

Brown Branch Stream Restoration – Project #53 Fourth Annual Monitoring Report



Delivered to: NCDENR-Ecosystem Enhancement Program
1619 Mail Service Center
Raleigh, NC 27699-1619



Prepared by: MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604
(919) 876-0416

Project Designed By: Biohabitats, Inc.

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IV. Executive Summary/Project Abstract

The North Carolina Wetland Restoration Program conducted a restoration on 5,100 feet of Brown Branch for the purpose of obtaining mitigation credit. Brown Branch is located in Caldwell County, North Carolina and within the Yadkin River Basin. The Brown Branch watershed comprises three square miles and is part of the Elk River drainage, eight-digit hydrologic unit code 06010103.

The project site is 3.5 miles east of U.S. Highway 321 at Happy Valley and 3.0 miles north of Olivette, NC. The Brown Branch restoration reach is entirely contained in the Anita-Alta 4H Camp and is the last mile of the creek before its confluence with Mulberry Creek.

The purpose of this restoration project was to improve water quality in Brown Branch by reducing the severe bank erosion. The stream features that motivated the restoration project were an unstable channel configuration, a featureless bed, a lack of riparian cover. These features caused poor water quality and aquatic habitat.

The goals of the Brown Branch restoration project were to establish a stable plan form, create cross sectional and profile patterns that will enhance in-stream habitat and water quality, and to improve the functional and aesthetic value of the riparian corridor. The design increased the sinuosity of the channel and incorporated rock and log structures to decrease erosive stress on the banks and provide increased aquatic habitat. By creating a range of aquatic niches, the project intends to provide in-stream habitats that may support future trout populations.

A previous monitoring report from Monitoring Year 3 (MY3) covered the period from end of construction (September 2002) through the first year post-construction. This report noted extensive channel damage due to heavy rains and high flows that occurred during the first year. Most of these noted problems are still apparent because they were not considered significant enough to result in a critical failure and lack of achieving project goals status. The second monitoring period was conducted by North Carolina State University and the third by EcoLogic Associates according to information provided by EEP. Some previous stream data were obtained by reports from NCSU Stream Restoration Institute, but no final report was provided to MACTEC for the MY4 monitoring period causing a lack of available historical information. Due to the lack of information, MACTEC was unable to provide information about the design issues, the as-built condition, or prior monitoring data.

Overall, the channel has become more stable since construction. Previous areas of concern noted during the monitoring have stabilized or appear to be of no significant long term risk to the stability of the project. Vegetation has become well established throughout the project with the only concern being related to the establishment of multiflora rose (*Rosa multiflora*) and sporadic saplings of Chinese privet (*Ligustrum sinense*). Channel cross sections, in general, are consistent with previous measurements and appear stable. The channel bed in each of the monitoring reaches appears to have stabilized and is maintaining elevation and bedform throughout. Planform remains consistent with reported design conditions.

The banks were well-covered with vegetation. Planted trees and shrubs are doing well throughout the buffer.

Results and Discussion

Overall, the majority of the stream is functioning well and holding grade, the stream has areas of concern and areas of immediate need. Table 2 shows a summary of monitoring measurement results. The stream classifies as a C4. Channel dimension and pattern are similar to as-built conditions with the exception of some limited areas of bank erosion. The channel profile does not indicate continued down cutting in the

upstream reach as reported in Year 2004 Monitoring Report. Throughout the reach a majority of the pools have incurred some sedimentation from the bank scour encountered soon after the construction effort was completed. However, evidence that flushing of the fines in the pools is occurring is present in that the pools a deepening along the restored channel and have a slightly higher d50 than previous reports indicate. Minor bank scour was primarily occurring behind root wads and a few meander-bends along the outside portion of the bend. As reported previously, two locations along the reach have large mid channel bars. These are prevalent in areas where due to an over widening of the channel, sediment was being deposited. The stream in these two areas are narrowing and appears to be flowing primarily along one side of the stream in one area and splits in the lower reach mid channel bar. This bar is being eroded as the stream has adjusted its grade in these areas and narrowed in area. Root wads causing bank scour appear to be installed at a higher elevation relative to the stream channel bed. Some rock structures have lost function in the stream channel. However, in most cases these do not appear to be causing problems in the stream. Placed structures throughout most of the reach are holding grade and functioning appropriately, with the exception of some localized erosion on single rock vane and rock cross vane structures. Finally, vegetation appears to be indicating moderate success. Most vegetation identified throughout the riparian buffer appears to be of natural recruitment origin. Planted vegetation in most areas is rather small in size but appear to be surviving.

V. Project Background

1. *Project Objectives*

The restoration of Brown Branch, located within the Anita Alta 4-H Camp, was conducted to correct identified system deficiencies to 5,100-linear feet of stream, using a Priority 1 restoration approach. Additional objectives of the project were to establish a riparian zone along the stream, improve the aquatic habitat within the channel and the riparian area, and incorporation of this project into a watershed-wide management plan.

2. *Project Structure*

A Priority 1 stream restoration design was implemented for 5,100 lf of stream channel and riparian buffer. The project involved channel dimension adjustments, pattern alterations, in-stream structures (rock vanes, root wads, rock and log vanes, and woody debris) to provide grade control and channel stability, and riparian buffer restoration which included the replanting of woody vegetation, construction of floodplain wetland depressions, and fencing for exclusion of farm animals.

**Exhibit Table I. Project Restoration Components
Brown Branch - Project #53**

Project Segment or Reach ID	Existing Length (Lf)	Type	Approach	Restored Length (Lf)	Mitigation Ratio	Mitigation Units	Stationing	Comment
Reach 1	5,100 lf	R	P1	5,100	1	5,100	0+00 - 51+00	Includes 5,100 lf riparian buffer restoration
Rip Area	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No data

NA = Not applicable for this project.

3. *Location and Setting*

The project consisted of 1.1 square mile portion of the Brown Branch watershed (located within USGS Hydrologic Unit Code 03050101, NCDWQ Sub-basin 11-38-32-13 Upper Catawba River Basin) located just north of the city limits of Lenoir, North Carolina in Caldwell County. The project is contained within the boundaries of the Anita-Alta 4-H camp in the Mulberry Community (Figure 1). To access the site

from I-40, travel north on US 321 to Lenoir and continue north towards Boone. Turn left onto US 321-Alternate traveling south for approximately 0.3-miles before turning right onto NC 90/Collettsville Road. Travel west for approximately 4 miles and turn left onto Mulberry Creek Road. Travel north about 3.5 miles to the Anita-Alta 4-H camp located east of Mulberry Creek Road. Turn into a gravel drive and cross a small bridge preceding the caretaker's two-story house. Brown Branch flows along the southern portion of the property along the edge of the valley.

4. History and Background

Project planning was initiated for the Brown Branch Stream Restoration in 2002 for the implementation of a stream restoration project in Mulberry, North Carolina, located in Caldwell County. (Figure 1). Following coordination with local leaders, the Wetlands Restoration Program and citizens groups, the project was initiated and focused on the restoration of approximately 5,100 linear feet of degraded stream within the Anita Alta 4-H Camp. Detailed environmental assessments and engineering studies were conducted and design plans and documents were prepared to facilitate the stream and riparian buffer restoration. Biohabitats, Inc. provided a mitigation plan dated March 2003.

Implementation of the project was completed by September 2003. The restoration of this portion of Brown Branch was conducted to correct identified system deficiencies including severe bank erosion, channel widening, and the loss of aquatic habitat resulting from stream channelization, the loss of riparian vegetation, and watershed development.

DIRECTIONS TO SITE:

From US-321 ALT/N MAIN ST in Lenoir NC:

LEFT onto NC-90/VALWAY RD NW
 Continue on NC-90/VALWAY RD NW 1.3mi
 LEFT onto NC-90/COLLETTSVILLE RD.
 Continue on NC-90/COLLETTSVILLE RD 4.0mi
 RIGHT onto MULBERRY CREEK RD.
 Continue on MULBERRY CREEK RD 3.5mi
 RIGHT into ANITA ALTA 4-H CAMP. BROWN BRANCH on RIGHT



Scale: 1" = 2,000'

Source: EEP, NCDOT, USGS (Collettsville, NC Topographic Quadrangle)

Prepared / Date:

Checked / Date:

2006 Annual Monitoring (MY4)
 Brown Branch Stream Restoration
 Caldwell County, North Carolina

Prepared For:



Prepared By:



Vicinity Map

Project: 6470-06-1410/02

Figure 1

Table II. Project Activity and Reporting History		
Project Number and Name: 279 (Brown Branch)		
Activity or Report	Calendar Year of Completion or Planned Completion	Actual Completion Date
Restoration Plan	*	*
Mitigation Plan	March 2003	March 2003
Construction	September 2003	September 2003
Temporary S&E mix applied to entire project area	September 2003	September 2003
As-Built report	October-03	October-03
Permanent seed mix applied to reach	*	*
Structural maintenance (Bank repair and revegetation)	*	*
Initial – Year 1 monitoring	June-01	June-03
Year 2 Monitoring	June-02	June-04
Year 3 Monitoring	June-03	June-05
Year 4 Monitoring	June-04	October-06
Year 5 Monitoring	June-05	June-05

Table III. Project Contact Table	
Project Number and Name: 279 (Brown Branch)	
Designer Primary project design POC	Biohabitats Inc. 15 West Aylesbury Road Timonium, MD 21093 Mr. Tim Burkette
Construction Contractor Construction contractor POC	Shamrock Environmental Corporation 503 Patton Avenue Greensboro, NC 27406 Bill Wright
Planting Contractor Planting contractor POC	*
Seeding Contractor Planting contractor point of contact	*
Seed Mix Sources	Ernst Conservation Seed, 9006 Mercer Pike, Meadville, Pennsylvania 16335 (814) 336-2404
Nursery Stock Suppliers	*
Monitoring Performers	MACTEC Engineering and Consulting, Inc. 3301 Atlantic Avenue Raleigh, North Carolina 27604 (919) 876-0416
Stream Monitoring POC	Robert Sain (828) 252-8130
Vegetation Monitoring POC	Lori Saal (919) 876-0416

* Historical project documents reviewed did not provide these data.

In a review of the historical project documents (i.e.: Mitigation Plan), provided by EEP, data gaps were revealed including various ranges of morphological data from previous Monitoring Years (MY), historical data, and accurate survey datum point locations. These data gaps were reported to the EEP prior to field monitoring efforts.

In an attempt to survey the longitudinal profile and cross sections of Brown Branch only two previously established datum locations and the permanent bench mark were identified and located using the information gathered from the EEP. MACTEC personnel made multiple attempts to locate previously reported cross sections and other monumented stream features. This resulted in the identification of six cross sections. Of these six cross sections four were poorly marked and two were missing markers.

MACTEC, in order to correct the missing survey points, re-established datum locations and recorded previously established survey locations when available. The site was initially evaluated in April 2006 and appeared to be functioning as designed. Subsequent evaluations in June, September, and October 2006 revealed, in general, that the design is functioning successfully, with a few minor exceptions detailed below.

A. Vegetation Assessment

Using the protocols specified in the Content, Format and Data Requirements for EEP Monitoring Reports; dated November 11, 2006, 12 vegetation monitoring plots were established and surveyed on September 28 and October 31, 2006, within the riparian buffer of the Brown Branch project area.

Vegetation within the riparian buffer of this stream is moderate in coverage and mostly successful. The banks are generally well-covered with vegetation. Canopy cover has not yet formed due to the immaturity of vegetation on site. Planted trees and shrubs are doing well throughout the buffer. *Betula* species dominate the woody stem count with a total of 80 stems within the 12 plots. Invasive species were infrequent at the site. The plot data is summarized in Tables 1 through 5 in Appendix A.

1. Vegetative Problem Areas

Problem areas are defined as either lacking vegetation or containing exotic vegetation and are categorized as Bare Bank, Bare Bench, Bare Floodplain, or Invasive Population. The primary vegetative problem at Brown Branch is Japanese privet (*Ligustrum japonicum*). We observed individual plants throughout the reach, adjacent to the forest line near the edge of the mitigation area.

2. Vegetative Problem Area Plan View

No problem areas were evident during the vegetation monitoring for 2006. Therefore, no vegetative problem area plan view was prepared.

The following table summarizes vegetation and soils results for MY4 monitoring. Soil samples were collected and analyzed during the MY4 monitoring period. Raw vegetation data can be found in Appendix A. Data is summarized in Table VIII below. Photos of each vegetation plot can be found in the photo log in Appendix A.

B. Stream Assessment

1. Procedural Items

a. Morphometric Criteria

MACTEC staff evaluated the Brown Branch site during April, June, September and October 2006 and took notes and photographs regarding the condition and success of the project. The stream channel is in a more stable condition, with only two immediate local problem areas identified in this survey. Overall, the site is maintaining a stable dimension, pattern, and profile, and planted woody stem density is generally good.

MACTEC staff collected MY4 quantitative geomorphological data (six cross sections and approximately 5,100 linear stream feet) during November and December 2006, respectively. Photographs were taken at cross sections and vegetation monitoring plots. No permanent photo locations were identified from historical data and none were taken for the MY4 report.

Most problems located along the stream channel were due to the formation of mid-channel bars from aggradation. Other areas of concern were downstream of large tree falls located during the stream profile survey. Areas where trees had fallen into the stream are undergoing significant erosion and scour. Also, noted was the presence of two beaver dams located in the upper reach of Brown Branch above the restoration area.

b. Hydrologic Criteria

No crest gauges are installed at this site to document bankfull events. Potential discharge estimates were based on the rural piedmont regional curve for a stream with a drainage area of 1.1 square miles. According to the curve, a stream with a drainage area of 1.1 square miles would reach bankfull discharge at 95 cubic feet per second (cfs). No USGS peak flow data were available for streams in Caldwell County during 2006. Using the rural piedmont regional curve, bankfull discharge is 95 cubic feet per second (cfs), making the high flow event observed on December 8 the only approximate bankfull event known for MY4. The flow in the stream was observed to reach the floodplain during this event. Approximate depth of the floodplain measured was about 1.5 feet which corresponds to the estimate of bankfull depth from the rural piedmont regional curves. Drift lines, downed herbaceous and woody vegetation were also observed on the floodplain providing further evidence that a bankfull event had taken place.

Date of Data Collection	Date of Occurrence (mm/dd/yyyy)	Method	Photo # (if available)
12/8/2006	12/08/2006	On-site observation and high water indicators observed.	Not Available

1. Bank Stability Assessments

BEHI (Bank Erosion Hazard Index) is only performed during MY5 monitoring.

2. Problems Areas Plan View (stream)

Exhibit B.1 provided in Appendix B provides categorical feature issues by station and type, the suspected cause, and denotes number of a representative photo of the condition in Appendix B.

3. Problem Areas Summary Table

Exhibit Problem Areas Summary Table is provided in Appendix B.

4. Numbered Issues Photo Stations

Problem area photos are provided in Appendix B.

5. Fixed Photo Station Photos

MACTEC reviewed all available monitoring reports and data to determine the location of fixed photo station locations. No locations were identified and no photos were collected. Specific cross section photos are provided in Appendix B.

6. Stability Assessment

The channel profile of Brown Branch remained in close approximation to the MY3 survey. The channel bed has maintained elevation over the past four monitoring periods. Bedform has appeared to shift somewhat significantly with a pool to pool spacing ranging from 26.3 to 196.4 feet whereas in past years the spacing has ranged from 35 to 65 feet due to fluctuations in bedform. Natural and planted vegetation dominating the channel banks is maintaining bank stability through the reach.

Channel cross sections remain somewhat stable. Both riffle and pool sections show some lateral migration over the past year but dense vegetation along the channel bank is maintaining channel bank stability. Cross sectional area has been maintained within four of the six cross sections. Cross section 3 indicates the most significant change in cross sectional area changing from 14.5 square feet to 37.5 sq. ft. (22.6 sq. ft.) in two years. The data collected may indicate that the cross section was not measured correctly in the field as the comparison graph does not match the previous cross section. Cross section 6 has actually reduced in area since the 2003 monitoring period. A change in area from 21.3 to 15.2 sq. ft. was indicated by the survey. This change appears to indicate that the stream may be narrowing in this area to a more stable bankfull width. Maximum depth is consistent to as-built conditions and the entire reach appears to be functioning properly.

Cross sections number 1, 2, 4 and 5 have remained stable with similar cross sectional areas, no major signs of erosion and similar substrate. Cross section #1 is a riffle located at STA 4+30 that has down cut 6 inches with bank erosion on the right bank that has since vegetated and stabilized. The cross sectional area has increased 12 percent to 22.6 sq.ft. from 19.8 sq.ft. Cross section #5 is a riffle located at STA 43+20 that has formed a mid-channel bar with minor bank erosion on the right bank. The cross sectional area has increased slightly to 17 sq ft. from 15.1 sq.ft. in MY3.

Riffle channel materials have coarsened over the past year. Gravel is dominant throughout the reach. Pool channel materials are similar to the past two year's surveys and appear to have stabilized. The channel appears to be transporting the sediment load delivered to it by its watershed.

Channel pattern appears to have been maintained since construction. Dense vegetation has established along the channel banks. This vegetation is providing an excellent root mass to stabilize the banks. There are no areas of visible meander migrations throughout this reach and areas of bank scour have re-vegetated and appear to have stabilized.

Exhibit Table VII. Categorical Stream Feature Visual Stability Assessment
Brown Branch - Project #53

Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles	100%	*	*	*	85%	
B. Pools	100%	*	*	*	85%	
C. Thalweg	100%	*	*	*	90%	
D. Meanders	100%	*	*	*	95%	
E. Bed General	100%	*	*	*	95%	
F. Bank Condition	100%	*	*	*	90%	
G. Vanes / J Hooks, etc.	100%	*	*	*	80%	
H. Wads and Boulders	100%	*	*	*	80%	

* = Data Gap. Historical data not supplied.

7. Quantitative Measures Tables (Morph and Hydro)

Baseline morphology and Summary morphology data are located in tables VII and VIII, respectively. Data gaps in the following tables are due to a lack of data from previous monitoring events. Attempts were made to locate and populate data tables with previously recorded data.

**Exhibit Table VIII. Baseline Morphology and Hydraulic Summary
Brown Branch - Project #53 (5100 feet)**

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)	*	*	*	*	*	*	*	*	28	*	*	52	*	*	22	10	16.8	13.4
Floodprone Width (ft)	*	*	*	*	*	*	*	*	300	*	*	NA	*	*	300	*	*	*
BF Cross Sectional Area (ft ²)	*	*	*	*	*	*	*	*	41	*	*	169	*	*	35	11.4	29.9	20.65
BF Mean Depth (ft)	*	*	*	*	*	*	*	*	1.4	*	*	3.2	*	*	1.6	0.73	1.1	0.92
BF Max Depth (ft)	*	*	*	*	*	*	*	*	2.9	*	*	NA	*	*	2.3	0.94	1.8	1.37
Width/Depth Ratio	*	*	*	*	*	*	*	*	20	*	*	16	*	*	13	*	*	*
Entrenchment Ratio	*	*	*	*	*	*	*	*	11	*	*	*	*	*	14	*	*	*
Wetted Perimeter(ft)	*	*	*	*	*	*	*	*	23.3	*	*	*	*	*	24.7	*	*	*
Hydraulic radius (ft)	*	*	*	*	*	*	*	*	1.4	*	*	*	*	*	1.5	*	*	*
Pattern																		
Channel Beltwidth (ft)	*	*	*	*	*	*	*	*	<120	192	300	*	*	*	*	*	*	*
Radius of Curvature (ft)	*	*	*	*	*	*	*	*	100	42	69	*	*	*	*	*	*	*
Meander Wavelength (ft)	*	*	*	*	*	*	*	*	600	60	112	*	*	*	*	*	*	*
Meander Width ratio	*	*	*	*	*	*	*	*	*	3.7	5.7	*	*	*	*	*	*	*
Profile																		
Riffle length (ft)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	22	71	31
Riffle slope (ft/ft)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0.006	0.45	0.014
Pool length (ft)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	9	62	35.5
Pool spacing (ft)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	35	65	50
Substrate																		
d50 (mm)	*	*	*	*	*	*	*	*	30	*	*	*	*	*	*	*	*	*
d84 (mm)	*	*	*	*	*	*	*	*	52	*	*	*	*	*	*	*	*	*
Additional Reach Parameters																		
Valley Length (ft)		*			*				1687		*			1687		3400		
Channel Length (ft)		*			*				1826		*			2808		5100		
Sinuosity		*			*				1.4		*			1.5		1.5		
Water Surface Slope (ft/ft)		*			*				*		*			0.005		*		
BF slope (ft/ft)		*			*				0.006		*			*		0.009		
Rosgen Classification		*			*				C4		*			C4		C4		
Number of Bankfull Events		*			*				*		*			*		*		
Extent of BF floodplain (acres)		*			*				*		*			300		300		
*BEHI		*			*				*		*			*		*		
*Habitat Index		*			*				*		*			*		*		
*Macrobenthos		*			*				*		*			*		*		

* = Data Gap. Historical data not supplied.

Exhibit Table IX. Morphology and Hydraulic Monitoring Summary

Project Number #53

Segment/Reach: Brown Branch (5,100 feet)

Parameter	Cross Section 1 Riffle					Cross Section 2 Pool					Cross Section 3 Riffle					Cross Section 4 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
BF Width (ft)	14.1	15.2	*	16.5		22.5	23.1	*	18.6		14.9	14.9	*	37.5		22.9	24.7	*	29	
Floodprone Width (ft)	*	*	*	60		*	*	*	>100		*	*	*	80		*	*	*	>100	
BF Cross Sectional Area (ft ²)	22.7	19.8	*	26.2		12.2	9.5	*	14.8		16.6	15.1	*	15.1		22.5	23.2	*	34.6	
BF Mean Depth (ft)	1.6	1.3	*	1.6		0.5	0.4	*	0.8		0.9	1	*	1.7		1	0.9	*	1.2	
BF Max Depth (ft)	2.3	2.1	*	2.3		1.5	1.6	*	1.6		1.7	1.7	*	3.1		2.1	1.9	*	2.7	
Width/Depth Ratio	8.81	11.7	*	10.3		45	57.8	*	23.3		16.5	14.9	*	22		22.9	27.4	*	24	
Entrenchment Ratio	*	*	*	3.6		*	*	*	*		*	*	*	2.1		*	*	*	*	
Wetted Perimeter(ft)	*	*	*	*		*	*	*	*		*	*	*	*		*	*	*	*	
Hydraulic radius (ft)	*	*	*	*		*	*	*	*		*	*	*	*		*	*	*	*	
Substrate																				
d50 (mm)	*	14.5	*	10.7		*	0.11	*	0.51		*	0.09	*	11.4		*	3.37	*	8.83	
d84 (mm)	*	48.9	*	36		*	0.7	*	5.52		*	15.1	*	23.8		*	15.4	*	18	

* = Data Gap. Historical data not supplied.

Parameter	MY-01 (2003)			MY-02 (2004)			MY-03			MY-04 (2006)			MY-05		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern															
Channel Beltwidth (ft)	57	230	120	24	56	33	*	*	*	22	59	40.5			
Radius of Curvature (ft)	26	86	55	28	87	66	*	*	*	29	86	66			
Meander Wavelength (ft)	170	350	203	83	104	100	*	*	*	86	106	96			
Meander Width ratio	1.62	6.57	3.42	*	*	*	*	*	*	1.3	3.47	2.38			
Profile															
Riffle length (ft)	15.8	97	15	22	71	31	*	*	*	9	22	15.5			
Riffle slope (ft/ft)	0.005	0.003	0	0.01	0.005	0.001	*	*	*	0.003	0.07	0.014			
Pool length (ft)	13.2	97	43.5	9	62	18	*	*	*	5	28	16.5			
Pool spacing (ft)	44	211	112	35	65	61	*	*	*	26.3	196	75.5			
Additional Reach Parameters															
	MY1			MY2			MY3			MY4			MY5		
Valley Length (ft)	*			*			*			3700					
Channel Length (ft)	*			*			*			5100					
Sinuosity	*			*			*			1.5					
Water Surface Slope (ft/ft)	*			*			*			2.1					
BF slope (ft/ft)	*			*			*			0.0091					
Rosgen Classification	C4			C4			C4			C4					
Number of Bankfull Events										1					
Extent of BF floodplain (area)															

* = Data Gap. Historical data not supplied.

