OAKLEY CROSSROADS
STREAM & BUFFER RESTORATION

MONITORING REPORT (YEAR 1 OF 5)

Pitt County, North Carolina
SCO Project Number 050659701
EEP Project Number 273

Prepared for:
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Status of Plan: Final
Construction Completed: 2011
Data Collected: 2011
Submission Date: November 2011

Prepared by:

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1.0 Executive Summary / Project Abstract

The overall goal of the Oakley restoration project was to improve water quality and wildlife habitat by restoring a stable stream and riparian buffer system to the project site. The objectives of the project were to restore stream stability and improve aquatic habitat, restore riparian buffer along the stream channel, preserve riverine wetlands, establish a wildlife corridor, divert an unbuffered agricultural ditch system from the stream channel to an irrigation pond, and establish native vegetation within the permanent conservation easement. The project included 3,789 linear feet of stream restoration and 329 linear feet of stream enhancement. Priority II stream restoration involved restoring riffle/pool sequences, the installation of structures, and floodplain grading to improve floodplain connectivity and provide diverse instream habitat. Enhancement II stream restoration involved the planting of native hardwood trees and shrubs. Also, native riparian buffer planting took place on over 18 acres of the site, and an additional 1.37 acres of wetland was preserved. The project will result in 3,931 stream mitigation units (SMUs), 16.9 acres of buffer mitigation units (BMUs), and 0.27 acres of wetland mitigation units (WMUs).

The Monitoring Year 1 [MY1] stem counts within each of the nine (9) vegetative monitoring plots are included in Tables 7 and 9 in Appendix C. Located within the Tar-Pamlico River basin, this project was instituted prior to October 11, 2007 and is therefore eligible for riparian buffer restoration credit up to 200 feet from the top of bank of all perennial and intermittent waterways within the conservation easement area. As such, the vegetative monitoring plots have been assessed for the vegetation success criteria for both buffer (320 planted trees/acre) and streams (MY3 interim criteria of 320 woody stems/acre). Seven of the nine vegetative monitoring plots met the vegetation success criteria for riparian buffers. Of the five plots within the 50-foot stream buffer, four are currently meeting the vegetation success criteria for streams. Ecosystems Grading Solutions, Inc. will be planting an additional 5,000 bare roots and livestakes at the Oakley site on January 31, 2012.

Several large areas of *Murdannia keisak* (marsh dayflower), an aquatic invasive plant, were observed to be either in or along the banks of stream Section 1, between Station 3+50 and 7+00. Minor areas of *Murdannia keisak* were also observed in the stream near Station 21+50. *Murdannia keisak* has the potential to out-compete native vegetation and overcrowd stream beds, disrupting flow and potentially causing ponding and sediment deposition upstream. Currently, these areas of *Murdannia keisak* do not pose a threat to native vegetation establishment or stream stability, but they will continue to be monitored during future field visits to document any changes. In addition, several areas of bare vegetation were observed. The streambanks on both left and right bank were observed to be bare below the Briley culvert, between Station 38+25 and 39+00. Additionally, two areas of bare vegetation were observed on the north and south side of the Briley pond. The bare area on the south side is due to a precipitation event in which the pond overflowed and washed away seeding. The bare area on the north side is due to poor vegetation establishment and seed being washed away during a precipitation event.

Sections 1, 2, and 3 of the Oakley restoration project were observed to be in generally stable condition. The channel's profile and cross-section adjusted only minimally from baseline conditions. The channel has good connection to its floodplain. Evidence of bankfull overflow was observed during the stream and vegetation monitoring on September 13th and 23rd, 2011. Evidence included the presence of wrack lines and sediment deposits on riparian vegetation. Hurricane Irene occurred in late August 2011. Additional

sediment transport evaluations were not undertaken. However, the dimension, pattern, and profile survey for MY1 conditions for Section 1 and Section 2 were analyzed, and the current shear stress and stream power are consistent with the design intent to reduce sediment transport.

One area of aggradation was observed below the upstream culvert between Station 0+00 and 0+60. Additionally, one area of minor bed downcutting was observed below the ford crossing. The areas of aggradation and bed downcutting do not currently threaten the stability of the stream. These areas will continue to be monitored during future field visits to document any changes. Several nutria burrows were also observed between Station 4+40 and 10+00. *Callitriche heterophylla* (water starwort), a non-invasive species, was observed in several areas along all three sections of the stream. This aquatic plant was also noted to be present prior to the construction of the restoration project. Neither the nutria nor the water starwort currently threatens the stability of the restored stream. These issues will continue to be monitored during future field visits to document any changes.

As per NCEEP's request the vegetative cover of brush mattresses along the entire stream length was also visually assessed. Several areas were observed where brush mattresses had less than the required 80% vegetative cover. These areas include brush mattresses located along the left bank on the meander bend near Stations 4+50, 8+50, 12+50, 17+00, and 25+00. Refer to Figure 2 in Appendix A for the location of these brush mattresses.

The wetland preservation areas were also visually assessed during the vegetation monitoring. No issues were observed in these areas and existing vegetation appears to be in good condition. These areas will continue to be monitored during future field visits.

Summary information, data, and statistics related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and 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

Channel stability and vegetation survival were monitored on the project site. Post-restoration monitoring will be conducted for a minimum of five years or until the success criteria are met following the completion of construction to document project success. The Monitoring Year 1 survey was completed using survey grade GPS on September 23, 2011.

2.1 MORPHOLOGICAL PARAMETERS AND CHANNEL STABILITY

2.1.1 Dimension

Dimensional characteristics were monitored at 7 permanent cross-sections (4 riffles, 3 pools) along Section 1 and Section 2. Survey data included points measured at all breaks in slope including top of bank, bankfull, inner berm, edge of water, and thalweg. Dimensional characteristics were compared to baseline conditions. All monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type. Stream channel stability and geomorphic monitoring for Section 3 was documented visually. Natural variability is expected, however the system should not experience trends toward excessive increasing bank erosion, channel degradation, or channel aggradation.

2.1.1 Pattern and Profile

The entire longitudinal profile of Section 1 and Section 2 was surveyed. Stationing from the as-built survey was used. The longitudinal profiles should show that the bedform features are remaining stable. The pools should remain deep with flat water surface slopes, and the riffles should remain steeper and shallower than the pools.

2.1.2 Substrate

Since the streams throughout the project site are dominated by sand-size particles, pebble count procedures would not show a significant change in bed material size or distribution over the monitoring period; therefore, as per NCEEP, bed material analyses were not undertaken for this project.

2.1.1 Sediment Transport

As mentioned previously, additional sediment transport evaluations will not be undertaken during the five-year monitoring period. However, the dimension, pattern, and profile survey for MY1 conditions for Section 1 and Section 2 were analyzed to determine whether the current sediment competency and capacity is consistent with the design.

2.2 VEGETATION

The Carolina Vegetation Survey (CVS) Level 1 methodology was utilized to sample vegetation in September of 2011. Nine 100-square meter CVS plots have been established within the project area. In each plot, four plot corners have been permanently located with rebar. Volunteer plant species (Level 2) will begin to be recorded in MY2 and will only be considered in vegetative success determinations for the stream portion of this project. As such, volunteer plant species will be recorded for subsequent monitoring

years in vegetation plots located within the 50 foot buffer of the restored stream. Refer to Figure 2 in Appendix A. In all vegetation plots species composition, density, and survival of the planted vegetation was monitored.

This project is generating both stream and riparian buffer mitigation assets. Vegetation success for these assets is measured in two ways. Stream mitigation units (SMUs) require 260 planted and volunteer native hardwood stems (trees and shrubs) per acre for a minimum of 5 years. Buffer mitigation units (BMUs) require 320 planted native hardwood stems (trees only) per acre for a minimum of 5 years. In accordance with North Carolina Division of Water Quality Administrative Code 15A NCAC 02B.0260 (TAR-PAMLICO RIVER BASIN, *Mitigation Program for Protection and Maintenance of Existing Riparian Buffers*) '[planted vegetation] shall include a minimum of at least two native hardwood tree species planted at a density to provide 320 trees per acre at maturity." Also, for SMUs and BMUs, the buffer must be at least 50-feet wide on both sides of the channel.

The interim measure of vegetative success for SMUs for the site will be the survival of at least 320 3-year old stems per acre at the end of year three of the monitoring period and 280 4-year old stems per acre at the end of year four monitoring period. There are no interim measures of vegetative success for BMUs.

2.3 HYDROLOGY

2.3.1 Wetland

Neither wetland restoration or enhancement credit is being sought for this project. Existing jurisdictional wetlands as depicted in Figure 2 in Appendix A are being preserved. The wetland preservation areas are visually assessed during each monitoring year.

2.3.2 Stream

One crest gauge has been installed onsite and is located near Cross-section 3. Each visit to the site included documentation of the highest stage for the monitoring interval and a reset of the device. Other indications of bankfull flow including the presence of wrack lines, sediment, or flooding were also monitored, and their presence was recorded and documented photographically. Refer to Figure 2 in Appendix A for the location of the crest gauge.

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 (http://cvs.bio.unc.edu/methods.htm)

NCDWQ. 2004. Tar-Pamlico River Basinwide Water Quality Plan. North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, NC.

NCEEP. 2010. Procedural Guidance and Content Requirements for EEP Monitoring Reports. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.3, January 15, 2010.

NCEEP. 2008. Mitigation Plan Document – Format Data Requirements, and Content Guidelines. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 2.0, March 27, 2008.

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

Schafale, M.P. and A.S. Weakley, 1990. Classification of the Natural Communities of North Carolina, Third Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDEHNR, Raleigh, North Carolina.

United States Army Corps of Engineers – Wilmington District, North Carolina Division of Water Quality, United States Environmental Protection Agency – Region IV, Natural Resources Conservation Service, North Carolina Wildlife Resources Commission. 2003. Stream Mitigation Guidelines.

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4.0 Appendices

Appendix A – Project Vicinity Map and Background Tables

Appendix B – Visual Assessment Data

Appendix C – Vegetation Plot Data

Appendix D – Stream Survey Data

Appendix E – Hydrologic Data

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Appendix A. Project Vicinity Map and Background Tables

Figure 1 – Vicinity Map and Directions
Table 1a.b. – Project Restoration Components
Table 2 – Project Activity and Reporting History
Table 3 – Project Contacts
Table 4 – Project Attribute

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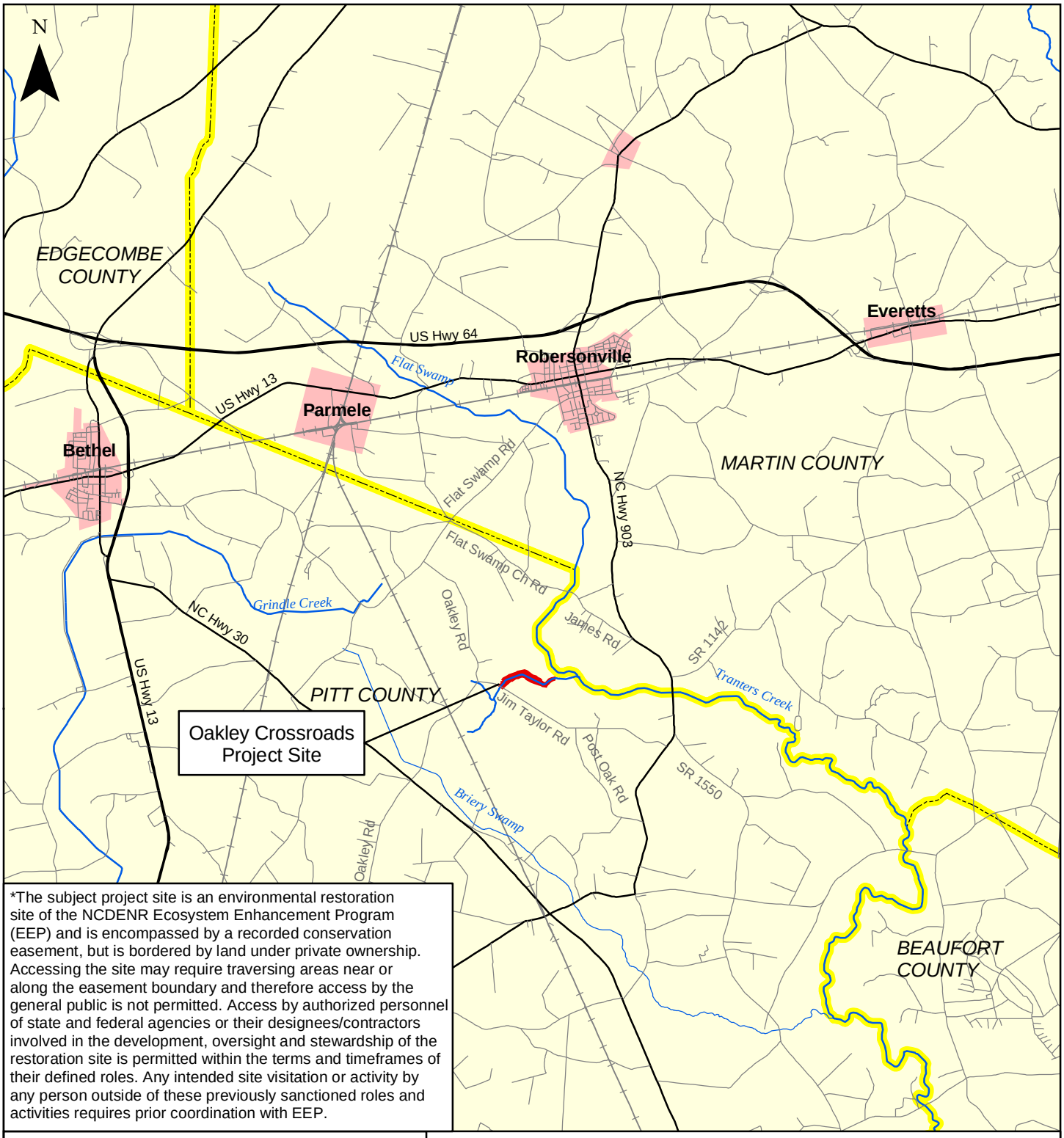
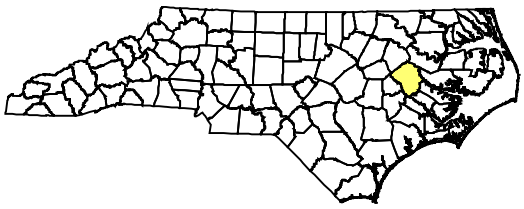


