

YEAR 5 (2015)
ANNUAL WETLAND MONITORING REPORT

SUMMIT SEEP NON-RIPARIAN WETLAND MITIGATION SITE

DMS Project # 94646 RFP # 16-002835 Contract # 003244
Davidson County, North Carolina
Data Collected February– November 2015



PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
Raleigh, North Carolina

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January 2016

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Part 1: Executive Summary/Project Abstract

1.1 Project Goals & Objectives

The 2009 *Yadkin Pee-Dee River Basin Restoration Priorities* document (NCDMS 2009) identified stormwater runoff and other development impacts as likely contributors to turbidity and chlorophyll violations within the Summit Seep Wetland Mitigation Site's Targeted Local Watershed (TLW) and 14-Digit Cataloging Unit 03040103020010. The Summit Seep Wetland Mitigation Site (hereby referred to as "Site") was identified as a non-riparian wetland restoration opportunity to improve water quality, enhance flood attenuation, and to restore wildlife habitat within the TLW.

The project goals address stressors identified in the TLW and include the following.

- Remove nonpoint sources of pollution associated with vegetation maintenance including:
 - a. the cessation of broadcasting fertilizer, pesticides, and other agricultural chemicals into and adjacent to Site drainage ditches; and
 - b. providing a vegetated wetland to aid in the treatment of runoff.
- Restore wetland hydro-periods that satisfy wetland jurisdictional requirements and approximate the Site's natural range and variation.
- Promote floodwater attenuation by filling ditches and enhancing groundwater storage capacity.
- Restore and reestablish natural community structure, habitat diversity, and functional continuity.
- Enhance and protect the Site's full potential of wetland functions and values in perpetuity.

The project goals will be addressed through the following project objectives:

- Providing 4.0 Non-riparian Wetland Mitigation Units (WMU's), as calculated in accordance with the requirements stipulated in RFP #16-002835, by restoring 3.91 acres and enhancing 0.18 acres of non-riparian wetland. This will be accomplished by filling ditches, removing spoil castings, excluding livestock, redirecting hydrology from a spring across the Site, and planting with native forest vegetation.
- Protecting the Site in perpetuity with a conservation easement.

1.2 Background Summary

Located in western Davidson County and within the 14-Digit Cataloging Unit 03040103020010, the Site is approximately five miles southwest of Lexington, North Carolina (Figure 1, Appendix A). Within the Southern Outer Piedmont physiographic province of North Carolina, the regional physiography is characterized by dissected irregular plains, some low rounded hills and ridges, and low to moderate gradient streams with mostly cobble, gravel, and sandy substrates (Griffith et al. 2002). The wetland restoration and enhancement area is located upslope along the western edge of an unnamed tributary's floodplain. The project drains 35.6 acres and ultimately connects to North Potts Creek. The 6.4 acre Site sits on both sides of the unnamed tributary, of which 4.1 acres have been restored. The North Carolina Division of Mitigation Services currently holds the conservation easement for the Site, the property is owned by Hillcrest Acres, LLC.

1.3 Vegetation Assessment

After planting was completed, six sample vegetation plots (10-meter by 10-meter) were installed and measured within the Site as per guidelines established in *CVS-DMS Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008). Vegetation plots are permanently monumented with 5-foot metal t-posts at each corner and half inch PVC at the origin. In each sample plot, vegetation parameters to be monitored include species composition and species density. Visual observations of the percent cover of shrub and herbaceous species will also be documented by photograph. Vegetation plot information can be found in

Appendix C. Year 5 (2015) stem count measurements indicate an average of 492 planted stems per acre across the Site. In addition, each individual plot met success criteria.

1.3.1 Vegetation Success Criteria

Characteristic Tree Species include woody tree and shrub species planted at the Site, observed within a reference forest, or outlined for the appropriate plant community in Schafale and Weakley (1990). An average density of 320 stems per acre of Characteristic Tree Species must be surviving in the first three monitoring years. Subsequently, 290 Characteristic Tree Species per acre must be surviving by the end of year 4 and 260 Characteristic Tree Species per acre by the end of year 5. The Interagency Review Team (IRT) may allow counting of acceptable volunteer species toward the 210-tree per acre density upon review and evaluation of the annual monitoring data.

If, within the first 3 years, any species exhibits greater than 50 percent mortality, the species will either be replanted or an acceptable replacement species will be planted in its place as specified in the contingency plan.

1.3.2 Vegetative Problem Areas

The year 1 (2011) Annual Monitoring Report indicated problems with Chinese privet (*Ligustrum sinense*) and small carpgrass (*Arthraxon hispidus*) (not considered invasive). Invasive species treatments for Chinese privet were completed in the spring of 2012 and will continue throughout the 5 year monitoring period, as necessary. Treatment of Chinese privet was effective and no occurrences of Chinese privet were noted during year 3 (2013), year 4 (2014), or year 5 (2015) monitoring.

Supplemental planting by Carolina Silvics occurred in the winter of 2012/2013 with bare-root trees including 800 American elm (*Ulmus americana*), 500 American hornbeam (*Carpinus caroliniana*), and 800 river birch (*Betula nigra*). These trees remained vigorous during Year 5 (2015) monitoring.

During the spring of 2014, a mature sweetgum (*Liquidambar styraciflua*) fell in the southwest portion of the easement, partially covering vegetation plot 5. Though several stems were killed, the tree does not appear to be a threat to site success. Additionally, one area was observed to have poor growth during year 4 (2014) monitoring; much of the wetland enhancement area on the south edge of the Site is characterized by reduced stem density and less vigorous trees than the remainder of the site. The lack of growth is likely due to poor soils in the ditch-fill area. This area has improved during year 5 (2015) monitoring and is trending toward success.

1.3.3 Vegetative Contingency Plan

If vegetation success criteria are not achieved based on average density calculations from combined plots over the entire restoration area, supplemental planting may be performed with tree species approved by regulatory agencies. Supplemental planting will be performed as needed until achievement of vegetation success criteria.

1.4 Wetland Assessment

Initially four groundwater monitoring gauges were installed at the Site. After the completion of the Baseline Monitoring Report, an additional monitoring gauge was installed on June 8, 2011 (Figure 2, Appendix B).

Hydrological sampling was conducted throughout the growing season at intervals no greater than thirty days, and was done so to satisfy the determination of jurisdictional hydrology success within the Site (USEPA 1990). In addition, rainfall data will be used for comparison of groundwater conditions with

extended drought conditions. Graphs of groundwater hydrology and precipitation from an onsite rain gauge, supplemented with data from a nearby weather station, are included in Appendix D.

1.4.1 Wetland Success Criteria

Target hydrological characteristics include saturation or inundation for 7.5 percent of the growing season, which during average climatic conditions is from March 28–November 3 (220 days) (2002 NRCS WETS Data). Restored/enhanced wetland areas are expected to support hydrophytic vegetation; if wetland parameters are marginal as indicated by vegetation and/or hydrology monitoring, a jurisdictional determination will be performed.

Based on the United States Army Corps of Engineers (USACE) Regional Supplement (USACE 2010), the growing season begins when biological indicators of plant growth (bud burst, emergence of herbs from the ground, or elongation of leaves, etc.) has occurred, and/or the soil temperature indicates microbial activity (soil temperature of 50-55 degrees at a depth of 12 inches from the soil surface). For the purpose of this year 5 (2015) Annual Monitoring Report, the Natural Resource Conservation Service (NRCS) growing season is being used. Future monitoring data collection (documentation of bud burst and soil temperature) will be used to verify the initiation of the growing season when conditions allow.

Summary of Monitoring Period/Hydrology Success Criteria by Year

Year	Soil Temperatures/Date Bud Burst Documented	Monitoring Period Used for Determining Success	7.5 Percent of Monitoring Period
2011 (Year 1)	--	March 28-November 3 (220 days)	17 days
2012 (Year 2)	Bud burst and soil temperatures documented on March 1, 2012	March 1-November 3 (248 days)	19 days
2013 (Year 3)	Bud burst on red maple (<i>Acer rubrum</i>) and elderberry (<i>Sambucus canadensis</i>) and soil temperature of 48°F documented on February 14, 2013	February 14-November 3 (263 days)	20 days
2014 (Year 4)	No bud burst documented, soil temperatures below biological activity threshold, NRCS growing season used.	March 28-November 3 (220 days)	17 days
2015 (Year 5)	No bud burst documented, soil temperatures below biological activity threshold, NRCS growing season used	March 28-November 3 (220 days)	17 days

1.4.2 Wetland Contingency Plan

Hydrologic contingency may include floodplain surface modifications such as construction of ephemeral pools, deep ripping of the soil profile, and installation of berms to retard surface water flows. Recommendations for contingency to establish wetland hydrology may be implemented and monitored until hydrology success criteria are achieved.

1.4.3 Wetland Problem Areas

There were no wetland problem areas observed during the 2015 monitoring season.

1.5 Supporting Data

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on NC Division of Mitigation Services (NCDMS) website. All raw data supporting the tables and figures in the appendices is available from NCDMS upon request.

Part 2: METHODS

2.1 Hydrology

Measurement of wetland hydrology was performed in accordance with traditional methods as per the April 2003 USACE Wilmington District Stream Mitigation Guidelines. Five continuously recording, surficial monitoring gauges were installed in accordance with specifications in *Installing Monitoring Wells/Piezometers in Wetlands* (NCWRP 1993). The fifth monitoring gauge was installed on June 8, 2011 per NCDMS recommendations received on May 31, 2011. Monitoring gauges were set to a depth of approximately 24 inches below the soil surface. Screened portions of each gauge were surrounded by filter fabric, buried in screened well sand, and sealed with a bentonite cap to prevent siltation and surface flow infiltration during floods. Data will be downloaded at least every 30 days during the growing season. Additionally, an electronic rain water recording gauge was installed at the Site.

2.2 Vegetation

Monitoring of planted vegetation follows the *CVS/DMS Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008). Six 10-meter by 10-meter vegetation plots were installed within the 4.1 acres of restored / enhanced wetlands (Figure 2, Appendix B). Vegetation received a visual evaluation at least once every thirty days and CVS data collection took place on July 7, 2015.

Part 3: CONCLUSIONS

3.1 Hydrology

All groundwater gauges met success criteria based on the NRCS established growing season. However, the true growing season should be based on biological activity in the soil, measured by soil temperature (50-55 degrees at a depth of 12 inches from the soil surface) and bud burst, which is consistently early to late February in the Piedmont of North Carolina. If the growing season is presumed to extend from February 14 to November 3 (263 days) then all five monitoring gauges far exceed success criteria, as depicted in the following table. Table 9 (Appendix D) gives gauge result data based on the biological growing season in applicable years in addition to the NRCS growing season.

Observations made during the 2012 growing season indicated that the original ditch plug and ditch running along the southern portion of the Site had settled below anticipated levels. This settling allowed water from the spring to follow historic ditch paths instead of being dispersed throughout the Site as planned. This resulted in unsatisfactory inundation of the Site in the area of Gauge 5. Restoration Systems implemented a remedial action plan on February 21st, 2013 to correct the elevation of the ditch plug, ultimately restoring groundwater levels throughout the Site. The Remedial Action Plan and correspondence with NCDMS can be found in Appendix E.

