FINAL

ANNUAL MONITORING REPORT
YEAR 5 (2013)
CHAPEL CREEK STREAM RESTORTION SITE
ORANGE COUNTY, NORTH CAROLINA
(EEP Project No. 77, Contract No. 004806)
Construction Completed July 2008

Submitted t o:
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

Axiom Environmental, Inc.

Ecosystem Enhancement PROGRAM

January 2014

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Appendices

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. Construction of the Chapel Creek Site, originated by the North Carolina Ecosystem Enhancement Program (EEP), was completed in July 2008. 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 5 (2013) monitoring.

The Site is located on the University of North Carolina Chapel Hill property in Orange County, North Carolina within 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 961 linear feet of Chapel Creek.
- Enhancing/stabilizing approximately 330 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 sinuousity. Project construction was completed in July 2008. The project restored 961 linear feet of stream using Priority I restoration by constructing a new meandering channel within the floodplain and enhanced (level II) 330 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 1093 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 September 16, 2013 for year 5 (2013) 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 607 planted stems per acre (excluding livestakes) surviving in year 5 (2013). 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.

Several vegetation areas of concern were identified within the Site during previous monitoring years; however, vegetation throughout the Site is currently doing very well. Natural recruitment of loblolly pine (*Pinus taeda*) and sweetgum (*Liquidambar styraciflua*) is high throughout the Site, especially in areas of higher planted stem mortality.

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 separate monitoring years. A crest gauge is located within the Site to assist with documentation of bankfull events. Three bankfull events were documented during the year 5 (2013) monitoring season for a total of eleven bankfull events with at least one event occurring in each monitoring year. The most recent bankfull event occurred after 8.1 inches of rain that fell between June 28 and July 1, 2013, which resulted in floods greater than two times the maximum bankfull channel depth.

Several areas of minor bank erosion/scour were identified in previous monitoring years; however, these areas have stabilized despite several large storm events that occurred during the 2013 monitoring year and are no longer cause for concern. These areas were planted with 125 silky dogwood live stakes in January 2012; the livestakes are doing very well.

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 EEPs 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 September 16, 2013 for the year 5 (2013) 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 May 9, 2013. Five permanent cross-sections, four riffle and one pool, were 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 were 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 was used to calculate width-depth ratios, entrenchment ratios, and bank height ratios for each cross-section. In addition, photographs were taken and pebble counts were conducted at each permanent cross-section location annually.

One approximately 1300-linear foot monitoring reach was used to evaluated stream pattern and longitudinal profile; locations are depicted on Figures 2 and 2A-2B (Appendix B). Measurements of channel pattern included belt-width and meander length. Subsequently, data was used to calculate meander-width ratios. Longitudinal profile measurements included average water surface slopes, facet slopes, and pool-to-pool spacing. In addition, visual stream morphology stability assessments were 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. 2013. Station at Chapel Hill (KGIX) in Chapel Hill, North Carolina. (online). Available: http://www.wunderground.com/history/airport/KIGX/2013/10/02/CustomHistory.html [October 2, 2013].

APPENDIX A

PROJECT VICINITY MAP AND BACKGROUND TABLES

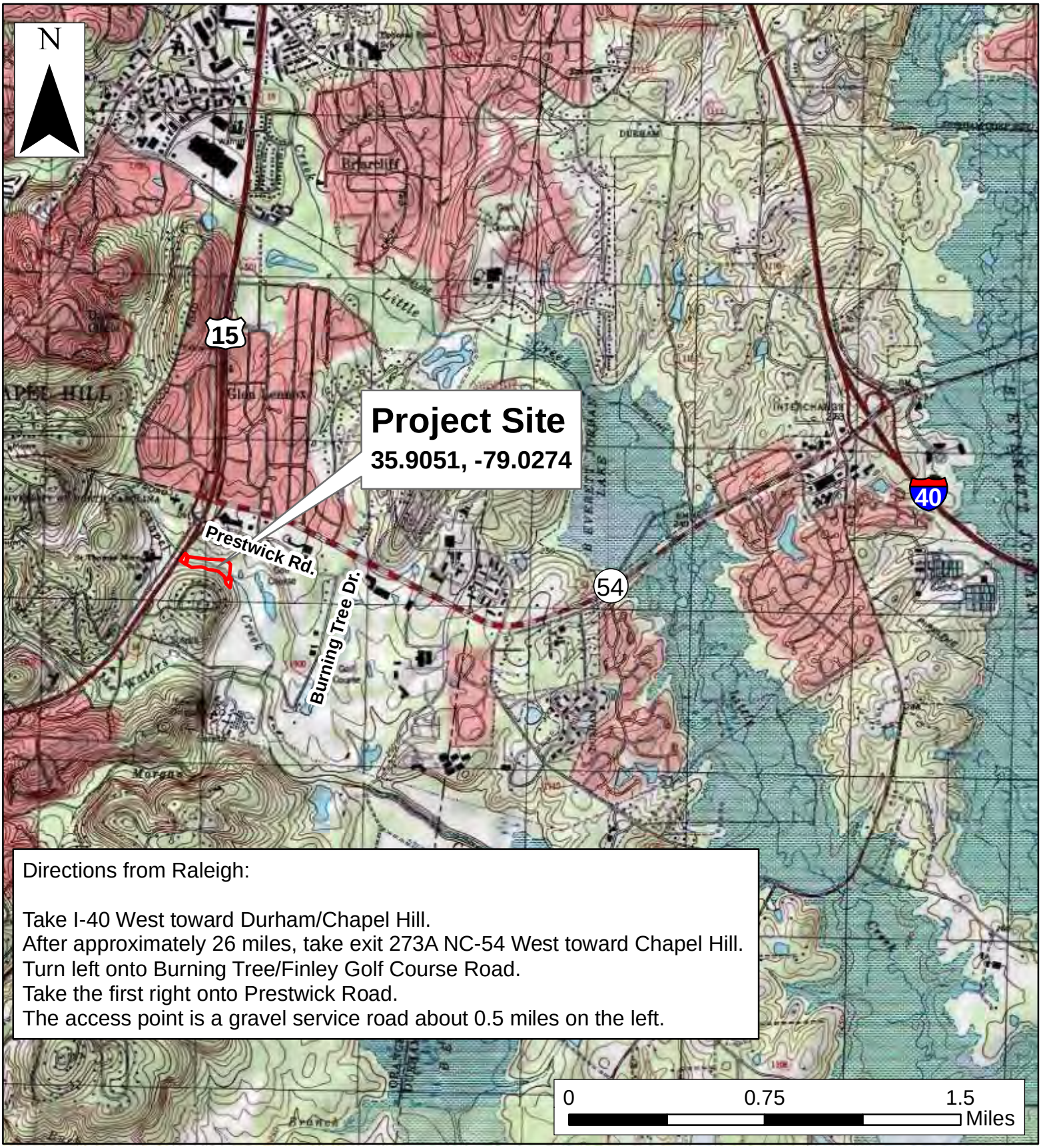
Figure 1. Vicinity Map

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.

Axiom Environmental, Inc.
Axiom Environmental
218 Snow Avenue
Raleigh, NC 27603
(919) 215-1693

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

Dwn. by. KRJ	FIGURE
Date: January 2013	1
Project: 12-025	

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

Mitigation Credits							
	Stream			Riparian Wetland		Buffer	
Type	Restoration		Restoration Equivalent	Restoration	Restoration Equivalent		
Totals	961		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	957	P1	Restoration	961	1:1	Priority I stream restoration.
Reach 2	09+94-13+50	356	P2/P3	Enhancement (Level II)	330	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	961	--	--
Enhancement (Level II)	330	--	--
Totals	**1291**	--	--
Mitigation Units	**1093 SMUs**	--	--

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

Elapsed Time Since Grading Complete: 5 years 3 months
Elapsed Time Since Planting Complete: 4 years 6 months
Number of Reporting Years: 5

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 enitre 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
Year 5 Monitoring (2013)	September 2013	January 2014

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 3 36-495-1713
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

Figure 2A

Figure 2B

1

2

3

4

XS-1 Sta 3+27

XS-2 Sta 5+40

XS-3 Sta 6+28

XS-4 Sta 9+19

XS-5 Sta 11+23

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

0 75 150 300 450 600 Feet

Legend

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

N

Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

CHAPEL CREEK STREAM RESTORATION SITE

Orange County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

(Overview Map)