*The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.



Legend

- Local Roads
- Major Roads
- Railroads
- Conservation Easement
- Streams
- Municipality
- County Boundary

Figure 1. Project Vicinity Map

Oakley Crossroads
Stream & Buffer Restoration
Pitt County, North Carolina

0 0.5 1 2 Miles

Stantec

Ecosystem Enhancement Program

Table 1a. Project Components and Mitigation Credits									
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)									
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing/ Location**	**Mitigation Ratio**	**Mitigation Units**	**BMP Elements[1]**	**Comment**
Section 1	2,950	R	PII	3,637	00+00 to 37+98.64	1:1	3,637		Ten foot width of ford crossing removed from total length. 152 LF of restored stream with <50' buffer separated into line item below. Total restoration footage 3,637 LF.
Section 1, <50 ft buffer	152	R	PII	152	~33+00 to ~37+00	1:1	152		152 LF of restored stream has <50' buffer on right bank. Mitigation ratio is likely to change once DWQ publishes reduced SMU calculation for areas with <50 ft of buffer.
Section 2	40	E	EII	40	~38+39 to ~38+79	1.5:1	26.7		Enhancement - log structures, brush mattresses and planting.
Section 3	289	E	EII	289	downstream of Section 2	2.5:1	115.6		Enhancement - planting only.
Riparian Buffer	n/a	R		735,728 sq ft	n/a	1:1	735,728		786,258 sq ft planted, 735,728 sq ft of which are eligible for mitigation credit. Area removed for areas with undiffuse flow, buffer width >200', or buffer width <50'.
Wetlands	1.37	P		1.37	n/a	5:1	0.27		

Table 1b. Component Summations							
UT Jumping Run Creek Restoration Project/EEP Project No. 92345							
Restoration	Stream	Riparian		Non-Ripar	Upland	Buffer	
Level	(lf)	Wetland (Ac)		(Ac)	(Ac)	(Ac)	BMP
		Riverine	Non-Riverine				
Restoration	3789					16.9	
Enhancement							
Enhancement I							
Enhancement II	329						
Creation							
Preservation		1.37					
HQ Preservation							
Totals (Feet/Acres)	**4118**	**1.37**				**16.9**	
MU Totals	**3,931**	**0.27**				**16.9**	

Non-Applicable

Table 2. Project Activity and Reporting History		
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)		
Elapsed Time Since Grading Complete:	**4 months**	
Elapsed Time Since Planting Complete:	**4 months**	
Number of Reporting Years[1]:	**1**	
Activity or Deliverable	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	n/a	August 2006
Final Design – Construction Plans	n/a	June 2010
Construction	n/a	May 2011
Seeding	n/a	May 2011
Planting	n/a	May 2011
As-built (Year 0 Monitoring – baseline)	June 2011	July 2011
Year 1 Monitoring	September 2011	November 2011
Year 2 Monitoring	n/a	n/a
Year 3 Monitoring	n/a	n/a
Year 4 Monitoring	n/a	n/a
Year 5 Monitoring	n/a	n/a

1 = Equals the number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table	
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)	
Designer	Stantec Consulting Services, Inc.
	801 Jones Franklin Rd, Ste 300, Raleigh, NC 27606
Primary project design POC	Nathan Jean (970) 449-8615
Construction Contractor	Ecosystems Grading Solutions, Inc.
	6642 Roper Hollow Rd., Morganton, NC 28655
Construction contractor POC	Bobby Koone (828) 584-3018
Survey Contractor	Turner Land Surveying
	3201 Glenridge Dr., Raleigh, NC 27604
Survey contractor POC	Elizabeth and David Turner (919) 875-1378
Planting Contractor	Bruton Natural Systems, Inc.
	P.O. Box 1197, Remont, NC 27830
Planting contractor POC	Charlie Bruton (919) 242-6555
Seeding Contractor	Ecosystems Grading Solutions, Inc.
	6642 Roper Hollow Rd., Morganton, NC 28655
Contractor point of contact	Bobby Koone (828) 584-3018
Seed Mix Sources	Green Resources
Nursery Stock Suppliers	Southeastern Native Plant Nursery
	South Carolina Super Tree Nursery
	Natives
Monitoring Performers	Stantec Consulting Services, Inc.
	801 Jones Franklin Rd, Ste 300, Raleigh, NC 27606
Stream Monitoring POC	Brian Mazzochi (919) 865-7580
Vegetation Monitoring POC	Amber Coleman (919)865-7399
Wetland Monitoring POC	n/a

Table 4. Project Baseline Information and Attributes			
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)			
Project Information			
Project County	Pitt		
Project Area (acres)	26.6		
Project Coordinates (latitude and longitude)	35.76692, -77.269077		
Project Watershed Summary Information			
Physiographic Region	Coastal Plain		
River Basin	Tar-Pamlico		
USGS HUC for Project (14 digit)	0302010309002		
NCDWQ Sub-basin for Project	03-03-06		
Project Drainage Area (sq mi)	1.59		
Project Drainage Area % Impervious	<1%		
CGIA Landuse Classification	Cropland and Pasture		
Reach Summary Information			
Reach name	Section 1	Section 2	Section 3
Length of reach (linear feet)	3,799	40	289
Valley classification	VIII	VIII	VIII
Drainage area (acres)	10,178.6	10,178.8	10,260.1
NCDWQ stream identification score	41	40.5	40.5
NCDWQ classification	n/a	n/a	n/a
Morphological description (stream type)	E5	F5	F5
Evolutionary trend	E5	C5	C5
Underlying mapped soils	Bladen	Pantego	Pantego
Drainage class	Poorly drained	Very poorly drained	Very poorly drained
Soil hydric status	Yes	Yes	Yes
Slope	0-2%	0-1%	0-1%
FEMA classification	Zone X	Zone X	Zone X
Native vegetation community	Riverine bottomland hardwood and mesic mixed hardwood forest		
Percent composition of exotic invasive vegetation	0%	0%	10%
Wetland Summary Information			
n/a - wetland preservation only			
Regulatory Considerations			
Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States - Section 404	Yes	Yes	USACE 404 permit
Waters of the United States - Section 401	Yes	Yes	NCDWQ 401 permit
Endangered Species Act	No	n/a	n/a
Historic Preservation Act	No	n/a	n/a
Coastal Zone Management Act (CZMA)/Coastal Aream Management Act (CAMA)	No	n/a	n/a
FEMA Floodplain Compliance	No	n/a	n/a

Appendix B. Visual Assessment

Figure 2 – Current Condition Plan View (3 Sheets)
Table 5 – Visual Stream Morphology Stability Assessment
Table 6 – Vegetation Condition Assessment
Photos – Stream Stations (S1-S9)
Photos – Vegetation Plots (V1-V19)

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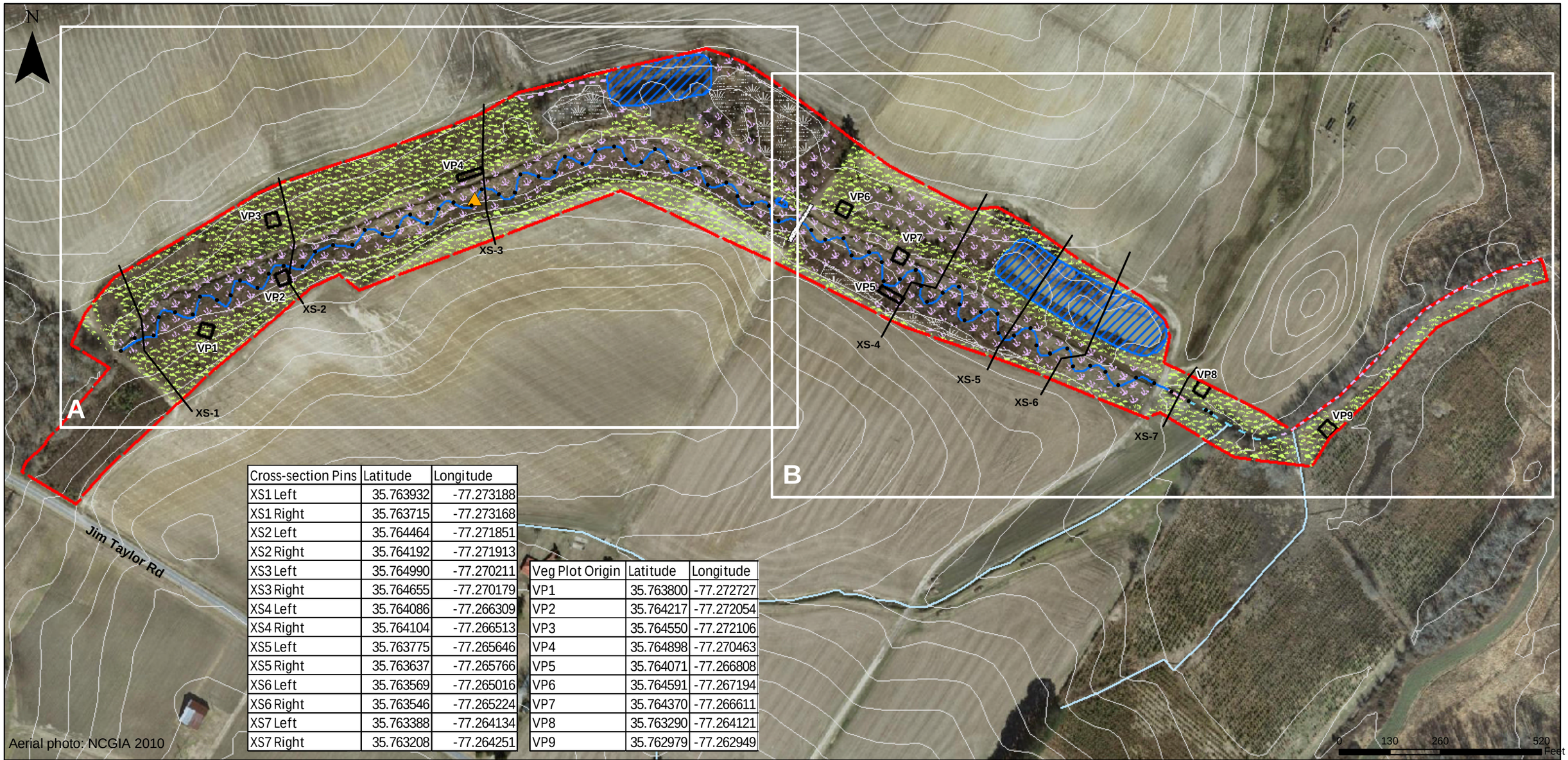

