YEAR 3 (2013)
ANNUAL WETLAND MONITORING REPORT

SUMMIT SEEP NON-RIPARIAN WETLAND MITIGATION SITE

EEP Project # 94646 RFP # 16-002835 Contract # 003244
Davidson County, North Carolina
Data Collected February 14, 2013 – November 13, 2013

PREPARED FOR:

NC Department of Environment & Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

PREPARED BY:

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Raleigh, NC 27604

December 2013

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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 (NCEEP 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 Ecosystem Enhancement Program 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-EEP 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 3 (2013) stem count measurements indicate an average of 573 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.

No single volunteer species (most notably red maple, loblolly pine, and sweet gum) will comprise more than 20 percent of the total composition at years 3, 4, or 5. If this occurs, remedial procedures/protocols outlined in the contingency plan will be implemented. During years 3, 4, and 5, no single volunteer species, comprising over 20 percent of the total composition, may be more than twice the height of the planted trees. If this occurs, remedial procedures outlined in the contingency plan will be implemented.

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) 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 were doing well during Year 3 (2013) monitoring.

No vegetation problem areas were identified within the Site during Year 3 (2013) Monitoring.

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 3 (2013) Annual Monitoring Report, a growing season initiation of February 14, 2013 is being used to compare with the standard Natural Resource Conservation Service (NRCS) published growing season dates. Future monitoring data collection (documentation of bud burst and soil temperature) will be used to verify the initiation of the growing season.

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 (*Acer rubrum*) and elderberry (*Sambucus canadensis*) and soil temperature of 48˚F documented on February 14, 2013	February 14-November 3 (263 days)	20 days
2014 (Year 4)			
2015 (Year 5)			

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 2013 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 Ecosystem Enhancement Program (NCEEP) website. All raw data supporting the tables and figures in the appendices is available from NCEEP 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 NCEEP 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/NCEEP 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 22, 2013.

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 to correct the elevation of the ditch plug, ultimately restoring groundwater levels throughout the Site. The Remedial Action Plan and correspondence with NCEEP 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)**	**Year 5 (2015)**
1	Yes / 37 days (16.81 percent)	Yes / 40 days (16.1 percent)	Yes / 58 days (22.1 percent)		
2	Yes / 73 days (33.18 percent)	Yes / 118 days (47.6 percent)	Yes / 211 days (80.2 percent)		
3	Yes / 23 days (10.45 percent)	Yes / 40 days (16.1 percent)	Yes / 105 days (39.9 percent)		
4	Yes / 67 days (30.45 percent)	Yes / 115 days (46.4 percent)	Yes / 232 days (86.5 percent)		
5	NA* / 4 days (1.8 percent)	No / 8 days (3.2 percent)	Yes / 71 days (27.0 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 form 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 600 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		
2	485	526	445		
3	687	648	648		
4	526	526	486		
5	1133	1052	1093		
6	607	405	405		
Average of All Plots (1-6)	**640**	**600**	**573**		

Part 4: REFERENCES

Griffith, G.E., J.M. Omernik, J.A. Comstock, M.P. Schafale, W.H. McNab, D.R. Lenat, T.F. MacPherson, J.B. Glover, and V.B. Shelbourne. 2002. Ecoregions of North Carolina and South Carolina. U.S. Geological Survey, Reston, Virginia.

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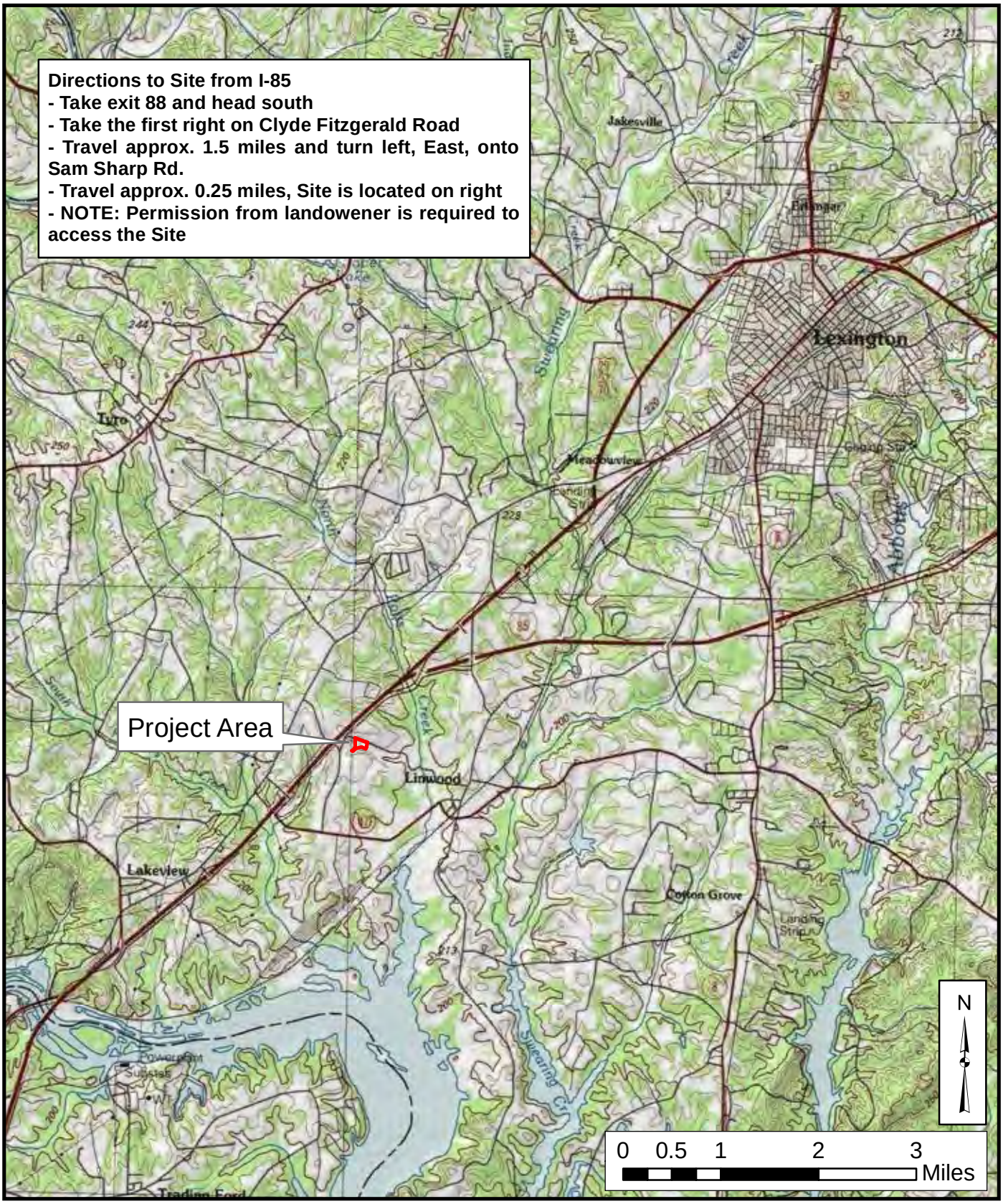
Appendix A: General Figures and Tables



Axiom Environmental
218 Snow Ave
Raleigh, NC 27603
Axiom Environmental, Inc.

