Collins Creek Stream Restoration Site
Monitoring Report – MY02
Orange County, NC
Basin 03030002 - Contract # D05011

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EXECUTIVE SUMMARY

The Collins Creek Stream Restoration Site is located in the Piedmont physiographic province in Orange County, North Carolina. The project will provide mitigation for stream impacts within the 8-digit hydrologic cataloging unit 03030002 in the Cape Fear River Basin by restoring and enhancing 9,453 linear feet on an Unnamed Tributary to Collins Creek (UTCC) and other associated tributaries, generating 8,933 stream mitigation units (SMU's.) The goals of the project include improving water quality in this agricultural stream system and creating high-quality aquatic and terrestrial habitat along an interconnected forested riparian corridor. In order to reach these goals, the project objectives included restoring and enhancing 9,453 linear feet of stable stream channel with the appropriate pattern, profile, and dimension that can handle the hydrologic input from the surrounding drainages; planting a functional Piedmont Alluvial Forest floodplain community along with Mesic Mixed Hardwood Forest to develop an effective riparian buffer, and removing cattle and horses from the riparian areas through livestock exclusion fencing. This report describes the results from the findings of the second year of monitoring that took place in 2009.

The riparian buffer was planted with 17 different species of bare root trees and shrubs and four different species of live stakes. Fifteen vegetation monitoring plots were established during the as-built survey. Riparian vegetation must meet a minimum survival success rate of 320 stems/acre after five years. The plots were monitored following the CVS-EEP monitoring protocol and the second-year monitoring counted an average of 623 stems/ acre. Isolated invasive species were noted in the restored stream buffer and will continue to be monitored to determine if corrective action is necessary. The second-year monitoring found the vegetation component of the project to be on track to meeting the success criterion.

The stream restoration included ten separate reaches, which were enhanced and restored based on a combination of Priority Approaches 2 and 3. Rock cross vanes, step pools, and riffle grade controls were used to control grade throughout the stream profiles. The streams were restored to B4c and C4 stream types. The second year of monitoring found the majority of the project to be functioning as designed. Small areas of bank erosion and streambed degradation have been noted in this report, but there are no systematic problems that indicate that the project streams are unstable or becoming so. In 2009, there were six bankfull events at the site. The project is on track to meeting the success criterion of at least two bankfull events in five years with each occurring in different monitoring periods.

1.0 PROJECT BACKGROUND

1.1 Project Objectives

The goals and objectives of the restoration project are as follows:

Restoration Goals:

- Improve water quality by reducing nutrient and sediment inputs.
- Create high-quality aquatic and terrestrial habitat along an interconnected forested riparian corridor.

Restoration Objectives:

- Plant a functional Piedmont Alluvial Forest floodplain community along with Mesic Mixed Hardwood Forest to develop an effective riparian buffer.
- Restore stable stream reaches that can handle the hydrologic input from the surrounding drainages.
- Remove cattle and horses from the riparian areas through livestock exclusion fencing.

1.2 Project Structure, Restoration Type, and Approach

The project streams had become degraded primarily through poor grazing management and vegetation removal. Historic aerial photographs show that the land surrounding the streams has been in rangeland for at least 65 years and cattle and horses have had access to the stream up until the restoration construction. The streams had experienced bank erosion, which led to excessive sediment throughout the site. Bed degradation and aggradation were also evident throughout the different project reaches. All of the reaches exhibited areas of vertical instability. Restoration and enhancement of 9,453 linear feet of channel was accomplished utilizing a combination of Priority 2 and 3 approaches (Table 1). UTCC-1 (Station 10+00 to 15+00) was enhanced and UTCC-2 (Station 15+00 to 24+00) and UTCC-3 (Station 24+00 to 33+49) were restored using a Priority 2 approach. The enhancement and restoration of a C4 channel with a sinuosity of 1.34 was accomplished by building a bankfull channel with a higher width/depth ratio than the existing stream, connecting it to a floodplain (bank height ratio=1.0), and creating distinct bed features by adding pools and riffles to the profile. UTCC-1 was enhanced by altering the stream cross-section and profile. UTCC-2 and UTCC-3 were restored by altering the stream cross-section, profile, and planform. In some instances, restoration was accomplished within the same belt-width and in the location of the pre-restoration channel. In the locations where the stream stayed on-line, the stream had been so drastically degraded that there was no form to the channel and the design was able to preserve one streambank and create a new bank and pattern on the opposite side of the stream.

1.3 Location and Setting

The project site is located in a rural setting within the Carolina Slate Belt ecoregion of the Piedmont physiographic province. The site drains to the southeast with a contributing drainage area of approximately 2.6 square miles at the downstream project limits (Figure 3). The watershed's southern boundary runs along NC 54. The northern boundary is below the intersection of Dodsons Crossroads and Dairyland Road. The eastern and western boundaries of the watershed are formed by the topography of the rural landscape.

The project site is spread over three different parcels of private property. The site is located off of Dodsons Crossroads six miles west of Carrboro, North Carolina in Orange County. Specifically, the site is approximately 800 feet north of the intersection of Dodsons Crossroads and NC 54

(Figure 1). The project is centered at approximately 35.9313 degrees north and 79.1788 degrees west (WGS84). To reach the site from Raleigh, proceed west on Interstate 40. Take Exit 273 and travel west on NC 54. Continue west on NC 54 as it joins NC 15-501 and then later splits off from NC 15-501. Approximately 7.5 miles after splitting off from NC 15-501, turn right onto Dodsons Crossroads. The project is accessible from a gravel driveway approximately 0.3 mile on the left.

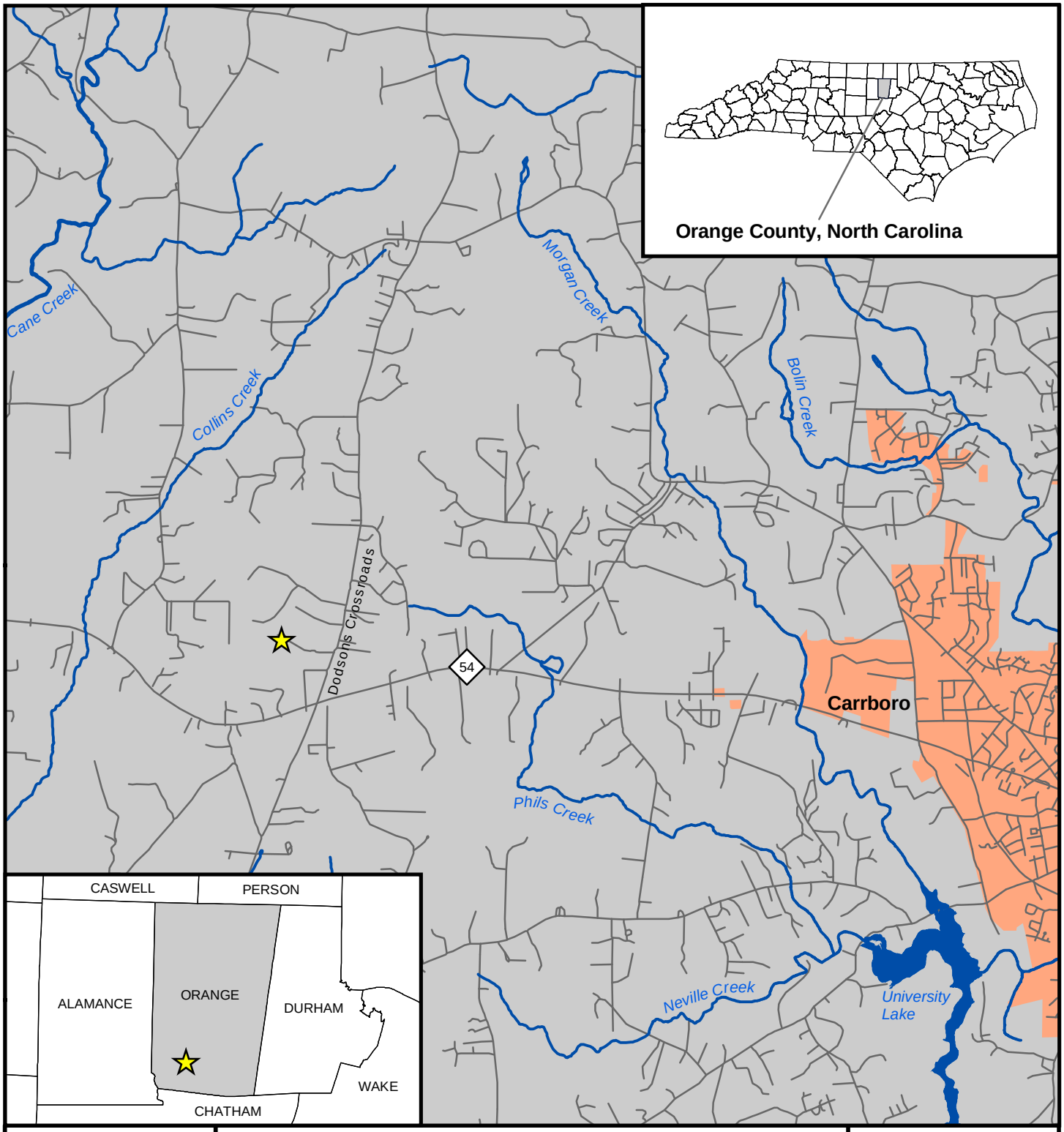

Figure 1. Vicinity Map

- Project Site Location
- Streams
- Lakes and Reservoirs
- Major Roads
- Cities and Towns
- Orange County
- County Boundaries

N
W E
S

1:63,360
1 inch equals 1 miles

1 0.5 0 1 Miles

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Environmental Technologies and Construction, Inc.

1.4 Project History and Background

Table 1. Project Restoration Components
Collins Creek Stream Restoration Site

Project Segment / Reach ID	Pre-Restoration Linear Footage	Type	Approach	As - Built Footage	Eligible Footage*	Mitigation Ratio	Stream Mitigation Units	Stationing	Stream Mitigation Units*
UTCC-1	500 lf	EI	P2	500 lf	500 lf	1.5	334 SMU	10+00 - 15+00	334 SMU
UTCC-2	909 lf	R	P2	900 lf	851 lf	1.0	851 SMU	15+00 - 24+00	851 SMU
UTCC-3	1,034 lf	R	P2	949 lf	898 lf	1.0	898 SMU	24+00 - 33+49	898 SMU
T1-1	637 lf	R	P2	519 lf	519 lf	1.0	519 SMU	40+00 - 45+19	519 SMU
T1-2	604 lf	R	P2	841 lf	774 lf	1.0	774 SMU	45+19 - 53+60	774 SMU
T1-3	1,932 lf	R	P2	2,010 lf	1,894 lf	1.0	1,894 SMU	53+60 - 73+70	1,894 SMU
T1A-1	192 lf	R	P2	240 lf	240 lf	1.0	240 SMU	80+00 - 82+40	240 SMU
T1A-2	533 lf	R	P2/P3	560 lf	506 lf	1.0	506 SMU	82+40 - 88+00	506 SMU
T1B	1,102 lf	R	P2	1,100 lf	1,100 lf	1.0	1,100 SMU	100+00 - 111+00	1,100 SMU
T2	1,879 lf	R	P3	1,833 lf	1,817 lf	1.0	1,817 SMU	120+00 - 138+33	1,817 SMU

Mitigation Unit Summations

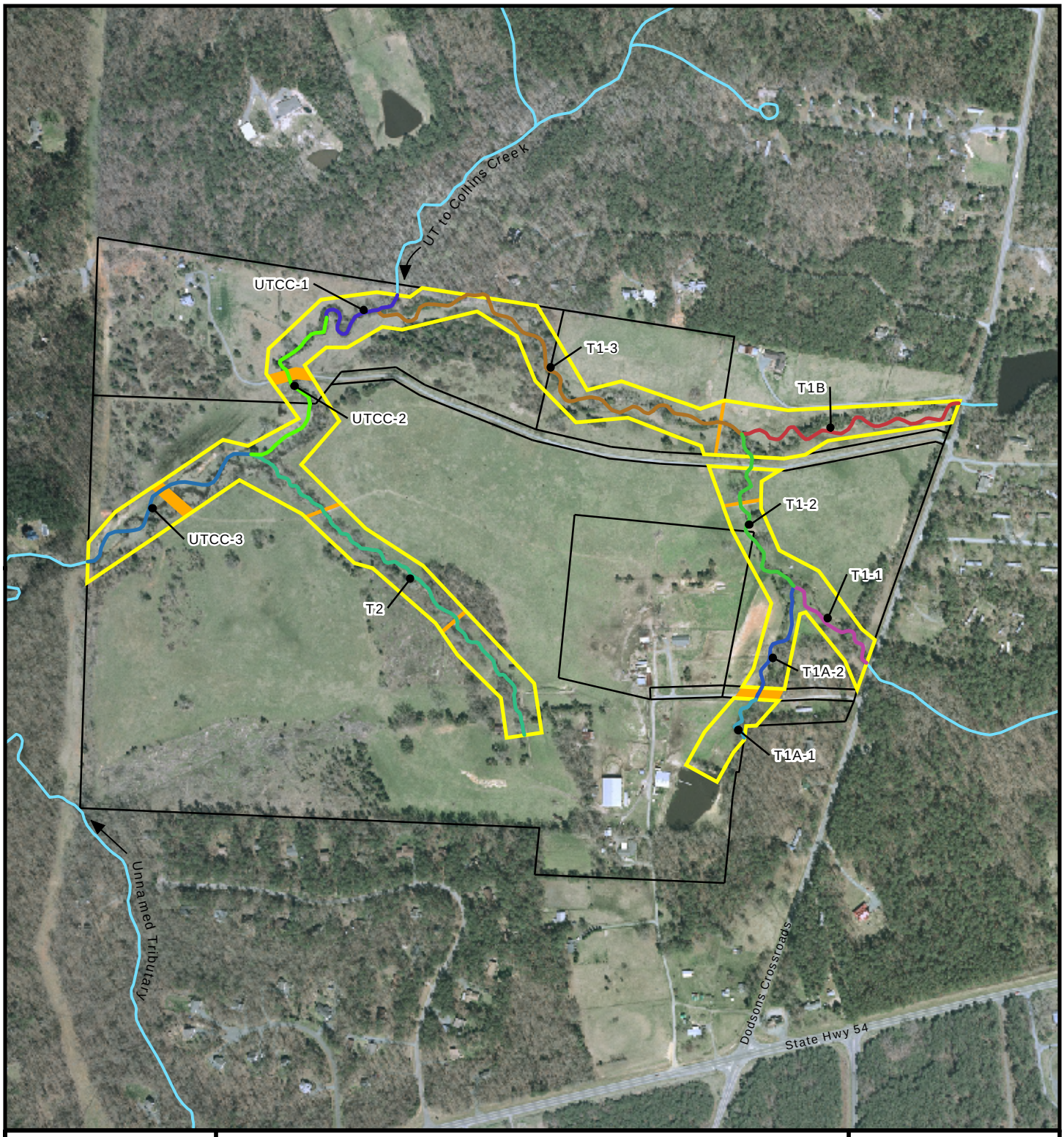
Stream (lf)	Riparian Wetland (Ac)	Nonriparian Wetland (Ac)	Total Wetland (Ac)	Buffer (Ac)
3,405		0	0	0

R = Restoration P2 = Priority 2 P2/P3 = Combination of Priorities 2 and 3
EI = Enhancement I P3 = Priority 3

* These lengths have been calculated by excluding the easement exceptions, including ford and culvert crossings for the landowner and culverted crossings under private driveways.

Table 2. Project Activity and Reporting History
Collins Creek Stream Restoration Site

Activity or Report	Data Collection Complete	Completion or Delivery
Restoration Plan	2005 - 2006	Nov 07
Final Design	2005 - 2006	Nov 07
Construction	N/A	Apr 08
Planting	N/A	Mar 08
Mitigation Plan / As-Built (Year 0 Monitoring - Baseline)	May - July 08	Oct 08
Monitoring Year 01	Oct 08	Dec 08
Monitoring Year 02	Dec 09	Dec 09



KCI TECHNOLOGIES

Figure 2. Project Reaches

Project Easement
Easement Exceptions
Other Streams
Project Parcel Boundaries

N
W E
S

1:7,200
1 inch equals 600 feet

600 300 0 600
Feet

Image Source: Orange County Land Records/GIS Orthoimagery 2003

KCI ASSOCIATES OF NC

ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

Table 3. Project Contact Table Collins Creek Stream Restoration Site	
Design Firm	KCI Technologies, Inc. Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Gary Mryncza Phone: (919) 783-9214 Fax: (919) 783-9266
Construction Contractor	Environmental Technologies and Construction Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Ryan McDavitt Phone: (919) 783-9214 Fax: (919) 783-9266
Planting Contractor	H & J Forest Services PO Box 458 Holly Ridge, NC 28445 Phone: (910) 512-6754
Monitoring Performers	
MY-00 - MY-05	KCI Associates of NC Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4. Project Background Table **Collins Creek Stream Restoration Site**	
Project County	Orange County
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Project River Basin	Cape Fear
USGS HUC for Project and Reference	03030002050060 (UT to Collins Creek)
	03030002050060 (Collins Creek - reference)
	03040103050050 (UT Back Creek - reference)
	03030002060110 (Long Branch - reference)
	03030003050010 (UT to Richland Creek - ref)
	03040101090010 (UT Fisher River - reference)
NCDWQ Sub-basin for Project and Reference	03-06-04 (UT to Collins Creek)
	03-06-04 (Collins Creek - reference)
	03-07-09 (UT Back Creek - reference)
	03-06-05 (Long Branch - reference)
	03-06-10 (UT to Richland Creek - reference)
	03-07-02 (UT Fisher River - reference)
Drainage Area	2.6 sq. mi.
Stream Order	First, Second, and Third Order
Watershed Type (Rural, Urban, Developing, etc.)	Rural
Watershed LULC Distribution Urban	1%
Ag-Row Crop	5%
Ag-Livestock	5%
Forested	88%
Water/Wetlands	1%
Watershed Impervious Cover (%)	3%
Rosgen Classification of As-built (Stream)	C4 (UTCC, T1, T1A-1, T1B)
	B4c (T2)
NCDWQ Classification for Project	Class C, NSW
Within EEP Watershed Plan?	No
Any portion of the project segment upstream of a 303d listed segment?	Yes
Reasons for 303d Listing or Stressor	biological integrity impaired, potentially due to agriculture
Total project acreage of easement	27.8 Acres
Total planted acreage	23.0 Acres
WRC Class (Warm, Cool, Cold)	warm
Species of concern, endangered etc.	none
Pre-construction Beaver activity?	Historically, according to landowner
Dominant Soil Types	Congaree fine sandy loam series
% of Project Easement Fenced	80%

2.0 PROJECT CONDITIONS AND MONITORING RESULTS

2.1 Vegetation Assessment

The planted vegetation on the site is growing well. Due to the baseline vegetation monitoring occurring while the plants had not yet leafed out, some of the plants could not be identified initially and they were recorded as unknown. During the first and second years of monitoring, most of these plants were identified. Some of the previously unknown plants were dead, damaged, or missing and could still not be identified. These plants were again recorded as unknown.

The floodplain, stream banks, and riparian buffer have isolated areas with sparse vegetation, but overall they are well vegetated. Some scattered populations of invasive species have been identified in the floodplain and surrounding areas. These include Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), and tropical soda apple (*Solanum viarum*). Asian dayflower (*Murdannia keisak*) was present within the channel in UTCC-3 and other isolated areas. Although they are not a problem at this time, these populations will continue to be monitored to determine if invasive control is required in the future.

The monitored vegetation plots within the stream revealed that the planted vegetation is growing well with an average of 623 stems/acre. There is one monitoring plot (Plot 15) that has a calculated planted stem density less than 320 stems/acre. This is not seen as problematic given the high potential for desirable volunteers to become established in the plots and across the site. Like natural vegetative communities, some areas will have slightly higher densities than others, but the data from the vegetation monitoring plots reveal that the site has an adequate average stem density. In the third year of monitoring KCI will use the Level 2 CVS-EEP vegetation monitoring protocol to quantify the number of volunteer woody stems. The vegetation assessment found the site to be on track to meeting the vegetative success criteria. The vegetative monitoring results are displayed in Appendix A.

2.2 Stream Assessment

During the 2009 growing season, the project streams have been functioning as designed. There are isolated areas of bank erosion, which have been noted on the Current Condition Plan View (CCPV). The on-site stream gauge recorded six bankfull events throughout the growing season.

The stream assessment found the stream to be stable overall. The surveyed profiles and cross-sections reveal few changes from last year's and this year's monitoring. It appears that there was a survey error that produced an approximate two-foot shift in this year's plot of Cross-Section 11. The apparent change is evident in the cross-section plot in Appendix B. After the third-year monitoring data are collected and this situation is verified as a survey error, the plot will be realigned to coincide with the previous survey data. The structures are performing well and as designed.

Prior to monitoring in 2009, several stream maintenance issues were addressed. T1A and T2 each had two constructed riffles installed and the banks adjacent to the rock ford crossing through UTCC were repaired and the ford was stabilized. The locations of these maintenance actions can be found on the CCPV.

Additional stream assessment data can be found in Appendix B and the Current Condition Plan View in Appendix C.

2.2.1 Bankfull Events

Table 5. Verification of Bankfull Events
Collins Creek Stream Restoration Site

Date of Data Collection	Date of Occurrence	Method	Photo Number
10/1/08	7/5/2008	Stream Gauge	N/A
10/1/08	8/27/2008	Stream Gauge	N/A
10/1/08	9/6/2008	Stream Gauge	N/A
10/1/08	9/10/2008	Stream Gauge	N/A
10/1/08	9/16/2008	Stream Gauge	N/A
12/7/09	3/1/2009	Stream Gauge	N/A
12/7/09	3/15/2009	Stream Gauge	N/A
12/7/09	6/5/2009	Stream Gauge	N/A
12/7/09	6/10/2009	Stream Gauge	N/A
12/7/09	11/11/2009	Stream Gauge	N/A
12/7/09	12/2/2009	Stream Gauge	N/A

2.2.2 Quantitative Measures Summary Tables

Table 6a. UTCC-1&2 Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	15.4	16.0		16.5	2	11.9	16		20.1	2	24.0			21.2		1
Floodprone Width (ft)	>54			>55	2		>60			1	54			>65		1
Bankfull Mean Depth (ft)	2.4	2.8		3.1	2	1.7	2.2		2.7	2	2.0			2.0		1
Bankfull Max Depth (ft)	3.3	4.0		4.6	2	3.3	3.8		4.2	2	2.9			3.1		1
Bankfull Cross-Sectional Area (ft^2)	40.4	43.8		47.1	2	32.4	32.9		33.4	2	47.0			42.5		1
Width/Depth Ratio	5.0	6.0		6.9	2	4.4	16.5		12.1	2	12.0			10.6		1
Entrenchment Ratio	>3.3			>3.5	2		>3			1	2.3			>3.1		1
Bank Height Ratio	1.0	1.0		1.0	2	1	1.1		1.1	2	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)	55			136		50			60		59	120	47		130	
Radius of Curvature (ft)	18			38		24			31		28	62	25		70	
Rc:Bankfull width (ft/ft)	1.1			2.5		1.2			2.6		1.2	2.6	1.2		3.3	
Meander Wavelength (ft)	79			286		77			138		91	275	70		270	
Meander Width Ratio	3.3			8.8		2.5			5.0		2.5	5.0	2.2		6.2	
Profile																
Riffle Length (ft)													27	55	82	5
Riffle Slope (ft/ft)						0.0030			0.0080		0.0020	0.0050	0.0009	0.0019	0.0037	5
Pool Length (ft)						13			21		11	32	11	38	57	8
Pool Spacing (ft)						32			80		40	200	88	139	175	7
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	48% / 17% / 30% / 5% / 0% / 0%					0% / 52% / 48% / 0% / 0% / 0%							7% / 57% / 32% / 3% / 0% / 1%			
d16 / d35 / d50 / d84 / d95 (mm)	0.062 / 0.06 / 0.1 / 20 / 61					0.656 / 1.17 / 1.9 / 16 / 26							0.12 / 0.28 / 0.42 / 11 / 45			
Additional Reach Parameters																
Channel length (ft)	1,409					304					1,391		1,400			
Drainage Area (SM)	2.51					1.68					2.51		2.51			
Rosgen Classification	E4					C4/E4					C4		C4			
Sinuosity	1.27					1.25					1.25		1.28			
Water Surface Slope (ft/ft)	0.0020					0.0030					0.0019		0.0015			

Table 6b. UTCC-3 Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	20.5				1	11.9	16		20.1	2	25.0		25.5	26.3	27.0	2
Floodprone Width (ft)	>60				1		>60			1	55		>74	>75	>76	2
Bankfull Mean Depth (ft)	2.4				1	1.7	2.2		2.7	2	2.0		1.9	2.0	2.1	2
Bankfull Max Depth (ft)	3.5				1	3.3	3.8		4.2	2	2.9		2.8	3.1	3.3	2
Bankfull Cross-Sectional Area (ft^2)	49.7				1	32.4	32.9		33.4	2	49.5		48.0	51.8	55.5	2
Width/Depth Ratio	8.5				1	4.4	16.5		12.1	2	12.5		13.1	13.3	13.5	2
Entrenchment Ratio	>2.9				1		>3			1	2.3		>2.7	>2.9	>3.0	2
Bank Height Ratio	1.1				1	1	1.1		1.1	2	1.0		1.0	1.0	1.0	2
Pattern																
Channel Beltwidth (ft)	53			73		50			60		85	100	85		100	
Radius of Curvature (ft)	16			126		24			31		40	70	40		70	
Rc:Bankfull width (ft/ft)	0.8			6.1		1.2			2.6		1.6	2.8	1.5		2.7	
Meander Wavelength (ft)	96			164		77			138		205	260	205		260	
Meander Width Ratio	2.6			3.6		2.5			5.0		3.4	4.0	3.2		3.8	
Profile																
Riffle Length (ft)													27	55	82	5
Riffle Slope (ft/ft)						0.0030			0.0080		0.0020	0.0050	0.0009	0.0019	0.0037	5
Pool Length (ft)						13			21		35	56	11	38	57	8
Pool Spacing (ft)						32			80		115	165	88	139	175	7
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	48% / 17% / 30% / 5% / 0% / 0%					0% / 52% / 48% / 0% / 0% / 0%							21% / 45% / 31% / 2% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.062 / 0.06 / 0.1 / 20 / 61					0.656 / 1.17 / 1.9 / 16 / 26							0.062 / 0.11 / 0.32 / 17 / 35			
Additional Reach Parameters																
Channel length (ft)	1,034					304					956		949			
Drainage Area (SM)	2.62					1.68					2.62		2.62			
Rosgen Classification	C4/E4					C4/E4					C4		C4			
Sinuosity	1.17					1.25					1.20		1.15			
Water Surface Slope (ft/ft)	0.0020					0.0030					0.0019		0.0017			

