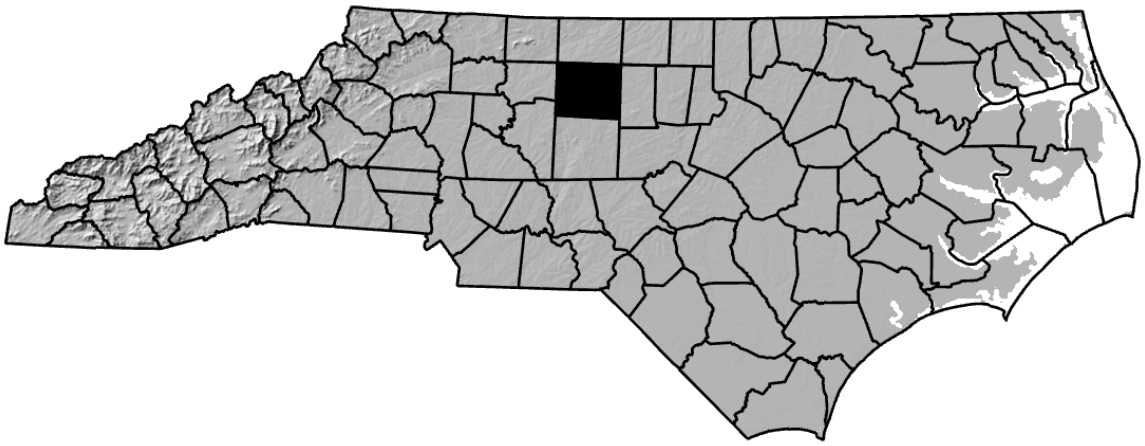
ANNUAL REPORT FOR 2024



R-2413A&B UT to Reedy Fork Creek - Site #2
Guilford County
TIP No. R-2413A&B
USACE Action ID: SAW-2013-00557
DWR Project #: 20130517 v.5

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Environmental Analysis Unit & Roadside Environmental Unit
North Carolina Department of Transportation
December 2024

TABLE OF CONTENTS

LIST OF FIGURES

TABLES

APPENDICES

SUMMARY

The following report summarizes the stream monitoring activities that occurred during 2024 at UT to Reedy Fork Creek Site #2 on the NC 68 Connector (R-2413A&B) project in Guilford County. The site was constructed during 2016 by the North Carolina Department of Transportation (NCDOT). The site was designed as stream mitigation for impacts associated with the construction of Transportation Improvement Program (TIP) number R-2413A&B and was planted in May 2016. This report provides the monitoring results for the fourth formal year of monitoring (Year 2024). The Year 2024 monitoring period is the fourth of five scheduled years of monitoring on Site #2 (See Success Criteria Section 2.1). No hydrologic monitoring is required for this project; however, vegetation monitoring is required for five years.

Based on the overall conclusions of monitoring at Site #2, the lower reach of the stream site remains stable at this time. Remediation activities were completed on the lower reach of the stream in March of 2021. The stream bank buffer is well vegetated for the fourth year of monitoring. The upper reach of Site #2 met the monitoring success criteria and was closed out in 2020 as agreed to by the resource agencies. Given that the upper reach is closed out and data prior to lower reach remediation is no longer applicable, those monitoring data have been removed from this report.

NCDOT will continue stream monitoring on the lower reach at the UT to Reedy Fork Creek Site #2 in 2025.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during 2024 at the UT to Reedy Fork Creek Site #2. The site is situated about 1,000 ft south of Bunch Rd and crosses I-73 flowing from east to west through a culvert under the road corridor (see Figure 1). The site was constructed to provide mitigation for stream impacts associated with construction of TIP number R-2413A&B. The site is composed of an upper and lower reach of an Unnamed Tributary (UT) of Reedy Fork (upstream and downstream of the newly constructed roadway corridor).

The mitigation project includes 906 linear feet of Priority I&II stream restoration/relocation on both the upper and lower reaches and 71 linear feet of stream enhancement on the lower reach. Construction was completed in March 2016 by NCDOT. Stream restoration involved the installation of rock cross vanes, constructed riffles, construction of a new stream channel, relocation of the upper reach, reconnection with the adjacent floodplain in Priority I restoration reaches, and construction of the floodplain through Priority II restoration reaches 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. Stream enhancement on a portion of the lower reach included minor bank grading, installation of coir fiber matting and live stakes along the graded banks, and planting of bareroot seedlings in the floodplain.