Drawn by: CLF/KRJ

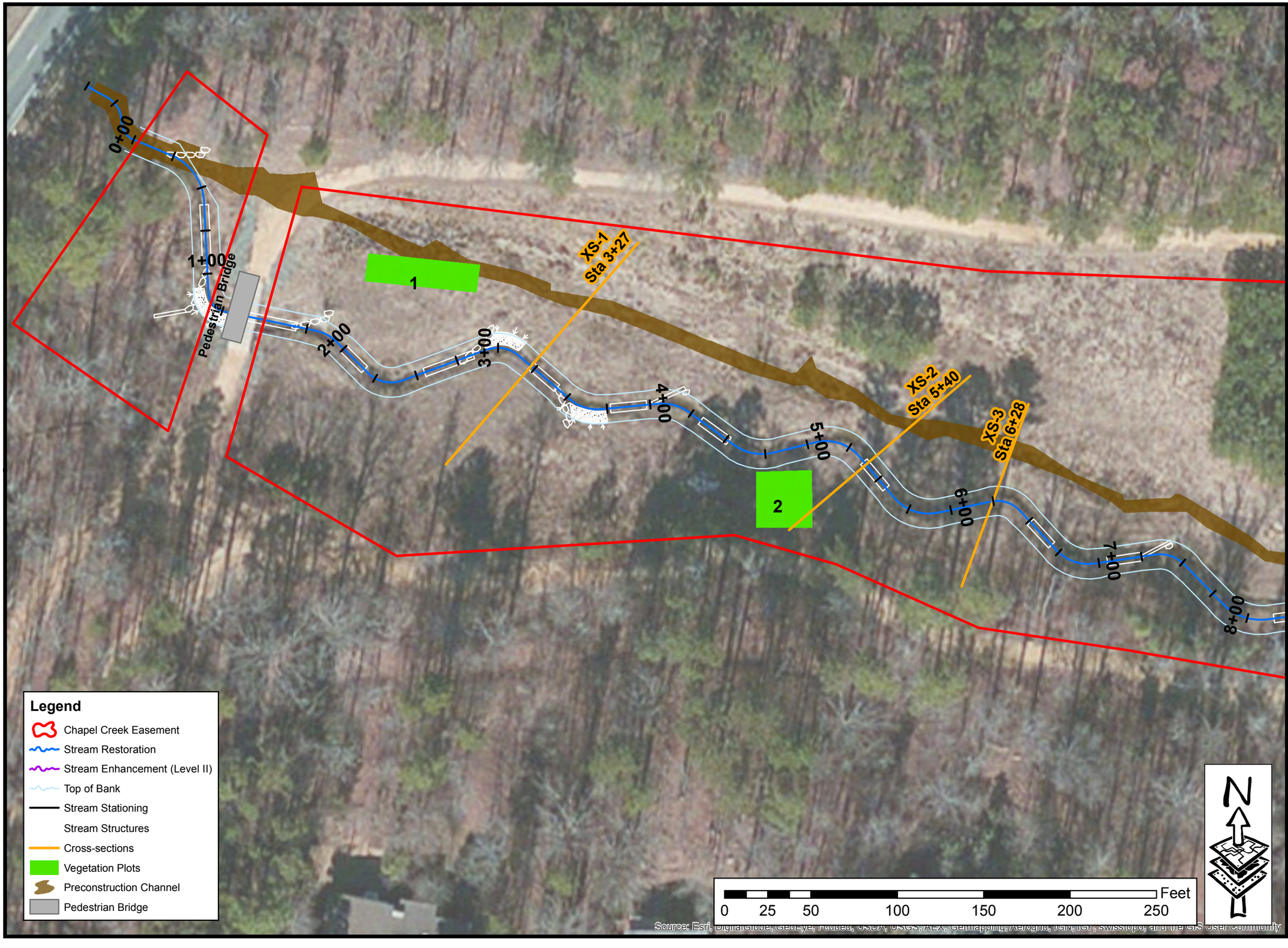
Date: Oct. 2013

Scale: 1:1200

Project No.: 12-004.07

FIGURE

2



Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

CHAPEL CREEK STREAM RESTORATION SITE

Orange County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: CLF/KRJ

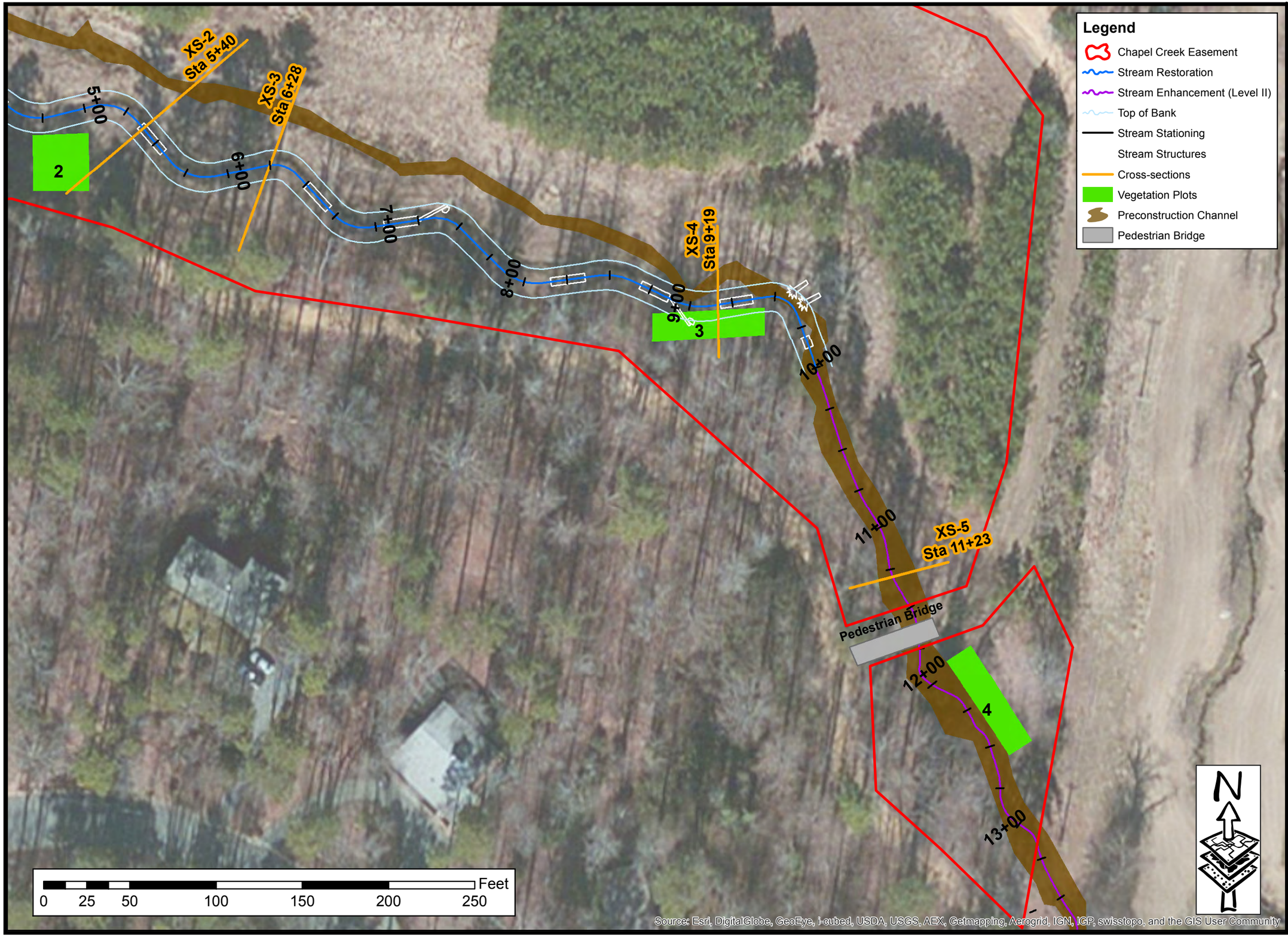
Date: Oct. 2013

Scale: 1:630

Project No.: 12-004.07

FIGURE

2A



Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

CHAPEL CREEK STREAM RESTORATION SITE

Orange County, NC

Title:

CURRENT CONDITIONS PLAN VIEW

Drawn by: CLF/KRJ

Date: Oct. 2013

Scale: 1:630

Project No.: 12-004.07

FIGURE

2B

Table 5 **Visual Stream Morphology Stability Assessment**

Reach ID **Reach 1 (Restoration)**
Assessed Length **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. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)					100%			
		2. Degradation - Evidence of downcutting					100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	17	17			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	17	17			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	17	17			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	17	17			100%			
		2. Thalweg centering at downstream of meander (Glide)	17	17			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion					100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.					100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse					100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	8	8			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	8	8			100%			

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **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	NA	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	NA	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	NA	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%

Easement Acreage[2] **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).	1000 SF	NA	0	0.00	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	NA	0	0.00	0.0%

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

2 = The acreage within the easement boundaries.

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

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

Chapel Creek
Vegetation Monitoring Photographs
Taken September 16, 2013

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	9/16/2013 15:14
database name	Axiom-EEP-2013-A-v2.3.1.mdb
database location	\\AE-SBS\RedirectedFolders\pperkinson\Desktop
computer name	PHILLIP-PC
file size	65798144
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 and Planted Stems by Plot and Species
EEP Project Code 77. Project Name: Chapel Creek

			Current Plot Data (MY5 2013)												Annual Means											
			E77-01-0001			E77-01-0002			E77-01-0003			E77-01-0004			MY5 (2013)			MY4 (2012)			MY3 (2011)			MY2 (2010)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Alnus serrulata	hazel alder	Shrub									22						22			64			45			63
Baccharis halimifolia	eastern baccharis	Shrub			7			9						5			21			37			44			17
Betula nigra	river birch	Tree				2	2	2	3	3	3	6	6	18	11	11	23	11	11	92	11	11	293	12	12	318.7
Calycanthus	sweetshrub	Shrub																					1	1	1	1
Calycanthus floridus	eastern sweetshrub	Shrub																1	1	1	1	1	1			
Carpinus caroliniana	American hornbeam	Tree									160	1	1	1	1	1	161	3	3	62	2	2	2	2	2	65.5
Carya	hickory	Tree																		8						
Cephalanthus occidentalis	common buttonbush	Shrub							1	1	1				1	1	1	1	1	1				1	1	1
Cercis canadensis	eastern redbud	Tree																					284			
Cornus amomum	silky dogwood	Shrub							1	1	1				1	1	1	2	2	2	2	2	2			
Diospyros virginiana	common persimmon	Tree	1	1	1	2	2	2	1	1	1				4	4	4	5	5	5	5	5	5	9	9	10
Elaeagnus umbellata	autumn olive	Exotic																					2			1
Fraxinus pennsylvanica	green ash	Tree				4	4	4	2	2	2	6	6	6	12	12	12	12	12	18	13	13	19	13	13	15
Hibiscus moscheutos	crimsoneyed rosemallo	Shrub	4	4	4										4	4	4	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							2	2	2				2	2	2	5	5	5	6	6	6	9	9	9
Liquidambar styraciflua	sweetgum	Tree						4			3			5			12			124			285			94
Liriodendron tulipifera	tuliptree	Tree												6			6			20			12			
Magnolia virginiana	sweetbay	Tree	1	1	1										1	1	1	1	1	1	1	1	1	3	3	3
Morella cerifera	wax myrtle	shrub									5			6			11			8			13			6
Pinus taeda	loblolly pine	Tree			52			28			210			188			478			199			527			178
Platanus occidentalis	American sycamore	Tree				3	3	3	1	1	1				4	4	4	4	4	4	4	4	5	3	3	7
Prunus serotina	black cherry	Tree																					5			
Quercus lyrata	overcup oak	Tree										2	2	2	2	2	2	2	2	2	2	2	2			
Quercus nigra	water oak	Tree				1	1	1							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	5	5	5
Salix nigra	black willow	Tree			12												12			16			69			52
Ulmus	elm	Tree																		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	1	1	1
Viburnum	viburnum	shrub																								2
Viburnum dentatum	southern arrowwood	Shrub	1	1	1				8	8	8				9	9	9	14	14	14	15	15	15	15	15	15
Viburnum nudum	possumhaw	Shrub							1	1	1				1	1	1	1	1	1	2	2	2	2	2	2
Xanthorhiza simplicissima	yellowroot	Shrub																			1	1	1	1	1	1
		Stem count	13	13	84	12	12	53	20	20	420	15	15	237	60	60	794	74	74	697	77	77	1664	85	85	881.2
		size (ares)	1			1			1			1			4			4			4			4		
		size (ACRES)	0.02			0.02			0.02			0.02			0.10			0.10			0.10			0.10		
		Species count	6	6	9	5	5	8	9	9	14	4	4	9	16	16	23	17	17	26	17	17	32	16	16	28
		Stems per ACRE	526.1	526.1	3399	485.6	485.6	2145	809.4	809.4	16997	607	607	9591	607	607	8033	748.7	748.7	7052	779	779	16835	860	860	8915

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 excluding livestakes
P-all = Planting including livestakes
T = All planted and natural recruits including livestakes
T includes 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