Table 6c. T1-1 Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	5.8	7.8	7.3	10.8	4	10.4	13.3		16.1	2	10.4			11.1		1
Floodprone Width (ft)	10			>38	4		150			2	>37			41.3		1
Bankfull Mean Depth (ft)	1.1	1.2	1.2	1.5	4	0.9	1.1		1.2	2	0.8			0.8		1
Bankfull Max Depth (ft)	1.6	2.0	2.0	2.3	4	1.4	1.6		1.7	2	1.2			1.3		1
Bankfull Cross-Sectional Area (ft^2)	8.6	8.9	8.8	9.3	4	12.5	13.5		14.4	2	8.2			8.4		1
Width/Depth Ratio	3.9	7.3	5.4	9.8	4	11.6	12.5		13.4	2	13.3			14.7		1
Entrenchment Ratio	1.0			>6.5	4	9.3	11.9		14.4	2	>3.6			3.7		1
Bank Height Ratio	2.0	2.2	2.2	2.4	4	1.0	1.1		1.1	2	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)	44			78		135					20	50	25		40	
Radius of Curvature (ft)	18			110		15			26		20	30	20		30	
Rc:Bankfull width (ft/ft)	1.7			19.0		1.4			1.6		2.0	3.0	1.8		2.7	
Meander Wavelength (ft)	135			250		70			120		70	125	75		115	
Meander Width Ratio	4.1			13.4		10.2			13.0		2.0	5.0	2.3		10.4	
Profile																
Riffle Length (ft)													19	41	83	13
Riffle Slope (ft/ft)	0.044					0.010			0.040		0.010	0.012	0.0039	0.0111	0.0214	13
Pool Length (ft)	10			20		31			108		10	30	8	22	44	13
Pool Spacing (ft)	32			43		43			181		40	90	48	88	169	12
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	31% / 31% / 37% / 0% / 0% / 0%					0% / 0% / 52% / 42% / 0% / 6%							8% / 20% / 72% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.062 / 0.14 / 0.24 / 12 / 21					12.3 / 35.5 / 53.7 / 114 / 172							0.41 / 3.2 / 7.4 / 20 / 27			
Additional Reach Parameters																
Channel length (ft)	637					712					595		519			
Drainage Area (SM)	0.12					0.63					0.12		0.12			
Rosgen Classification	G4c/E4					E4/C4					C4		C4			
Sinuosity	1.15					>1.5					1.25		1.15			
Water Surface Slope (ft/ft)	0.0073					0.0068					0.0075		0.0084			

Table 6d. T1-2 Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	5.7	7.9		10.1	2	10.4	13.3		16.1	2	12.0			11.7		1
Floodprone Width (ft)	11.1	13.5		16.0	2		150			2	>40			41.6		1
Bankfull Mean Depth (ft)	1.1	1.3		1.4	2	0.9	1.1		1.2	2	0.9			1.0		1
Bankfull Max Depth (ft)	1.4	1.6		1.8	2	1.4	1.6		1.7	2	1.4			1.5		1
Bankfull Cross-Sectional Area (ft^2)	8.2	9.5		10.8	2	12.5	13.5		14.4	2	11.2			11.5		1
Width/Depth Ratio	4.1	6.7		9.2	2	11.6	12.5		13.4	2	13.3			11.9		1
Entrenchment Ratio	1.1	2.0		2.8	2	9.3	11.9		14.4	2	>3.3			3.6		1
Bank Height Ratio	2.0	2.1		2.1	2	1.0	1.1		1.1	2	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)	42			83		135					40	60	45		66	
Radius of Curvature (ft)	17			34		15			26		20	30	20		30	
Rc:Bankfull width (ft/ft)	1.7			6		1.4			1.6		1.7	2.5	1.2		1.8	
Meander Wavelength (ft)	106			148		70			120		80	140	80		175	
Meander Width Ratio	4.2			14.6		10.2			13.0		3.3	5.0	2.7		4.0	
Profile																
Riffle Length (ft)													19	41	83	13
Riffle Slope (ft/ft)	0.006			0.009		0.010			0.040		0.005	0.011	0.0039	0.0111	0.0214	13
Pool Length (ft)	7					31			108		12	35	8	22	44	13
Pool Spacing (ft)						43			181		40	90	48	88	169	12
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	29% / 42% / 30% / 0% / 0% / 0%					0% / 0% / 52% / 42% / 0% / 6%							13% / 64% / 23% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.062 / 0.15 / 0.2 / 9 / 17					12.3 / 35.5 / 53.7 / 114 / 172							0.07 / 0.14 / 0.29 / 8.6 / 15			
Additional Reach Parameters																
Channel length (ft)	604					712					767		841			
Drainage Area (SM)	0.18					0.63					0.18		0.18			
Rosgen Classification	G4c/E4					E4/C4					C4		C4			
Sinuosity	1.21					>1.5					1.23		1.22			
Water Surface Slope (ft/ft)	0.0075					0.0068					0.0059		0.0072			

Table 6e. T1-3 Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	7.7	10.2	10.9	11.9	3	14.8	16.8		18.8	2	15.0		14.8	17.8	20.8	2
Floodprone Width (ft)	>55		>63	>70	3			>40		2	>40		49	57	65	2
Bankfull Mean Depth (ft)	1.3	1.5	1.3	2.0	3	1.3	1.6		1.8	2	1.1		1.0	1.0	1.0	2
Bankfull Max Depth (ft)	2.5	2.6	2.6	2.7	3	1.9	2.2		2.4	2	1.6		1.4	1.7	1.9	2
Bankfull Cross-Sectional Area (ft^2)	14.5	15.0	15.1	15.5	3	25	25.1		25.1	2	16.9		14.3	17.2	20.0	2
Width/Depth Ratio	3.9	7.2	8.2	9.4	3	8.8	11.3		13.8	2	13.3		15.3	18.5	21.6	2
Entrenchment Ratio	>5.0		>5.9	>8.2	3			>2.5		2	>2.5		3.1	3.2	3.3	2
Bank Height Ratio	1.2	1.2	1.2	1.3	3	1.2	1.4		1.5	2	1.0		1.0	1.0	1.0	2
Pattern																
Channel Beltwidth (ft)	39			86				60			30	75	35		85	
Radius of Curvature (ft)	14			55		16			87		30	70	30		60	
Rc:Bankfull width (ft/ft)	1.2			7.1		0.9			5.9		2.0	4.7	1.7		3.4	
Meander Wavelength (ft)	60			476		66			191		115	250	110		240	
Meander Width Ratio	3.3			11.2				4.1			2.0	5.0	2.0		4.8	
Profile																
Riffle Length (ft)													19	41	83	13
Riffle Slope (ft/ft)			0.011			0.013			0.035		0.007	0.009	0.0039	0.0111	0.0214	13
Pool Length (ft)	8			16		14			33		16	55	8	22	44	13
Pool Spacing (ft)	23			100		50			105		70	140	48	88	169	12
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	56% / 30% / 14% / 0% / 0% / 0%					1% / 27% / 73% / 0% / 0% / 0%							5% / 63% / 31% / 1% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.062 / 0.06 / 0.06 / 1.3 / 9.5					0.73 / 2.7 / 4.6 / 9.2 / 15							0.13 / 0.29 / 0.43 / 12 / 30			
Additional Reach Parameters																
Channel length (ft)	1,932					432					2,010		2,010			
Drainage Area (SM)	0.49					1.49					0.49		0.49			
Rosgen Classification	E4					C4					C4		C4			
Sinuosity	1.19										1.14		1.17			
Water Surface Slope (ft/ft)	0.0052					0.0099					0.0050		0.0057			

Table 6f. T1A-1 Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	4.5	5.7		6.8	2	14.8	21.0		27.1	2	7.0			7.9		1
Floodprone Width (ft)	6.0	26		45	2			200		2	>16			>40		1
Bankfull Mean Depth (ft)	0.3	0.8		1.2	2	0.8	1.2		1.5	2	0.5			0.3		1
Bankfull Max Depth (ft)	0.5	1.1		1.6	2	1.9	2.0		2.0	2	0.7			0.6		1
Bankfull Cross-Sectional Area (ft^2)	2.0	3.8		5.5	2	21.2	21.8		22.3	2	3.4			2.5		1
Width/Depth Ratio	3.6	13.4		23.1	2	18.1	18.3		18.5	2	14.4			25.0		1
Entrenchment Ratio	1.5	4.1		6.6	2	7.4	10.5		13.5	2	>2.3			>5		1
Bank Height Ratio	2.3	3.5		4.6	2	1.0	1.1		1.1	2	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)								75			15	40	20		40	
Radius of Curvature (ft)						16			26		7	21	10		20	
Rc:Bankfull width (ft/ft)						1			1.1		1.0	3.0	1.0		2.1	
Meander Wavelength (ft)						108			148		40	75	44		73	
Meander Width Ratio						3.6			5.1		2.1	5.7	2.1		4.1	
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)						0.003			0.076		0.001	0.024				
Pool Length (ft)						28			89		9	21				
Pool Spacing (ft)						38			147		25	52				
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	7% / 19% / 57% / 4% / 0% / 13%					0% / 52% / 48% / 0% / 0% / 0%							22% / 76% / 3% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.564 / 5.31 / 9.9 / 35 / 62					0.656 / 1.17 / 1.9 / 16 / 26							0.062 / 0.079 / 0.1 / 0.22 / 0.44			
Additional Reach Parameters																
Channel length (ft)	192					525					251		240			
Drainage Area (SM)	0.04					0.90					0.04		0.04			
Rosgen Classification	C4					C4					C4		C4			
Sinuosity	1.05					1.50					1.40		1.35			
Water Surface Slope (ft/ft)	0.0115					0.0120					0.0100		0.0110			

Table 6g. T1A-2 Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)			4.5		1	9.0	9.5		10.0	2	7.6			9.7		1
Floodprone Width (ft)			6.7		1	13	17		20	2	15			>40		1
Bankfull Mean Depth (ft)			1.2		1	1.1	1.2		1.2	2	0.8			0.5		1
Bankfull Max Depth (ft)			1.6		1	1.3	1.4		1.5	2	1.0			1.0		1
Bankfull Cross-Sectional Area (ft^2)			5.5		1	10.4	10.6		10.7	2	6.0			5.2		1
Width/Depth Ratio			3.8		1	8.0	9.0		10.0	2	9.6			18.1		1
Entrenchment Ratio			1.5		1	1.3	1.8		2.3	2	2.0			>4		1
Bank Height Ratio			2.3		1			1.0		2	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)								45			34	38	30		60	
Radius of Curvature (ft)						13			42		10	33	20		30	
Rc:Bankfull width (ft/ft)						1.3			4.4		1.3	4.4	2.5		3.8	
Meander Wavelength (ft)						93			136		68	114	90		150	
Meander Width Ratio						4.5			5.0		4.5	5.0	3.8		7.6	
Profile																
Riffle Length (ft)													9	27	57	5
Riffle Slope (ft/ft)	0.019			0.077		0.013			0.028		0.016	0.035	N/A*	N/A*	N/A*	-
Pool Length (ft)	4			9		3			25		9	26	2	6	9	6
Pool Spacing (ft)	8			34		30			59		40	104	8	49	81	5
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	7% / 19% / 57% / 4% / 0% / 13%					0% / 15% / 78% / 7% / 0% / 0%							32% / 58% / 10% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.564 / 5.31 / 9.9 / 35 / 62					2.0 / 4.2 / 6.9 / 30 / 70							0.062 / 0.071 / 0.14 / 0.48 / 11			
Additional Reach Parameters																
Channel length (ft)	533					297					565		560			
Drainage Area (SM)	0.05					0.38					0.05		0.05			
Rosgen Classification	G4					B4c					B4c		C4/B4c			
Sinuosity	1.05					1.20					1.15		1.17			
Water Surface Slope (ft/ft)	0.0218					0.0130					0.0160		0.0135			

*Riffle slope not available, stream was dry when survey was completed.

Table 6h. T1B Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	5.9	6.0		6.0	2	10.4	13.3		16.1	2	10.4			11.1		1
Floodprone Width (ft)			>70		2		150	150		2	>37			43		1
Bankfull Mean Depth (ft)	1.4	1.6		1.7	2	0.9	1.1		1.2	2	0.8			0.8		1
Bankfull Max Depth (ft)	2.0	2.1		2.1	2	1.4	1.6		1.7	2	1.2			1.4		1
Bankfull Cross-Sectional Area (ft^2)	8.4	9.2		9.9	2	12.5	13.5		14.4	2	8.2			8.4		1
Width/Depth Ratio	3.5	3.9		4.3	2	11.6	12.5		13.4	2	13.3			14.7		1
Entrenchment Ratio			>11.7		2	9.3	11.9		14.4	2	>3.6			3.8		1
Bank Height Ratio	1.0	1.4		1.7	2	1	1.1		1.1	2	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)			110					135			30	80	25		70	
Radius of Curvature (ft)	54			125		14			25		20	40	20		40	
Rc:Bankfull width (ft/ft)	9			21.2		1.4			1.6		1.9	3.8	1.9		3.8	
Meander Wavelength (ft)			400			70			120		110	150	120		160	
Meander Width Ratio	18.3			18.6		10.2			13.0		2.9	7.7	2.4		6.7	
Profile																
Riffle Length (ft)													42	49	55	3
Riffle Slope (ft/ft)	0.0060			0.0080		0.0100			0.0400		0.0080	0.0200	0.0059	0.0141	0.0219	3
Pool Length (ft)	9			17		31			108		12	35	14	20	29	3
Pool Spacing (ft)	13			18		43.5			181		61	111	80	86	93	2
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	8% / 66% / 26% / 0% / 0% / 0%					0% / 0% / 52% / 42% / 0% / 6%							17% / 60% / 23% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.151 / 0.23 / 0.4 / 7 / 28					12.3 / 35.5 / 53.7 / 114 / 172							0.062 / 0.11 / 0.22 / 5.5 / 9.2			
Additional Reach Parameters																
Channel length (ft)	1,102					712					1,134		1,100			
Drainage Area (SM)	0.24					0.63					0.24		0.24			
Rosgen Classification	E4					C4					C4		C4			
Sinuosity	1.12					>1.50					1.20		1.18			
Water Surface Slope (ft/ft)	0.0084					0.0070					0.0077		0.0083			

Table 6i. T2 Baseline Stream Summary
Collins Creek Stream Restoration Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	4.2	5.5	5.4	7.2	4	7.7	7.9	7.7	8.3	3	7.0			7.4		1
Floodprone Width (ft)	8	13	9	28	4	13	15	16	16	3	13			14		1
Bankfull Mean Depth (ft)	0.9	1.0	1.0	1.1	4	0.7	0.8	0.8	0.9	3	0.6			0.7		1
Bankfull Max Depth (ft)	1.3	1.4	1.5	1.5	4	1.1	1.3	1.3	1.4	3	1.0			1.2		1
Bankfull Cross-Sectional Area (ft^2)	4.0	5.3	5.4	6.4	4	6.1	6.4	6.2	7.0	3	4.8			5.2		1
Width/Depth Ratio	3.8	5.8	5.6	8.0	4	8.5	9.8	9.6	11.4	3	11.0			10.5		1
Entrenchment Ratio	1.3	2.4	1.8	4.6	4	1.6	1.9	2.1	2.1	3	1.9			1.8		1
Bank Height Ratio	1.3	2.1	2.3	2.8	4						1.0			1.0		1
Pattern																
Channel Beltwidth (ft)	22			50				22			14	20	25		40	
Radius of Curvature (ft)	14			78		11			23		7	21	10		20	
Rc:Bankfull width (ft/ft)	1.9			18.7		1.0			3.0		1.0	3.0	1.4		2.7	
Meander Wavelength (ft)	50			306		49			59		32	54	50		65	
Meander Width Ratio	3.1			15.0		2.0			2.9		2.0	2.9	3.4		5.4	
Profile																
Riffle Length (ft)													11	18	26	5
Riffle Slope (ft/ft)	0.0160			0.0540		0.0250			0.0470		0.0170	0.0470	0.0186	0.0271	0.0413	3
Pool Length (ft)	3			8		3			15		3	20	5	11	21	9
Pool Spacing (ft)	16			96		21			72		21	72	6	25	47	8
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	7% / 12% / 76% / 5% / 0% / 0%					1% / 27% / 64% / 6% / 1% / 0%							2% / 50% / 46% / 2% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	0.47 / 8.4 / 14 / 33 / 66					0.36 / 3.2 / 6.2 / 16 / 150							0.26 / 0.53 / 1.4 / 14 / 35			
Additional Reach Parameters																
Channel length (ft)	1,879					205					1,830		1,833			
Drainage Area (SM)	0.07					0.16					0.07		0.07			
Rosgen Classification	B4/E4/G4/G4c					B4c					B4/B4c		B4/B4c			
Sinuosity	1.10-1.16					1.20					1.10-1.20		1.09			
Water Surface Slope (ft/ft)	0.0147-0.0250					0.0120					0.0170-0.0250		0.0197			

Table 7a. Morphology and Hydraulic Monitoring Summary
Collins Creek Stream Restoration Site

Parameter	Cross-Section 1 Riffle						Cross-Section 2 Pool						Cross-Section 3 Pool					
Reach	UTCC-1						UTCC-1						UTCC-3					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	21.2	21.9	21.2				35.9	37.5	39.1				25.3	25.4	25.0			
Floodprone Width (ft)	>65	>65	>65				-	-	-				-	-	-			
Bankfull Cross-Sectional Area (ft^2)	42.5	43.6	41.7				86.7	88.0	83.7				49.1	48.6	49.1			
Bankfull Mean Depth (ft)	2.0	2.0	2.0				2.4	2.3	2.1				1.9	1.9	2.0			
Bankfull Max Depth (ft)	3.1	3.1	3.1				4.3	4.3	4.2				3.6	3.6	3.7			
Width/Depth Ratio	10.6	11.0	10.8				-	-	-				-	-	-			
Entrenchment Ratio	>3.1	>3.0	>3.0				-	-	-				-	-	-			
Bank Height Ratio	1.0	1.0	1.0				-	-	-				-	-	-			
Substrate																		
d50 (mm)	0.4	0.2	0.1				0.4	7.7	0.1				0.2	0.1	0.1			
d84 (mm)	17.0	17.0	0.2				4.9	15.0	20.0				16.0	11.0	16.0			

Table 7b. Morphology and Hydraulic Monitoring Summary continued
Collins Creek Stream Restoration Site

Parameter	Cross-Section 4 Riffle						Cross-Section 5 Riffle						Cross-Section 6 Riffle					
Reach	UTCC-3						UTCC-3						T1-1					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	25.5	25.9	25.8				27.0	28.2	28.6				11.1	11.8	11.3			
Floodprone Width (ft)	>76	>76	>76				>74	>74	>74				41	45	40			
Bankfull Cross-Sectional Area (ft^2)	48.0	46.2	46.7				55.5	54.9	55.6				8.4	8.5	8.4			
Bankfull Mean Depth (ft)	1.9	1.8	1.8				2.1	1.9	1.9				0.8	0.7	0.7			
Bankfull Max Depth (ft)	2.8	2.7	2.7				3.3	3.2	3.3				1.3	1.4	1.3			
Width/Depth Ratio	13.5	14.5	14.3				13.1	14.5	14.7				14.7	16.4	15.2			
Entrenchment Ratio	>3.0	>3.0	>3.0				>2.7	>3.0	>3.0				3.7	3.8	3.6			
Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				1.0	1.0	1.0			
Substrate																		
d50 (mm)	1.3	0.1	0.1				0.2	0.1	0.1				7.4	0.2	19.0			
d84 (mm)	24.0	11.0	0.1				1.0	9.2	0.1				20.0	0.4	27.0			

Table 7c. Morphology and Hydraulic Monitoring Summary continued
Collins Creek Stream Restoration Site

Parameter	Cross-Section 7 Riffle						Cross-Section 8 Pool						Cross-Section 9 Riffle					
Reach	T1-2						T1-2						T1-3					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	11.7	12.4	11.7				13.1	13.4	14.4				20.8	24.3	20.1			
Floodprone Width (ft)	42	42	45				-	-	-				>65	>65	>65			
Bankfull Cross-Sectional Area (ft^2)	11.5	12.4	12.6				10.9	10.5	11.7				20.0	19.3	17.1			
Bankfull Mean Depth (ft)	1.0	1.0	1.1				0.8	0.8	0.8				1.0	0.8	0.9			
Bankfull Max Depth (ft)	1.5	1.7	1.9				1.8	1.7	1.9				1.9	2.0	1.7			
Width/Depth Ratio	11.9	12.4	10.9				-	-	-				21.6	30.6	23.6			
Entrenchment Ratio	3.6	3.4	3.8				-	-	-				>3.1	>3.0	>3.0			
Bank Height Ratio	1.0	1.0	1.0				-	-	-				1.0	1.0	1.0			
Substrate																		
d50 (mm)	0.8	0.3	0.1				0.1	0.1	0.1				1.3	8.6	0.1			
d84 (mm)	13.0	15.0	6.0				0.3	0.3	0.1				24.0	21.0	0.1			

Table 7d. Morphology and Hydraulic Monitoring Summary continued
Collins Creek Stream Restoration Site

Parameter	Cross-Section 10 Pool						Cross-Section 11 Riffle						Cross-Section 12 Riffle					
Reach	T1-3						T1-3						T1A-1					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	22.3	21.6	23.8				14.8	14.6	16.3				7.9	7.7	7.2			
Floodprone Width (ft)	-	-	-				49	46	48				>40	>40	>40			
Bankfull Cross-Sectional Area (ft^2)	31.4	30.8	32.3				14.3	11.3	12.9				2.5	1.7	1.6			
Bankfull Mean Depth (ft)	1.4	1.4	1.4				1.0	0.8	0.8				0.3	0.2	0.2			
Bankfull Max Depth (ft)	2.9	3.1	3.0				1.4	1.2	1.2				0.6	0.5	0.6			
Width/Depth Ratio	-	-	-				15.3	19.0	20.6				25.0	34.9	32.1			
Entrenchment Ratio	-	-	-				3.3	3.2	3.0				>5.1	>5.2	>5.6			
Bank Height Ratio	-	-	-				1.0	1.0	1.0				1.0	1.0	1.0			
Substrate																		
d50 (mm)	0.2	0.6	0.1				0.7	12.0	0.1				0.1	0.1	0.2			
d84 (mm)	0.5	7.5	0.1				9.5	23.0	27.0				0.2	0.1	0.2			

Table 7e. Morphology and Hydraulic Monitoring Summary continued Collins Creek Stream Restoration Site																		
Parameter	Cross-Section 13 Riffle						Cross-Section 14 Riffle						Cross-Section 15 Pool					
Reach	T1A-2						T1A-2						T2					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	9.7	9.7	10.3				11.1	11.0	10.3				10.4	11.3	10.3			
Floodprone Width (ft)	>40	>40	>40				43	53	44				-	-	-			
Bankfull Cross-Sectional Area (ft^2)	5.2	6.3	7.1				8.4	9.1	9.5				9.8	12.0	10.1			
Bankfull Mean Depth (ft)	0.5	0.6	0.7				0.8	0.8	0.9				0.9	1.1	1.0			
Bankfull Max Depth (ft)	0.9	1.2	1.4				1.4	1.5	1.5				1.9	2.1	2.0			
Width/Depth Ratio	18.1	14.9	14.9				14.7	13.3	11.2				-	-	-			
Entrenchment Ratio	>4.1	>4.1	>3.9				3.8	4.8	4.3				-	-	-			
Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				-	-	-			
Substrate																		
d50 (mm)	0.1	0.1	0.1				0.2	0.3	0.1				2.2	1.3	0.1			
d84 (mm)	0.5	0.1	11.0				5.5	6.3	6.2				19.0	22.0	4.0			

Table 7f. Morphology and Hydraulic Monitoring Summary continued Collins Creek Stream Restoration Site						
Parameter	Cross-Section 16 Riffle					
Reach	T2					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	7.4	7.7	7.2			
Floodprone Width (ft)	14	14	13			
Bankfull Cross-Sectional Area (ft^2)	5.2	5.7	4.9			
Bankfull Mean Depth (ft)	0.7	0.7	0.7			
Bankfull Max Depth (ft)	1.2	1.3	1.2			
Width/Depth Ratio	10.5	10.4	10.6			
Entrenchment Ratio	1.8	1.9	1.9			
Bank Height Ratio	1.0	1.0	1.0			
Substrate						
d50 (mm)	0.9	9.3	0.1			
d84 (mm)	11.0	18.0	27.0			

Table 7g. Morphology and Hydraulic Monitoring Summary continued
Collins Creek Stream Restoration Site

Reach UTCC-1, 2, and 3															
Parameter	MY - 01 (2008)			MY - 02 (2009)			MY - 03 (2010)			MY - 04 (2011)			MY - 05 (2012)		
Profile	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max
Riffle Length (ft)	32	56	84	22	49	88									
Riffle Slope (ft/ft)			0.0013	0.0000	0.0019	0.0068									
Pool Length (ft)	4	28	45	10	34	67									
Pool Spacing (ft)	29	121	158	27	120	174									
Additional Reach Parameters															
Water Surface Slope (ft/ft)	0.0008			0.0007											
Rosgen Classification	C4			C4											

* Pattern measurements will only be taken after MY-00 if it is visually apparent that the pattern has changed.

Table 7h. Morphology and Hydraulic Monitoring Summary continued
Collins Creek Stream Restoration Site

Reach T1-1, 2, and 3															
Parameter	MY - 01 (2008)			MY - 02 (2009)			MY - 03 (2010)			MY - 04 (2011)			MY - 05 (2012)		
Profile	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max
Riffle Length (ft)	13	32	79	15	25	46									
Riffle Slope (ft/ft)	0.0048	0.0168	0.0282	0.0056	0.0188	0.0325									
Pool Length (ft)	7	25	43	5	28	54									
Pool Spacing (ft)	53	91	152	17	69	146									
Additional Reach Parameters															
Water Surface Slope (ft/ft)	0.0061			0.0060											
Rosgen Classification	C4			C4											

* Pattern measurements will only be taken after MY-00 if it is visually apparent that the pattern has changed.

Table 7i. Morphology and Hydraulic Monitoring Summary continued
Collins Creek Stream Restoration Site

Reach T1A-1, and 2															
Parameter	MY - 01 (2008)			MY - 02 (2009)			MY - 03 (2010)			MY - 04 (2011)			MY - 05 (2012)		
Profile	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max
Riffle Length (ft)	27	33	39	23	34	47									
Riffle Slope (ft/ft)	**	**	**	**	**	**									
Pool Length (ft)	6	9	12	7	10	18									
Pool Spacing (ft)	22	52	70	29	52	66									
Additional Reach Parameters															
Water Surface Slope (ft/ft)	N/A			N/A											
Rosgen Classification	C4			C4											

* Pattern measurements will only be taken after MY-00 if it is visually apparent that the pattern has changed.

