# Back Creek Stream and Wetland Restoration
## Project No. 17
## 2008 Monitoring Report (Final): Year 3 of 5

**March 2009**


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# EXECUTIVE SUMMARY

# Executive Summary

The Back Creek Stream and Wetland Restoration Project is a 17.5 acre lot located in Mecklenburg County, North Carolina and is a mitigation project for the North Carolina Department of Transportation (NCDOT). The project was transferred from NCDOT to the North Carolina Ecosystem Enhancement Program (NCEEP) in 2006. The following goals were established for the Back Creek Stream and Wetland Restoration Project.

1. Restore approximately 3,525 linear feet (lf) of Back Creek.
2. Restore approximately 827 lf of tributaries to Back Creek.
3. Restore approximately 1.5 acres (ac) of jurisdictional wetland, enhance approximately 1.8 ac of jurisdictional wetland, and create approximately 0.5 ac of open water/freshwater marsh adjacent to on-site channels.
4. Reforest approximately 17.5 ac of floodprone area and adjacent upland slopes with native forest species.

The Back Creek project consisted of restoring approximately 1,300 lf of the existing channel (Priority 1) and enhancing approximately 2,000 lf (Priority 2/3) where restoration was not feasible. Approximately 775 lf of two unnamed tributaries to Back Creek were also restored (Priority 1). Back Creek's riparian areas were planted to improve habitat and stabilize streambanks. The site contains 3.5 ac (proposed as 1.8) of wetland enhancement and 0.4 ac (proposed as 2.0) of wetland restoration. This report serves as the 3rd year of the 5 year monitoring plan for the Back Creek Stream and Wetland Restoration Site.

The 2008 vegetation monitoring results indicated that the Back Creek Site appears to be meeting vegetation success criteria. Vegetative monitoring success criteria, as stated in the 2003 NCDOT mitigation plan, requires an average number of planted stems per acre exceeding 320 stems per acre after the third year of monitoring. The survival rate for the woody vegetation monitored for 2008 is 69%. The site density is approximately 368 planted stems per acre with a plot size of 0.057 ac, which exceeds the year 3 goal of 320 planted stems per acre. A survivability increase from 2007 is most likely due to the resprouting of suspected dead stems recorded. Only one of the four vegetation monitoring plots (Plot 4) continues to result in a low survival rate (30%) with sparse ground cover of emergent wetland plants in comparison to the 2006 and 2007 monitoring year. Planted stem mortality within Plot 4 is most likely due to the severe drought experienced during the 2007 growing season.

Results from the 2008 stream monitoring effort indicate that Back Creek and the two unnamed tributaries appear to be maintaining vertical and lateral stability with stable structures and minimal bank erosion. A few problem areas were observed, such as moderate bank erosion, moderate to poor streambank cover, loose matting, and aggradation. It is recommended that the section with poor streambank cover (approximate stationing 33+14 and 34+38) should be stabilized with matting and vegetation as soon as possible to prevent future problems. Areas with aggradation, such as lateral and transverse bars will be closely monitored for shifts in lateral stability. These areas of stream instability do not appear to have advanced from the previous

monitoring years; however, it is suggested that these areas continue to be monitored closely for major shifts in bed features and the channel thalweg.

For the 2008 monitoring year, all gauges achieved the wetland success criterion of soil saturation within the upper 12 inches for 30 consecutive days, which is 12.5 percent of the March 21 to November 16 (241 days) growing season. However for this monitoring report, hydrologic data is shown through September 30 due to report submittal due dates. The planted woody stem species throughout the wetland areas are meeting the required success criteria with the exception of plot 4.

Overall, the Back Creek Stream and Wetland Restoration Site appears to be stable and has met the stream, vegetation, and wetland mitigation goals for monitoring year 3.

# SECTION 1
# PROJECT BACKGROUND

# SECTION 1

## PROJECT BACKGROUND

The background information provided in this report is referenced from the mitigation plan and previous monitoring reports prepared by EcoScience (2003).

## 1.1 Location and Setting

The Back Creek Site is located approximately five miles northeast of the City of Charlotte in Mecklenburg County, North Carolina. The site is east of Back Creek Church Road and southwest of the intersection of State Route 49 and Interstate 485 (Figure 1.1). The restoration site is located within the Piedmont eco-region and in the Yadkin-Peedee River Basin (USGS Subbasin HUC 03040105). The project site size is 17.5 ac.

To access the site from Interstate 85, take Exit 48 (I-485S), follow to Exit 33 (Highway 49), and turn right onto Highway 49. Next, turn left onto Back Creek Church Road, and continue until the intersection with Back Creek. The restoration project is located downstream from Back Creek Church Road.

## 1.2 Mitigation Structure and Objectives

Historically, the site was utilized for livestock grazing and agricultural hay production. Currently, the site is dominated by fallow, successional fields and a few stands of isolated hardwood forests. Sewer line construction and past landuse are the apparent causes of stream instability due to dredging and straightening of the upstream reach. A prior stabilization attempt included using rip-rap on the channel banks. Urban development in the watershed has also contributed to the instability of Back Creek.

The following goals were established for the Back Creek Stream and Wetland Restoration Project.

1. Restore approximately 3,525 lf of Back Creek.
2. Restore approximately 827 lf of tributaries to Back Creek.
3. Restore approximately 1.5 ac of jurisdictional wetland, enhance approximately 1.8 ac of jurisdictional wetland, and create approximately 0.5 ac of open water/freshwater marsh adjacent to on-site channels.
4. Reforest approximately 17.5 ac of floodprone area and adjacent upland slopes with native forest species.

The stream and its tributaries were restored using a Priority 2 approach and enhanced using a Priority 2/3 where restoration was not feasible. Back Creek and the upstream tributary were designed and constructed as E-channels. The central tributary was designed and constructed as a B-channel. The project also included enhancing the associated riparian zone. According to the "Transfer of Back Creek Mitigation Site" letter from NCDOT to NCEEP dated March 15, 2006, the mitigation site consists of approximately 4,075 (proposed as 4,352) lf of restored stream

including restoring approximately 3,300 (proposed as 3,525) lf of Back Creek and restoring approximately 775 (proposed as 827) lf of tributaries to Back Creek. Also, per the previous referenced letter, the site contains 3.5 ac (proposed as 1.8) of wetland enhancement and 0.4 ac (proposed as 2.0) of wetland restoration. Construction of the restoration project was completed in December 2005, and tree planting was completed in February 2006.

The Back Creek project consisted of restoring approximately 1,300 lf of the existing channel (Priority 1) and enhancing approximately 2,000 lf (Priority 2/3) where restoration was not feasible (Table 1.1). The relocated reaches and the restored in-place reaches were restored/enhanced using vegetation and in-stream stabilization structures, such as cross vanes, J-hook vanes, and grade control sills. Bankfull benches were created along each reach to re-establish floodplain connection. Approximately 775 lf of two unnamed tributaries to Back Creek were also restored (Priority 1). The upstream tributary was designed and constructed as an E-channel and in-stream stabilization structures were installed. The central tributary was designed and constructed as a B-channel and step-pool structures were installed. Riparian areas were planted with native bare root seedlings and herbaceous cover to enhance the riparian areas and stabilize streambanks.

**Table 1.1**
**Project Mitigation Structure and Objectives**
**Back Creek/Project No. 17**

| Segment/Reach | Mitigation Type | Approach | Linear Footage or Acres | Stationing (ft) | Comments |
|---|---|---|---|---|---|
| Back Creek/Reach 1 | R | P2 | 1,300 lf | 0+00-13+00 | Channel restoration, relocation with use of grade control and bank protection structures. |
| Back Creek/Reach 2 | EI | P2/3 | 2,000 lf | 13+00-33+00 | Channel restoration, in-place with use of grade control and bank protection structures. |
| Upstream Tributary | R | P2 | 400 lf | 0+00 - 4+00 | Channel restoration, relocation with use of grade control and bank protection structures. |
| Central Tributary | R | P2 | 375 lf | 0+00 - 3+75 | Channel restoration, relocation with use of grade control and bank protection structures. |
| Wetland Areas | R | - | 0.4 ac | - | Restoration of wetlands. |
| Wetland Area | E | - | 3.5 ac | - | Enhancement of jurisdictional wetland. |

| Component Summations | | | | | | |
|---|---|---|---|---|---|---|
| Restoration Level | Stream (lf) | Wetland (ac) | | Upland (ac) | Buffer (ac) | BMP |
| | | Riparian | Non-Riparian | | | |
| Restoration (R) | 2,075 | 0.4 | N/A | N/A | N/A | N/A |
| Enhancement (E) | N/A | 3.5 | N/A | N/A | N/A | N/A |
| Enahncement I (E) | 2,000 | N/A | N/A | N/A | N/A | N/A |
| Enhancement II (E) | N/A | N/A | N/A | N/A | N/A | N/A |
| Creation (C) | N/A | N/A | N/A | N/A | N/A | N/A |
| Preservation (P) | N/A | N/A | N/A | N/A | N/A | N/A |
| HQ Preservation (P) | N/A | N/A | N/A | N/A | N/A | N/A |
| **Totals** | **4,075** | **3.9** | **N/A** | **N/A** | **N/A** | **N/A** |

## 1.3 Project History and Background

The stream enhancement/restoration plan was designed by EcoScience Corporation and constructed by Shamrock Environmental. Construction activities were completed in December 2005. The first annual monitoring activities were conducted in the spring of 2006. This report serves as the 3rd year of the 5 year monitoring plan for the Back Creek project. Tables 1.2 and 1.3 provide detailed project activity, history, and contact information for this project. Table 1.4 provides more in-depth watershed/site background for the project.

**Table 1.2**
**Project Activity and Reporting History**
**Back Creek/Project No. 17**

| Activity or Report | Data Collection Completed | Actual Completion or Delivery |
|---|---|---|
| Restoration Plan | N/A | January 2003 |
| Final Design-90% | N/A | N/A |
| Construction | N/A | December 2005 |
| Temporary S&E mix applied to entire project area* | N/A | 2005 |
| Permanent seed mix applied to reach | N/A | N/A |
| Woody plantings for reach | N/A | February 2006 |
| As-Built Plansheet (Design Markups) | N/A | July 2004 |
| Year 1 Monitoring | November 2006 | January 2006 |
| Year 2 Monitoring | August 2007 | November 2007 |
| Year 3 Monitoring | May/June 2008 | November 2008 |
| Year 4 Monitoring | 2009 | 2009 |
| Year 5 Monitoring | 2010 | 2010 |

*Seed and mulch is added as each section of construction is completed.

**Table 1.3**
**Project Contacts**
**Back Creek/Project No. 17**

| | |
|---|---|
| **Designer** | EcoScience Corporation<br>1101 Haynes Street, Suite 101<br>Raleigh, NC 27604 |
| **Construction** | Shamrock Environmental Corportation<br>503 Patton Avenue<br>Greensboro, NC 27406 |
| **Planting Contractor** | Henry Rosso |
| **Seeding Contractor** | Shamrock Environmental Corportation<br>503 Patton Avenue<br>Greensboro, NC 27406 |
| **Monitoring Performers** | Jordan, Jones, & Goulding<br>9101 Southern Pine Blvd., Suite 160<br>Charlotte, NC 28273 |
| **Stream Monitoring, POC** | Kirsten Young, 704-527-4106 ext.246 |
| **Vegetation Monitoring, POC** | |

**Table 1.4**
**Project Background**
**Back Creek/Project No. 17**

| | |
|---|---|
| Project County | Mecklenburg County, North Carolina |
| Drainage Area – Main Reach | 4.1 sq. mi |
| Upstream Tributary | 0.1 sq. mi |
| Central Tributary | 0.04 sq. mi |
| Drainage impervious cover estimate | ~20% |
| Stream Order – Main Reach | 3rd |
| Upstream Tributary | 1st |
| Central Tributary | 1st |
| Physiographic Region | Piedmont |
| Ecoregion | Piedmont |
| Rosgen Classification of As-built – Main Reach | E4/5 |
| Upstream Tributary | E4/5 |
| Central Tributary | B |
| Cowardin Classification<br>Main Reach<br>Upstream Tributary<br>Downstream Tributary | <br>R2UB12<br>R4SB34<br>R4SB23 |
| Dominant soil types | Monacan, Enon, Wilkes |
| Reference site ID | UT to Crane Creek<br>UT to Reedy Creek<br>UT to Dutch Buffalo Creek |
| USGS HUC for Project and Reference – Back Creek | 03040105 |
| NCDWQ Sub-basin for Project and Reference | CTB31 |
| NCDWQ classification for Project and Reference | WS-II, HQW,C |
| Any portion of any project segment 303d list? | No |
| Any portion of any project segment upstream of a 303d listed segment? | No |
| Reason for 303d listing or stressor? | N/A |
| % of project easement fenced? | 100% |

## 1.4 Monitoring Plan View

The monitoring plan view map (Figure 1.2) illustrates the location of the longitudinal profile stations, cross-section stations, vegetation plots, photo points, and gauges. A total of seven cross-sections were established within the main reach of Back Creek and one cross-section was established within the upstream tributary in 2006. An additional cross-section was established within the central tributary during the 2007 monitoring year. Approximately 3,100 lf of longitudinal profile were monitored. Four previously established vegetative plots in the riparian zone adjacent to Back Creek were identified and monitored. Photographs were taken upstream and downstream at each cross-section, vegetation plot, and at photo points that were established during the 2006 monitoring year.

# SECTION 2
# PROJECT CONDITION AND MONITORING RESULTS

# SECTION 2

## PROJECT CONDITION AND MONITORING RESULTS

The following monitoring results are from the 2008 (year 3 of 5) survey.

## 2.1 Vegetation Assessment

### 2.1.1 Soil Data

Back Creek is situated within an agricultural valley in the inner Piedmont Belt of the North Carolina Piedmont Physiographic Province. Researchable data indicates that the soils within the project area are those found in alluvial landforms in this physiographic region; however, grading and filling activities during construction likely have disturbed the parent soil material.

Review of the *Soil Survey of Mecklenburg County, North Carolina* indicates that three soil series are found within the project limits. These soil series consist of Monacan, Enon, and Wilkes. Monacan soils are very deep, well-drained to somewhat poorly-drained soils found along stream corridors. These soils are formed in recent alluvium sediments of the Piedmont and Coastal Plain. Slopes are generally less than 2 percent. Enon soils are very deep, well-drained soils on ridges and side slopes of the Piedmont uplands. The soils are formed in clayey residuum weathered from mafic or intermediate igneous and metamorphic rocks such as diorite, gabbro, gneiss, and schist of the Piedmont uplands. Slopes range from 2 to 15 percent for the Enon series. Wilkes soils are shallow, well-drained soils adjacent to drainage ways. They are formed in residuum weathered from intermediate and mafic crystalline rocks on the Piedmont uplands. Slopes range from 15 to 25 percent for the Wilkes series. Please refer to Table 2.1 for descriptions of the soil series within the project area.

**Table 2.1**
**Preliminary Soil Data**
**Back Creek/Project No. 17**

| Series | Max Depth (in) | % Clay on Surface | K Factor | T Factor | OM % |
|---|---|---|---|---|---|
| **Enon** | 72 | 5-20 | 0.24 | 5 | 0.0 – 2.0 |
| **Monacan** | 80 | 7-27 | 0.43 | 5 | 0.0 – 3.0 |
| **Wilkes** | 48 | 5-20 | 0.24 | 2 | 0.0 – 2.0 |

### 2.1.2 Vegetative Current Condition

During the vegetative survey conducted in June 2008, it was noted that some areas of the streambanks have suffered localized loss of vegetative cover. In these areas, it is expected that flood events may have caused bank erosion; therefore, removing vegetation. Furthermore, the compaction of soil and nutrient poor conditions may also be contributing to the mortality of live stakes and herbaceous cover in these areas. Please refer to Appendix 1.1 and 1.2 for more details on vegetative current condition areas and photos.

### 2.1.3 Vegetative Current Condition Plan View

Please refer to Appendix 4 for location of vegetative current condition areas on-site and Appendix 1.2 for representative vegetation current condition photos.

### 2.1.4 Stem Counts

JJG conducted the 2008 (year 3 of 5) vegetative assessment and vegetative plot analysis in June 2008. Vegetation assessments were conducted following the NCEEP 2004 Stem Counting Protocol which consists of counting woody stems within the established vegetation plots. The four vegetative plots previously established in the design phase were selected randomly and represent the riparian buffer zone. The planted vegetative community goal for these plots is to establish a Piedmont floodplain forest. Success goals for vegetation were established in the January 2003 mitigation plan prepared by EcoScience. The following lists the vegetation success criteria used for the Back Creek Stream and Wetland Restoration Site.

- 320 stems per acre years 1 through 3
- 290 stems per acre year 4
- 260 stems per acre year 5

Up to 10-percent of the stems per acre can include naturally recruited "character species." Character species are represented by those tree species that were planted on site.

Trees planted within the monitored plots include swamp chestnut oak (*Quercus michauxii*), river birch (*Betula nigra*), American sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), and American elm (*Ulmus americana*). In addition, natural recruitment vegetation was also monitored within these plots. Naturally recruited species encountered were sweet gum (*Liquidambar styraciflua*) and red maple (*Acer rubrum*).

The survival rate for the planted woody vegetation monitored for 2008 is 69%, which has remained the same from previous data recorded in September 2007. The monitoring data indicates an average of 21 stems per plot. Using an average of 21 stems per plot and a plot size of 0.057 acre, the average stem density for the site is 368 stems per acre. In addition, natural recruitment stems were also monitored. The monitoring data indicates an average of 9 volunteer stems per plot. Please refer to Appendix 1.1 for vegetation raw data.

In conclusion, the riparian restoration project meets the success criteria requirements. Some loss of streambank vegetation was evident in 2006; however, the overall growth of the streambank vegetation is good and appears to have improved over the past few years. The overall success of the woody vegetation monitored within three of the four plots appears to be better than what was initially assessed in September 2006. This is most likely due to the resprouting of suspected dead saplings and new volunteer species. Although all plots met the vegetation success threshold with the exception of plot 4, the results from plot 4 did not affect the site's average survivability to be considered unsuccessful. In conclusion, the riparian restoration project meets the requirements per the success criterion for 2008 monitoring year. Refer to Appendix 1.1 for

vegetation raw data and Table 2.2 for a summary of stem counts for planted species recorded by plot for the 2008 monitoring year.

**Table 2.2**
**Stem Counts for Planted Species Arranged by Plot**
**Back Creek/Project No. 17**

| Stem Counts for Planted Species Arranged by Plot – MY-2008 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Vegetation Plots Monitored (MY-2008) | | | | MY1 - 2006 | MY2 - 2007 | MY2 - 2008 |
| **Species** | **Plot 1** | **Plot 2** | **Plot 3** | **Plot 4** | **Totals** | **Totals** | **Totals** |
| *Quercus michauxii* | 4 | 6 | | | **6** | **10** | **10** |
| *Fraxinus pennsylvanica* | 6 | 8 | 12 | 4 | **28** | **29** | **30** |
| *Platanus occidentalis* | 5 | 7 | 6 | 1 | **16** | **19** | **19** |
| *Betula nigra* | 4 | 4 | 10 | 4 | **14** | **23** | **22** |
| *Ulmus americana* | 2 | | | | **1** | **2** | **2** |
| Unknown Dead | 9 | 5 | 2 | 21 | **55** | **37** | **37** |
| **Total Planted Live Stems (2008)** | **21** | **25** | **28** | **9** | **N/A** | **N/A** | **83** |
| **Average # of Stems (2008)** | **21** | | | | | | |
| **Stem Density (2008)** | **368** | | | | | | |
| **Percent Survival (2008)** | **70%** | **83%** | **93%** | **30%** | **Avg=69%** | | |
| ***Volunteer Stems*** | | | | | | | |
| **Species** | **Plot 1** | **Plot 2** | **Plot 3** | **Plot 4** | **Totals** | **Totals** | **Totals** |
| *Liquidambar styraciflua* | | 17 | 3 | | **12** | **20** | **20** |
| *Acer rubrum* | | 1 | 1 | 3 | **2** | **2** | **5** |
| *Acer negundo* | 1 | | | 1 | **N/A** | **N/A** | **2** |
| *Fraxinus pennsylvanica* | 4 | | | 2 | **N/A** | **N/A** | **6** |
| *Platanus occidentalis* | 3 | | | | **N/A** | **N/A** | **3** |
| **Total Volunteer Strems (2008)** | 8 | 18 | 4 | 6 | **14** | **22** | **36** |

### 2.1.5 Vegetation Plot Photos

Please refer to Appendix 1.3 for photographs of the monitoring plots.

## 2.2 Stream Assessment

Stream dimension, profile, and substrate were evaluated within 3,100 lf of the Back Creek Stream and Wetland Restoration Site. The upstream and central tributaries were also evaluated through visual assessments, and cross-sectional surveys.

Data collected from the previous monitoring year (MY 2006) was not used in the longitudinal profile comparison, because it was collected using a different type of engineering equipment, such as a site or laser level. Using different instrumentation to collect the morphological data affects the longitudinal stationing of the profile. As a result, conclusions drawn from this analysis are not completely representative of the actual changes occurring along the channel

profile. The data collected in monitoring years 2007 and 2008 were chosen to represent the changes occurring within the longitudinal profile for the longitudinal graphical display because they are indicative of the actual morphological change that has occurred over the three year monitoring period.

Please refer to Table 2.3 for a summary of the visual stability assessment, Table 2.4 for the monitoring baseline morphology and hydraulic summary, Table 2.5 for monitoring years 2006-2008 morphology and hydraulic summary, Table 2.6 for hydrologic criteria, and Appendix 2 for more detailed stream data tables and plots.

### 2.2.1 Stream Current Condition Plan View

Please refer to Appendix 4 for location of stream current condition on-site.

### 2.2.2 Stream Current Condition Table

Please refer to Appendix 2.1 for the stream current condition table.

### 2.2.3 Numbered Issues Photo Section

Please refer to Appendix 2.2 for representative stream current condition photos.

### 2.2.4 Fixed Photo Station Photos

Please refer to Appendix 2.3 for stream photo station photos and Appendix 2.4 for stream cross-section photos.

### 2.2.5 Stability Assessment

The majority of the project conditions reflected the as-built drawings. The following general observations were noted.

*Main Channel*

The majority of project conditions continue to reflect the as-built drawings. The pattern, profile, and dimension of the restored channel appear stable. Please refer to the attached plan sheets and current condition table. A general overview is provided below.

- The pattern, profile, and dimension of the restored channel appear stable for the majority of the project.
- There are several areas with moderate erosion occurring under the matting.
- There are a few areas with eroding point bars on the upstream and downstream sides around stationing 3+30, 3+70, and 4+50.
- Three areas within the restored reach are illustrating signs of aggradation; two areas have lateral bars forming (approximate stationing 25+90 and 27+30), and the third area has a

transverse and mid channel bar forming (approximate stationing 14+90). All three areas show a shift in the thalweg.
- Bank erosion is occurring at different levels throughout the channel, particularly where the lateral, transverse, and mid channel bars are forming and within the lower end of the project.
- The medium-sized cedar tree, which had fallen into the stream during the 2006 monitoring year, has remained in place below the convergence of the B channel. The tree has continued to collect storm debris.
- The two side tributaries appear stable with minor bank scour occurring.
- The majority of structures appear to be in good condition; however, a few structures have moderate erosion around the arms where they tie into the bankfull elevation.

Overall, the present stream dimensions in Back Creek appear to be stable. The average bankfull width (30.15 ft) of the surveyed cross-sections is higher than the proposed 22.4 ft, and the average surveyed mean bankfull depth is 1.86 ft compared to the proposed 2.5 ft. The surveyed bankfull widths and depths lead to an average Width/Depth ratio of 16.45 and the sinuosity is 1.5. The W/D ratio (16.45) is typical of a C-type channel, but the sinuosity (1.5) is typical of an E-type channel. Therefore, due to these defining characteristics for this monitoring year, the stream classifies as an E4c. The average Width/Depth ratio has decreased since the 2006 monitoring year indicating that the channel is becoming more narrow and deep, which is typical for proposed E-type streams. Most likely this channel will continue to narrow and the W/D ratio over time will eventually be characterized as an E-type channel, thereby dropping the "little c" notation in the classification as well.

The 2008 substrate analysis illustrates that all of the cross-sections within the restoration site are showing a coarsening trend; therefore, recovering from the drought conditions experienced in 2007. JJG conducted a longitudinal profile along 3,100 lf of Back Creek. The thalweg profile appears to be stable, and was characterized by well-defined riffle and pool features. The average water surface slope and the average bankfull slope were similar for the surveyed reach, 0.0040 ft/ft and 0.0040 ft/ft, respectively. The surveyed water surface slope was slightly steeper than the proposed 0.0034 ft/ft, but similar to the 2006 and 2007 surveyed slopes.

Overall, the reach appears to be maintaining vertical and lateral stability with stable structures and minimal bank erosion. Areas with aggradation, such as lateral and transverse bars, in the future could potentially be flushed out with higher flows. However, this may also be an indicator that the constructed pattern is adjusting within certain sections. If these areas continue to shift and aggrade they could potentially create significant lateral instability and shifts in the stream's pattern and profile. These areas have not advanced from the previous monitoring years, but will continue to be monitored closely for major shifts in bed features and the channel thalweg.

*Upstream Tributary*

Based on current monitoring data and the visual inspection, the channel seems to be functioning properly and maintaining stability. No erosion or structure failure was observed along this reach.

*Central Tributary*

A visual assessment of stability was performed for the central tributary. The tributary appears to be maintaining its proposed function as a B-type storm drain channel. There are some areas with moderate bank erosion, but no structural failure is occurring along this reach.

**Table 2.3**
**Categorical Stream Feature Visual Stability Assessment**
**Back Creek/Project No. 17**

| Main Reach | As-Built (2005) | MY1 (2006) | MY2 (2007) | MY3 (2008) | MY4 (2009) | MY5 (2010) |
|---|---|---|---|---|---|---|
| A. Riffles | - | 100% | 100% | 100% | | |
| B. Pools | - | 99% | 100% | 100% | | |
| C. Thalweg | - | 100% | 98% | 98% | | |
| D. Meanders | - | 91% | 94% | 96% | | |
| E. Bed General | - | 99% | 99% | 99% | | |
| F. Bank | * | * | 96% | 97% | | |
| G. Vanes | - | 100% | 94% | 92% | | |
| H. Wads/ Boulders | - | N/A | N/A | N/A | | |

(Cells noted with a (-), data was not provided and Cells noted with a (*), new data measurement beginning in MY 2007)

### 2.2.6 Quantitative Measures Tables

Tables 2.4 and 2.5 display morphological summary data for baseline conditions and from the 2006 , 2007, and 2008 monitoring years. Please refer to Appendix 2 for morphological plots and raw data tables.

**Table 2.4**
**Baseline Morphology and Hydraulic Baseline As-Built Summary**
**Back Creek/Project No. 17**

| | Existing Channel | | | | | | | | | Reference Stream | | | Design | | | Baseline* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DIMENSION** | Upstream Straightened | | | Downstream Sinuous C | | | Downstream Sinuous E | | | UT to Crane Creek | | | Back Creek | | | Back Creek | | |
| | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** | **Min** | **Max** | **Mean** |
| Bankfull Width (ft) | 16.7 | 21.9 | 19.0 | 29.5 | 36.0 | 32.2 | - | - | 22.7 | 9.5 | 11.9 | 10.1 | 21.2 | 23.7 | 22.4 | 21.2 | 23.7 | 22.4 |
| Floodprone Width (ft) | 235.0 | 290.0 | 253.0 | 114.0 | 293.0 | 179.0 | - | - | 297.0 | 232.0 | 345.0 | 237.0 | 114.0 | 297.0 | 230.0 | 114.0 | 297.0 | 230.0 |
| Bankfull Cross-sectional Area (sq.ft) | 54.0 | | | 56.2 | | | 55.7 | | | 20.5 | | | 56.0 | | | 56.0 | | |
| Bankfull Mean Depth (ft) | 2.2 | 3.4 | 2.9 | 1.6 | 1.9 | 1.8 | - | - | 2.5 | 1.9 | 2.1 | 2.0 | 2.4 | 2.6 | 2.5 | 2.4 | 2.6 | 2.5 |
| Bankfull Max Depth (ft) | 4.0 | 4.7 | 4.4 | 3.0 | 3.6 | 3.3 | - | - | 3.8 | 2.5 | 2.9 | 2.6 | 2.8 | 3.8 | 3.3 | 2.8 | 3.8 | 3.3 |
| Width/Depth Ratio | 5.0 | 10.0 | 7.0 | 16.0 | 23.0 | 19.0 | - | - | 9.0 | 5.0 | 6.0 | 5.0 | 8.0 | 10.0 | 9.0 | 8.0 | 10.0 | 9.0 |
| Entrenchment Ratio | 13.0 | 14.0 | 13.3 | 4.0 | 10.0 | 6.0 | - | - | 13.0 | 20.0 | 34.5 | 25.0 | 5.1 | 13.3 | 10.3 | 5.1 | 13.3 | 10.3 |
| Wetted Perimeter (ft) | - | - | - | - | - | - | - | - | - | - | - | - | 25.4 | | | 25.4 | | |
| Hydraulic Radius (ft) | - | - | - | - | - | - | - | - | - | - | - | - | 2.1 | | | 2.1 | | |
| **PATTERN** | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | No distinctive repetitive pattern of riffles and pools due to straightening activities | | | 41.0 | 199.0 | 95.0 | 41.0 | 199.0 | 95.0 | 74.3 | 101.3 | 86.1 | 25.0 | 140.0 | 57.0 | 25.0 | 140.0 | 57.0 |
| Radius of Curvature (ft) | | | | 23.0 | 135.0 | 67.0 | 23.0 | 135.0 | 67.0 | 18.6 | 30.4 | 25.3 | 43.0 | 100.0 | 58.0 | 43.0 | 100.0 | 58.0 |
| Meander Wave Length (ft) | | | | 129.0 | 608.0 | 313.0 | 129.0 | 608.0 | 313.0 | 61.0 | 115.0 | 73.0 | 166.0 | 347.0 | 220.0 | 166.0 | 347.0 | 220.0 |
| Meander Width Ratio | | | | 1.3 | 6.2 | 3.0 | 1.8 | 8.8 | 4.2 | 7.4 | 10.0 | 8.5 | 1.1 | 6.3 | 2.5 | 1.1 | 6.3 | 2.5 |
| **PROFILE** | | | | | | | | | | | | | | | | | | |
| Riffle Length (ft) | No distinctive repetitive pattern of riffles and pools due to straightening activities | | | - | | | - | | | - | | | - | | | - | | |
| Riffle Slope (ft/ft) | | | | 0 | 0.0507 | 0.0144 | 0 | 0.0507 | 0.0144 | 0.0006 | 0.0033 | 0.0019 | 0.0033 | 0.0079 | 0.005 | 0.0033 | 0.0079 | 0.005 |
| Pool Length (ft) | | | | - | | | - | | | - | | | - | | | - | | |
| Pool to Pool Spacing (ft) | | | | 59 | 351 | 180 | 59 | 351 | 180 | 26 | 114 | 53 | 60 | 210 | 126 | 60 | 210 | 126 |
| **SUBSTRATE** | | | | | | | | | | | | | | | | | | |
| D50 (mm) | 0.7 | | | 0.6 | | | 19.8 | | | 1.9 | | | 2.0 | | | 2.0 | | |
| D84 (mm) | 10.0 | | | 32.0 | | | 55.0 | | | 12.0 | | | 34.0 | | | 34.0 | | |
| | | | | | | | | | | | | | | | | | | |
| **ADDITIONAL REACH PARAMETERS** | **Upstream Straightened** | | | **Downstream Sinuous C** | | | **Downstream Sinuous E** | | | **Project Reference Stream** | | | **Design** | | | **Baseline*** | | |
| Valley Length (ft) | - | | | - | | | - | | | - | | | 2,200 | | | 2,200 | | |
| Channel Length (ft) | - | | | - | | | - | | | - | | | 3,300 | | | 3,300 | | |
| Sinuosity | 1.0 | | | 1.4 | | | 1.4 | | | 1.8 | | | 1.5 | | | 1.5 | | |
| Water Surface Slope (ft/ft) | 0.0037 | | | 0.0037 | | | 0.0037 | | | 0.0014 | | | 0.0034 | | | 0.0034 | | |
| Bankfull Slope (ft/ft) | - | | | - | | | - | | | - | | | - | | | - | | |
| Rosgen Classification | E5 | | | C5 | | | E4 | | | E4/5 | | | E4/5 | | | E4/5 | | |

*To JJG's knowledge, monitoring baseline data was not prepared for Back Creek, therefore the monitoring baseline dimensions were assumed to be the same as the proposed dimensions from Ecoscience Inc.'s mitigation plan.
USGS Gage Data and Regional Curve Intervals were not provided.