Remediation of the lower reach was completed in March 2021. This involved reconstruction of rock cross vanes and installation of rock and roll riffle structures. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area. No work was performed in the stream enhancement portion of the site during the remediation.

1.2 Purpose

For a mitigation site to be considered successful, it must meet the success criteria. This report details the monitoring in 2024 at the UT to Reedy Fork Creek Site #2. Hydrologic monitoring was not required for the site.

1.3 Project History

March 2016	Construction Completed
May 2016	Planted Live Stakes and Bareroot Seedlings
September 2016	As-Built Survey Completed
October 2016	Vegetation Monitoring (Year 1)
December 2016	Stream Channel Monitoring (Year 1)

July 2017	Vegetation Monitoring (Year 2)
August 2017	Herbicide Application on Kudzu
November 2017	Stream Channel Monitoring (Year 2)
December 2017	Site #2 Upper Reach Supplemental Buffer Planting
June 2018	Vegetation Monitoring (Year 3)
November 2018	Stream Channel Monitoring (Year 3)
January 2019	Site #2 Live Staking @ XS #2 Right Bank
March 2019	Site #2 Lower Reach Supplemental Buffer Planting
June 2019	Vegetation Monitoring (Year 4)
December 2019	Stream Channel Monitoring (Year 4)
July 2020	Vegetation Monitoring (Year 5)
November 2020	Stream Channel Monitoring (Year 5)
March 2021	Site #2 Lower Reach Remediation Completed
May 2021	Agency Meeting & Site #2 Upper Reach Closed Out
August 2021	Vegetation Monitoring Lower Reach (Year 1 Restart)
October 2021	Stream Channel Monitoring Lower Reach (Year 1 Restart)
June 2022	Vegetation Monitoring Lower Reach (Year 2)
October 2022	Stream Channel Monitoring Lower Reach (Year 2)
August 2023	Vegetation Monitoring Lower Reach (Year 3)
October 2023	Stream Channel Monitoring Lower Reach (Year 3)
July 2024	Vegetation Monitoring Lower Reach (Year 4)
October 2024	Stream Channel Monitoring Lower Reach (Year 4)

1.4 Debit Ledger

The entire UT to Reedy Fork Creek Site #2 stream mitigation site was used for the R-2413A&B project to compensate for unavoidable stream impacts. The mitigation project includes 906 linear feet of Priority I&II stream restoration/relocation on both the upper and lower reaches and 71 linear feet of stream enhancement on the lower reach. The upper reach included 424 linear feet of stream restoration and was closed out in March 2021. The lower reach provides 482 linear feet of stream restoration and 71 feet of stream enhancement. Remediation efforts were conducted on 356 linear feet of the restoration/relocation portion of the lower reach in March 2021.

