

FINAL
ANNUAL MONITORING REPORT
YEAR 4 (2012)
CHAPEL CREEK STREAM RESTORTION SITE
ORANGE COUNTY, NORTH CAROLINA
(EEP Project No. 77, Contract No. 004806)
Construction Completed July 2008



Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina



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Prepared by:
Axiom Environmental, Inc.
218 Snow Avenue
Raleigh, North Carolina 27603



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1.0 EXECUTIVE SUMMARY

The North Carolina Ecosystem Enhancement Program (NCEEP) has completed restoration of 1350 linear feet of stream at the Chapel Creek Stream Restoration Site (hereafter referred to as the “Site”) to assist in fulfilling stream mitigation goals in the area. This report (compiled based on EEP’s *Procedural Guidance and Content Requirements for EEP Monitoring Reports* Version 1.4 dated 11/7/11) summarizes data for year 4 (2012) monitoring.

The Site is located on University of North Carolina Chapel Hill property in Orange County, North Carolina. The Site is located in United States Geological Survey (USGS) Hydrologic Unit and Targeted Local Watershed 03030002060080 (North Carolina Division of Water Quality [NCDWQ] Subbasin 03-06-06) of the Cape Fear River Basin. The Site occurs within the lower Morgan Creek watershed planning area; the Morgan Creek Local Watershed Plan noted water quality degradation and impaired biological communities in the watershed and identified major watershed stressors as streambank erosion, excess stormwater runoff, and disturbed riparian buffers (NCEEP 2004).

The drainage area for Chapel Creek is approximately 0.42 square miles at the Site outfall where a channel that drains through the A.E. Finley Golf Course converges with Chapel Creek. The watershed land use consists of the University of North Carolina facilities, single family residential land, elementary schools, roadways, and forested land.

The goals of the restoration project focus on improving water quality in the Chapel Creek and the Cape Fear River watersheds by the following

- Restoring pattern, profile, and dimension to approximately 964 linear feet of Chapel Creek.
- Enhancing/stabilizing approximately 331 linear feet using a combination of Priority 2 and Priority 3 restoration approaches, excavating a bankfull bench and repairing stream banks.
- Restoring stable stream channels capable of transporting flows and sediment loads efficiently.
- Improving aquatic habitat by revegetating stream banks to increase shade and restoring sinuosity and riffle-pool complexes.
- Reducing sediment inputs by restoring stable stream channels and revegetating banks.

Prior to construction, the Site contained a degraded stream channel located within an abandoned portion of the A.E. Finley Golf Course that was regularly mowed and maintained. Site streams were characterized by entrenched, narrow, deep, step-pool channels with low to moderate sinuosity. Project construction was completed in July 2008. The project restored 964 linear feet of stream using Priority I restoration by constructing a new meandering channel within the floodplain and enhanced (level II) 331 linear feet using a combination of Priority 2 and Priority 3 restoration approaches by excavating a bankfull bench and repairing stream banks. Site activities provide 1095 Stream Mitigation Units. The Site will be protected by a permanent conservation easement held by the State of North Carolina.

Four vegetation monitoring plots were monitored on July 17, 2012 for year 4 (2012) monitoring. Vegetation success criteria dictate that an average density of 320 stems per acre must be surviving in the first three monitoring years. Subsequently, 290 stems per acre must be surviving in year 4 and 260 stems per acre in year 5. Stem counts will be based on an average of the evaluated vegetation plots. Based on the number of stems counted, average densities were measured at 749 planted stems per acre surviving in year 4 (2012). The dominant species identified at the Site were planted stems of river birch (*Betula nigra*), green ash (*Fraxinus pennsylvanica*), and southern arrowwood (*Viburnum dentatum*). All individual plots met success criteria based on planted stems alone.

Vegetation problem areas within the Site include the following (depicted on Figures 2A-2B, Appendix B). Currently, most invasive species within the Site are not affecting planted tree stem survival or growth and are therefore expected to be shaded out as planted trees mature; however, they will continue to be watched throughout the monitoring period. Invasive species controls were undertaken in August 2012 to treat Lespedeza within the Site.

Map Label*	Notes
VPA2	Lespedeza, planted trees and natural recruits are present
VPA3	Lespedeza, planted trees and natural recruits are present
VPA5	Sparse herbaceous
VPA7	Sparse herbaceous with numerous pine trees
VPA 9	Lespedeza
VPA10	Microstegium established where bench was excavated
VPA 11	Poor planted stems with some natural recruits of sweetgum and sycamore
VPA 12	A few privet present
VPA 14	Some lespedeza, mostly pine trees with elms and river birch
VPA 15	Chinese privet with scattered lespedeza, numerous river birch and iron wood present in this area
VPA 16	Lespedeza

*Map labels on Figures 2A-2B, Appendix B

Success criteria for stream restoration will be based on stream stability and assessed using measurements of stream dimension, pattern, and profile; site photographs; visual assessments; and vegetation sampling. Overall, the stream is functioning properly and emulates design/as-built conditions. In addition, stream success criteria will include documentation of two bankfull channel events during the monitoring period. In the event that less than two bankfull events occur during the first five years, monitoring will continue until the second event is documented. In addition, bankfull events must occur during separate monitoring years. A crest gauge is located within the Site to assist with documentation of bankfull events. One bankfull event was documented during the year 4 (2012) monitoring season for a total of five bankfull events with at least one event occurring in each monitoring year.

Stream problem areas within the Site include areas of minor bank erosion/scour and are not causing additional issues up or downstream. Stream problem areas were planted with 125 silky dogwood live stakes in January 2012. Many areas considered problems during previous monitoring years have recovered and vegetation has established; therefore, these areas are no longer considered problems. Stream problem areas are depicted on Figures 2A-2B (Appendix B) and include the following.

Map Label*	Station	Notes
SPA1	1+40	Erosion and sedimentation under pedestrian bridge
SPA2	2:25	Minor erosion and undercut bank on right bank; vegetation is establishing
SPA3	5+10	Minor erosion on outer/right bank; vegetation is establishing

*Map labels on Figures 2A-2B, Appendix B

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in tables and figures within this report's appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 METHODOLOGY

2.1 Vegetation Assessment

Four vegetation plots were established and marked after construction with metal conduit demarking the four plot corners. The plots are 10 meters square or 5-meters by 20-meters and are located randomly within the Site. These plots were surveyed on July 17, 2012 for the year 4 (2012) monitoring season using the *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) (<http://cvs.bio.unc.edu/methods.htm>); results are included in Appendix C. The taxonomic standard for vegetation used for this document was *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (Weakley 2007).

2.2 Stream Assessment

Annual stream monitoring was conducted the week of July 16, 2012. Five permanent cross-sections, four riffle and one pool, will be used to evaluate stream dimension; locations are depicted on Figures 2 and 2A-2B (Appendix B). Cross-sections are permanently monumented with metal conduit at each end point. Cross-sections will be surveyed annually to provide a detailed measurement of the stream and banks including points on the adjacent floodplain, top of bank, bankfull, breaks in slope, edge of water, and thalweg. Data will be used to calculate width-depth ratios, entrenchment ratios, and bank height ratios for each cross-section. In addition, photographs will be taken and pebble counts will be conducted at each permanent cross-section location annually.

One approximately 1300-linear foot monitoring reach will be used to evaluate stream pattern and longitudinal profile; locations are depicted on Figures 2 and 2A-2B (Appendix B). Measurement of channel pattern will include belt-width, and meander length. Subsequently, data will be used to calculate meander-width ratios. Longitudinal profile measurements will include average water surface slopes and facet slopes and pool-to-pool spacing. In addition, visual stream morphology stability assessments will be completed in each of the three monitoring reaches annually to assess the channel bed, banks, and in-stream structures (Tables 5A-5C, Appendix B).

3.0 REFERENCES

- Lee, Michael T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. *CVS-EEP Protocol for Recording Vegetation, Version 4.2*. (online). Available: <http://cvs.bio.unc.edu/methods.htm>.
- North Carolina Ecosystem Enhancement Program (NCEEP). 2004. *Morgan Creek Local Watershed Plan Detailed Assessment Report*. Available: http://www.nceep.net/services/lwps/Morgan_Creek/MLCdata/DetailedAssessmentReport/MLCdetAssRep.pdf [July 2012]. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, North Carolina.
- Weakley, Alan S. 2007. *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (online). Available: <http://www.herbarium.unc.edu/WeakleysFlora.pdf> [February 1, 2008]. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.
- Weather Underground. 2012. Station at Chapel Hill (KGIX) in Chapel Hill, North Carolina. (online). Available: <http://www.wunderground.com/history/airport/KIGX/2012/7/30/CustomHistory.html> [July 30, 2012].

APPENDIX A

PROJECT VICINITY MAP AND BACKGROUND TABLES

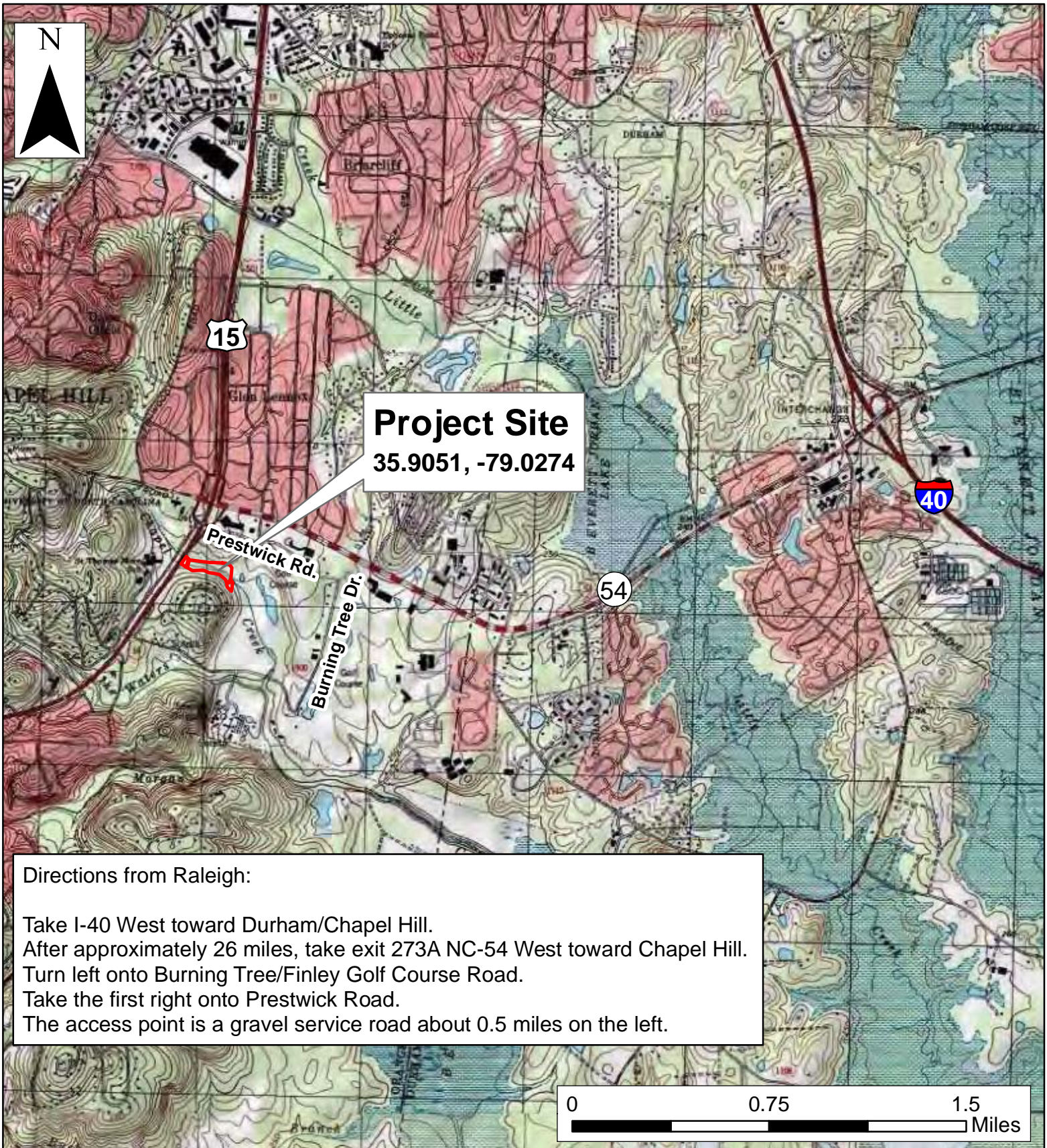
Figure 1. Vicinity Map

Table 1. Project Restoration Components

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Attributes Table



Directions from Raleigh:

Take I-40 West toward Durham/Chapel Hill.
 After approximately 26 miles, take exit 273A NC-54 West toward Chapel Hill.
 Turn left onto Burning Tree/Finley Golf Course Road.
 Take the first right onto Prestwick Road.
 The access point is a gravel service road about 0.5 miles on the left.



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 218 Snow Avenue
 Raleigh, NC 27603
 (919) 215-1693

Axiom Environmental, Inc.