**Table 2.5**
**Morphology and Hydraulic Monitoring Summary**
**Back Creek/Project No. 17**

| DIMENSION | Cross-Section 1-Riffle | | | Cross-Section 2-Pool | | | Cross-Section 3-Riffle | | | Cross-Section 4-Pool | | | Cross-Section 5-Riffle | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2006 | 2007 | 2008 | 2006 | 2007 | 2008 | 2006 | 2007 | 2008 | 2006 | 2007 | 2008 | 2006 | 2007 | 2008 |
| Bankfull Width (ft) | 26.86 | 21.56 | 22.07 | 33.11 | 34.82 | 31.88 | 43.00 | 30.67 | 34.94 | 32.70 | 28.46 | 27.66 | 29.15 | 27.09 | 28.80 |
| Floodprone Width (ft) | >100 | >100 | 220.00 | N/A | N/A | N/A | >100 | >100 | 200.00 | N/A | N/A | N/A | >100 | >100 | 190.00 |
| Bankfull Cross-sectional Area (sq.ft) | 38.3 | 39.57 | 34.97 | 84.07 | 83.71 | 72.03 | 52.99 | 53.41 | 53.84 | 59.47 | 52.11 | 49.74 | 48.27 | 44.50 | 46.64 |
| Bankfull Mean Depth (ft) | 1.43 | 1.84 | 1.58 | 2.54 | 2.40 | 2.26 | 1.23 | 1.74 | 1.54 | 1.82 | 1.83 | 1.80 | 1.66 | 1.64 | 1.62 |
| Bankfull Max Depth (ft) | 2.63 | 2.78 | 2.74 | 5.31 | 5.32 | 5.06 | 3.03 | 3.03 | 3.03 | 3.15 | 4.05 | 4.02 | 2.94 | 2.94 | 2.83 |
| Width/Depth Ratio | 18.78 | 11.75 | 13.97 | 13.04 | 14.51 | 14.11 | 34.96 | 17.63 | 22.69 | 17.97 | 15.55 | 15.37 | 17.56 | 16.52 | 17.78 |
| Entrenchment Ratio | >2.2 | >2.2 | 3.96 | N/A | N/A | N/A | >2.2 | >2.2 | 5.72 | N/A | N/A | N/A | >2.2 | >2.2 | 6.60 |
| Wetted Perimeter (ft) | 27.79 | 22.63 | 23.06 | 35.33 | 37.22 | 34.13 | 44.01 | 31.50 | 35.98 | 33.55 | 30.50 | 29.60 | 30.70 | 28.15 | 29.77 |
| Hydraulic Radius (ft) | 1.38 | 1.75 | 1.52 | 2.38 | 2.25 | 2.11 | 1.20 | 1.70 | 1.50 | 1.77 | 1.71 | 1.68 | 1.57 | 1.58 | 1.57 |
| Bank Height Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| **SUBSTRATE** | | | | | | | | | | | | | | | |
| D50 (mm) | 12.47 | 0.06 | 0.73 | 0.42 | 0.26 | 0.42 | 67.06 | 0.04 | 32.00 | 0.46 | 0.23 | 0.48 | 10.20 | 0.21 | 1.40 |
| D84 (mm) | 53.96 | 48.80 | 67.25 | 5.42 | 0.54 | 3.00 | 100.13 | 0.23 | 81.33 | 5.53 | 1.38 | 20.40 | 41.10 | 1.44 | 59.43 |

| DIMENSION | Cross-Section 6-Pool | | | Cross-Section 7-Riffle | | | Cross-Section 8-Riffle | | | Cross-Section 9-Riffle | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2006 | 2007 | 2008 | 2006 | 2007 | 2008 | 2006 | 2007 | 2008 | 2007 | 2008 |
| Bankfull Width (ft) | 29.33 | 34.33 | 34.69 | 32.66 | 30.39 | 30.98 | 12.70 | 8.37 | 13.00 | 10.42 | 12.31 |
| Floodprone Width (ft) | N/A | N/A | N/A | >100 | >100 | 232.00 | >100 | >100 | 200.00 | >100 | 110.00 |
| Bankfull Cross-sectional Area | 70.51 | 69.69 | 74.83 | 70.59 | 65.19 | 63.28 | 8.65 | 8.85 | 8.84 | 13.74 | 15.31 |
| Bankfull Mean Depth | 2.40 | 2.03 | 2.16 | 2.16 | 2.15 | 2.04 | 0.68 | 1.06 | 0.68 | 1.32 | 1.24 |
| Bankfull Max Depth | 5.01 | 4.53 | 4.81 | 3.36 | 3.10 | 3.03 | 1.33 | 1.65 | 1.33 | 2.51 | 2.23 |
| Width/Depth Ratio | 12.22 | 16.91 | 16.06 | 15.12 | 14.13 | 15.19 | 18.68 | 7.90 | 19.12 | 7.89 | 9.93 |
| Entrenchment Ratio | N/A | N/A | N/A | >2.2 | >2.2 | 7.49 | >2.2 | >2.2 | 15.38 | >2.2 | 8.94 |
| Wetted Perimeter (ft) | 32.64 | 36.46 | 36.5 | 33.72 | 31.52 | 32.22 | 13.03 | 9.27 | 13.43 | 12.41 | 13.74 |
| Hydraulic Radius (ft) | 2.16 | 1.91 | 2.05 | 2.09 | 2.07 | 1.96 | 0.66 | 0.95 | 0.66 | 1.11 | 1.11 |
| Bank Height Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| **SUBSTRATE** | | | | | | | | | | | |
| D50 (mm) | 29.99 | 0.38 | 0.78 | 5.27 | 1.78 | 0.72 | - | 0.04 | 0.05 | 0.04 | 0.06 |
| D84 (mm) | 69.20 | 54.50 | 28.87 | 45.00 | 52.60 | 57.67 | - | 0.38 | 5.70 | 0.08 | 3.00 |

**Table 2.5 cont.**
**Morphology and Hydraulic Monitoring Summary**
**Back Creek/Project No. 17**

| PROFILE | 2006 | | | 2007 | | | 2008 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Med | Min | Max | Med | Min | Max | Med |
| Riffle Length (ft) | 24.00 | 77.00 | 56.00 | 7.79 | 124.99 | 84.75 | 11.26 | 89.03 | 32.49 |
| Riffle Slope (ft/ft) | 0.0001 | 0.0173 | 0.0063 | 0.0002 | 0.0230 | 0.0098 | 0.0006 | 0.0228 | 0.0071 |
| Pool Length (ft) | 19.00 | 161.00 | 55.20 | 28.03 | 109.73 | 59.81 | 24.78 | 157.51 | 58.10 |
| Pool to Pool Spacing (ft) | 21.00 | 208.00 | 122.50 | 47.99 | 203.26 | 114.33 | 36.88 | 206.84 | 117.75 |

| ADDITIONAL REACH PARAMETERS | 2006 | 2007 | 2008 |
|---|---|---|---|
| Valley Length (ft) | 2,200 | 2,200 | 2,200 |
| Channel Length (ft) | 3,300 | 3,300 | 3,300 |
| Sinuosity | 1.5 | 1.5 | 1.5 |
| Water Surface Slope (ft/ft) | 0.0042 | 0.0041 | 0.0040 |
| Bankfull Slope (ft/ft) | 0.0043 | 0.0042 | 0.0040 |
| Rosgen Classification | C4 | C4 | C4 |

### 2.2.7 Hydrologic Criteria

A crest gauge is located downstream of cross-section 6 within the Back Creek project site. Table 2.6 below, verifies that one bankfull or greater event occurred within the Back Creek restoration project in monitoring year 2008. Other indicators such as old wrack lines and staining were observed at the bankfull and greater elevations within the restoration site as well.

**Table 2.6**
**Verification of Bankfull Events**
**BackCreek/Project No. 17**

| Date of Collection | Date of Occurrence | Method | Photo # (if available) |
|---|---|---|---|
| Summer/Fall 2006 | September 13, 2006 | Visual Assessment | N/A |
| 10/9/2007 | Unknown | Crest Gauge | N/A |
| 8/19/2008 | Unknown | Crest Gauge | N/A |

## 2.3 Wetland Assessment

Three groundwater monitoring gauges and one rain gauge were installed during the construction phase of the Back Creek Restoration Project. Two of these groundwater gauges were installed in close proximity to Vegetation Plot 2. One gauge is located within an emergent wetland area adjacent to the stream. The monitoring gauges are programmed to download groundwater levels daily and were downloaded monthly from March to October in order to capture hydrological data during the 2008 growing season. The target wetland hydrological success criterion is saturation

or inundation for at least 12.5 percent of the growing season in the lower landscape (floodplain) positions. To achieve the above hydrologic success criterion, groundwater levels must be within 12-inches of the ground surface for 30 consecutive days, which is 12.5 percent of the March 21 to November 16 (241 days) growing season. However, for this monitoring report hydrologic data is shown through September 30 due to report submittal due dates.

### 2.3.1 Wetland Current Condition Plan View

There were no problem areas observed within the wetland restoration zones for the Back Creek Stream and Wetland Restoration Project. Within the wetland zones, hydrophytic vegetation and hydrology indicators have developed. In some areas, the appropriate soil chroma has also developed. It is suspected that these areas may have already had hydric conditions present. Hydrophytic vegetation consists of a thick herbaceous layer of sedge species (*Carex* spp.), rush species (*Juncus* spp.), bulrush species (*Scirpus* spp.), spotted touch-me-not (*Impatiens capensis*), and Smartweed species (*Polygonum* spp.). The planted woody stem species throughout the wetland areas are meeting the required success criteria; however, mortality of woody stems was observed. It is suspected that the mortality of planted stems may be subject to the planting technique or the soil conditions prior to planting. The general success of hydrology within the wetland restoration zones is adequate to meet success requirements. Surface inundation to ground saturation was observed throughout the site; therefore, appropriate hydrological condition for the wetland zones appears to be present.

### 2.3.2 Wetland Criteria Attainment

All gauges on site achieved the wetland success criterion of soil saturation within the upper 12 inches for 30 consecutive days during the growing season. Please refer to Appendix 3 for wetland raw data tables and plots and Table 2.7 for a summary of wetland criteria attainment.

**Table 2.7**
**Wetland Criteria Attainment**
**Back Creek/Project No. 17**

| Gauge ID | Gauge Hydrology Met (Y/N) | Hydrology Met During Growing Season (%)* | Vegetation Plot ID | Vegetation Survival Threshold Met (Y/N) |
|---|---|---|---|---|
| **BC-1** | Y | 100 | Plot 1 | Y |
| **BC-2** | Y | 71 | Plot 2 | Y |
| **BC-3** | Y | 82 | Plot 3 | Y |
| | | | Plot 4 | N |

# SECTION 3
# METHODOLOGY

# SECTION 3
## METHODOLOGY

### 3.1 Methodology

Methods employed for the Back Creek Stream and Wetland Restoration Project were a combination of those established by standard regulatory guidance and procedures documents as well as previous monitoring reports completed by EcoScience. Geomorphic and stream assessments were performed following guidelines outlined in the Stream Channel Reference Sites: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration a Natural Channel Design Handbook (Doll et al, 2003). Vegetation assessments were conducted following the NCEEP 2004 Stem Counting Protocol which consists of counting woody stems within the established vegetation plots. JJG used the *Flora of the Carolinas, Virginia, Georgia, and surrounding areas* by Alan S. Weakley as the taxonomic standard for vegetation nomenclature for this report.

# SECTION 4
# REFERENCES

# SECTION 4
## REFERENCES

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E., 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, Cheryl C; Rawlins, C.L.; Potyondy, John P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique.* Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

EcoScience Corporation. 2003. Mitigation Report (Back Creek Stream and Wetland Restoration). Raleigh, NC.

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

Weakley, A.S. 2008. *Flora of the Carolinas, Virginia, Georgia, Northern Florida, and Surrounding Areas* (Draft April 2008). University of North Carolina at Chapel Hill: Chapel Hill, NC.

# SECTION 5
# FIGURES

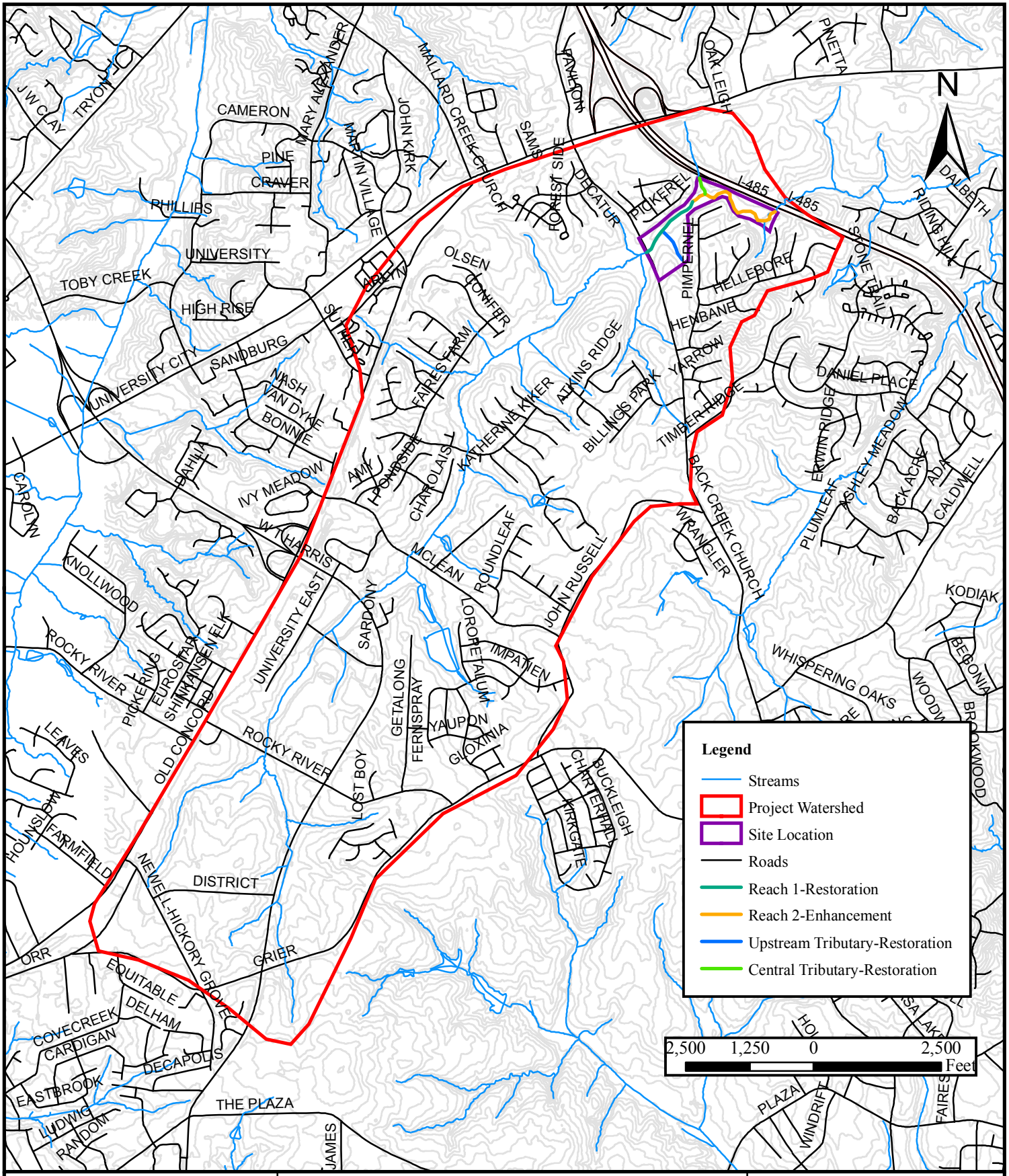



Figure 1.1 Project Location and Watershed Map
Back Creek Stream and Wetland Restoration
Mecklenburg County, NC
Year 3 of 5

Project No. 17
February 2009


Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=200'
JOB NO.: 03060005

FIGURE KEY

LEGEND

- CROSS VANE
- MEANDER REVETMENT
- MODIFIED CROSS VANE
- GRADE CONTROL SILL
- IMPERVIOUS CHANNEL BLOCK
- J–HOOK VANE
- STEP–POOL STRUCTURE
- PHOTO POINT
- RAIN GAUGE
- GROUNDWATER GAUGE
- MANHOLE
- VEGETATION PLOT

16' ACCESS GATE

RAIN GAUGE

APPROXIMATE N

BACK CREEK CHURCH ROAD SR 2827

VEG PLOT 1

EXISTING 25' WIDE SANITARY SEWER EASEMENT

CROSS–SECTION 1

START LONGITUDINAL PROFILE

0+00

1+00

2+00

3+00

4+00

5+00

EXISTING 25' WIDE SANITARY SEWER EASEMENT

EXISTING 128' WIDE DUKE POWER COMPANY R/W

CONSERVATION EASEMENT BOUNDARY

MATCHLINE STA. 5+50
SEE FIGURE 2 OF 6

GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )
1 inch = 40 ft.

Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

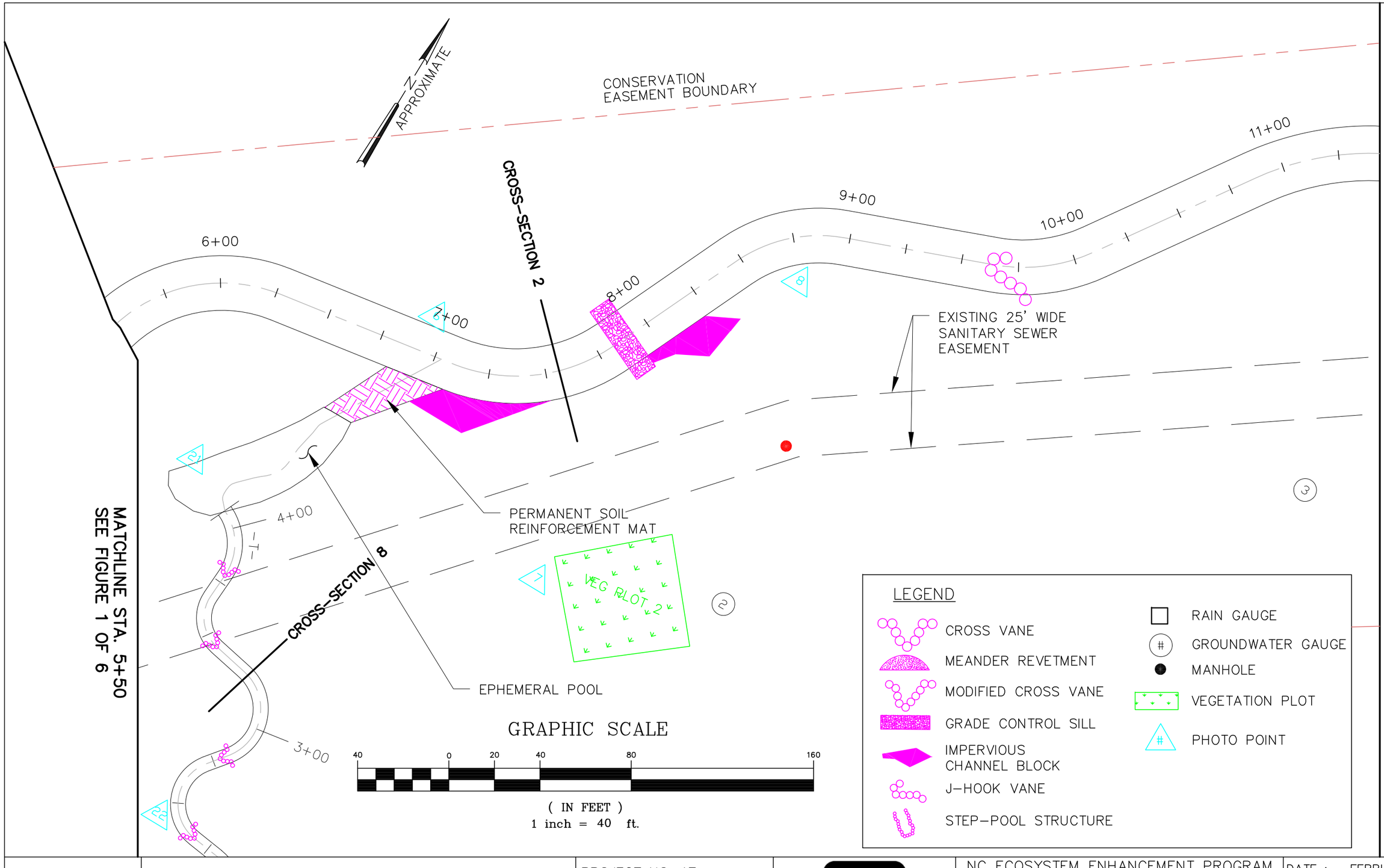
JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 1 OF 6




NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 2 OF 6

MATCHLINE STA. 11+50
SEE FIGURE 2 OF 6

APPROXIMATE

CROSS-SECTION 3

CROSS-SECTION 4

12+00

13+00

14+00

15+00

16+00

AVOIDANCE AREA

VEG PLOT 3

SAFETY FENCE

EXISTING 15' WIDE SANITARY SEWER EASEMENT

CONSERVATION EASEMENT BOUNDARY

MATCHLINE STA. 17+25
SEE FIGURE 4 OF 6

LEGEND

- CROSS VANE
- MEANDER REVETMENT
- MODIFIED CROSS VANE
- GRADE CONTROL SILL
- IMPERVIOUS CHANNEL BLOCK
- J-HOOK VANE
- STEP-POOL STRUCTURE
- RAIN GAUGE
- GROUNDWATER GAUGE
- MANHOLE
- VEGETATION PLOT
- PHOTO POINT

GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )
1 inch = 40 ft.

Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
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PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

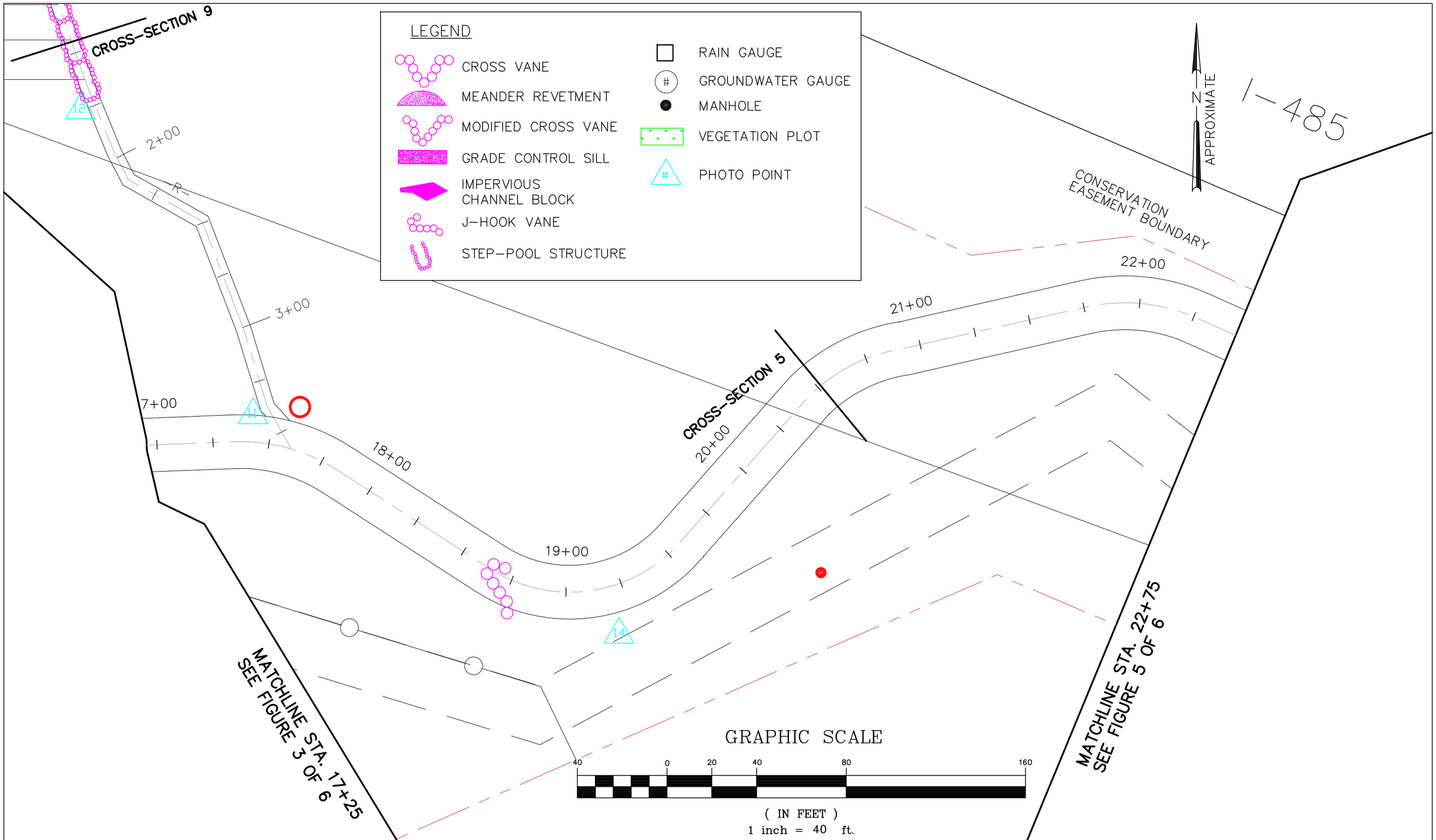
JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 3 OF 6




Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 4 OF 6

GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )
1 inch = 40 ft.

N

MATCHLINE STA. 22+75
SEE FIGURE 4 OF 6

MATCHLINE STA. 28+75
SEE FIGURE 6 OF 6

23+00
24+00
25+00
26+00
27+00
28+00

FENCE

EXISTING 25' WIDE
SANITARY SEWER EASEMENT

CROSS-SECTION 6

EXISTING 128' WIDE
DUKE POWER COMPANY R/W

FB

CROSS VANE
MEANDER REVETMENT
MODIFIED CROSS VANE
GRADE CONTROL SILL
IMPERVIOUS CHANNEL BLOCK
J-HOOK VANE
STEP-POOL STRUCTURE

RAIN GAUGE
GROUNDWATER GAUGE
MANHOLE
VEGETATION PLOT
PHOTO POINT

Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 5 OF 6

LEGEND

- CROSS VANE
- MEANDER REVETMENT
- MODIFIED CROSS VANE
- GRADE CONTROL SILL
- IMPERVIOUS CHANNEL BLOCK
- J-HOOK VANE
- STEP-POOL STRUCTURE
- RAIN GAUGE
- GROUNDWATER GAUGE
- MANHOLE
- VEGETATION PLOT
- PHOTO POINT

EXISTING 128' WIDE DUKE POWER COMPANY R/W

EXISTING 25' WIDE SANITARY SEWER EASEMENT

N

29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00

CROSS-SECTION 7

END LONGITUDINAL PROFILE

VEG PLOT 4

PHOTO POINT 17 18 19 20

MATCHLINE STA. 28+75
SEE FIGURE 5 OF 6

CONSERVATION EASEMENT BOUNDARY

GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )
1 inch = 40 ft.

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

FIGURE 1.2
MONITORING PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 6 OF 6

# SECTION 6
# APPENDICES

**Appendix 1 - Vegetation Raw Data**

**Appendix 2 - Geomorphic and Stream Stability Data**

**Appendix 3 - Wetland Raw Data**

**Appendix 4 – Current Condition Plan View (Integrated)**

# APPENDIX 1
# VEGETATION RAW DATA

1. **Vegetation Survey Data Tables***

2. **Representative Vegetation Current Condition Photos**

3. **Vegetation Monitoring Plot Photos**

*Raw data tables have been provided electronically.

Main Channel (3,300 lf)

| Feature Issue | Station Numbers | Suspected Cause | Photo ID # |
|---|---|---|---|
| Streambank Cover - Poor | 6+51-6+59 | Poor vegetative cover - RB | 1 |
| | 8+56-8+69 | Poor vegetative cover - LB | |
| | 33+14+33+86 | Poor vegetative cover - LB | |
| | 34+38+34+97 | Bare bank needs coverage - RB | |

LB - Left Bank Looking Downstream, RB - Right Bank Looking Downstream, BB - Both Banks, TOB - Top of Bank
Please refer to Appendix 1.2 for Problem Area Photos

1. Streambank Cover Poor (4/2008)

1. Monitoring Plot 1 (6/2008)

2. Monitoring Plot 2 (6/2008)

3. Monitoring Plot 3 (6/2008)

4. Monitoring Plot 4 (6/2008)

| | | |
|---|---|---|
| Prepared For: Ecosystem Enhancement Program | Back Creek Stream and Wetland Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 1.3 Vegetation Monitoring Plot Photos** | JJG |

# APPENDIX 2
# GEOMORPHIC AND STREAM STABILITY DATA

1. **Stream Current Condition Table**
2. **Representative Stream Current Condition Photos**
3. **Stream Photo Station Photos**
4. **Stream Cross-Section Photos**
5. **Qualitative Visual Stability Assessment**
6. **Cross-Section Plots and Raw Data Tables***
7. **Longitudinal Plots and Raw Data Tables***
8. **Pebble Count Plots and Raw Data Tables***

*Raw data tables have been provided electronically.

**Main Channel (3,300 lf)**

| Feature Issue | Station Numbers | Suspected Cause | Photo ID # |
|---|---|---|---|
| Bank Erosion - Moderate | 3+04+3+21 | Loose, torn matting, change in near bank stress - LB | 1 |
| | 3+30-3+36 | Point bar erosion - RB | |
| | 3+68-3+82 | | |
| | 3+61-3+82 | Bank slump | |
| | 4+49-4+57 | Point bar erosion - LB | |
| | 5+74-6+50 | Poor vegetation cover, no matting - LB | |
| | 6+04-6+24 | Eroding under matting/Poor vegetative cover - RB | |
| | 12+35-12+67 | Toe protection slightly undermined - TOB/RB | |
| | 20+83-20+95 | Change in near bank stress, eroding under matting - LB | |
| | 23+11-23+33 | Change in near bank stress, eroding under matting - LB | |
| | 24+12-24+27 | Very moderate bank erosion under matting - LB | |
| | 26+67-26+89 | Change in near bank stress, eroding under loose matting - RB | |
| | 24+31-27+58 | Change in near bank stress, eroding under matting - RB | |
| | 28+68-29+11 | Change in near bank stress - LB | |
| | 30+15-30+39 | Change in near bank stress - RB | |
| | 31+15-31+19 | Change in near bank stress, eroding under matting - LB | |
| | 33+39-33+60 | Bare bank, lack of vegetative cover - RB | |
| | 33+94-34+09 | Change in near bank stress, eroding under matting - LB | |
| Bank Erosion - Severe | 8+81-9+07 | Loose matting - LB | 2 |
| | 14+38-14+39 | Loose matting, bank erosion - RB | |
| | 14+62-14+90 | Loose matting, bank erosion under matting - LB | |
| | 21+88-22+14 | Bank erosion under matting - LB | |
| | 22+27-22+40 | | |
| | 22+54-22+67 | | |
| | 26+30-26+41 | Loose matting, bank erosion under matting - LB | |
| | 27+09-27+13 | Loose matting, bank erosion under matting - LB | |
| | 27+09-27+26 | Loose matting, bank erosion under matting - RB | |
| | 34+38-34+97 | Loose matting, vertical bank - RB | |
| Aggradation | 14+90-15+00 | Transverse Bar/Mid-Channel Bar | 3 |
| | 25+87+26+29 | Lateral bar forming - RB | 4 |
| | 27+27+27+62 | Lateral bar forming, pushing TW to REW - LB | |
| Down Tree | 17+50 | Down tree from streambank - potential for debris jam | 5 |
| Structure- Stressed | 13+27 | Scour around right arm - RB | 6 |
| | 14+28 | Scour under arm - LB | |
| | 31+55 | Boulder shifted in arms of cross-vane | |
| Downcut/Lost Riffle | 11+68+12+11 | Bed material shifted downstream | * |
| In-Stream Vegetation | 16+73+17+50 | Vegetation growing in middle of channel | 8 |
| | 17+94+18+64 | | |

**Central Tributary (375 lf)**

| Feature Issue | Station Numbers | Suspected Cause | Photo ID # |
|---|---|---|---|
| Bank Erosion-Moderate | 0+5-0+15 | Eroding under matting - RB | 1 |
| | 2+02-2+15 | Eroding under matting - LB | |
| | 2+25-2+26 | Eroding under matting - LB | |

LB - Left Bank Looking Downstream, RB - Right Bank Looking Downstream, BB - Both Banks, TOB - Top of Bank
Please refer to Appendix 2.2 for Problem Area Photos
*No photograph available

1. Bank Erosion: Moderate (4/2008)

2. Bank Erosion: Severe (4/2008)

3. Aggradation: Transverse Bar (4/2008)

4. Aggradation: Lateral Bar (4/2008)

5. Tree Down (4/2008)

6. Structure Stressed (4/2008)

7. In-Stream Vegetation (4/2008)

Photo Point 1 View Southeast (4/2008)

Photo Point 2 South (4/2008)

Photo Point 3-View Upstream
Main Channel (4/2008)

Photo Point 3-View Downstream
Main Channel (4/2008)

Photo Point 4-View Upstream
Main Channel (4/2008)

Photo Point 4-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: Ecosystem Enhancement Program | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | JJG |

Photo Point 5-View Upstream
Main Channel (4/2008)

Photo Point 5-View Downstream
Main Channel (4/2008)

Photo Point 6-View Upstream
Main Channel (4/2008)

Photo Point 6-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Photo Point 7 View Southwest (4/2008)

Photo Point 8-View Upstream
Main Channel(4/2008)

Photo Point 8-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Photo Point 9-View Upstream
Main Channel (4/2008)

Photo Point 9-View Downstream
Main Channel (4/2008)

Photo Point 10-View Upstream
Main Channel (4/2008)

Photo Point 10-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Photo Point 11-View Upstream
Main Channel (4/2008)

Photo Point 11-View Downstream
Main Channel (4/2008)

Photo Point 12-View Upstream
Tributary (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Photo Point 13 View Northwest (4/2008)

Photo Point 14-View Upstream
Main Channel (4/2008)

Photo Point 14-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Photo Point 15-View Upstream
Main Channel (4/2008)

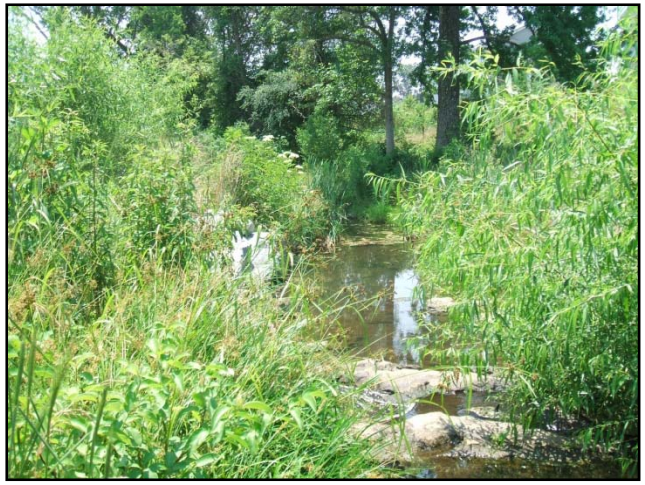


Photo Point 15-View Downstream
Main Channel (4/2008)

Photo Point 16-View Upstream
Main Channel (4/2008)

Photo Point 16-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Photo Point 17 View Veg Plot 4 (4/2008)

Photo Point 18-View Upstream
Main Channel (4/2008)

Photo Point 18-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Photo Point 19-View Upstream
Main Channel (4/2008)

Photo Point 19-View Downstream
Main Channel (4/2008)

Photo Point 20-View Upstream
Main Channel (4/2008)

Photo Point 20-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Photo Point 21-View Upstream
Main Channel (4/2008)

Photo Point 21-View Downstream
Main Channel (4/2008)

Photo Point 22-View Upstream
Main Channel (4/2008)

Photo Point 22-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.3 Stream Photo Station Photos** | |

Cross-Section 1-View Upstream
Main Channel (4/2008)

Cross-Section 1-View Downstream
Main Channel (4/2008)

Cross-Section 2-View Upstream
Main Channel (4/2008)

Cross-Section 2-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.4 Stream Cross-Section Photos** | |

Cross-Section 3-View Upstream
Main Channel (4/2008)

Cross-Section 3-View Downstream
Main Channel (4/2008)

