Newtown Stream and Wetland Restoration Project

Union County, North Carolina

EEP Project #94150

Contract No. 002025

MY-04 Monitoring Report

Data Collected: May & September 2014
Submitted: October 2014

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TABLE OF CONTENTS

I. Executive Summary 5
II. Methodology 9
III. References 9

APPENDICES

Appendix A. Project Vicinity Map and Background Tables 11
Figure 1. Vicinity Map 12
Table 1a. Project Components 13
Table 1b. Component Summations 14
Table 2. Project Activity and Reporting History 15
Table 3. Project Contacts Table 16
Table 4. Project Attribute Table 17

Appendix B. Visual Assessment Data 18
Figure 2. Consolidated Current Conditions Plan View 19
Table 5. Visual Stream Morphology Assessment Table 25
Table 6. Vegetation Condition Assessment Table 29
Photos 1-15. Cross Section Photos 31
Photos 16-28. Vegetation Plot Photos 39

Appendix C. Vegetation Plot Data 43
Table 7. Vegetation Plot Criteria Attainment 44
Table 8. CVS Vegetation Plot Metadata 45
Table 9. CVS Planted and Total Stem Counts 46

Appendix D. Stream Survey Data 47
Cross Section Figures 48
Longitudinal Profile 63
Pebble Count Plots 65
Table 10a. Baseline Stream Data Summary 75
Table 10b. Baseline Stream Data Summary 76
Table 11a. Dimensional Morphology Summary 79
Table 11b. Stream Reach Data Summary 81

Appendix E. Hydrologic Data 83
Table 12. Verification of Bankfull Events 84
Table 13. Wetland Criteria Attainment 85
Stream Pressure Transducer Charts 86
Groundwater Gauge Charts 88

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I. Executive Summary

The Newtown Stream and Wetland Restoration Site is located within the sub-basin 03-08-38 of the Catawba River Basin in Union County, North Carolina and contains Underwood Creek and one Unnamed Tributary (UT) to Underwood Creek. The restoration lengths of Underwood Creek (Main Channel) and UT to Underwood Creek (Tributary) are 1,273 and 4,075 feet, respectively, for a total project length of 5,348 feet (Figure 1). The project included restoration of 3.38 acres of riparian wetland and protection of an existing 0.15 acres of jurisdictional wetlands. The project site is owned by one property owner Mr. Frank W. Howey, Jr. The project is located within the HUC 03050103030020 (Lower Catawba Basin) of the South Atlantic-Gulf Region. NCDWQ classifies Underwood Creek (DWQ Stream Index Number 11-138-2-3-1) as class C. The 1.5 square mile watershed contributing drainage to the stream restoration segment is located in a rural setting. The land adjacent to the project streams is primarily used for agricultural practices and single family development. The floodplain is more confined in the upper reach of the project and opens up to a broad width for the majority of the project length. Vegetation typical of a Piedmont Alluvial Forest was planted throughout the conservation easement.

Project Goals:

- Improve water quality with the construction of stable stream banks and the establishment of a vegetated buffer
- Improve the stream function and habitat with the connection of the channelized and incised stream back to its floodplain
- Improve wetland hydrology with the functional uplift of the proposed channel
- Restore long-term stability with the restoration of channel pattern, profile and dimension
- Improve in-stream habitat with the installation of brush toes, root wads, constructed riffles, log vanes and rock cross vanes to enhance pool depths

Project Objectives:

- The restoration of 4,690 linear feet of Priority I, 558 feet of Priority II and 100 feet of Enhancement II in order to raise the stream bed elevation, reconnect the stream to its floodplain, restore pattern, and re-establish channel dimension on Underwood Creek and UT to Underwood Creek
- Restoration of 3.38 acres of wetlands through the functional uplift of the stream to improve wetland hydrology and the removal of depositional sediment from the wetland surface due to agricultural field soil wash
- Establish a minimum of 50 feet of riparian buffer along both sides of the entire stream length

Thirteen (13) vegetation plots were monitored using Level II of the CVS-EEP vegetation monitoring protocol (Version 4.2) which accounts for planted and natural stems. Counting only planted stems and excluding livestakes, there are 408 stems/acre. Counting both natural and planted stems, excluding live stakes and exotics, there are 1311 stems/acre. The success criterion for planted woody species is 320 stems/acre after

MY-03. A mortality rate of ten percent will be allowed after MY-04 (288 stems/acre), with another ten percent allowed after MY-05 (260 stems/acre). While all the vegetation plots combined meet the criteria for total planted stems, planted stem counts for plots 4, 6, 7, 8, and 11 were below the threshold requirements of 288 stems (Table 7). Plots 4, 6, 7, 8, and 11 exceeded the stem density requirements when including natural stems. Volunteers observed within the plot 4 and 7 were eastern cottonwood (*Populus deltoides*) trees. Eastern cottonwood is abundant throughout the vicinity of the stream confluence and is sporadic throughout the stream buffer corridor. Volunteers observed within plot 8 include eastern silverling (*Baccharus halimifolia*) and common elderberry (*Sambucus canadensis*). Other volunteer species observed within the conservation easement were black willow (*Salix nigra*), eastern sugarberry (*Celtis laevigata*), winged sumac (*Rhus copallinum*), and slippery elm (*Ulmus rubra*). Volunteer species densities are low within plots 6 and 11. Wetland hydrology is present with a thick dominant herbaceous layer dominant within the vicinity of Plot 6. Some planting may have been smothered by the herbaceous vegetation resulting in the low stem density. Planted species surviving within Plot 6 are river birch (*Betula nigra*), button bush (*Cephalanthus occidentalis*), green ash (*Fraxinus pennsylvanica*), and swamp chestnut oak (*Quercus michauxii*). Plot 11 is located within an area where the herbaceous layer is relatively sparse and wetland hydrology is absent. Planted species surviving are persimmon (*Diospyros virginiana*), green ash, swamp chestnut oak, and willow oak. The vegetation problem areas consist of areas with low stem densities and invasive exotic vegetation. Low stem densities are in the vicinity of plots 6 and 11 where the herbaceous layer is dominant and in areas of the floodplain bench where herbaceous vegetation diversity was low and sparse. These areas of the floodplain bench correspond to areas where excavation of the new stream floodplain occurred. Soil compactness and nutrient deficiency may be a factor in the survival rate of woody stems in the areas of low stem densities.

Five species of invasive exotics were observed in the conservation easement including Chinese privet (*Ligustrum sinense*), Johnson grass (*Sorghum halapense*), Japanese stiltgrass (*Microstegium vimineum*), multiflora rose (*Rosa multiflora*), and Asian dayflower (*Murdania keisak*). Chinese privet is present just upstream of the conservation easement along both reaches of stream. Although privet is being managed through an herbicidal foliar application some stems were observed within the conservation easement near the upstream extent of UT to Underwood Creek. One stem of Chinese privet was also observed within plot 5. Chinese privet was treated with a foliar herbicidal spray during the MY-02 period and those stems observed remain dead. Some living individual stems of Chinese privet were observed in the wetland reference site. Johnson grass stands remain prevalent along the conservation easement in the vicinity of the stream confluence. Although some dieback of Johnson grass was observed it remains it is still abundant in areas on the margins of the conservation easement. Only one stem of multiflora rose was observed and recorded in plot 7. Japanese stiltgrass is observed sporadically in patches in the conservation easement concentrating in shady areas within the vicinity of the wetland preservation. Asian dayflower is wetland obligate species and was observed in some areas of the stream channel throughout the conservation easement. Although these invasive exotic species are given different ranks of severity, the

functionality of the project is not expected to be impaired significantly. These species will continue to be observed and treated as necessary.

MY-04 Vegetation Problem Areas			
VPA #	**Station Number**	**Suspected Cause**	**Proposed Remedial Action**
1	See CCPV	Chinese Privet is scattered in forested areas that were present during pre-construction.	Chinese privet has been treated throughout the CE. Persistence will be monitored and treated again if deemed necessary.
2	See CCPV	Johnson grass is scattered in small patches and along the conservation easement boundary. The CCPV depicts areas where it is concentrated.	Johnson grass has been treated throughout the CE. Persistence will be monitored and treated again if deemed necessary.
3	See CCPV	Japanese stiltgrass is concentrated in an area adjacent to woodlands where it escaped.	Japanese stiltgrass persistence will be monitored and treated if deemed necessary.
5	See CCPV	Low stem densities were observed in patches throughout the conservation easement in areas where planted and natural stem densities were low.	Areas of low stem densities will be replanted in 2015.

Eleven RDS groundwater gauges (1-11) are located within the conservation easement. Gauges 1-8 were originally installed between February 2010 and April 2011. Three additional gauges (9-11) were installed in April of 2014 to evaluate the wetland extent near the conservation easement boundary. Gauges 1, 6, and 7 malfunctioned at some point during the monitoring period; battery replacement or entire gauge replacement resulted in gaps in the groundwater data. Despite these problems, nine of the ten groundwater gauges (Gauges 1-8 and 10-11) met hydrological requirements; the newly installed Gauge 9 did not meet hydrological requirements. Ten bankfull events have been recorded for the project site since 2011 (Table 12).

The monitoring reach of Underwood Creek is stable with little change to the stream pattern and profile. Water was observed through all of Underwood Creek and the unknown tributary to Underwood Creek on April 1st & 2nd, May 7th, and September 4th. The cross sections for MY-04 compare well to the MY-03 cross section data. One of the riffles did appear to show signs of down-cutting at STA 17+65 and will be noted for continued review in MY-05. The rills present in previous monitoring years have not shown any further degradation, Vegetation has grown in the area and is no longer considered a problem area.

The monitoring reach of UT to Underwood Creek also displays little change to pattern, profile, and dimension. Flowing water was present in both the upper and lower portions of the tributary. No vegetation was present in the channel. To address NCEEP comments regarding quantifying the presence or absence of water in the upper limits of UT to Underwood Creek, two stream pressure transducers were installed in the channel and a third was installed as an atmospheric control for the site. Transducer #1 was located just below the conservation easement in the enhancement section of the stream at the very top of the project. Transducer #2 was installed at Cross Section #1 midway within the area that has had periods of dryness. The transducer locations are shown on the condition plan views. From April 1st to September 17th flow data was recorded on the pressure transducers. Water was recorded to be flowing through the stream at Transducer #1 from April 1st to September 2nd, and water depth was recorded at Transducer 2, a pool in the stream, throughout the range of April 1st to September 17th with short infrequent durations of dry times in June and late August. Water surface elevation was recorded to be at or above bankfull on six (6) days during data collection at both transducer locations.

A comparison of the cross section data shows little change in geometry between MY-03 and MY-04 for all sections. In MY-03, Cross Section 4, a pool, appeared to be narrowing however it may have been due to the heavy herbaceous vegetation present in the channel during data collection as the MY-04 data compares well with earlier monitoring data. As noted in previous monitoring years, the root ball from the fallen tree in the floodplain adjacent to cross section 1, continues to not be compromising the channel banks. Minor bank erosion was noted near STA 13+00 but is not severe enough to report in the CCPV. A tree growing in the stream near STA 33+50 is causing debris build up and is recommended to be removed. The overall longitudinal profile of the stream is stable. One riffle did appear to be lower than previous monitoring years at STA 31+27 and it will be noted for continued observation in MY-05. Beaver dams were not present during the monitoring process.

Summary information/data related to the occurrence of items such as beaver or encroachment, and statistics related to performance of various project and monitoring elements, can be found in the tables and figures in the report appendices. Narrative background and supporting information formally 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.

MY-04 Stream Problem Areas			
PA	**Station**	**Suspected Cause**	**Proposed Remedial Action**
1	See CCPV	Tree growing in Stream	Recommend Removal

II. Methodology

Methodologies follow EEP monitoring report template Version 1.3 (01/15/10) and CVS vegetation monitoring protocol Version 4.2 (Lee et al 2008). Photos were taken with a digital camera. A Trimble Geo XT handheld unit with sub-meter accuracy was used to collect groundwater gauge locations, vegetation monitoring plot origins, and problem area locations. Cross sectional and longitudinal surveys were conducted using total station survey equipment. Data was entered into AutoCAD Civil3D to obtain dimensions of the cross sections and parameters applicable to the longitudinal profile. Reports were then generated to display summaries of the stream survey.

A. Vegetation Methodologies

Level II of the EEP/CVS protocol (Version 4.2) was used to collect data for MY-04. Data collected for these plots are in Appendix C.

B. Wetland Methodologies

There are a total of eleven RDS groundwater gauges within the conservation easement. Seven RDS groundwater monitoring gauges (1-3; 5-8) were installed in April of 2011. Gauge 4, the wetland reference gauge, was installed in February 2010. Gauge 9-11 were install April 2014. Gauges are downloaded bi- monthly to ensure proper function throughout the growing season. Data is provided in an Excel spreadsheet along with incorporation of local rainfall data provided by the NC State Climate Office.

C. Stream Methodologies

Stream profile and cross-sections were surveyed using total station equipment and methods, and plotted using AutoCAD Civil3D. The longitudinal profile was generated using the MY-00 alignment. Cross sectional data was extracted based on a linear alignment between the end pins. Cross section bankfull elevations for yearly comparisons are based on the baseline bankfull elevation established for each cross section. Stream flow on UT to Underwood Creek was monitored through the placement of two pressure transducers in the stream and one atmospheric gauge for calibration.

III. References

Lee, Michael T. Peet, Robert K. Roberts, Steven D., Wentworth, Thomas R. (2008). *CVS-EEP Protocol for Recording Vegetation Version 4.2.*

Weakley, Alan (2007). *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas*. http://www.herbarium.unc.edu/flora.htm.

Wolman, M.G., 1954. A Method of Sampling Coarse River-Bed Material, Transactions of American Geophysical Union 35:951-956.

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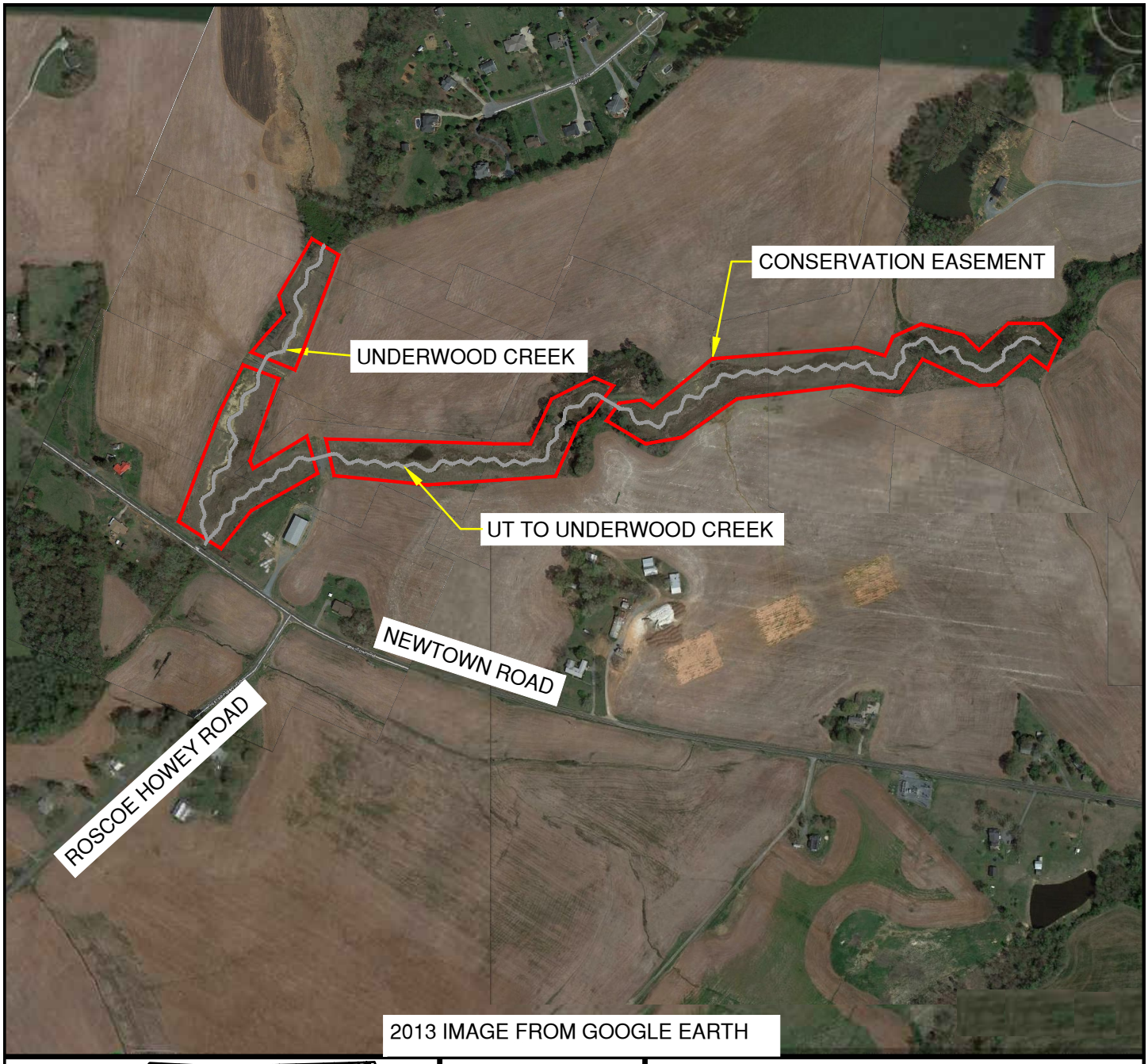
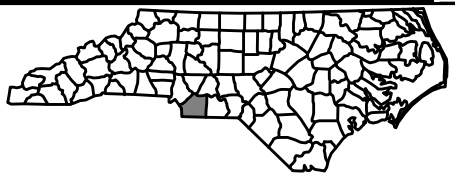
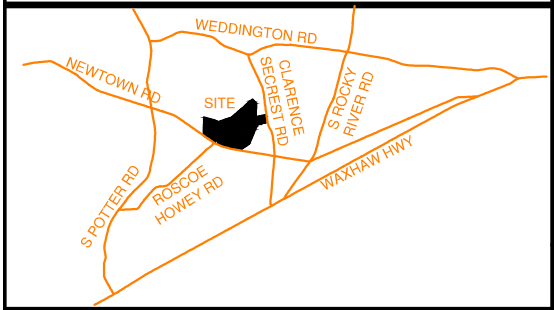
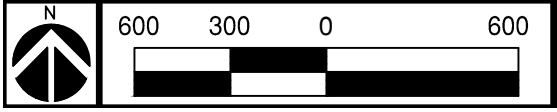
Appendix A. Project Vicinity Map and Background Tables









Ecosystem Enhancement PROGRAM

North Carolina - Ecosystem Enhancement Program

Newtown Stream and Wetland Restoration Site
Union County, North Carolina

FIGURE 1
NEWTOWN STREAM AND WETLAND RESTORATION AERIAL VICINITY MAP

DATE: January 7, 2014

WARD CONSULTING ENGINEERS, PC

4805 Green Road Suite 100
Raleigh, NC 27616-2848

(919) 870-0526
FAX (919) 870-5359

Table 1. Project Components Newtown Stream and Wetland Restoration									
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing**	**Mitigation Ratio**	**Mitigation Units**	**BMP Elements1**	**Comment**
Underwood Creek	520	R	P2	558	5+00 - 10+58	1:1	558		
Underwood Creek	625	R	P1	715	11+16 - 19+06	1:1	715		58 LF easement exclusion for Stream Crossing
UT to Underwood Creek	3923	R	P1	3975	2+00 - 43+07	1:1	3975		125 LF easement exclusion for two (2) Stream Crossings
UT to Underwood Creek	100	E2		100	1+00 - 2+00	2.5:1	40		
Wetland	3.38	R	-	3.38		1:1	3.38		
Wetland	0.15	P	-	0.15		5:1	0.03		Preservation

1 = BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area, O = Other; CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

Table 1b. Component Summations Newtown - EEP# 94150							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	5248	3.38					
Enhancement							
Enhancement I							
Enhancement II	100						
Creation							
Preservation		0.15					
HQ Preservation							
Totals (Feet/Acres)	**5348**	**3.41**					
MU Totals	**5288**	**3.41**					
	Non-Applicable						

Table 2. Project Activity and Reporting History

Newtown Stream and Wetland Restoration

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan	June 2010	June 2010
Final Design – Construction Plans	July 2010	July 2010
Construction	-	April 2011
Bare root and livestake planting	-	April 2011
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	April 2011	May 2011
Year 1 Monitoring	October 2011	December 2011
Year 2 Monitoring	November 2012	November 2012
Year 3 Monitoring	September 2013	November 2013
Year 4 Monitoring	September 2014	October 2014
Year 5 Monitoring		

Bolded items are examples of those items that are not standard, but may come up and should be included. Non-bolded items represent events that are standard components over the course of a typical project.

Table 3. Project Contacts Table Newtown Stream and Wetland Restoration	
Designer	Ward Consulting Engineers, P.C. 4805 Green Road, Suite 100 Raleigh, NC 27616
Primary project design POC	Becky Ward 919-870-0526
Construction Contractor	RFG Construction 1907 Cambridge Dr Kinston, NC 28504
Construction contractor POC	Robert Grady 252-559-6954
Survey Contractor	R.B. Pharr & Associates 420 Hawthorne Ln Charlotte, NC 28204
Survey contractor POC	Justin Cloninger 704-376-2186
Planting Contractor	New Forest Services P.O. Box 255 Manistee, MI 49660
Planting contractor POC	Brian Jarvinen 910-512-6754
Seeding Contractor	RFG Construction 1907 Cambridge Dr Kinston, NC 28504
Contractor point of contact	Robert Grady 252-559-6954
Seed Mix Sources	Evergreen Seed - Fuquay Varina, NC 919-567-1333
Nursery Stock Suppliers	Arbor Gen - Blenheim, SC - South Carolina SuperTree Nursery 800-222-1290
Monitoring Performers	Ward Consulting Engineers, P.C. 4805 Green Road, Suite 100 Raleigh, NC 27616
Stream Monitoring POC	Becky Ward 919-870-0526
Vegetation Monitoring POC	Chris Sheats - The Catena Group - 919-732-1300
Wetland Monitoring POC	Chris Sheats - The Catena Group - 919-732-1300

Table 4. Project Attribute Table Newtown Stream and Wetland Restoration		
Project County	Union	
Physiographic Region	Piedmont	
Ecoregion	Carolina Slate Belt	
Project River Basin	Catawba River Basin	
USGS HUC for Project (14 digit)	3050103030020	
NCDWQ Sub-basin for Project	03-08-38	
Within extent of EEP Watershed Plan?	No	
WRC Hab Class (Warm, Cool, Cold)	-	
% of project easement fenced or demarcated	100%	
Beaver activity observed during design phase?	No	
Restoration Component Attribute Table		
	Underwood Creek	**UT to Underwood Creek**
Drainage area	0.72 sq mi	0.74 sq mi
Stream order	-	-
Restored length (feet)	1273	3975
Perennial or Intermittent	Perennial	Perennial
Watershed type (Rural, Urban, Developing etc.)	Rural	Rural
Watershed LULC Distribution (e.g.)		
Residential	14%	
Ag-Row Crop	66%	
Ag-Livestock	-	
Forested	20%	
Etc.	-	
Watershed impervious cover (%)	-	
NCDWQ AU/Index number	11-138-2-3-1	N/A
NCDWQ classification	C	N/A
303d listed?	N	N
Upstream of a 303d listed segment?	N	N
Reasons for 303d listing or stressor	N/A	N/A
Total acreage of easement	16.43 Ac	
Total vegetated acreage within the easement	0.17 Ac	0.53 Ac
Total planted acreage as part of the restoration	14.3 Ac	
Rosgen classification of pre-existing	incised C4/E4	incised C4/E4 w/sections of G4
Rosgen classification of As-built	C4	C4
Valley type		
Valley slope	0.64%	0.63%
Valley side slope range (e.g. 2-3.%)	-	-
Valley toe slope range (e.g. 2-3.%)	-	-
Cowardin classification	-	-
Trout waters designation	N	N
Species of concern, endangered etc.? (Y/N)	N	N
Dominant soil series and characteristics		
Series	Chewacla	Chewacla
Depth	-	-
Clay%	-	-
K	-	-
T	-	-

Use N/A for items that may not apply. Use "-" for items that are unavailable and "U" for items that are unknown

Appendix B. Visual Assessment Data

Vegetation Plot Origins		
Plot Name	Northing	Easting
VP 1	448672.01	1507128.22
VP 2	448460.02	1506909.61
VP 3	448157.84	1506800.79
VP 4	447966.78	1506832.95
VP 5	448153.74	1507081.53
VP 6	448228.13	1507543.37
VP 7	448179.64	1507841.68
VP 8	448266.41	1508086.78
VP 9	448359.76	1508550.13
VP 10	448446.72	1508742.00
VP 11	448583.68	1508973.48
VP 12	448521.15	1509214.17
VP 13	448603.80	1509481.71

Cross Sections Underwood Creek				
	Left Pin		Right Pin	
	Northing	Easting	Northing	Easting
XS 1	448791.94	1507187.43	448790.30	1507136.44
XS 2	448657.90	1507124.68	448677.45	1507078.39
XS 3	448366.02	1506907.39	448404.06	1506885.52
XS 4	448140.89	1506841.37	448163.68	1506800.24
XS 5	448053.24	1506800.42	448089.27	1506775.75

Cross Sections UT to Underwood Creek				
	Left Pin		Right Pin	
	Northing	Easting	Northing	Easting
XS 1	448628.47	1509726.46	448682.84	1509702.58
XS 2	448532.49	1509448.30	448573.02	1509463.20
XS 3	448538.35	1509071.04	448597.67	1509099.72
XS 4	448538.71	1508911.29	448578.60	1508914.82
XS 5	448367.87	1508633.33	448431.03	1508619.55
XS 6	448264.34	1508171.97	448307.14	1508136.96
XS 7	448182.29	1508003.67	448221.68	1507995.64
XS 8	448177.18	1507786.94	448232.42	1507767.15
XS 9	448179.84	1507395.62	448237.37	1507413.75
XS 10	448103.36	1507024.96	448125.71	1506988.19

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

2013 Aerial from Google Earth

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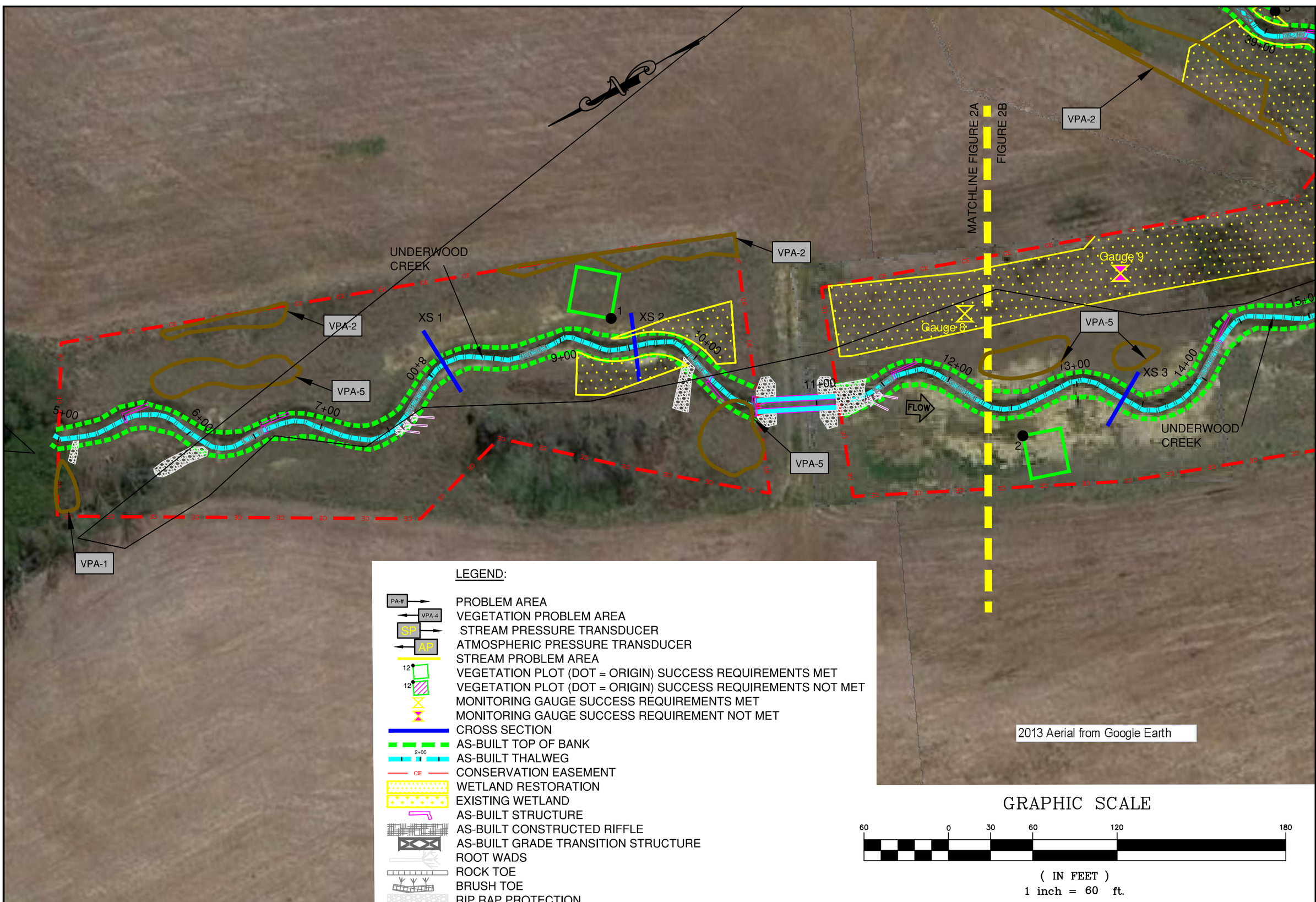
Ecosystem Enhancement Program

NEWTOWN EEP# 94150
OVERALL CURRENT CONDITIONS PLAN VIEW
UNION COUNTY, NORTH CAROLINA

DATE: October 2014
REVISIONS:
PROJECT NAME: EBX NEWTOWN
DWG NAME: CCPV
SCALE: 1" = 200
CURRENT CONDITIONS PLAN VIEW
SHEET NO.
FIGURE 2



LEGEND:

- PA-# — PROBLEM AREA
- VPA-4 — VEGETATION PROBLEM AREA
- SP — STREAM PRESSURE TRANSDUCER
- AP — ATMOSPHERIC PRESSURE TRANSDUCER
- STREAM PROBLEM AREA
- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS MET
- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS NOT MET
- MONITORING GAUGE SUCCESS REQUIREMENTS MET
- MONITORING GAUGE SUCCESS REQUIREMENT NOT MET
- CROSS SECTION
- AS-BUILT TOP OF BANK
- 2+00 — AS-BUILT THALWEG
- CE — CONSERVATION EASEMENT
- WETLAND RESTORATION
- EXISTING WETLAND
- AS-BUILT STRUCTURE
- AS-BUILT CONSTRUCTED RIFFLE
- AS-BUILT GRADE TRANSITION STRUCTURE
- ROOT WADS
- ROCK TOE
- BRUSH TOE
- RIP RAP PROTECTION

2013 Aerial from Google Earth

GRAPHIC SCALE

60 0 30 60 120 180

(IN FEET)
1 inch = 60 ft.

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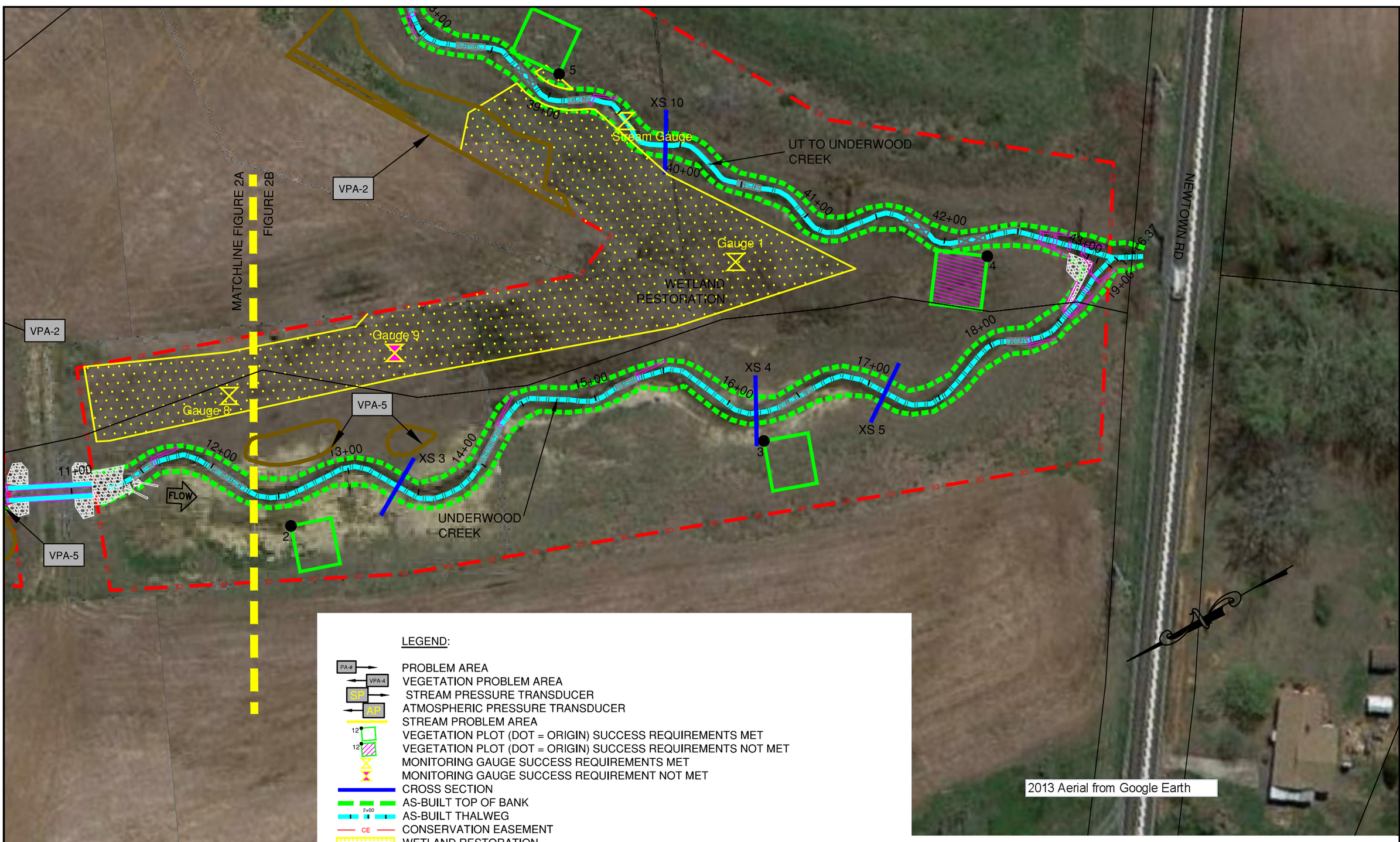
Ecosystem Enhancement Program

NEWTOWN
UNDERWOOD CREEK
UNION COUNTY, NORTH CAROLINA

DATE: October 2014
REVISIONS:
PROJECT NAME: EBX NEWTOWN
DWG NAME: CCPV
SCALE: 1" = 60'

CURRENT CONDITIONS PLAN VIEW

SHEET NO.
FIGURE 2A



LEGEND:

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- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS NOT MET
- MONITORING GAUGE SUCCESS REQUIREMENTS MET
- MONITORING GAUGE SUCCESS REQUIREMENT NOT MET
- CROSS SECTION
- 2+00 — AS-BUILT TOP OF BANK
- AS-BUILT THALWEG
- CE — CONSERVATION EASEMENT
- WETLAND RESTORATION
- EXISTING WETLAND
- AS-BUILT STRUCTURE
- AS-BUILT CONSTRUCTED RIFFLE
- AS-BUILT GRADE TRANSITION STRUCTURE
- ROOT WADS
- ROCK TOE
- BRUSH TOE
- RIP RAP PROTECTION

2013 Aerial from Google Earth

GRAPHIC SCALE

60 0 30 60 120 180

(IN FEET)
1 inch = 60 ft.

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Ecosystem Enhancement PROGRAM

NEWTOWN
UNDERWOOD CREEK
UNION COUNTY, NORTH CAROLINA

DATE: October 2014

REVISIONS:

PROJECT NAME: EBX NEWTOWN

DWG NAME: CCPV

SCALE: 1" = 60'

CURRENT CONDITIONS PLAN VIEW

SHEET NO.

