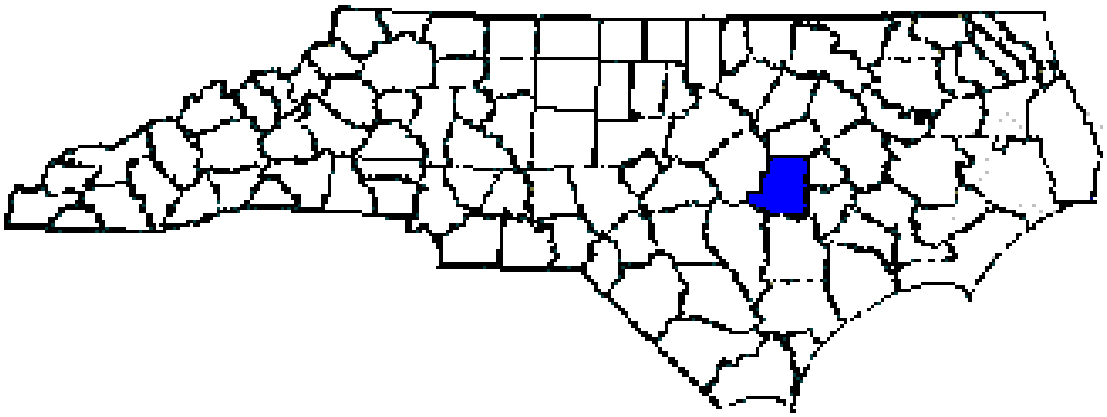
ANNUAL REPORT FOR 2014



Unnamed Tributary to Howell Branch
Wayne County
TIP No. R-2554BA – Site 5
COE Action ID: SAW 2008–00252
DWQ #: 20080570

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Roadside Environmental Unit & Natural Environment Section
North Carolina Department of Transportation
August 2014

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SUMMARY

The following report summarizes the stream monitoring activities that have occurred during 2014 at the UT to Howell Branch Mitigation Site in Wayne County. The site was completed construction in 2010 by the North Carolina Department of Transportation (NCDOT). This report provides the monitoring results for the fifth formal year of monitoring (Year 2014). The Year 2014 monitoring period is the fifth of five scheduled years for monitoring on UT to Howell Branch (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring along UT to Howell Branch, the site has met the required monitoring protocols for the fifth formal year of monitoring. Based on comparing the survey data, the channel is stable throughout the stream at this time. NCDOT took soil samples in November 2011 and applied fertilizer and lime to the site in February 2012 in an effort to get better planted vegetation success. A supplemental planting was completed for a second time in February 2012. The July 2014 vegetation monitoring revealed that the buffer is meeting planted vegetation success criteria for the fifth year of monitoring.

The longitudinal profile survey was not conducted along the stream at the UT to Howell Branch Mitigation Site in 2014 due to extensive vegetation growth along the channel. The heavy vegetation growth made it impossible to survey without cutting down many of the desired species along the channel. NCDOT proposed to discontinue profile monitoring at the 2012 Annual Monitoring Meeting but it was agreed that a visual inspection of the channel stability throughout the reach and photo documentation at the permanent photo point locations would be completed. All other monitoring activities will continue to be completed throughout the five year monitoring period.

NCDOT proposes to discontinue stream and vegetation monitoring at the UT to Howell Branch Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during 2014 at the UT to Howell Branch Mitigation Site. The site is located immediately south of SR 1571 (Tommy's Road) in Goldsboro, NC (Figure 1). UT to Howell Branch Mitigation Site was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2554BA in Wayne County.

The mitigation project covers approximately 561 linear feet of stream relocation Construction was completed in January 2010 by the North Carolina Department of Transportation (NCDOT). Stream restoration involved the installation of rock cross vanes, rock vanes, construction of a new stream channel and construction of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

1.2 Purpose

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2014 at the UT to Howell Branch Mitigation Site. Hydrologic monitoring was not required for the site.

1.3 Project History

January 2010	Construction Completed
October 2010	Stream Channel and Vegetation Monitoring (Year 1)
February 2011	Supplemental Planting of Buffer Area
August 2011	Stream Channel and Vegetation Monitoring (Year 2)
November 2011	Soil Test Completed
February 2012	Applied Lime and Fertilizer
February 2012	Supplemental Planting of Buffer Area
August 2012	Vegetation Monitoring (Year 3)
October 2012	Stream Channel Monitoring (Year 3)
July 2013	Stream Channel and Vegetation Monitoring (Year 4)
July 2014	Stream Channel and Vegetation Monitoring (Year 5)

1.4 Debit Ledger

The entire UT to Howell Branch stream mitigation site was used for the R-2554BA project to compensate for unavoidable stream impacts.