Cross-Section 4-View Upstream
Main Channel (4/2008)

Cross-Section 4-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.4 Stream Cross-Section Photos** | |

Cross-Section 5-View Upstream
Main Channel (4/2008)

Cross-Section 5-View Downstream
Main Channel (4/2008)

Cross-Section 6-View Upstream
Main Channel (4/2008)

Cross-Section 6-View Downstream
Main Channel (4/2008)

Cross-Section 7-View Upstream
Main Channel (4/2008)

Cross-Section 7-View Downstream
Main Channel (4/2008)

Cross-Section 8-View Upstream
Main Channel (4/2008)

Cross-Section 8-View Downstream
Main Channel (4/2008)

| | | |
|---|---|---|
| Prepared For: | Back Creek Stream Restoration<br>Year 3 of 5 | Date: February 2009<br>Project No.: 17 |
| | **Appendix 2.4 Stream Cross-Section Photos** | |

Cross-Section 9-View Upstream
Main Channel (4/2008)

Cross-Section 9-View Downstream
Main Channel (4/2008)

**Main Channel (3,300 lf)**

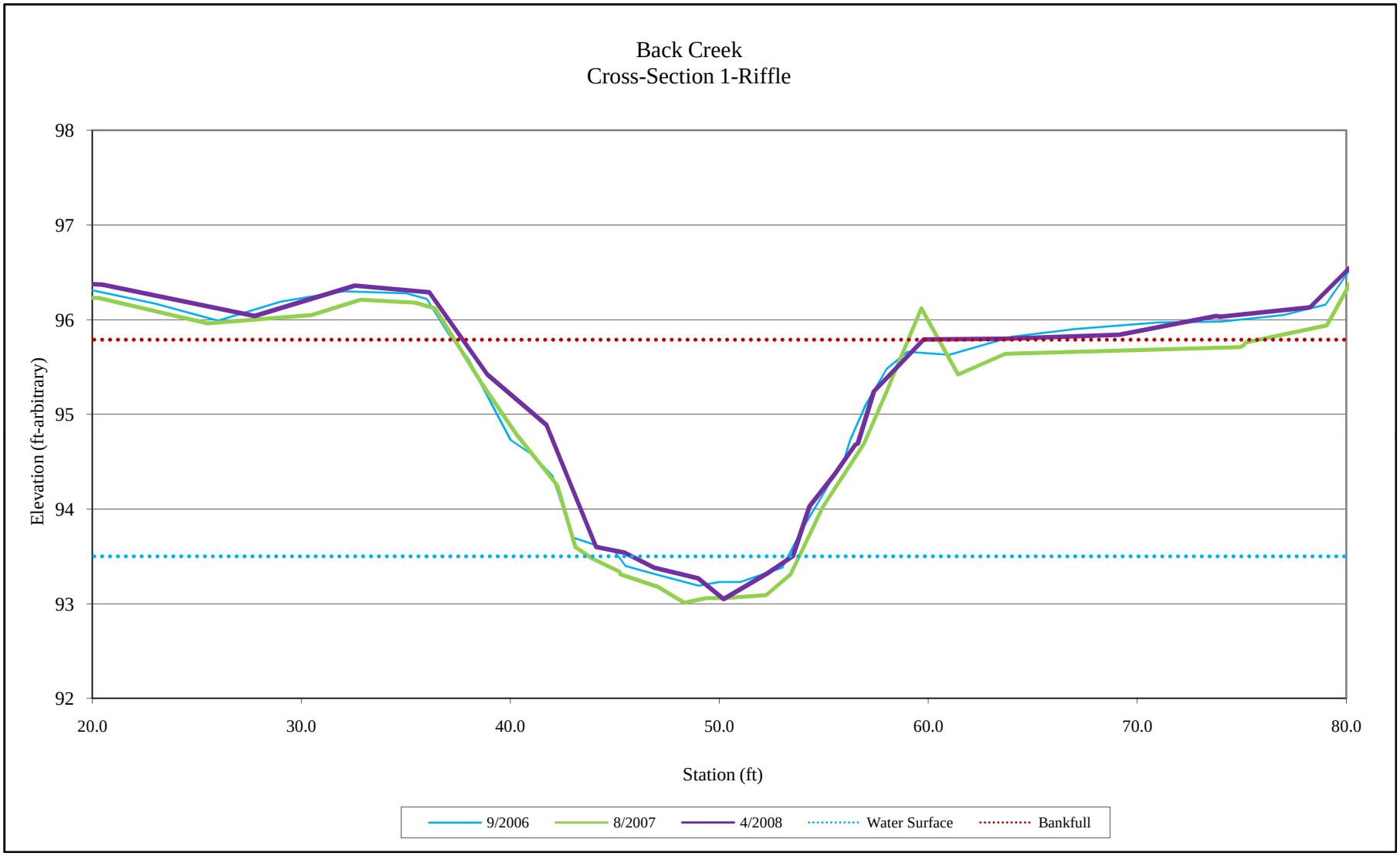
| Feature Category | | (# Stable) Number Performing as Intended | Total Number assessed per as-built survey | Total Number/ feet in unstable state | % Perform in Stable Condition | Feature Perform Mean or Total |
|---|---|---|---|---|---|---|
| A. Riffles | 1. Present? | 24 | 24 | N/A | 10% | **100%** |
| | 2. Armor Stable? | 24 | | | 100% | |
| | 3. Facet grade appears stable? | 24 | | | 100% | |
| | 4. Minimal evidence of embedding/fining? | 24 | | | 100% | |
| | 5. Length appropriate? | 24 | | | 100% | |
| B. Pools | 1. Present? | 26 | 26 | N/A | 100% | **100%** |
| | 2. Sufficiently deep? | 26 | | | 100% | |
| | 3. Length Appropriate? | 26 | | | 100% | |
| C. Thalweg | 1. Upstream of meander bend centering? | 25 | 26 | N/A | 96% | **98%** |
| | 2. Downstream of meander centering? | 26 | | | 100% | |
| D. Meanders | 1. Outer bend in state of limited/controlled erosion? | 22 | 26 | N/A | 85% | **96%** |
| | 2. Of those eroding, # w/concomitant point bar formation? | 26 | | | 100% | |
| | 3. Apparent Rc within spec? | 26 | | | 100% | |
| | 4. Sufficient floodplain access and relief? | 26 | | | 100% | |
| E. Bed General | 1. General channel bed aggradation areas (bar formation)? | N/A | | 3 / 87 | 98% | **99%** |
| | 2. Channel bed degradation - areas of increasing down-cutting or head cutting? | | | 0 | 100% | |
| F. Bank | 1. Actively eroding, wasting, or slumping bank | N/A | | 10 / 185 | 97% | **97%** |
| G. Vanes | 1. Free of back or arm scour? | 15 | 18 | N/A | 83% | **92%** |
| | 2. Height appropriate? | - | | | - | |
| | 3. Angle and geometry appear appropriate? | - | | | - | |
| | 4. Free of piping or other structural failures? | 18 | | | 100% | |
| H. Wads/ Boulders | 1. Free of scour? | N/A | | | | |
| | 2. Footing stable? | | | | | |

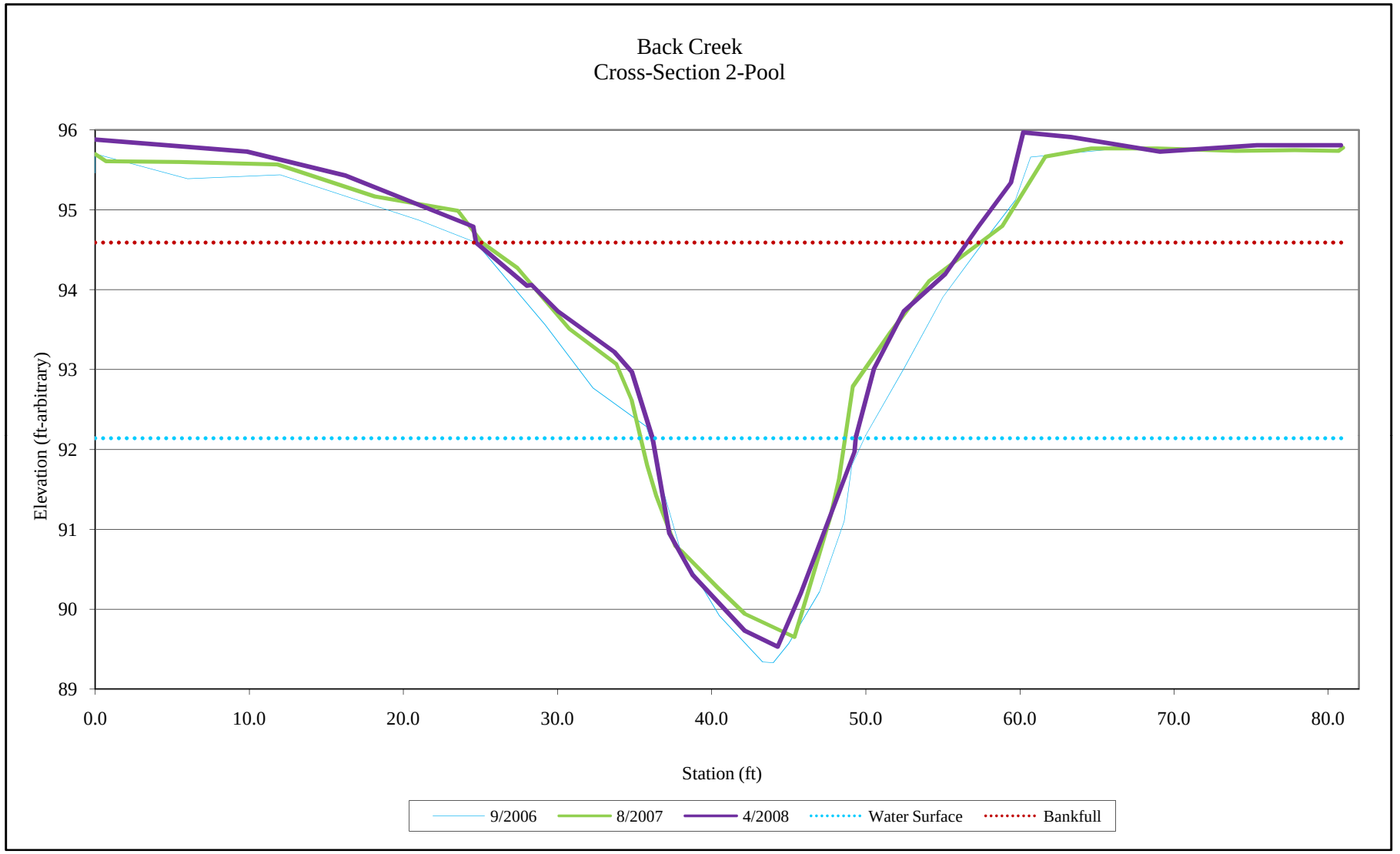
**Upstream Tributary (400 lf)**

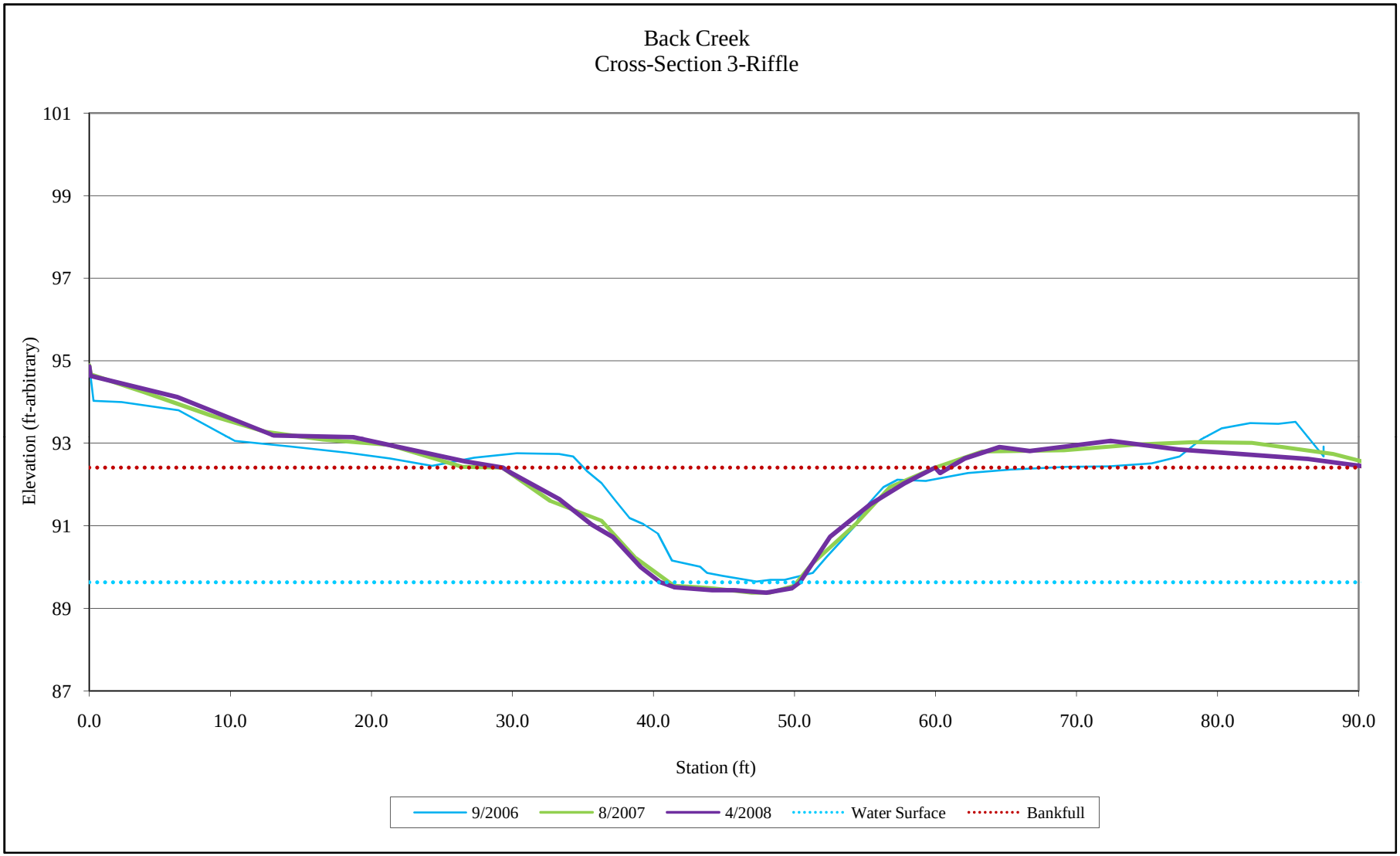
| Feature Category | | (# Stable) Number Performing as Intended | Total Number assessed per as-built survey | Total Number/ feet in unstable state | % Perform in Stable Condition | Feature Perform Mean or Total |
|---|---|---|---|---|---|---|
| A. Riffles | 1. Present? | 8 | 8 | N/A | 10% | **100%** |
| | 2. Armor Stable? | 8 | | | 100% | |
| | 3. Facet grade appears stable? | 8 | | | 100% | |
| | 4. Minimal evidence of embedding/fining? | 8 | | | 100% | |
| | 5. Length appropriate? | 8 | | | 100% | |
| B. Pools | 1. Present? | 7 | 7 | N/A | 100% | **100%** |
| | 2. Sufficiently deep? | N/A | | | 100% | |
| | 3. Length Appropriate? | 7 | | | 100% | |
| C. Thalweg | 1. Upstream of meander bend centering? | 7 | 7 | N/A | 100% | **100%** |
| | 2. Downstream of meander centering? | 7 | | | 100% | |
| D. Meanders | 1. Outer bend in state of limited/controlled erosion? | 7 | 7 | N/A | 100% | **100%** |
| | 2. Of those eroding, # w/concomitant point bar formation? | 7 | | | 100% | |
| | 3. Apparent Rc within spec? | 7 | | | 100% | |
| | 4. Sufficient floodplain access and relief? | 7 | | | 100% | |
| E. Bed General | 1. General channel bed aggradation areas (bar formation)? | N/A | | 0 | 100% | **100%** |
| | 2. Channel bed degradation - areas of increasing down-cutting or head cutting? | | | 0 | 100% | |
| F. Bank | 1. Actively eroding, wasting, or slumping bank | N/A | | 0 | 100% | **100%** |
| G. Vanes | 1. Free of back or arm scour? | 8 | 8 | N/A | 100% | **100%** |
| | 2. Height appropriate? | - | | | - | |
| | 3. Angle and geometry appear appropriate? | - | | | - | |
| | 4. Free of piping or other structural failures? | 8 | | | 100% | |
| H. Wads/ Boulders | 1. Free of scour? | N/A | | | | |
| | 2. Footing stable? | | | | | |

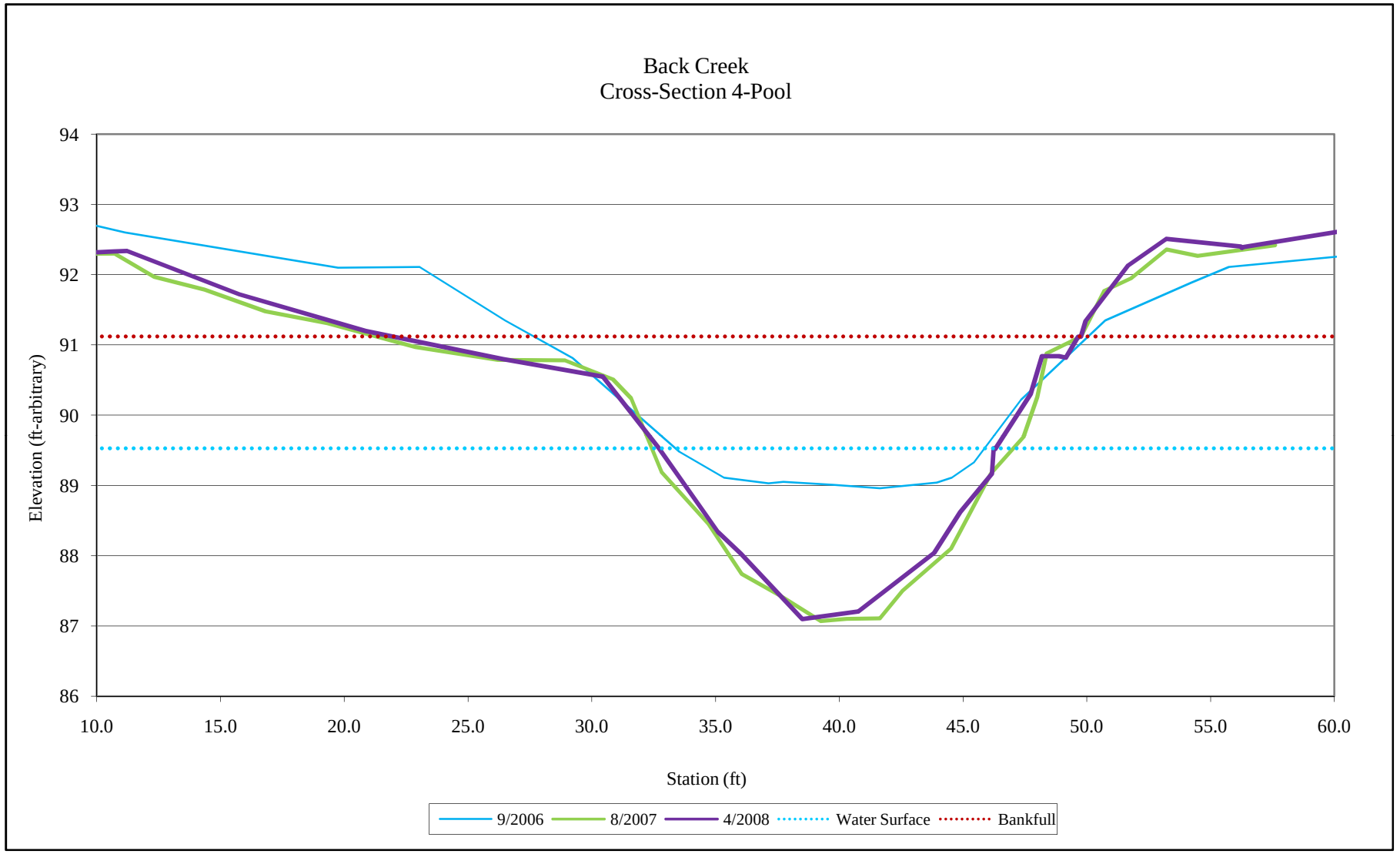
**Central Tributary (375 lf)**

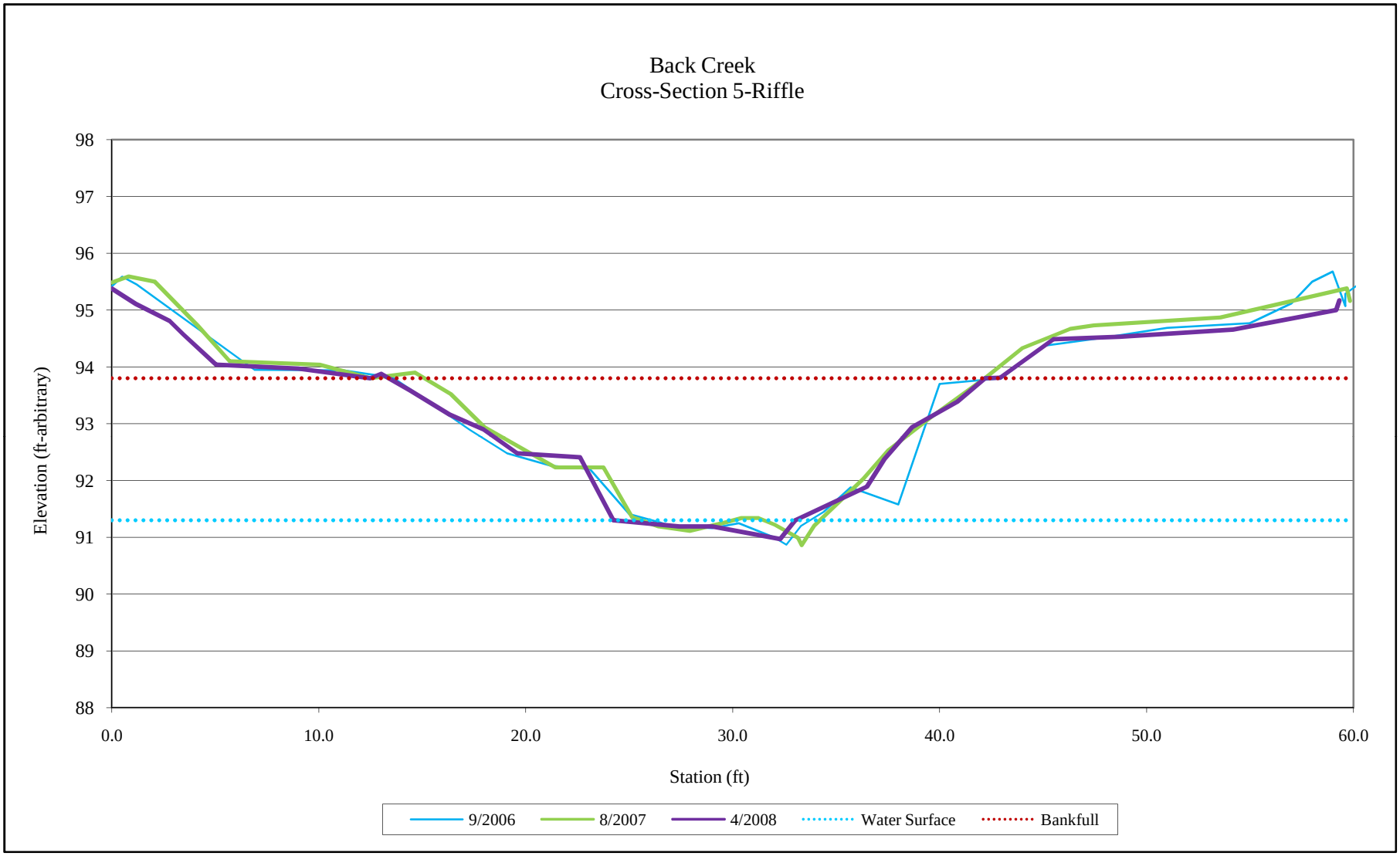
| Feature Category | | (# Stable) Number Performing as Intended | Total Number assessed per as-built survey | Total Number/ feet in unstable state | % Perform in Stable Condition | Feature Perform Mean or Total |
|---|---|---|---|---|---|---|
| A. Riffles | 1. Present? | N/A | N/A | N/A | 10% | **100%** |
| | 2. Armor Stable? | N/A | | | 100% | |
| | 3. Facet grade appears stable? | N/A | | | 100% | |
| | 4. Minimal evidence of embedding/fining? | N/A | | | 100% | |
| | 5. Length appropriate? | N/A | | | 100% | |
| B. Pools | 1. Present? | 11 | 11 | N/A | 100% | **100%** |
| | 2. Sufficiently deep? | N/A | | | 100% | |
| | 3. Length Appropriate? | 11 | | | 100% | |
| C. Thalweg | 1. Upstream of meander bend centering? | 11 | 11 | N/A | 100% | **100%** |
| | 2. Downstream of meander centering? | 11 | | | 100% | |
| D. Meanders | 1. Outer bend in state of limited/controlled erosion? | 2 | 2 | N/A | 100% | **100%** |
| | 2. Of those eroding, # w/concomitant point bar formation? | 2 | | | 100% | |
| | 3. Apparent Rc within spec? | 2 | | | 100% | |
| | 4. Sufficient floodplain access and relief? | 2 | | | 100% | |
| E. Bed General | 1. General channel bed aggradation areas (bar formation)? | N/A | | 0 | 100% | **100%** |
| | 2. Channel bed degradation - areas of increasing down-cutting or head cutting? | | | 0 | 100% | |
| F. Bank | 1. Actively eroding, wasting, or slumping bank | N/A | | 0 | 100% | **100%** |
| G. Vanes | 1. Free of back or arm scour? | 9 | 9 | N/A | 100% | **100%** |
| | 2. Height appropriate? | - | | | - | |
| | 3. Angle and geometry appear appropriate? | - | | | - | |
| | 4. Free of piping or other structural failures? | 9 | | | 100% | |
| H. Wads/ Boulders | 1. Free of scour? | N/A | | | | |
| | 2. Footing stable? | | | | | |

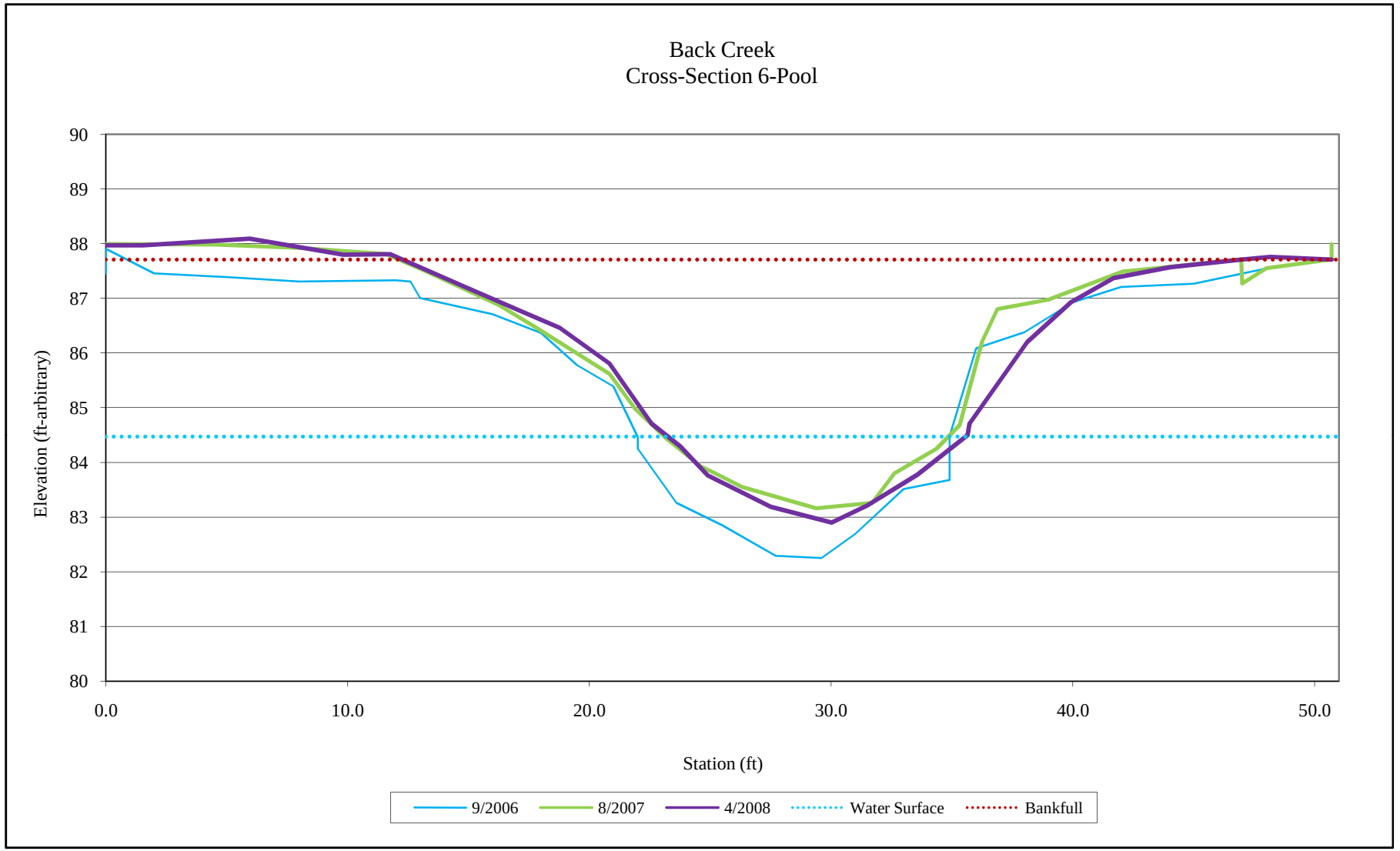

Back Creek
Cross-Section 1-Riffle
98
97
96
95
94
93
92
Elevation (ft-arbitrary)
20.0
30.0
40.0
50.0
60.0
70.0
80.0
Station (ft)
9/2006
8/2007
4/2008
Water Surface
Bankfull

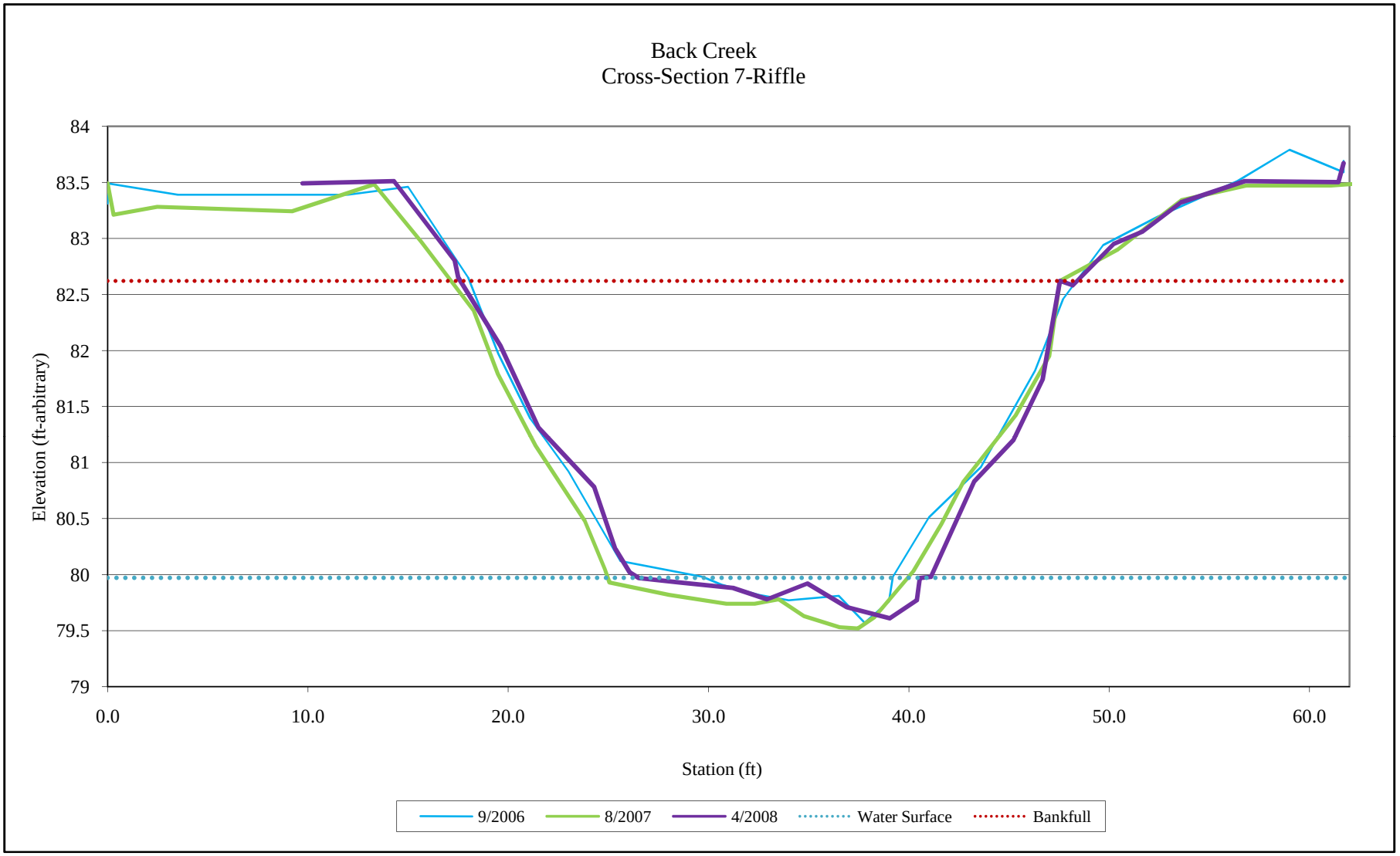

Back Creek
Cross-Section 2-Pool
Elevation (ft-arbitrary)
96
95
94
93
92
91
90
89
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
Station (ft)
9/2006
8/2007
4/2008
Water Surface
Bankfull

