OVERHILLS STREAM AND WETLAND RESTORATION

MONITORING REPORT (YEAR 1 OF 5)

Harnett County, North Carolina
NCEEP Project Number 199

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

Status of Plan: Final
Submission Date: March 2008

Monitoring Firm:

Stantec Consulting Services Inc
801 Jones Franklin Road, Suite 300
Raleigh, NC 27606

EXECUTIVE SUMMARY

Project Background

The North Carolina Ecosystems Enhancement Program (EEP) restored 4,482 linear feet of Jumping Run Creek and 70 acres of adjacent riverine 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 following report provides the monitoring information for year one (1) of the stream and wetland restoration project. The project consists of a portion of Jumping Run Creek and the adjacent riverine wetland. The site is located on the Fort Bragg Military Reservation in Harnett County, North Carolina and can be accessed from Nursery Road between NC 87 and Overhills Road. Project goals and objectives for the Overhills stream restoration project included restoration of stream dimension, pattern, and profile; restoration of riverine wetland hydrology and vegetation; improvement of water quality; and protection of future water quality. Jumping Run Creek had been significantly altered from its natural path prior to the restoration efforts. The channel was relocated from its natural path to the far edge of its floodplain. The purpose of this type of relocation was typically to improve drainage of the surrounding area and create a large field for agricultural purposes. The adjacent riverine wetlands were also significantly altered due to the stream relocation. In addition a ditch that was created on the eastern edge of the property. Undeveloped forested land is located to the east and west of the project site. An agriculture field is located to the north and Nursery Road serves as the southern boundary. The Jumping Run Creek watershed is comprised of a mixture of undeveloped forested land, wetlands, suburban residential areas, commercial areas, and a large golf course community. The watershed has a drainage area of 15.9 square miles. The topography of the watershed is typical sandhills type topography which is rolling in nature.

Vegetation Assessment

The Carolina Vegetation Survey (CVS) methodology was utilized to sample vegetation in October of 2007. Ten 100m^2 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 320 3-year old planted trees per acre at the end of year 3 of the monitoring period. Six of the plots have over 320 stems per acre while four of the plots have less than 320 stems per acre. In addition to the four failing vegetation plot sites, several vegetation problem areas (VPA) exist on site. In VPA 1 and 2, standing water had been present for a substantial length of time, causing the majority of the planted vegetation to die. VPA 3 is overrun with invasive species, primarily *Lespedeza. Lespedeza* is a major problem on this project site, as it is also invading most high areas.

Stream Assessment

The region has been in an extreme drought for much of 2007. No evidence of bankfull flows were observed onsite and flows were not measured with peak stage recorders. In order to verify bankfull events, a crest gauge should be installed onsite.

A major stream problem area is located from station 33+00 to 44+00 (1100 linear feet) where the stream has experienced serious failure. At Station 33+00 a head cut has developed and produced massive erosion around the bend at this location. Downstream from this head cut, most of the in-stream structures have failed. Erosion around the structures has forced the banks to migrate in as much as seven feet, making this section of stream extremely unstable. Mid-channel bar formation is also occurring along the reach. Other major issues include the presence of a beaver dam near Station 6+30. The dam is causing a hydraulic jump, producing scour downstream. Minor erosion problem areas were found from station 0+00 to station 32+00 of the restoration reach. Erosion causes were attributed to root wad failure in some cases, and shear stress in others. The placement and/or installation of some root wads has caused scouring along with bank erosion and migration from eddies that form around and behind the root wad structures.

Given the extent of the deterioration of this 1100 linear foot portion of the restoration reach, it will not be possible to repair the stream around the failed structures, or to rebuild or replace structures without addressing the characteristics of the stream. The stream has migrated vertically and is actively migrating horizontally. There are too many failed structures, and the potential for future bank erosion and additional horizontal migration is too great for a simple repair. The stream channel in this location has eroded below a clay layer into a highly erosive sandy soil layer which will continue to create stability problems. The channel should be realigned with the appropriate pattern, dimension, and structures that will adequately transition from the higher elevation of the restoration to the receiving stream which is at a lower elevation. There is room on the right side of the existing alignment to be able to develop a new pattern that will provide the correct channel dimensions, grade control structures, and step pools needed to dissipate energy though this section of the reach. This action will stop the head cut from continuing upstream causing further damage to the restored channel. The majority of the materials needed for construction could be salvaged from the impaired reach.

Wetland Assessment

Fifteen groundwater monitoring wells are currently active on the project site. Nine of the wells met the criteria of wetland attainment during the growing season of 2007, but six did not. Well JR-5 had a maximum of 24 consecutive days (10%) where the ground was saturated within 12 inches of the surface. Wells JR-10 and JR-11 had a maximum of 7 days (3%), JR-12 a maximum of 6 (3%), JR-13 21 days (9%), and JR-14 a maximum of 12 days (5%). No conclusions regarding the success or failure of wetland areas in the project area can be made at this time due to a short period of reference well data. A reference well was installed in early October, 2007, for a reference well record of just over a month at the time of this report. Given that precipitation was below the 30% percentile for the area during most of the growing season, the failure of some gauges to indicate hydrologic success is not cause for significant concern.

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1.0 Project Background

The project consists of a portion of Jumping Run Creek and the adjacent riverine wetland. The site is located on the Fort Bragg Military Reservation in Harnett County, North Carolina.

1.1 PROJECT OBJECTIVES

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

- restore stream dimension, pattern and profile
- restore riverine wetland hydrology and vegetation
- improve water quality
- protect future water quality

1.2 PROJECT STRUCTURE

The project consists of a portion of Jumping Run Creek and the adjacent riverine wetland. The site is located on the Fort Bragg Military Reservation in Harnett County, North Carolina.

Jumping Run Creek has been significantly altered from its natural path prior to the restoration efforts. The channel was relocated from its natural path to the far edge of its floodplain. The purpose of this type of relocation was typically to improve drainage of the surrounding area and create a large field for agricultural purposes. The existing channel was dug approximately 5-8 feet deep and about 15 feet wide at the stream bed to 20+ feet wide at the top of bank. The stream classification system for the existing reach of this project was a G4/G5c. The adjacent riverine wetlands were also significantly altered due to the stream relocation as well as a ditch that was created on the eastern edge of the property.

Priority 1 stream restoration was carried out on the entire reach resulting in restored C type channel. The pattern, dimension, and profile were restored throughout the project site by relocating the entire reach of stream. Log structures and root wads were installed to provide grade control, extra bank protection, and encourage development of bedform features. In wetland restoration areas, a mixture of grading to create microtopography, channel plugs, and berms were used manipulate and enhance the hydrology of the site. Two vegetative communities or zones were planted in the project area. One was the bottomland hardwood forest planted through the riverine wetland and the second was the stream corridor.

Exhibit Table I. Project Restoration Components Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199								
	Existing Feet/Acres	Type	Approach	Footage or Acreage	Mitigation Ratio	Mitigation Units	Stationing	Comment
Stream	3064	R	P1	4482	1.0	4482	10+00.0 to 55+00.0	includes log structures and root wads
Riparian Wetlands	NA	R	-	70.0	1.0	70.0		floodplain of restored stream

R = Restoration
P1 = Priority 1
P = Preservation

1.3 LOCATION AND SETTING

The restoration site is located on the Fort Bragg Military Reservation in Harnett County, North Carolina can be accessed from Nursery Road between NC 87 and Overhills Road (Figure 1).

Undeveloped forested land is located to the east and west of the project site. An agriculture field is located to the north and Nursery Road serves as the southern boundary. The Jumping Run Creek watershed is comprised of a mixture of undeveloped forested land, wetlands, suburban residential areas, commercial areas, and a large golf course community. The watershed has a drainage area of 15.9 square miles. The topography of the watershed is typical sandhills type topography which is rolling in nature.

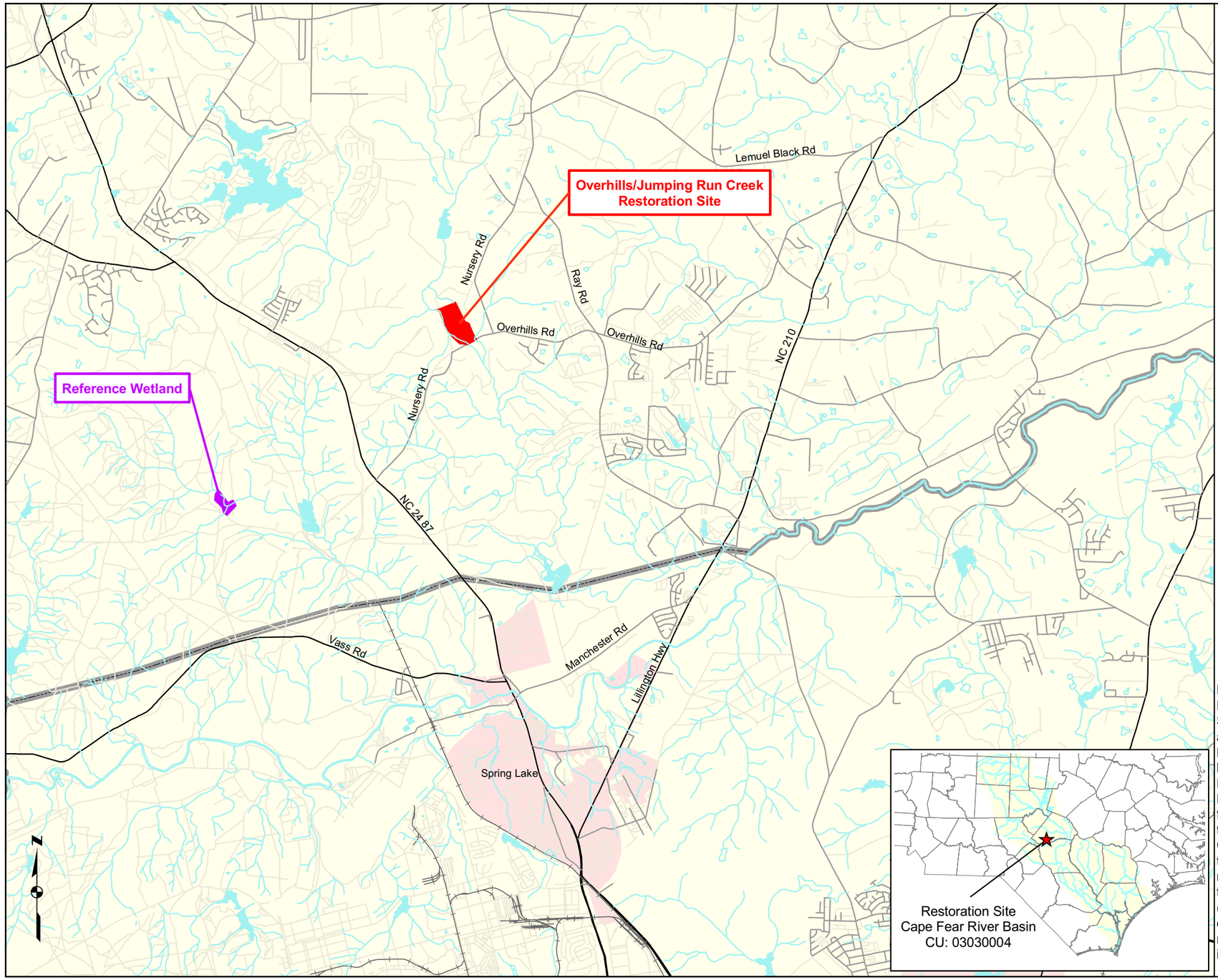

Figure 1. Location Map

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

Mitigation Plan
November 2007

0 0.5 1 2 3 Miles

- 1:24000 Hydrography
- NCDOT Primary Roads
- NCDOT Secondary Roads
- Railroads
- 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.

1.4 PROJECT HISTORY AND BACKGROUND

Exhibit Table II. 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 (2004-2006)	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 (Year 0 Monitoring - baseline)	July 2007	Nov 2007
Year 1 Monitoring	Nov 2007	Nov 2007
Year 2 Monitoring	NA	NA
Year 3 Monitoring	NA	NA
Year 4 Monitoring	NA	NA
Year 5 Monitoring	NA	NA

NA = Not Applicable

Exhibit Table III. Project Component Table 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	NA
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 919-851-6866 Amber Coleman 919-851-6866 Amber Coleman 919-851-6866

Exhibit Table IV. 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	
Percent of project easement fenced	0%

1.5 MONITORING PLAN VIEW

See Monitoring Plan View Sheets on the following pages.

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OVERHILLS

(Nursery Road)

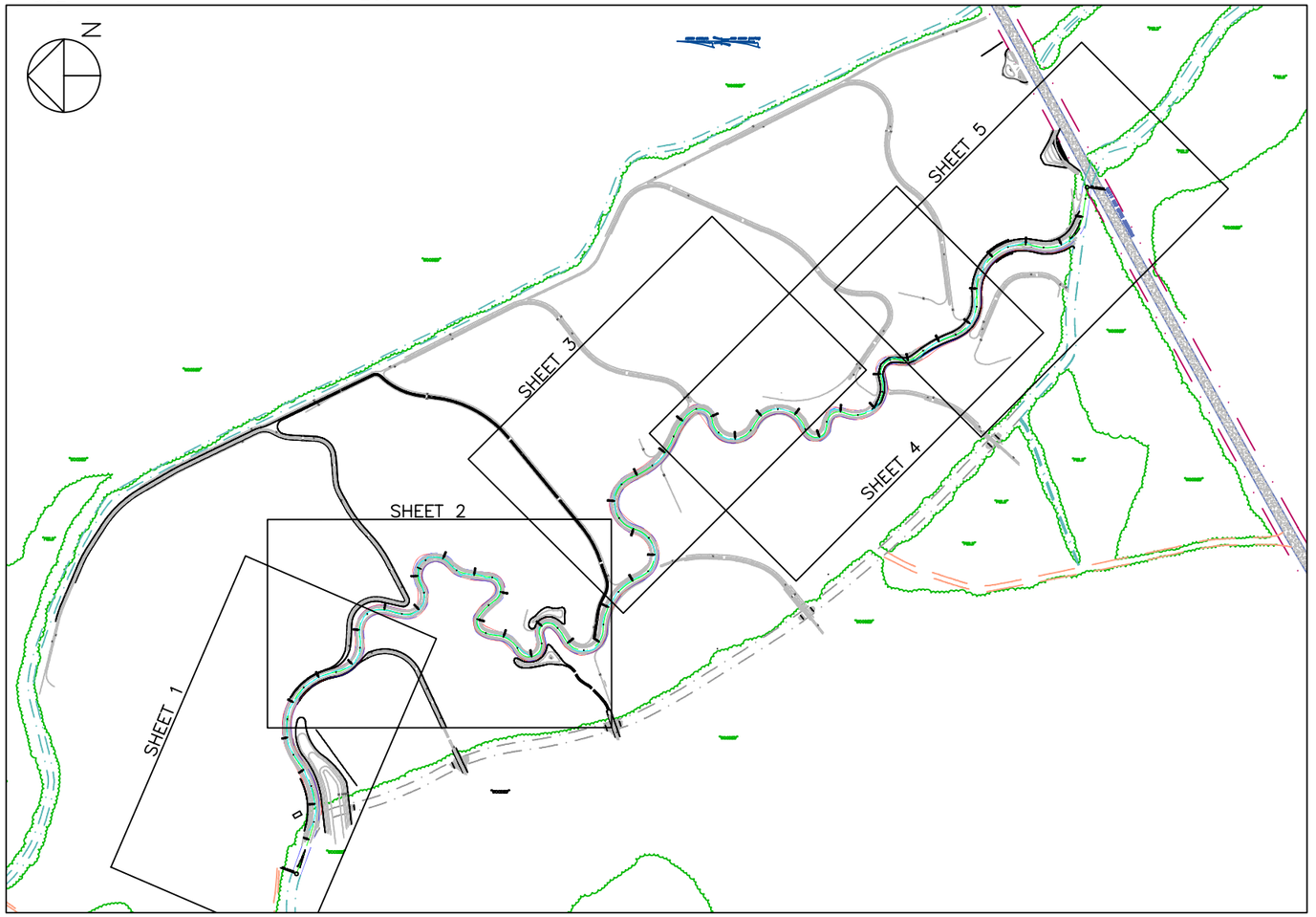
Jumping Run Creek / McLeod's Creek

Stream and Wetland Restoration Project

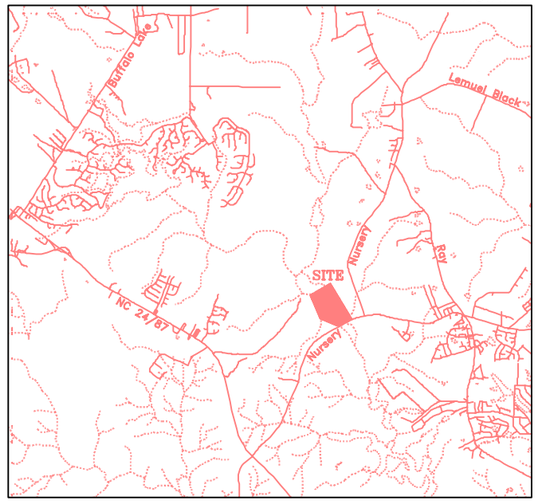
Barnett County, North Carolina

SITE

1" = 200'



VICINITY



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AS-BUILT PROJECT ENGINEER SIGNATURE

ORIGINAL STREAM RESTORATION DESIGN BY:
BLUE: LAND, WATER, INFRASTRUCTURE, PA

Prepared For: The NC Ecosystem Enhancement Program (NCEEP)

NOVEMBER, 2007

LEGEND

- DESIGN THALWEG
- AS-BUILT BANKFULL
- DESIGN BANKFULL
- MONITORING LONGITUDINAL PROFILE
- DESIGN GRADE
- DESIGN LOG CROSS VANE
- DESIGN ROOT WAD
- VEG PLOT PINS
- VEG PLOTS
- CROSS-SECTIONS
- PHOTO POINTS

CROSS SECTION PIN LOCATIONS		
PIN	LAT	LONG
XS1PL	35.26109096	-79.00252352
XS1PR	35.26124247	-79.00249424
XS2PL	35.26081361	-79.00061178
XS2PR	35.26072332	-79.00069698

VEG PLOT PIN COORDINATES		
PIN	LAT	LONG
VP1	35.26080136	-79.00066535
VP1	35.26092137	-79.00083395
VP7	35.26053462	-79.00144889
VP7	35.26064411	-79.00136751

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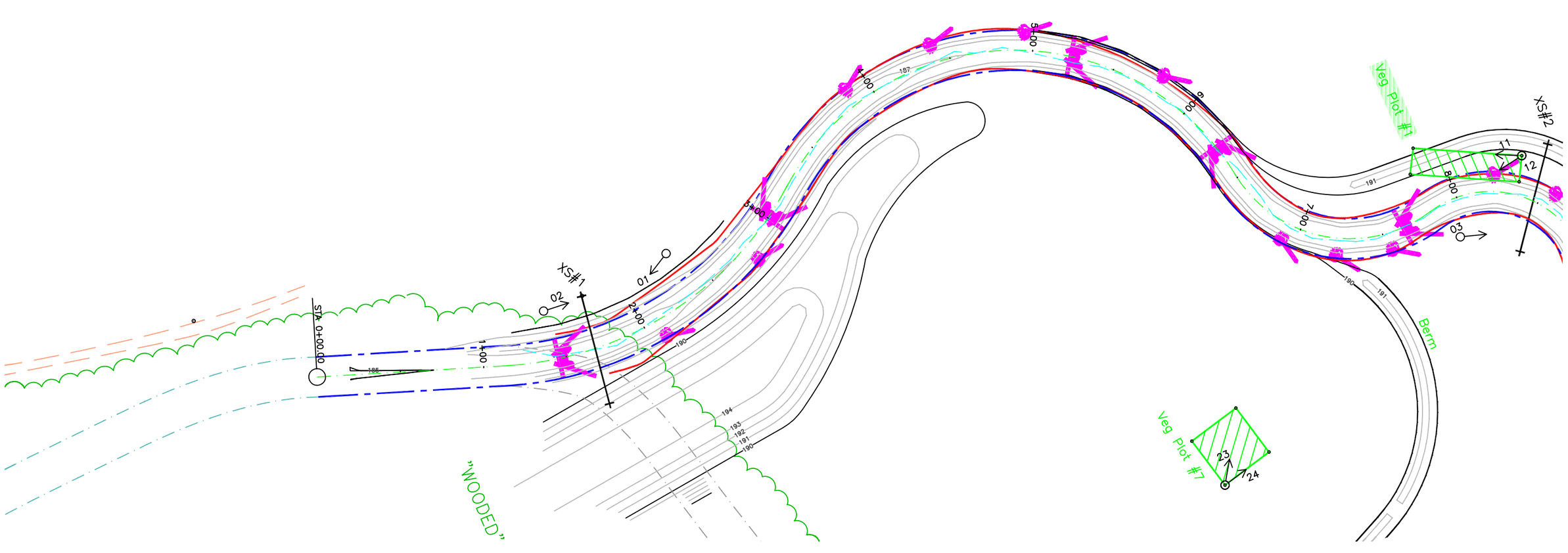
PROJECT NO.	SHEET NO.
SCO#070695701	01
AS-BUILT PROJECT ENGINEER	



PROJECT NO.	SHEET NO.
SCO#070695701	02
AS-BUILT PROJECT ENGINEER	

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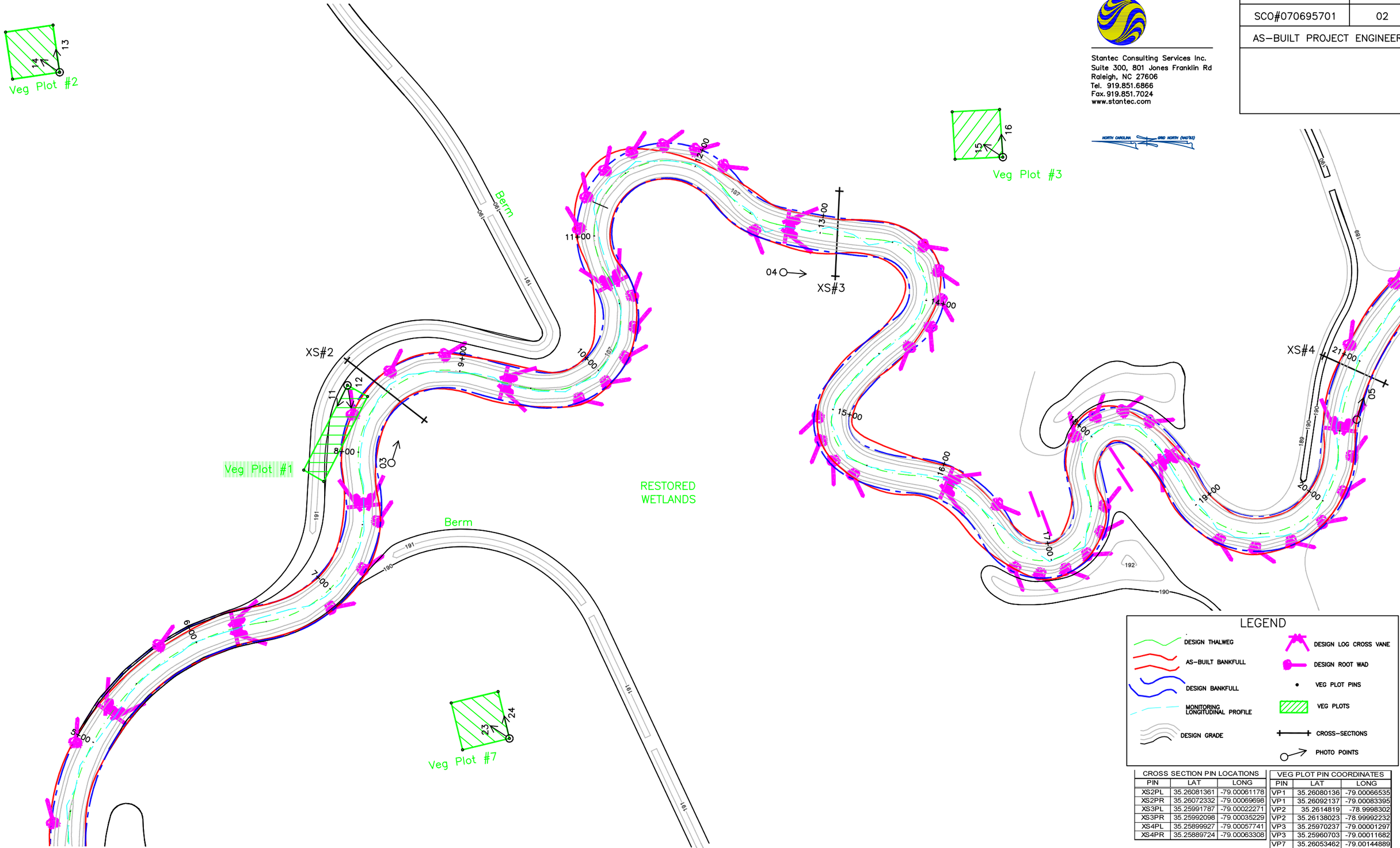
NORTH CAROLINA GRID NORTH (NAD'83)



LEGEND

- DESIGN THALWEG
- AS-BUILT BANKFULL
- DESIGN BANKFULL
- MONITORING LONGITUDINAL PROFILE
- DESIGN GRADE
- DESIGN LOG CROSS VANE
- DESIGN ROOT WAD
- VEG PLOT PINS
- VEG PLOTS
- CROSS-SECTIONS
- PHOTO POINTS

CROSS SECTION PIN LOCATIONS		
PIN	LAT	LONG
XS2PL	35.26081361	-79.00061178
XS2PR	35.26072332	-79.00069698
XS3PL	35.25991787	-79.00022271
XS3PR	35.25992098	-79.00035229
XS4PL	35.25899927	-79.00057741
XS4PR	35.25889724	-79.00063308

VEG PLOT PIN COORDINATES		
PIN	LAT	LONG
VP1	35.26080136	-79.00066535
VP1	35.26092137	-79.00083395
VP2	35.2614819	-78.9998302
VP2	35.26138023	-78.99992232
VP3	35.25970237	-79.00001297
VP3	35.25960703	-79.00011682
VP7	35.26053462	-79.00144889
VP7	35.26064411	-79.00136751

PROJECT NO.	SHEET NO.
SCO#070695701	03
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Veg Plot #9

Veg Plot #10

Veg Plot #8

XS#5

XS#6

06

07

22+00

23+00

24+00

25+00

26+00

27+00

28+00

29+00

30+00

31+00

32+00

LEGEND

- DESIGN THALWEG
- AS-BUILT BANKFULL
- DESIGN BANKFULL
- MONITORING LONGITUDINAL PROFILE
- DESIGN GRADE
- DESIGN LOG CROSS VANE
- DESIGN ROOT WAD
- VEG PLOT PINS
- VEG PLOTS
- CROSS-SECTIONS
- PHOTO POINTS

CROSS SECTION PIN LOCATIONS

PIN	LAT	LONG
XS5PL	35.25857955	-78.99914964
XS5PR	35.25849085	-78.99925158
XS6PL	35.25763716	-78.99869711
XS6PR	35.25764396	-78.99883106

VEG PLOT PIN COORDINATES

PIN	LAT	LONG
VP8	35.25882237	-78.99983412
VP8	35.25870055	-79.00000515
VP9	35.25930164	-78.99884514
VP9	35.25942907	-78.99884242
VP10	35.25851643	-78.99760386
VP10	35.25858954	-78.99773114

PROJECT NO.	SHEET NO.
SCO#070695701	04
AS-BUILT PROJECT ENGINEER	

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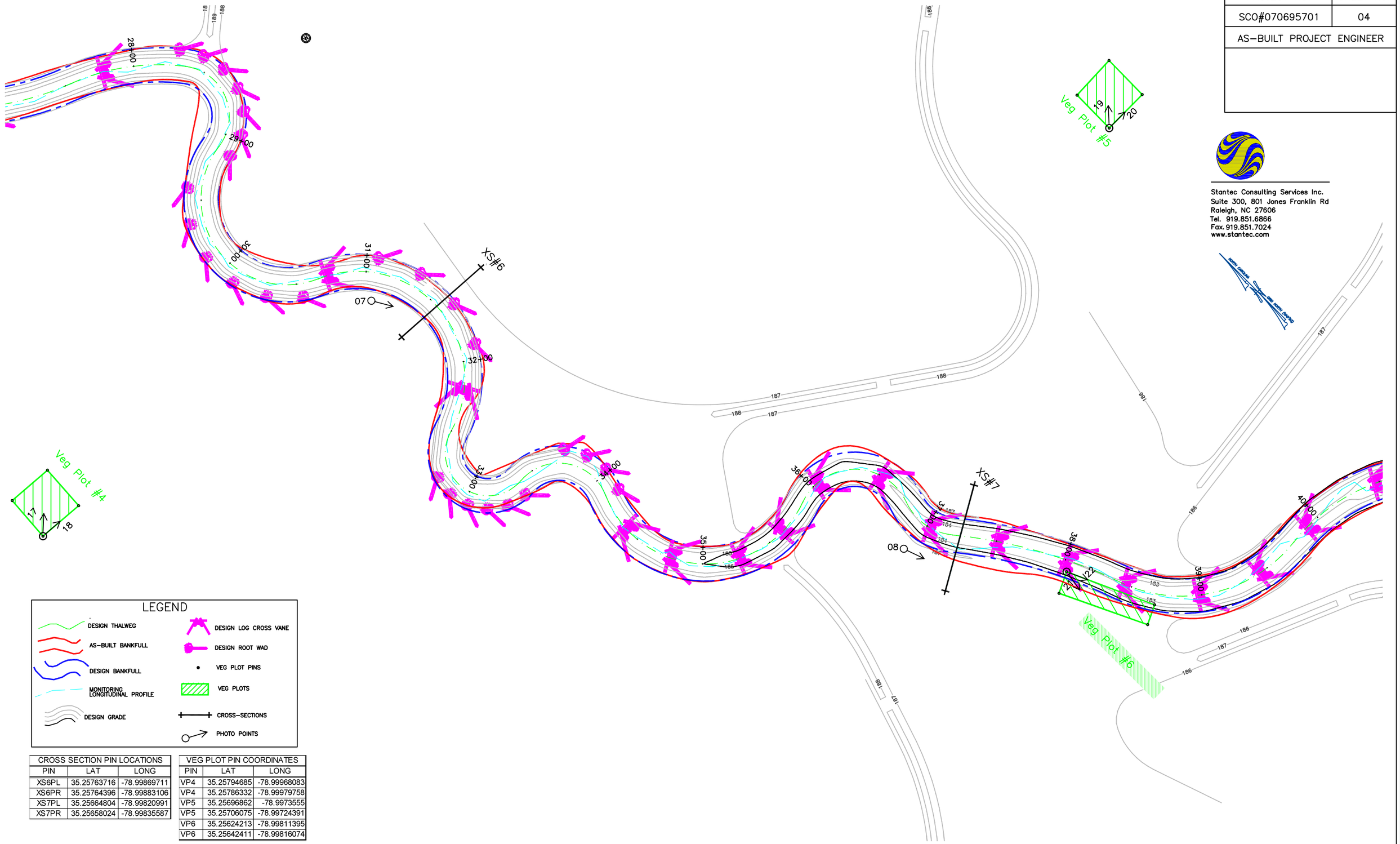

LEGEND

- DESIGN THALWEG
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- DESIGN GRADE
- DESIGN LOG CROSS VANE
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- VEG PLOTS
- CROSS-SECTIONS
- PHOTO POINTS

CROSS SECTION PIN LOCATIONS		
PIN	LAT	LONG
XS6PL	35.25763716	-78.99869711
XS6PR	35.25764396	-78.99883106
XS7PL	35.25664804	-78.99820991
XS7PR	35.25658024	-78.99835587

VEG PLOT PIN COORDINATES		
PIN	LAT	LONG
VP4	35.25794685	-78.99968083
VP4	35.25786332	-78.99979758
VP5	35.25696862	-78.9973555
VP5	35.25706075	-78.99724391
VP6	35.25624213	-78.99811395
VP6	35.25642411	-78.99816074