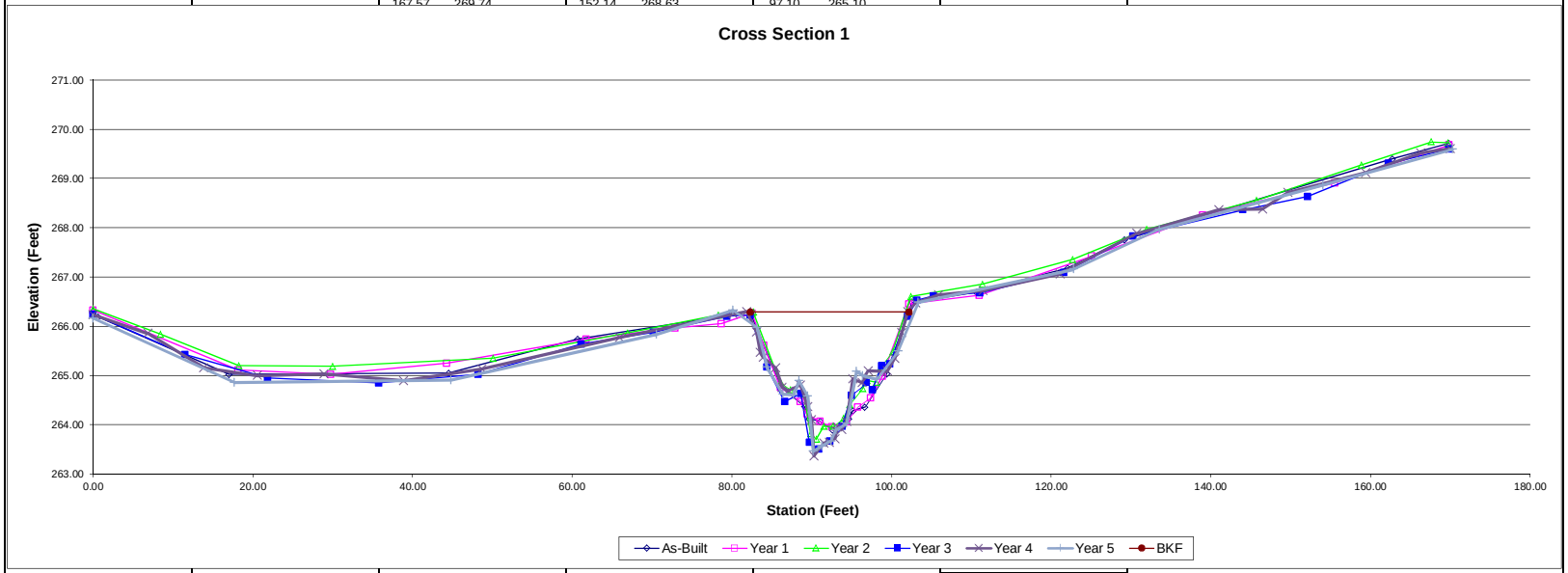
Project:	Chapel Creek
Cross Section:	Cross Section 1
Feature	Riffle
Station:	3+27
Date:	5/9/13
Crew:	Jernigan, Perkinson

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	30.6	29.2	28.2	31.3	28.8	29.8
W (BKF)	19.9	19.2	19.1	20.0	19.9	22.0
Max d	2.4	2.3	2.6	2.8	2.9	2.8
Mean d	1.5	1.5	1.5	1.6	1.4	1.4
W/D	12.9	12.6	12.9	12.7	13.7	16.2

Photo of XS-1, looking in the downstream direction

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year			MY05-Year		
Station	Elevation	Notes	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		266.16	LPIN
0.64	266.18		18.18	265.11		8.46	265.83		11.51	265.42		6.86	265.85		17.73	264.86	
17.02	265.02		29.77	265.02		18.26	265.20		21.88	264.94		13.88	265.16		44.83	264.91	
44.50	265.04		44.34	265.24		30.00	265.18		35.79	264.84		20.56	265.00		70.62	265.83	
60.68	265.73		61.77	265.73		50.07	265.35		48.23	265.02		28.95	265.03		80.18	266.33	TOBL
82.33	266.29	TOBL	72.92	265.96		66.96	265.86		61.16	265.63		38.93	264.89		83.15	265.97	
86.28	264.74		78.71	266.05		78.34	266.22		70.17	265.87		48.69	265.14		84.39	265.16	
89.10	264.37		82.59	266.26	TOBL	82.72	266.29	TOBL	79.43	266.20		65.95	265.77		86.41	264.62	
89.64	264.12		84.02	265.61		86.10	264.85		82.36	266.22	TOBL	80.20	266.25		87.72	264.61	
91.09	264.07		86.10	264.76		87.38	264.71		84.43	265.17		81.90	266.30	TOBL	88.42	264.89	
92.60	263.89	TW	88.63	264.47		89.05	264.62		86.66	264.47		83.14	265.88		89.53	264.58	
94.63	264.11		89.44	264.21		89.90	263.82	TOE L	88.68	264.63		83.56	265.47		90.24	263.46	
95.18	264.28		91.09	264.06		90.61	263.70	TW	89.75	263.64	TOE L	83.95	265.37		91.32	263.57	
96.67	264.35		92.55	263.95	TW	91.53	263.97		90.91	263.50		85.54	265.16		92.44	263.66	
99.42	265.03		94.36	264.05		92.69	263.96		92.27	263.67	TW	86.31	264.75		93.09	263.89	
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		94.41	264.02	
110.65	266.69		97.38	264.54		94.78	264.41		95.00	264.59		88.58	264.80		95.63	265.08	
122.07	267.18		98.88	264.98		96.37	264.73		96.90	264.85		89.55	264.37		96.43	264.99	
129.16	267.75		102.19	266.45	TOBR	96.92	264.89		97.67	264.70		89.97	264.10		98.21	264.92	
162.74	269.39		111.02	266.62		98.11	264.86		98.80	265.19		90.30	263.36		100.90	265.50	
169.80	269.71	RPIN	125.08	267.42		98.64	265.16		99.78	265.23		91.55	263.62		103.39	266.48	
			138.99	268.25		100.16	265.48		102.02	266.20		92.24	263.64		122.81	267.16	
			155.50	268.91		102.42	266.60	TOBR	103.19	266.52	TOBR	92.89	263.71		133.58	267.97	
			169.83	269.68	RPIN	111.42	266.85		105.27	266.61		93.20	263.95		154.04	268.87	
						122.66	267.35		111.12	266.67		93.77	263.90		170.27	269.59	
						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				



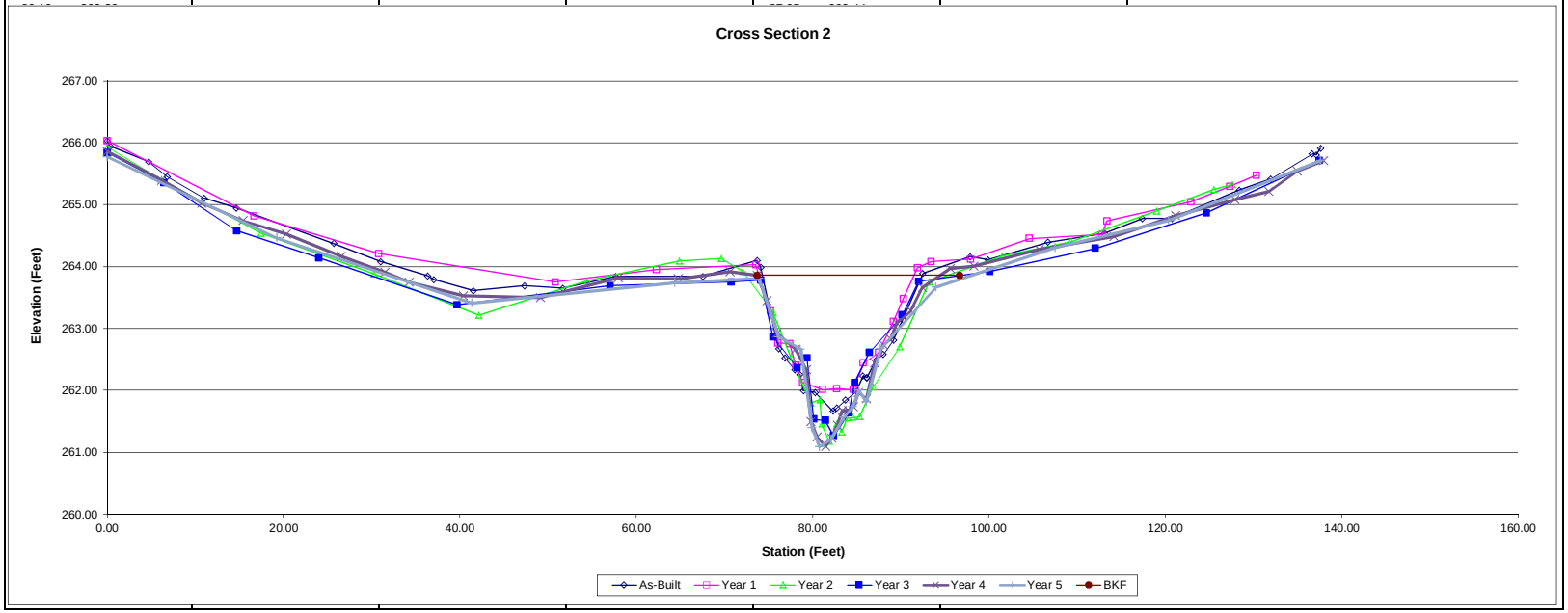
Project:	Chapel Creek
Cross Section:	Cross Section 2
Feature	Riffle
Station:	5+40
Date:	5/9/13
Crew:	Jernigan, Perkinson

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	29.9	25.0	36.9	28.5	26.6	26.9
W (BKF)	23.0	19.1	31.0	28.6	19.7	22.9
Max d	2.4	2.0	2.9	2.7	2.8	2.7
Mean d	1.3	1.3	1.2	1.0	1.4	1.2
W/D	17.6	14.6	26.1	28.6	14.6	19.5

Photo of XS-2, looking in the downstream direction

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year			MY05-Year		
Station	Elevation	Notes	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		265.86	LPIN		265.77	LPIN
0.38	265.94		16.68	264.81		6.21	265.40		6.47	265.35		6.21	265.39		19.27	264.46	
4.75	265.69		30.81	264.21		17.44	264.53		14.75	264.57		10.73	265.03		41.40	263.40	
6.82	265.45		50.86	263.75		30.23	263.88		24.01	264.14		15.42	264.74		64.43	263.74	
11.04	265.10		62.35	263.95		42.18	263.21		39.68	263.38		20.32	264.52		73.93	263.80	TOBL
14.64	264.94		73.58	264.03	TOBL	54.45	263.77		57.05	263.69		26.52	264.17		76.15	262.86	
25.70	264.37		75.25	263.28		64.88	264.09		70.82	263.75		31.50	263.91		78.66	262.66	
31.04	264.08		76.14	262.76		69.68	264.13		74.13	263.78	TOBL	34.28	263.74		79.96	261.39	
36.34	263.85		77.41	262.75		72.12	263.92	TOBL	75.57	262.86		40.42	263.53		80.81	261.09	
37.06	263.79		78.13	262.40		75.52	263.26		78.30	262.36		49.18	263.49		82.12	261.21	
41.50	263.61		78.89	262.12		77.55	262.53		79.38	262.52		58.01	263.82		83.62	261.57	
47.31	263.69		81.12	262.01	TOE L	79.82	261.79		80.18	261.53	TOE L	64.77	263.80		84.60	261.73	
51.71	263.65		82.79	262.02		80.88	261.84		81.52	261.51		70.66	263.91		85.30	262.00	
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		86.12	261.82	
67.59	263.84		85.80	262.44		81.90	261.18	TW	84.15	261.63	TOE R	74.83	263.45	TOBL	87.72	262.67	
73.72	264.10	TOBL	87.54	262.61	TW	82.76	261.45		84.79	262.12		76.00	262.92		94.00	263.67	TOBR
74.13	263.99		89.21	263.11		83.33	261.32		86.47	262.61		78.09	262.66		107.52	264.30	
76.20	262.67		90.31	263.48		83.97	261.55		90.21	263.22		79.35	262.33		120.44	264.74	
76.90	262.52		91.93	263.98	TOBR	84.61	261.56		92.08	263.76	TOBR	79.82	261.49		137.64	265.71	RPIN
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				



