

OVERHILLS STREAM AND WETLAND  
RESTORATION MONITORING REPORT (YEAR 4 OF 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: March 2011

Monitoring Firm:



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**Stantec**

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## 1.0 Executive Summary

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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

The Monitoring Year 4 stem counts within each of the vegetative monitoring plots are included in Table 7 in Appendix C. Seven of the plots have over 288 stems per acre (the success criteria for monitoring year four) while two of the plots have less than 288 stems per acre. Many of the same vegetation problem areas that have been observed during previous monitoring years are still present onsite. These problem areas are referred to as VPA 1 through 17 in 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. Other areas onsite are also flooded but are not listed as problem areas because the planted vegetation, especially *Taxodium*, is doing well. VPA 3, 5, 6, 8, 9, 10, 15, 16 and 17 are currently overrun with invasive species, primarily *Lespedeza* although *Typha latifolia* is present in a few wetter areas on site. It appears that the *Lespedeza* has lessened in extent from previous monitoring years due to higher water levels onsite. A few areas have been noticeably impacted by beaver foraging and are shown on the CCPV as VPA 7 and 11.

The major stream problem area continues to be the headcut and downstream reach located from station 31+94 to 44+00. In this area and downstream, the stream has failed. The headcut most likely first began at the location where the design changes from a C5 to an E5 channel between the Upper and Lower reaches at Station 33+00. Downstream of this headcut, most of the in-stream structures have failed and erosion is occurring. Erosion around the structures has forced the banks to migrate as much as ten feet, making this section of stream extremely unstable. Because of the vast migration of the stream channel, the stream has become over-widened in many sections, which has led to mid-channel bar formations. This year it appears that the headcut has stabilized and did not move substantially compared to last year. Upstream of the headcut, normal water surface elevations are at or near the constructed bankfull elevation, allowing the channel to access the floodplain under very small storm events. The areas immediately adjacent to this section of the channel were ponded near the channel banks. Despite ongoing efforts to remove beavers multiple beaver dams remain causing large areas of the floodplain to become inundated with water, some areas over 1 foot in depth. 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 2+75, 28+00 and 41+25. Repairs to the stream are scheduled for early 2011.

Other problems include downcutting at cross-sections XS 6, and widening at XS 4. These channel changes may be attributed to an undersized channel upstream.

The reference well met the hydrology success criteria, with three periods of consecutive days of saturation within 12 inches of the ground surface (103, 48, and 43 days respectively). This 194 day period comprises approximately 83% of the growing season. Additionally, all fifteen groundwater monitoring wells onsite met the hydrology success criteria, with 10 of the wells being within 12 inches of the ground surface for 80% of the growing season. Monthly precipitation averages for 2010 fell between the 30<sup>th</sup> and 70<sup>th</sup> percentiles during the growing season in June and July. For the month of April precipitation fell below the 30<sup>th</sup> percentile. For the months of January, March, May, and September, precipitation fell above the 70<sup>th</sup> 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**

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### **2.1 VEGETATION ASSESSMENT**

The Carolina Vegetation Survey (CVS) Level 2 methodology was utilized to sample vegetation in September of 2010. Ten 100m<sup>2</sup> plots have been established throughout the project. In each plot, two plot corners have been permanently located with conduit or rebar. As per the mitigation plan, the vegetative success criteria are based on the US Army Corps of Engineers Stream Mitigation Guidelines (USACE, 2003). The final vegetative success criteria will be the survival of 260 5-year old planted trees per acre at the end of the year 5 monitoring period. An interim measure of vegetation planting success will be the survival of at least 288 4-year old planted trees per acre at the end of year 4 of the monitoring period.

### **2.2 STREAM ASSESSMENT**

A longitudinal profile survey of the entire length of the project was completed in September 2010. The Upper Reach, classified as a Rosgen C5 stream, flows from the beginning of the project at Station 0+00 to Station 32+80. The Lower Reach, a Rosgen E5 stream, flows from 32+80 to the end of the project at Station 44+00. 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. A new riffle cross-section, Cross Section 9, was added in 2008 to provide sufficient cross-sectional data for the Lower Reach. 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 will be measured based on whether the channel features stay within the natural variability of the dimensionless ratios of the reference reaches.

### **2.3 WETLAND ASSESSMENT**

A 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 2010 (Appendix E). The growing season in this area is from March 18<sup>th</sup> to November 8<sup>th</sup> 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

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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. 2010. NC CRONOS Database – Dunn 4 Nw (312500). North Carolina State University State, Climate Office of North Carolina. <http://www.nc-climate.ncsu.edu/cronos>

NCEP. 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.



## **Project Condition and Monitoring Data Appendices**

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### **APPENDIX A. GENERAL FIGURES AND PLAN VIEWS**

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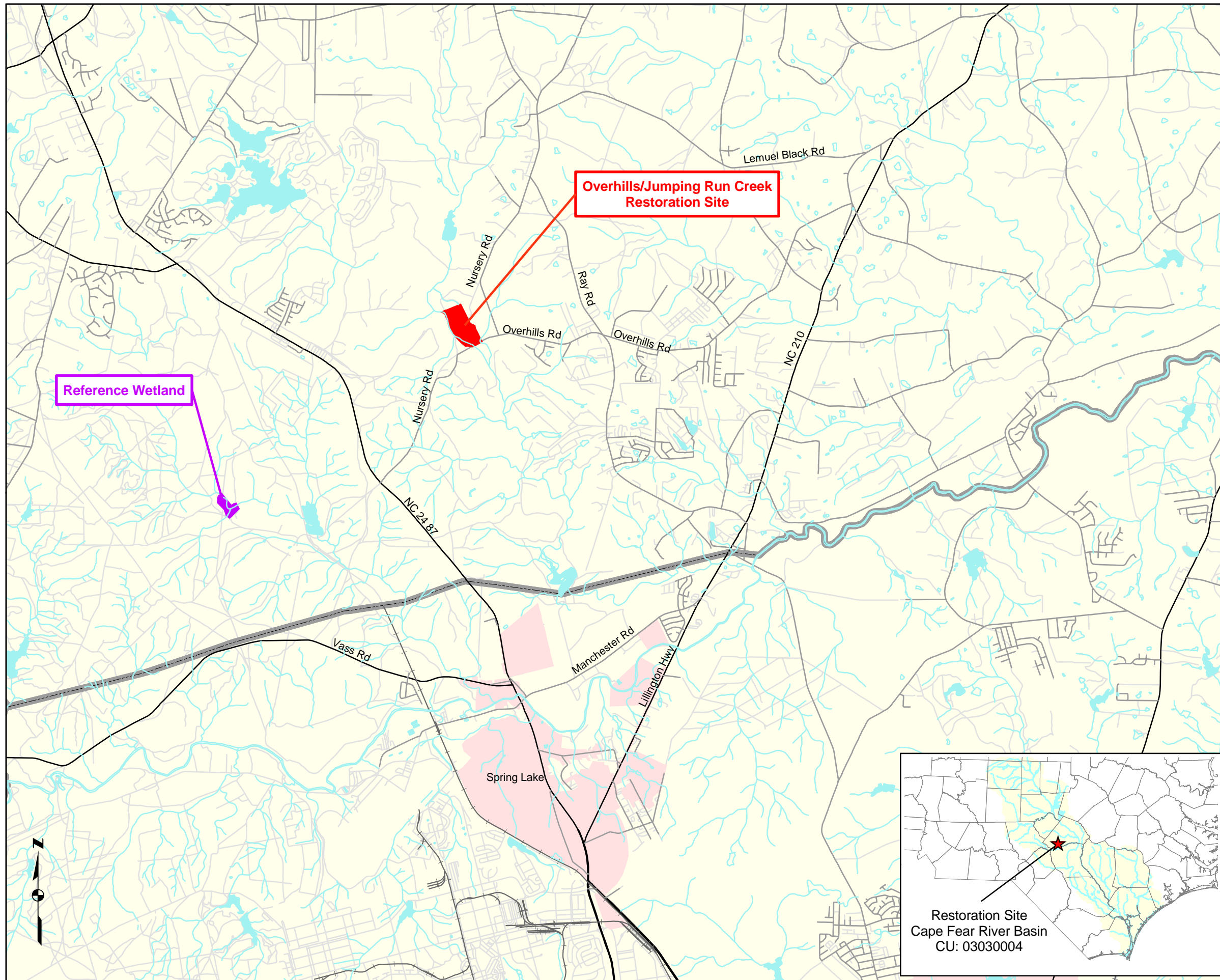


Figure 1 - Vicinity Map

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

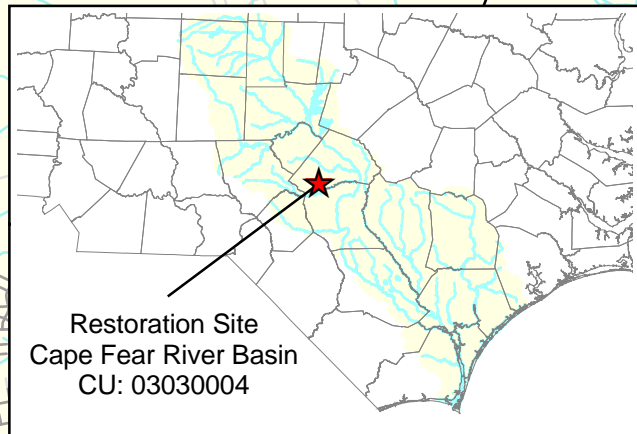
Monitoring Report  
November 2010



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



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.








**Figure 2 - Asset Map**

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

**Monitoring Year 4  
November 2010**

-  Project Boundary
-  Priority I Stream Restoration (4400 lf)
-  Wetland Restoration (60.2 ac)



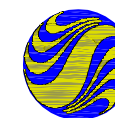
Source: Harnett County 2008 Aerials

# CURRENT CONDITION PLAN VIEW

## OVERHILLS STREAM AND WETLAND RESTORATION HARNETT COUNTY, NORTH CAROLINA

EEP PROJECT NUMBER 199  
MONITORING YEAR 4

THIS MAP DEPICTS MY4 CONDITIONS AS OF 09/2010



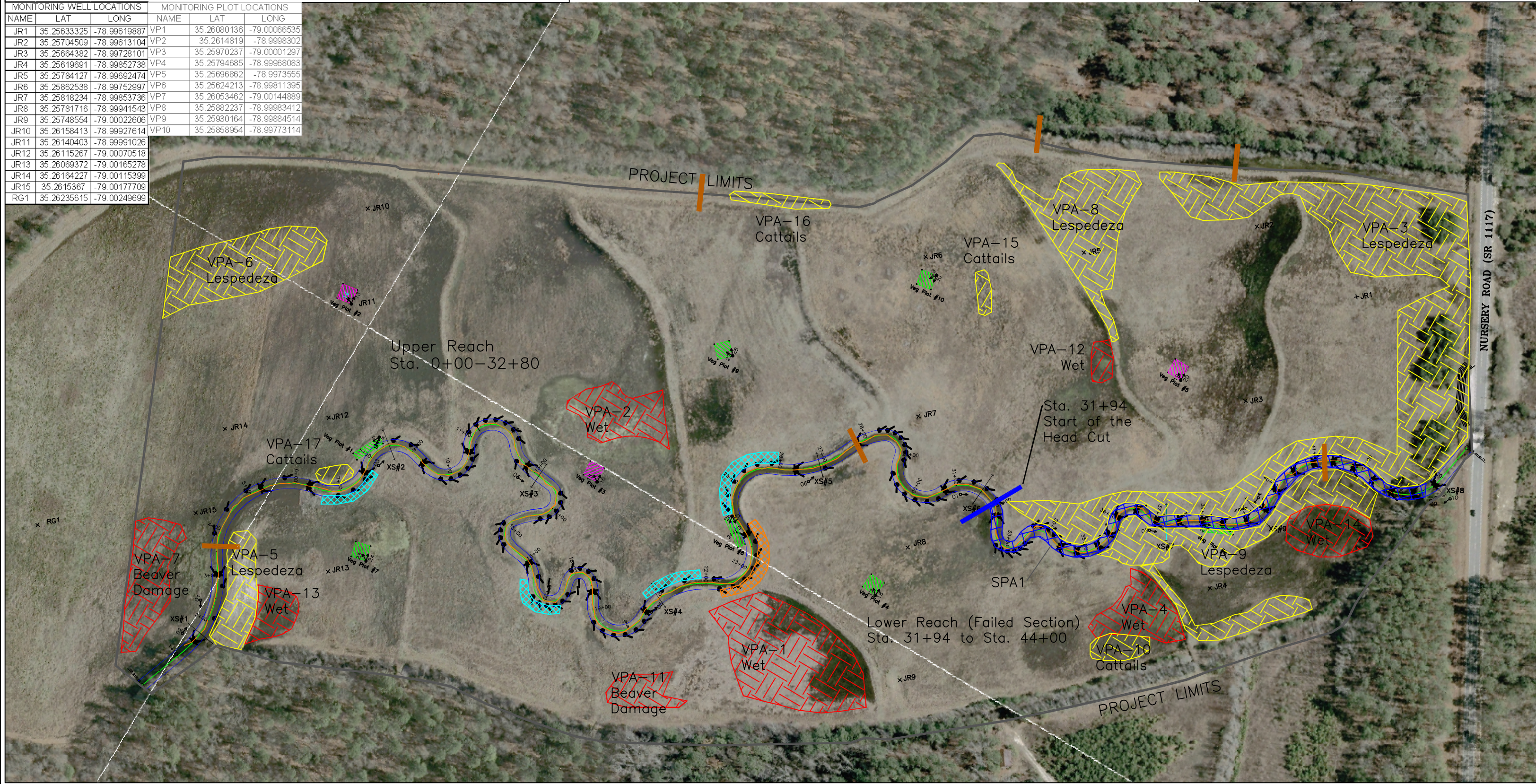
Stantec Consulting Services Inc.  
Suite 300, 801 Jones Franklin Rd  
Raleigh, NC 27606  
Tel. 919.851.6866  
Fax. 919.851.7024  
www.stantec.com

PROJECT NO. SCO#070695701	SHEET NO.
11/12/2010	
<p>Scale 1" = 100'</p>	
DATA SOURCE: HARNETT COUNTY 2008 AERIALS	

### LEGEND

- DESIGN THALWEG
- DESIGN BANKFUL
- 2010 THALWEG
- BEAVER DAMS
- ANNUAL PHOTO POINTS MONITORING WELLS/RAIN GAUGE
- DESIGN LOG CROSS VEIN
- DESIGN ROOT WAD
- VEG PLOT PINS
- VEG. PLOTS (<288 STEMS/AC)
- VEG. PLOTS (>288 STEMS/AC)
- MAJOR VEG. PROBLEM AREA
- MINOR VEG. PROBLEM AREA
- MINOR BANK EROSION
- MAJOR BANK EROSION
- CROSS SECTIONS
- REACH FAILURE (SPA1)

MONITORING WELL LOCATIONS			MONITORING PLOT LOCATIONS		
NAME	LAT	LONG	NAME	LAT	LONG
JR1	35.25633325	-78.99619887	VP1	35.26080136	-79.00066535
JR2	35.25704509	-78.99613104	VP2	35.2614819	-78.9998302
JR3	35.25664382	-78.99728101	VP3	35.25970237	-79.00001297
JR4	35.25619691	-78.99852738	VP4	35.25794685	-78.99968083
JR5	35.25784127	-78.99692474	VP5	35.25696862	-78.9973555
JR6	35.25862538	-78.99752997	VP6	35.25624213	-78.99811395
JR7	35.25818234	-78.99853736	VP7	35.26053462	-79.00144889
JR8	35.25781716	-78.99941543	VP8	35.25882237	-78.99983412
JR9	35.25748554	-79.00022606	VP9	35.25930164	-78.99884514
JR10	35.26158413	-78.99927614	VP10	35.25858954	-78.99773114
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			



## 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	3280	0+00 to 32+80	Includes log structures and root wads
Lower Reach		R	P1	1120	32+80 to 44+00	Includes log structures and root wads; step-down to existing channel
Riparian Wetlands	NA	R	-	60.2*		Floodplain of restored stream

R = Restoration

P1 = Priority 1

\*Wetland area was determined by subtracting the berm and stream area from the total easement area.

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
Year 5 Monitoring	NA	NA

NA = Not Applicable

<b>Table 3. Project Contacts</b> <b>Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199</b>	
<b>Designer</b>	BLUE: Land Water Infrastructure 1271 Old US Highway #1 South Southern Pines, NC 28387 Phone: 910-692-6461
<b>Construction Contractor</b>	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
<b>Vegetation Planting Contractor</b> & 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/Info Not Available
<b>Monitoring Performers</b>	Stantec Consulting Services, Inc 801 Jones Franklin Rd, Ste 300 Raleigh, NC 27606
Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	David Bidelspach 919-851-6866 Amber Coleman 919-851-6866 Amber Coleman 919-851-6866

**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%



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**APPENDIX C. VEGETATION ASSESSMENT DATA**

<b>Table 5 - Vegetation Plot Mitigation Success Summary</b>		
<b>Overhills/Jumping Run Creek Restoration Project / EEP Project No. 199</b>		
<b>Vegetation</b>	<b>Vegetation Density Met</b>	<b>Tract Mean</b>
<b>Plot ID</b>	<b>(288 stems/acre)</b>	
VP1	Y (364)	70% (425 stems/acre)
VP2	N (283)	
VP3	N (202)	
VP4	Y (324)	
VP5	N (121)	
VP6	Y (1093)	
VP7	Y (486)	
VP8	Y (567)	
VP9	Y (364)	
VP10	Y (445)	

## VEGETATION MONITORING PLOT PHOTOS



**Photo Station 11:** Vegetation Plot 1 looking northwest (9/8/10).



**Photo Station 12:** Vegetation Plot 1 looking west (9/8/10)



**Photo Station 13:** Vegetation Plot 2 looking northeast (9/8/10)



**Photo Station 14:** Vegetation Plot 2 looking east (9/8/10)



**Photo Station 15:** Vegetation Plot 3 looking northwest (9/8/10)



**Photo Station 16:** Vegetation Plot 3 looking west (9/8/10)



**Photo Station 17:** Vegetation Plot 4 looking northeast (9/8/10)



**Photo Station 18:** Vegetation Plot 4 looking east (9/8/10)



**Photo Station 19:** Vegetation Plot 5 looking northeast (9/8/10)



**Photo Station 20** Vegetation Plot 5 looking east (9/8/10)



**Photo Station 21** Vegetation Plot 6 looking south (9/8/10)



**Photo Station 22** Vegetation Plot 6 looking southwest (9/8/10)





**Photo Station 23** Vegetation Plot 7 looking north (9/8/10)



**Photo Station 24** Vegetation Plot 7 looking northeast (9/8/10)



**Photo Station 25** Vegetation Plot 8 looking northeast (9/8/10)



**Photo Station 26** Vegetation Plot 8 looking east (9/8/10)



**Photo Station 27** Vegetation Plot 9 looking north (9/8/10)



**Photo Station 28** Vegetation Plot 9 looking northeast (9/8/10)



**Photo Station 29** Vegetation Plot 10 looking northwest (9/8/10)



**Photo Station 30** Vegetation Plot 10 looking west (9/8/10)

**Table 6. Vegetation Metadata**

<b>Report Prepared By</b>	Alex Baldwin
<b>Date Prepared</b>	11/2/2010 11:19
<b>database name</b>	Stantec_2010.mdb
<b>database location</b>	U:\171300316\project\1-Overhills\site_data\cvs
<b>computer name</b>	BALDWINA
<b>file size</b>	50065408
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj, planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj, total stems</b>	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.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>Planted Stems by Plot and Spp</b>	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
<b>ALL Stems by Plot and spp</b>	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.
<b>PROJECT SUMMARY-----</b>	
<b>Project Code</b>	199
<b>project Name</b>	Overhills Stream and Wetland Restoration
<b>Description</b>	Stream and Wetland Restoration
<b>River Basin</b>	Cape Fear
<b>length(ft)</b>	4482
<b>stream-to-edge width (ft)</b>	
<b>area (sq m)</b>	
<b>Required Plots (calculated)</b>	
<b>Sampled Plots</b>	0



