MONITORING REPORT
2023 (Year 5)

MAJOR HILL STREAM AND WETLAND MITIGATION SITE

Alamance County, North Carolina

DMS Project ID No. 100015
Full Delivery Contract No. 7193
USACE Action ID No. SAW-2017-01472
DWR No. 17-0921
RFP No. 16-006990

Cape Fear River Basin
Cataloging Unit 03030002

Data Collection: January 2023 – October 2023
Submission: February 2024

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
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Response to Monitoring Year 5 (2023) DMS Comments
Major Hill Mitigation Site
DMS Project ID No. 100015
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DWR No. 17-0921
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Comments Received (Black Text) & Responses (Blue Text)

Report & Field Visit

1. Trash such as large metal gate, tires, and concrete were observed along UT-3 which will need to be removed before IRT closeout.
   Response: Surface debris in the Enhancement II area along UT-3 will be removed by hand in Q1 2024. No digging or equipment work will be conducted to avoid disruption to the existing mature riparian buffer.

2. Some privet sprouts (<1 ft) were observed along UT-3 near southern crossing. Please continue treatment. Overall, this site looks great.
   Response: Invasive treatments will continue as needed through closeout.

Digital Comments

1. The submission is missing summary tables 2, 5, 8, 9, 10 included in the report; please submit missing tables. If any photo points were established at the mitigation plan phase in addition to cross sections and vegetation plots, please submit these photos as well. Note that stream survey data should include data labels (ex. LTP, TW) in future submission.
   Response: Tables 1-4 have been added to the "Background Tables" folder in the digital submittal. Tables 5-6 were included in the "Tables" folder of the "Visual Assessment Data" folder in the draft digital submittal and have been included in the final as well. Table 8 was included in the "Veg Plot Data" folder of the draft digital submittal and has been included in the final as well. Tables 9 and 10 were added to the "Veg Plot Data" folder of the final digital submittal. No photo points were established in the mitigation plan other than vegetation plots and cross-sections.

Boundary Inspection

1. Please locate or install the corner monument at platted corners #35 and #41. It is recommended that the culvert position relative to the easement at the south-central portion, near corner #41, be verified.
   Response: A surveyor has been contracted to locate these pins. Work will be completed in Q1 2024.

2. Large debris were observed inside the conservation easement. Items noted were relict fencing debris, metal T-posts, permanent deer stand, bull gate, and wires which will need to be removed before IRT closeout.
   Response: Relict fencing will be removed in Q1 2024, and landowners will be advised regarding deer stand standards. Surface debris in the Enhancement II area along UT-3 will be removed by hand in Q1 2024. No digging or equipment work will be conducted to avoid disruption to the existing mature riparian buffer.

3. Please repair/ locate/ install missing signs at corners and in-line.
   Response: Noted. This will be corrected in Q1 2024.

4. Wooden H-brace that appears to be supporting the active fence at corner #21 and should be moved outside the conservation easement.
   Response: Noted. This will be corrected in Q1 2024.

5. There are several platted non-monumented corners at the crossing in the northwest corner of the site that are difficult to locate. It is recommended that they be marked with posts.
   Response: These non-platted corners are at the stream centerline where the parcel line runs, which is not practical to mark with posts. However, in Q1 2024 we will add marking along the general alignment of the crossing to better identify the corridor.

6. Fence maintenance is recommended at areas where trees have damaged the fence.
   Response: Recommendation noted. RS will continue to work with landowners to ensure fencing where livestock is present is adequate to prevent encroachment.

Major Hill Year 5, 2023 Monitoring Summary

General Notes

- No evidence of nuisance animal activity (i.e., beaver, heavy deer browsing, etc.) was observed.

Streams

- Stream monitoring measurements indicate minimal changes in the cross sections as compared to as-built data. The channel geometry compares favorably with the proposed conditions outlined in the Detailed Restoration Plan and as constructed.

- Across the Site, all in-stream structures are intact and functioning as designed. The channel geometry compares favorably with the proposed conditions outlined in the Detailed Restoration Plan and as constructed. No stream areas of concern were identified during year 5 (2023) monitoring. Stream visual assessment results are documented in Tables 5A-5B (Appendix B). Tables for year 5 (2023) data and annual quantitative assessments are included in Appendix D.

- Two bankfull events were documented during year 5 (2023), resulting in 9 bankfull events to date during the monitoring period (Table 15, Appendix E).

- Channel formation was evident in UT 1 during year 5 (2023). The two streamflow gauges and trail cameras recorded 233 and 249 consecutive streamflow days (Tables 14A-B, Appendix E).

- Benthic macroinvertebrate sampled data during MY 5 shows increases in richness and diversity when compared to preconstruction surveys. When compared to reference site data, the onsite data is only slightly below reference values for MY 5. Results and habitat forms are included in Appendix F.

Wetlands

- All six groundwater gauges met success for the Year 5 (2023) monitoring period. Wetland hydrology data is in Appendix E.

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)
1	No/14 days* 6.0 percent	Yes/136 days 57.9 percent	Yes/74 days 31.4 percent	Yes/93 days 39.4 percent	Yes/95 days 40.3 percent		
2	No/19 days* 8.1 percent	No/19 days 8.0 percent	No/21 days 8.9 percent	Yes/44 days 18.6 percent	Yes/50 days 21.3 percent		
3	Yes/25 days 10.6 percent	Yes/235 days 100 percent	Yes/226 days 95.8 percent	Yes/204 days 86.4 percent	Yes/190 days 80.9 percent		
4	Yes/34 days 14.5 percent	Yes/72 days 30.5 percent	Yes/60 days 25.4 percent	Yes/155 days 65.7 percent	Yes/85 days 36.2 percent		
5	Yes/119 days 50.6 percent	Yes/135 days 57.4 percent	Yes/53 days 22.5 percent	Yes/77 days 32.6 percent	Yes/51 days 21.7 percent		
6	Yes/77 days 32.8 percent	Yes/44 days 18.7 percent	Yes/80 days 33.9 percent	Yes/81 days 34.3 percent	Yes/100 days 42.6 percent		

Vegetation

- Measurements of the 8 permanent vegetation plots resulted in an average of 354 planted stems/acre excluding livestakes. Seven out of 8 plots met success criteria. Additionally, two temporary vegetation transects met success criteria resulting in a sitewide average of 547 stems/acre, including natural recruits. Lastly, stem height data from the 8 permanent vegetation plots indicates a Site average of 7.29 feet, which meets the 7-foot height criteria required at Year 5. Year 5 (2023) vegetation data is included in Tables 8-10 (Appendix C).

MY 5 (2023) Monitoring Activity and Reporting History

Activity or Deliverable	Data Collection Complete	Completion or Delivery
MY 5 (2023) Vegetation Data Collection	August 25, 2023	--
MY 5 (2023) Stream Data Collection	May 16, 2023	--
MY 5 (2023) Monitoring Report	October 2023	February 2024

Site Maintenance Report (2023)

Invasive Species Work	Maintenance work
05/17/2023 Privet, Russian Olive, Nodding Thistle, Multiflora rose 09/13/23 Privet, Russian Olive, Multiflora rose, Tree-of-heaven	06/14/2023, 06/21/2023, 09/27/2023, and 09/28/2023 Old fence within easement removal and boundary inspections. 12/02/2023 Fence relocation 12/05/2023 Supplemental planting

Boundary Inspection

- During the NC DMS boundary inspection with Danielle Mir and Jeff Horton on September 21, 20223, multiple issues were discovered. No conservation easement placards were visible across the entire property. One section of fence located at easement corner 1 was constructed +/-18 inches within the easement, see on Figure 3 (Appendix H). Easement corner 1 appeared to be improperly stamped. One stamped easement cap was not located at easement corner 2, see Figure 3 (Appendix H.)
    - Resolutions:
      On September 27th, 2023, RS staff members performed a comprehensive boundary inspection. While performing the inspection, conservation easement placards were installed at each corner of the easement, see Photo Log (Appendix H.) The section of fence constructed inside the easement is determined to remain in place due to property boundary constraints and large hardwood trees in line with the easement boundary, see NC DMS Email Response (Appendix H). Easement corner 1 is stamped appropriately according to the NC DEQ Guidance, see Easement Inspection Photo Log

(Appendix H). Easement corner 2 is a property corner and has an existing iron pipe marking property lines, see Map of Record (Appendix H).

- On September 27, 2023, while performing the easement inspection, RS staff members discovered an encroachment area measuring 0.04 acres on the Site's south side shown on Figure 2 (Appendix B). An existing cattle fence was not relocated to boundary corners during construction. No other encroachments were documented during the inspection.
    - Resolutions:
      On December 02, 2023, the fence was relocated outside the easement. On December 05, 2023, a supplemental planting of twenty 3-gallon pots consisting of mitigation plan approved species, including 5 Black gum (*Nyssa Sylvatica),* 5 Water Oak (*Quercus nigra*), and 10 Willow Oak (*Quercus phellos)* were planted within the encroached area, see Photo Log (Appendix H).

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APPENDICES

1.0 PROJECT SUMMARY

Restoration Systems, LLC has established the North Carolina Division of Mitigation Services (NCDMS) Major Hill Stream and Wetland Restoration Site (Site).

1.1 Project Goals & Objectives

Project goals are based on the *Cape Fear River Basin Restoration Priorities* (RBRP) report (NCEEP 2009) and on-site data collection of channel morphology and function observed during field investigations. The Site is located within Targeted Local Watershed (TLW) 03030002050050. The RBRP report documents benthic ratings vary between "Fair" and "Good-Fair" possibly due to cattle, dairy, and poultry operations. The project is not located in a Regional or Local Watershed Planning Area; however, RBRP goals are addressed by project activities as follows with Site specific information following the RBRP goals in parenthesis.

1. Reduce and control sediment inputs (reduction of 10.0 tons/year after mitigation is complete);
2. Reduce and manage nutrient inputs (livestock removal from streams, elimination of fertilizer application, and marsh treatment areas may result in a direct reduction of 852.4 pounds of nitrogen and 70.6 pounds of phosphorus per year);
3. Protect and augment designated natural heritage areas.

Site-specific mitigation goals and objectives were developed through the use of the North Carolina Stream Assessment Method (NC SAM) and North Carolina Wetland Assessment Method (NC WAM) analyses of existing and reference stream systems at the Site (NC SFAT 2015 and NC WFAT 2010).

Stream/Wetland Targeted Functions, Goals, and Objectives

Targeted Functions	Goals	Objectives	Compatibility of Success Criteria
(1) HYDROLOGY			
(2) Flood Flow (Floodplain Access) (3) Streamside Area Attenuation (4) Wooded Riparian Buffer (4) Microtopography	• Attenuate flood flow across the Site. • Minimize downstream flooding to the maximum extent possible. • Connect streams to functioning wetland systems.	• Construct new channel at historic floodplain elevation to restore overbank flows and restore jurisdictional wetlands • Plant woody riparian buffer • Remove livestock • Deep rip floodplain soils to reduce compaction and increase soil surface roughness • Protect riparian buffers with a perpetual conservation easement	• BHR not to exceed 1.2 • Document four overbank events in separate monitoring years • Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded

Stream/Wetland Targeted Functions, Goals, and Objectives (Continued)

Targeted Functions	Goals	Objectives	Compatibility of Success Criteria
(1) HYDROLOGY (Continued)			
(3) Stream Stability (4) Channel Stability (4) Sediment Transport	• Increase stream stability within the Site so that channels are neither aggrading nor degrading.	• Construct channels with proper pattern, dimension, and longitudinal profile • Remove livestock • Construct stable channels with cobble/gravel substrate • Plant woody riparian buffer •	• Cross-section measurements indicate a stable channel with cobble/gravel substrate • Visual documentation of stable channels and structures • BHR not to exceed 1.2 • ER of 1.4 or greater • < 10% change in BHR and ER in any given year • Livestock excluded from the easement • Attain Vegetation Success Criteria
(1) WATER QUALITY			
(2) Streamside Area Vegetation (3) Upland Pollutant Filtration (3) Thermoregulation (2) Indicators of Stressors	• Remove direct nutrient and pollutant inputs from the Site and reduce contributions to downstream waters.	• Remove livestock and reduce agricultural land/inputs • Install marsh treatment areas • Plant woody riparian buffer • Restore/enhance jurisdictional wetlands adjacent to Site streams	• Livestock excluded from the easement • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria
(1) HABITAT			
(2) In-stream Habitat (3) Substrate (3) Stream Stability (3) In-Stream Habitat (2) Streamside Habitat (3) Streamside Habitat (3) Thermoregulation Wetland Landscape Patch Structure Wetland Vegetation Composition	• Improve instream and streamside habitat.	• Construct stable channels with cobble/gravel substrate • Plant woody riparian buffer to provide organic matter and shade • Construct new channel at historic floodplain elevation to restore overbank flows and plant woody riparian buffer • Protect riparian buffers with a perpetual conservation easement • Restore/enhance jurisdictional wetlands adjacent to Site streams	• Cross-section measurement indicate a stable channel with cobble/gravel substrate • Visual documentation of stable channels and in-stream structures. • Attain Wetland Hydrology Success Criteria • Attain Vegetation Success Criteria • Conservation Easement recorded

1.2 Project Background

The Major Hill Stream and Wetland Mitigation Site (hereafter referred to as the "Site") encompasses 16.7 acres along warm water, unnamed tributaries to Pine Hill Branch. The Site is located approximately 3.5 miles southeast of Snow Camp and 6 miles north of Silk Hope in southern Alamance County near the Chatham County line (Figure 1, Appendix B).

Before construction, Site land use consisted of disturbed forest and agricultural land used for livestock grazing and hay production. Livestock had unrestricted access to Site streams, which had been relocated to the floodplain edge, ditched, impounded, trampled by livestock, eroded vertically and laterally, and received extensive sediment and nutrient inputs from stream banks and adjacent pastures. Approximately 60 percent of the stream channel was degraded, contributing to sediment export from the Site resulting from mechanical processes such as livestock hoof shear. In addition, streamside wetlands were cleared and drained by channel downcutting and land uses. Preconstruction Site conditions resulted in degraded water quality, a loss of aquatic habitat, reduced nutrient and sediment retention, and unstable channel characteristics (loss of horizontal flow vectors that maintain pools and an increase in erosive forces to channel bed and banks). Site restoration activities restored riffle-pool morphology aiding in energy dissipation, increased aquatic habitat, stabilized channel banks, and will greatly reduce sediment loss from channel banks.

1.3 Project Components and Structure

Site restoration activities generated 3058 Stream Mitigation Units (SMUs) and 0.76 Wetland Mitigation Units (WMUs) as the result of the following:

- 1738 linear feet of Priority I stream restoration
- 3299 linear feet of stream enhancement (Level II)
- 0.54 acre of riparian wetland restoration
- 0.44 acre of riparian wetland enhancement

Additional activities that occurred at the Site included the following.

- Installation of a marsh treatment area to treat drainage prior to entering UT1.
- Fencing the entire conservation easement by leaving some pre-existing fencing, removing fencing, and installing additional fencing.
- Planting 8.11 acres of the Site with 8600 stems (planted species and densities by zone are included in Table 7 [Appendix C]).
- Removing a small, abandoned farm pond by 1) notching the dam to dewater; 2) removal of the dam to the elevation of the adjacent floodplain; 3) excavating sediment that was unsuitable for channel bank construction; 4) backfilling areas of sediment removed with soil suitable for channel construction (as necessary); 5) excavation of the design channel, 6) stabilization of the channel with coir matting, seed, and mulch; and 7) installation of structures.

Site design was completed in February 2018. Construction started on July 25, 2018 and ended within a final walkthrough on September 6, 2018. The Site was planted in December 2018-January 2019. Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 1-4 (Appendix A).

1.4 Success Criteria

Project success criteria have been established per the October 24, 2016, NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*.

1.4.1 Stream Success Criteria

From a mitigation perspective, several goals and objectives are assumed to be functionally elevated by restoration activities without direct measurement. Other goals and objectives will be considered successful upon achieving vegetation success criteria. The following summarizes stream success criteria.

- All streams must maintain an Ordinary High-Water Mark (OHWM), per RGL 05-05.
- Continuous surface flow must be documented each year for at least 30 consecutive days.
- Bank height ratio (BHR) cannot exceed 1.2 at any measured cross-section.
- Entrenchment ratio (ER) must be no less than 1.4 at any measured riffle cross-section.
- BHR and ER at any measure riffle cross-section should not change by more than 10% from baseline condition during any given monitoring period.
- The stream project shall remain stable and all other performance standards shall be met through four separate bankfull events, occurring in separate years, during the monitoring years 1-7.

1.4.2 Wetland Success Criteria

The following summarizes wetland success criteria.

- Saturation or inundation within the upper 12 inches of the soil surface for, at a minimum, 10 percent of the growing season during average climatic conditions

According to the *Soil Survey of Alamance County*, the growing season for Alamance County is from April 17 – October 22 (USDA 1960). However, the start date for the growing season is not typical for the Piedmont region; therefore, for this project, hydrologic success will be determined using data from March 1 - October 22 to represent the period of biological activity more accurately. Based on growing season information outlined in the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* (USACE 2010), this will be confirmed annually by soil temperatures exceeding 41 degrees Fahrenheit at 12 inches depth and/or bud burst.

Target hydrological characteristics include saturation or inundation for 10 percent of the monitored period (March 1-October 22) during average climatic conditions. During years with atypical climatic conditions, groundwater gauges in reference wetlands may be used for comparison to the Site; however, reference gauge data will not be tied to success criteria. These areas are expected to support hydrophytic vegetation. A jurisdictional determination will be performed if wetland parameters are marginal as indicated by vegetation and/or hydrology monitoring. The jurisdictional determination will not supersede monitoring data or overturn a failure in meeting success criteria; however, this information may be used by the IRT, at the discretion of the IRT, to make a final determination on Site wetland re-establishment success.

1.4.3 Vegetation Success Criteria

The following summarizes vegetation success criteria.

- Within planted portions of the Site, a minimum of 320 stems per acre must be present at year 3; and a minimum of 210 stems per acre must be present at year 7.
- Trees must average 7 feet in height at year 5, and 10 feet in height at year 7.
- Planted and volunteer stems are counted, provided they are included in the approved planting list for the Site; natural recruits not on the planting list may be considered by the IRT on a case-by-case basis.
- Any single species can only account for 50% of the required stems within any vegetation plot.

2.0 METHODS

Monitoring requirements and success criteria outlined in this plan follow the October 24, 2016 NC Interagency Review Team *Wilmington District Stream and Wetland Compensatory Mitigation Update*. Monitoring will be conducted by Axiom Environmental, Inc. Annual monitoring reports of the data collected will be submitted to the NCDMS by Restoration Systems no later than December 31 of each monitoring year data is collected. The monitoring schedule is summarized in the following table.

Monitoring Schedule

Resource	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Streams	X	X	X		X		X
Wetlands	X	X	X	X	X	X	X
Vegetation	X	X	X		X		X
Macroinvertebrates			X		X		X
Water Quality	X	X	X	X	X	X	X
Visual Assessment	X	X	X	X	X	X	X
Report Submittal	X	X	X	X	X	X	X

2.1 Stream Monitoring

Annual monitoring will include development of channel cross-sections and substrate on riffles and pools (Figure 2, Appendix B). Data presented in graphic and tabular format include 1) cross-sectional area, 2) bankfull width, 3) average depth, 4) maximum depth, and 5) width-to-depth ratio. Longitudinal profiles were monitored for as-built; however, profiles will not be measured unless monitoring demonstrates channel bank or bed instability. In this case, longitudinal profiles may be required by the USACE along reaches of concern to track changes and demonstrate stability.

Stream Monitoring Summary

Parameter	Method	Schedule/Frequency	Number/Extent
Stream Profile	Full longitudinal survey	As-built (unless otherwise required)	All restored stream channels
Stream Dimension	Cross-sections	Years 1, 2, 3, 5, and 7	10 cross-sections
Channel Stability	Visual Assessments	Yearly	All restored stream channels
	Bank Pins	Yearly	Only if instability is documented during monitoring
	Additional Cross-sections	Yearly	Only if instability is documented during monitoring
Stream Hydrology	Continuous monitoring water level gauges and/or trail camera	Continuous recording through monitoring period	Two gauges on UT1 (upstream and downstream) and one trail camera on UT1 (downstream)
Water Quality	Water samples	Yearly	Two locations
Macroinvertebrates	Qual 4 sampling	Years 3, 5, and 7	Two locations

All streams are functioning as designed, and no stream areas of concern were observed during year 5 (2023) monitoring. Stream morphology and water quality data is available in Appendix D, and benthic macroinvertebrate data is in Appendix F.

Benthic macroinvertebrate sampled data during MY 5 shows increases in richness and diversity when compared to preconstruction surveys. When compared to reference site data, the onsite data is only slightly below reference values for MY 5. Results and habitat forms are included in Appendix F.

2.2 Wetland Monitoring

Six groundwater monitoring gauges were installed within the drained pond area and the remaining wetland restoration areas to take measurements after hydrological modifications were performed at the Site (Figure 2, Appendix B). Hydrological sampling will continue throughout the entire year at intervals necessary to satisfy jurisdictional hydrology success criteria. In addition, an on-site rain gauge will document rainfall data for comparison of groundwater conditions with extended drought conditions, and a trail camera was installed to confirm overbank flooding events. Growing season soil temperatures will also be documented using a continuously logging soil temperature probe, this data will be provided with wetland hydrology data (Appendix E).

Wetland Monitoring Summary

Parameter	Method	Schedule/Frequency	Number/Extent	Data Collected
Wetland Restoration	Groundwater gauges	As-built, Years 1, 2, 3, 4, 5, 6, and 7	6 gauges spread throughout restored wetlands	Soil temperature at the beginning of each monitoring period, groundwater and rain data for each monitoring period

Summary of Monitoring Period/Hydrology Success Criteria by Year

Year	Soil Temperatures/Date Bud Burst Documented	Monitoring Period Used for Determining Success	10 Percent of Monitoring Period
2019 (Year 1)	March 1, 2019	March 1-October 22 (236 days)	24 Days
2020 (Year 2)	March 1, 2020	March 1-October 22 (236 days)	24 Days
2021 (Year 3)	March 1, 2021	March 1- October 22 (236 days)	24 Days
2022 (Year 4)	March 1, 2022	March 1- October 22 (236 days)	24 Days
2022 (Year 5)	March 1, 2023*	March 1- October 22 (236 days)	24 Days

*An on-site soil temperature data logger installed 12 inches below the ground surface read 54.08°F on March 1, and the soil temperature remained well-above 41°F thereafter. Additionally, bud bursts were documented on February 28.

All six groundwater gauges met success criteria for the year 5 (2023) monitoring period. Year 5 (2023) groundwater gauge data and graphs are located in Appendix E.

2.3 Vegetation Monitoring

Planting occurred in December 2018-January 2019 within 8.11 acres of the Site and included 8600 stems. After planting was completed, an initial evaluation was performed to verify planting methods and to determine initial species composition and density.

In early January 2020, a winter-time visual assessment of the Site was performed, and it was determined that although Year 1 (2019) vegetation data, including random transects, showed a high density of trees, a light supplemental planting would help ensure the long-term success in several areas. On January 31, 2020, three areas that visually exhibited low stem density and/or poor vigor were supplementally planted (Figure 2, Appendix B). During the supplemental planting effort, 370 stems were planted across 1.20 acres (approximately 300 stems per acre). As the planting was designated for visual purposes and was not an effort to increase stem density data, no stems were planted within permanent vegetation plots.

Preparation included the application of 100 lbs of lime, 50 lbs of fertilizer, and 3 lbs of seed to stabilize bare areas. The following table lists species included in the supplemental planting list.

2020 Supplemental Planting Species List

Species	Number of Stems
Tag Alder (*Alnus serrulata*)@	20
Chinkapin (*Castanea pumila*)@	20
Hackberry (*Celtis occidentalis*)%	50
Hawthorn (*Crataegus marshallii*)@	20
Crab Apple (*Malus angustifolia*)@	50
Red Mulberry (*Morus rubra*)@	100
Sycamore (*Platanus occidentalis*)*	50
Shumard Oak (*Quercus shumardii*)@	50
Total	**370**

* Included in mitigation plan planting list

% Not included in mitigation plan planting list but meets target community

@ Species selected based on lack of availability of mitigation plan planting list and target community species

In addition, three random vegetation transects (MY2 2020 Random Vegetation Transects) were measured after planting was complete to determine that those areas met the required stem densities; results indicated a range of stems per acre of 364 to 1012.

An assessment was made during early Fall 2018 to treat fescue within the Dry-Mesic Oak Hickory Forest planting zones to reduce competition with planted stems. Treatment was conducted in December 2018. Treatments of invasive plant species continued during 2019 throughout the Site. Japanese Stiltgrass and Tree-of-Heaven were high priorities during the 2019 invasive treatment season. Restoration Systems will continue to treat and monitor the Site for invasive species throughout the monitoring period.

Site Maintenance Report (2023)

Invasive Species Work	Maintenance work
05/17/2023 Privet, Russian Olive, Nodding Thistle, Multiflora rose 09/13/23 Privet, Russian Olive, Multiflora rose, Tree-of-heaven	06/14/2023, 06/21/2023, 09/27/2023, and 09/28/2023 Old fence within easement removal and boundary inspections. 12/02/2023 Fence relocation 12/05/2023 Supplemental planting

2023 Planned Vegetation Maintenance

Restoration Systems continues to monitor fescue throughout the Site. Based on permanent and random vegetation monitoring plots and visual observations, planted stems are established within areas where fescue was a concern.

On September 27, 2023, while performing the easement inspection, members discovered an encroachment area measuring .04 acres on the site's south side shown on Figure 2 (Appendix B). An existing cattle fence was not relocated to boundary corners during construction. No other encroachments were documented during the inspection. On December 02, 2023, the fence was relocated outside the easement. On December 05, 2023, a supplemental planting of twenty 3-gallon pots consisting of mitigation plan approved species, including 5 Black gum (*Nyssa Sylvatica),* 5 Water Oak (*Quercus nigra*), and 10 Willow Oak (*Quercus phellos)* were planted within the encroached area, see Photo Log (Appendix H).

Vegetation Monitoring Summary

Parameter	Method	Schedule/Frequency	Number/Extent	Data Collected
Vegetation establishment and vigor	Permanent vegetation plots 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	8 plots spread across the Site	Species, height, location, planted vs. volunteer, and age
	Random vegetation plots, 0.0247 acre (100 square meters) in size	As-built, Years 1, 2, 3, 5, and 7	2 plots randomly selected each year	Species and height

During quantitative vegetation sampling, 8 sample plots (10-meter by 10-meter) were installed within the Site as per guidelines established in *CVS-EEP Protocol for Recording Vegetation*, *Version 4.2* (Lee et al. 2008). Measurement also included two random sample plots (50-meter by 2-meter). Measurements of the 8 permanent vegetation plots resulted in an average of 354 planted stems/acre excluding livestakes. All plots met the stem density success criteria based on planted stems alone except for permanent plots 1 and 4; however, when including naturally recruited stems of green ash (*Fraxinus pennsylvanica*), plot 1 met the stem density success criteria. Additionally, both temporary vegetation transects met the stem density success criteria resulting in a sitewide average of 547 stems/acre, including natural recruits. Lastly, stem height data from the 8 permanent vegetation plots indicates a Site average of 7.29 feet, which meets the 7-foot height criteria required at Year 5. Year 5 (2023) vegetation data is included in Tables 8-10 (Appendix C).

3.0 REFERENCES

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Appendix A
Background Tables

Table 1. Project Components and Mitigation Units
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Attributes Table

Table 1. Project Components and Mitigation Credits - Major Hill Restoration Site

Reach ID	Stream Stationing/ Wetland Type	Existing Footage/ Acreage	Mitigation Plan Footage/ Acreage	Constructed Footage/ Acreage	Restoration Level	Restoration or Restoration Equivalent	Mitigation Ratio	Mitigation Credits	Comment
UT 1	00+00 to 16+99	1829	1699	1699	Restoration	1699	1:1	1699	
UT 1	16+99 to 27+96	1097	1060	1097	EII	1097	2.5:1	439	
UT 2	00+00 to 01+68	168	168	168	EII	168	2.5:1	67	
UT 2	01+68 to 02+07	39	43	39	Restoration	39	1:1	39	
UT 3	00+00 to 22+98	2298	2197	2298*	EII	2298-80-144-40=2034	2.5:1	814	80 lf and 40 lf of UT3 are not credit generating due to crossings and drainage easement. 144 lf are not credit generating due to lack of control of south bank and drainage easement.
Wetlands	Riparian Riverine	--	0.54	0.54	Restoration	0.54	1:1	0.54	Wetland Restoration
Wetlands	Riparian Riverine	0.52	0.44	0.44	Enhancement	0.44	2:1	0.22	Wetland Enhancement

Table 1. Project Components and Mitigation Credits - Major Hill Restoration Site (Continued)

Length & Area Summations by Mitigation Category		
Restoration Level	**Stream (linear footage)**	**Riparian Wetland (acreage)**
Restoration	1738	0.54
Enhancement (Level II)	3299*	--
Enhancement	--	0.44**

* An additional 264 linear feet of stream enhancement (level II) is proposed outside of the easement (at road crossings), or the sponsor controls only one bank of the stream, and is therefore not included in this total or in mitigation credit calculations.
**Approximately 0.08 acre of existing, degraded wetland will not be enhanced as the result of the design channel crossing the wetland area.

Overall Assets Summary	
Asset Category	**Overall Credits**
Stream	**3057.600**
Riparian Riverine Wetland	**0.760**

Table 2. Project Activity and Reporting History - Major Hill Restoration Site

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Technical Proposal Issue Date (RFP No. 16-006990)	September 16, 2016	September 16, 2016
Institution Date (NCDMS Contract No. 7193)	--	May 22, 2017
Mitigation Plan	--	February 2018
404 Permit Date	--	June 28, 2018
Construction Plans	--	July 2018
Site Construction	--	July 25-September 6, 2018
Planting	--	December 2018-January 2019
As-built Stream Data Collection	September 19, 2018	--
As-built Vegetation Data Collection	January 8, 2019	--
As-built Baseline Monitoring Report	--	March 2019
MY1 (2019) Vegetation Data Collection	September 9, 2019	--
MY1 (2019) Stream Data Collection	September 10, 2019	--
MY1 (2019) Monitoring Report	October 2019	November 2019
Supplemental Planting	--	January 31, 2020
MY 2 (2020) Vegetation Data Collection	October 2020	--
MY 2 (2020) Stream Data Collection	July/October 2020	--
MY 2 (2020) Monitoring Report	October 2020	November 2020
MY 3 (2021) Vegetation Data Collection	October 2021	--
MY 3 (2021) Stream Data Collection	March 2021	--
MY 3 (2021) Monitoring Report	October 2021	January 2022
MY 4 (2022) Vegetation Data Collection	NA	--
MY 4 (2022) Stream Data Collection	NA	--
MY 4 (2022) Monitoring Report	October 2022	November 2022
MY 5 (2023) Vegetation Data Collection	August 25, 2023	--
MY 5 (2023) Stream Data Collection	May 16, 2023	--
MY 5 (2023) Monitoring Report	October 2023	February 2024

Table 3. Project Contacts Table - Major Hill Restoration Site

Full Delivery Provider Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 Worth Creech 919-755-9490	**Construction Contractor** Land Mechanic Designs 780 Landmark Road Willow Spring, NC 27592 Lloyd Glover 919-639-6132
Designer Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693	**Planting Contractor** Carolina Silvics, Inc. 908 Indian Trail Road Edenton, NC 27932 Mary-Margaret McKinney 252-482-8491
Construction Plans and Sediment and Erosion Control Plans Sungate Design Group, PA 915 Jones Franklin Road Raleigh, NC 27606 Joshua G. Dalton, PE 919-859-2243	**As-built Surveyor** K2 Design Group 5688 US Highway 70 East Goldsboro, NC 27534 John Rudolph 919-751-0075
	Baseline & Monitoring Data Collection Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis 919-215-1693

Table 4. Project Attribute Table - Major Hill Restoration Site

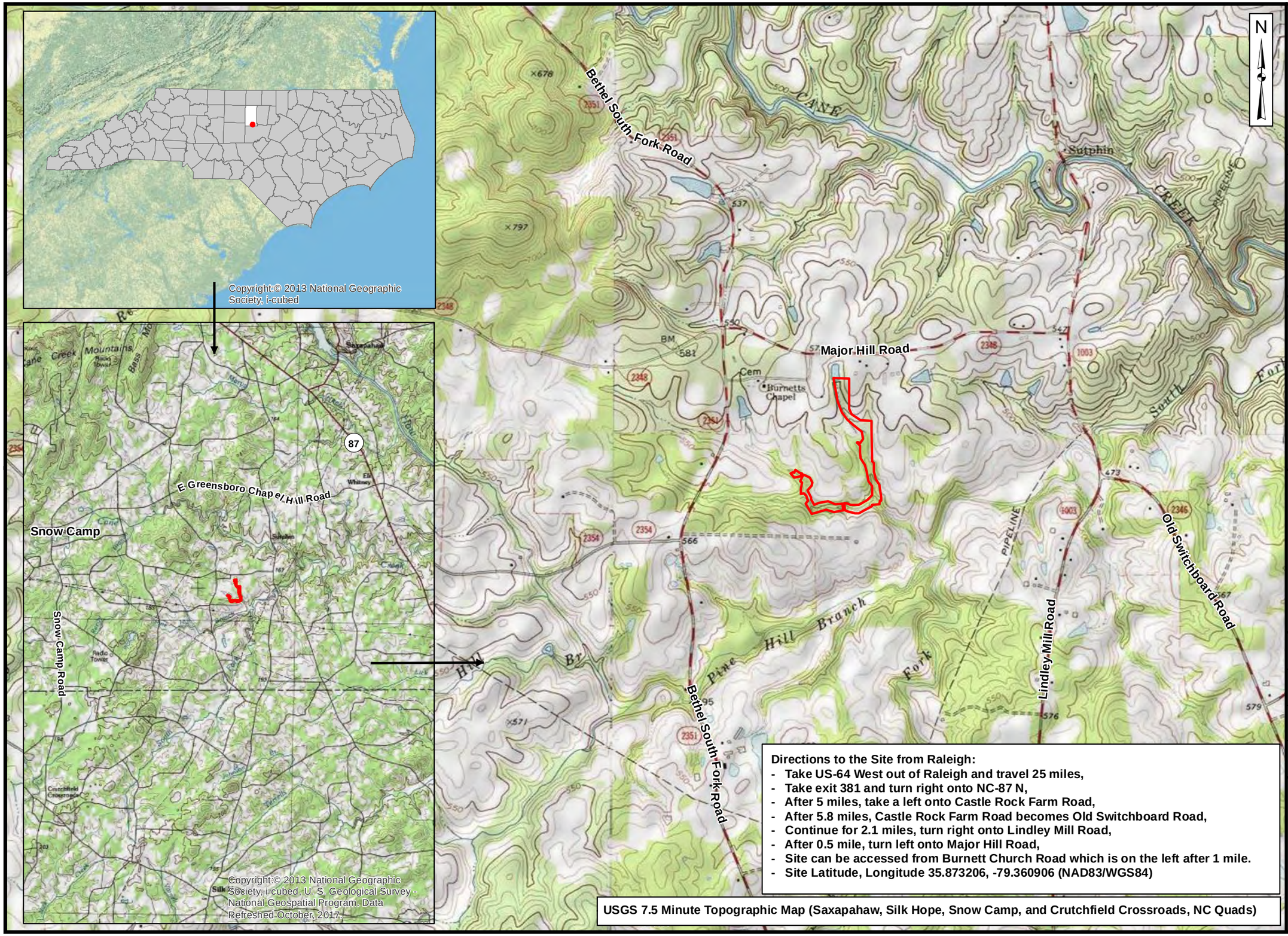
Project Information			
Project Name	Major Hill Restoration Site		
Project County	Alamance County, North Carolina		
Project Area (acres)	16.7		
Project Coordinates (latitude & latitude)	35.873206, -79.360906		
Planted Area (acres)	8.11		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
Project River Basin	Cape Fear		
USGS HUC for Project (14-digit)	03030002050050		
NCDWR Sub-basin for Project	03-06-04		
Project Drainage Area (acres)	17 to 445		
Percentage of Project Drainage Area that is Impervious	<2%		
CGIA Land Use Classification	Managed Herbaceous Cover & Mixed Upland Hardwoods		
Reach Summary Information			
Parameters	**UT 1**	**UT 2**	**UT 3**
Length of reach (linear feet)	2796	207	2298
Valley Classification & Confinement	Alluvial, moderately confined to confined		
Drainage Area (acres)	71.7	17.2	444.7
NCDWR Stream ID Score	20.25 – 33.5	--	--
Perennial, Intermittent, Ephemeral	Intermittent/Perennial	Intermittent	Perennial
NCDWR Water Quality Classification	WS-V, NSW		
Existing Morphological Description (Rosgen 1996)	Cg5	C4/5	C3
Proposed Stream Classification (Rosgen 1996)	C/E 4	C4/5	C3
Existing Evolutionary Stage (Simon and Hupp 1986)	III/IV	III	I
Underlying Mapped Soils	Efland silt loam, Georgeville silt loam, Herndon silt loam, Orange silt loam, Worsham sandy loam, Local Alluvial Land		
Drainage Class	Well-drained, well-drained, well-drained, poorly drained, well-drained, poorly drained, respectively		
Hydric Soil Status	Nonhydric, nonhydric, nonhydric, nonhydric, hydric, hydric, respectively		
Slope	0.0241	0.0256	0.0130
FEMA Classification	NA		
Native Vegetation Community	Piedmont Alluvial Forest/Dry-Mesic Oak-Hickory Forest		
Watershed Land Use/Land Cover (Site)	45% forest, 35% agricultural land, 20% low density residential/impervious surface		
Watershed Land Use/Land Cover (Cedarock Reference Channel)	65% forest, 30% agricultural land, <5% low density residential/impervious surface		
Percent Composition of Exotic Invasive Vegetation	<5%		

Table 4. Project Attribute Table - Major Hill Restoration Site (Continued)

Wetland Summary Information	
Parameters	**Wetlands**
Wetland acreage	0.54 acre drained or impounded & 0.44 acre degraded
Wetland Type	Riparian riverine
Mapped Soil Series	Worsham and Local Alluvial Land
Drainage Class	Poorly drained
Hydric Soil Status	Hydric
Source of Hydrology	Groundwater, stream overbank
Hydrologic Impairment	Incised streams, compacted soils, livestock
Native Vegetation Community	Piedmont/Low Mountain Alluvial Forest
% Composition of Exotic Invasive Vegetation	<5%
Restoration Method	Hydrologic, vegetative
Enhancement Method	Vegetative

Appendix B
Visual Assessment Data

Figure 1. Project Location
Figure 2. Current Conditions Plan View
Tables 5A-5B. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment
Vegetation Plot Photographs
Site Photo Log



Axiom Environmental, Inc.

