# Newtown Stream and Wetland Restoration Project

## Union County, North Carolina

### EEP Project #94150

## MY-01 Monitoring Report - Final

Data Collected: October 2011
Submitted: February 2012

Prepared for:
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Ecosystem Enhancement Program
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**APPENDICES**

# 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 1273 and 4075 feet, respectively, for a total project length of 5348 feet (Figure 1). The project included restoration of 3.38 acres of riparian wetland and wetland preservation of 0.15 acres. 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 4690 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 I of Version 4.2 of the CVS-EEP vegetation monitoring protocol which accounts only for planted stems. Counting only planted stems and excluding livestakes, there are 538 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, stem counts for plot 6 were low having 242 stems/acre. The vegetation problem areas consist of the area with low stem density in the vicinity of plot 6 and some areas of invasive exotic plants. Invasive exotics observed throughout the conservation easement include princess tree (*Pawlonia tomentosa*), Japanese stiltgrass (*Microstegium vimineum*), Chinese privet (*Ligustrum sinense*), and Johnson grass (*Sorghum halapense*). Although these species have been given different ranks of severity, the functionality of the project is not expected to be impaired significantly. It is likely that all of these species were present in and adjacent to the conservation easement prior to construction.

Eight (8) RDS groundwater monitoring gauges are located throughout the riparian wetlands within the conservation easement. There are a total of 3.38 acres of riparian wetland restoration and 0.15 acres of wetland preservation. According to the wetland groundwater gauges on site for MY-01, all groundwater gauges met wetland hydrology criteria (Table 13).

Additional cross sections were added during the data collection in October 2011 for future monitoring purposes. Data for the new pool sections will be collected in monitoring years 1, 3, and 5 or as deemed necessary by monitoring personnel. The existing cross sections, established for the baseline monitoring conditions, have been renumbered to alleviate confusion and inconsistent numbering throughout the two monitoring reaches. The new cross sections were added in pool locations to provide additional assessment criteria. The following table is a comparison of base line and MY-01 cross section numbers.

| Underwood Creek | | |
|---|---|---|
| Station | MY-01 Cross Section Number | Baseline Cross Section Number |
| 8+13 | CS 1 - Pool | N/A |
| 9+54 | CS 2 - Riffle | CS 1 |
| 13+36 | CS 3 - Riffle | CS 2 |
| 16+19 | CS 4 - Pool | N/A |
| 17+13 | CS 5 - Riffle | CS 3 |

| Underwood Creek | | |
|---|---|---|
| Station | MY-01 Cross Section Number | Baseline Cross Section Number |
| 6+40 | CS 1 - Riffle | CS 1 |
| 10+32 | CS 2 - Pool | N/A |
| 14+45 | CS 3 - Riffle | CS 2 |
| 16+30 | CS 4 - Pool | N/A |
| 20+04 | CS 5 - Riffle | CS 3 |
| 26+68 | CS 6 - Riffle | CS 4 |
| 28+82 | CS 7 - Pool | N/A |
| 31+25 | CS 8 - Riffle | CS 5 |
| 35+34 | CS 9 - Riffle | CS 6 |
| 39+90 | CS 10 - Riffle | CS 7 |

The monitoring reach of Underwood Creek is stable with little change to the stream profile. Out of the 22 riffles in this reach segment approximately 35% have lowered in elevation 0.2 to 0.5 feet. The riffle adjustments are due to adjustments to the newly worked soils after construction. These riffles are anticipated to stabilize and return to design grades as they develop with the import of coarser materials from the watershed. The overall profile and slope of the stream is being maintained as designed. Seventy one

percent (71%) of the pools are holding their constructed depth with 25% of the pools deepening and 4% with elevations reflecting filling. A comparison of the data collected in MY-02 as compared to the baseline data shows very little change to pattern or dimension of the riffles and pools. Two new cross sections, 1 and 4, were added in this reach and the existing cross sections have been renumbered. A comparison of the monitoring cross sections 1, 3, and 5, data to the baseline data also reflects the adjustment of the riffle elevations. This drop in elevation was mainly due to the condition of the soils and is expected to stabilize in future monitoring. The lowered thalweg elevations have not caused any instability in the stream toes or banks at these locations. As expected of near post construction pebble counts, all the sample cross sections are trending toward coarser material. The banks on Underwood Creek are stable along the majority of the stream. Lack of vegetation and subsequent riling was evident on the inside point bar of several pools as noted on the current condition plan exhibit. This riling does not compromise the stability of the stream; it is however a source of sediment import into the stream. The point bars for this project were not matted and therefore seed placed during construction had either poor germination or washed away in these areas. Stormwater from the adjacent fields entering the stream has formed the rills. The rills in the point bars are recommended to be filled and the areas seeded and matted. The installed structures are all functioning properly including the grade transition structures installed at the end of the project.

The monitoring reach of UT to Underwood Creek also displays little change to pattern, profile or dimension. Along this 3000 linear monitoring reach 75% of the riffles constructed and non-constructed are holding grade as designed. Twenty five percent (25%) of the earthen riffles are generally showing a decrease in elevation from 0.1 to 1.0 feet. The riffle showing the largest decrease in elevation of 1.0 feet is at station 11+44 and is in a transition area of the stream between two log riffles. The lowering of the riffle in this area is not causing any toe or bank erosion, but will be watched during subsequent monitoring years for evidence of instability. The decreases in elevations in the remaining riffles throughout the rest of the reach are also not creating stability issues or notable erosion problems. The pool depths along this reach are in general holding constructed grades or have deepened slightly since construction. Three new cross sections (2, 4 and 7) at pool locations were added in this reach and the existing cross sections have been renumbered as shown in the table above. The cross section comparisons show little change in geometry and dimension throughout this reach. The lowered thalweg elevations shown in the profile are evident in the cross sections however the adjustment in elevation is predominantly found in the low flow portion of the channel. The adjustments in the riffle elevations are not causing any stream toe or bank stability issues. The pebble counts for UT to Underwood Creek are trending coarser, as expected in the early monitoring phase. No problem areas were noted in the current condition plan view for UT to Underwood Creek. The installed structures are all functioning properly including the grade transition structures installed at the end of the project. The vegetation along the reach is well established and therefore the point bar issues demonstrated on Underwood Creek are not present on this monitoring reach. Cross section 10 (cross section 7 in MY-00) was used for baseline morphological conditions assessment but is no longer used in the statistical calculations for the monitoring reach of UT to Underwood

Creek since it exists outside the limits of the monitoring reach. Data for the cross section will continue to be collected.

The following table addresses the problem areas as discussed in this report and depicted on the current condition plan exhibit, along with their respective proposed remedial actions:

| **Problem Area Inventory Table<br>Newtown Stream and Wetland Restoration-Project No. 94150** | | | |
|---|---|---|---|
| **Stream Problem Areas** | | | |
| **Feature Issue** | **Station Numbers** | **Suspected Cause** | **Proposed Remedial Actions** |
| Bank - Scoured/Eroding | 5+25<br>5+35 | Point bar rill - lack of vegetation and overland flow on inside meander bend (Point bar) | Aerate/rake, lime, fertilize, seed and mat |
| Bank - Scoured/Eroding | 6+25<br>6+28 | Point bar rill - lack of vegetation and overland flow on inside meander bend (Point bar) | Aerate/rake, lime, fertilize, seed and mat |
| Bank - Scoured/Eroding | 9+28<br>9+40 | Point bar rill - lack of vegetation and overland flow on inside meander bend (Point bar) | Aerate/rake, lime, fertilize, seed and mat |
| Bank - Scoured/Eroding | 9+80<br>9+90 | Point bar rill - lack of vegetation and overland flow on inside meander bend (Point bar) | Aerate/rake, lime, fertilize, seed and mat |
| Bank - Scoured/Eroding | 12+40<br>12+60 | Point bar rill - lack of vegetation and overland flow on inside meander bend (Point bar) | Aerate/rake, lime, fertilize, seed and mat |
| Bank - Scoured/Eroding | 12+95<br>13+00 | Point bar rill - lack of vegetation and overland flow on inside meander bend (Point bar) | Aerate/rake, lime, fertilize, seed and mat |
| **Vegetation Problem Areas** | | | |
| **VPA #** | **Station Numbers** | **Suspected Cause** | **Proposed Remedial Actions** |
| 1 | See CCPV | *Chinese Privet* along woodland margin | To be sprayed in February 2012 prior to start of the growing season |
| 2 | See CCPV | *Johnson grass* along Conservation easement boundary | To be sprayed in 2012 before seed head develops taking care not to over spray on planted stems. |
| 3 | See CCPV | *Pawlonia tomentosa* (one stem w blue flagging) | To be cut and sprayed in 2012 |
| 4 | See CCPV | Low Stem Density in Veg Plot 6 | To be replanted in February 2012 |
| 5 | See CCPV | *Microstegium Vimineum* | To be monitored and treated if necessary |

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 formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly 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.

# 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 I of the EEP/CVS protocol Version 4.2 was used to collect data for MY-01. Data collected for these plots are in Appendix C.

## B. Wetland Methodologies

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. 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 State Climate Office and an onsite rain gauge.

## C. Stream Methodologies

Stream profile and cross-sections were surveyed using total station equipment and methods. The survey data was 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.

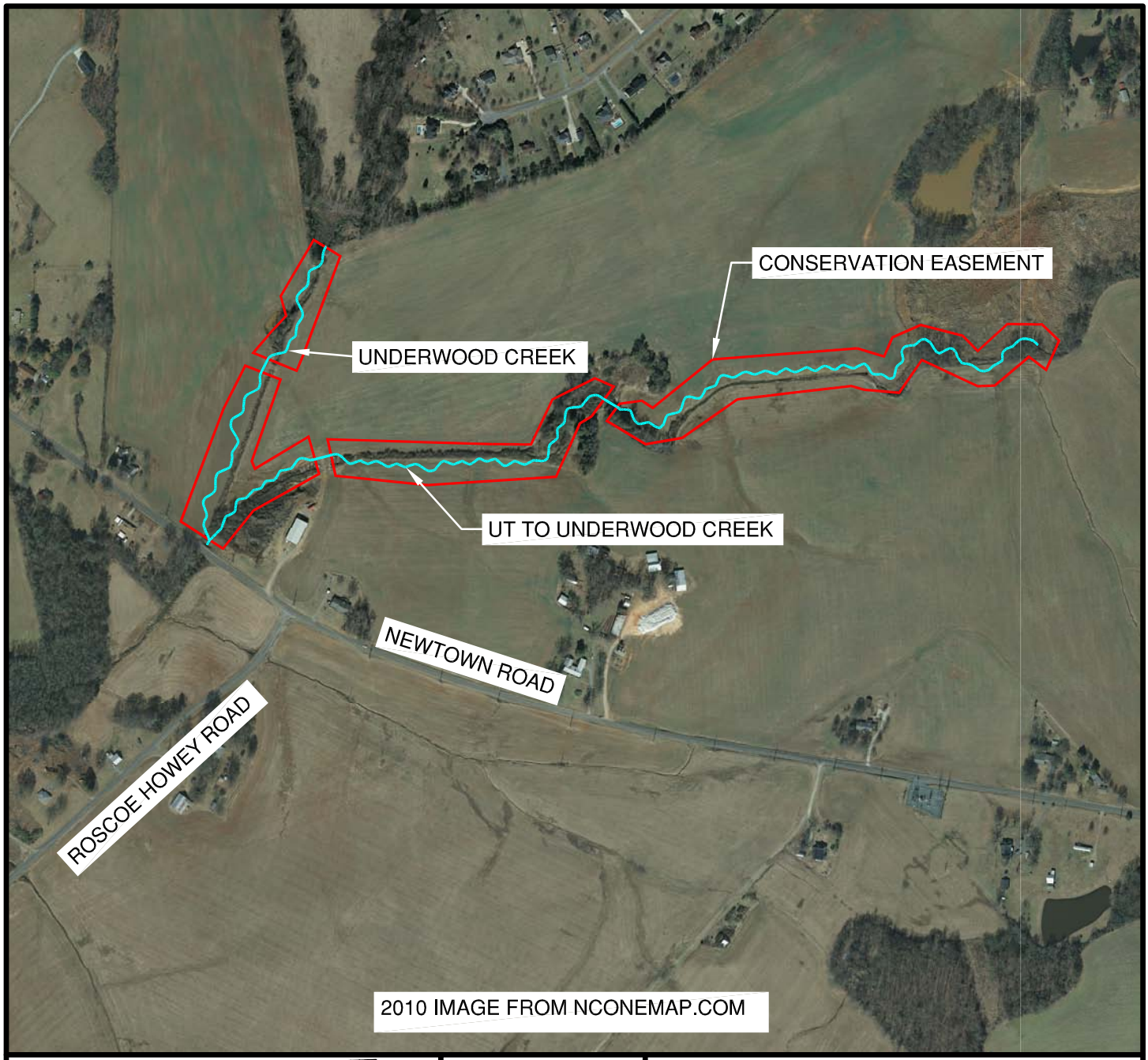
# III. References

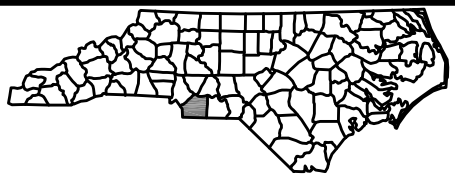

Lee, Michael T. Peet, Robert K. Roberts, Steven D., Wentworth, Thomas R. (2008). *CVS-EEP Protocol for Recording Vegetation Version 4.2.*

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.

# Appendix A. Project Vicinity Map and Background Tables

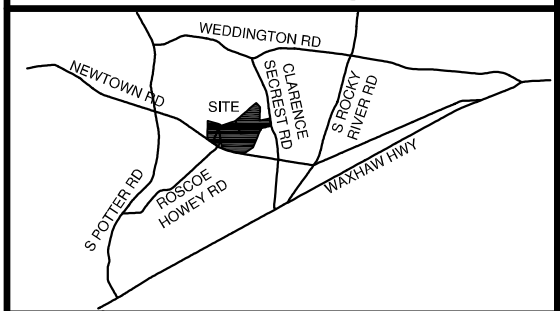


Ecosystem Enhancement PROGRAM

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: NOVEMBER 14, 2011

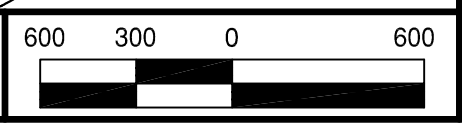





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**Table 1. Project Components**
**Newtown Stream and Wetland Restoration**

| 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 | | |

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 | | | | | | | |
| HQ Preservation | | | | | | | |
| **Totals (Feet/Acres)** | **5348** | **3.38** | | | | | |
| **MU Totals** | **5288** | **3.38** | | | | | |
| | 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 | | |
| Year 3 Monitoring | | |
| Year 4 Monitoring | | |
| 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<br>Newtown Stream and Wetland Restoration | |
|---|---|
| **Designer**<br><br><br>Primary project design POC | Ward Consulting Engineers, P.C.<br>8368 Six Forks Rd, Suite 104<br>Raleigh, NC 27615<br>Becky Ward 919-870-0526 |
| **Construction Contractor**<br><br><br>Construction contractor POC | RFG Construction<br>1907 Cambridge Dr<br>Kinston, NC 28504<br>Robert Grady 252-559-6954 |
| **Survey Contractor**<br><br><br>Survey contractor POC | R.B. Pharr & Associates<br>420 Hawthorne Ln<br>Charlotte, NC 28204<br>Justin Cloninger 704-376-2186 |
| **Planting Contractor**<br><br><br>Planting contractor POC | New Forest Services<br>P.O. Box 255<br>Manistee, MI 49660<br>Brian Jarvinen 910-512-6754 |
| **Seeding Contractor**<br><br><br>Contractor point of contact | RFG Construction<br>1907 Cambridge Dr<br>Kinston, NC 28504<br>Robert Grady 252-559-6954 |
| **Seed Mix Sources** | Evergreen Seed - Fuquay Varina, NC<br>919-567-1333 |
| **Nursery Stock Suppliers** | Arbor Gen - Blenheim, SC - South Carolina<br>SuperTree Nursery<br>800-222-1290 |
| **Monitoring Performers** | Ward Consulting Engineers, P.C.<br>8368 Six Forks Rd, Suite 104<br>Raleigh, NC 27615 |
| Stream Monitoring POC | Zack Pitts 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<br>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 | 15.73 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

**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) | | | | | 100% | | | |
| | | 2. Degradation - Evidence of downcutting | | | | | 100% | | | |
| | **2. Riffle Condition** | 1. Texture/Substrate - Riffle maintains coarser substrate | 18 | 22 | | | 82% | | | |
| | **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 | | | 6 | 65 | 97% | | | 97% |
| | **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. | | | | | 100% | | | 100% |
| | **3. Mass Wasting** | Bank slumping, calving, or collapse | | | | | 100% | | | 100% |
| | | | | **Totals** | 6 | 65 | 97% | 0 | 0 | 97% |
| 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**

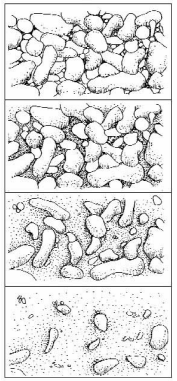
| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | 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) | | | | | 100% | | | |
| | | 2. Degradation - Evidence of downcutting | | | | | 100% | | | |
| | **2. Riffle Condition** | 1. Texture/Substrate - Riffle maintains coarser substrate | 44 | 65 | | | 68% | | | |
| | **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) | 61 | 63 | | | 97% | | | |
| | | | | | | | | | | |
| 2. Bank | **1. Scoured/Eroding** | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | | | 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. | | | | | 100% | | | 100% |
| | **3. Mass Wasting** | Bank slumping, calving, or collapse | | | | | 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<br>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**



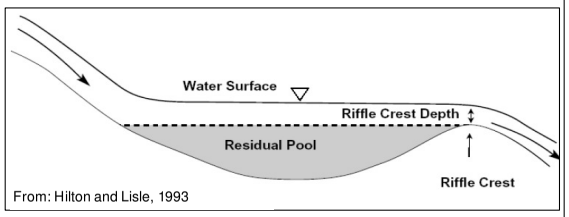
Progressing from top to bottom, the series of graphics to the left depicts the fining of interstial spaces between coarser particles. This describes increasing levels of embededness in riffles. The observer must have an understanding of the intended substrate distributions/texture of the bed for the 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**

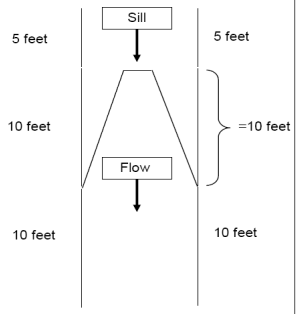
This residual pool table was provided in the event the tracking of bankfull at each pool feature to estimate a Dmax was inconvenient. Estimating the residual pool depth by measuring the max pool depth to water surface and subtracting the water depth at the riffle head may provide a more convenient way 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]** **15.73**

| 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 | 1 | 0.13 | 0.8% |
| | | | **Total** | 1 | 0.13 | 0.8% |
| **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** | 1 | 0.13 | 0.8% |

**Easement Acreage[2]** **14**

| 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). | 1000 SF | Brown Line | 11 | 0.37 | 2.6% |
| | | | | | | |
| **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 brevipeduncu | 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 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

## Vegetation Monitoring Plots Photos

Photo 16. Vegetation Plot 1 (August 11, 2011)

Photo 17. Vegetation Plot 2 (August 11, 2011)

Photo 18. Vegetation Plot 3 (August 11, 2011)

Photo 19. Vegetation Plot 4 (August 11, 2011)

Photo 20. Vegetation Plot 5 (August 11, 2011)

Photo 21. Vegetation Plot 6 (August 11, 2011)

Photo 22. Vegetation Plot 7 (August 11, 2011)

Photo 23. Vegetation Plot 8 (August 11, 2011)

Photo 24. Vegetation Plot 9 (August 11, 2011)

Photo 25. Vegetation Plot 10 (August 11, 2011)

Photo 26. Vegetation Plot 11 (August 11, 2011)

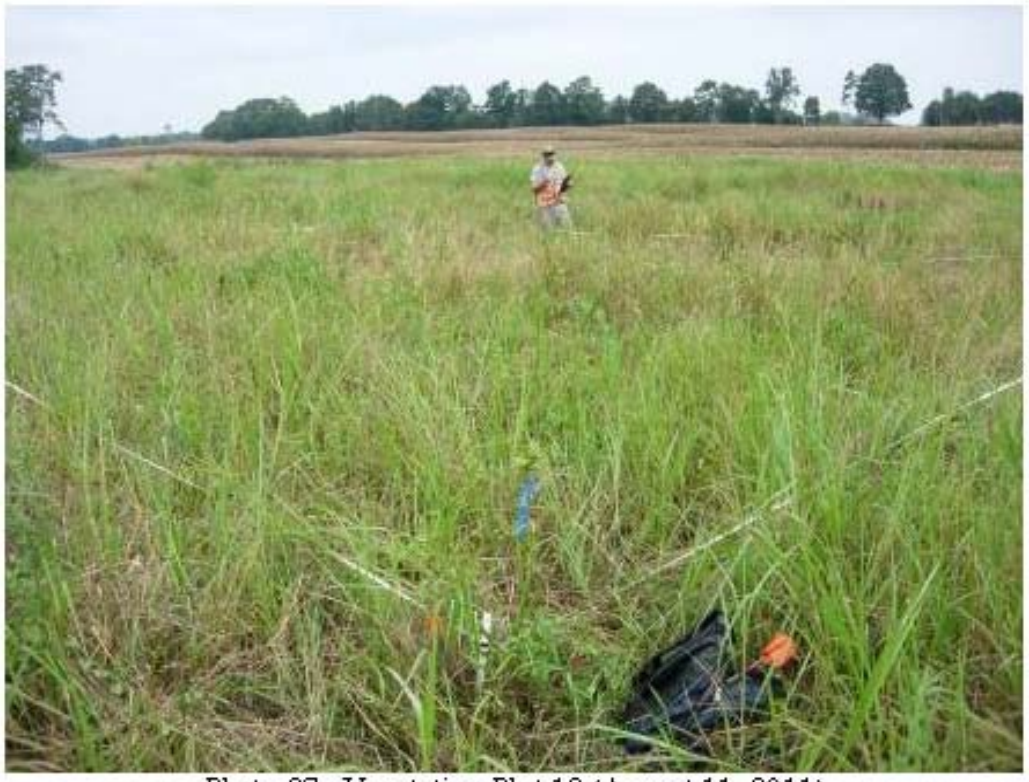


Photo 27. Vegetation Plot 12 (August 11, 2011)

Photo 28. Vegetation Plot 13 (August 11, 2011)

# 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 | Yes | |
| VP5 | Yes | |
| VP6 | No | |
| VP7 | Yes | |
| VP8 | Yes | |
| VP9 | Yes | |
| VP10 | Yes | |
| VP11 | Yes | |
| VP12 | Yes | |
| VP13 | Yes | |

**CVS Metadata**

| | |
|---|---|
| **Report Prepared By** | Chris Sheats |
| **Date Prepared** | 11/1/2011 13:51 |

| | |
|---|---|
| **database name** | TheCatenaGroup-2011-A-Newtownbaseline.mdb |
| **database location** | C:\Documents and Settings\chris\Desktop |
| **computer name** | TOSHIBA-USER |
| **file size** | 39956480 |

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.

