos

Vegetation Monitoring Plot 1

Vegetation Monitoring Plot 2

Vegetation Monitoring Plot 3

Vegetation Monitoring Plot 4

Vegetation Monitoring Plot 5

Permanent Photo Stations

Photo point #1a, facing upstream at Reach 1A.

Photo point #1b, facing stormwater control measure along Reach 1A boundary.

Photo point #1c, facing downstream at Reach 1B.

Photo point #1d, facing downstream at Reach 1B channel.

Photo point #1e facing upstream at Reach 1A/B culvert.

Photo point #1 supplemental, facing downstream from Reach 1B.

Photo point #2a, facing upstream towards, Reach 1B.

Photo point #2b, facing downstream, Reach 1C and Wetland B.

Photo point #2c, Reach 1C channel.

Photo point #2c, Reach 1C channel.

Photo point #3a, facing upstream, Reach 1C and Wetland B

Photo point #3b, facing downstream, Reach 1C and Wetland 1C.

Photo point #3c supplemental, facing upstream Reach 1C channel.

Photo point #3c supplemental, facing upstream Reach 1C channel.

Photo point #4a, facing upstream, Reach 1C and Wetland C.

Photo point #4b, facing downstream, Reach 1C and Wetland C.

Photo point #4c, facing downstream, Reach 1C channel.

Photo point #4c, XS 1, facing downstream, Reach 1C channel.

Photo point #5a, facing upstream, Reach 1C and Wetland C.

Photo point #5b, facing downstream, Reach 1C and Wetland C.

Photo point #5c, facing upstream, Reach 1C channel.

Photo point #5c, facing upstream, Reach 1C channel.

Photo point #6a, facing upstream, Reach 1C and Wetland C.

Photo point #6b, facing downstream. Reach 1C and Wetland C.

Photo point #6c, facing upstream from XS3, Reach 1C channel.

Photo point #6c, facing upstream from XS3, Reach 1C channel.

Photo point #7a, facing upstream from XS 5, Reach 1D.

Photo point #7b, facing downstream from XS 5, Reach 1D.

Photo point #8a, facing upstream from Caney Fork Road, Reach 1D.

Photo point #8b, facing downstream Caney Fork Road culvert, Reach 1D.

Problem Area Photos

Beaverdam at Caney Fork Rd Culvert

Easement Violation (Mowing) Station 103+00 to 105+50

Easement Violation (Mowing) Station 113+00 to 115+00

Easement Violation additional signs, 113+00 to 115+00

Easement Violation (Mowing) along residential fence line.

Appendix C
Vegetation Plot Data

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https://ncdms.shinyapps.io/Veg_Table_Tool/

Planted Acreage	4.46
Date of Initial Plant	2020-01-15
Date(s) of Supplemental Plant(s)	2021-02-26 2022-02-25
Date(s) Mowing	
Date of Current Survey	2022-09-09
Plot size (ACRES)	0.0247

Table 7a. Harrell Stream & Wetland Mitigation Site (100005) Vegetation Plot Table.

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 F		Veg Plot 2 F		Veg Plot 3 F		Veg Plot 4 F		Veg Plot 5 F		Veg Plot 6 R	Veg Plot 7 R	Veg Plot 8 R	Veg Plot 9 R
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Total	Total	Total	Total
Species Included in Approved Mitigation Plan	Alnus serrulata	hazel alder	Tree	OBL	5	5	2	2	1	1	1	1	5	5	1	2	2	5
	Betula nigra	river birch	Tree	FACW									2	2			1	
	Cephalanthus occidentalis	common buttonbush	Shrub	OBL					2	2	2	2	1	1		2	5	
	Cornus amomum	silky dogwood	Shrub	FACW	2	2	3	3	4	4	2	2	1	1	1	1		5
	Fraxinus pennsylvanica	green ash	Tree	FACW	2	2	3	3	3	3	1	1	1	1	3		1	
	Lindera benzoin	northern spicebush	Tree	FAC	1	1												
	Liriodendron tulipifera	tuliptree	Tree	FACU						1						1		2
	Platanus occidentalis	American sycamore	Tree	FACW													2	2
	Salix nigra	black willow	Tree	OBL	2	2	2	2		2	1	1	4	6	1			
Sum	Performance Standard				12	12	10	10	10	13	7	7	14	16	6	6	11	14
Post Mitigation Plan Species	*Acer rubrum*	*red maple*	*Tree*	*FAC*												*1*	*2*	*1*
	Carya sp.																	*1*
Sum	Proposed Standard				12	12	10	10	10	13	7	7	14	16	6	6	11	14
Mitigation Plan Performance Standard	Current Year Stem Count					12		10		13		7		16	6	6	11	14
	Stems/Acre					486		405		526		283		648	243	243	445	567
	Species Count					5		4		6		5		6	4	4	5	4
	Dominant Species Composition (%)					42		30		31		29		38	50	29	38	31
	Average Plot Height (ft.)					3		3		3		3		2	1	1	2	56
	% Invasives					0		0		0		0		0	0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count					12		10		13		7		16	6	6	11	14
	Stems/Acre					486		405		526		283		648	243	243	445	567
	Species Count					5		4		6		5		6	4	4	5	4
	Dominant Species Composition (%)					42		30		31		29		38	50	29	38	31
	Average Plot Height (ft.)					3		3		3		3		2	1	1	2	56
	% Invasives					0		0		0		0		0	0	0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 7b. Harrell Stream & Wetland Mitigation Site (100005) Vegetation Performance Standards Summary Table.

	Veg Plot 1 F				Veg Plot 2 F				Veg Plot 3 F			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	486	3	5	0	405	3	4	0	526	3	6	0
Monitoring Year 2	486	2	5	0	405	3	4	17	405	2	4	0
Monitoring Year 1	445	2	6	0	526	2	6	0	405	2	4	0
Monitoring Year 0	486	2	6	0	526	2	6	0	445	2	4	0
	Veg Plot 4 F				**Veg Plot 5 F**				**Veg Plot Group 1 R**			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	283	3	5	0	648	2	6	0	243	1	4	0
Monitoring Year 2	445	2	7	0	526	2	6	0				
Monitoring Year 1	202	2	3	0	769	1	7	0				
Monitoring Year 0	1052	2	9	0	972	2	7	0				
	Veg Plot Group 2 R				**Veg Plot Group 3 R**				**Veg Plot Group 4 R**			
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	243	1	4	0	445	2	5	0	567	56	4	0
Monitoring Year 2												
Monitoring Year 1												
Monitoring Year 0												

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

Appendix D
Stream Measurement and Geomorphology Data

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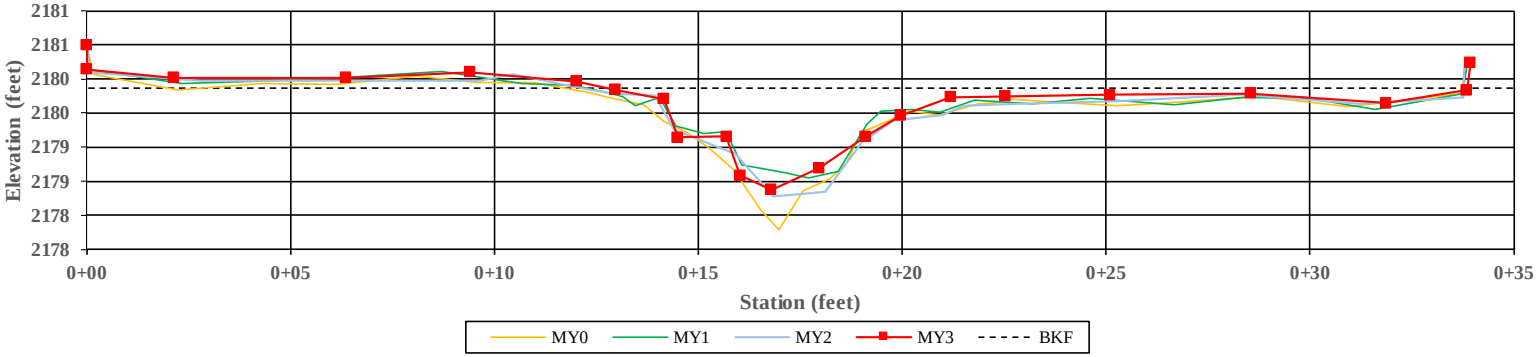
Project Name: Harrell Stream & Wetland **XS Number:** 1 **Station:** 107+75

Reach Name: Harrell Creek Reach 1C **XS Type:** Pool



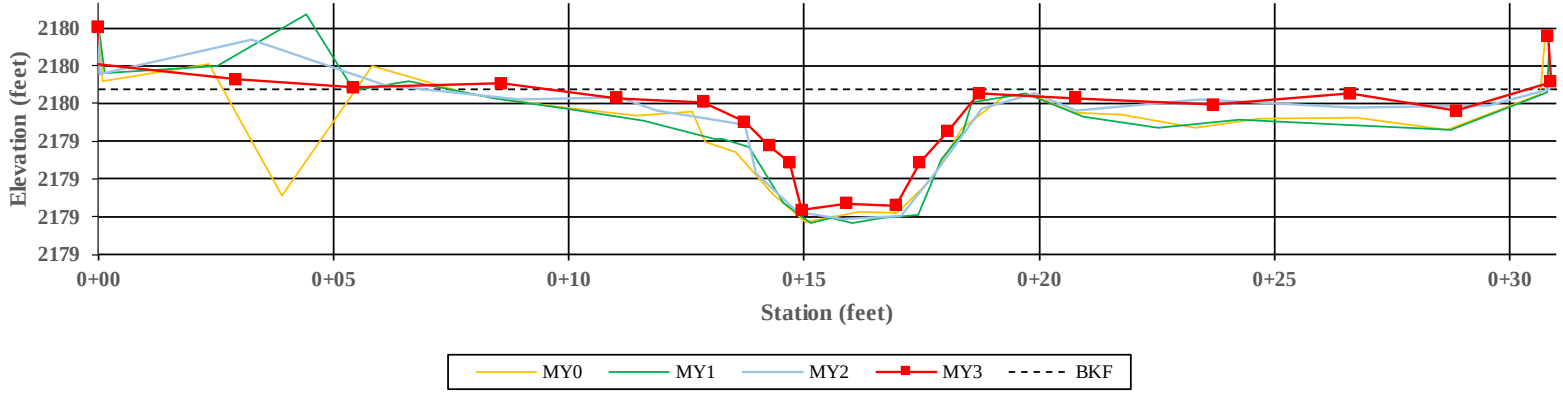
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	9.6	20.4	11.0	8.4	-	-	-	-
Floodprone Width (ft)	50.0	50.0	50.0	50.0	-	-	-	-
Bankfull Mean Depth (ft)	0.6	0.3	0.6	0.7	-	-	-	-
Bankfull Max Depth (ft)	1.9	1.2	1.5	1.5	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	6.0	6.0	6.0	6.0	-	-	-	-
Width/Depth Ratio	15.2	69.1	19.9	11.8	-	-	-	-
Entrenchment Ratio	5.2	2.5	4.6	6.0	-	-	-	-
Bank Height Ratio	1.0	0.9	0.9	0.9	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Harrell Stream & Wetland **XS Number:** 2 **Station:** 107+88

Reach Name: Harrell Creek Reach 1C **XS Type:** Riffle



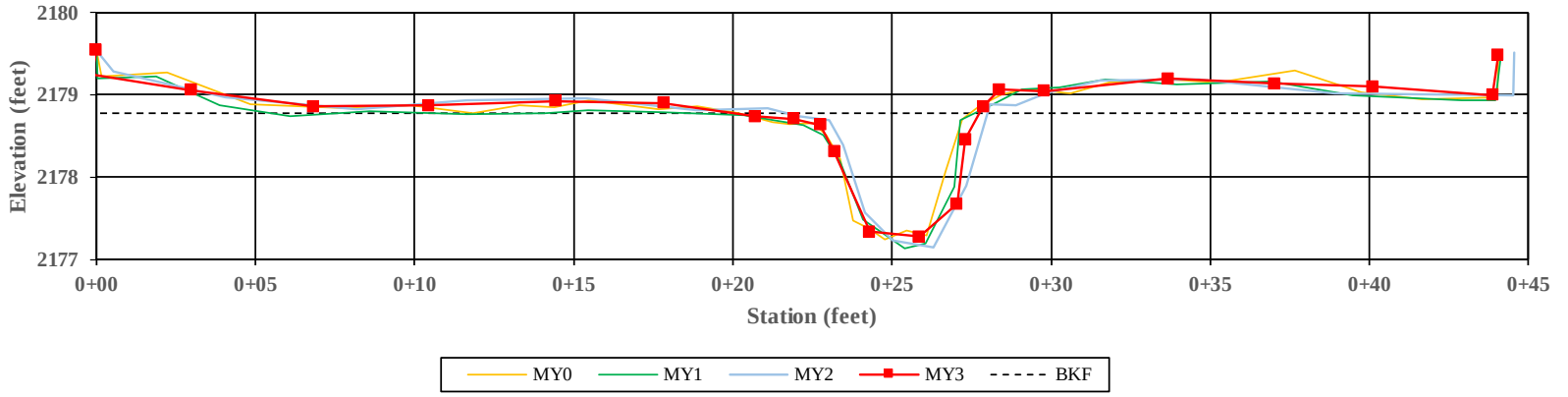
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	6.2	6.8	6.9	7.0	-	-	-	-
Floodprone Width (ft)	50.0	50.0	50.0	50.0	-	-	-	-
Bankfull Mean Depth (ft)	0.6	0.5	0.5	0.5	-	-	-	-
Bankfull Max Depth (ft)	0.9	0.9	0.9	1.0	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.4	3.4	3.4	3.4	-	-	-	-
Width/Depth Ratio	11.2	13.7	14.1	14.5	-	-	-	-
Entrenchment Ratio	8.1	7.4	7.2	7.1	-	-	-	-
Bank Height Ratio	1.1	1.2	1.1	1.0	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Harrell Stream & Wetland **XS Number:** 3 **Station:** 112+76