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									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	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)	Wetland (acres)		Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine		
Restoration	0	0	3.91	0	0
Enhancement		0	.18	0	0
Enhancement 1	0				
Enhancement II	0				
Creation		0	0		
Preservation	0	0	0		0
High Quality Preservation	0	0	0		0

Table 2: Project Activity and Reporting History

Elapsed Time Since Grading Complete: 2 Years and 7 Months
Elapsed Time Since Planting Complete: 2 Years and 7 Months
Number of Reporting Years: 3 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

Table 3: Project Contacts

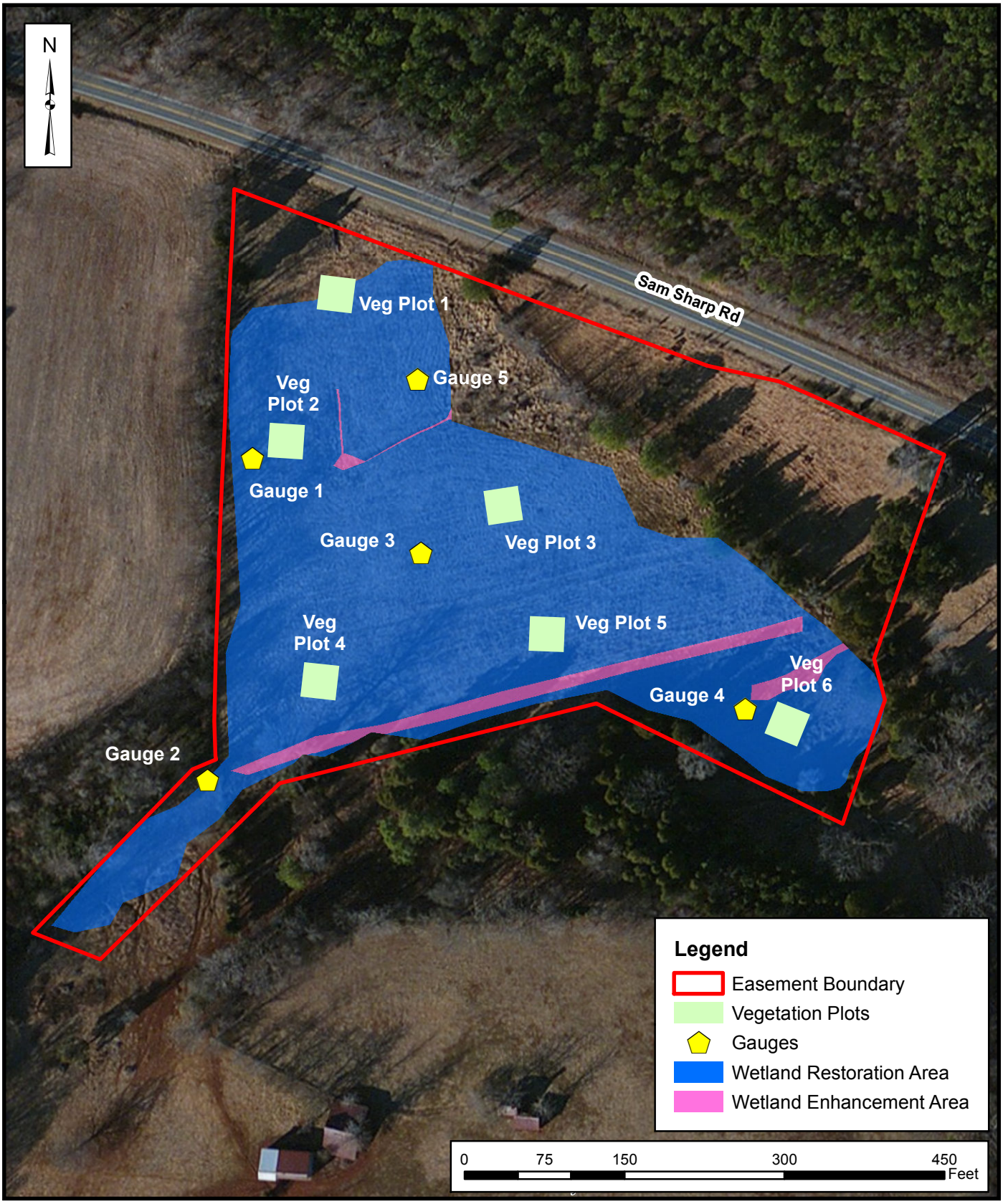
Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244		
	Firm	**POC & Address**
Designer:	Axiom Environmental, Inc.	Grant Lewis; 919.215.1693 218 Snow Ave. Raleigh, NC 27603
Construction Contractor:	Land Mechanics, Inc.	Lloyd Glover; 919.422.3392 780 Landmark Road Willow Spring, NC 27592-7756
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, NC.	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



Axiom Environmental, Inc.

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

Dwn. by.	WGL/KRJ
Date:	Dec 2013
Project:	10-001

FIGURE
2

Table 5: Vegetation Condition Assessment

Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244

Planted Acreage - 6.9 acres (Entire Easement)					
Vegetation Category		**Mapped Acreage**	**CCPV Symbol**	**Number of Polygons**	**% of planted Acreage**
Areas of Concern	No areas of vegetation concern were observed at the Site during year 3 (2013) monitoring.	NA	NA	NA	0%
Exotic Invasive Species	No areas of invasive species concern were observed at the Site during year 3 (2013) monitoring..	NA	NA	NA	0%

Appendix C: Vegetation Plot Data

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		
2	485	526	445		
3	687	648	648		
4	526	526	486		
5	1133	1052	1093		
6	607	405	405		
Average of All Plots (1-6)	**640**	**600**	**573**		

Table 7. CVS Vegetation Plot Metadata

Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244

Report Prepared By:	Corri Faquin
Date Prepared	9/16/2013 15:52
database name	cvs-eep-entrytool-v2.2.7.mdb
database location	S:\Projects\Projects (Existing)\Summit Seep\Task 7- Monitoring
computer name	SPARE
file size	37326848
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. Planted and Total Stems
Summit Seep

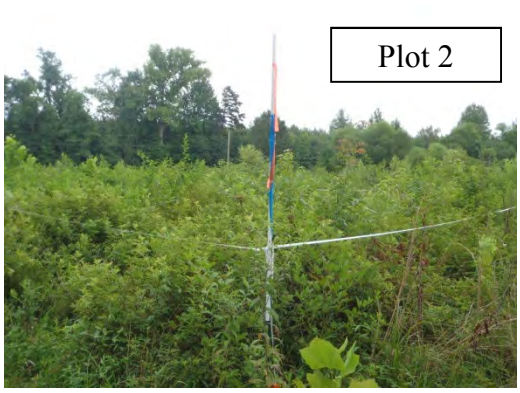
			Current Plot Data (MY3 2013)																		Annual Means											
			Summit-RS-0001			Summit-RS-0002			Summit-RS-0003			Summit-RS-0004			Summit-RS-0005			Summit-RS-0006			MY3 (2013)			MY2 (2012)			MY1 (2011)			MY0 (2011)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	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	red maple	Tree									2												2								
Asimina triloba	pawpaw	Tree										1	1	1	1	1	1				2	2	2	4	4	4	9	9	9	14	14	14
Betula nigra	river birch	Tree	3	3	3				2	2	2	2	2	2	1	1	1	1	1	1	9	9	9	10	10	10	10	10	10	10	10	10
Carpinus caroliniana	American hornbeam	Tree	1	1	1	1	1	1	2	2	2	1	1	1							5	5	5	6	6	6	19	19	19	9	9	9
Celtis laevigata	sugarberry	Tree													1	1	1				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						
Cornus amomum	silky dogwood	Shrub			1									1									2									
Diospyros virginiana	common persimmon	Tree	2	2	34			19	3	3	52			22	5	5	32				10	10	159	10	10	84	9	9	28	11	11	11
Fraxinus pennsylvanica	green ash	Tree			4				1	1	1			4							1	1	9	1	1	4						
Gleditsia triacanthos	honeylocust	Tree																											1			
Juglans nigra	black walnut	Tree																		1			1									
Juniperus virginiana	eastern redcedar	Tree															1						1						5			
Liquidambar styraciflua	sweetgum	Tree			26			13						4			17			10			70			66			13			
Pinus taeda	loblolly pine	Tree			1									2									3			4						
Platanus occidentalis	American sycamore	Tree				2	2	2	2	2	2	3	3	3	1	1	1	7	7	7	15	15	15	14	14	14	11	11	11	10	10	10
Pyrus calleryana	Callery pear	Exotic									2												2									
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	5	5	5	1	1	1	4	4	4							11	11	11	12	12	12	15	15	15	15	15	15
Quercus pagoda	cherrybark oak	Tree	1	1	1				3	3	3	1	1	1	1	1	1				6	6	6	4	4	4	7	7	7	13	13	13
Quercus phellos	willow oak	Tree	1	1	1	1	1	1							3	3	3				5	5	5	6	6	6	7	7	7	7	7	7
Salix nigra	black willow	Tree																		1			1									
Sambucus canadensis	Common Elderberry	Shrub																2	2	2	2	2	2	2	2	2						
Ulmus alata	winged elm	Tree													1	1	1				1	1	1									
Ulmus americana	American elm	Tree			3	1	1	6	2	2	9			6	13	13	25				16	16	49	18	18	53	8	8	8	8	8	8
Unknown		Shrub or Tree																												1	1	1
		Stem count	9	9	76	11	11	48	16	16	76	12	12	51	27	27	84	10	10	22	85	85	357	89	89	271	95	95	133	101	101	101
		size (ares)	1			1			1			1			1			1			6			6			6			6		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.15			0.15			0.15			0.15		
		Species count	6	6	11	6	6	8	8	8	10	6	6	12	9	9	11	3	3	6	14	14	22	13	13	15	9	9	12	11	11	11
		Stems per ACRE	364.2	364.2	3076	445.2	445.2	1942	647.5	647.5	3076	485.6	485.6	2064	1093	1093	3399	404.7	404.7	890.3	573.3	573.3	2408	600.3	600.3	1828	640.8	640.8	897.1	681.2	681.2	681.2