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 |

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

Current Plot Data (MY1 2011)

| Scientific Name | Common Name | Species Type | 4143-01-0001 | | | 4143-01-0002 | | | 4143-01-0003 | | | 4143-01-0004 | | | 4143-01-0005 | | | 4143-01-0006 | | | 4143-01-0007 | | | 4143-01-0008 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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 |
| Asimina triloba | pawpaw | Shrub Tree | | | | 1 | 1 | 1 | | | | | | | | | | | | | 6 | 6 | 6 | 7 | 7 | 7 |
| Betula nigra | river birch | Tree | 7 | 7 | 7 | 3 | 3 | 3 | 6 | 6 | 6 | | | | | | | 2 | 2 | 2 | 1 | 1 | 1 | | | |
| Carpinus caroliniana | American hornbeam | Shrub Tree | | | | | | | | | | | | | | | | | | | | | | | | |
| Carpinus caroliniana var. ca | Coastal American Horr | Shrub Tree | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | |
| Carya | hickory | Tree | | | | | | | | | | | | | | | | | | | | | | | | |
| Celtis laevigata | sugarberry | Shrub Tree | | | | | | | | | | 4 | 4 | 4 | | | | | | | | | | | | |
| Cornus amomum | silky dogwood | Shrub | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | |
| Diospyros virginiana | common persimmon | Tree | | | | 2 | 2 | 2 | | | | 2 | 2 | 2 | | | | | | | | | | 1 | 1 | 1 |
| Fraxinus pennsylvanica | green ash | Tree | | | | | | | 2 | 2 | 2 | | | | | | | 2 | 2 | 2 | 3 | 3 | 3 | 1 | 1 | 1 |
| Platanus occidentalis | American sycamore | Tree | | | | 4 | 4 | 4 | | | | 2 | 2 | 2 | | | | | | | | | | | | |
| Platanus occidentalis var. o | Sycamore, Plane-tree | Tree | | | | | | | | | | | | | 16 | 16 | 16 | | | | 1 | 1 | 1 | 2 | 2 | 2 |
| Quercus | oak | Shrub Tree | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | 1 | 1 | 1 | | | | | | |
| Quercus michauxii | swamp chestnut oak | Tree | 6 | 6 | 6 | 7 | 7 | 7 | 5 | 5 | 5 | 3 | 3 | 3 | 1 | 1 | 1 | | | | | | | 1 | 1 | 1 |
| Quercus phellos | willow oak | Tree | | | | | | | 2 | 2 | 2 | | | | 3 | 3 | 3 | | | | 1 | 1 | 1 | | | |
| Unknown | | unknown | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Stem count | 14 | 14 | 14 | 18 | 18 | 18 | 15 | 15 | 15 | 11 | 11 | 11 | 20 | 20 | 20 | 6 | 6 | 6 | 13 | 13 | 13 | 12 | 12 | 12 |
| | | size (ares) | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | |
| | | size (ACRES) | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | |
| | | Species count | 3 | 3 | 3 | 6 | 6 | 6 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 6 | 6 | 6 | 5 | 5 | 5 |
| | | Stems per ACRE | 566.6 | 566.6 | 566.6 | 728.4 | 728.4 | 728.4 | 607 | 607 | 607 | 445.2 | 445.2 | 445.2 | 809.4 | 809.4 | 809.4 | 242.8 | 242.8 | 242.8 | 526.1 | 526.1 | 526.1 | 485.6 | 485.6 | 485.6 |

Current Plot Data (MY1 2011)

| Scientific Name | Common Name | Species Type | 4143-01-0009 | | | 4143-01-0010 | | | 4143-01-0011 | | | 4143-01-0012 | | | 4143-01-0013 | | | Annual Means MY1 (2011) | | | Annual Means MY0 (2011) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 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 |
| Asimina triloba | pawpaw | Shrub Tree | | | | | | | | | | | | | | | | 14 | 14 | 14 | 16 | 16 | 16 |
| Betula nigra | river birch | Tree | | | | | | | | | | | | | 1 | 1 | 1 | 20 | 20 | 20 | 24 | 24 | 24 |
| Carpinus caroliniana | American hornbeam | Shrub Tree | | | | | | | | | | | | | | | | | | | 2 | 2 | 2 |
| Carpinus caroliniana var. ca | Coastal American Horr | Shrub Tree | | | | 1 | 1 | 1 | | | | | | | | | | 2 | 2 | 2 | 6 | 6 | 6 |
| Carya | hickory | Tree | | | | | | | | | | | | | | | | | | | 2 | 2 | 2 |
| Celtis laevigata | sugarberry | Shrub Tree | | | | 1 | 1 | 1 | | | | 2 | 2 | 2 | 2 | 2 | 2 | 9 | 9 | 9 | 5 | 5 | 5 |
| Cornus amomum | silky dogwood | Shrub | | | | | | | 2 | 2 | 2 | | | | 1 | 1 | 1 | 4 | 4 | 4 | 3 | 3 | 3 |
| Diospyros virginiana | common persimmon | Tree | 1 | 1 | 1 | 4 | 4 | 4 | 2 | 2 | 2 | 1 | 1 | 1 | 6 | 6 | 6 | 19 | 19 | 19 | 26 | 26 | 26 |
| Fraxinus pennsylvanica | green ash | Tree | 3 | 3 | 3 | 2 | 2 | 2 | | | | 2 | 2 | 2 | 2 | 2 | 2 | 17 | 17 | 17 | 20 | 20 | 20 |
| Platanus occidentalis | American sycamore | Tree | | | | | | | | | | | | | | | | 6 | 6 | 6 | 7 | 7 | 7 |
| Platanus occidentalis var. o | Sycamore, Plane-tree | Tree | 2 | 2 | 2 | | | | | | | | | | | | | 21 | 21 | 21 | 21 | 21 | 21 |
| Quercus | oak | Shrub Tree | | | | 5 | 5 | 5 | | | | | | | | | | 8 | 8 | 8 | 65 | 65 | 65 |
| Quercus michauxii | swamp chestnut oak | Tree | 5 | 5 | 5 | | | | 3 | 3 | 3 | 9 | 9 | 9 | 1 | 1 | 1 | 41 | 41 | 41 | 1 | 1 | 1 |
| Quercus phellos | willow oak | Tree | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | | | | 2 | 2 | 2 | 12 | 12 | 12 | | | |
| Unknown | | unknown | | | | | | | | | | | | | | | | | | | 10 | 10 | 10 |
| | | Stem count | 13 | 13 | 13 | 14 | 14 | 14 | 8 | 8 | 8 | 14 | 14 | 14 | 15 | 15 | 15 | 173 | 173 | 173 | 208 | 208 | 208 |
| | | size (ares) | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 13 | | | 13 | | |
| | | size (ACRES) | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.32 | | | 0.32 | | |
| | | Species count | 5 | 5 | 5 | 6 | 6 | 6 | 4 | 4 | 4 | 4 | 4 | 4 | 7 | 7 | 7 | 12 | 12 | 12 | 14 | 14 | 14 |
| | | Stems per ACRE | 526.1 | 526.1 | 526.1 | 566.6 | 566.6 | 566.6 | 323.7 | 323.7 | 323.7 | 566.6 | 566.6 | 566.6 | 607 | 607 | 607 | 538.5 | 538.5 | 538.5 | 647.5 | 647.5 | 647.5 |

**Color for Density**

- Exceeds requirements by 10%
- Exceeds requirements, but by less than 10%
- Fails to meet requirements, by less than 10%
- Fails to meet requirements by more than 10%

# Appendix D. Stream Survey Data

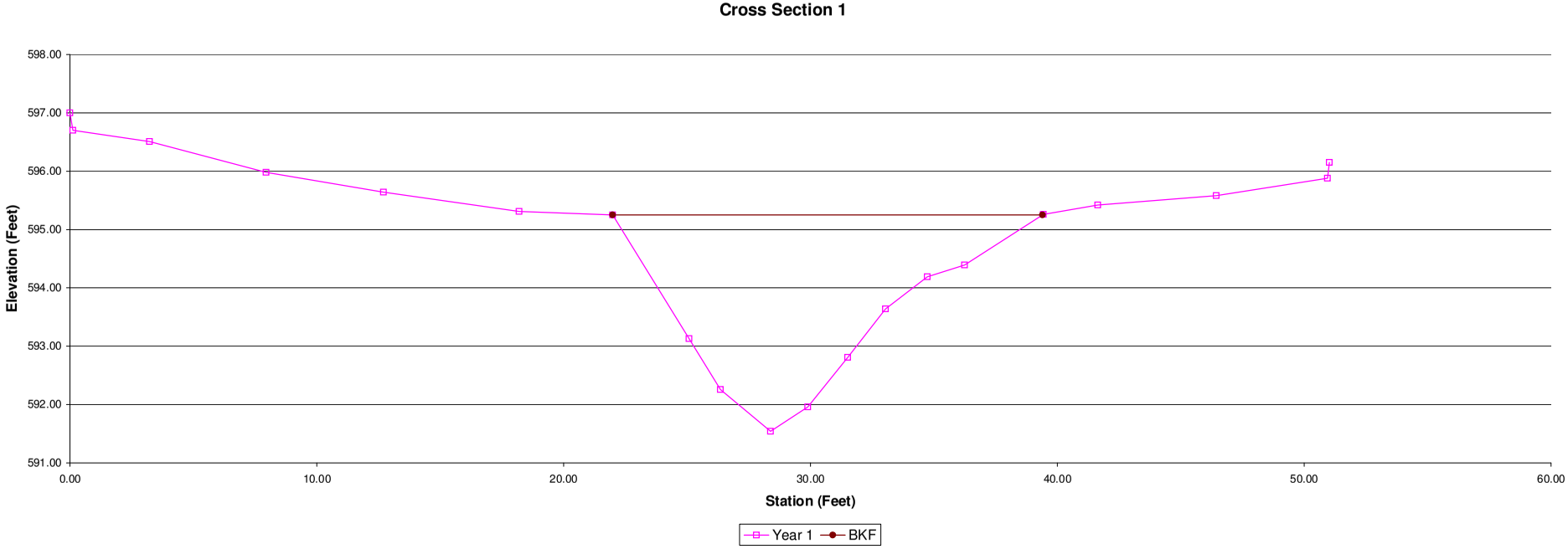
| | |
|---|---|
| Project: | Underwood Creek |
| Cross Section: | Cross Section 1 (New for MY-01) |
| Feature | Pool |
| Station: | 8+13 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | | 31.4 | | | | |
| W (BKF) | | 17.4 | | | | |
| Max d | | 3.7 | | | | |
| Mean d | | 1.8 | | | | |
| W/D | | 9.7 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| | | | 0.00 | 597.00 | LPIN | | | | | | |
| | | | 0.12 | 596.70 | | | | | | | |
| | | | 3.22 | 596.51 | | | | | | | |
| | | | 7.95 | 595.98 | | | | | | | |
| | | | 12.70 | 595.64 | | | | | | | |
| | | | 18.20 | 595.31 | | | | | | | |
| | | | 21.99 | 595.25 | BKF L | | | | | | |
| | | | 25.08 | 593.13 | TOE L | | | | | | |
| | | | 26.35 | 592.26 | | | | | | | |
| | | | 28.38 | 591.54 | TW | | | | | | |
| | | | 29.89 | 591.96 | | | | | | | |
| | | | 31.51 | 592.81 | TOE R | | | | | | |
| | | | 33.04 | 593.64 | | | | | | | |
| | | | 34.73 | 594.19 | | | | | | | |
| | | | 36.24 | 594.39 | | | | | | | |
| | | | 39.44 | 595.26 | BKF R | | | | | | |
| | | | 41.64 | 595.42 | | | | | | | |
| | | | 46.44 | 595.58 | | | | | | | |
| | | | 50.95 | 595.88 | | | | | | | |
| | | | 51.02 | 596.15 | RPIN | | | | | | |


Photo of XS-1, looking in the downstream direction



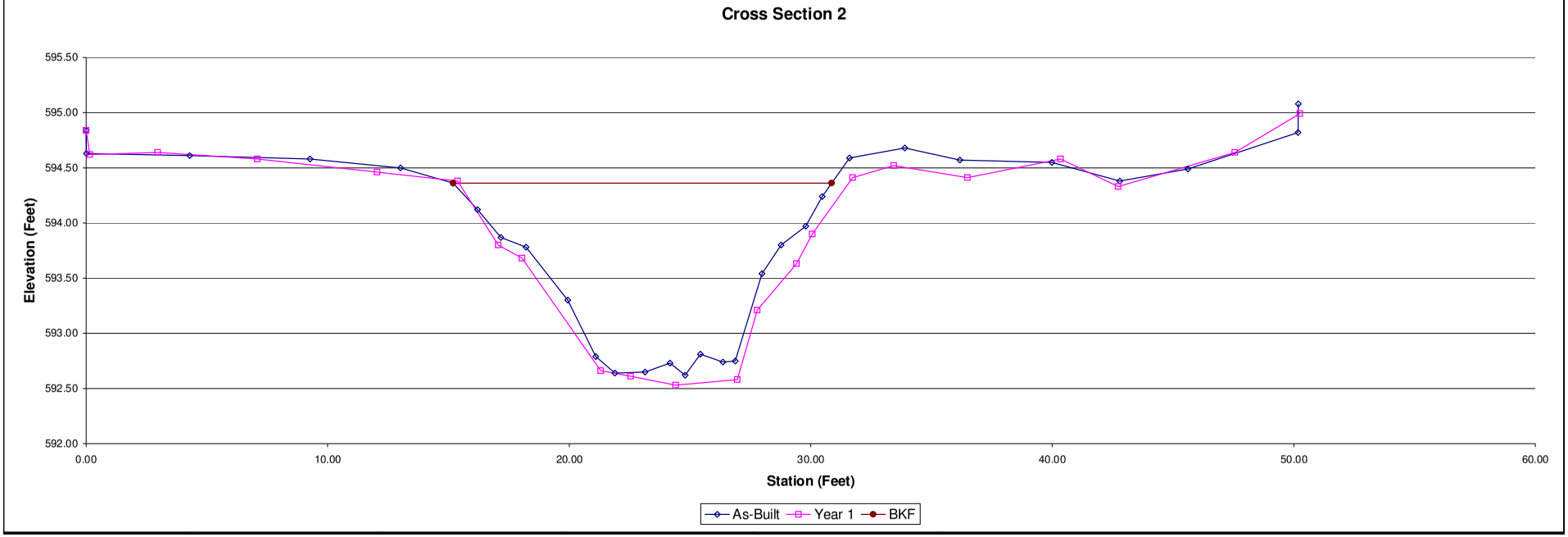
| | |
|---|---|
| Project: | Underwood Creek |
| Cross Section: | Cross Section 2 (CS-1 in MY-00) |
| Feature | Riffle |
| Station: | 9+54 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 16.1 | 18.3 | | | | |
| W (BKF) | 15.7 | 16.1 | | | | |
| Max d | 1.7 | 1.8 | | | | |
| Mean d | 1.0 | 1.1 | | | | |
| W/D | 15.2 | 14.2 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 594.84 | LPIN | 0.00 | 594.84 | LPIN | | | | | | |
| 0.01 | 594.63 | | 0.15 | 594.62 | | | | | | | |
| 4.29 | 594.61 | | 2.96 | 594.64 | | | | | | | |
| 9.27 | 594.58 | | 7.09 | 594.58 | | | | | | | |
| 13.01 | 594.50 | | 12.05 | 594.46 | | | | | | | |
| 15.20 | 594.36 | BKF L | 15.38 | 594.38 | BKF L | | | | | | |
| 16.21 | 594.12 | | 17.06 | 593.80 | | | | | | | |
| 17.17 | 593.87 | | 18.05 | 593.68 | | | | | | | |
| 18.21 | 593.78 | | 21.31 | 592.66 | TOE L | | | | | | |
| 19.94 | 593.30 | | 22.54 | 592.61 | | | | | | | |
| 21.10 | 592.79 | TOE L | 24.41 | 592.53 | TW | | | | | | |
| 21.89 | 592.64 | | 26.96 | 592.58 | TOE R | | | | | | |
| 23.14 | 592.65 | | 27.79 | 593.21 | | | | | | | |
| 24.17 | 592.73 | | 29.41 | 593.63 | | | | | | | |
| 24.80 | 592.62 | TW | 30.07 | 593.90 | | | | | | | |
| 25.43 | 592.81 | | 31.74 | 594.41 | BKF R | | | | | | |
| 26.36 | 592.74 | | 33.44 | 594.52 | | | | | | | |
| 26.87 | 592.75 | TOE R | 36.49 | 594.41 | | | | | | | |
| 27.98 | 593.54 | | 40.34 | 594.58 | | | | | | | |
| 28.77 | 593.80 | | 42.73 | 594.33 | | | | | | | |
| 29.79 | 593.97 | | 47.56 | 594.64 | | | | | | | |
| 30.48 | 594.24 | | 50.25 | 594.99 | RPIN | | | | | | |
| 31.61 | 594.59 | BKF R | | | | | | | | | |
| 33.90 | 594.68 | | | | | | | | | | |
| 36.18 | 594.57 | | | | | | | | | | |
| 39.99 | 594.55 | | | | | | | | | | |
| 42.80 | 594.38 | | | | | | | | | | |
| 45.62 | 594.49 | | | | | | | | | | |
| 50.18 | 594.82 | | | | | | | | | | |
| 50.19 | 595.08 | RPIN | | | | | | | | | |


Photo of XS-2, looking in the downstream direction



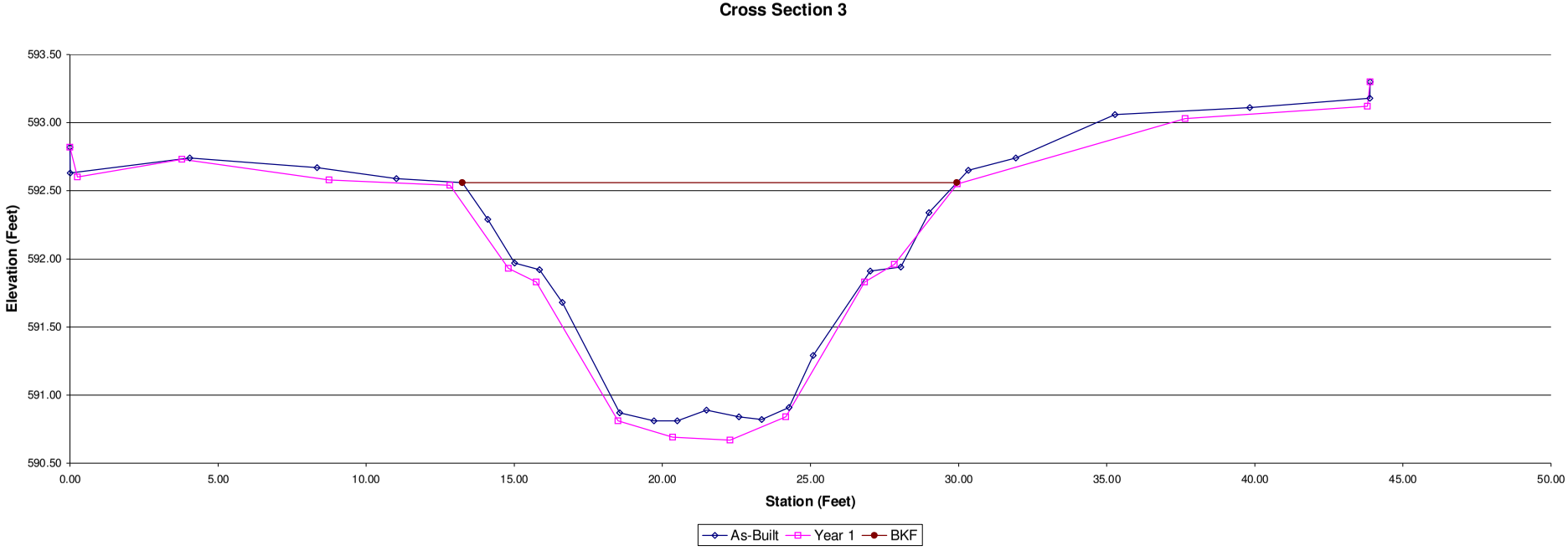
| | |
|---|---|
| Project: | Underwood Creek |
| Cross Section: | Cross Section 3 (CS-2 in MY-00) |
| Feature | Riffle |
| Station: | 13+36 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 18.1 | 20.3 | | | | |
| W (BKF) | 16.7 | 19.3 | | | | |
| Max d | 1.8 | 1.9 | | | | |
| Mean d | 1.1 | 1.0 | | | | |
| W/D | 15.4 | 18.4 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 592.82 | LPIN | 0.00 | 592.82 | LPIN | | | | | | |
| 0.01 | 592.63 | | 0.25 | 592.60 | | | | | | | |
| 4.04 | 592.74 | | 3.78 | 592.73 | | | | | | | |
| 8.34 | 592.67 | | 8.75 | 592.58 | | | | | | | |
| 11.02 | 592.59 | | 12.83 | 592.54 | BKF L | | | | | | |
| 13.25 | 592.56 | BKF L | 14.80 | 591.93 | | | | | | | |
| 14.11 | 592.29 | | 15.74 | 591.83 | | | | | | | |
| 15.01 | 591.97 | | 18.50 | 590.81 | TOE L | | | | | | |
| 15.85 | 591.92 | | 20.35 | 590.69 | TW | | | | | | |
| 16.62 | 591.68 | | 22.29 | 590.67 | | | | | | | |
| 18.56 | 590.87 | TOE L | 24.17 | 590.84 | TOE R | | | | | | |
| 19.72 | 590.81 | | 26.83 | 591.83 | | | | | | | |
| 20.50 | 590.81 | TW | 27.83 | 591.96 | | | | | | | |
| 21.49 | 590.89 | | 29.96 | 592.55 | BKF R | | | | | | |
| 22.58 | 590.84 | | 37.65 | 593.03 | | | | | | | |
| 23.35 | 590.82 | | 43.80 | 593.12 | | | | | | | |
| 24.28 | 590.91 | TOE R | 43.89 | 593.30 | RPIN | | | | | | |
| 25.09 | 591.29 | | | | | | | | | | |
| 27.02 | 591.91 | | | | | | | | | | |
| 28.05 | 591.94 | | | | | | | | | | |
| 29.00 | 592.34 | | | | | | | | | | |
| 30.33 | 592.65 | BKF R | | | | | | | | | |
| 31.93 | 592.74 | | | | | | | | | | |
| 35.28 | 593.06 | | | | | | | | | | |
| 39.83 | 593.11 | | | | | | | | | | |
| 43.88 | 593.18 | | | | | | | | | | |
| 43.89 | 593.30 | RPIN | | | | | | | | | |


Photo of XS-3 looking in the downstream direction



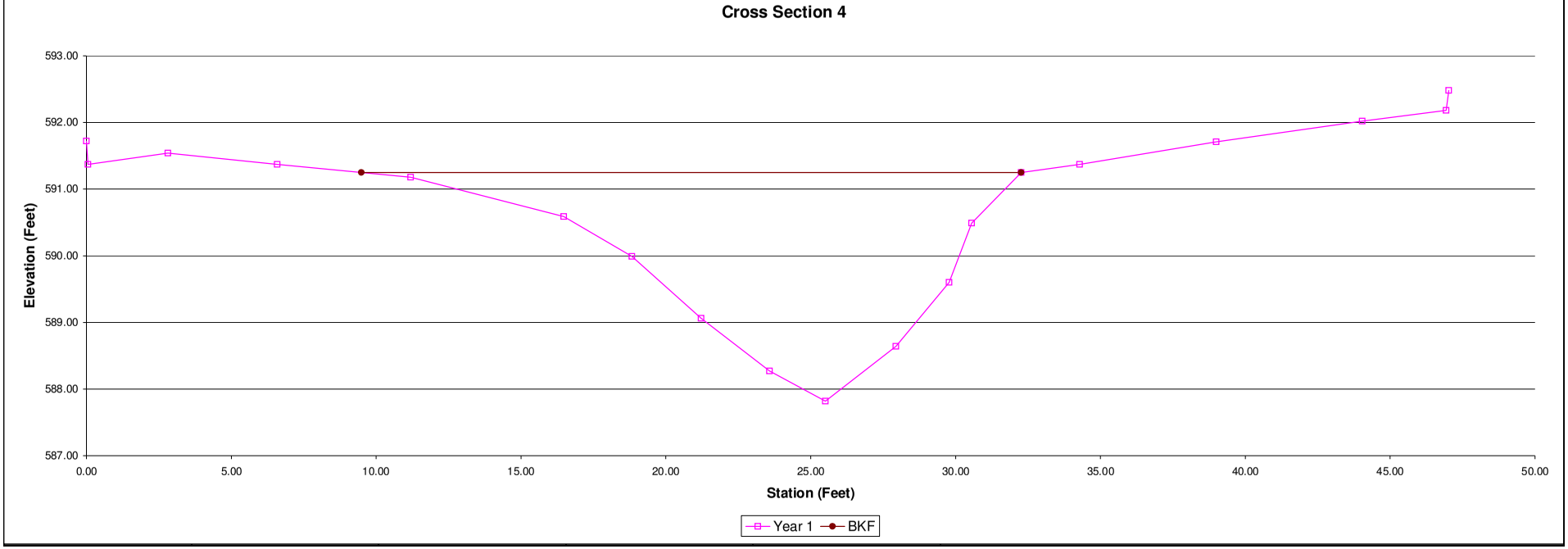
| | |
|---|---|
| Project: | Underwood Creek |
| Cross Section: | Cross Section 4 (New for MY-01) |
| Feature | Pool |
| Station: | 16+19 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | | 33.8 | | | | |
| W (BKF) | | 22.8 | | | | |
| Max d | | 3.4 | | | | |
| Mean d | | 1.5 | | | | |
| W/D | | 15.3 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| | | | 0.00 | 591.72 | LPIN | | | | | | |
| | | | 0.05 | 591.37 | | | | | | | |
| | | | 2.81 | 591.54 | | | | | | | |
| | | | 6.59 | 591.37 | | | | | | | |
| | | | 11.19 | 591.18 | BKF L | | | | | | |
| | | | 16.48 | 590.59 | | | | | | | |
| | | | 18.83 | 589.99 | | | | | | | |
| | | | 21.22 | 589.06 | TOE L | | | | | | |
| | | | 23.58 | 588.27 | | | | | | | |
| | | | 25.51 | 587.82 | TW | | | | | | |
| | | | 27.94 | 588.64 | | | | | | | |
| | | | 29.78 | 589.60 | TOE R | | | | | | |
| | | | 30.56 | 590.49 | | | | | | | |
| | | | 32.27 | 591.25 | BKF R | | | | | | |
| | | | 34.28 | 591.37 | | | | | | | |
| | | | 39.00 | 591.71 | | | | | | | |
| | | | 44.04 | 592.02 | | | | | | | |
| | | | 46.93 | 592.18 | | | | | | | |
| | | | 47.02 | 592.48 | RPIN | | | | | | |


Photo of XS-4, looking in the downstream direction



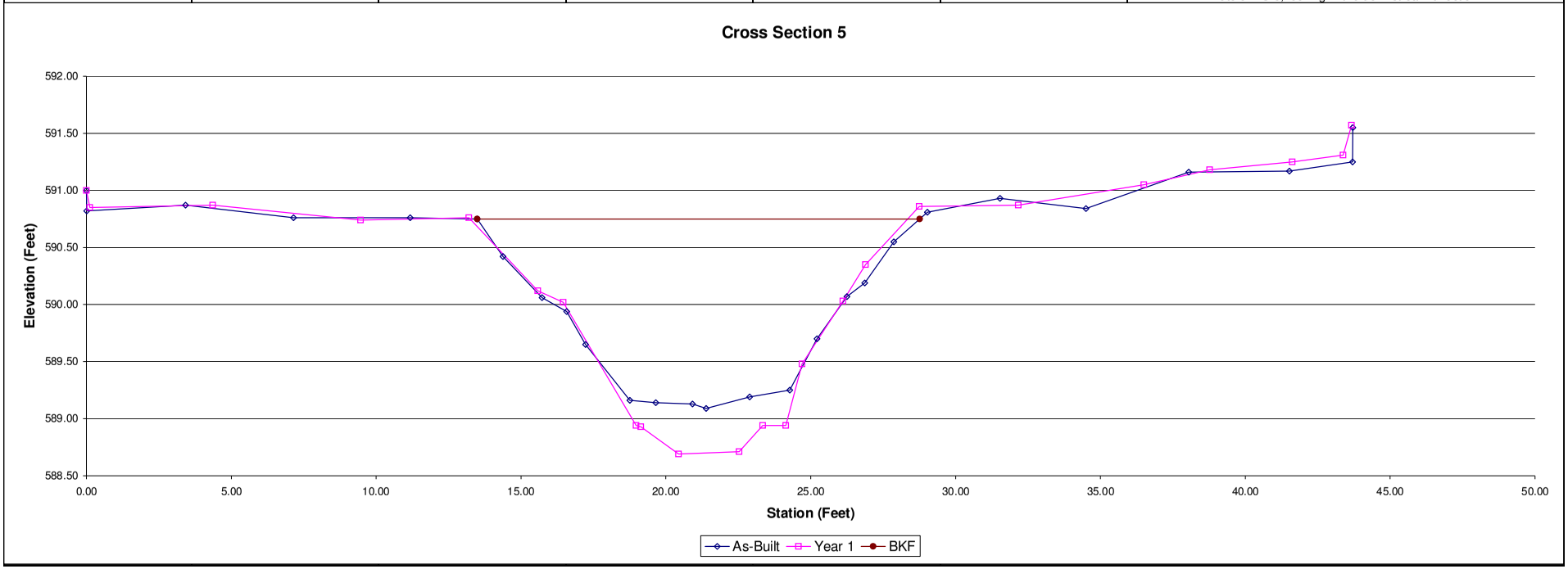
| | |
|---|---|
| Project: | Underwood Creek |
| Cross Section: | Cross Section 5 (CS-3 in MY-00) |
| Feature | Riffle |
| Station: | 17+13 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 15.9 | 17.5 | | | | |
| W (BKF) | 15.3 | 15.1 | | | | |
| Max d | 1.7 | 2.1 | | | | |
| Mean d | 1.0 | 1.2 | | | | |
| W/D | 14.7 | 13.1 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 591.00 | LPIN | 0.00 | 591.00 | LPIN | | | | | | |
| 0.01 | 590.82 | | 0.12 | 590.85 | | | | | | | |
| 3.42 | 590.87 | | 4.36 | 590.87 | | | | | | | |
| 7.15 | 590.76 | | 9.46 | 590.74 | | | | | | | |
| 11.17 | 590.76 | | 13.20 | 590.76 | BKF L | | | | | | |
| 13.49 | 590.75 | BKF L | 15.58 | 590.12 | | | | | | | |
| 14.38 | 590.42 | | 16.46 | 590.02 | | | | | | | |
| 15.73 | 590.06 | | 18.97 | 588.94 | TOE L | | | | | | |
| 16.58 | 589.94 | | 19.14 | 588.93 | | | | | | | |
| 17.23 | 589.65 | | 20.44 | 588.69 | TW | | | | | | |
| 18.76 | 589.16 | TOE L | 22.53 | 588.71 | | | | | | | |
| 19.65 | 589.14 | | 23.34 | 588.94 | | | | | | | |
| 20.92 | 589.13 | | 24.14 | 588.94 | TOE R | | | | | | |
| 21.39 | 589.09 | TW | 24.70 | 589.48 | | | | | | | |
| 22.89 | 589.19 | | 26.11 | 590.03 | | | | | | | |
| 24.28 | 589.25 | TOE R | 26.89 | 590.35 | | | | | | | |
| 25.22 | 589.70 | | 28.75 | 590.86 | BKF R | | | | | | |
| 26.25 | 590.07 | | 32.17 | 590.87 | | | | | | | |
| 26.86 | 590.19 | | 36.50 | 591.05 | | | | | | | |
| 27.87 | 590.55 | | 38.77 | 591.18 | | | | | | | |
| 29.03 | 590.81 | BKF R | 41.62 | 591.25 | | | | | | | |
| 31.53 | 590.93 | | 43.38 | 591.31 | | | | | | | |
| 34.50 | 590.84 | | 43.67 | 591.57 | RPIN | | | | | | |
| 38.05 | 591.16 | | | | | | | | | | |
| 41.52 | 591.17 | | | | | | | | | | |
| 43.70 | 591.25 | | | | | | | | | | |
| 43.71 | 591.55 | RPIN | | | | | | | | | |

Photo of XS-5, looking in the downstream direction



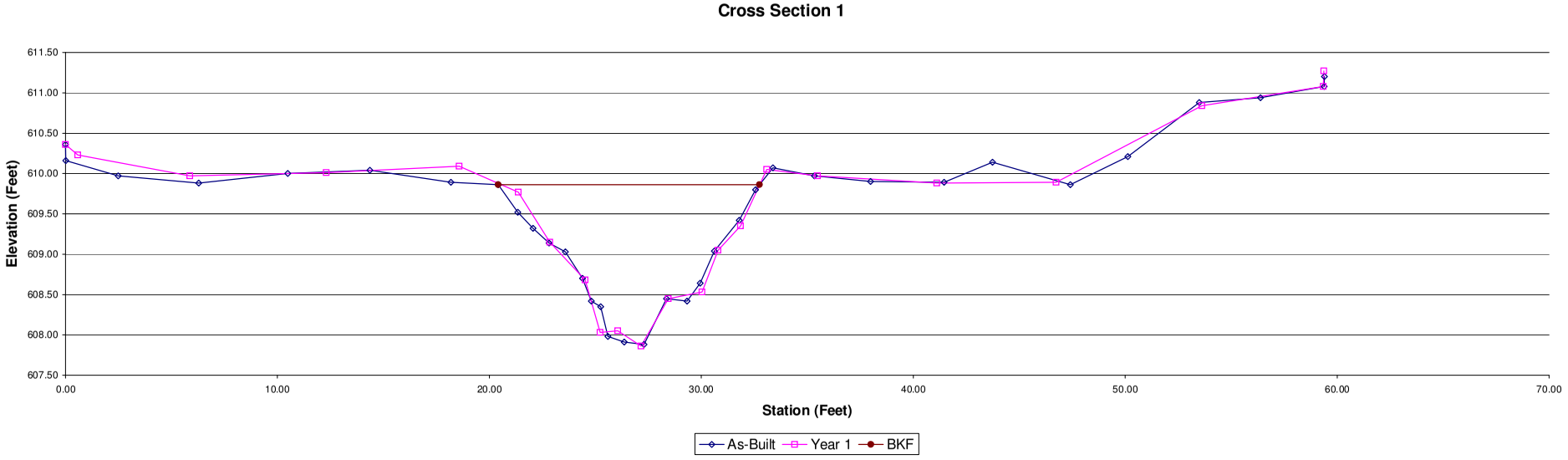
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 1 (Same as MY-00) |
| Feature | Riffle |
| Station: | 6+40 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 13.1 | 13.2 | | | | |
| W (BKF) | 12.3 | 12.2 | | | | |
| Max d | 2.0 | 2.0 | | | | |
| Mean d | 1.1 | 1.1 | | | | |
| W/D | 11.6 | 11.3 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 610.36 | LPIN | 0.00 | 610.36 | LPIN | | | | | | |
| 0.01 | 610.16 | | 0.58 | 610.23 | | | | | | | |
| 2.48 | 609.97 | | 5.87 | 609.97 | | | | | | | |
| 6.28 | 609.88 | | 12.30 | 610.01 | | | | | | | |
| 10.49 | 610.00 | | 18.57 | 610.09 | | | | | | | |
| 14.36 | 610.04 | | 21.36 | 609.77 | BKF L | | | | | | |
| 18.19 | 609.89 | | 22.86 | 609.15 | | | | | | | |
| 20.42 | 609.86 | BKF L | 24.52 | 608.68 | | | | | | | |
| 21.34 | 609.52 | | 25.23 | 608.03 | TOE L | | | | | | |
| 22.06 | 609.32 | | 26.06 | 608.05 | | | | | | | |
| 22.82 | 609.14 | | 27.16 | 607.86 | TW | | | | | | |
| 23.59 | 609.03 | | 28.45 | 608.45 | | | | | | | |
| 24.39 | 608.70 | | 30.04 | 608.53 | TOE R | | | | | | |
| 24.81 | 608.42 | TOE L | 30.79 | 609.05 | | | | | | | |
| 25.25 | 608.35 | | 31.85 | 609.35 | | | | | | | |
| 25.59 | 607.98 | | 33.09 | 610.05 | BKF R | | | | | | |
| 26.36 | 607.91 | TW | 35.49 | 609.97 | | | | | | | |
| 27.30 | 607.88 | | 41.11 | 609.88 | | | | | | | |
| 28.35 | 608.45 | | 46.74 | 609.89 | | | | | | | |
| 29.33 | 608.42 | | 53.62 | 610.84 | | | | | | | |
| 29.95 | 608.64 | TOE R | 59.35 | 611.08 | | | | | | | |
| 30.62 | 609.04 | | 59.38 | 611.27 | RPIN | | | | | | |
| 31.79 | 609.42 | | | | | | | | | | |
| 32.56 | 609.80 | | | | | | | | | | |
| 33.38 | 610.07 | BKF R | | | | | | | | | |
| 35.33 | 609.97 | | | | | | | | | | |
| 37.99 | 609.90 | | | | | | | | | | |
| 41.46 | 609.89 | | | | | | | | | | |
| 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



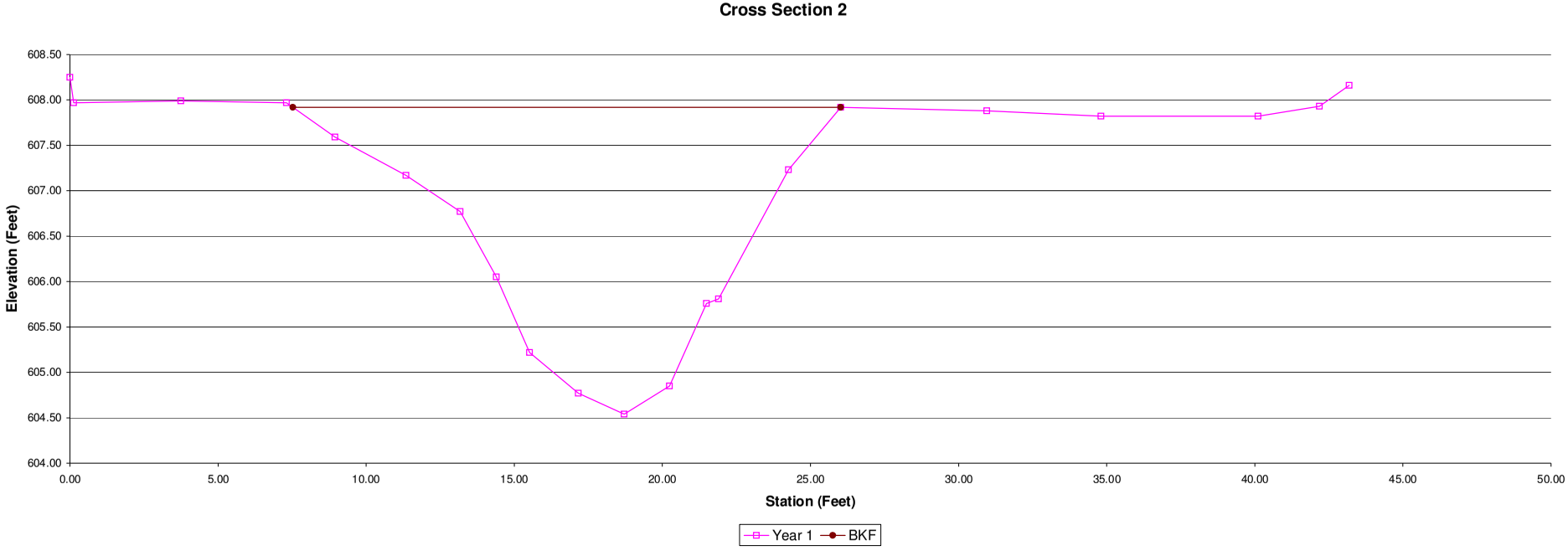
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 2 (New for MY-01) |
| Feature | Pool |
| Station: | 10+32 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | | 30.4 | | | | |
| W (BKF) | | 18.5 | | | | |
| Max d | | 3.4 | | | | |
| Mean d | | 1.6 | | | | |
| W/D | | 11.2 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| | | | 0.00 | 608.25 | LPIN | | | | | | |
| | | | 0.13 | 607.97 | | | | | | | |
| | | | 3.75 | 607.99 | | | | | | | |
| | | | 7.31 | 607.97 | BKF L | | | | | | |
| | | | 8.95 | 607.59 | | | | | | | |
| | | | 11.35 | 607.17 | | | | | | | |
| | | | 13.17 | 606.77 | | | | | | | |
| | | | 14.40 | 606.05 | | | | | | | |
| | | | 15.52 | 605.22 | TOE L | | | | | | |
| | | | 17.16 | 604.77 | | | | | | | |
| | | | 18.71 | 604.54 | TW | | | | | | |
| | | | 20.24 | 604.85 | | | | | | | |
| | | | 21.49 | 605.76 | | | | | | | |
| | | | 21.90 | 605.81 | TOE R | | | | | | |
| | | | 24.26 | 607.23 | | | | | | | |
| | | | 26.02 | 607.92 | BKF R | | | | | | |
| | | | 30.95 | 607.88 | | | | | | | |
| | | | 34.81 | 607.82 | | | | | | | |
| | | | 40.11 | 607.82 | | | | | | | |
| | | | 42.18 | 607.93 | | | | | | | |
| | | | 43.19 | 608.16 | RPIN | | | | | | |


Photo of XS-2, looking in the downstream direction



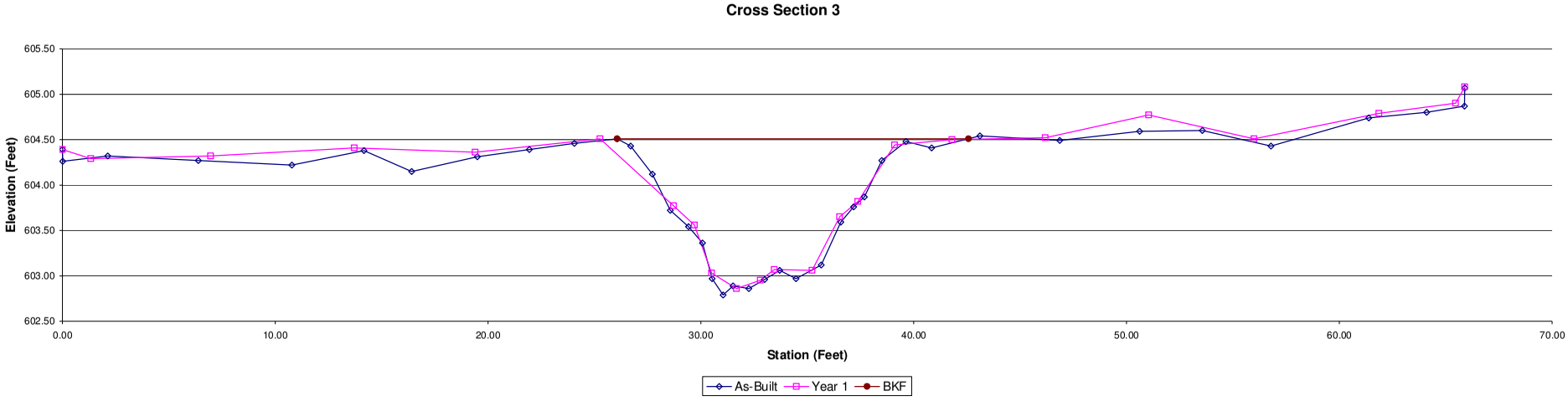
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 3 (CS-2 in MY-00) |
| Feature | Riffle |
| Station: | 14+45 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 13.4 | 13.2 | | | | |
| W (BKF) | 16.5 | 18.7 | | | | |
| Max d | 1.7 | 1.6 | | | | |
| Mean d | 0.8 | 0.7 | | | | |
| W/D | 20.4 | 26.6 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 604.39 | LPIN | 0.00 | 604.39 | LPIN | | | | | | |
| 0.01 | 604.26 | | 1.33 | 604.29 | | | | | | | |
| 2.13 | 604.32 | | 6.96 | 604.32 | | | | | | | |
| 6.38 | 604.27 | | 13.71 | 604.41 | | | | | | | |
| 10.78 | 604.22 | | 19.40 | 604.36 | | | | | | | |
| 14.17 | 604.38 | | 25.26 | 604.51 | BKF L | | | | | | |
| 16.41 | 604.15 | | 28.72 | 603.77 | | | | | | | |
| 19.49 | 604.31 | | 29.70 | 603.56 | | | | | | | |
| 21.94 | 604.39 | | 30.51 | 603.03 | TOE L | | | | | | |
| 24.06 | 604.46 | | 31.68 | 602.86 | TW | | | | | | |
| 26.07 | 604.51 | BKF L | 32.79 | 602.95 | | | | | | | |
| 26.70 | 604.43 | | 33.45 | 603.07 | | | | | | | |
| 27.72 | 604.12 | | 35.23 | 603.06 | TOE R | | | | | | |
| 28.56 | 603.72 | | 36.52 | 603.65 | | | | | | | |
| 29.42 | 603.54 | | 37.38 | 603.82 | | | | | | | |
| 30.07 | 603.36 | | 39.10 | 604.44 | BKF R | | | | | | |
| 30.53 | 602.97 | TOE L | 41.80 | 604.50 | | | | | | | |
| 31.04 | 602.79 | | 46.18 | 604.52 | | | | | | | |
| 31.51 | 602.89 | | 51.05 | 604.77 | | | | | | | |
| 32.26 | 602.86 | TW | 56.00 | 604.51 | | | | | | | |
| 33.00 | 602.96 | | 61.87 | 604.79 | | | | | | | |
| 33.70 | 603.06 | | 65.47 | 604.90 | | | | | | | |
| 34.47 | 602.97 | | 65.89 | 605.08 | RPIN | | | | | | |
| 35.66 | 603.12 | TOE R | | | | | | | | | |
| 36.57 | 603.59 | | | | | | | | | | |
| 37.18 | 603.76 | | | | | | | | | | |
| 37.68 | 603.87 | | | | | | | | | | |
| 38.50 | 604.27 | | | | | | | | | | |
| 39.63 | 604.48 | BKF R | | | | | | | | | |
| 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



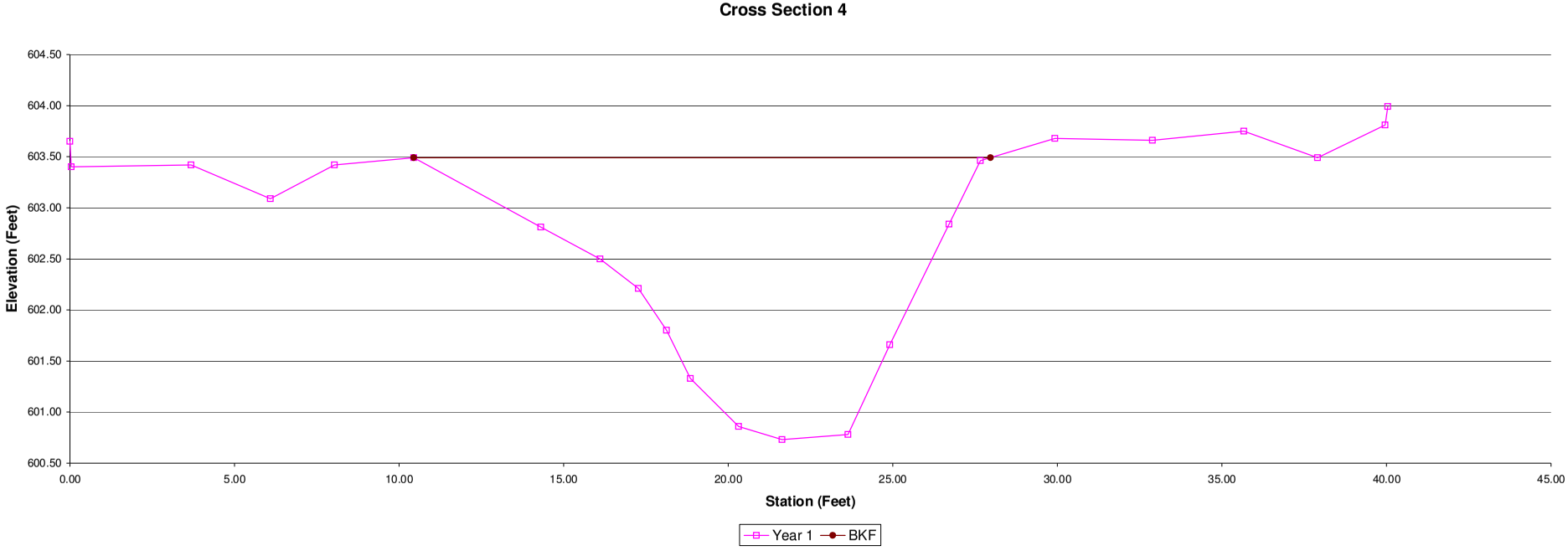
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 4 (New for MY-01) |
| Feature | Pool |
| Station: | 16+30 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | | 24.8 | | | | |
| W (BKF) | | 17.5 | | | | |
| Max d | | 2.8 | | | | |
| Mean d | | 1.4 | | | | |
| W/D | | 12.4 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| | | | 0.00 | 603.65 | LPIN | | | | | | |
| | | | 0.04 | 603.40 | | | | | | | |
| | | | 3.68 | 603.42 | | | | | | | |
| | | | 6.09 | 603.09 | | | | | | | |
| | | | 8.04 | 603.42 | | | | | | | |
| | | | 10.45 | 603.49 | BKF L | | | | | | |
| | | | 14.31 | 602.81 | | | | | | | |
| | | | 16.11 | 602.50 | | | | | | | |
| | | | 17.27 | 602.21 | | | | | | | |
| | | | 18.13 | 601.80 | | | | | | | |
| | | | 18.85 | 601.33 | TOE L | | | | | | |
| | | | 20.32 | 600.86 | | | | | | | |
| | | | 21.64 | 600.73 | TW | | | | | | |
| | | | 23.64 | 600.78 | | | | | | | |
| | | | 24.91 | 601.66 | TOE R | | | | | | |
| | | | 26.71 | 602.84 | | | | | | | |
| | | | 27.66 | 603.46 | BKF R | | | | | | |
| | | | 29.93 | 603.68 | | | | | | | |
| | | | 32.89 | 603.66 | | | | | | | |
| | | | 35.67 | 603.75 | | | | | | | |
| | | | 37.91 | 603.49 | | | | | | | |
| | | | 39.96 | 603.81 | | | | | | | |
| | | | 40.04 | 603.99 | RPIN | | | | | | |


Photo of XS-4, looking in the downstream direction



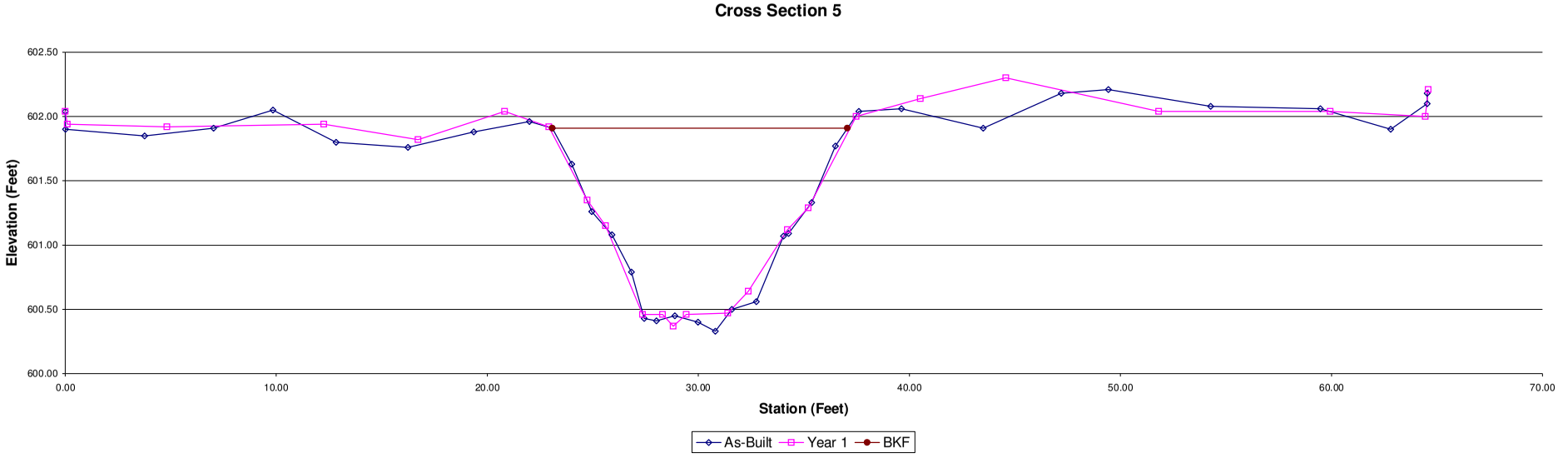
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 5 (CS-3 in MY-00) |
| Feature | Riffle |
| Station: | 20+04 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 13.6 | 13.4 | | | | |
| W (BKF) | 14.0 | 14.2 | | | | |
| Max d | 1.6 | 1.5 | | | | |
| Mean d | 1.0 | 0.9 | | | | |
| W/D | 14.4 | 15.2 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 602.04 | LPIN | 0.00 | 602.04 | LPIN | | | | | | |
| 0.01 | 601.90 | | 0.10 | 601.94 | | | | | | | |
| 3.76 | 601.85 | | 4.82 | 601.92 | | | | | | | |
| 7.03 | 601.91 | | 12.25 | 601.94 | | | | | | | |
| 9.84 | 602.05 | | 16.72 | 601.82 | | | | | | | |
| 12.83 | 601.80 | | 20.82 | 602.04 | | | | | | | |
| 16.24 | 601.76 | | 22.92 | 601.92 | BKF L | | | | | | |
| 19.36 | 601.88 | | 24.74 | 601.35 | | | | | | | |
| 21.99 | 601.96 | | 25.61 | 601.15 | | | | | | | |
| 23.08 | 601.91 | BKF L | 27.36 | 600.46 | TOE L | | | | | | |
| 24.00 | 601.63 | | 28.30 | 600.46 | | | | | | | |
| 24.95 | 601.26 | | 28.81 | 600.37 | TW | | | | | | |
| 25.91 | 601.08 | | 29.43 | 600.46 | | | | | | | |
| 26.83 | 600.79 | | 31.40 | 600.47 | | | | | | | |
| 27.43 | 600.43 | TOE L | 32.37 | 600.64 | TOE R | | | | | | |
| 28.02 | 600.41 | | 34.22 | 601.12 | | | | | | | |
| 28.88 | 600.45 | | 35.21 | 601.29 | | | | | | | |
| 29.99 | 600.40 | | 37.48 | 602.00 | BKF R | | | | | | |
| 30.80 | 600.33 | TW | 40.52 | 602.14 | | | | | | | |
| 31.59 | 600.50 | | 44.57 | 602.30 | | | | | | | |
| 32.75 | 600.56 | TOE R | 51.82 | 602.04 | | | | | | | |
| 34.04 | 601.07 | | 59.94 | 602.04 | | | | | | | |
| 34.27 | 601.09 | | 64.45 | 602.00 | | | | | | | |
| 35.37 | 601.33 | | 64.58 | 602.21 | RPIN | | | | | | |
| 36.49 | 601.77 | | | | | | | | | | |
| 37.60 | 602.04 | BKF R | | | | | | | | | |
| 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



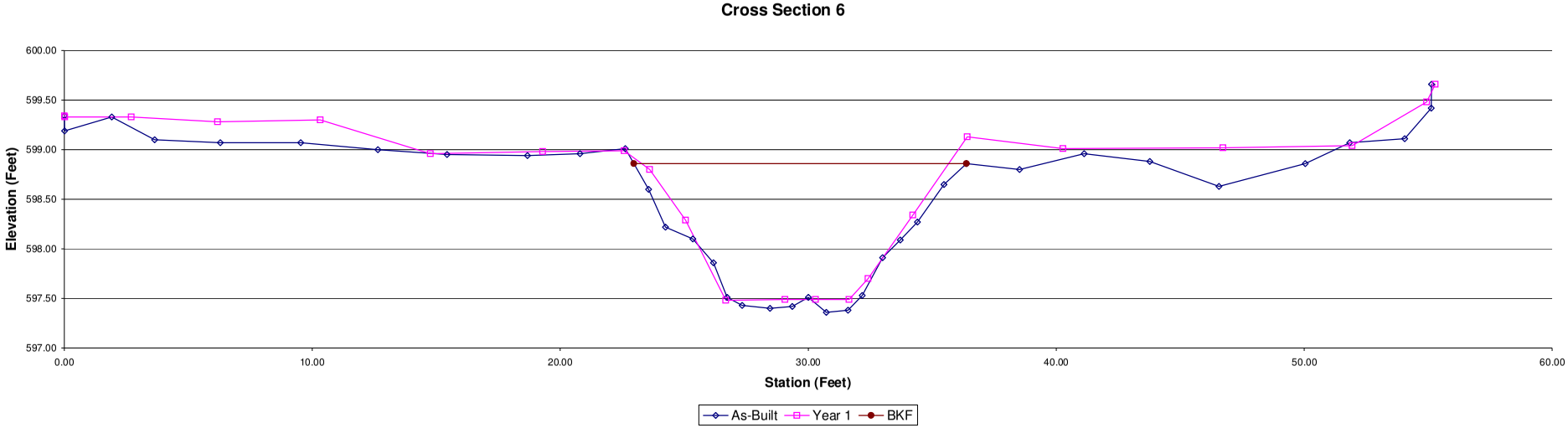
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 6 (CS-4 in MY-00) |
| Feature | Riffle |
| Station: | 26+68 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 12.9 | 11.8 | | | | |
| W (BKF) | 13.4 | 12.4 | | | | |
| Max d | 1.5 | 1.4 | | | | |
| Mean d | 1.0 | 1.0 | | | | |
| W/D | 13.9 | 13.0 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 599.34 | LPIN | 0.00 | 599.34 | LPIN | | | | | | |
| 0.01 | 599.19 | | 0.02 | 599.33 | | | | | | | |
| 1.91 | 599.33 | | 2.70 | 599.33 | | | | | | | |
| 3.64 | 599.10 | | 6.18 | 599.28 | | | | | | | |
| 6.29 | 599.07 | | 10.32 | 599.30 | | | | | | | |
| 9.53 | 599.07 | | 14.77 | 598.96 | | | | | | | |
| 12.65 | 599.00 | | 19.29 | 598.98 | | | | | | | |
| 15.43 | 598.95 | | 22.58 | 598.99 | BKF L | | | | | | |
| 18.68 | 598.94 | | 23.61 | 598.80 | | | | | | | |
| 20.80 | 598.96 | | 25.06 | 598.29 | | | | | | | |
| 22.62 | 599.01 | BKF L | 26.68 | 597.48 | TOE L | | | | | | |
| 23.56 | 598.60 | | 29.07 | 597.49 | TW | | | | | | |
| 24.24 | 598.22 | | 30.30 | 597.49 | | | | | | | |
| 25.35 | 598.10 | | 31.65 | 597.49 | | | | | | | |
| 26.18 | 597.86 | | 32.42 | 597.70 | TOE R | | | | | | |
| 26.73 | 597.51 | TOE L | 34.22 | 598.34 | | | | | | | |
| 27.34 | 597.43 | | 36.41 | 599.13 | BKF R | | | | | | |
| 28.46 | 597.40 | | 40.27 | 599.01 | | | | | | | |
| 29.36 | 597.42 | | 46.73 | 599.02 | | | | | | | |
| 30.01 | 597.51 | | 51.94 | 599.04 | | | | | | | |
| 30.73 | 597.36 | TW | 54.94 | 599.48 | | | | | | | |
| 31.61 | 597.38 | | 55.29 | 599.66 | RPIN | | | | | | |
| 32.18 | 597.53 | TOE R | | | | | | | | | |
| 33.00 | 597.91 | | | | | | | | | | |
| 33.71 | 598.09 | | | | | | | | | | |
| 34.41 | 598.27 | | | | | | | | | | |
| 35.47 | 598.65 | | | | | | | | | | |
| 36.38 | 598.86 | BKF R | | | | | | | | | |
| 38.52 | 598.80 | | | | | | | | | | |
| 41.13 | 598.96 | | | | | | | | | | |
| 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



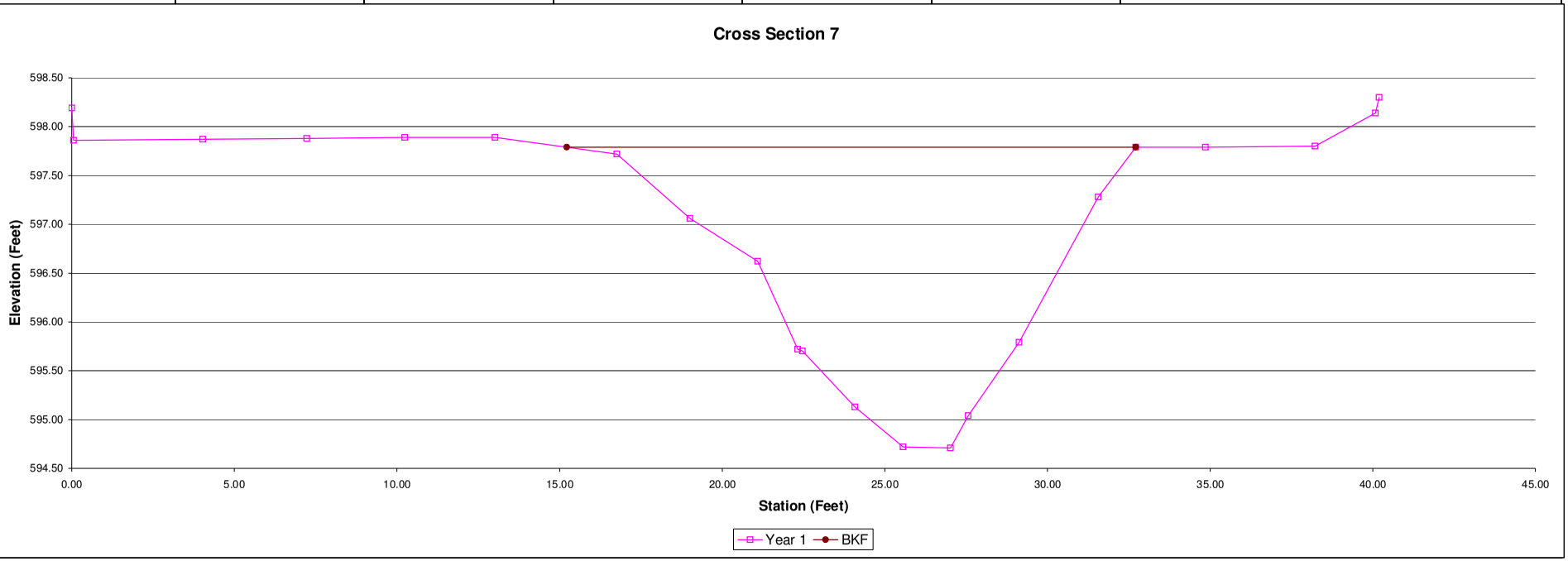
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 7 (New for MY-01) |
| Feature | Pool |
| Station: | 28+82 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 12.9 | 11.8 | | | | |
| W (BKF) | 13.4 | 12.4 | | | | |
| Max d | 1.5 | 1.4 | | | | |
| Mean d | 1.0 | 1.0 | | | | |
| W/D | 13.9 | 13.0 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| | | | 0.00 | 598.19 | LPIN | | | | | | |
| | | | 0.06 | 597.86 | | | | | | | |
| | | | 4.03 | 597.87 | | | | | | | |
| | | | 7.23 | 597.88 | | | | | | | |
| | | | 10.24 | 597.89 | | | | | | | |
| | | | 13.02 | 597.89 | | | | | | | |
| | | | 16.76 | 597.72 | BKF L | | | | | | |
| | | | 19.01 | 597.06 | | | | | | | |
| | | | 21.09 | 596.62 | | | | | | | |
| | | | 22.32 | 595.72 | TOE L | | | | | | |
| | | | 22.47 | 595.70 | | | | | | | |
| | | | 24.08 | 595.13 | | | | | | | |
| | | | 25.56 | 594.72 | | | | | | | |
| | | | 27.02 | 594.71 | TW | | | | | | |
| | | | 27.56 | 595.04 | | | | | | | |
| | | | 29.13 | 595.79 | TOE R | | | | | | |
| | | | 31.56 | 597.28 | | | | | | | |
| | | | 32.72 | 597.79 | BKF R | | | | | | |
| | | | 34.86 | 597.79 | | | | | | | |
| | | | 38.23 | 597.80 | | | | | | | |
| | | | 40.08 | 598.14 | | | | | | | |
| | | | 40.20 | 598.30 | RPIN | | | | | | |


Photo of XS-7, looking in the downstream direction



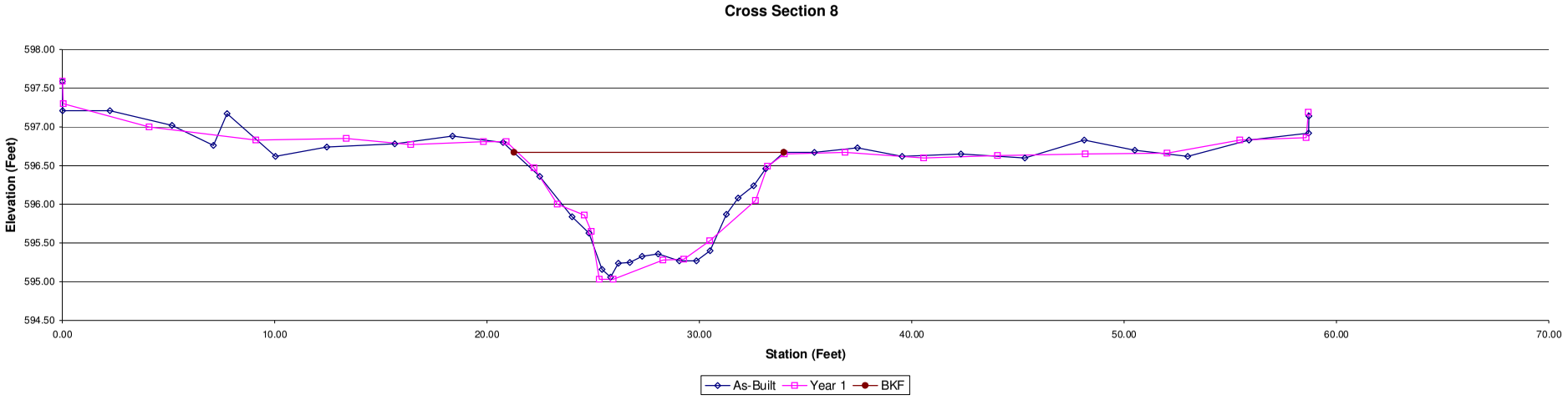
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 8 (CS-5 in MY-00) |
| Feature | Riffle |
| Station: | 31+25 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 11.6 | 9.4 | | | | |
| W (BKF) | 12.7 | 11.0 | | | | |
| Max d | 1.6 | 1.4 | | | | |
| Mean d | 0.9 | 0.9 | | | | |
| W/D | 13.9 | 12.7 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 597.59 | LPIN | 0.00 | 597.59 | LPIN | | | | | | |
| 0.01 | 597.21 | | 0.05 | 597.30 | | | | | | | |
| 2.24 | 597.21 | | 4.09 | 597.00 | | | | | | | |
| 5.17 | 597.02 | | 9.12 | 596.83 | | | | | | | |
| 7.12 | 596.76 | | 13.38 | 596.85 | | | | | | | |
| 7.76 | 597.17 | | 16.41 | 596.77 | | | | | | | |
| 10.04 | 596.62 | | 19.83 | 596.81 | | | | | | | |
| 12.46 | 596.74 | | 20.91 | 596.81 | BKF L | | | | | | |
| 15.65 | 596.78 | | 22.22 | 596.47 | | | | | | | |
| 18.38 | 596.88 | | 23.31 | 596.00 | | | | | | | |
| 20.76 | 596.80 | BKF L | 24.58 | 595.86 | | | | | | | |
| 22.48 | 596.36 | | 24.91 | 595.65 | | | | | | | |
| 24.00 | 595.84 | | 25.29 | 595.03 | TOE L | | | | | | |
| 24.80 | 595.63 | | 25.94 | 595.03 | TW | | | | | | |
| 25.41 | 595.16 | TOE L | 28.29 | 595.28 | | | | | | | |
| 25.82 | 595.06 | TW | 29.27 | 595.29 | | | | | | | |
| 26.19 | 595.24 | | 30.49 | 595.53 | TOE R | | | | | | |
| 26.73 | 595.25 | | 32.64 | 596.05 | | | | | | | |
| 27.31 | 595.33 | | 33.21 | 596.49 | | | | | | | |
| 28.06 | 595.36 | | 34.00 | 596.65 | BKF R | | | | | | |
| 29.06 | 595.27 | | 36.86 | 596.67 | | | | | | | |
| 29.86 | 595.27 | | 40.57 | 596.60 | | | | | | | |
| 30.51 | 595.40 | TOE R | 44.04 | 596.63 | | | | | | | |
| 31.27 | 595.87 | | 48.18 | 596.65 | | | | | | | |
| 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 | BKF R | 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



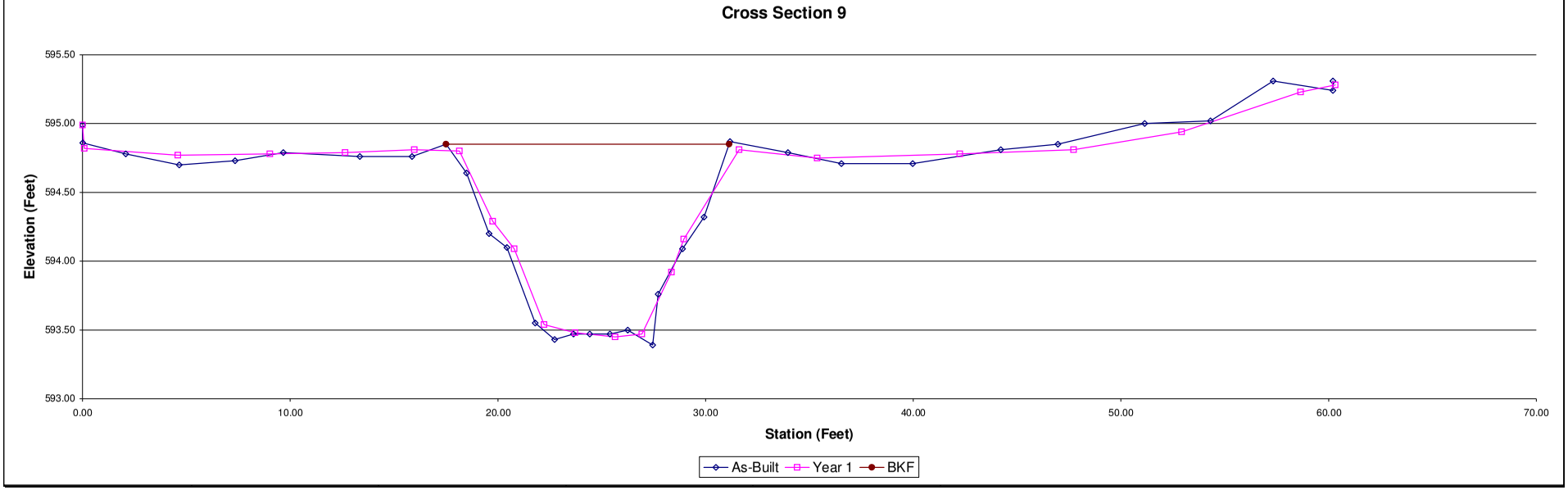
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 9 (CS-6 in MY-00) |
| Feature | Riffle |
| Station: | 35+34 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 12.8 | 12.1 | | | | |
| W (BKF) | 13.6 | 13.5 | | | | |
| Max d | 1.5 | 1.4 | | | | |
| Mean d | 0.9 | 0.9 | | | | |
| W/D | 14.5 | 15.0 | | | | |

| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 594.99 | LPIN | 0.00 | 594.99 | LPIN | | | | | | |
| 0.01 | 594.86 | | 0.09 | 594.82 | | | | | | | |
| 2.08 | 594.78 | | 4.60 | 594.77 | | | | | | | |
| 4.66 | 594.70 | | 9.03 | 594.78 | | | | | | | |
| 7.34 | 594.73 | | 12.65 | 594.79 | | | | | | | |
| 9.67 | 594.79 | | 15.98 | 594.81 | | | | | | | |
| 13.36 | 594.76 | | 18.15 | 594.80 | BKF L | | | | | | |
| 15.87 | 594.76 | | 19.75 | 594.29 | | | | | | | |
| 17.51 | 594.85 | BKF L | 20.79 | 594.09 | | | | | | | |
| 18.49 | 594.64 | | 22.23 | 593.54 | TOE L | | | | | | |
| 19.57 | 594.20 | | 23.72 | 593.48 | TW | | | | | | |
| 20.43 | 594.10 | | 25.65 | 593.45 | | | | | | | |
| 21.80 | 593.55 | TOE L | 26.94 | 593.47 | TOE R | | | | | | |
| 22.73 | 593.43 | | 28.36 | 593.92 | | | | | | | |
| 23.64 | 593.47 | | 28.96 | 594.16 | | | | | | | |
| 24.42 | 593.47 | TW | 31.62 | 594.81 | BKF R | | | | | | |
| 25.40 | 593.47 | | 35.38 | 594.75 | | | | | | | |
| 26.25 | 593.50 | | 42.24 | 594.78 | | | | | | | |
| 27.45 | 593.39 | TOE R | 47.72 | 594.81 | | | | | | | |
| 27.72 | 593.76 | | 52.92 | 594.94 | | | | | | | |
| 28.89 | 594.09 | | 58.65 | 595.23 | | | | | | | |
| 29.93 | 594.32 | | 60.32 | 595.28 | RPIN | | | | | | |
| 31.18 | 594.87 | BKF R | | | | | | | | | |
| 33.96 | 594.79 | | | | | | | | | | |
| 36.54 | 594.71 | | | | | | | | | | |
| 39.97 | 594.71 | | | | | | | | | | |
| 44.21 | 594.81 | | | | | | | | | | |
| 46.97 | 594.85 | | | | | | | | | | |
| 51.14 | 595.00 | | | | | | | | | | |
| 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



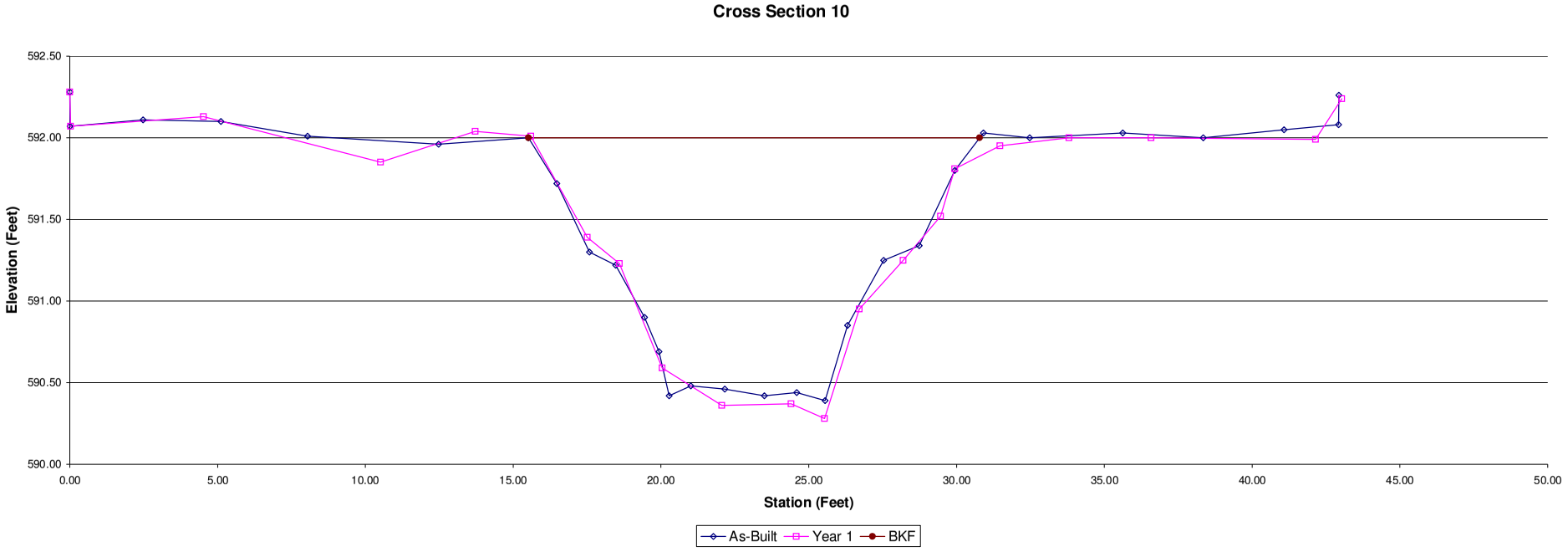
| | |
|---|---|
| Project: | UT to Underwood Creek |
| Cross Section: | Cross Section 10 (CS-7 in MY-00) |
| Feature | Riffle |
| Station: | 39+90 |
| Date: | 10/25/11 |
| Crew: | BW, SV, ZP |

**Summary (bankfull)**

| | MY0 | MY1 | MY2 | MY3 | MY4 | MY5 |
|---|---|---|---|---|---|---|
| A (BKF) | 15.2 | 14.1 | | | | |
| W (BKF) | 15.3 | 15.0 | | | | |
| Max d | 1.6 | 1.6 | | | | |
| Mean d | 1.0 | 0.9 | | | | |
| W/D | 15.3 | 15.9 | | | | |

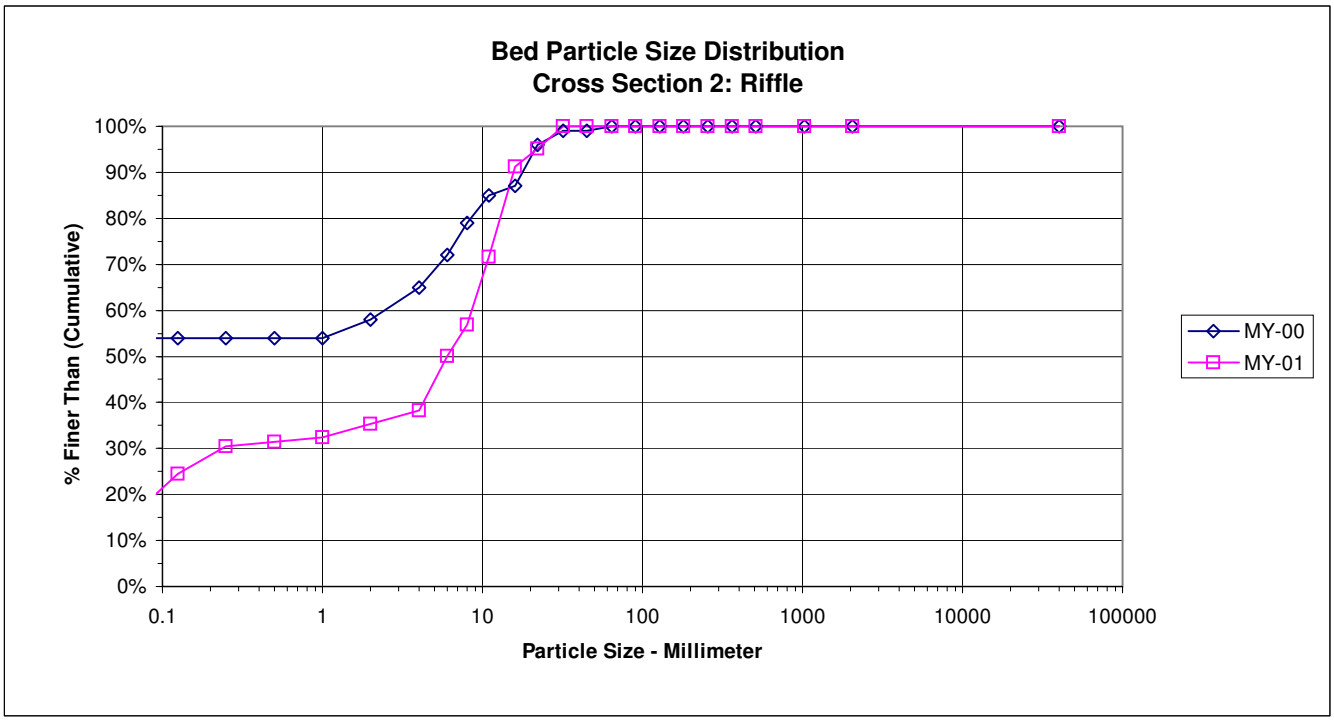
| MY00-2011 | | | MY01-2011 | | | MY02-2012 | | | MY03-2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes | Station | Elevation | Notes |
| 0.00 | 592.28 | LPIN | 0.00 | 592.28 | LPIN | | | | | | |
| 0.01 | 592.07 | | 0.03 | 592.07 | | | | | | | |
| 2.48 | 592.11 | | 4.52 | 592.13 | | | | | | | |
| 5.11 | 592.10 | | 10.51 | 591.85 | | | | | | | |
| 8.04 | 592.01 | | 13.72 | 592.04 | | | | | | | |
| 12.48 | 591.96 | | 15.60 | 592.01 | BKF L | | | | | | |
| 15.52 | 592.00 | BKF L | 17.51 | 591.39 | | | | | | | |
| 16.48 | 591.72 | | 18.59 | 591.23 | | | | | | | |
| 17.58 | 591.30 | | 20.04 | 590.59 | TOE L | | | | | | |
| 18.47 | 591.22 | | 22.06 | 590.36 | TW | | | | | | |
| 19.44 | 590.90 | | 24.40 | 590.37 | | | | | | | |
| 19.93 | 590.69 | | 25.53 | 590.28 | TOE R | | | | | | |
| 20.28 | 590.42 | TOE L | 26.71 | 590.95 | | | | | | | |
| 21.01 | 590.48 | | 28.19 | 591.25 | | | | | | | |
| 22.16 | 590.46 | | 29.46 | 591.52 | | | | | | | |
| 23.50 | 590.42 | TW | 29.94 | 591.81 | | | | | | | |
| 24.59 | 590.44 | | 31.47 | 591.95 | BKF R | | | | | | |
| 25.55 | 590.39 | TOE R | 33.80 | 592.00 | | | | | | | |
| 26.31 | 590.85 | | 36.58 | 592.00 | | | | | | | |
| 27.53 | 591.25 | | 42.15 | 591.99 | | | | | | | |
| 28.74 | 591.34 | | 43.03 | 592.24 | RPIN | | | | | | |
| 29.94 | 591.80 | | | | | | | | | | |
| 30.91 | 592.03 | BKF R | | | | | | | | | |
| 32.47 | 592.00 | | | | | | | | | | |
| 35.62 | 592.03 | | | | | | | | | | |
| 38.35 | 592.00 | | | | | | | | | | |
| 41.08 | 592.05 | | | | | | | | | | |
| 42.92 | 592.08 | | | | | | | | | | |
| 42.93 | 592.26 | RPIN | | | | | | | | | |


Photo of XS-10, looking in the downstream direction



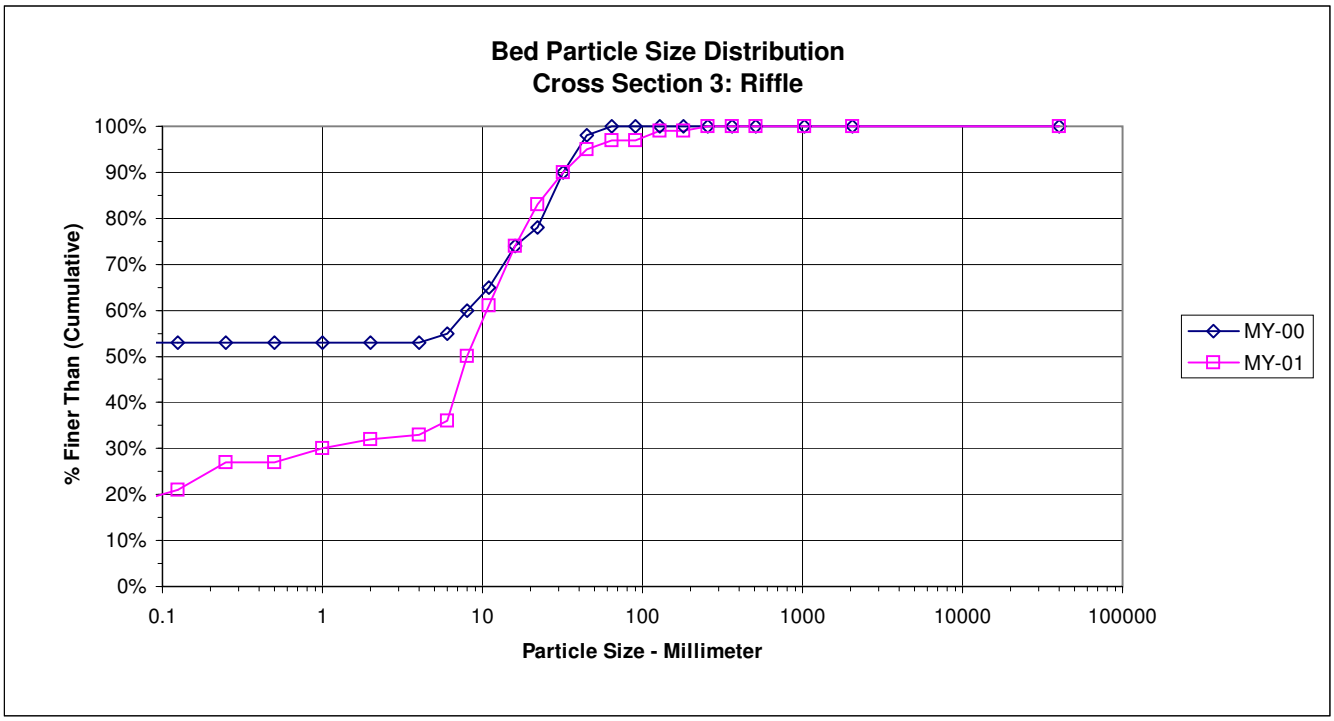
| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #2 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 15 | 0 | 15 | 15% | 15% |
| | Very Fine | .062 - .125 | S | 10 | 0 | 10 | 10% | 25% |
| | Fine | .125 - .25 | A | 6 | 0 | 6 | 6% | 30% |
| | Medium | .25 - .50 | N | 1 | 0 | 1 | 1% | 31% |
| | Coarse | .50 - 1.0 | D | 1 | 0 | 1 | 1% | 32% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 3 | 0 | 3 | 3% | 35% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 3 | 0 | 3 | 3% | 38% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 12 | 0 | 12 | 12% | 50% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 7 | 0 | 7 | 7% | 57% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 15 | 0 | 15 | 15% | 72% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 20 | 0 | 20 | 20% | 91% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 4 | 0 | 4 | 4% | 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 | 0% | 100% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 100% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 100% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 100% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **102** | **0** | **102** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 1.9 | 6.0 | 14.2 | 21.9 |



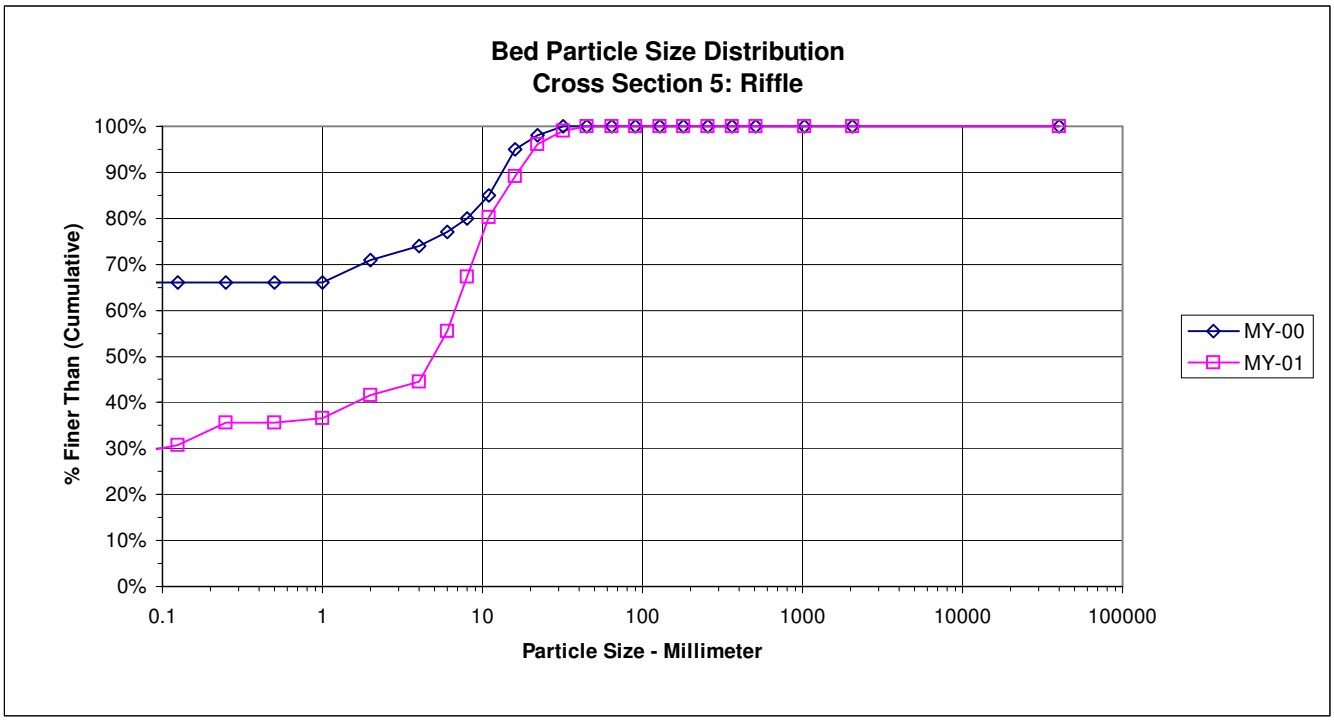
| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #3 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 18 | 0 | 18 | 18% | 18% |
| | Very Fine | .062 - .125 | S | 3 | 0 | 3 | 3% | 21% |
| | Fine | .125 - .25 | A | 6 | 0 | 6 | 6% | 27% |
| | Medium | .25 - .50 | N | 0 | 0 | 0 | 0% | 27% |
| | Coarse | .50 - 1.0 | D | 3 | 0 | 3 | 3% | 30% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 2 | 0 | 2 | 2% | 32% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 1 | 0 | 1 | 1% | 33% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 3 | 0 | 3 | 3% | 36% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 14 | 0 | 14 | 14% | 50% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 11 | 0 | 11 | 11% | 61% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 13 | 0 | 13 | 13% | 74% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 9 | 0 | 9 | 9% | 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 | | 2 | 0 | 2 | 2% | 97% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 97% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 2 | 0 | 2 | 2% | 99% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 99% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 1 | 0 | 1 | 1% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **100** | **0** | **100** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 5.3 | 8.0 | 23.4 | 45.0 |



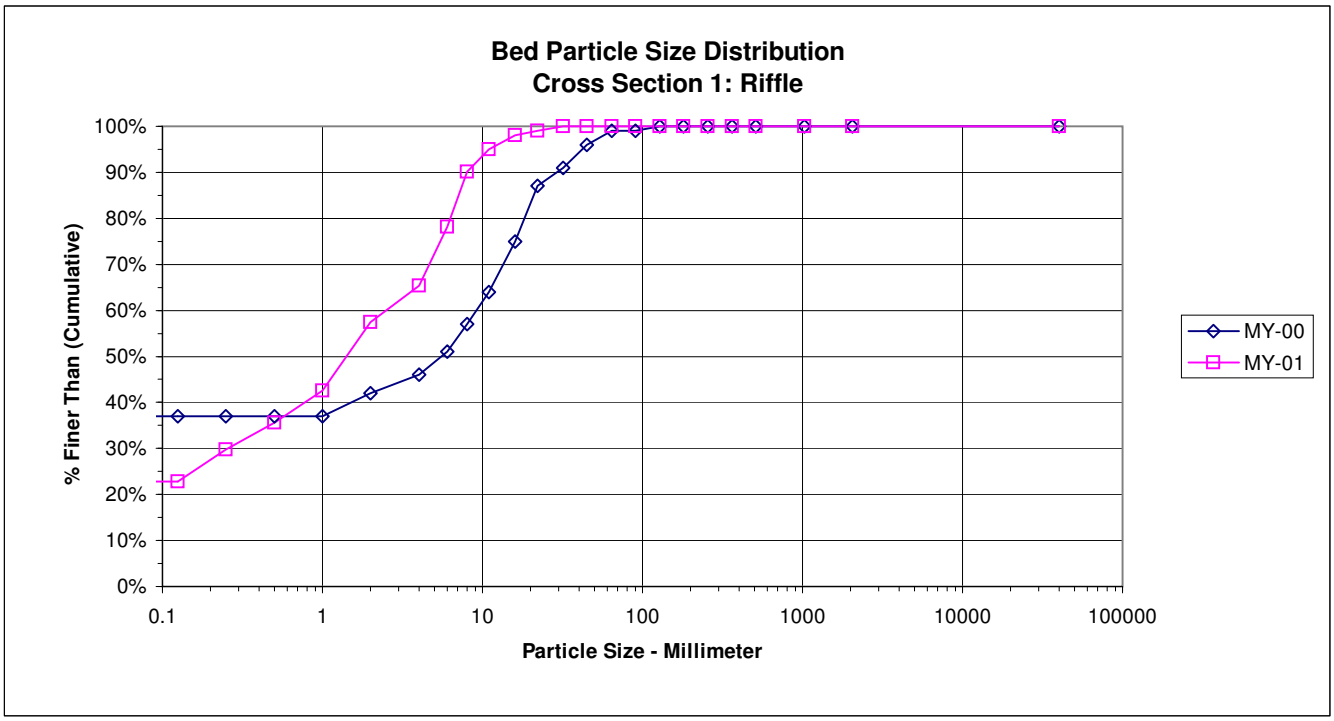
| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #5 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 29 | 0 | 29 | 29% | 29% |
| | Very Fine | .062 - .125 | S | 2 | 0 | 2 | 2% | 31% |
| | Fine | .125 - .25 | A | 5 | 0 | 5 | 5% | 36% |
| | Medium | .25 - .50 | N | 0 | 0 | 0 | 0% | 36% |
| | Coarse | .50 - 1.0 | D | 1 | 0 | 1 | 1% | 37% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 5 | 0 | 5 | 5% | 42% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 3 | 0 | 3 | 3% | 45% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 11 | 0 | 11 | 11% | 55% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 12 | 0 | 12 | 12% | 67% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 13 | 0 | 13 | 13% | 80% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 9 | 0 | 9 | 9% | 89% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 7 | 0 | 7 | 7% | 96% |
| .89 - 1.26 | Coarse | 22.6 - 32.0 | L | 3 | 0 | 3 | 3% | 99% |
| 1.26 - 1.77 | Very Coarse | 32.0 - 45.0 | S | 1 | 0 | 1 | 1% | 100% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 100% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 100% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 100% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **101** | **0** | **101** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 0.2 | 5.0 | 13.1 | 21.1 |



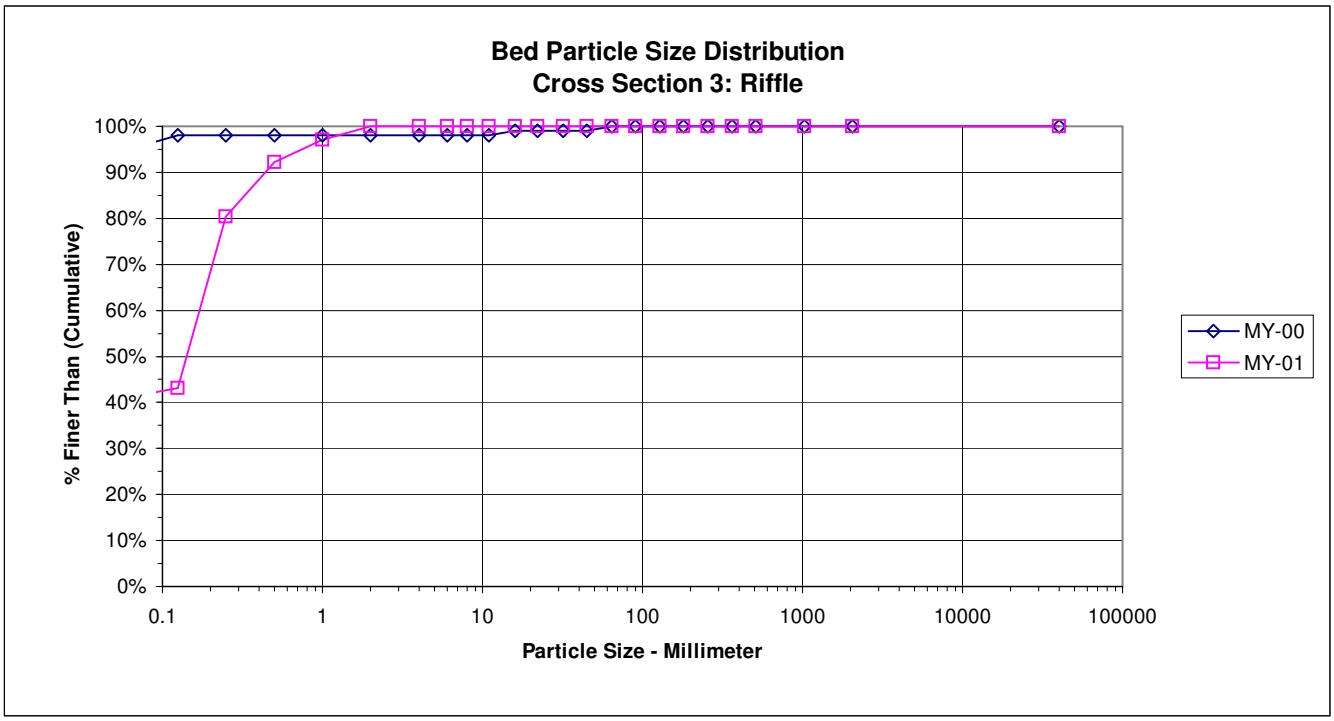
| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | UT to Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #1 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 23 | 0 | 23 | 23% | 23% |
| | Very Fine | .062 - .125 | S | 0 | 0 | 0 | 0% | 23% |
| | Fine | .125 - .25 | A | 7 | 0 | 7 | 7% | 30% |
| | Medium | .25 - .50 | N | 6 | 0 | 6 | 6% | 36% |
| | Coarse | .50 - 1.0 | D | 7 | 0 | 7 | 7% | 43% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 15 | 0 | 15 | 15% | 57% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 8 | 0 | 8 | 8% | 65% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 13 | 0 | 13 | 13% | 78% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 12 | 0 | 12 | 12% | 90% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 5 | 0 | 5 | 5% | 95% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 3 | 0 | 3 | 3% | 98% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 1 | 0 | 1 | 1% | 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 | 0% | 100% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 100% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 100% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 100% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **101** | **0** | **101** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 0.5 | 1.5 | 7.0 | 11.0 |



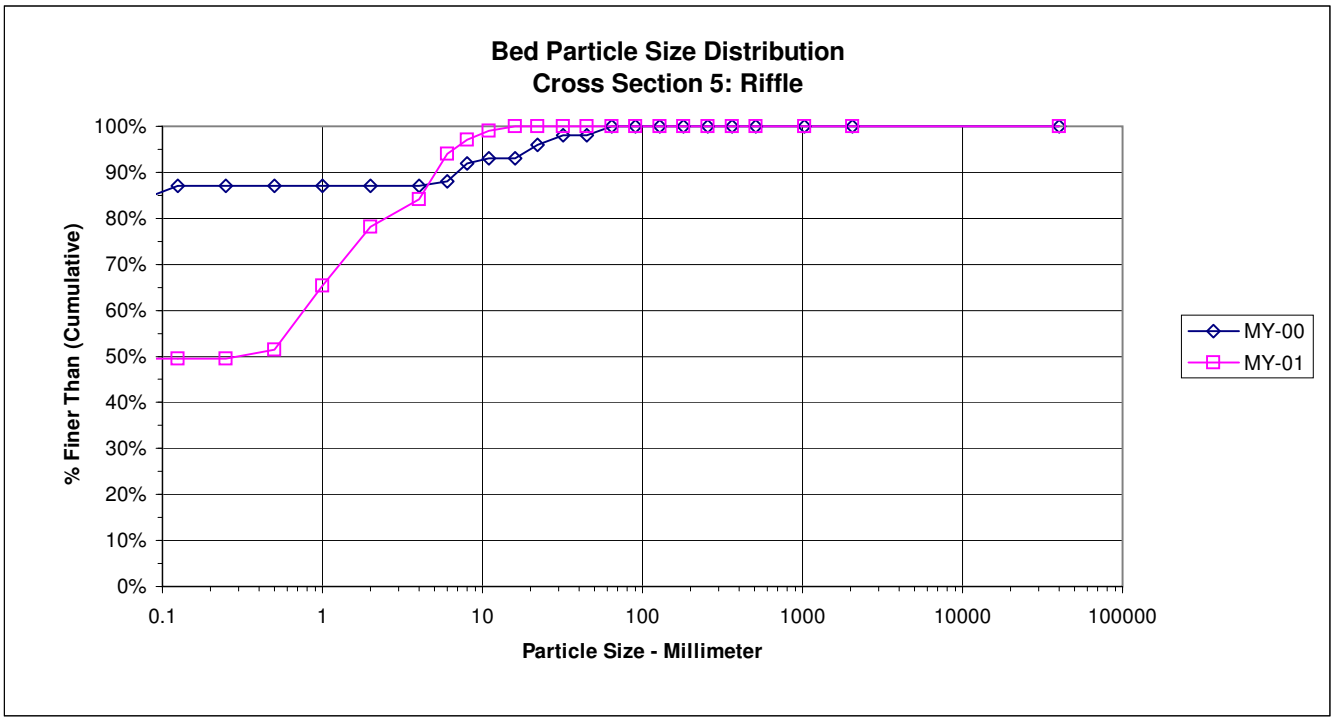
| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | UT to Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #3 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 42 | 0 | 42 | 41% | 41% |
| | Very Fine | .062 - .125 | S | 2 | 0 | 2 | 2% | 43% |
| | Fine | .125 - .25 | A | 38 | 0 | 38 | 37% | 80% |
| | Medium | .25 - .50 | N | 12 | 0 | 12 | 12% | 92% |
| | Coarse | .50 - 1.0 | D | 5 | 0 | 5 | 5% | 97% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 3 | 0 | 3 | 3% | 100% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 0 | 0 | 0 | 0% | 100% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 0 | 0 | 0 | 0% | 100% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 0 | 0 | 0 | 0% | 100% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 0 | 0 | 0 | 0% | 100% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 0 | 0 | 0 | 0% | 100% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 0 | 0 | 0 | 0% | 100% |
| .89 - 1.26 | Coarse | 22.6 - 32.0 | L | 0 | 0 | 0 | 0% | 100% |
| 1.26 - 1.77 | Very Coarse | 32.0 - 45.0 | S | 0 | 0 | 0 | 0% | 100% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 100% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 100% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 100% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **102** | **0** | **102** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 0.1 | 0.1 | 0.3 | 0.8 |



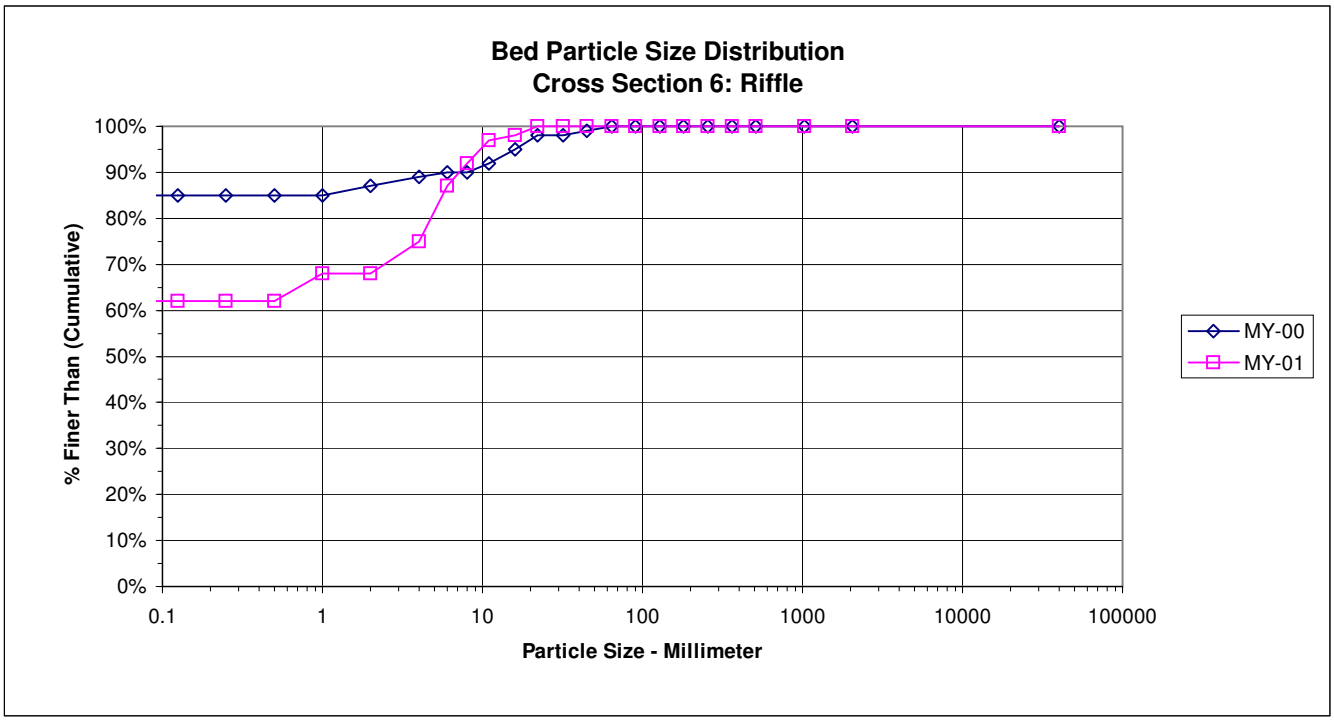
| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | UT to Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #5 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 50 | 0 | 50 | 50% | 50% |
| | Very Fine | .062 - .125 | S | 0 | 0 | 0 | 0% | 50% |
| | Fine | .125 - .25 | A | 0 | 0 | 0 | 0% | 50% |
| | Medium | .25 - .50 | N | 2 | 0 | 2 | 2% | 51% |
| | Coarse | .50 - 1.0 | D | 14 | 0 | 14 | 14% | 65% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 13 | 0 | 13 | 13% | 78% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 6 | 0 | 6 | 6% | 84% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 10 | 0 | 10 | 10% | 94% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 3 | 0 | 3 | 3% | 97% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 2 | 0 | 2 | 2% | 99% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 1 | 0 | 1 | 1% | 100% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 0 | 0 | 0 | 0% | 100% |
| .89 - 1.26 | Coarse | 22.6 - 32.0 | L | 0 | 0 | 0 | 0% | 100% |
| 1.26 - 1.77 | Very Coarse | 32.0 - 45.0 | S | 0 | 0 | 0 | 0% | 100% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 100% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 100% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 100% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **101** | **0** | **101** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 0.1 | 0.3 | 3.9 | 6.6 |



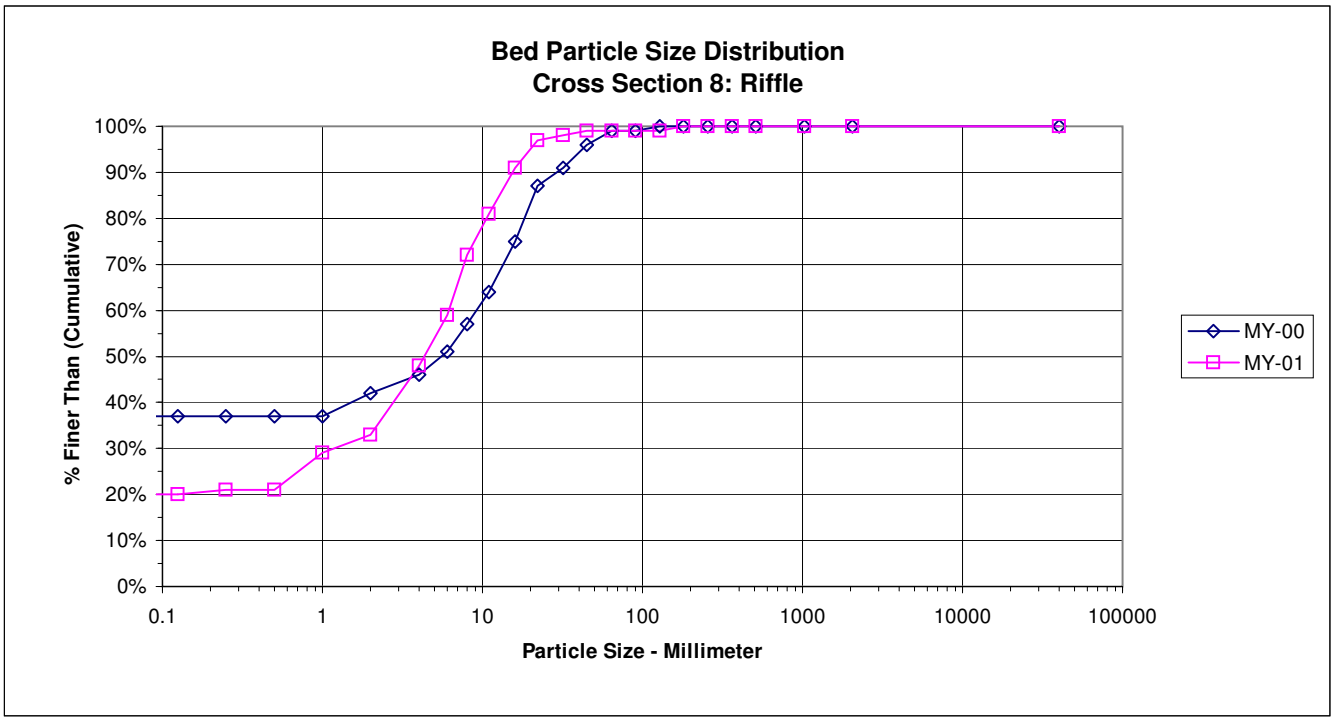
| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | UT to Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #6 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 62 | 0 | 62 | 62% | 62% |
| | Very Fine | .062 - .125 | S | 0 | 0 | 0 | 0% | 62% |
| | Fine | .125 - .25 | A | 0 | 0 | 0 | 0% | 62% |
| | Medium | .25 - .50 | N | 0 | 0 | 0 | 0% | 62% |
| | Coarse | .50 - 1.0 | D | 6 | 0 | 6 | 6% | 68% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 0 | 0 | 0 | 0% | 68% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 7 | 0 | 7 | 7% | 75% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 12 | 0 | 12 | 12% | 87% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 5 | 0 | 5 | 5% | 92% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 5 | 0 | 5 | 5% | 97% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 1 | 0 | 1 | 1% | 98% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 2 | 0 | 2 | 2% | 100% |
| .89 - 1.26 | Coarse | 22.6 - 32.0 | L | 0 | 0 | 0 | 0% | 100% |
| 1.26 - 1.77 | Very Coarse | 32.0 - 45.0 | S | 0 | 0 | 0 | 0% | 100% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 100% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 100% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 100% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **100** | **0** | **100** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 0.1 | 0.1 | 5.5 | 9.8 |



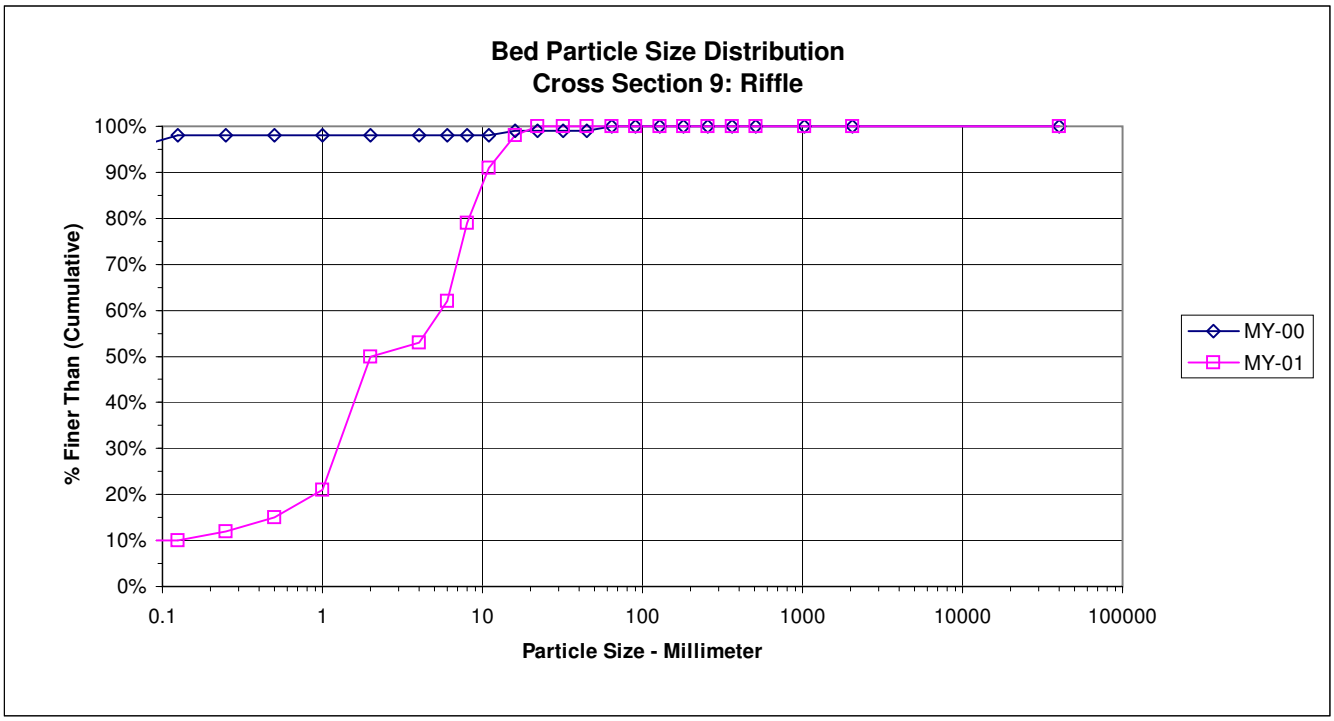
| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | UT to Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #8 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 20 | 0 | 20 | 20% | 20% |
| | Very Fine | .062 - .125 | S | 0 | 0 | 0 | 0% | 20% |
| | Fine | .125 - .25 | A | 1 | 0 | 1 | 1% | 21% |
| | Medium | .25 - .50 | N | 0 | 0 | 0 | 0% | 21% |
| | Coarse | .50 - 1.0 | D | 8 | 0 | 8 | 8% | 29% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 4 | 0 | 4 | 4% | 33% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 15 | 0 | 15 | 15% | 48% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 11 | 0 | 11 | 11% | 59% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 13 | 0 | 13 | 13% | 72% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 9 | 0 | 9 | 9% | 81% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 10 | 0 | 10 | 10% | 91% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 6 | 0 | 6 | 6% | 97% |
| .89 - 1.26 | Coarse | 22.6 - 32.0 | L | 1 | 0 | 1 | 1% | 98% |
| 1.26 - 1.77 | Very Coarse | 32.0 - 45.0 | S | 1 | 0 | 1 | 1% | 99% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 99% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 99% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 99% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 1 | 0 | 1 | 1% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **100** | **0** | **100** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 2.3 | 4.4 | 12.5 | 20.0 |



| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | UT to Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #9 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 10 | 0 | 10 | 10% | 10% |
| | Very Fine | .062 - .125 | S | 0 | 0 | 0 | 0% | 10% |
| | Fine | .125 - .25 | A | 2 | 0 | 2 | 2% | 12% |
| | Medium | .25 - .50 | N | 3 | 0 | 3 | 3% | 15% |
| | Coarse | .50 - 1.0 | D | 6 | 0 | 6 | 6% | 21% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 29 | 0 | 29 | 29% | 50% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 3 | 0 | 3 | 3% | 53% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 9 | 0 | 9 | 9% | 62% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 17 | 0 | 17 | 17% | 79% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 12 | 0 | 12 | 12% | 91% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 7 | 0 | 7 | 7% | 98% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 2 | 0 | 2 | 2% | 100% |
| .89 - 1.26 | Coarse | 22.6 - 32.0 | L | 0 | 0 | 0 | 0% | 100% |
| 1.26 - 1.77 | Very Coarse | 32.0 - 45.0 | S | 0 | 0 | 0 | 0% | 100% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 100% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 100% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 100% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **100** | **0** | **100** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.6 | 1.5 | 2.0 | 9.3 | 13.9 |



| PEBBLE COUNT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Project:** | UT to Underwood Creek | | | | | **Date:** | 10/25/2011 | |
| **Location:** | Cross Section #10 | | | | | | | |
| | | | | Particle Counts | | | | |
| Inches | Particle | Millimeter | | Riffles | Pools | Total No. | Item % | % Cumulative |
| | Silt/Clay | < 0.062 | S/C | 41 | 0 | 41 | 39% | 39% |
| | Very Fine | .062 - .125 | S | 0 | 0 | 0 | 0% | 39% |
| | Fine | .125 - .25 | A | 0 | 0 | 0 | 0% | 39% |
| | Medium | .25 - .50 | N | 0 | 0 | 0 | 0% | 39% |
| | Coarse | .50 - 1.0 | D | 0 | 0 | 0 | 0% | 39% |
| .04 -.08 | Very Coarse | 1.0 - 2.0 | S | 0 | 0 | 0 | 0% | 39% |
| .08 - .16 | Very Fine | 2.0 - 4.0 | | 7 | 0 | 7 | 7% | 46% |
| .16 - .22 | Fine | 4.0 - 5.7 | G | 10 | 0 | 10 | 10% | 56% |
| .22 - .31 | Fine | 5.7 - 8.0 | R | 11 | 0 | 11 | 11% | 66% |
| .31 - .44 | Medium | 8.0 - 11.3 | A | 11 | 0 | 11 | 11% | 77% |
| .44 - .63 | Medium | 11.3 - 16.0 | V | 10 | 0 | 10 | 10% | 87% |
| .63 - .89 | Coarse | 16.0 - 22.6 | E | 5 | 0 | 5 | 5% | 91% |
| .89 - 1.26 | Coarse | 22.6 - 32.0 | L | 7 | 0 | 7 | 7% | 98% |
| 1.26 - 1.77 | Very Coarse | 32.0 - 45.0 | S | 2 | 0 | 2 | 2% | 100% |
| 1.77 - 2.5 | Very Coarse | 45.0 - 64.0 | | 0 | 0 | 0 | 0% | 100% |
| 2.5 - 3.5 | Small | 64 - 90 | C | 0 | 0 | 0 | 0% | 100% |
| 3.5 - 5.0 | Small | 90 - 128 | O | 0 | 0 | 0 | 0% | 100% |
| 5.0 - 7.1 | Large | 128 - 180 | B | 0 | 0 | 0 | 0% | 100% |
| 7.1 - 10.1 | Large | 180 - 256 | L | 0 | 0 | 0 | 0% | 100% |
| 10.1 - 14.3 | Small | 256 - 362 | B | 0 | 0 | 0 | 0% | 100% |
| 14.3 - 20 | Small | 362 - 512 | L | 0 | 0 | 0 | 0% | 100% |
| 20 - 40 | Medium | 512 - 1024 | D | 0 | 0 | 0 | 0% | 100% |
| 40 - 80 | Lrg- Very Lrg | 1024 - 2048 | R | 0 | 0 | 0 | 0% | 100% |
| | Bedrock | | BDRK | 0 | 0 | 0 | 0% | 100% |
| | | | **Totals** | **104** | **0** | **104** | **100%** | **100%** |

| d16 | d35 | d50 | d84 | d95 |
|---|---|---|---|---|
| 0.1 | 0.1 | 4.8 | 14.7 | 27.4 |

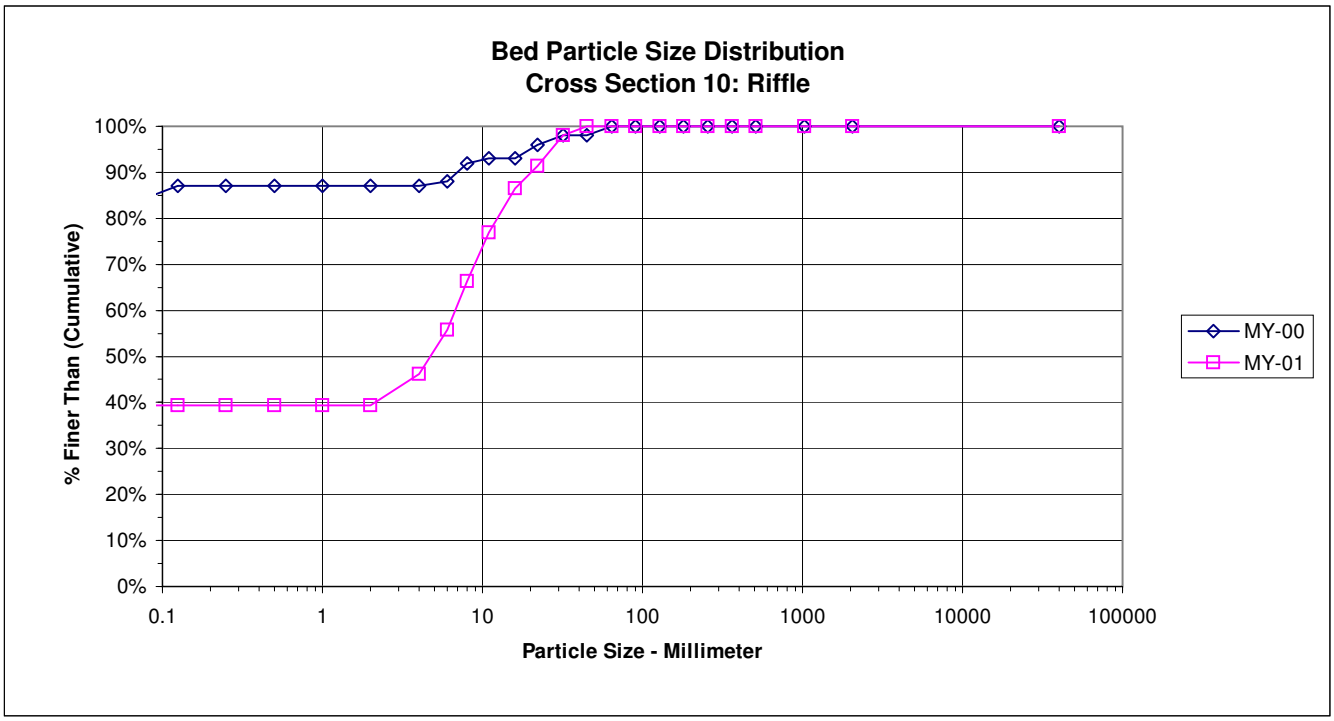


Table 10a. Baseline Stream Data Summary
Newtown - EEP# 94150 - Underwood Creek: 1273 feet

| 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 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