Reach Name: Harrell Creek Reach 1C **XS Type:** Pool



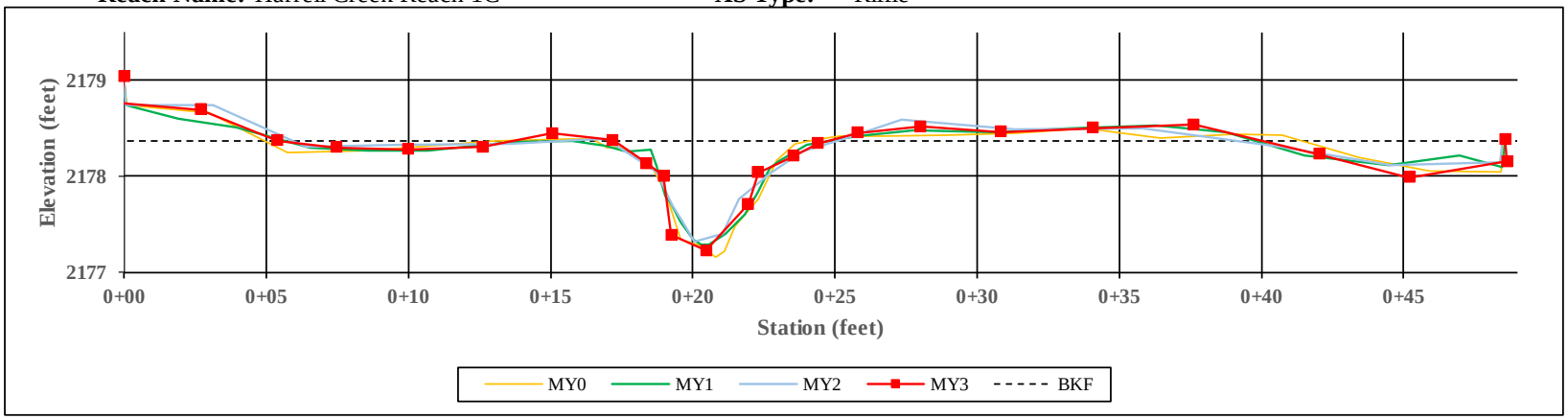
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	5.2	6.8	5.3	5.4	-	-	-	-
Floodprone Width (ft)	50.0	50.0	50.0	50.0	-	-	-	-
Bankfull Mean Depth (ft)	1.0	0.8	1.0	1.0	-	-	-	-
Bankfull Max Depth (ft)	1.6	1.6	1.6	1.5	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	5.3	5.3	5.3	5.3	-	-	-	-
Width/Depth Ratio	5.1	8.8	5.2	5.4	-	-	-	-
Entrenchment Ratio	9.6	7.4	9.5	9.3	-	-	-	-
Bank Height Ratio	1.1	1.0	1.0	0.9	-	-	-	-

Left Descending Bank

Upstream

Project Name: Harrell Stream & Wetland **XS Number:** 4 **Station:** 112+90

Reach Name: Harrell Creek Reach 1C **XS Type:** Riffle



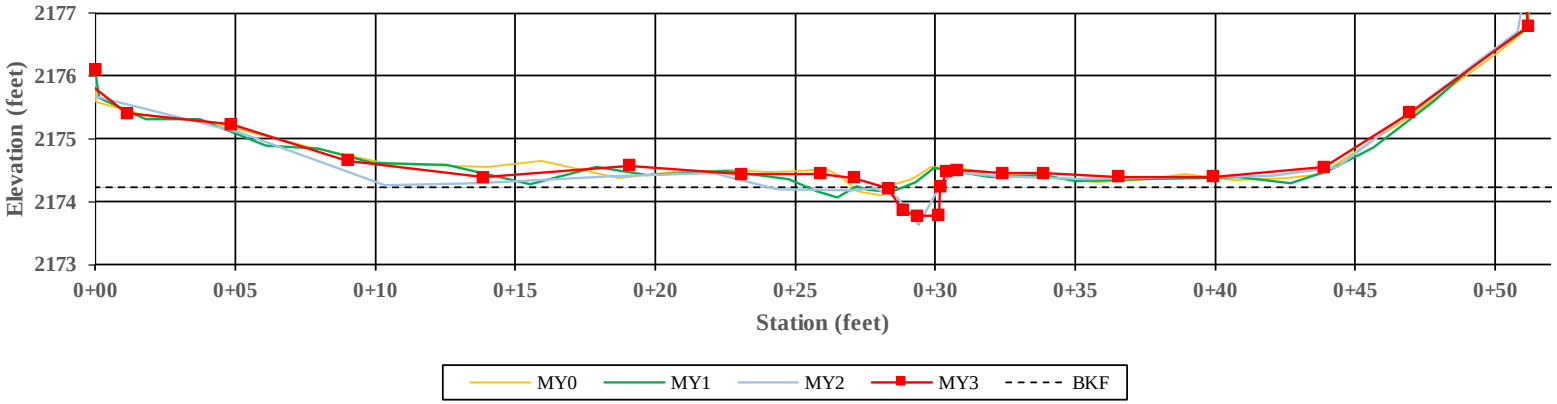
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	6.8	7.1	6.9	6.0	-	-	-	-
Floodprone Width (ft)	50.0	50.0	50.0	50.0	-	-	-	-
Bankfull Mean Depth (ft)	0.5	0.5	0.5	0.6	-	-	-	-
Bankfull Max Depth (ft)	1.2	1.1	1.1	1.1	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	3.6	3.6	3.6	3.6	-	-	-	-
Width/Depth Ratio	12.6	14.2	13.4	10.1	-	-	-	-
Entrenchment Ratio	14.8	7.0	7.2	8.3	-	-	-	-
Bank Height Ratio	1.0	1.0	1.0	1.0	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Harrell Stream & Wetland **XS Number:** 5 **Station:** 116+36

Reach Name: Harrell Creek Reach 1D **XS Type:** Riffle



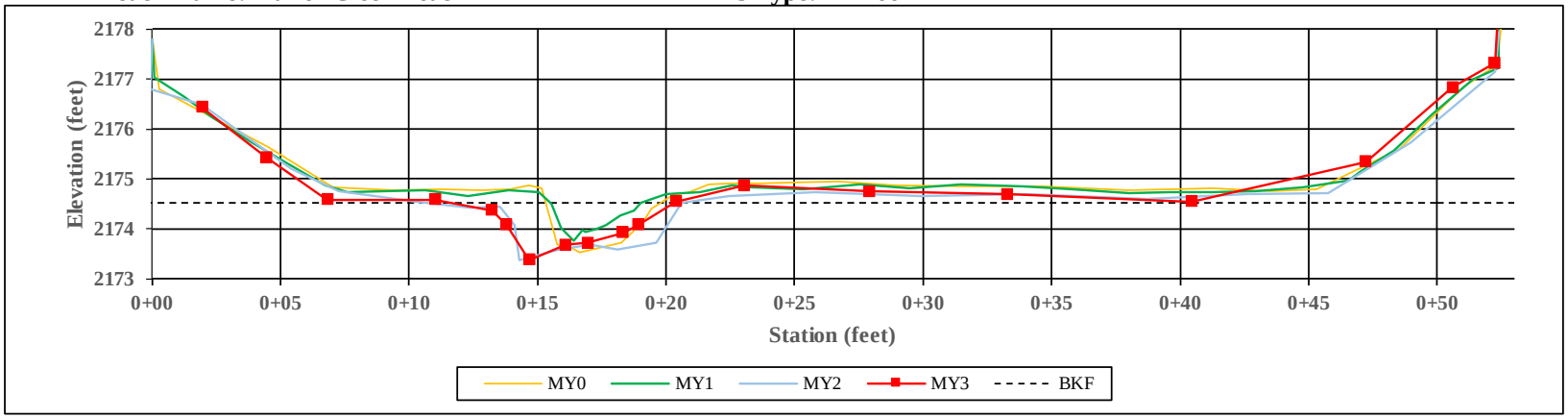
CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	2.5	4.4	5.8	1.8	-	-	-	-
Floodprone Width (ft)	33.4	33.4	33.4	33.4	-	-	-	-
Bankfull Mean Depth (ft)	0.3	0.2	0.1	0.4	-	-	-	-
Bankfull Max Depth (ft)	0.4	0.3	0.6	0.5	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	0.7	0.7	0.7	0.7	-	-	-	-
Width/Depth Ratio	8.6	29.6	46.4	4.9	-	-	-	-
Entrenchment Ratio	13.2	7.5	5.8	18.5	-	-	-	-
Bank Height Ratio	1.0	1.1	1.4	1.0	-	-	-	-

Left Descending Bank

Right Descending Bank

Project Name: Harrell Stream & Wetland **XS Number:** 6 **Station:** 116+65

Reach Name: Harrell Creek Reach 1D **XS Type:** Pool



CHANNEL DIMENSIONS SUMMARY	MY0	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankful Width (ft)	6.1	20.0	5.5	7.1	-	-	-	-
Floodprone Width (ft)	38.3	38.3	38.3	38.3	-	-	-	-
Bankfull Mean Depth (ft)	0.7	0.2	0.8	0.6	-	-	-	-
Bankfull Max Depth (ft)	1.3	1.1	1.0	1.1	-	-	-	-
Bankfull Cross-Sectional Area (ft^2)	4.5	4.5	4.5	4.5	-	-	-	-
Width/Depth Ratio	8.3	89.9	6.8	11.0	-	-	-	-
Entrenchment Ratio	6.3	1.9	6.9	5.4	-	-	-	-
Bank Height Ratio	1.0	0.9	1.0	1.1	-	-	-	-

Left Descending Bank

Upstream

Table 8. Baseline Stream Data Summary
Harrell Mitigation Site - Harrell Creek Reach 1C (1,189 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			As-Built / Baseline					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	4.1	7.1	5.0	10.0	3.7	5	6.3	8.5	-	10.7	-	-	-	4.1	-	6.2	6.5	-	6.8	0.4	2
Floodprone Width (ft)	-	-	-	11.0	13.4	13.0	13.0	1.8	5	25.0	32.2	-	40	-	-	-	>50	-	50.0	50.0	-	50.0	0.0	2
Bankfull Mean Depth (ft)	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	0.7	-	0.5	0.6	-	0.6	0.1	2
Bankfull Max Depth (ft)	-	-	-	0.2	0.6	0.6	0.9	0.3	5	1.2	1.4	-	1.6	-	-	-	0.9	-	0.9	1.0	-	1.2	0.2	2
Bankfull Cross Sectional Area (ft^2)	-			1.9	2.4	2.3	3.7	0.7	5	8.8	8.8	-	10	-	-	-	2.7	-	3.4	3.5	-	3.6	0.1	2
Width/Depth Ratio	-	-	-	7.4	26.6	13.4	77.8	29.7	5	5.2	8.4	-	10.5	-	-	-	6.1	-	11.2	11.9	-	12.6	1.0	2
Entrenchment Ratio	-	-	-	1.3	2.2	2.5	2.6	0.9	5	2.5	3.5	-	3.8	-	-	-	8.6	-	8.1	11.4	-	14.8	4.7	2
Bank Height Ratio	-	-	-	1.0	1.7	1.7	2.0	0.4	5	0.8	1.0	-	1.1	-	-	-	1.0	-	1.0	1.1	-	1.1	0.1	2
d50 (mm)	-	-	-	-	-	-	-	-	-	-	13.0	-	-	-	-	-	-	-	0.1	0.5	-	0.9	0.59	2
Profile																								
Riffle Length (ft)	-	-	-	-	-	-	-	-	-	4.0	6.6	-	10.0	-	-	-	-	-	4.5	11.6	9.8	34.0	6.2	35
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	0.9	2.2	-	4.0	-	-	0.004	-	0.06	1.156	1.321	0.000	1.725	0.167	35
Pool Length (ft)	-	-	-	-	-	-	-	-	-	3.0	15.2	-	23.0	-	-	-	-	-	3.3	10.6	0.0	38.5	6.0	56
Pool Max Depth (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9	1.8	0.0	2.9	0.4	60
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	0.8	1.6	-	2.5	-	-	8.2	10.9	13.6	1.0	18.7	0.0	41.0	7.8	64
Pattern																								
Channel Belt Width (ft)	-	-	-	-	-	-	-	-	-	20.0	33.0	-	53.0	-	-	-	-	-	2.7	8.7	8.0	29.4	4.1	52
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	7.5	11.2	-	15.0	-	-	-	18.0	-	16.8	17.8	17.6	19.2	0.9	8
Rc: Bankfull Width (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	2.8	2.7	3.0	0.1	8
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	25.0	41.0	-	56.0	-	-	-	-	-	24.6	37.7	38.7	58.3	7.9	30
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1	-	0.4	1.3	1.2	4.5	0.6	8
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2	-			-						-						-			-					
Max Part Size (mm) Mobilized at Bankfull	-			-						-						-			-					
Stream Power (Transport Capacity) W/m^2	-			-						-						-			-					
Additional Reach Parameters																								
Drainage Area (mi^2)	-			0.16						0.25						0.16			0.16					
Rosgen Classification	-			E						E;F						E4			E4					
Bankfull Velocity (fps)	-			-						-						-			-					
Bankfull Discharge (cfs)	-			-						-						13.0			-					
Valley Length (ft)	-			-						-						-			1,000					
Channel Thalweg Length (ft)	-			-						-						-			1,189					
Sinuosity	-			-						1.63						1.25			1.19					
Water Surface Slope (ft/ft)	-			-						-						0.005			0.005					
Bankfull Slope (ft/ft)	-			-						-						0.008			0.005					
Bankfull Floodplain Area (acres)	-			-						-						-			-					
% of Reach with Eroding Banks	-			-						-						-			-					
Channel Stability or Habitat Metric	-			-						-						-			-					
Biological or Other	-			-						-						-			-					