Prepared for:

RESTORATION SYSTEMS | LLC

Project:

MAJOR HILL STREAM AND WETLAND MITIGATION SITE

Alamance County, NC

Title:

PROJECT LOCATION

Drawn by: KRJ

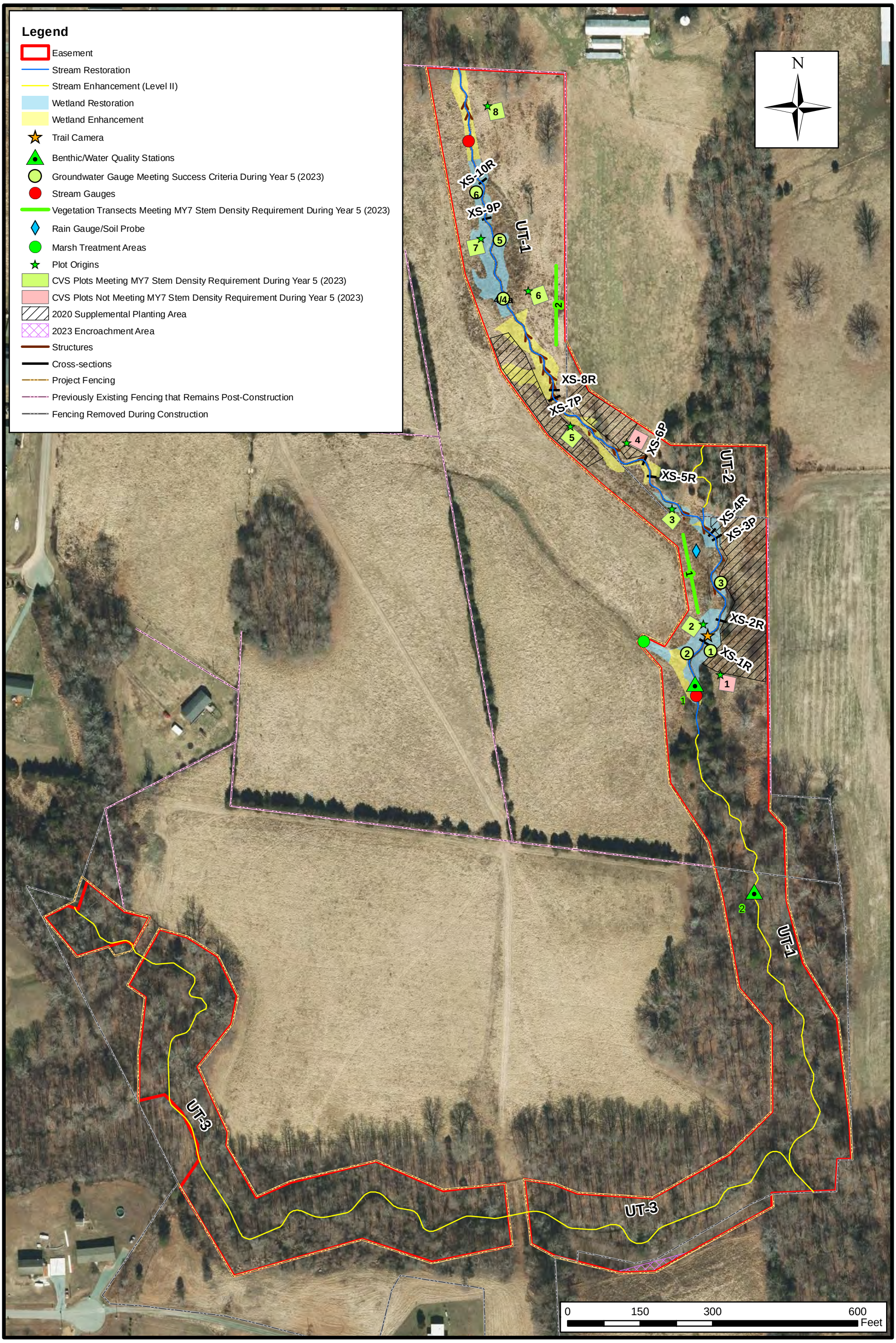
Date: NOV 2017

Scale: 1:20,000

Project No.: 17-009

FIGURE

1



Axiom Environmental
218 Snow Ave
Raleigh, NC 27607
(919) 215-1693

CURRENT CONDITIONS PLAN VIEW
Major Hill Stream and Wetland Mitigation
Alamance County, North Carolina

Dwn. By:	KRJ
Date:	Oct 2023
Project:	17-009

FIGURE 2

Table 5A **Visual Stream Morphology Stability Assessment**
Reach ID **Major Hill UT-1**
Assessed Length **1699**

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. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	71	71			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	70	70			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	70	70			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	70	70			100%			
		2. Thalweg centering at downstream of meander (Glide)	70	70			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	26	26			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	26	26			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	26	26			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	26	26			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	26	26			100%			

Table 5B **Visual Stream Morphology Stability Assessment**
Reach ID **Major Hill UT-2**
Assessed Length **39**

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. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	2	2			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	2	2			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	2	2			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		2. Thalweg centering at downstream of meander (Glide)	2	2			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	0	0			NA			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	0	0			NA			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0			NA			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			NA			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			NA			

Table 6 Vegetation Condition Assessment

Major Hill

Planted Acreage[1] **8.1**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	None	0.1 acres	none	0	0.00	0.0%
2. Low Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
2B. Low Planted Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	None	0.25 acres	none	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] **16.7**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	None	1000 SF	none	0	0.00	0.0%
5. Easement Encroachment Areas[3]	None	none	pink crosshatch	1	0.04	0.2%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by DMS such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Major Hill
MY-05 (2023) Vegetation Monitoring Photographs
Taken August 25, 2023

Plot 1

Plot 2

Plot 3

Plot 4

Plot 5

Plot 6

Major Hill
MY-05 (2023) Vegetation Monitoring Photographs (continued)
Taken August 25, 2023

Plot 7

Plot 8

Transect 1

Transect 2

Major Hill
MY-05 (2023) Photo Log

Photo 1: Buffer Vegetation along UT-1

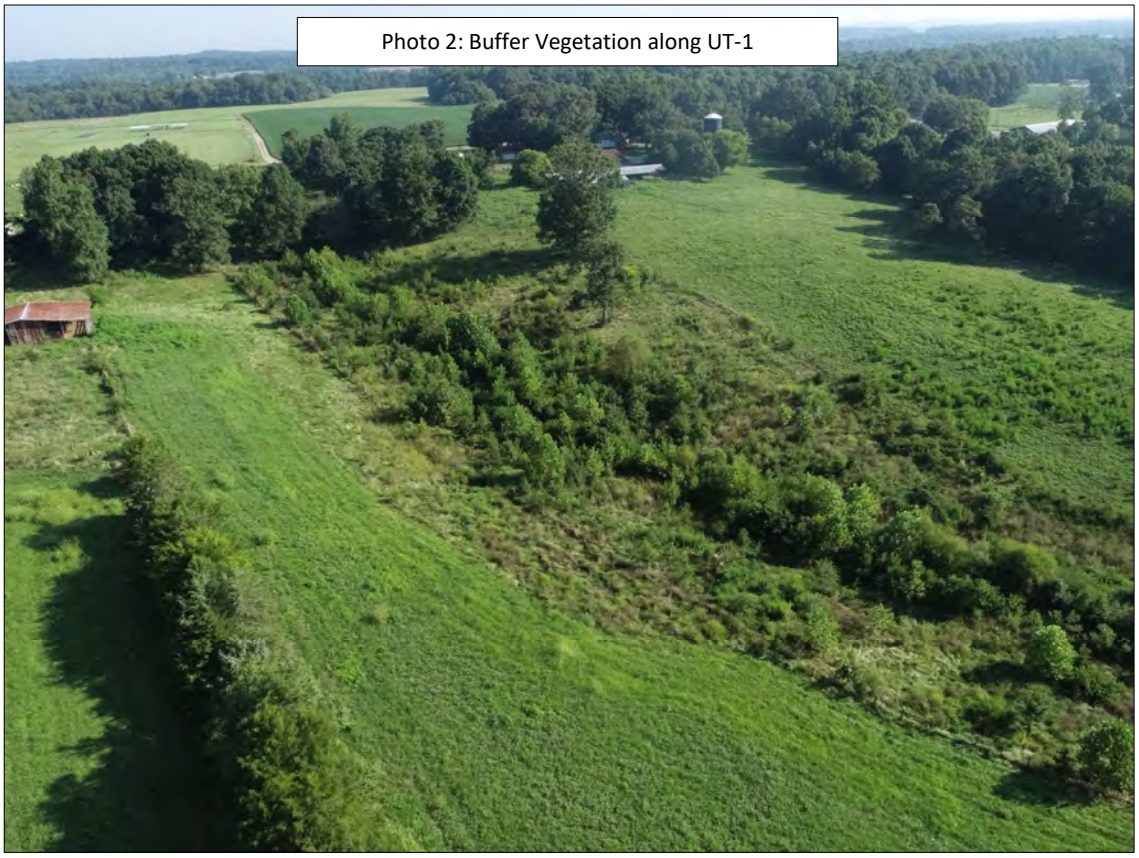


Photo 2: Buffer Vegetation along UT-1

Major Hill
MY-05 (2023) Photo Log

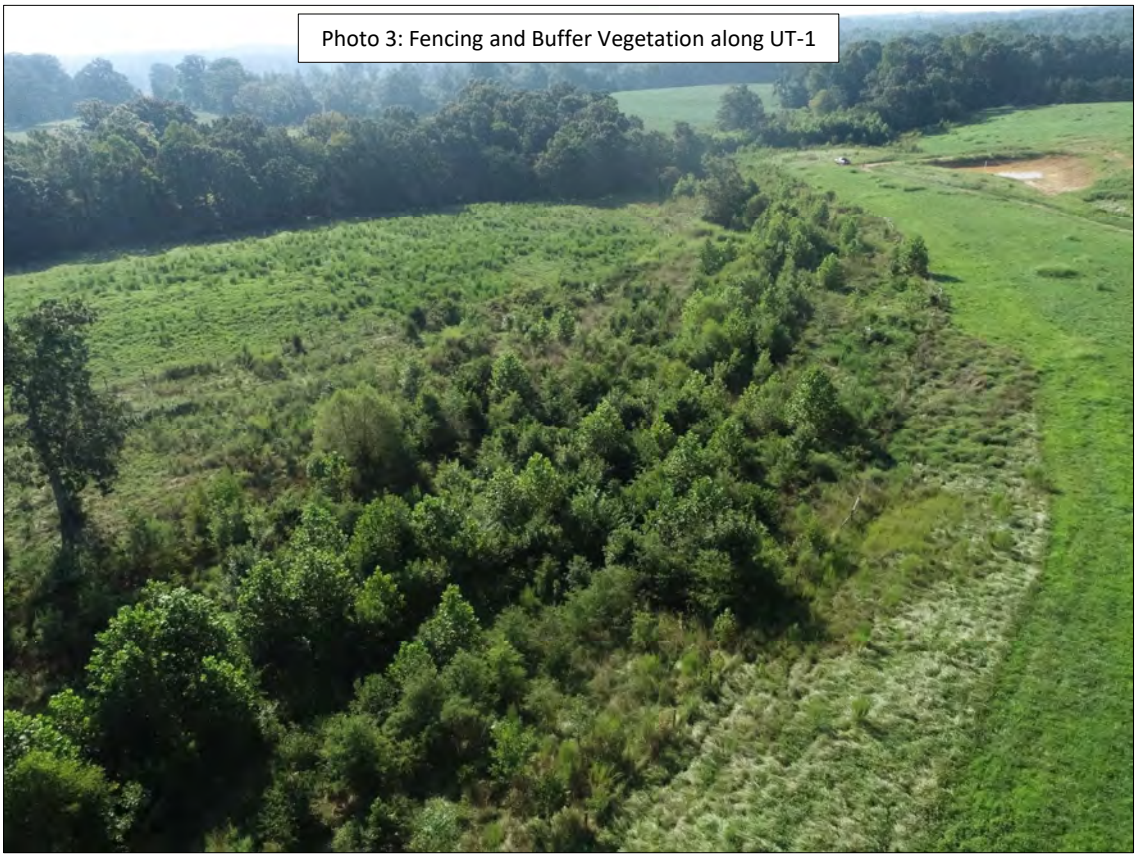


Photo 3: Fencing and Buffer Vegetation along UT-1

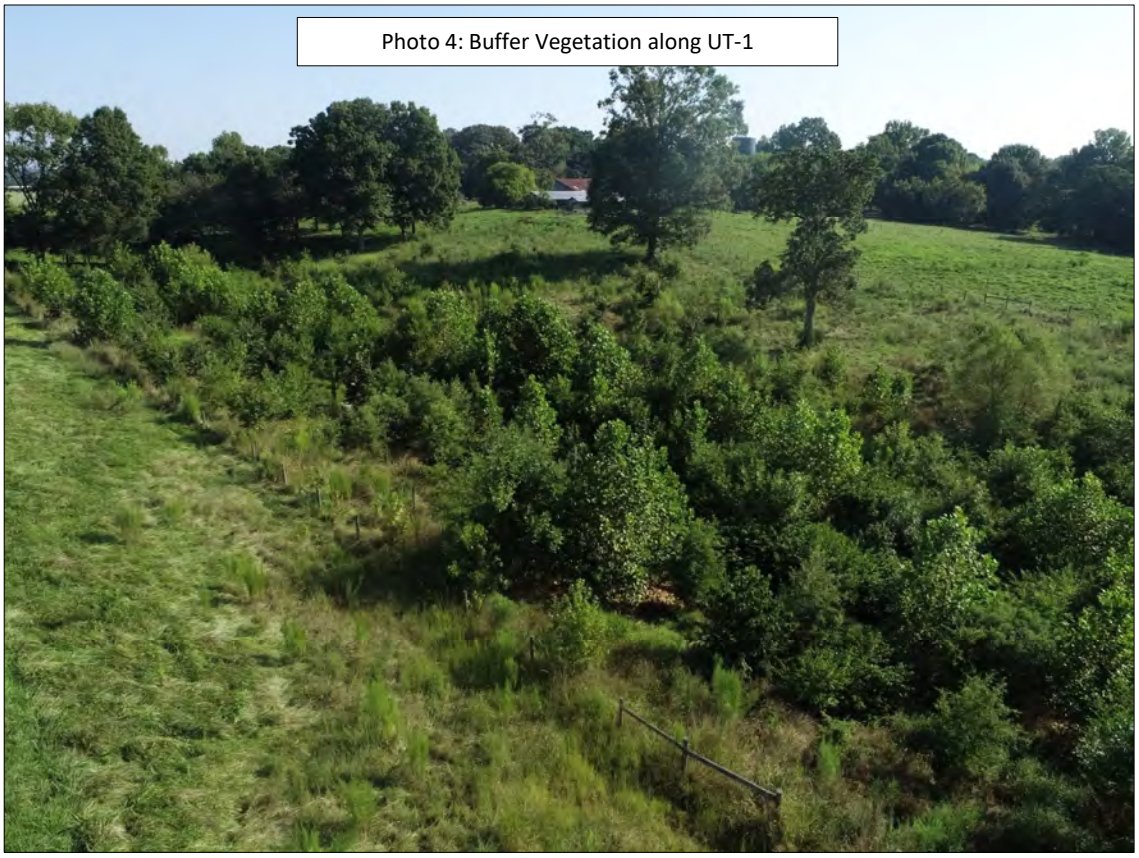


Photo 4: Buffer Vegetation along UT-1

Major Hill
MY-05 (2023) Photo Log

Photo 5: Marsh treatment area west of groundwater gauge 2

Photo 6: UT-1

Major Hill
MY-05 (2023) Photo Log

Photo 7: UT-3 Downstream Piped Crossing – Upstream End

Photo 8: UT-3 Downstream Piped Crossing – Downstream End

Major Hill
MY-05 (2023) Photo Log

Photo 9: Bud Burst of Carpinus caroliniana
Photo Taken 3/2/2023

Photo 10: Bud Burst of Lindera benzoin
Photo Taken 3/2/2023

Major Hill
MY-05 (2023) Photo Log

Photo 11: UT-1 Flow 6/19/23
Bankfull event

Photo 12: UT-1 Flow 6/21/23

Major Hill
MY-05 (2023) Photo Log

Photo 13: UT-2 leading out of easement

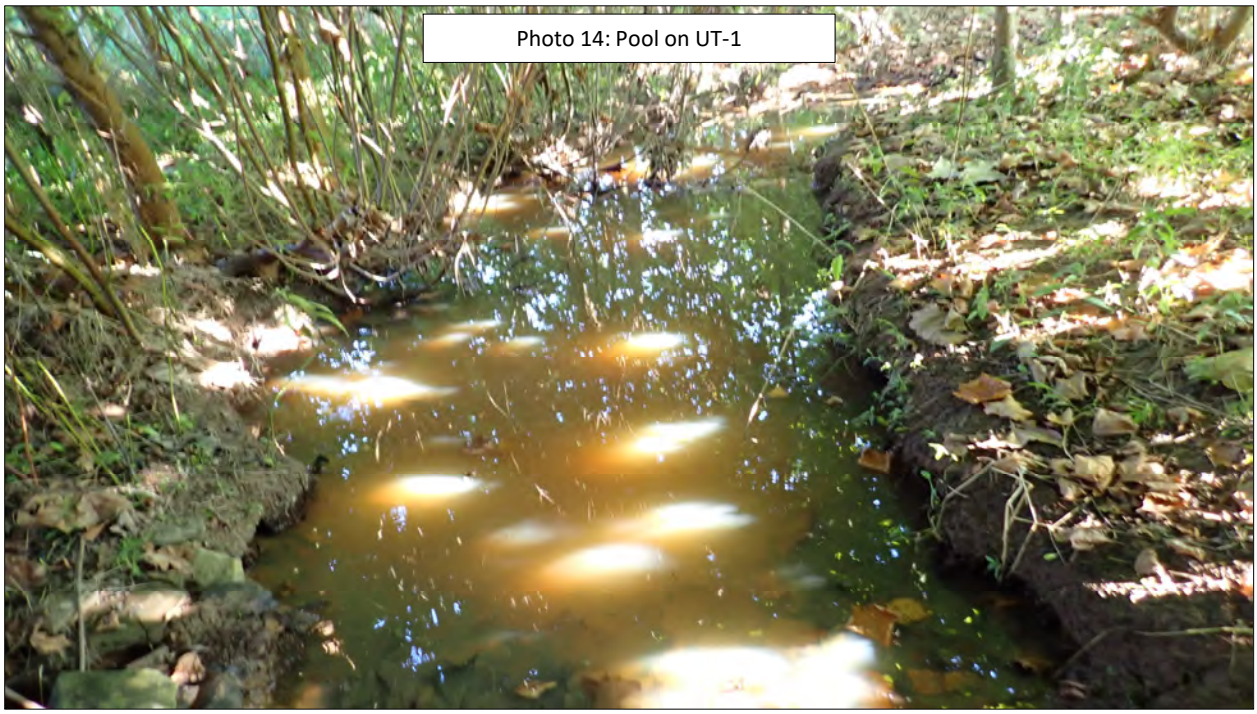


Photo 14: Pool on UT-1

Major Hill
MY-05 (2023) Photo Log

Photo 15: UT-3

Photo 16: UT-3

Appendix C
Vegetation Data

Table 7. Planted Bare Root Woody Vegetation
Table 8. Total Stems by Plot and Species
Table 9. Temporary Vegetation Plot Data
Table 10. Planted Vegetation Totals
Height Data

Table 7. Planted Bare Root Woody Vegetation – Major Hill Restoration Site

Species	Piedmont/Low Mountain Alluvial Forest	Dry-Mesic Oak/Hickory Forest	Marsh Treatment Wetland	Streamside Assemblage	Total
Acres	**1.1**	**5.5**	**0.01**	**1.5**	**8.11**
Alnus serrulata			5	20	25
Asimina triloba				200	200
Betula nigra	100			200	300
Carpinus caroliniana		600			600
Cephalanthus occidentalis			5	20	25
Cercis canadensis		500			500
Cornus amomum	95		5	800	900
Diospyros virginiana		450			450
Fraxinus americana		100			100
Fraxinus pennsylvanica	150			750	900
Liriodendron tulipifera	75				75
Nyssa sylvatia		600			600
Platanus occidentalis	120			780	900
Quercus nigra	110	790		500	1,400
Quercus phellos	100	700		400	1,200
*Salix nigra**				400*	400
Sambucus canadensis			11	14	25
TOTALS	750	3,740	26	4,084	**8,600**
Stems/Acre	682	680	2600	2722	**1060**

*Live stakes of *Salix nigra* were planted; all other planted species were planted as bare root plants.

Table 8. Total Stems by Plot and Species
DMS Project Code 17.009. Project Name: Major Hill

			Current Plot Data (MY5 2023)																							
			17.009-01-0001			17.009-01-0002			17.009-01-0003			17.009-01-0004			17.009-01-0005			17.009-01-0006			17.009-01-0007			17.009-01-0008		
Scientific Name	**Common Name**	**Species Type**	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree																								
Asimina triloba	pawpaw	Tree																			1	1	1			
Betula nigra	river birch	Tree										1	1	1							1	1	1	1	1	1
Carpinus caroliniana	American hornbeam	Tree	1	1	1	3	3	3	4	4	4							2	2	2				1	1	1
Cercis canadensis	eastern redbud	Tree							2	2	2													2	2	2
Cornus amomum	silky dogwood	Shrub																								
Diospyros virginiana	common persimmon	Tree				1	1	2	1	1	1	1	1	1	1	1	1	1	1	1				4	4	4
Fraxinus	ash	Tree																						1	1	1
Fraxinus americana	white ash	Tree																3	3	3				1	1	1
Fraxinus pennsylvanica	green ash	Tree	2	2	16							1	1	1	1	1	1				1	1	1			
Liquidambar styraciflua	sweetgum	Tree																								
Liriodendron tulipifera	tuliptree	Tree	1	1	1																					
Nyssa sylvatica	blackgum	Tree																								
Platanus occidentalis	American sycamore	Tree				1	1	1							1	1	1	2	2	2						
Quercus	oak	Tree	1	1	1																					
Quercus nigra	water oak	Tree										1	1	1	4	4	4	3	3	3	3	3	3	1	1	1
Quercus phellos	willow oak	Tree				2	2	2	3	3	3							1	1	1	5	5	5	3	3	4
Quercus rubra	northern red oak	Tree																								
Unknown		Shrub or Tree																								
		Stem count	5	5	19	7	7	8	10	10	10	4	4	4	7	7	7	12	12	12	11	11	11	14	14	15
		size (ares)	1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	6	5	5	5	8	8	8
		Stems per ACRE	202.3	202.3	768.9	283.3	283.3	323.7	404.7	404.7	404.7	161.9	161.9	161.9	283.3	283.3	283.3	485.6	485.6	485.6	445.2	445.2	445.2	566.6	566.6	607

			Annual Means														
			MY5 (2023)			MY3 (2021)			MY2 (2020)			MY1 (2019)			MY0 (2019)		
Scientific Name	**Common Name**	**Species Type**	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree												3			
Asimina triloba	pawpaw	Tree	1	1	1	2	2	2	2	2	2	3	3	3	7	7	7
Betula nigra	river birch	Tree	3	3	3	3	3	3	4	4	4	6	6	6	9	9	9
Carpinus caroliniana	American hornbeam	Tree	11	11	11	11	11	11	10	10	10	14	14	14	5	5	5
Cercis canadensis	eastern redbud	Tree	4	4	4	4	4	4	5	5	5	8	8	8	14	14	14
Cornus amomum	silky dogwood	Shrub										2	2	2	1	1	1
Diospyros virginiana	common persimmon	Tree	9	9	10	8	8	10	9	9	10	9	9	9	5	5	5
Fraxinus	ash	Tree	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fraxinus americana	white ash	Tree	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5
Fraxinus pennsylvanica	green ash	Tree	5	5	19	5	5	8	5	5	8	4	4	4	3	3	3
Liquidambar styraciflua	sweetgum	Tree												2			
Liriodendron tulipifera	tuliptree	Tree	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5
Nyssa sylvatica	blackgum	Tree				2	2	2	2	2	2	4	4	4	10	10	10
Platanus occidentalis	American sycamore	Tree	4	4	4	4	4	5	5	5	5	7	7	8	7	7	7
Quercus	oak	Tree	1	1	1	1	1	1	2	2	2	3	3	3	23	23	23
Quercus nigra	water oak	Tree	12	12	12	12	12	12	12	12	12	20	20	20	10	10	10
Quercus phellos	willow oak	Tree	14	14	15	13	13	14	12	12	12	16	16	16	18	18	18
Quercus rubra	northern red oak	Tree						1									
Unknown		Shrub or Tree													6	6	6
		Stem count	70	70	86	72	72	80	75	75	79	103	103	109	129	129	129
		size (ares)	8			8			8			8			8		
		size (ACRES)	0.20			0.20			0.20			0.20			0.20		
		Species count	13	13	13	14	14	15	14	14	14	15	15	17	16	16	16
		Stems per ACRE	354.1	354.1	435	364.2	364.2	404.7	379.4	379.4	399.6	521	521	551.4	652.6	652.6	652.6

Color for Density
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Table 9. Temporary Vegetation Plot Data – Major Hill Restoration Site

Species	50m x 2m Temporary Plot (Bearing)	
	T-1 (10°)	T-2 (345°)
Carpinus caroliniana	5	
Diospyros virginiana		8
Fraxinus pennsylvanica	6	
Platanus occidentalis	2	1
Quercus nigra		1
Quercus pagoda	3	1
Total Stems	**16**	**11**
Total Stems/Acre	**648**	**445**

Table 10. Planted Vegetation Totals – Major Hill Restoration Site

Plot #	Success Criteria Met?	MY 5 (2023) Planted Stems/Ac	MY 5 (2023) All Stems/Ac
1	No	202	769
2	Yes	283	324
3	Yes	405	405
4	No	162	162
5	Yes	283	283
6	Yes	486	486
7	Yes	445	445
8	Yes	567	607
T-1	Yes	--	648
T-2	Yes	--	445
Average Planted Stems/Acre	**Yes**	**354**	**457**

Major Hill MY5 (2023) Stem Height Data

Plot	SCIENTIFIC NAME	X	Y	Height (cm)	DBH	Vigor	Height (ft)	Plot Ave Height (ft)	Plot Ave Height (ft) - 6 tallest stems* (>210 stems/ac)
1	Liriodendron tulipifera	7.3	1.3	240	0.2	3	7.87		
1	Carpinus caroliniana	9.2	4.1	251	0.25	2	8.23		
1	Quercus	6.6	4.7	151	0.25	4	4.95	5.71	5.71
1	Fraxinus pennsylvanica	1.6	3.8	118	0.25	3	3.87		
1	Fraxinus pennsylvanica	6.7	9.7	110	0.1	4	3.61		
2	Quercus phellos	2.9	0.5	360	3	4	11.81		
2	Carpinus caroliniana	4.8	3.4	160	0.25	4	5.25		
2	Carpinus caroliniana	7.1	6.5	69		3	2.26		
2	Platanus occidentalis	10.0	7.1	230	1.5	4	7.55	6.46	7.16
2	Quercus phellos	1.6	5.9	280	2	4	9.19		
2	Diospyros virginiana	7.8	2.6	165	0.5	4	5.41		
2	Carpinus caroliniana	7.5	4.6	114		4	3.74		
3	Carpinus caroliniana	2.4	1.4	340	2	4	11.15		
3	Quercus phellos	5.3	1.4	260	1.5	4	8.53		
3	Carpinus caroliniana	8.1	1.3	71		4	2.33		
3	Carpinus caroliniana	6.8	2.7	110		4	3.61		
3	Quercus phellos	10.0	3.0	120	0.5	4	3.94	6.45	9.84
3	Carpinus caroliniana	6.3	5.3	50		3	1.64		
3	Cercis canadensis	4.2	10.0	10		4	0.33		
3	Cercis canadensis	1.3	10.0	35		4	1.15		
3	Diospyros virginiana	1.3	8.1	770	1.5	4	25.26		
3	Quercus phellos	1.7	5.3	200	0.5	4	6.56		
4	Fraxinus pennsylvanica	7.6	0.9	86		4	2.82		
4	Betula nigra	7.6	3.3	61		4	2.00	2.77	2.77
4	Quercus nigra	6.2	8.0	60		4	1.97		
4	Diospyros virginiana	2.4	7.2	131	0.1	4	4.30		
5	Quercus nigra	0.3	1.0	240	2.5	4	7.87		
5	Platanus occidentalis	2.8	0.1	370	5	4	12.14		
5	Fraxinus pennsylvanica	2.1	3.7	265	2	4	8.69		
5	Diospyros virginiana	5.1	4.3	50		4	1.64	6.37	7.16
5	Quercus nigra	5.5	1.2	100		4	3.28		
5	Quercus nigra	7.5	8.0	110		4	3.61		
5	Quercus nigra	0.2	6.5	225	0.25	4	7.38		
6	Quercus nigra	2.2	0.3	190	0.25	4	6.23		
6	Carpinus caroliniana	3.0	2.7	95		3	3.12		
6	Diospyros virginiana	0.9	3.4	205	1	4	6.73		
6	Quercus phellos	6.5	0.8	205	1.5	4	6.73		
6	Carpinus caroliniana	8.4	2.4	200	1	4	6.56		
6	Quercus nigra	9.8	3.9	210	1.5	4	6.89		
6	Platanus occidentalis	7.6	4.8	310	4	4	10.17	7.98	9.92
6	Fraxinus americana	9.0	7.0	380	2.5	4	12.47		
6	Fraxinus americana	6.8	7.2	285	2	4	9.35		
6	Fraxinus americana	4.6	8.0	290	2.5	4	9.51		
6	Quercus nigra	0.5	8.1	230	0.5	4	7.55		
6	Platanus occidentalis	2.2	6.7	320	2	4	10.50		
7	Quercus phellos	4.8	0.9	340	2.5	4	11.15		
7	Quercus phellos	5.3	3.0	390	5	4	12.80		
7	Betula nigra	5.7	4.9	290	1.75	4	9.51		
7	Quercus nigra	7.6	3.5	193	0.25	4	6.33		
7	Quercus phellos	8.8	1.2	290	2.75	4	9.51		
7	Asimina triloba	8.5	6.1	340	4.5	4	11.15	10.18	11.76
7	Quercus phellos	6.3	7.1	360	3.75	4	11.81		
7	Quercus nigra	8.8	8.5	380	4.5	4	12.47		
7	Quercus nigra	1.2	6.9	250	2	4	8.20		
7	Quercus phellos	1.7	5.1	240	1.75	4	7.87		
7	Fraxinus pennsylvanica	3.6	8.2	340	2.75	4	11.15		
8	Diospyros virginiana	4.3	1.5	165	0.25	4	5.41		
8	Fraxinus	4.8	3.2	150	0.25	4	4.92		
8	Diospyros virginiana	1.3	4.6	160	0.25	4	5.25		
8	Cercis canadensis	7.3	0.4	40		4	1.31		
8	Fraxinus americana	9.9	2.9	130	0.1	4	4.27		
8	Betula nigra	7.3	2.8	110		4	3.61		
8	Quercus nigra	5.1	5.0	195	0.25	4	6.40		
8	Carpinus caroliniana	7.5	5.7	95		4	3.12	4.82	6.71
8	Cercis canadensis	9.8	6.0	50		4	1.64		
8	Quercus phellos	7.4	6.2	280	1.5	4	9.19		
8	Diospyros virginiana	7.2	7.6	225	1	4	7.38		
8	Quercus phellos	8.4	8.7	190	0.5	4	6.23		
8	Fraxinus americana	5.0	8.5	92		4	3.02		
8	Diospyros virginiana	3.0	7.1	172	0.5	4	5.64		
8	Quercus phellos	1.7	9.2	151	0.25	4	4.95		
							Site Average	6.34	7.63

* Where applicable. For plots that contain <6 stems, this number represents the average of all stems in the plot.