SITE LOCATION MAP
CHAPEL CREEK STREAM RESTORATION SITE
 Orange County, North Carolina

Dwn. by.
 KRJ

Date:
 January 2013

Project:
 12-025

FIGURE
1

**Table 1. Project Components and Mitigation Credits
Chapel Creek Stream Restoration Site (EEP Project Number 77)**

Mitigation Credits							
Type	Stream			Riparian Wetland		Buffer	
	Restoration	Restoration Equivalent		Restoration	Restoration Equivalent		
Totals	964	132		--	--	--	
Projects Components							
Project Component/ Reach ID	Station Range	Existing Linear Footage/ Acreage	Priority Approach	Restoration/ Restoration Equivalent	Restoration Linear Footage/ Acreage	Mitigation Ratio	Comment
Reach 1	00+00– 09+94	964	P1	Restoration	994*	1:1	Priority I stream restoration.
Reach 2	09+94- 13+50	331	P2/P3	Enhancement (Level II)	356*	2.5:1	Reach 2 consists of a mix of P2 and P3.
Component Summation							
Restoration Level				Stream (linear footage)		Riparian Wetland (acres)	Buffer (square footage)
Restoration				964		--	--
Enhancement (Level II)				331		--	--
Totals				1295		--	--
Mitigation Units				1096 SMUs		--	--

*Site activities restored 994 linear feet of stream and enhanced 356 linear feet of stream; however, 30 linear feet of restoration (Stations 01+20-01+50) and 25 linear feet of enhancement (Stations 12+50-12+75) are excluded for pedestrian bridges and are not included in the SMU calculation.

Table 2. Project Activity and Reporting History
Chapel Creek Stream Restoration Site (EEP Project Number 77)

Elapsed Time Since Grading Complete: 4 years 3 months

Elapsed Time Since Planting Complete: 4 years 3 months

Number of Reporting Years: 4

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan		August 2006
Final Design – Construction Plans		June 2007
Construction		July 2008
Temporary S&E mix applied to entire project area		July 2008
Permanent seed mix applied to entire project area		July 2008
Repairs to stream due to damages from storm events		March 2009
Temporary S&E mix applied to area disturbed by repairs		March 2009
Permanent seed mix applied to area disturbed by repairs		March 2009
Containerized and B&B plantings for entire reach		March 2009
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	March 2009	March 2009
Year 1 Monitoring (2009)	September 2009	November 2009
Invasive species control		2010
Year 2 Monitoring (2010)	October 2010	November 2010
Year 3 Monitoring (2011)	August 2011	November 2011
Live Stake Installation		January 2012
Invasive species control (Lespedeza sp.)		August 2012
Year 4 Monitoring (2012)	July 2012	July 2012

Table 3. Project Contacts Table
Chapel Creek Stream Restoration Site (EEP Project Number 77)

Designer	Ward Consulting Engineers, P.C. 8368 Six Forks Road Suite 104 Raleigh, NC 27615-5083 Becky Ward 919-870-0526
Construction, Planting, and Seeding Contractor	River Works, Inc. 800 Regency Parkway, Suite 200 Cary, NC 27518 Will Pederson 919-459-9001
Surveyor	Level Cross Surveying, PLLC (all surveying) 668 Marsh County Lane Randleman, NC 27317 Sherie Willard 336-495-1713
Seed Mix Source	Green Resource 336-855-6363
Baseline Data Collection and Years 1-3 Monitoring Performers	Ward Consulting Engineers, P.C. 8368 Six Forks Road Suite 104 Raleigh, NC 27615-5083 Becky Ward 919-870-0526
Years 4-5 Monitoring Performers	Axiom Environmental, Inc. 218 Snow Avenue

	Raleigh, NC 27603 Grant Lewis 919-215-1693
--	---

**Table 4. Project Baseline Information and Attributes
Chapel Creek Stream Restoration Site (EEP Project Number 77)**

Project Information		
Project Name	Chapel Creek Stream Restoration Site	
Project County	Orange County, North Carolina	
Project Area	5.15 acres	
Project Coordinates	35.9055°N, 79.0289°W (near station 0+00 at Fordham Drive)	
Project Watershed Summary Information		
Physiographic Region	Piedmont	
Ecoregion	Triassic Basin	
Project River Basin	Cape Fear	
USGS 8-digit HUC	03030002	
USGS 14-digit HUC	03030002060080	
NCDWQ Subbasin	03-06-06	
Project Drainage Area	0.42 square miles	
Project Drainage Area Impervious Surface	9%	
Watershed Type	Urban	
Reach Summary Information		
Parameters	Reach 1	Reach 2
Restored/Enhanced Length	961 linear feet	356 linear feet
Drainage Area	0.42 square miles	
NCDWQ Index Number	16-41-2-8	
NCDWQ Classification	WS-IV, NSW	
Valley Type/Morphological Description	VIII/C4	
Dominant Soil Series	Chewacla	
Drainage Class	Somewhat poorly drained	
Soil Hydric Status	Nonhydric, may contain hydric Wehadkee inclusions	
Slope	0.0136	0.017
FEMA Classification	100-year floodplain	
Native Vegetation Community	Piedmont/Low Mountain Alluvial Forest	
Percent Composition of Exotic Invasives	5.4	
Regulatory Considerations		
Regulation	Applicable	
Waters of the U.S. –Sections 404 and 401	Yes-Received Appropriate Permits	
Endangered Species Act	No	
Historic Preservation Act	No	
CZMA/CAMA	No	
FEMA Floodplain Compliance	Yes-LOMR completed and confirmed by Sue Burke, Floodplain Manager, Town of Chapel Hill	
Essential Fisheries Habitat	No	

APPENDIX B

VISUAL ASSESSMENT DATA

Figures 2 and 2A-2B. Current Conditions Plan View

Table 5. Visual Stream Morphology Stability Assessment Table

Table 6. Vegetation Condition Assessment Table

Vegetation Monitoring Plot Photos

Fordham Drive

Vegetation Plot Pin Coordinate Table (NAD83)								
Vegetation Plot Number	Pin 1		Pin 2		Pin 3		Pin 4	
	Northing	Easting	Northing	Easting	Northing	Easting	Northing	Easting
1	784445.7	1991562.8	784429.7	1991560.5	784422.8	1991625.7	784438.7	1991627.9
2	784319.4	1991786.6	784320.5	1991819.2	784286.9	1991787.1	784287.1	1991819.9
3	784216.3	1992146.0	784249.9	1992211.3	784200.0	1992154.8	784203.7	1992211.7
4	784015.2	1992316.7	784024.2	1992330.8	783969.2	1992366.4	783960.4	1992353.1

Legend

- Chapel Creek Easement
- Stream Restoration
- Stream Enhancement (Level II)
- Top of Bank
- Stream Stationing
- Cross-sections
- Stream Structures
- Pedestrian Bridges
- Preconstruction Channel
- Vegetation Plots
- Vegetation Problem Areas

Stream Problem Areas

- Scoured/Eroded Bank



Prepared for:

Project:

CHAPEL CREEK STREAM RESTORATION SITE

Orange County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

(Overview Map)

Drawn by: CLF/KJ

Date: July 2012

Scale: 1:1200

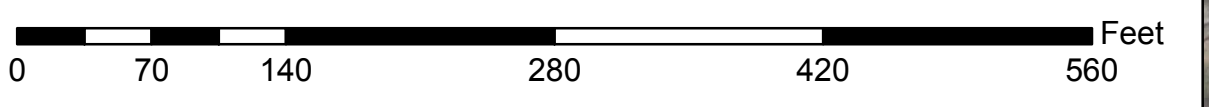
Project No.: 12-004.07

Figure 2A

Figure 2B

Cross Section Pin Coordinate Table (NAD83)				
Cross Section Number	Left Pin		Right Pin	
	Northing	Easting	Northing	Easting
1	784445.1	1991725.0	784315.4	1991615.7
2	784371.4	1991918.4	784280.9	1991815.1
3	784355.6	1991952.4	784249.4	1991915.3
4	784268.3	1992192.8	784192.1	1992194.8
5	784072.4	1992318.0	784060.4	1992271.5

2010 CGIA Leaf-off Aerial Photography





Prepared for:



Project:

CHAPEL CREEK STREAM RESTORATION SITE

Orange County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by:

CLF/KJ

Date:

July 2012

Scale:

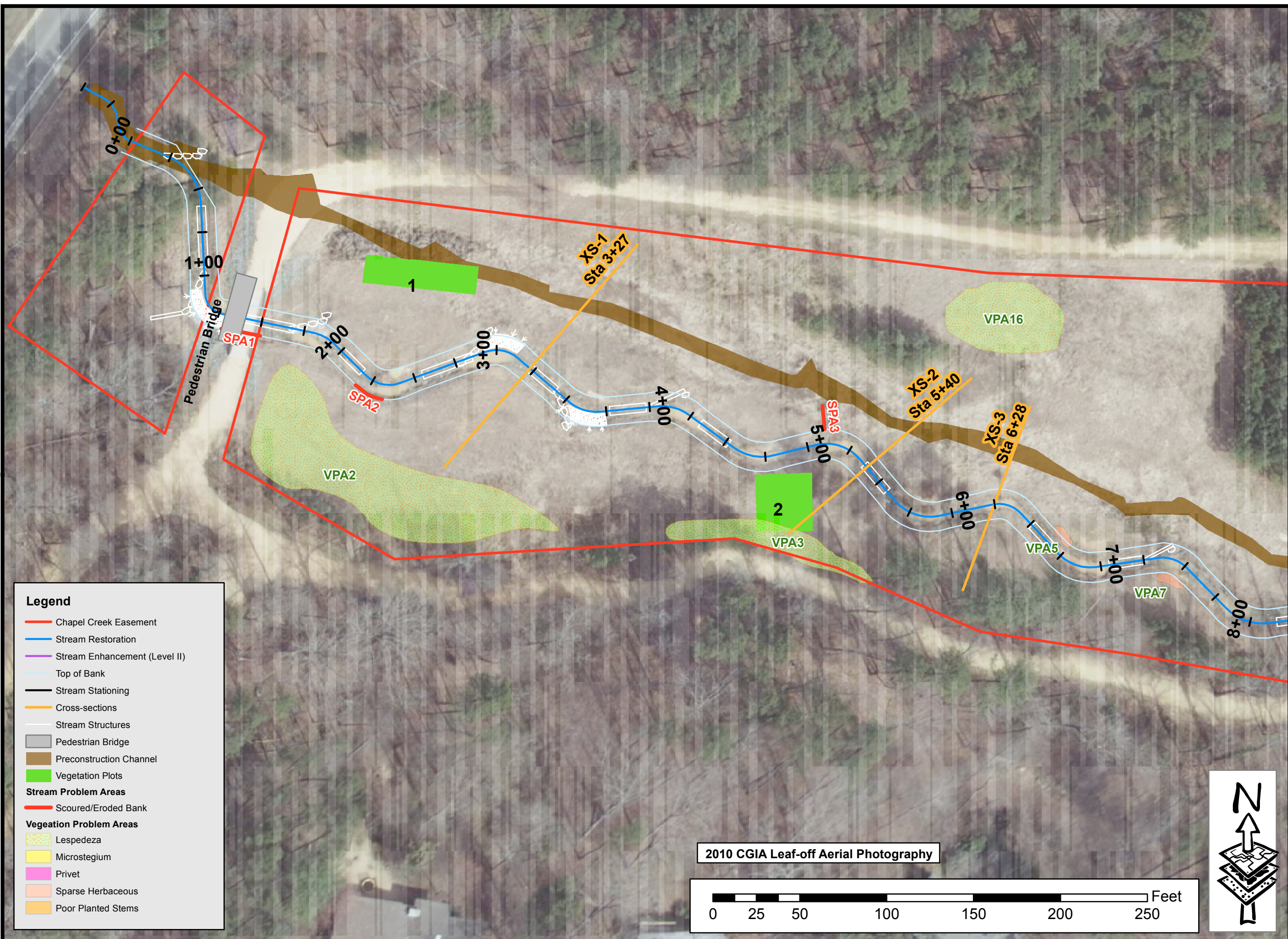
1:630

Project No.:

12-004.07

FIGURE

2A



Legend

- Chapel Creek Easement
- Stream Restoration
- Stream Enhancement (Level II)
- Top of Bank
- Stream Stationing
- Cross-sections
- Stream Structures
- Pedestrian Bridge
- Preconstruction Channel
- Vegetation Plots