## APPENDIX D. STREAM ASSESSMENT DATA



**Photo 1** – Evidence of bankfull overflow near Station 22+00 (11/09/10)



**Photo Station 1** – Cross Section 1 – looking upstream (9/16/10)

(Note: Locations of Photo Stations are shown on the Current Condition Plan View in Appendix A)



**Photo Station 2** – Cross Section 1 – looking downstream (9/16/10)



**Photo Station 3** – Cross Section 2 – looking downstream (9/16/10)





**Photo Station 4** – Cross Section 3 – looking downstream (9/16/10)



**Photo Station 5** – Cross Section 4 – looking downstream (9/16/10)



**Photo Station 6** – Cross Section 5 – looking downstream (9/16/10)



**Photo Station 7** – Head cut just downstream of Cross Section 6 – looking upstream (9/16/10)



**Photo Station 8** – Cross Section 7 – looking downstream (9/16/10)



**Photo Station 9** – Cross Section 8 – looking downstream (9/16/10)



**Photo Station 10** – Cross Section 8 – looking upstream from end of project (9/16/10)



**Photo Station 11** – Cross Section 9 – looking downstream (9/16/10)

**Exhibit Table 8A - Visual Morphological Stability Assessment - Upper Reach  
Overhills/Jumping Run Creek - EEP Project No. 199**

<b>Feature Category</b>	<b>Metric (per As-built and reference baselines)</b>	<b>(# Stable) Number Performing as Intended</b>	<b>Total Number per As-built</b>	<b>Total Number/Feet in Unstable State</b>	<b>% Perform in Stable Condition</b>	<b>Feature Perform. Mean or Total</b>
A. Riffles	1. Present?	14	15		93%	
	2. Armor stable (eg no displacement?)	N/A	N/A			
	3. Facet grade appears stable?	5	15		33%	
	4. Minimal evidence of embedding/fining?	N/A	N/A			
	5. Length appropriate?	10	14		71%	66%
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?	15	20		75%	
	2. Downstream of meander (glide/inflection) centering?	12	20		60%	68%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	20	20		100%	
	2. Of those eroding, # w/concomitant point bar formation?	0	3		0%	
	3. Apparent Rc within spec?	17	20		85%	
	4. Sufficient floodplain access and relief?	20	20		100%	71%
E. Bed General	1. General channel bed aggradation areas (bar formation)		3200	300	91%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?		3200	200	94%	92%
F. Bank	1. Actively eroding, wasting, or slumping bank?		3200	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?	0	7		0%	
	2. Armor stable (eg no displacement?)		N/A		NA	
	3. Facet grade appears stable?	0	7		0%	
	4. Minimal evidence of embedding/fining?	4	N/A		NA	
	5. Length appropriate?	1	7		14%	5%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	2	8		25%	
	2. Sufficiently deep (Max Pool D:Mean Bkf > 1.6?)	4	8		50%	
	3. Length appropriate?	4	8		50%	42%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	2	9		22%	
	2. Downstream of meander (glide/inflection) centering?	2	9		22%	22%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	1	9		11%	
	2. Of those eroding, # w/concomitant point bar formation?	1	9		11%	
	3. Apparent Rc within spec?	0	9		0%	
	4. Sufficient floodplain access and relief?	0	9		0%	6%
E. Bed General	1. General channel bed aggradation areas (bar formation)		1200	1200	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?		1200	1200	100%	100%
F. Bank	1. Actively eroding, wasting, or slumping bank?		1200	1200	100%	100%
G. Vanes	1. Free of back or arm scour?	0	22		0%	
	2. Height appropriate?	0	22		0%	
	3. Angle and geometry appear appropriate?	0	22		0%	
	4. Free of piping or other structural failures?	0	22		0%	0%
H. Wads/Boulders	1. Free of scour?	NA	N/A		NA	
	2. Footing stable?	NA	N/A		NA	NA

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
2010	November, 2010	Field observation	Appendix D, Photo 1

Project Name Overhills  
 Cross Section Cross Section 1  
 Feature  
 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  
 Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballesterro, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen

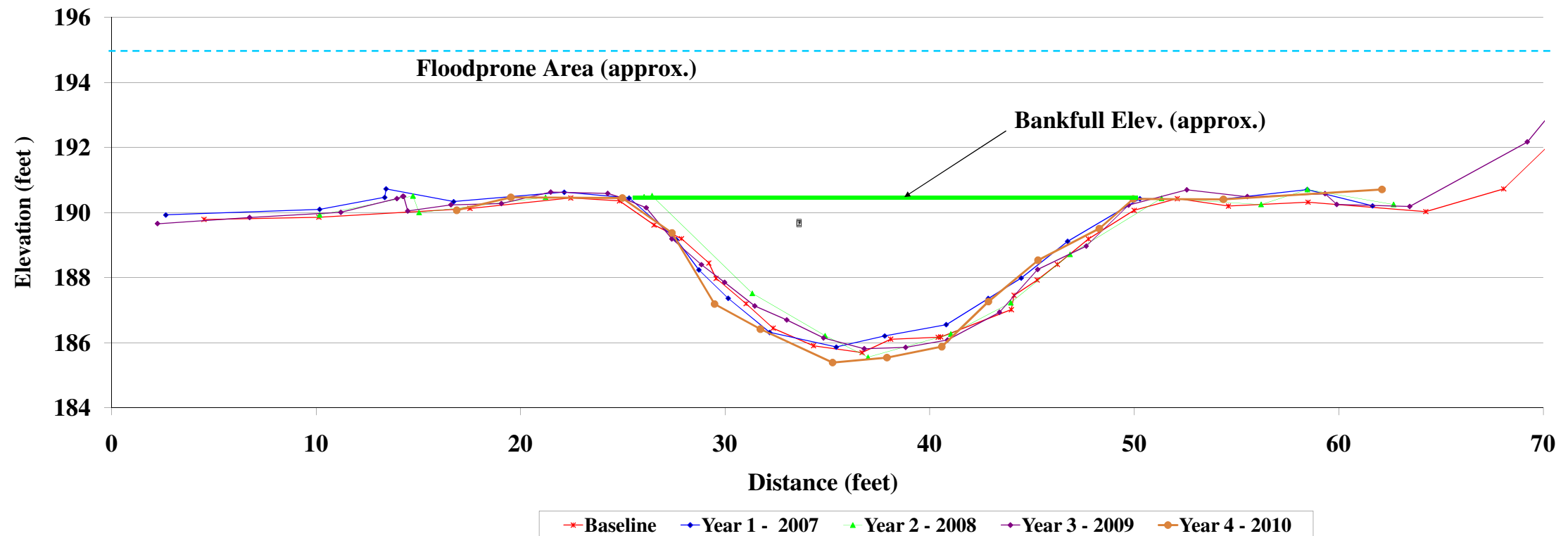
Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
			16.87	190.07		2.25	189.66		10.17	189.93		2.65	189.93	Left Pin	4.52	189.79	Left Pin
			19.52	190.47		6.75	189.85		14.73	190.51		10.17	190.1		10.13	189.86	
			24.97	190.45		11.21	190.01		15.03	190		13.35	190.47		17.52	190.13	
			27.4	189.38		13.95	190.43		21.21	190.47		13.42	190.73		22.45	190.45	
			29.48	187.19		14.24	190.5		26.03	190.48		16.72	190.34		24.83	190.36	LBK
			31.72	186.42		14.28	190.5		26.42	190.52		22.13	190.63		26.52	189.62	
			35.25	185.39		14.48	190.05		31.32	187.52		25.3	190.45	LBK	27.86	189.2	
			37.91	185.54		16.59	190.24		34.88	186.22		27.61	189.17		29.2	188.45	
			40.59	185.88		19.06	190.28		36.98	185.56		28.71	188.24		29.55	187.98	
			42.87	187.27		21.47	190.63		41.03	186.27		30.15	187.37		31.02	187.2	
			45.29	188.54		24.26	190.59		43.96	187.23		32.17	186.32		32.34	186.45	
			48.29	189.51		24.97	190.45		46.86	188.72		35.43	185.87		34.32	185.91	
		BKF	49.95	190.42		26.14	190.15		51.33	190.44		37.8	186.21		36.69	185.7	
			54.36	190.41		27.39	189.19		56.2	190.25		40.81	186.56		38.09	186.11	
			62.11	190.71		28.84	188.4		58.46	190.71		42.86	187.36		40.41	186.17	
						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	Bench
Area		75.30	69.97	67.39	67.45	71.89	
Width		24.91	25.19	24.42	24.66	26.87	
Mean Depth		3.02	2.78	2.76	2.74	2.68	
Max Depth		5.00	4.54	4.80	4.49	4.66	
W/D		8.24	9.07	8.85	9.02	10.04	

## Overhills Cross Section #1



Project Name Overhills  
 Cross Section Cross Section 2  
 Feature  
 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  
 Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballesterro, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen

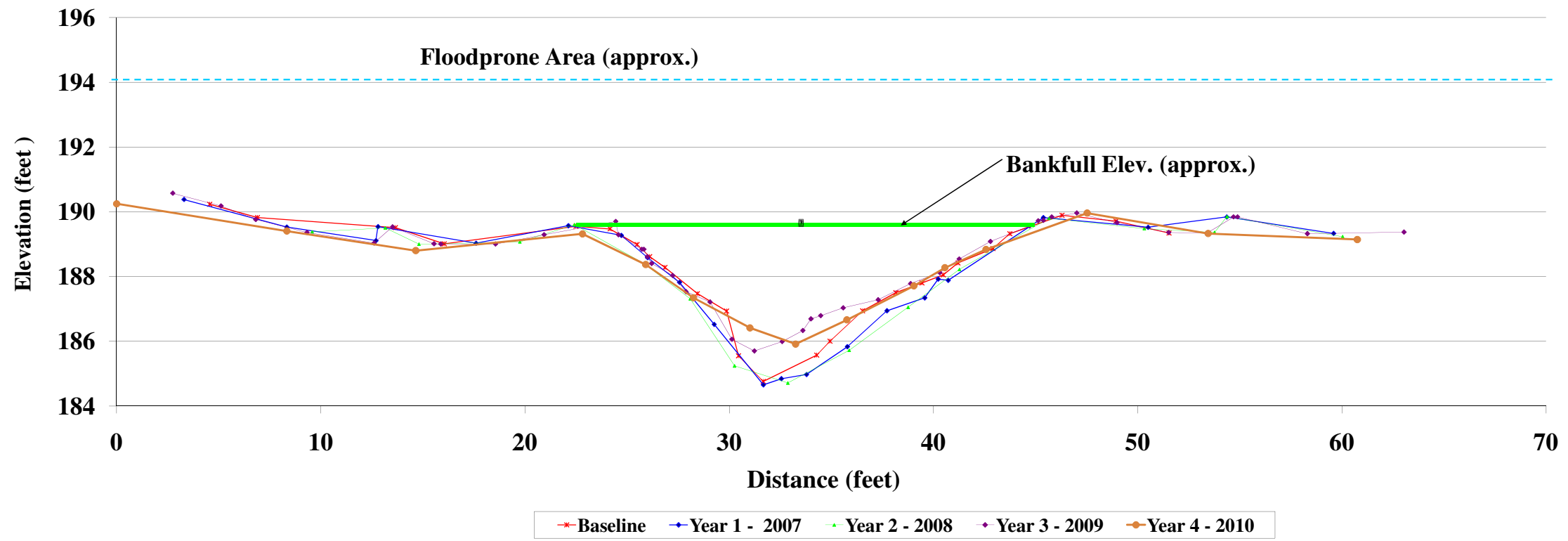
Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	0		190.247			2.75	190.57		9.58	189.38		3.3	190.38		4.56	190.23	
	8.34		189.404			5.11	190.18		13.16	189.5		8.33	189.53		6.9	189.82	
	14.65		188.798			6.81	189.76		14.81	189		12.7	189.11		13.65	189.51	Left Pin
	22.81		189.316			9.32	189.36		19.75	189.07		12.8	189.54	Left Pin	16.04	189.01	
	25.91		188.369			12.6	189.03		22.42	189.6		17.6	189.03		22.49	189.55	LBK
	28.25		187.339			13.51	189.53		25.82	188.4		22.12	189.57	LBK	24.16	189.47	
	31.01		186.412			15.54	189.01		28.09	187.31		24.71	189.27		25.49	188.99	
	33.25		185.911			15.87	189		30.26	185.24		26	188.58		26.1	188.61	
	35.76		186.658			18.55	189		32.87	184.71		27.56	187.82		26.85	188.28	
	39.04		187.709			20.93	189.29		35.87	185.72		29.26	186.52		28.44	187.47	
	40.56		188.27			24.44	189.7		38.76	187.05		31.67	184.65		29.87	186.93	
	42.57		188.833			24.57	189.29		41.27	188.22		32.55	184.84		30.45	185.55	
	47.52		189.96			25.72	188.84		45.66	189.8		33.78	184.97		31.66	184.76	
	53.45		189.327			25.82	188.84		50.32	189.48		35.78	185.83		34.28	185.57	
	60.75		189.141			25.99	188.61		53.76	189.36		37.72	186.94		34.93	186	
						26.2	188.4		54.37	189.85		39.57	187.34		36.53	186.94	
						27.23	188.03		60.03	189.23		40.23	187.92		38.16	187.5	
						27.88	187.53					40.72	187.88		39.43	187.8	
						29.06	187.21					45.38	189.82	FBK	40.48	188.05	
						30.13	186.06					50.51	189.52		41.2	188.42	
						31.23	185.7					54.36	189.84	Right Pin	42.91	188.86	
						32.59	185.99					59.59	189.33		43.74	189.32	
						33.6	186.33								46.29	189.89	FBK
						34	186.69								48.93	189.71	
						34.48	186.79								51.53	189.34	
						35.58	187.03								54.39	189.81	Right Pin
						37.29	187.28								57.19	189.28	
						38.88	187.78								62.87	189.3	
						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										



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	Bench
Area		38.08	39.54	54.18	51.12	44.82	
Width		28.93	20.86	22.40	22.29	22.27	
Mean Depth		1.32	1.90	2.42	2.29	2.01	
Max Depth		3.40	3.84	4.83	4.90	4.79	
W/D		21.90	11.01	9.26	9.72	11.07	

## Overhills Cross Section #2





**Project Name** Overhills  
**Cross Section** Cross Section 3  
**Feature**  
**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  
**Crew** As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballesterio, Year 3 - Jean/Geenen, Year 4 - Jean/Geenen

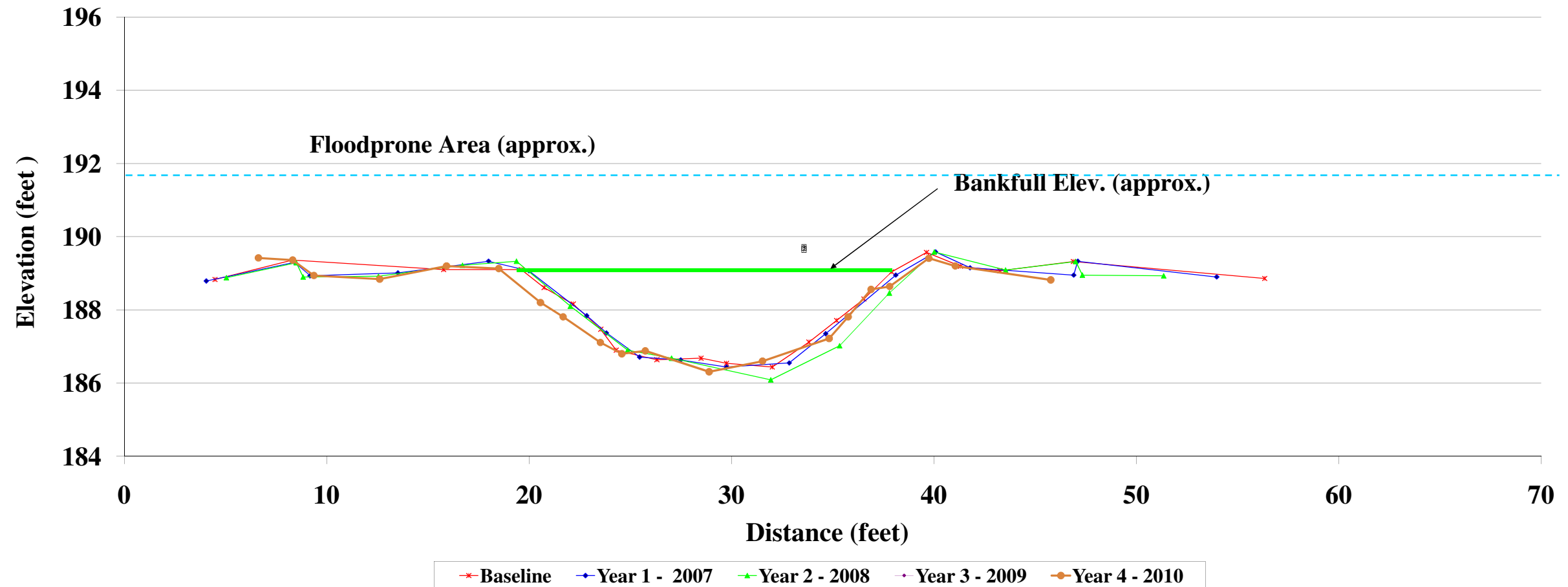
Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
			6.63	189.42		6.63	189.42		5.05	188.88		4.06	188.79		4.48	188.83	
			8.32	189.36		8.32	189.36		8.5	189.29		8.41	189.3	Left Pin	8.32	189.36	Left Pin
			9.37	188.94		9.37	188.94		8.84	188.9		9.18	188.93		15.78	189.1	
			12.62	188.84		12.62	188.84		12.56	188.92		13.52	189.01		19.61	189.1	
			15.92	189.2		15.92	189.2		16.71	189.22		18	189.33		20.74	188.61	LBK
			18.5	189.13		18.5	189.13		19.38	189.33		19.99	189.07	LBK	22.18	188.16	
			20.56	188.2		20.56	188.2		22.04	188.1		22.85	187.84		23.54	187.47	
			21.68	187.81		21.68	187.81		24.87	186.9		23.82	187.37		24.3	186.9	
			23.52	187.11		23.52	187.11		27.04	186.68		25.46	186.71		26.31	186.64	
			24.58	186.8		24.58	186.8		31.94	186.09		27.49	186.63		28.49	186.68	
			25.74	186.88		25.74	186.88		35.34	187.02		29.75	186.44		29.75	186.54	
			28.89	186.31		28.89	186.31		37.8	188.46		32.85	186.55		32.01	186.44	
			31.53	186.6		31.53	186.6		40.02	189.58		34.65	187.35		33.82	187.12	
			34.82	187.22		34.82	187.22		43.54	189.09		38.11	188.95		35.19	187.71	
			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	Bench
Area		33.96	33.96	35.19	31.56	31.03	
Width		19.22	19.22	18.94	18.36	18.15	
Mean Depth		1.77	1.77	1.86	1.72	1.71	
Max Depth		2.73	2.73	2.95	2.60	2.60	
W/D		10.87	10.87	10.19	10.68	10.62	

## Overhills Cross Section #3



Project Name Overhills  
 Cross Section Cross Section 4  
 Feature  
 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  
 Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballesterro, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen

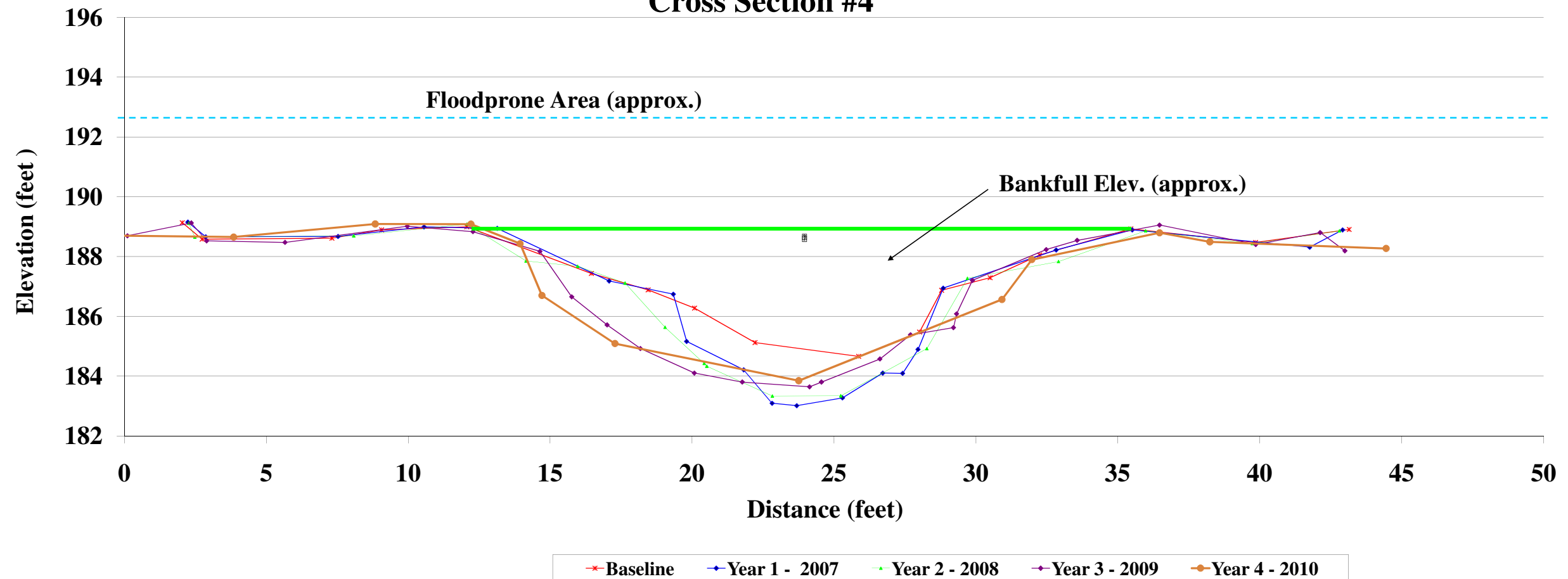
Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
			-8.72	188.843		0.11	188.69		2.27	189.11		2.24	189.15	Left Pin	2.04	189.13	Left Pin
			-2.46	188.719		2.36	189.12		2.48	188.65		2.87	188.66		2.74	188.58	
			3.85	188.649		2.9	188.52		8.08	188.69		7.53	188.67		7.31	188.61	
			8.84	189.086		5.66	188.47		12.07	189.08		10.56	188.99	LBK	9.06	188.89	
			12.21	189.08		9.97	189.01		14.15	187.85		13.14	188.94		12.06	188.99	LBK
			13.94	188.425		12.28	188.83		15.97	187.67		17.08	187.18		16.45	187.43	
			14.71	186.698		14.64	188.17		17.64	187.11		19.34	186.74		18.45	186.88	
			17.28	185.086		15.76	186.65		19.05	185.63		19.81	185.16		20.09	186.27	
			23.76	183.845		17.01	185.71		20.43	184.42		21.82	184.21		22.22	185.12	
			30.92	186.562		18.18	184.92		20.52	184.33		22.82	183.09		25.87	184.66	
			31.97	187.895		20.08	184.1		22.83	183.33		23.69	183.01		28.01	185.47	
			36.47	188.791		21.77	183.8		25.24	183.34		25.3	183.27		28.79	186.87	
			38.24	188.489		24.14	183.64		28.27	184.92		26.72	184.1		30.5	187.29	
			44.45	188.267		24.56	183.8		29.7	187.27		27.42	184.09		32.24	188.05	
						26.62	184.57		32.91	187.83		27.96	184.89		35.46	188.92	RBK
						27.7	185.38		35.98	188.86		28.85	186.94		39.85	188.47	
						29.21	185.62		39.74	188.43		32.83	188.22		43.15	188.9	Right Pin
						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	Bench
Area		65.77	66.54	64.86	59.60	49.19	
Width		22.40	23.39	23.11	22.25	23.19	
Mean Depth		2.94	2.84	2.81	2.68	2.12	
Max Depth		5.00	5.28	5.59	5.91	4.26	
W/D		7.70	8.23	8.23	8.31	10.93	

## Overhills Cross Section #4



Project Name Overhills  
 Cross Section Cross Section 5  
 Feature  
 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  
 Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballesterro, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen

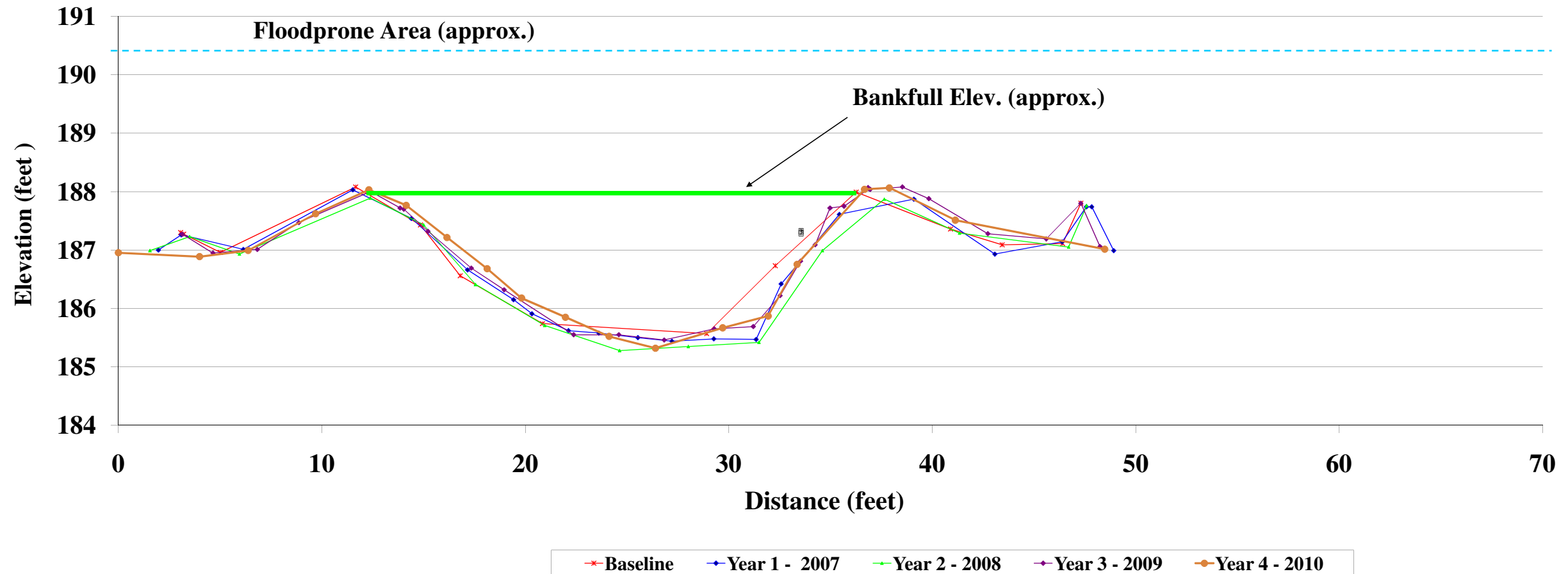
Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
			0	186.953		3.14	187.27		1.55	186.99		1.97	187		3.05	187.3	Left Pin
			3.99	186.887		4.64	186.95		3.5	187.23		3.09	187.26	Left Pin	3.21	187.27	
			6.37	186.992		6.82	187.01		5.95	186.93		6.14	187.01		5.01	186.96	
			9.69	187.621		8.86	187.47		12.38	187.89		11.52	188.03	LBK	11.66	188.08	LBK
			12.31	188.03		12.39	188		15	187.43		14.4	187.54		14.84	187.43	
			14.14	187.765		13.84	187.72		17.55	186.41		17.16	186.66		16.8	186.56	
			16.15	187.215		14.02	187.7		20.95	185.71		19.42	186.15		20.84	185.74	
			18.12	186.681		15.21	187.32		24.63	185.28		20.32	185.91		28.91	185.57	
			19.81	186.178		17.34	186.69		28.01	185.35		22.12	185.62		32.28	186.73	
			21.97	185.85		18.95	186.32		31.48	185.42		23.61	185.58		36.26	187.99	RBK
			24.11	185.521		22.37	185.55		34.6	186.99		25.53	185.5		40.89	187.36	
			26.39	185.319		24.59	185.55		37.64	187.87		27.2	185.44		43.43	187.09	
			29.7	185.668		26.82	185.46		41.34	187.29		29.26	185.48		46.4	187.11	Right Pin
			31.93	185.87		29.28	185.65		46.7	187.05		31.34	185.47		47.3	187.8	
			33.35	186.754		31.2	185.69		47.58	187.76		32.57	186.42				
			36.67	188.038		32.52	186.22					35.43	187.61				
			37.89	188.063		33.52	186.81					39.09	187.87	RBK			
			41.13	187.51		34.24	187.09					43.07	186.93				
			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	Bench
Area		39.37	39.36	44.36	40.91	37.70	
Width		24.30	24.41	24.63	24.50	24.16	
Mean Depth		1.62	1.61	1.80	1.67	1.56	
Max Depth		2.70	2.53	2.71	2.55	2.42	
W/D		15.00	15.14	13.67	14.68	15.48	

## Overhills Cross Section #5

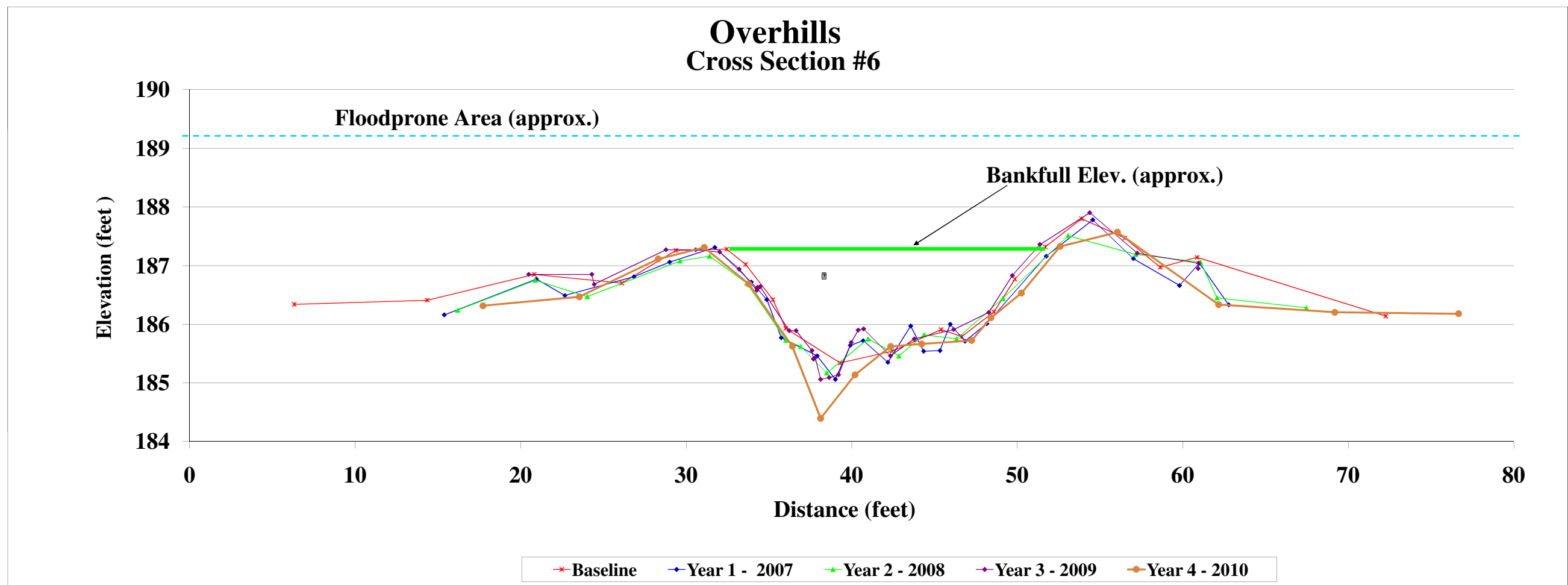


Project Name Overhills  
 Cross Section Cross Section 6  
 Feature  
 Date As Built - 7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09, Year 4 - 09/10  
 Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballesterro, Year 3 - Jean/Geenen, Year 4 - Jean/Geenen

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	
	17.72			186.315		20.49	186.85		16.19	186.24		15.39	186.16		6.32	186.34		
	23.54			186.467			24.3	186.85		20.88	186.75		20.95	186.77	Left Pin	14.35	186.41	
	28.31			187.113			24.44	186.68		24.02	186.47		22.67	186.49		20.81	186.85	Left Pin
	31.09			187.31			28.78	187.27		29.63	187.08		26.84	186.81		26.11	186.7	
	33.79			186.683			30.58	187.27		31.41	187.16		29	187.06		29.39	187.26	
	36.41			185.624			32.03	187.23		33.66	186.7		31.73	187.31	LBK	32.45	187.28	LBK
	38.12			184.395			33.2	186.94		36.02	185.73		33.93	186.72		33.59	187.02	
	40.2			185.138			34.27	186.58		36.92	185.62		34.87	186.42		35.23	186.42	
	42.35			185.622			34.28	186.61		38.49	185.17		35.74	185.77		36.01	185.93	
	44.23			185.664			34.31	186.63		40.99	185.75		37.91	185.46		39.3	185.34	
	47.24			185.722			34.32	186.61		42.85	185.46		39.01	185.06		42.44	185.54	
	48.41			186.11			34.47	186.64		44.37	185.82		39.91	185.64		45.4	185.91	
	50.25			186.532			36.22	185.89		46.34	185.75		40.69	185.72		46.64	185.79	
	52.59			187.327			36.64	185.89		49.14	186.44		42.18	185.35		48.59	186.21	
	56.05			187.569			37.6	185.55		53.07	187.51		43.56	185.97		49.86	186.77	
	62.16			186.335			37.69	185.407		57.15	187.19		44.34	185.54		51.69	187.32	RBK
	69.19			186.204			37.79	185.43		61.07	187.06		45.33	185.55		53.89	187.8	
	76.66			186.179			38.12	185.06		62.07	186.45		45.95	186		56.5	187.47	
							38.64	185.09		67.47	186.28		46.84	185.71		58.64	186.97	
							39.2	185.14					48.16	186.01		60.87	187.14	Right Pin
							39.97	185.69					51.75	187.16	RBK	72.27	186.14	
							40.39	185.9					54.56	187.78				
							40.72	185.92					57.01	187.12				
							42.34	185.46					59.8	186.66				
							43.78	185.75					61.01	187.04	Right Pin			
							46.16	185.91					62.77	186.33				
							48.28	186.2										
							49.7	186.83										
							51.37	187.36										
							54.38	187.9										
							57.25	187.21										
							60.95	187.04										
							60.93	186.95										



Photo of Cross-Section 6 - Looking Downstream @ STA 31+56							
	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area		33.92	23.06	25.14	25.35	23.43	
Width		21.70	18.65	19.23	19.24	19.06	
Mean Depth		1.56	1.24	1.31	1.32	1.23	
Max Depth		3.10	2.22	2.11	2.21	1.94	
W/D		13.88	15.08	14.71	14.59	15.51	



Project Name Overhills  
 Cross Section Cross Section 7  
 Feature  
 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  
 Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballesterero, Year 3 - Jean/Geenen, Year 4 - Jean/Geenen

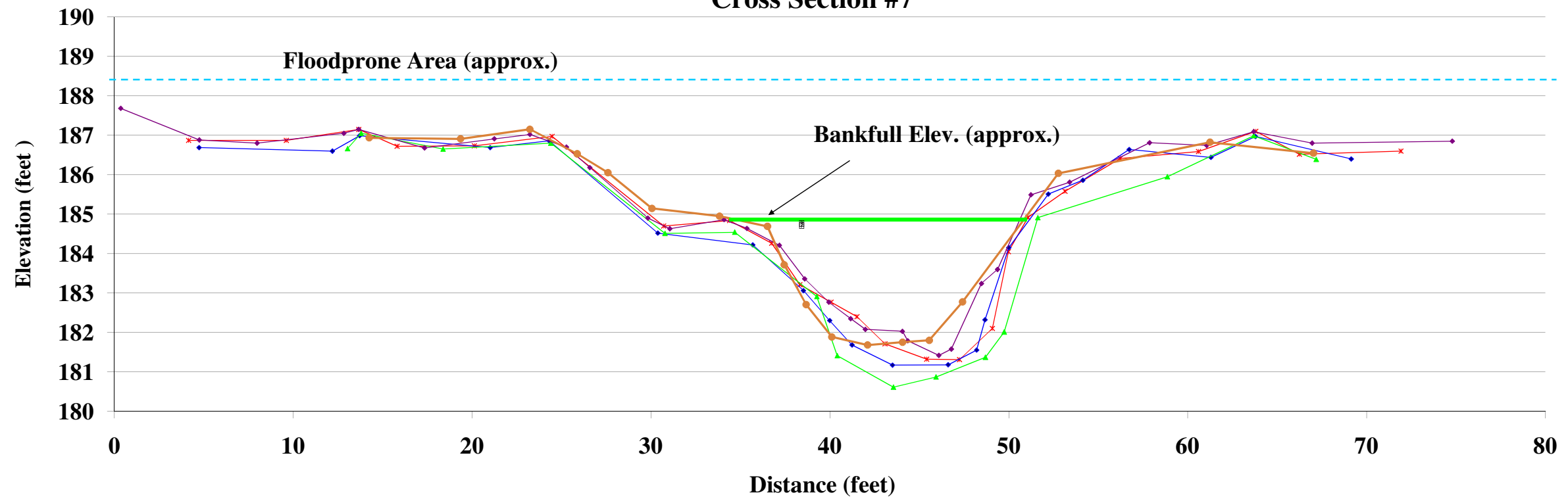
Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	14.25			186.935			0.36	187.68			13.04	186.66			4.74	186.69	
	19.35			186.91			4.75	186.88			13.8	187.05			12.19	186.6	
	23.23			187.152			7.98	186.8			18.38	186.65			13.71	186.99	Left Pin
	25.88			186.529			12.83	187.05			24.4	186.8			21.01	186.69	
	27.59			186.053			13.66	187.15			30.78	184.51			24.31	186.86	
	30.05			185.146			17.34	186.68			34.68	184.54			30.38	184.52	LBK
	33.83			184.949			21.24	186.91			39.27	182.91			35.69	184.22	
	36.51			184.69			23.23	187.02			40.41	181.41			38.52	183.06	
	37.45			183.716			25.27	186.7			43.55	180.61			39.99	182.3	
	38.67			182.705			26.58	186.18			45.93	180.87			41.24	181.68	
	40.11			181.887			29.82	184.9			48.69	181.37			43.5	181.17	
	42.11			181.681			31.05	184.63			49.74	182.01			46.61	181.18	
	44.06			181.752			34.08	184.86			51.62	184.91			48.2	181.55	
	45.55			181.8			35.36	184.64			58.86	185.95			48.67	182.32	
	47.41			182.774			37.18	184.21			63.69	186.99			50	184.15	
	52.77			186.035			38.59	183.36			67.18	186.39			52.21	185.51	RBK
	61.24			186.825			39.94	182.77							54.14	185.86	
	67.03			186.546			41.16	182.35							56.73	186.64	
							41.98	182.08							61.3	186.44	
							44.05	182.03							63.79	186.97	Right Pin
							44.35	181.79							69.14	186.4	
							46.09	181.42									
							46.79	181.58									
							48.47	183.24									
							49.37	183.6									
							51.24	185.49									
							53.4	185.81									
							57.87	186.81									
							61.06	186.74									
							63.69	187.09									
							66.96	186.8									
							74.79	186.85									