Appendix D
Stream Geomorphology Data

Tables 11A-11B. Baseline Stream Data Summary
Tables 12A-12D. Monitoring Data (Dimensional Morphology Summary & Stream Reach Data Summary)
Table 13. Water Quality Data
Cross-Section Plots

Table 11a. Baseline Stream Data Summary (UT 1 Upstream)
Major Hill Mitigation Project - NCDMS Project Number 100015

Parameter	Gauge	Regional Curve			Pre-Existing Condition (UT 1 Upstream)					Reference Reach(es) Data					Design (UT 1 Upstream)			Monitoring Baseline (UT 1 Upstream)					
Dimension and Substrate - Riffle Only		**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**Min**	**Mean**	**Med**	**Max**	**SD**	**Min**	**Max**	**Med**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
BF Width (ft)					3.8		5.6	6.4		8.0		9.6	12.1		5.6	6.4	6.0	6.0		10.9	11.8		3
Floodprone Width (ft)					11.0		27.0	48.0		15		75	140		20	60	40	23		40	40		3
BF Mean Depth (ft)					0.3		0.5	0.7		0.8		1.1	1.4		0.4	0.5	0.4	0.3		0.5	0.6		3
BF Max Depth (ft)					0.7		0.9	1.3		1.1		1.7	2.0		0.5	0.7	0.6	0.7		0.8	1.1		3
BF Cross Sectional Area (ft^2)					2.6		2.6	2.6		8.0		11.4	14.7		2.6	2.6	2.6	3.0		3.5	7.1		3
Width/Depth Ratio					5.4		13.4	27.0		8.0		9.6	15.1		12.0	16.0	14.0	12.0		19.6	33.9		3
Entrenchment Ratio					1.4		5.8	12.6		1.9		7.1	13.0		3.6	9.3	6.6	3.4		3.7	3.8		3
Bank Height Ratio					1.0		1.4	1.7		1.0		1.2	1.8		1.0	1.3	1.2	1.0		1.0	1.3		3
Profile																							
Riffle length (ft)																		5		16	47		3
Riffle slope (ft/ft)										0.0100		0.0207	0.0576		0.0268	0.0401	0.0357	0.0000		0.0252	0.0539		3
Pool length (ft)																		4.0		13.0	28.0		3
Pool Max depth (ft)										1.5		2.3	2.7		0.6	0.9	0.8	1.3		2.0	2.5		3
Pool spacing (ft)										22.0		40.8	81.0		18.0	48.0	24.0	18.0		24.0	48.0		3
Pattern																							
Channel Beltwidth (ft)										17		26.3	38		18	36	24	18		24	36		
Radius of Curvature (ft)										9		23.6	113		12	60	18	12		18	60		
Rc:Bankfull width (ft/ft)										0.8		2.4	10.3		2	10	3	2		3	10		
Meander Wavelength (ft)										10		65.7	116		36	72	51	36		51	72		
Meander Width ratio										1.5		2.7	4.7		3	6	4	3		4	6		
Transport parameters																							
Reach Shear Stress (competency) lbs/ft^2																							
Max part size (mm) mobilized at bankfull																							
Stream Power (transport capacity) W/m^2																							
Additional Reach Parameters																							
Rosgen Classification					Cg 5					Eb 5					E/C 4			E/C-type					
Bankfull Velocity (fps)																							
Bankfull Discharge (cfs)					9.5					28.8 - 60.6					9.5			9.5					
Valley Length (ft)																							
Channel Thalweg Length (ft)																							
Sinuosity					1.07					1.2 - 1.46					1.08			1.08					
Water Surface Slope (ft/ft)					0.0225					0.0053 - 0.0258					0.0223			0.0195					
BF slope (ft/ft)																							
Bankfull Floodplain Area (acres)																							
% of Reach with Eroding Banks																							
Channel Stability or Habitat Metric																							
Biological or Other																							

Table 11b. Baseline Stream Data Summary (UT 1 Downstream)
Major Hill Mitigation Project - NCDMS Project Number 100015

Parameter	Gauge	Regional Curve			Pre-Existing Condition (UT 1 Downstream)					Reference Reach(es) Data					Design (UT 1 Downstream)			Monitoring Baseline (UT 1 Downstream)					
Dimension and Substrate - Riffle Only		**LL**	**UL**	**Eq.**	**Min**	**Mean**	**Med**	**Max**	**SD**	**Min**	**Mean**	**Med**	**Max**	**SD**	**Min**	**Max**	**Med**	**Min**	**Mean**	**Med**	**Max**	**SD**	**n**
BF Width (ft)					4.9		6.7	8.7		8.0		9.6	12.1		6.8	7.8	7.3	8.6		10.3	11.8		3
Floodprone Width (ft)					9.0		14.0	21.0		15		75	140		25	75	50	22		40	40		3
BF Mean Depth (ft)					0.4		0.6	0.8		0.8		1.1	1.4		0.4	0.8	0.6	0.4		0.6	0.6		3
BF Max Depth (ft)					0.7		0.9	1.2		1.1		1.7	2.0		0.6	0.8	0.7	0.7		0.9	1.2		3
BF Cross Sectional Area (ft^2)					3.8		3.8	3.8		8.0		11.4	14.7		3.8	3.8	3.8	3.5		5.8	7.5		3
Width/Depth Ratio					6.1		13.1	21.8		8.0		9.6	15.1		12.0	16.0	14.0	18.0		18.0	21.0		3
Entrenchment Ratio					1.4		2.2	4.3		1.9		7.1	13.0		3.7	9.6	6.9	2.6		3.4	3.9		3
Bank Height Ratio					1.6		2.2	2.8		1.0		1.2	1.8		1.0	1.3	1.2	1.0		1.0	1.0		3
Profile																							
Riffle length (ft)																		5		16	47		1
Riffle slope (ft/ft)										0.0100		0.0207	0.0576		0.0000	0.0297	0.0264	0.0000		0.0252	0.0539		1
Pool length (ft)																		4.0		13.0	28.0		1
Pool Max depth (ft)										1.5		2.3	2.7		0.7	1.1	1.0	1.7		1.7	1.7		1
Pool spacing (ft)										22.0		40.8	81.0		21.9	58.4	29.2	18.0		24.0	48.0		1
Pattern																							
Channel Beltwidth (ft)										17		26.3	38		21.9	43.8	29.2	22		29	44		
Radius of Curvature (ft)										9		23.6	113		14.6	72.9	21.9	14		22	73		
Rc:Bankfull width (ft/ft)										0.8		2.4	10.3		2	10	3	2		3	10		
Meander Wavelength (ft)										10		65.7	116		43.8	87.5	62	44		62	88		
Meander Width ratio										1.5		2.7	4.7		3	6	4	3		4	6		
Transport parameters																							
Reach Shear Stress (competency) lbs/ft^2																							
Max part size (mm) mobilized at bankfull																							
Stream Power (transport capacity) W/m^2																							
Additional Reach Parameters																							
Rosgen Classification					Cg 5					Eb 5					E/C 4			E/C-type					
Bankfull Velocity (fps)																							
Bankfull Discharge (cfs)					14.2					28.8 - 60.6					14.2			14.2					
Valley Length (ft)																							
Channel Thalweg Length (ft)																							
Sinuosity					1.26					1.2 - 1.46					1.12			1.12					
Water Surface Slope (ft/ft)					0.0147					0.0053 - 0.0258					0.0165			0.0195					
BF slope (ft/ft)																							
Bankfull Floodplain Area (acres)																							
% of Reach with Eroding Banks																							
Channel Stability or Habitat Metric																							
Biological or Other																							

Table 12a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Major Hill Mitigation Project - NCDMS Project Number 100015

Parameter	Cross Section 1 (UT 1 Downstream) Riffle							Cross Section 2 (UT 1 Downstream) Riffle							Cross Section 3 (UT 1 Downstream) Pool							Cross Section 4 (UT 1 Downstream) Riffle						
Dimension	MY0	MY1	MY2	MY3	MY5	MY7	MY7+	MY0	MY1	MY2	MY3	MY5	MY7	MY7+	MY0	MY1	MY2	MY3	MY5	MY7	MY7+	MY0	MY1	MY2	MY3	MY5	MY7	MY7+
BF Width (ft)	11.8	11.2	12.6	12.7	14.1			8.6	7.4	7.8	7.7	9.3			13.0	12.5	13.1	12.6	12.5			10.3	10.4	12.8	10.8	12.7		
Floodprone Width (ft) (approx)	40.0	40.0	40.0	40.0	40.0			22.0	22.0	22.0	22.0	22.0			NA	NA	NA	NA	NA			40.0	40.0	40.0	40.0	40.0		
BF Mean Depth (ft)	0.6	0.7	0.6	0.6	0.5			0.4	0.5	0.4	0.4	0.4			0.6	0.7	0.6	0.7	0.7			0.6	0.6	0.5	0.5	0.5		
BF Max Depth (ft)	1.2	1.2	1.2	1.2	1.3			0.7	0.7	0.7	0.7	0.8			1.7	1.6	1.6	1.7	1.7			0.9	1.1	1.1	1.1	1.1		
Low Bank Height	1.2	1.3	1.2	1.3	1.3			0.7	0.8	0.7	0.7	0.7			1.7	1.7	1.7	1.3	1.6			0.9	1.1	1.1	1.1	1.1		
BF Cross Sectional Area (ft^2)	7.5	7.5	7.5	7.5	7.5			3.5	3.5	3.5	3.5	3.5			8.4	8.4	8.4	8.4	8.4			5.8	5.8	5.8	5.8	5.8		
Width/Depth Ratio	18.6	16.7	21.2	21.2	26.5			21.1	15.6	17.4	17.1	24.6			NA	NA	NA	NA	NA			18.3	18.6	28.2	21.6	28.0		
Entrenchment Ratio	3.4	3.6	3.2	3.1	2.8			2.6	3.0	2.8	2.9	2.4			NA	NA	NA	NA	NA			3.9	3.8	3.1	3.7	3.1		
Bank Height Ratio*	1.0	1.08	1.0	1.08	1.0			1.0	1.14	1.0	1.0	1.0			1.0	1.06	1.06	<1	1.0			1.0	1.0	1.0	1.0	1.0		
d50 (mm)	25.4	33.0	4.9	3.7	--			25.4	33.0	4.9	3.7	--			25.4	33.0	4.9	3.7	--			25.4	33.0	4.9	3.7	--		

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 12b. Monitoring Data - Stream Reach Data Summary
Major Hill Mitigation Project - NCDMS Project Number 100015

Parameter	Baseline (UT 1 Downstream)						MY-1 (UT 1 Downstream)						MY-2 (UT 1 Downstream)						MY-3 (UT 1 Downstream)						MY-5 (UT 1 Downstream)						MY-7 (UT 1 Downstream)					
Dimension and Substrate - Riffle Only	**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**
BF Width (ft)	8.6		10.3	11.8		3	7.4		10.4	11.2		3	7.8		12.6	12.8		3	7.7		10.8	12.7			9.3		12.7	14.1								
Floodprone Width (ft)	22		40	40		3	22		40	40		3	22		40	40		3	22		40	40			22		40	40								
BF Mean Depth (ft)	0.4		0.6	0.6		3	0.5		0.6	0.7		3	0.4		0.5	0.6		3	0.4		0.5	0.6			0.4		0.5	0.5								
BF Max Depth (ft)	0.7		0.9	1.2		3	0.7		1.1	1.2		3	0.7		1.1	1.2		3	0.7		1.1	1.2			0.8		1.1	1.3								
BF Cross Sectional Area (ft^2)	3.5		5.8	7.5		3	3.5		5.8	7.5		3	3.5		5.8	7.5		3	3.5		5.8	7.5			3.5		5.8	7.5								
Width/Depth Ratio	18.0		18.0	21.0		3	15.6		16.7	18.6		3	17.4		21.2	28.2		3	19.3		20.1	21.5			24.6		26.5	28.0								
Entrenchment Ratio	2.6		3.4	3.9		3	3.0		3.6	3.8		3	2.8		3.1	3.2		3	2.9		3.1	3.7			2.4		2.8	3.1								
Bank Height Ratio	1.0		1.0	1.0		3	1.0		1.1	1.1		3	1.0		1.0	1.0		3	1.0		1.0	1.0			1.0		1.0	1.0								
Profile																																				
Riffle length (ft)	5		16	47		1																														
Riffle slope (ft/ft)	0.0000		0.0252	0.0539		1																														
Pool length (ft)	4.0		13.0	28.0		1																														
Pool Max depth (ft)	1.7		1.7	1.7		1																														
Pool spacing (ft)	18.0		24.0	48.0		1																														
Pattern																																				
Channel Beltwidth (ft)	22		29	44																																
Radius of Curvature (ft)	14		22	73																																
Rc:Bankfull width (ft/ft)	2		3	10																																
Meander Wavelength (ft)	44		62	88																																
Meander Width ratio	3		4	6																																

Profile surveys during the stream monitoring period are not required, unless evidence of bed and/or bank instability is observed and the data is requested by the IRT.

Additional Reach Parameters

Rosgen Classification	E/C type																																			
Channel Thalweg Length (ft)																																				
Sinuosity	1.12																																			
Water Surface Slope (Channel) (ft/ft)	0.0195																																			
BF slope (ft/ft)																																				
Ri%/RU%P%G%/S%																																				
SC%/SA%/G%/C%/B%BE%																																				
d16/d35/d50/d84/d95																																				
% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Table 12c. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections)
Major Hill Mitigation Project - NCDMS Project Number 100015

Parameter	Cross Section 5 (UT 1 Upstream)							Cross Section 6 (UT 1 Upstream)							Cross Section 7 (UT 1 Upstream)							Cross Section 8 (UT 1 Upstream)						
	Riffle							Pool							Pool							Riffle						
Dimension	MY0	MY1	MY2	MY3	MY5	MY7	MY7+	MY0	MY1	MY2	MY3	MY5	MY7	MY7+	MY0	MY1	MY2	MY3	MY5	MY7	MY7+	MY0	MY1	MY2	MY3	MY5	MY7	MY7+
BF Width (ft)	11.8	11.8	12.3	12.7	12.7			8.9	9.9	10.0	10.5	9.5			7.4	9.5	6.9	7.2	10.1			6.0	5.7	6.5	6.5	6.5		
Floodprone Width (ft) (approx)	40.0	40.0	40.0	40.0	40.0			NA	NA	NA	NA	NA			NA	NA	NA	NA	NA			23.0	23.0	23.0	23.0	23.0		
BF Mean Depth (ft)	0.6	0.6	0.6	0.6	0.6			1.0	0.9	0.9	0.9	1.0			1.6	1.2	1.7	1.6	1.2			0.5	0.5	0.5	0.5	0.5		
BF Max Depth (ft)	1.1	1.2	1.1	1.2	1.2			2.0	2.1	2.0	2.2	2.0			2.5	2.4	2.0	2.4	2.2			0.8	0.9	0.9	0.9	1.0		
Low Bank Height	1.1	1.2	1.1	1.1	1.3			2.0	2.2	2.2	2.4	1.9			2.5	2.5	2.2	2.6	2.2			0.8	0.9	1.0	0.8	0.9		
BF Cross Sectional Area (ft^2)	7.1	7.1	7.1	7.1	7.1			9.1	9.1	9.1	9.1	9.1			11.7	11.7	11.7	11.7	11.7			3.0	3.0	3.0	3.0	3.0		
Width/Depth Ratio	19.6	19.6	21.3	21.2	23.0			NA	NA	NA	NA	NA			NA	NA	NA	NA	NA			12.0	10.8	14.1	13.0	14.3		
Entrenchment Ratio	3.4	3.4	3.3	3.1	3.1			NA	NA	NA	NA	NA			NA	NA	NA	NA	NA			3.8	4.0	3.5	3.5	3.5		
Bank Height Ratio*	1.0	1.0	1.0	<1	1.08			1.0	1.0	1.10	1.09	1.0			1.0	1.0	1.10	1.08	1.0			1.0	1.0	1.11	<1	<1		
d50 (mm)	25.4	33.0	4.9	3.7	--			25.4	33.0	4.9	3.7	--			25.4	33.0	4.9	3.7	--			25.4	33.0	4.9	3.7	--		

Parameter	Cross Section 9 (UT 1 Upstream)							Cross Section 10 (UT 1 Upstream)						
	Pool							Riffle						
Dimension	MY0	MY1	MY2	MY3	MY5	MY7	MY7+	MY0	MY1	MY2	MY3	MY5	MY7	MY7+
BF Width (ft)	7.0	9.4	8.0	11.8	11.5			10.9	11.2	13.3	9.4	12.4		
Floodprone Width (ft) (approx)	NA	NA	NA	NA	NA			40.0	40.0	40.0	40.0	40.0		
BF Mean Depth (ft)	0.7	0.5	0.6	0.4	0.4			0.3	0.3	0.3	0.4	0.3		
BF Max Depth (ft)	1.3	1.2	1.3	1.2	1.2			0.7	0.6	0.6	0.6	0.6		
Low Bank Height	1.3	1.3	1.3	1.3	1.3			0.7	0.6	0.6	0.5	0.7		
BF Cross Sectional Area (ft^2)	4.9	4.9	4.9	4.9	4.9			3.5	3.5	3.5	3.5	3.5		
Width/Depth Ratio	NA	NA	NA	NA	NA			33.9	35.8	50.5	23.5	44.0		
Entrenchment Ratio	NA	NA	NA	NA	NA			3.7	3.6	3.0	4.3	3.2		
Bank Height Ratio*	1.0	1.08	1.0	1.08	1.06			1.0	1.0	1.0	<1	1.07		
d50 (mm)	25.4	33.0	4.9	3.7	--			25.4	33.0	4.9	3.7	--		

*Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioners in NC (9/2018).

Table 12d. Monitoring Data - Stream Reach Data Summary
Major Hill Mitigation Project - NCDMS Project Number 100015

Parameter	Baseline (UT 1 Upstream)						MY-1 (UT 1 Upstream)						MY-2 (UT 1 Upstream)						MY-3 (UT 1 Upstream)						MY-5 (UT 1 Upstream)						MY-7 (UT 1 Upstream)					
Dimension and Substrate - Riffle Only	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
BF Width (ft)	6.0		10.9	11.8		3	5.7		11.2	11.8		3	6.5		12.3	13.3		3	6.5		9.4	12.7		3	6.5		12.4	12.7								
Floodprone Width (ft)	23		40	40		3	23		40	40		3	23		40	40		3	23		40	40		3	23		40	40								
BF Mean Depth (ft)	0.3		0.5	0.6		3	0.3		0.5	0.6		3	0.3		0.5	0.6		3	0.4		0.5	0.6		3	0.3		0.5	0.6								
BF Max Depth (ft)	0.7		0.8	1.1		3	0.6		0.9	1.2		3	0.6		0.9	1.1		3	0.6		0.9	1.1		3	0.6		1.0	1.2								
BF Cross Sectional Area (ft^2)	3.0		3.5	7.1		3	3.0		3.5	7.1		3	3.0		3.5	7.1		3	3.0		3.5	7.1		3	3.0		3.5	7.1								
Width/Depth Ratio	12.0		19.6	33.9		3	10.8		19.6	35.8		3	14.1		21.3	50.5		3	14.1		22.7	25.2		3	14.3		23.0	44.0								
Entrenchment Ratio	3.4		3.7	3.8		3	3.4		3.6	4.0		3	3.0		3.3	3.5		3	3.1		3.5	4.3		3	3.1		3.2	3.5								
Bank Height Ratio	1.0		1.0	1.3		3	1.0		1.0	1.0		3	1.0		1.0	1.1		3	0.8		1.1	1.3		3	0.8		0.8	0.9								
Profile																																				
Riffle length (ft)	5		16	47		3																														
Riffle slope (ft/ft)	0.0000		0.0252	0.0539		3																														
Pool length (ft)	4.0		13.0	28.0		3																														
Pool Max depth (ft)	1.3		2.0	2.5		3																														
Pool spacing (ft)	18.0		24.0	48.0		3																														
Pattern																																				
Channel Beltwidth (ft)	18		24	36																																
Radius of Curvature (ft)	12		18	60																																
Rc:Bankfull width (ft/ft)	2		3	10																																
Meander Wavelength (ft)	36		51	72																																
Meander Width ratio	3		4	6																																
							Profile surveys during the stream monitoring period are not required, unless evidence of bed and/or bank instability is observed and the data is requested by the IRT.																																	
Additional Reach Parameters																																				
Rosgen Classification	E/C type																																			
Channel Thalweg Length (ft)																																				
Sinuosity	1.08																																			
Water Surface Slope (Channel) (ft/ft)	0.0195																																			
BF slope (ft/ft)																																				
Ri%/RU%P%G%/S%																																				
SC%/SA%/G%/C%/B%BE%																																				
d16/d35/d50/d84/d95																																				
% of Reach with Eroding Banks																																				
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Table 13. Major Hill Water Quality Data – Major Hill Restoration Site

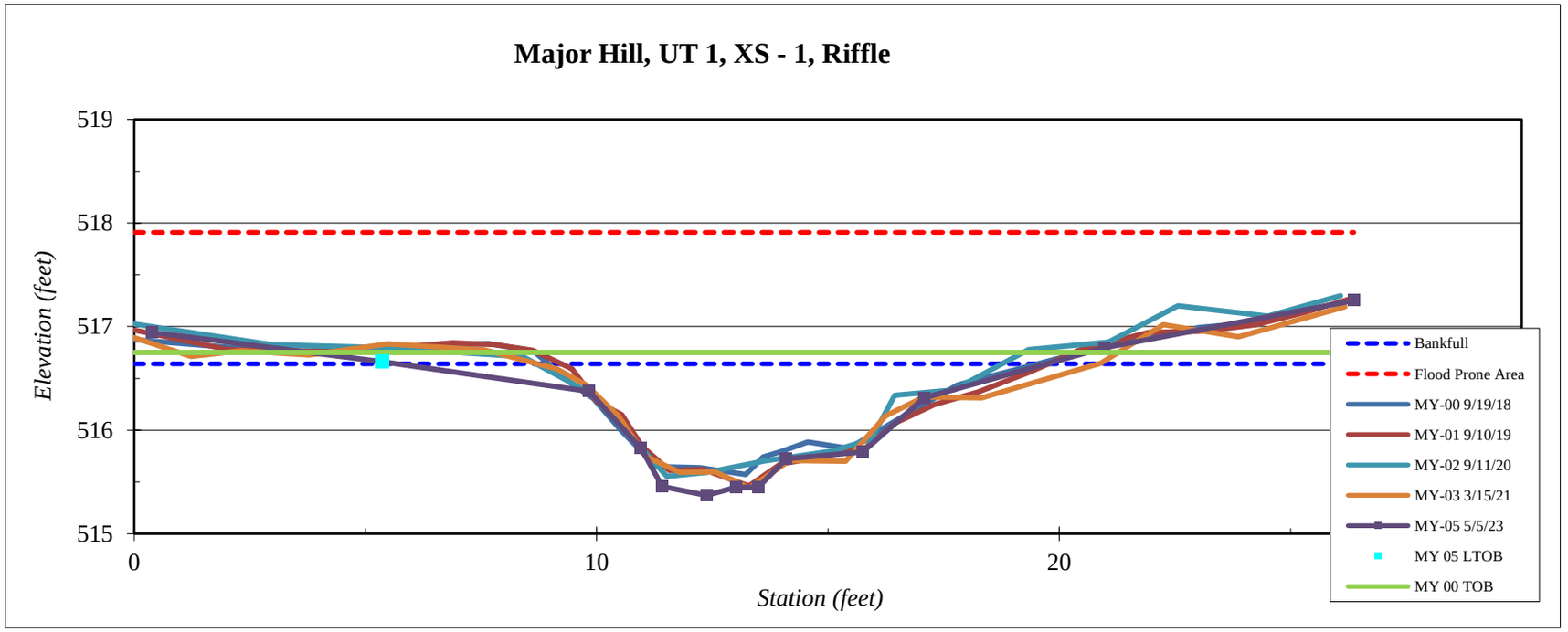
	Preconstruction				Year 1 (2019)		Year 2 (2020)		Year 3 (2021)		Year 4 (2022)		Year 5 (2023)	
	Upstream		Downstream		Upstream	Down-stream	Upstream	Down-stream	Upstream	Down-stream	Upstream	Down-stream	Upstream	Down-stream
Parameter	**July 28, 2017**	**August 14, 2017**	**July 28, 2017**	**August 14, 2017**	**November 20, 2019**	**November 20, 2019**	**October 28, 2020**	**October 28, 2020**	**May 19, 2021**	**May 19 2021**	**November 8, 2022**	**November 8, 2022**	**June 29, 2023**	**June 29, 2023**
TDS (ppm)	110.1	147	62.6	86.8	394	179	164.0	122.3	94.7	113.6	115.1	133.4	61.2	54.4
TDS (mg/l)	109.1	149	64.6	83.5	397	179	168.3	131.3	98.2	120.1	95.2	117.0	85.6	81.2
Conductivity (µS/cm)	159.2	215	92.1	128.3	557	252	242.1	186.9	135.4	162.3	151.3	107.6	120.4	107.1
Temperature (°C)	25.4	22.6	24.6	22.1	8	6.9	19.6	19.7	22.9	15.5	8.3	7.2	25.2	19.9
DO (mg/l)	-	1.93	-	3.06	-	-	5.36	7.64	5.68	7.16	6.36	7.31	4.23	6.55
DO (ppm)	-	1.06	-	2.53	-	-	5.42	7.72	5.71	7.25	6.16	7.13	4.10	6.26
pH	6.61	6.37	6.65	6.22	7	6.58	6.96	6.94	7.22	7.09	6.96	7.12	6.90	6.75

Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 1, Riffle
Feature	Riffle
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
0.4	516.94
5.4	516.66
9.8	516.38
11.0	515.82
11.4	515.46
12.4	515.37
13.0	515.45
13.5	515.45
14.1	515.72
15.7	515.79
17.1	516.31
21.0	516.79
26.4	517.25

SUMMARY DATA	
Bankfull Elevation:	516.6
LTOB Elevation:	516.7
Bankfull Cross-Sectional Area:	7.5
Bankfull Width:	14.1
Flood Prone Area Elevation:	517.9
Flood Prone Width:	40.0
Max Depth at Bankfull:	1.3
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.5
W / D Ratio:	26.5
Entrenchment Ratio:	2.8
Bank Height Ratio:	1.0

Stream Type	C/E

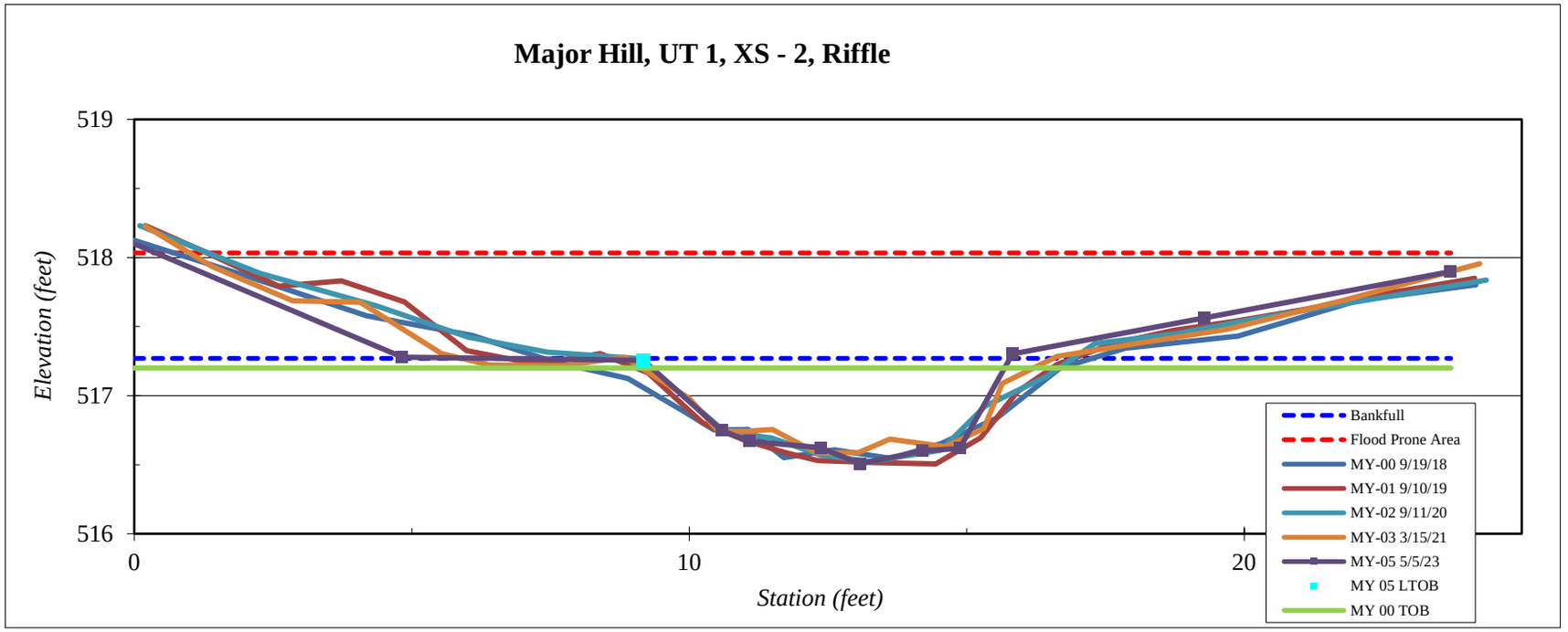


Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 2, Riffle
Feature	Riffle
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
-0.3	518.15
4.8	517.28
9.2	517.26
10.6	516.75
11.1	516.67
12.4	516.62
13.1	516.51
14.2	516.60
14.9	516.62
15.8	517.30
19.3	517.56
23.7	517.90

SUMMARY DATA	
Bankfull Elevation:	517.3
LTOB Elevation:	517.3
Bankfull Cross-Sectional Area:	3.5
Bankfull Width:	9.3
Flood Prone Area Elevation:	518.0
Flood Prone Width:	22.0
Max Depth at Bankfull:	0.8
Low Bank Height:	0.7
Mean Depth at Bankfull:	0.4
W / D Ratio:	24.6
Entrenchment Ratio:	2.4
Bank Height Ratio:	1.0

Stream Type	C/E

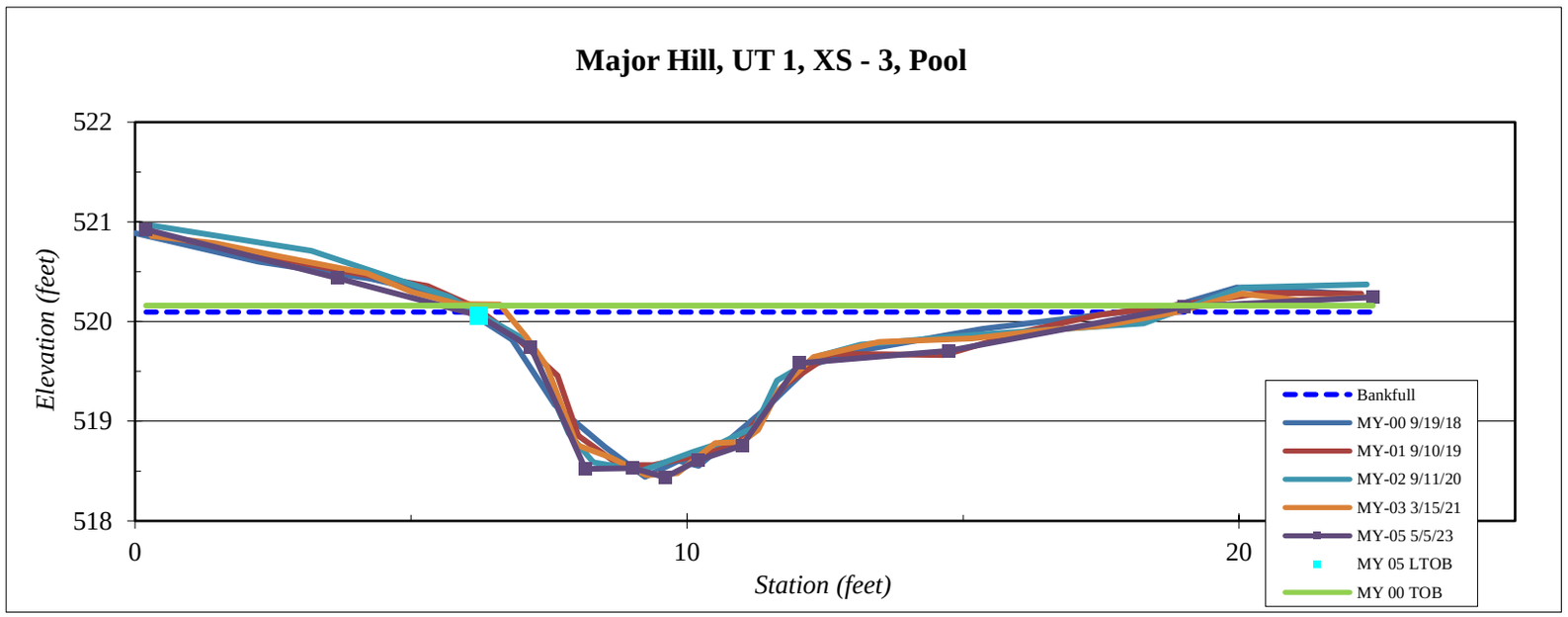


Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 3, Pool
Feature	Pool
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
0.2	520.9
3.7	520.4
6.2	520.1
7.2	519.7
8.2	518.5
9.0	518.5
9.6	518.4
10.2	518.6
11.0	518.8
12.0	519.6
14.7	519.7
19.0	520.1
22.4	520.2

