Monitoring Report – MY5
FINAL VERSION
Lake Wendell Mitigation Project
Calendar Year of Data Collection: 2022

NCDEQ DMS Project Identification # 97081
NCDEQ DMS Contract # 6826
Neuse River Basin (Cataloging Unit 03020201)
USACE Action ID Number: SAW-2016-00876
NCDEQ DWR Project # 2016-0385 V2
Johnston County, NC
Contracted Under RFP # 16-006477
Data Collection Period: March & September 2022
Submission Date: November 30th, 2022

Prepared for:

Environmental Quality

North Carolina Department of Environmental Quality
Division of Mitigation Services
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November 30th, 2022

NC Department of Environmental Quality

Division of Mitigation Services

Attn: Lindsay Crocker

217 West Jones Street, Suite 3000-A

Raleigh, NC 27603

RE: WLS Responses to NCDEQ DMS Review Comments for Task 11 Draft Monitoring Report Year 5 for the Lake Wendell Mitigation Project, NCDEQ DMS Full-Delivery Project ID #97081, Contract #6826, Neuse River Basin, Cataloging Unit 03020201, Johnston County, NC

Dear Ms. Crocker:
Water & Land Solutions, LLC (WLS) is pleased to present the Final Monitoring Report Year 5 for the Lake Wendell Mitigation Project to the North Carolina Department of Environmental Quality (NCDEQ) Division of Mitigation Services (DMS). The Final Monitoring Report Year 5 were developed by addressing NCDEQ DMS's review comments.

Under this cover, we are providing the Final Monitoring Report Year 5, and the required digital data for each (the .pdf copies of the entire updated reports and the updated digital data) via electronic delivery. We are providing our written responses to NCDEQ DMS's review comments on the Draft Monitoring Report Year 5 below. Each of the DMS review comments is copied below in **bold** text, followed by the appropriate response from WLS in regular text:

1. **DMS Comment: Update credit table to show three significant digits (3,392.100 is shown on the credit ledger). Stream footage is measured by the foot, but credit is shown to the thousandth. This may be DMS error for not requesting this sooner.** WLS Response: The credit table was updated to show total credits to three decimal places.

2. **DMS Comment: The narrative mentions a letter sent by WLS attorney for a small encroachment. Please provide a copy of the letter in the monitoring report.** WLS Response: A copy of the letter and attachments sent to the landowner are in Appendix F.

3. **DMS Comment: The narrative states that VPA1 was re-planted. Confirm if just the vegetation plot was replanted or if the entire kudzu area was replanted and revise statement as necessary. Please also provide the species, area, and number of stems in the replant.** WLS Response: All of VPA1 and the adjacent encroachment (VPA2) were planted during MY4 on February 1st, 2021. The planting list is below and was provided in the MY4 report. Language was added to the report for clarity regarding when the area was planted.

Common Name	Scientific Name	# Planted
Tulip Poplar	*Liriodendron tulipifera*	10
Sycamore	*Platanus occidentalis*	10
River Birch	*Betula nigra*	5
	TOTAL	25

4. **DMS Comment: There is mention of a red maple threshold for performance criteria in this report and in the Mitigation Plan but is not a traditional performance requirement. There are also several plots that exceed that threshold. Please provide explanation of where that criterion was established and explanation for current condition in the narrative.** WLS Response: The red maple threshold states that no red maple in a vegetation plot will count for more than 20 percent of the total stems. This criterion was established in the mitigation plan when red maple were included as a planted species. None of the fixed vegetation plots in MY5 had greater than 20 percent red maple. An additional column was added to Table 6a with the percent of red maple found in each plot. The random plot surveyed in VPA1 had 33 percent red maple, and WLS does not believe remedial action in this area is necessary.

5. **Section 5.2 (p.7) and Figure 2 geomorphic tables and MY5 Cross-sections: The 2016 guidance establishes that BHR should not exceed 1.2 or 10% change per year at any measured riffles, but this does not apply to pool cross-sections. Suggest removing BHR and % change BHR from riffle tables. Consider also revising narrative on p. 7 referring to these changes in pools, which appear to be natural geomorphologic processes for this site.** WLS Response: Language on page seven was updated to remove pool cross-sections and corresponding BHRs. Pool BHR was removed from the riffle table.

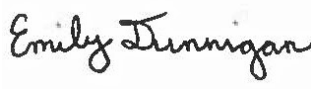
Electronic Deliverables:

1. **Stream problem area 4 has two separate labels in the photos (repair and new #4) but only a single location has been submitted as a point shape file denoting location. Please verify that both the repair and new problem area are co-located or submit a location for the missing problem area.** WLS Response: Photos of SPA 4 were relabeled for clarity. One new problem area was identified in MY5, SPA 4. There are photos of SPA 4 before repair and photos after repair.
2. **There are multiple vegetation problem area photos submitted but only a single location indicated on the CCPV, please verify these photos are located in the area depicted on the polygon shape submitted.** WLS Response: Two vegetation problem areas are on the CCPV, VPA 1 and VPA 3. Photos of both areas are included in the e-data folder. Since VPA 2 was removed from the CCPV as a problem area, photos of VPA 2 were removed from the submittal folder.
3. **Please submit cross section graphs and raw data.** WLS Response: Raw cross-section data and graphs are included in the Geomorphology folder.
4. **Please submit raw groundwater data.** WLS Response: Raw hydrology data are included in the Hydro folder.
5. **Please submit all cross section data, graphs and raw data.** WLS Response: See comment #3 above.

Please contact me if you have any questions or comments.

Sincerely,

Water & Land Solutions, LLC



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LIST OF APPENDICES

1 Project Summary

Water and Land Solutions, LLC (WLS) completed the construction and planting of the Lake Wendell Mitigation Project (Project) full-delivery project for the North Carolina Department of Environmental Quality (NCDEQ), Division of Mitigation Services (DMS) in March 2018. The Project is located in Johnston County, North Carolina, between the Community of Archer Lodge and the Town of Wendell at 35.73739˚, -78.3538°. The Project site is located in the NCDEQ Sub-basin 03-04-06, in the Upper Buffalo Creek Sub-watershed 030202011502.

The Project involved the restoration, enhancement, preservation, and permanent protection of five stream reaches (R1, R2, R3, R4, and R5) and their riparian buffers, totaling 4,269 linear feet of streams and 490,477 square feet of riparian buffers (see buffer summary table below). WLS staff visited the site several times throughout 2022. Monitoring Year 5 (MY5) data collection occurred in March and September of 2022 (Table 2). This report presents the data for MY5. The Project meets the MY5 success criteria for stream hydrology, streambed condition and stability, and stream flow. All vegetation plots meet the required stems/acre requirements for MY5. Two plots do not meet the height requirements. Based on these results, the Project is expected to meet the Monitoring Year 6 (MY6) success criteria in 2023.

Table 2. Buffer Project Areas and Assets: Lake Wendell

RIPARIAN BUFFER (15A NCAC 02B.0295)

Location	Jurisdictional Streams	Restoration Type	Reach ID/ Component	Buffer Width (ft)	Total Area (sf)	Creditable Area (sf)*	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits (BMU)	If Converted to Nutrient Offset: Convertible to Nutrient Offset (Yes or No)	If Converted to Nutrient Offset: Nutrient Offset: N (lbs)	If Converted to Nutrient Offset: Nutrient Offset: P (lbs)
Rural or Urban	Subject or Nonsubject	Restoration		20-29				75%	1.33333	-		-	-
			Restoration	0-100	342,525	342,525	1	100%	1.00000	342,525.000	Yes	17,873.412	N/A
				101-200				33%	3.03030	-		-	-
	Subject or	Enhancement		20-29				75%	2.66667	-		-	-
			Enh & Cattle Ex. Enh	0-100	44,852	44,852	2	100%	2.00000	22,426.000	No	-	-
				101-200				33%	6.06061	-		-	-
			SUBTOTALS			387,377				364,951.000		17,873.412	-
			ELIGIBLE PRESERVATION AREA			129,126							
Location	Jurisdictional Streams	Restoration Type	Reach ID/ Component	Buffer Width (ft)		Creditable Area (sf)*	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits (BMU)			
Rural	Subject	Preservation		20-29				75%	13.33333	-			
			Preservation	0-100	104,103	104,103	10	100%	10.00000	10,410.300			
				101-200				33%	30.30303	-			
	Nonsubject			20-29				75%	6.66667	-			
				0-100			5	100%	5.00000	-			
				101-200				33%	15.15152	-			
Urban	Subject or Nonsubject			20-29				75%	4.00000	-			
				0-100			3	100%	3.00000	-			
				101-200				33%	9.09091	-			
			SUBTOTALS			104,103				10,410.300			
			TOTALS			491,480				375,361.300			

2 Project Background

2.1 Project Location, Setting, and Existing Conditions

The Project site is located in the Upper Buffalo Creek Sub-watershed 030202011502 study area of the Neuse 01 Regional Watershed Plan, in the Wake-Johnston Collaborative Local Watershed Plan, and in Targeted Local Watershed 03020201180050.

The project includes five stream reaches (R1, R2, R3, R4, and R5) which consisted of restoration, enhancement, preservation, and permanent protection of 4,269 linear feet of streams and 490,477 square

feet of riparian buffers. The catchment area is 102 acres and has an impervious cover less than one percent. The dominant surrounding land uses are agriculture and mixed forest. Prior to construction, livestock had access to all Project streams, except R4, and the riparian buffers were less than 50 feet wide.

2.2 Mitigation Project Goals and Objectives

WLS established project mitigation goals and objectives based on the resource condition and functional capacity of the watershed to improve and protect diverse aquatic resources comparable to stable headwater stream systems within the Piedmont Physiographic Province. The proposed mitigation types and design approaches described in the final approved mitigation plan considered the general restoration and resource protection goals and strategies outlined in the 2010 Neuse River Basin Restoration Priority Plan (RBRP). The functional goals and objectives were further defined in the 2013 Wake-Johnston Collaborative Local Watershed Plan and 2015 Neuse 01 Regional Watershed Plan and include:

- Reducing sediment and nutrient inputs to the upper Buffalo Creek Watershed,
- Restoring, preserving, and protecting wetlands, streams, riparian buffers, and aquatic habitat,
- Implementing agricultural BMPs and stream restoration in rural catchments together as "project clusters".

The following site-specific goals were developed to address the primary concerns outlined in the LWP and RWP and include:

Functional Category (Level)	Functional Goal / Parameter	Functional Design Objective
Hydrology (Level 1)	Improve Base Flow	Remove man-made pond dam and restore a more natural flow regime and aquatic passage.
Hydraulics (Level 2)	Reconnect Floodplain / Increase Floodprone Area Widths	Lower BHRs from >2.0 to 1.0-1.2 and maintain ERs at 2.2 or greater.
Geomorphology (Level 3)	Improve Bedform Diversity	Increase riffle/pool percentage to 70/30 and pool-to-pool spacing ratio 4-7X bankfull width.
	Increase Lateral Stability	Reduce BEHI/NBS streambank erosion rates comparable to downstream reference condition and stable cross-section values.
	Establish Riparian Buffer Vegetation	Plant native species vegetation a minimum 50' wide from the top of the streambanks with a composition/density comparable to downstream reference condition.
Physicochemical (Level 4)	Improve Water Quality	Remove cattle from riparian corridor and reduce fecal coliform bacteria levels.
Biology (Level 5)	Improve Macroinvertebrate Community and Aquatic Species Health	Incorporate native woody debris into channel and change DWR bioclassification rating from 'Poor' to a minimum 'Fair' by Monitoring Year 7.

To accomplish these site-specific goals, the following objectives will be measured and included with the performance standards to document overall project success:

- Provide a floodplain connection to incised stream with BHRs that range from 1.0 – 1.2 and ERs greater than 2.2 by removing a man-made pond, thereby promoting more natural flood flows,

- Improve bedform diversity by increasing scour pool spacing/depth variability every 4X-7X bankfull channel widths,
- Increase benthic macroinvertebrate habitat value by changing the DWR bioclassification rating from 'Poor' to 'Fair' after monitoring year 7,
- Reduce sediment loading from accelerated streambank erosion rates by decreasing BEHI/NBS values to 'Low' and constructing Radius of Curvature Ratios (Rc) to 2X-3X bankfull channel widths,
- Improve pre-restoration water quality parameters by increasing dissolved oxygen concentrations (DO), such that it meets a functioning level after monitoring year 7,
- Increase native species riparian buffer vegetation density/composition along streambank and floodplain areas that meet requirements of a minimum 50-foot-wide and 210 stems/acre after monitoring year 7,
- Improve aquatic habitat and fish movement through pond dam removal and the addition of in-stream cover and native woody debris by increasing the existing biotic index to a higher functioning level,
- Prevent cattle from accessing the conservation easement boundary by installing permanent fencing and reducing fecal coliform bacteria from the pre-restoration levels.

2.3 Project History, Contacts, and Timeframe

The chronology of the project history and activity is presented in Table 2. Relevant project contact information is presented in Table 3. Relevant project background information is presented in Table 4.

3 Project Mitigation Components

Refer to Figure 1 and Table 1 for the project components/asset information. A recorded conservation easement consisting of 11.97 acres protects and preserves all stream reaches, existing wetland areas, and riparian buffers in perpetuity.

3.1 Stream Mitigation Types and Approaches

Stream restoration practices involved raising the existing streambed and reconnecting the stream to the relic floodplain and constructing a channel through a drained farm pond (Reach R3). Some portions of the existing degraded channels that were abandoned within the restoration areas were filled to decrease surface and subsurface drainage and raise the local water table. The project also included restoring, enhancing, and protecting riparian buffers and riparian wetlands within the conservation easement. The permanent fencing system consisting of woven wire fencing was installed to NRCS technical standards in the pasture areas along and outside of the northern conservation easement boundaries of Reaches R1, R2, and R3. The vegetative components of this project included stream bank, floodplain, and transitional upland zones planting. The Site was planted with native species riparian buffer vegetation and now protected through a permanent conservation easement. Table 1 and Figure 1 (Appendix A) provide a summary of the project components.

3.1.1 R1 Restoration

Due to the past manipulation and degraded nature of R1, a combination of Priority Level I/II Restoration approaches were implemented along the entire reach. A buried concrete pipe system was removed, and the stream channel was daylighted for approximately 200 feet to restore a more natural flow path and hydrologic function. Downstream of a culvert crossing installation, a new meandering channel was

constructed, and remnant spoil piles were removed from the floodplain. In-stream structures, including log vanes, log and rock riffles, log steps and log weirs, were installed to provide control grade as well as dissipate flow energy, protect streambanks, and eliminate potential for future incision.

3.1.2 R2 Restoration

Restoration work along R2 involved a Priority Level I Restoration approach by raising the bed elevation and reconnecting the stream with its abandoned floodplain. This approach promoted the restoration of a stable channel form with appropriate bedform diversity, as well as improved biological functions through increased aquatic and terrestrial habitats. Proposed in-stream structures included constructed wood and stone riffles for grade control and habitat, log j-hook vanes, and log weirs/jams for encouraging step-pool formation energy dissipation, bank stability, and bedform diversity. A few mature trees were protected during construction and incorporated into the design. Bioengineering techniques such as vegetated geolifts, brush layers, and live stakes were used to protect streambanks and establish woody vegetation growth.

3.1.3 R3 Restoration

R3 restoration activities began immediately downstream from R2. In this area, a man-made farm pond was drained to reconnect the new stream channel with its geomorphic floodplain. Channel and floodplain excavation in this reach segment included the removal of shallow legacy sediments (approx. 12" depth) to accommodate a new bankfull channel and in-stream structures, as well as a more natural step-pool morphology using grade control structures in the steeper transitional areas. Shallow floodplain depressions and vernal pools were created in the floodplain to provide habitat diversity, nutrient cycling, and improved treatment of overland flows. The existing drain-pipe under the dam was removed and a new culverted pipe crossing was installed at a lower elevation to allow for aquatic passage while blending with the natural valley topography.

3.1.4 R4 Preservation and Enhancement

R4 began immediately downstream from the new culverted crossing at R3. Preservation was proposed along much of this reach since the existing stream and wetland system is mostly stable with a mature riparian buffer due to minimal historic impacts. This approach will extend the wildlife corridor from the boundary of Lake Wendell throughout the entire riparian valley, while providing a hydrologic connection and critical habitat linkage within the catchment area. Enhancement Level II work was conducted along a short portion of this reach to address the bank erosion and lateral instability that occurred during Hurricane Matthew (October 10, 2016). Construction activities consisted of mechanized removal of the downed trees and resetting the remaining live root balls along the streambank and re-grading the stream bank back to a stable dimension, installing erosion control matting, and supplemental riparian buffer planting and live stakes.

3.1.5 R5 Restoration and Enhancement

A Priority Level I/II Restoration approach was for the upstream portion of the reach to improve stream functions and water quality. The existing concrete pipe system was completely removed to allow for the complete daylighting and raising of the stream bed elevation to reconnect the stream with its active floodplain. The reach was restored using appropriate riffle-pool and step-pool morphology with limited meander geometry. In-stream structures, including log weirs and woody and stone riffles will be used to control grade, as well as dissipate flow energy, protect streambanks, and eliminate potential for future incision. Restored streambanks will be graded to stable side slopes and the floodplain will be reconnected

to further promote stability and hydrological function. Work along the downstream portion of R5 involved Enhancement Level II practices to improve the current channel condition and aquatic function.

4 Performance Standards

The applied success criteria for the Project will follow necessary performance standards and monitoring protocols presented in final approved mitigation plan. Annual monitoring and semi-annual site visits will be conducted to assess the condition of the project throughout the monitoring period. Monitoring activities will be conducted for a period of seven years with the final duration dependent upon performance trends toward achieving project goals and objectives. Specific success criteria components and evaluation methods are described in the table below.

Functional Category (Level)	Project Goal / Parameter	Measurement Method	Performance Standard	Potential Functional Uplift
Hydrology (Level 1)	Improve Base Flow Duration and Overbank Flows (i.e. channel forming discharge)	Pressure transducer, regional curve, regression equations, catchment assessment	Maintain seasonal flow for a minimum of 30 consecutive days during normal annual rainfall.	Create a more natural and higher functioning headwater flow regime and provide aquatic passage.
Hydraulics (Level 2)	Reconnect Floodplain / Increase Floodprone Area Widths	Bank Height Ratio, Entrenchment Ratio, crest gauge	Maintain average BHRs at 1.2 and ERs at 2.2 or greater and document out of bank and/or geomorphically significant flow events.	Provide temporary water storage and reduce erosive forces (shear stress) in channel during larger flow events.
Geomorphology (Level 3)	Improve Bedform Diversity	Pool to Pool spacing, riffle-pool sequence, pool max depth ratio, Longitudinal Profile	Increase riffle/pool percentage and pool-to-pool spacing ratios compared to reference reach conditions.	Provide a more natural stream morphology, energy dissipation and aquatic habitat/refugia.
	Increase Vertical and Lateral Stability	BEHI / NBS, Cross-sections and Longitudinal Profile Surveys, visual assessment	Decrease streambank erosion rates comparable to reference condition cross-section, pattern and vertical profile values.	Reduce sedimentation, excessive aggradation, and embeddedness to allow for interstitial flow habitat.
	Establish Riparian Buffer Vegetation	CVS Level I & II Protocol Tree Veg Plots (Strata Composition and Density), visual assessment	Within planted portions of the site, a minimum of 320 stems per acre must be present at year three; a minimum of 260 stems per acre must be present at year five; and a minimum of 210 stems per acre must be present at year seven.	Increase woody and herbaceous vegetation will provide channel stability and reduce streambank erosion, runoff rates and exotic species vegetation.
Physicochemical (Level 4)	Improve Water Quality	N/A	N/A	Removal of excess nutrients, FC bacteria, and organic pollutants will increase the hyporheic exchange and dissolved oxygen (DO) levels.
Biology (Level 5)	Improve Benthic Macroinvertebrate Communities and Aquatic Health	DWR Small Stream/ Qual v4 sampling, IBI (MY7)	N/A	Increase leaf litter and organic matter critical to provide in-stream cover/shade, wood recruitment, and carbon sourcing.

Note: Level 4 and 5 project parameters and monitoring activities will not be tied to performance standards nor required to demonstrate success for credit release.

4.1 Streams

4.1.1 Stream Hydrology

Two separate bankfull events must be documented within the seven-year monitoring period. These two bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years. In addition to the two bankfull flow events, two geomorphically significant flow events ($Q_{gs}=0.66Q_2$) must also be documented during the monitoring period. There are no temporal requirements regarding the distribution of the geomorphically significant flows.

4.1.2 Stream Profiles, Vertical Stability, and Floodplain Access

Stream profiles, as a measure of vertical stability will be evaluated by looking at Bank Height Ratios (BHR). The BHR shall not exceed 1.2 within riffles along the restored project reaches. This standard only applies to the restored project reaches where BHRs were corrected through design and construction. In addition, observed bedforms should be consistent with those observed for channels of the design stream type(s).