FIGURE 2B

LEGEND:

- PA-# — PROBLEM AREA
- VPA-4 — VEGETATION PROBLEM AREA
- SP — STREAM PRESSURE TRANSDUCER
- AP — ATMOSPHERIC PRESSURE TRANSDUCER
- STREAM PROBLEM AREA
- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS MET
- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS NOT MET
- MONITORING GAUGE SUCCESS REQUIREMENTS MET
- MONITORING GAUGE SUCCESS REQUIREMENT NOT MET
- CROSS SECTION
- AS-BUILT TOP OF BANK
- 2+00 — AS-BUILT THALWEG
- CE — CONSERVATION EASEMENT
- WETLAND RESTORATION
- EXISTING WETLAND
- AS-BUILT STRUCTURE
- AS-BUILT CONSTRUCTED RIFFLE
- AS-BUILT GRADE TRANSITION STRUCTURE
- ROOT WADS
- ROCK TOE
- BRUSH TOE
- RIP RAP PROTECTION

VPA-2
VPA-5
UT TO UNDERWOOD CREEK
WETLAND RESTORATION
MATCHLINE FIGURE 2C
FIGURE 2D
AP
SP
SP
XS 1
XS 2
13
Gauge 5
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
2013 Aerial from Google Earth

GRAPHIC SCALE

60 0 30 60 120 180

(IN FEET)
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Ecosystem Enhancement PROGRAM

NEWTOWN
UT to UNDERWOOD CREEK
UNION COUNTY, NORTH CAROLINA

DATE: October 2014
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DWG NAME: CCPV
SCALE: 1" = 60'

CURRENT CONDITIONS PLAN VIEW

SHEET NO.
FIGURE 2C

LEGEND:

PROBLEM AREA
VEGETATION PROBLEM AREA
STREAM PRESSURE TRANSDUCER
ATMOSPHERIC PRESSURE TRANSDUCER
STREAM PROBLEM AREA
VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS MET
VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS NOT MET
MONITORING GAUGE SUCCESS REQUIREMENTS MET
MONITORING GAUGE SUCCESS REQUIREMENT NOT MET
CROSS SECTION
AS-BUILT TOP OF BANK
AS-BUILT THALWEG
CONSERVATION EASEMENT
WETLAND RESTORATION
EXISTING WETLAND
AS-BUILT STRUCTURE
AS-BUILT CONSTRUCTED RIFFLE
AS-BUILT GRADE TRANSITION STRUCTURE
ROOT WADS
ROCK TOE
BRUSH TOE
RIP RAP PROTECTION

MATCHLINE FIGURE 2C
FIGURE 2D
MATCHLINE FIGURE 2D
FIGURE 2E

VPA-5
Gauge 11
UT TO UNDERWOOD CREEK
Gauge 7
XS 5
19+00
20+00
21+00
22+00
23+00
18+00
17+00
16+00
15+00
14+00
13+00
WETLAND RESTORATION
Gauge 6
XS 4
XS 3
12
11
10
9
VPA-5
VPA-5
VPA-5
VPA-5

2013 Aerial from Google Earth

GRAPHIC SCALE

60 0 30 60 120 180

(IN FEET)
1 inch = 60 ft.

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Ecosystem Enhancement PROGRAM

NEWTOWN CREEK
UT to UNDERWOOD CREEK
UNION COUNTY, NORTH CAROLINA

DATE: October 2014
REVISIONS:
PROJECT NAME: EBX NEWTOWN
DWG NAME: CCPV
SCALE: 1" = 60'
CURRENT CONDITIONS PLAN VIEW
SHEET NO.
FIGURE 2D

MATCHLINE FIGURE 2D
FIGURE 2E

MATCHLINE FIGURE 2E
FIGURE 2F

VPA-3

VPA-5

PA-1

VPA-5

XS 6

XS 7

XS 8

UT TO UNDERWOOD CREEK

WETLAND RESTORATION

EXISTING WETLAND

Gauge 2

Gauge 3

Gauge 4
Wetland
Reference

Gauge 10

22+00
23+00
24+00
25+00
26+00
27+00
28+00
29+00
30+00
31+00
32+00
33+00

6
7
8

2013 Aerial from Google Earth

LEGEND:

- PA-# — PROBLEM AREA
- VPA-4 — VEGETATION PROBLEM AREA
- SP — STREAM PRESSURE TRANSDUCER
- AP — ATMOSPHERIC PRESSURE TRANSDUCER
- STREAM PROBLEM AREA
- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS MET
- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS NOT MET
- MONITORING GAUGE SUCCESS REQUIREMENTS MET
- MONITORING GAUGE SUCCESS REQUIREMENT NOT MET
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- EXISTING WETLAND
- AS-BUILT STRUCTURE
- AS-BUILT CONSTRUCTED RIFFLE
- AS-BUILT GRADE TRANSITION STRUCTURE
- ROOT WADS
- ROCK TOE
- BRUSH TOE
- RIP RAP PROTECTION

GRAPHIC SCALE

60 0 30 60 120 180

(IN FEET)
1 inch = 60 ft.

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NEWTOWN
UT to UNDERWOOD CREEK
UNION COUNTY, NORTH CAROLINA

DATE: October 2014
REVISIONS:
PROJECT NAME: EBX NEWTOWN
DWG NAME: CCPV
SCALE: 1" = 60'

CURRENT CONDITIONS PLAN VIEW

SHEET NO.

FIGURE 2E

LEGEND:

- PA-# — PROBLEM AREA
- VPA-4 — VEGETATION PROBLEM AREA
- SP — STREAM PRESSURE TRANSDUCER
- AP — ATMOSPHERIC PRESSURE TRANSDUCER
- STREAM PROBLEM AREA
- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS MET
- 12 — VEGETATION PLOT (DOT = ORIGIN) SUCCESS REQUIREMENTS NOT MET
- MONITORING GAUGE SUCCESS REQUIREMENTS MET
- MONITORING GAUGE SUCCESS REQUIREMENT NOT MET
- CROSS SECTION
- AS-BUILT TOP OF BANK
- 2+00 — AS-BUILT THALWEG
- CE — CONSERVATION EASEMENT
- WETLAND RESTORATION
- EXISTING WETLAND
- AS-BUILT STRUCTURE
- AS-BUILT CONSTRUCTED RIFFLE
- AS-BUILT GRADE TRANSITION STRUCTURE
- ROOT WADS
- ROCK TOE
- BRUSH TOE
- RIP RAP PROTECTION

MATCHLINE FIGURE 2E

FIGURE 2F

NEWTOWN RD

VPA-2

Rain Gauge

XS 9

34+00

35+00

36+00

37+00

38+00

UT TO UNDERWOOD CREEK

39+00

40+00

XS 10

Stream Gauge

Gauge 1

WETLAND RESTORATION

6

5

4

42+00

41+00

43+00

18+00

17+00

XS 5

XS 4

16+00

3

15+00

UNDERWOOD CREEK

14+00

Gauge 9

VPA-5

13+00

Gauge 8

2

VPA-5

VPA-2

2013 Aerial from Google Earth

GRAPHIC SCALE

60 0 30 60 120 180

(IN FEET)

1 inch = 60 ft.

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Ecosystem Enhancement PROGRAM

NEWTOWN
UT to UNDERWOOD CREEK
UNION COUNTY, NORTH CAROLINA

DATE: October 2014

REVISIONS:

PROJECT NAME: EBX NEWTOWN

DWG NAME: CCPV

SCALE: 1" = 60'

CURRENT CONDITIONS PLAN VIEW

SHEET NO.

FIGURE 2F

Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID **Underwood Creek**
Assessed Length **1273**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			1	15	99%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	20	22			91%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	24	24			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	24	24			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	22	22			100%			
		2. Thalweg centering at downstream of meander (Glide)	22	22			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0		100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0		100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0		100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	5	5			100%			

Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID **UT to Underwood Creek**
Assessed Length **3000**

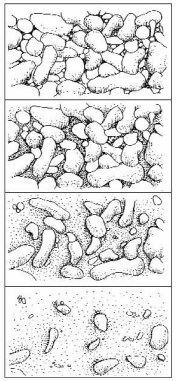
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			1	13	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	48	65			74%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	65	65			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	65	65			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	65	65			100%			
		2. Thalweg centering at downstream of meander (Glide)	63	63			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	18	18			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	18	18			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	17	17			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	16	16			100%			

Criteria, Definitions and Thresholds for Visual Stream Morphology Assessments

Major Channel Category	Channel Sub-Category	Metric	Definitions	Cataloging Threshold	CCPV Depiction
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)	*Aggradation refers to at least moderate increases in reach stored sediment. It is NOT simply constituted by minor fining of riffles or filling of pools at or below baseflow elevations. An aggrading reach is often characterized by sand or gravel bar formation/growth with associated fining of reach substrate and smoothing of the reach long profile. Bars/aggraded areas significant enough to deflect flow against banks should be catalogued. Repeat channel photopoints are a key tool in assessing project aggradation. (See photo exhibit 1 below for range of example bar development/aggradation)	Catalog only if feature has most of the characteristics described to the left (cell E11) and is at least 15 feet in length or 20% of the riffle/run length, whichever is less.	NA
		2. Degradation - Number and size of evident downcuts within Riffle/Run units.	Where projects have regularly-spaced engineered grade control, degredation/downcutting is expected only in short, discreet lengths. *Indicators include perched sill structures, channel bed "steps" in clay-rich parent material, evidence of bed retreat at the bank toe (parent material may be exposed); mobilization of coarse riffle substrate in to pools downstream, and perhaps riffles with run morphology. Long-profile surveys should support an assessment of bed degradation where the visual assessment and survey overlap.	Catalog only if feature has most of the characteristics described to the left (cell E12) and is at least 15 feet in length or 20% of the riffle/run length, whichever is less.	Dark Red or Purple Color to be certain to distinguish from Mass Wasting Color Code
	2. Riffle Condition	1. Texture	Riffles should maintain a coarseness similar to the design distribution. Significant fining of the riffle surface indicates non-attainment for the riffle. Repeat pebble counts should support an assessment of riffle fining where overlap occurs (see exhibit graphic 2 below describing embedding for gravel-cobble systems).	NA	NA
	3. **Meander Pool Condition**	1. Depth Sufficient?	This metric is used to assess meander pools and also step-pools along a Rosgen B-type channel reaches. For stepped reaches the pools will be evaluated and tallied here and under the Habitat Sub-Category below. The max pool bankfull depth should be 1.6 times the mean bankfull depth (Max Pool Depth : Mean Bankfull Depth > 1.6). The mean bankfull depth from the As-built/baseline survey can be utilized to make this determination. Exhibit 3 provides residual pool depths using the 1.6 multiplier for a range of mean channel riffle depths that typify restoration projects.	NA	NA
		2. Length appropriate?	This metric will only be applied to meander pools. The meander pool length should be >30% of the ~ linear centerline distance between the tail of the upstream riffle and the head of the downstream rifle.	NA	NA
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)?	This metric is used to characterize flow paths along riffle-run-pool transitions. The thalweg is expected to be against the outer bank in the bend apex, but vectors oriented towards the outer bank too far above the bend apex may indicate the potential for increased bank erosion. Similarly, the pool-glide-riffle transition is also expected to demonstrate flow path centering (Metric 4.2 below). The current-year thalweg rendered on the CCPV figure can assist in this assessment.	NA	NA
		2. Thalweg centering at downstream of meander bend (Glide)?	See Metric 4.1 above	NA	NA
2. Bank	**1. Scoured/Eroding Bank**	In order to better assess continued bank erosion risk, tallied bank segments are also characterized with respect to the proximity and integrated extent of stabilizing vegetation. Continued erosion risk for a given bank instability object is essentially adjusted downwards by adjacent mature vegetation and/or stabilizing roots. One or more mature trees in close proximity (e.g. 10 feet or less) or obvious integration of root mass within the bank failure are characteristics that would prompt the tallying of a given bank object into the additional sub-category related to risk of further instability (columns J-L of the actual data table). Essentially, the vegetative elements of rooting density and depth (e.g. from a BEHI assessment) need to be considered here.	Banks with evident scour /erosion	<table><tr><th>Bank Height</th><th>Minimum Length</th></tr><tr><td>>6</td><td>6</td></tr><tr><td>3-6</td><td>8</td></tr><tr><td><3</td><td>10</td></tr></table> See Footnote/Exhibit 5 below also This table provides a guide for working thresholds for bank erosion cataloging/mapping based on bank height. For the bank height ranges above, the minimum length of bank to be mapped and tallied is specified. For example, where banks are <3 feet high, only map an unstable segment if it is ≥ 10 feet.[5]	Yellow.
	2. Undercut		Banks undercut/overhanging to the extent that mass wasting appears likely? Does NOT include undercuts that modest, appear sustainable/stable and are providing habitat.		Orange.
	3. Mass Wasting		Bank slumping/calving/collapse?		Red.
3. Structures	**1. Overall Integrity**	The assessment of engineered structure performance should include all structures that provide grade control, bank protection, or habitat functions. These include Vanes, J-hooks, and rootwads, etc.	Bulk of structure physically intact with no dislodged boulders or logs?		Using callouts or some other means to maintain legibility, annotate structure with red **"S"** if structural failure has occurred
	2. Grade Control		Bed grade control maintained across the sill structure? No evident loss of bed elevation immediately upstream of structure? Some piping alone will not constitute a loss of grade control.		Using callouts or some other means to maintain legibility, annotate structure with red **"G"** if structure has lost grade control
	2a. Piping		Catalog structures lacking any substantial flow underneath sills or around arms?		Using callouts or some other means to maintain legibility, annotate structure with red **"P"** if significant piping has occurred
	3. Bank Protection		See exhibit 4 below for determining structural sphere of influence. If the amount of bank that is deemed to be actively eroding within the structures sphere of influence exceeds 15% of the total bank footage within the structures sphere of influence, then the structure should be classified as not providing adequate bank protection in the data table.		Using callouts or some other means to maintain legibility, annotate structure with red **"B"** if structure has failed to provide bank protection
	4. Habitat		Are pools maintained @ ~ Max Pool Depth : Mean Bankfull Depth > 1.6? For rootwads, habitat provision means interacting with baseflow and providing cover.		Using callouts or some other means to maintain legibility, annotate structure with red **"H"** if structure is not providing habitat

Exhibit 1. Examples of bar features warranting concerning related to cataloging item 1.1.1 of the assessment

Exhibit 2. Graphic depicting embedding of riffles with fine material



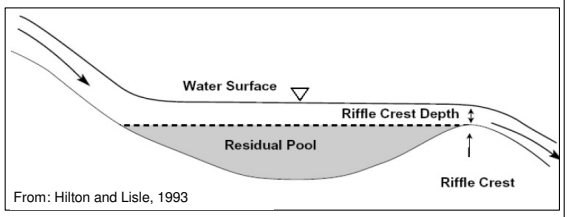
Progressing from top to bottom, the series of graphics to the left depicts the fining of interstial spaces between coarser particles. This describes increasing levels of embededness in riffles. The observer must have an understanding of the intended substrate distributions/texture of the bed for the projects riffles when assessing this. However, as a guideline for streams in the coarse gravel to cobble range, the 2nd panel from the top represents a visual guideline for the condition that would begin to elicit concern for this parameter, but still contains a good deal of coarse material. Progressing from that state to the conditions depicted in the the 3rd and 4th panel represents a visual que for significant emdedding.

From USEPA (EPA 841-B-97-003 - Nov 1997)

Exhibit 3. Residual Pool Depth Table - Relating 1.6 criterion for typical mean riffle depths to residual pool depths

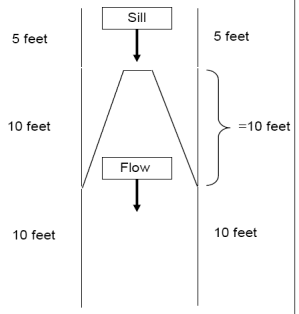
This residual pool table was provided in the event the tracking of bankfull at each pool feature to estimate a Dmax was inconvenient. Estimating the residual pool depth by measuring the max pool depth to water surface and subtracting the water depth at the riffle head may provide a more convenient way under certain circumstances to estimate in the field. For this reason the exhibit table provides a relationship between the 1.6 criterion applied to mean riffle depth for the site and the resulting residual pool depths.

Mean Riffle Depth D_{bkf}	Multiplier	Target Bankfull Pool Max	Residual Pool Depth
1.0	1.6	1.6	0.6
1.5	1.6	2.4	0.9
2.0	1.6	3.2	1.2
2.5	1.6	4.0	1.5
3.0	1.6	4.8	1.8
3.5	1.6	5.6	2.1
4.0	1.6	6.4	2.4
4.5	1.6	7.2	2.7
5.0	1.6	8.0	3.0



From: Hilton and Lisle, 1993

Exhibit 4. Extent of Structural Influence for Bank Protection



The drawing is a guideline for the extent of influence vane arms exert on stream banks. The bracketed segment (10ft) immediately adjacent to the vane arm is multiplied by 5 to determine the total length of bank influenced by a cross vane. This includes the bank length adjacent to each vane arm, 1 length (10 feet) below each van arm, and ½ length (5 feet) on each bank above the uppermost structural element (in this case the vane sill), yielding 50 feet in this example case. In this example a single arm vane or j-hook would only influence 25ft of bank.

If the amount of recent bank erosion observed within the extent of influence exceeds 15% then the structure is deemed not to be providing adequate bank protection. In the above examples this would amount to ~ 8 and 4 feet, respectively.

If in an earlier assessment the structure failed the 15% bank protection criteria but the erosion has subsequently stabilized, then the observer can use best professional judgment to determine if the structure is currently meeting the bank protection criteria.

5 = The above was developed because of the need to have a threshold given the large number of performers and to avoid spending time trying to catalog and map small objects that if excluded would have minimal overall impacts on the performance percentages. It is a guide that tries to strike a balance between the obvious need to have a threshold, yet provide confidence that the site conditions are accurately represented. For example, a scenario where 1 object nearly exceeding the threshold were to occur every 100 feet of bank height (which would be a high frequency and unlikely) with a bank height of 5 feet, would yield an error of ~3%. However, if the observer is encountering a truly high number of objects just below the threshold in the above table (e.g. > 1 per 100 feet of bank channel on average) and is concerned that the exclsuion of such objects is going to misrepresent the site conditions, then judgement should be applied and objects below the threshold may be cataloged. If a rare condition as described does occur and the thresholds are not utilized then a table footnote explaining this should be included.

Lastly, given the increase in overall area and the implications to stability, greater banks heights required smaller threshold minimums.

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **14.3**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Brown Line	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Brown Line	10	0.54	3.8%
			Total	10	0.54	3.8%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Brown Line	0	0.00	0.0%
			Cumulative Total	10	0.54	3.8%

Easement Acreage[2] **16.43**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	100 SF	Brown Line	13	0.33	2.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Brown Line	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

High Concern:				Low/Moderate Concern:	
Vines	**Genus/Species**	**Shrubs/Herbs**	**Genus/Species**	**Shrubs/Herbs**	**Genus/Species**
Kudzu	*Pueraria lobata*	Japanese Knotweed	Polygonum cuspidatum	Japanese Privet	Ligustrum Japonicum
Porcelain Berry	Ampelopsis brevipeduncul	Oriental Bittersweet	Celastrus orbiculatus	Glossy Privet	Ligustrum lucidum
Japanese Honeysuckle	Lonicera japonica	Multiflora Rose	Rosa multiflora	Fescue	Festuca spp.
Japanese Hops	Humulus japonicus	Russian olive	Elaeagnus angustifolia	English Ivy	Hedera helix
Wisterias	Wisteria spp.	Chinese Privet	Ligustrum sinense	Microstegium	Microstegium vimineum
Winter Creeper	Euonymus fortunei	Chinese Silvergrass	Miscanthus sinensis	Burning Bush	Euonymus alatus
Bush Killer (Watch List)	Cayratia japonica	Phragmites	Phragmites australis	Johnson Grass	Sorghum halepense
		Bamboos	Phyllostachys spp	Bush Honeysuckles	Lonicera, spp.
Trees		Sericea Lespedeza	Sericea Lespedeza	Periwinkles	Vinca minor
Tree of Heaven	Ailanthus altissima	Garlic Mustard (Watch List)	Alliaria petiolata	Morning Glories	Morning Glories
Mimosa	Albizia julibrissin	Cogon Grass (Watch List)	Imperata cylindrica	Bicolor Lespedeza (Watch List)	Lespedeza bicolor
Princess Tree	Paulownia tomentosa	Giant Reed (Watch List)	Arundo donax	Chinese Yams (Watch List)	Dioscorea oppositifolia
China Berry	Melia azedarach	Tropical Soda Apple (Watch List)	Solanum viarum	Air Potato (Watch List)	Dioscorea bulbifera
Callery Pear	Pyrus calleryana	Japanese Spirea (Watch List)	Spiraea japonica	Japanese Climbing Fern (Watch List)	Lygodium japonicum
White Mulberry	Morus alba	Japanese Barberry (Watch List)	Berberis thunbergii		
Tallow Tree (Watch List)	Triadica sebifera				

Stream Station Photos

Photo 1. Looking downstream at Underwood Creek XS-1

Photo 2. Looking downstream at Underwood Creek XS-2

Photo 3. Looking downstream at Underwood Creek XS-3

Photo 4. Looking downstream at Underwood Creek XS-4

Photo 5. Looking downstream at Underwood Creek XS-5

Photo 6. Looking downstream at UT to Underwood Creek XS-1

Photo 7. Looking downstream at UT to Underwood Creek XS-2

Photo 8. Looking downstream at UT to Underwood Creek XS-3

Photo 9. Looking downstream at UT to Underwood Creek XS-4

Photo 10. Looking downstream at UT to Underwood Creek XS-5

Photo 11. Looking downstream at UT to Underwood Creek XS-6

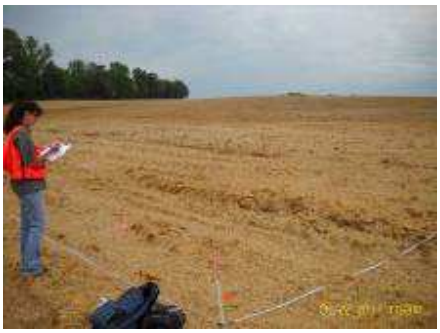
Photo 12. Looking downstream at UT to Underwood Creek XS-7

Photo 13. Looking downstream at UT to Underwood Creek XS-8

Photo 14. Looking downstream at UT to Underwood Creek XS-9

Photo 15. Looking downstream at UT to Underwood Creek XS-10

MY-00 Vegetation Plot Photos
April 22, 2011



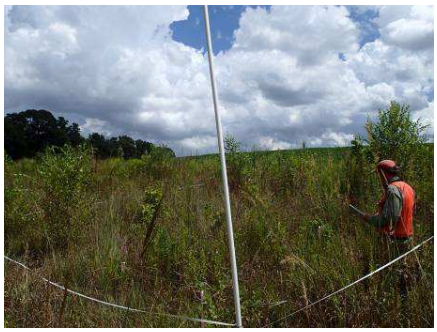
Veg Plot 1

Veg Plot 2

Veg Plot 3

Veg Plot 4

MY-04 Vegetation Plot Photos
September 4-5, 2014



Veg Plot 1

Veg Plot 2

Veg Plot 3

Veg Plot 4

Veg Plot 5

Veg Plot 5

Veg Plot 6

Veg Plot 6

Veg Plot 7

Veg Plot 7

Veg Plot 8

Veg Plot 8

Veg Plot 9

Veg Plot 9

Veg Plot 10

Veg Plot 10

Veg Plot 11

Veg Plot 11

Veg Plot 12

Veg Plot 12

Veg Plot 13

Veg Plot 13

Appendix C. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment		
Vegetation Plot ID	**Vegetation Survival Threshold Met?**	**Tract Mean**
VP1	Yes	100%
VP2	Yes	
VP3	Yes	
VP4	No	
VP5	Yes	
VP6	No	
VP7	No	
VP8	No	
VP9	Yes	
VP10	Yes	
VP11	No	
VP12	Yes	
VP13	Yes	

Report Prepared By	Chris Sheats
Date Prepared	9/30/2014 15:36
database name	TheCatenaGroup-2013-Newtown_D.mdb
database location	C:\Users\Katie\Desktop
computer name	HOMELAPTOP
file size	47439872

DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------

Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.

PROJECT SUMMARY----------

Project Code	94150
project Name	Newtown Stream and Wetland Restoration
Description	Underwood Creek Stream Restoration in Union County southwest of Monroe, NC.
River Basin	Catawba
length(ft)	5317
stream-to-edge width (ft)	50
area (sq m)	49391.55
Required Plots (calculated)	13
Sampled Plots	13

Table 9

EEP Project Code 94150. Project Name: Newtown Stream and Wetland Restoration

			Current Plot Data (MY4 2014)																																					Annual Means											
			E94150-01-0001			E94150-01-0002			E94150-01-0003			E94150-01-0004			E94150-01-0005			E94150-01-0006			E94150-01-0007			E94150-01-0008			E94150-01-0009			E94150-01-0010			E94150-01-0011			E94150-01-0012			E94150-01-0013			MY4 (2014)			MY3 (2013)			MY2 (2012)			MY1 (2011)			MY0 (2011)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree									1						1																								2											
Acer rubrum var. rubrum	red maple	Tree			4																					1														5											
Asimina triloba	pawpaw	Tree																		1																				1	1	1	1	4	4	14	14	14	16	16	16
Baccharis halimifolia	eastern baccharis	Shrub						9			5			7									14			40								1			1			2			79			30			34					
Betula nigra	river birch	Tree	7	7	7	3	3	3	5	5	5				1	1	4	1	1	1																	1	1	1	18	18	21	17	17	17	17	17	17	20	20	20	24	24	24
Carpinus caroliniana	American hornbeam	Tree																																																			
Carpinus caroliniana var. caroliniana	Coastal American Hornbeam	Tree																			1	1	1																		1	1	1	1	1	1	1	1	1	2	2	2	6	6	6
Carya	hickory	Tree																																																	2	2	2
Carya alba	mockernut hickory	Tree									1																														1											
Carya cordiformis	bitternut hickory	Tree												1																										1											
Celtis laevigata	sugarberry	Tree										1	1	1																										2	2	2	2	2	2	4	4	5	9	9	9	5	5	5
Cephalanthus occidentalis	common buttonbush	Shrub																1	1	2																				1	1	2	1	1	2	1	1	1						
Cornus amomum	silky dogwood	Shrub															1															2	2	3							3	3	5	3	3	3	3	3	3	4	4	4	3	3	3
Diospyros virginiana	common persimmon	Tree																									1	1	1	2	2	3	1	1	1	1	1	1	5	5	6	10	10	12	10	10	10	11	11	11	19	19	19	26	26	26
Fraxinus pennsylvanica	green ash	Tree							1	1	2			2				2	2	4	3	3	3	1	1	1	3	3	4	2	2	3				2	2	3	2	2	9	16	16	31	16	16	18	17	17	19	17	17	17	20	20	20
Ligustrum sinense	Chinese privet	Exotic																																							1						1						
Liquidambar styraciflua	sweetgum	Tree									5			1												8			1												16			8			2						
Nyssa sylvatica	blackgum	Tree																		3																					3											
Platanus occidentalis	American sycamore	Tree				3	3	3				2	2	2																										5	5	5	5	5	5	5	5	5	6	6	6	7	7	7
Platanus occidentalis var. occidentalis	Sycamore, Plane-tree	Tree													16	16	16				1	1	1	1	1	1	2	2	2												20	20	20	20	20	20	20	20	20	21	21	21	21	21	21
Populus deltoides	eastern cottonwood	Tree																																							90											
Populus deltoides var. deltoides	eastern cottonwood				5						3			39			18			1			13			8			1										6			94			91								
Pyrus calleryana	Callery pear	Exotic																					1																		1											
Quercus	oak	Tree																											2	2	2									2	2	2	3	3	3	3	3	3	8	8	8	65	65	65
Quercus michauxii	swamp chestnut oak	Tree	7	7	7	8	8	8	5	5	5	2	2	2	1	1	1	1	1	1				1	1	1	5	5	5				3	3	4	5	5	5	1	1	1	39	39	40	39	39	39	41	41	41	1	1	1
Quercus phellos	willow oak	Tree							2	2	3				3	3	3				1	1	1				2	2	2	3	3	3	1	1	1				2	2	2	14	14	15	13	13	13	14	14	14	12	12	12			
Rhus copallinum	flameleaf sumac	shrub																																							2											
Rhus copallinum var. copallinum	flameleaf sumac	shrub			4																																				4			1								
Rosa multiflora	multiflora rose	Exotic																																							1						1					
Rosa palustris	swamp rose	Shrub																															1								1			5								
Salix nigra	black willow	Tree												3						1												4								8			2								
Sambucus canadensis	Common Elderberry	Shrub															33									8														41			3			13					
Ulmus alata	winged elm	Tree																								4														4			5								
Ulmus rubra	slippery elm	Tree																								3			2										5						5					
Unknown		Shrub or Tree																																																10	10	10
		Stem count	14	14	27	14	14	23	13	13	30	5	5	58	20	20	73	5	5	12	7	7	26	3	3	25	13	13	78	9	9	20	7	7	10	9	9	11	12	12	29	131	131	422	131	131	276	141	141	297	173	173	173	208	208	208
		size (ares)	1			1			1			1			1			1			1			1			1			1			1			1			1			13			13			13			13		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.32			0.32			0.32			0.32		
		Species count	2	2	5	3	3	4	4	4	9	3	3	9	3	3	7	4	4	5	5	5	10	3	3	5	5	5	11	4	4	9	4	4	5	4	4	5	6	6	9	12	12	28	13	13	22	13	13	22	12	12	12	14	14	14
		Stems per ACRE	566.5599	566.5599	1093	566.5599	566.56	930.777	526.09133	526.1	1214	202.3	202.3	2347	809.3713	809.371	2954.2	202.3	202.3	485.6	283.3	283.3	1052	121.4	121.4	1012	526.1	526.1	3157	364.2	364.2	809.4	283.3	283.3	404.7	364.2	364.2	445.2	485.6	485.6	1174	407.8	407.8	1314	407.8	407.8	859.2	438.9	438.9	924.6	538.5	538.5	538.5	647.5	647.5	647.5

Appendix D. Stream Survey Data

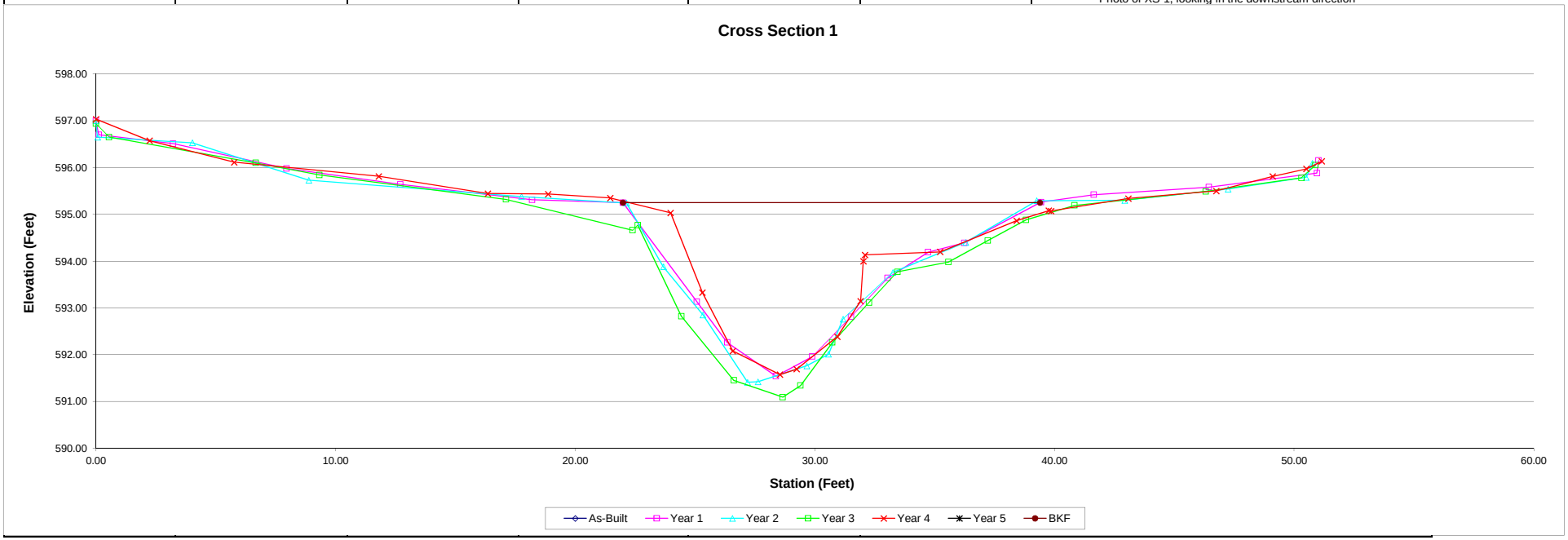
Project:	Underwood Creek
Cross Section:	Cross Section 1 (New for MY-01)
Feature	Pool
Station:	8+13
Date:	4/1/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)		31.4	33.0	33.4	29.9	
W (BKF)		17.4	17.3	16.2	19.8	
Max d		3.7	3.8	4.0	3.7	
Mean d	#DIV/0!	1.8	1.9	2.1	1.5	
W/D	#DIV/0!	9.7	9.1	7.9	13.1	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Stati
			0.00	597.00	LPIN	0.00	597.00	LPIN	0.00	596.94	LPIN		597.04	Lpin	
			0.12	596.70		0.07	596.65		0.55	596.65		2.24	596.58		
			3.22	596.51		4.02	596.53		6.67	596.1		5.77	596.12		
			7.95	595.98		8.88	595.73		9.33	595.84		11.80	595.81		
			12.70	595.64		17.76	595.38		17.12	595.32		16.35	595.44		
			18.20	595.31		22.14	595.24	BL Bankfull	22.4	594.66		18.87	595.43		
			21.99	595.25	BANKFULL	23.68	593.88		22.61	594.77	TOBL bank	21.46	595.35	BL Bankfull left	
			25.08	593.13	TOE L	25.33	592.85		24.43	592.82	TOE L	23.98	595.03		
			26.35	592.26		27.19	591.41	TOE L	26.62	591.45		25.31	593.33		
			28.38	591.54	TW	27.63	591.42	TW	28.66	591.09	TW	26.57	592.08		
			29.89	591.96		29.66	591.76		29.4	591.34		28.54	591.57	tw	
			31.51	592.81	TOE R	30.57	592.01	TOE R	30.73	592.26		29.24	591.69		
			33.04	593.64		31.17	592.76		32.26	593.11	TOE R	30.94	592.39		
			34.73	594.19		33.26	593.76		33.45	593.77	TOBR Ban	31.91	593.15	toer	
			36.24	594.39		36.29	594.40		35.57	593.98		32.02	594.00		
			39.44	595.26	R Bankfull l	39.26	595.29	R Bankfull l	37.22	594.44		32.09	594.13		
			41.64	595.42		42.93	595.30		38.81	594.88		35.23	594.20	TOBR	
			46.44	595.58		47.24	595.54		40.84	595.19		38.42	594.86		
			50.95	595.88		50.50	595.79		46.31	595.49		39.76	595.08	ankfull right	
			51.02	596.15	RPIN	50.76	596.09	RPIN	50.31	595.78		39.85	595.07		
									50.89	596.05	RPIN	43.08	595.34		
												46.75	595.50		
												49.10	595.81		
												50.51	595.97		
												51.15	596.13	rpin	

Photo of XS-1, looking in the downstream direction



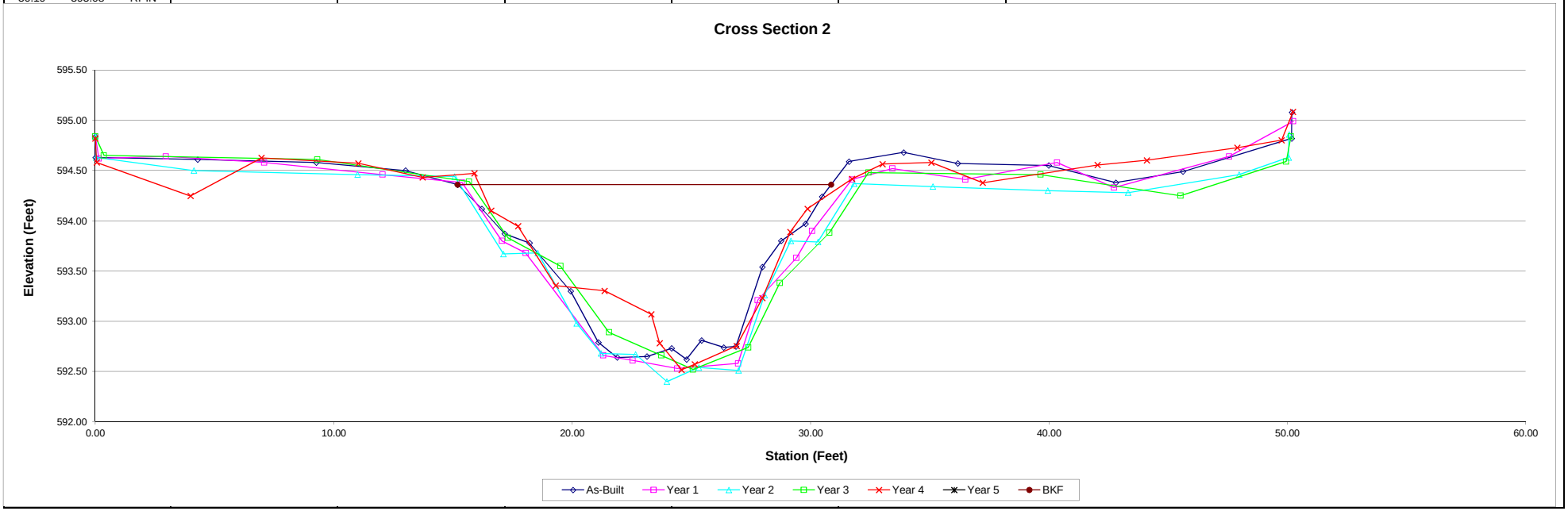
Project:	Underwood Creek
Cross Section:	Cross Section 2 (CS-1 in MY-00)
Feature	Riffle
Station:	9+54
Date:	4/1/14
Crew:	SV,CC,BW p