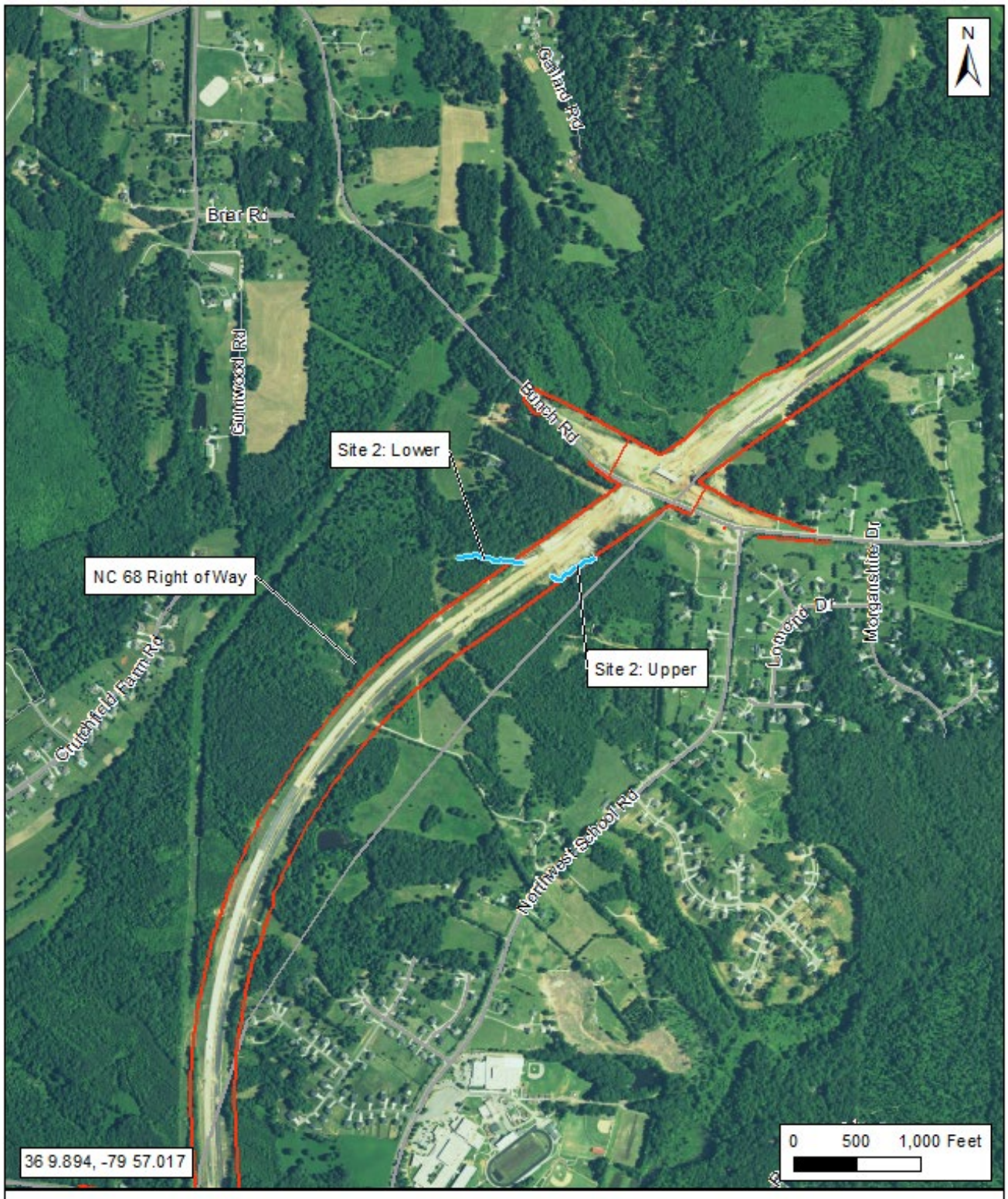


Figure 1: Project Vicinity Map
R-2413A UT to Reedy Creek Site #2 Stream Mitigation
Guilford County, SC

Figure 2: Post-Remediation Monitoring Points
R-2413A UT to Reedy Creek Site #2
Guilford County, NC

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 dimensions will consist of permanent cross sections placed at three cross sections (two riffles and one pool). 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 restoration and will cover a cumulative total of approximately 906 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. Pebble counts shall not be conducted. The monitoring shall be conducted annually for a minimum of five (5) years after final planting. The monitoring results shall be submitted to DWR in a final report within sixty (60) days after completing monitoring. After 5 years, the NCDOT shall contact the DWR to schedule a site visit to "close out" the mitigation site.

Vegetation Success

The success of vegetation and plantings will be measured through stem counts. Permanent quadrants will be used to sample the riparian buffer and restoration wetlands. The survival of the live stakes will be determined by visual observation throughout the five-year monitoring period.

Bare root vegetation will be evaluated using two staked survival plots. Plots will be 50ft. by 50ft. If site conditions prevent a 50ft. by 50ft. plot, then the plot will have varying dimensions to encompass an area of 2,500 ft^2. All flagged stems will be counted in those plots. Success will be defined as 320 stems per acre after three years and 260 stems per acre after five 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 906 linear feet of Priority I&II stream restoration/relocation and 71 linear feet of stream enhancement. Construction was completed in March 2016 by NCDOT. Stream restoration involved the installation of rock cross vanes, constructed riffles, construction of a new stream channel, relocation of

the upper reach, reconnection with the adjacent floodplain in Priority I restoration reaches, and construction of the floodplain through Priority II restoration reaches 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. Stream enhancement on a portion of the lower reach included minor bank grading, installation of coir fiber matting and live stakes along the graded banks, and planting of bareroot seedlings in the floodplain.

Remediation of the lower reach was completed in March 2021. This involved reconstruction of rock cross vanes and installation of rock and roll riffle structures. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area. No work was performed in the stream enhancement portion of the site during the remediation.