Cross-section Pins	Latitude	Longitude
XS1 Left	35.763932	-77.273188
XS1 Right	35.763715	-77.273168
XS2 Left	35.764464	-77.271851
XS2 Right	35.764192	-77.271913
XS3 Left	35.764990	-77.270211
XS3 Right	35.764655	-77.270179
XS4 Left	35.764086	-77.266309
XS4 Right	35.764104	-77.266513
XS5 Left	35.763775	-77.265646
XS5 Right	35.763637	-77.265766
XS6 Left	35.763569	-77.265016
XS6 Right	35.763546	-77.265224
XS7 Left	35.763388	-77.264134
XS7 Right	35.763208	-77.264251

Veg Plot Origin	Latitude	Longitude
VP1	35.763800	-77.272727
VP2	35.764217	-77.272054
VP3	35.764550	-77.272106
VP4	35.764898	-77.270463
VP5	35.764071	-77.266808
VP6	35.764591	-77.267194
VP7	35.764370	-77.266611
VP8	35.763290	-77.264121
VP9	35.762979	-77.262949

Figure 2. Current Condition Plan View

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
November 2011

- Crest gage
- Vegetation monitoring plots (VP 1-9)
- Stream cross-section surveys (XS 1-7)
- Conservation easement
- 2' contours
- Section 1 Stream Restoration Centerline MY1
- Section 2 Stream Enhacement II
- Section 3 Stream Enhacement II (planting only)
- Other on-site hydrography
- Non-buffered waterways
- Ponds
- Ford crossing
- Wetland preservation

Planting Zones
- Riverine Bottomland Hardwood Forest
- Mesic Mixed Hardwood Forest

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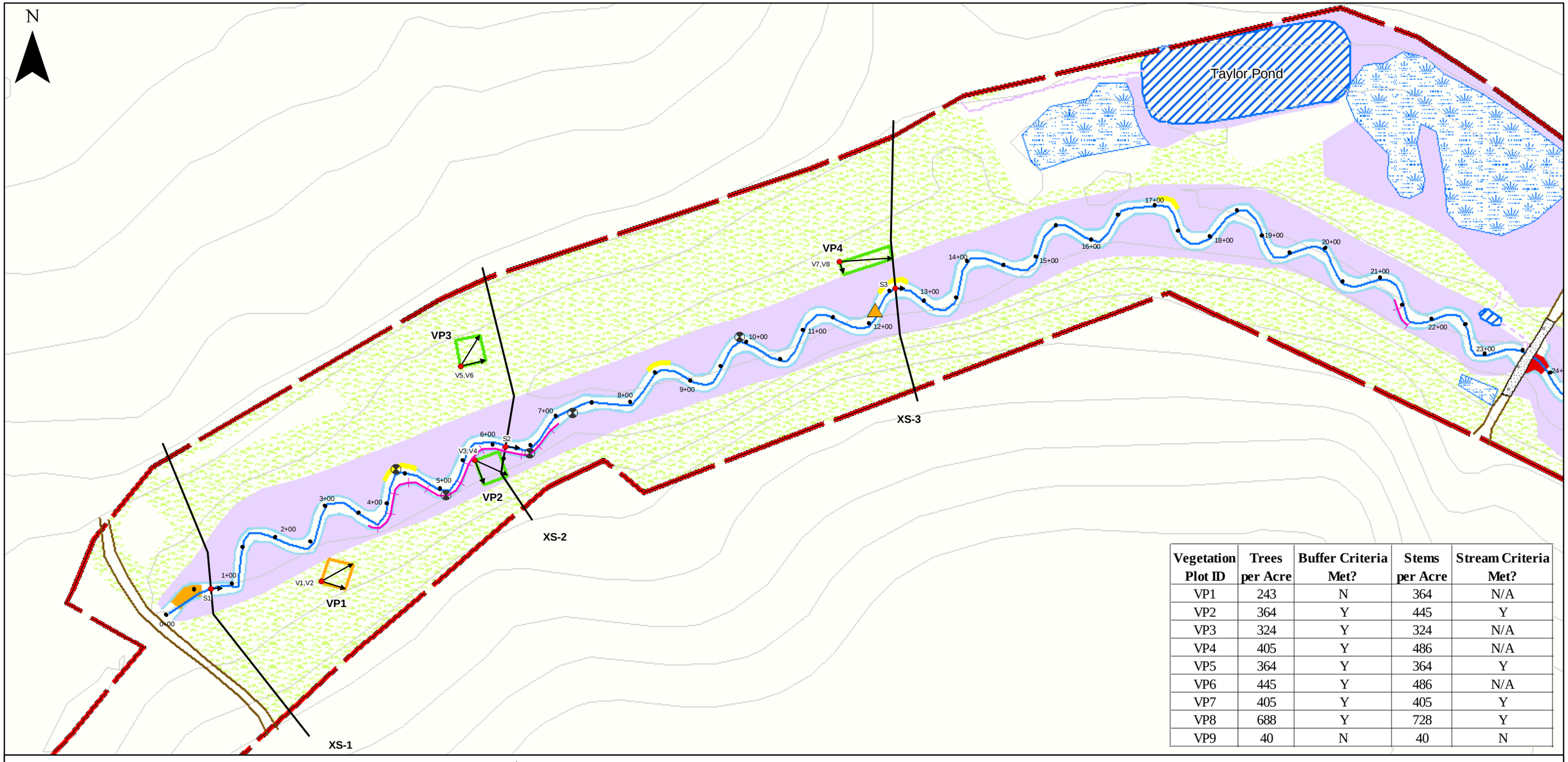

Vegetation Plot ID	Trees per Acre	Buffer Criteria Met?	Stems per Acre	Stream Criteria Met?
VP1	243	N	364	N/A
VP2	364	Y	445	Y
VP3	324	Y	324	N/A
VP4	405	Y	486	N/A
VP5	364	Y	364	Y
VP6	445	Y	486	N/A
VP7	405	Y	405	Y
VP8	688	Y	728	Y
VP9	40	N	40	N

Figure 2a. Current Condition Plan View

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
November 2011

Crest gage
Photo points (Veg=V, Stream=S)

Vegetation Plot Success (VP 1-9)
- Buffer=Yes, Stream=Yes or n/a
- Buffer=No, Stream=n/a
- Buffer=No, Stream=No

Stream cross-section surveys (XS 1-7)
2' contours
Farm paths
Ford crossing
Conservation easement

Section 1 Stream Restoration Thalweg MY1
Section 2 Stream Enhacement II
Section 3 Stream Enhacement II (planting only)
Other on-site hydrography
Ponds
Wetland preservation

Planting Zones
- Riverine Bottomland Hardwood Forest
- Mesic Mixed Hardwood Forest
- Livestakes

Vegetation Problem Areas
- Murdannia keisak
- Bare - no vegetation

Stream Problem Areas
- Nutria burrow
- Aggradation
- Bed downcutting
- Brush mattress <80% vegetative cover

0 100 200 Feet

Ecosystem Enhancement Program
Stantec

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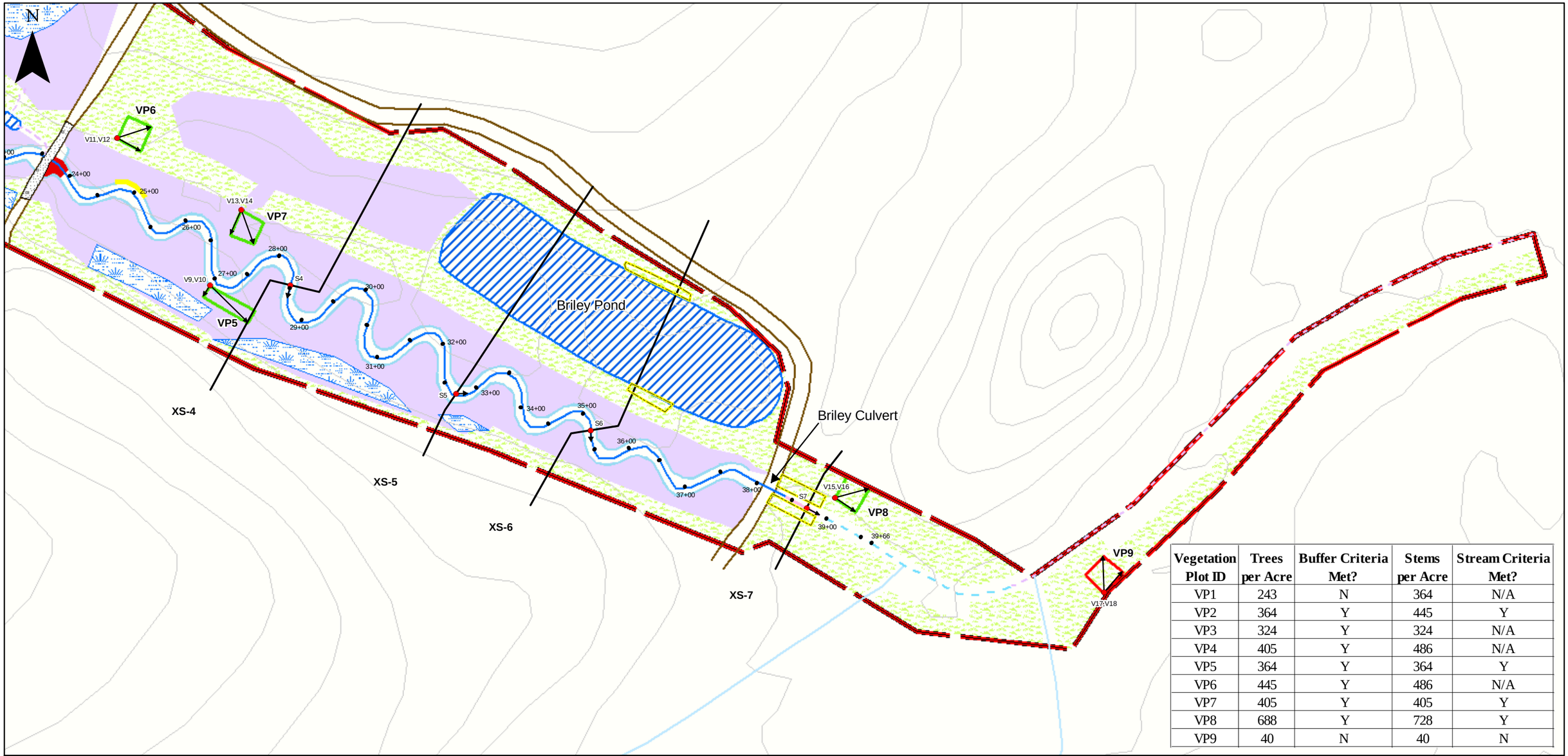

Vegetation Plot ID	Trees per Acre	Buffer Criteria Met?	Stems per Acre	Stream Criteria Met?
VP1	243	N	364	N/A
VP2	364	Y	445	Y
VP3	324	Y	324	N/A
VP4	405	Y	486	N/A
VP5	364	Y	364	Y
VP6	445	Y	486	N/A
VP7	405	Y	405	Y
VP8	688	Y	728	Y
VP9	40	N	40	N

Figure 2b. Current Condition Plan View

Oakley Crossroads Stream and Buffer Restoration Project
EEP #: 273
Pitt County, North Carolina
November 2011

Crest gage
Photo points (Veg=V, Stream=S)
Vegetation Plot Success (VP 1-9)
Buffer=Yes, Stream=Yes or n/a
Buffer=No, Stream=n/a
Buffer=No, Stream=No
Stream cross-section surveys (XS 1-7)
2' contours
Farm paths
Ford crossing
Conservation easement

Section 1 Stream Restoration Thalweg MY1
Section 2 Stream Enhancement II
Section 3 Stream Enhancement II (planting only)
Other on-site hydrography
Non-buffered waterways
Ponds
Wetland preservation
Planting Zones
Riverine Bottomland Hardwood Forest
Mesic Mixed Hardwood Forest
Livestakes

Vegetation Problem Areas
Murdannia keisak
Bare - no vegetation
Stream Problem Areas
Nutria burrow
Aggradation
Bed downcutting
Brush mattress <80% vegetative cover

0 100 200 Feet

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Table 5 **Visual Stream Morphology Stability Assessment**
Reach ID **Reach 1**
Assessed Length **3800**

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)			2	80	98%			
		2. Degradation - Evidence of downcutting			1	20	99%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	N/A	56			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	56	56			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	56	56			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	56	56			100%			
		2. Thalweg centering at downstream of meander (Glide)	56	56			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	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.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	11	11			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	7	11			64%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	11	11			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)	11	11			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	11	11			100%			

