OVERHILLS STREAM AND WETLAND RESTORATION MONITORING REPORT (YEAR 5)

Harnett County, North Carolina
EEP Project No. 199

Prepared for:
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Status of Plan: Final
Submission Date: November 2011

Monitoring Firm:

Stantec Consulting Services Inc
801 Jones Franklin Road, Suite 300
Raleigh, NC 27608

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1.0 Executive Summary

The North Carolina Ecosystem Enhancement Program (EEP) restored 4,482 linear feet of Jumping Run Creek and 70 acres of adjacent riparian wetlands located on the Fort Bragg Overhills tract, north of Spring Lake, in Harnett County, North Carolina. Construction of the project began on July 12, 2004 and the restoration was completed on May 30, 2006. The restoration project is located on the north side of Nursery Road (SR 1120) and has a total drainage area of 15.9 square miles. The site had been significantly altered from its natural state. Prior to 1955, the stream was straightened and moved to the west to provide more room for agricultural practices. Previous to restoration activities, the stream was deeply incised with only the largest rain events resulting in overbank flow. The associated wetlands had been drained and cultivated in various row crops for many years. Priority 1 stream restoration was carried out on the project resulting in a restored C type channel which was expected to naturally evolve in some areas to an E5 channel type. The entire restoration area including streambanks and riparian wetlands were planted with vegetation to stabilize the channel and provide shading, food, and habitat. Berms were installed across the site perpendicular to the valley to promote wetland hydrology and create microtopography beneficial for wildlife habitat.

Project goals and objectives for the Overhills stream and wetland restoration project include:

- Restoration of stream dimension, pattern and profile
- Restoration of riverine wetland hydrology and vegetation
- Improvement of current water quality
- Protection of future water quality

Major repair work on the lower reach took place over the winter of 2011. The repair was designed by Wildlands Engineering, Inc. and built by River Works. Construction was completed by mid-February 2011 and planting was completed in early March 2011. According to the construction plans, 1,025 linear feet of stream was relocated to the east of the existing failing stream channel. Seven of the floodplain berms onsite were notched to provide better flow across the wetlands. Some existing vegetation was salvaged and replanted within the limits of disturbance. The remaining area (11.7 acres) was seeded and planted with bareroot seedlings.

The Monitoring Year 5 stem counts within each of the 10 vegetative monitoring plots are included in Table 7 in Appendix C. Vegetation Plot 6 was moved in 2011 since it was a 5x20m streambank plot on the older failing section of stream. A new 10x10m plot, “6R”, has been installed on the floodplain of the newly repaired reach. Overall, eight of the plots have over 260 stems per acre (the success criteria for monitoring year five) while two of the plots (VP3 and VP5) have less than 260 stems per acre. Problem areas are referred to as VPA 1 through 20 on the Current Condition Plan View located in Appendix A. In VPA 1, 2, 4, 12, 13, and 14 persistent flooding has occurred and has caused the majority of the planted woody vegetation to die in those areas. Standing water continues to be present in these areas. As previously noted, even though these areas are not supporting the planted woody vegetation, they do and will continue to provide excellent habitat diversity for the site. Other wet areas are present onsite, but woody vegetation is present and viable in these areas and is not a cause for concern at this moment. A few

areas have been noticeably impacted by beaver foraging and are shown on the CCPV as VPA 7, 11, 18, and 19.

Lespedeza is still present in some drier areas onsite; however, a large portion of it has been removed during the repair construction work. Invasive plant species were sprayed on May 3, 2011. It appears that *Lespedeza* may be reestablishing in the newly repaired floodplain but was not of sufficient size to include on the CCPV. A few areas of *Typha* have also been observed onsite and seem to be growing in size from previous assessments. Areas of *Typha* were observed near the wetter areas and are shown on the map as VPA 10, 17 and 20. VPA-15 (*Typha*) has expanded. As previously noted, the remainder of the floodplain is exhibiting excellent vegetation growth, particularly in the cypress trees.

The lower four cross sections that were located in the failing section of stream (Cross sections 6, 7, 8 and 9) were moved to the repaired reach, and are now called R1, R2, R3 and R4. Currently the new stream is functioning as intended and no major problems were observed. Bank instability upstream of the repair reach was observed in isolated locations, and is primarily the result of scour caused by rootwad failure or concentrated flow over the banks due to beaver impoundments. This minor isolated instability is not likely to expand in size or become a significant problem.

The floodplain is drier than in past monitoring years, especially in the area surrounding Vegetation Plot 3. However, the most northern portions of the site are still inundated with water. Despite ongoing efforts to remove beavers, multiple beaver dams remain, causing large areas of the floodplain to become inundated with water, at times in excess of 1 foot deep. Headcuts are occurring in areas where the inundated water reenters the stream channel from the side. These areas are located at various locations along the stream's right bank. The beaver dams are located near Stations 3+86, 9+00 and 27+77. According to EEP, APHIS removed the beaver dams on the main stem between 8/8/11 and 8/18/11 with an additional trip to remove the large uppermost beaver dam on 10/31/11. As of the survey (9/21/11) beavers were still active on the site and had rebuilt the breeched dams. The CCPV shows beaver dam conditions as of 9/21/11. Continued beaver management will be beneficial to the stability of the site.

The reference well met the hydrology success criteria, with one period of consecutive days of saturation within 12 inches of the ground surface. This 48 day period comprises approximately 21% of the growing season. Additionally, all fifteen groundwater monitoring wells onsite met the hydrology success criteria, with 8 of the wells being within 12 inches of the ground surface for more than 50% of the growing season. During this growing season, it does not appear that the berm removals undertaken in February 2011 negatively affected the wetland hydrology. The dip in water table levels among the gauges on the north end of the site most likely corresponds with the removal of multiple beaver dams. Monthly precipitation averages for 2011 fell between the 30th and 70th percentiles during the growing season in March, June, August and September. For the months of January, February, July, and October, precipitation fell below the 30th percentile. In May, precipitation fell above the 70th percentile.

Summary information and 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 mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 Methodology

2.1 VEGETATION ASSESSMENT

The Carolina Vegetation Survey (CVS) Level 2 methodology was utilized to sample vegetation in October 2011. Ten 100m^2 plots have been established throughout the project. In each plot, two plot corners have been permanently located with conduit or rebar. Vegetation Plot 6 was moved in 2011 since it was a 5x20m streambank plot on the older failing section of stream. A new 10x10m plot, "6R", has been installed on the floodplain of the newly repaired reach. As per the mitigation plan, the vegetative success criteria are based on the US Army Corps of Engineers Stream Mitigation Guidelines (USACE, 2003). Livestakes are counted for success for Plots 1 and 8 since they were set up as 5x20m streambank plots. Leaving out livestakes would falsely skew the data since the majority of the area within each plot is taken up by livestakes. The final vegetative success criteria will be the survival of 260 5-year old trees per acre at the end of the year 5 monitoring period. In the repair area, the vegetative success criteria will also be the survival of 260 5-year old trees per acre for Monitoring Years 5 and 6, and the final Monitoring Year 7. Currently 8 of 10 plots are meeting success criteria and the average for the site is 332 stems per acre.

2.2 STREAM ASSESSMENT

The Upper Reach, classified as a Rosgen C5 stream, flows from the beginning of the project at Station 0+00 to Station 30+77. The Lower Reach, a priority 2 reach with constructed riffles, flows from 30+77 to the end of the project at Station 42+70. This reach break is approximately 200 feet upstream of the old reach break, to correspond with the upstream end of the 2011 repair. Pattern and profile, as well as dimension were monitored on both the Upper and Lower Reach.

A longitudinal profile survey of the entire length of the project was completed in September 2011. Additional data collected included riffle length, riffle slope, pool length and pool spacing. During the longitudinal survey, additional pattern data was collected including channel beltwidth, radius of curvature, meander wavelength and meander width ratio. Stability was also visually assessed.

A total of nine permanent cross-sections were characterized. The lower four cross sections that were located in the failing section of stream (Cross section 6, 7, 8 and 9) were moved to the repaired reach, and are now called R1, R2, R3 and R4. Data collected included, at a minimum, cross-sectional area, bankfull width, bankfull mean depth, bankfull max depth, floodprone width, width to depth ratio, and entrenchment ratio. Stream type was determined in riffle cross-sections only. Success was measured based on whether the channel features stayed within the natural variability of the dimensionless ratios of the reference reaches.

2.3 WETLAND ASSESSMENT

This site is considered to meet the success criteria for wetland hydrology if the groundwater saturation is within 12 inches of the ground surface consecutively for 12.5% of the growing season. Fifteen

groundwater monitoring wells are currently active on the project site. All 15 wells met the success criteria during the growing season of 2011 (Appendix E). The growing season in this area is from March 18th to November 8th for a total of 234 days (NRCS 2002).

A reference well was installed within the reference site on October 2, 2007. Data has been collected since its installation. More specific details regarding the physical and biological characteristics of the reference site can be found in the Overhills Stream and Wetland Restoration Plan.

3.0 References

Harrelson, C.C., C.L. Rawlins and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. United States Department of Agriculture, Fort Collins, CO.

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)

NC CRONOS. 2011. NC CRONOS Database – Dunn 4 Nw (312500). North Carolina State University State, Climate Office of North Carolina. http://www.nc-climate.ncsu.edu/cronos

NCEEP. 2009. Revised Table of Contents for 2009 Monitoring Report Submissions. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.2.1 June 1, 2009.

NRCS. 2002. WETS Table for Pope Air Force Base, NC6891 . Natural Resource Conservation Service, National Water and Climate Center.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, CO.

Weakley, Alan S. 2007. Flora of the Carolinas, Virginia, Georgia, and surrounding areas. University of North Carolina Herbarium. Chapel Hill, NC. Working draft of January 11, 2007.

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Project Condition and Monitoring Data Appendices

APPENDIX A. GENERAL FIGURES AND PLAN VIEWS

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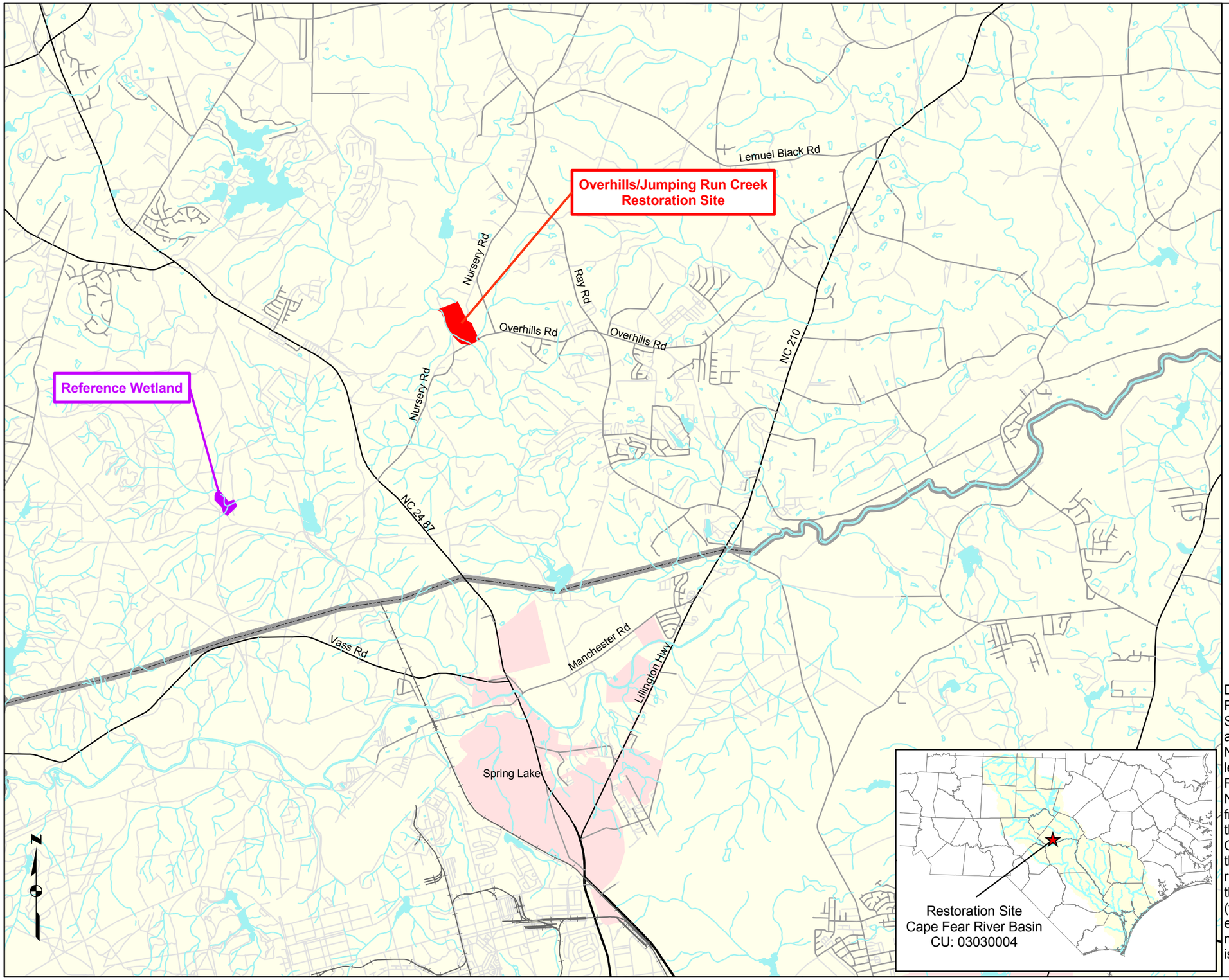

Figure 1 - Vicinity Map

Overhills/Jumping Run Creek Stream and Wetland Restoration Project
EEP #: 0199
Harnett County, North Carolina

Monitoring Report
November 2011

0 0.5 1 2 3Miles

- 1:24000 Hydrography
- Railroads
- NCDOT Secondary Roads
- NCDOT Primary Roads
- Overhills/Jumping Run Creek
  35.258N, 79.000W
- Reference Wetland
  35.227N, 79.050W

Ecosystem Enhancement Program

Stantec

Directions to Overhills/Jumping Run Creek Restoration Site: From Raleigh, take US401 South following signs through Fuquay-Varina and into downtown Lillington. Turn right onto NC 27 and follow for about 9 miles, then turn left onto Nursery Rd. After 6.5 miles, Nursery Rd will come to a T, turn right to stay on Nursery Rd. The restoration site is half a mile from the T on the right hand side. To get to the reference site from the restoration site: Continue travelling east on Nursery Rd for 2 miles, then turn left onto NC24/NC87 for 3 miles. Turn right onto Vass Rd/NC 690. Continue for 3.5 miles, then turn right at sign that states "NO POVs" (this is part of Fort Bragg, need permission to enter). Follow the dirt road straight, at least 1.7 miles (do not turn or veer). The reference well is in the woods, about 100 feet from the end of the road.

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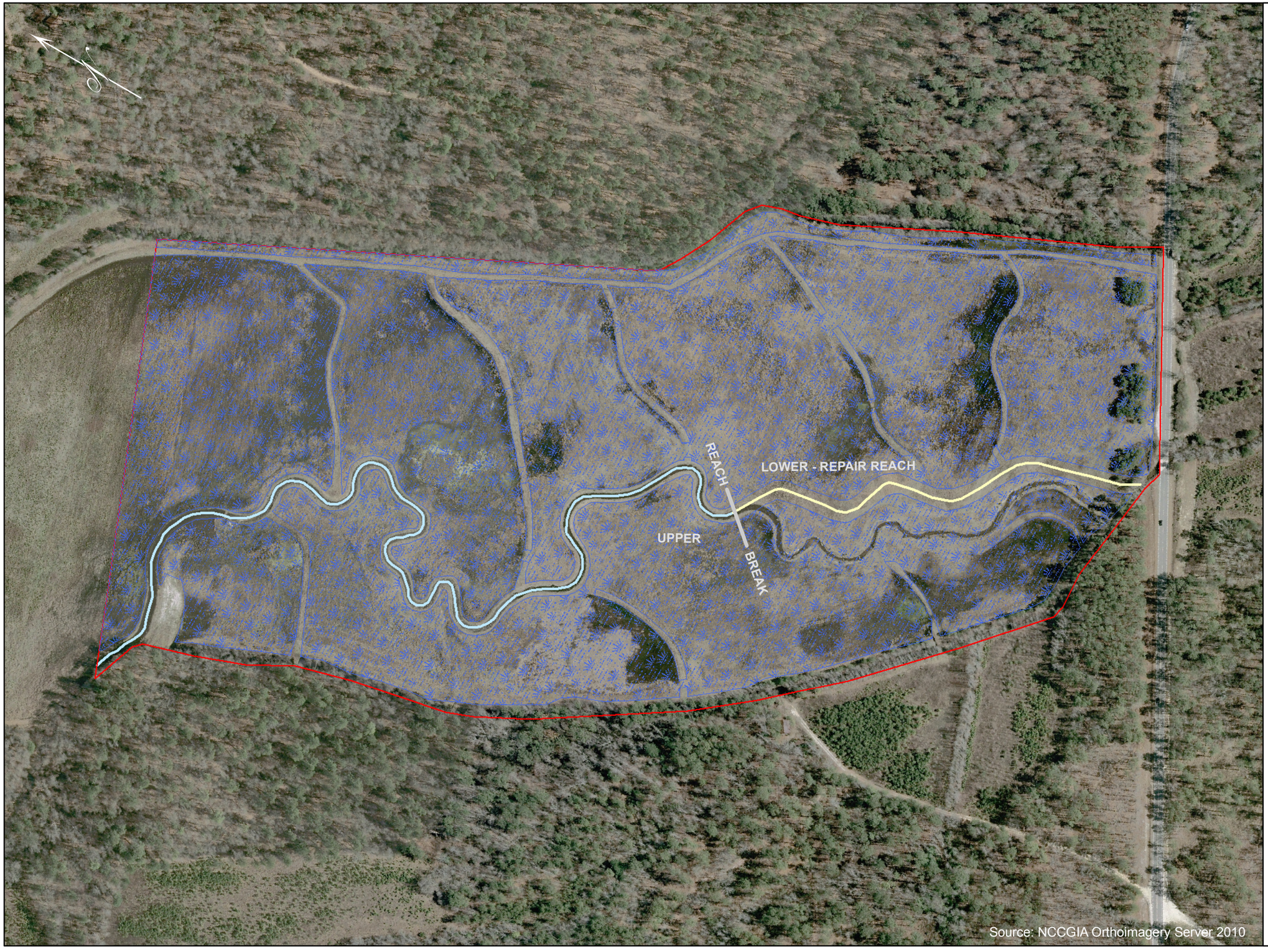

Figure 2 - Asset Map

Overhills Stream and Wetland Restoration Site
EEP Project #: 0199
Harnett County, North Carolina

Monitoring Year 5
December 2011

- Wetland Restoration (60.6 ac)
- Project Boundary
- Priority I Stream Restoration (3077 lf)
- Priority II Stream Restoration (1193 lf)

0 125 250 500 Feet

Ecosystem Enhancement PROGRAM

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CURRENT STATUS PLAN VIEW

OVERHILLS STREAM AND WETLAND RESTORATION
HARNETT COUNTY, NORTH CAROLINA

EEP PROJECT NUMBER 199
MONITORING YEAR 5

THIS MAP DEPICTS MY5 CONDITIONS AS OF 10/2011

LEGEND

- REPAIR THALWEG (2011)
- BANKFULL
- 2011 THALWEG
- BEAVER DAMS
- ANNUAL PHOTO POINTS
- ×JR MONITORING WELLS/ RAIN GAUGE
- DESIGN LOG CROSS VEIN
- DESIGN ROOT WAD
- DESIGN TOE PROTECTION
- CONSTRUCTED RIFFLE
- BERM REMOVAL AREA
- MAJOR VEG. PROBLEM AREA
- MINOR VEG. PROBLEM AREA
- VEG PLOT PINS
- VEG. PLOTS (>260 STEMS/AC)
- VEG. PLOTS (<260 STEMS/AC)
- 2011 REPAIR PLANTING AREA 11.7 acres
- CROSS SECTIONS
- MINOR BANK EROSION
- MAJOR BANK EROSION

MONITORING WELL LOCATIONS		
NAME	LAT	LONG
JR1	35.25633325	-78.99619887
JR2	35.25704509	-78.99613104
JR3	35.25664382	-78.99728101
JR4	35.25619691	-78.99852738
JR5	35.25784127	-78.99692474
JR6	35.25862538	-78.99752997
JR7	35.25818234	-78.99853736
JR8	35.25781716	-78.99941543
JR9	35.25748554	-79.00022606
JR10	35.26158413	-78.99927614
JR11	35.26140403	-78.99991026
JR12	35.26115267	-79.00070518
JR13	35.26069372	-79.00165278
JR14	35.26164227	-79.00115399
JR15	35.2615367	-79.00177709
RG1	35.26235615	-79.00249699

MONITORING PLOT LOCATIONS		
NAME	LAT	LONG
VP1	35.26080136	-79.00066535
VP2	35.2614819	-78.9998302
VP3	35.25970237	-79.00001297
VP4	35.25794685	-78.99968083
VP5	35.25696862	-78.9973555
VP6R	35.25660386	-78.99796926
VP7	35.26053462	-79.00144889
VP8	35.25882237	-78.99983412
VP9	35.25930164	-78.99884514
VP10	35.25858954	-78.99773114

Stantec Consulting Services Inc.
Suite 300, 801 Jones Franklin Rd
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Tel. 919.851.6866
Fax. 919.851.7024
www.stantec.com

PROJECT NO.	SHEET NO.
SCO#070695701	
1/23/2012	

Scale 1" = 100'

DATA SOURCE: HARNETT COUNTY 2008 AERIALS

PROJECT LIMITS
VPA–6 Lespedeza
VPA–18 Beaver Damage
VPA–19 Beaver Damage
VPA–2 Bare
VPA–17 Cattails
VPA–7 Beaver Damage
VPA–5 Lespedeza
VPA–13 Wet
VPA–11 Beaver Damage
VPA–1 Bare
VPA–15 Cattails
VPA–12 Bare
VPA–20 Cattails
VPA–4 Bare
VPA–10 Cattails
VPA–14 Bare
Upper Reach Sta. 0+00–30+77
Repair Section Lower Reach 30+77 – 42+70
Existing Reach Filled In Sta. 30+77 to Sta. 44+00
Drainage Swale
IMPROPERLY CONSTRUCTED LOG VANE
NURSERY ROAD (SR 1117)
BERM REMOVAL
BERM REMOVAL NOT PERFORMED

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APPENDIX B. GENERAL PROJECT TABLES

Table 1. Project Restoration Components Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199						
	Existing Feet/Acres	Type	Approach	Footage or Acreage	Stationing	Comment
Upper Reach	3064	R	P1	3077	0+00 to 30+77	Includes log structures and root wads
Lower Reach		R	P2	1193	30+77 to 42+70	Includes log structures and root wads; step-down to existing channel. Begins at 2011 repair.
Riparian Wetlands	NA	R	-	60.6		Floodplain of restored stream. Area was determined subracting the berm and stream area from the total easement area

R = Restoration

P1 = Priority 1, P2 = Priority 2

Reach break location and total length changed due to repair of lower reach on new location.

Table 2. Project Activity and Reporting History Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	NA	March 2003
Final Design - 90%	NA	Dec 2003
Construction	NA	June 2006
Temporary S&E mix applied to entire project area	NA	2004
Permanent seed mix applied to entire project area	NA	Nov 2004
Bare root, containers, and live stakes for majority of site	NA	Dec 2004
Water released into new channel	NA	Oct 2005
Permanent seed mix applied to entire project area	NA	Nov 2005
Bare root, containers, and live stakes for remainder of site	NA	Dec 2005
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	July 2007	Nov 2007
Year 1 Monitoring	Nov 2007	Nov 2007
Year 2 Monitoring	Nov 2008	Nov 2008
Year 3 Monitoring	Nov 2009	Nov 2009
Year 4 Monitoring	Nov 2010	Nov 2010
Repair of Lower Reach	March 2011	March 2011
Mitigation Plan Addendum	May 2011	May 2011
Year 5 Monitoring	Nov 2011	Nov 2011
Year 6 Monitoring (Repair)		
Year 7 Monitoring (Repair)		

NA = Not Applicable

Table 3A. Contacts Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199	
Designer	BLUE: Land Water Infrastructure 1271 Old US Highway #1 South Southern Pines, NC 28387 Phone: 910-692-6461
Construction Contractor	Vaughn Contracting, Inc P.O. Box 796 Wadesboro, NC 28170 Phone: 704-694-6450
Surveying Subcontractor	Barbara H. Mulkey Engineers, Inc 7516 E. Independence Blvd, Suite 100 Charlotte, NC 28227 Phone: 704-537-7300
Site Preparation Subcontractor	Herndon, Inc P.O. Box 36 Lugoff, SC 29078 Phone: 803-513-8002
Erosion Control Subcontractor	Carolina Environmental Contractors, Inc P.O. Box 1905 Monut Airy, NC 27030 Phone: 336-320-3849
Vegetation Planting Contractor & Nursery Stock Supplier for livestakes and potted plants	North State Environmental, Inc 2889 Lowery Street Winston-Salem, NC 27101 Phone: 339-725-2010
Nursery Stock Supplier for bare roots	International Paper
Seed Mix Sources	Unknown
Monitoring Performers	Stantec Consulting Services, Inc 801 Jones Franklin Rd, Ste 300 Raleigh, NC 27606
Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	David Bidelspach 919-218-0864 Amber Coleman 919-851-6866 Amber Coleman 919-851-6866

Table 3B. Contacts - 2011 Repair Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199	
Designer Primary Project Design POC	Wildlands Engineering, Inc. 5605 Chapel Hill Road, Suite 122 Raleigh, NC 27607 Daniel Taylor 919-851-9986, ext 105
Construction Contractor Construction Contractor POC	River Works, Inc. 8000 Regency Parkway, Suite 200 Cary, NC 27518 Will Pedersen 919-459-9001
Surveying Contractor Survey Contractor POC	Turner Land Surveying, PLLC P.O. Box 41023 Raleigh, NC 27629 David Turner, PLS, 919-875-1378
Planting Contractor Planting Contractor POC	Winstead's Reforestation 536 Jackson Road Nashville, NC 27856 David Winstead 252-462-0305
Bare Root Trees	Mellow Marsh Farm, Inc. 1312 Woody Store Road, Siler City, NC 27344 Sharon Day 919-742-1200 ArborGen (SuperTree Seedlings) 5594 Highway 38 South, Blenheim, SC 29616 800-222-1290 Superior Trees, Inc. PO Drawer 9400, Lee, FL 32059 850-971-5159
Brush Material/Live Stakes	Foggy Mountain Nursery LLC 2251 Ed Little Road, Creston, NC 28615 Glen Sullivan 336-384-5323
Seed Mix Sources	Green Resources PO Box 429, Colfax, NC 27235 Rodney Montgomery 336-855-6363

Table 4. Project Background Table Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199	
Project County	Harnett County
Drainage Area	15.9 square miles
Drainage impervious cover estimate (%)	5%
Stream Order	3rd
Physiographic Region	Sandhills
Ecoregion	Sandhills
Rosgen Classification of As-built	C5
Cowardin Classification	Palustrine
Dominant soil types	Roanoke
	Bibb
	Wehadkee
	Augusta
Reference site ID	Gum Swamp
USGS HUC for Project	03030004
USGS HUC for Reference	03030004
NCDWQ Subbasin for Project	03-16-14
NCDWQ Subbasin for Reference	03-16-13
NCDWQ Classification for Project	C
NCDWQ Classification for Reference	C
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	No
Percent of project easement fenced	0%

APPENDIX C. VEGETATION ASSESSMENT DATA

Table 5 - Vegetation Plot Mitigation Success Summary		
Overhills/Jumping Run Creek Restoration Project / EEP Project No. 199		
Vegetation Plot ID	**Vegetation Density Met (260 stems/acre)**	**Tract Mean**
VP1	Y (283)	80% (332 stems/acre)
VP2	Y (283)	
VP3	N (202)	
VP4	Y (324)	
VP5	N (121)	
VP6R*	Y (405)	
VP7	Y (364)	
VP8	Y (567)	
VP9	Y (324)	
VP10	Y (445)	

*Relocated due to lower reach repair

VEGETATION MONITORING PLOT PHOTOS

Photo Station 11: Vegetation Plot 1 looking northwest (10/11/11).

Photo Station 12: Vegetation Plot 1 looking west (10/11/11)

Photo Station 13: Vegetation Plot 2 looking northeast (10/11/11)

Photo Station 14: Vegetation Plot 2 looking east (10/11/11)

Photo Station 15: Vegetation Plot 3 looking northwest (10/10/11)

Photo Station 16: Vegetation Plot 3 looking west (10/10/11)

Photo Station 17: Vegetation Plot 4 looking northeast (10/11/11)

Photo Station 18: Vegetation Plot 4 looking east (10/11/10)

Photo Station 19: Vegetation Plot 5 looking northeast (10/11/11)

Photo Station 20 Vegetation Plot 5 looking east (10/11/11)

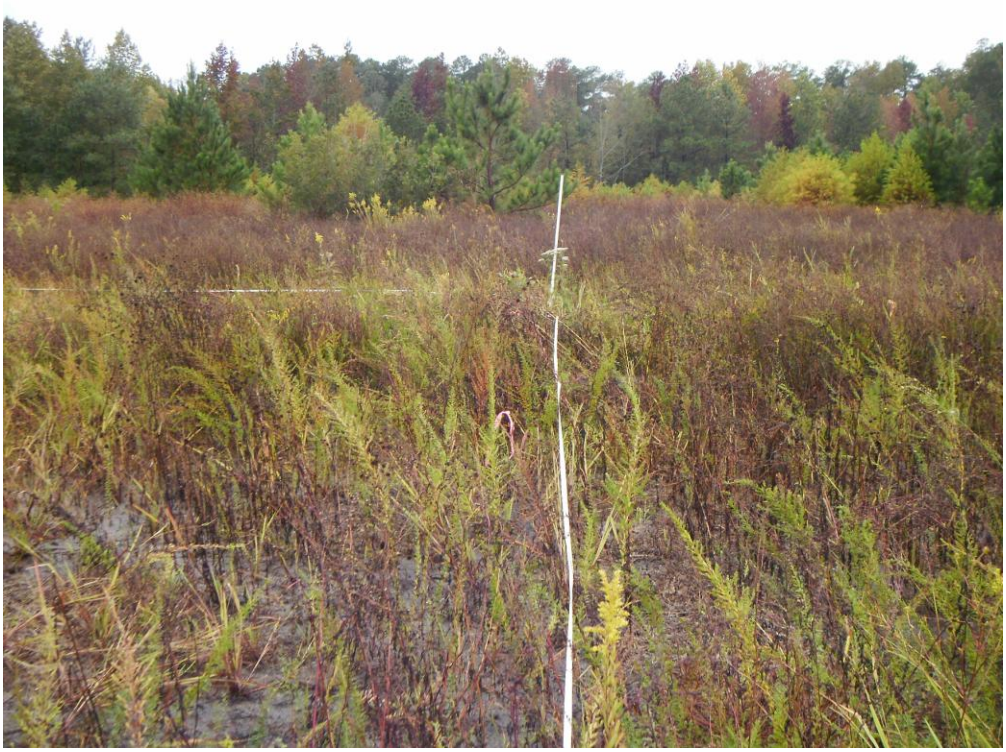


Photo Station 21 Vegetation Plot 6R looking northwest (10/11/11)

Photo Station 22 Vegetation Plot 6R looking north (10/11/11)

Photo Station 23 Vegetation Plot 7 looking north (10/11/11)

Photo Station 24 Vegetation Plot 7 looking northeast (10/11/11)

Photo Station 25 Vegetation Plot 8 looking northeast (10/11/11)

Photo Station 26 Vegetation Plot 8 looking east (10/11/11)

Photo Station 27 Vegetation Plot 9 looking north (10/11/11)

Photo Station 28 Vegetation Plot 9 looking northeast (10/11/11)

Photo Station 29 Vegetation Plot 10 looking northwest (10/11/11)

Photo Station 30 Vegetation Plot 10 looking west (10/11/11)

Table 6. Vegetation Metadata

Report Prepared By	Alex Baldwin
Date Prepared	11/6/2011 12:07
database name	Stantec_Overhills2011_A.mdb
database location	U:\171300316\project\1-Overhills\site_data\cvs
computer name	BALDWINA
file size	43790336
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	199
project Name	Overhills Stream and Wetland Restoration
Description	Stream and Wetland Restoration
River Basin	Cape Fear
length(ft)	4482
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	0

Table 7 - CVS Stem Count Total and Planted by Plot and Species
Overhills/Jumping Run Creek Restoration Project / EEP Project No. 199

			Current Plot Data (MY5 2011)																												Annual Means																	
			E0199-01-0006R			EOverhills-01-0001			EOverhills-01-0002			EOverhills-01-0003			EOverhills-01-0004			EOverhills-01-0005			EOverhills-01-0007			EOverhills-01-0008			EOverhills-01-0009			EOverhills-01-0010			MY5 (2011)			MY4 (2010)			MY3 (2009)			MY2 (2008)			MY1 (2007)			MY0 (2007)		
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	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															16			5			7			12			4			8			52			32			14			10					
Cephalanthus occidentalis	common buttonbush	Shrub Tree					4	6																										4	6	1	10	10	1	11	11	1	11	11	1	11	11	1	11	11
Cornus amomum	silky dogwood	Shrub				1	1	1																	5	7							1	6	8	1	12	12	1	12	12	1	11	11	1	12	12	1	13	13
Cyrilla racemiflora	swamp titi	Shrub Tree				1	1	1																									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Diospyros virginiana	common persimmon	Tree																			3	3	3	1	1	1							4	4	4	4	4	4	3	3	3								
Fraxinus pennsylvanica	green ash	Tree	1	1	1				1	1	1	2	2	2	3	3	3				1	1	1				1	1	1				9	9	9	8	8	8	7	7	7	7	7	7	7	7	7	7	7	7
Ilex decidua	possumhaw	Shrub Tree																																										1					
Liquidambar styraciflua	sweetgum	Tree															5									1			1			8			15			14			9			5					
Liriodendron tulipifera	tuliptree	Tree																								1									1														
Magnolia grandiflora	southern magnolia	Tree																																		2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
Morella cerifera	wax myrtle	Shrub Tree	1	1	1																			1	1	1							2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nyssa	tupelo	Tree																																				1												
Nyssa biflora	swamp tupelo	Tree	2	2	2							1	1	2	3	3	3	1	1	2	1	1	4	2	2	5	3	3	3	5	5	7	18	18	28	21	21	28	19	19	20	23	23	23	23	23	23	21	21	21
Pinus taeda	loblolly pine	Tree									9						6									2			12			2			31			42			67			35					
Quercus nigra	water oak	Tree																						1	1	1							1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Quercus phellos	willow oak	Tree	1	1	1																												1	1	1	4	4	4	4	4	4	2	2	2	4	4	4	4	4	4
Salix nigra	black willow	Tree					1	3																		1	2							2	5		5	5		4	4		6	7		6	6		6	6
Sambucus	elderberry	Shrub Tree	2	2	2																												2	2	2														
Sambucus canadensis	Common Elderberry	Shrub Tree																						1	1	1							1	1	1	2	6	6	2	6	7	1	8	8	1	8	8	1	12	12
Sambucus nigra	European black elderb	Shrub Tree																																								1	1	1	1	1	1	1	1	1
Taxodium distichum	bald cypress	Tree	3	3	3				6	6	6	2	2	2	2	2	2	2	2	2	4	4	4	2	2	2	4	4	4	6	6	6	31	31	31	29	29	29	29	29	29	27	27	27	27	27	27	27	27	27
Toxicodendron radicans	eastern poison ivy	Shrub Vine															7.5																		7.5														
Unknown		unknown																																								2	2	2	3	3	3	3	3	3
		Stem count	10	10	10	2	7	11	7	7	16	5	5	6	8	8	43	3	3	9	9	9	19	8	14	36	8	8	25	11	11	31	71	82	206	76	105	201	72	101	193	71	104	156	74	108	108	73	112	112
		size (ares)	1			1			1			1			1			1			1			1			1			1			10			10			10			10			10					
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.25			0.25			0.25			0.25			0.25			0.25		
		Species count	6	6	6	2	4	4	2	2	3	3	3	3	3	3	7	2	2	3	4	4	5	6	8	12	3	3	6	2	2	5	11	13	18	12	13	17	12	13	16	13	14	18	13	14	14	13	14	14
		Stems per ACRE	405	405	405	81	283	445	283	283	647	202	202	243	324	324	1720	121	121	364	364	364	769	324	567	1457	324	324	1012	445	445	1255	287	332	832	308	425	813	291	409	781	287	421	631	299	437	437	295	453	453

APPENDIX D. STREAM ASSESSMENT DATA

Photo 1 – Evidence of bankfull overflow near Station 42+00 – sediment on floodplain (9/21/11)

Photo 2 – Repaired reach looking upstream near Station 36+00 (2/23/11)

Photo 3. Repaired reach looking upstream near Station 35+50 (9/21/11)

Photo Station 1 – Looking upstream at beginning of project (12/13/11)

Photo Station 2 – Cross Section 1 – looking downstream (12/13/11)

Photo Station 3 – Cross Section 2 – looking downstream (9/21/11)

Photo Station 4 – Cross Section 3 – looking downstream (9/21/11)

Photo Station 5 – Cross Section 4 – looking downstream (9/21/11)

Photo Station 6 – Cross Section 5 – looking downstream (9/21/11)

Photo Station 7 –Cross Section R1 – looking downstream (9/21/11)

Photo Station 8 – Cross Section R2 – looking downstream (9/21/11)

Photo Station 9 – Cross Section R3 – looking downstream (9/21/11)

Photo Station 10 – Cross Section R4 – looking downstream (9/21/11)

Exhibit Table 8A - Visual Morphological Stability Assessment - Upper Reach Overhills/Jumping Run Creek - EEP Project No. 199						
Feature Category	**Metric (per As-built and reference baselines)**	**(# Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number/Feet in Unstable State**	**% Perform in Stable Condition**	**Feature Perform. Mean or Total**
A. Riffles	1. Present?	14	15		93%	
	2. Armor stable (eg no displacement?)	N/A	N/A			
	3. Facet grade appears stable?	15	15		100%	
	4. Minimal evidence of embedding/fining?	N/A	N/A			
	5. Length appropiate?	10	14		71%	88%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	12	19		63%	
	2. Sufficiently deep (Max Pool D:Mean Bkf > 1.6?)	13	19		68%	
	3. Length appropriate?	12	19		63%	65%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	19	19		100%	
	2. Downstream of meander (glide/inflection) centering?	19	19		100%	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	19	19		100%	
	2. Of those eroding, # w/concomitant point bar formation?	N/A	N/A			
	3. Apparent Rc within spec?	16	19		84%	
	4. Sufficient floodplain access and relief?	19	19		100%	95%
E. Bed General	1. General channel bed aggradation areas (bar formation)		3100	100	97%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?		3100	100	97%	97%
F. Bank	1. Actively eroding, wasting, or slumping bank?		3100	50	98%	98%
G. Vanes	1. Free of back or arm scour?	14	15		93%	
	2. Height appropriate?	12	15		80%	
	3. Angle and geometry appear appropriate?	10	15		67%	
	4. Free of piping or other structural failures?	12	15		80%	80%
H. Wads/Boulders	1. Free of scour?	12	N/A		NA	
	2. Footing stable?	N/A	N/A		NA	NA

Exhibit Table 8B - Visual Morphological Stability Assessment - Lower Reach Overhills/Jumping Run Creek - EEP Project No. 199						
Feature Category	**Metric (per As-built and reference baselines)**	**(# Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number/Feet in Unstable State**	**% Perform in Stable Condition**	**Feature Perform. Mean or Total**
A. Riffles	1. Present?	8	8		100%	
	2. Armor stable (eg no displacement?)	8	8		100%	
	3. Facet grade appears stable?	8	8		100%	
	4. Minimal evidence of embedding/fining?	4	8		50%	
	5. Length appropiate?	6	8		75%	85%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	8	8		100%	
	2. Sufficiently deep (Max Pool D:Mean Bkf > 1.6?)	4	8		50%	
	3. Length appropriate?	8	8		100%	83%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	6	6		100%	
	2. Downstream of meander (glide/inflection) centering?	6	6		100%	100%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	6	6		100%	
	2. Of those eroding, # w/concomitant point bar formation?	0	0		100%	
	3. Apparent Rc within spec?	6	6		100%	
	4. Sufficient floodplain access and relief?	6	6		100%	100%
E. Bed General	1. General channel bed aggradation areas (bar formation)		1200	0	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?		1200	0	100%	100%
F. Bank	1. Actively eroding, wasting, or slumping bank?		1200	0	100%	100%
G. Vanes	1. Free of back or arm scour?	0	1		0%	
	2. Height appropriate?	0	1		0%	
	3. Angle and geometry appear appropriate?	0	1		0%	
	4. Free of piping or other structural failures?	0	1		0%	0%
H. Wads/Boulders	1. Free of scour?	5	5		100%	
	2. Footing stable?	5	5		100%	100%

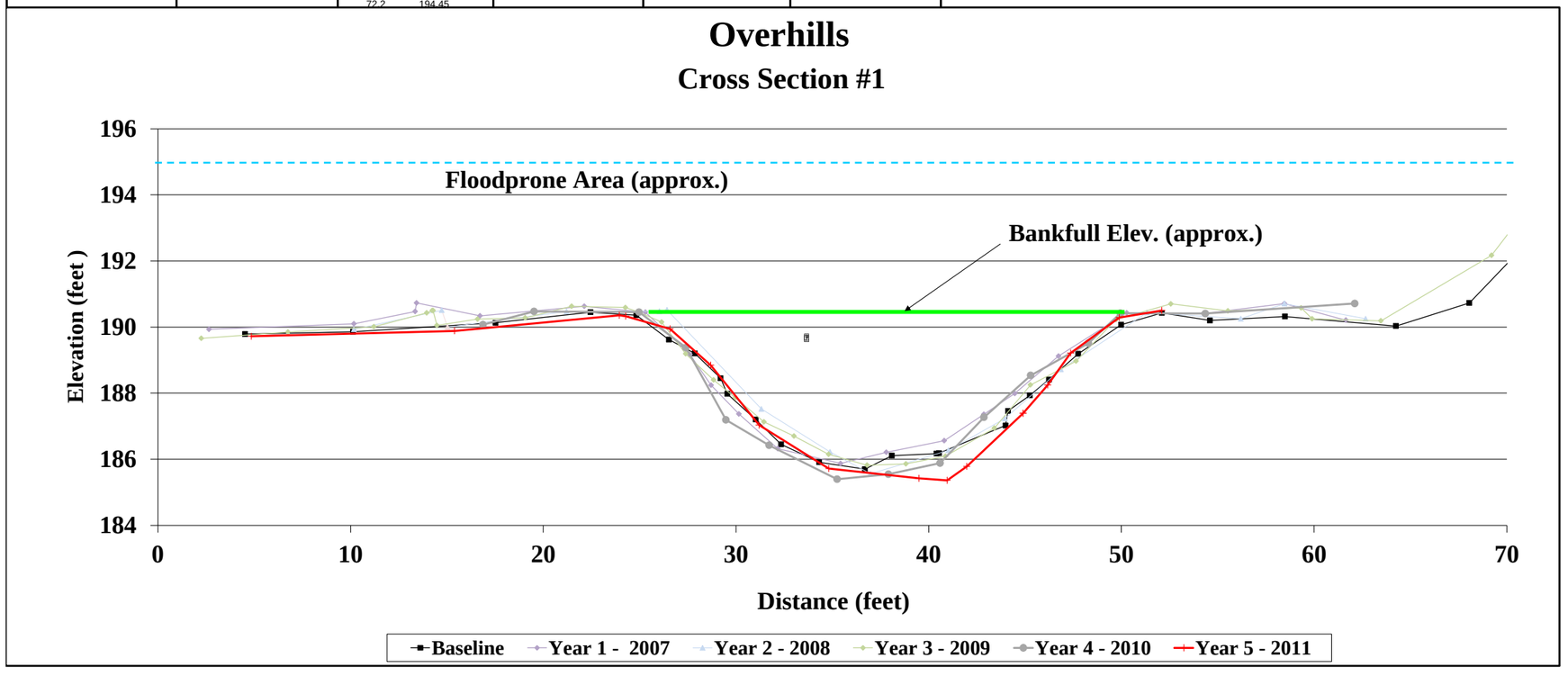
Table 9 - Verification of Bankfull Events Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
2011	September 2011	Field observation	Appendix D, Photo 1