Parameter	Cross Section 5 Riffle					Cross Section 6 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
BF Width (ft)	14.6	15.3	*	17.3		21.6	21.3	*	15.2	
Floodprone Width (ft)	*	*	*	60		*	*	*	50	
BF Cross Sectional Area (ft ²)	14.8	15.1	*	17		24.9	21.7	*	14.7	
BF Mean Depth (ft)	1	1	*	1		1.7	1	*	1	
BF Max Depth (ft)	1.5	1.4	*	1.4		1.83	1.8	*	1.5	
Width/Depth Ratio	14.6	21.3	*	17.3		12.7	21.3	*	15.2	
Entrenchment Ratio	*	*	*	3.3		*	*	*	*	
Wetted Perimeter(ft)	*	*	*	*		*	*	*	*	
Hydraulic radius (ft)	*	*	*	*		*	*	*	*	
Substrate										
d50 (mm)	*	1.38	*	9.77		*	1.46	*	1.42	
d84 (mm)	*	12.2	*	23.6		*	38.5	*	16	

* = Data Gap. Historical data not supplied.

Please note that Table X (Wetland Criteria Attainment) is not included because this restoration project does not have a wetlands component.

VII. Methodology Section

Monitoring methods used are based on US Army Corps of Engineering and NC Division of Water Quality Guides as referenced below.

References:

USACE (2003) *Stream Mitigation Guidelines*. USACE, USEPA, NCWRC, NCDENR-DWQ

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

APPENDIX A

Vegetation Raw Data

1. Vegetation Photo Log
2. Vegetation Problem Photos
3. Vegetation Survey Data Tables

North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
 Vegetation Photo Point Images – Brown Branch – NC EEP #53

	<p>VEGETATION PLOT PHOTOS</p> <p>Site: Brown Branch Plot ID: BBP-1 Caldwell County, North Carolina Project No: 6470-06-1410.02 Date: September 2006 Photo #: 1 Photographed by: L.B. Saal</p> <p>Description: Photo taken from plot origin toward diagonally opposite corner.</p>
	<p>Site: Brown Branch Plot ID: BBP-2 Caldwell County, North Carolina Project No: 6470-06-1410.02 Date: September 2006 Photo #: 2 Photographed by: L.B. Saal</p> <p>Description: Photo taken from plot origin toward diagonally opposite corner.</p>

North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
 Vegetation Photo Point Images – Brown Branch – NC EEP #53



VEGETATION PLOT PHOTOS
Site: Brown Branch Plot ID: BBP-3
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: September 2006
Photo #: 3
Photographed by: L.B. Saal
Description: Photo taken from plot origin toward diagonally opposite corner.



Site: Brown Branch Plot ID: BBP-4
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: September 2006
Photo #: 4
Photographed by: L.B. Saal
Description: Photo taken from plot origin toward diagonally opposite corner.

North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
 Vegetation Photo Point Images – Brown Branch – NC EEP #53

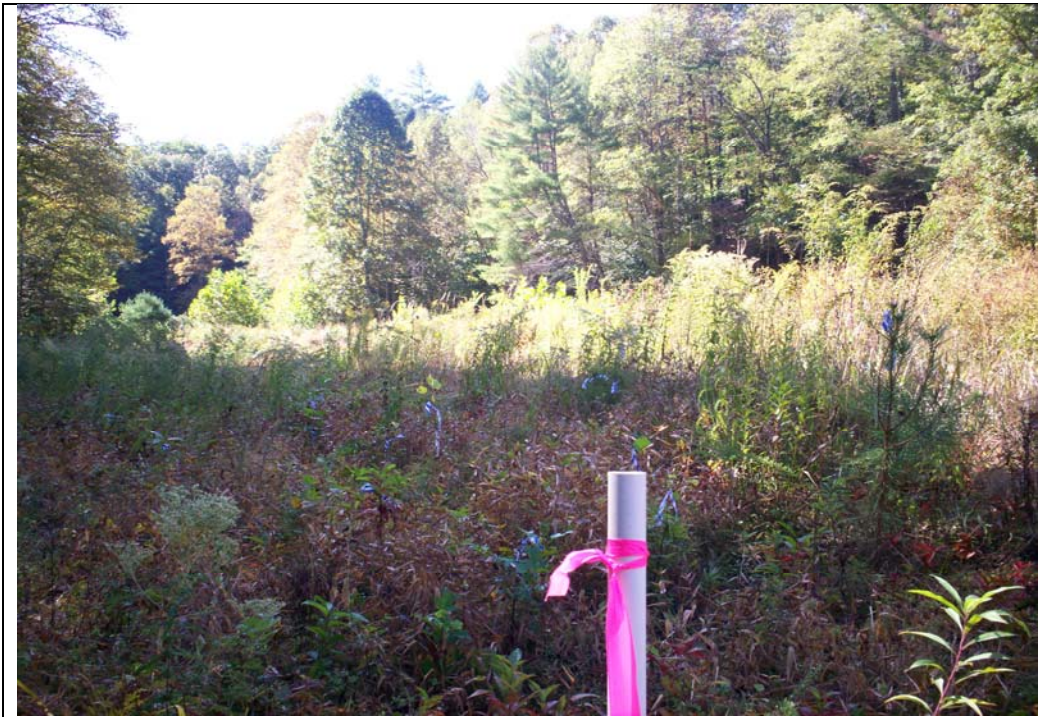


VEGETATION PLOT PHOTO5
Site: Brown Branch Plot ID: BBP-5
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: September 2006
Photo #: 5
Photographed by: L.B. Saal
Description: Photo taken from plot origin toward diagonally opposite corner.



Site: Brown Branch Plot ID: BBP-6
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: September 2006
Photo #: 6
Photographed by: L.B. Saal
Description: Photo taken from plot origin toward diagonally opposite corner.

North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
 Vegetation Photo Point Images – Brown Branch – NC EEP #53



VEGETATION PLOT PHOTOS
Site: Brown Branch Plot ID: BBP-7
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: October 2006
Photo #: 7
Photographed by: R.E. Spears
Description: Photo taken from plot origin toward diagonally opposite corner.



Site: Brown Branch Plot ID: BBP-8
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: October 2006
Photo #: 8
Photographed by: R.E. Spears
Description: Photo taken from plot origin toward diagonally opposite corner.

North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
 Vegetation Photo Point Images – Brown Branch – NC EEP #53



VEGETATION PLOT PHOTOS
Site: Brown Branch Plot ID: BBP-9
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: October 2006
Photo #: 9
Photographed by: R.E. Spears
Description: Photo taken from plot origin toward diagonally opposite corner. (Rotated 90 ⁰ clockwise)



Site: Brown Branch Plot ID: BBP-10
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: October 2006
Photo #: 10
Photographed by: R.E. Spears
Description: Photo taken from plot origin toward diagonally opposite corner.

North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
 Vegetation Photo Point Images – Brown Branch – NC EEP #53



	<p>VEGETATION PLOT PHOTOS</p> <p>Site: Brown Branch Plot ID: BBP-11 Caldwell County, North Carolina Project No: 6470-06-1410.02 Date: October 2006 Photo #: 11 Photographed by: R.E. Spears</p> <p>Description: Photo taken from plot origin toward diagonally opposite corner.</p>
	<p>Site: Brown Branch Plot ID: BBP-12 Caldwell County, North Carolina Project No: 6470-06-1410.02 Date: October 2006 Photo #: 12 Photographed by: R.E. Spears</p> <p>Description: Photo taken from plot origin toward diagonally opposite corner.</p>

Table 1: Vegetation Metadata

Project Number and Name: 53, Brown Branch

-	-
<u>Report Prepared By</u>	<u>Lori Saal</u>
<u>Date Prepared</u>	<u>12/18/2006 15:40</u>
-	-
-	-
<u>database name</u>	<u>CVS EEP DataEntry v202.mdb</u>
<u>database location</u>	<u>L:\Databases\Environmental\Natural Resources\Ecology\Vegetation\CVS EEP</u>
-	-
-	-

DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----

<u>Metadata</u>	<u>This worksheet, which is a summary of the project and the project data.</u>
<u>Plots</u>	<u>List of plots surveyed.</u>
<u>Vigor</u>	<u>Frequency distribution of vigor classes.</u>
<u>Vigor by Spp</u>	<u>Frequency distribution of vigor classes listed by species.</u>
<u>Damage</u>	<u>List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.</u>
<u>Damage by Spp</u>	<u>Damage values tallied by type for each species.</u>
<u>Damage by Plot</u>	<u>Damage values tallied by type for each plot.</u>
<u>Stem Count by Plot and Spp</u>	<u>Count of living stems of each species for each plot; dead and missing stems are excluded.</u>
-	-

PROJECT SUMMARY-----

<u>Project Code</u>	<u>8</u>
<u>project Name</u>	<u>Brown Branch</u>
<u>Description</u>	<u>Vegetation monitoring of selected portions of the 5200 linear feet of Brown Branch.</u>
<u>length (ft)</u>	<u>5200</u>
<u>stream-to-edge width (ft)</u>	-
<u>area (sq m)</u>	-
<u>Required Plots (calculated)</u>	<u>12</u>
<u>Sampled Plots</u>	<u>12</u>

					plot 00008- 01- BBP1	plot 00008- 01- BBP10	plot 00008- 01- BBP11	plot 00008- 01- BBP12	plot 00008- 01- BBP2	plot 00008- 01- BBP3	plot 00008- 01- BBP4	plot 00008- 01- BBP5	plot 00008- 01- BBP6	plot 00008- 01- BBP7	plot 00008- 01- BBP8	plot 00008- 01- BBP9
	Species	Total Stems	# plots	avg# stems												
	<i>Alnus</i>	6	1	6			6									
	<i>Alnus serrulata</i>	12	3	4					3			1		8		
	<i>Betula lenta</i>	20	4	5		1	5								10	4
	<i>Betula nigra</i>	60	6	10					1	3	27	6	7	16		
	<i>Cornus amomum</i>	5	3	1.67			3	1		1						
	<i>Diospyros virginiana</i>	1	1	1						1						
	<i>Fraxinus pennsylvanica</i>	5	3	1.67							2			1	2	
	<i>Hypericum</i>	1	1	1					1							
	<i>Lindera benzoin</i>	3	1	3				3								
	<i>Platanus occidentalis</i>	1	1	1	1											
	<i>Quercus</i>	1	1	1			1									
	<i>Quercus laevis</i>	1	1	1				1								
	<i>Quercus rubra</i>	1	1	1				1								
	<i>Salix nigra</i>	5	2	2.5						3		2				
	<i>Sambucus canadensis</i>	3	1	3			3									
	Unknown	2	1	2							2					
	<i>Vaccinium</i>	3	2	1.5		2					1					
TOT:	17	130	17		1	3	18	6	5	8	32	9	7	25	12	4

Table 2: Vegetation Vigor by Species						
Project Number and Name: 53, Brown Branch						
Species	4	3	2	1	0	Missing
<i>Alnus serrulata</i>	12					
<i>Betula nigra</i>	60					
<i>Cornus amomum</i>	3	2				
<i>Diospyros virginiana</i>	1					
<i>Fraxinus pennsylvanica</i>	2	3			1	
<i>Oxydendrum arboreum</i>						
<i>Pinus virginiana</i>						
<i>Quercus laevis</i>		1				
<i>Quercus velutina</i>						
<i>Salix nigra</i>	5					
<i>Sambucus canadensis</i>	1	2				
<i>Ilex opaca</i>						
<i>Alnus</i>	6					
<i>Betula</i>						
<i>Betula lenta</i>	7	10	3			
<i>Vaccinium</i>	3					
<i>Quercus</i>		1				
<i>Quercus rubra</i>	1					
<i>Hypericum</i>	1					
<i>Lindera benzoin</i>	3					
<i>Liriodendron tulipifera</i>						
<i>Pinus</i>						
<i>Platanus occidentalis</i>		1				
<i>Malus</i>						
<i>Acer rubrum</i>						
<i>Ulmus americana</i>						
Unknown	1	1				
TOT:	27	106	21	3	1	

Table 3: Vegetation Damage by Species
Project Number and Name: 53, Brown Branch

	Species	All Damage Categories	No Damage	Deer	Diseased	Unknown
	<i>Acer rubrum</i>	2	2			
	<i>Alnus</i>	6	6			
	<i>Alnus serrulata</i>	13	13			
	<i>Betula</i>	1	1			
	<i>Betula lenta</i>	22	22			
	<i>Betula nigra</i>	60	60			
	<i>Cornus amomum</i>	6	5	1		
	<i>Diospyros virginiana</i>	1	1			
	<i>Fraxinus pennsylvanica</i>	7	6			1
	<i>Hypericum</i>	1	1			
	<i>Ilex opaca</i>	1	1			
	<i>Lindera benzoin</i>	3	3			
	<i>Liriodendron tulipifera</i>	4	4			
	<i>Malus</i>	1	1			
	<i>Oxydendrum arboreum</i>	5	5			
	<i>Pinus</i>	4	4			
	<i>Pinus virginiana</i>	3	3			
	<i>Platanus occidentalis</i>	12	11			1
	<i>Quercus</i>	1			1	
	<i>Quercus laevis</i>	1	1			
	<i>Quercus rubra</i>	1	1			
	<i>Quercus velutina</i>	1	1			
	<i>Salix nigra</i>	5	5			
	<i>Sambucus canadensis</i>	3	3			
	<i>Unknown</i>	3	2			1
	<i>Ulmus americana</i>	1	1			
	<i>Vaccinium</i>	4	4			
TOT:	27	172	167	1	1	3

Table 4: Vegetation Damage by Plot						
Project Number and Name: 53, Brown Branch						
	plot	All Damage Categori es	No Damage	Deer	Diseased	Unknown
	00008-01-BBP1	8	7			1
	00008-01-BBP2	10	10			
	00008-01-BBP3	9	9			
	00008-01-BBP4	33	31			2
	00008-01-BBP5	10	10			
	00008-01-BBP6	9	9			
	00008-01-BBP7	27	27			
	00008-01-BBP8	15	15			
	00008-01-BBP9	7	7			
	00008-01-BBP10	8	8			
	00008-01-BBP11	22	20	1	1	
	00008-01-BBP12	14	14			
TOT:	12	172	167	1	1	3

Table 5: Vegetation Stem Count by Plot and Species
Project Number and Name: 53, Brown Branch

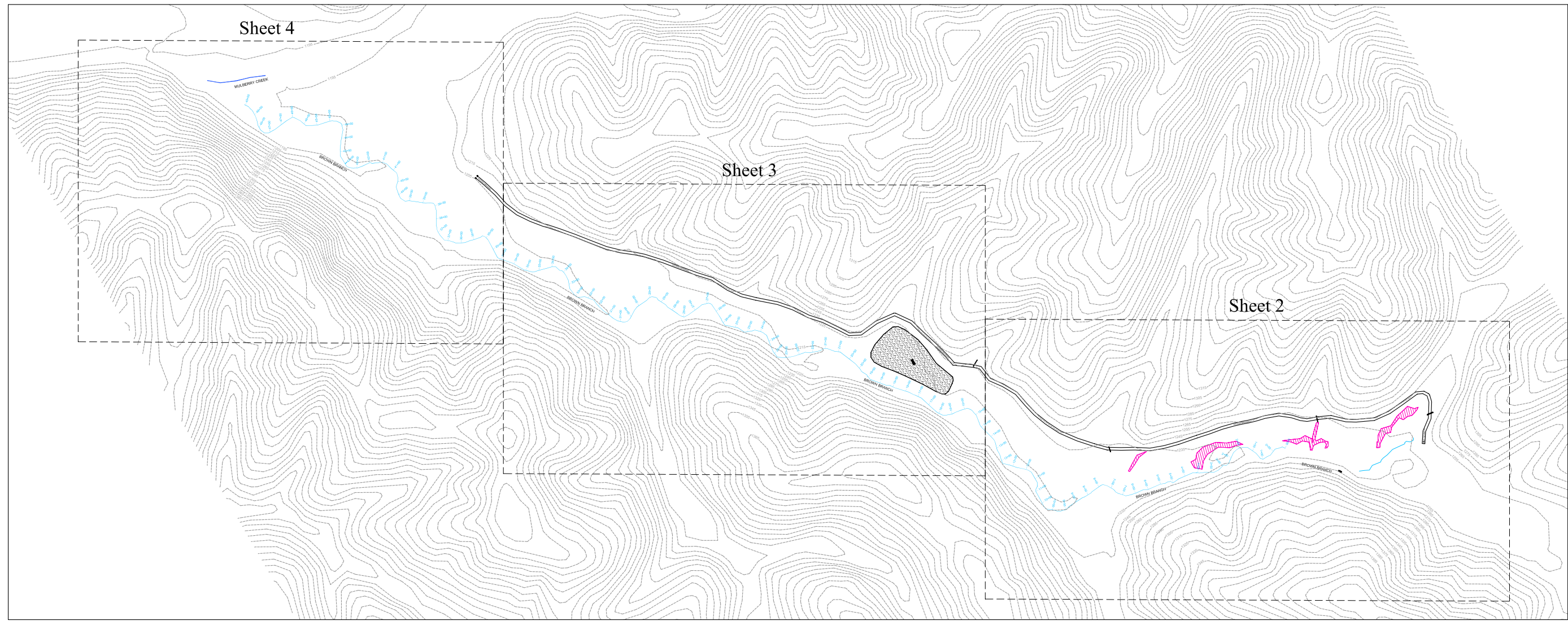
Species	Total Stems	# plots	avg# stems	plot 00008-01-BBP1	plot 00008-01-BBP2	plot 00008-01-BBP3	plot 00008-01-BBP4	plot 00008-01-BBP5	plot 00008-01-BBP6	plot 00008-01-BBP7	plot 00008-01-BBP8	plot 00008-01-BBP9	plot 00008-01-BBP10	plot 00008-01-BBP11	plot 00008-01-BBP12
<i>Alnus</i>	6	1	6											6	
<i>Alnus serrulata</i>	12	3	4		3			1		8					
<i>Betula lenta</i>	20	4	5								10	4	1	5	
<i>Betula nigra</i>	60	6	10		1	3	27	6	7	16					
<i>Cornus amomum</i>	5	3	1.7			1								3	1
<i>Diospyros virginiana</i>	1	1	1			1									
<i>Fraxinus pennsylvanica</i>	5	3	1.7				2			1	2				
<i>Hypericum</i>	1	1	1		1										
<i>Lindera benzoin</i>	3	1	3												3
<i>Platanus occidentalis</i>	1	1	1	1											
<i>Quercus</i>	1	1	1											1	
<i>Quercus laevis</i>	1	1	1												1
<i>Quercus rubra</i>	1	1	1												1
<i>Salix nigra</i>	5	2	2.5			3		2							
<i>Sambucus canadensis</i>	3	1	3											3	
Unknown	2	1	2				2								
<i>Vaccinium</i>	3	2	1.5				1						2		
TOT:	17	17		1	5	8	32	9	7	25	12	4	3	18	6

APPENDIX B

1. Exhibit Problem Areas Plan View (Stream)

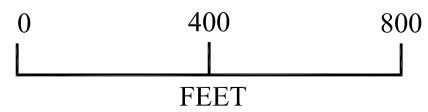
Note: There were no significant stream problems at this site

2. Stream Problem Area Table
3. Representative Stream Problem Area Photos
4. Exhibit Table B.1. Qualitative Visual Stability Assessment
5. Annual Overlays of Cross section Plots (with Photos)
6. Annual Overlays of Longitudinal Plots
7. Annual Overlays of pebble count frequency distribution Plots



1" = 400'

ECOLOGIC, NCDOT (10' Contour Elevations)



Prepared by / Date: R.R./12-20-06

Checked by/ Date:



**BROWN BRANCH RESTORATION
YEAR 4 MONITORING
CALDWELL COUNTY, NORTH CAROLINA**

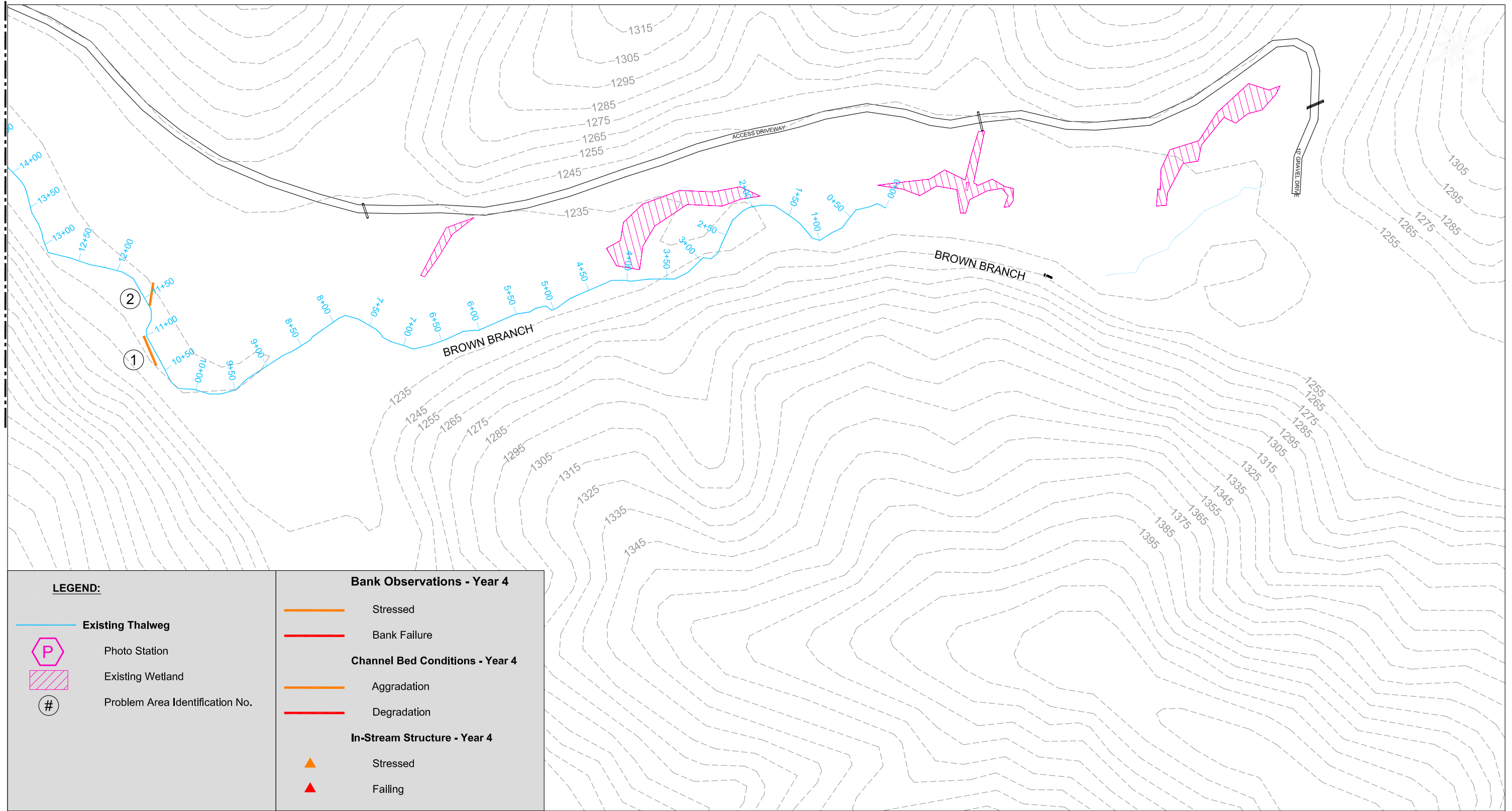
REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 072204_ABLT_CD.dwg, PROVIDED BY NC EEP, DATED AUGUST 20, 2004.