Table 6. Vegetation Condition Assessment						
Oakley Crossroads Stream and Buffer Restoration (EEP# 273)						
Planted acreage*	18					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover of woody material	0.1 acres	Dashed yellow/black outline	4	0.1	0.6%
2. Low Stem Density	Woody stem densities below target levels for stem count success criteria	0.1 acres	none	0	0	0.0%
			Total	4	0.1	0.6%
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	None	0	0	0.0%
			Total	4	0.1	0.6%
Easement acreage	26.6					
Vegetation Category	**Definitions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
4. Invasive areas of concern	*Murdannia keisak*	1000 SF	Magenta line with cross-hatches	2 line segments ~3' wide	0.025	0.1%
5. Encroachment areas		none	None	0	0	0.0%

*Total planted acreage

Stream Station Photos

Photo Station S1 – Stream channel looking downstream at cross-section 1 Station 00+72 - Priority 2 (9/23/2011 Year 1)

Photo Station S2 –Stream channel looking downstream at cross-section 2 Station 06+17 – Priority 2 (9/23/2011 Year 1)

Photo Station S3 – Stream channel looking downstream at cross-section 3
Station 12+59 – Priority 2 (9/23/2011 Year 1)

Photo Station S4 – Stream channel looking downstream at cross-section 4
Station 28+46 – Priority 2 (9/23/2011 Year 1)

Photo Station S5 – Stream channel looking downstream at cross-section 5 Station 32+71 – Priority 2 (9/23/2011 Year 1)

Photo Station S6 – Stream channel looking downstream at cross-section 6 Station 35+24 – Priority 2 (9/23/2011 Year 1)

Photo Station S7 – Stream channel looking downstream at cross-section 7 Station 38+71 – Enhancement 2 (9/23/2011 Year 1)

Photo S8 – Evidence of bankfull overflow – wrack lines near Veg Plot 1 (9/13/2011 Year 1)

Photo S9 – Evidence of bankfull overflow – wrack lines near Veg Plot 5 (9/13/2011)

Vegetation Plot Photos

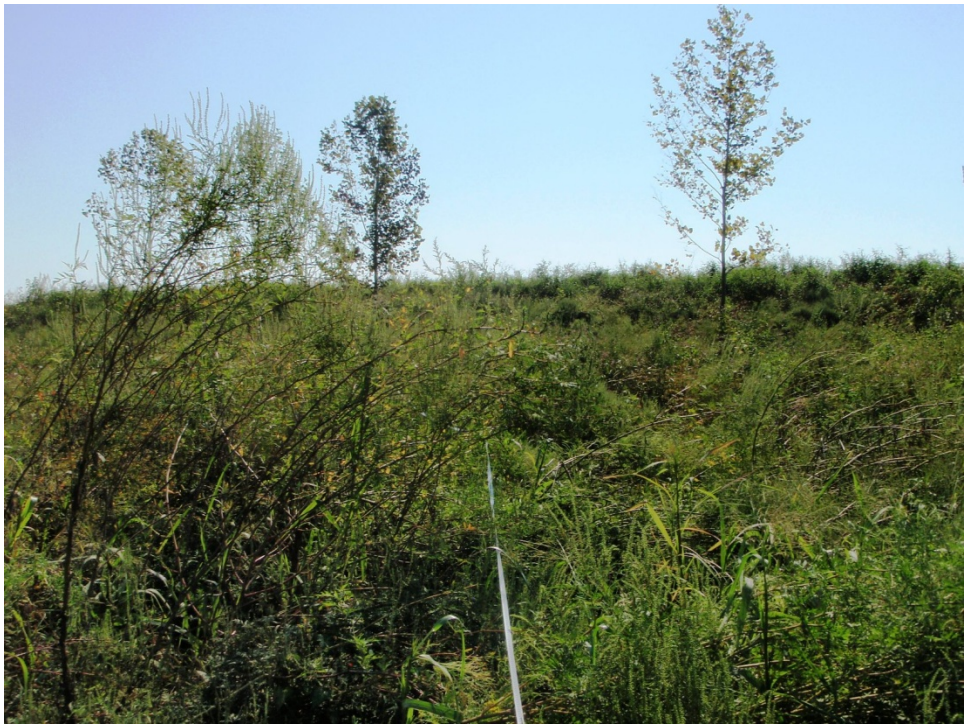

Photo Station V1 - Veg Plot 1 looking southeast (9/13/2011 Year 1)

Photo Station V2 - Veg Plot 1 looking east (9/13/2011 Year 1)

Photo Station V3 - Veg Plot 2 looking south (9/13/2011 Year 1)

Photo Station V4 - Veg Plot 2 looking southeast (9/13/2011 Year 1)

Photo Station V5 - Veg Plot 3 looking east (9/13/2011 Year 1)

Photo Station V6 - Veg Plot 3 looking northeast (9/13/2011 Year 1)

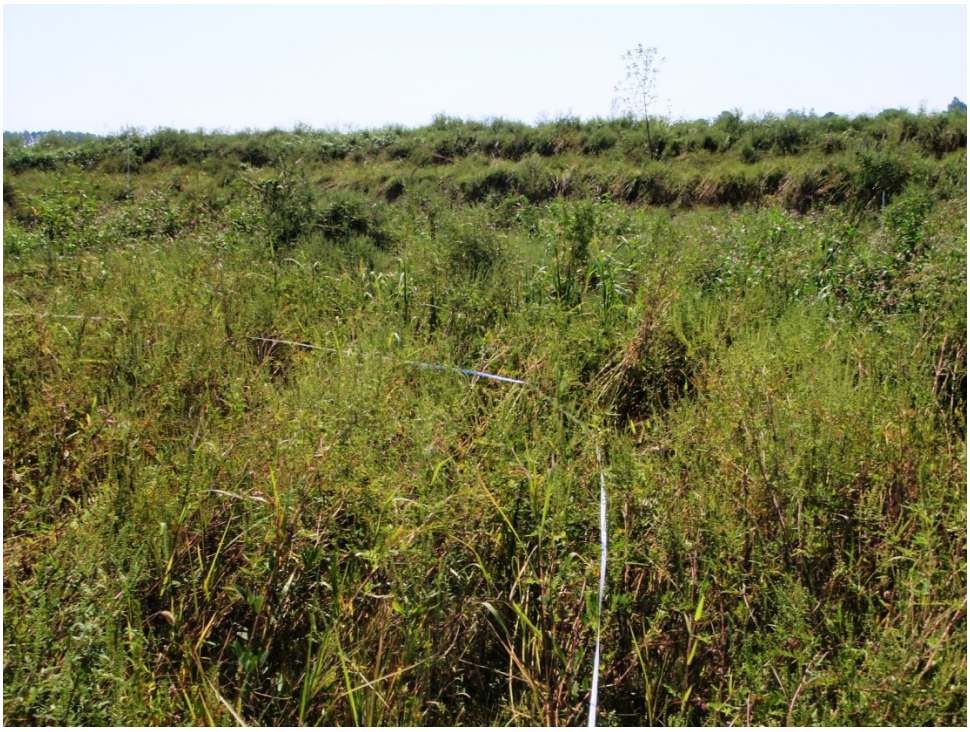

Photo Station V7 - Veg Plot 4 looking south (9/13/2011 Year 1)

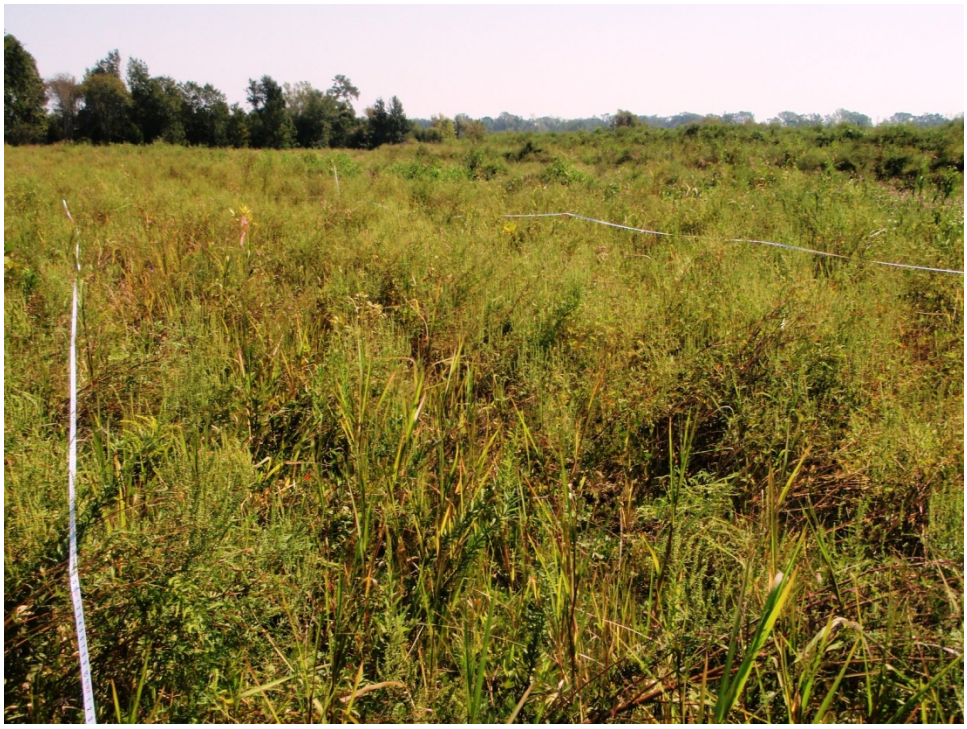

Photo Station V8 - Veg Plot 4 looking southeast (9/13/2011 Year 1)

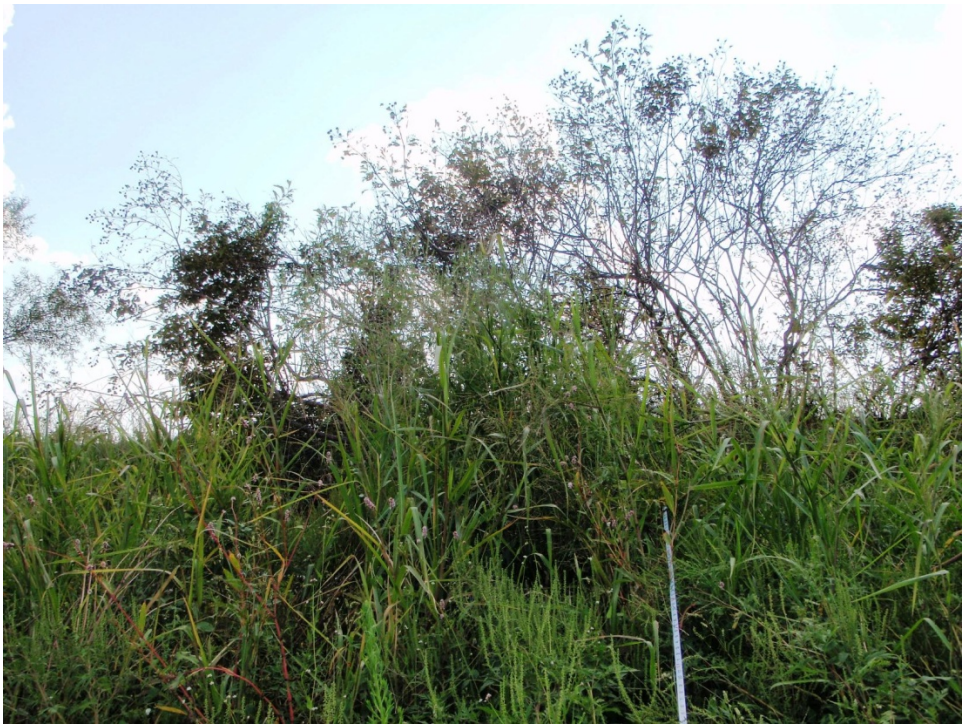

Photo Station V9 - Veg plot 5 looking south (9/13/2011 Year 1)

Photo Station V10 - Veg plot 5 looking southeast (9/13/2011 Year 1)

Photo Station V11 - Veg plot 6 looking east (9/13/2011 Year 1)

Photo Station V12 - Veg plot 6 looking northeast (9/13/2011 Year 1)

Photo Station V13 - Veg plot 7 looking south (9/13/2011 Year 1)

Photo Station V14 - Veg plot 7 looking southeast (9/13/2011 Year 1)

Photo Station V15 - Veg plot 8 looking east (9/13/2011 Year 1)

Photo Station V16 - Veg plot 8 looking northeast (9/13/2011 Year 1)

Photo Station V17 - Veg plot 9 looking northeast (9/13/2011 Year 1)

Photo Station V18 - Veg plot 9 looking north (9/13/2011 Year 1)

Appendix C. Vegetation Plot Data

Table 7a,b. – Vegetation Plot Mitigation Success Summary
Table 8 – CVS Vegetation Metadata
Table 9 – CVS Stem Count Total and Planted by Plot and Species

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Table 7a. Vegetation Plot Criteria Attainment Stream Criteria			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
Section 1	VP1	N/A	80%
Section 1	VP2	Y	
Section 1	VP3	N/A	
Section 1	VP4	N/A	
Section 1	VP5	Y	
Section 1	VP6	N/A	
Section 1	VP7	Y	
Section 2	VP8	Y	
Section 3	VP9	N	

Table 7b. Vegetation Plot Criteria Attainment Buffer Criteria			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
Section 1	VP1	N	78%
Section 1	VP2	Y	
Section 1	VP3	Y	
Section 1	VP4	Y	
Section 1	VP5	Y	
Section 1	VP6	Y	
Section 1	VP7	Y	
Section 2	VP8	Y	
Section 3	VP9	N	

Table 8 - CVS Metdata	
Oakley Crossroads Stream and Buffer Restoration - EEP #273	
Report Prepared By	Alex Baldwin
Date Prepared	9/20/2011 16:08
Database name	Stantec_Oakley-2011-A.mdb
Database location	U:\175613016\project\site_data\vegetation
Computer name	BALDWINA
File size	36032512
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.
Planted 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	273
Project Name	Oakley Crossroads (G)
Description	Stream and Wetland Restoration
River Basin	Tar-Pamlico
Length(ft)	
Stream-to-edge width (ft)	
Area (sq m)	
Required Plots (calculated)	
Sampled Plots	9

Table 9. CVS Stem Count Total and Planted by Plot and Species
EEP Project Code 273. Project Name: Oakley Crossroads

			Current Plot Data (MY1 2011)																										Annual Means					
			E273-01-0001			E273-01-0002			E273-01-0003			E273-01-0004			E273-01-0005			E273-01-0006			E273-01-0007			E273-01-0008			E273-01-0009			MY1 (2011)			MY0 (2011)		
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**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Eubotrys racemosa	swamp doghobble	Shrub				1	1	1																					1	1	1	1	1	1
Fraxinus pennsylvanica	green ash	Tree	4	4	4				2	2	2	3	3	3				4	4	4									13	13	13	13	13	13
Magnolia virginiana	sweetbay	Tree	1	1	1							1	1	1				1	1	1									3	3	3	3	3	3
Morella cerifera	wax myrtle	Shrub	2	2	2							1	1	1															3	3	3	3	3	3
Nyssa biflora	swamp tupelo	Tree																			1	1	1						1	1	1	1	1	1
Nyssa sylvatica	blackgum	Tree							1	1	1				1	1	1												2	2	2	2	2	2
Platanus occidentalis	American sycamore	Tree	2	2	2				3	3	3	5	5	5				1	1	1	2	2	2				1	1	1	14	14	14	14	14	14
Quercus	oak	Tree				1	1	1																1	1	1				2	2	2	7	7	7
Quercus falcata	southern red oak	Tree							2	2	2	2	2	2										6	6	6				10	10	10	12	12	12
Quercus lyrata	overcup oak	Tree				5	5	5							1	1	1	1	1	1										7	7	7	4	4	4
Quercus michauxii	swamp chestnut oak	Tree				2	2	2							3	3	3				2	2	2							7	7	7	9	9	9
Quercus nigra	water oak	Tree																5	5	5	1	1	1	7	7	7				13	13	13	7	7	7
Quercus pagoda	cherrybark oak	Tree				1	1	1																1	1	1				2	2	2			
Quercus phellos	willow oak	Tree				1	1	1							4	4	4				4	4	4	3	3	3				12	12	12	16	16	16
Unknown		unknown																														1	1	1
		Stem count	9	9	9	11	11	11	8	8	8	12	12	12	9	9	9	12	12	12	10	10	10	18	18	18	1	1	1	90	90	90	93	93	93
		Tree count	7	7	7	10	10	10	8	8	8	11	11	11	9	9	9	12	12	12	10	10	10	18	18	18	1	1	1	86	86	86	89	89	89
		size (ares)	1			1			1			1			1			1			1			1			1			9			9		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22			0.22		
		Species count	4	4	4	6	6	6	4	4	4	5	5	5	4	4	4	5	5	5	5	5	5	5	5	5	1	1	1	14	14	14	14	14	14
		Trees per ACRE	283.3	283.3	283.3	404.7	404.7	404.7	323.7	323.7	323.7	445.2	445.2	445.2	364.2	364.2	364.2	485.6	485.6	485.6	404.7	404.7	404.7	728.4	728.4	728.4	40.47	40.47	40.47	386.7	386.7	386.7	400.2	400.2	400.2
		Stems per ACRE	364.2	364.2	364.2	445.2	445.2	445.2	323.7	323.7	323.7	485.6	485.6	485.6	364.2	364.2	364.2	485.6	485.6	485.6	404.7	404.7	404.7	728.4	728.4	728.4	40.47	40.47	40.47	404.7	404.7	404.7	418.2	418.2	418.2

Vegetation success criteria for streams: 320 planted trees or shrubs per acre (3-year interim measure)
Vegetation success criteria for buffers: 320 planted trees per acre

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%

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Appendix D. Stream Survey Data

Figures 3a-j – Cross-Sections with Annual Overlays
Figure 4 – Longitudinal Profiles with Annual Overlays
Table 10a,b. – Baseline – Stream Data Summary
Table 11a. – Monitoring – Cross-section Morphology Data
Table 11b. – Monitoring – Stream Reach Morphology Data

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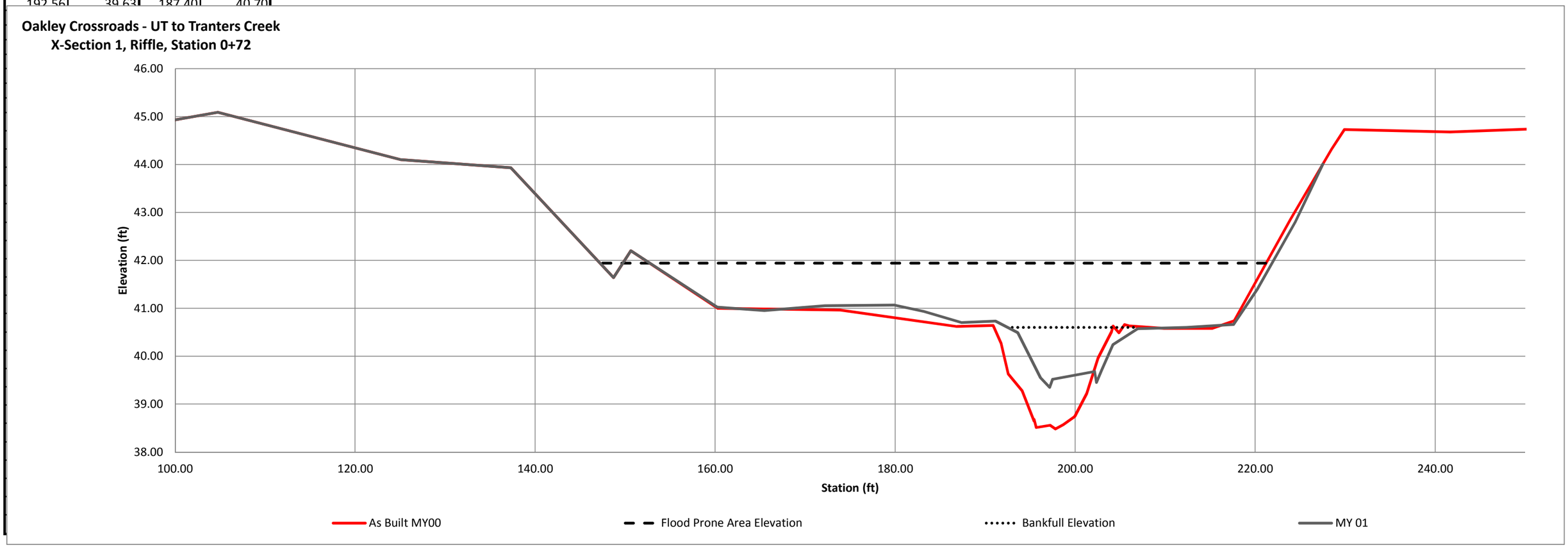
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-1, Riffle, STA 0+72
Drainage Area(sq. mi.)	1.59
Date	9/1/2011
Field Crew	N. Jean, B.Mazzochi, A. Baldwin

MY 00		MY 01	
Station	Elevation	Station	Elevation
12.21	49.05	12.21	49.05
19.33	48.29	19.33	48.29
28.16	46.74	28.16	46.74
35.77	46.38	35.77	46.38
47.80	45.82	47.80	45.82
59.77	45.48	59.77	45.48
74.68	45.23	74.68	45.23
81.30	45.02	81.30	45.02
87.17	45.62	87.17	45.62
93.57	44.59	93.57	44.59
98.13	44.87	98.13	44.87
104.75	45.09	104.75	45.09
125.09	44.10	125.09	44.10
137.30	43.93	137.30	43.93
148.71	41.64	148.71	41.64
150.62	42.20	150.62	42.20
160.31	41.00	160.25	41.02
173.90	40.96	165.47	40.95
186.83	40.62	172.19	41.05
190.89	40.64	179.93	41.07
191.77	40.27	183.19	40.94
192.56	39.63	187.40	40.70

SUMARY DATA	MY00	MY01
Bankfull Elevation	40.63	40.72
Bankfull Cross-Sectional Area	18.33	8.37
Bankfull Width	20.80	12.39
Flood Prone Area Elevation	42.78	41.63
Flood Prone Width	80.66	65.65
Max Depth at Bankfull	2.15	1.14
Mean Depth at Bankfull	0.88	0.68
W/D Ratio	23.64	18.22
Entrenchment Ratio	3.88	5.30
Bank Height Ratio	1.00	1.00
Stream Type	C	C

Sta. 0+75 Looking Downstream



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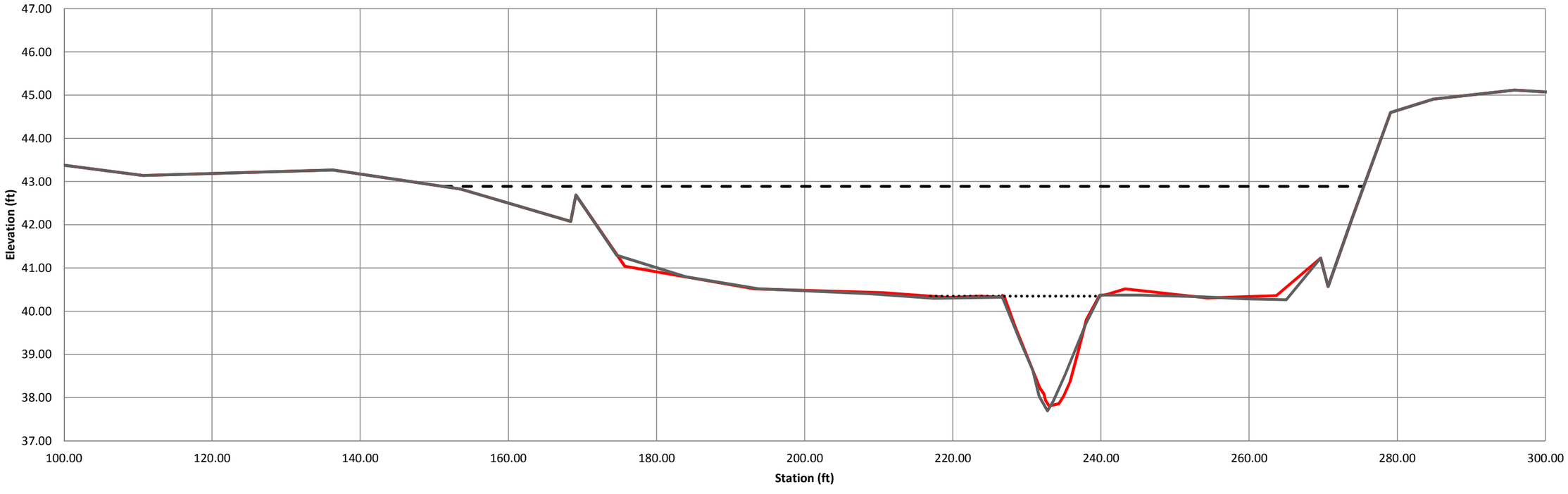
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-2, Riffle, STA 6+17
Drainage Area(sq. mi.)	1.59
Date	9/1/2011
Field Crew	N. Jean, B.Mazzochi, A. Baldwin