Table 8. Baseline Stream Data Summary
Harrell Mitigation Site - Harrell Creek Reach 1D (294 feet)

Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			As-Built / Baseline					
Dimension & Substrate - Riffle	**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**	**Min**	**Mean**	**Max**	**Min**	**Mean**	**Med**	**Max**	**SD**	**N**
Bankfull Width (ft)	-	-	-	2.9	-	-	2.9	-	1	6.3	8.5	-	10.7	-	-	-	4.2	-	2.5	-	-	2.5	0.0	1
Floodprone Width (ft)	-	-	-	35.0	-	-	35.0	-	1	25.0	32.2	-	40	-	-	-	>50	-	33.4	-	-	33.4	0.0	1
Bankfull Mean Depth (ft)	-	-	-	0.7	-	-	0.7	-	1	-	-	-	-	-	-	-	1.6	-	0.3	-	-	0.3	0.0	1
Bankfull Max Depth (ft)	-	-	-	1.0	-	-	1.0	-	1	1.2	1.4	-	1.6	-	-	-	2.3	-	0.4	-	-	0.4	0.0	1
Bankfull Cross Sectional Area (ft^2)	-			2.4	-	-	2.4	-	1	8.8	8.8	-	10	-	-	-	2.8	-	0.7	-	-	0.7	0.0	1
Width/Depth Ratio	-	-	-	3.5	-	-	3.5	-	1	5.2	8.4	-	10.5	-	-	-	6.1	-	8.6	-	-	8.6	0.0	1
Entrenchment Ratio	-	-	-	12.1	-	-	12.1	-	1	2.5	3.5	-	3.8	-	-	-	8.4	-	13.2	-	-	13.2	0.0	1
Bank Height Ratio	-	-	-	1.0	-	-	1.0	-	1	0.8	1.0	-	1.1	-	-	-	1.0	-	1.0	-	-	1.0	0.0	1
d50 (mm)	-	-	-	-	-	-	-	-	-	-	13.0	-	-	-	-	-	-	-	1.2	-	-	1.2	0	1
Profile																								
Riffle Length (ft)	-	-	-	-	-	-	-	-	-	4.0	6.6	-	10.0	-	-	4.0	6.6	-	10.0	-	-	27.0	7.2	35
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	0.9	2.2	-	4.0	-	-	0.9	2.2	-	4.0	-	-	0.97	0.03	35
Pool Length (ft)	-	-	-	-	-	-	-	-	-	3.0	15.2	-	23.0	-	-	3.0	15.2	-	23.0	-	-	48.5	23.3	2
Pool Max Depth (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	0.2	2
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	0.8	1.6	-	2.5	-	-	0.8	1.6	-	2.5	-	-	72.0	n/a	1
Pattern																								
Channel Belt Width (ft)	-	-	-	-	-	-	-	-	-	20.0	33.0	-	53.0	-	-	-	-	-	53.0	-	-	15.4	1.1	3
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	7.5	11.2	-	15.0	-	-	-	18.0	-	15.0	-	-	22.0	0.2	2
Rc: Bankfull Width (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.8	0.1	2
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	25.0	41.0	-	56.0	-	-	-	-	-	56.0	-	-	102.9	19.7	5
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1	-	-	-	-	6.2	0.4	2
Substrate, Bed and Transport Parameters																								
Reach Shear Stress (Competency) lb/ft^2	-			-						-						-			-					
Max Part Size (mm) Mobilized at Bankfull	-			-						-						-			-					
Stream Power (Transport Capacity) W/m^2	-			-						-						-			-					
Additional Reach Parameters																								
Drainage Area (mi^2)	-			0.17						0.25						0.17			0.17					
Rosgen Classification	-			E						E;F						E4			E4					
Bankfull Velocity (fps)	-			-						-						-			-					
Bankfull Discharge (cfs)	-			-						-						14			-					
Valley Length (ft)	-			-						-						-			275					
Channel Thalweg Length (ft)	-			-						-						-			294					
Sinuosity	-			-						1.63						1.06			1.07					
Water Surface Slope (ft/ft)	-			-						-						0.003			0.005					
Bankfull Slope (ft/ft)	-			-						-						0.003			0.006					
Bankfull Floodplain Area (acres)	-			-						-						-			-					
% of Reach with Eroding Banks	-			-						-						-			-					
Channel Stability or Habitat Metric	-			-						-						-			-					
Biological or Other	-			-						-						-			-					

^ Channel Centerline (ft): Based on stream centerline stationing from design stream stationing; accounts for breaks in conservation easement and utility right-of-ways.

- Information unavailable.

Non-Applicable.

Table 9a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)
Harrell Mitigation Site

	Cross Section 1 (Pool) Harrell Creek Reach 1C								Cross Section 2 (Riffle) Harrell Creek Reach 1C								Cross Section 3 (Pool) Harrell Creek Reach 1C							
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Record Elevation (datum) Used	2179.7	2179.8	2179.7	2179.9					2179.6	2179.6	2179.7	2179.8					2178.4	2178.3	2178.3	2178.3				
Low Bank Height Elevation (datum) Used	2179.7	2179.7	2179.6	2179.7					2179.8	2179.8	2179.8	2179.8					2178.6	2178.3	2178.3	2178.2				
Bankfull Width (ft)	9.6	20.4	11.0	8.4					6.2	6.8	6.9	7.0					5.2	6.8	5.3	5.4				
Floodprone Width (ft)	50.0	50.0	50.0	50.0					50.0	50.0	50.0	50.0					50.0	50.0	50.0	50.0				
Bankfull Mean Depth (ft)	0.6	0.3	0.6	0.7					0.6	0.5	0.5	0.5					1.0	0.8	1.0	1.0				
Bankfull Max Depth (ft)	1.9	1.2	1.5	1.5					0.9	0.9	0.9	1.0					1.6	1.6	1.6	1.5				
Bankfull Cross Sectional Area (ft^2)	6.0	6.0	6.0	6.0					3.4	3.4	3.4	3.4					5.3	5.3	5.3	5.3				
Bankfull Width/Depth Ratio	15.2	69.1	19.9	11.8					11.2	13.7	14.1	14.5					5.1	8.8	5.2	5.4				
Bankfull Entrenchment Ratio	5.2	2.5	4.6	6.0					8.1	7.4	7.2	7.1					9.6	7.4	9.5	9.3				
Bankfull Bank Height Ratio	1.0	0.9	0.9	0.9					1.1	1.2	1.1	1.0					1.1	1.0	1.0	0.9				
Low Top of Bank Depth (ft)	1.9	1.1	1.3	1.3					1.0	1.0	1.0	1.0					1.8	1.6	1.7	1.4				
	Cross Section 4 (Riffle) Harrell Creek Reach 1C								**Cross Section 5 (Riffle) Harrell Creek Reach 1D**								**Cross Section 6 (Pool) Harrell Creek Reach 1D**							
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Record Elevation (datum) Used	2178.3	2178.4	2178.4	2178.4					2174.5	2174.3	2174.2	2174.2					2174.3	2174.4	2173.9	2174.0				
Low Bank Height Elevation (datum) Used	2178.3	2178.4	2178.4	2178.4					2174.5	2174.4	2174.5	2174.2					2174.3	2174.3	2173.9	2174.1				
Bankfull Width (ft)	6.8	7.1	6.9	6.0					2.5	4.4	5.8	0.4					6.1	20.0	5.5	7.1				
Floodprone Width (ft)	50.0	50.0	50.0	50.0					33.4	33.4	33.4	33.4					38.3	38.3	38.3	38.3				
Bankfull Mean Depth (ft)	0.5	0.5	0.5	0.6					0.3	0.2	0.1	0.4					0.7	0.2	0.8	0.6				
Bankfull Max Depth (ft)	1.2	1.1	1.1	1.1					0.4	0.3	0.6	0.5					1.3	1.1	1.0	1.1				
Bankfull Cross Sectional Area (ft^2)	3.6	3.6	3.6	3.6					0.7	0.7	0.7	0.7					4.5	4.5	4.5	4.5				
Bankfull Width/Depth Ratio	12.6	14.2	13.4	10.1					8.6	29.6	46.4	4.9					8.3	89.9	6.8	11.0				
Bankfull Entrenchment Ratio	14.8	7.0	7.2	8.3					13.2	7.5	5.8	18.5					6.3	1.9	6.9	5.4				
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0					1.0	1.1	1.4	1.0					1.0	0.9	1.0	1.1				
Low Top of Bank Depth (ft)	1.2	1.1	1.1	1.2					0.4	0.3	0.8	0.4					1.3	1.0	1.1	1.2				

- Information Unavailable

N/A - Information does not apply.

Table 9b Cont'd. Monitoring Data - Stream Reach Data Summary
Harrell Reach 1C (1,189 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 5						MY - 7					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	6.2	6.5	-	6.8	0.4	2	6.8	6.9	-	7.1	0.2	2	6.9	6.9	-	6.9	0.0	2	6.0	6.5	-	7.0	0.7	2												
Floodprone Width (ft)	50.0	50.0	-	50.0	0.0	2	50	50.0	-	50	0.0	2	50	50	-	50	0.0	2	50.0	50.0	-	50.0	0.0	2												
Bankfull Mean Depth (ft)	0.5	0.6	-	0.6	0.1	2	0.5	0.5	-	0.5	0.0	2	0.5	0.5	-	0.5	0.0	2	0.5	0.5	-	0.6	0.1	2												
Bankfull Max Depth (ft)	0.9	1.0	-	1.2	0.2	2	0.9	1.0	-	1.1	0.2	2	1.0	3.5	-	0.9	0.1	2	1.0	1.1	-	1.1	0.1	2												
Bankfull Cross-Sectional Area (ft^2)	3.4	3.5	-	3.6	0.1	2	3.4	3.5	-	3.6	0.1	2	3.4	3.5		3.5	0.1	2	3.4	3.5	-	3.6	0.1	2												
Width/Depth Ratio	11.2	11.9	-	12.6	1.0	2	13.7	13.9	-	14.2	0.3	2	13.4	13.7	-	14.1	0.5	2	10.1	12.3	-	14.5	3.1	2												
Entrenchment Ratio	8.1	11.4	-	14.8	4.7	2	7.0	7.2	-	7.4	0.2	2	7.2	7.2	-	7.2	0.0	2	7.1	7.7	-	8.3	0.9	2												
Bank Height Ratio	1.0	1.1	-	1.1	0.1	2	1.0	1.1	-	1.2	0.1	2	1.0	1.1	-	1.1	0.1	2	1.0	1.0	-	1.0	0.0	2												
Profile																																				
Riffle Length (ft)	4.5	11.6	9.8	34.0	6.2	35																														
Riffle Slope (ft/ft)	1.156	1.321	0.000	1.725	0.167	35																														
Pool Length (ft)	3.3	10.6	0.0	38.5	6.0	56																														
Pool Max Depth (ft)	0.9	1.8	0.0	2.9	0.4	60																														
Pool Spacing (ft)	1.0	18.7	0.0	41.0	7.8	64																														
Pattern																																				
Channel Belt Width (ft)	2.7	8.7	8.0	29.4	4.1	52																														
Radius of Curvature (ft)	6.8	7.8	7.6	9.2	0.9	8																														
Rc: Bankfull Width (ft/ft)	1.0	1.2	1.2	1.4	0.1	8																														
Meander Wavelength (ft)	24.6	37.7	38.7	58.3	7.9	30																														
Meander Width Ratio	3.8	5.8	6.0	9.0	1.2	30																														
Additional Reach Parameters																																				
Rosgen Classification	E4																																			
Channel Thalweg Length (ft)	1,189																																			
Sinuosity (ft)	1.19																																			
Water Surface Slope (Channel) (ft/ft)	0.0050																																			
Bankfull Slope (ft/ft)	0.0050																																			
Ri% / Ru% / P% / G% / S%	32%	3%	48%	16%	0%																															