**PROBLEM AREA PLAN VIEW-
SEPTEMBER 2006**

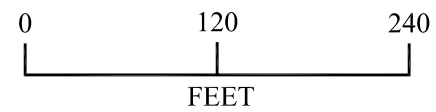
NC EEP Project : 53
Project: 6470-06-1410/02

MATCH LINE TO FIGURE 4



LEGEND:	
	Existing Thalweg
	Photo Station
	Existing Wetland
	Problem Area Identification No.
Bank Observations - Year 4	
	Stressed
	Bank Failure
Channel Bed Conditions - Year 4	
	Aggradation
	Degradation
In-Stream Structure - Year 4	
	Stressed
	Falling

1" = 120'
 ECOLOGIC, NCDOT (10' Contour Elevations)



Prepared by / Date: R.R./12-20-06
 Checked by/ Date:



**BROWN BRANCH RESTORATION
 YEAR 4 MONITORING
 CALDWELL COUNTY, NORTH CAROLINA**

REFERENCES

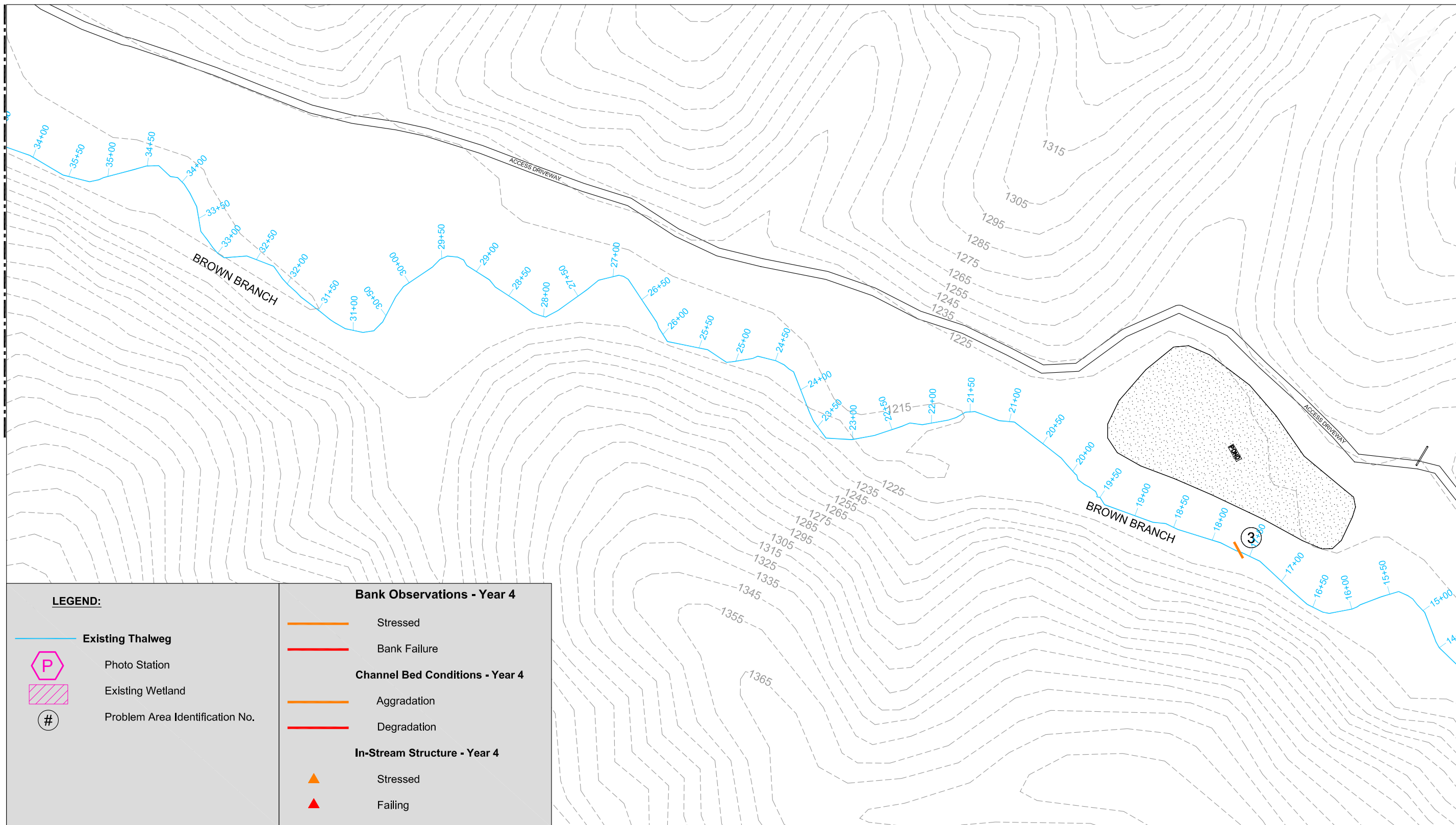
1.) BASE MAP TAKEN FROM DIGITAL FILE 072204_ABLT_CD.dwg, PROVIDED BY NC EEP, DATED AUGUST 20, 2004.

**PROBLEM AREA PLAN VIEW-
 SEPTEMBER 2006**

NC EEP Project : 53
 Project: 6470-06-1410/02

MATCH LINE TO FIGURE 5

MATCH LINE TO FIGURE 3



LEGEND:

- Existing Thalweg
- Photo Station
- Existing Wetland
- Problem Area Identification No.

Bank Observations - Year 4

- Stressed
- Bank Failure

Channel Bed Conditions - Year 4

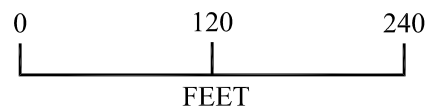
- Aggradation
- Degradation

In-Stream Structure - Year 4

- Stressed
- Failing

1" = 120'

ECOLOGIC, NCDOT (10' Contour Elevations)



Prepared by / Date: R.R./12-20-06

Checked by/ Date:



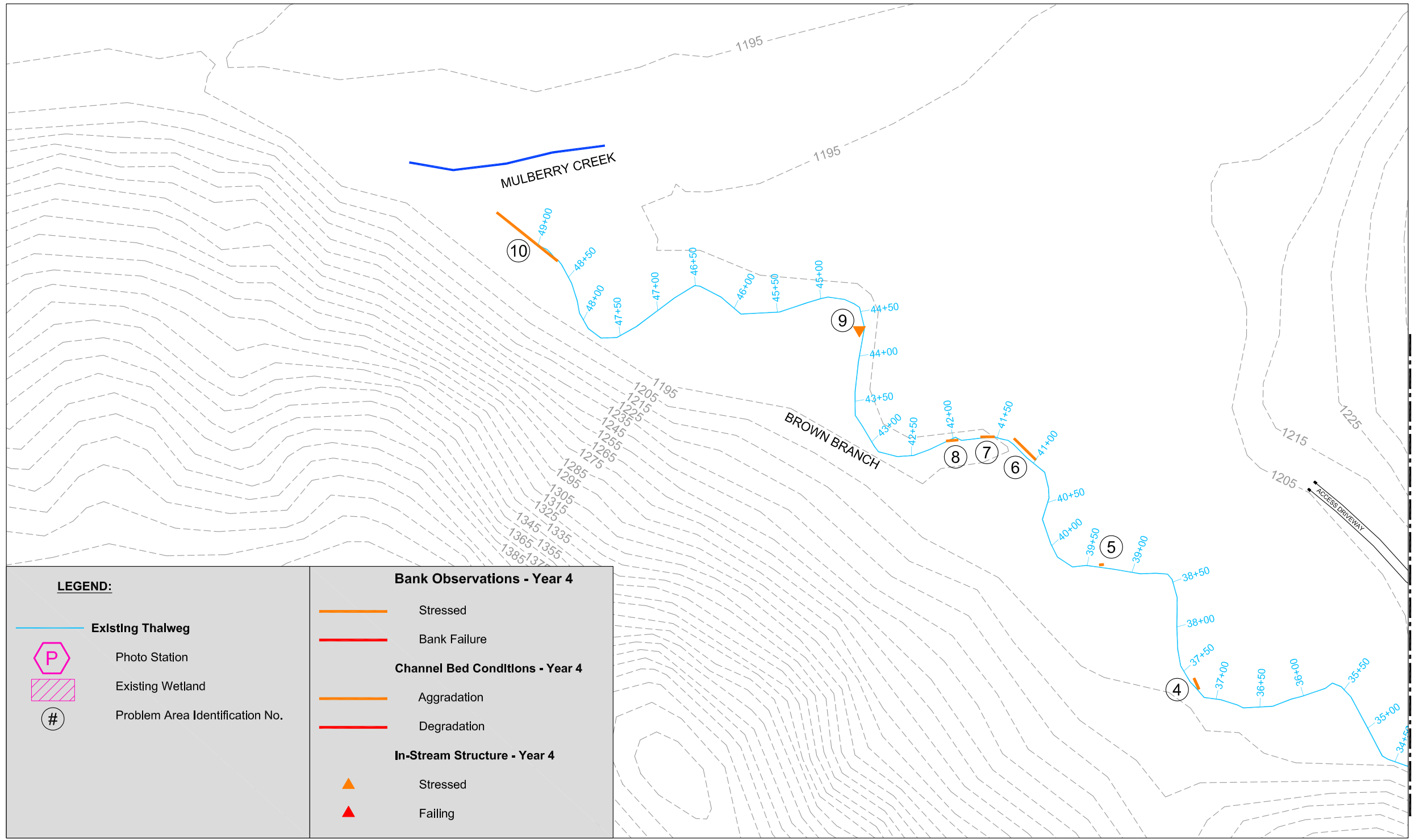
**BROWN BRANCH RESTORATION
YEAR 4 MONITORING
CALDWELL COUNTY, NORTH CAROLINA**

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 072204_ABLT_CD.dwg, PROVIDED BY NC EEP, DATED AUGUST 20, 2004.

**PROBLEM AREA PLAN VIEW-
SEPTEMBER 2006**

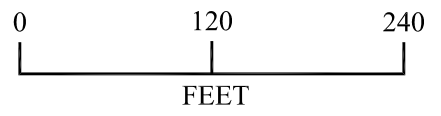
NC EEP Project : 53
Project: 6470-06-1410/02



LEGEND:		Bank Observations - Year 4	
	Existing Thalweg		Stressed
	Photo Station		Bank Failure
	Existing Wetland	Channel Bed Conditions - Year 4	
	Problem Area Identification No.		Aggradation
			Degradation
		In-Stream Structure - Year 4	
			Stressed
			Falling

MATCH LINE TO FIGURE 4

1" = 120'
 ECOLOGIC, NCDOT (10' Contour Elevations)



Prepared by / Date: R.R./12-20-06
 Checked by/ Date:



**BROWN BRANCH RESTORATION
 YEAR 4 MONITORING
 CALDWELL COUNTY, NORTH CAROLINA**

REFERENCES

1.) BASE MAP TAKEN FROM DIGITAL FILE 072204_ABLT_CD.dwg, PROVIDED BY NC EEP, DATED AUGUST 20, 2004.

**PROBLEM AREA PLAN VIEW-
 SEPTEMBER 2006**

NC EEP Project : 53
 Project: 6470-06-1410/02

Exhibit Table B.1.a - Stream Problem Areas			
Feature/Issue	Station/Range	Problem Cause	Photo #
Engineered Structures	20+86	Scour under log vane	*
	38+40	Scour under J-hook vane	*
	20+86	Scour under log vane	*
Bank Scour	38+40	Scour under J-hook vane	5
Aggradation/ Bar	14+72	Mid-channel bar	4
	38+00	Mid-channel bar	*
	43+10	Mid-channel bar	*
	44+00	Mid-channel bar	9
Other	8+20	Fallen Tree in creek	3
	15+12	Fallen Tree in creek	*

* - Photo over-exposed or not usable.

**North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
Problem Areas Photographic Log – Brown Branch – NC EEP #53**



PHOTOLOG SHEET
Site: Brown Branch Problem Area
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: October 2006
Photo #: 3
Photographed by: R.E. Spears
Description: Tree fall area. Erosion has started to impact the right bank. Recommend removing the tree.



Site: Brown Branch Problem Area
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: October 2006
Photo #: 4
Photographed by: R.E. Spears
Description: Aggradations in stream channel causing minor scour along the left bank due to stream widening and adjusting wavelength.

**North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
Problem Areas Photographic Log – Brown Branch – NC EEP #53**



PHOTOLOG SHEET
Site: Brown Branch Problem Area
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: October 2006
Photo #: 5
Photographed by: R.E. Spears
Description: J-hook vane severely eroded due to adjustment of stream grade in the area upstream of cross-section 3 near the pond.



PHOTOLOG SHEET
Site: Brown Branch Problem Area
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: May 2006
Photo #: 7
Description: Example of failed structure in stream channel bed. Stream has stabilized in this area.

North Carolina Ecosystem Enhancement Program (NC EEP)
Caldwell County, North Carolina
 Problem Areas Photographic Log – Brown Branch – NC EEP #53



PHOTOLOG SHEET
Site: Brown Branch Problem Area
Caldwell County, North Carolina
Project No: 6470-06-1410.02
Date: October 2006
Photo #: 9
Photographed by: R.E. Spears
Description: Mid channel bar formation at cross-section 5.

Table B.1.b. Qualitative Visual Stability Assessment

Project Number:53

Segment/Reach: Brown Branch

Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	28	28	0	100	
	2. Armor stable (e.g. no displacement)?	28	28	0	100	
	3. Facet grade appears stable?	28	28	0	100	
	4. Stable interval grade?	28	28	0	100	
	5. Feature spacing appropriate?	28	28	0	100	
	6. Minimal evidence of embedding/fining?	28	28	0	100	
	7. Depth appears appropriate for current discharge?	28	28	0	100	
	8. Length appropriate?	28	28	0	100	
						100
B. Pools	1. Present? (e.g not subject to severe aggradation?) 4	34	34	0	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	34	34	0	100	
	3. Thalweg located outer bend?	34	34	0	100	
	4. Spacing appropriate?	34	34	0	100	
	5. Non-aggrading (not filling)?	34	34	0	100	
	6. Length appropriate?	34	34	0	100	
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	34	34	0	100	
	2. Downstream of meander (glide/inflection) centering?	34	34	0	100	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	38	38	0	100	
	2. Of those eroding, # w/concomitant point bar formation?	0	NA	0	NA	
	3. Apparent Rc within spec?	38	38	NA	100	38
	4. Sufficient floodplain access and relief?	38	38	0	100	38
E. Bed General	1. General channel bed aggradation areas (bar formation)	All	NA	None	100	
	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	None	NA	None	100	
F. Channel Capac./Dimen.	1. Channel width: depth appears out of design/type spec?	None	NA	None	100	
G. Banks	1. Apparent scour points from channel processes	All	NA	None	100	
	2. Apparent cut points from overland flow	None	NA	None	100	
	3. Apparent cut or scour from flood water re-entry to channel (e.g. inadequate floodplain access?)	None	NA	None	100	
	4. Tension cracks	None	NA	None	100	
	5. Unstable cantilever blocks (e.g. height/undercut/soil type versus vegetation penetration and extent)	None	NA	None	100	
	5. Bank gradient in excess of 40%?	All	NA	None	100	
	6. Collapse/slumping	3	NA	None	100	
	7. Ratio of bank height: bankfull height elevated	3	3	0	100	3
H. Vanes	1. Free of back or arm scour?	3	3	0	100	3
	2. Height appropriate?	3	3	0	100	3
	3. Angle and geometry appear appropriate?	3	3	0	100	3
	4. Free of piping or other structural failures?	7	7	None	100	
I. Wads/Boulders	1. Free of scour?	All	NA	None	100	
	2. Footing stable?	4	4	0	100	

* = Historical project documents necessary to provide this data were unavailable at the time of this report submission.

Project Name Brown Branch
Cross Section #1
Feature Riffle
Date 11/10/2006
Crew Spears, J. Smith(Cav.)

2002 As-Built Survey			2003 2003 Survey			2004 2004 Survey			2006 2006 Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elev	Notes	Station	Elev	Notes
0.0	1195.09	lp	0.0	1195.09	lp	0	1195.09 lp		0	1195.09 lp	
0.0	1194.58		0.0	1194.59		0.3	1194.62		0	1194.59	
2.8	1194.49		2.5	1194.44		7.4	1194.14		2.5	1194.44	
5.8	1194.32		5.5	1194.22		15.5	1193.31 bkf		5.5	1194.22	
8.8	1194.02		8.5	1193.98		17.7	1192.05		8.5	1193.98	
11.8	1193.77		11.5	1193.76		21.7	1191.58		11.5	1193.76	
14.8	1193.50	bkf	13.5	1193.57		23.5	1191.35		13.5	1193.57	
17.1	1192.73		14.5	1193.49	bkf	25.3	1191.26		14.5	1193.49 bkf	
18.5	1192.23		15.9	1193.14		27	1191.28		15.9	1193.14	
21.3	1192.05		16.0	1192.51		27.7	1191.34		16	1192.51	
23.4	1191.68		17.2	1192		28.1	1191.67		17.2	1192	
25.3	1191.94		20.5	1191.71		30.1	1192.28		20.5	1191.71	
25.6	1192.24		23.5	1191.42		30.7	1193.36		23.5	1191.42	
27.0	1193.50	bkf	25.6	1191.17		32.1	1195.54		25.6	1191.17	
27.9	1194.17		27.9	1191.44		40.6	1195.87		27.9	1191.44	
31.7	1195.55		29.7	1192		51.6	1195.87		29.7	1192	
34.8	1195.90		30.0	1193.4		51.6	1196.26	rp	30	1193.4 bkf	
37.8	1195.97		31.3	1195.52					31.3	1195.52	
40.8	1195.80		34.3	1195.81					34.3	1195.81	
43.8	1195.83		37.5	1196					37.5	1196	
46.8	1196.23		40.5	1195.85					40.45	1195.85	
49.8	1196.03		43.5	1195.86					43.45	1195.86	
51.3	1196.08		46.5	1196.17					46.45	1196.17	
51.3	1196.31	rp	49.5	1195.98					49.45	1195.98	
			51.3	1195.97	rp				51.3	1195.97 rp	



Bankfull Area				
	As Built	2003	2004	2006
Area	14.1	26.18	21.26	26.18
Width	12.2	16.5	15.2	16.5
Mean Depth	1.2	1.6	1.4	1.6
Max Depth	1.8	2.3	2.2	2.3
w/d ratio	10.6	10.4	10.9	10.4
FPW	>100	>100	>100	>100
ER (greater than)	8.2	6.1	6.6	6.1
Stream Type	C	E	C	C

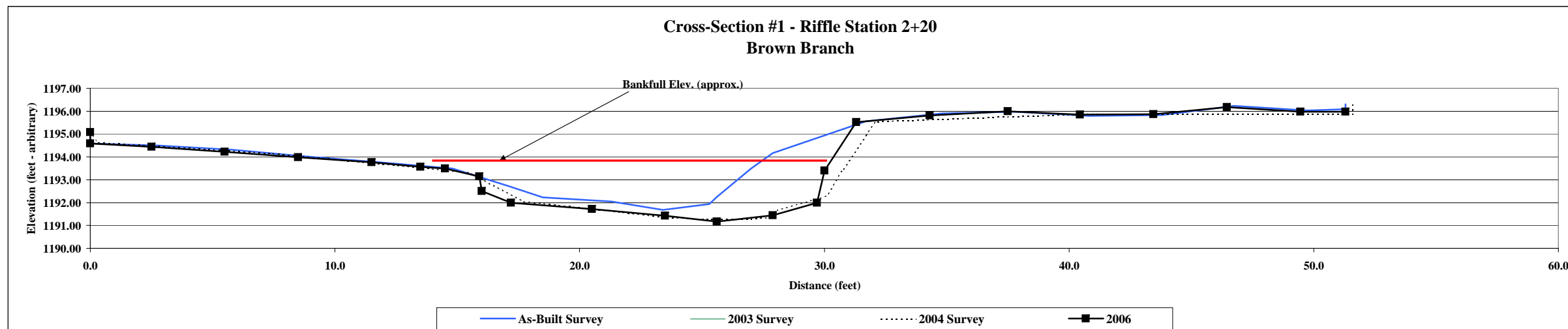


Photo of Cross-Section #1 - Looking Downstream

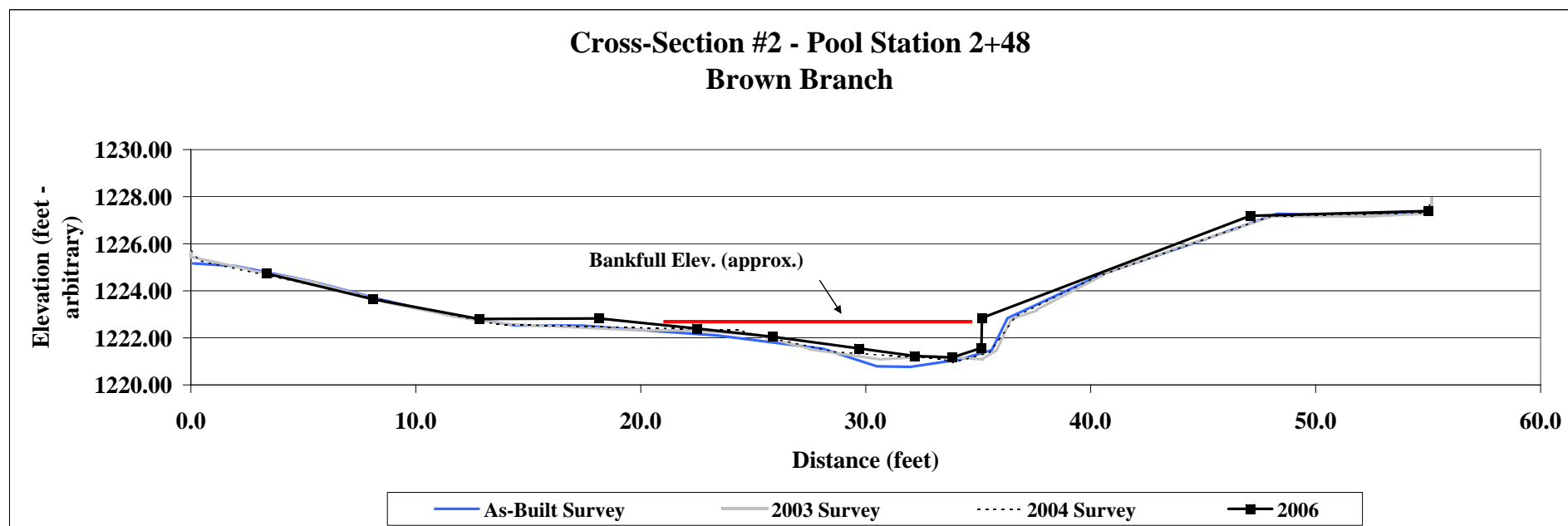
Project Name	Brown Branch
Cross Section	#2 (pins C-D)
Feature	Pool
Date	11/10/2006
Crew	R. Spears, J. Smith(Cav.)

