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Monitoring Report- Year 5  
FINAL VERSION  
Pen Dell Mitigation Project (Riparian Buffer Mitigation)  
Calendar Year of Data Collection: 2022

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NCDEQ DMS Project Identification # 97079  
NCDEQ DMS Contract # 6824  
Neuse River Basin (Cataloging Unit 03020201)  
USACE Action ID Number: SAW-2016-00885  
NCDEQ DWR Project # 2016-0403 V2  
Johnston County, NC  
Contracted Under RFP # 16-006477  
Data Collection Period: September 2022  
Submission Date: November 30<sup>th</sup>, 2022



Prepared for:



**North Carolina Department of Environmental Quality**  
**Division of Mitigation Services**  
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## 1 Project Summary

Water and Land Solutions, LLC (WLS) completed the construction and planting of the Pen Dell Mitigation Project (Project) full-delivery project for the North Carolina Department of Environmental Quality (NCDEQ), Division of Mitigation Services (DMS) in April 2018. The Project is located in Johnston County, NC between the Community of Archer Lodge and the Town of Wendell at 35.73125°, -78.35281°. The Project site is located in the NCDEQ Sub-basin 03-04-06, in the Lower Buffalo Creek Priority Sub-watershed 030202011504.

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 5,064 linear feet of streams and 633,803 square feet of riparian buffers. WLS staff visited the site several times throughout Monitoring Year 5 (MY5) for monitoring activities. MY5 data collection occurred in September 2022 (Table 2). This report presents the data for MY5. The Project meets the MY5 success criteria for vegetation. Based on these results, WLS proposes closing out the riparian buffer mitigation project.

## 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 the Targeted Local Watershed 03020201180050.

The catchment area is 156 acres and has an impervious cover of approximately one percent. The dominant surrounding land uses are agriculture and mixed forest. Prior to construction, livestock had access to Reaches R3 and R4, and the riparian buffers were less than 50 feet wide on all reaches except R5.

### 2.2 Mitigation Project Goals and Objectives

The following riparian buffer mitigation site -specific goals were developed:

- Restore and protect riparian buffer functions and habitat connectivity in perpetuity by recording a permanent conservation easement,
- Implement agricultural BMPs to reduce nonpoint source inputs to receiving waters.

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

- Increase native species riparian buffer vegetation density/composition along streambank and floodplain areas that meet requirements of a minimum 50-foot-wide and 260 stems/acre after monitoring year 5,
- 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 Project will provide riparian buffer mitigation credits in accordance with North Carolina Administrative Code (NCAC), “Consolidated Buffer Mitigation Rule”, Rule 15A NCAC 02B .0295, effective November 1, 2015. Riparian buffer mitigation site viability was confirmed by DWRs April 28, 2016 letter entitled “Site Viability for Buffer Mitigation & Nutrient Offset – Pen Dell Located Near 2505 Wendell Rd, Wendell, NC, Johnston County”. The referenced viability letter specified for Reach R1 that riparian buffer credits only being allowed outside of 25 feet off the top of stream banks. The described site viability confirmation included a determination by DWR that Project Reaches R2, R3 (Includes Project Reach R4) and R5 were either intermittent or perennial. A request for Stream Origin/Buffer Applicability Determination for Project Reach R1, as required in the referenced viability letter, was submitted to DWR on June 10, 2016. On June 20, 2016 and June 21, 2016 DWR performed the requested determination and Reach R1 was determined to be intermittent, as communicated in the DWR June 22, 2016 letter entitled “Subject: Buffer Determination Letter, NBRO #16-180 Johnston County”, therefore confirming Reach R1’s eligibility for riparian buffer mitigation. See Appendix D for DWR correspondence and approval letters.

The final mitigation plan and PCN were submitted to DMS September 29, 2017, for submission to DWR and the NCIRT. The Section 404 General (Regional and Nationwide) Permit Verification was issued January 12, 2018. Project construction started on January 29, 2018 and mitigation site earthwork was completed on April 1, 2018, and mitigation site planting was completed on April 6, 2018, both by RiverWorks Construction. Trueline Surveying, PC completed the as-built survey in June 2018. WLS completed the installation of baseline monitoring devices on April 19, 2018, and the installation of survey monumentation and conservation easement boundary marking on June 7, 2018. Monitoring year 1 occurred between April and November 2018. Monitoring year 2 occurred in between November 2018 and October 2019. Monitoring Year 3 occurred between September 2020 and October 2020. Monitoring Year 4 occurred in September 2021. Monitoring Year 5 occurred in September 2022.

During MY5, WLS discovered that the powerline right-of-way that was removed from DMS stream credits had not been removed from buffer credits. The powerline right of way runs along Lake Wendell Road and overlays the mitigation easement. The conflict was initially addressed at the As-Built stage and Reach R4 was reduced by 35 feet. WLS has removed the buffer credits in the powerline area, this resulted in a reduction of 4,613 restoration buffer credits and 3 enhancement buffer credits. With the reduction in buffer restoration credits the amount of preservation credits was also reduced to comply with the buffer Rule 15A NCAC 02B .0295 (n)(2), that preservation may be no more than 25 percent of the total area. The new total buffer credits for the project is 357,861.800.

The project background and attribute summary are presented in Table 1. Refer to Figure 1 and Table 2 for the project areas and buffer asset information. Relevant project contact information is presented in Table 3.