2.2.2 Monitoring Conditions

The objective of the UT to Reedy Fork Creek Site #2 restoration was to build a C5 stream type as identified in the Rosgen's Applied River Morphology. A total of three cross sections (one on the upper reach and two on the lower reach) were surveyed. For this report, only the riffle cross sections were used in the comparison of channel morphology in Table 1.

2.3 Results of the Stream Assessment

Table 1.0 Abbreviated Morphological Summary

R-2413A&B - Site 2 Cross Section #3							
Variable	**Proposed**	**As-Built**	**MY 1 (2021)**	**MY2 (2022)**	**MY 3 (2023)**	**MY 4 (2024)**	**MY5 (2025)**
Drainage Area (mi^2)	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Bankfull Width (ft)	7.6	8.45	8.6	7.38	4.73	5.27	
Bankfull Mean Depth (ft)	0.5	0.54	0.55	0.49	0.4	0.42	
Width/Depth Ratio	13.9	15.65	15.64	15.06	11.97	12.55	
Bankfull Cross Sectional Area (ft^2)	4.2	4.54	4.71	3.63	1.89	2.21	
Maximum Bankfull Depth (ft)	0.8	0.91	0.94	0.74	0.54	0.67	
Floodprone Area (ft)	34	23.1	23.45	17.05	10.1	12.34	
Entrenchment Ratio	4.5	2.74	2.73	2.31	2.11	2.34	

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

2.3.1 Site Data

The assessment included the survey of two cross sections and the longitudinal profile of UT to Reedy Fork Creek Site #2 lower reach. The length of the surveyed profile along the lower reach of Site #2 was approximately 544 linear feet. Two cross sections were established during the 2021 as-built survey following site remediation. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The locations of the cross sections and longitudinal profiles are shown in Appendix A.

- Cross Section #2: Lower Reach, Station 252+27.50 linear feet, midpoint of pool
- Cross Section #3: Lower Reach, Station 253+49.50 linear feet, midpoint of riffle

Based on visual assessment and comparisons of the as-built, MY4 (2024), XS-2 and XS-3 appear stable and are within expected thresholds for a C5 stream. The surveyed riffle cross section remains stable within design parameters. Presence of a silt bar was noted in the pool cross section however fluctuation of pool depth is expected as the stream conveys sediment down channel. Pebble counts were not required per the permit conditions and therefore were not completed. The longitudinal profile survey was not conducted in 2024. The vegetation along the stream buffer has demonstrated vigorous growth, conducting longitudinal survey would have been very challenging due to the vegetation blocking the survey equipment line of sight. NCDOT visually inspected the entire stream reach, and the stream appears stable throughout with heavy presence of streambank vegetation. NCDOT will continue stream and vegetation monitoring on the lower reach at the UT to Reedy Fork Creek Site #2 in 2025.

Hydrologic monitoring for the site was ceased following the 2022 monitoring period and subsequent discussion with agency staff at the 2022 monitoring meeting. Multiple overbank events were recorded in the first two monitoring years and the stream met the requirement for documented overbank events.

3.0 VEGETATION MONITORING: UT TO REEDY CREEK - SITE 2 LOWER (YEAR 4 MONITORING)

3.1 Success Criteria

Mitigation Plan: Success for vegetation monitoring within the riparian buffer and wetland areas is based on the survival of at least 320 stems at year three and 260 stems of five-year-old trees at year five. NCDOT will attempt to suppress the Kudzu within the ROW of the mitigation sites by herbicide applications prior to reforestation and during the required post construction monitoring period.

3.2 Description of Species

The following live stake species were planted in the Streambank Area (Type I):

Salix nigra, Black Willow

Cornus amomum, Silky Dogwood

The following tree species were planted in the Buffer Area (Type II):

Liriodendron tulipifera, Tulip Poplar

Platanus occidentalis, American Sycamore

Fraxinus pennsylvanica, Green Ash

Betula nigra, River Birch

Prunus serotina, Black Cherry

3.3 Results of Vegetation Monitoring

Plot #	Tulip Poplar	Sycamore	Green Ash	River Birch	Black Cherry	Total (Year 4)	Total (at planting)	Density (Trees/Acre)
1		20	8	12		40	48	567
Year 4 Average Density (Trees/Acre)								**567**
Year 3 Average Density (Trees/Acre)								595
Year 2 Average Density (Trees/Acre)								638
Year 1 Average Density (Trees/Acre)								638

Site Notes: Black Willow and Silky Dogwood live stakes that were planted along the streambank were surviving.

