

SANDY CREEK

Durham County, North Carolina
EEP Project No. 322

2011 Annual Monitoring Report
(Measurement Year-6 – MY6 (2011) – 2nd year post-repair)
Site Constructed 2003/Repaired 2008-2009



March 2012

Prepared for:



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1.0 EXECUTIVE SUMMARY

Sandy Creek is a wetland restoration and stream enhancement mitigation site located in Durham County, North Carolina. The project consists of 3.13 acres of wetland restoration and 2,461 linear feet of Level II stream enhancement. The conservation easement encompasses 22.6 acres and includes an additional 7.1 acres of preserved existing wetlands. Wetland and stream construction originally took place in 2003. Wetlands restoration consisted of grading activities and planting wetland vegetation. Stream enhancement consisted of the installation of log vanes to create pool features to enhance habitat and water quality along 2,461 linear feet of stream. In 2004, the site was partially replanted due to low plant survivorship. The wetland restoration area was again re-graded between December 2009 and February 2010 to correct final grade elevations to establish proper wetland hydrology. Topsoil was added to improve soil fertility for plant growth and the graded areas were replanted with native plant species.

1.1 Goals and Objectives

Project Goals:

- Improve water quality by incorporating log vanes within the stream channel and planting the stream buffer
- Improve wetland hydrology with the removal of fill material and the sludge drying beds
- Improve in-stream habitat with the installation of log vanes to enhance pool depths
- Restore wetland function with the incorporation of woody and herbaceous wetland plant species

Project Objectives:

- The Level II stream enhancement of 2,461 linear feet of Sandy Creek
- Restoration of 3.13 acres of wetlands through the removal of fill material and the sludge drying beds to improve wetland hydrology
- Establishment of a 22.6 acres conservation easement

1.2 Vegetative Assessment

Currently the vegetation is meeting the success criterion with 688 woody stems/acre. The success criterion for vegetation is 260 woody stems/acre at the end of the monitoring period. Based on the CVS vegetation data for planted woody stems there are 303 stems/acre. As a result of the wetland re-grading in December 2009, the vegetation in monitoring plots 2, 3, and 4 was removed, leaving only vegetation monitoring plot 1 intact. The site was replanted and plots 2, 3, and 4, were re-established in February 2010. Although trees survived, in order to comply with warranty requirements per the construction contract, areas of low stem densities were supplemented with plantings on February 25, 2011 due to low survivorship results for Monitoring Year (MY)-05. Five hundred (500) native woody stems, comprised of both bare root and 1 gallon containerized plant material, were installed across all three planting zones (Appendix B). One week after planting, planted stems within the vegetation monitoring plots were marked with flagging and counted in order to accurately monitor survivorship for MY-06. Level II of the CVS-EEP protocol was administered for plots 1, 2, 3, and 4 in the August of 2011 for MY-06, which accounts for natural and planted woody stems. Some planted stems were observed to have been smothered by the herbaceous vegetation (i.e. *Juncus effusus*). Vegetation problem areas are sections with

low stem densities and invasive exotic species. Low stem densities occurred within the immediate vicinity of plots 1. Several stands of Chinese lespedeza (*Lespedeza cuneata*), were observed along the woodland margins, plot 1, and 3. These areas along the woodland margin have remained undisturbed throughout the monitoring period.

1.3 Stream Assessment

The stream banks are well vegetated and stable. The log vanes are stable and functioning as intended. Some erosion was observed around the anchor boulder at the top of log vane 12. Aquatic habitat in the form of woody debris was observed at several locations along the stream. Two areas of minor debris buildup are located at stations 3+50 and 24+00, which do not span the entire width of the stream and are not causing bank instability issues presently. A debris pile at station 10+00, reported in MY-05, caused by a fallen tree is still present. This debris spans the entire width of the stream but is not currently causing bank instability. Woody debris is partially blocking the left two of the existing three box culverts at the downstream end of the project.

1.4 Wetland Assessment

The site was re-graded between December 2009 and February 2010. New groundwater gauges were installed in the spring of 2010 at three locations – the reference wetland gauge, gauge A, and gauge C. Gauge B remained undisturbed in its original location. All gauges exhibited saturation within 12 inches of the ground surface for more than 12.5% of the growing season (Table 13). The average annual growing season for Durham County is 227 days (March 30 -November 11).

1.5 Annual Monitoring Summary

Summary information/data related to the occurrence of items such as beaver or encroachment, and statistics related to performance of various projects 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 mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices are available from EEP upon request.

METHODOLOGY

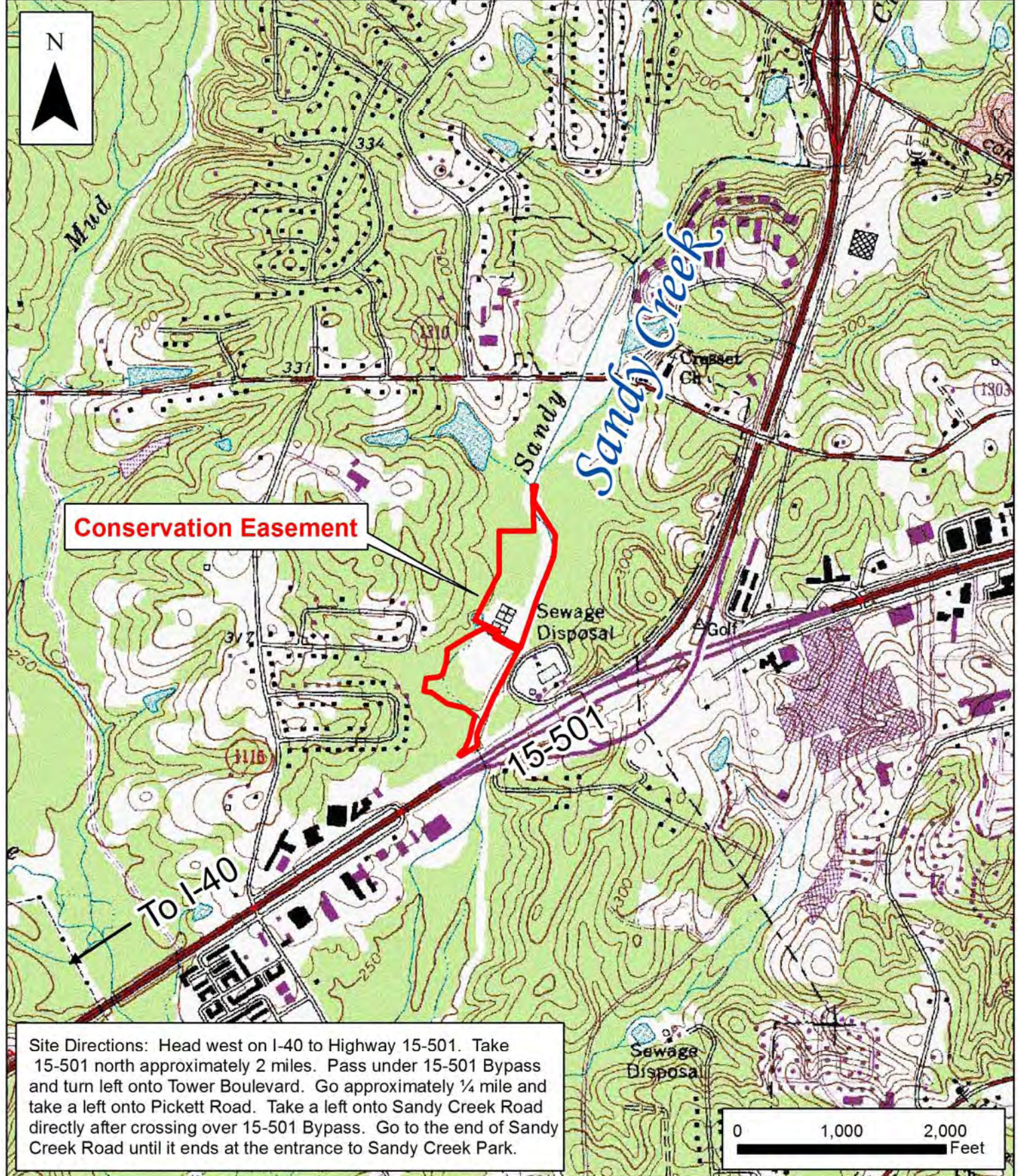
All monitoring methodologies are a combination of current NCEEP templates and guidelines and previous monitoring reports (EEP template version 1.2.1 2009). Level II of the CVS –EEP Protocol for Recording Vegetation (Lee et al 2008) was used for vegetation data collection. Photos were taken with a digital camera. A Trimble Geo XT handheld unit with sub-meter accuracy was used to collect monitoring feature locations and vegetation problem areas. Stream assessments followed methodologies outlined in *Applied River Morphology* (Rosgen 1996). Precipitation data were obtained from the State Climate Office of North Carolina (<http://www.nc-climate.ncsu.edu/services/request.php>) (State Office of North Carolina 2011). *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* was the taxonomic standard used throughout vegetation data collection (Weakley 2011). Vegetation monitoring data was collected on August 24, 2011. Stream monitoring was conducted on Mar 25 and August 18, 2011.