## 3 Project Mitigation Components

### 3.1 Riparian Buffer Mitigation Types and Approaches

Riparian buffer mitigation included restoring, enhancing and preserving the riparian buffer functions and corridor habitat. The project included planting to re-establish a native species vegetation riparian buffer corridor, which extended a minimum of 50 feet from the top of the streambanks along each of the project



reaches, as well as permanently protecting those buffers with a conservation easement. Many areas of the conservation easement had riparian buffer widths greater than 50 feet established along one or both streambanks to provide additional functional uplift. The only exception is at the upstream end of Reach R2, where the width of the proposed left riparian buffer varies between 20 feet and 29 feet from the right top of bank. This narrow area of proposed riparian buffer is due to the site constraint caused by an existing residential driveway. For project reaches proposed for restoration and enhancement, the riparian buffers were restored through reforestation of the entire conservation easement with native species riparian buffer vegetation. For project reach sections proposed for preservation, the existing riparian buffers are permanently protected via the conservation easement. A significant area of the existing northern riparian buffer for Reach R2 was incorrectly described as “Native hardwood forest, closed canopy” in the referenced site viability letter, as this area of the buffer was a fescue lawn. WLS proposed this area for riparian buffer restoration in the approved mitigation plan (Figure 11 Riparian Buffer Mitigation). Additionally, permanent fencing was installed along with alternative watering systems to exclude livestock from the restored riparian buffer and conservation easement areas. Table 1 and Figure 1 (Appendix A) provide a summary of the project components.

### 3.1.1 Tree and Shrub Planting Approaches

The riparian buffer planting zones for the project included the streambanks, floodplain, riparian wetland, and upland transitional areas. The as-built planting boundaries are shown on the as-built vegetation plans in Appendix E and Figure 1. Proposed plantings were conducted using native species bare-root trees and shrubs, live stakes, and seedlings. Proposed plantings predominantly consisted of bare-root vegetation and were generally planted at a total target density of 680 stems per acre. WLS implemented a riparian buffer planting strategy that includes a combination of overstory, or canopy, and understory species. The site planting strategy also included early successional, as well as climax species. The vegetation selections were mixed throughout the project planting areas so that the early successional species will give way to climax species as they mature over time.

### 3.1.2 Temporary and Permanent Seeding Approaches

Permanent seed mixtures of native species herbaceous vegetation and temporary herbaceous vegetation seed mixtures were applied to all disturbed areas of the project site. Temporary and permanent seeding were conducted simultaneously at all disturbed areas of the site during construction utilizing mechanical broadcast spreaders. The as-built re-vegetation plan lists the utilized species, mixtures, and application rates for permanent seeding.

### 3.1.3 Invasive Species Vegetation Treatment

During the project construction, invasive species exotic vegetation was either mechanically removed or chemically treated both to control its presence and reduce its spread within the conservation easement areas. During MY5 vegetation assessment, no areas of concern was observed within the conservation easement boundary.

## 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 five years. Specific success criteria components and evaluation methods are described below.

#### 4.1 Vegetation

Measurements of the final vegetative restoration success for the project will be achieving a density of not less than 260, five-year-old planted stems per acre in Year 5 of monitoring. This final performance criteria shall include a minimum of four native hardwood tree species or four native hardwood tree and native shrub species, where no one species is greater than 50 percent of the stems. Native hardwood tree and native shrub volunteer species will be included to meet the final performance criteria of 260 stems per acre. Volunteer species are only counted if they are at least 12" tall. Volunteer species will only be included if surviving for at least two years and are included were included in the approved planting plan. In addition, diffuse flow of runoff shall be maintained in the riparian buffer areas.

### 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 and was intended to document the site improvements based on restoration potential, catchment health, ecological stressors and overall constraints. All the monitoring device locations are depicted on the CCPV (Figure 1) and MY5 monitoring data results are listed in the appendices. The Project meets the MY5 success criteria for vegetation.

#### 5.1 Vegetation

Vegetation monitoring for MY5 was conducted utilizing the 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. All veg plots meet the vegetative success criteria of at least 260 planted stems per acre at the end of MY5 and the site is on trajectory to remain successful. Vegetation plots ranged from 324 to 849 stems per acre. The number of hardwood tree and shrub species ranged from 4 to 10 species per plot. The greatest percentage of a species in a single plot ranged from 19 percent to 50 percent. Summary data and photographs of each plot can be found in Appendix B and C.

The MY5 vegetation monitoring was also conducted utilizing visual assessment throughout the easement. A small encroachment area (VPA1) of approximately 0.05 acres was found along R1 left floodplain during a spring MY4 site visit. No trees were damaged due to mowing, only herbaceous vegetation. During MY5, encroachment in this area has stopped. Three additional encroachments were discovered during MY5. VPA2 (0.006 acres) and VPA3 (0.012 acres) are small encroachments due to mowing along the farm field of the right floodplain of R1. VPA4 (0.003 acres) is a small encroachment caused by mowing along the driveway adjacent to the easement near R2. All encroachments have been marked with additional t-posts and horse tape. These areas will be monitored closely in MY6 to ensure encroachments have ceased.

An area along R1 with dense pine volunteers was identified during MY5 (0.58 acres). During MY6, pine will be thinned to allow desirable volunteer and planted species to further establish. Pine will be thinned by hand. The results of the visual assessment did not indicate any additional significant negative changes to the existing vegetation community.



## 6 References

- Lee, M., Peet R., Roberts, S., Wentworth, T. CVS-NCEEP Protocol for Recording Vegetation, Version 4.1, 2007.
- North Carolina Department of Environmental Quality, Division of Mitigation Services, Wildlands Engineering, Inc. 2015. Neuse 01 Regional Watershed Plan Phase II. Raleigh, NC.
- North Carolina Department of Environmental Quality, Division of Mitigation Services, 2017. Annual Monitoring Report Format, Data and Content Requirement. Raleigh, NC.
- Schafale, M. P., and A. S. Weakley. 1990. Classification of the natural communities of North Carolina, third approximation. North Carolina Natural Heritage Program. NCDENR Division of Parks and Recreation. Raleigh, NC.
- United States Army Corps of Engineers. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. Environmental Laboratory. US Army Engineer Waterways Experiment Station. Vicksburg, MS.
- \_\_\_\_\_. 1997. Corps of Engineers Wetlands Research Program. Technical Note VN-RS-4.1. Environmental Laboratory. U.S. Army Engineer Waterways Experiment Station. Vicksburg, MS.
- \_\_\_\_\_. 2003. Stream Mitigation Guidelines, April 2003, U.S. Army Corps of Engineers. Wilmington District.
- Water and Land Solutions, LLC (2017). Pen Dell Stream and Riparian Buffer Mitigation Plan. NCDMS, Raleigh, NC.

