MONITORING YEAR 1 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: October 2020 – December 2020
Draft Submission Date: February 15, 2021

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
217 West Jones Street; 3rd Floor
Raleigh, NC 27603

February 15, 2020

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

RE: Draft Year 1 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 1 Monitoring Report for the Alexander Farm Mitigation Site. The report has been updated to reflect those comments. The Final MY1 Report is included. DMS' comments are listed below in **bold**. Wildlands' responses to DMS' comments are noted in *italics*.

DMS' comment: Section 1.2.5 (Stream Areas of Concern and Management Activity) indicates "a few minor areas of concern" on UT1 reach 2. This reach is listed for crediting at a ratio of 2:1 with E-II as mitigation type. Wildlands has indicated that stressed areas are likely to restabilize themselves. This reach has no corresponding visual assessment table, or cross sections, and there are no photos provided in the Area of Concern Photographs section. Given the conditions observed in 2020, DMS would like Wildlands to provide photos of the scoured segments of this reach in the MY1 report.

Wildlands' response: As requested, photos of erosional areas for UT1 Reach 2 have been included in the "Area of Concerns" photolog located in Appendix 2.

DMS' comment: Please submit the monitoring photos as jpegs.

Wildlands response: Monitoring photos are included in the digital support files.

DMS comment: The CVS Table 7 export produces divide by 0 errors. Please revise and resubmit, ensuring that the CVS data supports the table in the report.

Wildlands response: The CVS database has been updated so that the exported Excel file for Table 7 no longer produces "divide by 0 errors". The updated database has been resaved with the digital submittal.

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, 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. Please let me know if you have any questions.

Sincerely,

Kristi Suggs

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

PREPARED BY:

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

Phone: 704.332.7754
Fax: 704.332.3306

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full-delivery 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. Monitoring Year (MY) 1 assessments and Site visits were completed between October and December 2020 to assess the conditions of the project.

Overall, the Site has met the required stream and hydrology success criteria for MY1 but is not currently meeting the vegetative success criteria for MY3. The vegetative success criteria for MY3 requires 320 stems per acre, however, currently the overall average planted stem density for the Site is 304 stems per acre. A plan is in place to conduct supplemental planting across the Site in early 2021 in order to get the Site back on track and meet the vegetative success criteria in MY2. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring with some minor adjustments, and streams are functioning as intended. At least one bankfull event was documented on UT1 Reach 1A since the completion of construction. The MY1 visual assessment identified a few areas of concern including one small population of invasives and a few isolated areas of bank scour and aggradation. Wildlands will continue to monitor these areas, and an adaptive management plan will be implemented as necessary throughout the seven-year monitoring period to benefit the ecological health of the Site.

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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 and joins UT1 and continues south to its confluence with to 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 1 Data Assessment

Annual monitoring for MY1 was conducted between October and December 2020, with hydrology data collected between May and mid-November 2020, to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the 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 established during baseline conditions monitoring to be evaluated in MY1 throughout the planted conservation easement to evaluate the random vegetation performance for the Site. These plots will be subsequently reestablished in different random locations in monitoring years 2, 3, 5, and 7. Mobile vegetation plot

assessments will document stems, species, and height using 100-meter^2 circular, square, or rectangular plots. The final vegetative performance standard 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 MY1 vegetation survey was completed in October 2020, resulting in an average planted stem density of 304 stems per acre for all monitored permanent and mobile vegetation plots. The Site is currently failing to meet the interim MY3 requirement of 320 planted stems per acre, however, there is a plan in place to re-plant bare roots in areas with low stem density. This supplemental planting will occur early 2021 and will be monitored throughout the year. Results will be reported at the end of MY2. Out of the 9 permanent vegetation plots six are on track to meet the interim MY3 requirement of 320 planted stems per acre with densities ranging from 324 to 486 planted stems per acre. However, out of the 3 mobile vegetation plots all of them are failing to meet the MY3 requirements by more than 10% with stem densities ranging from 162 to 283 stems per acre. In the permanent vegetation plots, the majority of the surviving stems appear to be thriving with a vigor of 3 or greater indicating a plant health of good or better. Please refer to Appendix 2 for vegetation plot photographs and Appendix 3 for vegetation data tables.

1.2.2 Vegetation Areas of Concern and Management Activity

Overall, herbaceous ground cover is well established throughout the site and wetland vegetation has started to fill in the wet seeps, stabilizing the soil. There is one small bare area located on UT1 Reach 1B that is starting to fill in on its own but will continue to be monitored. Approximately 10 acres of the site, as evaluated during the site walk and through the vegetation plots, had a low planted-stem density. A delayed construction start-date and minor delays from a few storm events pushed the planting date into early April. Because of the delayed planting, some plant mortality throughout the site was expected and subsequent planting anticipated. Therefore, these areas will be replanted, monitored, and re-assessed in the MY2 report. Wildlands does not anticipate any difference in performance among the replanted areas in comparison to those planted after construction and assumes that the site will meet future vegetation monitoring success criteria in MY3, MY5, and MY7.

The MY1 visual assessments did indicate that some invasive plant populations are present within the conservation easement. There is one isolated area of immature Chinese privet along the right easement line of UT1 Reach 4B, which is not impacting any vegetation growth, was treated in MY1. This area will continue to be monitored and re-treated if necessary. Bare areas and invasive species will continue to be monitored in MY2 and adaptive management activities will be implemented as needed. The vegetation areas of concern that meet the required mapping threshold have been documented on Table 7 and are shown on the Current Condition Plan View (CCPV) Figures 3.0 – 3.3 in Appendix 2.

1.2.3 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 MY1 were conducted in December 2020. 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, as well as a slight increase in bank height elevations. These minor changes can be attributed to the establishment of herbaceous vegetation along the tops of banks and slight bed deposition, as well as point bar development in some pools and bench development in some riffles.

These occurrences are normal for newly restored streams and are examples of how a channel adjusts to maintain stability from natural processes, like the multiple large storm events which occurred in MY1 and a lack of woody canopy along a newly constructed channel. 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.

1.2.4 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. At as-built, the pressure transducer was programmed to record data every 3 hours and captured many high flow events throughout the first year of monitoring and one bankfull event on 11/12/2020. Please refer to Appendix 5 for hydrology summary data and gage plots.

1.2.5 Stream Areas of Concern and Management Activity

All streams on the Site remained stable during the multiple large storm events that had occurred during 2020. The Site's visual assessment was conducted on 11/05/2020 after there had been multiple large storm events in prior weeks; however, all the structures are still functioning as designed, and the channels have remained stable. The MY1 visual stream assessments did reveal a few minor areas of concern and include localized instances of bank scour on UT1 Reach 2 and one area of aggradation on UT1 Reach 4A. These areas are likely to restabilize themselves as woody vegetation matures along the banks and the channel moves the sediment through the system. 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.

1.2.6 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 MY1, show that riparian wetlands maintained free groundwater within 12 inches of the ground surface throughout the entire of monitored timeframe (May – November) or 88% of the growing season for GWG1 and 75% of the growing season for GWG2. In addition, photos of the ground water gages exhibit additional wetland indicators such as hydrophytic vegetation, surface water, saturated soils, water-stained leaves, and drainage patterns.

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 1 Summary

Overall, the Site has met the required stream and hydrology success criteria for MY1. The overall average planted stem density for the Site is 304 stems per acre and is currently failing to meet the MY3 requirement of 320 stems per acre by less than 10%. Supplemental planting will take place early next year (2021) in order to improve stem density and get the site back on track to meet the MY3, MY5 and MY7 vegetative requirements. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the 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. The MY1 visual assessment identified a few areas of concern including one small, isolated population of immature Chinese privet, a few isolated areas of bank scour, and one area of aggradation. Wildlands will continue to monitor these areas, and an adaptive management plan 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 monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

Section 3: REFERENCES

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

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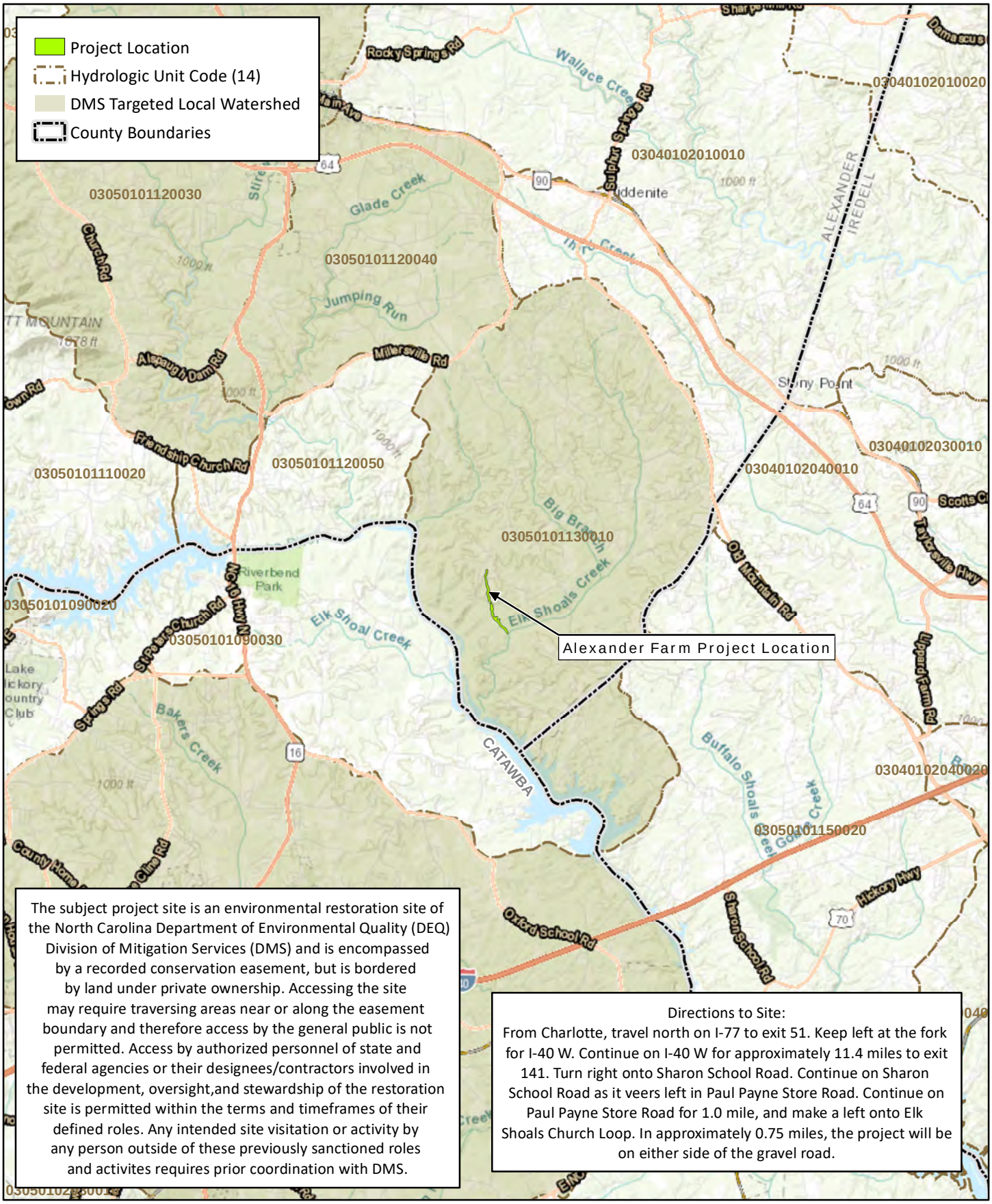
APPENDIX 1. General Figures and Tables



WILDLANDS ENGINEERING

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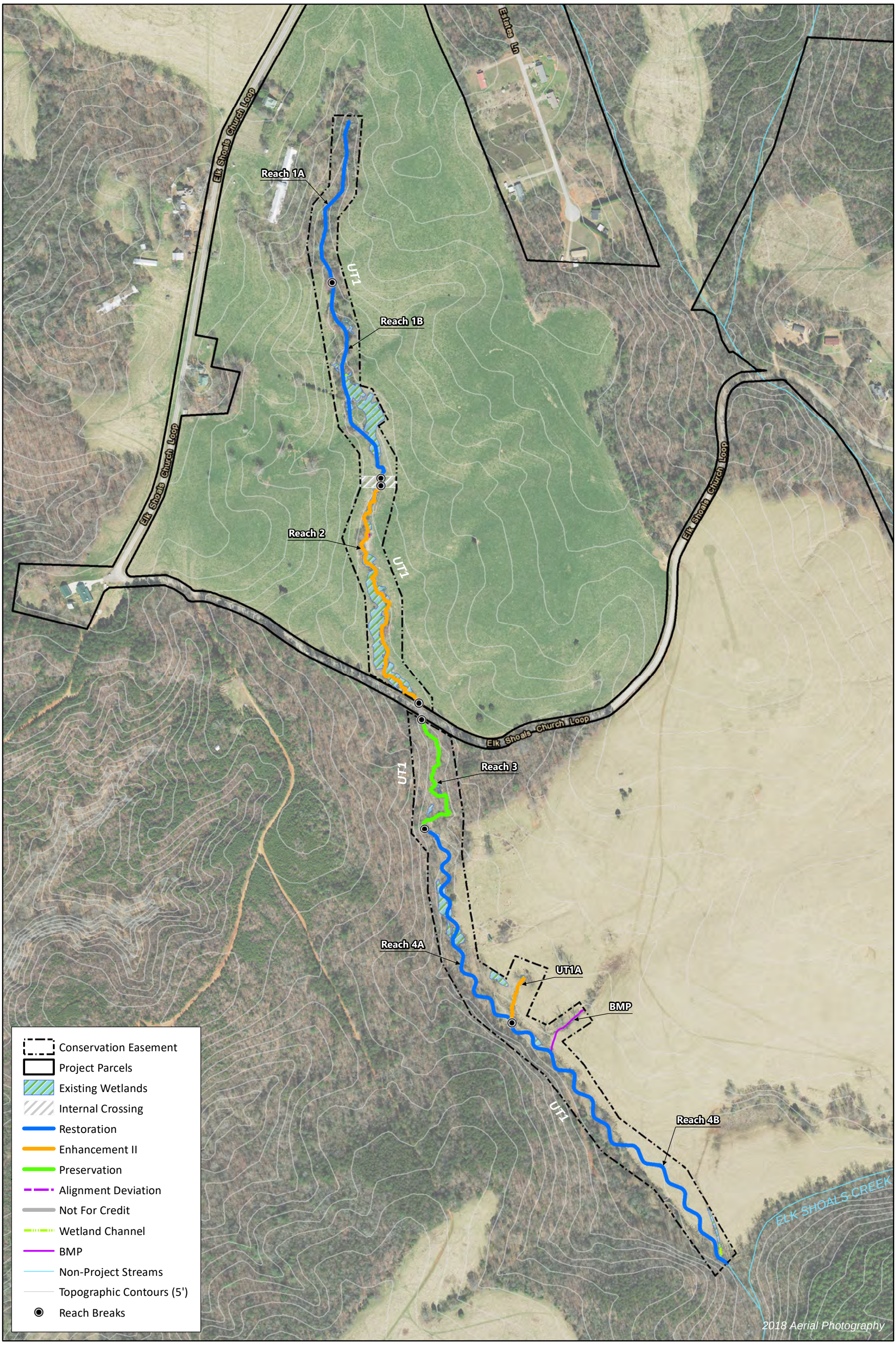
Figure 1 Project Vicinity Map
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020
Alexander County, NC



WILDLANDS ENGINEERING

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Figure 2 Project Component/ Asset Map
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020
Alexander County, NC

Table 1. Mitigation Assets and Components

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Project Components									
Project Area /Reach	**Existing Footage (LF) or Acreage**	**Mitigation Plan Footage/ Acreage**	**Mitigation Category**	**Restoration Level**	**Priority Level**	**Mitigation Ratio (X:1)[1]**	**As-Built Footage/Acreage[2]**	**Project Credit**	**Notes/Comments**
UT1 Reach 1A	1,901	770	Warm	Restoration	P1, P2	2.000	770.000	385.000	Full channel restoration with planted buffer. Livestock excluded, and invasive species treated.
UT1 Reach 1B*		969	Warm	Restoration	P1, P2	2.000	957.000	478.500	Full channel restoration with planted buffer. Livestock excluded, and invasive species treated.
UT1 Reach 2*	1,324	1260	Warm	Enhancement II	N/A	2.000	1,253.000	626.500	Channel stabilization with planted buffer. Livestock excluded, and invasive species treated.
UT1 Reach 3*	732	718	Warm	Preservation	N/A	10.000	701.000	70.100	Invasive species treated.
UT1 Reach 4A	2,825	252	Warm	Restoration	P2	2.500	252.000	100.800	Channel stablized. Floodplain bench cut to reconnect channel with floodplain and transition preservation reach to Priority 1 restoration. Planted buffer, livestock exclusion, and invasive species treated.
UT1 Reach 4A		920	Warm	Restoration	P1	1.000	920.000	920.000	Full channel restoration with planted buffer. Livestock excluded, and invasive species treated.
UT1 Reach 4B		1666	Warm	Restoration	P1, P2	1.000	1,666.000	1,666.000	Full channel restoration with planted buffer. Livestock excluded, and invasive species treated.
UT1A	158.00	203	Warm	Enhancement II	N/A	-	203.000	0.000	Channel reconnected with floodplain. Livestock excluded, invasive species treated, and planted buffer.
BMP	N/A	262	N/A	N/A	N/A	-	262.000	N/A	Step-pool conveyance system implemented to treat pasture stormwater run-off. Livestock excluded, and invasive species treated.