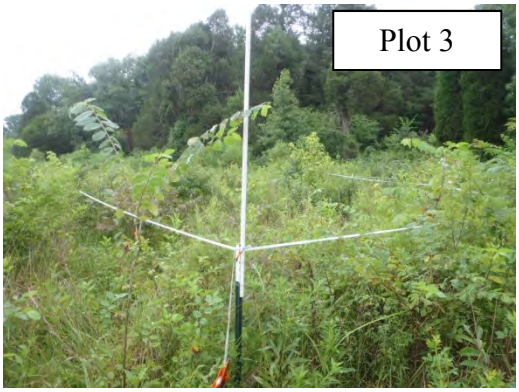
Color for Density

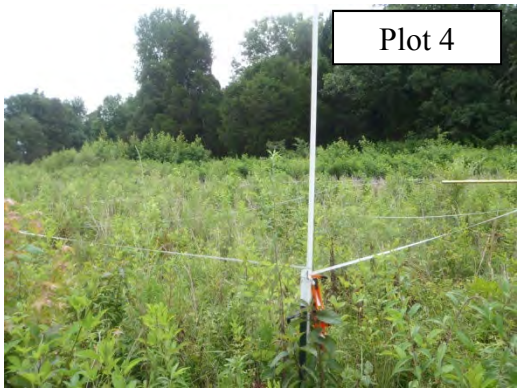
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

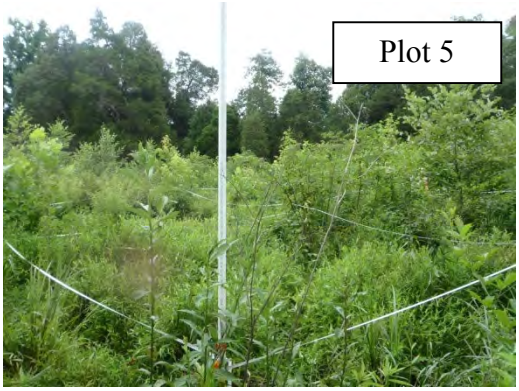
PnoLS = Planted excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes natural recruits

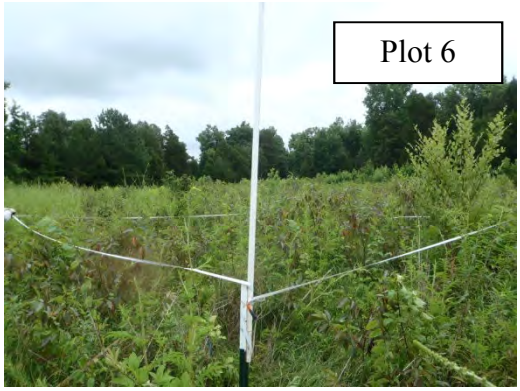
Summit Seep
2013 (Year 3) Vegetation Monitoring Photographs
Taken July 2013



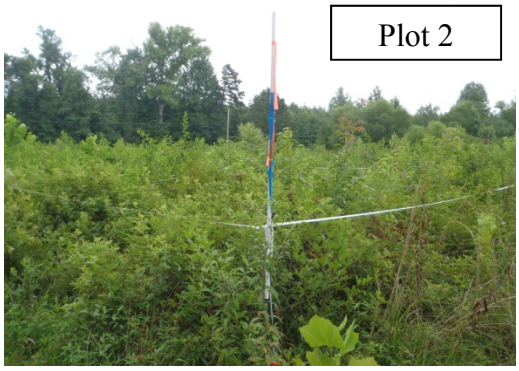


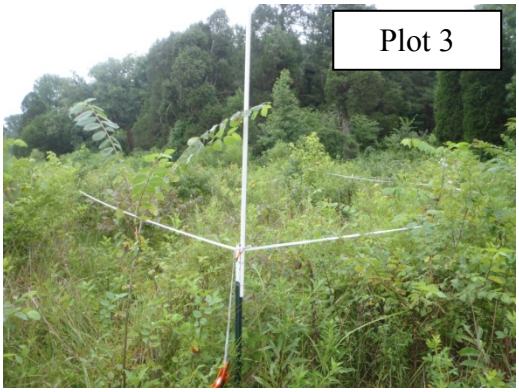


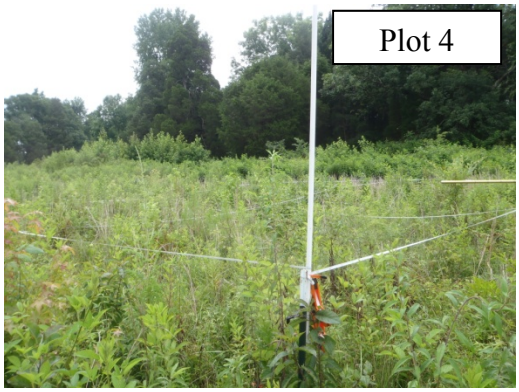


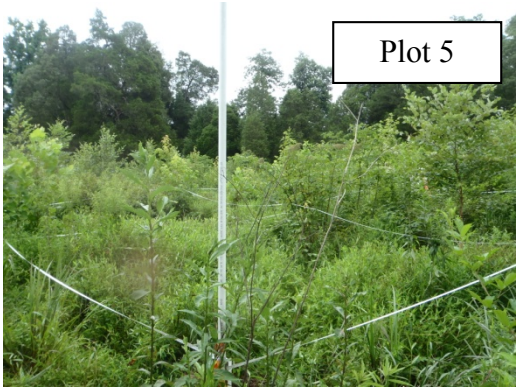


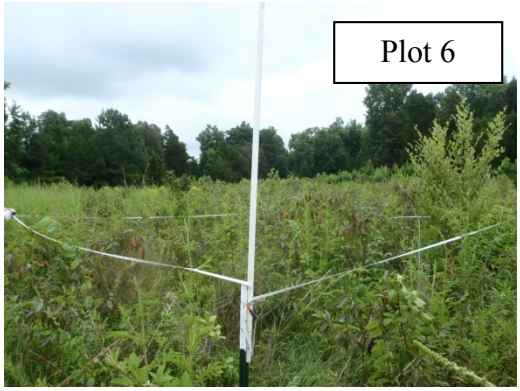
Summit Seep
2013 (Year 3) Vegetation Monitoring Photographs
Taken July 2013