**Slope not available due to no water in channel.

Table 7j. Morphology and Hydraulic Monitoring Summary continued
Collins Creek Stream Restoration Site

ReachT1B															
Parameter	MY - 01 (2008)			MY - 02 (2009)			MY - 03 (2010)			MY - 04 (2011)			MY - 05 (2012)		
Profile	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max
Riffle Length (ft)	27	46	58	13	33	48									
Riffle Slope (ft/ft)	0.0086	0.0148	0.0239	**	**	**									
Pool Length (ft)	18	24	27	11	16	24									
Pool Spacing (ft)	79	86	93	79	86	93									
Additional Reach Parameters															
Water Surface Slope (ft/ft)	0.0079			N/A											
Rosgen Classification	C4			C4											

* Pattern measurements will only be taken after MY-00 if it is visually apparent that the pattern has changed.

**Slope not available due to no water in channel.

Table 7k. Morphology and Hydraulic Monitoring Summary continued
Collins Creek Stream Restoration Site

Reach T2															
Parameter	MY - 01 (2008)			MY - 02 (2009)			MY - 03 (2010)			MY - 04 (2011)			MY - 05 (2012)		
Profile	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max	Min	Avg.	Max
Riffle Length (ft)	17	28	45	10	38	104									
Riffle Slope (ft/ft)	0.0129	0.0251	0.0327	**	**	**									
Pool Length (ft)	6	14	25	8	16	30									
Pool Spacing (ft)	7	35	90	34	64	160									
Additional Reach Parameters															
Water Surface Slope (ft/ft)	0.02			N/A											
Rosgen Classification	B4c			B4c											

* Pattern measurements will only be taken after MY-00 if it is visually apparent that the pattern has changed.

**Slope not available due to no water in channel.

Appendix A
Vegetation Data

Appendix A1: Vegetation Data

Table A1. Vegetation Metadata
Collins Creek Stream Restoration Site

Report Prepared By	Brian Roberts
Date Prepared	6/29/2009 13:26
Database Name	Collins_2009.mdb
Database Location	M:\2005\12054130_01_Collins_Creek\Veg_Database

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

Project Code	Project Name	Description	Length (ft)	Stream-to-Edge Width (ft)	Area (sq m)	Required Plots (calculated)	Sampled Plots
UTCC	Collins	This is a Full-Delivery Stream Restoration in Orange County, North Carolina	6,808	50	63,242	15	15

Table A2. Vegetation Vigor by Species
Collins Creek Stream Restoration Site

	Species	4	3	2	1	0	Missing
	Aronia arbutifolia		15	10		3	
	Betula nigra	2	11	4			
	Callicarpa americana		3	1			
	Carya ovata		7	3		1	1
	Cornus amomum	3	11	8		4	
	Diospyros virginiana	8	23	7			
	Fraxinus pennsylvanica		2				
	Ilex verticillata		1	3			
	Itea virginica					2	
	Juglans nigra	3	17	11	1	3	1
	Quercus falcata	5	9	3			
	Quercus michauxii		1	6		1	
	Quercus pagoda		1				
	Quercus phellos		5	2			
	Salix nigra	1	3			1	
	Salix sericea		1			3	
	Sambucus canadensis		1			14	
	Symphoricarpos orbiculatus	2	3			3	
	Ilex decidua		6	4		1	
	Quercus sp.		1	1		2	
	Lindera benzoin			1			
	Platanus occidentalis	10	10	1			
	Unknown					4	2
TOT:	**23**	**34**	**131**	**65**	**1**	**42**	**4**

Table A3. Damage by Species
Collins Creek Stream Restoration Site

	Species	All Damage Categories	No Damage	Other Damage	Beaver	Deer	Human Trampled	Insects	Site Too Wet	Unknown
	Aronia arbutifolia	28	26			2				
	Betula nigra	17	10			7				
	Callicarpa americana	4	4							
	Carya ovata	12	12							
	Cornus amomum	26	26							
	Diospyros virginiana	38	36			2				
	Fraxinus pennsylvanica	2	2							
	Ilex decidua	11	10			1				
	Ilex verticillata	4	3			1				
	Itea virginica	2	2							
	Juglans nigra	36	34			1			1	
	Lindera benzoin	1	1							
	Platanus occidentalis	21	15					5		1
	Quercus sp.	4	4							
	Quercus falcata	17	15	1			1			
	Quercus michauxii	8	8							
	Quercus pagoda	1	1							
	Quercus phellos	7	7							
	Salix nigra	5	4		1					
	Salix sericea	4	3			1				
	Sambucus canadensis	15	15							
	Symphoricarpos orbiculatus	8	8							
	Unknown	6	5						1	
TOT:	**23**	**277**	**251**	**1**	**1**	**15**	**1**	**5**	**2**	**1**

Table A4. Damage by Plot
Collins Creek Stream Restoration Site

	Plot	All Damage Categories	No Damage	Other Damage	Beaver	Deer	Human Trampled	Insects	Site Too Wet	Unknown
	UTCC-A-0001-year:2	17	11	1		3		2		
	UTCC-A-0002-year:2	18	12			4		1		1
	UTCC-A-0003-year:2	17	16				1			
	UTCC-A-0004-year:2	15	15							
	UTCC-A-0005-year:2	26	24			2				
	UTCC-A-0006-year:2	17	13			2			2	
	UTCC-A-0007-year:2	17	16			1				
	UTCC-A-0008-year:2	23	20		1	2				
	UTCC-A-0009-year:2	17	17							
	UTCC-A-0010-year:2	21	21							
	UTCC-A-0011-year:2	20	19					1		
	UTCC-A-0012-year:2	22	20			1		1		
	UTCC-A-0013-year:2	14	14							
	UTCC-A-0014-year:2	20	20							
	UTCC-A-0015-year:2	13	13							
TOT:	**15**	**277**	**251**	**1**	**1**	**15**	**1**	**5**	**2**	**1**

Table A5. Stem Count by Plot and Species
Collins Creek Stream Restoration Site

	Species	Total Stems	# Plots	Avg # Stems	plot UTCC-A-0001-year:2	plot UTCC-A-0002-year:2	plot UTCC-A-0003-year:2	plot UTCC-A-0004-year:2	plot UTCC-A-0005-year:2	plot UTCC-A-0006-year:2	plot UTCC-A-0007-year:2	plot UTCC-A-0008-year:2	plot UTCC-A-0009-year:2	plot UTCC-A-0010-year:2	plot UTCC-A-0011-year:2	plot UTCC-A-0012-year:2	plot UTCC-A-0013-year:2	plot UTCC-A-0014-year:2	plot UTCC-A-0015-year:2
	Aronia arbutifolia	25	8	3.12	1	4	4	1	4	7	2					2			
	Betula nigra	17	8	2.12	2	6	1		3	1	1				2	1			
	Callicarpa americana	4	2	2.00				3			1								
	Carya ovata	10	6	1.67				1					1	1	4	1	2		
	Cornus amomum	22	7	3.14	4			3	4			4	1	3				3	
	Diospyros virginiana	38	12	3.17	1	3	5		3			1	1	3	6	8	2	3	2
	Fraxinus pennsylvanica	2	2	1.00						1	1								
	Ilex decidua	10	6	1.67						2	1	2	1	3	1				
	Ilex verticillata	4	4	1.00		1	1				1					1			
	Juglans nigra	32	8	4.00								5	10	3	3	3	3	2	3
	Lindera benzoin	1	1	1.00			1												
	Platanus occidentalis	21	8	2.62	2	4		1	2	3	4				1	4			
	Quercus sp.	2	2	1.00				1										1	
	Quercus falcata	17	10	1.70	1		1		1				1	3	2	1	2	3	2
	Quercus michauxii	7	4	1.75			1		1	1	4								
	Quercus pagoda	1	1	1.00													1		
	Quercus phellos	7	4	1.75	1		1	3			2								
	Salix nigra	4	3	1.33	1							2						1	
	Salix sericea	1	1	1.00	1														
	Sambucus canadensis	1	1	1.00								1							
	Symphoricarpos orbiculatus	5	5	1.00			1					1	1		1	1			
TOT:	**21**	**231**	**21**		**14**	**18**	**16**	**13**	**18**	**15**	**17**	**16**	**16**	**16**	**20**	**22**	**10**	**13**	**7**

Table A6. Stem counts arranged by plot.
Collins Creek Stream Restoration Site

Species	Plots															Initial Totals	Year 2 Totals	Survival %
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
Shrubs																		
Aronia arbutifolia	1	4	4	1	4	7	2					2				31	25	81%
Callicarpa americana		0		3			1									5	4	80%
*Ilex decidua**						2	1	2	1	3	1				0	9	10	111%
Ilex verticillata		1	1				1	0				1				6	4	67%
Itea virginica												0	0	0		3	0	0%
Lindera benzoin	0		1							0						3	1	33%
Symphoricarpos orbiculatas			1					1	1		1	1	0	0		8	5	63%
Trees																		
Betula nigra	2	6	1		3	1	1			0	2	1				18	17	94%
*Carya ovata**				1					1	1	4	1	2			8	10	125%
Cornus amomum	4			3	4			4	1	3				3		32	22	69%
Diospyros virginiana	1	3	5	0	3			1	1	3	6	8	2	3	2	39	38	97%
Fraxinus pennsylvanica				0		1	1								0	2	2	100%
Juglans nigra						0		5	10	3	3	3	3	2	3	42	32	76%
Platanus occidentalis	2	4		1	2	3	4				1	4				22	21	95%
*Quercus falcata**	1	0	1		1				1	3	2	1	2	3	2	15	17	113%
Quercus michauxii	0		1		1	1	4			0				0		15	7	47%
Quercus pagoda													1			1	1	100%
*Quercus phellos**	1		1	3			2									6	7	117%
Quercus sp.				2						0		0	3	1	0	8	6	75%
Salix nigra	1							2						1	0	6	4	67%
Salix sericea	1									0						8	1	13%
Sambucus canadensis	0				0			1		0				0		26	1	4%
Total	14	18	16	14	18	15	17	16	16	16	20	22	13	13	7	327	262	80%
Density	560	720	640	560	720	600	680	640	640	640	800	880	520	520	280	888	627	79%

*Percentages greater than 100% are due to previously unknown species being positively identified.

Table A7. Vegetation History (stems/acre)
Collins Creek Stream Restoration Site

Plot Number	MY-00	MY-01	MY-02	MY-03	MY-04	MY-05
1	1,080	680	560			
2	760	720	720			
3	800	680	640			
4	640	600	560			
5	1,160	1,000	720			
6	760	680	600			
7	680	680	680			
8	1,080	840	640			
9	680	680	640			
10	1,360	840	640			
11	960	800	800			
12	1,120	880	880			
13	720	520	520			
14	840	560	520			
15	680	360	280			

Appendix A2: Vegetation Monitoring Plot Photos

Plot 1 Photo – 6/24/09 - MY 02

Plot 2 Photo – 6/24/09 - MY 02

Plot 3 Photo – 6/24/09 - MY 02

Plot 4 Photo – 6/24/09 - MY 02

Plot 5 Photo – 6/24/09 - MY 02

Plot 6 Photo – 6/19/09 - MY 02

Plot 7 Photo – 6/19/09 - MY 02

Plot 8 Photo – 6/19/09 - MY 02

Plot 9 Photo – 6/26/09 - MY 02

Plot 10 Photo – 6/26/09 - MY 02

Plot 11 Photo – 6/24/09 - MY 02

Plot 12 Photo – 6/24/09 - MY 02

Plot 13 Photo – 6/26/09 - MY 02

Plot 14 Photo – 6/26/09 - MY 02

Plot 15 Photo – 6/26/09 - MY 02

Appendix B
Geomorphologic Data

Appendix B1: Representative Stream Problem Area Photos

No photos taken this year.

Appendix B2: Stream Photos

PP#1A – MY02 – 12/7/09

PP#1B – MY02 – 12/7/09

PP#1C – MY02 – 12/7/09

PP#2A – MY02 – 12/7/09

PP#2B – MY02 – 12/7/09

PP#2C – MY02 – 12/7/09

PP#2D – MY02 – 12/7/09

PP#3A – MY02 – 12/7/09

PP#3B – MY02 – 12/7/09

PP#4A – MY02 – 12/7/09

PP#4B – MY02 – 12/7/09

PP#5A – MY02 – 12/7/09

PP#5B – MY02 – 12/7/09

PP#5C – MY02 – 12/7/09

PP#6A – MY02 – 12/7/09

PP#6B – MY02 – 12/7/09

PP#7A – MY02 – 12/7/09

PP#7B – MY02 – 12/7/09

PP#8 – MY02 – 12/7/09

PP#9A – MY02 – 12/7/09

PP#9B – MY02 – 12/7/09

PP#10A – MY02 – 12/7/09

PP#10B – MY02 – 12/7/09

PP#10C – MY02 – 12/7/09

PP#11A – MY02 – 12/7/09

PP#11B – MY02 – 12/7/09

PP#12A – MY02 – 12/7/09

PP#12B – MY02 – 12/7/09

PP#13A – MY02 – 12/7/09

PP#13B – MY02 – 12/7/09

PP#13C – MY02 – 12/7/09

PP#14A – MY02 – 12/7/09

PP#14B – MY02 – 12/7/09

PP#15A – MY02 – 12/7/09

PP#15B – MY02 – 12/7/09

PP#16A – MY02 – 12/7/09

PP#16B – MY02 – 12/7/09

PP#17A – MY02 – 12/7/09

PP#17B – MY02 – 12/7/09

PP#18A – MY02 – 12/7/09

PP#18B – MY02 – 12/7/09

PP#18C – MY02 – 12/7/09

PP#20 – MY02 – 12/7/09

PP#21A – MY02 – 12/7/09

PP#21B – MY02 – 12/7/09

PP#22A – MY02 – 12/7/09

PP#22B – MY02 – 12/7/09

PP#23 – MY02 – 12/7/09

PP#24A – MY02 – 12/7/09

PP#24B – MY02 – 12/7/09

PP#25A – MY02 – 12/7/09

PP#25B – MY02 – 12/7/09

PP#26 – MY02 – 12/7/09

PP#27A – MY02 – 12/7/09

PP#27B – MY02 – 12/7/09

PP#28A – MY02 – 12/7/09

PP#28B – MY02 – 12/7/09

PP#29A – MY02 – 12/7/09

PP#29B – MY02 – 12/7/09

PP#30A – MY02 – 12/7/09

PP#30B – MY02 – 12/7/09

PP#31A – MY02 – 12/7/09

PP#31B – MY02 – 12/7/09

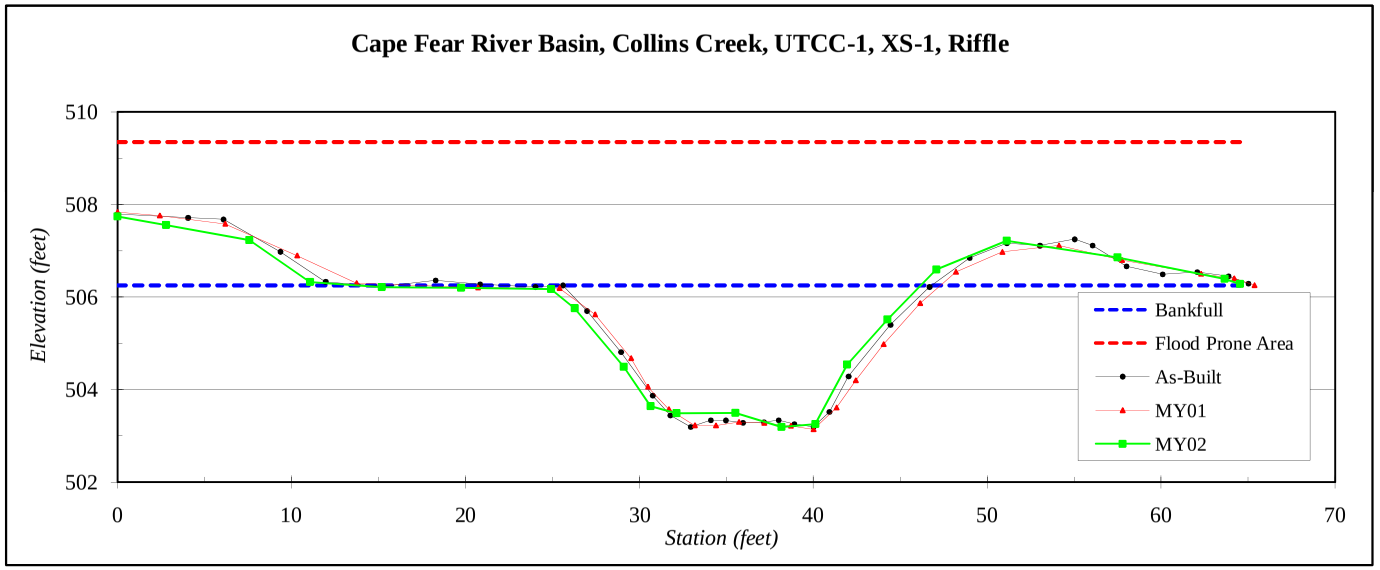
Appendix B3: Cross-Section Plots

River Basin:	Cape Fear
Watershed:	Collins Creek, UTCC-1
XS ID	XS-1, Riffle
Drainage Area (sq mi):	2.51
Date:	7/15/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	507.74
2.8	507.55
7.6	507.23
11.1	506.32
15.2	506.21
19.8	506.20
24.9	506.17
26.3	505.76
29.1	504.49
30.6	503.64
32.1	503.49
35.5	503.49
38.2	503.19
40.1	503.25
41.9	504.54
44.3	505.52
47.1	506.60
51.1	507.22
57.5	506.86
63.6	506.40
64.5	506.28

SUMMARY DATA	
Bankfull Elevation:	506.3
Bankfull Cross-Sectional Area:	41.7
Bankfull Width:	21.2
Flood Prone Area Elevation:	509.4
Flood Prone Width:	>65
Max Depth at Bankfull:	3.1
Mean Depth at Bankfull:	2.0
W / D Ratio:	10.8
Entrenchment Ratio:	>3
Bank Height Ratio:	1.0

Stream Type	C4

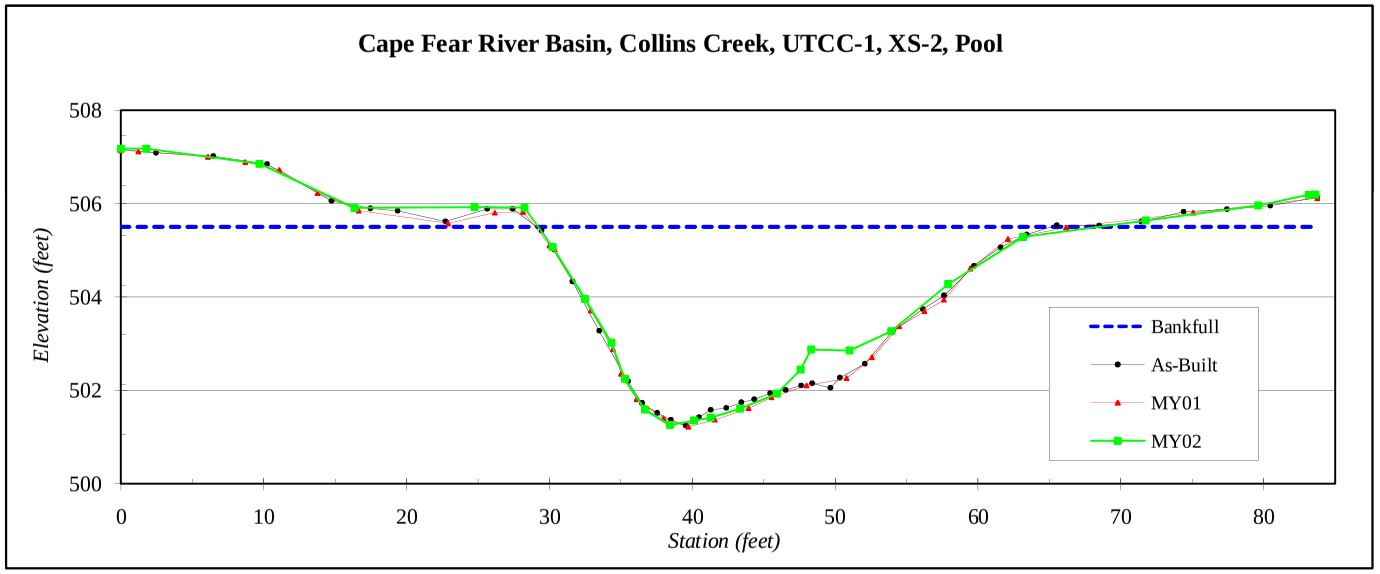


River Basin:	Cape Fear
Watershed:	Collins Creek, UTCC-1
XS ID	XS-2, Pool
Drainage Area (sq mi):	2.51
Date:	7/15/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	507.18
1.8	507.17
9.7	506.86
16.4	505.91
24.8	505.93
28.3	505.92
30.2	505.07
32.5	503.96
34.3	503.02
35.3	502.25
36.7	501.59
38.4	501.26
40.1	501.36
41.3	501.42
43.3	501.61
45.9	501.93
47.6	502.44
48.3	502.87
51.0	502.86
53.9	503.27
57.9	504.27
63.2	505.29
71.7	505.64
79.6	505.96
83.2	506.19
83.6	506.20

SUMMARY DATA	
Bankfull Elevation:	505.5
Bankfull Cross-Sectional Area:	83.7
Bankfull Width:	39.1
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	4.2
Mean Depth at Bankfull:	2.1
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C4

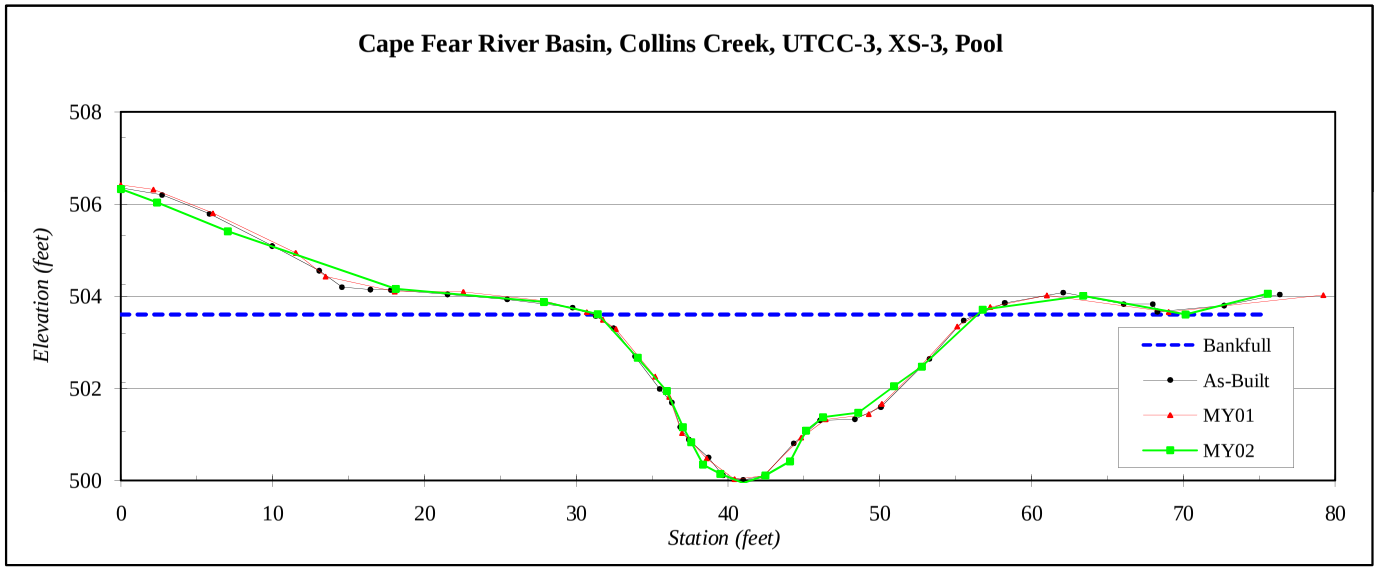


River Basin:	Cape Fear
Watershed:	Collins Creek, UTCC-3
XS ID	XS-3, Pool
Drainage Area (sq mi):	2.62
Date:	7/16/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	506.33
2.4	506.04
7.0	505.41
18.1	504.16
27.9	503.87
31.4	503.61
34.0	502.66
36.0	501.94
37.0	501.16
37.6	500.83
38.4	500.34
39.5	500.14
41.0	499.94
42.5	500.11
44.1	500.41
45.1	501.08
46.3	501.37
48.6	501.47
51.0	502.04
52.8	502.47
56.8	503.70
63.4	504.01
70.1	503.60
75.6	504.05

SUMMARY DATA	
Bankfull Elevation:	503.6
Bankfull Cross-Sectional Area:	49.1
Bankfull Width:	25.0
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	3.7
Mean Depth at Bankfull:	2.0
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C4

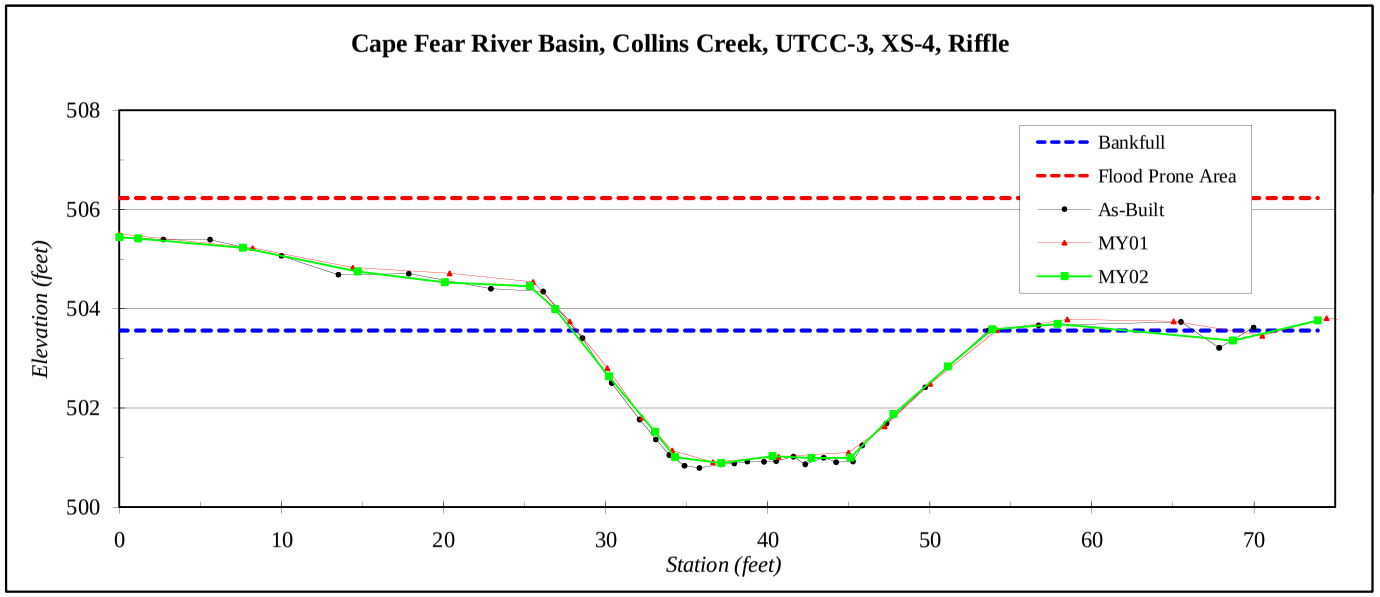


River Basin:	Cape Fear
Watershed:	Collins Creek, UTCC-3
XS ID	XS-4, Riffle
Drainage Area (sq mi):	2.62
Date:	7/16/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	505.44
1.2	505.42
7.6	505.23
14.7	504.75
20.1	504.53
25.3	504.45
26.9	503.99
30.2	502.64
33.0	501.52
34.3	501.01
37.1	500.89
40.3	501.03
42.7	500.99
45.1	501.00
47.8	501.88
51.1	502.84
53.8	503.58
57.9	503.70
68.7	503.36
73.9	503.77

