



MONITORING YEAR 2 ANNUAL REPORT

Final

ALEXANDER FARM MITIGATION SITE

Alexander County, NC
DEQ Contract No. 7416
DMS Project No. 100048
USACE Action ID No. SAW-2018-00451
NCDEQ DWR Certification No. 18-0665
RFP #: 16-007277

Catawba River Basin
HUC 03050101

Data Collection Period: January 2021 – November 2021
Final Submission Date: February 1, 2022

PREPARED FOR:



NC Department of Environmental Quality Division of Mitigation Services

1652 Mail Service Center
Raleigh, NC 27699-1652



February 01, 2022

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

RE: Draft Year 2 Monitoring Report
Alexander Farm Mitigation Site, Alexander County
Yadkin River CU 03040101
DMS Project ID No. 100022 / DEQ Contract #007186

Dear Mr. Tsomides:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft Year 2 Monitoring Report for the Alexander Farm Mitigation Site. The report has been updated to reflect those comments. The Final MY2 Report is included. DMS' comments are listed below in **bold**. Wildlands' responses to DMS' comments are noted in *italics*. Comments received via email on January 4, 2022 are also included.

DMS' comment: Please mention the recently submitted adaptive management planting plan in the executive summary.

Wildlands' response: Wildlands has added text about the submitted adaptive management planting plan in the executive summary.

DMS' comment: The February 2021 Adaptive Management Plan that was implemented for planting was noted in the write up and included as an Appendix, but it is not indicated whether or not the planting itself met the plan specifics (quantities, species, locations, etc). Please confirm the plan was followed, or note any deviations to species, quantities etc. if they occurred.

Wildlands' response: Wildlands notes that the February 2021 Adaptive Management Planting Plan was followed and that there were no deviations from the plan.

DMS' comment: There appears to be re-stating and internal redundancy when discussing the 2021 AMP planting in the last paragraph of Sec. 1.2.1 and first paragraph of 1.2.2, please review and revise as necessary.

Wildlands' response: Wildlands has revised these paragraphs by condensing them into one paragraph and removing redundant text.

DMS' comment: Please include the winter 2022 planting maps in Appendix 7, and the email transmittal, to go along with the table; When discussing the wet areas intended to be supplementally planted in Winter 2022 (sec. 1.2.3), please reference Appendix 7.

Wildlands' response: Wildlands has included the proposed planting list, the email correspondence, and the maps showing the supplemental planting areas in Appendix 7. The supplemental planting areas are depicted in a bright green outline and/or a pink diagonal hatch.



DMS' comment: Please keep an eye on some fescue-dense floodplain areas along Reaches 1a/1b/2, and address as appropriate.

Wildlands' response: Wildlands will keep an eye on these areas this spring and schedule ring sprays if necessary. Wildlands may also spray and reseed in patches to break up some of the larger fescue areas. Currently the bareroots in these areas are performing well.

DMS' comment: There is a crushed section of fencing (fallen branch) at the top of UT1 near the crossing, on the cattle pasture side of the creek. Please follow up with the landowner and/or farmer and include any appropriate discussion in the report.

Wildlands' response: Wildlands has already resolved this issue. There was only a little damage done to the fence itself, so we were able to remove the fallen branch and repair the fencing without issue.

DMS' comment: In looking at the signage and easement marking there were a few things I noted that may be an issue over time, or closer to close out; please respond to my email transmittal discussing some of these long-term items.

Email Correspondence received on January 4, 2022 in reference to a DMS site walk.

DMS' comment: Some of the signage is doubled-up (see photos sent via email); why are there double signs on most easement corners? It looked like maybe the wrong sign was initially installed. If there were misplaced signs, ideally the bad ones should be removed, if the top one falls off then there will be inaccurate signage on the project.

Wildlands' response: Wildlands will remove any incorrect signage posted along the conservation easement.

DMS' comment: Strongly recommend not using aluminum nails on signage in the future, especially on treated wood posts; the aluminum nails used on the signage is already starting to rust. Recommend tacking down the left and right corners on signs that are prone to cattle rubbing, there are a few that are getting bent up by passing cattle.

Wildlands' response: Wildlands will conduct the noted signage maintenance as needed.

DMS' comment: Wildlands notes that UT1 Reach 4A there is 110 LF of aggradation, and that remedial actions will be implemented if areas of concern threaten the stability of the project. What kind of remedial action would Wildlands conduct to rectify an overly aggraded section of channel, and when?

Wildlands' response: Though the area of aggradation has remained consistent in size throughout MY1 and MY2 and doesn't seem to be negatively affecting channel stability. If this condition changes, Wildlands will implement a remedial action plan that would likely consist of aggradation removal using hand tools and re-live staking the streambank as needed.

DMS' comment: There is a "bankfull" line on the CCPVs (thick dashed line), it is recommended removing this unless it serves a specific monitoring function on the maps.

Wildlands' response: Wildlands has removed the "bankfull" line from the CCPVs.

DMS' comment: What is meant by "alignment deviation" on the CCPVs? Does this mean there has been significant lateral migration of the channel? If there is an issue with this it should be identified appropriately and discussed in the report in addition to being mapped.

Wildlands' response: There is no issue with the channel in this area. The alignment deviation that is shown on the CCPV maps represents the as-built channel alignment and how it differs from the design alignment.



DMS' comment: Following MY1, some areas of erosion were noted by DMS along the enhancement reach along UT1 reach 2. Thank you for including the photos as requested. You have indicated that herbaceous vegetation has colonized and beginning to stabilize these areas and that repairs are not necessary at this time. Please continue to assess this reach; it would help to see some reach photos during the winter as well as summer.

Wildlands' response: Thank you. Wildlands will continue to monitor these areas and will take representative photos during the winter or early spring of 2022.

DMS' comment: Wildlands did not record a single bankfull event in 2021 using the automated pressure transducer (called "crest gage" in the report). It is unusual that a bankfull event did not occur, in a normal-ranged rain year (March, July and August all had >4 in. rainfall), and Wildlands reports that there were multiple relatively high flow events. The monitoring components table indicates that "Crest gages and/or transducers will be inspected and downloaded quarterly or semi-annually. Evidence of bankfull events such as rack lines or floodplain deposition will be documented with a photo when possible. Transducers, if used, will be set to record stage once every three hours."

1) Were the transducers fully functional and set to record every three hours? 2) Did Wildlands attempt to find any floodplain indicators of bankfull on the project? In the future, visual indicators might be noted with photos provided in the report. Please note that the credit release associated with the bankfull standard will not occur until the MP-approved credit release schedule bankfull standard is met (see approved mitigation plan credit release schedule for details).

Wildlands' response: 1) Yes, the one transducer on site (CG1) is fully functional and is set to record every 2 hours. 2) Though odd, Wildlands noted that many of our sites failed to generate a bankfull event this past year. Wildlands did not detect that the cause was a malfunctioning pressure transducer, and no floodplain indicators were noted during MY2. In future reports, visual indicators of bankfull will be included in the monitoring reports. Wildlands acknowledges that the credit release associated with the bankfull standard will not occur until the MP-approved credit release schedule bankfull standard is met.

Digital Support File Comments:

DMS' comment: Note that in Table 5, the column for UT1 Reach 1B says "warm".

Wildlands' response: Wildlands has fixed and updated the column for UT1 Reach 1B in Table 5 for the MY2 Final report.

DMS' comment: Please update Table 5 to state that there are 8 mobile vegetation plots.

Wildlands' response: Wildlands has updated Table 5 to reflect that there are 8 mobile vegetation plots.

DMS' comment: The submitted CVS mdb does not generate Table 7 or simple exports that match Table 10a. Please review the mdb and ensure the data it contains supports the table included in the report.

Wildlands' response: The "All Stem Plot" worksheet on the CVS Simple Table export is counting the dead stems; however, Table 10 in the report does not include dead stems. The CVS mdb included in the final electronic report files has been reviewed to ensure that the Table 7 export matches Table 10.

DMS' comment: Please submit a feature that characterizes the area(s) where supplemental planting occurred.

Wildlands' response: Wildlands has included with the electronic submittal the shapefiles that characterize the area(s) where supplemental planting occurred.



As requested, Wildlands has included two (2) hard copies of the final report, a full final .pdf copy of the report with the response letter inserted after the cover page, and a full final electronic submittal of the support files. A copy of our response letter has been included inside the front cover of each report's hard copy, as well. Please let me know if you have any questions.

Sincerely,

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

Kristi Suggs
Senior Environmental Scientist
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PREPARED BY:



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EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full-delivery stream mitigation project at the Alexander Farm Mitigation Site (Site) for the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS). The project restored, enhanced, and preserved a total of 6,722 linear feet (LF) of perennial stream in Alexander County, NC. The Site is located within the DMS targeted local watershed (TWL) for the Catawba River Basin HUC 03050101 and the NC Division of Water Resources (DWR) Subbasin 03-08-32. The project is providing 4,258.100 stream mitigation units (SMUs) for the Catawba River Basin Hydrologic Unit Code (HUC) 03050101130010 (Catawba 01).

The Site's immediate drainage area as well as the surrounding watershed has a long history of agricultural activity. Stream and wetland functional stressors for the Site were related to both historic and current land use practices. Major stream stressors for the Site included channel incision and widening, a lack of stabilizing riparian vegetation, a lack of bedform diversity and aquatic habitat, and agricultural related impacts such as channel manipulation or straightening and concentrated run-off inputs from agricultural fields. The effects of these stressors resulted in channel instability, loss of floodplain connection, degraded water quality, and the loss of both aquatic and riparian habitat throughout the Site's watershed when compared to reference conditions. The project approach for the Site focused on evaluating the Site's existing functional condition and evaluating its potential for recovery and need for intervention.

The project goals defined in the Mitigation Plan (Wildlands, 2019) were established with careful consideration of 2009 Upper Catawba River Basin Restoration Priorities (RBRP) goals and objectives to address stressors identified in the watershed through the implementation of stream restoration and enhancement activities and wetland re-establishment and rehabilitation activities, as well as riparian buffer re-vegetation. The established project goals include:

- Improve stream channel stability,
- Reconnect channels with historic floodplains,
- Improve in-stream habitat,
- Reduce sediment and nutrient inputs from adjacent farm fields,
- Restore and enhance native floodplain and wetland vegetation,
- Exclude livestock, and
- Permanently protect the project site from harmful uses.

The Site construction and as-built surveys were completed April - May 2020. Planting and baseline vegetation data collection occurred in April 2020. Fencing installation was completed in July 2020. MY2 assessments and Site visits were completed between January and November 2021 to assess the conditions of the project.

Overall, the Site is on track to meet the required stream, hydrology, and vegetative success criteria for MY3. The supplemental planting plan that was implemented in early 2021 has increased the overall average planted stem density for the Site from 304 stems in MY1 to 386 stems per acre in MY2. The Site is now on track to meet the vegetative success criteria for MY3, MY5, and MY7; however, there are approximately 2.1 acres within the easement that will need to be supplementally planted with more wetland tolerant species. Areas of loosely populated Chinese privet (*Ligustrum sinense*) were documented within the existing wooded areas along UT1 Reach 1A and the upstream portion of UT1 Reach 1B. A few isolated, mature stems of princess tree (*Paulownia tomentosa*) and tree of heaven (*Ailanthus altissima*) were also noted within the easement. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring with some minor adjustments, and streams are functioning as intended. In MY2, no bankfull events were documented on UT1 Reach 1A.



The MY2 visual assessment noted a few isolated areas of aggradation; however, the areas of bank scour noted in MY1 on UT1 Reach 2 have stabilized due to an increase in the establishment of bank vegetation. Wildlands will continue to monitor these areas throughout the seven-year monitoring period to benefit the ecological health of the Site.



ALEXANDER FARM MITIGATION SITE
Monitoring Year 2 Annual Report

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Department of Environmental Quality (DEQ)
Division of Mitigation Services (DMS)
Division of Water Resources (DWR)
Hydrologic Unit Code (HUC)
Interagency Review Team (IRT)
Monitoring Year (MY)
National Resource Conservation Service (NRCS)
Stream Mitigation Unit (SMU)
Targeted Local Watershed (TLW)
United States Army Corps of Engineers (USACE)
Unnamed Tributary (UT)
Catawba River Basin Restoration Priorities (RBRP)



Section 1: PROJECT OVERVIEW

The Alexander Farm Mitigation Site (Site) is located in Alexander County approximately 6 miles west of Statesville and 15 miles northeast of Hickory (Figure 1). The Site is located within the Elk Shoals Creek targeted local watershed (TLW) Hydrologic Unit Code (HUC) 03050101130010 and is being submitted for mitigation credit in the Upper Catawba River Basin 03050101. Located in the Northern Inner Piedmont belt within the Piedmont physiographic province (NCGS, 1985), the project watershed is dominated by agricultural and forested land.

The Site contains two unnamed tributaries, UT1 and UT1A, and eighteen riparian wetlands; however, no credit is being sought for project wetlands. For this project UT1 was broken into six reaches (Reach 1A, Reach 1B, Reach 2, Reach 3, Reach 4A, and Reach 4B). The project Site is bisected by Elk Shoals Church Loop Road between Reach 2 and Reach 3.

The overall Site topography consists of a gradually sloped valley running through the center of the project. Upstream of Elk Shoals Church Loop Road, the Site is characterized by a moderate slope. UT1 Reach 1 originates within the Site limits at a spring head and flows downslope through a moderately confined valley surrounded by open pasture. Approximately 600 feet downstream of the headwaters, the valley widens and continues downstream as a broad gently sloping floodplain to Elk Shoals Church Loop Road. Downstream of the road crossing, UT1 continues flowing south within a broad gently sloping floodplain to its confluence with UT1A from the left floodplain, where it originates as a wetland seep. At the confluence, UT1A joins UT1 and continues south to its confluence with Elk Shoals Creek within a broad alluvial floodplain. The site drains approximately 256 acres of rural land.

Prior to construction activities, the streams throughout the Site were in various stages of impairment related to the current and historical agricultural uses. UT1 Reaches 1 and 2 were severely impacted by cattle. On both reaches bedform diversity and habitat was very poor, primarily due to sedimentation and incision. UT1 Reach 3 was wooded and the majority of the reach consisted of low, stable stream banks with a few scour pockets located near ATV crossings. UT1 Reach 4 was extensively eroded, incised, and disconnected from its historic floodplain. Pre-construction conditions are outlined in Table 4 of Appendix 1 and Table 6 of Appendix 2.

The final mitigation plan was submitted and accepted by DMS in June of 2019 and the IRT in October of 2019. Construction activities were completed in April 2020 by Baker Grading & Landscaping Inc. Turner Mapping and Surveying completed the as-built survey in May 2020. Planting was completed following construction in April 2020 by Bruton Natural Systems, Inc. A conservation easement has been recorded and is in place on 21.7 acres. The project is providing 4,258.100 stream mitigation units (SMUs) for the Catawba River Basin Hydrologic Unit Code (HUC) 03050101130010 (Catawba 01). Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2027 given the success criteria are met.

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

1.1 Project Goals and Objectives

The Site is providing numerous ecological benefits within the Upper Catawba Basin. The project goals were established with careful consideration to address stressors that were identified in the 2009 Upper Catawba River Basin Restoration Priorities (RBRP) report. The project has improved stream functions



through stream restoration and the conversion of maintained agricultural fields into riparian buffer within the Upper Catawba River Basin, while creating a functional riparian corridor at the Site.

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

Goals	Objectives
Improve stream channel stability.	Restore stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions. Create stable tie-ins for tributaries joining restored channels. Add bank revetments and in-stream structures to protect restored streams.
Reconnect channels with historic floodplains.	Reconstruct stream channels with bankfull dimensions relative to the floodplain.
Improve instream habitat.	Install habitat features such as constructed riffles, cover logs, and brush toes into restored streams. Add woody materials to channel beds. Construct pools of varying depth.
Reduce sediment and fecal coliform and nutrient input from adjacent farm fields.	Construct a step pool stormwater conveyance system to slow and treat runoff from farm field before entering Site streams.
Restore and enhance native floodplain and wetland vegetation.	Plant native tree and understory species in riparian zone where currently insufficient. Remove invasive species within the riparian corridor.
Exclude livestock from stream channels.	Exclude livestock from stream channels and riparian areas.
Permanently protect the project site from harmful uses.	Establish a conservation easement on the Site.

1.2 Monitoring Year 2 Data Assessment

Annual monitoring for MY2 was conducted between January and November to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Alexander Farm Mitigation Plan (Wildlands, 2019).

1.2.1 Vegetation Assessment

Vegetation plot monitoring is being conducted in post-construction monitoring years 1, 2, 3, 5, and 7. Permanent plots are monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008) and the 2016 USACE Stream and Wetland Mitigation Guidance to assess the vegetation success. A total of 9 permanent vegetation plots were established within the project easement area using either a 10-meter by 10-meter square plot or a 5-meter by 20-meter rectangular plot. In addition, 3 mobile vegetation plots were relocated in MY2 throughout the planted conservation easement, as described in the Site’s Baseline Conditions Report (Wildlands, 2020). To evaluate the random vegetation performance for the Site, mobile plots will continue to be reestablished in different random locations in monitoring years 3, 5, and 7. Mobile vegetation plot assessments will document stems, species, and height using 100-meter² circular, square,

or rectangular plots. The final vegetative performance standard will be the survival of 210 planted stems per acre in the planted riparian areas at the end of the required seven-year monitoring period. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of MY3 and at least 260 stems per acre at the end of MY5.

The MY2 vegetation survey was completed in November 2021, resulting in a total average planted density of 386 stems per acre for all monitored permanent and mobile vegetation plots. This year's results, indicate that the supplemental planting that occurred in early 2021 has been successful in getting the project on track to meet future success criteria. The Site's average stem density currently exceeds the interim MY3 requirement of 320 planted stems per acre. Out of the 9 permanent vegetation plots, seven are on track to meet the interim MY3 requirement with densities ranging from 324 to 607 planted stems per acre. The two permanent plots that did not meet the MY3 planted stem densities were VP7 and VP9 with an average of 121 and 243, respectively.

Due to low planted stem densities recorded in MY1, an Adaptive Management Plan (AMP) was approved by the IRT in March 2021 for supplemental plantings within the low-density areas. As part of the monitoring requirements approved in the AMP, 5 additional mobile vegetation plots (MP4 - MP8) were installed for a total of 8 mobile plots. Currently, 5 of the 8 mobile vegetation plots are on track to meet the interim MY3 requirement of 320 planted stems per acre, with stem densities ranging from 400 to 688 stems per acre. Densities for the mobile plots that did not meet MY3 requirements ranged from 40 to 229 stems per acre. In both the permanent and mobile vegetation plots, the majority of the surviving stems appear to be thriving with a vigor of 3 or greater. Please refer to Section 1.2.2 and 1.2.3 for additional discussion of the MY2 vegetative areas of concern and the approved AMP. Appendix 2 for vegetation plot photographs, and Appendix 3 for vegetation data tables.

1.2.2 Approved Adaptive Management Plan

To address areas of low stem density that were recorded in MY1, an Adaptive Management Plan (AMP) was prepared and approved by the IRT on March 12, 2021. Supplemental planting occurred on March 23, 2021 and consisted of approximately 10 acres at a stem density of 500 stems per acre, as depicted on Figures 1.1 – 1.3 included in Appendix 6. As part of this plan's implementation, the IRT requested that additional mobile plots, and an additional year of monitoring, be implemented to monitor stem survival in the supplementally planted areas. In addition, the IRT also requested an extra mobile plot be installed to document stem densities within the existing wetlands. In response to this request, Wildlands added one mobile plot for monitoring existing wetlands (MP4) and four mobile plots (MP5 – MP8) to monitor the areas outlined in the AMP. Wildlands will also conduct an extra year of monitoring for the supplementally planted areas outlined in the AMP during MY6. If the data collected in these areas suggest that vegetative performance is not on a trajectory for success, an additional year of monitoring may be required in MY8. See Appendix 6 for a copy of the AMP.

1.2.3 Vegetation Areas of Concern

In general, the Site has responded well to supplemental planting and vegetation is establishing throughout the easement. However, in a small portion of the easement, areas of low planted stem density and invasive species continue to persist in MY2. These areas are discussed below in further detail.

Vegetative Cover

Overall, herbaceous ground cover is now well established throughout the Site and stabilizing the soil. After implementing the AMP in early 2021, observations during Site visits in MY2 identified that most of the areas outlined in the AMP for supplemental planting are doing very well with high survival rates, and

the Site's low stem density areas have decreased considerably from MY1 to MY2. Though low stem density areas are much smaller in size, there are still a few vegetative areas of concern (AOC) as described below.

Two of these areas of concern, located along the left floodplain of UT4B from Station 152+00 - 157+10 and 163+75 - 166+66, continue to struggle and are trending much wetter than anticipated, relative to existing conditions. The other area of concern is located within some of the existing wetlands. Though these wetlands' planted stem densities are less than optimal their overall densities are generally sufficient when volunteers are included. Therefore, the supplementally planted wetlands are not included in Table 7 and are represented as wetland planting areas on Figures 3.1 and 3.2 rather than low stem density.

In order to improve planted stem densities within these areas described, wetland species will be planted, as needed, during the winter of 2022. Out of ten of the proposed species, three were included in the approved Mitigation Plan. Wildlands is requesting the inclusion of the other seven species to increase diversity and tolerance of the wetter than expected conditions. See Appendix 7 for the proposed planting lists, NC IRT approval email, and for the proposed planting locations.

Invasive Species

MY2 visual assessments indicated approximately 0.40 acres of loosely populated Chinese privet (*Ligustrum sinense*) within some of the existing wooded areas along UT1 Reach 1A and the upstream portion of UT1 Reach 1B. In addition, a few isolated, mature stems of princess tree (*Paulownia tomentosa*) and tree of heaven (*Ailanthus altissima*) were noted with the easement. Wildlands' Stewardship Team is currently working on the removal of all of these invasives from the conservation easement and will continue to monitor these areas for resprouts throughout the seven-year monitoring period.

See Table 7 and Figures 3.0 – 3.3 in Appendix 2 for acreages and locations, respectively.

1.2.4 Stream Assessment

Riffle cross-sections on the restoration reaches should be stable and show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. All riffle cross-sections should fall within the parameters defined for the designated stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg and/or eroding channel banks. Remedial action would not be taken if channel changes indicate a movement toward stability.

Morphological surveys for MY2 were conducted in July 2021. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration reaches with minimal adjustments. Minor changes occurring within some cross-sections include slight decreases in cross-sectional areas and mean depths. These changes can be attributed to the establishment of vegetation along the tops of banks, point bar development, and in-stream bench development.

These occurrences are normal for newly restored streams and are examples of how a channel adjusts to maintain stability from natural processes. The fact that cross-sections have incurred only minor adjustments shows that the system is functioning as designed. It is able to move sediment through the system and access its floodplain thereby negating aggradational and degradational stressors such as an influx of sediment to the system and higher discharges and increased velocities.

Reachwide pebble counts along all restoration reaches indicate maintenance of coarser materials in riffle features and finer particles in the pool features. Please refer to Appendix 2 for the visual stability

assessment tables, CCPV Figures 3.0 – 3.3, and stream photographs, and Appendix 4 for the morphological tables and plots.

1.2.5 Stream Hydrology Assessment

An automated pressure transducer was installed to document stream hydrology throughout the seven-year monitoring period. Henceforth, these devices are referred to as “crest gages (CG)” for those recording bankfull events. At the end of the seven-year monitoring period, four or more bankfull flow events must have occurred in separate years. Though there were multiple relatively high flow events during MY2, no bankfull events were recorded. Please refer to Appendix 5 for hydrology summary data, gage plots, and monthly rainfall totals for 2021.

1.2.6 Stream Areas of Concern and Management Activity

All streams on the Site are remaining stable. The three areas of concern that were recorded in MY1 have stabilized with streambank vegetation and are no longer an issue. During the MY2 visual stream assessment a couple minor areas of concern were noted along UT1 Reach 1A and UT1 Reach 4A. On UT1 Reach 1A, station 140+00, there are a couple small areas of piping under the angled log sills within the riffle. On UT1 Reach 4A there is approximately 110 LF of aggradation from station 138+75 to 139+85. It is anticipated that the channel will continue to move the sediment through the system, and it will no longer be an issue. Wildlands will continue to monitor these areas and remedial actions will be implemented if areas of concern begin to threaten the stability of the project. Please refer to Appendix 2 for stream stability tables, area of concern photos, and CCPV Figures 3.0 – 3.3.

1.2.7 Wetland Assessment

During baseline monitoring, two In-situ Level TROLL® 100 pressure transducers, hereby referenced as ground water monitoring gages (GWGs), were installed within existing wetlands where Priority 1 restoration was conducted. This was done solely to verify the continuation of hydrologic wetland functions during the growing season, since no wetland credits are being sought for this project and no performance criteria have been established.

All GWGs are downloaded on a quarterly basis and maintained as needed. Calibration was completed by manually measuring water levels on all gages which confirmed the downloaded data. The NRCS Climate Analysis for Wetlands Tables (WETS) does not list a defined growing season for Alexander County due to insufficient data; therefore, the nearest WETS Station is Statesville 2 NNE (USDA, 2020) in Iredell County which is approximately 13.5 miles from the project site was used. The growing season based on data compiled from this WETS Station (1980 – 2020) is from April 4 through November 2 under typical precipitation conditions. The Site does not contain a rainfall gage; therefore, the daily precipitation data was collected from closest USGS gage, 354616081085145, located at Oxford RS NR in Claremont, NC.

Results from both GWGs, during MY2, show that riparian wetlands maintained free groundwater within 12 inches of the ground surface for 47 consecutive days or 22.1% of the growing season for GWG1 and the entire growing season, 213 consecutive days, for GWG2. Photos of the ground water gages exhibit additional wetland indicators such as hydrophytic vegetation and saturated soils.

Please refer to Appendix 2 for the groundwater gage locations on Figures 3.0-3.3, and the groundwater gage photographs. Please refer to Appendix 5 for groundwater hydrology data and plots.

1.3 Monitoring Year 2 Summary

Overall, the Site is performing well. The average planted stem density for the Site is 386 stems per acre and is currently on track to meet the MY3 requirement of 320 stems per acre. As previously mentioned, vegetative success rates have greatly improved throughout most of the Site in MY2 with help from

supplemental planting in early 2021. Most of the Site is on track to meet the MY3, MY5 and MY7 vegetative requirements; however, there are approximately 2.1 acres within the easement that will need to be supplementally planted with more wetland tolerant species. Areas of loosely populated Chinese privet (*Ligustrum sinense*) were documented within the existing wooded areas along UT1 Reach 1A and the upstream portion of UT1 Reach 1B. A few isolated, mature stems of princess tree (*Paulownia tomentosa*) and tree of heaven (*Ailanthus altissima*) were also noted. Geomorphic surveys indicate that cross-section bankfull dimensions closely match baseline monitoring with some minor adjustments, and the streams are functioning as intended. At least one bankfull event was documented on Site since the completion of construction; however, no bankfull events were documented in the current monitoring year. The MY2 visual assessment found that erosional areas of concern noted in MY1 are now well vegetated, stable, and are no longer of issue. Wildlands will continue to monitor the Site, and additional adaptive maintenance will be implemented, as necessary throughout the seven-year monitoring period to benefit the ecological health of the Site.



Section 2: METHODOLOGY

Geomorphic data were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Crest gages and groundwater gages are monitored quarterly. Hydrologic instrument installations are in accordance with the United States Army Corps of Engineers (USACE, 2005) standards and monitoring with the IRT's Stream and Wetland Mitigation Update (2016). Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

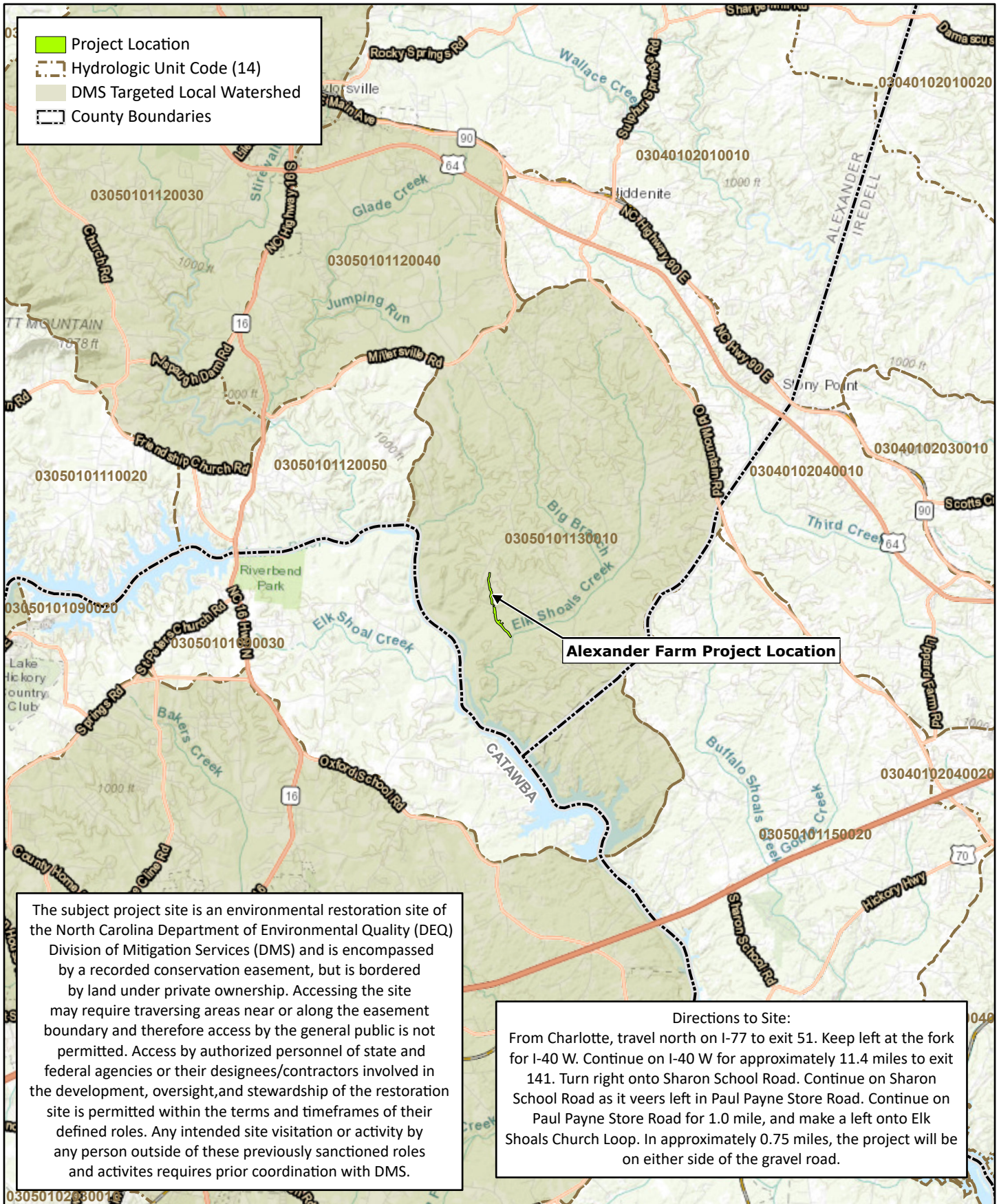


Section 3: REFERENCES

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APPENDIX 1. General Figures and Tables



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

Directions to Site:
 From Charlotte, travel north on I-77 to exit 51. Keep left at the fork for I-40 W. Continue on I-40 W for approximately 11.4 miles to exit 141. Turn right onto Sharon School Road. Continue on Sharon School Road as it veers left in Paul Payne Store Road. Continue on Paul Payne Store Road for 1.0 mile, and make a left onto Elk Shoals Church Loop. In approximately 0.75 miles, the project will be on either side of the gravel road.

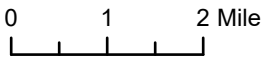
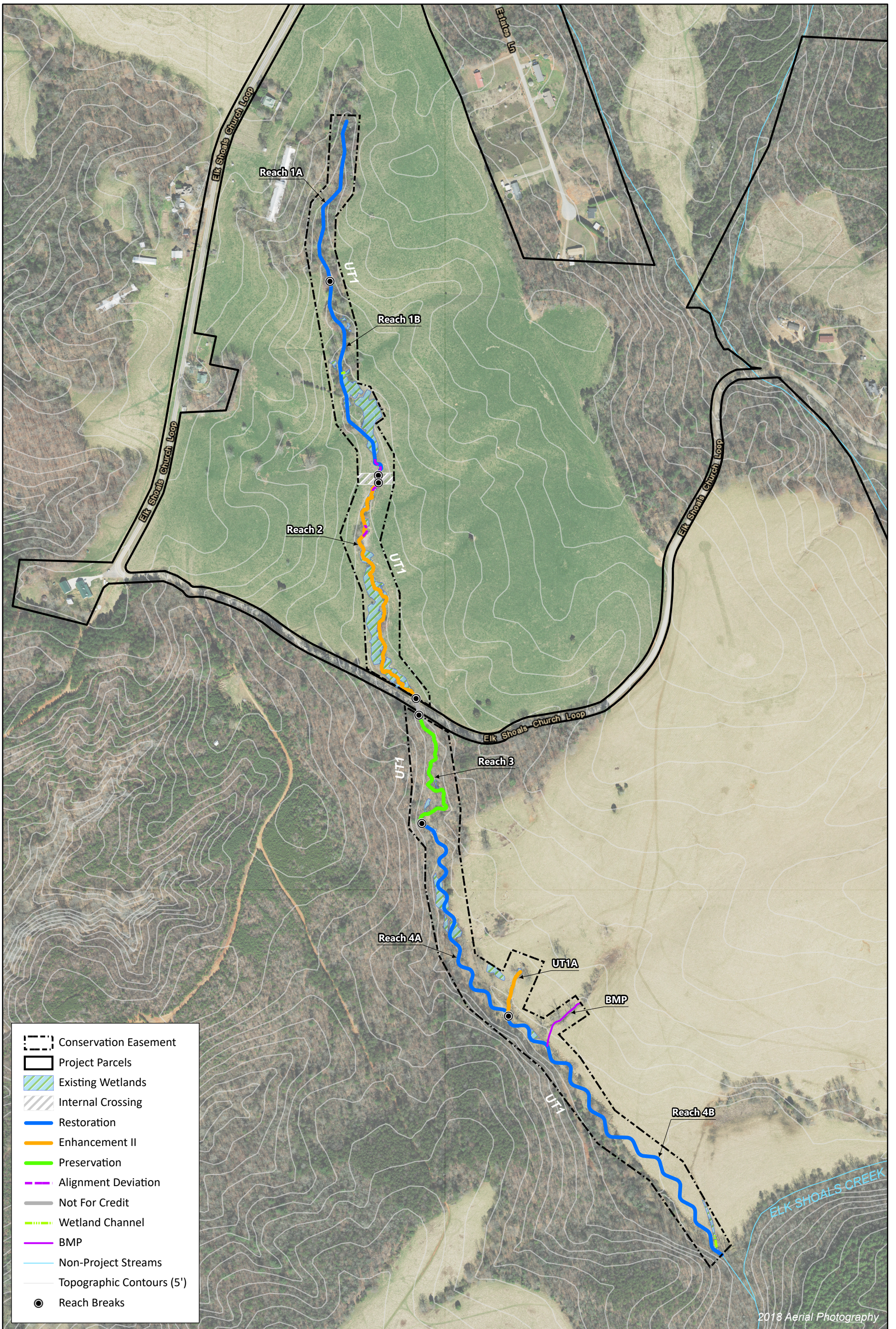


Figure 1 Project Vicinity Map
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021
 Alexander County, NC



- Conservation Easement
- Project Parcels
- Existing Wetlands
- Internal Crossing
- Restoration
- Enhancement II
- Preservation
- Alignment Deviation
- Not For Credit
- Wetland Channel
- BMP
- Non-Project Streams
- Topographic Contours (5')
- Reach Breaks

2018 Aerial Photography

Figure 2 Project Component/ Asset Map
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021
 Alexander County, NC

Table 2. Project Activity and Reporting History

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Activity or Report		Data Collection Complete	Completion or Delivery
404 Permit		October 2019	November 2019
Mitigation Plan		March 2018 - October 2019	October 2019
Final Design - Construction Plans		September 2019	September 2019
Construction		December 2019 - April 2020	April 2020
Temporary S&E mix applied to entire project area ¹		April 2020	April 2020
Permanent seed mix applied to reach/segments ¹		April 2020	April 2020
Bare root and live stake plantings for reach/segments		April 2020	April 2020
Baseline Monitoring (Year 0)	Stream Survey	April - May 2020	September 2020
	Vegetation Survey	Collected - April 2020 Verified - June 2020	
Year 1 Monitoring	Invasive treatment	May - August 2020	December 2020
	Stream Survey	December 2020	
	Vegetation Survey	October 2020	
Year 2 Monitoring	Supplemental Plantings	March 2021	December 2021
	Live Stake Install	March 2021	
	Soil Amendments & Seeding	June 2021	July 2021
	Invasive treatment	July 2021	August 2021
	Stream Survey	July 2021	December 2021
	Vegetation Survey	November 2021	
Year 3 Monitoring	Stream Survey		
	Vegetation Survey		
Year 4 Monitoring	Stream Survey		
	Vegetation Survey		
Year 5 Monitoring	Stream Survey		
	Vegetation Survey		
Year 6 Monitoring	Stream Survey		
	Vegetation Survey		
Year 7 Monitoring	Stream Survey		
	Vegetation Survey		

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

Table 3. Project Contact Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Designers Aaron Earley, PE, CFM	Wildlands Engineering, Inc. 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractors	Baker Grading & Landscaping, Inc 970 Bat Cave Road Old Fort, NC 28762
Planting Contractor	Bruton Natural Systems, Inc. PO Box 1197 Fremont, NC 27830
Seeding Contractor	Baker Grading & Landscaping, Inc. 970 Bat Cave Road Old Fort, NC 28762
Seed Mix Sources	Baker Grading & Landscaping, Inc.
Nursery Stock Suppliers	
Bare Roots Live Stakes	Bruton Natural Systems, Inc.
Herbaceous Plugs	Wetland Plants Inc.
Monitoring Performers	Wildlands Engineering, Inc.
Monitoring, POC	Kristi Suggs (704) 332.7754 x.110

Table 4. Project Information and Attributes

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Project Information					
Project Name	Alexander Farm Mitigation Site				
	Alexander County				
Project Area (acres)	21.7				
Project Coordinates (latitude and longitude)	35° 48' 42.36"N 81° 7' 14.46"W				
Planted Acreage (Acre of Woody Stems Planted)	17.5				
Project Watershed Summary Information					
Physiographic Province	Piedmont Physiographic Province				
River Basin	Catawba River				
USGS Hydrologic Unit 8-digit	3050101				
USGS Hydrologic Unit 14-digit	3050101130010				
DWR Sub-basin	03-08-32				
Project Drainage Area (acres)	UT1 - 256, UT1A - 7.4				
Project Drainage Area Percentage of Impervious Area	1%				
2011 NLCD Land Use Classification	Forest (20%), Cultivated (73%), Grassland (1%), Shrubland (1%), Urban (5%), Open Water (0%)				
Reach Summary Information					
Parameters	UT1 Reach 1A and 1B	UT1 Reach 2	UT1 Reach 3	UT1 Reach 4A and 4B	UT1A
Length of reach (linear feet) - Post-Restoration	1,727	1,253	701	2,838	203
Valley confinement (Confined, moderately confined, unconfined)	Confined	Unconfined	Moderately Confined	Unconfined	Unconfined
Drainage area (acres)	71	117	141	256	7
Perennial, Intermittent, Ephemeral	P	P	P	P	I
NCDWR Water Quality Classification	WS-IV				
Morphological Description (stream type) - Pre-Restoration	B4	B4	N/A	C4c/G4c	N/A
Morphological Description (stream type) - Post-Restoration	B4	B4	N/A	C4	N/A
Evolutionary trend (Simon's Model) - Pre-Restoration	III	V	I/II	IV	III
FEMA classification	N/A	N/A	N/A	Zone AE	N/A
Regulatory Considerations					
Regulation	Applicable?	Resolved?	Supporting Documentation		
Waters of the United States - Section 404	Yes	Yes	USACE Action ID #SAW-2018-00451		
Waters of the United States - Section 401	Yes	Yes	DWR# 18-0665		
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	NPDES Construction Stormwater General Permit NCG010000		
Endangered Species Act	Yes	Yes	Categorical Exclusion Document in Mitigation Plan		
Historic Preservation Act	Yes	Yes	Categorical Exclusion Document in Mitigation Plan		
Coastal Zone Management Act (CZMA)/Coastal Area Management Act	No	N/A	N/A		
FEMA Floodplain Compliance	Yes	Yes	Alexander County Floodplain Development Permit #01-2019		
Essential Fisheries Habitat	No	N/A	N/A		

Table 5. Monitoring Component Summary

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Parameter	Monitoring Feature	Quantity / Length by Reach							Wetlands	Frequency	Notes	
		UT1 Reach 1A	UT1 Reach 1B	UT1 Reach 2	UT1 Reach 3	UT1 Reach 4A	UT1 Reach 4B	UT1A				
Dimension	Riffle Cross-Section	1	1	N/A	N/A	2	3	N/A		Year 1, 2, 3, 5, and 7	1	
	Pool Cross-Section	1	1	N/A	N/A	2	3	N/A				
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	2	
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A		
Substrate	Reach Wide (RW) Pebble Count	1 RW	1 RW	N/A	N/A	1 RW	1 RW	N/A		Year 1, 2, 3, 5, and 7	3	
Hydrology	Crest Gage (CG) and or/Transducer (SG)	1 CG							N/A		Semi-Annual	4
Wetland Hydrology	Groundwater Gages (GWG)	2 GWG								2	Semi-Annual	8
Vegetation	CVS Level 2/Mobile plots	17 (9 permanent, 8 mobile)									Year 1, 2, 3, 5, and 7	5
Visual Assessment		Yes									Semi-Annual	
Exotic and Nuisance Vegetation											Semi-Annual	6
Project Boundary											Semi-Annual	7
Reference Photos	Photographs	24									Annual	

Notes:

1. Cross-sections were permanently marked with rebar to establish location. Surveys include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.
2. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile was collected during the as-built baseline monitoring survey only, unless observations indicate widespread lack of vertical stability (greater than 10% of reach is affected) and profile survey is warranted in additional years to monitor adjustments or survey repair work.
3. Riffle 100-count substrate sampling were collected during the baseline monitoring only. A reach-wide pebble count will be performed on each restoration or enhancement I reach each year for classification purposes.
4. Crest gages and/or transducers will be inspected and downloaded quarterly or semi-annually. Evidence of bankfull events such as rack lines or floodplain deposition will be documented with a photo when possible. Transducers, if used, will be set to record stage once every three hours.
5. Permanent vegetation monitoring plot assessments will follow CVS Level 2 protocols. Mobile vegetation monitoring plot assessments will document number of planted stems, height, and species using a circular or 100 m2 square/rectangular plot.
6. Locations of exotic and nuisance vegetation will be mapped.
7. Locations of vegetation damage, boundary encroachments, etc. will be mapped.
8. Wetland gages were installed within existing wetlands located where Priority 1 restoration was conducted to monitor groundwater hydrology. No wetland credits are being sought for this project and no performance criteria have been established.