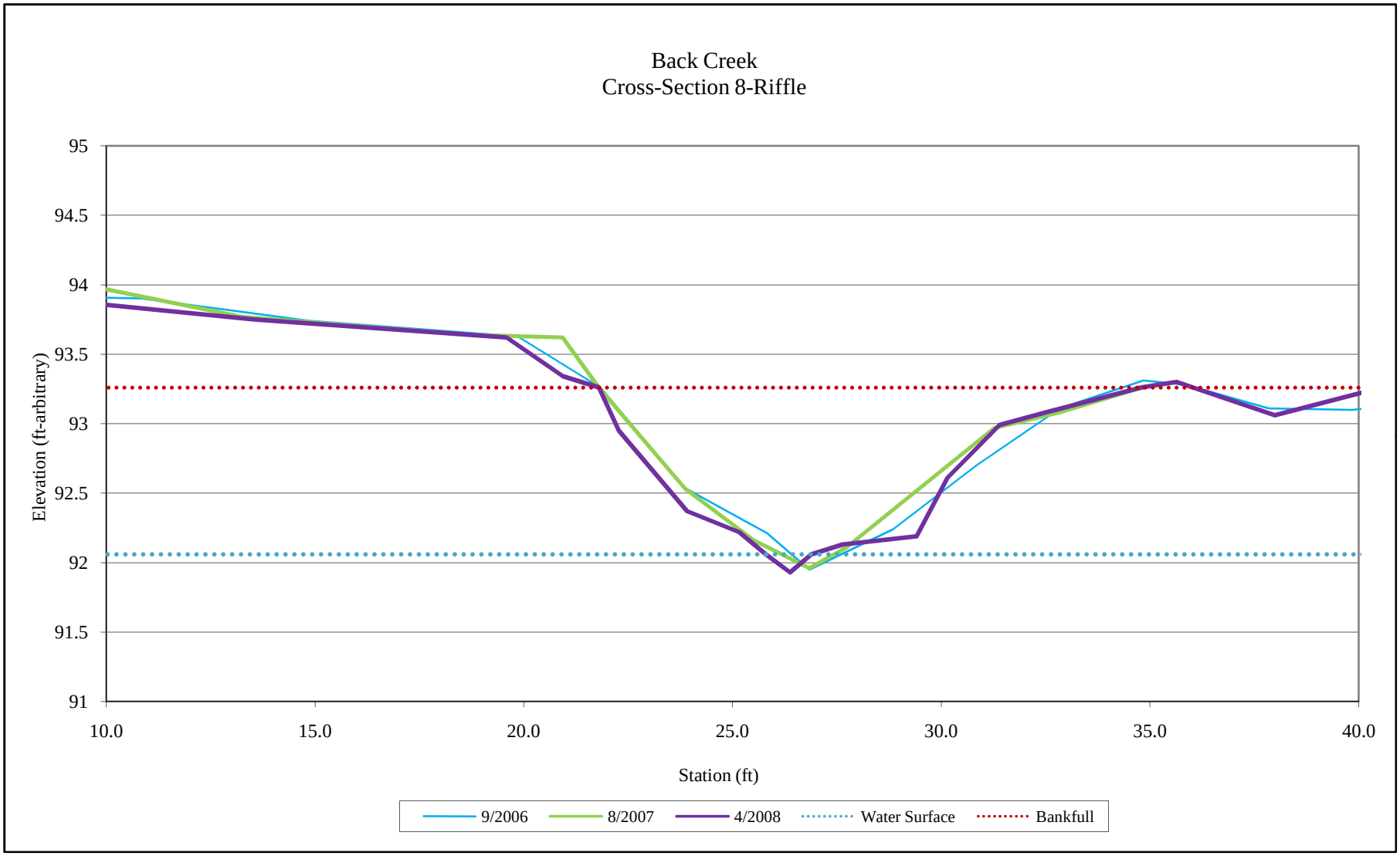

Back Creek
Cross-Section 3-Riffle
Elevation (ft-arbitrary)
101
99
97
95
93
91
89
87
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
Station (ft)
9/2006
8/2007
4/2008
Water Surface
Bankfull

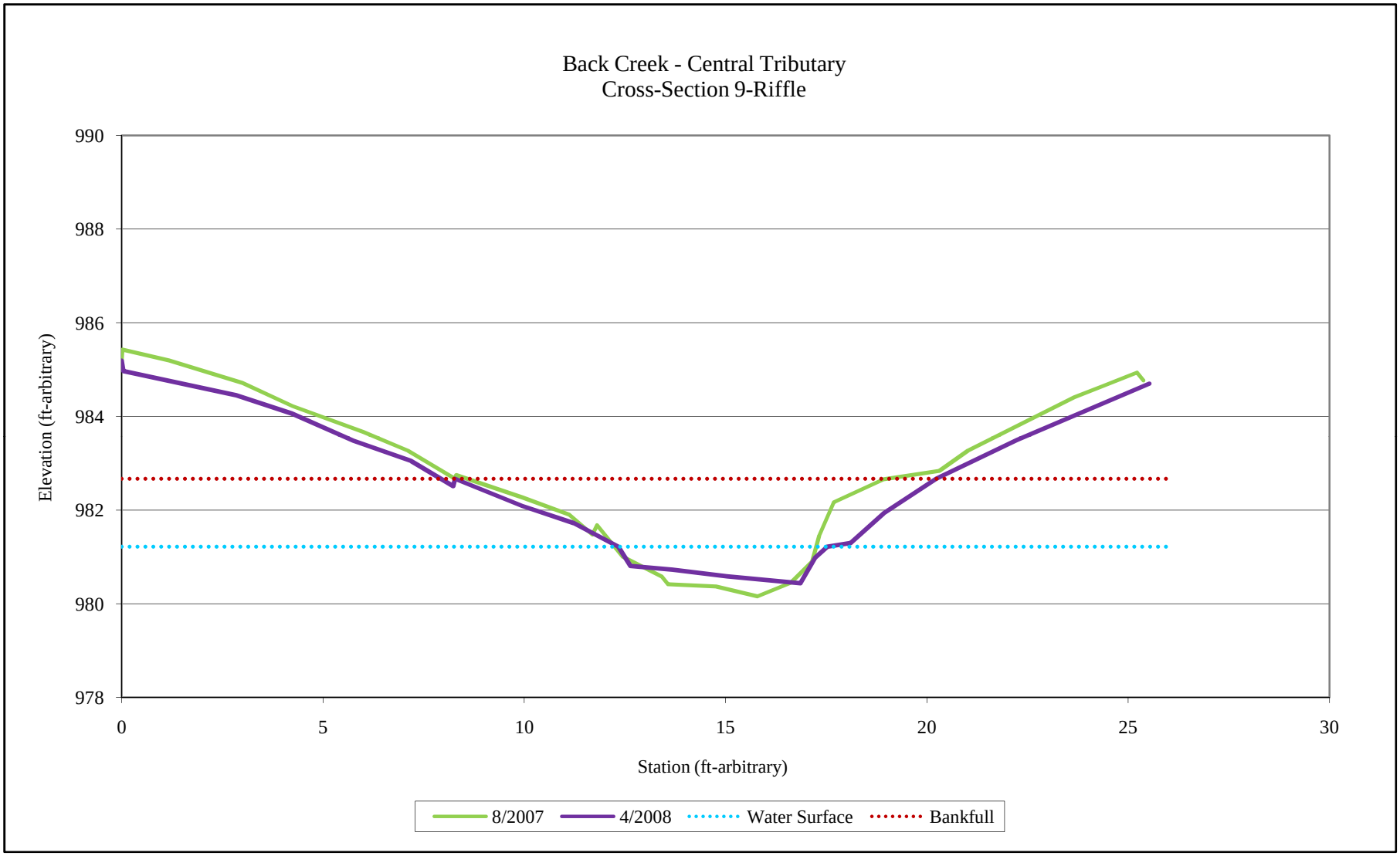

Back Creek
Cross-Section 4-Pool
Elevation (ft-arbitrary)
94
93
92
91
90
89
88
87
86
10.0
15.0
20.0
25.0
30.0
35.0
40.0
45.0
50.0
55.0
60.0
Station (ft)
9/2006
8/2007
4/2008
Water Surface
Bankfull

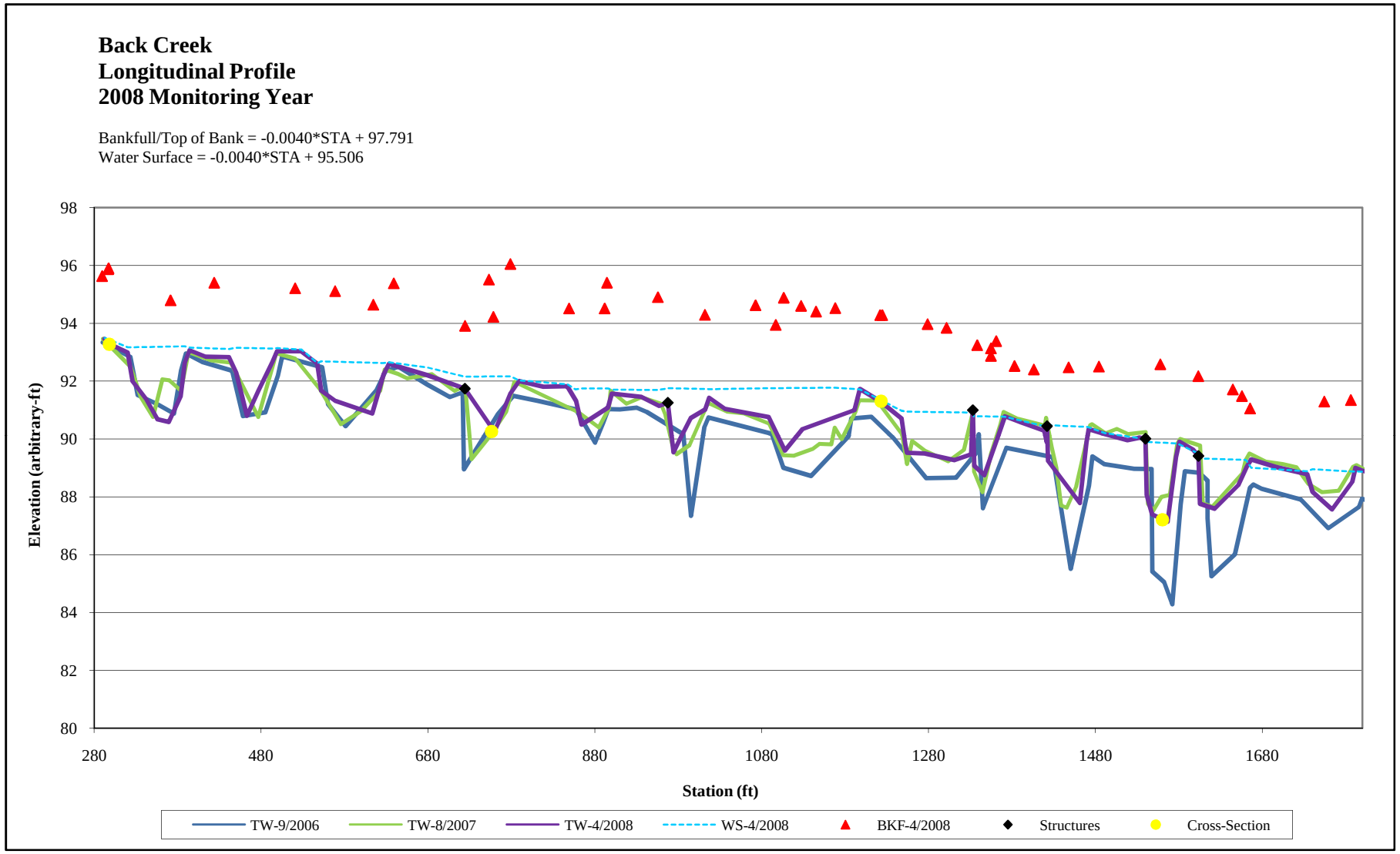

Back Creek
Cross-Section 5-Riffle
Elevation (ft-arbitrary)
98
97
96
95
94
93
92
91
90
89
88
0.0
10.0
20.0
30.0
40.0
50.0
60.0
Station (ft)
9/2006
8/2007
4/2008
Water Surface
Bankfull

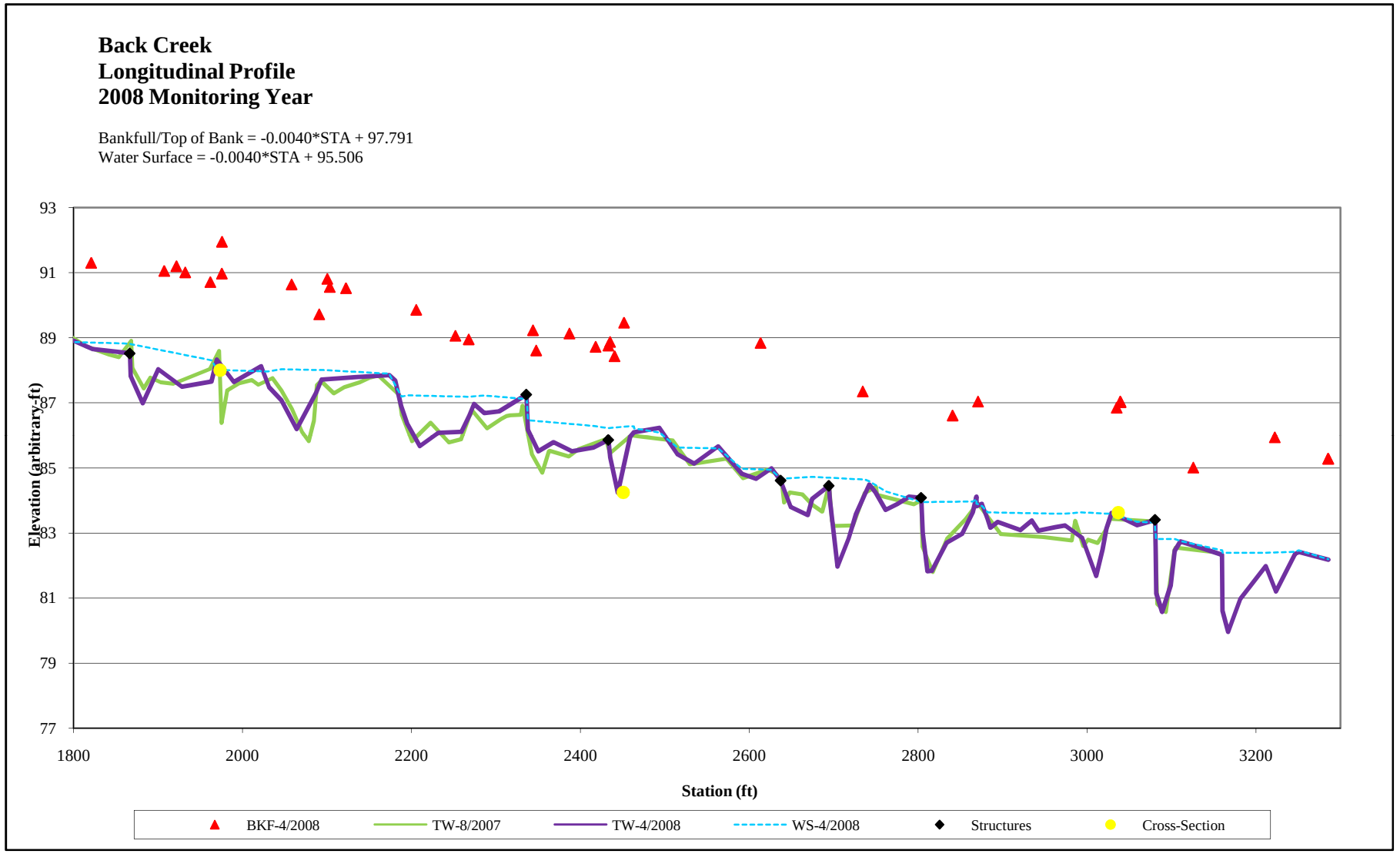

Back Creek
Cross-Section 6-Pool
Elevation (ft-arbitrary)
90
89
88
87
86
85
84
83
82
81
80
0.0
10.0
20.0
30.0
40.0
50.0
Station (ft)
9/2006
8/2007
4/2008
Water Surface
Bankfull

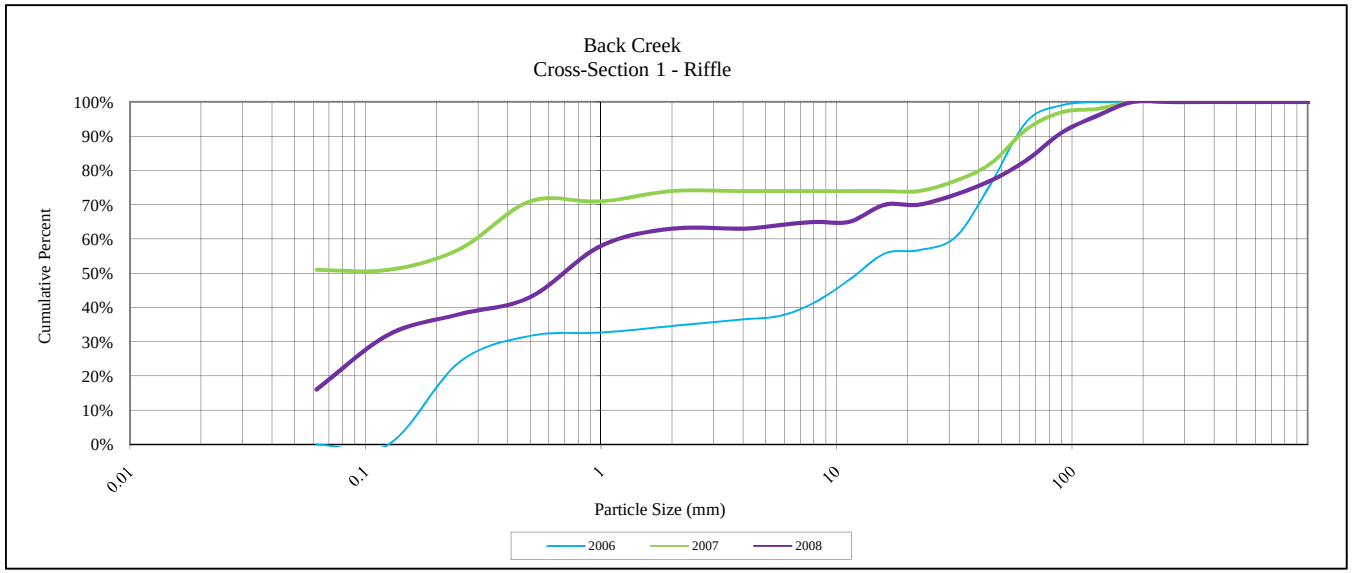

Back Creek
Cross-Section 7-Riffle
Elevation (ft-arbitrary)
84
83.5
83
82.5
82
81.5
81
80.5
80
79.5
79
0.0
10.0
20.0
30.0
40.0
50.0
60.0
Station (ft)
9/2006
8/2007
4/2008
Water Surface
Bankfull

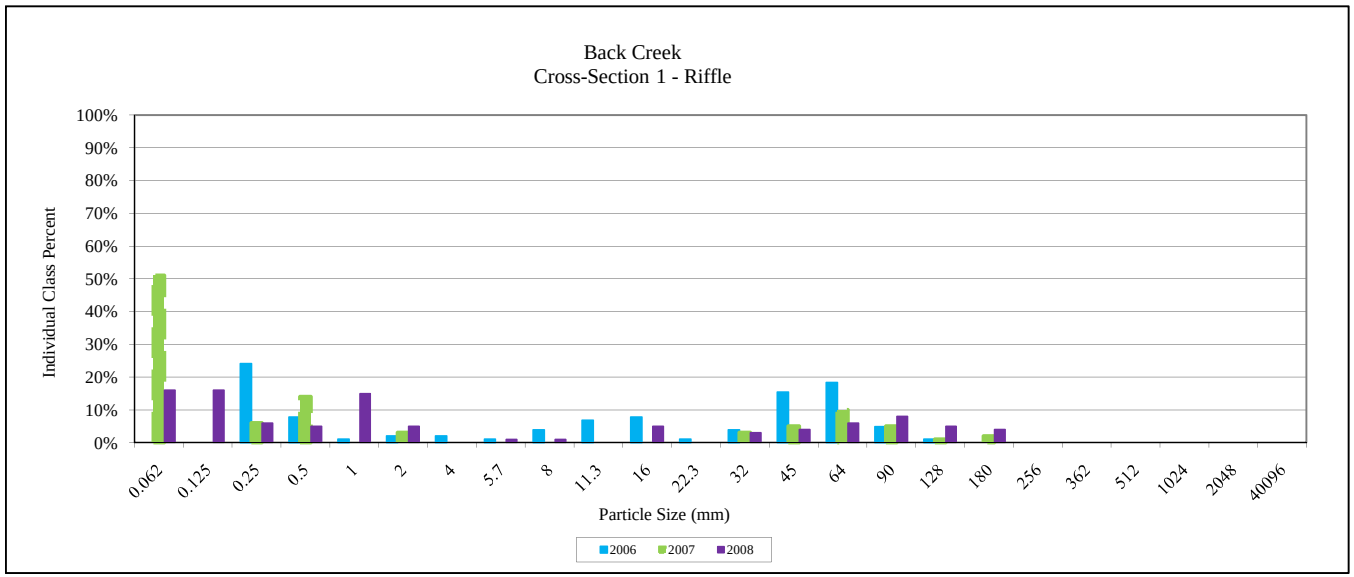

Back Creek
Cross-Section 8-Riffle
Elevation (ft-arbitrary)
95
94.5
94
93.5
93
92.5
92
91.5
91
10.0
15.0
20.0
25.0
30.0
35.0
40.0
Station (ft)
9/2006
8/2007
4/2008
Water Surface
Bankfull


Back Creek - Central Tributary
Cross-Section 9-Riffle
990
988
986
984
982
980
978
Elevation (ft-arbitrary)
0
5
10
15
20
25
30
Station (ft-arbitrary)
8/2007
4/2008
Water Surface
Bankfull

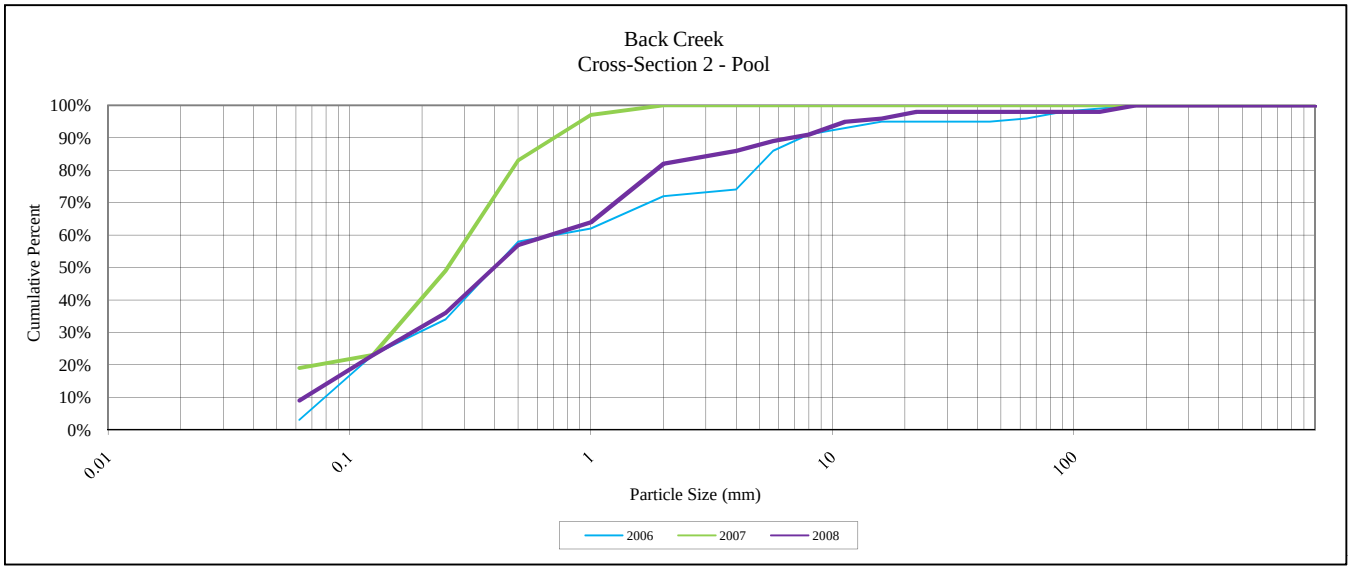

Back Creek
Longitudinal Profile
2008 Monitoring Year
Bankfull/Top of Bank = -0.0040*STA + 97.791
Water Surface = -0.0040*STA + 95.506
Elevation (arbitrary-ft)
98
96
94
92
90
88
86
84
82
80
280
480
680
880
1080
1280
1480
1680
Station (ft)
TW-9/2006
TW-8/2007
TW-4/2008
WS-4/2008
BKF-4/2008
Structures
Cross-Section

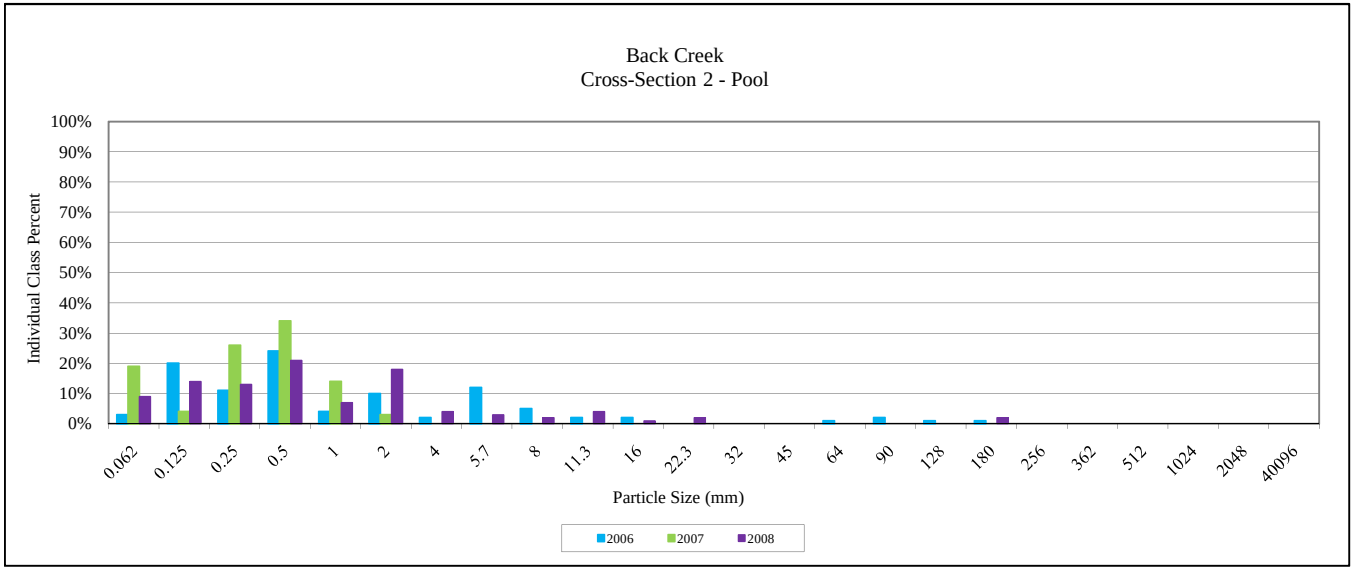

Back Creek
Longitudinal Profile
2008 Monitoring Year
Bankfull/Top of Bank = -0.0040*STA + 97.791
Water Surface = -0.0040*STA + 95.506
Elevation (arbitrary-ft)
93
91
89
87
85
83
81
79
77
1800
2000
2200
2400
2600
2800
3000
3200
Station (ft)
BKF-4/2008
TW-8/2007
TW-4/2008
WS-4/2008
Structures
Cross-Section



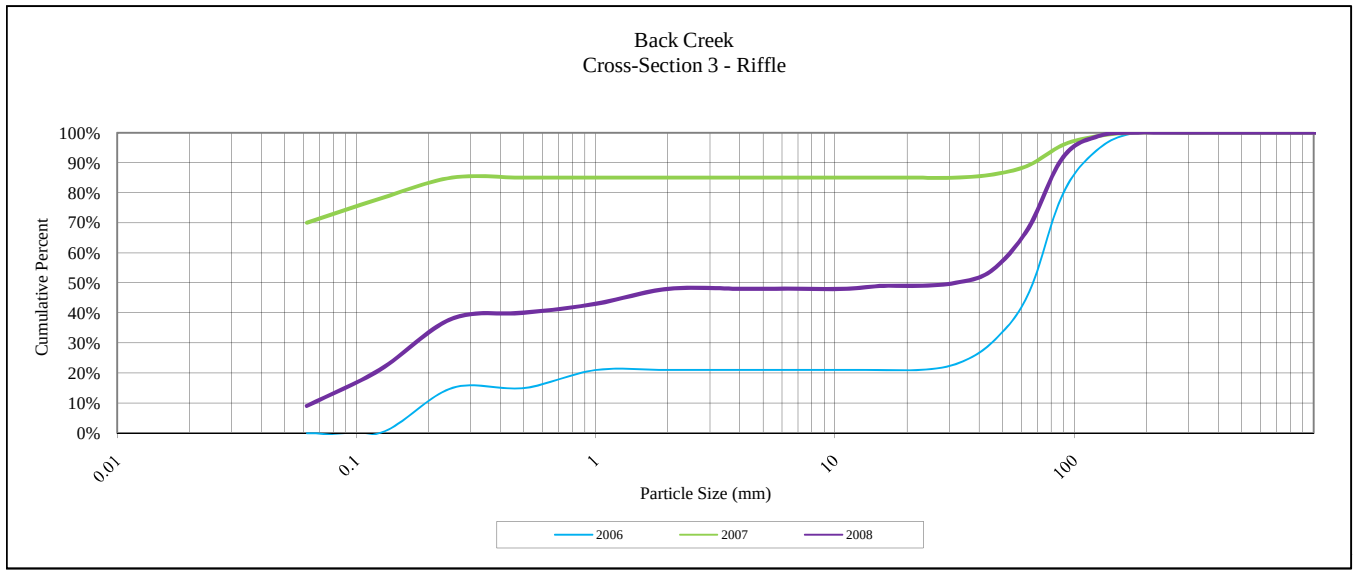



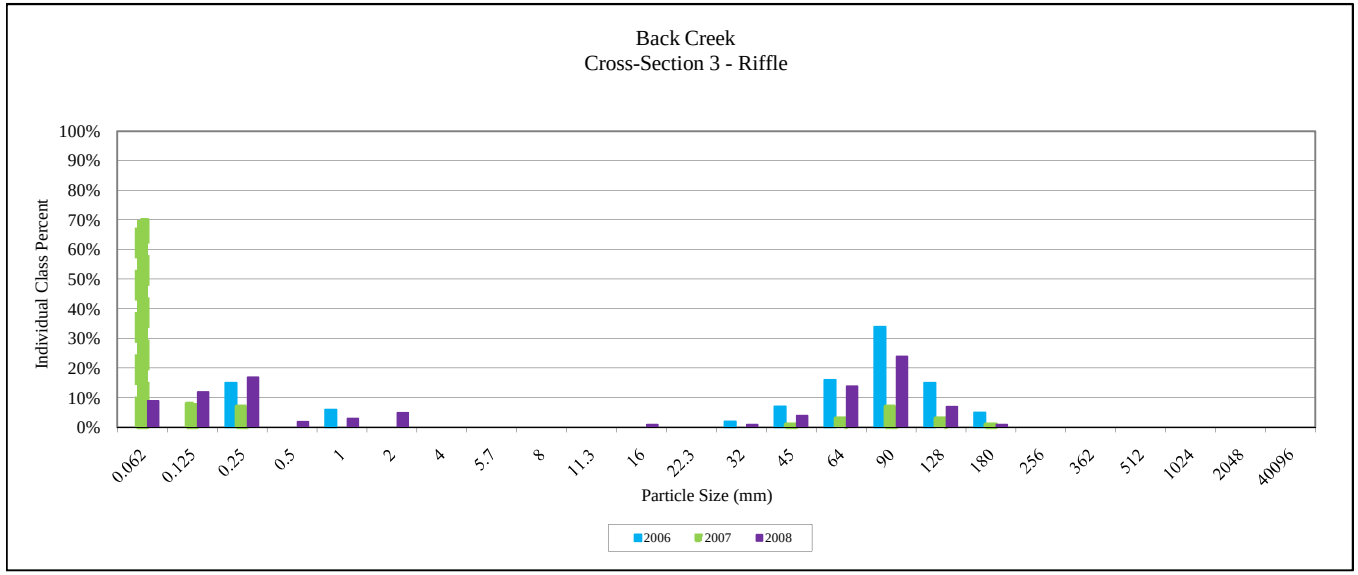

Appendix 2.8 Pebble Count Plots and Raw Data Tables
Back Creek Stream and Wetland Restoration
Year 3 of 5