SUMMARY DATA	
Bankfull Elevation:	520.1
LTOB Elevation:	520.1
Bankfull Cross-Sectional Area:	8.4
Bankfull Width:	12.5
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.7
Low Bank Height:	1.6
Mean Depth at Bankfull:	0.7
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.0

Stream Type	C/E

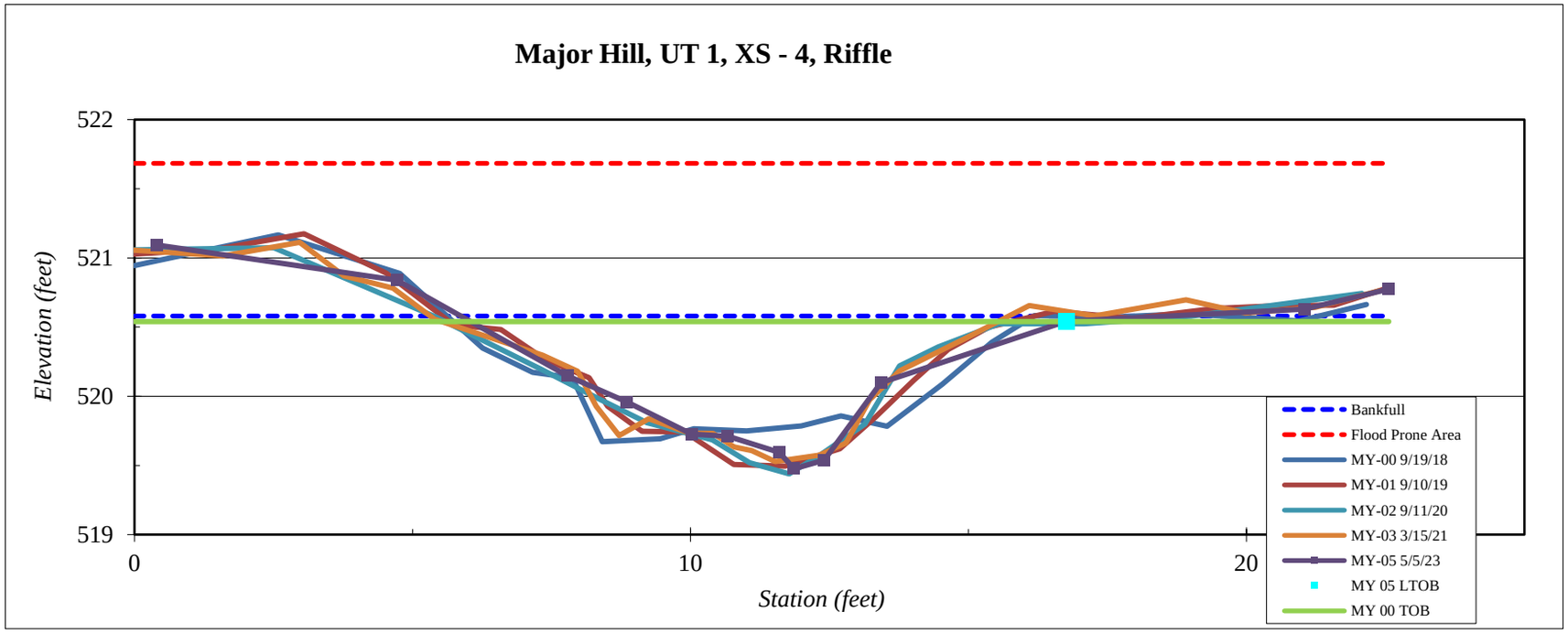


Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 4, Riffle
Feature	Riffle
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
0.4	521.09
4.7	520.84
7.8	520.15
8.9	519.96
10.0	519.73
10.7	519.71
11.6	519.59
11.9	519.48
12.4	519.54
13.4	520.10
16.8	520.54
21.0	520.63
22.6	520.78

SUMMARY DATA	
Bankfull Elevation:	520.6
LTOB Elevation:	520.5
Bankfull Cross-Sectional Area:	5.8
Bankfull Width:	12.7
Flood Prone Area Elevation:	521.7
Flood Prone Width:	40.0
Max Depth at Bankfull:	1.1
Low Bank Height:	1.1
Mean Depth at Bankfull:	0.5
W / D Ratio:	28.0
Entrenchment Ratio:	3.1
Bank Height Ratio:	1.0

Stream Type	C/E

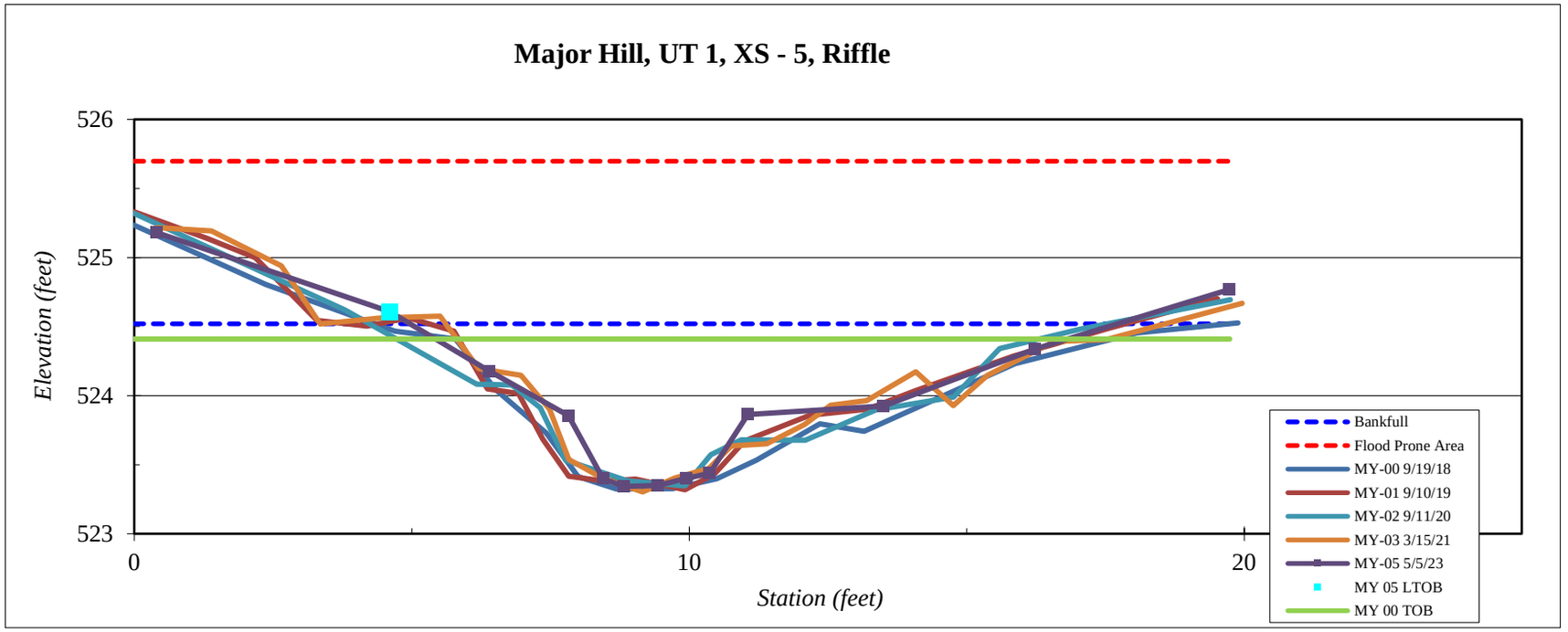


Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 5, Riffle
Feature	Riffle
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
0.4	525.18
4.6	524.61
6.4	524.18
7.8	523.85
8.4	523.40
8.8	523.34
9.4	523.35
9.9	523.40
10.4	523.44
11.1	523.86
13.5	523.92
16.2	524.34
19.7	524.77

SUMMARY DATA	
Bankfull Elevation:	524.5
LTOB Elevation:	524.6
Bankfull Cross-Sectional Area:	7.1
Bankfull Width:	12.7
Flood Prone Area Elevation:	525.7
Flood Prone Width:	40.0
Max Depth at Bankfull:	1.2
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.6
W / D Ratio:	23.0
Entrenchment Ratio:	3.1
Bank Height Ratio:	1.08

Stream Type	C/E

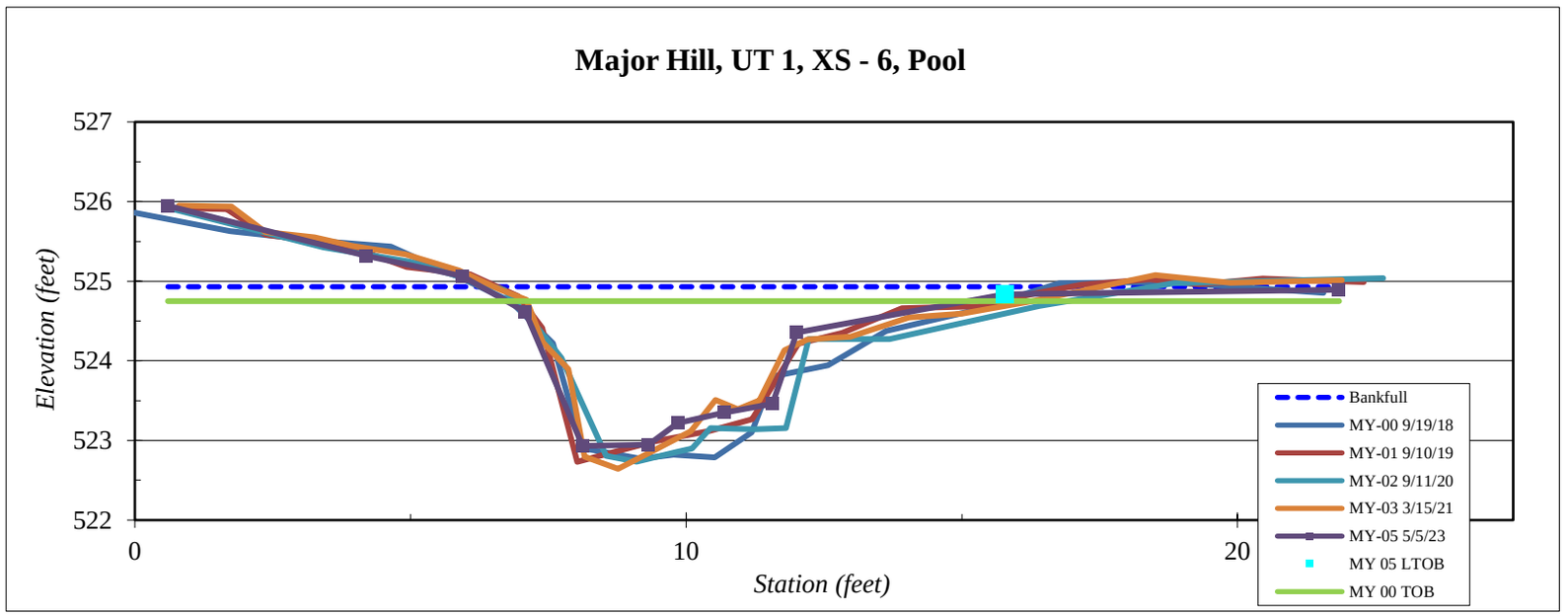


Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 6, Pool
Feature	Pool
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
0.6	525.9
4.2	525.3
5.9	525.1
7.1	524.6
8.1	522.9
9.3	522.9
9.8	523.2
10.7	523.3
11.6	523.5
12.0	524.4
15.8	524.8
21.8	524.9

SUMMARY DATA	
Bankfull Elevation:	524.9
LTOB Elevation:	524.8
Bankfull Cross-Sectional Area:	9.1
Bankfull Width:	9.5
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.0
Low Bank Height:	1.9
Mean Depth at Bankfull:	1.0
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.0

Stream Type	C/E

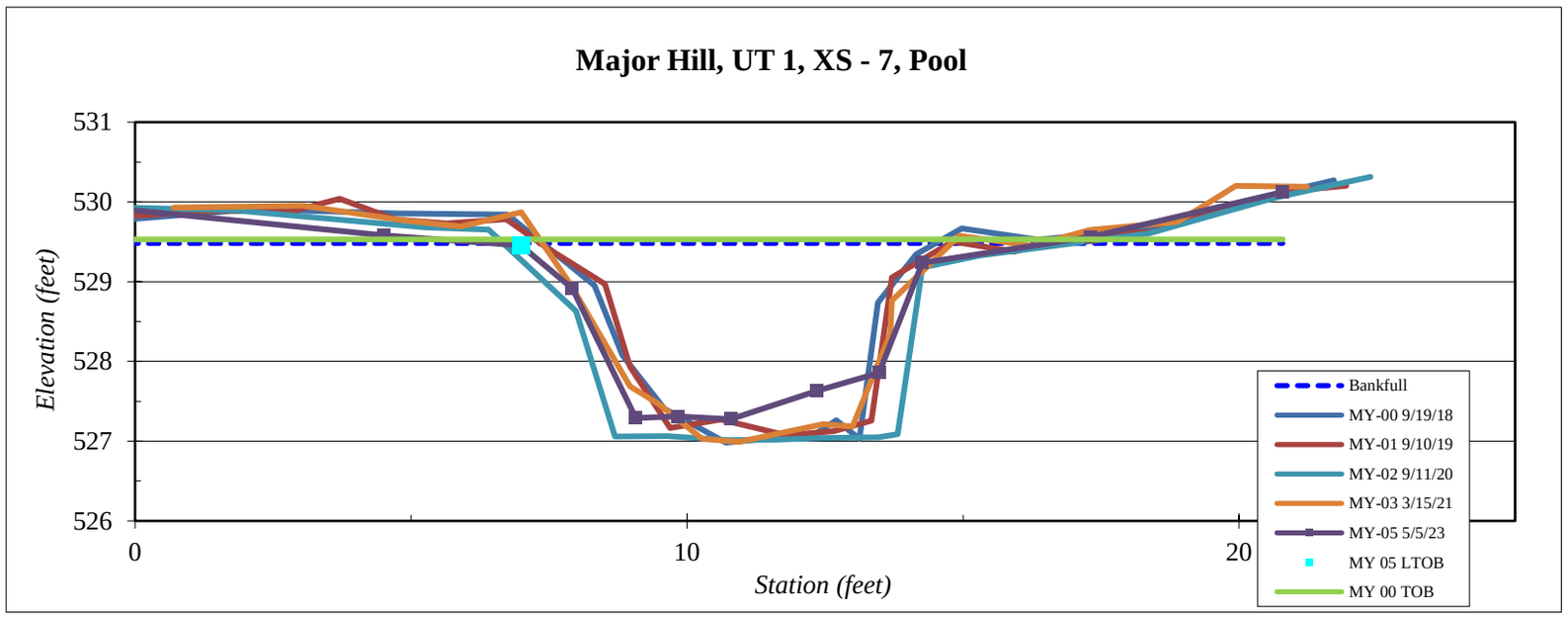


Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 7, Pool
Feature	Pool
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
-0.5	529.9
4.5	529.6
7.0	529.5
7.9	528.9
9.1	527.3
9.8	527.3
10.8	527.3
12.3	527.6
13.5	527.9
14.3	529.2
17.3	529.6
20.8	530.1

SUMMARY DATA	
Bankfull Elevation:	529.5
LTOB Elevation:	529.5
Bankfull Cross-Sectional Area:	11.7
Bankfull Width:	10.1
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	2.2
Low Bank Height:	2.2
Mean Depth at Bankfull:	1.2
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.0

Stream Type	C/E



Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 8, Riffle
Feature	Riffle
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
0.3	530.21
4.3	529.98
8.3	529.56
9.9	529.07
10.4	528.69
10.9	528.69
11.5	528.67
12.4	529.18
15.1	529.85
21.1	530.37
22.7	530.32

SUMMARY DATA	
Bankfull Elevation:	529.6
LTOB Elevation:	529.6
Bankfull Cross-Sectional Area:	3.0
Bankfull Width:	6.5
Flood Prone Area Elevation:	530.6
Flood Prone Width:	23.0
Max Depth at Bankfull:	1.0
Low Bank Height:	0.9
Mean Depth at Bankfull:	0.5
W / D Ratio:	14.3
Entrenchment Ratio:	3.5
Bank Height Ratio:	0.93

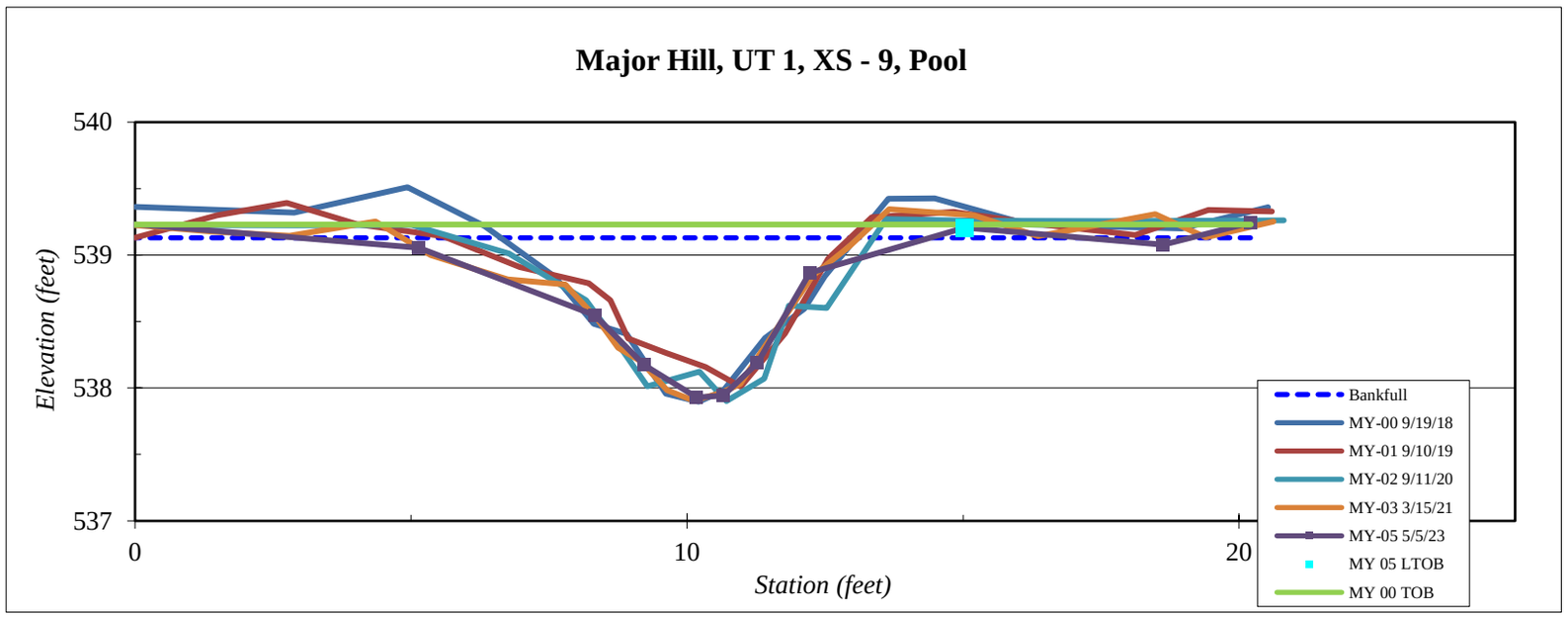
Stream Type	C/E

Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 9, Pool
Feature	Pool
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
-0.1	539.2
5.1	539.1
8.3	538.5
9.2	538.2
10.2	537.9
10.7	537.9
11.3	538.2
12.2	538.9
15.0	539.2
18.6	539.1
20.2	539.2

SUMMARY DATA	
Bankfull Elevation:	539.1
LTOB Elevation:	539.2
Bankfull Cross-Sectional Area:	4.9
Bankfull Width:	11.5
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.2
Low Bank Height:	1.3
Mean Depth at Bankfull:	0.4
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.06

Stream Type	C/E

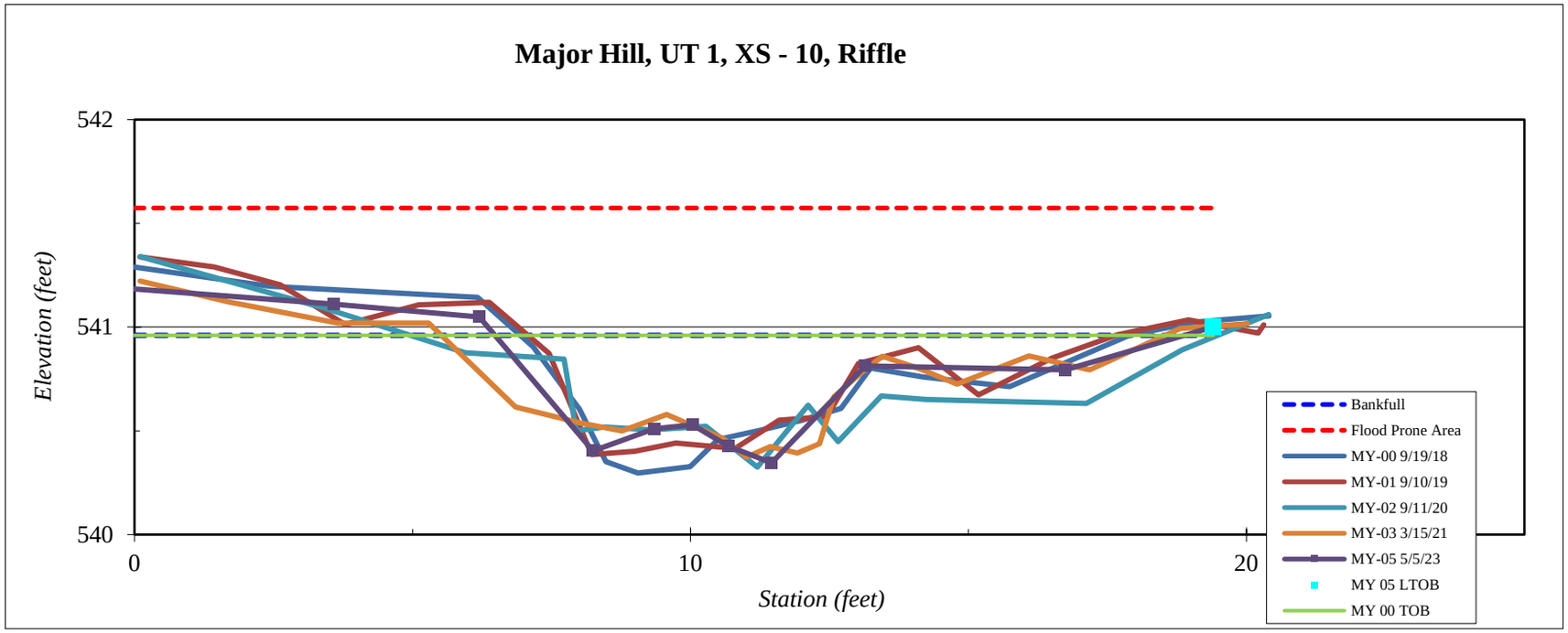


Site	Major Hill
Watershed:	Cape Fear, 0303002
XS ID	UT 1, XS - 10, Riffle
Feature	Riffle
Date:	5/16/2023
Field Crew:	Perkinson

Station	Elevation
-0.5	541.19
3.6	541.11
6.2	541.05
8.2	540.40
9.3	540.51
10.0	540.53
10.7	540.42
11.5	540.35
13.1	540.81
16.7	540.79
19.4	541.00

SUMMARY DATA	
Bankfull Elevation:	541.0
LTOB Elevation:	541.0
Bankfull Cross-Sectional Area:	3.5
Bankfull Width:	12.4
Flood Prone Area Elevation:	541.6
Flood Prone Width:	40.0
Max Depth at Bankfull:	0.6
Low Bank Height:	0.7
Mean Depth at Bankfull:	0.3
W / D Ratio:	44.0
Entrenchment Ratio:	3.2
Bank Height Ratio:	1.07

Stream Type	C/E



Appendix E.
Hydrology Data

Table 14A. UT1 Upstream Channel Evidence
Table 14B. UT1 Downstream Channel Evidence
Stream Gauge Graphs
Table 15. Verification of Bankfull Events
Table 16. Groundwater Hydrology Data
Soil Temperature Graph
Figure D1. 30-70 Percentile Graph for Rainfall
Groundwater Gauge Graphs

Table 14A. UT1 Upstream Channel Evidence – Major Hill Restoration Site

UT1 Upstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	99	158	136	149	233
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	Yes	Yes	Yes	Yes
Other:					

UT1 Upstream Channel Evidence (January 12, 2023)

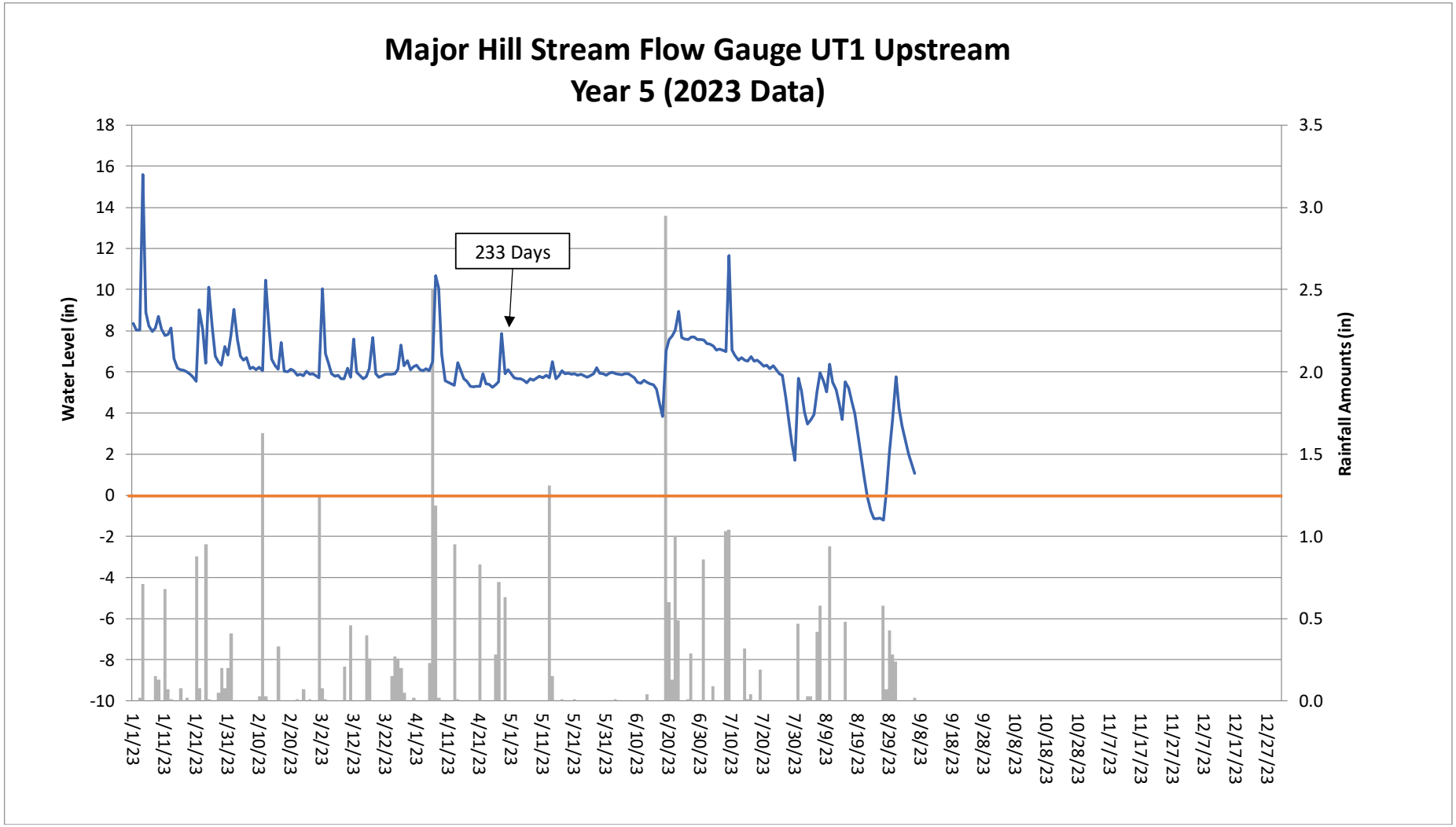

Major Hill Stream Flow Gauge UT1 Upstream
Year 5 (2023 Data)
Water Level (in)
Rainfall Amounts (in)
233 Days
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
10/18/23
10/28/23
11/7/23
11/17/23
11/27/23
12/7/23
12/17/23
12/27/23

Table 14B. UT1 Downstream Channel Evidence – Major Hill Restoration Site

UT1 Downstream Channel Evidence	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)
Max consecutive days channel flow	52	236	285	216	249
Presence of litter and debris (wracking)	Yes	Yes	Yes	Yes	Yes
Leaf litter disturbed or washed away	Yes	Yes	Yes	Yes	Yes
Matted, bent, or absence of vegetation (herbaceous or otherwise)	Yes	Yes	Yes	Yes	Yes
Sediment deposition and/or scour indicating sediment transport	Yes	Yes	Yes	Yes	Yes
Water staining due to continual presence of water	Yes	Yes	Yes	Yes	Yes
Formation of channel bed and banks	Yes	Yes	Yes	Yes	Yes
Sediment sorting within the primary path of flow	Yes	Yes	Yes	Yes	Yes
Sediment shelving or a natural line impressed on the banks	Yes	Yes	Yes	Yes	Yes
Change in plant community (absence or destruction of terrestrial vegetation and/or transition to species adapted for flow or inundation for a long duration, including hydrophytes)	Yes	Yes	Yes	Yes	Yes
Development of channel pattern (meander bends and/or channel braiding) at natural topographic breaks, woody debris piles, or plant root systems	Yes	Yes	Yes	Yes	Yes
Exposure of woody plant roots within the primary path of flow	No	Yes	Yes	Yes	Yes
Other:		Bankfull event documented.			