APPENDIX 2. Visual Assessment Data

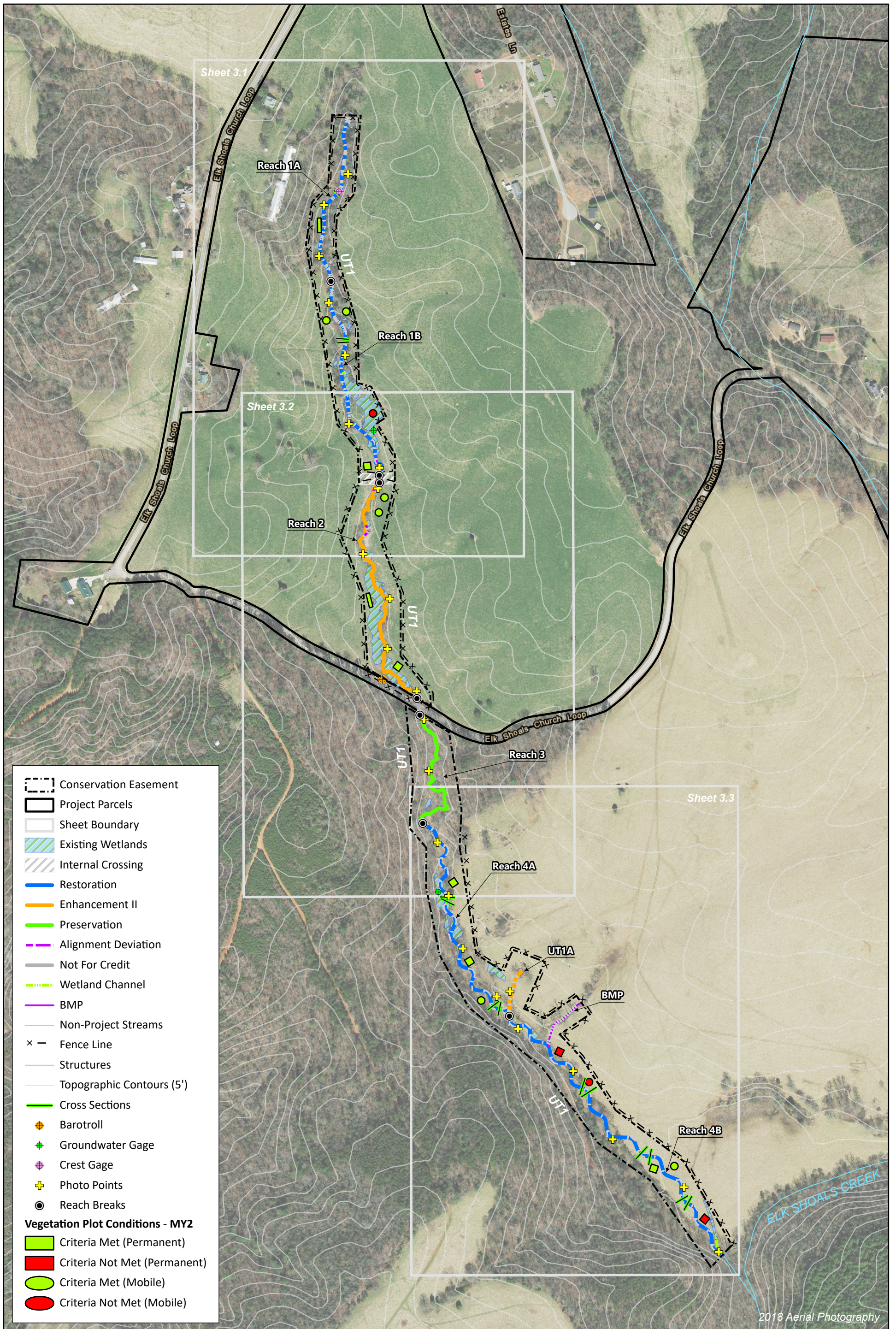
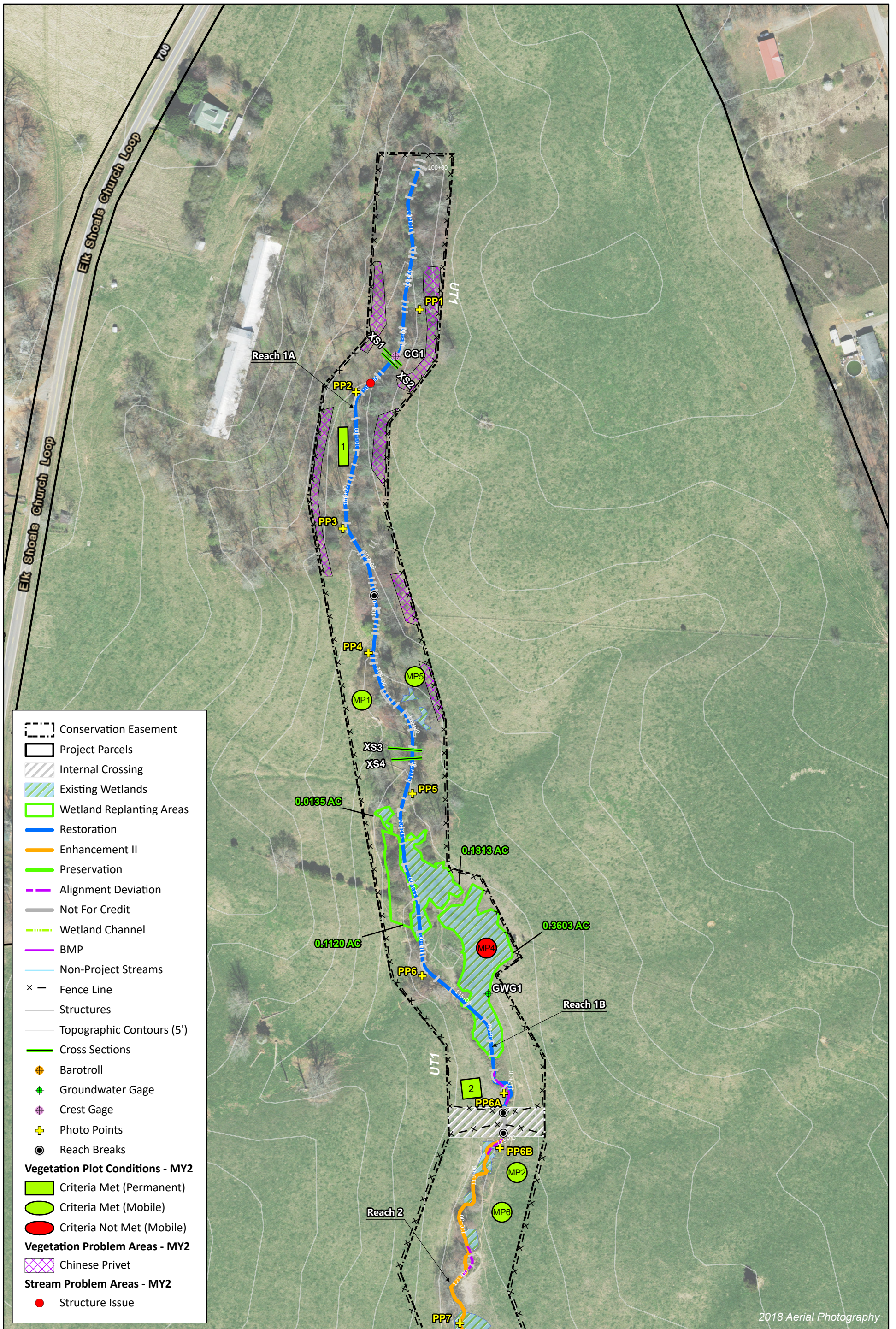
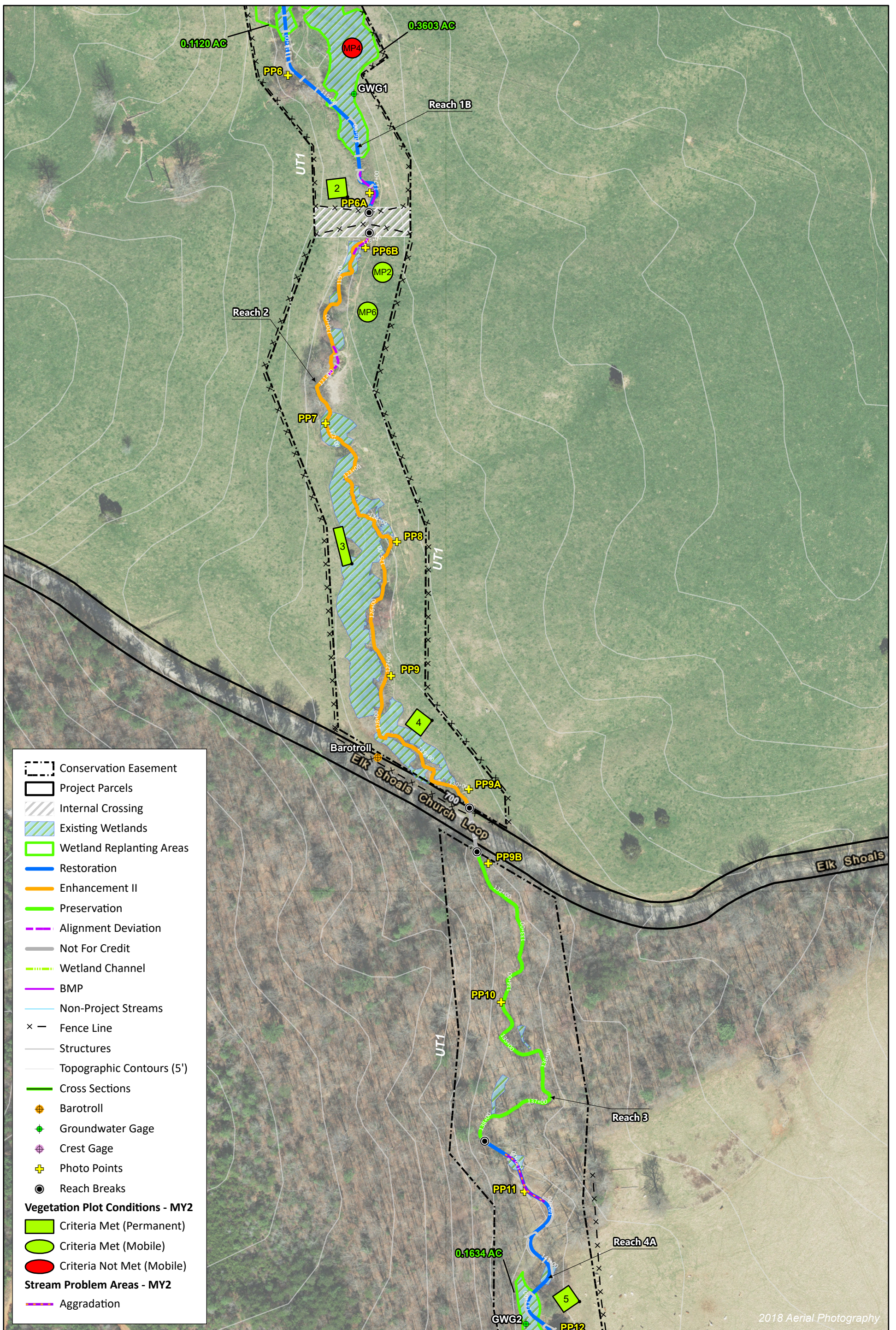


Figure 3.0 Current Condition Plan View (Key)
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021
 Alexander County, NC





2018 Aerial Photography

Figure 3.2 Current Condition Plan View
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021
 Alexander County, NC

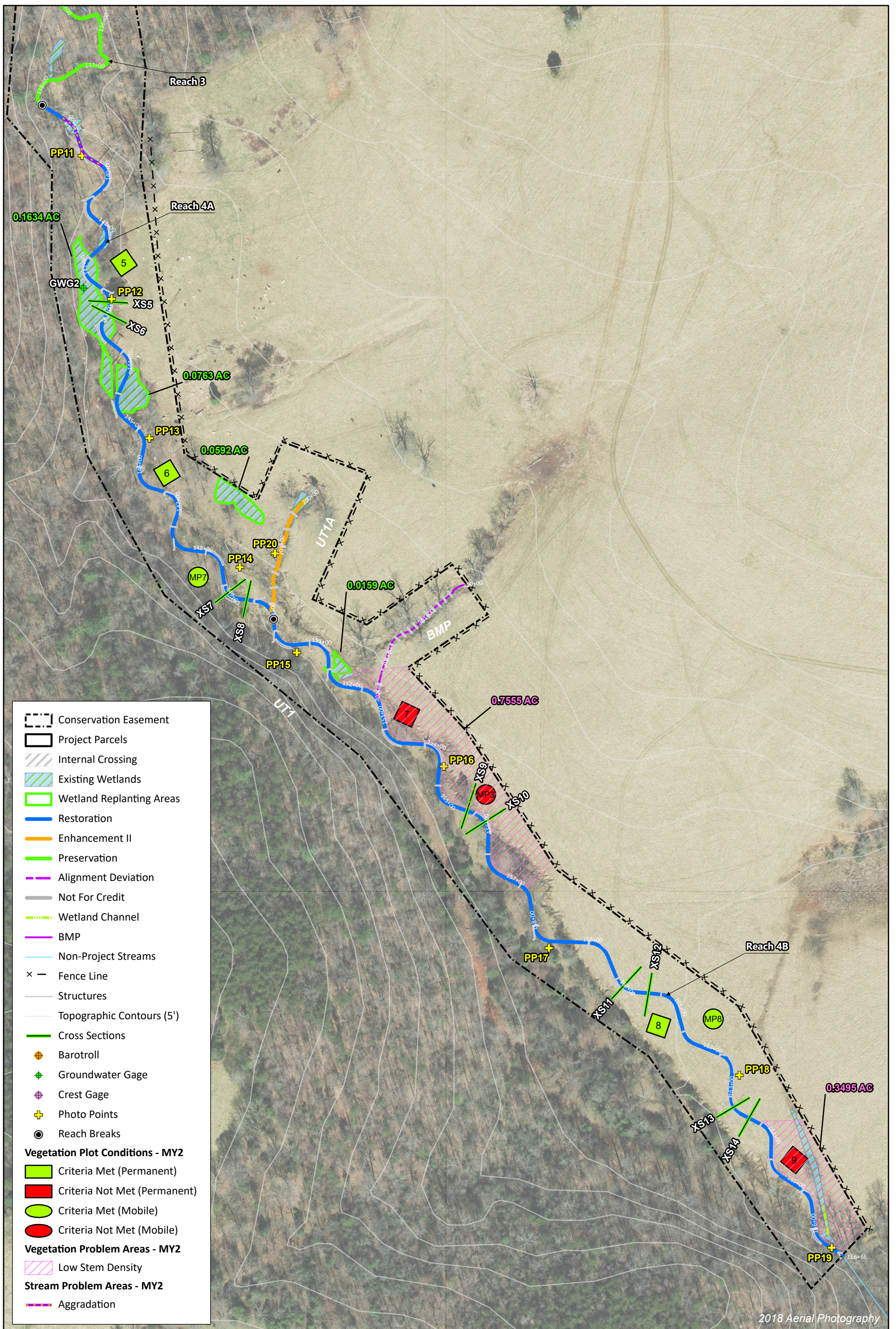


Figure 3.3 Current Condition Plan View
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021
 Alexander County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Date of visual assessment: November 03, 2021

Reach: UT1 Reach 1A

Assessed Length: 770

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	37	37			100%			
	3. Pool Condition ¹	Depth Sufficient	37	37			100%			
		Length Appropriate	37	37			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	6	6			100%			
Thalweg centering at downstream of meander bend (Glide)		6	6	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	47	47			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	39	39			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	38	39			97%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	47	47			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	47	47			100%			

¹Pool condition includes both types of pools: step pools and meander pools

Table 6b. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Date of visual assessment: November 03, 2021

Reach: UT1 Reach 1B

Assessed Length: 957

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	43	43			100%			
	3. Pool Condition ¹	Depth Sufficient	40	40			100%			
		Length Appropriate	40	40			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	6	6			100%			
Thalweg centering at downstream of meander bend (Glide)		6	6	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	52	52			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	42	42			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	42	42			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	52	52			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	52	52			100%			

¹Pool condition includes both types of pools: step pools and meander pools

Table 6c. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021

Date of visual assessment: November 03, 2021

Reach: UT1 Reach 4A

Assessed Length: 1,172

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			2	110	95%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	17	17		100%				
	3. Meander Pool Condition	Depth Sufficient	15	17		88%				
		Length Appropriate	17	17		100%				
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	16	16		100%				
Thalweg centering at downstream of meander bend (Glide)		16	16	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	30	30			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	18	18			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	18	18			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	30	30			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	28	30			93%			

Table 6d. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Date of visual assessment: November 03, 2021

Reach: UT1 Reach 4B

Assessed Length: 1,666

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	22	22			100%			
	3. Meander Pool Condition	Depth Sufficient	21	21			100%			
		Length Appropriate	21	21			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	21	21			100%			
Thalweg centering at downstream of meander bend (Glide)		21	21	100%						
Totals					0	0	100%	0	0	100%
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	34	34			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	22	22			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	22	22			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	34	34			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	34	34			100%			

Table 7. Vegetation Condition Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Date of visual assessment: November 03, 2021

Planted Acreage **17.5**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 5, or 7 stem count criteria.	0.1	2	1.1	6.3%
Total			2	1.1	6.3%
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.1	0	0.0	0.0%
Cumulative Total			2	1.1	6.3%

Easement Acreage **21.7**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	6	0.4	1.8%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0.00	0.0%

**Stream Photographs
Monitoring Year 2**



PP1 – view upstream—UT1 Reach 1A (06/29/2021)



PP1 – view downstream—UT1 Reach 1A (06/29/2021)



PP2 – view upstream—UT1 Reach 1A (06/29/2021)



PP2 – view downstream—UT1 Reach 1A (06/29/2021)



PP3 – view upstream—UT1 Reach 1A (06/29/2021)



PP3 – view downstream—UT1 Reach 1A (06/29/2021)



PP4 – view upstream- UT1 Reach 1B (06/29/2021)



PP4 – view downstream— UT1 Reach 1B (06/29/2021)



PP5 – view upstream- UT1 Reach 1B (06/29/2021)



PP5 – view downstream—UT1 Reach 1B (06/29/2021)



PP6- view upstream—UT1 Reach 1B (06/29/2021)



PP6 – view downstream—UT1 Reach 1B (06/29/2021)



PP6A- view upstream—UT1 Reach 1B (06/29/2021)



PP6A – view downstream—UT1 Reach 1B (06/29/2021)



PP6B- view upstream—UT1 Reach 2 (06/29/2021)



PP6B – view downstream—UT1 Reach 2 (06/29/2021)



PP7 – view upstream—UT1 Reach 2 (06/29/2021)



PP7 – view downstream-UT1 Reach 2 (06/29/2021)



PP8 – view upstream—UT1 Reach 2 (06/29/2021)



PP8 – view downstream—UT1 Reach 2 (06/29/2021)



PP9 – view upstream—UT1 Reach 2 (06/29/2021)



PP9 – view downstream—UT1 Reach 2 (06/29/2021)



PP9A – view upstream—UT1 Reach 2 (06/29/2021)



PP9A – view downstream—UT1 Reach 2 (06/29/2021)



PP9B – view upstream—UT1 Reach 3 (11/03/2021)



PP9B – view downstream—UT1 Reach 3 (11/03/2021)



PP10 – view upstream—UT1 Reach 3 (06/29/2021)



PP10 – view downstream—UT1 Reach 3 (06/29/2021)



PP11 – view upstream—UT1 Reach 4A (06/29/2021)



PP11 – view downstream—UT1 Reach 4A (06/29/2021)



PP12 – view upstream— UT1 Reach 4A (06/29/2021)



PP12 – view downstream—UT1 Reach 4A (06/29/2021)



PP13 – view upstream—UT1 Reach 4A (06/29/2021)



PP13 – view downstream— UT1 Reach 4A (06/29/2021)



PP14 – view upstream— UT1 Reach 4A (06/29/2021)



PP14 – view downstream— UT1 Reach 4A (06/29/2021)



PP15 – view upstream— UT1 Reach 4B (06/29/2021)



PP15 – view downstream— UT1 Reach 4B (06/29/2021)



PP16 – view upstream— UT1 Reach 4B (06/29/2021)



PP16 – view downstream— UT1 Reach 4B (06/29/2021)



PP17 – view upstream— UT1 Reach 4B (06/29/2021)



PP17 – view downstream— UT1 Reach 4B (06/29/2021)



PP18 – view upstream— UT1 Reach 4B (06/29/2021)



PP18 – view downstream— UT1 Reach 4B (06/29/2021)



PP19 – view upstream— UT1 Reach 4B (06/29/2021)



PP19 – view downstream— UT1 Reach 4B (06/29/2021)



PP20 – view upstream— UT1A (06/29/2021)



PP20 – view downstream— UT1A (06/29/2021)

Vegetation Plot Photographs
Monitoring Year 2



Permanent Vegetation Plot 1 (8/16/2021)



Permanent Vegetation Plot 2 (8/16/2021)



Permanent Vegetation Plot 3 (8/16/2021)



Permanent Vegetation Plot 4 (8/16/2021)



Permanent Vegetation Plot 5 (8/18/2021)



Permanent Vegetation Plot 6 (8/18/2021)





Permanent Vegetation Plot 7 (8/18/2021)



Permanent Vegetation Plot 8 (8/18/2021)



Permanent Vegetation Plot 9 (8/18/2021)



Mobile Vegetation Plot 1 (8/16/2021)



Mobile Vegetation Plot 2 (8/16/2021)



Mobile Vegetation Plot 3 (8/18/2021)





Mobile Vegetation Plot 4 (11/03/2021)



Mobile Vegetation Plot 5 (11/03/2021)



Mobile Vegetation Plot 6 (11/03/2021)



Mobile Vegetation Plot 7 (11/03/2021)



Mobile Vegetation Plot 8 (11/03/2021)



**Area of Concern Photographs
Monitoring Year 2**



UT1 R1A Structure Piping (STA 104+00) – view Upstream
(09/15/2021)



UT1 R1A Structure Piping (STA 104+00) – view Upstream
(09/15/2021)



UT1 R4A Aggradation (STA 139+00-139+75) – view downstream (09/15/2021)

**Repaired MY1 Areas of Concern Photographs
Monitoring Year 2**



UT1 R2 Right Bank Erosion (STA 120+00-120+20) – view downstream (2/9/2021)



UT1 R2 Right Bank Stabilized (STA 120+00-120+20) – view downstream (11/3/2021)



UT1 R2 Right Bank Erosion (STA 121+00-121+15) – view downstream (2/9/2021)



UT1 R2 Right Bank Stabilized (STA 121+00-121+15) – view downstream (11/3/2021)



UT1 R2 Right Bank Erosion (STA 126+00-126+20) – view downstream (2/9/2021)



UT1 R2 Right Bank Stabilized (STA 126+00-126+20) – view downstream (11/3/2021)

**Groundwater Gage Photographs
Monitoring Year 2**



Groundwater Gage 1 - (06/29/2021)



Groundwater Gage 2 - (06/29/2021)

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Permanent Vegetation Plot	MY2 Success Criteria Met (Y/N)	Tract Mean (MY2 - 2021)	
1	Y	78%	71%
2	Y		
3	Y		
4	Y		
5	Y		
6	Y		
7	N		
8	Y		
9	N		
Mobile Vegetation Plot	MY2 Success Criteria Met (Y/N)	63%	
1	Y		
2	Y		
3	N		
4	N		
5	Y		
6	Y		
7	Y		
8	N		

Table 9. CVS Permanent Vegetation Plot Metadata

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Report Prepared By	Brandon Romeo
Date Prepared	11/12/2021 11:30
Database Name	cvs-eep-entrytool-v2.5.0_AlexanderFarms_MY2.mdb
Database Location	\\192.168.3.7\projects\ActiveProjects\005-02169 Alexander Farm\Monitoring\Monitoring Year 2 (2021)\Vegetation Assessment
Computer Name	BRANDON
File Size	75628544
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	100048
Project Name	Alexander Farm Mitigation Site
Description	The Alexander Farm Mitigation Site (Site) is in Alexander County approximately 6 miles west of Statesville and 15 miles northeast of Hickory.
Sampled Plots	17

Table 10a. Planted and Total Stem Counts

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021

Current Permanent Vegetation Plot Data (MY2 2021)																	
Scientific Name	Common Name	Species Type	Permanent Plot 1			Permanent Plot 2			Permanent Plot 3			Permanent Plot 4			Permanent Plot 5		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Box elder	Tree	3	3	3									5	5	6	
<i>Acer rubrum</i>	Red maple	Tree								25			2				
<i>Betula nigra</i>	River birch	Tree	1	1	1				4	4	4	3	3	3	2	2	2
<i>Carpinus caroliniana</i>	American hornbeam	Shrub Tree															
<i>Diospyros virginiana</i>	Persimmon	Tree							2	2	2			2	1	1	1
<i>Gleditsia triacanthos</i>	Honey locust	Tree															
<i>Juglans nigra</i>	Black Walnut	Tree															
<i>Platanus occidentalis</i>	Sycamore	Tree	1	1	2	2	2	2	1	1	1				5	5	6
<i>Populus deltoides</i>	Cottonwood	Tree															
<i>Quercus sp. (unknown)</i>	Oak species (unknown)	Tree															
<i>Quercus alba</i> ¹	White oak	Tree										1	1	1			
<i>Quercus pagoda</i>	Cherrybark oak	Tree	4	4	4	6	6	6	3	3	3	1	1	1	2	2	2
<i>Quercus phellos</i>	Willow oak	Tree				1	1	1	2	2	2	3	3	3			
<i>Quercus rubra</i>	Northern Red oak	Tree				1	1	1	1	1	1						
<i>Robinia pseudoacacia</i>	Black Locust	Tree									1						
<i>Salix nigra</i>	Black willow	Tree															
<i>Salix sericea</i>	Silky Willow	Shrub Tree															
<i>Ulmus alata</i>	Winged elm	Tree									1						
Stem count			9	9	10	10	10	10	13	13	40	8	8	12	15	15	17
size (ares)			1			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			4	4	4	4	4	4	6	6	9	4	4	6	5	5	5
Stems per ACRE			364	364	405	405	405	405	526	526	1619	324	324	486	607	607	688

Current Permanent Vegetation Plot Data (MY2 2021)														Annual Mean									
Scientific Name	Common Name	Species Type	Permanent Plot 6 ²			Permanent Plot 7			Permanent Plot 8			Permanent Plot 9			MY2 (2021)			MY1 (2020)			MY0 (2020)		
			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
<i>Acer negundo</i>	Box elder	Tree				1	1	1	2	2	2				11	11	12	6	6	7	15	15	15
<i>Acer rubrum</i>	Red maple	Tree			10												37			35			
<i>Betula nigra</i>	River birch	Tree	5	5	5	2	2	2	3	3	3				20	20	20	15	15	15	17	17	17
<i>Carpinus caroliniana</i>	American hornbeam	Shrub Tree	1	1	1										1	1	1						
<i>Diospyros virginiana</i>	Persimmon	Tree	2	2	2										5	5	7			1			
<i>Gleditsia triacanthos</i>	Honey locust	Tree																		1			
<i>Juglans nigra</i>	Black Walnut	Tree									1						1						
<i>Platanus occidentalis</i>	Sycamore	Tree			2							3	3	3	12	12	16	8	8	10	9	9	9
<i>Populus deltoides</i>	Cottonwood	Tree			1												1						
<i>Quercus sp. (unknown)</i>	Oak species (unknown)	Tree																			7	7	7
<i>Quercus alba</i> ¹	White oak	Tree												1	1	1	3	3	3				
<i>Quercus pagoda</i>	Cherrybark oak	Tree	1	1	1							1	1	1	18	18	18	22	22	22	33	33	33
<i>Quercus phellos</i>	Willow oak	Tree							5	5	5	2	2	2	13	13	13	17	17	17	28	28	28
<i>Quercus rubra</i>	Northern Red oak	Tree												2	2	2	2	2	2	2	2	2	2
<i>Robinia pseudoacacia</i>	Black Locust	Tree																		1			
<i>Salix nigra</i>	Black willow	Tree																			20		
<i>Salix sericea</i>	Silky Willow	Shrub Tree						10														10	
<i>Ulmus alata</i>	Winged elm	Tree																				1	
Stem count			9	9	22	3	3	13	10	10	11	6	6	6	83	83	141	73	73	134	111	111	111
size (ares)			1			1			1			1			9			9			9		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.2224			0.2224			0.2224		
Species count			4	4	7	2	2	3	3	3	4	3	3	3	9	9	15	7	7	12	7	7	7
Stems per ACRE			364	364	890	121	121	526	405	405	445	243	243	243	373	373	634	328	328	603	499	499	499

¹Prior to leaf out in MY0, the species were identified as *Quercus sp.* (unknown).

²All 5 *Betula nigra*s were counted b/c the species only represents approximately 42% of the total stem count for the plot when *Acer negundo* and *Platanus occidentalis*, which are listed on the planting plan, are included in the total stem count.

Color for Density

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

PnoLS: Number of planted stems excluding live stakes
 P-all: Number of planted stems including live stakes
 T: Total stems

Table 10b. Planted and Total Stem Counts

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021

Current Mobile Vegetation Plot (MP) Data (MY2 2021)											Annual Mean		
Scientific Name	Common Name	Species Type	MP1	MP2	MP3	MP4 ¹	MP5	MP6	MP7	MP8	MY2 (2021)	MY1 (2020)	MY0 (2020)
			T	T	T	T	T	T	T	T	T	T	T
<i>Acer negundo</i>	Box elder	Tree	1	3			1	3	3		11	2	6
<i>Acer rubrum</i>	Red maple	Tree				3					3		
<i>Alnus serrulata</i>	Smooth alder	Tree				7					7		
<i>Betula nigra</i>	River birch	Tree	2	2	3		5		3	8	23	4	12
<i>Carpinus caroliniana</i>	American hornbeam	Shrub Tree		1							1		
<i>Diospyros virginiana</i>	Persimmon	Tree		2		1	1		5		9		
<i>Ilex opaca</i>	American Holly	Tree				3					3		
<i>Juniperus virginiana</i>	Eastern red cedar	Tree				3					3		
<i>Platanus occidentalis</i>	Sycamore	Tree	2	3	1		3	5	1		15	3	4
<i>Populus deltoides</i>	Eastern Cottonwood	Tree								1	1		
<i>Quercus sp. (unkown)</i> ¹	Oak species (unkown)	Tree											4
<i>Quercus alba</i> ¹	White oak	Tree						1			1		
<i>Quercus pagoda</i>	Cherrybark oak	Tree	3	3							6	7	8
<i>Quercus phellos</i>	Willow oak	Tree		1							1	1	3
<i>Quercus rubra</i>	Northern Red oak	Tree	2	2			1	5	1		11		2
Stem count			10	17	3 ²	1 ³	11	14	13	3 ⁴	79	17	39
size (ares)			1	1	1	1	1	1	1	1	8	3	3
size (ACRES)			0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.1977	0.0741	0.0741
Species count			5	8	2	5	5	4	5	2	14	5	7
Stems per ACRE			405	688	121	40	445	567	526	121	400	229	526

Overall Site Annual Mean					
Scientific Name	Common Name	Species Type	MY2 (2021)	MY1 (2020)	MY0 (2020)
			PnoLS	PnoLS	PnoLS
<i>Acer negundo</i>	Box elder	Tree	22	8	21
<i>Betula nigra</i>	River birch	Tree	43	19	29
<i>Carpinus caroliniana</i>	American hornbeam	Shrub Tree	2		
<i>Diospyros virginiana</i>	Persimmon	Tree	14		
<i>Platanus occidentalis</i>	Sycamore	Tree	27	11	13
<i>Populus deltoides</i>	Eastern Cottonwood	Tree	1		
<i>Quercus sp. (unkown)</i> ¹	Oak species (unkown)	Tree			11
<i>Quercus alba</i> ¹	White oak	Tree	2	3	
<i>Quercus pagoda</i>	Cherrybark oak	Tree	24	29	41
<i>Quercus phellos</i>	Willow oak	Tree	14	18	31
<i>Quercus rubra</i>	Northern Red oak	Tree	13	2	4
Stem count			162	90	150
size (ares)			17	12	12
size (ACRES)			0.4201	0.2965	0.2965
Species count			10	7	7
Stems per ACRE			386	304	506

¹Prior to leaf out in MY0, the species were identified as *Quercus sp. (unkown)*.