Notes:

1. No direct credit for BMP or UT1A.
2. Internal culvert crossing and external break excluded from stationing listed.

Project Credits							
Restoration Level	**Stream**			**Riparian Wetland**		**Non-Riparian Wetland**	**Coastal Marsh**
	Warm	**Cool**	**Cold**	**Riverine**	**Non-Riv**		
Restoration	3,556.300	N/A	N/A	N/A	N/A	N/A	N/A
Re-establishment				N/A	N/A	N/A	N/A
Rehabilitation				N/A	N/A	N/A	N/A
Enhancement				N/A	N/A	N/A	N/A
Enhancement I	-	N/A	N/A				
Enhancement II	630.000	N/A	N/A				
Creation				N/A	N/A	N/A	N/A
Preservation	71.800	N/A	N/A	N/A	N/A	N/A	
Totals	**4,258.100**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Table 2. Project Activity and Reporting History

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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	Stream Survey		
	Vegetation Survey		
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		

[1]Seed 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 1 - 2020

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 1 - 2020

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

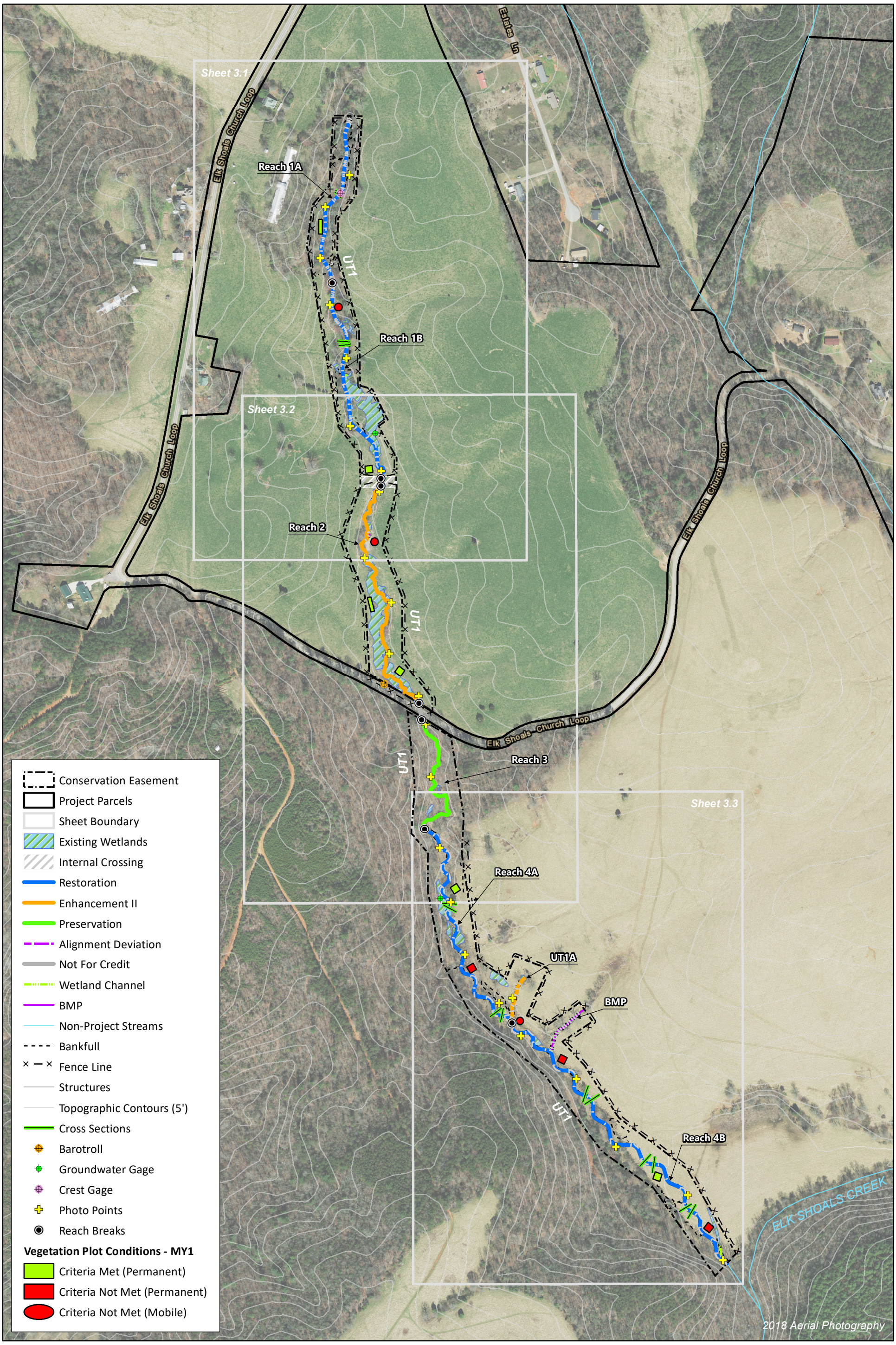
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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	warm	N/A	N/A	2	3	N/A		Year 1, 2, 3, 5, and 7	1
	Pool Cross-Section	1	warm	N/A	N/A	2	3	N/A			
Pattern	Pattern	N/A	warm	N/A	N/A	N/A	N/A	N/A		N/A	2
Profile	Longitudinal Profile	N/A	warm	N/A	N/A	N/A	N/A	N/A		N/A	
Substrate	Reach Wide (RW) Pebble Count	1 RW	warm	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	12 (9 permanent, 3 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

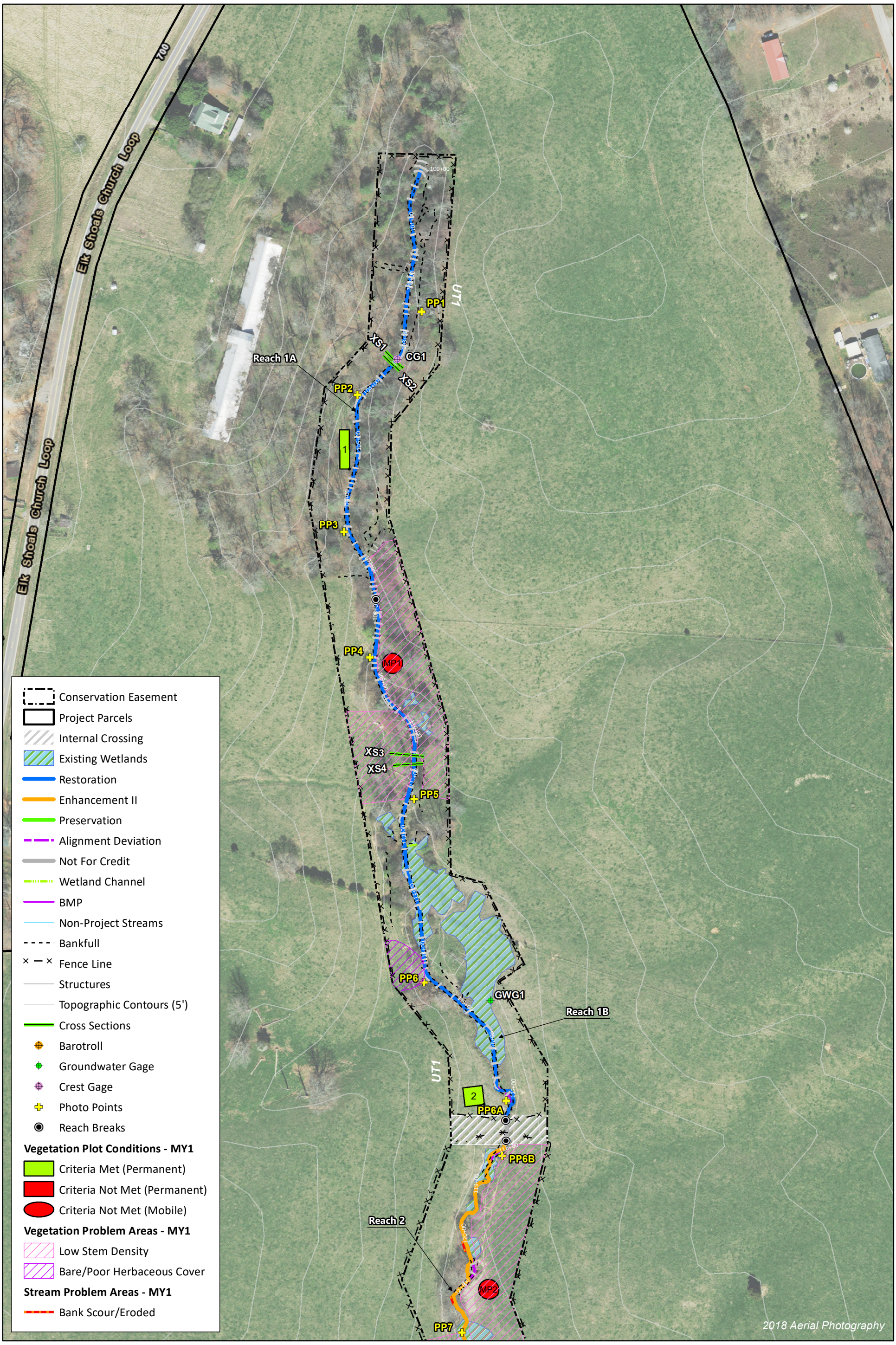


WILDLANDS ENGINEERING

0 400 800 Feet

N

Figure 3.0 Current Condition Plan View (Key)
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020
Alexander County, NC

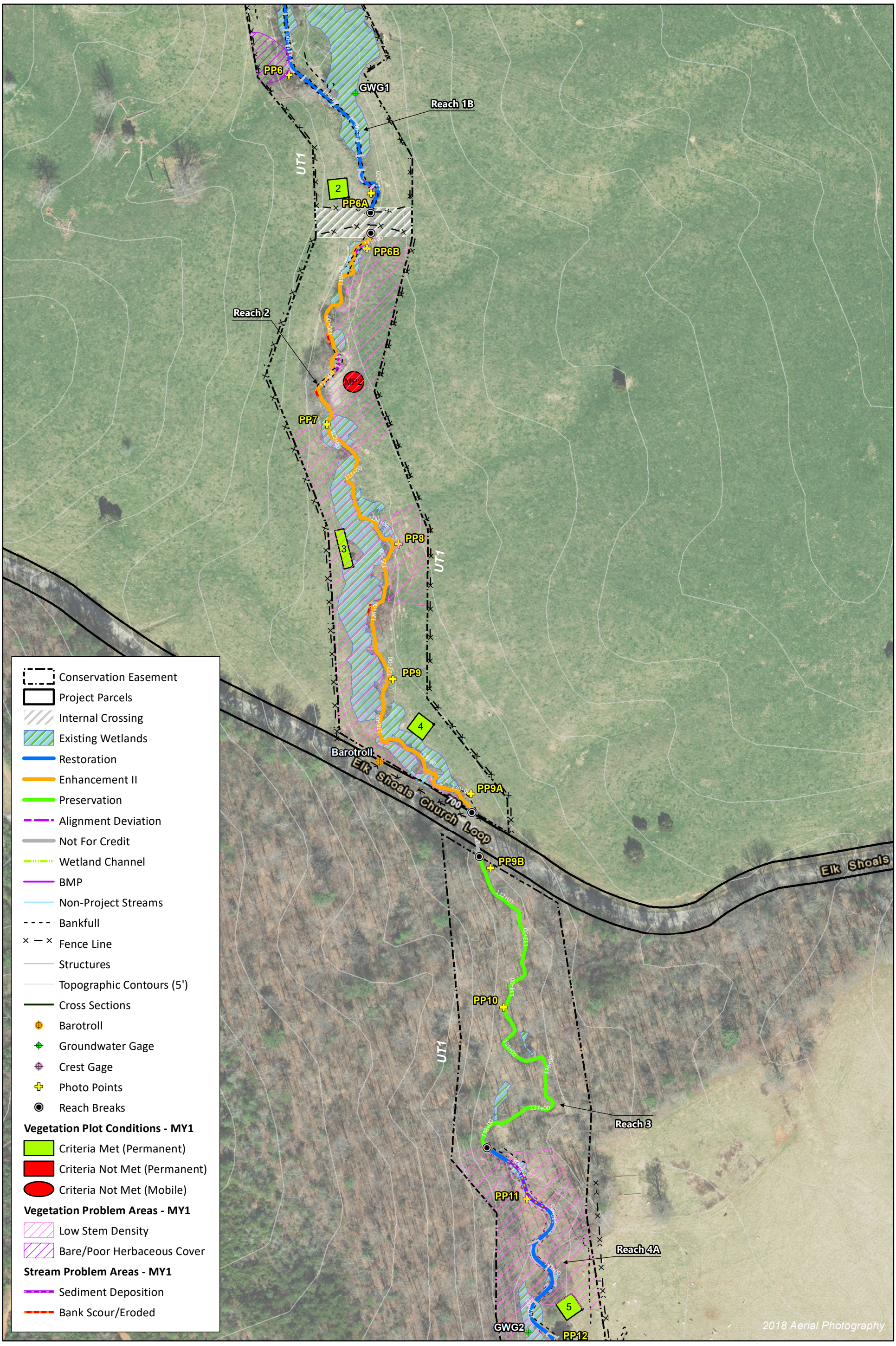


WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3.1 Current Condition Plan View
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020
Alexander County, NC

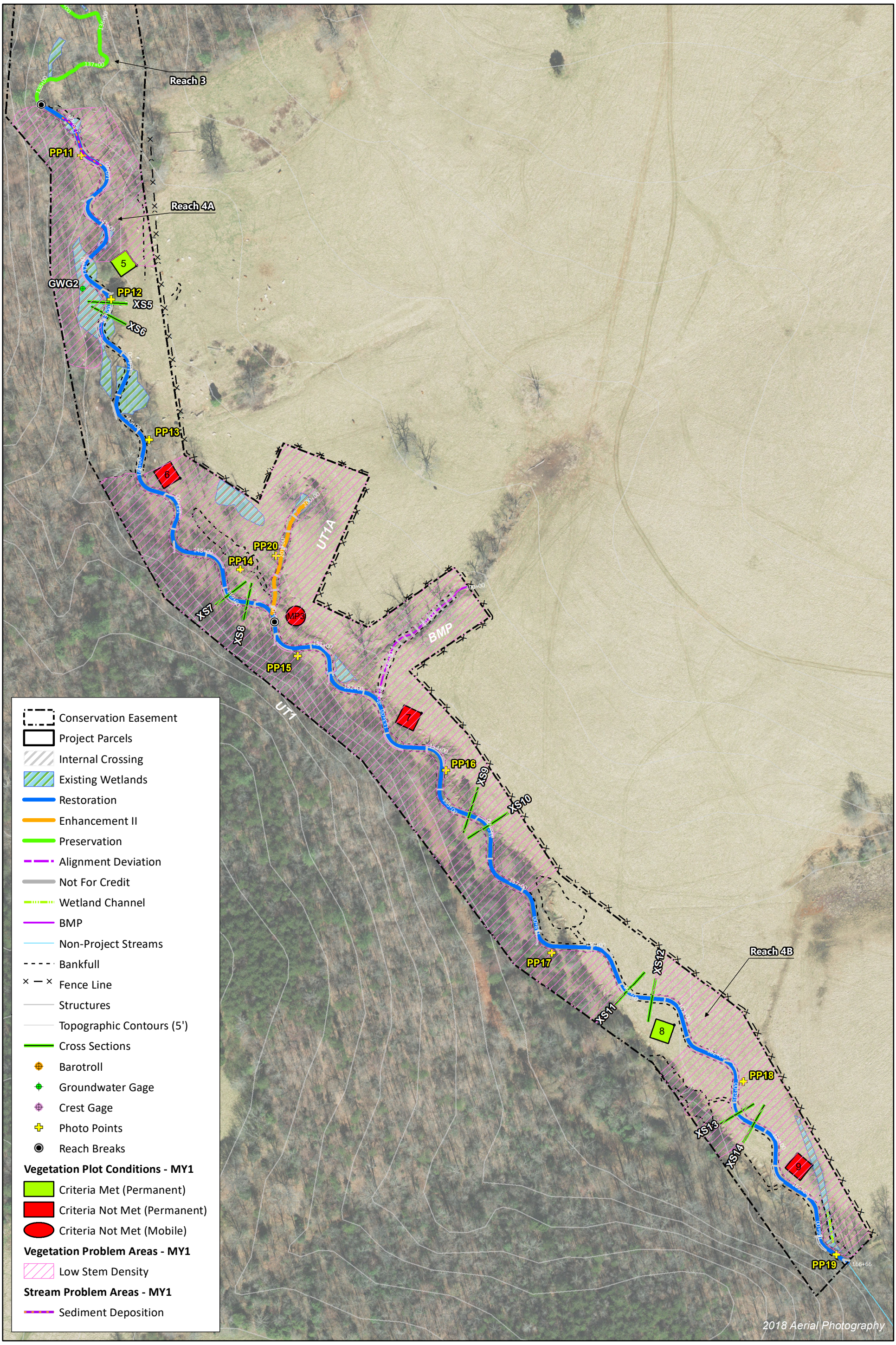


WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3.2 Current Condition Plan View
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020
Alexander County, NC



WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3.3 Current Condition Plan View
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020
Alexander County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 1 - 2020

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.	39	39			100%			
	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%			

[1]Pool 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 1 - 2020

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%			

[1]Pool 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 1 - 2020

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.	27	30			90%			

Table 6d. Visual Stream Morphology Stability Assessment Table

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 1 - 2020

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%			
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 1 - 2020

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	1	0.10	0.6%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 5, or 7 stem count criteria.	0.1	11	10.0	57.0%
		Total	**12**	**10.1**	**57.6%**
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	**12**	**10.1**	**57.6%**

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	0	0.0	0.0%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0.00	0.0%

Stream Photographs
Monitoring Year 1

	
PP1 – view upstream—UT1 Reach 1A (11/05/2020)	**PP1** – view downstream—UT1 Reach 1A (11/05/2020)
	
PP2 – view upstream—UT1 Reach 1A (11/05/2020)	**PP2** – view downstream—UT1 Reach 1A (11/05/2020)
	
PP3 – view upstream—UT1 Reach 1A (11/05/2020)	**PP3** – view downstream—UT1 Reach 1A (11/05/2020)

	
PP4 – view upstream- UT1 Reach 1B (11/05/2020)	**PP4** – view downstream— UT1 Reach 1B (11/05/2020)
	
PP5 – view upstream- UT1 Reach 1B (11/05/2020)	**PP5** – view downstream—UT1 Reach 1B (11/05/2020)
	
PP6- view upstream—UT1 Reach 1B (11/05/2020)	**PP6** – view downstream—UT1 Reach 1B (11/05/2020)