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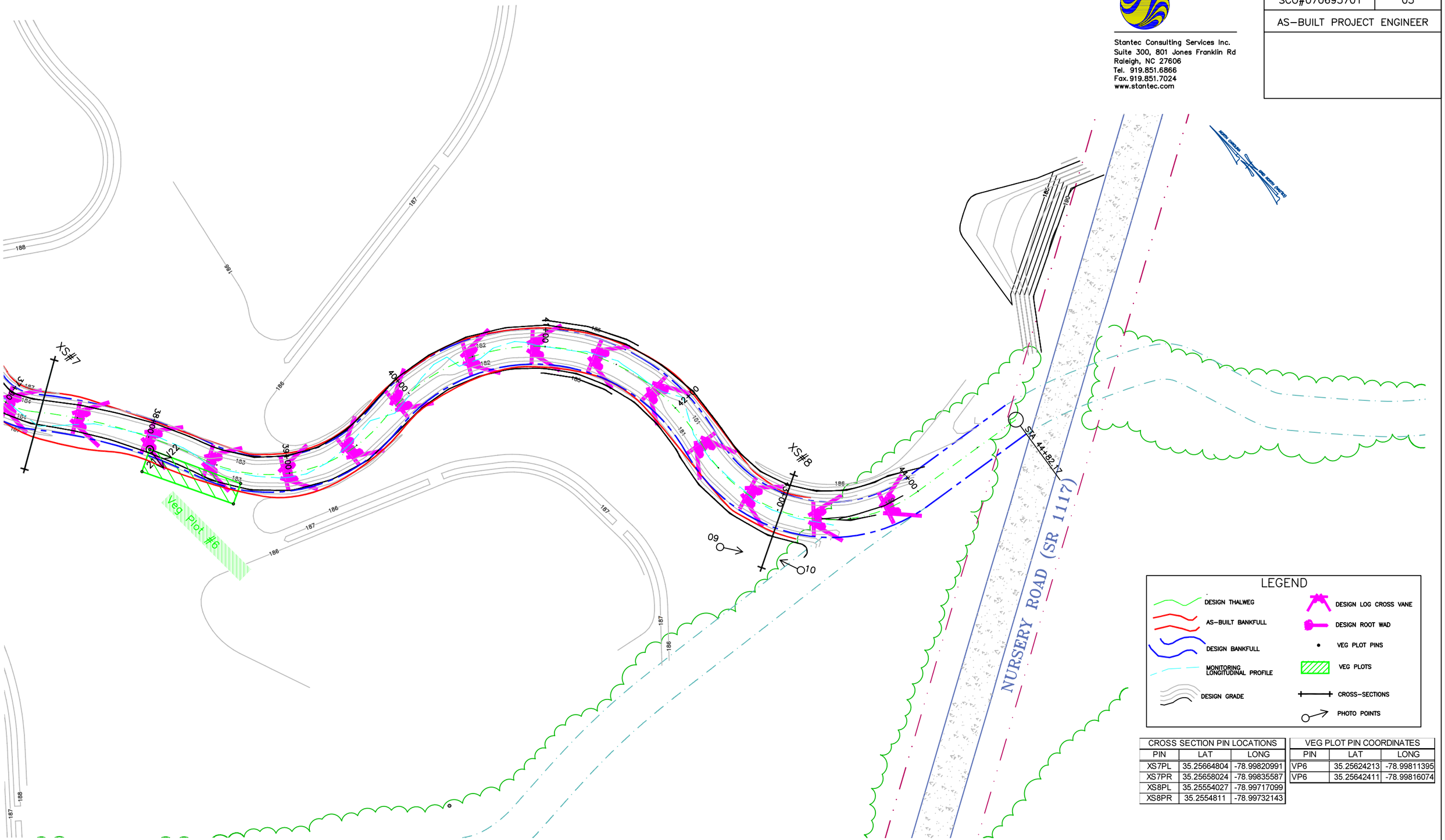

CROSS SECTION PIN LOCATIONS		
PIN	LAT	LONG
XS7PL	35.25664804	-78.99820991
XS7PR	35.25658024	-78.99835587
XS8PL	35.25554027	-78.99717099
XS8PR	35.2554811	-78.99732143

VEG PLOT PIN COORDINATES		
PIN	LAT	LONG
VP6	35.25624213	-78.99811395
VP6	35.25642411	-78.99816074

LEGEND

- DESIGN THALWEG
- AS-BUILT BANKFULL
- DESIGN BANKFULL
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- DESIGN GRADE
- DESIGN LOG CROSS VANE
- DESIGN ROOT WAD
- VEG PLOT PINS
- VEG PLOTS
- CROSS-SECTIONS
- × JR10 MONITORING WELLS

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

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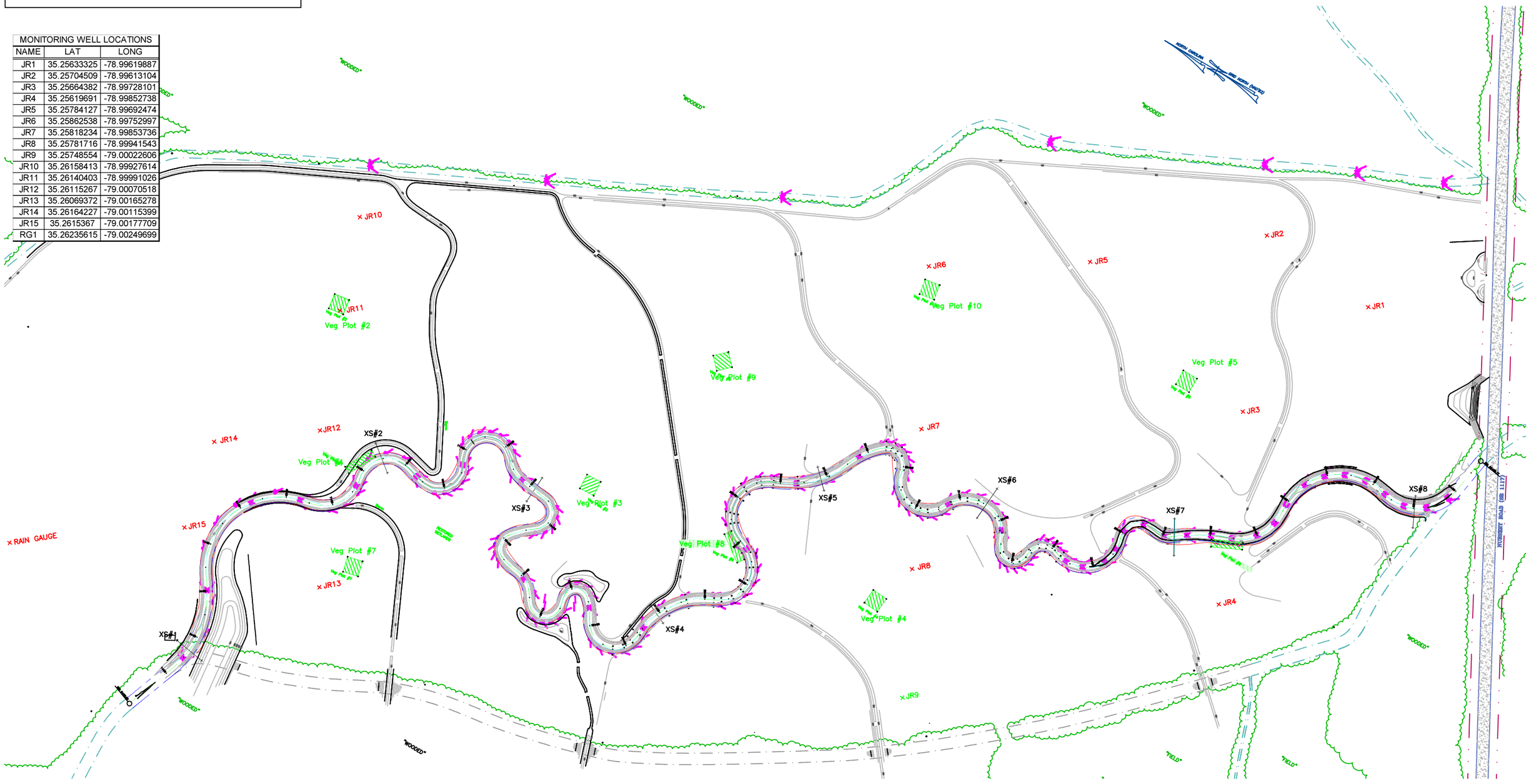

2.0 Project Condition and Monitoring Results

2.1 VEGETATION ASSESSMENT

The Carolina Vegetation Survey (CVS) methodology was utilized to sample vegetation in October of 2007. Ten 100m^2 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 320 3-year old planted trees per acre at the end of year 3 of the monitoring period.

The Year 1 stem counts within each of the vegetative monitoring plots are included in Exhibit Tables A1 through A5 in Appendix A. Six of the plots have over 320 stems per acre while four of the plots have less than 320 stems per acre.

2.1.1 Vegetation Problem Areas

In addition to the four failing vegetation plot sites, several vegetation problem areas exist on site. These sites are referred to as VPA 1, 2, & 3 on the Integrated Problem Area Plan View located in Appendix D. In VPA 1 and 2, standing water had been present for a substantial length of time, causing the majority of the planted vegetation to die (Photos 1 & 2 in Appendix A2). VPA 3 is currently overrun with invasive species, primarily *Lespedeza* (Photo 3). *Lespedeza* is a major problem on this project site, as it is also invading berms and most high areas (Photo 4).

2.1.2 Vegetation Problem Area Plan View

Vegetative problem areas are shown on the Current Condition Plan View in Appendix D.

2.2 STREAM ASSESSMENT

2.2.1 Hydrology

The region has been in an extreme drought for much of 2007. No evidence of bankfull flows were observed onsite and flows were not measured with peak stage recorders. In order to verify bankfull events, a crest gauge should be installed onsite.

Exhibit Table V. Verification of Bankfull Events Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
2007	None	NA	NA

2.2.2 Bank Stability

As directed by EEP, bank stability will not formally be measured for this project.

2.2.3 Stream Problem Areas

A major stream problem area is located from station 33+00 to 44+00 (1100 linear feet) where the stream has experienced serious failure. At Station 33+00 a head cut has developed and produced massive erosion around the bend at this location (see SPA Photos 1 & 2 in Appendix B3 and Appendix D Integrated Problem Areas Plan View). Downstream from this head cut, most of the in-stream structures have failed (SPA Photos 3 & 4). Erosion around the structures has forced the banks to migrate as much as seven feet, making this section of stream extremely unstable. Mid-channel bar formation is also occurring along the reach (SPA Photo 5). The headcut and downstream problems are apparent in the longitudinal profile of the channel. The survey data suggest that this section of the stream may not have been transitioned to the existing stream properly. The designed pattern and structures were not appropriate for a channel with this gradient. The log cross-vane structures on this reach do not match the goals of the design. Instead of notching the log arms that connect to the vane, the log arms were simply "butted" up against one another (SPA Photo 3). There was also a lack of geotextile fabric in the installation and the angle of the structure was not optimal to reduce near bank sheer stress and bank scour. Other major issues include the presence of a beaver dam near Station 6+30 (Photo 6). The dam is causing a hydraulic jump, producing scour downstream.

With the extent of the existing deterioration of this 1100 linear foot portion of the restoration reach, it will not be possible to repair the stream around the failed structures, or to rebuild or replace structures without addressing the characteristics of the stream. The stream has migrated vertically and is actively migrating horizontally. There are too many failed structures and the potential for future bank erosion and additional horizontal migration is too great for a simple repair. The stream channel in this location has eroded below a clay layer into a highly erosive sandy soil layer which will continue to create stability problems. The channel should be realigned with the appropriate pattern, dimension, and structures that will adequately transition from the higher elevation of the restoration to the receiving stream which is at a lower elevation. There is room on the right side of the existing alignment to be able to develop a new pattern that will provide the correct channel dimensions, grade control structures, and step pools needed to dissipate energy though this section of the reach. This action will stop the head cut from continuing upstream causing further damage to the restored channel. The majority of the materials needed for construction could be salvaged from the impaired reach.

Minor erosion problem areas were found from station 0+00 to station 32+00 of the restoration reach (Photo 7). Erosion causes were attributed to failure at the root wad in some cases and shear stress in others. Shear stress is caused by high velocity flows towards the outside of the meander. The placement and/or installation of some root wads has caused scouring, along with bank erosion and migration from

eddies that form around and behind the root wad structures (SPA Photo 8). The problem areas here can be fixed with simple hand grading of the banks and live stake planting around the toe of the structures. This will help stabilize the banks and limit the amount of erosion and degradation currently occurring. The hand grading should bring the banks back to a reasonable slope to the top of the banks or the berms on either side. These areas should be addressed to prevent additional erosion and migration from occurring. See Exhibit Table B1 and representative photos in Appendix B as well as the map in Appendix D for more information.

2.2.4 Stream Problem Area Plan View

Stream problem areas are shown on the Current Condition Plan View in Appendix D.

2.2.5 Stability Assessment

Exhibit Table VI. Categorical Stream Feature Visual Stability Assessment
Overhills/Jumping Run Creek - EEP Project No. 199

Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles	76%	76%				
B. Pools	70%	70%				
C. Thalweg	77%	77%				
D. Meanders	91%	91%				
E. Bed General	75%	75%				
F. Bank Condition	74%	73%				
G. Vanes / J Hooks, etc.	36%	34%				
H. Wads and Boulders	65%	63%				

2.2.6 Quantitative Measures Summary

Exhibit Table VII. Baseline Morphology and Hydraulics Summary
Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Stream Reference			Design			Baseline		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)							11.7	15.9	14.5	10.8	20.4	14.4	21.0	25.0	22.5	18.5	23.2	20.1
Flood Prone Width (ft)							-	-	16.5	-	-	200.0	-	-	200	-	-	-
BF Cross Sectional Area (SF)							54.6	77.5	56.7	13.5	22.1	21.0	35.0	46	41	23.0	49.0	36.0
BF Mean Depth (ft)							2.4	2.5	2.50	1.0	2.7	2.7	2.5	2.5	2.5	1.2	2.7	1.7
BF Max Depth (ft)							2.4	2.5	2.5	1.8	4.2	3.2	2.5	2.5	2.5	2.4	4.8	2.9
Width/Depth Ratio							4.9	6.4	5.8	4.1	8	5.4	8.4	10	9	7.8	15.5	11.7
Entrenchment Ratio							-	-	1.2	-	-	13.9	-	-	8.9	-	-	-
Bank Height Ratio							2.5	0.8	2.4	0.6	1.5	1.2	1.0	2.4	1.2	-	-	-
Wetted Perimeter (ft)							-	-	-	-	-	-	-	-	-	-	-	-
Hydraulic Radius (ft)							-	-	-	-	-	-	-	-	-	-	-	-
Pattern																		
Channel Beltwidth (ft)							-	-	600	45	110	77	80	200	110	48	149	100
Radius of Curvature (ft)							-	235	235	12	30	23.4	30	175	80	30	167	68.0
Meander Wavelength (ft)							315	660	500	125	175	150	125	250	200	10	276	220
Meander Width ratio							21.8	45.6	3.5	8.7	12.2	10.4	5.6	11.1	8.9	6.40	13.00	10.10
Profile																		
Riffle Length							-	-	-	-	-	-	-	-	-	12	183	72
Riffle Slope							-	-	-	-	-	-	-	-	-	0.0500	0.1100	0.0810
Pool Length							-	-	-	-	-	-	-	-	-	8	116	151
Pool Spacing							-	-	-	-	-	-	-	-	-	39	231.00	121
Substrate																		
d50 (mm)							0.5	9	0.5	0.58	0.65	0.62	0.5	9	0.5	0.09	0.27	0.21
d84 (mm)							2.6	30	2.6	1.7	1.7	1.7	2.6	30	2.6	0.36	0.44	0.4
Additional Reach Parameters																		
Valley Length (ft)							-	-	2808	-	-	230	-	-	2444	-	-	2444
Channel Length (ft)							-	-	3064	-	-	330	-	-	4400	-	-	4400
Sinuosity							-	-	1.1	-	2.3	1.4	-	2.1	1.6	-	-	1.8
Water Surface Slope							-	-	-	-	-	-	-	-	7E-04	-	-	0.0011
BF Slope							-	-	-	-	-	-	-	-	-	-	-	0.0015
Rosgen Classification							G5c	G4	G5c	E5	C5	E5	E	C	E	-	-	C5
*Habitat Index																		
*Macrobenthos																		

*Inclusion will be project specific and determined primarily by As-built monitoring plan/success criteria

Exhibit Table VIII. Morphology and Hydraulic Monitoring Summary
Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199
Overhills

Parameter	Cross Section 1			Cross Section 2			Cross Section 3			Cross Section 4			Cross Section 5			Cross Section 6			Cross Section 7			Cross Section 8		
	Sta 1+64 Pool			Sta 8+47 Pool			Sta 13+12 Riffle			Sta 20+93 Riffle			Sta 26+86 Pool			Sta 31+56 Riffle			Sta 37+24 Pool			Sta 43+82 Pool		
Dimension	MY0	MY1		MY0	MY1		MY0	MY1		MY0	MY1		MY0	MY1		MY0	MY1		MY0	MY1		MY0	MY1	
BF Width (ft)	26.87	24.66		22.27	22.29		18.15	17.86		23.19	22.25		24.16	24.5		19.06	19.24		16.54	16.68		27.1	27.7	
Floodprone Width (ft) (approx)	>100	>100		>100	>100		>100	>100		>100	>100		>100	>100		>100	>100		>100	>100		>100	>100	
BF Cross Sectional Area (ft^2)	71.89	67.45		44.82	51.12		31.03	31.52		49.19	59.6		37.7	40.91		23.43	25.35		35.21	39.41		106.1	111	
BF Mean Depth (ft)	2.74	2.68		2.01	2.29		1.71	1.76		2.12	2.68		1.56	1.67		1.23	1.32		2.13	2.36		3.92	4	
BF Max Depth (ft)	4.5	4.66		4.8	4.90		2.6	2.6		4.3	5.9		2.4	2.6		1.9	2.2		3.5	3.7		7.4	7.1	
Width/Depth Ratio	9.0	10.0		11.1	9.7		10.6	10.1		10.9	8.3		15.5	14.7		15.5	14.6		7.8	7.1		6.9	6.9	
Entrenchment Ratio	>3.72	>4.1		>4.49	>4.48		>5.51	>5.6		>4.32	>4.49		>4.14	>4.08		>5.25	>5.20		>6.05	>6.0		>3.69	>3.61	
Wetted Perimeter (ft)																								
Hydraulic radius (ft)																								
Substrate																								
d50 (mm)							0.27	0.10		0.093	0.081					0.27	0.15							
d84 (mm)							0.41	0.27		0.36	0.28					0.44	0.35							

Parameter	MY-00 (2007)			MY-01 (2007)			MY-02 (2008)			MY-03 (2009)			MY-04 (2010)			MY-05 (2011)								
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med						
Channel Beltwidth (ft)	48	149	100	42	146	94																		
Radius of Curvature (ft)	30	167	68.0	35	158	74																		
Meander Wavelength (ft)	130	26	220	125	276	205																		
Meander Width Ratio	6.40	13.70	10.10	6.30	14.00	10.10																		
Profile																								
Riffle Length (ft)	20	122	72	20	100	60																		
Riffle Slope (ft)	0.0011	0.1630	0.0815	0.0016	0.1404	0.0710																		
Pool Length (ft)	8	116	51.0	14	37	84																		
Pool Spacing (ft)	39	231	121	39	319	111																		
Additional Reach Parameters																								
Valley Length (ft)	2605			2605																				
Channel Length (ft)	4400			4400																				
Sinousity	1.68			2																				
Water Surface Slope (ft/ft)	0.0016			0.0015																				
BF Slope (ft/ft)	0.0012			0.0011																				
Rosgen Classification	C			C																				
*Habitat Index																								
*Macrobenthos																								

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2.3 WETLAND ASSESSMENT

2.3.1 Wetland Criteria Attainment

A site is considered to meet the requirements 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. Nine of the wells met the criteria during the growing season of 2007, but six did not. The growing season in this area is from March 18th to November 8th for a total of 234 days (NRCS 2002). Well JR-5 had a maximum of 24 consecutive days (10%) where the ground was saturated within 12 inches of the surface. Wells JR-10 and JR-11 had a maximum of 7 days (3%), JR-12 a maximum of 6 (3%), JR-13 21 days (9%), and JR-14 a maximum of 12 days (5%) (Appendix C1).

No conclusions regarding the success or failure of wetland areas in the project area can be made at this time due to a short period of reference well data. A reference well was installed in the vicinity of the site on October 2, 2007, and data was collected from this date until downloading on November 9th (Figure 1). The groundwater level at this site remained below the required saturation depth of 12 inches until October 27th. However, with just over a month of data at the reference well, no comparisons between the wells in the project area and the reference well can be made. Given that precipitation was below the 30% percentile for the area during most of the growing season, the failure of some gauges to indicate hydrologic success is not cause for significant concern.

Exhibit Table IX. Wetland Criteria Attainment Overhills/Jumping Run Creek Restoration Project / EEP Project No. 199							
Tract	**Well ID**	**Well Hydrology Threshold Met?**	**Tract Mean**		**Vegetation Plot ID**	**Vegetation Density Met (320 stems/acre)**	**Tract Mean**
Site	1	Y			VP1	Y (405)	
	2	Y			VP2	N (162)	
	3	Y			VP3	N (243)	60%
	4	Y			VP4	Y (324)	
	5	N			VP5	N (121)	
	6	Y			VP6	Y (1335)	
	7	Y			VP7	Y (445)	
	8	Y	60%		VP8	Y (769)	
	9	Y			VP9	N (283)	
	10	N			VP10	Y (445)	
	11	N					(453 stems/acre)
	12	N					
	13	N					
	14	N					
	15	Y					
Reference	Ref Site 1	n/a*					

*Reference well was installed near the end of the growing season

2.3.2 Current Condition Plan View

The plan view for the wetland problem areas is located in the Current Condition Plan View in Appendix D.

3.0 References

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Click on the Desired Link Below

Appendix A
(Veg. Data & Photos)

Appendix B
(Stream Photos)

Appendix C
(Hydro Data)

Appendix D
(Plan View)

APPENDIX A – VEGETATION RAW DATA & PHOTOS

Appendix A. Vegetation Raw Data

A.1 VEGETATION DATA TABLES

EXHIBIT TABLE A1. VEGETATION METADATA	
Report Prepared By	Amber Coleman
Date Prepared	11/25/2007 17:43
database name	Stantec-Overhills_MillBranch-2007-A-v220-yr0-yr1.mdb
database location	U:\171300168
computer name	COLEMANA
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT	
Metadata	This worksheet, which is a summary of the project and the project data.
Proj, planted	Each project is listed with its PLANTED stems, for each year. This excludes live stakes and lists stems per acre.
Proj, total stems	Each project is listed with its TOTAL stems, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. Listed in stems per acre.
Plots	List of plots surveyed.
Vigor	Frequency distribution of vigor classes.
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	Count of planted living stems of each species 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	
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	10

EXHIBIT TABLE A2. VEGETATION VIGOR BY SPECIES

	Species	4	3	2	1	0	Missing
	Cephalanthus occidentalis	3	5	3			
	Cornus amomum		6	6		1	
	Cyrilla racemiflora	1					
	Fraxinus pennsylvanica	7					
	Nyssa biflora	7	16				
	Quercus nigra		1				
	Quercus phellos	4					
	Salix nigra	4	2				
	Sambucus canadensis	1	5	2		4	
	Sambucus nigra		1				
	Taxodium distichum	26	1				
	Morella cerifera	1	1				
	Magnolia grandiflora	2				1	
	Unknown	1	2				
TOT:	**14**	**57**	**40**	**11**		**6**	

EXHIBIT TABLE A3. VEGETATION DAMAGE BY SPECIES

	Species	All Damage Categories	(no damage)	Drought	Other/Unknown Animal	Unknown
	Cephalanthus occidentalis	11	8	3		
	Cornus amomum	13	6	3	2	2
	Cyrilla racemiflora	1	1			
	Fraxinus pennsylvanica	7	7			
	Magnolia grandiflora	3	2			1
	Morella cerifera	2	2			
	Nyssa biflora	23	23			
	Quercus nigra	1	1			
	Quercus phellos	4	4			
	Salix nigra	6	6			
	Sambucus canadensis	12	7	5		
	Sambucus nigra	1	1			
	Taxodium distichum	27	27			
	Unknown	3	3			
TOT:	**14**	**114**	**98**	**11**	**2**	**3**

EXHIBIT TABLE A4. VEGETATION DAMAGE BY PLOT

	plot	All Damage Categories	(no damage)	Drought	Other/Unknown Animal	Unknown
	Overhills-01-0001-year:1	10	9			1
	Overhills-01-0002-year:1	4	4			
	Overhills-01-0003-year:1	7	7			
	Overhills-01-0004-year:1	8	8			
	Overhills-01-0005-year:1	3	3			
	Overhills-01-0006-year:1	34	22	10	1	1
	Overhills-01-0007-year:1	11	11			
	Overhills-01-0008-year:1	19	16	1	1	1
	Overhills-01-0009-year:1	7	7			
	Overhills-01-0010-year:1	11	11			
TOT:	**10**	**114**	**98**	**11**	**2**	**3**

EXHIBIT TABLE A5-A. STEM COUNT BY PLOT AND SPECIES - Year 1

	Species	Total Planted Stems	# plots	avg# stems	plot Overhills-01-0001-year:1	plot Overhills-01-0002-year:1	plot Overhills-01-0003-year:1	plot Overhills-01-0004-year:1	plot Overhills-01-0005-year:1	plot Overhills-01-0006-year:1	plot Overhills-01-0007-year:1	plot Overhills-01-0008-year:1	plot Overhills-01-0009-year:1	plot Overhills-01-0010-year:1
	Cephalanthus occidentalis	11	2	5.5	4					7				
	Cornus amomum	12	3	4	1					6		5		
	Cyrilla racemiflora	1	1	1	1									
	Fraxinus pennsylvanica	7	4	1.75			2	3			1		1	
	Magnolia grandiflora	2	1	2						2				
	Morella cerifera	2	2	1						1		1		
	Nyssa biflora	23	9	2.56	1		3	3	1	1	4	4	1	5
	Quercus nigra	1	1	1								1		
	Quercus phellos	4	2	2	1					3				
	Salix nigra	6	3	2	2					2		2		
	Sambucus canadensis	8	2	4						6		2		
	Sambucus nigra	1	1	1								1		
	Taxodium distichum	27	9	3		4	2	2	2	1	4	2	4	6
	Unknown	3	2	1.5							2		1	
TOT:	**14**	**108**	**14**		**10**	**4**	**7**	**8**	**3**	**29**	**11**	**18**	**7**	**11**
	Total Planted Stems/Acre				**405**	**162**	**283**	**324**	**121**	**1174**	**445**	**728**	**283**	**445**

EXHIBIT TABLE A5-B. STEM COUNT BY PLOT AND SPECIES - Year 0

	Species	Total Stems	# plots	avg# stems	plot Overhills-01-0001	plot Overhills-01-0002	plot Overhills-01-0003	plot Overhills-01-0004	plot Overhills-01-0005	plot Overhills-01-0006	plot Overhills-01-0007	plot Overhills-01-0008	plot Overhills-01-0009	plot Overhills-01-0010
	Cephalanthus occidentalis	11	2	5.5	4					7				
	Cornus amomum	13	3	4.33	1					7		5		
	Cyrilla racemiflora	1	1	1	1									
	Fraxinus pennsylvanica	7	4	1.75			2	3			1		1	
	Magnolia grandiflora	3	2	1.5						2		1		
	Morella cerifera	2	2	1						1		1		
	Nyssa biflora	21	8	2.62	1		2	3	1		4	4	1	5
	Quercus nigra	1	1	1								1		
	Quercus phellos	4	2	2	1					3				
	Salix nigra	7	3	2.33	2					2		3		
	Sambucus canadensis	12	2	6						10		2		
	Taxodium distichum	27	9	3		4	2	2	2	1	4	2	4	6
	Unknown	3	2	1.5							2		1	
TOT:	**13**	**112**	**13**		**10**	**4**	**6**	**8**	**3**	**33**	**11**	**19**	**7**	**11**
	Total Planted Stems/Acre				**405**	**162**	**243**	**324**	**121**	**1335**	**445**	**769**	**283**	**445**

EXHIBIT TABLE A6. VEGETATION PROBLEM AREAS

Feature/Issue	Station # / Range	Probable Cause	Photo #
death of trees and plants	VPA1 & VPA2	previous flooding	1 & 2
invasive/exotic species	VPA3	Invasion of *Lespedeza*	3 &4

*The location of vegetation problem areas is show in the integrated problem area plan view map in Appendix D

A.2 VEGETATION PROBLEM AREA PHOTOS

Photo 1. Flooding in VPA-1 facing northeast. Ponding caused vegetation failure. (6/13/07)

Photo 2. Dried pond in VPA1 facing southwest. Note absence of woody vegetation. (10/2/07)

Photo 3. Invasive species, *Lespedeza,* in VPA3 (8/23/07)

Photo 4. Invasive species, *Lespedeza,* on berms and high areas throughout the project area (10/2/07)

A.3 VEGETATION MONITORING PLOT PHOTOS

Photo Station 11. Veg Plot 1 – looking north (10/2/07)

Photo Station 12. Veg Plot 1 – looking northeast (10/2/07)

Photo Station 13. Veg Plot 2 – looking northeast (10/2/07)

Photo Station 14. Veg Plot 2 – looking north (10/2/07)

Photo Station 15. Veg Plot 3 – looking northeast (10/2/07)

Photo Station 16. Veg Plot 3 – looking north (10/2/07)

Photo Station 17. Veg Plot 4 – looking northeast (10/2/07)

Photo Station 18. Veg Plot 4 – looking east (10/2/07)

Photo Station 19. Veg Plot 5 – looking northeast (10/2/07)

Photo Station 20. Veg Plot 5 – looking east (10/2/07)

Photo Station 21. Veg Plot 6 – looking south (10/2/07)

Photo Station 22. Veg Plot 6 – looking southwest (10/2/07)

Photo Station 23. Veg Plot 7 – looking north (10/2/07)

Photo Station 24. Veg Plot 7 – looking northeast (10/2/07)

Photo Station 25. Veg Plot 8 – looking southwest (10/2/07)

Photo Station 26. Veg Plot 8 – looking west (10/2/07)

Photo Station 27. Veg Plot 9 – looking north (10/2/07)

Photo Station 28. Veg Plot 9 – looking northeast (10/2/07)

Photo Station 29. Veg Plot 10 – looking northwest (10/2/07)

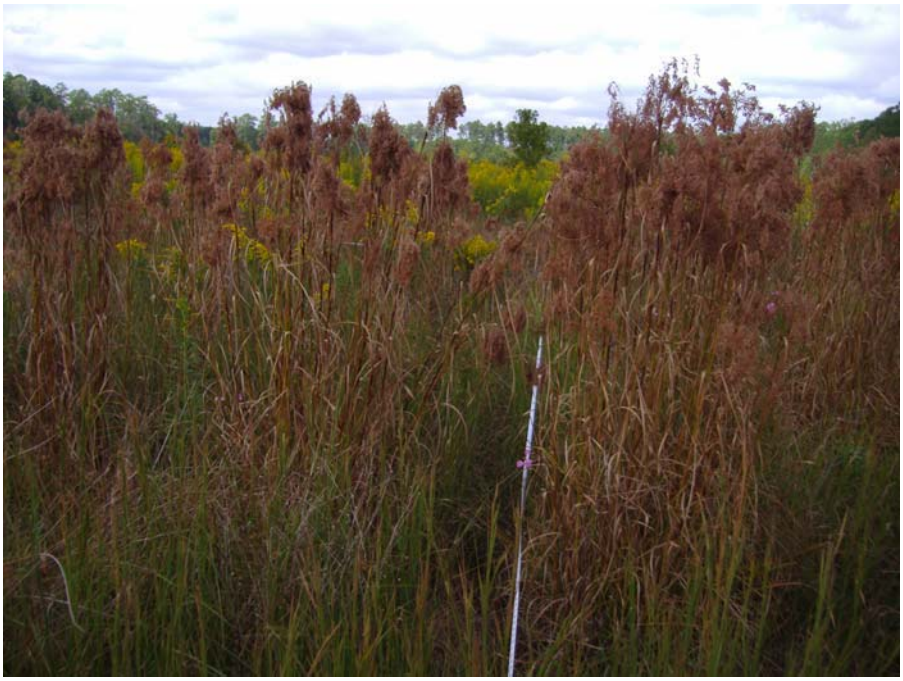


Photo Station 30. Veg Plot 10 – looking west (10/2/07)

APPENDIX B – GEOMORPHOLOGIC RAW DATA

Appendix B. Geomorphologic Raw Data

B.1 CURRENT CONDITION PLAN VIEW (STREAM)

Please see the Integrated Current Condition Plan View in Appendix D for stream problem areas.

B.2 STREAM PROBLEM AREAS TABLE

Exhibit Table B1. Stream Problem Areas Overhills/Jumping run Creek Restoration Project - EEP No. 199					
MAJOR PROBLEM AREAS					
Feature/Issue	**Stream Reach**	**Station # / Range**	**Probable Cause**	**ID**	**Photo #**
Headcut	Restored reach	33+00	In-stream structural failure	SPA 1	1 & 2
Bank Erosion/Migration	Restored reach	33+00 to 44+00	Headcut formation, in-stream structural failure	SPA 1	3 & 4
Mid-channel Bar Formation	Restored reach	33+00 to 44+00	In-stream structural failure	SPA 1	5
Hydraulic Jump/Scour	Restored reach	6+30	Beaver dam	SPA 9	6
MINOR PROBLEM AREAS					
Bank Erosion	Restored reach	0+00 to 32+00	Excess near bank shear stress	SPA 3 & 8	7
Bank Erosion	Restored reach	0+00 to 32+00	Root wad failure	SPA 2 & 4-7	8

B.3 REPRESENTATIVE STREAM PROBLEM AREAS PHOTOS

Photo 1. Looking downstream at the start of the head cut at Station 33+00 (7/4/07)

Photo 2. Looking upstream at the location of the head cut at Station 33+00 (7/4/07)

Photo 3. Failed log cross-vane structure downstream of the headcut. The logs were not notched together, allowing the arms to separate from the cross log. (7/4/07)

Photo 4. Typical example of a structure that has been washed away and resultant bank erosion (7/4/07)

Photo 5. Mid-channel bars forming in the failed restoration channel (7/4/07)

Photo 6. Beaver dam located at Station 6+30 (11/9/07)

Photo 7. Bank erosion developing around the meander bends at various locations of the project (7/4/07)

Photo 8. Example of eddies that have caused scouring and erosion around the toes and banks of the root wad structures (7/4/07)

B.4 STREAM PHOTO STATION PHOTOS

Photo Station 1. Beginning of Reach – looking upstream (7/4/07)
(Note: Locations of stations are shown on the monitoring plan view)

Photo Station 2. Cross section 1 – looking downstream (11/9/07)

Photo Station 3. Cross section 2 – looking downstream (11/9/07)

Photo Station 4. Cross section 3 – looking downstream (11/9/07)

Photo Station 5. Cross section 4 – looking downstream (11/9/07)

Photo Station 6. Cross section 5 – looking downstream (7/4/07)

Photo Station 7. Cross section 6 – looking downstream (11/9/07)

Photo Station 8. Cross section 7 – looking downstream (11/9/07)

Photo Station 9. Cross section 8 – looking downstream (11/9/07)

Photo Station 10. End of Project – looking upstream (7/4/07)

B.5 QUALITATIVE VISUAL STABILITY ASSESSMENT

Exhibit Table B.2. Visual Morphological Stability Assessment 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	21		67%	
	2. Armor stable (eg no displacement?)	N/A	N/A			
	3. Facet grade appears stable?	16	21		76%	
	4. Minimal evidence of embedding/fining?	N/A	N/A			
	5. Length appropiate?	18	21		86%	76%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	18	22		82%	
	2. Sufficiently deep (Max Pool D:Mean Bkf > 1.6?)	16	22		73%	
	3. Length appropriate?	12	22		55%	70%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	16	22		73%	
	2. Downstream of meander (glide/inflection) centering?	18	22		82%	77%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	24	32		75%	
	2. Of those eroding, # w/concomitant point bar formation?	3	3		100%	
	3. Apparent Rc within spec?	32	32		100%	
	4. Sufficient floodplain access and relief?	28	32		88%	91%
E. Bed General	1. General channel bed aggradation areas (bar formation)		4400	400	91%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?		4400	1100	75%	75%
F. Bank	1. Actively eroding, wasting, or slumping bank?		4400	1200	73%	73%
G. Vanes	1. Free of back or arm scour?	16	37		43%	
	2. Height appropriate?	12	37		32%	
	3. Angle and geometry appear appropriate?	10	37		27%	
	4. Free of piping or other structural failures?	12	37		32%	34%
H. Wads/Boulders	1. Free of scour?	12	19		63%	
	2. Footing stable?	N/A	N/A			63%

B.6 CROSS SECTION PLOTS

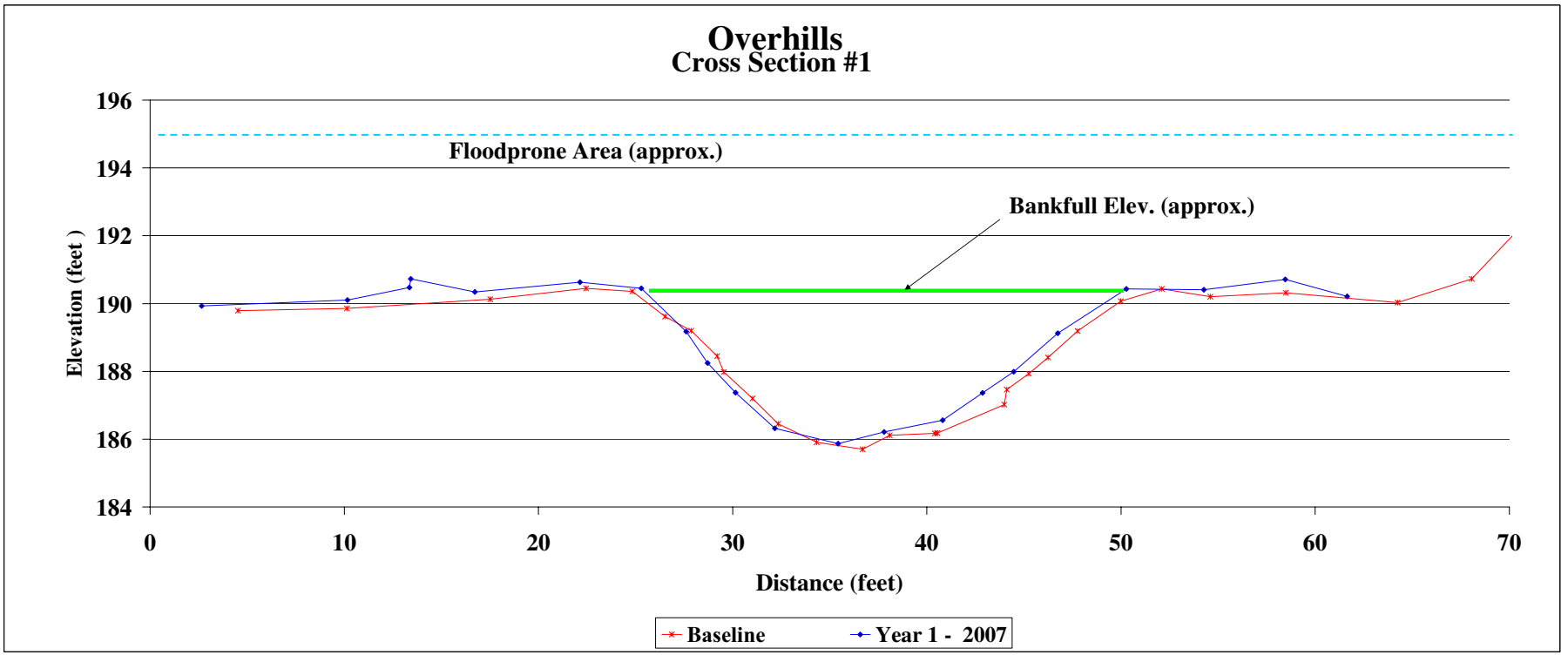
See following page for cross section plots.

Project Name	Overhills	**Feature**	Riffle	**Date**	As Built -7/4/2007, Year 1 - 11/09/2007
Cross Section	Cross Section 1			**Crew**	AS Built - Bidelspach, Jean, Geenen, Year 1 - Geenen, Ballestero

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**
												2.65	189.93	Left Pin	4.52	189.79	Left Pin
												10.17	190.1		10.13	189.86	
												13.35	190.47		17.52	190.13	
												13.42	190.73		22.45	190.45	
												16.72	190.34		24.83	190.36	LBK
												22.13	190.63		26.52	189.62	
												25.3	190.45	LBK	27.86	189.2	
												27.61	189.17		29.2	188.45	
												28.71	188.24		29.55	187.98	
												30.15	187.37		31.02	187.2	
												32.17	186.32		32.34	186.45	
												35.43	185.87		34.32	185.91	
												37.8	186.21		36.69	185.7	
												40.81	186.56		38.09	186.11	
												42.86	187.36		40.41	186.17	
												44.47	187.99		40.54	186.18	
												46.74	189.12		43.99	187.02	
												50.28	190.43	RBK	44.12	187.46	
												54.26	190.41		45.25	187.93	
												58.46	190.71	Right Pin	46.24	188.41	
												61.65	190.21		47.76	189.19	
															49.99	190.07	
															52.1	190.43	RBK
															54.6	190.2	
															58.49	190.32	Right Pin
															64.25	190.03	
															68.06	190.73	
															70.27	192.07	
															73.77	192.89	

Photo of Cross-Section 2 - Looking Downstream @ STA 1+64

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area					67.45	71.89	
Width					24.66	26.87	
Mean Depth					2.74	2.68	
Max Depth					4.49	4.66	
W/D					9.02	10.04	

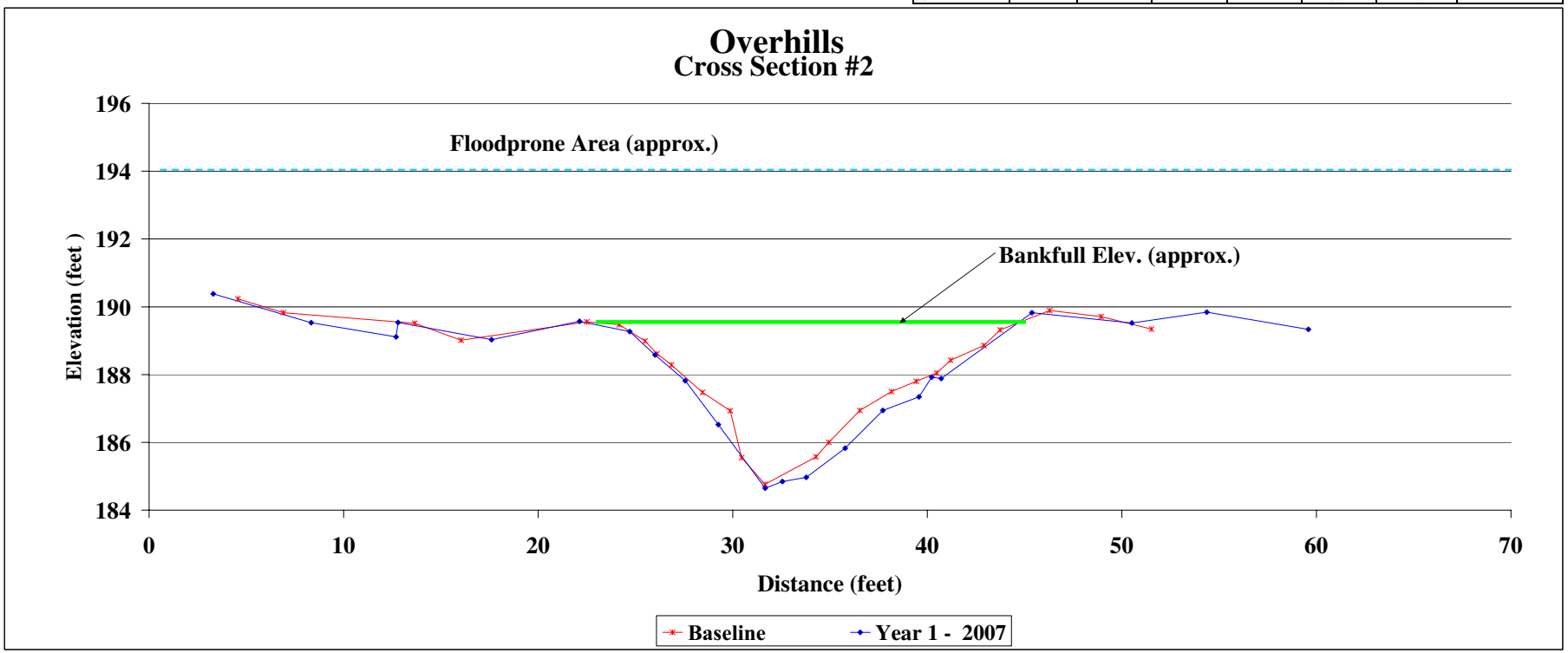


Project Name	Overhills	**Feature**	Pool	**Date**	As Built -7/4/2007, Year 1 - 11/09/2007
Cross Section	Cross Section 2			**Crew**	AS Built - Bidelspach, Jean, Geenen, Year 1 - Geenen, Ballestero

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**
												3.3	190.38		4.56	190.23	
												8.33	189.53		6.9	189.82	
												12.7	189.11		13.65	189.51	Left Pin
												12.8	189.54	Left Pin	16.04	189.01	
												17.6	189.03		22.49	189.55	LBK
												22.12	189.57	LBK	24.16	189.47	
												24.71	189.27		25.49	188.99	
												26	188.58		26.1	188.61	
												27.56	187.82		26.85	188.28	
												29.26	186.52		28.44	187.47	
												31.67	184.65		29.87	186.93	
												32.55	184.84		30.45	185.55	
												33.78	184.97		31.66	184.76	
												35.78	185.83		34.28	185.57	
												37.72	186.94		34.93	186	
												39.57	187.34		36.53	186.94	
												40.23	187.92		38.16	187.5	
												40.72	187.88		39.43	187.8	
												45.38	189.82	RBK	40.48	188.05	
												50.51	189.52		41.2	188.42	
												54.36	189.84	Right Pin	42.91	188.86	
												59.59	189.33		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	Bench
Area					51.12	44.82	
Width					22.29	22.27	
Mean Depth					2.29	2.01	
Max Depth					4.90	4.79	
W/D					9.72	11.07	

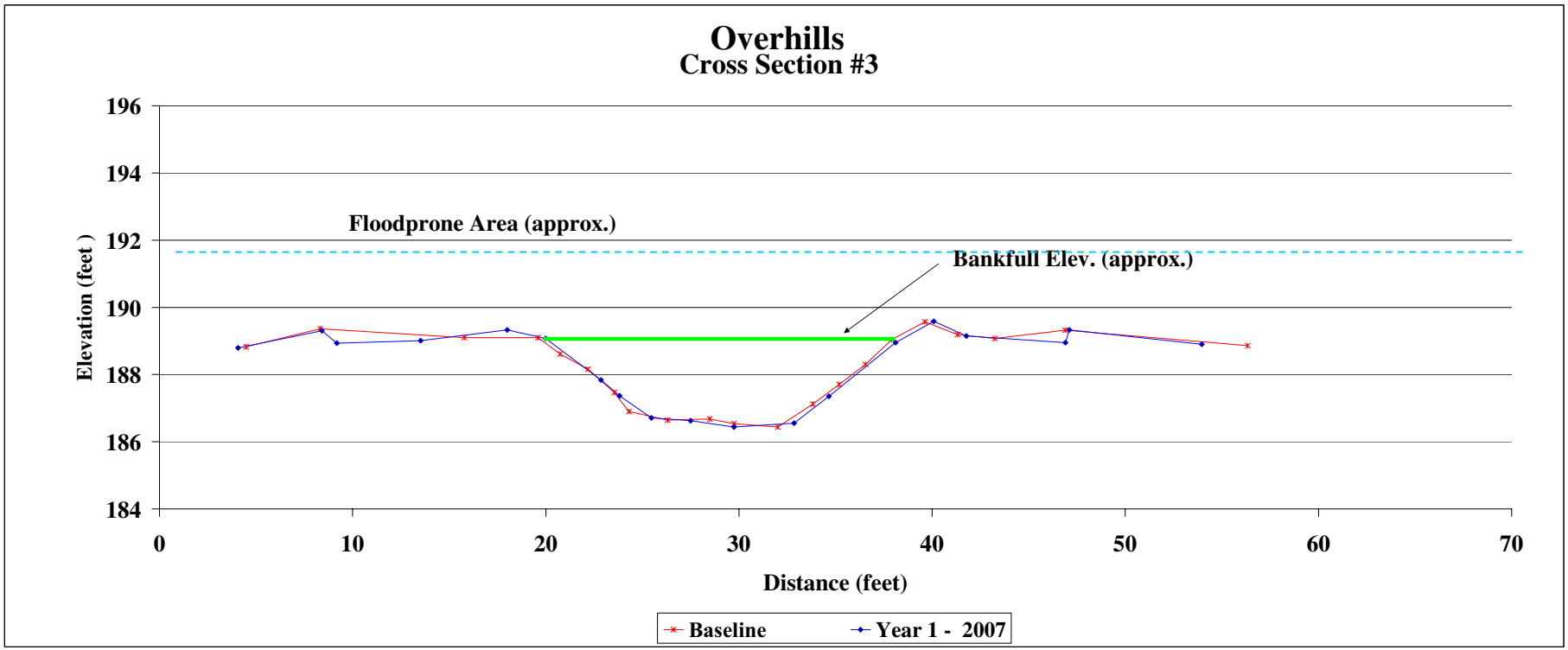


Project Name	Overhills	**Feature**	Riffle	**Date**	As Built -7/4/2007, Year 1 - 11/09/2007
Cross Section	Cross Section 3			**Crew**	AS Built - Bidelspach, Jean, Geenen, Year 1 - Geenen, Ballestero

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**
												4.06	188.79		4.48	188.83	
												8.41	189.3	Left Pin	8.32	189.36	Left Pin
												9.18	188.93		15.78	189.1	
												13.52	189.01		19.61	189.1	
												18	189.33		20.74	188.61	LBK
												19.99	189.07	LBK	22.18	188.16	
												22.85	187.84		23.54	187.47	
												23.82	187.37		24.3	186.9	
												25.46	186.71		26.31	186.64	
												27.49	186.63		28.49	186.68	
												29.75	186.44		29.75	186.54	
												32.85	186.55		32.01	186.44	
												34.65	187.35		33.82	187.12	
												38.11	188.95		35.19	187.71	
												40.08	189.58		36.54	188.3	
												41.78	189.15	RBK	37.91	189.04	RBK
												46.9	188.95		39.63	189.57	
												47.1	189.33	Right Pin	41.31	189.19	
												53.96	188.9		43.25	189.07	
															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					31.52	31.03	
Width					17.86	18.15	
Mean Depth					1.76	1.71	
Max Depth					2.60	2.60	
W/D					10.13	10.62	

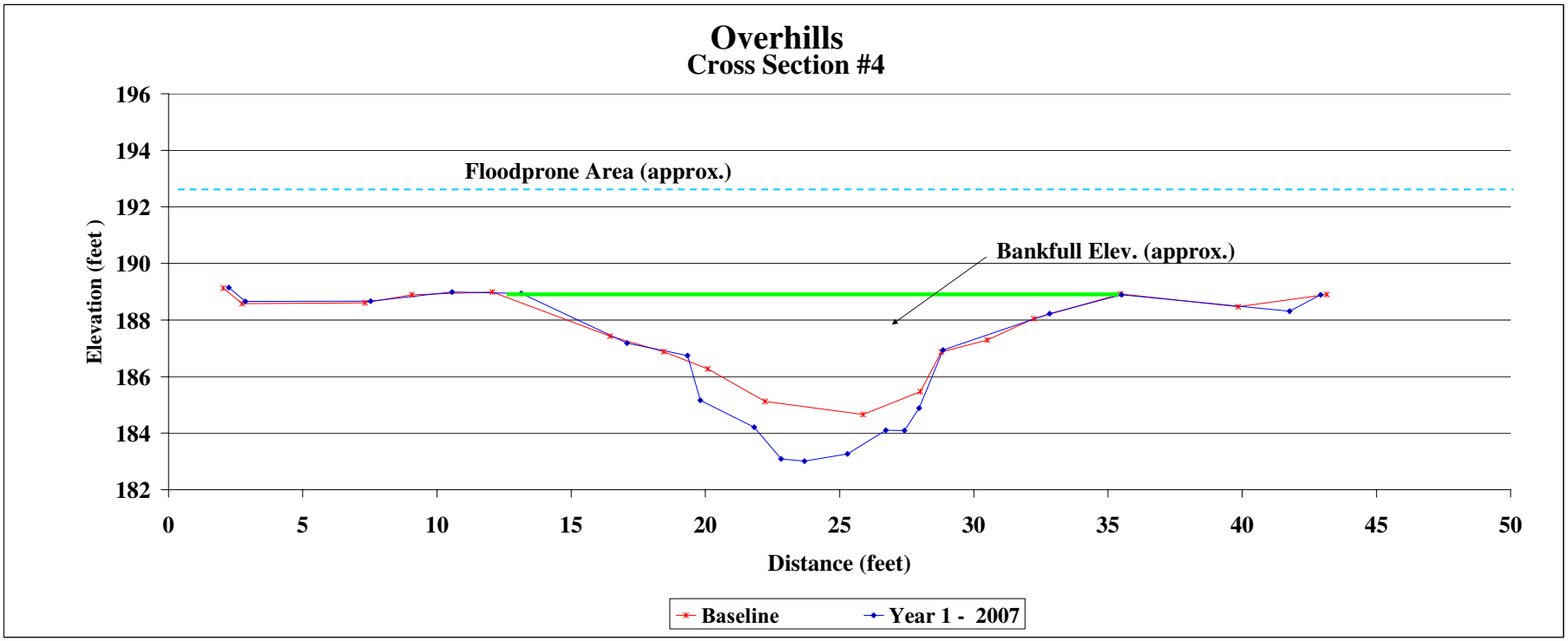


Project Name	Overhills	**Feature**	Pool	**Date**	As Built -7/4/2007, Year 1 - 11/09/2007
Cross Section	Cross Section 4			**Crew**	AS Built - Bidelspach, Jean, Geenen, Year 1 - Geenen, Ballestero

Year 5 - 2011 Survey			Year 4 - 2010 Survey			Year 3 - 2009 Survey			Year 2 - 2008 Survey			Year 1 - 2007 Survey			Baseline Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
												2.24	189.15	Left Pin	2.04	189.13	Left Pin
												2.87	188.66		2.74	188.58	
												7.53	188.67		7.31	188.61	
												10.56	188.99	LBK	9.06	188.89	
												13.14	188.94		12.06	188.99	LBK
												17.08	187.18		16.45	187.43	
												19.34	186.74		18.45	186.88	
												19.81	185.16		20.09	186.27	
												21.82	184.21		22.22	185.12	
												22.82	183.09		25.87	184.66	
												23.69	183.01		28.01	185.47	
												25.3	183.27		28.79	186.87	
												26.72	184.1		30.5	187.29	
												27.42	184.09		32.24	188.05	
												27.96	184.89		35.46	188.92	RBK
												28.85	186.94		39.85	188.47	
												32.83	188.22		43.15	188.9	Right Pin
												35.51	188.89	RBK			
												41.76	188.31				
												42.92	188.89	Right Pin			

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					59.60	49.19	
Width					22.25	23.19	
Mean Depth					2.68	2.12	
Max Depth					5.91	4.26	
W/D					8.31	10.93	

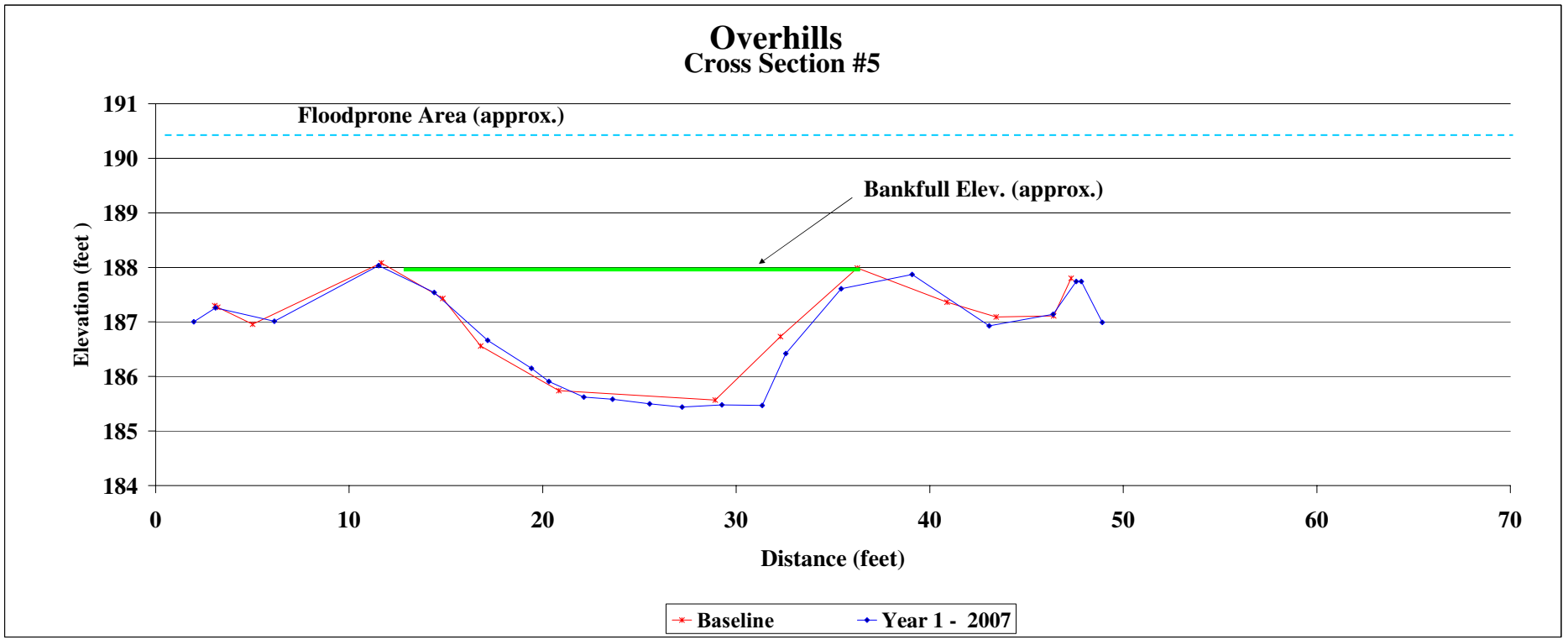


Project Name	Overhills	**Feature**	Riffle	**Date**	As Built -7/4/2007, Year 1 - 11/09/2007
Cross Section	Cross Section 5			**Crew**	AS Built - Bidelspach, Jean, Geenen, Year 1 - Geenen, Ballestero

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**
												1.97	187		3.05	187.3	Left Pin
												3.09	187.26	Left Pin	3.21	187.27	
												6.14	187.01		5.01	186.96	
												11.52	188.03	LBK	11.66	188.08	LBK
												14.4	187.54		14.84	187.43	
												17.16	186.66		16.8	186.56	
												19.42	186.15		20.84	185.74	
												20.32	185.91		28.91	185.57	
												22.12	185.62		32.28	186.73	
												23.61	185.58		36.26	187.99	RBK
												25.53	185.5		40.89	187.36	
												27.2	185.44		43.43	187.09	
												29.26	185.48		46.4	187.11	Right Pin
												31.34	185.47		47.3	187.8	
												32.57	186.42				
												35.43	187.61				
												39.09	187.87	RBK			
												43.07	186.93				
												46.38	187.14	Right Pin			
												47.57	187.74				
												47.83	187.74				
												48.91	186.99				

Photo of Cross-Section 2 - Looking Downstream @ STA 26+86

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area					40.91	37.70	
Width					24.50	24.16	
Mean Depth					1.67	1.56	
Max Depth					2.55	2.42	
W/D					14.68	15.48	

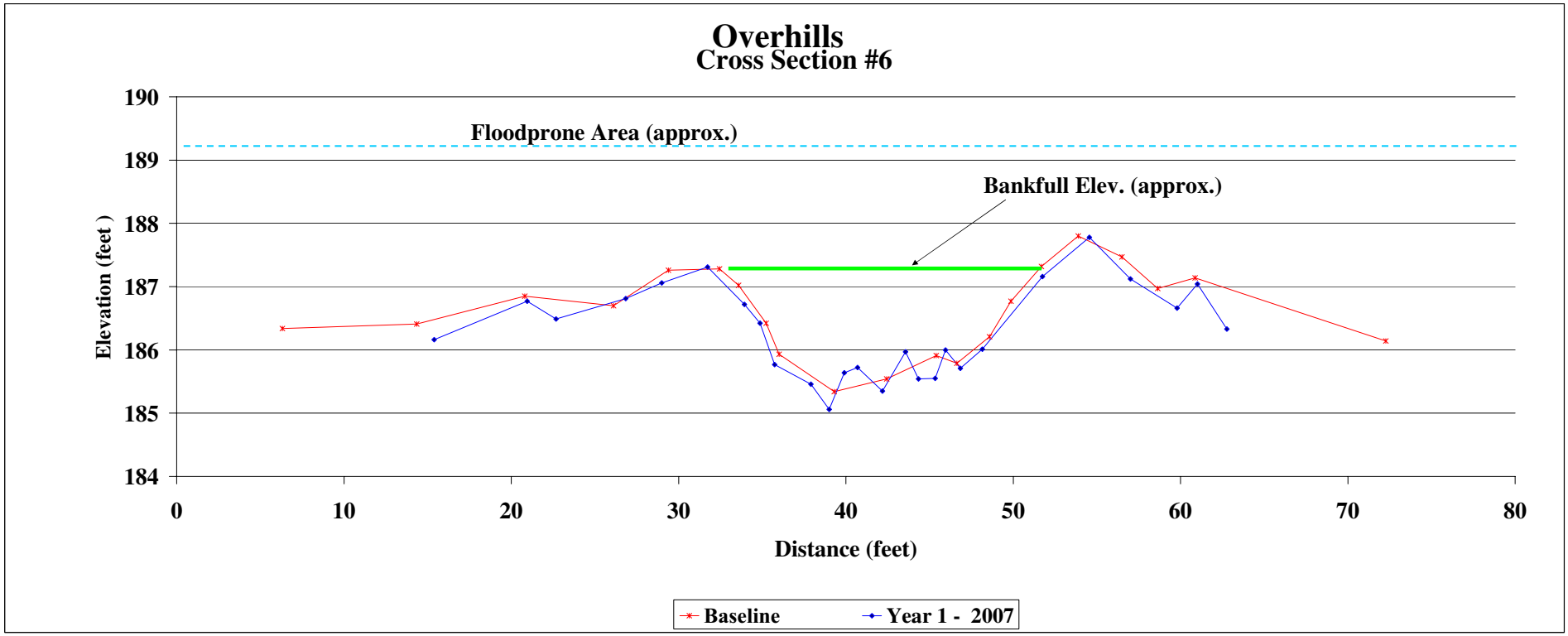


Project Name	Overhills	**Feature**	Pool	**Date**	As Built -7/4/2007, Year 1 - 11/09/2007
Cross Section	Cross Section 6			**Crew**	AS Built - Bidelspach, Jean, Geenen, Year 1 - Geenen, Ballestero

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**
												15.39	186.16		6.32	186.34	
												20.95	186.77	Left Pin	14.35	186.41	
												22.67	186.49		20.81	186.85	Left Pin
												26.84	186.81		26.11	186.7	
												29	187.06		29.39	187.26	
												31.73	187.31	LBK	32.45	187.28	LBK
												33.93	186.72		33.59	187.02	
												34.87	186.42		35.23	186.42	
												35.74	185.77		36.01	185.93	
												37.91	185.46		39.3	185.34	
												39.01	185.06		42.44	185.54	
												39.91	185.64		45.4	185.91	
												40.69	185.72		46.64	185.79	
												42.18	185.35		48.59	186.21	
												43.56	185.97		49.86	186.77	
												44.34	185.54		51.69	187.32	RBK
												45.33	185.55		53.89	187.8	
												45.95	186		56.5	187.47	
												46.84	185.71		58.64	186.97	
												48.16	186.01		60.87	187.14	Right Pin
												51.75	187.16	RBK	72.27	186.14	
												54.56	187.78				
												57.01	187.12				
												59.8	186.66				
												61.01	187.04	Right Pin			
												62.77	186.33				

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					25.35	23.43	
Width					19.24	19.06	
Mean Depth					1.32	1.23	
Max Depth					2.21	1.94	
W/D					14.59	15.51	

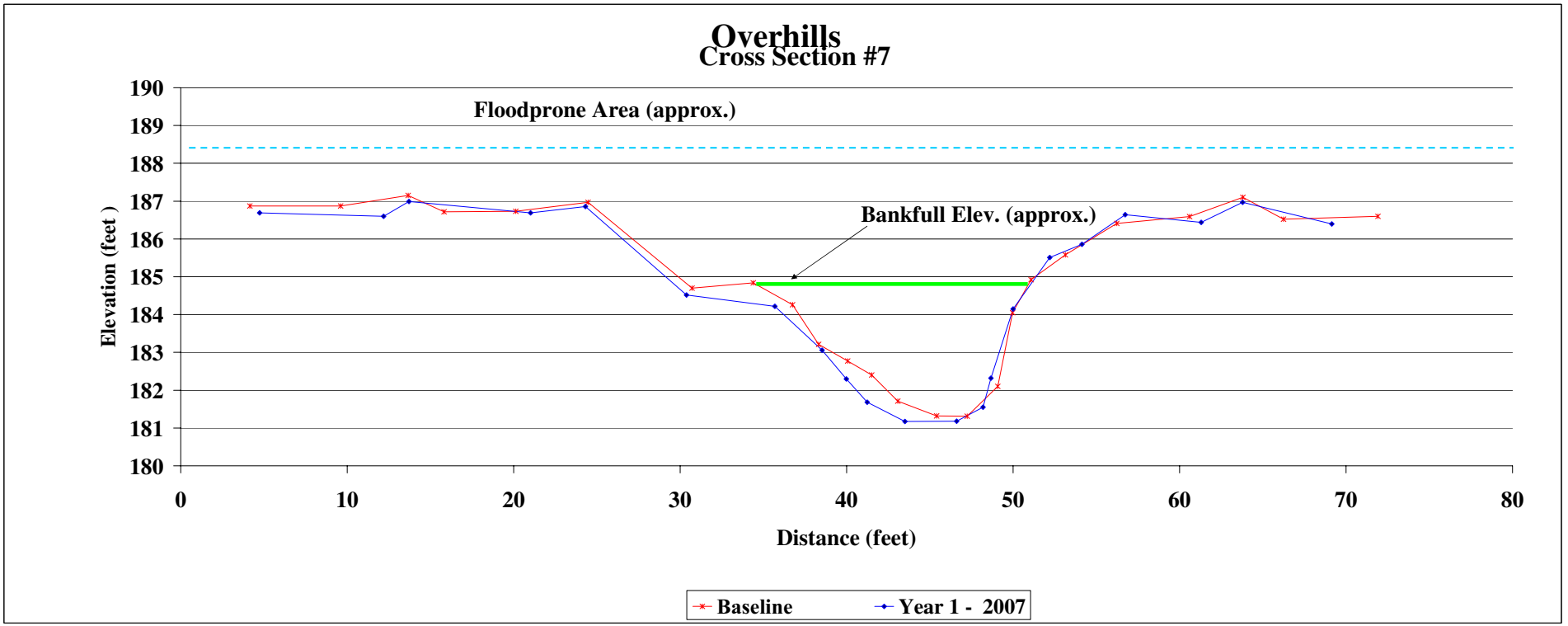


Project Name	Overhills	**Feature**	Riffle	**Date**	As Built -7/4/2007, Year 1 - 11/09/2007
Cross Section	Cross Section 7			**Crew**	AS Built - Bidelspach, Jean, Geenen, Year 1 - Geenen, Ballestero

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**
												4.74	186.69		4.15	186.87	
												12.19	186.6		9.61	186.87	
												13.71	186.99	Left Pin	13.66	187.15	Left Pin
												21.01	186.69		15.81	186.72	
												24.31	186.86		20.13	186.73	
												30.38	184.52	LBK	24.47	186.97	
												35.69	184.22		30.71	184.7	
												38.52	183.06		34.39	184.84	LBK
												39.99	182.3		36.75	184.26	
												41.24	181.68		38.32	183.21	
												43.5	181.17		40.06	182.77	
												46.61	181.18		41.51	182.4	
												48.2	181.55		43.08	181.71	
												48.67	182.32		45.41	181.32	
												50	184.15		47.24	181.31	
												52.21	185.51	RBK	49.08	182.1	
												54.14	185.86		49.97	184.05	
												56.73	186.64		51.07	184.92	RBK
												61.3	186.44		53.14	185.58	
												63.79	186.97	Right Pin	56.23	186.41	
												69.14	186.4		60.6	186.59	
															63.81	187.1	Right Pin
															66.24	186.52	
															71.92	186.6	

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					39.41	35.21	
Width					16.68	16.54	
Mean Depth					2.36	2.13	
Max Depth					3.67	3.53	
W/D					7.06	7.77	

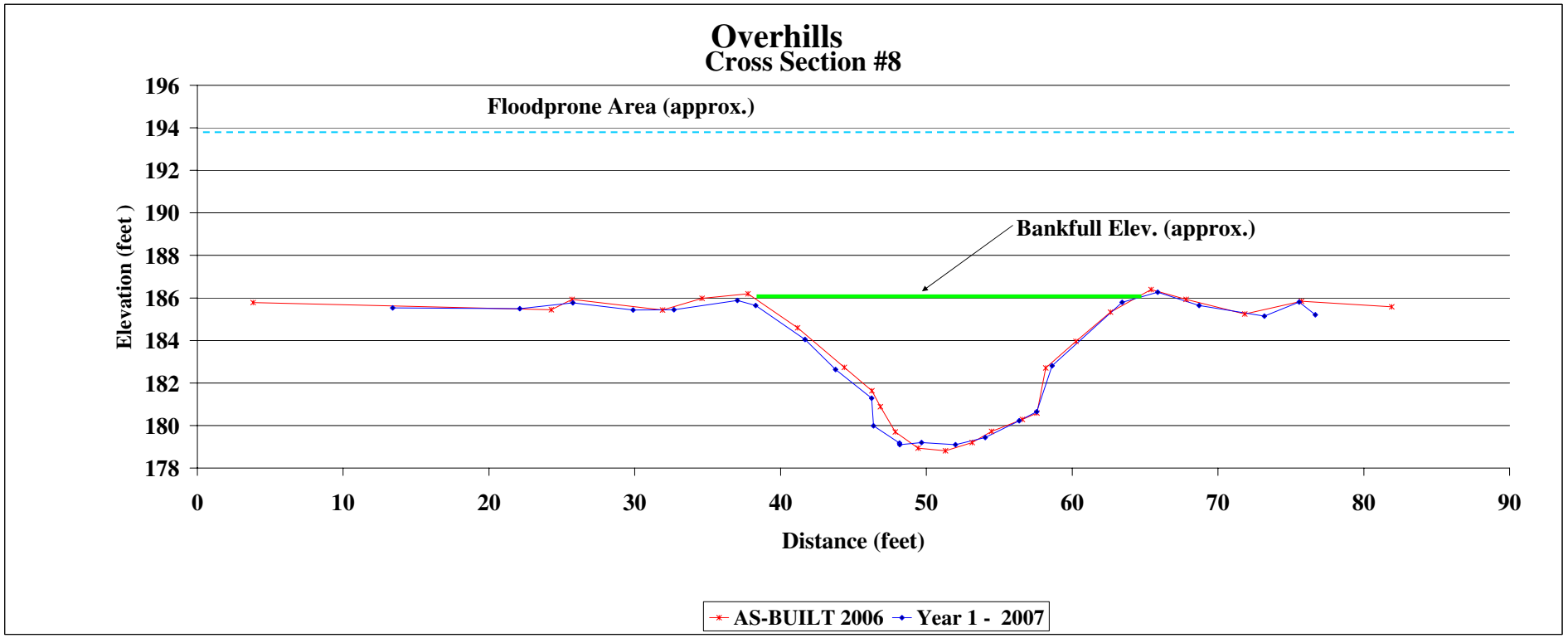


Project Name	Overhills	**Feature**	Pool	**Date**	As Built -7/4/2007, Year 1 - 11/09/2007
Cross Section	Cross Section 8			**Crew**	AS Built - Bidelspach, Jean, Geenen, Year 1 - Geenen, Ballestero

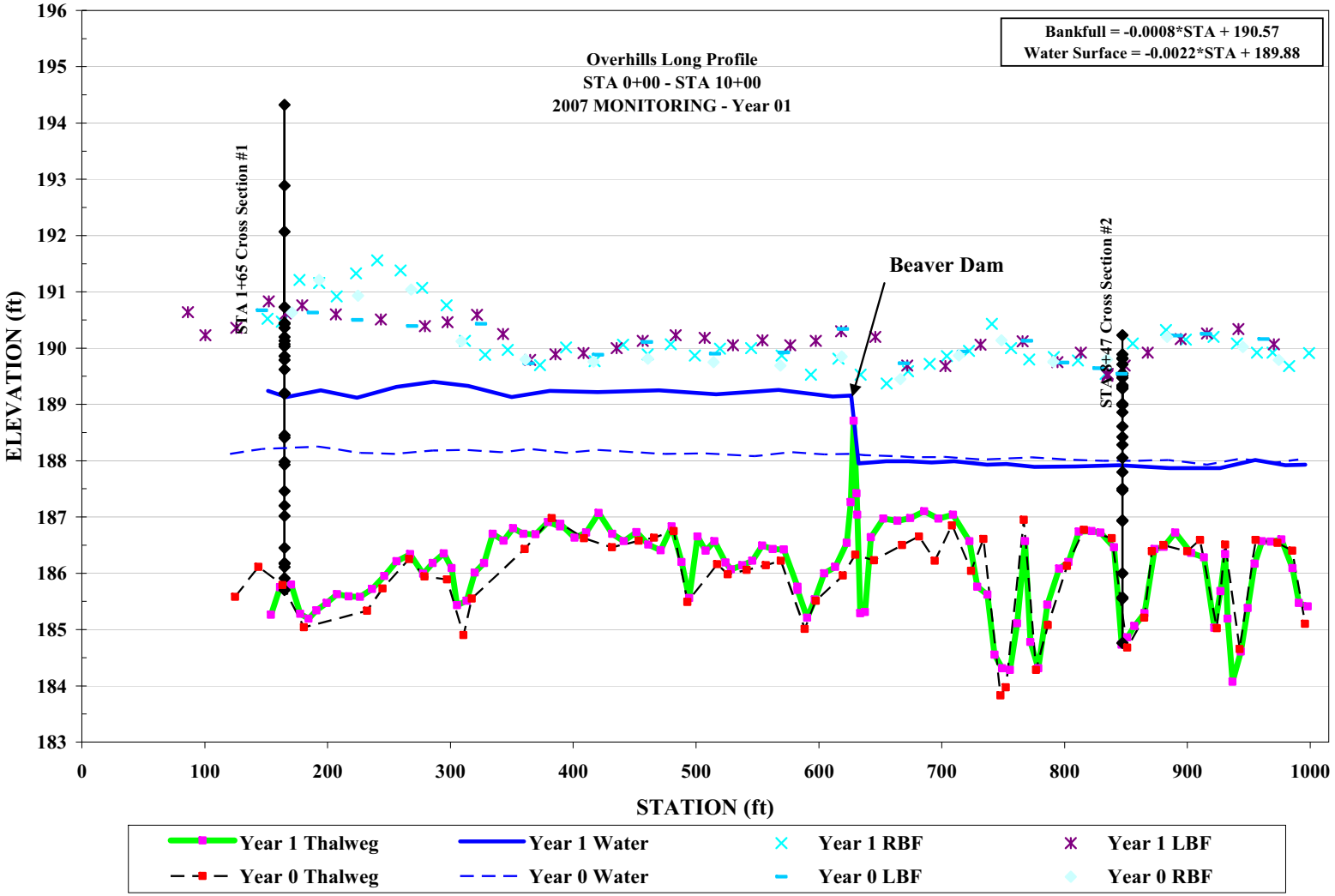
Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			AS-BUILT 2006 AS-BUILT Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
												13.4	185.53		3.83	185.78	
												22.11	185.5		24.28	185.45	
												25.75	185.77	Left Pin	25.7	185.93	Left Pin
												29.88	185.43		31.91	185.43	
												32.68	185.44		34.62	185.98	
												37.04	185.88	LBK	37.77	186.2	LBK
												38.3	185.65		41.17	184.6	
												41.67	184.04		44.37	182.74	
												43.77	182.64		46.27	181.63	
												46.24	181.29		46.85	180.88	
												46.38	179.99		47.86	179.7	
												48.16	179.17		49.44	178.94	
												48.17	179.1		51.31	178.81	
												49.67	179.2		53.14	179.2	
												51.99	179.1		54.48	179.72	RBK
												54.04	179.44	RBK	56.58	180.29	
												56.36	180.22		57.59	180.59	
												57.57	180.65		58.19	182.71	
												58.63	182.81		60.26	183.96	
												63.42	185.79		62.63	185.33	
												65.87	186.27		65.42	186.4	
												68.7	185.65		67.81	185.93	
												73.19	185.15		71.84	185.25	
												75.56	185.81	Right Pin	75.73	185.85	Right Pin
												76.68	185.21		81.92	185.58	
															89.04	186.33	

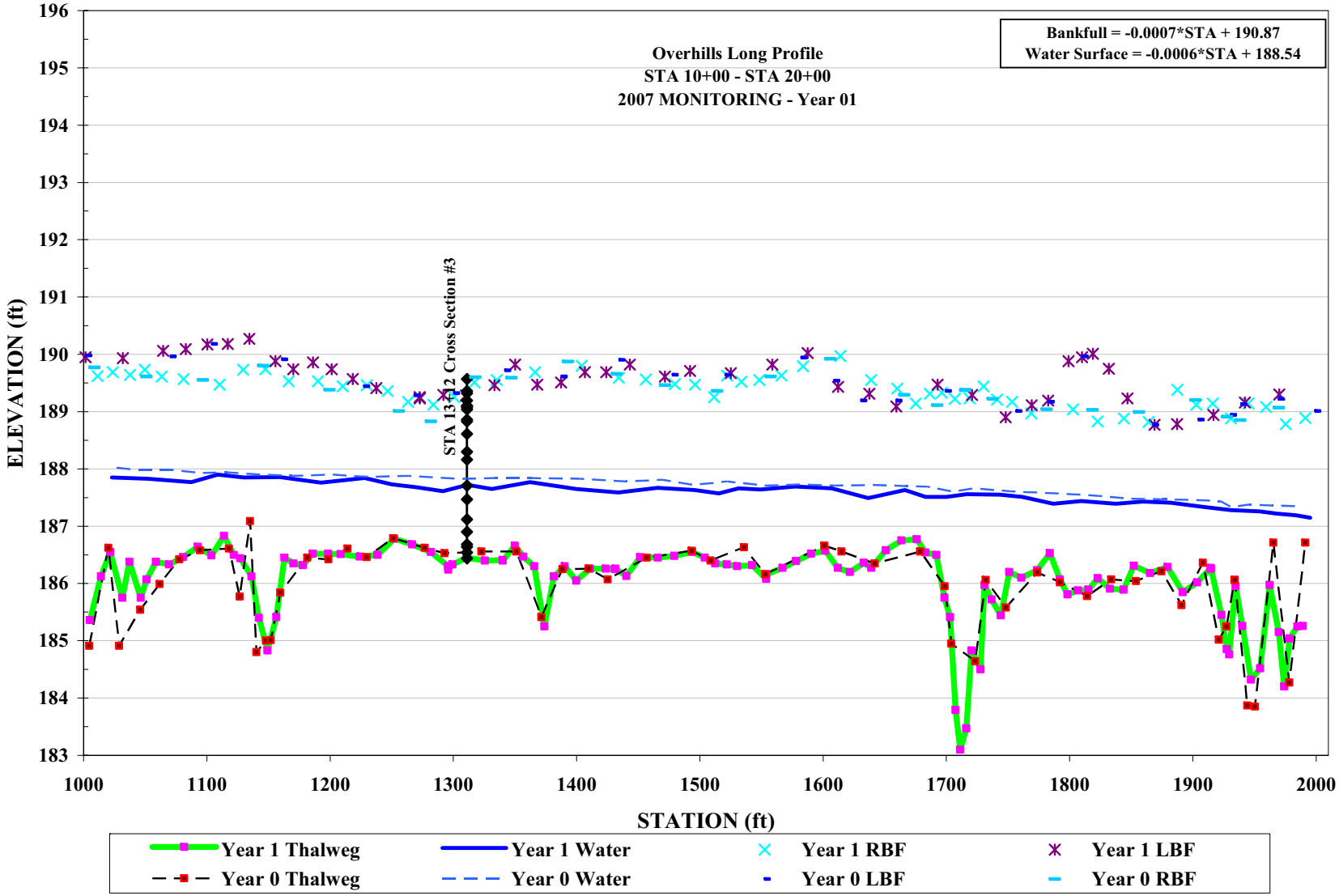
Photo of Cross-Section 8 - Looking Downstream @ STA 43+02

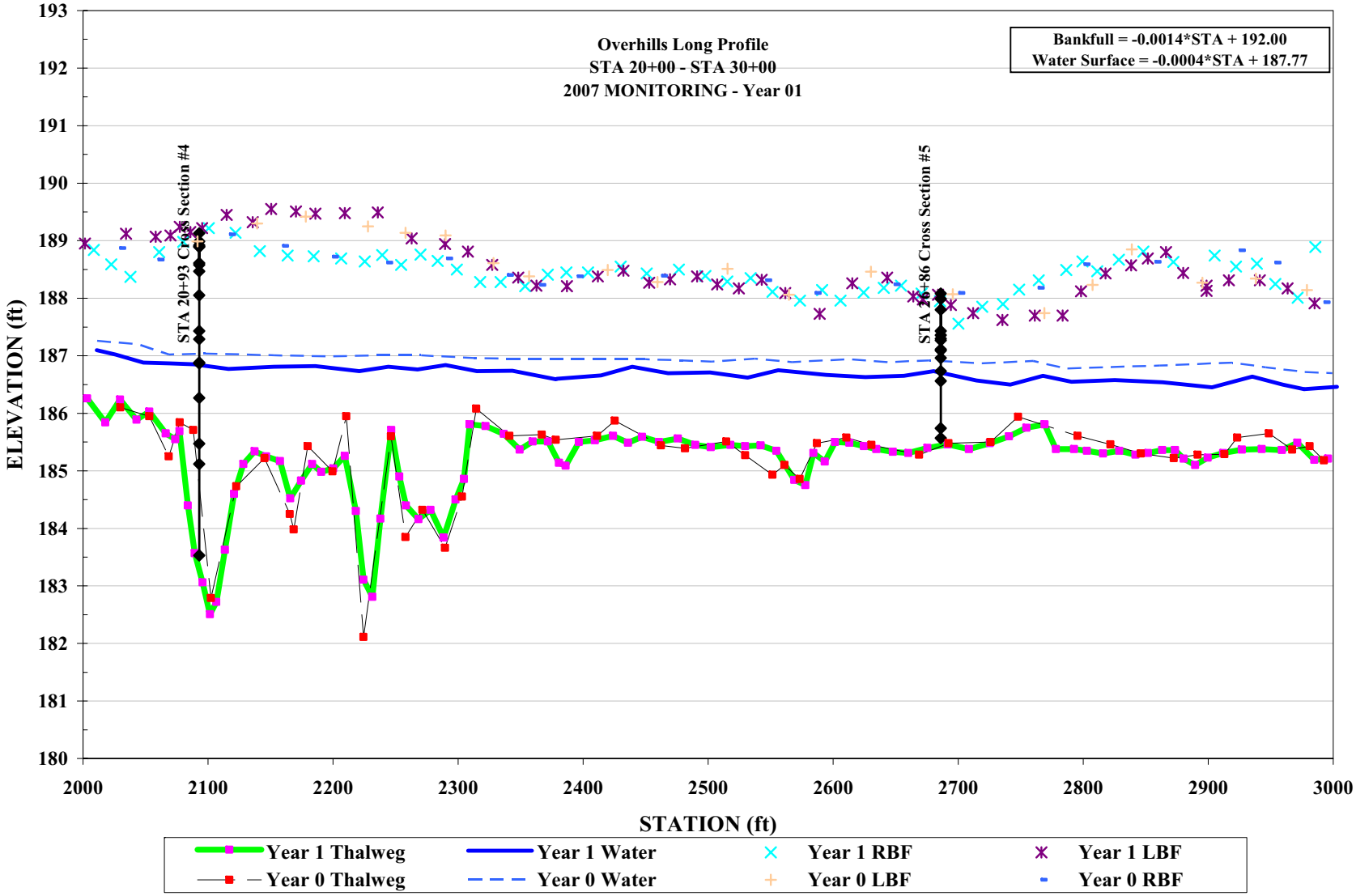
	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	AS-BUILT 2006	Bench
Area					110.97	106.10	
Width					27.72	27.10	
Mean Depth					4.00	3.92	
Max Depth					7.09	7.38	
W/D					6.92	6.92	

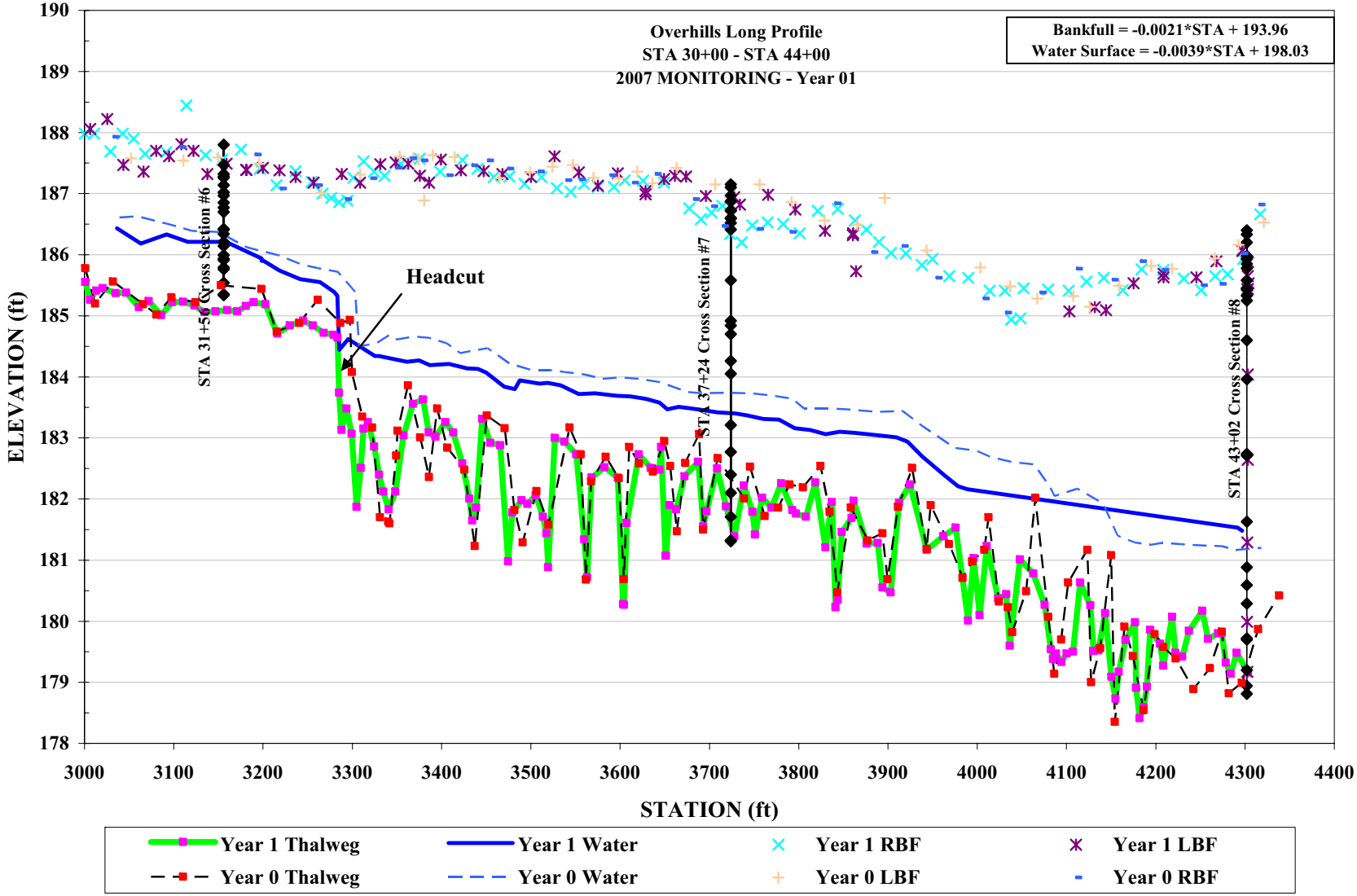


B.7 LONGITUDINAL PLOTS

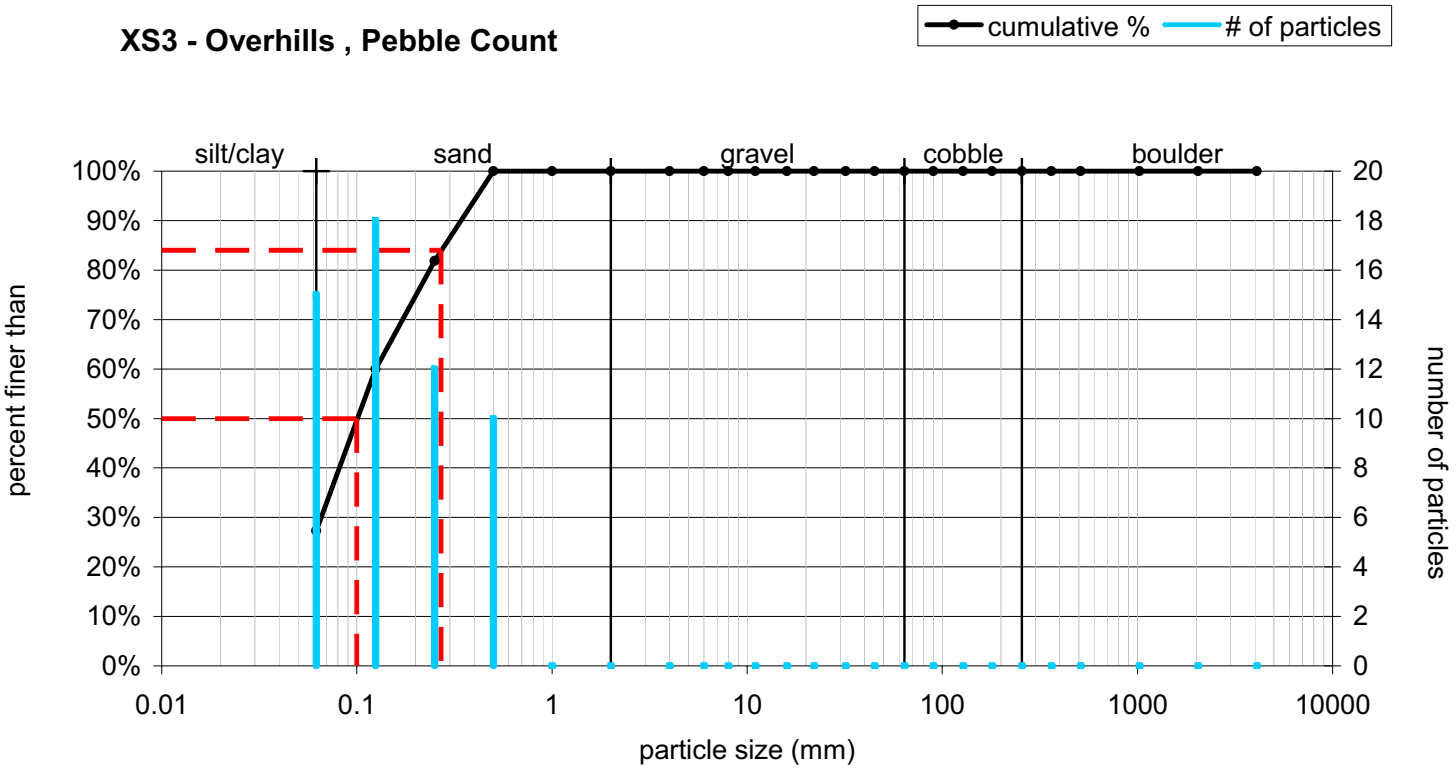



Bankfull = -0.0007*STA + 190.87
Water Surface = -0.0006*STA + 188.54
Overhills Long Profile
STA 10+00 - STA 20+00
2007 MONITORING - Year 01
STA 13+12 Cross Section #3
ELEVATION (ft)
STATION (ft)
196
195
194
193
192
191
190
189
188
187
186
185
184
183
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
2000
Year 1 Thalweg
Year 1 Water
Year 1 RBF
Year 1 LBF
Year 0 Thalweg
Year 0 Water
Year 0 LBF
Year 0 RBF


Overhills Long Profile
STA 20+00 - STA 30+00
2007 MONITORING - Year 01
Bankfull = -0.0014*STA + 192.00
Water Surface = -0.0004*STA + 187.77
STA 20+93 Cross Section #4
STA 26+86 Cross Section #5
ELEVATION (ft)
193
192
191
190
189
188
187
186
185
184
183
182
181
180
2000
2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
STATION (ft)
Year 1 Thalweg
Year 1 Water
Year 1 RBF
Year 1 LBF
Year 0 Thalweg
Year 0 Water
Year 0 LBF
Year 0 RBF


Overhills Long Profile
STA 30+00 - STA 44+00
2007 MONITORING - Year 01
Bankfull = -0.0021*STA + 193.96
Water Surface = -0.0039*STA + 198.03
ELEVATION (ft)
STATION (ft)
Headcut
STA 31+56 Cross Section #6
STA 37+24 Cross Section #7
STA 43+02 Cross Section #8
Year 1 Thalweg
Year 1 Water
Year 1 RBF
Year 1 LBF
Year 0 Thalweg
Year 0 Water
Year 0 LBF
Year 0 RBF

B.8 PEBBLE COUNT DISTRIBUTION

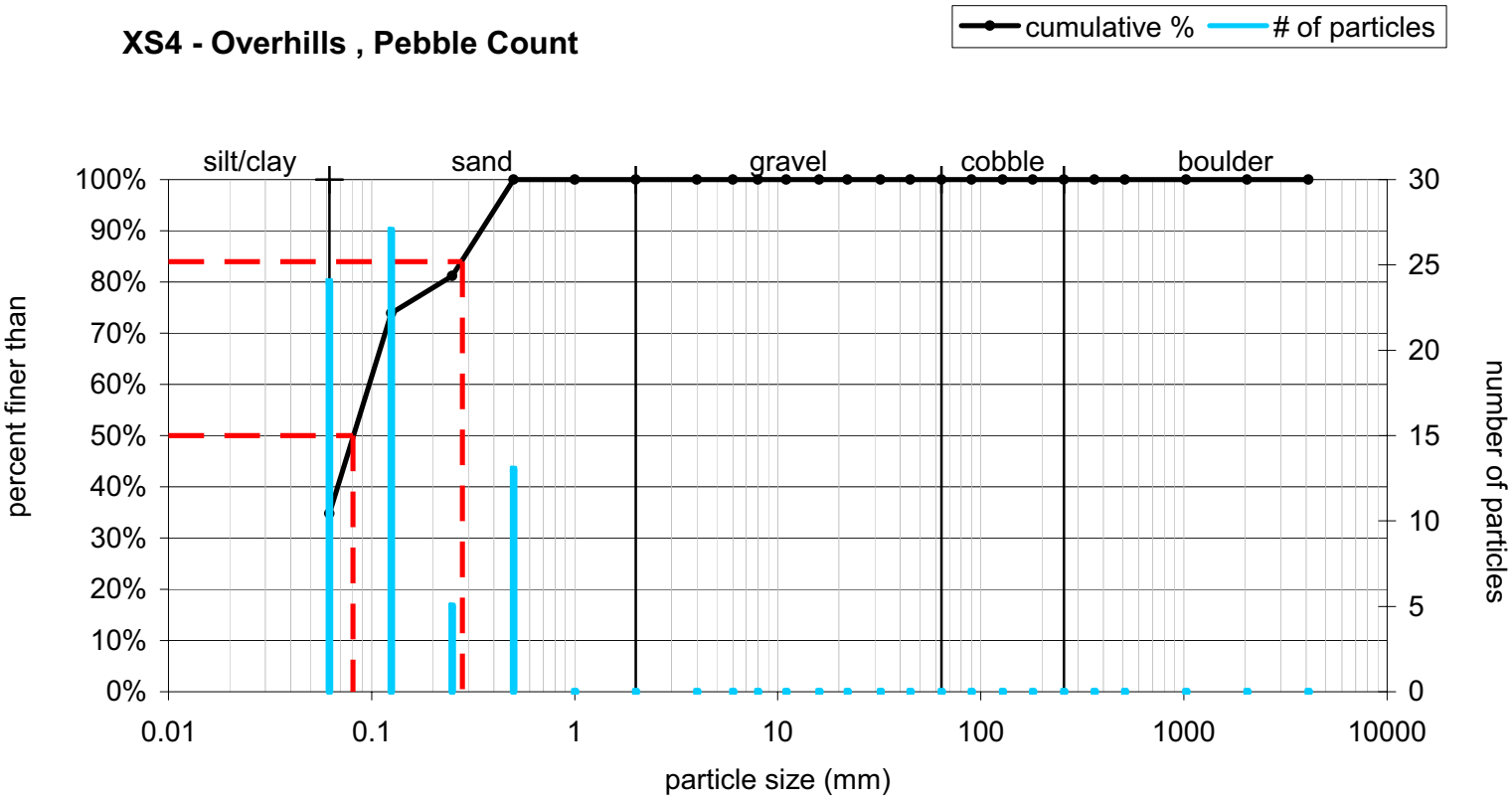


Size (mm)	
D16	0.062
D35	0.073
D50	0.1
D65	0.15
D84	0.27
D95	0.41

Size Distribution	
mean	0.1
dispersion	2.2
skewness	0.14

Type	
silt/clay	27%
sand	73%
gravel	0%
cobble	0%
boulder	0%

XS4 - Overhills , Pebble Count

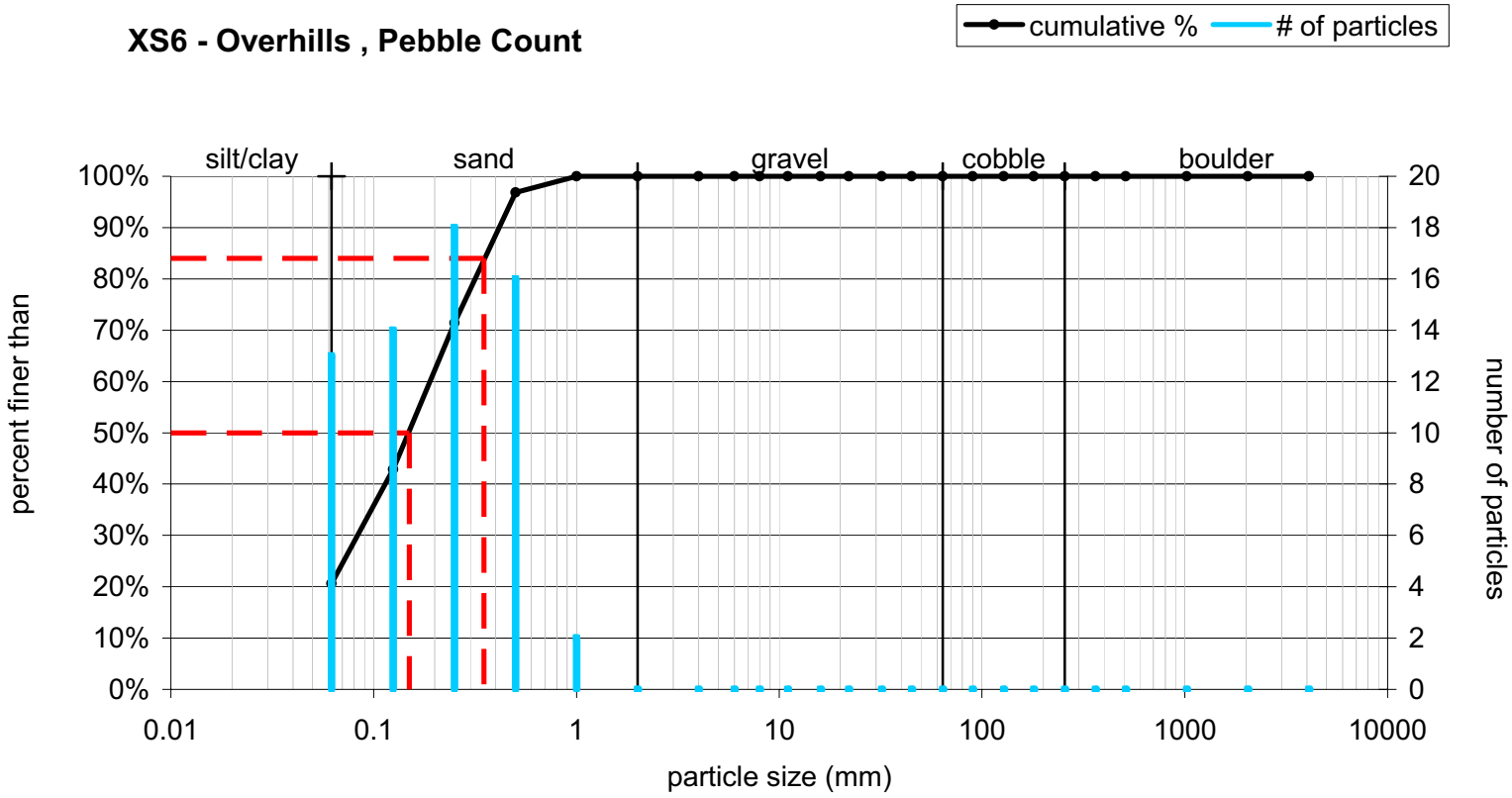


Size (mm)	
D16	0.062
D35	0.062
D50	0.081
D65	0.11
D84	0.28
D95	0.42

Size Distribution	
mean	0.1
dispersion	2.4
skewness	0.26

Type	
silt/clay	35%
sand	65%
gravel	0%
cobble	0%
boulder	0%

XS6 - Overhills , Pebble Count



Size (mm)	
D16	0.062
D35	0.098
D50	0.15
D65	0.21
D84	0.35
D95	0.48

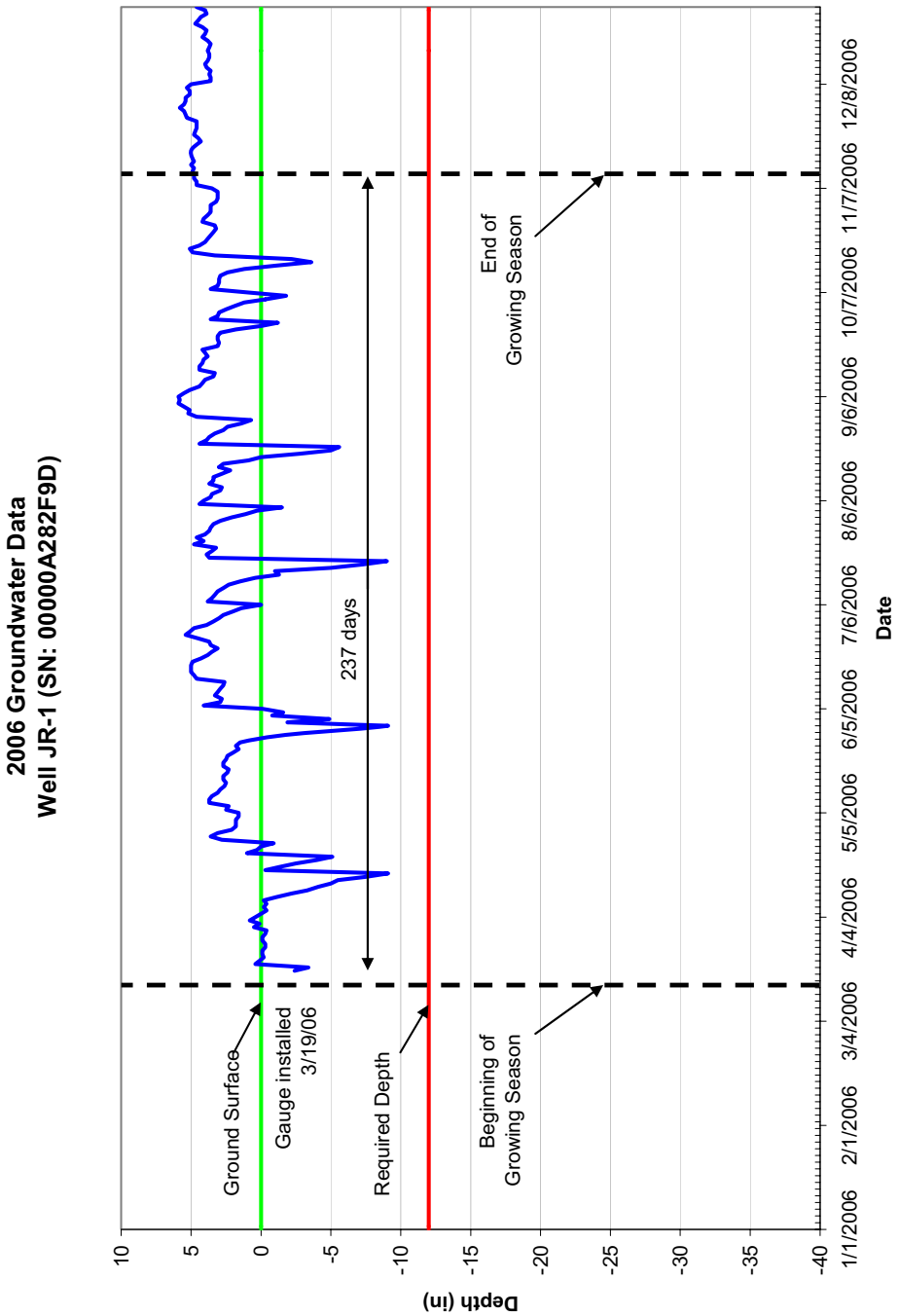
Size Distribution	
mean	0.1
dispersion	2.4
skewness	-0.01

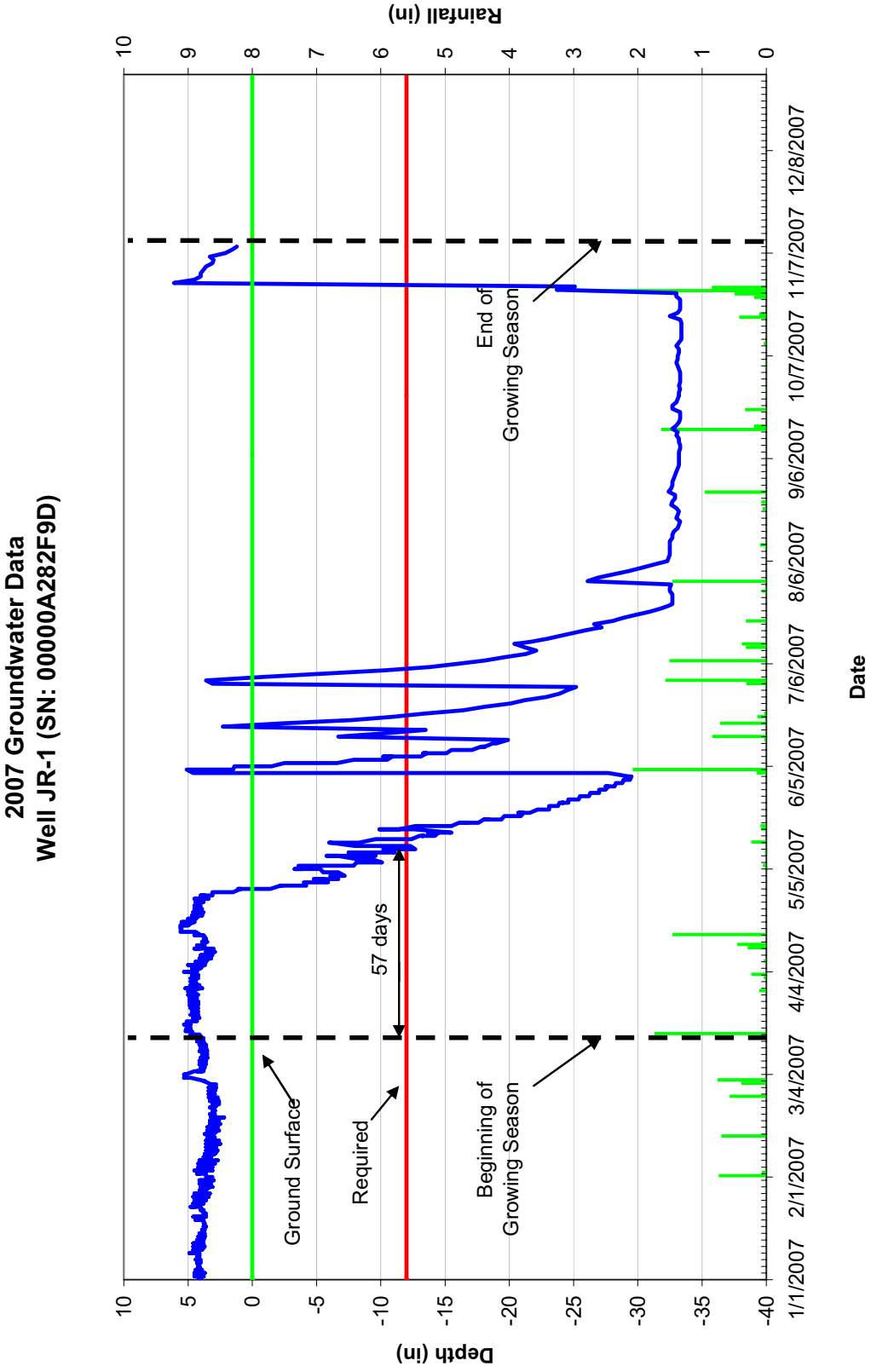
Type	
silt/clay	21%
sand	79%
gravel	0%
cobble	0%
boulder	0%

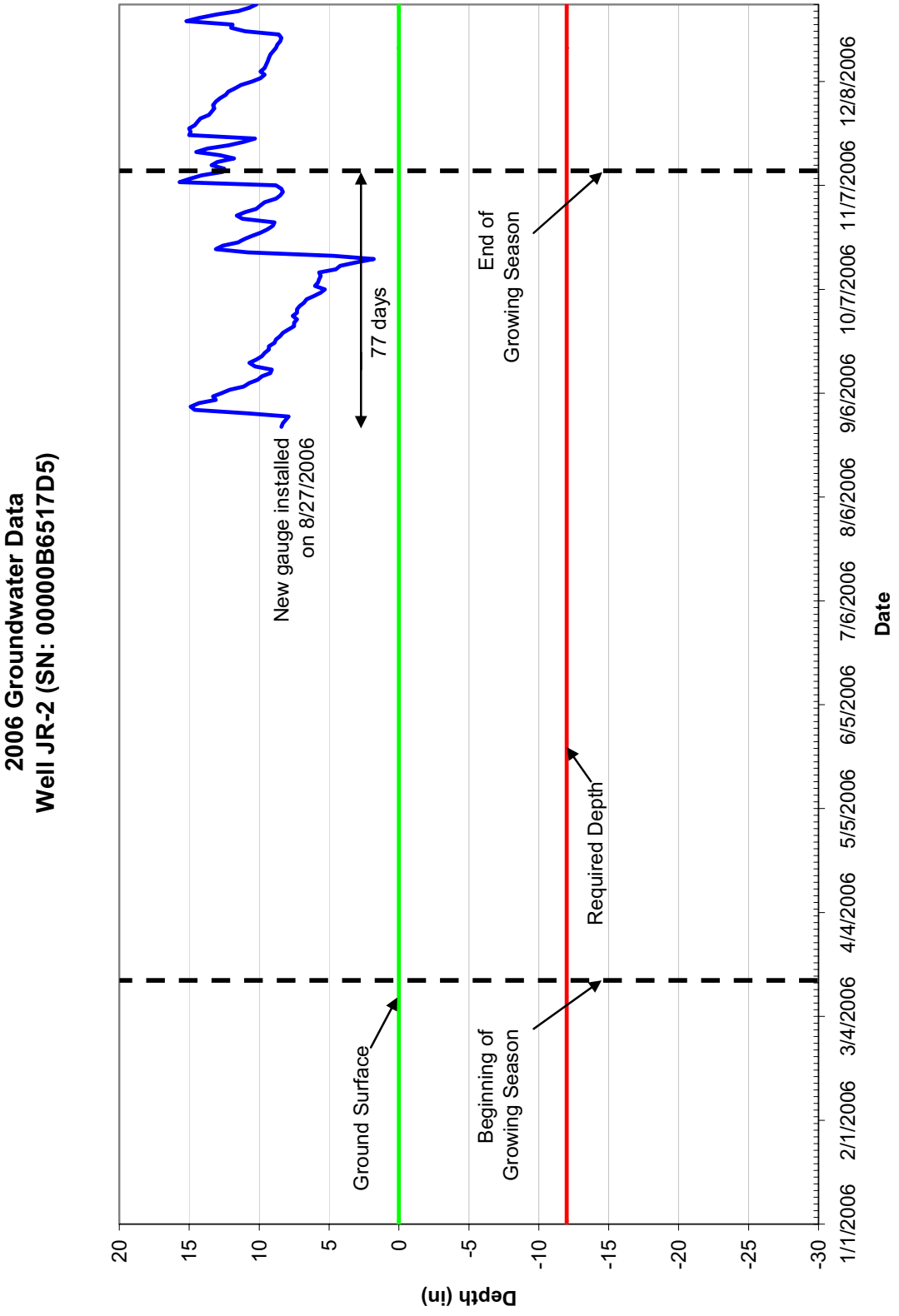
APPENDIX C – WETLAND RAW DATA

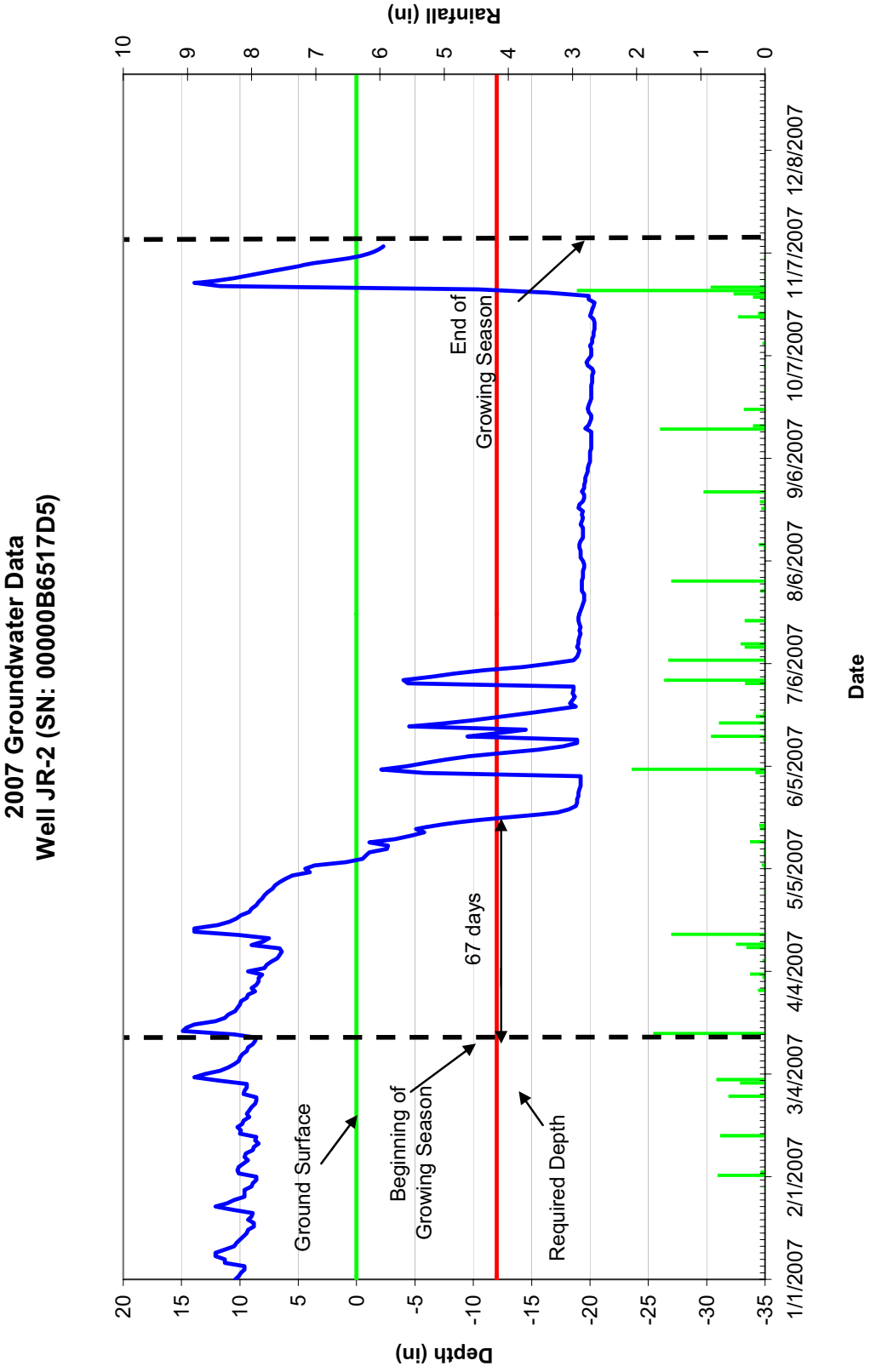
Appendix C. Wetland Raw Data

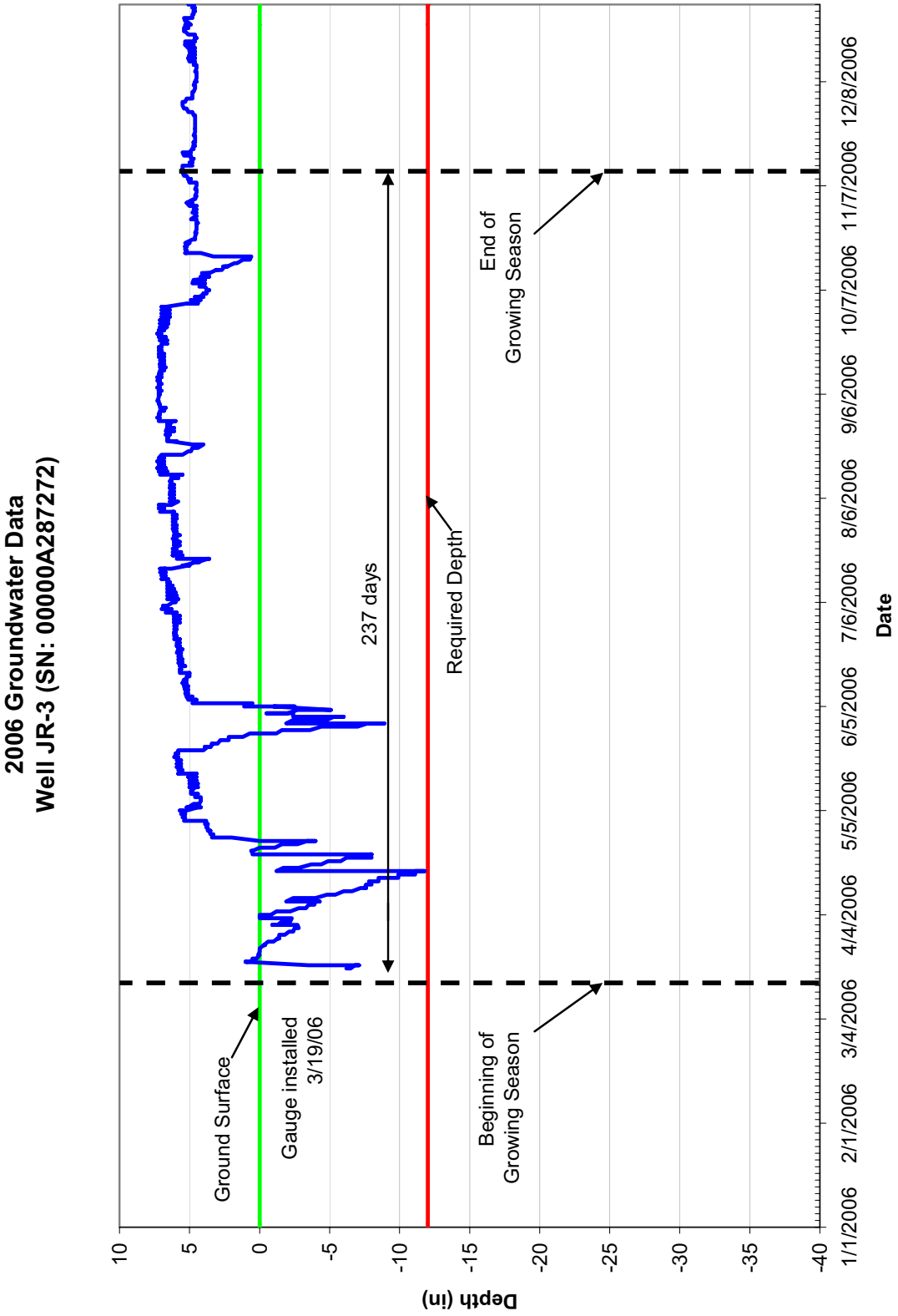
C.1 GAUGE DATA

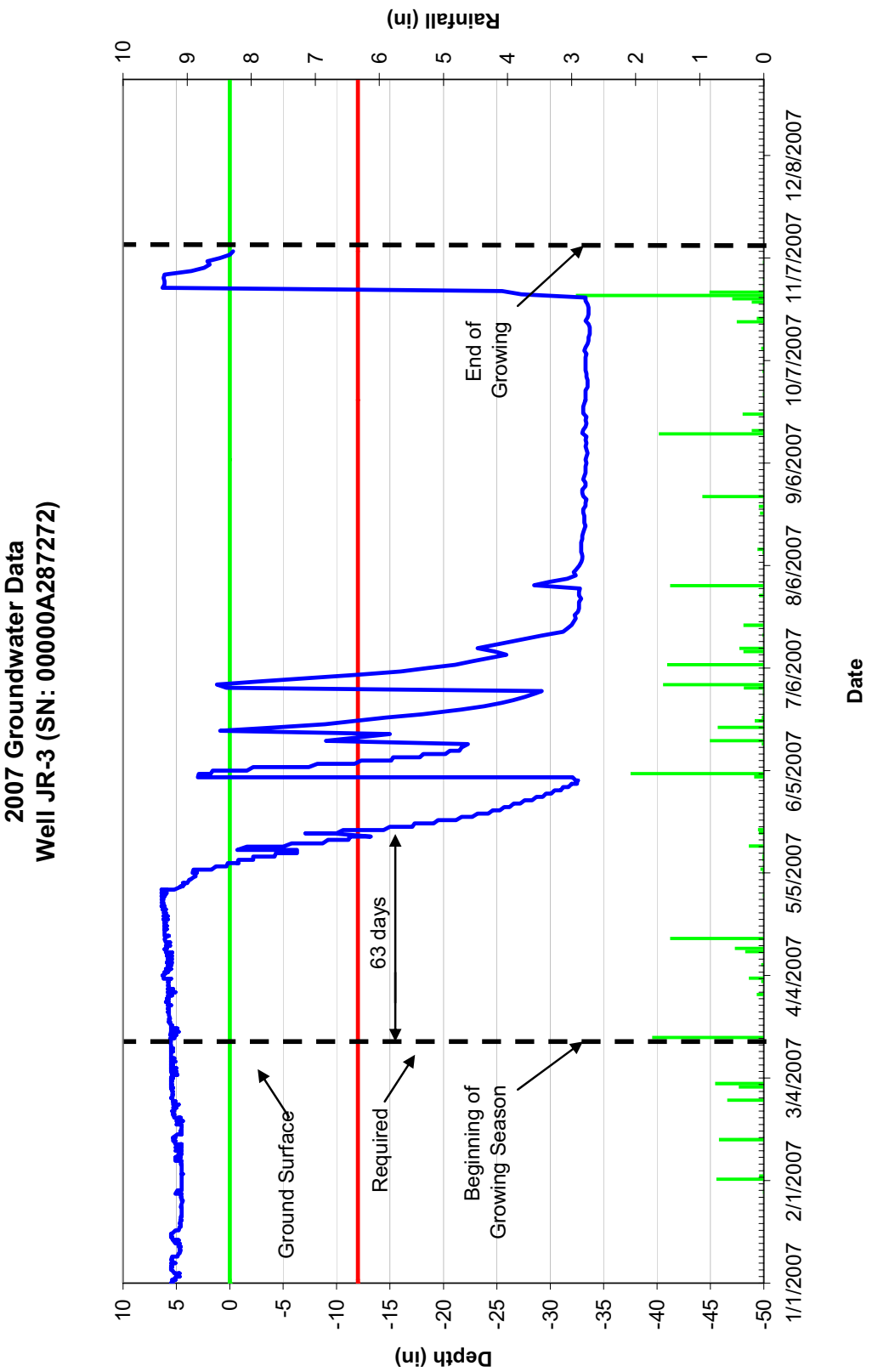


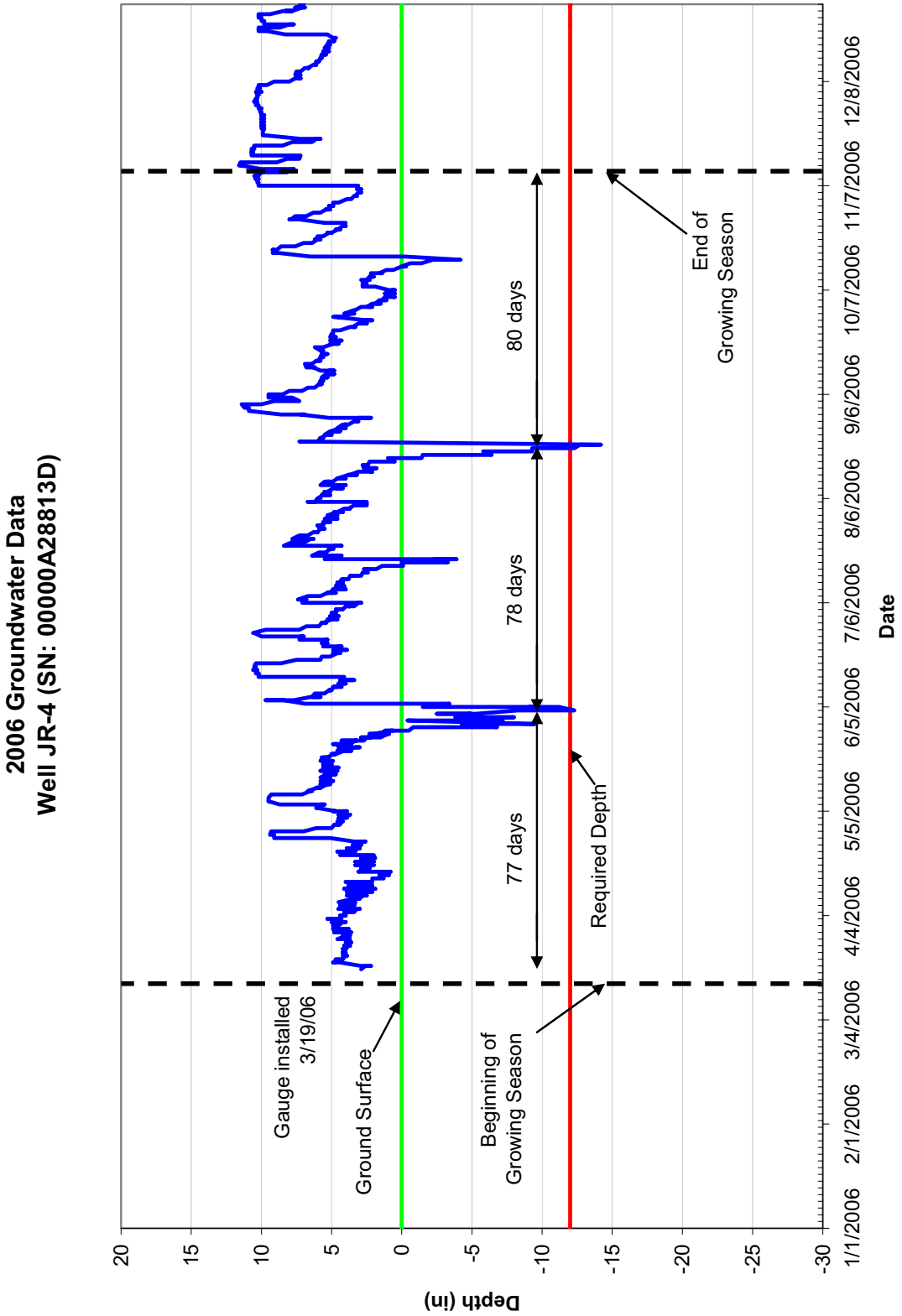

2007 Groundwater Data
Well JR-1 (SN: 00000A282F9D)
Depth (in)
Rainfall (in)
Date
Ground Surface
Required
57 days
Beginning of Growing Season
End of Growing Season
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
10
9
8
7
6
5
4
3
2
1
0
1/1/2007
2/1/2007
3/4/2007
4/4/2007
5/5/2007
6/5/2007
7/6/2007
8/6/2007
9/6/2007
10/7/2007
11/7/2007
12/8/2007

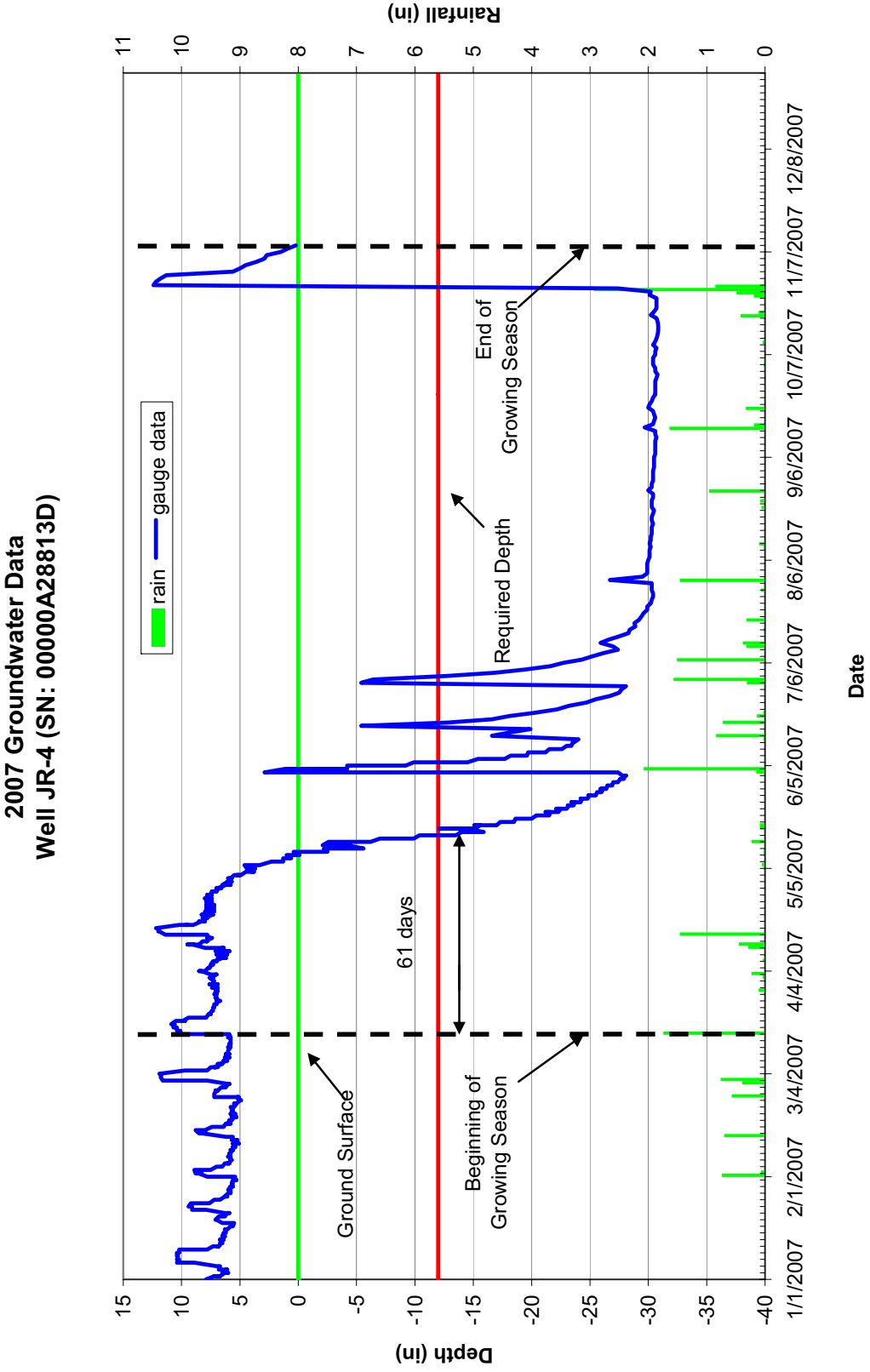

2006 Groundwater Data
Well JR-2 (SN: 00000B6517D5)
Depth (in)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
1/1/2006
2/1/2006
3/4/2006
4/4/2006
5/5/2006
6/5/2006
7/6/2006
8/6/2006
9/6/2006
10/7/2006
11/7/2006
12/8/2006
Date
New gauge installed on 8/27/2006
77 days
End of Growing Season
Required Depth
Ground Surface
Beginning of Growing Season

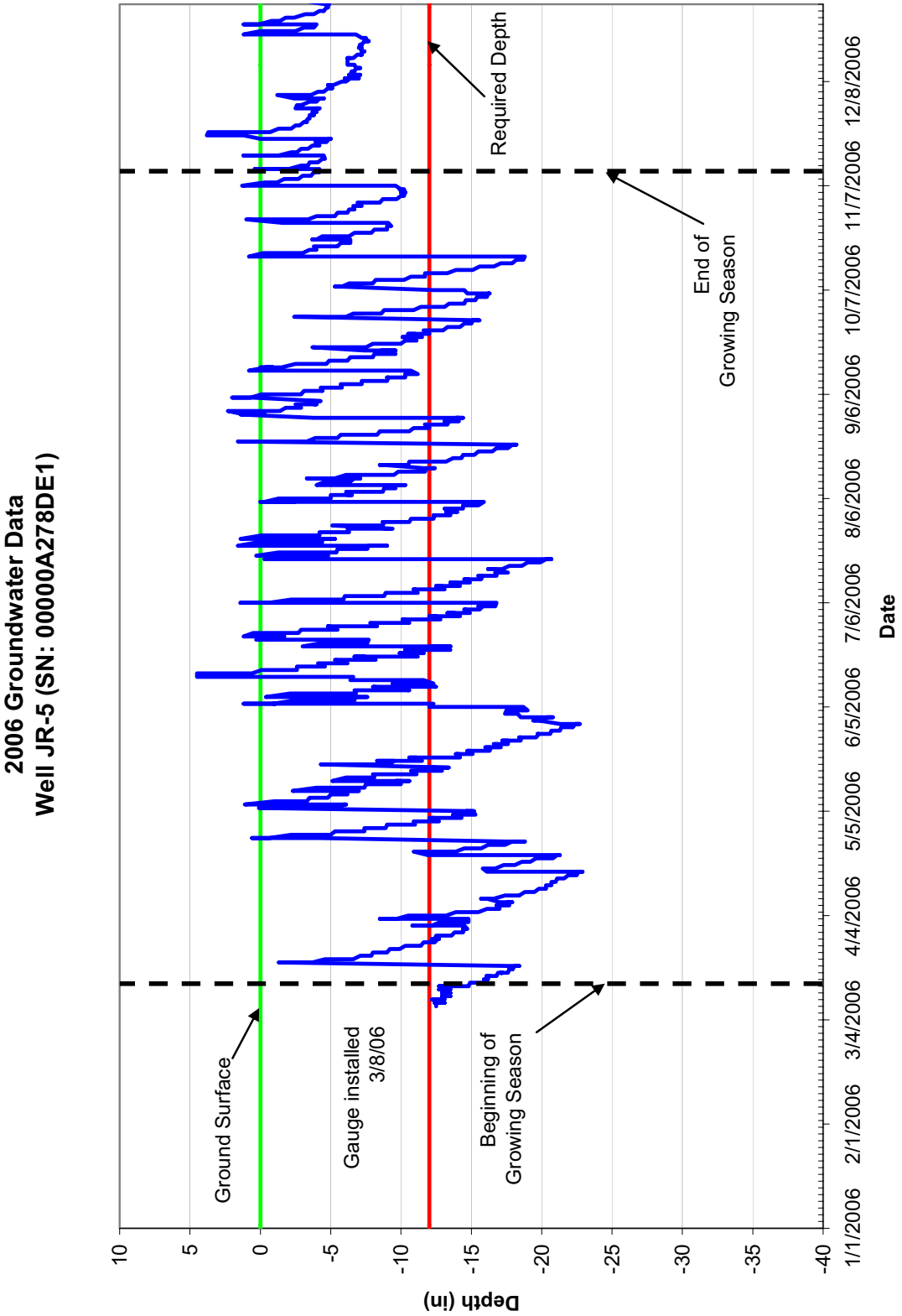

2007 Groundwater Data
Well JR-2 (SN: 00000B6517D5)
Depth (in)
Rainfall (in)
Date
Ground Surface
Beginning of Growing Season
67 days
End of Growing Season
Required Depth
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
10
9
8
7
6
5
4
3
2
1
0
1/1/2007
2/1/2007
3/4/2007
4/4/2007
5/5/2007
6/5/2007
7/6/2007
8/6/2007
9/6/2007
10/7/2007
11/7/2007
12/8/2007