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	16.1	18.3	18.4	17.7	14.8	
W (BKF)	15.7	16.1	16.5	16.8	15.3	
Max d	1.7	1.8	2.0	1.8	1.8	
Mean d	1.0	1.1	1.1	1.1	1.0	
W/D	15.2	14.2	14.9	15.9	15.8	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			St
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	
0.00	594.84	LPIN	0.00	594.84	LPIN	0.00	594.84	LPIN	0.00	594.84	LPIN		594.82	lpin	
0.01	594.63		0.15	594.62		0.03	594.63		0.36	594.65		0.06	594.58		
4.29	594.61		2.96	594.64		4.13	594.50		9.31	594.61		3.99	594.25		
9.27	594.58		7.09	594.58		11.00	594.46		15.68	594.39	3L Bankfull	6.97	594.63		
13.01	594.50		12.05	594.46		15.07	594.44	3L Bankfull	17.31	593.83		11.03	594.57		
15.20	594.36	BANKFULL	15.38	594.38	BANKFULL	17.12	593.67		19.51	593.55		13.73	594.43		
16.21	594.12		17.06	593.80		18.56	593.68		21.55	592.89	TOEL	15.90	594.47	ol bankfull left	
17.17	593.87		18.05	593.68		20.19	592.98		23.75	592.66		16.60	594.10		
18.21	593.78		21.31	592.66	TOE L	21.21	592.68	TOE L	25.07	592.52	TW	17.73	593.95		
19.94	593.30		22.54	592.61		22.66	592.67		27.39	592.74	TOER	19.31	593.36		
21.10	592.79	TOE L	24.41	592.53	TW	23.97	592.40		28.71	593.38		21.36	593.30		
21.89	592.64		26.96	592.58	TOE R	25.31	592.54	TW	30.79	593.88		23.32	593.07		
23.14	592.65		27.79	593.21		26.98	592.51	TOE R	32.43	594.48	R Bankfull	23.67	592.78		
24.17	592.73		29.41	593.63		28.07	593.26		39.65	594.46		24.59	592.52	TW	
24.80	592.62	TW	30.07	593.90		29.17	593.80		45.52	594.25		25.14	592.57		
25.43	592.81		31.74	594.41	BANKFULL	30.31	593.79		49.95	594.59		26.90	592.76	toer	
26.36	592.74		33.44	594.52		31.83	594.37	R Bankfull	50.15	594.84	RPIN	27.98	593.23		
26.87	592.75	TOE R	36.49	594.41		35.13	594.34					29.15	593.89		
27.98	593.54		40.34	594.58		39.95	594.30					29.87	594.12		
28.77	593.80		42.73	594.33		43.32	594.28					31.74	594.42	r bankfull right	
29.79	593.97		47.56	594.64		47.97	594.46					33.02	594.56		
30.48	594.24		50.25	594.99	RPIN	50.05	594.63					35.07	594.58		
31.61	594.59	BANKFULL RIGHT				50.07	594.86	RPIN				37.22	594.38		
33.90	594.68											42.04	594.56		
36.18	594.57											44.11	594.60		
39.99	594.55											47.90	594.73		
42.80	594.38											49.76	594.80		
45.62	594.49											50.24	595.09	rpin	
50.18	594.82														
50.19	595.08	RPIN													

Photo of XS-2, looking in the downstream direction



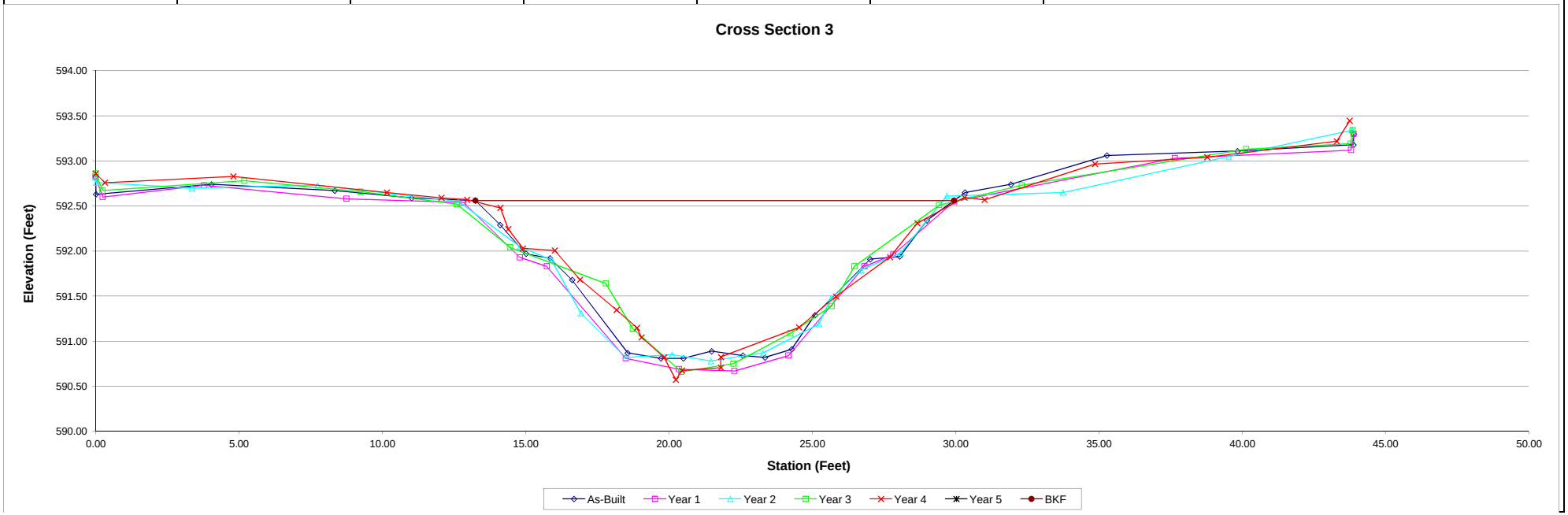
Project:	Underwood Creek
Cross Section:	Cross Section 3 (CS-2 in MY-00)
Feature	Riffle
Station:	13+36
Date:	4/1/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	18.1	20.3	18.7	17.2	17.2	
W (BKF)	16.7	19.3	17.2	16.8	17.0	
Max d	1.8	1.9	1.8	1.9	2.0	
Mean d	1.1	1.0	1.1	1.0	1.0	
W/D	15.4	18.4	15.8	16.5	16.8	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			Sta
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	
0.00	592.82	LPIN	0.00	592.82	LPIN	0.00	592.82	LPIN	0.00	592.86	LPIN		592.86	lpin	
0.01	592.63		0.25	592.60		0.01	592.76		0.24	592.67		0.32	592.76		
4.04	592.74		3.78	592.73		3.35	592.70		5.19	592.78		4.80	592.83		
8.34	592.67		8.75	592.58		7.74	592.73		9.24	592.66		10.16	592.65		
11.02	592.59		12.83	592.54	BANKFULL	12.65	592.55	3L Bankfull	12.60	592.52	3L Bankfull	12.06	592.59		
13.25	592.56	BANKFULL	14.80	591.93		14.80	592.05		14.46	592.04		12.96	592.57		
14.11	592.29		15.74	591.83		15.91	591.90		17.80	591.64		14.12	592.48	bl bankfull left	
15.01	591.97		18.50	590.81	TOE L	16.93	591.31		18.74	591.14	TOEL	14.39	592.24		
15.85	591.92		20.35	590.69	TW	18.49	590.82	TOE L	20.43	590.66	TW	14.90	592.03		
16.62	591.68		22.29	590.67		20.11	590.85	TW	22.25	590.75		16.02	592.01		
18.56	590.87	TOE L	24.17	590.84	TOE R	21.46	590.78		24.24	591.09	TOER	16.90	591.68		
19.72	590.81		26.83	591.83		23.29	590.87		25.68	591.39		18.17	591.35		
20.50	590.81	TW	27.83	591.96		25.23	591.19	TOE R	26.47	591.83		18.88	591.15		
21.49	590.89		29.96	592.55	BANKFULL	25.66	591.48		29.43	592.51	R Bankfull	19.04	591.04	toel	
22.58	590.84		37.65	593.03		26.70	591.79		32.31	592.73		19.83	590.82		
23.35	590.82		43.80	593.12		28.09	591.98		40.14	593.13		20.24	590.57		
24.28	590.91	TOE R	43.89	593.30	RPIN	29.69	592.61	R Bankfull	43.78	593.19		20.45	590.68	tw	
25.09	591.29					33.75	592.65		43.85	593.34	RPIN	21.81	590.71		
27.02	591.91					39.53	593.05					21.81	590.83		
28.05	591.94					43.82	593.34					24.54	591.15	toer	
29.00	592.34					43.84	593.34	RPIN				25.83	591.50		
30.33	592.65	BANKFULL RIGHT										27.71	591.93		
31.93	592.74											28.66	592.31		
35.28	593.06											30.31	592.60	r bankfull right	
39.83	593.11											31.01	592.57		
43.88	593.18											34.86	592.97		
43.89	593.30	RPIN										38.78	593.04		
												43.30	593.22		
												43.75	593.45	rpin	

Photo of XS-3 looking in the downstream direction



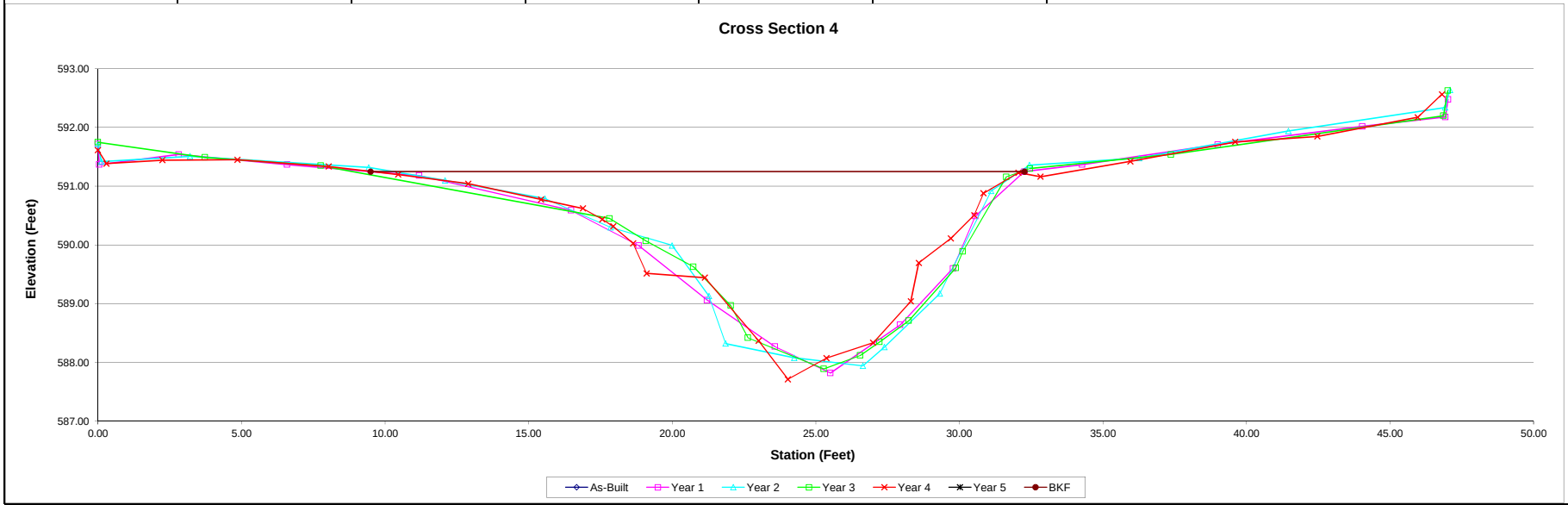
Project:	Underwood Creek
Cross Section:	Cross Section 4 (New for MY-01)
Feature	Pool
Station:	16+19
Date:	4/1/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)		33.8	33.4	33.6	31.4	
W (BKF)		22.8	21.8	23.9	24.3	
Max d		3.4	3.3	3.4	3.5	
Mean d	#DIV/0!	1.5	1.5	1.4	1.3	
W/D	#DIV/0!	15.3	14.3	17.0	18.8	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			St
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	
			0.00	591.72	LPIN	0.00	591.72	LPIN	0.00	591.75	LPIN		591.62	lpin	
			0.05	591.37		0.12	591.42		3.73	591.49		0.30	591.39		
			2.81	591.54		3.21	591.51		7.76	591.35	3L Bankfull	2.25	591.45		
			6.59	591.37		9.43	591.32	3L Bankfull	17.82	590.45		4.86	591.45		
			11.19	591.18	3L Bankfull	12.09	591.10		19.08	590.07		8.04	591.34		
			16.48	590.59		15.57	590.79		20.74	589.63		10.46	591.20		
			18.83	589.99		17.85	590.30		22.04	588.97		12.90	591.04		
			21.22	589.06	TOE L	20.00	589.99		22.64	588.42	TOE L	15.43	590.77	ol bankfull left	
			23.58	588.27		21.28	589.13		25.28	587.89	TW	16.89	590.62		
			25.51	587.82	TW	21.86	588.32	TOE L	26.55	588.12		17.57	590.44		
			27.94	588.64		24.25	588.08		27.22	588.35	TOE R	17.95	590.32		
			29.78	589.60	TOE R	26.64	587.94	TW	28.24	588.71		18.64	590.03		
			30.56	590.49		27.39	588.26	TOE R	29.88	589.61		19.11	589.52		
			32.27	591.25	BANKFULL	29.32	589.17		30.12	589.89		21.14	589.44	toel	
			34.28	591.37		31.11	590.92		31.64	591.16	R Bankfull	23.01	588.37		
			39.00	591.71		32.44	591.36	R Bankfull	32.46	591.30		24.03	587.71		
			44.04	592.02		36.27	591.48		37.37	591.54		25.37	588.07	tw	
			46.93	592.18		41.46	591.94		46.86	592.20		27.00	588.34		
			47.02	592.48	RPIN	46.92	592.34		47.01	592.63	RPIN	28.31	589.04		
						47.09	592.64	RPIN				28.59	589.69	toer	
												29.71	590.11		
												30.52	590.51		
												30.84	590.88		
												32.06	591.23	r bankfull right	
												32.83	591.16		
												35.96	591.42		
												39.61	591.75		
												42.47	591.85		
												45.97	592.17		
												46.81	592.56	rpin	

Photo of XS-4, looking in the downstream direction



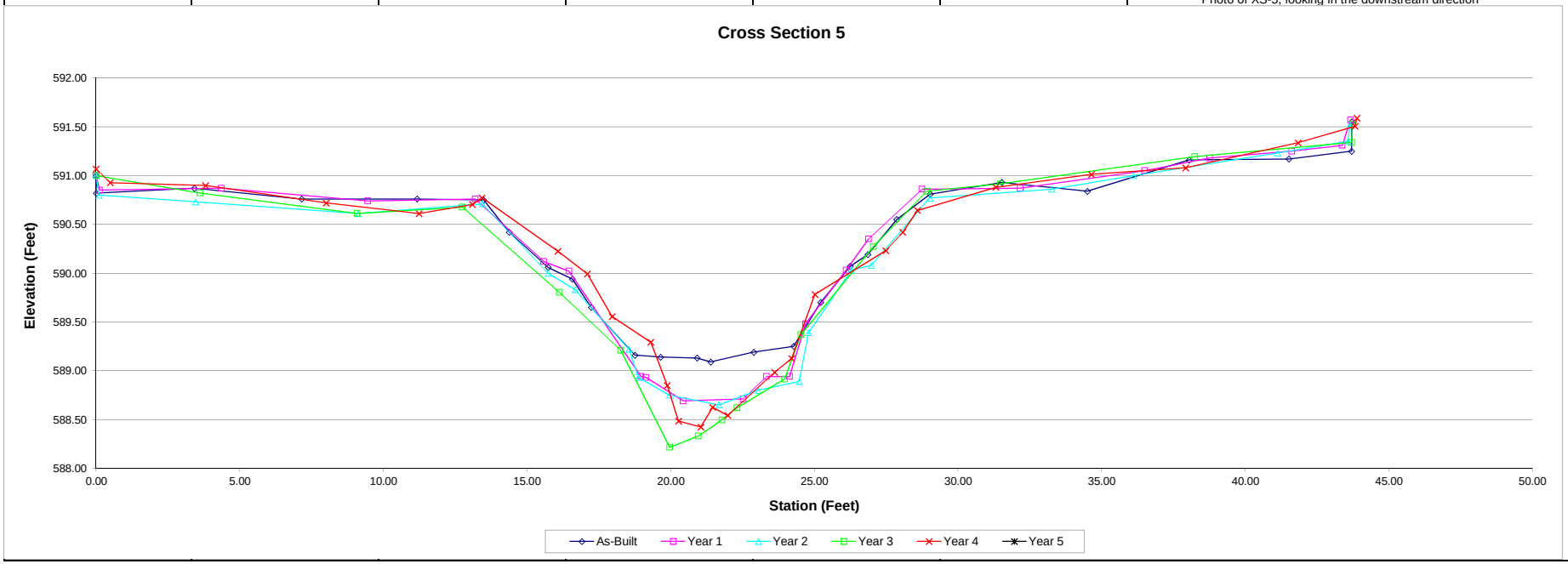
Project:	Underwood Creek
Cross Section:	Cross Section 5 (CS-3 in MY-00)
Feature	Riffle
Station:	17+13
Date:	4/1/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	15.9	17.5	19.7	20.3	17.2	
W (BKF)	15.3	15.1	26.5	16.2	16.3	
Max d	1.7	2.1	2.1	2.5	2.3	
Mean d	1.0	1.2	0.7	1.3	1.1	
W/D	14.7	13.1	35.6	12.9	15.5	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			Stat
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	
0.00	591.00	LPIN	0.00	591.00	LPIN	0.00	591.00	LPIN	0.00	591	LPIN		591.07	lpin	
0.01	590.82		0.12	590.85		0.10	590.80		3.62	590.821		0.49	590.93		
3.42	590.87		4.36	590.87		3.46	590.73		9.09	590.612		3.81	590.90		
7.15	590.76		9.46	590.74		9.12	590.61		12.75	590.676	L Bankfull	8.01	590.72		
11.17	590.76		13.20	590.76	BANKFULL	13.44	590.71	BL Bankfull	16.13	589.802		11.24	590.61		
13.49	590.75	BANKFULL	15.58	590.12		15.73	590.00		18.26	589.209	TOE L	13.10	590.70		
14.38	590.42		16.46	590.02		16.68	589.83		19.97	588.215	TW	13.43	590.77	bl bankfull left	
15.73	590.06		18.97	588.94	TOE L	18.55	589.22		20.97	588.33		16.07	590.23		
16.58	589.94		19.14	588.93		18.88	588.93	TOE L	21.79	588.495		17.10	589.99		
17.23	589.65		20.44	588.69	TW	19.95	588.75		22.31	588.619		17.96	589.56		
18.76	589.16	TOE L	22.53	588.71		21.68	588.65	TW	23.97	588.914	TOE R	19.31	589.29		
19.65	589.14		23.34	588.94		23.04	588.80		24.54	589.37		19.88	588.85	toel	
20.92	589.13		24.14	588.94	TOE R	24.47	588.89	TOE R	27.06	590.271		20.27	588.48		
21.39	589.09	TW	24.70	589.48		24.80	589.39		28.92	590.839	R Bankfull	21.05	588.42		
22.89	589.19		26.11	590.03		26.29	590.03		31.48	590.914		21.46	588.63	tw	
24.28	589.25	TOE R	26.89	590.35		26.99	590.08		38.25	591.194		21.99	588.54		
25.22	589.70		28.75	590.86	BANKFULL	29.02	590.77	R Bankfull	43.71	591.339		23.62	588.98		
26.25	590.07		32.17	590.87		33.26	590.86		43.72	591.527	RPIN	24.21	589.13	toer	
26.86	590.19		36.50	591.05		36.11	591.00					25.02	589.78		
27.87	590.55		38.77	591.18		41.12	591.23					27.49	590.23		
29.03	590.81	BANKFULL	41.62	591.25		43.58	591.35					28.08	590.42		
31.53	590.93		43.38	591.31		43.65	591.52	RPIN				28.59	590.64	ır bankfull right	
34.50	590.84		43.67	591.57	RPIN							31.32	590.88		
38.05	591.16											34.65	591.01		
41.52	591.17											37.93	591.08		
43.70	591.25											41.84	591.34		
43.71	591.55	RPIN										43.82	591.51		
												43.89	591.59	rpin	

Photo of XS-5, looking in the downstream direction



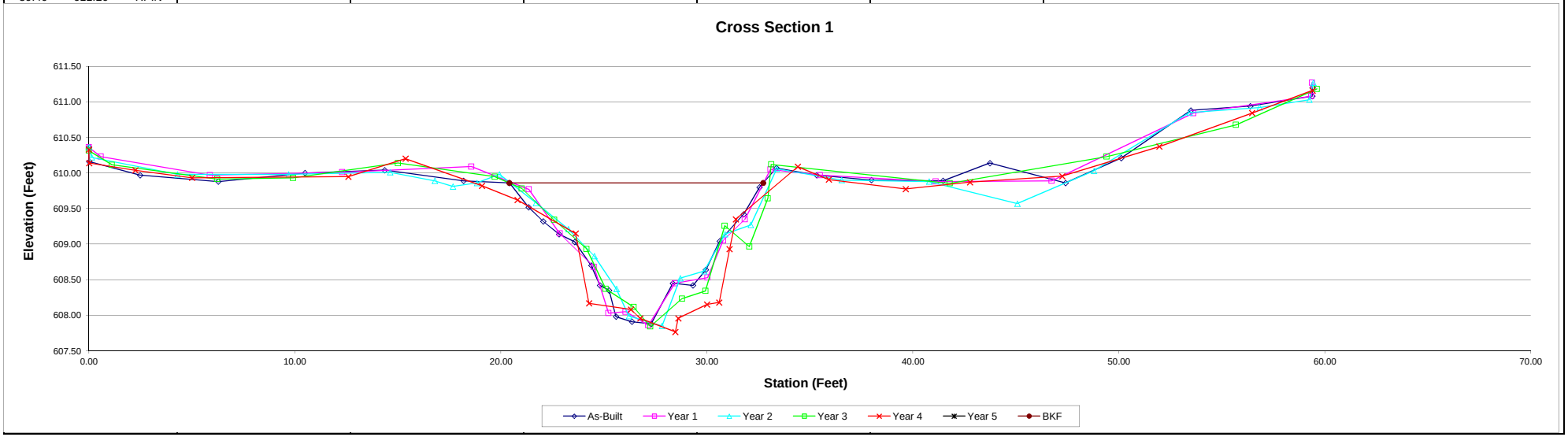
Project:	UT to Underwood Creek
Cross Section:	Cross Section 1 (Same as MY-00)
Feature	Riffle
Station:	6+40
Date:	9/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	13.1	13.2	12.5	12.5	15.3	
W (BKF)	12.3	12.2	12.6	12.0	14.5	
Max d	2.0	2.0	2.0	1.9	2.1	
Mean d	1.1	1.1	1.0	1.0	1.1	
W/D	11.6	11.3	12.7	11.5	13.8	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			S
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	
	610.36	LPIN		610.36	LPIN	0.00	610.36	LPIN		610.31	X1 LP		610.33	lpin	
0.01	610.16		0.58	610.23		0.13	610.22		1.12	610.12		0.01	610.14		
2.48	609.97		5.87	609.97		4.30	609.98		6.23	609.91		2.25	610.04		
6.28	609.88		12.30	610.01		9.70	609.98		9.92	609.93		5.01	609.93		
10.49	610.00		18.57	610.09		14.62	610.01		15.01	610.14		12.60	609.95		
14.36	610.04		21.36	609.77	BANKFULL	16.79	609.89		19.70	609.95		15.37	610.20		
18.19	609.89		22.86	609.15		17.67	609.81		21.02	609.78	L BANKFUL	19.08	609.82		
20.42	609.86	BANKFULL	24.52	608.68		18.83	609.86		22.59	609.34		20.81	609.62		
21.34	609.52		25.23	608.03	TOE L	19.93	609.98	BL Bankfull	24.16	608.93		23.63	609.15	bl bankfull left	
22.06	609.32		26.06	608.05		21.70	609.58		25.09	608.37	TOE L	24.28	608.17	toer	
22.82	609.14		27.16	607.86	TW	23.28	609.21		26.45	608.12		26.31	608.08		
23.59	609.03		28.45	608.45		24.54	608.83		27.26	607.84	X1 TW	26.77	607.96		
24.39	608.70		30.04	608.53	TOE R	25.61	608.37	TOE L	28.80	608.23		28.47	607.77	tw	
24.81	608.42	TOE L	30.79	609.05		26.21	607.99		29.93	608.34	TOE R	28.61	607.96		
25.25	608.35		31.85	609.35		27.82	607.85	TW	30.87	609.26		30.01	608.15	toer	
25.59	607.98		33.09	610.05	BANKFULL	28.71	608.52		32.06	608.97		30.60	608.18		
26.36	607.91	TW	35.49	609.97		29.87	608.62	TOE R	32.96	609.64		31.10	608.93		
27.30	607.88		41.11	609.88		30.88	609.14		33.13	610.12	R BANKFUL	31.41	609.35	r bankfull right	
28.35	608.45		46.74	609.89		32.13	609.27		41.79	609.86		34.42	610.09		
29.33	608.42		53.62	610.84		33.39	610.06	R Bankfull	49.41	610.23		35.92	609.91		
29.95	608.64	TOE R	59.35	611.08		36.54	609.90		55.69	610.68		39.65	609.78		
30.62	609.04		59.38	611.27	RPIN	40.79	609.88		59.62	611.18	X1 RP	42.77	609.87		
31.79	609.42					45.07	609.57					47.25	609.96		
32.56	609.80					48.79	610.03					51.97	610.37		
33.38	610.07	BANKFULL RIGHT				53.43	610.85					56.47	610.84		
35.33	609.97					56.84	610.92					59.40	611.16	rpin	
37.99	609.90					59.25	611.03								
41.46	609.89					59.44	611.27	RPIN							
43.74	610.14														
47.41	609.86														
50.12	610.21														
53.50	610.88														
56.38	610.94														
59.39	611.08														
59.40	611.20	RPIN													

Photo of XS-1, looking in the downstream direction



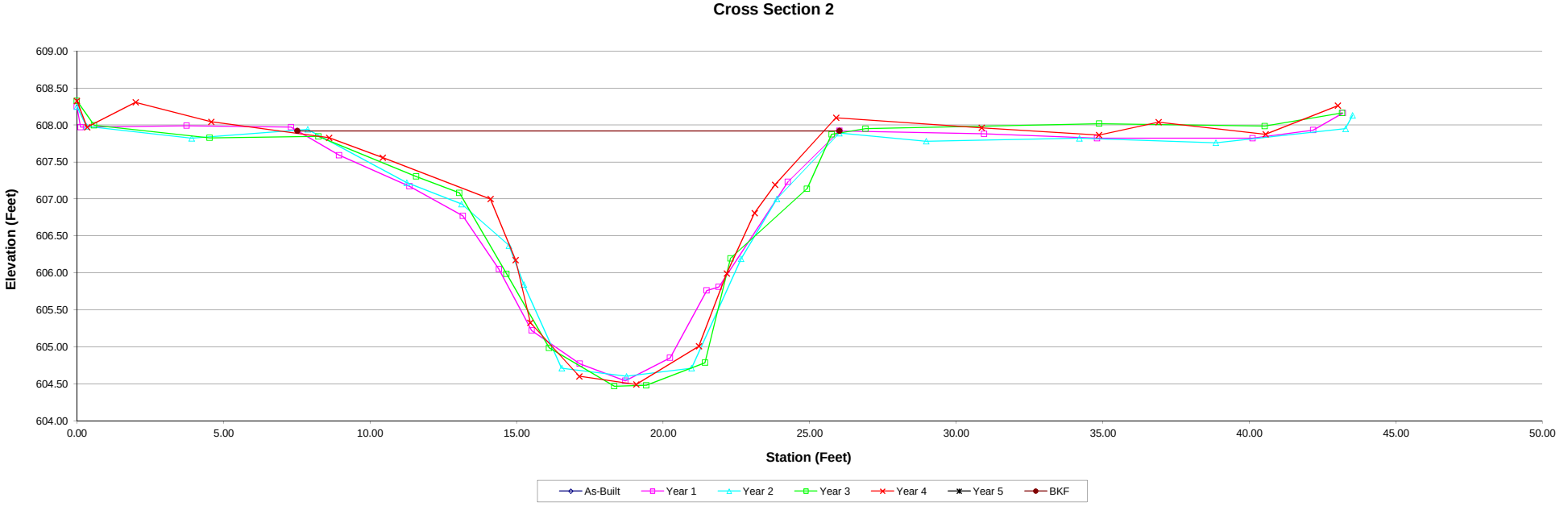
Project:	UT to Underwood Creek
Cross Section:	Cross Section 2 (New for MY-01)
Feature	Pool
Station:	10+32
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)		30.4	32.0	31.4	28.5	
W (BKF)		18.5	34.6	24.1	18.6	
Max d		3.4	3.3	3.5	3.4	
Mean d	#DIV/0!	1.6	0.9	1.3	1.5	
W/D	#DIV/0!	11.2	37.5	18.5	12.2	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	St
				608.25	LPIN	0.00	608.25	LPIN		608.33	LPIN		608.33	lpin	
			0.13	607.97		0.33	607.98		0.59	608.00		0.35	607.97		
			3.75	607.99		3.91	607.82		4.53	607.83		2.00	608.31		
			7.31	607.97	BANKFULL	7.87	607.94	BL Bankfull	8.24	607.85	BL Bankfull	4.58	608.04		
			8.95	607.59		11.25	607.22		11.58	607.30		8.60	607.83		
			11.35	607.17		13.12	606.93		13.05	607.08		10.43	607.56		
			13.17	606.77		14.74	606.37		14.66	605.99		14.11	607.00	bl bankfull left	
			14.40	606.05		15.25	605.84		16.11	604.99	TOEL	14.97	606.17		
			15.52	605.22	TOE L	16.54	604.71	TOE L	18.34	604.47	CP	15.47	605.33	toel	
			17.16	604.77		18.75	604.60	TW	19.43	604.48	TW	17.14	604.60		
			18.71	604.54	TW	20.97	604.71	TOE R	21.43	604.78	TOER	19.08	604.49	tw	
			20.24	604.85		22.66	606.19		22.30	606.20		21.22	605.01	toer	
			21.49	605.76		23.88	607.00		24.91	607.14		22.17	605.99		
			21.90	605.81	TOE R	26.01	607.89	R Bankfull	25.75	607.87	R Bankfull	23.12	606.81		
			24.26	607.23		28.97	607.78		26.91	607.95		23.82	607.19		
			26.02	607.92	BANKFULL	34.20	607.82		34.88	608.02		25.90	608.10	r bnakfull right	
			30.95	607.88		38.86	607.76		40.53	607.98		30.87	607.96		
			34.81	607.82		43.28	607.95		43.17	608.16	RPIN	34.87	607.86		
			40.11	607.82		43.52	608.13	RPIN				36.90	608.04		
			42.18	607.93								40.55	607.87		
			43.19	608.16	RPIN							43.02	608.26	rpin	

Photo of XS-2, looking in the downstream direction



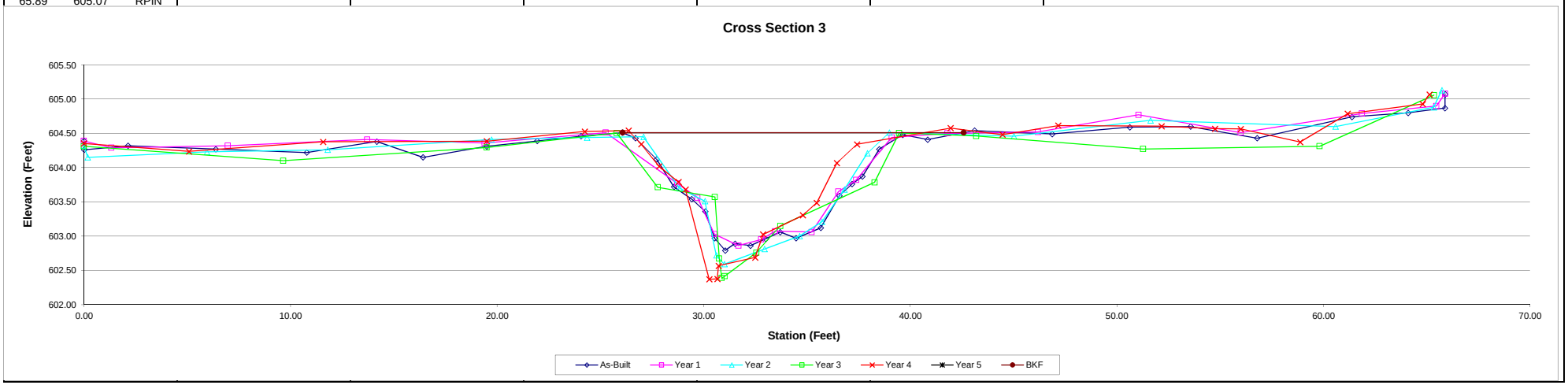
Project:	UT to Underwood Creek
Cross Section:	Cross Section 3 (CS-2 in MY-00)
Feature	Riffle
Station:	14+45
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	13.4	13.2	13.0	11.6	12.4	
W (BKF)	16.5	18.7	11.9	13.7	14.2	
Max d	1.7	1.6	1.9	2.1	2.1	
Mean d	0.8	0.7	1.1	0.9	0.9	
W/D	20.4	26.6	10.9	16.0	16.3	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.00	604.39	LPIN	0.00	604.39	LPIN	0.00	604.32	LPIN	0.00	604.31	LPIN		604.35	lpin
0.01	604.26		1.33	604.29		0.18	604.15		9.65	604.10		5.08	604.24	
2.13	604.32		6.96	604.32		5.95	604.23		19.50	604.29		11.57	604.38	
6.38	604.27		13.71	604.41		11.79	604.26		25.79	604.51	3L Bankfull	19.50	604.39	
10.78	604.22		19.40	604.36		19.73	604.41		27.78	603.71		24.24	604.53	
14.17	604.38		25.26	604.51	BANKFULL	24.35	604.44		30.54	603.57	TOE L	26.36	604.54	bl bankfull l
16.41	604.15		28.72	603.77		27.08	604.45	3L Bankfull	30.75	602.67		26.97	604.34	
19.49	604.31		29.70	603.56		28.83	603.70		30.87	602.39	tw	27.84	604.02	
21.94	604.39		30.51	603.03	TOE L	30.06	603.51		31.01	602.41		28.78	603.79	
24.06	604.46		31.68	602.86	TW	30.61	602.72	TOE L	32.55	602.76		29.12	603.68	
26.07	604.51	BANKFULL	32.79	602.95		31.00	602.59	TW	33.71	603.15	TOE R	30.27	602.37	toel
26.70	604.43		33.45	603.07		32.94	602.81		38.27	603.79		30.66	602.38	tw
27.72	604.12		35.23	603.06	TOE R	34.64	603.00		39.46	604.51	R Bankfull l	30.72	602.57	
28.56	603.72		36.52	603.65		35.73	603.21	TOE R	43.19	604.46		32.49	602.69	
29.42	603.54		37.38	603.82		36.81	603.68		51.27	604.27		32.87	603.02	
30.07	603.36		39.10	604.44	BANKFULL	37.92	604.21		59.82	604.31		34.80	603.30	
30.53	602.97	TOE L	41.80	604.50		38.98	604.51	R Bankfull l	65.35	605.06	RPIN	35.47	603.49	
31.04	602.79		46.18	604.52		45.01	604.46					36.44	604.07	
31.51	602.89		51.05	604.77		51.62	604.69					37.42	604.34	r bankfull r
32.26	602.86	TW	56.00	604.51		60.58	604.60					41.95	604.58	
33.00	602.96		61.87	604.79		65.34	604.88					44.46	604.48	
33.70	603.06		65.47	604.90		65.73	605.13	RPIN				47.16	604.61	
34.47	602.97		65.89	605.08	RPIN							52.16	604.61	
35.66	603.12	TOE R										54.75	604.57	
36.57	603.59											56.00	604.56	
37.18	603.76											58.87	604.37	
37.68	603.87											61.17	604.79	
38.50	604.27											64.81	604.93	
39.63	604.48	BANKFULL RIGHT										65.13	605.07	rpin
40.84	604.41													
43.11	604.54													
46.87	604.49													
50.62	604.59													
53.56	604.60													
56.79	604.43													
61.38	604.74													
64.10	604.80													
65.88	604.87													
65.89	605.07	RPIN												

Photo of XS-3 looking in the downstream direction



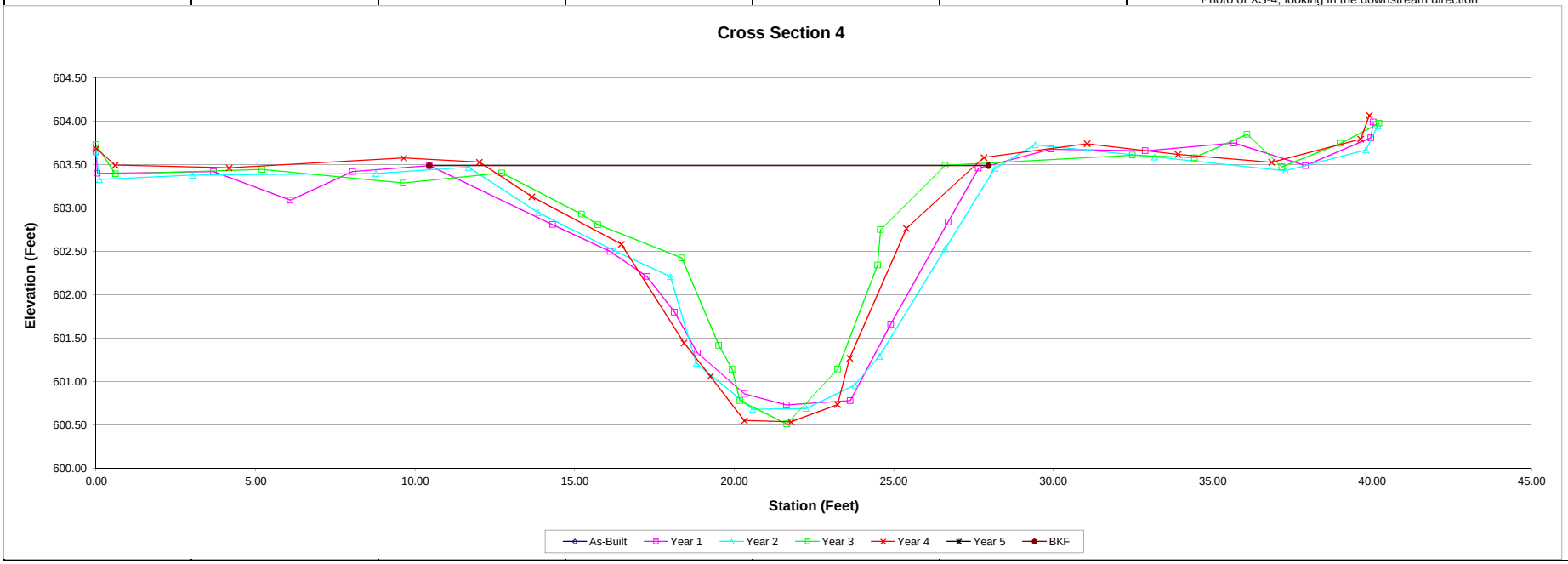
Project:	UT to Underwood Creek
Cross Section:	Cross Section 4 (New for MY-01)
Feature	Pool
Station:	16+30
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)		24.8	25.0	18.1	22.4	
W (BKF)		17.5	16.6	13.9	15.4	
Max d		2.8	2.8	3.0	3.0	
Mean d	#DIV/0!	1.4	1.5	1.3	1.5	
W/D	#DIV/0!	12.4	11.1	10.6	10.6	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			Su
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	
				603.65	LPIN	0.00	603.65	LPIN	0.00	603.73	LPIN		603.69	lpin	
			0.04	603.40		0.10	603.33		0.61	603.39		0.59	603.50		
			3.68	603.42		3.02	603.38		5.20	603.45		4.17	603.47		
			6.09	603.09		8.77	603.40		9.63	603.29		9.64	603.58		
			8.04	603.42		11.67	603.47	3L Bankfull	12.72	603.40	3ankfull Lef	12.01	603.53	bankfull left	
			10.45	603.49	BANKFULL	13.85	602.95		15.22	602.93		13.66	603.13		
			14.31	602.81		16.24	602.51		15.73	602.81		16.46	602.59	tobl	
			16.11	602.50		18.00	602.21		18.36	602.43		18.43	601.45	toel	
			17.27	602.21		18.81	601.21	TOE L	19.52	601.42		19.25	601.06		
			18.13	601.80		20.58	600.68		19.94	601.14	TOEL	20.32	600.55		
			18.85	601.33	TOE L	22.26	600.69	TW	20.18	600.78		21.78	600.54	tw	
			20.32	600.86		23.78	600.96		21.65	600.51	TW	23.24	600.74		
			21.64	600.73	TW	24.55	601.29	TOE R	23.25	601.14	TOER	23.62	601.27		
			23.64	600.78		26.61	602.53		24.50	602.34		25.40	602.77		
			24.91	601.66	TOE R	28.17	603.46	R Bankfull	24.59	602.75		27.83	603.58	toer	
			26.71	602.84		29.43	603.73		26.62	603.49	R Bankfull	31.06	603.74		
			27.66	603.46	BANKFULL	33.18	603.59		32.49	603.61		33.91	603.62	r bankfull right	
			29.93	603.68		37.28	603.43		34.43	603.58		36.85	603.53		
			32.89	603.66		39.80	603.67		36.08	603.85		39.64	603.80		
			35.67	603.75		40.18	603.95	RPIN	37.17	603.48		39.91	604.07	rpin	
			37.91	603.49					39.00	603.75					
			39.96	603.81					40.22	603.98	RPIN				
			40.04	603.99	RPIN										

Photo of XS-4, looking in the downstream direction



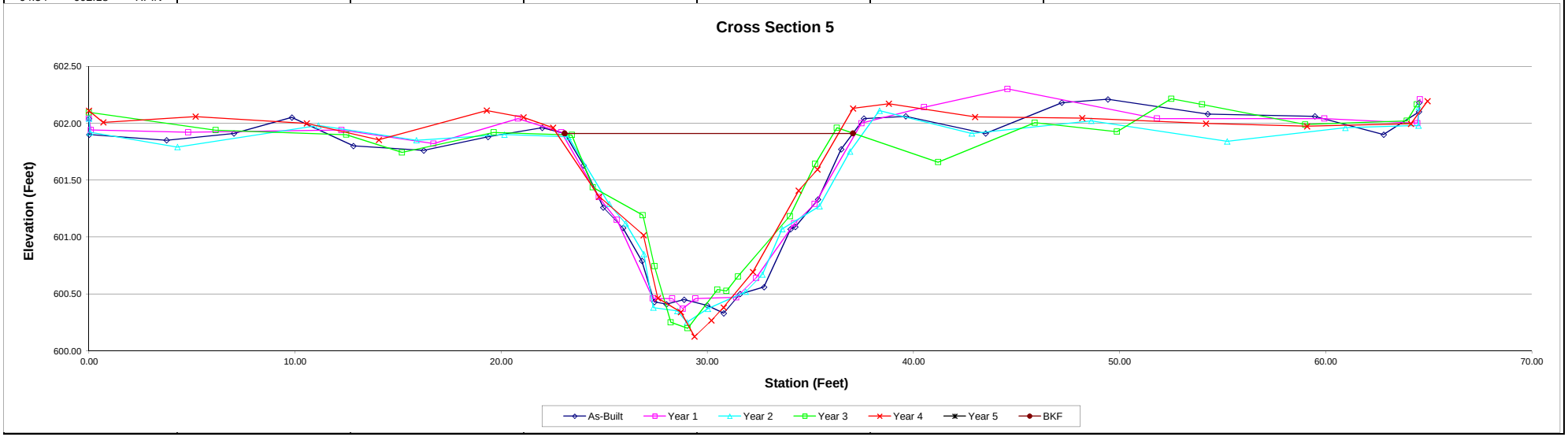
Project:	UT to Underwood Creek
Cross Section:	Cross Section 5 (CS-3 in MY-00)
Feature	Riffle
Station:	20+04
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	13.6	13.4	13.5	12.0	12.2	
W (BKF)	14.0	14.2	14.3	14.9	13.7	
Max d	1.6	1.5	1.7	1.7	1.8	
Mean d	1.0	0.9	0.9	0.8	0.9	
W/D	14.4	15.2	15.1	18.5	15.3	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	602.04	LPIN		602.04	LPIN	0.00	602.04	LPIN	0.00	602.10	LPIN		602.11	lpin
0.01	601.90		0.10	601.94		0.05	601.92		6.15	601.94		0.69	602.01	
3.76	601.85		4.82	601.92		4.29	601.79		12.49	601.90		5.17	602.06	
7.03	601.91		12.25	601.94		11.13	601.98		15.19	601.74		10.57	602.00	
9.84	602.05		16.72	601.82		15.89	601.85		19.64	601.92		14.06	601.85	
12.83	601.80		20.82	602.04		20.15	601.90		23.43	601.90	3L Bankfull	19.30	602.11	
16.24	601.76		22.92	601.92	BANKFULL	23.26	601.88	3L Bankfull	24.45	601.44		21.08	602.05	
19.36	601.88		24.74	601.35		25.24	601.29		26.87	601.19		22.51	601.96	bankfull left
21.99	601.96		25.61	601.15		26.04	601.12		27.44	600.74		24.75	601.36	tobl
23.08	601.91	BANKFULL	27.36	600.46	TOE L	26.92	600.85		28.23	600.25	TOEL	26.90	601.02	
24.00	601.63		28.30	600.46		27.38	600.38	TOE L	29.05	600.20	TW	27.60	600.46	toel
24.95	601.26		28.81	600.37	TW	28.55	600.35		30.49	600.54	TOER	28.72	600.34	
25.91	601.08		29.43	600.46		29.01	600.25	TW	30.93	600.53		29.38	600.13	tw
26.83	600.79		31.40	600.47		30.03	600.37		31.49	600.65		30.20	600.27	
27.43	600.43	TOE L	32.37	600.64	TOE R	31.86	600.52		34.01	601.18		30.79	600.38	
28.02	600.41		34.22	601.12		32.67	600.67	TOE R	35.24	601.64		32.21	600.69	toer
28.88	600.45		35.21	601.29		33.63	601.07		36.29	601.96	R Bankfull I	34.43	601.41	tobr
29.99	600.40		37.48	602.00	BANKFULL	35.44	601.27		41.20	601.66		35.35	601.59	
30.80	600.33	TW	40.52	602.14		36.92	601.75		45.89	602.00		37.07	602.13	bankfull right
31.59	600.50		44.57	602.30		38.35	602.11	R Bankfull I	49.88	601.93		38.81	602.17	
32.75	600.56	TOE R	51.82	602.04		42.83	601.91		52.51	602.21		42.99	602.06	
34.04	601.07		59.94	602.04		48.63	602.02		54.01	602.16		48.19	602.05	
34.27	601.09		64.45	602.00		55.22	601.84		59.01	601.99		54.19	602.00	
35.37	601.33		64.58	602.21	RPIN	60.95	601.96		63.94	602.02		59.09	601.97	
36.49	601.77					64.50	601.98		64.43	602.17	RPIN	64.14	602.00	
37.60	602.04	BANKFULL RIGHT				64.51	602.14	RPIN				64.94	602.19	rpin
39.63	602.06													
43.50	601.91													
47.20	602.18													
49.43	602.21													
54.28	602.08													
59.47	602.06													
62.81	601.90													
64.53	602.10													
64.54	602.18	RPIN												

Photo of XS-5, looking in the downstream direction



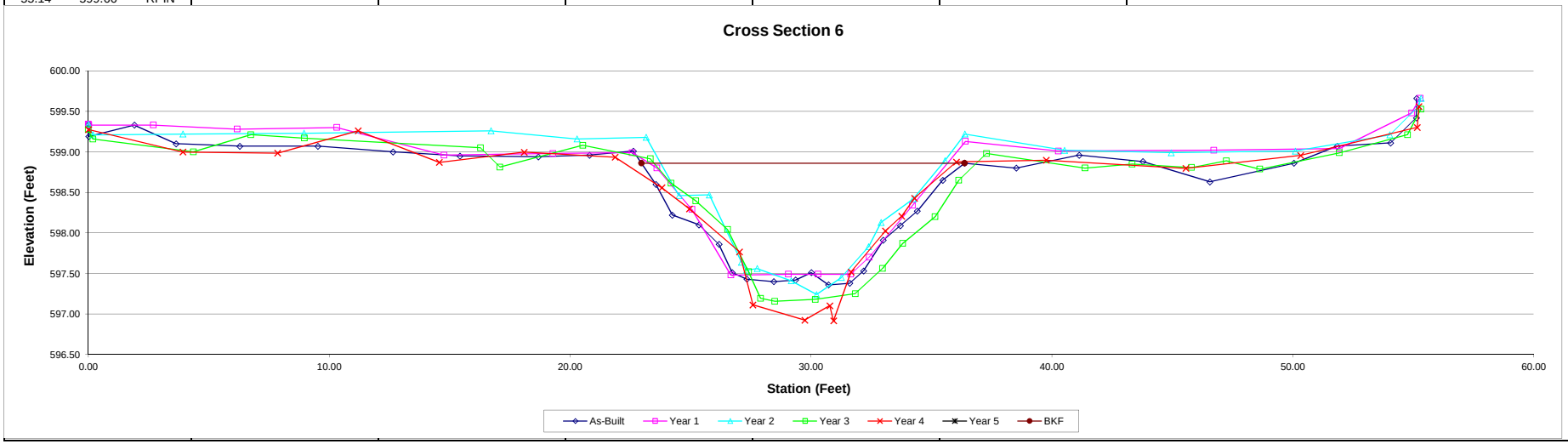
Project:	UT to Underwood Creek
Cross Section:	Cross Section 6 (CS-4 in MY-00)
Feature	Riffle
Station:	26+68
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	12.9	11.8	10.3	13.9	13.3	
W (BKF)	13.4	12.4	11.7	13.4	13.7	
Max d	1.5	1.4	1.6	1.7	1.9	
Mean d	1.0	1.0	0.9	1.0	1.0	
W/D	13.9	13.0	13.3	12.8	14.1	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Static
0.00	599.34	LPIN	0.00	599.34	LPIN	0.00	599.34	LPIN		599.28	LPIN		599.28	lpin	
0.01	599.19		0.02	599.33		0.19	599.21		0.19	599.16		3.92	599.00		
1.91	599.33		2.70	599.33		3.92	599.22		4.36	599.00		7.86	598.98		
3.64	599.10		6.18	599.28		8.95	599.23		6.75	599.21		11.20	599.26		
6.29	599.07		10.32	599.30		16.71	599.26		8.97	599.17		14.57	598.87		
9.53	599.07		14.77	598.96		20.28	599.16		16.28	599.05		18.09	599.00		
12.65	599.00		19.29	598.98		23.16	599.18	3L Bankfull	17.09	598.81		21.87	598.93	bl bankfull left	
15.43	598.95		22.58	598.99	BANKFULL	24.52	598.46		20.53	599.08		23.81	598.56		
18.68	598.94		23.61	598.80		25.78	598.47		23.34	598.91	3L Bankfull	24.95	598.30		
20.80	598.96		25.06	598.29		27.11	597.64		24.19	598.61		27.03	597.77		
22.62	599.01	BANKFULL	26.68	597.48	TOE L	27.32	597.54	TOE L	25.22	598.40		27.59	597.11	toel	
23.56	598.60		29.07	597.49	TW	27.76	597.56		26.54	598.04		29.74	596.92		
24.24	598.22		30.30	597.49		29.18	597.41		27.41	597.52	TOEL	30.78	597.10		
25.35	598.10		31.65	597.49		30.23	597.24	TW	27.91	597.19		30.94	596.92	tw	
26.18	597.86		32.42	597.70	TOE R	31.26	597.45		28.50	597.16	TW	31.66	597.52	toer	
26.73	597.51	TOE L	34.22	598.34		32.39	597.83	TOE R	30.18	597.18		33.09	598.02		
27.34	597.43		36.41	599.13	BANKFULL	32.91	598.13		31.84	597.25		33.77	598.21		
28.46	597.40		40.27	599.01		34.24	598.42		32.97	597.56	TOER	34.30	598.43		
29.36	597.42		46.73	599.02		35.56	598.89		33.81	597.87		36.04	598.88	r bankfull right	
30.01	597.51		51.94	599.04		36.39	599.22	R Bankfull	35.16	598.20		39.76	598.90		
30.73	597.36	TW	54.94	599.48		40.52	599.02		36.14	598.65		45.56	598.80		
31.61	597.38		55.29	599.66	RPIN	44.95	598.99		37.29	598.98	R Bankfull	50.33	598.96		
32.18	597.53	TOE R				50.10	599.01		41.38	598.80		55.17	599.30		
33.00	597.91					54.03	599.21		43.34	598.85		55.24	599.56	rpin	
33.71	598.09					55.22	599.56		45.80	598.81					
34.41	598.27					55.32	599.66	RPIN	47.25	598.89					
35.47	598.65								48.64	598.79					
36.38	598.86	BANKFULL RIGHT							51.94	598.99					
38.52	598.80								54.77	599.21					
41.13	598.96								55.32	599.53	RPIN				
43.78	598.88														
46.56	598.63														
50.05	598.86														
51.84	599.07														
54.06	599.11														
55.13	599.42														
55.14	599.66	RPIN													

Photo of XS-6, looking in the downstream direction



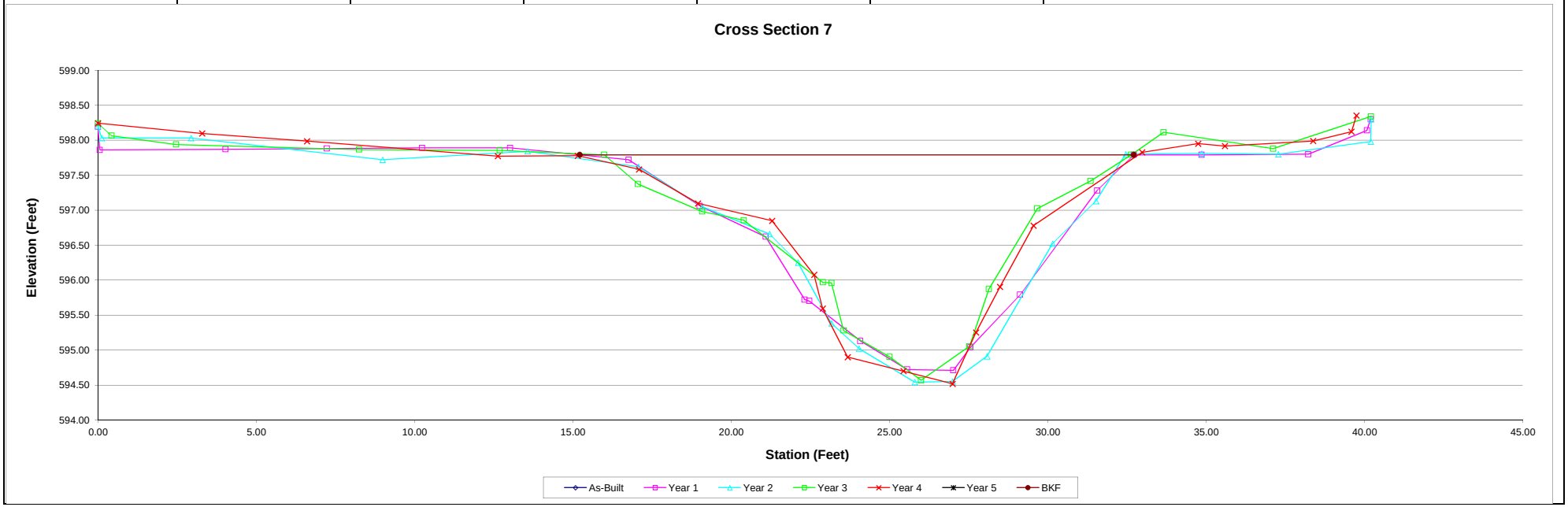
Project:	UT to Underwood Creek
Cross Section:	Cross Section 7 (New for MY-01)
Feature	Pool
Station:	28+82
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)		26.9	27.7	27.4	24.5	#REF!
W (BKF)		17.5	18.1	17.7	20.7	#REF!
Max d		3.1	3.3	3.4	3.3	#REF!
Mean d		1.5	1.5	1.6	1.2	
W/D		11.4	11.8	11.4	17.5	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	No
			0.00	598.19	LPIN	0.00	598.20	LPIN		598.24	LPIN		598.24	lp
			0.06	597.86		0.12	598.03		0.43	598.06		3.29	598.10	
			4.03	597.87		2.94	598.03		2.47	597.94		6.60	597.99	
			7.23	597.88		8.99	597.72		8.25	597.87		12.63	597.77	
			10.24	597.89		13.57	597.84		12.69	597.86		15.15	597.78	bl ban
			13.02	597.89		17.07	597.62	BL Bankfull	15.99	597.79	BL Bankfull	17.09	597.58	
			16.76	597.72	BL Bankfull	19.08	597.05		17.06	597.37		18.95	597.10	
			19.01	597.06		21.21	596.66		19.09	596.98		21.29	596.85	
			21.09	596.62		22.11	596.25		20.40	596.86		22.62	596.08	
			22.32	595.72	TOE L	23.17	595.38	TOE L	22.90	595.97		22.89	595.59	to
			22.47	595.70		24.04	595.02		23.17	595.96	TOEL	23.68	594.90	
			24.08	595.13		25.80	594.54	TW	23.55	595.28		25.44	594.70	
			25.56	594.72		26.99	594.55		25.00	594.90		26.99	594.52	tv
			27.02	594.71	TW	28.08	594.91	TOE R	26.00	594.57	TW	27.73	595.25	
			27.56	595.04		30.15	596.52		27.53	595.05		28.49	595.90	to
			29.13	595.79	TOE R	31.52	597.13		28.14	595.87	TOER	29.55	596.78	
			31.56	597.28		32.46	597.80	R Bankfull	29.67	597.02		32.98	597.83	r ban
			32.72	597.79	BANKFULL	34.86	597.81		31.36	597.42		34.75	597.95	
			34.86	597.79		37.28	597.80		32.63	597.79		35.59	597.92	
			38.23	597.80		40.20	597.98		33.66	598.11	R Bankfull	38.38	597.99	
			40.08	598.14		40.21	598.30	RPIN	37.12	597.88		39.59	598.12	
			40.20	598.30	RPIN				40.21	598.34	RPIN	39.75	598.36	rp

Photo of XS-7, looking in the downstream direction



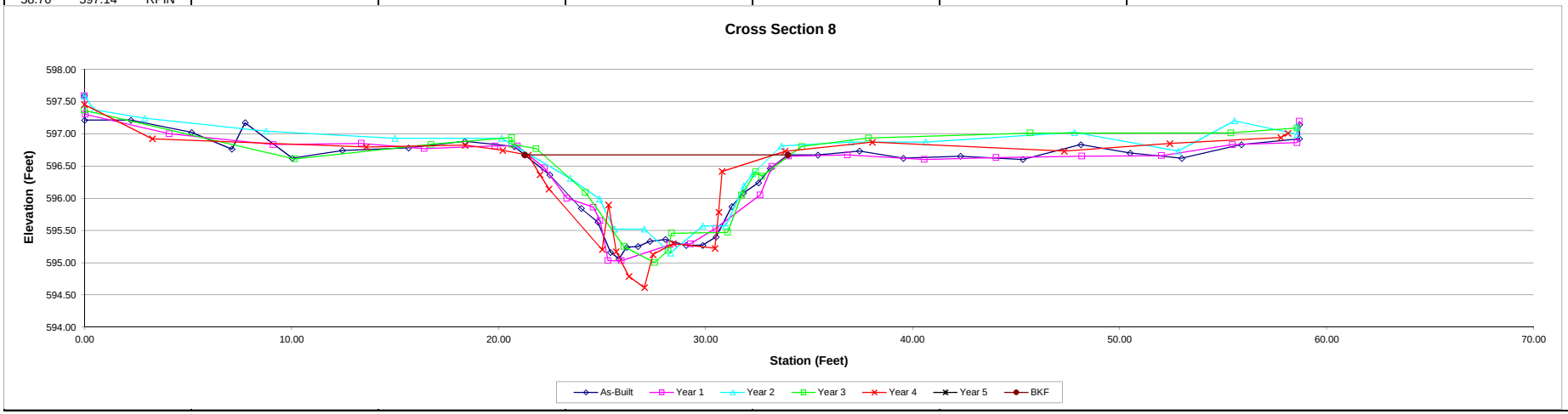
Project:	UT to Underwood Creek
Cross Section:	Cross Section 8 (CS-5 in MY-00)
Feature	Riffle
Station:	31+25
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	11.6	9.4	7.2	10.9	11.7	
W (BKF)	12.7	11.0	10.0	12.5	11.9	
Max d	1.6	1.4	1.3	1.7	2.1	
Mean d	0.9	0.9	0.7	0.9	1.0	
W/D	13.9	12.7	13.8	14.3	12.1	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.00	597.59	LPIN	0.00	597.59	LPIN	0.00	597.59	LPIN		597.36	LPIN		597.45	lpin
0.01	597.21		0.05	597.30		0.45	597.37		10.15	596.61		3.28	596.92	
2.24	597.21		4.09	597.00		2.91	597.24		16.74	596.83		13.62	596.80	
5.17	597.02		9.12	596.83		8.78	597.04		20.64	596.94		18.39	596.82	
7.12	596.76		13.38	596.85		14.99	596.93		20.65	596.84	Bankfull left	20.20	596.74	bl bankfull l
7.76	597.17		16.41	596.77		20.15	596.93	BL Bankfull	21.82	596.77		21.44	596.67	
10.04	596.62		19.83	596.81		23.46	596.31		24.20	596.09		22.00	596.37	
12.46	596.74		20.91	596.81	BANKFULL	24.88	595.99		26.06	595.25	TOE L	22.44	596.14	
15.65	596.78		22.22	596.47		25.60	595.52	TOE L	27.55	595.00	TW	25.01	595.20	toel
18.38	596.88		23.31	596.00		27.05	595.52		28.19	595.19		25.32	595.90	
20.76	596.80	BANKFULL	24.58	595.86		28.31	595.15	TW	28.36	595.46	TOE R	25.69	595.17	
22.48	596.36		24.91	595.65		29.87	595.57		31.07	595.47		26.30	594.79	
24.00	595.84		25.29	595.03	TOE L	30.97	595.57	TOE R	31.75	596.05		27.05	594.61	tw
24.80	595.63		25.94	595.03	TW	31.85	596.19		32.43	596.41	ankfull Righ	27.46	595.13	
25.41	595.16	TOE L	28.29	595.28		32.29	596.38		32.72	596.34		28.44	595.30	
25.82	595.06	TW	29.27	595.29		33.67	596.81	R Bankfull l	34.65	596.80		30.45	595.22	toer
26.19	595.24		30.49	595.53	TOE R	37.04	596.87		37.88	596.93		30.64	595.78	
26.73	595.25		32.64	596.05		40.63	596.87		45.68	597.01		30.80	596.41	r bankfull r
27.31	595.33		33.21	596.49		47.82	597.02		55.39	597.01		33.84	596.73	
28.06	595.36		34.00	596.65	BANKFULL	52.83	596.73		58.58	597.09	RPIN	38.06	596.87	
29.06	595.27		36.86	596.67		55.55	597.20					47.33	596.73	
29.86	595.27		40.57	596.60		58.57	596.99					52.43	596.85	
30.51	595.40	TOE R	44.04	596.63		58.58	597.11	RPIN				57.79	596.94	
31.27	595.87		48.18	596.65								58.13	597.01	rpin
31.83	596.08		52.03	596.66										
32.56	596.24		55.45	596.83										
33.12	596.46		58.58	596.86										
33.98	596.67	BANKFULL	58.68	597.19	RPIN									
35.42	596.67													
37.44	596.73													
39.55	596.62													
42.32	596.65													
45.33	596.60													
48.12	596.83													
50.51	596.70													
53.00	596.62													
55.88	596.83													
58.69	596.92													
58.70	597.14	RPIN												

Photo of XS-8, looking in the downstream direction



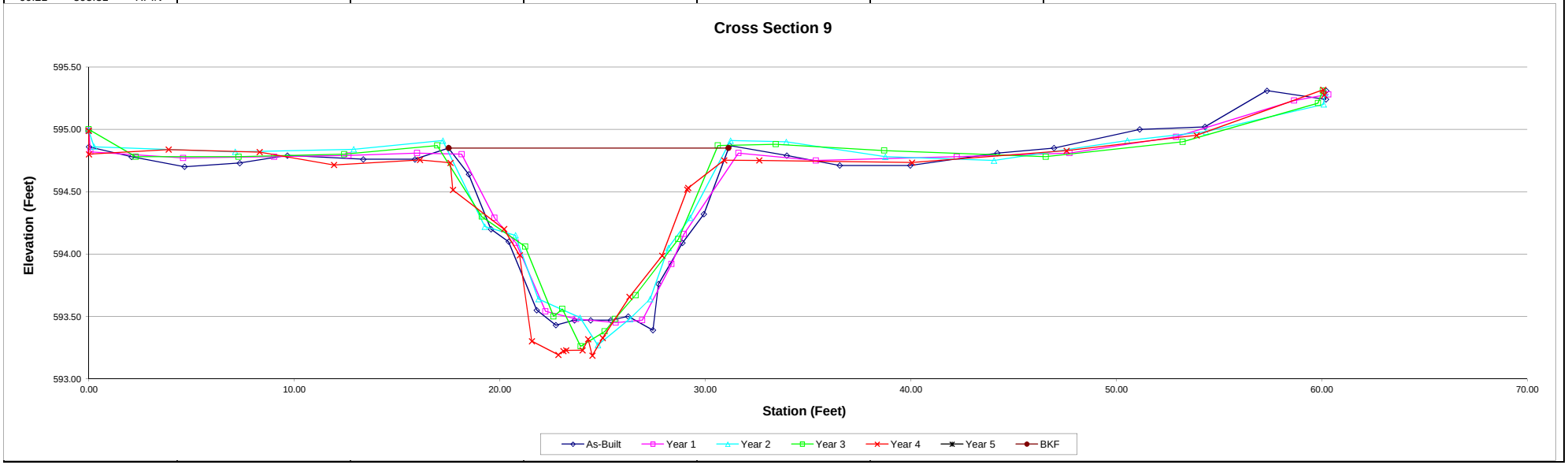
Project:	UT to Underwood Creek
Cross Section:	Cross Section 9 (CS-6 in MY-00)
Feature	Riffle
Station:	35+34
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	12.8	12.1	11.8	11.4	10.7	
W (BKF)	13.6	13.5	13.6	13.5	13.1	
Max d	1.5	1.4	1.6	1.6	1.5	
Mean d	0.9	0.9	0.9	0.8	0.8	
W/D	14.5	15.0	15.7	16.0	16.1	

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014			
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	S
	594.99	LPIN		594.99	LPIN	0.00	594.99	LPIN		595.00	LPIN		594.99	lpin	
0.01	594.86		0.09	594.82		0.26	594.86		2.29	594.78		0.01	594.80		
2.08	594.78		4.60	594.77		7.13	594.82		7.30	594.78		3.89	594.84		
4.66	594.70		9.03	594.78		12.89	594.84		12.44	594.80		8.32	594.82		
7.34	594.73		12.65	594.79		17.23	594.91	3L Bankfull	16.96	594.87	NKFULL LE	11.93	594.71		
9.67	594.79		15.98	594.81		19.27	594.22		19.13	594.30		16.11	594.76		
13.36	594.76		18.15	594.80	BANKFULL	20.76	594.15		21.24	594.06		17.60	594.73	bankfull left	
15.87	594.76		19.75	594.29		21.88	593.64	TOE L	22.62	593.50	TOE L	17.72	594.51		
17.51	594.85	BANKFULL	20.79	594.09		23.91	593.49		23.05	593.56		20.21	594.20	tobl	
18.49	594.64		22.23	593.54	TOE L	24.77	593.27	TW	23.94	593.26	TW	20.97	593.99		
19.57	594.20		23.72	593.48	TW	26.33	593.48		25.11	593.38		21.56	593.30	toel	
20.43	594.10		25.65	593.45		27.32	593.64	TOE R	25.61	593.48		22.85	593.19		
21.80	593.55	TOE L	26.94	593.47	TOE R	28.21	594.05		26.61	593.67	TOE R	23.09	593.22		
22.73	593.43		28.36	593.92		29.26	594.29		28.69	594.12		23.23	593.23		
23.64	593.47		28.96	594.16		31.23	594.91	R Bankfull	30.62	594.87	NKFULL RI	24.03	593.23		
24.42	593.47	TW	31.62	594.81	BANKFULL	33.94	594.90		33.43	594.88		24.30	593.32		
25.40	593.47		35.38	594.75		38.76	594.78		38.71	594.83		24.50	593.19	tw	
26.25	593.50		42.24	594.78		44.05	594.75		46.57	594.78		25.01	593.33		
27.45	593.39	TOE R	47.72	594.81		50.54	594.91		53.23	594.90		26.31	593.66	toer	
27.72	593.76		52.92	594.94		54.36	594.98		59.82	595.21		27.90	593.99		
28.89	594.09		58.65	595.23		60.09	595.20		60.05	595.31	RPIN	29.12	594.52		
29.93	594.32		60.32	595.28	RPIN	60.15	595.29	RPIN				29.17	594.53		
31.18	594.87	BANKFULL RIGHT										30.92	594.75	r bankfull right	
33.96	594.79											32.63	594.75		
36.54	594.71											40.06	594.73		
39.97	594.71											47.58	594.83		
44.21	594.81											53.91	594.95		
46.97	594.85											60.06	595.32		
51.14	595.00											60.11	595.28	rpin	
54.31	595.02														
57.33	595.31														
60.20	595.24														
60.21	595.31	RPIN													

Photo of XS-9, looking in the downstream direction



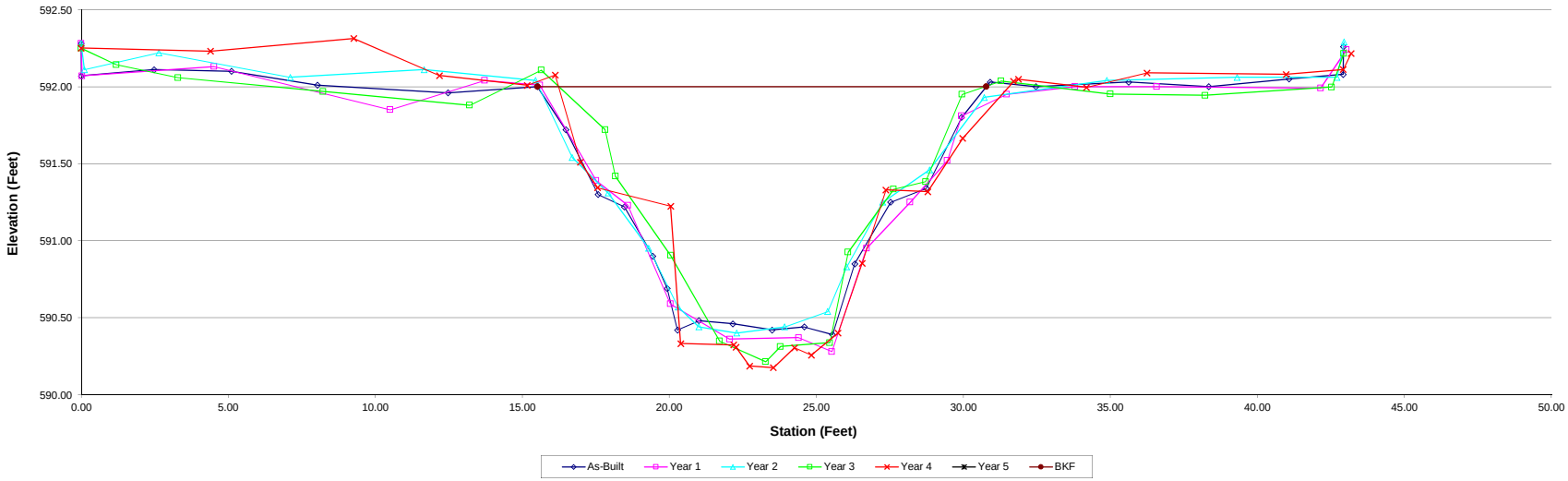
Project:	UT to Underwood Creek
Cross Section:	Cross Section 10 (CS-7 in MY-00)
Feature	Riffle
Station:	39+90
Date:	4/2/14
Crew:	SV,CC,BW

Summary (bankfull)

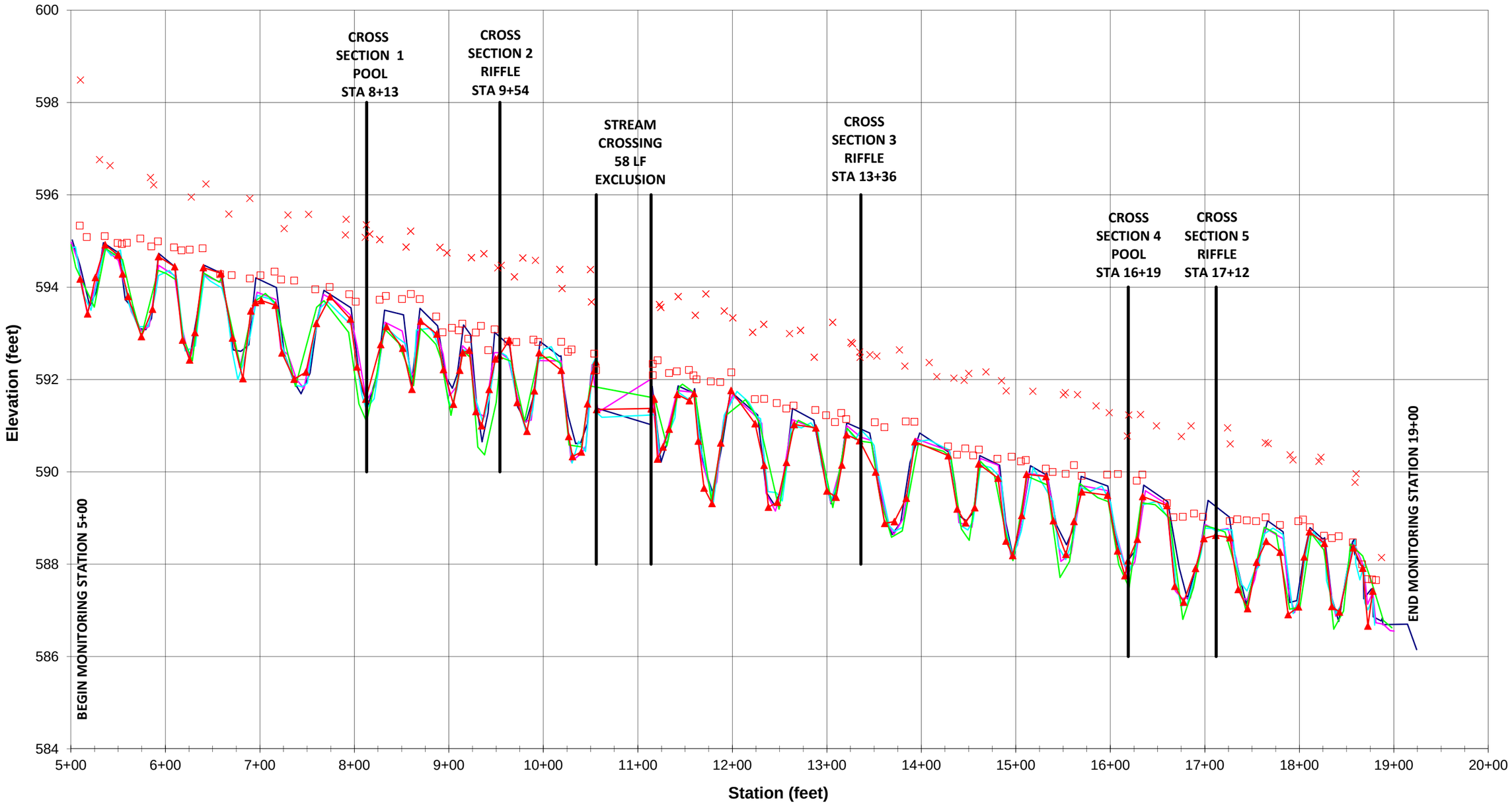
	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	15.2	14.1	13.3	12.7	14.0	
W (BKF)	15.3	15.0	14.8	14.3	14.7	
Max d	1.6	1.6	1.5	1.7	1.7	
Mean d	1.0	0.9	0.9	0.9	1.0	
W/D	15.3	15.9	16.5	16.1	15.4	

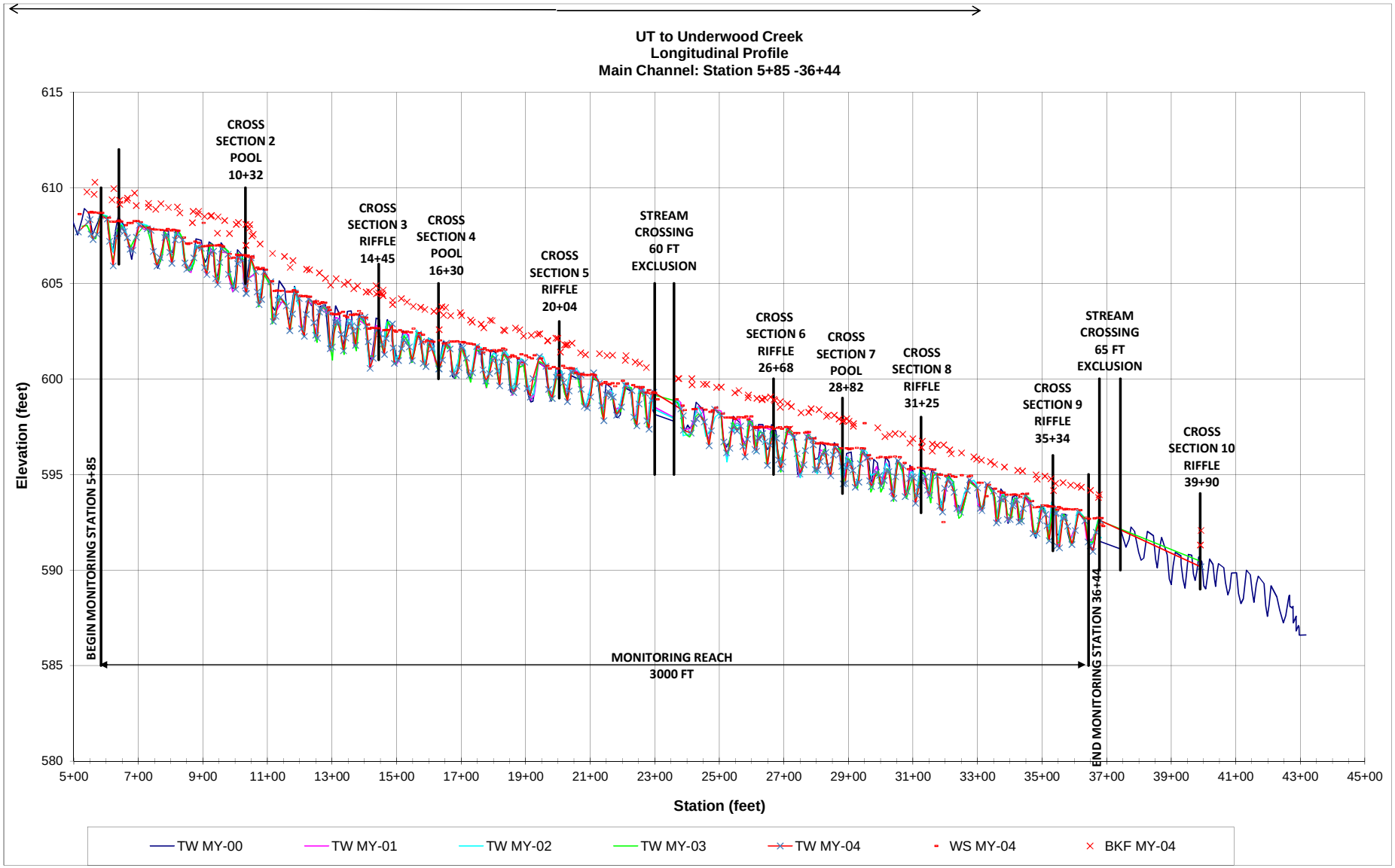
Photo of XS-10, looking in the downstream direction

MY00-2011			MY01-2011			MY02-2012			MY03-2013			MY04-2014		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
	592.28	LPIN		592.28	LPIN	0.00	592.28	LPIN		592.25	LPIN		592.25	lpin
0.01	592.07		0.03	592.07		0.11	592.11		1.19	592.14		4.40	592.23	
2.48	592.11		4.52	592.13		2.64	592.22		3.29	592.06		9.27	592.31	
5.11	592.10		10.51	591.85		7.11	592.06		8.23	591.97		12.18	592.07	
8.04	592.01		13.72	592.04		11.66	592.11		13.21	591.88		15.17	592.01	
12.48	591.96		15.60	592.01	BANKFULL	15.45	592.04	3L Bankfull	15.65	592.11	3ankfull Lef	16.12	592.08	bl bankfull left
15.52	592.00	BANKFULL	17.51	591.39		16.70	591.54		17.82	591.72		16.98	591.51	
16.48	591.72		18.59	591.23		17.92	591.31		18.17	591.42		17.56	591.34	
17.58	591.30		20.04	590.59	TOE L	19.30	590.95		20.05	590.90		20.05	591.22	
18.47	591.22		22.06	590.36	TW	20.30	590.57	TOE L	21.71	590.35	TOE L	20.39	590.33	toel
19.44	590.90		24.40	590.37		21.01	590.44		23.28	590.21	TW	22.19	590.32	
19.93	590.69		25.53	590.28	TOE R	22.29	590.40	TW	23.78	590.31		22.27	590.31	
20.28	590.42	TOE L	26.71	590.95		23.92	590.44		25.46	590.34	TOE R	22.73	590.19	
21.01	590.48		28.19	591.25		25.39	590.54	TOE R	26.08	590.93		23.54	590.18	tw
22.16	590.46		29.46	591.52		26.03	590.83		27.63	591.33		24.26	590.31	
23.50	590.42	TW	29.94	591.81		27.26	591.25		28.72	591.38		24.83	590.26	
24.59	590.44		31.47	591.95	3ANKFULL	28.85	591.46		29.96	591.95	ankfull Rigl	25.74	590.40	
25.55	590.39	TOE R	33.80	592.00		30.71	591.93	R Bankfull	31.28	592.04		26.56	590.85	
26.31	590.85		36.58	592.00		34.88	592.04		35.00	591.95		27.37	591.33	
27.53	591.25		42.15	591.99		39.31	592.06		38.23	591.94		28.79	591.32	tobr
28.74	591.34		43.03	592.24	RPIN	42.71	592.06		42.53	592.00		29.98	591.67	
29.94	591.80					42.95	592.29	RPIN	42.94	592.22	RPIN	31.71	592.04	
30.91	592.03	3ANKFULL RIGHT										31.88	592.05	ankfull right
32.47	592.00											34.19	592.00	
35.62	592.03											36.25	592.09	
38.35	592.00											40.98	592.08	
41.08	592.05											42.92	592.11	
42.92	592.08											43.19	592.22	rpin
42.93	592.26	RPIN												



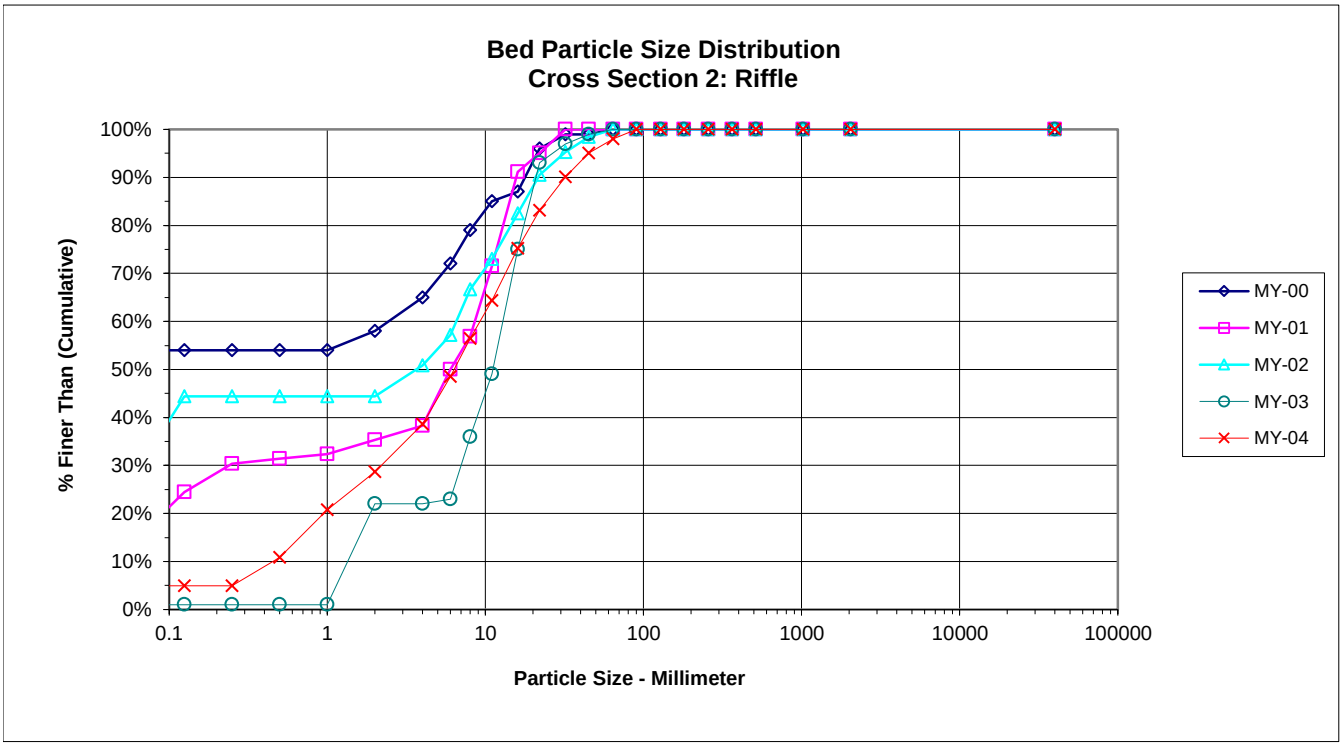
Underwood Creek (Newtown)
Longitudinal Profile
Main Channel: Station 5+00 - 19+00




UT to Underwood Creek
Longitudinal Profile
Main Channel: Station 5+85 -36+44
Elevation (feet)
Station (feet)
615
610
605
600
595
590
585
580
5+00
7+00
9+00
11+00
13+00
15+00
17+00
19+00
21+00
23+00
25+00
27+00
29+00
31+00
33+00
35+00
37+00
39+00
41+00
43+00
45+00
CROSS SECTION 2 POOL 10+32
CROSS SECTION 3 RIFFLE 14+45
CROSS SECTION 4 POOL 16+30
CROSS SECTION 5 RIFFLE 20+04
STREAM CROSSING 60 FT EXCLUSION
CROSS SECTION 6 RIFFLE 26+68
CROSS SECTION 7 POOL 28+82
CROSS SECTION 8 RIFFLE 31+25
CROSS SECTION 9 RIFFLE 35+34
STREAM CROSSING 65 FT EXCLUSION
CROSS SECTION 10 RIFFLE 39+90
BEGIN MONITORING STATION 5+85
END MONITORING STATION 36+44
MONITORING REACH 3000 FT
TW MY-00
TW MY-01
TW MY-02
TW MY-03
TW MY-04
WS MY-04
BKF MY-04

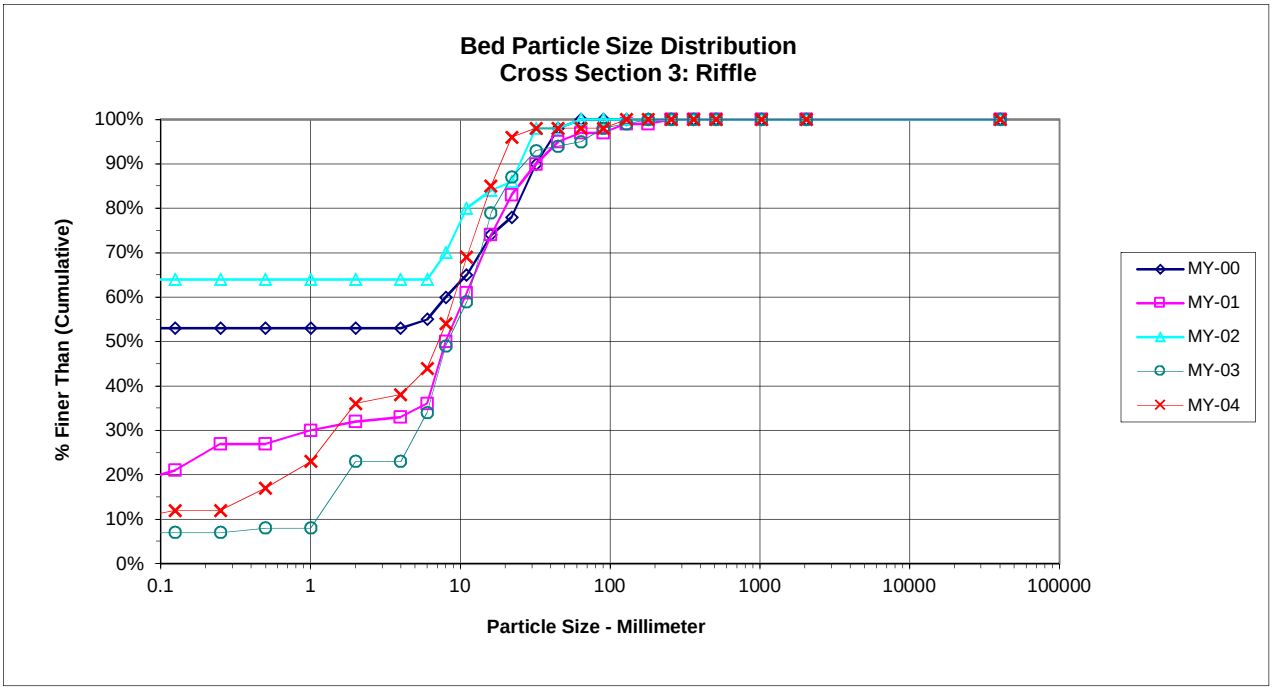
PEBBLE COUNT								
Project:	Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #2							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	5	0	5	5%	5%
	Very Fine	.062 - .125	S		0	0	0%	5%
	Fine	.125 - .25	A		0	0	0%	5%
	Medium	.25 - .50	N	6	0	6	6%	11%
	Coarse	.50 - 1.0	D	10	0	10	10%	21%
.04 -.08	Very Coarse	1.0 - 2.0	S	8	0	8	8%	29%
.08 - .16	Very Fine	2.0 - 4.0		10	0	10	10%	39%
.16 - .22	Fine	4.0 - 5.7	G	10	0	10	10%	49%
.22 - .31	Fine	5.7 - 8.0	R	8	0	8	8%	56%
.31 - .44	Medium	8.0 - 11.3	A	8	0	8	8%	64%
.44 - .63	Medium	11.3 - 16.0	V	11	0	11	11%	75%
.63 - .89	Coarse	16.0 - 22.6	E	8	0	8	8%	83%
.89 - 1.26	Coarse	22.6 - 32.0	L	7	0	7	7%	90%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	5	0	5	5%	95%
1.77 - 2.5	Very Coarse	45.0 - 64.0		3	0	3	3%	98%
2.5 - 3.5	Small	64 - 90	C	2	0	2	2%	100%
3.5 - 5.0	Small	90 - 128	O		0	0	0%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**101**	**0**	**101**	**100%**	**100%**

d16	d35	d50	d84	d95
0.8	3.3	6.4	23.2	44.9



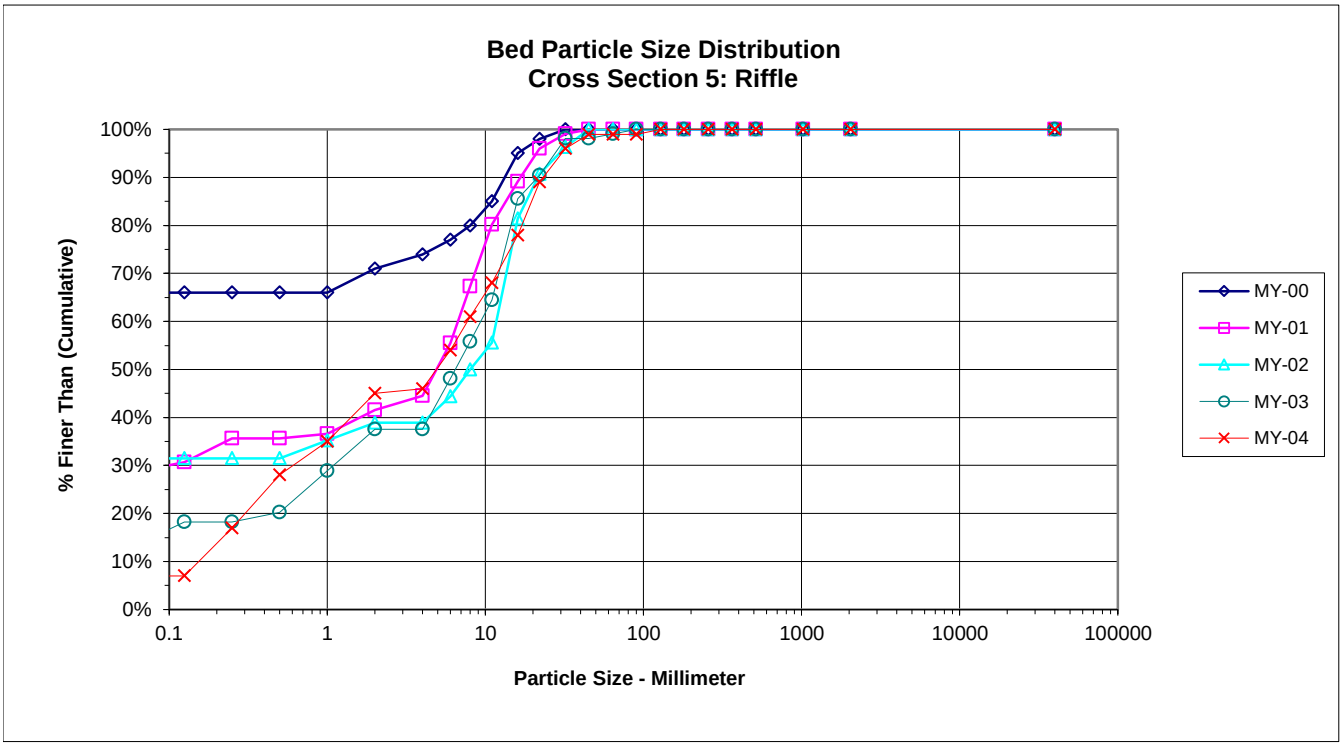
PEBBLE COUNT								
Project:	Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #3							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	18	0	10	10%	10%
	Very Fine	.062 - .125	S	2	0	2	2%	12%
	Fine	.125 - .25	A	5	0	0	0%	12%
	Medium	.25 - .50	N	12	0	5	5%	17%
	Coarse	.50 - 1.0	D	13	0	6	6%	23%
.04 -.08	Very Coarse	1.0 - 2.0	S	13	0	13	13%	36%
.08 - .16	Very Fine	2.0 - 4.0		2	0	2	2%	38%
.16 - .22	Fine	4.0 - 5.7	G	2	0	6	6%	44%
.22 - .31	Fine	5.7 - 8.0	R	4	0	10	10%	54%
.31 - .44	Medium	8.0 - 11.3	A	7	0	15	15%	69%
.44 - .63	Medium	11.3 - 16.0	V	16	0	16	16%	85%
.63 - .89	Coarse	16.0 - 22.6	E	11	0	11	11%	96%
.89 - 1.26	Coarse	22.6 - 32.0	L	2	0	2	2%	98%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S		0	0	0%	98%
1.77 - 2.5	Very Coarse	45.0 - 64.0			0	0	0%	98%
2.5 - 3.5	Small	64 - 90	C		0	0	0%	98%
3.5 - 5.0	Small	90 - 128	O	2	0	2	2%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**109**	**0**	**100**	**100%**	**100%**

d16	d35	d50	d84	d95
Silt/Clay	1.9	7.2	15.7	21.5



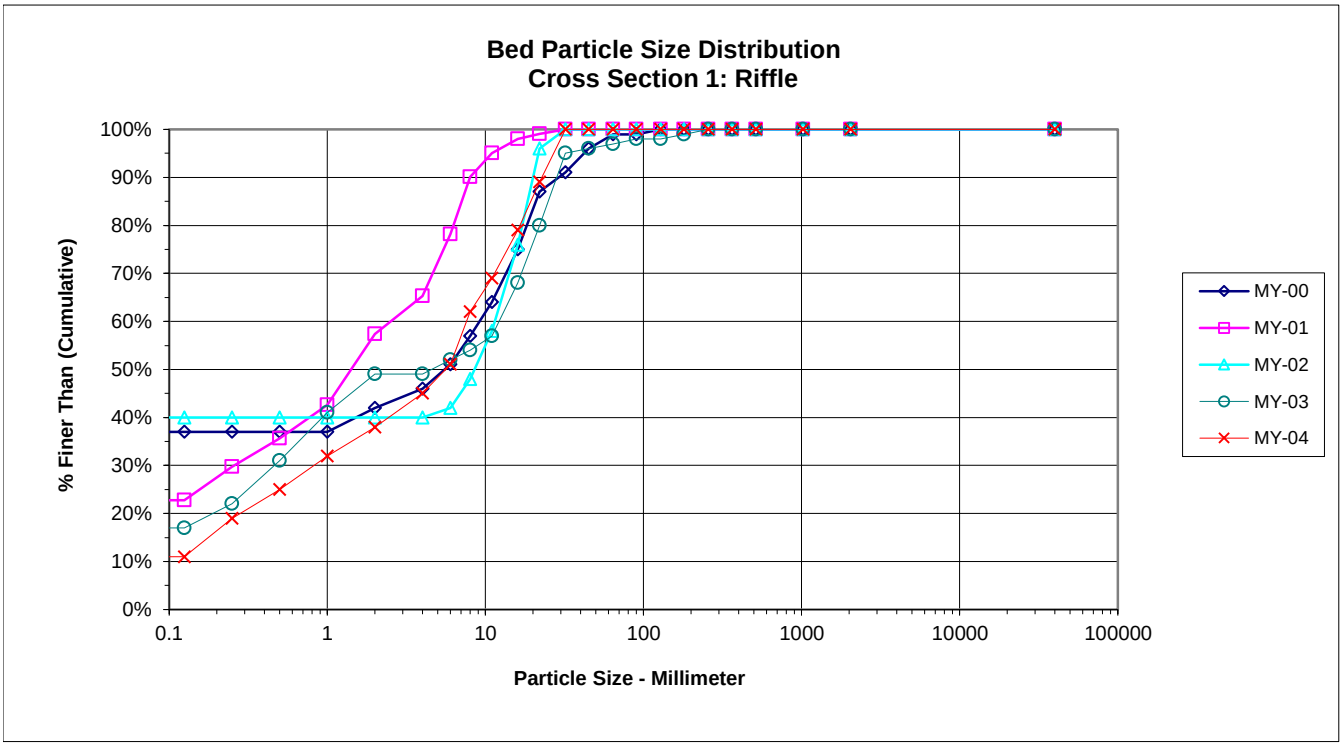
PEBBLE COUNT								
Project:	Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #5							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	7	0	7	7%	7%
	Very Fine	.062 - .125	S		0	0	0%	7%
	Fine	.125 - .25	A	10	0	10	10%	17%
	Medium	.25 - .50	N	11	0	11	11%	28%
	Coarse	.50 - 1.0	D	7	0	7	7%	35%
.04 -.08	Very Coarse	1.0 - 2.0	S	10	0	10	10%	45%
.08 - .16	Very Fine	2.0 - 4.0		1	0	1	1%	46%
.16 - .22	Fine	4.0 - 5.7	G	8	0	8	8%	54%
.22 - .31	Fine	5.7 - 8.0	R	7	0	7	7%	61%
.31 - .44	Medium	8.0 - 11.3	A	7	0	7	7%	68%
.44 - .63	Medium	11.3 - 16.0	V	10	0	10	10%	78%
.63 - .89	Coarse	16.0 - 22.6	E	11	0	11	11%	89%
.89 - 1.26	Coarse	22.6 - 32.0	L	7	0	7	7%	96%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	3	0	3	3%	99%
1.77 - 2.5	Very Coarse	45.0 - 64.0			0	0	0%	99%
2.5 - 3.5	Small	64 - 90	C		0	0	0%	99%
3.5 - 5.0	Small	90 - 128	O	1	0	1	1%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**100**	**0**	**100**	**100%**	**100%**

d16	d35	d50	d84	d95
Silt/Clay	1.0	5.0	19.3	30.6



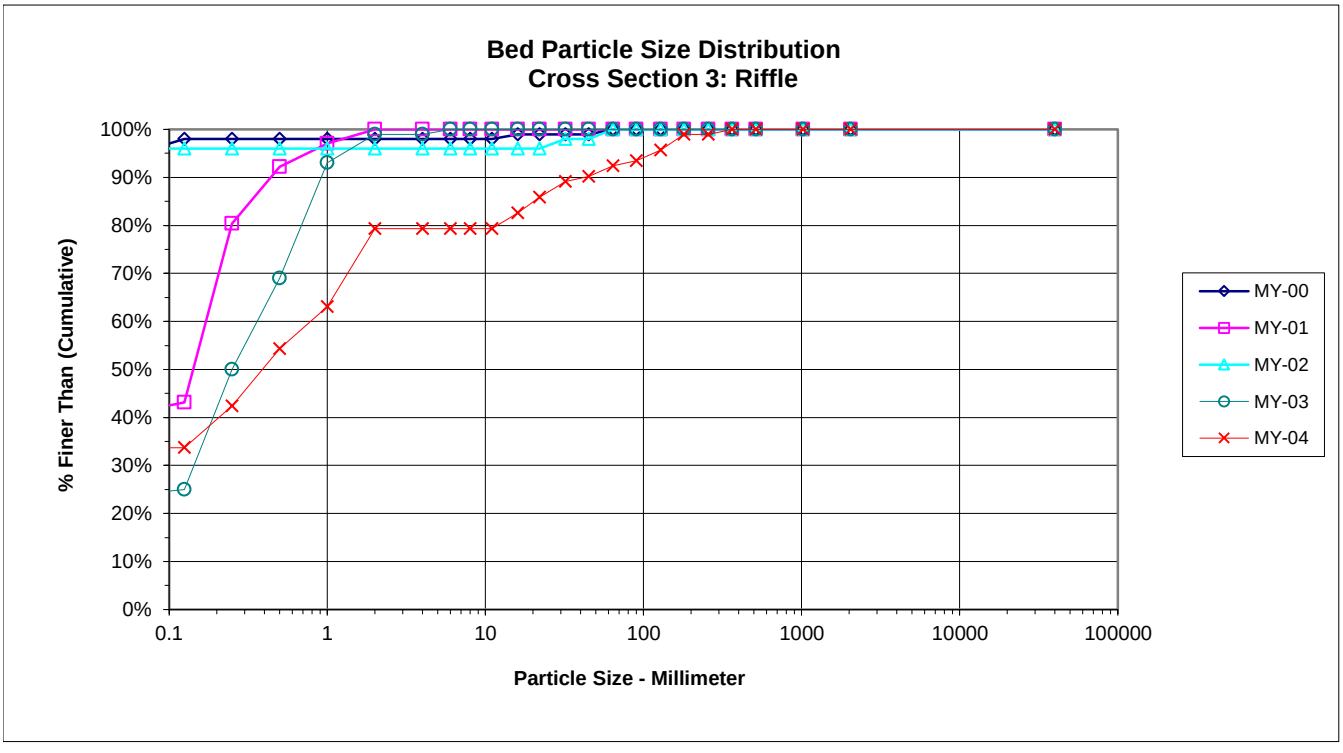
PEBBLE COUNT								
Project:	UT to Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #1							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	11	0	11	11%	11%
	Very Fine	.062 - .125	S		0	0	0%	11%
	Fine	.125 - .25	A	8	0	8	8%	19%
	Medium	.25 - .50	N	6	0	6	6%	25%
	Coarse	.50 - 1.0	D	7	0	7	7%	32%
.04 -.08	Very Coarse	1.0 - 2.0	S	6	0	6	6%	38%
.08 - .16	Very Fine	2.0 - 4.0		7	0	7	7%	45%
.16 - .22	Fine	4.0 - 5.7	G	6	0	6	6%	51%
.22 - .31	Fine	5.7 - 8.0	R	11	0	11	11%	62%
.31 - .44	Medium	8.0 - 11.3	A	7	0	7	7%	69%
.44 - .63	Medium	11.3 - 16.0	V	10	0	10	10%	79%
.63 - .89	Coarse	16.0 - 22.6	E	10	0	10	10%	89%
.89 - 1.26	Coarse	22.6 - 32.0	L	11	0	11	11%	100%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S		0	0	0%	100%
1.77 - 2.5	Very Coarse	45.0 - 64.0			0	0	0%	100%
2.5 - 3.5	Small	64 - 90	C		0	0	0%	100%
3.5 - 5.0	Small	90 - 128	O		0	0	0%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**100**	**0**	**100**	**100%**	**100%**

d16	d35	d50	d84	d95
Silt/Clay	1.5	5.7	19.0	27.5



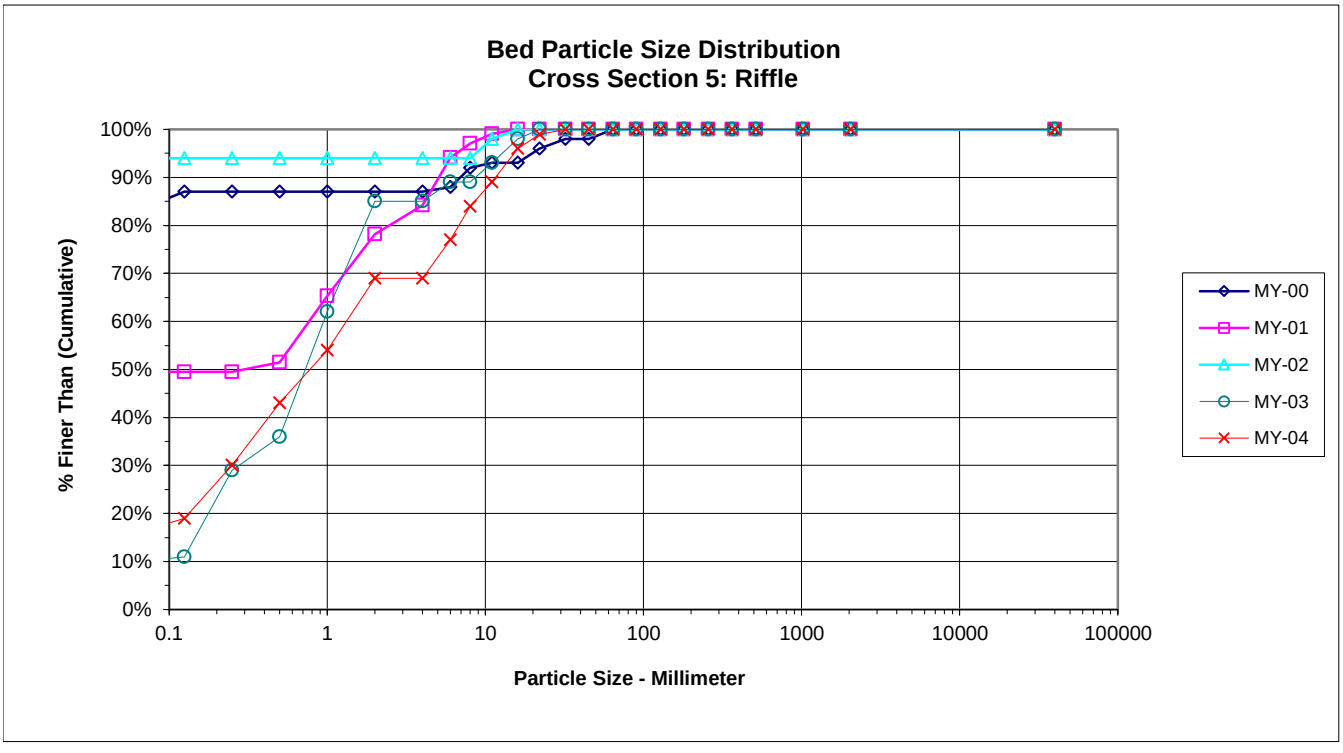
PEBBLE COUNT								
Project:	UT to Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #3							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	31	0	31	34%	34%
	Very Fine	.062 - .125	S		0	0	0%	34%
	Fine	.125 - .25	A	8	0	8	9%	42%
	Medium	.25 - .50	N	11	0	11	12%	54%
	Coarse	.50 - 1.0	D	8	0	8	9%	63%
.04 -.08	Very Coarse	1.0 - 2.0	S	15	0	15	16%	79%
.08 - .16	Very Fine	2.0 - 4.0			0	0	0%	79%
.16 - .22	Fine	4.0 - 5.7	G		0	0	0%	79%
.22 - .31	Fine	5.7 - 8.0	R		0	0	0%	79%
.31 - .44	Medium	8.0 - 11.3	A		0	0	0%	79%
.44 - .63	Medium	11.3 - 16.0	V	3	0	3	3%	83%
.63 - .89	Coarse	16.0 - 22.6	E	3	0	3	3%	86%
.89 - 1.26	Coarse	22.6 - 32.0	L	3	0	3	3%	89%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	1	0	1	1%	90%
1.77 - 2.5	Very Coarse	45.0 - 64.0		2	0	2	2%	92%
2.5 - 3.5	Small	64 - 90	C	1	0	1	1%	93%
3.5 - 5.0	Small	90 - 128	O	2	0	2	2%	96%
5.0 - 7.1	Large	128 - 180	B	3	0	3	3%	99%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	99%
10.1 - 14.3	Small	256 - 362	B	1	0	1	1%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**92**	**0**	**92**	**100%**	**100%**