2002 As-Built Survey			2003 2003 Survey			2004 2004 Survey			2006 2006 Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elev	Notes	Station	Elev	Notes
0.0	1225.63	lp	0	1225.64	lp	0	1225.69	lp	0	1225.2103	lp
0.1	1225.16		0	1225.46		0.4	1225.28		3.359604	1224.733	
2.0	1225.05		2.6	1224.89		13.6	1222.58	bkf	8.111064	1223.64	
5.4	1224.39		5.6	1224.34		24.4	1222.34		12.82685	1222.805	
8.4	1223.64		8.6	1223.54		24.9	1222.18		18.13662	1222.82	bkf
11.4	1222.98		11.6	1222.93		28.6	1221.41		22.50321	1222.393	
14.4	1222.53	bkf	14	1222.59	bkf	33.4	1221.11		25.87437	1222.051	
17.4	1222.52		16.6	1222.48		33.9	1220.95		29.71429	1221.553	
20.4	1222.31		19.6	1222.34		35.5	1221.39		32.16516	1221.228	
23.4	1222.10		22.6	1222.3		36.7	1222.93	bkf	33.83527	1221.161	
28.1	1221.54		25.2	1222.12		40.2	1224.58		35.14181	1221.572	
30.5	1220.79		27.5	1221.52		48	1227.18		35.16942	1222.846	bkf
32.0	1220.77		30.6	1221.09		55	1227.33		47.08773	1227.185	
34.2	1221.08		33.1	1221.22		55.1	1227.85	rp	55.00648	1227.389	
35.6	1221.48		35.2	1221.09							
36.3	1222.84	bkf	35.8	1221.5							
40.5	1224.70		36.5	1222.79							
45.1	1226.19		37.6	1223.17							
48.3	1227.28		40.6	1224.72							
51.4	1227.18		43.6	1225.74							
55.2	1227.33		46.575	1226.67							
55.2	1227.91	rp	48.075	1227.17							
			52.575	1227.18							
			55.155	1227.29							
			55.155	1227.91	rp						

Bankfull Area				
	As-Built	2003	2004	2006
Area	16.1	24.10	14.98	15.3
Width	21.9	24.2	36.3	17.0
Mean Depth	0.7	1.0	0.4	0.9
Max Depth	1.8	1.7	1.9	1.7



Photo of Area 1 Cross-Section #2 - Looking downstream



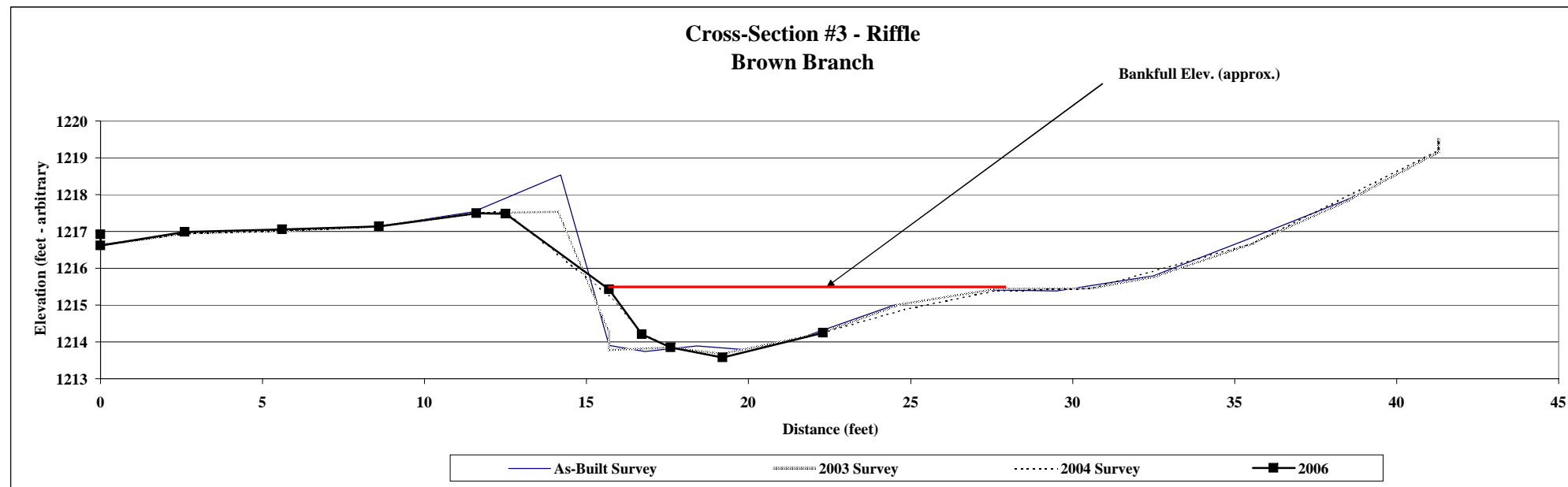
Project Name	Brown Branch
Cross Section	#3
Feature	Riffle
Date	11/10/2006
Crew	R. Spears, J. Smith(Cav.)

2002 As-Built Survey			2003 2003 Survey			2004 2004 Survey			2006 2006 Survey		
Station	Elevation	Notes	Station	Elev*	Notes	Station	Elev	Notes	Station	Elev	Notes
0	1216.94		0	1216.95		0	1216.95		0	1216.92	
0	1216.64		0	1216.61		0	1216.61		0	1216.61	
2.5	1216.93		2.6	1216.94		2.6	1216.94		2.6	1216.98	
5.5	1217.03		5.6	1217.02		5.6	1217.02		5.6	1217.06	
8.5	1217.12		8.6	1217.14		8.6	1217.14		8.6	1217.14	
11.5	1217.54		11.6	1217.5		11.6	1217.5		11.6	1217.5	
14.2	1218.53		14.1	1217.54		12.5	1217.54		12.5	1217.48	
15.7	1213.91 bkf		15.7	1214.28 bkf		15.7	1215.25		15.7	1215.42 bkf	
16.8	1213.74		15.7	1213.78		16.7	1214.23		16.7	1214.21	
18.4	1213.89		17.6	1213.85		17.6	1213.85		17.6	1213.85	
19.8	1213.8		19.2	1213.67		19.2	1213.57		19.2	1213.57	
21.4	1214.04		22.3	1214.25		22.3	1214.24		22.3	1214.24	
24.5	1215		24.6	1215	0	24.8	1214.88		24.8	1214.88	
27.5	1215.41 bkf		27.6	1215.44	bkf	27.6	1215.39	bkf	27.6	1215.4	bkf
29.5	1215.39		30.6	1215.45		30.6	1215.45		30.6	1215.45	
32.5	1215.79		32.6	1215.78		35.6	1216.69		35.6	1216.69	
35.5	1216.82		35.6	1216.69		41.3	1219.2		41.3	1219.2	
38.5	1217.87		38.6	1217.88		41.3	1219.5		41.3	1219.5	
41.3	1219.14		41.3	1219.18							
41.3	1219.49		41.3	1219.5							



Bankfull Area				
	As-Built	2003	2004	2006
Area	15.8	15.98	14.21	14.96
Width	13.8	11.9	11.9	14.9
Mean Depth	1.1	1.3	1.19	1.00
Max Depth	1.7	1.7	1.8	1.8
w/d ratio	12.1	8.9	10.0	14.8
FPW			>100	
ER (greater than)	7.2	8.4	8.4	6.7
Stream Type	C	C	E	E

Photo of Area 2 Cross-Section #3 - Looking Downstream



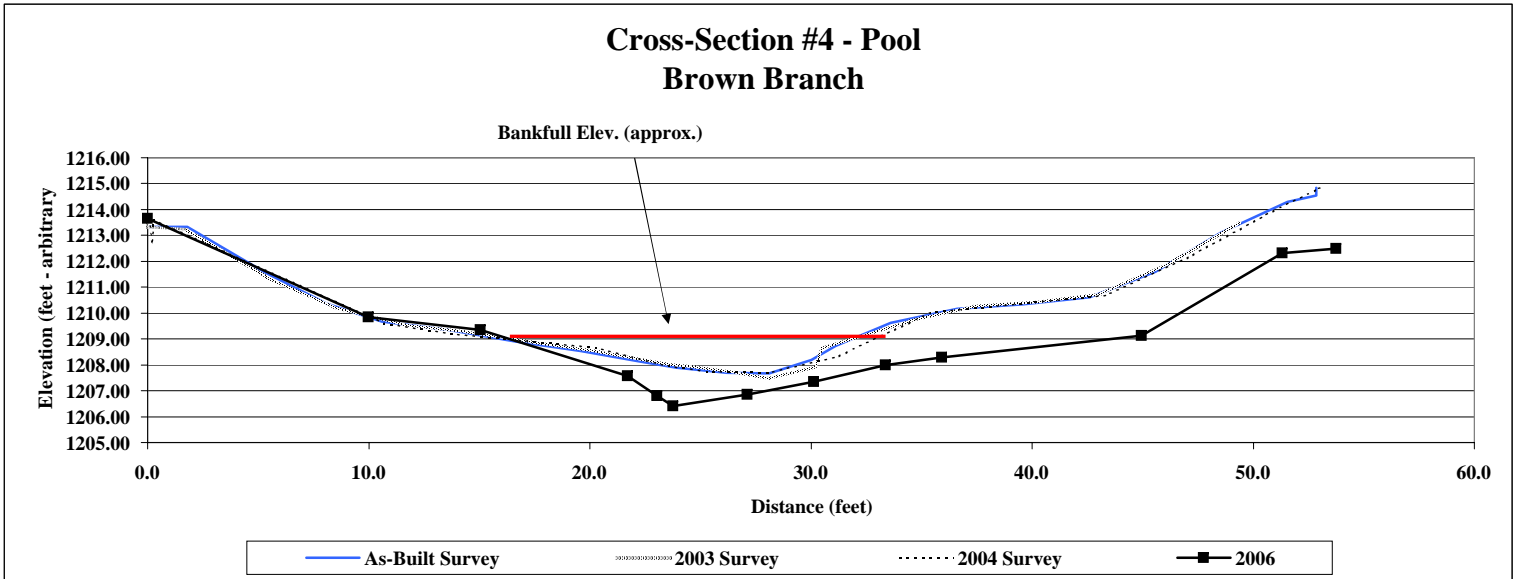
Project Name	Brown Branch
Cross Section	#4
Feature	Pool
Date	11/10/2006
Crew	R. Spears, J. Smith(Cav.)

2002 As-Built Survey			2003 2003 Survey			2004 2004 Survey			2006 2006 Survey		
Station	Elevation	Notes	Station	Elev*	Notes	Station	Elev	Notes	Station	Elev	Notes
0.0	1213.65		0	1213.65		0	1213.64		0	1213.65	
0.0	1213.33		0.0	1213.34		0.1	1213.74		9.97486549	1209.8427	
1.8	1213.33		1.8	1213.24		0.2	1212.64		15.0523442	1209.3629	bkf
5.3	1211.57		5.4	1211.37		0.3	1213.59		21.7145223	1207.5592	
8.1	1210.36		8.4	1210.25		0.3	1213.59		23.0509778	1206.8164	
10.6	1209.66	bkf	11.6	1209.54	bkf	10.7	1209.6	bkf	23.7498776	1206.4014	
13.6	1209.36		14.4	1209.27		13.7	1209.2		27.1113721	1206.843	
16.6	1208.91		17.4	1208.88		20.3	1208.67		30.1316201	1207.3441	
19.6	1208.53		20.4	1208.52		23.6	1207.93		33.370253	1207.9794	
22.2	1208.15		23.4	1208.03		25.3	1207.75		35.9157631	1208.2808	
23.9	1207.90		24.8	1207.92		28.1	1207.69		44.9547122	1209.1383	
26.2	1207.69		26.7	1207.69		31.2	1208.31		51.3073468	1212.3219	
28.1	1207.67		28.1	1207.48		35.4	1210.01		53.7589617	1212.5012	
30.0	1208.18		30.2	1207.92		43.4	1210.68				
31.1	1208.74		30.5	1208.63		47.2	1212.22				
33.6	1209.63		34.5	1209.69		50.6	1213.8				
36.6	1210.17		37.4	1210.26		52.9	1214.8				
39.6	1210.35		40.4	1210.43		52.9	1214.82				
42.6	1210.61		43.1	1210.74		53.1	1214.86				
45.6	1211.60		46.4	1212							
48.6	1213.11		49.4	1213.53							
51.6	1214.29		52.4	1214.43							
52.9	1214.54		52.9	1214.53							
52.9	1214.85		52.9	1214.85							

	Bankfull Area			
	As-Built	2003	2004	2006
Area	23.3	23.78	26.72	36.10
Width	23.0	25.8	32.7	20.9
Mean Depth	1.0	0.9	0.8	1.7
Max Depth	1.9	1.9	1.9	3.2



Photo of Cross-Section #4 - Looking Upstream



Project Name	Brown Branch
Cross Section	#5
Feature	Riffle
Date	11/10/2006
Crew	R. Spears, J. Smith(Cav.)

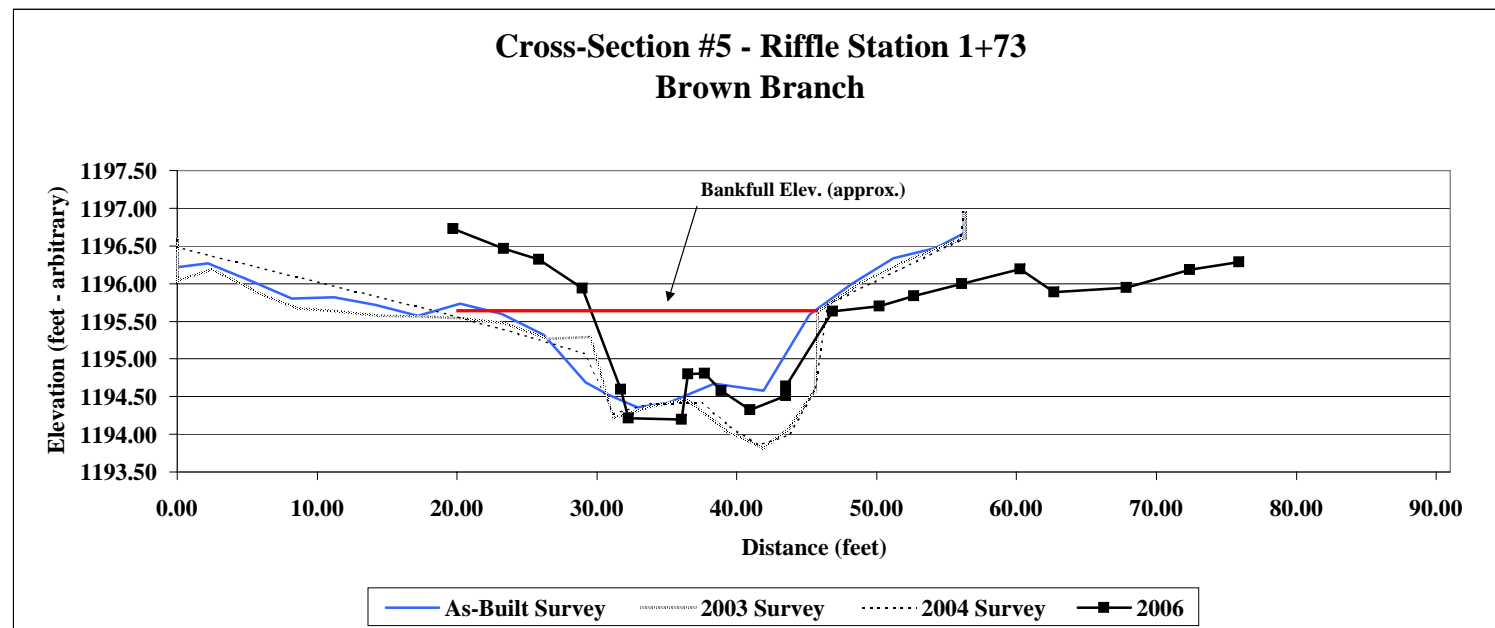
2006 data adjusted by 19.71 feet horizontal

2002 As-Built Survey			2003 2003 Survey			2004 2004 Survey			2006 2006 Survey		
Station	Elevation	Notes	Station	Elev*	Notes	Station	Elev**	Notes	Station	Elev**	Notes
0.00	1196.58	lp	0.0	1196.58	p	0.0	1196.58	lp	75.9	1196.28579	lp
0.00	1196.22		0.0	1196.03		0.0	1196.48		72.4	1196.18238	
2.20	1196.27		2.5	1196.19		19.2	1195.6		67.9	1195.94811	
5.20	1196.04		5.5	1195.9		25.2	1195.29	bkf	62.7	1195.88472	bkf
8.20	1195.80		8.5	1195.67		29.1	1195.07		60.3	1196.18876	
11.20	1195.82		11.5	1195.63		31.2	1194.27		56.1	1195.99339	
14.20	1195.72		14.5	1195.57		33.9	1194.41		52.6	1195.83419	
17.20	1195.57		17.5	1195.56		37.5	1194.42		50.2	1195.70203	
20.20	1195.73		20.5	1195.54		39.4	1194.12		46.8	1195.63492	
23.20	1195.60		23.5	1195.47		41.6	1193.86		43.5	1194.64225	
26.20	1195.32	bkf	26.5	1195.27		43.7	1193.98		43.5	1194.51261	
29.20	1194.69		29.5	1195.29	bkf	45.6	1194.59		41.0	1194.32406	
30.80	1194.53		31.2	1194.21		46.5	1195.72		38.9	1194.57548	
32.90	1194.36		33.5	1194.35		56.0	1196.58		37.7	1194.80935	
35.10	1194.42		36.5	1194.47		56.2	1196.95	rp	36.5	1194.79887	
38.40	1194.67		39.2	1194.05					36.1	1194.19463	
41.90	1194.58	bkf	41.9	1193.81					32.3	1194.21518	
45.20	1195.59		43.5	1194.05					31.7	1194.59799	
48.20	1196.00		45.6	1194.57					28.9	1195.9336	
51.20	1196.34		45.8	1195.62					25.9	1196.31752	
54.20	1196.47		48.5	1195.97					23.3	1196.46499	
56.25	1196.67		51.5	1196.25					19.7	1196.72371	rp
56.25	1196.94	rp	54.5	1196.48							
			56.3	1196.61							
			56.3	1196.94	rp						

	Bankfull Area			
	As-Built	2003	2004	2006
Area	9.7	14.92	15.12	9.03
Width	15.7	16.1	20.4	15.2
Mean Depth	0.6	0.9	0.7	0.6
Max Depth	1.0	1.5	1.5	1.1
w/d ratio	25.4	17.4	27.5	25.4
FPW			>100	
ER (greater than)	6.4	6.2	4.9	6.6
Stream Type	E	E	E	E



Photo of Cross-Section #5 - Looking Downstream



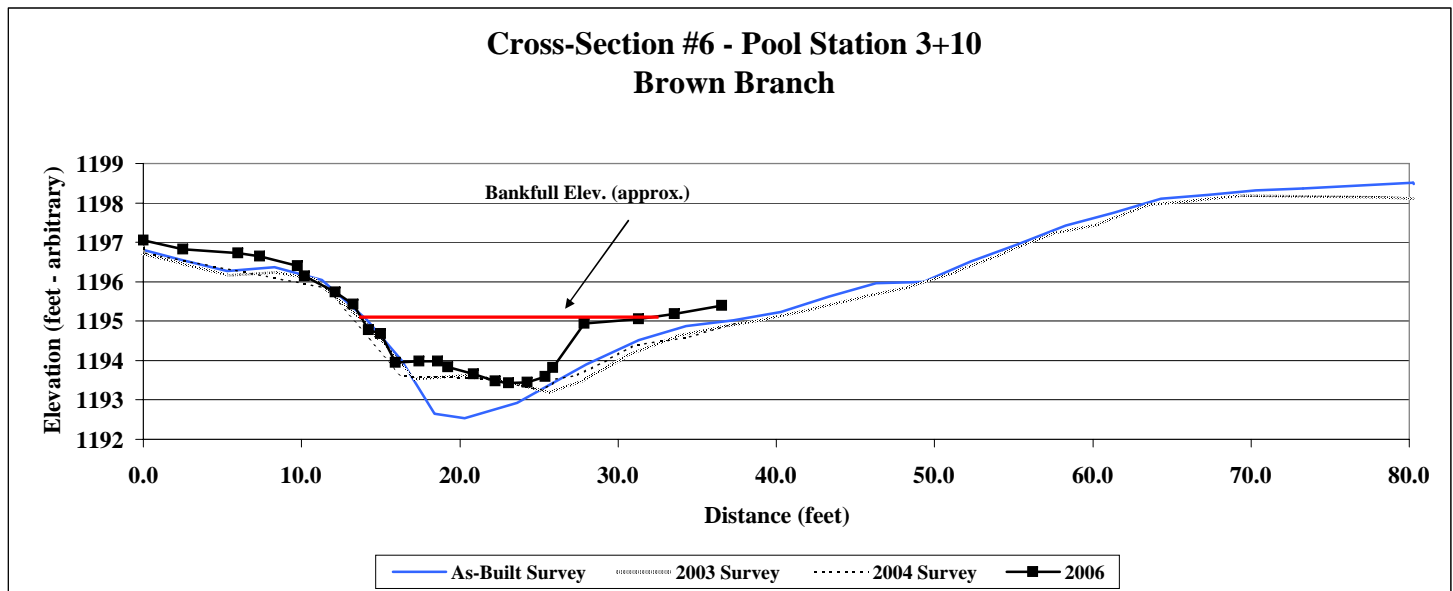
Project Name Brown Branch
Cross Section #6
Feature Pool
Date 11/10/2006
Crew R. Spears, J. Smith(Cav.)

2002 As-Built Survey			2003 2003 Survey			2004 2004 Survey			2006 2006 Survey		
Station	Elevation	Notes	Station	Elev	Notes	Station	Elev	Notes	Station	Elev	Notes
0.0	1197.06		0	1197.04		0	1197.05		0.00	1197.05	
0.0	1196.8		0.00	1196.71		0.10	1196.72		2.51	1196.82	
2.3	1196.56		2.40	1196.47		11.20	1195.87		5.98	1196.72	
5.3	1196.27		5.40	1196.16		11.40	1195.88		7.34	1196.64	
8.3	1196.37		8.40	1196.24		16.30	1193.61		9.76	1196.40	
11.3	1196.04		10.90	1196.06		21.50	1193.55		10.18	1196.15	
14.1	1195.04 bkf		13.80	1195.03 bkf		25.20	1193.25		12.15	1195.74	
16.3	1194.02		14.80	1194.57		25.80	1193.39		13.25	1195.43 bkf	
18.4	1192.65		17.20	1193.53		26.10	1193.52		14.24	1194.77	
20.3	1192.54		20.40	1193.62		27.40	1193.62		15.01	1194.68	
23.6	1192.92		22.60	1193.51		29.30	1194.00		15.94	1193.94	
28.0	1193.9		25.70	1193.18		31.00	1194.38		17.43	1193.98	
31.3	1194.52		27.80	1193.49		34.40	1194.58		18.61	1193.99	
34.3	1194.88		30.40	1194.10		37.50	1194.96	bkf	19.26	1193.83	
37.3	1195.02 bkf		33.70	1194.62					20.86	1193.66	
40.3	1195.24		36.40	1194.84					22.24	1193.48	
43.3	1195.62		39.40	1195.05 bkf					23.08	1193.42	
46.3	1195.96		42.40	1195.32					24.27	1193.44	
49.3	1196		45.40	1195.60					25.39	1193.59	
52.3	1196.52		48.40	1195.87					25.89	1193.82	
55.3	1196.96		51.40	1196.25					27.85	1194.95	
58.3	1197.43		54.40	1196.72					31.29	1195.06 bkf	
61.3	1197.75		57.40	1197.21					33.58	1195.19	
64.3	1198.11		60.40	1197.45					36.55	1195.40	
67.3	1198.2		63.40	1197.95							
70.3	1198.32		66.40	1198.07							
73.3	1198.37		69.40	1198.19							
80.3	1198.51		78.40	1198.14							
80.3	1198.48		80.30	1198.11							

	Bankfull Area			
	As-Built	2003	2004	2006
Area	31.2	26.13	26.63	16.49
Width	26.2	28.6	26.1	20.6
Mean Depth	1.2	0.9	1.0	0.8
Max Depth	2.5	1.8	1.8	1.6



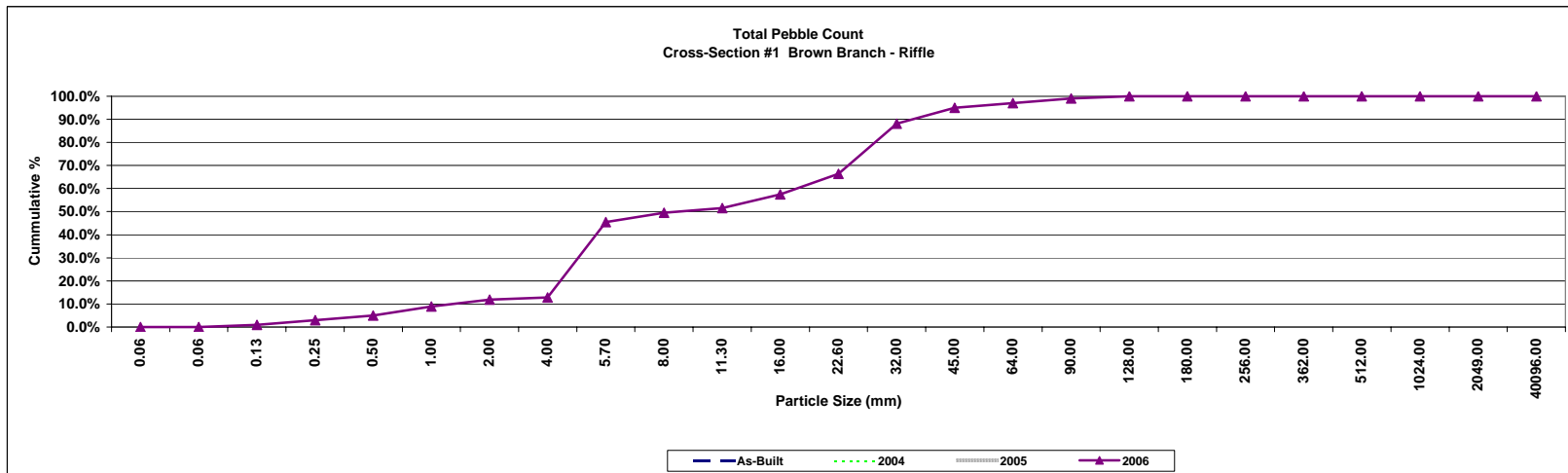
Photo of Cross-Section #6 - Looking Downstream



Project Name	Brown Branch
Cross Section	#1
Feature	Riffle
Date	11/31/06
Crew	R.E. Spears
Notes	Pebble count data not available for 2002-2005.

Description	Material	As-Built					2003					2004					2005					
		Size (mm)	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	d16	d35	d50	d84	d95	Riffle - Bed	Riffle - Bank	%	Cum %	%	Cum %
Silt/Clay	silt/clay	0.061	N/A														N/A	N/A				
Sand	very fine sand	0.062	N/A														N/A	N/A				
	fine sand	0.125	N/A														N/A	N/A				
	medium sand	0.25	N/A														N/A	N/A				
	course sand	0.50	N/A														N/A	N/A				
	very course sand	1.0	N/A														N/A	N/A				
Gravel	very fine gravel	2.0	N/A														N/A	N/A				
	fine gravel	4.0	N/A														N/A	N/A				
	fine gravel	5.7	N/A														N/A	N/A				
	medium gravel	8.0	N/A														N/A	N/A				
	medium gravel	11.3	N/A														N/A	N/A				
	course gravel	16.0	N/A														N/A	N/A				
	course gravel	22.6	N/A														N/A	N/A				
	very course gravel	32	N/A														N/A	N/A				
Cobble	small cobble	64	N/A														N/A	N/A				
	medium cobble	90	N/A														N/A	N/A				
	large cobble	128	N/A														N/A	N/A				
	very large cobble	180	N/A														N/A	N/A				
Boulder	small boulder	256	N/A														N/A	N/A				
	small boulder	362	N/A														N/A	N/A				
	medium boulder	512	N/A														N/A	N/A				
	large boulder	1024	N/A														N/A	N/A				
Bedrock	bedrock	40096	N/A														N/A	N/A				
TOTAL / %of whole count			N/A														N/A	N/A				

	d16	d35	d50	d84	d95
As-Built	N/A	N/A	N/A	N/A	N/A
2003	N/A	N/A	N/A	N/A	N/A
2004	N/A	N/A	N/A	N/A	N/A
2005	N/A	N/A	N/A	N/A	N/A
2006	5.04	6.20	10.65	36.38	54.39

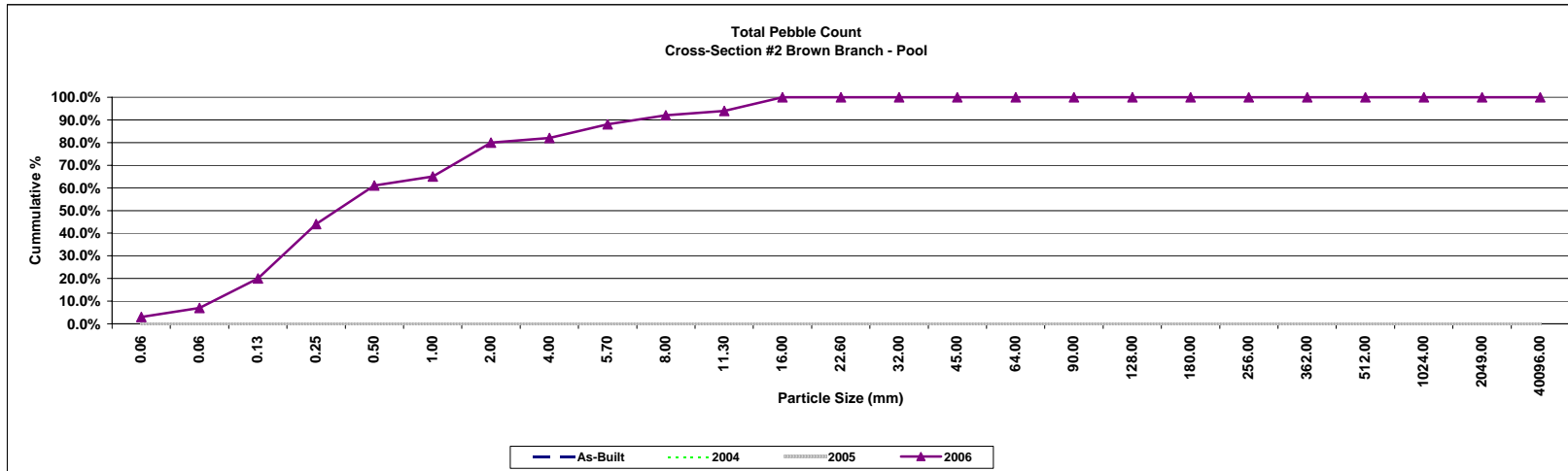


2006				2007																		
Rifle - Bed	Rifle - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	Rifle - Bed	Rifle - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	
		0.0%	0.0%						0.0%	0.0%			0.0%	0.0%								
		0.0%	0.0%						0.0%	0.0%			0.0%	0.0%								
1		1.0%	1.0%						1.0%	1.0%			0.0%	0.0%								
2		2.0%	3.0%						2.0%	3.0%			0.0%	0.0%								
2		2.0%	5.0%						2.0%	5.0%			0.0%	0.0%								
4		4.0%	8.9%						4.0%	8.9%			0.0%	0.0%								
3		3.0%	11.9%						3.0%	11.9%			0.0%	0.0%								
1		1.0%	12.9%						1.0%	12.9%			0.0%	0.0%								
33		32.7%	45.5%	5.042	6.205				32.7%	45.5%			0.0%	0.0%								
4		4.0%	49.5%						4.0%	49.5%			0.0%	0.0%								
2		2.0%	51.5%			10.650			2.0%	51.5%			0.0%	0.0%								
6		5.9%	57.4%						5.9%	57.4%			0.0%	0.0%								
9		8.9%	66.3%						8.9%	66.3%			0.0%	0.0%								
22		21.8%	88.1%				36.382		21.8%	88.1%			0.0%	0.0%								
7		6.9%	95.0%					54.386	6.9%	95.0%			0.0%	0.0%								
2		2.0%	97.0%						2.0%	97.0%			0.0%	0.0%								
2		2.0%	99.0%						2.0%	99.0%			0.0%	0.0%								
1		1.0%	100.0%						1.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
101	0	100.0%		5.041515	6.204545	10.65	36.38218	54.38571	100.0%		0	0	0.0%									

Project Name Brown Branch
Cross Section #2
Feature Pool
Date 11/31/06
Crew R.E. Spears
Notes Pebble count data not available for 2000-2005.

Description	Material	As-Built					2003					2004					2005						
		Size (mm)	Pool - Bed	%	Cum %	Pool - Bed	%	Cum %	Pool - Bed	%	Cum %	d16	d35	d50	d84	d95	Pool - Bed	Pool - Bank	%	Cum %	%	Cum %	
Silt/Clay	silt/clay	0.061			N/A			N/A			N/A												
Sand	very fine sand	0.062			N/A			N/A			N/A												
	fine sand	0.125			N/A			N/A			N/A												
	medium sand	0.25			N/A			N/A			N/A												
	course sand	0.50			N/A			N/A			N/A												
	very course sand	1.0			N/A			N/A			N/A												
Gravel	very fine gravel	2.0			N/A			N/A			N/A												
	fine gravel	4.0			N/A			N/A			N/A												
	fine gravel	5.7			N/A			N/A			N/A												
	medium gravel	8.0			N/A			N/A			N/A												
	medium gravel	11.3			N/A			N/A			N/A												
	course gravel	16.0			N/A			N/A			N/A												
	course gravel	22.6			N/A			N/A			N/A												
	very course gravel	32			N/A			N/A			N/A												
very course gravel	45			N/A			N/A			N/A													
Cobble	small cobble	64			N/A			N/A			N/A												
	medium cobble	90			N/A			N/A			N/A												
	large cobble	128			N/A			N/A			N/A												
	very large cobble	180			N/A			N/A			N/A												
Boulder	small boulder	256			N/A			N/A			N/A												
	small boulder	362			N/A			N/A			N/A												
	medium boulder	512			N/A			N/A			N/A												
	large boulder	1024			N/A			N/A			N/A												
very large boulder	2049			N/A			N/A			N/A													
Bedrock	bedrock	40096			N/A	0		N/A	0		N/A	0											
TOTAL / % of whole count			0		N/A	0		N/A	0		N/A	0	0	0	0	0	0	0	0.0%	N/A	0.0%	N/A	

	d16	d35	d50	d84	d95
As-Built	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.00
2006	0.16	0.30	0.51	5.52	14.59

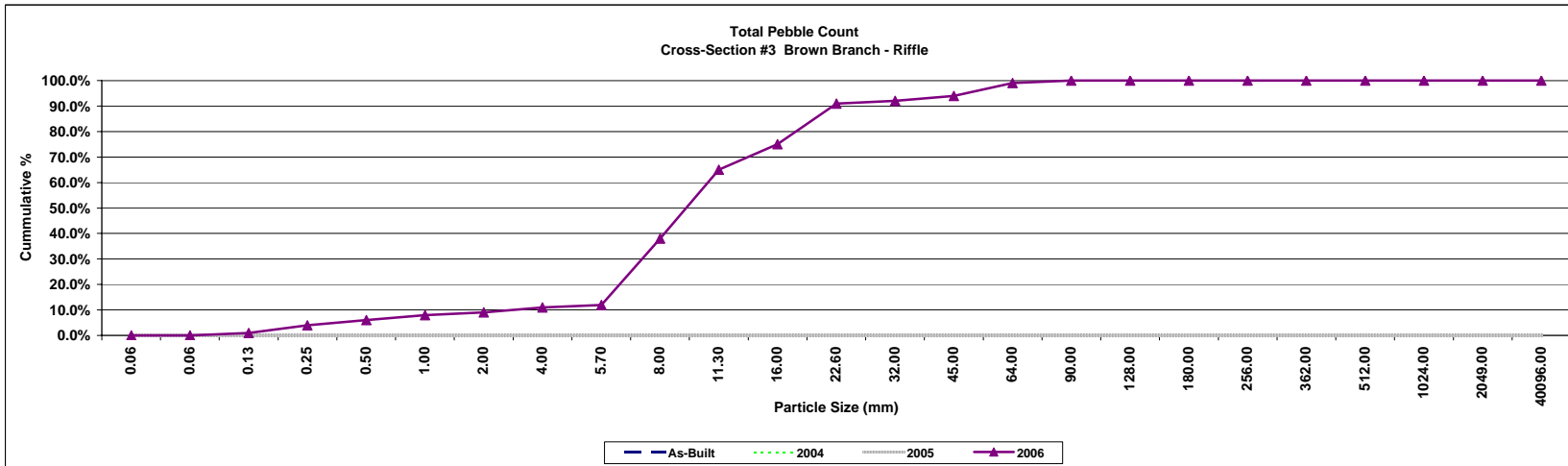


2006				2007																		
Pool - Bed	Pool - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	Pool - Bed	Pool - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	
3		3.0%	3.0%	0.159	0.305	0.507	5.517	14.592	3.0%	3.0%			0.0%	0.0%								
4		4.0%	7.0%						4.0%	7.0%			0.0%	0.0%								
13		13.0%	20.0%						13.0%	20.0%			0.0%	0.0%								
24		24.0%	44.0%						24.0%	44.0%			0.0%	0.0%								
17		17.0%	61.0%						17.0%	61.0%			0.0%	0.0%								
4		4.0%	65.0%						4.0%	65.0%			0.0%	0.0%								
15		15.0%	80.0%						15.0%	80.0%			0.0%	0.0%								
2		2.0%	82.0%						2.0%	82.0%			0.0%	0.0%								
6		6.0%	88.0%						6.0%	88.0%			0.0%	0.0%								
4		4.0%	92.0%						4.0%	92.0%			0.0%	0.0%								
2		2.0%	94.0%						2.0%	94.0%			0.0%	0.0%								
6		6.0%	100.0%						6.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%													
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%													
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%													
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%													
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%													
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%													
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%													
100	0	100.0%		0.158577	0.304688	0.507353	5.516667	14.59167	100.0%		0	0	0.0%		0	0	0	0	0			

Project Name	Brown Branch
Cross Section	#3
Feature	Riffle
Date	11/31/06
Crew	R.E. Spears
Notes	Pebble count data not available for 2000-2005.

Description	Material	Size (mm)	As-Built			2003			2004			2005											
			Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	d16	d35	d50	d84	d95	Riffle - Bed	Riffle - Bank	%	Cum %	%	Cum %	
Silt/Clay	silt/clay	0.061			0.0%			0.0%			0.0%									0.0%			0.0%
Sand	very fine sand	0.062			0.0%			0.0%			0.0%									0.0%			0.0%
	fine sand	0.125			0.0%			0.0%			0.0%									0.0%			0.0%
	medium sand	0.25			0.0%			0.0%			0.0%									0.0%			0.0%
	course sand	0.50			0.0%			0.0%			0.0%									0.0%			0.0%
	very course sand	1.0			0.0%			0.0%			0.0%									0.0%			0.0%
Gravel	very fine gravel	2.0			0.0%			0.0%			0.0%									0.0%			0.0%
	fine gravel	4.0			0.0%			0.0%			0.0%									0.0%			0.0%
	fine gravel	5.7			0.0%			0.0%			0.0%									0.0%			0.0%
	medium gravel	8.0			0.0%			0.0%			0.0%									0.0%			0.0%
	medium gravel	11.3			0.0%			0.0%			0.0%									0.0%			0.0%
	course gravel	16.0			0.0%			0.0%			0.0%									0.0%			0.0%
	course gravel	22.6			0.0%			0.0%			0.0%									0.0%			0.0%
	very course gravel	32			0.0%			0.0%			0.0%									0.0%			0.0%
	very course gravel	45			0.0%			0.0%			0.0%									0.0%			0.0%
Cobble	small cobble	64			0.0%			0.0%			0.0%									0.0%			0.0%
	medium cobble	90			0.0%			0.0%			0.0%									0.0%			0.0%
	large cobble	128			0.0%			0.0%			0.0%									0.0%			0.0%
	very large cobble	180			0.0%			0.0%			0.0%									0.0%			0.0%
Boulder	small boulder	256			0.0%			0.0%			0.0%									0.0%			0.0%
	small boulder	362			0.0%			0.0%			0.0%									0.0%			0.0%
	medium boulder	512			0.0%			0.0%			0.0%									0.0%			0.0%
	large boulder	1024			0.0%			0.0%			0.0%									0.0%			0.0%
Boulder	very large boulder	2049			0.0%			0.0%			0.0%									0.0%			0.0%
Bedrock	bedrock	40096			0.0%	0		0.0%	0		0.0%									0.0%			0.0%
TOTAL / %of whole count			0			0			0			0	0	0	0	0	0	0		0.0%			0.0%

	d16	d35	d50	d84	d95
As-Built	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.00
2006	7.28	9.33	11.43	23.80	59.00

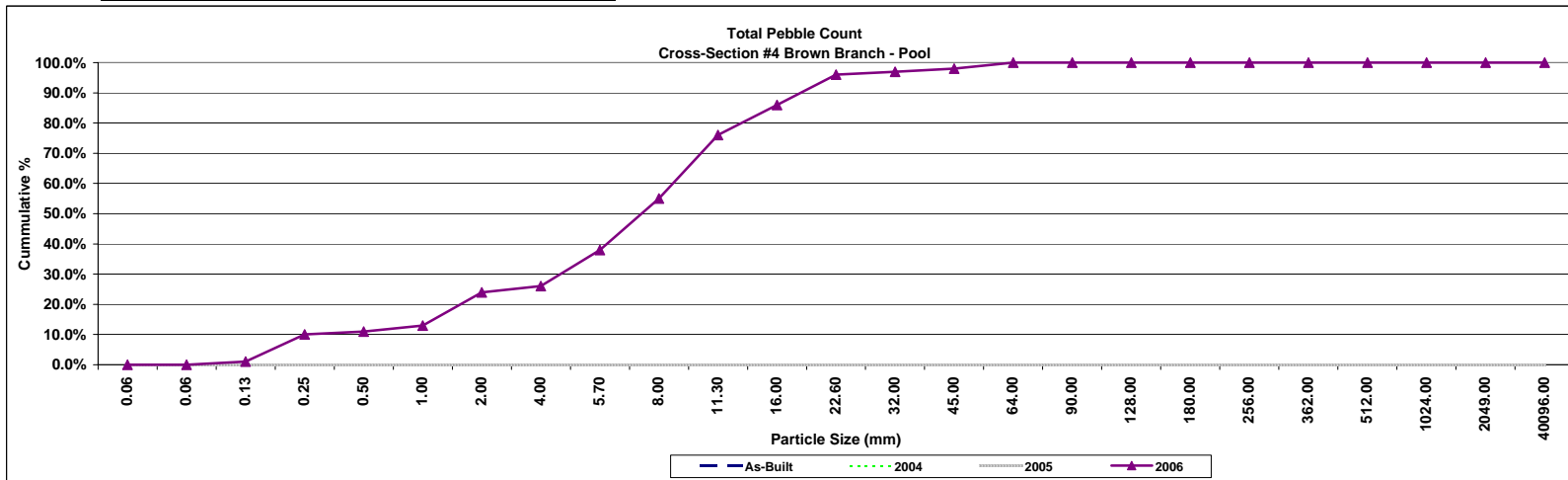


2006				2007																		
Riffle - Bed	Riffle - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	Riffle - Bed	Riffle - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	
0		0.0%	0.0%						0.0%	0.0%			0.0%	0.0%								
0		0.0%	0.0%						0.0%	0.0%			0.0%	0.0%								
1		1.0%	1.0%						1.0%	1.0%			0.0%	0.0%								
3		3.0%	4.0%						3.0%	4.0%			0.0%	0.0%								
2		2.0%	6.0%						2.0%	6.0%			0.0%	0.0%								
2		2.0%	8.0%						2.0%	8.0%			0.0%	0.0%								
1		1.0%	9.0%						1.0%	9.0%			0.0%	0.0%								
2		2.0%	11.0%						2.0%	11.0%			0.0%	0.0%								
1		1.0%	12.0%						1.0%	12.0%			0.0%	0.0%								
26		26.0%	38.0%	7.281	9.327				26.0%	38.0%			0.0%	0.0%								
27		27.0%	65.0%			11.428			27.0%	65.0%			0.0%	0.0%								
10		10.0%	75.0%						10.0%	75.0%			0.0%	0.0%								
16		16.0%	91.0%				23.800		16.0%	91.0%			0.0%	0.0%								
1		1.0%	92.0%						1.0%	92.0%			0.0%	0.0%								
2		2.0%	94.0%						2.0%	94.0%			0.0%	0.0%								
5		5.0%	99.0%					59.000	5.0%	99.0%			0.0%	0.0%								
1		1.0%	100.0%						1.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
100	0	100.0%		7.280769	9.326923	11.42778	23.8	59	100.0%		0	0	0.0%		0	0	0	0	0			

Project Name	Brown Branch
Cross Section	#4
Feature	Pool
Date	11/31/06
Crew	R.E. Spears
Notes	Pebble count data not available for 2000-2005.

Description	Material	As-Built				2003				2004				2005										
		Size (mm)	Pool - Bed	%	Cum %	Pool - Bed	%	Cum %	Pool - Bed	%	Cum %	d16	d35	d50	d84	d95	Pool - Bed	Pool - Bank	%	Cum %	%	Cum %		
Silt/Clay	silt/clay	0.061			0.0%				0.0%													0.0%		0.0%
Sand	very fine sand	0.062			0.0%				0.0%													0.0%		0.0%
	fine sand	0.125			0.0%				0.0%													0.0%		0.0%
	medium sand	0.25			0.0%				0.0%													0.0%		0.0%
	course sand	0.50			0.0%				0.0%													0.0%		0.0%
	very course sand	1.0			0.0%				0.0%													0.0%		0.0%
Gravel	very fine gravel	2.0			0.0%				0.0%													0.0%		0.0%
	fine gravel	4.0			0.0%				0.0%													0.0%		0.0%
	fine gravel	5.7			0.0%				0.0%													0.0%		0.0%
	medium gravel	8.0			0.0%				0.0%													0.0%		0.0%
	medium gravel	11.3			0.0%				0.0%													0.0%		0.0%
	course gravel	16.0			0.0%				0.0%													0.0%		0.0%
	course gravel	22.6			0.0%				0.0%													0.0%		0.0%
	very course gravel	32			0.0%				0.0%													0.0%		0.0%
	very course gravel	45			0.0%				0.0%													0.0%		0.0%
Cobble	small cobble	64			0.0%				0.0%													0.0%		0.0%
	medium cobble	90			0.0%				0.0%													0.0%		0.0%
	large cobble	128			0.0%				0.0%													0.0%		0.0%
	very large cobble	180			0.0%				0.0%													0.0%		0.0%
Boulder	small boulder	256			0.0%				0.0%													0.0%		0.0%
	small boulder	362			0.0%				0.0%													0.0%		0.0%
	medium boulder	512			0.0%				0.0%													0.0%		0.0%
	large boulder	1024			0.0%				0.0%													0.0%		0.0%
very large boulder	2049			0.0%				0.0%													0.0%		0.0%	
Bedrock	bedrock	40096			0.0%	0			0.0%	0												0.0%		0.0%
TOTAL	/%of whole count		0			0				0		0	0	0	0	0	0							

	d16	d35	d50	d84	d95
As-Built	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.00
2006	1.91	6.35	8.83	18.17	26.50

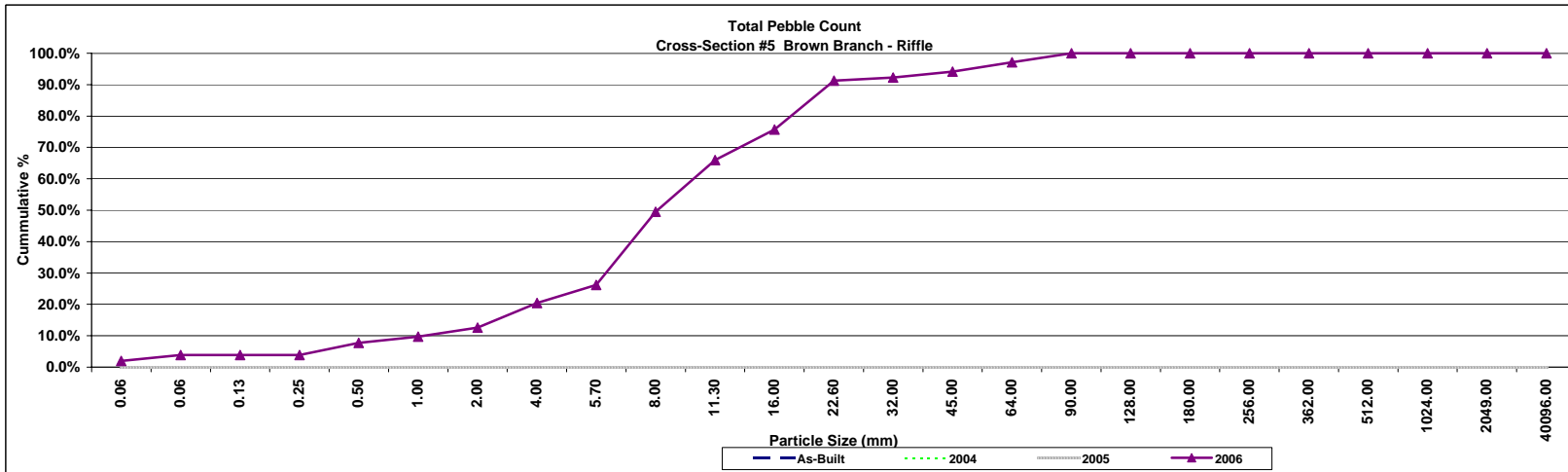


2006				2007																		
Pool - Bed	Pool - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	Pool - Bed	Pool - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	
0		0.0%	0.0%						0.0%	0.0%			0.0%	0.0%								
0		0.0%	0.0%						0.0%	0.0%			0.0%	0.0%								
1		1.0%	1.0%						1.0%	1.0%			0.0%	0.0%								
9		9.0%	10.0%						9.0%	10.0%			0.0%	0.0%								
1		1.0%	11.0%						1.0%	11.0%			0.0%	0.0%								
2		2.0%	13.0%						2.0%	13.0%			0.0%	0.0%								
11		11.0%	24.0%	1.909					11.0%	24.0%			0.0%	0.0%								
2		2.0%	26.0%						2.0%	26.0%			0.0%	0.0%								
12		12.0%	38.0%		6.350				12.0%	38.0%			0.0%	0.0%								
17		17.0%	55.0%			8.826			17.0%	55.0%			0.0%	0.0%								
21		21.0%	76.0%						21.0%	76.0%			0.0%	0.0%								
10		10.0%	86.0%				18.170		10.0%	86.0%			0.0%	0.0%								
10		10.0%	96.0%					26.500	10.0%	96.0%			0.0%	0.0%								
1		1.0%	97.0%						1.0%	97.0%			0.0%	0.0%								
1		1.0%	98.0%						1.0%	98.0%			0.0%	0.0%								
2		2.0%	100.0%						2.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
		0.0%	100.0%						0.0%	100.0%			0.0%	0.0%								
100	0	100.0%		1.909091	6.35	8.826471	18.17	26.5	100.0%		0	0	0.0%		0	0	0	0	0			

Project Name	Brown Branch
Cross Section	#5
Feature	Riffle
Date	11/31/06
Crew	R.E. Spears
Notes	Pebble count data not available for 2000-2005.