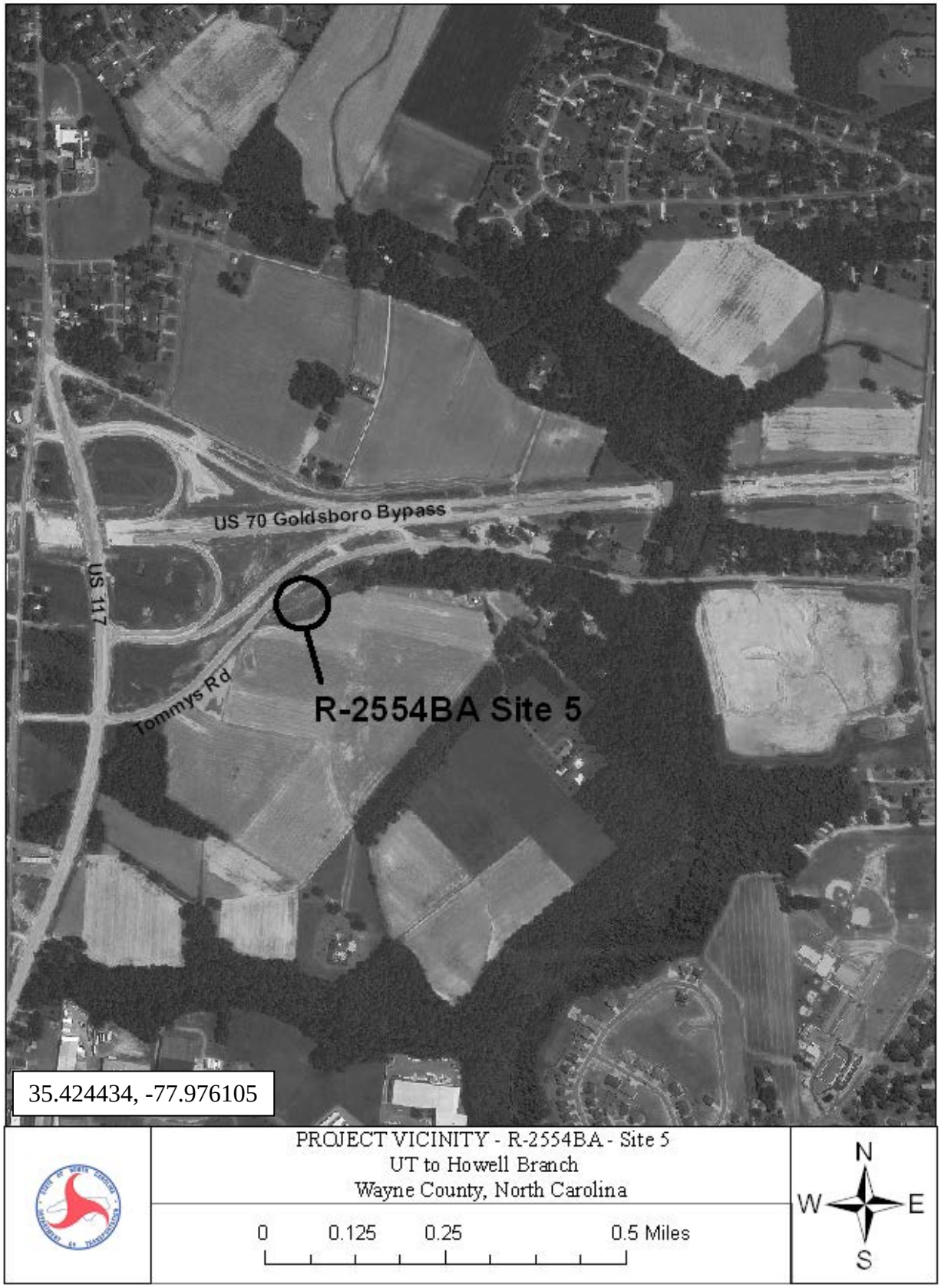


Figure 1. Site Location Map

2.0 STREAM ASSESSMENT

2.1 Success Criteria

The stream mitigation site shall be monitored for five years or until success criteria are satisfied. Monitoring protocols shall follow the Monitoring Level I outlined in the Stream Mitigation Guidelines, April 2003. NCDOT will evaluate the success of the stream relocation project based on guidance provided by the Stream Mitigation Guidelines disseminated by the United States Army Corps of Engineers-Wilmington District. The survey of channel dimension will consist of permanent cross sections placed at approximately four cross sections (two riffles and two pools). Annual photographs showing both banks and upstream and downstream views will be taken from permanent, mapped photo points. The survey of the longitudinal profile will represent distinct areas of the stream and will cover a cumulative total of 535 linear feet of channel. The entire restored length of stream will be investigated for channel stability and in-stream structure functionality. Any evidence of channel instability will be identified, mapped and photographed.

Vegetation Success

For the onsite buffer mitigation sites, the permittee shall monitor the sites for five years. An annual report shall be submitted to the DWQ for a period of 5 years showing monitoring results, survival rate, success of tree and vegetation establishment, and that diffuse flow through the riparian buffer has been maintained. The first annual report shall be submitted within one year of final planting. Failure to achieve a buffer density of 320 trees per acre after 5 years will require the annual report to provide appropriate remedial actions to be implemented and a schedule for implementation. Approval of the final annual report, and a formal “close out” of the mitigation site by the DWQ is required. The success of vegetation plantings will be measured through stem counts. Permanent quadrants will be used to sample the riparian buffer. Survival of the live stakes will be determined by visual observation throughout the 5 year monitoring period.

Bareroot vegetation will be evaluated using 2 staked survival plots. Plots will be 50 ft. by 50 ft. or 100 ft. by 25 ft. and flagged stems will be counted in these plots. Success will be defined as 320 stems per acre after 5 years. All vegetation monitoring will be conducted during the growing season.