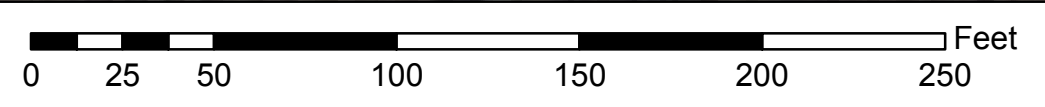
Stream Problem Areas

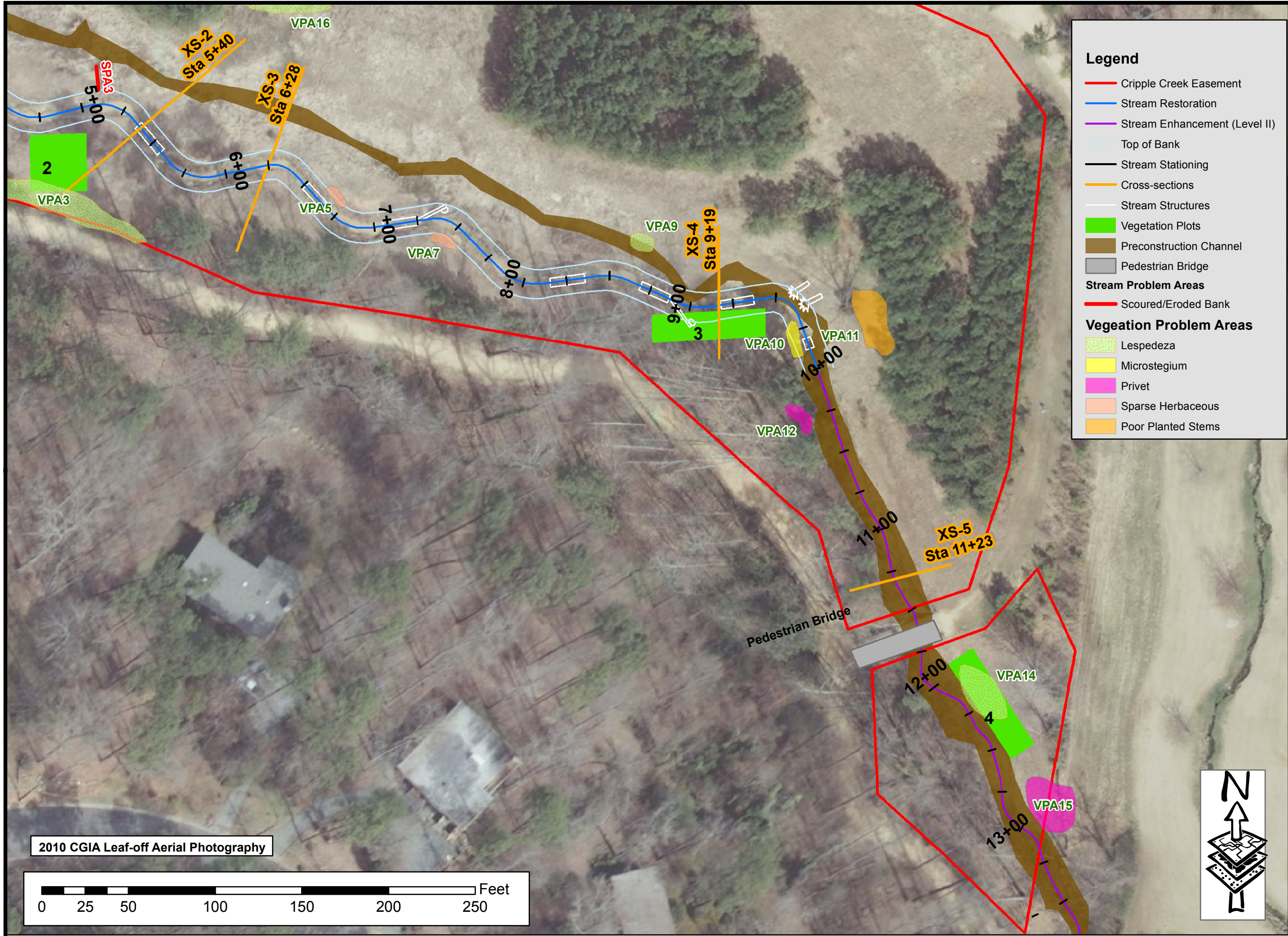
- Scoured/Eroded Bank

Vegetation Problem Areas

- Lespedeza
- Microstegium
- Privet
- Sparse Herbaceous
- Poor Planted Stems

2010 CGIA Leaf-off Aerial Photography





Legend

- Cripple Creek Easement
- Stream Restoration
- Stream Enhancement (Level II)
- Top of Bank
- Stream Stationing
- Cross-sections
- Stream Structures
- Vegetation Plots
- Preconstruction Channel
- Pedestrian Bridge

Stream Problem Areas

- Scoured/Eroded Bank

Vegetation Problem Areas

- Lespedeza
- Microstegium
- Privet
- Sparse Herbaceous
- Poor Planted Stems



Project:
CHAPEL CREEK STREAM RESTORATION SITE
 Orange County, NC

Title:
CURRENT CONDITIONS PLAN VIEW

Drawn by: CLF
 Date: July 2012
 Scale: 1:630
 Project No.: 12-004.07

FIGURE
2B

2010 CGIA Leaf-off Aerial Photography

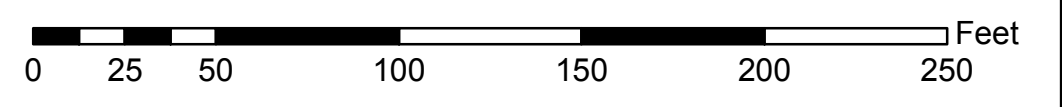


Table 5
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Reach 1 (Restoration)
 961

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)					100%			
		2. <u>Degradation</u> - Evidence of downcutting			1	20	98%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	17	17			100%			
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	17	17					
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)		17	17			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	16	17			94%			
		2. Thalweg centering at downstream of meander (Glide)	17	17			100%			
Totals										
2. Bank	1. <u>Scoured/Eroding</u>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			2	20	99%			99%
	2. <u>Undercut</u>	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.					100%			100%
	3. <u>Mass Wasting</u>	Bank slumping, calving, or collapse					100%			100%
Totals										
3. Engineered Structures	1. <u>Overall Integrity</u>	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. <u>Grade Control</u>	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. <u>Piping</u>	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. <u>Bank Protection</u>	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	8	8			100%			
	4. <u>Habitat</u>	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	8	8			100%			

Table 6 **Vegetation Condition Assessment**

Planted Acreage¹

4

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

Easement Acreage²

5.153

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern ⁴	Areas or points (if too small to render as polygons at map scale).	100 SF	Light green, yellow, and dark pink	8	0.28	5.4%
5. Easement Encroachment Areas ³	Areas or points (if too small to render as polygons at map scale).	none	Brown Line	0	0.00	0.0%

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

² = The acreage within the easement boundaries.

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

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

**Chapel Creek
Vegetation Monitoring Photographs
Taken July 17 2012**



APPENDIX C
VEGETATION PLOT DATA

Table 7. Vegetation Plot Criteria Attainment

Table 8. CVS Vegetation Plot Metadata

Table 9. Total and Planted Stems by Plot and Species

**Table 7. Vegetation Plot Criteria Attainment
Chapel Creek Restoration Site (EEP Project Number 77)**

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	100%
2	Yes	
3	Yes	
4	Yes	

**Table 8. CVS Vegetation Plot Metadata
Chapel Creek Restoration Site (EEP Project Number 77)**

Report Prepared By	Corri Faquin
Date Prepared	7/20/2012 12:02
database name	Axiom-EEP-2012-A.mdb
database location	C:\Axiom\Business\CVS
computer name	CORRI-PC
file size	40550400
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
ALL Stems by Plot and spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	77
project Name	Chapel Creek
Description	
River Basin	Cape Fear
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	4

Table 9. Total Planted and Natural Recruits Stems by Plot and Species

Chapel Creek			Current Plot Data (MY4 2012)												Annual Means								
Scientific Name	Common Name	Species Type	E77-01-0001			E77-01-0002			E77-01-0003			E77-01-0004			MY4 (2012)			MY3 (2011)			MY2 (2010)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Alnus serrulata	hazel alder	Shrub														64			45			63	
Baccharis halimifolia	eastern baccharis	Shrub			8			6			17			6			37			44			17
Betula nigra	river birch	Tree			1	2	2	2	3	3	3	6	6	86	11	11	92	11	11	293	12	12	318.6667
Calycanthus	sweetshrub	Shrub																	1	1	1	1	
Calycanthus floridus	eastern sweetshrub	Shrub										1	1	1	1	1	1	1	1	1	1	1	
Carpinus caroliniana	American hornbeam	Tree				1	1	2			58	2	2	2	3	3	62	2	2	2	2	2	65.5
Carya	hickory	Tree									8					8							
Cephalanthus occidentalis	common buttonbush	Shrub							1	1	1				1	1	1				1	1	1
Cercis canadensis	eastern redbud	Tree																	284				
Cornus amomum	silky dogwood	Shrub							2	2	2				2	2	2	2	2	2	2	2	
Diospyros virginiana	common persimmon	Tree	1	1	1	3	3	3	1	1	1				5	5	5	5	5	5	9	9	10
Elaeagnus umbellata	autumn olive	Exotic																	2			1	
Fraxinus pennsylvanica	green ash	Tree			6	4	4	4	2	2	2	6	6	6	12	12	18	13	13	19	13	13	15
Hibiscus moscheutos	crimson-eyed rosemallow	Shrub	5	5	5										5	5	5	5	5	5	5	5	5
Juglans nigra	black walnut	Tree																				2	
Ligustrum sinense	Chinese privet	Exotic																	3			1	
Lindera benzoin	northern spicebush	Shrub							4	4	4	1	1	1	5	5	5	6	6	6	9	9	9
Liquidambar styraciflua	sweetgum	Tree			2			1			76			45		124			285			94	
Liriodendron tulipifera	tuliptree	Tree									2			18		20			12				
Magnolia virginiana	sweetbay	Tree	1	1	1										1	1	1	1	1	1	3	3	3
Morella cerifera	wax myrtle	shrub									1			7		8			13			6	
Pinus taeda	loblolly pine	Tree			68			2			73			56		199			527			178	
Platanus occidentalis	American sycamore	Tree				3	3	3	1	1	1				4	4	4	4	4	5	3	3	7
Prunus serotina	black cherry	Tree																	5				
Quercus lyrata	overcup oak	Tree										2	2	2				2					
Quercus nigra	water oak	Tree				1	1	1							1	1	1	1	1	1	3	3	3
Quercus phellos	willow oak	Tree																	1				
Rosa multiflora	multiflora rose	Exotic																	2			1	
Rosa palustris	swamp rose	Shrub	5	5	5										5	5	5	5	5	5	5	5	5
Salix nigra	black willow	Tree			16											16			69			52	
Ulmus	elm	Tree			1											1			5				
Ulmus alata	winged elm	Tree																				2	
Vaccinium corymbosum	highbush blueberry	Shrub	1	1	1										1	1	1	1	1	1	1	1	1
Viburnum	viburnum	shrub																				2	
Viburnum dentatum	southern arrowwood	Shrub	1	1	1				13	13	13				14	14	14	15	15	15	15	15	15
Viburnum nudum	possumhaw	Shrub							1	1	1				1	1	1	2	2	2	2	2	2
Xanthorrhiza simplicissima	yellowroo	Shrub																1	1	1	1	1	1
Stem count			14	14	116	14	14	24	28	28	327	18	18	230	74	74	697	77	77	1664	85	85	881.1667
size (ares)			1	1	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4	4	4	4	4
size (ACRES)			0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Species count			6	6	13	6	6	9	9	9	17	6	6	11	17	17	26	17	17	32	16	16	28
Stems per ACRE			566.5599	566.5599	4694.353	566.5599	566.5599	971.2455	1133.12	1133.12	13233.22	728.4342	728.4342	9307.77	748.6684	748.6684	7051.647	779.0199	779.0199	16834.92	859.957	859.957	8914.887

Color for Density
 Exceeds requirements by 10%
 Exceeds requirements, but by less than 10%
 Fails to meet requirements, by less than 10%
 Fails to meet requirements by more than 10%

PnoLS = Planted stems excluding livestakes
 P-all= Planted stems including livestakes
 T = Planted stems and natural recruits
 Total includes stems of natural recruits

APPENDIX D
STREAM SURVEY DATA

Cross-section Plots

Longitudinal Profile Plots

Substrate Plots

Tables 10a-b. Baseline Stream Data Summary

Tables 11a-b. Monitoring Data

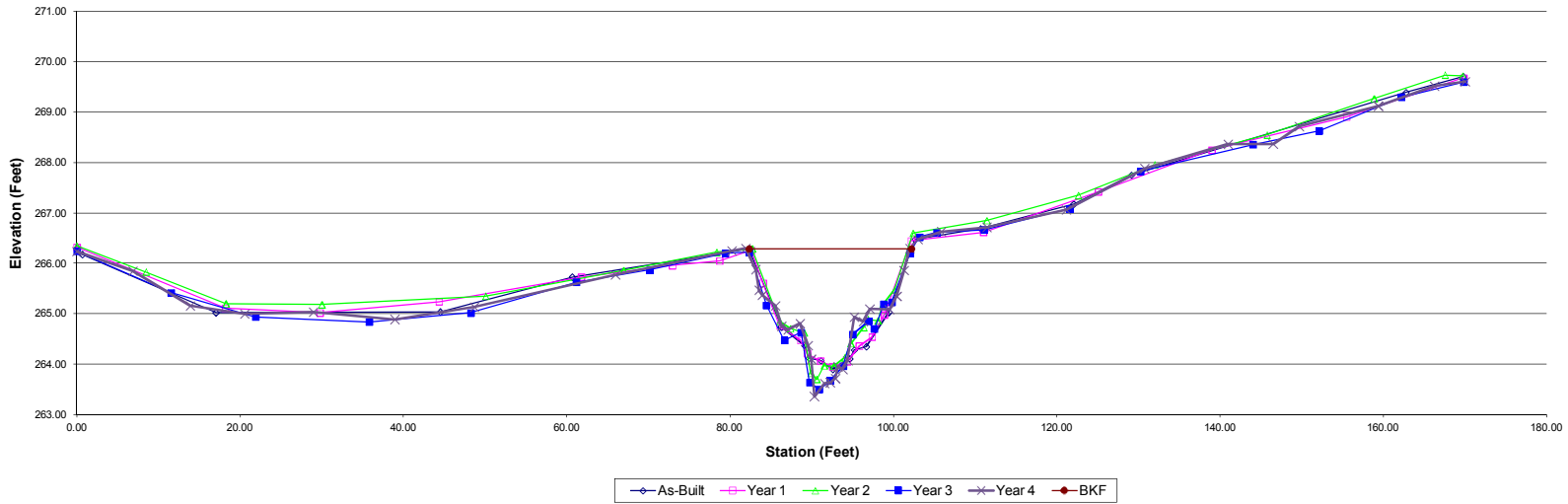
Project:	Chapel Creek	Summary (bankfull)						
Cross Section:	Cross Section 1		MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Rifle	A (BKF)	30.6	29.2	28.2	31.3	28.8	
Station:	3+27	W (BKF)	19.9	19.2	19.1	20.0	19.9	
Date:	7/16/12	Max d	2.4	2.3	2.6	2.8	2.9	
Crew:	Jerrigan, Perkinson	Mean d	1.5	1.5	1.5	1.6	1.4	
		W/D	12.9	12.6	12.9	12.7	13.7	



Photo of XS-1, looking in the downstream direction

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.00	266.30	LPIN	0.00	266.32	LPIN	0.00	266.35	LPIN		266.24	LPIN		266.24	LPIN
0.64	266.18		18.18	265.11		8.46	265.83		11.51	265.42		6.86	265.85	
17.02	265.02		29.77	265.02		18.26	265.20		21.88	264.94		13.88	265.16	
44.50	265.04		44.34	265.24		30.00	265.18		35.79	264.84		20.56	265.00	
60.68	265.73		61.77	265.73		50.07	265.35		48.23	265.02		28.95	265.03	
82.33	266.29	TOBL	72.92	265.96		66.96	265.86		61.16	265.63		38.93	264.89	
86.28	264.74		78.71	266.05		78.34	266.22		70.17	265.87		48.69	265.14	
89.10	264.37		82.59	266.26	TOBL	82.72	266.29	TOBL	79.43	266.20		65.95	265.77	
89.64	264.12		84.02	265.61		86.10	264.85		82.36	266.22	TOBL	80.20	266.25	
91.09	264.07		86.10	264.76		87.38	264.71		84.43	265.17		81.90	266.30	TOBL
92.60	263.89	TW	88.63	264.47		89.05	264.62		86.66	264.47		83.14	265.88	
94.63	264.11		89.44	264.21		89.90	263.82	TOE L	88.68	264.63		83.56	265.47	
95.18	264.28		91.09	264.06		90.61	263.70	TW	89.75	263.64	TOE L	83.95	265.37	
96.67	264.35		92.55	263.95	TW	91.53	263.97		90.91	263.50		85.54	265.16	
99.42	265.03		94.36	264.05		92.69	263.96		92.27	263.67	TW	86.31	264.75	
102.61	266.48	TOBR	95.80	264.36		94.04	264.13	TOE R	93.84	263.96	TOE R	87.09	264.68	
110.65	266.69		97.38	264.54		94.78	264.41		95.00	264.59		88.58	264.80	
122.07	267.18		98.88	264.98		96.37	264.73		96.90	264.85		89.55	264.37	
129.16	267.75		102.19	266.45	TOBR	96.92	264.89		97.67	264.70		89.97	264.10	
162.74	269.39		111.02	266.62		98.11	264.86		98.80	265.19		90.30	263.36	
169.80	269.71	RPIN	125.08	267.42		98.84	265.16		99.78	265.23		91.55	263.62	
			138.99	268.25		100.16	265.48		102.02	266.20		92.24	263.64	
			155.50	268.91		102.42	266.80	TOBR	103.19	266.52	TOBR	92.89	263.71	
			169.83	269.68	RPIN	111.42	266.85		105.27	266.61		93.20	263.95	
						122.66	267.35		111.12	266.67		93.77	263.90	
						131.99	267.96		121.57	267.09		94.39	264.07	
						145.75	268.55		130.29	267.83		95.19	264.93	
						158.85	269.27		144.03	268.36		96.30	264.85	
						167.57	269.74		152.14	268.63		97.10	265.10	

Cross Section 1



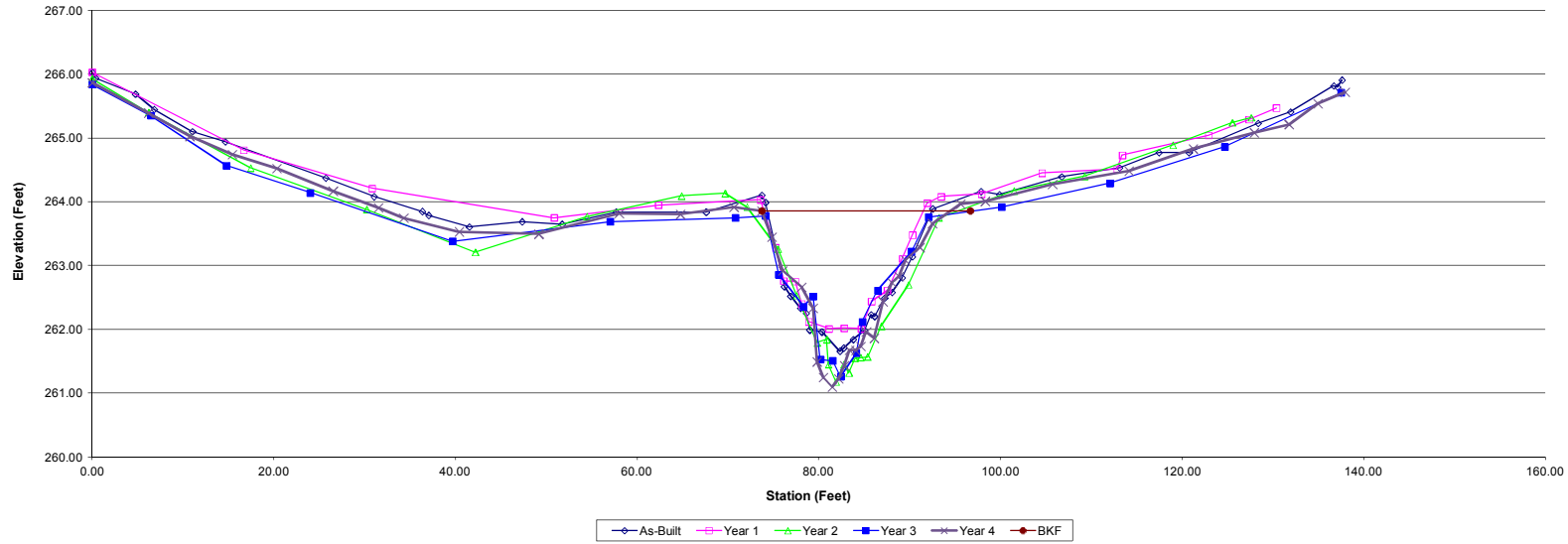
Project:	Chapel Creek	Summary (bankfull)						
Cross Section:	Cross Section 2		MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Rifle	A (BKF)	29.9	25.0	36.9	28.5	26.6	
Station:	5+40	W (BKF)	23.0	19.1	31.0	28.6	19.7	
Date:	7/16/12	Max d	2.4	2.0	2.9	2.7	2.8	
Crew:	Jerrigan, Perkinson	Mean d	1.3	1.3	1.2	1.0	1.4	
		W/D	17.6	14.6	26.1	28.6	14.6	



Photo of XS-2, looking in the downstream direction

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.00	266.03	LPIN	0.00	266.03	LPIN	0.00	265.93	LPIN		265.84	LPIN	6.21	265.86	LPIN
0.38	265.94		16.68	264.81		6.21	265.40		6.47	265.35		6.21	265.39	
4.75	265.69		30.81	264.21		17.44	264.53		14.75	264.57		10.73	265.03	
6.82	265.45		50.86	263.75		30.23	263.88		24.01	264.14		15.42	264.74	
11.04	265.10		62.35	263.95		42.18	263.21		39.68	263.38		20.32	264.52	
14.64	264.94		73.58	264.03	TOBL	54.45	263.77		57.05	263.69		26.52	264.17	
25.70	264.37		75.25	263.28		64.88	264.09		70.82	263.75		31.50	263.91	
31.04	264.08		76.14	262.76		69.68	264.13		74.13	263.78	TOBL	34.28	263.74	
36.34	263.85		77.41	262.75		72.12	263.92	TOBL	75.57	262.86		40.42	263.53	
37.06	263.79		78.13	262.40		75.52	263.26		78.30	262.36		49.18	263.49	
41.50	263.61		78.89	262.12		77.55	262.53		79.38	262.52		58.01	263.82	
47.31	263.69		81.12	262.01	TOE L	79.82	261.79		80.18	261.53	TOE L	64.77	263.80	
51.71	263.65		82.79	262.02		80.88	261.84		81.52	261.51		70.66	263.91	
57.67	263.84		84.67	262.01	TOE R	81.07	261.45	TOE L	82.40	261.26	TW	73.72	263.86	
67.59	263.84		85.80	262.44		81.90	261.18	TW	84.15	261.63	TOE R	74.83	263.45	TOBL
73.72	264.10	TOBL	87.54	262.61	TW	82.76	261.45		84.79	262.12		76.00	262.92	
74.13	263.99		89.21	263.11		83.33	261.32		86.47	262.61		78.09	262.66	
76.20	262.67		90.31	263.48		83.97	261.55		90.21	263.22		79.35	262.33	
76.90	262.52		91.93	263.98	TOBR	84.61	261.56		92.08	263.76	TOBR	79.82	261.49	
77.98	262.33		93.46	264.08		85.37	261.57	TOE R	100.11	263.92		80.49	261.25	
78.59	262.25		97.93	264.12		86.89	262.05		112.07	264.29		81.47	261.10	
79.00	261.99		104.58	264.45		89.87	262.70		124.67	264.86		82.20	261.22	
80.33	261.96		112.83	264.51		93.23	263.75	TOBR	137.52	265.71	RPIN	82.83	261.43	
82.32	261.66	TW	113.42	264.73		101.49	264.17					83.38	261.67	
82.76	261.71		122.91	265.04		109.26	264.40					84.06	261.67	
83.77	261.84		127.37	265.29	RPIN	119.00	264.89					84.62	261.74	
85.02	261.98		130.38	265.47		125.53	265.24					85.22	261.96	
85.73	262.23					127.62	265.32	RPIN				86.10	261.86	

Cross Section 2



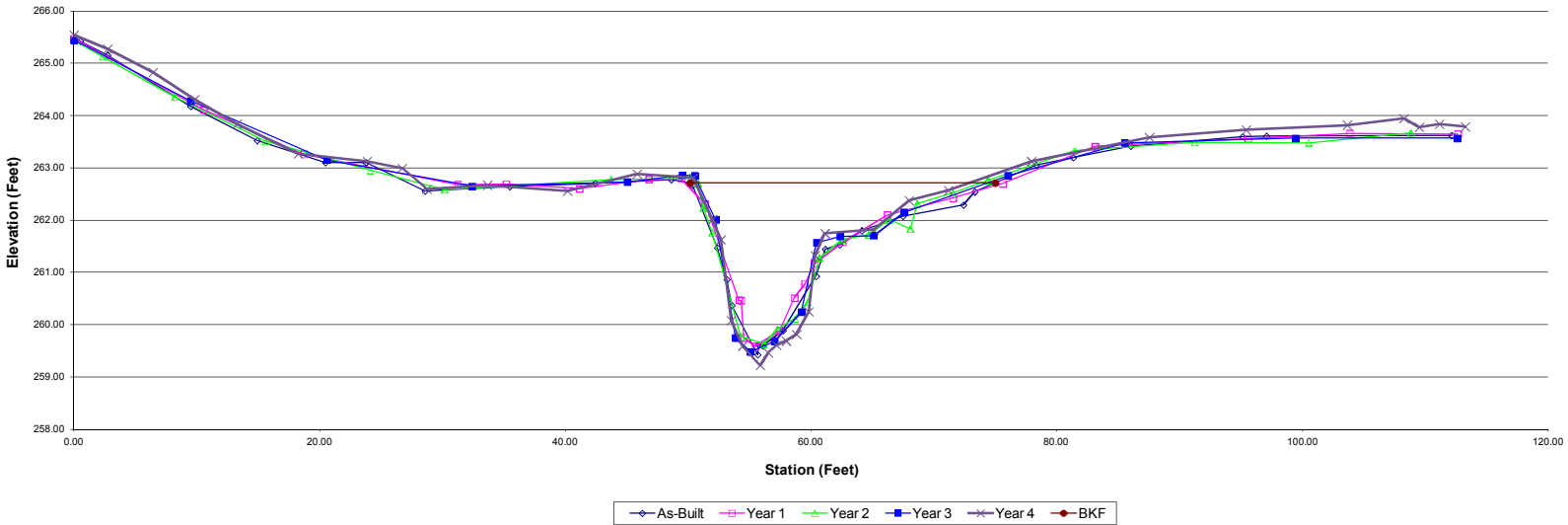
Project:	Chapel Creek	Summary (bankfull)						
Cross Section:	Cross Section 3		MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Pool	A (BKF)	31.7	31.1	30.7	30.3	32.6	
Station:	6+28	W (BKF)	24.8	27.1	22.9	23.0	23.7	
Date:	7/16/12	Max d	3.3	3.2	3.1	3.2	3.6	
Crew:	Jernigan, Perkinson	Mean d	1.3	1.1	1.3	1.3	1.4	
		W/D	19.4	23.6	17.0	17.4	NA	



Photo of XS-3 looking in the downstream direction

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.00	265.48	LPIN	0.00	265.48	LPIN	0.00	265.44	LPIN		265.44	LPIN	2.73	265.54	LPIN
0.52	265.42		10.55	264.11		2.33	265.13		9.48	264.28		2.73	265.28	
2.73	265.16		18.73	263.26		8.21	264.36		20.58	263.15		6.42	264.83	
9.49	264.18		31.24	262.68		15.58	263.51		32.42	262.65		9.81	264.31	
14.90	263.52		35.17	262.69		24.11	262.95		45.03	262.73		13.27	263.84	
20.47	263.10		41.14	262.60		30.15	262.58		49.51	262.86		18.26	263.27	
23.77	263.10		46.79	262.78		43.70	262.78		50.51	262.85	TOBL	23.86	263.13	
28.58	262.56		49.43	262.79	TOBL	50.17	262.80	TOBL	52.22	262.01		26.70	262.99	
35.48	262.64		51.32	262.31		50.79	262.70		53.85	259.75	TOE L	28.70	262.59	
42.42	262.70		51.38	262.31		51.21	262.23		55.03	259.48	TW	33.66	262.67	
48.60	262.78		54.13	260.47		51.94	261.76		57.02	259.68		40.16	262.56	
50.14	262.71	TOBL	54.31	260.46		54.27	259.78	TOE L	59.20	260.24	TOE R	45.83	262.88	
50.34	262.67		54.51	259.75		56.14	259.63	TW	60.45	261.57	TOBR	50.39	262.81	TOBL
52.36	261.47		55.46	259.59	TW	57.23	259.91		62.36	261.69		51.97	262.01	
53.15	260.86		57.44	259.89		58.67	260.11		65.09	261.70		52.65	261.62	
53.53	260.37		58.64	260.51		59.72	260.43	TOE R	67.67	262.15		53.48	260.08	
55.64	259.43	TW	59.48	260.78		60.66	261.28	TOBR	76.01	262.85		54.42	259.59	
55.72	259.62		60.26	261.17		62.52	261.63		85.54	263.48		55.85	259.23	
56.04	259.60		62.56	261.58		64.67	261.72		99.43	263.57	RPIN	56.50	259.46	
57.72	259.89		66.21	262.10		66.31	262.01		112.58	263.57		57.18	259.61	
60.40	260.93		71.54	262.42		68.06	261.83					57.98	259.69	
61.16	261.44		75.60	262.70		68.63	262.31					58.81	259.82	
62.34	261.53		83.12	263.41	TOBR	71.52	262.52					59.79	260.25	
64.14	261.80		83.12	263.41		74.38	262.76					60.34	261.32	TOBR
67.47	262.07		95.56	263.56		81.44	263.33					61.11	261.74	
72.39	262.29		103.84	263.66		91.21	263.49					65.09	261.81	
73.32	262.54		112.64	263.65	RPIN	100.50	263.48					67.97	262.37	
78.30	263.05	TOBR				108.81	263.67	RPIN				71.18	262.57	

Cross Section 3



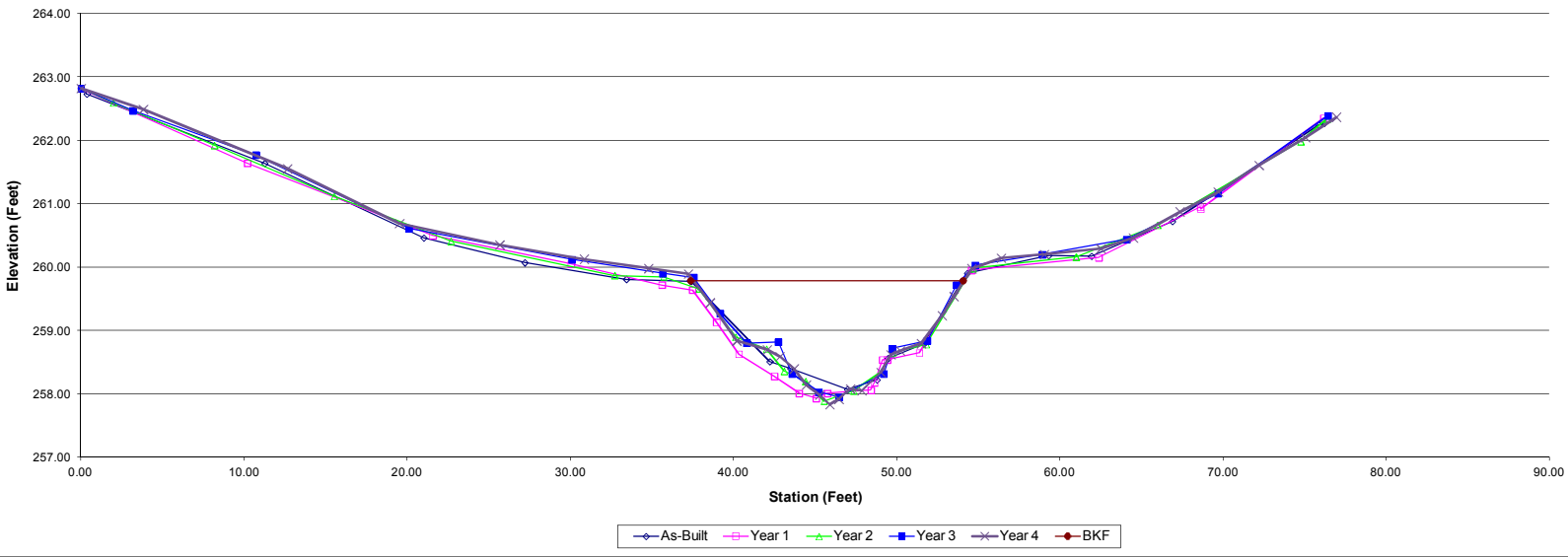
Project:	Chapel Creek	Summary (bankfull)						
Cross Section:	Cross Section 4		MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Rifle	A (BKF)	17.8	19.4	19.8	18.8	20.1	
Station:	9+19	W (BKF)	16.7	18.4	18.6	16.9	17.1	
Date:	7/16/12	Max d	1.7	1.8	2.0	1.9	2.1	
Crew:	Jerrigan, Perkinson	Mean d	1.1	1.1	1.1	1.1	1.2	
		W/D	15.7	17.5	17.5	15.2	14.6	



Photo of XS-4, looking in the downstream direction

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.00	262.82	LPIN	0.00	262.81	LPIN	0.00	262.82	LPIN		262.82	LPIN	3.81	262.82	LPIN
0.37	262.73		10.20	261.64		1.98	262.59		3.18	262.47			262.49	
11.25	261.64		21.56	260.50		8.18	261.92		10.72	261.77		12.66	261.55	
21.00	260.46		30.04	260.05		15.52	261.12		20.11	260.61		19.52	260.69	
27.20	260.07		35.61	259.72		22.67	260.41		30.09	260.12		25.67	260.35	
33.42	259.81		37.48	259.64	TOBL	32.71	259.87		35.67	259.90		30.85	260.13	
37.40	259.78		38.96	259.13		35.71	259.85		37.54	259.84	TOBL	34.78	259.98	
37.36	259.79	TOBL	40.32	258.63		37.89	259.66	TOBL	39.17	259.27		37.23	259.90	TOBL
42.23	258.51		42.50	258.28		40.12	258.90		40.81	258.80		38.57	259.44	
43.48	258.40		44.02	258.01		42.02	258.71		42.75	258.82		40.19	258.84	
46.99	258.07	TW	45.06	257.93	TW	43.10	258.36		43.58	258.32	TOE L	42.05	258.70	
48.79	258.22		45.75	258.01		44.41	258.20	TOE L	45.22	258.03		42.83	258.59	
49.47	258.56		48.42	258.06		45.55	257.89	TW	46.43	257.95	TW	43.71	258.40	
51.67	258.79		48.64	258.18		47.36	258.05		49.20	258.32	TOE R	44.45	258.14	
54.33	259.90	TOBR	49.13	258.54		49.07	258.35	TOE R	49.72	258.72		45.28	257.99	
59.33	260.18		49.42	258.54		49.75	258.65		51.87	258.84		45.90	257.83	
61.93	260.17		51.39	258.65		51.81	258.78		53.67	259.72		46.45	257.92	
66.89	260.72		54.59	259.95	TOBR	54.66	259.98	TOBR	54.81	260.03	TOBR	47.17	258.08	
75.89	262.24		62.38	260.15		61.00	260.16		58.93	260.20		47.86	258.05	
76.23	262.27	RPIN	68.60	260.95		65.99	260.66		64.10	260.44		49.03	258.35	
			68.64	260.92		74.77	261.98		69.69	261.16		49.65	258.62	
			76.18	262.35	RPIN	76.39	262.34	RPIN	76.45	262.39	RPIN	50.22	258.68	
												51.50	258.80	
												52.78	259.24	
												53.50	259.54	
												54.60	259.98	TOBR
												56.41	260.14	
												59.05	260.20	

Cross Section 4



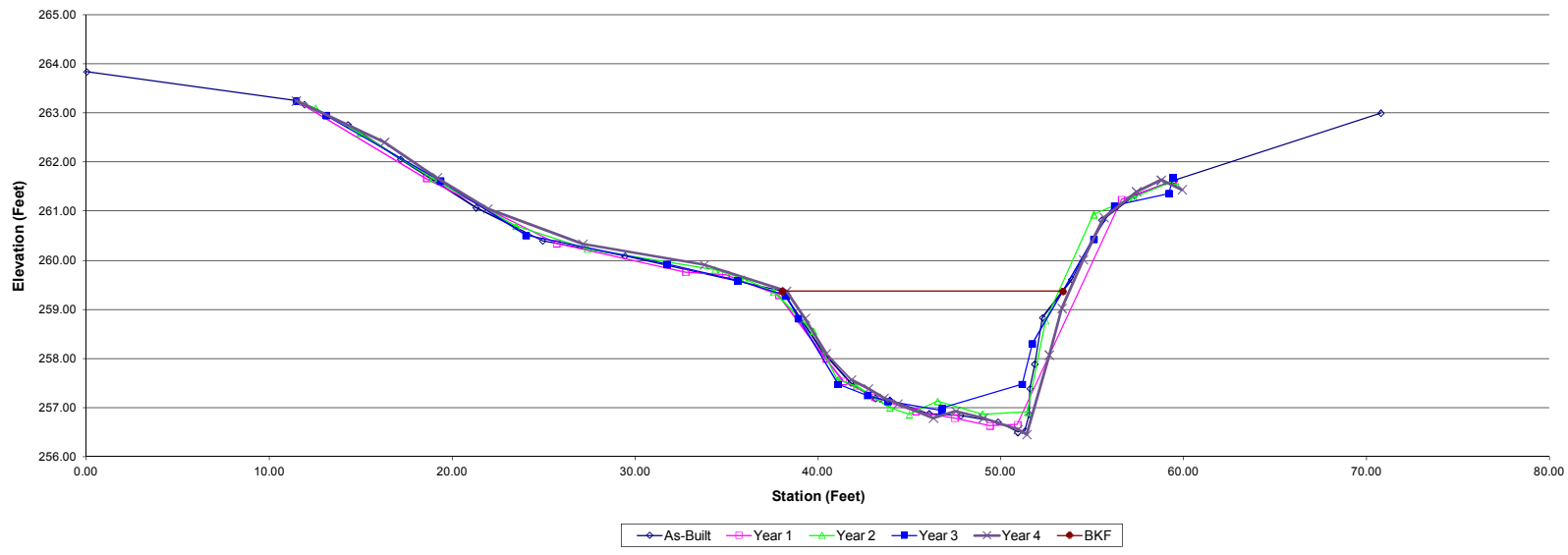
Project:	Chapel Creek	Summary (bankfull)						
Cross Section:	Cross Section 5		MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Rifle	A (BKF)	28.9	29.8	32.5	26.7	30.1	
Station:	11+23	W (BKF)	15.4	16.3	17.5	15.9	15.5	
Date:	7/16/12	Max d	2.9	2.7	2.8	2.4	2.9	
Crew:	Jerrigan, Perkinson	Mean d	1.9	1.8	1.9	1.7	1.9	
		W/D	8.2	8.9	9.4	9.5	8.0	