Description	Material	As-Built					2003					2004					2005						
		Size (mm)	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	Riffle - Bed	%	Cum %	d16	d35	d50	d84	d95	Riffle - Bed	Riffle - Bank	%	Cum %	%	Cum %	
Silt/Clay	silt/clay	0.061			0.0%					0.0%										0.0%			0.0%
Sand	very fine sand	0.062			0.0%					0.0%										0.0%			0.0%
	fine sand	0.125			0.0%					0.0%										0.0%			0.0%
	medium sand	0.25			0.0%					0.0%										0.0%			0.0%
	course sand	0.50			0.0%					0.0%										0.0%			0.0%
	very course sand	1.0			0.0%					0.0%										0.0%			0.0%
Gravel	very fine gravel	2.0			0.0%					0.0%										0.0%			0.0%
	fine gravel	4.0			0.0%					0.0%										0.0%			0.0%
	fine gravel	5.7			0.0%					0.0%										0.0%			0.0%
	medium gravel	8.0			0.0%					0.0%										0.0%			0.0%
	medium gravel	11.3			0.0%					0.0%										0.0%			0.0%
	course gravel	16.0			0.0%					0.0%										0.0%			0.0%
	course gravel	22.6			0.0%					0.0%										0.0%			0.0%
	very course gravel	32			0.0%					0.0%										0.0%			0.0%
	very course gravel	45			0.0%					0.0%										0.0%			0.0%
Cobble	small cobble	64			0.0%					0.0%										0.0%			0.0%
	medium cobble	90			0.0%					0.0%										0.0%			0.0%
	large cobble	128			0.0%					0.0%										0.0%			0.0%
	very large cobble	180			0.0%					0.0%										0.0%			0.0%
Boulder	small boulder	256			0.0%					0.0%										0.0%			0.0%
	small boulder	362			0.0%					0.0%										0.0%			0.0%
	medium boulder	512			0.0%					0.0%										0.0%			0.0%
	large boulder	1024			0.0%					0.0%										0.0%			0.0%
Boulder	very large boulder	2049			0.0%					0.0%										0.0%			0.0%
Bedrock	bedrock	40096			0.0%	0				0.0%	0									0.0%			0.0%
TOTAL / %of whole count			0			0				0	0	0	0	0	0	0	0						

	d16	d35	d50	d84	d95
As-Built	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.00
2006	3.80	7.91	9.77	23.56	60.87

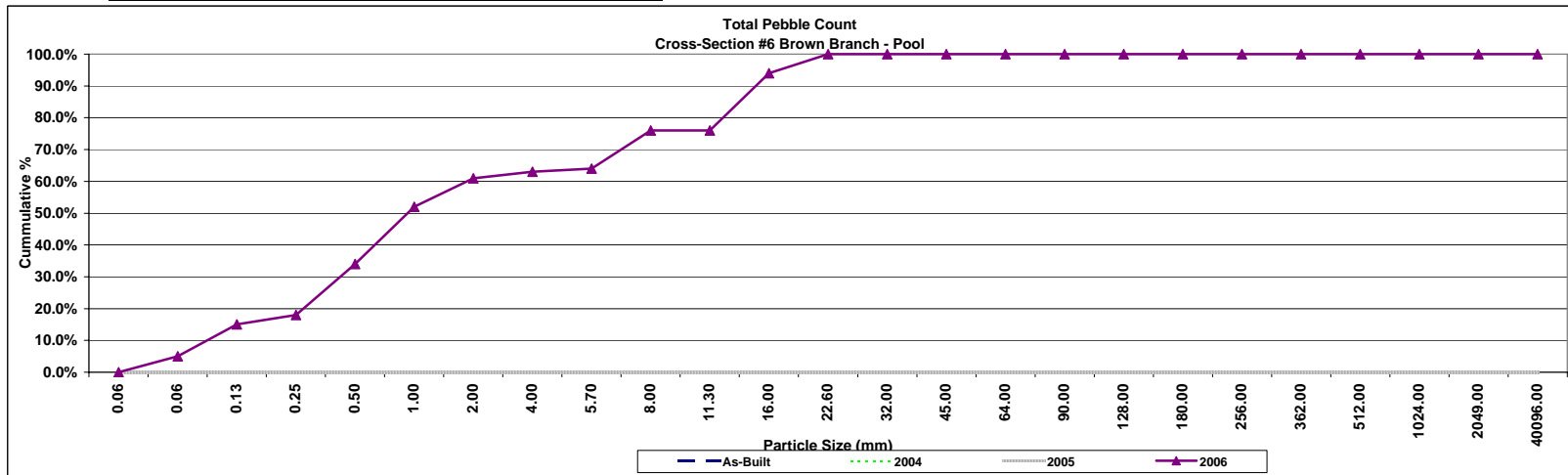


2006				2007																	
Riffle - Bed	Riffle - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	Riffle - Bed	Riffle - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %
0	2	1.9%	1.9%	3.805	7.906	9.768	23.560	60.875	0.0%	0.0%			0.0%	0.0%	0	0	0	0	0		
1	1	1.9%	3.9%						1.0%	1.0%			0.0%	0.0%							
0		0.0%	3.9%						0.0%	1.0%			0.0%	0.0%							
0		0.0%	3.9%						0.0%	1.0%			0.0%	0.0%							
4		3.9%	7.8%						4.0%	5.0%			0.0%	0.0%							
2		1.9%	9.7%						2.0%	7.0%			0.0%	0.0%							
3		2.9%	12.6%						3.0%	10.0%			0.0%	0.0%							
8		7.8%	20.4%						8.0%	18.0%			0.0%	0.0%							
6		5.8%	26.2%						6.0%	24.0%			0.0%	0.0%							
24		23.3%	49.5%						24.0%	48.0%			0.0%	0.0%							
17		16.5%	66.0%						17.0%	65.0%			0.0%	0.0%							
10		9.7%	75.7%						10.0%	75.0%			0.0%	0.0%							
16		15.5%	91.3%						16.0%	91.0%			0.0%	0.0%							
1		1.0%	92.2%						1.0%	92.0%			0.0%	0.0%							
2		1.9%	94.2%						2.0%	94.0%			0.0%	0.0%							
3		2.9%	97.1%						3.0%	97.0%			0.0%	0.0%							
3		2.9%	100.0%	3.0%	100.0%			0.0%	0.0%												
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%												
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%												
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%												
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%												
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%												
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%												
		0.0%	100.0%	0.0%	100.0%			0.0%	0.0%												
100	3	100.0%		3.80475	7.905833	9.767647	23.56	60.875	100.0%		0	0	0.0%		0	0	0	0	0		

Project Name Brown Branch
Cross Section #6
Feature Pool
Date 11/31/06
Crew R.E. Spears
Notes Pebble count data not available for 2000-2005.

Description	Material	As-Built				2003				2004				2005									
		Size (mm)	Pool - Bed	%	Cum %	Pool - Bed	%	Cum %	Pool - Bed	%	Cum %	d16	d35	d50	d84	d95	Pool - Bed	Pool - Bank	%	Cum %	%	Cum %	
Silt/Clay	silt/clay	0.061			0.0%						0.0%									0.0%			0.0%
Sand	very fine sand	0.062			0.0%						0.0%									0.0%			0.0%
	fine sand	0.125			0.0%						0.0%									0.0%			0.0%
	medium sand	0.25			0.0%						0.0%									0.0%			0.0%
	course sand	0.50			0.0%						0.0%									0.0%			0.0%
	very course sand	1.0			0.0%						0.0%									0.0%			0.0%
Gravel	very fine gravel	2.0			0.0%						0.0%									0.0%			0.0%
	fine gravel	4.0			0.0%						0.0%									0.0%			0.0%
	fine gravel	5.7			0.0%						0.0%									0.0%			0.0%
	medium gravel	8.0			0.0%						0.0%									0.0%			0.0%
	medium gravel	11.3			0.0%						0.0%									0.0%			0.0%
	course gravel	16.0			0.0%						0.0%									0.0%			0.0%
	course gravel	22.6			0.0%						0.0%									0.0%			0.0%
	very course gravel	32			0.0%						0.0%									0.0%			0.0%
	very course gravel	45			0.0%						0.0%									0.0%			0.0%
Cobble	small cobble	64			0.0%						0.0%									0.0%			0.0%
	medium cobble	90			0.0%						0.0%									0.0%			0.0%
	large cobble	128			0.0%						0.0%									0.0%			0.0%
	very large cobble	180			0.0%						0.0%									0.0%			0.0%
Boulder	small boulder	256			0.0%						0.0%									0.0%			0.0%
	small boulder	362			0.0%						0.0%									0.0%			0.0%
	medium boulder	512			0.0%						0.0%									0.0%			0.0%
	large boulder	1024			0.0%						0.0%									0.0%			0.0%
	very large boulder	2049			0.0%						0.0%									0.0%			0.0%
Bedrock	bedrock	40096			0.0%	0					0.0%	0								0.0%			0.0%
TOTAL / %of whole count			0			0				0		0	0	0	0	0	0	0					

	d16	d35	d50	d84	d95
As-Built	0.00	0.00	0.00	0.00	0.00
2003	0.00	0.00	0.00	0.00	0.00
2004	0.00	0.00	0.00	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.00
2006	0.25	0.79	1.42	16.16	20.63



2006				2007																	
Pool - Bed	Pool - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %	Pool - Bed	Pool - Bank	%	Cum %	d16	d35	d50	d84	d95	%	Cum %
0		0.0%	0.0%						0.0%	0.0%				0.0%							
1	4	5.0%	5.0%						1.1%	1.1%				0.0%							
7	3	10.0%	15.0%						7.6%	8.7%				0.0%							
3		3.0%	18.0%	0.250					3.3%	12.0%				0.0%							
15	1	16.0%	34.0%						16.3%	28.3%				0.0%							
18		18.0%	52.0%		0.792	1.417			19.6%	47.8%				0.0%							
9		9.0%	61.0%						9.8%	57.6%				0.0%							
2		2.0%	63.0%						2.2%	59.8%				0.0%							
1		1.0%	64.0%						1.1%	60.9%				0.0%							
12		12.0%	76.0%						13.0%	73.9%				0.0%							
		0.0%	76.0%						0.0%	73.9%				0.0%							
18		18.0%	94.0%				16.161		19.6%	93.5%				0.0%							
6		6.0%	100.0%					20.633	6.5%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
		0.0%	100.0%						0.0%	100.0%				0.0%							
92	8	100.0%		0.25	0.791667	1.416667	16.16111	20.63333	100.0%		0	0	0.0%		0	0	0	0	0		

Reference Reach		Hints
Stream:	EEP - Brown Branch	
Watershed:	Upper Catawba River	
Location:	Rufus, NC	
County:	Caldwell County	
Date:	Sept/Oct 2005	
Channel Type:	C4	
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TOB Slope				Hints
	station	elevation	% slope	note
point 1	83.0	1237.6		
point 2	214.7	1234.7	2.2	
point 1	214.7	1234.7		
point 2	231.7	1235.2	-2.5	
point 1	231.7	1235.2		
point 2	278.9	1235.3	-0.2	
point 1	278.9	1235.3		
point 2	375.8	1234.2	1.2	
point 1	375.8	1234.2		
point 2	878.5	1227.4	1.3	
point 1	878.5	1227.4		
point 2	1266.4	1223.1	1.1	
point 1	1266.4	1223.1		
point 2	1592.2	1220.2	0.9	
point 1	1592.2	1220.2		
point 2	1993.7	1225.5	-1.3	
Minimum:		0.9	%	
Maximum:		-2.5	%	
Mean:		0.3	%	
Median:		1.0	%	
Overall:		0.6%	%	

BKF Slope				Hints
	station	elevation	% slope	note
point 1	83.0	1234.9		
point 2	1111.3	1223.3	1.1	
point 1	1111.3	1223.3		
point 2	1425.0	1220.9	0.8	
point 1	1425.0	1223.3		
point 2	1592.2	1220.9	1.4	
point 1	1425.0	1220.9		
point 2	1592.2	1220.2	0.4	
point 1	1592.2	1220.2		
point 2	1641.0	1218.4	3.5	
point 1	1641.0	1218.4		
point 2	2376.0	1213.4	0.7	
point 1	2376.0	1213.4		
point 2	2444.9	1212.8	0.8	
point 1	2444.9	1212.8		
point 2	3221.2	1205.7	0.9	
point 1	3221.2	1205.7		
point 2	4329.5	1196.6	0.8	
point 1	4329.5	1196.6		
point 2	4793.5	1194.0	0.6	
point 1	4793.5	1194.0		
point 2	4865.7	1192.7	1.7	
point 1	4865.7	1192.7		
point 2	5098.1	1190.6	0.9	
Minimum:		0.42	%	
Maximum:		3.53	%	
Mean:		1.14	%	
Median:		0.87	%	

Calculations						
Riffle Station	Riffle Slope	Riffle Length		Pool Station	Pool Length	Pool-Pool Spacing
9.2	2.32%	14.8		24.0	59.0	-
83.0	1.78%	17.7		100.6	34.6	76.7
135.2	1.99%	17.5		152.7	21.4	52.0
174.0	0.85%	15.5		214.7	57.3	62.0
262.6	1.48%	63.2		325.9	49.9	111.2
375.8	3.05%	22.5		398.3	24.8	72.4
423.1	1.22%	76.0		499.1	15.3	100.7
514.4	1.43%	13.6		528.0	26.7	28.9
554.7	3.50%	51.6		606.3	17.9	78.3
680.9	0.90%	10.2		624.2	56.7	17.9
720.3	4.05%	10.2		691.1	29.1	66.9
745.4	2.18%	41.7		730.4	14.9	39.3
878.5	0.42%	74.7		787.1	48.7	56.6
986.8	0.44%	21.1		835.7	24.0	48.7
1071.1	1.06%	32.1		859.7	18.8	24.0
1125.5	1.04%	36.4		953.2	33.6	93.5
1266.4	1.19%	27.8		1007.9	63.1	54.7
1312.4	1.40%	8.2		1103.2	22.3	95.3
1347.7	1.64%	38.7		1163.0	20.0	59.8
1425.0	1.26%	37.3		1183.0	57.0	20.0
1513.5	2.59%	17.9		1240.0	26.3	57.0
1592.2	6.53%	4.4		1294.2	18.1	54.2
1662.3	0.25%	25.2		1320.5	27.2	26.3
1793.4	0.46%	54.9		1386.4	38.6	65.9
1880.9	0.43%	63.0		1462.3	51.1	75.9
1956.2				1531.3	60.9	69.0
2126.6	0.67%	42.8		1596.6	65.7	65.3
2253.8	1.20%	32.3		1687.6	105.8	91.0
2311.7	0.35%	64.3		1848.3	32.6	160.7
2432.9	0.76%	71.3		1943.9	12.3	95.6
2524.1	0.54%	22.3		1973.0	153.6	29.1
2576.4	0.54%	9.6		2169.4	84.4	196.4
2614.2	0.61%	50.3		2286.1	25.6	116.7
2706.7	1.27%	48.5		2376.0	56.9	89.9
2810.9	0.88%	43.7		2504.2	19.9	128.2
2916.5	0.64%	27.1		2546.4	30.1	42.1
2955.6	1.17%	33.6		2586.0	28.2	39.6
3039.3	0.54%	93.6		2664.5	42.2	78.5
3183.0	0.87%	20.9		2755.2	55.7	90.7
3221.2	0.59%	37.7		2854.6	61.9	99.4
3336.8	1.60%	27.6		2943.6	12.1	89.0
3439.6	1.49%	18.8		2989.2	50.1	45.6
3491.9	0.99%	19.4		3132.9	50.1	143.7
3539.9	1.13%	39.3		3203.9	17.3	71.1
3679.4	0.72%	53.0		3258.9	77.9	55.0
3776.8	3.89%	39.2		3364.4	75.2	105.5
3849.4	1.29%	27.1		3458.4	33.5	94.0
3910.9	1.10%	31.2		3511.3	28.6	52.9
3969.7	0.96%	33.0		3579.2	100.2	67.9
4073.0	0.66%	22.3		3732.4	44.4	153.2
4148.3	0.71%	16.3		3816.0	33.4	83.7
4225.0	2.86%	13.7		3876.5	34.4	60.5
4329.5	0.30%	9.9		3942.1	27.6	65.6
4383.6	0.52%	21.0		4002.7	70.3	60.6
4430.0	1.36%	73.0		4095.3	53.0	92.6
4597.3	0.91%	11.4		4164.6	60.4	69.3
4635.4	0.77%	72.4		4238.6	90.9	74.0
4738.4	1.94%	10.5		4339.4	44.2	100.8
4793.5	0.67%	29.9		4404.6	25.4	65.2
4884.7	1.26%	9.5		4503.0	36.3	98.4
4952.9	2.05%	57.5		4539.3	58.0	36.3
5028.5	1.16%	17.6		4608.7	26.7	69.4
5098.1	2.06%	52.3		4707.8	30.6	99.2
				4748.9	44.5	41.1
Overall	Minimum	Minimum		4824.3	60.4	75.4
Water	0.25%	4.4		4894.2	58.8	69.9
Surface				5010.5	18.1	116.3
Slope	Maximum	Maximum		5046.2	51.9	35.7
0.93%	6.53%	93.6		5150.4	29.0	104.2
Valley	Mean	Mean			Minimum	Minimum
Slope	1.36%	33.9			12.1	17.9
0.63%						
	Median	Median			Maximum	Maximum
	1.10%	27.8			153.6	196.4
					Mean	Mean
					44.0	74.4
					Median	Median
					35.4	67.9