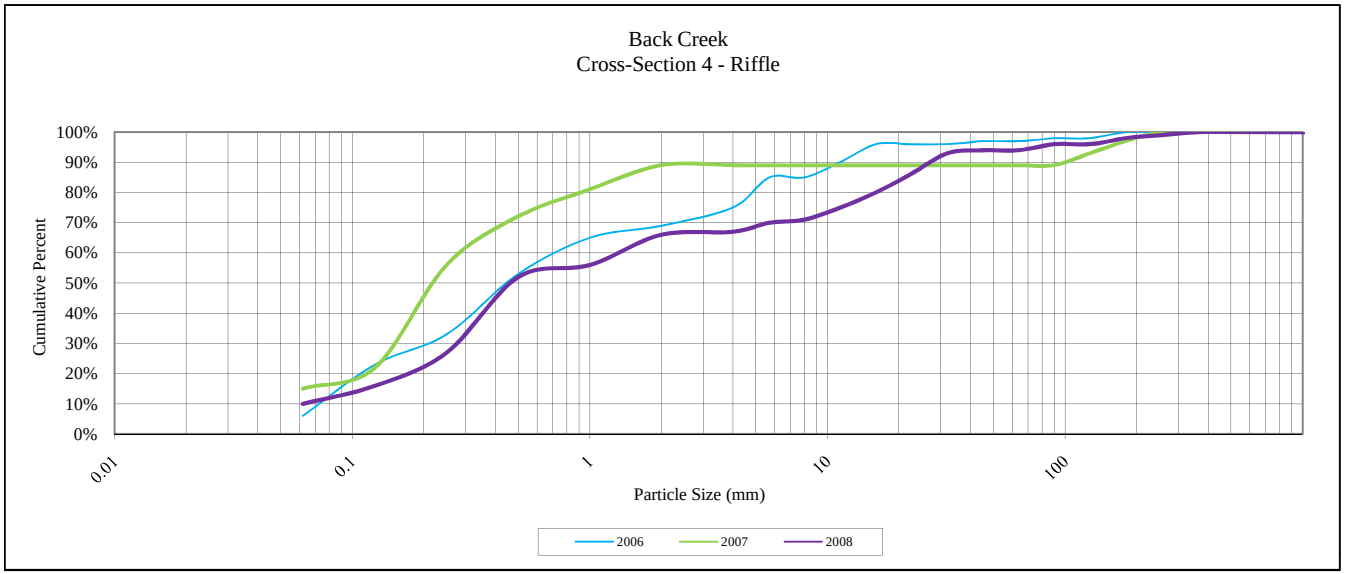



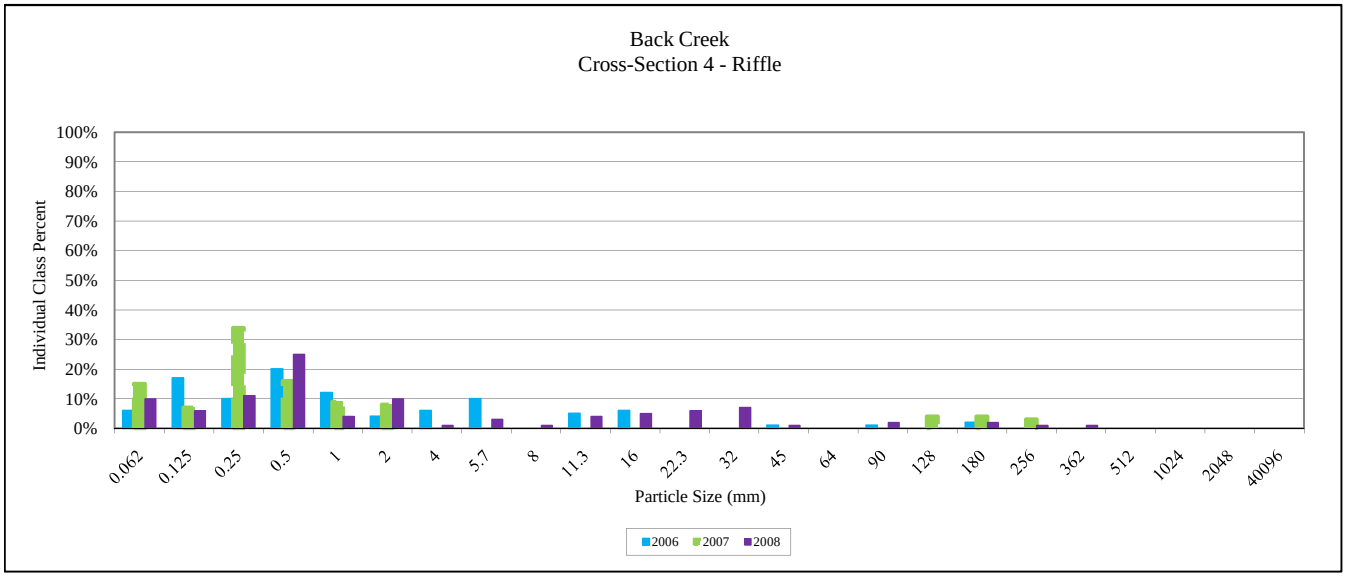

Appendix 2.8 Pebble Count Plots and Raw Data Tables
Back Creek Stream and Wetland Restoration
Year 3 of 5

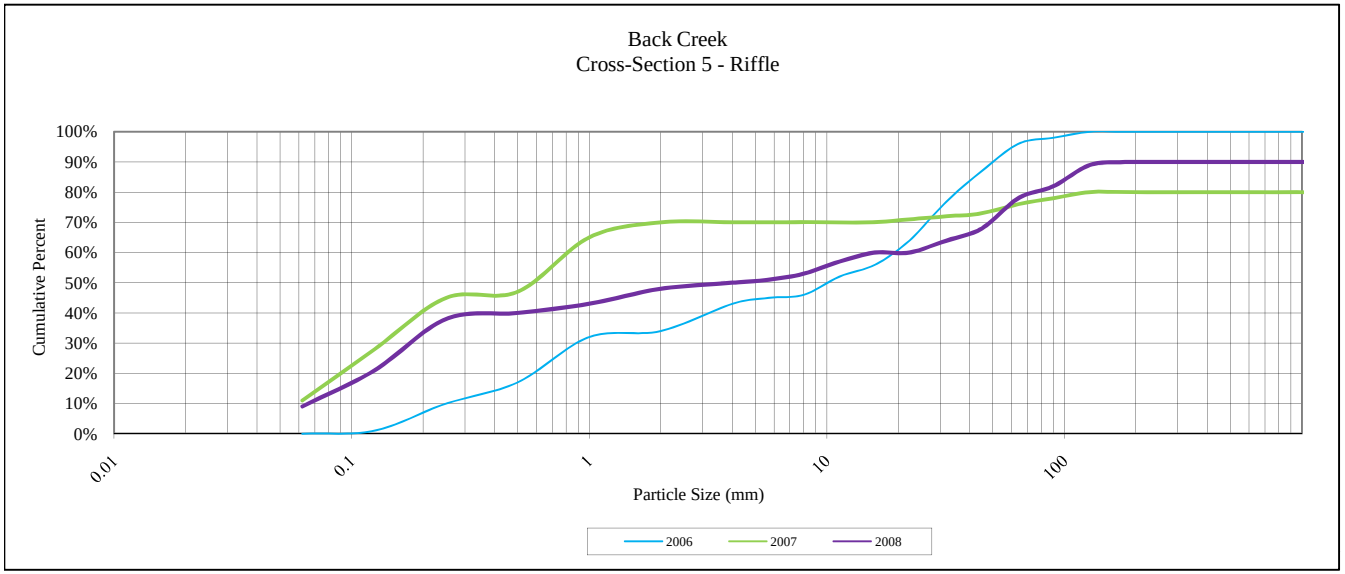


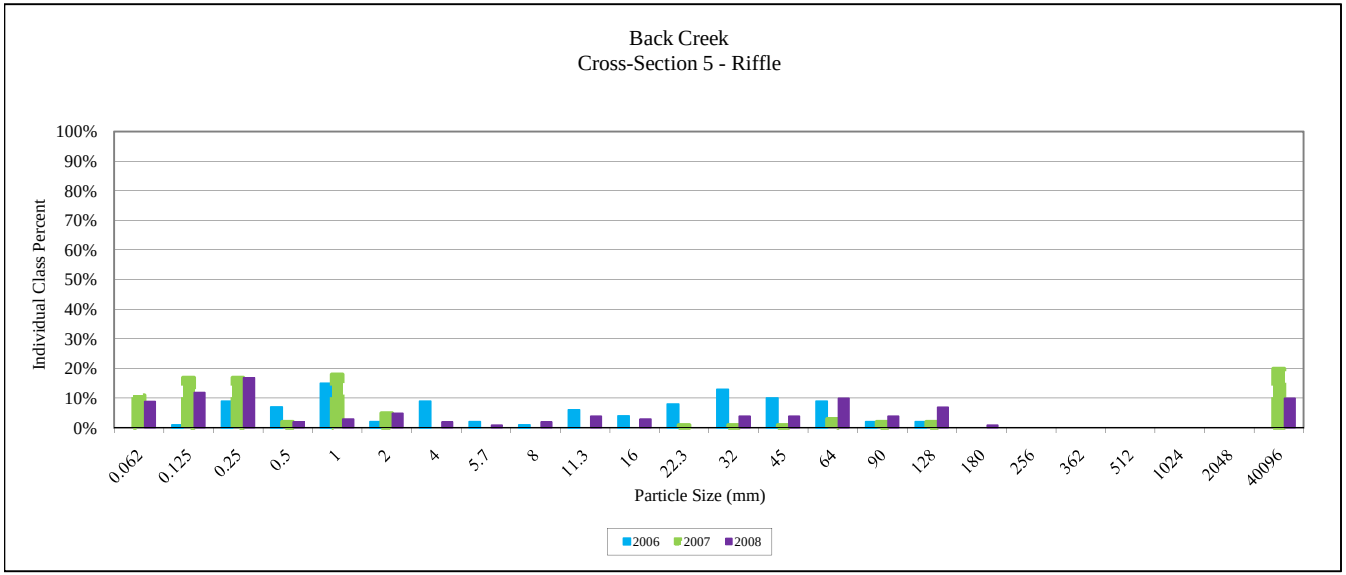




Appendix 2.8 Pebble Count Plots and Raw Data Tables
Back Creek Stream and Wetland Restoration
Year 3 of 5

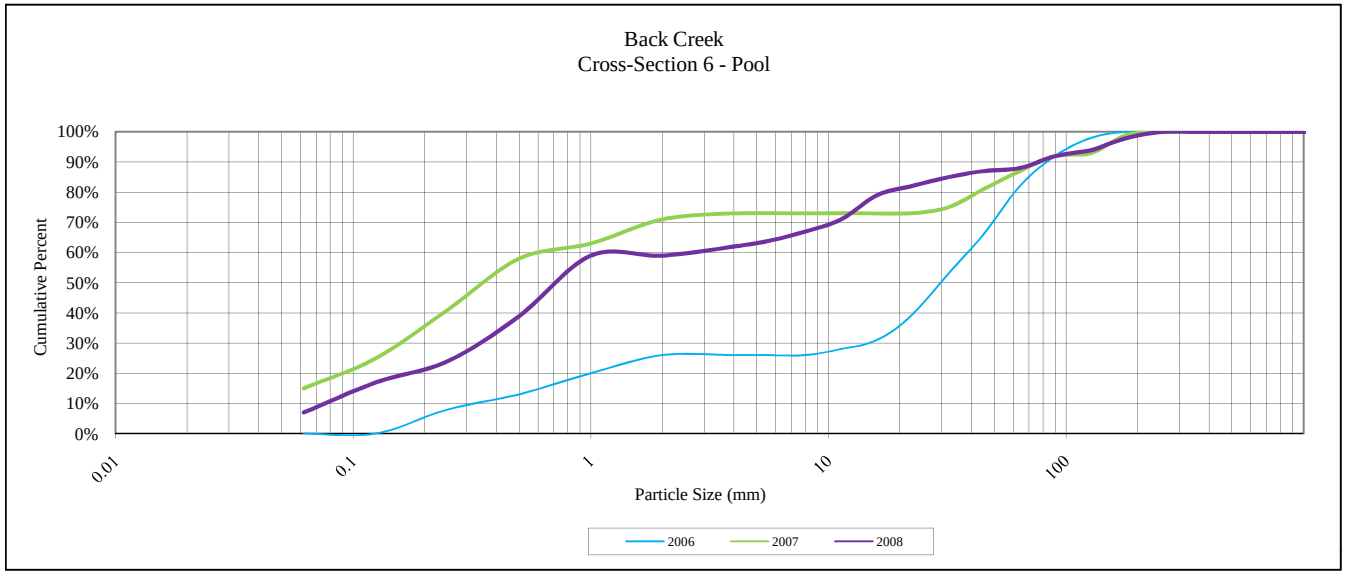

Back Creek
Cross-Section 4 - Riffle
Cumulative Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
Particle Size (mm)
2006
2007
2008

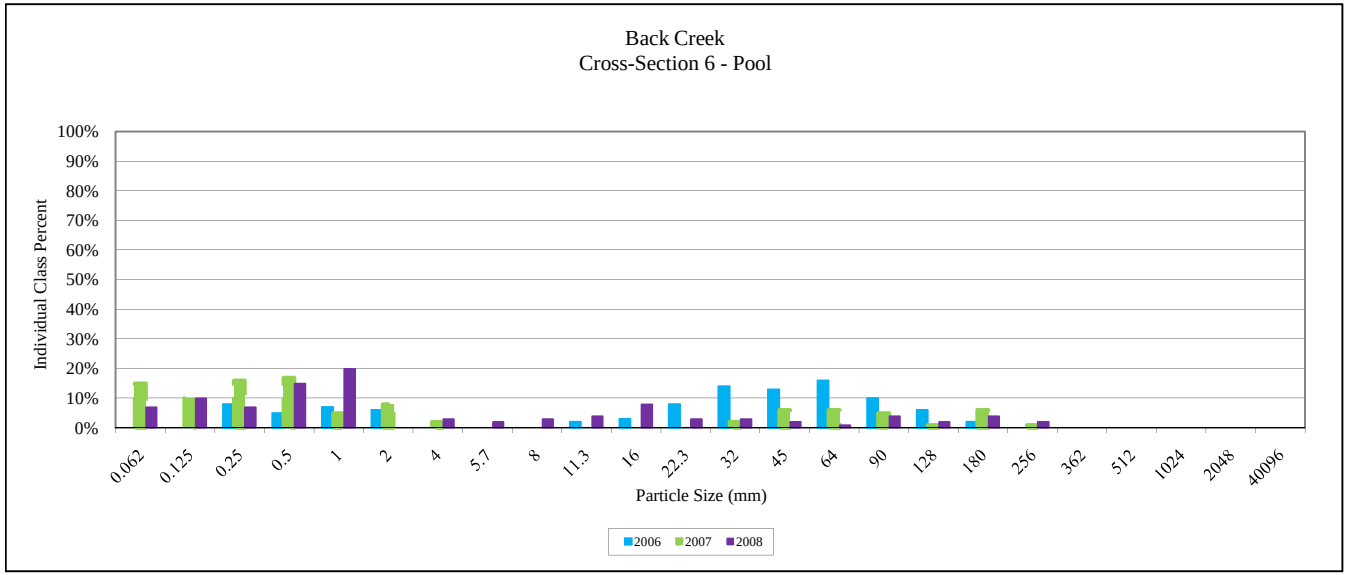

Back Creek
Cross-Section 4 - Riffle
Individual Class Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.3
32
45
64
90
128
180
256
362
512
1024
2048
40096
Particle Size (mm)
2006
2007
2008

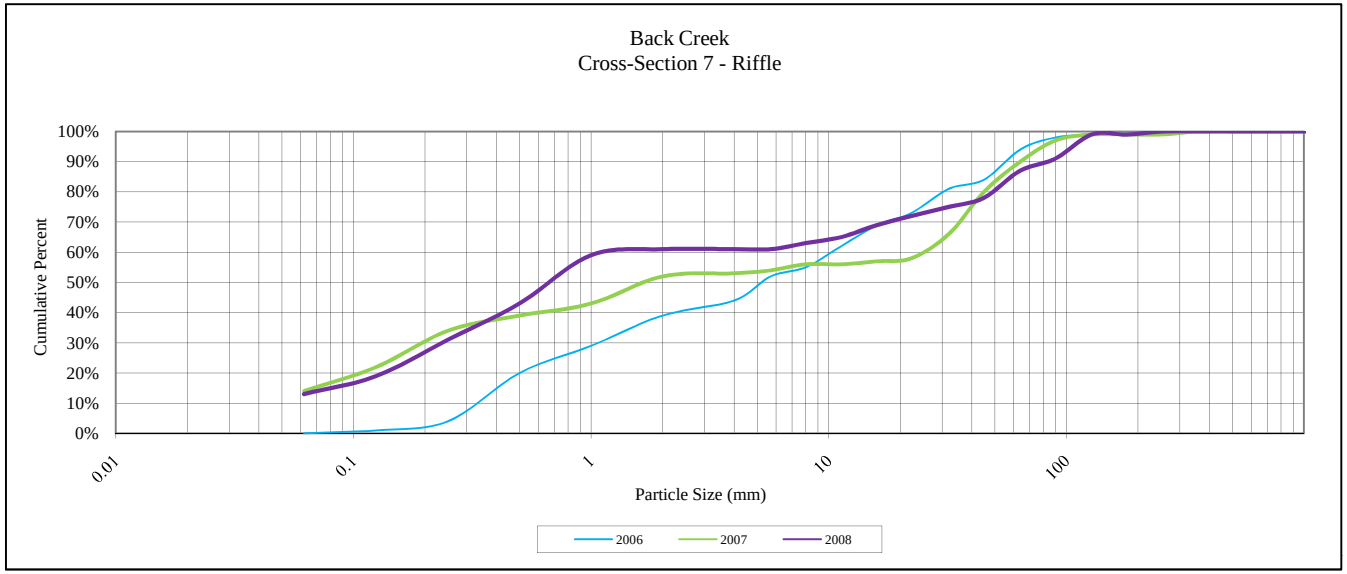


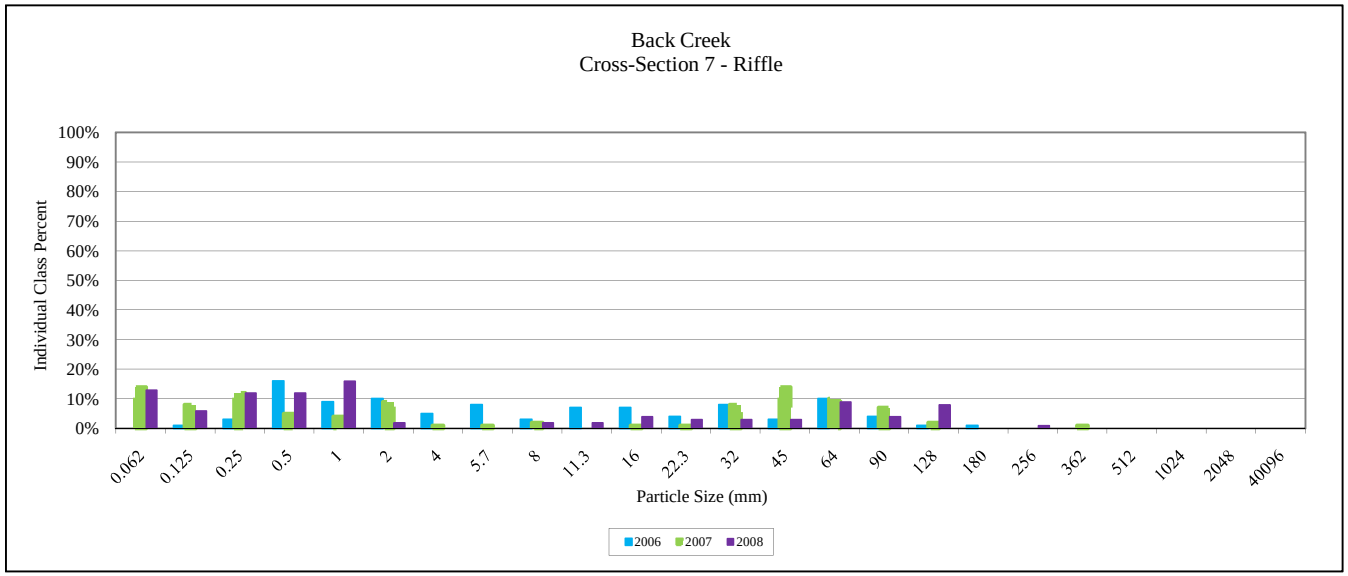




Appendix 2.8 Pebble Count Plots and Raw Data Tables
Back Creek Stream and Wetland Restoration
Year 3 of 5

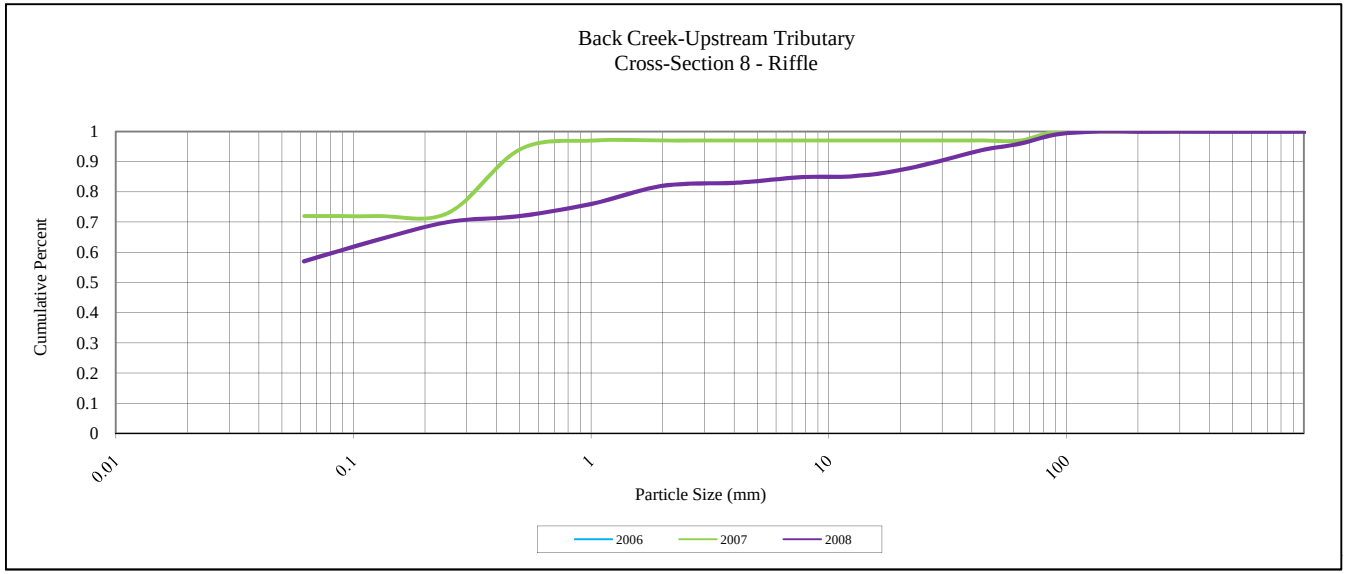

Back Creek
Cross-Section 6 - Pool
Cumulative Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
Particle Size (mm)
2006
2007
2008

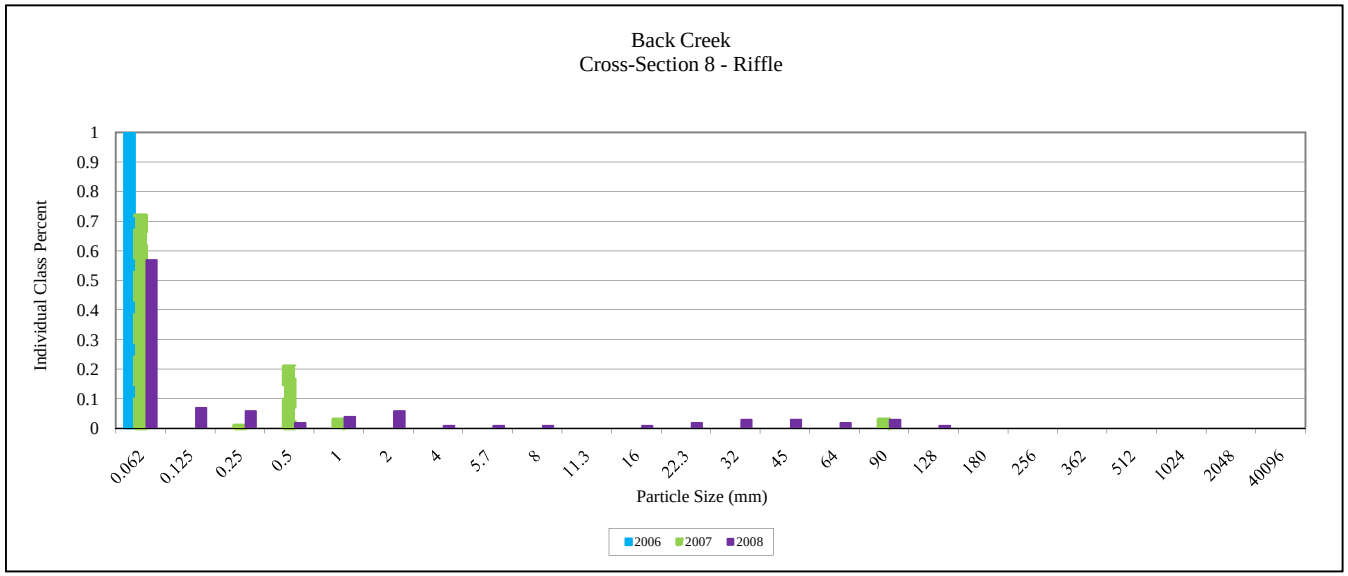

Back Creek
Cross-Section 6 - Pool
Individual Class Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.062
0.125
0.25
0.5
1
2
4
5.7
8
11.3
16
22.3
32
45
64
90
128
180
256
362
512
1024
2048
4096
Particle Size (mm)
2006
2007
2008



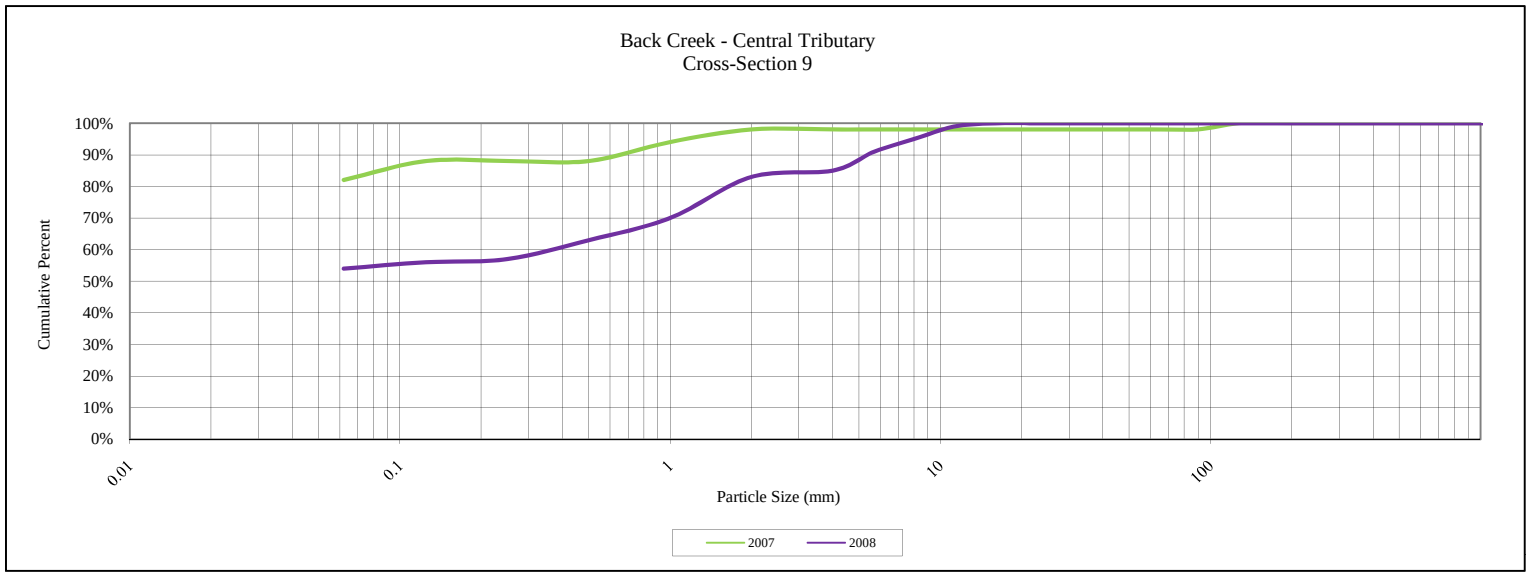



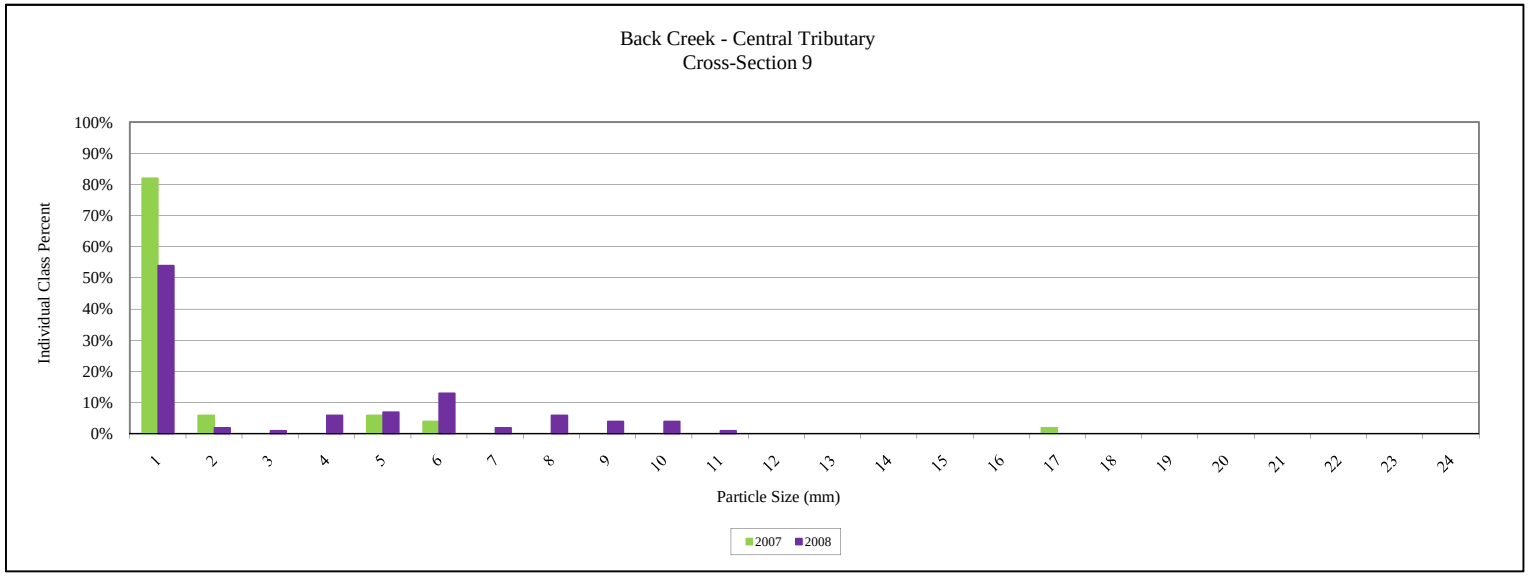

Appendix 2.8 Pebble Count Plots and Raw Data Tables
Back Creek Stream and Wetland Restoration
Year 3 of 5




Appendix 2.8 Pebble Count Plots and Raw Data Tables
Back Creek Stream and Wetland Restoration
Year 3 of 5




Appendix 2.8 Pebble Count Plots and Raw Data Tables
Back Creek Stream and Wetland Restoration
Year 3 of 5

# APPENDIX 3
# WETLAND RAW DATA

**1. Data Tables for Hydrological Data***

**2. Precipitation – Water Level Plots for Gauges***

*Raw data tables have been provided electronically.