4.1.3 Stream Horizontal Stability

Cross-sections will be used to evaluate horizontal stream stability. There should be little change expected in as-built restoration cross-sections. If measurable changes do occur, they should be evaluated to determine if the changes represent a movement toward a more unstable condition (e.g., downcutting, erosion) or a movement towards increased stability (e.g., settling, vegetation establishment, deposition along the streambanks, decrease in width/depth ratio). Cross-sections shall be classified using the Rosgen Stream Classification method and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

4.1.4 Streambed Material Condition and Stability

Pebble counts or streambed material samples will not be collected per the DMS Pebble Count Data Requirements memo sent on October 19, 2021. The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period.

4.1.5 Jurisdictional Stream Flow

The restored stream systems must be classified as at least intermittent, and therefore must exhibit base flow with at least 30 days of continuous flow during a year with normal rainfall conditions as described in the approved mitigation plan.

4.2 Vegetation

Vegetative restoration success for the project during the intermediate monitoring years will be based on the survival of at least 320, three-year-old planted trees per acre at the end of Year 3 of the monitoring period and at least 260, five-year-old, planted trees per acre at the end of Year 5 of the monitoring period. The final vegetative restoration success criteria will be achieving a density of not less than 210, seven-year-old planted stems per acre in Year 7 of monitoring. Planted vegetation (for projects in coastal plain and piedmont counties) must average seven feet in height at Year 5 of monitoring and 10 feet in height at Year 7 of monitoring. Volunteer species will be counted toward success if they are at least 12” tall, surviving for at least two years, and if they are species found on the approved planting list. For all of the monitoring years (Year 1 through Year 7), the number of Red maple (*Acer rubrum*) stems cannot exceed 20 percent of the total stems in any of the vegetation monitoring plots.

5 Monitoring Year 5 Assessment and Results

Annual monitoring was conducted during MY5 in accordance with the monitoring plan as described in the approved mitigation plan to document the site conditions. All monitoring device locations are depicted on the CCPV (Figure 1). MY5 results are provided in the appendices. The Project meets the MY5 success criteria for stream hydrology and jurisdictional stream flow. Visual surveys indicate that the stream horizontal and vertical stability are meeting requirements. All vegetation plots meet the required stem/acre success criteria. Two veg plots do not meet the height requirement at MY5.

5.1 Stream Hydrology

Monitoring to document the occurrence of the bankfull events (overbank flows) and geomorphically significant flow events ($Q_{gs}=0.66Q_2$) within the monitoring period, along with floodplain access by flood flows, is being conducted using a crest gauge installed near the downstream end of Reach R2 (Figure 1), to record the watermark associated with the highest flood stage between monitoring site visits. Photographs are also being used to document the occurrence of debris lines and sediment deposition on the floodplain during monitoring site visits. One recorded bankfull event occurred during MY5. This event was documented using photography (Table 8). Documented flow events in MY1 and MY2 satisfied the requirement of the occurrence of two bankfull events in separate years. See the table below for a summary of bankfull events documented in all monitoring years.

Monitoring Year	Documented Bankfull Events	Requirement Met
1	2	No
2	2	Yes
3	2	Yes
4	1	Yes
5	1	Yes

5.2 Stream Horizontal & Vertical Stability

Visual assessment was utilized for assessment of MY5 horizontal and vertical stream stability. The visual assessments for each stream reach concluded that the MY5 stream channel pattern and longitudinal profiles, in-stream structure location/function, still closely match the profile design parameters and MY0/baseline conditions (Appendix D). The MY5 plan form geometry and dimensions fall within acceptable ranges of the design parameters for all restored reaches. Cross-section 1 had a change in BHR greater than 10%. XS-1 is a riffle with a 13% change in BHR due to aggradation. No remedial action is proposed at this time. Minor channel adjustments in riffle slopes, pool depths, and pattern were observed based on natural sediment migration and stream bank vegetation establishment but did not present a stability concern or indicate a need for remedial action. Maximum riffle depths are expected to fluctuate slightly throughout the monitoring period as the channels adjust to the new flow regime. It is expected over time that some pools may accumulate fine sediment and organic matter, however, this may not be an indicator of channel instability.

Minor piping was noted in MY3 at two instream structures near approximate stations 26+00 (SPA1) and 26+50 (SPA2). An additional log structure was found to have minor piping near station 24+00 (SPA4). While these three structures are not functioning as designed, there is not a systemic problem upstream or downstream. Hand repair was conducted during MY5 to fix the piping at SPA2 and SPA4. Crushed stone was added behind the log structures to prevent water from piping underneath. Livestakes were also added near the structures to prevent bank erosion. Monitoring of these areas will continue in MY6.

5.4 Jurisdictional Stream Flow Documentation

Jurisdictional stream flow documentation and monitoring of restored intermittent reaches is achieved by the installation of a flow gauge (continuous-read pressure transducer) within the thalweg of the channel towards the middle portion of the Reach R5 (Figure 1). Additionally, to determine if rainfall amounts are normal for the given year, precipitation data was obtained from CLAY Central Crops Research Station in Johnston County, approximately nine miles southwest of the site. The monitoring gauge documented the stream exhibited surface flow for 95 consecutive days from January 1st to April 5th, 2022 (see Figure 3).

5.5 Vegetation

Vegetation monitoring for MY5 was conducted utilizing seven vegetation monitoring Plots, with monitoring conducted in accordance with the CVS-EEP Level I & II Monitoring Protocol (CVS, 2008) and DMS Stream and Wetland Monitoring Guidelines (DMS, 2017). See Figure 1 in Appendix B for the vegetation monitoring plot locations. Summary data and photographs of each Plot can be found in Appendix 3.

The seven vegetation plots met the required success criteria at year 5 of 260 stems per acre. The vegetation plots had a range of 405 to 607 stems per acre (including appropriate volunteers). Five of the seven vegetation plots meet the MY5 height requirements of seven feet. Plot 2 and plot 6 have average stem heights of 6.1 feet and 6.9 feet, respectively. Red maple stems do not account for more than 20 percent of stems in any plots.

The MY5 vegetation monitoring was also conducted utilizing visual assessment throughout the easement. The results of the visual assessment did not indicate any negative changes to the existing vegetation community. An area of encroachment approximately 0.009 acres was found along R5 in MY5, see Figure 1 (VPA3). This area had been mowed by the adjacent homeowner and was vegetated with dog fennel and other pasture weeds. Management of this area in MY5 included additional t-posts and a physical barrier (horse tape) to delineate the easement boundary and discourage further mowing. The landowner was contacted via mail by our attorney. During MY6, additional trees will be planted in this area. A previous area of concern (VPA1) located along R1 buffer as shown on the CCPV (noted first in MY1) was utilized as a temporary staging area during construction and contains invasive vegetation (kudzu) along the right buffer. The area was treated once during the 2022 year in September (see table below for treatments). Following these treatments, the percent cover of kudzu was reduced to approximately one percent. The entirety of VPA1 was planted with trees from the approved list in the mitigation plan on February 1st, 2021 (see table below for plant list). A random vegetation plot was surveyed on March 30th, 2022 (see table below for results). This area will continue to be treated during MY6 and documented in future reports.

Kudzu Treatment Table

Monitoring Year	Invasive Treatment	Date Treatment Conducted
2	Kudzu foliar spray and cut	August 15, 2019
	Kudzu foliar spray	September 24, 2019
3	Kudzu crown removal	March 18, 2020
	Kudzu foliar spray	October 7, 2020
4	Kudzu foliar spray	July 1, 2021
5	Kudzu spray and cut	September 8, 2022

Random Veg Plot (VPA1) Results

Species	Number of Stems	Heights
Tulip Poplar	6	2.3, 5.2, 3, 2.4, 2, 4.4
Red Maple	3	8.5, 4.5, 1.5

5.3 Wetlands

Wetland mitigation credits are not contracted or proposed for this project. One groundwater monitoring well (pressure transducer) was installed during the baseline monitoring within an existing wetland area along Reach R4. The well was installed as a reference to document groundwater levels within the preservation area (Figure 3). No performance standards for wetland hydrology success were proposed in the Mitigation Plan and therefore wetland mitigation monitoring is not included for this project. The wetland gauge recorded a maximum consecutive hydroperiod of 60 days or 26.43% of the growing season. The wetland gauge data is located in the appendices.

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Appendix A:
Background Tables and Figures

Table 1. Mitigation Assets and Components
Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)

Project Component (reach ID, etc.)[1]	Wetland Position and HydroType[2]	Existing Footage or Acreage	Stationing	Mitigation Plan Footage or Acreage	As-Built Footage or Acreage	Restoration Level	Approach Priority Level	Mitigation Ratio (X:1)	Mitigation Credits*	Notes/Comments
R1		839	10+00 -18+39	806	839	R	PI/PII	1	806	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement
R2		995	18+39 - 28+00	995	992	R	PI	1	995	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement.
R3		1208	28+00 - 40+77	1208	1268	R	PI	1	1208	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement.
R4		711	40+77 - 49+11	711	702	P	-	10	71	Livestock Exclusion, Invasive Control, Permanent Conservation Easement.
R4 (middle)		111	46+26 - 47+37	111	111	EII	EII	2.5	44	Bank Stabilization, Floodplain Debris Clearing, Invasive Control, Permanent Conservation Easement.
R5 (upper)		210	10+00 - 12+10	210	210	R	PI/PII	1	210	Full Channel Restoration, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement.
R5 (lower)		144	12+10 - 13+58	144	147	EII	EII	2.5	58	Enhancement, Planted Buffer, Exclusion of Livestock, Permanent Conservation Easement.

Length and Area Summations by Mitigation Category

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)
		Riverine	Non-Riverine	
Restoration	3219			
Enhancement				
Enhancement I				
Enhancement II	255			
Creation				
Preservation	711			
High Quality Pres				

Overall Assets Summary

Asset Category	Overall Credits*
Stream	**3,392.100**
RP Wetland	
NR Wetland	

* Mitigation Credits are from the final approved mitigation plan, as verified by the as-built survey.

Table 2. Project Activity and Reporting History
Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)

Elapsed Time Since grading complete:	**4 yrs 6 months**
Elapsed Time Since planting complete:	**4 yrs 6 months**
Number of reporting Years[0]:	**5**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Project Contract Execution	N/A	3/18/2016
Final Mitigation Plan Submittal	N/A	8/25/2017
Section 404 General (Regional and Nationwide) Permit Verfication	N/A	10/5/2017
Begin Construction	N/A	11/13/2017
Mitigation Site Earthwork Completed	N/A	3/13/2018
Mitigation Site Planting Completed	N/A	3/30/2018
Installation of Monitoring Devices Completed	N/A	4/19/2018
Installation of Survey Monumentation and Boundary Marking	N/A	6/7/2018
As-built/Baseline (Year 0) Monitoring Report Submittal	6/23/2018	12/3/2018
Year 1 Monitoring Report Submittal	11/24/2018	12/4/2019
Year 2 MonitoringReport Submittal	10/29/2019	11/15/2019
Encroachment Documented (VPA 2)	10/1/2020	N/A
Year 3 Monitoring Report Submittal	10/15/2020	12/11/2020
Encroachment/Kudzu Area Planting (VPA1 & 2)	N/A	2/1/2021
Year 4 Monitoring Report Submittal	9/14/2021	10/20/2021
In-Stream Structure Repairs (SPA 2 & 4)	N/A	6/14/2022
Encroachment Documented (VPA3)	6/14/2022	N/A
Year 5 Monitoring Report Submittal	9/13/2022	11/30/2022
Year 6 Monitoring Report Submittal		
Year 7 Monitoring Report Submittal		

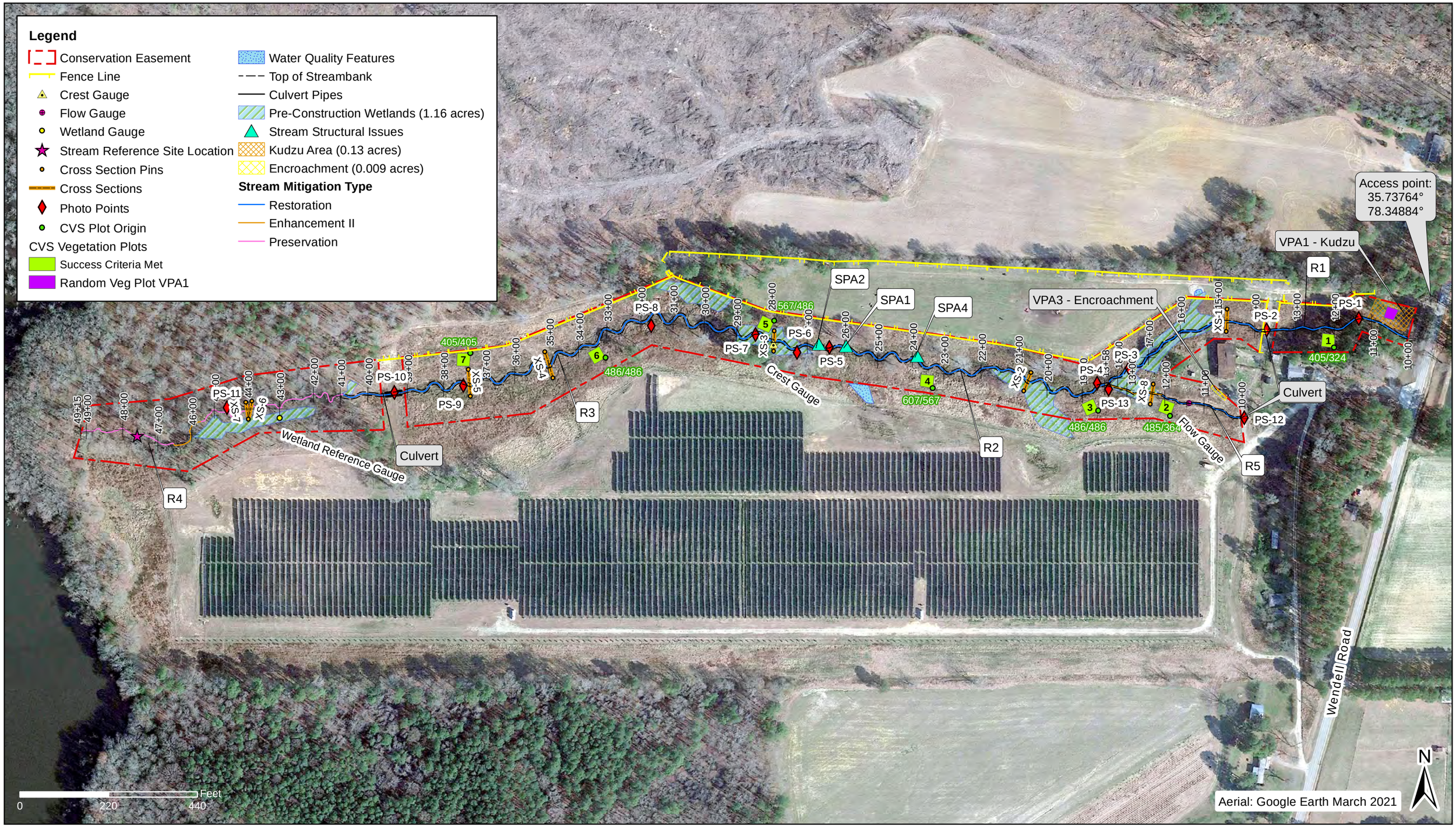
Table 3. Project Contacts Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)	
Mitigation Provider	Water & Land Solutions, LLC
	7721 Six Forks Road, Suite 130 Raleigh, NC 27615
Primary Project POC	Catherine Manner Phone: 571-643-3165
Construction Contractor	RiverWorks Construction
	114 W. Main Street, Suite 106, Clayton, NC 27520
Primary Project POC	Bill Wright Phone: 919-590-5193
Survey Contractor (Existing Condition Surveys)	WithersRavenel
	115 MacKenan Drive, Cary, NC 27511
Primary Project POC	Marshall Wight, PLS Phone: 919-469-3340
Survey Contractor (Conservation Easement, Construction and As-Builts Surveys)	True Line Surveying, PC
	205 West Main Street, Clayton, NC 27520
Primary Project POC	Curk T. Lane, PLS 919-359-0427
Planting Contractor	RiverWorks Construction
	114 W. Main Street, Suite 106, Clayton, NC 27520
Primary Project POC	Bill Wright Phone: 919-590-5193
Seeding Contractor	RiverWorks Construction
	114 W. Main Street, Suite 106, Clayton, NC 27520
Primary Project POC	Bill Wright Phone: 919-590-5193
Seed Mix Sources	Green Resource
	5204 Highgreen Ct., Colfax, NC 27235
	Rodney Montgomery Phone: 336-215-3458
Nursery Stock Suppliers	Foggy Mountain Nursery (Live Stakes) 797 Helton Creek Rd, Lansing, NC 28643 Glenn Sullivan Phone: 336-977-2958
	Dykes & Son Nursery (Bare Root Stock) 825 Maude Etter Rd, Mcminnville, Tn 37110 Jeff Dykes Phone: 931-668-8833
Monitoring Performers	Water & Land Solutions, LLC
	7721 Six Forks Road, Suite 130 Raleigh, NC 27615
Stream Monitoring POC	Emily Dunnigan Phone: 269-908-6306
Vegetation Monitoring POC	Emily Dunnigan Phone: 269-908-6306

Table 4. Project Information and Attributes					
Project Name	Lake Wendell Mitigation Project				
County	Johnston				
Project Area (acres)	11.97				
Project Coordinates (latitude and longitude)	35.7373910 N, -78.3538050 W				
Planted Acreage (Acres of Woody Stems Planted)	8.9				
Project Watershed Summary Information					
Physiographic Province	Piedmont				
River Basin	Neuse				
USGS Hydrologic Unit 8-digit	03020201				
DWR Sub-basin	30406				
Project Drainage Area (Acres and Square Miles)	102 acres, 0.16 sq mi				
Project Drainage Area Percentage of Impervious Area	<1%				
CGIA Land Use Classification	2.01.03, 413, 4.99 (61% pasture, 31% mixed forest, 1% open water)				
Reach Summary Information					
Parameters	**Reach 1**	**Reach 2**	**Reach 3**	**Reach 4**	**Reach 5**
Length of reach (linear feet)	850	952	1121	955	354
Valley confinement (Confined, moderately confined, unconfined)	unconfined	unconfined	unconfined	unconfined	unconfined
Drainage area (Acres and Square Miles)	33 acres, 0.05 sq mi	64 acres, 0.1 sq mi	83 acres, 0.13 sq mi	102 acres, 0.16 sq mi	10 acres, 0.02 sq mi
Perennial, Intermittent, Ephemeral	Perennial	Perennial	Perennial	Perennial	Intermittent
NCDWR Water Quality Classification	C; NSW	C; NSW	C;NSW	C; NSW	C; NSW
Stream Classification (existing)	G5c	E5/F5	N/A pond	E5	G5
Stream Classification (proposed)	C5b	C5	C5	E5	C5b
Evolutionary trend (Simon)	II	II (upper), III/IV (lower	N/A pond	I	II (lower), III (upper)
FEMA classification	N/A	N/A	N/A	Zone AE	N/A
Wetland Summary Information					
Parameters	**Wetland 1**	**Wetland 2**	**Wetland 3**		
Size of Wetland (acres)	N/A	N/A	N/A		
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)					
Mapped Soil Series					
Drainage class					
Soil Hydric Status					
Source of Hydrology					
Restoration or enhancement method (hydrologic, vegetative etc.)					
Regulatory Considerations					
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**		
Water of the United States - Section 404	Yes	Yes	Categorical Exclusion		
Water of the United States - Section 401	Yes	Yes	Categorical Exclusion		
Endangered Species Act	No	Yes	Categorical Exclusion		
Historic Preservation Act	No	N/A	Categorical Exclusion		
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	Categorical Exclusion		
FEMA Floodplain Compliance	Yes	Yes	Categorical Exclusion		
Essential Fisheries Habitat	No	N/A	Categorical Exclusion		

Appendix B:

Visual Assessment Data

Figure 1: Current Condition Plan View (CCPV)
Table 5a-e: Visual Stream Morphology Stability Assessment
Table 5f: Vegetation Condition Assessment
Stream Station Photographs
Vegetation Plot Photographs
Stream Problem Area Photographs
Vegetation Problem Area Photographs



WATER & LAND™ SOLUTIONS	NC Mitigation Services ENVIRONMENTAL QUALITY	**Lake Wendell Mitigation Project** **Johnston County, North Carolina**	NCDMS Contract No. 6826 NCDMS Project No. 97081 November 2022 MY5	Current Conditions Plan View Monitoring Year 5 NAD 1983 2011 State Plane North Carolina FIPS 3200 FT US	FIGURE 1

Table 5a	Visual Stream Morphology Stability Assessment
Project	Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)
Reach ID	R1
Assessed Length	839

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	17	17			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	3	3			100%			

Table 5b	Visual Stream Morphology Stability Assessment
Project	Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)
Reach ID	R2
Assessed Length	992

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	4			25%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	7	7			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	7	7			100%			

Table 5c	Visual Stream Morphology Stability Assessment
Project	Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)
Reach ID	R3
Assessed Length	1,268

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	27	27			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	12	12			100%			

Table 5d	Visual Stream Morphology Stability Assessment
Project	Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)
Reach ID	R4
Assessed Length	813

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	0	0			#DIV/0!			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	0	0			#DIV/0!			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0			#DIV/0!			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			#DIV/0!			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			#DIV/0!			

Table 5e	Visual Stream Morphology Stability Assessment
Project	Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)
Reach ID	R5
Assessed Length	357

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
2. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	0	0			#DIV/0!			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			#DIV/0!			

Table 5f Project Planted Acreage[1]	Vegetation Condition Assessment Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081) 8.9					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.01 acres	Solid light blue	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Pattern and Color	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Pattern and Color	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2]	**12**					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	1000 SF	orange hatched	1	0.13	1.1%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	yellow hatched	1	0.009	0.1%

PS-1, R1, facing upstream, Sta 11+50, June 11, 2018 (MY-00)

PS-1, R1, facing upstream, Sta 11+50, March 30, 2022 (MY-05)

PS-1, R1, facing downstream, Sta 11+50, June 11, 2018 (MY-00)

PS-1, R1, facing downstream, Sta 11+50, March 30, 2022 (MY-05)

PS-2, R1, facing upstream, Sta 13+50, April 27, 2018 (MY-00)

PS-2, R1, facing upstream, Sta 13+50, March 30, 2022 (MY-05)

PS-2, R1, facing downstream, Sta 13+50, April 27, 2018 (MY-00)

PS-2, R1, facing downstream, Sta 13+50, March 30, 2022 (MY-05)

PS-3, R1, facing downstream, Sta 17+50, April 27, 2018 (MY-00)

PS-3, R1, facing downstream, Sta 17+50, March 30, 2022 (MY-05)

PS-3, R1, facing upstream, Sta 17+50, April 27, 2018 (MY-00)

PS-3, R1, facing upstream, Sta 17+50, March 30, 2022 (MY-05)

PS-4, R2, facing downstream, Sta 18+50, April 30, 2018 (MY-00)

PS-4, R2, facing downstream, Sta 18+50, March 30, 2022 (MY-05)

PS-5, R2, facing upstream, Sta 26+50, April 27, 2018 (MY-00)

PS-5, R2, facing upstream, Sta 26+50, March 30, 2022 (MY-05)

PS-6, R2, facing downstream, Sta 27+50, April 27, 2018 (MY-00)

PS-6, R2, facing downstream, Sta 27+50, March 30, 2022 (MY-05)

PS-7, R2, facing upstream, Sta 28+25, April 27, 2018 (MY-00)

PS-7, R2, facing upstream, Sta 28+25, March 30, 2022 (MY-05)

PS-8, R3, facing downstream, Sta 32+00, April 27, 2018 (MY-00)

PS-8, R3, facing downstream, Sta 32+00, March 30, 2022 (MY-05)

PS-9, R3, facing downstream, Sta 37+50, April 27, 2018 (MY-00)

PS-9, R2, facing downstream, Sta 37+50, March 30, 2022 (MY-05)

PS-10, R3, facing upstream, Sta 39+50, March 20, 2018 (MY-00)

PS-10, R3, facing upstream, Sta 39+50, March 30, 2022 (MY-05)

PS-10, R4, facing downstream, Sta 40+00, March 20, 2018 (MY-00)

PS-10, R4, facing downstream, Sta 40+00, March 30, 2022 (MY-05)

PS-11, R4, facing downstream, Sta 44+50, August 21, 2018 (MY-00)

PS-11, R4, facing downstream, Sta 44+50, March 30, 2022 (MY-05)

PS-12, R5, facing downstream, Sta 10+00, April 27, 2018 (MY-00)

PS-12, R5, facing downstream, Sta 10+00, March 30, 2022 (MY-05)

PS-13, R5, facing upstream, old crest gauge, Sta 13+50, Apr 27, 2018 (MY-00)

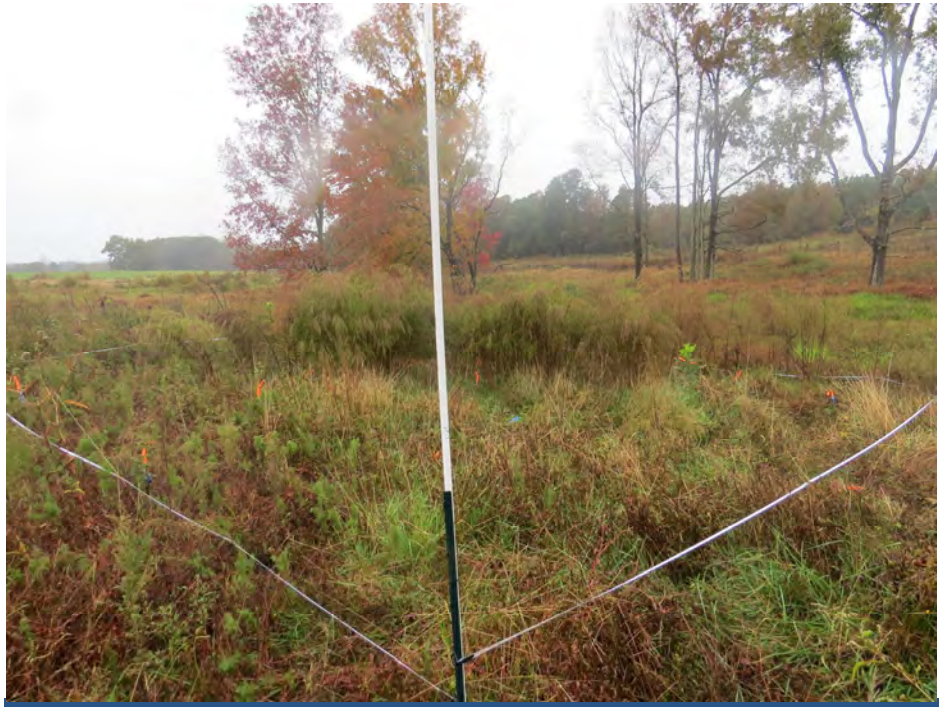
PS-13, R5, facing upstream, Sta 13+50, March 30, 2022 (MY-05)

Veg Plot 1, November 5, 2018 (MY-01)

Veg Plot 1, September 13, 2022 (MY-05)

Veg Plot 2, April 27, 2018 (MY-00)

Veg Plot 2, September 13, 2022 (MY-05)



Veg Plot 3, November 5, 2018 (MY-01)

Veg Plot 3, September 13, 2022 (MY-05)

Veg Plot 4, April 13, 2018 (MY-00)

Veg Plot 4, September 13, 2022 (MY-05)

Veg Plot 5, April 13, 2018 (MY-00)

Veg Plot 5, September 13, 2022 (MY-05)

Veg Plot 6, April 13, 2018 (MY-00)

Veg Plot 6, September 13, 2022 (MY-05)

Veg Plot 7, April 13, 2018 (MY-00)

Veg Plot 7, September 13, 2022 (MY-05)

SPA1, October 14, 2020 (MY-03)

SPA1, September 13, 2022 (MY-05)

SPA2, October 14, 2020 (MY-03)

SPA2 (after repair), June 14, 2022 (MY-05)

SPA4, March 30, 2022 (MY-05)

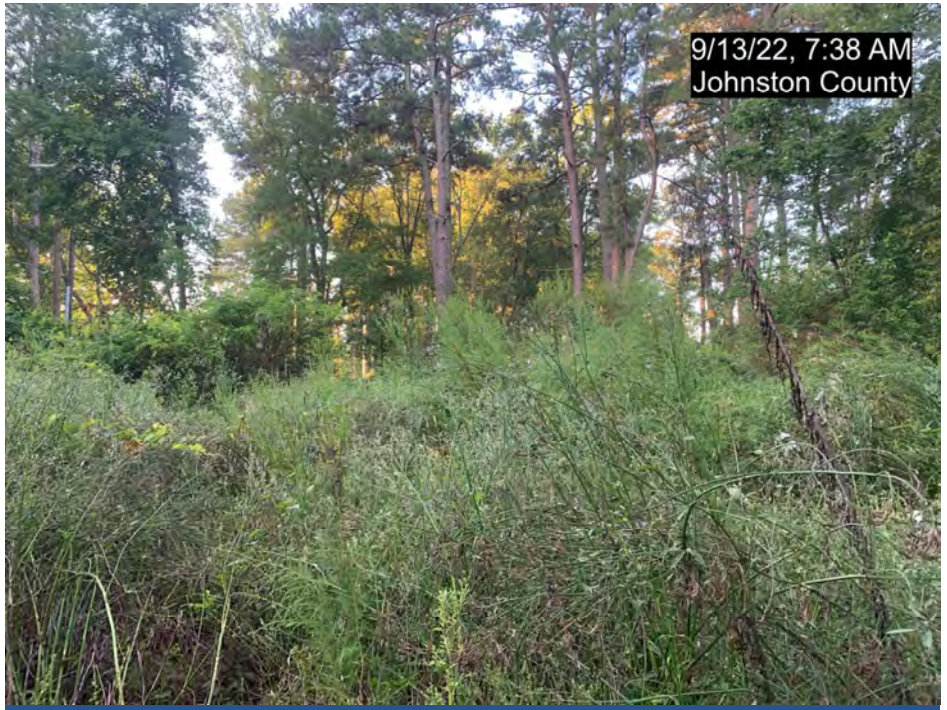
SPA4, March 30, 2022 (MY-05)

SPA4 (after repair), June 14, 2022 (MY-05)

Kudzu Problem Area (VPA1), October 22, 2020 (MY-03)

Kudzu Problem Area (VPA1), September 13, 2022 (MY-05)

Kudzu Problem Area (VPA1), October 22, 2020 (MY-03)



Kudzu Problem Area (VPA1), September 13, 2022 (MY-05)

Encroachment Area (VPA3), June 14, 2022 (MY-05)

Encroachment Area (VPA3), September 13, 2022 (MY-05)

Random Veg Plot in VPA1, March 30, 2022 (MY-05)

Appendix C:
Vegetation Plot Data

Table 6: Planted and Total Stem Counts
Table 6a: Vegetation Plot Mitigation Success Summary

Table 6: Planted and Total Stem Counts

Lake Wendell

Scientific Name	Common Name	Species Type	Current Plot Data (MY5 2022)																					Annual Means														
			001-01-0001			001-01-0002			001-01-0003			001-01-0004			001-01-0005			001-01-0006			001-01-0007			MY5 (2022)			MY4 (2021)			MY3 (2020)			MY2 (2019)			MY1 (2018)			MY0 (2018)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo		Tree																														1								
Acer rubrum		Tree			2			2				2	2	3			2	2	2	2	2	2	2	5	5	12	6	6	41	6	6	68	6	6	25	6	6	62	7	7	7
Alnus serrulata	Tag Alder, Smooth Alde	Shrub Tree							1	1	1							1	1	1	1	1	1	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	3	3
Betula nigra	River Birch, Red Birch	Tree	1	1	1	1	1	1	2	2	2	2	2	2				2	2	2				8	8	8	8	8	8	8	8	8	11	11	11	9	9	9	12	12	12
Carpinus caroliniana		Shrub Tree	1	1	1										1	1	1							2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	5	5	5
Cornus amomum	Silky Dogwood	Shrub Tree	1	1	1	3	3	3																4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
Diospyros virginiana	American Persimmon,	Tree										2	2	2										2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	1	1	1	1	1	1	1	1	1				1	1	1							4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Ilex verticillata	Winterberry	Shrub Tree																																					1	1	1
Lindera benzoin	Northern Spicebush	Shrub Tree																																					8	8	8
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree			10						4						2			4						20			21			16			8			9			
Liriodendron tulipifera		Tree	1	1	1			1	2	2	2				1	1	1	1	1	1	2	2	2	7	7	8	7	7	7	7	7	8	8	8	8	13	13	13	27	27	27
Magnolia virginiana		Shrub Tree				3	3	3	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	9	9	9	6	6	6	7	7	7	7	7	7	8	8	8	8	8	8
Pinus taeda	Loblolly Pine, Old Field	Tree						3									2			3						8			9			12								
Platanus occidentalis	Sycamore, Plane-tree	Tree	1	1	1	1	1	1	1	1	1				4	4	4	1	1	1	3	3	3	11	11	11	11	11	11	11	11	11	11	11	11	12	12	12	18	18	18
Prunus serotina		Shrub Tree			1																					1			1			1			2					
Quercus michauxii	Basket Oak, Swamp Ch	Tree	2	2	2							5	5	5	1	1	1	1	1	1				9	9	9	8	8	8	8	8	8	7	7	7	7	7	7	7	7	7
Quercus nigra	Water Oak, Paddle Oak	Tree										1	1	1										1	1	1	2	2	2	3	3	3	4	4	4	4	4	4	9	9	9
Quercus phellos	Willow Oak	Tree							4	4	4				3	3	3	3	3	3	1	1	1	11	11	11	11	11	11	11	11	11	9	9	9	10	10	10	11	11	11
Rhus copallinum		Shrub Tree																											2											
Rosa palustris	Swamp Rose	Shrub Vine																																				1			
Salix nigra	Black Willow	Tree									1															1			1									1			
Ulmus alata	Winged Elm	Tree			1																					1			1												
		Stem count	8	8	22	9	9	15	12	12	17	14	14	15	12	12	18	12	12	19	10	10	10	76	76	115	73	73	142	75	75	167	77	77	107	83	83	150	125	125	125
		size (ares)	1			1			1			1			1			1			1			7			7			7			7			7					
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.17			0.17			0.17			0.17			0.17					
		Species count	7	7	11	5	5	8	7	7	9	6	6	6	7	7	10	8	8	10	6	6	6	13	13	18	13	13	18	13	13	16	13	13	16	13	13	16	15	15	15
		Stems per ACRE	324	324	890	364	364	607	486	486	688	567	567	607	486	486	728	486	486	769	405	405	405	439	439	665	422	422	821	434	434	965	445	445	619	480	480	867	723	723	723

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%

Table 6a: Vegetation Plot Mitigation Success Summary Table							
Plot #	Planted Stems/Acre	Volunteers/ Acre	Total Stems/Acre	Stems/Acre Success Criteria Met	Average Stem Height (ft)	Height Success Criteria Met	Percent Red Maple
1	324	81	405	Yes	8.1	Yes	20%
2	364	121	485	Yes	6.1	No	18%
3	486	0	486	Yes	11.7	Yes	0%
4	567	40	607	Yes	8.5	Yes	20%
5	486	81	567	Yes	15.0	Yes	14%
6	486	0	486	Yes	6.9	No	17%
7	405	0	405	Yes	18.5	Yes	20%
Project Average	445	46	492	Yes	10.7	Yes	16%

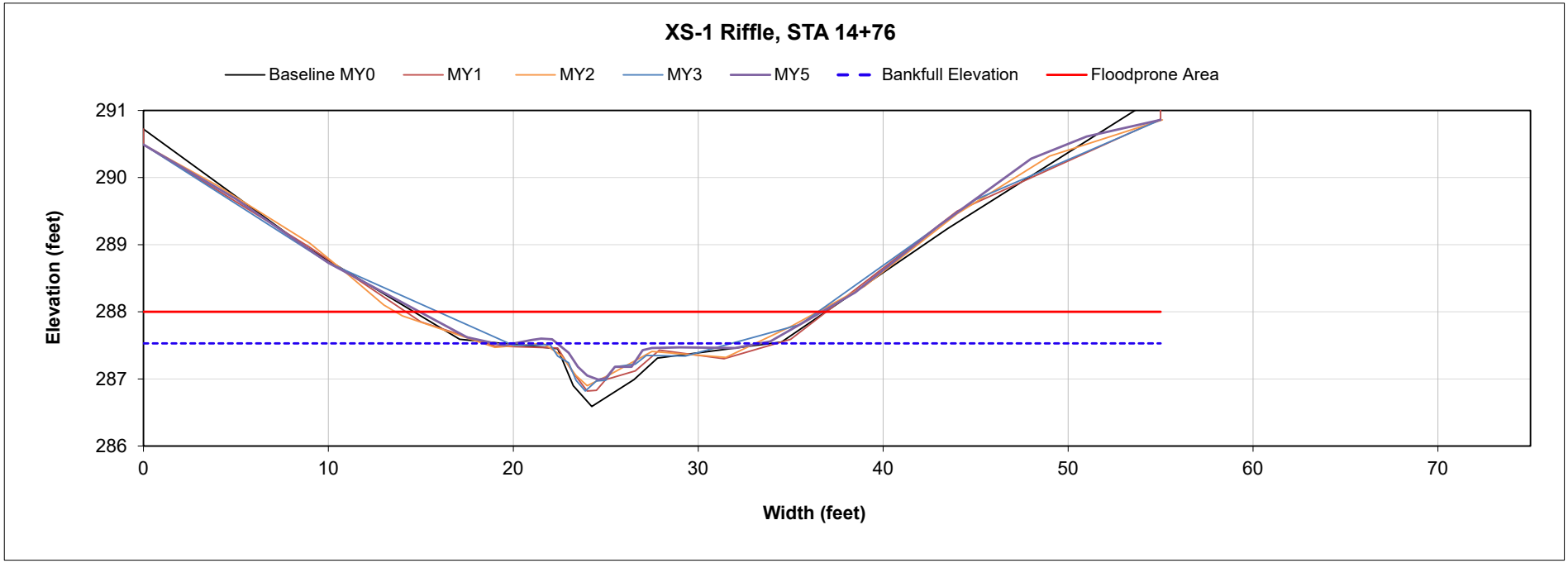
Appendix D:
Stream Measurement and Geomorphology Data

Figure 2: MY5 Cross-Sections
Table 7a: Baseline Stream Data Summary
Table 7b: Cross-section Morphology Data
Table 7c: Stream Reach Morphology Data

Project Name	Lake Wendell Mitigation Project
Project ID	97081
Reach ID	R1
Cross Section ID	XS-1
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY5 2022	
Bankfull Elevation (ft)	287.5
Low Bank Height Elevation (ft)	287.5
Bankfull Max Depth (ft)	0.5
Low Bank Height (ft)	0.5
Bank Height Ratio	0.87
Bankfull X-section Area (ft²)	1.9
% Change Bank Height Ratio	13.0%

Looking Downstream



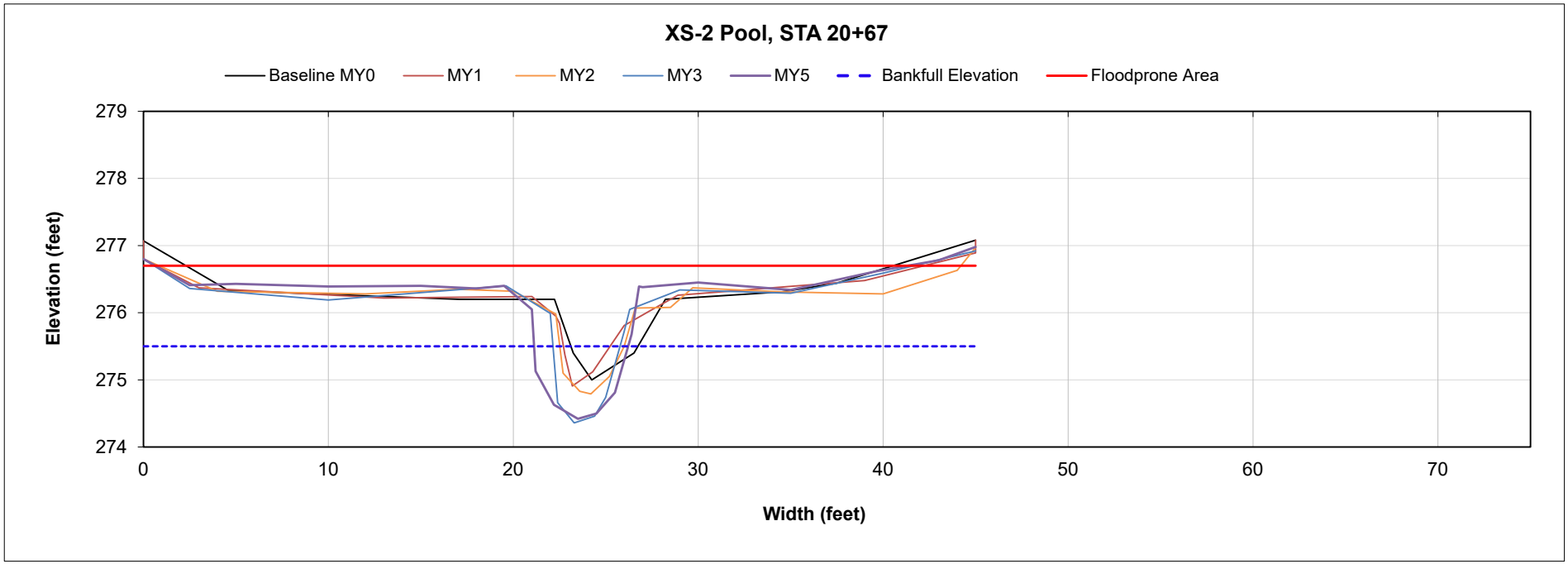
** Bank Height Ratio is calculated based on MY1 cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioner sin NC (9/2018). The remainder of the bankfull dimensions are calculated based on the current year's low bank height.*

*** MY1 used in place of as-built (MY0) due to issues with the as-built survey standards identified during MY1.*

Project Name	Lake Wendell Mitigation Project
Project ID	97081
Reach ID	R2
Cross Section ID	XS-2
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY5 2022	
Bankfull Elevation (ft)	275.5
Low Bank Height Elevation (ft)	276.1
Bankfull Max Depth (ft)	1.1
Low Bank Height (ft)	1.6
Bank Height Ratio	N/A
Bankfull X-section Area (ft²)	4.1
% Change Bank Height Ratio	N/A

Looking Downstream



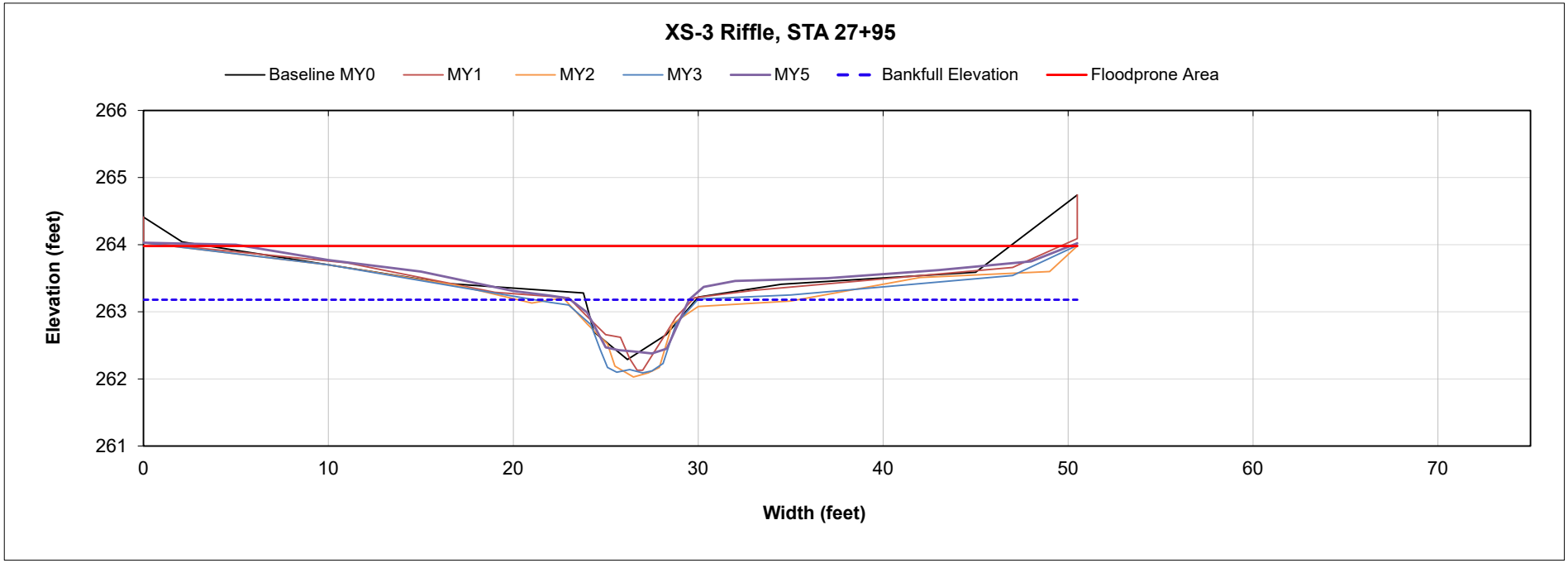
** Bank Height Ratio is calculated based on MY1 cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioner sin NC (9/2018). The remainder of the bankfull dimensions are calculated based on the current year's low bank height.*

*** MY1 used in place of as-built (MY0) due to issues with the as-built survey standards identified during MY1.*

Project Name	Lake Wendell Mitigation Project
Project ID	97081
Reach ID	R2
Cross Section ID	XS-3
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY5 2022	
Bankfull Elevation (ft)	263.2
Low Bank Height Elevation (ft)	263.2
Bankfull Max Depth (ft)	0.8
Low Bank Height (ft)	0.8
Bank Height Ratio	1.0
Bankfull X-section Area (ft²)	3.5
% Change Bank Height Ratio	0.0%

Looking Downstream



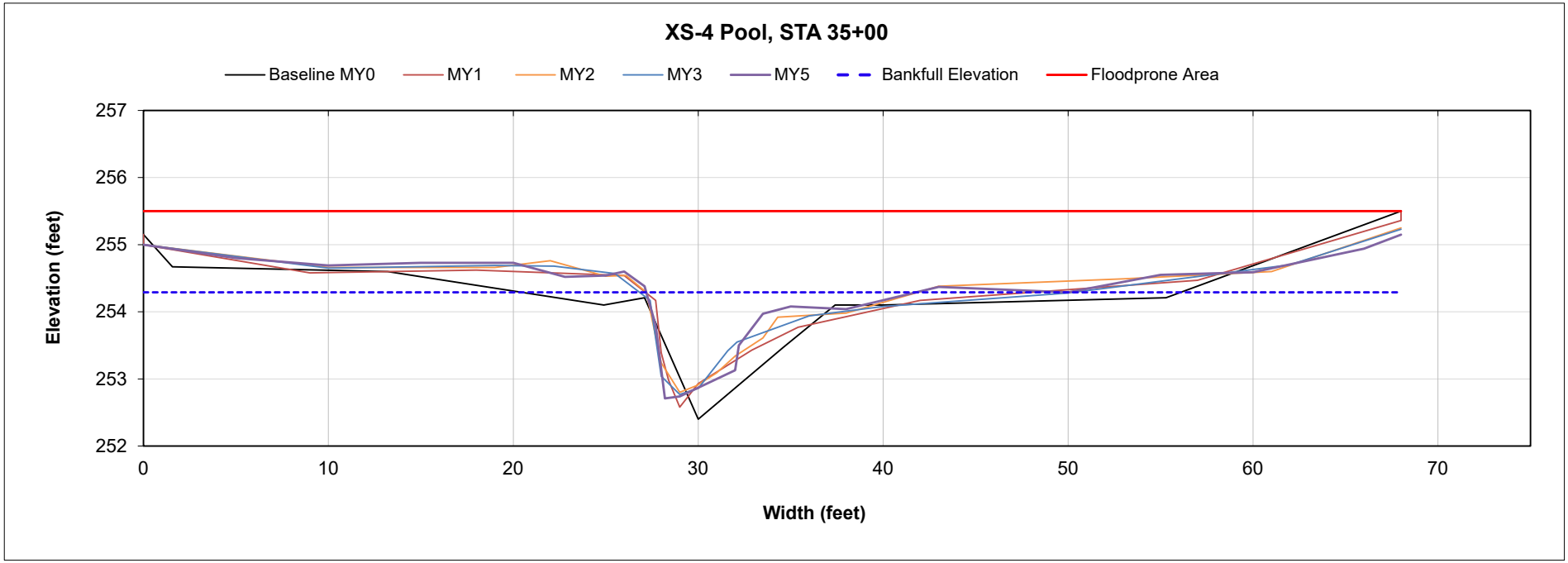
** Bank Height Ratio is calculated based on MY1 cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioner sin NC (9/2018). The remainder of the bankfull dimensions are calculated based on the current year's low bank height.*

*** MY1 used in place of as-built (MY0) due to issues with the as-built survey standards identified during MY1.*

Project Name	Lake Wendell Mitigation Project
Project ID	97081
Reach ID	R3
Cross Section ID	XS-4
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY5 2022	
Bankfull Elevation (ft)	254.3
Low Bank Height Elevation (ft)	254.4
Bankfull Max Depth (ft)	1.6
Low Bank Height (ft)	1.7
Bank Height Ratio	N/A
Bankfull X-section Area (ft²)	8.5
% Change Bank Height Ratio	N/A

Looking Downstream



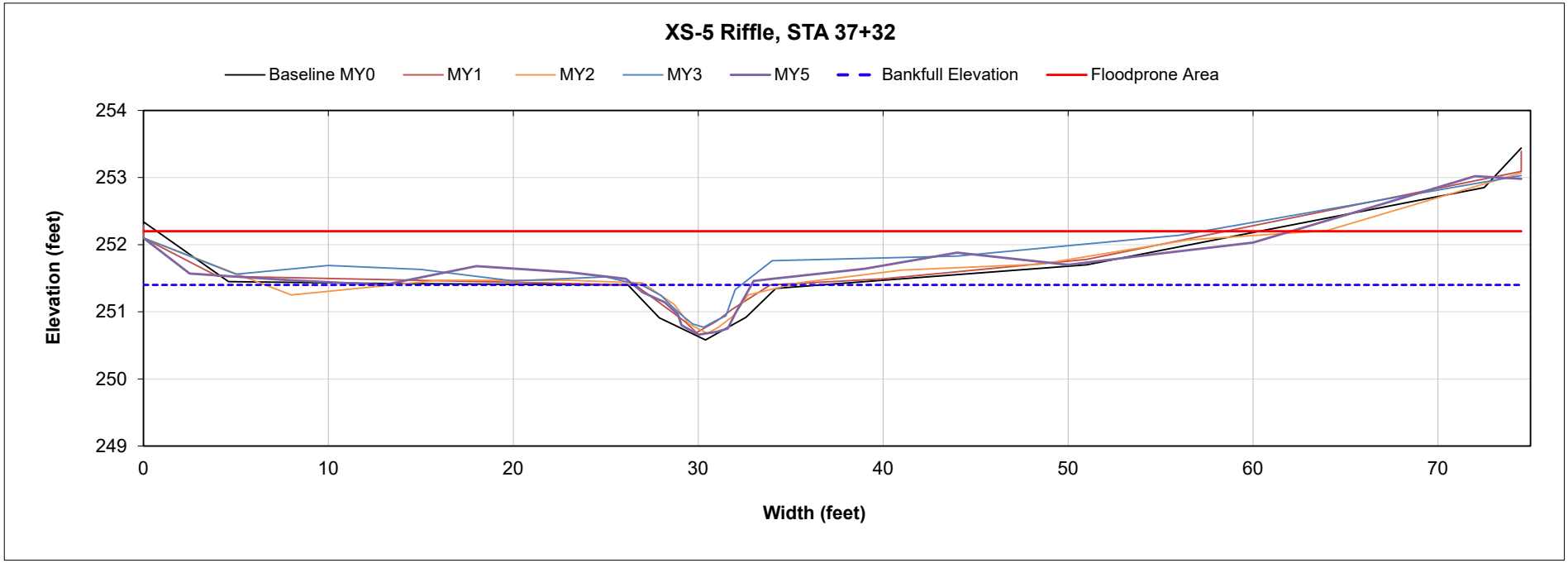
** Bank Height Ratio is calculated based on MY1 cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioner sin NC (9/2018). The remainder of the bankfull dimensions are calculated based on the current year's low bank height.*

*** MY1 used in place of as-built (MY0) due to issues with the as-built survey standards identified during MY1.*

Project Name	Lake Wendell Mitigation Project
Project ID	97081
Reach ID	R3
Cross Section ID	XS-5
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY5 2022	
Bankfull Elevation (ft)	251.4
Low Bank Height Elevation (ft)	251.5
Bankfull Max Depth (ft)	0.7
Low Bank Height (ft)	0.8
Bank Height Ratio	1.08
Bankfull X-section Area (ft²)	2.7
% Change Bank Height Ratio	8.0%

Looking Downstream



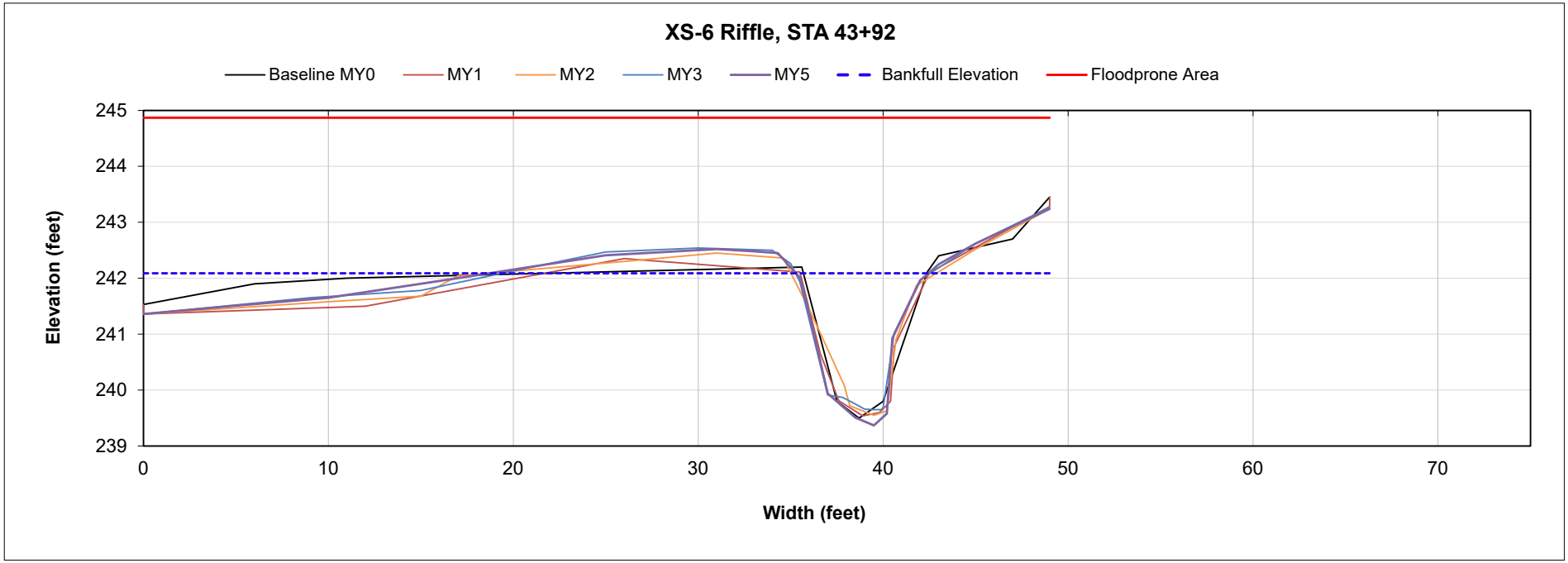
** Bank Height Ratio is calculated based on MY1 cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioner sin NC (9/2018). The remainder of the bankfull dimensions are calculated based on the current year's low bank height.*

*** MY1 used in place of as-built (MY0) due to issues with the as-built survey standards identified during MY1.*

Project Name	Lake Wendell Mitigation Project
Project ID	97081
Reach ID	R4 (Preservation)
Cross Section ID	XS-6
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY5 2022	
Bankfull Elevation (ft)	242.1
Low Bank Height Elevation (ft)	242.3
Bankfull Max Depth (ft)	2.7
Low Bank Height (ft)	2.9
Bank Height Ratio	1.06
Bankfull X-section Area (ft²)	11.2
% Change Bank Height Ratio	6.0%

Looking Downstream



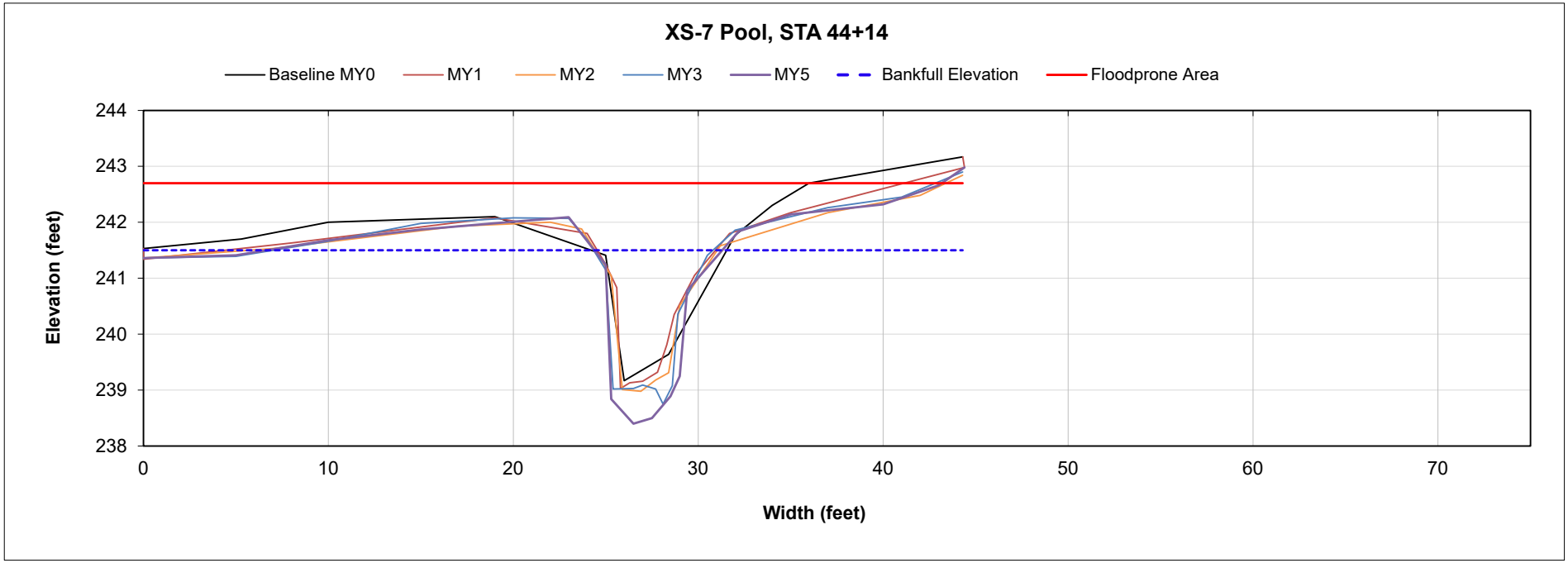
** Bank Height Ratio is calculated based on MY1 cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioner sin NC (9/2018). The remainder of the bankfull dimensions are calculated based on the current year's low bank height.*

*** MY1 used in place of as-built (MY0) due to issues with the as-built survey standards identified during MY1.*

Project Name	Lake Wendell Mitigation Project
Project ID	97081
Reach ID	R4 (Preservation)
Cross Section ID	XS-7
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY5 2022	
Bankfull Elevation (ft)	241.5
Low Bank Height Elevation (ft)	241.8
Bankfull Max Depth (ft)	3.1
Low Bank Height (ft)	3.4
Bank Height Ratio	N/A
Bankfull X-section Area (ft²)	12.3
% Change Bank Height Ratio	N/A

Looking Downstream



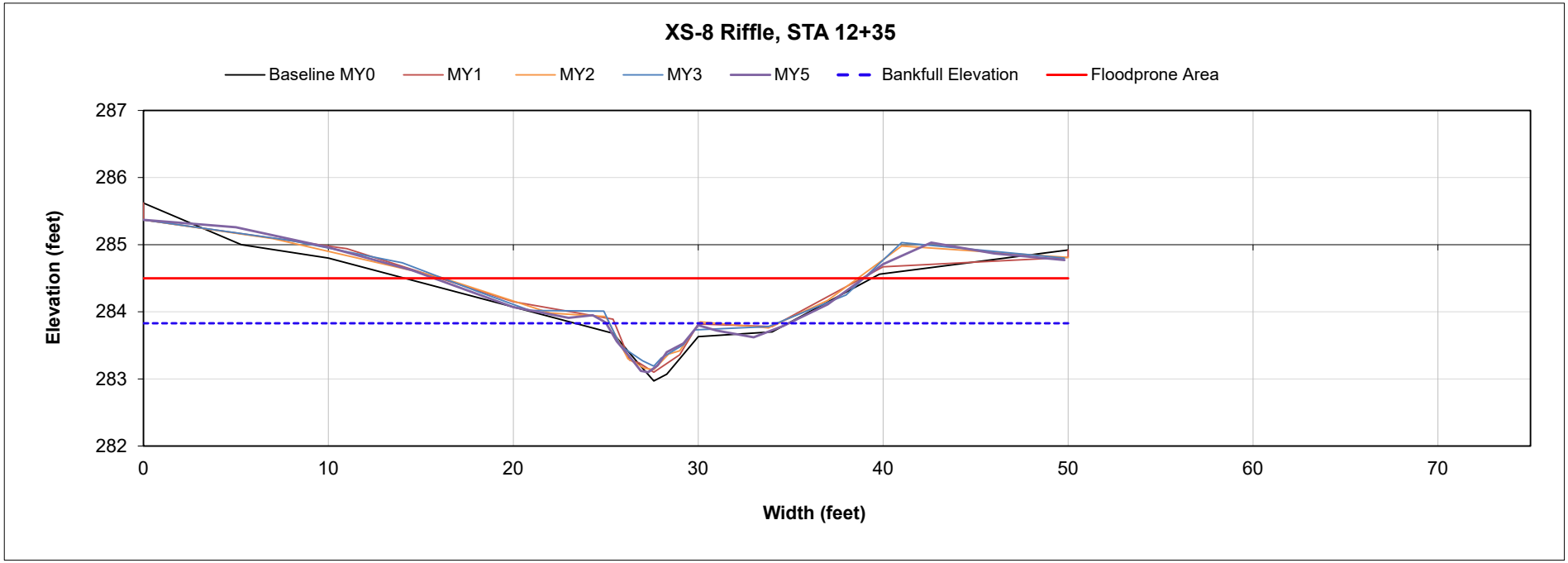
** Bank Height Ratio is calculated based on MY1 cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioner sin NC (9/2018). The remainder of the bankfull dimensions are calculated based on the current year's low bank height.*

*** MY1 used in place of as-built (MY0) due to issues with the as-built survey standards identified during MY1.*

Project Name	Lake Wendell Mitigation Project
Project ID	97081
Reach ID	R5
Cross Section ID	XS-8
Field Crew	K. Obermiller, C. Durham

Dimension Data Summary: MY5 2022	
Bankfull Elevation (ft)	283.8
Low Bank Height Elevation (ft)	283.8
Bankfull Max Depth (ft)	0.7
Low Bank Height (ft)	0.7
Bank Height Ratio	0.96
Bankfull X-section Area (ft²)	2.1
% Change Bank Height Ratio	4.0%

Looking Downstream



** Bank Height Ratio is calculated based on MY1 cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document produced by the technical industry work group consisting of the NCIRT, NCDMS, and Industry Practitioner sin NC (9/2018). The remainder of the bankfull dimensions are calculated based on the current year's low bank height.*

*** MY1 used in place of as-built (MY0) due to issues with the as-built survey standards identified during MY1.*

Table 7a. Baseline Stream Data Summary
Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)

Parameter	Pre-Restoration Condition		Reference Reach Data		Design		As-Built/ Baseline	
Reach ID: R1								
Dimension (Riffle)	Min	Max	Min	Max	Min	Max	Min	Max
Bankfull Width (ft)	5.0	7.0	4.5	8.3	5.9	-	5.8	-
Floodprone Width (ft)	6.1	18.7	10.0	20.0	14.0	30.0	23.1	-
Bankfull Mean Depth (ft)	0.5	0.7	0.8	1.6	0.5	-	0.4	-
Bankfull Max Depth (ft)	0.8	1.5	0.9	1.3	0.6	-	0.7	-
Bankfull Cross Sectional Area (ft^2)	2.5	2.8	3.0	5.0	2.7	-	2.3	-
Width/Depth Ratio	5.3	17.7	6.2	14.2	13.0	-	14.6	-
Entrenchment Ratio	1.2	9.9	7.1	8.4	2.4	5.1	4.3	-
Bank Height Ratio	1.1	2.3	0.9	1.1	1.0	1.0	1.0	-
Profile								
Riffle Length (ft)	6.2	38.2	9.5	22.7	10.0	30.0	11.3	31.2
Riffle Slope (ft/ft)	0.016	0.037	0.009	0.015	0.020	0.035	0.017	0.036
Pool Length (ft)	4.1	7.9	6.1	8.7	7.0	10.0	5.5	12.5
Pool Max Depth (ft)	1.1	2.3	1.8	2.4	1.1	1.6	1.2	1.7
Pool Spacing (ft)	26.4	83.9	14.4	22.3	11.8	35.5	7.7	33.3
Pattern								
Channel Beltwidth (ft)	11.0	32.0	23.4	29.0	30.0	45.0	25.0	51.0
Radius of Curvature (ft)	8.0	50.0	11.2	17.5	15.0	25.0	11.0	36.0
Rc:Bankfull Width (ft/ft)	1.6	10.0	1.6	2.5	2.0	3.0	2.1	4.2
Meander Wavelength (ft)	20.0	100.0	43.4	65.1	30.0	44.8	23.0	56.0
Meander Width Ratio	2.2	6.4	3.9	4.5	5.1	7.6	4.1	7.4
Transport Parameters								
Boundary Shear Stress ($lb/ft^{2)}$	---		---		0.67		---	
Max part size (mm) mobilized at bankfull	---		---		2.00		---	
Stream Power ($W/m^{2)}$	---		---		42.00		---	
Additional Reach Parameters								
Rosgen Classification	G5c		E5/C5		B5c		B5c	
Bankfull Velocity (fps)	3.7		4.5		4.0		4.0	
Bankfull Discharge (cfs)	10.0		---		10.0		10.0	
Sinuosity	1.05		1.1 - 1.3		1.10		1.10	
Water Surface Slope (Channel) (ft/ft)	0.025		0.020		0.025		0.026	
Bankfull Slope (ft/ft)	0.027		0.020		0.025		0.027	

Parameter	Pre-Restoration Condition		Reference Reach Data		Design		As-Built/ Baseline	
Reach ID: R2								
Dimension (Riffle)	Min	Max	Min	Max	Min	Max	Min	Max
Bankfull Width (ft)	5.9	9.5	4.5	8.3	6.8	-	6.6	-
Floodprone Width (ft)	13.7	14.1	10.0	20.0	15.0	30.0	45.0	-
Bankfull Mean Depth (ft)	0.6	0.7	0.8	1.6	0.5	-	0.5	-
Bankfull Max Depth (ft)	0.9	1.0	0.9	1.3	0.7	-	1.1	-
Bankfull Cross Sectional Area (ft^2)	4.2	5.9	3.0	5.0	3.6	-	3.6	-
Width/Depth Ratio	8.2	15.2	6.2	14.2	13.0	13.0	12.8	-
Entrenchment Ratio	1.4	2.2	7.1	8.4	2.2	4.4	7.4	-
Bank Height Ratio	1.8	1.9	0.9	1.1	1.0	-	1.0	-
Profile								
Riffle Length (ft)	5.9	27.7	9.5	22.7	10.0	30.0	9.9	33.3
Riffle Slope (ft/ft)	0.015	0.029	0.009	0.015	0.015	0.020	0.016	0.033
Pool Length (ft)	3.9	7.8	6.1	8.7	7.9	9.8	5.4	13.6
Pool Max Depth (ft)	2.0	3.8	1.8	2.4	1.1	1.6	1.2	1.9
Pool Spacing (ft)	17.0	51.0	14.4	22.3	22.0	48.0	13.0	37.1
Pattern								
Channel Beltwidth (ft)	13.0	37.0	23.4	29.0	30.0	45.0	25.0	47.0
Radius of Curvature (ft)	7.0	29.0	11.2	17.5	15.0	25.0	9.8	30.3
Rc:Bankfull Width (ft/ft)	1.2	4.9	1.6	2.5	2.0	3.0	2.5	4.2
Meander Wavelength (ft)	42.0	121.0	43.4	65.1	30.0	44.8	29.0	17.0
Meander Width Ratio	2.3	6.3	3.9	4.5	5.1	7.6	4.4	7.9
Transport Parameters								
Boundary Shear Stress ($lb/ft^{2)}$	-		-		0.51		-	
Max part size (mm) mobilized at bankfull	-		-		2.00		-	
Stream Power ($W/m^{2)}$	-		-		29.10		-	
Additional Reach Parameters								
Rosgen Classification	E5/F5		E5/C5		C5		C5	
Bankfull Velocity (fps)	4.1		4.5		4.7		4.0	
Bankfull Discharge (cfs)	16.9		-		16.9		16.9	
Sinuosity	1.14		1.1 - 1.3		1.17		1.15	
Water Surface Slope (Channel) (ft/ft)	0.016		0.020		0.018		0.019	
Bankfull Slope (ft/ft)	0.017		0.020		0.017		0.019	

Parameter	Pre-Restoration Condition		Reference Reach Data		Design		As-Built/ Baseline	
Reach ID: R3	**(Pond)**							
Dimension (Riffle)	Min	Max	Min	Max	Min	Max	Min	Max
Bankfull Width (ft)	9.5	-	4.5	8.3	7.8	-	7.3	-
Floodprone Width (ft)	13.7	-	10.0	35.0	17.0	35.0	59.0	-
Bankfull Mean Depth (ft)	0.6	-	0.8	1.6	0.6	-	0.5	-
Bankfull Max Depth (ft)	0.9	-	0.9	1.3	0.7	-	0.8	-
Bankfull Cross Sectional Area (ft^2)	5.9	-	3.0	5.0	4.4	-	3.5	-
Width/Depth Ratio	15.2	-	6.2	14.2	14.0	-	15.1	-
Entrenchment Ratio	1.4	-	7.1	8.4	2.2	4.5	8.0	-
Bank Height Ratio	1.8	-	0.9	1.1	1.0	-	1.0	-
Profile								
Riffle Length (ft)	-	-	9.5	22.7	12.0	33.0	10.0	30.0
Riffle Slope (ft/ft)	-	-	0.009	0.015	0.015	0.022	0.020	0.035
Pool Length (ft)	-	-	6.1	8.7	8.0	10.5	7.0	10.0
Pool Max Depth (ft)	-	-	1.8	2.4	1.4	2.0	1.1	1.6
Pool Spacing (ft)	-	-	14.4	22.3	25.0	55.0	11.8	35.5
Pattern								
Channel Beltwidth (ft)	-	-	23.4	29.0	25.0	45.0	30.0	46.0
Radius of Curvature (ft)	-	-	11.2	17.5	16.0	23.0	15.0	27.0
Rc:Bankfull Width (ft/ft)	-	-	1.6	2.5	2.0	3.0	2.5	4.2
Meander Wavelength (ft)	-	-	43.4	65.1	30.0	44.8	21.0	49.0
Meander Width Ratio	-	-	3.9	4.5	3.3	5.7	5.1	7.6
Transport Parameters								
Boundary Shear Stress (lb/ft^2)	-		-		0.52		-	
Max part size (mm) mobilized at bankfull	-		-		2.00		-	
Stream Power (W/m^2)	-		-		29.80		-	
Additional Reach Parameters								
Rosgen Classification	N/A (Pond)		E5/C5		C5		C5	
Bankfull Velocity (fps)	2.7		4.5		4.4		4.0	
Bankfull Discharge (cfs)	16.9		-		16.9		16.9	
Sinuosity	-		1.1 - 1.3		1.18		1.17	
Water Surface Slope (Channel) (ft/ft)	0.016		0.020		0.017		0.015	
Bankfull Slope (ft/ft)	-		0.020		0.018		0.016	

Parameter	Pre-Restoration Condition		Reference Reach Data		Design		As-Built/ Baseline	
Reach ID: R4								
Dimension (Riffle)	Min	Max	Min	Max	Min	Max	Min	Max
Bankfull Width (ft)	6.2	-	4.5	8.3	6.2	8.5	6.2	8.5
Floodprone Width (ft)	44.1	-	10.0	35.0	17.0	35.0	17.0	35.0
Bankfull Mean Depth (ft)	1.0	-	0.8	1.6	0.7	0.9	0.7	0.9
Bankfull Max Depth (ft)	1.8	-	0.9	1.3	0.8	0.9	0.8	0.9
Bankfull Cross Sectional Area (ft^2)	6.2	-	3.0	5.0	6.2	6.2	6.2	6.2
Width/Depth Ratio	6.3	-	6.2	14.2	12.0	12.0	12.0	12.0
Entrenchment Ratio	7.1	-	7.1	8.4	1.8	5.3	1.8	1.8
Bank Height Ratio	1.0	-	0.9	1.1	1.0	1.1	1.0	1.1
Profile								
Riffle Length (ft)	9.5	21.9	9.5	22.7	12.0	33.0	9.5	21.9
Riffle Slope (ft/ft)	0.013	0.022	0.009	0.015	0.013	0.022	0.013	0.022
Pool Length (ft)	6.1	8.5	6.1	8.7	8.0	10.5	6.1	8.5
Pool Max Depth (ft)	2.0	2.2	1.8	2.4	1.4	2.0	2.0	2.2
Pool Spacing (ft)	18.0	44.0	14.4	22.3	25.0	55.0	18.0	44.0
Pattern								
Channel Beltwidth (ft)	29.0	53.0	23.4	29.0	25.0	45.0	29.0	53.0
Radius of Curvature (ft)	12.0	20.0	11.2	17.5	16.0	23.0	12.0	20.0
Rc:Bankfull Width (ft/ft)	1.9	3.2	1.6	2.5	2.0	3.0	1.9	3.2
Meander Wavelength (ft)	52.0	77.0	43.4	65.1	30.0	44.8	52.0	77.0
Meander Width Ratio	4.7	8.5	3.9	4.5	3.3	5.7	4.7	8.5
Transport Parameters								
Boundary Shear Stress (lb/ft^2)	-		-		0.49		-	
Max part size (mm) mobilized at bankfull	-		-		2.00		-	
Stream Power (W/m^2)	-		-		29.00		-	
Additional Reach Parameters								
Rosgen Classification	E5		E5/C5		E5		E5	
Bankfull Velocity (fps)	3.2		4.0		3.2		3.2	
Bankfull Discharge (cfs)	23.7		-		23.7		23.7	
Sinuosity	1.25		1.1 - 1.3		1.25		1.25	
Water Surface Slope (Channel) (ft/ft)	0.014		0.020		0.014		0.014	
Bankfull Slope (ft/ft)	0.015		0.020		0.015		0.015	

Parameter	Pre-Restoration Condition		Reference Reach Data		Design		As-Built/ Baseline	
Reach ID: R5								
Dimension (Riffle)	Min	Max	Min	Max	Min	Max	Min	Max
Bankfull Width (ft)	2.3	-	4.5	8.3	4.4	-	4.3	
Floodprone Width (ft)	3.3	-	10.0	35.0	15.0	30.0	24.0	
Bankfull Mean Depth (ft)	0.6	-	0.8	1.6	0.4	-	0.4	
Bankfull Max Depth (ft)	0.8	-	0.9	1.3	0.5	-	0.7	
Bankfull Cross Sectional Area (ft^2)	1.4	-	3.0	5.0	1.5	-	1.6	
Width/Depth Ratio	3.5	-	10.3	14.2	13.0	-	12.1	
Entrenchment Ratio	1.5	-	2.0	5.0	3.4	6.8	5.5	
Bank Height Ratio	3.3	-	0.9	1.1	1.0	-	1.0	
Profile								
Riffle Length (ft)	15.7	37.1	5.1	13.9	13.0	31.0	10.3	37.0
Riffle Slope (ft/ft)	0.019	0.027	0.017	0.026	0.015	0.027	0.017	0.027
Pool Length (ft)	3.1	11.0	4.5	7.0	6.8	9.4	4.7	8.5
Pool Max Depth (ft)	2.1	2.3	1.1	1.7	1.1	1.6	1.1	1.5
Pool Spacing (ft)	11.0	36.0	10.0	30.0	22.0	44.0	8.7	33.3
Pattern								
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-
Radius of Curvature (ft)	-	-	-	-	-	-	-	-
Rc:Bankfull Width (ft/ft)	-	-	-	-	-	-	-	-
Meander Wavelength (ft)	-	-	-	-	-	-	-	-
Meander Width Ratio	-	-	-	-	-	-	-	-
Transport Parameters								
Boundary Shear Stress ($lb/ft^{2)}$	-		-		0.48		-	
Max part size (mm) mobilized at bankfull	-		-		2.00		-	
Stream Power ($W/m^{2)}$	-		-		24.30		-	
Additional Reach Parameters								
Rosgen Classification	G5		B5		B5		B5	
Bankfull Velocity (fps)	4.7		4.0		4.5		4.5	
Bankfull Discharge (cfs)	4.5		-		4.5		4.5	
Sinuosity	1.03		1.1 - 1.2		1.25		1.06	
Water Surface Slope (Channel) (ft/ft)	0.026		0.025		0.027		0.025	
Bankfull Slope (ft/ft)	0.025		0.025		0.027		0.024	

Table 7b. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)						
Parameters	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	5.8	5.5	10.4	8.6	N/A	11.0		6.1	7.9	7.0	4.0	N/A	5.1		6.6	6.8	6.4	6.0	N/A	6.4	
Floodprone Width (ft)	23.1	23.0	21.7	21.6	N/A	22.7		45.0	45.0	49.0	49.0	N/A	48.8		46.0	45.0	50.0	46.2	N/A	44.7	
Bankfull Mean Depth (ft)	0.4	0.4	0.2	0.2	N/A	0.2		0.8	0.6	0.6	1.0	N/A	0.8		0.5	0.5	0.5	0.6	N/A	0.5	
Bankfull Max Depth (ft)	0.7	0.6	0.6	0.6	N/A	0.5		1.2	1.3	1.3	1.4	N/A	1.1		1.1	1.1	1.0	0.9	N/A	0.8	
Bankfull Cross Sectional Area (ft^2)	2.3	2.0	2.0	2.0	N/A	1.9		4.6	4.1	4.1	4.1	N/A	4.1		3.5	3.5	3.5	3.5	N/A	3.5	
Bankfull Width/Depth Ratio	14.6	13.2	55.2	38.0	N/A	61.9		8.0	14.2	12.0	3.9	N/A	6.3		12.7	13.0	11.9	10.1	N/A	11.8	
Bankfull Entrenchment Ratio	4.3	4.2	2.1	2.5	N/A	2.1		7.5	5.7	7.0	12.2	N/A	9.5		7.5	6.8	7.8	7.7	N/A	7.0	
Bankfull Bank Height Ratio	1.0	1.0	<1	<1	N/A	0.87		N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.0	1.1	1.1	N/A	1.00	
d50 (mm)	N/A	0.80	21.00	0.82	21.00	N/A		N/A	0.64	1.35	0.20	0.65	N/A		N/A	0.80	21.00	0.82	21.00	N/A	
	Cross Section 4 (Pool)							**Cross Section 5 (Riffle)**							**Cross Section 6 (Riffle)**						
Parameters	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	14.2	14.3	14.2	19.8	N/A	14.7		7.9	7.3	8.4	7.9	N/A	6.4		6.7	7.0	8.6	7.7	N/A	7.2	
Floodprone Width (ft)	68.0	68.0	68.0	68.0	N/A	68.0		59.0	59.0	49.0	59.1	N/A	61.3		49.0	49.0	49.0	49.0	N/A	49.0	
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.4	N/A	0.6		0.5	0.5	0.3	0.3	N/A	0.4		1.6	1.6	1.3	1.4	N/A	1.6	
Bankfull Max Depth (ft)	1.6	1.6	1.5	1.5	N/A	1.6		0.8	0.8	0.8	0.8	N/A	0.7		2.5	2.6	2.7	2.5	N/A	2.7	
Bankfull Cross Sectional Area (ft^2)	8.5	8.5	8.5	8.5	N/A	8.5		3.7	2.7	2.7	2.7	N/A	2.7		10.8	11.2	11.2	11.2	N/A	11.2	
Bankfull Width/Depth Ratio	23.8	24.4	23.8	46.5	N/A	25.3		16.8	15.1	25.2	23.1	N/A	14.9		4.2	4.4	6.7	5.3	N/A	4.6	
Bankfull Entrenchment Ratio	4.8	4.8	4.8	3.4	N/A	4.6		7.4	8.0	5.8	7.5	N/A	9.6		7.3	7.0	5.7	6.3	N/A	6.8	
Bankfull Bank Height Ratio	N/A	N/A	N/A	N/A	N/A	N/A		1.0	<1	1.0	1.0	N/A	1.08		1.0	1.0	1.0	1.0	N/A	1.06	
d50 (mm)	N/A	0.64	1.35	0.20	0.65	N/A		N/A	0.80	21.00	0.82	21.00	N/A		N/A	0.80	21.00	0.82	21.00	N/A	
	Cross Section 7 (Pool)							**Cross Section 8 (Riffle)**													
Parameters	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+							
Bankfull Width (ft)	13.1	12.7	10.7	8.0	N/A	6.9		4.3	4.6	4.9	8.6	N/A	5.0								
Floodprone Width (ft)	44.0	44.0	44.0	44.0	N/A	43.2		24.0	20.0	23.0	23.0	N/A	23.2								
Bankfull Mean Depth (ft)	1.2	1.3	1.2	1.5	N/A	1.8		0.4	0.5	0.4	0.2	N/A	0.4								
Bankfull Max Depth (ft)	2.9	2.8	2.9	3.0	N/A	3.1		0.7	0.6	0.7	0.6	N/A	0.7								
Bankfull Cross Sectional Area (ft^2)	15.4	12.3	12.3	12.3	N/A	12.3		1.6	2.1	2.1	2.1	N/A	2.1								
Bankfull Width/Depth Ratio	10.9	9.6	9.3	5.2	N/A	3.9		12.1	10.1	11.3	35.4	N/A	12.0								
Bankfull Entrenchment Ratio	3.4	3.5	4.1	5.5	N/A	6.2		5.5	4.3	4.7	2.7	N/A	4.7								
Bankfull Bank Height Ratio	N/A	N/A	N/A	N/A	N/A	N/A		1.0	1.2	1.0	<1	N/A	0.96								
d50 (mm)	N/A	0.64	1.35	0.20	0.65	N/A		N/A	0.80	21.00	0.82	21.00	N/A								

Table 7c. Monitoring Data - Stream Reach Summary
Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5	
Reach ID: R1												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	11.3	31.2										
Riffle Slope (ft/ft)	0.017	0.036										
Pool Length (ft)	5.5	12.5										
Pool Max depth (ft)	1.2	1.7										
Pool Spacing (ft)	7.7	33.3										
Pattern												
Channel Beltwidth (ft)	25	51										
Radius of Curvature (ft)	11	36										
Rc:Bankfull width (ft/ft)	2.1	4.2										
Meander Wavelength (ft)	23	56										
Meander Width Ratio	4.1	7.4										
Additional Reach Parameters												
Rosgen Classification	G5c											
Sinuosity (ft)	1.05											
Water Surface Slope (Channel) (ft/ft)	0.026											
BF slope (ft/ft)	0.0265											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations from baseline conditions

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5	
Reach ID: R2												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	9.9	33.3										
Riffle Slope (ft/ft)	0.016	0.033										
Pool Length (ft)	5.4	13.6										
Pool Max depth (ft)	1.2	1.9										
Pool Spacing (ft)	13	37.1										
Pattern												
Channel Beltwidth (ft)	25	47										
Radius of Curvature (ft)	9.8	30.3										
Rc:Bankfull width (ft/ft)	2.5	4.2										
Meander Wavelength (ft)	29	17										
Meander Width Ratio	4.4	7.9										
Additional Reach Parameters												
Rosgen Classification	C5											
Sinuosity (ft)	1.15											
Water Surface Slope (Channel) (ft/ft)	0.019											
BF slope (ft/ft)	0.019											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations from baseline conditions

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5	
Reach ID: R3												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	10	30										
Riffle Slope (ft/ft)	0.02	0.035										
Pool Length (ft)	7	10										
Pool Max depth (ft)	1.1	1.6										
Pool Spacing (ft)	11.8	35.5										
Pattern												
Channel Beltwidth (ft)	30	46										
Radius of Curvature (ft)	15	27										
Rc:Bankfull width (ft/ft)	2.5	4.2										
Meander Wavelength (ft)	21	49										
Meander Width Ratio	5.1	7.6										
Additional Reach Parameters												
Rosgen Classification	C5											
Sinuosity (ft)	1.17											
Water Surface Slope (Channel) (ft/ft)	0.0153											
BF slope (ft/ft)	0.016											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations from baseline conditions

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5	
Reach ID: R4												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	9.5	21.9										
Riffle Slope (ft/ft)	0.013	0.022										
Pool Length (ft)	6.1	8.5										
Pool Max depth (ft)	2	2.2										
Pool Spacing (ft)	18	44										
Pattern												
Channel Beltwidth (ft)	29	53										
Radius of Curvature (ft)	12	20										
Rc:Bankfull width (ft/ft)	1.9	3.2										
Meander Wavelength (ft)	52	77										
Meander Width Ratio	4.7	8.5										
Additional Reach Parameters												
Rosgen Classification	E5											
Sinuosity (ft)	1.25											
Water Surface Slope (Channel) (ft/ft)	0.014											
BF slope (ft/ft)	0.015											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations from baseline conditions

Parameter	Baseline		MY1		MY2		MY3		MY4		MY5	
Reach ID: R5												
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Profile												
Riffle Length (ft)	10.3	37										
Riffle Slope (ft/ft)	0.017	0.027										
Pool Length (ft)	4.7	8.5										
Pool Max depth (ft)	1.1	1.5										
Pool Spacing (ft)	8.7	33.3										
Pattern												
Channel Beltwidth (ft)	-	-										
Radius of Curvature (ft)	-	-										
Rc:Bankfull width (ft/ft)	-	-										
Meander Wavelength (ft)	-	-										
Meander Width Ratio	-	-										
Additional Reach Parameters												
Rosgen Classification	B5											
Sinuosity (ft)	1.06											
Water Surface Slope (Channel) (ft/ft)	0.025											
BF slope (ft/ft)	0.024											
[3]Ri% / Ru% / P% / G% / S%												
[3]SC% / Sa% / G% / C% / B% / Be%												
[3]d16 / d35 / d50 / d84 / d95 /												
[2]% of Reach with Eroding Banks												
Channel Stability or Habitat Metric												
Biological or Other												

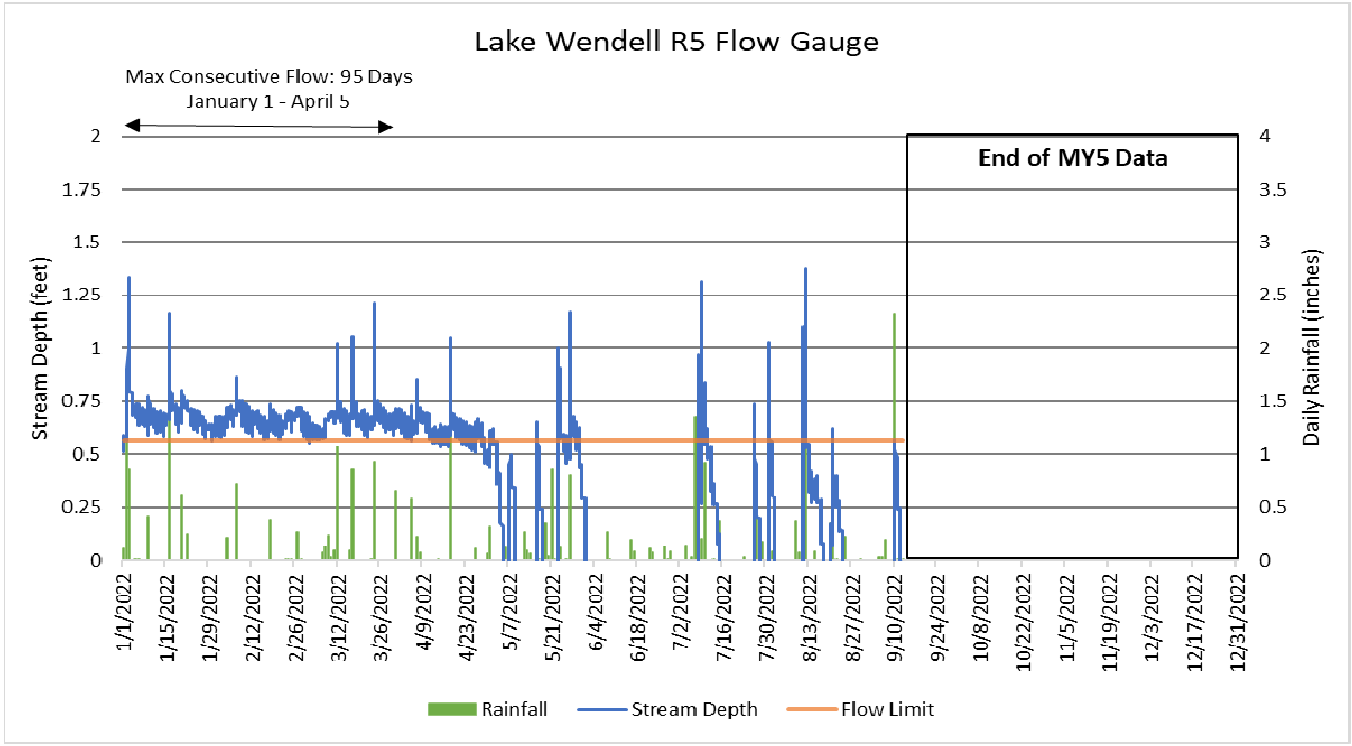
Pattern and Profile data will not typically be collected unless visual data, dimensional data or profile data indicate significant deviations from baseline conditions

Appendix E: Hydrologic Data

Table 8: Verification of Flow Events
Figure 3a: Hydrograph Data
Figure 3b: Groundwater Gauge Data
Figure 4: Monthly Rainfall Data

Table 8. Verification of Flow Events						
Monitoring Year	Date of Data Collection	Date of Occurrence	Method	Greater than Bankfull (Bkf) or Qgs (Q2*0.66 = 21.73 CFS) Stage?	Photo/ Notes	Height above bankfull
MY1	8/16/2018	8/3/2018	Crest Gauge	Bkf, 3" above FP elevation	Photos	
	9/17/2018	9/16-9/17/2018	Oberserved visual indicators (wrack lines) of stage after storm	Bkf	Photos	
	11/21/2018	9/16-9/17/2018	Crest Gauge	Bkf	Photos	
MY2	7/26/2019	7/24/2019	Crest Gauge	Bkf	Photos	.325 ft
	8/20/2019	uknown	Crest Gauge	Bkf & Qgs	Photos	.45 ft
MY3	2/7/2020	uknown	Crest Gauge	Bkf & Qgs	Photos	.6 ft
	9/30/2020	uknown	Crest Gauge	Bkf & Qgs	Photos	1.2 ft
MY4	1/13/2021	unknown	Crest Gauge	Bkf	Photos	0.5 ft
MY5	3/30/2022	unknown	Oberserved visual indicators (recent alluvial deposit and wrack lines) of stage after storm	Bkf	Photos	

Figure 3a: Hydrograph Data (pressure transducer)



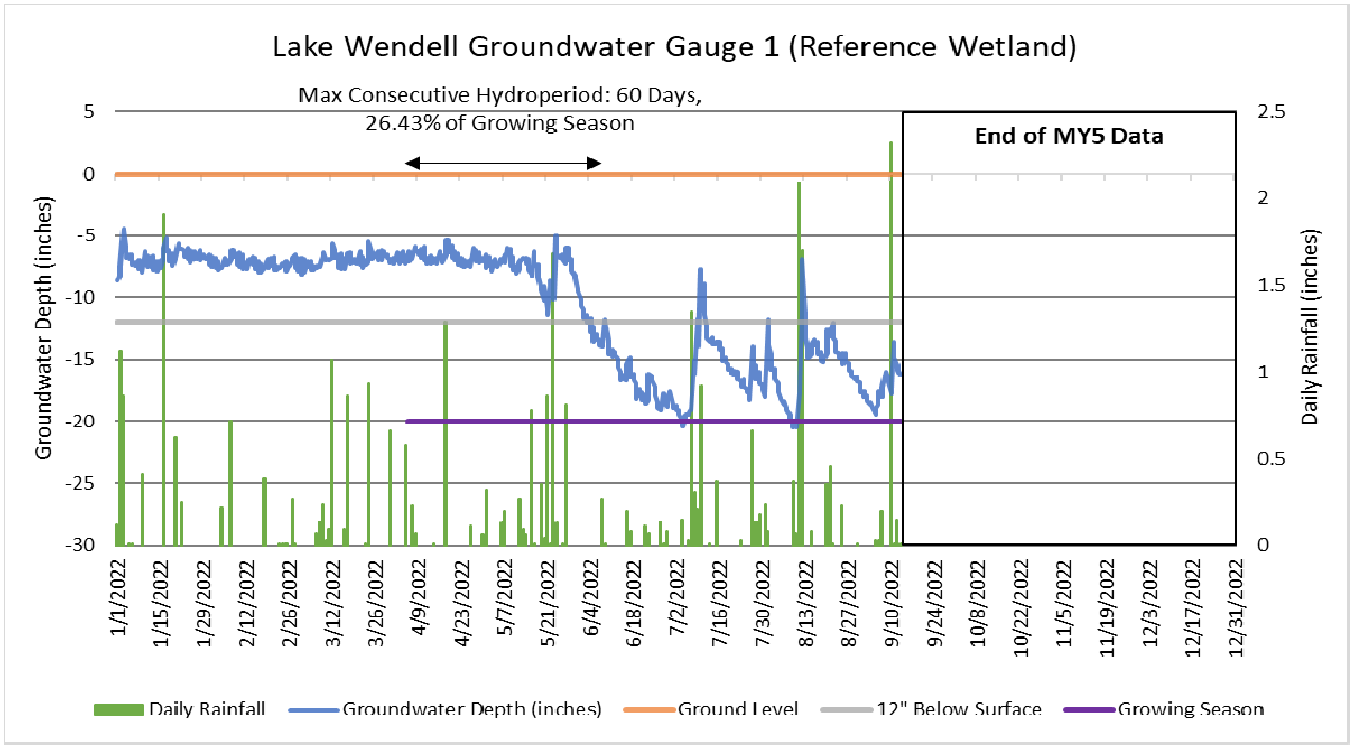
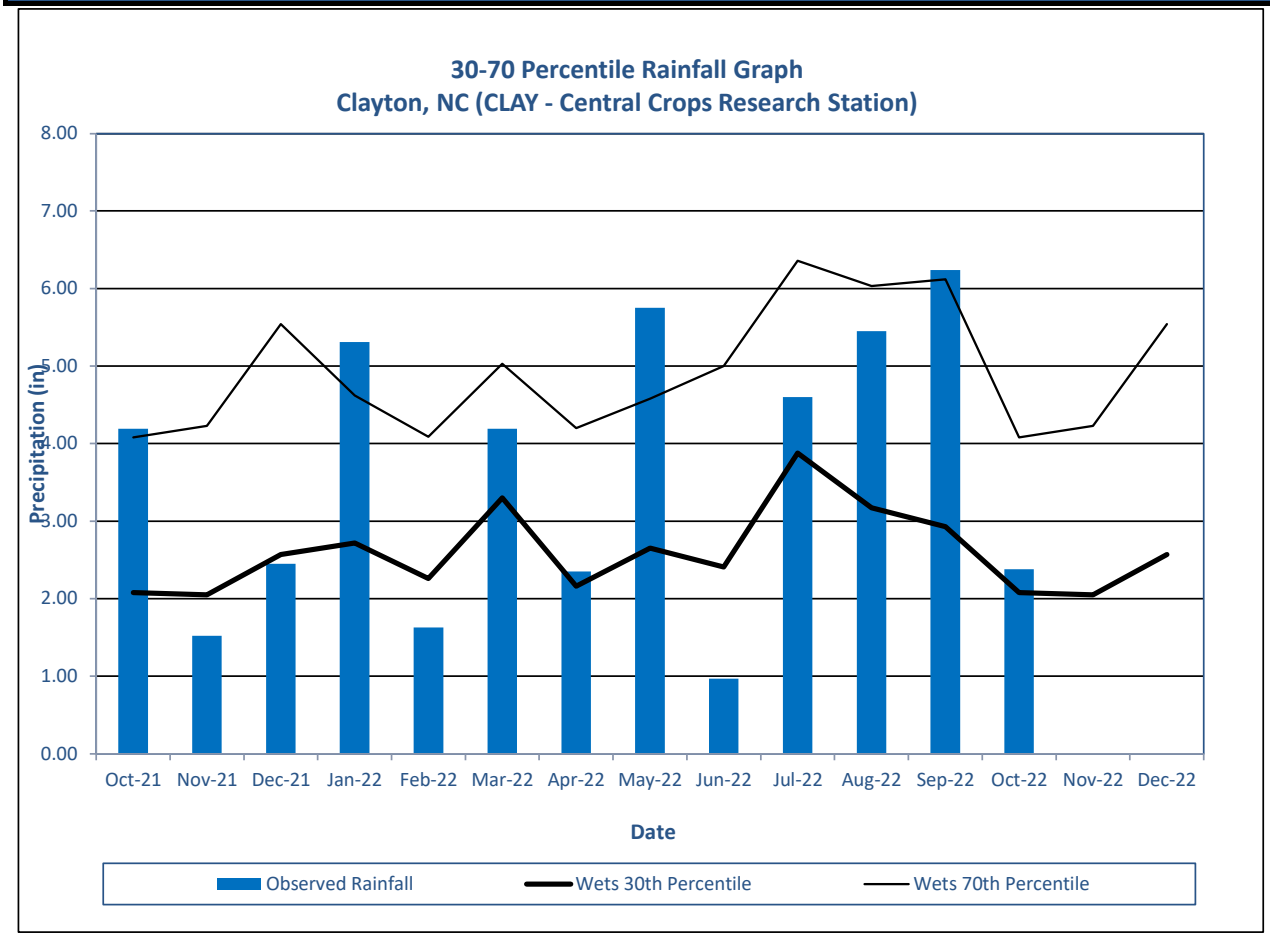


Figure 3b: Groundwater Gauge Data Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081) MY5 2022								
Monitoring Gauge Name	Max Consecutive Hydroperiod: Saturation within 12 Inches of Soil Surface (Percent of Growing Season) WETS Station: 317994 - Smithfield Growing Season: 4/6-11/4 (227 days)							
	2018	2019	2020	2021	2022	2023	2024	Mean
Lake Wendell Reference Wetland	95.20%	53.52%	32.16%	33.04%	26.43%			

Annual Precip Total	NA
WETS 30th Percentile	42.7
WETS 70th Percentile	51.8
Normal	Y

Figure 4: Monthly Rainfall Data
Lake Wendell Mitigation Project (NCDEQ DMS Project ID# 97081)
MY5 2022



*30th and 70th percentile rainfall data collected from weather station CLAY - Central Crops Research Station in Clayton, NC.
**Incomplete Month

Month	30%	70%	Observed
Oct-21	2.08	4.08	4.19
Nov-21	2.05	4.23	1.52
Dec-21	2.57	5.54	2.45
Jan-22	2.72	4.62	5.31
Feb-22	2.26	4.09	1.63
Mar-22	3.30	5.03	4.19
Apr-22	2.16	4.20	2.35
May-22	2.65	4.58	5.75
Jun-22	2.41	5.00	0.97
Jul-22	3.88	6.36	4.6
Aug-22	3.17	6.03	5.45
Sep-22	2.93	6.12	6.24
Oct-22	2.08	4.08	2.38
Nov-22	2.05	4.23	**
Dec-22	2.57	5.54	**

Appendix F: Correspondence

Attorney Landowner Encroachment Letter

Michael Best & Friedrich LLP
Attorneys at Law
Justin G. May
T 984.220.8747
E jgmay@michaelbest.com

June 24, 2022

VIA CERTIFIED MAIL – RETURN RECEIPT REQUESTED

W. Odell Edwards Irrevocable Trust
c/o Melanie E. Durham, Trustee
337 Jackson Road
Four Oaks, NC 27524

Re: Conservation Easement Encroachment - Cease and Desist

Dear Ms. Durham:

My firm represents Water and Land Solutions, LLC ("WLS"). This letter regards the conservation easement held upon your property by the State of North Carolina for the Lake Wendell Mitigation Project and for which WLS provides project management services. As you know, the State holds a permanent conservation easement that prohibits the destruction, cutting, or mowing of vegetation within the scope of the easement. It also prohibits the operation of vehicles, including mowers or agricultural equipment as well as the agricultural use of the land within the easement. For your reference, I have enclosed a copy of the deed and assignment for your reference.

Recently, it has come to WLS' attention that a trailer was placed near the easement. While the trailer itself is not an issue, WLS discovered, on June 14, 2022, mowing of vegetation on land surrounding the trailer that is within the bounds of the easement. For your reference, I have enclosed photographs of the mowing that violated the terms of the easement as well as an aerial view showing the exact location of the mowing marked "New Encroachment (Mowing MY5)". Please take note that this mowing constitutes a violation of the easement.

I respectfully ask that you address this matter with the occupant of the trailer and any other person who may mow the property surrounding the trailer. Please provide them with a copy of this letter to provide them notice of the encroachment and instructions to immediately cease and desist. To help prevent this from happening again, WLS has marked the easement line with additional t-posts and will be marking it with horse tape soon.

Our hope is that we can work to resolve this concern quickly and amicably to ensure the proper preservation of the conservation easement. However, please recall that if the State is unable to resolve these encroachments, it will consider all the remedies available to it consistent with the terms of the deed and assignment. This letter shall constitute the written notice required by Section IV.A of the Conservation Deed for the purpose of enforcement.

If you have any questions or concerns, please do not hesitate to contact my office or speak directly with Emily Dunnigan, WLS' Monitoring Manager, or Catherine Roland, WLS' Project Manager:

Emily Dunnigan
Water and Land Solutions, LLC
7721 Six Forks Road
Suite 130
Raleigh, NC 27615
Phone: (269) 908-6306
Email: emily@waterlandsolutions.com

Catherine Roland
Water and Land Solutions, LLC
7721 Six Forks Road
Suite 130
Raleigh, NC 27615
Phone: (571) 643-3165
Email: catherine@waterlandsolutions.com

Regards,

MICHAEL BEST & FRIEDRICH LLP

Justin G. May

JGM:

Encl.: 12 July 2017 Deed of Conservation Easement and Right of Access
Aerial Encroachment Map
14 June 2022 Photographs of Encroachment

Filed in JOHNSTON COUNTY, NC CRAIG OLIVE, Register of Deeds Filed 07/12/2017 12:00:18 PM
DEED BOOK: 4989 PAGE: 725-738 INSTRUMENT # 2017536744
Real Estate Excise Tax: $478.68 Deputy/Assistant Register of Deeds: Adi Santos

STATE OF NORTH CAROLINA

JOHNSTON COUNTY

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

Rec: 478.68

SPO File Number: 051-bx
DMS Project Number: 97081

Prepared by and mail after recording:
Robert H. Merritt, Jr.
Bailey & Dixon, LLP
P. O. Box 1351
Raleigh, NC 27602

THIS DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS, made this 12th day of July, 2017, by **Melanie E. Durham, Executrix under the Last Will and Testament of William Odell Edwards, deceased, Estate file 17-E-384, Johnston County, North Carolina and Successor Trustee of the W. Odell Edwards Revocable Trust under Agreement dated May 10, 2007, ("Grantor"),** whose mailing address is 337 Jackson Road, Four Oaks, NC 27524, to the **State of North Carolina**, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Division of Mitigation Services (formerly known as the Ecosystem Enhancement Program and the Wetlands Restoration Program) within the Department of Environmental Quality for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and

improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between **Water and Land Solutions, LLC,** 11030 Raven Ridge Road, Ste. 119, Raleigh, North Carolina 27614 and the North Carolina Department of Environmental Quality, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environmental Quality Purchase and Services Contract Number 6826.

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Understanding, (MOU) duly executed by all parties on November 4, 1998. This MOU recognized that the Wetlands Restoration Program was to provide effective compensatory mitigation for authorized impacts to wetlands, streams and other aquatic resources by restoring, enhancing and preserving the wetland and riparian areas of the State; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Division of Mitigation Services is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the Department of Environment and Natural Resources, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina Division of Water Quality, the North Carolina Division of Coastal Management, and the National Marine Fisheries Service entered into an agreement to continue the In-Lieu Fee operations of the North Carolina Department of Natural Resources' Division of Mitigation Services (formerly Ecosystem Enhancement Program) with an effective date of 28 July, 2010, which supersedes and replaces the previously effective MOA and MOU referenced above; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Division of Mitigation Services in the Department of Environmental Quality, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple in certain real property situated, lying, and being in Wilders Township, Johnston County, North Carolina (the "**Property**"), and being more particularly described as (1) that certain parcel of land containing approximately .49 acres (PIN: 179200-33-1900) and being conveyed to the decedent W. Odell Edwards by deed recorded in **Deed Book 4301 at Page 471,** of the Johnston County Registry, North Carolina, and (2) that certain parcel of land containing approximately 75.06 acres according to Johnston County tax records and 76.635 acres pursuant to survey (PIN: 179200-13-5539) and being conveyed to the decedent W. Odell Edwards by deed recorded in **Deed Book 910 at Page 218**, and **Deed Book 1900 at Page 478,** of the Johnston County Registry, North Carolina. The Last Will and Testament of W. Odell Edwards is probated in File No. 17-E-384, in the office of the Clerk of Court, Johnston County, North Carolina; and

WHEREAS, Grantor is willing to grant a Conservation Easement and Right of Access over the herein described areas of the Property, thereby restricting and limiting the use of the areas of the Property subject to the Conservation Easement to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept said Easement and Access Rights. The Conservation Easement shall be for the protection and benefit of the waters of an unnamed tributary to Buffalo Creek.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Conservation Easement Area consists of the following:

Conservation Easements identified as R-1, R-2, R-3 and R-4, as shown on a map entitled *"Conservation Easement Survey for State of North Carolina, Division of Mitigation Services, Lake Wendell Mitigation Project on the property of William Odell Edwards, deceased, Wilders Township, Johnston County, North Carolina"* dated April 12, 2017, and recorded in Plat Book 86, Page 148 & 149, of the Johnston County Registry.

TOGETHER with an easement for access, ingress, egress and regress as described on the above-referenced recorded plat and this Conservation Easement Deed.

The Conservation Easement described above is hereinafter referred to as the "Easement Area" or the "Conservation Easement Area" and is further set forth in a metes and bounds description attached hereto as Exhibit A and incorporated herein by reference.

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Conservation Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Conservation Easement Area in its natural condition, consistent with these purposes; and to prevent any use of

the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

The Conservation Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Conservation Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Conservation Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat.

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. Damage to Vegetation. Except within Crossing Area(s) as shown on the recorded survey plat and as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Conservation Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Conservation Easement Area is prohibited.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Conservation Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Conservation Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Conservation Easement Area.

H. Roads and Trails. There shall be no construction or maintenance of roads, trails, walkways, or paving in the Conservation Easement.

All roads, trails and crossings within the Conservation Easement Area shall be shown on the recorded survey plat.

I. Signs. No signs shall be permitted in the Conservation Easement Area except interpretive signs describing restoration activities and the conservation values of the Conservation Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Conservation Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Conservation Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling, hydraulic fracturing; removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Conservation Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Conservation Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Conservation Easement Area may temporarily be withdrawn for good cause shown as needed for the survival of livestock on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no further subdivision, partitioning, or dividing of the Conservation Easement Area portion of the Property owned by the Grantor in fee simple ("fee") that is subject to this Conservation Easement is allowed. Any future transfer of the Property shall be subject to this Conservation Easement and Right of Access and to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Conservation Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Conservation Easement Area and are non-transferrable.

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Conservation Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation Easement, and the Grantor obtains advance written approval from the Division of Mitigation Services, whose mailing address is 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual Right of Access to the Conservation Easement Area over the Property at reasonable times to undertake any activities to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. Conservation Easements are purchased to protect the investments by the State (Grantee) in natural resources. Livestock within conservation easements damage the investment and can result in reductions in natural resource value and mitigation credits which would cause financial harm to the State. Therefore, Landowners (Grantor) with livestock are required to restrict livestock access to the Conservation Easement Area. Repeated failure to do so may result in the State (Grantee) repairing or installing livestock exclusion devices (fences) within the conservation area for the purpose of restricting livestock access. In such cases, the landowner (Grantor) must provide access to the State (Grantee) to make repairs.

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features

in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Conservation Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Conservation Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision

to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed is subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the State Property Office and the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property or of any request to void or modify this Conservation Easement. Such notifications and modification requests shall be addressed to:

Division of Mitigation Services
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

and

General Counsel
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event

it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Conservation Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Conservation Easement Area, and the right of quiet enjoyment of the Conservation Easement Area,

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes,

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

[Remainder of this page intentionally left blank]

IN TESTIMONY WHEREOF, the Grantor has hereunto set her hand and seal, the day and year first above written.

GRANTOR:

Melanie E. Durham (SEAL)
Melanie E. Durham, Executrix of the Estate
of W. Odell Edwards and Successor Trustee
to the W. Odell Edwards Revocable Trust
under Agreement dated May 10, 2007

STATE OF NORTH CAROLINA
COUNTY OF WAKE

I, Robert H. Merritt, JR, the undersigned Notary Public, certify that Melanie E. Durham, the Grantor, being Executrix under the Last Will and Testament of William Odell Edwards, deceased, filed at 17-E-384, Johnston County, North Carolina and being the Successor Trustee of the W. Odell Edwards Revocable Trust under Agreement dated May 10, 2007, personally appeared before me this day, and acknowledged to me that she voluntarily signed the forgoing document in the capacities indicated.

Witness my hand and official stamp or seal, this the 12th day of JULY, 2017.

(NOTARY SEAL)
My Comm. Exp. 5/1/2022

Robt H Merritt
NOTARY PUBLIC

ROBERT H. MERRITT, JR. NOTARY PUBLIC WAKE COUNTY, NC

Exhibit A
Legal Description
Permanent Conservation Easements
Lake Wendell
Johnston County, NC

1. Permanent Conservation Easement (PIN: 179200-33-1900) R-1

A permanent conservation easement over a portion of land in Wilders Township, Johnston County, North, as shown on map entitled "Conservation Easement Survey for State of North Carolina, Division of Mitigation Services, Lake Wendell Mitigation Project on the property of William Odell Edwards, Deceased, Wilders Township, Johnston County, North Carolina," dated April 12, 2017, and recorded in Plat Book 85, at Page 148 & 149, Johnston County Registry, and being a portion of a parcel owned by William Odell Edwards (PIN: 179200-33-1900), more particularly described as follows:

Commencing at a point, said point being an iron pipe set along the western right-of-way of Wendell Road (SR 1701) in Wilders Township, Johnston County, North Carolina. Point further described as the southeastern corner of the Russell Richardson Heirs property as recorded in Deed Book 1052 Page 337 (Parcel Number 16K02036), Johnston County Registry. Point also described as the northeastern corner of the William Odell Edwards property as recorded in Deed Book 1900 Page 478. Thence from said point in a southerly direction along the western right-of-way of Wendell Road a bearing and distance of S 15°34'00" W 146.58 feet to an iron pipe set. Thence leaving the western right-of-way of Wendell Road a bearing and distance of N 71°39'46" W 37.46 feet to a point and the **POINT OF BEGINNING.** Thence S 15°47'02" W a distance of 15.96 feet to a point. Thence N 71°53'26" W a distance of 113.66 feet to a point. Thence S 25°12'23" W a distance of 56.14 feet to a point. Thence N 89°59'38" W a distance of 21.12 feet to a point. Thence N 24°47'17" E a distance of 79.28 feet to a point. Thence S 71°39'46" E a distance of 130.81 feet to a point and the **POINT OF BEGINNING** and containing 0.076 acres.

2. Permanent Conservation Easement (PIN: 179200-13-5539) R-2

A permanent conservation easement over a portion of land in Wilders Township, Johnston County, North, as shown on map entitled "Conservation Easement Survey for State of North Carolina, Division of Mitigation Services, Lake Wendell Mitigation Project on the property of William Odell Edwards, Deceased, Wilders Township, Johnston County, North Carolina," dated April 12, 2017, and recorded in Plat Book 85, at Page 148 & 149, Johnston County Registry, and being a portion of a parcel owned by William Odell Edwards (PIN: 179200-13-5539), more particularly described as follows:

Commencing at a point, said point being an iron pipe set along the western right-of-way of Wendell Road (SR 1701) in Wilders Township, Johnston County, North Carolina. Point further described as the southeastern corner of the Russell Richardson Heirs property as recorded in Deed Book 1052 Page 337 (Parcel Number 16K02036), Johnston County Registry. Point also described as the northeastern corner of the William Odell Edwards property as recorded in Deed Book 1900 Page 478. Thence from said point in a southerly direction along the western right-of-way of Wendell Road a bearing and distance of S 15°34'00" W 146.58 feet to an iron pipe set. Thence leaving the western right-of-way of Wendell Road a bearing and distance of N 71°39'46" W 37.46 feet to a point and the **POINT OF BEGINNING.** Thence N 71°39'46" W a distance of 130.81 feet to a point. Thence S 24°47'17" W a distance of 79.28 feet to a point. Thence N 89°59'38" W a distance of 178.81 feet to a point. Thence N 09°58'23" E a distance of 127.00 feet to a point. Thence S 86°31'47" E a distance of 137.00 feet to a point. Thence N 58°31'43" E a distance of 55.73 feet to a point. Thence S 76°02'14" E a distance of 156.42 feet to a point. Thence S 15°47'02" W a distance of 80.37 feet to a point and the **POINT OF BEGINNING** and containing 0.788 acres.

3. Permanent Conservation Easement (PIN: 179200-13-5539) R-3

A permanent conservation easement over a portion of land in Wilders Township, Johnston County, North, as shown on map entitled "Conservation Easement Survey for State of North Carolina, Division of Mitigation Services, Lake Wendell Mitigation Project on the property of William Odell Edwards, Deceased, Wilders Township, Johnston County, North Carolina," dated April 12, 2017, and recorded in Plat Book 85, at Page 148 & 149, Johnston County Registry, and being a portion of a parcels owned by William Odell Edwards (PIN: 179200-13-5539), more particularly described as follows:

Commencing at a point, said point being an iron pipe set along the western right-of-way of Wendell Road (SR 1701) in Wilders Township, Johnston County, North Carolina. Point further described as the southeastern corner of the Russell Richardson Heirs property as recorded in Deed Book 1052 Page 337 (Parcel Number 16K02036), Johnston County Registry. Point also described as the northeastern corner of the William Odell Edwards property as recorded in Deed Book 1900 Page 478. Thence from said point in a southerly direction along the western right-of-way of Wendell Road a bearing and distance of S 15°34'00" W 146.58 feet to an iron pipe set. Thence leaving the western right-of-way of Wendell Road a bearing and distance of N 71°39'46" W 168.27 feet to a point. Thence S 24°47'17" W 79.28 feet to a point. Thence N 89°59'38" W 178.81 feet to a point. Thence N 89°59'38" W 30.46 feet to a point and the **POINT OF BEGINNING.** Thence N 54°36'58" W a distance of 56.13 feet to a point. Thence N 89°35'35" W a distance of 66.02 feet to a point. Thence S 54°19'34" W a distance of 149.00 feet to a point. Thence S 76°53'30" E a distance of 120.00 feet to a point. Thence S 48°59'06" E a distance of 90.00 feet to a point. Thence S 06°59'23" E a distance of 84.00 feet to a point. Thence N 74°58'57" W a distance of 230.00 feet to a point. Thence S 89°02'02" W a distance of 201.12 feet to a point. Thence N 79°35'46" W a distance of 376.05 feet to a point. Thence N 82°06'47" W a distance of 289.20 feet to a point. Thence N 78°46'55" W a distance of 395.42 feet to a point. Thence S 60°34'02" W a distance of 343.56 feet to a point. Thence S 83°42'58" W a distance of 307.47 feet to a point. Thence N 04°38'44" W a distance of 173.16 feet to a point. Thence N 83°30'17" E a distance of 254.44 feet to a point. Thence N 67°23'24" E a distance of 452.82 feet to a point. Thence S 69°48'10" E a distance of 250.60 feet to a point. Thence S 81°52'27" E a distance of 589.06 feet to a point. Thence S 75°38'07" E a distance of 203.44 feet to a point. Thence N 57°18'35" E a distance of 309.48 feet to a point. Thence S 87°08'23" E a distance of 200.00 feet to a point. Thence S 09°58'23" W a distance of 129.00 feet to a point and the **POINT OF BEGINNING** and having an area of 8.333 acres.

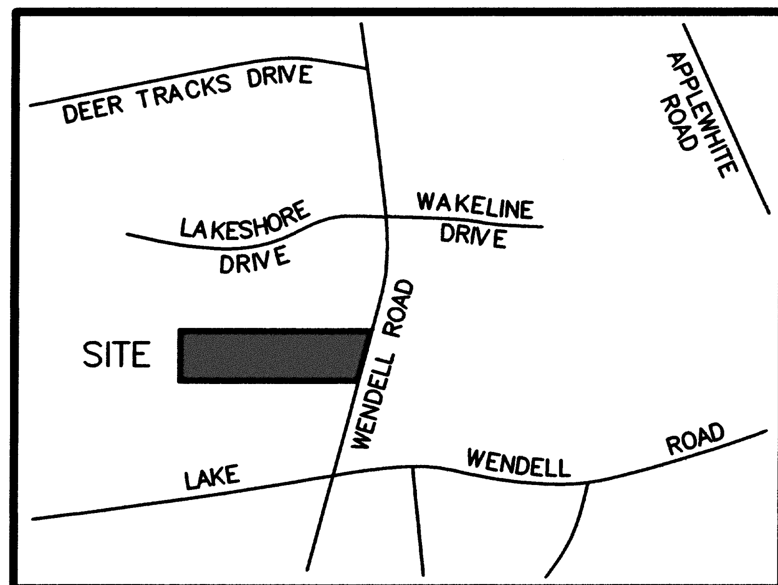
4. Permanent Conservation Easement (PIN: 179200-13-5539) R-4

A permanent conservation easement over a portion of land in Wilders Township, Johnston County, North, as shown on map entitled "Conservation Easement Survey for State of North Carolina, Division of Mitigation Services, Lake Wendell Mitigation Project on the property of William Odell Edwards, Deceased, Wilders Township, Johnston County, North Carolina," dated April 12, 2017, and recorded in Plat Book 85, at Page 148 & 149, Johnston County Registry, and being a portion of

a parcel owned by William Odell Edwards (PIN: 179200-13-5539), more particularly described as follows:

Commencing at a point. said point being an iron pipe set along the western right-of-way of Wendell Road (SR 1701) in Wilders Township, Johnston County, North Carolina. Point further described as the southeastern corner of the Russell Richardson Heirs property as recorded in Deed Book 1052 Page 337 (Parcel Number 16K02036), Johnston County Registry. Point also described as the northeastern corner of the William Odell Edwards property as recorded in Deed Book 1900 Page 478. Thence leaving the western right-of-way of Wendell Road in a westerly direction a bearing and distance of N 87°25'25" W 1180.32 feet to an iron pipe found. Thence N 87°25'25" W 2035.73 feet to an iron pipe found along the bank of Lake Wendell. Thence a bearing and distance of S 61°12'34" E 670.19 feet to a point and the **POINT OF BEGINNING.** Thence S 04°53'15" E a distance of 175.00 feet to a point. Thence S 88°41'41" W a distance of 310.00 feet to a point. Thence S 61°23'03" W a distance of 200.00 feet to a point. Thence N 83°09'27" W a distance of 285.47 feet to a point. Thence N 16°14'45" E a distance of 135.00 feet to a point. Thence N 85°24'44" E a distance of 200.00 feet to a point. Thence N 72°56'55" E a distance of 200.00 feet to a point. Thence N 83°10'49" E a distance of 328.00 feet to a point and the **POINT OF BEGINNING** and containing 2.770 acres.

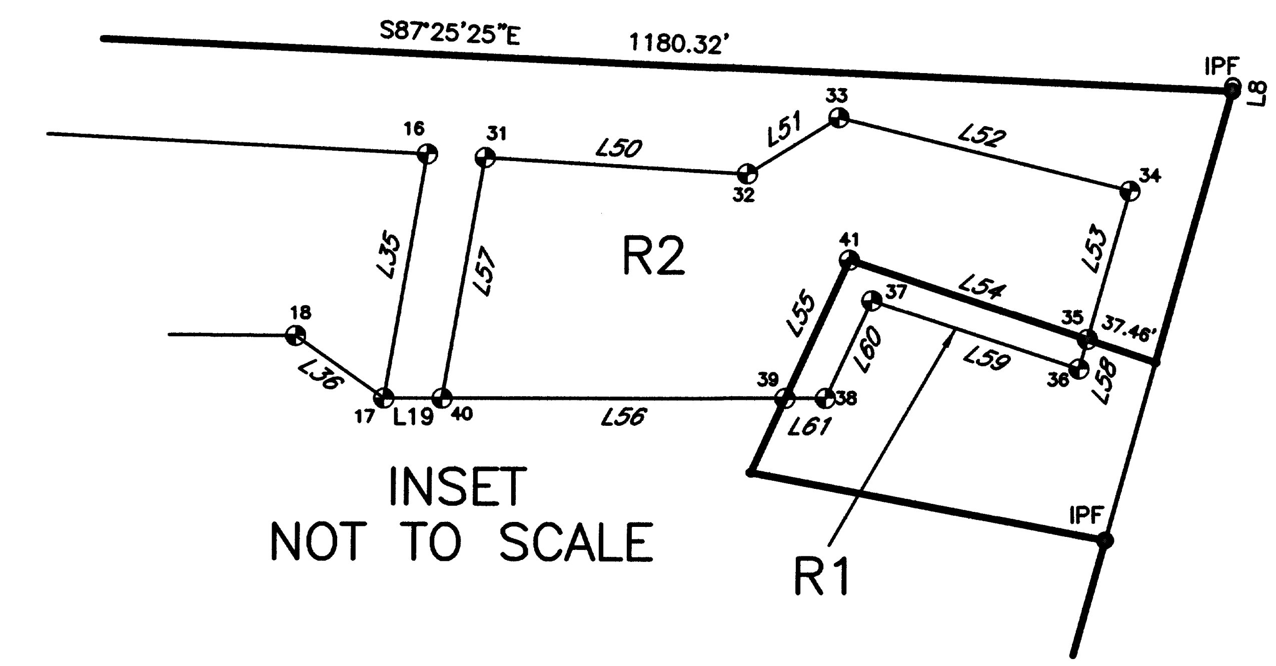
0418591/1



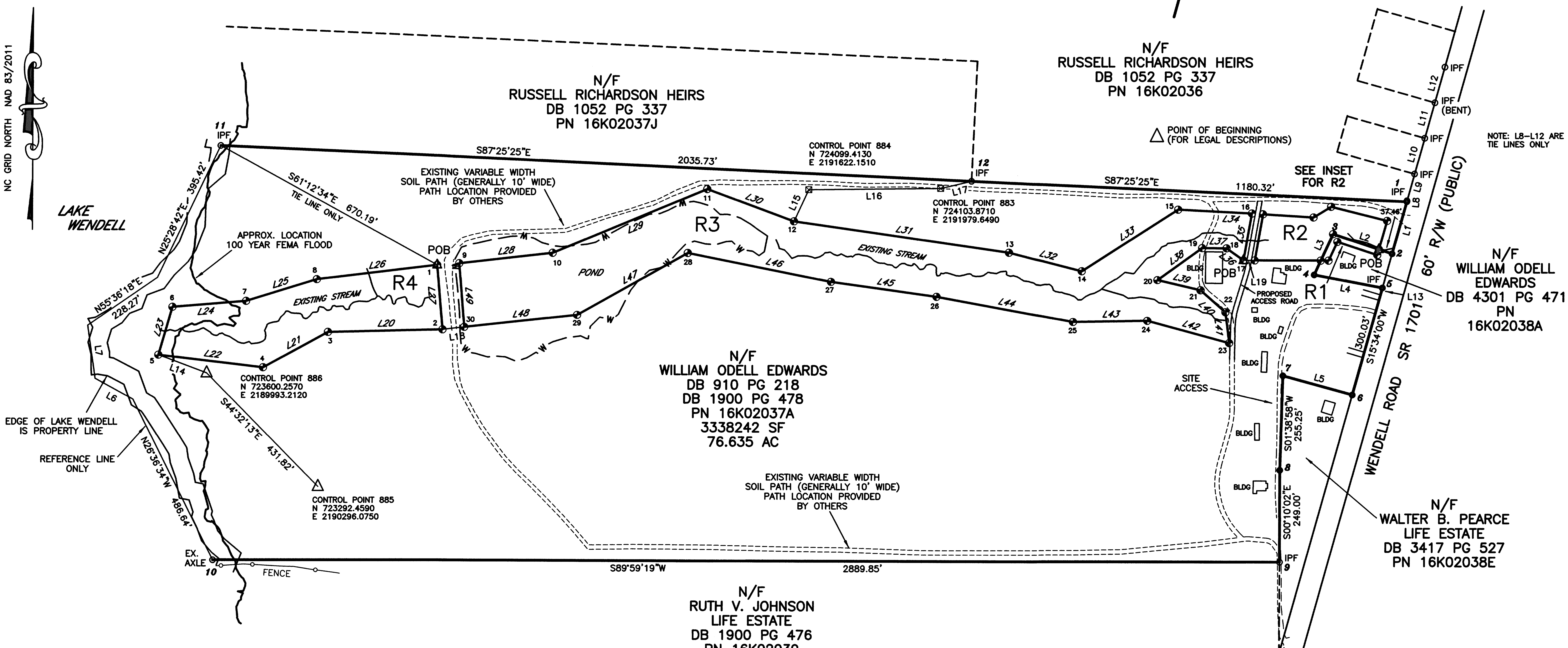
VICINITY MAP (NOT TO SCALE)

BOUNDARY CORNER POINT CHART

POINT NO.	NORTHING	EASTING
1	724070.5735	2193242.1900
2	723929.3746	2193202.8549
3	723982.3140	2193043.1290
4	723871.8631	2192992.1216
5	723836.7680	2193176.7150
6	723547.6773	2193096.5217
7	723598.7652	2192908.4816
8	723343.6209	2192901.1338
9	723094.6220	2192901.8600
10	723094.0447	2190012.0099
11	724215.1406	2190029.3943
12	724123.6310	2192063.0630



LINE	BEARING	DISTANCE
L1	S15°34'00"W	146.58'
L2	N71°39'46"W	168.27'
L3	S24°47'17"W	121.66'
L4	S79°14'07"E	187.90'
L5	N74°48'02"W	194.86'
L6	N61°10'24"W	116.81'
L7	N08°13'05"W	145.26'
L8	N05°45'30"E	2.77'
L9	N15°38'02"E	74.85'
L10	N15°38'41"E	100.36'
L11	N15°49'31"E	99.71'
L12	N15°27'04"E	100.02'
L13	S79°14'07"E	0.33'
L14	S69°27'05"E	139.35'
L15	N24°53'03"E	94.18'
L16	N89°17'08"E	357.53'
L17	N76°40'22"E	85.72'
L18	N83°11'18"E	59.30'
L19	S89°59'38"E	30.46'



N/F
RUTH V. JOHNSON
LIFE ESTATE
DB 1900 PG 476
PN 16K02039

STATE OF NORTH CAROLINA, JOHNSTON COUNTY

I, CURK T. LANE, DO HEREBY CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK 1900, PAGE 478, ETC.); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK 1900, PAGE 478; THAT THE RATIO OF PRECISION AS CALCULATED IS 1:10,000+; THAT THE GLOBAL POSITIONING ACCURACY (GPS) OBSERVATIONS WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS, PART 2: STANDARDS FOR GEODETIC NETWORKS AT 1 CENTIMETER ACCURACY CLASSIFICATION (95% CONFIDENCE) USING RTK NETWORK; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED. THAT THIS PLAT MEETS THE REQUIREMENT OF G.S. 47-30 SECTION F-11 -d. WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS 27th DAY OF JUNE, A.D. 2017

NORTH CAROLINA PROFESSIONAL SEAL L-3990 LAND SURVEYOR CURK T. LANE

SURVEYOR

L - 3990
LICENSE NUMBER

CONSERVATION EASEMENT SURVEY
FOR

STATE OF NORTH CAROLINA
DIVISION OF MITIGATION SERVICES
LAKE WENDELL MITIGATION PROJECT

ON THE PROPERTY OF

WILLIAM ODELL EDWARDS, DECEASED

WILDERS TOWNSHIP, JOHNSTON COUNTY
NORTH CAROLINA
JUNE 27, 2017
SHEET 1 OF 2
SPO FILE NO: 051-bx
NCDMS IMS PROJECT NO: 97081

OWNER: WILLIAM ODELL EDWARDS, DECEASED
100 SALEM CHURCH RD
WENDELL, N.C. 27591

0 200 400 600
SCALE: 1" = 200'

STATE OF NORTH CAROLINA, JOHNSTON COUNTY

THIS INSTRUMENT WAS PRESENTED FOR REGISTRATION AND RECORDING THIS 12 DAY OF July 2017 AT 12:00:18 PM

CRAIG OLIVE
REGISTER OF DEEDS
BY [signature], deputy
~~ASST.~~ REG. OF DEEDS

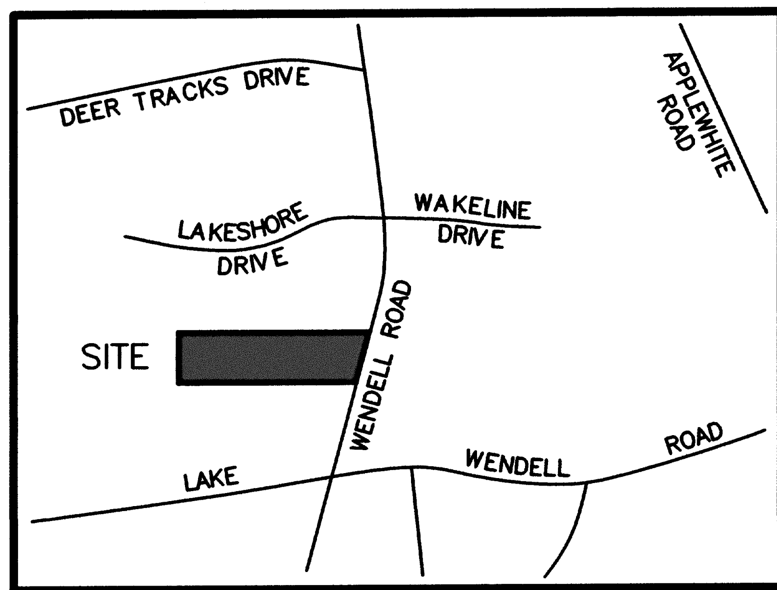
RECORDED IN PB 85 PG 148

SURVEYED BY:	TLS
DRAWN BY:	MIKE
CHECKED BY:	CURK
DRAWING NAME:	RESTORATION.DWG
SURVEY DATE:	11-15-16
JOB NO.	2862.001

TRUE LINE SURVEYING, P.C.

205 WEST MAIN STREET
CLAYTON, N.C. 27520
TELEPHONE: (919) 359-0427
FAX: (919) 359-0428
www.truelinesurveying.com

C-1859



VICINITY MAP (NOT TO SCALE)

NOTES

1. THE PURPOSE OF THIS PLAT IS TO IDENTIFY THE LOCATION OF CONSERVATION EASEMENTS (DEPICTED AS TRACT R1, TRACT R2, TRACT R3 AND TRACT R4 HEREIN) TO PROVIDE A BASIS FOR THE CONVEYANCE AND DEDICATION OF SAID CONSERVATION EASEMENTS AND TO PROVIDE ACCESS EASEMENTS OVER THE ASSOCIATED LANDS. THIS PLAT DOES NOT CREATE NEW PROPERTY LINES OR AFFECT ANY EXISTING PROPERTY LINES.
2. BOUNDARY INFORMATION IS DERIVED FROM DEEDS, PLATS AND TAX RECORDS OF THE JOHNSTON COUNTY REGISTRY AS SHOWN HEREON, SURVEYED BOUNDARY LINES ARE SHOWN AS SOLID LINES.
3. THE RIGHT(S) OF NON-EXCLUSIVE INGRESS, EGRESS, AND REGRESS OVER THE SUBJECT PROPERTY AND OVER AND ALONG ANY AND ALL EXISTING PATHS/ROADS TRANSECTING THE SUBJECT PROPERTY ARE RESERVED BY THE GRANTOR(S) AND THE GRANTEE(S) OF THE CONSERVATION EASEMENT(S) AS SET FORTH HEREIN AND IN THE CONSERVATION EASEMENT DEED RECORDED IN CONNECTION WITH THIS CONSERVATION EASEMENT PLAT FOR THE USE AND PURPOSES NOT INCONSISTENT WITH THE USES OF TRACTS R1, R2, R3 AND R4 DESCRIBED HEREON FOR CONSERVATION EASEMENT PURPOSES.

OWNERS CERTIFICATE

PIN: 179200-33-1900
PIN: 179200-13-5539

I, MELANIE E. DURHAM, AS EXECUTRIX UNDER THE LAST WILL AND TESTAMENT OF WILLIAM ODELL EDWARDS, DECEASED (17-E-384) JOHNSTON COUNTY, NORTH CAROLINA, AND AS SUCCESSOR TRUSTEE OF THE W. ODELL EDWARDS REVOCABLE TRUST UNDER AGREEMENT DATED MAY 10, 2007 (THE "TRUST") HEREBY CERTIFY THAT IN MY CAPACITY AS EXECUTRIX OF THE ESTATE OF WILLIAM ODELL EDWARDS AND SUCCESSOR TRUSTEE UNDER THE TRUST, I AM THE OWNER OF THE PROPERTY SHOWN AND DESCRIBED HEREON, WHICH PROPERTY WAS CONVEYED TO WILLIAM ODELL EDWARDS BY DEEDS RECORDED IN BOOK 4301, PAGE 471, PAGE 910, PAGE 218 AND BOOK 1900, PAGE 478 JOHNSTON COUNTY REGISTRY; AND THAT I, IN MY CAPACITY AS EXECUTRIX AND TRUSTEE, HEREBY ADOPT THE PLAN OF SUBDIVISION AND GRANT AND CONVEY THE EASEMENTS HEREIN WITH MY FREE CONSENT. FURTHER, I HEREBY CERTIFY THAT THE LAND, AS SHOWN HEREIN, IS WITHIN THE SUBDIVISION REGULATION JURISDICTION OF JOHNSTON COUNTY, NORTH CAROLINA.

Melanie E. Durham, Executrix and Trustee 7-12-17
MELANIE E. DURHAM, EXECUTRIX AND TRUSTEE DATE

STATE OF NORTH CAROLINA
COUNTY OF WAKE

I, Robert H. Merritt, Jr., THE UNDERSIGNED NOTARY PUBLIC, CERTIFY THAT MELANIE E. DURHAM, EXECUTRIX UNDER THE LAST WILL AND TESTAMENT OF WILLIAM ODELL EDWARDS, DECEASED, FILED AT 17-E-384, JOHNSTON COUNTY, NORTH CAROLINA AND BEING THE SUCCESSOR TRUSTEE OF THE W. ODELL EDWARDS REVOCABLE TRUST UNDER AGREEMENT DATED MAY 10, 2007, PERSONALLY APPEARED BEFORE ME THIS DAY AND ACKNOWLEDGED TO ME THAT SHE VOLUNTARILY SIGNED THE FORGOING DOCUMENT.

WITNESS MY HAND AND NOTARIAL STAMP OR SEAL THIS 12th DAY OF JULY, 2017

ROBERT H. MERRITT, JR. NOTARY PUBLIC WAKE COUNTY, NC

NOTARY PUBLIC

MY COMMISSION EXPIRES: 5/1/2022

THIS SURVEY:

IS OF ANOTHER CATEGORY SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION

06-27-17
DATE SURVEYOR

SURVEYOR'S DISCLAIMER: NO ATTEMPT WAS MADE TO LOCATE ANY CEMETERIES, WETLANDS, HAZARDOUS MATERIAL SITES, UNDERGROUND UTILITIES OR ANY OTHER FEATURES ABOVE OR BELOW GROUND OTHER THAN THOSE SHOWN.

06-27-17
DATE SURVEYOR

STATE OF NORTH CAROLINA, JOHNSTON COUNTY

I, CURK T. LANE, DO HEREBY CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN BOOK 1900, PAGE 478, ETC.); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN BOOK 1900, PAGE 478; THAT THE RATIO OF PRECISION AS CALCULATED IS 1: 10,000+; THAT THE GLOBAL POSITIONING ACCURACY (GPS) OBSERVATIONS WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS, PART 2: STANDARDS FOR GEODETIC NETWORKS AT 1 CENTIMETER ACCURACY CLASSIFICATION (95% CONFIDENCE) USING RTK NETWORK; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED. THAT THIS PLAT MEETS THE REQUIREMENT OF G.S. 47-30 SECTION F-11 -d. WITNESS MY ORIGINAL SIGNATURE AND SEAL THIS 27th DAY OF JUNE, A.D. 2017

NORTH CAROLINA PROFESSIONAL SEAL L-3990 LAND SURVEYOR CURK T. LANE

SURVEYOR

L - 3990
LICENSE NUMBER

REVIEW OFFICER'S CERTIFICATE

I, Joni R. Sanderford REVIEW OFFICER OF JOHNSTON COUNTY, NC CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

7/12/2017
DATE REVIEW OFFICER

STATE OF NORTH CAROLINA, JOHNSTON COUNTY

THIS INSTRUMENT WAS PRESENTED FOR REGISTRATION AND RECORDING THIS 12 DAY OF July 2017 AT 12:00:18 PM

CRAIG OLIVE BY [signature], deputy
REGISTER OF DEEDS ~~ASST.~~ REG. OF DEEDS

RECORDED IN PB 85 PG 149

EXEMPT FROM SUBDIVISION REGULATION WITHIN THE JOHNSTON COUNTY PLANNING JURISDICTION
7/12/17
DATE PLANNER

R-1

LINE	BEARING	DISTANCE
L58	S15°47'02"W	15.96'
L59	N71°53'26"W	113.66'
L60	S25°12'23"W	56.14'
L61	N89°59'38"W	21.12'

3291 SF
0.076 AC

R-2

LINE	BEARING	DISTANCE
L50	S86°31'47"E	137.00'
L51	N58°31'43"E	55.73'
L52	S76°02'14"E	156.42'
L53	S15°47'02"W	80.37'
L54	N71°39'46"W	130.81'
L55	S24°47'17"W	79.28'
L56	N89°59'38"W	178.81'
L57	N09°58'23"E	127.00'

34344 SF
0.788 AC

R-3

LINE	BEARING	DISTANCE
L28	N83°30'17"E	254.44'
L29	N67°23'24"E	452.82'
L30	S69°48'10"E	250.60'
L31	S81°52'27"E	589.06'
L32	S75°38'07"E	203.44'
L33	N57°18'35"E	309.48'
L34	S87°08'23"E	200.00'
L35	S09°58'23"W	129.00'
L36	N54°36'58"W	56.13'
L37	N89°35'35"W	66.02'
L38	S54°19'34"W	149.00'
L39	S76°53'30"E	120.00'
L40	S48°59'06"E	90.00'
L41	S06°59'23"E	84.00'
L42	N74°58'57"W	230.00'
L43	S89°02'02"W	201.12'
L44	N79°35'46"W	376.05'
L45	N82°06'47"W	289.20'
L46	N78°46'55"W	395.42'
L47	S60°34'02"W	343.56'
L48	S83°42'58"W	307.47'
L49	N04°38'44"W	173.16'

363004 SF
8.333 AC

R-4

LINE	BEARING	DISTANCE
L20	S88°41'41"W	310.00'
L21	S61°23'03"W	200.00'
L22	N83°09'27"W	285.47'
L23	N16°14'45"E	135.00'
L24	N85°24'44"E	200.00'
L25	N72°56'55"E	200.00'
L26	N83°10'49"E	328.00'
L27	S04°53'15"E	175.00'

120662 SF
2.770 AC

CONSERVATION EASEMENT POINT CHART

POINT	NORTHING	EASTING
1	723892.3700	2190616.7427
2	723718.0063	2190631.6527
3	723710.9446	2190321.7331
4	723615.1578	2190146.1630
5	723649.1691	2189862.7283
6	723778.7786	2189900.4957
7	723794.7762	2190099.8549
8	723853.4220	2190291.0634
9	723897.6284	2190676.5120
10	723926.4108	2190929.3149
11	724100.5008	2191347.3327
12	724013.9809	2191582.5234
13	723930.7170	2192165.6732
14	723880.2451	2192362.7534
15	724047.3960	2192623.2151
16	724037.4154	2192822.9659
17	723910.3647	2192800.6249
18	723942.8694	2192754.8591
19	723943.3384	2192688.8449
20	723856.4459	2192567.8048
21	723829.2309	2192684.6780
22	723770.1678	2192752.5865
23	723686.7921	2192762.8086
24	723746.3885	2192540.6639
25	723742.9978	2192339.5696
26	723810.9078	2191969.7027
27	723850.5904	2191683.2421
28	723927.5181	2191295.3730
29	723758.6943	2190996.1596
30	723725.0399	2190690.5364
31	724035.4424	2192853.0792
32	724027.1499	2192989.8280
33	724056.2454	2193037.3608
34	724018.5027	2193189.1576
35	723941.1604	2193167.2954
36	723925.8058	2193162.9552
37	723961.1362	2193054.9219
38	723910.3399	2193031.0121
39	723910.3422	2193009.8916
40	723910.3615	2192831.0846
41	723982.3140	2193043.1290

CONSERVATION EASEMENT SURVEY
FOR

STATE OF NORTH CAROLINA DIVISION OF MITIGATION SERVICES LAKE WENDELL MITIGATION PROJECT

ON THE PROPERTY OF

WILLIAM ODELL EDWARDS, DECEASED

WILDERS TOWNSHIP, JOHNSTON COUNTY
NORTH CAROLINA
JUNE 27, 2017
SHEET 2 OF 2
SPO FILE NO: 051-bx
NCDMS IMS PROJECT NO: 97081

OWNER: WILLIAM ODELL EDWARDS, DECEASED
100 SALEM CHURCH RD
WENDELL, N.C. 27591

LEGEND

IPF	IRON PIPE FOUND
IPS	IRON PIPE SET
CMF	CONCRETE MONUMENT FOUND
PKNF	PARKER-KALON NAIL FOUND
PNKS	PARKER-KALON NAIL SET
RRS	RAILROAD SPIKE
CC	CONTROL CORNER
	REBAR WITH 3-1/4" ALUMINUM CAPS WITH NC STATE LOGO
CP	COMPUTED POINT
P/P	POWER POLE
OPW	OVERHEAD POWER LINE
R/W	RIGHT OF WAY
S.F.	SQUARE FEET
AC	ACRE
DB	DEED BOOK
PB	PLAT BOOK
BOM	BOOK OF MAPS
PG	PAGE
LF	LINEAR FEET
15S	LOT HAS OFFSITE SEWER
15SL	OFFSITE SEWER LOT
15R	RECOMBINATION LOT
100	STREET ADDRESS
----	LINES NOT SURVEYED

SURVEYED BY:	TLS
DRAWN BY:	MIKE
CHECKED BY:	CURK
DRAWING NAME:	RESTORATION.DWG
SURVEY DATE:	11-15-16
JOB NO.	2862.001

TRUE LINE SURVEYING, P.C.

205 WEST MAIN STREET
CLAYTON, N.C. 27520
TELEPHONE: (919) 359-0427
FAX: (919) 359-0428
www.truelinesurveying.com

C-1859

WATER & LAND™ SOLUTIONS

Lake Wendell Mitigation Project
Johnston County, North Carolina

NCDMS Contract No. 6826
NCDMS Project No. 97081
June 2022
MY5

Landowner Encroachment Map

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
1


6/14/22, 10:46 AM
Johnston County


6/14/22, 10:37 AM
Johnston County