MY 00		MY 01	
Station	Elevation	Station	Elevation
12.76	46.91	12.76	46.91
33.99	44.63	33.99	44.63
54.24	44.37	54.24	44.37
72.47	43.91	72.47	43.91
92.77	43.54	92.77	43.54
110.68	43.14	110.68	43.14
136.32	43.27	136.32	43.27
153.53	42.83	153.53	42.83
168.42	42.08	168.42	42.08
169.10	42.69	169.10	42.69
175.71	41.04	174.60	41.30
193.21	40.52	183.93	40.80
210.45	40.43	193.68	40.52
219.41	40.32	208.61	40.41
223.60	40.35	217.46	40.30
226.57	40.33	226.67	40.33
226.69	40.37	229.04	39.32
227.04	40.30	230.82	38.62
228.42	39.64	231.63	38.04
229.95	38.99	232.76	37.70
231.78	38.21	233.53	37.92
232.29	38.09	235.12	38.52
232.51	37.94	237.92	39.70

SUMARY DATA	MY00	MY01
Bankfull Elevation	40.35	40.38
Bankfull Cross-Sectional Area	18.16	17.88
Bankfull Width	16.60	13.16
Flood Prone Area Elevation	42.89	43.06
Flood Prone Width	124.27	124.27
Max Depth at Bankfull	2.54	2.68
Mean Depth at Bankfull	1.09	1.37
W/D Ratio	15.23	9.61
Entrenchment Ratio	7.49	9.44
Bank Height Ratio	1.00	1.00
Stream Type	C	C

Sta. 6+17 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 2, Riffle, Station 6+17



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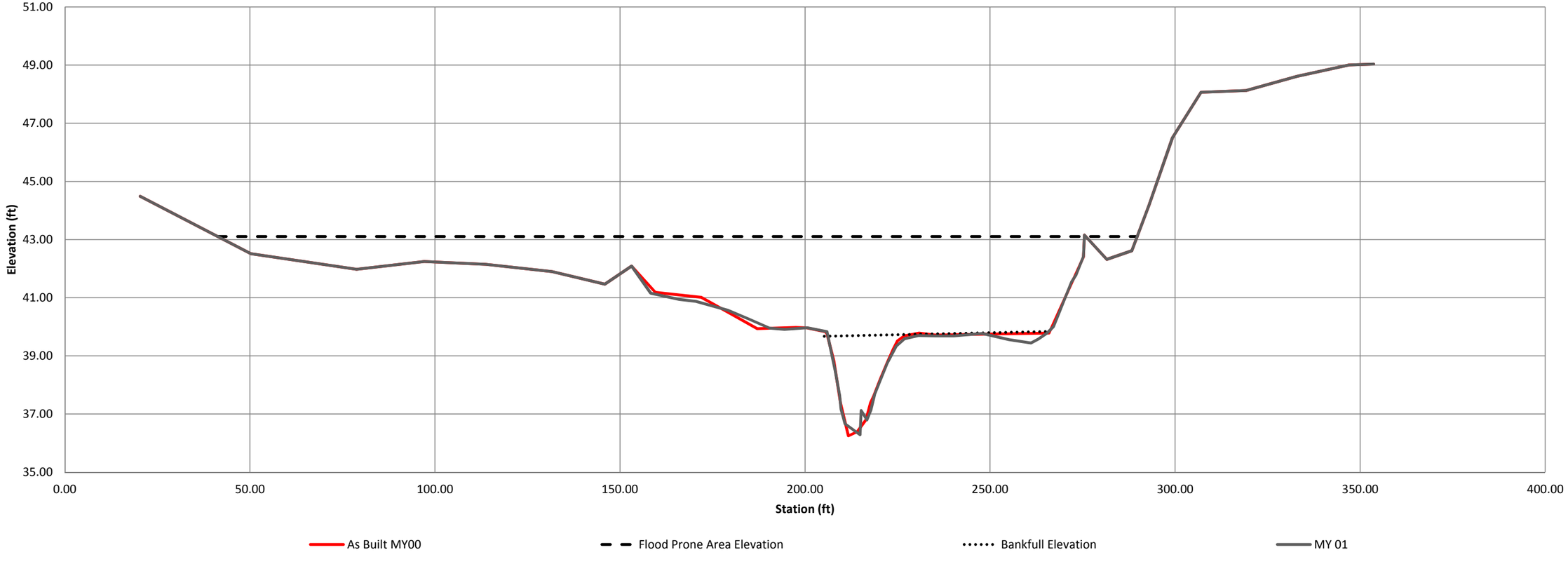
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-3, Pool, STA 12+59
Drainage Area(sq. mi.)	1.59
Date	9/1/2011
Field Crew	N. Jean, B.Mazzochi, A. Baldwin

MY 00		MY 01	
Station	Elevation	Station	Elevation
20.32	44.49	20.32	44.49
50.25	42.52	50.25	42.52
78.82	41.98	78.82	41.98
97.11	42.25	97.11	42.25
113.72	42.15	113.72	42.15
131.64	41.90	131.64	41.90
145.91	41.47	145.91	41.47
153.13	42.09	153.13	42.09
159.54	41.19	158.28	41.16
171.94	41.02	166.00	40.94
180.95	40.38	170.52	40.88
187.04	39.94	179.13	40.57
197.51	39.98	184.61	40.28
200.36	39.97	190.41	39.96
205.21	39.84	194.41	39.92
205.63	39.82	200.59	39.97
205.93	39.76	205.91	39.83
207.79	38.83	208.18	38.48
209.56	37.40	209.36	37.63
210.71	36.78	209.67	37.18
211.70	36.25	210.78	36.66
214.13	36.40	214.84	36.29

SUMARY DATA	MY00	MY01
Bankfull Elevation	39.68	39.70
Bankfull Cross-Sectional Area	36.86	37.87
Bankfull Width	20.58	24.45
Flood Prone Area Elevation	43.11	43.11
Flood Prone Width	248.46	248.07
Max Depth at Bankfull	3.43	3.41
Mean Depth at Bankfull	1.79	1.55
W/D Ratio	11.50	15.77
Entrenchment Ratio	12.07	10.15
Bank Height Ratio	1.00	1.00
Stream Type	C	C

Sta. 12+59 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 3, Pool, Station 12+59



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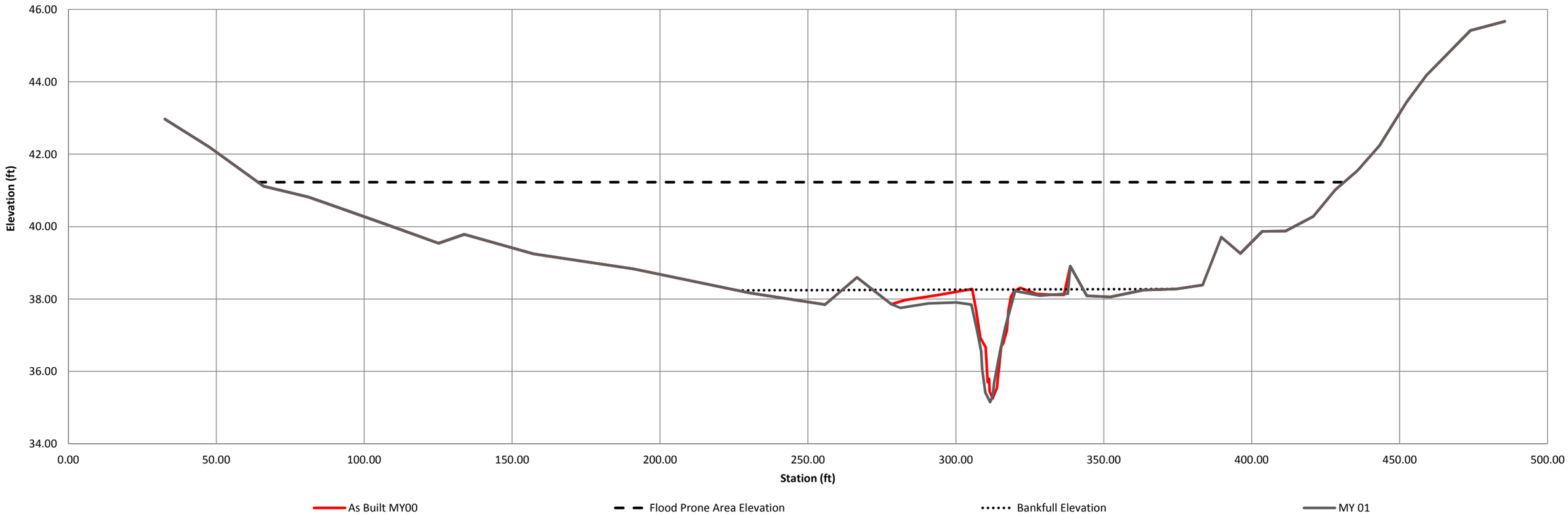
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-4, Riffle, STA 28+46
Drainage Area(sq. mi.)	1.59
Date	9/1/2011
Field Crew	N. Jean, B.Mazzochi, A. Baldwin

MY 00		MY 01	
Station	Elevation	Station	Elevation
32.58	42.97	32.58	42.97
47.64	42.20	47.64	42.20
65.92	41.12	65.92	41.12
81.03	40.82	81.03	40.82
88.43	40.61	88.43	40.61
108.82	40.02	108.82	40.02
125.06	39.54	125.06	39.54
133.82	39.79	133.82	39.79
157.24	39.25	157.24	39.25
191.12	38.83	191.12	38.83
230.32	38.17	230.32	38.17
255.76	37.85	255.76	37.85
266.56	38.60	266.56	38.60
278.21	37.86	278.21	37.86
282.75	37.97	281.24	37.759
293.74	38.11	290.68	37.881
305.40	38.28	300.11	37.906
305.58	38.25	305.26	37.848
306.89	37.65	307.23	37.095
308.24	36.93	308.54	36.55
310.07	36.67	308.85	36.062
310.71	35.71	309.92	35.422

SUMARY DATA	MY00	MY01
Bankfull Elevation	38.24	37.85
Bankfull Cross-Sectional Area	20.90	18.22
Bankfull Width	14.64	13.70
Flood Prone Area Elevation	41.23	40.54
Flood Prone Width	367.14	332.68
Max Depth at Bankfull	2.99	2.69
Mean Depth at Bankfull	1.43	1.33
W/D Ratio	10.24	10.30
Entrenchment Ratio	25.08	24.28
Bank Height Ratio	1.00	1.00
Stream Type	C	C

Sta. 28+46 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 4, Riffle, Station 28+46



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River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-5, Pool, STA 32+71
Drainage Area(sq. mi.)	1.59
Date	9/1/2011
Field Crew	N. Jean, B.Mazzochi, A. Baldwin