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.00	263.84		11.46	263.25	LPIN	11.46	263.25	LPIN	11.46	263.25	LPIN	11.46	263.25	LPIN
11.46	263.25	LPIN	18.59	261.67		12.53	263.10		13.11	262.95		16.28	262.40	
11.90	263.17		25.70	260.34		14.95	262.59		19.34	261.62		19.17	261.68	
14.29	262.76		32.76	259.76		18.94	261.67		24.03	260.51		21.94	261.05	
17.16	262.06		34.95	259.71		23.47	260.70		31.75	259.92		27.14	260.33	
21.29	261.07		37.85	259.29	TOBL	27.38	260.23		35.60	259.59		33.77	259.91	
24.94	260.40		40.42	258.00		34.37	259.81		38.25	259.28	TOBL	38.27	259.38	TOBL
29.43	260.09		41.37	257.54	TOE L	35.96	259.62		38.92	258.82		39.29	258.82	
38.04	259.37	TOBL	43.11	257.21		37.58	259.36	TOBL	41.10	257.48		40.44	258.10	
40.27	258.13		45.35	256.92		39.74	258.56		42.69	257.25		41.83	257.57	
41.78	257.51		47.47	256.79		41.08	257.57	TOE L	43.82	257.13	TOE L	42.75	257.39	
43.14	257.19		49.40	256.63	TW	42.09	257.44		46.77	256.94	TW	43.60	257.20	
43.92	257.16		50.91	256.66	TOE R	43.92	257.00		46.78	256.99	TOE R	44.36	257.08	
46.07	256.88		58.60	261.24	TOBR	44.99	256.86	TW	51.17	257.48		46.31	256.79	
47.81	256.84		59.41	261.60	RPIN	46.54	257.13		51.72	258.30		47.54	256.93	
49.84	256.71					49.00	256.87		55.08	260.43		49.03	256.79	
50.92	256.50	TW				51.45	256.91	TOE R	56.21	261.11	TOBR	50.93	256.56	
51.32	256.53					52.45	258.77		59.19	261.36		51.42	256.45	
51.55	256.86					55.08	260.93	TOBR	59.43	261.69	RPIN	52.64	258.07	
51.59	257.39					57.25	261.28					53.34	259.02	
51.85	257.89					59.53	261.62	RPIN				54.51	260.02	
52.29	258.83											55.65	260.87	TOBR
53.88	259.61											57.42	261.40	
55.53	260.82											58.77	261.63	
57.29	261.32	TOBR										59.92	261.44	RPIN
59.48	261.63	RPIN												
70.78	263.00													

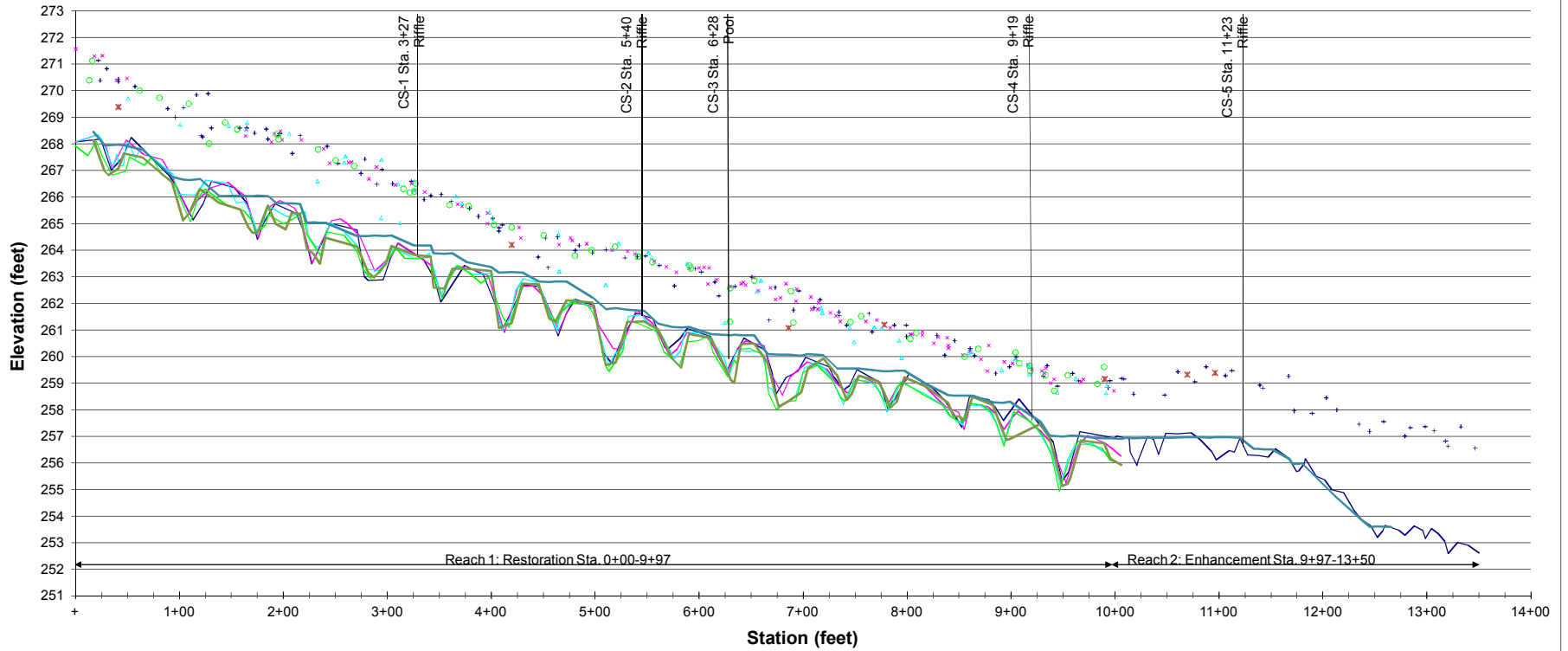


Photo of XS-5, looking in the downstream direction

Cross Section 5



**Chapel Creek
Longitudinal Profile
Main Channel: Station 0+00 - 14+00**

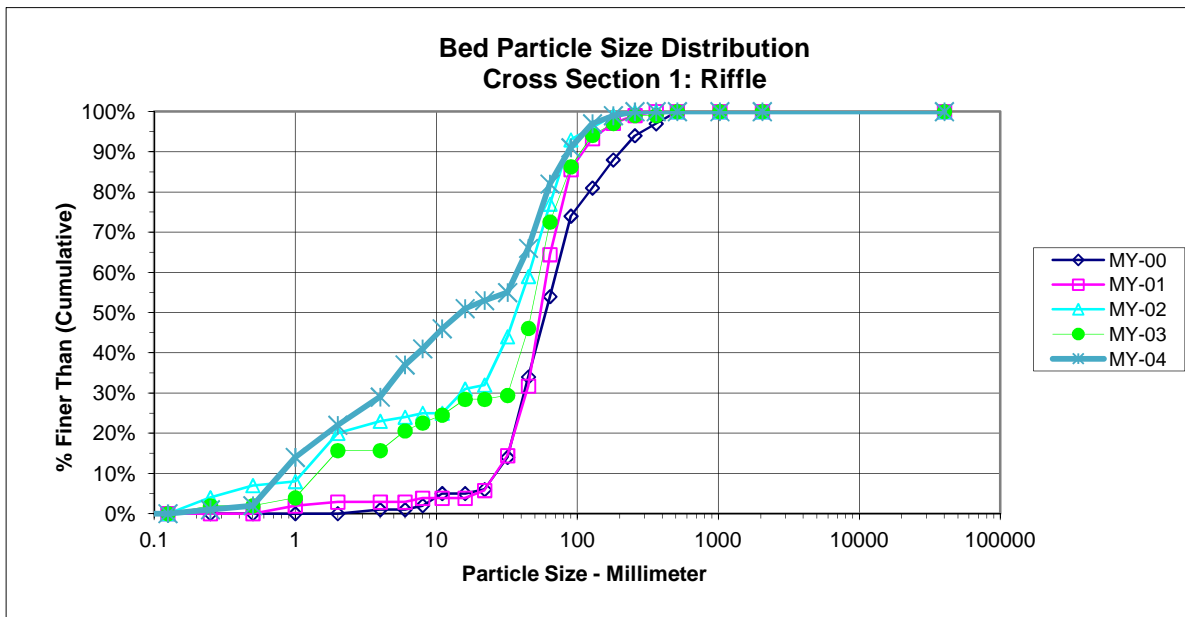


— TW MY-00 + BKF MY-00 — TW MY-01 * BKF MY-01 — TW MY-02 △ BKF MY-02 — TW MY-03 ○ BKF MY-03 — TW MY-04 — WS MY-04 * BKF MY-04

PEBBLE COUNT

Project: Chapel Creek				Date: 7/26/2012				
Location: Cross Section #1								
Particle Counts								
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	0	0	0	0%	0%
.04 - .08	Very Fine	.062 - .125	S	0	0	0	0%	0%
	Fine	.125 - .25	A	1	0	1	1%	1%
	Medium	.25 - .50	N	1	0	1	1%	2%
	Coarse	.50 - 1.0	D	12	0	12	12%	14%
	Very Coarse	1.0 - 2.0	S	8	0	8	8%	22%
.08 - .16	Very Fine	2.0 - 4.0		7	0	7	7%	29%
.16 - .22	Fine	4.0 - 5.7	G	8	0	8	8%	37%
.22 - .31	Fine	5.7 - 8.0	R	4	0	4	4%	41%
.31 - .44	Medium	8.0 - 11.3	A	5	0	5	5%	46%
.44 - .63	Medium	11.3 - 16.0	V	5	0	5	5%	51%
.63 - .89	Coarse	16.0 - 22.6	E	2	0	2	2%	53%
.89 - 1.26	Coarse	22.6 - 32.0	L	2	0	2	2%	55%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	11	0	11	11%	66%
1.77 - 2.5	Very Coarse	45.0 - 64.0		16	0	16	16%	82%
2.5 - 3.5	Small	64 - 90	C	9	0	9	9%	91%
3.5 - 5.0	Small	90 - 128	O	6	0	6	6%	97%
5.0 - 7.1	Large	128 - 180	B	2	0	2	2%	99%
7.1 - 10.1	Large	180 - 256	L	1	0	1	1%	100%
10.1 - 14.3	Small	256 - 362	B		0	0	0%	100%
14.3 - 20	Small	362 - 512	L		0	0	0%	100%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	100%
40 - 80	Large- Very Large	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
Totals				100	0	100	100%	100%

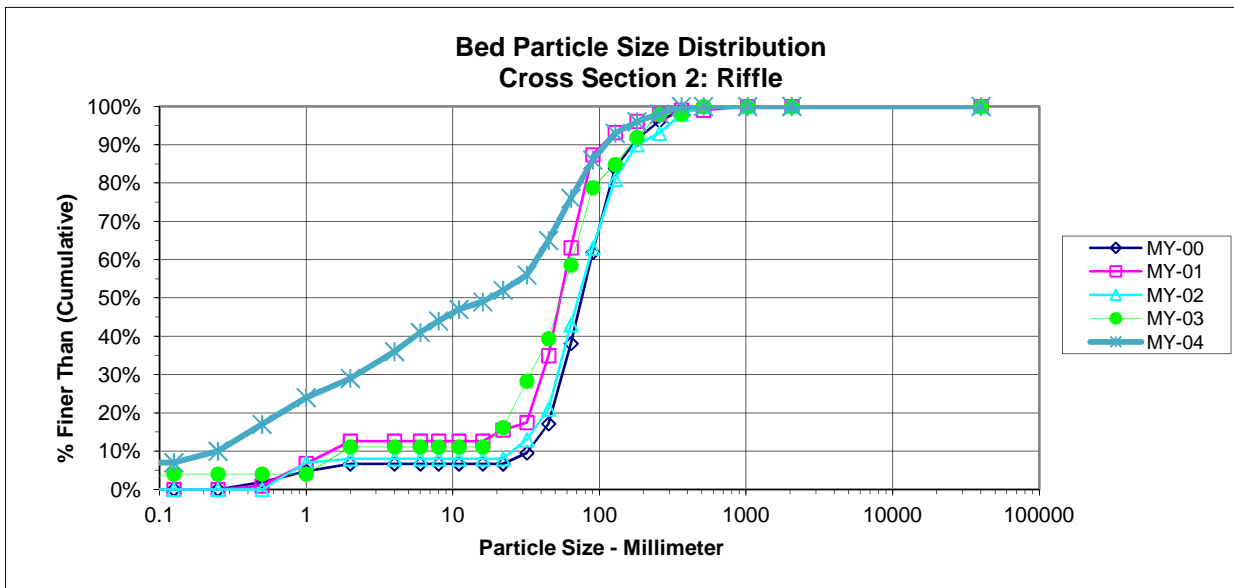
d16	d35	d50	d84	d95
1.2	5.4	14.8	69.0	113.8