Slope	Feature (Head)	Water Surface				Thalweg				Other Features	
		Water Surface Easting (ft)	Water Surface Northing (ft)	Water Surface Station (ft)	Water Surface Elevation	Thalweg Easting (ft)	Thalweg Northing (ft)	Thalweg Station (ft)	Thalweg Elevation	ELEV BKF	ELEV TOB
		0.02%	Rock Cross Vane	827138.3477	1222638.244	0.0	1235.81	827139.3661	1222639.985	0.0	1235.92
0.02%	Riffle	827135.015	1222629.663	9.2	1235.81	827137.3888	1222638.597	2.4	1232.58		
1.43%	Riffle	827130.4832	1222628.85	13.8	1235.74	827133.3403	1222631.941	10.2	1234.59		
5.49%	Riffle / Pool	827120.4326	1222627.305	24.0	1235.18	827130.618	1222628.636	14.5	1235.44		
0.82%	Pool	827104.0925	1222622.107	41.1	1235.04	827120.1555	1222627.083	25.1	1234.71		
0.03%	Pool	827090.0766	1222627.934	56.3	1235.04	827103.9227	1222622.263	42.0	1234.38		
-0.05%	Double Pool	827078.2922	1222632.839	69.1	1235.05	827089.849	1222627.923	57.2	1234.46		
-0.03%	Double Pool / Riffle	827064.4209	1222631.772	83.0	1235.05	827078.1339	1222632.894	69.9	1234.23	1234.883	1237.584
3.58%	Riffle / Pool	827046.7703	1222632.142	100.6	1234.42	827064.3061	1222631.781	83.8	1234.71		
0.09%	Pool	827039.6388	1222625.738	110.2	1234.41	827046.4862	1222632.627	101.6	1234.22		
0.09%	Pool	827038.2025	1222615.29	120.8	1234.40	827039.3778	1222625.146	111.9	1233.39		
0.25%	Pool / Riffle	827035.2943	1222601.157	135.2	1234.36	827037.9985	1222615.645	121.5	1234.00		
3.72%	Riffle / Pool	827028.1308	1222585.238	152.7	1233.71	827035.1109	1222600.975	136.5	1234.14		
0.11%	Pool	827020.961	1222576.542	163.9	1233.70	827028.1167	1222585.18	153.8	1233.28		
0.60%	Pool / Riffle	827018.8886	1222566.632	174.0	1233.64	827020.9129	1222576.723	164.9	1232.09		
1.10%	Riffle	827005.7791	1222558.327	189.6	1233.47	827018.9394	1222566.774	175.0	1233.45		
-0.08%	Log Vane	826990.8837	1222553.013	205.4	1233.48	827005.67	1222558.389	190.7	1233.11		
0.09%	Pool (Scour)	826981.6109	1222552.252	214.7	1233.47	826991.1395	1222553.207	206.1	1232.75	1234.746	
0.26%	Pool (Scour)	826965.1447	1222556.676	231.7	1233.43	826982.0444	1222552.885	215.2	1232.01	1235.175	
0.02%	Pool / Riffle	826937.0665	1222569.57	262.6	1233.42	826964.6449	1222556.616	233.0	1232.76		
2.61%	Riffle	826927.9463	1222583.024	278.9	1233.00	826938.8846	1222574.877	264.6	1233.10		1235.29
0.20%	Riffle	826916.7782	1222584.604	290.2	1232.98	826928.3561	1222582.935	277.9	1232.63		
1.02%	Riffle	826909.5482	1222578.822	299.4	1232.88	826917.3077	1222584.597	289.0	1232.50		
3.57%	Riffle / Pool	826883.9405	1222585.452	325.9	1231.94	826910.0345	1222578.541	298.5	1232.57		
0.05%	Pool	826866.5402	1222583.986	343.3	1231.93	826884.2278	1222585.019	325.1	1231.77		
1.63%	Pool / Tree Down	826838.1214	1222568.325	375.8	1231.40	826866.1086	1222583.897	343.3	1231.34		1234.151
4.48%	Riffle / Pool	826817.4978	1222559.287	399.3	1230.39	826838.7711	1222568.225	374.8	1231.14		
-0.29%	Pool	826808.4156	1222552.668	408.5	1230.42	826817.7945	1222559.276	397.6	1230.09		
0.15%	Log Vane / Riffle	826796.3737	1222546.451	423.1	1230.40	826808.9223	1222552.654	408.6	1229.47		
1.83%	Riffle	826740.6971	1222539.688	479.2	1229.38	826808.7204	1222552.616	408.8	1229.47		
1.67%	Riffle / Pool	826720.9519	1222541.94	499.1	1229.04	826797.0108	1222546.146	422.2	1230.27		
1.94%	Pool	826714.3134	1222541.254	505.7	1228.91	826740.8161	1222539.662	478.8	1229.19		
-0.45%	Pool / Riffle	826710.4215	1222533.541	514.4	1228.95	826720.9627	1222541.902	498.8	1228.85		
3.31%	Riffle / Pool	826697.5487	1222529.178	528.0	1228.50	826714.0903	1222541.102	505.7	1227.96		
-0.13%	Pool	826689.5165	1222529.647	536.0	1228.51	826710.3888	1222532.996	514.6	1228.75		
0.05%	Pool / Riffle	826671.9646	1222523.322	554.7	1228.50	826698.192	1222528.859	527.5	1228.16		
0.90%	Riffle	826622.2017	1222516.853	604.8	1228.05	826689.3593	1222529.2	536.3	1227.23		
9.55%	Riffle / Pool	826621.2037	1222515.824	606.3	1227.91	826672.5052	1222522.727	554.4	1228.24		
0.00%	RCV / Pool	826604.7544	1222508.763	624.2	1227.91	826621.4463	1222516.997	605.8	1227.68		
2.10%	Pool	826580.6307	1222506.46	648.4	1227.40	826620.5253	1222515.598	607.4	1226.58		
0.03%	Pool	826560.4827	1222502.953	668.9	1227.40	826605.3792	1222508.64	624.1	1227.80		
0.22%	Pool / Riffle	826549.1307	1222498.957	680.9	1227.37	826580.971	1222506.668	648.6	1227.13		
1.58%	Riffle / Pool	826539.4335	1222495.72	691.1	1227.21	826560.9769	1222502.838	668.9	1226.95		
-0.53%	Pool	826536.4639	1222486.182	701.1	1227.26	826548.9133	1222499.326	681.5	1227.09		
0.33%	Pool / Riffle	826521.2551	1222474.535	720.3	1227.20	826540.0029	1222496.174	691.0	1226.44		
7.77%	Riffle / Pool	826516.3934	1222465.594	730.4	1226.41	826534.1244	1222488.614	700.5	1225.92		
-2.26%	Pool	826513.5727	1222458.055	738.5	1226.59	826521.0744	1222474.72	719.6	1227.01		
0.58%	Pool / Riffle	826512.4535	1222451.252	745.4	1226.55	826515.2875	1222465.119	730.8	1226.16		
1.59%	Riffle	826499.522	1222429.351	770.8	1226.15	826514.662	1222458.319	737.6	1225.38		
4.38%	Riffle / Pool	826487.7797	1222418.144	787.1	1225.44	826512.769	1222452.154	744.1	1226.38		
1.21%	Pool	826480.4962	1222416.918	794.4	1225.35	826500.0018	1222430.043	769.6	1225.98		
0.14%	Log Vane	826439.3895	1222420.92	835.7	1225.29	826488.2501	1222418.164	786.3	1225.01		
17.44%	Pool	826434.9491	1222419.162	840.5	1224.46	826480.4594	1222417.162	794.2	1224.53		
0.45%	Rock Vane	826416.2849	1222423.681	859.7	1224.37	826439.4761	1222420.793	835.3	1224.86		
0.35%	Pool	826406.2531	1222424.077	869.8	1224.33	826435.5806	1222422.766	839.7	1222.68		
-0.09%	Pool / Riffle	826397.6439	1222422.444	878.5	1224.34	826416.3345	1222423.694	859.0	1224.07		1227.374
1.04%	Riffle	826340.1394	1222425.24	936.1	1223.74	826406.7434	1222423.727	868.6	1223.43		
0.30%	Riffle / Pool	826323.8459	1222430.516	953.2	1223.69	826397.7361	1222422.461	877.6	1224.09		
0.15%	Pool	826306.0349	1222426.864	971.4	1223.66	826340.6739	1222425.693	934.8	1223.42		
0.53%	Pool / Riffle	826292.9618	1222418.69	986.8	1223.58	826324.3476	1222430.242	951.8	1223.40		
0.35%	Riffle / Log Vane	826278.4832	1222403.315	1007.9	1223.51	826305.1071	1222425.243	971.6	1222.62		
1.34%	Pool	826262.1174	1222392.67	1027.5	1223.25	826293.5378	1222418.64	985.0	1223.17		
0.08%	Pool	826259.832	1222380.708	1039.6	1223.24	826279.092	1222403.561	1005.8	1223.33		
-0.04%	Pool / Riffle	826261.364	1222349.307	1071.1	1223.25	826262.5942	1222392.559	1025.7	1222.63		
2.17%	Riffle / Pool	826260.8845	1222317.185	1103.2	1222.55	826259.3703	1222381.591	1037.1	1222.06		
0.02%	Pool	826265.0866	1222310.256	1111.3	1222.55	826260.8046	1222349.567	1069.2	1223.09	1223.278	
-0.13%	Pool / Riffle	826276.7357	1222302.142	1125.5	1222.57	826261.2302	1222316.744	1102.0	1222.34		
0.70%	Riffle	826282.4766	1222290.454	1138.5	1222.48	826265.1937	1222309.76	1110.0	1221.51		
2.56%	Riffle	826282.7974	1222267.029	1162.0	1221.88	826276.6192	1222302.365	1123.6	1222.01		
19.97%	Pool / Fallen Tree	826282.1044	1222266.268	1163.0	1221.67	826282.7717	1222290.84	1136.7	1221.71		
0.52%	Pool / RCV	826282.1887	1222246.256	1183.0	1221.57	826282.7671	1222266.84	1160.7	1221.08		
0.36%	Pool	826274.9081	1222233.068	1198.1	1221.51	826282.687	1222265.412	1162.1	1220.78		
-0.06%	Pool	826258.7374	1222217.164	1220.7	1221.53	826282.7703	1222246.593	1180.9	1221.25		
0.26%	Pool / Root Wad	826244.6759	1222203.968	1240.0	1221.48	826275.2952	1222232.958	1196.5	1220.88		
-0.25%	Pool / Riffle	826226.9209	1222184.512	1266.4	1221.54	826259.2442	1222217.164	1219.0	1220.50		1223.063
2.63%	Riffle / Pool	826207.1675	1222164.884	1294.2	1220.81	826244.9156	1222204.774	1237.9	1220.93		
0.31%	Pool / Riffle	826210.6819	1222147.082	1312.4	1220.75	826227.2882	1222184.691	1264.7	1221.32		
2.48%	Riffle / Pool	826213.135	1222139.303	1320.5	1220.55	826207.2485	1222165.523	1292.4	1220.21		
0.51%	Pool	826214.0998	1222128.682	1331.2	1220.50	826210.0747	1222147.713	1310.4	1220.63		
0.30%	Pool / Riffle	826214.2623	1222112.158	1347.7	1220.45						

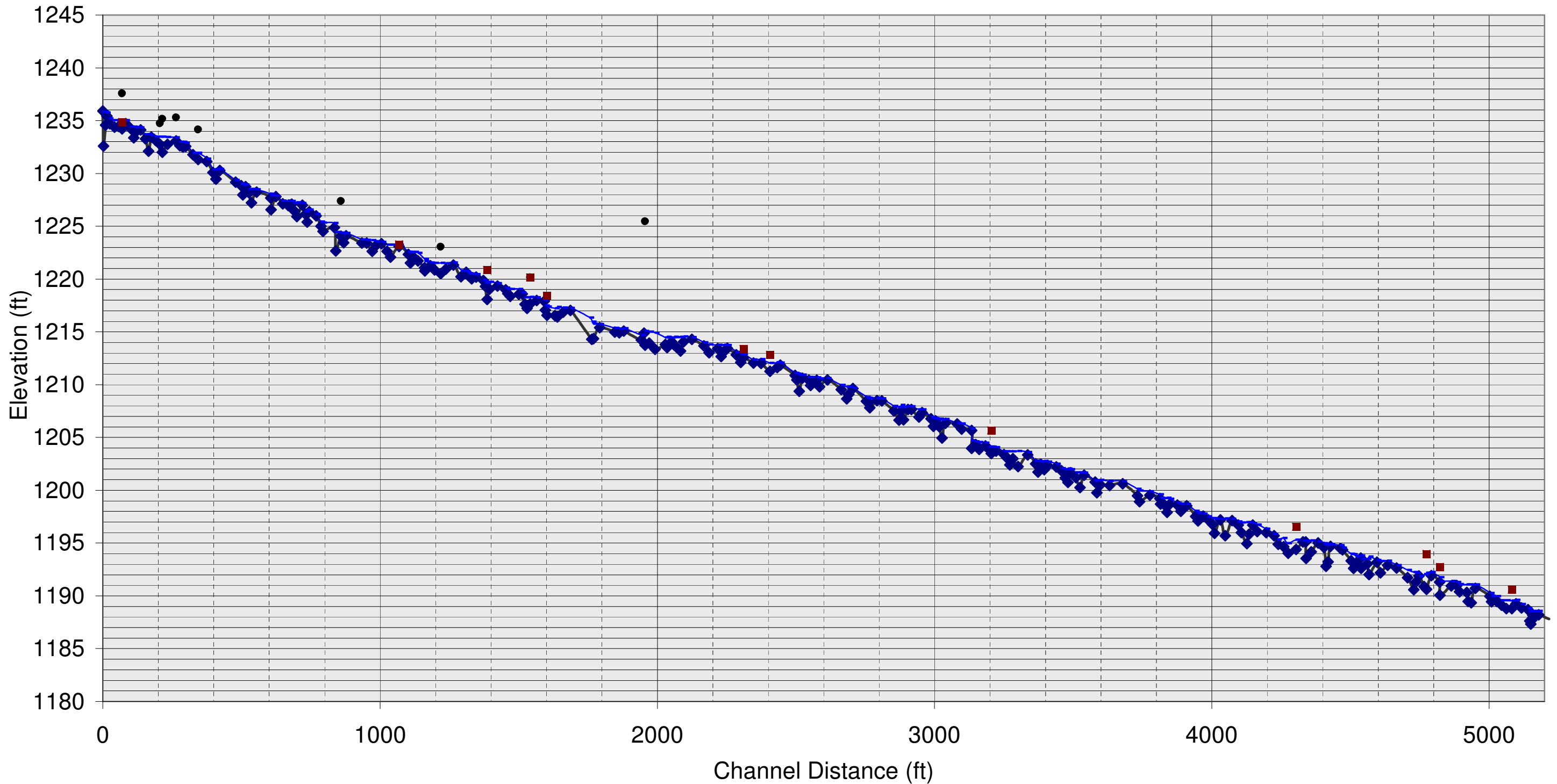
Slope	Feature (Head)	Water Surface				Thalweg				Other Features	
		Water Surface	Water Surface	Water Surface	Water Surface	Thalweg	Thalweg	Thalweg	Thalweg	ELEV	ELEV
		Easting (ft)	Northing (ft)	Station (ft)	Elevation	Easting (ft)	Northing (ft)	Station (ft)	Elevation	BKF	TOB
1.28%	Log Vane / Pool	826223.0857	1222074.55	1386.4	1219.63	826221.7267	1222086.716	1373.1	1219.87		
-1.00%	Pool	826220.5655	1222065.016	1396.3	1219.72	826222.8127	1222080.209	1379.7	1219.31		
0.42%	Pool / Riffle	826213.735	1222037.119	1425.0	1219.61	826222.7337	1222073.067	1386.8	1218.06	1220.857	
1.41%	Riffle	826205.6622	1222008.396	1454.9	1219.19	826221.0299	1222065.423	1394.6	1219.06		
1.97%	Riffle / Pool	826205.6069	1222000.917	1462.3	1219.04	826213.6995	1222037.154	1423.9	1219.34		
-0.13%	Pool	826206.8622	1221991.8	1471.5	1219.05	826205.6607	1222009.24	1452.9	1218.98		
0.02%	Pool	826210.9598	1221962.319	1501.3	1219.04	826205.7026	1222001.06	1461.1	1218.62		
2.69%	Pool / Riffle	826208.3324	1221950.449	1513.5	1218.72	826207.042	1221992.987	1469.3	1218.36		
5.16%	Riffle	826207.2462	1221941.489	1522.5	1218.25	826211.8283	1221962.612	1500.0	1218.56		
-0.07%	Log Vane / Pool	826203.4727	1221933.474	1531.3	1218.26	826208.7639	1221950.484	1512.5	1218.59		
-0.22%	Pool	826196.7865	1221924.274	1542.7	1218.28	826207.3511	1221940.834	1522.3	1217.61		
0.06%	Pool	826174.7599	1221919.379	1565.3	1218.27	826204.0079	1221934.171	1529.7	1217.23		
0.98%	Pool / Riffle	826148.1249	1221915.314	1592.2	1218.01	826196.9914	1221924.541	1541.6	1217.63	1220.161	1220.161
12.08%	Riffle / Pool	826143.7123	1221915.029	1596.6	1217.47	826174.6775	1221919.281	1564.6	1217.97		
0.94%	Pool	826136.2082	1221914.297	1604.2	1217.40	826147.7652	1221914.989	1591.8	1217.90		
0.58%	Pool	826109.3968	1221904.723	1632.7	1217.24	826144.0229	1221915.355	1595.6	1217.07		
-1.49%	Pool	826103.4623	1221898.854	1641.0	1217.36	826137.2334	1221914.687	1602.4	1216.57	1218.439	
0.36%	Pool / Riffle	826091.4109	1221881.231	1662.3	1217.28	826109.9735	1221905.272	1631.2	1216.54		
0.15%	Riffle / Pool	826083.7266	1221857.184	1687.6	1217.25	826103.9063	1221899.936	1639.3	1216.40		
1.29%	Pool	826058.7387	1221791.625	1757.8	1216.34	826092.2312	1221882.287	1660.5	1216.86		
4.90%	Pool	826052.4309	1221786.886	1765.6	1215.96	826083.8248	1221857.652	1686.5	1217.02		
3.14%	Pool	826049.6998	1221781.698	1771.5	1215.77	826054.0896	1221786.618	1763.5	1214.28		
0.28%	Pool / Riffle	826036.8359	1221763.947	1793.4	1215.71	826049.703	1221781.702	1770.1	1214.35		
0.64%	Riffle / Pool	826000.5171	1221722.815	1848.3	1215.36	826037.8332	1221763.475	1791.9	1215.40		
0.26%	Pool	825990.5801	1221708.706	1865.6	1215.31	826000.8974	1221723.513	1846.3	1214.98		
-0.15%	Pool / Riffle	825978.0689	1221699.791	1880.9	1215.34	825991.363	1221709.486	1863.2	1214.91		
1.01%	Riffle / Pool	825937.6327	1221651.53	1943.9	1214.70	825978.6929	1221700.487	1878.8	1215.06		
-2.98%	Pool / Riffle	825936.6027	1221639.293	1956.2	1215.07	825938.2201	1221652.209	1941.8	1214.23		
0.32%	Riffle / Pool	825931.261	1221623.294	1973.0	1215.01	825937.8504	1221641.727	1952.3	1214.88		
0.49%	Pool	825925.0174	1221603.539	1993.7	1214.91	825936.2078	1221637.992	1956.3	1213.72	1225.475	
1.26%	Pool	825934.8741	1221639.022	2030.6	1214.45	825932.6571	1221623.966	1970.8	1213.95		
-1.24%	Pool	825936.4075	1221632.894	2036.9	1214.53	825926.8491	1221603.362	1992.2	1213.34		
0.35%	Pool	825929.0722	1221618.656	2052.9	1214.47	825934.7994	1221639.006	2028.7	1213.79		
-0.55%	Double Pool	825925.221	1221609.32	2063.0	1214.52	825936.8158	1221632.67	2035.4	1213.50		
0.53%	Double Pool	825926.017	1221602.415	2070.0	1214.49	825929.3297	1221618.59	2051.3	1214.07		
-0.26%	Double Pool	825922.6479	1221588.067	2084.7	1214.53	825925.3258	1221609.401	2061.4	1213.74		
-0.24%	Double Pool	825919.9958	1221576.028	2097.0	1214.56	825926.1327	1221602.506	2068.3	1213.57		
0.20%	Double Pool / Riffle	825909.2931	1221548.425	2126.6	1214.50	825922.8922	1221587.502	2083.7	1213.18		
1.14%	Riffle / Pool	825892.923	1221508.901	2169.4	1214.01	825920.7671	1221576.111	2095.2	1214.06		
1.06%	Pool	825877.8179	1221498.194	2187.9	1213.81	825909.722	1221548.637	2124.9	1214.29		
0.09%	Pool	825857.2227	1221474.016	2219.7	1213.78	825893.1853	1221509.215	2167.6	1213.67		
0.32%	Double Pool	825847.4355	1221469.157	2230.6	1213.75	825877.9654	1221498.526	2186.2	1213.03		
-0.21%	Double Pool	825833.8172	1221468.47	2244.2	1213.78	825857.7224	1221473.971	2218.0	1213.41		
0.42%	Double Pool / Riffle	825824.4725	1221466.385	2253.2	1213.74	825847.2285	1221468.771	2229.7	1212.67		
1.97%	Riffle / Pool	825794.0875	1221455.465	2286.1	1213.10	825834.3417	1221468.865	2242.6	1213.19		
1.52%	Pool	825781.5976	1221446.225	2301.6	1212.86	825824.5552	1221466.735	2252.6	1213.45		
-0.40%	Pool / Riffle	825771.5856	1221444.968	2311.7	1212.90	825793.9436	1221455.692	2285.2	1212.82		
1.47%	Riffle	825736.6428	1221437.893	2347.4	1212.38	825781.6372	1221446.225	2300.7	1212.12		
-0.02%	Riffle / Pool	825710.0046	1221427.485	2376.0	1212.39	825771.3992	1221444.879	2311.0	1212.56	1213.39	
1.06%	Pool	825683.5421	1221410.589	2407.4	1212.05	825736.6164	1221437.786	2346.5	1212.06		
-0.21%	Log Vane / Riffle	825680.8234	1221385.221	2432.9	1212.11	825710.1247	1221428.389	2374.6	1212.03		
0.22%	Riffle	825681.7352	1221373.224	2444.9	1212.08	825683.5618	1221410.904	2406.4	1211.27	1212.837	
1.82%	Riffle	825689.3546	1221320.479	2498.2	1211.11	825680.62	1221385.238	2432.3	1211.61		
1.20%	Riffle / Pool	825686.848	1221315.019	2504.2	1211.04	825681.7669	1221373.401	2444.2	1211.84		
1.14%	Pool	825683.3905	1221307.392	2512.6	1210.94	825689.709	1221320.653	2497.5	1210.86		
0.03%	Pool / Riffle	825677.3014	1221297.635	2524.1	1210.94	825686.69	1221315.201	2503.7	1210.44		
1.06%	Riffle / Pool	825661.8469	1221281.626	2546.4	1210.71	825683.8423	1221307.215	2512.2	1209.38		
0.11%	Pool	825654.4342	1221281.414	2553.8	1210.70	825677.6248	1221297.952	2523.4	1210.60		
0.08%	Pool / Riffle	825633.3534	1221273.141	2576.4	1210.68	825661.2326	1221282.163	2546.1	1210.42		
1.01%	Riffle / Pool	825624.508	1221269.495	2586.0	1210.58	825654.6335	1221281.461	2552.8	1209.94		
-0.08%	Pool / Riffle	825611.6197	1221244.376	2614.2	1210.60	825633.1427	1221273.437	2575.7	1210.42		
1.29%	Riffle / Pool	825573.9725	1221211.086	2664.5	1209.95	825624.4289	1221269.651	2585.2	1209.80		
0.84%	Pool	825573.3142	1221191.368	2684.2	1209.79	825612.0166	1221244.496	2613.3	1210.44		
-0.04%	Pool	825574.8253	1221183.712	2692.0	1209.79	825574.4271	1221211.294	2663.4	1209.54		
0.73%	Pool / Riffle	825574.1313	1221169.02	2706.7	1209.68	825573.6196	1221191.749	2683.0	1208.66		
1.81%	Riffle / Pool	825570.3387	1221120.708	2755.2	1208.81	825574.942	1221184.3	2690.5	1209.07		
1.02%	Pool	825567.9539	1221115.18	2761.2	1208.75	825573.94	1221169.382	2705.5	1209.62		
0.23%	Pool	825563.7081	1221111.825	2766.6	1208.73	825570.9621	1221121.174	2753.8	1208.42		
0.08%	Pool	825538.1923	1221103.549	2793.4	1208.71	825567.6134	1221114.942	2760.9	1208.33		
0.08%	Pool / Riffle	825520.9914	1221106.544	2810.9	1208.70	825563.457	1221111.093	2766.5	1207.82		
1.68%	Riffle / Pool	825477.5165	1221111.098	2854.6	1207.96	825538.8599	1221104.034	2792.1	1208.48		
0.44%	Pool	825459.2016	1221109.979	2873.0	1207.88	825521.5056	1221106.881	2809.7	1208.46		
-2.74%	Pool	825454.2522	1221105.033	2879.9	1208.07	825477.7082	1221111.234	2853.7	1207.52		
2.44%	Double Pool	825450.0508	1221098.695	2887.6	1207.89	825460.2101	1221110.679	2871.2	1206.62		
-0.44%	Double Pool	825443.5632	1221083.558	2904.0	1207.96	825455.1064	1221105.417	2878.6	1207.45		
0.29%	Double Pool / Riffle	825436.7344	1221073.091	2916.5	1207.93	825449.4099	1221098.325	2887.7	1206.66		
0.98%	Riffle / Pool	825425.8001	1221048.344	2943.6	1207.66	825442.9474	1221083.651	2903.7	1207.65		
0.07%	Pool / Riffle	825423.1807	1221036.567	2955.6	1207.65	825437.7791	1221072.604	2915.9	1207.66		
2.27%	Riffle / Pool	825407.8812	1221006.704	2989							