Photo of Cross-Section 7 - Looking Downstream @ STA 37+24

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area		37.09	30.41	40.80	39.41	35.21	
Width		21.28	16.15	16.71	16.68	16.54	
Mean Depth		1.74	1.88	2.44	2.36	2.13	
Max Depth		3.50	3.41	4.22	3.67	3.53	
W/D		12.21	8.58	6.85	7.06	7.77	

## Overhills Cross Section #7



x Baseline   
 ◆ Year 1 - 2007   
 ▲ Year 2 - 2008   
 ◆ Year 3 - 2009   
 ● Year 4 - 2010

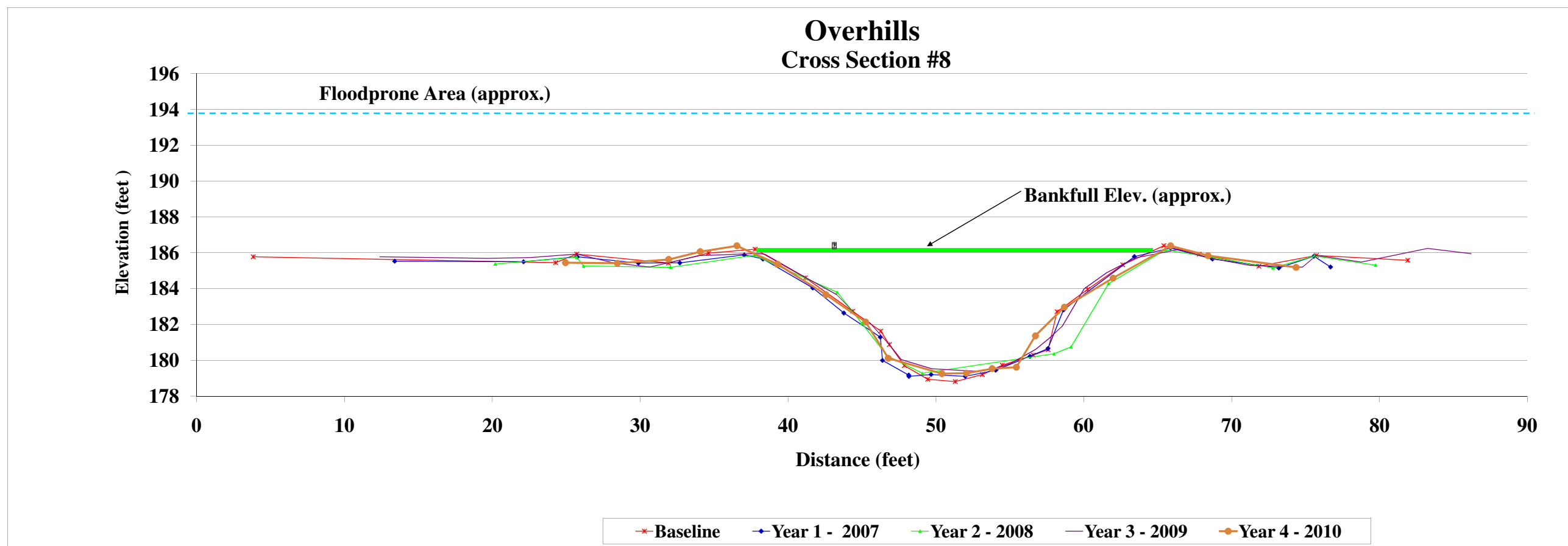
Project Name Overhills  
 Cross Section Cross Section 8  
 Feature  
 Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09, Year 4 -09/10  
 Crew As Built - Bidenspach/Jean/Geenen, Year 1&2 - Geenen/Ballesterro, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen

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
	24.95		24.95	185.445		12.4	185.77		20.2	185.37		13.4	185.53		3.83	185.78	
	28.46		28.46	185.414		19.67	185.69		25.7	185.75		22.11	185.5		24.28	185.45	
	31.93		31.93	185.625		22.55	185.73		26.17	185.26		25.75	185.77	Left Pin	25.7	185.93	Left Pin
	34.06		34.06	186.063		25.7	185.93	Left Pin	32.05	185.19		29.88	185.43		31.91	185.43	
	36.54		36.54	186.386		28.13	185.45		37.73	185.86		32.68	185.44		34.62	185.98	
	39.29		39.29	185.359		30.63	185.2		39.24	185.29		37.04	185.88	LBK	37.77	186.2	LBK
	42.56		42.56	183.66		34.01	185.84		43.33	183.79		38.3	185.65		41.17	184.6	
	45.24		45.24	182.138		37.88	185.96		44.99	182.06		41.67	184.04		44.37	182.74	
	46.78		46.78	180.109		38.43	185.92		46.69	180.25		43.77	182.64		46.27	181.63	
	50.4		50.4	179.25		41.08	184.66		49.08	179.27		46.24	181.29		46.85	180.88	
	52.06		52.06	179.27		43.28	183.66		57.99	180.36		46.38	179.99		47.86	179.7	
	53.81		53.81	179.531		44.79	182.39		59.14	180.74		48.16	179.17		49.44	178.94	
	55.44		55.44	179.612		45.55	182.07		61.67	184.27		48.17	179.1		51.31	178.81	
	56.73		56.73	181.362		46.97	180.77		65.53	186.17		49.67	179.2		53.14	179.2	
	58.68		58.68	182.958		47.65	180.04		68.83	185.72		51.99	179.1		54.48	179.72	RBK
	61.98		61.98	184.586		49.71	179.53		72.79	185.15		54.04	179.44	RBK	56.58	180.29	
	65.87		65.87	186.389		52.7	179.38		75.6	185.82		56.36	180.22		57.59	180.59	
	68.41		68.41	185.836		53.88	179.51		79.74	185.31		57.57	180.65		58.19	182.71	
	74.36		74.36	185.185		55.03	179.81					58.63	182.81		60.26	183.96	
						56.74	180.6					63.42	185.79		62.63	185.33	
						57.68	181.24					65.87	186.27		65.42	186.4	
						58.54	181.9					68.7	185.65		67.81	185.93	
						60.03	183.99					73.19	185.15		71.84	185.25	
						61.54	184.88					75.56	185.81	Right Pin	75.73	185.85	Right Pin
						63.48	185.71					76.68	185.21		81.92	185.58	
						66.38	186.18								89.04	186.33	
						68.56	185.7										
						71.21	185.3										
						74.8	185.2										
						75.73	185.85	Right Pin									
						78.76	185.48										
						83.25	186.24										
						86.19	185.95										



Photo of Cross-Section 8 - Looking Downstream @ STA 43+02

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area		133.55	103.50	113.54	110.97	106.10	
Width		30.00	27.75	27.75	27.72	27.10	
Mean Depth		4.45	3.73	4.09	4.00	3.92	
Max Depth		7.80	6.82	6.92	7.09	7.38	
W/D		6.74	7.44	6.78	6.92	6.92	



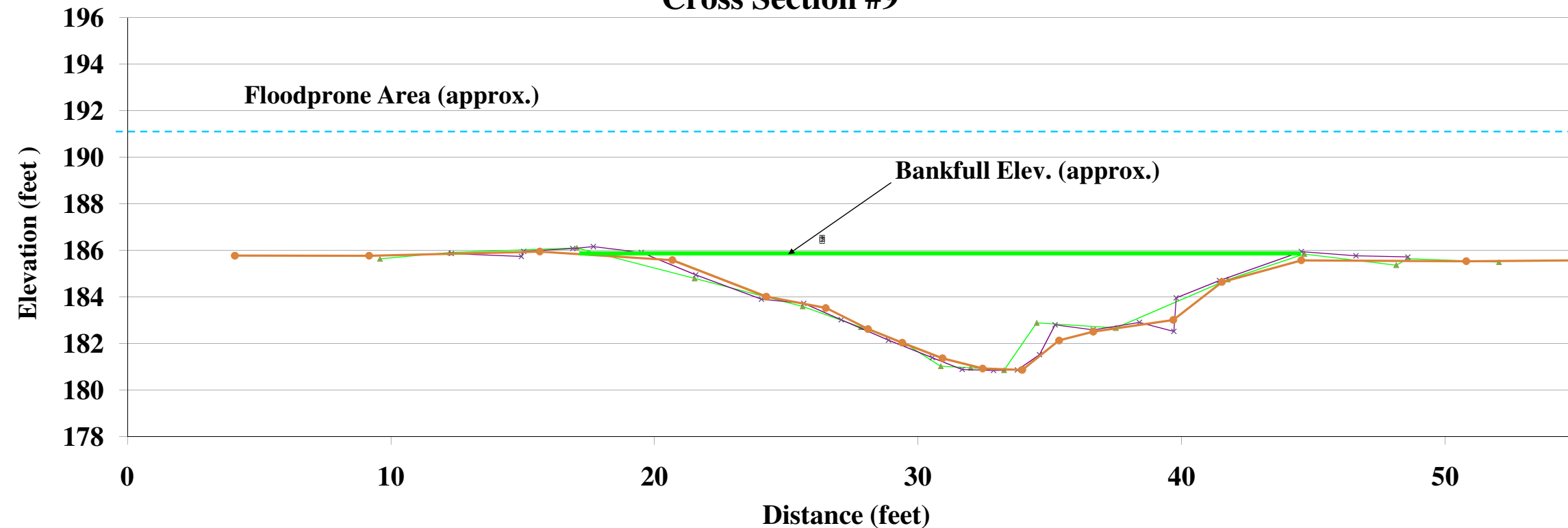
Project Name Overhills  
 Cross Section Cross Section 9  
 Feature  
 Date Year 2 - 8/12/08, Year 3 - 8/15/09, Year 4 -09/10  
 Crew Year 2 - Geenen/Ballestero, Year 3 - Jean/Geenen, Year 4 -Jean/Geenen

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
			4.08	185.777		12.29	185.87	Left Pin	9.58	185.64							
			9.17	185.772		14.95	185.74		12.23	185.91	Left Pin						
			15.65	185.951		15.04	185.96		17.05	186.11	BKF						
			20.68	185.587		16.9	186.08		21.52	184.8							
			24.24	184.018		17.68	186.17		25.62	183.6							
			26.5	183.53		19.5	185.91		27.83	182.7							
			28.1	182.624		21.56	184.95		29.5	182.01							
			29.4	182.038		24.06	183.91		30.86	181.03							
			30.93	181.37		25.66	183.73		31.99	180.96							
			32.45	180.931		27.08	183.02		33.26	180.86							
			33.95	180.869		28.88	182.15		34.5	182.89							
			35.35	182.135		30.54	181.39		37.5	182.67							
			36.65	182.514		31.67	180.89		41.75	184.75							
			39.68	183.015		32.86	180.85	thalweg	44.65	185.85	BKF						
			41.53	184.644		33.77	180.87		48.14	185.37							
			44.54	185.577		34.61	181.53		48.58	185.65	Right Pin						
			50.8	185.537		35.2	182.81		52.04	185.5							
			57.9	185.602		36.64	182.59										
						38.4	182.91										
						39.7	182.52										
						39.79	183.96										
						41.43	184.71										
						44.54	185.95										
						46.61	185.77										
						48.58	185.72	Right Pin									



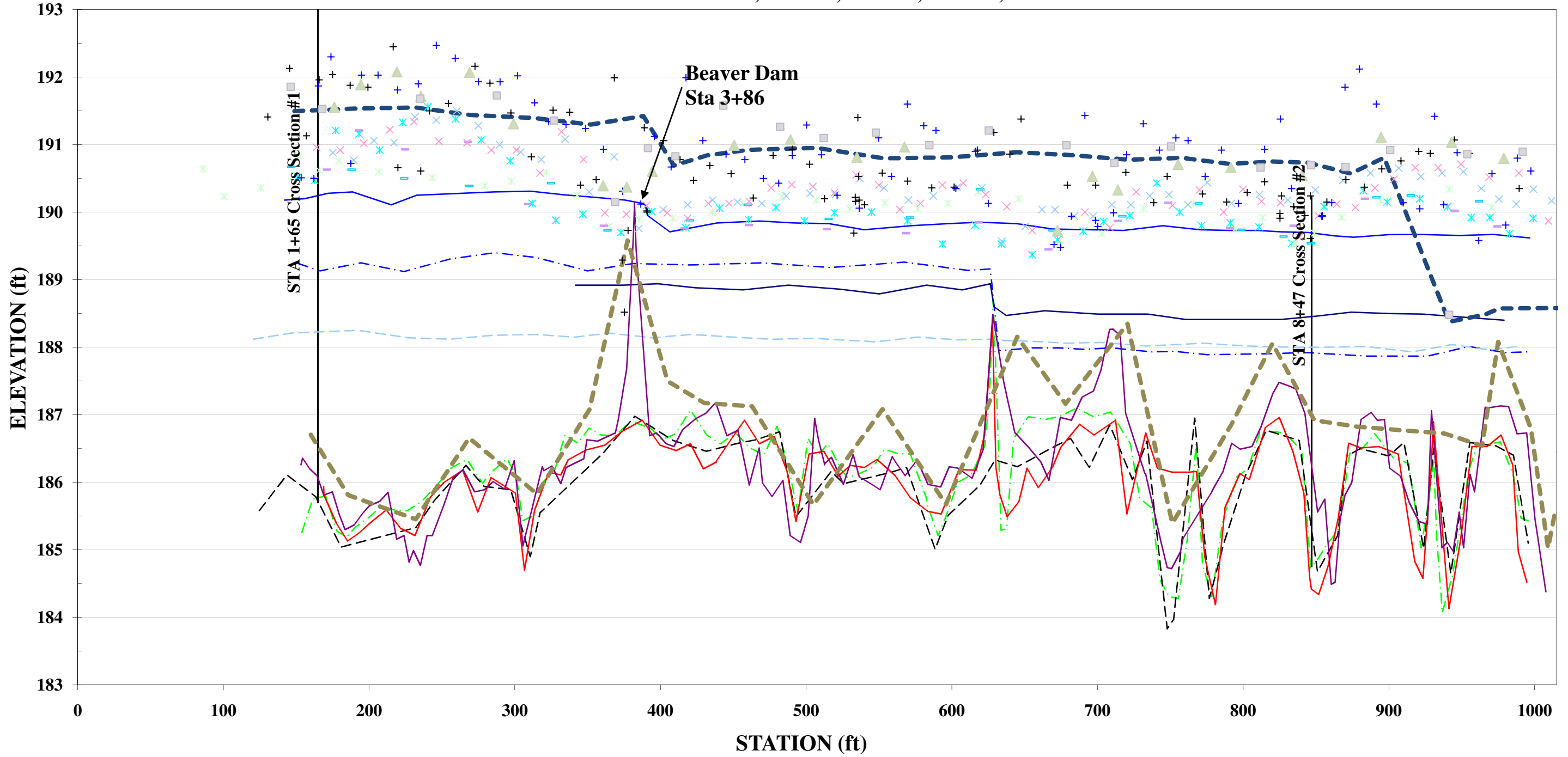
Photo of Cross-Section 9 - Looking Downstream @ STA 39+30							
	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area		57.89	64.11	62.92			
Width		23.80	24.65	26.63			
Mean Depth		2.43	2.60	2.36			
Max Depth		4.70	5.00	4.99			
W/D		9.78	9.48	11.27			

## Overhills Cross Section #9



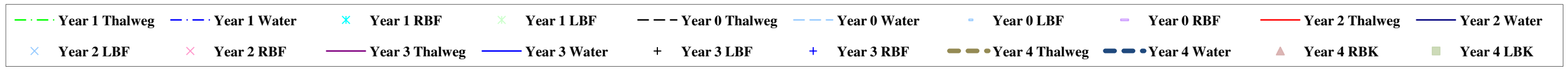
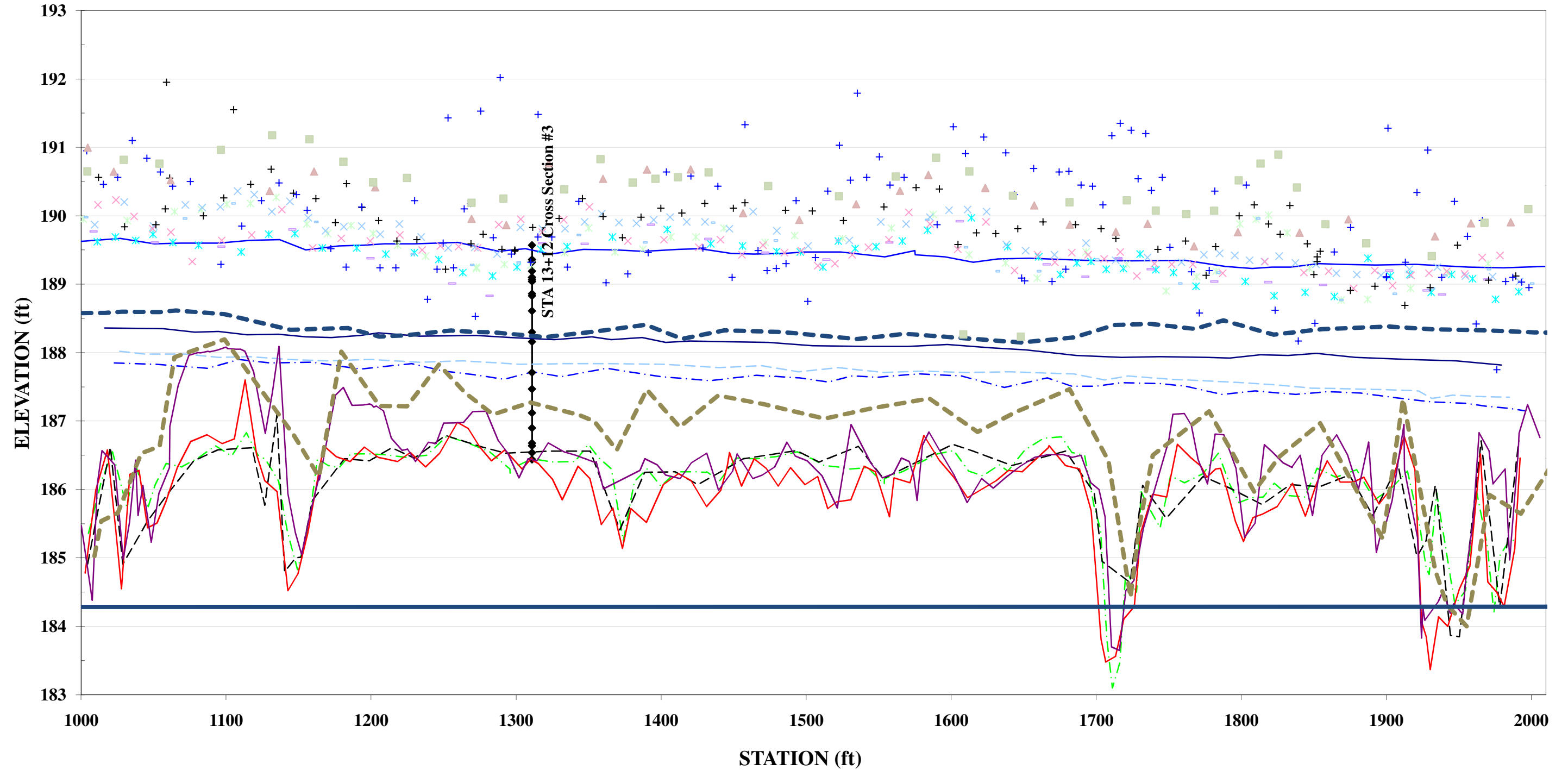
\* Baseline   
 ◆ Year 1 - 2007   
 ▲ Year 2 - 2008   
 × Year 3 - 2009   
 ● Year 4 - 2010

**Overhills Profile -Upper Reach**  
**STA 0+00 - STA 10+00**  
**2010 MONITORING - Year 0, Year 01, Year 02, Year 03, Year 04**