PEBBLE COUNT

Project: Chapel Creek				Date: 7/26/2012				
Location: Cross Section #2								
Particle Counts								
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	7	0	7	7%	7%
.04 - .08	Very Fine	.062 - .125	S	0	0	0	0%	7%
	Fine	.125 - .25	A	3	0	3	3%	10%
	Medium	.25 - .50	N	7	0	7	7%	17%
	Coarse	.50 - 1.0	D	7	0	7	7%	24%
	Very Coarse	1.0 - 2.0	S	5	0	5	5%	29%
.08 - .16	Very Fine	2.0 - 4.0		7	0	7	7%	36%
.16 - .22	Fine	4.0 - 5.7	G	5	0	5	5%	41%
.22 - .31	Fine	5.7 - 8.0	R	3	0	3	3%	44%
.31 - .44	Medium	8.0 - 11.3	A	3	0	3	3%	47%
.44 - .63	Medium	11.3 - 16.0	V	2	0	2	2%	49%
.63 - .89	Coarse	16.0 - 22.6	E	3	0	3	3%	52%
.89 - 1.26	Coarse	22.6 - 32.0	L	4	0	4	4%	56%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	9	0	9	9%	65%
1.77 - 2.5	Very Coarse	45.0 - 64.0		11	0	11	11%	76%
2.5 - 3.5	Small	64 - 90	C	10	0	10	10%	86%
3.5 - 5.0	Small	90 - 128	O	7	0	7	7%	93%
5.0 - 7.1	Large	128 - 180	B	3	0	3	3%	96%
7.1 - 10.1	Large	180 - 256	L	2	0	2	2%	98%
10.1 - 14.3	Small	256 - 362	B	2	0	2	2%	100%
14.3 - 20	Small	362 - 512	L	0	0	0	0%	100%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	100%
40 - 80	Large - Very Large	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
Totals				100	0	100	100%	100%

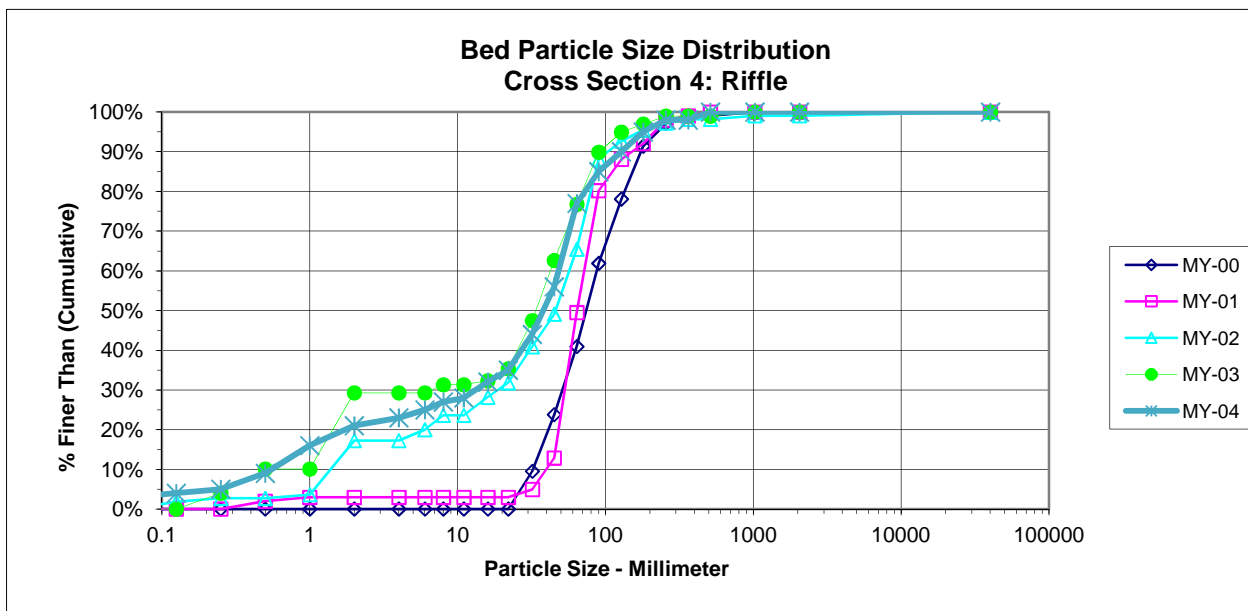
d16	d35	d50	d84	d95
0.5	3.6	17.8	84.1	160.7



PEBBLE COUNT

Project: Chapel Creek				Date: 7/26/2012				
Location: Cross Section #4								
Particle Counts								
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	3	0	3	3%	3%
.04 - .08	Very Fine	.062 - .125	S	1	0	1	1%	4%
	Fine	.125 - .25	A	1	0	1	1%	5%
	Medium	.25 - .50	N	4	0	4	4%	9%
	Coarse	.50 - 1.0	D	7	0	7	7%	16%
	Very Coarse	1.0 - 2.0	S	5	0	5	5%	21%
.08 - .16	Very Fine	2.0 - 4.0		2	0	2	2%	23%
.16 - .22	Fine	4.0 - 5.7	G	2	0	2	2%	25%
.22 - .31	Fine	5.7 - 8.0	R	2	0	2	2%	27%
.31 - .44	Medium	8.0 - 11.3	A	1	0	1	1%	28%
.44 - .63	Medium	11.3 - 16.0	V	4	0	4	4%	32%
.63 - .89	Coarse	16.0 - 22.6	E	3	0	3	3%	35%
.89 - 1.26	Coarse	22.6 - 32.0	L	9	0	9	9%	44%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	12	0	12	12%	56%
1.77 - 2.5	Very Coarse	45.0 - 64.0		21	0	21	21%	77%
2.5 - 3.5	Small	64 - 90	C	8	0	8	8%	85%
3.5 - 5.0	Small	90 - 128	O	5	0	5	5%	90%
5.0 - 7.1	Large	128 - 180	B	5	0	5	5%	95%
7.1 - 10.1	Large	180 - 256	L	3	0	3	3%	98%
10.1 - 14.3	Small	256 - 362	B	0	0	0	0%	98%
14.3 - 20	Small	362 - 512	L	2	0	2	2%	100%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	100%
40 - 80	Large - Very Large	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
Totals				100	0	100	100%	100%

d16	d35	d50	d84	d95
1.0	22.0	37.9	86.2	180.0



PEBBLE COUNT

Project: Chapel Creek **Date:** 7/26/2012

Location: Cross Section #5

Particle Counts								
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	1	0	1	1%	1%
.04 - .08	Very Fine	.062 - .125	S	0	0	0	0%	1%
	Fine	.125 - .25	A	1	0	1	1%	2%
	Medium	.25 - .50	N	4	0	4	4%	6%
	Coarse	.50 - 1.0	D	10	0	10	10%	16%
	Very Coarse	1.0 - 2.0	S	7	0	7	7%	23%
.08 - .16	Very Fine	2.0 - 4.0		7	0	7	7%	30%
.16 - .22	Fine	4.0 - 5.7	G	8	0	8	8%	38%
.22 - .31	Fine	5.7 - 8.0	R	6	0	6	6%	44%
.31 - .44	Medium	8.0 - 11.3	A	4	0	4	4%	48%
.44 - .63	Medium	11.3 - 16.0	V	5	0	5	5%	53%
.63 - .89	Coarse	16.0 - 22.6	E	7	0	7	7%	60%
.89 - 1.26	Coarse	22.6 - 32.0	L	4	0	4	4%	64%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	7	0	7	7%	71%
1.77 - 2.5	Very Coarse	45.0 - 64.0		11	0	11	11%	82%
2.5 - 3.5	Small	64 - 90	C	3	0	3	3%	85%
3.5 - 5.0	Small	90 - 128	O	5	0	5	5%	90%
5.0 - 7.1	Large	128 - 180	B	3	0	3	3%	93%
7.1 - 10.1	Large	180 - 256	L	2	0	2	2%	95%
10.1 - 14.3	Small	256 - 362	B	4	0	4	4%	99%
14.3 - 20	Small	362 - 512	L	1	0	1	1%	100%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
Totals				100	0	100	100%	100%

d16	d35	d50	d84	d95
1.0	5.2	12.8	80.3	256.0

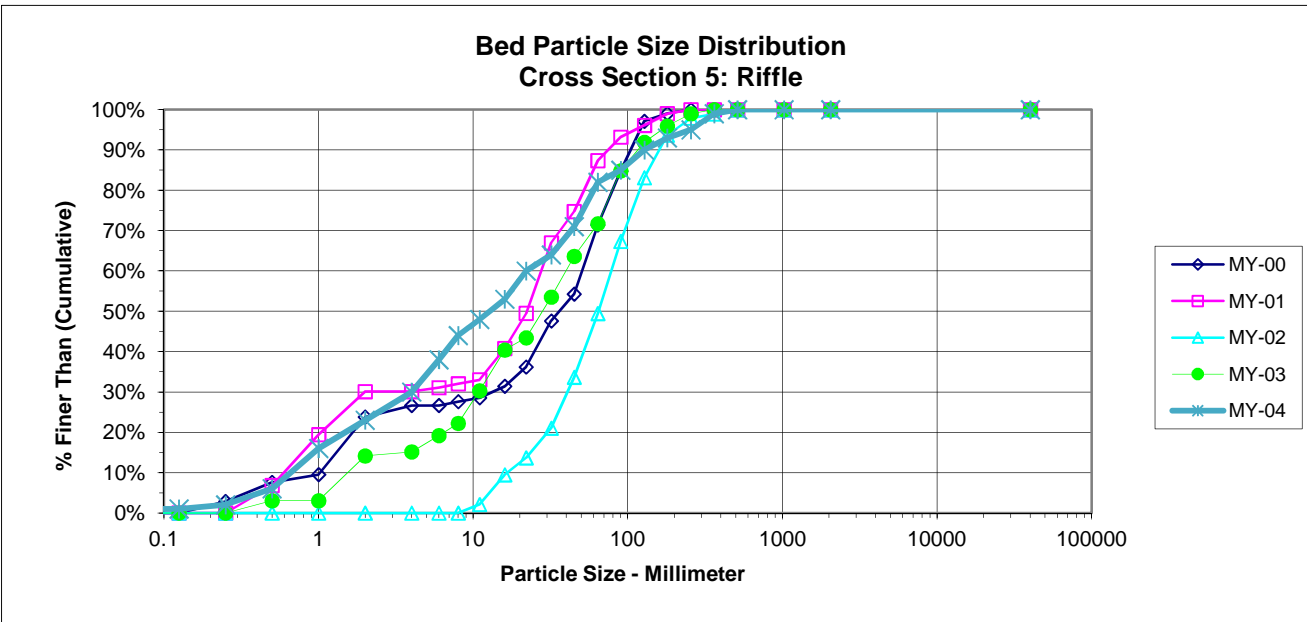


Table 10a. Baseline Stream Data Summary
Chapel Creek Stream Restoration Site-Project No. 77

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Med	Max	SD ⁵	n	Min	Med	Max	Min	Mean	Med	Max	SD ⁵	n
Dimension and Substrate -Riffle Only																									
Bankfull Width (ft)	-	-	-	-	9.5	12.7	-	16.3	-	-	16.2	16.7	-	21.1	-	-	-	17.5	-	19.9	20.7	20.5	21.6	0.89	3
Floodprone Width (ft)	-	-	-	-	18	24.7	-	35	-	-	58	97	-	120	-	-	61	102	126	61	184	224	266	108	3
Bankfull Mean Depth (ft)	-	-	-	-	1.4	1.7	-	1.9	-	-	1.3	1.6	-	1.7	-	-	1.59	-	0.87	1.2	1.1	1.5	0.34	3	
¹ Bankfull Max Depth (ft)	-	-	-	-	2.8	3.2	-	3.8	-	-	2.2	2.3	-	2.5	-	-	2.3	2.4	2.5	1.8	2.2	2.3	2.4	0.34	3
Bankfull Cross Sectional Area (ft ²)	-	-	-	-	17.5	21.6	-	29.2	-	-	27.2	27.5	-	27.8	-	-	27.8	-	18.9	24.1	22.7	30.6	6	3	
Width/Depth Ratio	-	-	-	-	5	4.6	-	9.1	-	-	9.6	10.2	-	16	-	-	11	-	12.9	18.7	18.5	24.8	0.89	3	
Entrenchment Ratio	-	-	-	-	1.5	2.1	-	3.2	-	-	3.5	5.8	-	7.2	-	-	3.5	5.8	7.2	2.8	9	11.3	13	5.5	3
¹ Bank Height Ratio	-	-	-	-	1.7	3.3	-	4.4	-	-	1.5	1.6	-	1.7	-	-	1	-	1	1	1	1	0	3	
Profile																									
Riffle Length (ft)	-	-	-	-	3.5	6.8	-	13	-	-	7	21.2	-	42	-	-	7	21.2	42	13.7	23.1	22.91	36.6	6.2	17
Riffle Slope (ft/ft)	-	-	-	-	0	0.01	-	0.05	-	-	0	0.03	-	0.1	-	-	0	0.03	0.1	0	0.02	0.02	0.05	0.01	17
Pool Length (ft)	-	-	-	-	6	6.5	-	7	-	-	6.4	13.2	-	19.4	-	-	6.5	13.2	19.4	26.8	34.2	34.3	40.8	4.7	16
Pool Max depth (ft)	-	-	-	-	2.1	2.7	-	3.5	-	-	2.5	3	-	4.2	-	-	2.5	3	4.2	2.5	3.8	4	4.7	0.7	16
Pool Spacing (ft)	-	-	-	-	16	42	-	91	-	-	41	56	-	78	-	-	40	55	75	40	56	54	71	9.1	15
Pattern																									
Channel Beltwidth (ft)	-	-	-	-	15	17.7	-	20	-	-	28.7	22	-	40	-	-	21.2	27.6	38.5	31.9	43.8	40.9	75.9	10.9	14
Radius of Curvature (ft)	-	-	-	-	14.6	23.4	-	30.1	-	-	10.6	20	-	38.2	-	-	10.2	19.3	36.8	23.7	44.6	42.9	66.7	12.1	13
Rc:Bankfull width (ft/ft)	-	-	-	-	1.2	1.9	-	2.4	-	-	0.58	1.1	-	2.1	-	-	0.58	1.1	2.1	1.1	2.2	2.1	66.7	0.59	13
Meander Wavelength (ft)	-	-	-	-	55	58.3	-	65	-	-	113	125	-	140	-	-	109	120	135	90	104	104	121	9.1	13
Meander Width Ratio	-	-	-	-	1.2	1.43	-	1.62	-	-	1.2	1.6	-	2.2	-	-	1.2	1.6	2.2	1.6	2.2	2.1	2.8	0.55	14
Transport parameters																									
Reach Shear Stress (competency) lb/ft ²	-	-	-	-	0.98												-			-					
Max part size (mm) mobilized at bankfull	-	-	-	-	120												-			-					
Stream Power (transport capacity) W/m ²	-	-	-	-	-												-			-					
Additional Reach Parameters																									
Rosgen Classification	-	-	-	-	G4						C4/E4						C4			C4					
Bankfull Velocity (fps)	-	-	-	-	6.83												5.8			6.92					
Bankfull Discharge (cfs)	-	-	-	-	160																				
Valley length (ft)	-	-	-	-	870						350														
Channel Thalweg length (ft)	-	-	-	-	957						400						994			994					
Sinuosity (ft)	-	-	-	-	1.06						1.14						1.14			1.14					
Water Surface Slope (Channel) (ft/ft)	-	-	-	-	-						-						-			0.0105					
BF slope (ft/ft)	-	-	-	-	0.0128						0.011						0.012			0.0111					
³ Bankfull Floodplain Area (acres)	-	-	-	-	-						-						-			-					
⁴ % of Reach with Eroding Banks	-	-	-	-	-						-						-			-					
Channel Stability or Habitat Metric	-	-	-	-	-						-						-			-					
Biological or Other	-	-	-	-	-						-						-			-					