UT1 Downstream Channel Evidence (January 12, 2023)

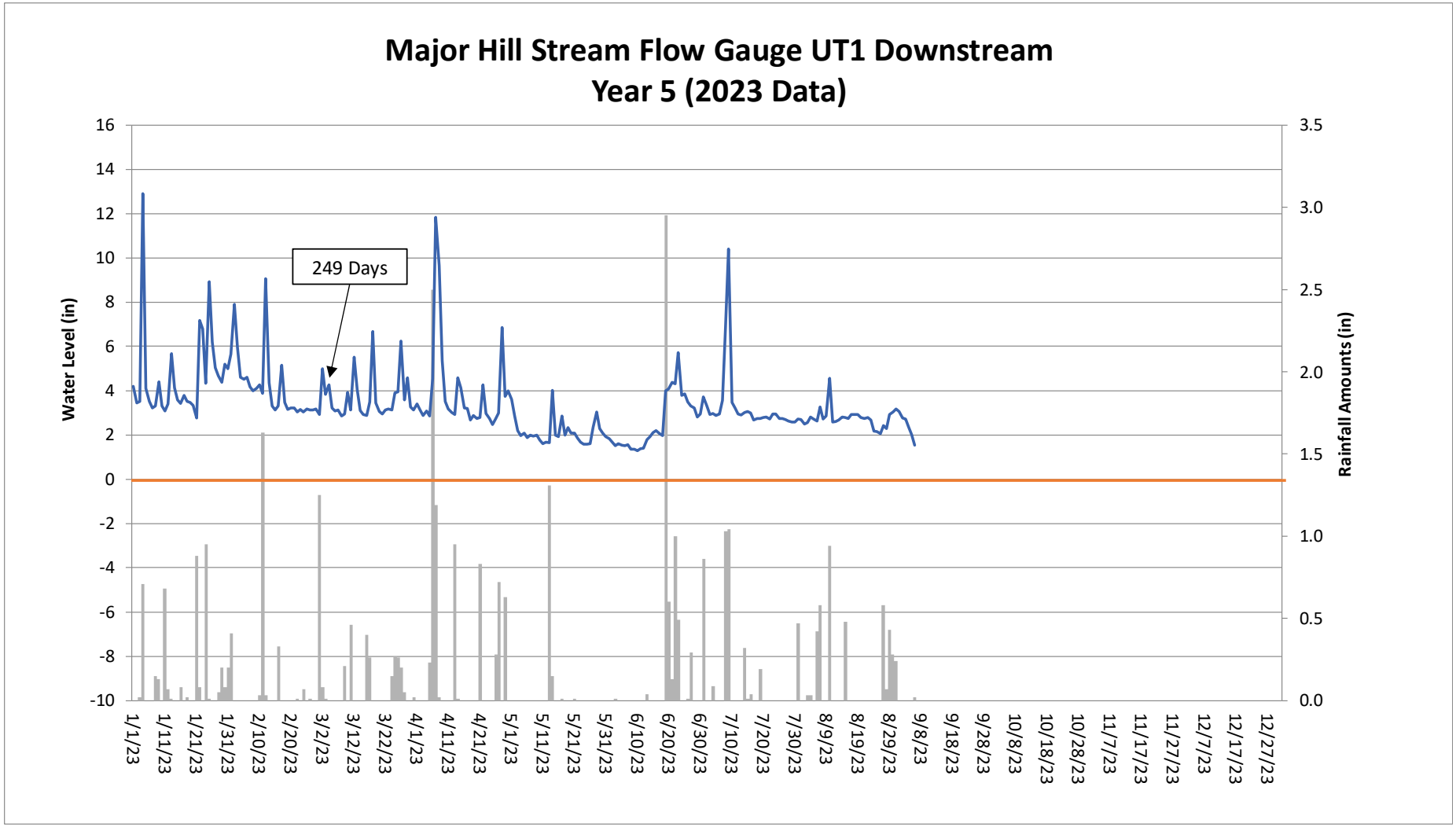

Major Hill Stream Flow Gauge UT1 Downstream
Year 5 (2023 Data)
Water Level (in)
Rainfall Amounts (in)
249 Days
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
10/18/23
10/28/23
11/7/23
11/17/23
11/27/23
12/7/23
12/17/23
12/27/23

Table 15. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
March 19, 2019	January 13, 2019	A trail camera captured the stream at bankfull after 1.10 inches of rain was documented on January 13, 2019 at an on-site rain gauge.	1
March 19, 2019	February 23, 2019	A trail camera captured the stream at bankfull after 2.74 inches of rain was documented between February 22-23, 2019 at an on-site rain gauge.	2
June 27, 2019	April 13, 2019	Stream gauge data indicates a bankfull event occurred after 4.11 inches of rain was documented between April 12-13, 2019 at an on-site rain gauge.	--
September 9, 2019	July 24, 2019	A bankfull event likely occurred after 3.02 inches of rain was documented between July 23-24, 2019 at an on-site rain gauge.	--
September 9, 2019	August 1, 2019	A bankfull event likely occurred after 1.96 inches of rain was documented on August 1, 2019 at an on-site rain gauge.	--
April 13, 2020	April 13, 2020	A bankfull event was documented via trail camera after approximately 2.31 inches of rain was recorded at an on-site rain gauge	3
January 31, 2021	January 31, 2021	A bankfull event was documented via trail camera after approximately 1.19 inches of rain was recorded at an on-site rain gauge	4
March 11, 2021	February 15, 2021	Wrack and laid-back vegetation were observed along the top of bank and floodplain of UT-1 indicating a bankfull event occurred after 2.93 inches of rain was documented between February 11 and 15, 2021.	5
March 16, 2022	March 16, 2022	A trail camera captured the stream at bankfull after 1.47 inches of rain was documented on March 16, 2022 at an on-site rain gauge.	6
August 2, 2022	July 27, 2022	Wrack piles were observed along the top of bank and floodplain of UT-1 indicating a bankfull event occurred after 1.73 inches of rain was documented on July 27, 2022.	7
February 12, 2023	February 12, 2023	A bankfull event was documented via trail camera after approximately 1.63 inches of rain was recorded at an on-site rain gauge.	8
April 7, 2023	April 7, 2023	A bankfull event was documented via trail camera after approximately 1.19 inches of rain was recorded at an on-site rain gauge.	9
June 19, 2023	June 19, 2023	A bankfull event was documented via trail camera after approximately 2.95 inches of rain was recorded at an on-site rain gauge.	10


Photo 1
29.82inHg 39°F 02/23/2019 02:35PM MH DS


Photo 2
29.79inHg -47155°F 01/13/2019 07:15AM MH DS


Photo 3
29.23 inHg 64°F 04/13/2020 07:31AM MH DS


Photo 4
29.67 inHg -47155°F 01/31/2021 10:00AM MH DS


Photo 5


Photo 6
29.67inHg
59°F
03/16/2022 06:05PM MH UT1


Photo 7


Photo 8
39 F
MAJ HILL
02/12/2023 09:11AM


Photo 9
46 F
MAJ HILL
04/07/2023 03:09PM


Photo 10
69 F
MAJ HILL
06/19/2023 04:08PM

Table 16. Groundwater Hydrology Data – Major Hill Restoration Site

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)
1	No/14 days* 6.0 percent	Yes/136 days 57.9 percent	Yes/74 days 31.4 percent	Yes/93 days 39.4 percent	Yes/95 days 40.3 percent		
2	No/19 days* 8.1 percent	No/19 days 8.0 percent	No/21 days 8.9 percent	Yes/44 days 18.6 percent	Yes/50 days 21.3 percent		
3	Yes/25 days 10.6 percent	Yes/235 days 100 percent	Yes/226 days 95.8 percent	Yes/204 days 86.4 percent	Yes/190 days 80.9 percent		
4	Yes/34 days 14.5 percent	Yes/72 days 30.5 percent	Yes/60 days 25.4 percent	Yes/155 days 65.7 percent	Yes/85 days 36.2 percent		
5	Yes/119 days 50.6 percent	Yes/135 days 57.4 percent	Yes/53 days 22.5 percent	Yes/77 days 32.6 percent	Yes/51 days 21.7 percent		
6	Yes/77 days 32.8 percent	Yes/44 days 18.7 percent	Yes/80 days 33.9 percent	Yes/81 days 34.3 percent	Yes/100 days 42.6 percent		

* These gauges did not meet success criteria due to a data shuttle failure that resulted in the loss of data. Based on rainfall and hydrology data that was not lost, all gauges would have likely met success criteria had the loss of data not occurred.

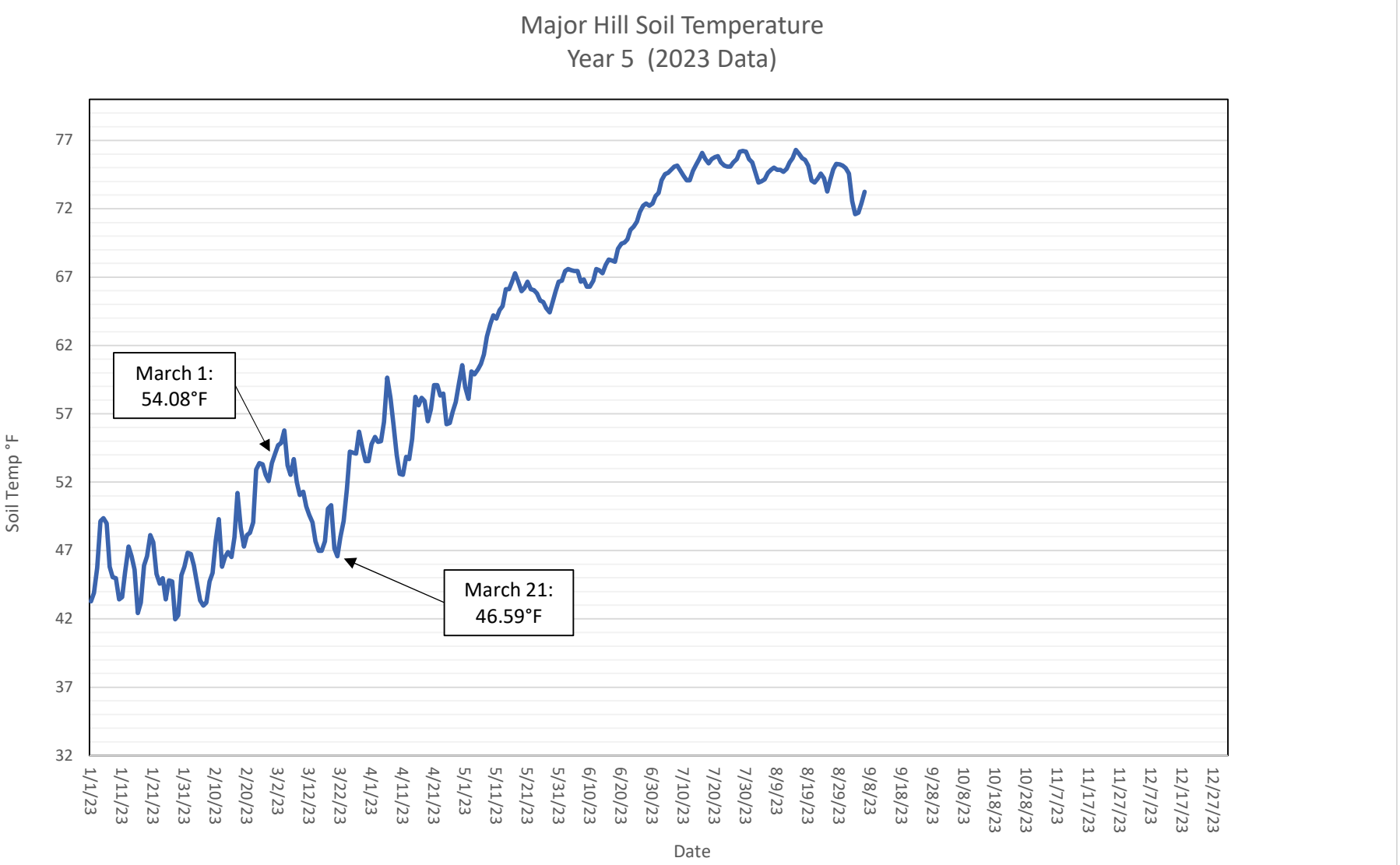
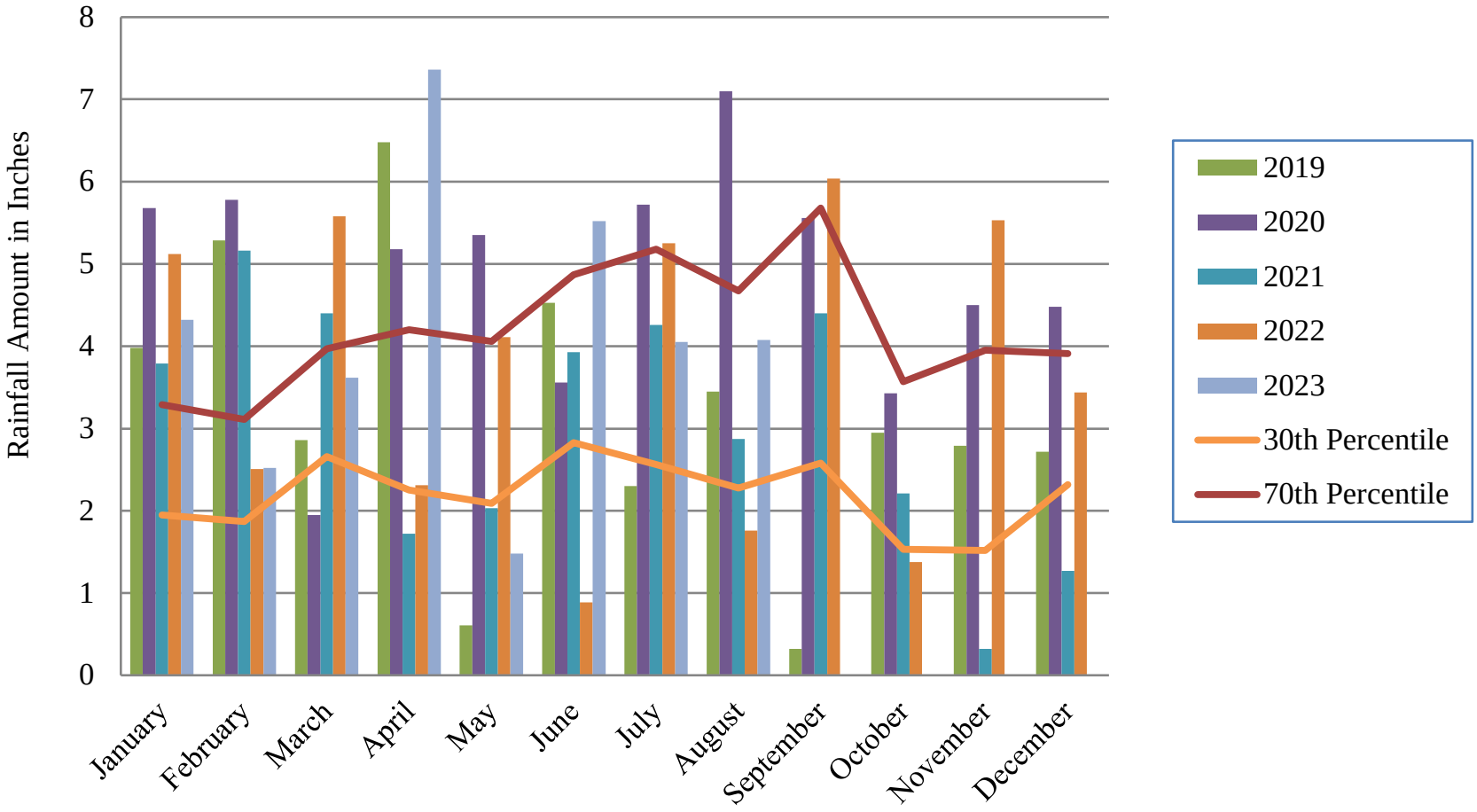
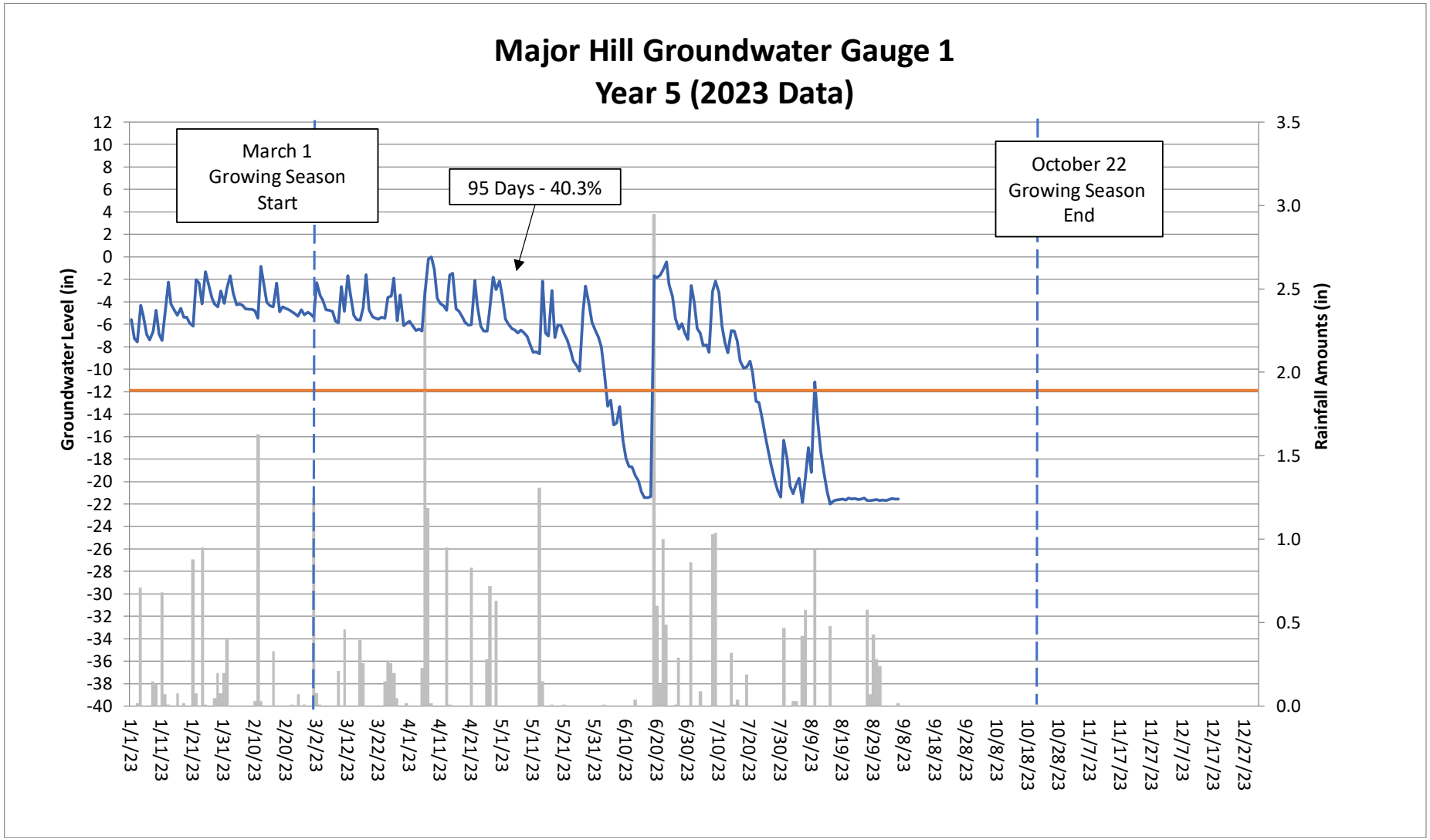

Major Hill Soil Temperature
Year 5 (2023 Data)
Soil Temp °F
77
72
67
62
57
52
47
42
37
32
March 1:
54.08°F
March 21:
46.59°F
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
10/18/23
10/28/23
11/7/23
11/17/23
11/27/23
12/7/23
12/17/23
12/27/23
Date

Figure D1: Major Hill
30-70 Percentile Graph for Rainfall

Current year data from onsite rain gauge

30-70th percentile data from WETS Station: Burlington Alamance Regional Airport, NC




Major Hill Groundwater Gauge 1
Year 5 (2023 Data)
March 1
Growing Season
Start
95 Days - 40.3%
October 22
Growing Season
End
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
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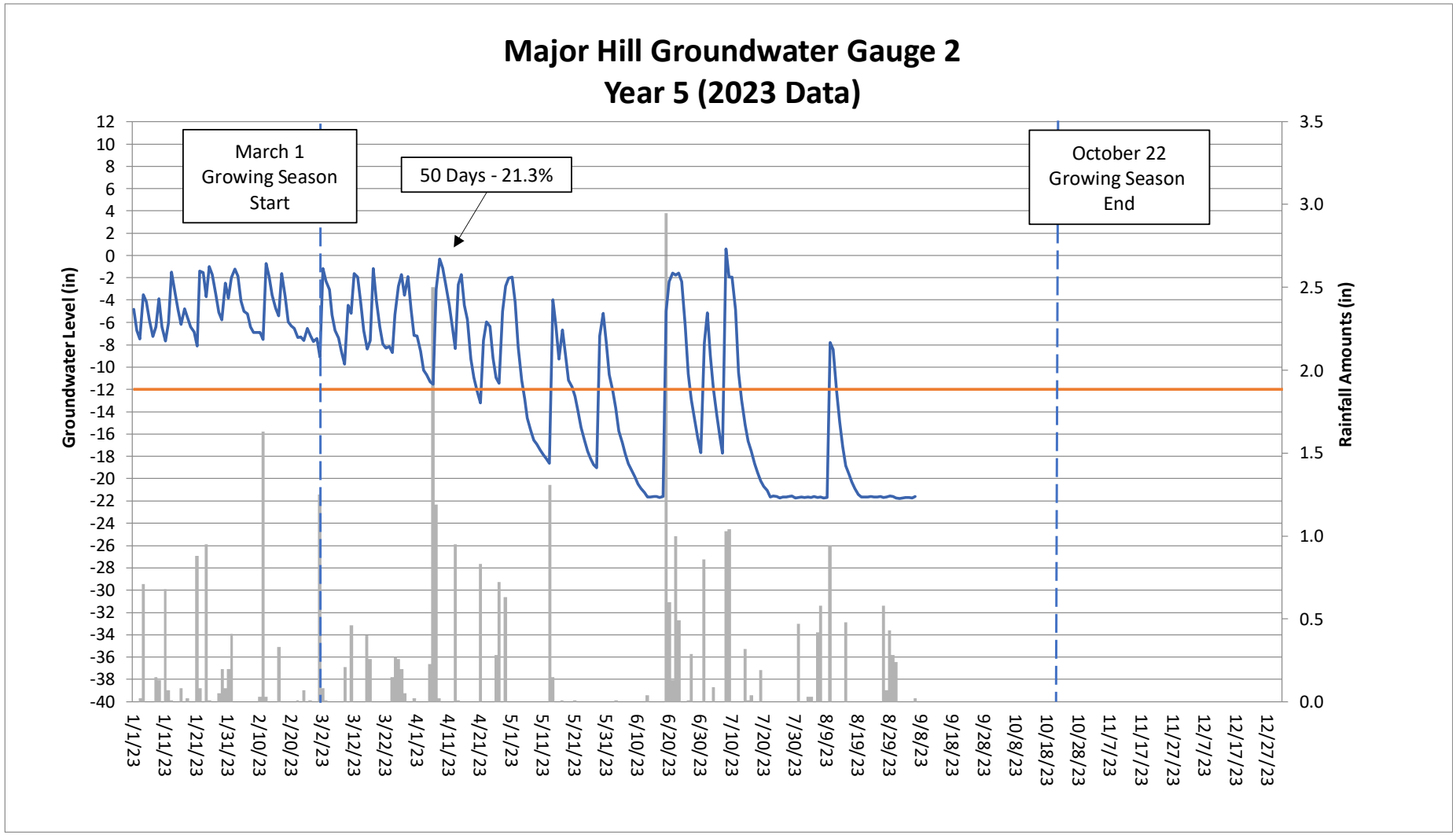
12/17/23
12/27/23


Major Hill Groundwater Gauge 2
Year 5 (2023 Data)
March 1
Growing Season
Start
50 Days - 21.3%
October 22
Growing Season
End
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
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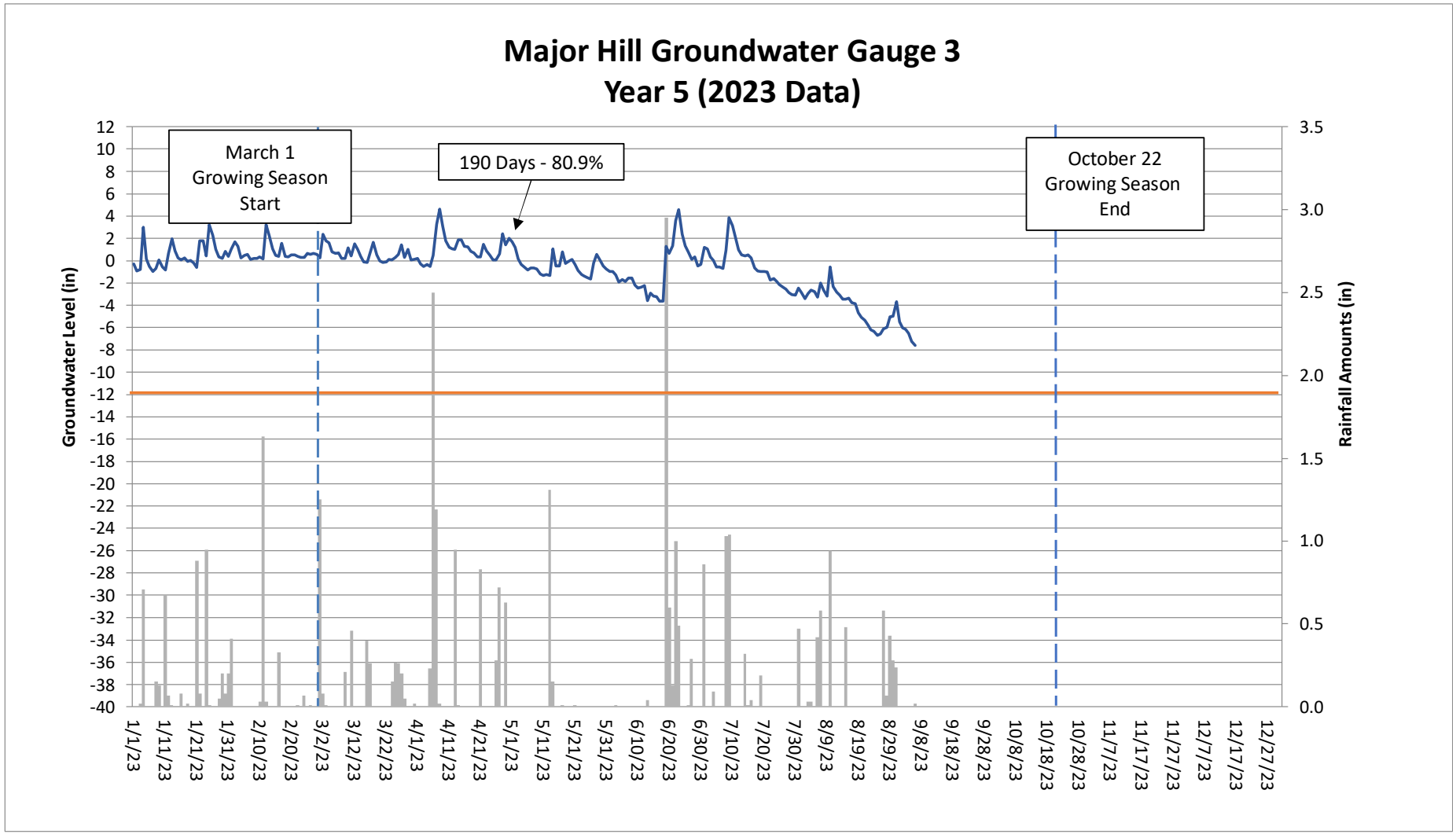
12/7/23
12/17/23
12/27/23


Major Hill Groundwater Gauge 3
Year 5 (2023 Data)
March 1
Growing Season
Start
190 Days - 80.9%
October 22
Growing Season
End
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
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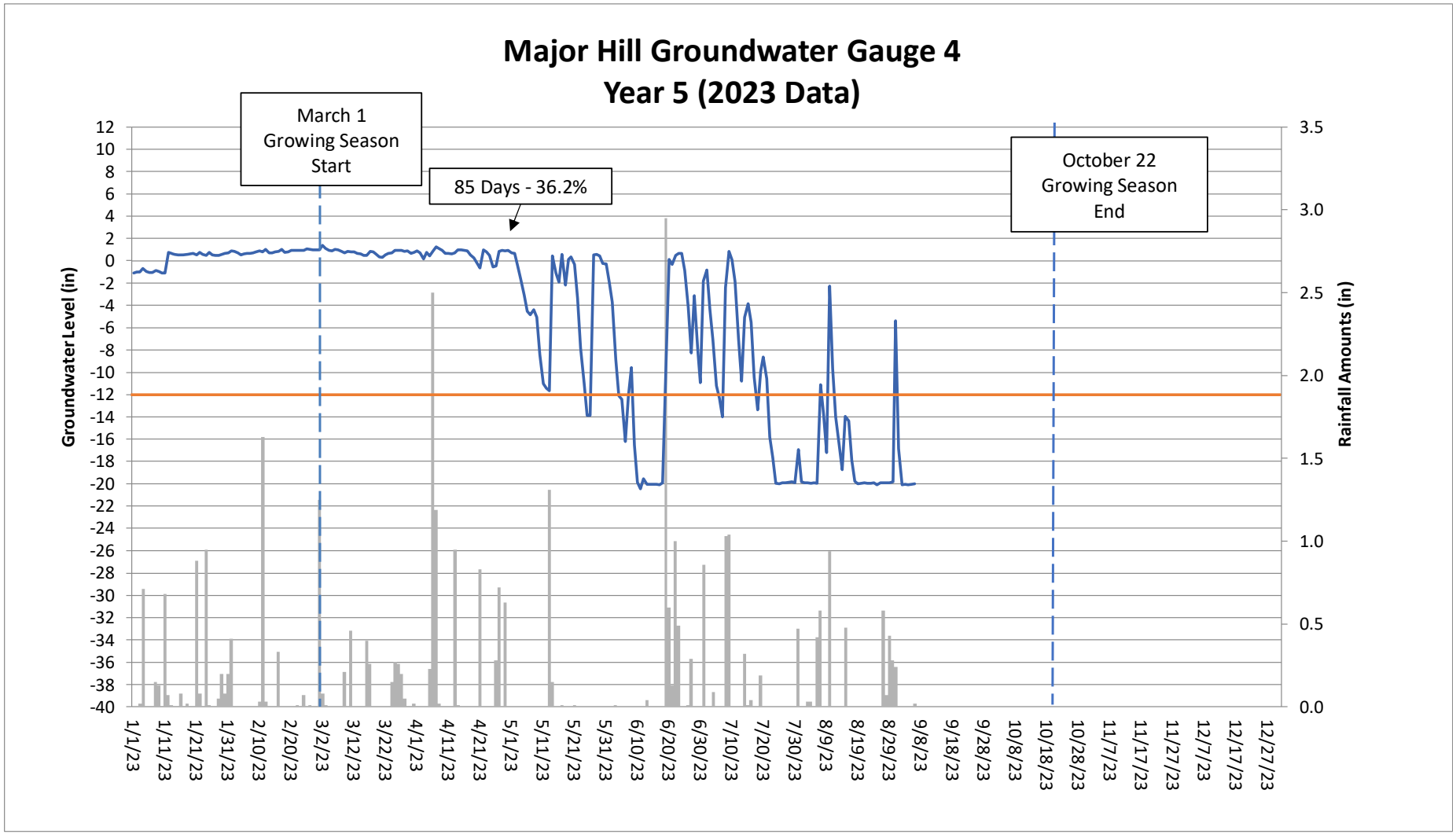
12/17/23
12/27/23


Major Hill Groundwater Gauge 4
Year 5 (2023 Data)
March 1
Growing Season
Start
85 Days - 36.2%
October 22
Growing Season
End
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
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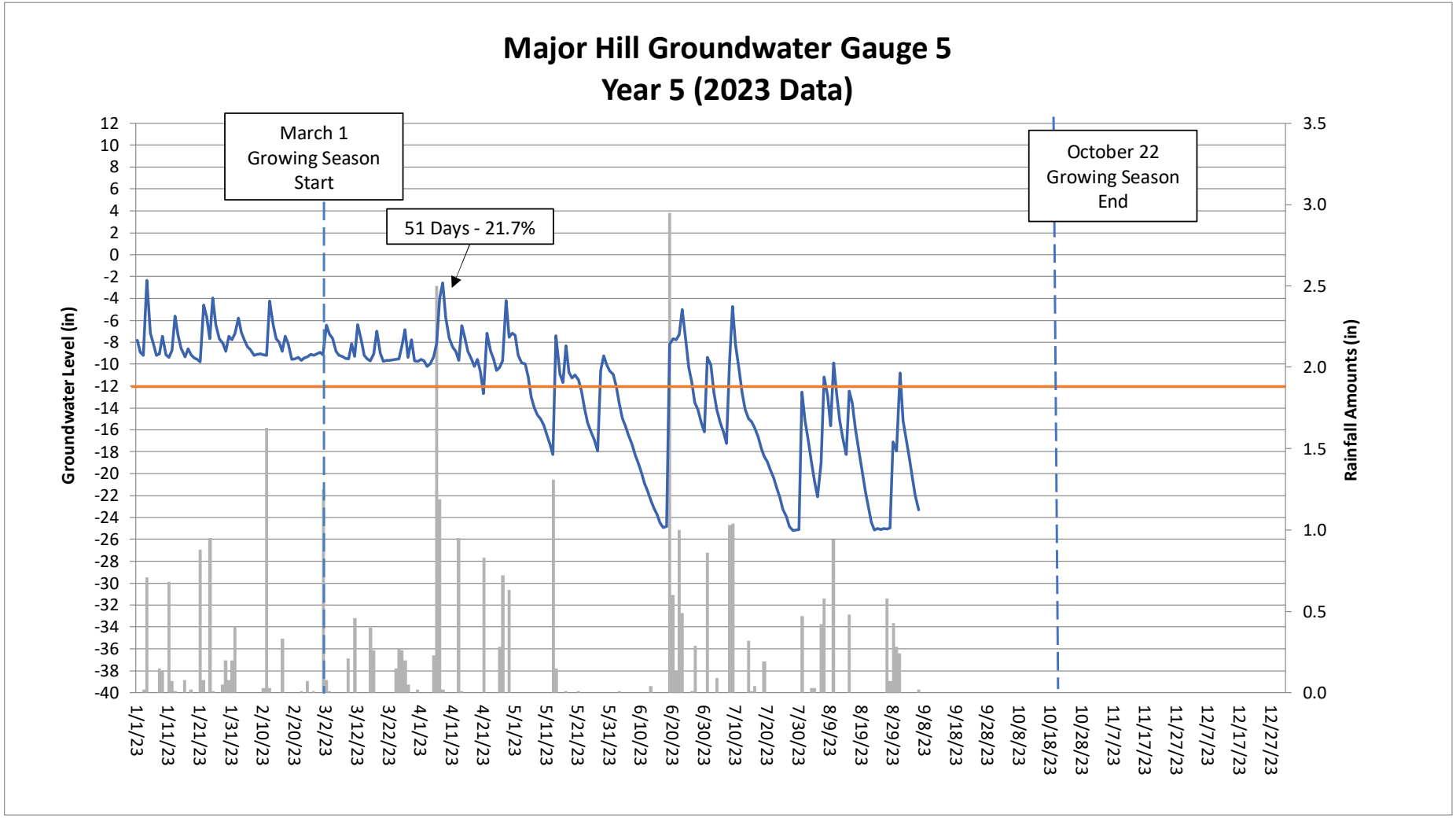
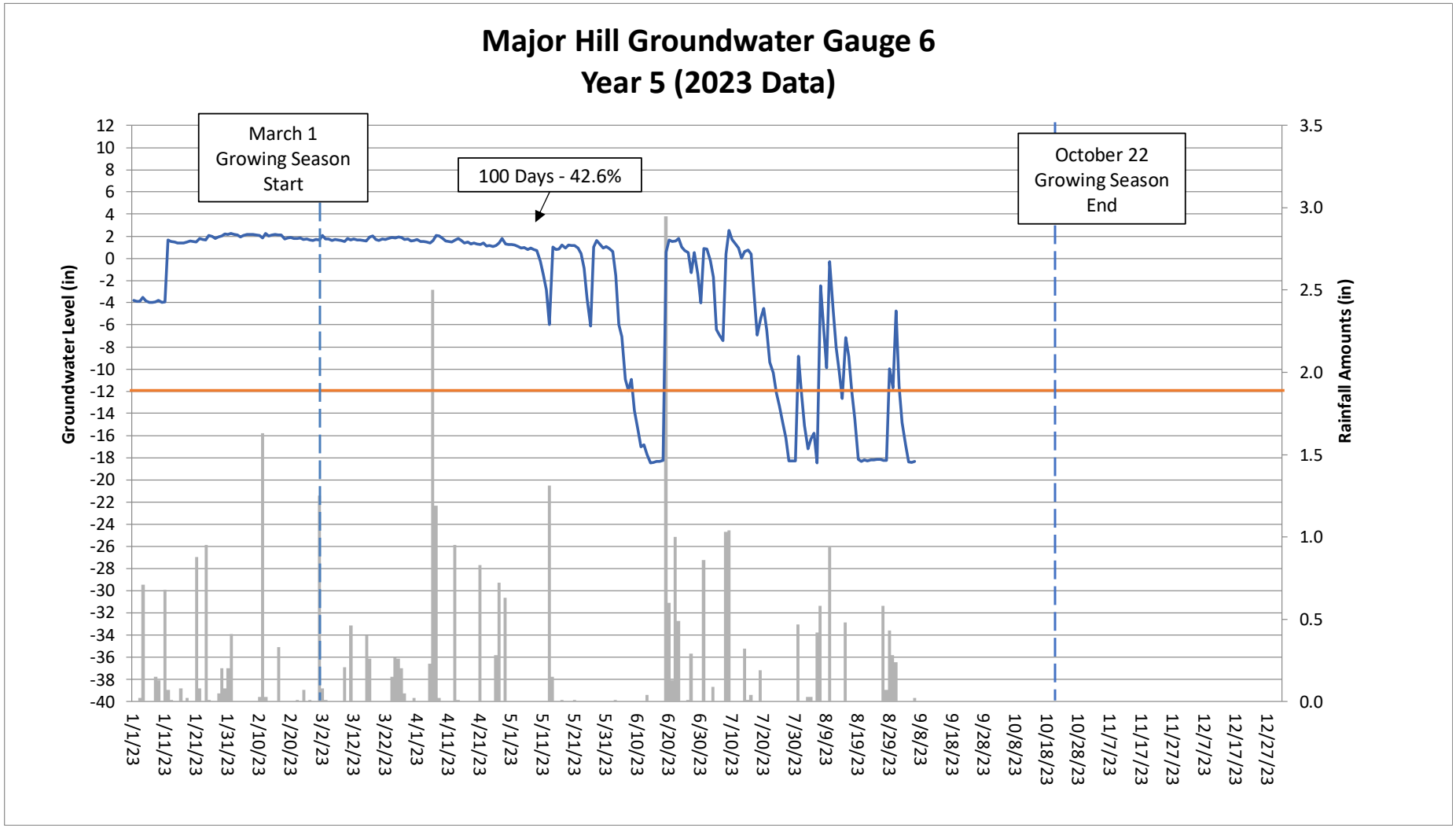
12/17/23
12/27/23