# Appendix A:

## Background Tables



<b>Table 1. Buffer Project Attributes</b>	
<b>Project Name</b>	<b>Pen Dell Mitigation Project</b>
<b>Hydrologic Unit Code</b>	<b>03020201</b>
<b>River Basin</b>	<b>Neuse</b>
<b>Geographic Location (Lat, Long)</b>	<b>35°43' 52.51'' N 78°21' 10.12'' W</b>
<b>Site Protection Instrument (DB, PG)</b>	<b>85, 148</b>
<b>Total Credits (BMU)</b>	<b>0</b>
<b>Types of Credits</b>	<b>Riparian Buffer</b>
<b>Mitigation Plan Date</b>	<b>Nov-18</b>
<b>Initial Planting Date</b>	<b>Mar-18</b>
<b>Baseline Report Date</b>	<b>Nov-18</b>
<b>MY1 Report Date</b>	<b>Dec-18</b>
<b>MY2 Report Date</b>	<b>Dec-19</b>
<b>MY3 Report Date</b>	<b>Nov-20</b>
<b>MY4 Report Date</b>	<b>Oct-21</b>
<b>MY5 Report Date</b>	<b>Nov-22</b>

Table 2. Buffer Project Areas and Assets											If Converted to Nutrient Offset		
RIPARIAN BUFFER (15A NCAC 02B.0295)											Nutrient Offset: N (lbs)	Nutrient Offset: P (lbs)	
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	Convertible to Nutrient Offset (Yes or No)		
Rural or Urban	Subject or Nonsubject	Restoration		20-29			1	75%	1.33333	0.000		-	0.000
Rural or Urban	Subject or Nonsubject	Restoration	Restoration	0-100	282,274	282,274	1	100%	1.00000	282,274.000	Yes	14,729.435	--
Rural or Urban	Subject or Nonsubject	Restoration		101-200			1	33%	3.03030	0.000		-	0.000
Rural or Urban	Subject or Nonsubject	Enhancement		20-29			2	75%	2.66667	0.000		-	0.000
Rural or Urban	Subject or Nonsubject	Enhancement	Cattle Exc. Enh	0-100	124,085	124,085	2	100%	2.00000	62,042.500	No	-	0.000
Rural or Urban	Subject or Nonsubject	Enhancement		101-200			2	33%	6.06061	0.000		-	0.000
<b>SUBTOTALS</b>						<b>406,359</b>				<b>344,316.500</b>		<b>14,729.435</b>	<b>0.000</b>
<b>ELIGIBLE PRESERVATION AREA</b>						<b>135,453</b>							
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			
Rural	Subject	Preservation		20-29			10	75%	13.33333	0.000			
Rural	Subject	Preservation	Preservation	0-100	222,827	135,453	10	100%	10.00000	13,545.300			
Rural	Subject	Preservation		101-200			10	33%	30.30303	0.000			
Rural	Nonsubject	Preservation		20-29			5	75%	6.66667	0.000			
Rural	Nonsubject	Preservation		0-100			5	100%	5.00000	0.000			
Rural	Nonsubject	Preservation		101-200			5	33%	15.15152	0.000			
Urban	Subject or Nonsubject	Preservation		20-29			3	75%	4.00000	0.000			
Urban	Subject or Nonsubject	Preservation		0-100			3	100%	3.00000	0.000			
Urban	Subject or Nonsubject	Preservation		101-200			3	33%	9.09091	0.000			
<b>SUBTOTALS</b>						<b>135,453</b>							
<b>TOTALS</b>						<b>541,812</b>							
										<b>13,545.300</b>			
										<b>357,861.800</b>			

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

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

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

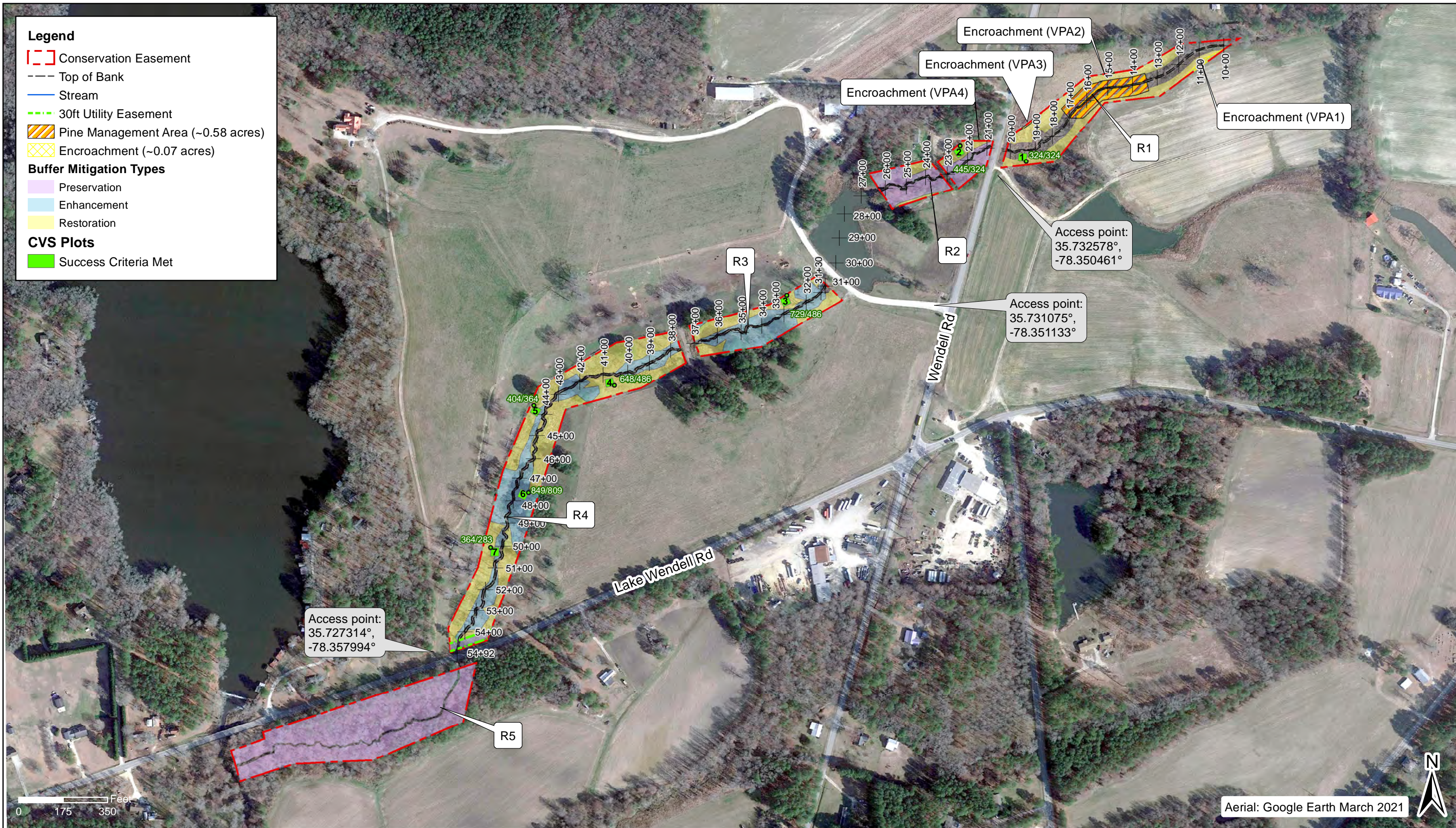
\*Previous year total buffer credit was 362,631.200. After removing the area in the powerline right-of-way new total buffer credit is 357,861.800.