Summary of Groundwater Gauge Results

Gauge	Success Criteria Achieved / Max Consecutive Days During Growing Season (Percentage)				
	Year 1 (2011) March 28 Growing Season Start	Year 2 (2012) March 1 Growing Season Start	Year 3 (2013) Feb. 14 Growing Season Start	Year 4 (2014) March 28 Growing Season Start	Year 5 (2015) March 28 Growing Season Start
1	Yes / 37 days (16.81 percent)	Yes / 40 days (16 percent)	Yes / 58 days (22 percent)	Yes/ 96 Days (43 percent)	Yes/ 42 Days (19 percent)
2	Yes / 73 days (33 percent)	Yes / 118 days (47 percent)	Yes / 211 days (80 percent)	Yes/ 102 Days (46 percent)	Yes/ 42 Days (19 percent)
3	Yes / 23 days (10 percent)	Yes / 40 days (16 percent)	Yes / 105 days (39 percent)	Yes/ 100 Days (45 percent)	Yes/ 48 Days (21 percent)
4	Yes / 67 days (30 percent)	Yes / 115 days (46 percent)	Yes / 232 days (86 percent)	Yes/ 99 Days (45 percent)	Yes/ 63 Days (28 percent)
5	NA* / 4 days (1.8 percent)	No / 8 days (3 percent)	Yes / 71 days (27 percent)	Yes 54 Days (24 Percent)	Yes 39 Days (17 Percent)

* This gauge was installed in early June 2011; therefore, data from the beginning of the growing season is not available. Based on the data from other gauges, it is likely that this gauge would have met criteria.

3.2 Vegetation

Vegetation sampling across the Site was above the required average density with 492 planted stems per acre surviving. In addition, each individual plot was above success criteria.

It should be noted that there were variations in species documented between Year 1 (2011) and Year 2 (2012). Multiple plants appear to have been misidentified during Year 1 (2011) monitoring. The species were corrected during Year 2 (2012) monitoring, resulting in differences in species identified within each vegetation monitoring plot.

Summary of Planted Vegetation Plot Results

Plot	Planted Stems / Acre Counting Towards Success Criteria				
	Year 1 (2011)	Year 2 (2012)	Year 3 (2013)	Year 4 (2014)	Year 5 (2015)
1	404	445	364	364	364
2	485	526	445	445	405
3	687	648	648	647	607
4	526	526	486	485	486
5	1133	1052	1093	768	728
6	607	405	405	404	364
Average of All Plots (1-6)	640	600	573	519	492

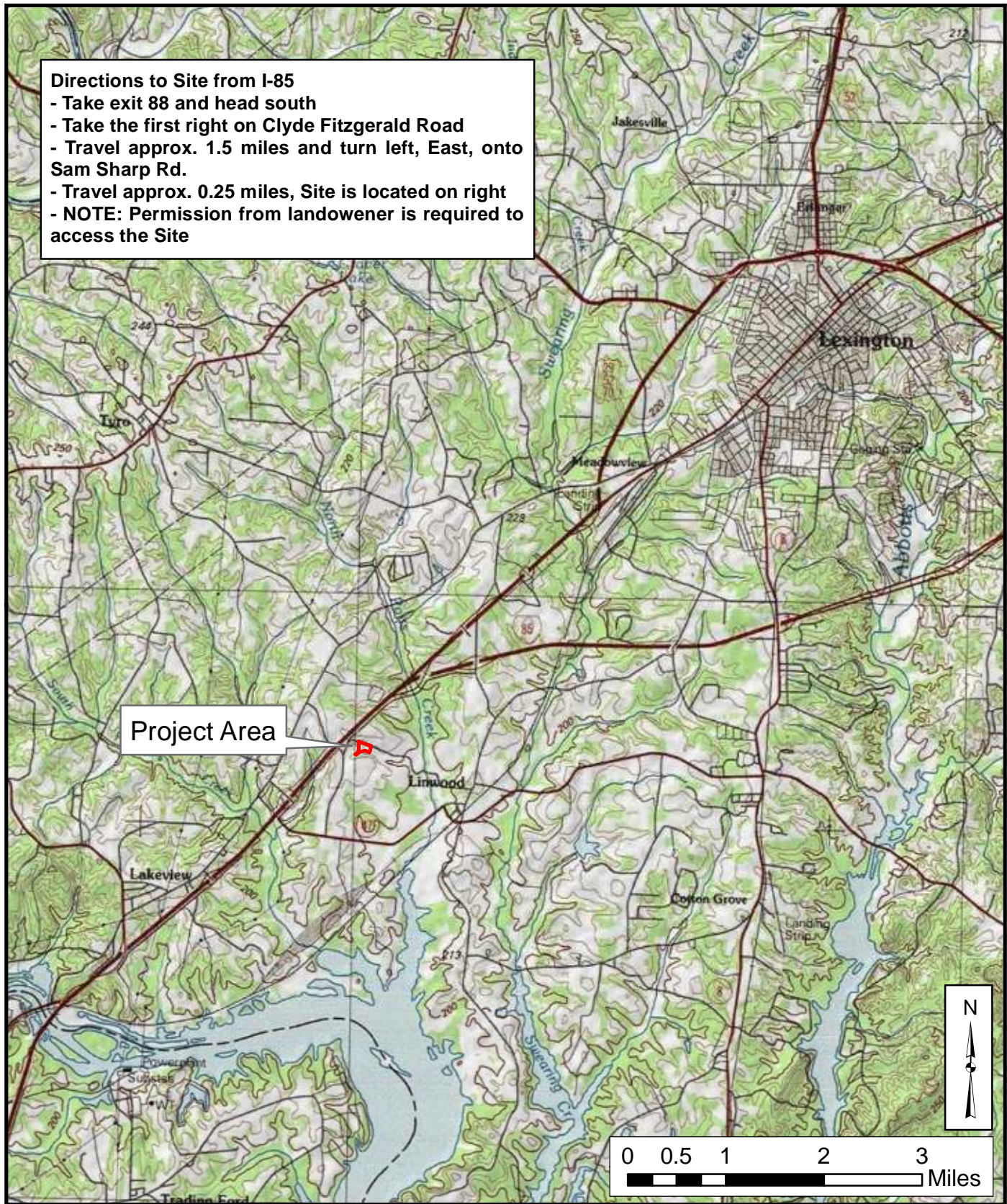
Part 4: REFERENCES

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- United States Army Corps of Engineers (USACE), United States Environmental Protection Agency (USEPA), North Carolina Wildlife Resources Commission (NCWRC), Natural Resources Conservation Service (NRCS), and North Carolina Division of Water Quality (NCDWQ). 2003. Stream Mitigation Guidelines. State of North Carolina.
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- United States Environmental Protection Agency (USEPA). 1990. Mitigation Site Type Classification (MiST). USEPA Workshop, August 13-15, 1989. USEPA Region IV and Hardwood Research Cooperative, NCSU, Raleigh, North Carolina.

Appendix A: General Figures and Tables

- Figure 1. Vicinity Map & Directions
- Table 1. Project Components and Mitigation Credits
- Table 2. Project Activity and Reporting History
- Table 3. Project Contacts
- Table 4. Project Baseline Information and Attributes

- Directions to Site from I-85**
- Take exit 88 and head south
 - Take the first right on Clyde Fitzgerald Road
 - Travel approx. 1.5 miles and turn left, East, onto Sam Sharp Rd.
 - Travel approx. 0.25 miles, Site is located on right
 - NOTE: Permission from landowner is required to access the Site



VICINITY MAP & DIRECTIONS
SUMMIT SEEP NON-RIPARIAN WETLAND
MITIGATION SITE
Davidson County, North Carolina

Dwn. by:	KRJ
Date:	Sept 2012
Project:	10-001

FIGURE
1

Table 1. Project Components and Mitigation Credits
 Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244

Mitigation Credits									
Type	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
	R	RE	R	RE	R	RE			
Totals					3.91	0.09			
Project Components									
Project Component -or- Reach ID	Stationing / Location	Existing Footage/Acreage	Approach (PI,PII etc.)	Restoration – or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio			
Non-riparian restoration	NA	3.91	NA	Restoration	3.91	1:1			
Non-riparian enhancement	NA	0.18	NA	Enhancement	0.18	2:1			
Component Summation									
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)			
		Riverine	Non-Riverine						
Restoration	0	0	0	3.91	0	0			
Enhancement		0	0	0.18	0	0			
Enhancement I	0								
Enhancement II	0								
Creation		0	0	0					
Preservation	0	0	0	0		0			
High Quality Preservation	0	0	0	0		0			

Table 2: Project Activity and Reporting History

Elapsed Time Since Grading Complete: 4 Years and 7 Months

Elapsed Time Since Planting Complete: 4 Years and 7 Months

Number of Reporting Years: 5 Years

Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244		
Activity or Report	Data Collection Complete	Completion or Delivery
CE Document	NA	Oct-2010
Conservation Easement	Apr-2011	Apr-2011
Mitigation Plan	NA	Nov-2010
Construction	NA	Apr-2011
Bare Root Planting	NA	Apr-2011
Baseline Monitoring Document	Apr-2011	June-2011
Year 1 (2011) Monitoring	Sep-2011	Nov-2011
Invasive Species (Chinese privet) Treatment		ongoing
Year 2 (2012) Monitoring	Oct-2012	Nov-2012
Remedial Action for Hydrology		Feb-2013
Supplemental Planting (2,000 stems)		Feb-2013
Year 3 (2013) Monitoring	Nov-2013	Nov-2013
Year 4 (2014) Monitoring	Sept-2014	Nov-2014
Year 5 (2015) Monitoring	Sept-2015	Nov-2015

Table 3: Project Contacts

Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244		
	Firm	POC & Address
Designer:	Axiom Environmental, Inc.	Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603
Construction Contractor:	Land Mechanics, Inc.	Lloyd Glover; 919.422.3392 780 Landmark Road Willow Spring, NC 27592-7756
Planting Contractor:	Restoration Systems, LLC	Worth Creech; 919.334.9114 1101 Haynes St. Suite 211 Raleigh, NC 2604
Seeding Contractor:	Land Mechanics, Inc.	Lloyd Glover; 919.422.3392 780 Landmark Road Willow Spring, NC 27592-7756
Nursery Stock Suppliers:	ArborGen	1.888.888.7158
Baseline Data Collection	Axiom Environmental, Inc.	Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603
Vegetation Monitoring:	Restoration Systems, LLC and Axiom Environmental, Inc.	Ray Holz; 919.604.9314 and Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603
Wetland Monitoring:	Restoration Systems, LLC and Axiom Environmental, Inc.	Ray Holz; 919.604.9314 and Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603