2.2 Stream Description

2.2.1 Post-Construction Conditions

The mitigation project covers approximately 561 linear feet of stream relocation. Construction was completed in January 2010 by the North Carolina Department of Transportation (NCDOT). Stream restoration involved the installation of rock cross vanes, rock vanes, construction of a new stream channel and construction of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

2.2.2 Monitoring Conditions

The objective of the UT to Howell Branch Mitigation Site relocation was to build a C5 stream type as identified in the Rosgen's Applied River Morphology. A total of four cross sections (two in a riffle, two in a pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology in Table 1.

Table 1. Abbreviated Morphological Summary (UT to Howell Branch - Site 5 Cross Sections #1 and #3)				
Variable	**As Built**	**Cross Section #1 (Riffle)**	**Cross Section #3 (Riffle)**	**Min. - Max Values (Riffle Sections Only)**
		2014	**2014**	**2014**
Drainage Area (sq. mi)	0.17	0.17	0.17	0.17
Bankfull Width (ft)	9.0	16.67	12.76	12.76 – 16.67
Bankfull Mean Depth (ft)	0.7	0.48	0.57	0.48 – 0.57
Width/Depth Ratio	12.9	34.73	22.39	22.39 – 34.73
Bankfull Cross Sectional Area (ft^2)	6.3	7.95	7.21	7.21 – 7.95
Maximum Bankfull Depth (ft)	1.0	0.98	1.18	0.98 – 1.18
Floodprone Area (ft)	72 - 155	70	60	60 – 70
Entrenchment Ratio	9.0 - 17.2	4.2	4.7	4.2 – 4.7

*Drainage Area, Floodprone Width, and Slope are averaged values only.
*Riffle values are used for classification purposes.

2.3 Results of the Stream Assessment

2.3.1 Site Data

The assessment included the survey of four cross sections and the longitudinal profile of UT to Howell Branch Mitigation Site established by the NCDOT after construction. The length of the profile along UT to Howell Branch was approximately 535 linear feet. Four cross sections were established during the as-built. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The location of the cross sections are shown in Appendix A.

- Cross Section #1. UT to Howell Branch, Station 155+50 linear feet, midpoint of riffle

- Cross Section #2. UT to Howell Branch, Station 251+00 linear feet, midpoint of pool

- Cross Section #3. UT to Howell Branch, Station 333+00 linear feet, midpoint of riffle

- Cross Section #4. UT to Howell Branch, Station 428+00 linear feet, midpoint of pool

Based on comparisons of the as-built to the monitoring data, all four cross sections appear stable with little or no active bank erosion. The right bank of Cross Section #1 has settled within the past year but this area is vegetated and stable. Graphs of the cross sections are presented in Appendix A. Future survey data will vary depending on actual location of rod placement and alignment; however this information should remain similar in appearance.

The longitudinal profile survey was not conducted along the stream at the UT to Howell Branch Mitigation Site in 2014 due to extensive vegetation growth along the channel. The heavy vegetation growth made it impossible to survey without cutting down many of the desired species along the channel. NCDOT proposed to discontinue profile monitoring at the 2012 Annual Monitoring Meeting but it was agreed that a visual inspection of the channel stability throughout the reach and photo documentation at the permanent photo point locations would be completed. All other monitoring activities were to be continued throughout the five year monitoring period.

A visual inspection of the channel and photos taken from photo points 1 through 4 showed that the channel bed is stable throughout the stream relocation at this time.

2.4 Results of Stream and Buffer Vegetation

2.4.1 Description of Species

The following live stake species were planted on the streambank:

Salix nigra, Black Willow

Cornus amomum, Silky Dogwood

The following tree species were planted in the buffer area:

Liriodendron tulipifera, Tulip Poplar

Platanus occidentalis, American Sycamore

Juglans nigra, Black Walnut

Betula nigra, River Birch

Fraxinus pennsylvanica, Green Ash

2.4.2 Results of Vegetation Monitoring

Buffer Vegetation: One 50 ft. x 50 ft. vegetation plot and one 100 ft. x 25 ft. vegetation plot were set to determine the trees per acre in the buffer area.

Table 2. Vegetation Monitoring Results

Plot #	Tulip Poplar	American Sycamore	Black Walnut	River Birch	Green Ash	Total (Year 5)	Total (at planting)	Density (Trees/Acre)
1	10	11		13	8	42	54	529
2		11		18	19	48	53	616
Year 5 Average Density								**572**
Year 4 Average Density								585
Year 3 Average Density								604
Year 2 Average Density								197
Year 1 Average Density								276

Site Notes: The black willow live stakes were noted surviving along the streambank. Other vegetation noted included wax myrtle, cattail, fennel, sweetgum, lespedeza, *Juncus* sp., woolgrass, pine, baccharis, and various grasses.

2.4.3 Conclusions

There were two vegetation monitoring plots established throughout the buffer area. The 2014 vegetation monitoring of the site revealed an average tree density of 572 trees per acre. This average is above the minimum success criteria of 320 trees per acre after the fifth year of monitoring. NCDOT proposes to discontinue monitoring the vegetation at the UT to Howell Branch Mitigation Site.

3.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The UT to Howell Branch Mitigation Site met the required monitoring protocols for the fifth formal year of monitoring. The channel and structures throughout the stream are stable at this time. The buffer is meeting planted vegetation success criteria for the fifth year of monitoring. NCDOT proposes to discontinue stream and vegetation monitoring at the UT to Howell Branch Mitigation Site.

4.0 REFERENCES

Natural Channel Design for UT to Howell Branch (Permit Site 5); Wayne County, NC, Rev. October 10, 2007.

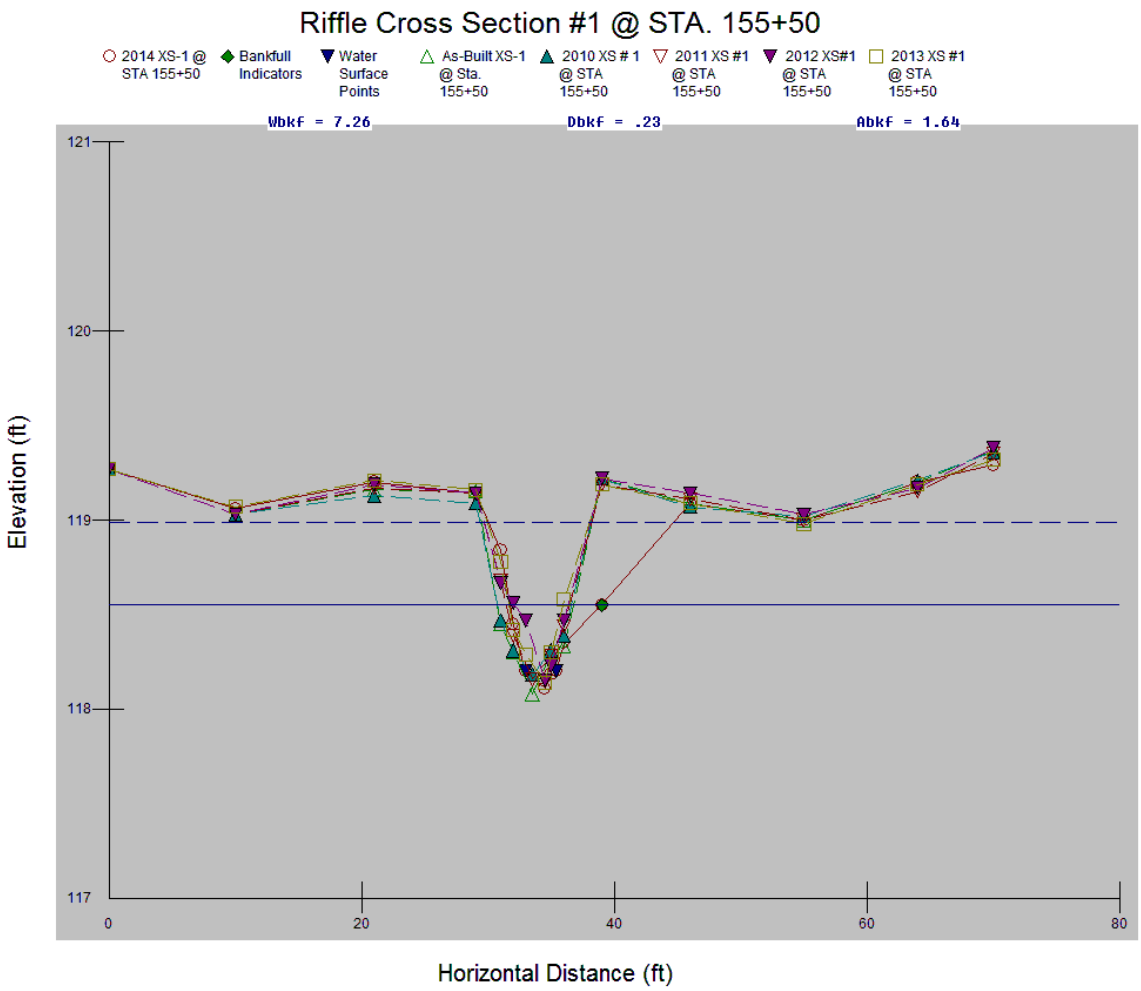
As-Built Report for Stream Restoration on R-2554BA Permit Site 5, Wayne County, NC, February 26, 2010.

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

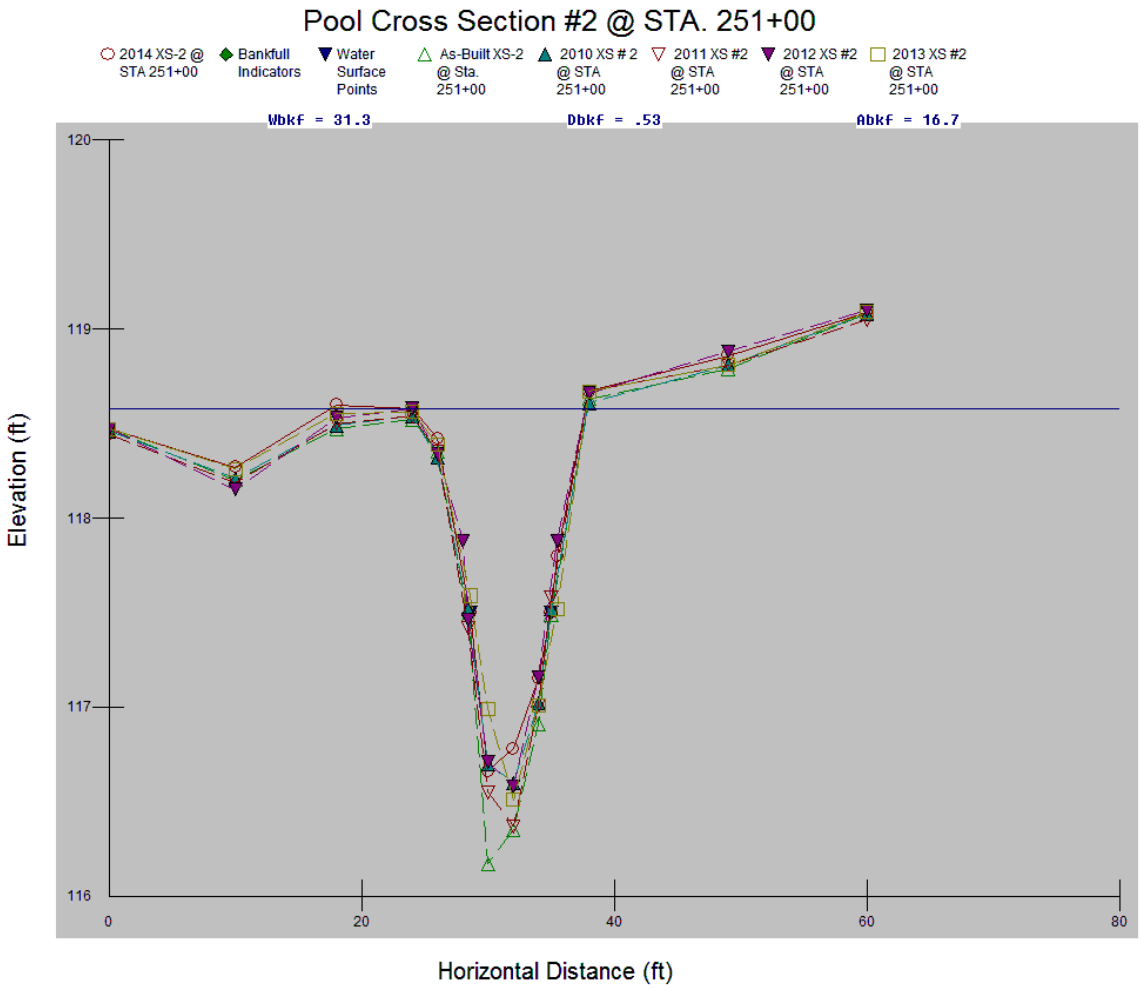
US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. Prepared with cooperation from the US Environmental Protection Agency, NC Wildlife Resources Commission, and the NC Division of Water Quality.