- Information Unavailable

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

Table 9b Cont'd. Monitoring Data - Stream Reach Data Summary
Harrell Reach 1D (249 feet)

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 5						MY - 7					
Dimension & Substrate - Riffle	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
Bankfull Width (ft)	2.5	-	-	2.5	0.0	1	4.4	-	-	4.4	0	1	5.8	-	-	5.8	-	1	0.4	-	-	0.4	-	1												
Floodprone Width (ft)	33.4	-	-	33.4	0.0	1	33.4	-	-	33.4	0	1	33	-	-	33	-	1	33.4	-	-	33.4	-	1												
Bankfull Mean Depth (ft)	0.3	-	-	0.3	0.0	1	0.2	-	-	0.2	0	1	0.1	-	-	0.1	-	1	0.4	-	-	0.4	-	1												
Bankfull Max Depth (ft)	0.4	-	-	0.4	0.0	1	0.3	-	-	0.3	0	1	0.6	-	-	0.6	-	1	0.5	-	-	0.5	-	1												
Bankfull Cross-Sectional Area (ft^2)	0.7	-	-	0.7	0.0	1	0.7	-	-	0.7	0	1	0.7	-	-	0.7	-	1	0.7	-	-	0.7	-	1												
Width/Depth Ratio	8.6	-	-	8.6	0.0	1	29.6	-	-	29.6	0	1	46.4	-	-	46.4	-	1	4.9	-	-	4.9	-	1												
Entrenchment Ratio	13.2	-	-	13.2	0.0	1	7.5	-	-	7.5	0	1	5.8	-	-	5.8	-	1	18.5	-	-	18.5	-	1												
Bank Height Ratio	1.0	-	-	1.0	0.0	1	1.1	-	-	1.1	0	1	1.4	-	-	1.4	-	1	1.0	-	-	1.0	-	1												
Profile																																				
Riffle Length (ft)	12.7	19.6	9.8	27.0	7.2	35																														
Riffle Slope (ft/ft)	0.90	0.94	0.00	0.97	0.03	35																														
Pool Length (ft)	15.5	32.0	0.0	48.5	23.3	2																														
Pool Max Depth (ft)	1.1	1.2	0.0	1.4	0.2	2																														
Pool Spacing (ft)	72.0	72.0	0.0	72.0	n/a	1																														
Pattern																																				
Channel Belt Width (ft)	12.7	19.6	9.8	27.0	7.2	35																														
Radius of Curvature (ft)	0.9	0.9	0.0	1.0	0.0	35																														
Rc: Bankfull Width (ft/ft)	15.5	32.0	0.0	48.5	23.3	2																														
Meander Wavelength (ft)	1.1	1.2	0.0	1.4	0.2	2																														
Meander Width Ratio	72.0	72.0	0.0	72.0	n/a	1																														
Additional Reach Parameters																																				
Rosgen Classification	E4																																			
Channel Thalweg Length (ft)	294																																			
Sinuosity (ft)	1.07																																			
Water Surface Slope (Channel) (ft/ft)	0.005																																			
Bankfull Slope (ft/ft)	0.006																																			
Ri% / Ru% / P% / G% / S%	19%	41%	21%	8%	11%																															

- Information Unavailable

N/A - Information does not apply.

Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step

Appendix E
Hydrologic Data

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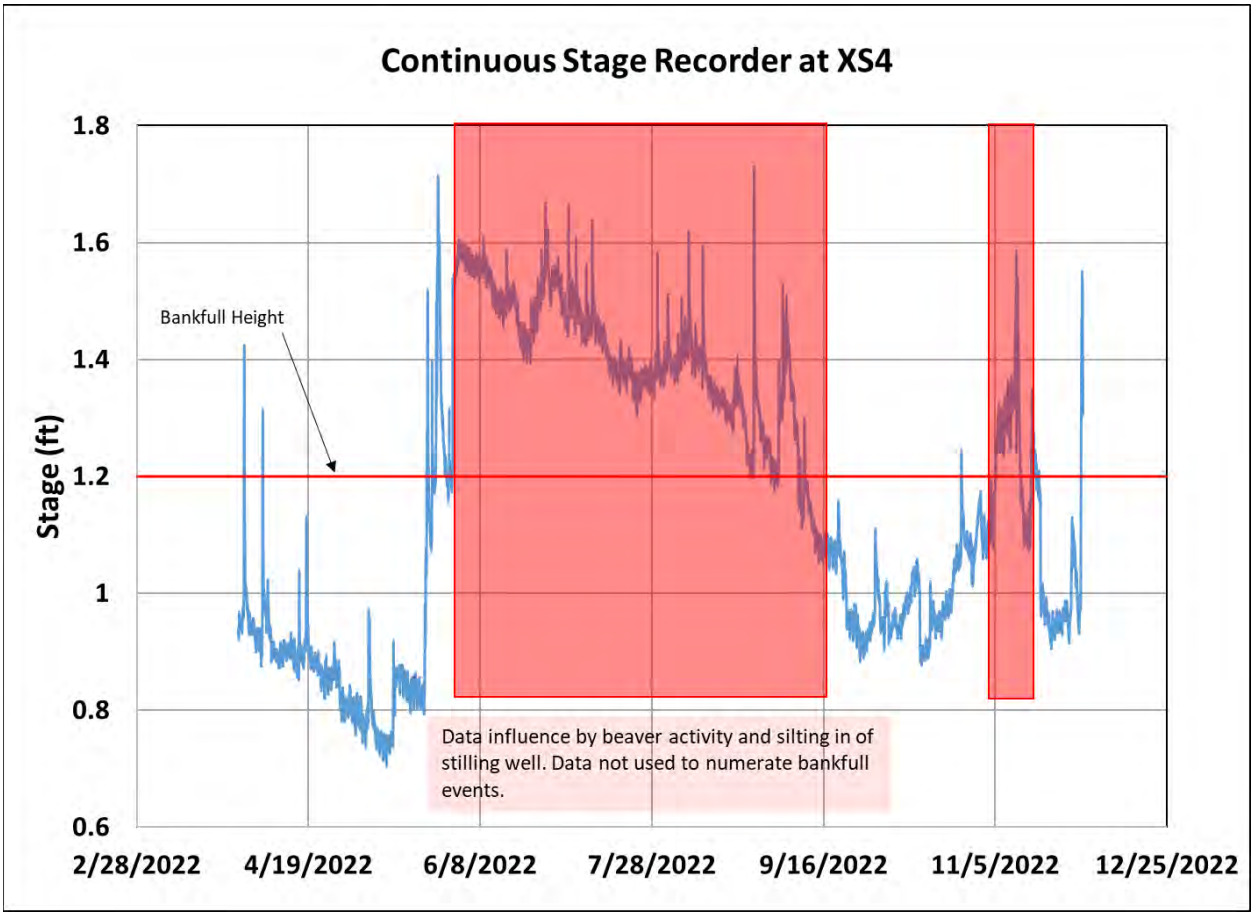
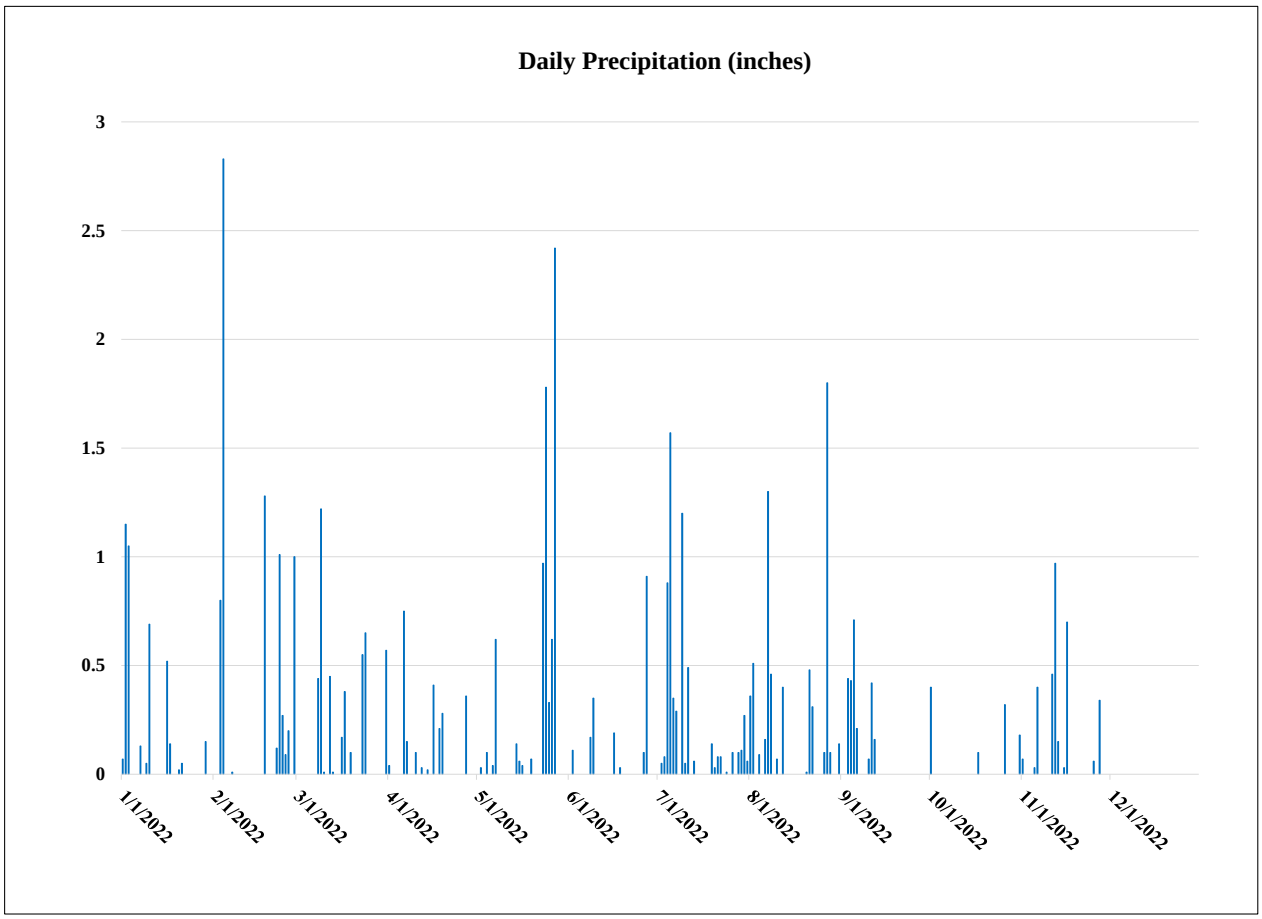
Table 10. Verification of Bankfull Events Harrell Creek Mitigation Project					
Reach 1					
Date of Data Collection	**Date of Occurrence**	**Method**	**Feet Above Bankfull Elevation**	**Photo # (if available)**	**Monitoring Year**
4/1/2020	2/6/2020	Stage Recorder	0.43	n/a	MY1
4/1/2020	2/11/2020	Stage Recorder	< 0.1	n/a	
4/1/2020	2/13/2020	Stage Recorder	0.2	n/a	
4/1/2020	3/25/2020	Stage Recorder	0.23	n/a	
9/10/2020	4/13/2020	Stage Recorder	0.42	n/a	
9/10/2020	6/14 - 6/15/2020	Stage Recorder	0.39	n/a	
9/10/2020	7/1 &7/3/2020	Stage Recorder	0.38	n/a	
9/10/2020	7/20, 7/22, and 7/24/2020	*Stage Recorder	Unknown	n/a	
9/10/2020	7/28/2020	Stage Recorder	0.27	n/a	
9/10/2020	8/21-8/22/2020	Wrack Lines	0.35	n/a	
9/29/2021	1/1/2021	Stage Recorder	0.14	n/a	MY2
9/29/2021	2/18/2021	Stage Recorder	0.11	n/a	
9/29/2021	3/1/2021	Stage Recorder	0.09	n/a	
9/29/2021	3/25/2021	Stage Recorder	0.24	n/a	
9/29/2021	3/31/2021	Stage Recorder	0.07	n/a	
9/29/2021	5/4/2021	+Stage Recorder	0.16	n/a	
6/30/2022	3/31/2022	Stage Recorder	0.21	n/a	MY3
6/30/2022	4/5/2022	Stage Recorder	0.10	n/a	
6/30/2022	▪5/23/2022-5/26/2022	Stage Recorder	0.50	n/a	
11/30/2022	11/30/2022	Stage Recorder	< 0.1	n/a	