Slope	Feature (Head)	Water Surface				Thalweg				Other Features	
		Water Surface Easting (ft)	Water Surface Northing (ft)	Water Surface Station (ft)	Water Surface Elevation	Thalweg Easting (ft)	Thalweg Northing (ft)	Thalweg Station (ft)	Thalweg Elevation	ELEV BKF	ELEV TOB
0.88%	Riffle	825327.912	1220991.193	3082.5	1206.37	825370.8681	1220988.232	3039.3	1206.33		
0.44%	Riffle	825313.6156	1220997.618	3098.1	1206.30	825328.1589	1220991.228	3082.1	1206.28		
1.25%	Riffle / Pool	825284.0709	1221015.825	3132.9	1205.87	825313.4273	1220997.502	3098.1	1205.80		
97.83%	Rock Cross Vane	825283.0967	1221016.496	3134.0	1204.71	825283.6551	1221016.436	3133.4	1205.65		
0.61%	Pool (Scour)	825270.0497	1221020.66	3147.7	1204.63	825283.1142	1221016.222	3134.0	1203.97		
0.60%	Pool (Scour)	825257.7403	1221015.206	3161.2	1204.55	825269.5267	1221019.953	3148.1	1204.31		
0.23%	Pool / Riffle	825241.1588	1221001.052	3183.0	1204.50	825257.0107	1221015.14	3161.5	1203.88		
2.84%	Riffle	825233.9806	1220988.569	3197.4	1204.09	825240.6169	1221000.435	3183.5	1204.20		
-0.46%	Riffle / Pool	825230.6678	1220982.94	3203.9	1204.12	825233.2251	1220987.797	3198.2	1203.84		
0.25%	Pool / Riffle	825224.0804	1220966.921	3221.2	1204.07	825230.3438	1220982.057	3204.6	1203.47	1205.655	
1.41%	Riffle	825213.8118	1220940.314	3249.8	1203.67	825224.124	1220966.331	3221.8	1203.70		
0.10%	Riffle / Pool	825210.5956	1220931.723	3258.9	1203.66	825213.048	1220940.01	3250.1	1203.38		
-0.23%	Pool	825207.8865	1220920.653	3270.3	1203.69	825210.5101	1220930.184	3260.2	1203.08		
0.14%	Pool	825204.5203	1220910.554	3281.0	1203.67	825206.9195	1220919.462	3271.5	1202.41		
-0.25%	Double Pool	825202.5693	1220890.912	3300.7	1203.72	825204.5502	1220909.076	3282.2	1202.98		
0.31%	Double Pool / Riffle	825179.8548	1220862.884	3336.8	1203.61	825202.7477	1220890.202	3301.1	1202.23		
2.89%	Riffle / Pool	825155.2411	1220850.362	3364.4	1202.81	825180.6205	1220862.839	3336.3	1203.36		
0.63%	Pool	825151.4055	1220843.706	3372.1	1202.76	825155.5319	1220850.845	3364.1	1202.52		
0.36%	Pool	825149.1426	1220833.25	3382.8	1202.73	825151.505	1220842.562	3373.3	1201.71		
-0.21%	Double Pool	825147.9792	1220819.924	3396.2	1202.75	825149.7999	1220833.576	3382.5	1202.46		
0.41%	Double Pool	825146.2676	1220807.624	3408.6	1202.70	825148.5786	1220820.996	3395.1	1201.95		
0.61%	Double Pool / Riffle	825157.7745	1220778.813	3439.6	1202.51	825146.8375	1220808.726	3407.5	1202.33		
2.36%	Riffle / Pool	825158.5194	1220760.022	3458.4	1202.07	825157.7312	1220779.617	3438.6	1202.22		
0.52%	Pool	825157.9205	1220746.712	3471.7	1202.00	825158.7586	1220760.712	3457.5	1201.84		
-0.31%	Pool	825155.0498	1220735.828	3483.0	1202.03	825158.0691	1220747.635	3470.6	1201.17		
0.40%	Pool / Riffle	825147.6152	1220730.982	3491.9	1202.00	825155.2636	1220737.23	3481.4	1200.73		
1.59%	Riffle / Pool	825141.6158	1220712.511	3511.3	1201.69	825148.2234	1220731.677	3490.4	1201.66		
-0.07%	Pool	825128.1651	1220705.59	3526.4	1201.70	825142.5375	1220713.01	3509.9	1201.20		
0.37%	Pool / Riffle	825115.1984	1220701.87	3539.9	1201.65	825129.0955	1220705.699	3525.2	1200.27		
1.89%	Riffle / Pool	825077.1905	1220691.982	3579.2	1200.91	825115.5007	1220702.419	3539.2	1201.43		
-0.52%	Pool	825070.2592	1220690.654	3586.2	1200.94	825076.5149	1220691.848	3579.6	1200.78		
-0.32%	Pool	825058.9739	1220687.329	3598.0	1200.98	825070.8035	1220691.352	3585.3	1199.78		
0.27%	Pool	825035.1081	1220663.621	3631.6	1200.89	825059.3246	1220687.76	3597.3	1200.51		
0.12%	Pool / Riffle	825011.6313	1220622.063	3679.4	1200.83	825035.2825	1220664.401	3630.9	1200.47		
1.32%	Riffle / Pool	824976.7219	1220582.207	3732.4	1200.13	825012.0314	1220623.067	3678.3	1200.62		
2.36%	Pool	824973.4355	1220575.832	3739.5	1199.96	824977.152	1220582.64	3731.7	1199.46		
0.18%	Pool / Riffle	824974.4478	1220538.603	3776.8	1199.89	824973.3587	1220576.187	3739.2	1198.91		
0.79%	Riffle	824976.3715	1220502.541	3812.9	1199.61	824974.8466	1220539.343	3776.0	1199.55		
10.69%	Riffle / Log Vane	824974.9758	1220499.733	3816.0	1199.27	824975.955	1220502.729	3812.7	1199.23		
0.12%	Pool (Scour)	824971.53	1220487.518	3828.7	1199.26	824975.3815	1220500	3815.5	1198.70		
-0.29%	Pool (Scour)	824965.2048	1220479.063	3839.3	1199.29	824972.274	1220487.296	3828.5	1198.63		
1.16%	Pool / Riffle	824955.1646	1220480.303	3849.4	1199.17	824965.8093	1220479.104	3839.0	1197.92		
1.42%	Riffle / Pool	824928.6243	1220474.701	3876.5	1198.78	824956.3361	1220480.26	3848.5	1198.68		
0.59%	Pool	824916.6683	1220471.864	3888.8	1198.71	824929.6107	1220475.014	3875.7	1198.59		
0.04%	Pool / Riffle	824894.8642	1220468.167	3910.9	1198.70	824917.5466	1220471.689	3888.3	1197.99		
2.16%	Riffle / Pool	824867.3795	1220453.372	3942.1	1198.03	824896.2764	1220468.375	3909.8	1198.52		
2.55%	Pool	824863.2736	1220446.775	3949.9	1197.83	824867.4722	1220453.831	3942.1	1197.52		
0.19%	Pool / Riffle	824849.2454	1220432.741	3969.7	1197.79	824863.1334	1220447.501	3949.7	1197.10		
1.64%	Riffle	824835.3831	1220423.474	3986.4	1197.52	824850.1784	1220433.354	3968.9	1197.56		
1.04%	Riffle / Pool	824833.1112	1220407.331	4002.7	1197.35	824835.7596	1220422.319	3987.1	1197.20		
0.16%	Pool	824831.5167	1220399.64	4010.6	1197.34	824832.9305	1220407.551	4002.1	1196.77		
0.38%	Pool	824831.1004	1220378.75	4031.5	1197.26	824831.0758	1220400.147	4009.7	1195.92		
-0.32%	Double Pool	824836.8542	1220361.83	4049.3	1197.31	824830.7254	1220379.493	4030.4	1197.21		
0.14%	Double Pool / Riffle	824848.1759	1220341.057	4073.0	1197.28	824836.8679	1220362.334	4048.6	1195.70		
1.19%	Riffle / Pool	824858.8285	1220321.495	4095.3	1197.02	824848.171	1220340.847	4072.9	1197.12		
0.72%	Pool	824864.465	1220310.66	4107.5	1196.93	824859.9531	1220321.006	4096.0	1196.69		
-0.14%	Pool	824869.7597	1220291.922	4127.0	1196.96	824865.1248	1220311.921	4106.4	1195.98		
0.00%	Pool	824868.903	1220284.579	4134.4	1196.96	824870.1517	1220291.965	4127.0	1194.96		
0.54%	Pool / Riffle	824857.4861	1220276.642	4148.3	1196.88	824868.7709	1220284.571	4134.5	1195.83		
0.88%	Riffle / Pool	824843.3409	1220268.474	4164.6	1196.74	824858.0231	1220277.324	4147.5	1196.69		
1.19%	Pool	824818.3187	1220249.233	4196.2	1196.36	824843.2637	1220269.503	4164.2	1196.10		
1.70%	Pool / Riffle	824795.5844	1220231.511	4225.0	1195.87	824818.5732	1220249.021	4196.3	1195.99		
4.02%	Riffle / Pool	824782.9193	1220226.401	4238.6	1195.32	824795.8303	1220231.496	4225.0	1195.70		
-0.69%	Pool	824773.631	1220208.747	4258.6	1195.46	824782.2343	1220225.576	4239.8	1194.88		
2.94%	Pool	824773.201	1220192.636	4274.7	1194.99	824773.2401	1220207.882	4259.7	1194.64		
-1.06%	Pool	824778.7813	1220163.527	4304.3	1195.30	824774.1885	1220191.648	4275.9	1194.05		
0.26%	Pool / Riffle	824797.43	1220146.632	4329.5	1195.23	824779.6538	1220163.522	4304.6	1194.39		
0.35%	Riffle / Pool	824801.9656	1220137.831	4339.4	1195.20	824797.6881	1220146.854	4329.1	1195.11	1196.556	
-0.15%	RCV / Pool	824806.2803	1220131.379	4347.2	1195.21	824802.33	1220137.797	4339.3	1195.10		
-0.11%	Pool (Scour)	824807.4704	1220119.615	4359.0	1195.22	824802.8197	1220136.68	4340.5	1193.55		
0.27%	Pool / Riffle	824799.0636	1220096.487	4383.6	1195.16	824807.7113	1220119.959	4358.0	1194.17		
0.77%	Riffle / Pool	824793.2416	1220076.345	4404.6	1195.00	824798.8234	1220096.776	4382.8	1195.00		
1.86%	Pool	824790.3558	1220069.313	4412.2	1194.85	824793.0922	1220075.429	4404.9	1194.57		
-0.46%	Pool	824783.6567	1220064.225	4420.6	1194.89	824790.3765	1220069.351	4411.5	1192.81		
0.08%	Pool / Riffle	824777.8353	1220056.838	4430.0	1194.89	824784.8339	1220064.493	4418.9	1193.21		
0.30%	Riffle	824745.4385	1220044.917	4464.5	1194.78	824778.7786	1220057.927	4427.8	1194.70		
3.18%	Riffle	824741.5488	1220038.367	4472.1	1194.54	824746.0688	1220043.792	4463.5	1194.49		
1.88%	Riffle / Pool	824710.8322	1220035.21	4503.0	1193.96	824741.9311	1220037.444	4471.1	1194.37		
0.49%	Pool	824703.0366	1220034.26	4510.9	1193.92	824710.5913	1220034.974	4502.5	1193.33		
1.67%	Pool	824692.1673	1220031.994	4522.0	1193.74	824702.4119	1220033.753	4510.8	1192.61		
-0.39%	Pool	824677.004	1220025.727	4538.4	1193.80	824692.0762	1220031.819	4521.3	1193.06		
34.36%	RCV / Pool	824676.2752	1220025.126	4539.3	1193.48	824677.8017	1220024.817	4537.2	1193.57		
-0.10%	Pool (Scour)	824661.3466	1220009.678	4560.8	1193.50	824676.302	1220024.206	4538.8	1192.60		
-2.79%	Double Pool	824660.0108	1220002.57	4568.0	1193.70	824660.6585	1220009.048	4560.6	1193.01		
1.09%	Double Pool / Riffle	824659.0771	1219973.342	4597.3	1193.38	824659.7767	1220002.419	4567.3	1192.00		
0.73%	Riffle / Pool	824657.41	1219962.041	4608.7	1193.29	824659.3383	1219973.605	4596.1	1193.20		

Slope	Feature (Head)	Water Surface				Thalweg				Other Features	
		Water Surface Easting (ft)	Water Surface Northing (ft)	Water Surface Station (ft)	Water Surface Elevation	Thalweg Easting (ft)	Thalweg Northing (ft)	Thalweg Station (ft)	Thalweg Elevation	ELEV BKF	ELEV TOB
-0.04%	Pool / Riffle	824670.2941	1219938.635	4635.4	1193.30	824658.4688	1219961.494	4608.2	1192.19		
1.16%	Riffle	824692.2525	1219911.779	4670.1	1192.90	824671.0054	1219939.464	4633.6	1192.89		
1.19%	Riffle / Pool	824715.4536	1219882.007	4707.8	1192.45	824690.6066	1219912.716	4666.7	1192.62		
0.96%	Pool	824722.3532	1219861.608	4729.4	1192.25	824715.6329	1219882.971	4705.6	1191.73		
0.64%	Pool / Riffle	824718.2649	1219853.517	4738.4	1192.19	824722.0092	1219860.906	4728.6	1190.57		
3.23%	Riffle / Pool	824711.9466	1219845.172	4748.9	1191.85	824718.7522	1219854.293	4735.9	1191.31		
-1.11%	Pool	824696.8051	1219833.354	4768.1	1192.06	824711.999	1219845.015	4747.4	1191.89		
-1.55%	Pool	824689.8078	1219831.315	4775.4	1192.18	824697.5537	1219833.756	4765.7	1190.88		
-0.29%	Pool / Riffle	824672.449	1219826.389	4793.5	1192.23	824689.5255	1219831.209	4774.2	1190.62	1193.958	
1.63%	Riffle	824643.0809	1219820.746	4823.4	1191.74	824672.8255	1219827.315	4791.3	1191.93		
37.32%	RCV / Pool	824642.15	1219820.644	4824.3	1191.39	824642.7724	1219821.28	4822.0	1191.30		
-0.04%	Pool (Scour)	824605.2286	1219801.906	4865.7	1191.41	824642.2777	1219820.818	4822.6	1190.06	1192.747	
0.62%	Pool / Riffle	824598.6332	1219784.084	4884.7	1191.29	824605.3887	1219802.12	4864.0	1190.93		
1.90%	Riffle / Pool	824595.8591	1219775.043	4894.2	1191.11	824598.9566	1219784.22	4883.0	1190.96		
0.18%	Pool	824581.4846	1219752.817	4920.6	1191.06	824595.7432	1219774.895	4892.9	1190.39		
-0.35%	Pool	824576.2536	1219749.379	4926.9	1191.08	824581.5926	1219752.938	4919.0	1190.33		
0.15%	Pool	824564.6064	1219749.295	4938.5	1191.06	824576.8371	1219749.436	4924.9	1189.48		
0.06%	Pool / Riffle	824550.2485	1219750.476	4952.9	1191.06	824565.4794	1219749.774	4936.3	1189.35		
1.55%	Riffle	824498.6351	1219756.729	5004.9	1190.25	824550.5988	1219750.139	4951.2	1190.72		
4.53%	Riffle / Pool	824493.1269	1219756.167	5010.5	1190.00	824499.0588	1219756.473	5003.1	1189.98		
0.14%	Pool / Riffle	824475.0891	1219754.946	5028.5	1189.98	824493.1185	1219756.41	5009.0	1189.45		
2.19%	Riffle / Pool	824458.7225	1219748.362	5046.2	1189.59	824474.2588	1219756.166	5027.9	1189.49		
0.17%	Pool	824452.2719	1219731.891	5063.9	1189.56	824458.7909	1219748.002	5045.4	1189.11		
0.04%	Pool	824452.5011	1219712.644	5083.1	1189.55	824451.9493	1219732.05	5062.7	1188.81		
-0.28%	Pool / Riffle	824456.6216	1219698.271	5098.1	1189.59	824452.0375	1219712.423	5082.4	1188.80	1190.593	
1.99%	Riffle	824461.003	1219679.29	5117.6	1189.21	824456.7845	1219698.82	5096.8	1189.26		
1.62%	Riffle	824461.4531	1219655.075	5141.8	1188.81	824460.9681	1219679.263	5116.8	1188.84		
6.77%	Riffle	824460.7143	1219651.307	5145.6	1188.55	824461.6426	1219655.778	5140.3	1188.71		
0.18%	Riffle / Pool	824460.5922	1219646.514	5150.4	1188.54	824460.6291	1219650.052	5146.1	1187.63		
-0.36%	Pool	824457.085	1219637.827	5159.8	1188.58	824458.8021	1219646.471	5150.1	1187.34		
1.18%	Pool	824455.5401	1219634.168	5163.8	1188.53	824457.4904	1219638.747	5157.9	1188.14		
-0.19%	Pool / Riffle	824447.4608	1219620.802	5179.4	1188.56	824456.3006	1219634.205	5162.6	1187.95		
						824447.0303	1219620.8	5178.9	1188.20		
						824433.5892	1219585.938	5216.3	1187.83		

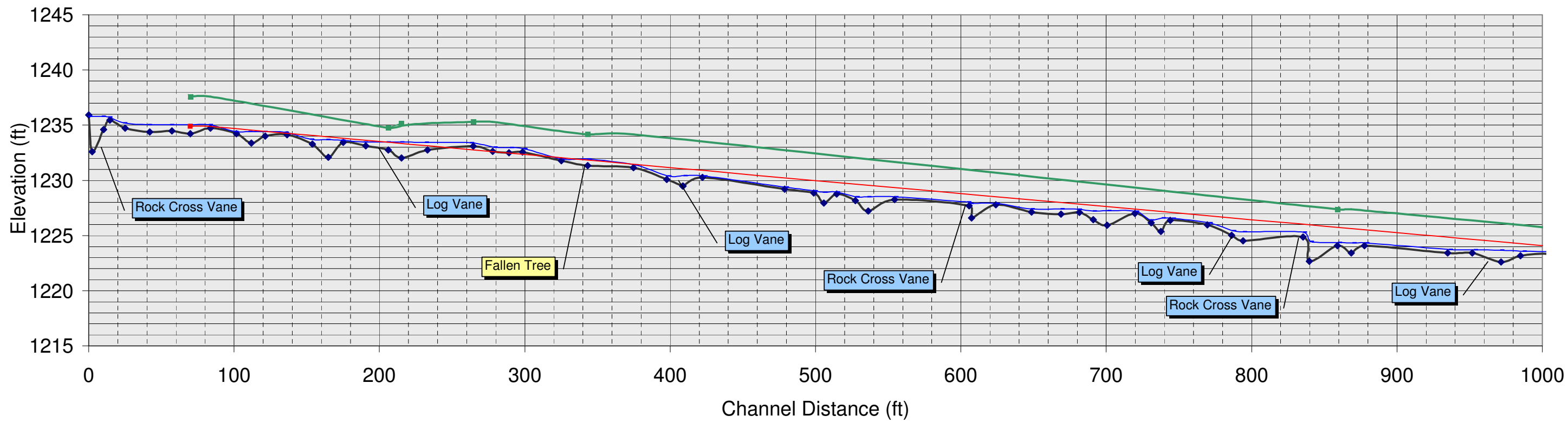
EEP - Brown Branch Upper Catawba River Rufus, NC

◆ Thalweg — Water Surface ● TOB ■ BKF



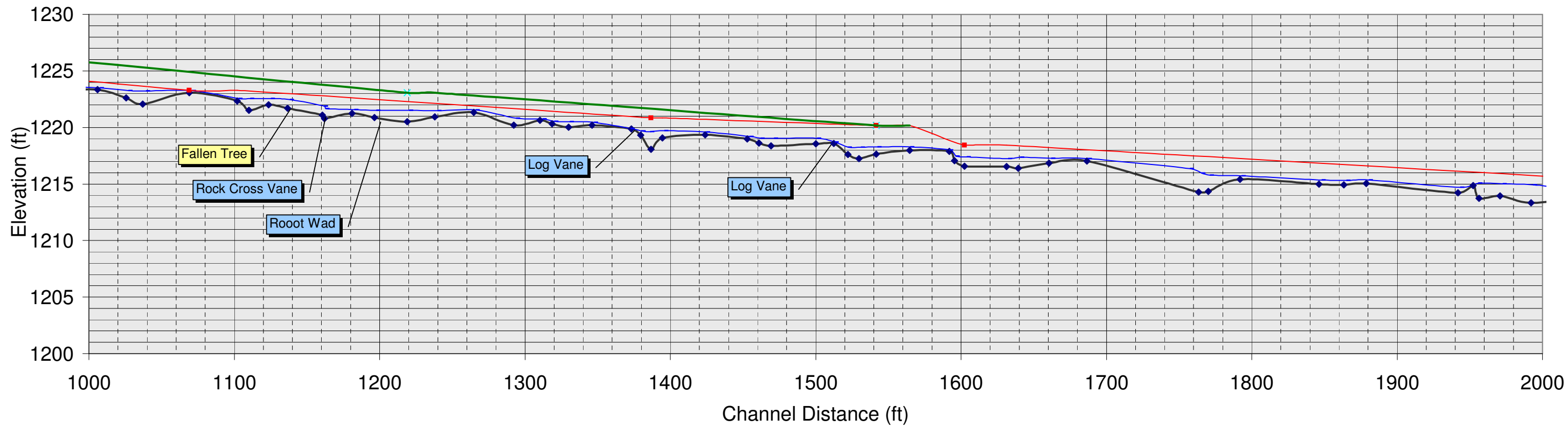
EEP - Brown Branch Upper Catawba River Rufus, NC

Thalweg Water Surface TOB BKF Average BKF Average TOB



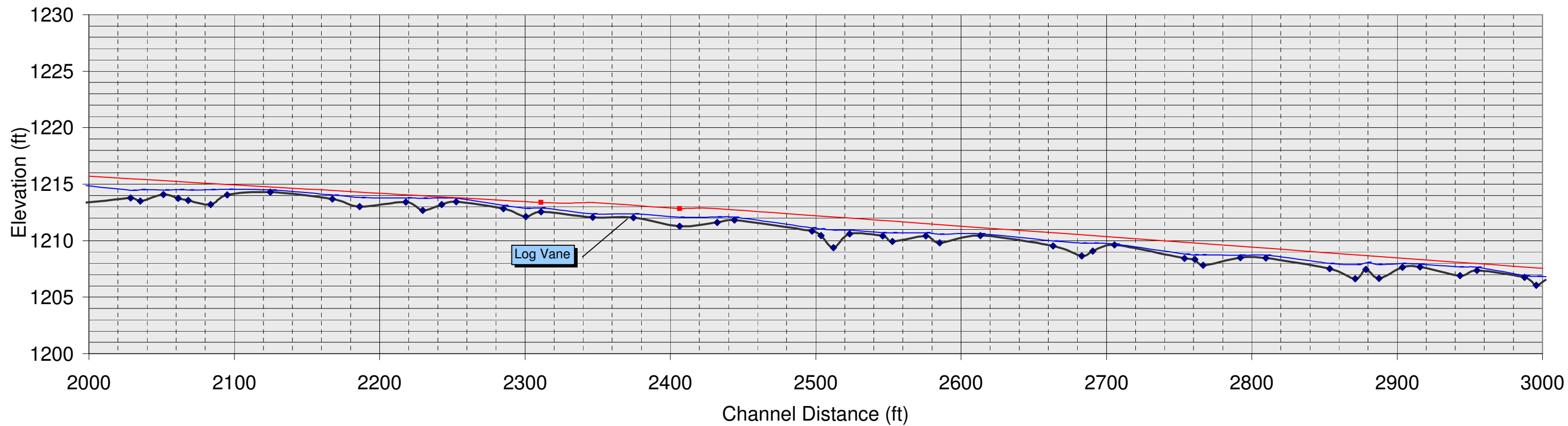
EEP - Brown Branch Upper Catawba River Rufus, NC

Thalweg Water Surface TOB BKF Average BKF Average TOB



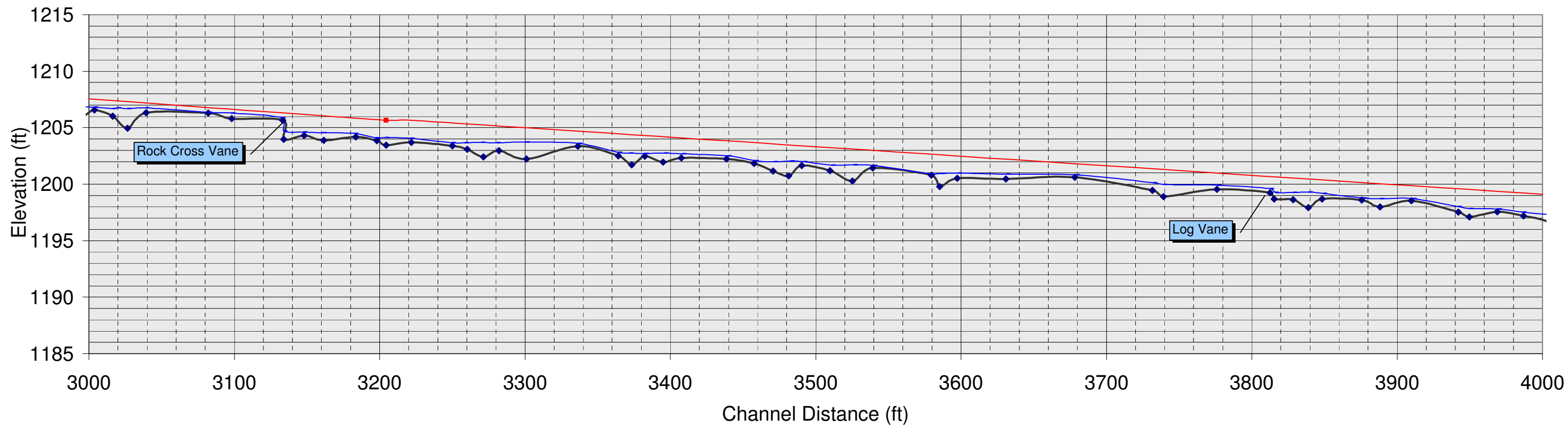
EEP - Brown Branch Upper Catawba River Rufus, NC

Thalweg Water Surface TOB BKF Average BKF



EEP - Brown Branch Upper Catawba River Rufus, NC

Thalweg Water Surface TOB BKF Average BKF



EEP - Brown Branch Upper Catawba River Rufus, NC