SUMMARY DATA	
Bankfull Elevation:	503.6
Bankfull Cross-Sectional Area:	46.7
Bankfull Width:	25.8
Flood Prone Area Elevation:	506.2
Flood Prone Width:	>76
Max Depth at Bankfull:	2.7
Mean Depth at Bankfull:	1.8
W / D Ratio:	14.3
Entrenchment Ratio:	>3
Bank Height Ratio:	1.0

Stream Type	C4

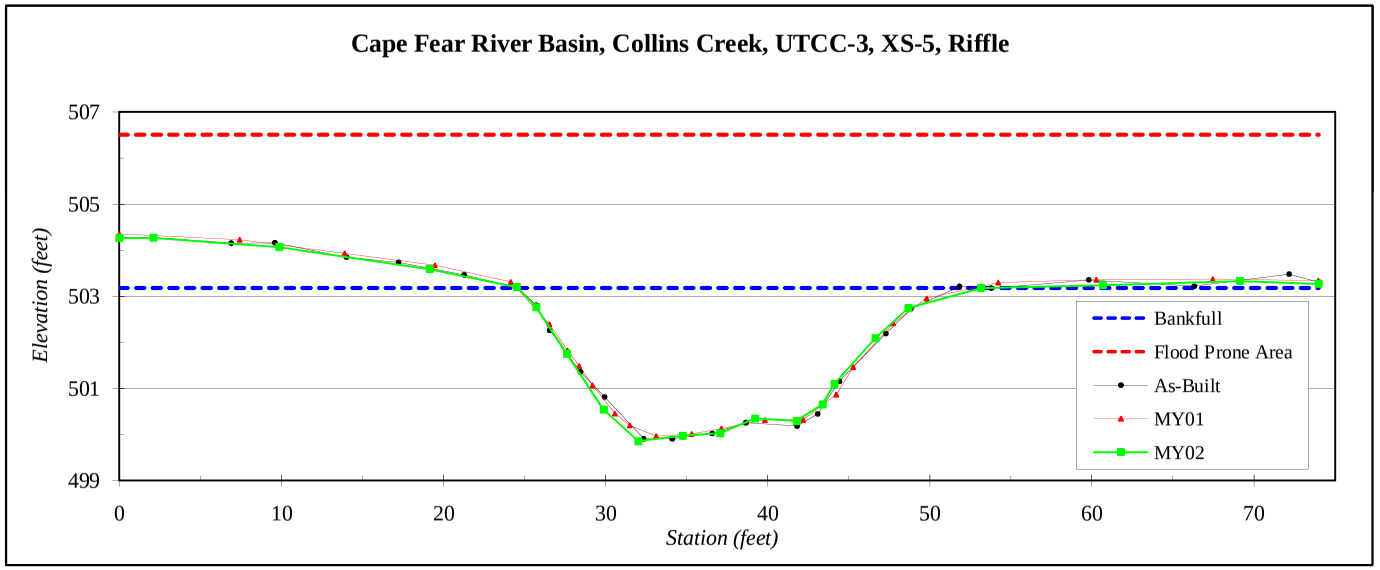


River Basin:	Cape Fear
Watershed:	Collins Creek, UTCC-3
XS ID	XS-5, Riffle
Drainage Area (sq mi):	2.62
Date:	7/16/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	504.26
2.1	504.27
9.9	504.06
19.2	503.58
24.5	503.20
25.7	502.76
27.6	501.75
29.9	500.54
32.0	499.85
34.8	499.97
37.1	500.03
39.2	500.35
41.8	500.29
43.4	500.65
44.1	501.10
46.6	502.09
48.7	502.74
53.2	503.18
60.7	503.24
69.1	503.33
74.0	503.27

SUMMARY DATA	
Bankfull Elevation:	503.2
Bankfull Cross-Sectional Area:	55.6
Bankfull Width:	28.6
Flood Prone Area Elevation:	506.5
Flood Prone Width:	>74
Max Depth at Bankfull:	3.3
Mean Depth at Bankfull:	1.9
W / D Ratio:	14.7
Entrenchment Ratio:	>3
Bank Height Ratio:	1.0

Stream Type	C4

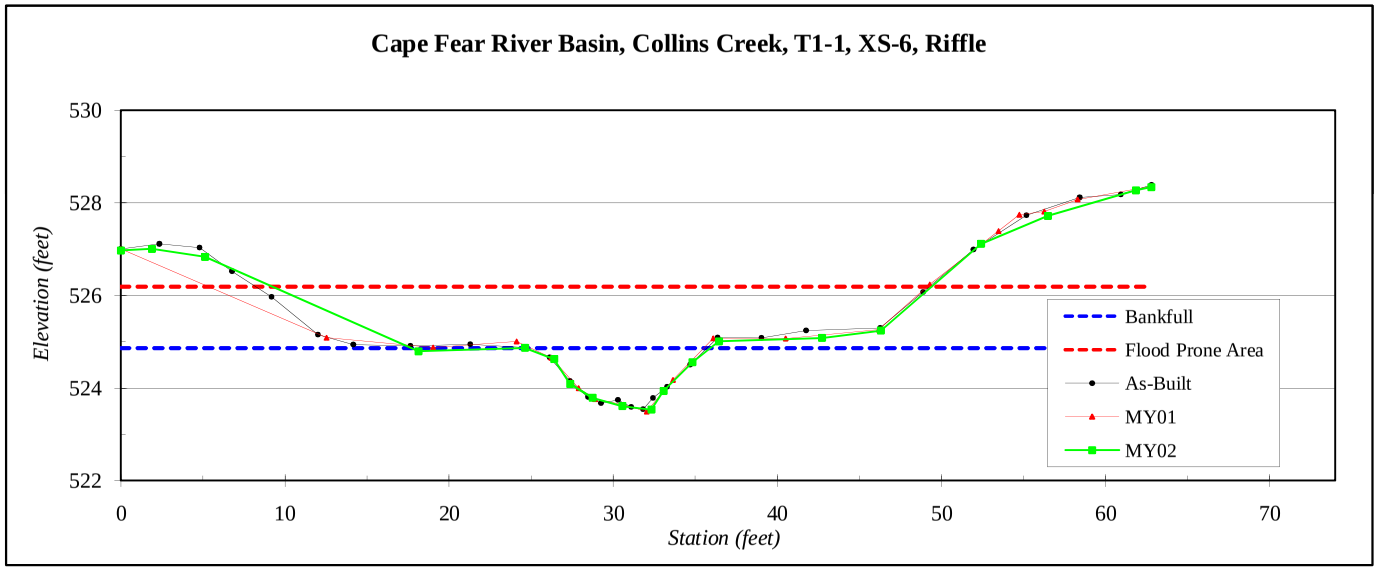


River Basin:	Cape Fear
Watershed:	Collins Creek, T1-1
XS ID	XS-6, Riffle
Drainage Area (sq mi):	0.12
Date:	7/31/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	526.97
1.9	527.01
5.1	526.83
18.1	524.79
24.6	524.86
26.4	524.62
27.4	524.09
28.7	523.79
30.6	523.61
32.3	523.53
33.1	523.94
34.8	524.56
36.4	525.01
42.7	525.08
46.3	525.24
52.4	527.11
56.5	527.72
61.8	528.27
62.8	528.34

SUMMARY DATA	
Bankfull Elevation:	524.9
Bankfull Cross-Sectional Area:	8.4
Bankfull Width:	11.3
Flood Prone Area Elevation:	526.2
Flood Prone Width:	40.2
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.7
W / D Ratio:	15.2
Entrenchment Ratio:	3.6
Bank Height Ratio:	1.0

Stream Type	C4

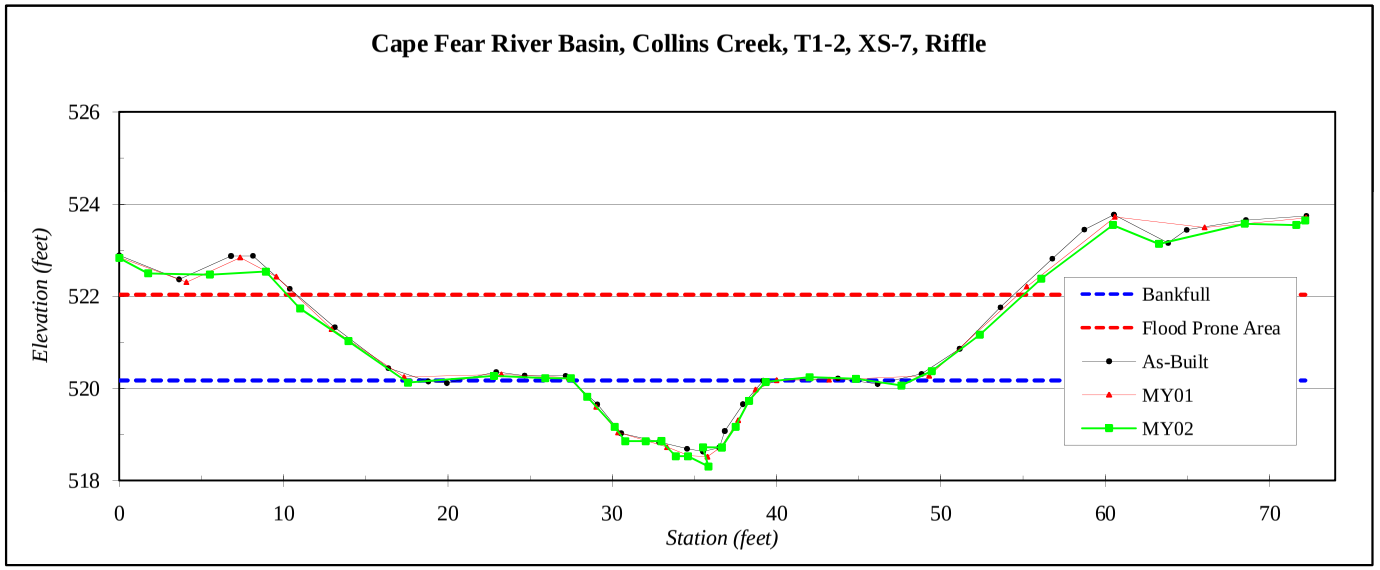


River Basin:	Cape Fear
Watershed:	Collins Creek, T1-2
XS ID	XS-7, Riffle
Drainage Area (sq mi):	0.18
Date:	7/14/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	522.83
1.7	522.49
5.5	522.47
8.9	522.53
11.0	521.73
13.9	521.02
17.6	520.13
22.8	520.27
25.9	520.22
27.5	520.22
28.5	519.82
30.1	519.17
30.8	518.85
32.0	518.85
33.0	518.86
33.9	518.53
34.6	518.53
35.9	518.31
35.5	518.72
36.7	518.72
37.5	519.17
38.3	519.73
39.3	520.14
42.0	520.24
44.8	520.21
47.6	520.06
49.4	520.37
52.4	521.16
56.1	522.38
60.5	523.54
63.3	523.14
68.5	523.57
71.6	523.54
72.2	523.64

SUMMARY DATA	
Bankfull Elevation:	520.2
Bankfull Cross-Sectional Area:	12.6
Bankfull Width:	11.7
Flood Prone Area Elevation:	522.0
Flood Prone Width:	44.8
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.1
W / D Ratio:	10.9
Entrenchment Ratio:	3.8
Bank Height Ratio:	1.0

Stream Type	C4

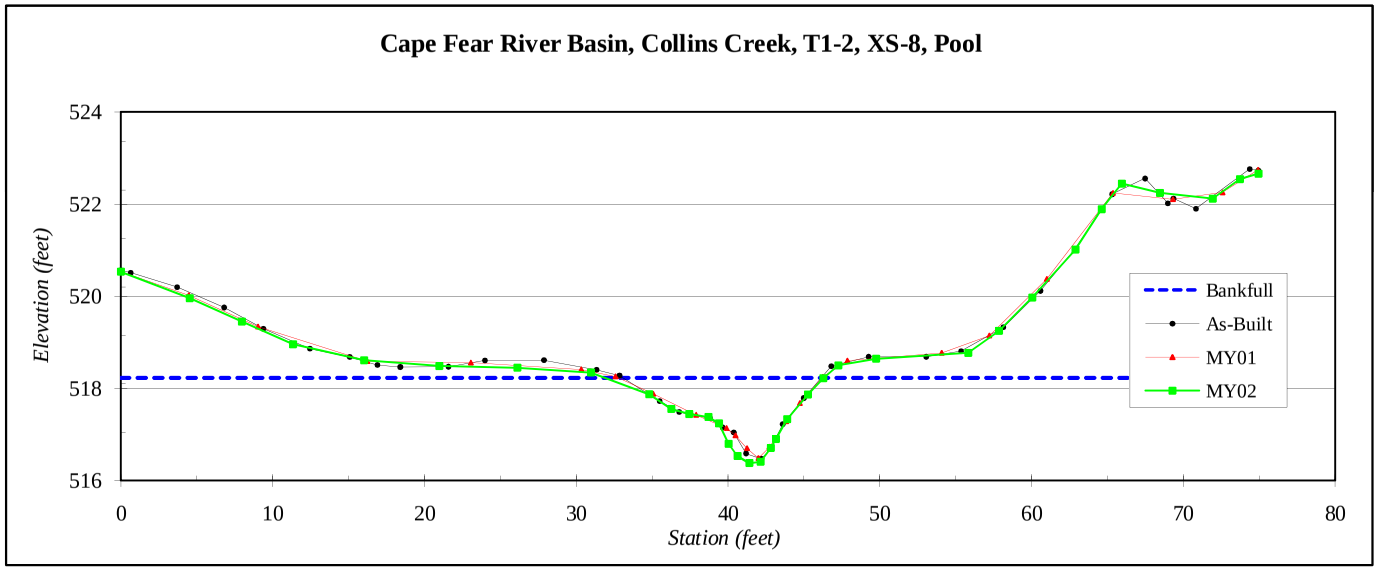


River Basin:	Cape Fear
Watershed:	Collins Creek, T1-2
XS ID	XS-8, Pool
Drainage Area (sq mi):	0.18
Date:	7/14/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	520.53
4.5	519.96
8.0	519.45
11.3	518.96
16.0	518.61
21.0	518.49
26.1	518.45
31.0	518.34
34.8	517.87
36.3	517.55
37.4	517.44
38.7	517.38
39.4	517.24
40.0	516.80
40.6	516.54
41.4	516.38
42.1	516.41
42.8	516.70
43.2	516.90
43.9	517.33
45.3	517.87
46.3	518.22
47.3	518.50
49.8	518.64
55.8	518.77
57.8	519.25
60.1	519.97
62.9	521.01
64.6	521.89
65.9	522.44
68.5	522.24
71.9	522.12
73.7	522.54
74.9	522.66

SUMMARY DATA	
Bankfull Elevation:	518.2
Bankfull Cross-Sectional Area:	11.7
Bankfull Width:	14.4
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	0.8
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C4

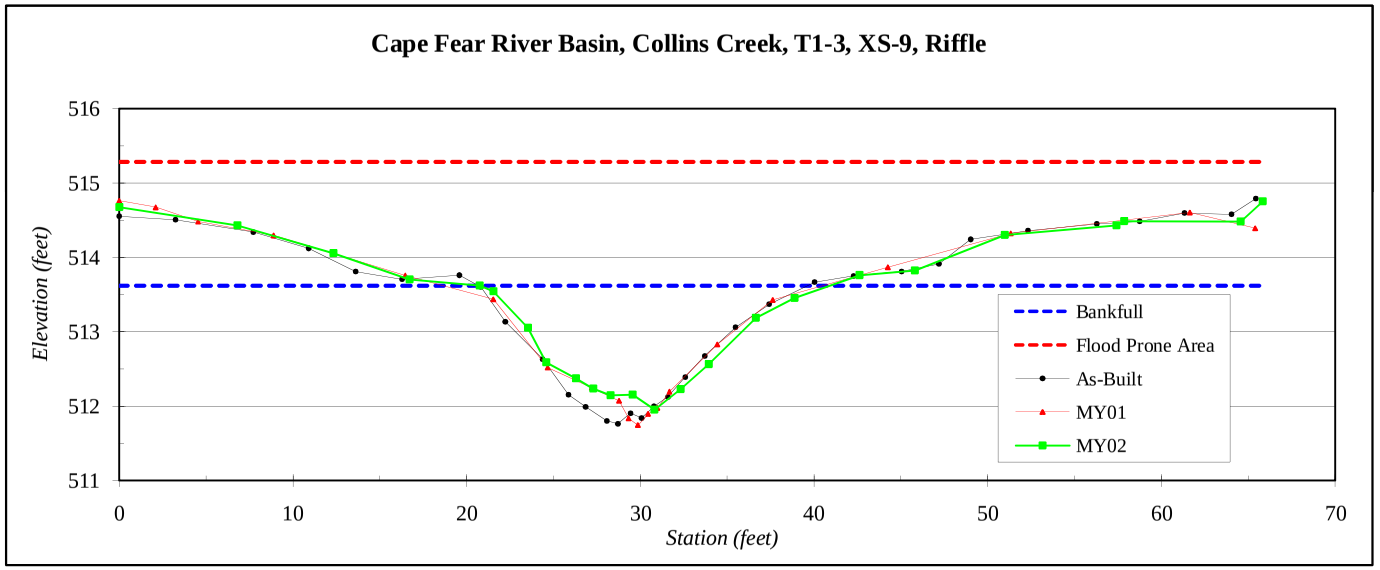


River Basin:	Cape Fear
Watershed:	Collins Creek, T1-3
XS ID	XS-9, Riffle
Drainage Area (sq mi):	0.49
Date:	7/14/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	514.67
6.8	514.43
12.3	514.06
16.7	513.70
20.8	513.62
21.5	513.55
23.5	513.05
24.6	512.59
26.3	512.38
27.3	512.24
28.3	512.15
29.6	512.16
30.8	511.95
32.3	512.23
33.9	512.57
36.7	513.19
38.9	513.46
42.6	513.76
45.8	513.83
51.0	514.30
57.4	514.43
57.9	514.49
64.6	514.48
65.8	514.75

SUMMARY DATA	
Bankfull Elevation:	513.6
Bankfull Cross-Sectional Area:	17.1
Bankfull Width:	20.1
Flood Prone Area Elevation:	515.3
Flood Prone Width:	>65
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.9
W / D Ratio:	23.6
Entrenchment Ratio:	>3
Bank Height Ratio:	1.0

Stream Type	C4

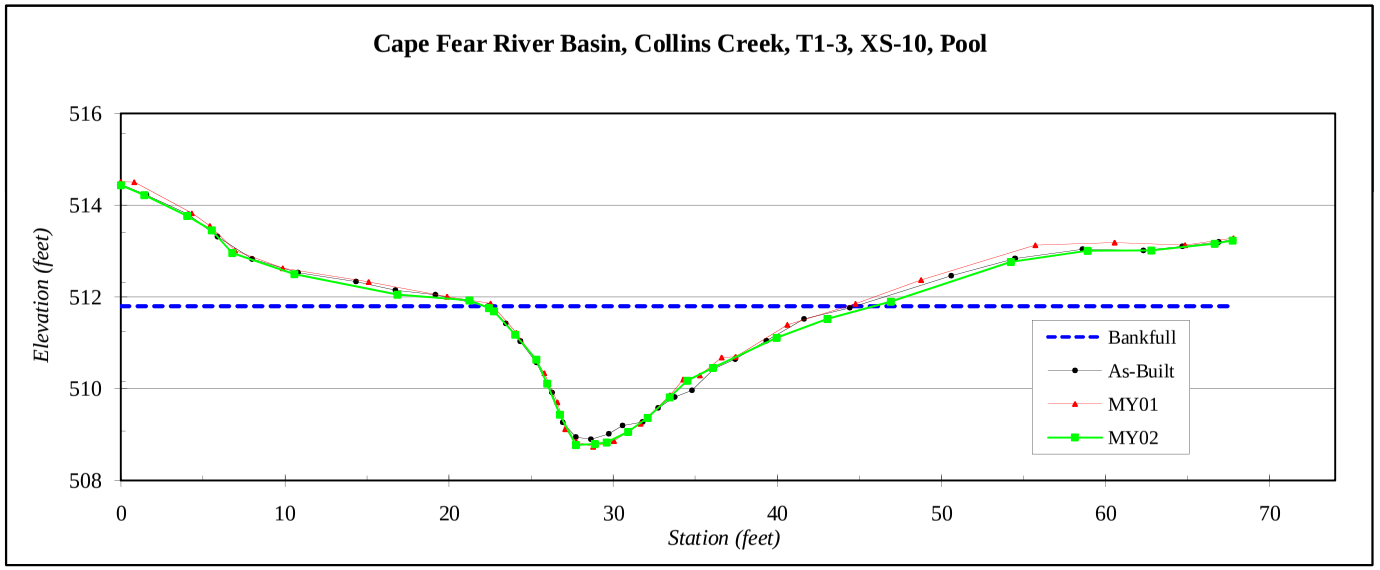


River Basin:	Cape Fear
Watershed:	Collins Creek, T1-3
XS ID	XS-10, Pool
Drainage Area (sq mi):	0.49
Date:	7/14/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	514.44
1.4	514.22
4.0	513.76
5.5	513.45
6.8	512.96
10.6	512.50
16.8	512.05
21.2	511.93
22.4	511.76
22.7	511.69
24.0	511.18
25.3	510.63
26.0	510.11
26.7	509.43
27.7	508.77
28.9	508.79
29.6	508.83
30.9	509.06
32.1	509.36
33.5	509.81
34.5	510.18
36.1	510.46
40.0	511.11
43.1	511.52
46.9	511.90
54.2	512.76
58.9	513.01
62.8	513.01
66.7	513.16
67.7	513.23

SUMMARY DATA	
Bankfull Elevation:	511.8
Bankfull Cross-Sectional Area:	32.3
Bankfull Width:	23.8
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	3.0
Mean Depth at Bankfull:	1.4
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C4

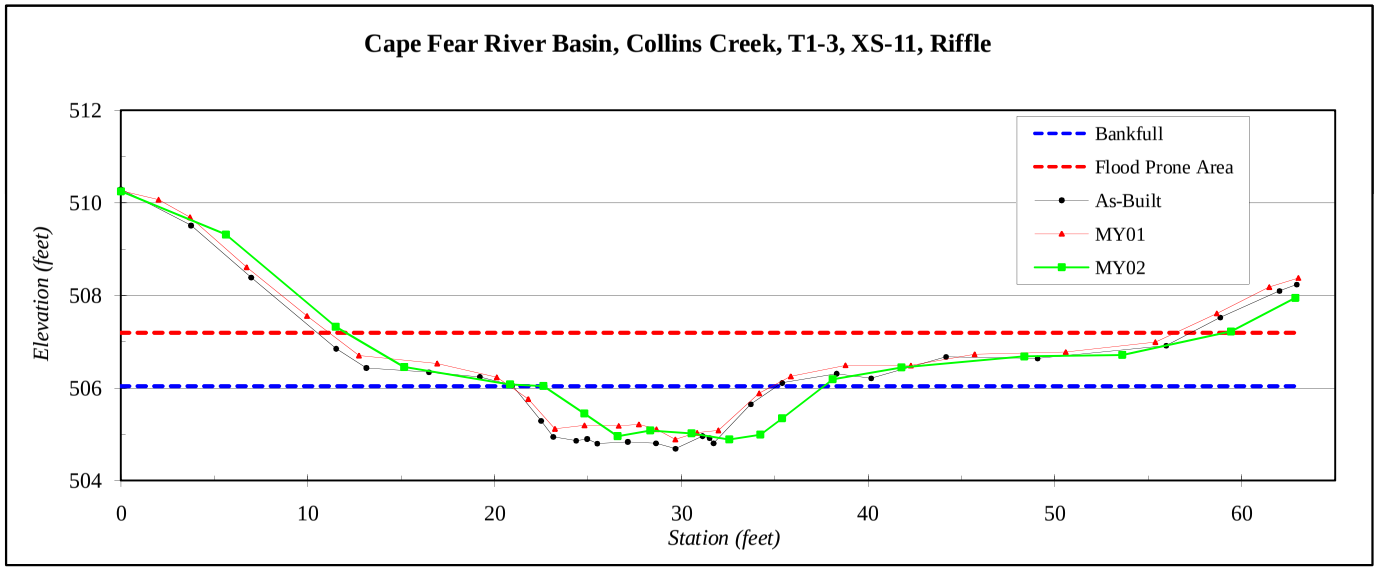


River Basin:	Cape Fear
Watershed:	Collins Creek, T1-3
XS ID	XS-11, Riffle
Drainage Area (sq mi):	0.49
Date:	7/15/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	510.25
5.6	509.32
11.5	507.33
15.2	506.45
20.8	506.08
22.6	506.04
24.8	505.44
26.6	504.96
28.3	505.08
30.6	505.02
32.6	504.89
34.2	504.99
35.4	505.34
38.1	506.19
41.8	506.44
48.4	506.68
53.6	506.71
59.4	507.22
62.9	507.95

SUMMARY DATA	
Bankfull Elevation:	506.0
Bankfull Cross-Sectional Area:	12.9
Bankfull Width:	16.3
Flood Prone Area Elevation:	507.2
Flood Prone Width:	48.3
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	0.8
W / D Ratio:	20.6
Entrenchment Ratio:	3.0
Bank Height Ratio:	1.0

Stream Type	C4



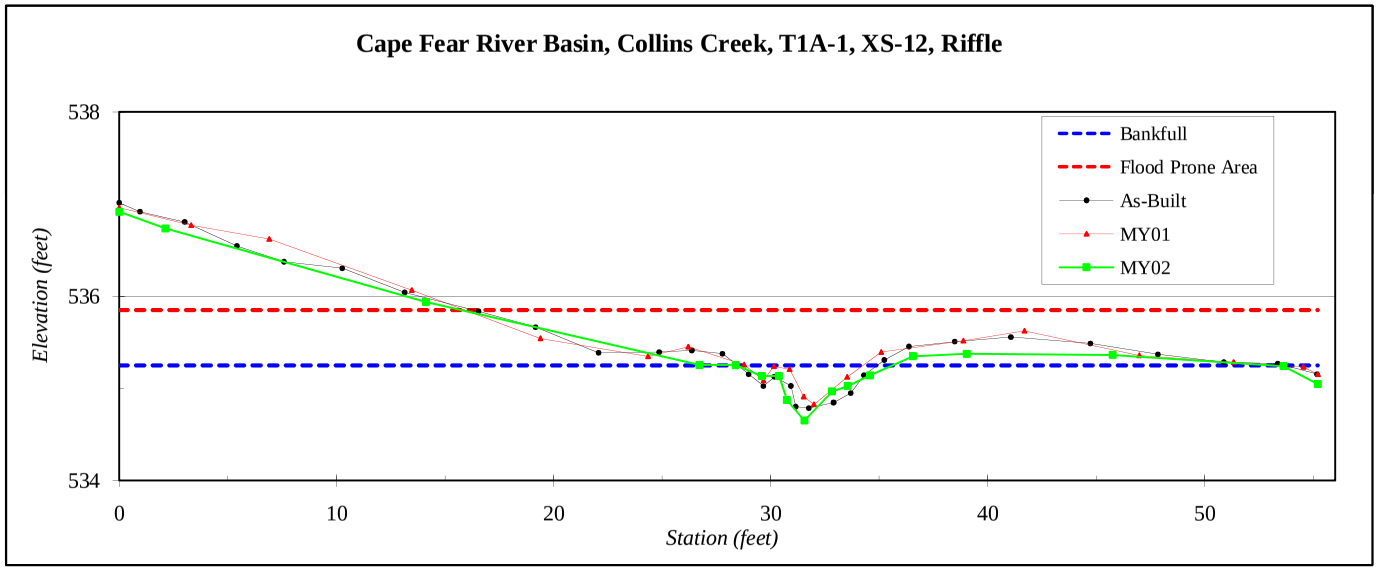
* Shift in cross-section presumably due to survey error, MY03 data will verify the source of the shift.