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

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

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

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

**Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Chapel Creek Stream Restoration-Project No. 77 Reach 1 (961 feet)**

Parameter	Pre-Existing Condition						Reference Reach(es) Data						Design						As-built/Baseline									
¹ Ri% / Ru% / P% / G% / S%													37%		61%						41%		57%					
¹ SC% / Sa% / G% / C% / B% / Be%																												
¹ d16 / d35 / d50 / d84 / d95 / di ^P / di ^{SP} (mm)	1.6	7.2	11.7	22	30.3		0.39	1.3	11.4	69.8	164.9																	
² Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
³ Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

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

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

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

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

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

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

Chapel Creek Stream Restoration-Project No. 77 Reach 1 (961 feet)

	Cross Section 1 (Riffle)							Cross Section 2 (Riffle)							Cross Section 3 (Pool)						
Based on fixed baseline bankfull elevation ¹	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	266.29	266.26	266.29	266.29	266.25			264.00	264.01	264.00	264.00	263.86			262.67	262.79	262.67	262.67	262.81		
Bankfull Width (ft)	19.86	19.17	19.07	19.99	19.9			22.96	19.11	31.02	28.57	19.7			24.84	27.12	22.88	22.96	23.7		
Floodprone Width (ft)	224	224	224	224	224			266	266	266	266	266			95	95	95	95	95		
Bankfull Mean Depth (ft)	1.5416	1.5241	1.4766	1.5681	1.4			1.3016	1.3078	1.1881	0.9971	1.4			1.2771	1.1481	1.3418	1.321	1.4		
Bankfull Max Depth (ft)	2.4	2.31	2.59	2.79	2.9			2.44	2.02	2.95	2.74	2.8			3.28	3.2	3.07	3.19	3.6		
Bankfull Cross Sectional Area (ft ²)	30.619	29.221	28.165	31.346	28.8			29.886	24.998	36.858	28.483	26.6			31.724	31.14	30.694	30.335	32.6		
Bankfull Width/Depth Ratio	12.884	12.579	12.918	12.747	13.7			17.641	14.616	26.112	28.65	14.6			19.45	23.625	17.048	17.383	NA		
Bankfull Entrenchment Ratio	11.278	11.684	11.743	11.206	11.3			11.585	13.916	8.5742	9.3118	13.5			3.8245	3.5025	4.153	4.137	NA		
Bankfull Bank Height Ratio	1	1	1	0.914	1.0			1	0.6782	0.8712	0.9124	1.0			1	1	0.5375	0.6552	1.0		
Cross Sectional Area between end pins (ft ²)	339.13	327.85	321.93	328.30	---			245.58	193.07	211.96	242.96	---			188.14	186.78	186.23	180.07	---		
d50 (mm)	60.2	55.6	37.2	47.8	14.8			77	55.2	73.1	55.5	17.8			N/A	N/A	N/A	N/A	N/A		
	Cross Section 4 (Riffle)							Cross Section 5 (Riffle)													
Based on fixed baseline bankfull elevation ¹	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+							
Record elevation (datum) used	259.85	259.80	259.85	259.85	259.89			259.37	259.29	259.37	259.37	259.38									
Bankfull Width (ft)	16.71	18.41	18.64	16.92	17.1			15.35	16.33	17.52	15.93	15.5									
Floodprone Width (ft)	92	92	92	92	92			48	48	48	48	48									
Bankfull Mean Depth (ft)	1.0659	1.0523	1.0642	1.1098	1.2			1.8823	1.8282	1.8573	1.6769	1.9									
Bankfull Max Depth (ft)	1.72	1.79	1.96	1.9	2.1			2.87	2.66	2.76	2.43	2.9									
Bankfull Cross Sectional Area (ft ²)	17.808	19.377	19.838	18.777	20.1			28.895	29.85	32.549	26.709	30.1									
Bankfull Width/Depth Ratio	15.673	17.498	17.516	15.246	14.6			8.1553	8.9308	9.4358	9.4979	8.0									
Bankfull Entrenchment Ratio	5.5069	4.9962	4.9353	5.4374	5.4			3.1269	2.9398	2.739	3.0137	3.1									
Bankfull Bank Height Ratio	1	0.9553	0.9031	0.9947	1.0			1	1	0.9058	0.963	1.0									
Cross Sectional Area between end pins (ft ²)	165.32	170.80	165.78	163.44	---			131.28	135.96	128.65	131.32	---									
d50 (mm)	75.8	64.4	46.1	34.2	37.9			36.6	22.3	64.8	28.5	12.8									

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

**Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Chapel Creek Stream Restoration-Project No. 77 Reach 1 (961 feet)**

Parameter	Baseline						MY-1						MY-2						MY-3						MY-4						MY-5								
	Min	Mean	Med	Max	SD ¹	n	Min	Mean	Med	Max	SD ¹	n	Min	Mean	Med	Max	SD ¹	n	Min	Mean	Med	Max	SD ¹	n	Min	Mean	Med	Max	SD ¹	n	Min	Mean	Med	Max	SD ¹	n			
Dimension and Substrate - Riffle only																																							
Bankfull Width (ft)	15.4	19.6	20.7	21.6	2.906	4	16.33	18.51	18.92	19.86	1.535	4	17.52	21.57	18.86	31.02	6.339	4	15.93	20.35	18.45	28.57	5.743	4	15.5	18.1	18.4	19.9	2.1	4									
Floodprone Width (ft)	48	149.8	142.5	266	111.4	4	48.09	157.5	158	266	104	4	48	157.5	158	266	104	4	48	157.5	158	266	104	4	48	158	158	266	104	4									
Bankfull Mean Depth (ft)	0.87	1.35	1.325	1.88	0.449	4	1.047	1.429	1.421	1.828	0.33	4	1.064	1.397	1.332	1.857	0.352	4	0.997	1.338	1.339	1.677	0.335	4	1.2	1.5	1.4	1.9	0.3	4									
Bankfull Max Depth (ft)	1.78	2.348	2.37	2.87	0.446	4	1.865	2.207	2.153	2.66	0.355	4	1.96	2.565	2.675	2.95	0.429	4	1.9	2.465	2.585	2.79	0.409	4	2.1	2.7	2.9	2.9	0.4	4									
Bankfull Cross Sectional Area (ft ²)	18.9	25.28	25.8	30.6	5.44	4	20.79	26.12	26.92	29.85	4.248	4	19.84	29.35	30.36	36.86	7.268	4	18.78	26.33	27.6	31.35	5.385	4	20.1	26.4	27.7	30.1	4.4	4									
Width/Depth Ratio	8.16	16.07	15.7	24.7	7.141	4	8.931	13.66	13.37	18.98	4.166	4	9.436	16.5	15.22	26.11	7.215	4	9.498	16.54	14	28.65	8.412	4	8.2	12.7	14.1	14.3	3	4									
Entrenchment Ratio	2.81	7.56	7.215	13	5.347	4	2.945	8.376	8.158	14.24	5.443	4	2.739	6.998	6.755	11.74	3.975	4	3.014	7.242	7.375	11.21	3.703	4	3.1	8.3	8.3	13.5	4.9	4									
Bank Height Ratio	0.97	0.993	1	1	0.015	4	0.687	0.901	0.958	1	0.148	4	0.871	0.92	0.904	1	0.056	4	0.912	0.946	0.938	0.995	0.04	4	1	1	1	1		4									
Profile																																							
Riffle Length (ft)	13.7	23.1	22.91	36.6	6.2	17	12.96	22.04	20.37	34.75	6.42	17	15.09	27.92	26.54	44.53	8.84	17	18.51	28.18	27.68	45.62	7.72	17	8	26.3	25.4	58.7	13.4	21									
Riffle Slope (ft/ft)	0	0.02	0.02	0.05	0.01	17	0.007	0.019	0.016	0.036	0.009	17	0.004	0.017	0.016	0.04	0.011	16	1.03	2.359	2.375	3.225	0.491	17	0.1	1.69	1.77	3.7	0.01	20									
Pool Length (ft)	26.8	34.2	34.3	40.8	4.7	16	25.24	34.76	32.6	63.29	9.33	17	22.54	28.63	26.33	51.15	6.87	17	21.76	28.05	27.24	37.02	4.834	17	12.4	28.4	26.7	45.5	7.8	25									
Pool Max depth (ft)	2.5	3.8	4	4.7	0.7	16	2.64	3.64	6.75	4.6	0.57	17	2.59	3.34	3.29	4.36	0.57	17	2.48	3.655	3.83	4.56	0.63	17	3.6	3.6	3.6	3.6	---	---									
Pool Spacing (ft)	40	56	54	71	9.1	15	38.54	57.35	57.76	74.75	10.18	16	40.01	57	57.47	72.19	9.38	16	41.41	56.93	57.59	75.03	11.04	16	23	51	50	88	16	24									
Pattern																																							
Channel Beltwidth (ft)	31.9	43.8	40.9	75.9	10.9	14																																	
Radius of Curvature (ft)	23.7	44.6	42.9	66.7	12.1	13																																	
Rc:Bankfull width (ft/ft)	1.1	2.2	2.1	66.7	0.59	13																																	
Meander Wavelength (ft)	90	104	104	121	9.1	13																																	
Meander Width Ratio	1.6	2.2	2.1	2.8	0.55	14																																	
Additional Reach Parameters																																							
Rosgen Classification				C4						C4						C4						C4						C/E 4											
Channel Thalweg length (ft)				994						994						994						994						994											
Sinuosity (ft)				1.14						1.14						1.14						1.14						1.14											
Water Surface Slope (Channel) (ft/ft)				0.0105						0.0105						0.0117						0.0117						0.012											
BF slope (ft/ft)				0.0111						0.0111						0.0132						0.0118						----											
² Ri% / Ru% / P% / G% / S%	41%		57%				38%	59%					49%	51%					51%	48%					44%	56%													
³ SC% / Sa% / G% / C% / B% / Be%													0%	11%	47%	38%	3%	0%	1%	17%	52%	29%	1%	0%	3%	21%	56%	19%	2%	0									
⁴ d16 / d35 / d50 / d84 / d95 /													16.4	38.42	55.28	109.5	197.2	7.916	27.71	41.5	93.75	164.8							0.9	9.0	20.8	79.9	177.6						
² % of Reach with Eroding Banks																9%						2%						1%											
Channel Stability or Habitat Metric																																							
Biological or Other																																							

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

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

APPENDIX E
HYDROLOGY DATA

Table 12. Verification of Bankfull Events

Table 12. Verification of Bankfull Events

Chapel Creek Restoration Site (EEP Project Number 77)

Date of Data Collection	Date of Occurrence	Method	Photo (if available)
September 30, 2010	September 30, 2010	Nearby NWS COOP station	--
September 30, 2010	September 30, 2010	Nearby USGS Stream gauge	--
July 27, 2011	May 28, 2011	Nearby NWS COOP station and site visit	Bankfull Photo 1
October 6, 2011	September 7, 2011	Nearby NWS COOP station	--
July 16, 2012	May 22-23, 2012	1.8 inches of rain occurred on May 22-23, 2012 as documented at a nearby rain station*	Bankfull Photo 2

* Reported at KIGX Weather Station for Chapel Hill (Weatherunderground 2012).

Bankfull Photo 1: Evidence of overbank including wrack and debris on crest gage.



Bankfull Photo 2: Evidence of overbank including wrack and debris in trees and on banks.