**Table 3. Project Contacts  
Pen Dell Mitigation Project (NCDEQ DMS Project ID# 97079)**

<b>Mitigation Provider</b>	Water & Land Solutions, LLC
	7721 Six Forks Road, Suite 130, Raleigh, NC 27615
Primary Project POC	Catherine Manner Phone: 571-643-3165
<b>Construction Contractor</b>	RiverWorks Construction
	114 W. Main Street, Suite 106, Clayton, NC 27520
Primary Project POC	Bill Wright Phone: 919-590-5193
<b>Survey Contractor (Existing Condition Surveys)</b>	WithersRavenel
	115 MacKenan Drive, Cary, NC 27511
Primary Project POC	Marshall Wight, PLS Phone: 919-469-3340
<b>Survey Contractor (Conservation Easement, Construction and As-Builts Surveys)</b>	True Line Surveying, PC
	205 West Main Street, Clayton, NC 27520
Primary Project POC	Curk T. Lane, PLS 919-359-0427
<b>Planting Contractor</b>	RiverWorks Construction
	114 W. Main Street, Suite 106, Clayton, NC 27520
Primary Project POC	Bill Wright Phone: 919-590-5193
<b>Seeding Contractor</b>	RiverWorks Construction
	114 W. Main Street, Suite 106, Clayton, NC 27520
Primary Project POC	Bill Wright Phone: 919-590-5193
<b>Seed Mix Sources</b>	Green Resource
	5204 Highgreen Ct., Colfax, NC 27235
	Rodney Montgomery Phone: 336-215-3458
<b>Nursery Stock Suppliers</b>	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
<b>Monitoring Performers</b>	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

# Appendix B:

## Visual Assessment Data



<b>Table 4</b> <b>Project</b> <b>Planted Acreage<sup>1</sup></b>							<b>Vegetation Condition Assessment</b> <b>Pen Dell Mitigation Project (NCDEQ DMS Project ID# 97079)</b> <b>10.1</b>						
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	Pattern and Color	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%							
<b>Total</b>				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%							
<b>Cumulative Total</b>				0	0.00	0.0%							
<b>Easement Acreage<sup>2</sup></b>							<b>15.95</b>						
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage							
4. Invasive Areas of Concern <sup>4</sup>	Areas or points (if too small to render as polygons at map scale).	1000 SF	Pattern and Color	0	0.00	0.0%							
5. Easement Encroachment Areas <sup>3</sup>	Areas or points (if too small to render as polygons at map scale).	none	yellow hatch	4	0.07	0.7%							



Veg Plot 1, April 12, 2018 (MY-00)



9/13/22, 1:01 PM  
Johnston County

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



Veg Plot 2, April 12, 2018 (MY-00)



9/13/22, 1:17 PM  
Johnston County

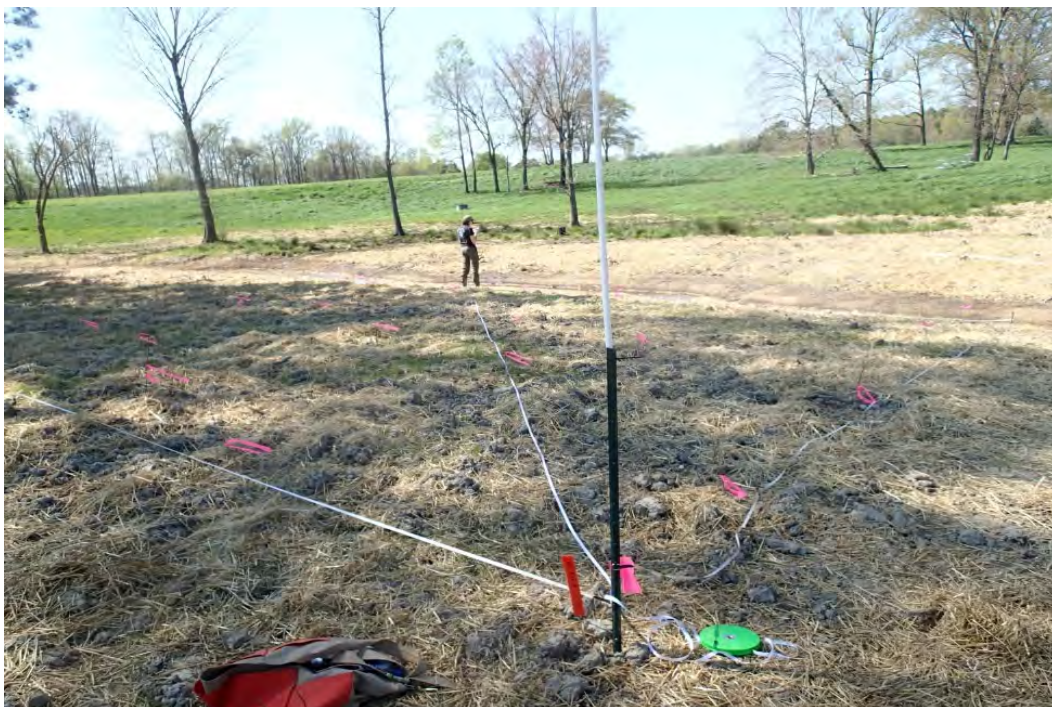
Veg Plot 2, September 13, 2022 (MY-05)



Veg Plot 3, April 12, 2018 (MY-00)



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



Veg Plot 4, April 12, 2018 (MY-00)



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

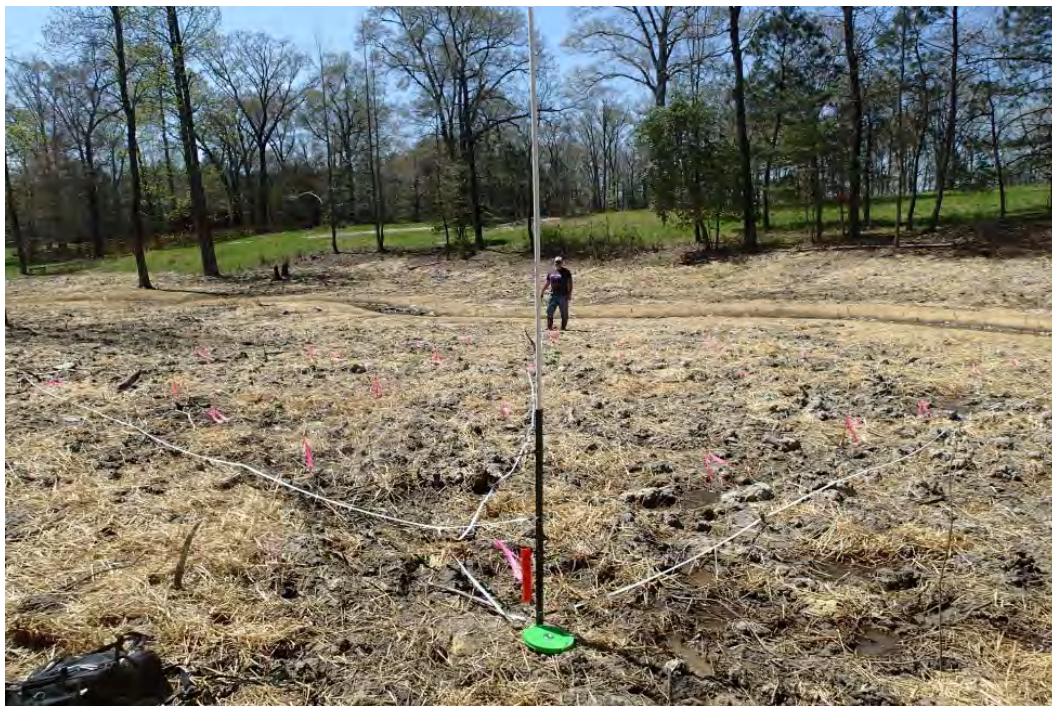




Veg Plot 5, April 12, 2018 (MY-00)



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



Veg Plot 6, April 12, 2018 (MY-00)



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



Veg Plot 7, April 12, 2018 (MY-00)



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

3/25/21, 10:21 AM  
Johnston



Encroachment (VPA1), R1 Left Floodplain, March 17, 2021 (MY-04)

9/13/22 12:45 PM  
Johnston County



Encroachment (VPA1), R1 Left Floodplain, September 13, 2022 (MY-05)

9/14/21 11:14 AM  
Johnston County



Encroachment (VPA1) R1 Left Floodplain, September 14, 2021 (MY-04)

9/13/22 12:45 PM  
Johnston County



Encroachment (VPA1), R1 Left Floodplain, September 13, 2022 (MY-05)



11/22/22, 10:54 AM  
Johnston County

Encroachment (VPA2), R1 Right Floodplain (MY-05)



11/22/22, 10:54 AM  
Johnston County

Encroachment (VPA2), R1 Right Floodplain (MY-05)



11/22/22, 10:47 AM  
Johnston County

Encroachment (VPA3) R1 Right Floodplain (MY-05)



11/22/22, 10:47 AM  
Johnston County

Encroachment (VPA3), R1 Right Floodplain (MY-05)



11/22/22, 9:54 AM  
Johnston County

Encroachment (VPA4), R2 adjacent driveway, (MY-05)



11/22/22, 9:52 AM  
Johnston County

Encroachment (VPA4), R2 adjacent driveway, (MY-05)

# Appendix C: Vegetation Plot Data

**Table 5: Planted and Total Stem Counts**

Pen Dell

			Current Plot Data (MY5 2022)																					Annual Means																								
Scientific Name	Common Name	Species Type	002-01-0001			002-01-0002			002-01-0003			002-01-0004			002-01-0005			002-01-0006			002-01-0007			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										
Acer rubrum		Tree	1	1	1			2			3	1	1	3	1	1	1	1	1	1	1	1	4	4	12	3	3	38	3	3	30	3	3	14	4	4	122	3	3	3								
Alnus serrulata	Tag Alder, Smooth Alder	Shrub Tree	1	1	1				1	1	1								1	1	1				3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3								
Baccharis halimifolia	Silverling, High-tide Bush	Shrub Tree						1																																								
Betula nigra	River Birch, Red Birch	Tree	3	3	3				1	1	4	2	2	4	1	1	1	3	3	3				10	10	15	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9					
Carpinus caroliniana		Shrub Tree						1	1	1																																						
Carya	Hickory	Tree																																														
Cornus amomum	Silky Dogwood	Shrub Tree							2	2	2																																					
Diospyros virginiana	American Persimmon,	Tree																																														
Fraxinus pennsylvanica	Green Ash, Red Ash	Tree	1	1	1				1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			
Ilex verticillata	Winterberry	Shrub Tree				3	3	3																																								
Lindera benzoin	Northern Spicebush	Shrub Tree																																														
Liquidambar styraciflua	Sweet Gum, Red Gum	Tree			2			2			4			2																																		
Liriodendron tulipifera		Tree				2	2	3																																								
Magnolia virginiana		Shrub Tree				1	1	1	1	1	1	2	2	2																																		
Pinus taeda	Loblolly Pine, Old Field	Tree									3			4																																		
Platanus occidentalis	Sycamore, Plane-tree	Tree							2	2	2				4	4	5	4	4	4	1	1	1	11	11	12	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
Populus deltoides		Tree																																														
Quercus michauxii	Basket Oak, Swamp Chestnut	Tree	2	2	2				3	3	3	2	2	2				3	3	3				10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Quercus nigra	Water Oak, Paddle Oak	Tree										2	2	2				1	1	2				3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
Quercus phellos	Willow Oak	Tree				2	2	2				1	1	1				1	1	1	1	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Rhus copallinum		Shrub Tree												3																																		
Rosa carolina		Shrub Vine																																														
Rosa palustris	Swamp Rose	Shrub Vine																																														
Salix nigra	Black Willow	Tree												2																																		
Salix sericea	Silky Willow	Shrub Tree																																														
Sambucus canadensis	Common Elderberry	Shrub Tree																																														
Ulmus alata	Winged Elm	Tree						3																																								
Ulmus rubra	Slippery Elm, Red Elm	Tree																																														
Viburnum nudum	Southern Wild Raisin,	Shrub Tree																																														
Stem count			8	8	10	8	8	17	12	12	25	12	12	25	9	9	12	20	20	30	7	7	15	76	76	134	74	74	138	77	77	129	78	78	106	100	100	279	132	132	132							
size (ares)			1			1			1			1			1			1			1			7			7			7			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			0.17			0.17						
Species count			5	5	6	4	4	8	8	8	11	7	7	10	5	5	6	10	10	13	5	5	7	14	14	20	13	13	20	15	15	18	15	15	20	15	15	23	16	16	16							
Stems per ACRE			324	324	405	324	324	688	486	486	1012	486	486	1012	364	364	486	809	809	1214	283	283	607	439	439	775	428	428	798	445	445	746	451	451	613	578	578	1613	763	763	763							

**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 5a: Vegetation Plot Mitigation Success Summary Table**

<b>Plot #</b>	<b>Planted Stems/Acre</b>	<b>Volunteers/Acre</b>	<b>Total Stems/Acre</b>	<b>Stems/Acre Success Criteria Met</b>	<b>Number of Hardwood Shrub/Tree Species</b>	<b>Number of Species Success Criteria Met</b>	<b>Greatest Percentage of a Single Species by Plot</b>
1	324	0	324	Yes	5	Yes	38%
2	324	121	445	Yes	4	Yes	27%
3	486	243	729	Yes	8	Yes	22%
4	486	162	648	Yes	7	Yes	25%
5	364	40	404	Yes	5	Yes	50%
6	809	40	849	Yes	10	Yes	19%
7	283	40	323	Yes	5	Yes	22%
Project Average	439	92	532	Yes	6	Yes	29%



Appendix D:  
NC DWR Correspondence and  
Approvals



PAT MCCRORY

*Governor*

DONALD R. VAN DER VAART

*Secretary*

S. JAY ZIMMERMAN

*Director*

April 28, 2016

DWR Project #: 2016-0403

Scott Hunt  
 Water & Land Solutions, LLC  
 11030 Raven Ridge Rd, Suite 119  
 Raleigh, NC 27614  
 (via electronic mail)

Re: Site Viability for Buffer Mitigation & Nutrient Offset – Pen Dell  
 Located near 2505 Wendell Rd, Wendell, NC  
 Johnston County

Dear Mr. Hunt,

On April 8, 2016, Katie Merritt, with the Division of Water Resources (DWR), assisted you and others from Water & Land Solutions, LLC at the proposed Pen Dell Mitigation Site (Site) in Wendell, NC. The Site is located in the Neuse River Basin within the 8-digit Hydrologic Unit Code 03020201. The Site is being proposed as part of a full-delivery stream restoration project for the Division of Mitigation Services (RFP #16-006477). The Interagency Review Team (IRT) was also present onsite. At your request, Ms. Merritt performed a site assessment of features onsite to determine suitability for buffer and nutrient offset mitigation. Features are more accurately shown in the attached maps signed by Ms. Merritt on April 25, 2016. If approved, mitigating this site could provide stream mitigation credits, riparian buffer credits and/or nutrient offset credits.

Ms. Merritt’s evaluation of the features from Top of Bank (TOB) out to 200’ for buffer and nutrient offset mitigation pursuant to Rule 15A NCAC 02B .0295 (effective November 1, 2015) and Rule 15A NCAC 02B .0240 is provided in the table below:

<u>Feature</u>	<u>Classification</u>	<u><sup>1</sup>Subject to Buffer Rule</u>	<u>Adjacent Land uses</u>	<u>Buffer Credit Viable</u>	<u><sup>2</sup>Nutrient Offset Viable at 2,273 lbs/acre</u>	<u>Mitigation Type/Comments</u>
R1 (wood line to road)	Undetermined conveyance	n/a	Active and pre-existing row crop; Land use along the conveyance consisted of a +/- 25’ narrow forested fringe w/ canopy from 1999-2010	n/a	Yes	Restoration for nutrient offset outside of 25’ on both sides of conveyance w/ plantings and easement starting at TOB back max 200’; Need stream determination by DWR if pursuing buffer credit; if feature is a stream, feature is viable for buffer restoration per 15A NCAC 02B .0295 (o)(3) outside of 25’ on both sides of conveyance.

R2 (Wendell Rd to below pond)	stream	Yes	Native hardwood forest, closed canopy	Yes	No	Preservation per 15A NCAC 02B .0295 (o)(5)
R3 (dirt path crossing to Lake Wendell Rd)	stream	Yes	All pasture actively grazed by cattle with mix of Native hardwood forest canopy	Yes	Yes	entire 50' from TOB and within all clusters of closed canopy hardwoods= Enhancement per 15A NCAC 02B .0295 (6); outside of forested areas ( <i>pine tree clustered areas are not viable for credit</i> ) =Restoration
R5	Stream	Yes	Native hardwood forest, closed canopy	Yes	No	Preservation per 15A NCAC 02B .0295 (o)(5)

<sup>1</sup>Subjectivity calls were determined using the 1:24,000 scale quadrangle topographic map prepared by USGS and the most recent printed version of the soil survey map prepared by the NRCS

<sup>2</sup>For nutrient offset viability to be determined, the landowner must provide proof in writing that the land is being used for agriculture or has been used for agriculture previously (prior to rule baseline). Dates, supported by photos or other written records, must be included to confirm that the uses of the open fields onsite are/were for hay crop cultivation/row crop/cattle.

Maps showing the project site and the features are provided and are signed by Ms. Merritt on April 25, 2016. This letter should be provided in all future mitigation plans for this Site. In addition, all vegetative plantings, performance criteria and other mitigation requirements for riparian restoration, enhancement and preservation must follow the requirements in 15A NCAC 02B .0295 to be eligible for buffer and/or nutrient offset credits. Where buffer and nutrient offset credits are viable in the same area, only one credit type is allowed to be generated for credit, not both.

For any areas depicted as not being viable for nutrient offset credit, one could propose a different measure other than riparian restoration/enhancement, along with supporting calculations and sufficient detail to support estimates of load reduction, for review by the DWR to determine viability for nutrient offset according to 15A NCAC 02B .0240.

Please contact Katie Merritt at (919)-807-6371 if you have any questions regarding this correspondence.

Sincerely,

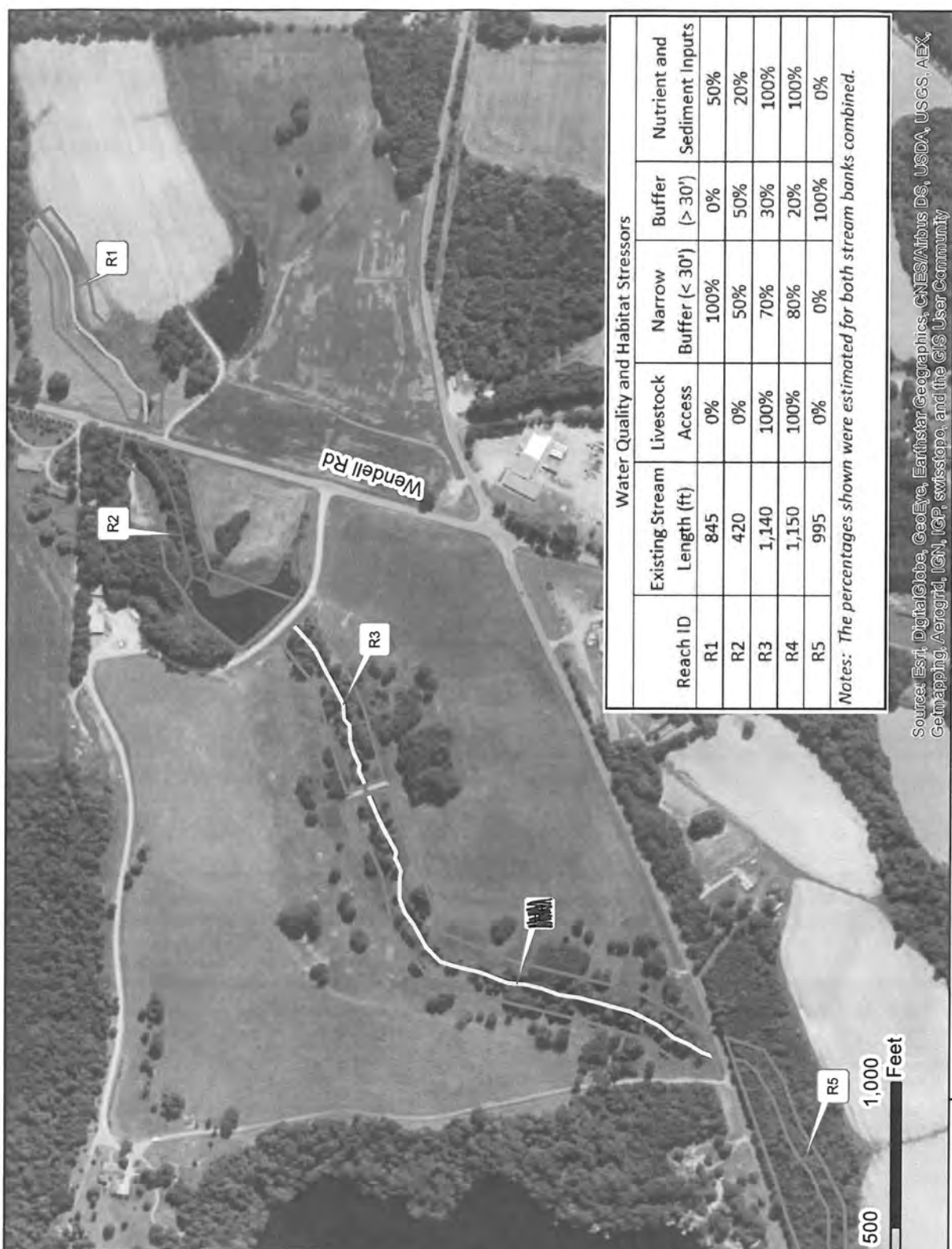
Karen Higgins, Supervisor  
 401 and Buffer Permitting Branch