River Basin:	Cape Fear
Watershed:	Collins Creek, T1A-1
XS ID	XS-12, Riffle
Drainage Area (sq mi):	0.04
Date:	7/31/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	536.92
2.1	536.73
14.1	535.94
26.7	535.25
28.4	535.25
29.6	535.13
30.4	535.13
30.8	534.87
31.6	534.65
32.8	534.97
33.5	535.03
34.6	535.14
36.6	535.35
39.0	535.37
45.8	535.36
53.6	535.24
55.2	535.05

SUMMARY DATA	
Bankfull Elevation:	535.3
Bankfull Cross-Sectional Area:	1.6
Bankfull Width:	7.2
Flood Prone Area Elevation:	535.8
Flood Prone Width:	>40
Max Depth at Bankfull:	0.6
Mean Depth at Bankfull:	0.2
W / D Ratio:	32.4
Entrenchment Ratio:	>5.6
Bank Height Ratio:	1.0

Stream Type	C4

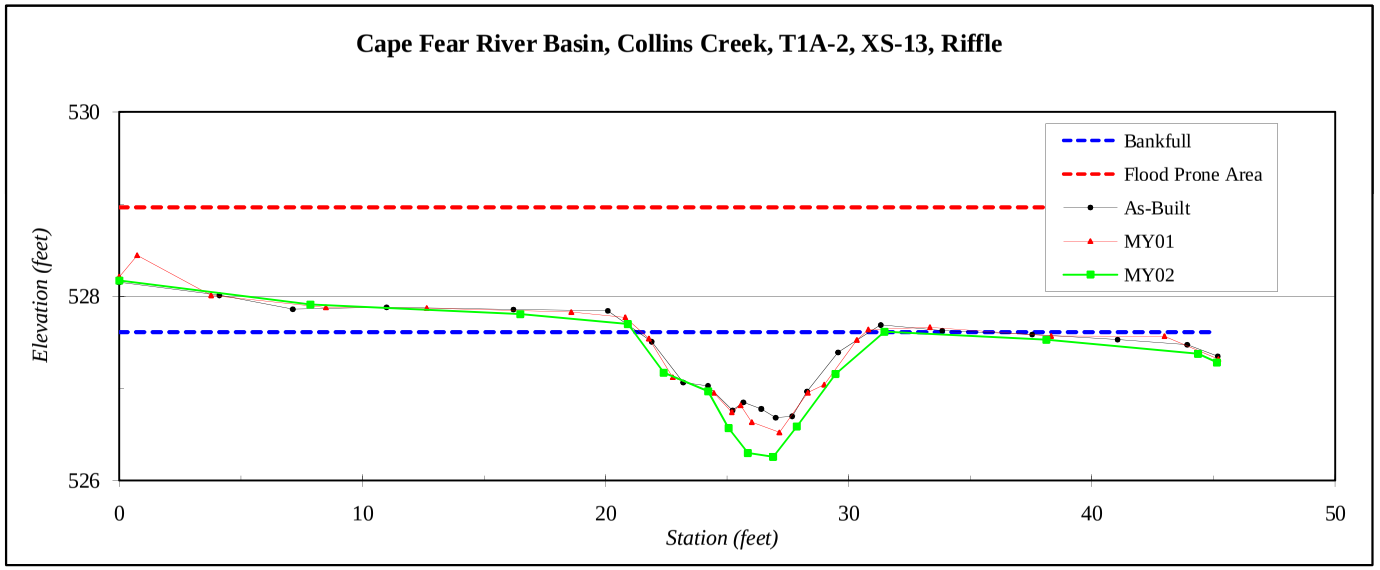


River Basin:	Cape Fear
Watershed:	Collins Creek, T1A-2
XS ID	XS-13, Riffle
Drainage Area (sq mi):	0.05
Date:	7/31/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	528.17
7.9	527.91
16.5	527.80
20.9	527.70
22.4	527.17
24.2	526.97
25.1	526.57
25.8	526.30
26.9	526.26
27.9	526.59
29.5	527.16
31.5	527.62
38.1	527.53
44.4	527.38
45.1	527.28

SUMMARY DATA	
Bankfull Elevation:	527.6
Bankfull Cross-Sectional Area:	7.1
Bankfull Width:	10.3
Flood Prone Area Elevation:	529.0
Flood Prone Width:	>40
Max Depth at Bankfull:	1.4
Mean Depth at Bankfull:	0.7
W / D Ratio:	14.9
Entrenchment Ratio:	>4
Bank Height Ratio:	1.0

Stream Type	C4

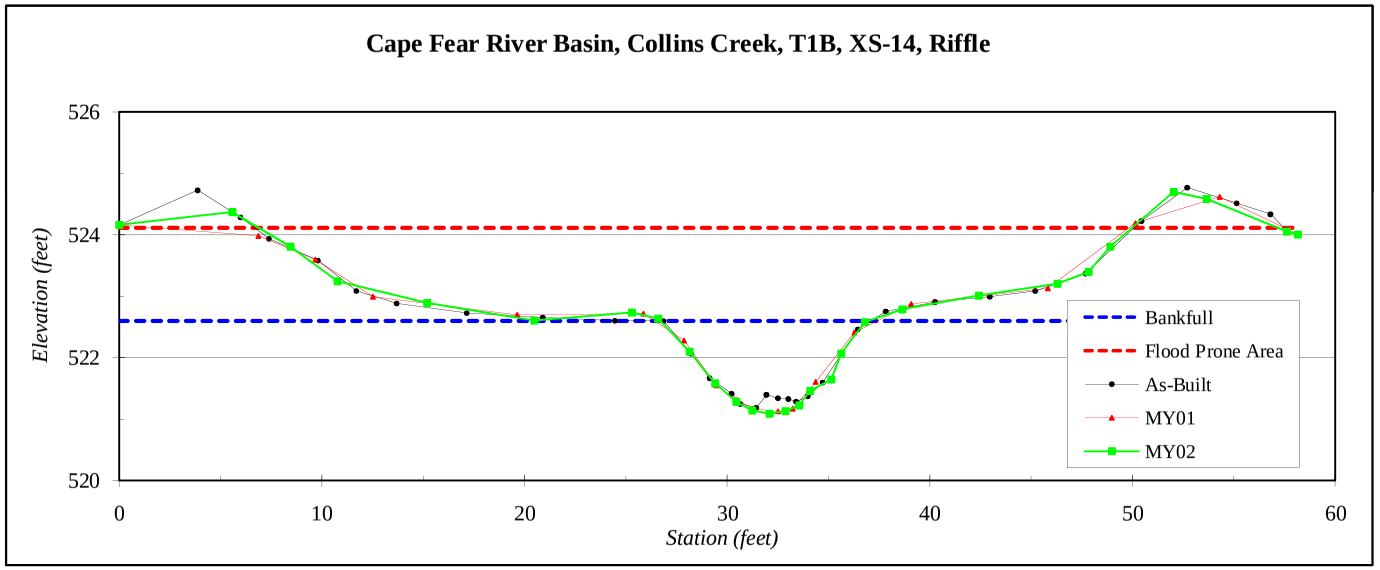


River Basin:	Cape Fear
Watershed:	Collins Creek, T1B
XS ID	XS-14, Riffle
Drainage Area (sq mi):	0.24
Date:	7/14/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	524.16
5.6	524.37
8.5	523.81
10.8	523.24
15.2	522.89
20.5	522.60
25.3	522.74
26.6	522.64
28.1	522.10
29.4	521.58
30.5	521.28
31.2	521.14
32.1	521.09
32.9	521.13
33.6	521.22
34.1	521.46
35.1	521.65
35.6	522.07
36.8	522.58
38.6	522.79
42.4	523.01
46.3	523.21
47.8	523.40
48.9	523.81
52.0	524.70
53.7	524.58
57.6	524.05
58.2	524.00

SUMMARY DATA	
Bankfull Elevation:	522.6
Bankfull Cross-Sectional Area:	9.5
Bankfull Width:	10.3
Flood Prone Area Elevation:	524.1
Flood Prone Width:	44.0
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	0.9
W / D Ratio:	11.2
Entrenchment Ratio:	4.3
Bank Height Ratio:	1.0

Stream Type	C4

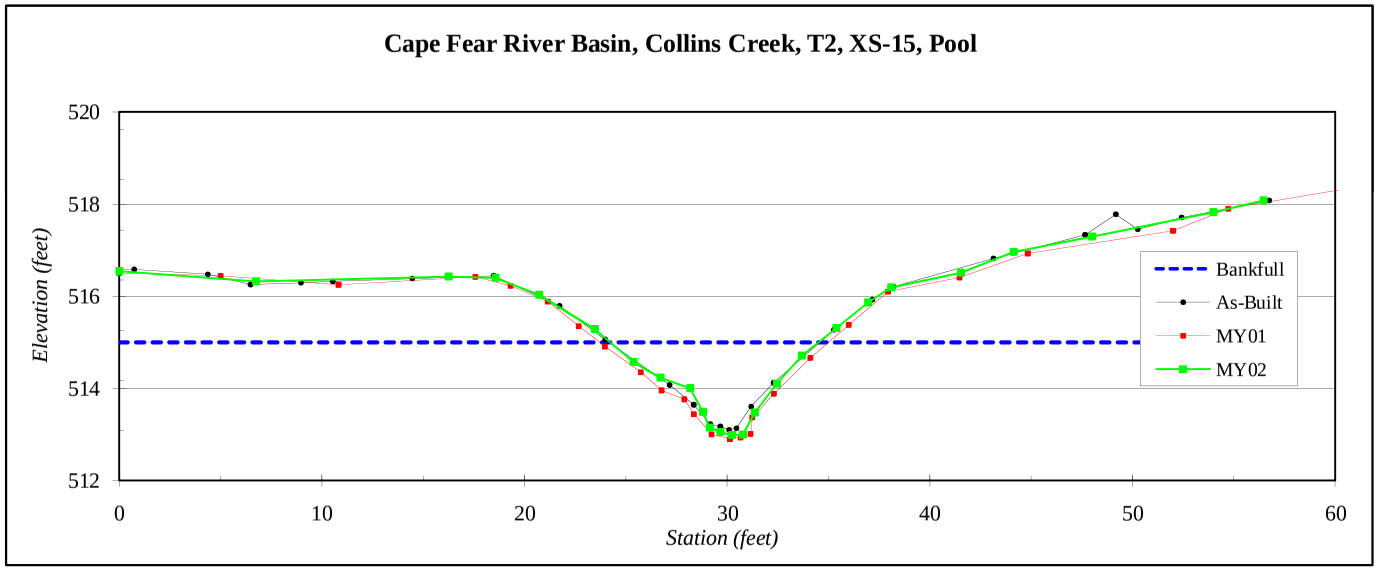


River Basin:	Cape Fear
Watershed:	Collins Creek, T2
XS ID	XS-15, Pool
Drainage Area (sq mi):	0.07
Date:	7/16/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	516.54
6.7	516.32
16.3	516.43
18.6	516.40
20.7	516.03
23.5	515.29
25.4	514.58
26.7	514.23
28.2	514.01
28.8	513.49
29.1	513.15
29.7	513.05
30.2	512.99
30.8	513.00
31.4	513.47
32.5	514.10
33.7	514.71
35.4	515.31
37.0	515.86
38.1	516.19
41.5	516.51
44.1	516.97
48.0	517.30
54.0	517.83
56.5	518.08

SUMMARY DATA	
Bankfull Elevation:	515.0
Bankfull Cross-Sectional Area:	10.1
Bankfull Width:	10.3
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	2.0
Mean Depth at Bankfull:	1.0
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	B4c

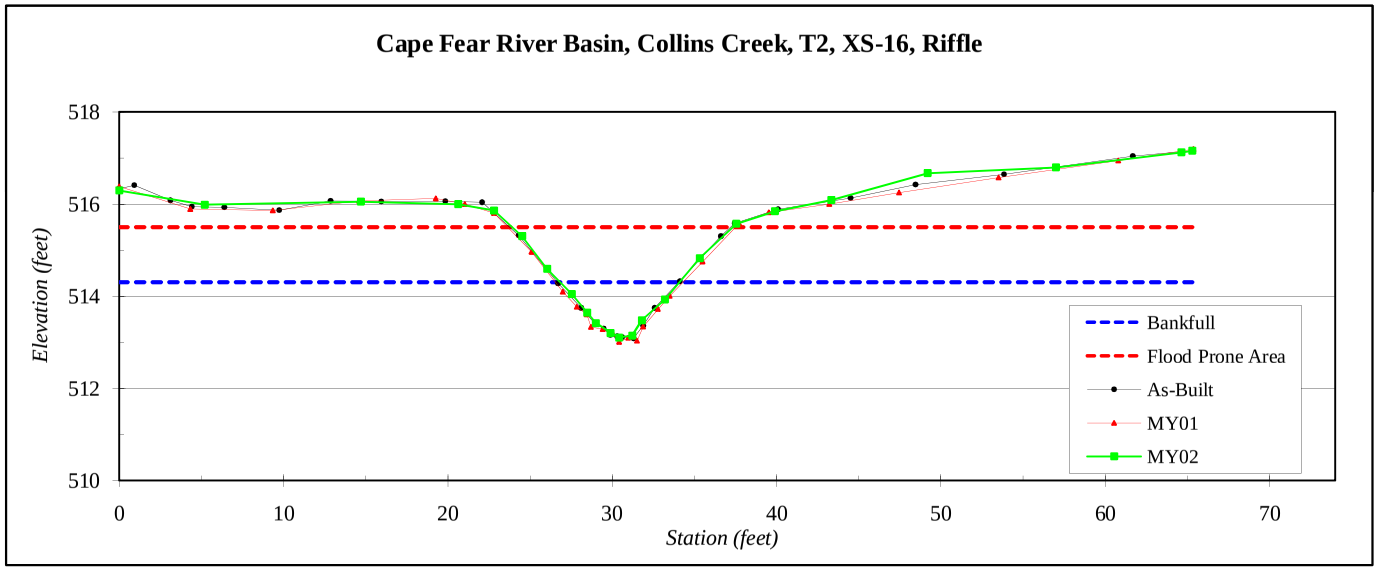


River Basin:	Cape Fear
Watershed:	Collins Creek, T2
XS ID	XS-16, Riffle
Drainage Area (sq mi):	0.07
Date:	7/16/2009
Field Crew:	A. French and A. Davis

Station	Elevation
0.0	516.29
5.2	515.98
14.7	516.05
20.6	516.00
22.8	515.86
24.5	515.30
26.0	514.59
27.5	514.05
28.5	513.64
29.0	513.42
29.9	513.20
30.4	513.11
31.2	513.15
31.8	513.48
33.2	513.93
35.3	514.83
37.6	515.57
39.9	515.84
43.3	516.09
49.2	516.67
57.0	516.79
64.6	517.12
65.3	517.16

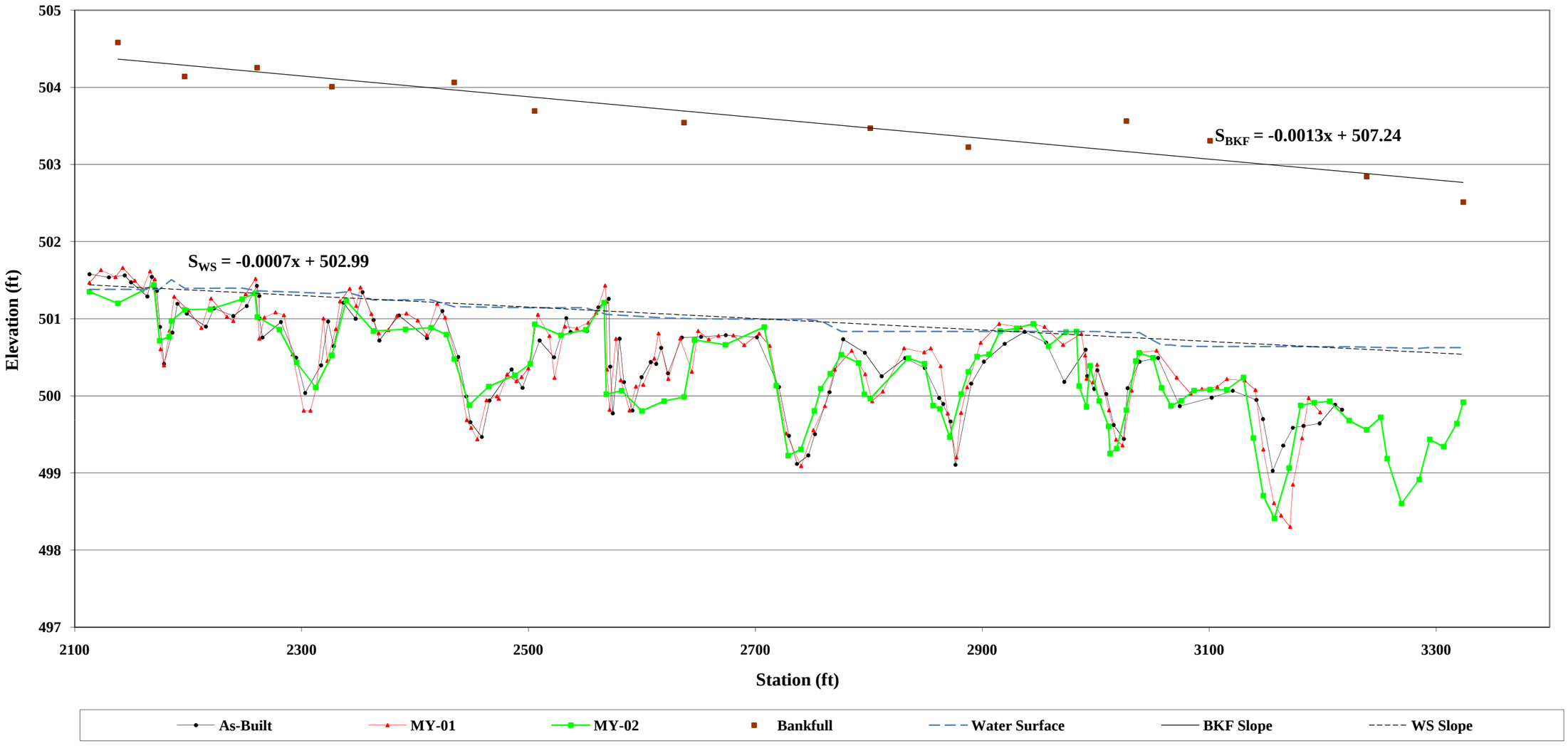
SUMMARY DATA	
Bankfull Elevation:	514.3
Bankfull Cross-Sectional Area:	4.9
Bankfull Width:	7.2
Flood Prone Area Elevation:	515.5
Flood Prone Width:	13.4
Max Depth at Bankfull:	1.2
Mean Depth at Bankfull:	0.7
W / D Ratio:	10.6
Entrenchment Ratio:	1.9
Bank Height Ratio:	1.0

Stream Type	B4c



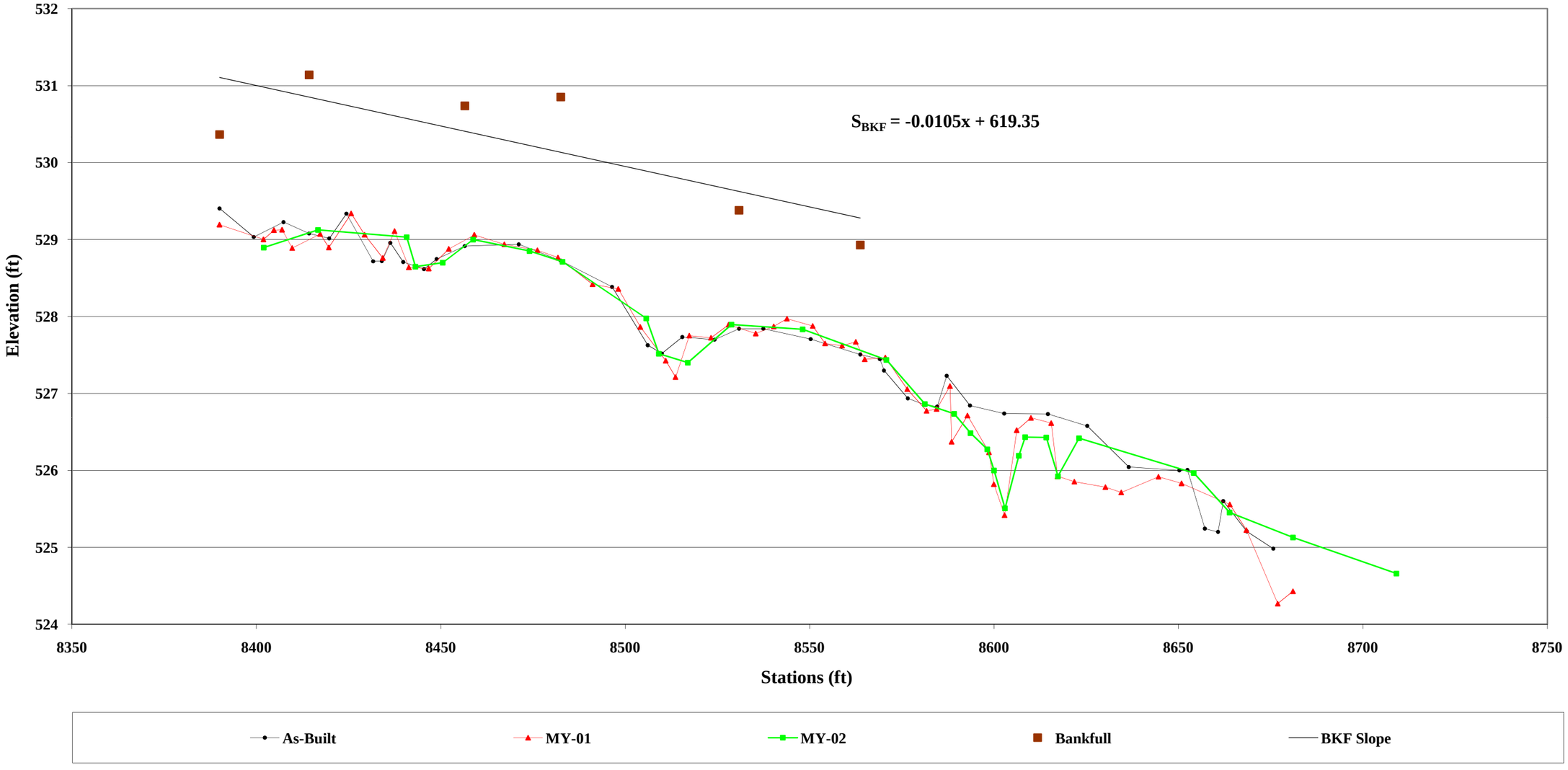
Appendix B4: Longitudinal Profile

Longitudinal Profile
UTCC MY-02
Stations 21+13 - 32+17



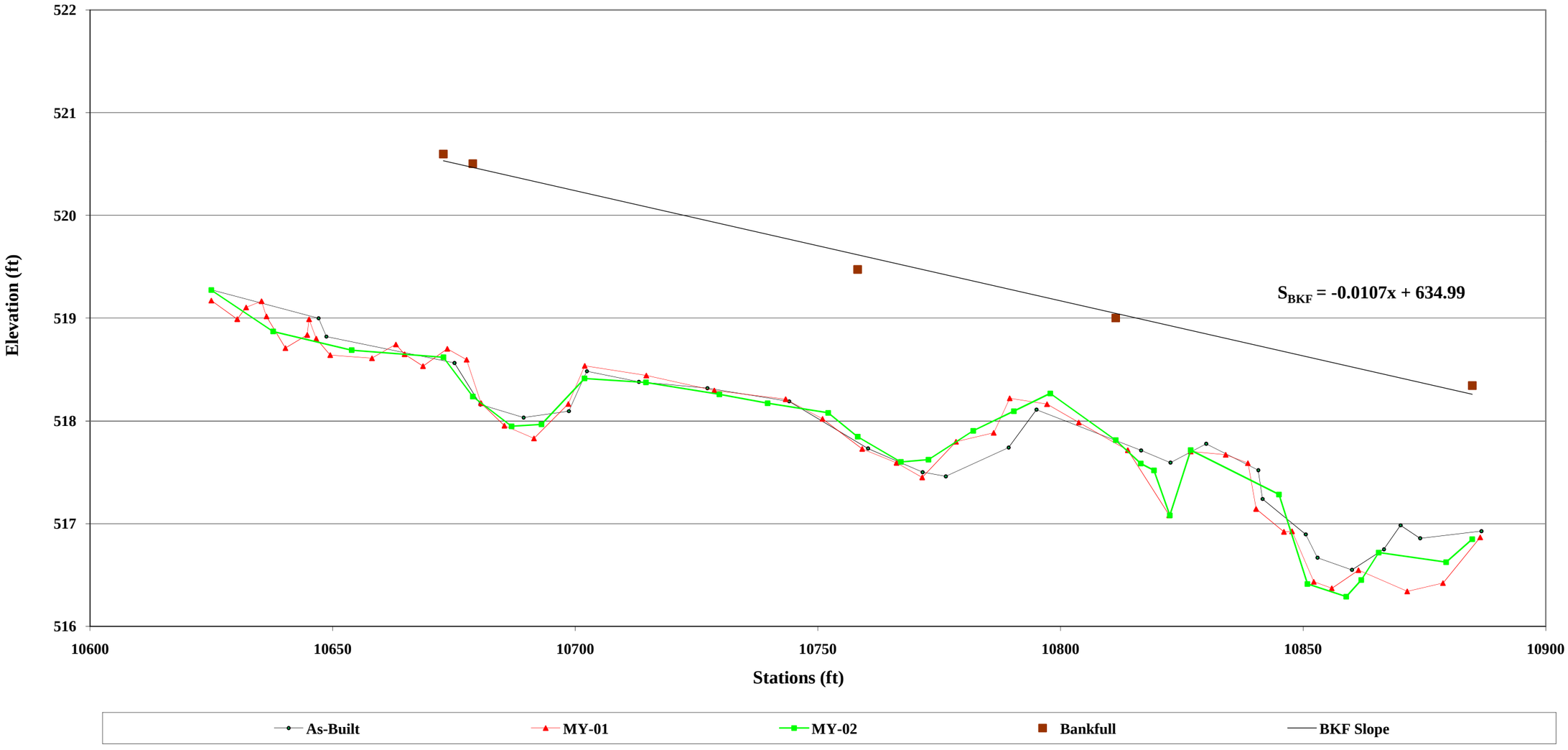
Longitudinal Profile
Tributary 1 MY-02
Stations 53+25 - 65+00

Longitudinal Profile
Tributary 1A MY-02
Stations 83+80 - 86+80



*No WS due to no flow in channel during survey.