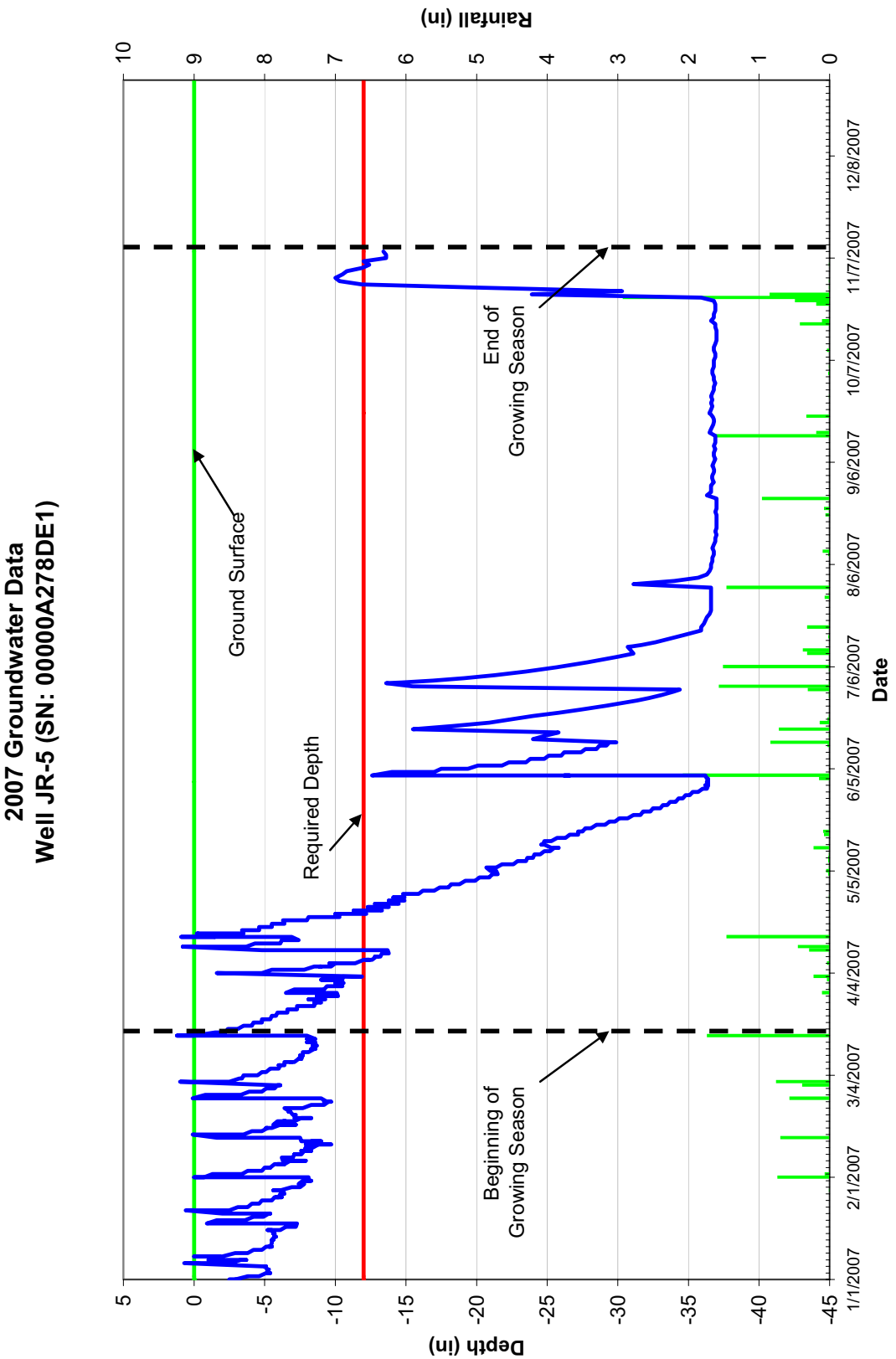

2006 Groundwater Data
Well JR-3 (SN: 00000A287272)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/2006
2/1/2006
3/4/2006
4/4/2006
5/5/2006
6/5/2006
7/6/2006
8/6/2006
9/6/2006
10/7/2006
11/7/2006
12/8/2006
Date
Ground Surface
Gauge installed 3/19/06
237 days
Required Depth
Beginning of Growing Season
End of Growing Season

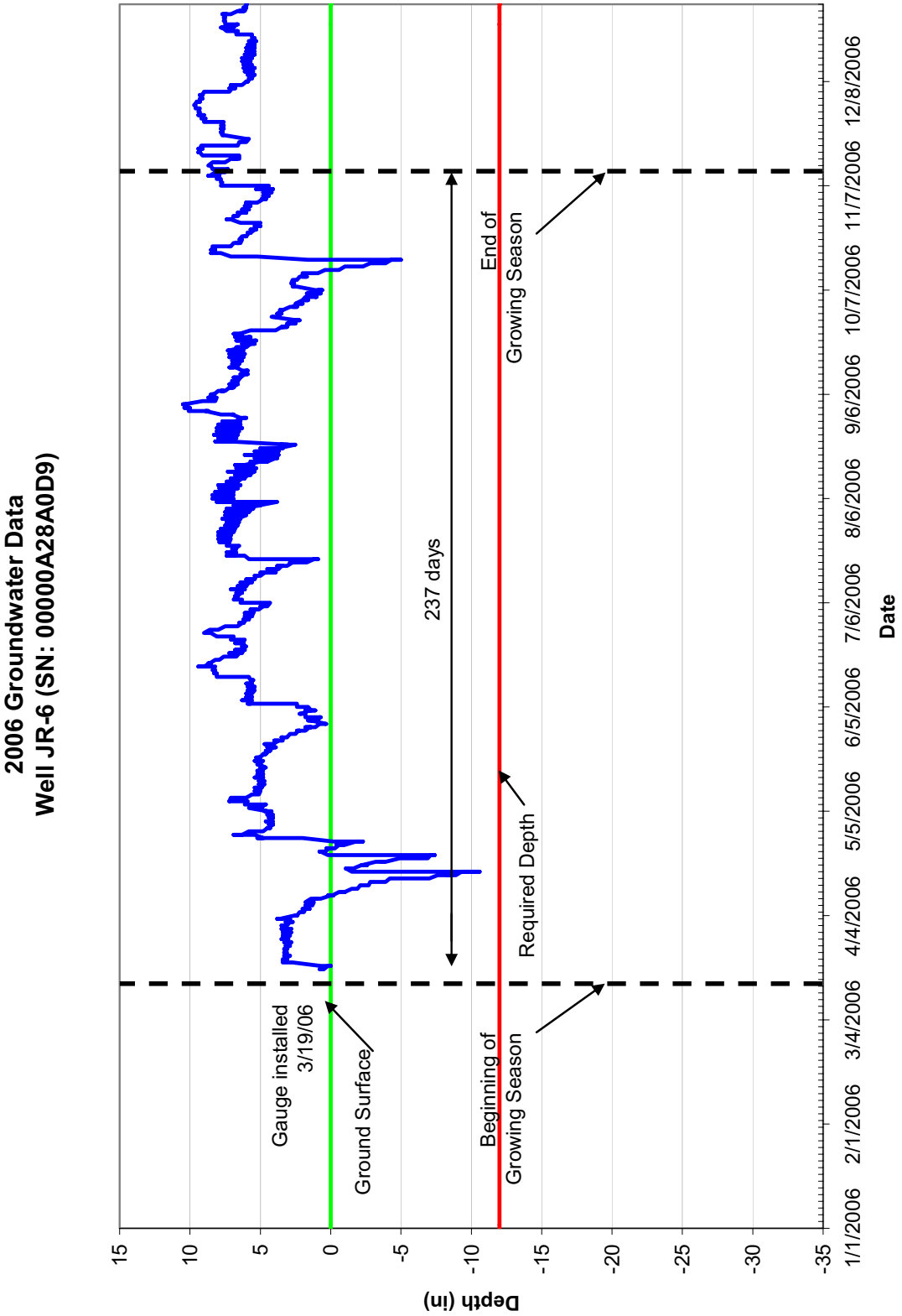

2007 Groundwater Data
Well JR-3 (SN: 00000A287272)
Rainfall (in)
Depth (in)
Date
Ground Surface
Required
63 days
Beginning of Growing Season
End of Growing
10
9
8
7
6
5
4
3
2
1
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/2007
2/1/2007
3/4/2007
4/4/2007
5/5/2007
6/5/2007
7/6/2007
8/6/2007
9/6/2007
10/7/2007
11/7/2007
12/8/2007

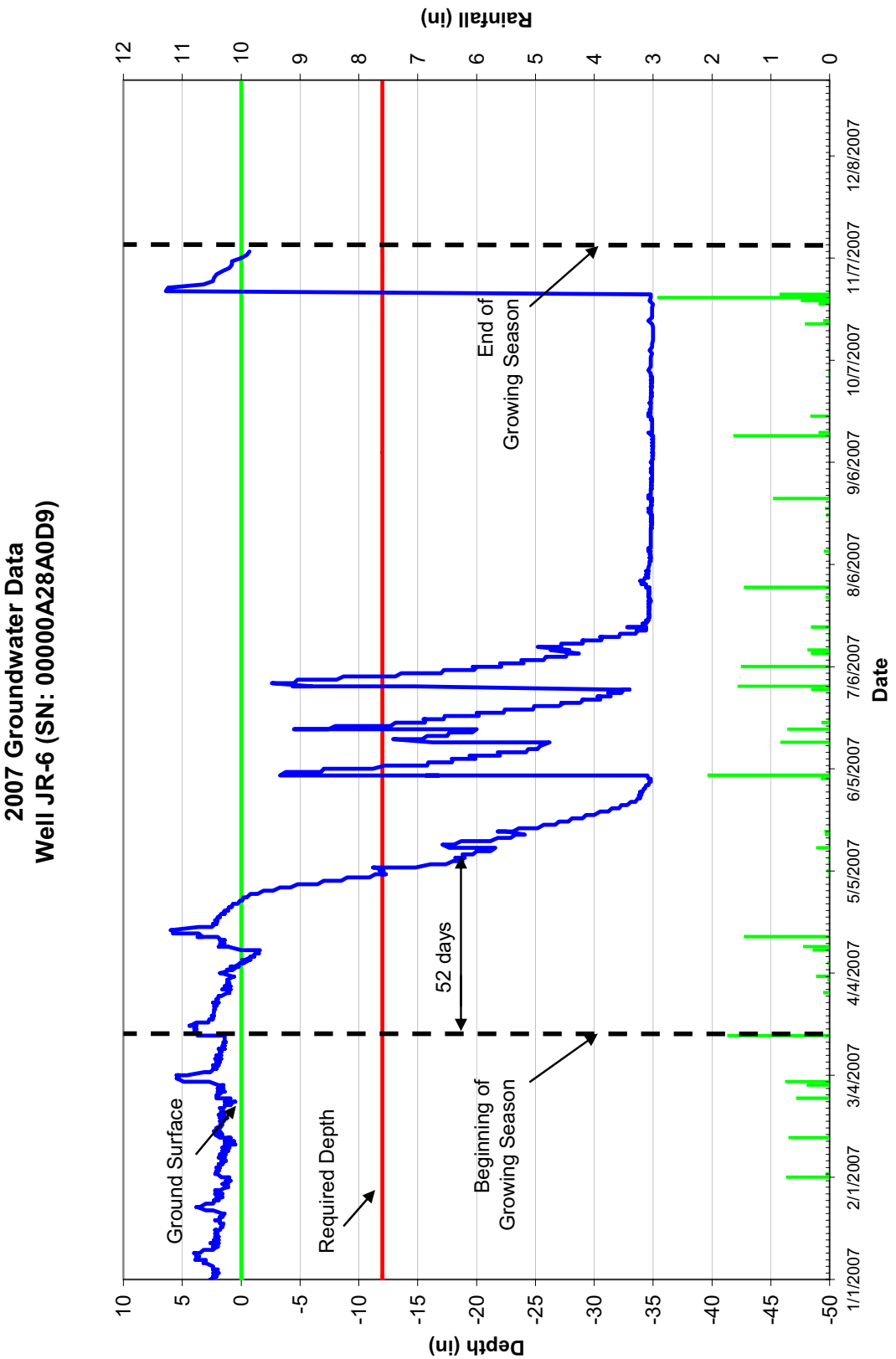

2006 Groundwater Data
Well JR-4 (SN: 00000A28813D)
Depth (in)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
1/1/2006
2/1/2006
3/4/2006
4/4/2006
5/5/2006
6/5/2006
7/6/2006
8/6/2006
9/6/2006
10/7/2006
11/7/2006
12/8/2006
Date
Gauge installed 3/19/06
Ground Surface
Beginning of Growing Season
Required Depth
End of Growing Season
77 days
78 days
80 days

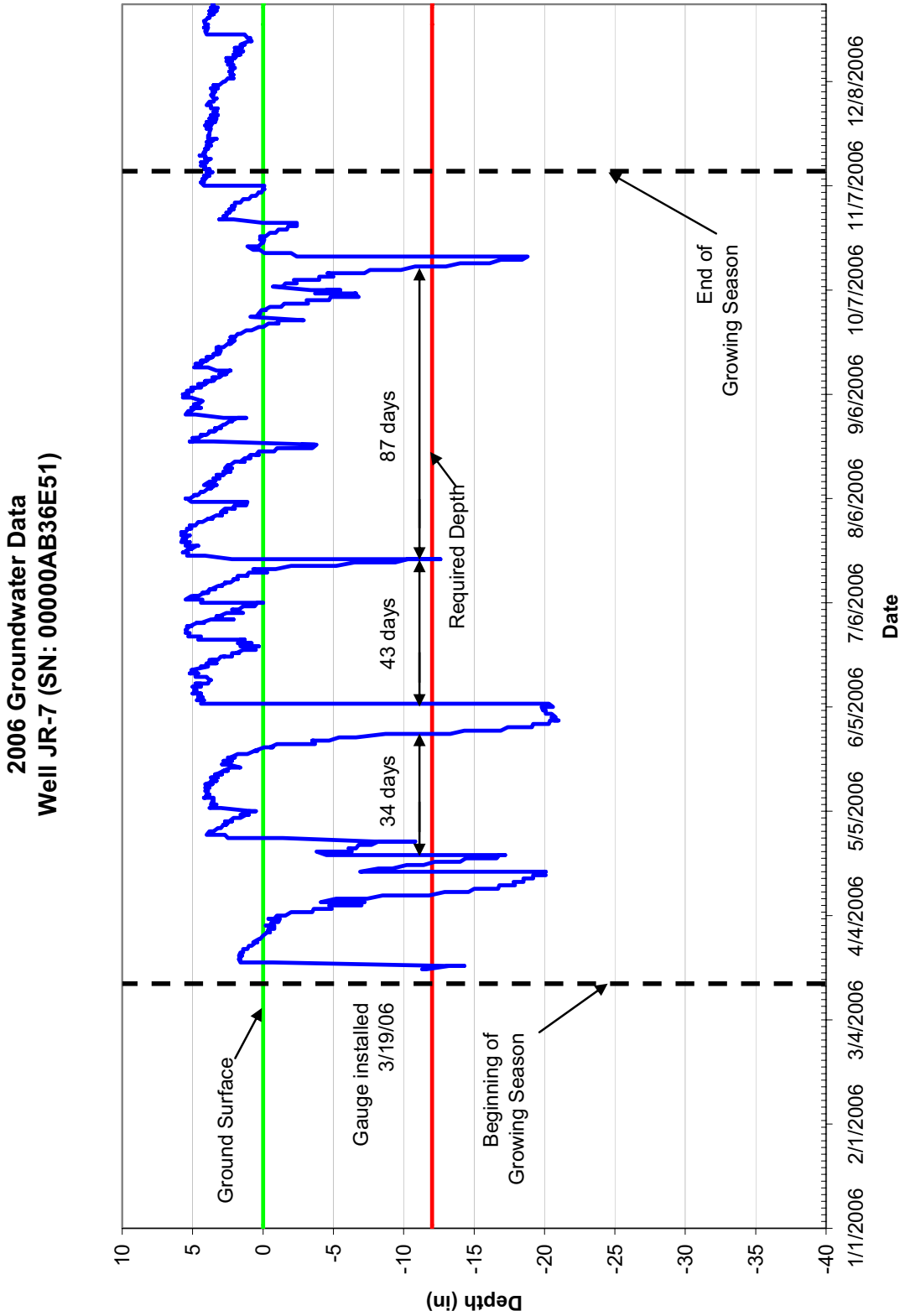

2007 Groundwater Data
Well JR-4 (SN: 00000A28813D)
Depth (in)
Rainfall (in)
Date
rain
gauge data
Ground Surface
Beginning of Growing Season
61 days
Required Depth
End of Growing Season
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
11
10
9
8
7
6
5
4
3
2
1
0
1/1/2007
2/1/2007
3/4/2007
4/4/2007
5/5/2007
6/5/2007
7/6/2007
8/6/2007
9/6/2007
10/7/2007
11/7/2007
12/8/2007

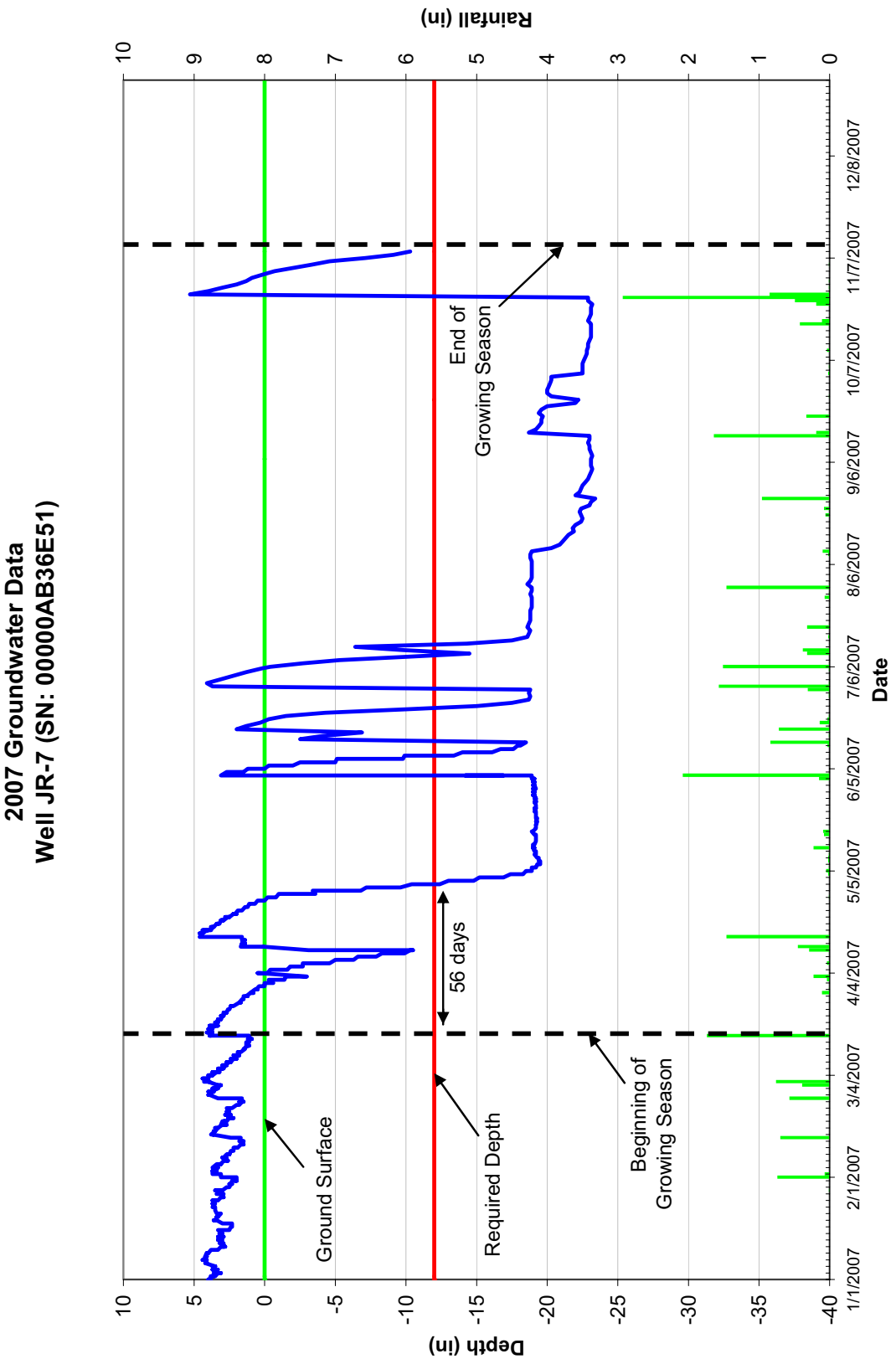

2006 Groundwater Data
Well JR-5 (SN: 00000A278DE1)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/2006
2/1/2006
3/4/2006
4/4/2006
5/5/2006
6/5/2006
7/6/2006
8/6/2006
9/6/2006
10/7/2006
11/7/2006
12/8/2006
Date
Ground Surface
Gauge installed 3/8/06
Beginning of Growing Season
Required Depth
End of Growing Season

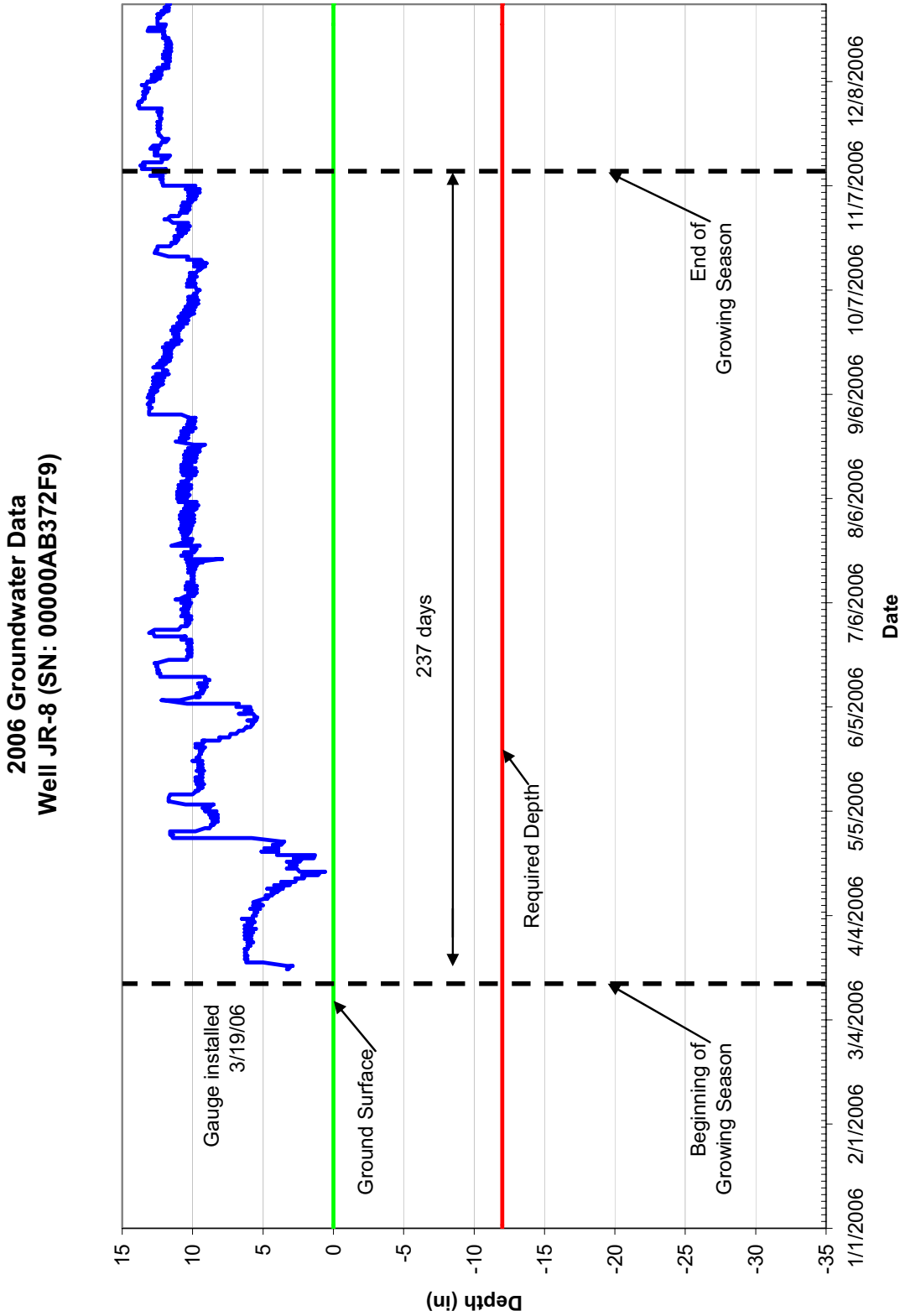

2007 Groundwater Data
Well JR-5 (SN: 00000A278DE1)
Rainfall (in)
Depth (in)
Date
Ground Surface
Required Depth
Beginning of Growing Season
End of Growing Season
10
9
8
7
6
5
4
3
2
1
0
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
1/1/2007
2/1/2007
3/4/2007
4/4/2007
5/5/2007
6/5/2007
7/6/2007
8/6/2007
9/6/2007
10/7/2007
11/7/2007
12/8/2007

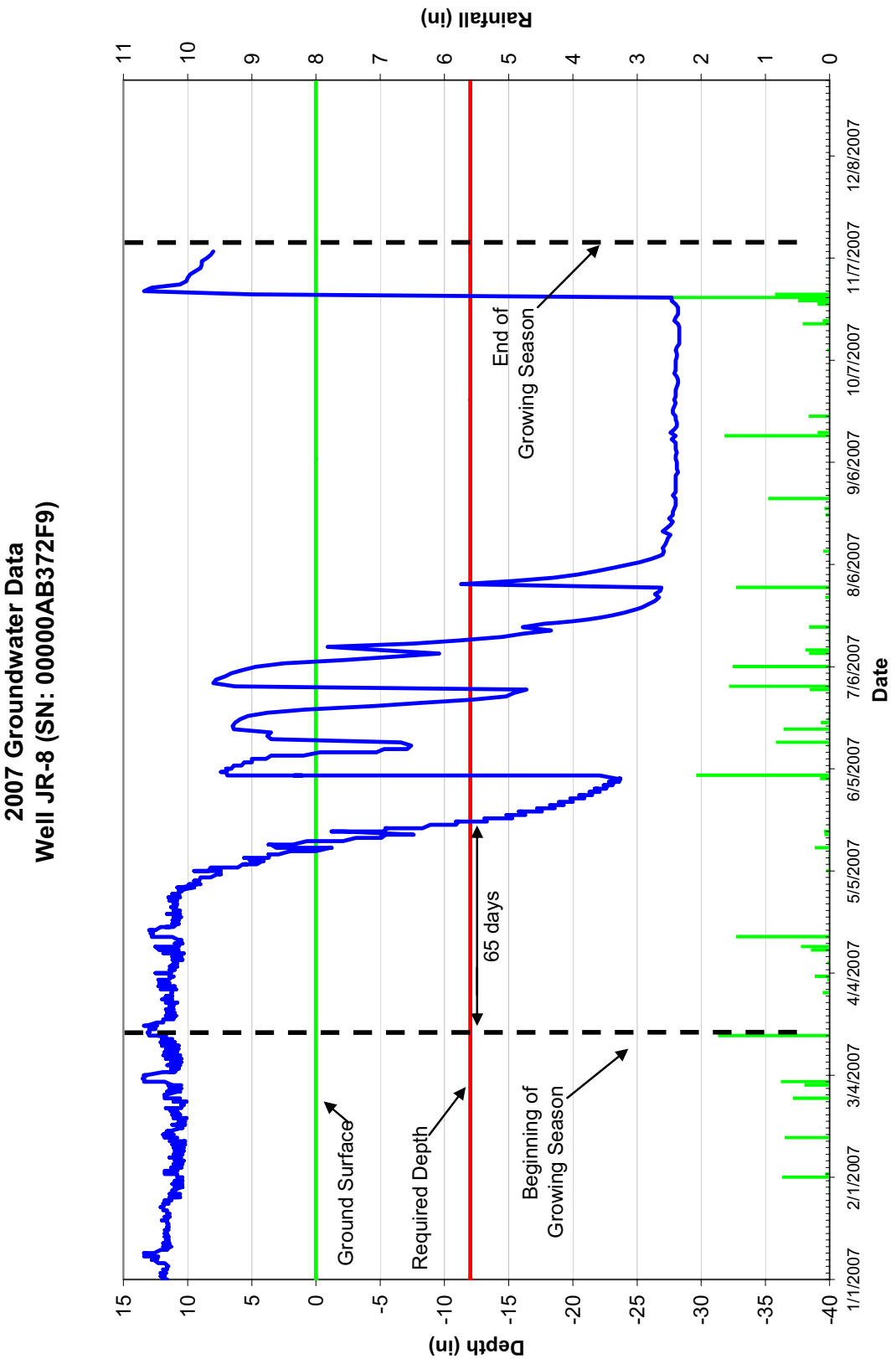

2006 Groundwater Data
Well JR-6 (SN: 00000A28A0D9)
Depth (in)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
1/1/2006
2/1/2006
3/4/2006
4/4/2006
5/5/2006
6/5/2006
7/6/2006
8/6/2006
9/6/2006
10/7/2006
11/7/2006
12/8/2006
Date
Gauge installed 3/19/06
Ground Surface
Beginning of Growing Season
237 days
Required Depth
End of Growing Season


2007 Groundwater Data
Well JR-6 (SN: 00000A28A0D9)
Rainfall (in)
Depth (in)
Date
Ground Surface
Required Depth
Beginning of Growing Season
52 days
End of Growing Season
1/1/2007
2/1/2007
3/4/2007
4/4/2007
5/5/2007
6/5/2007
7/6/2007
8/6/2007
9/6/2007
10/7/2007
11/7/2007
12/8/2007


2006 Groundwater Data
Well JR-7 (SN: 00000AB36E51)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/2006
2/1/2006
3/4/2006
4/4/2006
5/5/2006
6/5/2006
7/6/2006
8/6/2006
9/6/2006
10/7/2006
11/7/2006
12/8/2006
Date
Ground Surface
Gauge installed 3/19/06
Beginning of Growing Season
End of Growing Season
Required Depth
34 days
43 days
87 days


2007 Groundwater Data
Well JR-7 (SN: 00000AB36E51)
Rainfall (in)
Depth (in)
Date
Ground Surface
Required Depth
Beginning of Growing Season
End of Growing Season
56 days
1/1/2007
2/1/2007
3/4/2007
4/4/2007
5/5/2007
6/5/2007
7/6/2007
8/6/2007
9/6/2007
10/7/2007
11/7/2007
12/8/2007


2006 Groundwater Data
Well JR-8 (SN: 00000AB372F9)
Depth (in)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
1/1/2006
2/1/2006
3/4/2006
4/4/2006
5/5/2006
6/5/2006
7/6/2006
8/6/2006
9/6/2006
10/7/2006
11/7/2006
12/8/2006
Date
Gauge installed 3/19/06
Ground Surface
237 days
Required Depth
Beginning of Growing Season
End of Growing Season