APPENDIX A

CROSS SECTION COMPARISONS

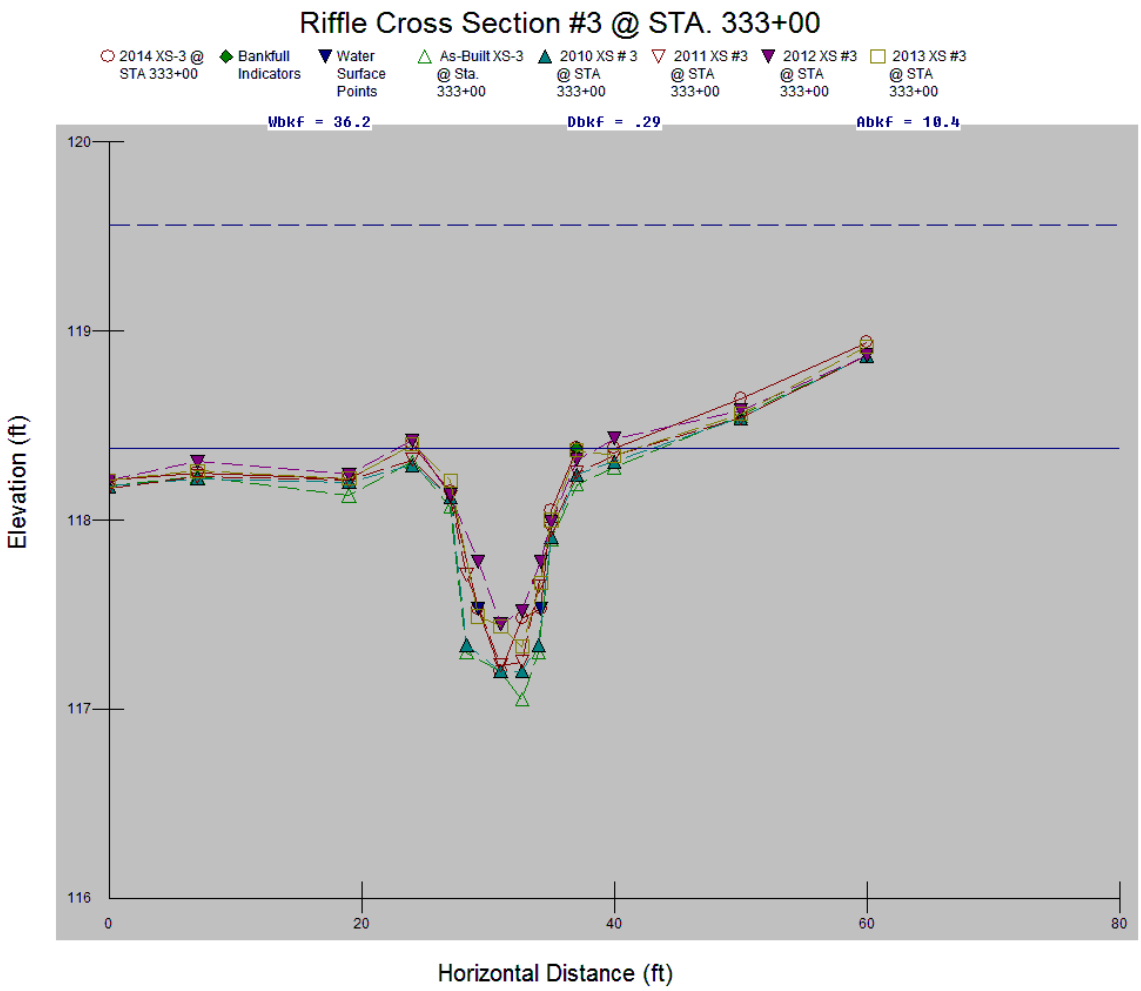


Cross-Section #1 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Width (ft)	10	10	10	10	16.67
Bankfull Mean Depth (ft)	0.67	0.6	0.58	0.55	0.48
Width/Depth Ratio	14.93	16.67	17.24	18.18	34.73
Bankfull Cross Sectional Area (ft^2)	6.75	6	5.81	5.48	7.95
Maximum Bankfull Depth (ft)	1.04	1.03	1.07	1.05	0.98
Width of the Floodprone Area (ft)	70	70	70	70	70
Entrenchment Ratio	7	7	7	7	4.2

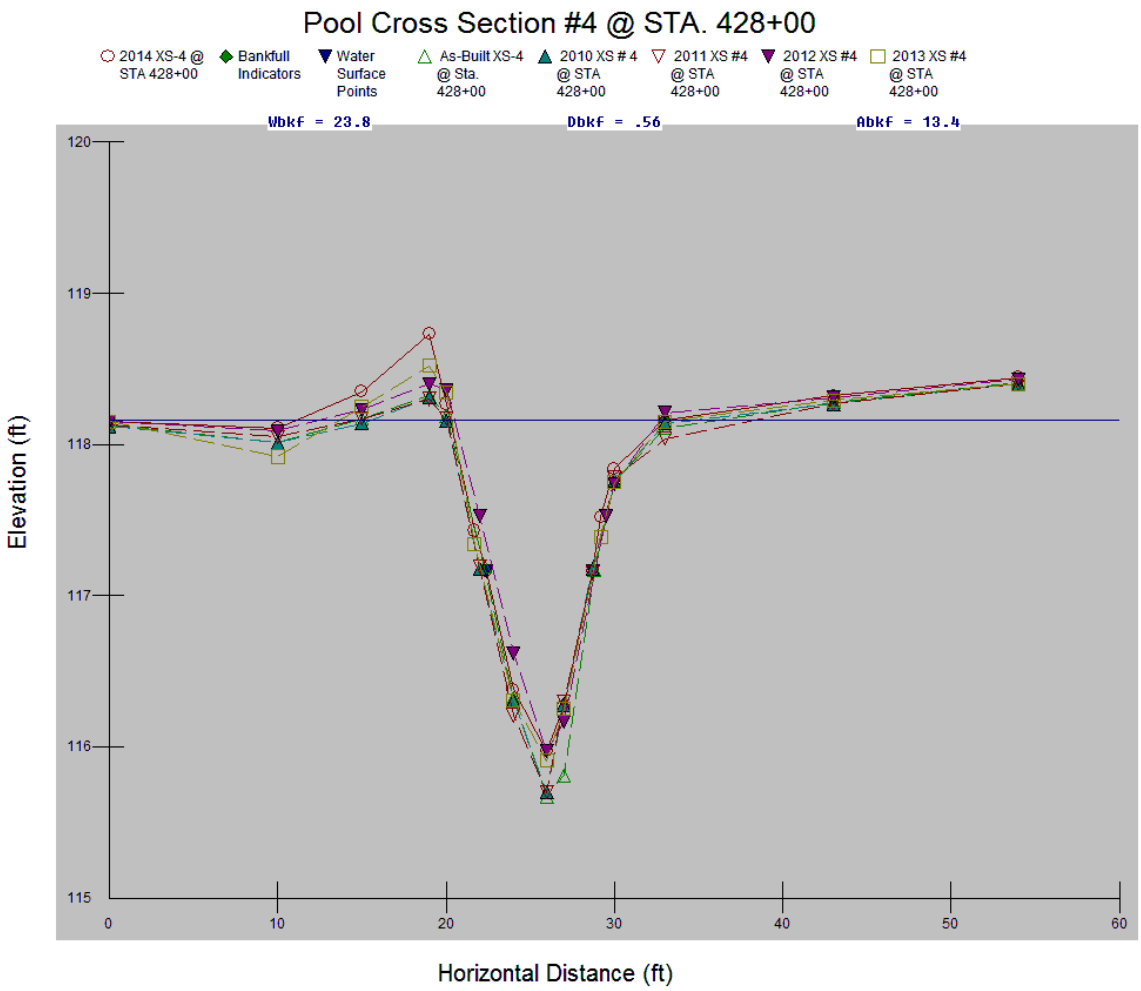


Cross-Section #2 (Pool) Abbreviated Morphological Summary*					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft^2)	13.94	14.62	13.6	13.77	13.42
Maximum Bankfull Depth (ft)	1.94	2.17	2	2.05	1.92
Bankfull Mean Depth (ft)	1.01	1.07	0.99	1	0.98
Bankfull Width (ft)	13.81	13.64	13.74	13.76	13.74

* According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.



Cross-Section #3 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Width (ft)	12.12	11.95	11.97	12.53	12.76
Bankfull Mean Depth (ft)	0.61	0.52	0.45	0.54	0.57
Width/Depth Ratio	19.87	22.98	26.6	23.2	22.39
Bankfull Cross Sectional Area (ft^2)	7.38	6.18	5.36	6.75	7.21
Maximum Bankfull Depth (ft)	1.04	1.02	0.87	1.04	1.18
Width of the Floodprone Area (ft)	60	60	60	60	60
Entrenchment Ratio	4.95	5.02	5.01	4.79	4.7



Cross-Section #4 (Pool) Abbreviated Morphological Summary*					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft^2)	13.99	12.73	13.19	13.75	13.11
Maximum Bankfull Depth (ft)	2.44	2.34	2.24	2.24	2.19
Bankfull Mean Depth (ft)	1.08	1.02	1.04	1.08	1.03
Bankfull Width (ft)	12.96	12.73	12.64	12.68	12.78

* According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.

APPENDIX B

SITE PHOTOGRAPHS, CROSS SECTION, PHOTO POINT LOCATIONS, VEGETATION PLOT AND STREAMBANK REFORESTATION PLAN

UT to Howell Branch

Photo Point #1 (Upstream)

Photo Point #1 (Downstream)

Photo Point #2 (Upstream)

Photo Point #2 (Downstream)

Photo Point #3 (Upstream)

Photo Point #3 (Downstream)

July 2014

UT to Howell Branch

Photo Point #4 (Upstream)

Photo Point #4 (Downstream)

Vegetation Plot #1

Vegetation Plot #2

Overview of the Site

July 2014

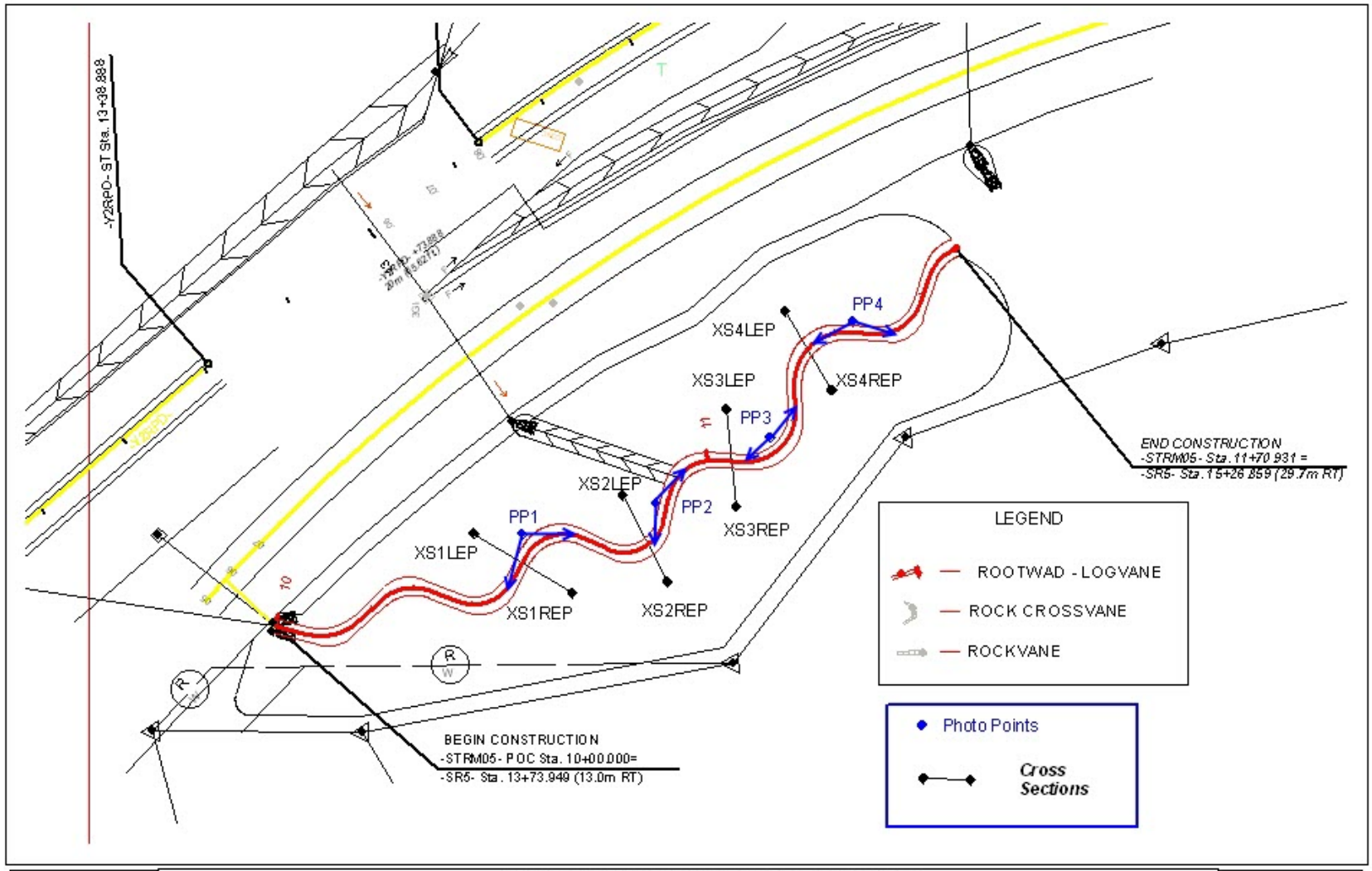
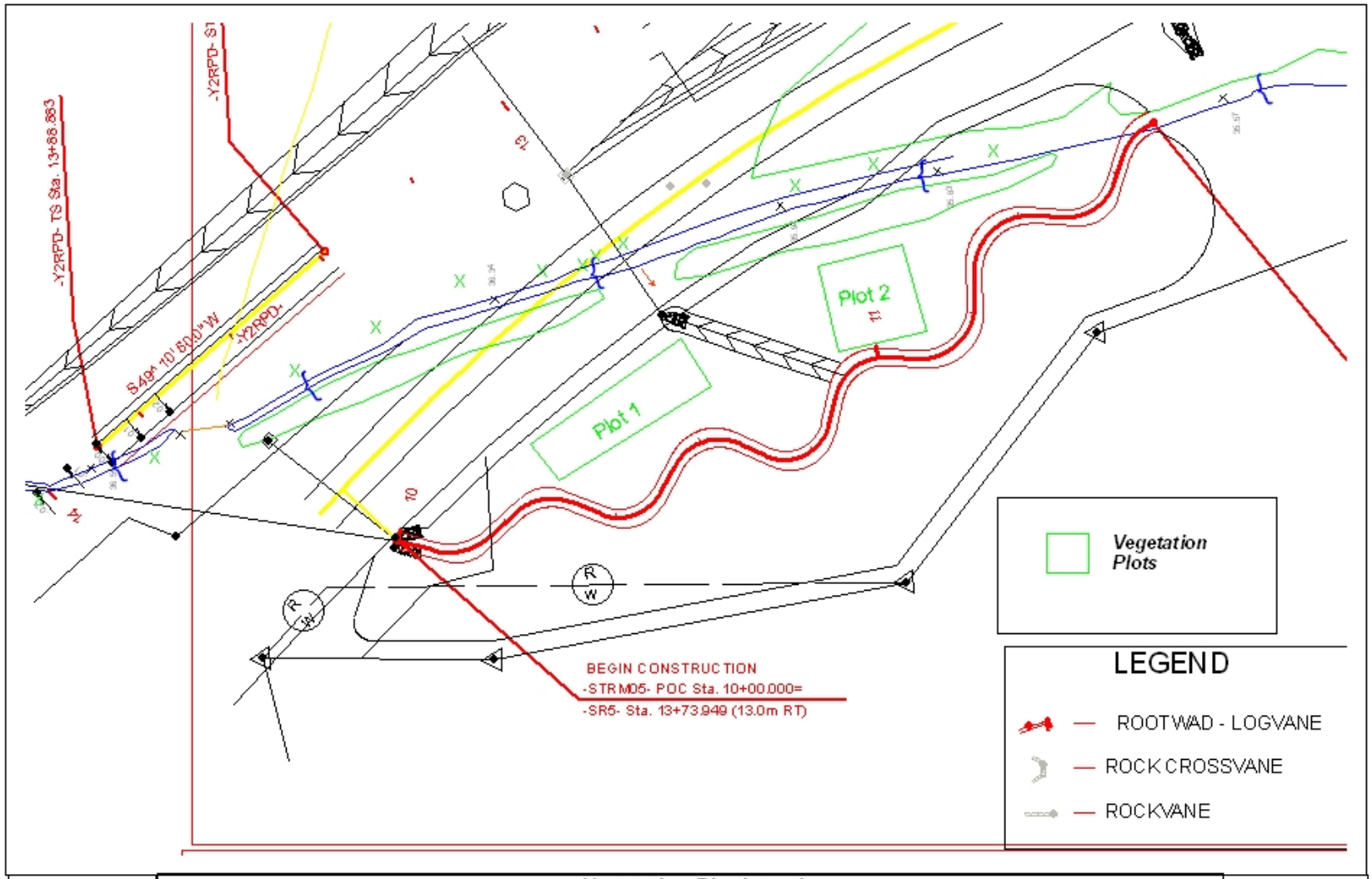


Photo Point and Cross Section Locations
R-2554BA Site 5 UT to Howell Branch
Wayne County, North Carolina

0 75 150 300 450 600
Feet

N W E S



Vegetation Plot Locations
R-2554BA SITE 5 UT to Howell Branch
Wayne County, North Carolina

0 50 100 200 300 400
Feet

N
W E
S

PROJECT REFERENCE NO.	SHEET NO.
R-2554BA	EC-43/CDW37.8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

0.65 HECTARE STREAMBANK REFORESTATION

SEE RF–2, RF–3 AND PROJECT SPECIAL PROVISIONS

Streambank Reforestation Plan
R-2554BA Site 5 UT to Howell Branch
Wayne County, North Carolina