²The inclusion of all 3 *Betula nigras* would result in the species representing more than 50% of the total stem count for the plot, so only 2 *Betula nigras* were included in the total stem count.

³*Diospyros virginiana* is the only species on the planting list.

⁴The inclusion of all 8 *Betula nigras* would result in the species representing more than 50% of the total stem count for the plot, so only 2 *Betula nigras* were included in the total stem count.

Color for Density

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

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021

Parameter	Gage	Pre-Restoration Condition								Design								As-Built/Baseline							
		UT1 R1A		UT1 R1B		UT1 R4A		UT1 R4B		UT1 R1A		UT1 R1B		UT1 R4A		UT1 R4B		UT1 R1A		UT1 R1B		UT1 R4A		UT1 R4B	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																									
Bankfull Width (ft)	N/A	5.8	7.2	5.8	7.2	6.0	9.1	8.2	8.6	6.5	8.0	11.5	12.0	6.6	7.9	11.6	12.9	11.4	12.5						
Floodprone Width (ft)		7	9	7	9	24	54	8	10	9	14	11	18	25	58	26	60	23	25	64	68	75	83		
Bankfull Mean Depth (ft)		0.6	0.7	0.6	0.7	1.0	1.4	1.2		0.5		0.5		0.9		0.9		0.4	0.7	0.8	1.0	1.0	1.1		
Bankfull Max Depth (ft)		0.8	0.9	0.8	0.9	1.9	2.0	2.0	2.1	0.6	0.7	0.6	0.8	1.1	1.3	1.1	1.4	0.9	0.9	1.3	1.4	1.3	1.6		
Bankfull Cross-sectional Area (ft ²) ¹		4.0	4.4	4.0	4.4	8.6	8.8	10.1	10.3	3.0		4.3		10.1		11.3		2.7	5.5	10.6	12.0	11.9	12.6		
Width/Depth Ratio		8.5	12.0	8.5	12.0	8.0	14.1	6.6	7.2	14.0		15.0		13.0		13.0		16.3	11.4	11.3	15.8	10.3	13.1		
Entrenchment Ratio ³		1.2		1.2		3.0	9.1	1.0	1.1	1.4	2.2	1.4	2.2	2.2	5.0	2.2	5.0	3.5	3.2	5.3	5.5	6.0	6.6		
Bank Height Ratio		5.9	6.4	5.9	6.4	1.0	2.1	2.0	2.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.0	1.0		1.0			
D ₅₀ (mm)		13.6	22.6	13.6	22.6	17.7	22.6	17.7	22.6	---		---		---		---		49.6	65.3	59.4	71.0	55.6	69.1		
Profile																									
Riffle Length (ft)	N/A	---		---		---		---		0.009	0.052	0.018	0.049	0.002	0.024	0.002	0.026	0.006	0.052	0.002	0.063	0.001	0.037	0.004	0.021
Riffle Slope (ft/ft)		---		---		---		---		---		---		---		---		---		---		---		---	
Pool Length (ft)		---		---		---		---		---		---		---		---		---		---		---		---	
Pool Max Depth (ft)		1.0	1.0	2.1		N/A		0.9	1.4	1.1	1.6	1.8	2.6	1.9	2.8	0.9	2.1	1.2	2.4	1.9	2.8	1.8	3.9		
Pool Spacing (ft)		8	24	8	24	11	19	N/A		7.0	33.0	8.0	40.0	26.0	81.0	28.0	84.0	7.8	49.9	7.8	49.7	28.0	97.5	47.2	115.3
Pool Volume (ft ³)		---		---		---		---		---		---		---		---		---		---		---		---	
Pattern																									
Channel Beltwidth (ft)	N/A	N/A		N/A		9.0	99.0	9.0	99.0	N/A		N/A		23.0	92.0	24.0	96.0	N/A		N/A		23.0	92.0	24.0	96.0
Radius of Curvature (ft)		N/A		N/A		27.0	65.0	27.0	65.0	N/A		N/A		23.0	35.0	24.0	36.0	N/A		N/A		23.0	35.0	24.0	36.0
Rc/Bankfull Width		N/A		N/A		4.5	7.1	3.3	7.6	N/A		N/A		2.0	3.0	2.0	3.0	N/A		N/A		2.0	3.0	2.0	3.0
Meander Length (ft)		N/A		N/A		58.0	201.0	58.0	201.0	N/A		N/A		58.0	161.0	60.0	168.0	N/A		N/A		58.0	161.0	60.0	168.0
Meander Width Ratio		N/A		N/A		1.5	10.9	1.1	11.5	N/A		N/A		2.0	8.0	2.0	8.0	N/A		N/A		2.0	8.0	2.0	8.0
Substrate, Bed and Transport Parameters																									
Ri%/Ru%/P%/G%/S%	N/A	---		---		---		---		---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---		---		---		---		---	
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /dip/disp		0.4/0.7/1.3/23.6/42.0/90.0		0.3/0.5/0.9/33.7/45.0/90.0		---		---		---		---		---		0.2/0.8/7.7/102.0/156.8/256.0		SC/0.2/2.0/86.5/128.0/512.0		SC/0.3/1.7/76.7/128.0/256.0		SC/SC/0.7/75.9/128.0/256.0			
Reach Shear Stress (Competency) lb/ft ²		---		---		---		---		---		---		---		---		---		---		---		---	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m ²		---		---		---		---		---		---		---		---		---		---		---		---	
Additional Reach Parameters																									
Drainage Area (SM)	N/A	0.05		0.11		0.29		0.40		0.05		0.11		0.29		0.40		0.05		0.11		0.29		0.40	
Watershed Impervious Cover Estimate (%)		1%		1%		1%		1%		1%		1%		1%		1%		1%		1%		1%		1%	
Rosgen Classification		B4		B4		C4c		G4c		B4		B4		C4		C4		B4		B4		C4		C4	
Bankfull Velocity (fps)		5.5	5.8	5.5	5.8	3.4	3.8	3.9	4.0	4.1	4.5	3.50	3.9	---		---		---		---		---		---	
Bankfull Discharge (cfs)		---		23.0		31.0	54.6	40.1		12	20	32	40	---		---		---		---		---		---	
Q-NFF regression (2-yr)		---		---		---		---		---		---		---		---		---		---		---		---	
Q-USGS extrapolation (1.2-yr)		---		---		---		---		---		---		---		---		---		---		---		---	
Max Q-Mannings		---		---		---		---		---		---		---		---		---		---		---		---	
Valley Slope (ft/ft)		0.0370		0.0370		0.0130		0.0130		0.0370		0.0370		0.0130		0.0130		0.0370		0.0370		0.0130		0.0130	
Channel Thalweg Length (ft)		1,901		1,901		2,825		2,825		770	969	1,172	1,666	770	957	1,172	1,666	770	957	1,172	1,666	770	957	1,172	1,666
Sinuosity	1.14		1.14		1.13		1.13		1.03	1.03	1.11	1.11	1.02	0.96	1.23	1.15	1.02	0.96	1.23	1.15	1.02	0.96	1.23	1.15	
Bankfull/Channel Slope (ft/ft)	0.0340		0.0340		0.0080		0.0080		0.0362	0.0362	0.0093	0.0093	0.0370	0.0375	0.0088	0.0085	0.0370	0.0375	0.0088	0.0085	0.0370	0.0375	0.0088	0.0085	

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

2. ER for the baseline/monitoring parameters are based on the width of the cross-section, in lieu of assuming the width across the floodplain.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 11b. Reference Reach Data Summary

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Reference Reach Data																	
Parameter	Gage	Agony Acres UT1		UT to Kelly Creek		UT to Austin Branch		Timber Trib		UT to Lyle Creek		UT to Varnals		Walker Branch		Box Creek	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																	
Bankfull Width (ft)	N/A	11.1	7.91	6.2	8.9	7.0	9.3	10.5	11.5	12.3	23.5						
Floodprone Width (ft)		25	9	27	14	45	49	60	100	31	76						
Bankfull Mean Depth		0.7	0.73	0.7	0.5	0.47	1.1	1.2	0.8	1.0	1.2						
Bankfull Max Depth		1.0	1.1	1.2	0.7	1.0	1.1	1.5	1.7	1.2	1.6						
Bankfull Cross-sectional Area (ft ²)		7.4	5.7	4.4	4.6	3.5	4.1	10.3	12.3	8.9	12.2						
Width/Depth Ratio		16.6	10.9	8.8	17.0	14.9	18.3	8.1	9.3	12.3	14.4						
Entrenchment Ratio		2.3	1.2	4.3	1.5	6.0	6.0	5.7	10.0	2.5	2.7						
Bank Height Ratio		1.0	2.5	1.0	1.0	1.0	1.0	1.0	1.0	---	1.5						
D50 (mm)		50.6	---	59	6.5	0.5	15	27.8	22								
Profile																	
Riffle Length (ft)	N/A	---		0.025		0.730	0.020	0.150	0.006	0.060	0.024	0.057	0.000	0.100	0.600		
Riffle Slope (ft/ft)		---		---		---	---	---	---	---	---	---	---	---	---		
Pool Length (ft)		---		---		---	---	---	---	---	---	---	---	---	---		
Pool Max Depth (ft)		1.6	---	1.7	---	1.3	2.5	2.6	1.8	2.3	4.4						
Pool Spacing (ft)		---	---	2.0	5.0	1.0	6.0	2.0	4.0	0.5	5.6	2.3	6.1	1.2			
Pool Volume (ft ³)		---		---		---	---	---	---	---	---	---	---	---	---		
Pattern																	
Channel Beltwidth (ft)	N/A	---	18.0	34.0	---	---	21.0	15.0	45.0	102.0	62.0	87.8					
Radius of Curvature (ft)		---	8	26	---	---	19	32	8	47	23	38	8	38			
Rc/Bankfull Width		---	---	---	---	---	2.7	3.7	0.6	3.2	2.0	3.1	0.3	1.6			
Meander Length (ft)		---	---	---	---	---	---	---	---	---	---	---	---	---			
Meander Width Ratio		---	---	---	---	---	---	---	---	---	---	---	---	---			
Substrate, Bed and Transport Parameters																	
Ri%/Ru%/P%/G%/S%	N/A	---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---	
d16/d35/d50/d84/d95/d100		2.0/12.9/50.6/168.1	---	11.0/42.0/59.0/170.0	0.49/3.5/6.5/48.0/83.0	SC/0.1/0.2/0.5/4.0/8.0	2.9/9.2/15.0/56.0/88.0/256.0	0.6/12.2/27.8/74.5/128.0/>2048	4.1/11.0/22.0/50.0/78.0								
Reach Shear Stress (Competency) lb/ft ²		---		---		---		---		---		---		---		---	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m ²		---		---		---		---		---		---		---		---	
Additional Reach Parameters																	
Drainage Area (SM)	N/A	0.15	0.08	0.12	0.04	0.25	0.41	0.29	2.13								
Watershed Impervious Cover Estimate (%)		---	---	---	---	---	---	---	---	---							
Rosgen Classification		B3	B4/B4a	B4a/A4	B4	C5	C4/E4	E4	C4								
Bankfull Velocity (fps)		4.9	5.9	6.2	3.7	4.7	4.4	5.2	3.8	3.4							
Bankfull Discharge (cfs)		37	23	27	17	18	54	40	99								
Q-NFF regression (2-yr)		---		---		---		---		---		---		---		---	
Q-USGS extrapolation (1.2-yr)		---		---		---		---		---		---		---		---	
Q-Mannings		---		---		---		---		---		---		---		---	
Valley Slope (ft/ft)		0.050	0.049	0.048	0.041	0.009	0.020	0.030	2.250								
Channel Thalweg Length (ft)		---	---	---	---	---	---	---	---								
Sinuosity		1.0	1.0	1.2	1.1	1.1	1.2	1.4	1.3								
Water Surface Slope (ft/ft)		---	---	---	---	---	---	---	---								
Bankfull/Channel Slope (ft/ft)		0.049	0.030	0.065	0.040	0.033	0.004	0.017	0.010	0.840							

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided N/A: Not Applicable

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

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021

Dimension and Substrate	UT1 R1A Cross-Section 1 (Riffle)								UT1 R1A Cross-Section 2 (Pool)								UT1 R1B Cross-Section 3 (Pool)								UT1 R1B Cross-Section 4 (Riffle)							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation ¹	976.6	976.6	976.6						976.2	976.3	976.3						945.7	945.5	945.5						945.3	945.6	945.6					
Low Bank Elevation	976.6	976.6	976.6						976.2	976.3	976.3						945.7	945.5	945.5						945.3	945.2	945.3					
Bankfull Width (ft)	6.6	6.6	5.6						7.0	8.0	7.8						8.3	7.1	7.7						7.9	6.4	6.3					
Floodprone Width (ft) ²	23.3	21.5	22.2						-	-	-						-	-	-						25.2	18.8	21.3					
Bankfull Mean Depth (ft)	0.4	0.4	0.5						1.2	1.1	1.0						1.4	1.2	1.0						0.7	0.4	0.5					
Bankfull Max Depth (ft)	0.9	0.9	0.9						1.9	2.0	1.9						2.1	1.9	1.7						0.9	0.8	0.8					
Bankfull Cross-Sectional Area (ft ²)	2.7	2.8	2.7						8.2	8.5	8.1						11.7	8.4	7.7						5.5	2.8	3.0					
Bankfull Width/Depth Ratio	16.3	15.6	11.9						6.0	7.6	7.5						5.9	6.1	7.7						11.4	14.6	13.5					
Bankfull Entrenchment Ratio ³	3.5	3.2	3.9						-	-	-						-	-	-						3.2	2.9	3.4					
Bankfull Bank Height Ratio	1.0	1.0	1.0						-	-	-						-	-	-						1.0	0.7	0.7					
Dimension and Substrate	UT1 R4A Cross-Section 5 (Pool)								UT1 R4A Cross-Section 6 (Riffle)								UT1 R4A Cross-Section 7 (Pool)								UT1 R4A Cross-Section 8 (Riffle)							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation ¹	891.5	891.6	891.7						891.8	892.0	892.0						885.5	885.6	885.4						885.1	885.4	885.4					
Low Bank Elevation	891.5	891.6	891.7						891.8	891.9	891.9						885.5	885.6	885.4						885.1	885.4	885.4					
Bankfull Width (ft)	8.9	7.8	8.1						12.9	13.5	13.0						16.2	16.2	13.5						11.6	12.7	14.1					
Floodprone Width (ft) ²	-	-	-						68.0	66.5	66.3						-	-	-						64.2	62.6	62.6					
Bankfull Mean Depth (ft)	1.4	1.1	1.1						0.8	0.6	0.7						1.0	0.9	0.8						1.0	0.9	0.9					
Bankfull Max Depth (ft)	2.1	2.0	2.0						1.3	1.2	1.4						2.3	2.3	2.2						1.4	1.5	1.6					
Bankfull Cross-Sectional Area (ft ²)	12.9	8.6	8.9						10.6	8.4	9.4						15.7	14.2	10.8						12.0	11.6	12.3					
Bankfull Width/Depth Ratio	6.2	7.1	7.4						15.8	21.5	18.1						16.7	18.5	16.8						11.3	13.9	16.3					
Bankfull Entrenchment Ratio ³	-	-	-						5.3	4.9	5.1						-	-	-						5.5	4.9	4.4					
Bankfull Bank Height Ratio	-	-	-						1.0	0.9	0.9						-	-	-						1.0	1.0	1.0					
Dimension and Substrate	UT1 R4B Cross Section 9 (Riffle)								UT1 R4B Cross Section 10 (Pool)								UT1 R4B Cross-Section 11 (Pool)								UT1 R4B Cross-Section 12 (Riffle)							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Bankfull Elevation ¹	879.8	880.2	880.1						879.5	879.7	879.9						875.5	875.4	875.4						875.1	875.4	875.3					
Low Bank Elevation	879.8	880.0	880.1						879.5	879.7	879.9						875.5	875.4	875.4						875.1	875.3	875.2					
Bankfull Width (ft)	12.5	12.8	14.9						13.3	15.0	18.3						13.2	10.9	11.4						12.5	12.3	12.8					
Floodprone Width (ft) ²	82.5	80.9	80.8						-	-	-						-	-	-						74.7	74.6	74.5					
Bankfull Mean Depth (ft)	1.0	0.7	0.8						2.5	1.8	1.5						1.6	1.6	1.5						1.0	0.8	0.9					
Bankfull Max Depth (ft)	1.3	1.3	1.4						3.7	3.5	3.7						3.0	2.7	2.8						1.6	1.5	1.5					
Bankfull Cross-Sectional Area (ft ²)	11.9	9.0	11.3						32.7	26.5	28.1						21.0	17.7	17.6						12.5	10.2	11.2					
Bankfull Width/Depth Ratio	13.1	18.2	19.6						5.4	8.5	12.0						8.3	6.8	7.4						12.5	14.8	14.6					
Bankfull Entrenchment Ratio ³	6.6	6.3	5.4						-	-	-						-	-	-						6.0	6.1	5.8					
Bankfull Bank Height Ratio	1.0	0.9	1.0						-	-	-						-	-	-						1.0	0.9	0.9					
Dimension and Substrate	UT1 R4B Cross Section 13 (Pool)								UT1 R4B Cross Section 14 (Riffle)																							
	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7																
Bankfull Elevation ¹	873.3	873.6	873.4						873.2	873.6	873.4																					
Low Bank Elevation	873.3	873.6	873.4						873.2	873.5	873.2																					
Bankfull Width (ft)	13.0	16.6	15.4						11.4	12.6	11.2																					
Floodprone Width (ft) ²	-	-	-						75.2	74.0	73.7																					
Bankfull Mean Depth (ft)	1.4	1.1	1.1						1.1	0.9	0.9																					
Bankfull Max Depth (ft)	2.6	2.7	2.7						1.5	1.6	1.6																					
Bankfull Cross-Sectional Area (ft ²)	18.0	18.4	16.6						12.6	11.3	10.0																					
Bankfull Width/Depth Ratio	9.4	15.0	14.3						10.3	13.9	12.4																					
Bankfull Entrenchment Ratio ³	-	-	-						6.6	5.9	6.6																					
Bankfull Bank Height Ratio	-	-	-						1.0	1.0	0.9																					

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

²Floodprone width is calculated from the width of cross-section but valley width may extend further.

³ER for the baseline/monitoring parameters is based on the width of the cross-section, in lieu of assuming the width across the floodplain.

Table 13a. Monitoring Data - Stream Reach Data Summary

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle²																
Bankfull Width (ft)	6.6		6.6		5.6											
Floodprone Width (ft)	23		22		22											
Bankfull Mean Depth (ft)	0.4		0.4		0.5											
Bankfull Max Depth (ft)	0.9		0.9		0.9											
Bankfull Cross-sectional Area (ft ²)	2.7		2.8		2.7											
Width/Depth Ratio	16.3		15.6		11.9											
Entrenchment Ratio	3.5		3.2		3.9											
Bank Height Ratio	1.0		1.0		1.0											
D ₅₀ (mm)	49.6															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.006	0.052														
Pool Length (ft)																
Pool Max Depth (ft)	0.9	2.1														
Pool Spacing (ft)	7.8	49.9														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	N/A ¹															
Radius of Curvature (ft)	N/A ¹															
Rc/Bankfull Width (ft/ft)	N/A ¹															
Meander Length (ft)	N/A ¹															
Meander Width Ratio	N/A ¹															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	0.2/0.8/7.7/102.0/156.8/256.0		0.2/0.9/19.6/77.0/119.7/256.0		1.5/10.3/16.8/103.6/151.8/180.0											
Reach Shear Stress (Competency) lb/ft ²	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.05															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	---															
Bankfull Discharge (cfs)	---															
Valley Slope (ft/ft)	0.0370															
Channel Thalweg Length (ft)	770															
Sinuosity	1.02															
Bankfull/Channel Slope (ft/ft)	0.0370															

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

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

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13b. Monitoring Data - Stream Reach Data Summary

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021

UT1 R1B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	7.9		6.4		6.3											
Floodprone Width (ft)	25		19		21											
Bankfull Mean Depth (ft)	0.7		0.4		0.5											
Bankfull Max Depth (ft)	0.9		0.8		0.8											
Bankfull Cross-sectional Area (ft ²)	5.5		2.8		3.0											
Width/Depth Ratio	11.4		14.6		13.5											
Entrenchment Ratio	3.2		2.9		3.4											
Bank Height Ratio	1.0		0.7		0.7											
D ₅₀ (mm)	65.3															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.002	0.063														
Pool Length (ft)																
Pool Max Depth (ft)	1.2	2.4														
Pool Spacing (ft)	7.8	49.7														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	N/A															
Radius of Curvature (ft)	N/A															
Rc/Bankfull Width (ft/ft)	N/A															
Meander Length (ft)	N/A															
Meander Width Ratio	N/A															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₁₀₀	SC/0.2/2.0/86.5/128.0/512.0		0.5/0.9/18.6/57.2/105.0/128.0		0.1/4.7/13.3/95.4/135.5/180.0											
Reach Shear Stress (Competency) lb/ft ²			---													
Max part size (mm) mobilized at bankfull			---													
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.11															
Watershed Impervious Cover Estimate (%)	0															
Rosgen Classification	B4															
Bankfull Velocity (fps)	---															
Bankfull Discharge (cfs)	---															
Valley Slope (ft/ft)	0.0370															
Channel Thalweg Length (ft)	957															
Sinuosity	0.96															
Bankfull/Channel Slope (ft/ft)	0.0375															

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

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13c. Monitoring Data - Stream Reach Data Summary

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

UT1 R4A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	11.6	12.9	12.7	13.5	13.0	14.1										
Floodprone Width (ft)	64	68	63	67	63	66										
Bankfull Mean Depth (ft)	0.8	1.0	0.6	0.9	0.7	0.9										
Bankfull Max Depth (ft)	1.3	1.4	1.2	1.5	1.4	1.6										
Bankfull Cross-sectional Area (ft ²)	10.6	12.0	8.4	11.6	9.4	12.3										
Width/Depth Ratio	11.3	15.8	13.9	21.5	16.3	18.1										
Entrenchment Ratio	5.3	5.5	4.9		4.4	5.1										
Bank Height Ratio	1.0		0.9	1.0	0.9	1.0										
D ₅₀ (mm)	59.4	71.0														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001	0.037														
Pool Length (ft)																
Pool Max Depth (ft)	1.9	2.8														
Pool Spacing (ft)	28.0	97.5														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	23.0	92.0														
Radius of Curvature (ft)	23.0	35.0														
Rc/Bankfull Width (ft/ft)	2.0	3.0														
Meander Length (ft)	58.0	161.0														
Meander Width Ratio	2.0	8.0														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/0.3/1.7/76.7/128.0/256.0		SC/0.3/1.0/93.2/146.7/256.0		0.1/8.0/13.3/100.0/155.5/256.0											
Reach Shear Stress (Competency) lb/ft ²	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)	0.29															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	---															
Bankfull Discharge (cfs)	---															
Valley Slope (ft/ft)	0.0130															
Channel Thalweg Length (ft)	1,172															
Sinuosity	1.23															
Bankfull/Channel Slope (ft/ft)	0.0088															

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

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13d. Monitoring Data - Stream Reach Data Summary

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021

UT1 R4B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle¹																
Bankfull Width (ft)	11.4	12.5	12.3	12.8	11.2	14.9										
Floodprone Width (ft)	75	83	74	81	74	81										
Bankfull Mean Depth (ft)	1.0	1.1	0.7	0.9	0.8	0.9										
Bankfull Max Depth (ft)	1.3	1.6	1.3	1.6	1.4	1.6										
Bankfull Cross-sectional Area (ft ²)	11.9	12.6	9.0	11.3	10.0	11.3										
Width/Depth Ratio	10.3	13.1	13.9	18.2	12.4	19.6										
Entrenchment Ratio	6.0	6.6	5.9	6.3	5.4	6.6										
Bank Height Ratio	1.0		0.9	1.0	0.9	1.0										
D ₅₀ (mm)	55.6	69.1														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.004	0.021														
Pool Length (ft)																
Pool Max Depth (ft)	1.8	3.9														
Pool Spacing (ft)	47.2	115.3														
Pool Volume (ft ³)																
Pattern																
Channel Beltwidth (ft)	24.0	96.0														
Radius of Curvature (ft)	24.0	36.0														
Rc/Bankfull Width (ft/ft)	2.0	3.0														
Meander Length (ft)	60.0	168.0														
Meander Width Ratio	2.0	8.0														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
D ₁₆ /D ₃₅ /D ₅₀ /D ₈₄ /D ₉₅ /D ₁₀₀	SC/SC/0.7/75.9/128.0/256.0		SC/0.2/0.9/67.5/87.9/256.0		SC/0.7/5.6/90.0/139.4/256.0											
Reach Shear Stress (Competency) lb/ft ²																
Max part size (mm) mobilized at bankfull																
Stream Power (Capacity) W/m ²																
Additional Reach Parameters																
Drainage Area (SM)		0.40														
Watershed Impervious Cover Estimate (%)		1%														
Rosgen Classification		C4														
Bankfull Velocity (fps)		---														
Bankfull Discharge (cfs)		---														
Valley Slope (ft/ft)		0.0130														
Channel Thalweg Length (ft)		1,666														
Sinuosity		1.15														
Bankfull/Channel Slope (ft/ft)		0.0085														

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

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

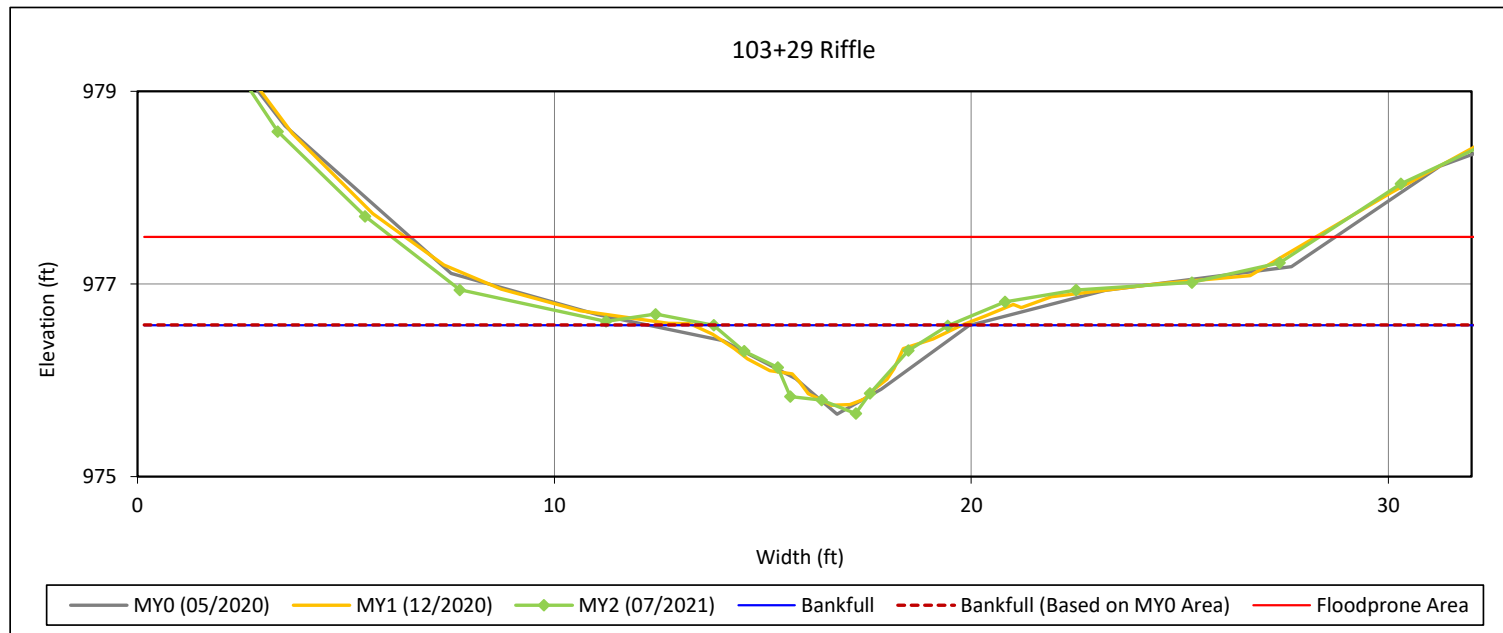
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 1-UT1 Reach 1A



Bankfull Dimensions

2.7	x-section area (ft.sq.)
5.6	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
6.0	wetted perimeter (ft)
0.4	hydraulic radius (ft)
11.9	width-depth ratio
22.2	W flood prone area (ft)
3.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

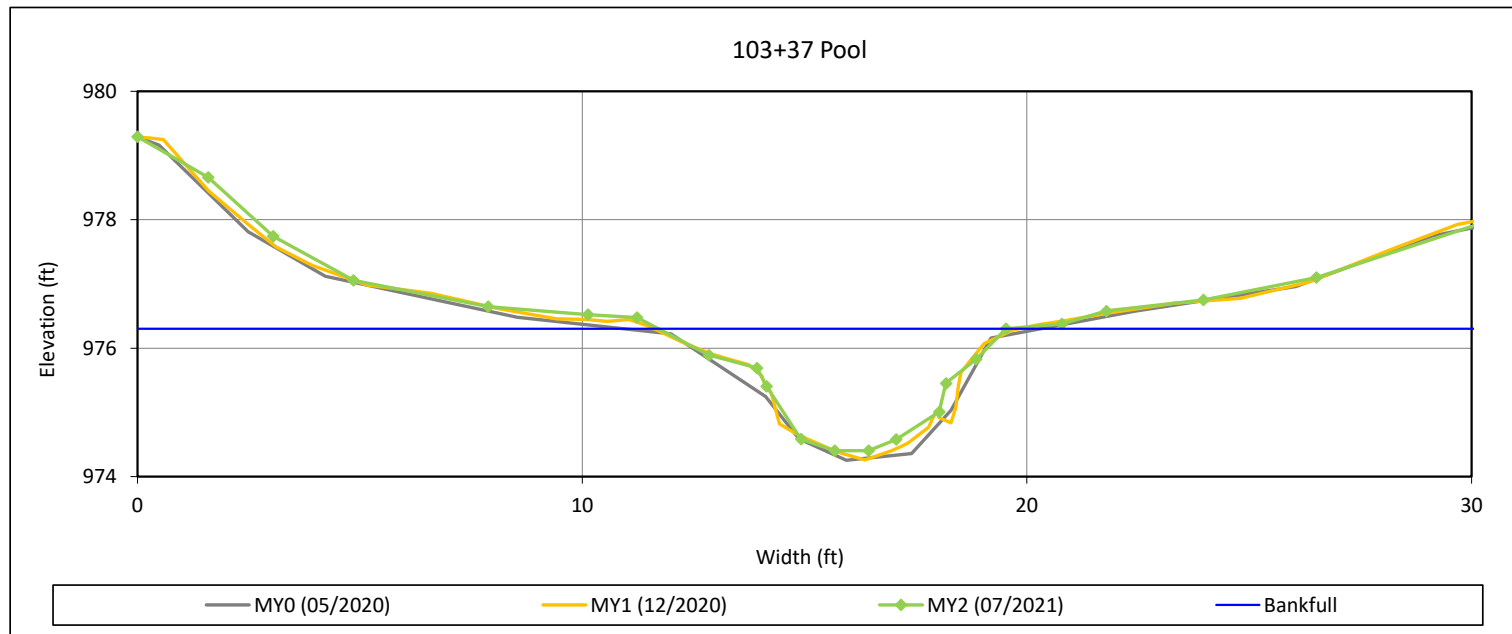
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 2-UT1 Reach 1A



Bankfull Dimensions

8.1	x-section area (ft.sq.)
7.8	width (ft)
1.0	mean depth (ft)
1.9	max depth (ft)
9.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
7.5	width-depth ratio

Survey Date: 07/2021
Field Crew: Wildlands Engineering



View Downstream

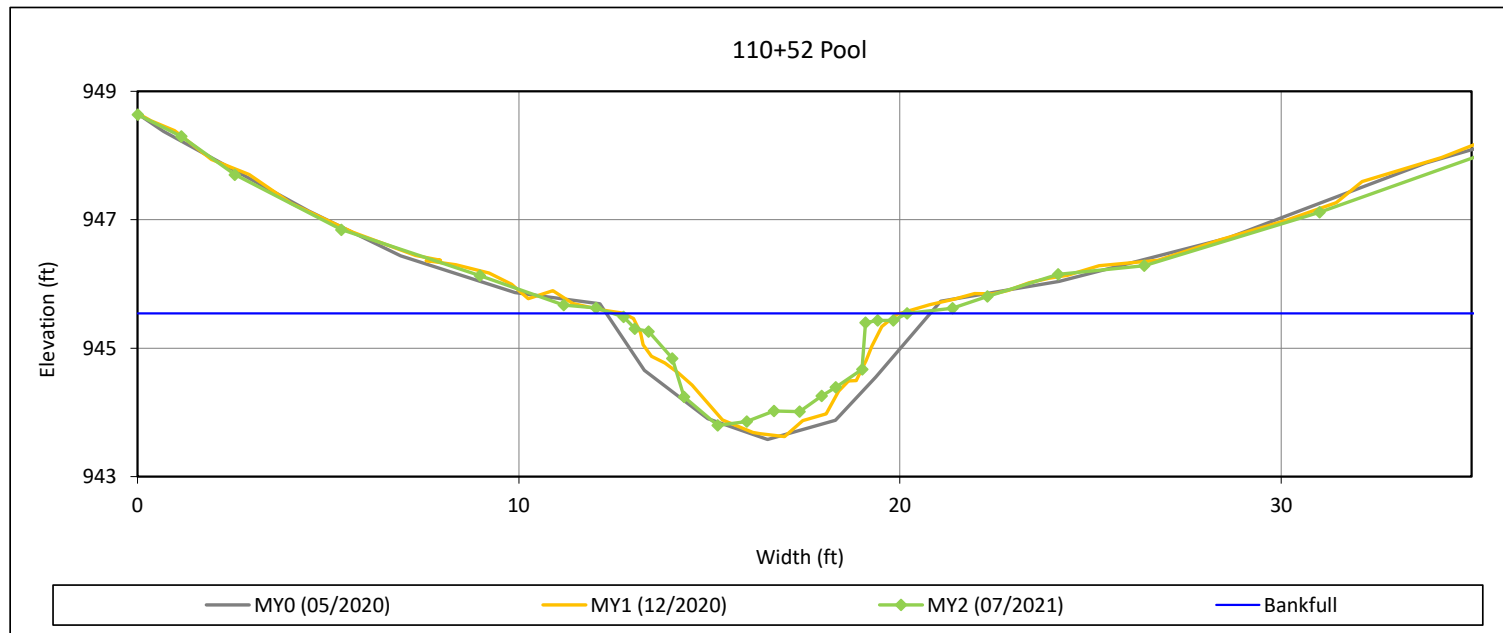
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 3-UT1 Reach 1B



Bankfull Dimensions

7.7	x-section area (ft.sq.)
7.7	width (ft)
1.0	mean depth (ft)
1.7	max depth (ft)
9.2	wetted perimeter (ft)
0.8	hydraulic radius (ft)
7.7	width-depth ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

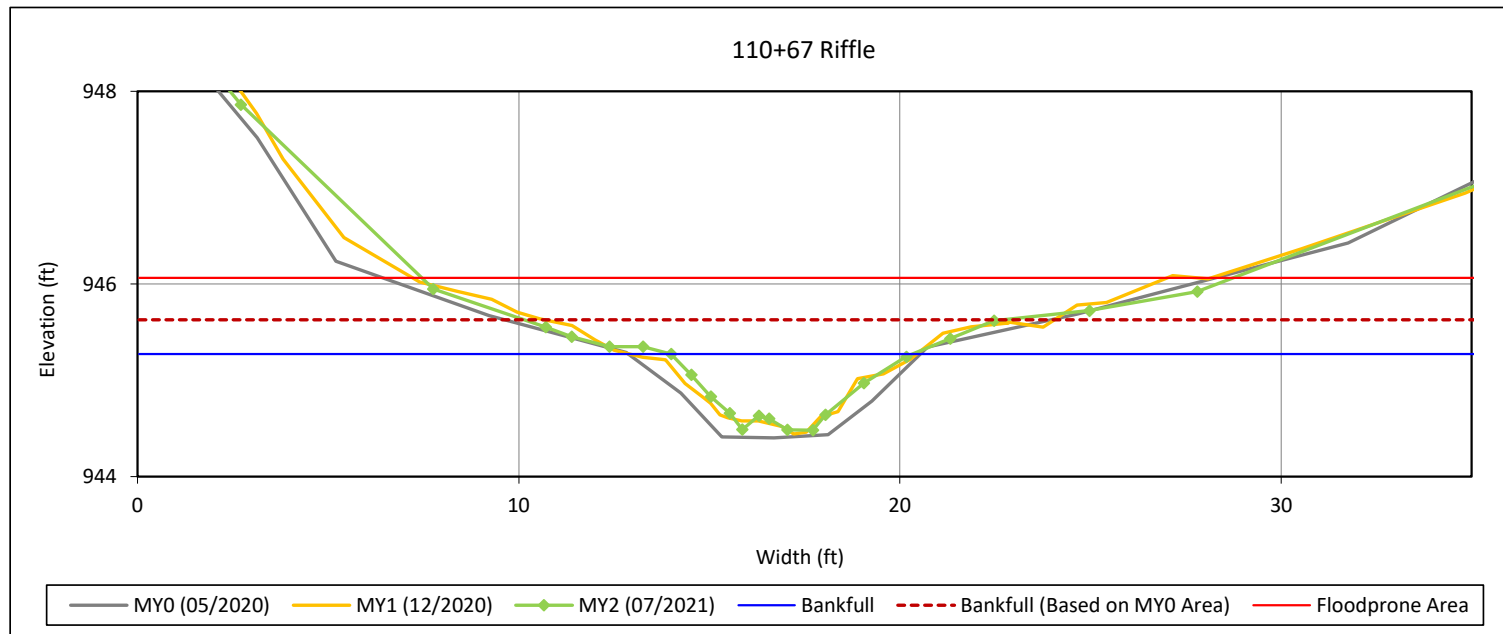
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 4-UT1 Reach 1B



Bankfull Dimensions

3.0	x-section area (ft.sq.)
6.3	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
6.7	wetted perimeter (ft)
0.4	hydraulic radius (ft)
13.5	width-depth ratio
21.3	W flood prone area (ft)
3.4	entrenchment ratio
0.7	low bank height ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

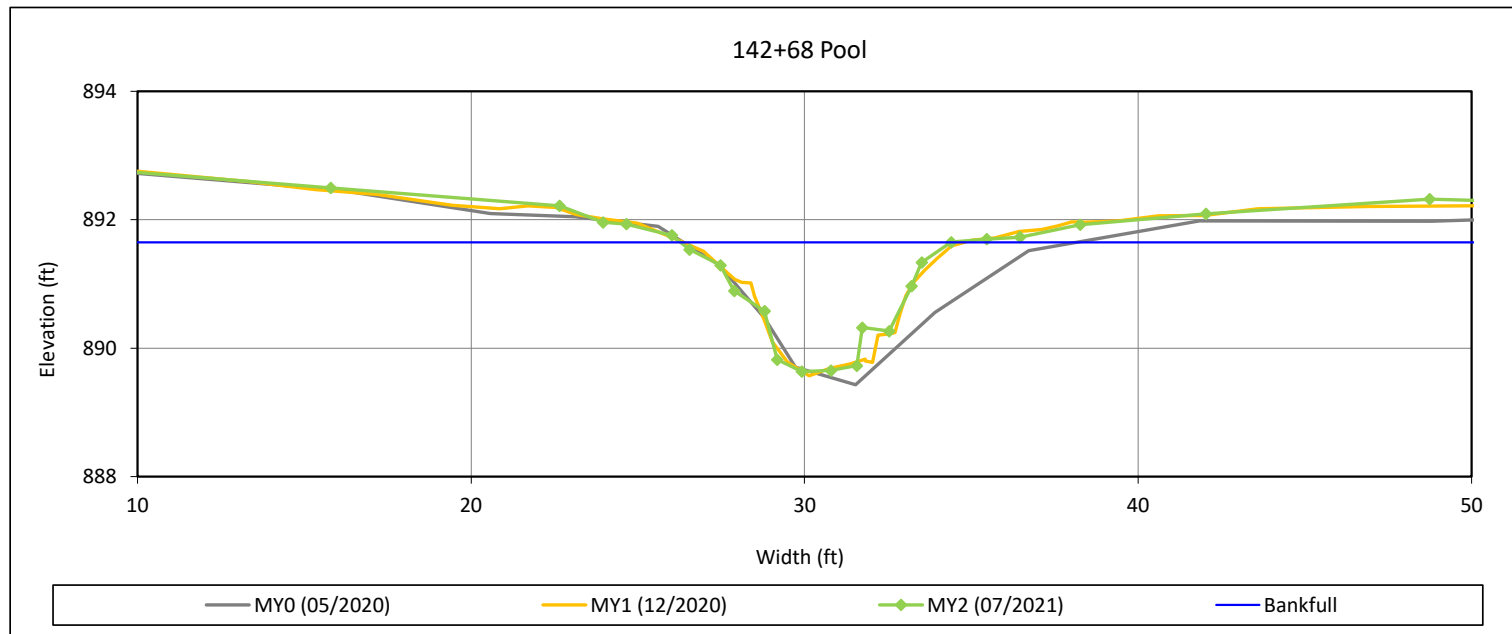
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 5-UT1 Reach 4A



Bankfull Dimensions

8.9	x-section area (ft.sq.)
8.1	width (ft)
1.1	mean depth (ft)
2.0	max depth (ft)
9.9	wetted perimeter (ft)
0.9	hydraulic radius (ft)
7.4	width-depth ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

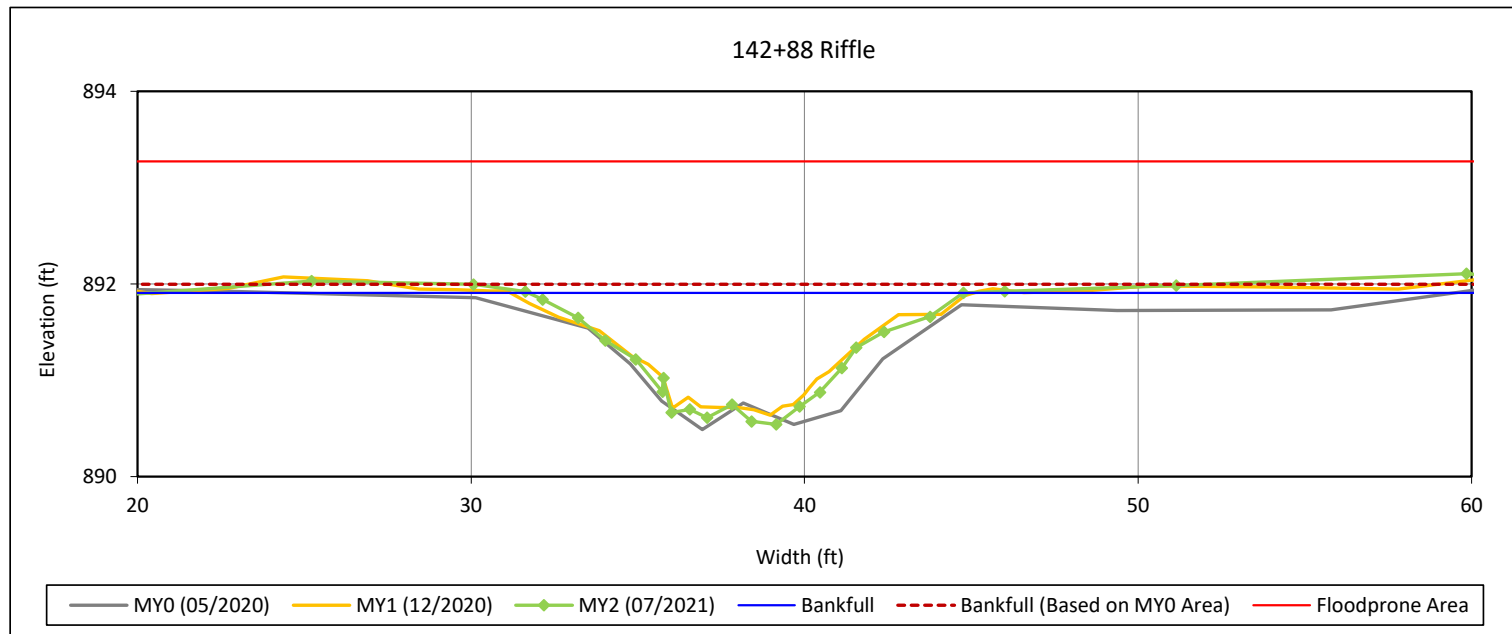
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 6-UT1 Reach 4A



Bankfull Dimensions

9.4	x-section area (ft.sq.)
13.0	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
13.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
18.1	width-depth ratio
66.3	W flood prone area (ft)
5.1	entrenchment ratio
0.9	low bank height ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

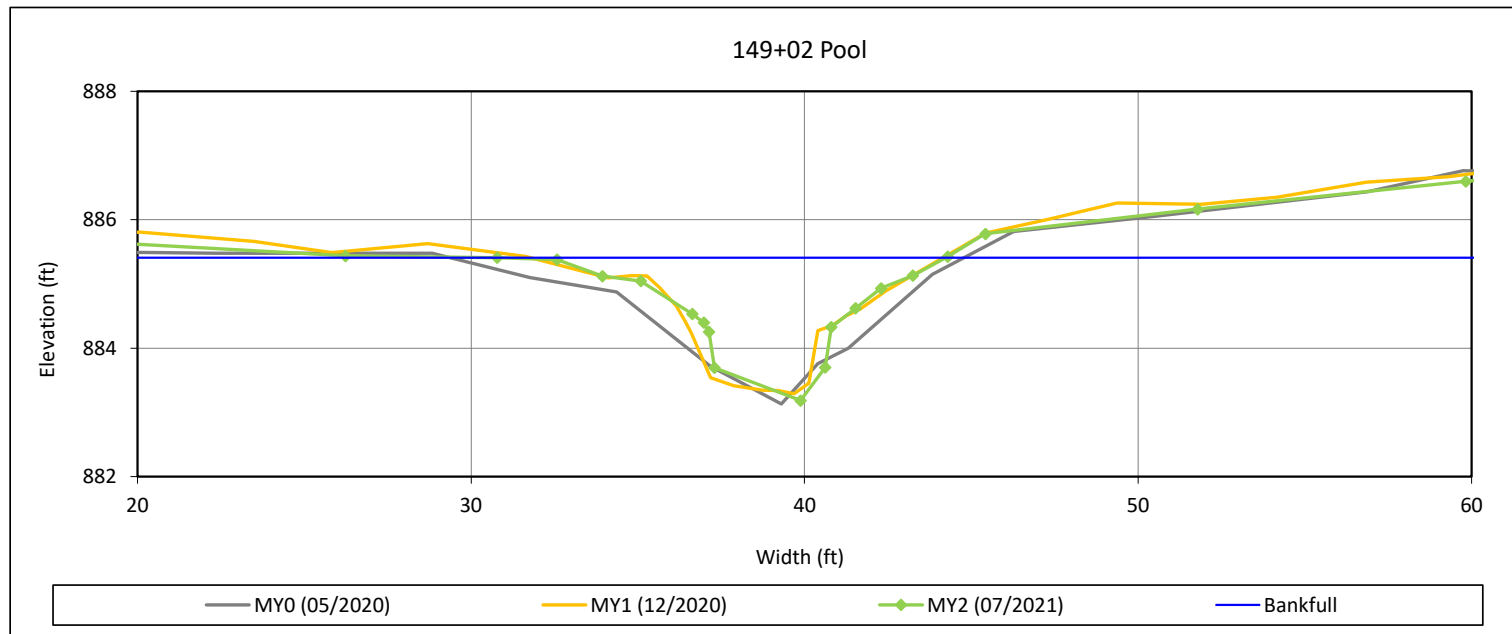
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 7-UT1 Reach 4A



Bankfull Dimensions

10.8	x-section area (ft.sq.)
13.5	width (ft)
0.8	mean depth (ft)
2.2	max depth (ft)
14.9	wetted perimeter (ft)
0.7	hydraulic radius (ft)
16.8	width-depth ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

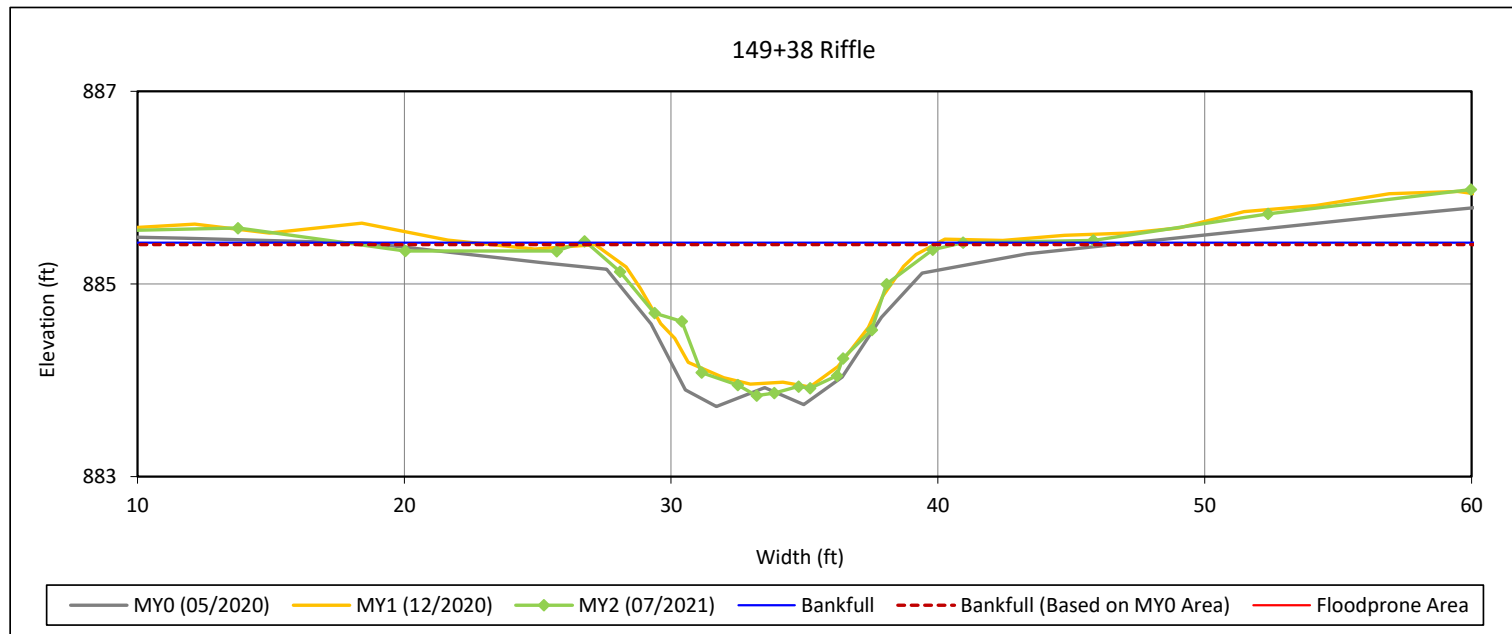
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 8-UT1 Reach 4A



Bankfull Dimensions

12.3	x-section area (ft.sq.)
14.1	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
14.7	wetted perimeter (ft)
0.8	hydraulic radius (ft)
16.3	width-depth ratio
62.6	W flood prone area (ft)
4.4	entrenchment ratio
1.0	low bank height ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

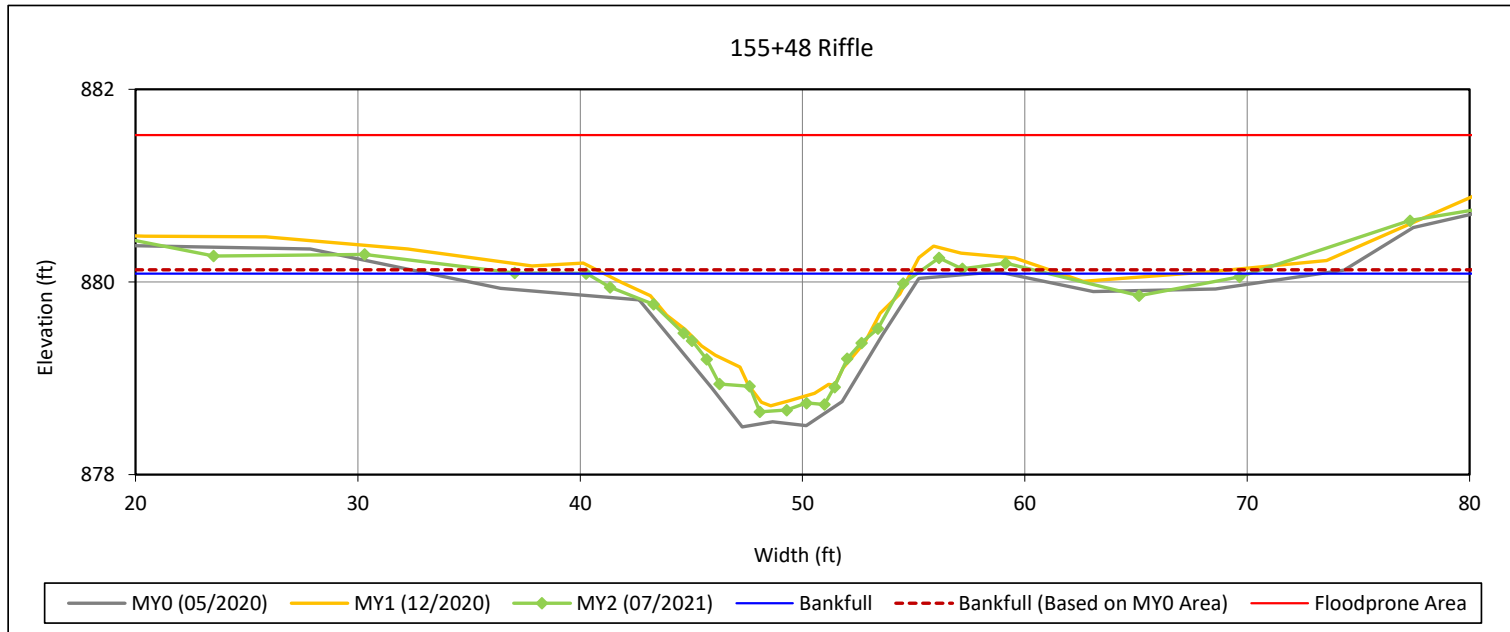
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 9-UT1 Reach 4B



Bankfull Dimensions

11.3	x-section area (ft.sq.)
14.9	width (ft)
0.8	mean depth (ft)
1.4	max depth (ft)
15.3	wetted perimeter (ft)
0.7	hydraulic radius (ft)
19.6	width-depth ratio
80.8	W flood prone area (ft)
5.4	entrenchment ratio
1.0	low bank height ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

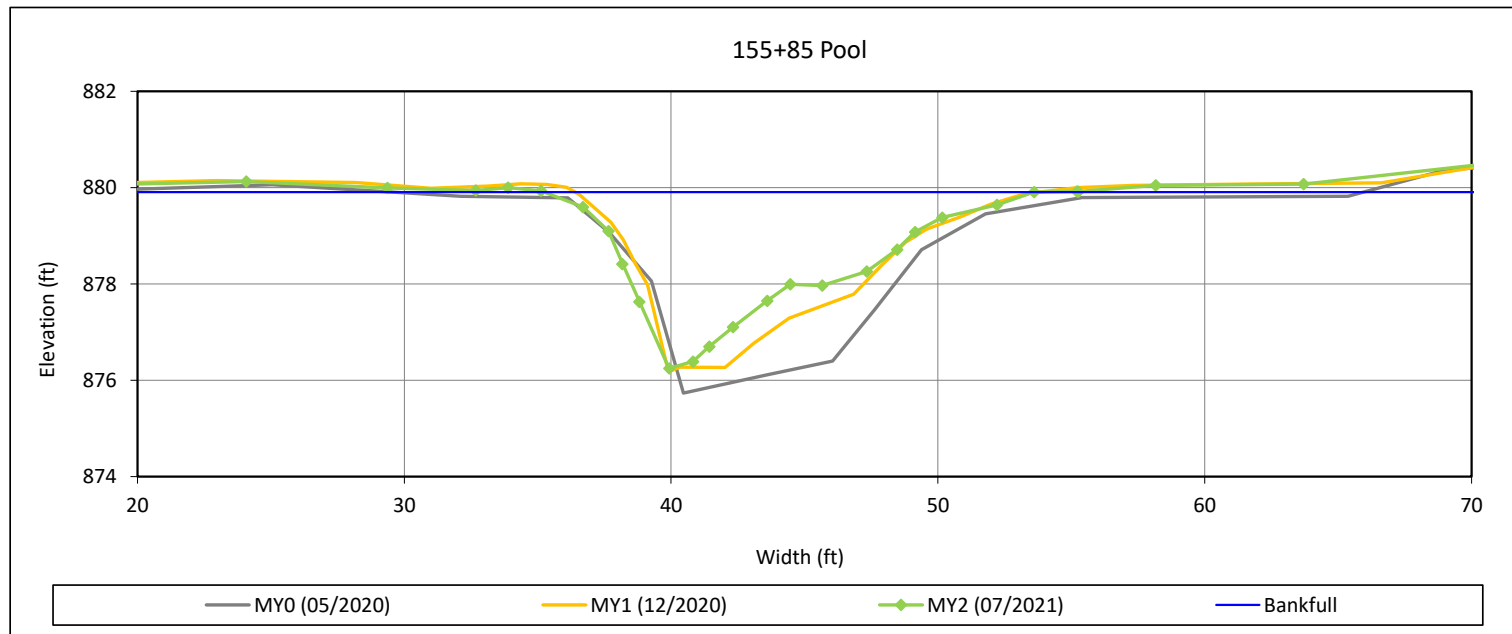
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 10-UT1 Reach 4B



Bankfull Dimensions

28.1	x-section area (ft.sq.)
18.3	width (ft)
1.5	mean depth (ft)
3.7	max depth (ft)
20.5	wetted perimeter (ft)
1.4	hydraulic radius (ft)
12.0	width-depth ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

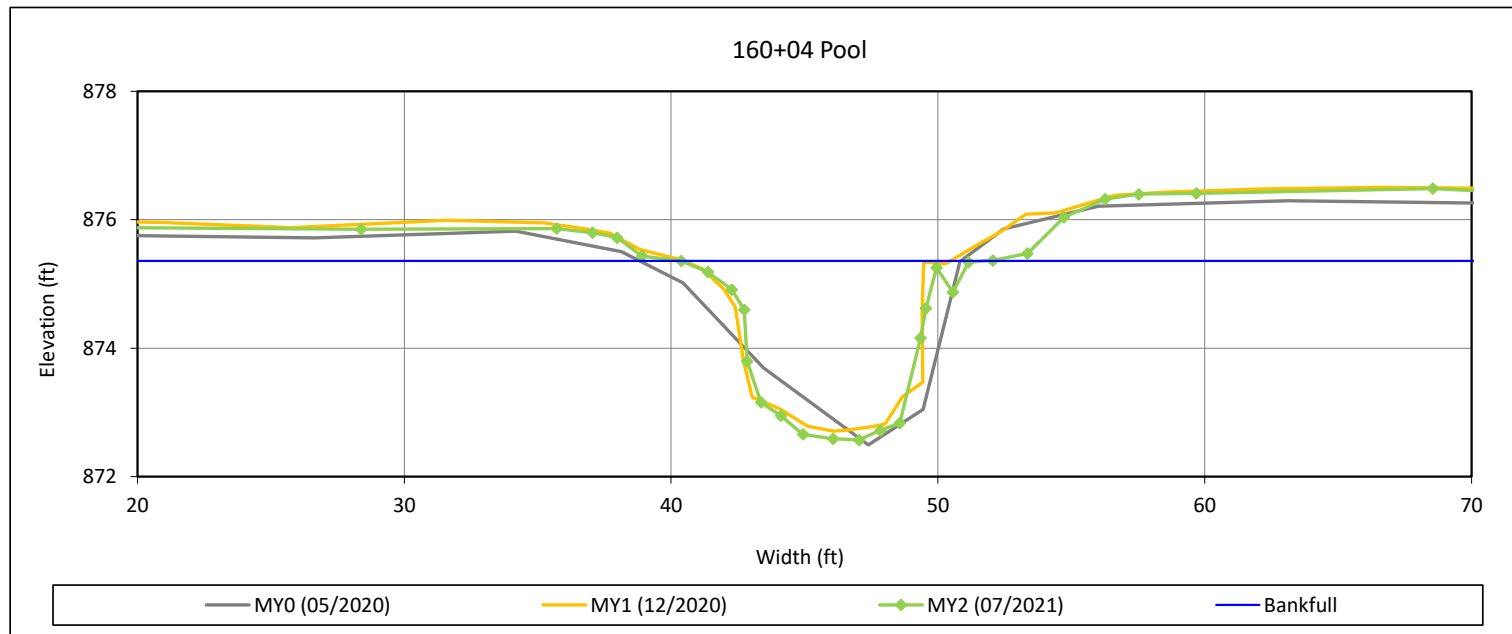
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 11-UT1 Reach 4B



Bankfull Dimensions

17.6	x-section area (ft.sq.)
11.4	width (ft)
1.5	mean depth (ft)
2.8	max depth (ft)
14.4	wetted perimeter (ft)
1.2	hydraulic radius (ft)
7.4	width-depth ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

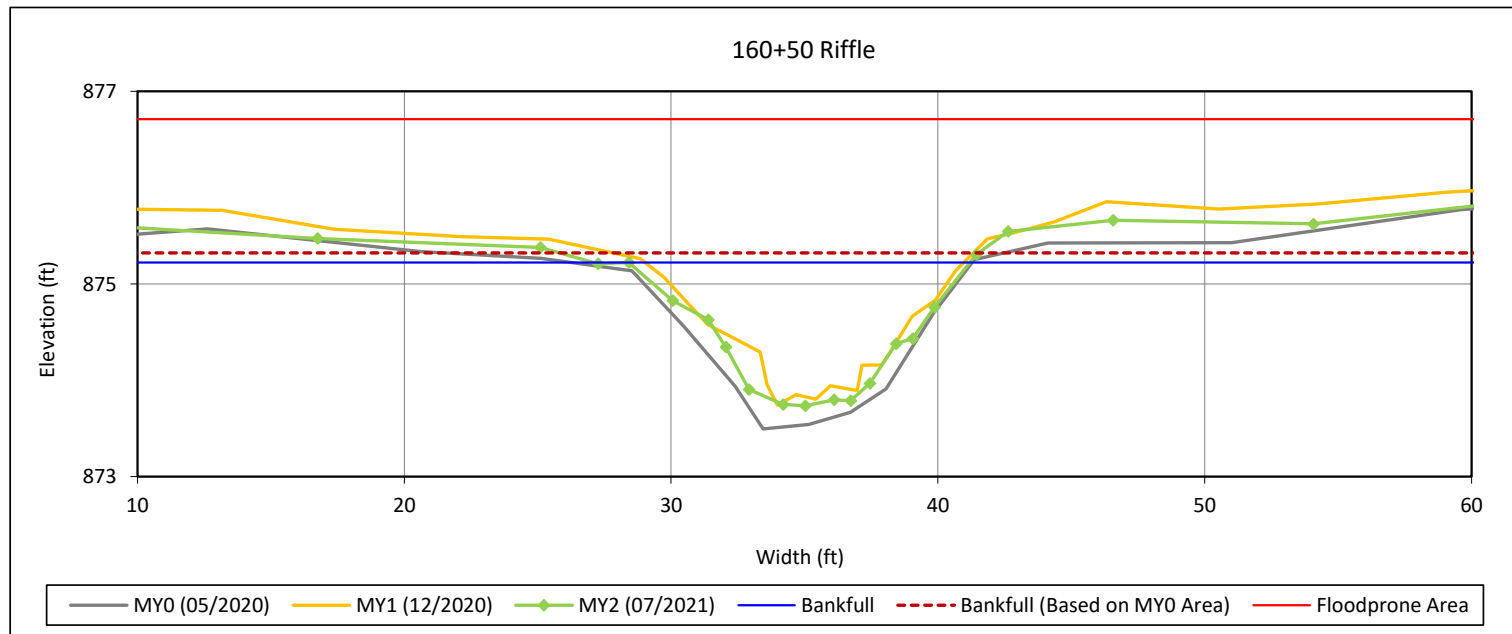
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 12-UT1 Reach 4B



Bankfull Dimensions

11.2	x-section area (ft.sq.)
12.8	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
13.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
14.6	width-depth ratio
74.5	W flood prone area (ft)
5.8	entrenchment ratio
0.9	low bank height ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

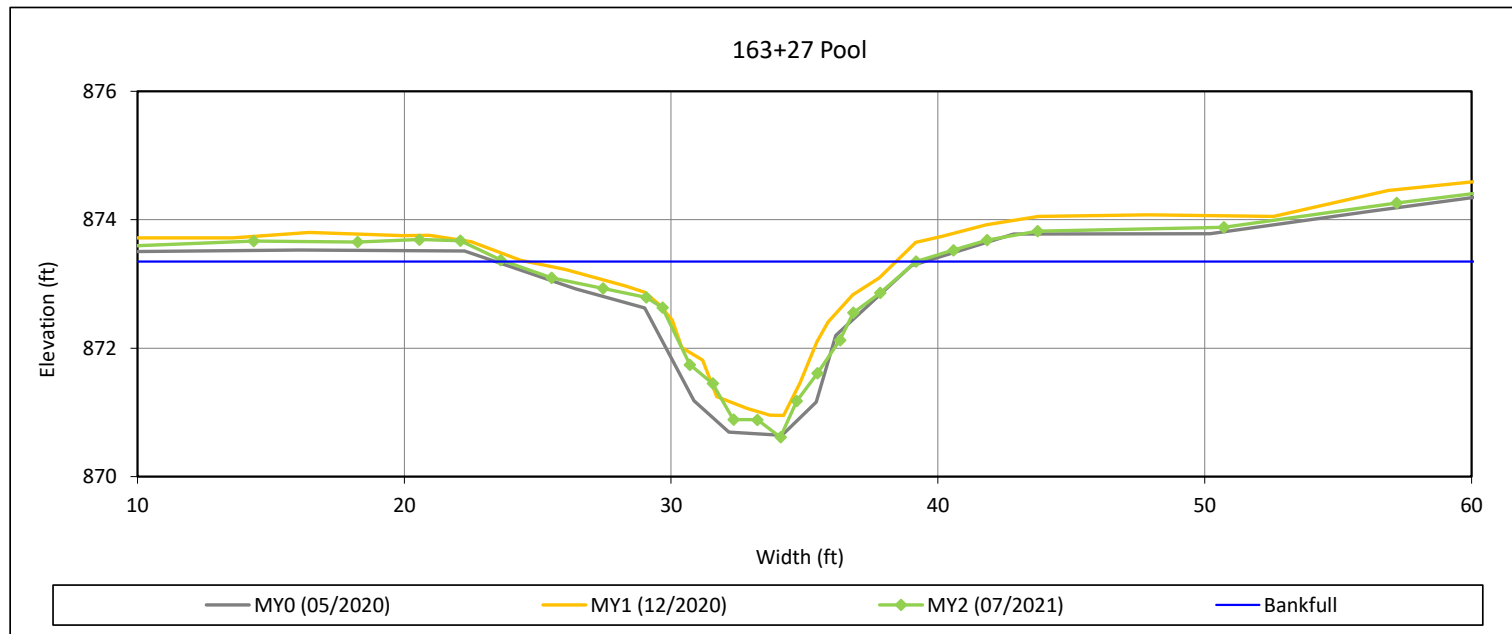
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 13-UT1 Reach 4B



Bankfull Dimensions

16.6	x-section area (ft.sq.)
15.4	width (ft)
1.1	mean depth (ft)
2.7	max depth (ft)
16.8	wetted perimeter (ft)
1.0	hydraulic radius (ft)
14.3	width-depth ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

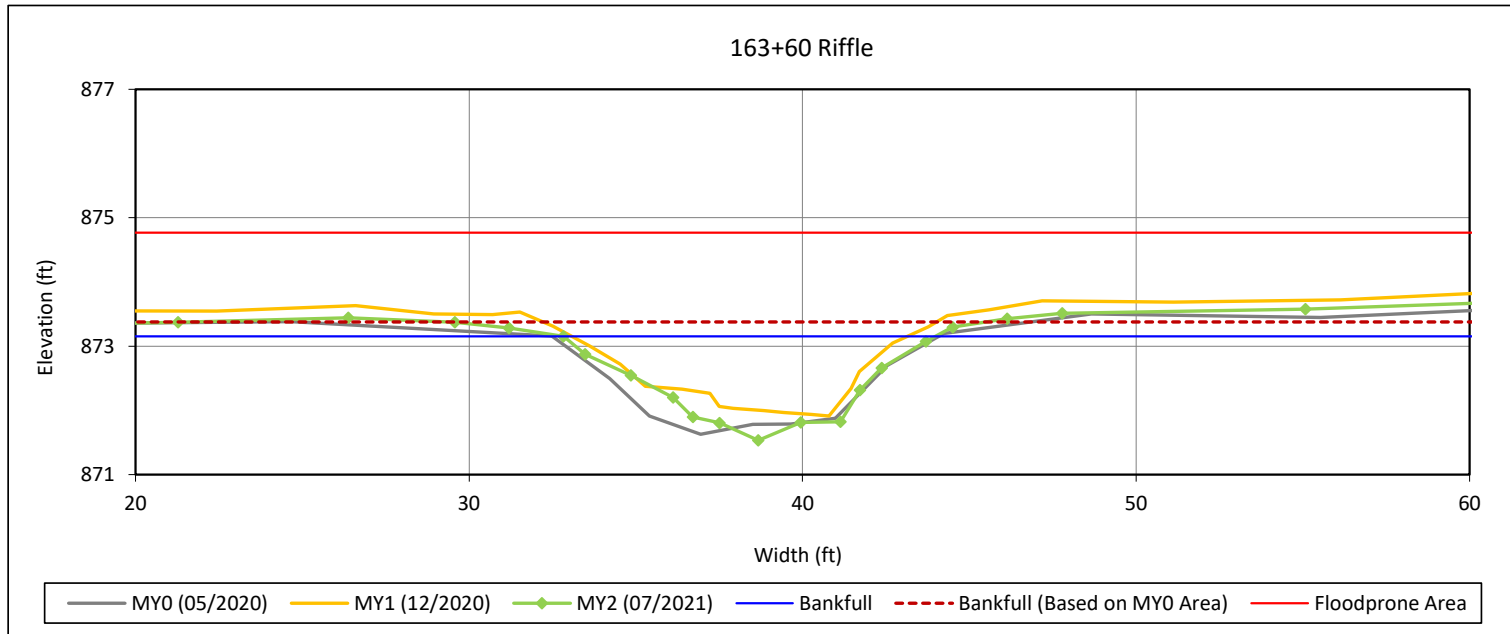
Cross-Section Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Cross-Section 14-UT1 Reach 4B



Bankfull Dimensions

10.0	x-section area (ft.sq.)
11.2	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
11.8	wetted perimeter (ft)
0.9	hydraulic radius (ft)
12.4	width-depth ratio
73.7	W flood prone area (ft)
6.6	entrenchment ratio
0.9	low bank height ratio

Survey Date: 07/2021

Field Crew: Wildlands Engineering



View Downstream

Reachwide Pebble Count Plots

Alexander Farm Mitigation Site

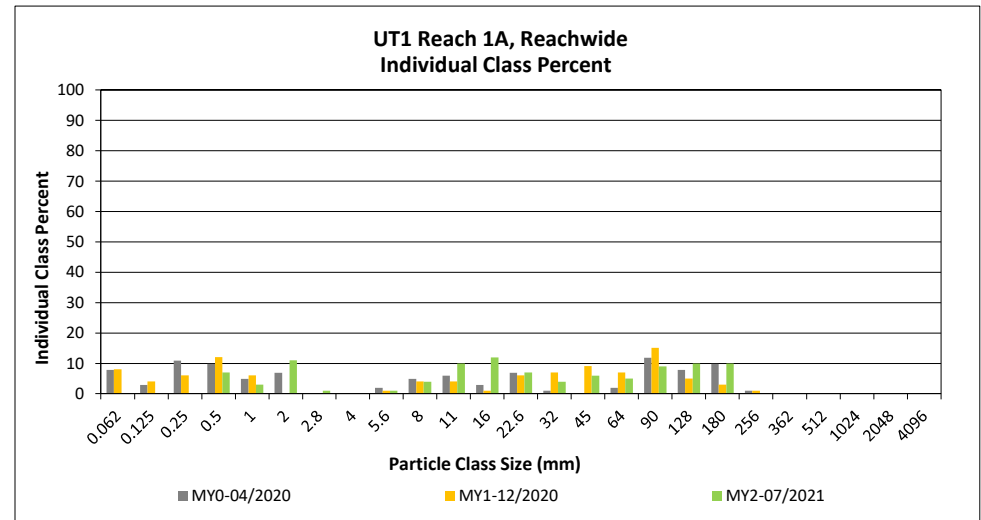
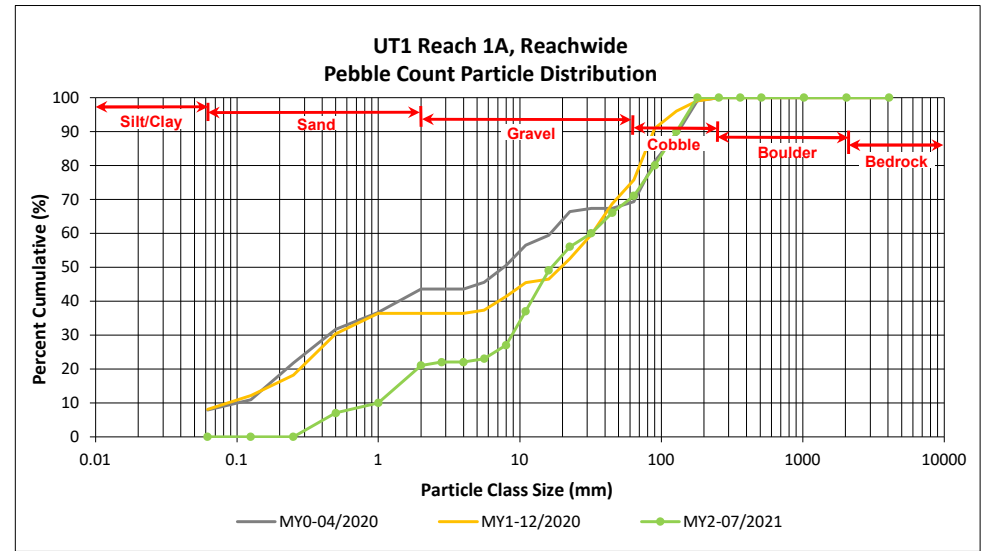
DMS Project No. 100048

Monitoring Year 2 - 2021

UT1 Reach 1A, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125					0
	Fine	0.125	0.250					0
	Medium	0.25	0.50		7	7	7	7
	Coarse	0.5	1.0		3	3	3	10
	Very Coarse	1.0	2.0	1	10	11	11	21
GRAVEL	Very Fine	2.0	2.8		1	1	1	22
	Very Fine	2.8	4.0					22
	Fine	4.0	5.6		1	1	1	23
	Fine	5.6	8.0	1	3	4	4	27
	Medium	8.0	11.0	4	6	10	10	37
	Medium	11.0	16.0	7	5	12	12	49
	Coarse	16.0	22.6	3	4	7	7	56
	Coarse	22.6	32	1	3	4	4	60
	Very Coarse	32	45	4	2	6	6	66
	Very Coarse	45	64	4	1	5	5	71
	COBBLE	Small	64	90	9		9	9
Small		90	128	8	2	10	10	90
Large		128	180	8	2	10	10	100
Large		180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	1.5
D ₃₅ =	10.3
D ₅₀ =	16.8
D ₈₄ =	103.6
D ₉₅ =	151.8
D ₁₀₀ =	180.0



Reachwide Pebble Count Plots

Alexander Farm Mitigation Site

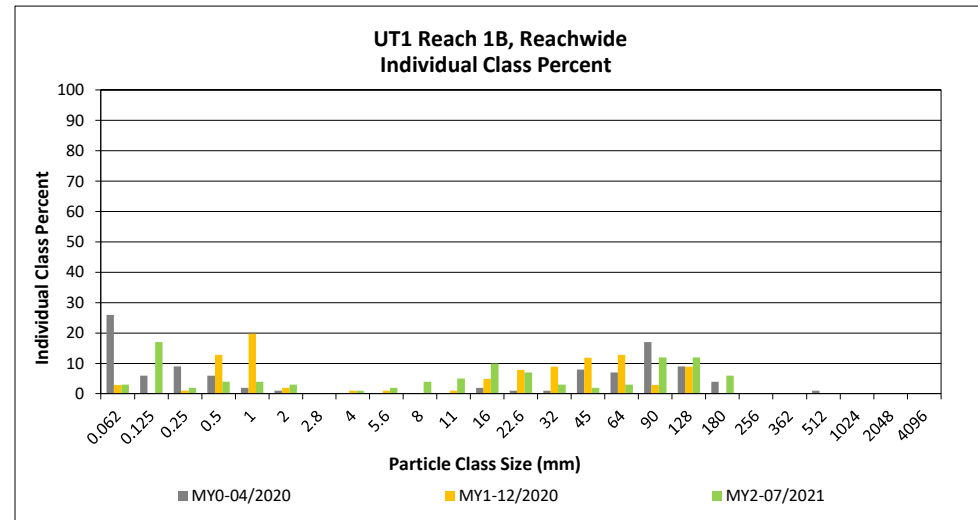
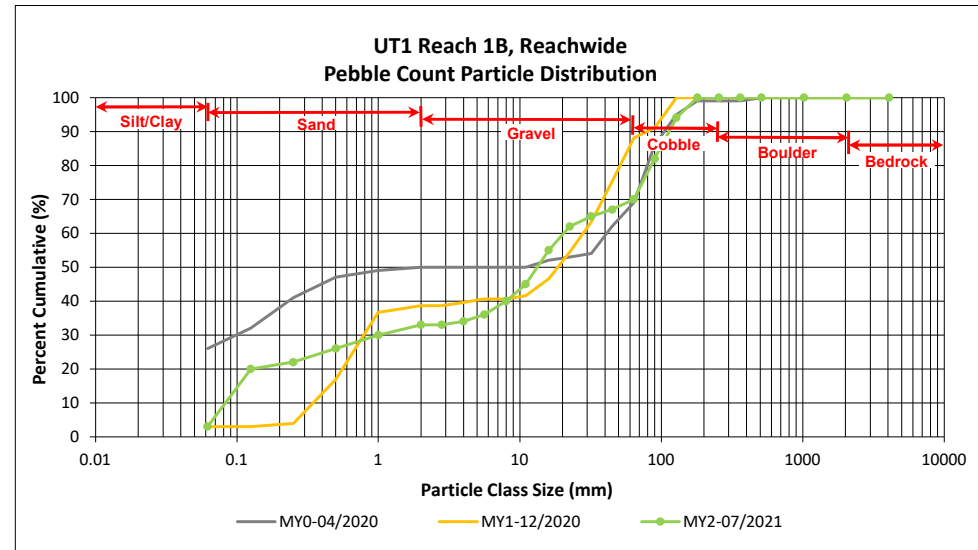
DMS Project No. 100048

Monitoring Year 2 - 2021

UT1 Reach 1B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		3	3	3	3
SAND	Very fine	0.062	0.125		17	17	17	20
	Fine	0.125	0.250	1	1	2	2	22
	Medium	0.25	0.50	1	3	4	4	26
	Coarse	0.5	1.0	1	3	4	4	30
	Very Coarse	1.0	2.0	1	2	3	3	33
GRAVEL	Very Fine	2.0	2.8					33
	Very Fine	2.8	4.0		1	1	1	34
	Fine	4.0	5.6		2	2	2	36
	Fine	5.6	8.0		4	4	4	40
	Medium	8.0	11.0	1	4	5	5	45
	Medium	11.0	16.0	5	5	10	10	55
	Coarse	16.0	22.6	4	3	7	7	62
	Coarse	22.6	32	2	1	3	3	65
	Very Coarse	32	45	2		2	2	67
	Very Coarse	45	64	2	1	3	3	70
COBBLE	Small	64	90	12		12	12	82
	Small	90	128	12		12	12	94
	Large	128	180	6		6	6	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	4.7
D ₅₀ =	13.3
D ₈₄ =	95.4
D ₉₅ =	135.5
D ₁₀₀ =	180.0



Reachwide Pebble Count Plots

Alexander Farm Mitigation Site

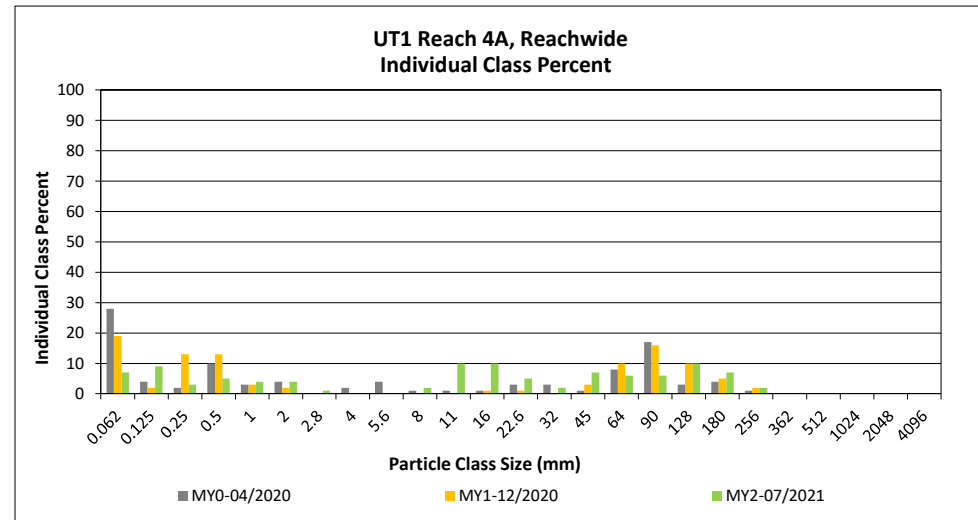
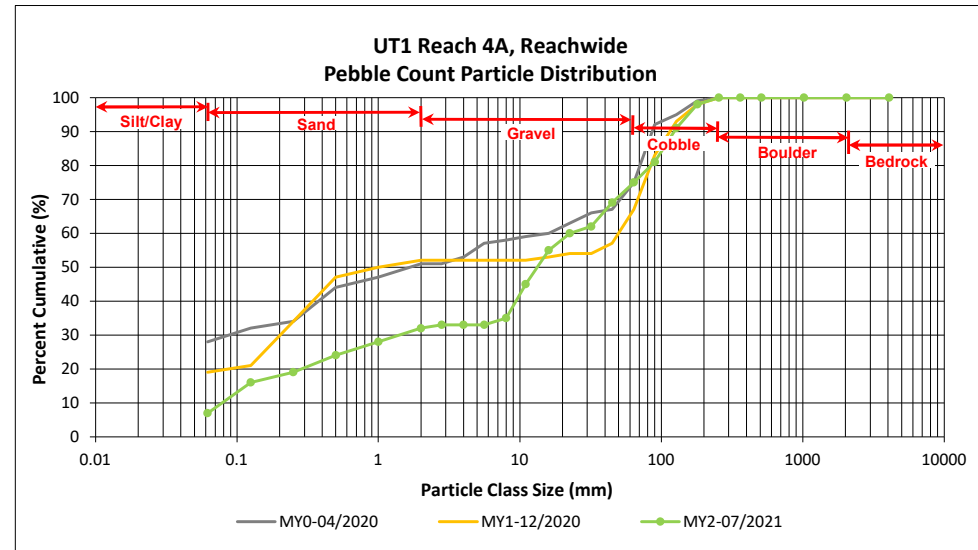
DMS Project No. 100048

Monitoring Year 2 - 2021

UT1 Reach 4A, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		7	7	7	7
SAND	Very fine	0.062	0.125		9	9	9	16
	Fine	0.125	0.250		3	3	3	19
	Medium	0.25	0.50		5	5	5	24
	Coarse	0.5	1.0		4	4	4	28
	Very Coarse	1.0	2.0	1	3	4	4	32
GRAVEL	Very Fine	2.0	2.8		1	1	1	33
	Very Fine	2.8	4.0					33
	Fine	4.0	5.6					33
	Fine	5.6	8.0		2	2	2	35
	Medium	8.0	11.0	3	7	10	10	45
	Medium	11.0	16.0	3	7	10	10	55
	Coarse	16.0	22.6	4	1	5	5	60
	Coarse	22.6	32	2		2	2	62
	Very Coarse	32	45	6	1	7	7	69
	Very Coarse	45	64	6		6	6	75
COBBLE	Small	64	90	6		6	6	81
	Small	90	128	10		10	10	91
	Large	128	180	7		7	7	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	8.0
D ₅₀ =	13.3
D ₈₄ =	100.0
D ₉₅ =	155.5
D ₁₀₀ =	256.0



Reachwide Pebble Count Plots

Alexander Farm Mitigation Site

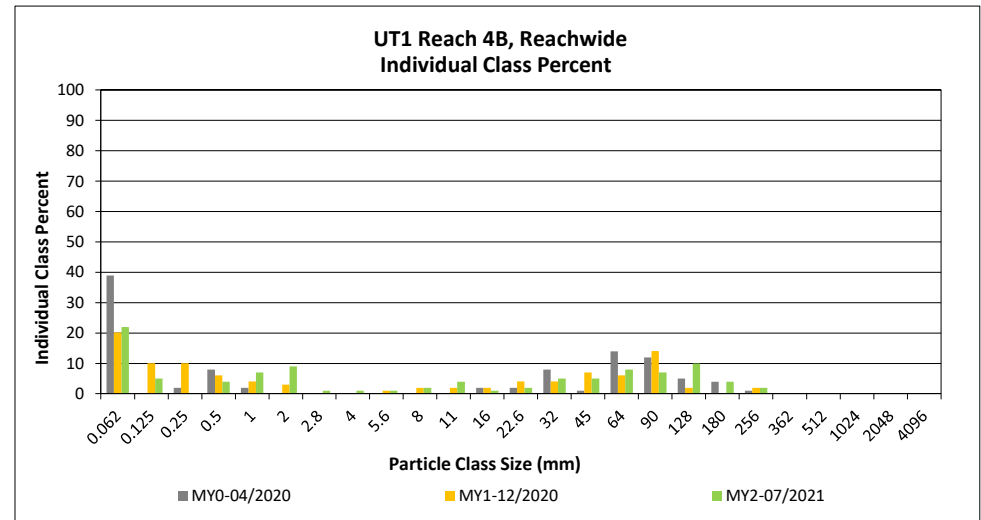
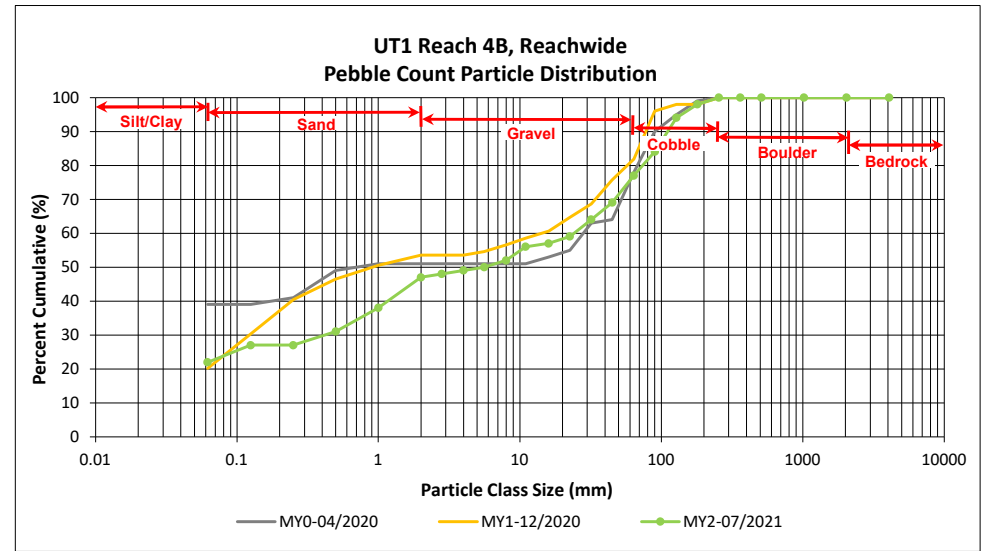
DMS Project No. 100048

Monitoring Year 2 - 2021

UT1 Reach 4B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	21	22	22	22
SAND	Very fine	0.062	0.125	1	4	5	5	27
	Fine	0.125	0.250					27
	Medium	0.25	0.50		4	4	4	31
	Coarse	0.5	1.0	3	4	7	7	38
	Very Coarse	1.0	2.0	1	8	9	9	47
GRAVEL	Very Fine	2.0	2.8		1	1	1	48
	Very Fine	2.8	4.0		1	1	1	49
	Fine	4.0	5.6		1	1	1	50
	Fine	5.6	8.0		2	2	2	52
	Medium	8.0	11.0	2	2	4	4	56
	Medium	11.0	16.0	1		1	1	57
	Coarse	16.0	22.6	1	1	2	2	59
	Coarse	22.6	32	5		5	5	64
	Very Coarse	32	45	5		5	5	69
	Very Coarse	45	64	8		8	8	77
COBBLE	Small	64	90	7		7	7	84
	Small	90	128	9	1	10	10	94
	Large	128	180	4		4	4	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.7
D ₅₀ =	5.6
D ₈₄ =	90.0
D ₉₅ =	139.4
D ₁₀₀ =	256.0



APPENDIX 5. Hydrology Summary Data and Plots

Table 14. Verification of Bankfull Events

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

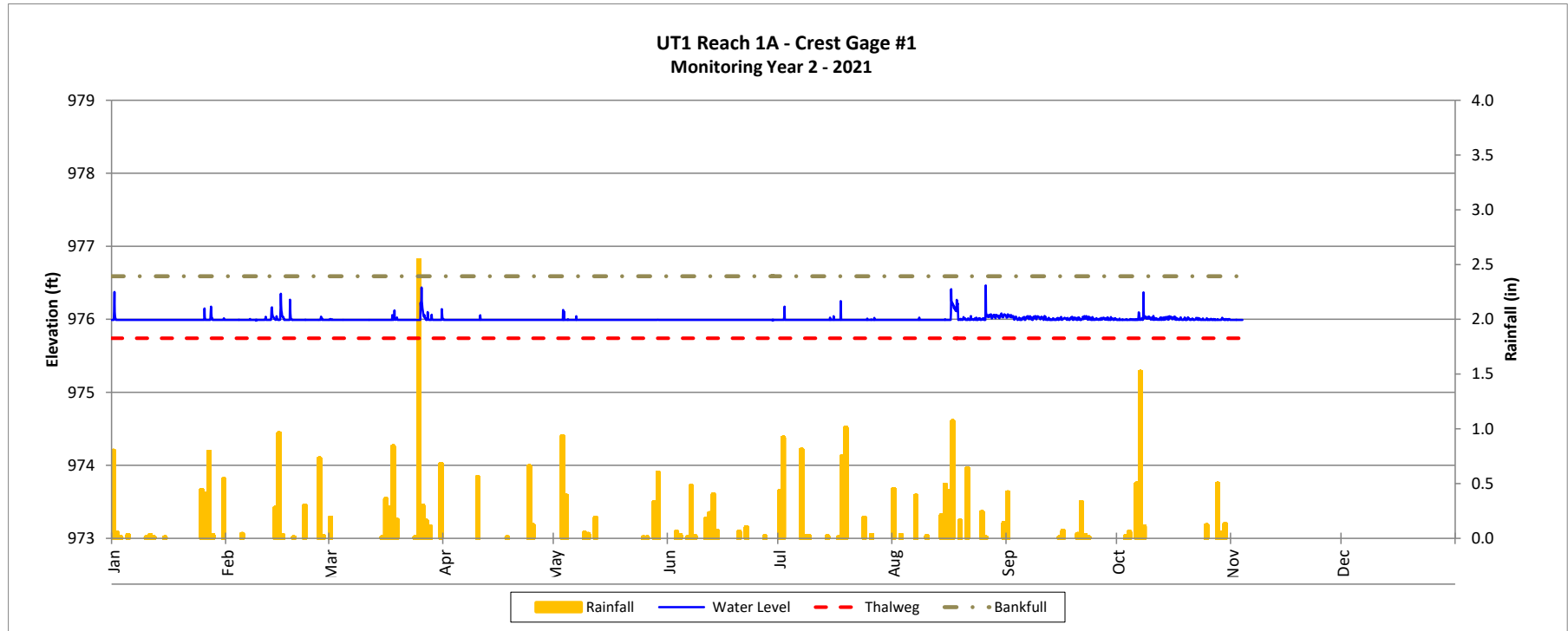
Reach	MY	Date of Occurrence	Date of Data Collection	Method
UT1 - 1A	MY1	11/12/2020	11/12/2020	Crest Gage
UT1 - 1A	MY2	---	---	Crest Gage

Recorded Bankfull Events

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021



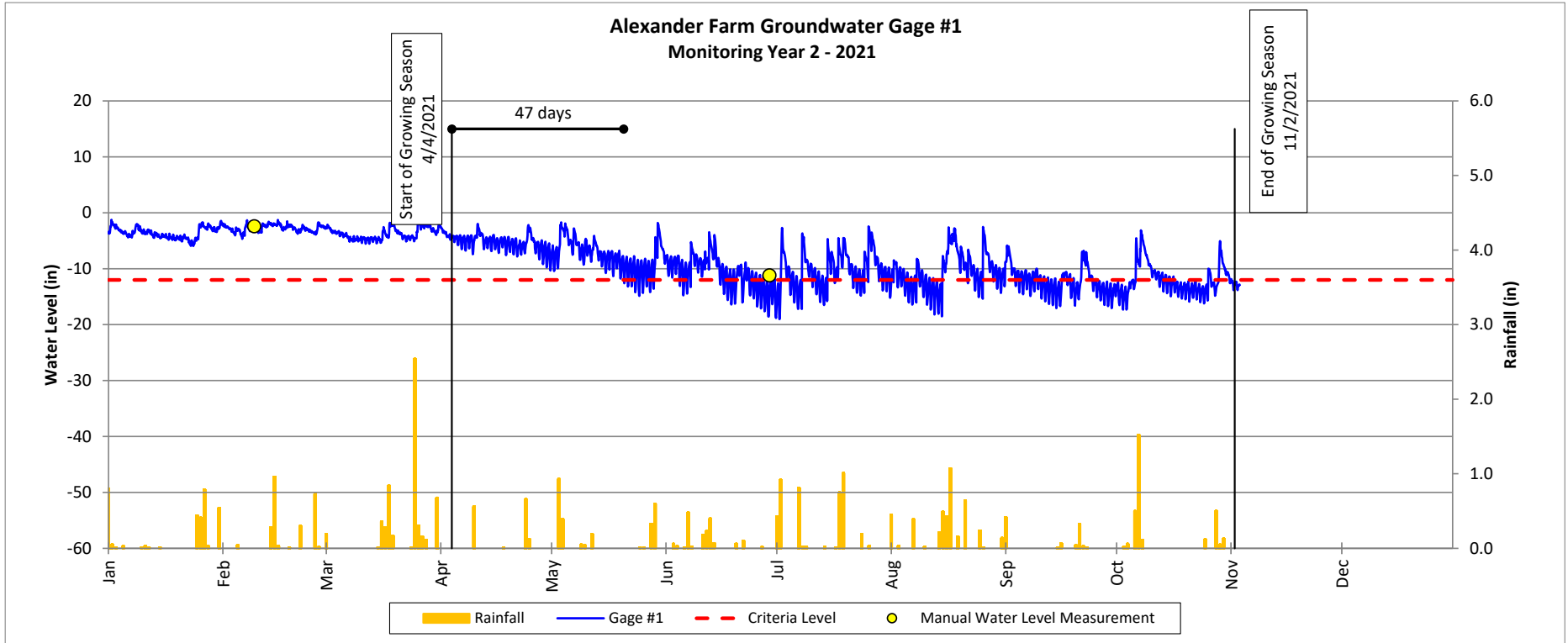
Groundwater Gage Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Wetland E on UT1 R1B



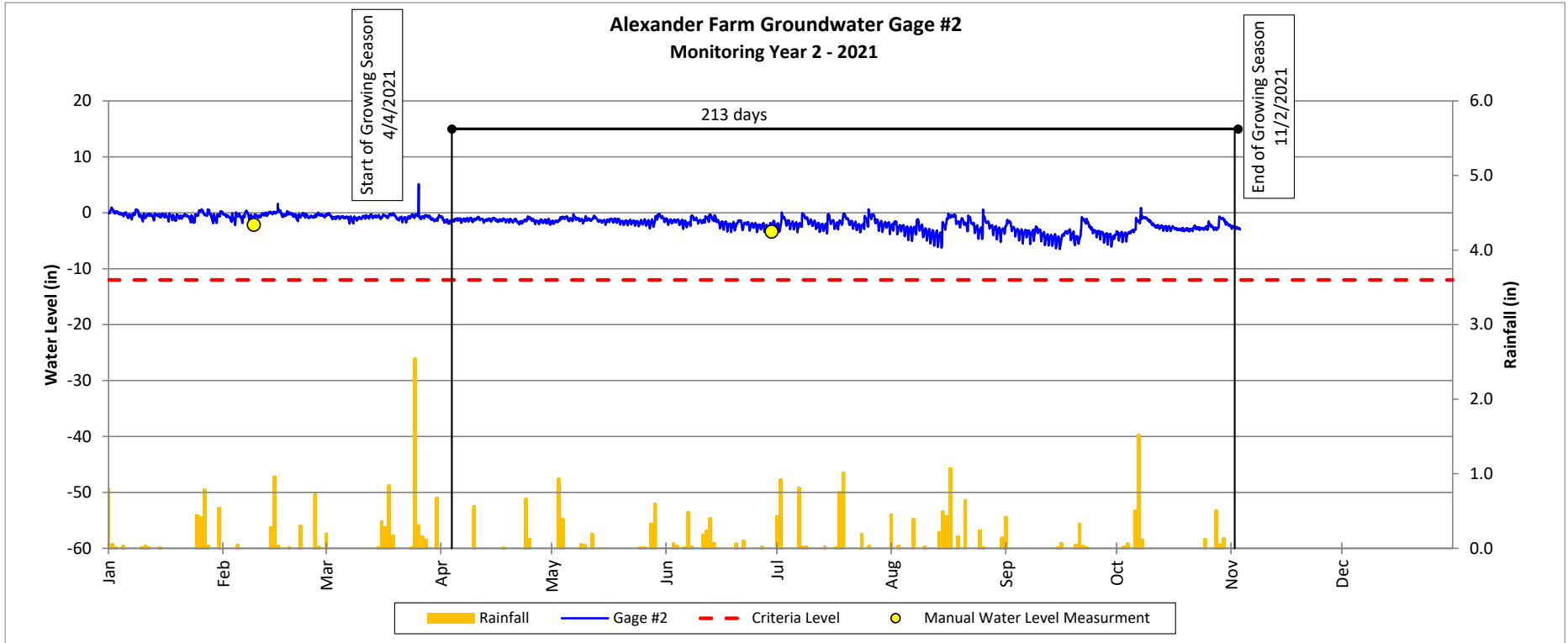
Groundwater Gage Plots

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021

Wetland N on UT1 R4A

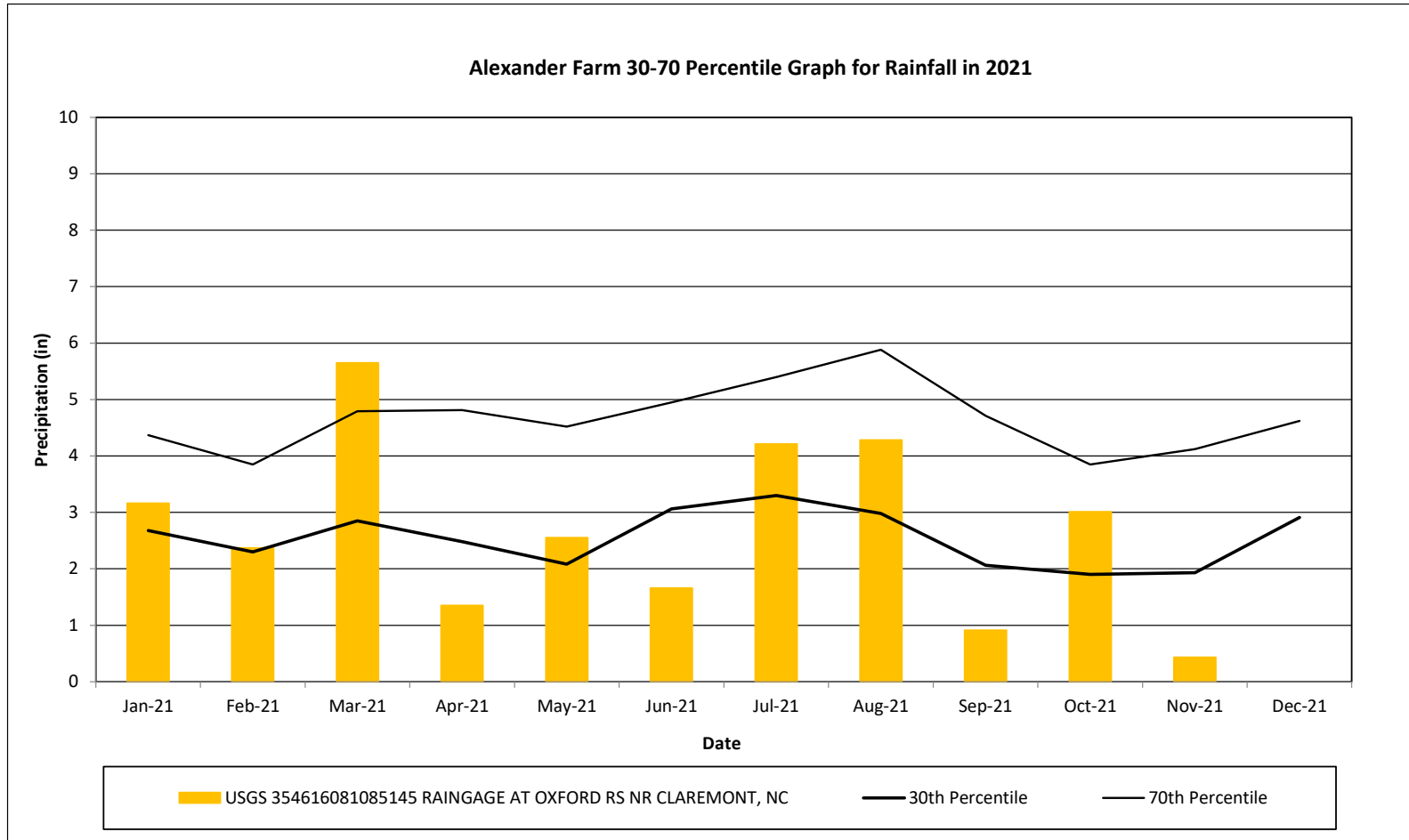


Monthly Rainfall Data

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 2 - 2021



Annual Rainfall collected by USGS 354616081085145 RAINGAGE AT OXFORD RS NR CLAREMONT, NC

30th and 70th percentile rainfall data collected from WETS station Statesville 2 NNE, NC

APPENDIX 6. Adaptive Management Plan & Wildlands Responses to AMP Comments



ADAPTIVE MANAGEMENT PLAN

ALEXANDER FARM MITIGATION SITE

Alexander County, NC

DEQ Contract No. 7416

DMS Project No. 100048

USACE Action ID No. SAW-2018-00451

NCDEQ DWR Certification No. 18-0665

RFP #: 16-007277

Catawba River Basin

HUC 03050101

Data Collection Period: October 2020 – February 2021

Submission Date: February 23, 2021

PREPARED FOR:



NC Department of Environment Quality

Division of Mitigation Services

217 West Jones Street; 3rd Floor

Raleigh, NC 27603

PREPARED BY:



Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Phone: 704.332.7754
Fax: 704.332.3306

Alexander Farm MITIGATION SITE
Adaptive Management Plan

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Section 2: Vegetative Assessment 1

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APPENDICES

Appendix 1 Vegetation Assessment and Planting Plan

Figure 1.1 – 1.3 Supplemental Planting Map

Table 1 Vegetation Plot Criteria Attainment

Table 2a-b Planted and Total Stem Counts

Table 3 Supplemental Vegetation Planting

Appendix 2 Approved Planting Plans

 Final Mitigation Planting List & Plan

 Final As-built Baseline Conditions Planting List & Plan

Section 1: Introduction

Wildlands Engineering, Inc. (Wildlands) implemented a full-delivery stream mitigation project at the Alexander Farm Mitigation Site (Site) for the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS). The project restored, enhanced, and preserved a total of 6,722 linear feet (LF) of perennial stream in Alexander County, NC. The Site is located at 35.811767, -81.120683 (decimal degrees) within the DMS targeted local watershed (TWL) for the Catawba River Basin HUC 03050101 and the NC Division of Water Resources (DWR) Subbasin 03-08-32. The project is providing 4,258.100 stream mitigation units (SMUs) for the Catawba River Basin Hydrologic Unit Code (HUC) 03050101130010 (Catawba 01). The final mitigation plan was submitted and accepted by DMS in June of 2019 and the IRT in October of 2019.

Wildlands Engineering submitted a Monitoring Year 1 (MY1) report at the beginning of 2021 describing vegetation areas of concern on the Site that were caused by poor soils along with late season planting which was completed by April 17th, 2020. Based on comments and discussions among DMS, the NC Interagency Review Team (IRT), and Wildlands, it was determined that an Adaptive Management Plan (AMP) was needed to describe planned efforts to improve those areas. This effort is outlined in the following sections.

Section 2: Vegetative Assessment

2.1 Performance Criteria

Based on the Final Mitigation Plan for the Alexander Farm Mitigation Site (Wildlands, 2019), the final vegetative success criteria will be the survival of 210 planted stems per acre in the open planted riparian corridor at the end of the required seventh monitoring period. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of MY3 and at least 260 stems per acre at the end of MY5. Planted vegetation in each plot must average 7 feet in height by MY5 and 10 feet in height at the end of the MY7. No success criteria are associated with shaded area planting.

2.2 Results

The MY1 vegetation survey that was completed in October 2020 identified six of twelve vegetation plots (Permanent and Mobile) that are not on track to meet MY3 interim success criteria of 320 planted stems per acre. Of those six plots, three are not on track to meet the final success criteria of 210 planted stems per acre. Additionally, low stem density areas across the site total approximately 10.0 acres. These areas of low stem density were noted along UT1 Reach 1A, Reach 1B, Reach 2, Reach 4A, Reach 4B, and UT1A.

See Appendix 1 for the location of areas of low stem density (Figures 1.1 – 1.3) and Tables 1 and 2a-b for the results of MY1 vegetation plot monitoring.

Section 3: Supplemental Vegetation Planting

3.1 Site Assessment

Following the MY1 vegetative survey, Wildlands surveyed the Site to assess the extent of the tree mortality and explored reasons why mortality was higher in some areas compared to others. After assessing the Site, 10.0 acres were identified for supplemental planting which will be conducted in early 2021. Wildlands believes significant factors contributing to the high mortality rate across the project was due to a combination of late season planting which was completed by April 17th, 2020 and poor soils in graded areas.

3.2 Bare root plantings

Throughout the 10.0 acres, a mixture of nine species will be planted at a density of 500 stems per acre (Figures 1.1, 1.2, and 1.3). This is 57.6% of the original planted area. Planted trees will all be bare root stock. Species and quantities of trees to be planted are shown in Table 3. Five of the species were not included in the Final Mitigation Plan for the Alexander Farm Site (Wildlands, 2019). They are northern red oak (*Quercus rubra*), white oak (*Quercus alba*), winged elm (*Ulmus alata*), sassafras (*Sassafras albidum*), and eastern cottonwood (*Populus deltoides*). Two of the five species, northern red oak and white oak were previously approved by the IRT for addition to the planting list as part of the As-built Baseline Monitoring Report for the Site (Wildlands, 2020). Though the remaining three species (Winged elm, sassafras, and cottonwood) were not included as part of the project's previously approved planting plans, we believe that they will do well at the site as early successional species and have been added to the planting plan. Winged elm (*Ulmus alata*), sassafras (*Sassafras albidum*), and eastern cottonwood (*Populus deltoides*) are good early successional and hardy trees that should establish well in the growing conditions found on-site (poor soils with variability in moisture regimes). Also, since eastern cottonwoods grow quickly, they can create more favorable growing conditions for the later successional plant species by acting as nurse trees. Supplementally planted trees added to a vegetation plot will be flagged with a color different from what was used to flag the originally planted trees. The additional trees will not be counted towards success criteria until two growing seasons have passed.

The approved planting list and plan from the Site's Mitigation Plan is included in Appendix 2.

Section 4: Soil Amendments

Across the Site, all areas slated for replanting, which total 10.0 acres along UT1 Reach 1A, Reach 1B, Reach 2, Reach 4A, Reach 4B, and UT1A (Figures 1.1, 1.2, and 1.3) will be further treated with soil amendments. Grading during construction exposed poor-quality subsoils with low organic matter content and limited biology. Planned soil amendment additions include humic acid, biochar, dried molasses, slow-release fertilizer (2-4-3), rock phosphate, and azomite (a trace mineral supplement). Beyond boosting macro- and micronutrients in the soil, the addition of these amendments will improve other soil properties including cation exchange capacity, pH, and microbial communities. Expected improvements include higher moisture-holding capacity, organic matter, and nutrient availability for plants. The amendments will be applied to the base of each stem rather than broadcasted across the entire 10.0-acre area.

Section 5: Conclusion

In summary, Wildlands will plant nine species in early 2021 over 10.0 acres at a density of 500 stems per acre. The supplemental plants will consist of only bare root stock. Soil amendments will also be added during MY2 on all areas of the project that are replanted.

Wildlands will continue to monitor Site vegetation as previously planned. If the monitoring requirements are not met during MY7 in any of the planted areas, including ones with supplemental planting, Wildlands proposes to add another year of vegetation monitoring for those areas. Vegetation monitoring will continue until success criteria are met.

Section 6: REFERENCES

Wildlands Engineering, Inc (Wildlands), 2020. Alexander Farm Mitigation Site As-built Baseline Monitoring Report. DMS, Raleigh, NC.

Wildlands, 2019. Alexander Farm Mitigation Site Mitigation Plan. DMS, Raleigh, NC.

APPENDIX 7. MY2 Supplemental Planting

Alexander Farm Supplemental Planting Areas (MY2)

Total Planted Easement Acreage = 17.5 acres

Supplemental Planting Area = 2.1 acres or 11.9%

Low Stem Density Areas: 1.1 acres or 6.3% Total Planted Easement Acreage						
<u>Species</u>	<u>Common Name</u>	<u>Approved Mitigation Plan</u>	<u>BR/LS</u>	<u>%</u>	<u># of stems</u>	<u>Wetland Indicator Status</u>
<i>Alnus serrulata</i>	Smooth Alder	No	BR	15%	60	OBL
<i>Cephalanthus occidentalis</i>	Buttonbush	No	BR	15%	60	OBL
<i>Ulmus americana</i>	American Elm	No	BR	15%	60	FACW
<i>Acer negundo</i>	Boxelder	Yes	BR	5%	20	FAC
<i>Quercus lyrata</i>	Overcup Oak	No	BR	10%	40	OBL
<i>Salix nigra</i>	Black Willow	No	LS	5%	20	OBL
<i>Salix sericea</i>	Silky Willow	Yes	LS	10%	40	OBL
<i>Sambucus nigra</i>	Elderberry	No	LS	5%	20	FAC
<i>Viburnum nudum</i>	Possumhaw Viburnum	No	BR	10%	40	OBL
<i>Cornus amomum</i>	Silky Dogwood	Yes	LS	10%	40	FACW
Total				100%	400	

Wetland Replanting Areas : 1.0 acres or 5.6% of Total Planted Easement Acreage						
<u>Species</u>	<u>Common Name</u>	<u>Approved Mitigation Plan</u>	<u>BR/LS</u>	<u>%</u>	<u># of stems</u>	<u>Wetland Indicator Status</u>
<i>Alnus serrulata</i>	Smooth Alder	No	BR	15%	60	OBL
<i>Cephalanthus occidentalis</i>	Buttonbush	No	BR	15%	60	OBL
<i>Ulmus americana</i>	American Elm	No	BR	10%	40	FACW
<i>Acer negundo</i>	Boxelder	Yes	BR	5%	20	FAC
<i>Quercus lyrata</i>	Overcup Oak	No	BR	5%	20	OBL
<i>Salix nigra</i>	Black Willow	No	LS	15%	60	OBL
<i>Salix sericea</i>	Silky Willow	Yes	LS	15%	60	OBL
<i>Sambucus nigra</i>	Elderberry	No	LS	10%	40	FAC
<i>Cornus amomum</i>	Silky Dogwood	Yes	LS	10%	40	FACW
Total				100%	400	

From: [Haywood, Casey M CIV USARMY CESAW \(USA\)](#)
To: [Kristi Suggs](#)
Cc: [Tsomides, Harry](#); [Aaron Earley](#); [Brandon Romeo](#); [Sam Kirk](#); [Tugwell, Todd J CIV USARMY CESAW \(USA\)](#); [Browning, Kimberly D CIV USARMY CESAW \(USA\)](#); [Davis, Erin B](#); ["Wilson, Travis W. \(travis.wilson@ncwildlife.org\)"](#); [Munzer, Olivia](#); [Merritt, Katie](#); [holland_youngman@fws.gov](#); ["Bowers, Todd \(bowers.todd@epa.gov\)"](#)
Subject: RE: Alexander Farm Mitigation Site, Alexander County, NC (SAW-2018-00451) - Review request for the inclusion of additional woody species in the project's planting plan
Date: Wednesday, January 5, 2022 1:27:35 PM

Hi Kristi,

The IRT is okay with the proposed species list and you may proceed with the proposed supplemental planting. Please note that the IRT is concerned that this is the second year portions of the site needed to be replanted. As previously discussed during the IRT Adaptive Management Plan review, please ensure you provide additional transects in supplemental planting areas to demonstrate stem survival in future monitoring reports. As a reminder, an additional year of monitoring is required in MY6. If data suggests that the vegetative performance is not on a trajectory for success, an additional year of monitoring in MY8 may be required. Please reach out if you have any questions.

Thank you,
Casey

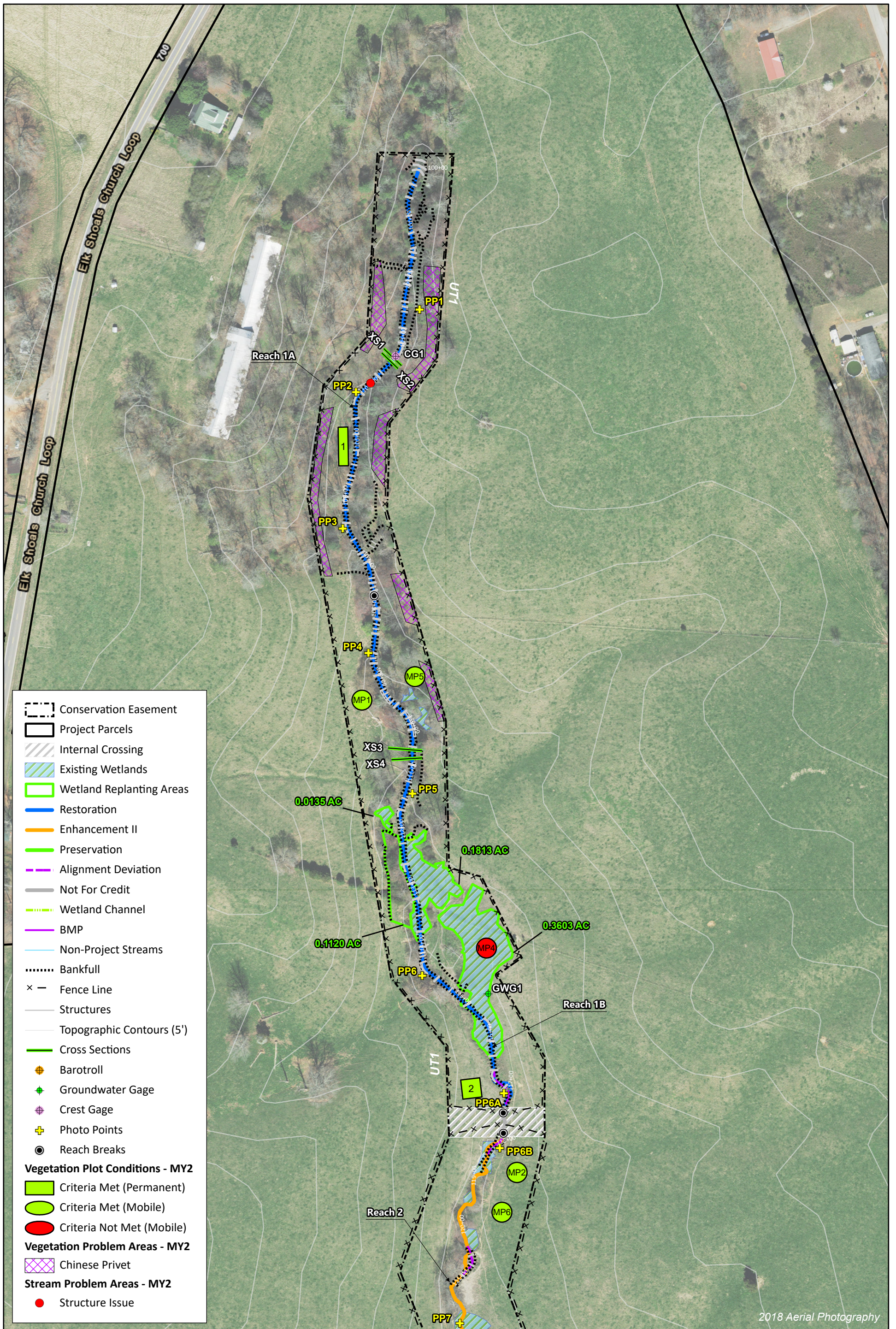
From: Kristi Suggs <ksuggs@wildlandseng.com>
Sent: Wednesday, December 29, 2021 9:12 AM
To: Haywood, Casey M CIV USARMY CESAW (USA) <Casey.M.Haywood@usace.army.mil>
Cc: [Tsomides, Harry](#) <harry.tsomides@ncdenr.gov>; [Aaron Earley](#) <aeearley@wildlandseng.com>; [Brandon Romeo](#) <bromeo@wildlandseng.com>; [Sam Kirk](#) <skirk@wildlandseng.com>
Subject: [URL Verdict: Neutral][Non-DoD Source] Alexander Farm Mitigation Site, Alexander County, NC (SAW-2018-00451) - Review request for the inclusion of additional woody species in the project's planting plan

Hi Casey,

I hope that you are enjoying the Holiday Season. I wanted to touch base with you per the request of Harry Tsomides (DMS PM for Alexander Farm) to see if you could post the following request for IRT review. We are needing to supplementally plant approximately 2.1 acres or 11.9% of the planted area this winter at Alexander Farms. These areas consist of some of the existing wetlands and riparian areas that are trending wetter than originally anticipated. Since the approved Mitigation Plan did not include a separate wetland planting list, we are requesting the IRT's review of the proposed supplemental planting list for these areas. Please see the attached list for use in this request. If you need any additional information or have any questions, please let me know.

Thank you very much!

Kristi Suggs



2018 Aerial Photography

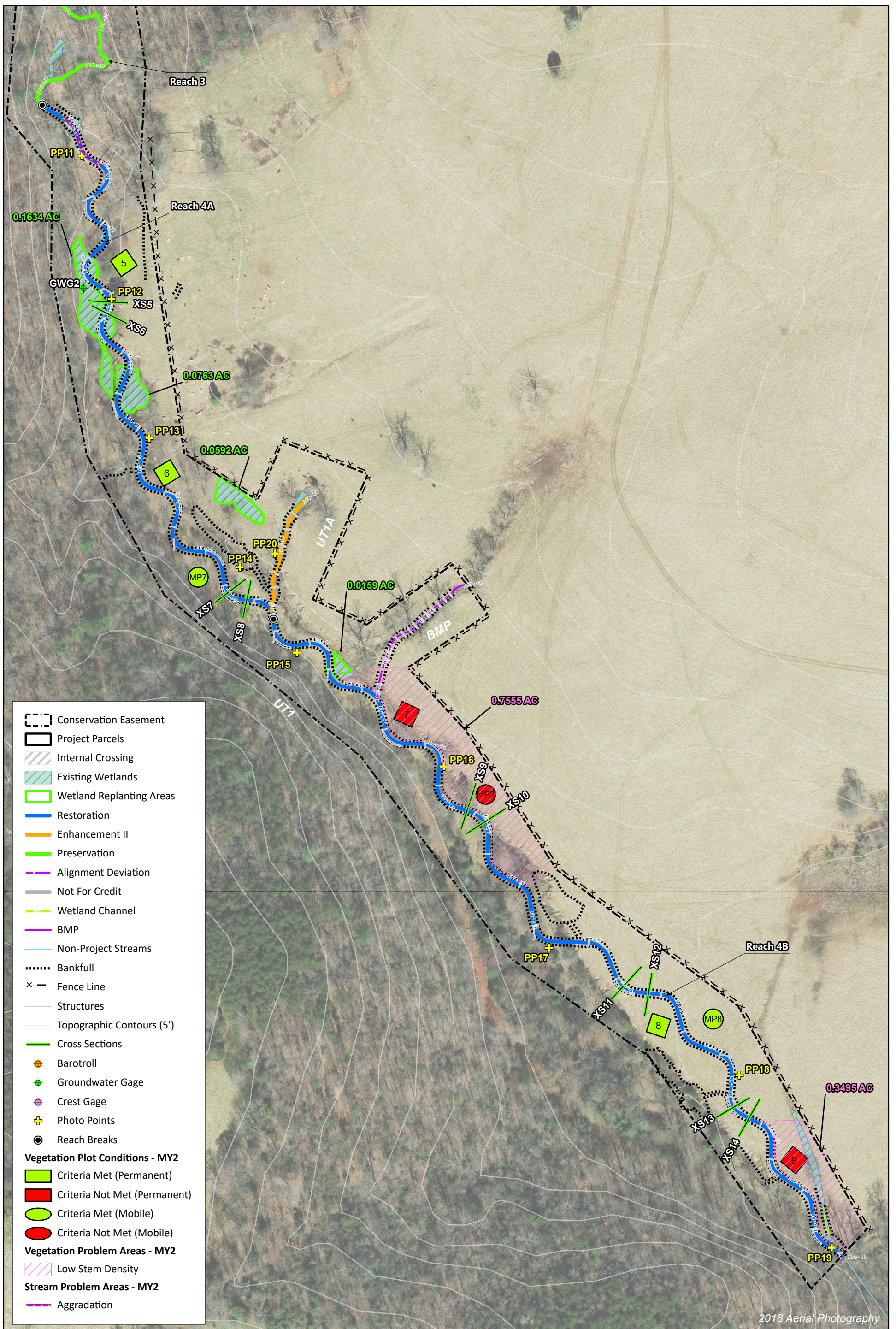


Figure 3.3 Current Condition Plan View
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Monitoring Year 2 - 2021
 Alexander County, NC

APPENDIX 1. Vegetation Assessment and Planting Plan

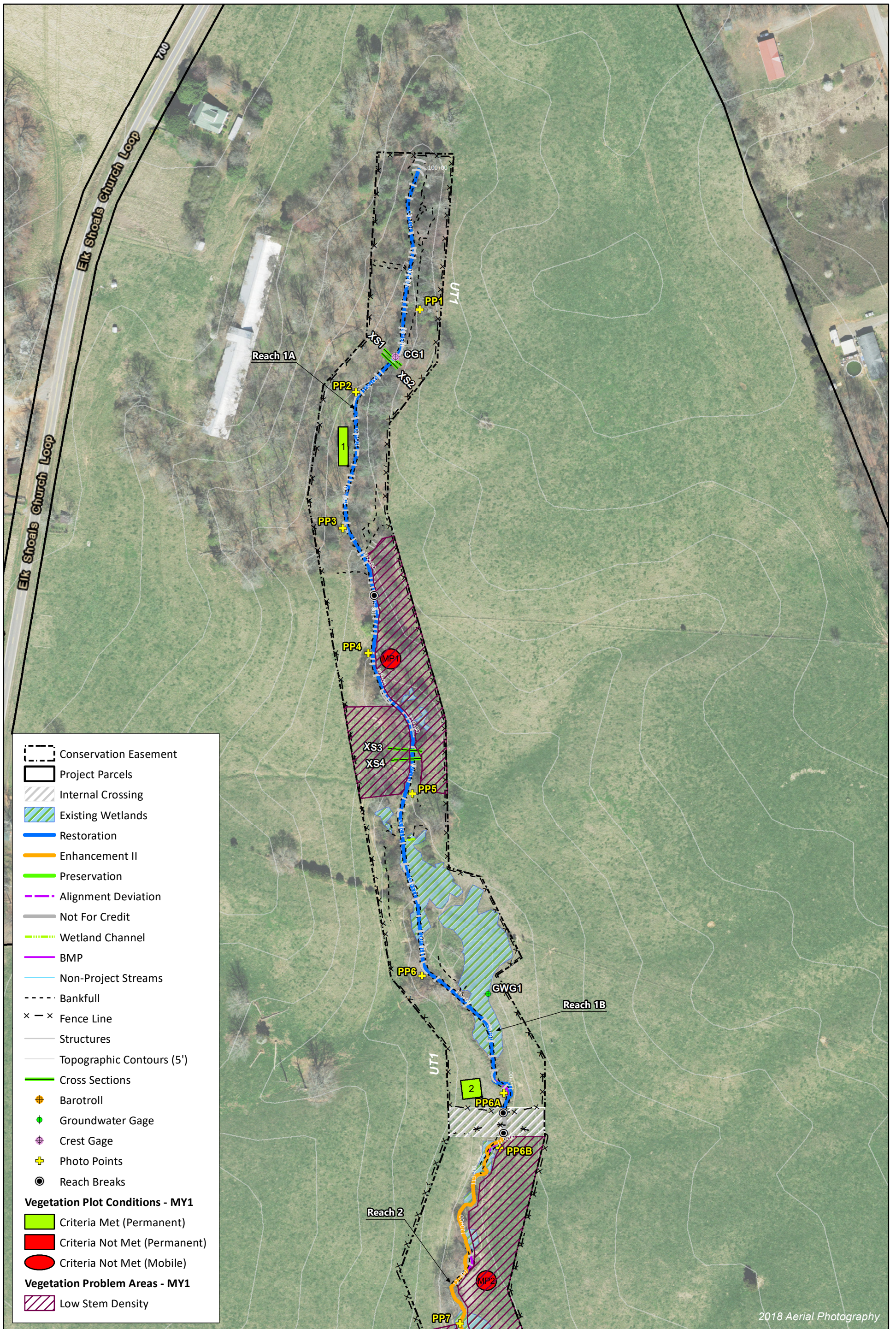
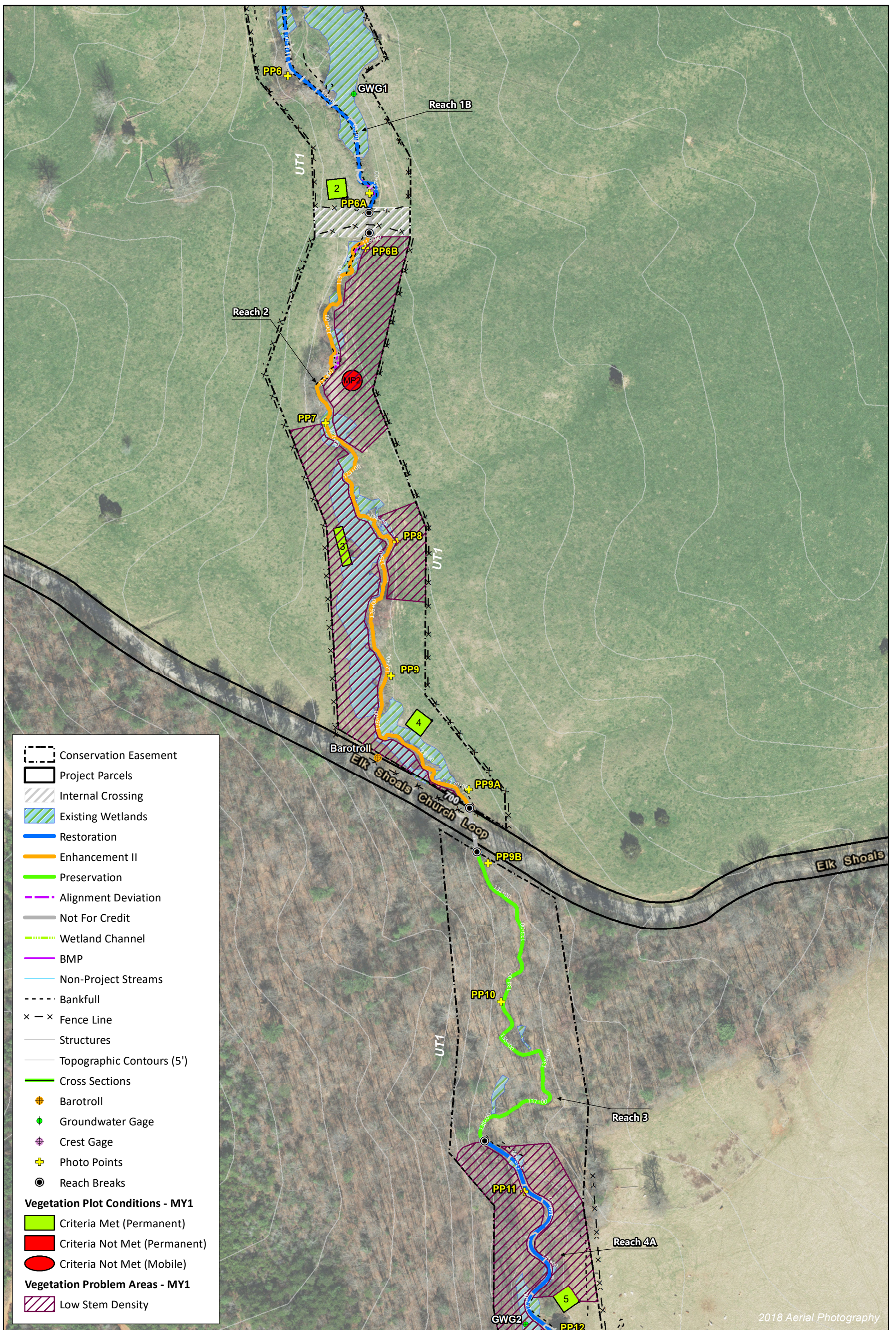


Figure 1.1 Supplemental Planting Map
 Alexander Farm Mitigation Site
 DMS Project No. 100048
 Adaptive Management Plan
 Alexander County, NC



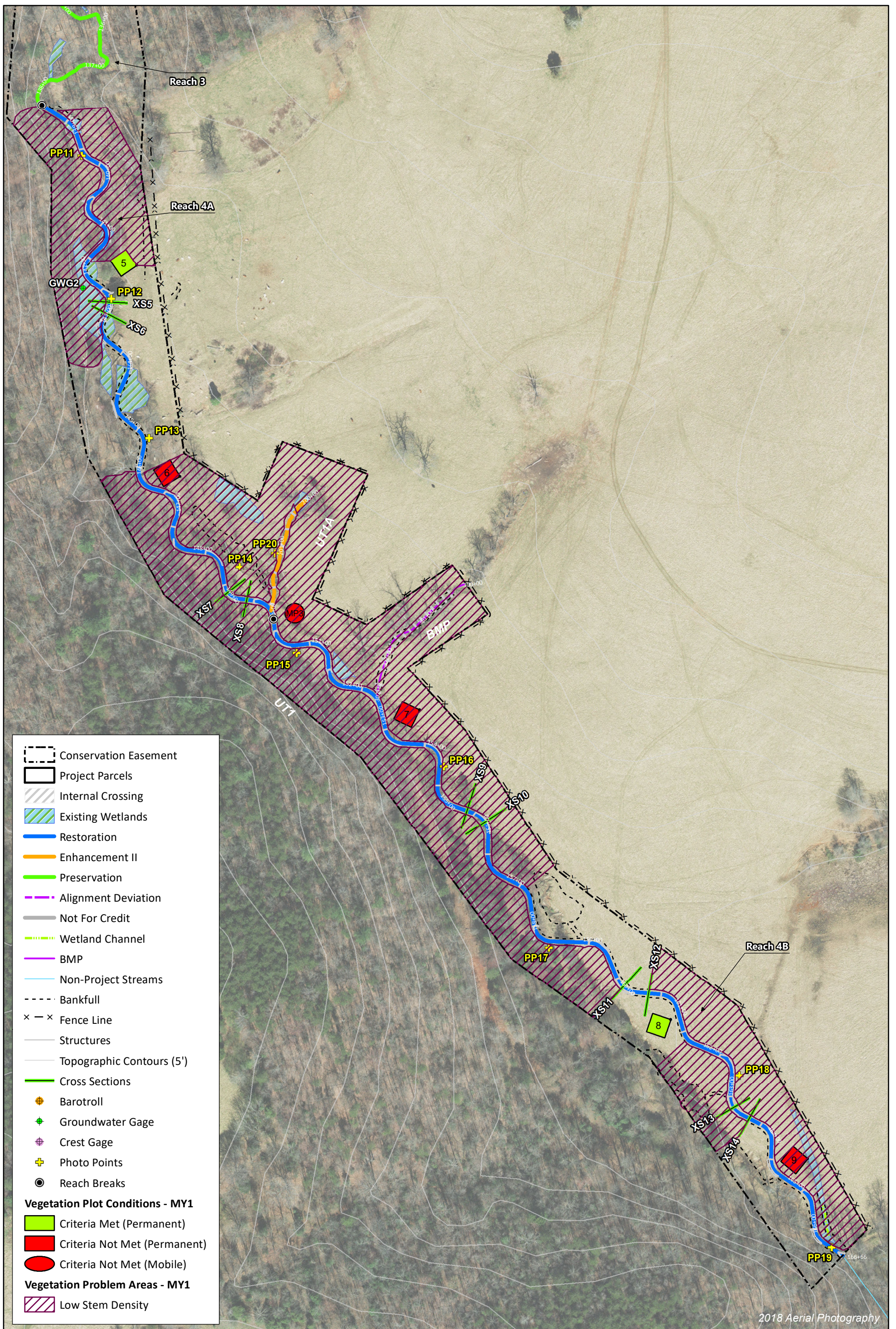


Table 1. Vegetation Plot Criteria Attainment

Alexander Farm Mitigation Site

DMS Project No. 100048

Adaptive Management Plan

Permanent Vegetation Plot	MY1 Success Criteria Met* (Y/N)	Tract Mean (MY1 - 2020)	
1	Y	67%	50%
2	Y		
3	Y		
4	Y		
5	Y		
6	N		
7	N		
8	Y		
9	N		
Mobile Vegetation Plot	MY1 Success Criteria Met* (Y/N)	0%	
1	N		
2	N		
3	N		

*Success Criteria Met is based on the interim success criteria for MY3 of 320 planted stems per acre.

Table 2a. Planted and Total Stem Counts

Alexander Farm Mitigation Site
 DMS Project No. 100048
 Adaptive Management Plan

Current Permanent Vegetation Plot Data (MY1 2020)																	
Scientific Name	Common Name	Species Type	Permanent Plot 1			Permanent Plot 2			Permanent Plot 3			Permanent Plot 4			Permanent Plot 5		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Box elder	Tree	2	2	3										2	2	2
<i>Acer rubrum</i>	Red maple	Tree								35							
<i>Betula nigra</i>	River birch	Tree	1	1	1	1	1	1	5	5	5	3	3	3	1	1	1
<i>Diospyros virginiana</i>	Persimmon	Tree			1												
<i>Gleditsia triacanthos</i>	Honey locust	Tree								1							
<i>Platanus occidentalis</i>	Sycamore	Tree			2	2	2	2	1	1	1				2	2	2
<i>Quercus alba</i> ¹	White oak	Tree										1	1	1			
<i>Quercus pagoda</i>	Cherrybark oak	Tree	5	5	5	6	6	6	3	3	3	1	1	1	2	2	2
<i>Quercus phellos</i>	Willow oak	Tree	1	1	1	1	1	1	2	2	2	3	3	3	1	1	1
<i>Quercus rubra</i>	Northern Red oak	Tree				1	1	1	1	1	1						
<i>Salix nigra</i>	Black willow	Tree															
<i>Ulmus alata</i>	Winged elm	Tree									1						
Stem count			9	9	13	11	11	11	12	12	49	8	8	8	8	8	8
size (ares)			1			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247		
Stems per ACRE			4	4	6	5	5	5	5	5	7	4	4	4	5	5	5
			364	364	526	445	445	445	486	486	1983	324	324	324	324	324	324

Current Permanent Vegetation Plot Data (MY1 2020)																	
Scientific Name	Common Name	Species Type	Permanent Plot 6			Permanent Plot 7			Permanent Plot 8			Permanent Plot 9			MY1 (2020)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Box elder	Tree							2	2	2				6	6	7
<i>Acer rubrum</i>	Red maple	Tree															35
<i>Betula nigra</i>	River birch	Tree				1	1	1	3	3	3				15	15	15
<i>Diospyros virginiana</i>	Persimmon	Tree															1
<i>Gleditsia triacanthos</i>	Honey locust	Tree															1
<i>Platanus occidentalis</i>	Sycamore	Tree										3	3	3	8	8	10
<i>Quercus alba</i> ¹	White oak	Tree							2	2	2				3	3	3
<i>Quercus pagoda</i>	Cherrybark oak	Tree	2	2	2	1	1	1	1	1	1	1	1	1	22	22	22
<i>Quercus phellos</i>	Willow oak	Tree				2	2	2	4	4	4	3	3	3	17	17	17
<i>Quercus rubra</i>	Northern Red oak	Tree													2	2	2
<i>Salix nigra</i>	Black willow	Tree						20									20
<i>Ulmus alata</i>	Winged elm	Tree															1
Stem count			2	2	2	4	4	24	12	12	12	7	7	7	73	73	134
size (ares)			1			1			1			1			9		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.2224		
Species count			1	1	1	3	3	3	5	5	5	3	3	3	7	7	12
Stems per ACRE			81	81	81	162	162	971	486	486	486	283	283	283	328	328	603

¹Prior to leaf out in MY0, the species were identified as *Quercus sp.* (unknown).

Color for Density

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

PnoLS: Number of planted stems excluding live stakes
 P-all: Number of planted stems including live stakes
 T: Total stems

Table 2b. Planted and Total Stem Counts

Alexander Farm Mitigation Site

DMS Project No. 100048

Adaptive Management Plan

Current Mobile Vegetation Plot (MP) Data (MY1 2020)						Annual Mean	
Scientific Name	Common Name	Species Type	MP1	MP2	MP3	MY1 (2020)	MY0 (2020)
			PnoLS	PnoLS	PnoLS	PnoLS	PnoLS
<i>Acer negundo</i>	Box elder	Tree	1	1		2	6
<i>Betula nigra</i>	River birch	Tree	2	2		4	12
<i>Platanus occidentalis</i>	Sycamore	Tree		3		3	4
<i>Quercus sp. (unkown)</i> ¹	Oak species (unkown)	Tree					4
<i>Quercus pagoda</i>	Cherrybark oak	Tree	3	1	3	7	8
<i>Quercus phellos</i>	Willow oak	Tree	1		1	1	3
<i>Quercus rubra</i>	Northern Red oak	Tree					2
Stem count			7	7	4	17	39
size (ares)			1	1	1	3	3
size (ACRES)			0.0247	0.0247	0.0247	0.0741	0.0741
Species count			4	4	2	5	7
Stems per ACRE			283	283	162	229	526

Overall Site Annual Mean				
Scientific Name	Common Name	Species Type	MY1 (2020)	MY0 (2020)
			PnoLS	PnoLS
<i>Acer negundo</i>	Box elder	Tree	8	21
<i>Acer rubrum</i>	Red maple	Tree		
<i>Betula nigra</i>	River birch	Tree	19	29
<i>Diospyros virginiana</i>	Persimmon	Tree		
<i>Gleditsia triacanthos</i>	Honey locust	Tree		
<i>Platanus occidentalis</i>	Sycamore	Tree	11	13
<i>Quercus sp. (unkown)</i> ¹	Oak species (unkown)	Tree		11
<i>Quercus alba</i> ¹	White oak	Tree	3	
<i>Quercus pagoda</i>	Cherrybark oak	Tree	29	41
<i>Quercus phellos</i>	Willow oak	Tree	18	31
<i>Quercus rubra</i>	Northern Red oak	Tree	2	4
<i>Salix nigra</i>	Black willow	Tree		
<i>Ulmus alata</i>	Winged elm	Tree		
Stem count			90	150
size (ares)			12	12
size (ACRES)			0.2965	0.2965
Species count			7	7
Stems per ACRE			304	506

¹Prior to leaf out in MY0, the species were identified as *Quercus sp.* (unkown).

Color for Density

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

PnoLS: Number of planted stems excluding live stakes

P-all: Number of planted stems including live stakes

T: Total stems

Table 3. Supplemental Vegetation Planting

Alexander Farm Mitigation Site

DMS Project No. 100048

Adaptive Management Plan

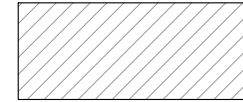
Common Name	Scientific Name	Approved for Mitigation Plan	Approved for As-Built Plan	Wetland Status	Bare Root Planting Rates	Total
Boxelder	<i>Acer negundo</i>	Yes	Yes	FAC	15%	758
Sycamore	<i>Platanus occidentalis</i>	Yes	Yes	FACW	15%	758
River Birch	<i>Betula nigra</i>	Yes	Yes	FACW	15%	758
White Oak	<i>Quercus alba</i>	No	Yes	FACU	10%	505
Northern Red Oak	<i>Quercus rubra</i>	No	Yes	FACU	10%	505
Persimmon	<i>Diospyros virginiana</i>	Yes	Yes	FAC	10%	505
Winged Elm	<i>Ulmus alata</i>	No	No	FACU	10%	505
Sassafras	<i>Sassafras albidum</i>	No	No	FACU	5%	253
Eastern Cottonwood	<i>Populus deltoides</i>	No	No	FAC	10%	505
Total		---	---	---	100%	5,052

APPENDIX 2. Approved Planting Plans

Streambank Planting Zone						
Live Stakes and Herbaceous Plugs						
Species	Common Name	Max Spacing	Indiv. Spacing	Min. Size	Stratum	# of Stems
<i>Physocarpus opulifolius</i>	Ninebark	8 ft.	2-8 ft.	0.5"-1.5" cal.	Shrub	20%
<i>Cornus ammomum</i>	Silky Dogwood	8 ft.	2-8 ft.	0.5"-1.5" cal.	Shrub	40%
<i>Salix sericea</i>	Silky Willow	8 ft.	2-8 ft.	0.5"-1.5" cal.	Shrub	40%
<i>Juncus effusus</i>	Common Rush	5 ft.	4-6 ft.	1.0"- 2.0" plug	Herb	N/A
<i>Carex alata</i>	Broadwing Sedge	5 ft.	4-6 ft.	1.0"- 2.0" plug	Herb	N/A
						100%

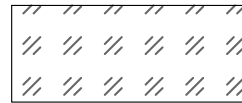
See detail 3, sheet 5.7

All streambank and buffer planting zones within easement.



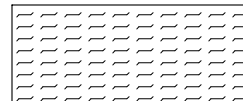
Open/Graded Buffer Planting Zone						
Bare Root						
Species	Common Name	Max Spacing	Indiv. Spacing	Min. Caliper Size	Stratum	# of Stems
<i>Acer negundo</i>	Box Elder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	20%
<i>Quercus phellos</i>	Willow Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
<i>Platanus occidentalis</i>	Sycamore	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
<i>Betula nigra</i>	River Birch	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
<i>Quercus pagoda</i>	Cherrybark Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
<i>Quercus michauxii</i>	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	20%
						100%

All disturbed areas.



All disturbed pasture areas outside easement.

Shaded Areas Bare Roots - Buffer Planting As Needed to Increase Density		
Species	Common name	# of stems
<i>Platanus occidentalis</i>	Sycamore	18%
<i>Fraxinus pennsylvanicum</i>	Green Ash	18%
<i>Betula nigra</i>	River Birch	10%
<i>Liriodendron tulipifera</i>	Tulip Poplar	10%
<i>Quercus michauxii</i>	Swamp Chestnut Oak	10%
<i>Carpinus caroliniana</i>	Ironwood	5%
<i>Diospyros virginiana</i>	Persimmon	5%
<i>Quercus pagoda</i>	Cherrybark Oak	5%
<i>Acer saccharinum</i>	Silver Maple	5%
<i>Nyssa sylvatica</i>	Black Gum	5%
<i>Callicarpa americana</i>	Beautyberry	5%
<i>Euonymus americanus</i>	American Strawberry Bush	1%
<i>Calycanthus floridus</i>	Sweetshrub	1%
<i>Magnolia virginiana</i>	Sweetbay Magnolia	1%
<i>Hamamelis virginiana</i>	Witch-Hazel	1%
		100%



Permanent Riparian Seeding				
Pure Live Seed (20 lbs/ acre)				
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)
All Year	<i>Panicum rigidulum</i>	Redtop Panicgrass	Herb	2.0
All Year	<i>Agrostis Hyemalis</i>	Winter Bentgrass	Herb	2.0
All Year	<i>Rudbeckia hirta</i>	Blackeyed Susan	Herb	1.0
All Year	<i>Coreopsis lanceolata</i>	Lanceleaf Coreopsis	Herb	1.0
All Year	<i>Carex vulpinoidea</i>	Fox Sedge	Herb	3.0
All Year	<i>Panicum clandestinum</i>	Deertongue	Herb	3.0
All Year	<i>Elymus virginicus</i>	Virginia Wildrye	Herb	3.0
All Year	<i>Bidens aristosa</i>	Bur-Marigold	Herb	1.2
All Year	<i>Helianthus angustifolius</i>	Swamp Sunflower	Herb	0.8
All Year	<i>Panicum virgatum</i>	Switchgrass	Herb	1.0
All Year	<i>Sorghastrum nutans</i>	Indiangrass	Herb	2.0

Temporary Seeding			
Scientific Name	Common Name	Application Dates	Application Rate
<i>Secale cereale</i>	<i>Rye Grain</i>	October 1 - March 31	120 lb/acre
<i>Panicum ramosum</i>	<i>Browntop Millet</i>	April 1 - June 30	45 lb/acre
<i>Pennisetum glaucum</i>	<i>Pearl Headed Millet</i>	July 1 - September 30	20 lb/acre

Pasture Seeding				
Approved Date	Species Name	Stratum	Common Name	Density (lbs/acre)
All Year	<i>Festuca arundinacea</i>	Herb	Tall Fescue	80
All Year	<i>Trifolium repens</i>	Herb	White Clover	8

Vernal Pool Planting Zone						
Herbaceous Plugs						
Species	Common Name	Max Spacing	Indiv. Spacing	Min. Size	Stratum	# of Stems
<i>Calamagrostis canadensis</i>	<i>Bluejoint Grass</i>	5 ft.	3-5 ft.	1.0"- 2.0" plug	Herb	30%
<i>Carex alata</i>	<i>Broadwing Sedge</i>	5 ft.	3-5 ft.	1.0"- 2.0" plug	Herb	35%
<i>Juncus effusus</i>	<i>Common Rush</i>	5 ft.	3-5 ft.	1.0"- 2.0" plug	Herb	35%
						100%

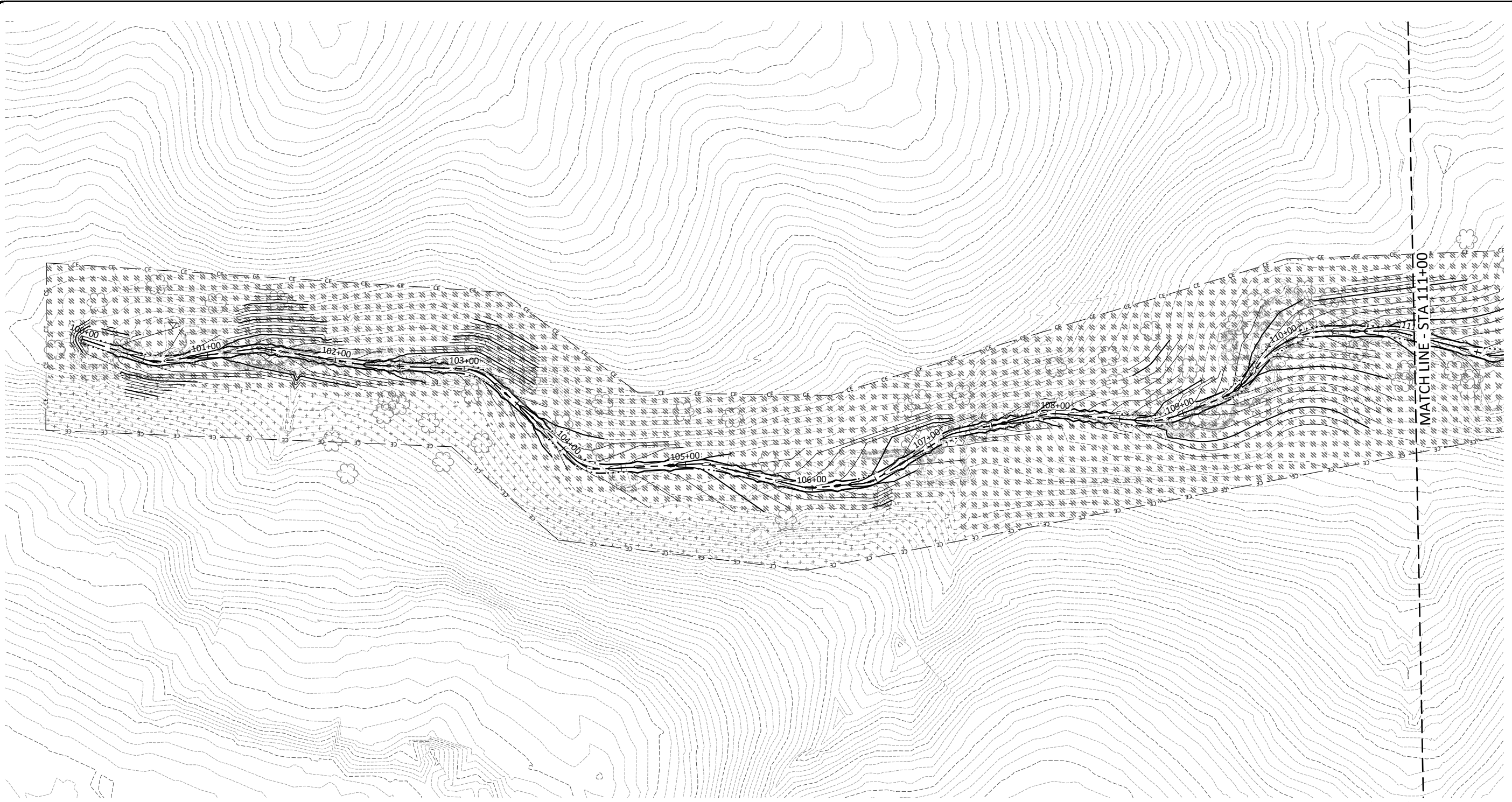
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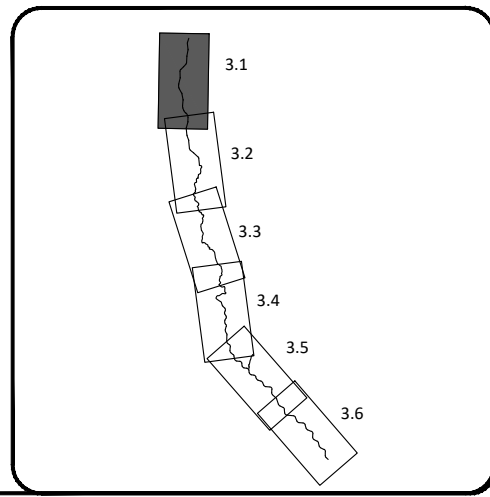
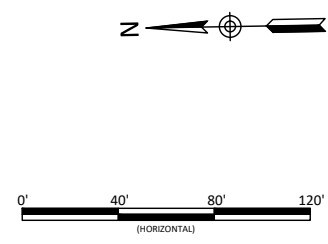
Plant List
 Planting Plan

Revisions:

Date: 08/19/2019
 Job Number: 005-02169
 Project Engineer: ASE
 Drawn By: JMS
 Checked By: ETN



Sheet Index



Date: 08.19.2019
 Job Number: 005-02109
 Project Engineer: ASE
 Drawn By: JMS
 Checked By: ETN

3.1

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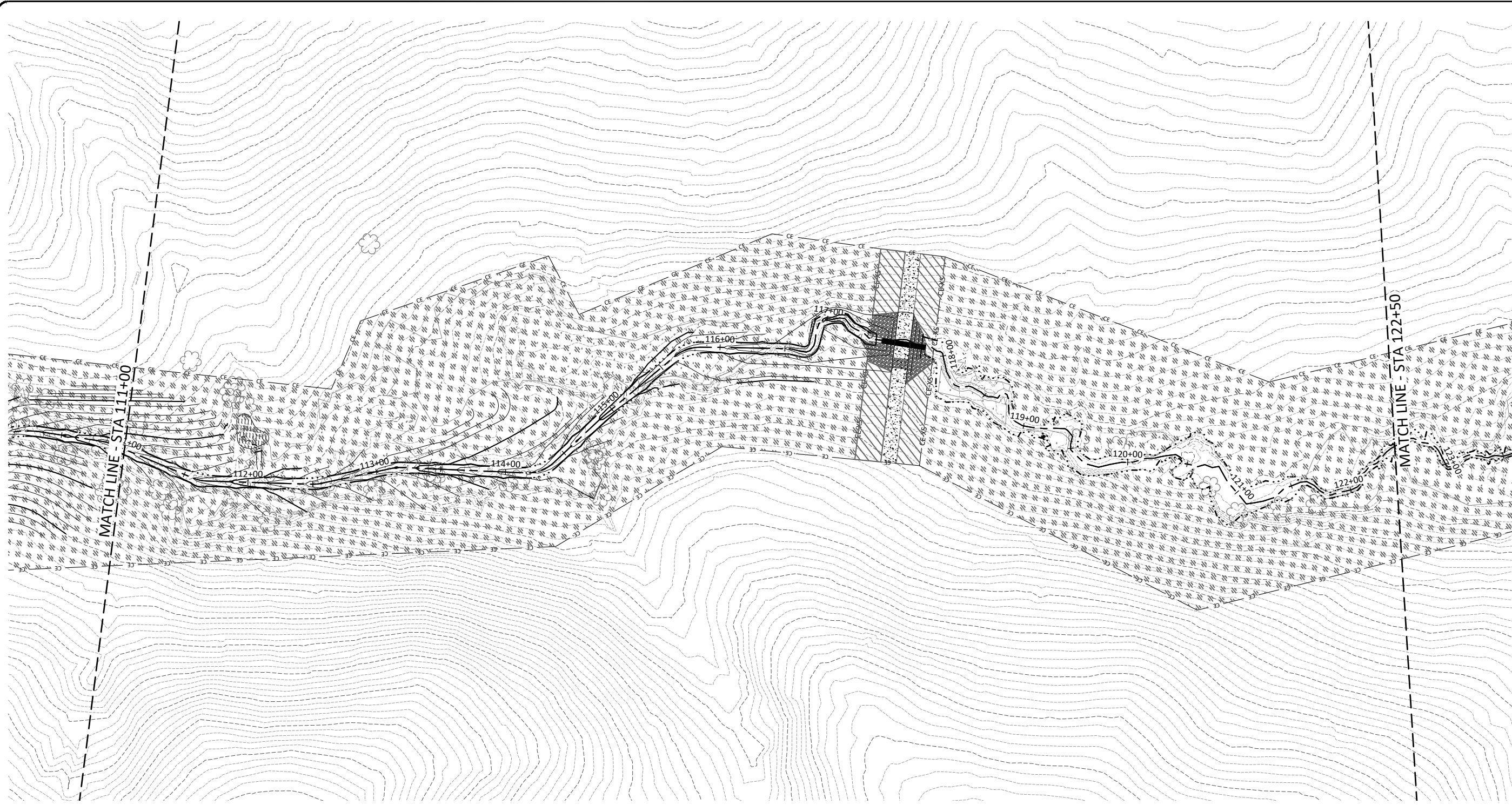
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UT1 Reach 1A & 1B
 Planting Plan

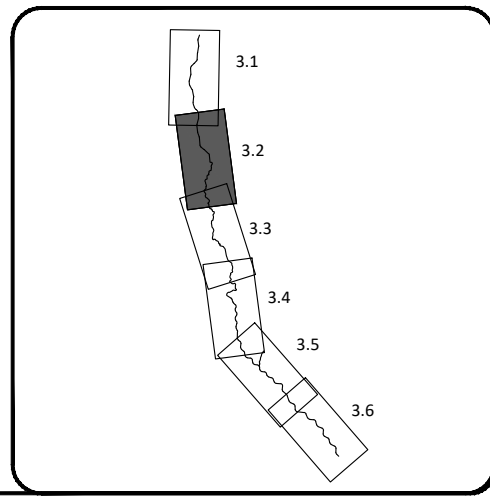
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 Project Engineer: ASE
 Drawn By: JMS
 Checked By: ETN


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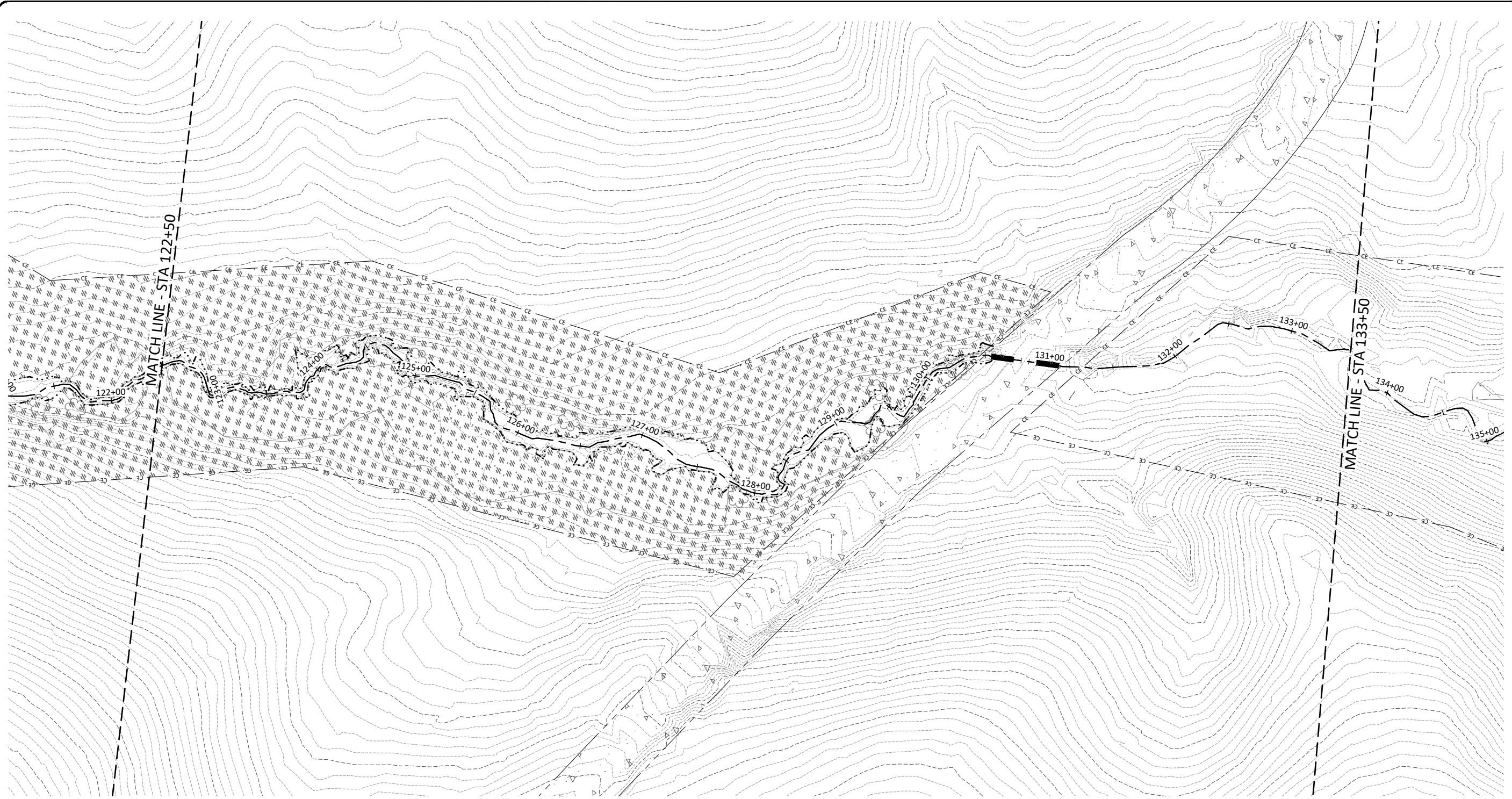
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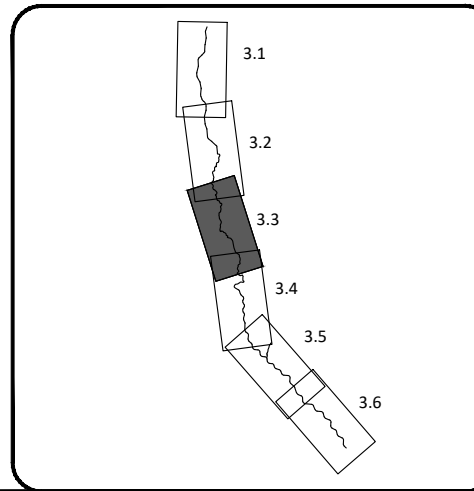
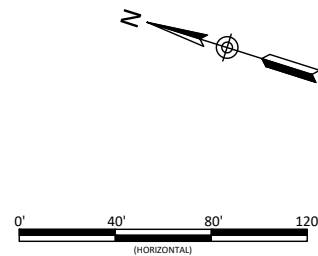
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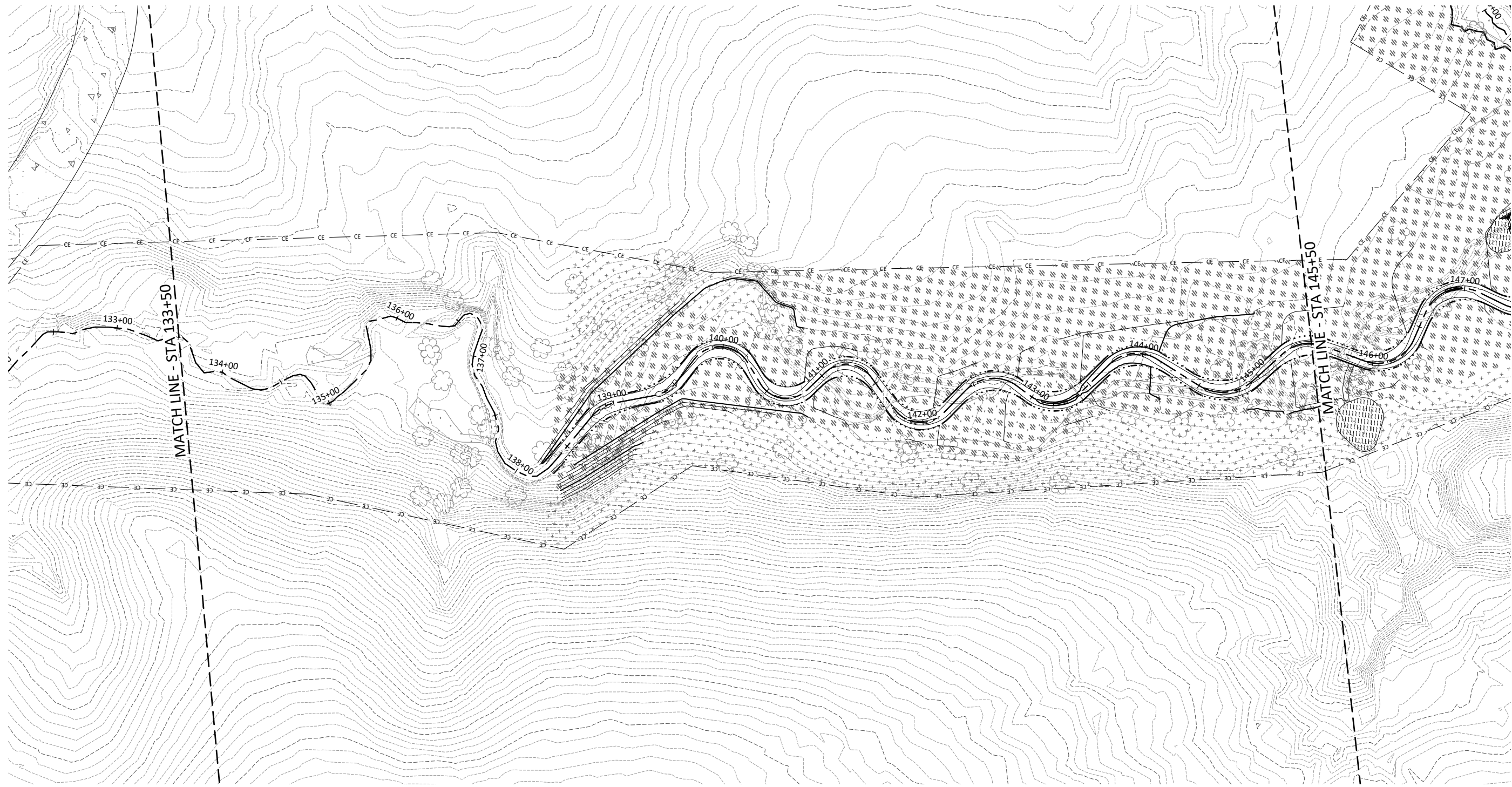
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 Alexander County, North Carolina

UT1 Reach 2 & 3
 Planting Plan

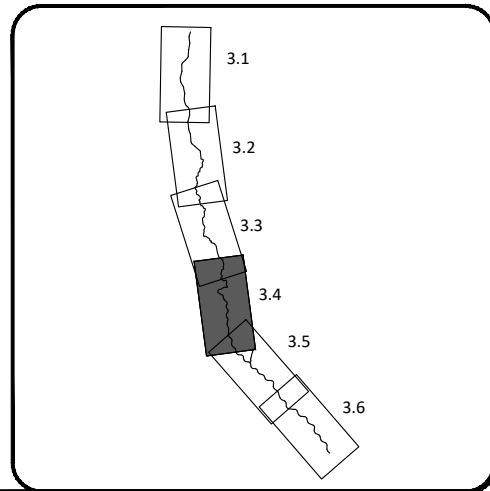
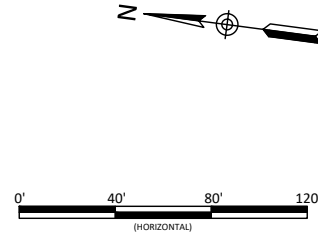
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Job Number:	005-02169
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Checked By:	ETN

3.3



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 Project Engineer: ASE
 Drawn By: JMS
 Checked By: ETN

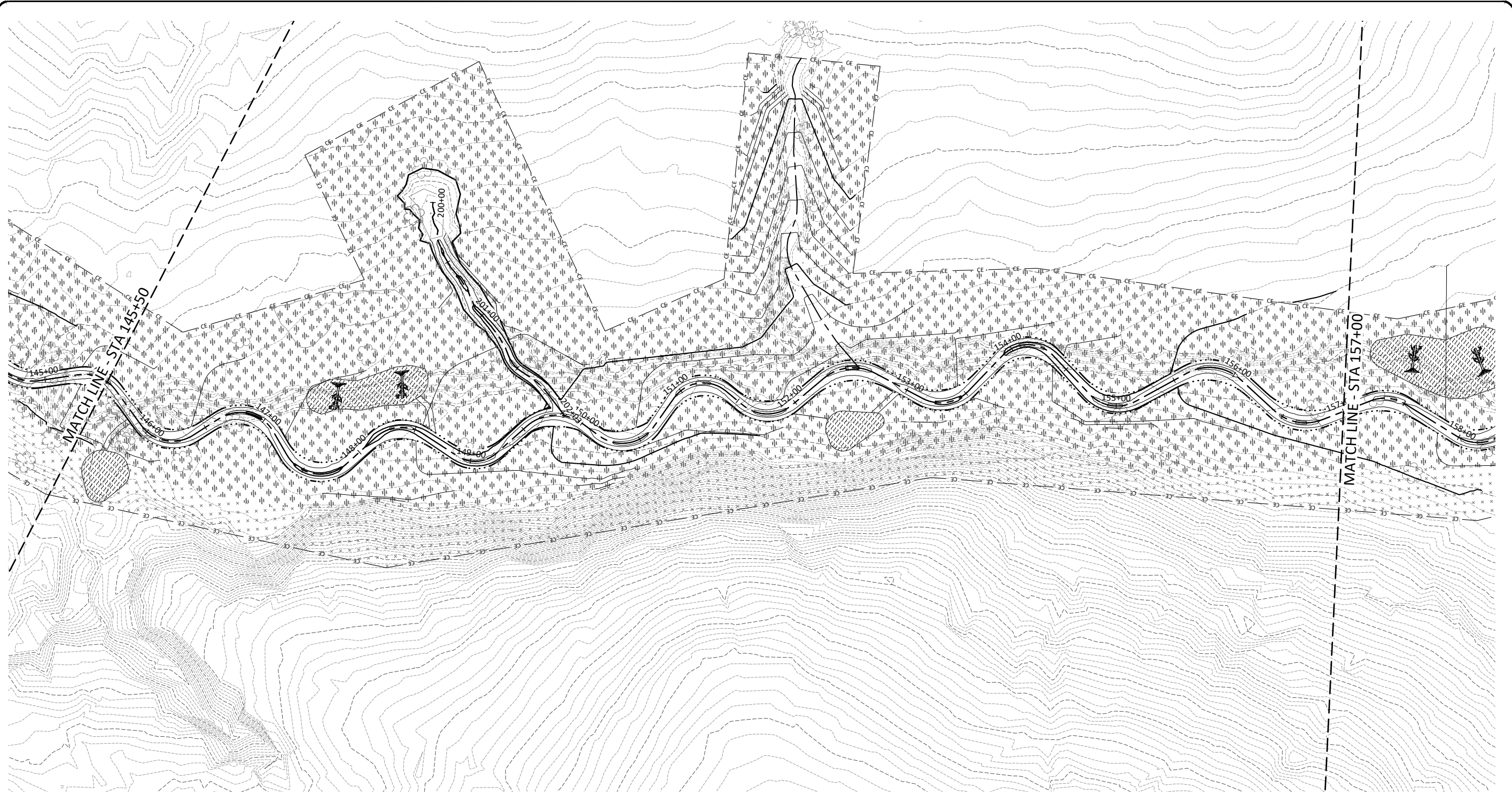
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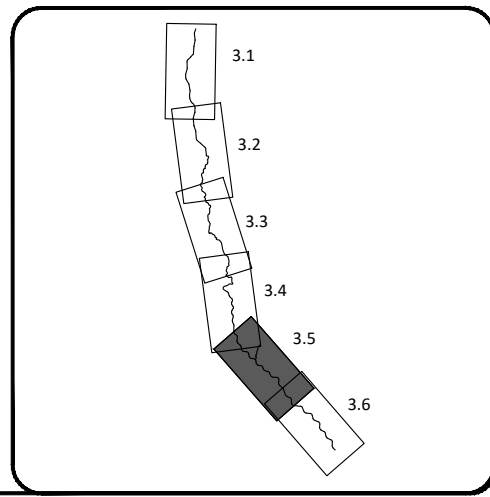
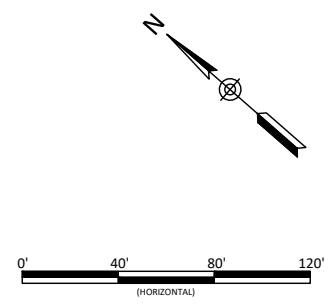
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UT1 Reach 3 & 4A
 Planting Plan

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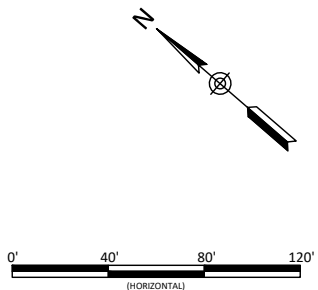
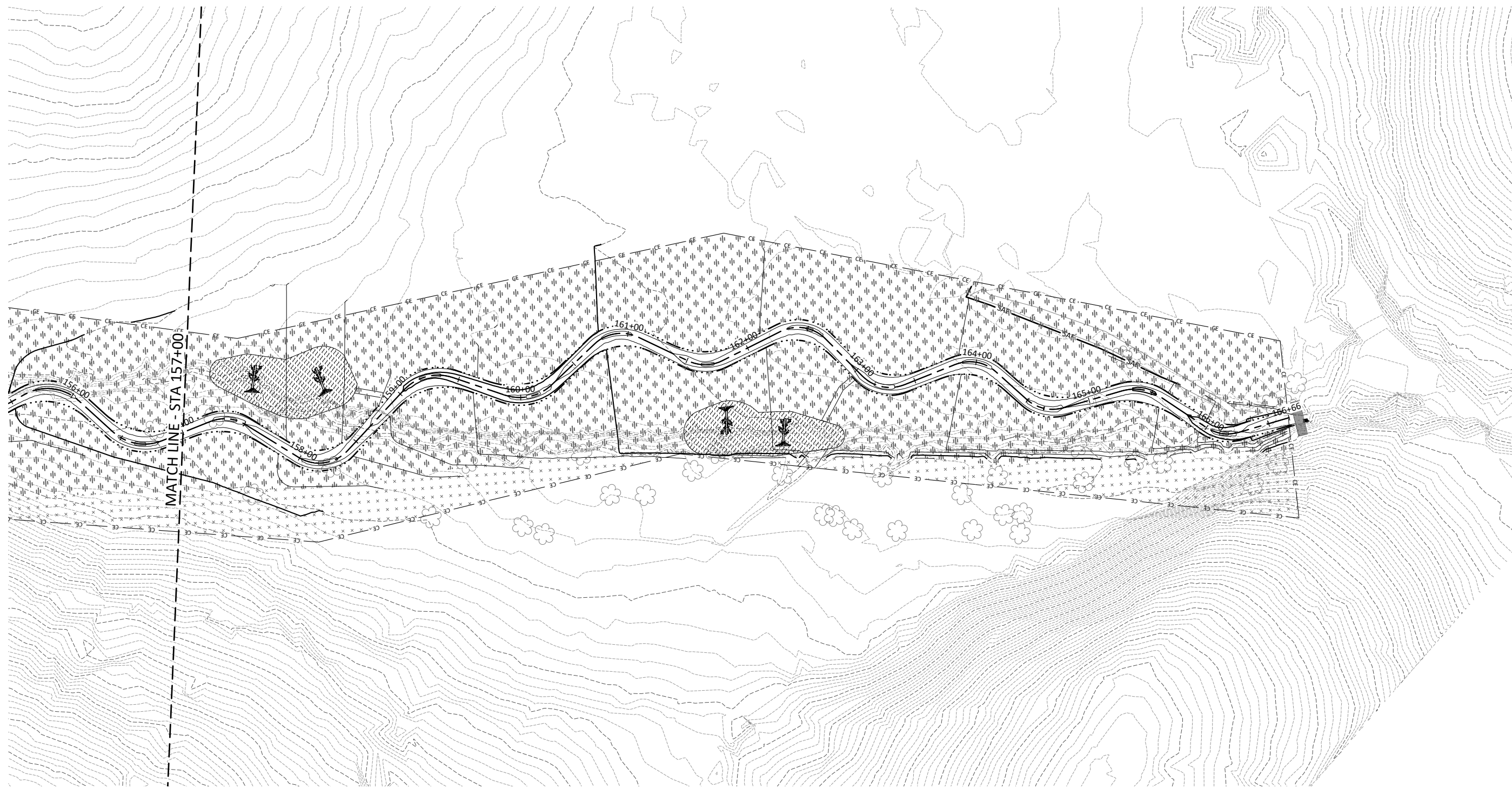
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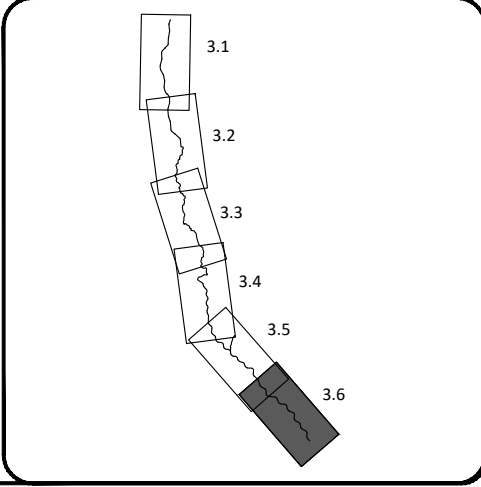
Alexander Farm Mitigation Site
 Alexander County, North Carolina
 UT1 Reach 4A, 4B & UT1A
 Planting Plan

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UT1 Reach 4B

Planting Plan

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Streambank Planting Zone						
Live Stakes and Herbaceous Plugs						
Species	Common Name	Max Spacing	Indiv. Spacing	Min. Size	Stratum	# of Stems
<i>Physocarpus opulifolius</i>	Ninebark	8 ft.	2-8 ft.	0.5"-1.5" cal.	Shrub	20%
<i>Cornus amomum</i>	Silky Dogwood	8 ft.	2-8 ft.	0.5"-1.5" cal.	Shrub	40% 36%
<i>Salix sericea</i>	Silky Willow	8 ft.	2-8 ft.	0.5"-1.5" cal.	Shrub	40% 44%
<i>Juncus effusus</i>	Common Rush	5 ft.	4-6 ft.	1.0"- 2.0" plug	Herb	N/A
<i>Carex alata</i>	Broadwing Sedge	5 ft.	4-6 ft.	1.0"- 2.0" plug	Herb	N/A
						100%

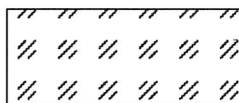
Open/Graded Buffer Planting Zone						
Bare Root						
Species	Common Name	Max Spacing	Indiv. Spacing	Min. Caliper Size	Stratum	# of Stems
<i>Acer negundo</i>	Box Elder	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	20%
<i>Quercus phellos</i>	Willow Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
<i>Platanus occidentalis</i>	Sycamore	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
<i>Betula nigra</i>	River Birch	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
<i>Quercus pagoda</i>	Cherrybark Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	15%
<i>Quercus michauxii</i>	Swamp Chestnut Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	20%
<i>Quercus alba</i>	White Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	13%
<i>Quercus rubra</i>	Northern Red Oak	12 ft.	6-12 ft.	0.25"-1.0"	Canopy	7%
						100%

Shaded Areas Bare Roots - Buffer Planting As Needed to Increase Density		
Species	Common name	# of stems
<i>Platanus occidentalis</i>	Sycamore	18%
<i>Fraxinus pennsylvanicum</i>	Green Ash	18%
<i>Betula nigra</i>	River Birch	10%
<i>Liriodendron tulipifera</i>	Tulip Poplar	10%
<i>Quercus michauxii</i>	Swamp Chestnut Oak	10%
<i>Quercus alba</i>	White Oak	10%
<i>Carpinus caroliniana</i>	Ironwood	5% 6%
<i>Diospyros virginiana</i>	Persimmon	5%
<i>Quercus pagoda</i>	Cherrybark Oak	5%
<i>Acer saccharinum</i>	Silver Maple	5%
<i>Nyssa sylvatica</i>	Black Gum	5% 7%
<i>Callicarpa americana</i>	Beautyberry	5%
<i>Euonymus americanus</i>	American Strawberry Bush	1%
<i>Calycanthus floridus</i>	Sweetshrub	1%
<i>Magnolia virginiana</i>	Sweetbay Magnolia	1% 3%
<i>Hamamelis virginiana</i>	Witch-Hazel	1% 3%
		100%

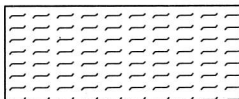
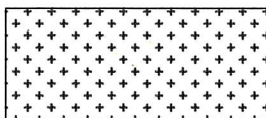
All streambank and buffer planting zones within easement.



All disturbed areas.



All disturbed pasture areas outside easement.



Permanent Riparian Seeding				
Pure Live Seed (20 lbs/ acre)				
Approved Date	Species Name	Common Name	Stratum	Density (lbs/acre)
All Year	<i>Panicum rigidulum</i>	Redtop Panicgrass	Herb	2.0
All Year	<i>Agrostis Hyemalis</i>	Winter Bentgrass	Herb	2.0
All Year	<i>Rudbeckia hirta</i>	Blackeyed Susan	Herb	1.0
All Year	<i>Coreopsis lanceolata</i>	Lanceleaf Coreopsis	Herb	1.0
All Year	<i>Carex vulpinoidea</i>	Fox Sedge	Herb	3.0
All Year	<i>Panicum clandestinum</i>	Deertongue	Herb	3.0
All Year	<i>Elymus virginicus</i>	Virginia Wildrye	Herb	3.0
All Year	<i>Bidens aristosa</i>	Bur-Marigold	Herb	1.2
All Year	<i>Helianthus angustifolius</i>	Swamp Sunflower	Herb	0.8
All Year	<i>Panicum virgatum</i>	Switchgrass	Herb	1.0
All Year	<i>Sorghastrum nutans</i>	Indiangrass	Herb	2.0

Temporary Seeding			
Scientific Name	Common Name	Application Dates	Application Rate
<i>Secale cereale</i>	Rye Grain	October 1 - March 31	120 lb/acre
<i>Panicum ramosum</i>	Browntop Millet	April 1 - June 30	45 lb/acre
<i>Pennisetum glaucum</i>	Pearl Headed Millet	July 1 - September 30	20 lb/acre

Pasture Seeding				
Approved Date	Species Name	Stratum	Common Name	Density (lbs/acre)
All Year	<i>Festuca arundinacea</i>	Herb	Tall Fescue	80
All Year	<i>Trifolium repens</i>	Herb	White Clover	8

Vernal Pool Planting Zone						
Herbaceous Plugs						
Species	Common Name	Max Spacing	Indiv. Spacing	Min. Size	Stratum	# of Stems
<i>Calamagrostis canadensis</i>	Bluejoint Grass	5 ft.	3-5 ft.	1.0"- 2.0" plug	Herb	30%
<i>Carex alata</i>	Broadwing Sedge	5 ft.	3-5 ft.	1.0"- 2.0" plug	Herb	35%
<i>Juncus effusus</i>	Common Rush	5 ft.	3-5 ft.	1.0"- 2.0" plug	Herb	35%
<i>Caryx crinata</i>	Fringed Sedge	5 ft.	3-5 ft.	1.0"- 2.0" plug	Herb	35%
<i>Andropogon glomeratus</i>	Bushy Beardgrass	5 ft.	3-5 ft.	1.0"- 2.0" plug	Herb	30%
						100%

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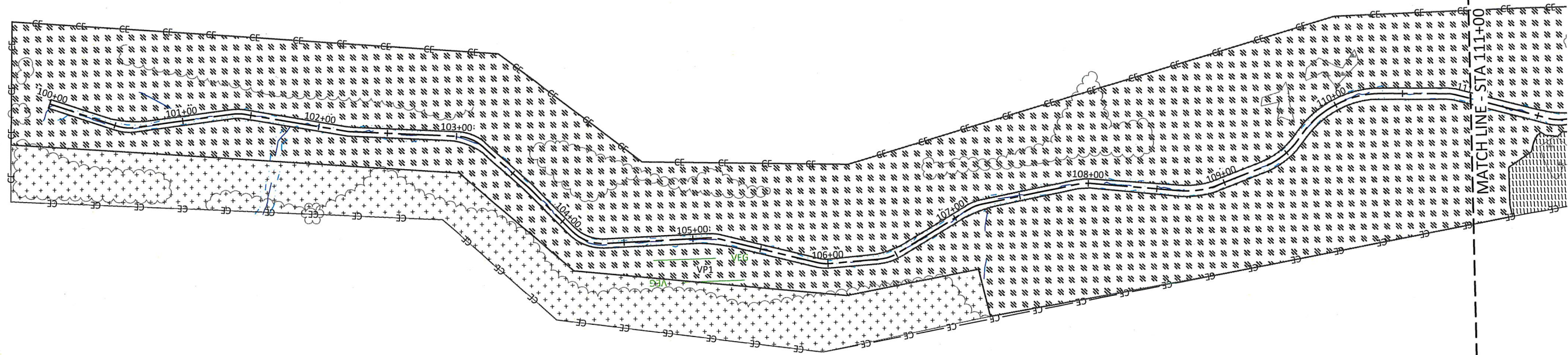
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 Alexander County, North Carolina
 Plant List
 Planting Tables

Revisions:

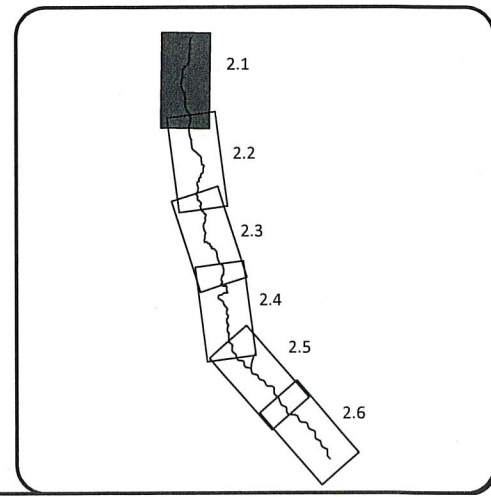
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 Project Engineer: ASE
 Drawn By: HCB
 Checked By: JCK

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Sheet Index



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Project Engineer:	ASE
Drawn By:	HCB
Checked By:	JCK

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Alexander Farm Mitigation Site - Record Drawings

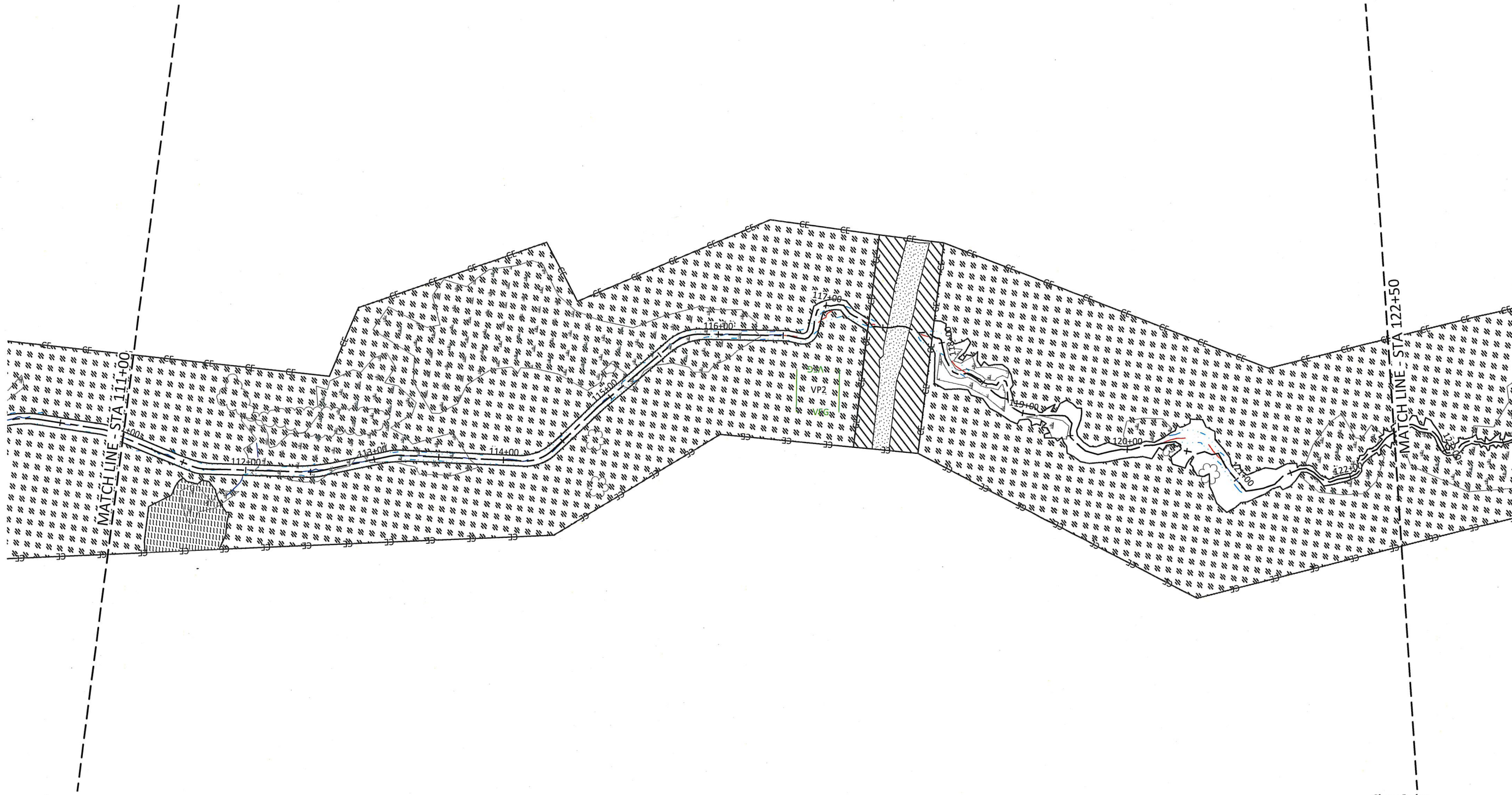
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UT1 Reach 1A & 1B
Planting Plan

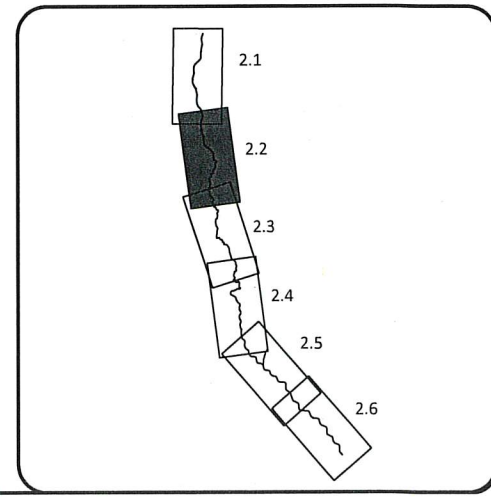


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8-21-20



Sheet Index



Revisions:

Date: 08/13/2020
 Job Number: 005-02169
 Project Engineer: ASE
 Drawn By: HCB
 Checked By: JCK

2.2

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Alexander Farm Mitigation Site - Record Drawings
 Alexander County, North Carolina

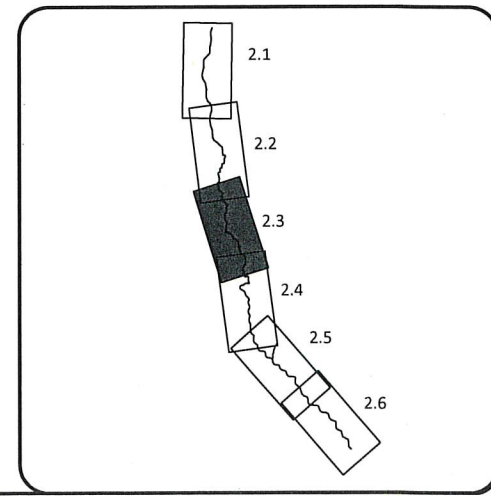
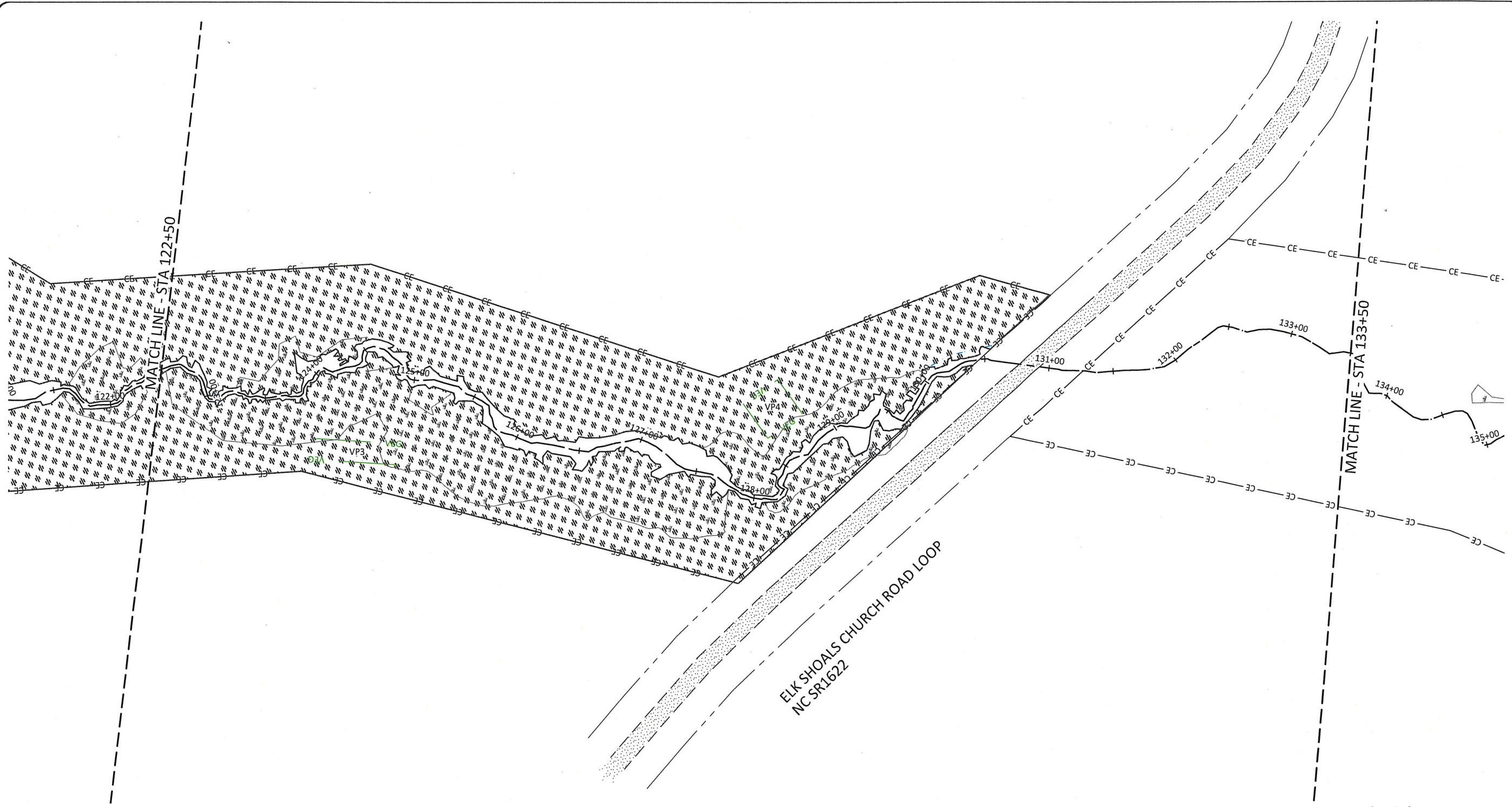
UT1 Reach 1B & 2
 Planting Plan



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August 20, 2020

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Alexander Farm Mitigation Site - Record Drawings
Alexander County, North Carolina

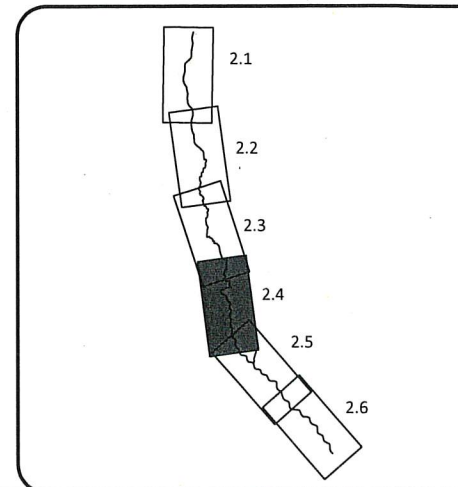
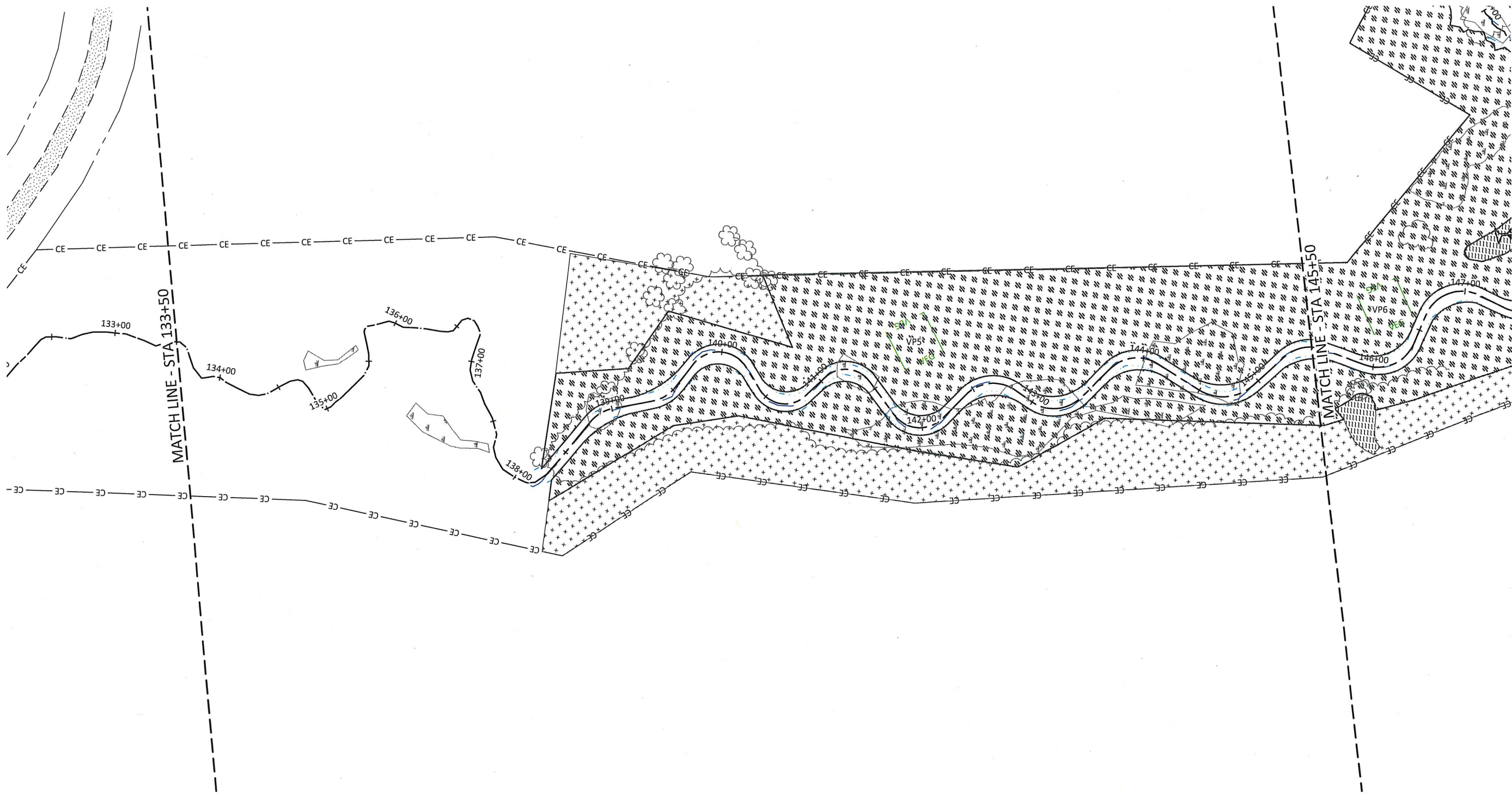
UT1 Reach 2 & 3
Planting Plan

Revisions:

Date: 08/13/2020
Job Number: 005-02169
Project Engineer: ASE
Drawn By: HCB
Checked By: JCK

2.3

Sheet



Sheet Index

Date:	08/13/2020
Job Number:	005-02169
Project Engineer:	ASE
Drawn By:	HCB
Checked By:	JCK

2.4

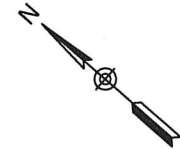
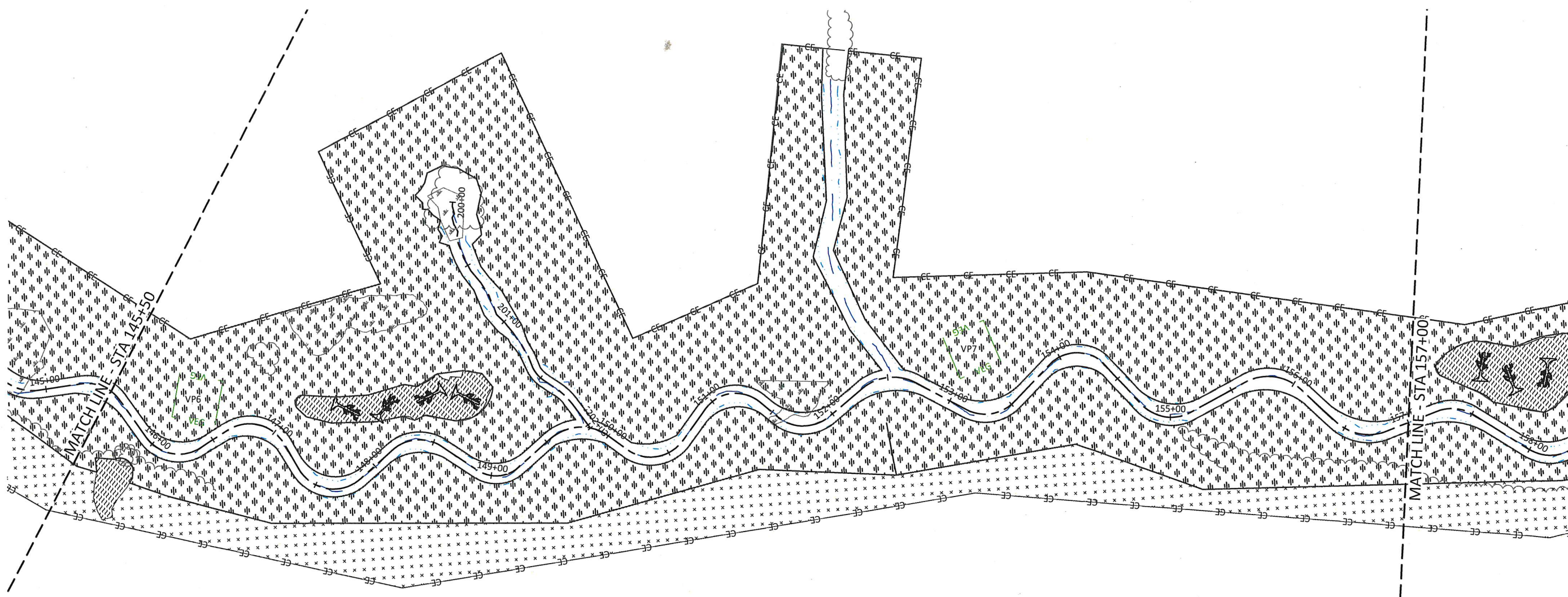
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Alexander Farm Mitigation Site - Record Drawings
 Alexander County, North Carolina

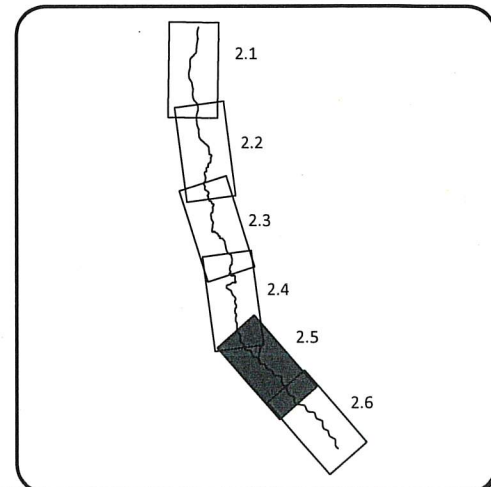
UT1 Reach 3 & 4A
 Planting Plan



WILDLANDS
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 1436 S. WILKINSON ST., SUITE 104
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Sheet Index



Revisions:

Date:	08/13/2020
Job Number:	005-02169
Project Engineer:	ASE
Drawn By:	HCB
Checked By:	JCK

2.5

Sheet

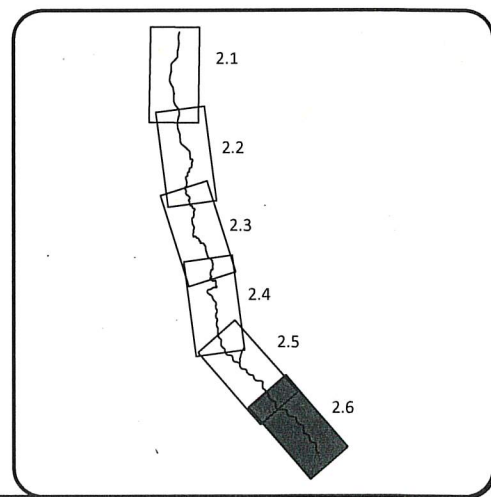
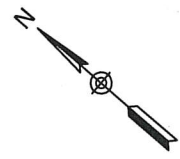
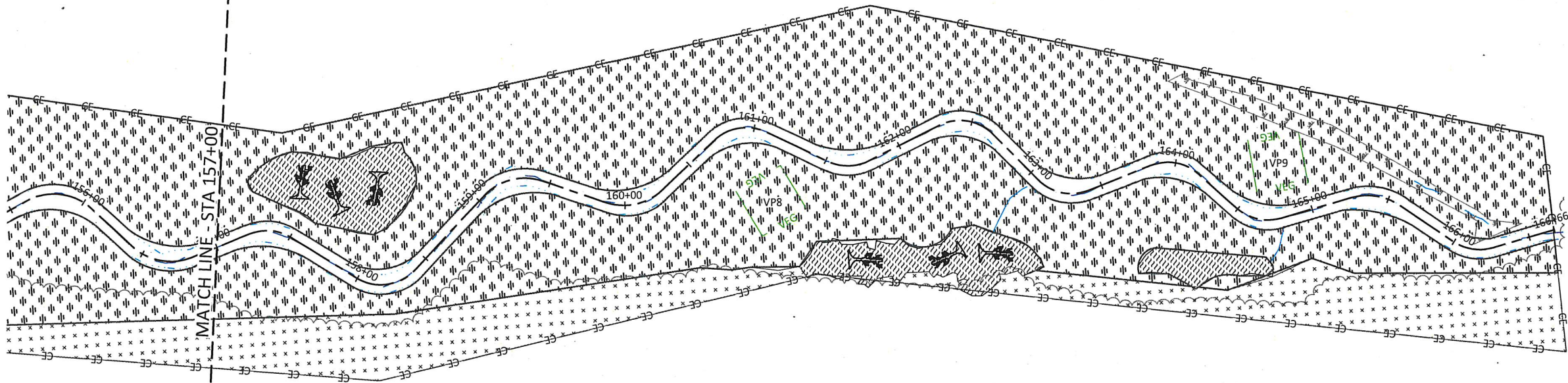
Alexander Farm Mitigation Site - Record Drawings
 Alexander County, North Carolina

UT1 Reach 4A 4B & UT1A
 Planting Plan



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C:\Acter\Projects\005-02109-Alexander Farm\Monitor\Baseline\Monitor\Plans\02109-AB\Planting.dwg
 August 20, 2020



Date: 08/13/2020

Job Number:	005-02109
Project Engineer:	ASE
Drawn By:	HCB
Checked By:	JCK

2.6

Sheet

Alexander Farm Mitigation Site - Record Drawings
 Alexander County, North Carolina

UT1 Reach 4B
 Planting Plan



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Kristi Suggs

From: Tsomides, Harry <harry.tsomides@ncdenr.gov>
Sent: Friday, March 12, 2021 2:32 PM
To: Kim Browning; Aaron Earley
Cc: Wiesner, Paul; Shawn Wilkerson; Kristi Suggs; Tugwell, Todd J CIV USARMY CESAW (US); Haywood, Casey M CIV (USA); Davis, Erin B; Youngman, Holland J; Merritt, Katie; Bowers, Todd; Wilson, Travis W.; Munzer, Olivia
Subject: RE: [External] IRT Adaptive Management Plan Review/ NCDMS Alexander Farm Mitigation Site/ Alexander County/ SAW-2018-00451

Follow Up Flag: Follow up
Due By: Monday, September 27, 2021 4:00 PM
Flag Status: Flagged

Ok thanks Kim. The MY2 (2021) deliverable will reflect the comments and communications accordingly.

=====
Harry Tsomides
Project Manager
Division of Mitigation Services
NC Department of Environmental Quality

Tel. (828) 545-7057
Harry.Tsomides@ncdenr.gov

5 Ravenscroft Drive
Suite 102
Asheville, NC 28801



Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Browning, Kimberly D CIV USARMY CESAW (USA) [mailto:Kimberly.D.Browning@usace.army.mil]
Sent: Friday, March 12, 2021 11:49 AM
To: Tsomides, Harry <harry.tsomides@ncdenr.gov>; Aaron Earley <aeasley@wildlandseng.com>

Cc: Wiesner, Paul <paul.wiesner@ncdenr.gov>; Shawn Wilkerson <swilkerson@wildlandseng.com>; Kristi Suggs <ksuggs@wildlandseng.com>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Haywood, Casey M CIV (USA) <Casey.M.Haywood@usace.army.mil>; Davis, Erin B <erin.davis@ncdenr.gov>; Youngman, Holland J <holland_youngman@fws.gov>; Merritt, Katie <katie.merritt@ncdenr.gov>; Bowers, Todd <bowers.todd@epa.gov>; Wilson, Travis W. <travis.wilson@ncwildlife.org>; Munzer, Olivia <olivia.munzer@ncwildlife.org>
Subject: [External] IRT Adaptive Management Plan Review/ NCDMS Alexander Farm Mitigation Site/ Alexander County/ SAW-2018-00451

CAUTION: External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to [Report Spam](#).

Harry and Aaron,

The NCDMS Alexander Farm Adaptive Management Plan review ended March 11, 2021. A copy of this AMP is attached. Per Section 332.8(o)(9) of the 2008 Mitigation Rule, this review followed the streamlined review process, which requires an IRT review period of 15 calendar days. IRT comments are below; you may reply to this email with your responses. You may proceed with the proposed supplemental planting, provided you address IRT comments. Please provide additional transects in supplemental planting areas to demonstrate stem survival in future monitoring reports. An additional year of monitoring will be required, which can be done in MY6. If data suggests that the vegetative performance is not on a trajectory for success, an additional year of monitoring in MY8 may be required. Additionally, please add a veg plot in the large wetland on Reach 1B, near Photo Point 6 (random is fine). Lastly, during the Draft Mitigation Plan review stage, both the Corps and DWR requested gauge data in areas where stream restoration would impact existing wetlands to ensure no loss of waters, and since no pre-data is available, a re-verification of jurisdictional limits may be requested prior to MY7 if current gauge data suggests that hydrology was altered negatively. Please feel free to reach out if you have any questions.

DWR Comments, Erin Davis:

Considering the significant area requiring replanting, DWR would support a one year extension of the monitoring period that could be rescinded at MY7 if vegetation problem areas are not reoccurring and the site meets target performance criteria.

Replanting along Enhancement II Reach UT R2 includes a large existing wetland area. With no grading shown in this area, was late planting determined to be the primary reason for failed establishment? Was the hydrology regime in this area a consideration for species selection (e.g. number of FACW species)?

In reviewing this AMP, DWR went back to the final mitigation plan and noted that the narrative did not include discussion of soil restoration or plant target community(s). DWR hopes that more recent requests to consider these elements more thoroughly during project planning will assist with better site vegetative establishment and diversity moving forward.

EPA Comments, Todd Bowers:

I have reviewed the Adaptive Management Plan for the Alexander Farms mitigation site sponsored by Wildlands Engineering dated February 23, 2021. Following the MY1 Report it was determined that much of the site (10 acres) would need supplemental planting in order to meet interim vegetation performance as much of the project was experiencing high mortality rates due to poor soil conditions and late planting during the site construction. Wildlands has proposed a reasonable approach to correct this deficiency and has recommended additional monitoring and soil amendments to ensure vegetation success. I am curious about the proposed soil amendments going only to the new bare root plantings. If there is a possible sitewide deficiency in soil nutrients, carbon or low cation exchange capability, what is the contingency to ensure the rest of the site remains in a trajectory towards success? Should we be expecting continued or excessive mortality in the areas that will not receive the soil amendments? I am all for improving the soil conditions of the areas of low stem density but will the rest of the site be able to perform as expected? I suppose this a question that can only be answered as MY2 data is collected.

As it stands, I approve of the adaptive management plan for supplemental planting at the Alexander Farm mitigation site in Alexander County, North Carolina. I recommend that Wildlands begin planting immediately in order to take advantage of what remains of the dormant season ideal for planting bare root seedlings and saplings. Thank you for the opportunity to provide feedback on the aforementioned Adaptive Management Plan proffered by Wildlands. If you have any questions pertaining to my comments please do not hesitate to contact me.

USACE Comments, Casey Haywood:

- * Plots 1 & 2: Cherrybark accounts for more than half of the species. Please note that all planted stems can be shown on the vegetation table but no one species in excess of 50% can be used to demonstrate success.
- * Plots 1, 4, & 5 are barely meeting success and are not indicated as an area that will need to be replanted. When accounting for mortality, do you anticipate that these areas will need a supplemental planting in the future? Would random transects in these areas indicate low stem density or is it just where the plot is?
- * The corps made note that veg plot 3 has 35 volunteer red maples. Please continue to monitor this plot and do selective thinning as necessary so these species don't outcompete desired species.
- * Most of the veg plots are outside of wetland areas. While wetland credits were not generated, if wetland areas were planted, it would be recommended to have veg plots in these areas to demonstrate success. The large wetland near Reach 1B does not appear to be monitored for veg success, was this area planted? If so, recommend a plot in this area.
- * Is the site trending towards being more wet? Not sure if there is a correlation, but the highest survival of stems is from FAC/FACW species despite none of the veg plots being in wetlands. Was consideration of FACW species to be planted in these areas? The majority of the species listed on the replant are FACU species. Given the amount of wetlands in planting areas, using upland species would not be appropriate and more FACW and/or OBL species should be planted. For example, Sassafras is an upland shrub and may not be appropriate for this site.
- * In future plans please present planting zones that are appropriate for streamside assemblage, wetland areas and upland areas. Discussion of the target community is also encouraged.
- * If the majority of the site is experiencing soil issues, there is concern that survivability of the site as a whole will be low. Will the soil amendments on the roots of planted stems be enough to ensure success of the entire site?
- * Replanting includes River Birch at 758 stems- however, this is one of the more dominant species on site and we would like to see less emphasis on River Birch. Also, please note that sycamore and river birch are more typical of larger stream systems; we recommend eliminating these species in favor of other species more typical of smaller systems.
- * Recommending at least 2 additional transects in supplemental planting areas to demonstrate stem survival.
- * Given the extensive replanting, and due to late planting and poor soils, an additional year of vegetation monitoring will be required. If the site is meeting target performance standards at MY7, the decision to extend monitoring could be rescinded.
- * Please provide a soil map in future AMP documents

Thanks,
Kim

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



November 29, 2021

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

Subject: IRT Adaptive Management Plan Review Comments: 15-Day Review
Alexander Farm Mitigation Site, Alexander County
Yadkin River Basin – HUC 03040101
DMS Project ID No. 100048 / DEQ Contract #007416

Dear Ms. Browning:

Wildlands Engineering, Inc. (Wildlands) has reviewed the 15-Day Adaptive Management Plan (AMP) review comments from the NC Interagency Review Team (IRT) in regard to the Alexander Farm Mitigation Site received via email on 3/12/2021. Wildlands understands that the implementation of the additional monitoring measures outlined in the IRT's comments to the AMP are required and will document the requirements and their results in future monitoring reports. All comments from the IRT are noted below in **Bold**. Wildlands' responses to those comments are noted below in *italics*.

NC DWR, ERIN DAVIS

DWR comment: Considering the significant area requiring replanting, DWR would support a one-year extension of the monitoring period that could be rescinded at MY7 if vegetation problem areas are not reoccurring and the site meets target performance criteria.

Wildlands' response: As instructed in the AMP review email from 3/12/21, Wildlands will conduct an extra year of vegetation monitoring in MY6. (MY6 is a reduced monitoring year and vegetation monitoring isn't normally conducted.) However, if the data doesn't suggest that the vegetative performance is trending toward success, an additional year of monitoring may be required in MY8.

DWR comment: Replanting along Enhancement II Reach UT R2 includes a large existing wetland area. With no grading shown in this area, was late planting determined to be the primary reason for failed establishment? Was the hydrology regime in this area a consideration for species selection (e.g. number of FACW species)?

Wildlands' response: Though the hydrologic regime within the wetland along UT1 R2 may have contributed to the failed establishment of some of the planted vegetation within this wetland complex, it wouldn't account as the primary factor throughout the entire reach. The areas of low stem density along UT1 R2 consisted of wetland and non-wetland areas and a mix of FACU through FACW species would be needed to account for wetland and non-wetland areas. Therefore, it is expected that the main contributing factor along this reach would be late season planting.

DWR comment: In reviewing this AMP, DWR went back to the final mitigation plan and noted that the narrative did not include discussion of soil restoration or plant target community(s). DWR hopes that more recent requests to consider these elements more thoroughly during project planning will assist with better site vegetative establishment and diversity moving forward.

Wildlands' response: Wildlands has heeded requests from IRT members and will consider more robust discussions of the soil conditions present onsite and the types of naturally occurring riparian communities



in subsequent mitigation plans, as well as the proposed activities to establish more conducive growing conditions so the target communities are more adaptive while developing into a diverse and healthy riparian buffer area.

EPA, TODD BOWERS

EPA comment: Following the MY1 Report it was determined that much of the site (10 acres) would need supplemental planting in order to meet interim vegetation performance as much of the project was experiencing high mortality rates due to poor soil conditions and late planting during the site construction. Wildlands has proposed a reasonable approach to correct this deficiency and has recommended additional monitoring and soil amendments to ensure vegetation success. I am curious about the proposed soil amendments going only to the new bare root plantings. If there is a possible sitewide deficiency in soil nutrients, carbon or low cation exchange capability, what is the contingency to ensure the rest of the site remains in a trajectory towards success? Should we be expecting continued or excessive mortality in the areas that will not receive the soil amendments? I am all for improving the soil conditions of the areas of low stem density but will the rest of the site be able to perform as expected? I suppose this a question that can only be answered as MY2 data is collected.

Wildlands' response: In the past, Wildlands has found that broadcasting soil amendments throughout a large area over fertilizes the weeds and dilutes their effectiveness where the nutrients are needed; whereas, focusing those amendments on the targeted areas allows for better woody growth and success. Additionally, broadcasted amendments are more susceptible to washing away during storm events; thereby, creating conditions similar to those being corrected.

EPA comment: As it stands, I approve of the adaptive management plan for supplemental planting at the Alexander Farm mitigation site in Alexander County, North Carolina. I recommend that Wildlands begin planting immediately in order to take advantage of what remains of the dormant season ideal for planting bare root seedlings and saplings. Thank you for the opportunity to provide feedback on the aforementioned Adaptive Management Plan proffered by Wildlands. If you have any questions pertaining to my comments, please do not hesitate to contact me.

Wildlands' response: Thank you for providing your comments. We really appreciate it. Also, we wanted to let you know that the Site was supplementally planted on March 23, 2021.

USACE, CASEY HAYWOOD

USACE comment: Plots 1 & 2: Cherrybark accounts for more than half of the species. Please note that all planted stems can be shown on the vegetation table but no one species in excess of 50% can be used to demonstrate success.

Wildlands' response: The inclusion of all the cherrybark oak (*Quercus pagoda*) species in permanent vegetation plot (VP) 1 and 2, for MY1 was an oversight. Only 4 cherrybark oak stems should have been included in VP1's success criteria and only 5 in the success criteria for VP2. None of the volunteer species in VP1 are eligible for inclusion in the success criteria for the plot until after they are present for at least two years. This loss of the one woody stem in each plot decreases the overall stems per acre for VP1 and VP2 to 324 and 405, respectively.

USACE comment: Plots 1, 4, & 5 are barely meeting success and are not indicated as an area that will need to be replanted. When accounting for mortality, do you anticipate that these areas will need a supplemental planting in the future? Would random transects in these areas indicate low stem density or is it just where the plot is?



Wildlands' response: Wildlands often finds that replanting this early in the monitoring timeline is not needed. Resprouts and missing stems are often found and/or volunteers become established in MY2 and MY3; thereby, negating the issue. Transects conducted in the areas surrounding VP1 & VP4 would show that the lower stem counts are isolated to the plots, while VP5 is located on the southern fringe of low-density areas designated for replanting. Therefore, transects conducted north of VP5 would likely indicate low stem density, but not south of VP5 and the delineated replanting area.

USACE comment: The corps made note that veg plot 3 has 35 volunteer red maples. Please continue to monitor this plot and do selective thinning as necessary so these species don't outcompete desired species.

Wildlands' response: Wildlands will continue to monitor these volunteers. We anticipate that competition will reduce the number of species present; however, if this trend continues, action will be taken to remediate the issue.

USACE comment: Most of the veg plots are outside of wetland areas. While wetland credits were not generated, if wetland areas were planted, it would be recommended to have veg plots in these areas to demonstrate success. The large wetland near Reach 1B does not appear to be monitored for veg success, was this area planted? If so, recommend a plot in this area.

Wildlands' response: Though the large wetland along UT1 R1B was planted, a permanent vegetation plot was not included in the wetland when the Mitigation Plan was approved. Wildlands had anticipated that wetland areas would be monitored in subsequent monitoring years by use of the Site's mobile plots. However, per the IRT's request, Wildlands installed an additional mobile vegetation plot during MY1 within the wetland area along UT1 Reach 1B. This mobile vegetation plot will be moved to random locations within the Site's wetland complexes in subsequent monitoring years to capture the vegetative health of the wetlands.

USACE comment: Is the site trending towards being more wet? Not sure if there is a correlation, but the highest survival of stems is from FAC/FACW species despite none of the veg plots being in wetlands. Was consideration of FACW species to be planted in these areas? The majority of the species listed on the replant are FACU species. Given the amount of wetlands in planting areas, using upland species would not be appropriate and more FACW and/or OBL species should be planted. For example, Sassafras is an upland shrub and may not be appropriate for this site.

Wildlands' response: It is true that some of the site is trending wetter, but not the entire site, so a mix of FACW, FAC, and FACU were used to accommodate the range of conditions, with FACU species accounting for only 35% of the supplementally planted stems and 65% consisting of FAC and FACW species. Also, unlike UPL species, FACU species, like sassafras, are able to tolerate wetter conditions that tend to dry out during the summer season, such as along wetland fringes and raised hummocks within the wetlands, as well as upland areas; therefore, accommodating a wider range of conditions throughout the site than true UPL species.

USACE comment: In future plans please present planting zones that are appropriate for streamside assemblage, wetland areas and upland areas. Discussion of the target community is also encouraged.

Wildlands' response: Wildlands acknowledges the comment and will continue to strive to improve planting assemblages for project planting areas, as well as the target community types. It should be noted that 55% of the proposed species were included in the approved Mitigation's Planting Plan and that an additional 20% were from the project's approved As-built Planting Plan. If additional planting is



needed for the site, Wildlands proposes to choose more FACW and/or OBL species within the project's target riparian community.

USACE comment: If the majority of the site is experiencing soil issues, there is concern that survivability of the site as a whole will be low. Will the soil amendments on the roots of planted stems be enough to ensure success of the entire site?

Wildlands' response: See Wildlands response to the EPA's first comment by Todd Bowers.

USACE comment: Replanting includes River Birch at 758 stems- however, this is one of the more dominant species on site and we would like to see less emphasis on River Birch. Also, please note that sycamore and river birch are more typical of larger stream systems; we recommend eliminating these species in favor of other species more typical of smaller systems.

*Wildlands' response: Wildlands understands the IRT's concern and though the species chosen were not ideal due to the previous planting quantities, these species were available at the time of planting (early 2021). Securing more diverse and less commonly planted species would have required submitting a planting request with a nursery in late 2021 for planting the following year (2022). If additional supplemental planting is required during the remainder of the seven year monitoring period, Wildlands will try and refrain from using river birch (*Betula nigra*) and sycamore (*Platanus occidentalis*) to allow for additional planting diversity onsite.*

USACE comment: Recommending at least 2 additional transects in supplemental planting areas to demonstrate stem survival.

Wildlands' response: Wildlands will install at least 2 additional mobile transects within the supplementally planted areas to document stem survival.

USACE comment: Given the extensive replanting, and due to late planting and poor soils, an additional year of vegetation monitoring will be required. If the site is meeting target performance standards at MY7, the decision to extend monitoring could be rescinded.

Wildlands' response: See Wildlands response to NC DWR's first comment by Erin Davis.

USACE comment: Please provide a soil map in future AMP documents.

Wildlands' response: Wildlands will provide a soil map in future AMP documents as requested.

As requested, Wildlands has responded to the IRT's comments in this letter via a response email and will include a copy of the original comments and our response letter in the Monitoring Year (MY) 2 submittal.

Sincerely,

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

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com