REFERENCES

- Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (<http://cvs.bio.unc.edu/methods.htm>)
- Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.
- State Climate Office of North Carolina 2011. North Durham Water Reclamation Facility Precipitation Data (*Jan 1, 2010 – Nov. 1, 2011 Daily Totals*)
- Weakley, A.S. 2011. *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas*. Working draft of May 2011. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina. 1015pp.

Appendix A

General Figures and Plan Views



Conservation Easement

Site Directions: Head west on I-40 to Highway 15-501. Take 15-501 north approximately 2 miles. Pass under 15-501 Bypass and turn left onto Tower Boulevard. Go approximately ¼ mile and take a left onto Pickett Road. Take a left onto Sandy Creek Road directly after crossing over 15-501 Bypass. Go to the end of Sandy Creek Road until it ends at the entrance to Sandy Creek Park.



The
Catena
Group

Sandy Creek
Stream Enhancement and Wetland Restoration Site
Site Location Map
Durham County, North Carolina

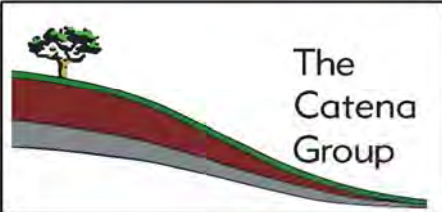
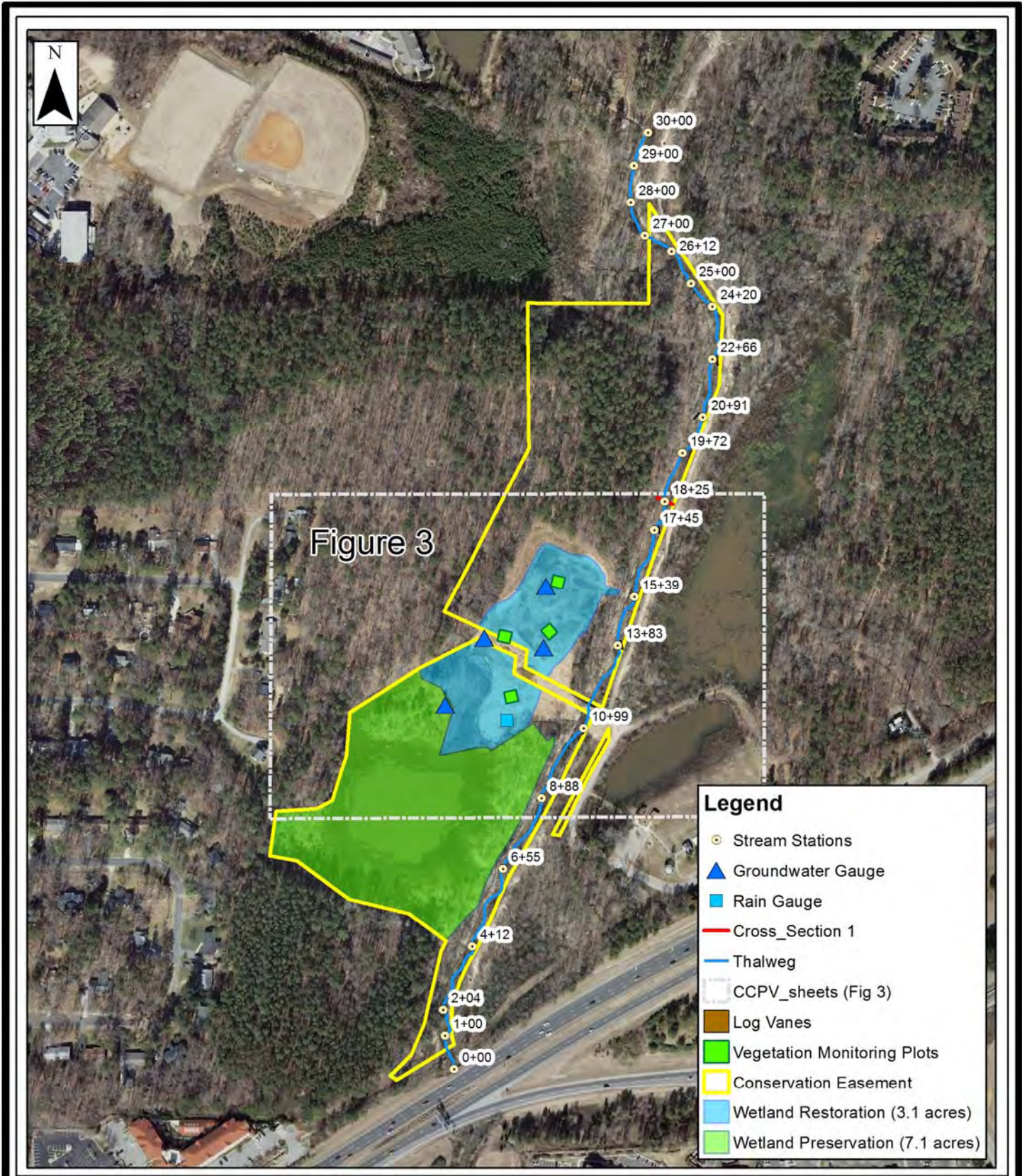
EEP Project No. 322

USGS 7.5-Minute Topographic Quadrangle Map

Date:
March 2012



Figure
1



Sandy Creek: Wetland Restoration and Stream Enhancement Site

CCPV Sheet Index

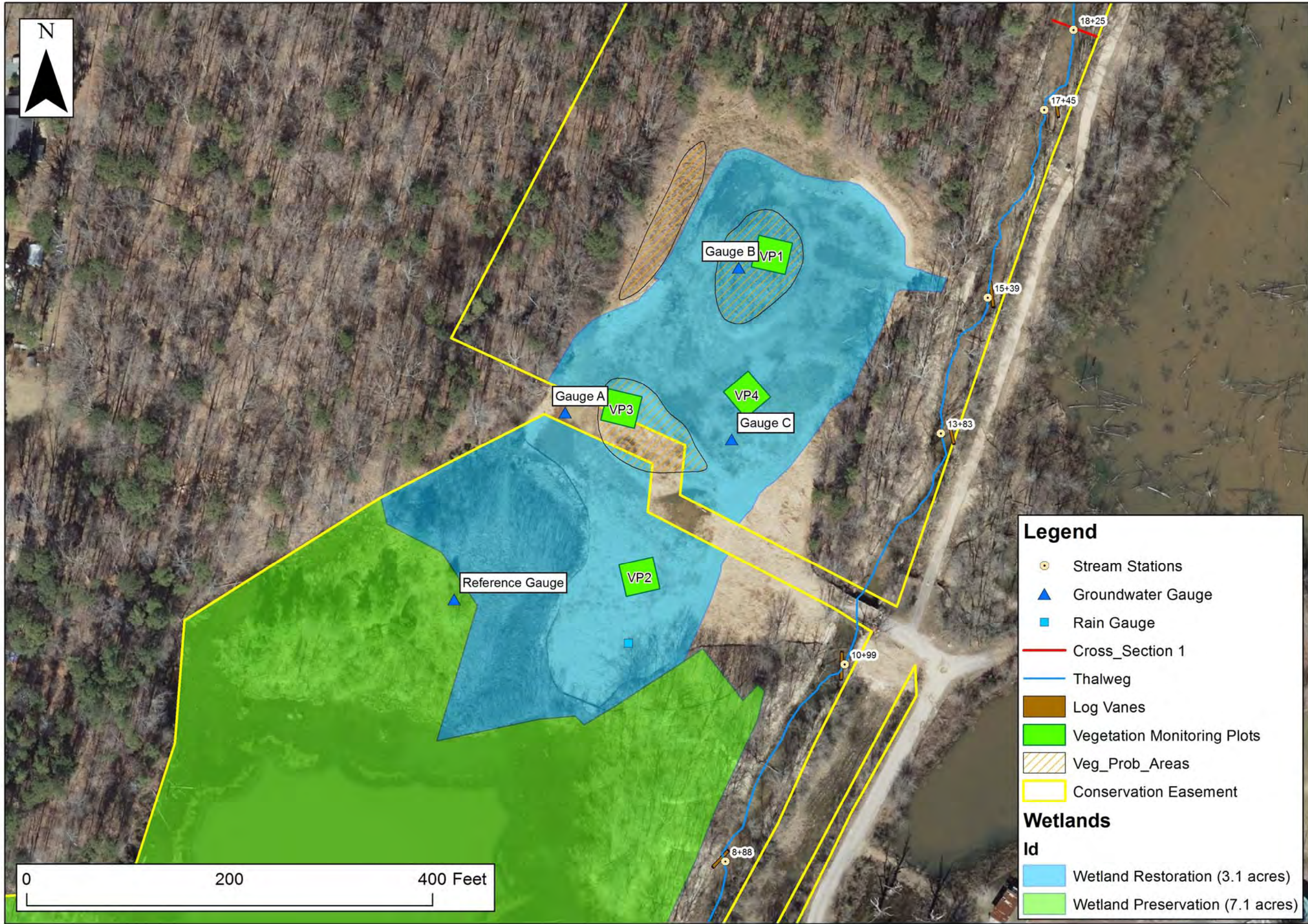
2010 Aerial Photography
Durham County, North Carolina

Date: March 2012

Scale: 0 150 300 Feet

EEP #: 322

Figure
2



Date: March 2012

Scale: As Shown

Job No.: 9000

Title:
**Sandy Creek
 Wetland
 Restoration
 and Stream
 Enhancement
 Site**

2010 Aerial
 Orthophotography

Source:
 NC One Maps

Client:



Figure
3

Legend

- Stream Stations
- Groundwater Gauge
- Rain Gauge
- Cross_Section 1
- Thalweg
- Log Vanes
- Vegetation Monitoring Plots
- Veg_Prob_Areas
- Conservation Easement

Wetlands

- Id**
- Wetland Restoration (3.1 acres)
 - Wetland Preservation (7.1 acres)

Appendix B

General Project Tables

Table 1. Project Restoration Components

Exhibit Table 1. Project Mitigation Objectives and Structure					
Sandy Creek Stream Enhancement and Wetland Restoration Site/ EEP Project No. 322					
Project Segment or Reach ID	Mitigation Type *	Approach **	Linear Footage or Acreage	Stationing	Comments
Reach I	EII	SBS	2,461 linear feet	00+00 to 27+00	Primarily achieved with placement of log vanes
Wetland Restoration	R	~	3.13 acres	N/A	The site was replanted in February of 2011.
Wetland Preservation	P	~	7.1 acres	N/A	7.1 acres of preserved wetlands are within the 22.63 acre conservation easement.

* EII = Enhancement II, R = Restoration. ** SBS = Stream Bank Stabilization, P=Preservation

*** Stationing begins at downstream end of project and increases upstream

Table 2. Project Activity and Reporting History

Exhibit Table II. Project Activity and Reporting History			
Sandy Creek Stream Enhancement and Wetland Restoration Site / EEP Project No. 322			
Elapsed Time Since Grading Complete: 2 years / Elapsed Time Since Planting: 7 Months			
Number of Reports ¹ : 6			
Activity Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	N/A*	N/A*	Aug 2002
Final Design (90%)	N/A*	N/A*	Dec 2002
Construction	N/A*	N/A*	Jun 2003
Temporary S&E mix applied to entire project area	N/A*	N/A*	Jun 2003
Permanent seed mix applied to reach/segments	N/A*	N/A*	Jun 2003
Bare root seedling installation	N/A*	N/A*	Jun 2003
Mitigation Plan/As-builts (Year 0 Monitoring – baseline)	N/A*	Jun 2003	Oct 2003
Year 1 Monitoring	N/A*	May 2004	Dec 2004
Site Replanting (portions of Zone 3)	~	~	Mid 2004
Year 1 Monitoring re-sampling	N/A*	Sep 2004	Dec 2004
Year 2 Monitoring (Vegetation)	Dec 2005	Oct 2005	Dec 2005
Year 2 Monitoring (Groundwater Gauges)	Dec 2005	Oct 2005	Dec 2005
Year 3 Monitoring (Vegetation)	Dec 2006	Oct 2006	Dec 2006
Year 3 Monitoring (Groundwater Gauges)	Dec 2006	Oct 2006	Dec 2006
Year 4 Monitoring (Vegetation)	Dec 2007	Oct 2007	Dec 2007
Year 4 Monitoring (Groundwater Gauges)	Dec 2007	Oct 2007	Dec 2007
Site Repair Period (Re-grading)	~	~	Nov 2009
Site Replanting	Dec 2009	~	Dec 2009
Year 5 Monitoring (Vegetation)	Nov 2010	Oct 2010	Nov 2010
Year 5 Monitoring (Groundwater Gauges)	Nov 2010	Oct 2010	Nov 2010
Site Replanting	Feb 2011	~	Feb 2011
Year 6 Monitoring (Vegetation)	Aug 2011	Aug 2011	Dec 2011
Year 6 Monitoring (Groundwater Gauges)	Nov 2011	Nov 2011	Dec 2011

Bold items represent those events of deliverables that are variable. Plain-font items represent events that are standard over the course of a typical project.

*N/A –Data not available.

1-Equals the number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table

Exhibit Table III. Project Contacts Sandy Creek Stream Enhancement and Wetland Restoration Site / EEP Project No. 322	
Designer: Ward Consulting Engineers, P.C.	8368 Six Forks Road, Suite 104 Raleigh, NC 27615-5083 Ph: 919-870-0526 email: bward@wce-corp.com
Construction Contractor: Shamrock Environmental, Inc.	Mr. Greg Kiser 6106 Corporate Park Drive Browns Summit, NC 27214 (336) 375-1989
Planting Contractor: Shamrock Environmental, Inc.	Mr. Greg Kiser 6106 Corporate Park Drive Browns Summit, NC 27214 (336) 375-1989
Seeding Contactor: Shamrock Environmental, Inc.	Mr. Greg Kiser 6106 Corporate Park Drive Browns Summit, NC 27214 (336) 375-1989
Seed Mix Sources	N/A*
Nursery Stock Suppliers	N/A*
Monitoring Performers (MY-01-04): EcoScience Corporation	1101 Haynes Street, Ste. 101 Raleigh, NC 27604 (919) 828-3433
Re-Designer: Ward Consulting Engineers, P.C.	8368 Six Forks Road, Suite 104 Raleigh, NC 27615-5083 Ph: 919-870-0526 email: bward@wce-corp.com
Re-Construction: Environmental Quality Resources, LLC	1405 Benson Court, Suite C Arbutus, MD 21227 Tel: (443) 304-3310
Re-Planting: Bruton Natural Systems, Inc.	P.O. Box 1197 Freemont, NC 27830 (919) 242-6555
Re-Seeding: Erosion Supply Company	P.O. Box 91208 Raleigh, NC 27675 (919) 787-0334
Monitoring Performers (MY-05+): The Catena Group	410B Millstone Drive Hillsborough, NC 27278 (919)732-1300

Table 4. Project Attribute Table

Exhibit Table IV. Project Background Sandy Creek Stream Enhancement and Wetland Restoration Site / EEP Project No. 322	
Project County	Durham
Drainage Area	7.3 square miles to culvert at Bypass 15-501
Impervious cover estimate (%)	10 percent
Stream Order	3 rd order
Physiographic Region	Piedmont
Ecoregion (Griffith and Omernik)	Triassic Basin
Rosgen Classification of As-built	NA (Enhancement only)
Cowardin Classification	Stream (R3UB2)
	Wetlands (PFO1)
Dominant soil types	Stream - Chewacla and Wehadkee soils (Ch)
	Wetlands - Urban Land (Ur)
SCO #ID 0	10542301
USGS HUC for Project and Reference	03030002060110 / N/A
NCDWQ Sub-basin for Project and Reference	03-06-05 / N/A
NCDWQ classification for Project and Reference	C, NSW / N/A
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
Percent of project easement fenced	None

Appendix C

Vegetation Assessment Data

Table 5. Vegetation Plot Success Summary Table

Vegetation Success Criteria Attainment Sandy Creek Stream Enhancement and Wetland Restoration Site / EEP Project No. 322		
Vegetation Plot ID	Vegetation Density Met? (260 total woody stems/acre)	Tract Mean
P1	Yes	100%
P2	Yes	
P3	Yes	
P4	Yes	

Vegetation Monitoring Plot Photos

MY-05 Aug 16 2010



Plot 1

MY06 Aug 24, 2011



Plot 1



Plot 2



Plot 2



Plot 3



Plot 3

MY-05 Aug 16 2010



Plot 4

MY06 Aug 24, 2011



Plot 4

Table 5. Vegetation Metadata Table

Report Prepared By	The Catena Group
Date Prepared	11/15/2011 12:56
database name	TheCatenaGroup-2010-D-SandyCreek.mdb
database location	Z:\Jobs\2008\4130-34 (EEP Monitoring)\4134 (Sandy Crk)\2010_MY-05\Sandy Creek CVS MY-5
computer name	TOSHIBA-USER
file size	38248448
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	322
project Name	Sandy Creek
Description	Sandy Creek Wetland Restoration and Stream Enhancement Project MY-06 (2010) EEP project # 322; 1st CVS year for VP 1; VP 2,3,&4 reset in February 2010;
River Basin	Cape Fear
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	4

Table 7. CVS Stem Counts Total and Planted by Plot and Species

EEP Project Code 322. Project Name: Sandy Creek			Current Plot Data (MY6 2011)												Annual Means						
Scientific Name	Common Name	Species Type	E322-01-0001			E322-01-0002			E322-01-0003			E322-01-0004			MY6 (2011)			MY5 (2010)			
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	
Acer negundo var. negundo	boxelder	Tree			1														1		2
Baccharis halimifolia	eastern baccharis	Shrub Tree						1											1		
Betula nigra	river birch	Tree										4	4	5	4	4	5	1	1	1	
Carpinus caroliniana var. caroliniana	Coastal American Hornbeam	Shrub Tree				1	1	1				1	1	1	2	2	2	2	2	2	
Cephalanthus occidentalis	common buttonbush	Shrub Tree							1	1	1				1	1	1	2	2	2	
Cornus amomum	silky dogwood	Shrub							1	1	1				1	1	1	1	1	1	
Fraxinus pennsylvanica	green ash	Tree				5	5	6			2				5	5	8	4	4	4	
Gleditsia triacanthos	honeylocust	Shrub Tree			1														1		
Liriodendron tulipifera var. tulipifera	Tulip-tree, Yellow Poplar, Whitewood	Tree							1	1	1				1	1	1				
Nyssa sylvatica	blackgum	Tree																1	1	1	
Platanus occidentalis var. occidentalis	Sycamore, Plane-tree	Tree							1	1	1				1	1	1	2	2	2	
Quercus	oak	Shrub Tree																		1	
Quercus lyrata	overcup oak	Tree							1	1	1				1	1	1	1	1	1	
Quercus michauxii	swamp chestnut oak	Tree				1	1	1				1	1	1	2	2	2				
Quercus phellos	willow oak	Tree							7	7	7				7	7	7	3	3	3	
Robinia pseudoacacia	black locust	Tree																		2	
Salix nigra	black willow	Tree	4	4	5			10			14	1	1	3	5	5	32	7	7	7	
Ulmus	elm	Tree																		4	
Ulmus rubra	slippery elm	Tree			4														4		
Stem count			4	4	11	7	7	19	12	12	28	7	7	10	30	30	68	24	24	33	
size (ares)			1			1			1			1			4			4			
size (ACRES)			0.02			0.02			0.02			0.02			0.10			0.10			
Species count			1	1	4	3	3	5	6	6	8	4	4	4	11	11	15	10	10	14	
Stems per ACRE			161.87	161.87	445.15	283.28	283.28	768.90	485.62	485.62	1133.12	283.28	283.28	404.69	303.51	303.51	687.97	242.81	242.81	333.87	

Appendix D

Stream Assessment Data

Sandy Creek Stream Enhancement Photo Stations

Photo Station 1: Log Vane #1 (Station 2 + 04)



Photo Station 2: Log Vane #2 (Station 4 + 12)



Woody debris obstruction

Sandy Creek Stream Enhancement (Log Vanes)

Photo Station 3: Log Vane #3 (Station 6 + 55)



Photo Station 4: Log Vane #4 (Station 8 + 88)



Sandy Creek Stream Enhancement (Log Vanes)

Photo Station 5: Log Vane #5 (Station 10 + 99)



Photo Station 6: Log Vane #6 (Station 13 + 83)



Sandy Creek Stream Enhancement (Log Vanes)

Photo Station 7: Log Vane #7 (Station 15 + 39)



Photo Station 8: Log Vane #8 (Station 17 + 45)



Sandy Creek Stream Enhancement (Log Vanes)

Photo Station 9: Log Vane #9 (Station 19 + 72)



Photo Station 10: Log Vane #10 (Station 20 + 91)



Sandy Creek Stream Enhancement (Log Vanes)

Photo Station 11: Log Vane #11 (Station 22 + 66)



Photo Station 12: Log Vane #12 (Station 24 + 20)



Note Woody Debris and Exposed Boulder

Sandy Creek Stream Enhancement (Log Vanes) & Permanent Cross Section

Photo Station 13: Log Vane #13 (Station 26 + 12)



Photo Station 14: Permanent Cross-Section (18 + 25) Viewed Looking Downstream



Sandy Creek Stream Enhancement Miscellaneous

Woody Debris in Stream (Station 10 + 00)



Culverts and Debris (Station 0 + 00)



Table 6. Visual Morphological Stability Assessment

Not provided as project contains only stream enhancement via log vanes.

Table 7. Verification of Bankfull Events

Not provided as project contains only stream enhancement via log vanes.

Figure 4. Cross Sectional Profiles with Annual Overlays

Project: Sandy Creek/Project No. 322		Summary (bankfull)												
Cross Section: Cross Section 1		A (BKF)	MY0	MY2	MY3	MY5	MY6	MY7						
Feature: Riffle		109.6	114.7	119.7	110.5	105.9								
Station: 18+25		W (BKF)	31.4	31.4	31.2	31.3	30.9							
Date: 1/18/11		Max d	4.1	4.6	5.3	4.2	4.1							
Crew: ZP, SV		Mean d	3.5	3.7	3.8	3.5	3.4							
		W/D	9.0	8.6	8.1	8.9	9.0							
MY00-2003			MY02-2005			MY03-2006			MY05-2010			MY06-2011		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
1.00	264.33		1.00	264.50		1.00	264.55	LPIN	1.00	264.55	LEFT PIN	1.00	265.02	LPIN
5.70	264.44		3.00	264.57		2.00	264.60		5.00	264.80		1.00	264.55	
8.00	264.20		5.00	264.66		4.00	264.69		8.00	264.55	TOBL	4.00	264.66	
9.50	263.64	3L Bankfull	7.00	264.60	TOBL	6.00	264.78		9.00	263.86	Bankfull Left	6.50	264.79	
9.90	262.79		8.00	264.29		8.00	264.47	TOBL	10.00	262.72		8.00	264.65	3L Bankfull
10.30	262.40		9.00	263.82	Bankfull Left	8.70	264.24		11.50	261.58		11.00	261.90	
11.20	261.72		10.00	262.78		9.50	263.84	Bankfull Left	12.60	260.06	TOE L	12.50	260.03	Toe L
12.00	261.12		11.00	261.96		10.00	263.11		17.60	259.84		14.00	260.19	
12.20	260.07	Toe L	11.80	261.04		11.30	262.01		19.00	259.71		18.00	259.87	
13.00	259.97		12.00	259.54	Toe L	11.70	261.48		22.00	259.85		22.00	259.92	
14.00	259.99		15.00	259.49		12.40	260.37		23.00	259.75		28.00	259.58	TW
15.00	259.87		17.00	259.79		14.00	260.32		26.60	259.64	(WS = 259	30.50	259.72	GS / WSEL
16.00	259.83		21.00	259.82		18.00	260.49		31.00	259.93		34.00	259.85	
17.00	259.86		25.00	259.88		19.50	260.11		35.00	260.02		36.00	259.77	
18.00	259.83		31.00	259.77		23.00	260.00		37.20	259.75	TOE R	38.00	259.50	TOE R
19.00	259.82		33.70	259.71		27.00	259.42		38.40	262.10		38.50	262.08	
22.00	259.60		35.00	259.51		32.00	258.52	TW	39.25	262.85	Bankfull right	40.20	263.84	
23.00	259.72		35.70	259.37		36.00	258.66		40.40	263.97		41.00	264.04	
35.50	259.51	NS = elev 2	37.00	259.27	TW	38.20	258.76	Toe R	41.30	264.41	TOBR	43.00	264.50	R Bankfull
36.40	259.70		37.90	259.70	Toe R	39.00	262.32		44.00	264.52		46.00	264.30	
37.40	259.81	Toe R	38.70	262.01		41.00	264.13	TOBR	48.00	264.16	RIGHT PIN	48.00	264.10	
38.40	260.96		39.60	263.09		43.00	264.47							
39.10	262.08		40.00	263.66		46.00	264.36							
39.70	262.64		41.00	264.11		48.00	264.19	RPIN						
41.60	264.18	TOBR	42.00	264.35	TOBR									
43.00	264.30		45.00	264.35										
45.00	264.31		48.00	264.18										
48.00	264.13													



Photo of XS-1, looking in the downstream direction

Cross Section 1

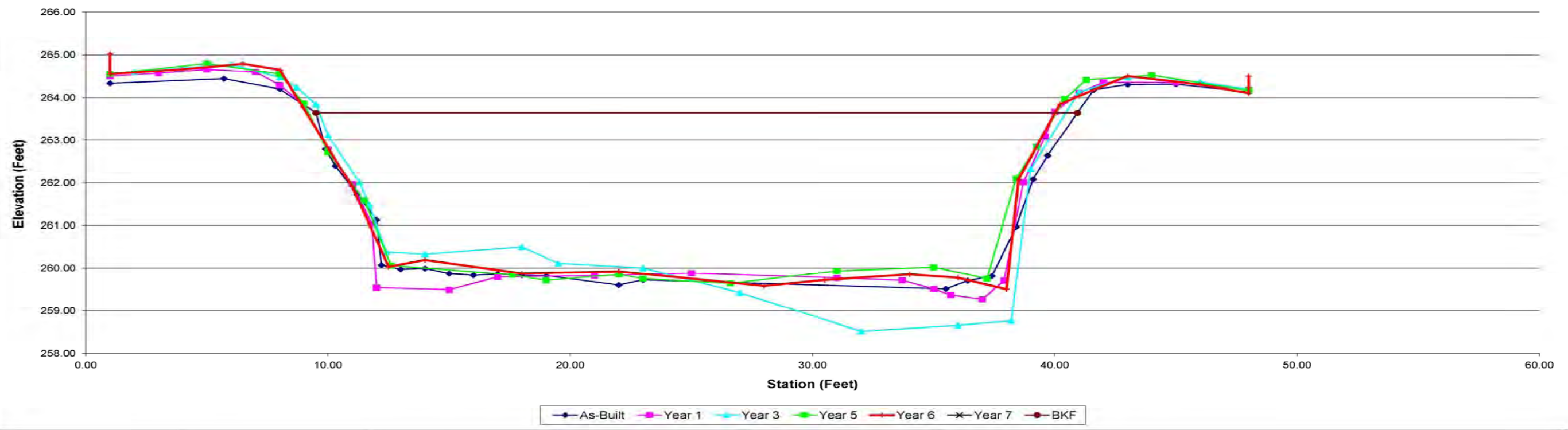


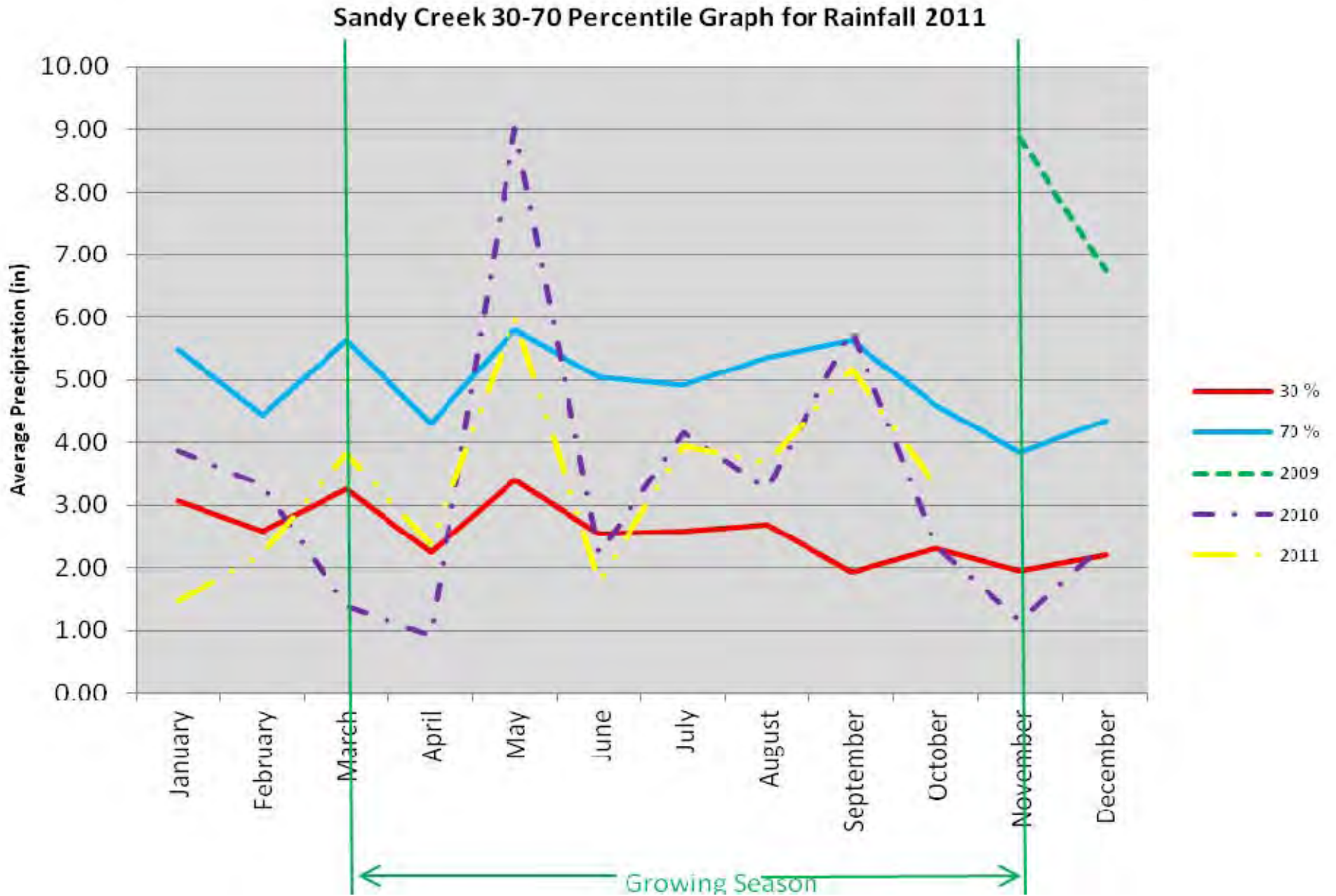
Figure 5. Pebble count plots with annual overlays

Not provided as project contains only stream enhancement via log vanes.

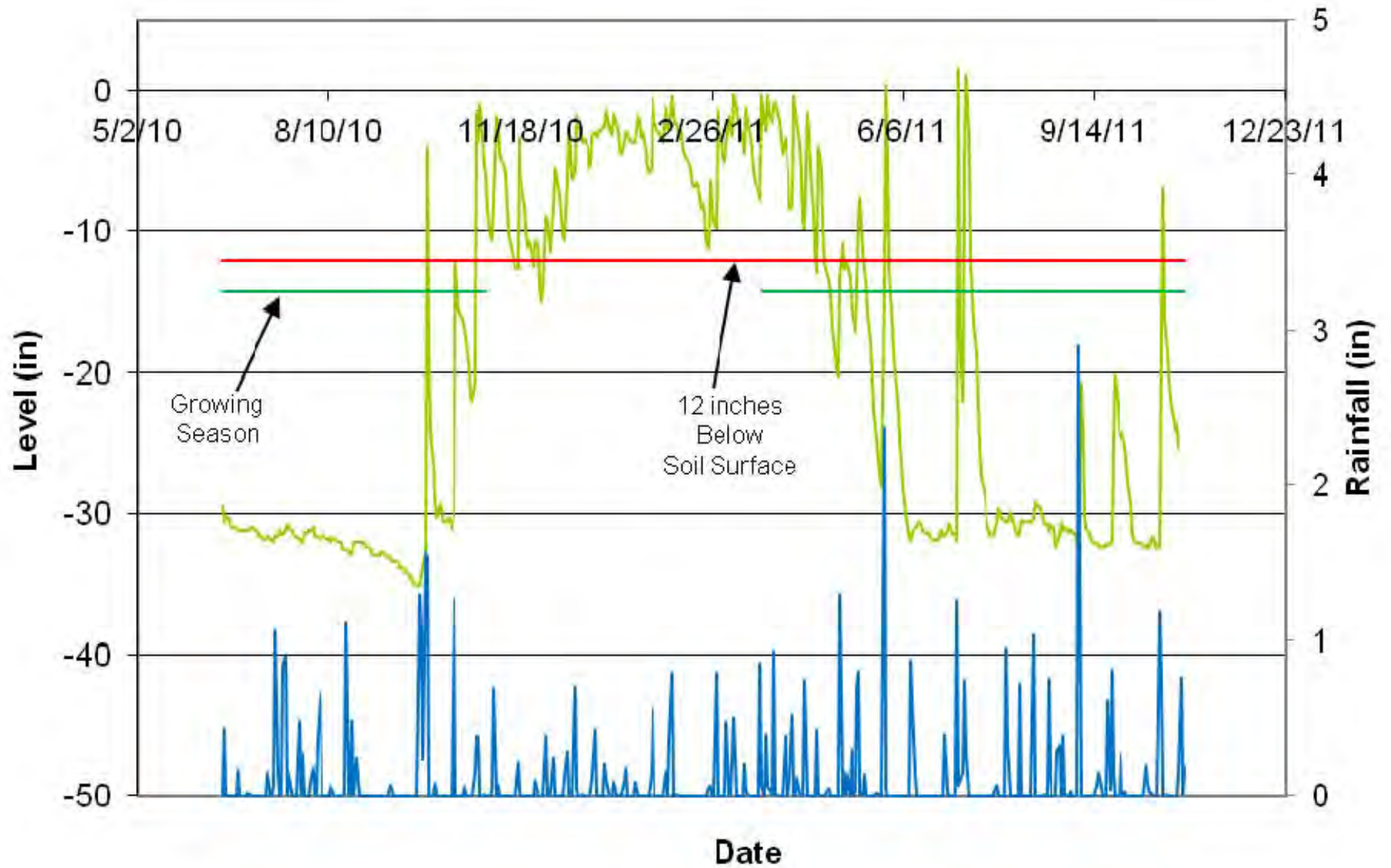
Appendix E

Wetland Assessment

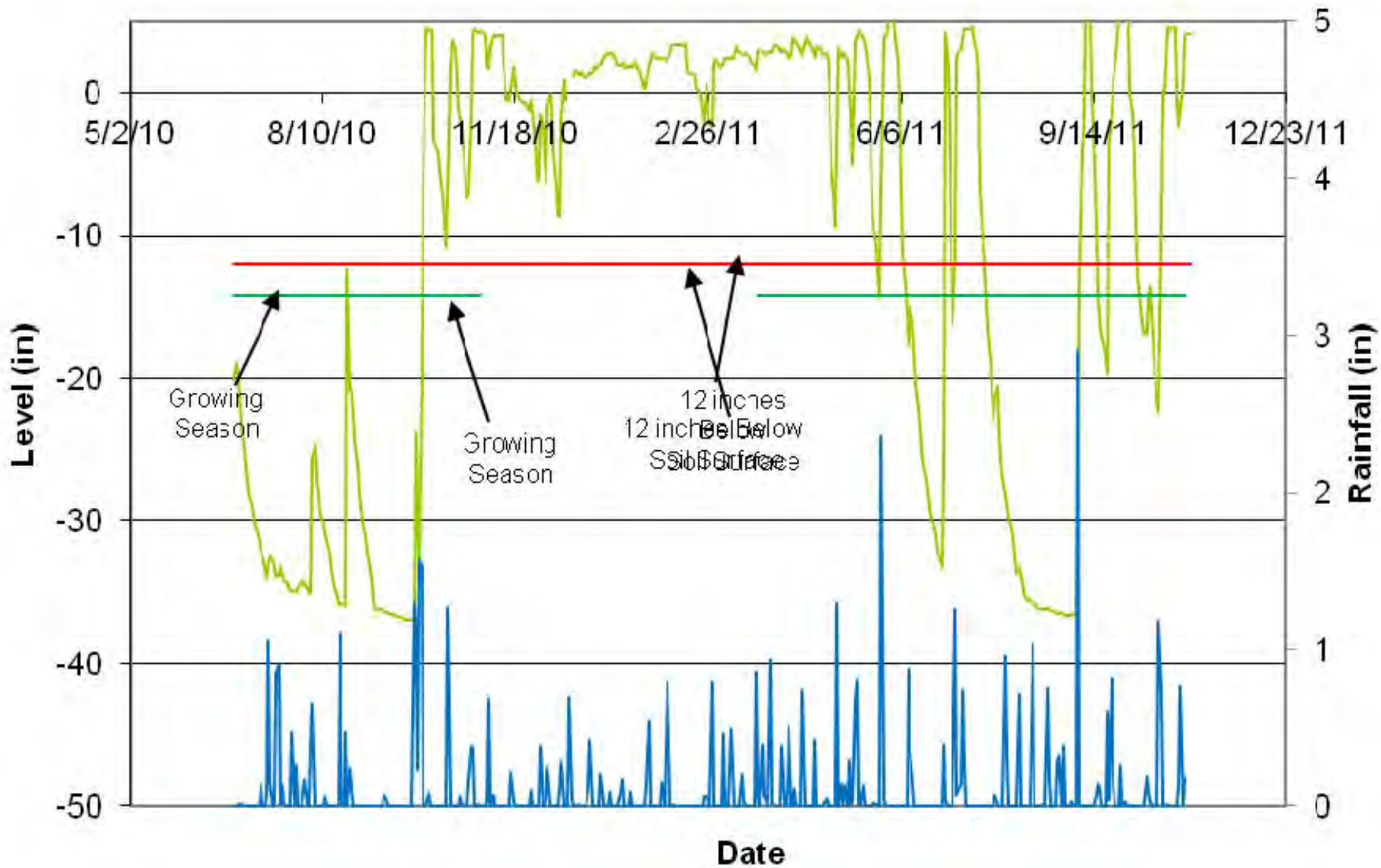
Figure 6. Precipitation and Water Level Plots



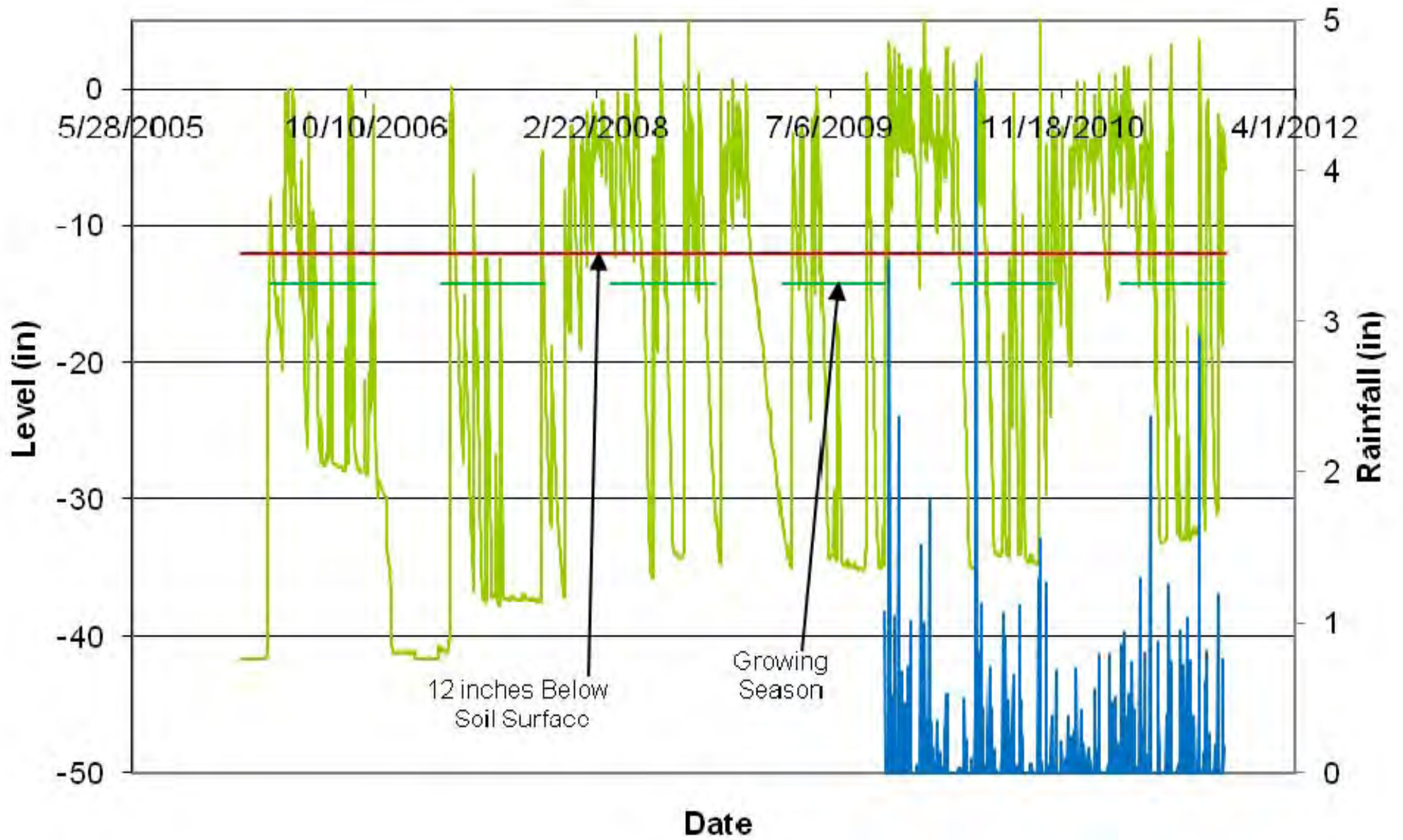
Sandy Creek Wetland Reference Gauge



Sandy Creek Gauge A



Sandy Creek Gauge B - Island



Sandy Creek Gauge C

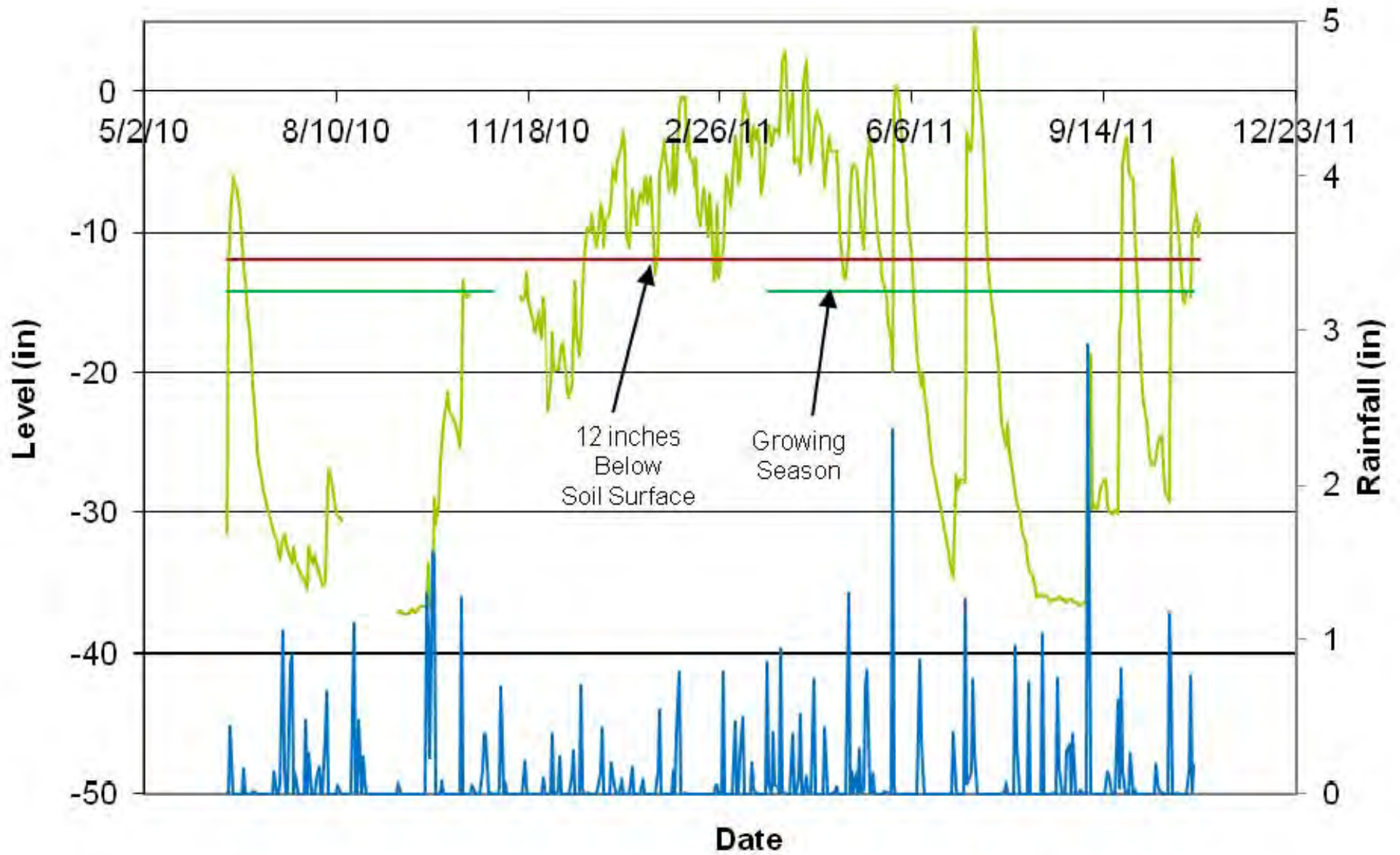


Table 8. Wetland Hydrology Criteria Attainment

Exhibit Table X. Wetland Criteria Attainment Sandy Creek / EEP Project No. 322			
Tract	Well ID	Well Hydrology Threshold Met?	Tract Mean
1	A	YES	100%
1	B	YES	
1	C	YES	
REF	Ref Site	YES	

“Groundwater levels are monitored to determine if levels are within 12 inches of the soil surface for at least 5% of the growing season. These areas will be considered wetlands if the groundwater is within 12 inches for at least 5% of the growing season, and the area supports hydrophytic vegetation, and meets the hydric soil requirements. According to the wetland groundwater gauges on site for MY-06, wetlands met wetland hydrology criterion (Appendix E)”.