d16	d35	d50	d84	d95
0.1	0.0	0.4	18.6	116.6



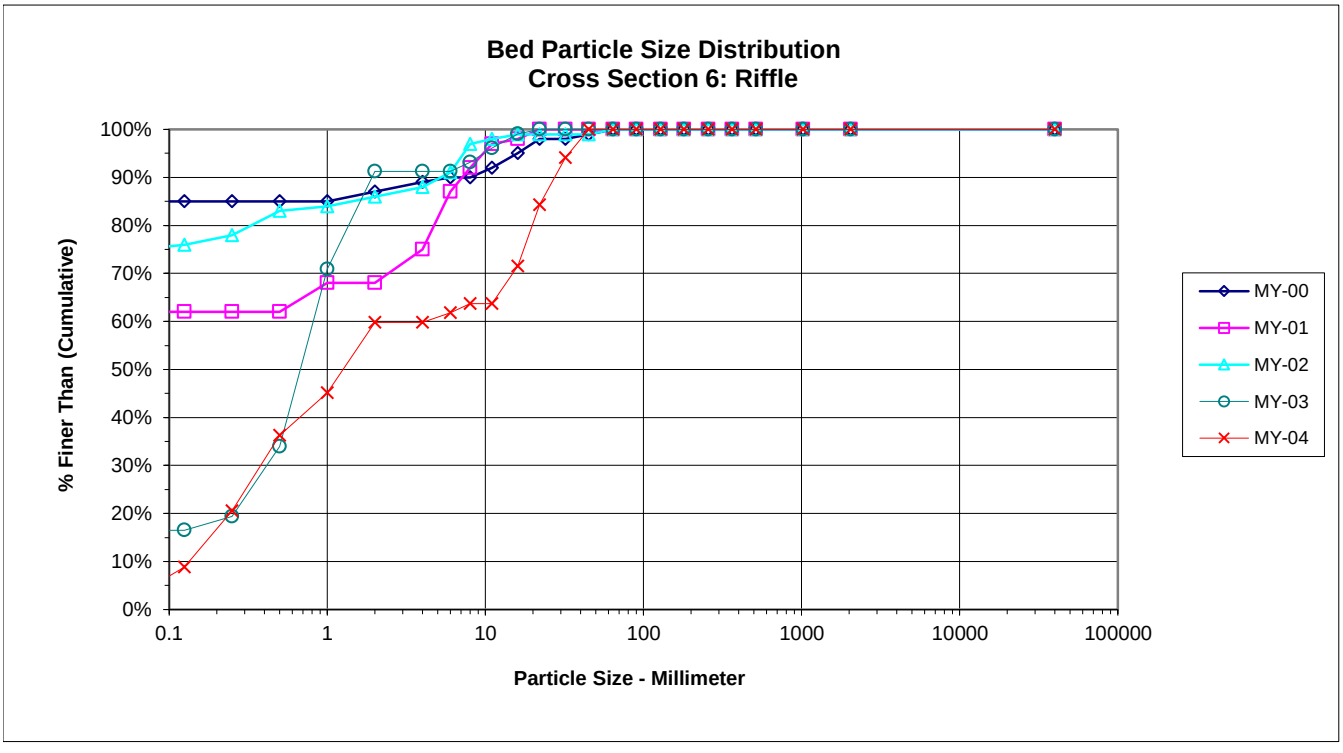
PEBBLE COUNT								
Project:	UT to Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #5							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	16	0	16	16%	16%
	Very Fine	.062 - .125	S	3	0	3	3%	19%
	Fine	.125 - .25	A	11	0	11	11%	30%
	Medium	.25 - .50	N	13	0	13	13%	43%
	Coarse	.50 - 1.0	D	11	0	11	11%	54%
.04 -.08	Very Coarse	1.0 - 2.0	S	15	0	15	15%	69%
.08 - .16	Very Fine	2.0 - 4.0			0	0	0%	69%
.16 - .22	Fine	4.0 - 5.7	G	8	0	8	8%	77%
.22 - .31	Fine	5.7 - 8.0	R	7	0	7	7%	84%
.31 - .44	Medium	8.0 - 11.3	A	5	0	5	5%	89%
.44 - .63	Medium	11.3 - 16.0	V	7	0	7	7%	96%
.63 - .89	Coarse	16.0 - 22.6	E	3	0	3	3%	99%
.89 - 1.26	Coarse	22.6 - 32.0	L	1	0	1	1%	100%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S		0	0	0%	100%
1.77 - 2.5	Very Coarse	45.0 - 64.0			0	0	0%	100%
2.5 - 3.5	Small	64 - 90	C		0	0	0%	100%
3.5 - 5.0	Small	90 - 128	O		0	0	0%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**100**	**0**	**100**	**100%**	**100%**

d16	d35	d50	d84	d95
0.1	0.3	0.8	8.0	15.3



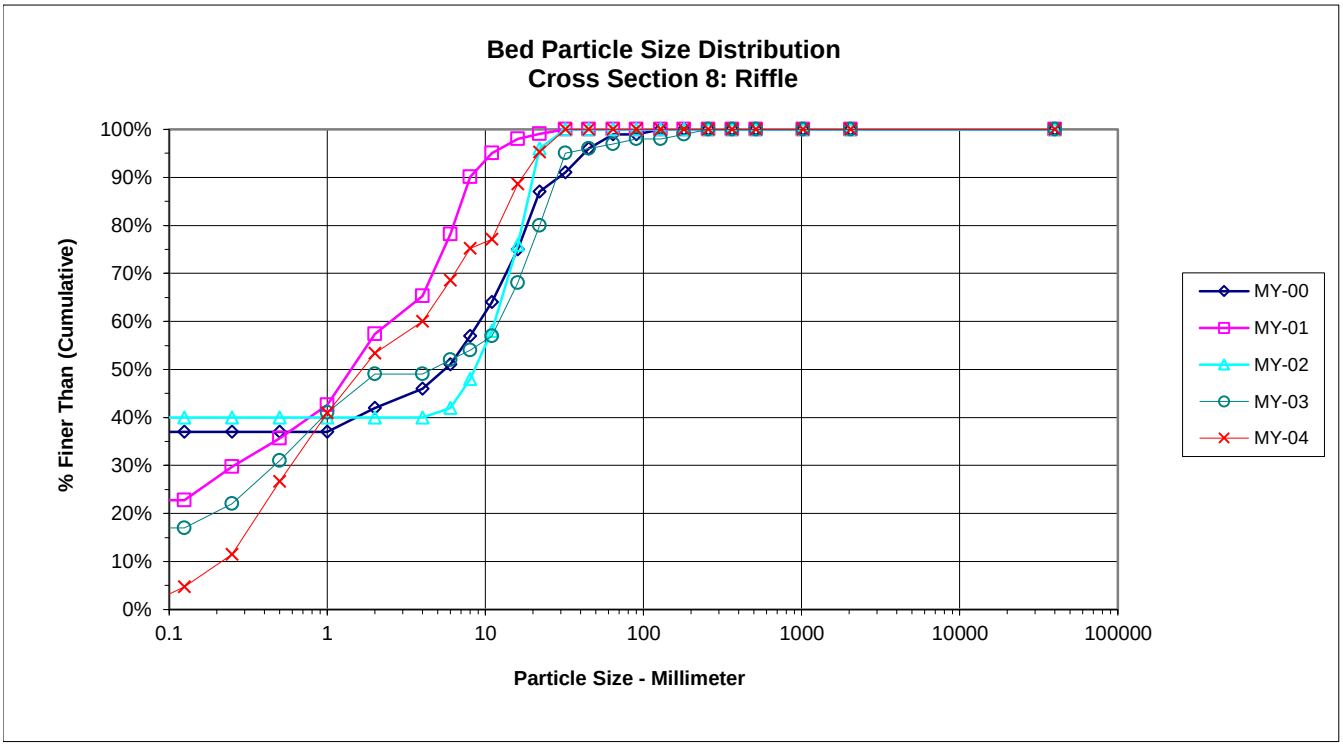
PEBBLE COUNT								
Project:	UT to Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #6							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	3	0	3	3%	3%
	Very Fine	.062 - .125	S	6	0	6	6%	9%
	Fine	.125 - .25	A	12	0	12	12%	21%
	Medium	.25 - .50	N	16	0	16	16%	36%
	Coarse	.50 - 1.0	D	9	0	9	9%	45%
.04 -.08	Very Coarse	1.0 - 2.0	S	15	0	15	15%	60%
.08 - .16	Very Fine	2.0 - 4.0			0	0	0%	60%
.16 - .22	Fine	4.0 - 5.7	G	2	0	2	2%	62%
.22 - .31	Fine	5.7 - 8.0	R	2	0	2	2%	64%
.31 - .44	Medium	8.0 - 11.3	A		0	0	0%	64%
.44 - .63	Medium	11.3 - 16.0	V	8	0	8	8%	72%
.63 - .89	Coarse	16.0 - 22.6	E	13	0	13	13%	84%
.89 - 1.26	Coarse	22.6 - 32.0	L	10	0	10	10%	94%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	6	0	6	6%	100%
1.77 - 2.5	Very Coarse	45.0 - 64.0			0	0	0%	100%
2.5 - 3.5	Small	64 - 90	C		0	0	0%	100%
3.5 - 5.0	Small	90 - 128	O		0	0	0%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**102**	**0**	**102**	**100%**	**100%**

d16	d35	d50	d84	d95
Silt/Clay	0.5	1.3	21.9	34.0



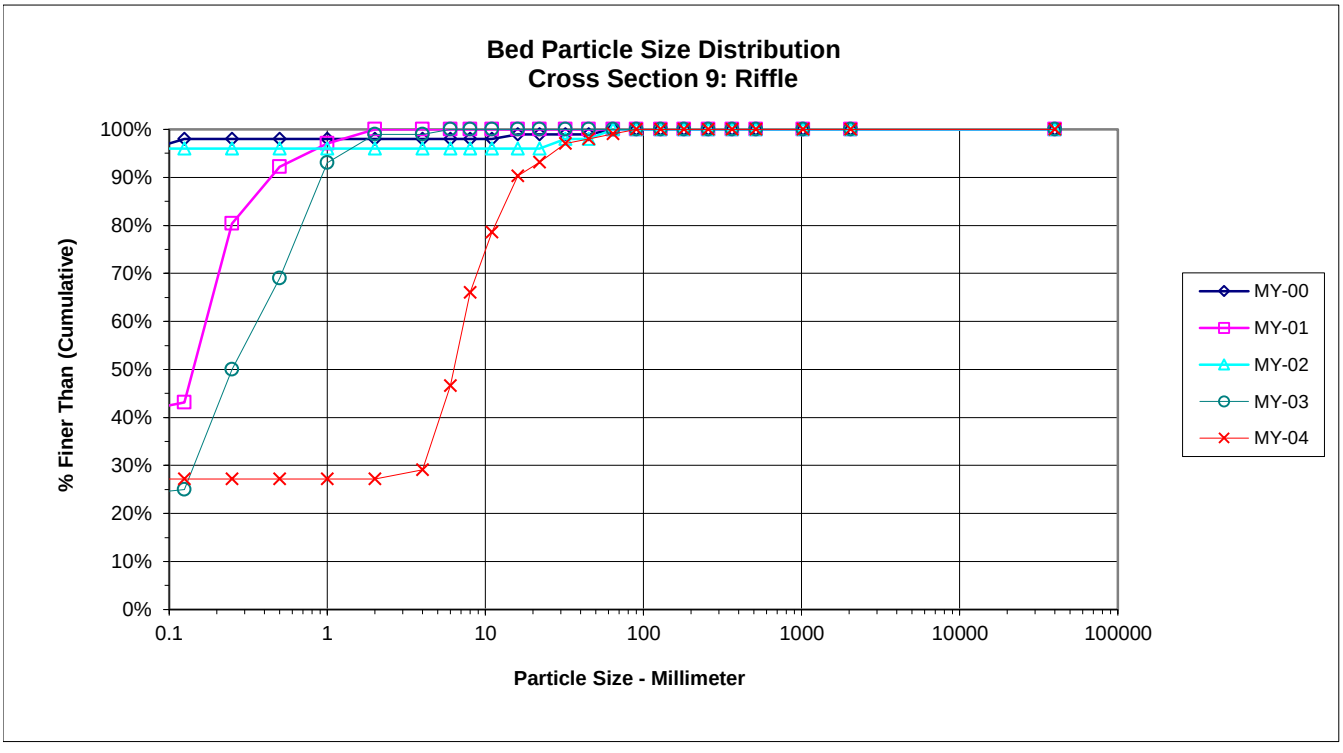
PEBBLE COUNT								
Project:	UT to Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #8							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C		0	0	0%	0%
	Very Fine	.062 - .125	S	5	0	5	5%	5%
	Fine	.125 - .25	A	7	0	7	7%	11%
	Medium	.25 - .50	N	16	0	16	15%	27%
	Coarse	.50 - 1.0	D	15	0	15	14%	41%
.04 -.08	Very Coarse	1.0 - 2.0	S	13	0	13	12%	53%
.08 - .16	Very Fine	2.0 - 4.0		7	0	7	7%	60%
.16 - .22	Fine	4.0 - 5.7	G	9	0	9	9%	69%
.22 - .31	Fine	5.7 - 8.0	R	7	0	7	7%	75%
.31 - .44	Medium	8.0 - 11.3	A	2	0	2	2%	77%
.44 - .63	Medium	11.3 - 16.0	V	12	0	12	11%	89%
.63 - .89	Coarse	16.0 - 22.6	E	7	0	7	7%	95%
.89 - 1.26	Coarse	22.6 - 32.0	L	5	0	5	5%	100%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S		0	0	0%	100%
1.77 - 2.5	Very Coarse	45.0 - 64.0			0	0	0%	100%
2.5 - 3.5	Small	64 - 90	C		0	0	0%	100%
3.5 - 5.0	Small	90 - 128	O		0	0	0%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**105**	**0**	**105**	**100%**	**100%**

d16	d35	d50	d84	d95
Silt/Clay	0.8	1.7	14.0	21.8



PEBBLE COUNT								
Project:	UT to Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #9							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	28	0	28	27%	27%
	Very Fine	.062 - .125	S		0	0	0%	27%
	Fine	.125 - .25	A		0	0	0%	27%
	Medium	.25 - .50	N		0	0	0%	27%
	Coarse	.50 - 1.0	D		0	0	0%	27%
.04 -.08	Very Coarse	1.0 - 2.0	S		0	0	0%	27%
.08 - .16	Very Fine	2.0 - 4.0		2	0	2	2%	29%
.16 - .22	Fine	4.0 - 5.7	G	18	0	18	17%	47%
.22 - .31	Fine	5.7 - 8.0	R	20	0	20	19%	66%
.31 - .44	Medium	8.0 - 11.3	A	13	0	13	13%	79%
.44 - .63	Medium	11.3 - 16.0	V	12	0	12	12%	90%
.63 - .89	Coarse	16.0 - 22.6	E	3	0	3	3%	93%
.89 - 1.26	Coarse	22.6 - 32.0	L	4	0	4	4%	97%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	1	0	1	1%	98%
1.77 - 2.5	Very Coarse	45.0 - 64.0		1	0	1	1%	99%
2.5 - 3.5	Small	64 - 90	C	1	0	1	1%	100%
3.5 - 5.0	Small	90 - 128	O		0	0	0%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**103**	**0**	**103**	**100%**	**100%**

d16	d35	d50	d84	d95
0.1	4.7	6.4	13.3	26.6



PEBBLE COUNT								
Project:	UT to Underwood Creek					**Date:**	5/7/2014	
Location:	Cross Section #10							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	20	0	20	20%	20%
	Very Fine	.062 - .125	S		0	0	0%	20%
	Fine	.125 - .25	A	16	0	16	16%	36%
	Medium	.25 - .50	N	21	0	21	21%	57%
	Coarse	.50 - 1.0	D	8	0	8	8%	65%
.04 -.08	Very Coarse	1.0 - 2.0	S	6	0	6	6%	71%
.08 - .16	Very Fine	2.0 - 4.0			0	0	0%	71%
.16 - .22	Fine	4.0 - 5.7	G	6	0	6	6%	77%
.22 - .31	Fine	5.7 - 8.0	R		0	0	0%	77%
.31 - .44	Medium	8.0 - 11.3	A		0	0	0%	77%
.44 - .63	Medium	11.3 - 16.0	V	3	0	3	3%	80%
.63 - .89	Coarse	16.0 - 22.6	E		0	0	0%	80%
.89 - 1.26	Coarse	22.6 - 32.0	L	8	0	8	8%	88%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	12	0	12	12%	100%
1.77 - 2.5	Very Coarse	45.0 - 64.0			0	0	0%	100%
2.5 - 3.5	Small	64 - 90	C		0	0	0%	100%
3.5 - 5.0	Small	90 - 128	O		0	0	0%	100%
5.0 - 7.1	Large	128 - 180	B		0	0	0%	100%
7.1 - 10.1	Large	180 - 256	L		0	0	0%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D		0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R		0	0	0%	100%
	Bedrock		BDRK		0	0	0%	100%
			Totals	**100**	**0**	**100**	**100%**	**100%**

d16	d35	d50	d84	d95
0.1	0.0	0.4	27.0	39.6

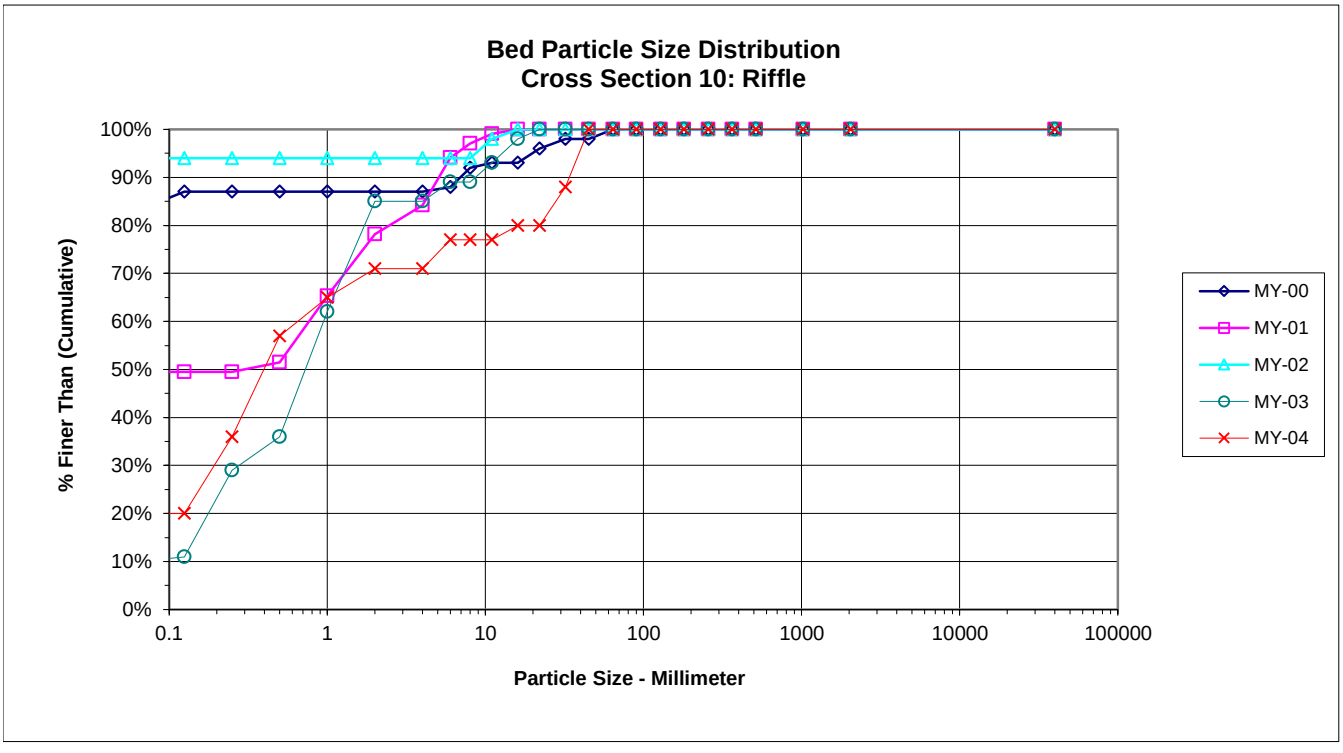


Table 10a. Baseline Stream Data Summary
Newtown - EEP# 94150 - Underwood Creek: 1273 feet

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					8.3	11.72		16.3			10	12.2		14.3				16		15.272	15.878	15.667	16.694	0.7338	3
Floodprone Width (ft)					12	58		107									130	140	250	110	158.33	140	225	59.652	3
Bankfull Mean Depth (ft)					0.93	1.16		1.29			0.92	1.12		1.34				1.06		1.0281	1.0491	1.0349	1.0842	0.0306	3
[1]Bankfull Max Depth (ft)					1.02	1.58		2.05										1.6		1.66	1.7167	1.74	1.75	0.0493	3
Bankfull Cross Sectional Area (ft^2)					10.5	13.3		19.6			12.2	13		13.4				17		15.806	16.671	16.108	18.099	1.2459	3
Width/Depth Ratio					6.5	10.42		16.8			7.7	11.3		15.6				15		14.757	15.131	15.238	15.398	0.3337	3
Entrenchment Ratio					1.47	4.65		7.71			2.9	6.5		8.6			8	9	16	7.2026	9.8721	8.9357	13.478	3.2408	3
[1]Bank Height Ratio					1.61	1.83		2.28			0.9	1		1.2				1		1	1	1	1	0	3
Profile																									
Riffle Length (ft)					6.33	37.84		106.87			4.03	14.18		23.61			10	21.696	58	7.36	20.808	20.505	31.54	5.5775	22
Riffle Slope (ft/ft)					0.0001	0.0537		0.2384			0	0.0202		0.0815			0.0069	0.0125	0.0171	0.0034	0.0132	0.0135	0.0285	0.0054	22
Pool Length (ft)					19.07	55.73		119.93			18.51	32.11		58.03			19	35.957	54	17.45	34.809	34.925	52.82	7.6111	24
Pool Max depth (ft)					2	2.31		3.1			1.7	2.47		3.1			2.4	3.5	4.5	2.76	3.4017	3.43	4.04	0.374	24
Pool Spacing (ft)					34	91		245			29	48		84			37	63	110	31.47	55.969	54.565	78.46	10.484	22
Pattern																									
Channel Beltwidth (ft)					35	47.8		56			25	40		65			34	53	86	34		53	86		
Radius of Curvature (ft)					7	47		173			20	31		122			26	41	59	26		41	59		
Rc:Bankfull width (ft/ft)					0.06	0.04		0.148			0.016	0.0255		0.037			0.016	0.0255	0.037	0.016		0.0255	0.037		
Meander Wavelength (ft)					55	113.57		245			62	85.5		99			82	112	130	82		112	130		
Meander Width Ratio					1.84	2.52		2.95			2.1	3.3		5.4			2.1	3.3	5.4	2.1		3.3	5.4		
Transport parameters																									
Reach Shear Stress (competency) lb/ft^2						0.45												0.43			0.43				
Max part size (mm) mobilized at bankfull																		60			60				
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification						incised C4/E4						E4/C4						C4			C4				
Bankfull Velocity (fps)						4.05												3.3			3.3				
Bankfull Discharge (cfs)						55																			
Valley length (ft)						1110						542													
Channel Thalweg length (ft)						1149						650						1331			1331				
Sinuosity (ft)						1.04						1.2						1.3			1.3				
Water Surface Slope (Channel) (ft/ft)						0.006						0.0065						0.0048			0.0048				
BF slope (ft/ft)						0.0071						0.0114						0.0048			0.0048				
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10a. Baseline Stream Data Summary
Newtown - EEP# 94150 - UT to Underwood Creek: 3000 feet

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)					6.3	11.75		16			10	12.2		14.3				14		12.322	13.977	13.625	16.516	1.4652	7
Floodprone Width (ft)					19	109		352									95	160	220	95	172.86	135	280	76.095	7
Bankfull Mean Depth (ft)					0.73	1.12		1.56			0.92	1.12		1.34				0.98		0.8103	0.9506	0.963	1.0596	0.0775	7
[1]Bankfull Max Depth (ft)					1.1	1.92		2.6										1.4		1.46	1.6371	1.61	1.98	0.1729	7
Bankfull Cross Sectional Area (ft^2)					7.3	12.9		18.8			12.2	13		13.4				13.7		11.585	13.225	13.057	15.215	1.0894	7
Width/Depth Ratio					5.4	11.21		19.8			7.7	11.3		15.6				14.3		11.629	14.868	14.373	20.383	2.6834	7
Entrenchment Ratio					2	9.04		29.3			2.9	6.5		8.6			6.8	11	16	6.9727	12.435	8.8446	22.723	5.7683	7
[1]Bank Height Ratio					1.26	1.31		1.99			0.9	1		1.2				1		0.9419	0.979	0.9848	1	0.0254	7
Profile																									
Riffle Length (ft)					1.64	38.85		289.95			4.03	14.18		23.61			10	16.45	80	9.19	16.294	15.51	34.04	4.4599	64
Riffle Slope (ft/ft)					0.0002	0.021		0.121			0	0.0202		0.0815			0.0074	0.0158	0.057	0.0008	0.0175	0.0156	0.0556	0.011	60
Pool Length (ft)					8.87	54.34		435			18.51	32.11		58.03			14	30.242	53	19.68	30.254	28.74	51.91	7.7476	65
Pool Max depth (ft)					1.3	2.57		4.8			1.7	2.47		3.1			2.1	2.8	3.9	2.42	2.9651	2.92	3.68	0.2746	65
Pool Spacing (ft)					8.5	105		752			29	48		84			32	55	97	31.79	46.166	44.57	80.51	9.6963	63
Pattern																									
Channel Beltwidth (ft)					40	43.75		51			25	40		65			30	46	76	30		46	76		
Radius of Curvature (ft)					2.4	23		169			20	31		122			23	36	52	23		36	52		
Rc:Bankfull width (ft/ft)					0.002	0.0197		0.144			0.016	0.0255		0.037			0.016	0.0255	0.037	0.016		0.0255	0.037		
Meander Wavelength (ft)					80	126.5		190			62	85.5		99			72	98	113	72		98	113		
Meander Width Ratio					7.71	1.87		2.18			2.1	3.3		5.4			2.1	3.3	5.4	2.1		3.3	5.4		
Transport parameters																									
Reach Shear Stress (competency) lb/ft^2						0.41												0.28			0.28				
Max part size (mm) mobilized at bankfull																		38			38				
Stream Power (transport capacity) W/m^2																									
Additional Reach Parameters																									
Rosgen Classification						incised C4/E4 w/sections of G4						E4/C4						C4			C4				
Bankfull Velocity (fps)						3.19												3.07			3.07				
Bankfull Discharge (cfs)						42																			
Valley length (ft)						3506						542													
Channel Thalweg length (ft)						4097						650						4100			4100				
Sinuosity (ft)						1.17						1.2						1.3			1.3				
Water Surface Slope (Channel) (ft/ft)						0.0054						0.0065						0.0048			0.0048				
BF slope (ft/ft)						0.0063						0.0114						0.0048			0.0048				
[3]Bankfull Floodplain Area (acres)																									
[4]% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Newtown - EEP# 94150 - Underwood Creek: 1273 feet

Parameter	Pre-Existing Condition							Reference Reach(es) Data						
[1]Ri% / Ru% / P% / G% / S%	38%	6%	48%	8%				28%	4%	60%	8%			
[1]SC% / Sa% / G% / C% / B% / Be%	2.16%	4.95%	81.62%	9.12%	0.43%	1.72%		0.91%	3%	81.59%	14%	0%	0.50%	
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	8.15	19.25	27.75	58.65	105.10			11.59	20.73	29.25	60.76	82.68		
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10														
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0														

Parameter	Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%	36%		59%		2%			24%		43%		2%		
[1]SC% / Sa% / G% / C% / B% / Be%														
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)														
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10														
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0														

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary. The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions. ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section surveys and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a m

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Newtown - EEP# 94150 - UT to Underwood Creek: 3000 feet

Parameter	Pre-Existing Condition							Reference Reach(es) Data						
[1]Ri% / Ru% / P% / G% / S%	39%	2%	53%	4%				28%	4%	60%	8%			
[1]SC% / Sa% / G% / C% / B% / Be%	0%	2%	92.81%	4.72%	0.47%	0%		0.9%	3%	81.6%	14.0%	0%	0.5%	
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	12.70	19.80	24.50	43.05	60.50			11.59	20.73	29.25	60.76	82.68		
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10														
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0														

Parameter	Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%	34%		64%		1%			34%		64%		1%		
[1]SC% / Sa% / G% / C% / B% / Be%														
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)														
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10														
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0														

Shaded cells indicate that these will typically not be filled in.

1 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

2 = Entrenchment Class - Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as visual estimates

3 = Assign/bin the reach footage into the classes indicated and provide the percentage of the total reach footage in each class in the table. This will result from the measured cross-sections as well as the longitudinal profile

Footnotes 2,3 - These classes are loosely built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary. The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions. ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-constrution distribution of these parameters, leaving the reader/consumer with a sample that is weighted heavily on the stable sections of the reach. This means that the distributions for these parameters should include data from both the cross-section surveys and the longitudinal profile and in the case of ER, visual estimates. For example, the typical longitudinal profile permits sampling of the BHR at riffles beyond those subject to cross-sections and therefore can be readily integrated and provide a

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Newtown - EEP# 94150 - Underwood Creek: 1273 feet

	Cross Section 1 (Pool) [New for MY-01]							Cross Section 2 (Riffle) [CS-1 in MY-00]							Cross Section 3 (Riffle) [CS-2 in MY-00]						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	N/A	595.25	595.25	595.25	595.25			594.36	594.36	594.36	594.36	594.36			592.56	592.56	592.56	592.56	592.56		
Bankfull Width (ft)	N/A	17.413	17.299	16.20	19.77			15.67	16.138	16.521	16.75	15.27			16.69	19.33	17.186	16.83	17.02		
Floodprone Width (ft)	N/A	205	205	205	205			140	140	140	140	140			225	225	225	225	225		
Bankfull Mean Depth (ft)	N/A	1.8039	1.907	2.06	1.51			1.03	1.135	1.1123	1.06	0.97			1.08	1.0495	1.0893	1.02	1.01		
Bankfull Max Depth (ft)	N/A	3.71	3.84	3.98	3.68			1.74	1.83	1.96	1.84	1.84			1.75	1.89	1.78	1.9	1.99		
Bankfull Cross Sectional Area (ft^2)	N/A	31.411	32.991	33.40	29.86			16.11	18.317	18.375	17.70	14.78			18.10	20.288	18.721	17.16	17.22		
Bankfull Width/Depth Ratio	N/A	9.6532	9.0713	7.86	13.09			15.24	14.219	14.853	15.85	15.77			15.40	18.418	15.776	16.5	16.83		
Bankfull Entrenchment Ratio	N/A	11.773	11.85	12.65	10.37			8.94	8.675	8.4742	8.36	9.17			13.48	11.64	13.092	13.37	13.22		
Bankfull Bank Height Ratio	N/A	1	0.9948	0.93	0.71			1.00	1.0109	0.9337	1.02	1.03			1.00	0.9788	0.9551	0.97	0.91		
Cross Sectional Area between end pins (ft^2)	N/A	82.74	83.888	88.73	80.53			39.17	40.67	41.371	37.31	38.63			33.48	36.13	36.238	34.73	35.83		
d50 (mm)	N/A	N/A	N/A	N/A	N/A			Silt	6	3.8	11.2	6.4			Silt	8	0.1	8.3	1.3		

	Cross Section 4 (Pool) [New for MY-01]							Cross Section 5 (Riffle) [CS-3 in MY-00]						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	N/A	591.25	591.25	591.25	591.25			590.75	590.75	590.75	590.75	590.75		
Bankfull Width (ft)	N/A	22.775	21.831	23.88	24.3			15.27	15.112	26.461	16.19	16.29		
Floodprone Width (ft)	N/A	180	180	180	180			110	110	110	110	110		
Bankfull Mean Depth (ft)	N/A	1.4849	1.5317	1.41	1.29			1.04	1.1567	0.7441	1.25	1.05		
Bankfull Max Depth (ft)	N/A	3.43	3.31	3.36	3.54			1.66	2.06	2.1	2.53	2.33		
Bankfull Cross Sectional Area (ft^2)	N/A	33.817	33.438	33.57	31.4			15.88	17.48	19.69	20.27	17.16		
Bankfull Width/Depth Ratio	N/A	15.338	14.253	16.99	18.81			14.69	13.064	35.562	12.93	15.47		
Bankfull Entrenchment Ratio	N/A	7.9035	8.2451	7.54	7.41			7.20	7.2792	4.157	6.79	6.75		
Bankfull Bank Height Ratio	N/A	0.9796	1.0211	0.97	0.76			1.00	1.0049	0.981	0.955	0.87		
Cross Sectional Area between end pins (ft^2)	N/A	65.07	68.305	68.55	74.5			34.16	35.758	38.127	37.96	37.59		
d50 (mm)	N/A	N/A	N/A	N/A	N/A			Silt	5	8	6.5	5		

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Newtown - EEP# 94150 - UT to Underwood Creek: 3000 feet