KAH/km

Attachments: Site Aerial Map, USGS Topographic Map, 1999 Aerial Photo, 2010 Aerial Photo

cc:File Copy (Katie Merritt)  
 DMS – Jeff Schaffer (via electronic mail)

- Legend**
- Conservation Easement
  - Water Quality Stressors
    - Buffer (>30 ft)
    - Narrow Buffer
    - Narrow Buffer & Cattle Access
    - Nutrient and Sediment Inputs



Reach ID	Water Quality and Habitat Stressors					Nutrient and Sediment Inputs
	Existing Stream Length (ft)	Livestock Access	Narrow Buffer (< 30')	Buffer (> 30')		
R1	845	0%	100%	0%	50%	
R2	420	0%	50%	50%	20%	
R3	1,140	100%	70%	30%	100%	
R4	1,150	100%	80%	20%	100%	
R5	995	0%	0%	100%	0%	

Notes: The percentages shown were estimated for both stream banks combined.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Site Aerial (Current) *Kym 4/25/14* Water Quality Pen Dell Stressors  
 Mitigation Project DNR # *2011-040B*

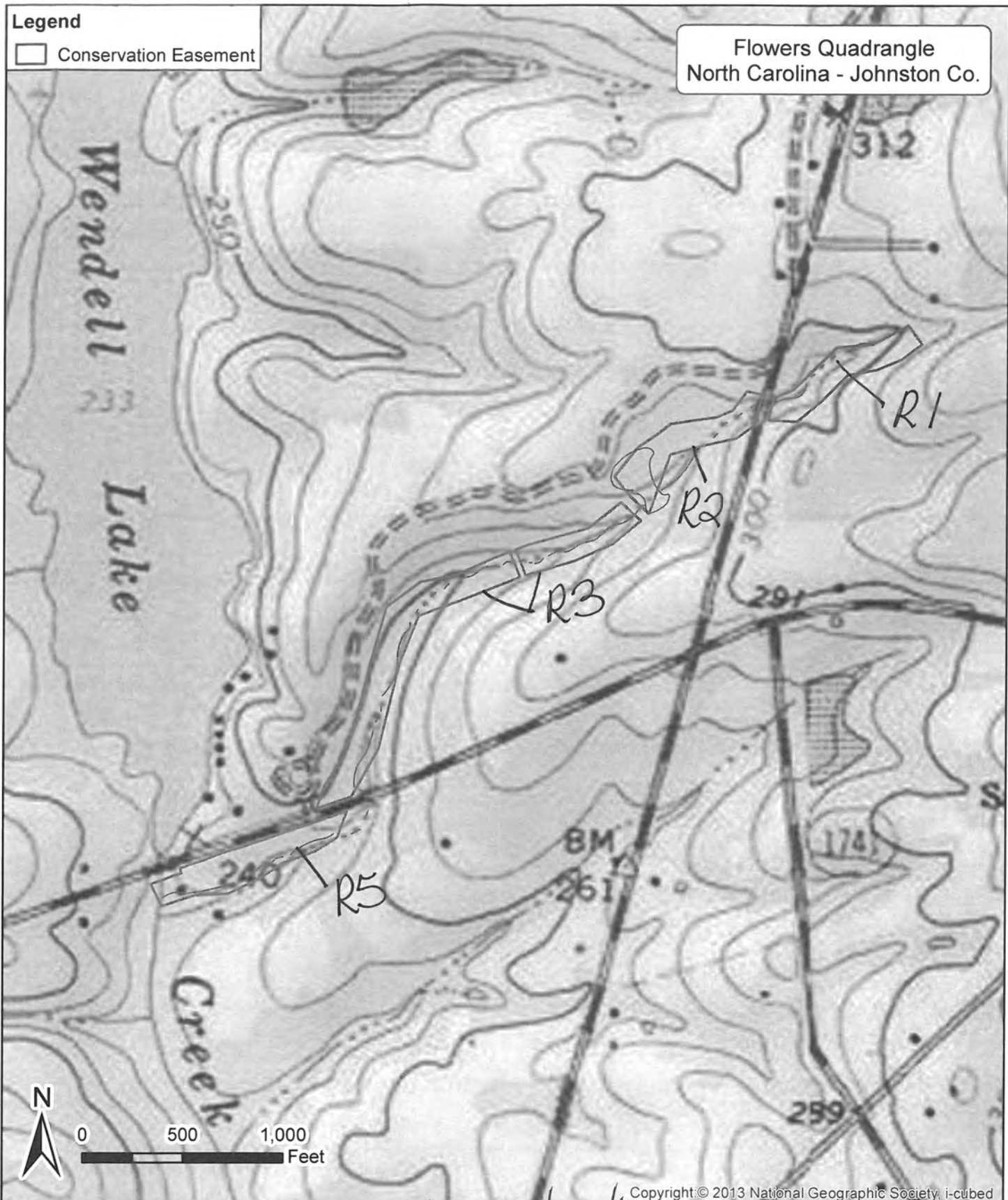


FIGURE 9

NAD 1983 2011 State Plane  
 North Carolina FIPS 3200 FT US

Legend  
□ Conservation Easement

Flowers Quadrangle  
North Carolina - Johnston Co.



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*Jym 4/25/14*  
Pen Dell  
Mitigation Project  
DNR # 2010-0403

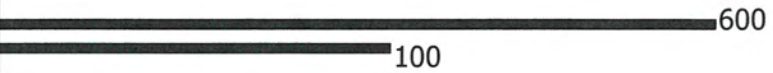
USGS  
Topographic  
Map  
NAD 1983 2011 State Plane

FIGURE  
**2**



Google earth

feet  
meters



Aerial dated 12/2005  
DWR# 2014-0403 (Pen Dell)  
Kym 4/25/14



Google earth



Aerial dated 7/2010

DWR# 2014-0403 (Pen Dell)  
Kym 4/25/14