Project:	Chapel Creek
Cross Section:	Cross Section 3
Feature	Pool
Station:	6+28
Date:	5/9/13
Crew:	Jernigan, Perkinson

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	31.7	31.1	30.7	30.3	32.6	30.4
W (BKF)	24.8	27.1	22.9	23.0	23.7	23.6
Max d	3.3	3.2	3.1	3.2	3.6	3.3
Mean d	1.3	1.1	1.3	1.3	1.4	1.3
W/D	19.4	23.6	17.0	17.4	NA	NA

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year			MY05-Year		
Station	Elevation	Notes	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		265.54	LPIN		265.56	LPIN
0.52	265.42		10.55	264.11		2.33	265.13		9.48	264.28		2.73	265.28		18.56	263.40	
2.73	265.16		18.73	263.26		8.21	264.36		20.58	263.15		6.42	264.83		30.51	262.67	
9.49	264.18		31.24	262.68		15.58	263.51		32.42	262.65		9.81	264.31		45.03	262.83	
14.90	263.52		35.17	262.69		24.11	262.95		45.03	262.73		13.27	263.84		50.13	263.01	TOBL
20.47	263.10		41.14	262.60		30.15	262.58		49.51	262.86		18.26	263.27		52.23	261.87	
23.77	263.10		46.79	262.78		43.70	262.78		50.51	262.85	TOBL	23.86	263.13		53.36	259.74	
28.58	262.56		49.43	262.79	TOBL	50.17	262.80	TOBL	52.22	262.01		26.70	262.99		55.12	259.48	
35.48	262.64		51.32	262.31		50.79	262.70		53.85	259.75	TOE L	28.70	262.59		57.12	259.61	
42.42	262.70		51.38	262.31		51.21	262.23		55.03	259.48	TW	33.66	262.67		59.51	260.37	
48.60	262.78		54.13	260.47		51.94	261.76		57.02	259.68		40.16	262.56		60.54	261.77	TOBR
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		62.02	261.89	
50.34	262.67		54.51	259.75		56.14	259.63	TW	60.45	261.57	TOBR	50.39	262.81	TOBL	68.10	262.42	
52.36	261.47		55.46	259.59	TW	57.23	259.91		62.36	261.69		51.97	262.01		85.09	263.53	
53.15	260.86		57.44	259.89		58.67	260.11		65.09	261.70		52.65	261.62		99.25	263.79	
53.53	260.37		58.64	260.51		59.72	260.43	TOE R	67.57	262.15		53.48	260.08		112.81	263.85	RPIN
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		56.50	259.46				
57.72	259.89		66.21	262.10		66.31	262.01		112.58	263.57	RPIN	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				

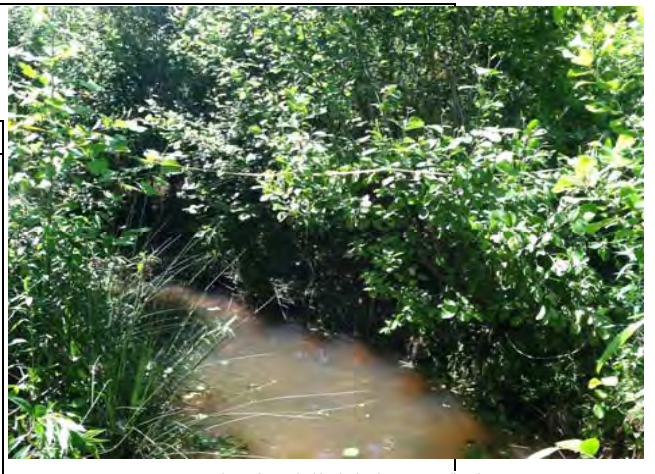
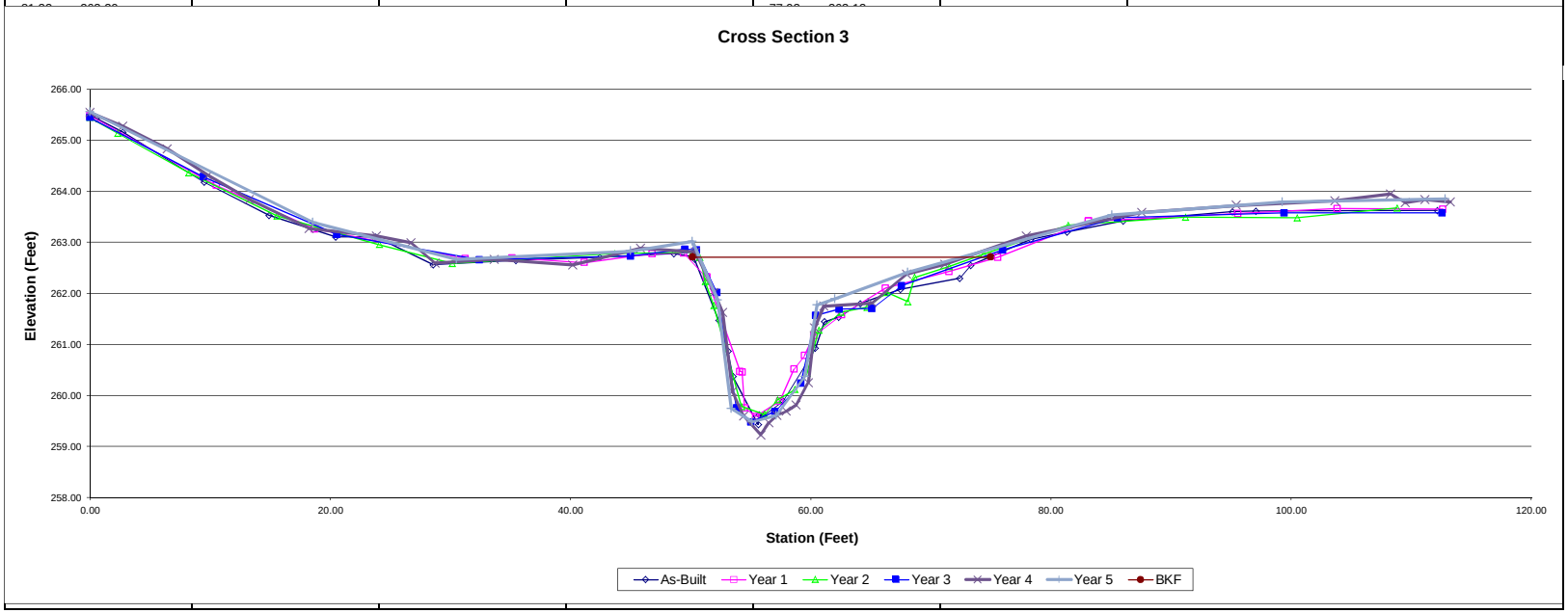


Photo of XS-3 looking in the downstream direction



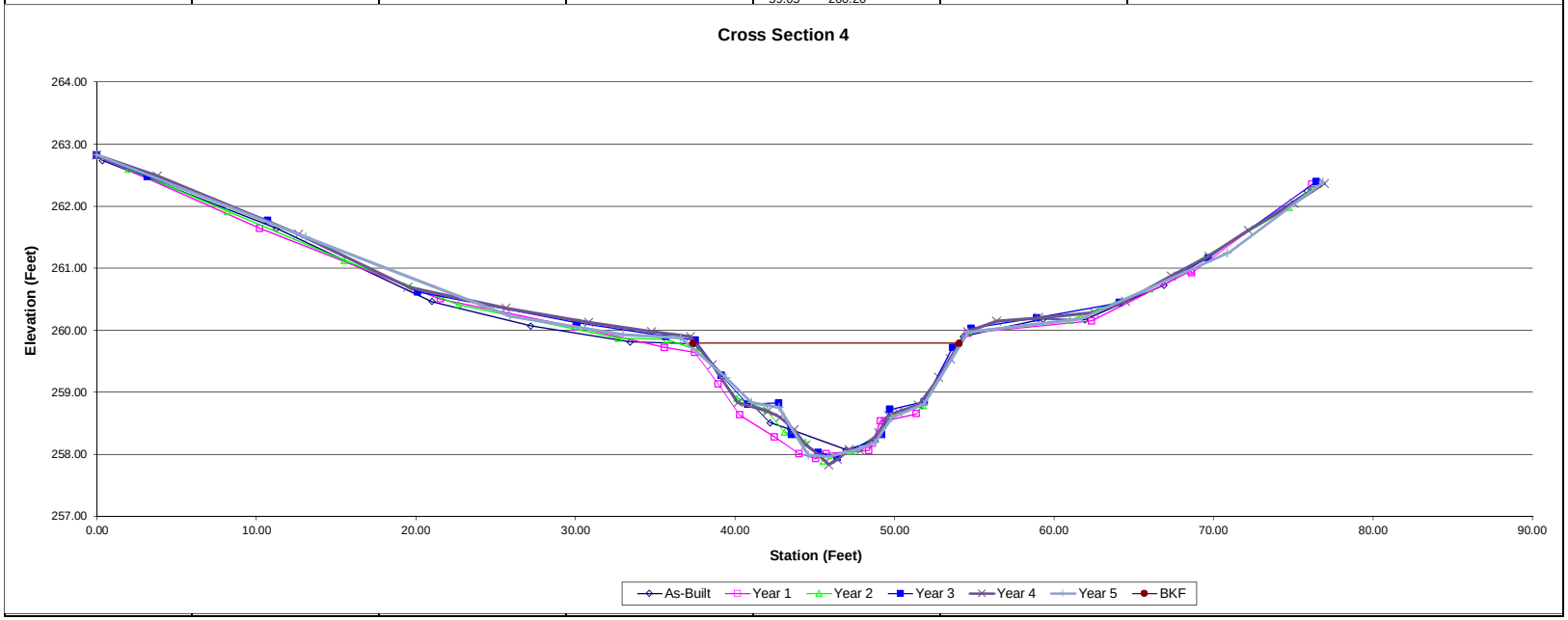
Project:	Chapel Creek
Cross Section:	Cross Section 4
Feature	Riffle
Station:	9+19
Date:	5/9/13
Crew:	Jernigan, Perkinson

Summary (bankfull)

	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	17.8	19.4	19.8	18.8	20.1	19.9
W (BKF)	16.7	18.4	18.6	16.9	17.1	17.8
Max d	1.7	1.8	2.0	1.9	2.1	1.9
Mean d	1.1	1.1	1.1	1.1	1.2	1.1
W/D	15.7	17.5	17.5	15.2	14.6	16.0