2007 Groundwater Data
Well JR-8 (SN: 00000AB372F9)
Depth (in)
Rainfall (in)
Date
Ground Surface
Required Depth
65 days
Beginning of Growing Season
End of Growing Season
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
11
10
9
8
7
6
5
4
3
2
1
0
1/1/2007
2/1/2007
3/4/2007
4/4/2007
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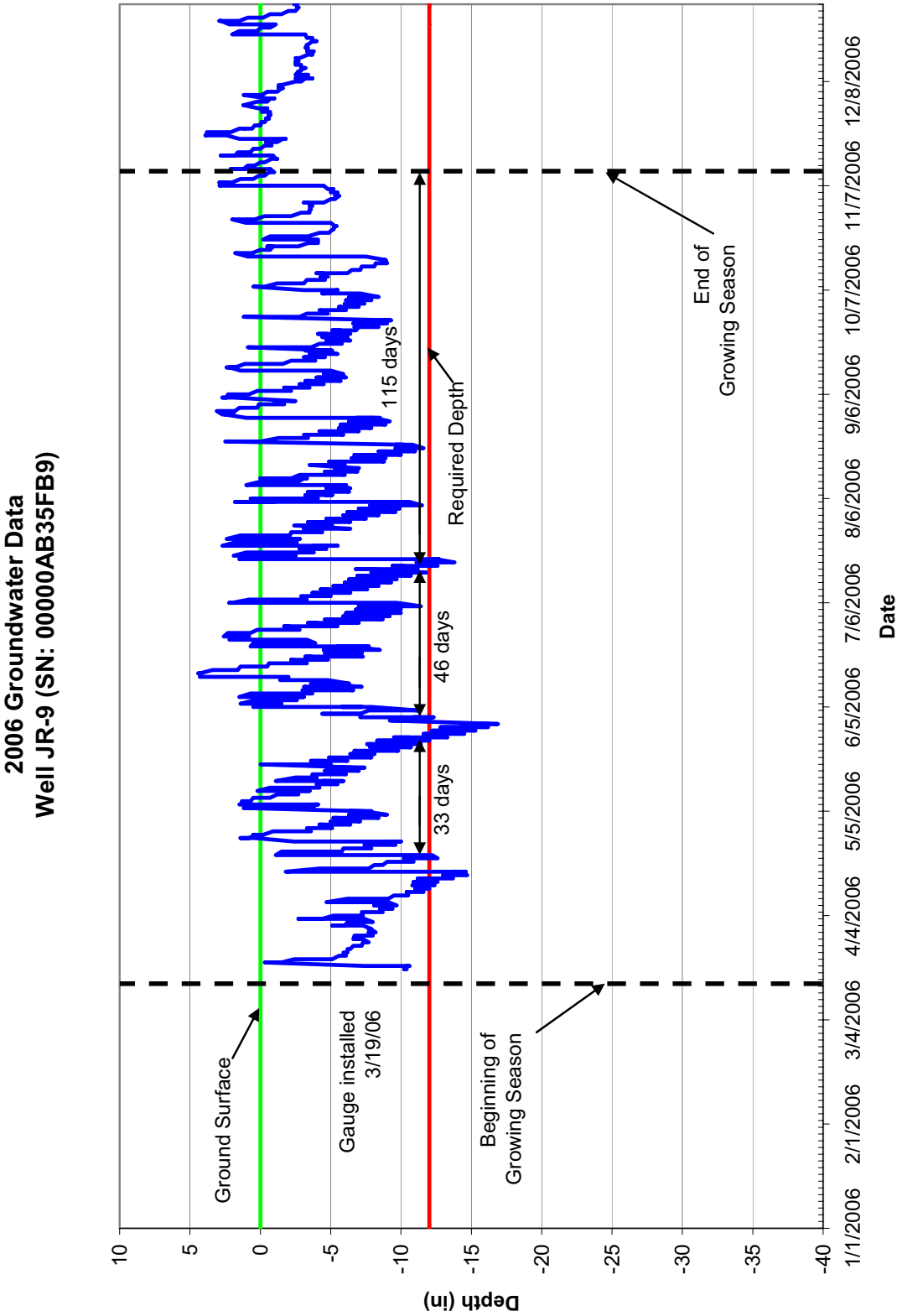
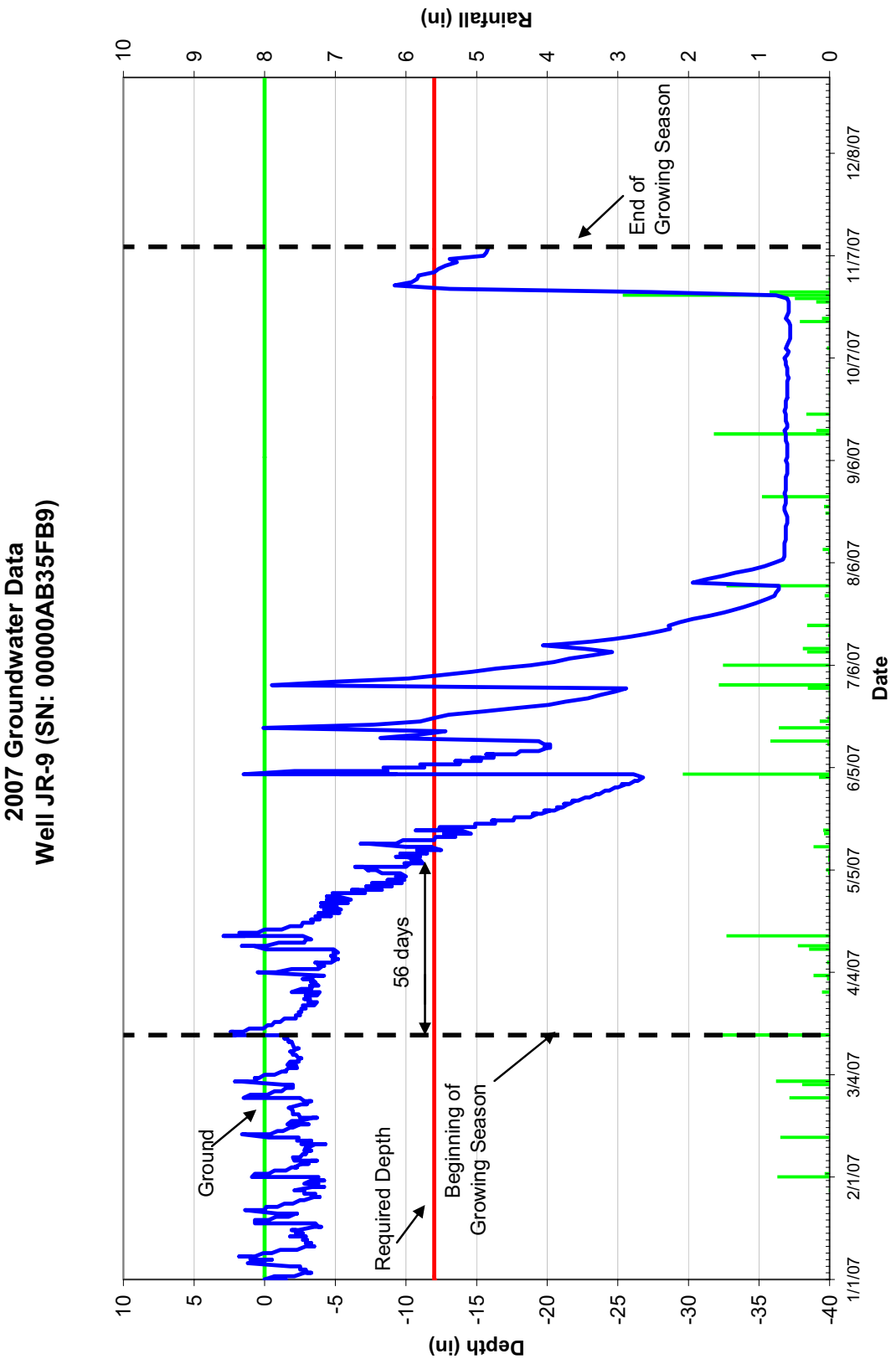
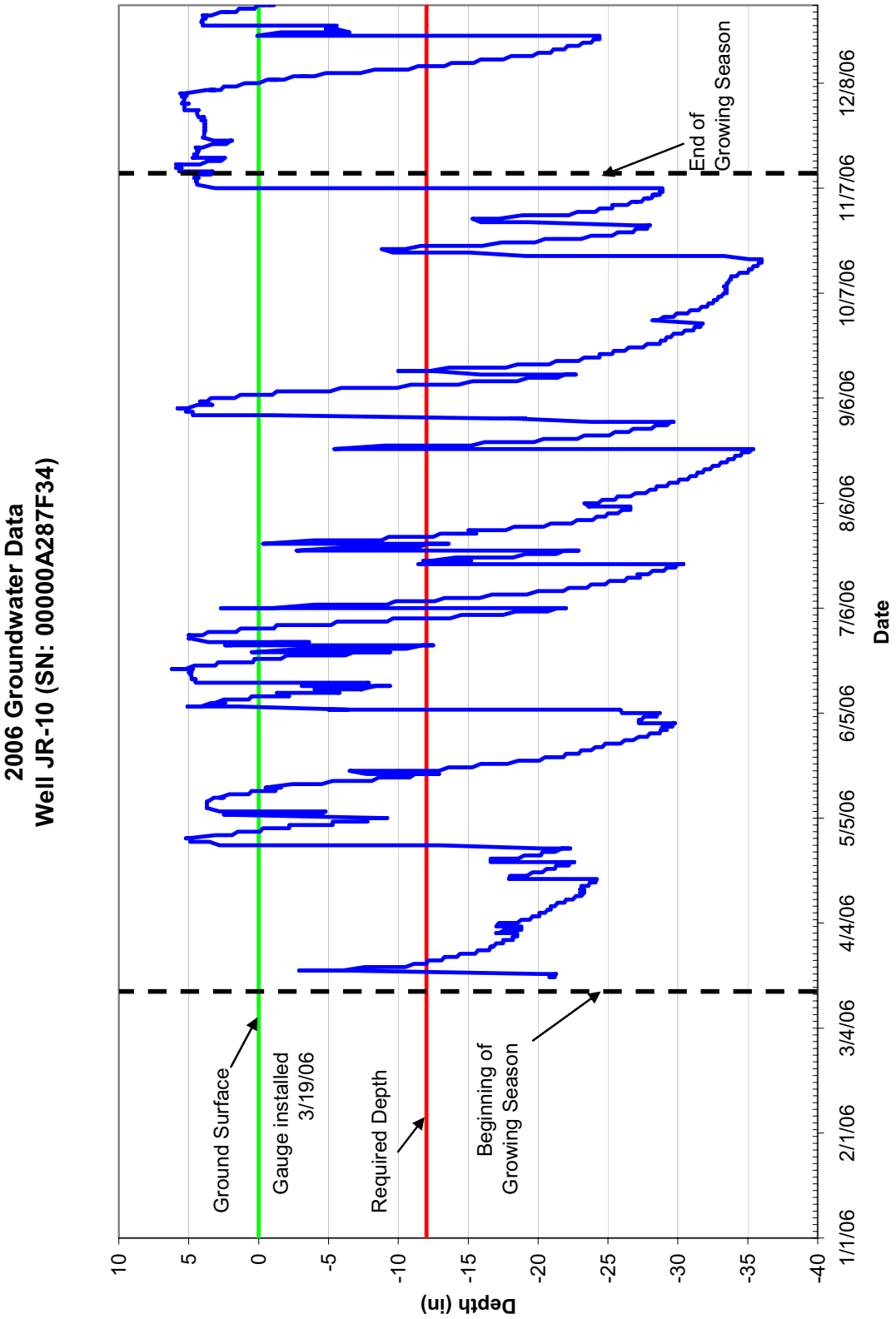
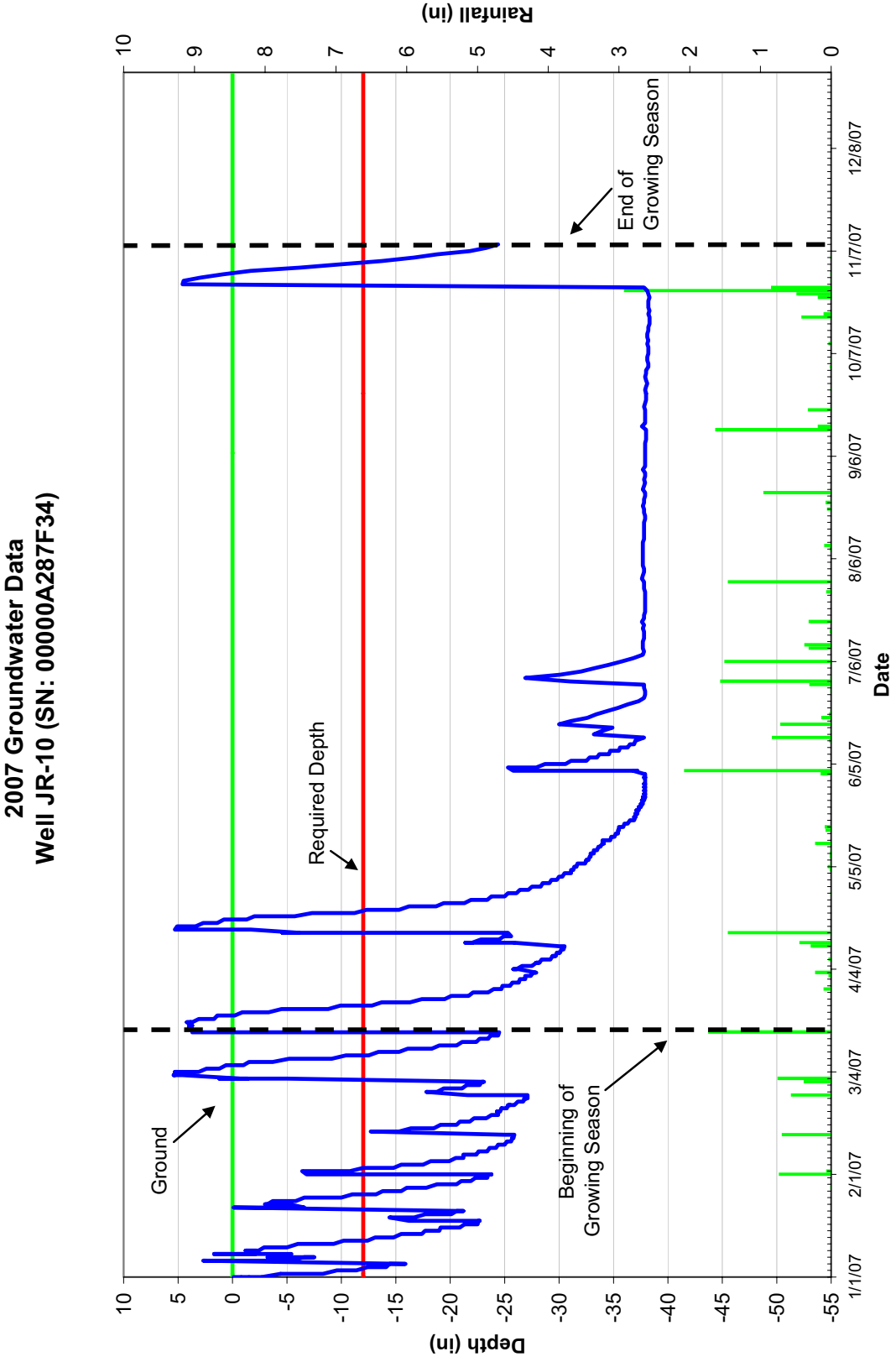
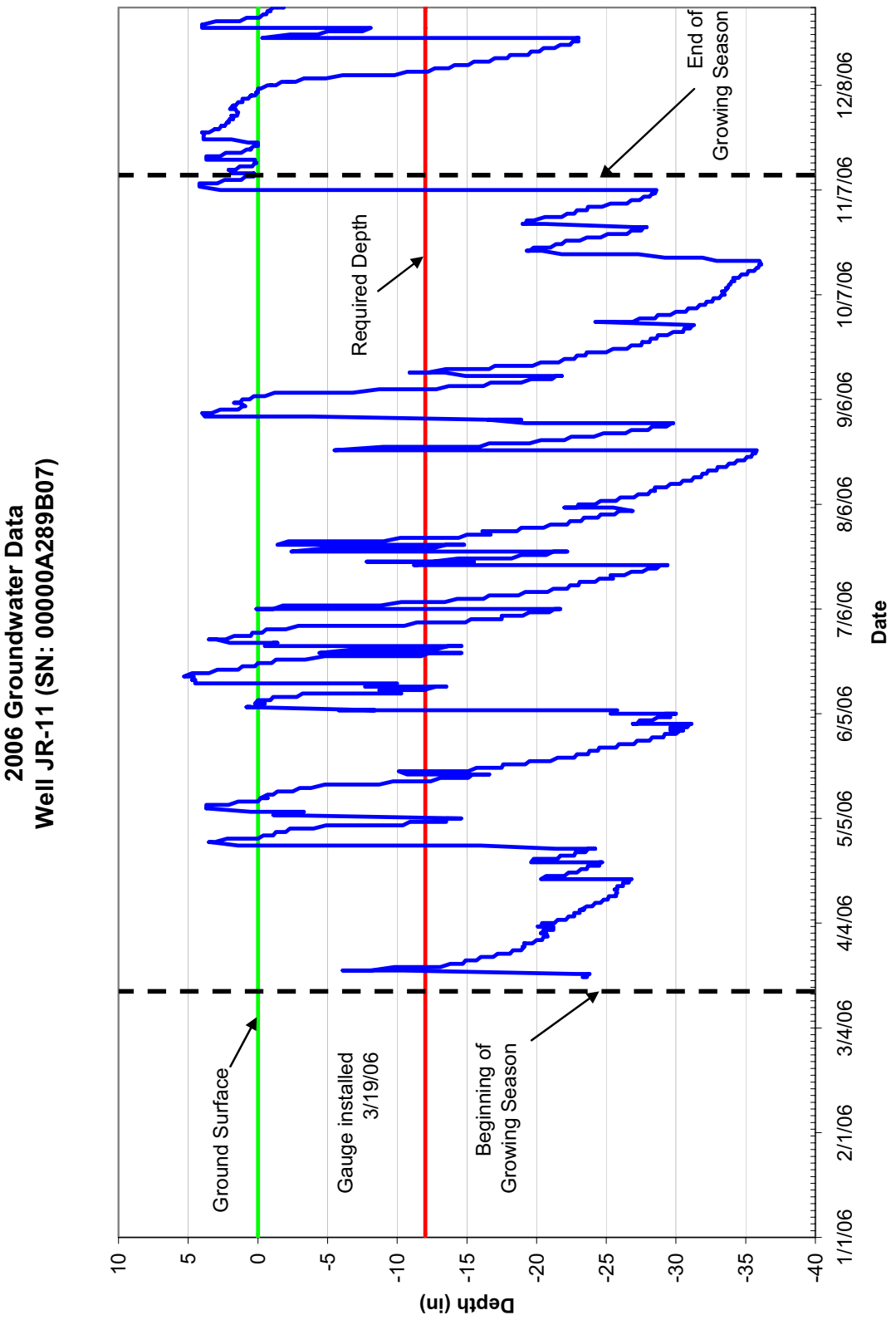
12/8/2007

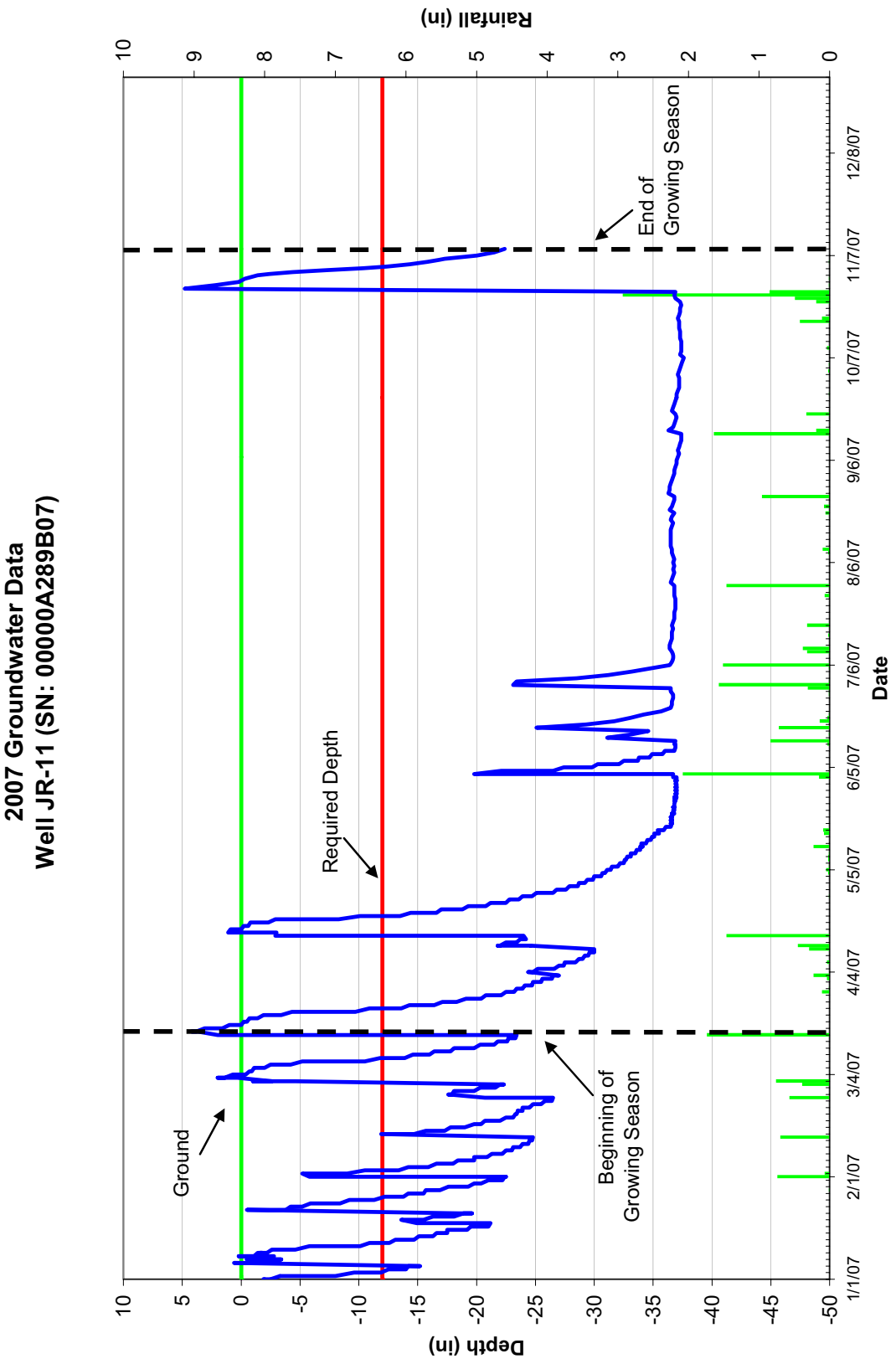

2006 Groundwater Data
Well JR-9 (SN: 00000AB35FB9)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/2006
2/1/2006
3/4/2006
4/4/2006
5/5/2006
6/5/2006
7/6/2006
8/6/2006
9/6/2006
10/7/2006
11/7/2006
12/8/2006
Date
Ground Surface
Gauge installed 3/19/06
Beginning of Growing Season
End of Growing Season
Required Depth
115 days
46 days
33 days


2007 Groundwater Data
Well JR-9 (SN: 00000AB35FB9)
Depth (in)
Rainfall (in)
Date
Ground
Required Depth
Beginning of Growing Season
End of Growing Season
56 days
1/1/07
2/1/07
3/4/07
4/4/07
5/5/07
6/5/07
7/6/07
8/6/07
9/6/07
10/7/07
11/7/07
12/8/07


2006 Groundwater Data
Well JR-10 (SN: 00000A287F34)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/06
2/1/06
3/4/06
4/4/06
5/5/06
6/5/06
7/6/06
8/6/06
9/6/06
10/7/06
11/7/06
12/8/06
Date
Ground Surface
Gauge installed 3/19/06
Required Depth
Beginning of Growing Season
End of Growing Season


2007 Groundwater Data
Well JR-10 (SN: 00000A287F34)
Rainfall (in)
Depth (in)
Date
Ground
Required Depth
Beginning of Growing Season
End of Growing Season
10
9
8
7
6
5
4
3
2
1
0
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
1/1/07
2/1/07
3/4/07
4/4/07
5/5/07
6/5/07
7/6/07
8/6/07
9/6/07
10/7/07
11/7/07
12/8/07


2006 Groundwater Data
Well JR-11 (SN: 00000A289B07)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/06
2/1/06
3/4/06
4/4/06
5/5/06
6/5/06
7/6/06
8/6/06
9/6/06
10/7/06
11/7/06
12/8/06
Date
Ground Surface
Gauge installed 3/19/06
Beginning of Growing Season
Required Depth
End of Growing Season


2007 Groundwater Data
Well JR-11 (SN: 00000A289B07)
Rainfall (in)
Depth (in)
Date
Ground
Required Depth
Beginning of Growing Season
End of Growing Season
10
9
8
7
6
5
4
3
2
1
0
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/07
2/1/07
3/4/07
4/4/07
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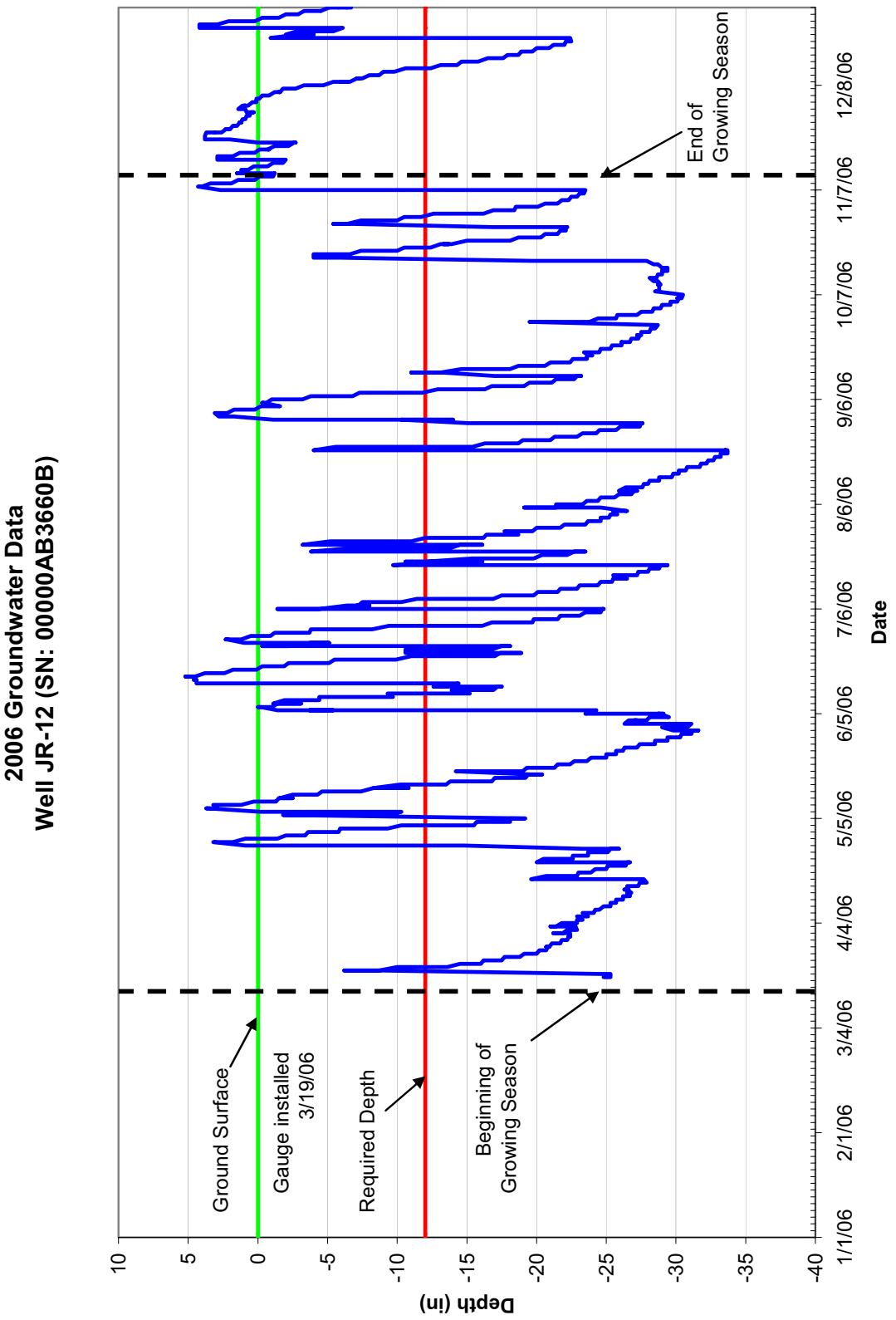
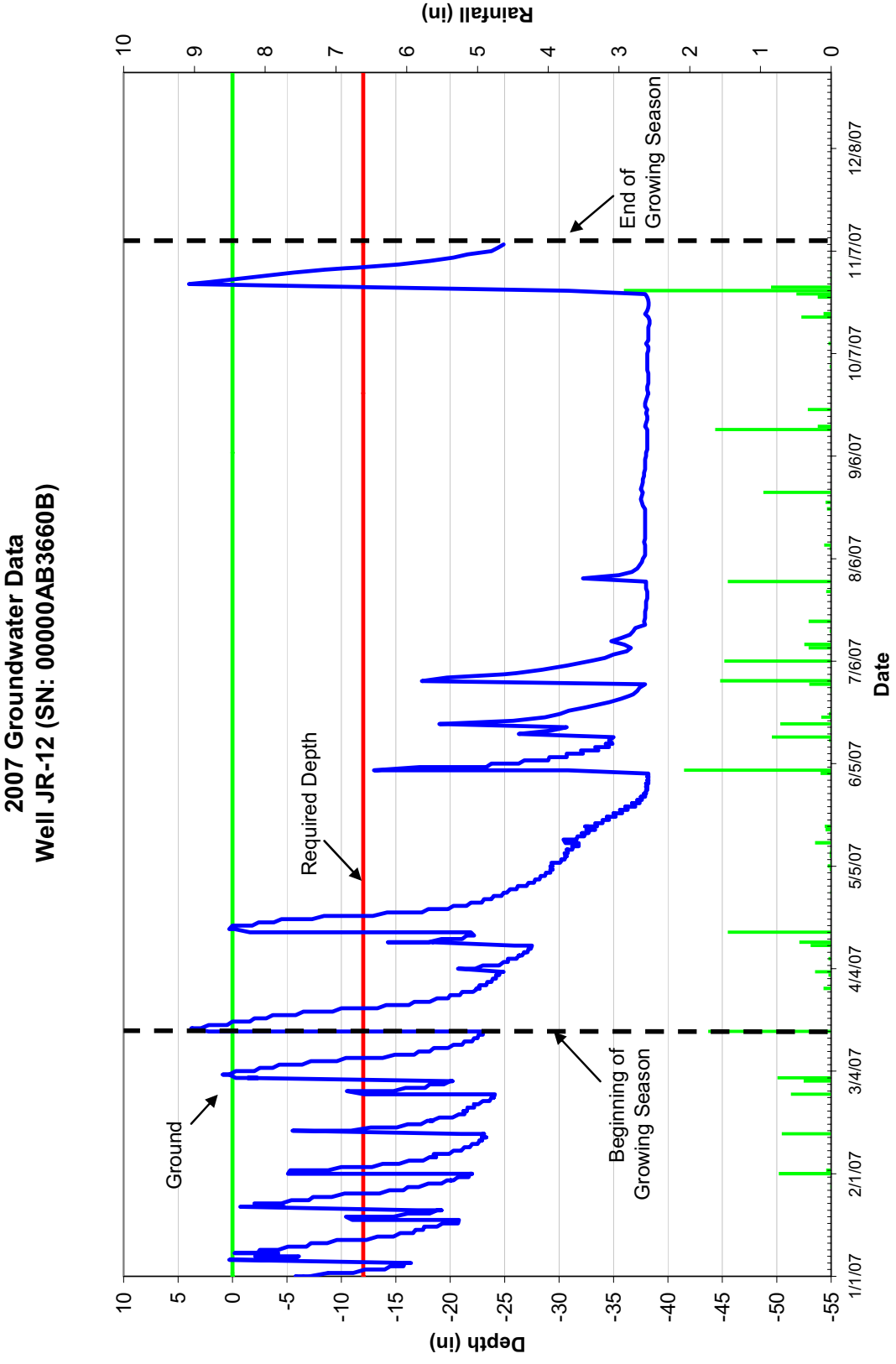
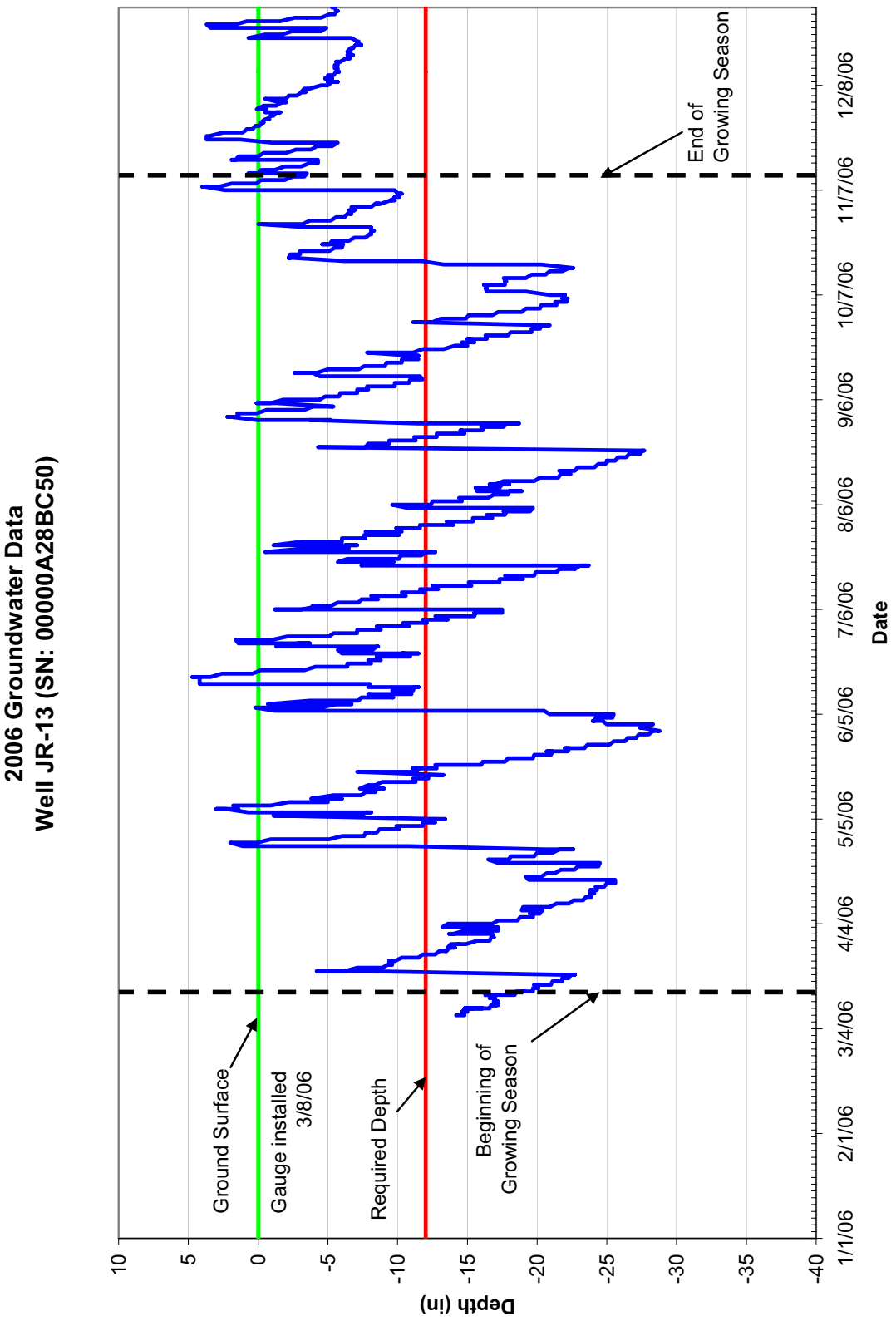
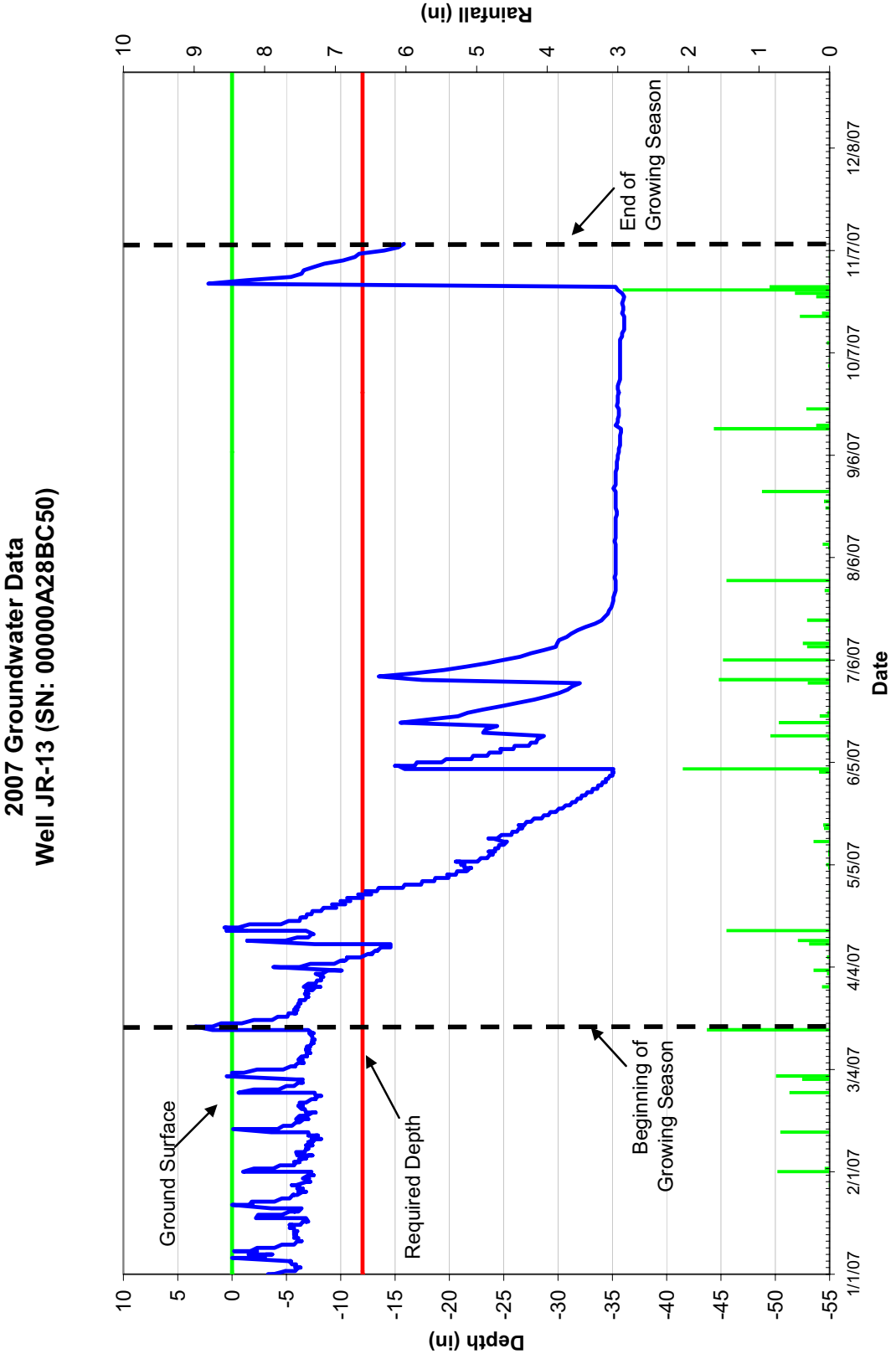
6/5/07
7/6/07
8/6/07
9/6/07
10/7/07
11/7/07
12/8/07