3.4 Conclusions

There is one vegetation monitoring plot established throughout the buffer area. The 2024 vegetation monitoring of the site revealed an average tree density of 567 trees per acre. This average is above the minimum success criteria of 290 trees per acre for Year 4. NCDOT proposes to continue vegetation monitoring at UT to Reedy Creek – Site 2 Lower.

4.0 Overall Conclusions and Recommendations

The UT to Reedy Fork Creek Site #2 has met the required stream monitoring protocols for the fourth formal year of monitoring. Based on comparing the monitoring data to the as-built, the stream channel on the lower reach remains stable at this time. The stream bank buffer is heavily vegetated for the fourth year of monitoring. The upper reach of Site #2 met the monitoring success criteria and was closed out in 2020 as agreed to by the resource agencies.

NCDOT will continue stream monitoring on the lower reach at the UT to Reedy Fork Creek Site #2 in 2025.

5.0 References

On-Site Stream Mitigation Plan for R-2413 A NC 68 Connector from SR 2011 to the Haw River; Guilford County, NC, T.I.P. Number R-2413 A&B, WBS No's: 34429.1.1, 34429.2.2, 34429.2.3, June 25, 2013.

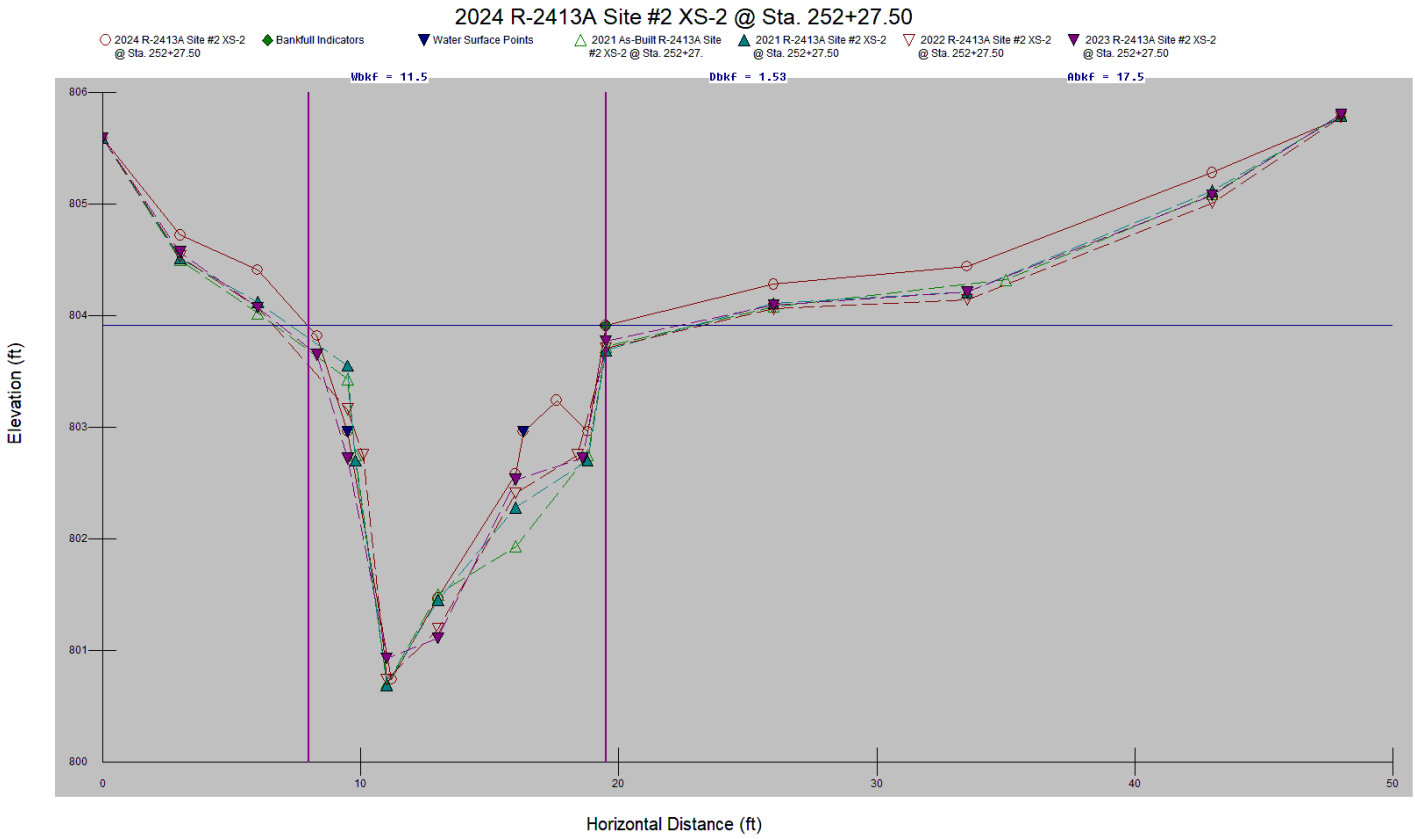
As-Built Report/Record Drawings for R-2413 Site #2 Mitigation Site, Guilford County, NC, September 28, 2016.

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.

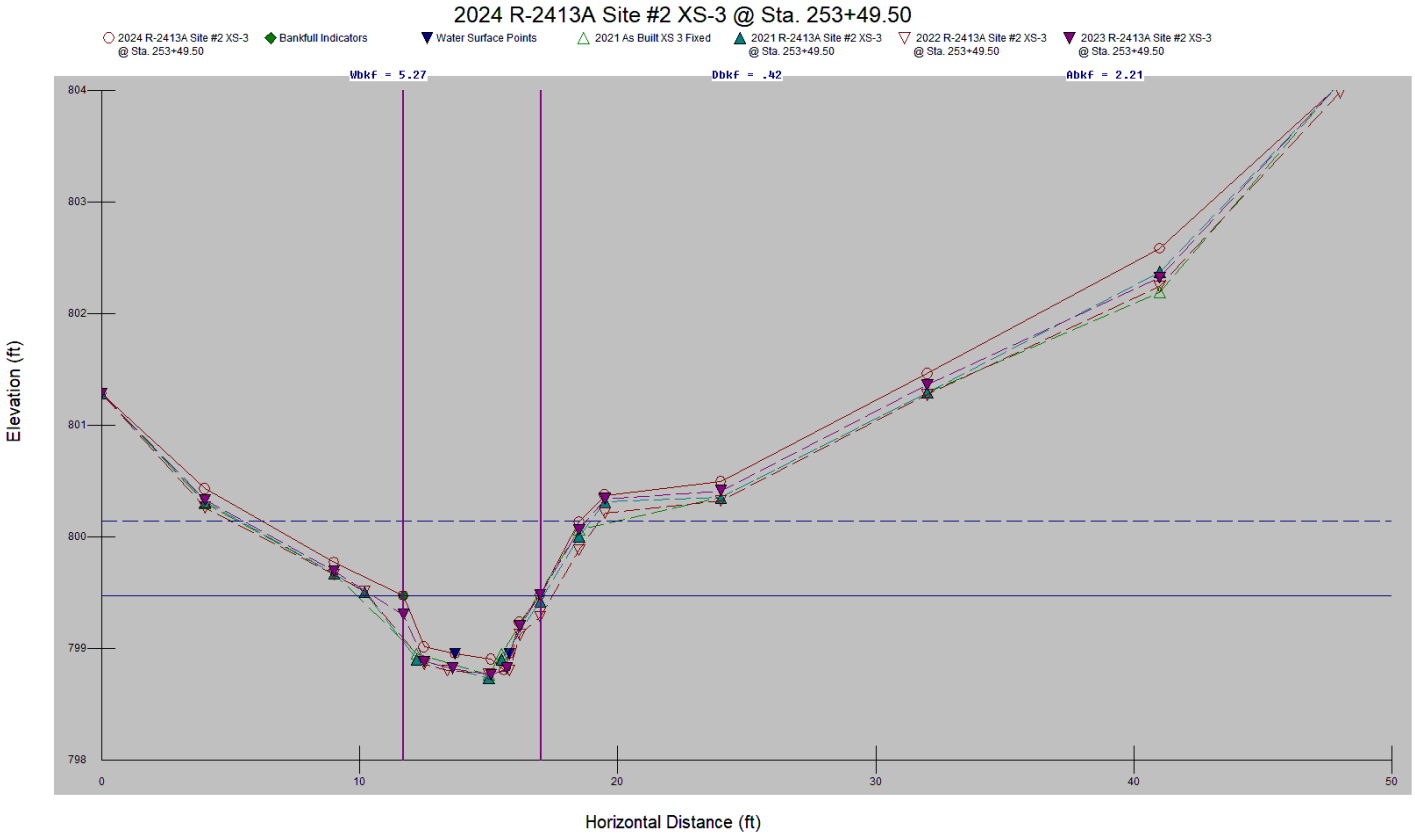
APPENDIX A

CROSS SECTION COMPARISONS



Site 2: Cross-Section #2 (Pool) Abbreviated Morphological Summary						
	As-built	MY1 (2021)	MY2 (2022)	MY3 (2023)	MY4 (2024)	MY5 (2025)
Bankfull Width (ft)	11.72	9.9	9.37	11.86	11.5	
Bankfull Mean Depth (ft)	1.56	1.57	1.21	1.56	1.53	
Bankfull Cross Sectional Area (ft^2)	18.29	15.59	11.35	18.46	17.54	
Maximum Bankfull Depth (ft)	3.02	2.86	2.42	2.84	3.17	

*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



Site 2: Cross-Section #3 (Riffle) Abbreviated Morphological Summary						
Variable	**As-built**	**MY1 (2021)**	**MY2 (2022)**	**MY3 (2023)**	**MY4 (2024)**	**MY5 (2025)**
Bankfull Width (ft)	**8.45**	**8.6**	**7.38**	**4.73**	**5.27**	
Bankfull Mean Depth (ft)	**0.54**	**0.55**	**0.49**	**0.4**	**0.42**	
Width/Depth Ratio	**15.65**	**15.64**	**15.06**	**11.97**	**12.55**	
Bankfull Cross Sectional Area (ft^2)	**4.54**	**4.71**	**3.63**	**1.89**	**2.21**	
Maximum Bankfull Depth (ft)	**0.91**	**0.94**	**0.74**	**0.54**	**0.67**	
Width of the Floodprone Area (ft)	**23.1**	**23.45**	**17.05**	**10.1**	**12.34**	
Entrenchment Ratio	**2.74**	**2.73**	**2.31**	**2.11**	**2.34**	

APPENDIX B

SITE PHOTOGRAPHS

R-2413A UT to Reedy Fork Creek Site #2

Photo Point #1 Upstream

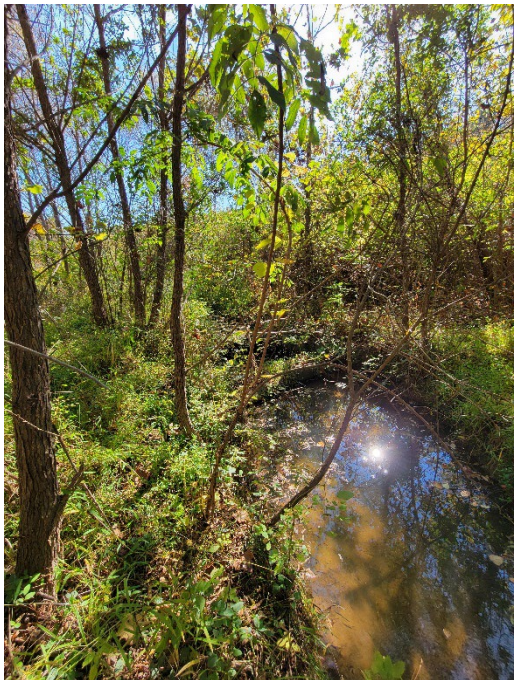
Photo Point #1 Downstream

Photo Point #2 Upstream

Photo Point #2 Downstream

October 2024

R-2413A UT to Reedy Fork Creek Site #2



Upstream in Upper Remediation Area

Downstream in Upper Remediation Area

Upstream in Lower Remediation Area

Downstream Lower Remediation Area

October 2024

R-2413A UT to Reedy Fork Creek Site #2

Photo Point #1 Upstream

Photo Point #1 Downstream

Photo Point #2 Upstream

Photo Point #2 Downstream

July 2024

R-2413A UT to Reedy Fork Creek Site #2

Site overview looking upstream from 2022 to demonstrate vigorous vegetative growth.

Site overview looking downstream from 2022 to demonstrate vigorous vegetative growth.

October 2022

R-2413A UT to Reedy Fork Creek Site #2

Vegetation Plot #1

July 2024

R-2413A UT to Reedy Fork Creek Site #2

Overview photo taken from I-73

July 2024

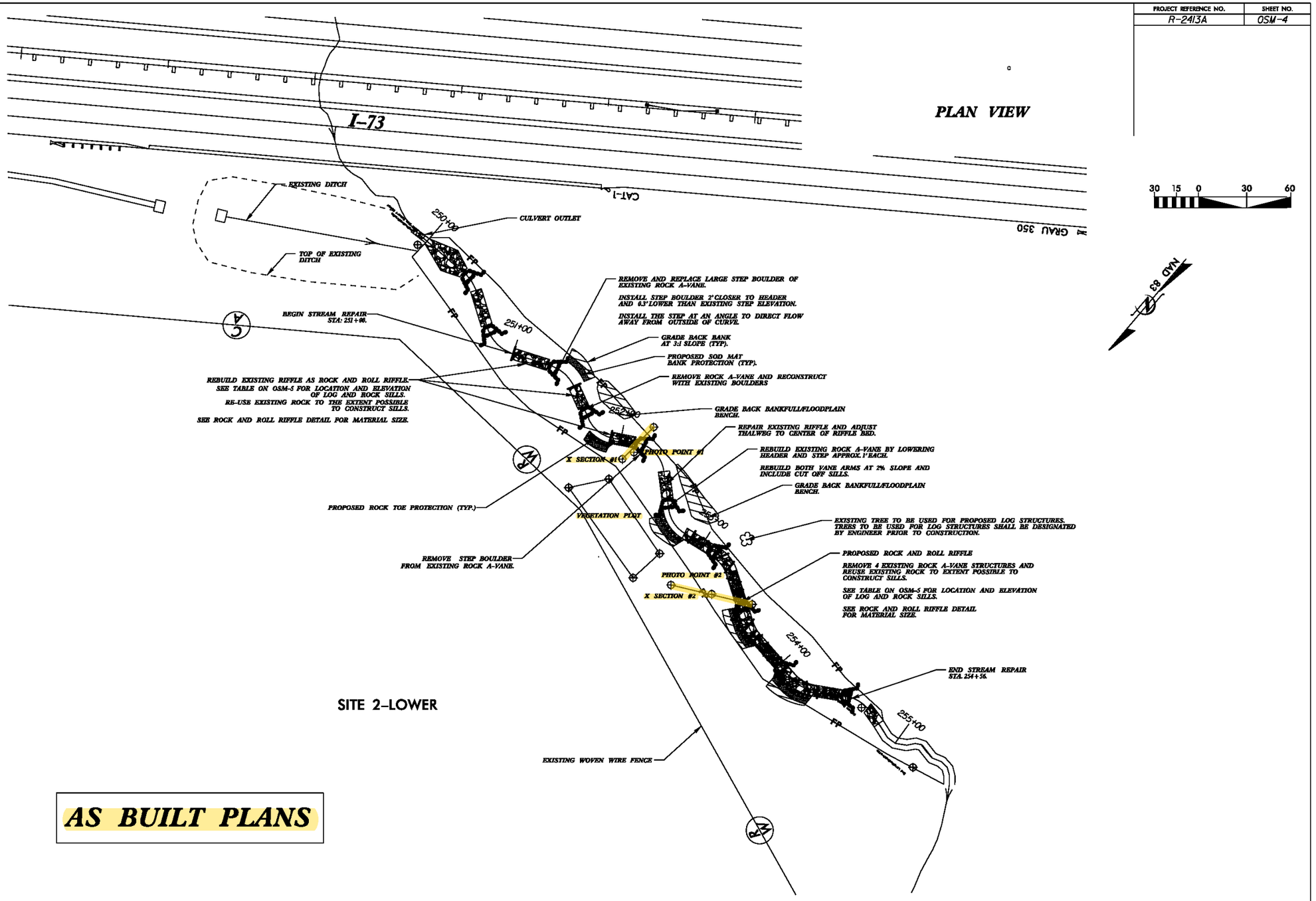
APPENDIX C

CROSS SECTION, VEGETATION PLOT & PHOTO POINT LOCATIONS (AS-BUILT PLANS)

09/25/20

PROJECT REFERENCE NO.	SHEET NO.
R-2413A	OSM-4

PLAN VIEW



SITE 2-LOWER

AS BUILT PLANS