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year			MY05-Year		
Station	Elevation	Notes	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		262.82	LPIN		262.82	LPIN
0.37	262.73		10.20	261.64		1.98	262.59		3.18	262.47		3.81	262.49		13.10	261.50	
11.25	261.64		21.56	260.50		8.18	261.92		10.72	261.77		12.66	261.55		25.92	260.23	
21.00	260.46		30.04	260.05		15.52	261.12		20.11	260.61		19.52	260.69		33.00	259.93	
27.20	260.07		35.61	259.72		22.67	260.41		30.09	260.12		25.67	260.35		36.59	259.88	TOBL
33.42	259.81		37.48	259.64	TOBL	32.71	259.87		35.67	259.90		30.85	260.13		39.46	259.23	
37.40	259.78		38.96	259.13		35.71	259.85		37.54	259.84	TOBL	34.78	259.98		41.05	258.83	
37.36	259.79	TOBL	40.32	258.63		37.89	259.66	TOBL	39.17	259.27		37.23	259.90	TOBL	42.78	258.75	
42.23	258.51		42.50	258.28		40.12	258.90		40.81	258.80		38.57	259.44		44.60	257.98	
43.48	258.40		44.02	258.01		42.02	258.71		42.75	258.82		40.19	258.84		45.87	257.96	
46.99	258.07	TW	45.06	257.93	TW	43.10	258.36		43.58	258.32	TOE L	42.05	258.70		47.83	258.09	
48.79	258.22		45.75	258.01		44.41	258.20	TOE L	45.22	258.03		42.83	258.59		48.78	258.19	
49.47	258.56		48.42	258.06		45.55	257.89	TW	46.43	257.95	TW	43.71	258.40		49.84	258.59	
51.67	258.79		48.64	258.18		47.36	258.05		49.20	258.32	TOE R	44.45	258.14		51.85	258.80	
54.33	259.90	TOBR	49.13	258.54		49.07	258.35	TOE R	49.72	258.72		45.28	257.99		54.62	259.97	TOBR
59.33	260.18		49.42	258.54		49.75	258.65		51.87	258.84		45.90	257.83		61.77	260.19	
61.93	260.17		51.39	258.65		51.81	258.78		53.67	259.72		46.45	257.92		70.90	261.24	
66.89	260.72		54.59	259.95	TOBR	54.66	259.98	TOBR	54.81	260.03	TOBR	47.17	258.08		76.88	262.38	RPIN
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				

Photo of XS-4, looking in the downstream direction



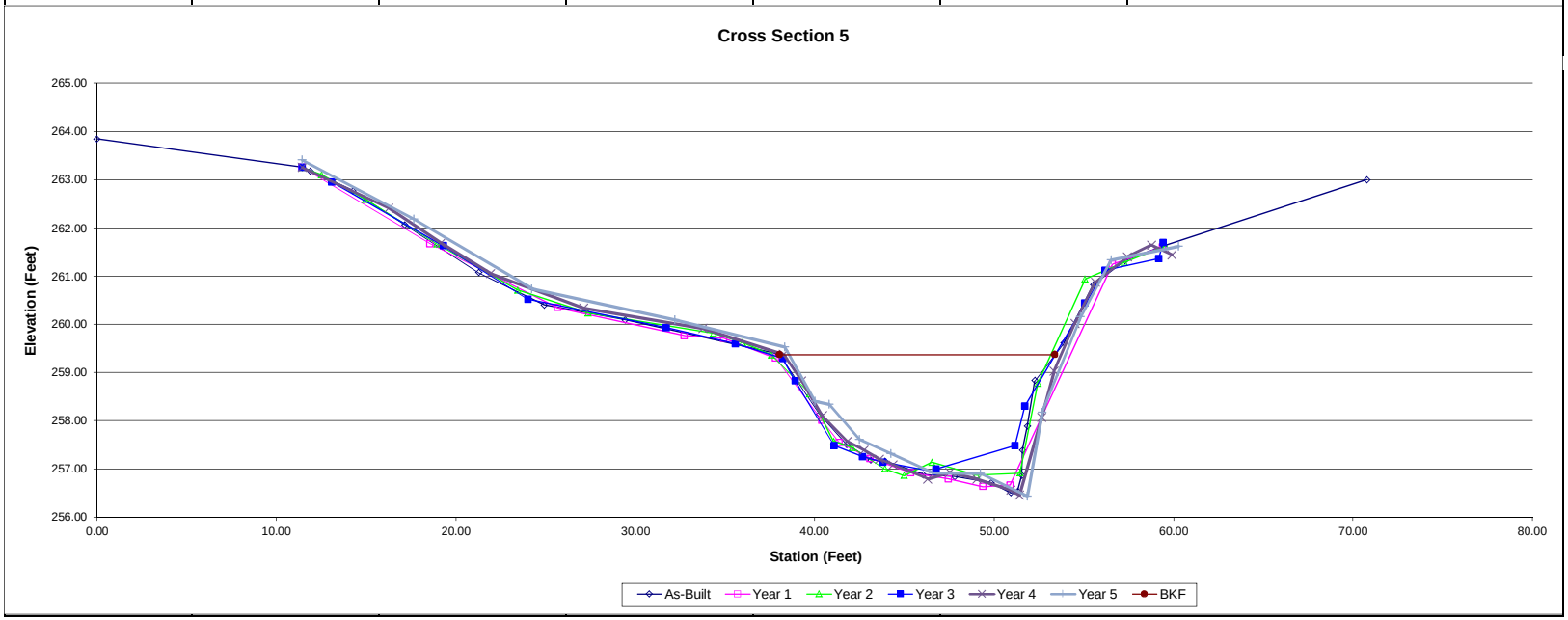
Project:	Chapel Creek
Cross Section:	Cross Section 5
Feature	Riffle
Station:	11+23
Date:	5/9/13
Crew:	Jernigan, Perkinson

Summary (bankfull)

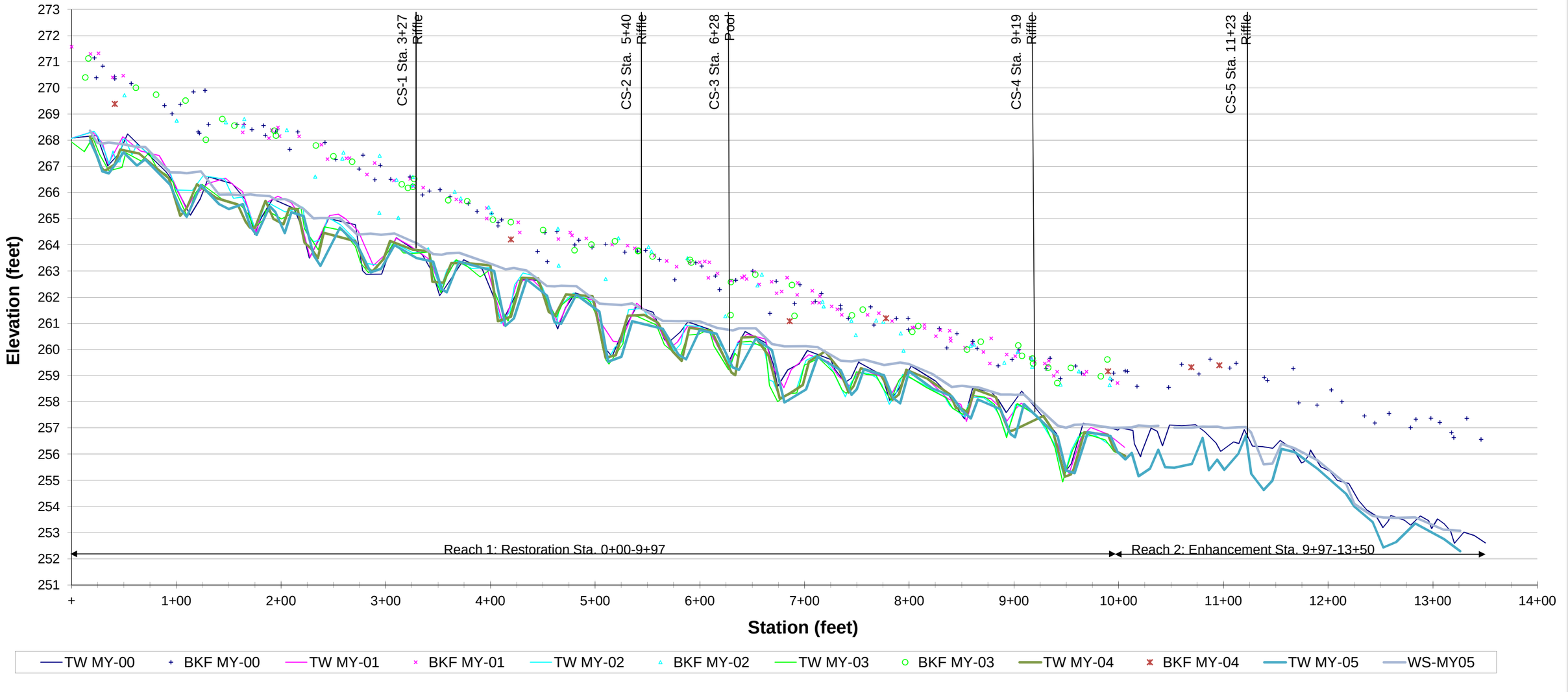
	MY0	MY1	MY2	MY3	MY4	MY5
A (BKF)	28.9	29.8	32.5	26.7	30.1	28.7
W (BKF)	15.4	16.3	17.5	15.9	15.5	15.4
Max d	2.9	2.7	2.8	2.4	2.9	2.9
Mean d	1.9	1.8	1.9	1.7	1.9	1.9
W/D	8.2	8.9	9.4	9.5	8.0	8.3

MY00-2009			MY01-2009			MY02-2010			MY03-2011			MY04-Year			MY05-Year		
Station	Elevation	Notes	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	263.40	LPIN
11.46	263.25	LPIN	18.59	261.67		12.53	263.10		13.11	262.95		16.28	262.40		17.67	262.18	
11.90	263.17		25.70	260.34		14.95	262.59		19.34	261.62		19.17	261.68		24.27	260.73	
14.29	262.76		32.76	259.76		18.94	261.67		24.03	260.51		21.94	261.05		32.23	260.09	
17.16	262.06		34.95	259.71		23.47	260.70		31.75	259.92		27.14	260.33		38.35	259.52	TOBL
21.29	261.07		37.85	259.29	TOBL	27.38	260.23		35.60	259.59		33.77	259.91		40.05	258.40	
24.94	260.40		40.42	258.00		34.37	259.81		38.25	259.28	TOBL	38.27	259.38	TOBL	40.82	258.34	
29.43	260.09		41.37	257.54	TOE L	35.96	259.62		38.92	258.82		39.29	258.82		42.50	257.61	
38.04	259.37	TOBL	43.11	257.21		37.58	259.36	TOBL	41.10	257.48		40.44	258.10		44.26	257.31	
40.27	258.13		45.35	256.92		39.74	258.56		42.69	257.25		41.83	257.57		46.60	256.91	
41.78	257.51		47.47	256.79		41.08	257.57	TOE L	43.82	257.13	TOE L	42.75	257.39		49.25	256.90	
43.14	257.19		49.40	256.63	TW	42.09	257.44		46.77	256.94	TW	43.60	257.20		51.86	256.44	
43.92	257.16		50.91	256.66	TOE R	43.92	257.00		46.78	256.99	TOE R	44.36	257.08		52.70	258.17	
46.07	256.88		56.60	261.24	TOBR	44.99	256.86	TW	51.17	257.48		46.31	256.79		54.84	260.15	
47.81	256.84		59.41	261.60	RPIN	46.54	257.13		51.72	258.30		47.54	256.93		56.54	261.33	TOBR
49.84	256.71					49.00	256.87		55.08	260.43		49.03	256.79		60.30	261.61	RPIN
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