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 1/1/2008 | 7:00 | 3.3 | in |
| 1/2/2008 | 7:00 | 3 | in |
| 1/3/2008 | 7:00 | 2.8 | in |
| 1/4/2008 | 7:00 | 2.5 | in |
| 1/5/2008 | 7:00 | 2.8 | in |
| 1/6/2008 | 7:00 | 3.2 | in |
| 1/7/2008 | 7:00 | 3.1 | in |
| 1/8/2008 | 7:00 | 3.3 | in |
| 1/9/2008 | 7:00 | 4.1 | in |
| 1/10/2008 | 7:00 | 3.6 | in |
| 1/11/2008 | 7:00 | 4.4 | in |
| 1/12/2008 | 7:00 | 3.3 | in |
| 1/13/2008 | 7:00 | 3.5 | in |
| 1/14/2008 | 7:00 | 3.1 | in |
| 1/15/2008 | 7:00 | 2.9 | in |
| 1/16/2008 | 7:00 | 2.8 | in |
| 1/17/2008 | 7:00 | 3.4 | in |
| 1/18/2008 | 7:00 | 3.5 | in |
| 1/19/2008 | 7:00 | 3.8 | in |
| 1/20/2008 | 7:00 | 3.3 | in |
| 1/21/2008 | 7:00 | 2.9 | in |
| 1/22/2008 | 7:00 | 3.4 | in |
| 1/23/2008 | 7:00 | 3.8 | in |
| 1/24/2008 | 7:00 | 3.8 | in |
| 1/25/2008 | 7:00 | 2.8 | in |
| 1/26/2008 | 7:00 | 3.2 | in |
| 1/27/2008 | 7:00 | 2.9 | in |
| 1/28/2008 | 7:00 | 2.7 | in |
| 1/29/2008 | 7:00 | 3.7 | in |
| 1/30/2008 | 7:00 | 3.8 | in |
| 1/31/2008 | 7:00 | 2.7 | in |
| 2/1/2008 | 7:00 | 3.7 | in |
| 2/2/2008 | 7:00 | 3 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 1/1/2008 | 7:00 | 3.3 | in |
| 1/2/2008 | 7:00 | 1.8 | in |
| 1/3/2008 | 7:00 | -0.5 | in |
| 1/4/2008 | 7:00 | -3.1 | in |
| 1/5/2008 | 7:00 | -4.5 | in |
| 1/6/2008 | 7:00 | -4.8 | in |
| 1/7/2008 | 7:00 | -5.9 | in |
| 1/8/2008 | 7:00 | -7 | in |
| 1/9/2008 | 7:00 | -7.1 | in |
| 1/10/2008 | 7:00 | -8.3 | in |
| 1/11/2008 | 7:00 | -1.7 | in |
| 1/12/2008 | 7:00 | -2.4 | in |
| 1/13/2008 | 7:00 | -4.2 | in |
| 1/14/2008 | 7:00 | -5.7 | in |
| 1/15/2008 | 7:00 | -7.9 | in |
| 1/16/2008 | 7:00 | -9.7 | in |
| 1/17/2008 | 7:00 | -9 | in |
| 1/18/2008 | 7:00 | 4.1 | in |
| 1/19/2008 | 7:00 | 4.3 | in |
| 1/20/2008 | 7:00 | 3.9 | in |
| 1/21/2008 | 7:00 | 3.6 | in |
| 1/22/2008 | 7:00 | 3.5 | in |
| 1/23/2008 | 7:00 | 3.7 | in |
| 1/24/2008 | 7:00 | 4.1 | in |
| 1/25/2008 | 7:00 | 3.3 | in |
| 1/26/2008 | 7:00 | 3.2 | in |
| 1/27/2008 | 7:00 | 2.7 | in |
| 1/28/2008 | 7:00 | 2.1 | in |
| 1/29/2008 | 7:00 | 2.1 | in |
| 1/30/2008 | 7:00 | 2.6 | in |
| 1/31/2008 | 7:00 | 0 | in |
| 2/1/2008 | 7:00 | 4.2 | in |
| 2/2/2008 | 7:00 | 3.7 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
|---|---|---|---|
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| 1/2/2008 | 7:00 | 1.7 | in |
| 1/3/2008 | 7:00 | 0.3 | in |
| 1/4/2008 | 7:00 | -1.2 | in |
| 1/5/2008 | 7:00 | -1.7 | in |
| 1/6/2008 | 7:00 | -0.1 | in |
| 1/7/2008 | 7:00 | -1.3 | in |
| 1/8/2008 | 7:00 | -2 | in |
| 1/9/2008 | 7:00 | -1.8 | in |
| 1/10/2008 | 7:00 | -2.7 | in |
| 1/11/2008 | 7:00 | 2.8 | in |
| 1/12/2008 | 7:00 | 0.5 | in |
| 1/13/2008 | 7:00 | -0.3 | in |
| 1/14/2008 | 7:00 | -1.4 | in |
| 1/15/2008 | 7:00 | -3.4 | in |
| 1/16/2008 | 7:00 | -4.8 | in |
| 1/17/2008 | 7:00 | -1.4 | in |
| 1/18/2008 | 7:00 | 3.7 | in |
| 1/19/2008 | 7:00 | 2.9 | in |
| 1/20/2008 | 7:00 | 3.3 | in |
| 1/21/2008 | 7:00 | 1.3 | in |
| 1/22/2008 | 7:00 | 1.5 | in |
| 1/23/2008 | 7:00 | 2.5 | in |
| 1/24/2008 | 7:00 | 1.8 | in |
| 1/25/2008 | 7:00 | 0.3 | in |
| 1/26/2008 | 7:00 | 0.3 | in |
| 1/27/2008 | 7:00 | -0.2 | in |
| 1/28/2008 | 7:00 | -0.9 | in |
| 1/29/2008 | 7:00 | 0 | in |
| 1/30/2008 | 7:00 | 0.3 | in |
| 1/31/2008 | 7:00 | -1.9 | in |
| 2/1/2008 | 7:00 | 3.8 | in |
| 2/2/2008 | 7:00 | 3.6 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
| 1/1/2008 | 23:59:59 | 0.01 | in |
| 1/2/2008 | 23:59:59 | 0 | in |
| 1/3/2008 | 23:59:59 | 0 | in |
| 1/4/2008 | 23:59:59 | 0 | in |
| 1/5/2008 | 23:59:59 | 0 | in |
| 1/6/2008 | 23:59:59 | 0 | in |
| 1/7/2008 | 23:59:59 | 0 | in |
| 1/8/2008 | 23:59:59 | 0.01 | in |
| 1/9/2008 | 23:59:59 | 0 | in |
| 1/10/2008 | 23:59:59 | 0.29 | in |
| 1/11/2008 | 23:59:59 | 0.1 | in |
| 1/12/2008 | 23:59:59 | 0 | in |
| 1/13/2008 | 23:59:59 | 0 | in |
| 1/14/2008 | 23:59:59 | 0 | in |
| 1/15/2008 | 23:59:59 | 0 | in |
| 1/16/2008 | 23:59:59 | 0 | in |
| 1/17/2008 | 23:59:59 | 0.79 | in |
| 1/18/2008 | 23:59:59 | 0.11 | in |
| 1/19/2008 | 23:59:59 | 0.28 | in |
| 1/20/2008 | 23:59:59 | 0.03 | in |
| 1/21/2008 | 23:59:59 | 0 | in |
| 1/22/2008 | 23:59:59 | 0.07 | in |
| 1/23/2008 | 23:59:59 | 0 | in |
| 1/24/2008 | 23:59:59 | 0 | in |
| 1/25/2008 | 23:59:59 | 0 | in |
| 1/26/2008 | 23:59:59 | 0 | in |
| 1/27/2008 | 23:59:59 | 0 | in |
| 1/28/2008 | 23:59:59 | 0 | in |
| 1/29/2008 | 23:59:59 | 0.03 | in |
| 1/30/2008 | 23:59:59 | 0.05 | in |
| 1/31/2008 | 23:59:59 | 0.03 | in |
| 2/1/2008 | 23:59:59 | 1.2 | in |
| 2/2/2008 | 23:59:59 | 0 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
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| 2/4/2008 | 7:00 | 3.4 | in |
| 2/5/2008 | 7:00 | 3.5 | in |
| 2/6/2008 | 7:00 | 3.9 | in |
| 2/7/2008 | 7:00 | 3.4 | in |
| 2/8/2008 | 7:00 | 3.3 | in |
| 2/9/2008 | 7:00 | 3.3 | in |
| 2/10/2008 | 7:00 | 3.2 | in |
| 2/11/2008 | 7:00 | 3 | in |
| 2/12/2008 | 7:00 | 3.3 | in |
| 2/13/2008 | 7:00 | 3.7 | in |
| 2/14/2008 | 7:00 | 3 | in |
| 2/15/2008 | 7:00 | 3.1 | in |
| 2/16/2008 | 7:00 | 3.4 | in |
| 2/17/2008 | 7:00 | 3.6 | in |
| 2/18/2008 | 7:00 | 4 | in |
| 2/19/2008 | 7:00 | 3.1 | in |
| 2/20/2008 | 7:00 | 3 | in |
| 2/21/2008 | 7:00 | 3.3 | in |
| 2/22/2008 | 7:00 | 3.4 | in |
| 2/23/2008 | 7:00 | 4.2 | in |
| 2/24/2008 | 7:00 | 3.5 | in |
| 2/25/2008 | 7:00 | 3.4 | in |
| 2/26/2008 | 7:00 | 4 | in |
| 2/27/2008 | 7:00 | 3.3 | in |
| 2/28/2008 | 7:00 | 2.8 | in |
| 2/29/2008 | 7:00 | 3 | in |
| 3/1/2008 | 7:00 | 3.3 | in |
| 3/2/2008 | 7:00 | 3 | in |
| 3/3/2008 | 7:00 | 3 | in |
| 3/4/2008 | 7:00 | 3.9 | in |
| 3/5/2008 | 7:00 | 3.8 | in |
| 3/6/2008 | 7:00 | 3.5 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 2/3/2008 | 7:00 | 3.9 | in |
| 2/4/2008 | 7:00 | 4.5 | in |
| 2/5/2008 | 7:00 | 4.6 | in |
| 2/6/2008 | 7:00 | 4.8 | in |
| 2/7/2008 | 7:00 | 4.9 | in |
| 2/8/2008 | 7:00 | 4.4 | in |
| 2/9/2008 | 7:00 | 4.2 | in |
| 2/10/2008 | 7:00 | 3.8 | in |
| 2/11/2008 | 7:00 | 3.4 | in |
| 2/12/2008 | 7:00 | 2.9 | in |
| 2/13/2008 | 7:00 | 4.6 | in |
| 2/14/2008 | 7:00 | 4 | in |
| 2/15/2008 | 7:00 | 3.9 | in |
| 2/16/2008 | 7:00 | 4.5 | in |
| 2/17/2008 | 7:00 | 4.6 | in |
| 2/18/2008 | 7:00 | 5.3 | in |
| 2/19/2008 | 7:00 | 4.7 | in |
| 2/20/2008 | 7:00 | 3.8 | in |
| 2/21/2008 | 7:00 | 3.5 | in |
| 2/22/2008 | 7:00 | 4 | in |
| 2/23/2008 | 7:00 | 4.1 | in |
| 2/24/2008 | 7:00 | 4.8 | in |
| 2/25/2008 | 7:00 | 4.6 | in |
| 2/26/2008 | 7:00 | 5.1 | in |
| 2/27/2008 | 7:00 | 4.8 | in |
| 2/28/2008 | 7:00 | 4.3 | in |
| 2/29/2008 | 7:00 | 4.2 | in |
| 3/1/2008 | 7:00 | 4.6 | in |
| 3/2/2008 | 7:00 | 4 | in |
| 3/3/2008 | 7:00 | 3.8 | in |
| 3/4/2008 | 7:00 | 4.3 | in |
| 3/5/2008 | 7:00 | 5.1 | in |
| 3/6/2008 | 7:00 | 4.8 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
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| 2/4/2008 | 7:00 | 2.7 | in |
| 2/5/2008 | 7:00 | 2.5 | in |
| 2/6/2008 | 7:00 | 2.3 | in |
| 2/7/2008 | 7:00 | 2.8 | in |
| 2/8/2008 | 7:00 | 2 | in |
| 2/9/2008 | 7:00 | 1.6 | in |
| 2/10/2008 | 7:00 | 1 | in |
| 2/11/2008 | 7:00 | 0.2 | in |
| 2/12/2008 | 7:00 | 0.2 | in |
| 2/13/2008 | 7:00 | 2.1 | in |
| 2/14/2008 | 7:00 | 3.1 | in |
| 2/15/2008 | 7:00 | 2.5 | in |
| 2/16/2008 | 7:00 | 2.1 | in |
| 2/17/2008 | 7:00 | 1.7 | in |
| 2/18/2008 | 7:00 | 3.1 | in |
| 2/19/2008 | 7:00 | 1.6 | in |
| 2/20/2008 | 7:00 | 0.9 | in |
| 2/21/2008 | 7:00 | 0.3 | in |
| 2/22/2008 | 7:00 | 3.1 | in |
| 2/23/2008 | 7:00 | 3 | in |
| 2/24/2008 | 7:00 | 2.2 | in |
| 2/25/2008 | 7:00 | 2 | in |
| 2/26/2008 | 7:00 | 2 | in |
| 2/27/2008 | 7:00 | 4.1 | in |
| 2/28/2008 | 7:00 | 2.8 | in |
| 2/29/2008 | 7:00 | 2.4 | in |
| 3/1/2008 | 7:00 | 2.3 | in |
| 3/2/2008 | 7:00 | 1.6 | in |
| 3/3/2008 | 7:00 | 1.2 | in |
| 3/4/2008 | 7:00 | 1.7 | in |
| 3/5/2008 | 7:00 | 5.1 | in |
| 3/6/2008 | 7:00 | 5.1 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
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| 2/4/2008 | 23:59:59 | 0.01 | in |
| 2/5/2008 | 23:59:59 | 0.01 | in |
| 2/6/2008 | 23:59:59 | 0.14 | in |
| 2/7/2008 | 23:59:59 | 0 | in |
| 2/8/2008 | 23:59:59 | 0 | in |
| 2/9/2008 | 23:59:59 | 0 | in |
| 2/10/2008 | 23:59:59 | 0 | in |
| 2/11/2008 | 23:59:59 | 0 | in |
| 2/12/2008 | 23:59:59 | 0.13 | in |
| 2/13/2008 | 23:59:59 | 0.37 | in |
| 2/14/2008 | 23:59:59 | 0 | in |
| 2/15/2008 | 23:59:59 | 0 | in |
| 2/16/2008 | 23:59:59 | 0 | in |
| 2/17/2008 | 23:59:59 | 0.12 | in |
| 2/18/2008 | 23:59:59 | 0.02 | in |
| 2/19/2008 | 23:59:59 | 0 | in |
| 2/20/2008 | 23:59:59 | 0 | in |
| 2/21/2008 | 23:59:59 | 0.21 | in |
| 2/22/2008 | 23:59:59 | 0.11 | in |
| 2/23/2008 | 23:59:59 | 0 | in |
| 2/24/2008 | 23:59:59 | 0.01 | in |
| 2/25/2008 | 23:59:59 | 0 | in |
| 2/26/2008 | 23:59:59 | 0.48 | in |
| 2/27/2008 | 23:59:59 | 0 | in |
| 2/28/2008 | 23:59:59 | 0 | in |
| 2/29/2008 | 23:59:59 | 0 | in |
| 3/1/2008 | 23:59:59 | 0 | in |
| 3/2/2008 | 23:59:59 | 0 | in |
| 3/3/2008 | 23:59:59 | 0 | in |
| 3/4/2008 | 23:59:59 | 1.83 | in |
| 3/5/2008 | 23:59:59 | 0 | in |
| 3/6/2008 | 23:59:59 | 0.01 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 3/7/2008 | 7:00 | 4.2 | in |
| 3/8/2008 | 7:00 | 4.2 | in |
| 3/9/2008 | 7:00 | 3.1 | in |
| 3/10/2008 | 7:00 | 3.1 | in |
| 3/11/2008 | 7:00 | 3.3 | in |
| 3/12/2008 | 7:00 | 3.3 | in |
| 3/13/2008 | 7:00 | 3.6 | in |
| 3/14/2008 | 7:00 | 3.9 | in |
| 3/15/2008 | 7:00 | 3.8 | in |
| 3/16/2008 | 7:00 | 3.8 | in |
| 3/17/2008 | 7:00 | 3.7 | in |
| 3/18/2008 | 7:00 | 3.9 | in |
| 3/19/2008 | 7:00 | 4.2 | in |
| 3/20/2008 | 7:00 | 3.8 | in |
| 3/21/2008 | 7:00 | 3.7 | in |
| 3/22/2008 | 7:00 | 3.8 | in |
| 3/23/2008 | 7:00 | 3.7 | in |
| 3/24/2008 | 7:00 | 3.7 | in |
| 3/25/2008 | 7:00 | 3.5 | in |
| 3/26/2008 | 7:00 | 3.6 | in |
| 3/27/2008 | 7:00 | 3.8 | in |
| 3/28/2008 | 7:00 | 4 | in |
| 3/29/2008 | 7:00 | 4.4 | in |
| 3/30/2008 | 7:00 | 4.1 | in |
| 3/31/2008 | 7:00 | 4.2 | in |
| 4/1/2008 | 7:00 | 4.9 | in |
| 4/2/2008 | 7:00 | 4.2 | in |
| 4/3/2008 | 7:00 | 4.1 | in |
| 4/4/2008 | 7:00 | 4.2 | in |
| 4/5/2008 | 7:00 | 4.5 | in |
| 4/6/2008 | 7:00 | 4.6 | in |
| 4/7/2008 | 7:00 | 4.2 | in |
| 4/8/2008 | 7:00 | 4.4 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 3/7/2008 | 7:00 | 5 | in |
| 3/8/2008 | 7:00 | 5.2 | in |
| 3/9/2008 | 7:00 | 4.3 | in |
| 3/10/2008 | 7:00 | 4.2 | in |
| 3/11/2008 | 7:00 | 4.6 | in |
| 3/12/2008 | 7:00 | 4.8 | in |
| 3/13/2008 | 7:00 | 4.6 | in |
| 3/14/2008 | 7:00 | 5.2 | in |
| 3/15/2008 | 7:00 | 5.1 | in |
| 3/16/2008 | 7:00 | 5.3 | in |
| 3/17/2008 | 7:00 | 5 | in |
| 3/18/2008 | 7:00 | 5 | in |
| 3/19/2008 | 7:00 | 5.4 | in |
| 3/20/2008 | 7:00 | 5.4 | in |
| 3/21/2008 | 7:00 | 5 | in |
| 3/22/2008 | 7:00 | 5.2 | in |
| 3/23/2008 | 7:00 | 5 | in |
| 3/24/2008 | 7:00 | 4.9 | in |
| 3/25/2008 | 7:00 | 4.6 | in |
| 3/26/2008 | 7:00 | 4 | in |
| 3/27/2008 | 7:00 | 4.2 | in |
| 3/28/2008 | 7:00 | 3.8 | in |
| 3/29/2008 | 7:00 | 2.8 | in |
| 3/30/2008 | 7:00 | 2.7 | in |
| 3/31/2008 | 7:00 | 3.7 | in |
| 4/1/2008 | 7:00 | 5.2 | in |
| 4/2/2008 | 7:00 | 5.3 | in |
| 4/3/2008 | 7:00 | 5.5 | in |
| 4/4/2008 | 7:00 | 5.1 | in |
| 4/5/2008 | 7:00 | 5.7 | in |
| 4/6/2008 | 7:00 | 5.7 | in |
| 4/7/2008 | 7:00 | 5.5 | in |
| 4/8/2008 | 7:00 | 5.6 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
|---|---|---|---|
| 3/7/2008 | 7:00 | 4.8 | in |
| 3/8/2008 | 7:00 | 4.8 | in |
| 3/9/2008 | 7:00 | 4.3 | in |
| 3/10/2008 | 7:00 | 4.1 | in |
| 3/11/2008 | 7:00 | 4 | in |
| 3/12/2008 | 7:00 | 3.9 | in |
| 3/13/2008 | 7:00 | 3.7 | in |
| 3/14/2008 | 7:00 | 3.8 | in |
| 3/15/2008 | 7:00 | 3.6 | in |
| 3/16/2008 | 7:00 | 5.2 | in |
| 3/17/2008 | 7:00 | 4.5 | in |
| 3/18/2008 | 7:00 | 4.6 | in |
| 3/19/2008 | 7:00 | 4.6 | in |
| 3/20/2008 | 7:00 | 4.8 | in |
| 3/21/2008 | 7:00 | 4.6 | in |
| 3/22/2008 | 7:00 | 4.7 | in |
| 3/23/2008 | 7:00 | 4.4 | in |
| 3/24/2008 | 7:00 | 4.3 | in |
| 3/25/2008 | 7:00 | 3.7 | in |
| 3/26/2008 | 7:00 | 3.7 | in |
| 3/27/2008 | 7:00 | 3.7 | in |
| 3/28/2008 | 7:00 | 3.6 | in |
| 3/29/2008 | 7:00 | 3.3 | in |
| 3/30/2008 | 7:00 | 3.4 | in |
| 3/31/2008 | 7:00 | 4 | in |
| 4/1/2008 | 7:00 | 4.9 | in |
| 4/2/2008 | 7:00 | 4.8 | in |
| 4/3/2008 | 7:00 | 4.4 | in |
| 4/4/2008 | 7:00 | 5 | in |
| 4/5/2008 | 7:00 | 5 | in |
| 4/6/2008 | 7:00 | 4.9 | in |
| 4/7/2008 | 7:00 | 5 | in |
| 4/8/2008 | 7:00 | 5.1 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
| 3/7/2008 | 23:59:59 | 0.56 | in |
| 3/8/2008 | 23:59:59 | 0.08 | in |
| 3/9/2008 | 23:59:59 | 0 | in |
| 3/10/2008 | 23:59:59 | 0 | in |
| 3/11/2008 | 23:59:59 | 0 | in |
| 3/12/2008 | 23:59:59 | 0.04 | in |
| 3/13/2008 | 23:59:59 | 0 | in |
| 3/14/2008 | 23:59:59 | 0 | in |
| 3/15/2008 | 23:59:59 | 1.26 | in |
| 3/16/2008 | 23:59:59 | 0.01 | in |
| 3/17/2008 | 23:59:59 | 0 | in |
| 3/18/2008 | 23:59:59 | 0 | in |
| 3/19/2008 | 23:59:59 | 0.67 | in |
| 3/20/2008 | 23:59:59 | 0 | in |
| 3/21/2008 | 23:59:59 | 0 | in |
| 3/22/2008 | 23:59:59 | 0 | in |
| 3/23/2008 | 23:59:59 | 0.01 | in |
| 3/24/2008 | 23:59:59 | 0 | in |
| 3/25/2008 | 23:59:59 | 0 | in |
| 3/26/2008 | 23:59:59 | 0 | in |
| 3/27/2008 | 23:59:59 | 0 | in |
| 3/28/2008 | 23:59:59 | 0 | in |
| 3/29/2008 | 23:59:59 | 0.08 | in |
| 3/30/2008 | 23:59:59 | 0.01 | in |
| 3/31/2008 | 23:59:59 | 0.35 | in |
| 4/1/2008 | 23:59:59 | 0.07 | in |
| 4/2/2008 | 23:59:59 | 0 | in |
| 4/3/2008 | 23:59:59 | 0.44 | in |
| 4/4/2008 | 23:59:59 | 0.52 | in |
| 4/5/2008 | 23:59:59 | 0.19 | in |
| 4/6/2008 | 23:59:59 | 0.04 | in |
| 4/7/2008 | 23:59:59 | 0 | in |
| 4/8/2008 | 23:59:59 | 0 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 4/9/2008 | 7:00 | 4 | in |
| 4/10/2008 | 7:00 | 4.1 | in |
| 4/11/2008 | 7:00 | 4.6 | in |
| 4/12/2008 | 7:00 | 4.9 | in |
| 4/13/2008 | 7:00 | 4.2 | in |
| 4/14/2008 | 7:00 | 3.8 | in |
| 4/15/2008 | 7:00 | 3.9 | in |
| 4/16/2008 | 7:00 | 3.4 | in |
| 4/17/2008 | 7:00 | 3.3 | in |
| 4/18/2008 | 7:00 | 3.5 | in |
| 4/19/2008 | 7:00 | 3.9 | in |
| 4/20/2008 | 7:00 | 4.1 | in |
| 4/21/2008 | 7:00 | 3.9 | in |
| 4/22/2008 | 7:00 | 4.5 | in |
| 4/23/2008 | 7:00 | 4.4 | in |
| 4/24/2008 | 7:00 | 3.8 | in |
| 4/25/2008 | 7:00 | 4.1 | in |
| 4/26/2008 | 7:00 | 4.1 | in |
| 4/27/2008 | 7:00 | 5 | in |
| 4/28/2008 | 7:00 | 5.1 | in |
| 4/29/2008 | 7:00 | 4.2 | in |
| 4/30/2008 | 7:00 | 3.6 | in |
| 5/1/2008 | 7:00 | 3.7 | in |
| 5/2/2008 | 7:00 | 4.5 | in |
| 5/3/2008 | 7:00 | 4.3 | in |
| 5/4/2008 | 7:00 | 3.9 | in |
| 5/5/2008 | 7:00 | 3.9 | in |
| 5/6/2008 | 7:00 | 3.7 | in |
| 5/7/2008 | 7:00 | 3.9 | in |
| 5/8/2008 | 7:00 | 4.9 | in |
| 5/9/2008 | 7:00 | 5.7 | in |
| 5/10/2008 | 7:00 | 4.5 | in |
| 5/11/2008 | 7:00 | 4.4 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 4/9/2008 | 7:00 | 5.1 | in |
| 4/10/2008 | 7:00 | 5.3 | in |
| 4/11/2008 | 7:00 | 4.9 | in |
| 4/12/2008 | 7:00 | 4.9 | in |
| 4/13/2008 | 7:00 | 4.5 | in |
| 4/14/2008 | 7:00 | 3.2 | in |
| 4/15/2008 | 7:00 | 2.3 | in |
| 4/16/2008 | 7:00 | 0 | in |
| 4/17/2008 | 7:00 | -2 | in |
| 4/18/2008 | 7:00 | -4 | in |
| 4/19/2008 | 7:00 | -5.9 | in |
| 4/20/2008 | 7:00 | -4.6 | in |
| 4/21/2008 | 7:00 | -6.6 | in |
| 4/22/2008 | 7:00 | -7.4 | in |
| 4/23/2008 | 7:00 | -8.3 | in |
| 4/24/2008 | 7:00 | -9.4 | in |
| 4/25/2008 | 7:00 | -10.5 | in |
| 4/26/2008 | 7:00 | -11.6 | in |
| 4/27/2008 | 7:00 | 5.1 | in |
| 4/28/2008 | 7:00 | 5.3 | in |
| 4/29/2008 | 7:00 | 5 | in |
| 4/30/2008 | 7:00 | 4.8 | in |
| 5/1/2008 | 7:00 | 4.8 | in |
| 5/2/2008 | 7:00 | 3.9 | in |
| 5/3/2008 | 7:00 | 1.4 | in |
| 5/4/2008 | 7:00 | -1.4 | in |
| 5/5/2008 | 7:00 | -4.6 | in |
| 5/6/2008 | 7:00 | -7.9 | in |
| 5/7/2008 | 7:00 | -10.5 | in |
| 5/8/2008 | 7:00 | -12.3 | in |
| 5/9/2008 | 7:00 | -11.8 | in |
| 5/10/2008 | 7:00 | -13.5 | in |
| 5/11/2008 | 7:00 | -15.2 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
|---|---|---|---|
| 4/9/2008 | 7:00 | 4.8 | in |
| 4/10/2008 | 7:00 | 4.8 | in |
| 4/11/2008 | 7:00 | 4.8 | in |
| 4/12/2008 | 7:00 | 4.8 | in |
| 4/13/2008 | 7:00 | 4.4 | in |
| 4/14/2008 | 7:00 | 3.7 | in |
| 4/15/2008 | 7:00 | 3.5 | in |
| 4/16/2008 | 7:00 | 2.4 | in |
| 4/17/2008 | 7:00 | 2.2 | in |
| 4/18/2008 | 7:00 | 2 | in |
| 4/19/2008 | 7:00 | 1.8 | in |
| 4/20/2008 | 7:00 | 2.6 | in |
| 4/21/2008 | 7:00 | 2 | in |
| 4/22/2008 | 7:00 | 1.8 | in |
| 4/23/2008 | 7:00 | 1.4 | in |
| 4/24/2008 | 7:00 | 0.8 | in |
| 4/25/2008 | 7:00 | 0 | in |
| 4/26/2008 | 7:00 | -0.9 | in |
| 4/27/2008 | 7:00 | 5.4 | in |
| 4/28/2008 | 7:00 | 5.4 | in |
| 4/29/2008 | 7:00 | 5.2 | in |
| 4/30/2008 | 7:00 | 5 | in |
| 5/1/2008 | 7:00 | 5 | in |
| 5/2/2008 | 7:00 | 5.1 | in |
| 5/3/2008 | 7:00 | 4.2 | in |
| 5/4/2008 | 7:00 | 3.4 | in |
| 5/5/2008 | 7:00 | 2.4 | in |
| 5/6/2008 | 7:00 | 1.2 | in |
| 5/7/2008 | 7:00 | -0.3 | in |
| 5/8/2008 | 7:00 | -1.7 | in |
| 5/9/2008 | 7:00 | 0.7 | in |
| 5/10/2008 | 7:00 | -2.7 | in |
| 5/11/2008 | 7:00 | -3.1 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
| 4/9/2008 | 23:59:59 | 0.01 | in |
| 4/10/2008 | 23:59:59 | 0 | in |
| 4/11/2008 | 23:59:59 | 0.06 | in |
| 4/12/2008 | 23:59:59 | 0.08 | in |
| 4/13/2008 | 23:59:59 | 0.05 | in |
| 4/14/2008 | 23:59:59 | 0 | in |
| 4/15/2008 | 23:59:59 | 0 | in |
| 4/16/2008 | 23:59:59 | 0 | in |
| 4/17/2008 | 23:59:59 | 0 | in |
| 4/18/2008 | 23:59:59 | 0 | in |
| 4/19/2008 | 23:59:59 | 0.08 | in |
| 4/20/2008 | 23:59:59 | 0.02 | in |
| 4/21/2008 | 23:59:59 | 0 | in |
| 4/22/2008 | 23:59:59 | 0 | in |
| 4/23/2008 | 23:59:59 | 0 | in |
| 4/24/2008 | 23:59:59 | 0 | in |
| 4/25/2008 | 23:59:59 | 0 | in |
| 4/26/2008 | 23:59:59 | 0.75 | in |
| 4/27/2008 | 23:59:59 | 0.45 | in |
| 4/28/2008 | 23:59:59 | 0.9 | in |
| 4/29/2008 | 23:59:59 | 0 | in |
| 4/30/2008 | 23:59:59 | 0 | in |
| 5/1/2008 | 23:59:59 | 0 | in |
| 5/2/2008 | 23:59:59 | 0 | in |
| 5/3/2008 | 23:59:59 | 0 | in |
| 5/4/2008 | 23:59:59 | 0 | in |
| 5/5/2008 | 23:59:59 | 0 | in |
| 5/6/2008 | 23:59:59 | 0 | in |
| 5/7/2008 | 23:59:59 | 0 | in |
| 5/8/2008 | 23:59:59 | 0.01 | in |
| 5/9/2008 | 23:59:59 | 0.14 | in |
| 5/10/2008 | 23:59:59 | 0 | in |
| 5/11/2008 | 23:59:59 | 0.24 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 5/12/2008 | 7:00 | 4.3 | in |
| 5/13/2008 | 7:00 | 3.5 | in |
| 5/14/2008 | 7:00 | 3.4 | in |
| 5/15/2008 | 7:00 | 5 | in |
| 5/16/2008 | 7:00 | 5.5 | in |
| 5/17/2008 | 7:00 | 3.8 | in |
| 5/18/2008 | 7:00 | 3.6 | in |
| 5/19/2008 | 7:00 | 4 | in |
| 5/20/2008 | 7:00 | 4 | in |
| 5/21/2008 | 7:00 | 4.5 | in |
| 5/22/2008 | 7:00 | 3.7 | in |
| 5/23/2008 | 7:00 | 3.6 | in |
| 5/24/2008 | 7:00 | 4.1 | in |
| 5/25/2008 | 7:00 | 3.5 | in |
| 5/26/2008 | 7:00 | 4 | in |
| 5/27/2008 | 7:00 | 3.9 | in |
| 5/28/2008 | 7:00 | 5.6 | in |
| 5/29/2008 | 7:00 | 4.8 | in |
| 5/30/2008 | 7:00 | 4.5 | in |
| 5/31/2008 | 7:00 | 4.9 | in |
| 6/1/2008 | 7:00 | 4.5 | in |
| 6/2/2008 | 7:00 | 4.2 | in |
| 6/3/2008 | 7:00 | 4 | in |
| 6/4/2008 | 7:00 | 4.4 | in |
| 6/5/2008 | 7:00 | 3.1 | in |
| 6/6/2008 | 7:00 | 2.7 | in |
| 6/7/2008 | 7:00 | 2.1 | in |
| 6/8/2008 | 7:00 | 0.9 | in |
| 6/9/2008 | 7:00 | 0.3 | in |
| 6/10/2008 | 7:00 | -0.5 | in |
| 6/11/2008 | 7:00 | -2 | in |
| 6/12/2008 | 7:00 | 4.6 | in |
| 6/13/2008 | 7:00 | 4.3 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 5/12/2008 | 7:00 | -10.4 | in |
| 5/13/2008 | 7:00 | -14.2 | in |
| 5/14/2008 | 7:00 | -16 | in |
| 5/15/2008 | 7:00 | -16.6 | in |
| 5/16/2008 | 7:00 | -15 | in |
| 5/17/2008 | 7:00 | -14.3 | in |
| 5/18/2008 | 7:00 | -16.3 | in |
| 5/19/2008 | 7:00 | -16.4 | in |
| 5/20/2008 | 7:00 | -17.3 | in |
| 5/21/2008 | 7:00 | -0.9 | in |
| 5/22/2008 | 7:00 | -6.8 | in |
| 5/23/2008 | 7:00 | -10.9 | in |
| 5/24/2008 | 7:00 | -13.7 | in |
| 5/25/2008 | 7:00 | -15.5 | in |
| 5/26/2008 | 7:00 | -17.4 | in |
| 5/27/2008 | 7:00 | -18.8 | in |
| 5/28/2008 | 7:00 | -19.8 | in |
| 5/29/2008 | 7:00 | -8.1 | in |
| 5/30/2008 | 7:00 | -9.7 | in |
| 5/31/2008 | 7:00 | -11.6 | in |
| 6/1/2008 | 7:00 | -14.2 | in |
| 6/2/2008 | 7:00 | -16.6 | in |
| 6/3/2008 | 7:00 | -18.8 | in |
| 6/4/2008 | 7:00 | -20 | in |
| 6/5/2008 | 7:00 | -21.6 | in |
| 6/6/2008 | 7:00 | -23.1 | in |
| 6/7/2008 | 7:00 | -24.4 | in |
| 6/8/2008 | 7:00 | -25.5 | in |
| 6/9/2008 | 7:00 | -26.5 | in |
| 6/10/2008 | 7:00 | -27.3 | in |
| 6/11/2008 | 7:00 | -28.1 | in |
| 6/12/2008 | 7:00 | -28 | in |
| 6/13/2008 | 7:00 | -27.2 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
|---|---|---|---|
| 5/12/2008 | 7:00 | 0.5 | in |
| 5/13/2008 | 7:00 | -4 | in |
| 5/14/2008 | 7:00 | -6.1 | in |
| 5/15/2008 | 7:00 | -6.2 | in |
| 5/16/2008 | 7:00 | 1.1 | in |
| 5/17/2008 | 7:00 | -4.7 | in |
| 5/18/2008 | 7:00 | -7.2 | in |
| 5/19/2008 | 7:00 | -5 | in |
| 5/20/2008 | 7:00 | -8.5 | in |
| 5/21/2008 | 7:00 | 4.8 | in |
| 5/22/2008 | 7:00 | 1.7 | in |
| 5/23/2008 | 7:00 | -2.7 | in |
| 5/24/2008 | 7:00 | -5.5 | in |
| 5/25/2008 | 7:00 | -7.7 | in |
| 5/26/2008 | 7:00 | -10 | in |
| 5/27/2008 | 7:00 | -12.1 | in |
| 5/28/2008 | 7:00 | -10.2 | in |
| 5/29/2008 | 7:00 | 4 | in |
| 5/30/2008 | 7:00 | 0.6 | in |
| 5/31/2008 | 7:00 | -2.9 | in |
| 6/1/2008 | 7:00 | -6.8 | in |
| 6/2/2008 | 7:00 | -10 | in |
| 6/3/2008 | 7:00 | -12.7 | in |
| 6/4/2008 | 7:00 | -13.7 | in |
| 6/5/2008 | 7:00 | -16.5 | in |
| 6/6/2008 | 7:00 | -18.3 | in |
| 6/7/2008 | 7:00 | -19.2 | in |
| 6/8/2008 | 7:00 | -20.2 | in |
| 6/9/2008 | 7:00 | -20.9 | in |
| 6/10/2008 | 7:00 | -21.2 | in |
| 6/11/2008 | 7:00 | -21.4 | in |
| 6/12/2008 | 7:00 | -13.7 | in |
| 6/13/2008 | 7:00 | -15.7 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
| 5/12/2008 | 23:59:59 | 0.02 | in |
| 5/13/2008 | 23:59:59 | 0 | in |
| 5/14/2008 | 23:59:59 | 0 | in |
| 5/15/2008 | 23:59:59 | 0.06 | in |
| 5/16/2008 | 23:59:59 | 0.06 | in |
| 5/17/2008 | 23:59:59 | 0.01 | in |
| 5/18/2008 | 23:59:59 | 0.15 | in |
| 5/19/2008 | 23:59:59 | 0 | in |
| 5/20/2008 | 23:59:59 | 0.09 | in |
| 5/21/2008 | 23:59:59 | 0.03 | in |
| 5/22/2008 | 23:59:59 | 0.01 | in |
| 5/23/2008 | 23:59:59 | 0.02 | in |
| 5/24/2008 | 23:59:59 | 0.01 | in |
| 5/25/2008 | 23:59:59 | 0 | in |
| 5/26/2008 | 23:59:59 | 0.01 | in |
| 5/27/2008 | 23:59:59 | 0.06 | in |
| 5/28/2008 | 23:59:59 | 0.07 | in |
| 5/29/2008 | 23:59:59 | 0.02 | in |
| 5/30/2008 | 23:59:59 | 0.02 | in |
| 5/31/2008 | 23:59:59 | 0.02 | in |
| 6/1/2008 | 23:59:59 | 0.01 | in |
| 6/2/2008 | 23:59:59 | 0.02 | in |
| 6/3/2008 | 23:59:59 | 0 | in |
| 6/4/2008 | 23:59:59 | 0 | in |
| 6/5/2008 | 23:59:59 | 0 | in |
| 6/6/2008 | 23:59:59 | 0 | in |
| 6/7/2008 | 23:59:59 | 0 | in |
| 6/8/2008 | 23:59:59 | 0 | in |
| 6/9/2008 | 23:59:59 | 0.01 | in |
| 6/10/2008 | 23:59:59 | 0 | in |
| 6/11/2008 | 23:59:59 | 0.73 | in |
| 6/12/2008 | 23:59:59 | 0.12 | in |
| 6/13/2008 | 23:59:59 | 0 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 6/14/2008 | 7:00 | 4.2 | in |
| 6/15/2008 | 7:00 | 4.5 | in |
| 6/16/2008 | 7:00 | 4.2 | in |
| 6/17/2008 | 7:00 | 3.9 | in |
| 6/18/2008 | 7:00 | 2.9 | in |
| 6/19/2008 | 7:00 | 1.8 | in |
| 6/20/2008 | 7:00 | 1.4 | in |
| 6/21/2008 | 7:00 | 4.5 | in |
| 6/22/2008 | 7:00 | 4.8 | in |
| 6/23/2008 | 7:00 | 5.1 | in |
| 6/24/2008 | 7:00 | 4.6 | in |
| 6/25/2008 | 7:00 | 4.4 | in |
| 6/26/2008 | 7:00 | 4.3 | in |
| 6/27/2008 | 7:00 | 4.4 | in |
| 6/28/2008 | 7:00 | 4.9 | in |
| 6/29/2008 | 7:00 | 4.8 | in |
| 6/30/2008 | 7:00 | 4.4 | in |
| 7/1/2008 | 7:00 | 4 | in |
| 7/2/2008 | 7:00 | 3.6 | in |
| 7/3/2008 | 7:00 | 4 | in |
| 7/4/2008 | 7:00 | 2.8 | in |
| 7/5/2008 | 7:00 | 5.1 | in |
| 7/6/2008 | 7:00 | 5.1 | in |
| 7/7/2008 | 7:00 | 5 | in |
| 7/8/2008 | 7:00 | 4.9 | in |
| 7/9/2008 | 7:00 | 5.5 | in |
| 7/10/2008 | 7:00 | 5.3 | in |
| 7/11/2008 | 7:00 | 5.5 | in |
| 7/12/2008 | 7:00 | 5 | in |
| 7/13/2008 | 7:00 | 4.9 | in |
| 7/14/2008 | 7:00 | 6 | in |
| 7/15/2008 | 7:00 | 4.8 | in |
| 7/16/2008 | 7:00 | 4.6 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 6/14/2008 | 7:00 | -27.3 | in |
| 6/15/2008 | 7:00 | -27.3 | in |
| 6/16/2008 | 7:00 | -27.9 | in |
| 6/17/2008 | 7:00 | -28.4 | in |
| 6/18/2008 | 7:00 | -29.1 | in |
| 6/19/2008 | 7:00 | -29 | in |
| 6/20/2008 | 7:00 | -29.1 | in |
| 6/21/2008 | 7:00 | -29.2 | in |
| 6/22/2008 | 7:00 | -29 | in |
| 6/23/2008 | 7:00 | -19.6 | in |
| 6/24/2008 | 7:00 | -17.2 | in |
| 6/25/2008 | 7:00 | -18.2 | in |
| 6/26/2008 | 7:00 | -19.3 | in |
| 6/27/2008 | 7:00 | -20.5 | in |
| 6/28/2008 | 7:00 | -21.2 | in |
| 6/29/2008 | 7:00 | -21.6 | in |
| 6/30/2008 | 7:00 | -22.8 | in |
| 7/1/2008 | 7:00 | -24.2 | in |
| 7/2/2008 | 7:00 | -25.5 | in |
| 7/3/2008 | 7:00 | -26.7 | in |
| 7/4/2008 | 7:00 | -27.7 | in |
| 7/5/2008 | 7:00 | -25 | in |
| 7/6/2008 | 7:00 | -23.2 | in |
| 7/7/2008 | 7:00 | -22 | in |
| 7/8/2008 | 7:00 | -21.4 | in |
| 7/9/2008 | 7:00 | 6 | in |
| 7/10/2008 | 7:00 | 5.8 | in |
| 7/11/2008 | 7:00 | 4.2 | in |
| 7/12/2008 | 7:00 | -0.5 | in |
| 7/13/2008 | 7:00 | -6.1 | in |
| 7/14/2008 | 7:00 | -0.3 | in |
| 7/15/2008 | 7:00 | -6.7 | in |
| 7/16/2008 | 7:00 | -10.7 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
|---|---|---|---|
| 6/14/2008 | 7:00 | -17.5 | in |
| 6/15/2008 | 7:00 | -18.3 | in |
| 6/16/2008 | 7:00 | -19.4 | in |
| 6/17/2008 | 7:00 | -20.5 | in |
| 6/18/2008 | 7:00 | -21.3 | in |
| 6/19/2008 | 7:00 | -21.6 | in |
| 6/20/2008 | 7:00 | -22 | in |
| 6/21/2008 | 7:00 | -21.6 | in |
| 6/22/2008 | 7:00 | -8.8 | in |
| 6/23/2008 | 7:00 | 5.1 | in |
| 6/24/2008 | 7:00 | 0.3 | in |
| 6/25/2008 | 7:00 | -6.8 | in |
| 6/26/2008 | 7:00 | -11.6 | in |
| 6/27/2008 | 7:00 | -13.8 | in |
| 6/28/2008 | 7:00 | -10.9 | in |
| 6/29/2008 | 7:00 | -13.1 | in |
| 6/30/2008 | 7:00 | -16.2 | in |
| 7/1/2008 | 7:00 | -18.3 | in |
| 7/2/2008 | 7:00 | -20.4 | in |
| 7/3/2008 | 7:00 | -21.2 | in |
| 7/4/2008 | 7:00 | -21.6 | in |
| 7/5/2008 | 7:00 | -4.5 | in |
| 7/6/2008 | 7:00 | -7.2 | in |
| 7/7/2008 | 7:00 | -8.8 | in |
| 7/8/2008 | 7:00 | -10.8 | in |
| 7/9/2008 | 7:00 | 6.1 | in |
| 7/10/2008 | 7:00 | 5.6 | in |
| 7/11/2008 | 7:00 | 4.6 | in |
| 7/12/2008 | 7:00 | 2 | in |
| 7/13/2008 | 7:00 | -1.9 | in |
| 7/14/2008 | 7:00 | 3.4 | in |
| 7/15/2008 | 7:00 | -1.4 | in |
| 7/16/2008 | 7:00 | -6.3 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
| 6/14/2008 | 23:59:59 | 0.12 | in |
| 6/15/2008 | 23:59:59 | 0 | in |
| 6/16/2008 | 23:59:59 | 0 | in |
| 6/17/2008 | 23:59:59 | 0 | in |
| 6/18/2008 | 23:59:59 | 0 | in |
| 6/19/2008 | 23:59:59 | 0 | in |
| 6/20/2008 | 23:59:59 | 0.31 | in |
| 6/21/2008 | 23:59:59 | 0.27 | in |
| 6/22/2008 | 23:59:59 | 0.31 | in |
| 6/23/2008 | 23:59:59 | 0.09 | in |
| 6/24/2008 | 23:59:59 | 0 | in |
| 6/25/2008 | 23:59:59 | 0 | in |
| 6/26/2008 | 23:59:59 | 0.06 | in |
| 6/27/2008 | 23:59:59 | 0.15 | in |
| 6/28/2008 | 23:59:59 | 0.14 | in |
| 6/29/2008 | 23:59:59 | 0 | in |
| 6/30/2008 | 23:59:59 | 0 | in |
| 7/1/2008 | 23:59:59 | 0 | in |
| 7/2/2008 | 23:59:59 | 0 | in |
| 7/3/2008 | 23:59:59 | 0 | in |
| 7/4/2008 | 23:59:59 | 0.35 | in |
| 7/5/2008 | 23:59:59 | 0.38 | in |
| 7/6/2008 | 23:59:59 | 0.06 | in |
| 7/7/2008 | 23:59:59 | 0.03 | in |
| 7/8/2008 | 23:59:59 | 0.04 | in |
| 7/9/2008 | 23:59:59 | 0.06 | in |
| 7/10/2008 | 23:59:59 | 0.07 | in |
| 7/11/2008 | 23:59:59 | 0.06 | in |
| 7/12/2008 | 23:59:59 | 0.02 | in |
| 7/13/2008 | 23:59:59 | 0.02 | in |
| 7/14/2008 | 23:59:59 | 0.02 | in |
| 7/15/2008 | 23:59:59 | 0.02 | in |
| 7/16/2008 | 23:59:59 | 0.04 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 7/17/2008 | 7:00 | 4.4 | in |
| 7/18/2008 | 7:00 | 4.5 | in |
| 7/19/2008 | 7:00 | 5.1 | in |
| 7/20/2008 | 7:00 | 4.7 | in |
| 7/21/2008 | 7:00 | 4.6 | in |
| 7/22/2008 | 7:00 | 3.8 | in |
| 7/23/2008 | 7:00 | 5.2 | in |
| 7/24/2008 | 7:00 | 5.1 | in |
| 7/25/2008 | 7:00 | 5.1 | in |
| 7/26/2008 | 7:00 | 5.5 | in |
| 7/27/2008 | 7:00 | 5.7 | in |
| 7/28/2008 | 7:00 | 4.8 | in |
| 7/29/2008 | 7:00 | 5.3 | in |
| 7/30/2008 | 7:00 | 5.1 | in |
| 7/31/2008 | 7:00 | 5.1 | in |
| 8/1/2008 | 7:00 | 5.5 | in |
| 8/2/2008 | 7:00 | 4.9 | in |
| 8/3/2008 | 7:00 | 4.8 | in |
| 8/4/2008 | 7:00 | 4.5 | in |
| 8/5/2008 | 7:00 | 4.4 | in |
| 8/6/2008 | 7:00 | 4.3 | in |
| 8/7/2008 | 7:00 | 2.3 | in |
| 8/8/2008 | 7:00 | 3 | in |
| 8/9/2008 | 7:00 | 0.3 | in |
| 8/10/2008 | 7:00 | 0 | in |
| 8/11/2008 | 7:00 | 0.7 | in |
| 8/12/2008 | 7:00 | -1.9 | in |
| 8/13/2008 | 7:00 | 5 | in |
| 8/14/2008 | 7:00 | 4.3 | in |
| 8/15/2008 | 7:00 | 4.5 | in |
| 8/16/2008 | 7:00 | 4.4 | in |
| 8/17/2008 | 7:00 | 4.4 | in |
| 8/18/2008 | 7:00 | 4.6 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 7/17/2008 | 7:00 | -14 | in |
| 7/18/2008 | 7:00 | -16.2 | in |
| 7/19/2008 | 7:00 | -18 | in |
| 7/20/2008 | 7:00 | -19.2 | in |
| 7/21/2008 | 7:00 | -20.5 | in |
| 7/22/2008 | 7:00 | -22.1 | in |
| 7/23/2008 | 7:00 | -23 | in |
| 7/24/2008 | 7:00 | 6 | in |
| 7/25/2008 | 7:00 | 4.1 | in |
| 7/26/2008 | 7:00 | 0.7 | in |
| 7/27/2008 | 7:00 | -2.5 | in |
| 7/28/2008 | 7:00 | -7.6 | in |
| 7/29/2008 | 7:00 | -11.2 | in |
| 7/30/2008 | 7:00 | -13.5 | in |
| 7/31/2008 | 7:00 | -15.1 | in |
| 8/1/2008 | 7:00 | -15.8 | in |
| 8/2/2008 | 7:00 | -17.2 | in |
| 8/3/2008 | 7:00 | -18.9 | in |
| 8/4/2008 | 7:00 | -20.5 | in |
| 8/5/2008 | 7:00 | -21.4 | in |
| 8/6/2008 | 7:00 | -22.9 | in |
| 8/7/2008 | 7:00 | -24.3 | in |
| 8/8/2008 | 7:00 | -25.5 | in |
| 8/9/2008 | 7:00 | -26.9 | in |
| 8/10/2008 | 7:00 | -28.1 | in |
| 8/11/2008 | 7:00 | -28.9 | in |
| 8/12/2008 | 7:00 | -29.1 | in |
| 8/13/2008 | 7:00 | -29.2 | in |
| 8/14/2008 | 7:00 | -29.2 | in |
| 8/15/2008 | 7:00 | -29.3 | in |
| 8/16/2008 | 7:00 | -29.3 | in |
| 8/17/2008 | 7:00 | -29.3 | in |
| 8/18/2008 | 7:00 | -29.3 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
|---|---|---|---|
| 7/17/2008 | 7:00 | -10.5 | in |
| 7/18/2008 | 7:00 | -12.7 | in |
| 7/19/2008 | 7:00 | -14.3 | in |
| 7/20/2008 | 7:00 | -15.8 | in |
| 7/21/2008 | 7:00 | -17.7 | in |
| 7/22/2008 | 7:00 | -19.2 | in |
| 7/23/2008 | 7:00 | -13.6 | in |
| 7/24/2008 | 7:00 | 5.8 | in |
| 7/25/2008 | 7:00 | 3.1 | in |
| 7/26/2008 | 7:00 | 1.6 | in |
| 7/27/2008 | 7:00 | -0.2 | in |
| 7/28/2008 | 7:00 | -5.3 | in |
| 7/29/2008 | 7:00 | -8.7 | in |
| 7/30/2008 | 7:00 | -11.2 | in |
| 7/31/2008 | 7:00 | -12.6 | in |
| 8/1/2008 | 7:00 | -11.4 | in |
| 8/2/2008 | 7:00 | -13.4 | in |
| 8/3/2008 | 7:00 | -15.7 | in |
| 8/4/2008 | 7:00 | -17.5 | in |
| 8/5/2008 | 7:00 | -19.4 | in |
| 8/6/2008 | 7:00 | -20.2 | in |
| 8/7/2008 | 7:00 | -20.4 | in |
| 8/8/2008 | 7:00 | -20.5 | in |
| 8/9/2008 | 7:00 | -20.7 | in |
| 8/10/2008 | 7:00 | -20.9 | in |
| 8/11/2008 | 7:00 | -21.2 | in |
| 8/12/2008 | 7:00 | -21.6 | in |
| 8/13/2008 | 7:00 | -21.7 | in |
| 8/14/2008 | 7:00 | -20.9 | in |
| 8/15/2008 | 7:00 | -20.9 | in |
| 8/16/2008 | 7:00 | -21 | in |
| 8/17/2008 | 7:00 | -21.1 | in |
| 8/18/2008 | 7:00 | -20.7 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
| 7/17/2008 | 23:59:59 | 0.01 | in |
| 7/18/2008 | 23:59:59 | 0 | in |
| 7/19/2008 | 23:59:59 | 0 | in |
| 7/20/2008 | 23:59:59 | 0 | in |
| 7/21/2008 | 23:59:59 | 0 | in |
| 7/22/2008 | 23:59:59 | 0.14 | in |
| 7/23/2008 | 23:59:59 | 1 | in |
| 7/24/2008 | 23:59:59 | 0.1 | in |
| 7/25/2008 | 23:59:59 | 0 | in |
| 7/26/2008 | 23:59:59 | 0.02 | in |
| 7/27/2008 | 23:59:59 | 0 | in |
| 7/28/2008 | 23:59:59 | 0.03 | in |
| 7/29/2008 | 23:59:59 | 0.03 | in |
| 7/30/2008 | 23:59:59 | 0 | in |
| 7/31/2008 | 23:59:59 | 0.15 | in |
| 8/1/2008 | 23:59:59 | 0.04 | in |
| 8/2/2008 | 23:59:59 | 0 | in |
| 8/3/2008 | 23:59:59 | 0 | in |
| 8/4/2008 | 23:59:59 | 0 | in |
| 8/5/2008 | 23:59:59 | 0 | in |
| 8/6/2008 | 23:59:59 | 0 | in |
| 8/7/2008 | 23:59:59 | 0 | in |
| 8/8/2008 | 23:59:59 | 0 | in |
| 8/9/2008 | 23:59:59 | 0 | in |
| 8/10/2008 | 23:59:59 | 0.01 | in |
| 8/11/2008 | 23:59:59 | 0 | in |
| 8/12/2008 | 23:59:59 | 0 | in |
| 8/13/2008 | 23:59:59 | 0.12 | in |
| 8/14/2008 | 23:59:59 | 0.05 | in |
| 8/15/2008 | 23:59:59 | 0.03 | in |
| 8/16/2008 | 23:59:59 | 0.01 | in |
| 8/17/2008 | 23:59:59 | 0.01 | in |
| 8/18/2008 | 23:59:59 | 0.01 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 8/19/2008 | 7:00 | 4.2 | in |
| 8/20/2008 | 7:00 | 4.1 | in |
| 8/21/2008 | 7:00 | 3.9 | in |
| 8/22/2008 | 7:00 | 4.1 | in |
| 8/23/2008 | 7:00 | 3.8 | in |
| 8/24/2008 | 7:00 | 3.8 | in |
| 8/25/2008 | 7:00 | 3.7 | in |
| 8/26/2008 | 7:00 | 6 | in |
| 8/27/2008 | 7:00 | 7.5 | in |
| 8/28/2008 | 7:00 | 5.7 | in |
| 8/29/2008 | 7:00 | 5.6 | in |
| 8/30/2008 | 7:00 | 5.5 | in |
| 8/31/2008 | 7:00 | 5.4 | in |
| 9/1/2008 | 7:00 | 5.4 | in |
| 9/2/2008 | 7:00 | 5 | in |
| 9/3/2008 | 7:00 | 4.8 | in |
| 9/4/2008 | 7:00 | 4.7 | in |
| 9/5/2008 | 7:00 | 4.6 | in |
| 9/6/2008 | 7:00 | 5.3 | in |
| 9/7/2008 | 7:00 | 4.8 | in |
| 9/8/2008 | 7:00 | 4.6 | in |
| 9/9/2008 | 7:00 | 4.7 | in |
| 9/10/2008 | 7:00 | 4.9 | in |
| 9/11/2008 | 7:00 | 5.6 | in |
| 9/12/2008 | 7:00 | 6 | in |
| 9/13/2008 | 7:00 | 5.7 | in |
| 9/14/2008 | 7:00 | 5.5 | in |
| 9/15/2008 | 7:00 | 5.4 | in |
| 9/16/2008 | 7:00 | 5.1 | in |
| 9/17/2008 | 7:00 | 5.7 | in |
| 9/18/2008 | 7:00 | 5.5 | in |
| 9/19/2008 | 7:00 | 5.2 | in |
| 9/20/2008 | 7:00 | 5.1 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 8/19/2008 | 7:00 | -29.4 | in |
| 8/20/2008 | 7:00 | -29.4 | in |
| 8/21/2008 | 7:00 | -29.4 | in |
| 8/22/2008 | 7:00 | -29.4 | in |
| 8/23/2008 | 7:00 | -29.4 | in |
| 8/24/2008 | 7:00 | -29.3 | in |
| 8/25/2008 | 7:00 | -29.3 | in |
| 8/26/2008 | 7:00 | -29 | in |
| 8/27/2008 | 7:00 | 6.4 | in |
| 8/28/2008 | 7:00 | 6.4 | in |
| 8/29/2008 | 7:00 | 6.4 | in |
| 8/30/2008 | 7:00 | 6.2 | in |
| 8/31/2008 | 7:00 | 4.6 | in |
| 9/1/2008 | 7:00 | 2.9 | in |
| 9/2/2008 | 7:00 | -1.4 | in |
| 9/3/2008 | 7:00 | -4.9 | in |
| 9/4/2008 | 7:00 | -8.4 | in |
| 9/5/2008 | 7:00 | -11 | in |
| 9/6/2008 | 7:00 | -11.5 | in |
| 9/7/2008 | 7:00 | -13.8 | in |
| 9/8/2008 | 7:00 | -15.2 | in |
| 9/9/2008 | 7:00 | -16.1 | in |
| 9/10/2008 | 7:00 | -16.9 | in |
| 9/11/2008 | 7:00 | 6.2 | in |
| 9/12/2008 | 7:00 | 6.2 | in |
| 9/13/2008 | 7:00 | 6.1 | in |
| 9/14/2008 | 7:00 | 6.2 | in |
| 9/15/2008 | 7:00 | 5.3 | in |
| 9/16/2008 | 7:00 | 3.5 | in |
| 9/17/2008 | 7:00 | 5.8 | in |
| 9/18/2008 | 7:00 | 5.7 | in |
| 9/19/2008 | 7:00 | 5.5 | in |
| 9/20/2008 | 7:00 | 5.3 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
|---|---|---|---|
| 8/19/2008 | 7:00 | -21.1 | in |
| 8/20/2008 | 7:00 | -21.4 | in |
| 8/21/2008 | 7:00 | -21.7 | in |
| 8/22/2008 | 7:00 | -21.9 | in |
| 8/23/2008 | 7:00 | -22 | in |
| 8/24/2008 | 7:00 | -22.1 | in |
| 8/25/2008 | 7:00 | -22.5 | in |
| 8/26/2008 | 7:00 | -11.8 | in |
| 8/27/2008 | 7:00 | 7.7 | in |
| 8/28/2008 | 7:00 | 6.8 | in |
| 8/29/2008 | 7:00 | 6.5 | in |
| 8/30/2008 | 7:00 | 6.3 | in |
| 8/31/2008 | 7:00 | 5.2 | in |
| 9/1/2008 | 7:00 | 4 | in |
| 9/2/2008 | 7:00 | 2.2 | in |
| 9/3/2008 | 7:00 | 0 | in |
| 9/4/2008 | 7:00 | -3.1 | in |
| 9/5/2008 | 7:00 | -5.8 | in |
| 9/6/2008 | 7:00 | -4 | in |
| 9/7/2008 | 7:00 | -8.8 | in |
| 9/8/2008 | 7:00 | -10.5 | in |
| 9/9/2008 | 7:00 | -11.1 | in |
| 9/10/2008 | 7:00 | -11.6 | in |
| 9/11/2008 | 7:00 | 6.7 | in |
| 9/12/2008 | 7:00 | 6.8 | in |
| 9/13/2008 | 7:00 | 6.4 | in |
| 9/14/2008 | 7:00 | 6.1 | in |
| 9/15/2008 | 7:00 | 4.5 | in |
| 9/16/2008 | 7:00 | 3.5 | in |
| 9/17/2008 | 7:00 | 6.4 | in |
| 9/18/2008 | 7:00 | 6.2 | in |
| 9/19/2008 | 7:00 | 6.1 | in |
| 9/20/2008 | 7:00 | 5.7 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
| 8/19/2008 | 23:59:59 | 0.01 | in |
| 8/20/2008 | 23:59:59 | 0.06 | in |
| 8/21/2008 | 23:59:59 | 0 | in |
| 8/22/2008 | 23:59:59 | 0 | in |
| 8/23/2008 | 23:59:59 | 0 | in |
| 8/24/2008 | 23:59:59 | 0 | in |
| 8/25/2008 | 23:59:59 | 1.27 | in |
| 8/26/2008 | 23:59:59 | 4.21 | in |
| 8/27/2008 | 23:59:59 | 4.33 | in |
| 8/28/2008 | 23:59:59 | 0.01 | in |
| 8/29/2008 | 23:59:59 | 0.02 | in |
| 8/30/2008 | 23:59:59 | 0 | in |
| 8/31/2008 | 23:59:59 | 0.09 | in |
| 9/1/2008 | 23:59:59 | 0 | in |
| 9/2/2008 | 23:59:59 | 0 | in |
| 9/3/2008 | 23:59:59 | 0 | in |
| 9/4/2008 | 23:59:59 | 0 | in |
| 9/5/2008 | 23:59:59 | 0.09 | in |
| 9/6/2008 | 23:59:59 | 0 | in |
| 9/7/2008 | 23:59:59 | 0 | in |
| 9/8/2008 | 23:59:59 | 0 | in |
| 9/9/2008 | 23:59:59 | 0.01 | in |
| 9/10/2008 | 23:59:59 | 2.33 | in |
| 9/11/2008 | 23:59:59 | 0.01 | in |
| 9/12/2008 | 23:59:59 | 0.03 | in |
| 9/13/2008 | 23:59:59 | 0 | in |
| 9/14/2008 | 23:59:59 | 0 | in |
| 9/15/2008 | 23:59:59 | 0 | in |
| 9/16/2008 | 23:59:59 | 1.29 | in |
| 9/17/2008 | 23:59:59 | 0.03 | in |
| 9/18/2008 | 23:59:59 | 0 | in |
| 9/19/2008 | 23:59:59 | 0 | in |
| 9/20/2008 | 23:59:59 | 0 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 9/21/2008 | 7:00 | 5.3 | in |
| 9/22/2008 | 7:00 | 5.5 | in |
| 9/23/2008 | 7:00 | 4.9 | in |
| 9/24/2008 | 7:00 | 5 | in |
| 9/25/2008 | 7:00 | 4.9 | in |
| 9/26/2008 | 7:00 | 5.5 | in |
| 9/27/2008 | 7:00 | 6.6 | in |
| 9/28/2008 | 7:00 | 5.6 | in |
| 9/29/2008 | 7:00 | 5.5 | in |
| 9/30/2008 | 7:00 | 5.5 | in |
| 10/1/2008 | 7:00 | 5.1 | in |
| 10/2/2008 | 7:00 | 4.5 | in |
| 10/3/2008 | 7:00 | 4.4 | in |
| 10/4/2008 | 7:00 | 4.4 | in |
| 10/5/2008 | 7:00 | 4.4 | in |
| 10/6/2008 | 7:00 | 4.4 | in |
| 10/7/2008 | 7:00 | 4.8 | in |
| 10/8/2008 | 7:00 | 4.8 | in |
| 10/9/2008 | 7:00 | 6.3 | in |
| 10/10/2008 | 7:00 | 5.9 | in |
| 10/11/2008 | 7:00 | 5.5 | in |
| 10/12/2008 | 7:00 | 5 | in |
| 10/13/2008 | 7:00 | 4.3 | in |
| 10/14/2008 | 7:00 | 4.2 | in |