2006 Groundwater Data
Well JR-12 (SN: 00000AB3660B)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/06
2/1/06
3/4/06
4/4/06
5/5/06
6/5/06
7/6/06
8/6/06
9/6/06
10/7/06
11/7/06
12/8/06
Date
Ground Surface
Gauge installed 3/19/06
Required Depth
Beginning of Growing Season
End of Growing Season


2007 Groundwater Data
Well JR-12 (SN: 00000AB3660B)
Rainfall (in)
Depth (in)
Date
Ground
Required Depth
Beginning of Growing Season
End of Growing Season
10
9
8
7
6
5
4
3
2
1
0
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
1/1/07
2/1/07
3/4/07
4/4/07
5/5/07
6/5/07
7/6/07
8/6/07
9/6/07
10/7/07
11/7/07
12/8/07


2006 Groundwater Data
Well JR-13 (SN: 00000A28BC50)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/06
2/1/06
3/4/06
4/4/06
5/5/06
6/5/06
7/6/06
8/6/06
9/6/06
10/7/06
11/7/06
12/8/06
Date
Ground Surface
Gauge installed 3/8/06
Required Depth
Beginning of Growing Season
End of Growing Season


2007 Groundwater Data
Well JR-13 (SN: 00000A28BC50)
Rainfall (in)
Depth (in)
Date
Ground Surface
Required Depth
Beginning of Growing Season
End of Growing Season
10
9
8
7
6
5
4
3
2
1
0
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
1/1/07
2/1/07
3/4/07
4/4/07
5/5/07
6/5/07
7/6/07
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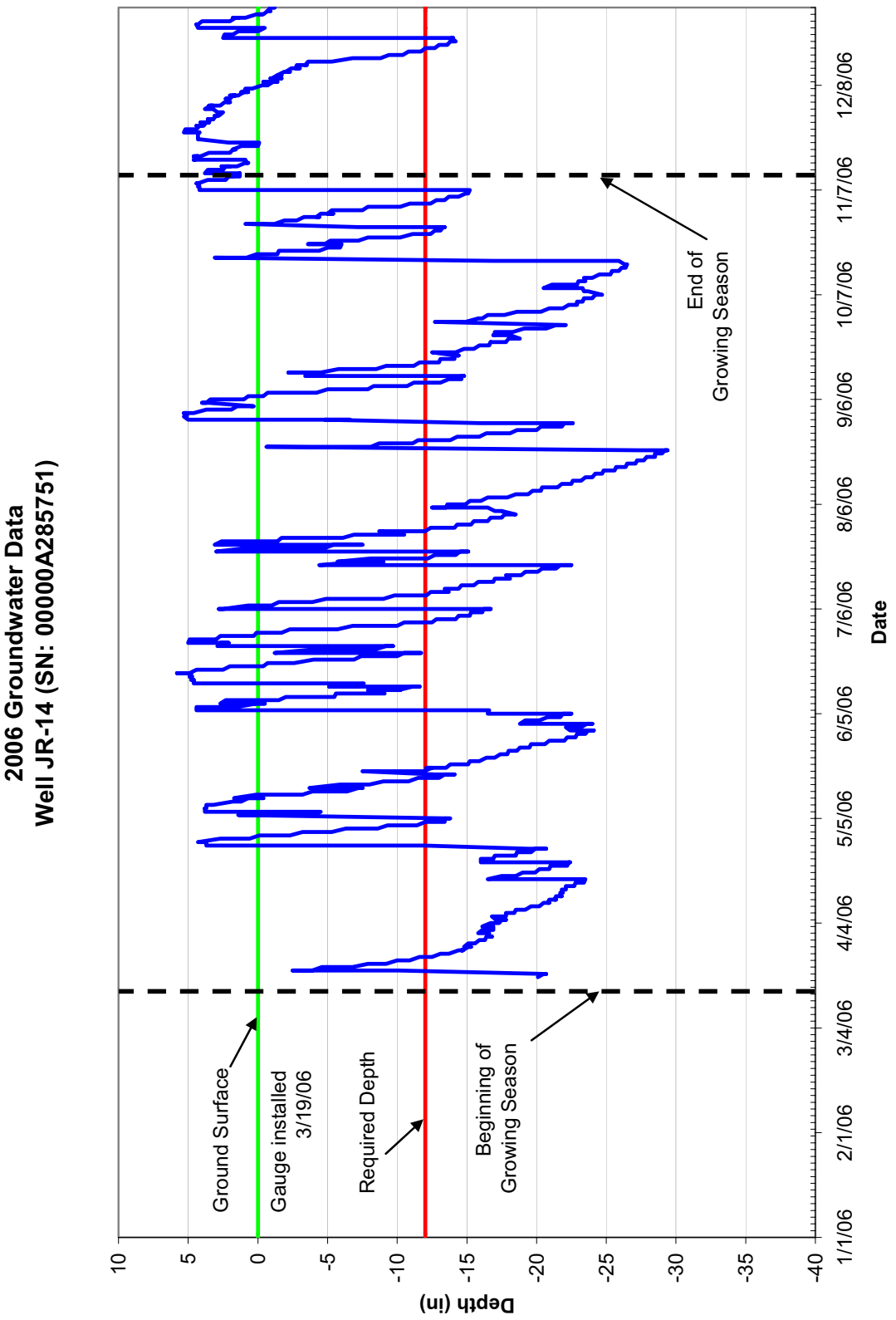
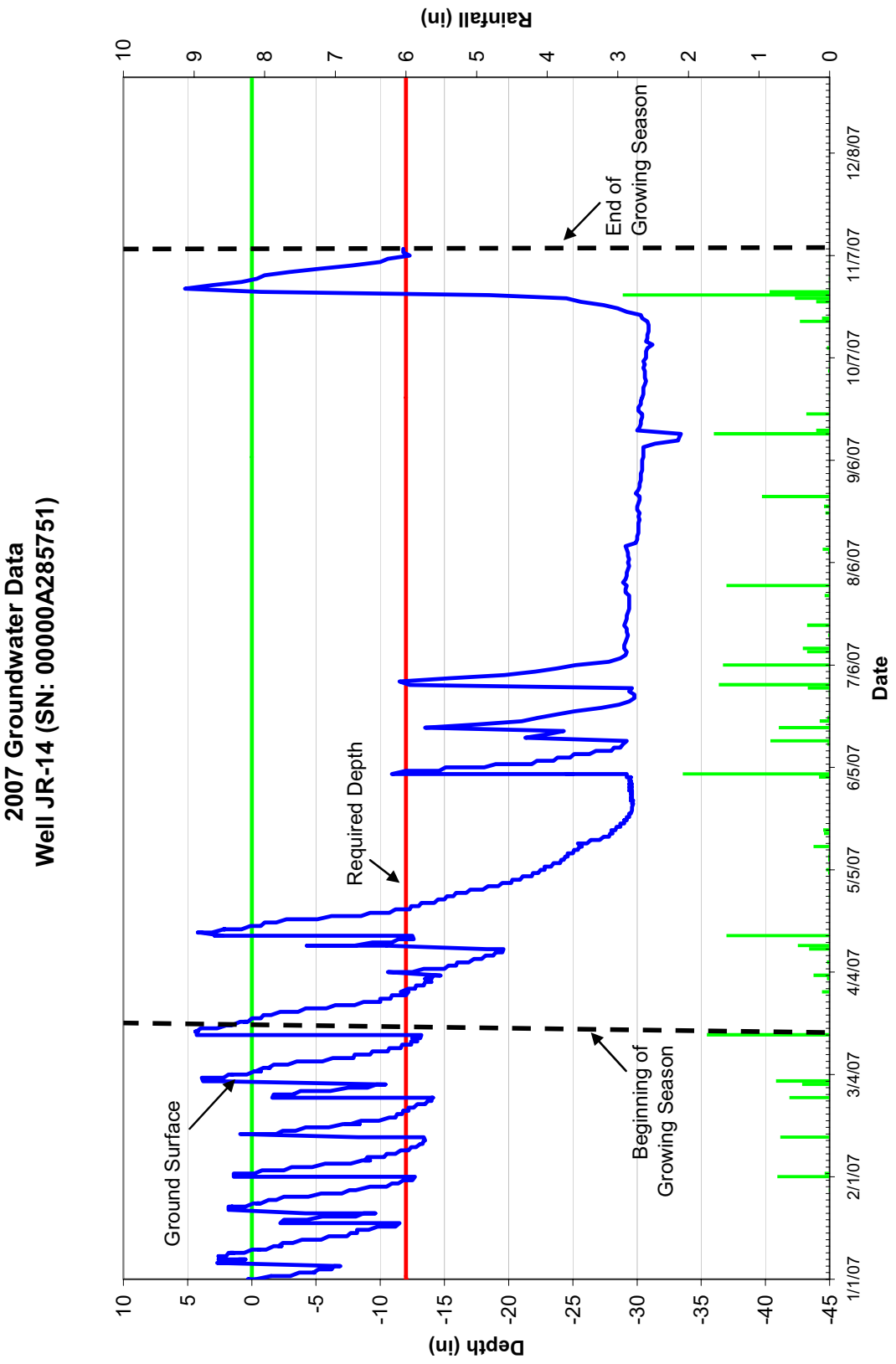
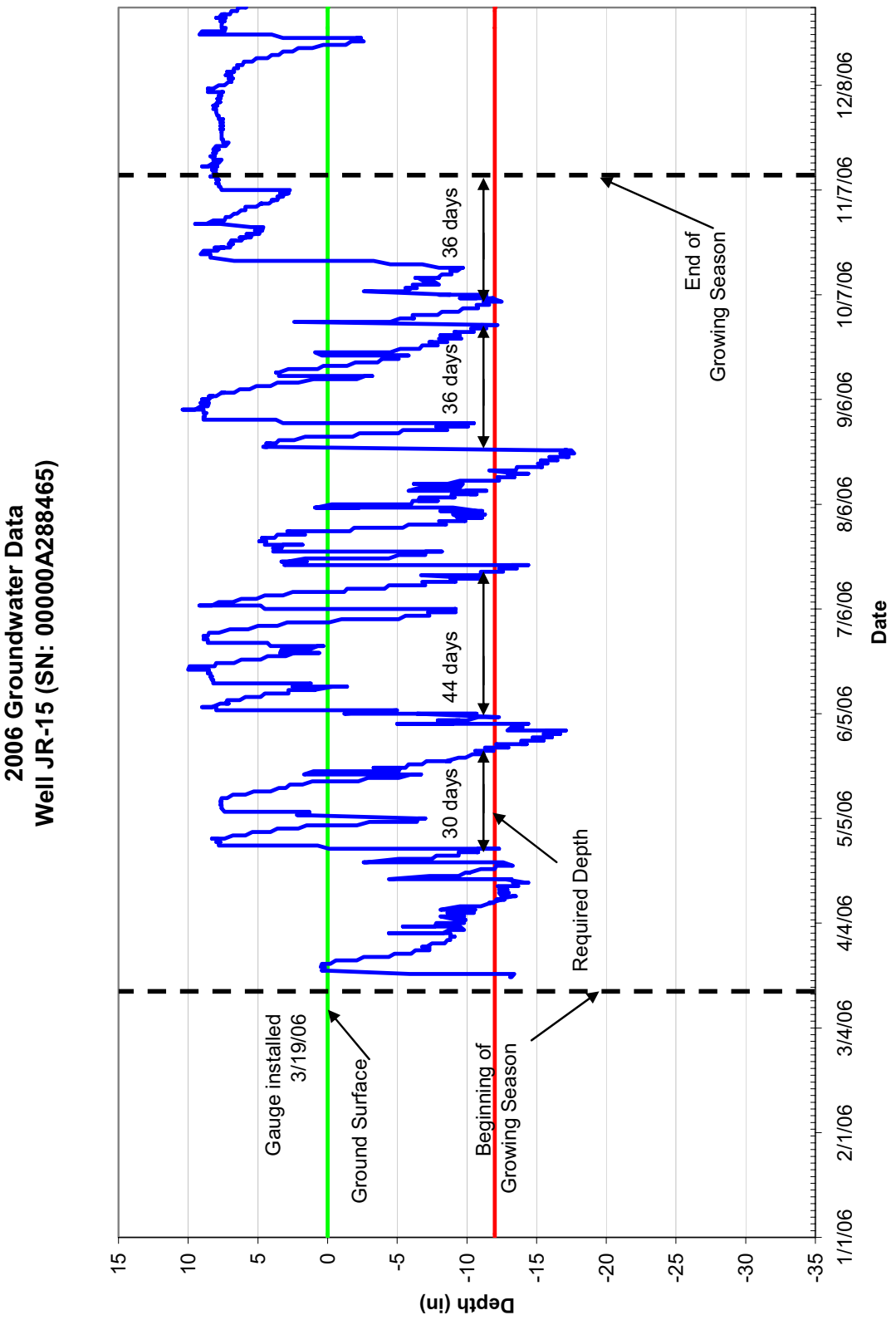
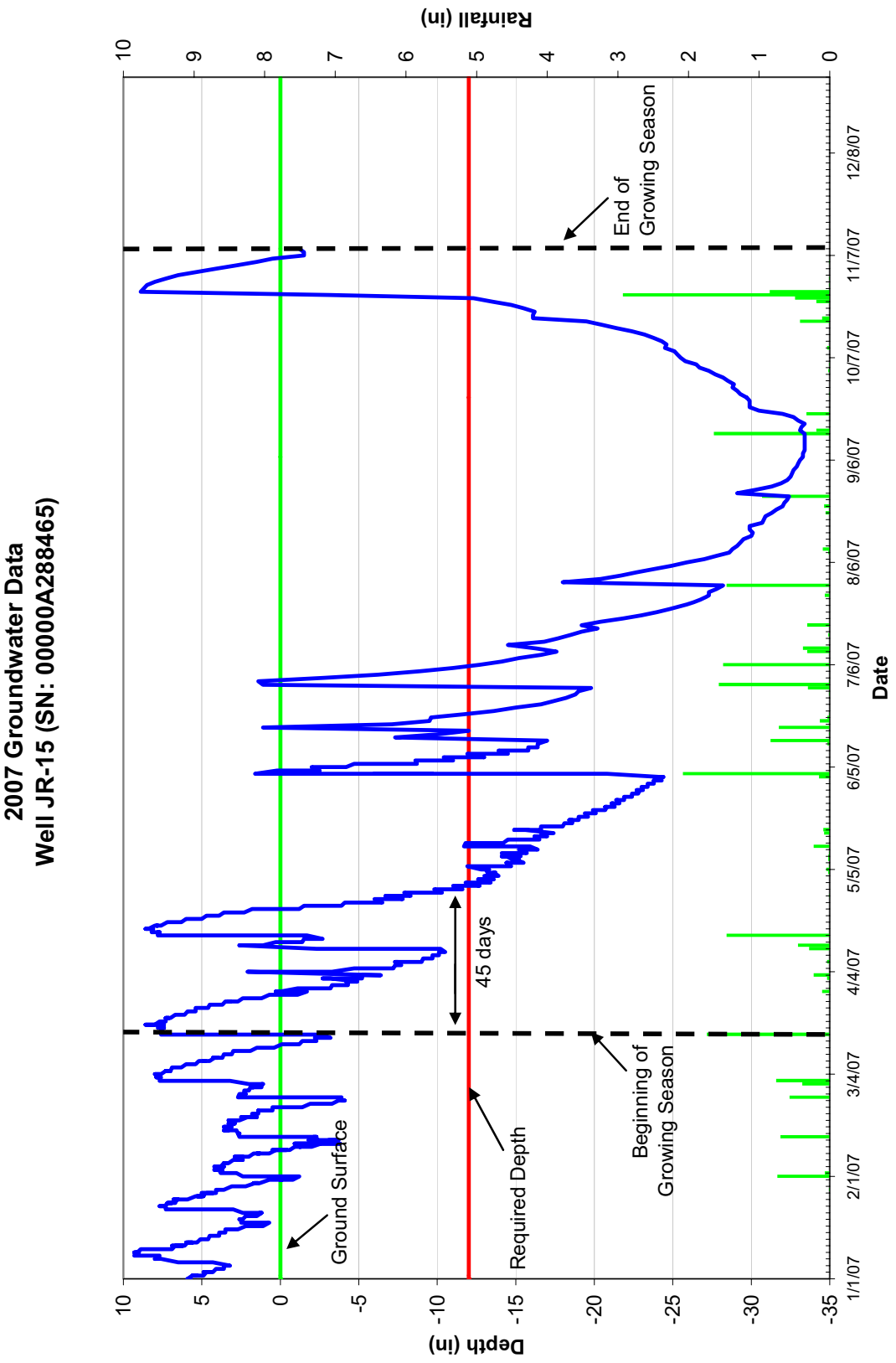
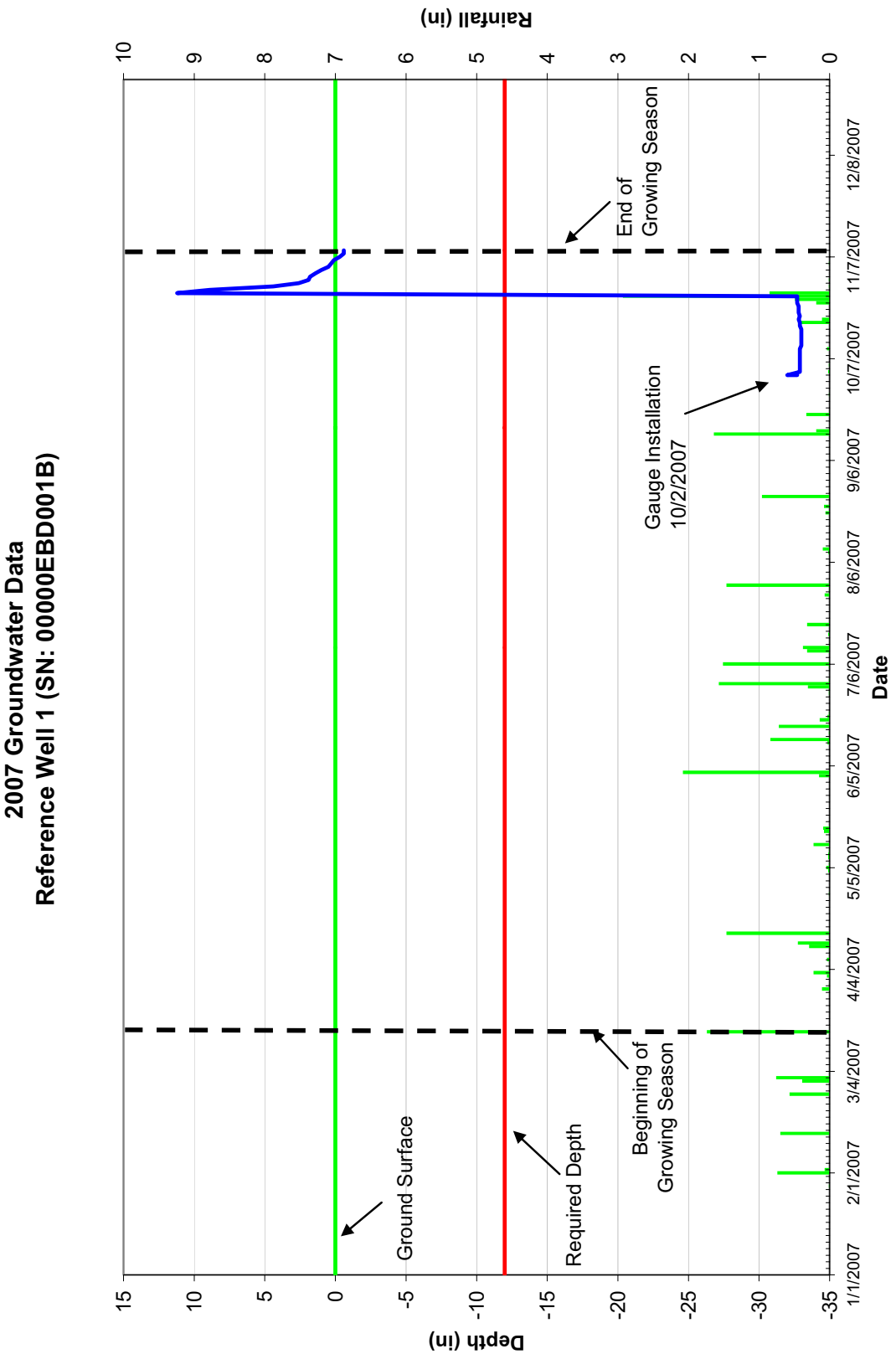
9/6/07
10/7/07
11/7/07
12/8/07


2006 Groundwater Data
Well JR-14 (SN: 00000A285751)
Depth (in)
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
1/1/06
2/1/06
3/4/06
4/4/06
5/5/06
6/5/06
7/6/06
8/6/06
9/6/06
10/7/06
11/7/06
12/8/06
Date
Ground Surface
Gauge installed 3/19/06
Required Depth
Beginning of Growing Season
End of Growing Season

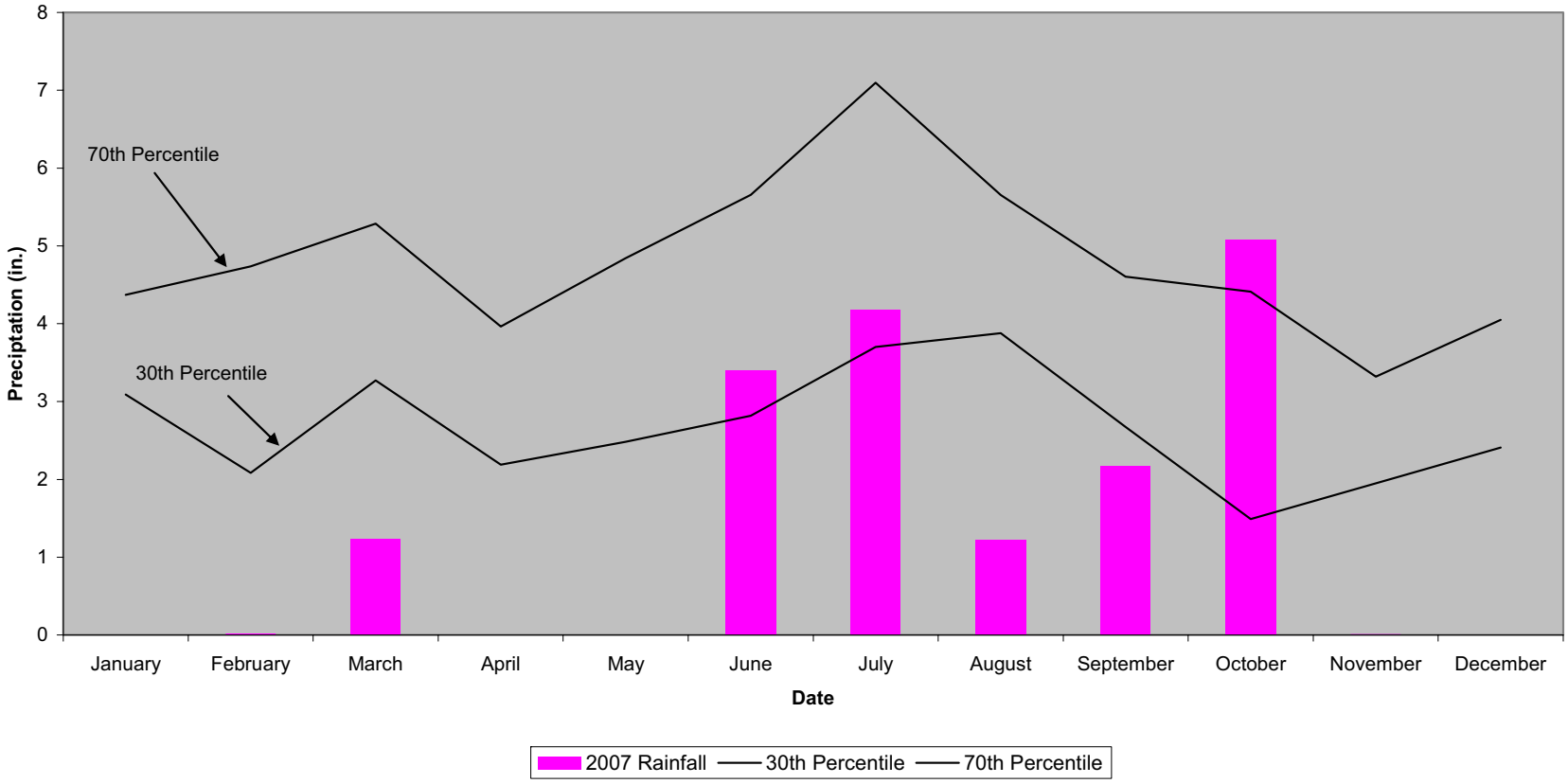

2007 Groundwater Data
Well JR-14 (SN: 00000A285751)
Rainfall (in)
Depth (in)
Date
Ground Surface
Required Depth
Beginning of Growing Season
End of Growing Season
10
9
8
7
6
5
4
3
2
1
0
-45
-40
-35
-30
-25
-20
-15
-10
-5
0
5
10
1/1/07
2/1/07
3/4/07
4/4/07
5/5/07
6/5/07
7/6/07
8/6/07
9/6/07
10/7/07
11/7/07
12/8/07


2006 Groundwater Data
Well JR-15 (SN: 00000A288465)
Depth (in)
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
1/1/06
2/1/06
3/4/06
4/4/06
5/5/06
6/5/06
7/6/06
8/6/06
9/6/06
10/7/06
11/7/06
12/8/06
Date
Gauge installed 3/19/06
Ground Surface
Beginning of Growing Season
Required Depth
End of Growing Season
30 days
44 days
36 days
36 days


2007 Groundwater Data
Well JR-15 (SN: 00000A288465)
Depth (in)
Rainfall (in)
Date
Ground Surface
Required Depth
45 days
Beginning of Growing Season
End of Growing Season
10
5
0
-5
-10
-15
-20
-25
-30
-35
10
9
8
7
6
5
4
3
2
1
0
1/1/07
2/1/07
3/4/07
4/4/07
5/5/07
6/5/07
7/6/07
8/6/07
9/6/07
10/7/07
11/7/07
12/8/07


2007 Groundwater Data
Reference Well 1 (SN: 00000EBD001B)
Rainfall (in)
Depth (in)
Date
Ground Surface
Required Depth
Beginning of Growing Season
Gauge Installation 10/2/2007
End of Growing Season
1/1/2007
2/1/2007
3/4/2007
4/4/2007
5/5/2007
6/5/2007
7/6/2007
8/6/2007
9/6/2007
10/7/2007
11/7/2007
12/8/2007

Overhills 30-70 Percentile Graph
Harnett, Co.



APPENDIX D – CURRENT CONDITION PLAN VIEW

Appendix D. Current Condition Plan View

See following page for Current Condition Plan View Map.

\171300168\200_Overhills-JumpingRun\site_data\cad\Overhills_ProblemAreas_Final.dwg, 3/10/2008 3:09:01 PM

LEGEND

- Wells not meeting hydrologic success criteria
- Wells meeting hydrologic success criteria
- Rootwad Failure
- Bank Erosion
- Reach Failure (SPA1)
- Vegetation Problem Area (VPA1,2,3)
- Vegetation Plots w/ >320 stems/ac
- Vegetation Plots w/ <320 stems/ac
- Beaver Dam SPA 9

Well JR10
Well JR11
Well JR12
Well JR14
Well JR5
Well JR13
Well JR6
Well JR5
Well JR2
Well JR1
Well JR3
Well JR7
Well JR8
Well JR4
Well JR9

VPA-1
VPA-2
VPA-3

SPA9
SPA1

Sta. 33+00
Start of the
Head Cut

Failed Section of the Reach
Sta. 33+00 to Sta. 44+00

Scale 1" = 100'

*** RECORD DOCUMENT ***
NCDOA File: 01-05249-01A
NCEEP Project: JR/CF/01
*** RECORD DOCUMENT ***

NO	REVISIONS	DRN	CHK	DATE
1	DRAFT REVISION 2 DESIGN	DAB	TJB	07/10/06

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

OVERHILLS
STREAM RESTORATION MONITORING
ASSESSMENT
APPENDIX D
CURRENT CONDITIONS PLAN VIEW

DATE 8/07/2007
PROJECT NO.
FILENAME .DWG
SHEET NO.
DRAWING NO.