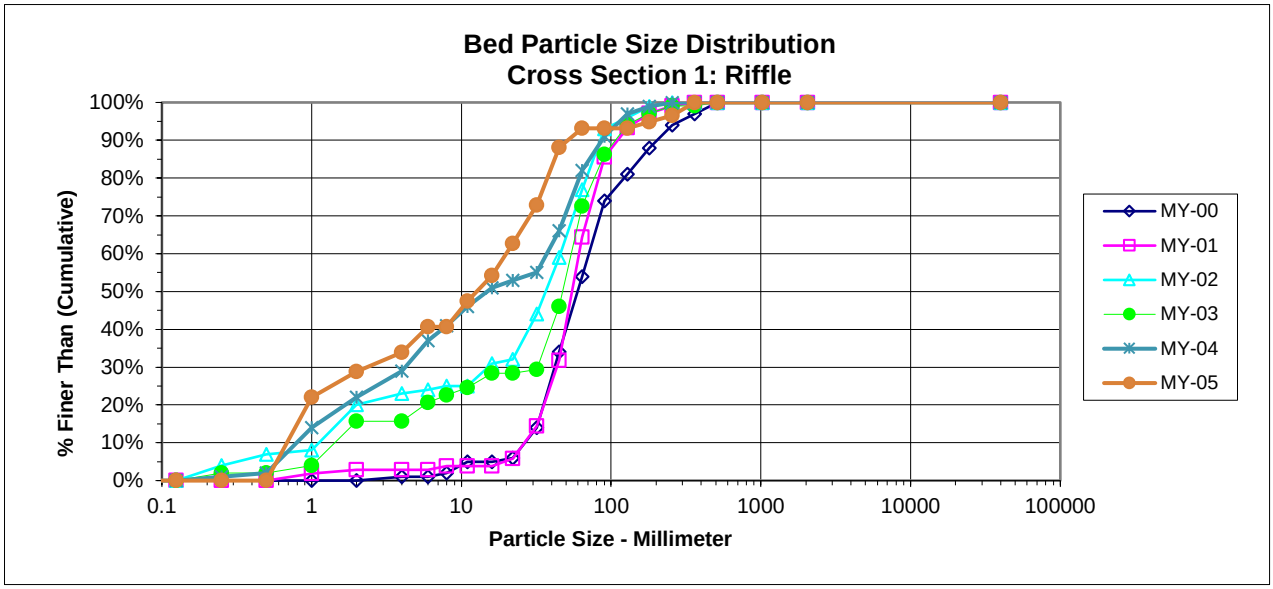


Chapel Creek
Longitudinal Profile
Main Channel: Station 0+00 - 14+00



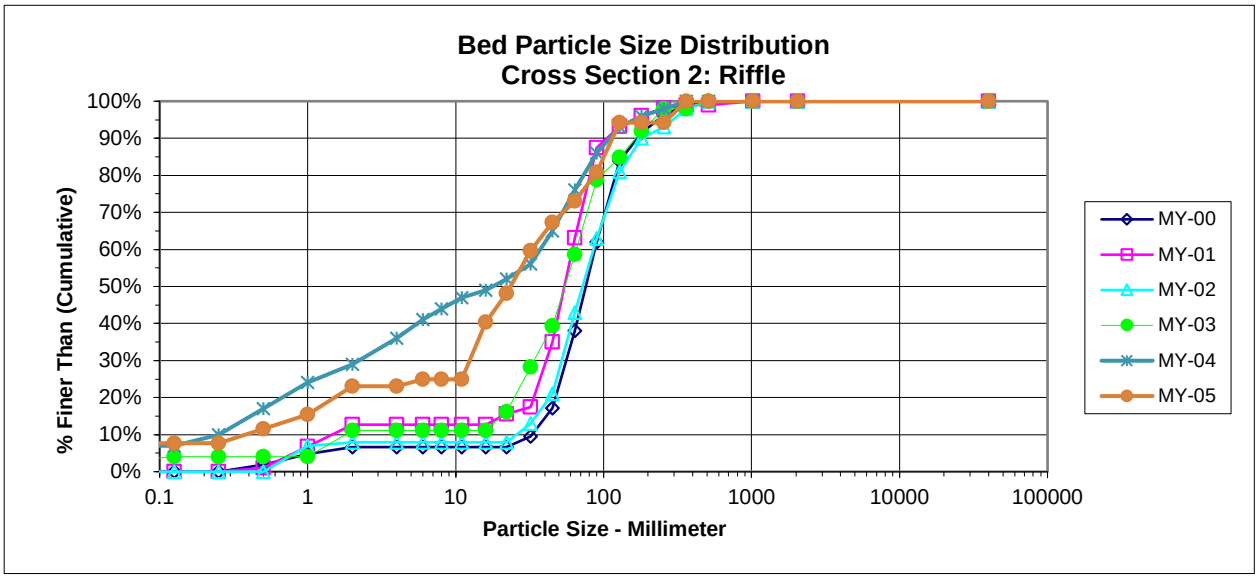
PEBBLE COUNT								
Project:	Chapel Creek					**Date:**	6/21/2013	
Location:	Cross Section #1							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	0	0	0	0%	0%
	Very Fine	.062 - .125	S	0	0	0	0%	0%
	Fine	.125 - .25	A	0	0	0	0%	0%
	Medium	.25 - .50	N	0	0	0	0%	0%
	Coarse	.50 - 1.0	D	13	0	13	22%	22%
.04 -.08	Very Coarse	1.0 - 2.0	S	4	0	4	7%	29%
.08 - .16	Very Fine	2.0 - 4.0		3	0	3	5%	34%
.16 - .22	Fine	4.0 - 5.7	G	4	0	4	7%	41%
.22 - .31	Fine	5.7 - 8.0	R	0	0	0	0%	41%
.31 - .44	Medium	8.0 - 11.3	A	4	0	4	7%	47%
.44 - .63	Medium	11.3 - 16.0	V	4	0	4	7%	54%
.63 - .89	Coarse	16.0 - 22.6	E	5	0	5	8%	63%
.89 - 1.26	Coarse	22.6 - 32.0	L	6	0	6	10%	73%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	9	0	9	15%	88%
1.77 - 2.5	Very Coarse	45.0 - 64.0		3	0	3	5%	93%
2.5 - 3.5	Small	64 - 90	C	0	0	0	0%	93%
3.5 - 5.0	Small	90 - 128	O	0	0	0	0%	93%
5.0 - 7.1	Large	128 - 180	B	1	0	1	2%	95%
7.1 - 10.1	Large	180 - 256	L	1	0	1	2%	97%
10.1 - 14.3	Small	256 - 362	B	2	0	2	3%	100%
14.3 - 20	Small	362 - 512	L	0	0	0	0%	100%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	100%
40 - 80	Lrg- Very Lr	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
			Totals	**59**	**0**	**59**	**100%**	**100%**

d16	d35	d50	d84	d95
0.8	4.3	12.7	41.0	183.2



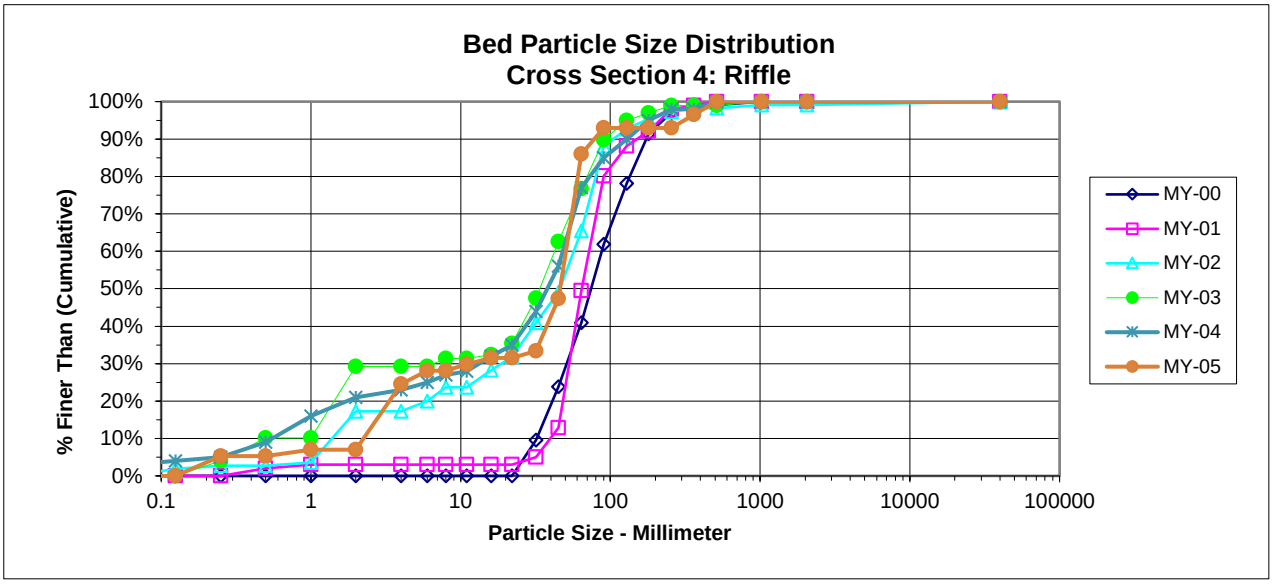
PEBBLE COUNT								
Project:	Chapel Creek					**Date:**	6/21/2013	
Location:	Cross Section #2							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	4	0	4	8%	8%
	Very Fine	.062 - .125	S	0	0	0	0%	8%
	Fine	.125 - .25	A	0	0	0	0%	8%
	Medium	.25 - .50	N	2	0	2	4%	12%
	Coarse	.50 - 1.0	D	2	0	2	4%	15%
.04 -.08	Very Coarse	1.0 - 2.0	S	4	0	4	8%	23%
.08 - .16	Very Fine	2.0 - 4.0		0	0	0	0%	23%
.16 - .22	Fine	4.0 - 5.7	G	1	0	1	2%	25%
.22 - .31	Fine	5.7 - 8.0	R	0	0	0	0%	25%
.31 - .44	Medium	8.0 - 11.3	A	0	0	0	0%	25%
.44 - .63	Medium	11.3 - 16.0	V	8	0	8	15%	40%
.63 - .89	Coarse	16.0 - 22.6	E	4	0	4	8%	48%
.89 - 1.26	Coarse	22.6 - 32.0	L	6	0	6	12%	60%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	4	0	4	8%	67%
1.77 - 2.5	Very Coarse	45.0 - 64.0		3	0	3	6%	73%
2.5 - 3.5	Small	64 - 90	C	4	0	4	8%	81%
3.5 - 5.0	Small	90 - 128	O	7	0	7	13%	94%
5.0 - 7.1	Large	128 - 180	B	0	0	0	0%	94%
7.1 - 10.1	Large	180 - 256	L	0	0	0	0%	94%
10.1 - 14.3	Small	256 - 362	B	3	0	3	6%	100%
14.3 - 20	Small	362 - 512	L	0	0	0	0%	100%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	100%
40 - 80	Lrg- Very Lr	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
			Totals	**52**	**0**	**52**	**100%**	**100%**