## 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 | | | | | | 594.36 | 594.36 | | | | | | 592.56 | 592.56 | | | | | |
| Bankfull Width (ft) | N/A | 17.4132 | | | | | | 15.67 | 16.1383 | | | | | | 16.69 | 19.3302 | | | | | |
| Floodprone Width (ft) | N/A | 205 | | | | | | 140 | 140 | | | | | | 225 | 225 | | | | | |
| Bankfull Mean Depth (ft) | N/A | 1.80387 | | | | | | 1.03 | 1.13501 | | | | | | 1.08 | 1.04954 | | | | | |
| Bankfull Max Depth (ft) | N/A | 3.71 | | | | | | 1.74 | 1.83 | | | | | | 1.75 | 1.89 | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | N/A | 31.4112 | | | | | | 16.11 | 18.3172 | | | | | | 18.10 | 20.2878 | | | | | |
| Bankfull Width/Depth Ratio | N/A | 9.65324 | | | | | | 15.24 | 14.2187 | | | | | | 15.40 | 18.4178 | | | | | |
| Bankfull Entrenchment Ratio | N/A | 11.7727 | | | | | | 8.94 | 8.67499 | | | | | | 13.48 | 11.6398 | | | | | |
| Bankfull Bank Height Ratio | N/A | 1 | | | | | | 1.00 | 1.01093 | | | | | | 1.00 | 0.97884 | | | | | |
| Cross Sectional Area between end pins ($ft^2$) | N/A | 82.7397 | | | | | | 39.17 | 40.6695 | | | | | | 33.48 | 36.1303 | | | | | |
| d50 (mm) | N/A | N/A | | | | | | Silt | 6 | | | | | | Silt | 8 | | | | | |

| | 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 | | | | | | 590.75 | 590.75 | | | | | |
| Bankfull Width (ft) | N/A | 22.7747 | | | | | | 15.27 | 15.1116 | | | | | |
| Floodprone Width (ft) | N/A | 180 | | | | | | 110 | 110 | | | | | |
| Bankfull Mean Depth (ft) | N/A | 1.48487 | | | | | | 1.04 | 1.15674 | | | | | |
| Bankfull Max Depth (ft) | N/A | 3.43 | | | | | | 1.66 | 2.06 | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | N/A | 33.8175 | | | | | | 15.88 | 17.4802 | | | | | |
| Bankfull Width/Depth Ratio | N/A | 15.3379 | | | | | | 14.69 | 13.064 | | | | | |
| Bankfull Entrenchment Ratio | N/A | 7.90349 | | | | | | 7.20 | 7.27916 | | | | | |
| Bankfull Bank Height Ratio | N/A | 0.97959 | | | | | | 1.00 | 1.00485 | | | | | |
| Cross Sectional Area between end pins ($ft^2$) | N/A | 65.0698 | | | | | | 34.16 | 35.7582 | | | | | |
| d50 (mm) | N/A | N/A | | | | | | Silt | 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 | | | | | | N/A | 607.92 | | | | | | 604.51 | 604.51 | | | | | | N/A | 603.49 | | | | | | 601.91 | 601.91 | | | | | |
| Bankfull Width (ft) | 12.32 | 12.1781 | | | | | | N/A | 18.4942 | | | | | | 16.52 | 17.1657 | | | | | | N/A | 17.5195 | | | | | | 13.99 | 14.2403 | | | | | |
| Floodprone Width (ft) | 280 | 280 | | | | | | N/A | 190 | | | | | | 245 | 245 | | | | | | N/A | 190 | | | | | | 230 | 230 | | | | | |
| Bankfull Mean Depth (ft) | 1.06 | 1.08101 | | | | | | N/A | 1.64521 | | | | | | 0.81 | 0.76829 | | | | | | N/A | 1.41475 | | | | | | 0.97 | 0.93924 | | | | | |
| Bankfull Max Depth (ft) | 1.98 | 2 | | | | | | N/A | 3.38 | | | | | | 1.72 | 1.65 | | | | | | N/A | 2.76 | | | | | | 1.58 | 1.54 | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 13.06 | 13.1646 | | | | | | N/A | 30.4269 | | | | | | 13.38 | 13.1883 | | | | | | N/A | 24.7857 | | | | | | 13.61 | 13.3751 | | | | | |
| Bankfull Width/Depth Ratio | 11.63 | 11.2655 | | | | | | N/A | 11.2412 | | | | | | 20.38 | 22.3426 | | | | | | N/A | 12.3835 | | | | | | 14.37 | 15.1615 | | | | | |
| Bankfull Entrenchment Ratio | 22.72 | 22.9921 | | | | | | N/A | 10.2735 | | | | | | 14.83 | 14.2726 | | | | | | N/A | 10.845 | | | | | | 16.45 | 16.1513 | | | | | |
| Bankfull Bank Height Ratio | 0.98 | 0.955 | | | | | | N/A | 1 | | | | | | 0.94 | 0.96 | | | | | | N/A | 0.98913 | | | | | | 1.00 | 1.00649 | | | | | |
| Cross Sectional Area between end pins ($ft^2$) | 57.18 | 57.0575 | | | | | | N/A | 43.2436 | | | | | | 31.77 | 30.81 | | | | | | N/A | 37.4425 | | | | | | 24.19 | 24.079 | | | | | |
| d50 (mm) | 5.60 | 1.5 | | | | | | N/A | N/A | | | | | | Silt | 0.10 | | | | | | N/A | N/A | | | | | | Silt | 0.3 | | | | | |
| | **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 | | | | | | N/A | 597.79 | | | | | | 596.67 | 596.67 | | | | | | 594.85 | 594.85 | | | | | | 592.00 | 592 | | | | | |
| Bankfull Width (ft) | 13.42 | 12.3768 | | | | | | N/A | 17.5 | | | | | | 12.71 | 10.9641 | | | | | | 13.62 | 13.47 | | | | | | 15.26 | 17.8611 | | | | | |
| Floodprone Width (ft) | 115 | 115 | | | | | | N/A | 180 | | | | | | 110 | 110 | | | | | | 95 | 95 | | | | | | 135 | 135 | | | | | |
| Bankfull Mean Depth (ft) | 0.96 | 0.95074 | | | | | | N/A | 1.53518 | | | | | | 0.91 | 0.88145 | | | | | | 0.94 | 0.90062 | | | | | | 1.00 | 0.85914 | | | | | |
| Bankfull Max Depth (ft) | 1.50 | 1.38 | | | | | | N/A | 3.08 | | | | | | 1.61 | 1.44 | | | | | | 1.46 | 1.4 | | | | | | 1.61 | 1.72 | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 12.92 | 11.7671 | | | | | | N/A | 26.8657 | | | | | | 11.59 | 9.66431 | | | | | | 12.80 | 12.1313 | | | | | | 15.22 | 15.3453 | | | | | |
| Bankfull Width/Depth Ratio | 13.93 | 13.018 | | | | | | N/A | 11.3993 | | | | | | 13.95 | 12.4387 | | | | | | 14.50 | 14.9564 | | | | | | 15.31 | 20.7895 | | | | | |
| Bankfull Entrenchment Ratio | 8.57 | 9.29159 | | | | | | N/A | 10.2857 | | | | | | 8.65 | 10.0328 | | | | | | 6.97 | 7.05271 | | | | | | 8.84 | 7.55831 | | | | | |
| Bankfull Bank Height Ratio | 1.00 | 1.08696 | | | | | | N/A | 0.97727 | | | | | | 1.00 | 1.125 | | | | | | 0.95 | 0.94286 | | | | | | 0.98 | 0.92442 | | | | | |
| Cross Sectional Area between end pins ($ft^2$) | 43.35 | 36.1685 | | | | | | N/A | 43.0746 | | | | | | 46.57 | 38.0631 | | | | | | 31.80 | 30.4305 | | | | | | 25.97 | 24.7681 | | | | | |
| d50 (mm) | Silt | 0.1 | | | | | | N/A | N/A | | | | | | Silt | 4.4 | | | | | | Silt | 2 | | | | | | Silt | 4.8 | | | | | |

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) | 15.272 | 15.878 | 15.667 | 16.694 | 0.7338 | 3 | 15.112 | 16.86 | 16.138 | 19.33 | 2.1999 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| Floodprone Width (ft) | 110 | 158.33 | 140 | 225 | 59.652 | 3 | 110 | 158.33 | 140 | 225 | 59.652 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Mean Depth (ft) | 1.0281 | 1.0491 | 1.0349 | 1.0842 | 0.0306 | 3 | 1.0495 | 1.1138 | 1.135 | 1.1567 | 0.0567 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| [1]Bankfull Max Depth (ft) | 1.66 | 1.7167 | 1.74 | 1.75 | 0.0493 | 3 | 1.83 | 1.9267 | 1.89 | 2.06 | 0.1193 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 15.806 | 16.671 | 16.108 | 18.099 | 1.2459 | 3 | 17.48 | 18.695 | 18.317 | 20.288 | 1.4414 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| Width/Depth Ratio | 14.757 | 15.131 | 15.238 | 15.398 | 0.3337 | 3 | 13.064 | 15.233 | 14.219 | 18.418 | 2.8175 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| Entrenchment Ratio | 7.2026 | 9.8721 | 8.9357 | 13.478 | 3.2408 | 3 | 7.2792 | 9.198 | 8.675 | 11.64 | 2.2269 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| [1]Bank Height Ratio | 1 | 1 | 1 | 1 | 0 | 3 | 0.9788 | 0.9982 | 1.0049 | 1.0109 | 0.017 | 3 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 7.36 | 20.808 | 20.505 | 31.54 | 5.5775 | 22 | 8.58 | 21.4 | 19.56 | 35.95 | 6.1111 | 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 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Length (ft) | 17.45 | 34.809 | 34.925 | 52.82 | 7.6111 | 24 | 18.27 | 34.33 | 32.865 | 50.34 | 7.2143 | 24 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Max depth (ft) | 2.76 | 3.4017 | 3.43 | 4.04 | 0.374 | 24 | 2.91 | 3.5154 | 3.515 | 3.94 | 0.2514 | 24 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 31.47 | 55.969 | 54.565 | 78.46 | 10.484 | 22 | 37.01 | 57.451 | 55.8 | 92.83 | 13.993 | 23 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 34 | | 53 | 86 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 26 | | 41 | 59 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc:Bankfull width (ft/ft) | 0.016 | | 0.0255 | 0.037 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | 82 | | 112 | 130 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | 2.1 | | 3.3 | 5.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | C4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Thalweg length (ft) | 1331 | | | | | | 1331 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.3 | | | | | | 1.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | 0.0048 | | | | | | 0.00485 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BF slope (ft/ft) | 0.0048 | | | | | | 0.00522 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [3]Ri% / Ru% / P% / G% / S% | 24% | | 43% | | 2% | | 36% | | 64% | | 2% | | | | | | | | | | | | | | | | | | | | | | | | | |
| [3]SC% / Sa% / G% / C% / B% / Be% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [3]d16 / d35 / d50 / d84 / d95 / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [2]% of Reach with Eroding Banks | 0 | | | | | | 3% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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) | 12.322 | 13.977 | 13.625 | 16.516 | 1.4652 | 7 | 10.964 | 13.399 | 12.923 | 17.166 | 2.1617 | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| Floodprone Width (ft) | 95 | 172.86 | 135 | 280 | 76.095 | 7 | 95 | 179.17 | 172.5 | 280 | 81.328 | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Mean Depth (ft) | 0.8103 | 0.9506 | 0.963 | 1.0596 | 0.0775 | 7 | 0.7683 | 0.9202 | 0.9199 | 1.081 | 0.1021 | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| [1]Bankfull Max Depth (ft) | 1.46 | 1.6371 | 1.61 | 1.98 | 0.1729 | 7 | 1.38 | 1.5683 | 1.49 | 2 | 0.2341 | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Cross Sectional Area ($ft^2$) | 11.585 | 13.225 | 13.057 | 15.215 | 1.0894 | 7 | 9.6643 | 12.215 | 12.648 | 13.375 | 1.4077 | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| Width/Depth Ratio | 11.629 | 14.868 | 14.373 | 20.383 | 2.6834 | 7 | 11.266 | 14.864 | 13.987 | 22.343 | 3.9564 | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| Entrenchment Ratio | 6.9727 | 12.435 | 8.8446 | 22.723 | 5.7683 | 7 | 7.0527 | 13.299 | 12.153 | 22.992 | 5.81 | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| [1]Bank Height Ratio | 0.9419 | 0.979 | 0.9848 | 1 | 0.0254 | 7 | 0.9429 | 1.0123 | 0.982 | 1.125 | 0.0767 | 6 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Profile** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | 9.19 | 16.294 | 15.51 | 34.04 | 4.4599 | 64 | 6.49 | 15.282 | 13.945 | 47.85 | 6.6304 | 64 | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Length (ft) | 19.68 | 30.254 | 28.74 | 51.91 | 7.7476 | 65 | 16.33 | 31.91 | 29.535 | 55.66 | 8.3181 | 64 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Max depth (ft) | 2.42 | 2.9651 | 2.92 | 3.68 | 0.2746 | 65 | 2.6 | 3.2741 | 3.1675 | 12.61 | 1.2177 | 64 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pool Spacing (ft) | 31.79 | 46.166 | 44.57 | 80.51 | 9.6963 | 63 | 24.26 | 46.85 | 45.795 | 85.42 | 11.441 | 62 | | | | | | | | | | | | | | | | | | | | | | | | |
| **Pattern** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | 30 | | 46 | 76 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Radius of Curvature (ft) | 23 | | 36 | 52 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rc:Bankfull width (ft/ft) | 0.016 | | 0.0255 | 0.037 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Wavelength (ft) | 72 | | 98 | 113 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Meander Width Ratio | 2.1 | | 3.3 | 5.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Additional Reach Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | C4 | | | | | | C4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Thalweg length (ft) | 4100* | | | | | | 3000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sinuosity (ft) | 1.3 | | | | | | 1.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Water Surface Slope (Channel) (ft/ft) | 0.0048 | | | | | | 0.00529 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BF slope (ft/ft) | 0.0048 | | | | | | 0.00528 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [3]Ri% / Ru% / P% / G% / S% | 34% | | 64% | | 1% | | 33% | | 67% | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [3]SC% / Sa% / G% / C% / B% / Be% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [3]d16 / d35 / d50 / d84 / d95 / | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [2]% of Reach with Eroding Banks | 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

* - 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<br>Newtown - EEP# 94150 | | | |
|---|---|---|---|
| **Date of Data Collection** | **Date of Occurrence** | **Method** | **Photo #** |
| 25-Oct-11 | N/A | Site Visit observing visible wrack lines | 29-30 |

During the data collection site visit on October 25, 2011, visible wrack lines and debris on the floodplain were observed in several locations along the stream.

Photo #29. Visible overland flow indicators on floodplain

Photo #30. Wrack on floodplain

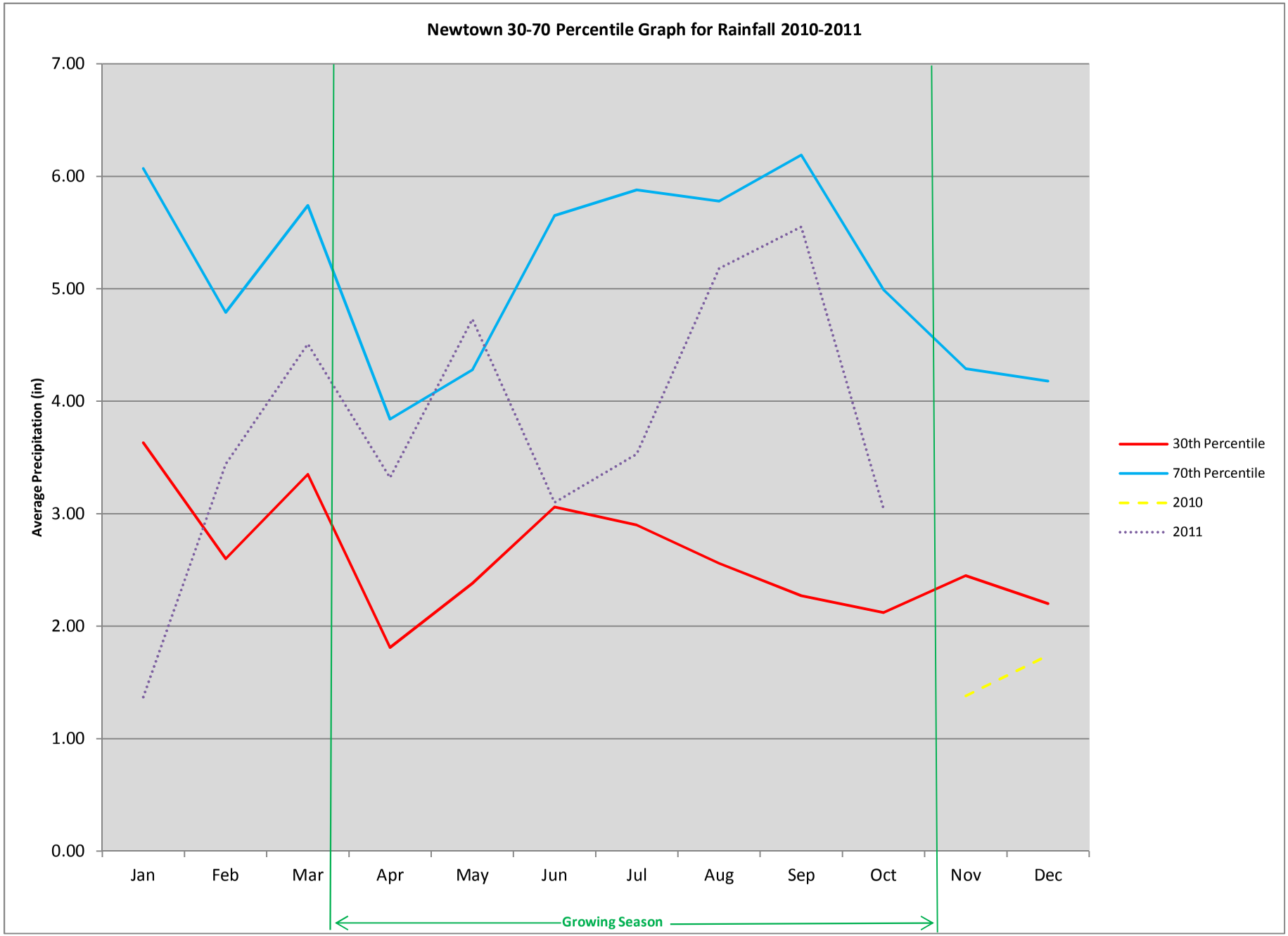
Table 13. Wetland Criteria Attainment 2010-2011

| | 2010 | | | 2011 | | |
|---|---|---|---|---|---|---|
| **Gauge #** | **Max # Consecutive Days** | **% Growing Season** | **Success Criteria Attained** | **Max # Consecutive Days** | **% Growing Season** | **Success Criteria Attained** |
| **1** | ~ | ~ | ~ | 59[a] | 32 | Yes |
| **2** | ~ | ~ | ~ | 188[b] | 100 | Yes |
| **3** | ~ | ~ | ~ | 187[a] | 100 | Yes |
| **4** | 3 | 1 | No | 77[c] | 35 | Yes |
| **5** | ~ | ~ | ~ | 59[b] | 31 | Yes |
| **6** | ~ | ~ | ~ | 59[a] | 32 | Yes |
| **7** | ~ | ~ | ~ | 17[d] | 11 | Yes |
| **8** | ~ | ~ | ~ | 8[e] | 11 | Yes |

a – Gauge installed April 23, 2011 –187 days of growing season monitored
b - Gauge installed April 22, 2011 –188 days of growing season monitored
c – Report produced prior to end of growing season –217 days monitored
d – Gauge installed May 24, 2011 –156 days of growing season monitored
e – Gauge installed August 13, 2011 –75 days of growing season monitored

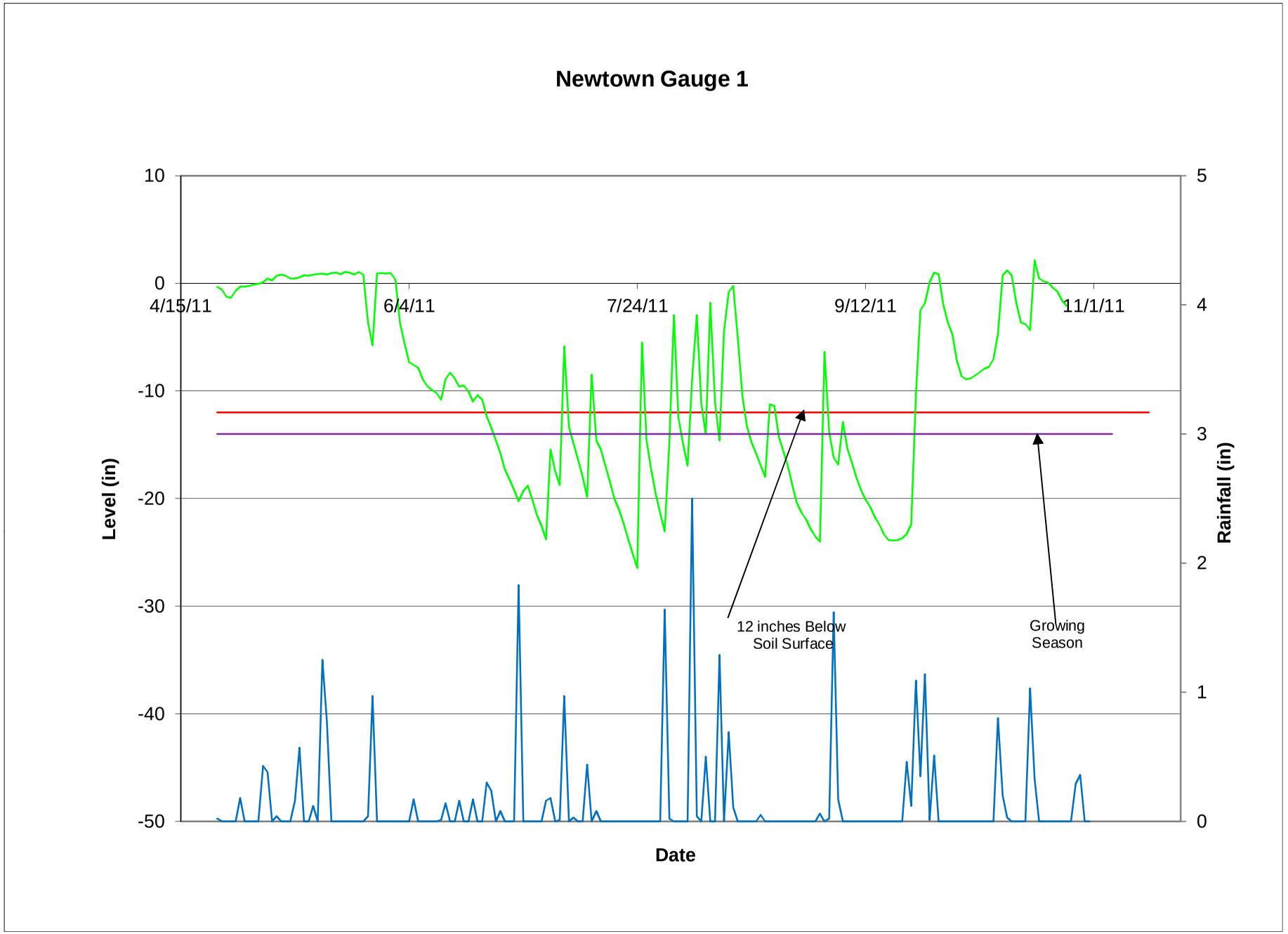
Growing Season: March 23 to November 6 (source: http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=nc)

Groundwater levels should be within 12 inches of the surface for at least 6.3% of the growing season to meet wetland hydrology success criteria. Union County has a growing season of 221 days (March 23-October 6). Therefore groundwater levels must be within 12 inches of the soil surface for a minimum of 14 consecutive days within the growing season to meet wetland hydrology success criteria. All of the wetland groundwater gauges exhibit hydroperiod criterion that exceeds the minimum 6.3% as described in the Baseline Monitoring Document and As-Built Baseline Report.



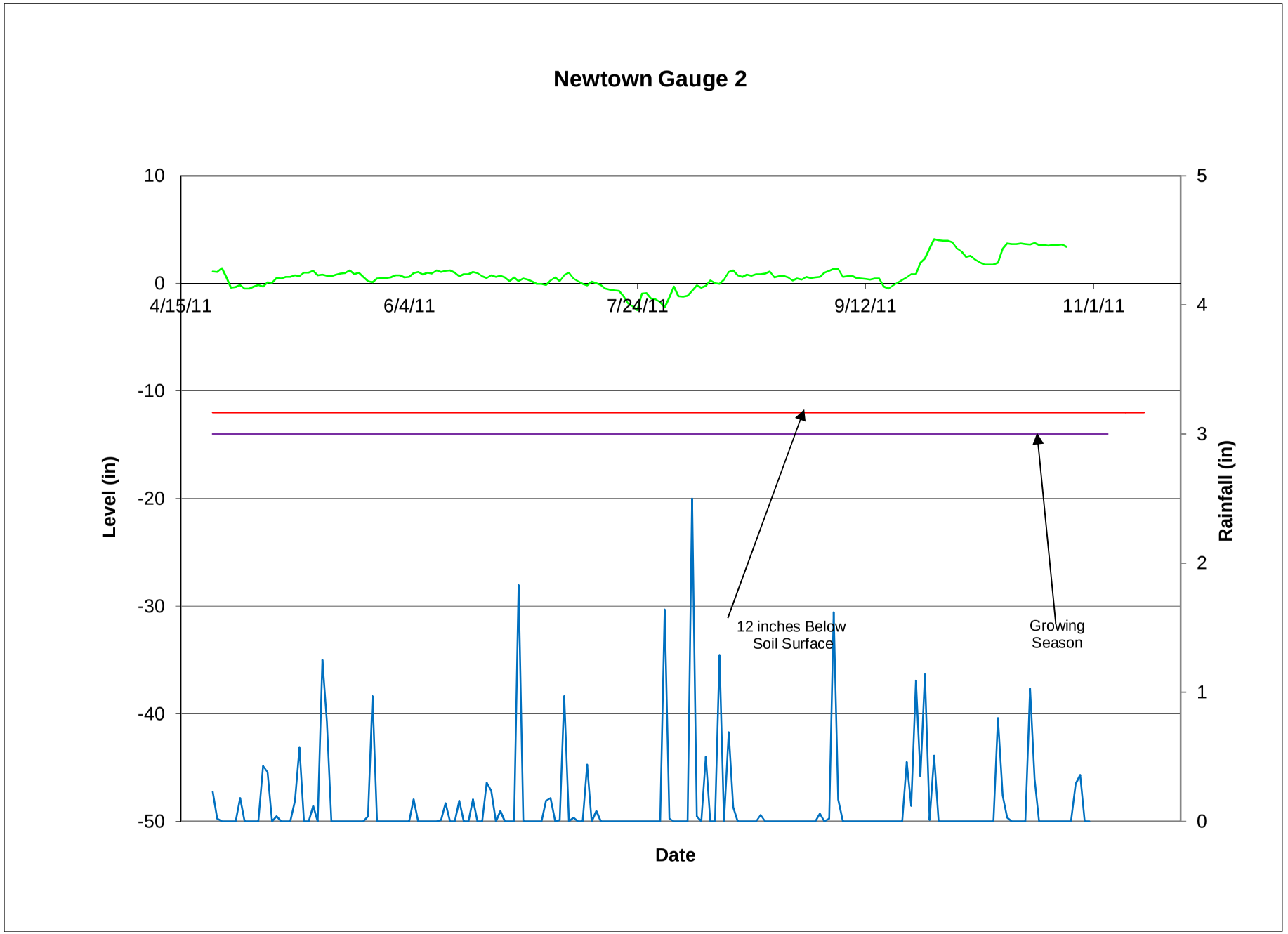

Growing Season: March 23 to November 6 (228 days)
(http://www.wcc.nrcs.usda.gov/cgibin/sate.pl?state=nc)

2010-2011 Rain Data: Station 311690
(http://www.nc-climate.ncsu.edu/services/request.php)



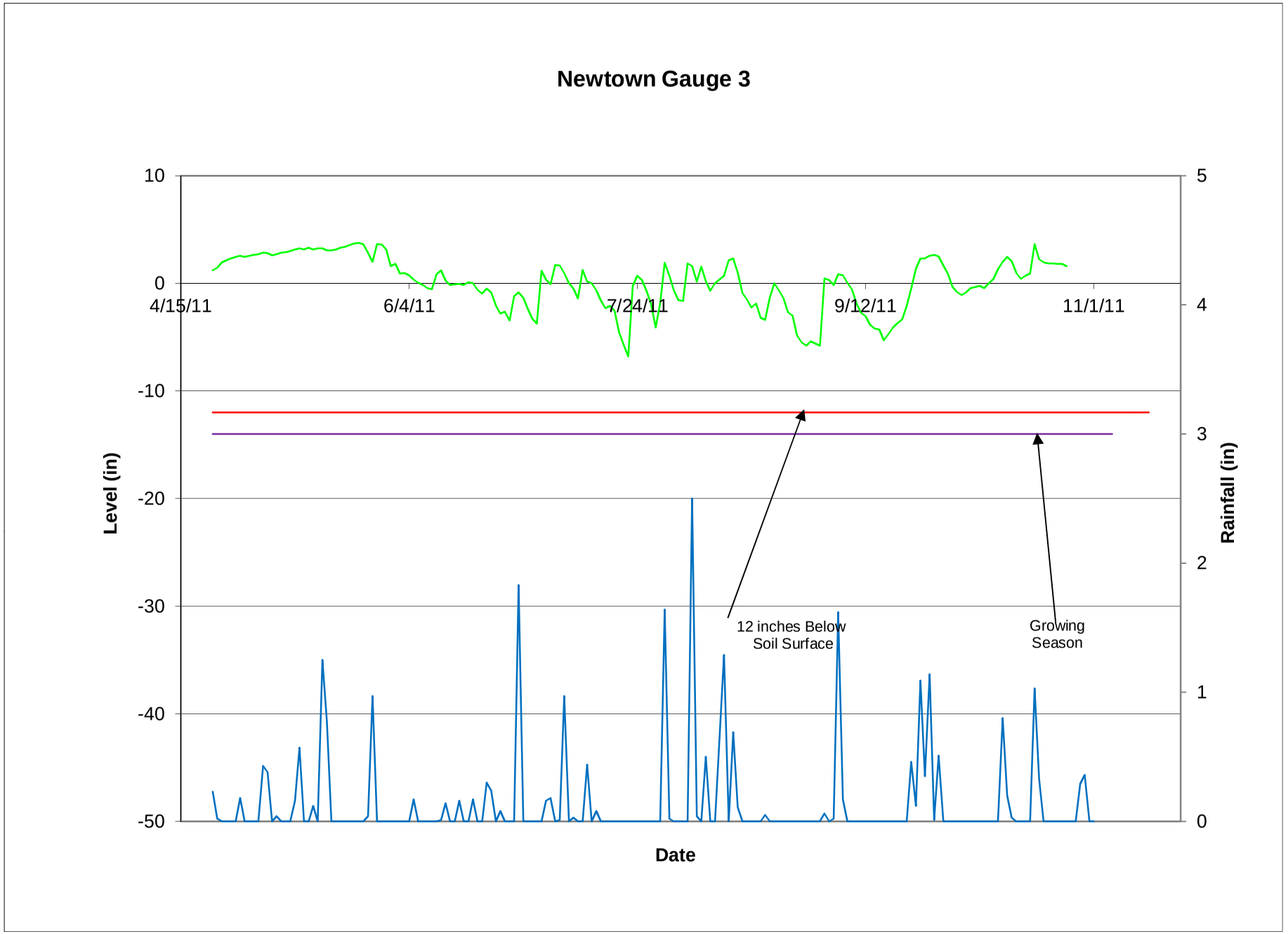

Growing Season: March 23 to November 6 (228 days)
(http://www.wcc.nrcs.usda.gov/cgibin/sate.pl?state=nc)

2010-2011 Rain Data: Station 311690
(http://www.nc-climate.ncsu.edu/services/request.php)



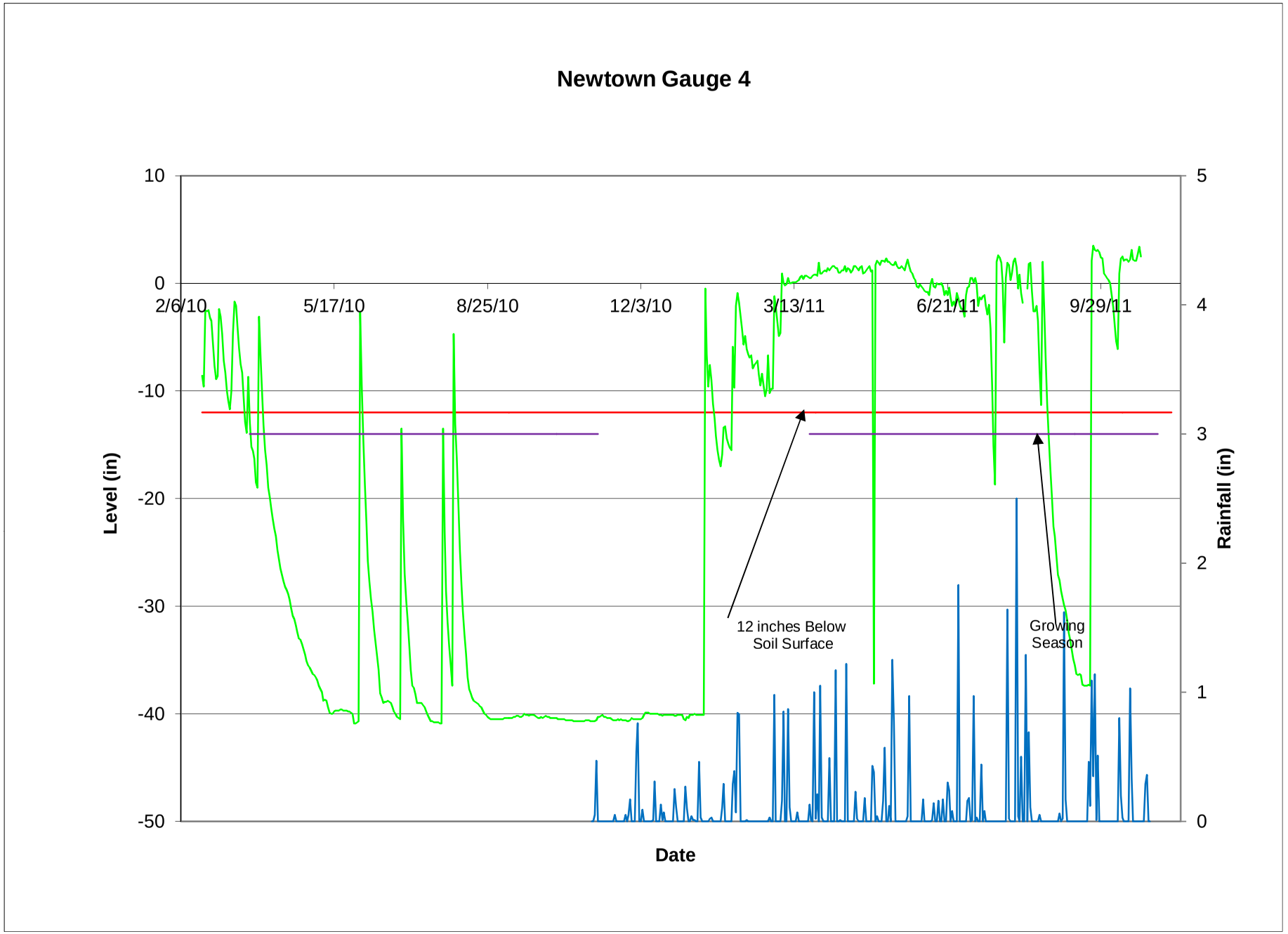

Growing Season: March 23 to November 6 (228 days)
(http://www.wcc.nrcs.usda.gov/cgibin/sate.pl?state=nc)

2010-2011 Rain Data: Station 311690
(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)

2010-2011 Rain Data: Station 311690
(http://www.nc-climate.ncsu.edu/services/request.php)




Growing Season: March 23 to November 6 (228 days)
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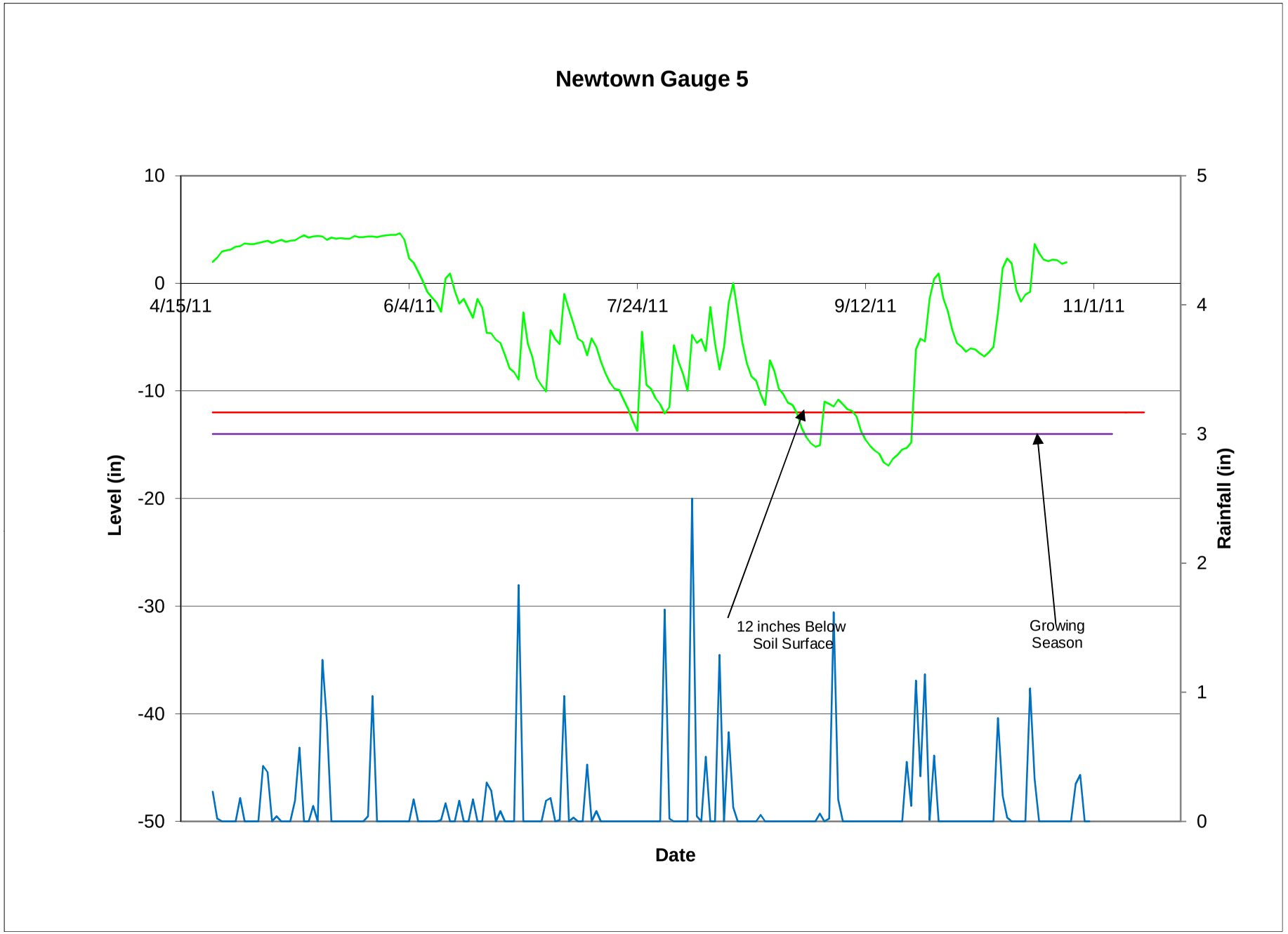
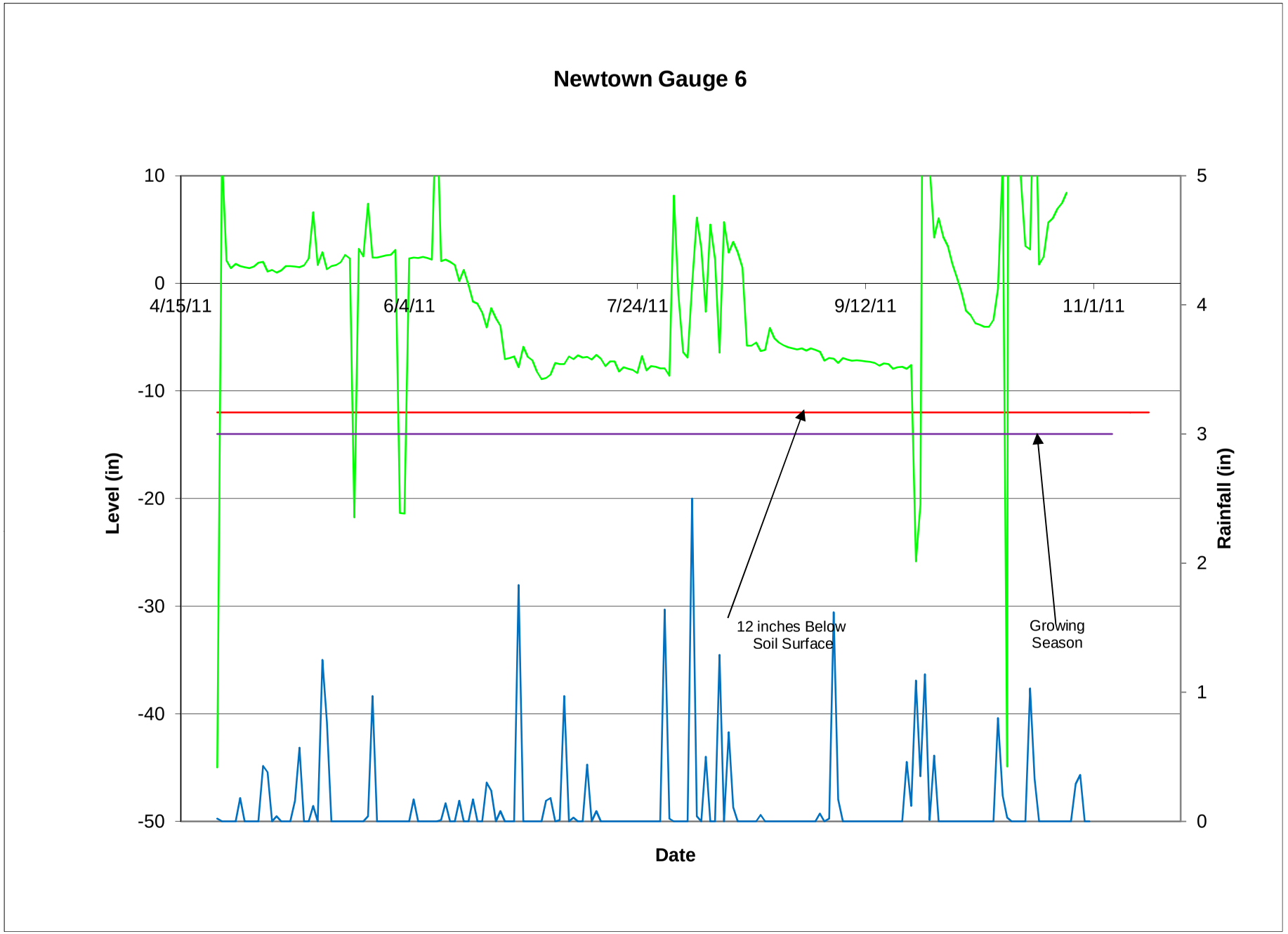
2010-2011 Rain Data: Station 311690
(http://www.nc-climate.ncsu.edu/services/request.php)



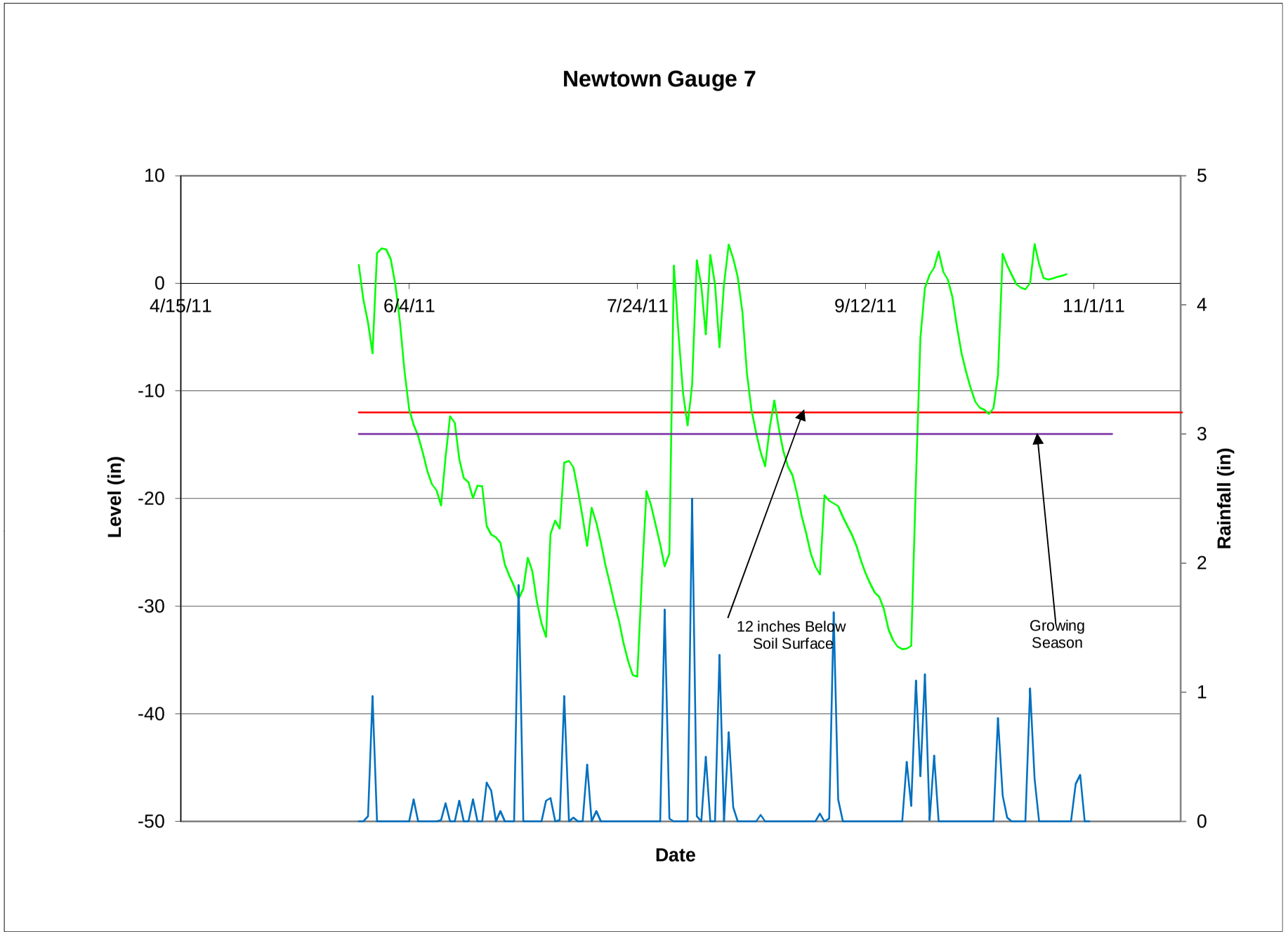

Growing Season: March 23 to November 6 (228 days)
(http://www.wcc.nrcs.usda.gov/cgibin/sate.pl?state=nc)

2010-2011 Rain Data: Station 311690
(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)

2010-2011 Rain Data: Station 311690
(http://www.nc-climate.ncsu.edu/services/request.php)




Growing Season: March 23 to November 6 (228 days)
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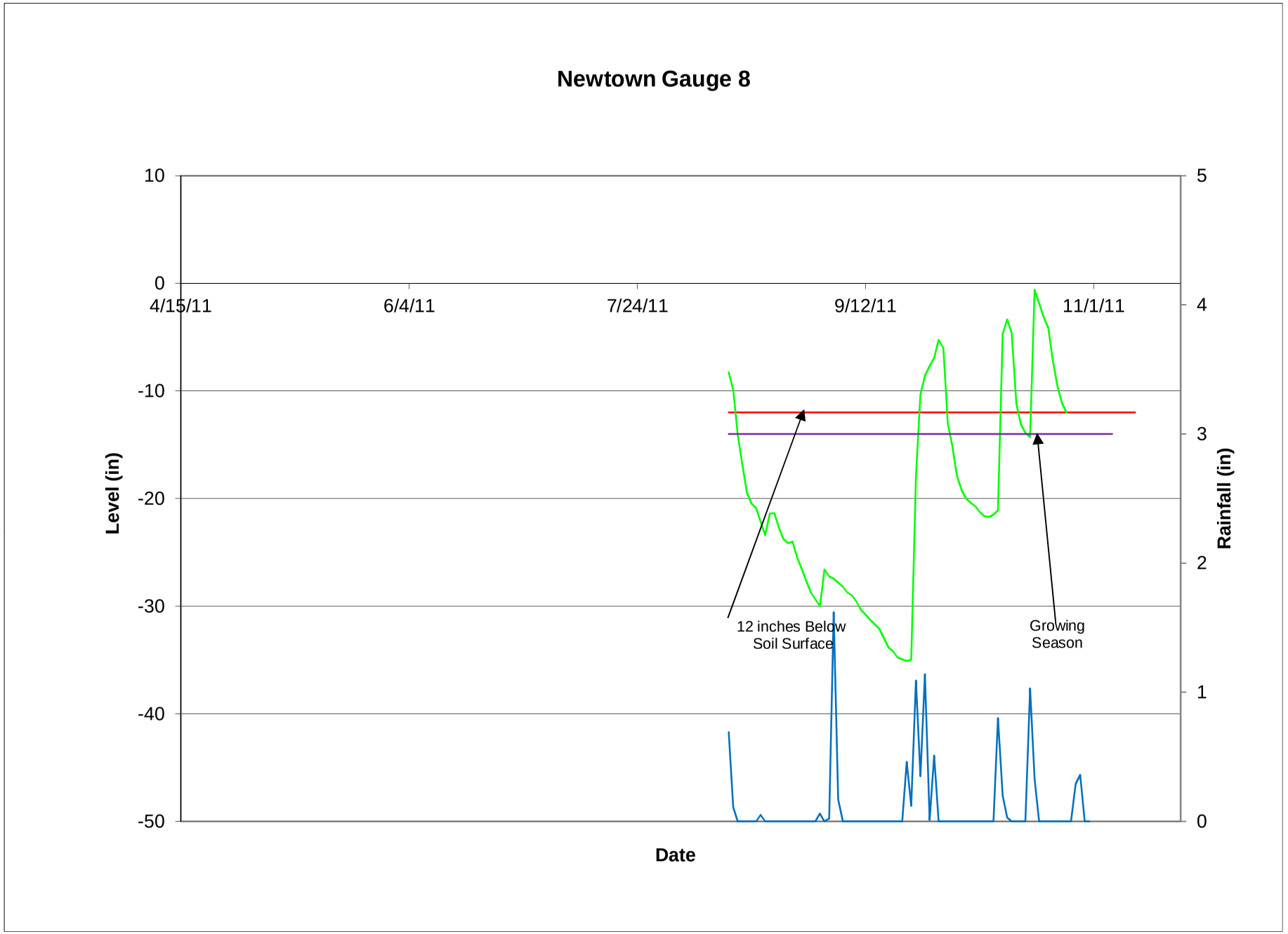
2010-2011 Rain Data: Station 311690
(http://www.nc-climate.ncsu.edu/services/request.php)




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

2010-2011 Rain Data: Station 311690
(http://www.nc-climate.ncsu.edu/services/request.php)