Major Hill Groundwater Gauge 5
Year 5 (2023 Data)
March 1
Growing Season
Start
51 Days - 21.7%
October 22
Growing Season
End
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
10/18/23
10/28/23
11/7/23
11/17/23
11/27/23
12/7/23
12/17/23
12/27/23


Major Hill Groundwater Gauge 6
Year 5 (2023 Data)
March 1
Growing Season
Start
100 Days - 42.6%
October 22
Growing Season
End
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1/1/23
1/11/23
1/21/23
1/31/23
2/10/23
2/20/23
3/2/23
3/12/23
3/22/23
4/1/23
4/11/23
4/21/23
5/1/23
5/11/23
5/21/23
5/31/23
6/10/23
6/20/23
6/30/23
7/10/23
7/20/23
7/30/23
8/9/23
8/19/23
8/29/23
9/8/23
9/18/23
9/28/23
10/8/23
10/18/23
10/28/23
11/7/23
11/17/23
11/27/23
12/7/23
12/17/23
12/27/23

Appendix F.
Benthic Data

Benthic Results
Habitat Datasheets

PA ID NO			56918	56919
STATION			Major Hill	Major Hill
			UT1U	UT1D
DATE			6/13/2023	6/13/2023
SPECIES	T.V.	F.F.G.		
PLATYHELMINTHES			1	1
MOLLUSCA				
Bivalvia				
Veneroida				
Sphaeriidae		FC		
Musculium lacustre		FC		2
Pisidium sp.	6.6	FC		
Gastropoda				
Basommatophora				
Physidae				
Physella sp.	8.7	CG	3	1
ANNELIDA				
Clitellata				
Oligochaeta		CG		
Lumbriculida				
Lumbriculidae		CG		
Lumbriculus sp.		CG		
Hirudinea		P		
Arhynchobdellida				
Erpobdellidae		P	2	
Rhynchobdellida				
Glossiphoniidae		P		
Helobdella sp.		P	1	
ARTHROPODA				
Cladocera				
Daphnidae				
Ceriodaphnia sp.				
Copepoda				
Cyclopoida				
Cyclopidae				
Mesocyclops edax				
Isopoda				
Asellidae		SH		
Caecidotea sp.	8.4	CG		4
Amphipoda		CG		
Crangonyctidae				
Crangonyx sp.	7.2	CG	1	6

PA ID NO			56918	56919
STATION			Major Hill	Major Hill
			UT1U	UT1D
DATE			6/13/2023	6/13/2023
SPECIES	T.V.	F.F.G.		
Insecta				
Ephemeroptera				
Baetidae		**CG**		
Odonata				
Aeshnidae		**P**		
Aeshna umbrosa		**P**		
Anax junius		**P**		
Coenagrionidae		**P**		
Corduliidae				
Somatochlora sp.	8.9	**P**		
Libellulidae		**P**		
Libellula vibrans	9.4	**P**		
Pachydiplax longipennis	9.6			
Plecoptera				
Perlidae		**P**		
Perlesta sp.	2.9	**P**		1
Hemiptera				
Belostomatidae				
Belostoma sp.	9.5	**P**		
Corixidae		**PI**	2	
Hesperocorixa sp.		**PI**		
Notonectidae				
Notonecta sp.		**P**		
Megaloptera				
Corydalidae		**P**		
Chauliodes rastricornis		**P**		
Sialidae		**P**		
Sialis sp.	7	**P**	2	2
Trichoptera				
Hydropsychidae		**FC**		
Cheumatopsyche sp.	6.6	**FC**		
Limnephilidae				
Pycnopsyche sp.	2.5	**SH**		1

PA ID NO			56918	56919
STATION			Major Hill	Major Hill
			UT1U	UT1D
DATE			6/13/2023	6/13/2023
SPECIES	T.V.	F.F.G.		
Coleoptera				
Dytiscidae		P		
Neoporus sp.	5			1
Thermonectus sp.		P		
Hydrophilidae		P		
Tropisternus sp.	*9.3*	P		
Diptera				
Chaboridae				
Chaoborus albatus		P		
Chironomidae				
Ablabesmyia mallochi	*7.4*	P		
Chironomus sp.	*9.3*	CG	5	1
Conchapelopia sp.	8.4	P		
Cryptochironomus sp.	*6.4*	P		1
Microtendipes pedellus gp.	*3.9*	CG		1
Natarsia sp.	*9.6*	P		
Paratendipes albimanus/duplicatus	*5.6*			2
Procladius sp.	*8.8*	P		2
Psectrotanypus dyari	*10*	P		
Tanytarsus sp.	*6.6*	FC	1	
Zavrelimyia sp.	*8.6*	P	1	1
Culicidae		FC		
Anopheles sp.	*8.6*	FC	2	1
Culex sp.		FC		
Psychodidae		CG	1	
TOTAL NO. OF ORGANISMS			**204038**	**204046**
TOTAL NO. OF TAXA			**16**	**20**
EPT INDEX			**0**	**2**
BIOTIC INDEX Assigned Values			**8.39**	**6.24**

MH MY5 BENTHICS MH-UT1d

3/06 Revision 6

MH - 17-009

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

Biological Assessment Unit, DWQ

TOTAL SCORE 85

Directions for use: The observer is to survey a **minimum of 100 meters with 200 meters preferred** of stream, preferably in an **upstream** direction starting above the bridge pool and the road right-of-way. The segment which is assessed should represent average stream conditions. To perform a proper habitat evaluation the observer needs to get into the stream. To complete the form, select the description which best fits the observed habitats and then circle the score. If the observed habitat falls in between two descriptions, select an intermediate score. A final habitat score is determined by adding the results from the different metrics.

Stream MH-UT1d Location/road: Graham (Road Name Burwell Church)County Alamance

Date 6/13/23 CC# 03030002 Basin Cape Fear Subbasin 03-06-04

Observer(s) PP LB Type of Study: ☐ Fish ☒Benthos ☐ Basinwide ☐Special Study (Describe) ______

Latitude 36.073213 Longitude -79.358804 Ecoregion: ☐ MT ☒ P ☒ Slate Belt ☐ Triassic Basin

Water Quality: Temperature ______ ^{0}C DO ______ mg/l Conductivity (corr.) ______ µS/cm pH ______

Physical Characterization: Visible land use refers to immediate area that you can see from sampling location - include what you estimate driving thru the watershed in watershed land use.

Visible Land Use: 60 %Forest ______ %Residential 40 %Active Pasture ______ % Active Crops
______ %Fallow Fields ______ % Commercial ______ %Industrial ______ %Other - Describe: ______

Watershed land use : ☒Forest ☐Agriculture ☐Urban ☐ Animal operations upstream

Width: (meters) Stream 2-4 Channel (at top of bank) 3-4 **Stream Depth:** (m) Avg .01 Max .1
☐ Width variable ☐ Large river >25m wide

Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) .5-1

Bank Angle: 90-100 ° or ☐ NA (Vertical is 90°, horizontal is 0°. Angles > 90° indicate slope is towards mid-channel, < 90° indicate slope is away from channel. NA if bank is too low for bank angle to matter.)

☐ Channelized Ditch
☐Deeply incised-steep, straight banks ☐Both banks undercut at bend ☐Channel filled in with sediment
☐ Recent overbank deposits ☐Bar development ☐Buried structures ☐Exposed bedrock
☐ Excessive periphyton growth ☐ Heavy filamentous algae growth ☐Green tinge ☐ Sewage smell

Manmade Stabilization: ☒N ☐Y: ☐Rip-rap, cement, gabions ☐ Sediment/grade-control structure ☐Berm/levee

Flow conditions : ☐High ☐Normal ☒Low

Turbidity: ☐Clear ☐ Slightly Turbid ☐Turbid ☐Tannic ☐Milky ☐Colored (from dyes)

Good potential for Wetlands Restoration Project?? ☐ YES ☒NO **Details** - restored/enhancement

Channel Flow Status

Useful especially under abnormal or low flow conditions.

A. Water reaches base of both lower banks, minimal channel substrate exposed .... ☐
B. Water fills >75% of available channel, or <25% of channel substrate is exposed............ ☐
C. Water fills 25-75% of available channel, many logs/snags exposed............ ☒
D. Root mats out of water............ ☐
E. Very little water in channel, mostly present as standing pools............ ☐

Weather Conditions: no rain 48-5 **Photos:** ☒N ☐Y ☐ Digital ☐35mm

Remarks: Cattle have been removed from riparian area
some open pasture upstream

Lots of salamanders + spiders -
few crayfish

"HT1D

I. Channel Modification

	Score
A. channel natural, frequent bends	5
B. channel natural, infrequent bends (channelization could be old)	(4)
C. some channelization present	3
D. more extensive channelization, >40% of stream disrupted	2
E. no bends, completely channelized or rip rapped or gabioned, etc	0

☐ Evidence of dredging ☐Evidence of desnagging=no large woody debris in stream ☐Banks of uniform shape/height

Remarks_____ Subtotal 4

II. Instream Habitat: Consider the percentage of the reach that is favorable for benthos colonization or fish cover. If >70% of the reach is rocks, 1 type is present, circle the score of 17. Definition: leafpacks consist of older leaves that are packed together and have begun to decay (not piles of leaves in pool areas). Mark as Rare, Common, or Abundant.

__(C)__**Rocks** ____**Macrophytes** __C__**Sticks and leafpacks** ____**Snags and logs** ____**Undercut banks or root mats**

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

	>70% Score	40-70% Score	20-40% Score	<20% Score
4 or 5 types present	20	16	12	8
3 types present	19	15	11	7
2 types present	18	(14)	10	6
1 type present	17	13	9	5
No types present	0			

☐ No woody vegetation in riparian zone Remarks_____ Subtotal 14

III. Bottom Substrate (silt, sand, detritus, gravel, cobble, boulder) Look at entire reach for substrate scoring, but only look at riffle for embeddedness, and use rocks from all parts of riffle-look for "mud line" or difficulty extracting rocks.

	Score
A. substrate with good mix of gravel, cobble and boulders	
1. embeddedness <20% (very little sand, usually only behind large boulders)	15
2. embeddedness 20-40%	12
3. embeddedness 40-80%	8
4. embeddedness >80%	3
B. substrate gravel and cobble	
1. embeddedness <20%	14
2. embeddedness 20-40%	(11)
3. embeddedness 40-80%	6
4. embeddedness >80%	2
C. substrate mostly gravel	
1. embeddedness <50%	8
2. embeddedness >50%	4
D. substrate homogeneous	
1. substrate nearly all bedrock	3
2. substrate nearly all sand	3
3. substrate nearly all detritus	2
4. substrate nearly all silt/ clay	1

Remarks_____ Subtotal 11

IV. Pool Variety Pools are areas of deeper than average maximum depths with little or no surface turbulence. Water velocities associated with pools are always slow. Pools may take the form of "pocket water", small pools behind boulders or obstructions, in large high gradient streams, or side eddies.

	Score
A. Pools present	
1. Pools Frequent (>30% of 200m area surveyed)	
a. variety of pool sizes	10
b. pools about the same size (indicates pools filling in)	8
2. Pools Infrequent (<30% of the 200m area surveyed)	
a. variety of pool sizes	(6)
b. pools about the same size	4
B. Pools absent	0

Subtotal 6

☒ Pool bottom boulder-cobble=hard ☐ Bottom sandy-sink as you walk ☐ Silt bottom ☐ Some pools over wader depth

Remarks_____

Page Total 35

UT1D

V. Riffle Habitats

Definition: Riffle is area of reaeration-can be debris dam, or narrow channel area.

	Riffles **Frequent** Score	Riffles **Infrequent** Score
A. well defined riffle and run, riffle as wide as stream and extends 2X width of stream....	(16)	12
B. riffle as wide as stream but riffle length is not 2X stream width	14	7
C. riffle not as wide as stream and riffle length is not 2X stream width	10	3
D. riffles absent.....	0	

Channel Slope: ☐Typical for area ☐Steep=fast flow ☐Low=like a coastal stream Subtotal 16

VI. Bank Stability and Vegetation

FACE UPSTREAM	Left Bank Score	Rt. Bank Score
A. Banks stable		
1. little evidence of erosion or bank failure(except outside of bends), little potential for erosion..	(5)	(7)
B. Erosion areas present		
1. diverse **trees**, shrubs, grass; plants healthy with good root systems.....	6	6
2. few trees or small trees and **shrubs**; vegetation appears generally healthy.....	5	5
3. sparse **mixed** vegetation; plant types and conditions suggest poorer soil binding.....	3	3
4. mostly **grasses**, few if any trees and shrubs, high erosion and failure potential at high flow..	2	2
5. little or no bank vegetation, mass erosion and bank failure evident.....	0	0
		Total 14

Remarks _____

VII. Light Penetration Canopy is defined as tree or vegetative cover directly above the stream's surface. Canopy would block out sunlight when the sun is directly overhead. Note shading from mountains, but not use to score this metric.

	Score
A. Stream with **good** canopy with some breaks for light penetration	(10)
B. Stream with **full canopy** - breaks for light penetration absent.....	8
C. Stream with **partial** canopy - sunlight and shading are essentially equal.....	7
D. Stream with **minimal** canopy - full sun in all but a few areas.....	2
E. **No canopy** and no shading.....	0

Remarks _____ Subtotal 10

VIII. Riparian Vegetative Zone Width

Definition: Riparian zone for this form is area of natural vegetation adjacent to stream (can go beyond floodplain). Definition: A break in the riparian zone is any place on the stream banks which allows sediment or pollutants to directly enter the stream, such as paths down to stream, storm drains, uprooted trees, otter slides, etc.

FACE UPSTREAM	Lft. Bank Score	Rt. Bank Score
Dominant vegetation: ☑Trees ☑Shrubs ☐ Grasses ☐ Weeds/old field ☐Exotics (kudzu, etc)		
A. Riparian zone **intact** (no breaks)		
1. width > 18 meters.....	(5)	(5)
2. width 12-18 meters.....	4	4
3. width 6-12 meters.....	3	3
4. width < 6 meters.....	2	2
B. Riparian zone **not intact** (breaks)		
1. breaks rare		
a. width > 18 meters.....	4	4
b. width 12-18 meters.....	3	3
c. width 6-12 meters.....	2	2
d. width < 6 meters.....	1	1
2. breaks common		
a. width > 18 meters.....	3	3
b. width 12-18 meters.....	2	2
c. width 6-12 meters.....	1	1
d. width < 6 meters.....	0	0
		Total 10

Remarks _____

Page Total 50

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 85

MH UT1q

3/06 Revision 6

MH_17-009

Habitat Assessment Field Data Sheet
Mountain/ Piedmont Streams

Biological Assessment Unit, DWQ

TOTAL SCORE 99

Directions for use: The observer is to survey a **minimum of 100 meters with 200 meters preferred** of stream, preferably in an **upstream** direction starting above the bridge pool and the road right-of-way. The segment which is assessed should represent average stream conditions. To perform a proper habitat evaluation the observer needs to get into the stream. To complete the form, select the description which best fits the observed habitats and then circle the score. If the observed habitat falls in between two descriptions, select an intermediate score. A final habitat score is determined by adding the results from the different metrics.

Stream MH-UT1q Location/road: Graham (Road Name Barnett Church) County Alamance

Date 4/13/23 **CC#** 03030002 Basin Cape Fear Subbasin 03-06-04

Observer(s) BF DM Type of Study: ☐ Fish ☒Benthos ☐ Basinwide ☐Special Study (Describe) _____

Latitude 35.674390 Longitude 79.359219 Ecoregion: ☐ MT ☑ P ☐ Slate Belt ☐ Triassic Basin

Water Quality: Temperature_____°C DO _____mg/l Conductivity (corr.) _____µS/cm pH _____

Physical Characterization: Visible land use refers to immediate area that you can see from sampling location - include what you estimate driving thru the watershed in watershed land use.

Visible Land Use: 30 %Forest _____%Residential 70 %Active Pasture _____% Active Crops
_____%Fallow Fields _____% Commercial _____%Industrial _____%Other - Describe:_____

Watershed land use : ☐Forest ☐Agriculture ☐Urban ☐ Animal operations upstream

Width: (meters) Stream 1 Channel (at top of bank) 0.8 **Stream Depth**: (m) Avg 0.1 Max 0.5
☐ Width variable ☐ Large river >25m wide
Bank Height (from deepest part of riffle to top of bank-first flat surface you stand on): (m) 0.4

Bank Angle: 120 ° or ☒NA (Vertical is 90°, horizontal is 0°. Angles > 90° indicate slope is towards mid-channel, < 90° indicate slope is away from channel. NA if bank is too low for bank angle to matter.)

☐ Channelized Ditch
☐Deeply incised-steep, straight banks ☐Both banks undercut at bend ☐Channel filled in with sediment
☐ Recent overbank deposits ☐Bar development ☐Buried structures ☒Exposed bedrock
☐ Excessive periphyton growth ☐ Heavy filamentous algae growth ☐Green tinge ☐ Sewage smell
Manmade Stabilization: ☒N ☐Y: ☐Rip-rap, cement, gabions ☐ Sediment/grade-control structure ☐Berm/levee
Flow conditions : ☐High ☐Normal ☒Low
Turbidity: ☐Clear ☒ Slightly Turbid ☐Turbid ☐Tannic ☐Milky ☐Colored (from dyes)
Good potential for Wetlands Restoration Project?? ☑YES ☐NO Details restored stream

Channel Flow Status

Useful especially under abnormal or low flow conditions.

A. Water reaches base of both lower banks, minimal channel substrate exposed	☐
B. Water fills >75% of available channel, or <25% of channel substrate is exposed	☐
C. Water fills 25-75% of available channel, many logs/snags exposed	☐
D. Root mats out of water	☐
E. Very little water in channel, mostly present as standing pools	☒

Weather Conditions: Cloudy 69° **Photos:** ☐N ☒Y ☐ Digital ☐35mm

Remarks: _____

I. Channel Modification Score

A. channel natural, frequent bends..... (5)
B. channel natural, infrequent bends (channelization could be old)..... 4
C. some channelization present..... 3
D. more extensive channelization, >40% of stream disrupted..... 2
E. no bends, completely channelized or rip rapped or gabioned, etc..... 0

☐ Evidence of dredging ☐Evidence of desnagging=no large woody debris in stream ☑Banks of uniform shape/height
Remarks _____ Subtotal 5

II. Instream Habitat: Consider the percentage of the reach that is favorable for benthos colonization or fish cover. If >70% of the reach is rocks, 1 type is present, circle the score of 17. Definition: leafpacks consist of older leaves that are packed together and have begun to decay (not piles of leaves in pool areas). Mark as Rare, Common, or Abundant.

A **Rocks** C **Macrophytes** C **Sticks and leafpacks** R **Snags and logs** R **Undercut banks or root mats**

AMOUNT OF REACH FAVORABLE FOR COLONIZATION OR COVER

	>70% Score	40-70% Score	20-40% Score	<20% Score
4 or 5 types present.....	20	16	12	8
3 types present.....	(19)	15	11	7
2 types present.....	18	14	10	6
1 type present.....	17	13	9	5
No types present.....	0			

☐ No woody vegetation in riparian zone Remarks leaf packs, rocks (riffles) Subtotal 19

III. Bottom Substrate (silt, sand, detritus, gravel, cobble, boulder) Look at entire reach for substrate scoring, but only look at riffle for embeddedness, and use rocks from all parts of riffle-look for "mud line" or difficulty extracting rocks.

	Score
A. substrate with good mix of gravel, cobble and boulders	
1. embeddedness <20% (very little sand, usually only behind large boulders).....	(15)
2. embeddedness 20-40%.....	12
3. embeddedness 40-80%.....	8
4. embeddedness >80%.....	3
B. substrate gravel and cobble	
1. embeddedness <20%.....	14
2. embeddedness 20-40%.....	11
3. embeddedness 40-80%.....	6
4. embeddedness >80%.....	2
C. substrate mostly gravel	
1. embeddedness <50%.....	8
2. embeddedness >50%.....	4
D. substrate homogeneous	
1. substrate nearly all bedrock.....	3
2. substrate nearly all sand.....	3
3. substrate nearly all detritus.....	2
4. substrate nearly all silt/ clay.....	1

Remarks _____ Subtotal 15

IV. Pool Variety Pools are areas of deeper than average maximum depths with little or no surface turbulence. Water velocities associated with pools are always slow. Pools may take the form of "pocket water", small pools behind boulders or obstructions, in large high gradient streams, or side eddies.

	Score
A. Pools present	
1. Pools Frequent (>30% of 200m area surveyed)	
a. variety of pool sizes.....	(10)
b. pools about the same size (indicates pools filling in).....	8
2. Pools Infrequent (<30% of the 200m area surveyed)	
a. variety of pool sizes.....	6
b. pools about the same size.....	4
B. Pools absent.....	0

Subtotal 10

☑ Pool bottom boulder-cobble=hard ☐ Bottom sandy-sink as you walk ☐ Silt bottom ☐ Some pools over wader depth
Remarks _____

Page Total 49

V. Riffle Habitats

Definition: Riffle is area of reaeration-can be debris dam, or narrow channel area.

	Riffles **Frequent** Score	Riffles **Infrequent** Score
A. well defined riffle and run, riffle as wide as stream and extends 2X width of stream....	16	12
B. riffle as wide as stream but riffle length is not 2X stream width	14	7
C. riffle not as wide as stream and riffle length is not 2X stream width	10	3
D. riffles absent.....	0	

Channel Slope: ☑Typical for area ☐Steep=fast flow ☐Low=like a coastal stream Subtotal 14

VI. Bank Stability and Vegetation

FACE UPSTREAM	Left Bank Score	Rt. Bank Score
A. Banks stable		
1. little evidence of erosion or bank failure(except outside of bends), little potential for erosion.	9	9
B. Erosion areas present		
1. diverse **trees**, shrubs, grass; plants healthy with good root systems.....	6	6
2. few trees or small trees and **shrubs**; vegetation appears generally healthy.....	5	5
3. sparse **mixed** vegetation; plant types and conditions suggest poorer soil binding.....	3	3
4. mostly **grasses**, few if any trees and shrubs, high erosion and failure potential at high flow..	2	2
5. little or no bank vegetation, mass erosion and bank failure evident.....	0	0
		Total 14

Remarks_____

VII. Light Penetration Canopy is defined as tree or vegetative cover directly above the stream's surface. Canopy would block out sunlight when the sun is directly overhead. Note shading from mountains, but not use to score this metric.

	Score
A. Stream with **good** canopy with some breaks for light penetration	10
B. Stream with **full canopy** - breaks for light penetration absent.....	8
C. Stream with **partial** canopy - sunlight and shading are essentially equal.....	7
D. Stream with **minimal** canopy - full sun in all but a few areas.....	2
E. **No canopy** and no shading.....	0

Remarks_____ Subtotal 10

VIII. Riparian Vegetative Zone Width

Definition: Riparian zone for this form is area of natural vegetation adjacent to stream (can go beyond floodplain). Definition: A break in the riparian zone is any place on the stream banks which allows sediment or pollutants to directly enter the stream, such as paths down to stream, storm drains, uprooted trees, otter slides, etc.

FACE UPSTREAM

Dominant vegetation: ☑Trees ☐ Shrubs ☑ Grasses ☐ Weeds/old field ☐Exotics (kudzu, etc)

	Lft. Bank Score	Rt. Bank Score
A. Riparian zone **intact** (no breaks)		
1. width > 18 meters.....	5	5
2. width 12-18 meters.....	4	4
3. width 6-12 meters.....	3	3
4. width < 6 meters.....	2	2
B. Riparian zone **not intact** (breaks)		
1. breaks rare		
a. width > 18 meters.....	4	4
b. width 12-18 meters.....	3	3
c. width 6-12 meters.....	2	2
d. width < 6 meters.....	1	1
2. breaks common		
a. width > 18 meters.....	3	3
b. width 12-18 meters.....	2	2
c. width 6-12 meters.....	1	1
d. width < 6 meters.....	0	0
		Total 10

Remarks_____

Page Total 50

☐ Disclaimer-form filled out, but score doesn't match subjective opinion-atypical stream. **TOTAL SCORE** 99

Appendix G.
Riparian Buffer Year 5 (2023) Monitoring Report

RIPARIAN BUFFER MY5 (2023) MONITORING REPORT

MAJOR HILL MITIGATION SITE

Alamance County, North Carolina

DMS Project ID No. 100015
Full Delivery Contract No. 7193
USACE Action ID No. SAW-2017-01472
DWR No. 17-0921
RFP No. 16-006990

Cape Fear River Basin – Haw River Arm
Cataloging Unit 03030002

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
1652 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1652

February 2024

This project with conforms with the North Carolina consolidated buffer mitigation rule 15A NCAC 02B .0295, effective November 1, 2015 and the Jordan Lake Buffer Protection Rule (15A NCAC 02B .0267 & 15A NCAC 02B .0268)

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Tables

Attachments

1.0 MITIGATION PROJECT SUMMARY

The Major Hill Stream and Wetland Mitigation Site (hereafter referred to as the "Site") encompasses 16.7 acres along warm water, unnamed tributaries to Pine Hill Branch. The Site is located approximately 3.5 miles southeast of Snow Camp and 6 miles north of Silk Hope in southern Alamance County near the Chatham County line. Project attributes are included in the following table.

Table 1. Buffer Project Attributes

Project Name	Major Hill
Hydrologic Unit Code	3030002050050
River Basin	Cape Fear
Geographic Location (Lat, Long)	35.873206, -79.360906
Site Protection Instrument (DB, PG)	(2789, 896), (2514, 756), (3143, 270), (3150, 920)
Total Credits (BMU)	402,837
Types of Credits	Riparian Buffer Restoration, Enhancement, & Preservation
Mitigation Plan Date	Apr-18
Initial Planting Date	Dec 2018-Jan 2019
Baseline Report Date	Mar-19
MY1 Report Date	Nov-19
MY2 Report Date	Jan-21
MY3 Report Date	Jan-22
MY4 Report Date	Nov-22
MY5 Report Date	Feb-24

The Site drainage area is primarily composed of pasture, forest, agricultural land, and sparse residential property. Impervious surfaces account for less than five percent of the upstream land surface.

Before construction, Site land use consisted of pasture, hayfields, disturbed forest, and agricultural land used for livestock grazing and hay production. Livestock had unrestricted access to Site streams, and stream banks were eroded vertically and laterally and received extensive sediment and nutrient inputs. Riparian zones in the upper reaches of UT 1 were primarily composed of herbaceous vegetation that was sparse and disturbed due to livestock grazing, bush hogging, and regular land-management activities. The downstream reaches of UT 1 and all of UT 3 were primarily wooded with livestock disturbance to stream channels. UT 2 was the lone tributary not subject to continuous, unrestricted livestock access. Riparian areas immediately adjacent to UT 2 were forested with a fence to protect this area from livestock access.

The riparian areas were restored in concurrence with the Major Hill Stream and Wetland Mitigation Site (NC DMS Project ID 10015, SAW-2017-01472) and involved restoring riparian buffers adjacent to restored streams to help reduce non-point source contaminant discharges to downstream waters in the Haw River sub-watershed of Jordan Lake. All riparian areas were assessed by DWR (Katie Merritt and Sue Homewood) during a site visit on February 20, 2018, to determine the Site's viability for buffer mitigation.

The Site is protected with a permanent conservation easement. Riparian restoration, enhancement, and preservation area widths adjacent to restored streams extend out to a maximum of 200 feet from the top

of stream banks with a minimum width of 50 from the top of banks. Riparian buffer enhancement and preservation credits generated on this Site are allowed pursuant to 15A NCAC 02B .0295 (o). No riparian restoration areas less than 20 feet wide, measured perpendicularly from the top of banks, are used to generate riparian buffer credit.

Riparian Buffer Mitigation Credit was not generated in areas generating wetland mitigation credit.

2.0 REGULATORY CONSIDERATIONS

Credit determination for this Site follows the North Carolina consolidated buffer mitigation rule 15A NCAC 02B .0295, effective November 1, 2015 (see Table 2 on the following page and Figure A, Attachment 1).

3.0 RIPARIAN RESTORATION, ENHANCEMENT, & PRESERVATION PLAN

This Site was also proposed as a stream and wetland mitigation project; therefore, the restoration of riparian areas was accomplished through the goals and methods outlined by the *Major Hill Stream and Wetland Mitigation Plan*. All applicable federal, state and local permits or authorizations were acquired to implement the mitigation plan.

Primary goals focused on 1) improving water quality, 2) enhancing flood attenuation and hydrology, 3) improving aquatic resources, and 4) restoring riparian habitat. Completed mitigation provides floodplain connectivity, floodplain resistance, stream stability, sediment transport, surface and subsurface storage/retention, in-stream habitat, riparian habitat and structure, thermal regulation, floodplain biogeochemical processing, and pollutant filtration/removal of pollutant sources. The riparian area will be restored through the revegetation of native plant communities.

3.1 Riparian Area Restoration Activities

3.1.1 Site Preparation

Soil grading occurred during stream restoration activities. Topsoils were stockpiled during construction activities and spread on the soil surface once critical subgrade was established. The replaced topsoil will serve as a viable growing medium for community restoration to provide nutrients and aid in the survival of planted species.

Farm Pond Removal

To complete the stream and wetland restoration activities and subsequent riparian buffer restoration, the removal of a small farm pond, ~0.58 acres, occurred. Stream, wetland, and riparian area restoration within the abandoned pond included 1) notching the dam to dewater; 2) removal of the dam to the elevation of the adjacent floodplain; 3) excavating sediment that is unsuitable for channel bank construction; 4) backfilling areas of sediment removed with soil suitable for channel construction (as necessary); 5) excavation of the design channel, 6) stabilization of the channel with coir matting, seed, and mulch; and 7) installation of structures.

Table 2. Buffer Project Areas and Assets

RIPARIAN BUFFER (15A NCAC 02B.0295)

Location	Jurisdictional Streams	Restoration Type	Reach ID/ Component	Buffer Width (ft)	Creditable Area (sf)*	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits (BMU)	Convertible to Nutrient Offset (Yes or No)	If Converted to Nutrient Offset: Nutrient Offset: N (lbs)	If Converted to Nutrient Offset: Nutrient Offset: P (lbs)
Rural	Subject & Nonsubject	Restoration	1	0-100	213,290	1	100%	1.00000	213,290.000	Yes	11129.775	716.842
Rural	Subject & Nonsubject	Restoration	2	101-200	40,976	1	33%	3.03030	13,522.094	Yes	2138.186	137.715
Rural	Subject	Enhancement	3	0-100	341,433	2	100%	2.00000	170,716.500	No	0.000	0.000
				SUBTOTALS	**595,699**				**397,528.594**		**13,267.960**	**854.558**
			ELIGIBLE PRESERVATION AREA		**198,566**							
Location	**Jurisdictional Streams**	**Restoration Type**	**Reach ID/ Component**	**Buffer Width (ft)**	**Creditable Area (sf)***	**Initial Credit Ratio (x:1)**	**% Full Credit**	**Final Credit Ratio (x:1)**	**Riparian Buffer Credits (BMU)**			
Rural	Nonsubject	Preservation	4	0-100	25,614	5	100%	5.00000	5,122.800			
Rural	Nonsubject	Preservation	5	101-200	2,814	5	33%	15.15152	185.724			
				SUBTOTALS	**28,428**				**5,308.524**			
				TOTALS	**624,127**				**402,837.117**			

**Area eligible for preservation may be no more than 25% of total area, where total area is back-calculated with the equation R+E/0.75.*

**Buffers must be at minimum 20' wide for riparian buffer credit, buffers must be 50' wide for nutrient offset credit*

**When preservation areas exceed the total eligible preservation area, select the areas with the best credit ratios as the creditable areas.*

3.1.2 Planting

Bare-root seedlings within the Piedmont Alluvial and Dry-Mesic Oak-Hickory Forests were initially planted at a density of approximately 680 stems per acre on 8-foot centers. Species in the streamside assemblage and Marsh Wetland Treatment Areas were planted at a density of approximately 2720 stems per acre on 4-foot centers. The following table summarizes planted bare-root stems within the Site.

Table 3. Planted Bare Root Woody Vegetation

Species	Piedmont/Low Mountain Alluvial Forest	Dry-Mesic Oak/Hickory Forest	Marsh Treatment Wetland	Streamside Assemblage	Total
Acres	**1.1**	**5.5**	**0.01**	**1.5**	**8.11**
Alnus serrulata			5	20	25
Asimina triloba				200	200
Betula nigra	100			200	300
Carpinus caroliniana		600			600
Cephalanthus occidentalis			5	20	25
Cercis canadensis		500			500
Cornus amomum	95		5	800	900
Diospyros virginiana		450			450
Fraxinus americana		100			100
Fraxinus pennsylvanica	150			750	900
Liriodendron tulipifera	75				75
Nyssa sylvatia		600			600
Platanus occidentalis	120			780	900
Quercus nigra	110	790		500	1,400
Quercus phellos	100	700		400	1,200
*Salix nigra**				400*	400
Sambucus canadensis			11	14	25
TOTALS	750	3,740	26	4,084	**8,600**
Stems/Acre	682	680	2600	2722	**1060**

*Live stakes of *Salix nigra* were planted; all other planted species were planted as bare root plants.

3.2 Riparian Buffer Enhancement via Cattle Exclusion Activities

Riparian buffer enhancement included permanently protecting the existing riparian buffer from livestock via exclusionary fencing, cutting, clearing, filling, grading, and any similar activities that would affect the functionality of the riparian buffer. These areas are defined primarily as disturbed mixed hardwoods. Buffer credits sought in the enhancement area are allowed under 15A NCAC 02B .0295 (o)(6). The enhancement area extends a maximum of 200 feet from the top of the bank with a minimum width of 20 from the top of stream banks.

A small portion of UT-3 generates riparian buffer enhancement credit from only one side of the stream. Before construction, cattle had access to the entire area; however, the only access point was from the pasture on the northern side of the stream, the parcel owned by Mr. Lamm. Once fencing was installed to prevent cattle access from Mr. Lamm's parcel to the stream, cattle were no longer able to access the south side of the stream. This action will result in compliance with 15A NCAC 02B .0295 (o)(6), which states that the permanent exclusion of grazing livestock must be done such that the livestock are fenced out of the stream and its adjacent buffer. The southern parcel, which is not a part of the conservation easement, is owned by the Caviness family and is a single-family home.

3.3 Riparian Buffer Preservation Activities

Riparian buffer preservation includes permanently protecting existing riparian buffers from cutting, clearing, filling, grading, and any similar activities that would affect the functionality of the riparian buffer. Areas specified for Preservation at the Site, in accordance with 15A NCAC 02B .0295, are defined primarily as mixed hardwoods, with a number of high-value species and over 200 species total per acre. They are areas where livestock was fenced out before construction – these areas had little or no historical livestock access.

3.4 Marsh Treatment Area

A marsh treatment area was constructed to intercept surface waters draining through agricultural areas before discharging into UT1. The marsh treatment area is excluded from credit calculations.

4.0 ANNUAL MONITORING

4.1 Monitoring

Eight vegetation monitoring plots (10-meter by 10-meter) were installed within the Site as per guidelines established in *CVS-EEP Protocol for Recording Vegetation*, *Version 4.2* (Lee et al. 2008); this covers 3.4% of the area generating riparian buffer restoration credit. Vegetation monitoring will occur annually in the fall (between September and November), prior to the loss of leaves for a period of five monitoring years following planting. Parameters to be monitored include species composition and species density. Visual observations of the percent cover of shrub and herbaceous species will also be documented by photograph. In addition, inspections for beaver and other potential nuisance species will occur throughout the monitoring period.

The following table outlines riparian buffer monitoring for this project; monitoring parameter descriptions follow.

Table 4. Riparian Buffer Monitoring

Required	Parameter	Quantity	Frequency	Notes
Yes	Vegetation	Eight (8) plots located across all restored buffer zones.	Annual	Vegetation will be monitored for five years or until performance standards are met. Visual monitoring of the site will be done all five years. Analysis of vegetation will be recorded using level 2 CVS Monitoring protocol.
Yes	Project Boundary	NA	Annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped.

4.2 Performance Standards

Performance standards were established to verify that the vegetation component supports community elements necessary for forest development and the maintenance of diffuse flow through the riparian buffer in accordance with North Carolina Division of Water Resources Administrative Code 15A NCAC 02B.0295 (Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers). Performance standards are dependent upon the density and growth of at least four native hardwood tree species where no one species is greater than 50% of the stems. After five years of monitoring, an average density of 260 woody stems per acre, including planted shrubs (silky dogwood and blueberry), must be surviving, and diffuse flow maintained. 15A NCAC 02b .0295 (2)(E) dictates that monitoring for planted stems would also include the health of planted stems. Level 2 CVS monitoring protocol requires the vigor, a determinant of health, of a monitored stem be recorded. If requested, RS will make available during the monitoring years, planted stem health, e.g. vigor.

4.3 Results and Discussion

In early January 2020, a winter-time visual assessment of the Site was performed, and it was determined that although Year 1 (2019) vegetation data, including random transects, showed a high density of trees, a light supplemental planting would help ensure the long-term success in several areas. On January 31, 2020, three areas that visually exhibited low stem density and/or poor vigor were supplementally planted. During the supplemental planting effort, approximately 370 stems were planted across 1.20 acres (approximately 300 stems per acre). As the planting was designated for visual purposes and was not an effort to increase stem density data, no stems were planted within permanent vegetation plots. The following table lists species included in the supplemental planting list. Preparation included the application of 100 lbs of lime, 50 lbs of fertilizer, and 3 lbs of seed to stabilize bare areas (see Figure A for planting areas).

2020 Supplemental Planting Species List

Species	Number of Stems
Tag Alder (*Alnus serrulata*)	20
Chinkapin (*Castanea pumila*)	20
Hackberry (*Celtis occidentalis*)	50
Hawthorn (*Crataegus marshallii*)	20
Crab Apple (*Malus angustifolia*)	50
Red Mulberry (*Morus rubra*)	100
Sycamore (*Platanus occidentalis*)	50
Shumard Oak (*Quercus shumardii*)	50
Total	**370**

Based on the number of stems counted, average densities were measured at 354 hardwood tree stems per acre (excluding livestakes, shrubs, pines, and vines) in year 5 (2023). In addition, all but two permanent plots met success criteria based on planted stems alone. Plot 1 meets success criteria when including naturally recruited stems of green ash (*Fraxinus pennsylvanica*). Additionally, two temporary vegetation transects also met success criteria. The following Table 5 summarizes riparian buffer success criteria and Table 6 summarizes all permanent vegetation plot data by species, plot, and year. Table 7 summarizes all

temporary vegetation plot data by species and transect. Vegetation plot photographs are included in Appendix B of the *Major Hill Stream and Wetland Mitigation Site Year 5 (2023) Annual Monitoring Report*.

Table 5. Riparian Buffer Vegetation Totals

Plot #	Success Criteria Met?	MY 5 (2023) Planted Stems/Ac	MY 5 (2023) All Stems/Ac
1	No	202	769
2	Yes	283	324
3	Yes	405	405
4	No	162	162
5	Yes	283	283
6	Yes	486	486
7	Yes	445	445
8	Yes	567	607
T-1	Yes	--	648
T-2	Yes	--	445
Average Planted Stems/Acre	**Yes**	**354**	**457**

4.4 2023 Maintenance and Management

Restoration Systems continues to monitor fescue throughout the Site. Based on permanent and random vegetation monitoring plots and visual observations, planted stems are establishing within areas where fescue was a concern.

On September 27, 2023, RS Staff members discovered an encroachment area measuring .04 acres on the site's south side shown on Figure 2 (Appendix B). An existing cattle fence was not relocated to boundary corners during construction. On December 02, 2023, the fence was relocated to outside of the easement. On December 05, 2023, a supplemental planting of twenty 3-gallon pots of mitigation plan approved species including of 5 Black gum (*Nyssa Sylvatica),* 5 Water Oak (*Quercus nigra*), and 10 Willow Oak (*Quercus phellos)* were planted within the encroached area, see Easement Inspection MY5 (2023) Photo Log.

Table 6. Total Stems by Plot and Species
DMS Project Code 17.009. Project Name: Major Hill

			Current Plot Data (MY5 2023)																						Annual Means																	
			17.009-01-0001			17.009-01-0002			17.009-01-0003			17.009-01-0004			17.009-01-0005			17.009-01-0006			17.009-01-0007			17.009-01-0008			MY5 (2023)			MY4 (2022)			MY3 (2021)			MY2 (2020)			MY1 (2019)			MY0 (2019)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree																													2								3				
Asimina triloba	pawpaw	Tree																			1	1	1				1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	7	7	7
Betula nigra	river birch	Tree										1	1	1							1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	4	4	4	6	6	6	9	9	9
Carpinus caroliniana	American hornbeam	Tree	1	1	1	3	3	3	4	4	4							2	2	2				1	1	1	11	11	11	11	11	11	11	11	11	10	10	10	14	14	14	5	5	5
Cercis canadensis	eastern redbud	Tree							2	2	2													2	2	2	4	4	4	3	3	3	4	4	4	5	5	5	8	8	8	14	14	14
Cornus amomum	silky dogwood	Shrub																																					2	2	2	1	1	1
Diospyros virginiana	common persimmon	Tree				1	1	2	1	1	1	1	1	1	1	1	1	1	1	1				4	4	4	9	9	10	8	8	8	8	8	10	9	9	10	9	9	9	5	5	5
Fraxinus	ash	Tree																						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fraxinus americana	white ash	Tree																3	3	3				1	1	1	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Fraxinus pennsylvanica	green ash	Tree	2	2	16							1	1	1	1	1	1				1	1	1				5	5	19	5	5	12	5	5	8	5	5	8	4	4	4	3	3	3
Liquidambar styraciflua	sweetgum	Tree																																							2				
Liriodendron tulipifera	tuliptree	Tree	1	1	1																						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5
Nyssa sylvatica	blackgum	Tree																												1	1	1	2	2	2	2	2	2	4	4	4	10	10	10
Platanus occidentalis	American sycamore	Tree				1	1	1							1	1	1	2	2	2							4	4	4	4	4	5	4	4	5	5	5	5	7	7	8	7	7	7
Quercus	oak	Tree	1	1	1																						1	1	1	1	1	1	1	1	1	2	2	2	3	3	3	23	23	23
Quercus nigra	water oak	Tree										1	1	1	4	4	4	3	3	3	3	3	3	1	1	1	12	12	12	12	12	12	12	12	12	12	12	12	20	20	20	10	10	10
Quercus phellos	willow oak	Tree				2	2	2	3	3	3							1	1	1	5	5	5	3	3	4	14	14	15	15	15	15	13	13	14	12	12	12	16	16	16	18	18	18
Quercus rubra	northern red oak	Tree																																	1									
Unknown		Shrub or Tree																																							6	6	6
		Stem count	5	5	19	7	7	8	10	10	10	4	4	4	7	7	7	12	12	12	11	11	11	14	14	15	70	70	86	72	72	82	72	72	80	75	75	79	103	103	109	129	129	129
		size (ares)	1			1			1			1			1			1			1			1			8			8			8			8			8			8		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.20			0.20			0.20			0.20			0.20			0.20		
		Species count	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	6	5	5	5	8	8	8	13	13	13	14	14	15	14	14	15	14	14	14	15	15	17	16	16	16
		Stems per ACRE	202.3	202.3	768.9	283.3	283.3	323.7	404.7	404.7	404.7	161.9	161.9	161.9	283.3	283.3	283.3	485.6	485.6	485.6	445.2	445.2	445.2	566.6	566.6	607	354.1	354.1	435	364.2	364.2	414.8	364.2	364.2	404.7	379.4	379.4	399.6	521	521	551.4	652.6	652.6	652.6

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

Table 7. Temporary Vegetation Plot Data

Species	50m x 2m Temporary Plot (Bearing)	
	T-1 (10°)	T-2 (345°)
Carpinus caroliniana	5	
Diospyros virginiana		8
Fraxinus pennsylvanica	6	
Platanus occidentalis	2	1
Quercus nigra		1
Quercus pagodas	3	1
Total Stems	**16**	**11**
Total Stems/Acre	**648**	**445**

5.0 REFERENCES

Jordan Lake Water Supply Watershed Buffer Rules 15A NCAC 02B .0267, 15A NCAC 02B .0268, and 15A NCAC 02B .0295

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Level 1-2 Plot Version 4.2. Ecosystem Enhancement Program, North Carolina Department of Environment and Natural Resources.

Schafale, M.P. and A.S. Weakley. 1990. *Classification of the Natural Communities of North Carolina: Third Approximation*. North Carolina Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, North Carolina.

ATTACHMENT 1

Figure A. Riparian Buffer Asset Map
Figure B. Riparian Buffer Planting Map
Year 5 (2023) Planted Stem Height Data

Legend

- Easement
- New Fencing Installed for Cattle Exclusion
- Existing Fencing Left in Place for Cattle Exclusion
- Fencing Removed/Reworked for Cattle Exclusion
- Stream Asbuilt TOB-TOB
- Marsh Treatment Area
- Plot Origins
- CVS Plots Meeting Success Criteria MY5
- CVS Plots Not Meeting Success Criteria MY5
- Vegetation Transects Meeting Success Criteria MY5
- 2020 Supplemental Planting Area
- Wetland Restoration
- Wetland Enhancement

Riparian Buffer Mitigation Type

- TOB - 100 ft. Restoration (1:1) - 213,290 sq ft
- 101 ft. - 200 ft. Restoration (1:1 but 33% credit per Rule) - 40,976 sq ft
- TOB - 100 ft. Enhancement (2:1 Cattle Ex. per Rule) - 341,433 sq ft
- TOB - 100 ft. Preservation (Non-Subject Stream 5:1) - 25,614 sq ft
- 101 ft. - 200 ft. Preservation (Non-Subject Stream 5:1 and 33% Credit per Rule) - 2,814 sq ft
- Non Credit Generating (Less than 20 ft.)
- TOB to 50 feet
- 100 foot line
- 150 foot line
- 200 foot line

N

UT-1

UT-2

UT-3

8 7 6 5 4 3 2 1

2

1

No credit is being generated within the Marsh Treatment Area.

This area is located outside of the easement and is not generating credit.

0 70 140 280 420 560 Feet

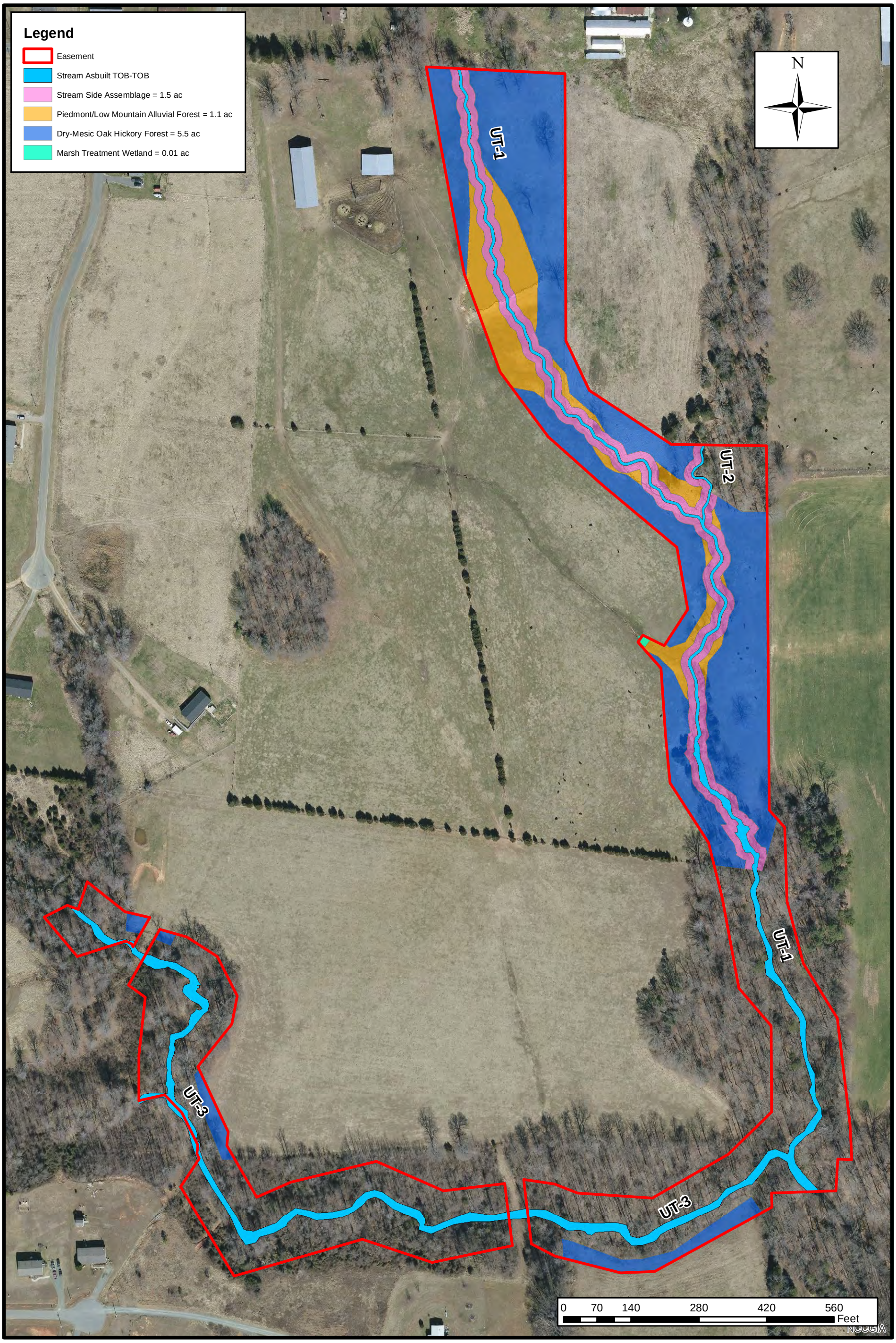
NCCGIA, NC 911 Board, community

Axiom Environmental
218 Snow Ave
Raleigh, NC 27607
(919) 215-1693

Riparian Buffer Asset Map
Major Hill Mitigation Site
Alamance County, North Carolina

Dwn. By:	KRJ
Date:	Nov 2023
Project:	17-009

FIGURE
A



Axiom Environmental
218 Snow Ave
Raleigh, NC 27607
(919) 215-1693
Axiom Environmental, inc.

Riparian Buffer Planting Map
Major Hill Mitigation Site
Alamance County, North Carolina

Dwn. By:	KRJ
Date:	Feb 2019
Project:	17-009

FIGURE
B

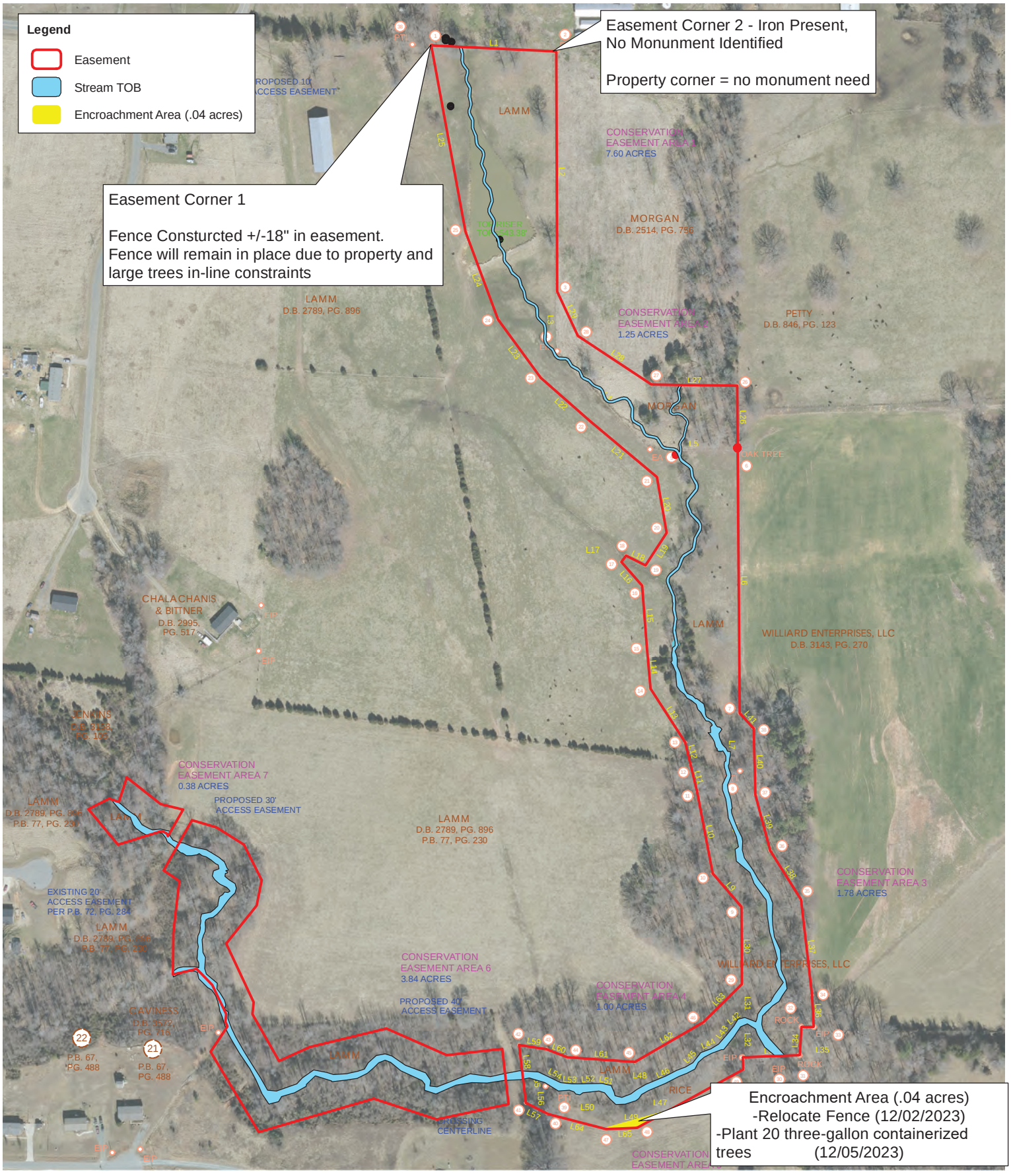
Year 5 (2023) Planted Stem Height Data

Plot	Scientific Name	X	Y	Height (cm)	DBH (cm)	Vigor
1	Liriodendron tulipifera	7.3	1.3	240	0.2	3
1	Carpinus caroliniana	9.2	4.1	251	0.25	2
1	Quercus	6.6	4.7	151	0.25	4
1	Fraxinus pennsylvanica	1.6	3.8	118	0.25	3
1	Fraxinus pennsylvanica	6.7	9.7	110	0.1	4
2	Quercus phellos	2.9	0.5	360	3	4
2	Carpinus caroliniana	4.8	3.4	160	0.25	4
2	Carpinus caroliniana	7.1	6.5	69		3
2	Platanus occidentalis	10.0	7.1	230	1.5	4
2	Nyssa sylvatica	4.5	8.0	0		0
2	Quercus phellos	1.6	5.9	280	2	4
2	Diospyros virginiana	7.8	2.6	165	0.5	4
2	Carpinus caroliniana	7.5	4.6	114		4
3	Carpinus caroliniana	2.4	1.4	340	2	4
3	Quercus phellos	5.3	1.4	260	1.5	4
3	Carpinus caroliniana	8.1	1.3	71		4
3	Carpinus caroliniana	6.8	2.7	110		4
3	Quercus phellos	10.0	3.0	120	0.5	4
3	Carpinus caroliniana	6.3	5.3	50		3
3	Cercis canadensis	4.2	10.0	10		4
3	Cercis canadensis	1.3	10.0	35		4
3	Diospyros virginiana	1.3	8.1	770	1.5	4
3	Quercus phellos	1.7	5.3	200	0.5	4
4	Fraxinus pennsylvanica	7.6	0.9	86		4
4	Betula nigra	7.6	3.3	61		4
4	Asimina triloba	8.3	8.2	0		0
4	Quercus nigra	6.2	8.0	60		4
4	Diospyros virginiana	2.4	7.2	131	0.1	4
5	Quercus nigra	0.3	1.0	240	2.5	4
5	Platanus occidentalis	2.8	0.1	370	5	4
5	Fraxinus pennsylvanica	2.1	3.7	265	2	4
5	Diospyros virginiana	5.1	4.3	50		4
5	Quercus nigra	5.5	1.2	100		4
5	Quercus nigra	7.5	8.0	110		4
5	Quercus nigra	0.2	6.5	225	0.25	4
5	Betula nigra	2.5	7.2	0		Missing
6	Quercus nigra	2.2	0.3	190	0.25	4
6	Carpinus caroliniana	3.0	2.7	95		3
6	Diospyros virginiana	0.9	3.4	205	1	4
6	Quercus phellos	6.5	0.8	205	1.5	4
6	Carpinus caroliniana	8.4	2.4	200	1	4
6	Quercus nigra	9.8	3.9	210	1.5	4
6	Platanus occidentalis	7.6	4.8	310	4	4
6	Fraxinus americana	9.0	7.0	380	2.5	4
6	Fraxinus americana	6.8	7.2	285	2	4
6	Fraxinus americana	4.6	8.0	290	2.5	4
6	Quercus nigra	0.5	8.1	230	0.5	4
6	Platanus occidentalis	2.2	6.7	320	2	4

Plot	Scientific Name	X	Y	Height (cm)	DBH (cm)	Vigor
7	Platanus occidentalis	2.6	2.5	0		Missing
7	Quercus phellos	4.8	0.9	340	2.5	4
7	Quercus phellos	5.3	3.0	390	5	4
7	Betula nigra	5.7	4.9	290	1.75	4
7	Quercus nigra	7.6	3.5	193	0.25	4
7	Quercus phellos	8.8	1.2	290	2.75	4
7	Asimina triloba	8.5	6.1	340	4.5	4
7	Quercus phellos	6.3	7.1	360	3.75	4
7	Quercus nigra	8.8	8.5	380	4.5	4
7	Quercus nigra	1.2	6.9	250	2	4
7	Quercus phellos	1.7	5.1	240	1.75	4
7	Fraxinus pennsylvanica	3.6	8.2	340	2.75	4
8	Diospyros virginiana	4.3	1.5	165	0.25	4
8	Fraxinus	4.8	3.2	150	0.25	4
8	Diospyros virginiana	1.3	4.6	160	0.25	4
8	Cercis canadensis	7.3	0.4	40		4
8	Fraxinus americana	9.9	2.9	130	0.1	4
8	Betula nigra	7.3	2.8	110		4
8	Quercus nigra	5.1	5.0	195	0.25	4
8	Carpinus caroliniana	7.5	5.7	95		4
8	Cercis canadensis	9.8	6.0	50		4
8	Quercus phellos	7.4	6.2	280	1.5	4
8	Diospyros virginiana	7.2	7.6	225	1	4
8	Quercus phellos	8.4	8.7	190	0.5	4
8	Fraxinus americana	5.0	8.5	92		4
8	Diospyros virginiana	3.0	7.1	172	0.5	4
8	Quercus phellos	1.7	9.2	151	0.25	4

Appendix H.
Easement Inspection Response

Figure 3. Map of Record Overview
NC DMS Comment Response
NC DMS Email Correspondence
Map of Record
Easement Inspection MY5 (2023) Photo Log



RESTORATION SYSTEMS, LLC
1101 HAYNES ST, SUITE 211
RALEIGH, NC 27604
PHONE : 919.755.9490
FAX : 919.755.9492

RESTORATION SYSTEMS
a DAVEY company

SCALE:1 in = 292 ft
DATE: Dec - 2023
PROJECT: Boudary Ins.

Major Hill Stream & Wetland Mitigation Site
NCDMS Contract # 7193. NCDMS Project ID 100015.
RFP # 16-006990

Figure 3: Map of Record Overview

AERIAL PHOTOGRAPHY
(c) 2010 Microsoft Corporation and its data suppliers
Copyright: (c) 2011 Esri, DeLorme, NAVTEQ, TomTom
COORDINATE SYSTEM: NAD 1983 SPLAS FEET

Response to Easement Boundary Inspection Year 5 (2023) Comments

Major Hill Mitigation Site (DMS #100015)
Cape Fear River Basin 0303002, Alamance County
Contract No. 100015

Comments Received (Black Text) & Response (Blue Text)

Danielle L. Mir, Eastern Project Manager, NC DEG Division of Mitigation Services

1. There were no conservation easement signs anywhere along the fence line.
   Response: Easement signs were installed at all easement corners and within easement boundary lines longer than 200 feet.

2. North side of fence corner falls about 12”-18” inside easement. The fence needs to be moved outside of the easement.
   Response: The fence built inside the easement at easement corner 1 will remain in place due to property constraints and large trees in-line of the property boundary. Please NC DMS Email Correspondence (Appendix H).

3. Cap does not have the survey number stamped which corresponds to the coordinates.
   Response: Survey cap 1 was determined to be appropriately stamped. See Easement Inspection MY5 (2023)se Photo Log (Appendix H).

4. There is not a 3 ¼ inch aluminum cap on this corner.
   Response: Easement corner 2 is a property corner identified as an existing iron pipe, see Map of Record (Appendix H).

From: Mir, Danielle
To: Merritt, Josh
Cc: Holz, Raymond; Dow, Jeremiah J
Subject: RE: [External] RE: Major Hill Stream and Wetland Restoration Site (100015) - Property Boundary Issues
Date: Monday, September 25, 2023 4:45:44 PM
Attachments: image003.png
image004.png
image001.png
image002.png

Hello Josh,

FYI. I just spoke with our property person, he let me know that there is another property owner near that corner that I marked red in the parcel's that I labeled A & B. . If the property mark is right on the parcel boundary, the fence cannot go outside the easement into another person's property. Since you will have a surveyor out to put a seal on the plates and verify, it may be helpful to make sure and mark that there is a different parcel. (The Easement shape and county parcel may not be all georeferenced properly since much of the project looks to be in parcel B – this is a quick overlay with nc one map)

Parcel A = Andrew M Tinnin (104203)
Parcel B = Andrew M Tinnin (104211)
Parcel C = Carol Lamim (104191)

Please let me know if you have any questions.

Danielle L. Mir
Eastern Project Manager
NC DEQ, Division of Mitigation Services
Cell: 919-896-0012 Off: 919-707-8949
danielle.mir@deq.nc.gov

From: Merritt, Josh <Joshua.Merritt@davey.com>
Sent: Monday, September 25, 2023 3:47 PM
To: Mir, Danielle <Danielle.Mir@deq.nc.gov>
Cc: Holz, Raymond <Raymond.Holz@davey.com>
Subject: [External] RE: Major Hill Stream and Wetland Restoration Site (100015) - Property Boundary Issues

Hey Danielle,

Thank you for your update and phone call. RS will work on resolving your noted issues.

We will coordinate with you on another site visit this Fall once the boundary has been thoroughly inspected and all issues are resolved.

Thanks again,
Josh M.

Joshua Merritt
Project Manager
(M): 919.830.9232

From: Mir, Danielle <Danielle.Mir@deq.nc.gov>
Sent: Monday, September 25, 2023 2:54 PM
To: Merritt, Josh <Joshua.Merritt@davey.com>
Cc: Holz, Raymond <Raymond.Holz@davey.com>
Subject: Major Hill Stream and Wetland Restoration Site (100015) - Property Boundary Issues

Hello Josh,

We went to Major Hill Thursday afternoon and looked at about 25% of the boundary. We will be happy to reschedule a full boundary inspection after the following items are addressed:

Entire Property

- There were no conservation easement signs anywhere along the fence line. (Please refer to the 3rd bullet of items 7, Step Three: Task 2 Payment, page 16 of the RFP below)

Placemark 1

- **Photo 1** – North side of fence corner falls about 12”-18” inside the easement.
  - The fence needs to be moved to the outside of the easement.

- **Photo 2** – Cap does not have the survey number stamped which corresponds to the coordinates. (Please refer to the 1st bullet of item 7, Step Three: Task 2 Payment, page 16 of the RFP below)

Placemark 2

- **Photo 3** – There is not a 3 ¼ inch aluminum cap on this corner.

Please note, that we did not look at the entire site and it is advised for you all to check all boundary corners prior to us coming out. Please let me know if you have any questions.

Have a great day.
-Danielle

Step Three: Task 2 Payment

The Contractor will complete the seven (7) listed deliverables along with invoice for Task 2 payment. Document deliverables shall be submitted electronically to the DMS project manager and SPO Manager Blane Rice (Blane.Rice@doa.nc.gov). Additionally, SPO requires one (1) hard copy of all the original documents and a compact disk mailed to Blane Rice, NC Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. Once received, SPO will issue authorization for payment.

1. Recorded Conservation Easement in Adobe PDF form
2. Recorded Survey Plat in Adobe PDF form
3. Updated digital easement file in AutoCAD (.dwg) and ArcMap (.shp) format
4. Final attorneys report on title based on 30-year search with deeds and documentation.

Additionally, the following must be satisfied during Task 2:

5. Original title insurance policy shall be forwarded to SPO as soon as it is available to Blane Rice.
6. Provide the name, address, phone number, and e-mail address (if available) of each grantor via electronic communication to SPO and DMS.
7. Install survey monumentation and conduct boundary marking with the following specifications:
   - The Contractor shall set 5/8" rebar 30" in length with 3-1/4" aluminum caps on all easement corners. Caps shall meet DMS specifications (Berntsen RBD5325, imprinted with NC State Logo # B9087 or equivalent). After installation, caps shall be stamped with the corresponding number from the table of coordinates on the survey.
   - The Contractor shall place a 6-foot tall durable witness post at each corner in the conservation easement boundary. Posts shall be made of material that will last a minimum of 20 years.
   - The Contractor shall attach a conservation easement sign to each witness post and place additional signs at no more than 200-foot intervals on long boundary lines. When applicable, the Contractor can mark existing trees (>3dbh) with conservation easement signs and/or blaze property lines at approximate eye level in lieu of line posts. Where applicable, established fence posts can be used for placement of signage.