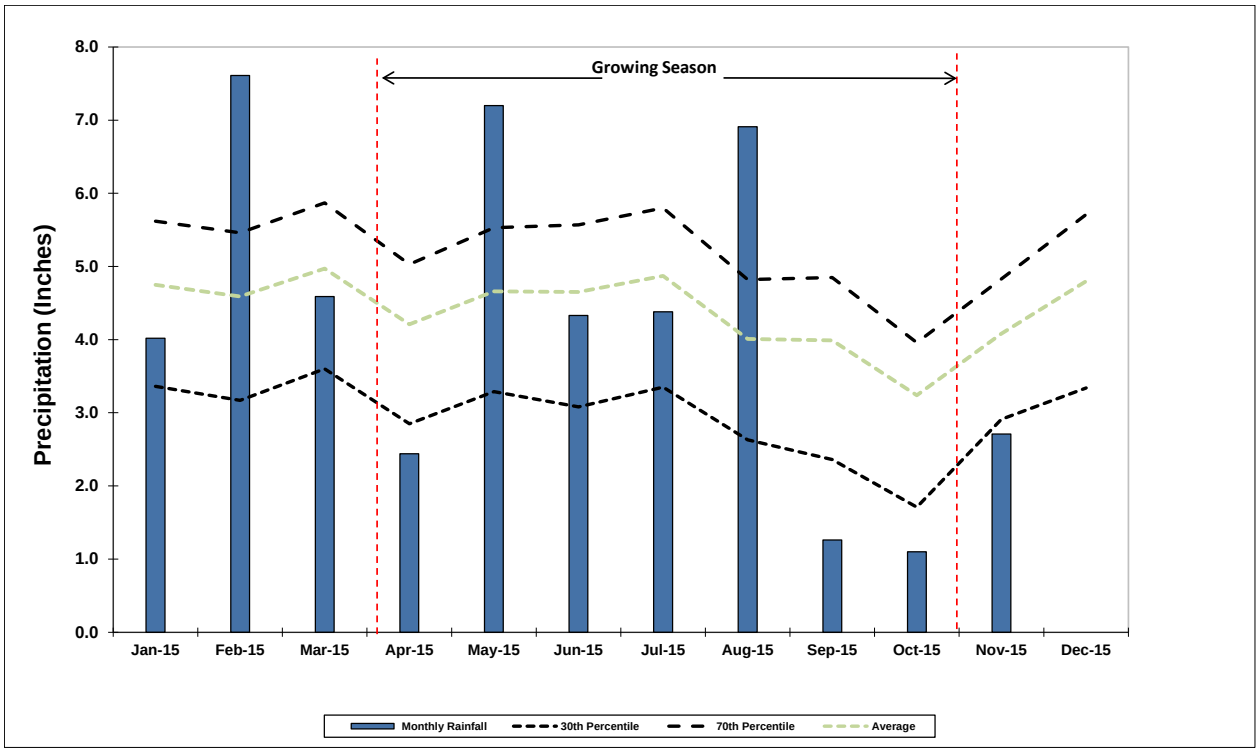
* Crest Gage recorded abnormally high bankfull event relative to rainfall. True event elevation undetermined.

+ Stage recorder failed on May 6, 2021.

▪ Near-continuous bankfull recorded over a four day rain event (6.12 inches)

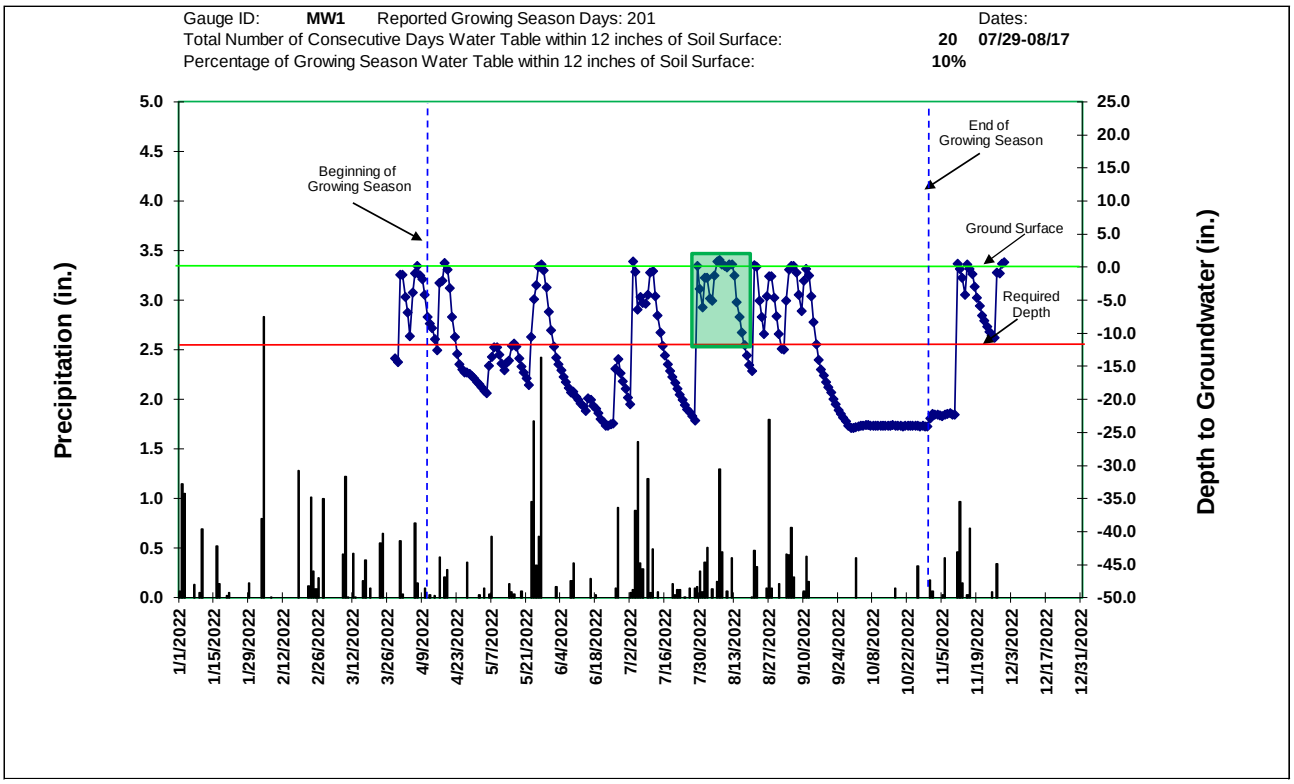



Daily Precipitation (inches)
3
2.5
2
1.5
1
0.5
0
1/1/2022
2/1/2022
3/1/2022
4/1/2022
5/1/2022
6/1/2022
7/1/2022
8/1/2022
9/1/2022
10/1/2022
11/1/2022
12/1/2022

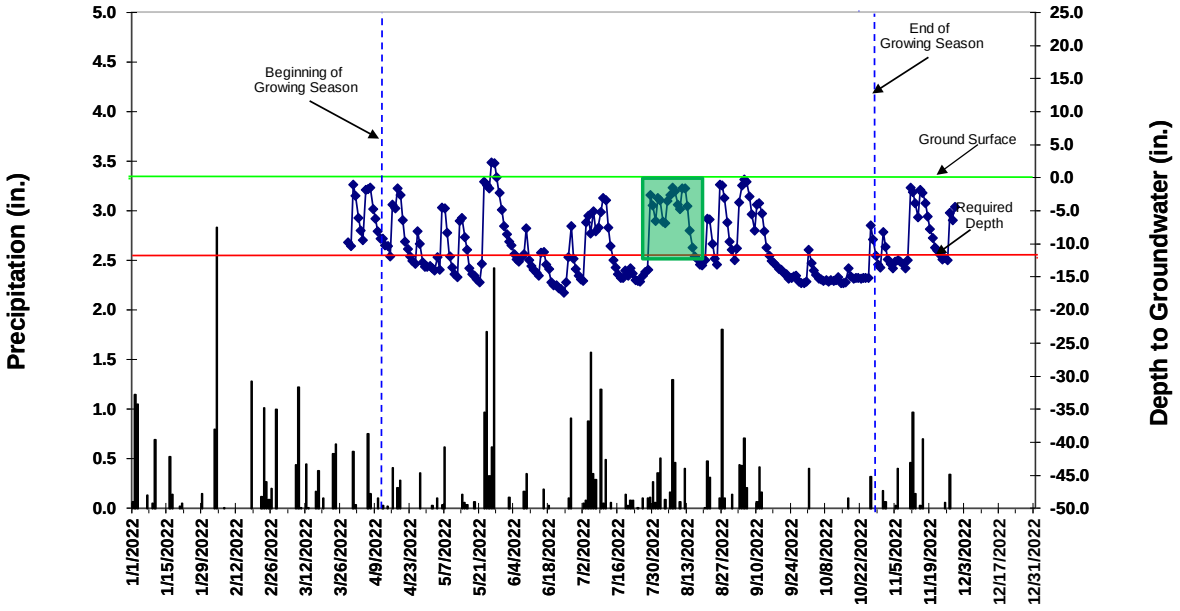

Growing Season
Precipitation (Inches)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Jan-15
Feb-15
Mar-15
Apr-15
May-15
Jun-15
Jul-15
Aug-15
Sep-15
Oct-15
Nov-15
Dec-15
Monthly Rainfall
30th Percentile
70th Percentile
Average

Monitoring Gauge	Performance Standard: **12 %** WETS Station: **Cullowhee, NC** Growing Season: **4/11 to 10/28 (201 days)**						
	Max. Consecutive Hydroperiod (%)						
	MY-1 (2020)	**MY-2 (2021)**	**MY-3 (2022)**	**MY-4 (2024)**	**MY-5 (2025)**	**MY-6 (2026)**	**MY-7 (2027)**
MW-1	22	11	10	-	-	-	-
MW-2	17	12	9	-	-	-	-
MW-3	24	50	47	-	-	-	-
MW-4	71	85	100	-	-	-	-
MW-5	3	5	3	-	-	-	-
MW-6	76	85	84	-	-	-	-
MW-7	3	5	3	-	-	-	-
MW-8	51	13*	79	-	-	-	-
MW-9	100	85	100	-	-	-	-
Meets	Fails to meet						

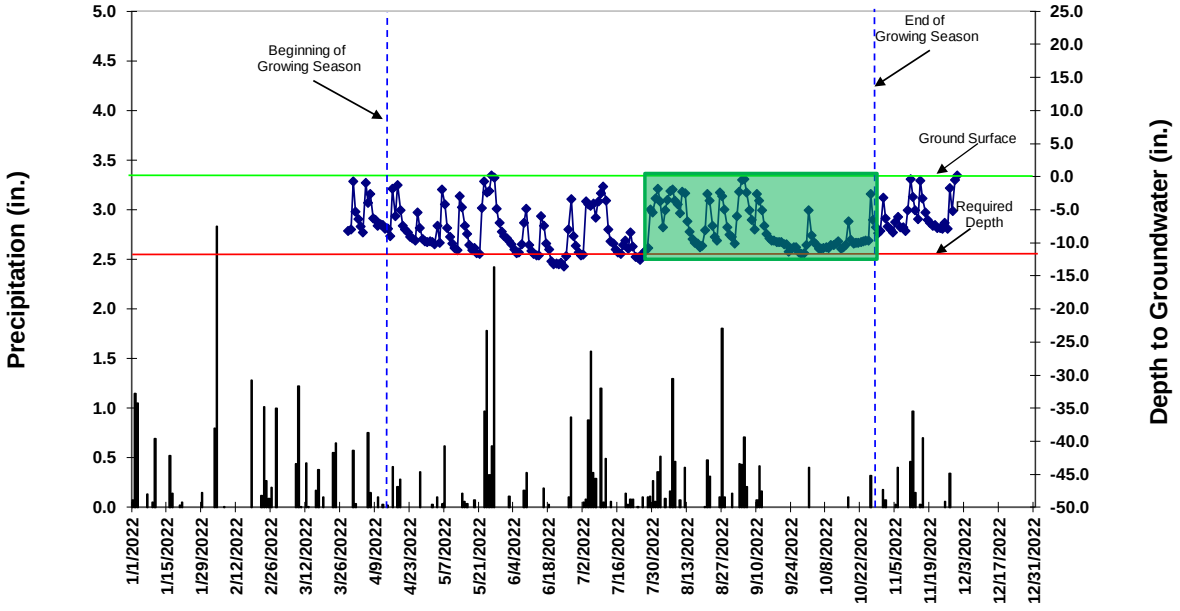
*Gauge failed to reset after deployment, MY2 results are reflective of the period after reset.