Longitudinal Profile
Tributary 1B MY-02
Stations 106+00 - 109+00



*No WS due to no flow in channel during survey.

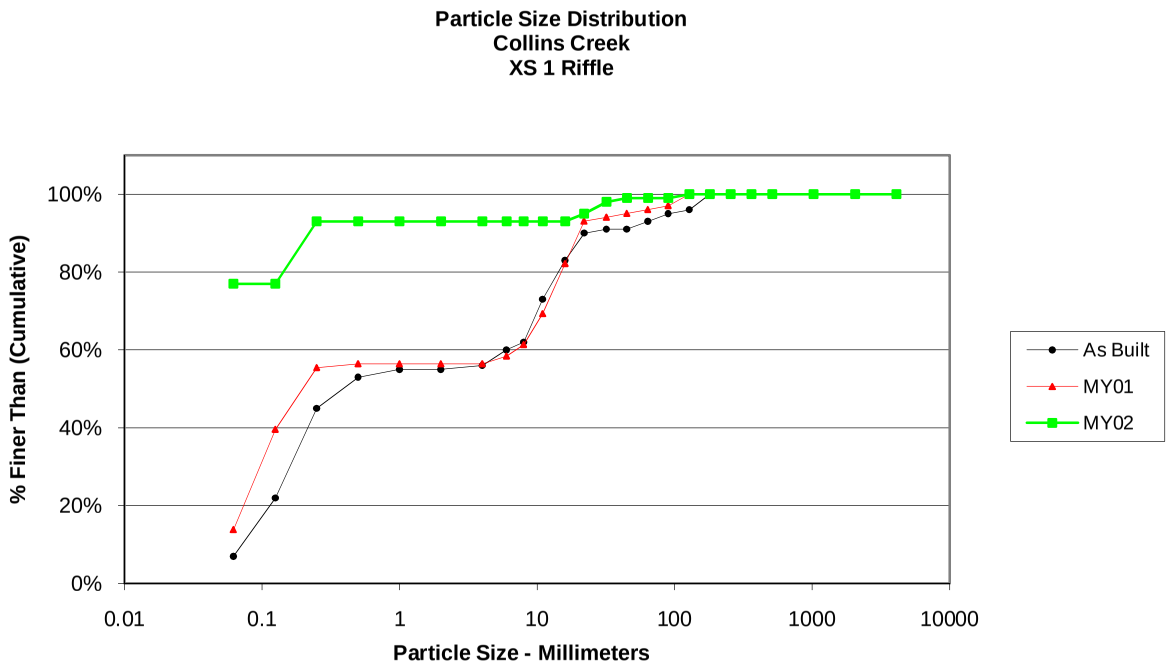
Longitudinal Profile
Tributary 2 MY-02
Stations 132+50 - 138+50

*No WS due to no flow in channel during survey.

Appendix B5: Pebble Count Plots

Cross-Section 1 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	77
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	16
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	1
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note: Heavy vegetation in stream bed



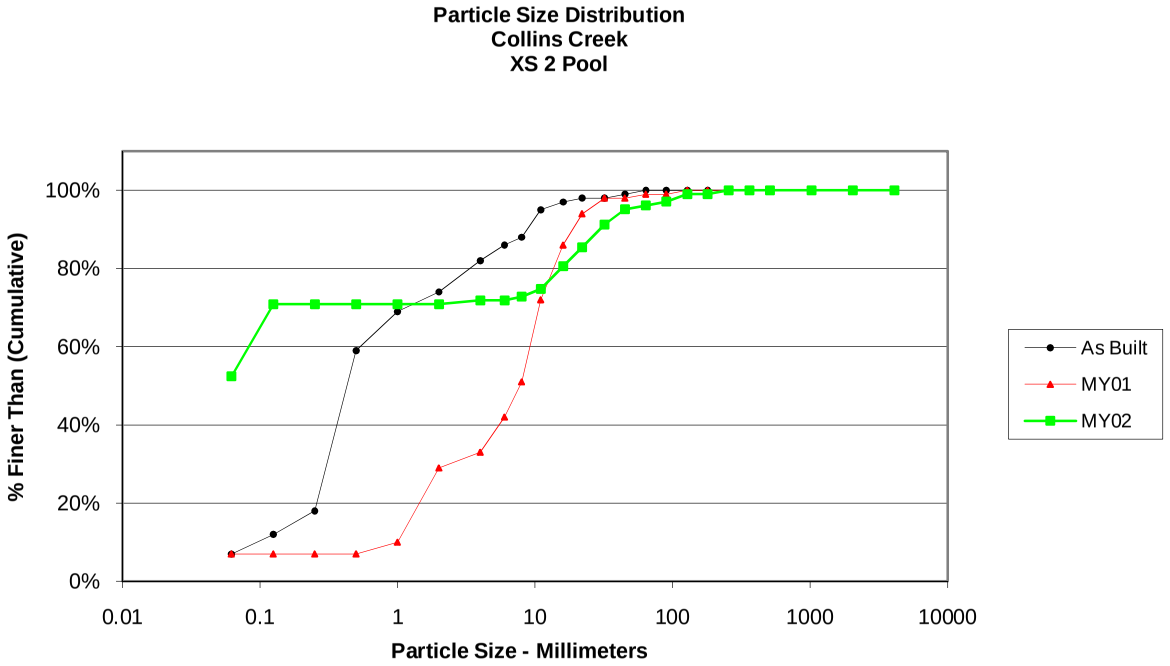
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.17
D95	22

Size Distribution	
mean	0.1
dispersion	1.9
skewness	0.33

Type	
silt/clay	77%
sand	16%
gravel	6%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 2 Pool - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	54
Very Fine	.062 - .125	S	19
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	6
Very Coarse	32 - 45	S	4
Very Coarse	45 - 64		1
Small	64 - 90	C	1
Small	90 - 128	O	2
Large	128 - 180	B	
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103

Note:



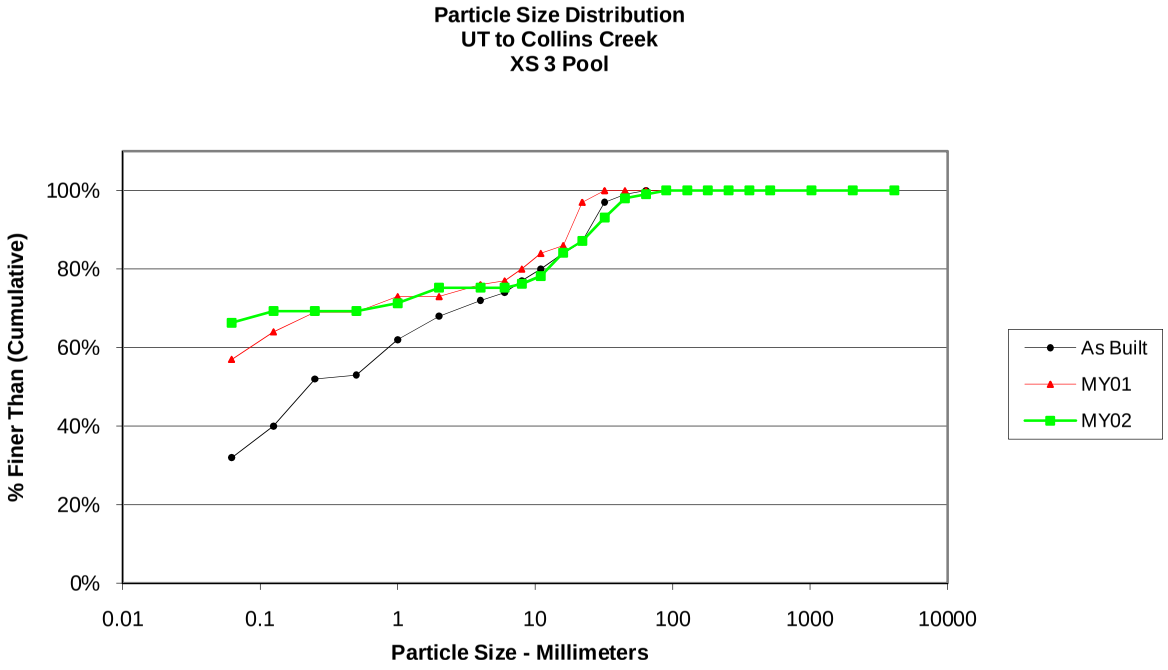
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.1
D84	20
D95	44

Size Distribution	
mean	1.1
dispersion	161.8
skewness	0.79

Type	
silt/clay	52%
sand	18%
gravel	25%
cobble	4%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 3 Pool - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	67
Very Fine	.062 - .125	S	3
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	4
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	6
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	6
Very Coarse	32 - 45	S	5
Very Coarse	45 - 64		1
Small	64 - 90	C	1
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



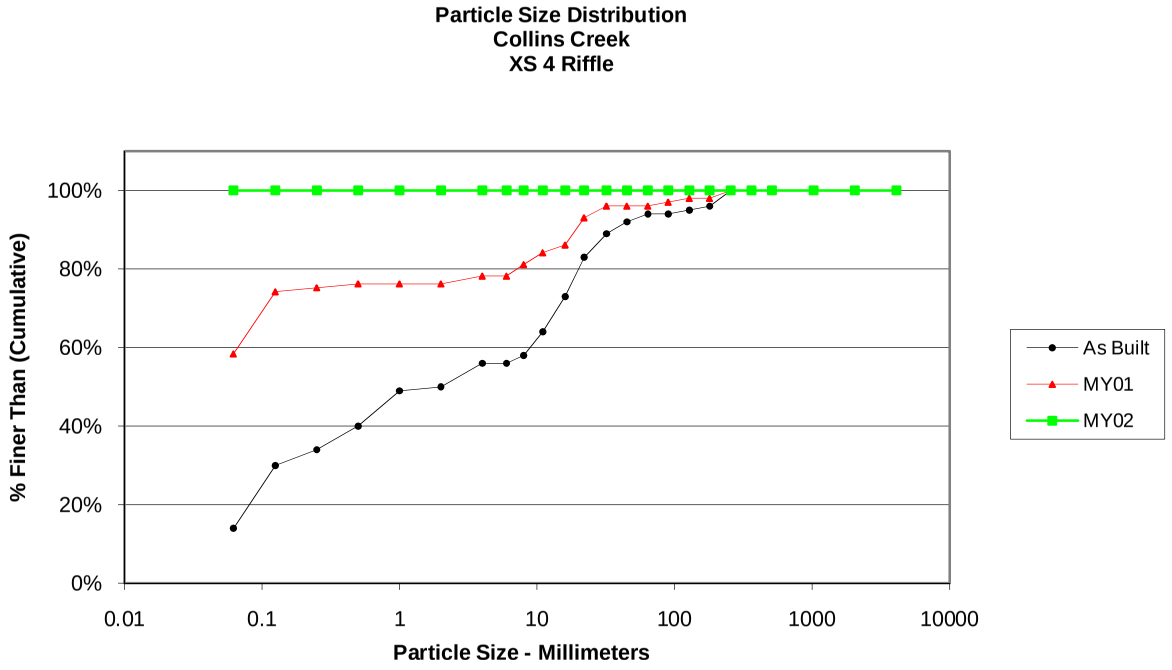
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	16
D95	37

Size Distribution	
mean	1.0
dispersion	129.5
skewness	0.78

Type	
silt/clay	66%
sand	9%
gravel	24%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 4 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note: Heavy vegetation in stream bed



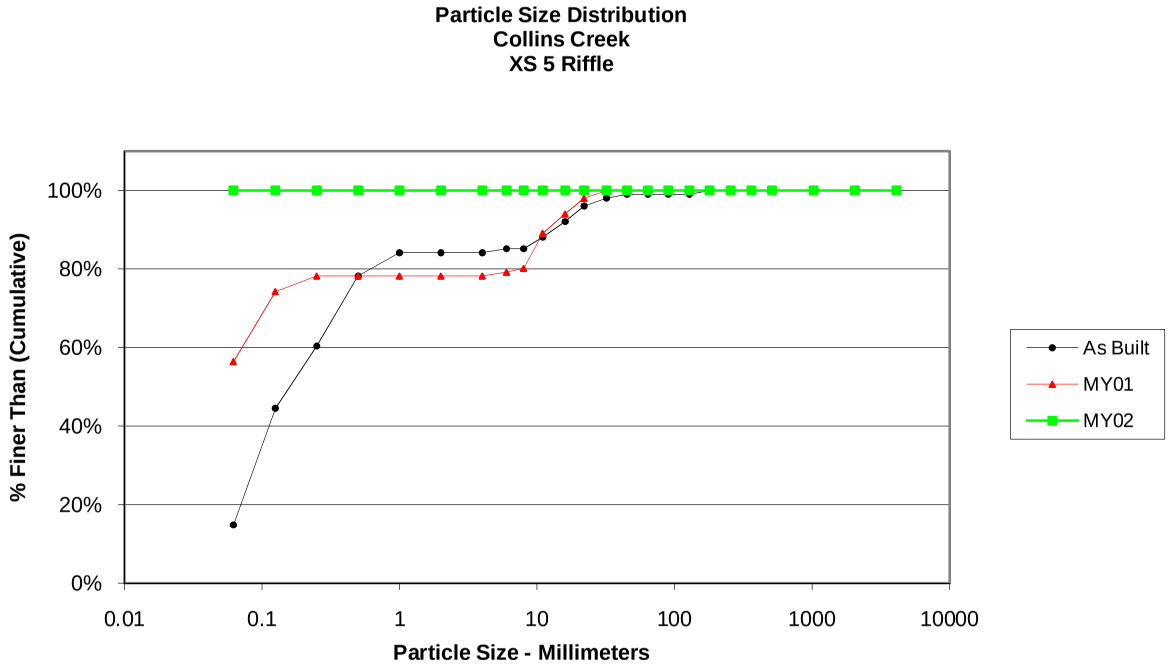
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note: Heavy vegetation in stream bed



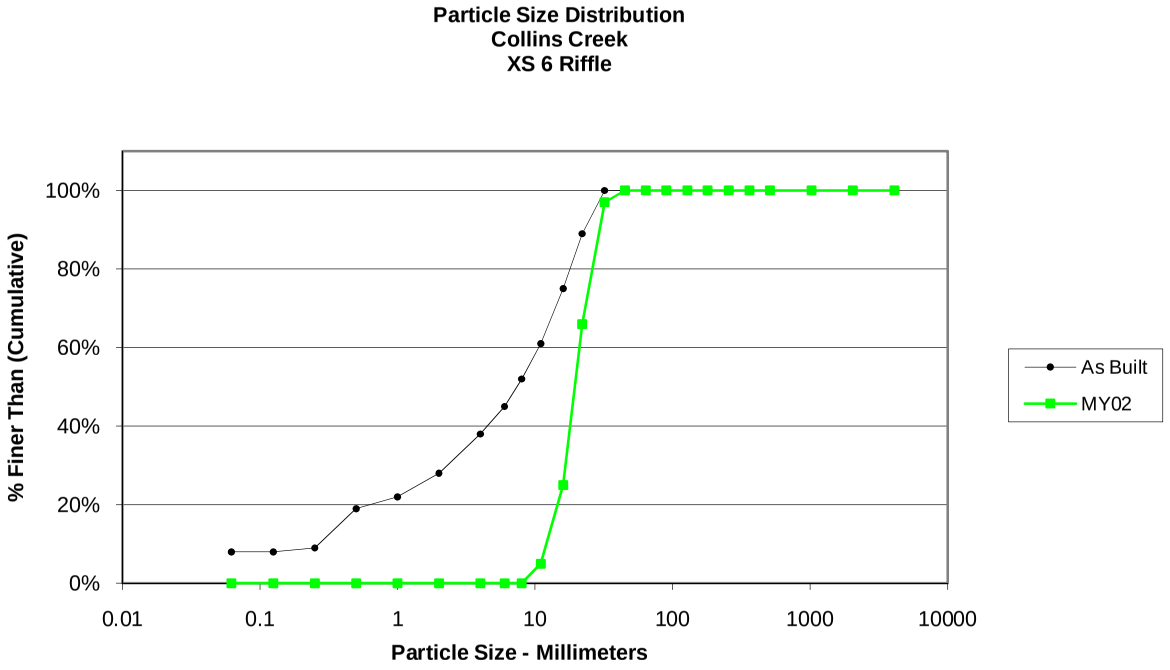
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	20
Coarse	16 - 22.6	E	41
Coarse	22.6 - 32	L	31
Very Coarse	32 - 45	S	3
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note: MY01 - N/A



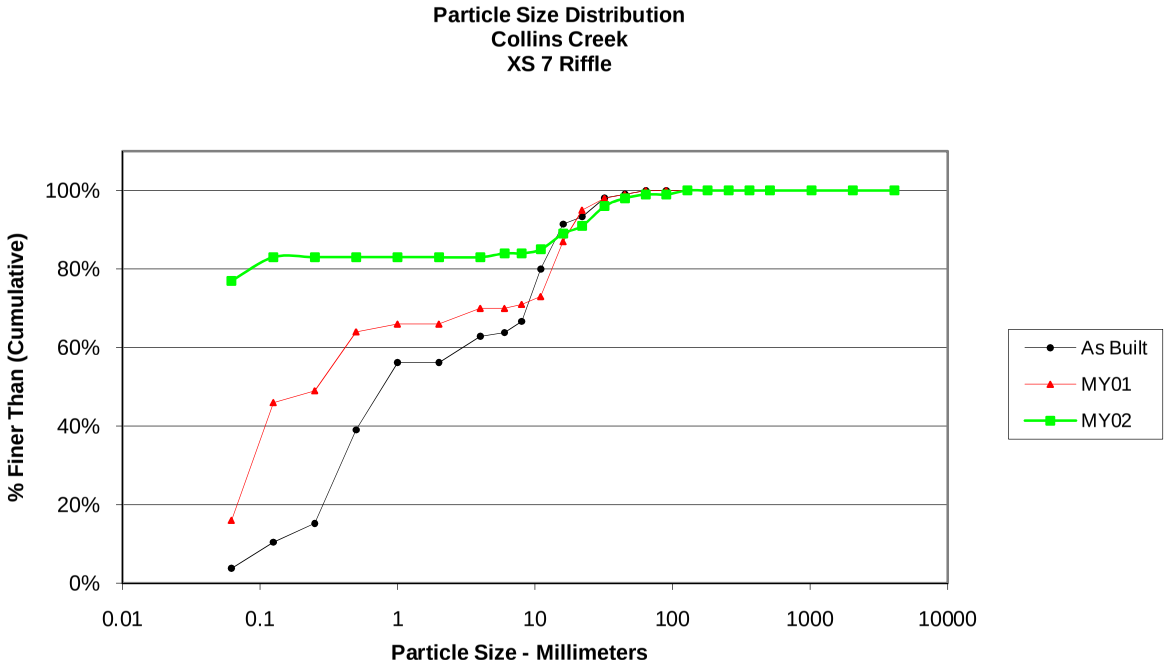
Size (mm)	
D16	14
D35	17
D50	19
D65	22
D84	27
D95	31

Size Distribution	
mean	19.4
dispersion	1.4
skewness	0.02

Type	
silt/clay	0%
sand	0%
gravel	100%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 7 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	77
Very Fine	.062 - .125	S	6
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	5
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		1
Small	64 - 90	C	
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



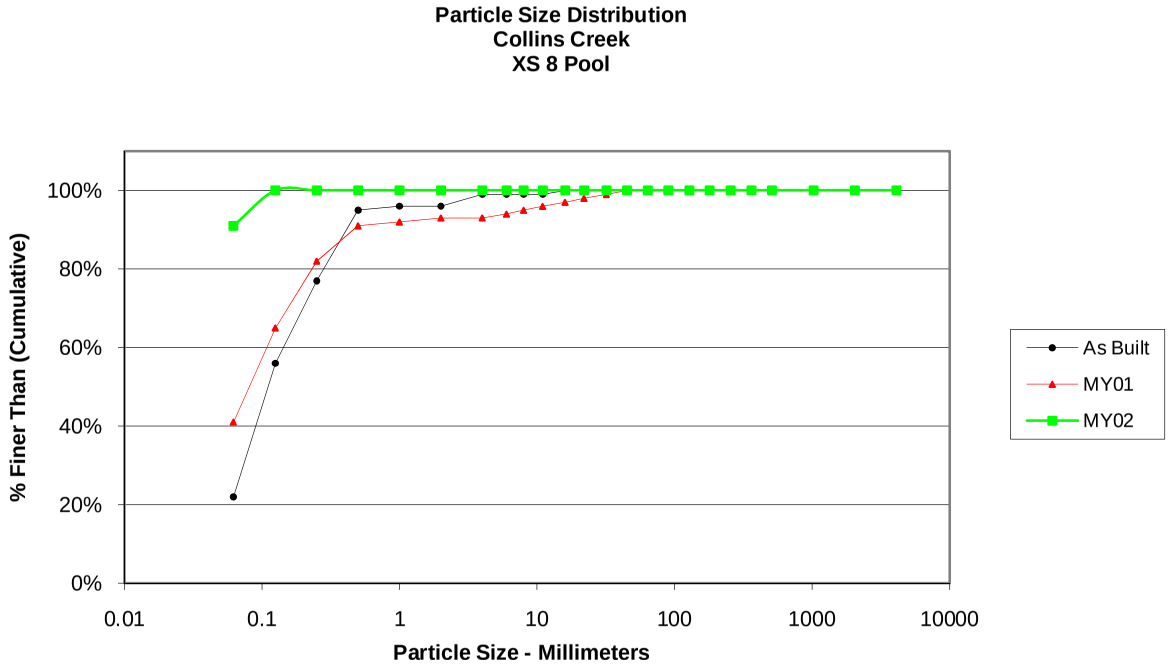
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	6
D95	30

Size Distribution	
mean	0.6
dispersion	48.9
skewness	0.70

Type	
silt/clay	77%
sand	6%
gravel	16%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 Pool - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	91
Very Fine	.062 - .125	S	9
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



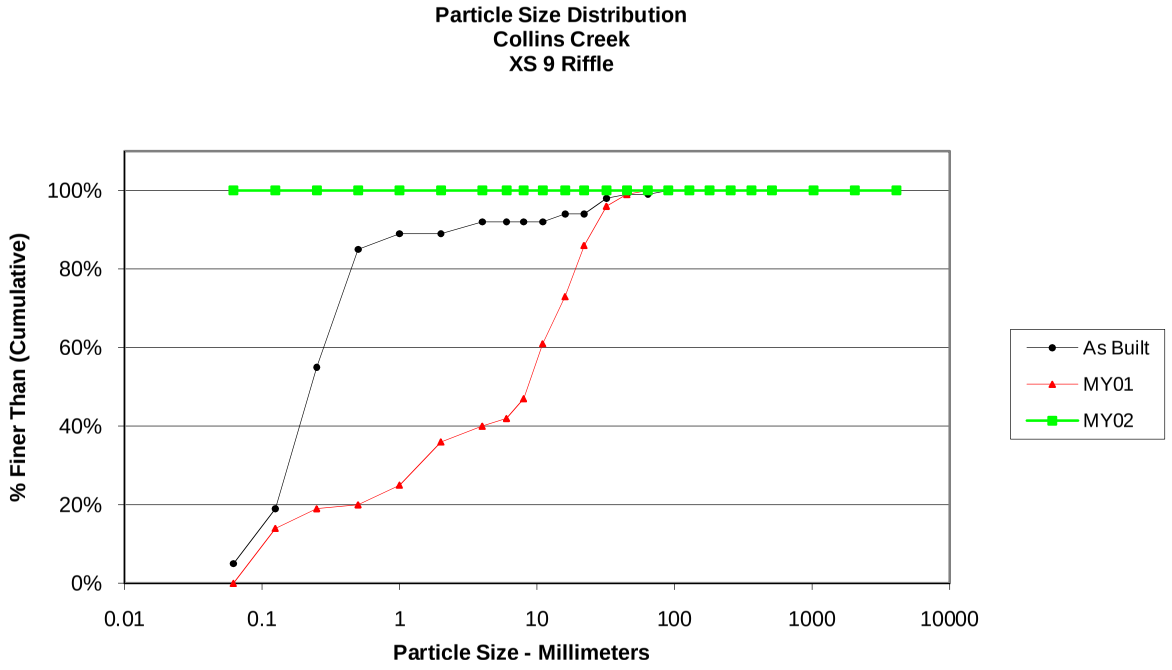
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.085

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	91%
sand	9%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 9 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note: Heavy vegetation in stream bed