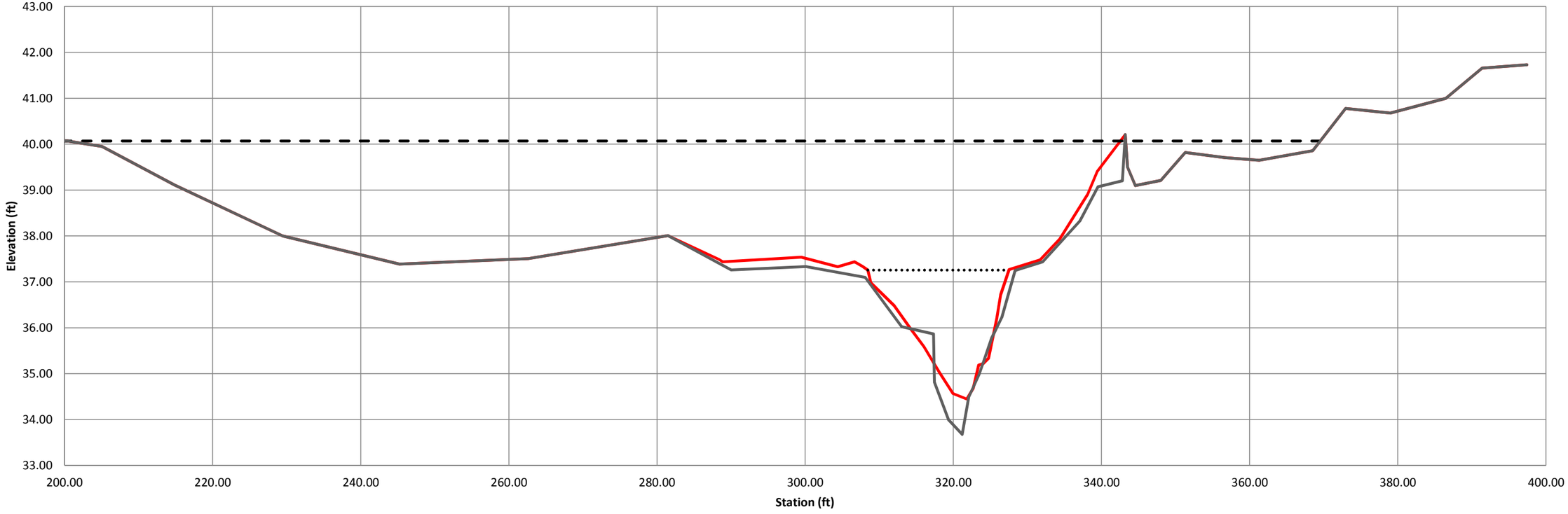
MY 00		MY 01	
Station	Elevation	Station	Elevation
26.15	42.13	26.15	42.13
36.87	42.19	36.87	42.19
68.22	41.81	68.22	41.81
85.37	36.59	85.37	36.59
90.80	34.92	90.80	34.92
176.23	35.02	176.23	35.02
177.81	35.70	177.81	35.70
185.44	38.11	185.44	38.11
195.27	40.20	195.27	40.20
205.06	39.95	205.06	39.95
214.85	39.11	214.85	39.11
229.47	38.00	229.47	38.00
245.21	37.39	245.21	37.39
262.60	37.51	262.60	37.51
281.47	38.01	281.47	38.01
288.37	37.49	289.99	37.262
288.85	37.44	300.08	37.334
299.46	37.54	308.08	37.1
304.38	37.33	313.02	36.025
306.65	37.44	317.31	35.866
307.72	37.34	317.44	34.823
308.44	37.26	319.38	33.992
308.86	36.98	321.18	33.679

SUMARY DATA	MY00	MY01*
Bankfull Elevation	37.26	37.33
Bankfull Cross-Sectional Area	29.47	35.63
Bankfull Width	19.06	29.71
Flood Prone Area Elevation	40.07	40.98
Flood Prone Width	289.16	315.10
Max Depth at Bankfull	2.81	3.65
Mean Depth at Bankfull	1.55	1.20
W/D Ratio	12.30	24.76
Entrenchment Ratio	15.17	10.61
Bank Height Ratio	1.00	1.00
Stream Type	C	C

*Floodprone width adjusted to not include adjacent farm pond.

Sta. 32+71 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 5 Pool, Station 32+71



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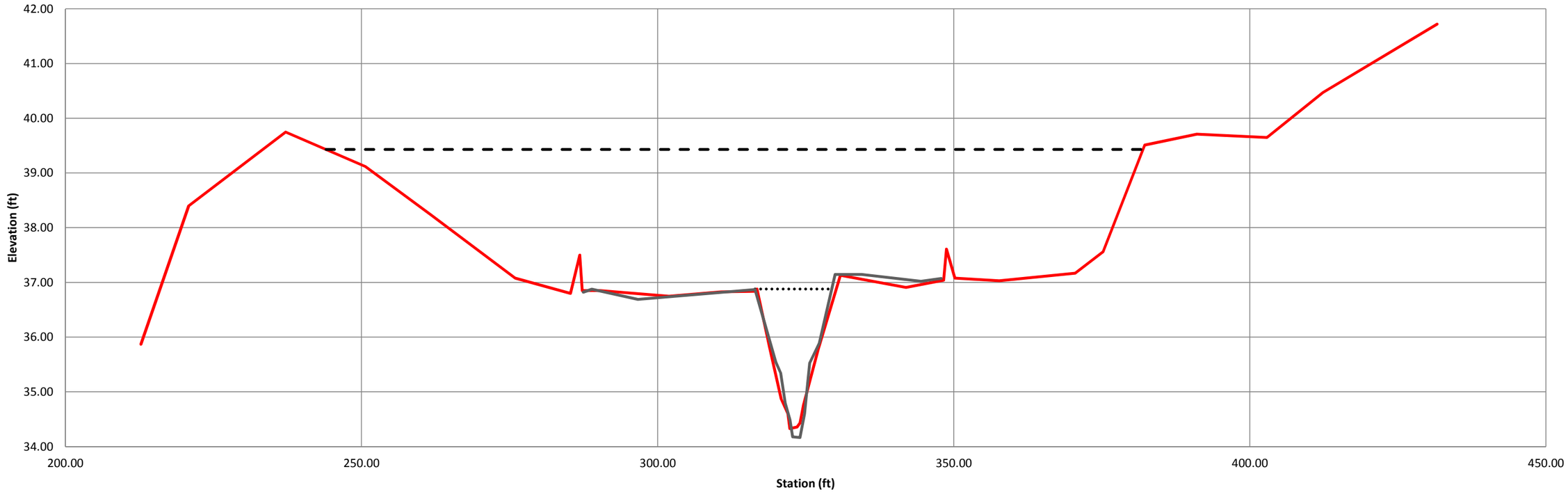
River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-6, Riffle, STA 35+24
Drainage Area(sq. mi.)	1.59
Date	9/1/2011
Field Crew	N. Jean, B.Mazzochi, A. Baldwin

MY 00		MY 01	
Station	Elevation	Station	Elevation
212.76	35.87	212.76	35.87
220.80	38.40	220.80	38.40
237.17	39.75	237.17	39.75
250.63	39.12	250.63	39.12
261.67	38.24	261.67	38.24
275.95	37.08	275.95	37.08
285.28	36.80	285.28	36.80
286.84	37.50	286.84	37.50
287.26	36.85	287.26	36.85
290.35	36.85	287.43	36.82
301.91	36.75	288.9	36.88
310.76	36.83	296.65	36.69
316.51	36.84	316.45	36.87
316.76	36.88	319.93	35.55
318.89	35.81	320.76	35.34
320.87	34.87	321.54	34.79
321.98	34.60	322.35	34.49
322.30	34.33	322.78	34.18
323.55	34.36	324.04	34.17
324.04	34.43	324.79	34.60
324.63	34.76	325.66	35.52
327.11	35.78	327.28	35.89

SUMARY DATA	MY00	MY01
Bankfull Elevation	36.88	36.87
Bankfull Cross-Sectional Area	18.91	17.43
Bankfull Width	17.17	12.92
Flood Prone Area Elevation	39.43	39.57
Flood Prone Width	158.46	166.08
Max Depth at Bankfull	2.55	2.70
Mean Depth at Bankfull	1.10	1.35
W/D Ratio	15.61	9.59
Entrenchment Ratio	9.23	12.82
Bank Height Ratio	1.00	0.95
Stream Type	C	C

Sta. 35+24 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 6, Riffle, Station 35+24



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River Basin	Tar-Pamlico River
Watershed	Tranters Creek
XS ID	XS-7, Riffle, STA 38+71
Drainage Area(sq. mi.)	1.59
Date	9/1/2011
Field Crew	N. Jean, B.Mazzochi, A. Baldwin

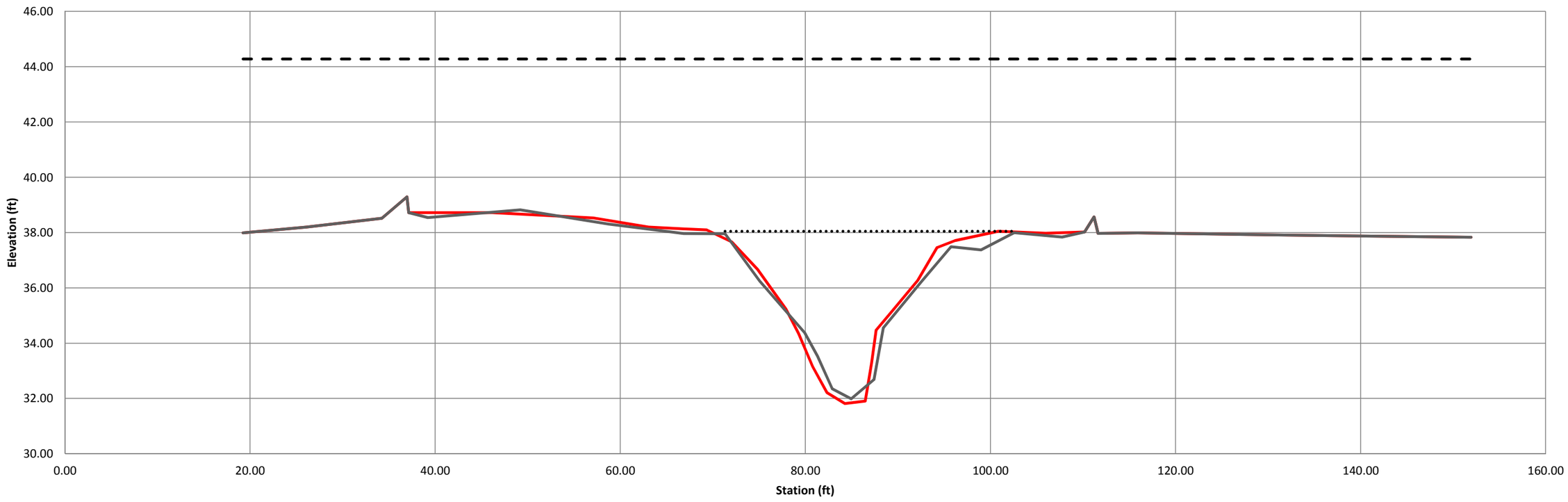
MY 00		MY 01	
Station	Elevation	Station	Elevation
19.24	37.99	19.24	37.99
26.11	38.20	26.11	38.20
34.24	38.52	34.24	38.52
36.95	39.29	36.95	39.29
37.14	38.72	37.14	38.72
39.57	38.72	39.21	38.544
46.18	38.72	49.19	38.823
57.09	38.53	58.73	38.308
63.06	38.20	66.87	37.967
66.76	38.14	71.32	37.96
69.33	38.10	75.06	36.251
72.02	37.67	79.92	34.376
74.83	36.67	81.32	33.533
77.89	35.25	82.9	32.353
79.27	34.35	84.95	31.993
80.79	33.16	87.42	32.686
82.34	32.21	88.42	34.553
84.27	31.82	92.45	36.186
86.46	31.91	95.74	37.49
87.16	33.28	98.99	37.375
87.65	34.47	102.57	37.996
89.37	35.16	107.75	37.837

SUMARY DATA	MY00*	MY01
Bankfull Elevation	38.05	38.00
Bankfull Cross-Sectional Area	75.91	77.93
Bankfull Width	31.46	36.52
Flood Prone Area Elevation	44.28	44.01
Flood Prone Width	132.69	132.69
Max Depth at Bankfull	6.23	6.01
Mean Depth at Bankfull	2.41	2.13
W/D Ratio	13.05	17.15
Entrenchment Ratio	4.22	3.63
Bank Height Ratio	1.00	1.00
Stream Type	C	C

* REVISED X-SEC DATA

Sta. 38+71 Looking Downstream

Oakley Crossroads - UT to Tranters Creek
X-Section 7 Riffle, Station 38+71



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Oakley Crossroads Stream and Buffer Restoration - Longitudinal Profile
Station 0+00 to 38+79
2011 Monitoring - Year 0, Year 01

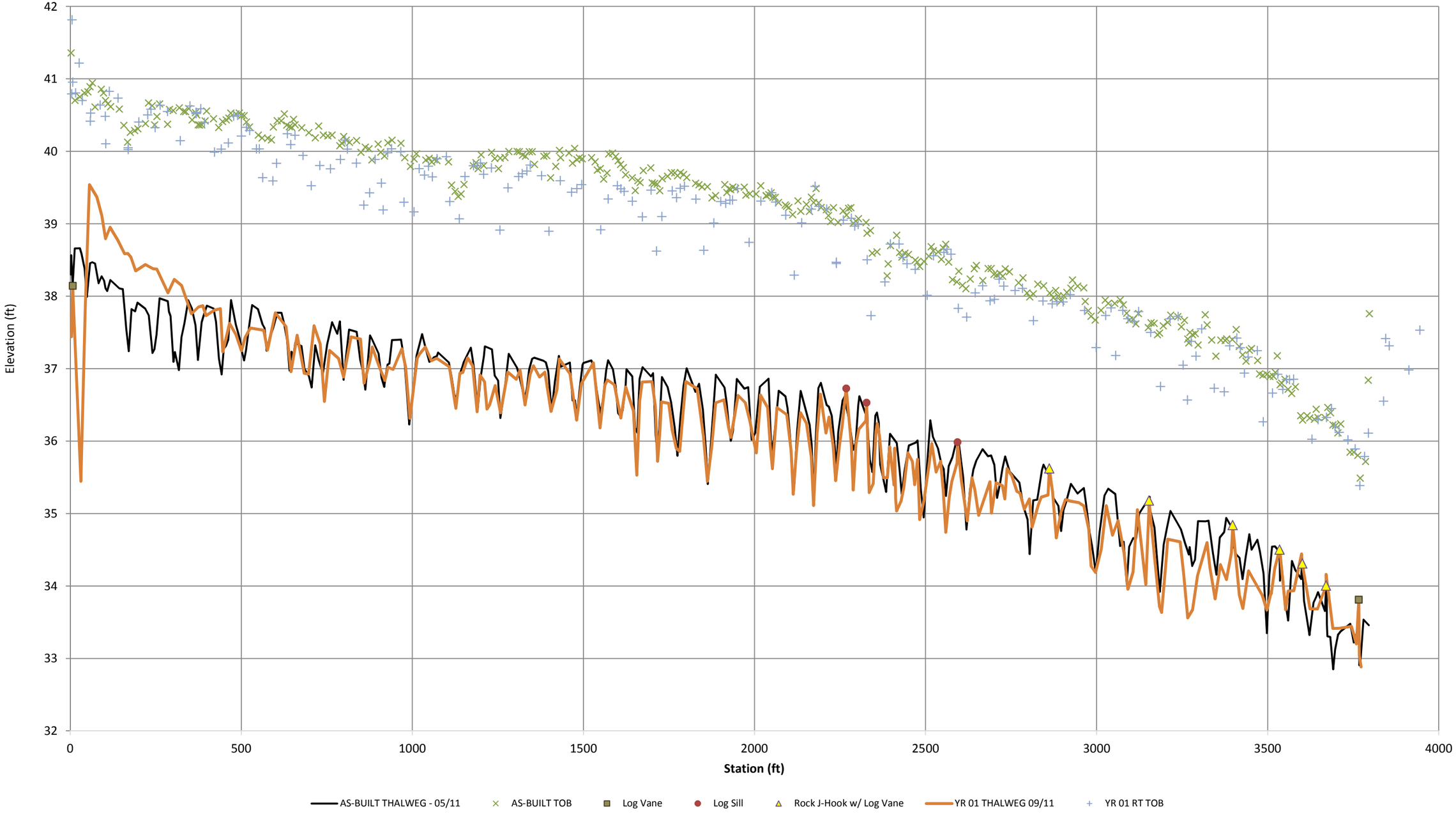

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Table 10a. Baseline Stream Data Summary
Oakley Crossroads Stream and Buffer Restoration / EEP Project No. 273 - Segment/Reach: Mainstem (3,950 feet)

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)					-	10.40	-	-	-	4	7.80	11.20	-	14.60	-	2	-	12.3	-	14.64	17.31	-	20.82	-	4
Floodprone Width (ft)					-	15.00	-	-	-	4	120.00	126.50	-	133.00	-	2	-	240.0	-	80.66	182.63	-	367.14	-	4
Bankfull Mean Depth (ft)					-	1.80	-	-	-	4	0.70	1.15	-	1.60	-	2	-	1.5	-	0.88	1.13	-	1.43	-	4
[1]Bankfull Max Depth (ft)					-	2.70	-	-	-	4	1.60	1.85	-	2.10	-	2	-	2.4	-	2.15	2.56	-	2.99	-	4
Bankfull Cross Sectional Area (ft^2)					-	19.00	-	-	-	4	9.50	11.05	-	12.60	-	2	-	19.0	-	18.16	19.08	-	20.90	-	4
Width/Depth Ratio					-	5.70	-	-	-	4	4.80	13.60	-	22.40	-	2	-	8.0	-	10.24	16.19	-	23.66	-	4
Entrenchment Ratio					-	1.40	-	-	-	4	8.20	12.65	-	17.10	-	2	-	19.5	-	4.66	10.55	-	21.21	-	4
[1]Bank Height Ratio					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Profile																									
Riffle Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24.83	35.98	-	53.02		4
Riffle Slope (ft/ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	0.003	-	0.006		4
Pool Length (ft)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20.47	33.67	-	44.45		2
Pool Max depth (ft)					-	-	-	-	-	-	1.7	2.3	-	2.9	-	2	-	4	-	2.81	3.12	-	3.43		2
Pool Spacing (ft)					-	-	-	-	-	-	5	27	35	67	-	4	43	52.5	62	43.4	64.26	-	94.03		2
Pattern																									
Channel Beltwidth (ft)					-	-	-	-	-	-	45	72.5	-	100		2	62	74.0	86	38.56	55.94	-	86.18	-	48.00
Radius of Curvature (ft)					-	-	-	-	-	-	8	12.8	14	21		4	22	27.0	31	19.24	27.81	-	36.28	-	56.00
Rc:Bankfull width (ft/ft)					-	-	-	-	-	-	0.5	1.2	1.4	1.8		4	1.8	2.2	2.5	1.11	1.61	-	2.10	-	56.00
Meander Wavelength (ft)					-	-	-	-	-	-	17	75	100	156		4	86	111	135	85.46	103.92	-	118.61	-	48.00
Meander Width Ratio					-	-	-	-	-	-	5.8	6.3	-	6.8		2	5	6.0	7	2.23	3.23	-	4.98	-	48.00
Transport parameters																									
Reach Shear Stress (competency) lb/ft^2					0.2												0.14			0.093					
Max part size (mm) mobilized at bankfull					-												-			25					
Unit Stream Power (transport capacity) lbs/ft/s per unit width[6]					0.25												0.17			0.16					
Additional Reach Parameters																									
Rosgen Classification					G5c						C5, E5						E5			C4					
Bankfull Velocity (fps)					1.9												1.7			1.65					
Bankfull Discharge (cfs)					30																				
Valley length (ft)					-						-														
Channel Thalweg length (ft)					-						-						-			3950					
Sinuosity (ft)					1.01						1.18						1.28			1.4					
Water Surface Slope (Channel) (ft/ft)					0.0018						0.002						0.0014			0.00146					
BF slope (ft/ft)					-						-						-			**0.00144**					
[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; 6. Units changed from W/m^2 to reflect those provided in original design.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)
Oakley Crossroads Stream and Buffer Restoration / EEP Project No. 273 - Segment/Reach: Mainstem (3,950 feet)

Parameter	Pre-Existing Condition							Reference Reach(es) Data							Design							As-built/Baseline						
[1]Ri% / Ru% / P% / G% / S%	-	0	-	0	0			-	-	-	-	-			-	-	-	-	-			52	-	48	-	-		
[1]SC% / Sa% / G% / C% / B% / Be%	0	33	67	0	0	0		0	100	0	0	0	0															
[1]d16 / d35 / d50 / d84 / d95 / di^{p} / di^{sp} (mm)	0.14	0.26	0.5	4.4	7.3	-	30	0.3	0.4	0.5	0.9	1.2	-	-														
[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-constrution 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)

Oakley Crossroads Stream and Buffer Restoration / EEP Project No. 273 - Segment/Reach: Mainstem (3,950 feet)

	Cross Section 1 (STA 0+72, Riffle)							Cross Section 2 (STA 6+17, Riffle)							Cross Section 3 (STA 12+59, Pool)							Cross Section 4 (STA 28+46, Riffle)							Cross Section 5 (STA 32+71, 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+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)	20.82	12.39						16.60	13.16						20.58	24.38						14.64	13.70						19.06	29.71					
Floodprone Width (ft)	80.66	65.65						124.27	131.28						248.08	120.86						367.14	332.68						289.16	315.10					
Bankfull Mean Depth (ft)	0.88	0.68						1.09	1.37						1.79	1.55						1.43	1.33						1.55	1.20					
Bankfull Max Depth (ft)	2.15	1.14						2.54	2.68						3.43	3.41						2.99	2.69						2.81	3.65					
Bankfull Cross Sectional Area (ft^2)	18.33	8.37						18.16	17.88						36.86	37.87						20.90	18.22						29.47	35.63					
Bankfull Width/Depth Ratio	23.66	18.22						15.23	9.61						11.50	15.73						10.24	10.30						12.30	24.76					
Bankfull Entrenchment Ratio	3.88	5.30						7.49	7.51						12.05	4.96						25.08	24.28						15.17	10.61					
Bankfull Bank Height Ratio	1.00	0.95						1.00	1.00						1.00	0.95						1.00	0.90						1.00	0.98					
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

	Cross Section 6 (STA 35+24, Riffle)							Cross Section 7 (STA 38+71, Other)							Cross Section 8 (Riffle)							Cross Section 9 (Pool)							Cross Section 10 (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+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used																																				
Bankfull Width (ft)	17.17	12.92						31.46	36.52																											
Floodprone Width (ft)	158.46	166.08						132.69	132.69																											
Bankfull Mean Depth (ft)	1.10	1.35						2.41	2.13																											
Bankfull Max Depth (ft)	2.55	2.70						6.23	6.01																											
Bankfull Cross Sectional Area (ft^2)	18.91	17.43						75.91	77.93																											
Bankfull Width/Depth Ratio	15.61	9.59						13.05	17.15																											
Bankfull Entrenchment Ratio	9.23	12.82						4.22	3.63																											
Bankfull Bank Height Ratio	1.00	0.95						1.00	1.00																											
Cross Sectional Area between end pins (ft^2)																																				
d50 (mm)																																				

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."

Table 11b. Monitoring Data - Stream Reach Data Summary
Oakley Crossroads Stream and Buffer Restoration / EEP Project No. 273 - Segment/Reach: Mainstem (3,950 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)	14.6	17.31	-	20.82	-	4	12.4	12.8	12.9	13.16	0.39	4																								
Floodprone Width (ft)	80.7	182.63	-	367.14	-	4	65.7	118.7	124	166.1	50.4	4																								
Bankfull Mean Depth (ft)	0.9	1.13	-	1.43	-	4	0.7	1.1	1.35	1.37	0.39	4																								
[1]Bankfull Max Depth (ft)	2.2	2.56	-	2.99	-	4	1.1	2.2	2.68	2.703	0.9	4																								
Bankfull Cross Sectional Area (ft^2)	18.2	19.08	-	20.9	-	4	8.4	8.4	17.4	17.88	5.37	4																								
Width/Depth Ratio	10.2	16.19	-	23.66	-	4	9.6	12.5	9.61	18.22	4.98	4																								
Entrenchment Ratio	4.7	10.55	-	21.21	-	4	5.3	9.2	9.44	12.82	3.77	4																								
[1]Bank Height Ratio	-	-	-	-	-	-	1	1	1	1	1	4																								
Profile																																				
Riffle Length (ft)	24.8	35.98	-	53.02		4	24.2	35.2	-	53.1	-	4																								
Riffle Slope (ft/ft)	0.002	0.003	-	0.006		4	0.002	0.003	-	0.006	-	4																								
Pool Length (ft)	20.47	33.67	-	44.45		2	21	32.54	-	45.21	-	2																								
Pool Max depth (ft)	2.81	3.12	-	3.43		2	3.41	3.53	-	3.65	-	2																								
Pool Spacing (ft)	43.4	64.26	-	94.03		2	42.1	65.2	-	95.2	-	2																								
Pattern																																				
Channel Beltwidth (ft)	38.6	55.94	-	86.18	-	48																														
Radius of Curvature (ft)	19.2	27.81	-	36.28	-	56																														
Rc:Bankfull width (ft/ft)	1.1	1.61	-	2.1	-	56																														
Meander Wavelength (ft)	85.5	103.92	-	118.61	-	48																														
Meander Width Ratio	2.2	3.23	-	4.98	-	48																														
Additional Reach Parameters																																				
Rosgen Classification	C4,E5						C4,E5																													
Channel Thalweg length (ft)	1.65						1.64																													
Sinuosity (ft)	1.4						1.4																													
Water Surface Slope (Channel) (ft/ft)	0.00146						0.00145																													
BF slope (ft/ft)	0.00144						0.00139																													
[3]Ri% / Ru% / P% / G% / S%	**52**	**-**	**48**	**-**	**-**		**52**	**-**	**48**	**-**	**-**																									
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks																																				
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

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Table 12 - Verification of Bankfull Events Oakley Crossroads Stream and Buffer Restoration Project (EEP #273)			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
September 13, 2011	unknown	Visual observation of wrack lines	S8, S9