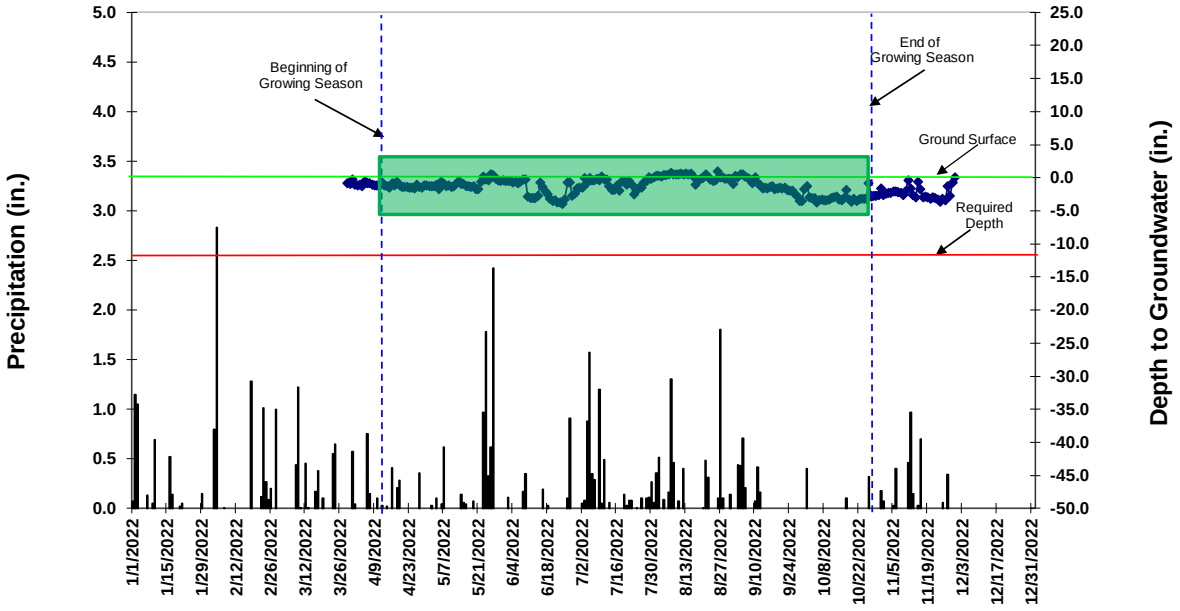
Gauge ID: **MW2** Reported Growing Season Days: 201 Dates:
Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **19** **07/29-08/16**
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **9%**



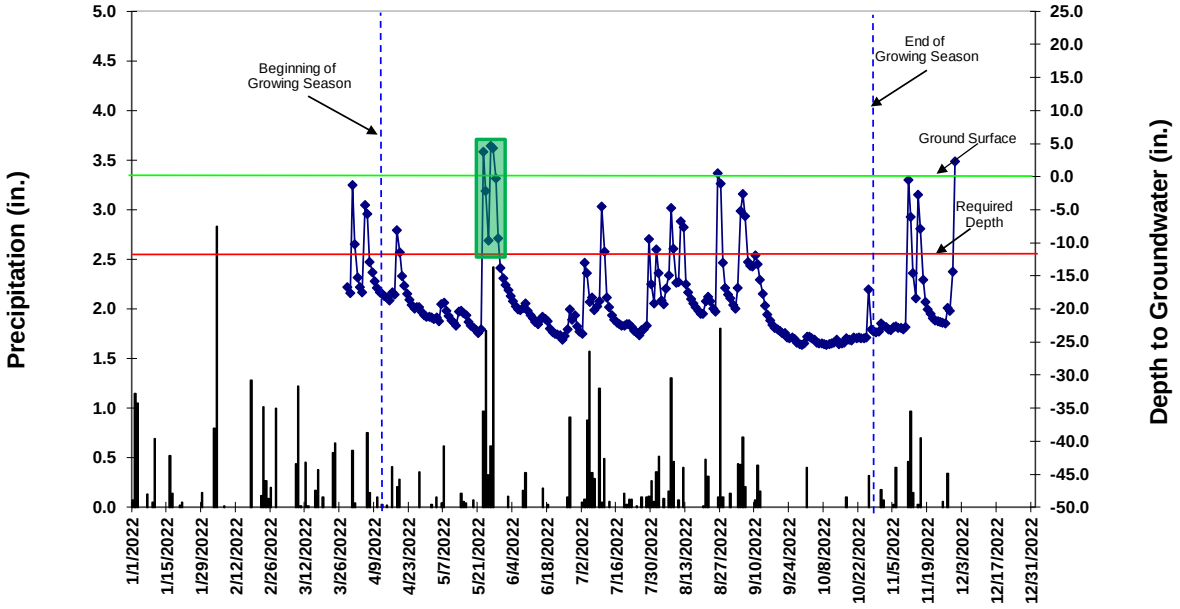
Gauge ID: **MW3** Reported Growing Season Days: 201 Dates:
Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **95** **07/26-10/28**
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **47%**



Gauge ID: **MW4** Reported Growing Season Days: 201 Dates:
Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **201** **04/11-10/28**
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **100%**



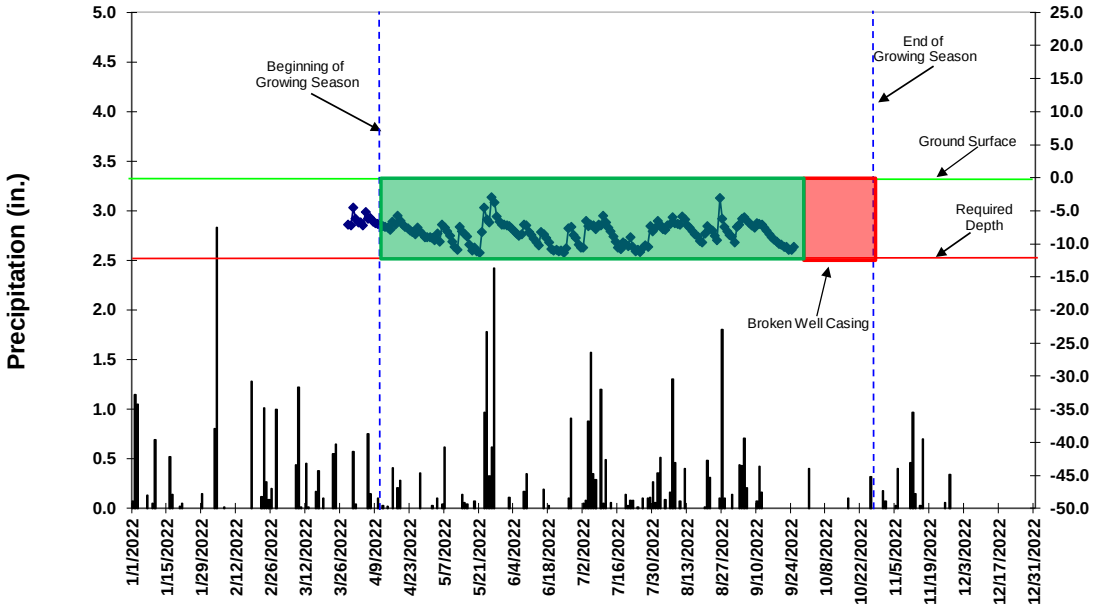
Gauge ID: **MW5** Reported Growing Season Days: 201 Dates:
Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **7** **05/22-05/28**
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **3%**



Gauge ID: **MW6** Reported Growing Season Days: 153 Dates:

Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **168** **04/11-09/29**

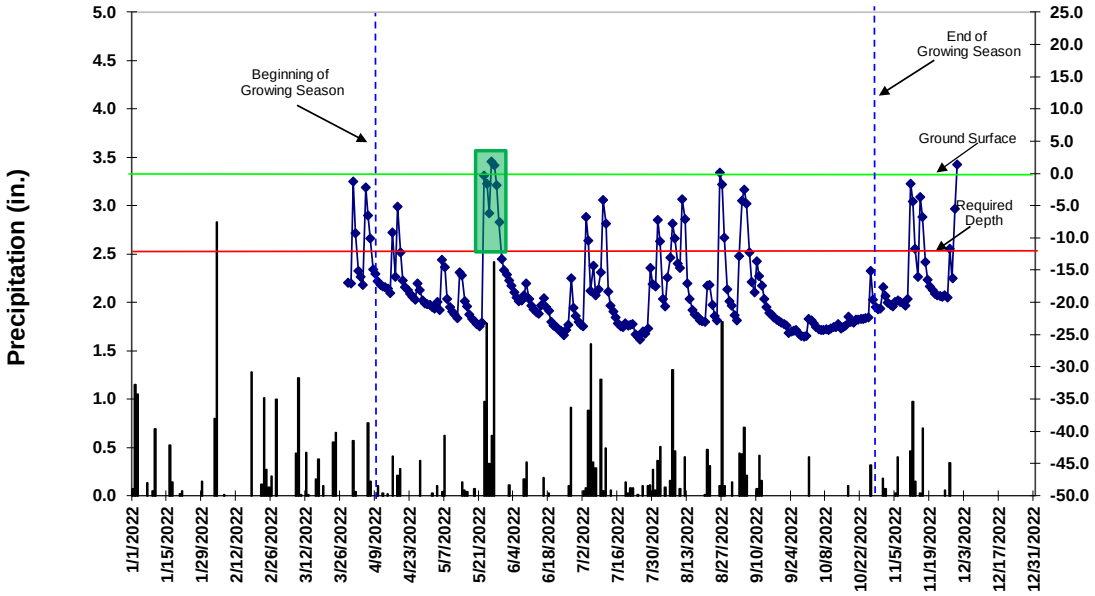
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **84%**



Gauge ID: **MW7** Reported Growing Season Days: 201 Dates:

Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **7** **05/22-05/28**

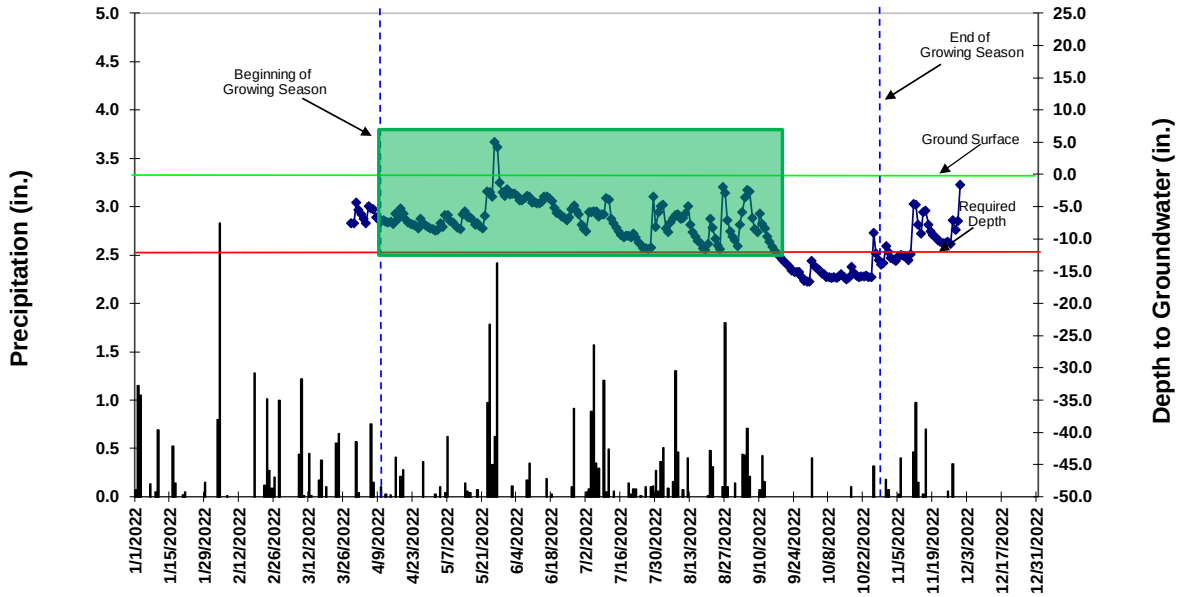
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **3%**



Gauge ID: **MW8** Reported Growing Season Days: 201 Dates:

Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **159** **04/11-09/16**

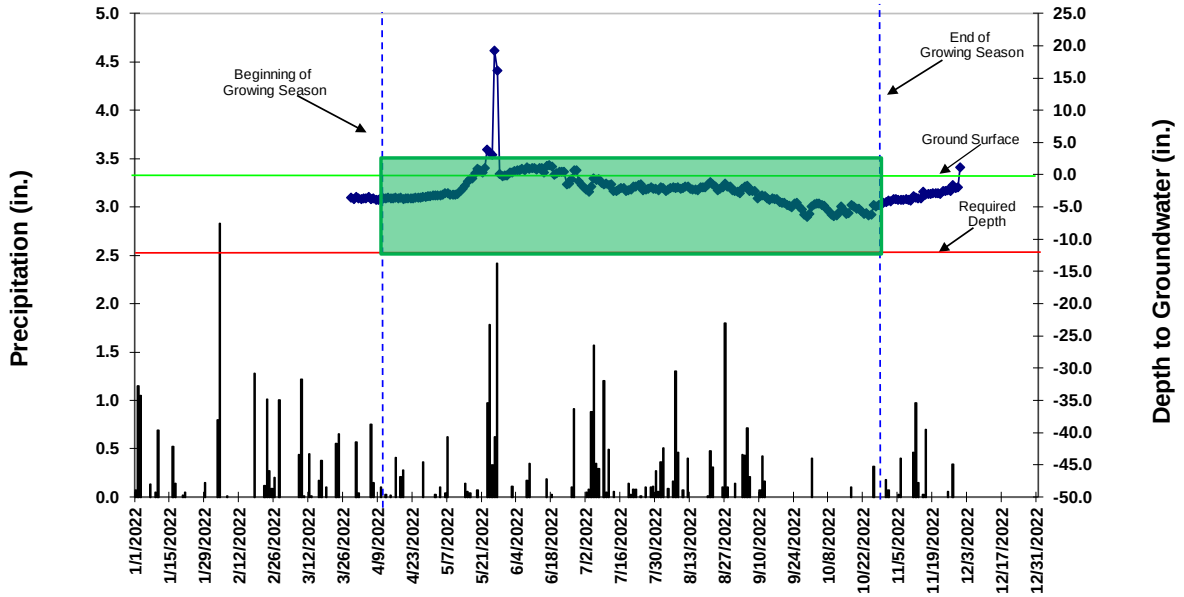
Percentage of Growing Season Water Table within 12 inches of Soil Surface: **79%**



Gauge ID: **MW9** Reported Growing Season Days: 201 Dates:

Total Number of Consecutive Days Water Table within 12 inches of Soil Surface: **201** **04/11-10/28**

Percentage of Growing Season Water Table within 12 inches of Soil Surface: **100%**



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Appendix F
MY3 Supplemental Information

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MY3 Supplemental Planting Summary			
Scientific Name	**Common Name**	**Material**	**Indicator Status**
Alnus serrulata	Tag alder	bareroot	OBL
Cornus amomum	Silky dogwood	bareroot	FACW
Liriodendron tulipifera	Tulip poplar	bareroot	FACU
Salix nigra	Black willow	live stake	OBL
Salix sericea	Silky willow	live stake	OBL

* Supplemental planting was conducted on February 24, 2022. Additional livestakes were installed along Harrell Reach 1B, 1C, and 1D. Bare root plantings were installed along the right descending bank of Reaches 1B and 1C.

EWS-Harrell MY3 (2022) Herbicide Application Log									
Date	**Start / End Time**	**Certified Applicator #**	**Site & Target Species**	**Herbicide**	**Concentration (%)**	**Volume Herbicide Concentration Used (oz)**	**Volume Mixture Used (gal)**	**Weather (Temp/Wind)**	**Site Notes**
6/28/2022	09.00 - 15:00	C. Lawson 26-38261	Harrell site-wide; Multifloral rose, barberry, bittersweet, and privet.	Tryclopyr	4	47	12	80+/light var	Sitewide treatment residual pockets of multifloral rose, barberry, bittersweet, and privet.

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ROY COOPER
Governor
ELIZABETH S. BISER
Secretary
MARC RECKTENWALD
Director

NORTH CAROLINA
Environmental Quality

December 6, 2022

Paul Wiesner
Western Regional Supervisor
NCDEQ-DMS
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, NC 28778-8211
Cell: (828) 273-1673

Subject: Conservation Easement Inspection Report - MY3 Site
Harrell Stream and Wetland Mitigation Site
Little Tennessee River Basin - CU# 06010203 - Jackson County
DMS ID No.100005 - DEQ Contract # 007006

Paul,

The MY3 boundary inspection was conducted by DMS on November 30, 2022. The inspection was conducted in accordance with the DMS Property Checklist which included a pre-inspection office review of the plat, aerial photographs, as-built, conservation easement and monitoring reports. The entire easement boundary was inspected to validate the easement integrity and identify any potential issues on the site. The site inspection results are shown in the attached checklist and kmz map.

Office Review:

- DOT and Provider maintenance has been ongoing at the 36" cmp culvert under Caney Fork Road near the easement and the overhead wire (ow) shown on the plat at this location will be checked.
- The upstream 36' cmp culvert at the external crossing will be checked for compliance.
- The springhead and any associated piping located at the beginning of Harrell Creek will be checked.
- The back yard of the residence will be checked for potential encroachment.

Field Inspection:

- No encroachment issues were seen with the culverted crossings or the overhead line at Caney Fork Road.
- Portions of the relict piping from the former springhead remain inside the conservation easement.
- A mowed area extending approximately 6 feet into the easement is located along the fence at the rear of the residence and continues approximately 200' to the west and north in a triangular area.
- A second mowed area is located along the northeast section of the easement along a roughly 30' wide by 250' long strip.
- Corners were marked with t-Posts with signs or trees with signs. Signs were the brown low visibility type and the trees were not balzed which made the boundary difficult to follow in the field.
- One sign was fastened to a tree using small nails, one sign is missing the lower t-post connector and several t-posts were loose.

Action Items

- Due to mowing encroachments and difficulty seeing the boundary in the field the low-visibility marking should be upgraded. Recommend blazing trees with paint and notifying the landowner of the boundary location. Supplemental signs and posts have already been installed but installation of additional markings should be considered.
- Mowed areas will require re-planting in accordance with the approved mitigation plan and IRT coordination.

- Repair damaged and improperly fastened signs.
- Remove the spring piping from the conservation easement.
- All loose posts should be driven more firmly into the ground.

Let me know if you have any questions or need additional information and thank you for conducting the inspection with me.

Sincerely,
Kelly Phillips

Project Manager
NCDEQ-DMS
610 East Center Avenue, Suite 301
Mooresville, NC 28115
Cell: (919) 723-7565

cc: R:\EEP PROJECT LIBRARY FILES\PROJECT DELIVERABLES(REPORTS)\FD PROJECTS\Harrell 007006 (#100005)\4_T2_Cons_Ease\5-DMS Easement Inspections\MY3 Inspection 11_2022

Property Boundary Verification Checklist			
Project Name	Harrell Stream and Wetland Mitigation Site	**County**	Jackson
DMS PM	Paul Wiesner	**Monitoring Phase**	MY3
DMS Project No.	100005	**DMS Inspector**	Phillips/Wiesner
Provider	EW Solutions/Equinox	**Provider Contact**	Danvey Walsh

In-Office Review

Plat/As Built Review	Plat	As-Built	Comments
Internal Roads/Trails	no	no	
Internal Crossings	no	no	
External Crossings	yes	yes	Check upstream 36"cmp and downstream 36"cmp at Caney Fk Rd (ongoing DOT maint).
Dedicated Ingress/Egress	yes	no	Plat Note 6 gives general perpetual right; CE Sec IV. A. perpetual access right over and upon the easement.
ROWs	yes	no	Check Caney Fk Rd ow near Caps 1 and 21
Exclusion Fencing	no	no	
Infrastructure	yes	yes	Check residence back lawn and fence at Cap 5 and 6; Check springhead (pipe?) at Cap 27 to 28
Corners of Survey with #	yes	no	
Line Segments >200'	yes	yes	
Other	**Yes**	**No**	**Comments**
Special Use Allowances in CE (Y/N)	x		Vehicle use allowed on platted roads/trails and crossing,
Plat signed by landowner (Y/N)	x		
History of Encroachment - Project Docs, Aerials, CCPVs etc.		x	None listed in the MY2 report, aerial photo concern at residence's lawn.

Field Review (Inspection Date: 11/30/2022)

Field Verified Entity	As-built Record Drawing Boundary/Verification	Observations/Results
Corners monumented	#5 rebar x 30", with aluminum cap on easement corners with number per plat. Three in-ground monuments verified; additional if not found or errors	Corners were adequately monumented, multiple stamped caps were verified. Rebar was not checked.
Corners marked	6' durable witness post with approved sign. All witness posts at corners in correct location, signed, stable and visible where necessary	Corners were marked with t-Posts with signs or trees with signs. Signs were the brown low visibility type. Trees were not blazed and signs were difficult to follow in the field. Examples of the low-vis signs are shown in the .kmz file. Several t-posts were loose possibly due to bedrock intercept.
In-line marking	Posts and signs at minimum every 200' in line between corners; trees may be blazed in lieu of signs where possible. All lines > than 200' posted at acceptable intervals and visible where necessary	In-line marker spacing was adequate but difficult to see as previously noted. One sign was fastened to a tree using small nails, one sign is missing the lower t-post connector (locations are shown on the .kmz).
Encroachments	Vegetative, vehicular, structural, grading, crossing infrastructure, fencing, etc. Note location on plat, extent (boundary and approximated size) and type of encroachment	A mowed area is located along the fence at the rear of the residence extending approximately 200' to the west and north in a triangular area. A second mowed area is located in the northwest portion of the easement along a roughly 30' wide strip extending approximately 250' to the north.

Documentation	Yes	No	DMS Inspector Signature/Date
Site is fully compliant; adequately marked, no encroachments, plats appear to be complete and accurate		X	Kelly Phillips/12-2-2022

Notes:

Supplemental support documentation will be included with this checklist as needed for non-compliant sites.

Checklist and report documents will be submitted to the PM and Property Supervisor and saved to the R: drive in the CE subfolder

Report and checklist will also be sent to Regional Supervisor for non-compliant sites

PM is responsible for coordinating with Providers for corrective actions such as adding signage/marking and assigning deadline

For sites needing SPO or legal interpretation PM is responsible for coordinating with Property Supervisor to initiate process

Sites resolutions requiring follow up in-office or in-field evaluations must be re-initiated by the PM via email request to Supervisor and Inspector

December 7, 2022

Paul Wiesner
Western Regional Supervisor
NCDEQ-DMS
Asheville Regional Office
2090 U.S. 70 Highway

Subject: RE: Conservation Easement Inspection Report – MY3
Harrell Stream and Wetland Mitigation Site
Little Tennessee River Basin – CU#06010203 – Jackson County
DMS ID No. 100005 – DEQ Contract # 007006

Mr. Wiesner,

On November 30, 2022 Mr. Kelly Phillips conducted the MY3 boundary inspection for the Harrell Stream and Wetland Mitigation Site in Jackson County. As part of this inspection Mr. Phillips conducted an Office Review, Field Inspection, and suggested Action Items as a result of the inspection. Below is the summary of the finding by Mr. Phillips and the proposed actions by EWS (**in RED**).

Office Review:

- DOT and Provider maintenance has been ongoing at the 36" cmp culvert under Caney Fork Road near the easement and the overhead wire (ow) shown on the plat at this location will be checked.
- The upstream 36' cmp culvert at the external crossing will be checked for compliance.
- The springhead and any associated piping located at the beginning of Harrell Creek will be checked.
- The back yard of the residence will be checked for potential encroachment.

Field Inspection:

- No encroachment issues were seen with the culverted crossings or the overhead line at Caney Fork Road.
- Portions of the relict piping from the former springhead remain inside the conservation easement.
- A mowed area extending approximately 6 feet into the easement is located along the fence at the rear of the residence and continues approximately 200' to the west and north in a triangular area.
- A second mowed area is located along the northeast section of the easement along a roughly 30' wide by 250' long strip.
- Corners were marked with t-Posts with signs or trees with signs. Signs were the brown low visibility type and the trees were not blazed which made the boundary difficult to follow in the field.
- One sign was fastened to a tree using small nails, one sign is missing the lower t-post connector and several t- posts were loose.

Action Items

- Due to mowing encroachments and difficulty seeing the boundary in the field the low-visibility marking should be upgraded. Recommend blazing trees with paint and notifying the landowner of the boundary location. Supplemental signs and posts have already been installed but installation of additional markings should be considered. Blazing will be used to augment existing signs and posts along the forested (Southern) portion of the easement boundary. Replacement signs in this forested area will be upgraded to hi-visibility signs using forestry grade nails.
- Mowed areas will require re-planting in accordance with the approved mitigation plan and IRT coordination. Replanting of woody stems will be conducted as part of the repair and reclamation of encroachment areas. Species will be selected from those within the approved mitigation plan.
- Repair damaged and improperly fastened signs. Damaged signs will be replaced and upgraded to solid aluminum fastener and u-post configuration. Low visibility signage will be retained on the northern easement boundary/field interface as per request from the original property owner.
- Remove the spring piping from the conservation easement. Previously existing water supply infrastructural components will be removed as part of Monitoring Year 4.
- All loose posts should be driven more firmly into the ground. Loose posts and signs will be repaired or upgraded as needed.

Sincerely,

David Tuch
Managing Partner
EW Solutions
37 Haywood Street, Suite 100
Asheville, NC 28801

Property Boundary Verification Checklist			
Project Name	Harrell Stream and Wetland Mitigation Site	**County**	Jackson
DMS PM	Paul Wiesner	**Monitoring Phase**	MY3
DMS Project No.	100005	**DMS Inspector**	Phillips/Wiesner
Provider	EW Solutions/Equinox	**Provider Contact**	Danvey Walsh

In-Office Review

Plat/As Built Review	Plat	As-Built	Comments
Internal Roads/Trails	no	no	
Internal Crossings	no	no	
External Crossings	yes	yes	Check upstream 36"cmp and downstream 36"cmp at Caney Fk Rd (ongoing DOT maint).
Dedicated Ingress/Egress	yes	no	Plat Note 6 gives general perpetual right; CE Sec IV. A. perpetual access right over and upon the easement.
ROWs	yes	no	Check Caney Fk Rd ow near Caps 1 and 21
Exclusion Fencing	no	no	
Infrastructure	yes	yes	Check residence back lawn and fence at Cap 5 and 6; Check springhead (pipe?) at Cap 27 to 28
Corners of Survey with #	yes	no	
Line Segments >200'	yes	yes	
Other	**Yes**	**No**	**Comments**
Special Use Allowances in CE (Y/N)	x		Vehicle use allowed on platted roads/trails and crossing,
Plat signed by landowner (Y/N)	x		
History of Encroachment - Project Docs, Aerials, CCPVs etc.		x	None listed in the MY2 report, aerial photo concern at residence's lawn.

Field Review (Inspection Date: 11/30/2022)

Field Verified Entity	As-built Record Drawing Boundary/Verification	Observations/Results
Corners monumented	#5 rebar x 30", with aluminum cap on easement corners with number per plat. Three in-ground monuments verified; additional if not found or errors	Corners were adequately monumented, multiple stamped caps were verified. Rebar was not checked.
Corners marked	6' durable witness post with approved sign. All witness posts at corners in correct location, signed, stable and visible where necessary	Corners were marked with t-Posts with signs or trees with signs. Signs were the brown low visibility type. Trees were not blazed and signs were difficult to follow in the field. Examples of the low-vis signs are shown in the .kmz file. Several t-posts were loose possibly due to bedrock intercept.
In-line marking	Posts and signs at minimum every 200' in line between corners; trees may be blazed in lieu of signs where possible. All lines > than 200' posted at acceptable intervals and visible where necessary	In-line marker spacing was adequate but difficult to see as previously noted. One sign was fastened to a tree using small nails, one sign is missing the lower t-post connector (locations are shown on the .kmz).
Encroachments	Vegetative, vehicular, structural, grading, crossing infrastructure, fencing, etc. Note location on plat, extent (boundary and approximated size) and type of encroachment	A mowed area is located along the fence at the rear of the residence extending approximately 200' to the west and north in a triangular area. A second mowed area is located in the northwest portion of the easement along a roughly 30' wide strip extending approximately 250' to the north.

Documentation	Yes	No	DMS Inspector Signature/Date
Site is fully compliant; adequately marked, no encroachments, plats appear to be complete and accurate		x	Kelly Phillips/12-2-2022

Notes:

Supplemental support documentation will be included with this checklist as needed for non-compliant sites.

Checklist and report documents will be submitted to the PM and Property Supervisor and saved to the R: drive in the CE subfolder

Report and checklist will also be sent to Regional Supervisor for non-compliant sites

PM is responsible for coordinating with Providers for corrective actions such as adding signage/marking and assigning deadline

For sites needing SPO or legal interpretation PM is responsible for coordinating with Property Supervisor to initiate process

Sites resolutions requiring follow up in-office or in-field evaluations must be re-initiated by the PM via email request to Supervisor and Inspector

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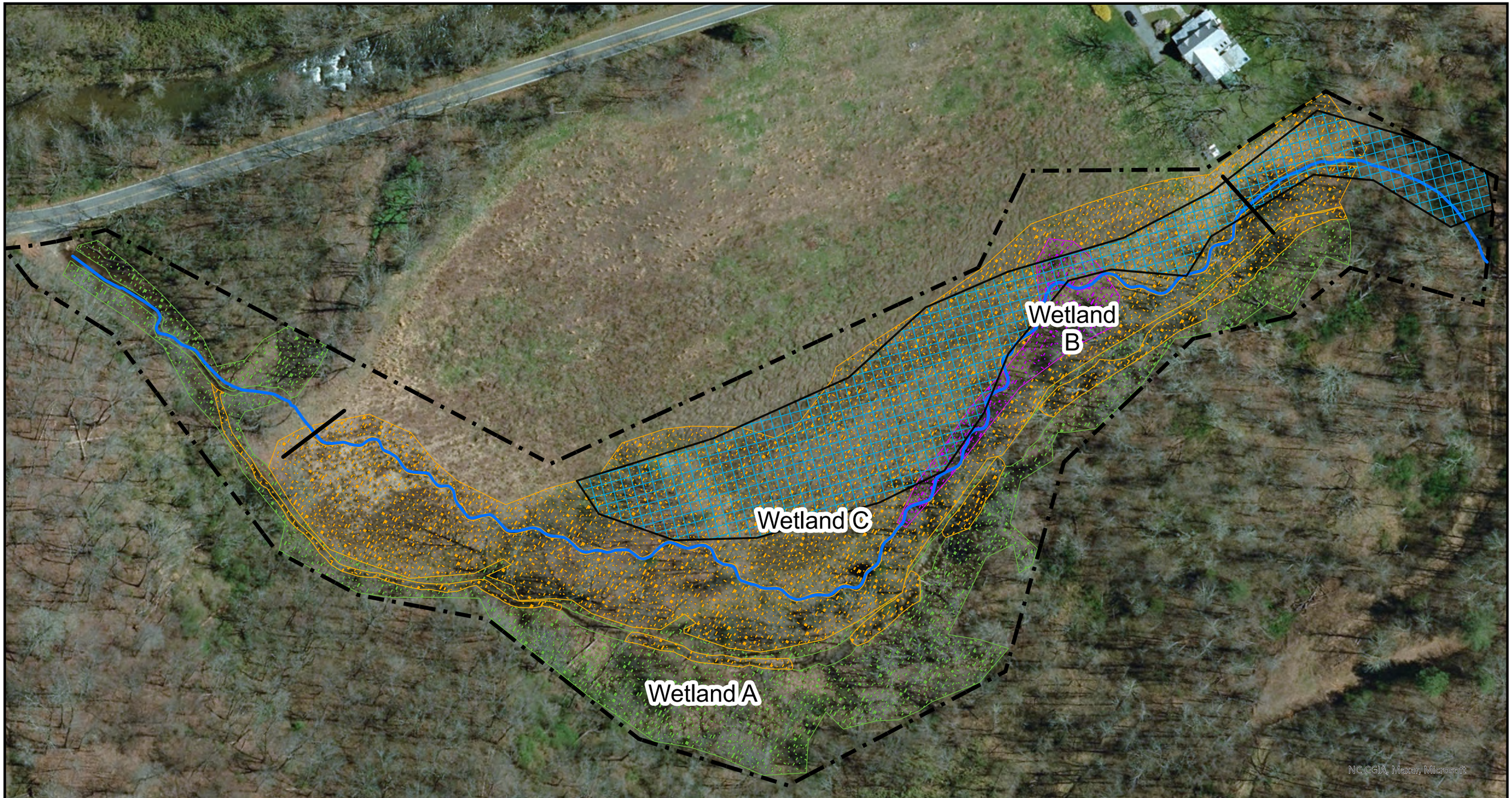


Mitigation Services
ENVIRONMENTAL QUALITY

MY3 Supplemental Planting
Harrell Mitigation Site
Jackson County, NC
December 2022

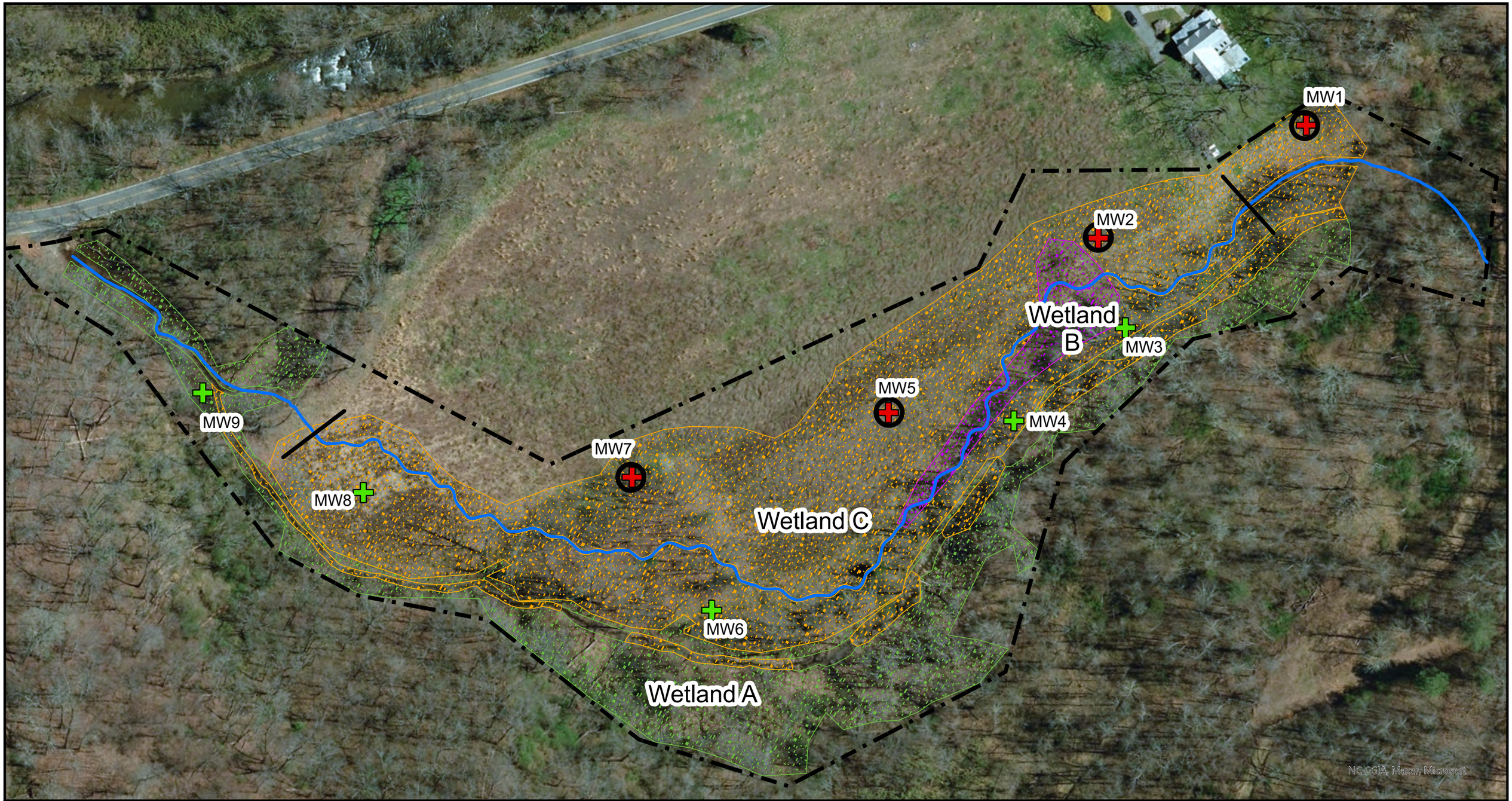
0 15 30 60 90 120 150
Feet

Conservation Easement Boundary
Supplemental_Planting

Wetlands
Reestablishment
Rehabilitation
Preservation (No Credit)

Streams
Restoration
Reach Breaks

EQUINOX



Mitigation Services
ENVIRONMENTAL QUALITY

MY3 Soil Profile Location Map
Harrell Mitigation Site
Jackson County, NC
January 2023

0 15 30 60 90 120 150
Feet

Conservation Easement Boundary

Soil Profiles

Groundwater Gauge

- Not Meeting Criteria
- Meeting Criteria

Wetlands

- Reestablishment
- Rehabilitation
- Preservation (No Credit)

Streams

- Restoration
- Reach Breaks

EQUINOX

Kim 1193

1/25/23 MW1 Saturated

SOIL Sampling Point: MW1 Pit

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 0.5'	2.5Y 3/2	100					S Loam	
0.5' - 0.6	2.5Y 5/2	99	2.5YR 3/4	1	C	PL	L Sand	
0.6 - 1.4	5Y 4/1	100	/	/	/	/	L Sand	Gravelly

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☑ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☑ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12) **(LRR T, U)**
- ☐ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:

SOIL 1/25/23 WT = 1.4' Sat = Surface Kim 1201

Sampling Point: MW 2 10.X

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-0.9'	2.5Y 3/2	100					S. Loam	Sat
0.9-1.1'	2.5Y 3/2	99	2.5YR 3/6	1	C	PL	S. Loam	↓
1.1-1.5'	2.5Y 4/1	95	2.5YR 3/6	5	C	PL	S. Loam	WT

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☑ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☑ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12) **(LRR T, U)**
- ☐ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:


5
4
3
2
1
9
8
7
6
5
4
3
2
1

35.30030 -83.13445 C Lawson 10/19/22 Harrell

SOIL Sampling Point: MW 5 P.t

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 3/2	100					Sandy Loam	
3-11	7.5YR 3/2	99						
	2.5YR 4/8	1						Fill zone
11-12	7.5YR 3/2	20						
	2.5YR 4/8	20						
	2.5Y 4/1	60	7.5YR 3/4	1	D	M		
12-14	5Y 3/1	95	7.5YR 3/4	5	C	PL	Loamy Sand	Saturated

[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) **(LRR N, MLRA 147, 148)**
- ✓ 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 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 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**
- ___ Red Parent Material (F21) **(MLRA 127, 147)**

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)**
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: None noted

Depth (inches): ___

Hydric Soil Present? Yes ✓ No ___

Remarks:

SOIL 1/25/23 Rim 1208 & 1209 Sampling Point: MW 7 Pit

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-0.4'	7.5YR 3/2	100					L Clay	Sat
0.4-0.8	2.5Y 3/2	95	2.5YR 3/6	5	C	PL	S Loam	WT 0.4'
0.8-1.0'	2.5Y 3/1	90	2.5YR 3/6	10	C	PL	S Loam	↓

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated 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)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☑ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12) **(LRR T, U)**
- ☐ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: None

Depth (inches): _____

Hydric Soil Present? Yes ☑ No ☐

Remarks:

3
2
1
9
8
7
6
5
4
3
2
1