d16	d35	d50	d84	d95
1.1	14.0	23.4	97.9	268.1



PEBBLE COUNT								
Project:	Chapel Creek					**Date:**	6/21/2013	
Location:	Cross Section #4							
			Particle Counts					
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	0	0	0	0%	0%
	Very Fine	.062 - .125	S	0	0	0	0%	0%
	Fine	.125 - .25	A	3	0	3	5%	5%
	Medium	.25 - .50	N	0	0	0	0%	5%
	Coarse	.50 - 1.0	D	1	0	1	2%	7%
.04 -.08	Very Coarse	1.0 - 2.0	S	0	0	0	0%	7%
.08 - .16	Very Fine	2.0 - 4.0		10	0	10	18%	25%
.16 - .22	Fine	4.0 - 5.7	G	2	0	2	4%	28%
.22 - .31	Fine	5.7 - 8.0	R	0	0	0	0%	28%
.31 - .44	Medium	8.0 - 11.3	A	1	0	1	2%	30%
.44 - .63	Medium	11.3 - 16.0	V	1	0	1	2%	32%
.63 - .89	Coarse	16.0 - 22.6	E	0	0	0	0%	32%
.89 - 1.26	Coarse	22.6 - 32.0	L	1	0	1	2%	33%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	8	0	8	14%	47%
1.77 - 2.5	Very Coarse	45.0 - 64.0		22	0	22	39%	86%
2.5 - 3.5	Small	64 - 90	C	4	0	4	7%	93%
3.5 - 5.0	Small	90 - 128	O	0	0	0	0%	93%
5.0 - 7.1	Large	128 - 180	B	0	0	0	0%	93%
7.1 - 10.1	Large	180 - 256	L	0	0	0	0%	93%
10.1 - 14.3	Small	256 - 362	B	2	0	2	4%	96%
14.3 - 20	Small	362 - 512	L	2	0	2	4%	100%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	100%
40 - 80	Lrg- Very Lr	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
			Totals	**57**	**0**	**57**	**100%**	**100%**

d16	d35	d50	d84	d95
2.9	32.4	45.7	62.7	309.7



PEBBLE COUNT								
Project:	Chapel Creek					**Date:**	6/21/2013	
Location:	Cross Section #5							
			Particle Counts					
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	0	0	0	0%	0%
	Very Fine	.062 - .125	S	0	0	0	0%	0%
	Fine	.125 - .25	A	2	0	2	4%	4%
	Medium	.25 - .50	N	1	0	1	2%	6%
	Coarse	.50 - 1.0	D	10	0	10	19%	24%
.04 -.08	Very Coarse	1.0 - 2.0	S	1	0	1	2%	26%
.08 - .16	Very Fine	2.0 - 4.0		1	0	1	2%	28%
.16 - .22	Fine	4.0 - 5.7	G	2	0	2	4%	31%
.22 - .31	Fine	5.7 - 8.0	R	2	0	2	4%	35%
.31 - .44	Medium	8.0 - 11.3	A	4	0	4	7%	43%
.44 - .63	Medium	11.3 - 16.0	V	0	0	0	0%	43%
.63 - .89	Coarse	16.0 - 22.6	E	2	0	2	4%	46%
.89 - 1.26	Coarse	22.6 - 32.0	L	10	0	10	19%	65%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	9	0	9	17%	81%
1.77 - 2.5	Very Coarse	45.0 - 64.0		7	0	7	13%	94%
2.5 - 3.5	Small	64 - 90	C	0	0	0	0%	94%
3.5 - 5.0	Small	90 - 128	O	0	0	0	0%	94%
5.0 - 7.1	Large	128 - 180	B	1	0	1	2%	96%
7.1 - 10.1	Large	180 - 256	L	2	0	2	4%	100%
10.1 - 14.3	Small	256 - 362	B	0	0	0	0%	100%
14.3 - 20	Small	362 - 512	L	0	0	0	0%	100%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	100%
40 - 80	Lrg- Very Lrg	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
			Totals	**54**	**0**	**54**	**100%**	**100%**

d16	d35	d50	d84	d95
0.7	7.9	23.7	48.2	141.8

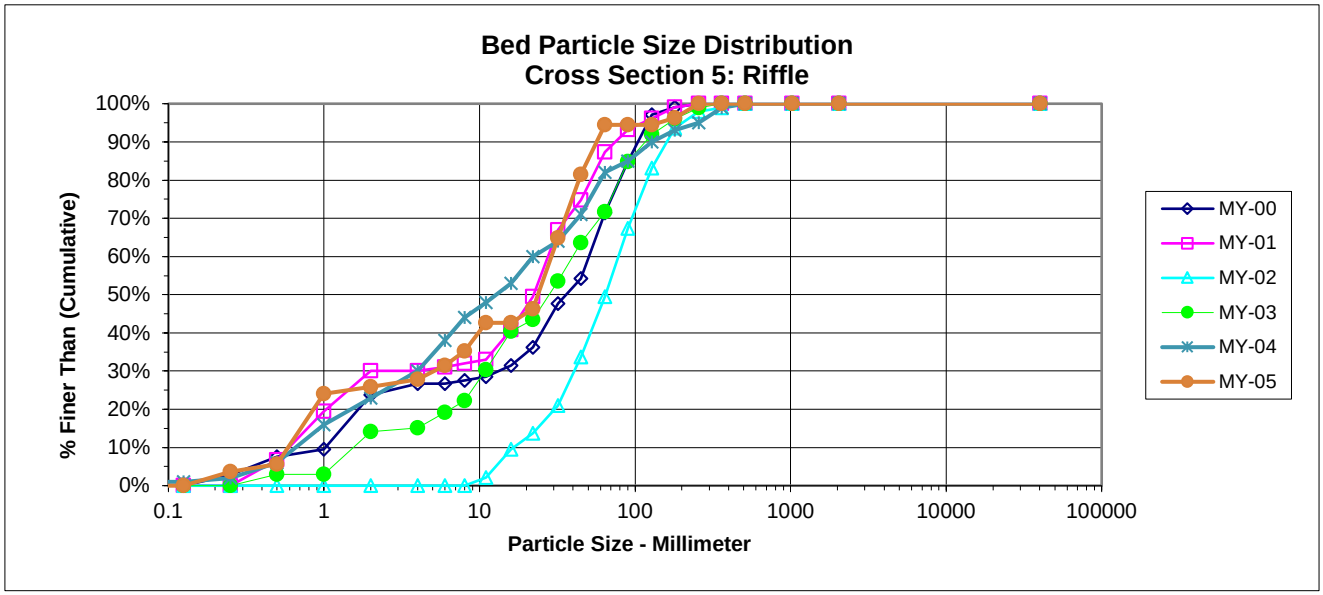


Table 10a. Baseline Stream Data Summary
Chapel Creek Stream Restoration Site-Project No. 77

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)	-	-	-	-	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/f^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	165																
[2]Entrenchment Class <1.5 / 1.5-1.99 / 2.0-4.9 / 5.0-9.9 / >10																												
[3]Incision Class <1.2 / 1.2-1.49 / 1.5-1.99 / >2.0																												

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

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

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

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

Footnotes 2,3 - These classes are loosley built around the Rosgen classification and hazard ranking breaks, but were adjusted slightly to make for easier assignment to somewhat coarser bins based on visual estimates in the field such that measurement of every segment for ER would not be necessary. The intent here is to provide the reader/consumer of design and monitoring information with a good general sense of the extent of hydrologic containment in the pre-existing and the rehabilitated states as well as comparisons to the reference distributions. ER and BHR have been addressed in prior submissions as a subsample (cross-sections as part of the design survey), however, these subsamples have often focused entirely on facilitating design without providing a thorough pre-construtions 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	266.25		264.00	264.01	264.00	264.00	263.86	263.80		262.67	262.79	262.67	262.67	262.81	262.81	
Bankfull Width (ft)	19.86	19.17	19.07	19.99	19.9	22.00		22.96	19.11	31.02	28.57	19.7	22.90		24.84	27.12	22.88	22.96	23.7	23.60	
Floodprone Width (ft)	224	224	224	224	224	224		266	266	266	266	266	266		95	95	95	95	95	95	
Bankfull Mean Depth (ft)	1.5416	1.5241	1.4766	1.5681	1.4	1.4		1.3016	1.3078	1.1881	0.9971	1.4	1.2		1.2771	1.1481	1.3418	1.321	1.4	1.3	
Bankfull Max Depth (ft)	2.4	2.31	2.59	2.79	2.9	2.8		2.44	2.02	2.95	2.74	2.8	2.7		3.28	3.2	3.07	3.19	3.6	3.3	
Bankfull Cross Sectional Area (ft^2)	30.619	29.221	28.165	31.346	28.8	29.8		29.886	24.998	36.858	28.483	26.6	26.9		31.724	31.14	30.694	30.335	32.6	30.4	
Bankfull Width/Depth Ratio	12.884	12.579	12.918	12.747	13.7	16.2		17.641	14.616	26.112	28.65	14.6	19.5		19.45	23.625	17.048	17.383	NA	NA	
Bankfull Entrenchment Ratio	11.278	11.684	11.743	11.206	11.3	10.2		11.585	13.916	8.5742	9.3118	13.5	11.6		3.8245	3.5025	4.153	4.137	NA	NA	
Bankfull Bank Height Ratio	1	1	1	0.914	1.0	1		1	0.6782	0.8712	0.9124	1.0	1		1	1	0.5375	0.6552	1.0	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	12.7		77	55.2	73.1	55.5	17.8	23.4		N/A	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	259.88		259.37	259.29	259.37	259.37	259.38	259.38	
Bankfull Width (ft)	16.71	18.41	18.64	16.92	17.1	17.80		15.35	16.33	17.52	15.93	15.5	15.40	
Floodprone Width (ft)	92	92	92	92	92	92		48	48	48	48	48	48	
Bankfull Mean Depth (ft)	1.0659	1.0523	1.0642	1.1098	1.2	1.1		1.8823	1.8282	1.8573	1.6769	1.9	1.9	
Bankfull Max Depth (ft)	1.72	1.79	1.96	1.9	2.1	1.9		2.87	2.66	2.76	2.43	2.9	2.9	
Bankfull Cross Sectional Area (ft^2)	17.808	19.377	19.838	18.777	20.1	19.9		28.895	29.85	32.549	26.709	30.1	28.7	
Bankfull Width/Depth Ratio	15.673	17.498	17.516	15.246	14.6	16		8.1553	8.9308	9.4358	9.4979	8.0	8.3	
Bankfull Entrenchment Ratio	5.5069	4.9962	4.9353	5.4374	5.4	5.2		3.1269	2.9398	2.739	3.0137	3.1	3.1	
Bankfull Bank Height Ratio	1	0.9553	0.9031	0.9947	1.0	1		1	1	0.9058	0.963	1.0	1	
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	45.7		36.6	22.3	64.8	28.5	12.8	23.7	