Gauge 2
Serial Number: 000009DE6C7E

| Date | Time | Level | Units |
|---|---|---|---|
| 9/21/2008 | 7:00 | 4.9 | in |
| 9/22/2008 | 7:00 | 4.4 | in |
| 9/23/2008 | 7:00 | 2 | in |
| 9/24/2008 | 7:00 | 0.4 | in |
| 9/25/2008 | 7:00 | -1.7 | in |
| 9/26/2008 | 7:00 | 2.5 | in |
| 9/27/2008 | 7:00 | 5.7 | in |
| 9/28/2008 | 7:00 | 5.8 | in |
| 9/29/2008 | 7:00 | 5.9 | in |
| 9/30/2008 | 7:00 | 5.6 | in |
| 10/1/2008 | 7:00 | 5.4 | in |
| 10/2/2008 | 7:00 | 4.2 | in |
| 10/3/2008 | 7:00 | 2.6 | in |
| 10/4/2008 | 7:00 | 0.5 | in |
| 10/5/2008 | 7:00 | -1.1 | in |
| 10/6/2008 | 7:00 | -2.8 | in |
| 10/7/2008 | 7:00 | -4.4 | in |
| 10/8/2008 | 7:00 | -5.2 | in |
| 10/9/2008 | 7:00 | 5.6 | in |
| 10/10/2008 | 7:00 | 5.7 | in |
| 10/11/2008 | 7:00 | 5.9 | in |
| 10/12/2008 | 7:00 | 5.7 | in |
| 10/13/2008 | 7:00 | 4.3 | in |
| 10/14/2008 | 7:00 | 2.6 | in |

Gauge 3
Serial Number: 000009BEA425

| Date | Time | Level | Units |
|---|---|---|---|
| 9/21/2008 | 7:00 | 5.5 | in |
| 9/22/2008 | 7:00 | 5.6 | in |
| 9/23/2008 | 7:00 | 3.9 | in |
| 9/24/2008 | 7:00 | 3.5 | in |
| 9/25/2008 | 7:00 | 2.5 | in |
| 9/26/2008 | 7:00 | 5.6 | in |
| 9/27/2008 | 7:00 | 6.6 | in |
| 9/28/2008 | 7:00 | 6.1 | in |
| 9/29/2008 | 7:00 | 5.9 | in |
| 9/30/2008 | 7:00 | 5.9 | in |
| 10/1/2008 | 7:00 | 5.7 | in |
| 10/2/2008 | 7:00 | 4.8 | in |
| 10/3/2008 | 7:00 | 4.2 | in |
| 10/4/2008 | 7:00 | 3.5 | in |
| 10/5/2008 | 7:00 | 3.2 | in |
| 10/6/2008 | 7:00 | 2.6 | in |
| 10/7/2008 | 7:00 | 2 | in |
| 10/8/2008 | 7:00 | 1.9 | in |
| 10/9/2008 | 7:00 | 6.1 | in |
| 10/10/2008 | 7:00 | 6 | in |
| 10/11/2008 | 7:00 | 5.8 | in |
| 10/12/2008 | 7:00 | 5.6 | in |
| 10/13/2008 | 7:00 | 4.8 | in |
| 10/14/2008 | 7:00 | 4.3 | in |

Rain Gauge

| Date | Time | Level | Units |
|---|---|---|---|
| 9/21/2008 | 23:59:59 | 0 | in |
| 9/22/2008 | 23:59:59 | 0 | in |
| 9/23/2008 | 23:59:59 | 0 | in |
| 9/24/2008 | 23:59:59 | 0 | in |
| 9/25/2008 | 23:59:59 | 0.01 | in |
| 9/26/2008 | 23:59:59 | 1.13 | in |
| 9/27/2008 | 23:59:59 | 0.23 | in |
| 9/28/2008 | 23:59:59 | 0 | in |
| 9/29/2008 | 23:59:59 | 0 | in |
| 9/30/2008 | 23:59:59 | 0.03 | in |
| 10/1/2008 | 23:59:59 | 0 | in |
| 10/2/2008 | 23:59:59 | 0.01 | in |
| 10/3/2008 | 23:59:59 | 0 | in |
| 10/4/2008 | 23:59:59 | 0 | in |
| 10/5/2008 | 23:59:59 | 0 | in |
| 10/6/2008 | 23:59:59 | 0 | in |
| 10/7/2008 | 23:59:59 | 0 | in |
| 10/8/2008 | 23:59:59 | 0.57 | in |
| 10/9/2008 | 23:59:59 | 0.09 | in |
| 10/10/2008 | 23:59:59 | 0.01 | in |
| 10/11/2008 | 23:59:59 | 0 | in |
| 10/12/2008 | 23:59:59 | 0 | in |
| 10/13/2008 | 23:59:59 | 0.02 | in |
| 10/14/2008 | 23:59:59 | 0 | in |

Gauge 1
Serial Number: 000009BE9013

| Date | Time | Level | Units |
|---|---|---|---|
| 10/15/2008 | 7:00 | 4.1 | in |
| 10/16/2008 | 7:00 | 4.2 | in |
| 10/17/2008 | 7:00 | 5.7 | in |
| 10/18/2008 | 7:00 | 5.1 | in |
| 10/19/2008 | 7:00 | 4.2 | in |
| 10/20/2008 | 7:00 | 4 | in |
| 10/21/2008 | 7:00 | 4 | in |
| 10/22/2008 | 7:00 | 4 | in |
| 10/23/2008 | 7:00 | 3.9 | in |
| 10/24/2008 | 7:00 | 4.3 | in |
| 10/25/2008 | 7:00 | 6.1 | in |
| 10/26/2008 | 7:00 | 4.2 | in |
| 10/27/2008 | 7:00 | 4.1 | in |
| 10/28/2008 | 7:00 | 3.8 | in |
| 10/29/2008 | 7:00 | 3.7 | in |
| 10/30/2008 | 7:00 | 3.7 | in |
| 10/31/2008 | 7:00 | 3.6 | in |
| 11/1/2008 | 7:00 | 3.7 | in |
| 11/2/2008 | 7:00 | 3.8 | in |
| 11/3/2008 | 7:00 | 4.3 | in |
| 11/4/2008 | 7:00 | 5.5 | in |
| 11/5/2008 | 7:00 | 5.5 | in |
| 11/6/2008 | 7:00 | 3.9 | in |
| 11/7/2008 | 7:00 | 3.7 | in |
| 11/8/2008 | 7:00 | 5.2 | in |
| 11/9/2008 | 7:00 | 3.6 | in |
| 11/10/2008 | 7:00 | 3.5 | in |
| 11/11/2008 | 7:00 | 3.4 | in |
| 11/12/2008 | 7:00 | 3.7 | in |
| 11/13/2008 | 7:00 | 4.2 | in |
| 11/14/2008 | 7:00 | 5.1 | in |
| 11/15/2008 | 7:00 | 5 | in |
| 11/16/2008 | 7:00 | 4 | in |