Appendix D: Hydrology Data

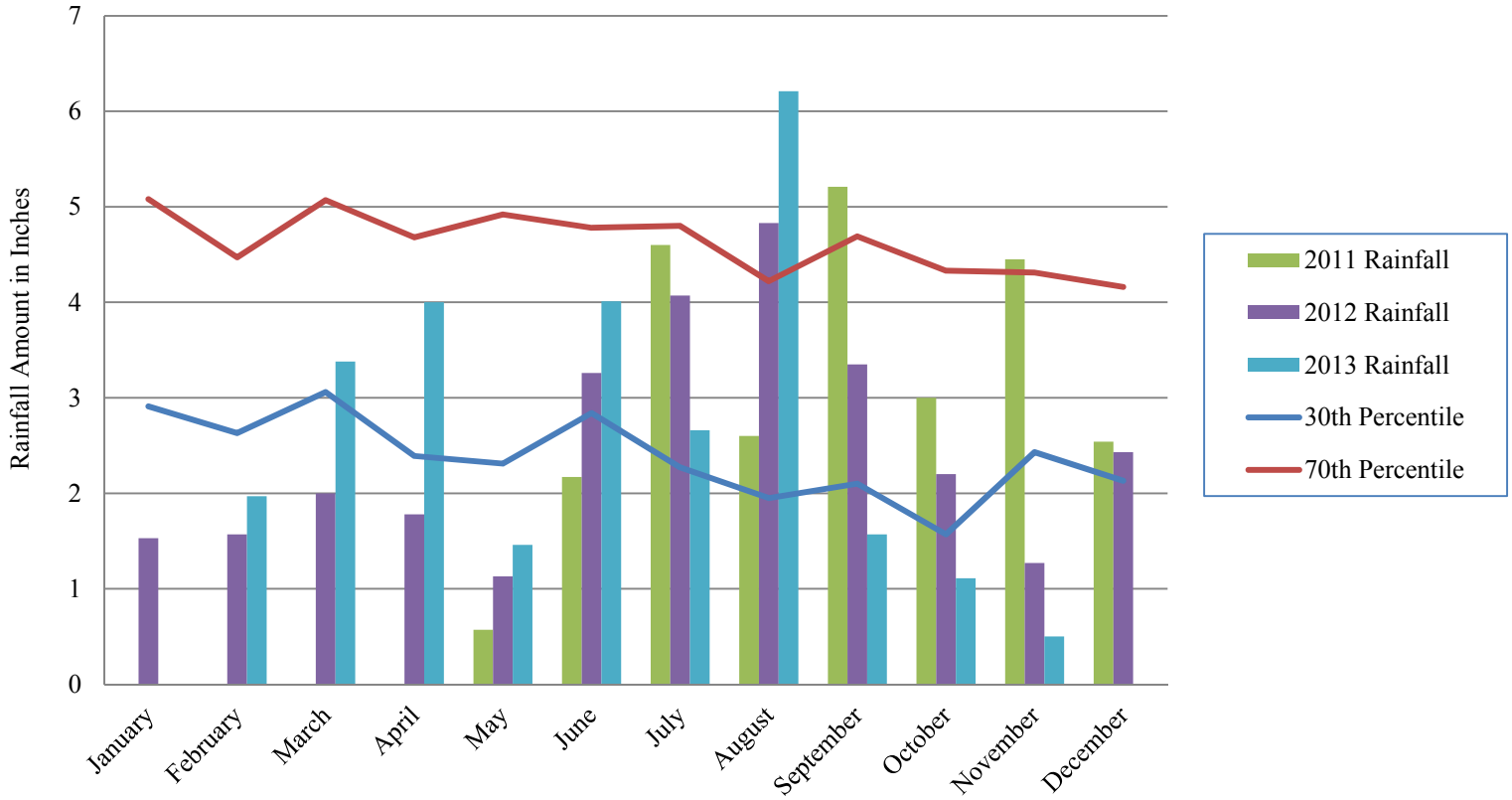
Table 9. Wetland Gauge Attainment Data
Figure 3. Summit Seep 30-70 Percentile Graph for Rainfall
2013 Groundwater Gauge Graphs