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					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	15.4	19.6	20.7	21.6	2.91	4	16.3	18.5	18.9	19.9	1.53	4	17.5	21.6	18.9	31	6.34	4	15.9	20.4	18.5	28.6	5.74	4	15.5	18.1	18.4	19.9	2.1	4	15.4	19.5	19.9	22.9	3.5	4
Floodprone Width (ft)	48	150	143	266	111	4	48.1	158	158	266	104	4	48	158	158	266	104	4	48	158	158	266	104	4	48	158	158	266	104	4	48	158	158	266	104	4
Bankfull Mean Depth (ft)	0.87	1.35	1.33	1.88	0.45	4	1.05	1.43	1.42	1.83	0.33	4	1.06	1.4	1.33	1.86	0.35	4	1	1.34	1.34	1.68	0.33	4	1.2	1.5	1.4	1.9	0.3	4	1.1	1.4	1.3	1.9	0.4	4
[1]Bankfull Max Depth (ft)	1.78	2.35	2.37	2.87	0.45	4	1.86	2.21	2.15	2.66	0.35	4	1.96	2.57	2.68	2.95	0.43	4	1.9	2.46	2.58	2.79	0.41	4	2.1	2.7	2.9	2.9	0.4	4	1.9	2.6	2.8	2.9	0.5	4
Bankfull Cross Sectional Area (ft^2)	18.9	25.3	25.8	30.6	5.44	4	20.8	26.1	26.9	29.8	4.25	4	19.8	29.4	30.4	36.9	7.27	4	18.8	26.3	27.6	31.3	5.38	4	20.1	26.4	27.7	30.1	4.4	4	19.9	26.3	27.8	29.8	4.4	4
Width/Depth Ratio	8.16	16.1	15.7	24.7	7.14	4	8.93	13.7	13.4	19	4.17	4	9.44	16.5	15.2	26.1	7.21	4	9.5	16.5	14	28.6	8.41	4	8.2	12.7	14.1	14.3	3	4	8.1	14.8	15.9	19.1	4.7	4
Entrenchment Ratio	2.81	7.56	7.22	13	5.35	4	2.95	8.38	8.16	14.2	5.44	4	2.74	7	6.75	11.7	3.97	4	3.01	7.24	7.37	11.2	3.7	4	3.1	8.3	8.3	13.5	4.9	4	3.1	7.5	7.7	11.6	4	4
[1]Bank Height Ratio	0.97	0.99	1	1	0.02	4	0.69	0.9	0.96	1	0.15	4	0.87	0.92	0.9	1	0.06	4	0.91	0.95	0.94	0.99	0.04	4	1	1	1	1		4	1	1	1	1		4
Profile																																				
Riffle Length (ft)	13.7	23.1	22.9	36.6	6.2	17	13	22	20.4	34.8	6.42	17	15.1	27.9	26.5	44.5	8.84	17	18.5	28.2	27.7	45.6	7.72	17	8	26.3	25.4	58.7	13.4	21	5	25	22	87	18	23
Riffle Slope (ft/ft)	0	0.02	0.02	0.05	0.01	17	0.01	0.02	0.02	0.04	0.01	17	0	0.02	0.02	0.04	0.01	16	1.03	2.36	2.38	3.23	0.49	17	0.1	1.69	1.77	3.7	0.01	20	0.04	2.51	2.33	6.76	1.4	23
Pool Length (ft)	26.8	34.2	34.3	40.8	4.7	16	25.2	34.8	32.6	63.3	9.33	17	22.5	28.6	26.3	51.2	6.87	17	21.8	28	27.2	37	4.83	17	12.4	28.4	26.7	45.5	7.8	25	15	30	29	44	7	24
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	3.66	3.83	4.56	0.63	17	3.6	3.6	3.6	3.6	---	---	3.3	3.3	3.3	3.3	---	---
Pool Spacing (ft)	40	56	54	71	9.1	15	38.5	57.4	57.8	74.8	10.2	16	40	57	57.5	72.2	9.38	16	41.4	56.9	57.6	75	11	16	23	51	50	88	16	24	24	53	51	118	20	23
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																														

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

Additional Reach Parameters																																				
Rosgen Classification	C4						C4						C4						C4						C/E 4						C/E 4					
Channel Thalweg length (ft)	994						994						994						994						994						994					
Sinuosity (ft)	1.14						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						0.0115					
BF slope (ft/ft)	0.0111						0.0111						0.0132						0.0118						-----						-----					
[3]Ri% / Ru% / P% / G% / S%	41%		57%				38%		59%				49%		51%				51%		48%				44%		56%				45%		55%			
[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%	2%	19%	67%	10%	2%	0%
[3]d16 / d35 / d50 / d84 / d95 /													16.4	38.4	55.3	110	197		7.92	27.7	41.5	93.8	165		0.9	9.0	20.8	79.9	177.6		1.4	14.7	26.4	62.5	225.7	
[2]% of Reach with Eroding Banks													9%						2%						1%						0%					
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 = 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* with evidence of overbank including wrack and debris in trees and on banks	Bankfull Photo 2
October 2, 2013	September 3, 2012	3.6 inches of rain occurred on September 2-3, 2012 as documented at a nearby rain station*	--
October 2, 2013	September 6, 2012	2.6 inches of rain occurred on September 6, 2012 as documented at a nearby rain station*	--
October 2, 2013	September 18, 2012	2.1 inches of rain occurred on September 18, 2012 as documented at a nearby rain station*	--
October 2, 2013	May 20, 2013	2.8 inches of rain occurred on May 20, 2013 as documented at a nearby rain station*	--
October 2, 2013	June 7, 2013	3.2 inches of rain occurred on June 7, 2013 as documented at a nearby rain station*	--
October 2, 2013	June 30, 2013	8.1 inches of rain occurred on June 28-July 1, 2013 as documented at a nearby rain station*	Bankfull Photo 3

* Reported at KIGX Weather Station for Chapel Hill (Weather Underground 2013).

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

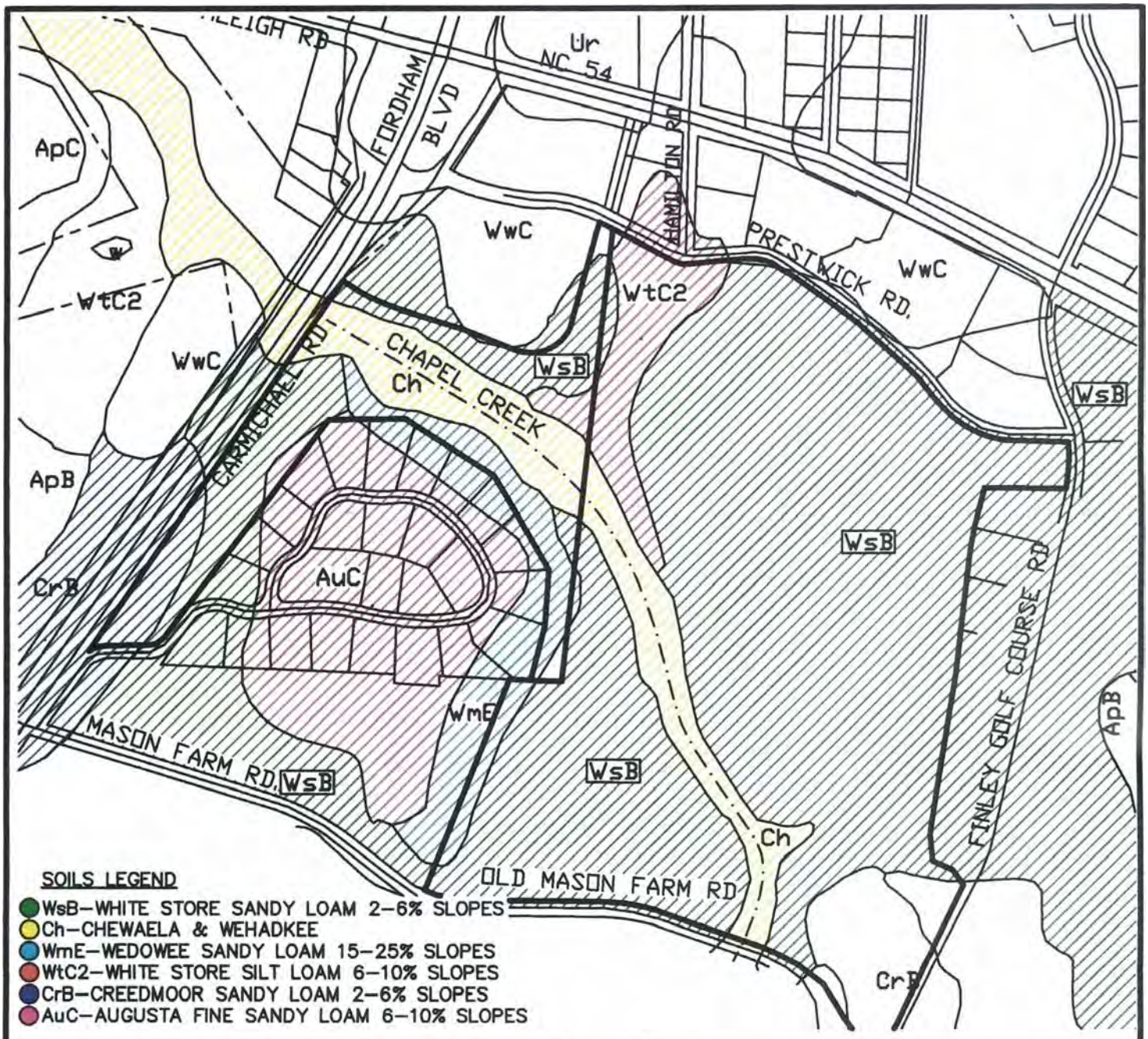
Bankfull Photo 2: Evidence of overbank including wrack and debris in trees and on banks.

Bankfull Photo 3: Evidence of overbank including wrack and debris on crest gage.

APPENDIX F

ADDITIONAL SITE MAPPING

Restoration Plan Figure 3. NRCS Soil Survey



Ecosystem Enhancement Program

North Carolina – Ecosystem Enhancement Program

Chapel Creek Stream Reference Site
Orange County, North Carolina
SCO ID #050645701

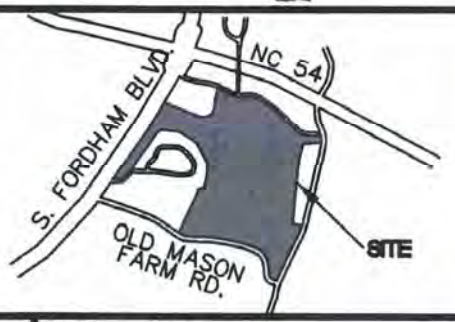


FIGURE 3
RESTORATION SITE
CHAPEL CREEK
NRCS SOILS SURVEY

DATE: JULY 25, 2006

WARD CONSULTING ENGINEERS, PC

1512 Eglantyne Court
Raleigh, NC 27613

(919) 870-0526
FAX (918) 870-5359

APPENDIX G

ADDITIONAL SITE PHOTOGRAPHS

Preconstruction Site Photographs

Asbuilt Site Photographs

Preconstruction Site Photographs

Asbuilt Photographs

Taken April 2, 2009