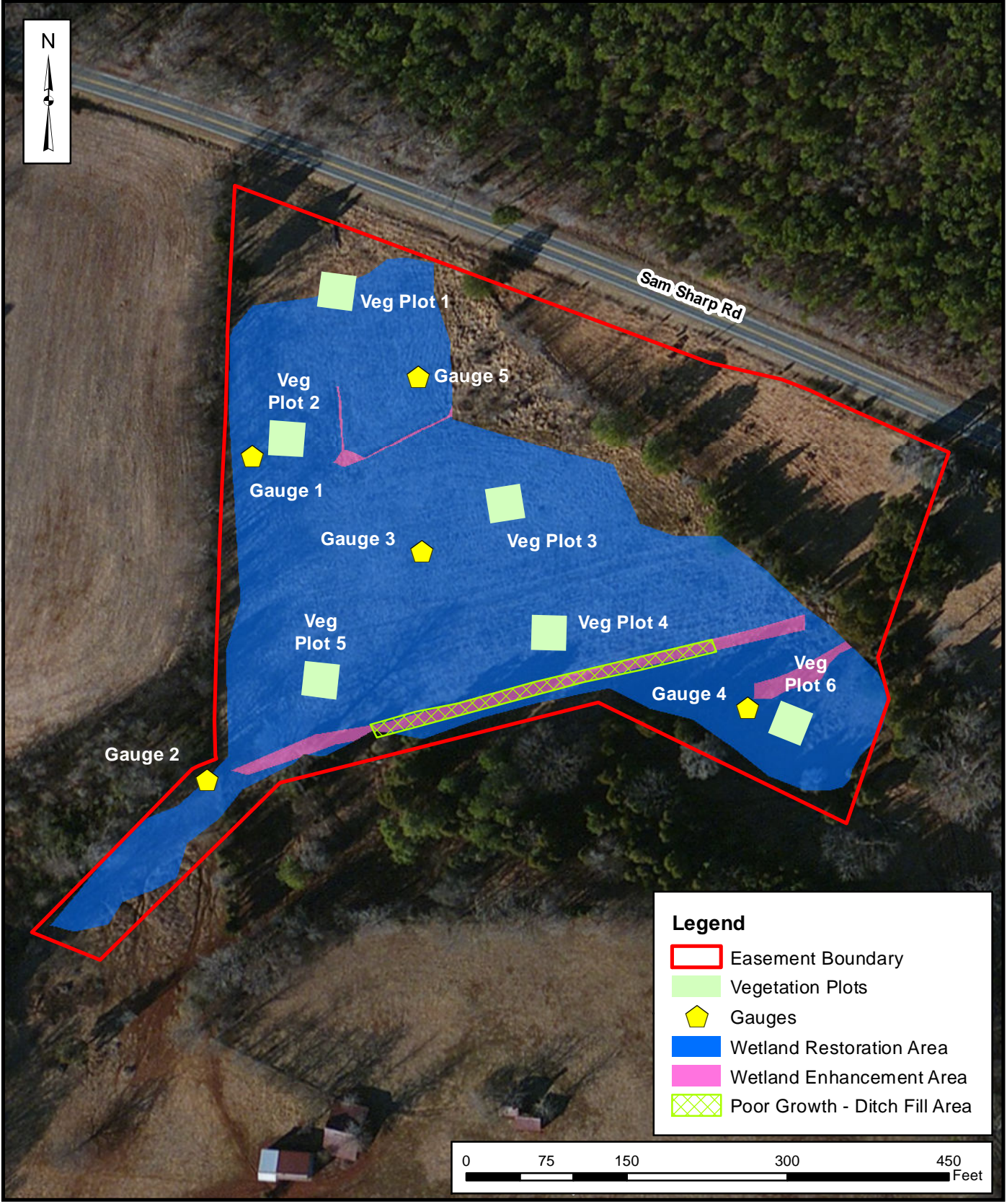
Table 4: Project Baseline Information & Attributes

Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244			
Project Information			
Project Name		Summit Seep	
County		Davidson	
Project Area (acres)		6.4	
Project Coordinates (latitude and longitude)		35.76130, 80.33430	
Project Watershed Summary Information			
Physiographic Province		Southern Outer Piedmont	
River Basin		Yadkin	
USGS Hydrologic Unit 8-digit	3040103	USGS Hydrologic Unit 14-digit	3040103020010
DWQ Sub-basin		3/7/2004	
Project Drainage Area, Total Outfall (acres)		51.5	
Groundwater Treated by Site (acres)		35.6	
Project Drainage Area Percentage of Impervious Area		< 3%	
CGIA Land Use Classification		Cropland and Pasture	
Wetland Summary Information			
Parameters		Wetland 1	
Size of Wetland (acres)		4.1	
Wetland Type (non-riparian, riparian riverine or riparian non riverine)		Non-riparian	
Mapped Soil Series		Armenia silt loam	
Drainage class		Class A	
Soil Hydric Status		Hydric	
Source of Hydrology		Natural Seep	
Hydrologic Impairment		Ditches	
Native vegetation community		Low Elevation Seep	
Percent composition of exotic invasive vegetation		0%	
Regulatory Considerations			
Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States – Section 404	Yes	Yes	Yes, Appendix A
Waters of the United States – Section 401	Yes	Yes	Yes, Appendix A
Endangered Species Act	No		
Historic Preservation Act	No		
Coastal Zone Management Act [CZMA/Coastal Area Management Act (CAMA)]	No		
FEMA Floodplain Compliance	No		
Essential Fisheries Habitat	No		

Appendix B: Visual Assessment Data

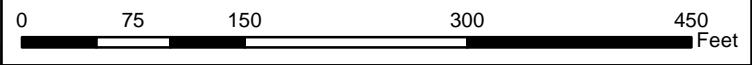
Figure 2. Current Condition Plan View (CCPV)

Table 5. Vegetation Condition Assessment



Legend

-  Easement Boundary
-  Vegetation Plots
-  Gauges
-  Wetland Restoration Area
-  Wetland Enhancement Area
-  Poor Growth - Ditch Fill Area



Axiom Environmental
218 Snow Ave
Raleigh, NC 27603

Axiom Environmental, Inc.

CURRENT CONDITIONS PLANVIEW
SUMMIT SEEP WETLAND RESTORATION SITE
Davidson County, North Carolina

Dwn. by:	WGL/KRJ
Date:	Nov. 2015
Project:	10-001

FIGURE
2

Table 5: Vegetation Condition Assessment

Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244

Vegetation Category	Description	Mapped Acreage	CCPV Symbol	Number of Polygons	% of planted Acreage
Planted Acreage - 6.9 acres (Entire Easement)					
Areas of Concern	Poor growth in wetland enhancement area on southern edge of site. This area has improved since previous years and is trending toward success.	0.09	Green Crosshatch	1	1.3%
Exotic Invasive Species	No areas of invasive species concern were observed at the Site during year 5 (2015) monitoring.	NA	NA	NA	0%

Appendix C: Vegetation Plot Data

Table 6. Vegetation Plot Criteria Attainment

Table 7. CVS Vegetation Plot Metadata

Table 8. Planted & Total Stem Counts

Vegetation Plot Photos

Table 6: Vegetation Plot Criteria Attainment

Summit Seep Non-Riparian Wetland Mitigation Site

Contract # 003244

Plot	Planted Stems / Acre Counting Towards Success Criteria				
	Year 1 (2011)	Year 2 (2012)	Year 3 (2013)	Year 4 (2014)	Year 5 (2015)
1	404	445	364	364	364
2	485	526	445	445	405
3	687	648	648	647	607
4	526	526	486	485	486
5	1133	1052	1093	768	728
6	607	405	405	404	364
Average of All Plots (1-6)	640	600	573	519	492

Table 7. CVS Vegetation Plot Metadata

Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244

Report Prepared By:	Corri Faquin
Date Prepared	7/20/2015 12:28
database name	RS-SummitSeep-2015-A-v2.3.1.mdb
database location	\\ae-sbs\Share\CVS database\2015
computer name	ED-PC
file size	37130240
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
Project Code	Summit
project Name	Summit Seep
Description	Non-Riparian Wetland Mitigation Site
River Basin	Yadkin-Pee Dee
area (sq m)	16,592
Required Plots (calculated)	6
Sampled Plots	6

Table 8. Total and Planted Stems by Plot and Species
CVS Project Code Summit. Project Name: Summit Seep

			Current Plot Data (MY5 2015)																	
Scientific Name	Common Name	Species Type	Summit-RS-0001			Summit-RS-0002			Summit-RS-0003			Summit-RS-0004			Summit-RS-0005			Summit-RS-0006		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree																		
Asimina triloba	pawpaw	Tree										1	1	1	1	1	1			
Betula nigra	river birch	Tree	3	3	3				2	2	2	2	2	2	1	1	1	1	1	1
Carpinus caroliniana	American hornbeam	Tree	1	1	1	1	1	1	2	2	2	1	1	1						
Celtis laevigata	sugarberry	Tree																		
Celtis occidentalis	common hackberry	Tree																		
Cornus	dogwood	Shrub or Tree				1	1	1												
Cornus amomum	silky dogwood	Shrub						2												
Diospyros virginiana	common persimmon	Tree	2	2	16			12	3	3	23	16	14	1	1	42				
Fraxinus pennsylvanica	green ash	Tree							1	1	1		1							
Gleditsia triacanthos	honeylocust	Tree																		
Juglans nigra	black walnut	Tree																		
Juniperus virginiana	eastern redcedar	Tree																1		
Liquidambar styraciflua	sweetgum	Tree			23			6					6		18					8
Pinus taeda	loblolly pine	Tree											5							
Platanus occidentalis	American sycamore	Tree				2	2	2	2	2	2	3	3	3	1	1	1	7	7	7
Pyrus calleryana	Callery pear	Exotic																		
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	5	5	5	1	1	1	4	4	4						
Quercus pagoda	cherrybark oak	Tree	1	1	1				2	2	2	1	1	1	1	1	1			
Quercus phellos	willow oak	Tree	1	1	1	1	1	1							1	1	1			
Salix nigra	black willow	Tree																		
Sambucus canadensis	Common Elderberry	Shrub																1	1	1
Ulmus alata	winged elm	Tree													1	1	1			
Ulmus americana	American elm	Tree			2	1	1	1	2	2	7		7	11	11	14				
Unknown		Shrub or Tree																		
Stem count			9	9	48	11	11	31	15	15	40	12	12	45	18	18	81	9	9	17
size (ares)			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			6	6	8	6	6	9	8	8	8	6	6	11	8	8	10	3	3	4
Stems per ACRE			364.2	364.2	1942	445.2	445.2	1255	607	607	1619	485.6	485.6	1821	728.4	728.4	3278	364.2	364.2	688

Color for Density

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

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

Table 8. Total and Planted Stems by Plot and Species (continued)
CVS Project Code Summit. Project Name: Summit Seep

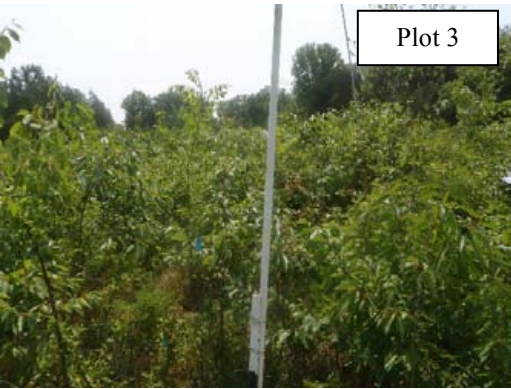
Scientific Name	Common Name	Species Type	Annual Means																	
			MY5 (2015)			MY4 (2014)			MY3 (2013)			MY2 (2012)			MY1 (2011)			MY0 (2011)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree										2								
Asimina triloba	pawpaw	Tree	2	2	2	2	2	2	2	2	2	4	4	4	9	9	9	14	14	14
Betula nigra	river birch	Tree	9	9	9	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10
Carpinus caroliniana	American hornbeam	Tree	5	5	5	5	5	5	5	5	5	6	6	6	19	19	19	9	9	9
Celtis laevigata	sugarberry	Tree								1	1	1	1	1	1					
Celtis occidentalis	common hackberry	Tree																3	3	3
Cornus	dogwood	Shrub or Tree	1	1	1	1	1	1	1	1	1	1	1	1						
Cornus amomum	silky dogwood	Shrub			2			4			2									
Diospyros virginiana	common persimmon	Tree	6	6	107	7	7	153	10	10	159	10	10	84	9	9	28	11	11	11
Fraxinus pennsylvanica	green ash	Tree	1	1	2	1	1	7	1	1	9	1	1	4						
Gleditsia triacanthos	honeylocust	Tree															1			
Juglans nigra	black walnut	Tree									1									
Juniperus virginiana	eastern redcedar	Tree			1			1			1						5			
Liquidambar styraciflua	sweetgum	Tree			61			176			70			66			13			
Pinus taeda	loblolly pine	Tree			5			5			3			4						
Platanus occidentalis	American sycamore	Tree	15	15	15	15	15	15	15	15	15	14	14	14	11	11	11	10	10	10
Pyrus calleryana	Callery pear	Exotic									2									
Quercus michauxii	swamp chestnut oak	Tree	11	11	11	11	11	11	11	11	11	12	12	12	15	15	15	15	15	15
Quercus pagoda	cherrybark oak	Tree	5	5	5	6	6	6	6	6	6	4	4	4	7	7	7	13	13	13
Quercus phellos	willow oak	Tree	3	3	3	3	3	3	5	5	5	6	6	6	7	7	7	7	7	7
Salix nigra	black willow	Tree									1									
Sambucus canadensis	Common Elderberry	Shrub	1	1	1	2	2	2	2	2	2	2	2	2						
Ulmus alata	winged elm	Tree	1	1	1	1	1	1	1	1	1									
Ulmus americana	American elm	Tree	14	14	31	14	14	20	16	16	49	18	18	53	8	8	8	8	8	8
Unknown		Shrub or Tree																1	1	1
Stem count			74	74	262	77	77	421	85	85	357	89	89	271	95	95	133	101	101	101
size (ares)			6			6			6			6			6			6		
size (ACRES)			0.15			0.15			0.15			0.15			0.15			0.15		
Species count			13	13	17	13	13	17	14	14	22	13	13	15	9	9	12	11	11	11
Stems per ACRE			499.1	499.1	1767	519.3	519.3	2840	573.3	573.3	2408	600.3	600.3	1828	640.8	640.8	897.1	681.2	681.2	681.2

Color for Density

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

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

**Summit Seep
2015 (Year 5) Vegetation Monitoring Photographs
Taken July 2015**



Appendix D: Hydrology Data

Table 9. Wetland Gauge Attainment Data

Figure 3. Summit Seep 30-70 Percentile Graph for Rainfall

2015 Groundwater Gauge Graphs

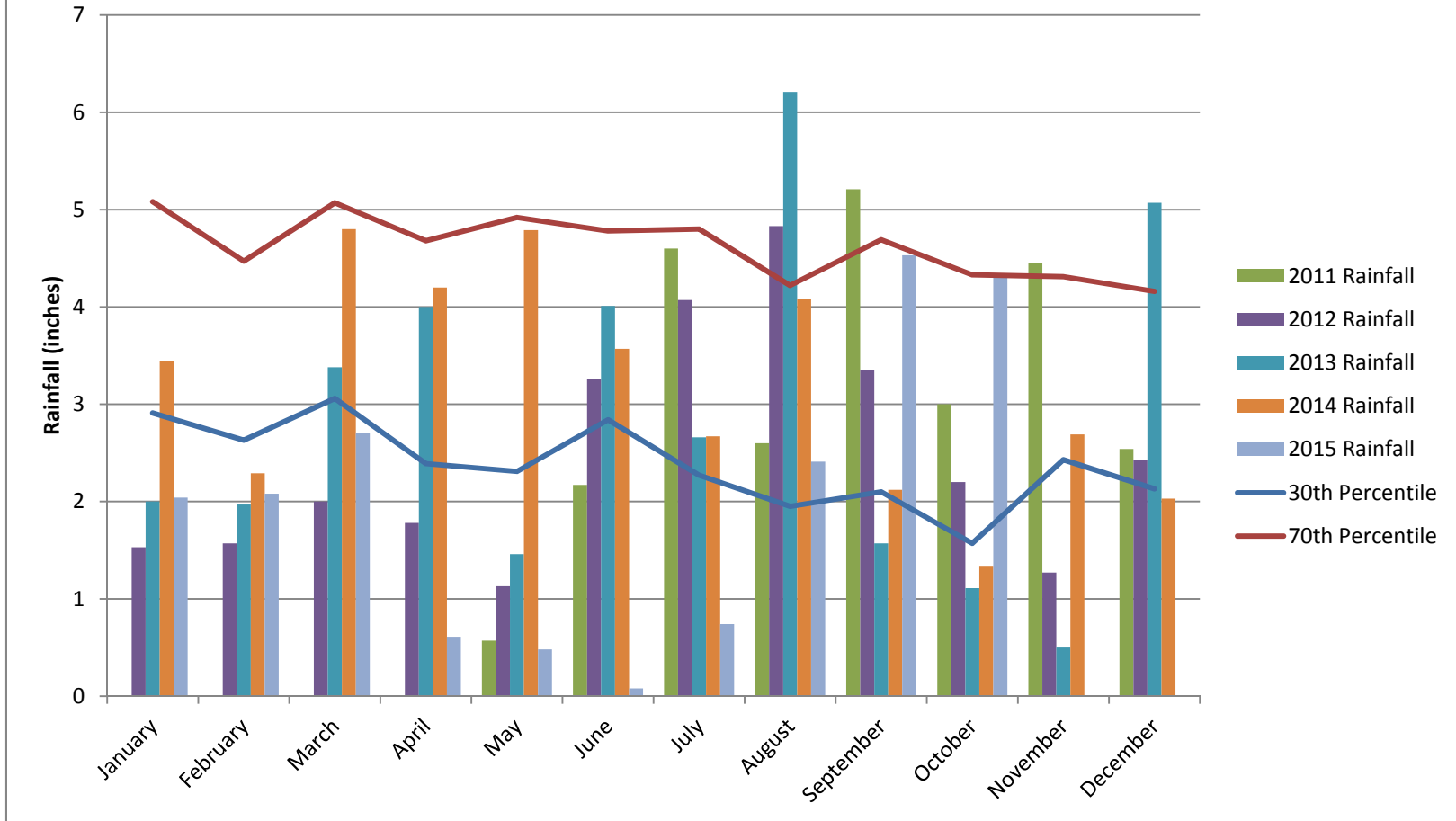
Table 9. Ground Gauge Attainment Data

Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244

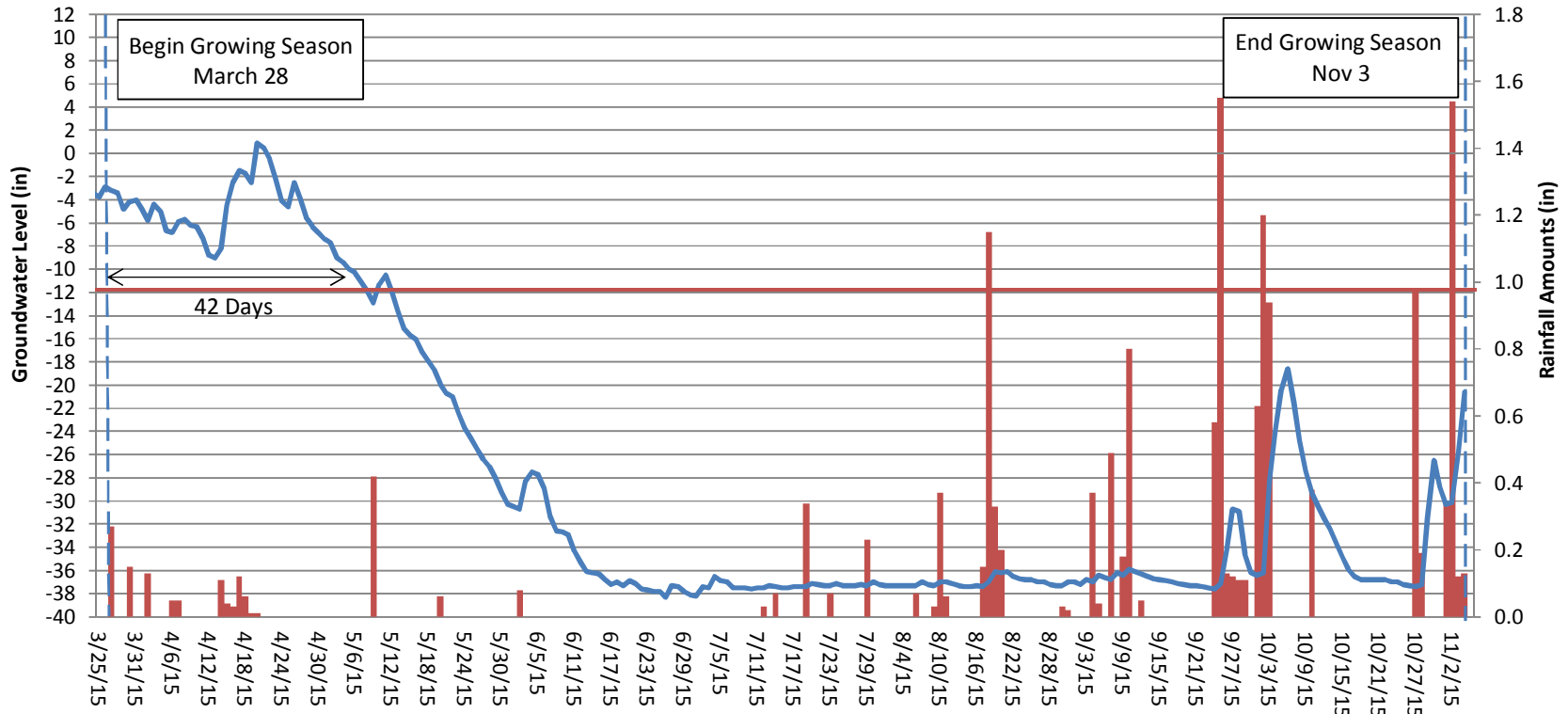
Gauge	Success Criteria Achieved / Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2011) March 28 – NRCS Growing Season Start	Year 2 (2012) March 1 Growing Season Start	Year 2 (2012) March 28 – NRCS Growing Season Start	Year 3 (2013) Feb. 14 Growing Season Start	Year 3 (2013) March 28 – NRCS Growing Season Start	Year 4 (2014) March 28 Growing Season Start	Year 5 (2015) March 28 Growing Season Start
1	Yes / 37 days (16.81 percent)	Yes / 40 days (16.1 percent)	Yes / 16 days (7.3 percent)	Yes / 58 days (22.1 percent)	Yes / 29 days (13.1 percent)	Yes/ 96 Days (43 percent)	Yes/ 42 Days (19 percent)
2	Yes / 73 days (33.18 percent)	Yes / 118 days (47.6 percent)	Yes / 92 days (41.8 percent)	Yes / 211 days (80.2 percent)	Yes / 169 days (76.5 percent)	Yes/ 102 Days (46 percent)	Yes/ 42 Days (19 percent)
3	Yes / 23 days (10.45 percent)	Yes / 40 days (16.1 percent)	No / 15 days (6.8 percent)	Yes / 105 days (39.9 percent)	Yes / 63 days (28.5 percent)	Yes/ 100 Days (45 percent)	Yes/ 48 Days (21 percent)
4	Yes / 67 days (30.45 percent)	Yes / 115 days (46.4 percent)	Yes / 81 days (36.8 percent)	Yes / 232 days (86.5 percent)	Yes / 190 days (86.0 percent)	Yes/ 99 Days (45 percent)	Yes/ 63 Days (28 percent)
5	NA* / 4 days (1.8 percent)	No / 8 days (3.2 percent)	No / 8 days (3.6 percent)	Yes / 71 days (27.0 percent)	Yes / 29 days (13.1 percent)	Yes 54 Days (24 Percent)	Yes 39 Days (17 Percent)

Figure 3. Summit Seep 30-70 Percentile Graph for Rainfall (2011-2015)

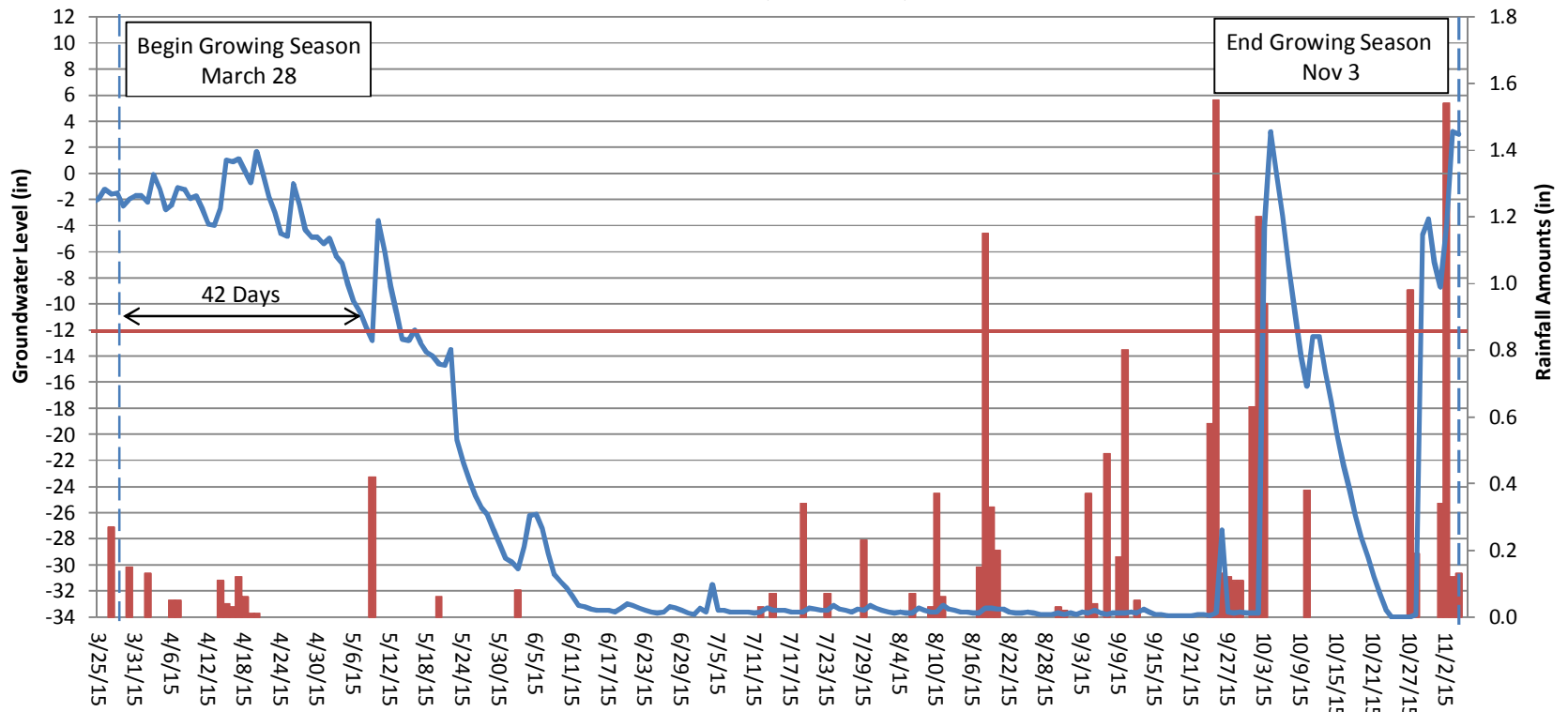
Data from WETS Station: Lexington, NC 4970 and onsite rain gauge



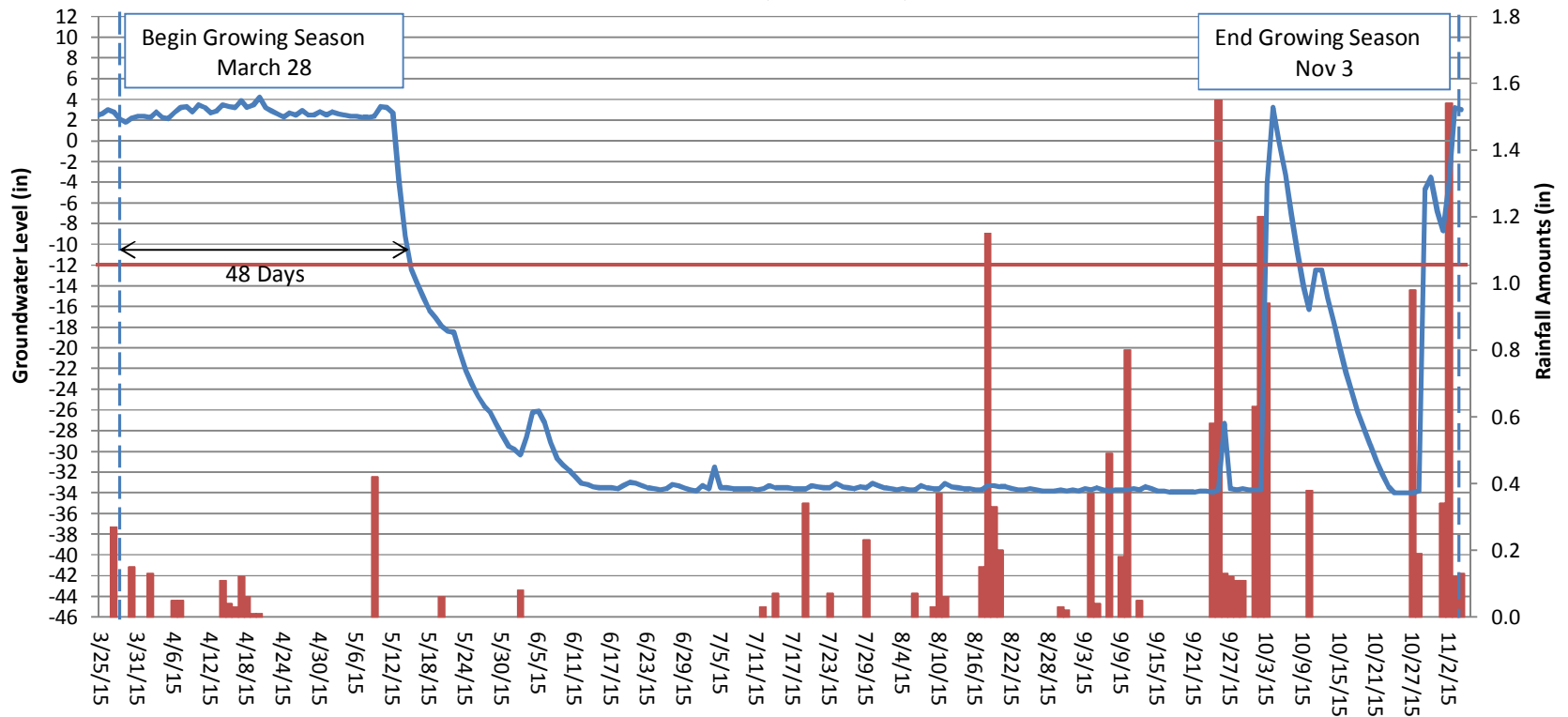
Summit Seep Groundwater Gauge 1 Year 5 (2015 Data)



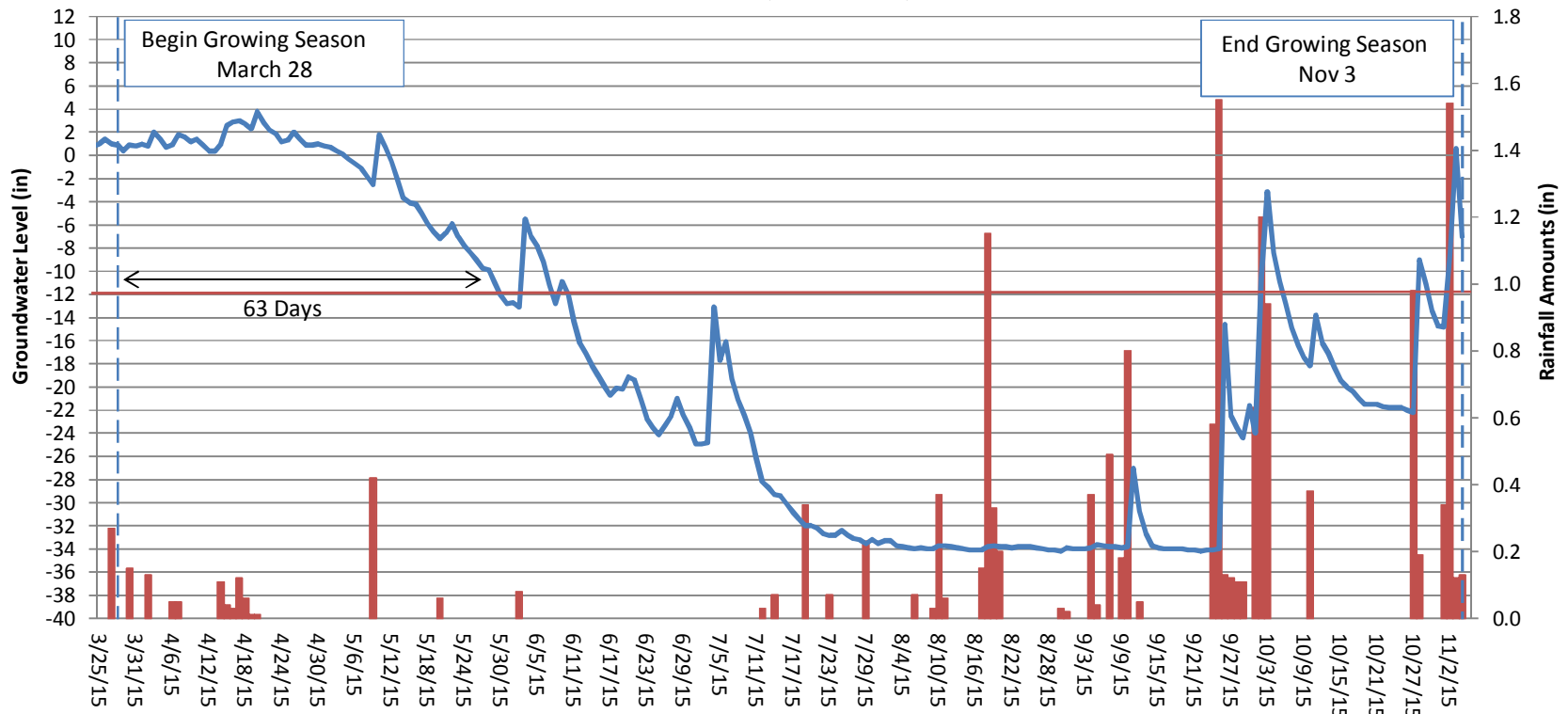
Summit Seep Groundwater Gauge 2 Year 5 (2015 Data)



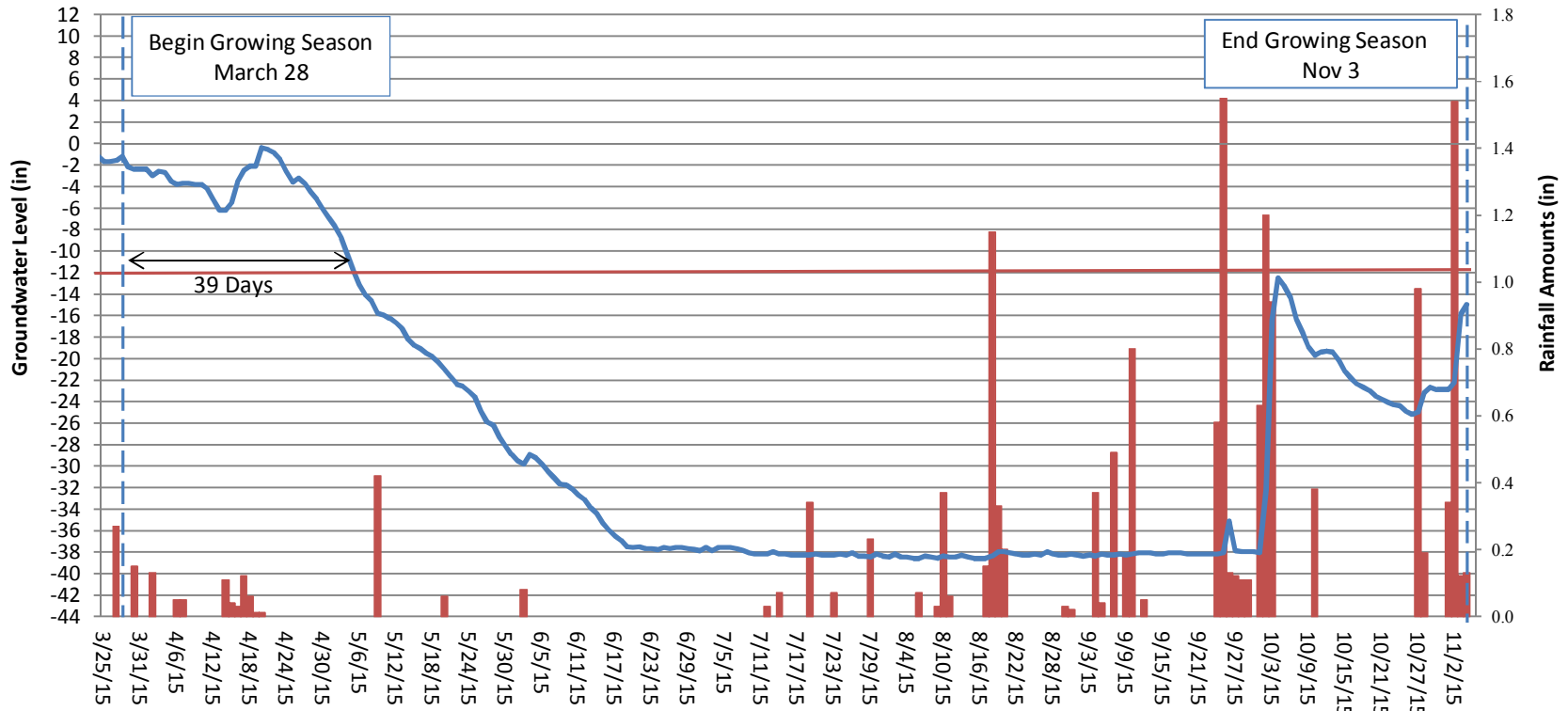
Summit Seep Groundwater Gauge 3 Year 5 (2015 Data)



Summit Seep Groundwater Gauge 4 Year 5 (2015 Data)



Summit Seep Groundwater Gauge 5 Year 5 (2015 Data)



Appendix E: 2013 Remedial Actions

Remedial Action Plan for Hydrology
NCDMS Correspondence



Natural Resource
Restoration & Conservation

January 17, 2013

Paul Wiesner
Western Project Manager
N.C. Ecosystem Enhancement Program
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

Subject: Remedial Action Plan for hydrology at Summit Seep Non-Riparian Wetland Mitigation Site [EEP Project ID #94646]

Dear Mr. Wiesner,

Section 3.1 of the Year 2 Monitoring Report for Summit Seep recognized observations made during the 2012 growing season which indicated that ditch plugs placed during construction had settled. Further observations made during the dormant season indicate that in addition to settling ditch plugs, historic ditches filled during construction have settled as well. As a result, Restoration Systems performed multiple transect topographic surveys to determine the degree of conveyance the historical ditches were having on the Site (Figure 1). Our findings showed that overall settling of historical ditches is having a drastically larger influence on surface hydrology being conveyed off Site than anticipated. The settling in combination with historic micro topography due to agricultural activities is clearly conveying surface hydrology from the hillside seeps and rain events through the Site and into the unnamed tributary. As a result the time frame for surface water infiltration has been drastically decreased.

Year 2 rain and groundwater gauge data clearly show a direct correlation between rain events and groundwater saturation with 12 inches of the surface. The Site has seen remarkable results where gauges are successful and it is our conclusion that minimizing the conveyance of surface hydrology and thus increasing the infiltration duration will undoubtedly result in hydrological success. Thus, it is the goal of our remedial action plan to minimize surface water conveyance, with minimal impact to the Site as possible. Figure 2 outlines the location where RS plans to mimic historic floodplain topography by connecting crown elevations in three locations on Site. Elevations will tie directly into existing crown elevations (Figure 3). This approach is the least invasive option available, and will undoubtedly minimize the conveyance of surface hydrology.

No work will be done in monitoring areas, and RS has set aside 2,100 bare root saplings to vegetate disturbed and bare areas throughout the Site, a seed mix will also be used to reestablish herbaceous material as quickly as possible. All bare root saplings are of species originally planted, and include a combination of *Ulmus Americana*, *Carpinus caroliniana*, and *Betula nigra*. Sediment and erosion control plans are needed on projects where land-disturbing activity is greater than one (1) acre (Article 4. Sedimentation Pollution Control Act of 1973), anticipated land impacts for the remedial action plan will be no greater than ½ an acre (Figure 2), thus a S&E control permit is not needed. The project's original construction contractor (Land Mechanics) will be performing the repair which is anticipated to take one day.

If you have any questions please feel free to contact me via e-mail or telephone at 919.755.9490

Sincerely,

A handwritten signature in black ink, appearing to read 'Raymond Holz', written over a light blue horizontal line.

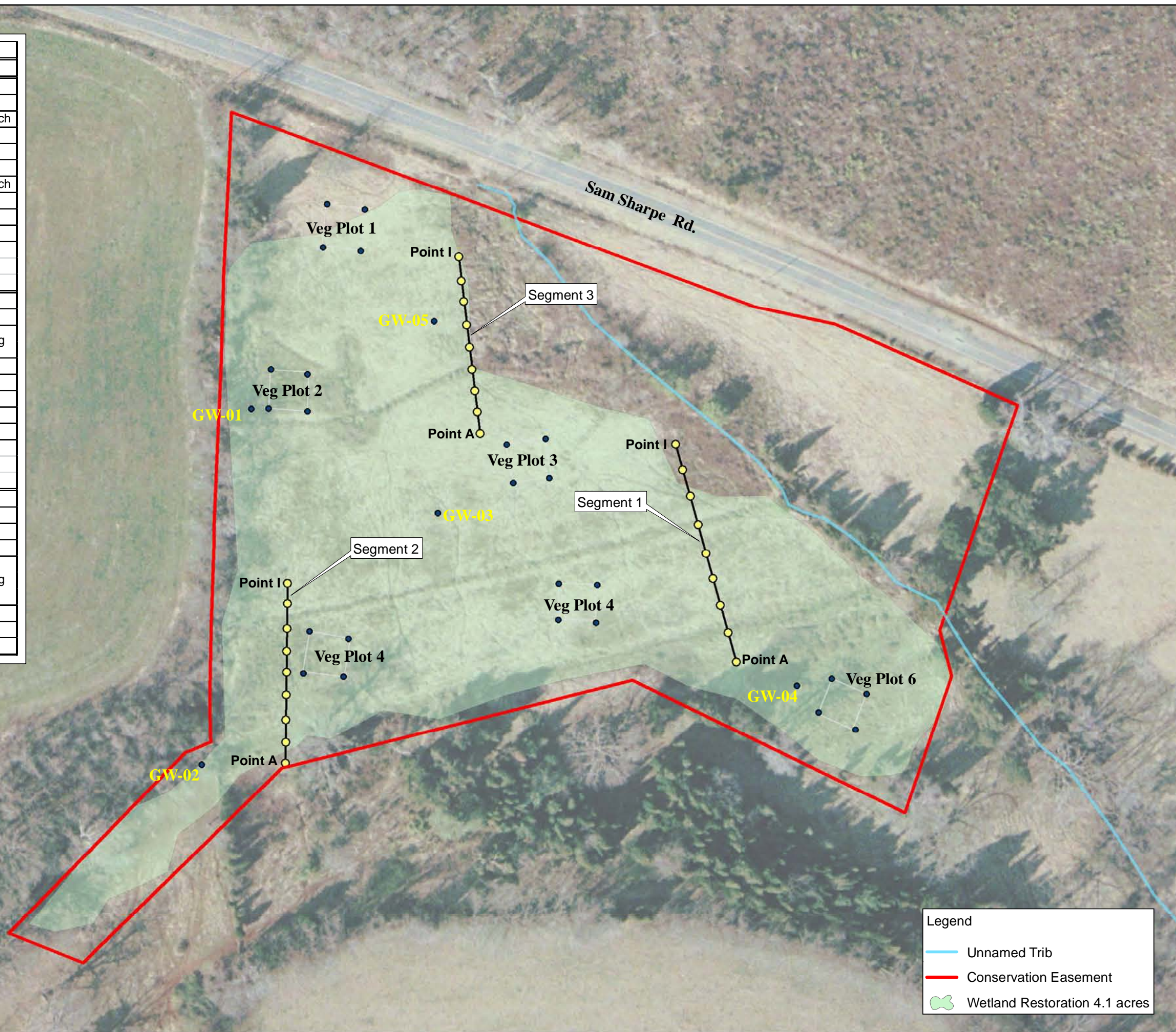
Raymond Holz

Restoration Systems
1101 Haynes St. Suite 211
Raleigh, NC
27604

Attachments:

- Figure 1: Topographic Transect Survey
- Figure 2: Remedial Action Plan – Plan View
- Figure 3: Remedial Action Plan – Cross Sections

Transect Suvery Elevations		
Segment 1		
Point	Elevation	
A	0	
B	-1.4	Location of Historic Ditch
C	-0.73	
D	-0.98	
E	-1.18	
F	-1.77	Location of Historic Ditch
G	-1.33	
H	-1.68	
I	-1.91	
Segment 2		
Point	Elevation	
A	0	
B	-0.26	Location of Ditch Plug
C	-0.59	
D	-0.08	
E	-0.35	
F	-0.58	
G	-0.99	
H	-1.18	
I	-0.67	
Segment 3		
Point	Elevation	
A	0	
B	-0.52	
C	-0.7	
D	-0.87	
E	-1.27	Location of Ditch Plug
F	-1.25	
G	-1.15	
H	-0.8	
I	-0.9	



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

Prepared For:



Remedial Action Plan Topographic Transect Survey



Project: Summit Seep

ID: EEP ID 94646

Drawn By: RJH

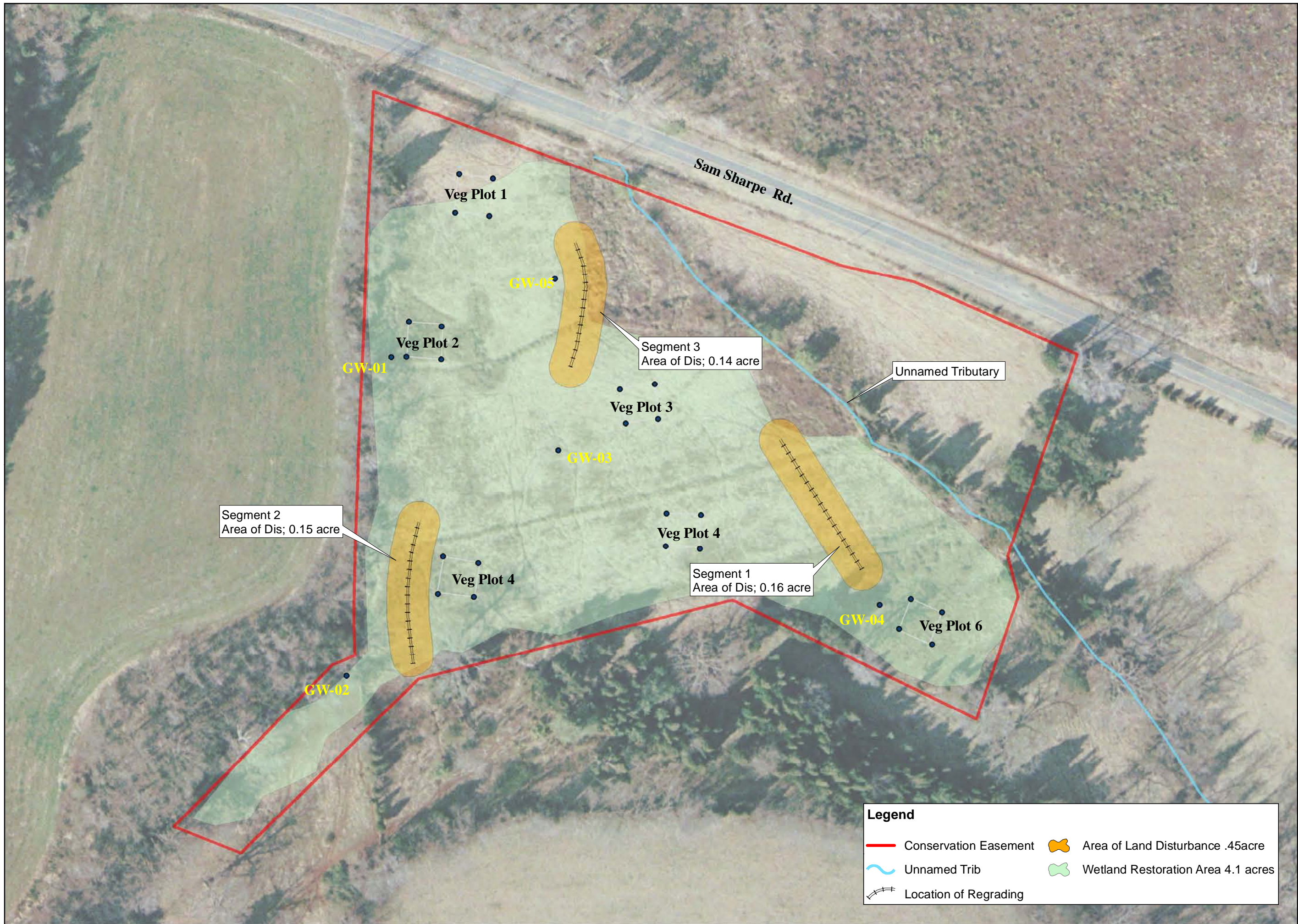
Date: Jan 2013

Scale: 1 inch = 83 feet

Figure:

Figure 1

Legend	
	Unnamed Trib
	Conservation Easement
	Wetland Restoration 4.1 acres



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

Prepared For:



Remedial Action Plan
 Plan of Action



Project: Summit Seep

ID: EEP ID 94646

Drawn By: RJH

Date: Jan 2013

Scale: 1 inch = 83 feet

Figure:

Figure
 2



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

Prepared For:

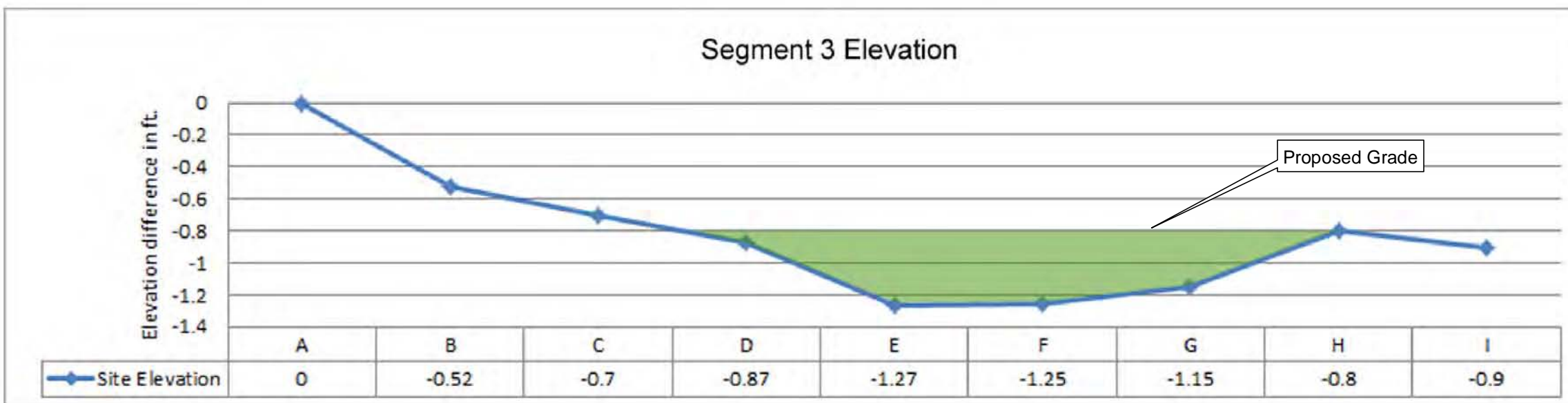
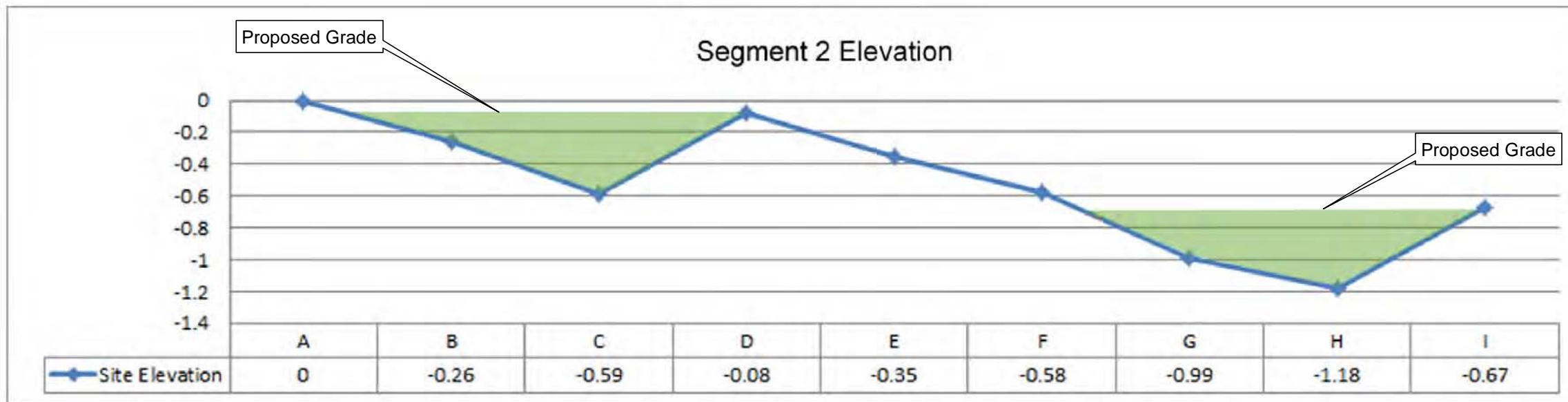


Remedial Action Plan
Proposed Grade Elevations

Project: Summit Seep
 ID: EEP ID 94646
 Drawn By: RJH
 Date: Jan 2013
 Scale: No to Scale

Figure:

Figure
3



Raymond Holz

From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Monday, February 25, 2013 8:38 AM
To: Raymond Holz
Subject: RE: Summit Seep Remedial Action Plan EEP Project # 94646

Thanks for the update Raymond.

Paul Wiesner
Western Project Manager
[N.C. Ecosystem Enhancement Program](#)
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801
(828)273-1673 Mobile
paul.wiesner@ncdenr.gov

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Raymond Holz [<mailto:rhoz@restorationsystems.com>]
Sent: Friday, February 22, 2013 2:27 PM
To: Wiesner, Paul
Cc: Pearce, Guy; Worth Creech
Subject: RE: Summit Seep Remedial Action Plan EEP Project # 94646

Paul,

We finished the remedial work at Summit Seep (EEP Project ID 94646) yesterday with the planting of 2,000 bare root saplings (a mixture of American elm, river birch and American hornbeam were used). I have attached a .pdf of photos taken of the work. Please follow up if you have any specific questions, 919.604.9314)

All the best,

RH

From: Wiesner, Paul [<mailto:paul.wiesner@ncdenr.gov>]
Sent: Friday, January 18, 2013 8:48 AM
To: Raymond Holz
Cc: Pearce, Guy
Subject: FW: Summit Seep Remedial Action Plan EEP Project # 94646

Raymond,

This looks good. Please send me a quick e-mail when the remedial work has been completed.

Guy,

This remedial action plan will go in the file and IMS will be updated to note this anticipated work.

Thanks

Paul Wiesner
Western Project Manager
[N.C. Ecosystem Enhancement Program](#)
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801
(828)273-1673 Mobile
paul.wiesner@ncdenr.gov

E-mail correspondence to and from this address may be subject to the North Carolina Public Records Law and may be disclosed to third parties.

From: Raymond Holz [<mailto:rholz@restorationsystems.com>]
Sent: Thursday, January 17, 2013 4:41 PM
To: Wiesner, Paul
Cc: Worth Creech
Subject: Summit Seep Remedial Action Plan EEP Project # 94646

Paul,

Please see the attached Remedial Action Plan for Summit Seep, a hard copy of the signed letter was put in the mail today. If you have any questions please feel free to contact me at 919.604.9314. I will be in most of next week.

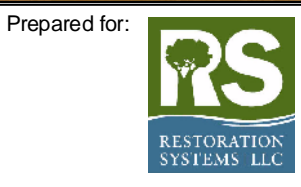
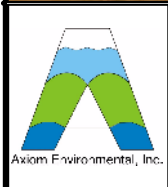
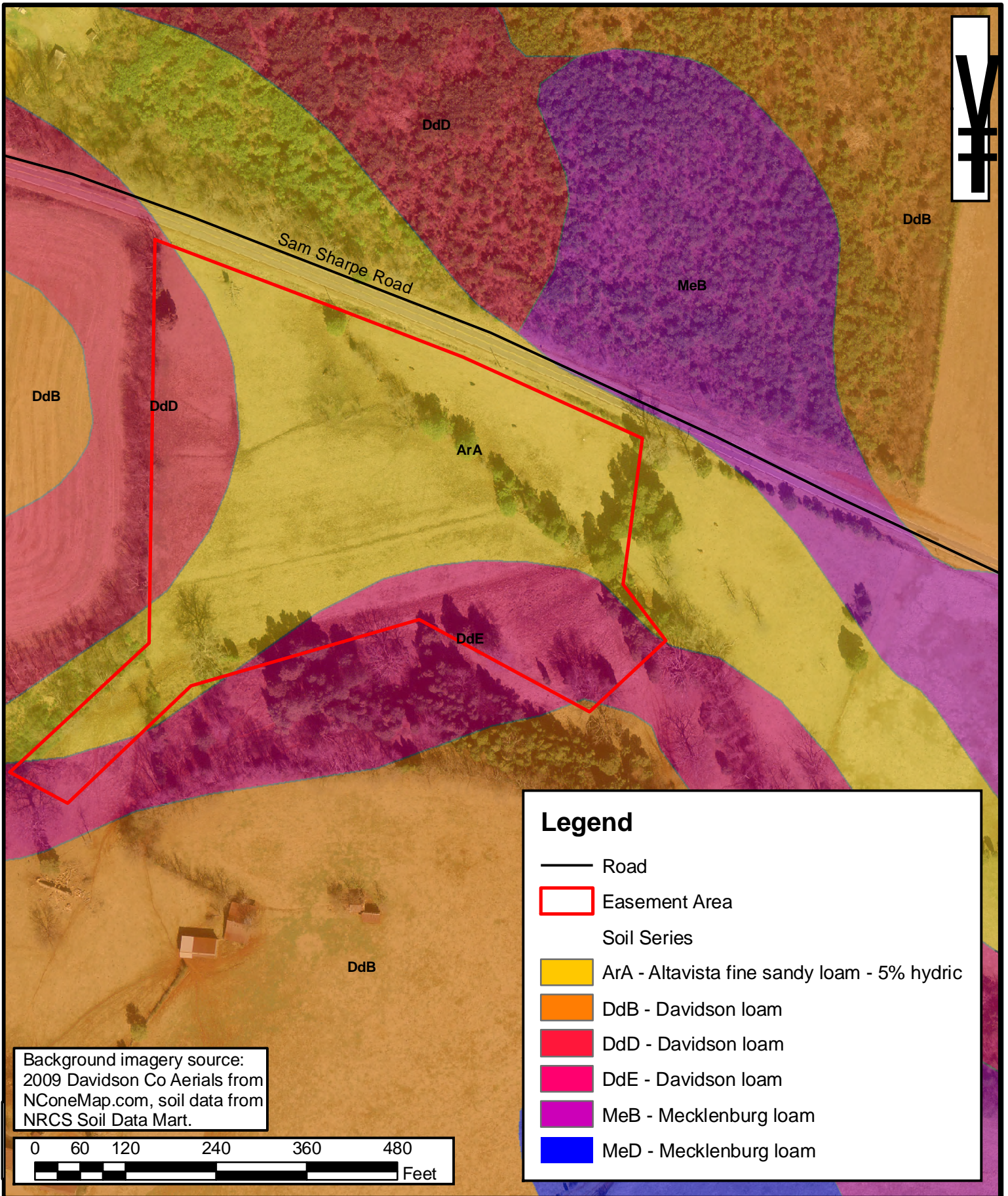
Sincerely,
Raymond Holz

Appendix F: Additional Site Data

Restoration Plan Figure 3. Soils Map

Restoration Plan Figure 6. Contour Map

Preconstruction Site Photographs



Project:

SUMMIT SEEP

Davidson County, NC

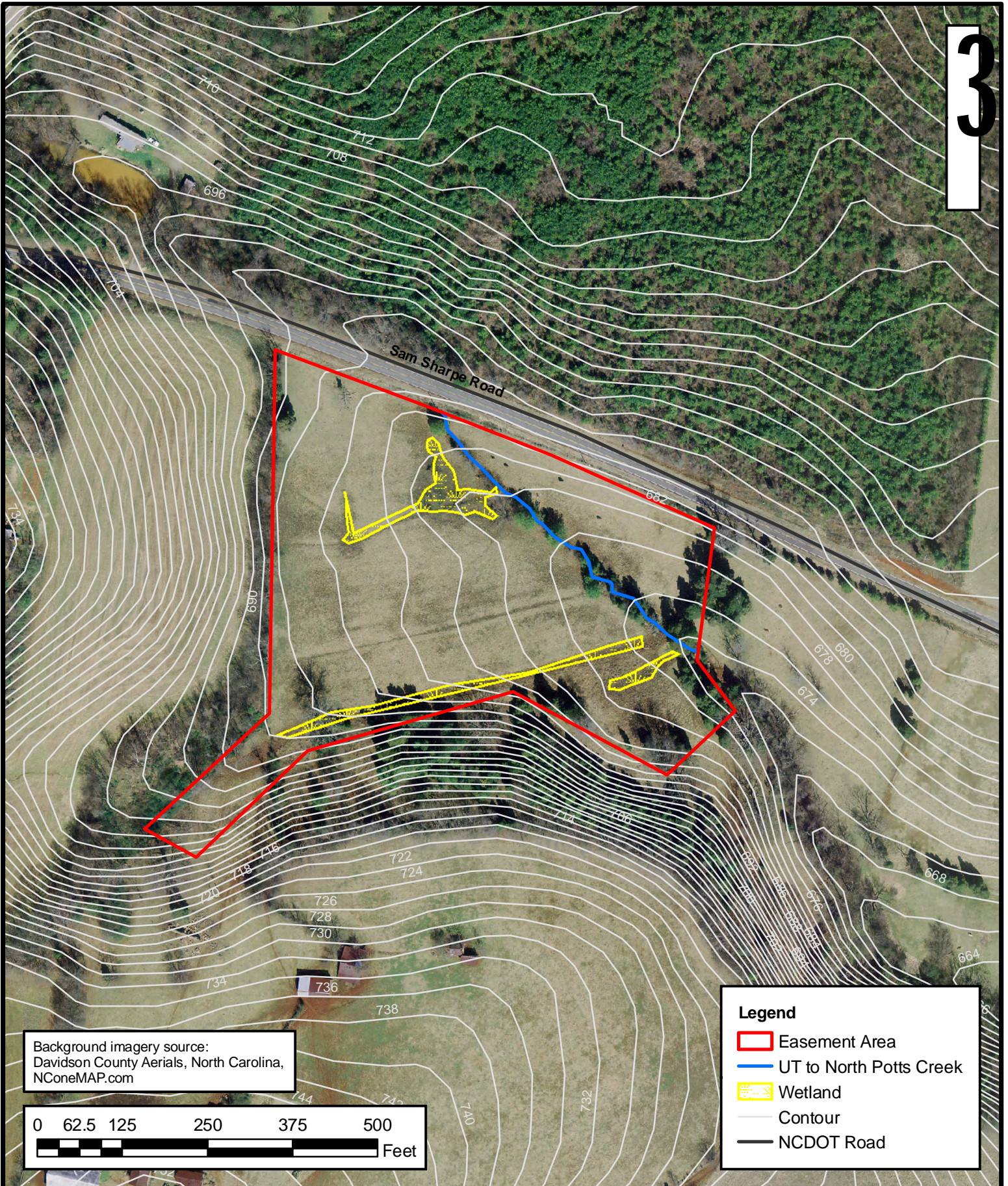
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SOILS MAP

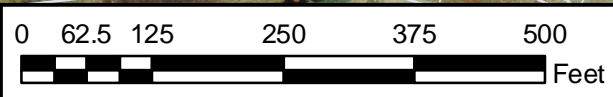
Drawn by:	MDT
Date:	DEC 2010
Scale:	1:2000
Project No.:	10-017

FIGURE

3



Background imagery source:
Davidson County Aerials, North Carolina,
NConeMAP.com



Legend

- Easement Area
- UT to North Potts Creek
- Wetland
- Contour
- NCDOT Road



Prepared for:

RESTORATION SYSTEMS LLC

Project:

SUMMIT SEEP

Davidson County, NC

Title:

CONTOUR MAP

Drawn by: MDT

Date: DEC 2010

Scale: 1:2200

Project No.: 10-017

FIGURE

6

Preconstruction Site Photographs



Panoramic view of Site looking across the existing pasture to the Northeast.



Panoramic view of Site looking across the existing pasture, along the UT to North Plots Creek.



Persimmon sapling found in existing pasture.



Among many, a crawfish hole located on Site.