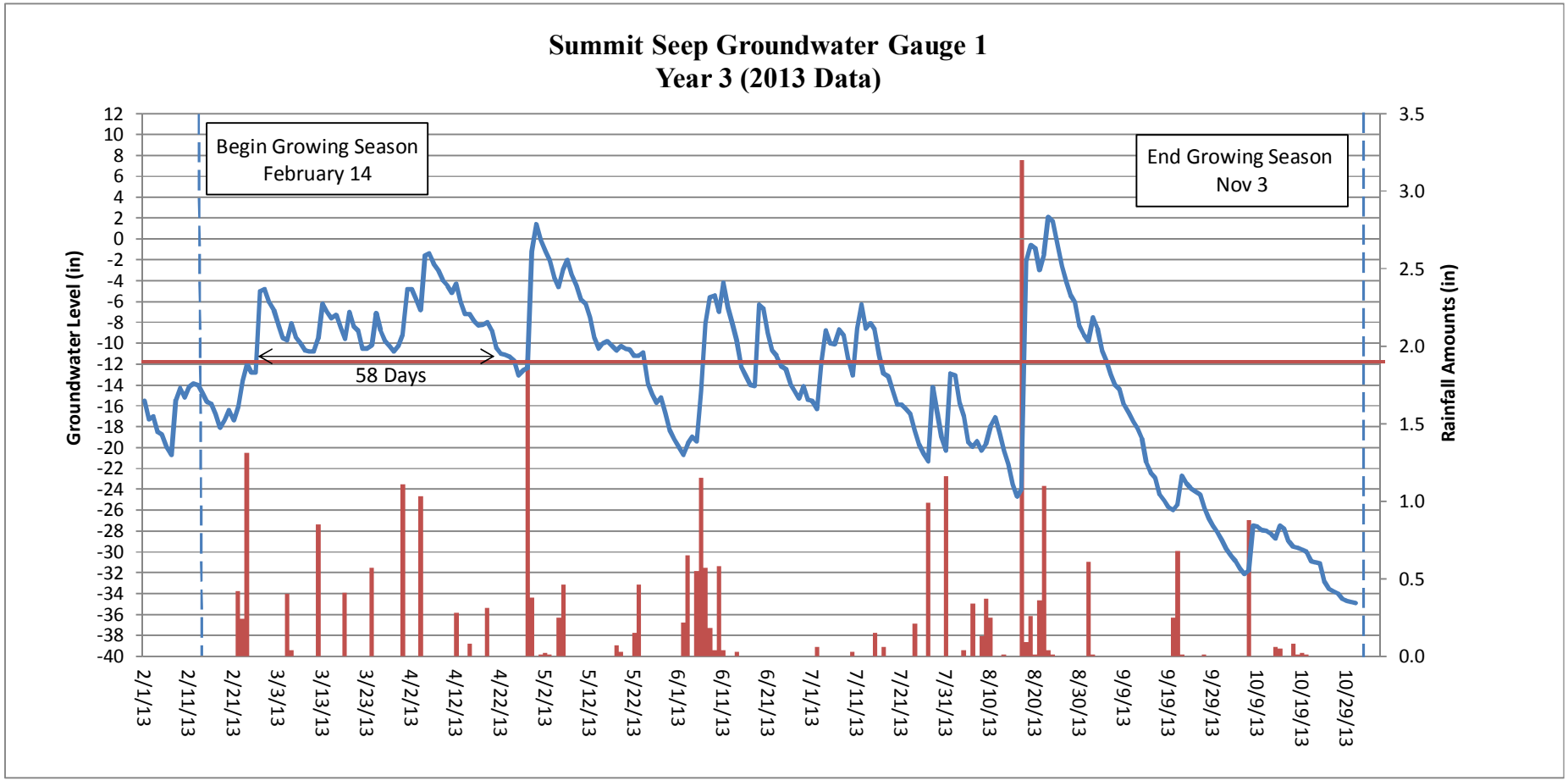
Table 9. Ground Gauge Attainment Data

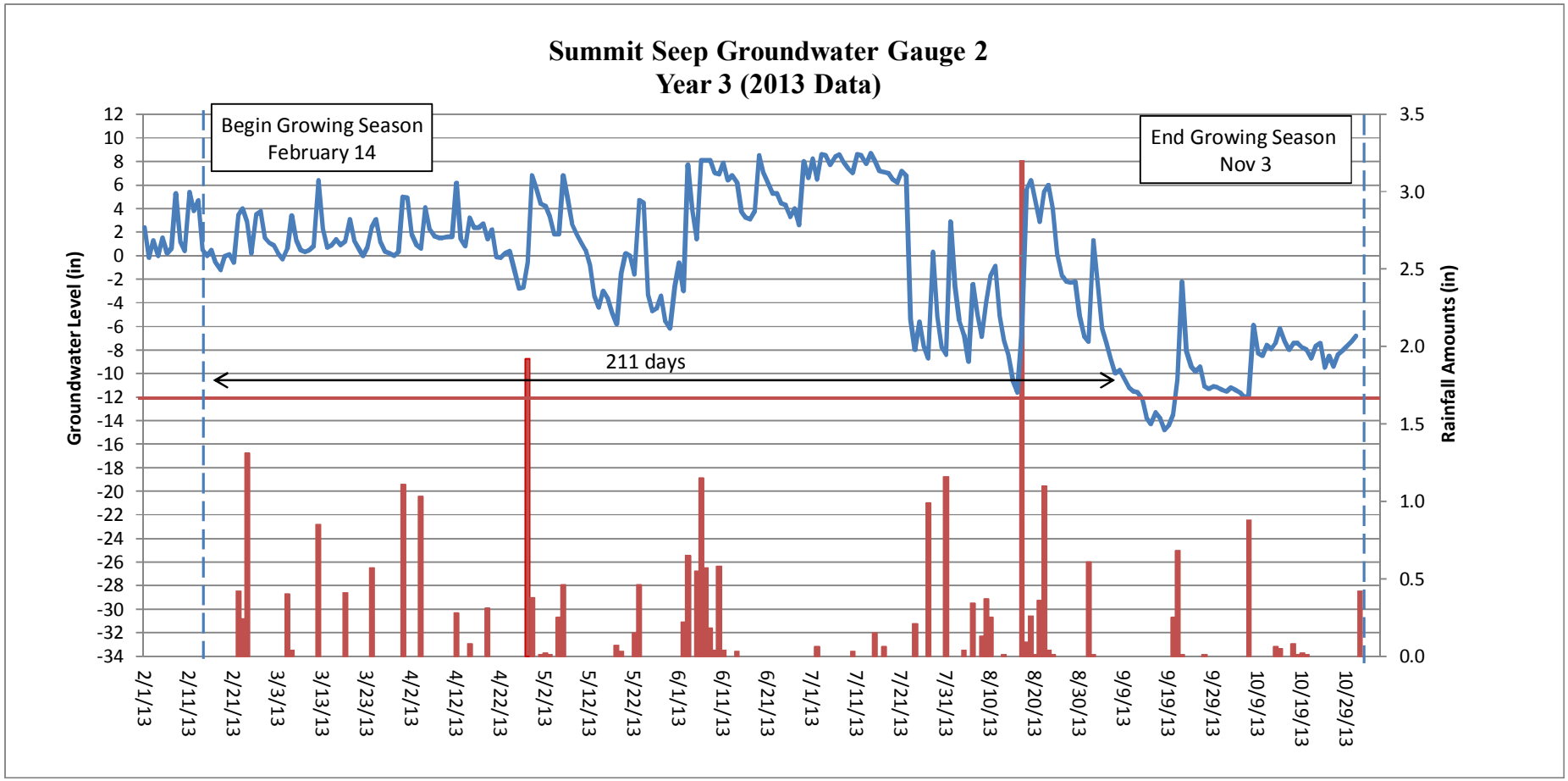
Summit Seep Non-Riparian Wetland Mitigation Site Contract # 003244

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)**	**Year 5 (2015)**
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)		
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)		
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)		
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)		
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)		

Figure 3: Summit Seep 30-70 Percentile Graph for Rainfall in 2013
Data from WETS Station : LEXINGTON, NC4970




Summit Seep Groundwater Gauge 1
Year 3 (2013 Data)
Begin Growing Season
February 14
End Growing Season
Nov 3
58 Days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2/1/13
2/11/13
2/21/13
3/3/13
3/13/13
3/23/13
4/2/13
4/12/13
4/22/13
5/2/13
5/12/13
5/22/13
6/1/13
6/11/13
6/21/13
7/1/13
7/11/13
7/21/13
7/31/13
8/10/13
8/20/13
8/30/13
9/9/13
9/19/13
9/29/13
10/9/13
10/19/13
10/29/13


Summit Seep Groundwater Gauge 2
Year 3 (2013 Data)
Begin Growing Season
February 14
End Growing Season
Nov 3
211 days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2/1/13
2/11/13
2/21/13
3/3/13
3/13/13
3/23/13
4/2/13
4/12/13
4/22/13
5/2/13
5/12/13
5/22/13
6/1/13
6/11/13
6/21/13
7/1/13
7/11/13
7/21/13
7/31/13
8/10/13
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8/30/13
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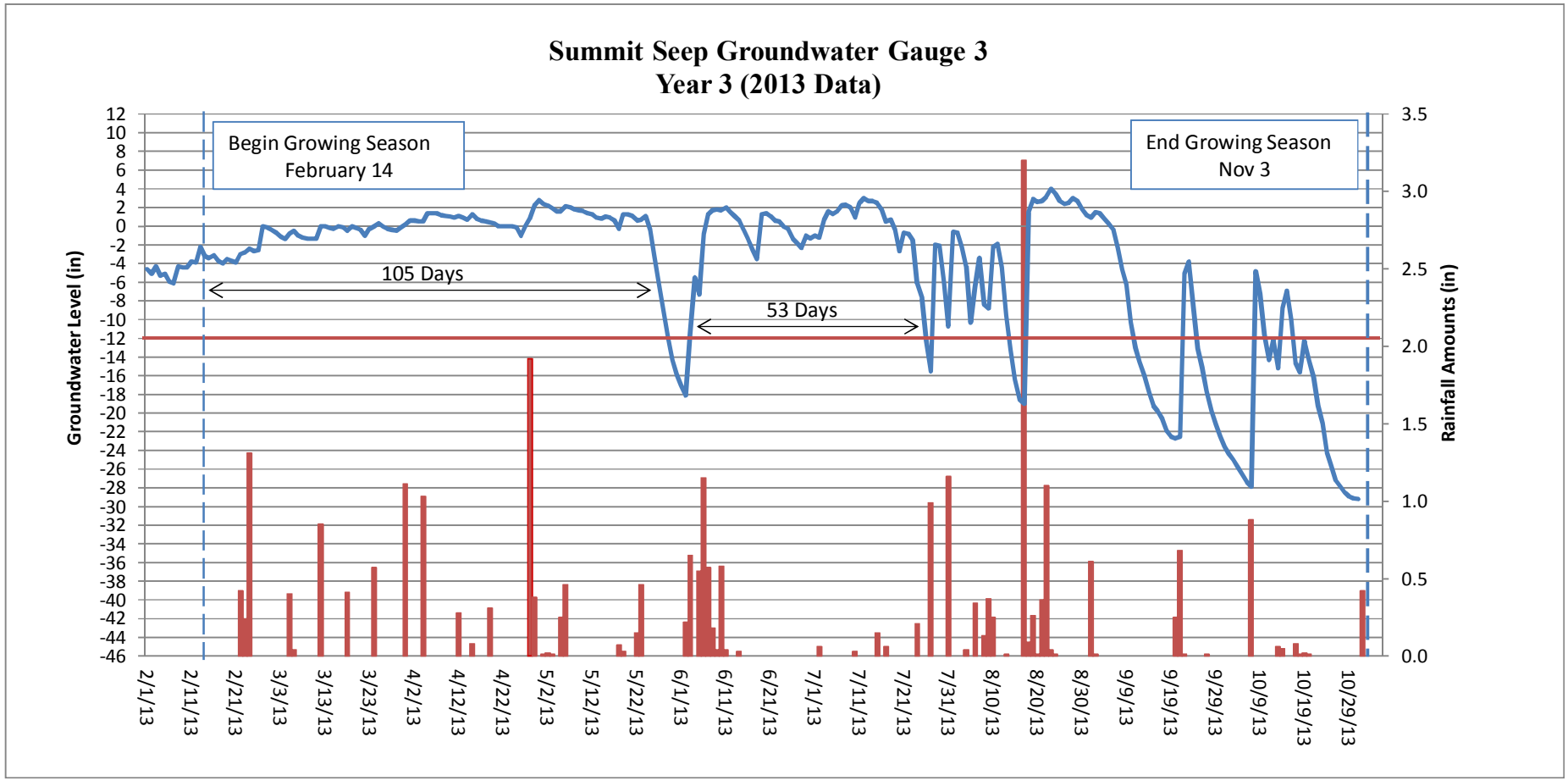
9/19/13
9/29/13
10/9/13
10/19/13
10/29/13


Summit Seep Groundwater Gauge 3
Year 3 (2013 Data)
Begin Growing Season
February 14
End Growing Season
Nov 3
105 Days
53 Days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
-46
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2/1/13
2/11/13
2/21/13
3/3/13
3/13/13
3/23/13
4/2/13
4/12/13
4/22/13
5/2/13
5/12/13
5/22/13
6/1/13
6/11/13
6/21/13
7/1/13
7/11/13
7/21/13
7/31/13
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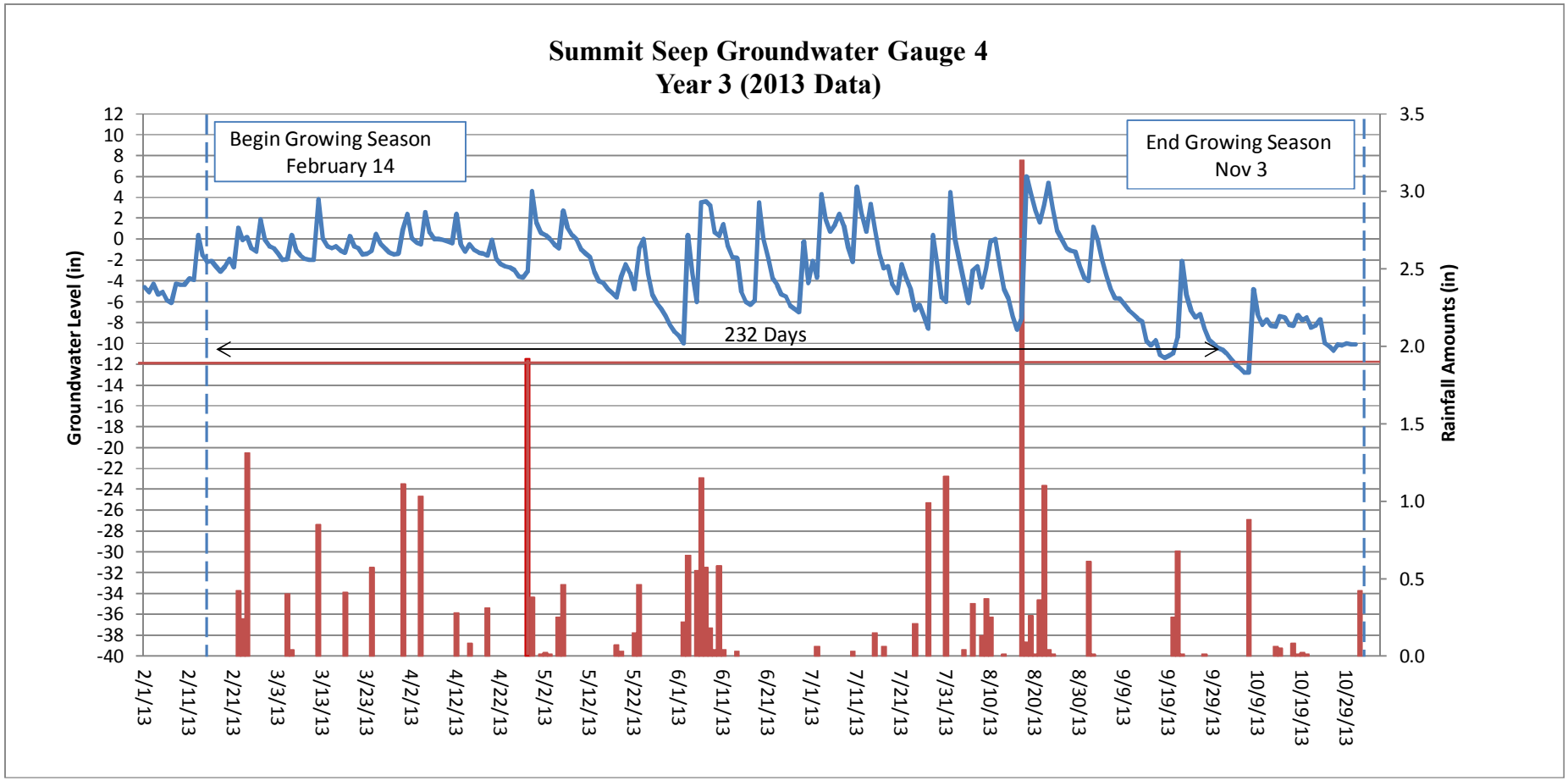
9/29/13
10/9/13
10/19/13
10/29/13


Summit Seep Groundwater Gauge 4
Year 3 (2013 Data)
Begin Growing Season
February 14
End Growing Season
Nov 3
232 Days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2/1/13
2/11/13
2/21/13
3/3/13
3/13/13
3/23/13
4/2/13
4/12/13
4/22/13
5/2/13
5/12/13
5/22/13
6/1/13
6/11/13
6/21/13
7/1/13
7/11/13
7/21/13
7/31/13
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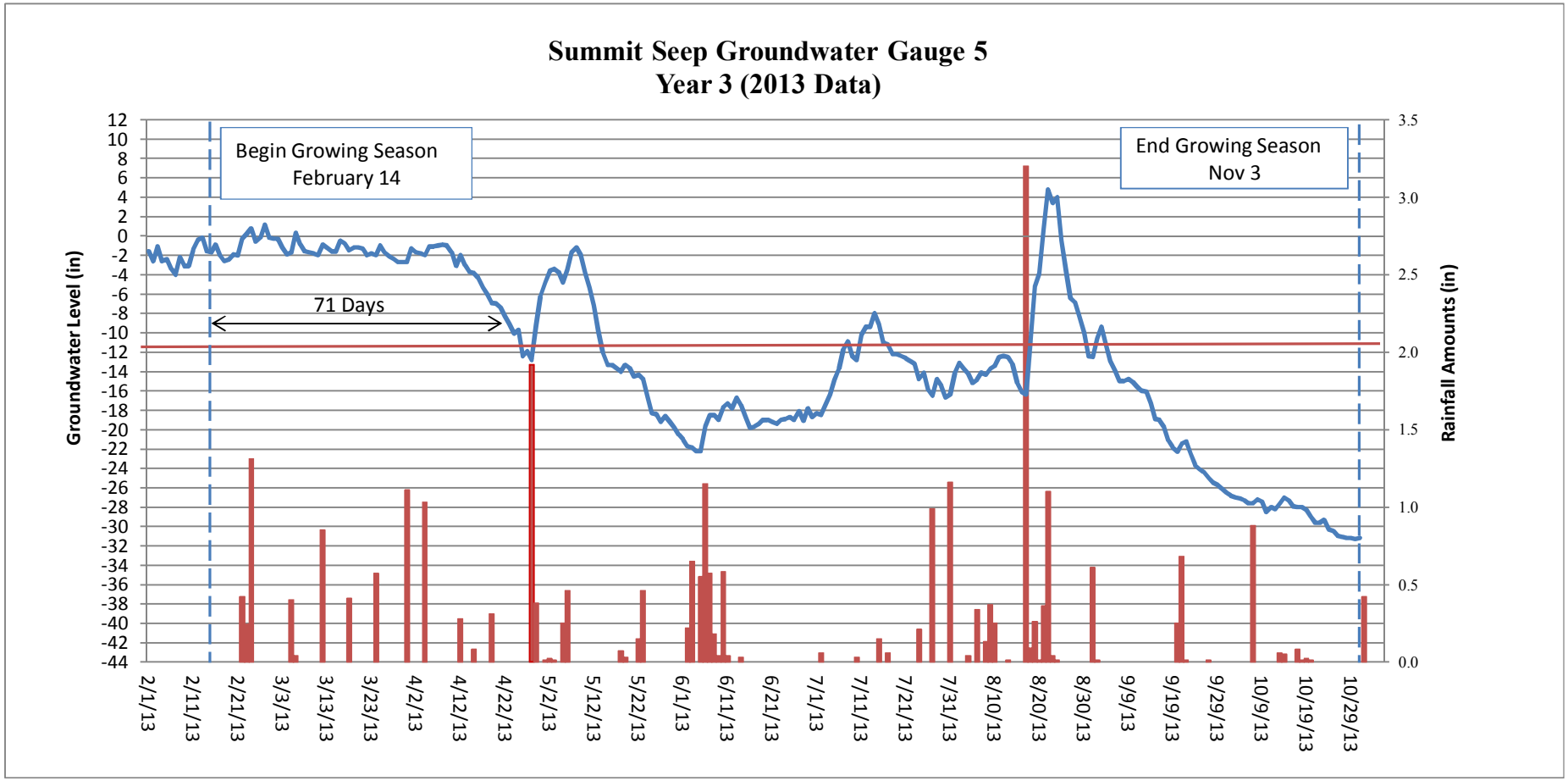
9/29/13
10/9/13
10/19/13
10/29/13