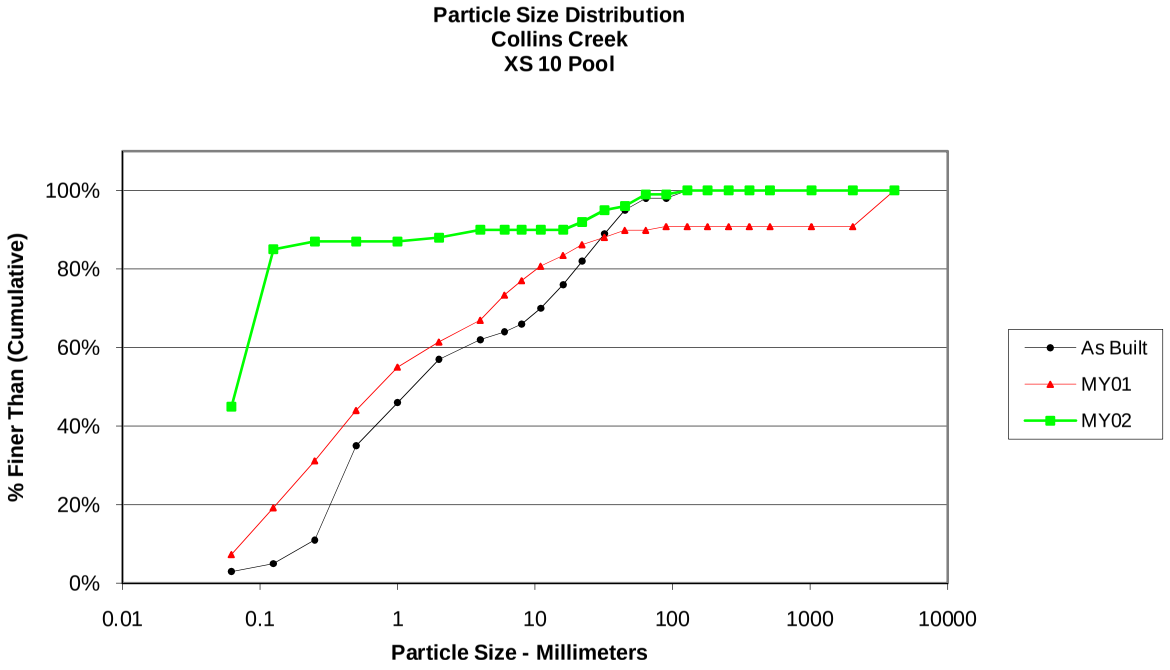
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 Pool - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	45
Very Fine	.062 - .125	S	40
Fine	.125 - .25	A	2
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	1
Very Fine	2 - 4		2
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	1
Very Coarse	45 - 64		3
Small	64 - 90	C	
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



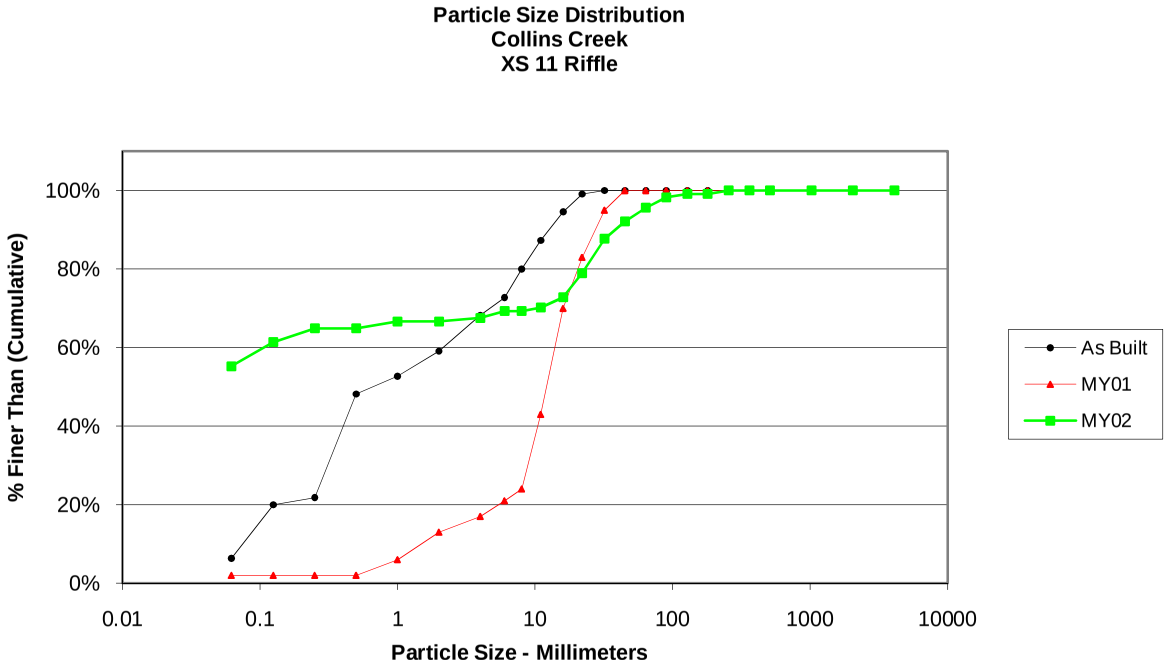
Size (mm)	
D16	0.062
D35	0.062
D50	0.068
D65	0.088
D84	0.12
D95	32

Size Distribution	
mean	0.1
dispersion	1.4
skewness	0.19

Type	
silt/clay	45%
sand	43%
gravel	11%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 11 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	63
Very Fine	.062 - .125	S	7
Fine	.125 - .25	A	4
Medium	.25 - .50	N	
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	7
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	5
Very Coarse	45 - 64		4
Small	64 - 90	C	3
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	114

Note:



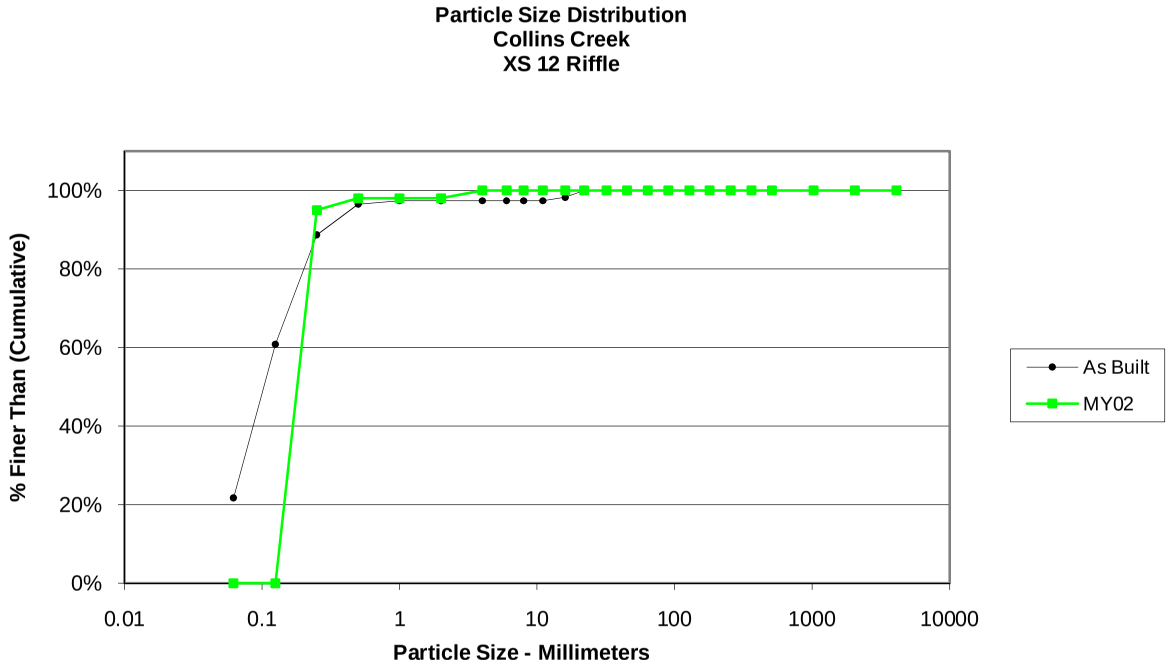
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.52
D84	27
D95	60

Size Distribution	
mean	1.3
dispersion	218.2
skewness	0.81

Type	
silt/clay	55%
sand	11%
gravel	29%
cobble	4%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 12 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	95
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		2
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note: MY01 - N/A



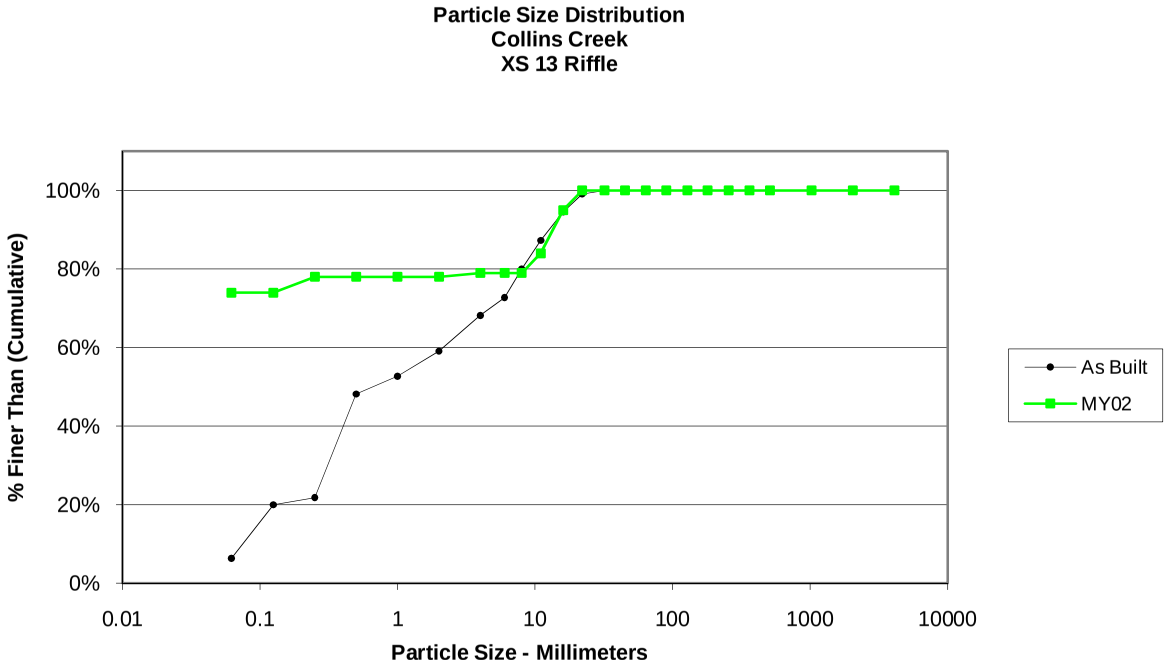
Size (mm)	
D16	0.14
D35	0.16
D50	0.18
D65	0.2
D84	0.23
D95	0.25

Size Distribution	
mean	0.2
dispersion	1.3
skewness	0.00

Type	
silt/clay	0%
sand	98%
gravel	2%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 13 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	74
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	4
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	11
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note: MY01 - N/A



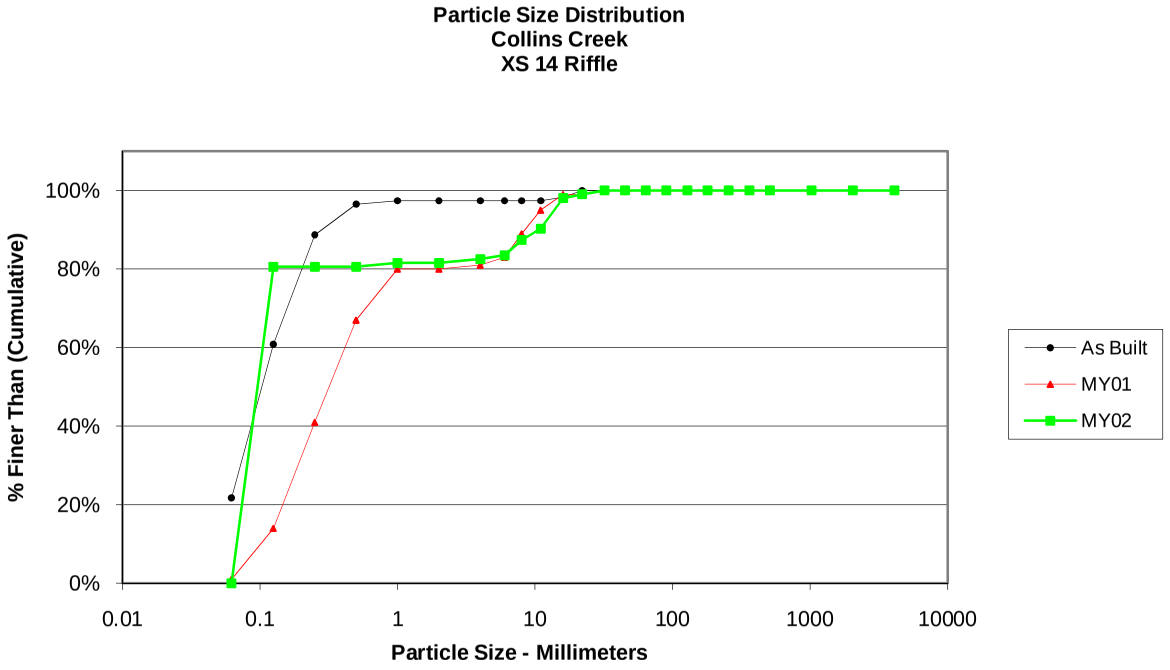
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	11
D95	16

Size Distribution	
mean	0.8
dispersion	89.2
skewness	0.75

Type	
silt/clay	74%
sand	4%
gravel	22%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 14 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	83
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	8
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103

Note:



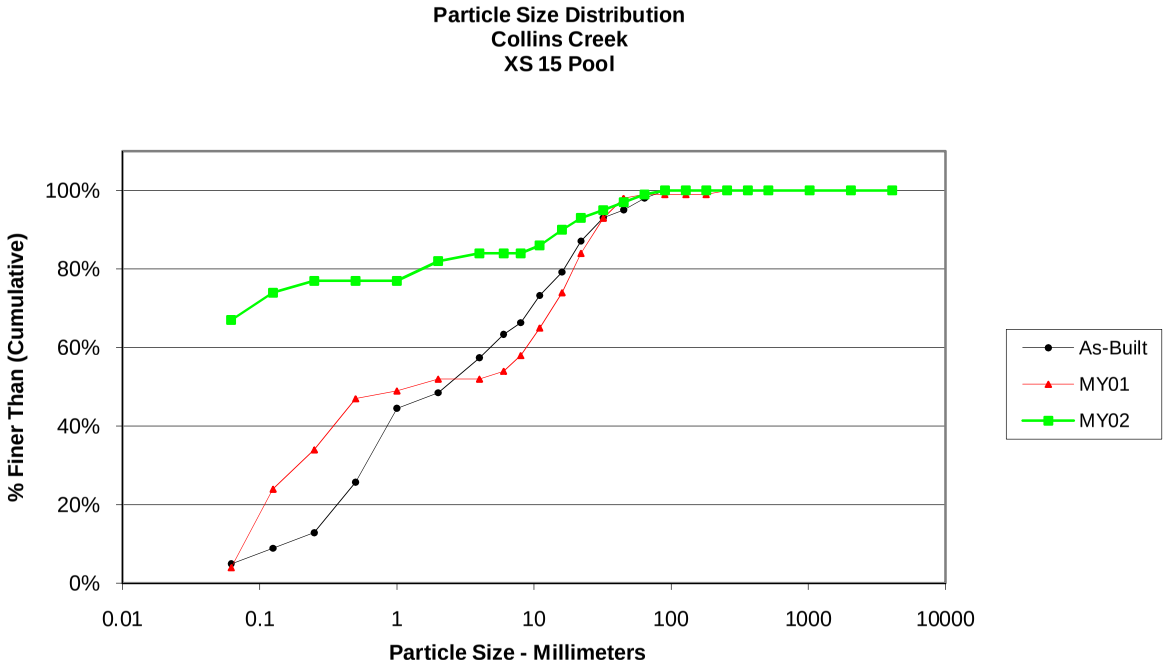
Size (mm)	
D16	0.071
D35	0.084
D50	0.096
D65	0.11
D84	6.2
D95	14

Size Distribution	
mean	0.7
dispersion	33.0
skewness	0.60

Type	
silt/clay	0%
sand	82%
gravel	18%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 15 Pool - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	67
Very Fine	.062 - .125	S	7
Fine	.125 - .25	A	3
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	5
Very Fine	2 - 4		2
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		2
Small	64 - 90	C	1
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



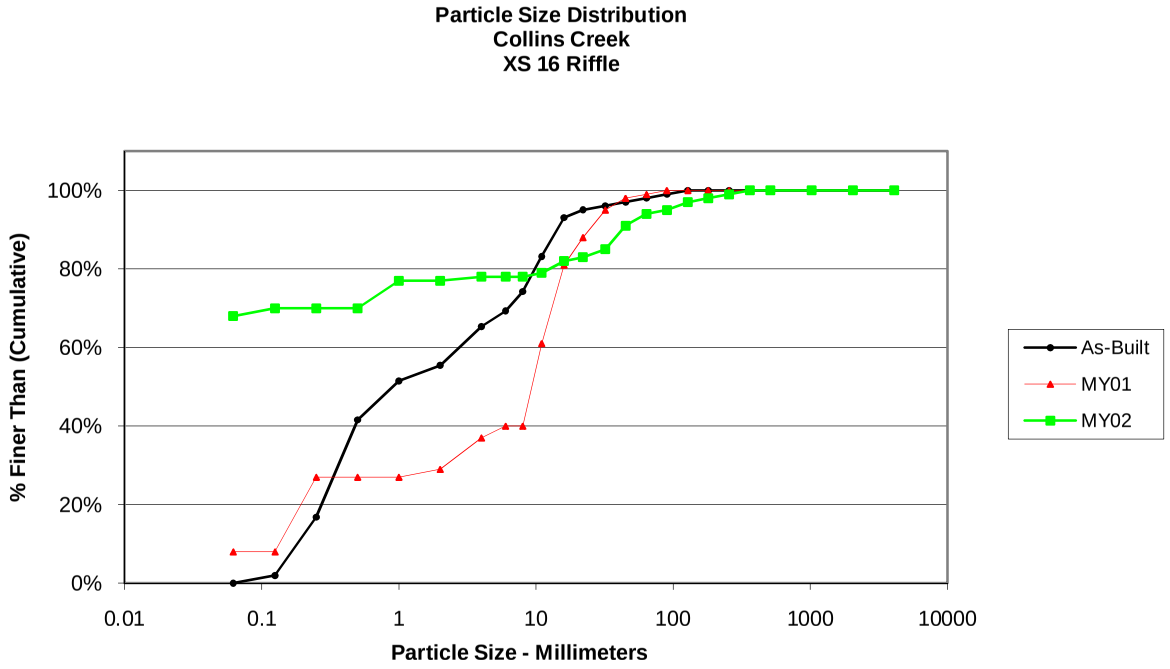
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	4
D95	32

Size Distribution	
mean	0.5
dispersion	32.8
skewness	0.67

Type	
silt/clay	67%
sand	15%
gravel	17%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 16 Riffle - MY02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	68
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	7
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	6
Very Coarse	45 - 64		3
Small	64 - 90	C	1
Small	90 - 128	O	2
Large	128 - 180	B	1
Large	180 - 256	L	1
Small	256 - 362	B	1
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:

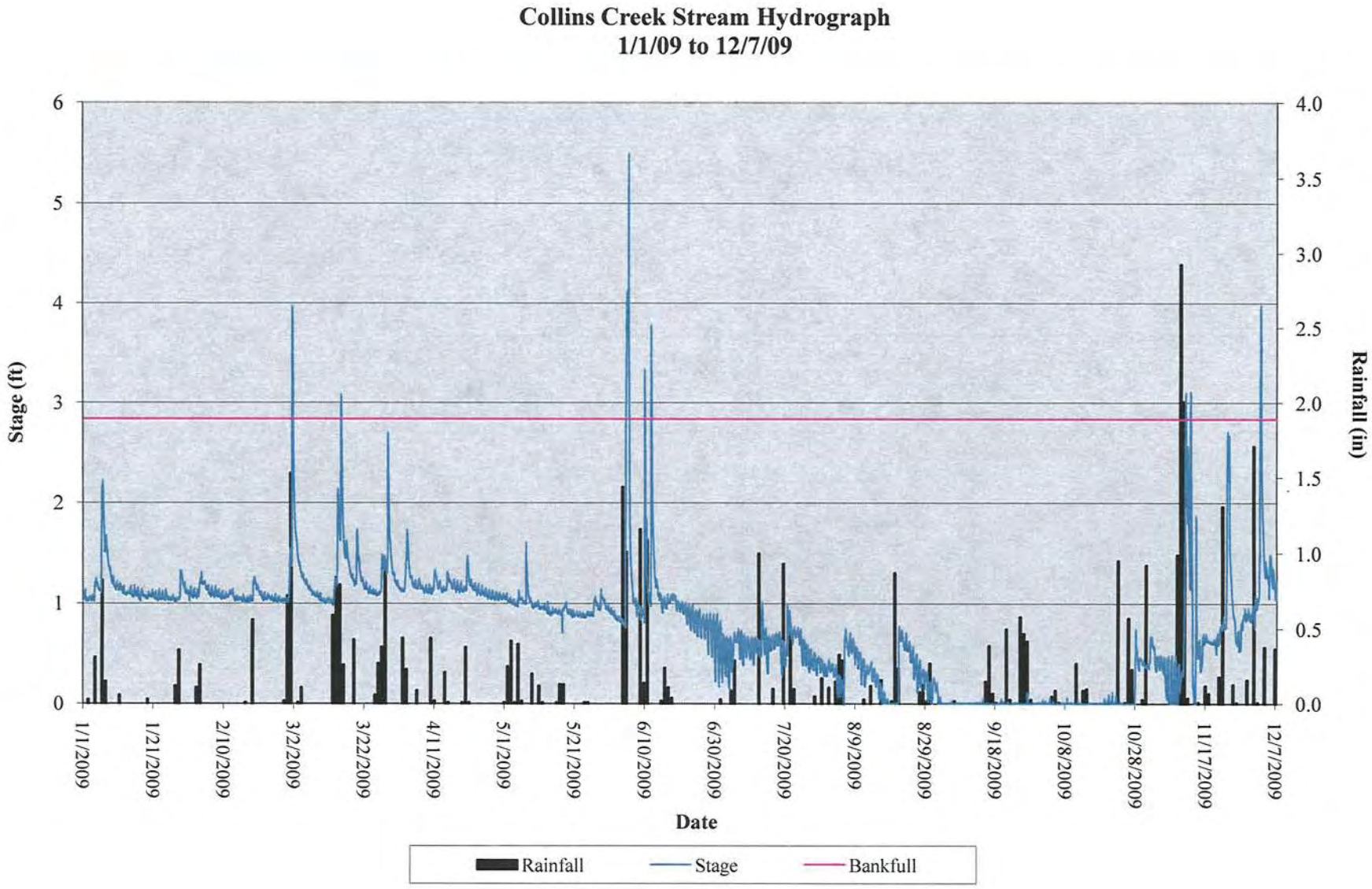


Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	27
D95	90

Size Distribution	
mean	1.3
dispersion	218.2
skewness	0.81

Type	
silt/clay	68%
sand	9%
gravel	17%
cobble	5%
boulder	1%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Appendix B6: Stream Hydrograph



Appendix C
Current Condition Plan View

SYM.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

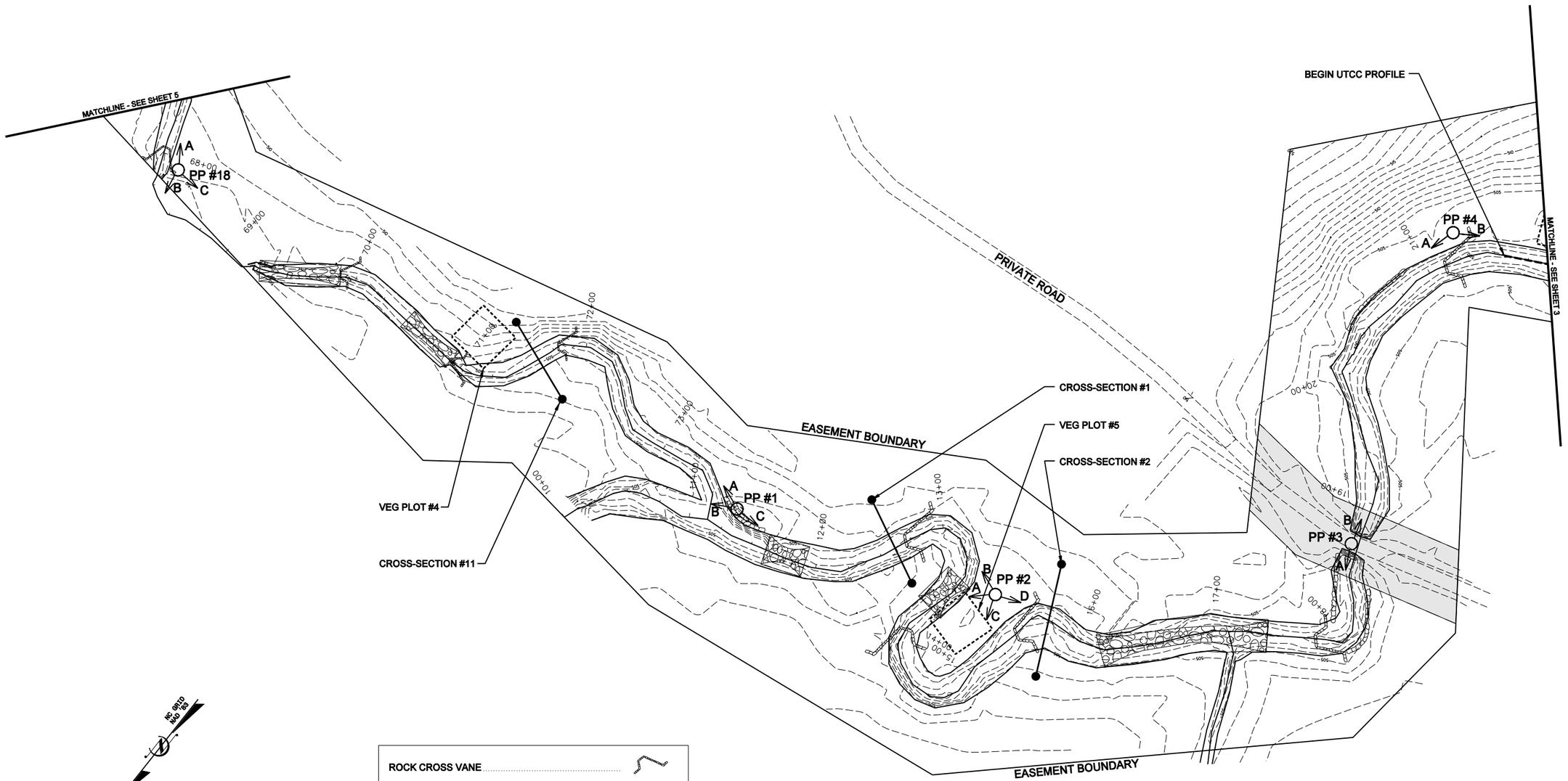
KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