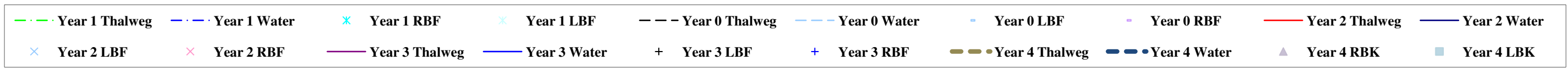
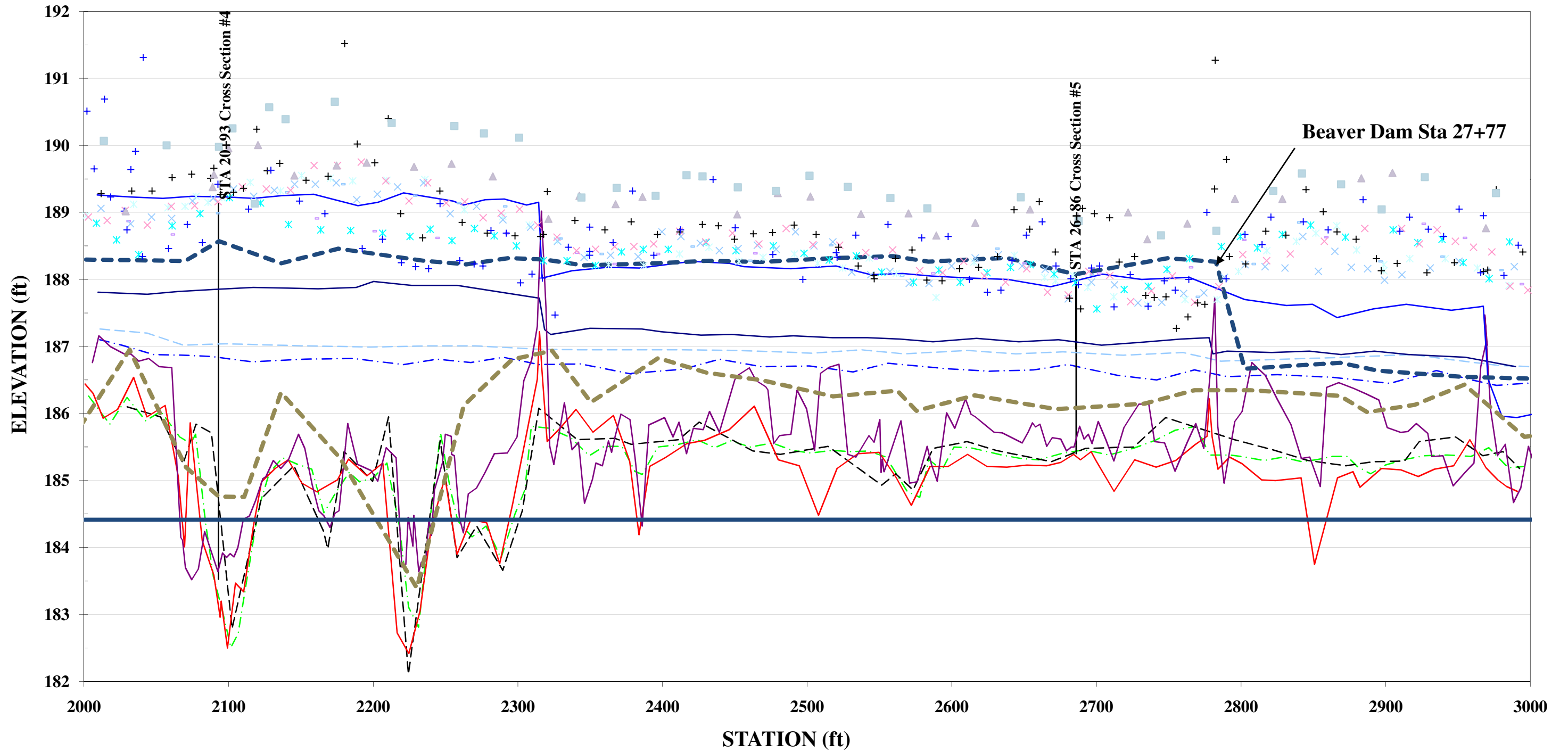




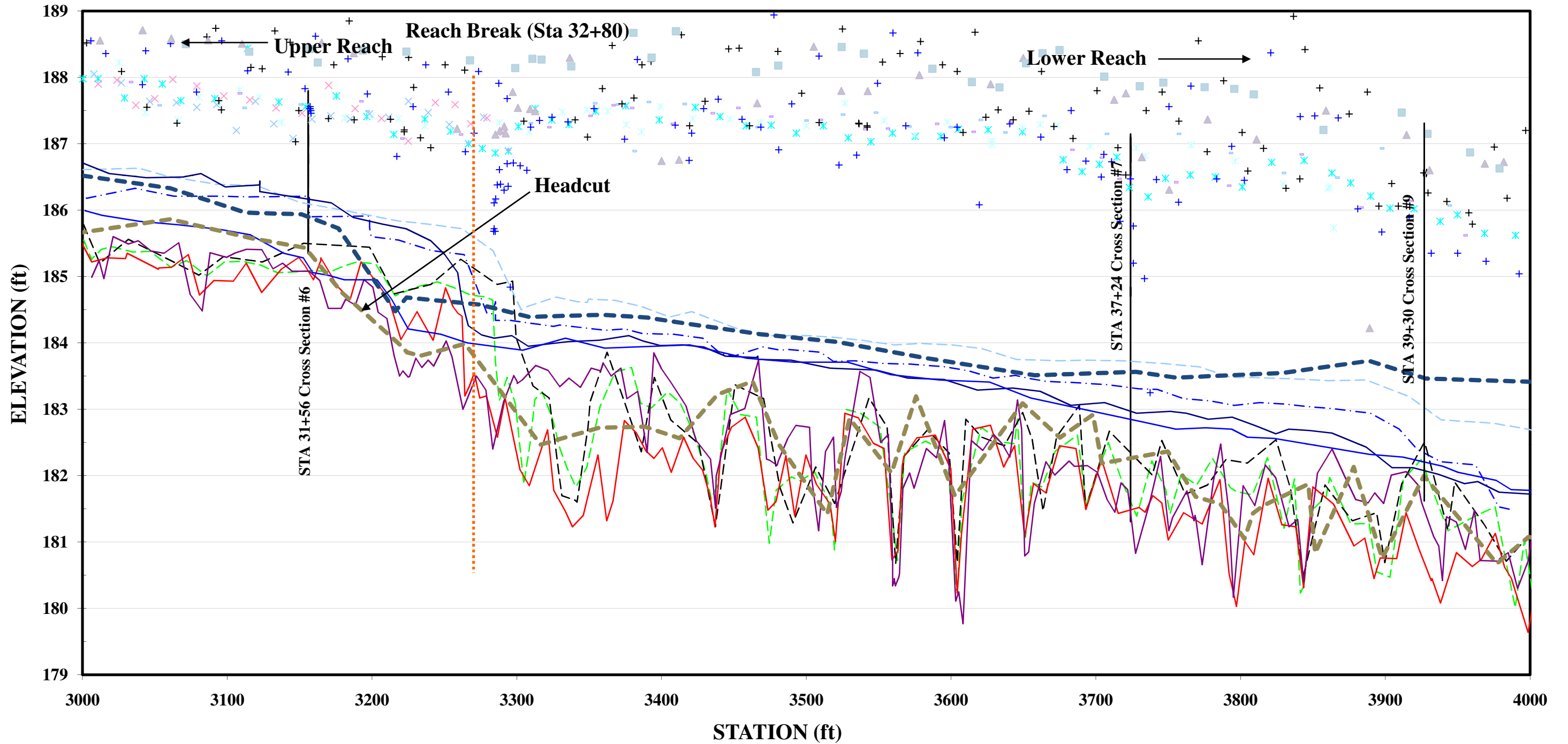
**Overhills Profile - Upper Reach**  
**STA 10+00 - STA 20+00**  
**2010 MONITORING - Year 0, Year 01, Year 02 Year 03, Year 04**



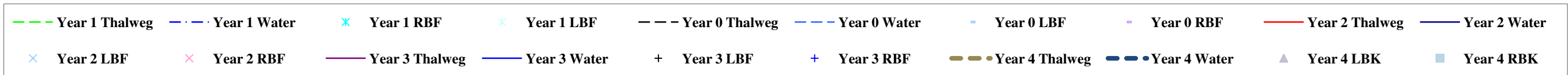
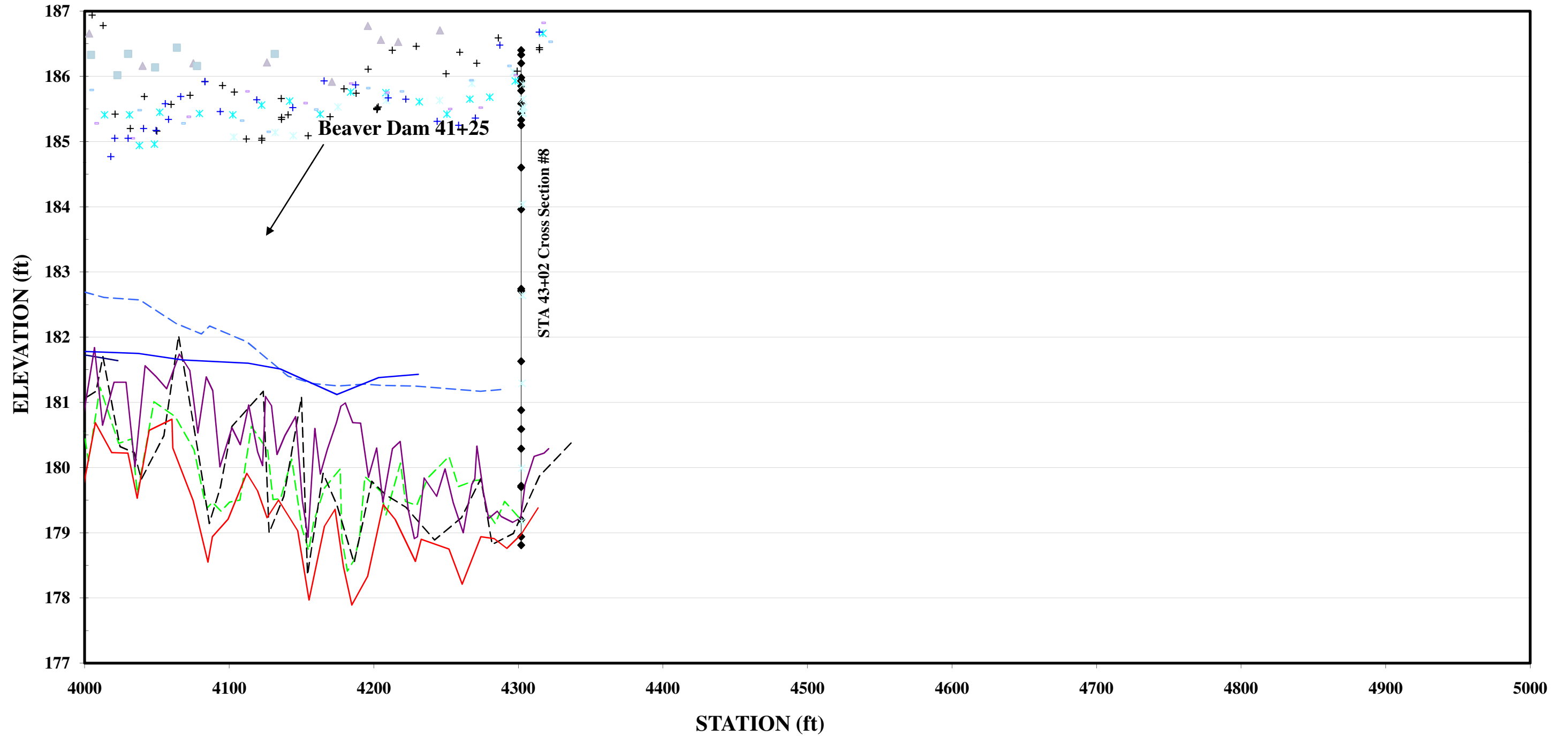
**Overhills Profile - Upper Reach**  
**STA 20+00 - STA 30+00**  
**2010 MONITORING - Year 0, Year 01, Year 02, Year 03, Year 04**



**Overhills Profile - Upper & Lower Reaches**  
**STA 30+00 - STA 40+00**  
**2010 MONITORING - Year 0, Year 01, Year 02, Year 03, Year 04**

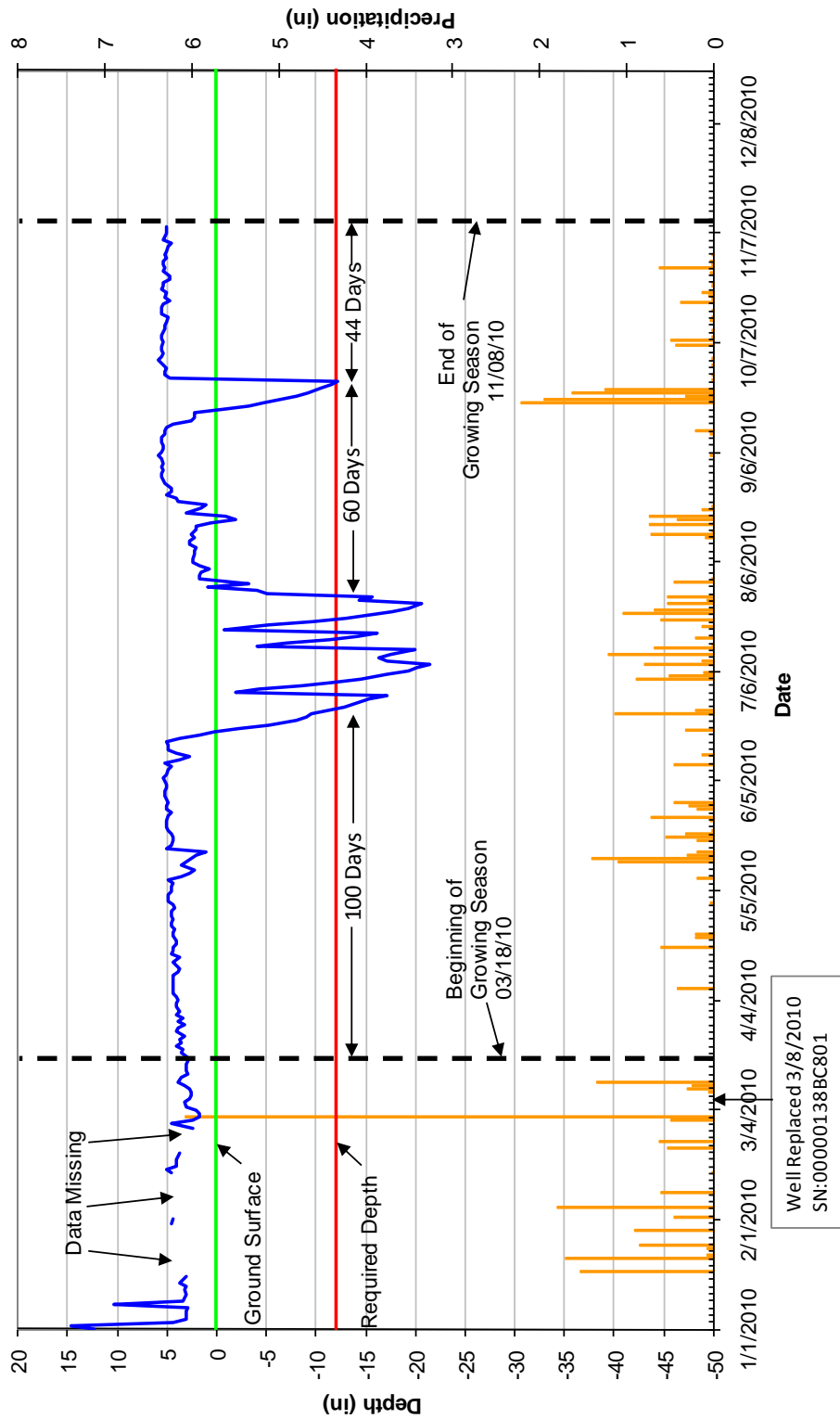


Overhills Profile  
 Lower Reach  
 STA 40+00 - STA 50+00  
 2010 MONITORING - Year 0, Year 01, Year 02, Year 03, Year 04

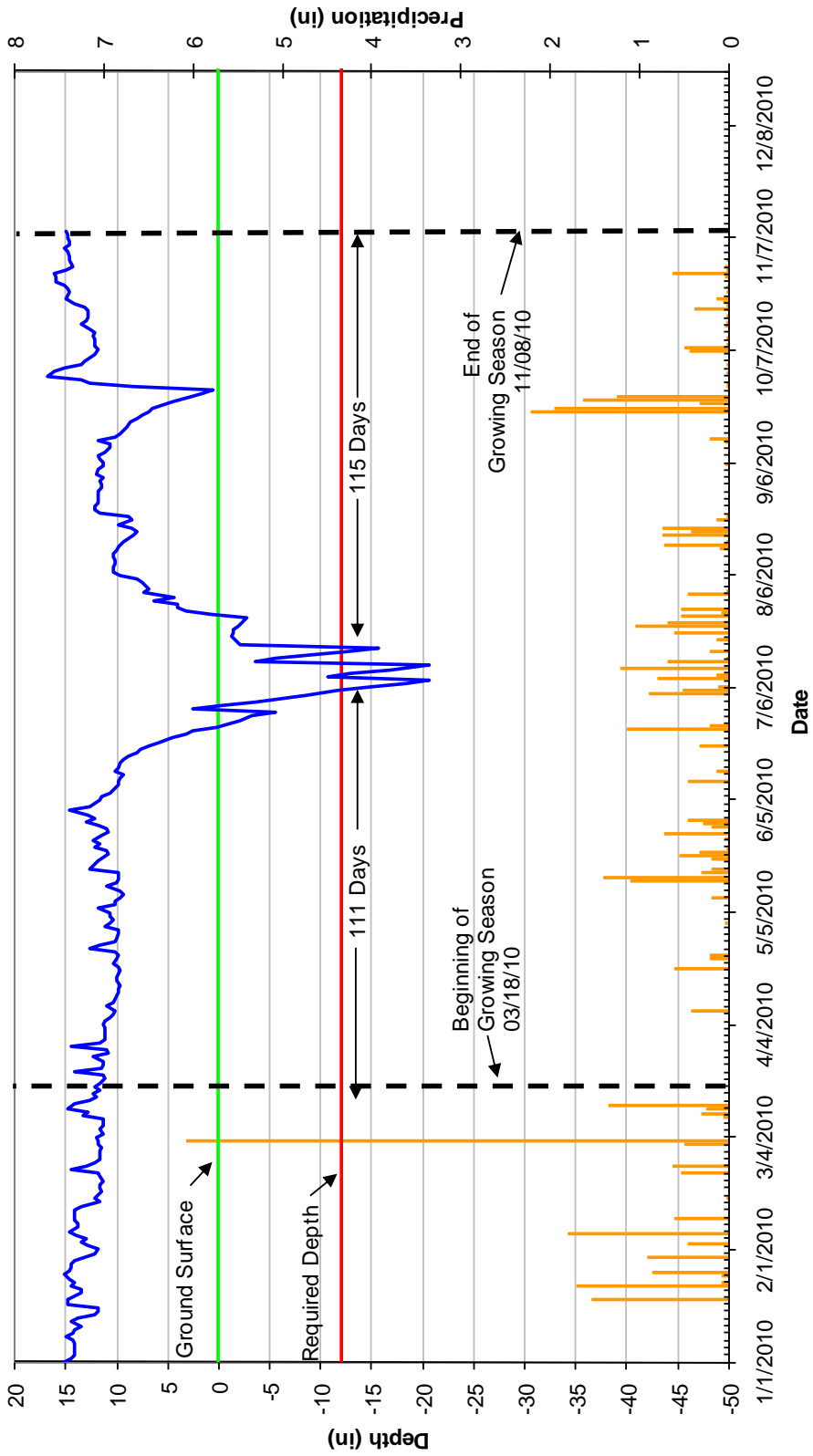


# APPENDIX E. WETLAND ASSESSMENT

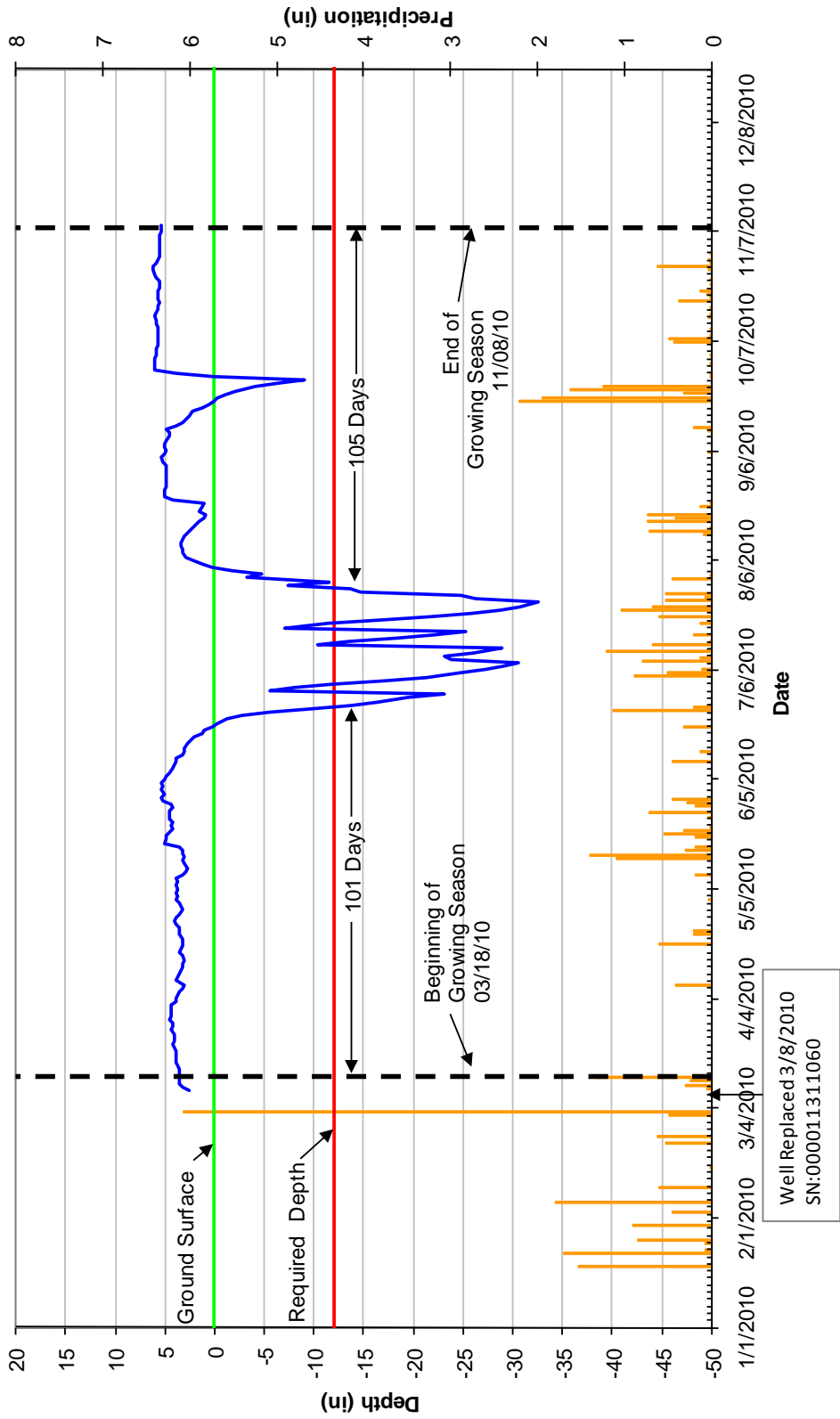
2010 Groundwater Data  
Well JR-1 (SN: 00000138BC801)



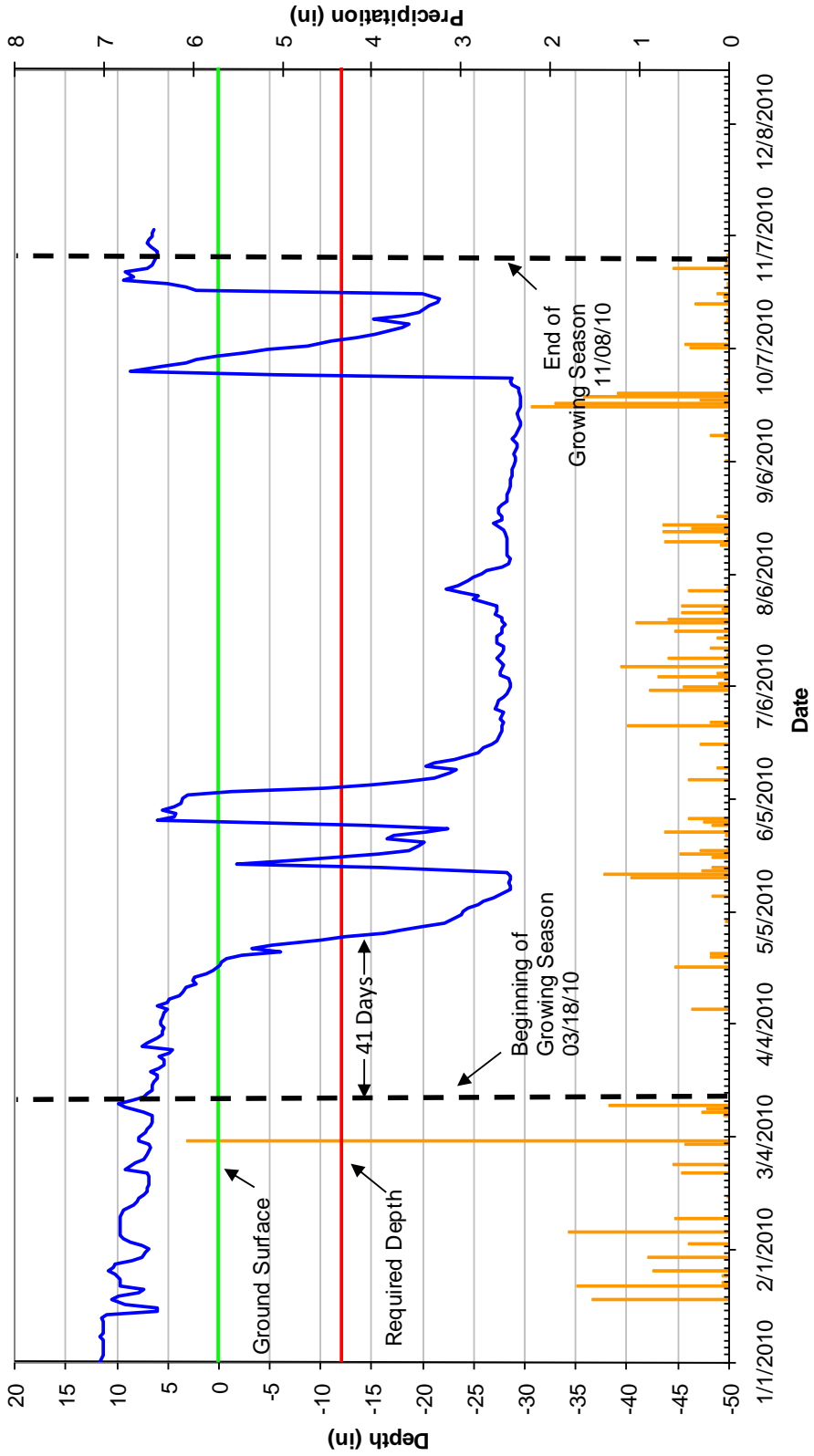
2010 Groundwater Data  
Well JR-2 (SN: 00000A28BE77)



2010 Groundwater Data  
Well JR-3 (SN: 0000011311060)

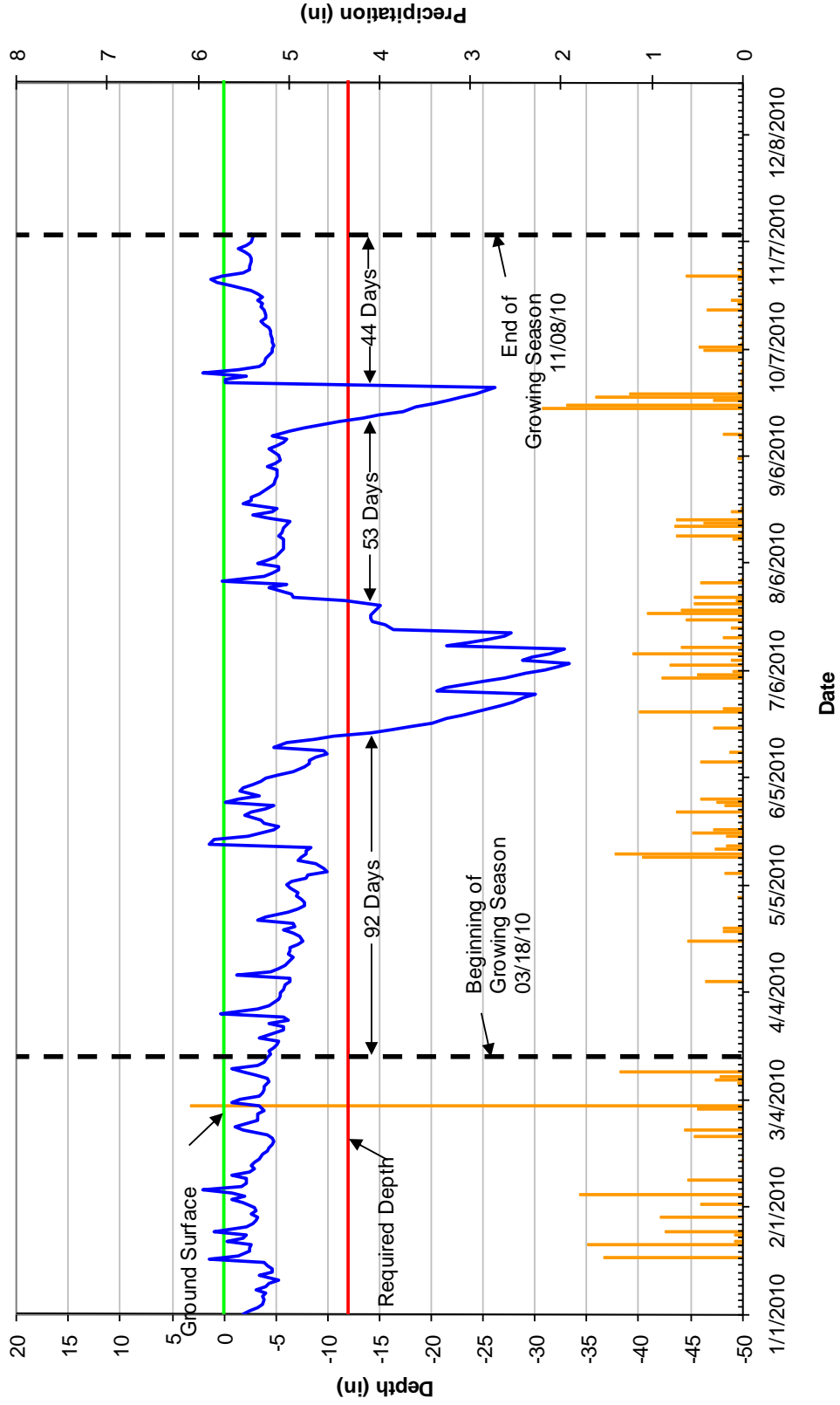


2010 Groundwater Data  
Well JR-4 (SN: 00000A28813D)

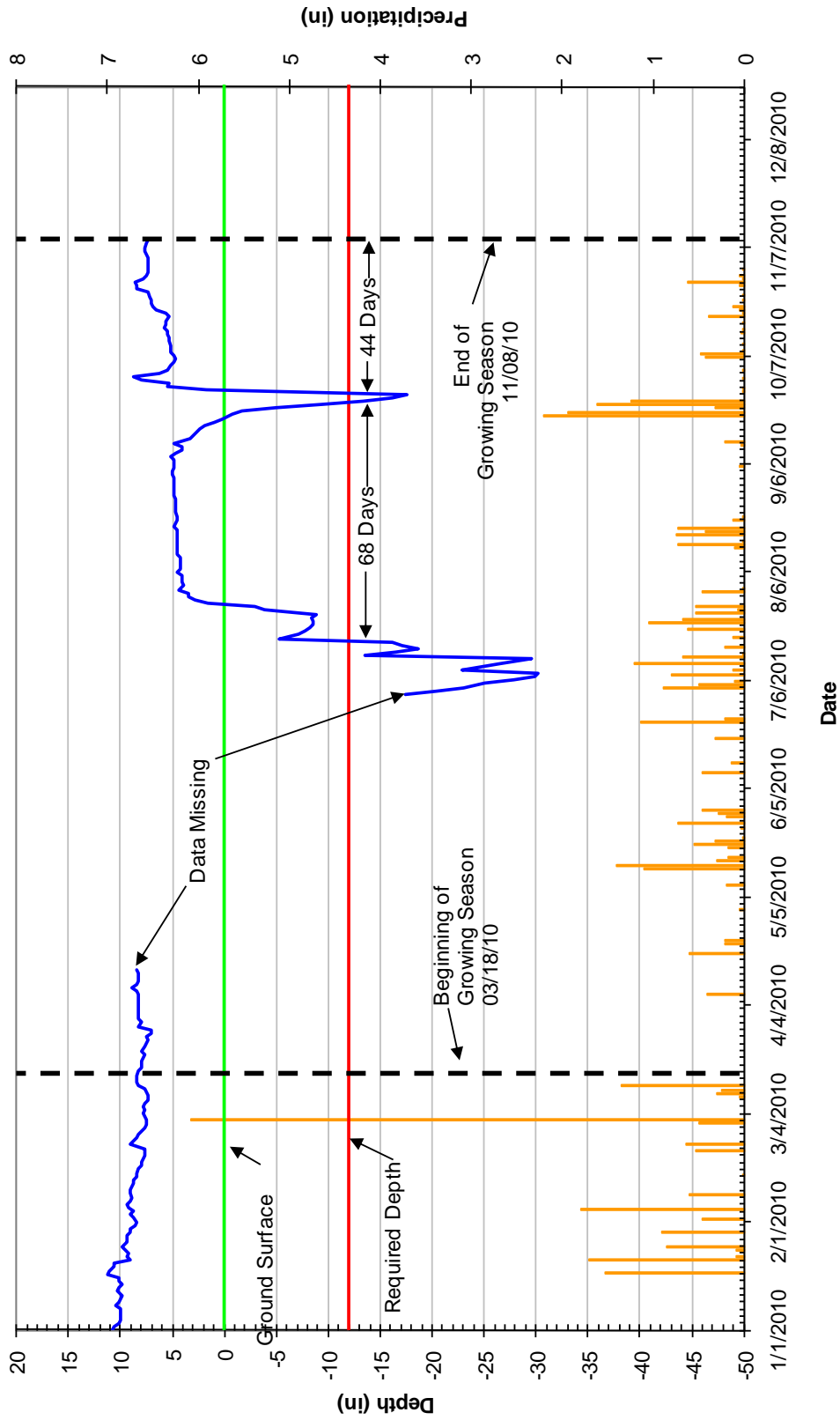




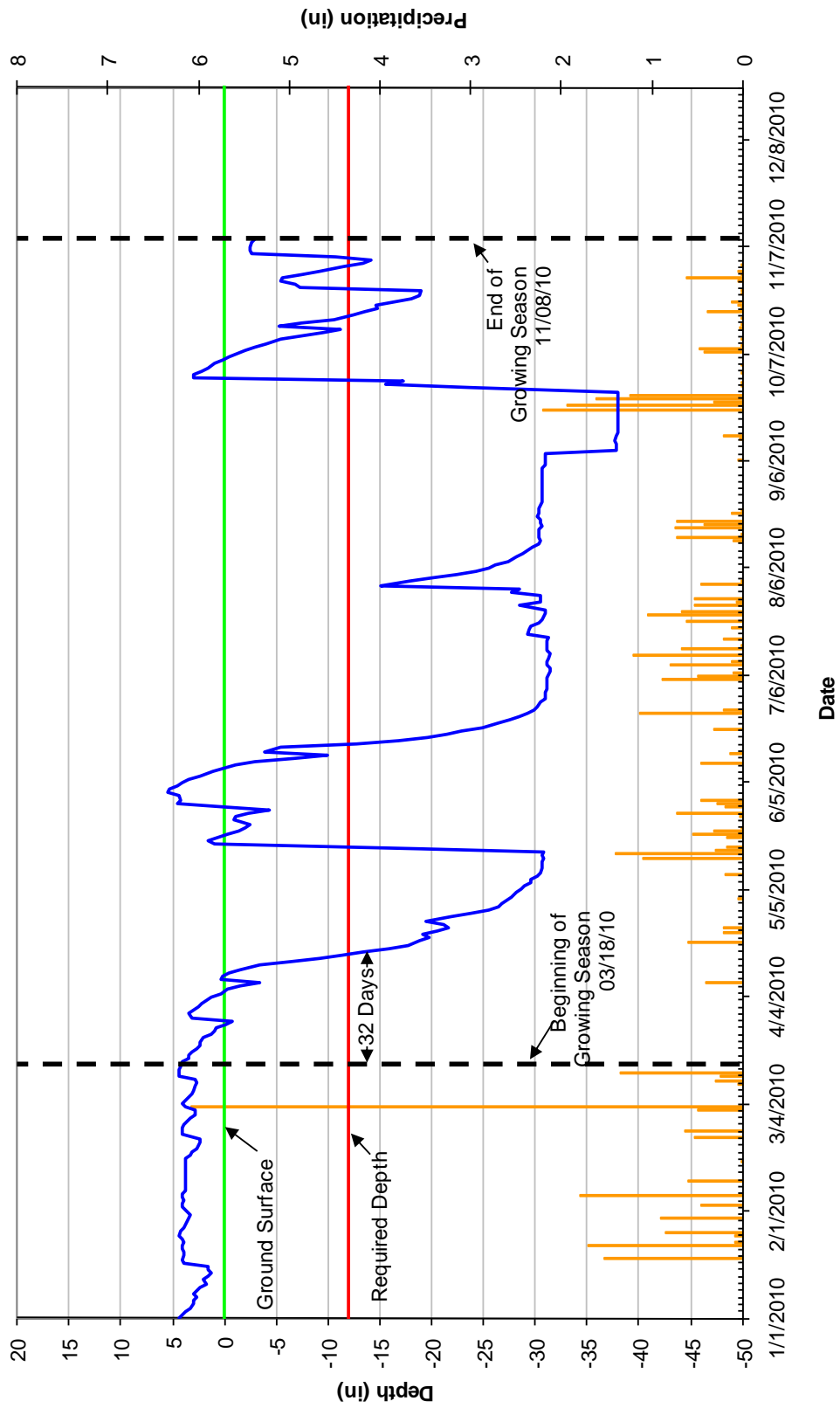
2010 Groundwater Data  
Well JR-5 (SN: 00000A278DE1)



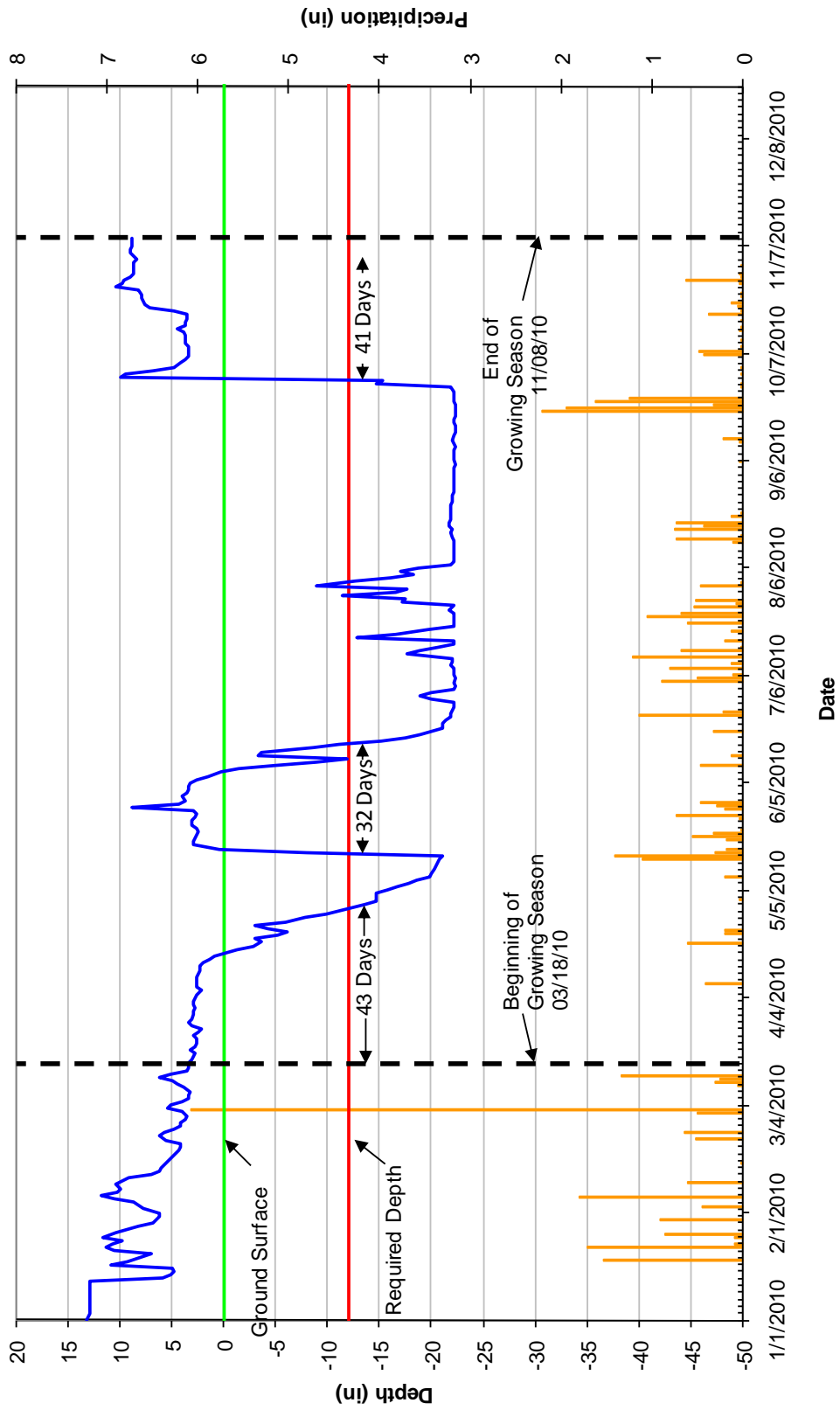
2010 Groundwater Data  
Well JR-6 (SN: 000011313014)



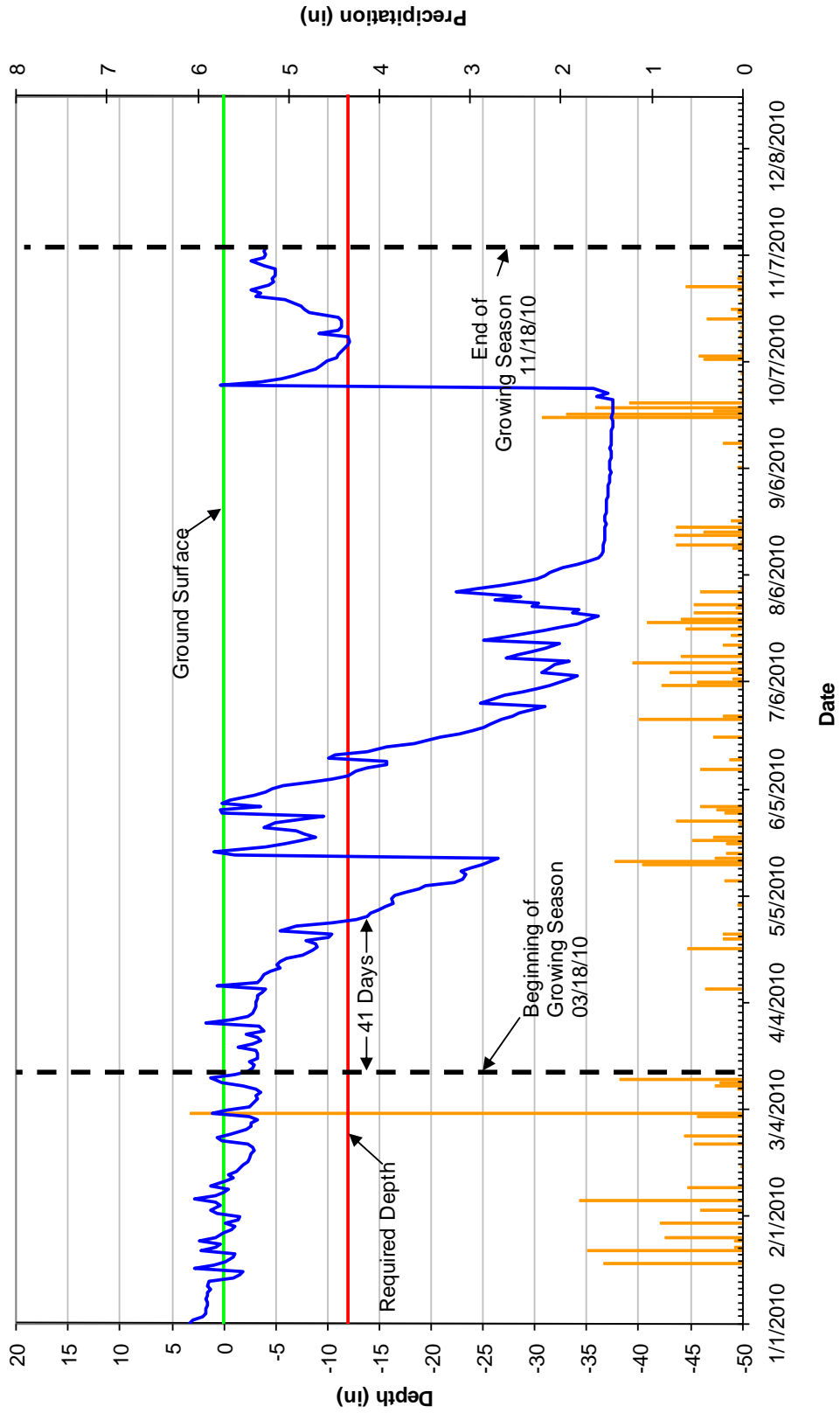
2010 Groundwater Data  
Well JR-7 (SN: 00000AB36E51)



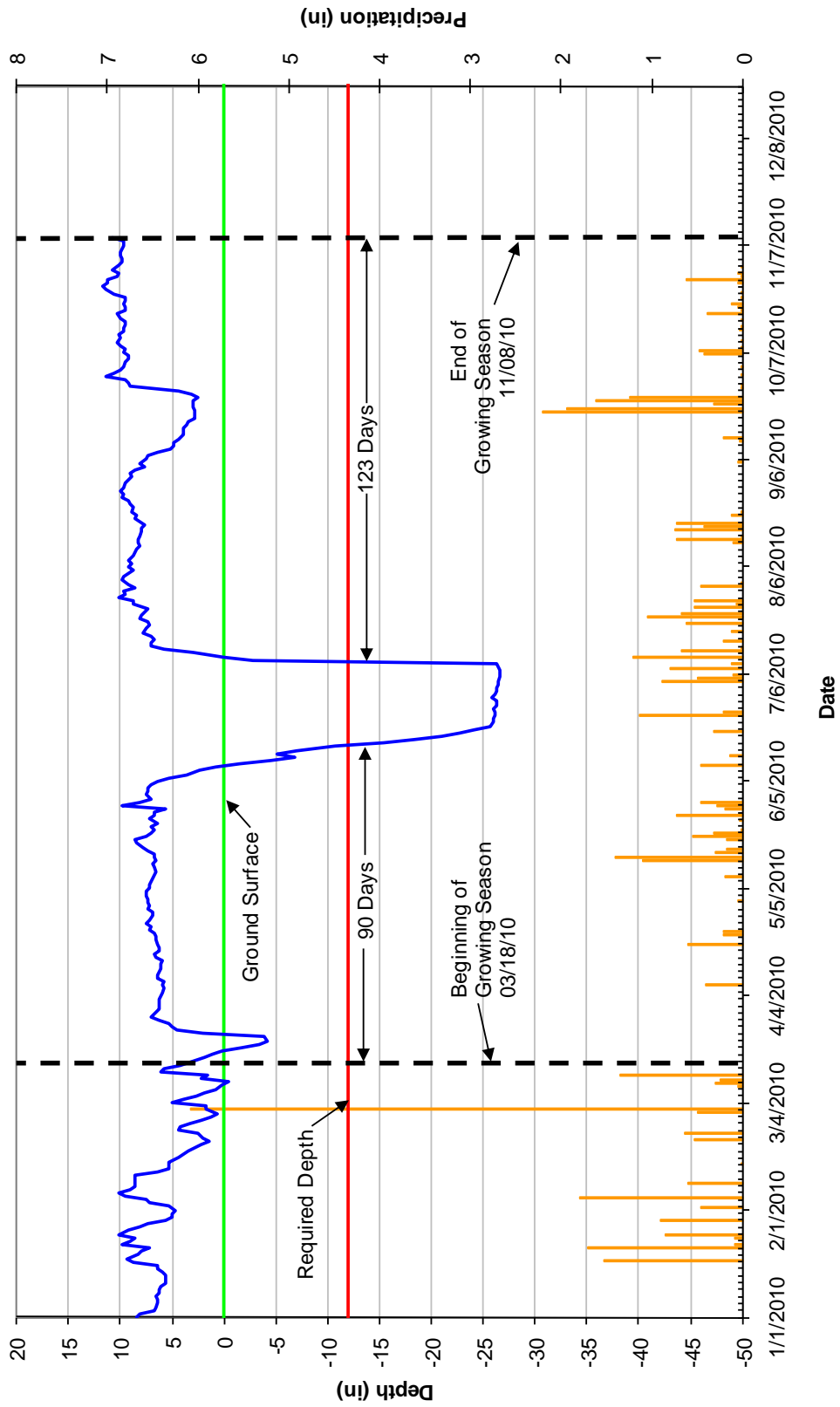
2010 Groundwater Data  
Well JR-8 (SN: 00000136ACA3C)



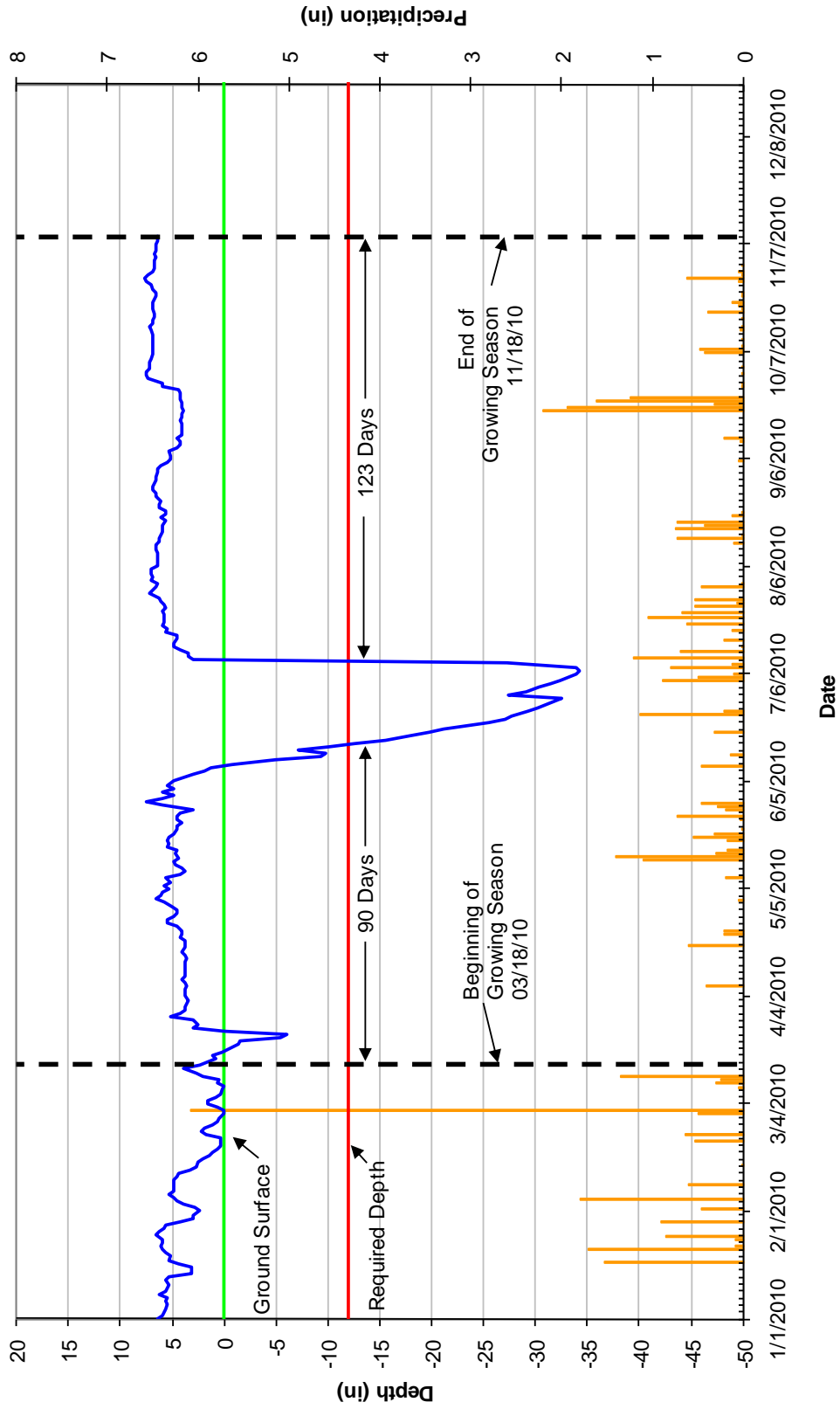
2010 Groundwater Data  
Well JR-9 (SN: 00000EBDAB32)



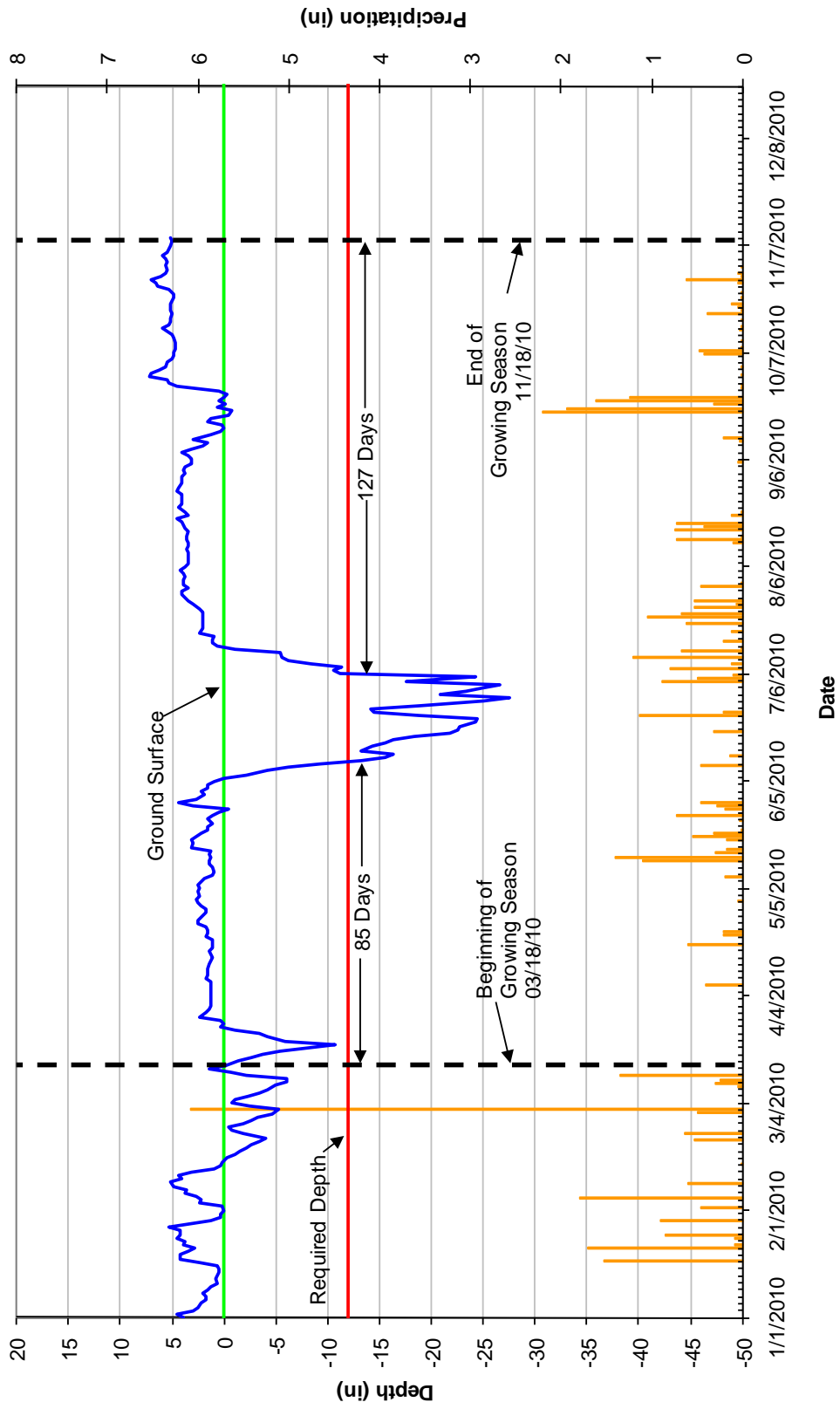
2010 Groundwater Data  
Well JR-10 (SN: 000009DE3E2D)



2010 Groundwater Data  
Well JR-11 (SN: 000009DE69AB)

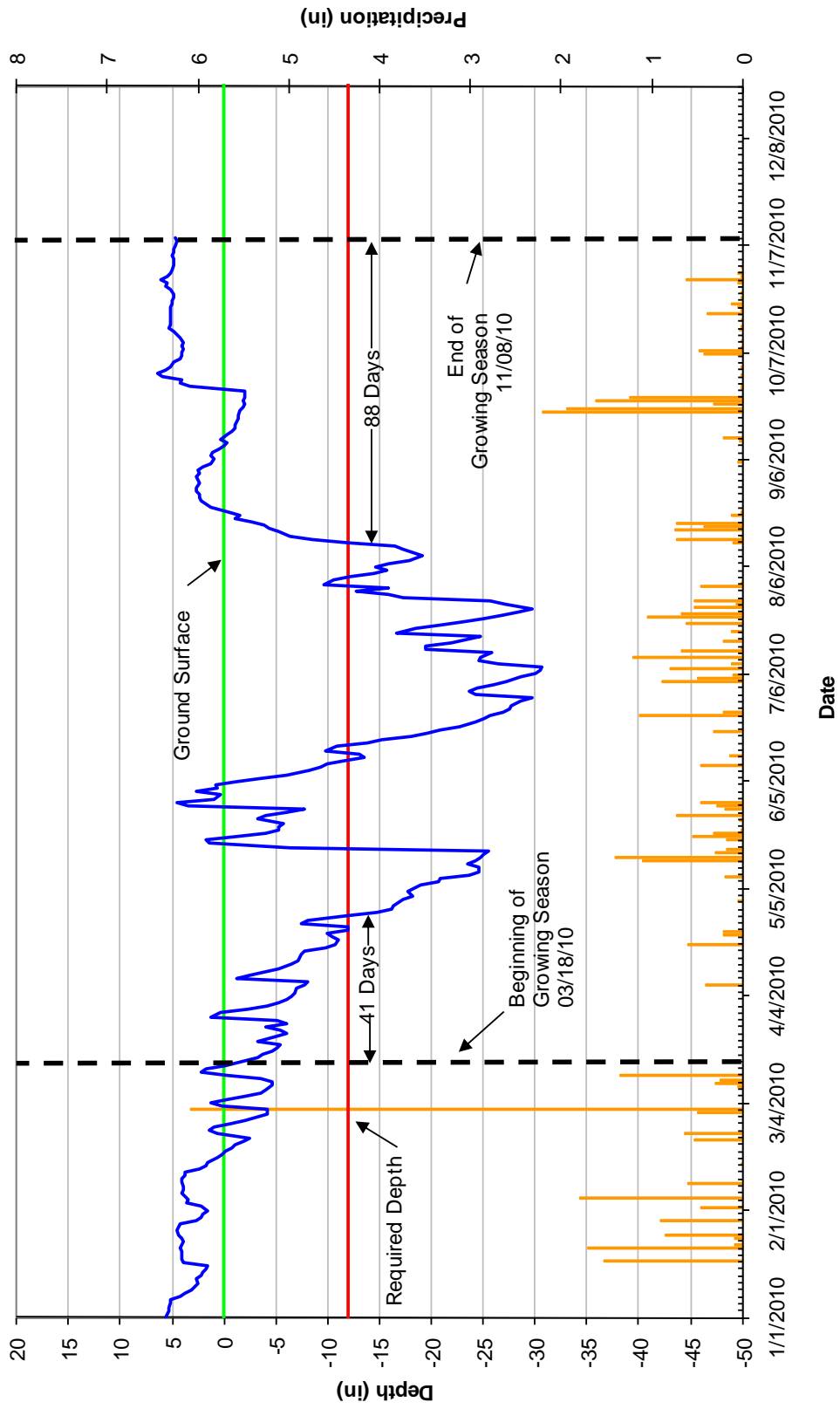


2010 Groundwater Data  
Well JR-12 (SN: 00000A28A6E4)

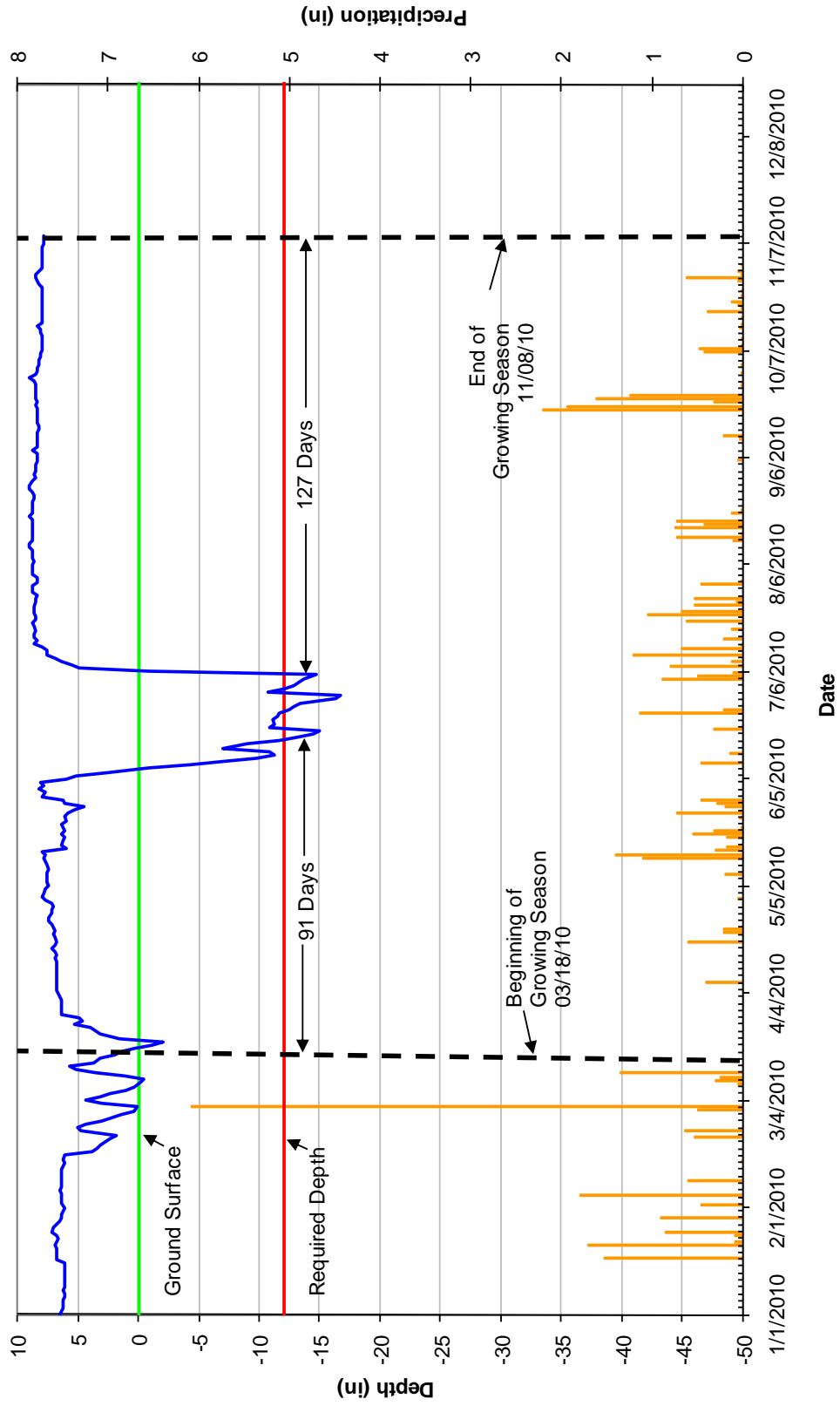




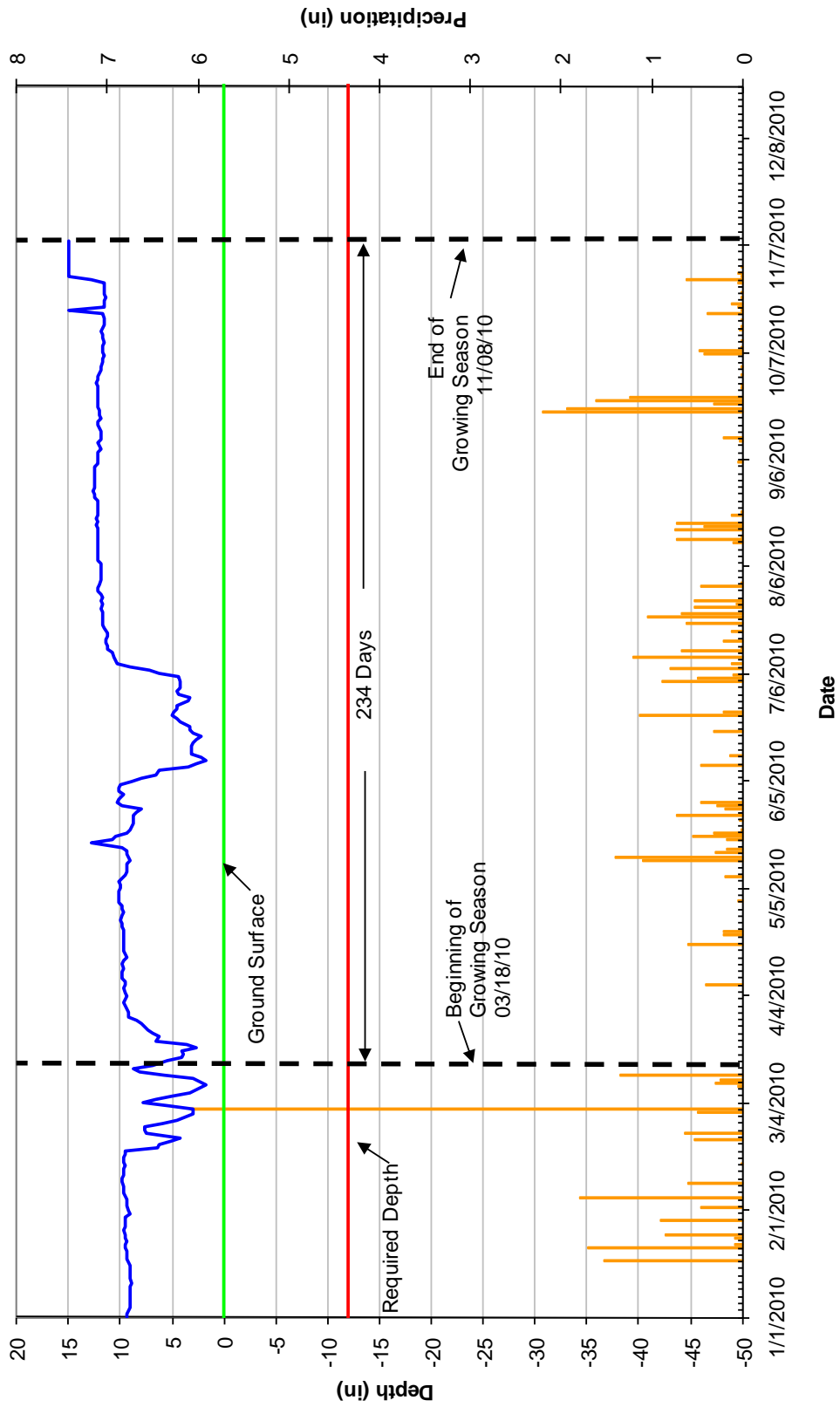
2010 Groundwater Data  
Well JR-13 (SN: 00000A28BC50)



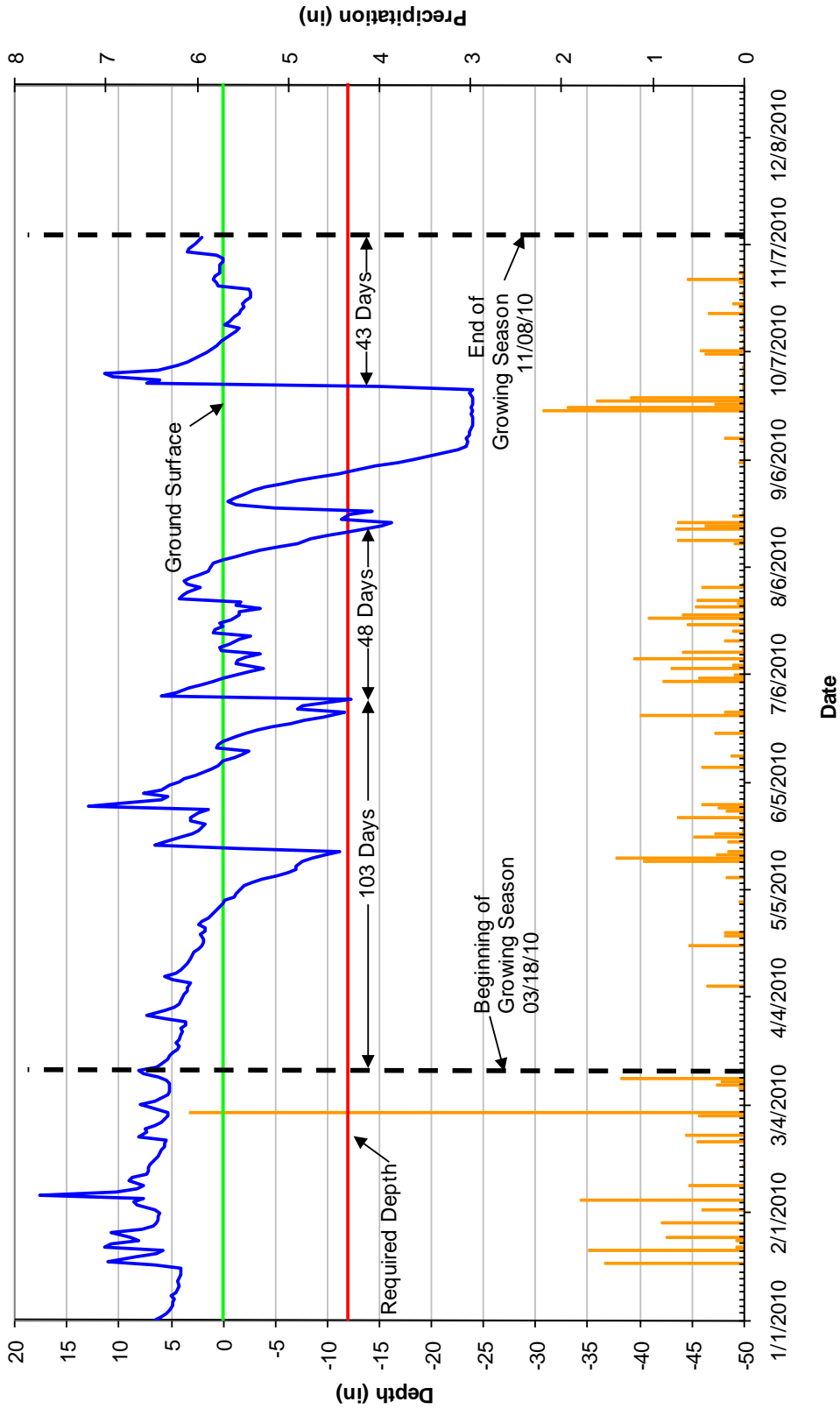
2010 Groundwater Data  
 Well JR-14 (SN: 00000A285751)



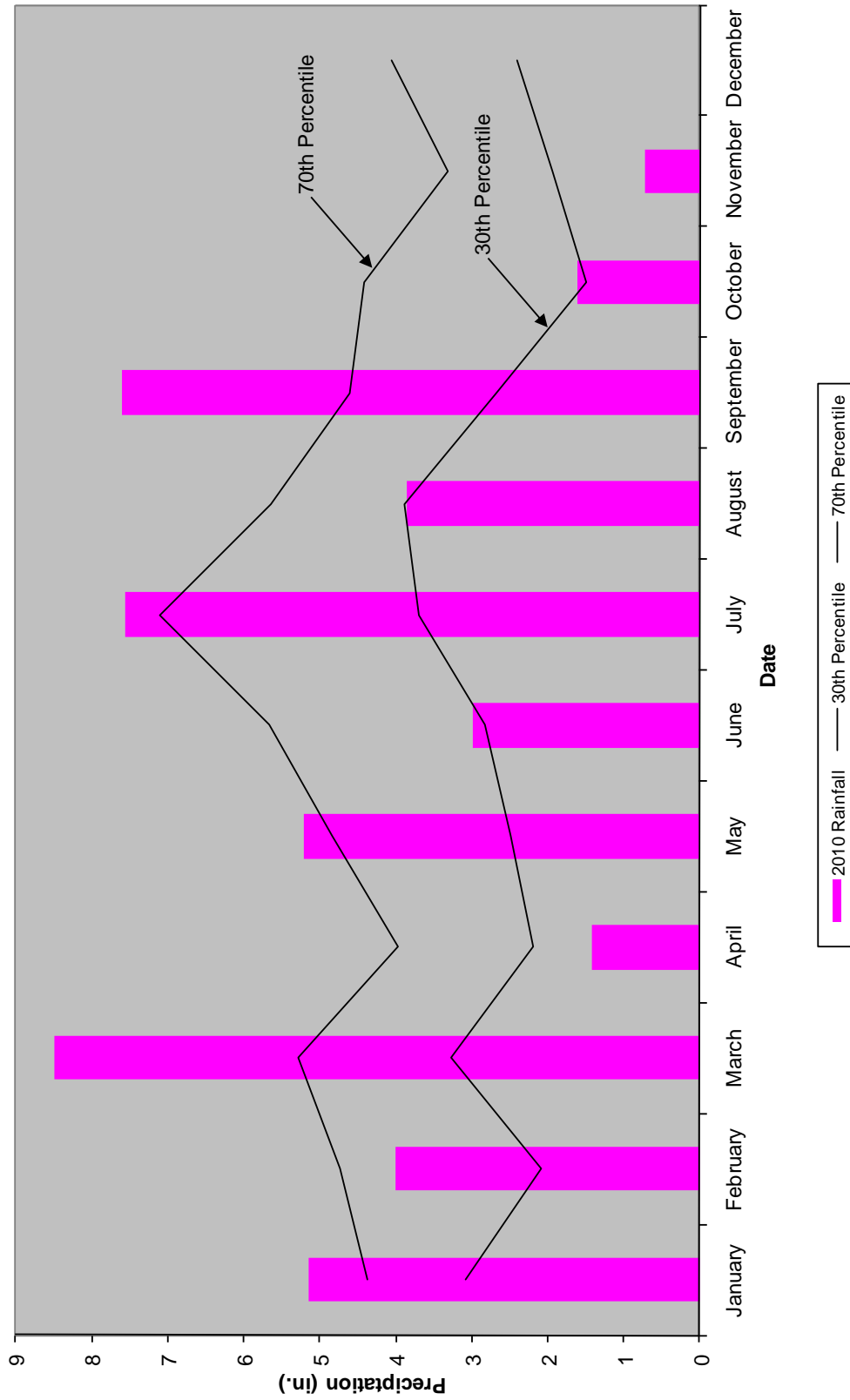
2010 Groundwater Data  
Well JR-15 (SN: 00000138BD32A)



2010 Groundwater Data  
Reference Well 1 (SN: 00000EBD001B)



2010 Overhills 30-70 Percentile Graph  
Harnett County, North Carolina



<b>Table 10 - Summary of Groundwater Results for Years 1 - 5 Overhills/Jumping Run Creek Restoration Project / EEP Project No. 199</b>					
<b>Guage</b>	<b>Success Criteria Achieved/Max Consecutive Days During Growing</b>				
	<b>Year 1 (2007)</b>	<b>Year 2 (2008)</b>	<b>Year 3 (2009)</b>	<b>Year 4 (2010)</b>	<b>Year 5 (2011)</b>
GW1	Yes/57 days (24 percent)	Yes/148 days (63 percent)	Yes/159 days (68 percent)	Yes/204 days (87 percent)	
GW2	Yes/67 days (29 percent)	Yes/188 days (80 percent)	Yes/234 days (100 percent)	Yes/226 days (97 percent)	
GW3	Yes/63 days (27 percent)	Yes/149 days (64 percent)	Yes/234 days (100 percent)	Yes/206 days (88 percent)	
GW4	Yes/61 days (26 percent)	Yes/135 days (58 percent)	Yes/234 days (100 percent)	Yes/41 days (18 percent)	
GW5	No	Yes/129 days (55 percent)	Yes/234 days (100 percent)	Yes/189 days (81 percent)	
GW6	Yes/52 days (22 percent)	Yes/146 days (62 percent)	Yes/234 days (100 percent)	Yes/112 days (48 percent)	
GW7	Yes/56 days (24 percent)	Yes/108 days (46 percent)	Yes/97 days (41 percent)	Yes/32 days (14 percent)	
GW8	Yes/65 days (28 percent)	Yes/205 days (88 percent)	Yes/234 days (100 percent)	Yes/116 days (50 percent)	
GW9	Yes/56 days (24 percent)	Yes/138 days (59 percent)	Yes/234 days (100 percent)	Yes/41 days (18 percent)	
GW10	No	Yes/73 days (31 percent)	Yes/63 days (27 percent)	Yes/213 days (91 percent)	
GW11	No	Yes/39 days (17 percent)	Yes/70 days (30 percent)	Yes/213 days (91 percent)	
GW12	No	Yes/33 days (14 percent)	Yes/88 days (38 percent)	Yes/212 days (91 percent)	
GW13	No	Yes/90 days (38 percent)	Yes/228 days (97 percent)	Yes/129 days (55 percent)	
GW14	No	Yes/87 days (37 percent)	Yes/140 days (60 percent)	Yes/218 days (93 percent)	
GW15	Yes/45 days (19 percent)	Yes/140 days (60 percent)	Yes/233 days (99 percent)	Yes/234 days (100%)	
Reference	N/A	Yes/166 days (71 percent)	Yes/213 days (91 percent)	Yes/194 days (83 percent)	