Project Name Overhills
Cross Section Cross Section 1
Feature Pool
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09, Year 4 -09/10, Year 5 09/11
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen, Year 5 - Jean/Mazzochi/Baldwin

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
4.85	189.72		16.87	190.07		2.25	189.66		10.17	189.93		2.65	189.93	Left Pin	4.52	189.79	Left Pin
15.4	189.884		19.52	190.47		6.75	189.85		14.73	190.51		10.17	190.1		10.13	189.86	
23.95	190.354		24.97	190.45		11.21	190.01		15.03	190		13.35	190.47		17.52	190.13	
24.28	190.329		27.4	189.38		13.95	190.43		21.21	190.47		13.42	190.73		22.45	190.45	
26.58	189.944		29.48	187.19		14.24	190.5		26.03	190.48		16.72	190.34		24.83	190.36	LBK
28.69	188.844		31.72	186.42		14.28	190.5		26.42	190.52		22.13	190.63		26.52	189.62	
31.2	187.031		35.25	185.39		14.48	190.05		31.32	187.52		25.3	190.45	LBK	27.86	189.2	
34.82	185.717		37.91	185.54		16.59	190.24		34.88	186.22		27.61	189.17		29.2	188.45	
39.5	185.419		40.59	185.88		19.06	190.28		36.98	185.56		28.71	188.24		29.55	187.98	
40.96	185.358		42.87	187.27		21.47	190.63		41.03	186.27		30.15	187.37		31.02	187.2	
41.98	185.779		45.29	188.54		24.26	190.59		43.96	187.23		32.17	186.32		32.34	186.45	
44.9	187.391		48.29	189.51		24.97	190.45		46.86	188.72		35.43	185.87		34.32	185.91	
46.18	188.244		49.95	190.42	BKF	26.14	190.15		51.33	190.44		37.8	186.21		36.69	185.7	
47.37	189.211		54.36	190.41		27.39	189.19		56.2	190.25		40.81	186.56		38.09	186.11	
49.89	190.29	BKF	62.11	190.71		28.84	188.4		58.46	190.71		42.86	187.36		40.41	186.17	
52.1	190.5					29.97	187.86		62.68	190.25		44.47	187.99		40.54	186.18	
						31.45	187.13					46.74	189.12		43.99	187.02	
						33.01	186.7					50.28	190.43	RBK	44.12	187.46	
						34.81	186.15					54.26	190.41		45.25	187.93	
						36.8	185.82					58.46	190.71	Right Pin	46.24	188.41	
						38.82	185.86					61.65	190.21		47.76	189.19	
						40.87	186.09								49.99	190.07	
						43.41	186.94								52.1	190.43	RBK
						45.28	188.25								54.6	190.2	
						47.65	188.97								58.49	190.32	Right Pin
						49.72	190.23								64.25	190.03	
						52.57	190.7								68.06	190.73	
						55.53	190.49								70.27	192.07	
						59.33	190.58								73.77	192.89	
						59.9	190.25										
						63.47	190.19										
						69.21	192.17										
						72.2	194.45										

Photo of Cross-Section 1 - Looking Downstream @ STA 1+64

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline
BKF Area	73.61	75.30	69.97	67.39	67.45	71.89
BKF Width	25.38	24.91	25.19	24.42	24.66	26.87
BKF Mean Depth	2.90	3.02	2.78	2.76	2.74	2.68
BKF Max Depth	5.00	5.00	4.54	4.80	4.49	4.66
W/D	8.75	8.24	9.07	8.85	9.02	10.04



Project Name Overhills
Cross Section Cross Section 2
Feature Pool
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09, Year 4 -09/10, Year 5 09/11
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen, Year 5 - Jean/Mazzochi/Baldwin

Year 5 - 2011
2011 Survey

Station	Elevation	Notes
7.13	189.534	
9.11	189.356	
11.49	189.28	
13.44	188.753	
19.31	188.591	
22.27	189.105	
23.4	189.052	
23.59	189.063	BKF
24.54	188.762	
26.71	187.761	
29.62	186.826	
32.1	186.269	
35.62	186.495	
37.59	187.381	
39.93	188.122	
42.55	188.801	
47.87	189.612	

Year 4 - 2010
2010 Survey

Station	Elevation	Notes
0	190.247	
8.34	189.404	
14.65	188.798	
22.81	189.316	
25.91	188.369	
28.25	187.339	
31.01	186.412	
33.25	185.911	
35.76	186.658	
39.04	187.709	
40.56	188.27	
42.57	188.833	
47.52	189.96	
53.45	189.327	
60.75	189.141	

Year 3 - 2009
2009 Survey

Station	Elevation	Notes
2.75	190.57	
5.11	190.18	
6.81	189.76	
9.32	189.36	
12.6	189.03	
13.51	189.53	
15.54	189.01	
15.87	189	
18.55	189	
20.93	189.29	
24.44	189.7	
24.57	189.29	
25.72	188.84	
25.82	188.84	
25.99	188.61	
26.2	188.4	
27.23	188.03	
27.88	187.53	
29.06	187.21	
30.13	186.06	
31.23	185.7	
32.59	185.99	
33.6	186.33	
34	186.69	
34.48	186.79	
35.58	187.03	
37.29	187.28	
38.88	187.78	
40.31	188.12	
41.26	188.54	
42.79	189.08	
44.71	189.56	
45.13	189.72	
45.38	189.73	
45.79	189.84	
47.02	189.96	
48.99	189.66	
51.52	189.36	
53.38	189.34	
54.69	189.84	
54.89	189.84	
58.31	189.32	
63.04	189.37	

Year 2 - 2008
2008 Survey

Station	Elevation	Notes
9.58	189.38	
13.16	189.5	
14.81	189	
19.75	189.07	
22.42	189.6	
25.82	188.4	
28.09	187.31	
30.26	185.24	
32.87	184.71	
35.87	185.72	
38.76	187.05	
41.27	188.22	
45.66	189.8	
50.32	189.48	
53.76	189.36	
54.37	189.85	
60.03	189.23	

Year 1 - 2007
2007 Survey

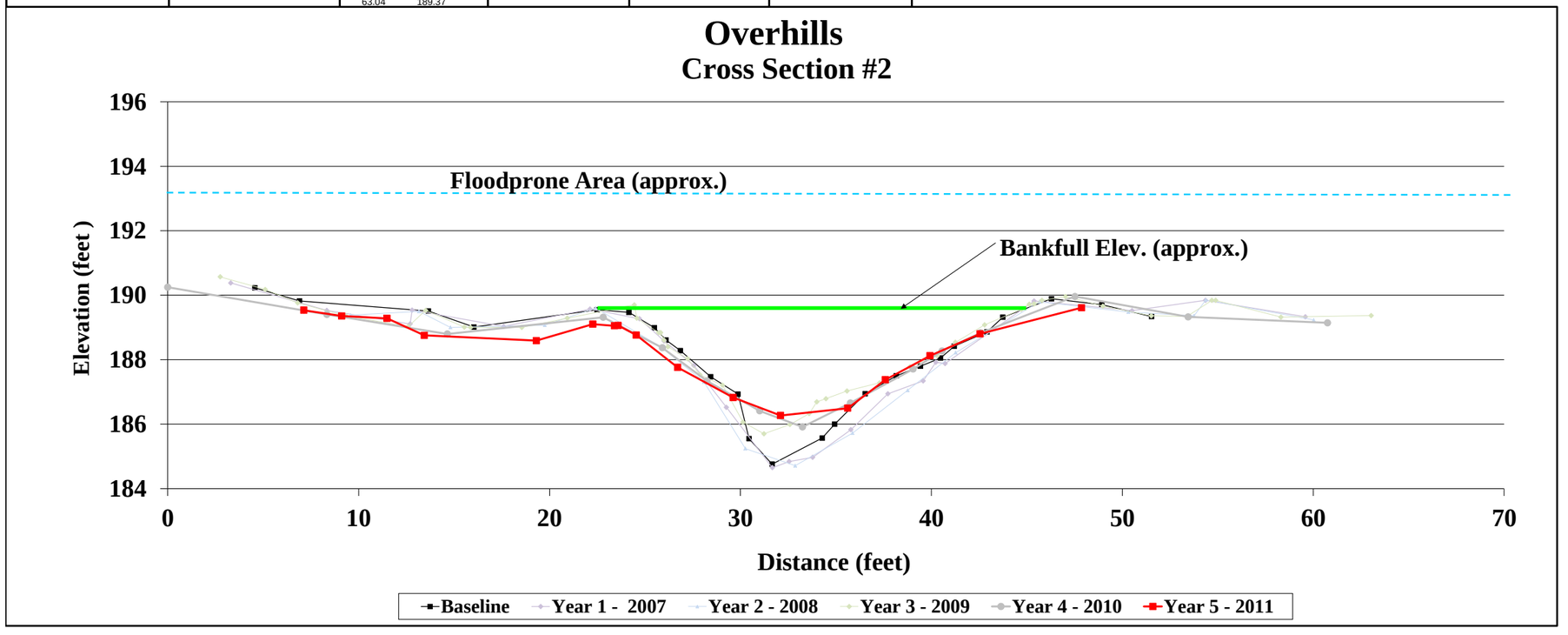
Station	Elevation	Notes
3.3	190.38	
8.33	189.53	
12.7	189.11	
12.8	189.54	Left Pin
17.6	189.03	
22.12	189.57	LBK
24.71	189.27	
26	188.58	
27.56	187.82	
29.26	186.52	
31.67	184.65	
32.55	184.84	
33.78	184.97	
35.78	185.83	
37.72	186.94	
39.57	187.34	
40.23	187.92	
40.72	187.88	
45.38	189.82	RBK
50.51	189.52	
54.36	189.84	Right Pin
59.59	189.33	

Baseline
Survey

Station	Elevation	Notes
4.56	190.23	
6.9	189.82	
13.65	189.51	Left Pin
16.04	189.01	
22.49	189.55	LBK
24.16	189.47	
25.49	188.99	
26.1	188.61	
26.85	188.28	
28.44	187.47	
29.87	186.93	
30.45	185.55	
31.66	184.76	
34.28	185.57	
34.93	186	
36.53	186.94	
38.16	187.5	
39.43	187.8	
40.48	188.05	
41.2	188.42	
42.91	188.86	
43.74	189.32	
46.29	189.89	RBK
48.93	189.71	
51.53	189.34	
54.39	189.81	Right Pin
57.19	189.28	
62.87	189.3	

Photo of Cross-Section 2 - Looking Downstream @ STA 8+47

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline
BKF Area	31.70	38.08	39.54	54.18	51.12	44.82
BKF Width	20.65	28.93	20.86	22.40	22.29	22.27
BKF Mean Depth	1.54	1.32	1.90	2.42	2.29	2.01
BKF Max Depth	2.79	3.40	3.84	4.83	4.90	4.79
W/D	13.45	21.90	11.01	9.26	9.72	11.07



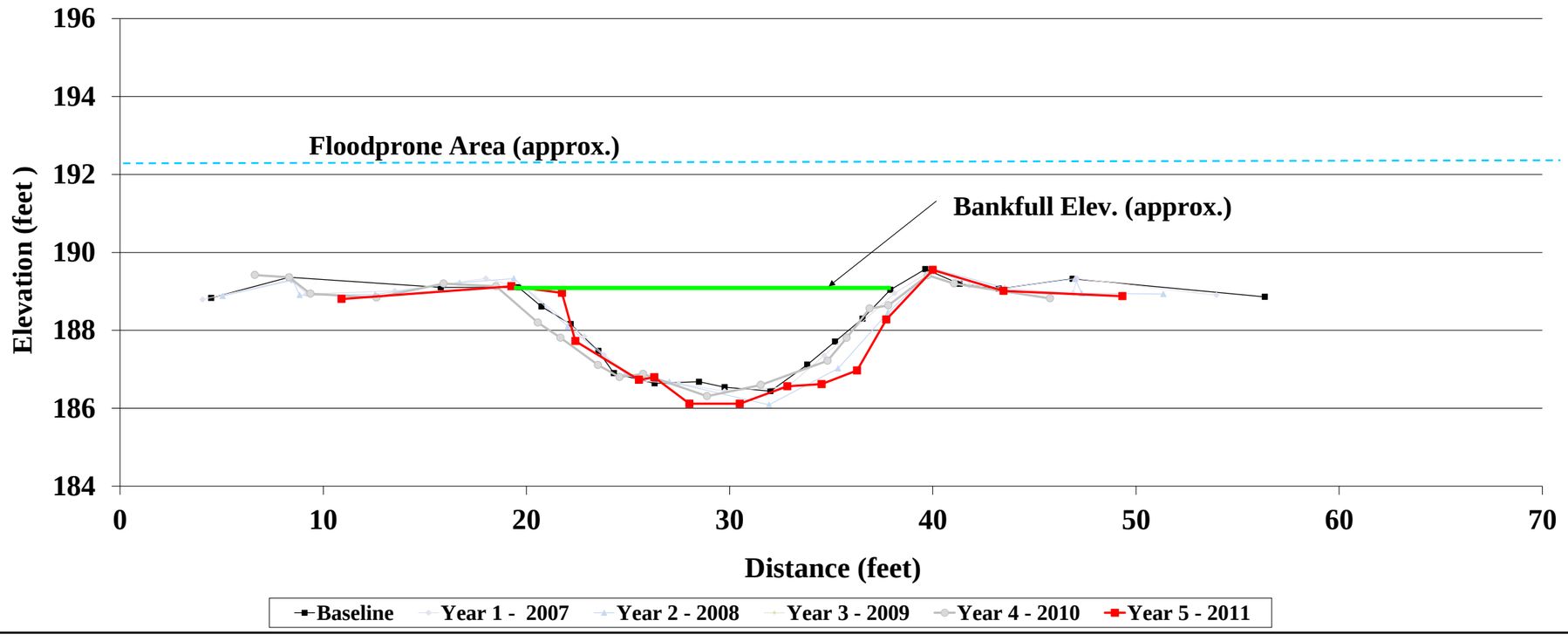
Project Name Overhills
Cross Section Cross Section 3
Feature Riffle
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09, Year 4 -09/10, Year 5 09/11
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen, Year 5 - Jean/Mazzochi/Baldwin

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
10.9	188.80		6.63	189.42		6.63	189.42		5.05	188.88		4.06	188.79		4.48	188.83	
19.26	189.13		8.32	189.36		8.32	189.36		8.5	189.29		8.41	189.3	Left Pin	8.32	189.36	Left Pin
21.75	188.96		9.37	188.94		9.37	188.94		8.84	188.9		9.18	188.93		15.78	189.1	
22.41	187.73		12.62	188.84		12.62	188.84		12.56	188.92		13.52	189.01		19.61	189.1	
25.54	186.73		15.92	189.2		15.92	189.2		16.71	189.22		18	189.33		20.74	188.61	LBK
26.29	186.79		18.5	189.13		18.5	189.13		19.38	189.33		19.99	189.07	LBK	22.18	188.16	
28.02	186.12		20.56	188.2		20.56	188.2		22.04	188.1		22.85	187.84		23.54	187.47	
30.5	186.12		21.68	187.81		21.68	187.81		24.87	186.9		23.82	187.37		24.3	186.9	
32.84	186.56		23.52	187.11		23.52	187.11		27.04	186.68		25.46	186.71		26.31	186.64	
34.53	186.62		24.58	186.8		24.58	186.8		31.94	186.09		27.49	186.63		28.49	186.68	
36.27	186.97		25.74	186.88		25.74	186.88		35.34	187.02		29.75	186.44		29.75	186.54	
37.71	188.28		28.89	186.31		28.89	186.31		37.8	188.46		32.85	186.55		32.01	186.44	
40	189.55		31.53	186.6		31.53	186.6		40.02	189.58		34.65	187.35		33.82	187.12	
43.48	189.01		34.82	187.22		34.82	187.22		43.54	189.09		38.11	188.95		35.19	187.71	
49.33	188.88		35.76	187.81		35.76	187.81		47	189.32		40.08	189.58		36.54	188.3	
			36.89	188.56		36.89	188.56		47.33	188.95		41.78	189.15	RBK	37.91	189.04	RBK
			37.81	188.64		37.81	188.64		51.35	188.93		46.9	188.95		39.63	189.57	
			39.75	189.41		39.75	189.41					47.1	189.33	Right Pin	41.31	189.19	
			41.05	189.2		41.05	189.2					53.96	188.9		43.25	189.07	
			45.77	188.82		45.77	188.82								46.88	189.32	Right Pin
															56.34	188.86	

Photo of Cross-Section 3 - Looking Downstream @ STA 13+12

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline
BKF Area	38.43	33.96	33.96	35.19	31.56	31.03
BKF Width	19.98	19.22	19.22	18.94	18.36	18.15
BKF Mean Depth	1.91	1.77	1.77	1.86	1.72	1.71
BKF Max Depth	3.01	2.73	2.73	2.95	2.60	2.60
W/D	10.46	10.87	10.87	10.19	10.68	10.62

Overhills
Cross Section #3

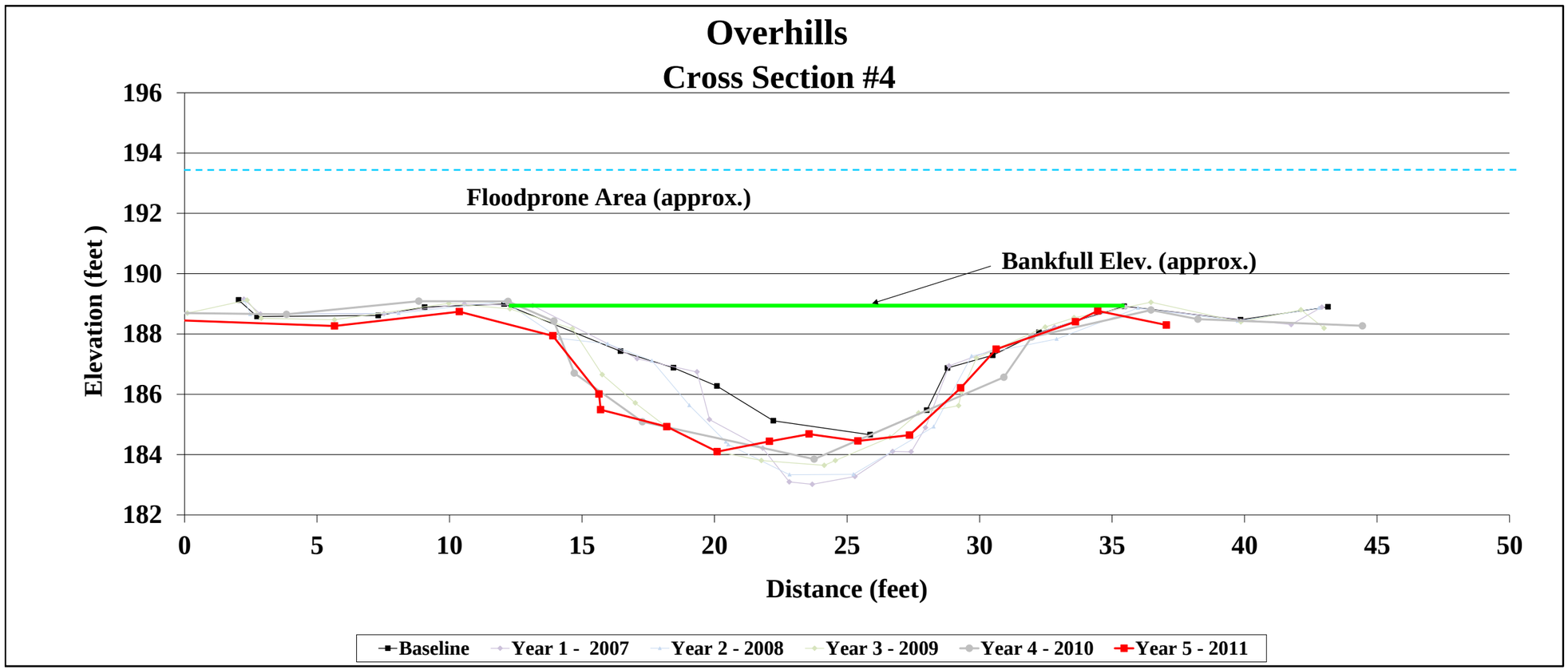


Project Name Overhills
Cross Section Cross Section 4
Feature Pool
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09, Year 4 -09/10, Year 5 09/11
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen, Year 5 - Jean/Mazzochi/Baldwin

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-6.5	188.297		-8.72	188.843		0.11	188.69		2.27	189.11		2.24	189.15	Left Pin	2.04	189.13	Left Pin
-0.16	188.453		-2.46	188.719		2.36	189.12		2.48	188.65		2.87	188.66		2.74	188.58	
5.66	188.264		3.85	188.649		2.9	188.52		8.08	188.69		7.53	188.67		7.31	188.61	
10.37	188.741		8.84	189.086		5.66	188.47		12.07	189.08		10.56	188.99	LBK	9.06	188.89	
13.9	187.938		12.21	189.08		9.97	189.01		14.15	187.85		13.14	188.94		12.06	188.99	LBK
15.64	186.006		13.94	188.425		12.28	188.83		15.97	187.67		17.08	187.18		16.45	187.43	
15.7	185.485		14.71	186.698		14.64	188.17		17.64	187.11		19.34	186.74		18.45	186.88	
18.2	184.922		17.28	185.086		15.76	186.65		19.05	185.63		19.81	185.16		20.09	186.27	
20.1	184.095		23.76	183.845		17.01	185.71		20.43	184.42		21.82	184.21		22.22	185.12	
22.07	184.438		30.92	186.562		18.18	184.92		20.52	184.33		22.82	183.09		25.87	184.66	
23.57	184.68		31.97	187.895		20.08	184.1		22.83	183.33		23.69	183.01		28.01	185.47	
25.41	184.449		36.47	188.791		21.77	183.8		25.24	183.34		25.3	183.27		28.79	186.87	
27.36	184.643		38.24	188.489		24.14	183.64		28.27	184.92		26.72	184.1		30.5	187.29	
29.29	186.21		44.45	188.267		24.56	183.8		29.7	187.27		27.42	184.09		32.24	188.05	
30.63	187.492					26.62	184.57		32.91	187.83		27.96	184.89		35.46	188.92	RBK
33.62	188.405					27.7	185.38		35.98	188.86		28.85	186.94		39.85	188.47	
34.46	188.764					29.21	185.62		39.74	188.43		32.83	188.22		43.15	188.9	Right Pin
37.05	188.295					29.32	186.08		42.81	188.86		35.51	188.89	RBK			
						29.88	187.2					41.76	188.31				
						32.48	188.23					42.92	188.89	Right Pin			
						33.57	188.54										
						36.47	189.05										
						39.86	188.4										
						42.13	188.8										
						43	188.19										

Photo of Cross-Section 4 - Looking Upstream @ STA 20+93

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline
BKF Area	64.16	65.77	66.54	64.86	59.60	49.19
BKF Width	24.06	22.40	23.39	23.11	22.25	23.19
BKF Mean Depth	2.67	2.94	2.84	2.81	2.68	2.12
BKF Max Depth	4.66	5.00	5.28	5.59	5.91	4.26
W/D	9.02	7.70	8.23	8.23	8.31	10.93



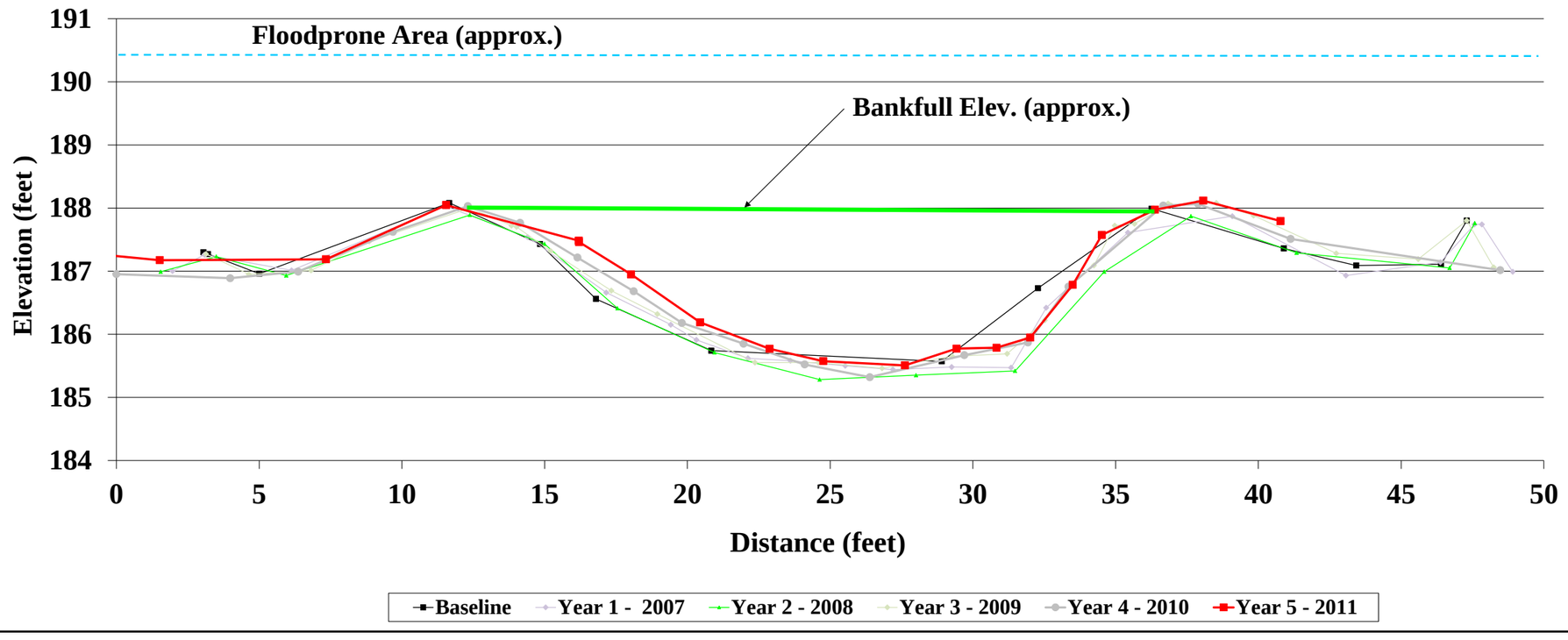
Project Name Overhills
Cross Section Cross Section 5
Feature Riffle
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09, Year 4 -09/10, Year 5 09/11
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen, Year 5 - Jean/Mazzochi/Baldwin

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-2.5	187.349		0	186.953		3.14	187.27		1.55	186.99		1.97	187		3.05	187.3	Left Pin
1.52	187.173		3.99	186.887		4.64	186.95		3.5	187.23		3.09	187.26	Left Pin	3.21	187.27	
7.34	187.188		6.37	186.992		6.82	187.01		5.95	186.93		6.14	187.01		5.01	186.96	
11.55	188.046		9.69	187.621		8.86	187.47		12.38	187.89		11.52	188.03	LBK	11.66	188.08	LBK
16.2	187.483		12.31	188.03		12.39	188		15	187.43		14.4	187.54		14.84	187.43	
16.21	187.459		14.14	187.765		13.84	187.72		17.55	186.41		17.16	186.66		16.8	186.56	
18.03	186.948		16.15	187.215		14.02	187.7		20.95	185.71		19.42	186.15		20.84	185.74	
20.45	186.187		18.12	186.681		15.21	187.32		24.63	185.28		20.32	185.91		28.91	185.57	
22.88	185.769		19.81	186.178		17.34	186.69		28.01	185.35		22.12	185.62		32.28	186.73	
24.76	185.574		21.97	185.85		18.95	186.32		31.48	185.42		23.61	185.58		36.26	187.99	RBK
27.62	185.507		24.11	185.521		22.37	185.55		34.6	186.99		25.53	185.5		40.89	187.36	
29.43	185.771		26.39	185.319		24.59	185.55		37.64	187.87		27.2	185.44		43.43	187.09	
30.83	185.785		29.7	185.668		26.82	185.46		41.34	187.29		29.26	185.48		46.4	187.11	Right Pin
32.01	185.947		31.93	185.87		29.28	185.65		46.7	187.05		31.34	185.47		47.3	187.8	
33.5	186.782		33.35	186.754		31.2	185.69		47.58	187.76		32.57	186.42				
34.52	187.573		36.67	188.038		32.52	186.22					35.43	187.61				
36.38	187.974		37.89	188.063		33.52	186.81					39.09	187.87	RBK			
38.07	188.117		41.13	187.51		34.24	187.09					43.07	186.93				
40.78	187.792		48.47	187.014		34.97	187.72					46.38	187.14	Right Pin			
						35.66	187.75					47.57	187.74				
						36.88	188.05					47.83	187.74				
						36.84	188.07					48.91	186.99				
						36.95	188.04										
						38.53	188.08										
						39.83	187.88										
						42.73	187.28										
						45.6	187.19										
						47.3	187.8										
						48.24	187.06										

Photo of Cross-Section 5 - Looking Downstream @ STA 26+86

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline
BKF Area	37.99	39.37	39.36	44.36	40.91	37.70
BKF Width	26.08	24.30	24.41	24.63	24.50	24.16
BKF Mean Depth	1.46	1.62	1.61	1.80	1.67	1.56
BKF Max Depth	2.57	2.70	2.53	2.71	2.55	2.42
W/D	17.90	15.00	15.14	13.67	14.68	15.48

Overhills
Cross Section #5

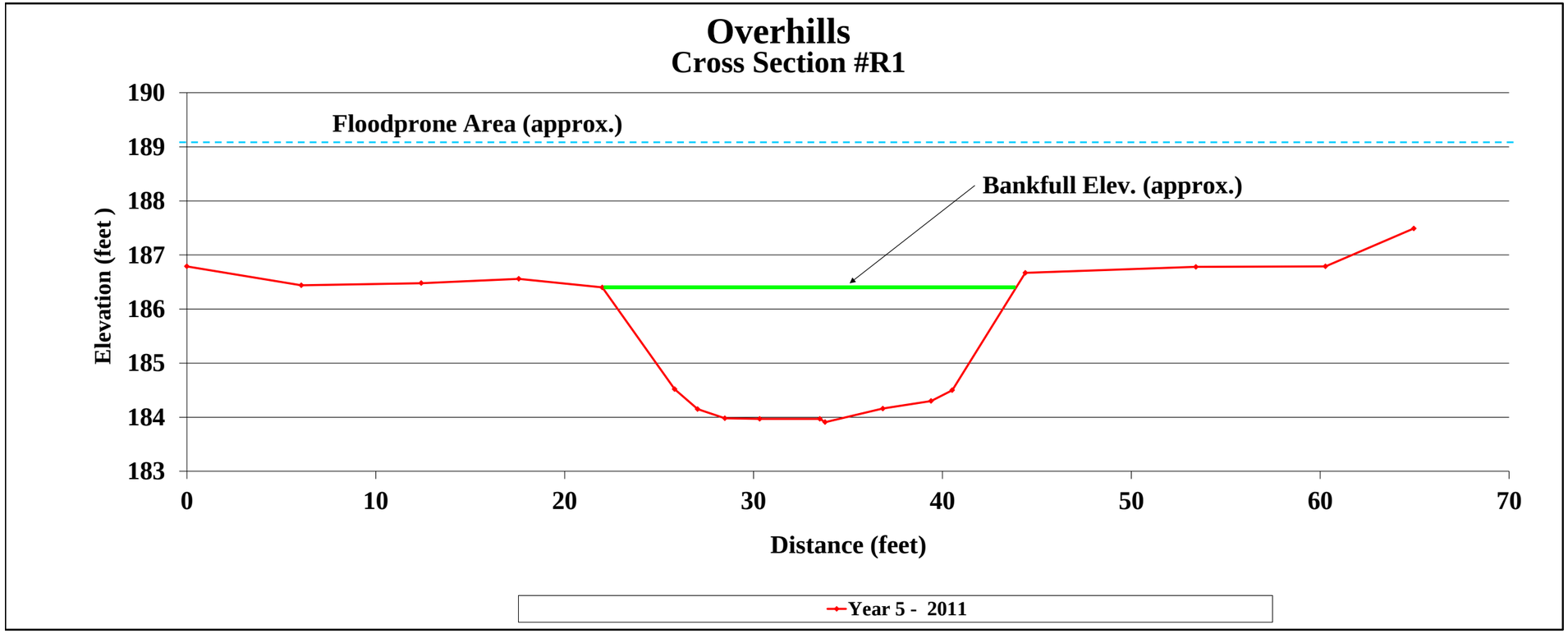


Project Name Overhills
Cross Section Cross Section R1 (Repair)
Feature Riffle
Date Baseline - 03/11, Year 5 -09/11
Crew Baseline - Turner Land Surveying, Year 5 - Jean/Mazzochi/Baldwin

Year 6- 2012 2012 Survey			Year 5 - 2011 2011 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
			0	186.79				
			6.06	186.44				
			12.41	186.48				
			17.57	186.56				
			21.99	186.4				
			25.82	184.52				
			27.04	184.15				
			28.48	183.98				
			30.33	183.97				
			33.51	183.97				
			33.79	183.91				
			36.85	184.16				
			39.4	184.3		DATA NOT AVAILABLE		
			40.52	184.5				
			44.39	186.67				
			53.42	186.78				
			60.28	186.79				
			64.96	187.49				

Photo of Cross-Section R1 - Looking Downstream @ STA 32+82

	Year 6- 2012	Year 5 - 2011	Asbuilt - 2011			
BKF Area		44.50				
BKF Width		26.62				
BKF Mean Depth		1.67				
BKF Max Depth		2.65				
W/D		15.94				



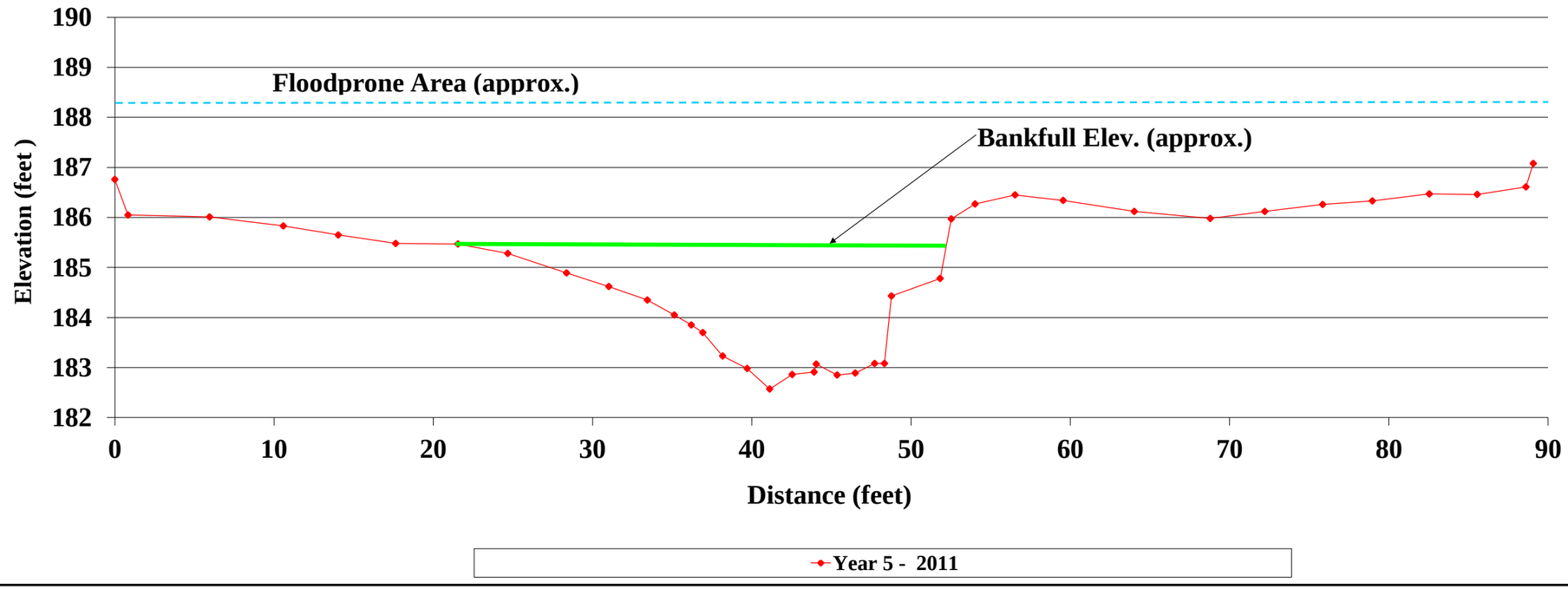
Project Name Overhills
Cross Section Cross Section R2 (Repair)
Feature Pool
Date Baseline - 03/11, Year 1 - 09/11
Crew Baseline - Turner Land Surveying, Year 1 - Jean/Mazzochi/Baldwin

Year 6 - 2012 2012 Survey			Year 5 - 2011 2011 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
			0	186.76				
			0.83	186.05				
			5.95	186.01				
			10.58	185.83				
			14.03	185.65				
			17.64	185.48				
			21.55	185.47				
			24.68	185.28				
			28.37	184.89				
			31.02	184.62				
			33.44	184.35				
			35.14	184.05				
			36.2	183.85		DATA NOT AVAILABLE		
			36.92	183.7				
			38.17	183.23				
			39.71	182.98				
			41.12	182.57				
			42.54	182.86				
			43.91	182.91				
			44.05	183.07				
			45.36	182.85				
			46.5	182.89				
			47.71	183.08				
			48.33	183.08				
			48.77	184.43				
			51.83	184.78				
			52.53	185.97				
			54.02	186.27				
			56.5	186.5				
			59.55	186.34				
			64.02	186.12				
			68.79	185.98				
			72.21	186.12				

Photo of Cross-Section R2 - Looking Downstream @ STA 34+09

				Year 6 - 2012	Year 5 - 2011	Baseline
BKF Area					43.02	
BKF Width					30.69	
BKF Mean Depth					1.40	
BKF Max Depth					2.90	
W/D					21.92	

Overhills
Cross Section #R2



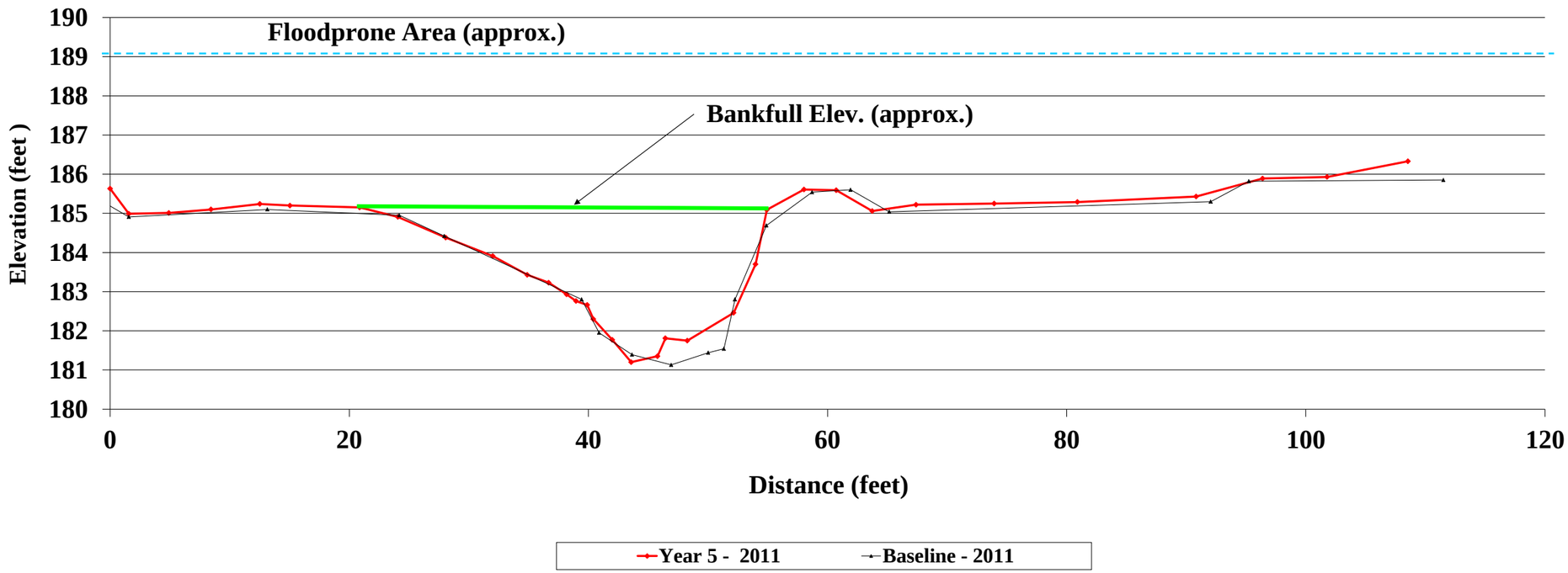
Project Name Overhills
Cross Section Cross Section R3 (Repair)
Feature Pool
Date Baseline - 03/11, Year 5 - 09/11
Crew Baseline - Turner Land Surveying, Year 5 - Jean/Mazzochi/Baldwin

Year 6 - 2012 2012 Survey			Year 5 - 2011 2011 Survey			Baseline - 2011 Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
			0	185.63		-20.82	185.5	
			1.57	184.99		-3.34	185.78	
			4.91	185.01		1.57	184.91	
			8.44	185.1		13.15	185.1	
			12.52	185.24		24.19	184.95	
			15.04	185.2		27.95	184.42	
			20.87	185.15		39.44	182.8	
			24.07	184.91		40.89	181.95	
			28.07	184.38		43.65	181.39	
			32.01	183.91		46.93	181.13	
			34.88	183.43		50.02	181.44	
			36.68	183.23		51.33	181.54	
			38.18	182.93		52.26	182.8	
			38.97	182.76		54.89	184.69	
			39.9	182.66		58.71	185.54	
			40.41	182.3		61.93	185.6	
			42	181.77		65.16	185.04	
			43.58	181.2		92.05	185.3	
			45.78	181.35		95.24	185.82	
			46.44	181.81		111.51	185.85	
			48.27	181.75				
			52.15	182.46				
			53.98	183.7				
			54.93	185.09				
			58.03	185.61				
			60.73	185.59				
			63.74	185.06				
			67.41	185.22				
			73.9	185.3				
			80.90	185.29				
			90.83	185.43				
			96.39	185.89				

Photo of Cross-Section R3 - Looking Downstream @ STA 37+28

				Year 6 - 2012	Year 5 - 2011	Baseline - 2011
BKF Area					66.57	63.05
BKF Width					34.41	31.87
BKF Mean Depth					1.93	1.98
BKF Max Depth					3.95	3.85
W/D					17.83	16.10

Overhills
Cross Section #R3



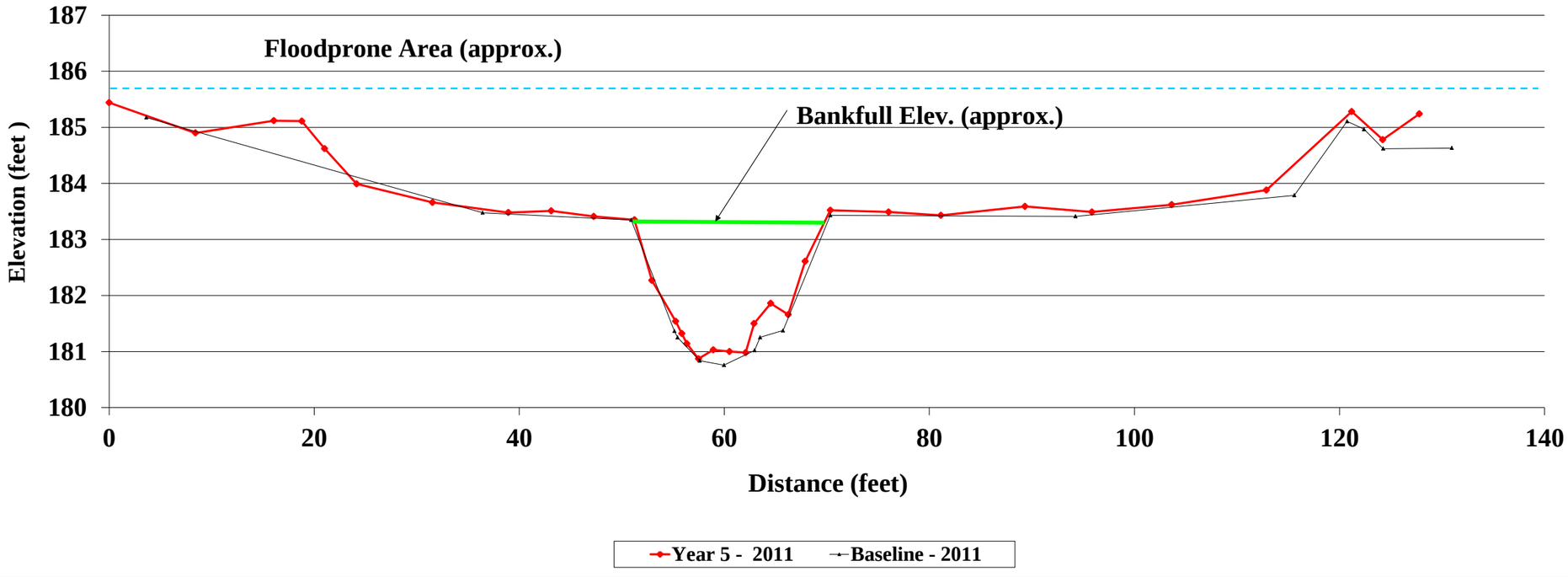
Project Name Overhills
Cross Section Cross Section R4 (Repair)
Feature Riffle
Date Baseline - 03/11, Year 5 - 09/11
Crew Baseline - Turner Land Surveying, Year 5 - Jean/Mazzochi/Baldwin

Year 6 - 2012 2012 Survey			Year 5 - 2011 2011 Survey			Baseline - 2011 Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
			0	185.44		3.62	185.175	
			8.42	184.9		36.43	183.476	
			16.06	185.12		50.92	183.346	
			18.79	185.11		55.14	181.366	
			21.01	184.62		55.44	181.251	
			24.14	183.99		57.6	180.836	
			31.53	183.66		59.97	180.758	
			38.93	183.48		62.96	181.021	
			43.12	183.51		63.49	181.254	
			47.26	183.41		65.72	181.375	
			51.23	183.35		70.34	183.43	
			52.93	182.27		94.25	183.412	
			55.26	181.54		115.6	183.787	
			55.86	181.32		120.75	185.107	
			56.35	181.14		122.4	184.965	
			57.48	180.87		124.27	184.619	
			58.92	181.03		130.96	184.63	
			60.5	181				
			62.08	180.98				
			62.9	181.5				
			64.53	181.86				
			66.23	181.66				
			67.88	182.61				
			70.34	183.52				
			76.02	183.49				
			81.12	183.43				
			89.33	183.59				
			95.85	183.49				
			103.6	183.6				
			112.87	183.88				
			121.19	185.28				
			124.22	184.78				

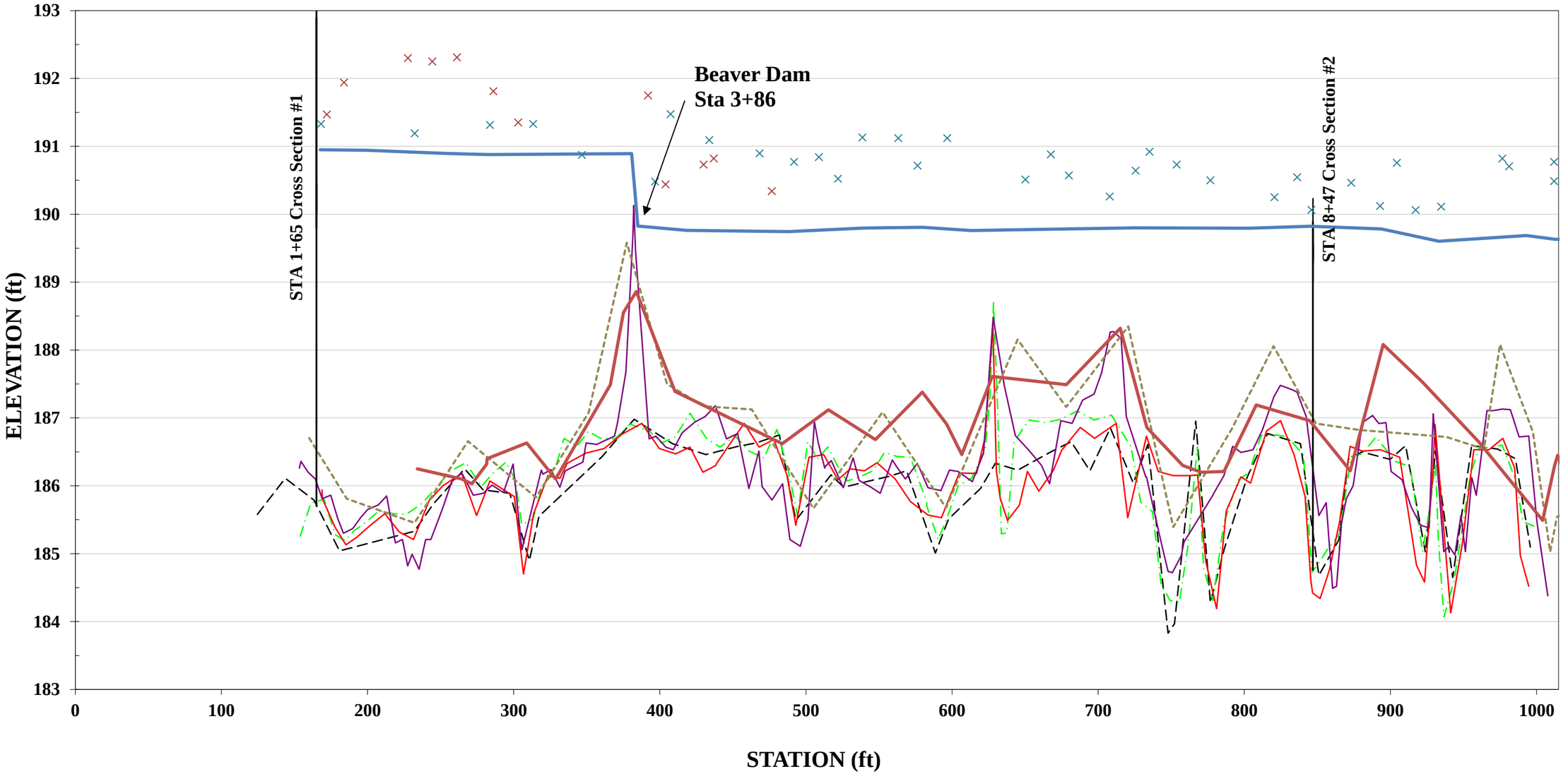
Photo of Cross-Section R4 - Looking Downstream @ STA 39+93

				Year 6 - 2012	Year 5 - 2011	Baseline - 2011
BKF Area					29.90	33.29
BKF Width					18.65	19.24
BKF Mean Depth					1.60	1.73
BKF Max Depth					2.48	2.59
W/D					11.66	11.12

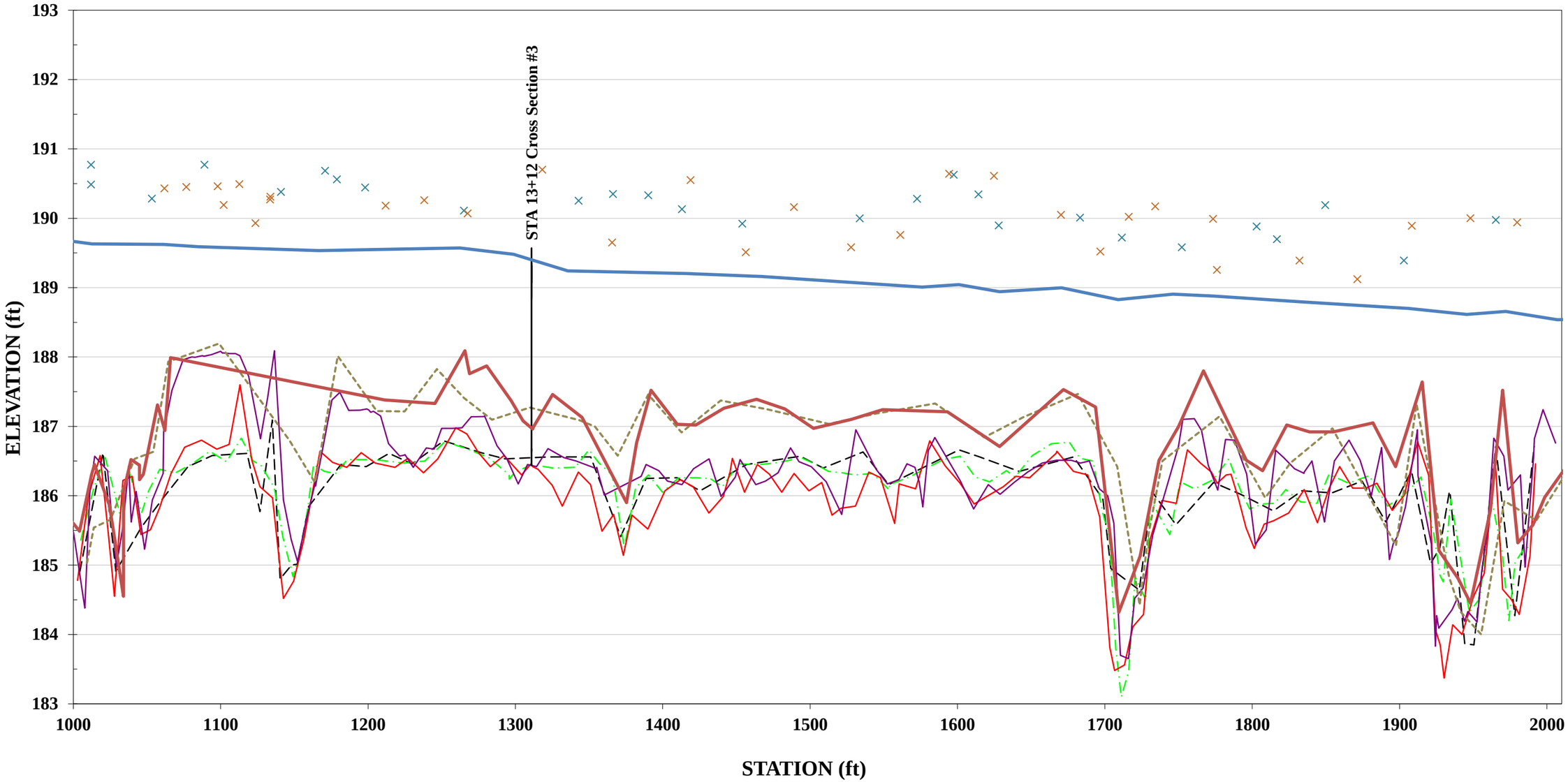
Overhills
Cross Section #R4



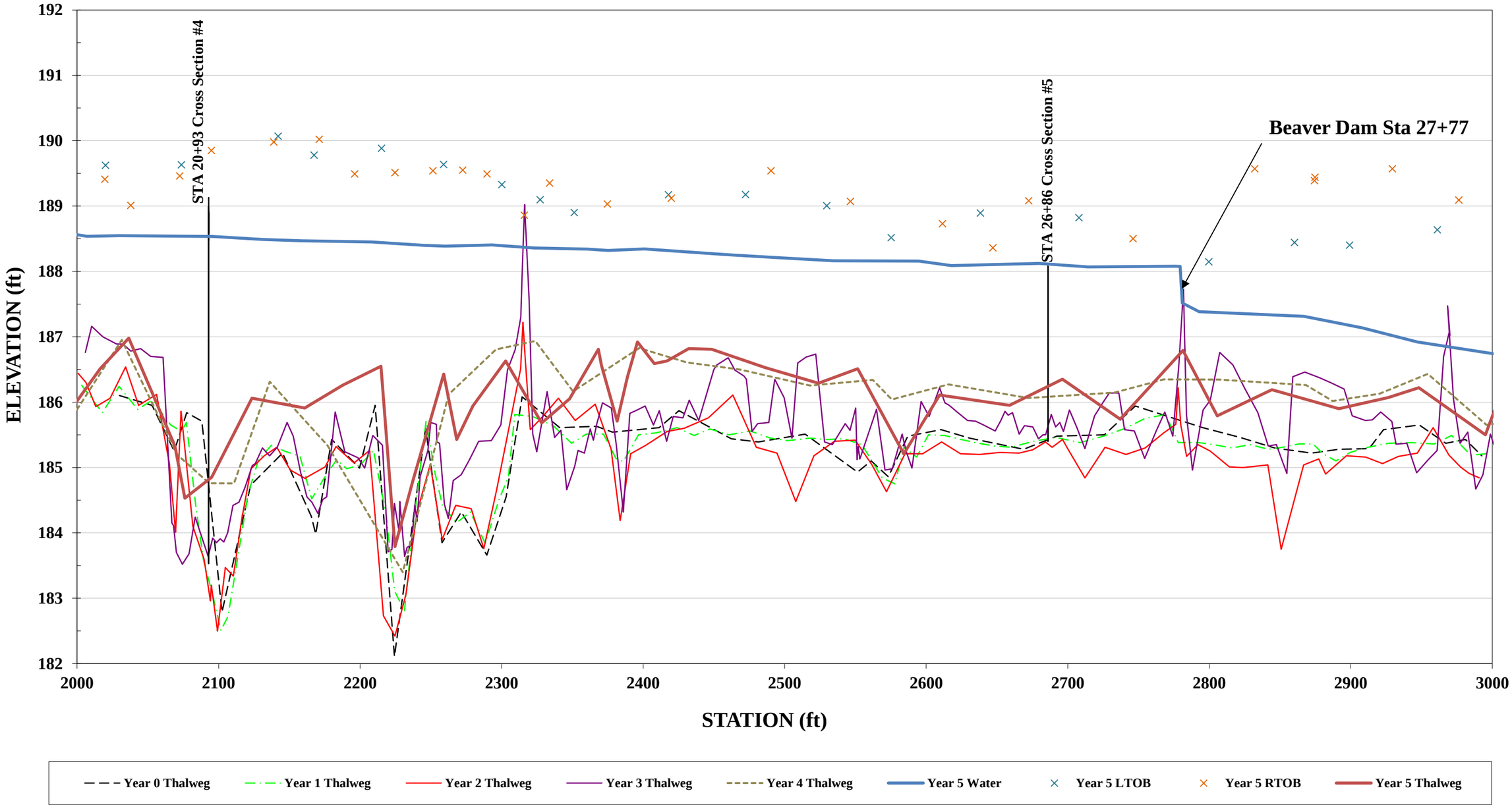
Overhills Profile -Upper Reach
STA 0+00 - STA 10+00
2011 MONITORING - Year 0, Year 01, Year 02, Year 03, Year 04, Year 05



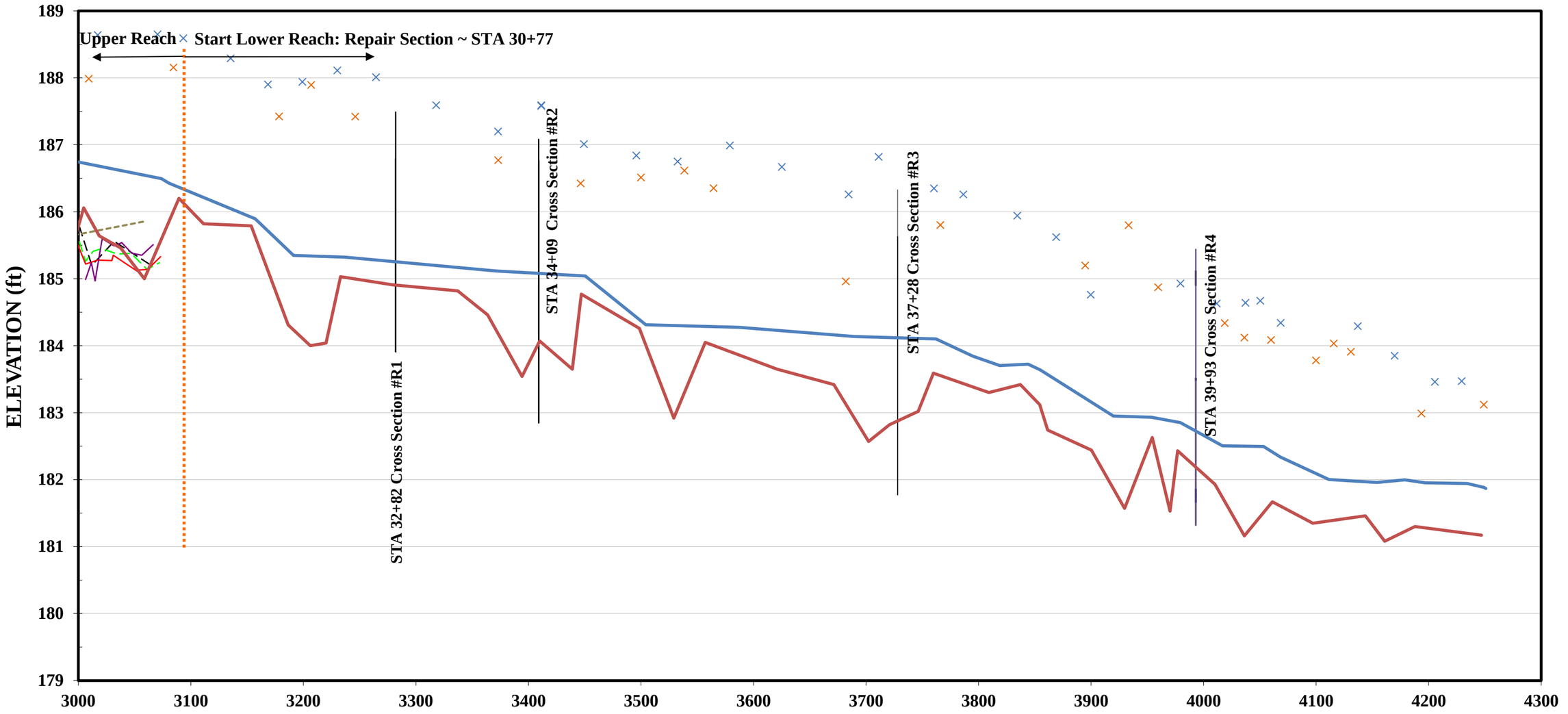
Overhills Profile - Upper Reach
STA 10+00 - STA 20+00
2011 MONITORING - Year 0, Year 01, Year 02 Year 03, Year 04, Year 05



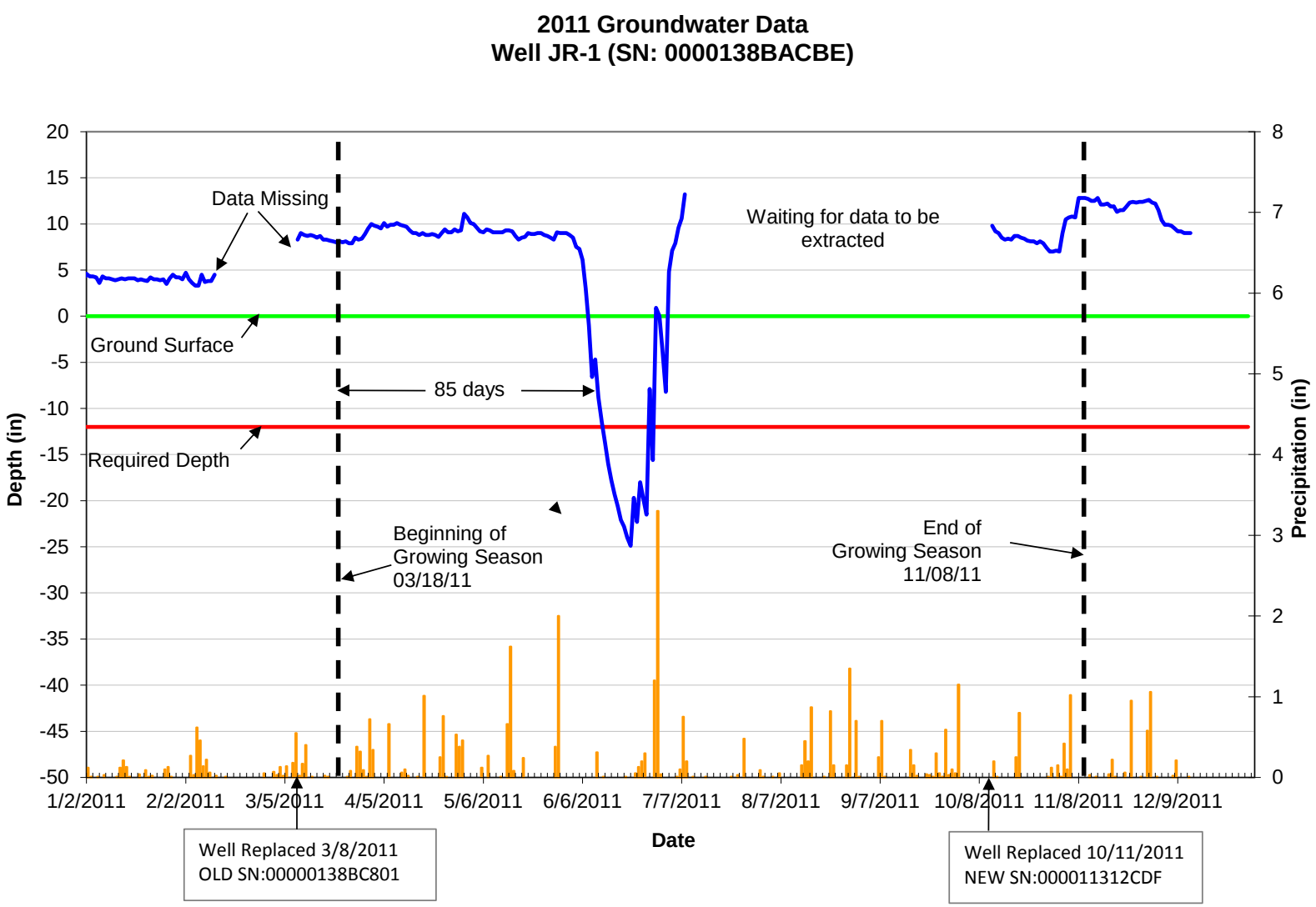
Overhills Profile - Upper Reach
STA 20+00 - STA 30+00
2011 MONITORING - Year 0, Year 01, Year 02, Year 03, Year 04, Year 05



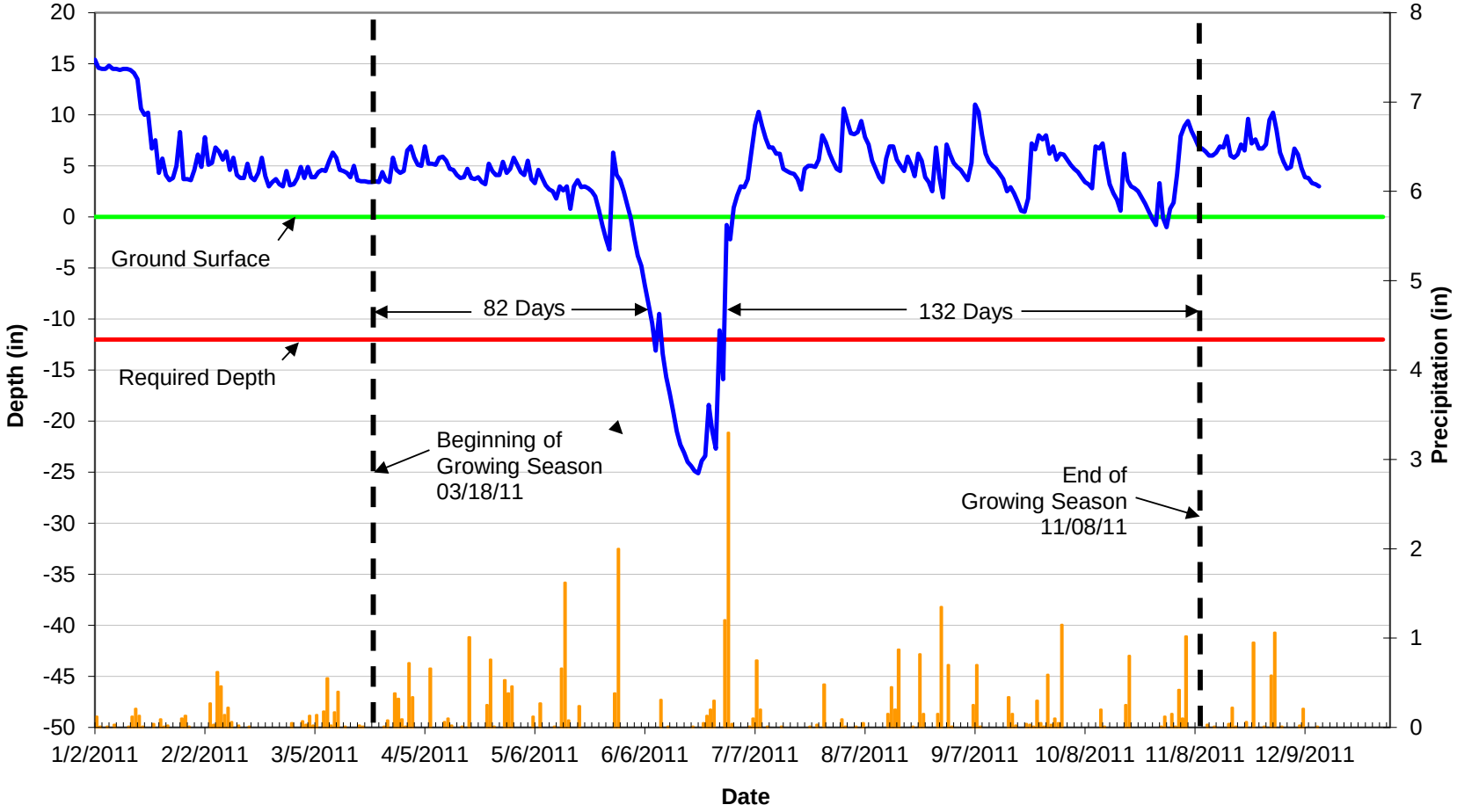
Overhills Profile - Upper & Lower Reaches
STA 30+00 - STA 40+00
2011 MONITORING - Year 0, Year 01, Year 02, Year 03, Year 04, Year 05

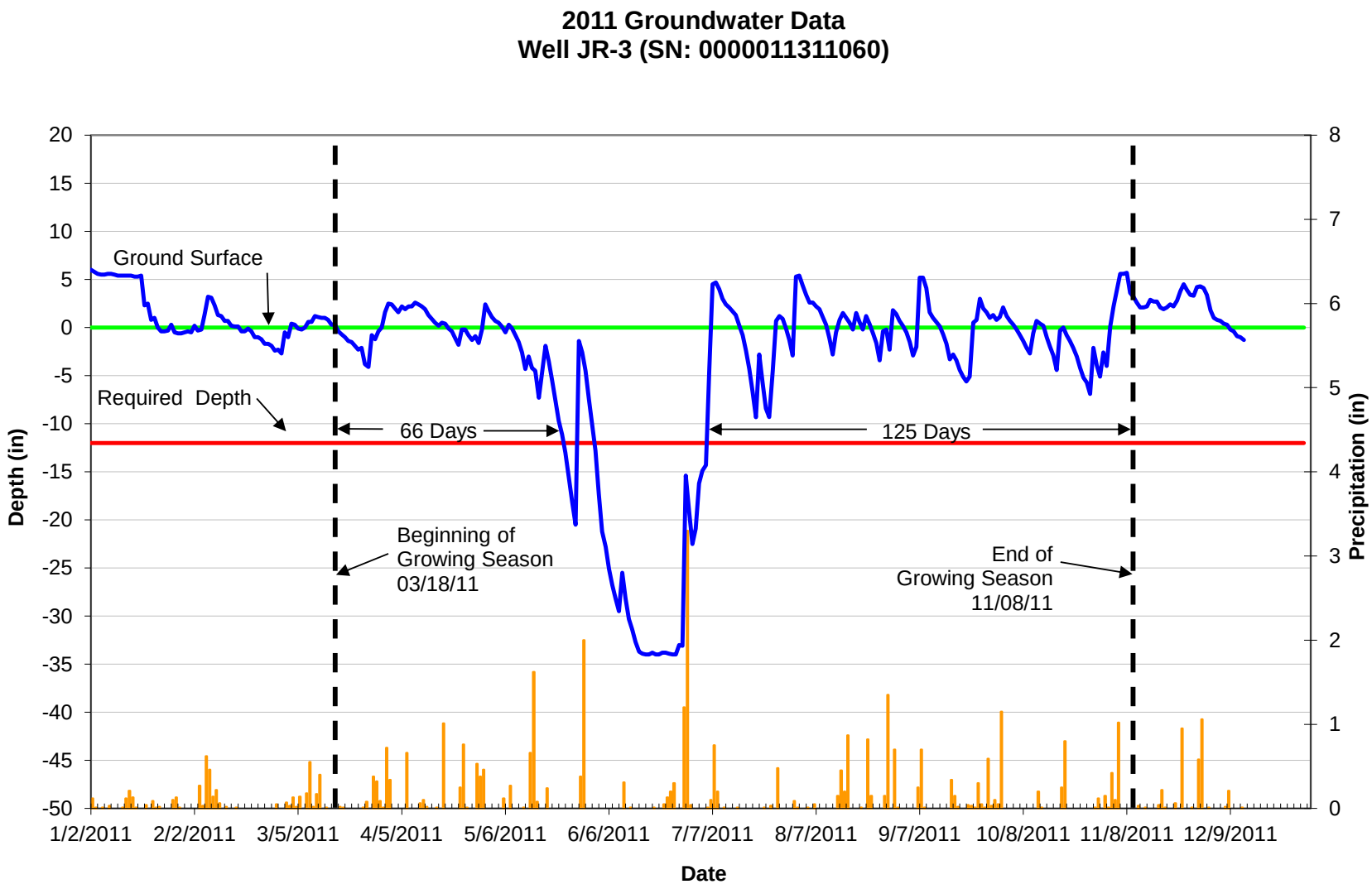


APPENDIX E. WETLAND ASSESSMENT

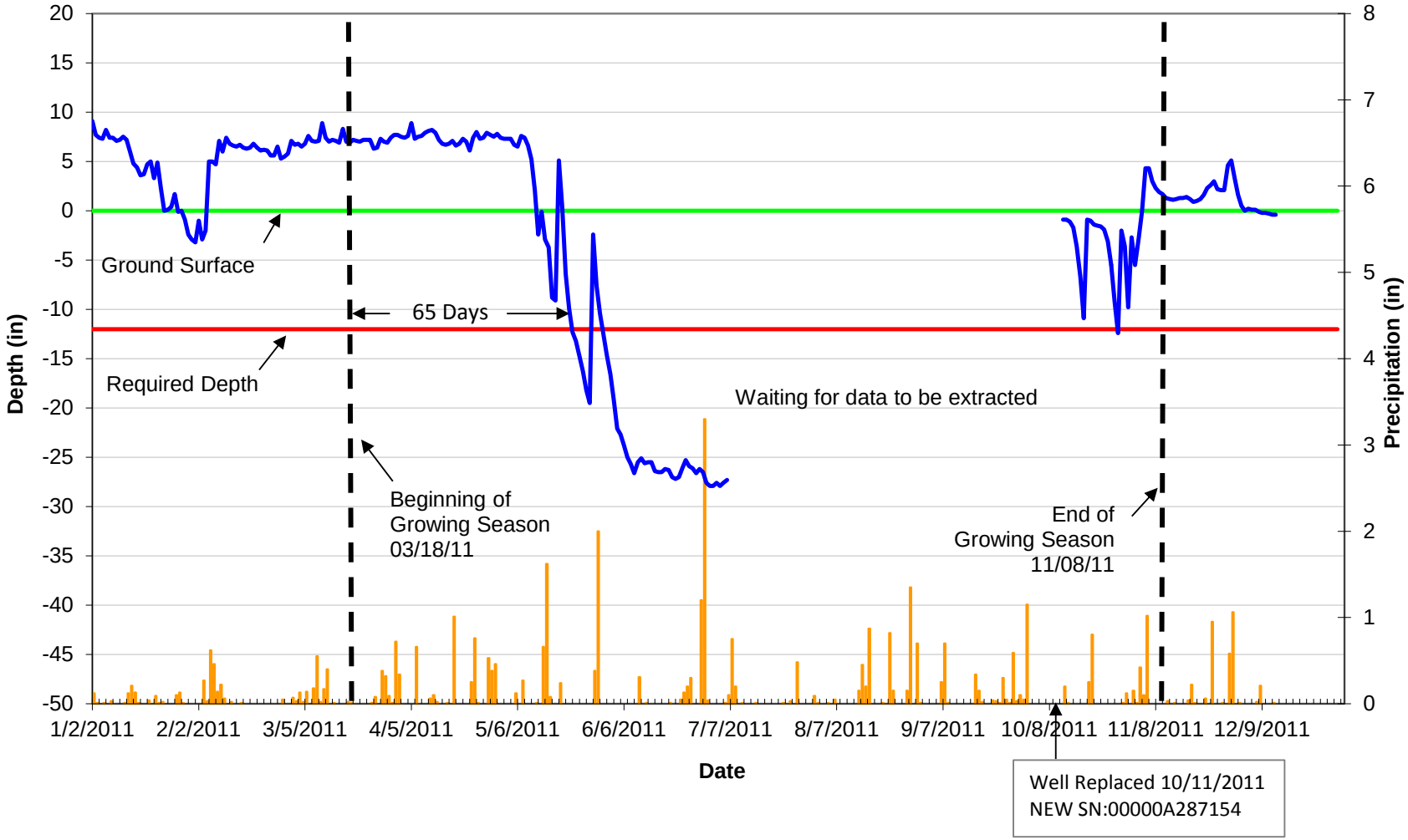

2011 Groundwater Data
Well JR-1 (SN: 0000138BACBE)
Depth (in)
Precipitation (in)
Date
Data Missing
Waiting for data to be extracted
Ground Surface
85 days
Required Depth
Beginning of Growing Season 03/18/11
End of Growing Season 11/08/11
Well Replaced 3/8/2011
OLD SN:00000138BC801
Well Replaced 10/11/2011
NEW SN:000011312CDF
1/2/2011
2/2/2011
3/5/2011
4/5/2011
5/6/2011
6/6/2011
7/7/2011
8/7/2011
9/7/2011
10/8/2011
11/8/2011
12/9/2011

2011 Groundwater Data
Well JR-2 (SN: 00000A28BE77)

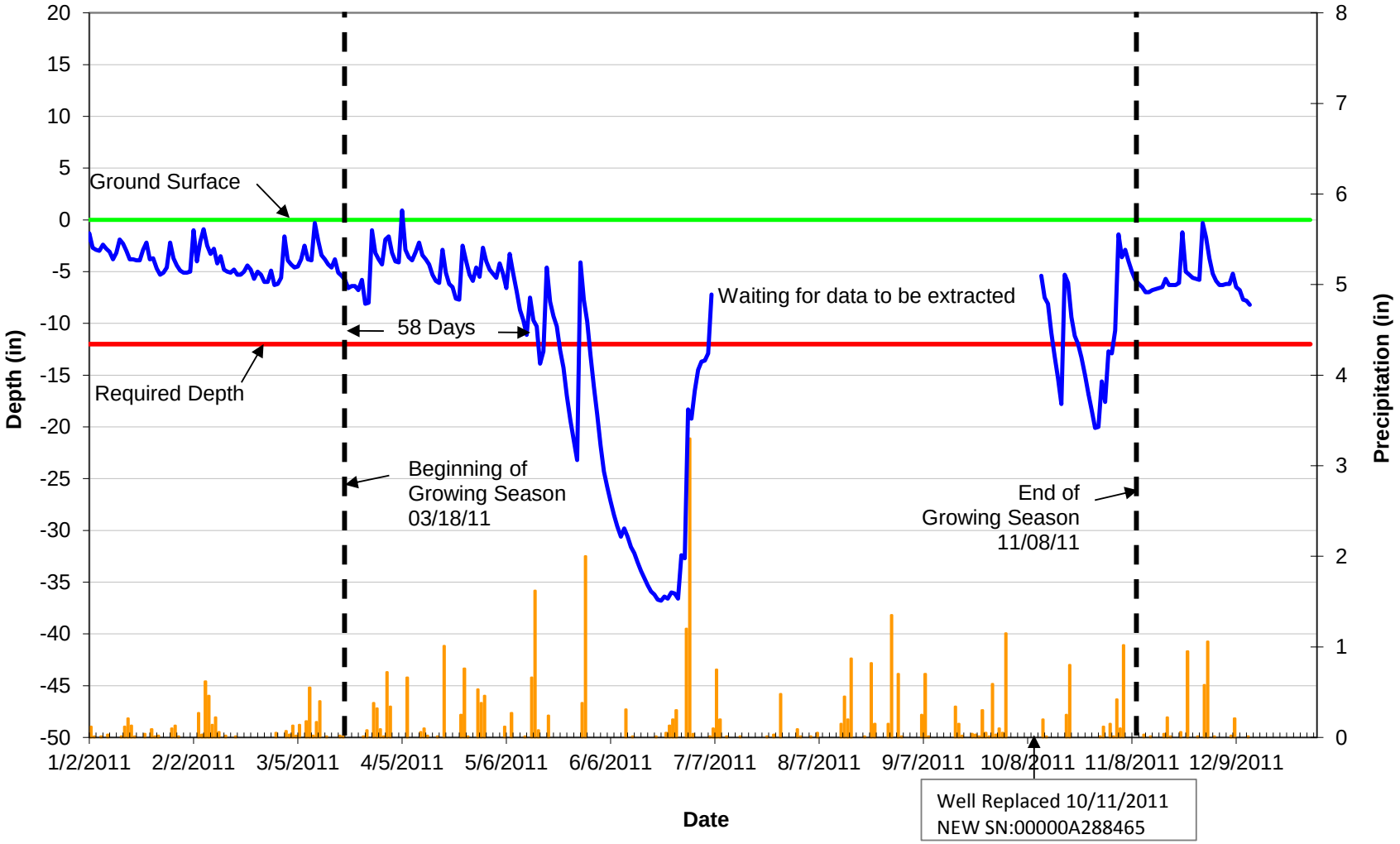


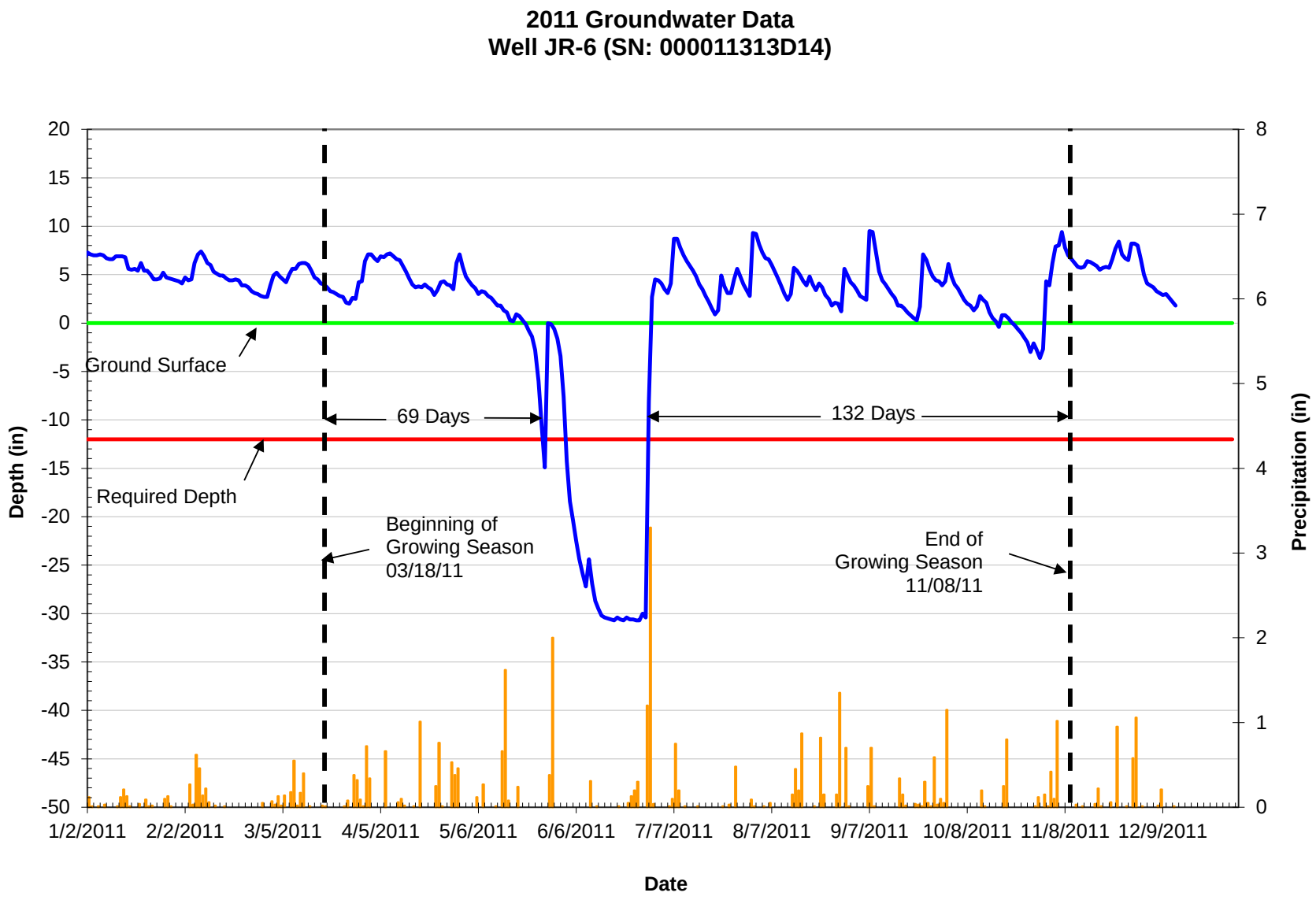

2011 Groundwater Data
Well JR-3 (SN: 0000011311060)
Depth (in)
Precipitation (in)
Date
Ground Surface
Required Depth
66 Days
125 Days
Beginning of Growing Season 03/18/11
End of Growing Season 11/08/11
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
8
7
6
5
4
3
2
1
0
1/2/2011
2/2/2011
3/5/2011
4/5/2011
5/6/2011
6/6/2011
7/7/2011
8/7/2011
9/7/2011
10/8/2011
11/8/2011
12/9/2011

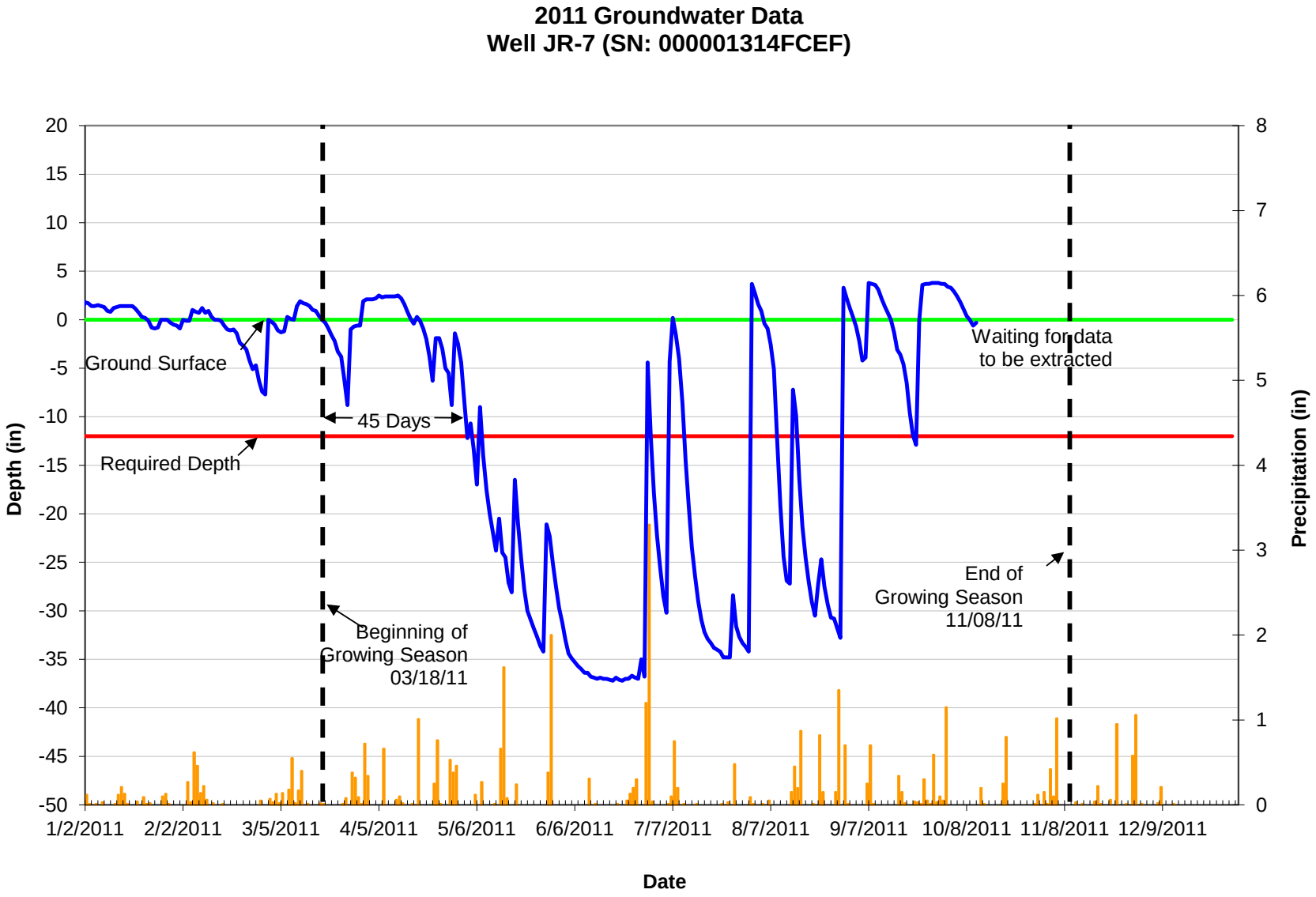
2011 Groundwater Data
Well JR-4 (SN: 00000A28813D)

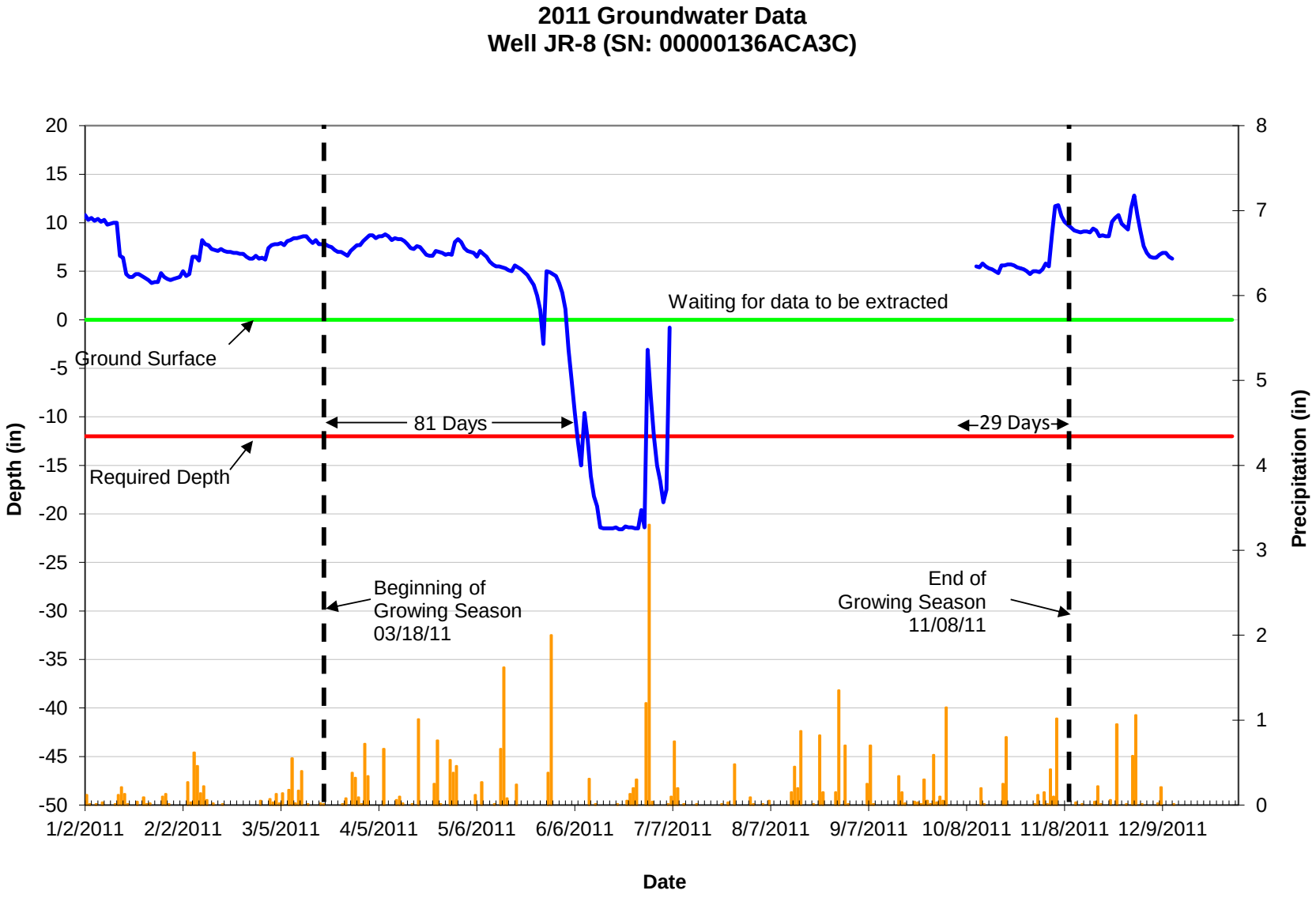


2011 Groundwater Data
Well JR-5 (SN: 00000A278DE1)

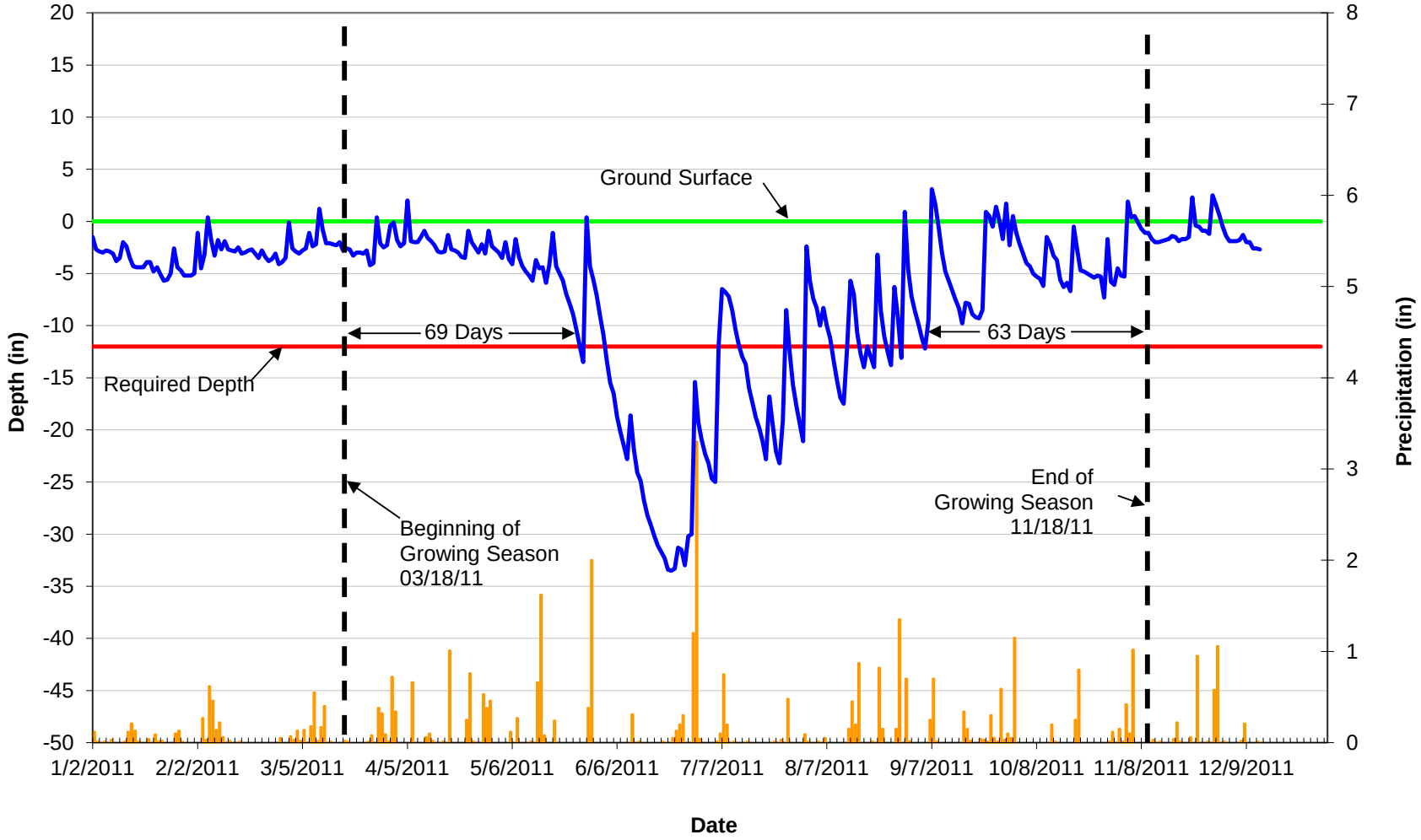



2011 Groundwater Data
Well JR-6 (SN: 000011313D14)
Depth (in)
Precipitation (in)
Date
Ground Surface
Required Depth
69 Days
132 Days
Beginning of Growing Season 03/18/11
End of Growing Season 11/08/11
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
8
7
6
5
4
3
2
1
0
1/2/2011
2/2/2011
3/5/2011
4/5/2011
5/6/2011
6/6/2011
7/7/2011
8/7/2011
9/7/2011
10/8/2011
11/8/2011
12/9/2011

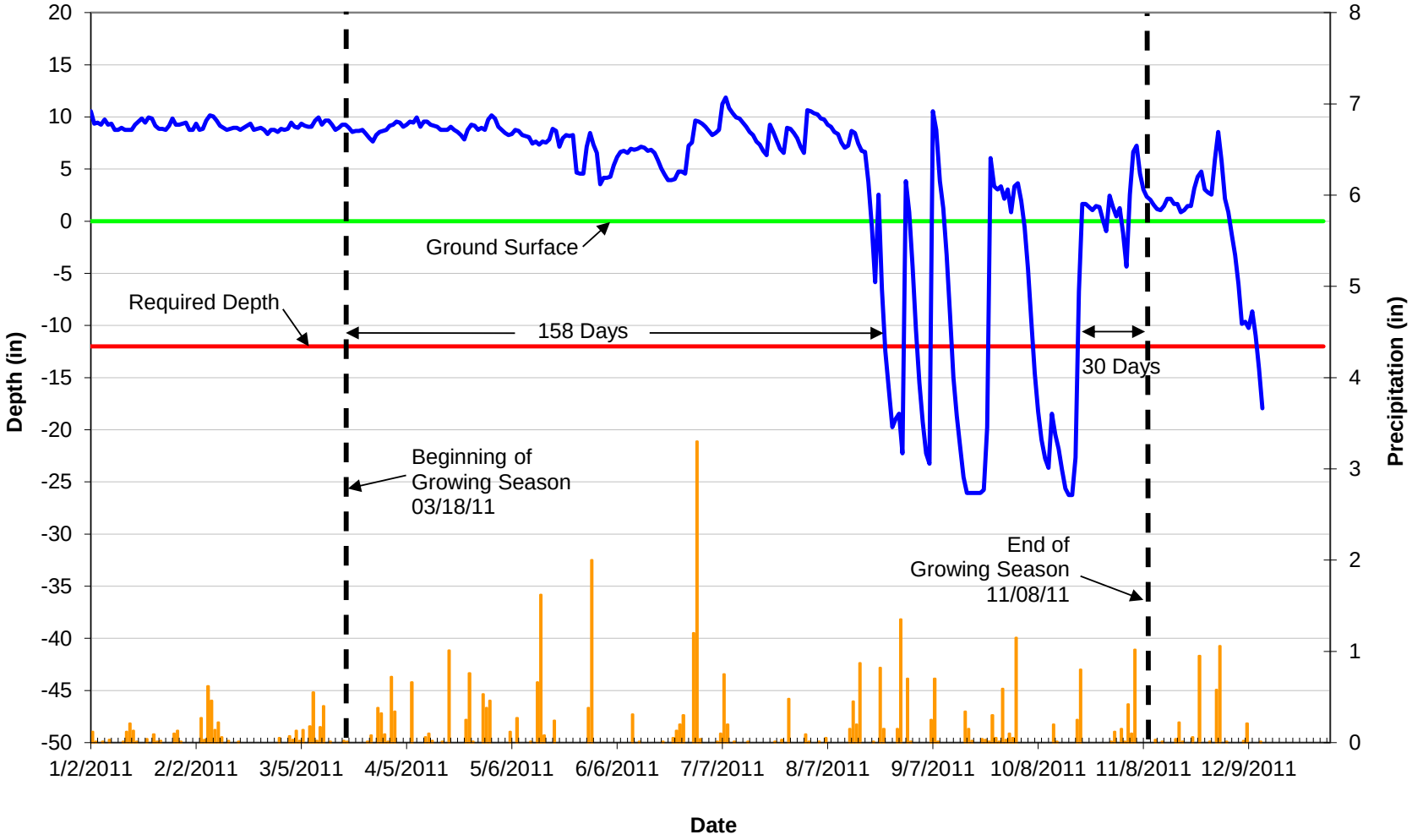

2011 Groundwater Data
Well JR-7 (SN: 000001314FCEF)
Depth (in)
Precipitation (in)
Date
Ground Surface
Required Depth
45 Days
Beginning of Growing Season 03/18/11
End of Growing Season 11/08/11
Waiting for data to be extracted
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
8
7
6
5
4
3
2
1
0
1/2/2011
2/2/2011
3/5/2011
4/5/2011
5/6/2011
6/6/2011
7/7/2011
8/7/2011
9/7/2011
10/8/2011
11/8/2011
12/9/2011


2011 Groundwater Data
Well JR-8 (SN: 00000136ACA3C)
Waiting for data to be extracted
Ground Surface
Required Depth
81 Days
29 Days
Beginning of
Growing Season
03/18/11
End of
Growing Season
11/08/11
Depth (in)
Precipitation (in)
Date
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
8
7
6
5
4
3
2
1
0
1/2/2011
2/2/2011
3/5/2011
4/5/2011
5/6/2011
6/6/2011
7/7/2011
8/7/2011
9/7/2011
10/8/2011
11/8/2011
12/9/2011

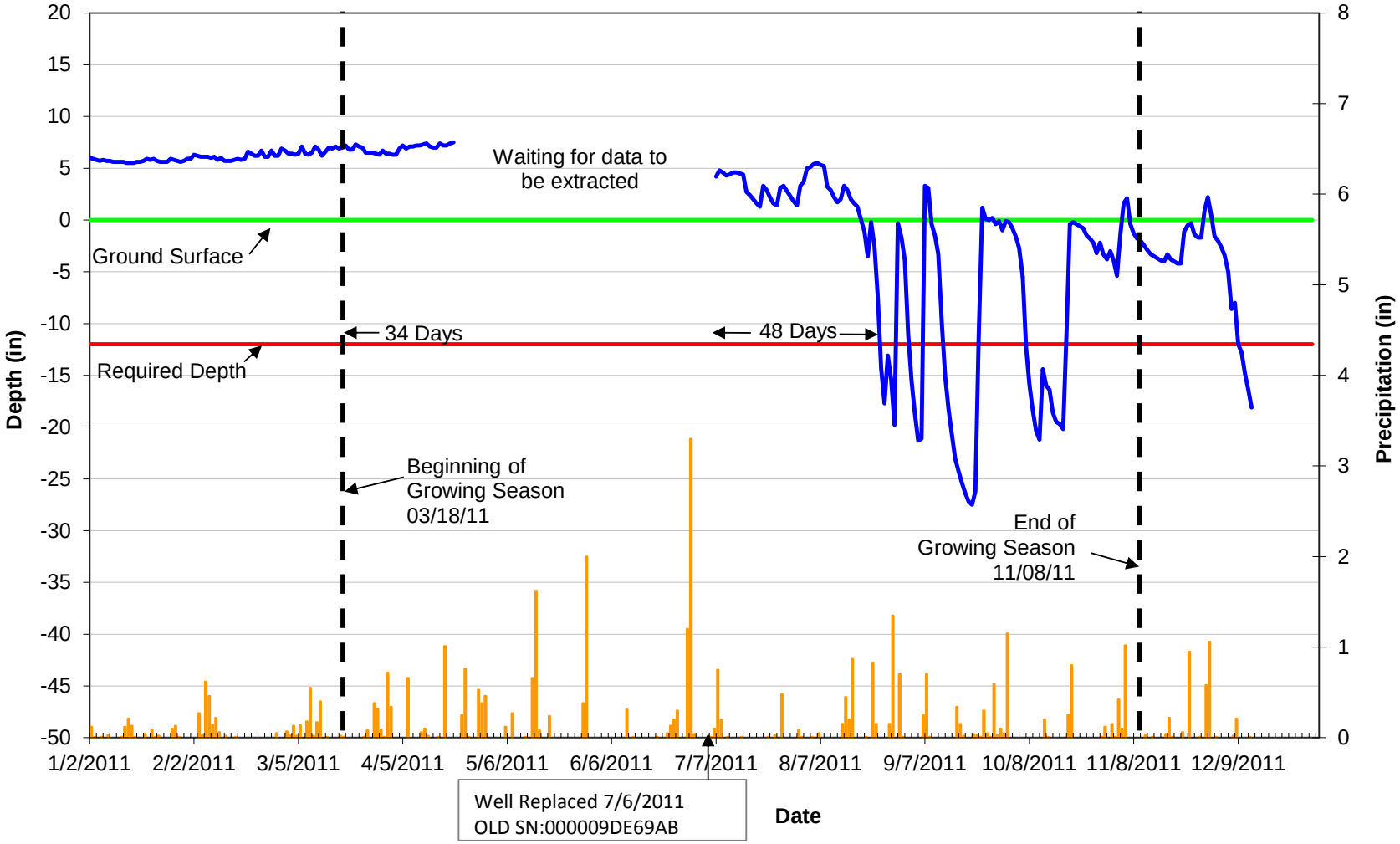
2011 Groundwater Data
Well JR-9 (SN: 00000EBDAB32)



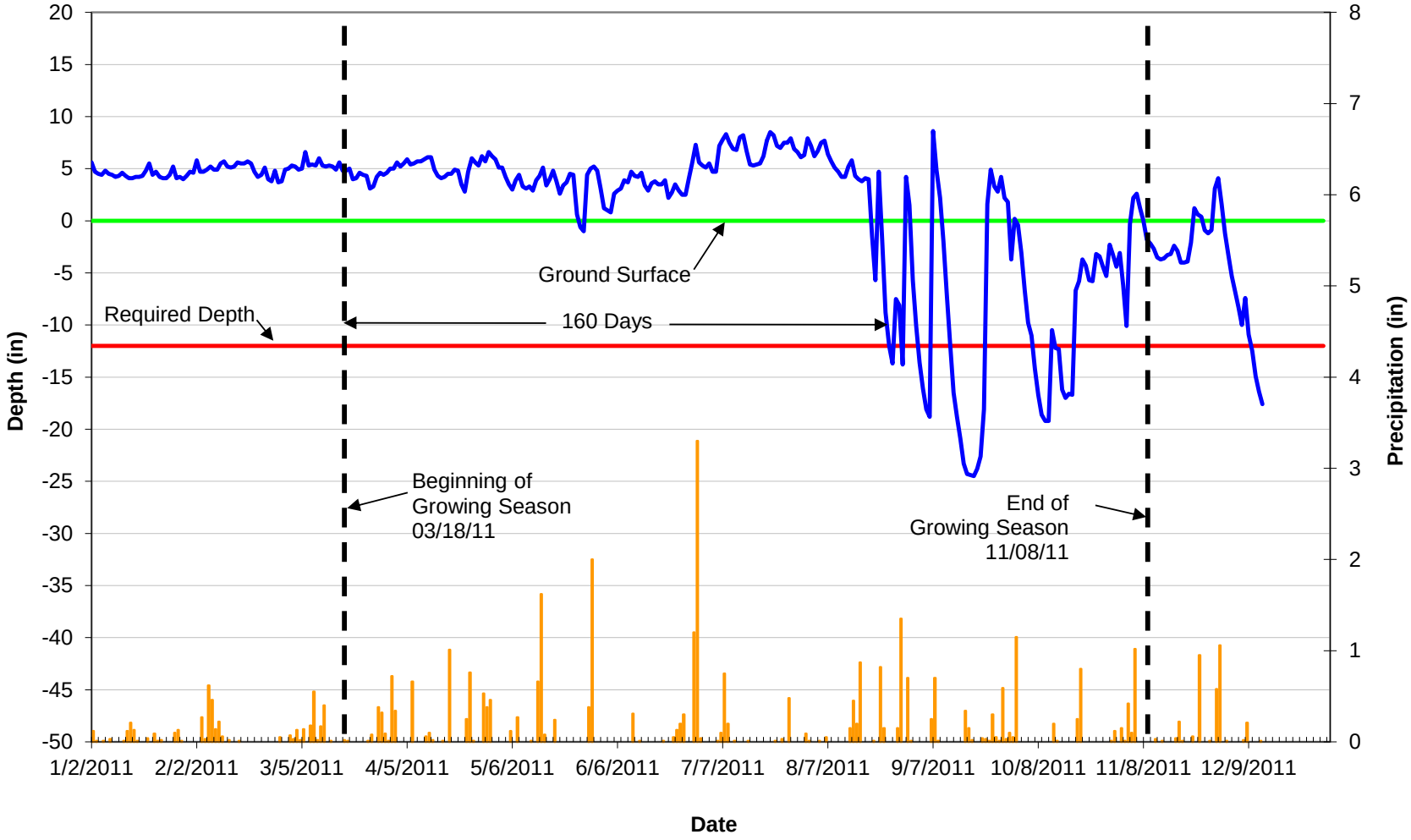
2011 Groundwater Data
Well JR-10 (SN: 000009DE3E2D)



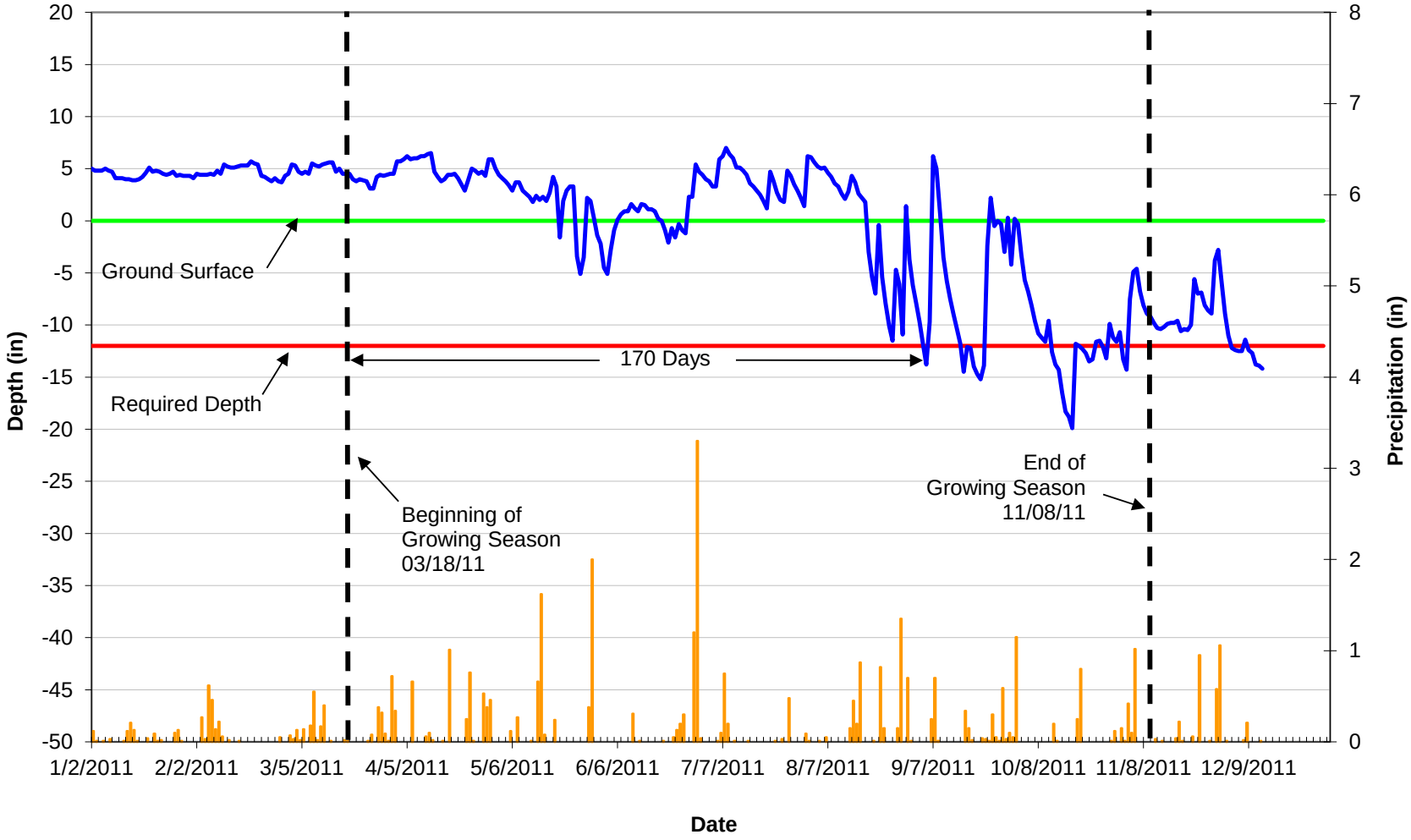
2011 Groundwater Data
Well JR-11 (SN: 000009DE6D56)

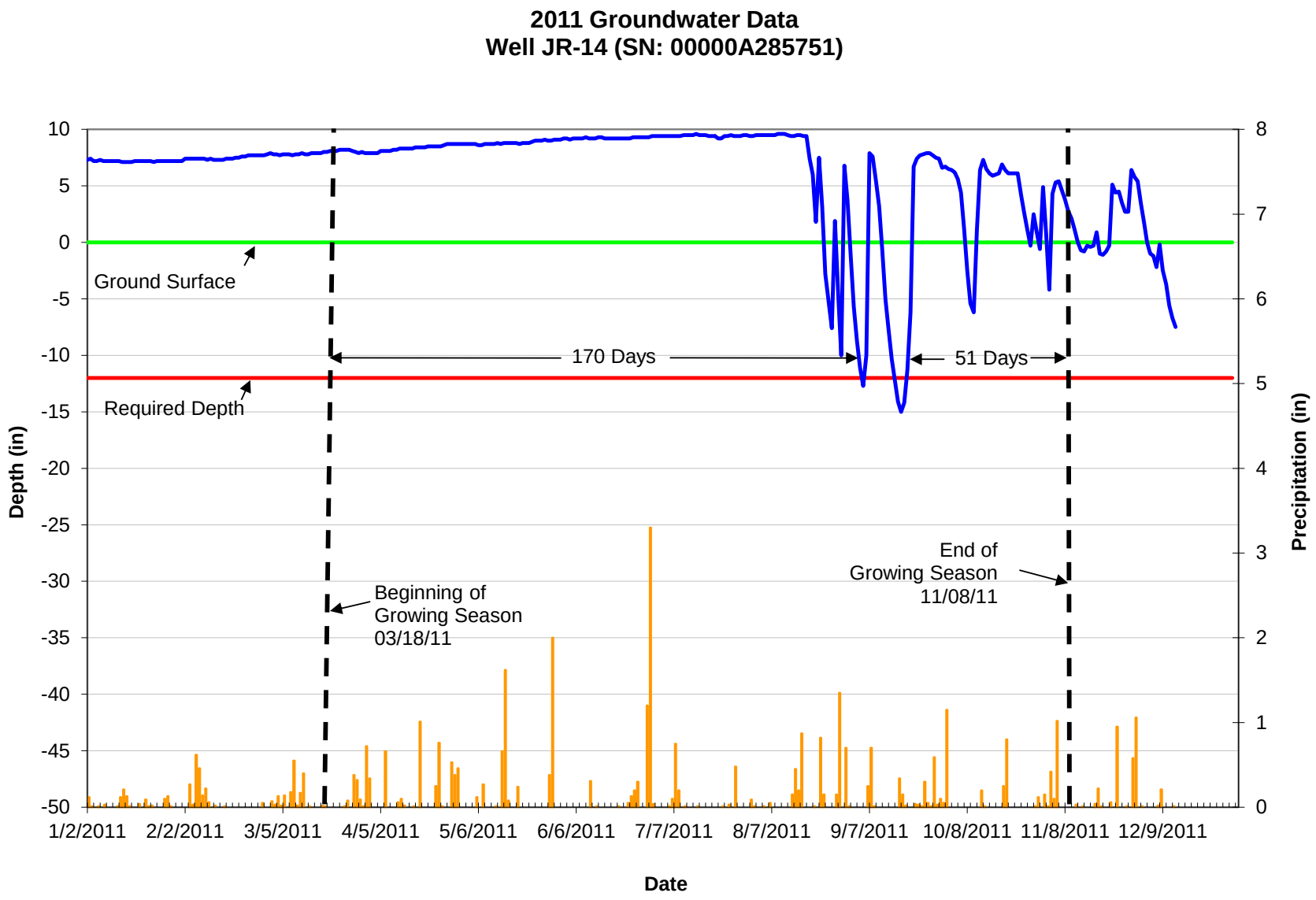


2011 Groundwater Data
Well JR-12 (SN: 00000A28A6E4)



2011 Groundwater Data
Well JR-13 (SN: 00000A28BC50)




2011 Groundwater Data
Well JR-14 (SN: 00000A285751)
Ground Surface
Required Depth
170 Days
51 Days
Beginning of
Growing Season
03/18/11
End of
Growing Season
11/08/11
Depth (in)
Precipitation (in)
Date
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
8
7
6
5
4
3
2
1
0
1/2/2011
2/2/2011
3/5/2011
4/5/2011
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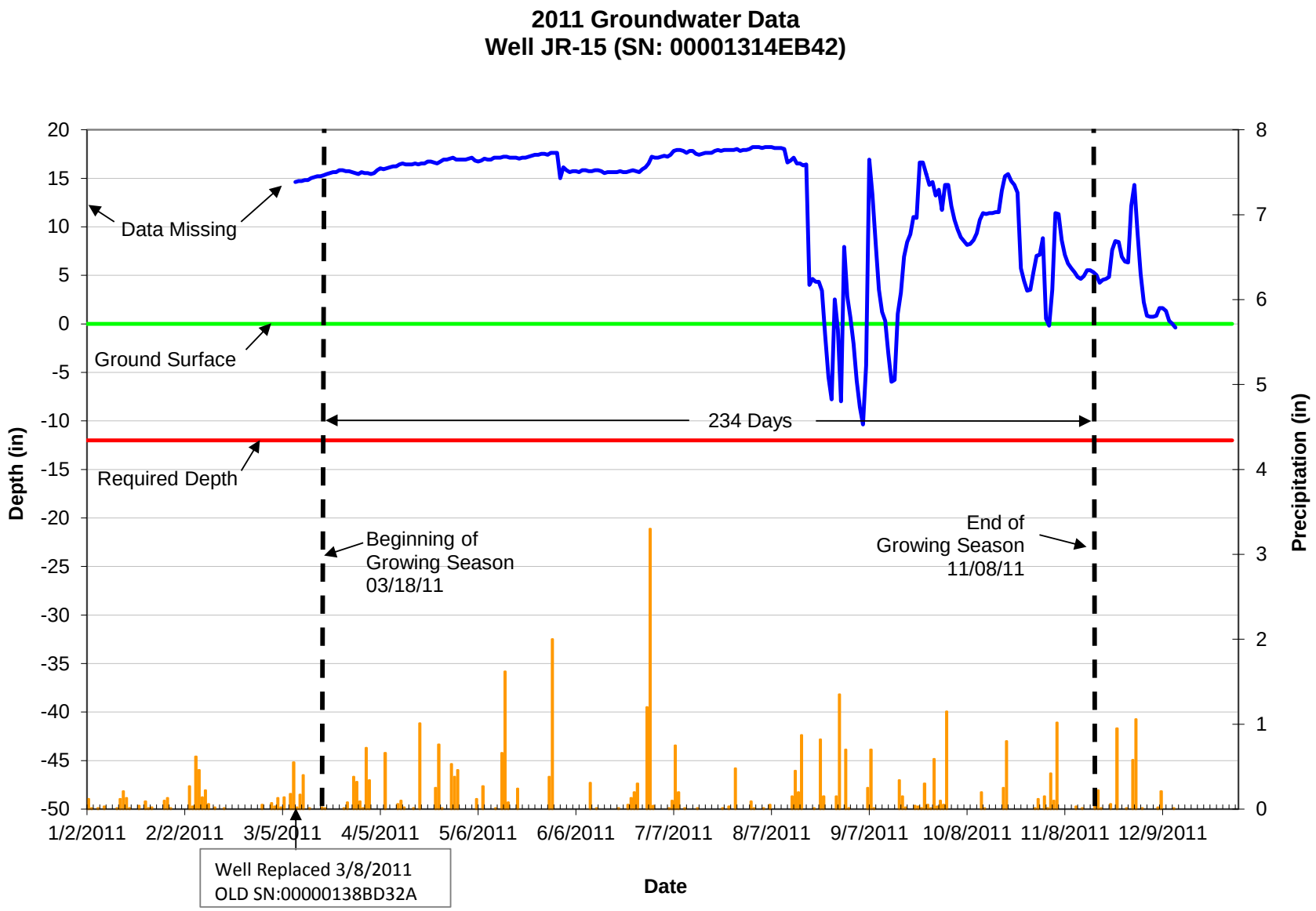
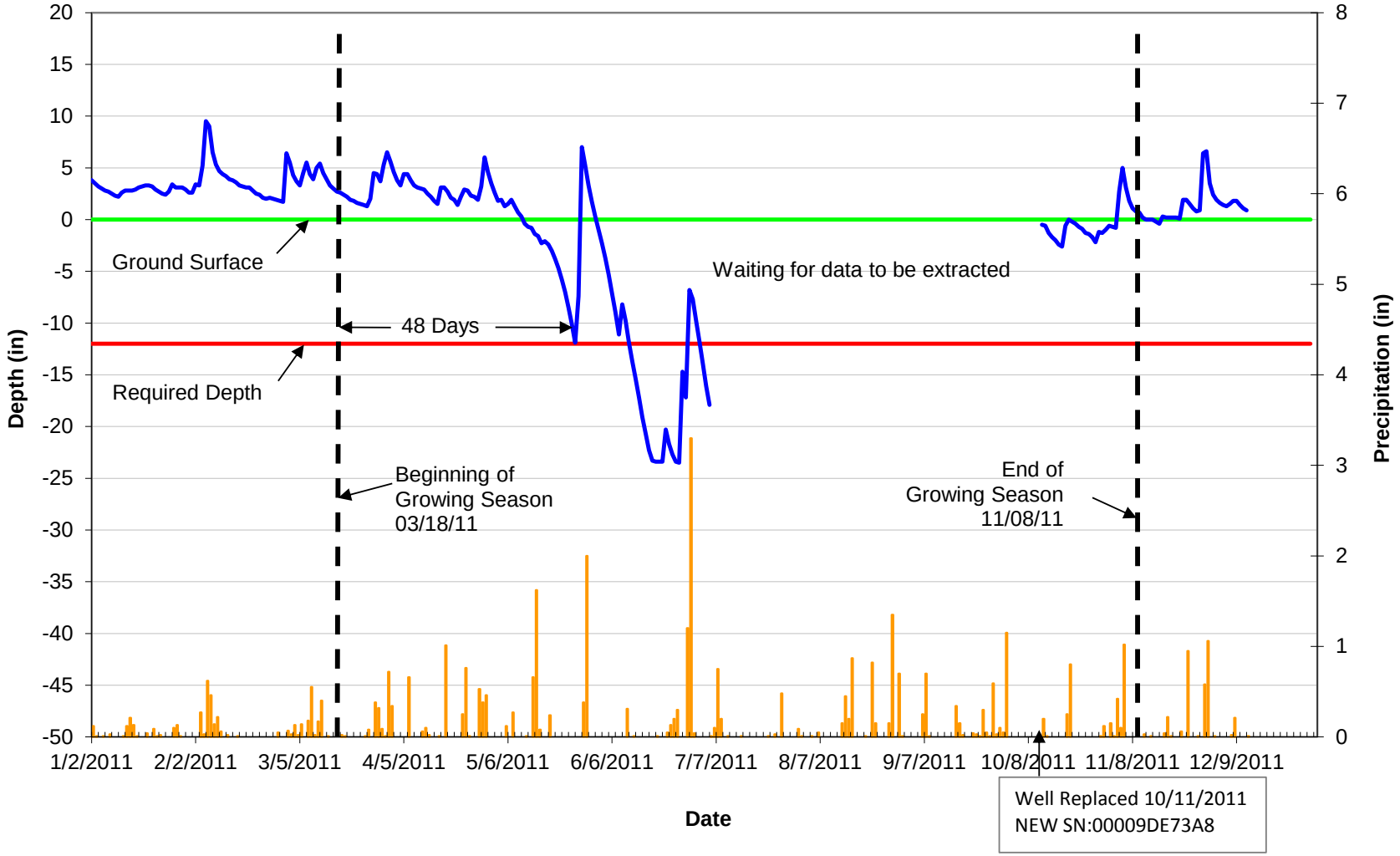
9/7/2011
10/8/2011
11/8/2011
12/9/2011


2011 Groundwater Data
Well JR-15 (SN: 00001314EB42)
Depth (in)
Precipitation (in)
Date
Data Missing
Ground Surface
Required Depth
234 Days
Beginning of Growing Season 03/18/11
End of Growing Season 11/08/11
Well Replaced 3/8/2011
OLD SN:00000138BD32A
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
8
7
6
5
4
3
2
1
0
1/2/2011
2/2/2011
3/5/2011
4/5/2011
5/6/2011
6/6/2011
7/7/2011
8/7/2011
9/7/2011
10/8/2011
11/8/2011
12/9/2011

2011 Groundwater Data
Reference Well 1 (SN: 00000EBD001B)



2011 Overhills 30-70 Percentile Graph
Harnett County, North Carolina

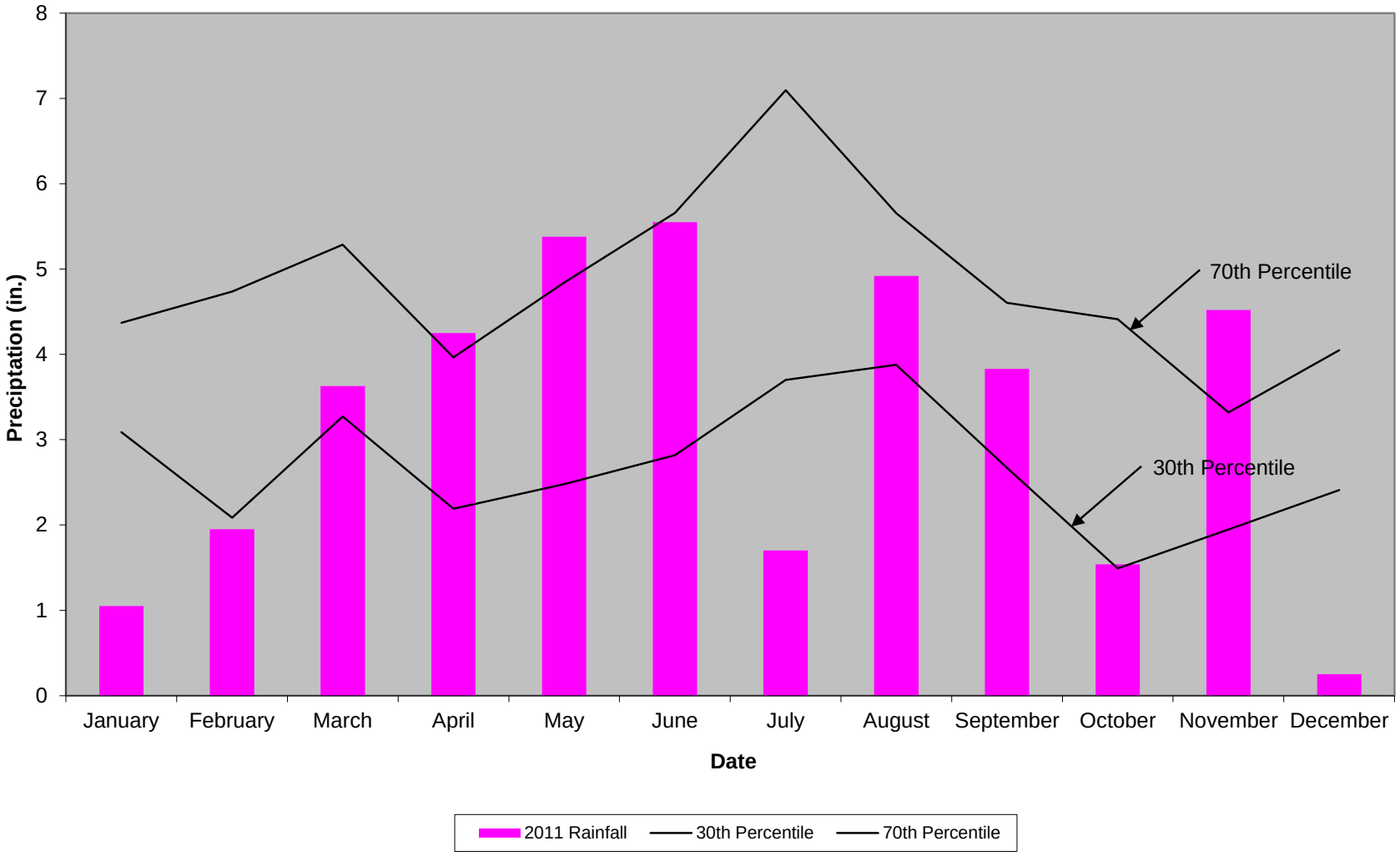


Table 10 - Summary of Groundwater Results for Years 1 - 5 Overhills/Jumping Run Creek Restoration Project / EEP Project No. 199					
	Success Criteria Achieved/Max Consecutive Days During Growing Season				
Guage	Year 1 (2007)	Year 2 (2008)	Year 3 (2009)	Year 4 (2010)	Year 5 (2011)
GW1	Yes/57 days (24 percent)	Yes/77 days (33 percent)	Yes/121 days (52 percent)	Yes/100 days (43 percent)	Yes/85 days* (36 percent)
GW2	Yes/67 days (29 percent)	Yes/78 days (33 percent)	Yes/234 days (100 percent)	Yes/115 days (49 percent)	Yes/132 days (56 percent)
GW3	Yes/63 days (27 percent)	Yes/78 days (33 percent)	Yes/234 days (100 percent)	Yes/105 days (45 percent)	Yes/125 days (53 percent)
GW4	Yes/61 days (26 percent)	Yes/70 days (30 percent)	Yes/234 days (100 percent)	Yes/41 days (18 percent)	Yes/65 days* (28 percent)
GW5	No	Yes/63 days (27 percent)	Yes/234 days (100 percent)	Yes/92 days (39 percent)	Yes/58 days* (25 percent)
GW6	Yes/52 days (22 percent)	Yes/75 days (32 percent)	Yes/234 days (100 percent)	Yes/68 days (29 percent)	Yes/132 days (56 percent)
GW7	Yes/56 days (24 percent)	Yes/61 days (26 percent)	Yes/57 days (24 percent)	Yes/32 days (14 percent)	Yes/45 days* (19 percent)
GW8	Yes/65 days (28 percent)	Yes/121 days (52 percent)	Yes/234 days (100 percent)	Yes/43 days (18 percent)	Yes/81 days* (35 percent)
GW9	Yes/56 days (24 percent)	Yes/76 days (32 percent)	Yes/234 days (100 percent)	Yes/41 days (18 percent)	Yes/69 days (29 percent)
GW10	No	Yes/39 days (17 percent)	Yes/63 days (27 percent)	Yes/123 days (53 percent)	Yes/158 days (68 percent)
GW11	No	Yes/39 days (17 percent)	Yes/70 days (30 percent)	Yes/123 days (53 percent)	Yes/48 days* (21 percent)
GW12	No	Yes/33 days (14 percent)	Yes/88 days (38 percent)	Yes/127 days (54 percent)	Yes/160 days (68 percent)
GW13	No	Yes/54 days (23 percent)	Yes/130 days (56 percent)	Yes/88 days (38 percent)	Yes/170 days (73 percent)
GW14	No	Yes/56 days (24 percent)	Yes/109 days (47 percent)	Yes/127 days (54 percent)	Yes/170 days (73 percent)
GW15	Yes/45 days (19 percent)	Yes/71 days (30 percent)	Yes/130 days (56 percent)	Yes/234 days (100 percent)	Yes/234 days (100 percent)
Reference	N/A	Yes/88 days (38 percent)	Yes/109 days (47 percent)	Yes/103 days (44 percent)	Yes/48 days* (21 percent)

* Waiting for data extraction: hydroperiod is likely longer