	Cross Section 1 (Riffle) [CS-1 in MY-00]							Cross Section 2 (Pool) [New for MY-01]							Cross Section 3 (Riffle) [CS-2 in MY-00]							Cross Section 4 (Pool) [New for MY-01]							Cross Section 5 (Riffle) [CS-3 in MY-00]						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	609.86	609.86	609.86	609.78	609.86			N/A	607.92	607.92	607.92	607.92			604.51	604.51	604.51	604.51	604.51			N/A	603.49	603.49	603.49	603.49			601.91	601.91	601.91	601.91	601.91		
Bankfull Width (ft)	12.32	12.178	12.61	11.99	14.51			N/A	18.494	34.618	24.13	18.62			16.52	17.166	11.9	13.67	14.21			N/A	17.52	16.64	13.89	15.38			13.99	14.24	14.296	14.93	13.67		
Floodprone Width (ft)	280	280	280	280	280			N/A	190	190	190	190			245	245	245	245	245			N/A	190	190	190	190			230	230	230	230	230		
Bankfull Mean Depth (ft)	1.06	1.081	0.9935	1.04	1.06			N/A	1.6452	0.9243	1.3	1.53			0.81	0.7683	1.0941	0.85	0.87			N/A	1.4147	1.4996	1.3	1.45			0.97	0.9392	0.944	0.81	0.89		
Bankfull Max Depth (ft)	1.98	2	2.01	1.94	2.09			N/A	3.38	3.32	3.45	3.43			1.72	1.65	1.92	2.12	2.14			N/A	2.76	2.81	2.98	2.96			1.58	1.54	1.66	1.71	1.78		
Bankfull Cross Sectional Area (ft^2)	13.06	13.165	12.527	12.5	15.32			N/A	30.427	31.997	31.42	28.51			13.38	13.188	13.02	11.64	12.43			N/A	24.786	24.954	18.13	22.37			13.61	13.375	13.494	12.05	12.23		
Bankfull Width/Depth Ratio	11.63	11.266	12.693	11.5	13.75			N/A	11.241	37.455	18.53	12.16			20.38	22.343	10.876	16.05	16.25			N/A	12.384	11.096	10.65	10.57			14.37	15.162	15.144	18.51	15.27		
Bankfull Entrenchment Ratio	22.72	22.992	22.205	23.35	19.29			N/A	10.273	5.4884	7.87	10.21			14.83	14.273	20.588	17.92	17.24			N/A	10.845	11.418	13.68	12.36			16.45	16.151	16.089	15.4	16.83		
Bankfull Bank Height Ratio	0.98	0.955	1.0597	1	0.66			N/A	1	0.991	0.97	0.73			0.94	0.96	0.9688	1	0.92			N/A	0.9891	0.9858	0.97	0.69			1.00	1.0065	0.9819	0.99	0.69		
Cross Sectional Area between end pins (ft^2)	57.18	57.058	59.344	54.42	57.64			N/A	43.244	44.07	44.07	42.16			31.77	30.81	30.788	36.31	28.11			N/A	37.442	37.49	32.5	35.72			24.19	24.079	24.707	24.62	22.49		
d50 (mm)	5.60	1.5	8.6	4.7	5.7			N/A	N/A	N/A	N/A	N/A			Silt	0.10	0.1	0.3	0.4			N/A	N/A	N/A	N/A	N/A			Silt	0.3	0.1	0.8	0.8		
	Cross Section 6 (Riffle) [CS-4 in MY-00]							**Cross Section 7 (Pool) [New for MY-01]**							**Cross Section 8 (Riffle) [CS-5 in MY-00]**							**Cross Section 9 (Riffle) [CS-6 in MY-00]**							**Cross Section 10 (Riffle-NOT in Monitoring Reach) [CS-7 in MY-00]**						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	598.86	598.86	598.86	598.86	598.86	598.86		N/A	597.79	597.79	597.79	597.79			596.67	596.67	596.67	596.67	596.67			594.85	594.85	594.85	594.85	594.73			592.00	592	592	592	592		
Bankfull Width (ft)	13.42	12.377	11.711	13.38	13.73			N/A	17.5	18.081	17.67	20.71			12.71	10.964	9.973	12.49	11.9			13.62	13.47	13.632	13.53	13.15			15.26	17.861	14.791	14.31	14.69		
Floodprone Width (ft)	115	115	115	115	115			N/A	180	180	180	180			110	110	110	110	110			95	95	95	95	95			135	135	135	135	135		
Bankfull Mean Depth (ft)	0.96	0.9507	0.881	1.04	0.97			N/A	1.5352	1.5321	1.55	1.18			0.91	0.8815	0.7223	0.87	0.99			0.94	0.9006	0.8657	0.84	0.82			1.00	0.8591	0.898	0.89	0.93		
Bankfull Max Depth (ft)	1.50	1.38	1.62	1.7	1.95			N/A	3.08	3.25	3.38	3.27			1.61	1.44	1.32	1.67	2.06			1.46	1.4	1.58	1.59	1.55			1.61	1.72	1.5	1.69	1.73		
Bankfull Cross Sectional Area (ft^2)	12.92	11.767	10.318	13.94	13.35			N/A	26.866	27.702	27.39	24.52			11.59	9.6643	7.2034	10.9	11.75			12.80	12.131	11.801	11.43	10.75			15.22	15.345	13.283	12.71	13.7		
Bankfull Width/Depth Ratio	13.93	13.018	13.293	12.84	14.11			N/A	11.399	11.801	11.4	17.49			13.95	12.439	13.808	14.31	12.06			14.50	14.956	15.748	16.02	16.08			15.31	20.789	16.471	16.11	15.76		
Bankfull Entrenchment Ratio	8.57	9.2916	9.8196	8.6	8.38			N/A	10.286	9.9555	10.19	8.69			8.65	10.033	11.03	8.81	9.24			6.97	7.0527	6.9689	7.02	7.23			8.84	7.5583	9.127	9.43	9.19		
Bankfull Bank Height Ratio	1.00	1.087	1.1975	1.03	1.01			N/A	0.9773	0.9477	1.05	1			1.00	1.125	1.2576	1.08	0.88			0.95	0.9429	1.038	1.01	0.66			0.98	0.9244	1.02	0.98	0.66		
Cross Sectional Area between end pins (ft^2)	43.35	36.169	33.323	38.48	38.82			N/A	43.075	44.027	39.66	41.02			46.57	38.063	34.766	32.28	36.81			31.80	30.431	28.766	30	31.34			25.97	24.768	25	24.08	22.23		
d50 (mm)	Silt	0.1	0.1	0.7	1.3			N/A	N/A	N/A	N/A	N/A			Silt	4.4	1.4	1.8	1.7			Silt	2	7.4	4.6	6.4			Silt	4.8	0.7	9.7	0.4		

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Newtown - EEP# 94150 - Underwood Creek: 1273 feet

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	15.27	15.88	15.67	16.69	0.734	3	15.11	16.86	16.14	19.33	2.2	3	16.52	20.06	17.19	26.46	5.557	3	16.19	16.59	16.75	16.83	0.35	3	15.27	16.19	16.29	17.021	0.88	3						
Floodprone Width (ft)	110	158.3	140	225	59.65	3	110	158.3	140	225	59.65	3	110	158.3	140	225	59.65	3	110	158.3	140	225	59.65	3	110	158.3	140	225	59.65	3						
Bankfull Mean Depth (ft)	1.028	1.049	1.035	1.084	0.031	3	1.05	1.114	1.135	1.157	0.057	3	0.744	0.982	1.089	1.112	0.206	3	1.02	1.11	1.06	1.25	0.12	3	0.9681	1.011	1.011	1.0533	0.043	3						
[1]Bankfull Max Depth (ft)	1.66	1.717	1.74	1.75	0.049	3	1.83	1.927	1.89	2.06	0.119	3	1.78	1.947	1.96	2.1	0.16	3	1.84	2.09	1.9	2.53	0.39	3	1.843	2.053	1.988	2.327	0.248	3						
Bankfull Cross Sectional Area (ft^2)	15.81	16.67	16.11	18.1	1.246	3	17.48	18.7	18.32	20.29	1.441	3	18.38	18.93	18.72	19.69	0.681	3	17.16	18.38	17.7	20.27	1.66	3	14.783	16.39	17.16	17.216	1.389	3						
Width/Depth Ratio	14.76	15.13	15.24	15.4	0.334	3	13.06	15.23	14.22	18.42	2.817	3	14.85	22.06	15.78	35.56	11.7	3	12.93	15.1	15.85	16.5	1.9	3	15.469	16.02	15.77	16.829	0.714	3						
Entrenchment Ratio	7.203	9.872	8.936	13.48	3.241	3	7.279	9.198	8.675	11.64	2.227	3	4.157	8.574	8.474	13.09	4.468	3	6.79	9.51	8.36	13.37	3.43	3	6.7515	9.713	9.168	13.219	3.268	3						
[1]Bank Height Ratio	1	1	1	1	0	3	0.979	0.998	1.005	1.011	0.017	3	0.934	0.957	0.955	0.981	0.024	3	0.950	0.980	0.970	1.020	0.030	3	0.8668	0.935	0.907	1.0309	0.085	3						
Profile																																				
Riffle Length (ft)	7.36	20.81	20.51	31.54	5.577	22	8.58	21.4	19.56	35.95	6.111	22	7.34	22.88	22.73	38.3	7.234	21	8.09	19.46739	18.64	34.57	6.742777	23	6.91	19.04	17.44	35.26	6.02	22						
Riffle Slope (ft/ft)	0.0034	0.0132	0.0135	0.0285	0.0054	22	0.0004	0.0112	0.0100	0.0284	0.0068	22	0.0005	0.0095	0.0101	0.0349	0.0075	21	0.00459	0.014253	0.01208	0.03393	0.00754	23	0.0024	0.0125	0.0129	0.0283	0.0079	19						
Pool Length (ft)	17.45	34.81	34.92	52.82	7.611	24	18.27	34.33	32.87	50.34	7.214	24	11.35	33.02	33.11	46.16	7.173	24	23.11	35.23042	34.185	53.41	7.629916	24	19.24	36.14	34.59	58.6	9.77	24						
Pool Max depth (ft)	2.76	3.402	3.43	4.04	0.374	24	2.91	3.515	3.515	3.94	0.251	24	2.95	5.68	3.72	52.99	10.08	24	2.86	3.604167	3.57	4.21	0.366368	24	3.06	3.55	3.55	4.1	0.26	24						
Pool Spacing (ft)	31.47	55.97	54.57	78.46	10.48	22	37.01	57.45	55.8	92.83	13.99	23	33.03	56.57	53.37	92.77	13.48	22	35.5	57.02826	53.96	90.26	13.98921	23	29.85	56.12	55.29	85.61	11.98	22						
Pattern																																				
Channel Beltwidth (ft)	34		53	86																																
Radius of Curvature (ft)	26		41	59																																
Rc:Bankfull width (ft/ft)	0.016		0.026	0.037																																
Meander Wavelength (ft)	82		112	130																																
Meander Width Ratio	2.1		3.3	5.4																																
Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4						C4						C4											
Channel Thalweg length (ft)	1331						1331						1331						1331						1331											
Sinuosity (ft)	1.3						1.3						1.3						1.3						1.3											
Water Surface Slope (Channel) (ft/ft)	0.0048						0.00485						0.00418						0.0048						0.0051											
BF slope (ft/ft)	0.0048						0.00522						0.00550						0.0047						0.0051											
[3]Ri% / Ru% / P% / G% / S%	24%		43%		2%		36%		64%		2%		38%		62%				**34%**		**64%**		**0%**		**33%**		**67%**									
[3]SC% / Sa% / G% / C% / B% / Be%													41%	8%	51%	0%	0%	0%	**7%**	**20%**	**71%**	**2%**	**0%**	**0%**	**9%**	**34%**	**55%**	**2%**	**0%**	**0%**						
[3]d16 / d35 / d50 / d84 / d95 /													0.085	0.394	3.954	16.91	30.22		**1.12**	**5.23**	**8.66**	**18.13**	**39.67**		**0.29**	**1.6**	**4.24**	**19.24**	**32.22**							
[2]% of Reach with Eroding Banks	0						3%						0%						0%						0%											
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Newtown - EEP# 94150 - UT to Underwood Creek: 3000 feet

Parameter	Baseline*						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	12.32	13.98	13.62	16.516	1.465	7	10.96	13.4	12.92	17.17	2.162	6	9.973	12.35	12.26	14.3	1.533	6	11.99	13.33	13.46	14.93	1.02	6	11.904	13.5286	13.6964	14.51	0.926	6						
Floodprone Width (ft)	95	172.9	135	280	76.1	7	95	179.2	172.5	280	81.33	6	95	179.2	172.5	280	81.33	6	95	179.2	172.5	280	81.33	6	95	179.167	172.5	280	81.33	6						
Bankfull Mean Depth (ft)	0.81	0.951	0.963	1.0596	0.077	7	0.768	0.92	0.92	1.081	0.102	6	0.722	0.917	0.912	1.094	0.126	6	0.81	0.91	0.86	1.04	0.1	6	0.81756	0.93371	0.93377	1.055	0.087	6						
[1]Bankfull Max Depth (ft)	1.46	1.637	1.61	1.98	0.173	7	1.38	1.568	1.49	2	0.234	6	1.32	1.685	1.64	2.01	0.249	6	1.59	1.79	1.71	2.12	0.2	6	1.545	1.9275	2.0005	2.141	0.226	6						
Bankfull Cross Sectional Area (ft^2)	11.59	13.22	13.06	15.215	1.089	7	9.664	12.22	12.65	13.38	1.408	6	7.203	11.39	12.16	13.49	2.334	6	10.9	12.08	11.85	13.94	1.06	6	10.7473	12.6385	12.333	15.32	1.567	6						
Width/Depth Ratio	11.63	14.87	14.37	20.383	2.683	7	11.27	14.86	13.99	22.34	3.956	6	10.88	13.59	13.55	15.75	1.754	6	11.5	14.87	15.16	18.5	2.52	6	12.061	14.5876	14.6919	16.25	1.598	6						
Entrenchment Ratio	6.973	12.44	8.845	22.723	5.768	7	7.053	13.3	12.15	22.99	5.81	6	6.969	14.45	13.56	22.2	6.158	6	7.02	13.52	12.1	23.35	6.45	6	7.22682	13.0335	13.0348	19.29	5.31	6						
[1]Bank Height Ratio	0.942	0.979	0.985	1	0.025	7	0.943	1.012	0.982	1.125	0.077	6	0.969	1.084	1.049	1.258	0.118	6	0.99	1.02	1.01	1.08	0.03	6	0.65761	0.80141	0.78228	1.008	0.152	6						
Profile																																				
Riffle Length (ft)	9.19	16.29	15.51	34.04	4.46	64	6.49	15.28	13.94	47.85	6.63	64	4	17.06	16.56	36.16	4.884	64	6.84	15.21	15.21	24.78	4.64	64	4.11	14.74	14.49	43.65	6.17	63						
Riffle Slope (ft/ft)	0.0008	0.0175	0.0156	0.0556	0.0110	60	0.0017	0.0178	0.0170	0.0586	0.0116	58	0.0014	0.0174	0.0147	0.0673	0.0132	51	0.0017	0.0197	0.0166	0.0607	0.0130	59	0.0007	0.0194	0.0195	0.048	0.01	51						
Pool Length (ft)	19.68	30.25	28.74	51.91	7.748	65	16.33	31.91	29.53	55.66	8.318	64	18.59	30.18	28.3	58.78	8.982	64	19.09	13.35	28.89	57.33	8.09	64	15.37	32.08	30.48	59.18	8.8	66						
Pool Max depth (ft)	2.42	2.965	2.92	3.68	0.275	65	2.6	3.274	3.167	12.61	1.218	64	0.38	2.99	2.94	4.57	0.50	64	1.63	3.05	2.95	12.09	1.28	64	1.8	3.05	3.11	4.37	0.54	66						
Pool Spacing (ft)	31.79	46.17	44.57	80.51	9.696	63	24.26	46.85	45.8	85.42	11.44	62	29.23	47.1	43.69	81.57	11.35	62	26.16	47.11	43.59	131.26	15.35	63	27.75	46.37	43.94	74.35	10.72	64						
Pattern																																				
Channel Beltwidth (ft)	30		46	76																																
Radius of Curvature (ft)	23		36	52																																
Rc:Bankfull width (ft/ft)	0.016		0.026	0.037																																
Meander Wavelength (ft)	72		98	113																																
Meander Width Ratio	2.1		3.3	5.4																																

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4						C4						C-4											
Channel Thalweg length (ft)	4100*						3000						3000						3000						3000											
Sinuosity (ft)	1.3						1.3						1.3						1.3						1.3											
Water Surface Slope (Channel) (ft/ft)	0.0048						0.00529						0.00492						0.0045						0.0051											
BF slope (ft/ft)	0.0048						0.00528						0.00512						0.005						0.0051											
[3]Ri% / Ru% / P% / G% / S%	34%		64%		1%		33%		67%				36%		64%				33%		67%				31%		69%									
[3]SC% / Sa% / G% / C% / B% / Be%													59%	7%	34%	0%	0%	0%	11%	59%	29%	0%	0%		15%	39%	44%	1%	0%	0%						
[3]d16 / d35 / d50 / d84 / d95 /													0.297	0.964	2.952	7.462	12.12		0.41	0.81	2.14	8.27	15.35		0.05	1.3	2.72	15.79	40.28							
[2]% of Reach with Eroding Banks	0						0						0%						0%						0%											
Channel Stability or Habitat Metric																																				
Biological or Other																																				

* - The Baseline calculations were performed for the entire restoration length and includes Cross Section 10 (CS-7 in MY-00) which is not in the monitoring Reach for UT to Underwood Creek

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

4. = Of value/needed only if the n exceeds 3

Appendix E. Hydrologic Data

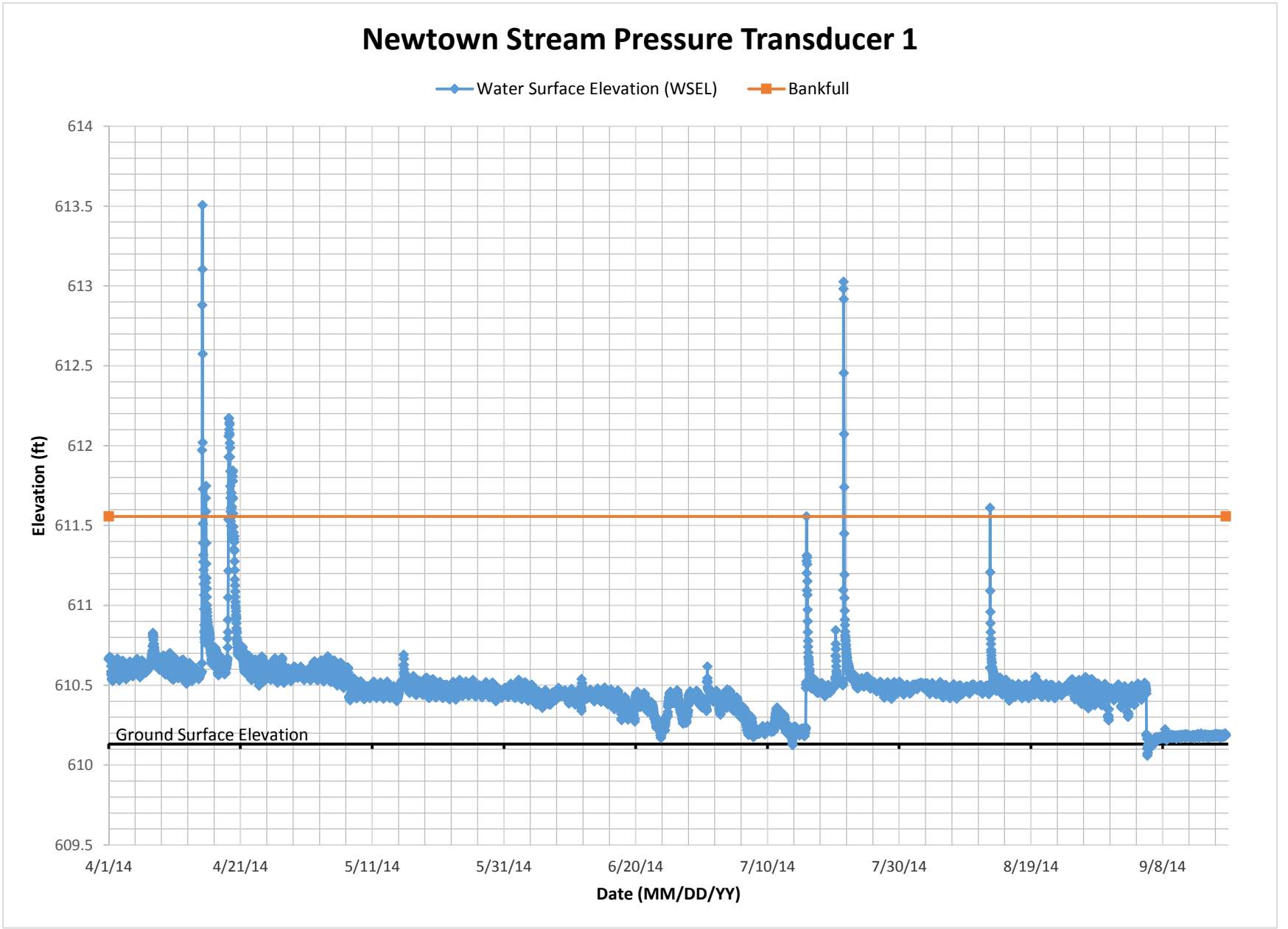
Table 12. Verification of Bankfull Events			
Newtown - EEP# 94150			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo Number**
25-Oct-11	N/A	Site Visit observing visible wrack lines	MY-01 29-30
23-Aug-13	30-June-13	Gauge data	N/A
23-Aug-13	07-July-13	Gauge data	N/A
09-Oct-13	21-Sept-13	Gauge data	N/A
9-Sept-14	15-April-14	Transducer data	N/A
9-Sept-14	19-April-14	Transducer data	N/A
9-Sept-14	20-April-14	Transducer data	N/A
9-Sept-14	15-July-14	Transducer data	N/A
9-Sept-14	21-July-14	Transducer data	N/A
9-Sept-14	12-August-14	Transducer data	N/A

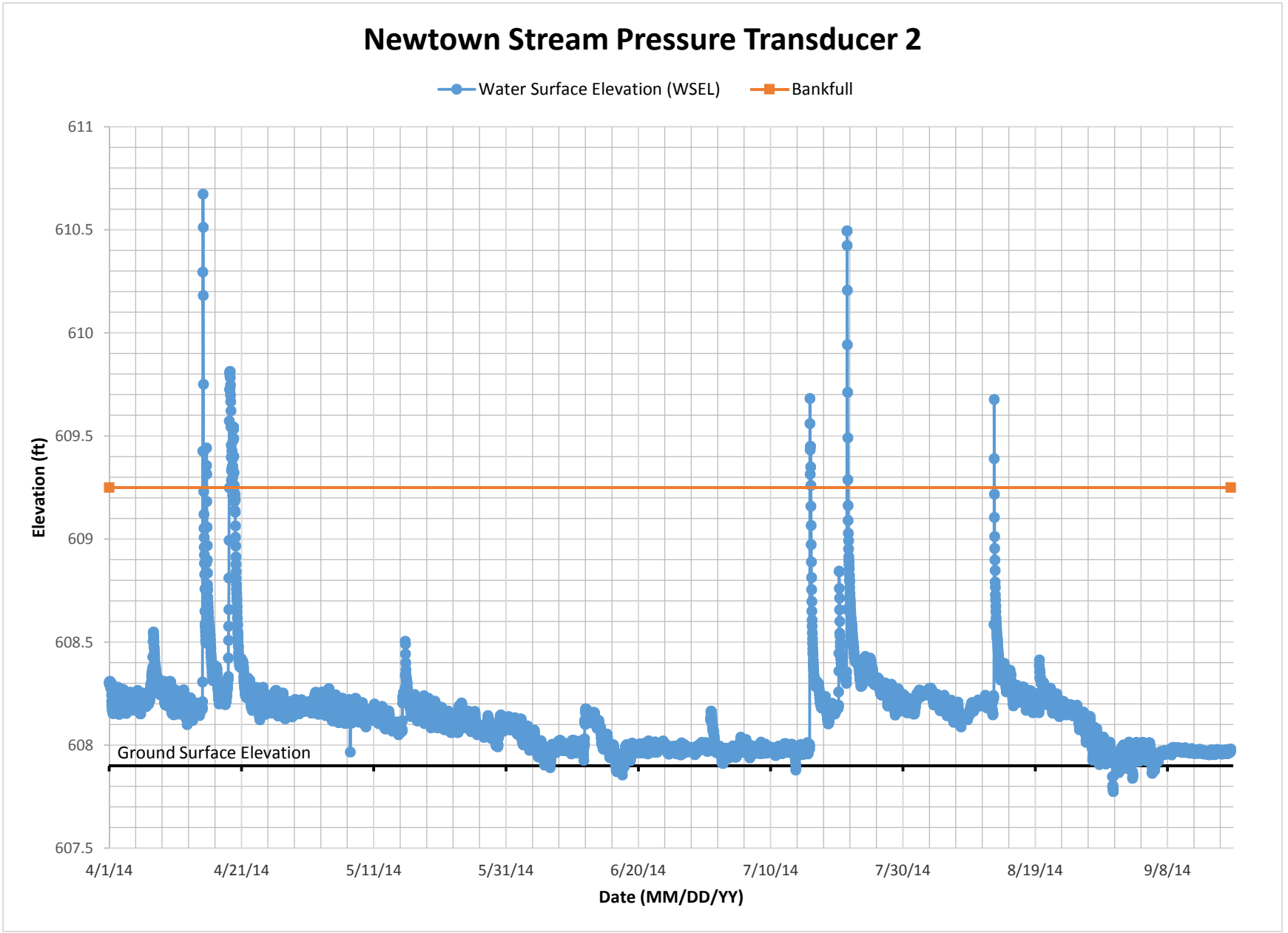
Table 13. Wetland Criteria Attainment 2010-2014

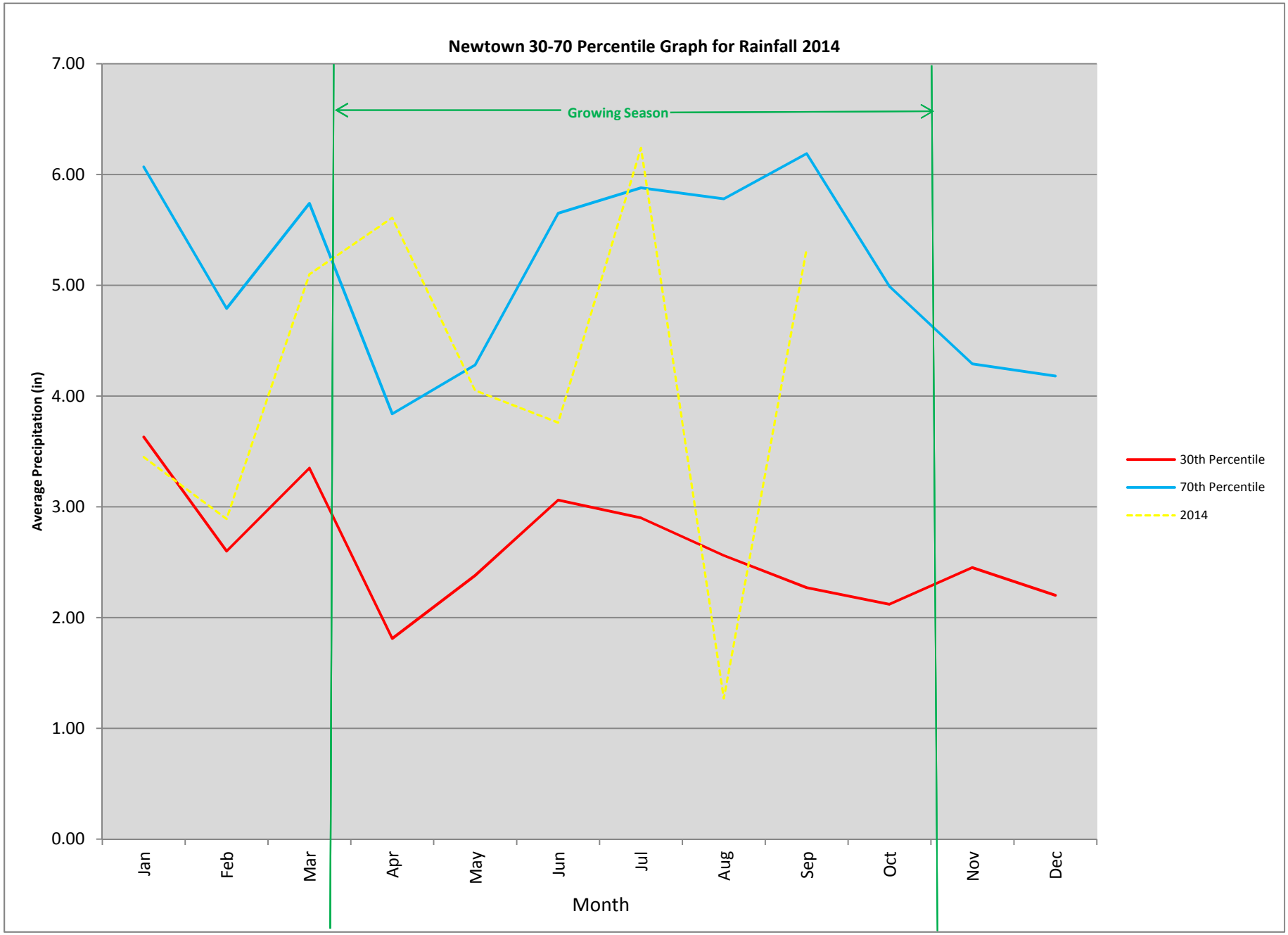
	MY-01 (2011)			MY-02 (2012)			MY-03 (2013)			MY-04 (2014)		
Gauge #	**Max # Consecutive Days**	**% Growing Season**	**Success Criteria Attained**	**Max # Consecutive Days**	**% Growing Season**	**Success Criteria Attained**	**Max # Consecutive Days**	**% Growing Season**	**Success Criteria Attained**	**Max # Consecutive Days**	**% Growing Season**	**Success Criteria Attained**
1	59[a]	26	Yes	79	35	Yes	168	74	Yes	46[i]	20	Yes
2	198[b]	87	Yes	228	100	Yes	228	100	Yes	166[j]	73	Yes
3	198[b]	87	Yes	228	100	Yes	228	100	Yes	166[j]	73	Yes
4	77[c]	34	Yes	75[f]	33	Yes	228	100	Yes	113[j]	50	Yes
5	92[b]	40	Yes	105[g]	46	Yes	179	79	Yes	113[j]	50	Yes
6	111[b]	49	Yes	228	100	Yes	228	100	Yes	106[k]	46	Yes
7	27[d]	12	Yes	64	28	Yes	228	100	Yes	59[l]	26	Yes
8	7[e]	3	**No**	5	2	**No**	22[h]	10	Yes	14[j]	6	Yes
9	~	~	~	~	~	~	~	~	~	0[m]	0	**No**
10	~	~	~	~	~	~	~	~	~	49[m]	21	Yes
11	~	~	~	~	~	~	~	~	~	49[m]	21	Yes

a – Gauge installed April 23, 2011 –197 days of growing season monitored
b – Gauge installed April 22, 2011 –198 days of growing season monitored
c – Gauge installed February 20, 2010; Data missing due to gauge failure - 217 days of growing season monitored
d – Gauge installed May 24, 2011 – 166 days of growing season monitored
e – Gauge installed August 13, 2011 –85 days of growing season monitored
f – Data missing due to gauge failure; new gauge installed March 26, 2012; 224 days of growing season monitored
g – Data missing due to gauge failure; 184 days of growing season monitored
h – Data missing due to gauge failure; 149 days of growing season monitored
i – Report sent before growing season end; Data missing due to gauge failure; 105 days of growing season monitored
j – Report sent before growing season end; 166 days of growing season monitored
k – Report sent before growing season end; Data missing due to gauge failure; 106 days of growing season monitored
l – Report sent before growing season end; Data missing due to gauge failure; new gauge installed September 5, 2014; 59 days of growing season monitored
m – Report sent before growing season end; Gauge installed April 3, 2014 –155 days of growing season monitored

Growing Season: March 23 to November 6 (source: http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=nc)

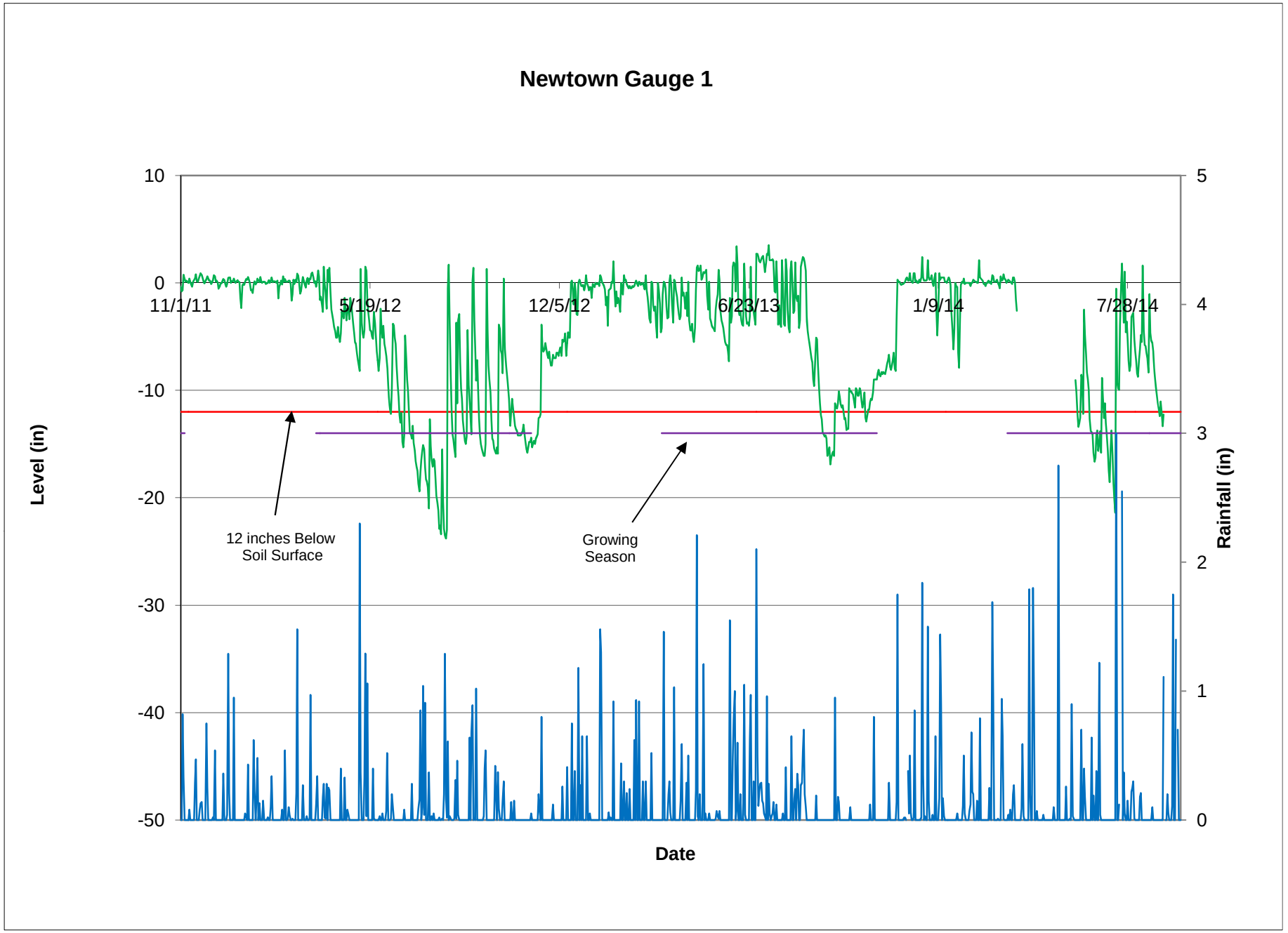

Newtown Stream Pressure Transducer 1
Water Surface Elevation (WSEL)
Bankfull
Ground Surface Elevation
Elevation (ft)
614
613.5
613
612.5
612
611.5
611
610.5
610
609.5
4/1/14
4/21/14
5/11/14
5/31/14
6/20/14
7/10/14
7/30/14
8/19/14
9/8/14
Date (MM/DD/YY)


Newtown Stream Pressure Transducer 2
Water Surface Elevation (WSEL)
Bankfull
611
610.5
610
609.5
609
608.5
608
607.5
Elevation (ft)
Ground Surface Elevation
4/1/14
4/21/14
5/11/14
5/31/14
6/20/14
7/10/14
7/30/14
8/19/14
9/8/14
Date (MM/DD/YY)



Growing Season: March 23 to November 6 (228 days)
(http://www.wcc.nrcs.usda.gov/cgibin/sate.pl?state=nc)

2011-2014 Rain Data: Station KCLT
(http://www.nc-climate.ncsu.edu/services/request.php)



Growing Season: March 23 to November 6 (228 days)
(http://www.wcc.nrcs.usda.gov/cgibin/sate.pl?state=nc)

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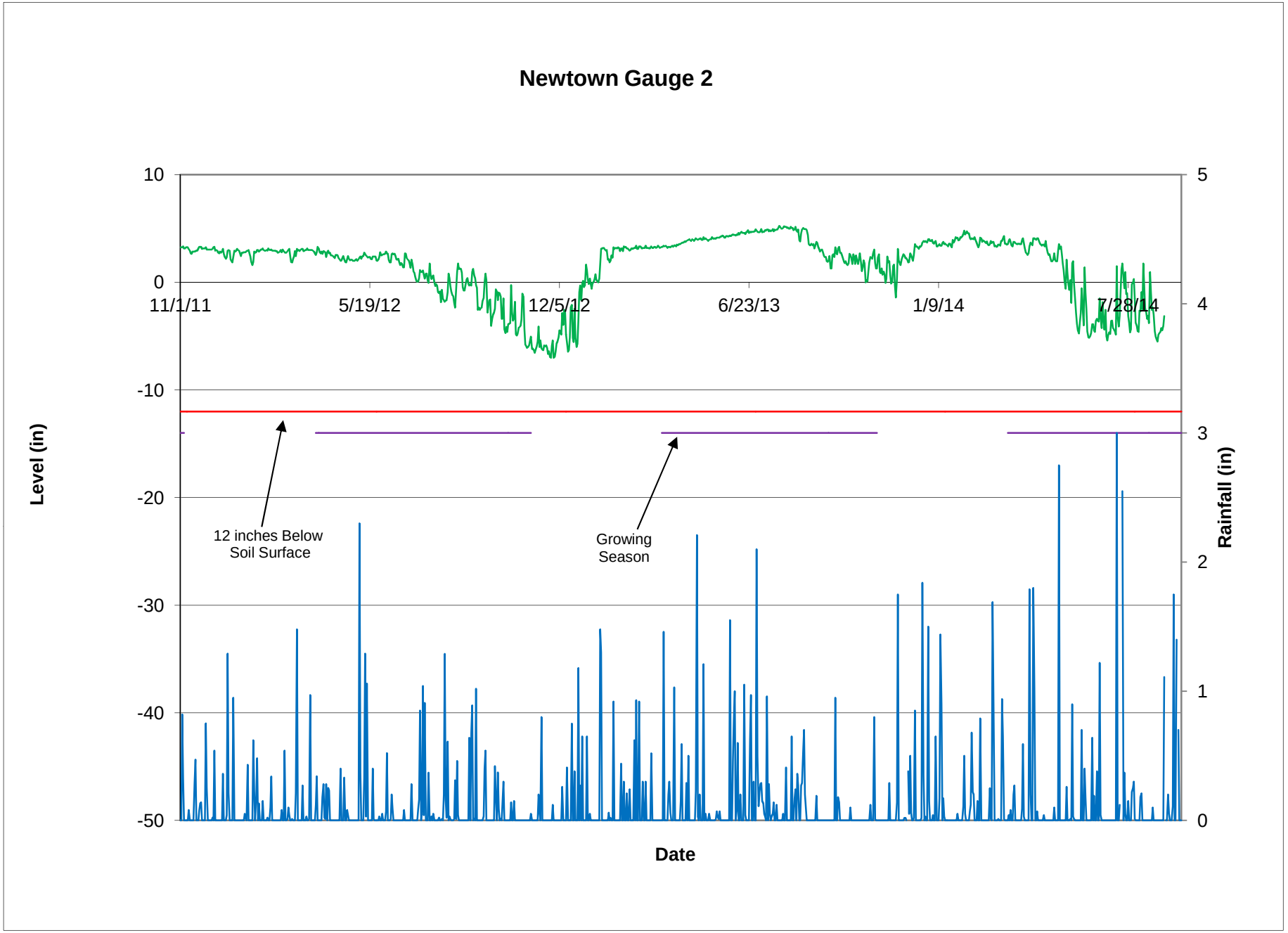

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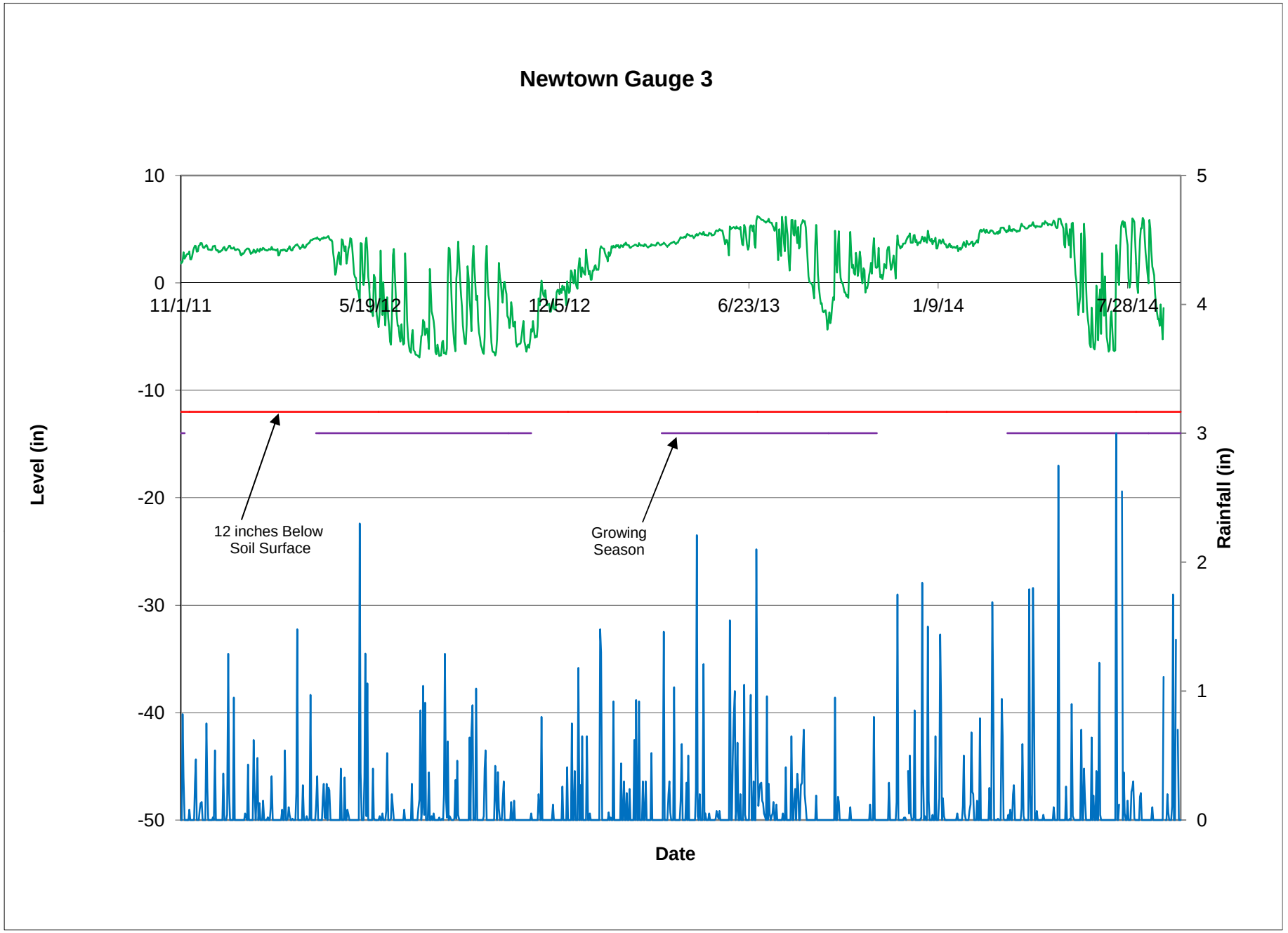

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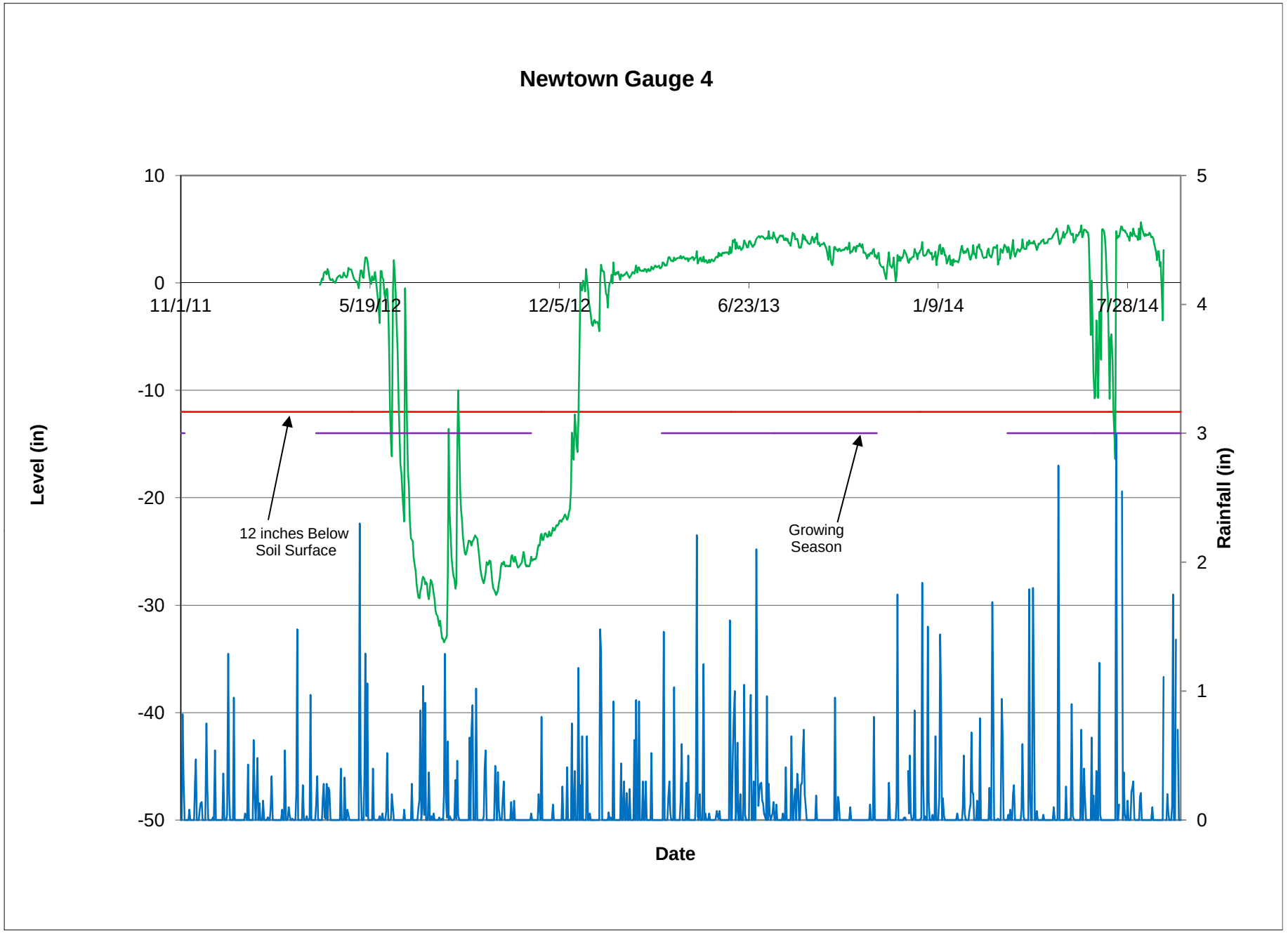

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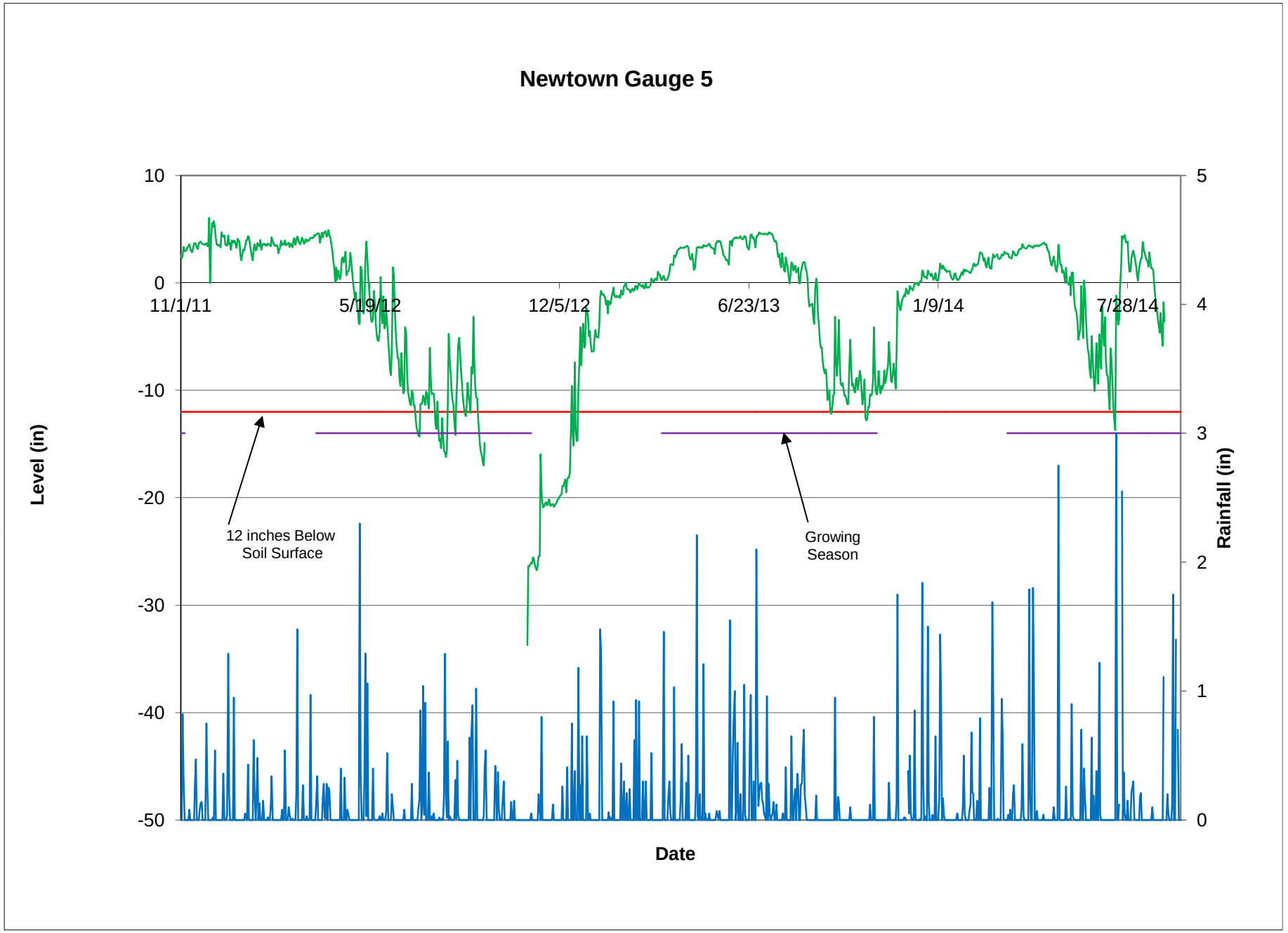

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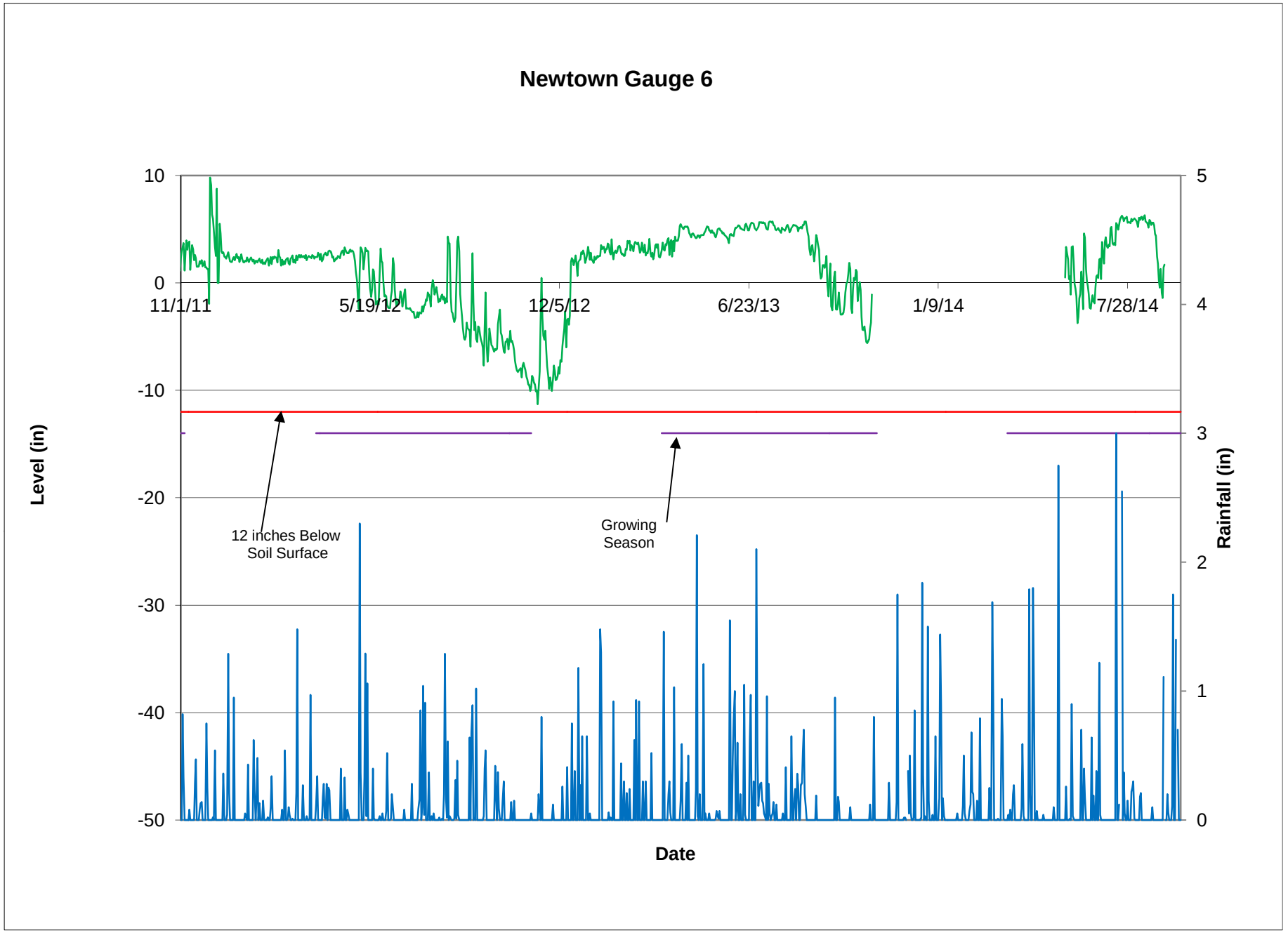

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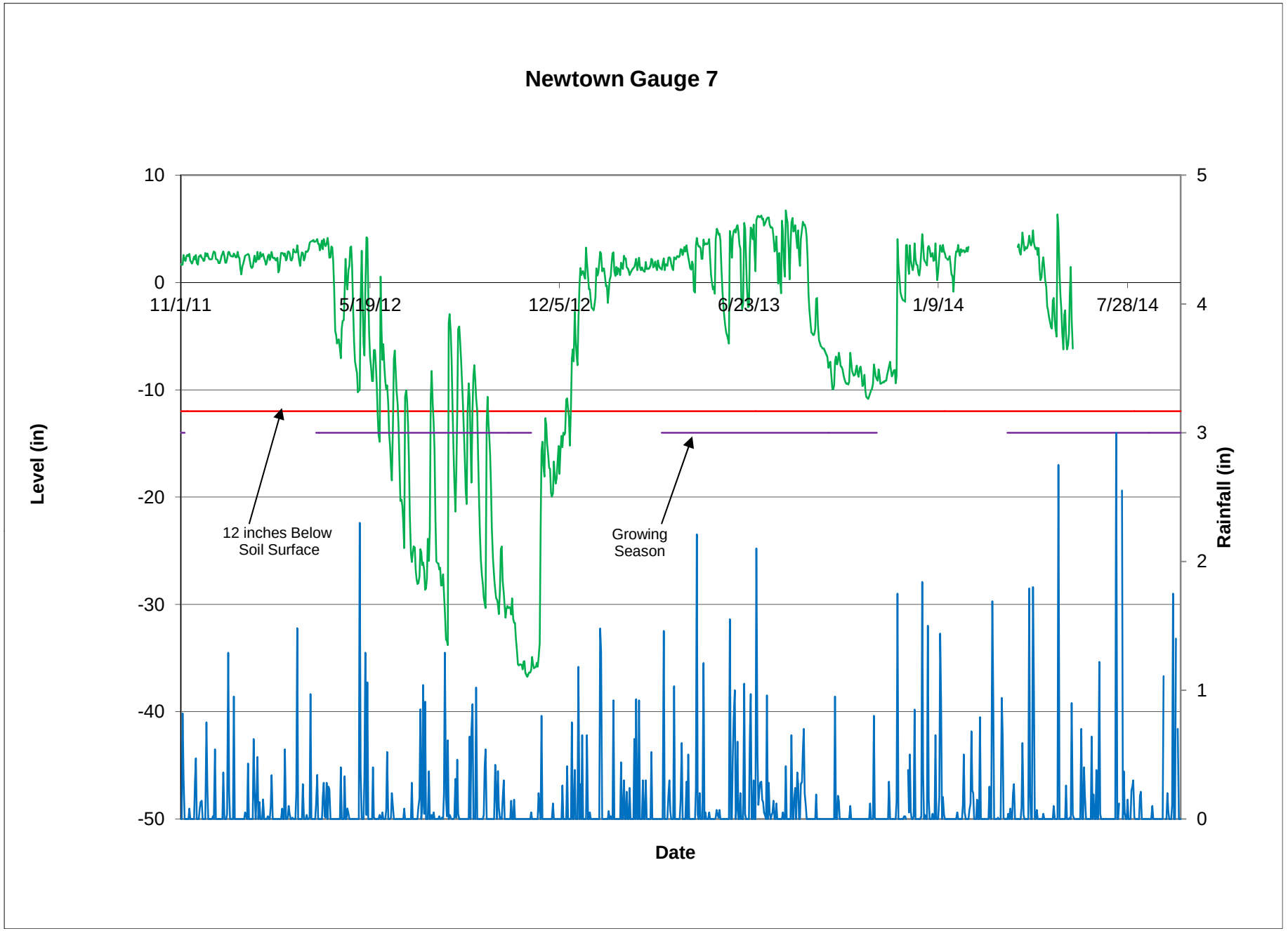

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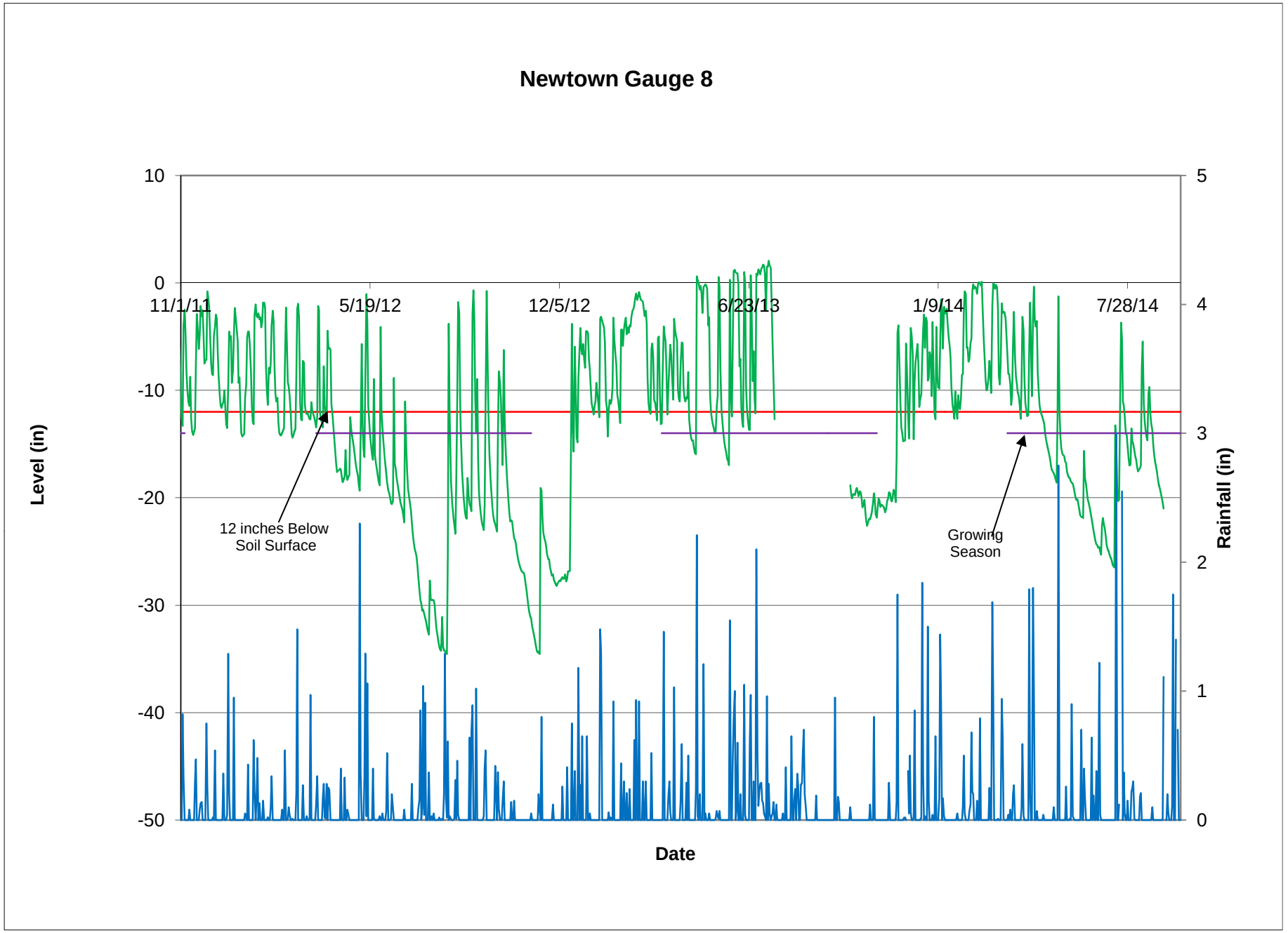

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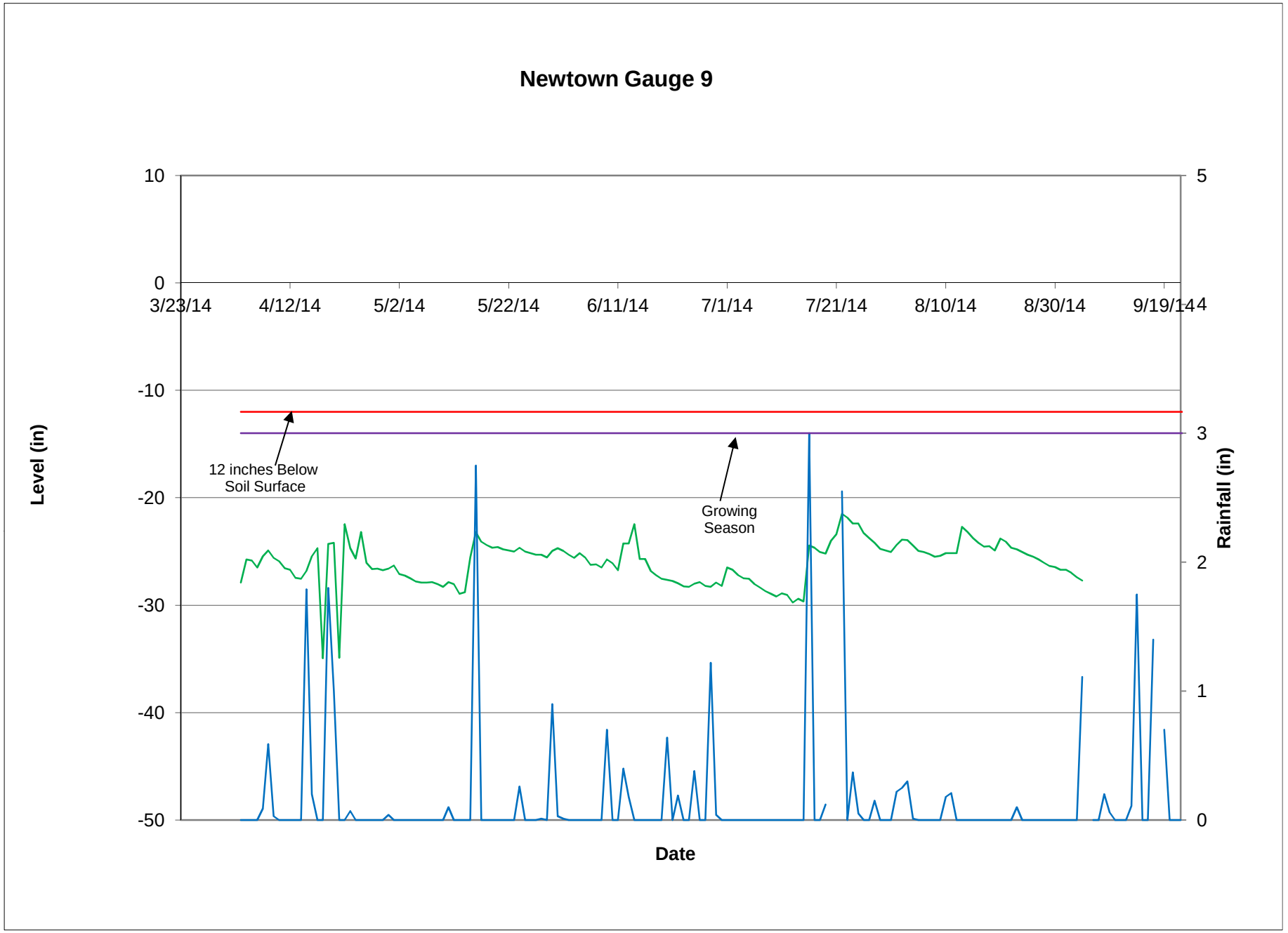

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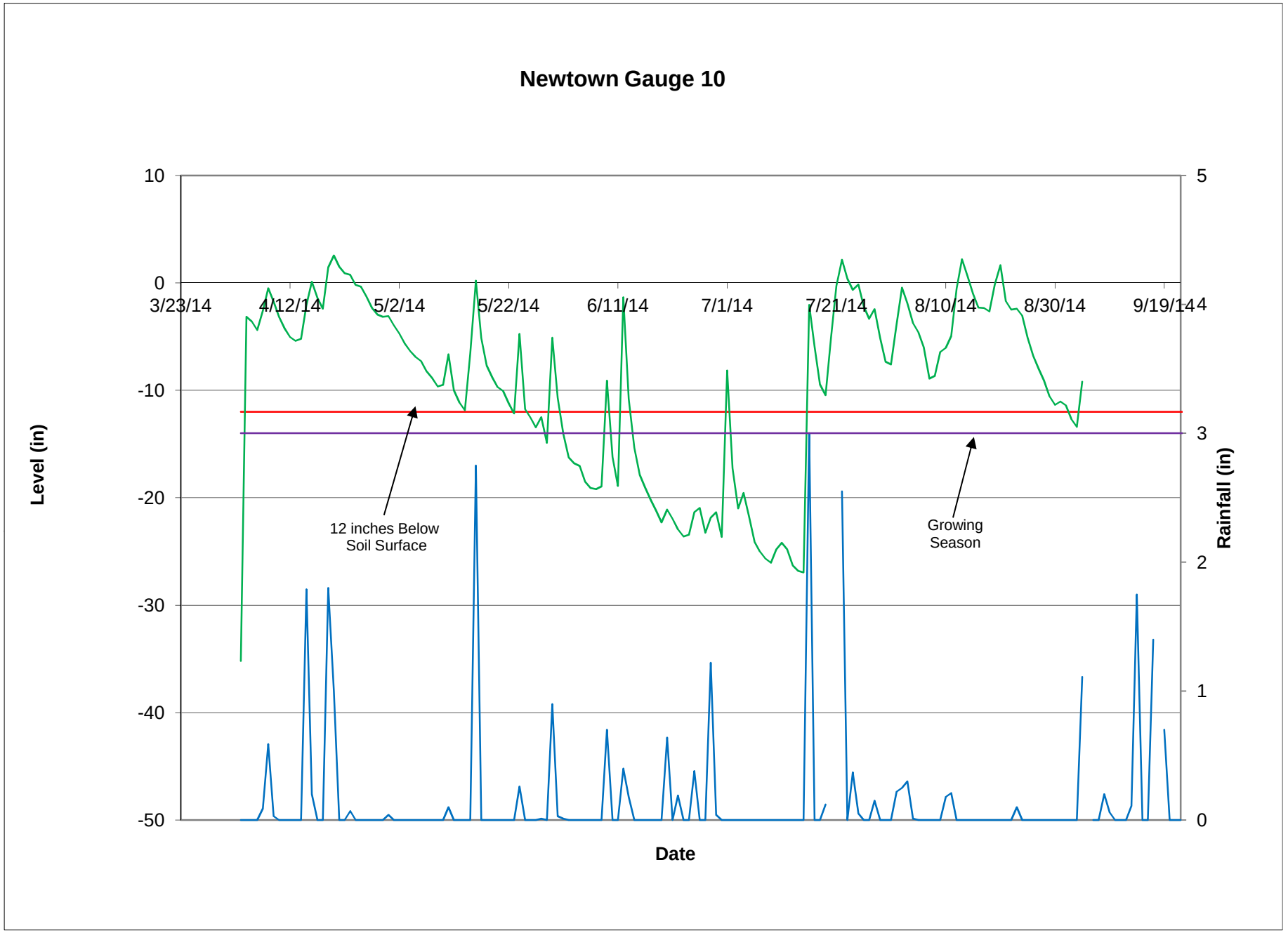

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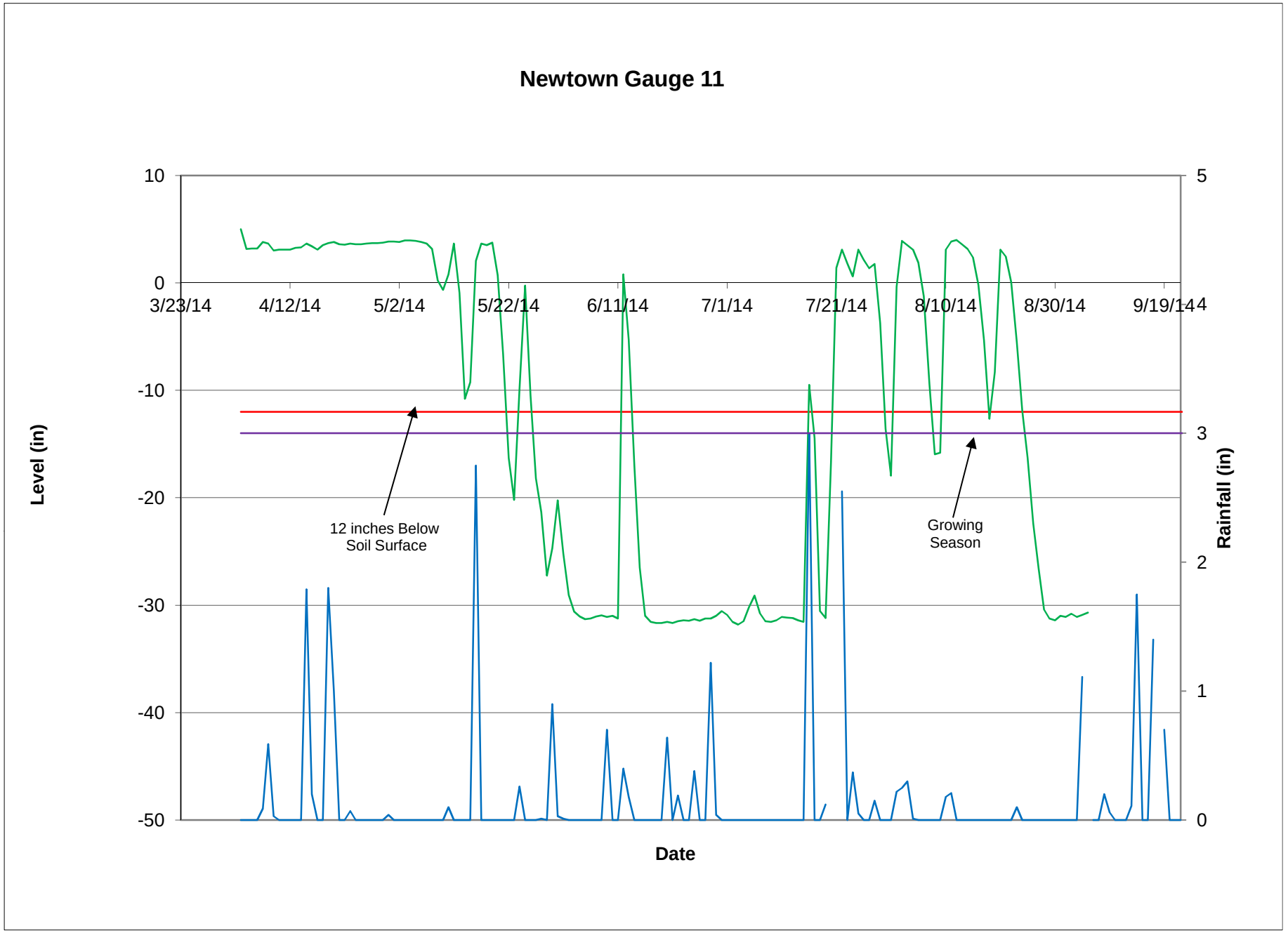

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