/er: 7/1/15 Page 16 of 46

Danielle L. Mir
Eastern Project Manager
NC DEQ, Division of Mitigation Services
Cell: 919-896-0012 Off: 919-707-8949
danielle.mir@deq.nc.gov

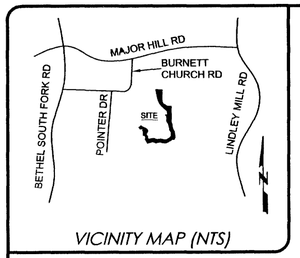
From:	Mir, Danielle
To:	Merritt, Josh
Cc:	Holz, Raymond; Dow, Jeremiah J
Subject:	100015 - Major Hill Stream and Wetland - Fence line
Date:	Monday, October 16, 2023 3:54:25 PM
Attachments:	image001.png

Hello Josh,

After speaking with the Property Team and Stewardship the fence at Major Hill on the north end is where it should be. The corner, that is 18" inside the easement will **not** need to be moved. I hope this helps.

Have a great day.
-Danielle

Danielle L. Mir
Eastern Project Manager
NC DEQ, Division of Mitigation Services
Cell: 919-896-0012 Off: 919-707-8949
danielle.mir@deq.nc.gov



VICINITY MAP (NTS)

DEED REFERENCE(S):

BEING A PORTION OF THE PROPERTIES RECORDED IN D B 2514, PG 756, D B 2789, PG 896, D B 3143, PG 270 AND D B 3150, PG 920 OF THE ALAMANCE COUNTY REGISTER OF DEEDS

SEE ALSO D B 2887, PG 545 & D B 3499, PG 383

MAP REFERENCE(S):

P B 77, PG 230
P B 42, PG 17
P B 62, PG 660
P B 48, PG 68
P B 69, PG 423
P B 70, PG 305
P B 72, PG 284
P B 71, PG 367
BK 67, PG 488
P B 75, PG 163
P B 77, PG 158

CERTIFICATION OF EXEMPTION:

I (We) hereby certify that I am (We are) the Owner(s) of the property shown and described hereon, which was conveyed to me (us) by deed recorded in Deed Book 2514, Page 756 (see also will filed in Alamance County Superior Court, Estates Division, 15 E 577), Deed Book 2887, Page 545, Deed Book 3143, Page 270, Deed Book 3150, Page 920, Book 3352, Page 536, and Deed Book 3499, Page 383 and that the subdivision of the property shown on this plat is an exception to the Subdivision Ordinance of Alamance County, North Carolina under Section 32 1

7-12-18 Date — James D Lamm

7-12-18 Date — Carol W Lamm

7-12-18 Date — James D Lamm, as Trustee of the James D Lamm Revocable Inter Vivos Trust Dated July 1, 1998

7-12-18 Date — Carol W Lamm, as Trustee of the James D Lamm Revocable Inter Vivos Trust Dated July 1, 1998

7-12-18 Date — Willliard Enterprises, LLC

7-12-18 Date — Andrew Morgan Tinnin, unmarried

7-12-18 Date — Joseph Marshall Rice, as Trustee of the Joseph Marshall Rice Revocable Declaration of Trust dated October 12, 2012

7-12-18 Date — Mary Elizabeth Rice, as Trustee of the Mary Elizabeth Rice Revocable Declaration of Trust dated October 12, 2012

7-12-18 Date — Joseph Marshall Rice

7-12-18 Date — Mary Elizabeth Rice

Date — Alamance County Subdivision Administrator

SURVEYORS CERTIFICATION(S)

Surveyor's disclaimer No attempt was made to locate any cemeteries, wetlands, hazardous material sites, underground utilities or any other features above, or below ground other than those shown However, no visible evidence of cemeteries or utilities, aboveground or otherwise, was observed by the undersigned (other than those shown).

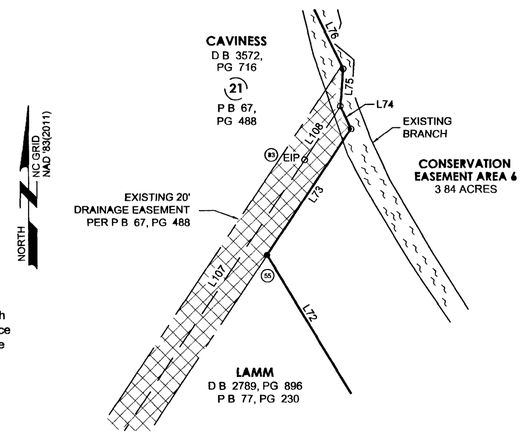
I certify that the survey is of another category (conservation easement), such as the recombination of existing parcels, a court-ordered survey, or other exemption or exception to the definition of subdivision.

I JOHN A. RUDOLPH , certify that this plat was drawn under my supervision from an actual survey made under my supervision (deed description recorded in Book SEE, Page REFS, etc.) (other); that the boundaries not surveyed are clearly indicated as drawn from information from in Book____, page____; that the ratio of precision or positional accuracy as calculated is 1/10,000+; that this plat was prepared in accordance with G S. 47-30 as amended. Witness my original signature, license number and seal this 21st day of June, A D , 2018.

SEAL OR STAMP

NORTH CAROLINA PROFESSIONAL SEAL L-4194 LAND SURVEYOR JOHN A RUDOLPH

Professional Land Surveyor — L-4194 License Number



INSET "B"

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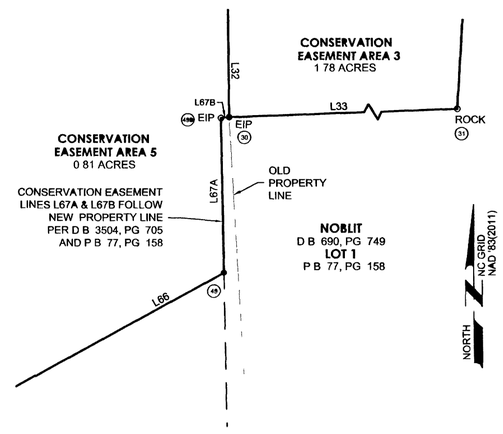
GRAPHIC SCALE 1" = 50'



INSET "C"

20 10 0 20 40 60

GRAPHIC SCALE 1" = 20'

FILED
ALAMANCE COUNTY, NC
HUGH WEBSTER
REGISTER OF DEEDS

FILED	Jul 17, 2018
AT	10:38:59 am
BOOK	00079
START PAGE	0237
END PAGE	0237
INSTRUMENT #	11836
EXCISE TAX	(None)

CH

STATE OF NORTH CAROLINA
COUNTY OF ALAMANCE

I, Nathan Page , Review Officer of Alamance County, certify that the map or plat to which this certification is affixed meets all statutory requirements for recording.

7/17/18 Date — Review Officer

STATE OF NORTH CAROLINA
COUNTY OF ALAMANCE

Filed for registration at _____ M _____, 2018 in the Register of Deeds

Office Recorded in P B _____, PG _____

Register of Deeds — By

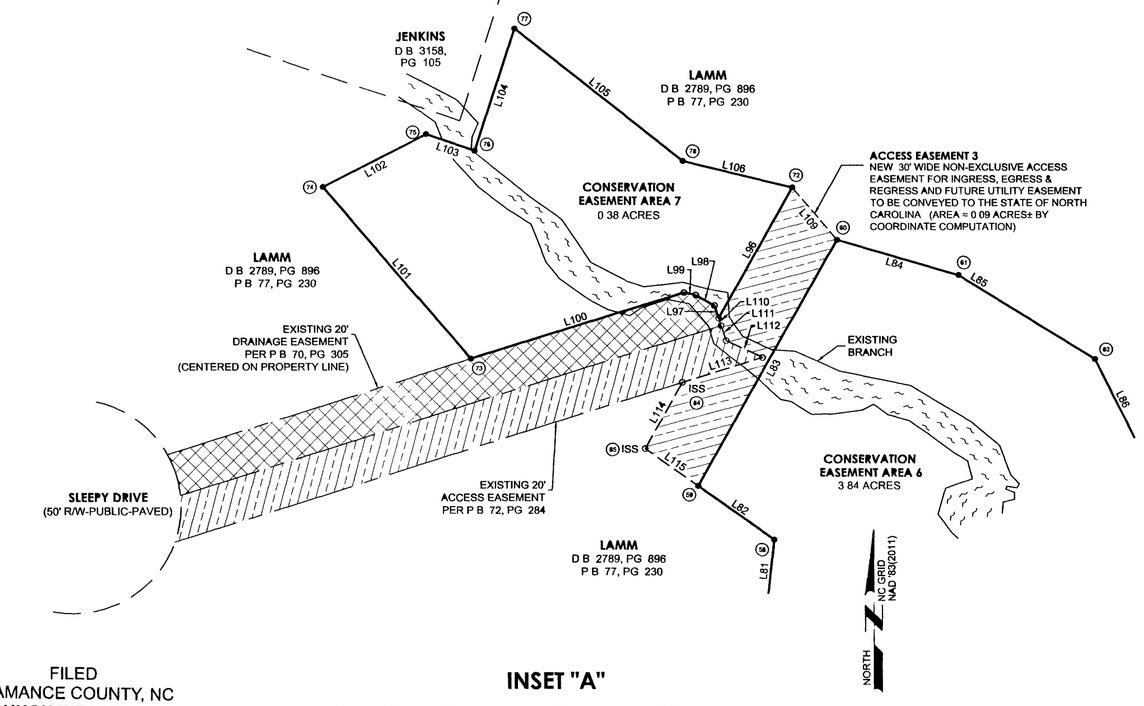
GENERAL NOTES:

1) NOTE: NO ABSTRACT OF TITLE, NOR TITLE COMMITMENT, OR RESULTS OF TITLE SEARCH WERE FURNISHED TO THE SURVEYOR ALL DOCUMENTS OF RECORD REVIEWED ARE NOTED HEREON (SEE REFERENCES) THERE MAY EXIST OTHER DOCUMENTS OF RECORD THAT MAY AFFECT THIS SURVEYED PARCEL

2) ALL DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES

3) THE NCSPC SHOWN ON ISS (86) WERE OBTAINED FROM AN NGS OPUS SOLUTION THIS OBSERVATION WAS STARTED ON 2017/07/27 16 05 00 AND ENDED ON 2017/07/27 18 10 00 USING A TOPCON HYPERLITE PLUS GPS UNIT THE COMBINED FACTOR IS 0 99991041 (GEOID 2012b CONUS) THE DATUM IS NAD '83(2011) THE FOLLOWING BASE STATIONS WERE USED IN THE OPUS SOLUTION

PID	DESIGNATION	LATITUDE	LONGITUDE
DG9328	DURH DURHAM COOP CORS ARP	N355946 129	W0785358 036
DF9213	NCBU BURLINGTON CORS ARP	N360529 586	W0792612 176
DL6900	NCZO ASHEBORO 2 CORS ARP	N353749 385	W0794553 753



INSET "A"

50 25 0 50 100 150

GRAPHIC SCALE 1" = 50'

FEMA FLOOD STATEMENT:

ALL OF THE AREA REPRESENTED BY THIS PLAT IS NOT LOCATED IN A FLOOD HAZARD BOUNDARY ACCORDING TO FEMA MAP NUMBER(S) 3710879700, ZONE(S) SHADED X, DATED SEPTEMBER 6, 2006

CONSERVATION EASEMENT ACREAGE DATA:

CONSERVATION EASEMENT AREA 1 (SPO FILE No 01-BA)	LAMM TRACT D B 2789, PG 896 P B 77, PG 230 PIN 8797237841 PARCEL ID 104191	7 60 ACRES±	12 82 ACRES±
CONSERVATION EASEMENT AREA 4 (SPO FILE No 01-BA)	LAMM TRACT D B 2789, PG 896 P B 77, PG 230 PIN 8797237841 PARCEL ID 104191	1 00 ACRES±	
CONSERVATION EASEMENT AREA 6 (SPO FILE No 01 BA)	LAMM TRACT D B 2789, PG 896 P B 77, PG 230 PIN 8797237841 PARCEL ID 104191	3 84 ACRES±	
CONSERVATION EASEMENT AREA 7 (SPO FILE No 01 BA)	LAMM TRACT D B 2789, PG 896 P B 77, PG 230 PIN 8797237841 PARCEL ID 104191	0 38 ACRES±	
CONSERVATION EASEMENT AREA 2 (SPO FILE No 01 BC)	TINNIN TRACT D B 2514, PG 756 PIN 8797344561 PARCEL ID 104211	1 25 ACRES±	1 25 ACRES±
CONSERVATION EASEMENT AREA 3 (SPO FILE No 01 BD)	WILLIARD ENTERPRISES, LLC TRACT D B 3143, PG 270 PIN 8797539910 PARCEL 104223	1 78 ACRES±	1 78 ACRES±
CONSERVATION EASEMENT AREA 5 (SPO FILE No 01 BB)	RICE TRACT D B 3150, PG 920 PIN 8797312076 PARCEL ID 104210	0 81 ACRES±	0 81 ACRES±
TOTAL CONSERVATION EASEMENT EXCLUDING ALL ACCESS EASEMENTS BY COORDINATE COMPUTATION			16 66 ACRES±

SHEET 1 OF 2

CONSERVATION EASEMENT SURVEY
FOR

THE STATE OF NORTH CAROLINA, DIVISION OF MITIGATION SERVICES

DMS PROJECT ID No. 100015

SPO FILE NUMBERS 01-BA, 01-BB, 01-BC & 01-BD

OF THE

MAJOR HILL STREAM & WETLAND MITIGATION SITE

JAMES D. LAMM AND CAROL W. LAMM, HUSBAND AND WIFE, AND JAMES D. LAMM AS TRUSTEE OF THE JAMES D. LAMM REVOCABLE INTER VIVOS TRUST DATED JULY 1, 1998 AND CAROL W. LAMM AS TRUSTEE OF THE CAROL W. LAMM REVOCABLE INTER VIVOS TRUST DATED JULY 1, 1998; ANDREW MORGAN TINNIN; WILLARD ENTERPRISES, LLC, A NORTH CAROLINA LIMITED LIABILITY COMPANY; AND JOSEPH M. RICE, AS TRUSTEE OF THE JOSEPH MARSHALL RICE REVOCABLE DECLARATION OF TRUST DATED OCTOBER 12, 2012 AND MARY ELIZABETH RICE, AS TRUSTEE OF THE MARY ELIZABETH RICE REVOCABLE DECLARATION OF TRUST DATED OCTOBER 12, 2012

NEWLIN TOWNSHIP ALAMANCE COUNTY NORTH CAROLINA

(THE FIELD SURVEY TOOK PLACE DURING DECEMBER 2017 & JANUARY 2018)

200 100 0 200 400 600

GRAPHIC SCALE 1" = 200'

DRAWN BY: FGR
DATE: 06/21/18
DWG. NO.: CWT269MR18
SURVEYED BY: J.A R.

k2 design group
5688 U S Hwy 70 East
Goldsboro, NC 27534
919 394 2547
k2design@suddenlink net

FIRM LICENSE No C-2111 K2 DESIGN GROUP P.A. CORPORATE SEAL 2000 NORTH CAROLINA

RESTORATION SYSTEMS, LLC
1101 HAYNES STREET
SUITE 211
RALEIGH, NC 27604

79-237

STATE OF NORTH CAROLINA
COUNTY OF ALAMANCE

Filed for registration at _____ M. _____ , 2018 in the Register of Deeds

Office Recorded in P B _____ , PG. _____ .

_____ _____
Register of Deeds By

STATE OF NORTH CAROLINA
COUNTY OF ALAMANCE

I, _____ , Review Officer of Alamance County, certify that the map or plat to which this certification is affixed meets all statutory requirements for recording.

_____ _____
Date Review Officer

COORDINATES ALONG CONSERVATION EASMENTS		
POINT No	NORTHING	EASTING
1	774642 1864	1893021 5159
2	774628 0790	1893308 8436
3	774075 8634	1893310 6023
4	773938 5379	1893311 0396
5	773712 6725	1893524 3815
6	773715 5966	1893726 0522
7	773105 4905	1893730 7806
8	772972 7761	1893731 8092
9	772660 1707	1893734 4617
10	772737 3081	1893668 5316
11	772925 1139	1893633 2760
12	772988 2119	1893617 6563
13	773038 2125	1893605 2788
14	773161 6870	1893525 4352
15	773260 2581	1893516 6333
16	773399 2977	1893506 7704
17	773453 2529	1893459 0716
18	773467 7794	1893469 4409
19	773445 9897	1893514 0289
20	773520 6970	1893562 7647
21	773649 3596	1893539 9522
22	773778 0221	1893385 4496
23	773877 6318	1893273 4610
24	774011 4824	1893174 9526
25	774213 8146	1893100 2936
26	773858 5358	1893724 9444
27	773861 7676	1893528 2085
28	773973 4773	1893358 9391
29	772482 0983	1893735 9727
30	772313 9419	1893737 3996
31	772318 5675	1893868 8809
32	772384 1794	1893872 8046
33	772383 7912	1893901 3329
34	772457 1558	1893897 6933
35	772676 2629	1893871 6517
36	772789 1882	1893801 2587
37	772917 8507	1893767 2992
38	773070 2234	1893762 8129
39	772247 6731	1893284 1550
40	772184 4427	1893287 4583
41	772209 1691	1893239 2423
42	772341 9821	1893223 6884
43	772332 6437	1893286 9411
44	772313 9669	1893334 6400
45	772303 6981	1893489 4154
46	772394 4141	1893647 0289
47	772148 9883	1893423 8160
48	772152 1011	1893494 3273
49	772284 9243	1893736 3523
49B	772313 8072	1893735 8753
50	772333 7358	1893184 3808
51	772205 6602	1893199 3799
52	772171 0395	1893033 9246
53	772219 1503	1892889 3469
54	772142 4102	1892624 4852
55	772326 9538	1892513 9451
56	772505 0446	1892427 6842
57	772599 8743	1892428 2077
58	772719 1138	1892441 4551
59	772744 0995	1892406 0851
60	772859 5306	1892470 9411
61	772843 0754	1892527 1817
62	772803 4348	1892590 4980
63	772721 4431	1892631 4673
64	772663 5068	1892619 6167
65	772575 4166	1892549 5286
66	772440 5708	1892612 5063
67	772412 7885	1892610 1362
68	772305 4768	1892671 1291
69	772336 9013	1892741 6404
70	772379 9241	1892918 5913
71	772319 2773	1893057 0744
72	772883 9244	1892450 2360
73	772803 4707	1892300 5965
74	772884 2960	1892232 3280
75	772908 6807	1892280 0506
76	772900 8878	1892302 6187
77	772957 7411	1892321 2258
78	772896 1543	1892399 2527

NOTE ONLY CORNER #110 IS A TRUE NORTH CAROLINA STATE PLANE GRID COORDINATE COORDINATES SHOWN ARE BASED ON GROUND DISTANCES TO MATCH PLAT

NORTH CAROLINA PROFESSIONAL SEAL L-4194 LAND SURVEYOR JOHN A RUDOLPH
06/21/2018

CURVE DATA ALONG TIE DOWN LINE					
CURVE	ARC LENGTH	RADIUS	DELTA ANGLE	CHORD BEARING	CHORD LENGTH
C1	70 52'	50 00'	80°48'43"	N83°15'31"E	64 82'

LINE DATA ALONG TIE DOWN LINES		
LINE	BEARING	DISTANCE
107	N33°42'37"E	323 02'
108	N33°42'37"E	30 00'
109	N40°19'27"W	32 00'
110	S18°03'41"E	3 72'
111	S18°03'41"E	7 41'
112	S65°01'39"E	18 66'
113	S72°33'25"W	39 14'
114	S29°19'47"W	35 45'
115	S54°45'44"E	30 16'

LINE DATA ALONG CONSERVATION EASEMENTS		
LINE	BEARING	DISTANCE
L1	S87°11'21"E	287 67'
L2	S00°10'57"E	552 22'
L3	S00°10'57"E	137 33'
L4	S43°22'00"E	310 69'
L5	N89°10'10"E	201 69'
L6	S00°26'39"E	610 12'
L7	S00°26'39"E	132 72'
L8	S00°29'10"E	312 62'
L9	N40°31'15"W	101 47'
L10	N10°37'55"W	191 09'
L11	N13°54'14"W	65 00'
L12	N13°54'14"W	51 51'
L13	N32°53'18"W	147 04'
L14	N05°06'10"W	98 96'
L15	N04°03'27"W	139 39'
L16	N41°28'41"W	72 02'
L17	N35°31'13"E	17 85'
L18	S63°57'21"E	49 63'
L19	N33°07'07"E	89 20'
L20	N10°03'16"W	130 67'
L21	N50°12'51"W	201 06'
L22	N48°20'53"W	149 88'
L23	N36°21'05"W	166 19'
L24	N20°15'13"W	215 67'
L25	N10°25'13"W	435 56'
L26	N00°26'39"W	142 94'
L27	N89°03'32"W	196 76'
L28	N56°34'38"W	202 81'
L29	N25°16'20"W	113 22'
L30	S00°29'10"E	178 08'
L31	S00°29'10"E	87 73'
L32	S00°29'10"E	80 43'
L33	N87°59'06"E	131 56'
L34	N03°25'20"E	65 73'
L35	S89°13'13"E	28 53'
L36	N02°50'24"W	73 45'
L37	N06°46'41"W	220 65'
L38	N31°56'16"W	133 07'
L39	N14°47'08"W	133 07'
L40	N01°41'11"W	152 44'
L41	N42°14'53"W	47 64'
L42	S51°50'20"W	14 45'
L43	S37°17'35"W	60 71'
L44	S65°36'26"W	49 10'
L45	S43°31'55"W	35 59'
L46	S64°38'30"W	130 56'
L47	S49°26'36"W	24 27'
L48	S74°06'47"W	23 16'
L49	N72°04'31"W	22 12'
L50	N33°30'07"W	26 02'
L51	N79°04'12"W	16 52'
L52	S86°14'41"W	48 68'
L53	N83°32'06"W	44 55'
L54	N62°23'02"W	37 07'
L55	S02°59'26"E	16 02'
L56	S02°59'26"E	63 32'
L57	N62°51'00"W	54 19'
L58	N06°40'47"W	133 72'
L59	S81°36'06"E	63 94'
L60	S68°37'00"E	51 22'
L61	S86°12'15"E	155 12'
L62	N60°04'37"E	181 86'
L63	N45°24'31"E	124 90'
L64	S75°25'31"E	140 89'
L65	N87°28'20"E	70 58'
L66	N61°14'31"E	276 08'
L67A	N00°56'46"W	28 89'
L67B	N84°57'00"E	1 53'
L68	S06°40'47"E	128 95'
L69	S78°10'54"W	169 04'
L70	N71°35'39"W	152 37'
L71	S73°50'30"W	275 75'
L72	N30°55'17"W	215 12'
L73	N33°42'37"E	70 36'
L74	N24°36'30"W	11 75'
L75	N04°29'13"E	17 36'
L76	N25°42'08"W	73 85'
L77	N43°54'06"W	36 81'
L78	N43°54'06"W	15 07'
L79	S77°03'59"W	55 17'
L80	N00°18'59"E	94 83'
L81	N06°20'22"E	119 97'
L82	N54°45'44"W	43 30'
L83	N29°19'47"E	132 40'
L84	S73°41'28"E	58 60'
L85	S57°57'02"E	74 70'
L86	S26°33'01"E	91 66'
L87	S11°33'37"W	59 14'
L88	S38°30'26"W	112 57'
L89	S25°02'03"E	148 83'
L90	S04°52'34"W	27 86'
L91	S29°36'46"E	123 43'
L92	N65°58'45"E	77 20'
L93	N76°20'05"E	182 11'
L94	S66°20'59"E	151 18'
L95	N83°31'14"E	128 12'
L96	S29°19'47"W	70 34'
L97	N18°03'41"W	6 28'
L98	N60°19'33"W	9 97'
L99	N78°19'42"W	5 54'
L100	S72°33'25"W	103 93'
L101	N40°11'09"W	105 80'
L102	N62°56'04"E	53 59'
L103	S70°56'59"E	23 88'
L104	N18°07'21"E	59 82'
L105	S51°42'57"E	99 40'
L106	S76°30'39"E	52 43'

LEGEND:
ISS - IRON STAKE SET
ECM - EXISTING CONCRETE MARKER
EIP - EXISTING IRON PIPE
EN - EXISTING NAIL
MNS - MAG NAIL SET
EIS - EXISTING IRON STAKE
EPP - EXISTING PUMP PIPE
PPS - PUMP PIPE SET
NMC - NON-MONUMENTED CORNER
R/W - RIGHT OF WAY
EOP - EDGE OF PAVEMENT
E/B - EASEMENT BOUNDARY
CL - CENTERLINE
UP - UTILITY POLE
P B - PLAT BOOK
D B - DEED BOOK
PG - PAGE
O NON-MONUMENTED CORNER
● No 5 REBAR FLUSH WITH GRADE WITH AN ALUMINUM 3 1/4" CAP INSCRIBED "STATE OF NORTH CAROLINA CONSERVATION EASEMENT"
CONSERVATION EASEMENT LINE
TIE DOWN LINE
RIGHT OF WAY LINE OR ADJOINER LINE
EASEMENT LINE
E UTILITY LINE
ACCESS EASEMENTS
DRAINAGE EASEMENTS

CORNER DESCRIPTIONS	
CORNER #	DESCRIPTION
1	No 5 REBAR FLUSH WITH GRADE WITH AN ALUMINUM 3 1/4" CAP INSCRIBED "STATE OF NORTH CAROLINA CONSERVATION EASEMENT"
2	0 75" O D IRON PIPE FLUSH WITH GRADE, BENT
3	No 5 REBAR FLUSH WITH GRADE WITH AN ALUMINUM 3 1/4" CAP INSCRIBED, "STATE OF NORTH CAROLINA CONSERVATION EASEMENT"
4	1 0" O D IRON PIPE 0 5' ABOVE GRADE
5	1 0" O D AXLE 0 1' ABOVE GRADE
6	OAK TREE
7	No 5 REBAR FLUSH WITH GRADE WITH AN ALUMINUM 3 1/4" CAP INSCRIBED "STATE OF NORTH CAROLINA CONSERVATION EASEMENT"
8	1 0" O D PINCHED-TOP IRON 1 0' ABOVE GRADE
9 THRU 29	No 5 REBAR FLUSH WITH GRADE WITH AN ALUMINUM 3 1/4" CAP INSCRIBED "STATE OF NORTH CAROLINA CONSERVATION EASEMENT"
30	1 5" O D IRON PIPE 0 75' ABOVE GRADE
31	6" x 8" ROCK 0 75' ABOVE GRADE
32	12" x 4" ROCK 0 5' ABOVE GRADE
33	1 0" O D IRON PIPE 0 5' ABOVE GRADE
34 THRU 38	No 5 REBAR FLUSH WITH GRADE WITH AN ALUMINUM 3 1/4" CAP INSCRIBED "STATE OF NORTH CAROLINA CONSERVATION EASEMENT"
39	1 0" O D PINCHED-TOP IRON 0 1' ABOVE GRADE
40 THRU 49	No 5 REBAR FLUSH WITH GRADE WITH AN ALUMINUM 3 1/4" CAP INSCRIBED "STATE OF NORTH CAROLINA CONSERVATION EASEMENT"
49B	1 0" O D IRON PIPE 0 3' ABOVE GRADE
50 THRU 78	No 5 REBAR FLUSH WITH GRADE WITH AN ALUMINUM 3 1/4" CAP INSCRIBED "STATE OF NORTH CAROLINA CONSERVATION EASEMENT"
79	No 5 REBAR FLUSH WITH GRADE
80	0 75" O D PINCHED-TOP IRON 0 1' ABOVE GRADE
81	1 0" O D IRON PIPE 0 2' ABOVE GRADE
82	1 5" O D IRON PIPE 0 3 BELOW GRADE
83	1 0" O D IRON PIPE FLUSH WITH GRADE, BENT
84 THRU 85	No. 5 REBAR FLUSH WITH GRADE
86	No 5 REBAR FLUSH WITH GRADE WITH BLUE PLASTIC CAP INSCRIBED "K2 DESIGN CONTROL POINT"

N.C.S.R. 2349
BURNETT CHURCH ROAD
(60' R/W-PUBLIC-PAVED)

ACCESS EASEMENT 1
NEW 10' WIDE NON-EXCLUSIVE ACCESS EASEMENT FOR INGRESS, EGRESS & REGRESS AND FUTURE UTILITY EASEMENT TO BE CONVEYED TO THE STATE OF NORTH CAROLINA (AREA = 0 10 ACRES± BY COORDINATE COMPUTATION)

S87°11'21"E 396 20' (TIE DOWN)
S87°11'21"E 43 88' (TIE DOWN)

CONSERVATION EASEMENT AREA 1
7 60 ACRES

TINNIN
D B 2514, PG 756

CONSERVATION EASEMENT AREA 2
1 25 ACRES

PETTY
D B 846, PG 123

LAMM
D B 2789, PG 896
P B 77, PG 230

THERE EXIST A FENCE ALONG CONSERVATION EASEMENT LINES L1 THROUGH L7 THAT IS NOT SHOWN FOR CLARITY

WILLIARD ENTERPRISES, LLC
D B 3143, PG 270

N54°52'43"E 140 56' (TIE DOWN ONLY)

NC GRID COORDINATE N=773,080 8226' E=1,893,410 4684'

ISS, REFERENCE POINT ONLY (SUITABLE FOR GPS OBSERVATION)

OLD BARBED WIRE FENCE

CHALACHANIS & BITTNER
D B 2995, PG 517

JENKINS
D B. 3158, PG 105

CONSERVATION EASEMENT AREA 7
0 38 ACRES

INSET "A" SEE SHEET 1 OF 2

ACCESS EASEMENT 3
NEW 30' WIDE NON-EXCLUSIVE ACCESS EASEMENT FOR INGRESS, EGRESS & REGRESS AND FUTURE UTILITY EASEMENT TO BE CONVEYED TO THE STATE OF NORTH CAROLINA (AREA = 0 09 ACRES± BY COORDINATE COMPUTATION)

LAMM
D B 2789, PG 896
P B 77, PG 230

EXISTING 20' DRAINAGE EASEMENT PER P B 70, PG 305 (CENTERED ON PROPERTY LINE)

EXISTING 20' ACCESS EASEMENT PER P B 72, PG 284

CONSERVATION EASEMENT AREA 3
1 78 ACRES

ACCESS EASEMENT 2
NEW 40' WIDE NON-EXCLUSIVE ACCESS EASEMENT FOR INGRESS, EGRESS & REGRESS AND FUTURE UTILITY EASEMENT TO BE CONVEYED TO THE STATE OF NORTH CAROLINA (AREA = 0 12 ACRES± BY COORDINATE COMPUTATION)

CONSERVATION EASEMENT AREA 6
3 84 ACRES

CONSERVATION EASEMENT AREA 4
1 00 ACRES

S78°09'06"W 40 16' (TIE DOWN)

CAVINESS
D B 3572, PG 716

P B 67, PG 488

EXISTING 20' DRAINAGE EASEMENT PER P B 67, PG 488

NOBLIT
D B 690, PG 749
LOT 1
P B 77, PG 158

INSET "C" SEE SHEET 1 OF 2

N84°58'10"E 40 02' (TIE DOWN)

CONSERVATION EASEMENT AREA 5
0 81 ACRES

LINES FROM L42 - L54 ARE THE CENTERLINE OF EXISTING BRANCH

RICE
D B 3150, PG 920-923

OLD PROPERTY LINE

FILED
ALAMANCE COUNTY, NC
HUGH WEBSTER
REGISTER OF DEEDS

FILED	Jul 17, 2018
AT	10:39:04 am
BOOK	00079
START PAGE	0238
END PAGE	0238
INSTRUMENT #	11837
EXCISE TAX	(None)

CH

SHEET 2 OF 2
CONSERVATION EASEMENT SURVEY
FOR
THE STATE OF NORTH CAROLINA, DIVISION OF MITIGATION SERVICES
DMS PROJECT ID No. 100015
SPO FILE NUMBERS 01-BA, 01-BB, 01-BC & 01-BD
OF THE
MAJOR HILL STREAM & WETLAND MITIGATION SITE

JAMES D. LAMM AND CAROL W. LAMM, HUSBAND AND WIFE, AND JAMES D. LAMM AS TRUSTEE OF THE JAMES D. LAMM REVOCABLE INTER VIVOS TRUST DATED JULY 1, 1998 AND CAROL W. LAMM AS TRUSTEE OF THE CAROL W. LAMM REVOCABLE INTER VIVOS TRUST DATED JULY 1, 1998; ANDREW MORGAN TINNIN; WILLARD ENTERPRISES, LLC, A NORTH CAROLINA LIMITED LIABILITY COMPANY; AND JOSEPH M. RICE, AS TRUSTEE OF THE JOSEPH MARSHALL RICE REVOCABLE DECLARATION OF TRUST DATED OCTOBER 12, 2012 AND MARY ELIZABETH RICE, AS TRUSTEE OF THE MARY ELIZABETH RICE REVOCABLE DECLARATION OF TRUST DATED OCTOBER 12, 2012

NEWLIN TOWNSHIP ALAMANCE COUNTY NORTH CAROLINA
(THE FIELD SURVEY TOOK PLACE DURING DECEMBER 2017 & JANUARY 2018)

200 100 0 200 400 600
GRAPHIC SCALE 1" = 200'

79-238

Major Hill
Boundary Inspection MY-05 (2023) Photo Log

Photo 1: Newly Installed Conservation Easement Sign (12/05/2023)

Photo 2: Newly Installed Conservation Easement Sign (12/5/2023)

Major Hill
Boundary Inspection MY-05 (2023) Photo Log

Photo 3: Fence Constructed 12”-18” Inside Easement Due Property and Trees In-line constraints (10/06/2023)

Photo 4: Easement Corner 1 Stamped Appropriately (10/06/2023)

Major Hill
Boundary Inspection MY-05 (2023) Photo Log

Photo 5: Encroached Area Depicted by Horse Tape (10/12/2023)

Photo 6: Relocated Fence and Planted Three-Gallon Trees Flagged with Pink Flagging (12/05/2023)