	
PP6A- view upstream—UT1 Reach 1B (11/05/2020)	**PP6A** – view downstream—UT1 Reach 1B (11/05/2020)
	
PP6B- view upstream—UT1 Reach 2 (11/05/2020)	**PP6B** – view downstream—UT1 Reach 2 (11/05/2020)
	
PP7 – view upstream—UT1 Reach 2 (11/05/2020)	**PP7** – view downstream-UT1 Reach 2 (11/05/2020)

	
PP8 – view upstream—UT1 Reach 2 (11/05/2020)	**PP8** – view downstream—UT1 Reach 2 (11/05/2020)
	
PP9 – view upstream—UT1 Reach 2 (11/05/2020)	**PP9** – view downstream—UT1 Reach 2 (11/05/2020)
	
PP9A – view upstream—UT1 Reach 2 (11/05/2020)	**PP9A** – view downstream—UT1 Reach 2 (11/05/2020)

	
PP9B – view upstream—UT1 Reach 3 (11/05/2020)	**PP9B** – view downstream—UT1 Reach 3 (11/05/2020)
	
PP10 – view upstream—UT1 Reach 3 (11/05/2020)	**PP10** – view downstream—UT1 Reach 3 (11/05/2020)
	
PP11 – view upstream—UT1 Reach 4A (11/05/2020)	**PP11** – view downstream—UT1 Reach 4A (11/05/2020)

	
PP12 – view upstream— UT1 Reach 4A (11/05/2020)	**PP12** – view downstream—UT1 Reach 4A (11/05/2020)
	
PP13 – view upstream—UT1 Reach 4A (11/05/2020)	**PP13** – view downstream— UT1 Reach 4A (11/05/2020)
	
PP14 – view upstream— UT1 Reach 4A (11/05/2020)	**PP14** – view downstream— UT1 Reach 4A (11/05/2020)

	
PP15 – view upstream— UT1 Reach 4B (11/05/2020)	**PP15** – view downstream— UT1 Reach 4B (11/05/2020)
	
PP16 – view upstream— UT1 Reach 4B (11/05/2020)	**PP16** – view downstream— UT1 Reach 4B (11/05/2020)
	
PP17 – view upstream— UT1 Reach 4B (11/05/2020)	**PP17** – view downstream— UT1 Reach 4B (11/05/2020)

	
PP18 – view upstream— UT1 Reach 4B (11/05/2020)	**PP18** – view downstream— UT1 Reach 4B (11/05/2020)
	
PP19 – view upstream— UT1 Reach 4B (11/05/2020)	**PP19** – view downstream— UT1 Reach 4B (11/05/2020)
	
PP20 – view upstream— UT1A (11/05/2020)	**PP20** – view downstream— UT1A (11/05/2020)

Vegetation Plot Photographs
Monitoring Year 1

Permanent Vegetation Plot 1 *(10/27/2020)*

Permanent Vegetation Plot 2 *(10/27/2020)*

Permanent Vegetation Plot 3 *(10/27/2020)*

Permanent Vegetation Plot 4 *(10/27/2020)*

Permanent Vegetation Plot 5 *(10/27/2020)*

Permanent Vegetation Plot 6 *(10/27/2020)*

Permanent Vegetation Plot 7 *(10/27/2020)*

Permanent Vegetation Plot 8 *(10/27/2020)*

Permanent Vegetation Plot 9 *(10/27/2020)*

Mobile Vegetation Plot 1 *(10/27/2020)*

Mobile Vegetation Plot 2 *(10/27/2020)*

Mobile Vegetation Plot 3 *(10/27/2020)*

Area of Concern Photographs
Monitoring Year 1

	
UT1 R2 Right Bank Erosion (STA 120+00-120+20) – view downstream (2/9/2021)	**UT1 R2 Right Bank Erosion** (STA 121+00-121+15) – view downstream (2/9/2021)
	
UT1 R2 Right Bank Erosion (STA 126+00-126+20) – view downstream (2/9/2021)	**UT1 R4A Aggradation** (STA 139+00-139+75) – view downstream (11/05/2020)

Groundwater Gage Photographs
Monitoring Year 1

	
Groundwater Gage 1 - *(12/18/2020)*	**Groundwater Gage 2** - *(12/18/2020)*

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 1 - 2020

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)**		
1	N	0%	
2	N		
3	N		

Table 9. CVS Permanent Vegetation Plot Metadata

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Report Prepared By	Sara Thompson
Date Prepared	10/30/2020 14:00
Database Name	cvs-eep-entrytool-v2.5.0_Deep Meadow (MY0).mdb
Database Location	\\192.168.3.7\projects\ActiveProjects\005-02169 Alexander Farm\Monitoring\Monitoring Year 1 (2020)\Vegetation Assessment
Computer Name	SARA2020
File Size	75223040
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	12

Table 10a. Planted and Total Stem Counts
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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**
Acer negundo	Box elder	Tree	2	2	3										2	2	2
Acer rubrum	Red maple	Tree									35						
Betula nigra	River birch	Tree	1	1	1	1	1	1	5	5	5	3	3	3	1	1	1
Diospyros virginiana	Persimmon	Tree			1												
Gleditsia triacanthos	Honey locust	Tree									1						
Platanus occidentalis	Sycamore	Tree			2	2	2	2	1	1	1				2	2	2
Quercus alba [1]	White oak	Tree										1	1	1			
Quercus pagoda	Cherrybark oak	Tree	5	5	5	6	6	6	3	3	3	1	1	1	2	2	2
Quercus phellos	Willow oak	Tree	1	1	1	1	1	1	2	2	2	3	3	3	1	1	1
Quercus rubra	Northern Red oak	Tree				1	1	1	1	1	1						
Salix nigra	Black willow	Tree															
Ulmus alata	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	
			4	4	6	5	5	5	5	5	7	4	4	4	5	5	5
		Stems per ACRE	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**
Acer negundo	Box elder	Tree							2	2	2				6	6	7
Acer rubrum	Red maple	Tree															35
Betula nigra	River birch	Tree				1	1	1	3	3	3				15	15	15
Diospyros virginiana	Persimmon	Tree															1
Gleditsia triacanthos	Honey locust	Tree															1
Platanus occidentalis	Sycamore	Tree										3	3	3	8	8	10
Quercus alba [1]	White oak	Tree							2	2	2				3	3	3
Quercus pagoda	Cherrybark oak	Tree	2	2	2	1	1	1	1	1	1	1	1	1	22	22	22
Quercus phellos	Willow oak	Tree				2	2	2	4	4	4	3	3	3	17	17	17
Quercus rubra	Northern Red oak	Tree													2	2	2
Salix nigra	Black willow	Tree						20									20
Ulmus alata	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

[1]Prior 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 10b. Planted and Total Stem Counts
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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**
Acer negundo	Box elder	Tree	1	1		2	6
Betula nigra	River birch	Tree	2	2		4	12
Platanus occidentalis	Sycamore	Tree		3		3	4
Quercus sp. (unkown) [1]	Oak species (unkown)	Tree					4
Quercus pagoda	Cherrybark oak	Tree	3	1	3	7	8
Quercus phellos	Willow oak	Tree	1		1	1	3
Quercus rubra	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**
Acer negundo	Box elder	Tree	8	21
Acer rubrum	Red maple	Tree		
Betula nigra	River birch	Tree	19	29
Diospyros virginiana	Persimmon	Tree		
Gleditsia triacanthos	Honey locust	Tree		
Platanus occidentalis	Sycamore	Tree	11	13
Quercus sp. (unkown) [1]	Oak species (unkown)	Tree		11
Quercus alba [1]	White oak	Tree	3	
Quercus pagoda	Cherrybark oak	Tree	29	41
Quercus phellos	Willow oak	Tree	18	31
Quercus rubra	Northern Red oak	Tree	2	4
Salix nigra	Black willow	Tree		
Ulmus alata	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

[1]Prior 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

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

		Pre-Restoration Condition								Design								As-Built/Baseline							
Parameter	**Gage**	**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																								
Riffle Slope (ft/ft)		---		---		---		---		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
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^1		---		---		---		---		---		---		---		---		---		---		---		---		---	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m^1																									
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%							
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				2,825				770		969		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	
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	

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 1 - 2020

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	1.9	
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	28.9	
Width/Depth Ratio		16.6		10.9		8.8		17.0		14.9	18.3	8.1	9.3	12.3	14.4	19.1	
Entrenchment Ratio		2.3		1.2		4.3		1.5		6.0	6.0	5.7	10.0	2.5	2.7	3.3	
Bank Height Ratio		1.0		2.5		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																
Riffle Slope (ft/ft)		---		---		0.025	0.730	0.020	0.150	0.006	0.060	0.024	0.057	0.000	0.100	0.600	
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 /2048.0/>2048		---		11.0/42.0/59.0/170.0 /256.0		0.49/3.5/6.5/48.0/83.0 /128.0		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 1 - 2020

	UT1 R1A Cross-Section 1 (Riffle)								UT1 R1A Cross-Section 2 (Pool)								UT1 R1B Cross-Section 3 (Pool)								UT1 R1B Cross-Section 4 (Riffle)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation[1]	976.6	976.6							976.2	976.3							945.7	945.5							945.3	945.6						
Low Bank Elevation	976.6	976.6							976.2	976.3							945.7	945.5							945.3	945.2						
Bankfull Width (ft)	6.6	6.6							7.0	8.0							8.3	7.1							7.9	6.4						
Floodprone Width (ft)[2]	23.3	21.5							-	-							-	-							25.2	18.8						
Bankfull Mean Depth (ft)	0.4	0.4							1.2	1.1							1.4	1.2							0.7	0.4						
Bankfull Max Depth (ft)	0.9	0.9							1.9	2.0							2.1	1.9							0.9	0.8						
Bankfull Cross-Sectional Area (ft^2)	2.7	2.8							8.2	8.5							11.7	8.4							5.5	2.8						
Bankfull Width/Depth Ratio	16.3	15.6							6.0	7.6							5.9	6.1							11.4	14.6						
Bankfull Entrenchment Ratio[3]	3.5	3.2							-	-							-	-							3.2	2.9						
Bankfull Bank Height Ratio	1.0	1.0							-	-							-	-							1.0	0.7						

	UT1 R4A Cross-Section 5 (Pool)								UT1 R4A Cross-Section 6 (Riffle)								UT1 R4A Cross-Section 7 (Pool)								UT1 R4A Cross-Section 8 (Riffle)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation[1]	891.5	891.6							891.8	892.0							885.5	885.6							885.1	885.4						
Low Bank Elevation	891.5	891.6							891.8	891.9							885.5	885.6							885.1	885.4						
Bankfull Width (ft)	8.9	7.8							12.9	13.5							16.2	16.2							11.6	12.7						
Floodprone Width (ft)[2]	-	-							68.0	66.5							-	-							64.2	62.6						
Bankfull Mean Depth (ft)	1.4	1.1							0.8	0.6							1.0	0.9							1.0	0.9						
Bankfull Max Depth (ft)	2.1	2.0							1.3	1.2							2.3	2.3							1.4	1.5						
Bankfull Cross-Sectional Area (ft^2)	12.9	8.6							10.6	8.4							15.7	14.2							12.0	11.6						
Bankfull Width/Depth Ratio	6.2	7.1							15.8	21.5							16.7	18.5							11.3	13.9						
Bankfull Entrenchment Ratio[3]	-	-							5.3	4.9							-	-							5.5	4.9						
Bankfull Bank Height Ratio	-	-							1.0	0.9							-	-							1.0	1.0						

	UT1 R4B Cross Section 9 (Riffle)								UT1 R4B Cross Section 10 (Pool)								UT1 R4B Cross-Section 11 (Pool)								UT1 R4B Cross-Section 12 (Riffle)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation[1]	879.8	880.2							879.5	879.7							875.5	875.4							875.1	875.4						
Low Bank Elevation	879.8	880.0							879.5	879.7							875.5	875.4							875.1	875.3						
Bankfull Width (ft)	12.5	12.8							13.3	15.0							13.2	10.9							12.5	12.3						
Floodprone Width (ft)[2]	82.5	80.9							-	-							-	-							74.7	74.6						
Bankfull Mean Depth (ft)	1.0	0.7							2.5	1.8							1.6	1.6							1.0	0.8						
Bankfull Max Depth (ft)	1.3	1.3							3.7	3.5							3.0	2.7							1.6	1.5						
Bankfull Cross-Sectional Area (ft^2)	11.9	9.0							32.7	26.5							21.0	17.7							12.5	10.2						
Bankfull Width/Depth Ratio	13.1	18.2							5.4	8.5							8.3	6.8							12.5	14.8						
Bankfull Entrenchment Ratio[3]	6.6	6.3							-	-							-	-							6.0	6.1						
Bankfull Bank Height Ratio	1.0	0.9							-	-							-	-							1.0	0.9						

	UT1 R4B Cross Section 13 (Pool)								UT1 R4B Cross Section 14 (Riffle)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
Bankfull Elevation[1]	873.3	873.6							873.2	873.6						
Low Bank Elevation	873.3	873.6							873.2	873.5						
Bankfull Width (ft)	13.0	16.6							11.4	12.6						
Floodprone Width (ft)[2]	-	-							75.2	74.0						
Bankfull Mean Depth (ft)	1.4	1.1							1.1	0.9						
Bankfull Max Depth (ft)	2.6	2.7							1.5	1.6						
Bankfull Cross-Sectional Area (ft^2)	18.0	18.4							12.6	11.3						
Bankfull Width/Depth Ratio	9.4	15.0							10.3	13.9						
Bankfull Entrenchment Ratio[3]	-	-							6.6	5.9						
Bankfull Bank Height Ratio	-	-							1.0	1.0						

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.
[2]Floodprone width is calculated from the width of cross-section but valley width may extend further.
[3]ER for the baseline/monitoring parameters is based on the width of the cross-section, in lieu of assuming the width across the floodplain.

Table 13a. Monitoring Data - Stream Reach Data Summary
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

UT1 R1A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[2]																
Bankfull Width (ft)	6.6		6.6													
Floodprone Width (ft)	23		22													
Bankfull Mean Depth (ft)	0.4		0.4													
Bankfull Max Depth (ft)	0.9		0.9													
Bankfull Cross-sectional Area (ft^2)	2.7		2.8													
Width/Depth Ratio	16.3		15.6													
Entrenchment Ratio	3.5		3.2													
Bank Height Ratio	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													
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															

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

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

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13b. Monitoring Data - Stream Reach Data Summary
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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 - Riffle[1]																
Bankfull Width (ft)	7.9		6.4													
Floodprone Width (ft)	25		19													
Bankfull Mean Depth (ft)	0.7		0.4													
Bankfull Max Depth (ft)	0.9		0.8													
Bankfull Cross-sectional Area (ft^2)	5.5		2.8													
Width/Depth Ratio	11.4		14.6													
Entrenchment Ratio	3.2		2.9													
Bank Height Ratio	1.0		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%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/0.2/2.0/86.5/128.0/512.0		0.5/0.9/18.6/57.2/105.0/128.0													
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															

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

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13c. Monitoring Data - Stream Reach Data Summary
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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 - Riffle[1]																
Bankfull Width (ft)	11.6	12.9	12.7	13.5												
Floodprone Width (ft)	64	68	63	67												
Bankfull Mean Depth (ft)	0.8	1.0	0.6	0.9												
Bankfull Max Depth (ft)	1.3	1.4	1.2	1.5												
Bankfull Cross-sectional Area (ft^2)	10.6	12.0	8.4	11.6												
Width/Depth Ratio	11.3	15.8	13.9	21.5												
Entrenchment Ratio	5.3	5.5	4.9													
Bank Height Ratio	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													
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															

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

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13d. Monitoring Data - Stream Reach Data Summary
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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 - Riffle[1]																
Bankfull Width (ft)	11.4	12.5	12.3	12.8												
Floodprone Width (ft)	75	83	74	81												
Bankfull Mean Depth (ft)	1.0	1.1	0.7	0.9												
Bankfull Max Depth (ft)	1.3	1.6	1.3	1.6												
Bankfull Cross-sectional Area (ft^2)	11.9	12.6	9.0	11.3												
Width/Depth Ratio	10.3	13.1	13.9	18.2												
Entrenchment Ratio	6.0	6.6	5.9	6.3												
Bank Height Ratio	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													
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															

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

SC: Silt/Clay <0.062 mm diameter particles

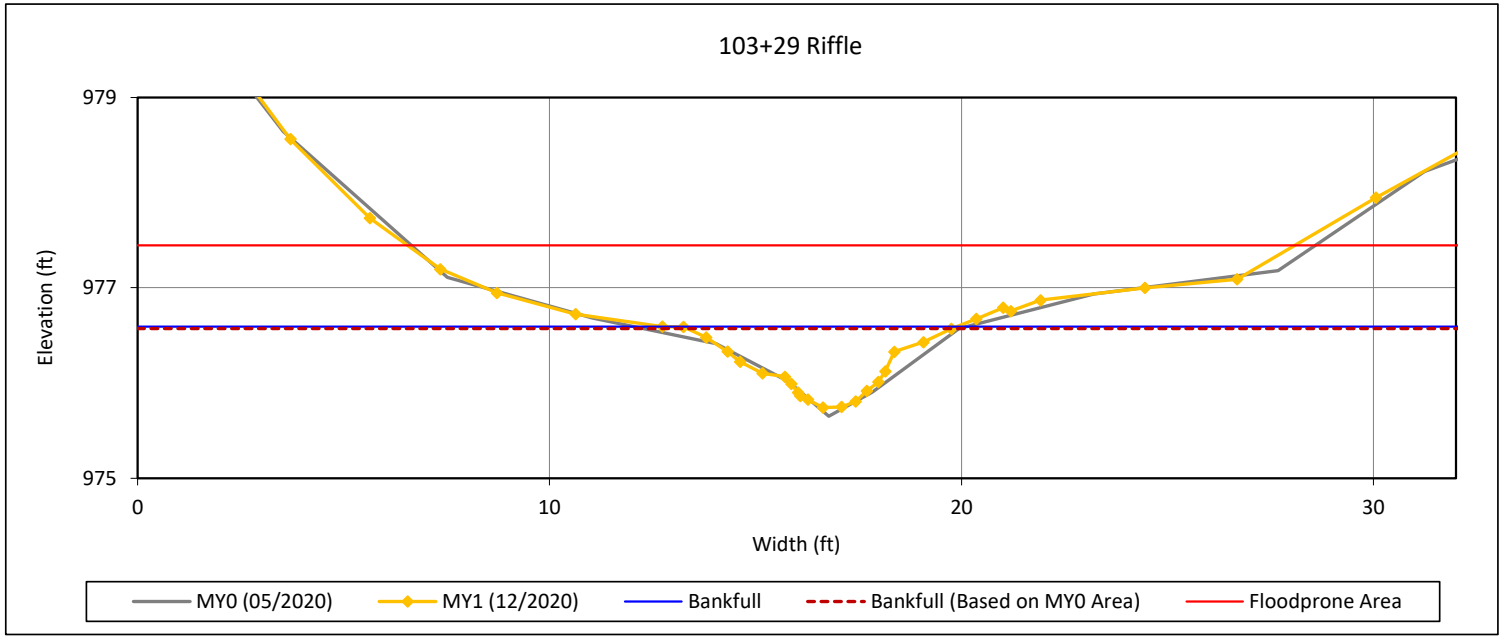
(---): Data was not provided

N/A: Not Applicable

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 1-UT1 Reach 1A



Bankfull Dimensions	
2.8	x-section area (ft.sq.)
6.6	width (ft)
0.4	mean depth (ft)
0.9	max depth (ft)
7.0	wetted perimeter (ft)
0.4	hydraulic radius (ft)
15.6	width-depth ratio
21.5	W flood prone area (ft)
3.2	entrenchment ratio
1.0	low bank height ratio

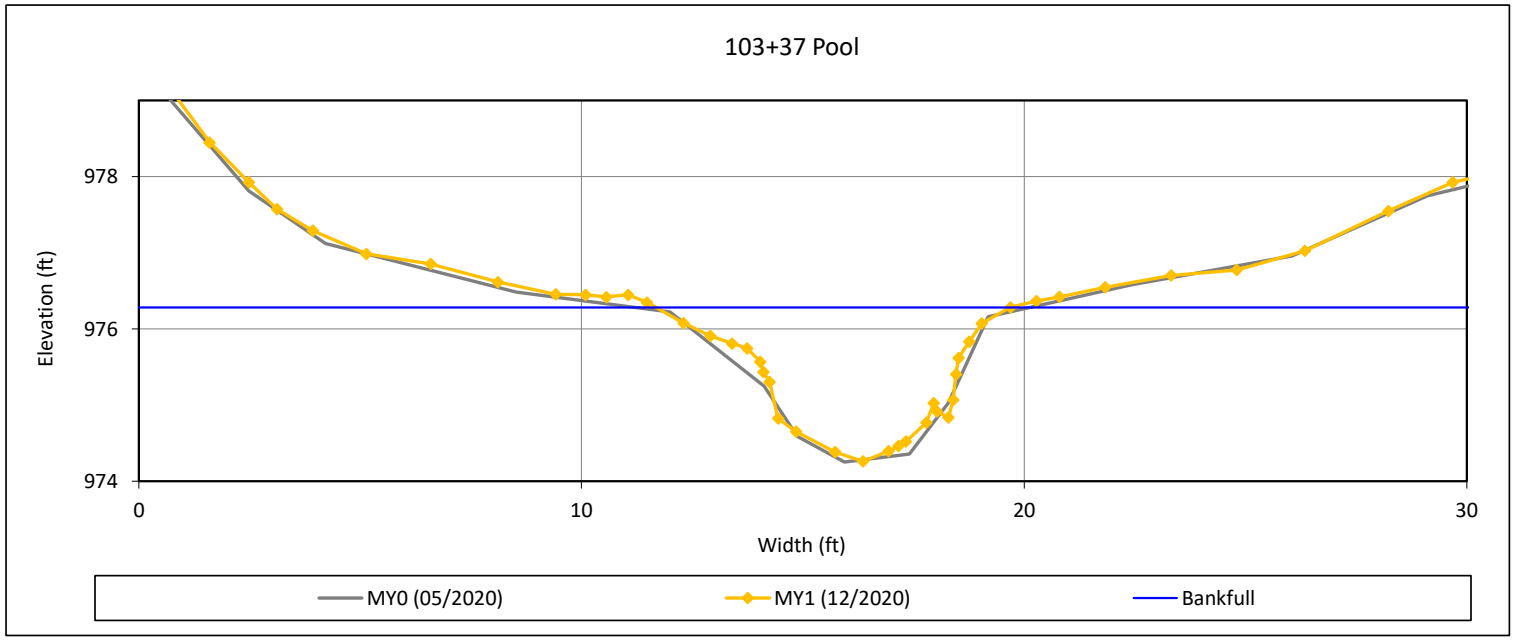
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 2-UT1 Reach 1A



Bankfull Dimensions	
8.5	x-section area (ft.sq.)
8.0	width (ft)
1.1	mean depth (ft)
2.0	max depth (ft)
9.8	wetted perimeter (ft)
0.9	hydraulic radius (ft)
7.6	width-depth ratio

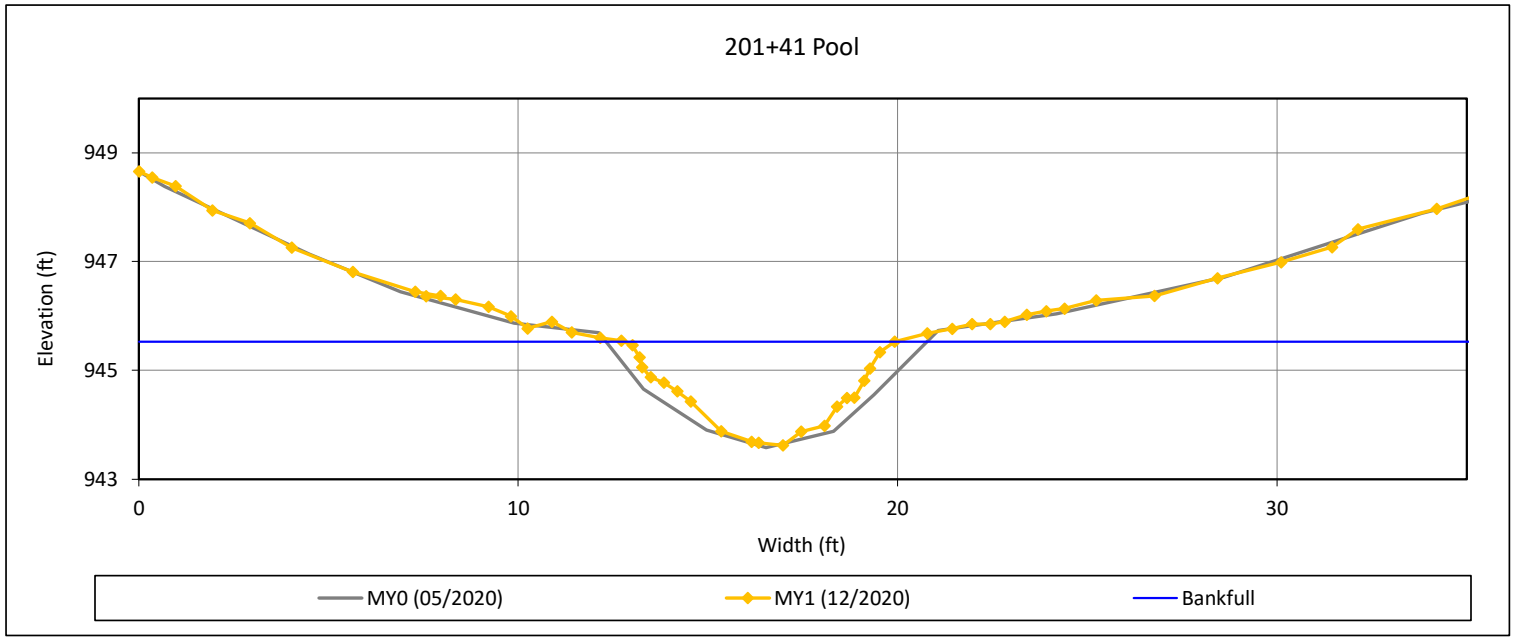
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 3-UT1 Reach 1B



Bankfull Dimensions	
8.4	x-section area (ft.sq.)
7.1	width (ft)
1.2	mean depth (ft)
1.9	max depth (ft)
8.4	wetted perimeter (ft)
1.0	hydraulic radius (ft)
6.1	width-depth ratio

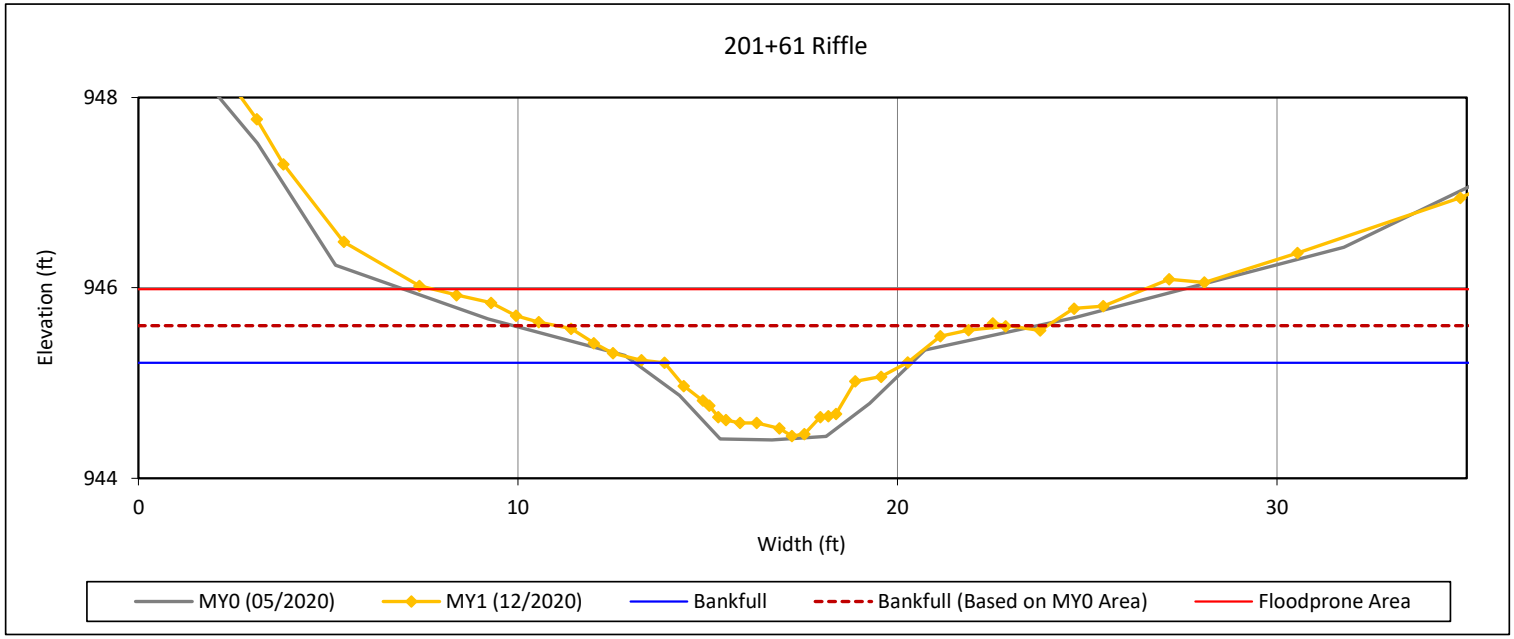
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 4-UT1 Reach 1B



Bankfull Dimensions	
2.8	x-section area (ft.sq.)
6.4	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
6.7	wetted perimeter (ft)
0.4	hydraulic radius (ft)
14.6	width-depth ratio
18.8	W flood prone area (ft)
2.9	entrenchment ratio
0.7	low bank height ratio

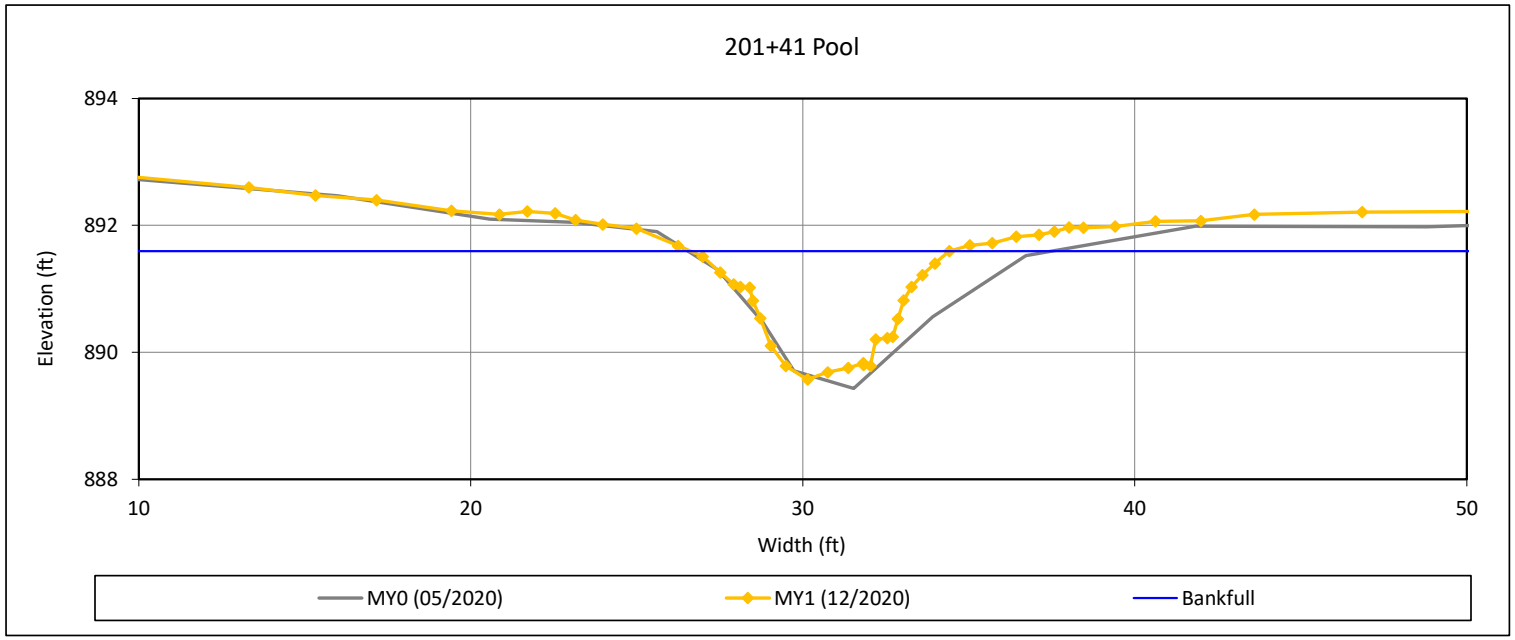
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 5-UT1 Reach 4A



Bankfull Dimensions	
8.6	x-section area (ft.sq.)
7.8	width (ft)
1.1	mean depth (ft)
2.0	max depth (ft)
9.4	wetted perimeter (ft)
0.9	hydraulic radius (ft)
7.1	width-depth ratio

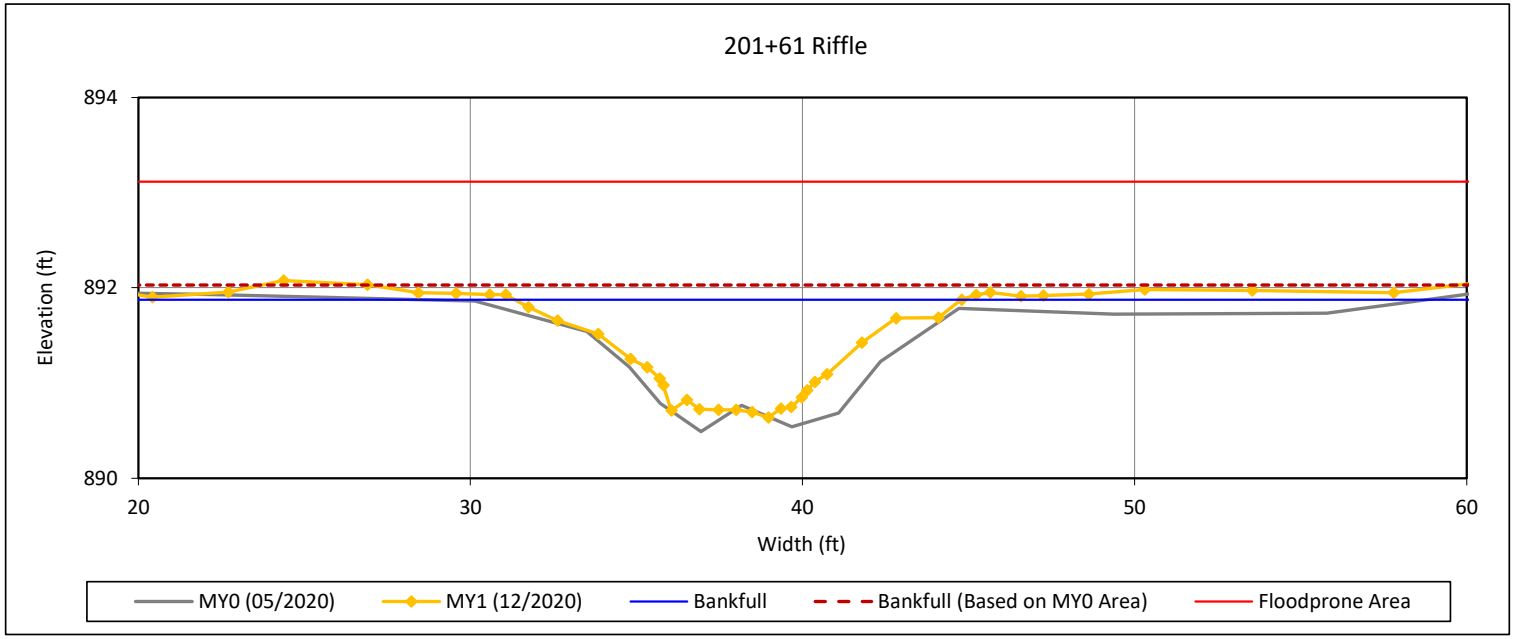
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 6-UT1 Reach 4A



Bankfull Dimensions	
8.4	x-section area (ft.sq.)
13.5	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
13.9	wetted perimeter (ft)
0.6	hydraulic radius (ft)
21.5	width-depth ratio
66.5	W flood prone area (ft)
4.9	entrenchment ratio
0.9	low bank height ratio

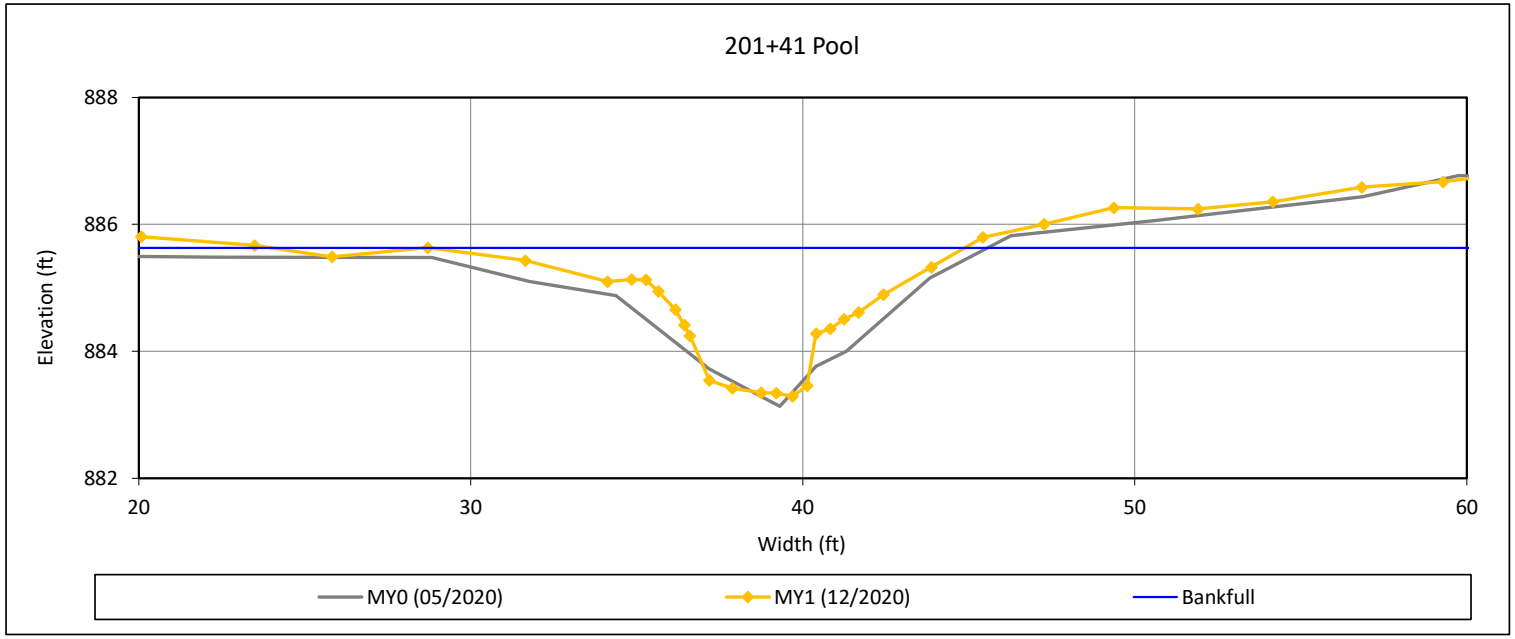
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 7-UT1 Reach 4A



Bankfull Dimensions	
14.2	x-section area (ft.sq.)
16.2	width (ft)
0.9	mean depth (ft)
2.3	max depth (ft)
17.7	wetted perimeter (ft)
0.8	hydraulic radius (ft)
18.5	width-depth ratio

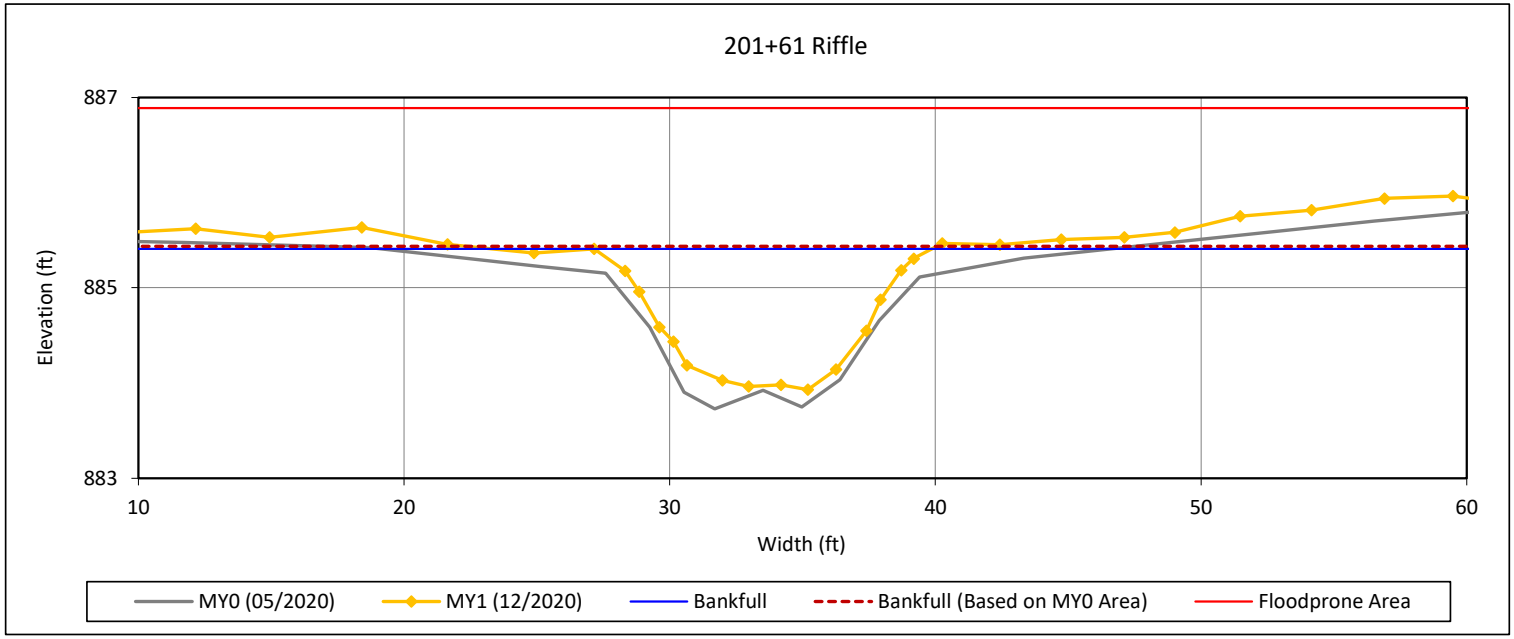
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 8-UT1 Reach 4A



Bankfull Dimensions	
11.6	x-section area (ft.sq.)
12.7	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
13.2	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.9	width-depth ratio
62.6	W flood prone area (ft)
4.9	entrenchment ratio
1.0	low bank height ratio

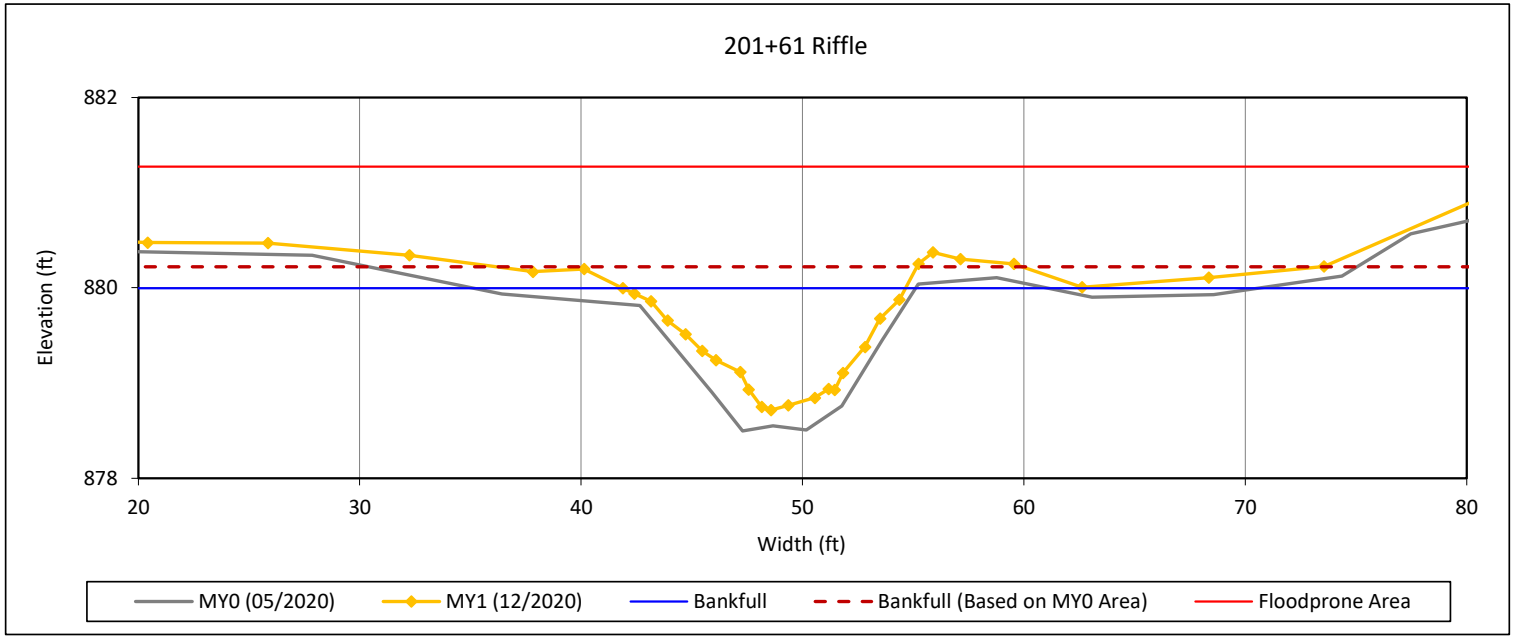
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 9-UT1 Reach 4B



Bankfull Dimensions	
9.0	x-section area (ft.sq.)
12.8	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
13.1	wetted perimeter (ft)
0.7	hydraulic radius (ft)
18.2	width-depth ratio
80.9	W flood prone area (ft)
6.3	entrenchment ratio
0.9	low bank height ratio

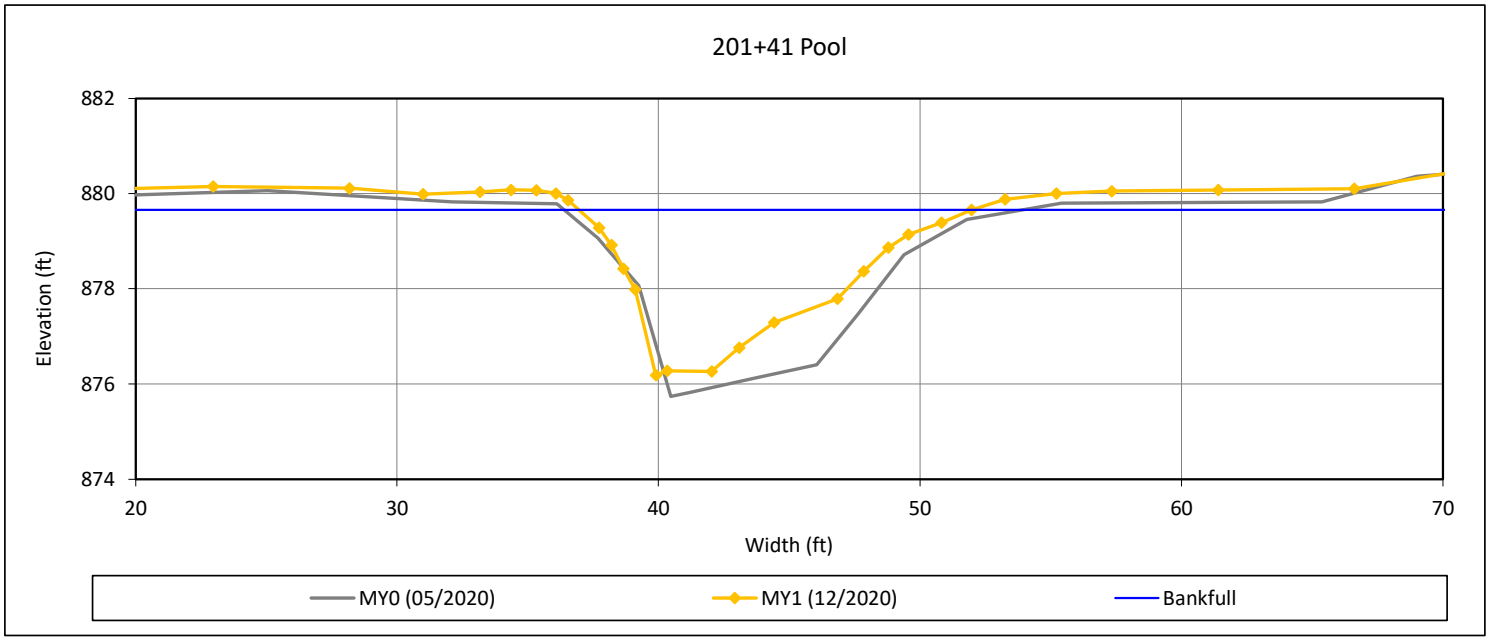
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 10-UT1 Reach 4B



Bankfull Dimensions	
26.5	x-section area (ft.sq.)
15.0	width (ft)
1.8	mean depth (ft)
3.5	max depth (ft)
17.5	wetted perimeter (ft)
1.5	hydraulic radius (ft)
8.5	width-depth ratio

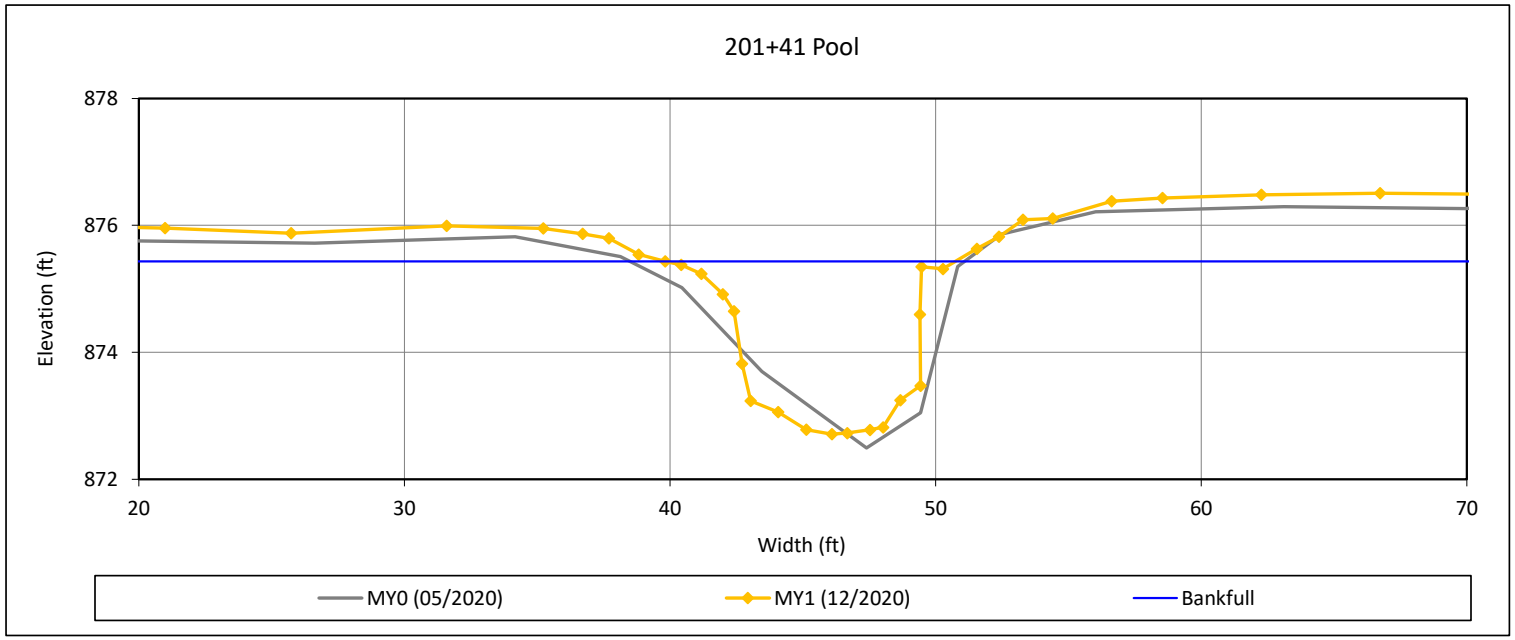
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 11-UT1 Reach 4B



Bankfull Dimensions	
17.7	x-section area (ft.sq.)
10.9	width (ft)
1.6	mean depth (ft)
2.7	max depth (ft)
14.1	wetted perimeter (ft)
1.3	hydraulic radius (ft)
6.8	width-depth ratio

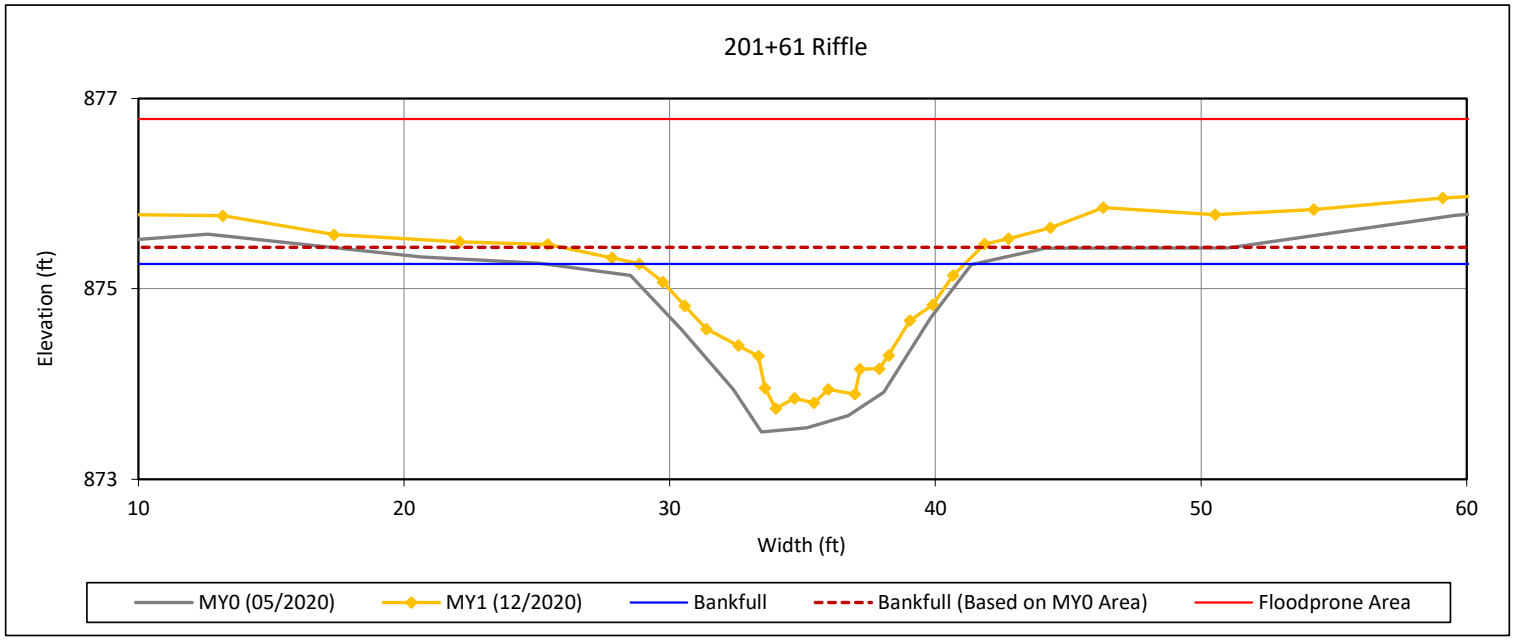
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 12-UT1 Reach 4B



Bankfull Dimensions	
10.2	x-section area (ft.sq.)
12.3	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
13.0	wetted perimeter (ft)
0.8	hydraulic radius (ft)
14.8	width-depth ratio
74.6	W flood prone area (ft)
6.1	entrenchment ratio
0.9	low bank height ratio

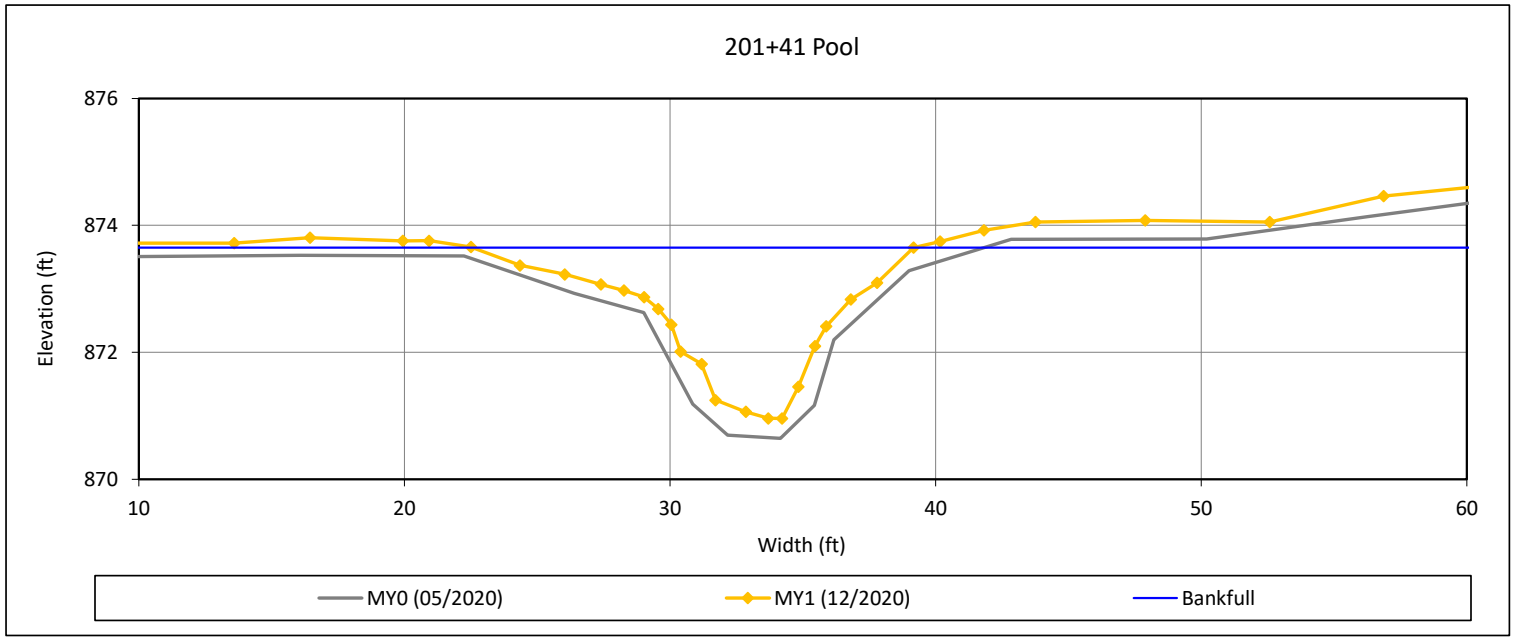
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 13-UT1 Reach 4B



Bankfull Dimensions	
18.4	x-section area (ft.sq.)
16.6	width (ft)
1.1	mean depth (ft)
2.7	max depth (ft)
18.0	wetted perimeter (ft)
1.0	hydraulic radius (ft)
15.0	width-depth ratio

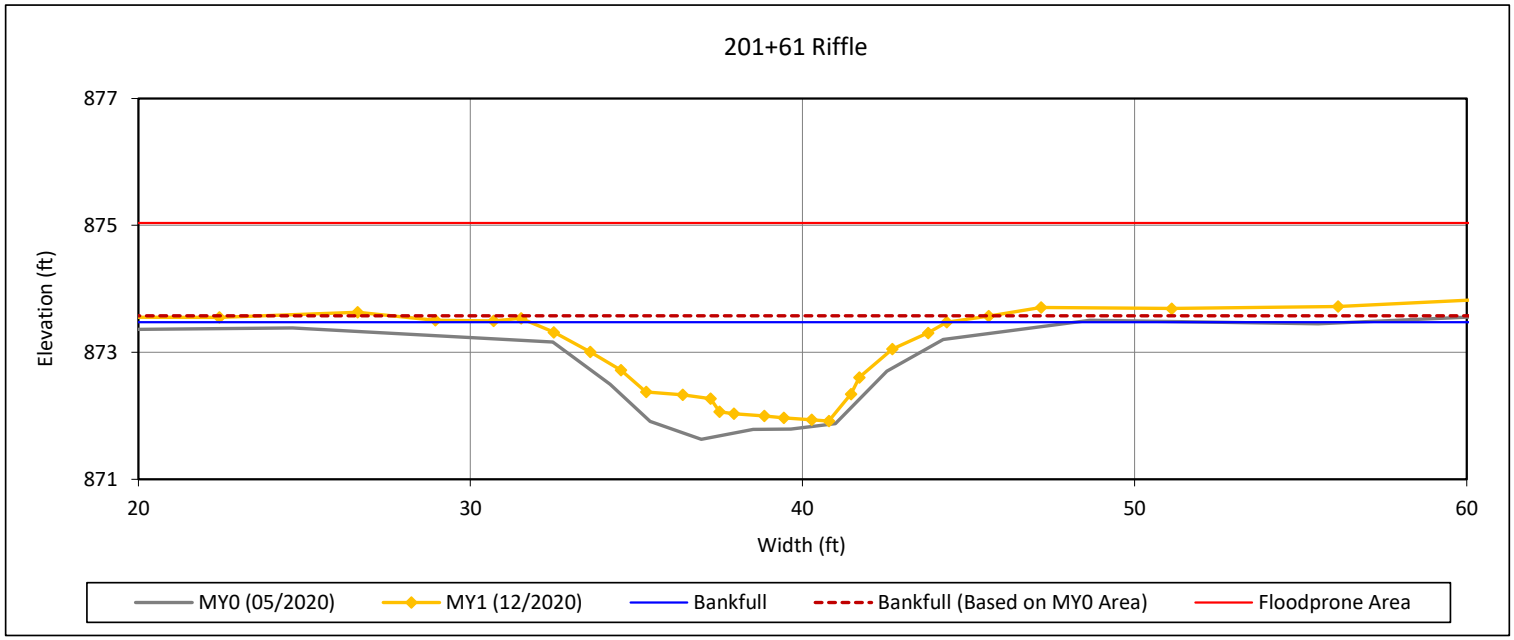
Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Cross-Section 14-UT1 Reach 4B



Bankfull Dimensions	
11.3	x-section area (ft.sq.)
12.6	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
13.2	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.9	width-depth ratio
74.0	W flood prone area (ft)
5.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 12/2020
Field Crew: Wildlands Engineering

View Downstream

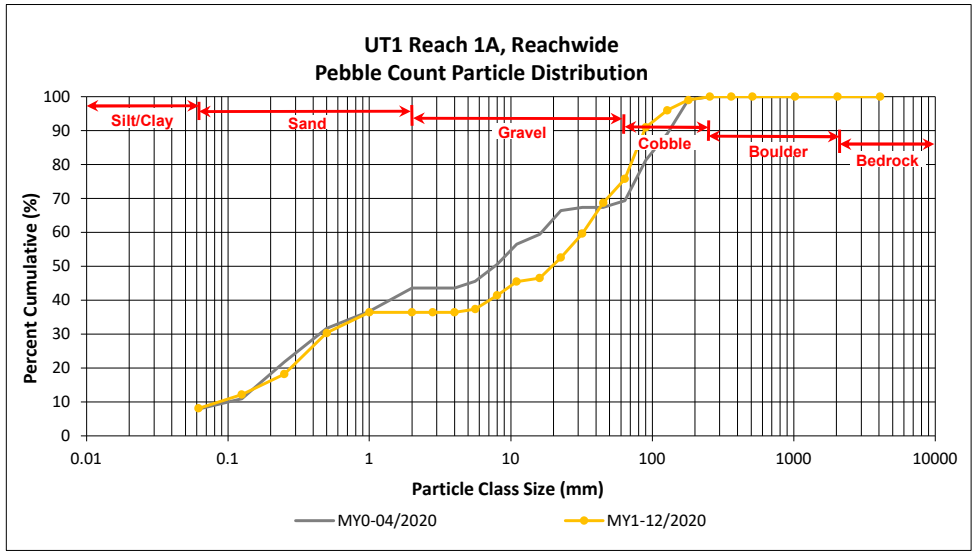
Reachwide Pebble Count Plots

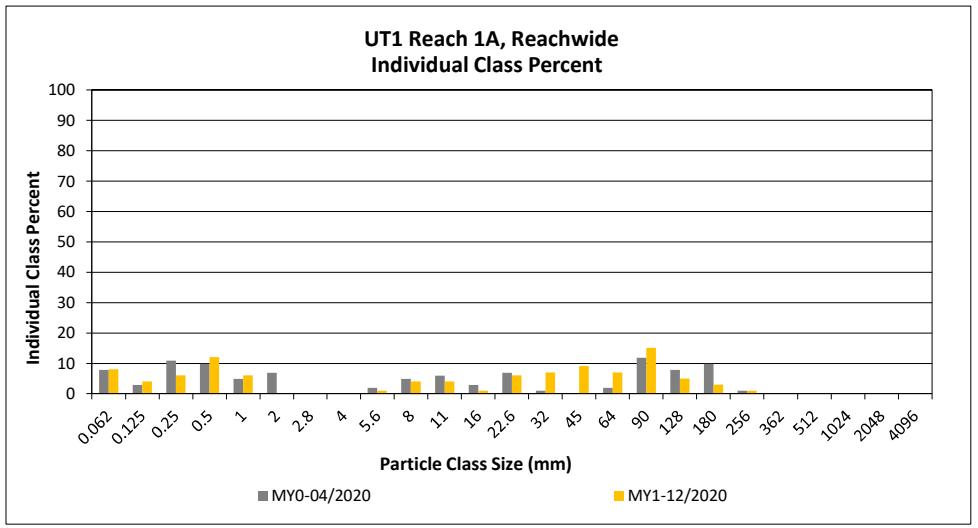
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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		8	8	8	8
SAND	Very fine	0.062	0.125		4	4	4	12
	Fine	0.125	0.250		6	6	6	18
	Medium	0.25	0.50		12	12	12	30
	Coarse	0.5	1.0		6	6	6	36
	Very Coarse	1.0	2.0					36
GRAVEL	Very Fine	2.0	2.8					36
	Very Fine	2.8	4.0					36
	Fine	4.0	5.6		1	1	1	37
	Fine	5.6	8.0		4	4	4	41
	Medium	8.0	11.0		4	4	4	45
	Medium	11.0	16.0		1	1	1	46
	Coarse	16.0	22.6	3	3	6	6	53
	Coarse	22.6	32	7		7	7	60
	Very Coarse	32	45	9		9	9	69
	Very Coarse	45	64	7		7	7	76
COBBLE	Small	64	90	15		15	15	91
	Small	90	128	5		5	5	96
	Large	128	180	3		3	3	99
	Large	180	256	1		1	1	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**	**49**	**99**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.2
D_{35} =	0.9
D_{50} =	19.6
D_{84} =	77.0
D_{95} =	119.7
D_{100} =	256.0





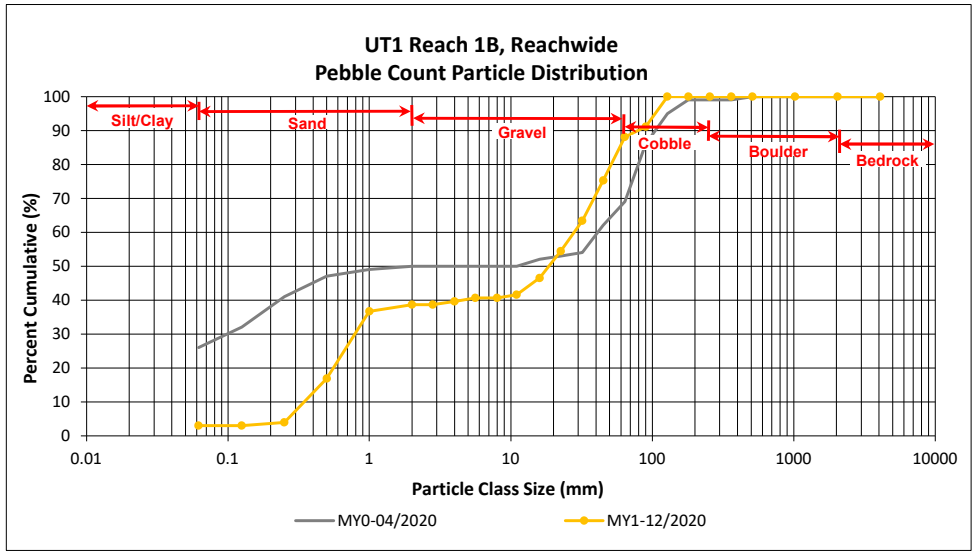
Reachwide Pebble Count Plots

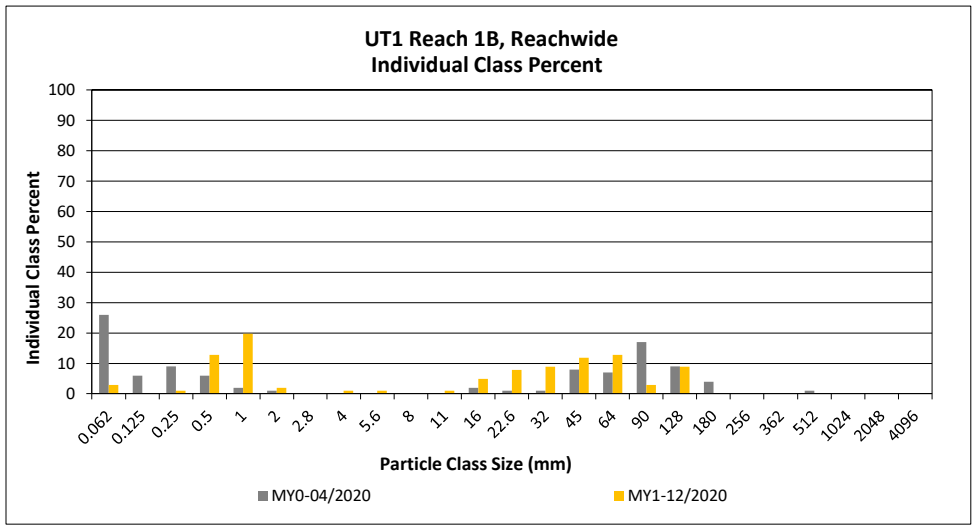
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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					3
	Fine	0.125	0.250		1	1	1	4
	Medium	0.25	0.50		13	13	13	17
	Coarse	0.5	1.0		20	20	20	37
	Very Coarse	1.0	2.0		2	2	2	39
GRAVEL	Very Fine	2.0	2.8					39
	Very Fine	2.8	4.0		1	1	1	40
	Fine	4.0	5.6		1	1	1	41
	Fine	5.6	8.0					41
	Medium	8.0	11.0	1		1	1	42
	Medium	11.0	16.0	4	1	5	5	47
	Coarse	16.0	22.6	6	2	8	8	54
	Coarse	22.6	32	6	3	9	9	63
	Very Coarse	32	45	9	3	12	12	75
	Very Coarse	45	64	12	1	13	13	88
COBBLE	Small	64	90	3		3	3	91
	Small	90	128	9		9	9	100
	Large	128	180					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**	**51**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.5
D_{35} =	0.9
D_{50} =	18.6
D_{84} =	57.2
D_{95} =	105.0
D_{100} =	128.0





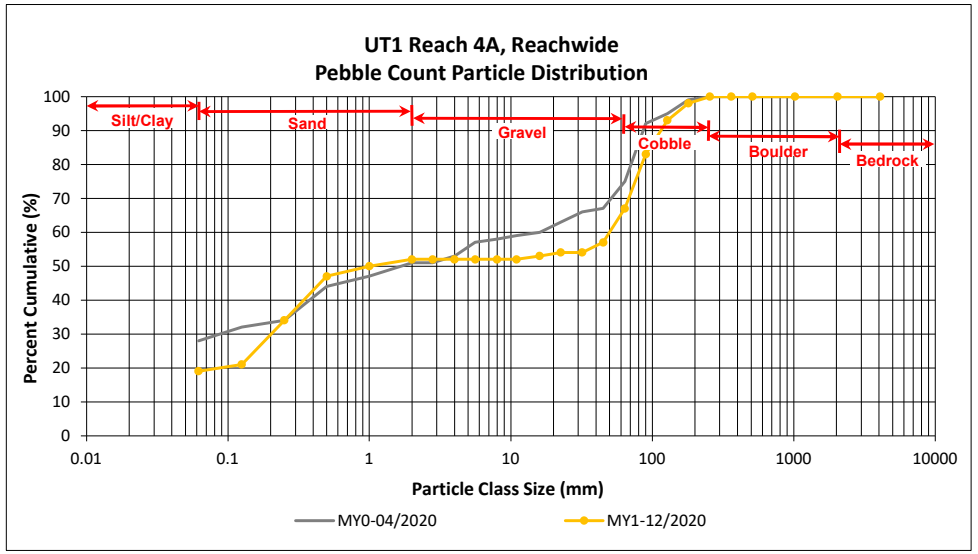
Reachwide Pebble Count Plots

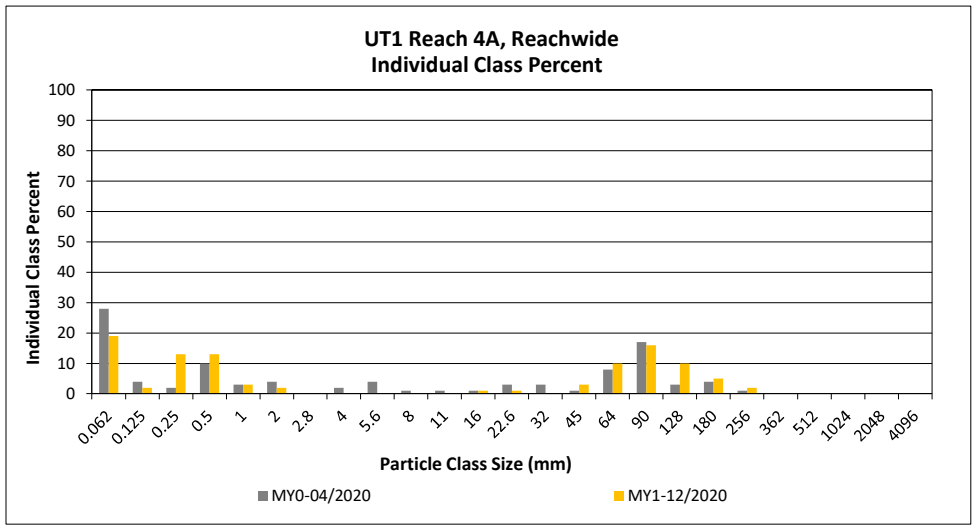
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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	2	17	19	19	19
SAND	Very fine	0.062	0.125		2	2	2	21
	Fine	0.125	0.250		13	13	13	34
	Medium	0.25	0.50		13	13	13	47
	Coarse	0.5	1.0		3	3	3	50
	Very Coarse	1.0	2.0		2	2	2	52
GRAVEL	Very Fine	2.0	2.8					52
	Very Fine	2.8	4.0					52
	Fine	4.0	5.6					52
	Fine	5.6	8.0					52
	Medium	8.0	11.0					52
	Medium	11.0	16.0	1		1	1	53
	Coarse	16.0	22.6	1		1	1	54
	Coarse	22.6	32					54
	Very Coarse	32	45	3		3	3	57
	Very Coarse	45	64	10		10	10	67
COBBLE	Small	64	90	16		16	16	83
	Small	90	128	10		10	10	93
	Large	128	180	5		5	5	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} =	Silt/Clay
D_{35} =	0.3
D_{50} =	1.0
D_{84} =	93.2
D_{95} =	146.7
D_{100} =	256.0





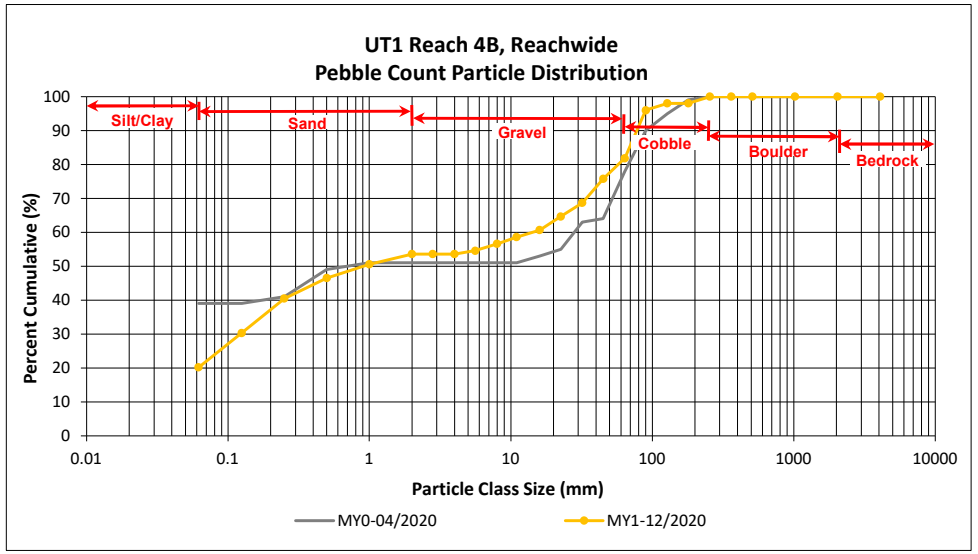
Reachwide Pebble Count Plots

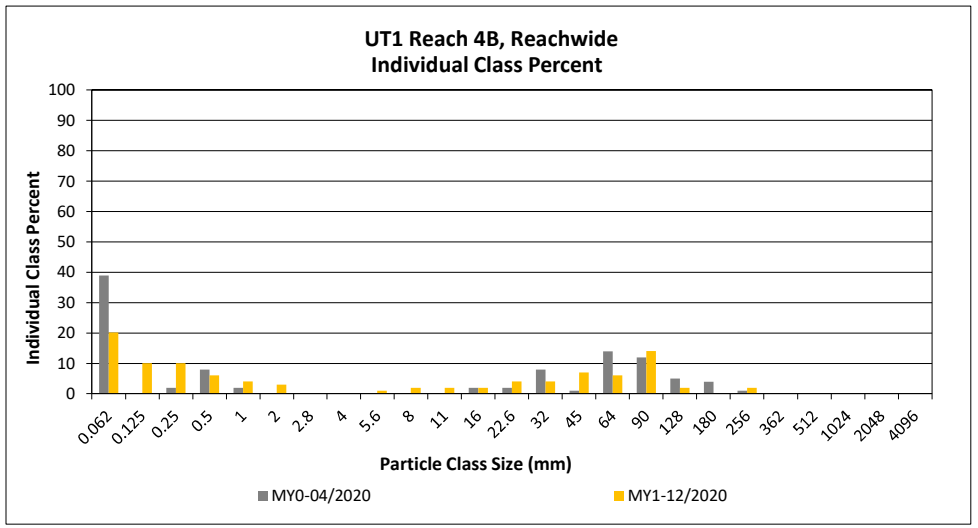
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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	2	18	20	20	20
SAND	Very fine	0.062	0.125		10	10	10	30
	Fine	0.125	0.250		10	10	10	40
	Medium	0.25	0.50	1	5	6	6	46
	Coarse	0.5	1.0		4	4	4	51
	Very Coarse	1.0	2.0	2	1	3	3	54
GRAVEL	Very Fine	2.0	2.8					54
	Very Fine	2.8	4.0					54
	Fine	4.0	5.6	1		1	1	55
	Fine	5.6	8.0	2		2	2	57
	Medium	8.0	11.0	2		2	2	59
	Medium	11.0	16.0	2		2	2	61
	Coarse	16.0	22.6	4		4	4	65
	Coarse	22.6	32	4		4	4	69
	Very Coarse	32	45	6	1	7	7	76
	Very Coarse	45	64	6		6	6	82
COBBLE	Small	64	90	14		14	14	96
	Small	90	128	2		2	2	98
	Large	128	180					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**	**49**	**99**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.2
D_{50} =	0.9
D_{84} =	67.5
D_{95} =	87.9
D_{100} =	256.0





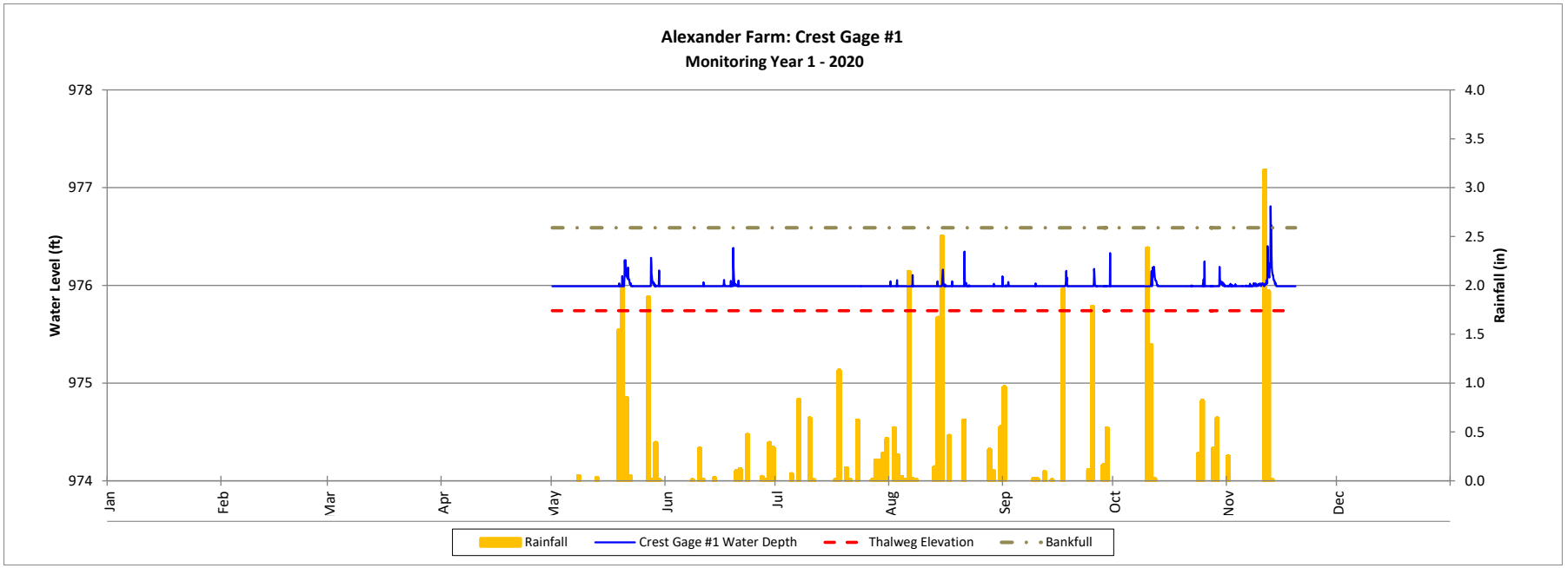
APPENDIX 5. Hydrology Summary Data and Plots

Table 14. Verification of Bankfull Events

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

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

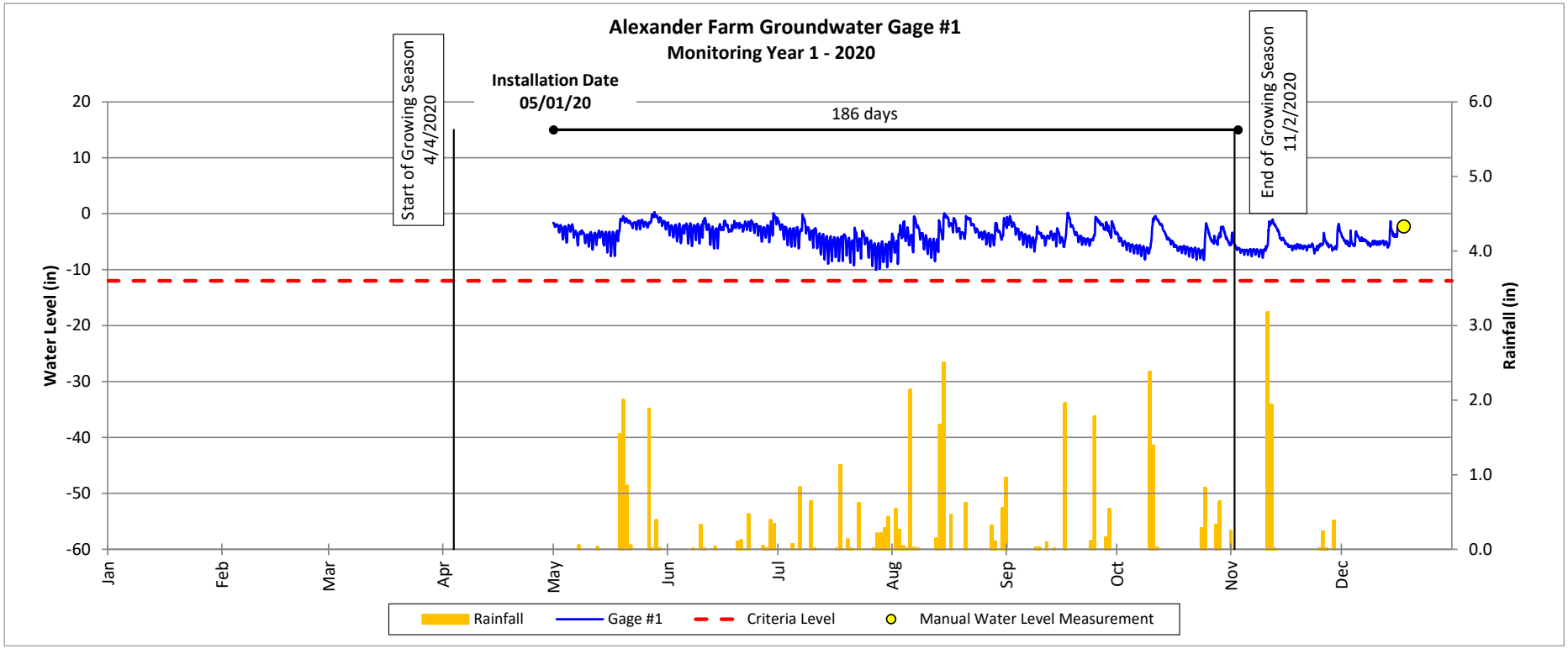
Recorded Bankfull Events
Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020



Groundwater Gage Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

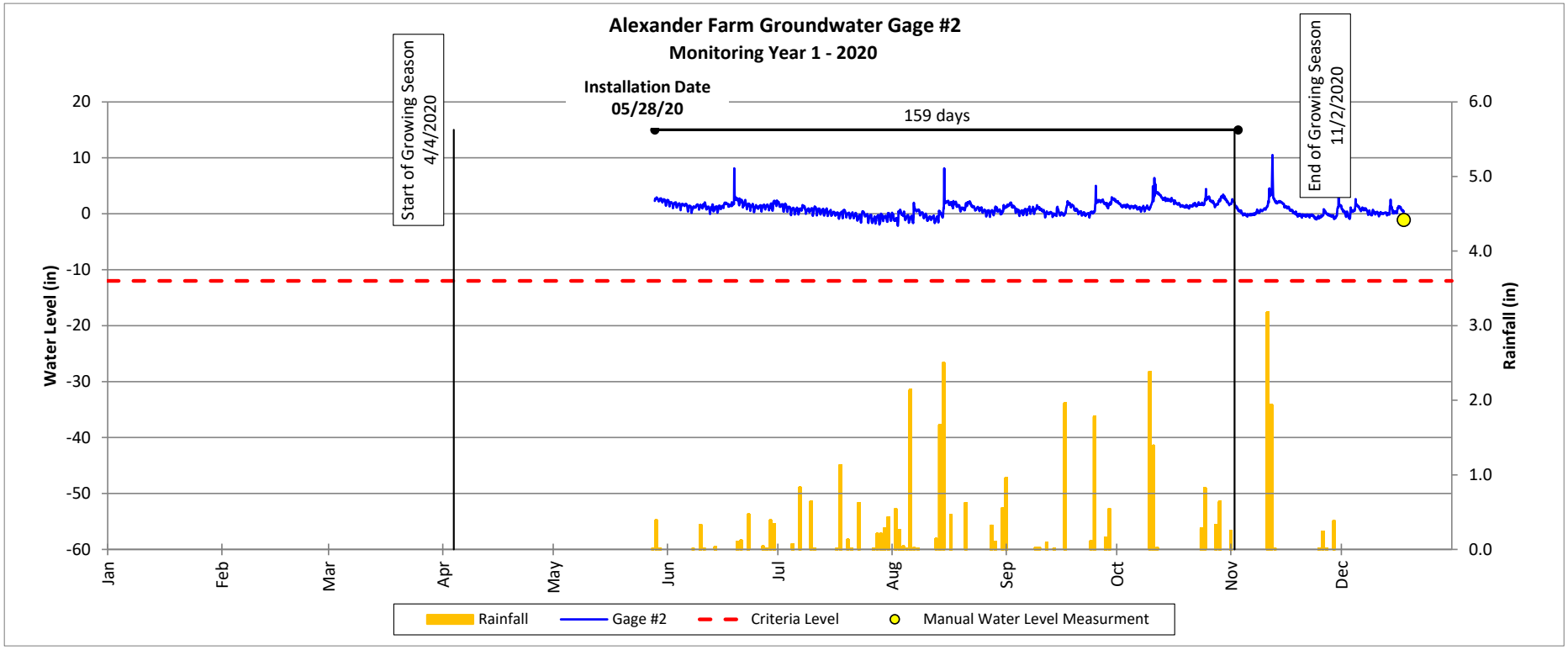
Wetland E on UT1 R1B



Groundwater Gage Plots

Alexander Farm Mitigation Site
DMS Project No. 100048
Monitoring Year 1 - 2020

Wetland N on UT1 R4A

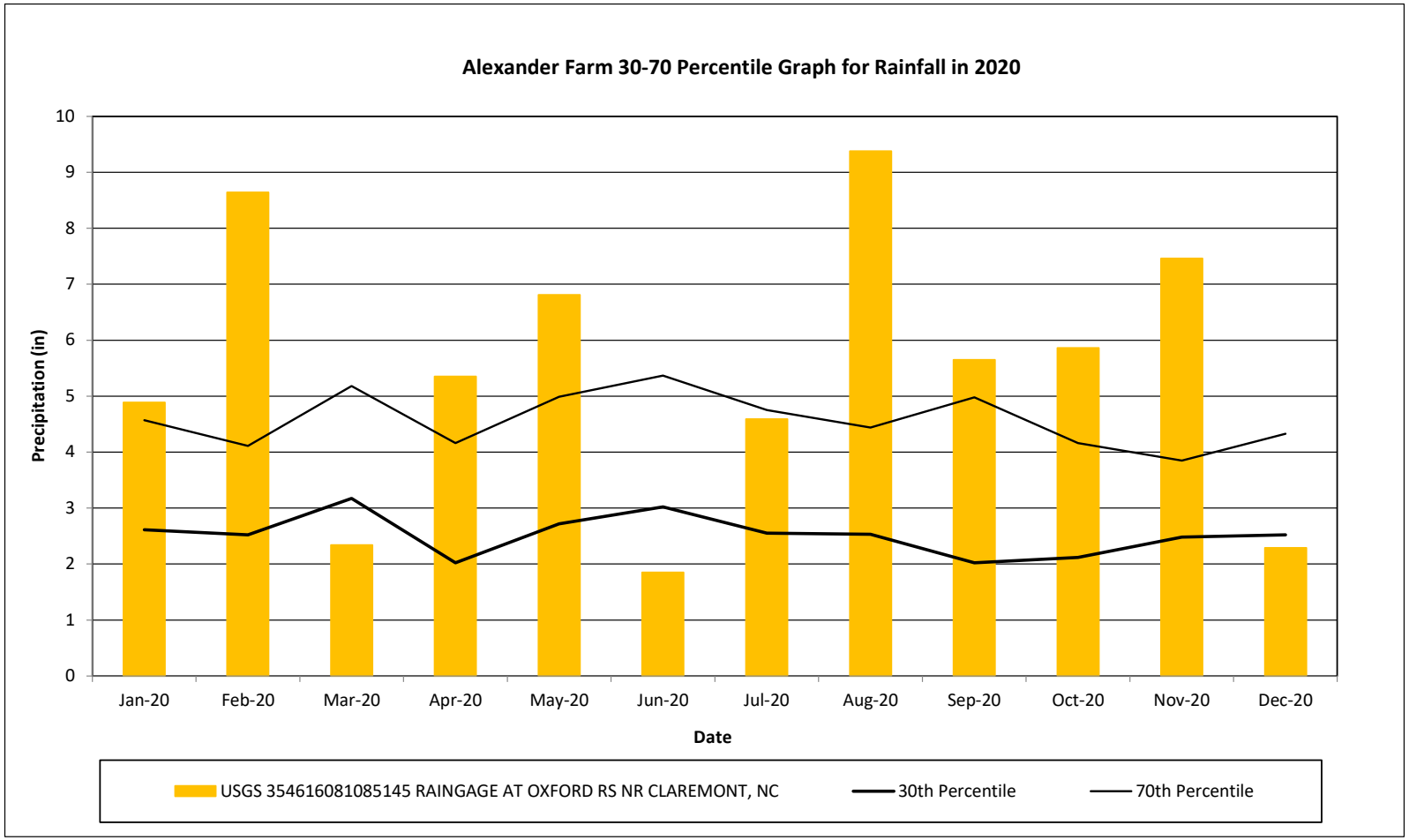


Monthly Rainfall Data

Alexander Farm Mitigation Site

DMS Project No. 100048

Monitoring Year 1 - 2020



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. Response to IRT Comments

November 12, 2020

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

Subject: IRT Review Comments: 15-Day Record Drawing 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 Record Drawing review comments from the NC Interagency Review Team (IRT) and subsequent email from Paul Wiesner at the NC Division of Mitigation Services (DMS) in regard to the Alexander Farm Mitigation Site. The first set of comments outlined below have been paraphrased from an email that Wildlands received on 10/22/2020 from Paul Wiesner at DMS and references a brief discussion with Kim Browning at the U.S. Army Corps of Engineers (USACE) about the 15-day Record Drawing review comments, which were received earlier in the day on 10/22/2020. The next set of comments are the actual 15-day Record Drawing review comments received from the IRT. All comments are noted below in **Bold**. Wildlands' responses to all comments are noted below in *italics*.

Email received from NCDMS on 10/22/2020

NCDMS, PAUL WIESNER

DMS Comment: Do not reduce the mitigation credit in future monitoring reports or in the DMS credit ledger for Alexander Farm. However, please provide a better detailed explanation of the difference in length (36 feet).

Wildlands response: As requested, Wildlands will not adjust the mitigation credit table in future Alexander Farm monitoring reports to address the loss of 36 linear feet (LF) of stream at baseline conditions versus the proposed design lengths that were specified in the mitigation plan. In addition, Wildlands' has included a better detailed explanation for the difference in length and is outlined below.

- *UT1 Reach 1B:*
    - *An alignment change from Station 116+50 – 117+44, which softened the meander pattern just upstream of the culverted crossing, was conducted to improve bank stability and reduce hydraulic stress on the channel. This resulted in a loss of 12 linear feet (LF) in as-built length from the design length.*
- *UT1 Reach 2:*
    - *An alignment change from Station 117+80 to 118+35, which softened the meander pattern just downstream of the culverted crossing, was conducted to improve bank stability and reduce hydraulic stress on the channel. This resulted in a loss of 5 LF in as-built length from the design length.*

- *An alignment change from Station 120+27 to 120+84, which softened the meander pattern and shifted the channel alignment away from the existing right top of bank, was conducted to improve bank stability, reduce hydraulic stress on the channel, and save existing mature trees at the right top of bank. This resulted in a gain of 2 LF in as-built length from the design length.*
- *The mitigation planset listed the end stationing on the reach at 130+50; however, this was incorrect. The end stationing should have been noted at the easement break which was Station 130+46. This accounted for a loss of 4 LF.*
- *The total net loss on UT1 Reach 2 at as-built was 7 LF.*

- *UT1 Reach 3*
  - *The mitigation planset listed the begin stationing on the reach at 131+10; however, this was incorrect. The begin stationing should have been noted at the easement break, which was Station 131+27. This accounted for a loss of 17 LF in as-built length from the design length.*

DMS Comment: Please make sure to that all future MY0 reports have a detailed explanation when mitigation plan lengths do not match as-built lengths. Project credits established in the IRT approved mitigation plan are the project credits at MY0 unless there are significant deviations during construction. Any upward or downward credit changes requires a mitigation plan addendum.

Wildlands response: Wildlands acknowledges this comment and will heed this request to provide a more detailed explanation when there are differences between mitigation plan lengths and as-built record drawing lengths. In addition, we understand that significant changes made during construction will require credit changes and a mitigation plan addendum.

DMS Comment: Please do not provide any mitigation credit assessments as footnotes of the MY0 asset table. Please remove that from the Alexander MY1 report. Again, the project credits are established at the IRT approved mitigation plan stage.

Wildlands response: The mitigation credit assessment footnote will not be included as part of the MY1 asset report table, nor any subsequent monitoring reports.

15-Day Record Drawing Review Comments (10/22/2020)

USACE, KIM BROWNING

USACE comment: The proposed and As-Built mitigation plan assets are consistent (4,258.100 SMUs), but the approved mitigation plan length and the As-Built lengths differ (6,555 LF vs 6,519 LF). The As-Built credits should be adjusted to reflect the actual amount built unless the difference is from areas that were not for credit. Please verify.

Wildlands response: Per the email received from Paul Wiesner at DMS on 10/22/2020, this comment is no longer an issue. Please see the first two comment responses listed under the "Email received from NC DMS 10/22/2020" for the updated comment request.

NC DWR, ERIN DAVIS

DWR comment: Rock was added at 13 locations within the project. A few questions:

a) Were other stabilization options considered prior to deciding to harden these areas?

b) Was placement of rock within existing wetlands accounted for as permanent impacts in the submitted PCN? Rock placed near stations 112+00, 113+00, 115+00, 144+50, and 166+50 appear to overlap the wetland polygons on the redline drawings.

Wildlands response:

a) Each of the areas where rock was added exhibited significant potential for erosion due to concentrated overland flow. Wildlands considered three options at these and other locations: do nothing, regrade a new swale connection, or add stone protection. Several locations were left alone due to low risk. Regrading was not an option for most locations due to topography and impact to trees.

b) Most of the rock placement that overlapped into the wetland areas were included in the permanent wetland impacts for the project, but not all. Approximately 0.005 acres were only permitted as temporary impacts, while 0.0003 acres were inadvertently omitted in the permitted wetland acreage. This error was oversight and was not done intentionally. The placement of stone protection within the wetland outlet boundaries were conducted as field calls by the engineer because field conditions during construction determined that the areas were at high risk for erosion and assumed that the areas were included as part of the permitted allowances since they were within the limits of disturbance. Wildlands acknowledges to do a better job in the future at assessing these type of site condition issues during the design phase and communicating the potential for field changes, so that these areas are included as part of the permanent impacts, in case there is a need for additional stability measures and/or design changes during construction.

DWR comment: DWR requests an additional photo point near Station 118+00 focusing on the culvert crossing connection.

Wildlands response: A photo point will be added upstream and downstream of the internal culvert crossing near Station 118+00. The photo point will collect both an upstream and a downstream viewpoint and will be included in the MY1 and subsequent monitoring reports.

DWR comment: DWR appreciates the bulleted descriptions of field changes included in the baseline report. We would request that a few more words be added to changes "due to site/field conditions" in order to provide context.

Wildlands response: As requested, Wildlands' will provide additional context to field change descriptions in future baseline reports.

DWR comment: In future baseline reports, please note if monitoring locations have changed from locations shown in the approved mitigation plan monitoring figure (this isn't meant to include shift of a few feet in the field). The IRT regularly comment on gauge and plot locations during the draft mitigation plan review and need to be aware of changes in order to compare documents.

Wildlands response: As requested, Wildlands' will note changes in monitoring locations in future baseline reports when their established locations differ significantly from those in the approved mitigation plan.

EPA, *TODD BOWERS*

EPA comment: Excellent spread of photos highlighting stream structures, veg plots and gauges. I would recommend adding photos of culverts at the cattle crossing easement break and at the road.

Wildlands response: Thank you for the kind remark. As requested, Wildlands' has added a photo point upstream and downstream of the internal cattle crossing near Station 118+00 and upstream and

downstream of the Elk Shoals Church Road crossing. These photos will capture both an upstream and a downstream viewpoint and will be included in the MY1 and subsequent monitoring reports.

EPA comment: Recommend identifying the unknown oak species as Quercus alba as it is the only other oak species that was planted especially since they were just planted. I hope this gets rectified in the MY1 report.

Wildlands response: Wildlands' acknowledges that the unknown oak species is likely Quercus alba and will make sure to correctly identify the planted stem in the MY1 report.

EPA comment: Recommend adding a beaver contingency to the Adaptive Management plan in Section 4.1.

Wildlands response: The monitoring of nuisance beaver activity and the potential removal of beavers and their dams is included through project close-out as part of Wildlands' adaptive management measures listed in Section 4.1 for the stream maintenance component.

EPA comment: Late planting date (April 17, 2020) is noted and that the earliest date of MY1 monitoring will be October 17, 2020. (approximately 180-days post planting)

Wildlands response: Wildlands acknowledges that the 180-day post planting requirement for monitoring did not expire until October 17, 2020 and made sure to wait until after that date to collect data for MY1.

EPA comment: Species change noted in planting plan. No concerns with substitutions.

Wildlands response: Thank you for confirming that the planted species substitutions are acceptable.

EPA comment: Recommend adding wetland indicator status to planting plans for vernal pools planting zone.

Wildlands response: Wildlands acknowledges this request and will include the wetland indicator status for planted vernal pool species in the record drawings of future baseline monitoring reports.

EPA comment: 2.0 credit ratio for restoration work on Reaches 1A and 1B noted; due to contracted credit requirement.

Wildlands response: Wildlands' acknowledges the comment. No response is needed.

As requested, Wildlands has responded in this attached letter to the IRT's comments via email. In addition, Wildlands would like to thank the IRT with taking the time to provide these thoughtful comments, which will help us to continue to improve the quality of our mitigation deliverables.

Sincerely,

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

APPENDIX 7. Response to DMS Comments

September 24, 2020

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

RE: Task 6 – Final As-built Baseline Monitoring Report
Alexander Farm Mitigation Site, Alexander County
Yadkin River Basin – HUC 03040101
DMS Project ID No. 100048 / DEQ Contract #007416

Dear Mr. Tsomides:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft As-built Baseline Monitoring report for the Alexander Farm Mitigation Site. The report has been updated to reflect those comments. The Final As-built Baseline Monitoring Document and Record Drawings are included. Wildlands' responses to DMS' report comments are noted below in *italics*.

DMS comment: Please list the DWR# on the report cover page.

Wildlands response: The DWR# is now included on the report cover page.

DMS comment: Section 5.0 (As-Built Condition) indicates site construction and as built surveys were completed in April and May 2020. What dates were stream morphology data collected, and when was the site planted? Please be aware that at least 180 days must separate MY0/Baseline versus MY1 data.

Wildlands response: As requested, specific dates for site planting and morphological and vegetative data collection were included in Section 5.0. Wildlands acknowledges that 180 days must separate MY0 versus MY1 data; therefore, MY1 data collection will commence in mid- to late- fall, and delivery of the MY1 report will be delayed until December 31st to account for this requirement.

DMS comment: Spelling typo- page 1-8 (Reach 3 "beings" should be "begins").

Wildlands response: The spelling typo found on page 1-8 has now been corrected.

DMS comment: Table 1 (Assets)

- ***Mitigation Category* entries (non-BMP) should be "warm", not "SMU";**
- **Please add a credits column to the right of the As-Built Footage/Acreage column. Credits should be calculated out to three decimals;**
- **Delete footnotes 4 and 5; credit ratio proposals are not needed here since they were established in the approved mitigation plan and have not changed.**

Wildlands response: Table 1 (Assets)

- *Mitigation Category entries found in Table 1 have now been changed to "Warm" for all non-BMP areas.*

- *The Project Credits column has now been added to Table 1, and the credits are calculated out to the third decimal per request.*
- *As directed, footnotes related to approved credit ratios that were established in the mitigation plan have been removed from Table 1 (Assets).*

DMS comment: Table 2 (Project Activity)

- **Please break out baseline data collection dates into stream and vegetation (related to previous comment).**

Wildlands response: Table 2 (Project Activity)

- *As requested, the baseline data collection dates have been broken out into stream and vegetation collection activities.*

DMS comment: Some of the long-pro graph dates indicate April 2018 as the collection date. Please correct this apparent error or clarify.

Wildlands response: The long-pro graph dates have been corrected to May 2020, the month the data was collected.

DMS comment: Please provide a PLS-sealed as-built survey for the project. DMS and the IRT require 3 separate deliverables. Deliverable 1 is the as-built survey of the constructed channel/wetland sealed by a PLS; deliverable 2 is the 'redline' record drawings sealed by a PE, and deliverable 3 is the baseline or MY0 data used for monitoring. You have submitted deliverables 2 and 3 but not #1.

Wildlands response: As directed, the PLS has signed and sealed the as-built survey certification block on the title sheet of the record drawings as required for Deliverable 1.

DMS comment: The following features have feature lengths that do not match the lengths reported in the asset table outlined below as reported length vs. feature length. Please resubmit these features ensuring that the feature lengths match the reported lengths.

- **UT1 R1B: 981 ft vs. 968 ft**
- **UT1 R3: 701 ft vs. 713 ft**

Wildlands response: As requested, the conflicting lengths between the GIS features and the asset table have been reviewed and corrected. Modifications and/or corrections made are described below as it relates to the reach referenced.

- *UT1 R1B: 981 ft vs. 968 ft – Neither length is correct. The actual as-built length is 957-ft. The GIS features did correctly reflect this footage; however, the naming convention used for the "ReachName" attribute field was ill-defined and the feature class included additional line features that should not have been included as part of the as-built deliverable. The as-built geodatabase has been updated so that the "ReachName" attribute for UT1 R1B is listed as "UT1 R1B" and the extraneous line features have been removed from the database. As for the asset table, the referenced 981-ft was incorrectly recorded. The alignment deviation length was incorrectly calculated and led to this inaccuracy. The asset table and the corresponding notation have been corrected.*
- *UT1 R3: 701 ft vs. 713 ft – As stated in the asset table, the correct length is 701 ft. The GIS features did correctly reflect this footage; however, as stated above, the naming convention used for the "ReachName" attribute field was ill-defined and the feature class included additional line features that should not have been included as part of the as-built deliverable. The as-built*

geodatabase has been updated so that the "ReachName" attribute for UT1 R3 is listed as "UT1 R3" and the extraneous line features have been removed from the database.

As requested, Wildlands has included two hard copies of the Final Alexander Farm Mitigation Site As-built Baseline Monitoring Report, as well as a CD with a PDF of the report, a PDF of our written responses to comments, and all digital support files in the correct file structure. Additionally, a copy of our response letter has been included inside the front cover of each hard copy report.

Sincerely,

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com