Gauge 2
Serial Number: 000009DE6C7E

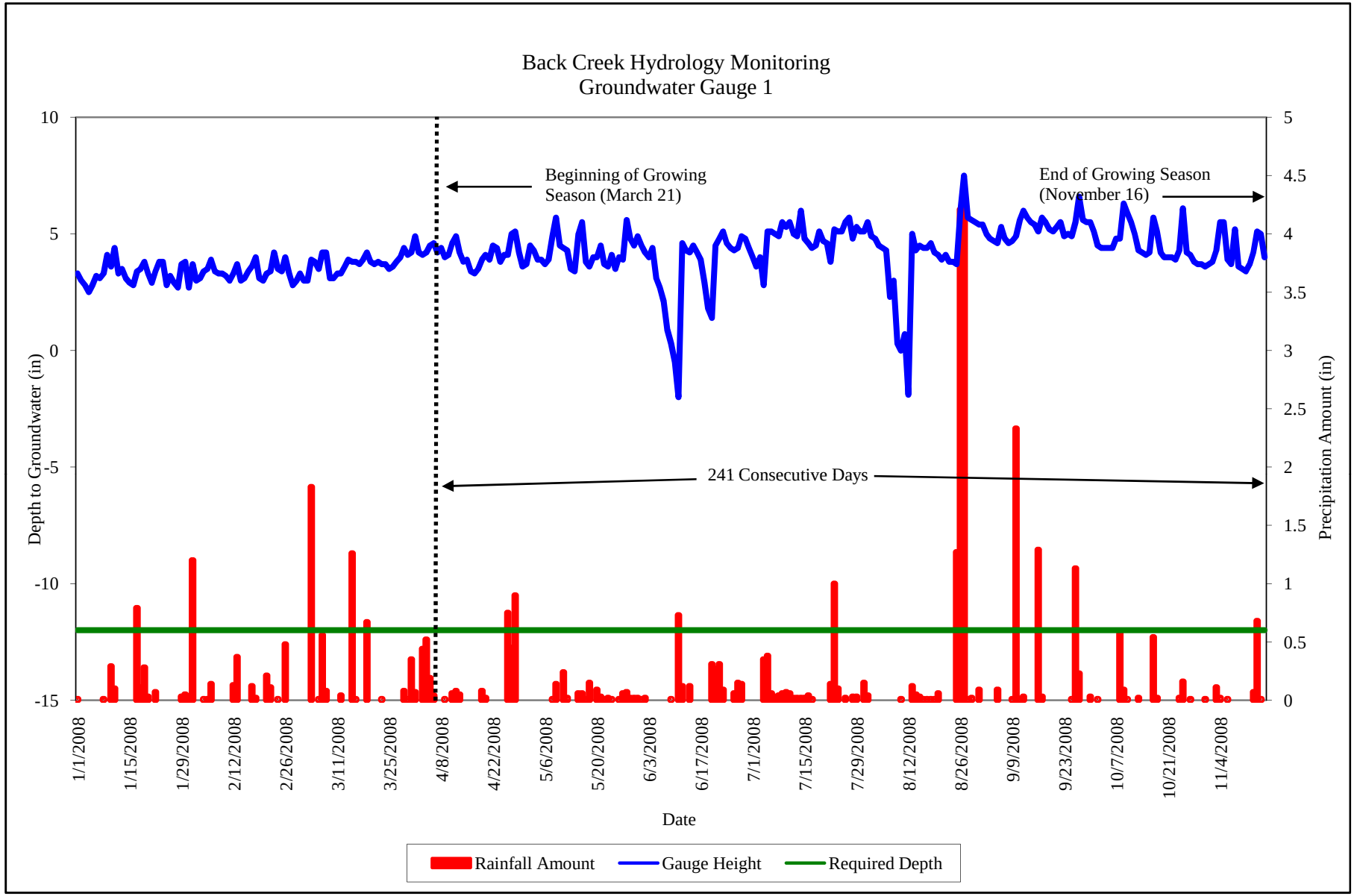
| Date | Time | Level | Units |
|---|---|---|---|
| 10/15/2008 | 7:00 | 0.5 | in |
| 10/16/2008 | 7:00 | -1.2 | in |
| 10/17/2008 | 7:00 | -2.6 | in |
| 10/18/2008 | 7:00 | 5.1 | in |
| 10/19/2008 | 7:00 | 4.5 | in |
| 10/20/2008 | 7:00 | 3.1 | in |
| 10/21/2008 | 7:00 | 2 | in |
| 10/22/2008 | 7:00 | 0.1 | in |
| 10/23/2008 | 7:00 | -2 | in |
| 10/24/2008 | 7:00 | -3.1 | in |
| 10/25/2008 | 7:00 | 0 | in |
| 10/26/2008 | 7:00 | 1.4 | in |
| 10/27/2008 | 7:00 | -0.2 | in |
| 10/28/2008 | 7:00 | -2.1 | in |
| 10/29/2008 | 7:00 | -3.7 | in |
| 10/30/2008 | 7:00 | -4.6 | in |
| 10/31/2008 | 7:00 | -5.8 | in |
| 11/1/2008 | 7:00 | -6.2 | in |
| 11/2/2008 | 7:00 | -6.7 | in |
| 11/3/2008 | 7:00 | -7.4 | in |
| 11/4/2008 | 7:00 | -5 | in |
| 11/5/2008 | 7:00 | -4.4 | in |
| 11/6/2008 | 7:00 | -4.5 | in |
| 11/7/2008 | 7:00 | -5.5 | in |
| 11/8/2008 | 7:00 | -5.8 | in |
| 11/9/2008 | 7:00 | -7.3 | in |
| 11/10/2008 | 7:00 | -8.4 | in |
| 11/11/2008 | 7:00 | -9.1 | in |
| 11/12/2008 | 7:00 | -9.2 | in |
| 11/13/2008 | 7:00 | -9 | in |
| 11/14/2008 | 7:00 | -7.6 | in |
| 11/15/2008 | 7:00 | 5.1 | in |
| 11/16/2008 | 7:00 | 4.5 | in |

Gauge 3
Serial Number: 000009BEA425

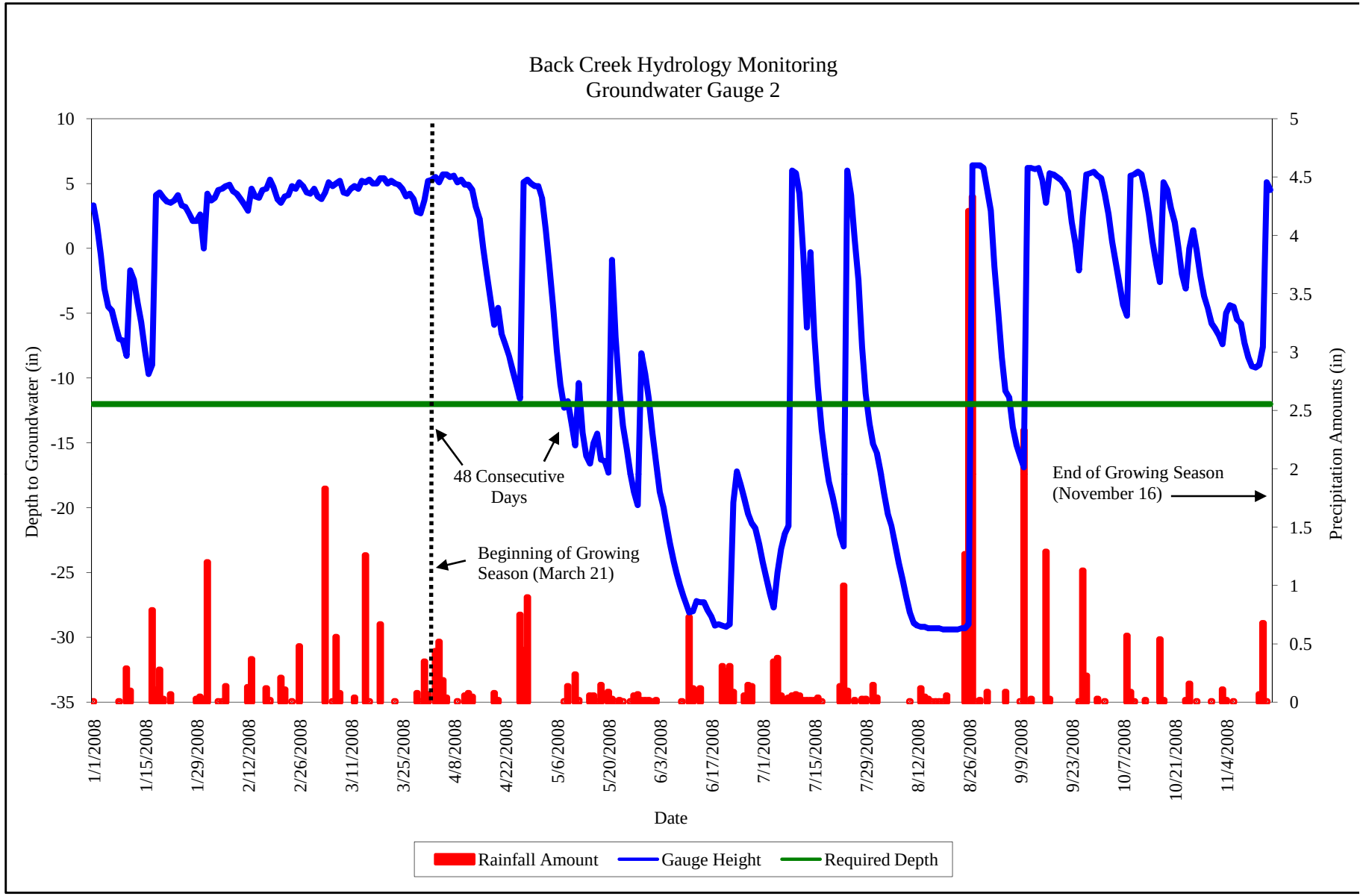
| Date | Time | Level | Units |
|---|---|---|---|
| 10/15/2008 | 7:00 | 3.9 | in |
| 10/16/2008 | 7:00 | 3.3 | in |
| 10/17/2008 | 7:00 | 4.6 | in |
| 10/18/2008 | 7:00 | 5.6 | in |
| 10/19/2008 | 7:00 | 5.5 | in |
| 10/20/2008 | 7:00 | 4.8 | in |
| 10/21/2008 | 7:00 | 4.4 | in |
| 10/22/2008 | 7:00 | 3.7 | in |
| 10/23/2008 | 7:00 | 2.5 | in |
| 10/24/2008 | 7:00 | 2.6 | in |
| 10/25/2008 | 7:00 | 5.6 | in |
| 10/26/2008 | 7:00 | 4.5 | in |
| 10/27/2008 | 7:00 | 4.1 | in |
| 10/28/2008 | 7:00 | 3 | in |
| 10/29/2008 | 7:00 | 2 | in |
| 10/30/2008 | 7:00 | 1.4 | in |
| 10/31/2008 | 7:00 | 0.9 | in |
| 11/1/2008 | 7:00 | 0.6 | in |
| 11/2/2008 | 7:00 | 0.5 | in |
| 11/3/2008 | 7:00 | 0.3 | in |
| 11/4/2008 | 7:00 | 2.9 | in |
| 11/5/2008 | 7:00 | 4.1 | in |
| 11/6/2008 | 7:00 | 2.5 | in |
| 11/7/2008 | 7:00 | 1.7 | in |
| 11/8/2008 | 7:00 | 2 | in |
| 11/9/2008 | 7:00 | 0.7 | in |
| 11/10/2008 | 7:00 | -0.1 | in |
| 11/11/2008 | 7:00 | -0.7 | in |
| 11/12/2008 | 7:00 | -0.9 | in |
| 11/13/2008 | 7:00 | -0.5 | in |
| 11/14/2008 | 7:00 | 0.9 | in |
| 11/15/2008 | 7:00 | 5.2 | in |
| 11/16/2008 | 7:00 | 4.9 | in |

Rain Gauge

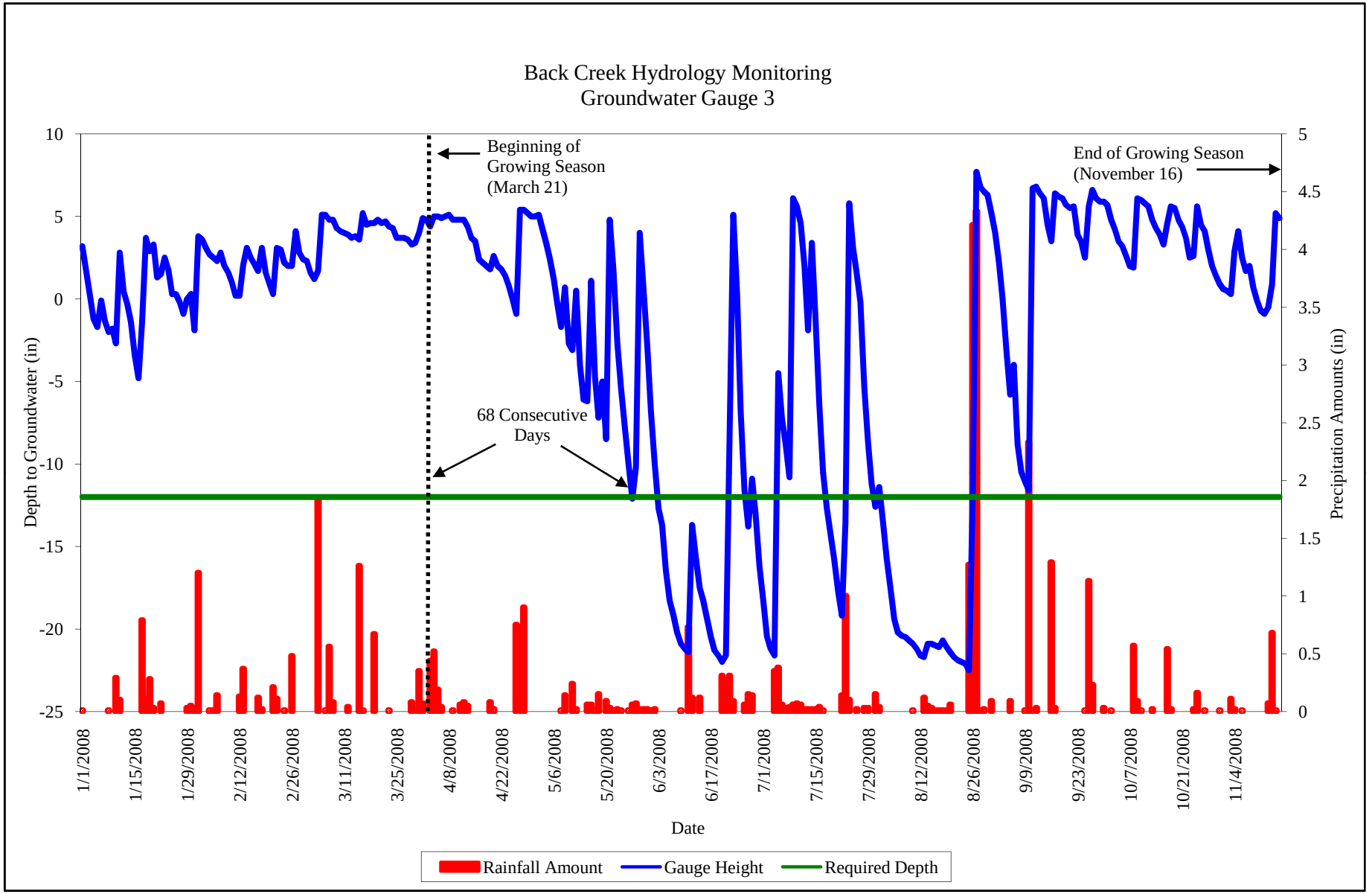
| Date | Time | Level | Units |
|---|---|---|---|
| 10/15/2008 | 23:59:59 | 0 | in |
| 10/16/2008 | 23:59:59 | 0 | in |
| 10/17/2008 | 23:59:59 | 0.54 | in |
| 10/18/2008 | 23:59:59 | 0.02 | in |
| 10/19/2008 | 23:59:59 | 0 | in |
| 10/20/2008 | 23:59:59 | 0 | in |
| 10/21/2008 | 23:59:59 | 0 | in |
| 10/22/2008 | 23:59:59 | 0 | in |
| 10/23/2008 | 23:59:59 | 0 | in |
| 10/24/2008 | 23:59:59 | 0.02 | in |
| 10/25/2008 | 23:59:59 | 0.16 | in |
| 10/26/2008 | 23:59:59 | 0 | in |
| 10/27/2008 | 23:59:59 | 0.01 | in |
| 10/28/2008 | 23:59:59 | 0 | in |
| 10/29/2008 | 23:59:59 | 0 | in |
| 10/30/2008 | 23:59:59 | 0 | in |
| 10/31/2008 | 23:59:59 | 0.01 | in |
| 11/1/2008 | 23:59:59 | 0 | in |
| 11/2/2008 | 23:59:59 | 0 | in |
| 11/3/2008 | 23:59:59 | 0.11 | in |
| 11/4/2008 | 23:59:59 | 0.02 | in |
| 11/5/2008 | 23:59:59 | 0 | in |
| 11/6/2008 | 23:59:59 | 0.01 | in |
| 11/7/2008 | 23:59:59 | 0 | in |
| 11/8/2008 | 23:59:59 | 0 | in |
| 11/9/2008 | 23:59:59 | 0 | in |
| 11/10/2008 | 23:59:59 | 0 | in |
| 11/11/2008 | 23:59:59 | 0 | in |
| 11/12/2008 | 23:59:59 | 0 | in |
| 11/13/2008 | 23:59:59 | 0.07 | in |
| 11/14/2008 | 23:59:59 | 0.68 | in |
| 11/15/2008 | 23:59:59 | 0.01 | in |
| 11/16/2008 | 23:59:59 | 0 | in |




Appendix 3.2 Precipitation - Water Level Plots for Gauges
Back Creek Stream and Wetland Restoration
Year 3 of 5



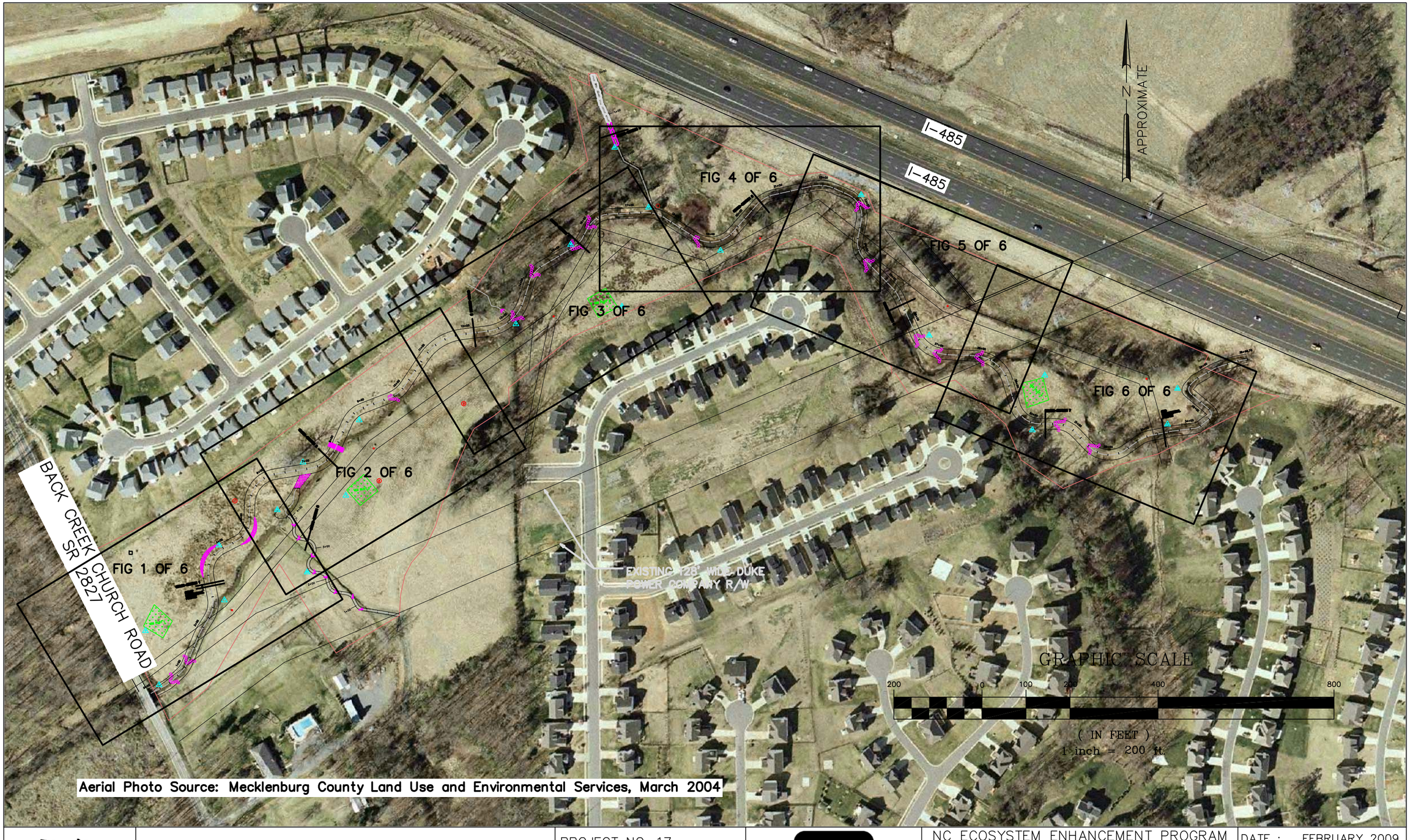

Appendix 3.2 Precipitation - Water Level Plots for Gauges
Back Creek Stream and Wetland Restoration
Year 3 of 5




Appendix 3.2 Precipitation - Water Level Plots for Gauges
Back Creek Stream and Wetland Restoration
Year 3 of 5

# APPENDIX 4
# CURRENT CONDITION PLAN VIEW (INTEGRATED)

## 1. Current Condition Plan View Map (Integrated)




Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

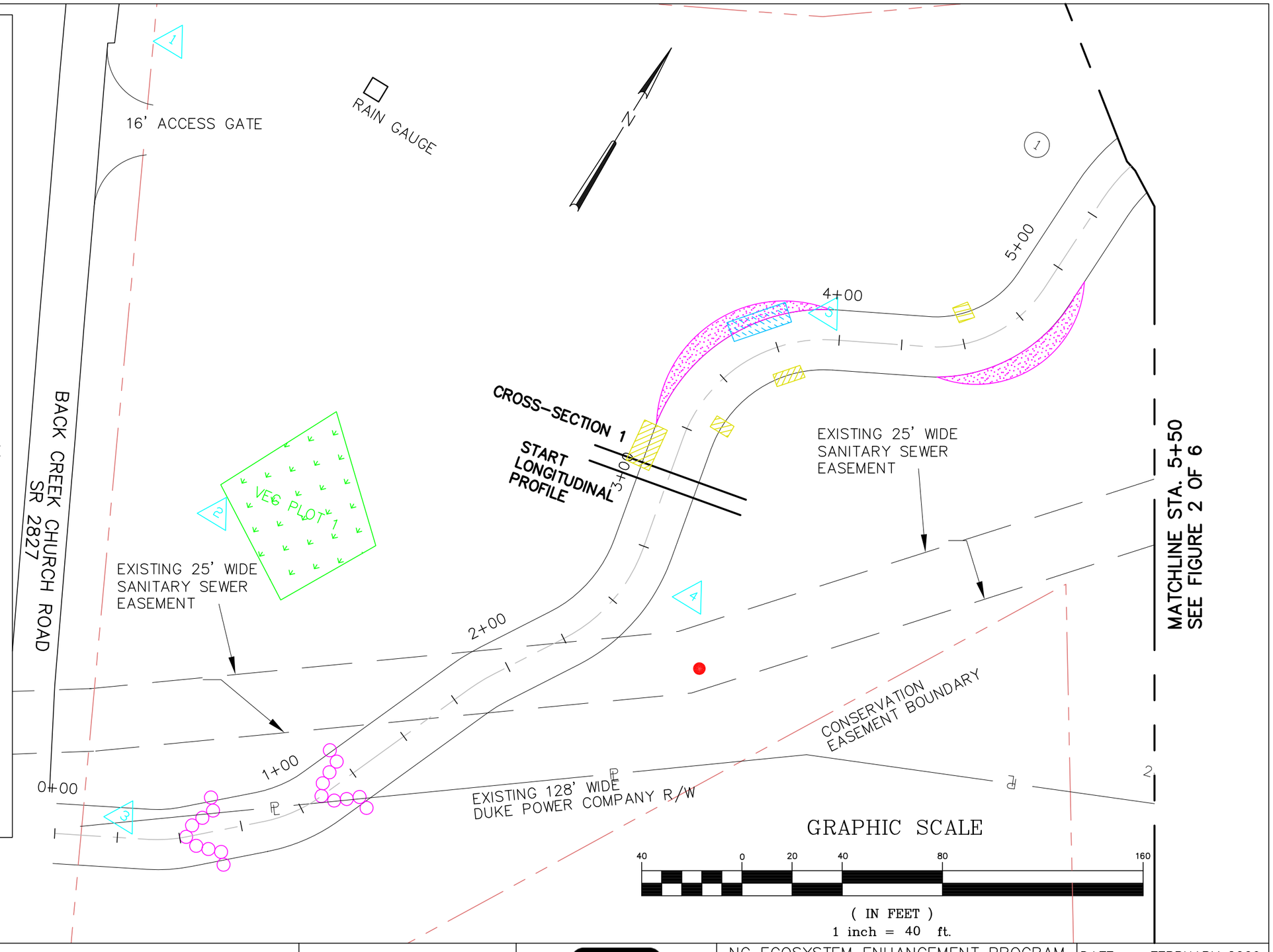
APPENDIX 4
CURRENT CONDITION PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=200'
JOB NO.: 03060005

FIGURE KEY

LEGEND

- CROSS VANE
- MEANDER REVETMENT
- MODIFIED CROSS VANE
- GRADE CONTROL SILL
- IMPERVIOUS CHANNEL BLOCK
- J–HOOK VANE
- STEP–POOL STRUCTURE
- PHOTO POINT
- RAIN GAUGE
- GROUNDWATER GAUGE
- MANHOLE
- BANK EROSION – MODERATE
- BANK EROSION–SEVERE
- TRANSVERSE BAR
- DOWN TREE
- LATERAL BAR
- VEGETATION PLOT
- STREAMBANK COVER – POOR
- STRUCTURE – STRESSED
- LOOSE MATTING
- IN–STREAM VEGETATION
- DOWNCUT LOST RIFFLE
- BANK SLUMP




GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )

1 inch = 40 ft.

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

APPENDIX 4
CURRENT CONDITION PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 1 OF 6

N

CONSERVATION
EASEMENT BOUNDARY

CROSS-SECTION 2

CROSS-SECTION 8

6+00

7+00

8+00

9+00

10+00

11+00

4+00

3+00

EXISTING 25' WIDE
SANITARY SEWER
EASEMENT

PERMANENT SOIL
REINFORCEMENT MAT

EPHEMERAL POOL

VEG PLOT 2

MATCHLINE STA. 11+50
SEE FIGURE 3 OF 6

MATCHLINE STA. 5+50
SEE FIGURE 1 OF 6

GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )
1 inch = 40 ft.

LEGEND

- CROSS VANE
- MEANDER REVETMENT
- MODIFIED CROSS VANE
- GRADE CONTROL SILL
- IMPERVIOUS CHANNEL BLOCK
- J-HOOK VANE
- STEP-POOL STRUCTURE
- PHOTO POINT
- RAIN GAUGE
- GROUNDWATER GAUGE
- IN-STREAM VEGETATION
- DOWNCUT LOST RIFFLE
- MANHOLE
- BANK EROSION - MODERATE
- BANK EROSION - SEVERE
- TRANSVERSE BAR
- DOWN TREE
- LATERAL BAR
- VEGETATION PLOT
- STREAMBANK COVER - POOR
- STRUCTURE - STRESSED
- LOOSE MATTING
- BANK SLUMP

Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

APPENDIX 4
CURRENT CONDITION PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 2 OF 6

MATCHLINE STA. 11+50
SEE FIGURE 2 OF 6

N

CROSS-SECTION 3

CROSS-SECTION 4

12+00

13+00

14+00

15+00

16+00

AVOIDANCE AREA

SAFETY FENCE

VEG PLOT 3

MATCHLINE STA. 17+25
SEE FIGURE 4 OF 6

EXISTING 15' WIDE SANITARY SEWER EASEMENT

CONSERVATION EASEMENT BOUNDARY

LEGEND

- CROSS VANE
- MEANDER REVETMENT
- MODIFIED CROSS VANE
- GRADE CONTROL SILL
- IMPERVIOUS CHANNEL BLOCK
- J-HOOK VANE
- STEP-POOL STRUCTURE
- PHOTO POINT
- RAIN GAUGE
- GROUNDWATER GAUGE
- IN-STREAM VEGETATION
- DOWNCUT LOST RIFFLE
- MANHOLE
- BANK EROSION – MODERATE
- BANK EROSION – SEVERE
- TRANSVERSE BAR
- DOWN TREE
- LATERAL BAR
- VEGETATION PLOT
- STREAMBANK COVER – POOR
- STRUCTURE – STRESSED
- LOOSE MATTING
- BANK SLUMP

GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )
1 inch = 40 ft.

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

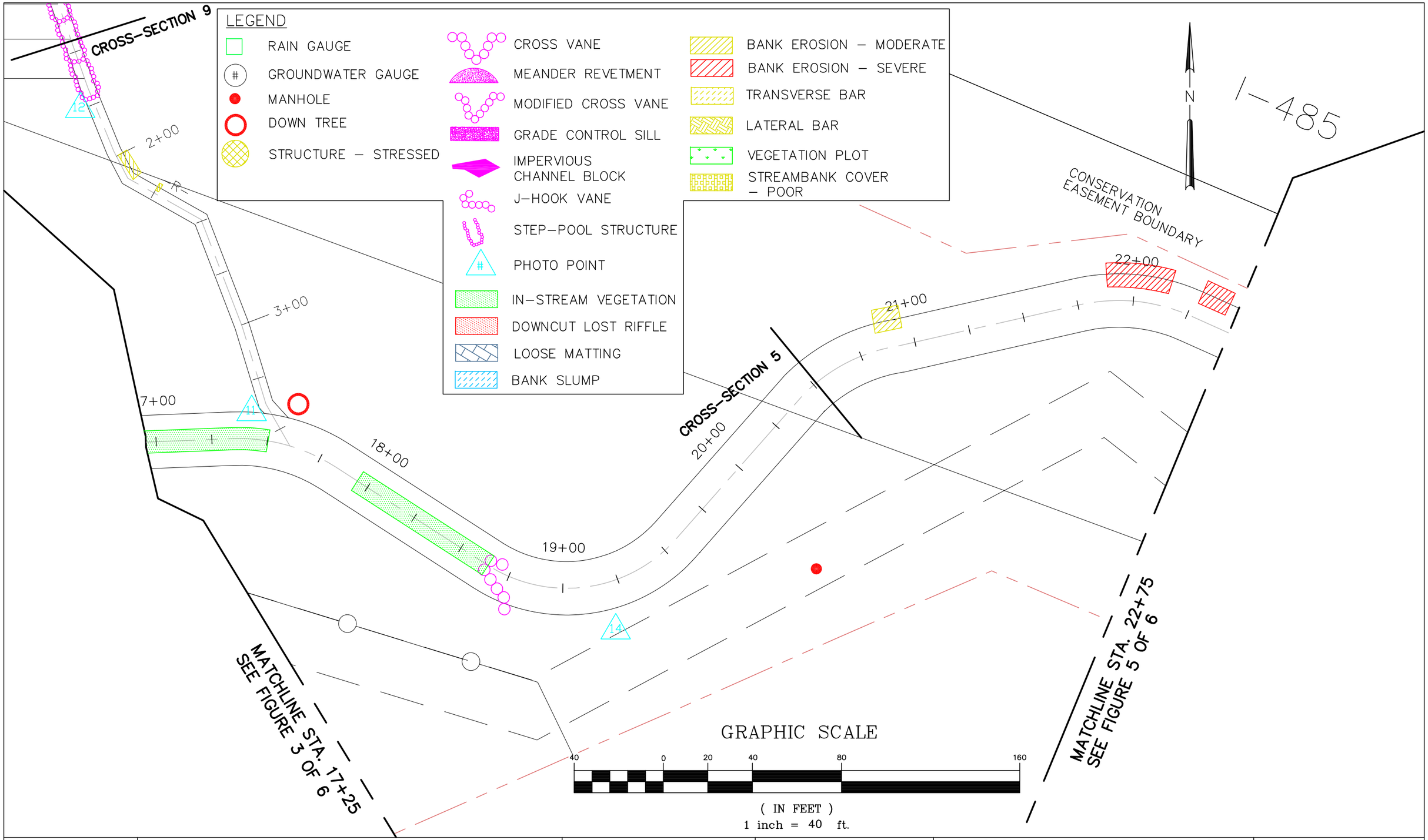
PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

APPENDIX 4
CURRENT CONDITION PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 3 OF 6




NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

APPENDIX 4
CURRENT CONDITION PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 4 OF 6

GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )

1 inch = 40 ft.

N

MATCHLINE STA. 22+75
SEE FIGURE 4 OF 6

MATCHLINE STA. 28+75
SEE FIGURE 6 OF 6

23+00

24+00

25+00

26+00

27+00

28+00

FENCE

EXISTING 25' WIDE SANITARY SEWER EASEMENT

EXISTING 128' WIDE DUKE POWER COMPANY R/W

CROSS-SECTION 6

FP

LEGEND

- CROSS VANE
- MEANDER REVETMENT
- MODIFIED CROSS VANE
- GRADE CONTROL SILL
- IMPERVIOUS CHANNEL BLOCK
- J-HOOK VANE
- STEP-POOL STRUCTURE
- PHOTO POINT
- RAIN GAUGE
- GROUNDWATER GAUGE
- IN-STREAM VEGETATION
- DOWNCUT LOST RIFFLE
- MANHOLE
- BANK EROSION - MODERATE
- BANK EROSION - SEVERE
- TRANSVERSE BAR
- DOWN TREE
- LATERAL BAR
- VEGETATION PLOT
- STREAMBANK COVER - POOR
- STRUCTURE - STRESSED
- LOOSE MATTING
- BANK SLUMP

Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

APPENDIX 4
CURRENT CONDITION PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 5 OF 6

LEGEND

- CROSS VANE
- MEANDER REVETMENT
- MODIFIED CROSS VANE
- GRADE CONTROL SILL
- IMPERVIOUS CHANNEL BLOCK
- J-HOOK VANE
- STEP-POOL STRUCTURE
- PHOTO POINT
- RAIN GAUGE
- GROUNDWATER GAUGE
- IN-STREAM VEGETATION
- DOWNCUT LOST RIFFLE
- MANHOLE
- BANK EROSION - MODERATE
- BANK EROSION - SEVERE
- TRANSVERSE BAR
- DOWN TREE
- LATERAL BAR
- VEGETATION PLOT
- STREAMBANK COVER - POOR
- STRUCTURE - STRESSED
- LOOSE MATTING
- BANK SLUMP

EXISTING 25' WIDE SANITARY SEWER EASEMENT

N

36+00

35+00

34+00

33+00

32+00

31+00

30+00

29+00

END LONGITUDINAL PROFILE

CROSS-SECTION 7

VEG PLOT 4

17

18

19

20

MATCHLINE STA. 28+75
SEE FIGURE 5 OF 6

CONSERVATION EASEMENT BOUNDARY

GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )
1 inch = 40 ft.

Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 17
MECKLENBURG COUNTY
NORTH CAROLINA
MONITORING
YEAR 3 of 5

JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
BACK CREEK STREAM AND WETLAND RESTORATION

APPENDIX 4
CURRENT CONDITION PLAN VIEW

DATE : FEBRUARY 2009
SCALE : 1"=40'
JOB NO.: 03060005

FIGURE 6 OF 6