Summit Seep Groundwater Gauge 5
Year 3 (2013 Data)
Begin Growing Season
February 14
End Growing Season
Nov 3
71 Days
Groundwater Level (in)
Rainfall Amounts (in)
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
-38
-40
-42
-44
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2/1/13
2/11/13
2/21/13
3/3/13
3/13/13
3/23/13
4/2/13
4/12/13
4/22/13
5/2/13
5/12/13
5/22/13
6/1/13
6/11/13
6/21/13
7/1/13
7/11/13
7/21/13
7/31/13
8/10/13
8/20/13
8/30/13
9/9/13
9/19/13
9/29/13
10/9/13
10/19/13
10/29/13

Appendix E: 2013 Remedial Actions

Remedial Action Plan for Hydrology
NCEEP Correspondence

RESTORATION SYSTEMS LLC

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 preformed 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 were RS plains 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,

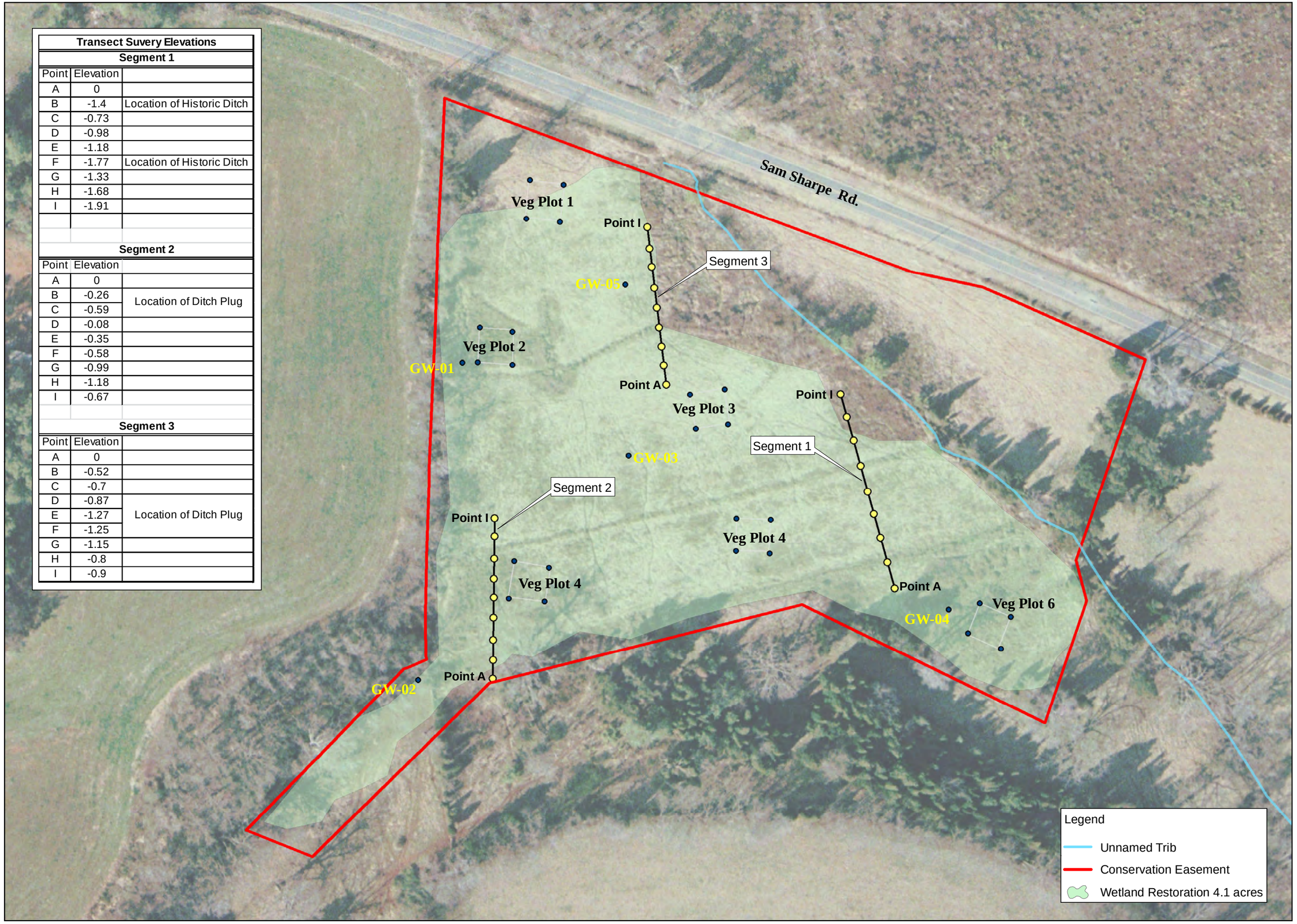
Raymond Holz

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

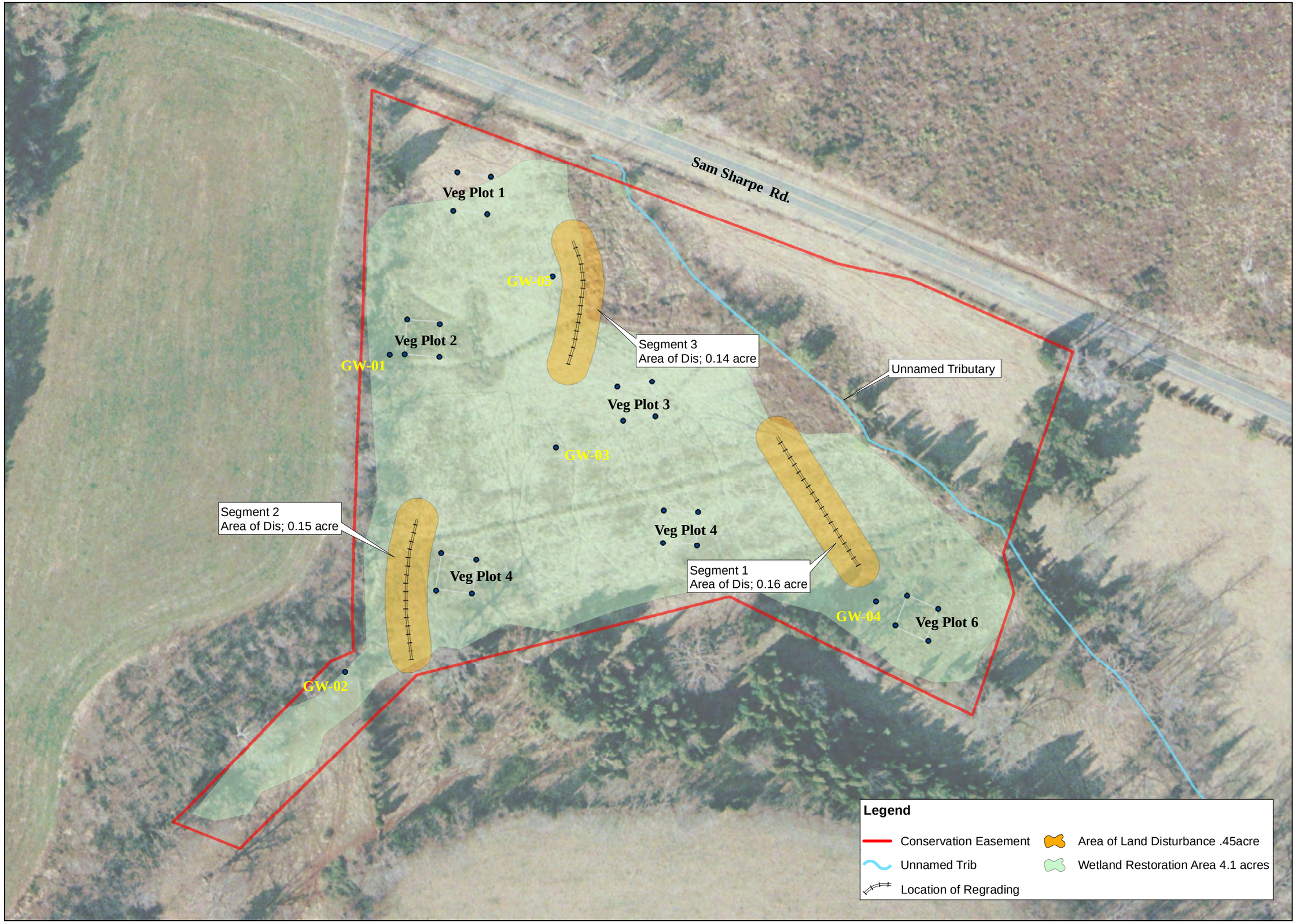
1101 HAYNES ST, SUITE 211
RALEIGH, NC 27604
PHONE : 919.755.9490
FAX : 919.755.9492

Prepared For:

Ecosystem Enhancement Program

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



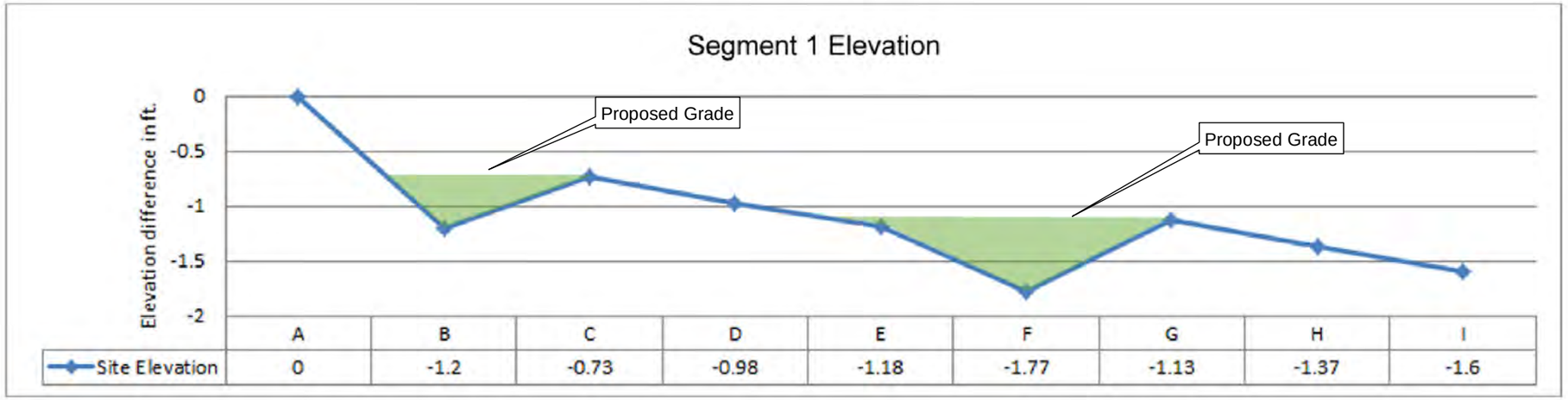
RESTORATION SYSTEMS | LLC
1101 HAYNES ST, SUITE 211
RALEIGH, NC 27604
PHONE : 919.755.9490
FAX : 919.755.9492

Prepared For:

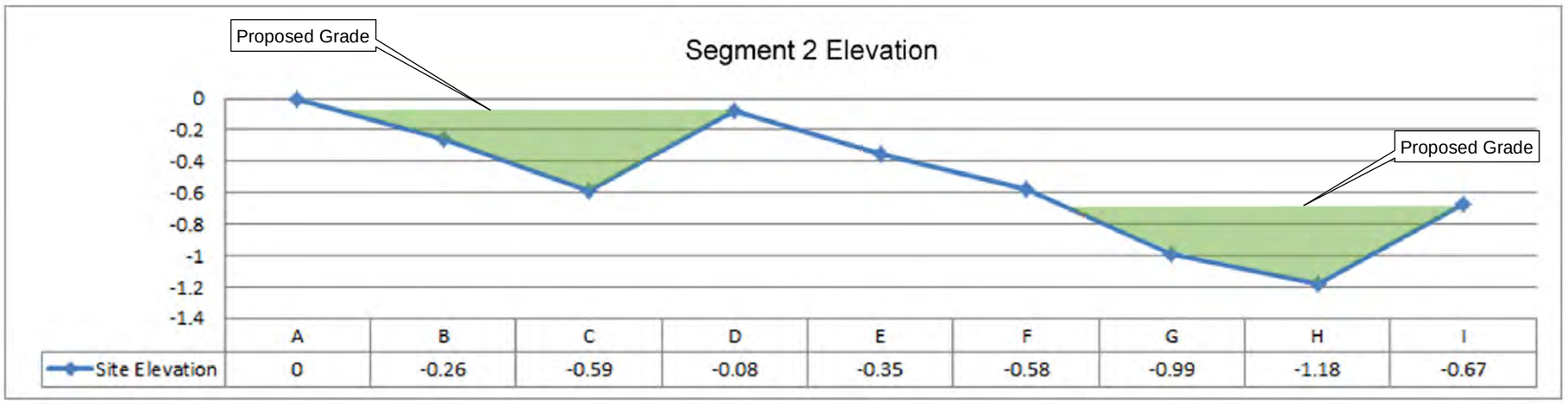
Ecosystem Enhancement Program

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



	A	B	C	D	E	F	G	H	I
Site Elevation	0	-1.2	-0.73	-0.98	-1.18	-1.77	-1.13	-1.37	-1.6



	A	B	C	D	E	F	G	H	I
Site Elevation	0	-0.26	-0.59	-0.08	-0.35	-0.58	-0.99	-1.18	-0.67

	A	B	C	D	E	F	G	H	I
Site Elevation	0	-0.52	-0.7	-0.87	-1.27	-1.25	-1.15	-0.8	-0.9

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

Prepared For:

Ecosystem Enhancement Program

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

From: Raymond Holz [mailto:rholz@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

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