COLLINS CREEK
STREAM RESTORATION PROJECT
CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA

DATE: DECEMBER 2009
SCALE: 1"=320'

CURRENT CONDITION PLAN VIEW

SHEET 1 OF 9



ROCK CROSS VANE

CONSTRUCTED RIFFLE

STONE TOE PROTECTION

STEP POOL STRUCTURE

ROCK OUTLET

SYM.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

COLLINS CREEK STREAM RESTORATION PROJECT

CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA

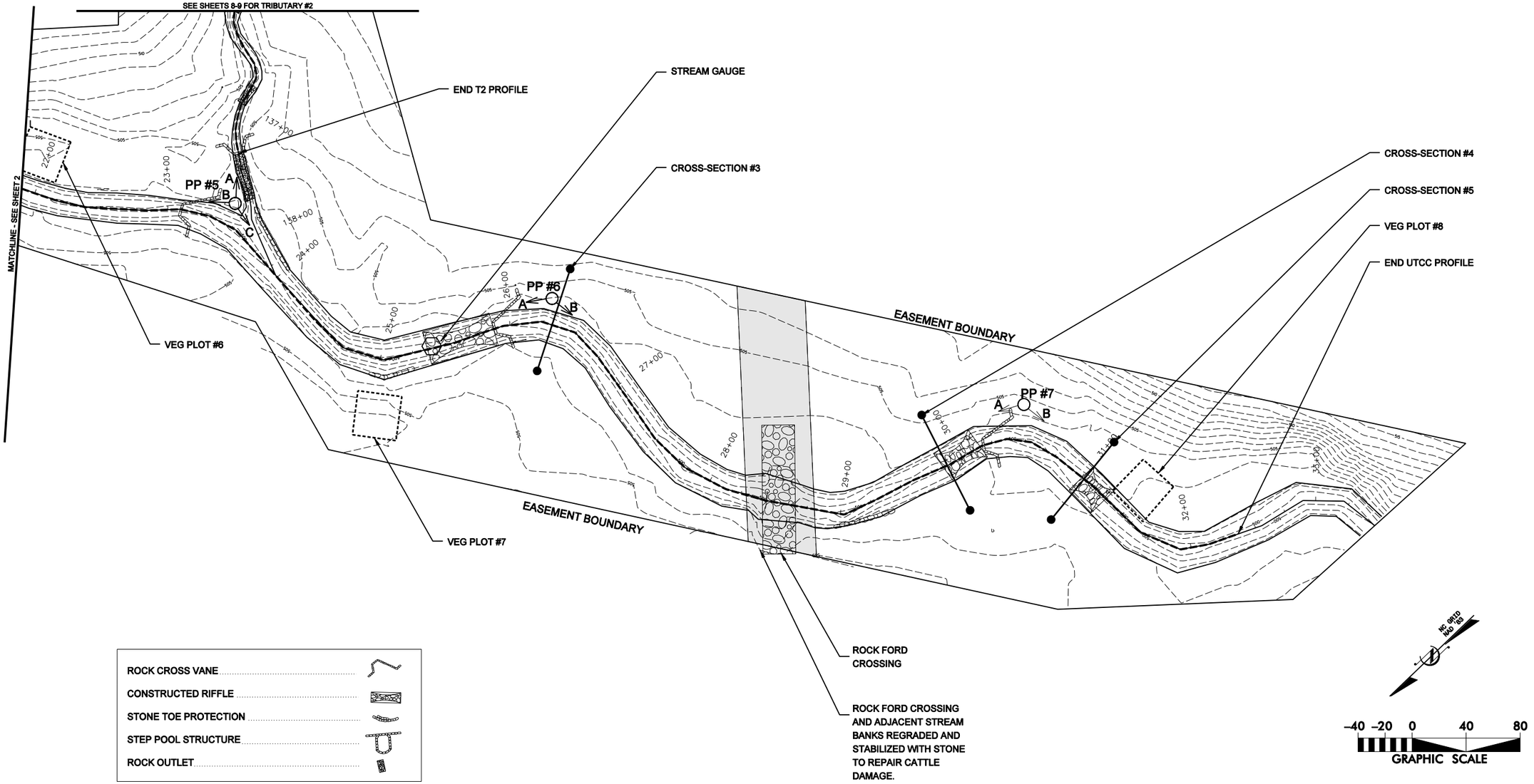
UTCC-1 & 2: STA. 10+00 - 21+90, T1-3: STA. 67+60 - 73+70

DATE: DECEMBER 2009

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SHEET 2 OF 9



NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

COLLINS CREEK
STREAM RESTORATION PROJECT
CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA
UTCC-2 AND UTCC-3: STATION 21+90 TO STATION 33+50

DATE: DECEMBER 2009
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SEE SHEET 6 FOR TRIBUTARY #1A

CONSTRUCTED RIFFLES INSTALLED TO REPAIR BED DEGRADATION

CROSS-SECTION #13

END T1A PROFILE

CREST GAUGE

VEG PLOT #12

ROCK FORD CROSSING

PP #8

PP #9

PP #10

PP #11

DODSONS CROSSROADS

EASEMENT BOUNDARY

CROSS-SECTION #6

VEG PLOT #11

MODERATE BANK EROSION

CROSS-SECTION #7

EASEMENT BOUNDARY

PRIVATE ROAD

CROSS-SECTION #8

BEGIN T1 PROFILE

FENCE PULLED UP, NO SIGN OF DAMAGE WITHIN EASEMENT

PP #12

PP #13

MATCHLINE - SEE SHEET 5

SEE SHEET 7 FOR TRIBUTARY #1B

NO GRID NO GS

–40 –20 0 40 80

GRAPHIC SCALE

ROCK CROSS VANE

CONSTRUCTED RIFFLE

STONE TOE PROTECTION

STEP POOL STRUCTURE

ROCK OUTLET

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

Ecosystem Enhancement Program

KCI TECHNOLOGIES
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460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

COLLINS CREEK STREAM RESTORATION PROJECT

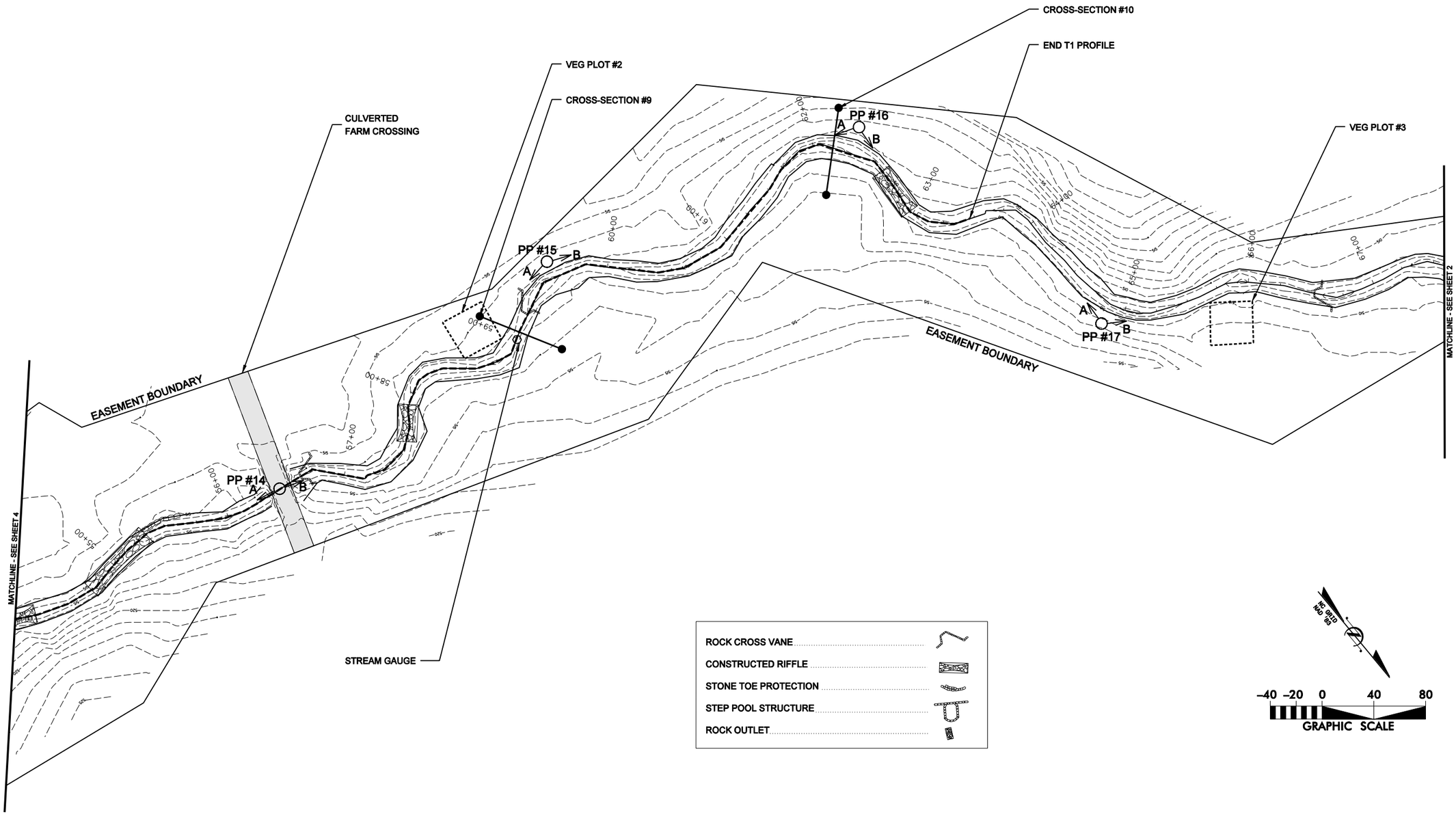
CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA

T1-1 AND T1-2: STATION 40+00 TO STATION 54+10

DATE: DECEMBER 2009

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW



NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

KCI TECHNOLOGIES
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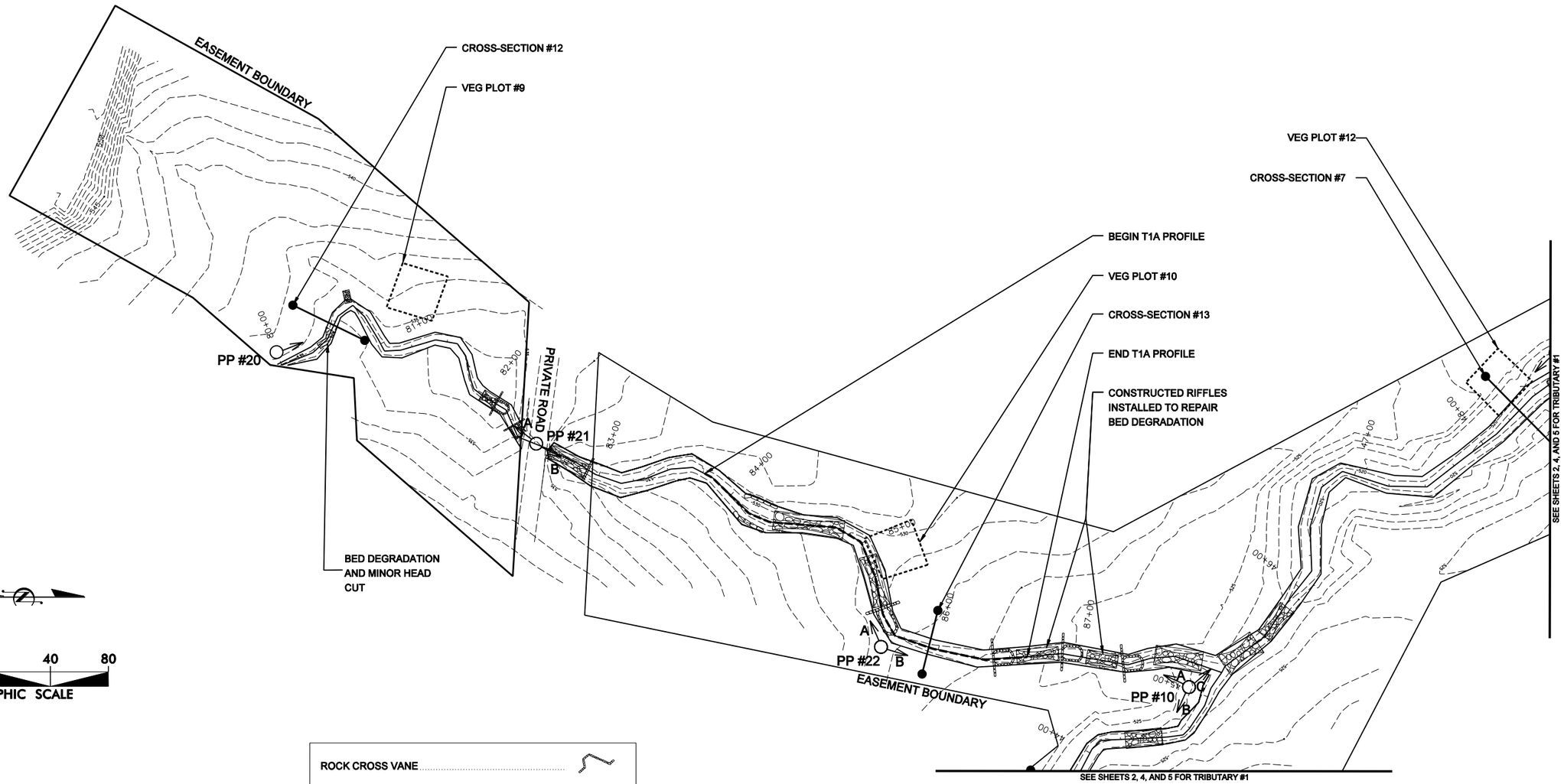
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

COLLINS CREEK
STREAM RESTORATION PROJECT
CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA
T1-3: STATION 54+10 TO STATION 67+60

DATE: DECEMBER 2009
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SHEET 5 OF 9



NC GRID
NAD '83

–40 –20 0 40 80
GRAPHIC SCALE

ROCK CROSS VANE	
CONSTRUCTED RIFFLE	
STONE TOE PROTECTION	
STEP POOL STRUCTURE	
ROCK OUTLET	

REVISIONS

SYM.	DESCRIPTION	DATE	APPROVED

Ecosystem Enhancement Program

KCI TECHNOLOGIES
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RALEIGH, NORTH CAROLINA 27609

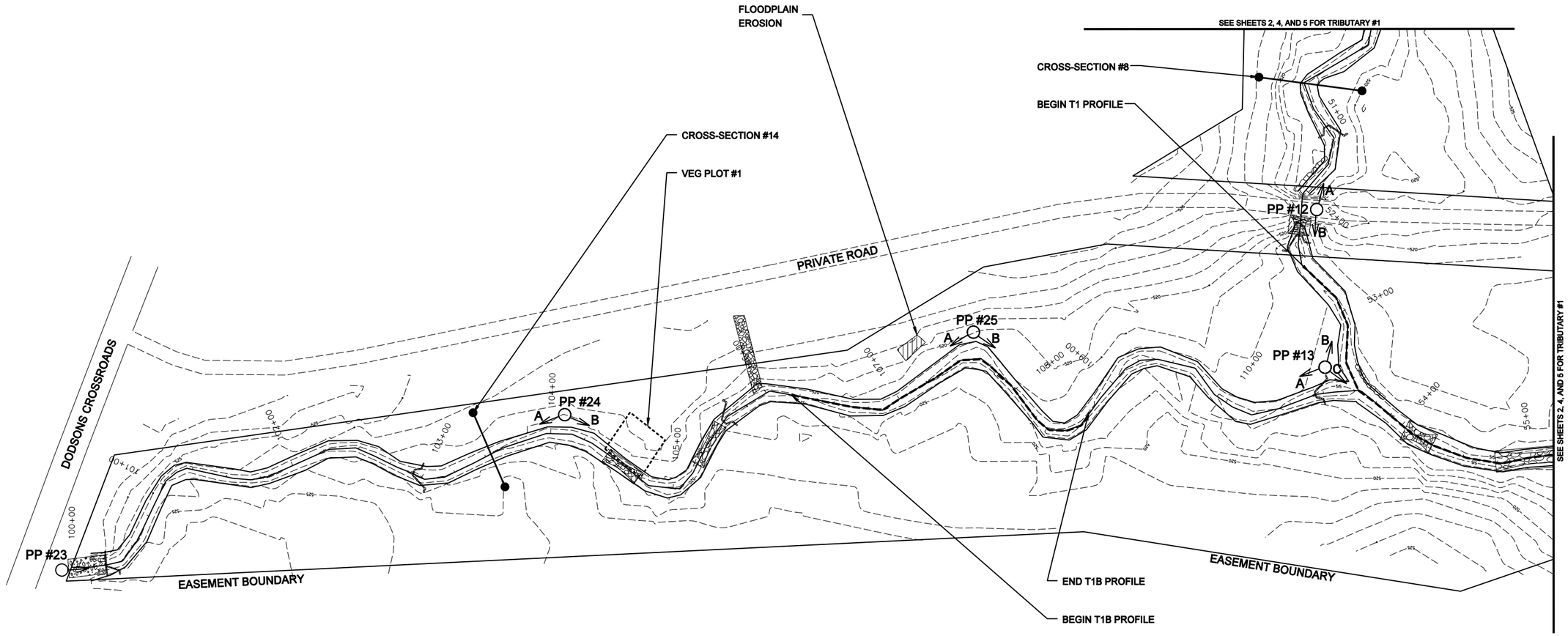
COLLINS CREEK STREAM RESTORATION PROJECT

CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA

T1A-1 AND TIA-2: STATION 80+00 TO STATION 87+75

DATE: DECEMBER 2009
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW



- ROCK CROSS VANE
- CONSTRUCTED RIFFLE
- STONE TOE PROTECTION
- STEP POOL STRUCTURE
- ROCK OUTLET

NAD 1983 NAD 83

GRAPHIC SCALE
–40 –20 0 40 80

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

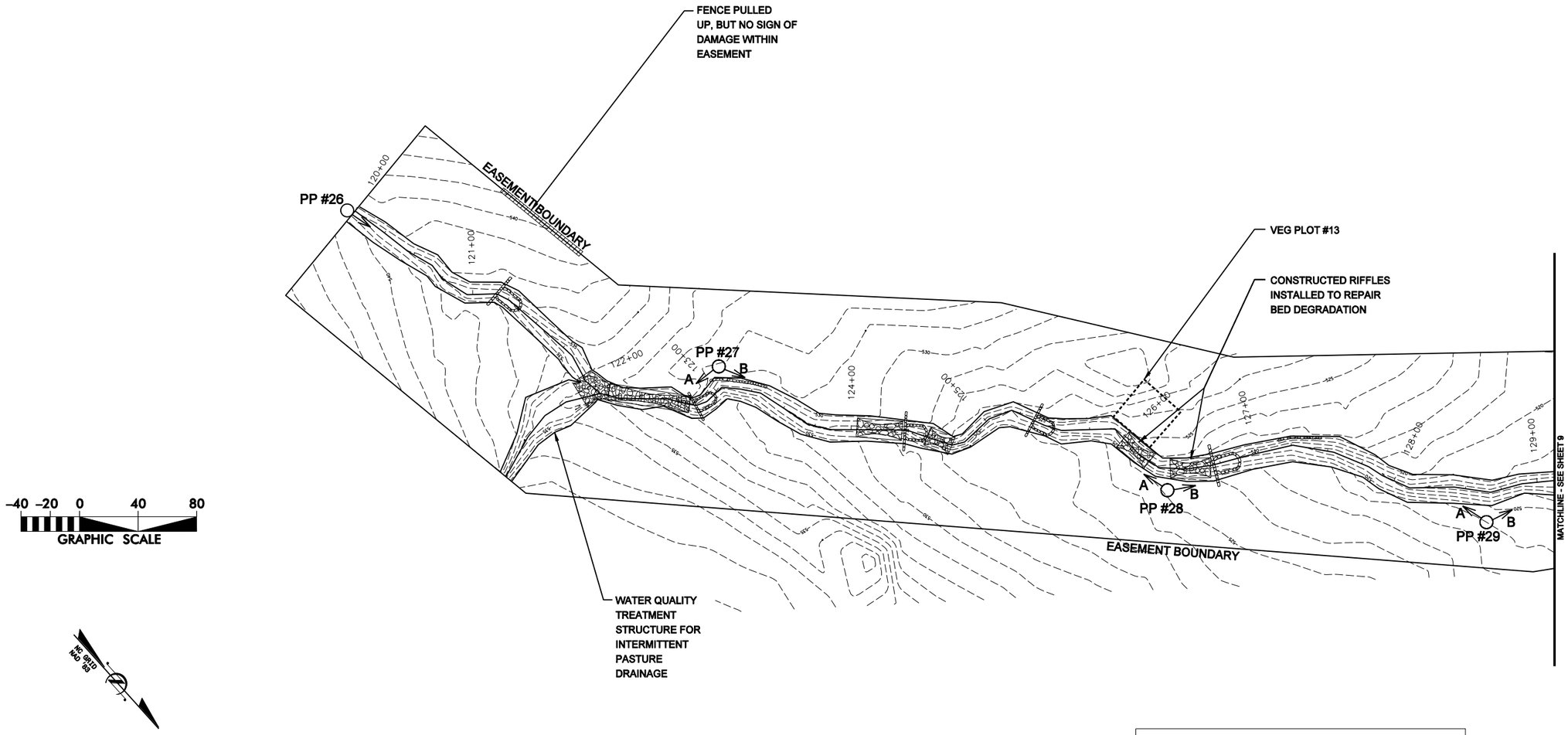
Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
460I SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

COLLINS CREEK
STREAM RESTORATION PROJECT
CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA
T1B: STATION 100+00 TO STATION 111+00

DATE: DECEMBER 2009
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW



-40 -20 0 40 80

GRAPHIC SCALE

NO GRID NAD 83

ROCK CROSS VANE

CONSTRUCTED RIFFLE

STONE TOE PROTECTION

STEP POOL STRUCTURE

ROCK OUTLET

REVISIONS

SYM.	DESCRIPTION	DATE	APPROVED

Ecosystem Enhancement Program

KCI TECHNOLOGIES
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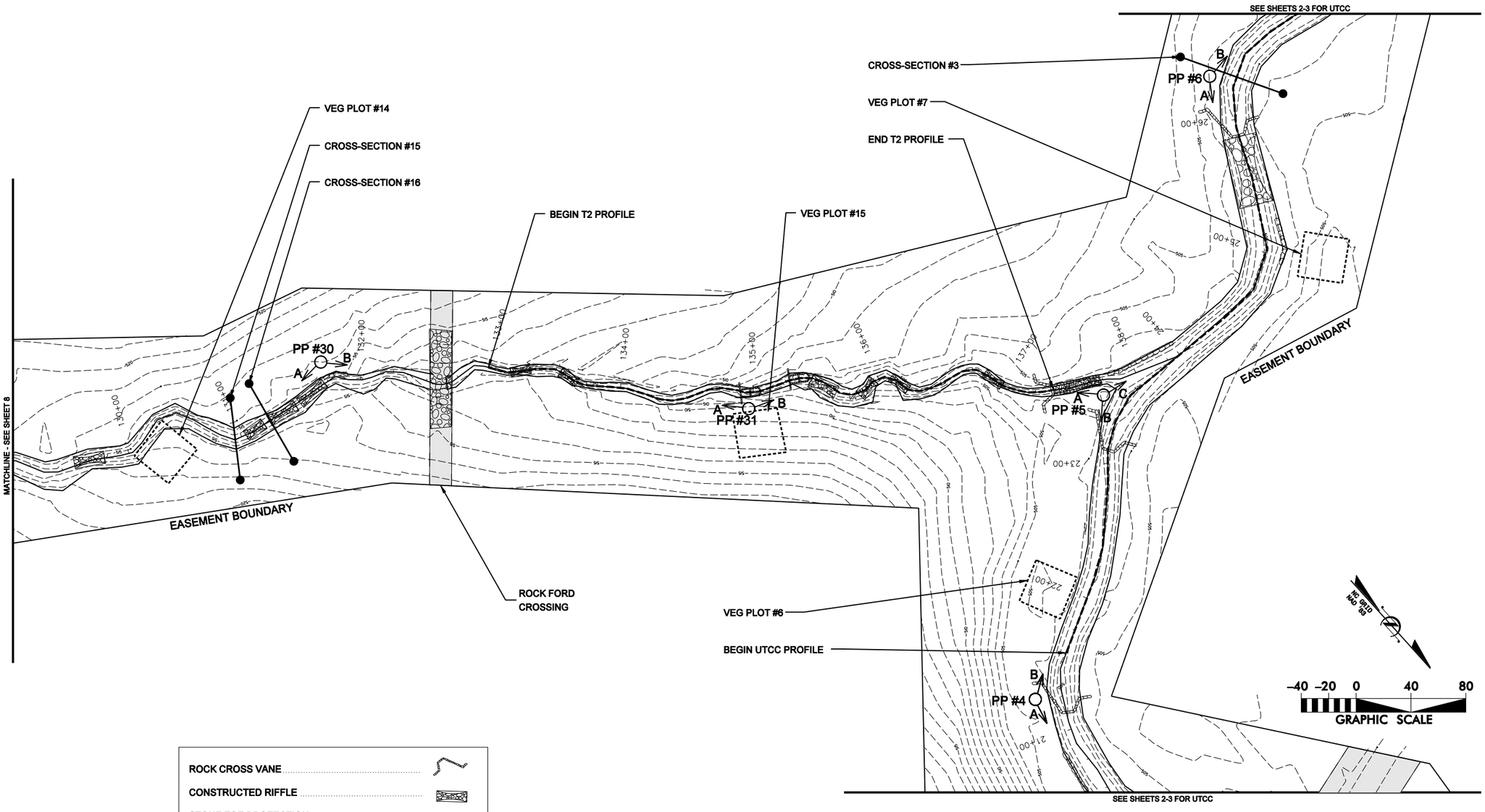
RALEIGH, NORTH CAROLINA 27609

COLLINS CREEK
STREAM RESTORATION PROJECT
CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA
T2: STATION 120+00 TO STATION 129+12

DATE: DECEMBER 2009
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SHEET 8 OF 9



ROCK CROSS VANE

CONSTRUCTED RIFFLE

STONE TOE PROTECTION

STEP POOL STRUCTURE

ROCK OUTLET

SYM.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

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4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

COLLINS CREEK STREAM RESTORATION PROJECT

CHAPEL HILL, ORANGE COUNTY, NORTH CAROLINA

T2: STATION 129+12 TO STATION 138+33

DATE: DECEMBER 2009

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW