UT to Cane Creek Restoration Project
Year 7 Final Monitoring Report

Alamance County, North Carolina

DMS Project ID Number – 95729, DEQ Contract No. 4951

Permits: SAW-2012-01907, DWR# 13-1177

Project Info:	Monitoring Year: 7 of 7 Year of Data Collection: 2020 Year of Completed Construction: 2014 Submission Date: January 2021
Submitted To:	NCDEQ - Division of Mitigation Services 1625 Mail Service Center Raleigh, NC 27699 NC DEQ Contract ID No. 004951

Mitigation Project Name	**UT to Cane Creek**	**USACE Action ID**	**2012-01907**
DMS ID	**95729**	**DWR Permit**	**2013-1177**
River Basin	**Cape Fear**	**Date Project Instituted**	**10/29/2012**
Cataloging Unit	**03030002**	**Date Prepared**	**4/20/2020**
County	**Alamance**	**Stream/Wet. Service Area**	**Cape Fear 03030002**

Todd J Tugwell 9/21/2020

Signature & Date of Official Approving Credit Release

1 - For NCDMS, no credits are released during the first milestone

2 - For NCDMS projects, the initial credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the IRT by posting it to the DMS portal, provided the following have been met:

1) Approved of Final Mitigation Plan
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan.
4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met.

Credit Release Milestone	**Warm Stream Credits**						
Project Credits	**Scheduled Releases %**	**Proposed Releases %**	**Proposed Released #**	**Not Approved # Releases**	**Approved Credits**	**Anticipated Release Year**	**Actual Release Date**
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	1,378.160	0.000	1,378.160	2014	12/1/2014
3 - Year 1 Monitoring	10.00%	10.00%	459.387	0.000	459.390	2015	4/23/2015
4 - Year 2 Monitoring	10.00%	10.00%	459.387	0.000	459.390	2016	4/25/2016
5 - Year 3 Monitoring	10.00%	10.00%	459.387	0.000	459.390	2017	4/3/2017
6 - Year 4 Monitoring	5.00%	5.00%	229.693	0.000	229.693	2018	4/25/2018
7 - Year 5 Monitoring	10.00%	10.00%	459.387	0.000	459.387	2019	4/26/2019
8 - Year 6 Monitoring	5.00%	5.00%	229.693	0.000	229.693	2020	4/20/2020
9 - Year 7 Monitoring	10.00%					2021	
Stream Bankfull Standard	10.00%	10.00%	459.387	0.000	459.390	2017	4/3/2017
			Totals	0.000	4,134.493		

Total Gross Credits	4,593.867
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	4,134.493
Total Percentage Released	90.00%
Remaining Unreleased Credits	459.374

Notes

Contingencies (if any)

Project Quantities

Mitigation Type	**Restoration Type**	**Physical Quantity**
Warm Stream	Restoration	3,314.000
Warm Stream	Enhancement I	433.000
Warm Stream	Enhancement II	2,478.000

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Cataloging Unit	**03030002**	**Date Prepared**	**4/20/2020**
County	**Alamance**	**Stream/Wet. Service Area**	**Cape Fear 03030002**

Debits

							Stream Restoration Credits
Beginning Balance (mitigation credits)							**4,593.867**
Released Credits							**4,134.493**
Unrealized Credits							**0.000**
Owning Program	**Req. Id**	**TIP #**	**Project Name**	**USACE Permit #**	**DWR Permit #**	**DCM Permit #**	
NCDOT Stream & Wetland ILF Program	REQ-005957	R-2413A R-2413B	NC 68 Connector	2013-00557	2013-0517		1,325.600
NCDOT Stream & Wetland ILF Program	REQ-005957	R-2413A R-2413B	NC 68 Connector	2013-00557	2013-0517		115.467
NCDOT Stream & Wetland ILF Program	REQ-005957	R-2413A R-2413B	NC 68 Connector	2013-00557	2013-0517		396.480
NCDOT Stream & Wetland ILF Program	REQ-005957	R-2413A R-2413B	NC 68 Connector	2013-00557	2013-0517		331.400
NCDOT Stream & Wetland ILF Program	REQ-005957	R-2413A R-2413B	NC 68 Connector	2013-00557	2013-0517		28.867
NCDOT Stream & Wetland ILF Program	REQ-005957	R-2413A R-2413B	NC 68 Connector	2013-00557	2013-0517		99.120
NCDOT Stream & Wetland ILF Program	REQ-005994	R-2612B	US 421 Improvements	2013-01990	2013-0912		662.800
NCDOT Stream & Wetland ILF Program	REQ-005994	R-2612B	US 421 Improvements	2013-01990	2013-0912		57.733
NCDOT Stream & Wetland ILF Program	REQ-005994	R-2612B	US 421 Improvements	2013-01990	2013-0912		198.240
NCDOT Stream & Wetland ILF Program	REQ-006028	U-2525B U-2525C	Greensboro Eastern Loop	2005-21386	2013-0918		459.387
NCDOT Stream & Wetland ILF Program	REQ-006028	U-2525B U-2525C	Greensboro Eastern Loop	2005-21386	2013-0918		165.700
NCDOT Stream & Wetland ILF Program	REQ-006028	U-2525B U-2525C	Greensboro Eastern Loop	2005-21386	2013-0918		14.433
NCDOT Stream & Wetland ILF Program	REQ-006028	U-2525B U-2525C	Greensboro Eastern Loop	2005-21386	2013-0918		49.560
Total Credits Debited							**3,904.787**
Remaining Available balance (mitigation credits)							**229.706**
Remaining Credits (unreleased credits)							**459.374**

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January 8, 2021

Jeremiah Dow
NCDEQ, Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Subject: Response letter to DMS review comments regarding the Draft Year 7 Monitoring Report for the UT to Cane Creek Restoration Project (#95729)
Cape Fear Basin – CU#03030002, Alamance County, North Carolina
Service Contract No. 004951, DMS No. 95729, RFP No. 16-004357, Baker No. 132700

Mr. Dow,

Please find below our responses to the NC Division of Mitigation Services (DMS) review comments dated December 21, 2020 in reference to the UT to Cane Creek Restoration Project MY7 Draft report. We have revised the draft document and the digital submission files as outlined below:

1. Digital files/drawings:
    a. Please include a photo point shapefile containing the spatial features that depict the photo points in the CCPV.
    Response: The photo-point location shapefile used in the CCPV has been provided with the revised digital submission files.

    b. Please include photos as JPEGs.
    Response: Photos have been provided as JPEGs in the revised digital file submission.

    c. Please verify bank height ratio calculations. Ensure that the elevation that achieves the MY0 bankfull area in the MY7 channel is being used in these calculations. For example: Cross Section 4 should have a BHR of 1.09, and should be using bankfull elevation of 479.54 to achieve the MY0 cross sectional area.
    Response: Baker checked each of the BHR calculations and verified that they are all correct with the exception of XS-4 as noted. The bankfull elevation derived from the as-built area for XS-4 was determined to be 479.54' (as noted) using the Mecklenburg spreadsheet and was used to determine the BHR shown, but just wasn't correctly brought into the project cross-section figure. However, using this elevation provides a BHR of 0.97, which rounds to the 1.0 shown in the cross-section tables. For clarity, the calculation was made using the following elevations (as provided in the XS-4 figure) and equation:
    BHR = (Low bank elevation - TWG elevation) / (MY7 Bkf elevation – TWG elevation)
    BHR = (479.51' – 478.35') / (479.54' – 478.35') = 1.16 / 1.19 = 0.97

As requested, Baker has provided one (1) hardcopy and a pdf version of the Final report, along with all the revised digital data/drawings and e-submission files, which will be sent via secure ftp link. Please do not hesitate to contact me at 919-219-6339 or by email at scott.king@mbakerintl.com should you have any questions regarding our response submittal.

Sincerely,

Scott King, LSS, PWS
Project Manager

Enclosures

UT to Cane Creek Restoration Project
Year 7 Final Monitoring Report

Alamance County, North Carolina

DMS Project ID Number – 95729, DEQ Contract No. 4951

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Report Prepared and Submitted by Michael Baker Engineering, Inc.

NC Professional Engineering License # F-1084

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APPENDICES

1.0 EXECUTIVE SUMMARY

Michael Baker Engineering, Inc. (Baker) restored 3,314 linear feet (LF) of perennial and intermittent streams and enhanced 2,911 linear feet of channel for the Unnamed Tributary (UT) to Cane Creek Restoration Project (Site). Baker also planted approximately 14.0 acres of native riparian species vegetation within the recorded conservation easement areas along the restored and enhanced reaches (Reaches R1, R3, R4, R5 and R5a) for the Site. Table 1 summarizes project components and mitigation credits (Appendix A). The Site is located in Alamance County, approximately three miles south of the Town of Saxapahaw (Figure 1). The Site is located in the NC Division of Water Resources (NCDWR) Sub-basin 03-06-04 and the North Carolina Department of Environmental Quality (NCDEQ) - Division of Mitigation Services' (DMS) Targeted Local Watershed (TLW) 03030002-050050 of the Cape Fear River Basin. The Project involved the restoration and enhancement of rural Piedmont streams, which had been impaired due to past agricultural conversion and cattle grazing.

Based on the DMS 2009 Cape Fear River Basin Restoration Priority (RBRP) Plan, the UT to Cane Creek Restoration Project area is located in an existing TLW within the Cape Fear River Basin, although it is not located in a Local Watershed Planning (LWP) area. The restoration strategy for the Cape Fear River Basin targets specific projects, which focus on developing creative strategies for improving water quality flowing to the Haw River in order to reduce non-point source (NPS) pollution to Jordan Lake.

The primary goals of the Project were to improve ecologic functions and to manage NPS inputs to the impaired areas as described in the DMS 2009 Cape Fear RBRP and as identified below:

- Create geomorphically stable conditions along the UTs across the Site,
- Implement agricultural best management practices (BMPs) to reduce NPS inputs to receiving waters,
- Protect and improve water quality by reducing stream bank erosion, and nutrient and sediment inputs,
- Restore stream and floodplain interaction by connecting historic flow paths and promoting natural flood processes, and
- Restore and protect riparian buffer functions and corridor habitat in perpetuity by establishing a permanent conservation easement.

To accomplish these goals, the following objectives were identified:

- Restore existing incised, eroding, and channelized streams by providing flood water access to the relic floodplains,
- Prevent cattle from accessing the conservation easement by installing permanent fencing thus reducing excessive stream bank erosion and nutrient inputs,
- Increase aquatic habitat value by providing more bedform diversity, creating natural scour pools and reducing sediment inputs from accelerated stream bank erosion,
- Plant native species riparian buffer vegetation along stream bank and floodplain areas, protected by a permanent conservation easement, to increase stormwater runoff filtering capacity, improve stream bank stability and riparian habitat connectivity, and shade the stream to decrease water temperature,
- Improve aquatic and terrestrial habitat through improved substrate and in-stream cover, addition of woody debris, and reduction of water temperature, and
- Treat invasive species vegetation within the Site area and, if necessary, continue treatments during the monitoring period.

The Year 7 monitoring survey data of the twelve permanent cross-sections indicates that these stream sections are geomorphically stable and are within the lateral/vertical stability and in-stream structure performance categories. Certain cross-sections (Appendix D) have shown very minor fluctuations in their geometry as compared to the previous survey conducted in Year 5. These minor fluctuations represent a trend towards increased stability based off visual field evaluations. All reaches are fully stable and performing as designed and are rated at 100 percent for all the visual parameters evaluated in Table 5.

There were no Stream Problem Areas (SPAs) observed during the Year 7 monitoring. The previously reported section of bank scour along Reach R4 from Year 5 has continued to stabilize with livestake vegetation establishing well based on visual observations made during the monitoring year. Baker will continue to evaluate this area and supplement with additional livestake transplants over the winter to ensure continued stability. Additionally, a beaver dam was discovered towards the top of Reach R1 in early 2020 (see CCPV for location) and was removed in March 2020. The beaver likely came up the reach from the adjacent Cane Creek but the dam has not been reestablished. This reach will be closely monitored for additional beaver activity.

During Year 7 monitoring, the planted acreage performance categories were functioning at 100 percent with no thin or bare areas to report (Appendix B). The average density of total planted stems, based on data collected from the six monitoring plots during the Year 7 monitoring in August 2020, was 587 stems per acre (Appendix C). Thus, the vegetation data demonstrate that the Site has met the minimum success interim criteria of 210 trees per acre by the end of Year 7.

There were a few Vegetation Problem Areas (VPA) observed during the Year 7 monitoring. They each consist of scattered resprouts of the invasive species Chinese privet (*Ligustrum sinense*) found along the middle and lowers sections of Reach R4 and along lower Reach R3, as detailed in Table 6a and 6b. The total combined area of the scattered privet is approximately 1.8 acres in size. They are almost entirely located within the mature forested area along the project enhancement reach. Their locations are shown on the Current Condition Plan View (CCPV) maps in the Appendix B. They will be treated in the spring of 2021.

Additionally, the scattered Chinese privet noted in the Year 6 report was treated in March of 2020 in the lower section of Reach R4, in an area approximately 0.5 acres in size. Much of this treated area overlaps with the current VPA privet locations and represents continued resprouts.

During Year 7 monitoring, the Reach R3 crest gauge (crest gauge #2) documented one bankfull event from the flooding resulting from heavy rainfall over two days in early August. Based on visual evidence of the floodplain it also appears that Reach R5 experienced an overbank event during the same storm but crest gauge #1 was found to have an established ant nest within it which destroyed any potential cork indicator. The crest gauge was thoroughly cleaned out and set back up. All crest gauge reading information is presented in Appendix E.

Summary information/data related to the Site and statistics related to 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 Baseline Monitoring Report and in the Mitigation Plan available on the DMS website. All raw data supporting the tables and figures in the Appendices is available from DMS upon request.

This report documents the successful completion of the Year 7 monitoring activities for the post-construction monitoring period.

2.0 METHODOLOGY

The seven-year monitoring plan for the Site includes criteria to evaluate the success of the stream and vegetation components of the Site. The methodology and report template used to evaluate these components adheres to the DMS guidance document "Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation" dated 11/7/11 (DMS 2011), and to the Monitoring Report Template, Version 1.5 (DMS 2012), which will continue to serve as the template for subsequent monitoring years. The specific locations of monitoring features, such as vegetation plots, permanent cross-sections, reference photograph stations, and crest gauges, are shown on the Current Condition Plan View (CCPV) map (Figure 4) found in Appendix B.

The Year 7 cross-section data was collected in September 2020, while the vegetation plot data was collected in late August 2020. All visual site assessment data contained in Appendix B was collected in October 2020.

2.1 Stream Assessment

The Project involved the restoration and enhancement of a rural Piedmont stream system that had been impaired due to past agricultural conversion and cattle grazing. Restoration practices involved raising the existing streambed and reconnecting the stream to the relic floodplain, and restoring natural flows to areas previously drained by ditching activities. The existing channels abandoned within the restoration areas were partially to completely filled to decrease surface and subsurface drainage and raise the local water table. Permanent cattle exclusion fencing was provided around all proposed reaches and riparian buffers, with the exception of Reach R1, where cattle lack access.

Stream survey data was collected to a minimum of Class C Vertical and Class A Horizontal accuracy using Leica TS06 Total Station and was georeferenced to the NAD83 State Plane Coordinate System, FIPS3200 in US Survey Feet, which was derived from the As-built survey.

2.1.1 Morphological Parameters and Channel Stability

Survey data from the twelve permanent project cross-sections were collected and classified using the Rosgen Stream Classification System (Rosgen 1994), and all monitored cross-sections fall within the quantitative parameters defined for channels of the design stream type. The Year 7 monitoring survey data for the cross-sections indicates that the Site is geomorphically stable and performing at virtually 100 percent for all the parameters evaluated. The data collected are within the lateral/vertical stability and in-stream structure performance categories. All morphological survey data is presented in Appendix D.

A longitudinal profile was surveyed for the entire length of channel immediately after construction to document as-built baseline conditions for the first year of monitoring only. Annual longitudinal profiles will not be conducted during subsequent monitoring years unless channel instability has been documented or remedial actions/repairs are required by the U.S. Army Corps of Engineers (USACE) or DMS.

2.1.2 Hydrology

To monitor on-site bankfull events, crest gauges were installed along two of the restored reaches. One crest gauge was installed on the floodplain at the bankfull elevation along the left top of bank on Reach R5 (Crest gauge 1), approximately at Station 22+00. The second crest gauge was installed on the floodplain along the right top of bank along Reach R3 (Crest gauge 2), approximately at Station 13+50.

2.1.3 Photographic Documentation

Reference photograph transects were taken at each permanent cross-section. The survey tape was centered in the photographs of the bank. The water line was located in the lower edge of the frame, and as much of the bank as possible is included in each photograph.

Representative photographs also were taken of grade control structures and buffer areas along the restored stream. Stream photographs from Year 7 monitoring are shown in Appendix B.

2.1.4 Visual Stream Morphological Stability Assessment

The visual stream morphological stability assessment involves the qualitative evaluation of lateral and vertical channel stability, and the integrity and overall performance of in-stream structures throughout the Project reaches as a whole. Habitat parameters and pool depth maintenance are also evaluated. During Year 7 monitoring, Baker staff walked the entire length of each of the Project reaches, noting geomorphic conditions of the stream bed profile (riffle/pool facets), both stream banks, and engineered in-stream structures. Representative photos were taken per the Site's Mitigation Plan. Locations of potential Stream Problem Areas (SPAs) are documented in the field for subsequent mapping on the CCPV figures (no SPAs were identified in Year 7, as described above). A detailed summary of the results for the visual stream stability assessment can be found in Appendix B, which includes all supporting figures, data tables, and SPA photos if applicable.

2.2 Vegetation Assessment

In order to determine if the success criteria are achieved, vegetation-monitoring quadrants were installed and are monitored across the restoration site in accordance with the Carolina Vegetation Survey (CVS)-DMS Protocol for Recording Vegetation, Version 4.1 (Lee 2007). The vegetation monitoring plots are a minimum of 2 percent of the planted portion of the Site with six plots established randomly within the planted riparian buffer areas per Monitoring Levels 1 and 2. No monitoring quadrants were established within the undisturbed wooded areas of Reach R4. The sizes of individual quadrants are 100 square meters for woody tree species.

Year 7 vegetation assessment information is provided in Appendices B and C.

3.0 REFERENCES

Carolina Vegetation Survey (CVS) and NC Division of Mitigation Services (DMS). CVS-DMS Data Entry Tool v. 2.3.1. University of North Carolina, Raleigh, NC. 2012.

Lee, M., Peet R., Roberts, S., Wentworth, T. 2007. CVS-DMS Protocol for Recording Vegetation, Version 4.1.

North Carolina Division of Mitigation Services (DMS). 2012. NCDMS Monitoring Report Template, Version 1.5, June 8, 2012.

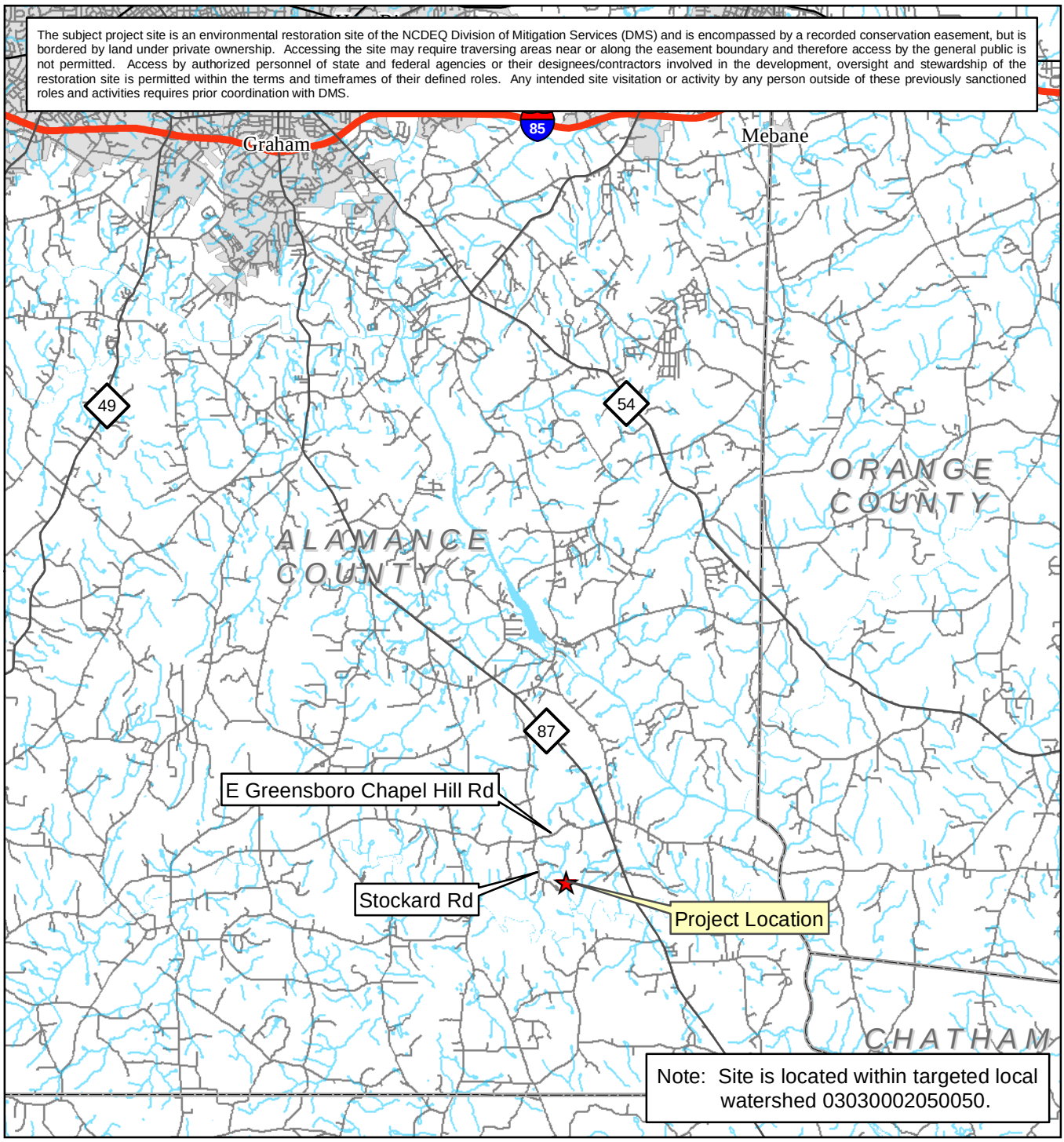
North Carolina Division of Mitigation Services (DMS). 2011. Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation. Version 1.4, November 7, 2011.

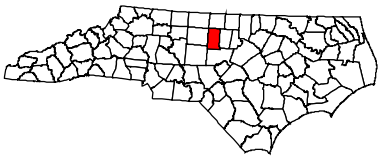
North Carolina Division of Mitigation Services (DMS). 2009. Cape Fear River Basin Restoration Priorities.

Rosgen, D. L. 1994. A Classification of Natural Rivers. Catena 22:169-199.

Appendix A

Project Maps and Background Tables





Alamance County

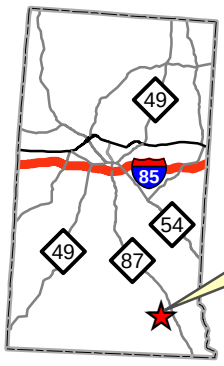


Figure 1
Project Vicinity Map
UT to Cane Creek Site

DEQ - Division of Mitigation Services

N

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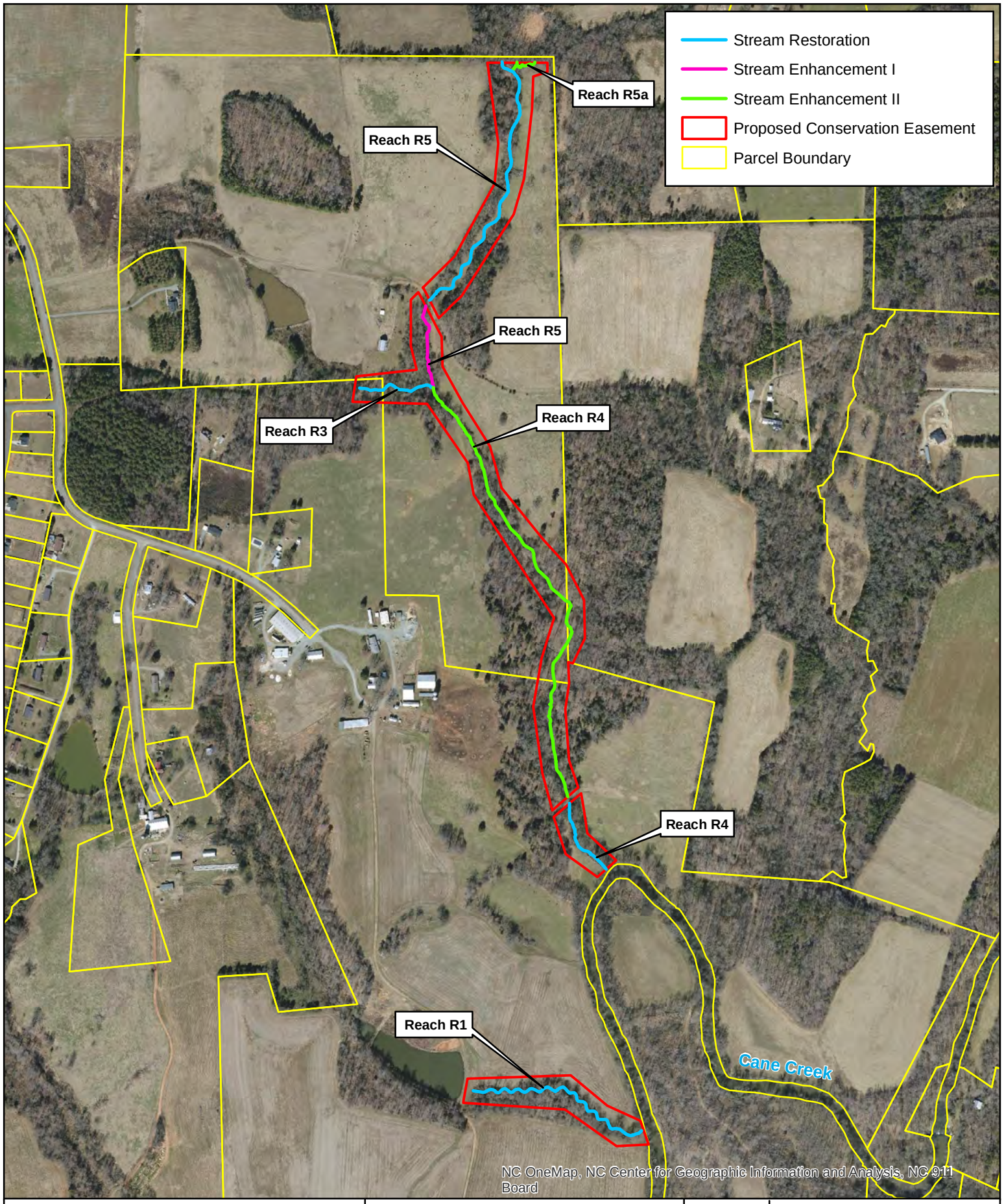
0 0.5 1 2 3 Miles



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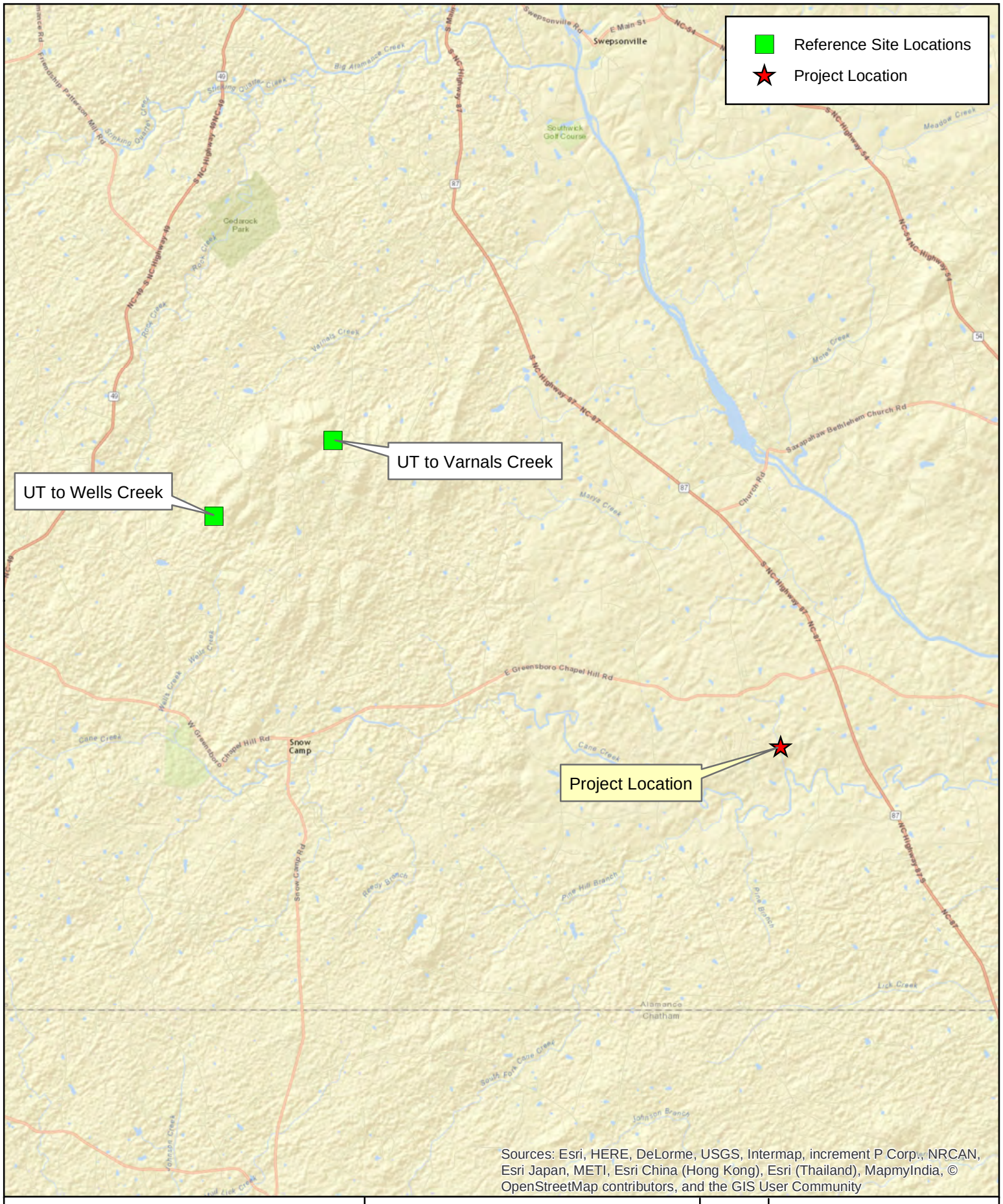
0 500 1,000 Feet

N

DEQ -Division of Mitigation Services
Project # 95729

Figure 2
Mitigation Work Plan
UT to Cane Creek Site



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0 1 2 Miles

N

DEQ - Division of Mitigation Services
Project #95729

Figure 3
Reference Reach Location Map
UT to Cane Creek Site

Table 1. Project Components and Mitigation Credits

UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Mitigation Credits

	Stream	Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R, E1, EII	R	E					
Totals	4,594 SMU	0	0					

Project Components

Project Component or Reach ID	Stationing/ Location	Existing Footage/ Acreage (LF)	Approach	Restoration/ Restoration Equivalent (SMU)	Restoration Footage or Acreage (LF)	Mitigation Ratio
Reach 1	10+00 – 20+45	944	Restoration	1,045	1,045	1:1
Reach 3	10+00 – 13+98	425	Restoration	398	398	1:1
Reach 4 (Upstream section)	29+32 – 52+86	2,346	Enhancement Level II	933	2,333	2.5:1
Reach 4 (Downstream section)	53+20 – 57+30	411	Restoration	410	410	1:1
Reach 5 (Upstream section)	10+03 – 24+64	1,386	Restoration	1,461	1,461	1:1
Reach 5 (Downstream section)	25+00 – 29+32	426	Enhancement Level I	289	433	1.5:1
Reach 5a	10+02 – 11+47	144	Enhancement Level II	58	145	2.5:1

Component Summation

Restoration Level	Stream (LF)	Riparian Wetland (AC)		Non-riparian Wetland (AC)	Buffer (SF)	Upland (AC)
		Riverine	Non-Riverine			
Restoration	3,314					
Enhancement I	433					
Enhancement II	2,478					
Creation	0					
Preservation	0					
High Quality Preservation	0					

BMP Elements

Element	Location	Purpose/Function	Notes

BMP Elements: BR= Bioretention Cell; SF= Sand Filter; SW= Stormwater Wetland; WDP= Wet Detention Pond; DDP= Dry Detention Pond; FS= Filter Strip; S= Grassed Swale; LS= Level Spreader; NI=Natural Infiltration Area

Table 2. Project Activity and Reporting History UT to Cane Creek Restoration Project: DMS Project ID No. 95729			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Mitigation Plan Prepared	N/A	N/A	Aug-13
Mitigation Plan Amended	N/A	N/A	Oct-13
MItigation Plan Approved	May-13	N/A	Dec-13
Final Design – (at least 90% complete)	N/A	N/A	Feb-14
Construction Begins	Nov-13	N/A	Mar-14
Temporary S&E mix applied to entire project area	Feb-14	N/A	Jun-14
Permanent seed mix applied to entire project area	Feb-14	N/A	Jun-14
Planting of live stakes	Feb-14	N/A	Jun-14
Planting of bare root trees	Feb-14	N/A	Jun-14
End of Construction	Feb-14	N/A	Jun-14
Survey of As-built conditions (Year 0 Monitoring-baseline)	Apr-14	Jul-14	Aug-14
Year 1 Monitoring	Dec-14	Jan-15	Apr-15
Year 2 Monitoring	Dec-15	Oct-15	Nov-15
Year 3 Monitoring	Dec-16	Oct-16	Nov-16
Year 4 Monitoring	Dec-17	Oct-17	Nov-17
Year 5 Monitoring	Dec-18	Oct-18	Dec-18
Year 6 Monitoring	Dec-19	Oct-19	Jan-20
Year 7 Monitoring	Dec-20	Oct-20	Dec-20

Table 3. Project Contacts **UT to Cane Creek Restoration Project: DMS Project ID No. 95729**	
Designer	
Michael Baker Engineering, Inc.	8000 Regency Parkway, Suite 600 Cary, NC 27518 Contact: Katie McKeithan, Telephone: 919-481-5703
Construction Contractor	
KBS Earthworks	5616 Coble Church Rd Julian, NC 27283 Contact: Chris Sizemore, Telephone: 336-362-0289
Planting Contractor	
KBS Earthworks	5616 Coble Church Rd Julian, NC 27283 Contact: Chris Sizemore, Telephone: 336-362-0289
Seeding Contractor	
KBS Earthworks	5616 Coble Church Rd Julian, NC 27283 Contact: Chris Sizemore, Telephone: 336-362-0289
Seed Mix Sources Nursery Stock Suppliers	Green Resources, Telephone: 336-855-6363 Mellow Marsh Farm, Telephone: 919-742-1200 ArborGen, Telephone: 843-528-3204
Monitoring Performers	
Michael Baker Engineering, Inc.	8000 Regency Parkway, Suite 600 Cary, NC 27518 Contact:
Stream Monitoring Point of Contact	Scott King, Tel. 919-481-5731
Vegetation Monitoring Point of Contact	Scott King, Tel. 919-481-5731

Table 4. Project Attributes (Pre-Construction Conditions)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Project Information	
Project Name	UT to Cane Creek Restoration Project
County	Alamance
Project Area (acres)	19.9
Project Coordinates (latitude and longitude)	35.8934 N, -79.3187 W

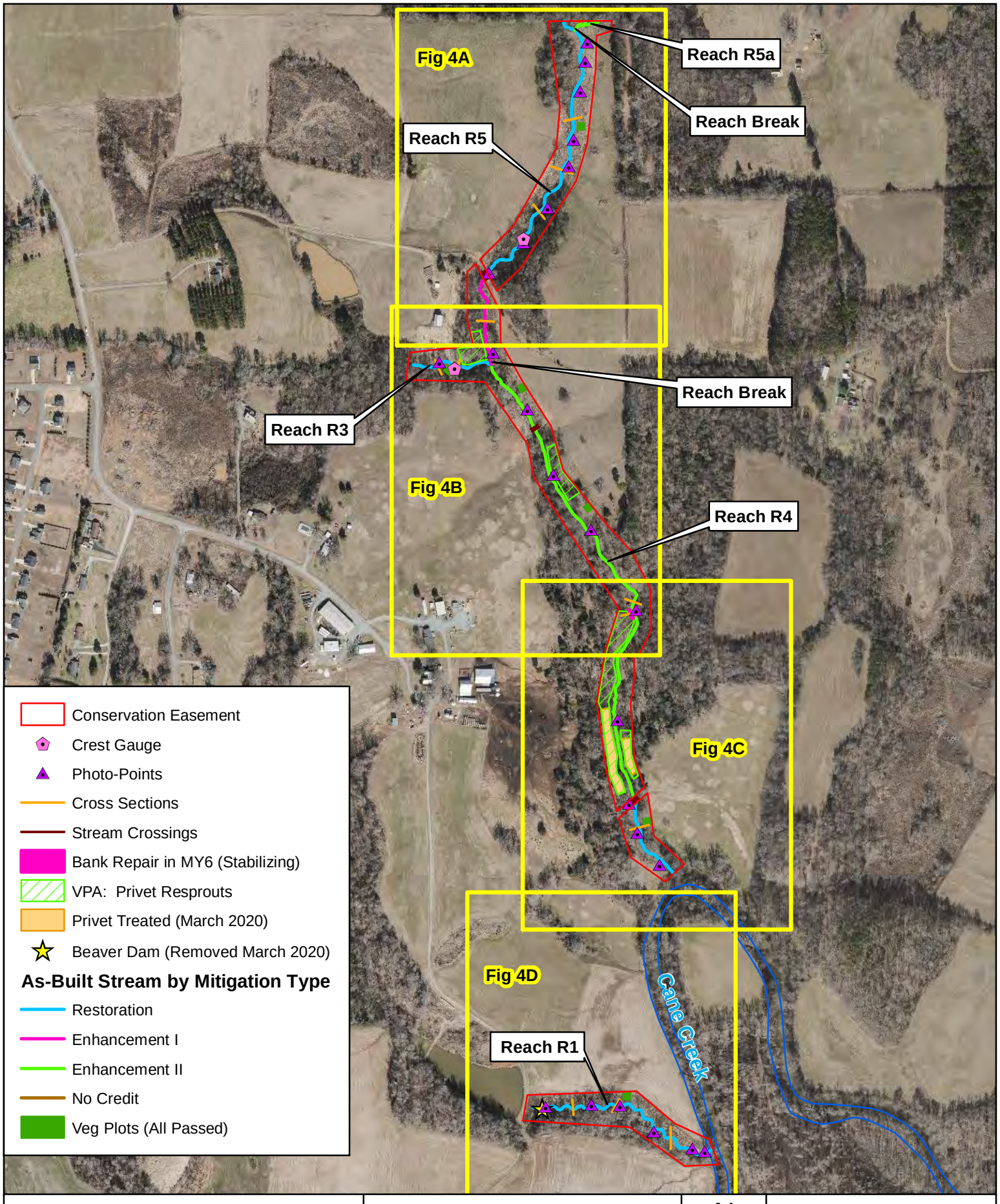
Project Watershed Summary Information	
Physiographic Province	Piedmont
River Basin	Cape Fear
USGS Hydrologic Unit 8-digit and 14-digit	03030002 / 03030002050050
NCDWR Sub-basin	03-06-04
Project Drainage Area (acres)	452 (Reach R4 main stem at downstream confluence w/ Cane Creek)
Project Drainage Area Percent Impervious	<1%
CGIA Use Classification	2.01.01.01, 2.03.01, 2.99.01, 3.02 / Forest (49%) Agriculture (46%) Impervious Cover (1%)

Reach Summary Information					
Parameters	**Reach R1**	**Reach R3**	**Reach R4**	**Reach R5**	**Reach R5a**
Length of Reach (linear feet)	1,052	400	2,731	1,925	145
Valley Classification (Rosgen)	VII	VII	VII	VII	VII
Drainage Area (acres)	80	91	452	290	14
NCDWR Stream Identification Score	30.5	36	42.5	38.5	33.5
NCDWR Water Quality Classification	WS V; NSW				
Morphological Description (Rosgen stream type)	Incised E	G	Bc (upstream)/ F (downstream)	G	B
Evolutionary Trend	Incised E→Gc→F	Bc→G→Fb	Bc→G→Fb	Bc→G→Fb	B→G
Underlying Mapped Soils	We, GaE, Cg, DbB	We	We, GbD3, Mc, Cg, TaD	We	We
Drainage Class	Poorly drained	Poorly drained	Poorly	Poorly drained	Poorly
Soil Hydric Status	Hydric	Hydric	Hydric	Hydric	Hydric
Average Channel Slope (ft/ft)	0.0127	0.0168	0.0169	0.0126	0.0223
FEMA Classification	N/A	Zone AE	Zone AE	N/A	N/A
Native Vegetation Community	Piedmont Small Stream				
Percent Composition of Exotic/Invasive Vegetation	<5%	<5%	<5%	<5%	<5%

Regulatory Considerations			
Regulation	**Applicable**	**Resolved**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Yes	Categorical Exclusion
Waters of the United States – Section 401	Yes	Yes	Categorical Exclusion
Endangered Species Act	No	N/A	Categorical Exclusion
Historic Preservation Act	No	N/A	Categorical Exclusion
Coastal Area Management Act (CAMA)	No	N/A	Categorical Exclusion
FEMA Floodplain Compliance	Yes	Yes	Categorical Exclusion
Essential Fisheries Habitat	No	N/A	Categorical Exclusion

Appendix B

Visual Assessment Data



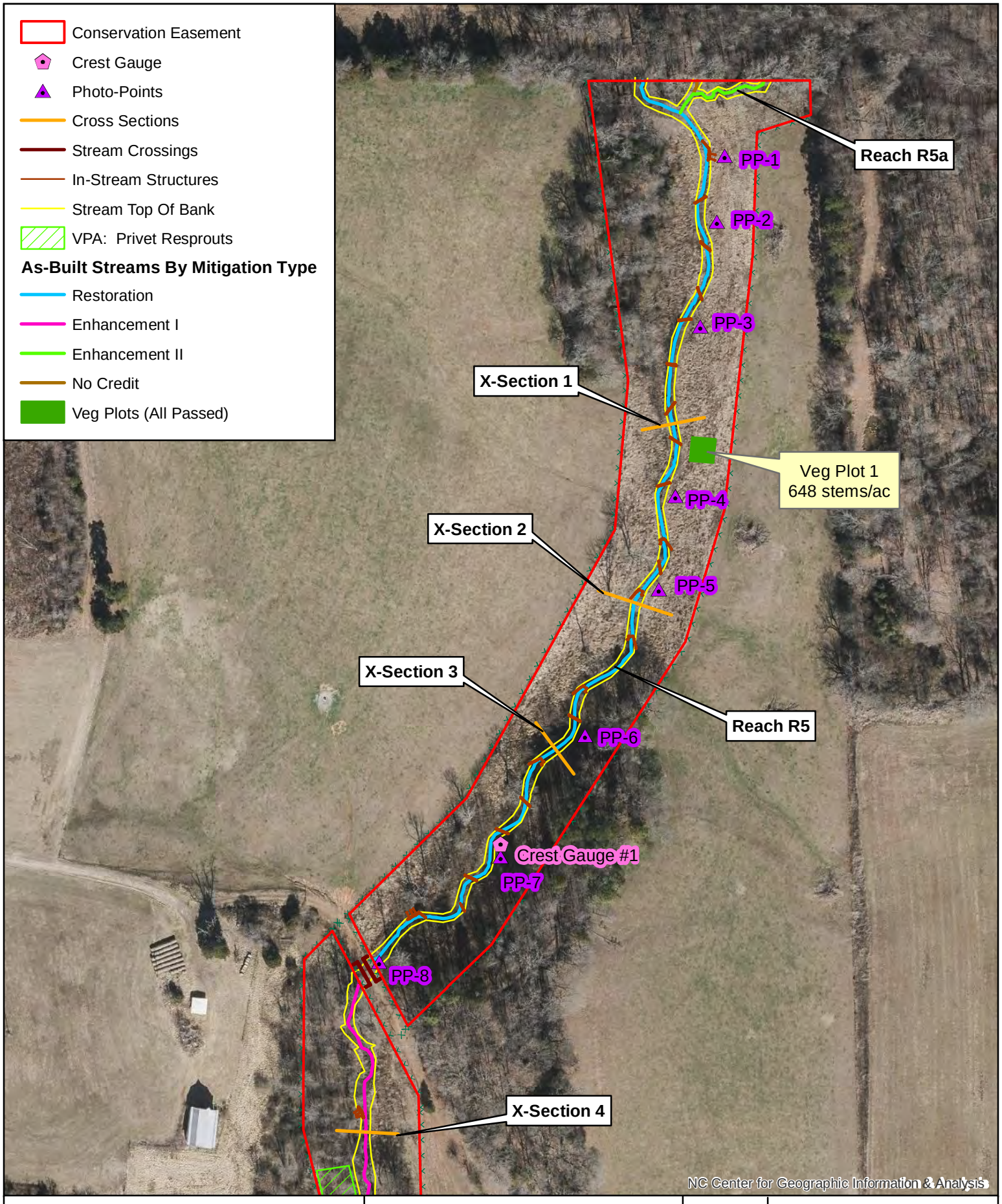
Michael Baker INTERNATIONAL

0 250 500 Feet

N

DEQ - Division of Mitigation Services
Project # 95729

Current Condition
Plan View - Figure Index
Monitoring Year 7
UT to Cane Creek Site



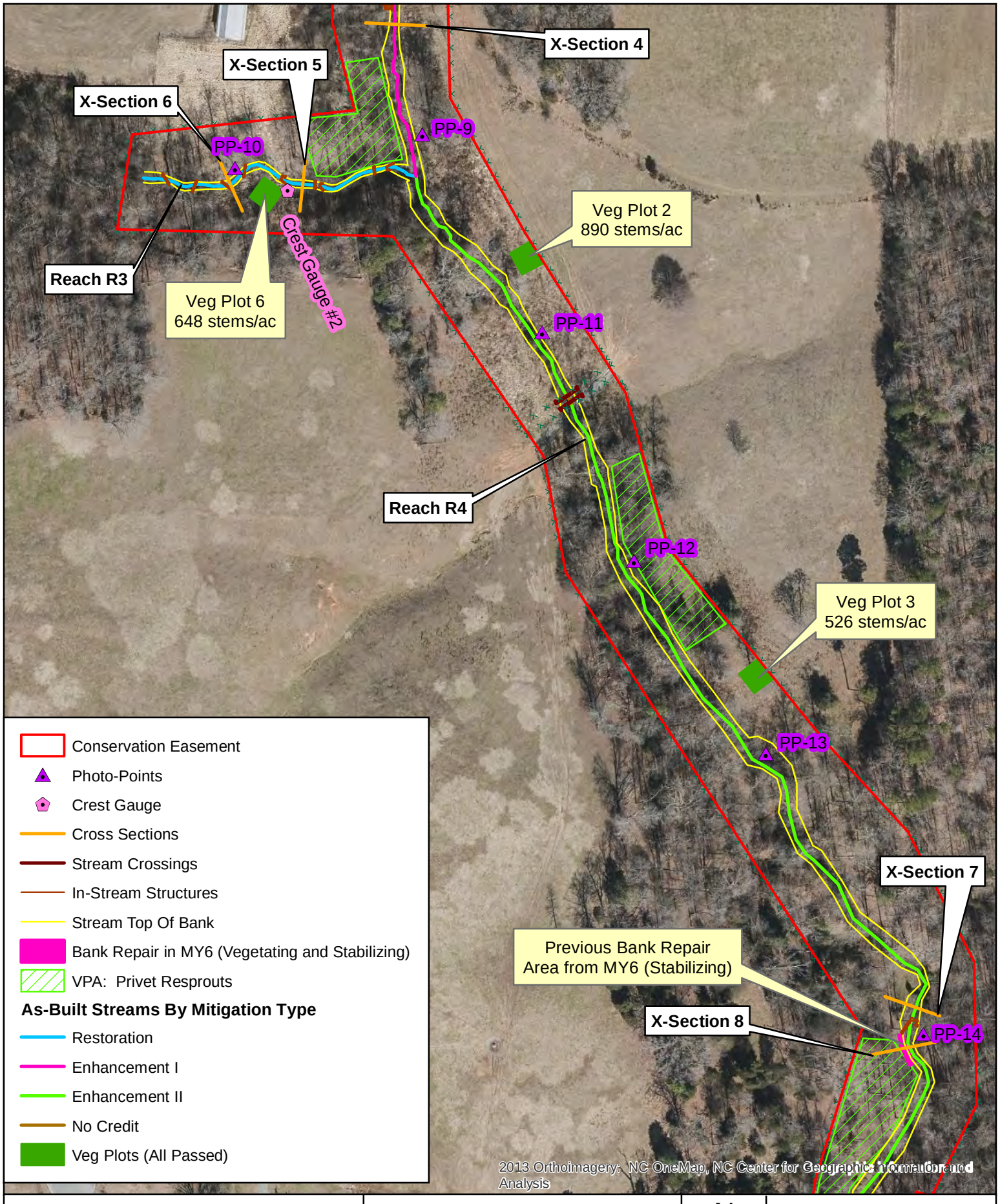
Michael Baker INTERNATIONAL

0 100 200 Feet

N

DEQ - Division of Mitigation Services
Project # 95729

Current Condition Plan View - Figure 4A
Monitoring Year 7
UT to Cane Creek Site



Michael Baker INTERNATIONAL

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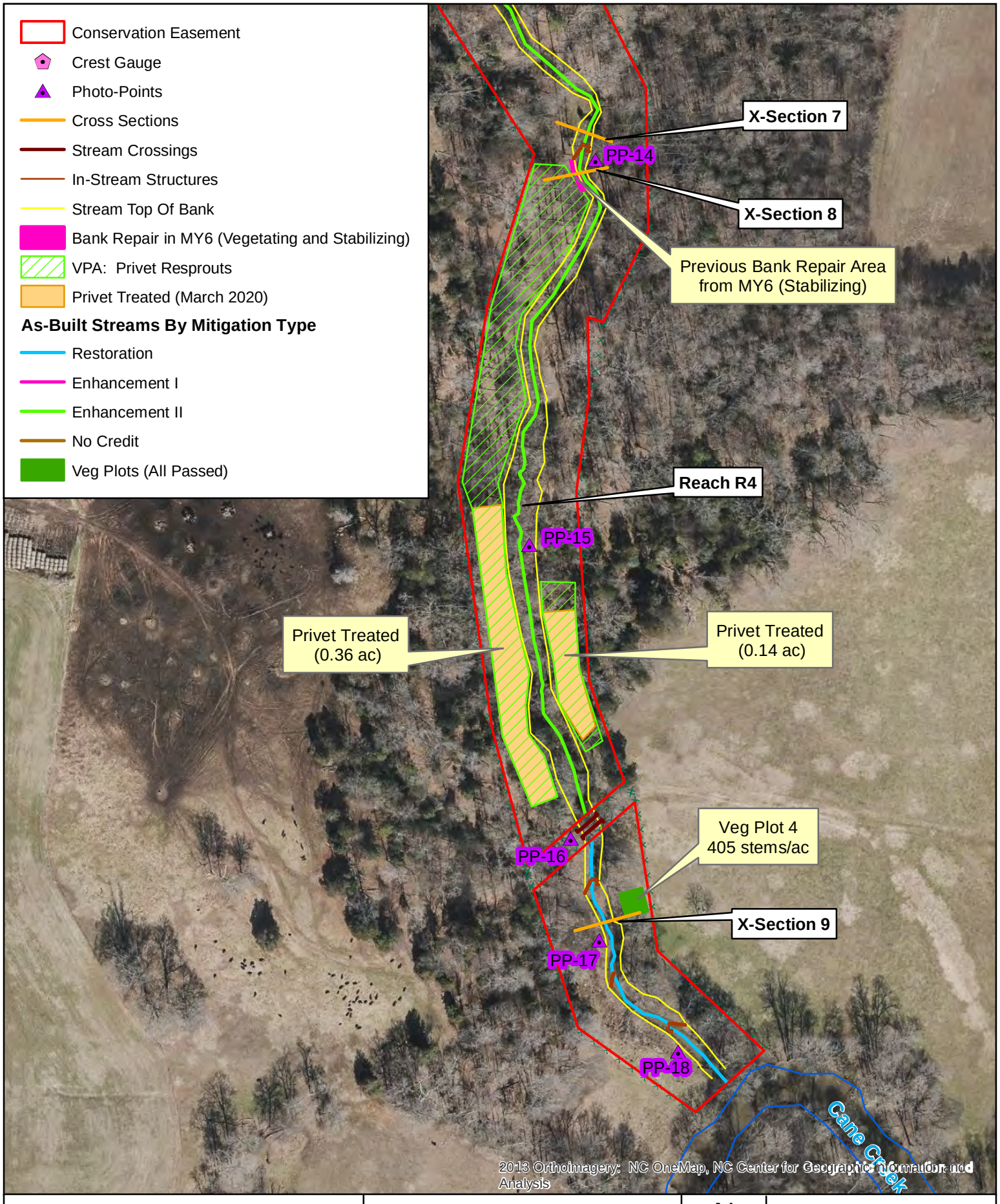
DEQ - Division of Mitigation Services
Project # 95729

Current Condition Plan View - Figure 4B
Monitoring Year 7
UT to Cane Creek Site



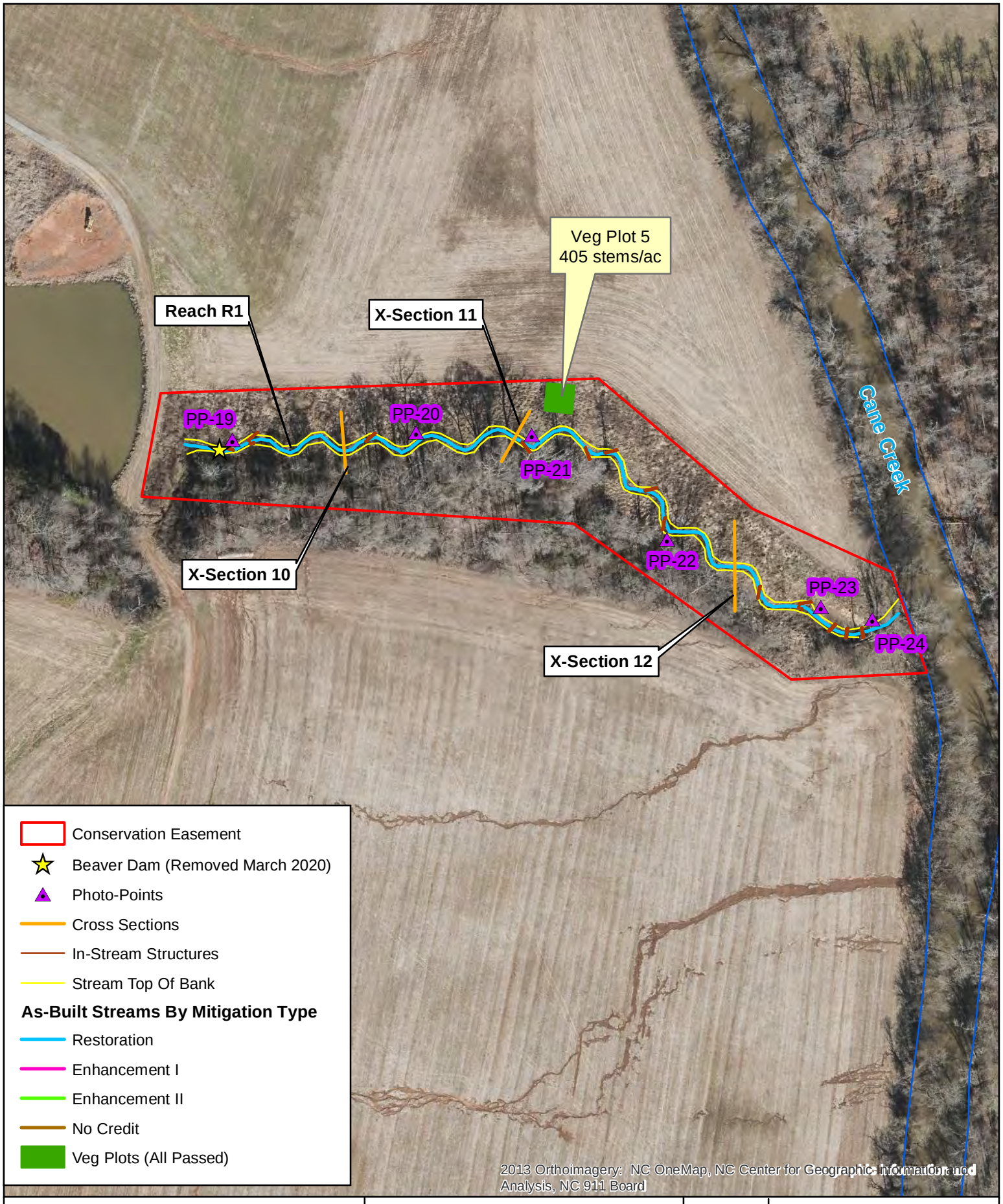
Michael Baker INTERNATIONAL

0 100 200 Feet

N

DEQ - Division of Mitigation Services
Project # 95729

Current Condition Plan View - Figure 4C Monitoring Year 7 UT to Cane Creek Site



Michael Baker INTERNATIONAL

0 100 200 Feet

N

DEQ - Division of Mitigation Services
Project # 95729

Current Condition Plan View - Figure 4D Monitoring Year 7 UT to Cane Creek Site

Table 5a. Visual Steam Morphology Stability Assessment
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach ID: Reach 1
Assessed Length (LF): 1,045

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1.Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture Substrate	9	9			100%			
	3. Meander Pool Condition	1. Depth	21	21			100%			
		2. Length	21	21			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	21	21			100%			
		2. Thalweg centering at downstream of meander bend (Glide)	20	20			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			0	0	100%	0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%	0	0	100%
		Totals			0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sill or arms	4	4			100%			
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	4	4			100%			
	4. Habitat	Pool forming structures maintaining - Max Pool Depth	4	4			100%			

Table 5a. Visual Steam Morphology Stability Assessment
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach ID: Reach 3
Assessed Length (LF): 398

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1.Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture Substrate	6	6			100%			
	3. Meander Pool Condition	1. Depth	3	3			100%			
		2. Length	3	3			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	3	3			100%			
		2. Thalweg centering at downstream of meander bend (Glide)	3	3			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			0	0	100%	0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%	0	0	100%
		Totals			0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sill or arms	4	4			100%			
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	4	4			100%			
	4. Habitat	Pool forming structures maintaining - Max Pool Depth	4	4			100%			

Table 5a. Visual Steam Morphology Stability Assessment
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach ID: Reach 4
Assessed Length (LF): 2,743

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1.Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture Substrate	7	7			100%			
	3. Meander Pool Condition	1. Depth	2	2			100%			
		2. Length	2	2			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		2. Thalweg centering at downstream of meander bend (Glide)	2	2			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			0	0	100%	0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%	0	0	100%
		Totals			0	0	100%	0	0	99%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sill or arms	3	3			100%			
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	3	3			100%			
	4. Habitat	Pool forming structures maintaining - Max Pool Depth	3	3			100%			

Table 5a. Visual Steam Morphology Stability Assessment
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach ID: Reach 5
Assessed Length (LF): 2,039

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1.Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture Substrate	15	15			100%			
	3. Meander Pool Condition	1. Depth	19	19			100%			
		2. Length	19	19			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	19	19			100%			
		2. Thalweg centering at downstream of meander bend (Glide)	18	18			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			0	0	100%	0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%	0	0	100%
		Totals			0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	17	17			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	17	17			100%			
	2a. Piping	Structures lacking any substantial flow underneath sill or arms	17	17			100%			
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	17	17			100%			
	4. Habitat	Pool forming structures maintaining - Max Pool Depth	17	17			100%			

Table 5b. Stream Problem Areas (SPAs)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Feature Issue	Station Numbers	Suspected Cause	Photos
None	-	-	-

Table 6a. Vegetation Conditions Assessment
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Planted Acreage: 14.0						
Vegetation Category	**Defintions**	**Mapping Threshold (acres)**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Planted Acreage**
1. Bare Areas	Very limited cover both woody and herbaceous material.	0.1	NA	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4 or 5 stem count criteria.	0.1	NA	0	0.00	0.0%
			Total	**0**	**0.00**	**0.0%**
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems or a size class that are obviously small given the monitoring year.	0.25	NA	0	0.00	0.0%
			Cumulative Total	**0**	**0.00**	**0.0%**
Easement Acreage: 19.9						
Vegetation Category	**Defintions**	**Mapping Threshold**	**CCPV Depiction**	**Number of Polygons**	**Combined Acreage**	**% of Easement Acreage**
5. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale)	1000 ft²	Green polygons with hatching	4	1.80	9.0%
6. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	none	NA	0	0.00	0.0%

Table 6b. Vegetation Problem Areas (VPAs)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Feature Issue	Location	Suspected Cause	Photos
Scattered Chinese privet (*Ligustrum sinense*)	Reach R4: Mid and lower right bank and lower left bank. Reach R3: Lower left bank. Total area ~1.8 acres	Re-sprouts	N/A

UT to Cane Creek: MY7 Stream Station Photo-Points (from 10/08/20)

PP-1: Reach R5, view upstream, Station 11+50

PP-2: Reach R5, view upstream, Station 12+50

PP-3: Reach R5, view upstream, Station 13+75

PP-4: Reach R5, view upstream, Station 16+50

PP-5: Reach R5, view upstream, Station 17+25

PP-6: Reach R5, view upstream, Station 20+00

UT to Cane Creek: MY7 Stream Station Photo-Points (from 10/08/20)

PP-7: Reach R5, view upstream from crest gauge, Station 22+00

PP-8: Reach R5, view upstream of culvert crossing, Station 24+75

PP-9: Reach R5, view upstream, Station 28+50

PP-10: Reach R3, view upstream, at cross-section 6

PP-11: Reach R4, view upstream, Station 31+50

PP-12: Reach R4, view of upstream, Station 35+00

UT to Cane Creek: MY7 Stream Station Photo-Points (from 10/08/20)

PP-13: Reach R4, view upstream, Station 38+50

PP-14: Reach R4, view upstream, Station 43+50

PP-15: Reach R4, view upstream, Station 49+00

PP-16: Reach R4, view upstream at crossing, Station 53+00

PP-17: Reach R4, view upstream, Station 54+75

PP-18: Reach R4, view upstream, Station 56+50

UT to Cane Creek: MY7 Stream Station Photo-Points (from 10/08/20)

PP-19: Reach R1, view upstream, Station 10+50

PP-20: Reach R1, view upstream, Station 13+50

PP-21: Reach R1, view upstream, Station 15+00

PP-22: Reach R1, view upstream, Station 17+00

PP-23: Reach R1, view upstream, Station 19+25

PP-24: Reach R1, view upstream, Station 20+00

UT to Cane Creek: MY7 Vegetation Plot Photographs (from 8/28/20)

Vegetation Plot 1

Vegetation Plot 2

Vegetation Plot 3

Vegetation Plot 4

Vegetation Plot 5

Vegetation Plot 6

UT to Cane Creek: MY7 Crest Gauge Photographs

Reach R3: Crest Gauge #2, 0.67 feet on 8/28/2020 (after 2.47” storm event on 8/4 and 8/5)

Reach R3: Closeup of Crest Gauge #2 on 8/28/20

Reach R5: Crest Gauge #1 (ant colony destroyed cork indicators – has been cleaned and restored)

UT to Cane Creek: MY7 Additional Project Photographs

Pipe culvert crossing on lower Reach R5

Ford crossing in upper Reach R4

Ford crossing in lower Reach R4

Reach R4 Station 43+50: Stabilizing and vegetating from previously documented bank scour from Hurricane Florence in Sept 2018 (photo from Oct 2020)

Reach R4 Station 43+50: Stabilizing and vegetating from previously documented bank scour from Hurricane Florence in Sept 2018 (photo from Oct 2020)

Reach R4 Station 43+50: Stabilizing and vegetating from previously documented bank scour from Hurricane Florence in Sept 2018 (photo from Oct 2020)

Appendix C

Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Plot ID	Vegetation Survival Threshold Met?	MY7 Total / Planted Stem Count	Tract Mean
1	Y	648/880	587
2	Y	890/1,012	
3	Y	526/648	
4	Y	405/688	
5	Y	405/728	
6	Y	648/971	

Notes:

***** Total/Planted Stem Count reflects the change in stem density based on the current total density of planted stems (Total), over the density of stems at the time of the As-Built Survey (Planted).

Table 8. CVS Vegetation Plot Metadata
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Report Prepared By	Drew Powers
Date Prepared	09/14/2020 13:13
database name	MichaelBaker_2020_UTCaneCrk_95729.mdb
database location	L:\Projects\132700\Monitoring\Post_Restoration\Veg Plots\Year 7
computer name	CARYLAPOWERS1
file size	50827264
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.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	95729
project Name	UT to Cane Creek
Description	
River Basin	Cape Fear
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	6

Table 9a. CVS Stem Count of Planted Stems by Plot and Species

UT to Cane Creek Restoration Project: DMS Project ID No. 95729

	Comment	Species	SpType	CommonName	Total Planted Stems	# plots	avg# stems	plot 95729-01-0001-year:5	plot 95729-01-0002-year:5	plot 95729-01-0003-year:5	plot 95729-01-0004-year:5	plot 95729-01-0005-year:5	plot 95729-01-0006-year:5
		Betula nigra	Tree	river birch	10	3	3.33	6				1	3
		Carpinus caroliniana	Shrub Tree	American hornbeam	7	5	1.4		1	1	1	1	3
		Diospyros virginiana	Tree	common persimmon	5	5	1	1	1	1	1	1	
		Fraxinus pennsylvanica	Tree	green ash	23	6	3.83	1	9	5	2	3	3
		Liriodendron tulipifera	Tree	tuliptree	2	2	1	1			1		
		Nyssa sylvatica	Tree	blackgum	2	1	2				2		
		Platanus occidentalis	Tree	American sycamore	12	5	2.4	5	2	2		1	2
		Quercus alba	Tree	white oak	4	3	1.33		2	1	1		
		Quercus laurifolia	Tree	laurel oak	1	1	1	1					
		Quercus lyrata	Tree	overcup oak	10	4	2.5		6	1		2	1
		Quercus michauxii	Tree	swamp chestnut oak	8	4	2		1	1	2		4
		Quercus nigra	Tree	water oak	3	3	1	1		1		1	
TOT:	**0**	**12**	**12**	**12**	**87**	**12**		**16**	**22**	**13**	**10**	**10**	**16**

Table 9b. Stem Count for Each Species Arranged by Plot
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Botanical Name	Common Name	Plots						
		1	2	3	4	5	6	
Tree Species								
Betula nigra	river birch	6				1	3	
Fraxinus pennsylvanica	green ash	1	9	5	2	3	3	
Liriodendron tulipfera	tulip poplar	1			1			
Nyssa sylvatica	black gum				2			
Platanus occidentalis	American sycamore	5	2	2		1	2	
Quercus alba	white oak		2	1	1			
Quercus laurifolia	laurel oak	1						
Quercus lyrata	overcup oak		6	1		2	1	
Quercus michauxii	swamp chestnut oak		1	1	2		4	
Quercus nigra	water oak	1		1		1		
Shrub Species								
Asimina triloba	paw paw							
Carpinus caroliniana	ironwood		1	1	1	1	3	
Diospyros virginiana	persimmon	1	1	1	1	1		
Hamamelis virginiana	witch hazel							
Itea virginica	Virginia sweetspire							
Lindera benzoin	spicebush							
Viburnum dentatum	arrowwood viburnum							
Total Stems Per Plot for Year 5 (September 2020)		16	22	13	10	10	16	**Average Stems Per Acre**
Density Per Plot for Year 7 (September 2020)		648	890	526	405	405	648	**587**
Density Per Plot for Year 5 (September 2018)		688	890	607	405	445	728	627
Density Per Plot for Year 3 (September 2016)		607	890	526	405	526	769	620
Density Per Plot for Year 2 (October 2015)		607	890	728	486	607	769	681
Density Per Plot for Year 1 (After Supplemental Planting Mar. 2015)		728	1012	648	688	728	971	796
Total Stems/ Acre for Year 1 (Before Supplemental Dec. 2014)		728	405	121	364	202	567	398
Total Stems/ Acre for Year 0 As-Built (Baseline Data)		880	680	640	680	760	520	693

Table 9c. CVS Density Per Plot

UT to Cane Creek Restoration Project: DMS Project ID No. 95729

			Current Plot Data (MY7 2020)																		Annual Means											
			95729-01-0001			95729-01-0002			95729-01-0003			95729-01-0004			95729-01-0005			95729-01-0006			MY7 (2020)			MY5 (2018)			MY3 (2016)			MY2 (2015)			MY1 (2014)		
Scientific Name	Common Name	Species Type	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T
Alnus serrulata	Tag alder	Shrub														1	1					1	1										
Asimina triloba	pawpaw	Tree											1	1								1	1										
Betula nigra	river birch	Tree	6		6										1		1	3	5	8	10	5	15	10	1	11	10		10	10		10	13		13
Carpinus caroliniana	American hornbeam	Tree				1		1	1		1	1	1	2	1		1	3		3	7	1	8	7		7	7		7	7		7	5		5
Celtis laevigata	sugarberry	Tree																							4	4								
Cornus amomum	silky dogwood	Shrub														1	1					1	1										
Diospyros virginiana	common persimmon	Tree	1		1	1		1	1		1	1	1	2	1		1				5	1	6	5	4	9	6		6	5		5	1		1
Fraxinus pennsylvanica	green ash	Tree	1	1	2	9	2	11	5		5	2		2	3	5	8	3		3	23	8	31	23	20	43	24		24	27		27	15		15
Liquidambar styraciflua	sweetgum	Tree		5	5		5	5		5	5											15	15											
Liriodendron tulipifera	tuliptree	Tree	1		1					4	4	1		1		1	1				2	5	7	2	3	5	1		1	1		1			
Nyssa sylvatica	blackgum	Tree										2		2							2		2	2		2	2		2	3		3	4		4
Platanus occidentalis	American sycamore	Tree	5	1	6	2		2	2		2		1	1	1		1	2		2	12	2	14	12	4	16	11		11	11		11	7		7
Quercus	oak	Tree																												1		1			
Quercus alba	white oak	Tree				2		2	1		1	1		1							4		4	5		5	5		5	5		5			
Quercus laurifolia	laurel oak	Tree	1		1																1		1	2		2	3		3	3		3	3		3
Quercus lyrata	overcup oak	Tree				6		6	1		1				2		2	1		1	10		10	11		11	11		11	11		11			
Quercus michauxii	swamp chestnut oak	Tree				1		1	1		1	2		2				4		4	8		8	11	1	12	11		11	13		13	9		9
Quercus nigra	water oak	Tree	1		1				1		1				1		1				3		3	3		3	3		3	3		3	1		1
Salix nigra	black willow	Tree																							1	1								
Ulmus alata	winged elm	Tree		1	1																	1	1		2	2								
Unknown	Unknown	Shrub or Tree																												2		2	1		1
		Stem count	16	8	24	22	7	29	13	9	22	10	4	14	10	8	18	16	5	21	87	41	128	93	40	133	94	0	94	102	0	102	59	0	59
		size (ares)	1			1			1			1			1			1			6			6			6			6			6		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.15			0.15			0.15			0.15			0.15		
		Species count	7	4	9	7	2	8	8	2	10	7	4	9	7	4	10	6	1	6	12	11	17	12	9	15	12	0	12	14	0	14	10	0	10
		Stems per ACRE	**648**	**324**	**971**	**890**	**283**	**1,174**	**526**	**364**	**890**	**405**	**162**	**567**	**405**	**324**	**728**	**648**	**202**	**850**	**587**	**277**	**863**	**627**	**270**	**897**	**634**	**0**	**634**	**688**	**0**	**688**	**398**	**0**	**398**

Table 9d. CVS Vegetation Summary and Totals
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

UT to Cane Creek (#95729)

Year 7 (September 2020)

Vegetation Plot Summary Information

Plot #	Riparian Buffer Stems[1]	Stream/ Wetland Stems[2]	Live Stakes	Invasives	Volunteers[3]	Total[4]	Unknown Growth Form
1	n/a	16	0	0	8	**24**	0
2	n/a	22	0	0	7	**29**	0
3	n/a	13	0	0	9	**22**	0
4	n/a	10	0	0	4	**14**	0
5	n/a	10	0	0	8	**18**	0
6	n/a	16	0	0	5	**21**	0

Wetland/Stream Vegetation Totals

(per acre)

Plot #	Stream/ Wetland Stems[2]	Volunteers[3]	Total[4]	Success Criteria Met?
1	648	324	971	Yes
2	890	283	1174	Yes
3	526	364	890	Yes
4	405	162	567	Yes
5	405	324	728	Yes
6	648	202	850	Yes
Project Avg	**587**	**277**	**863**	**Yes**

Riparian Buffer Vegetation Totals

(per acre)

Plot #	Riparian Buffer Stems[1]	Success Criteria Met?
1	n/a	
2	n/a	
3	n/a	
4	n/a	
5	n/a	
6	n/a	
Project Avg	**n/a**	

Stem Class	characteristics
[1]Buffer Stems	Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.
[2]Stream/ Wetland Stems	Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines
[3]Volunteers	Native woody stems. Not planted. No vines.
[4]Total	Planted + volunteer native woody stems. Includes live stakes. Excl. exotics. Excl. vines.

Appendix D

Stream Survey Data

Figure 5. Year 7 Cross-Sections with Annual Overlays

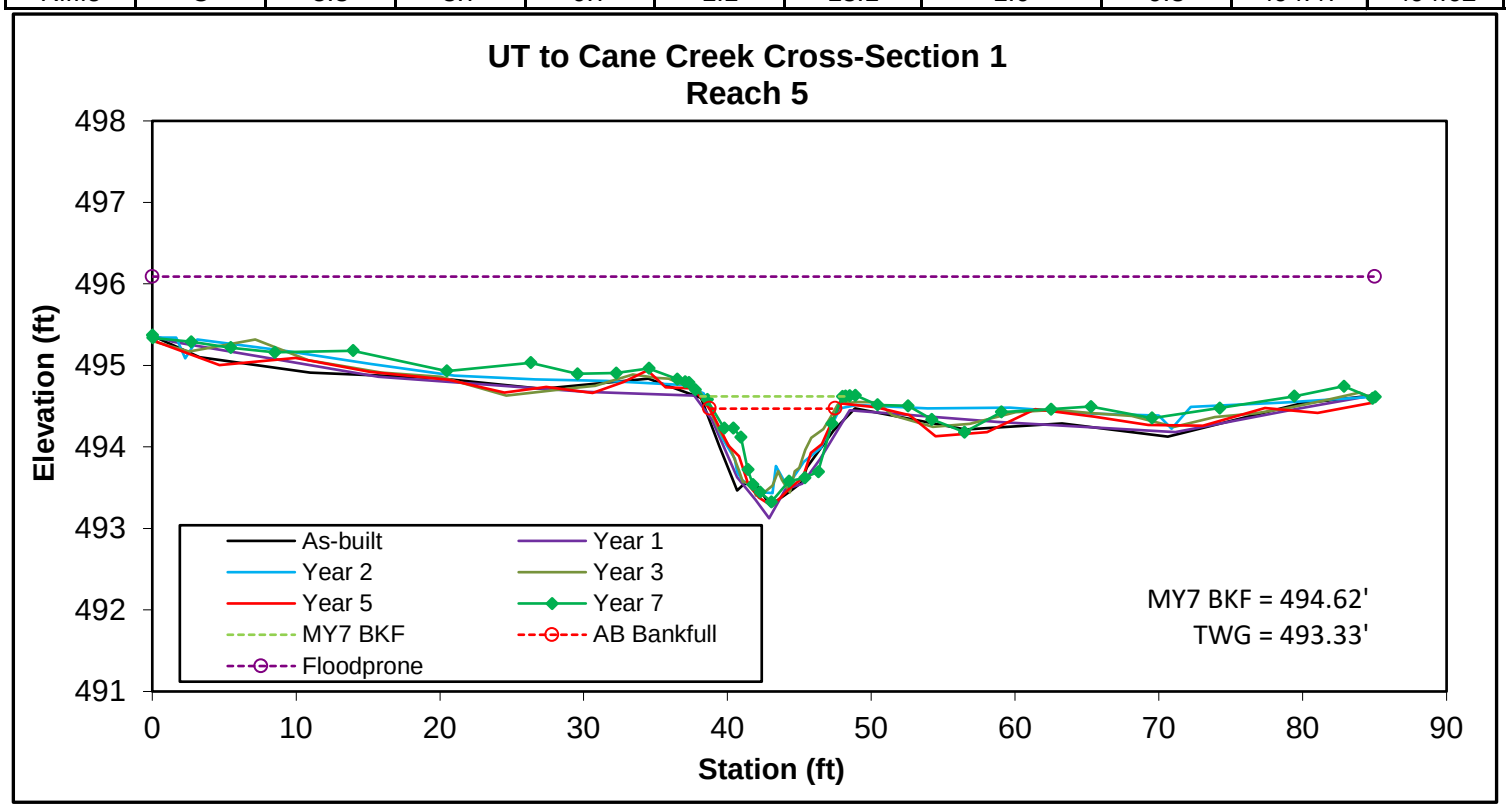
Permanent Cross-Section 1, Reach 5

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Riffle	C	5.8	8.7	0.7	1.1	13.1	1.0	9.8	494.47	494.62



Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the bankfull elevation as determined using the as-built bankfull area. All other values were calculated using the original as-built bankfull elevation, as was done for previous monitoring reports.

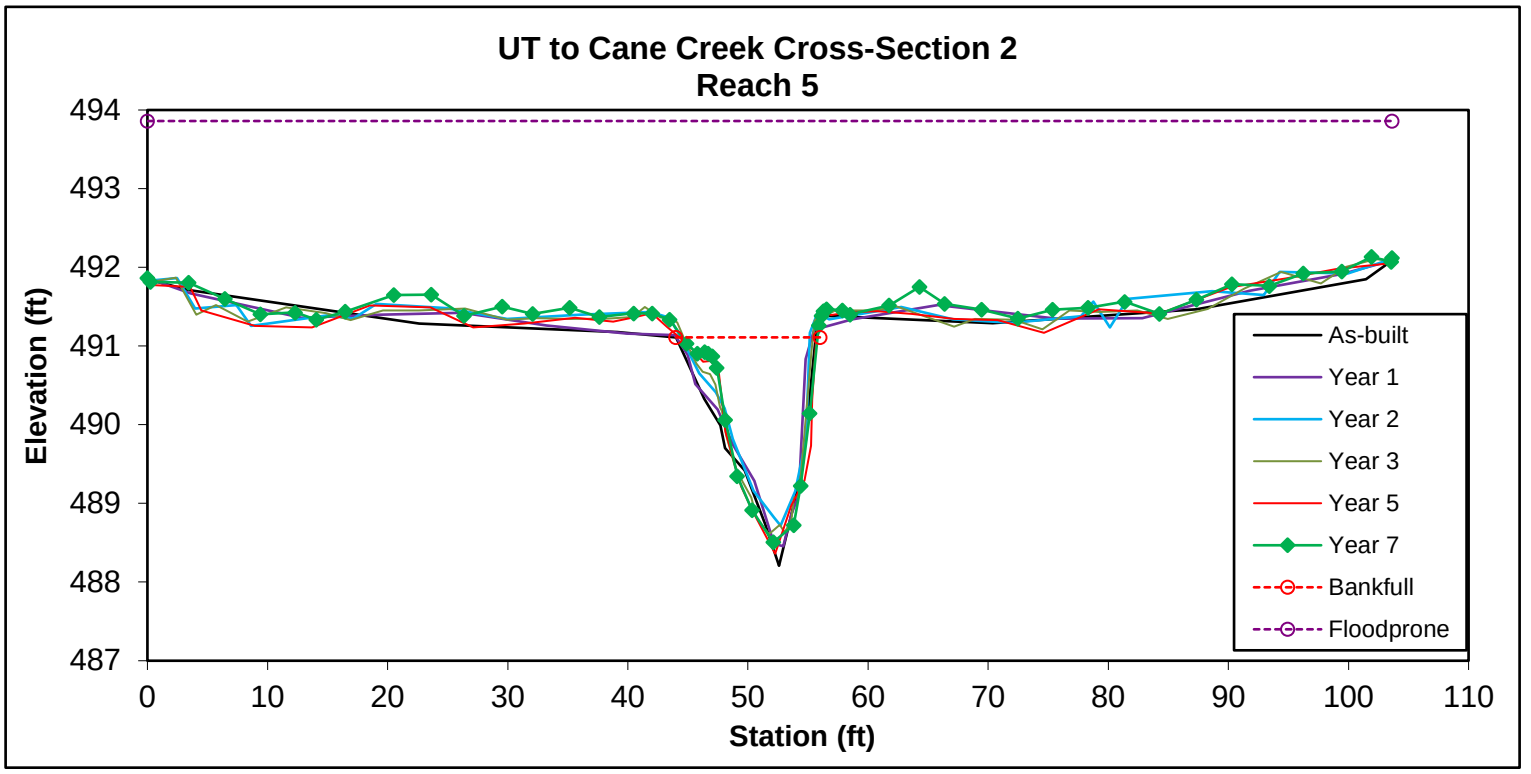
Permanent Cross-Section 2, Reach 5

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Pool	-	15.9	11.2	1.4	2.6	7.9	-	-	491.11	491.11



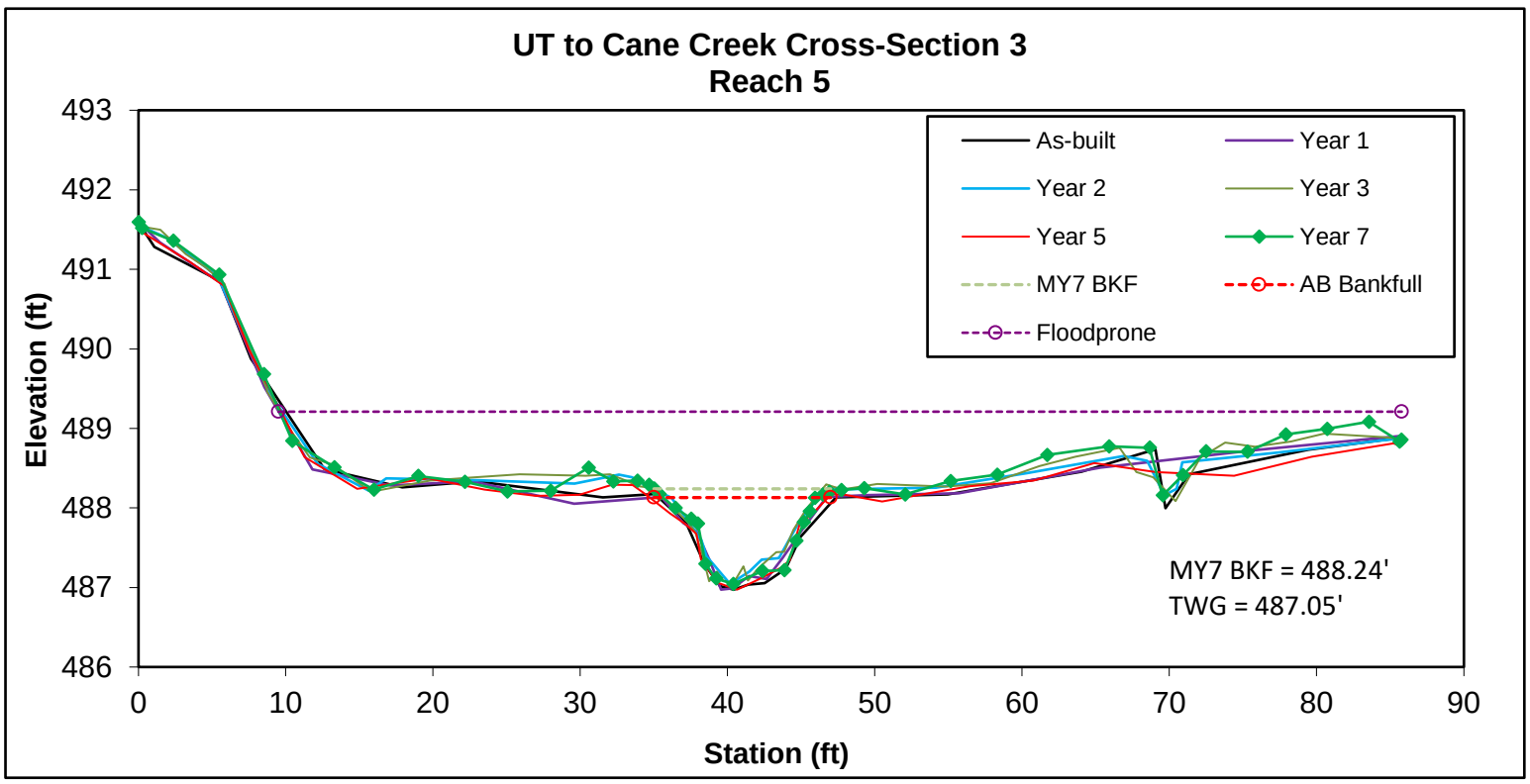
Permanent Cross-Section 3, Reach 5

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Riffle	C	6.9	10.3	0.7	1.1	15.5	0.9	7.4	488.13	488.17



Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the bankfull elevation as determined using the as-built bankfull area. All other values were calculated using the original as-built bankfull elevation, as was done for previous monitoring reports.

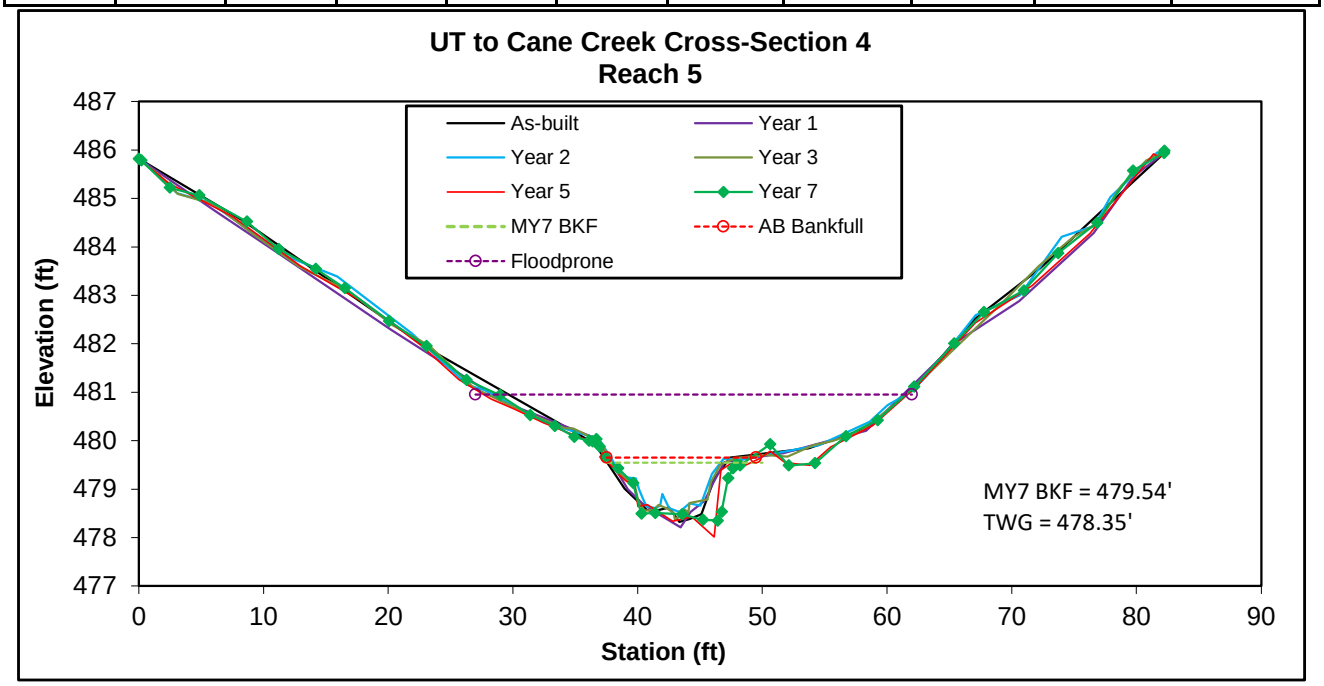
Permanent Cross-Section 4, Reach 5

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Riffle	C	9.5	11.7	0.8	1.3	14.3	1.0	2.8	479.65	479.51



Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the bankfull elevation as determined using the as-built bankfull area. All other values were calculated using the original as-built bankfull elevation, as was done for previous monitoring reports.

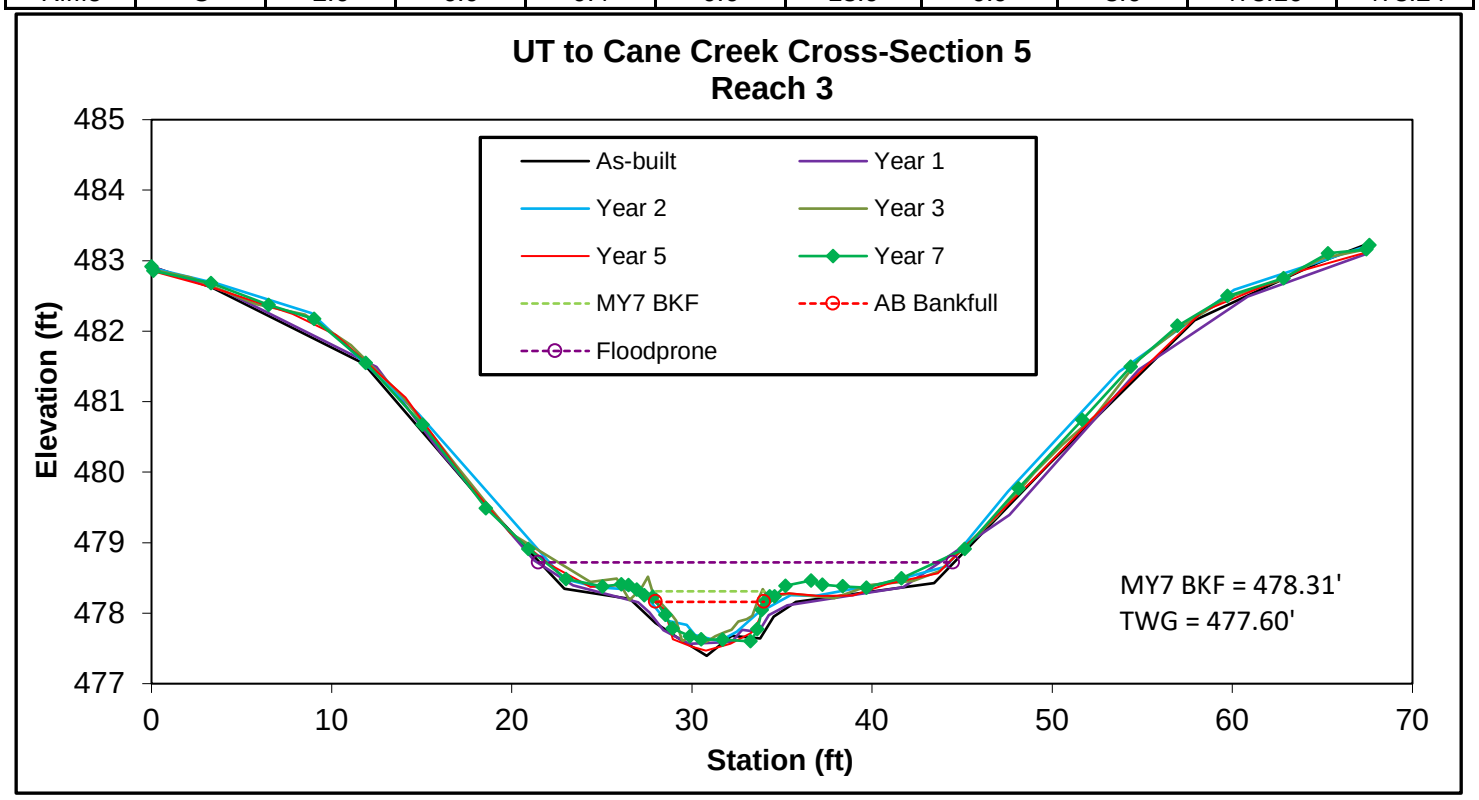
Permanent Cross-Section 5, Reach 3

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Riffle	C	2.6	6.0	0.4	0.6	13.9	0.9	3.6	478.16	478.24



Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the bankfull elevation as determined using the as-built bankfull area. All other values were calculated using the original as-built bankfull elevation, as was done for previous monitoring reports.

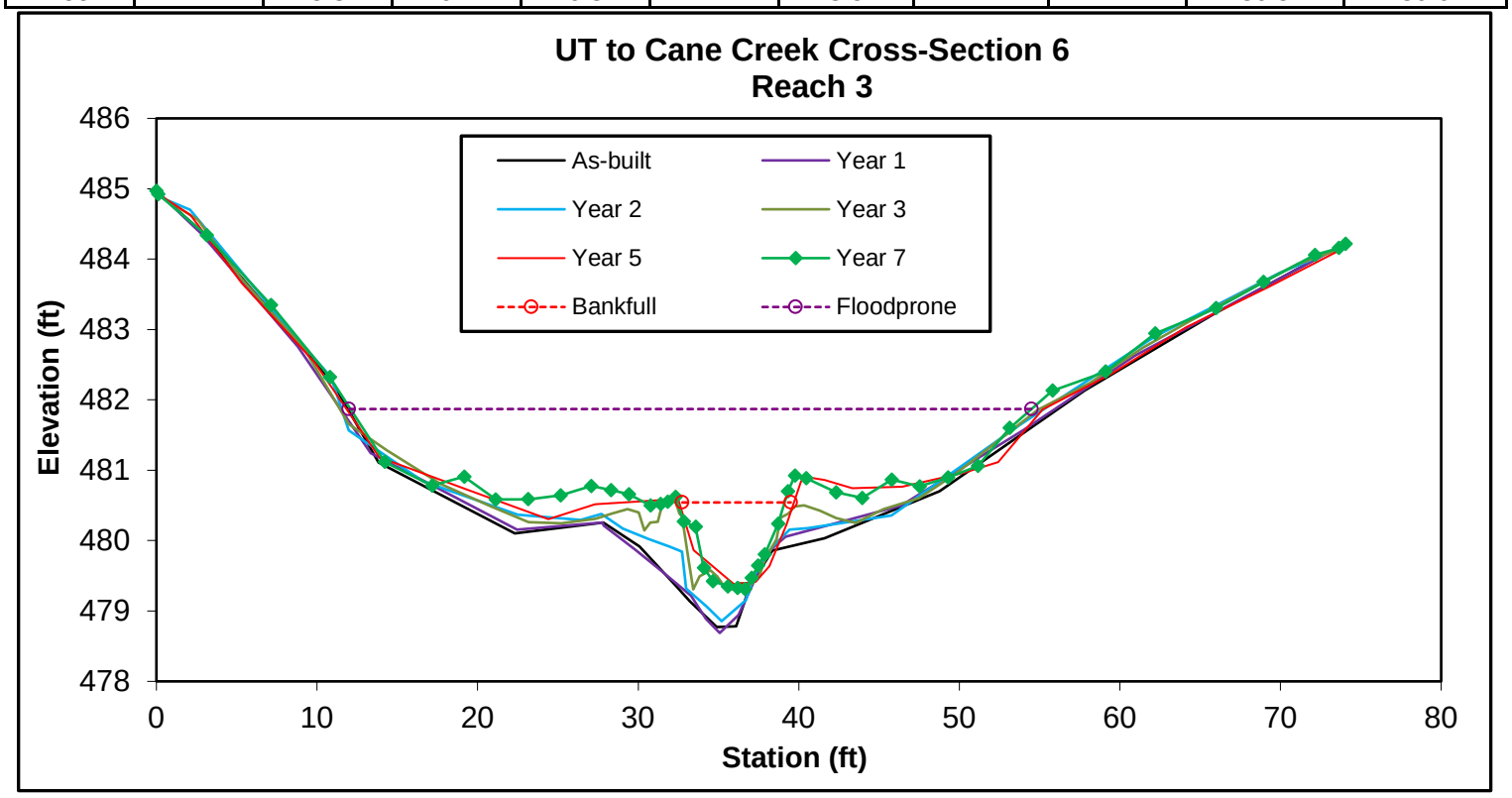
Permanent Cross-Section 6, Reach 3

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	-	5.3	6.7	0.8	1.2	8.5	-	-	480.54	480.62



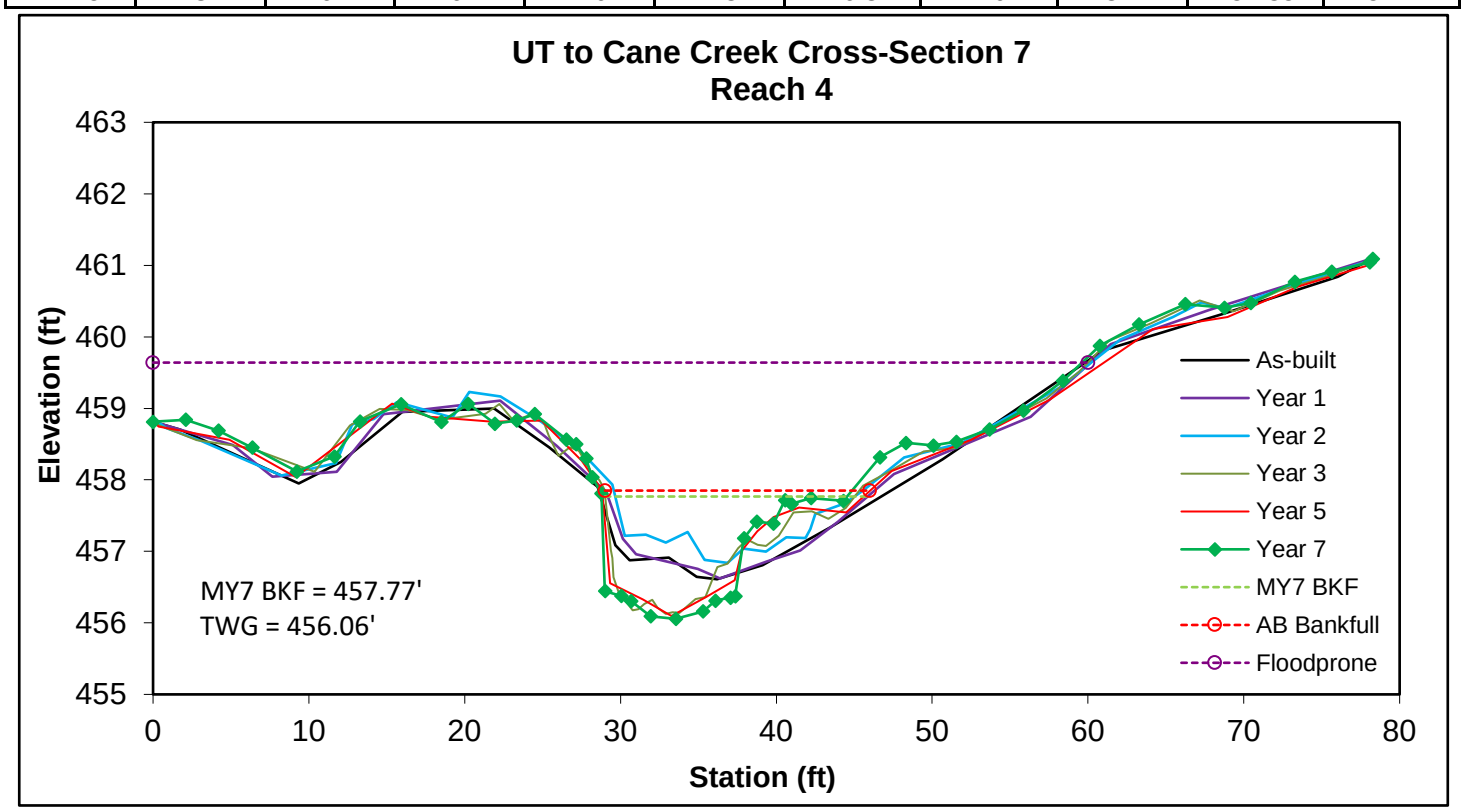
Permanent Cross-Section 7, Reach 4

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Riffle	C	16.1	16.2	1.0	1.8	16.3	1.0	3.7	457.85	457.71



Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the bankfull elevation as determined using the as-built bankfull area. All other values were calculated using the original as-built bankfull elevation, as was done for previous monitoring reports.

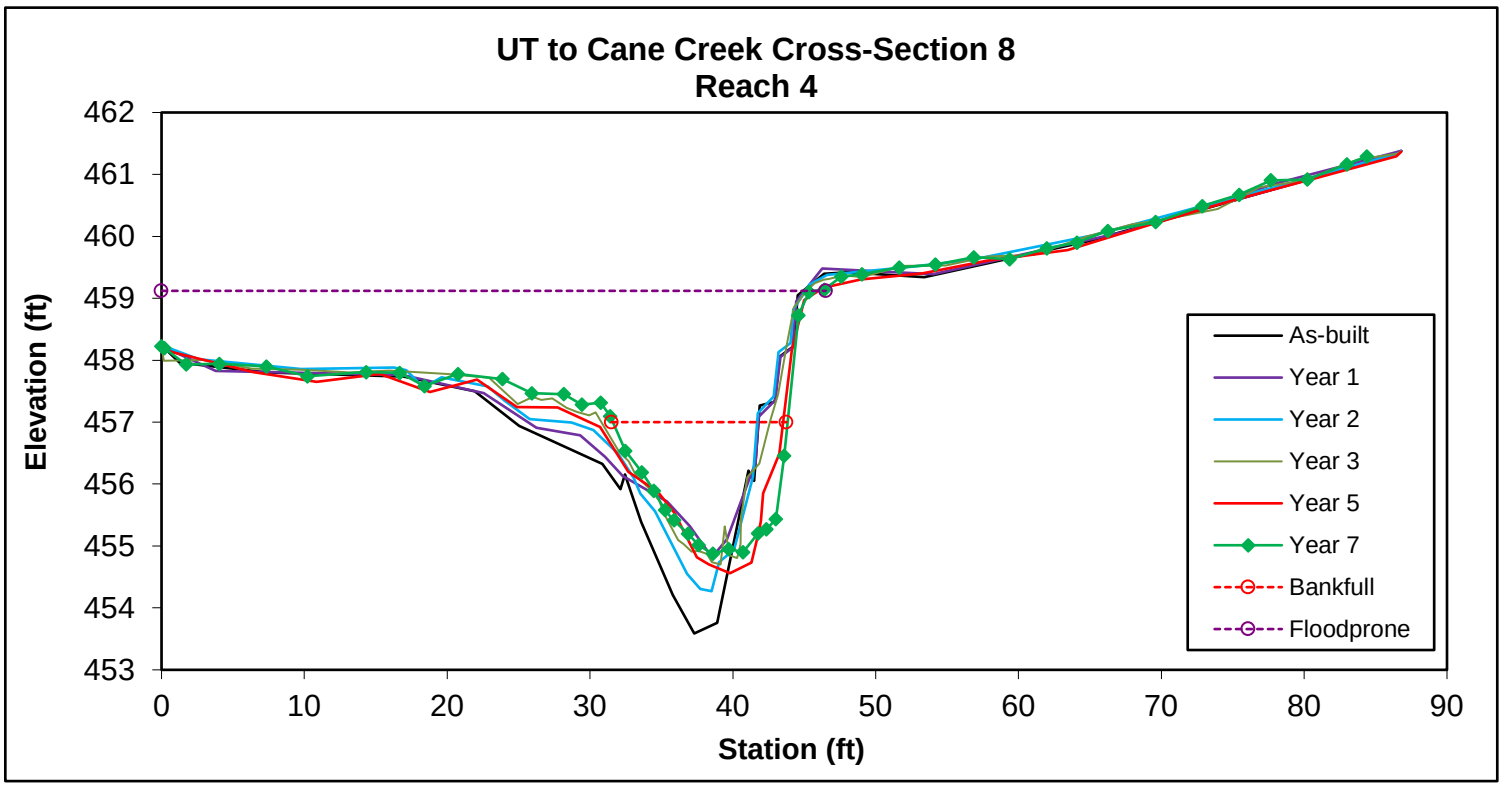
Permanent Cross-Section 8, Reach 4

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Pool	-	18.0	12.2	1.5	2.1	8.3	-	-	457.0	457.31



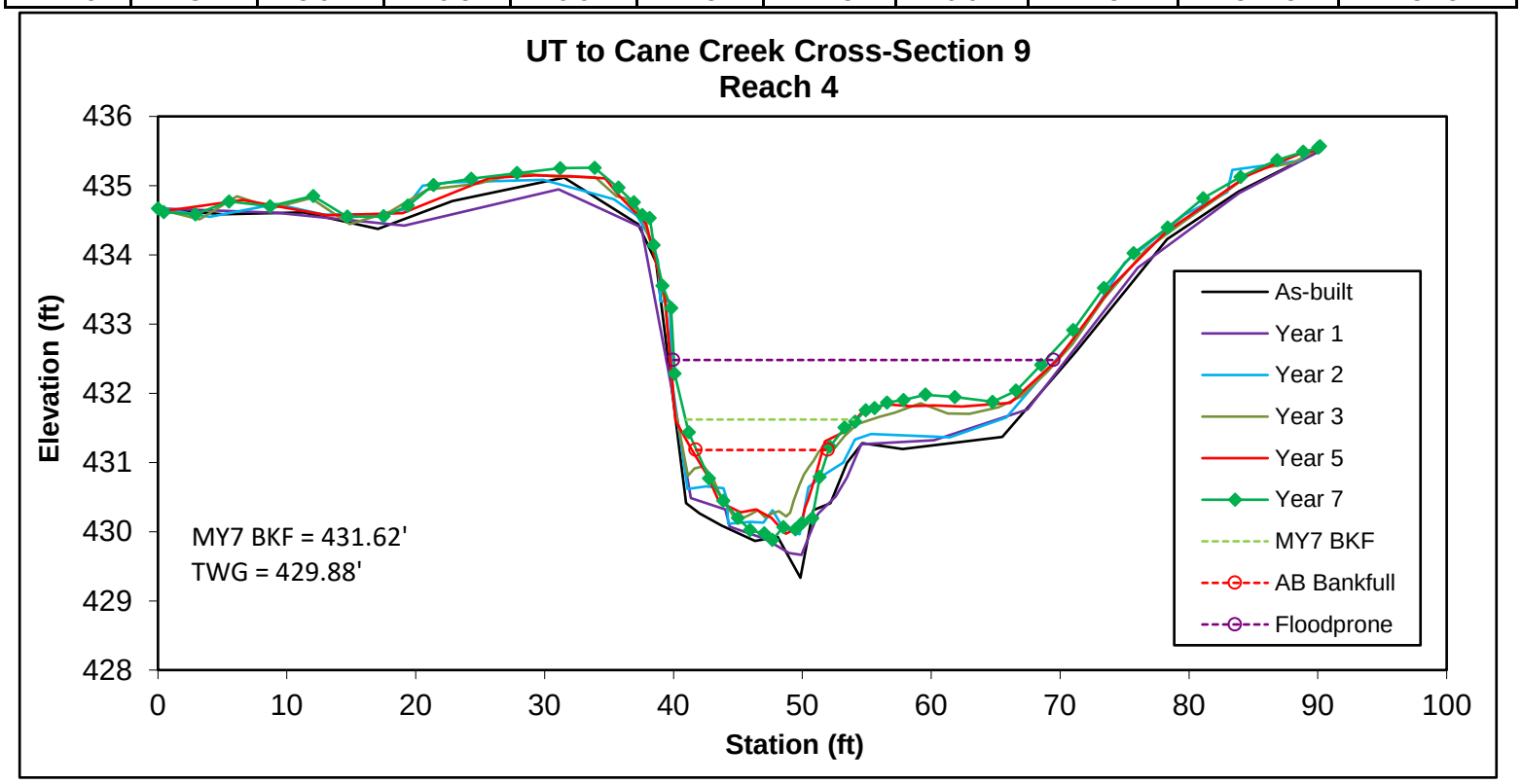
Permanent Cross-Section 9, Reach 4

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Riffle	C	8.91	10.3	0.9	1.3	11.8	0.9	2.8	431.18	431.5



Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the bankfull elevation as determined using the as-built bankfull area. All other values were calculated using the original as-built bankfull elevation, as was done for previous monitoring reports.

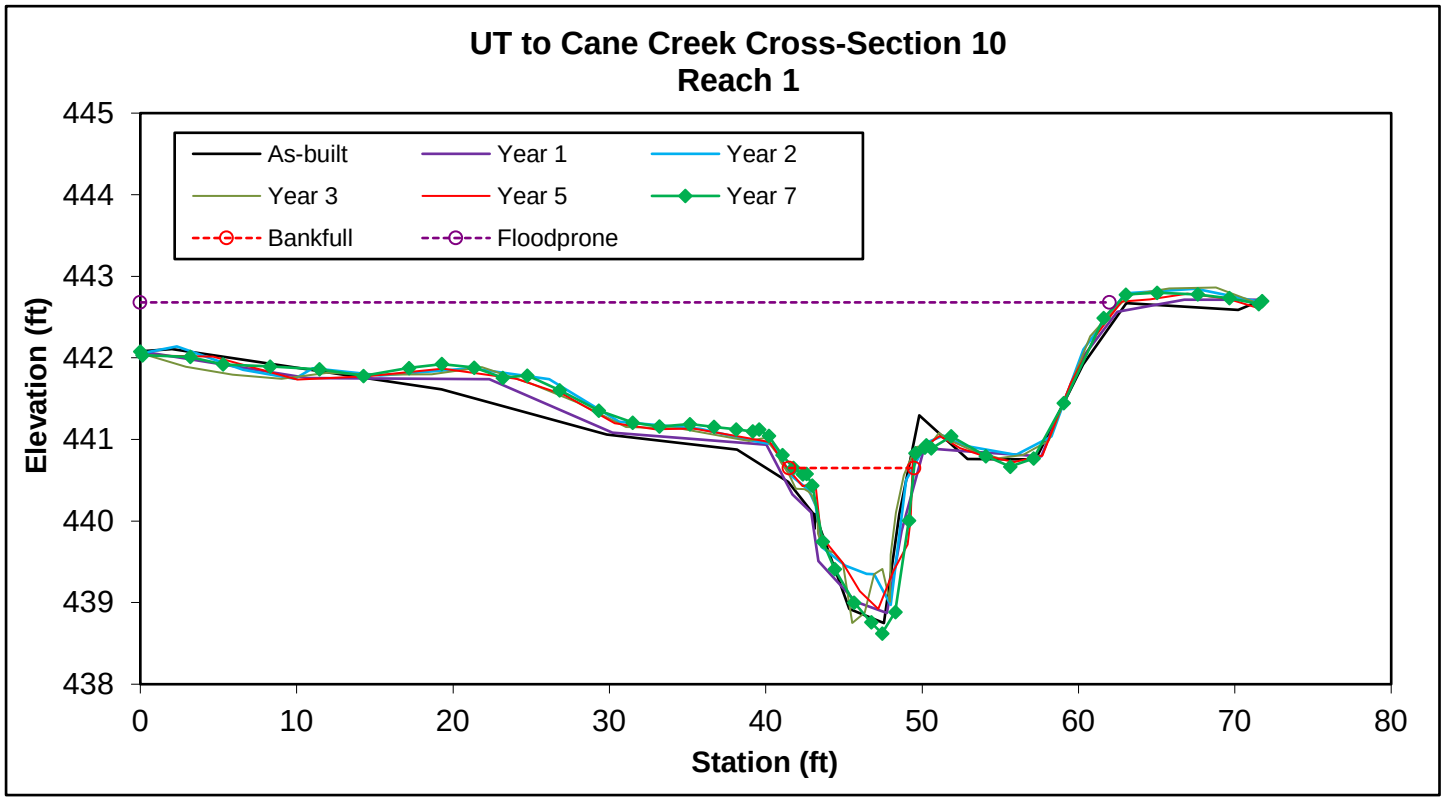
Permanent Cross-Section 10, Reach 1

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Pool	-	9.1	7.7	1.2	2.0	6.5	-	-	440.65	440.57



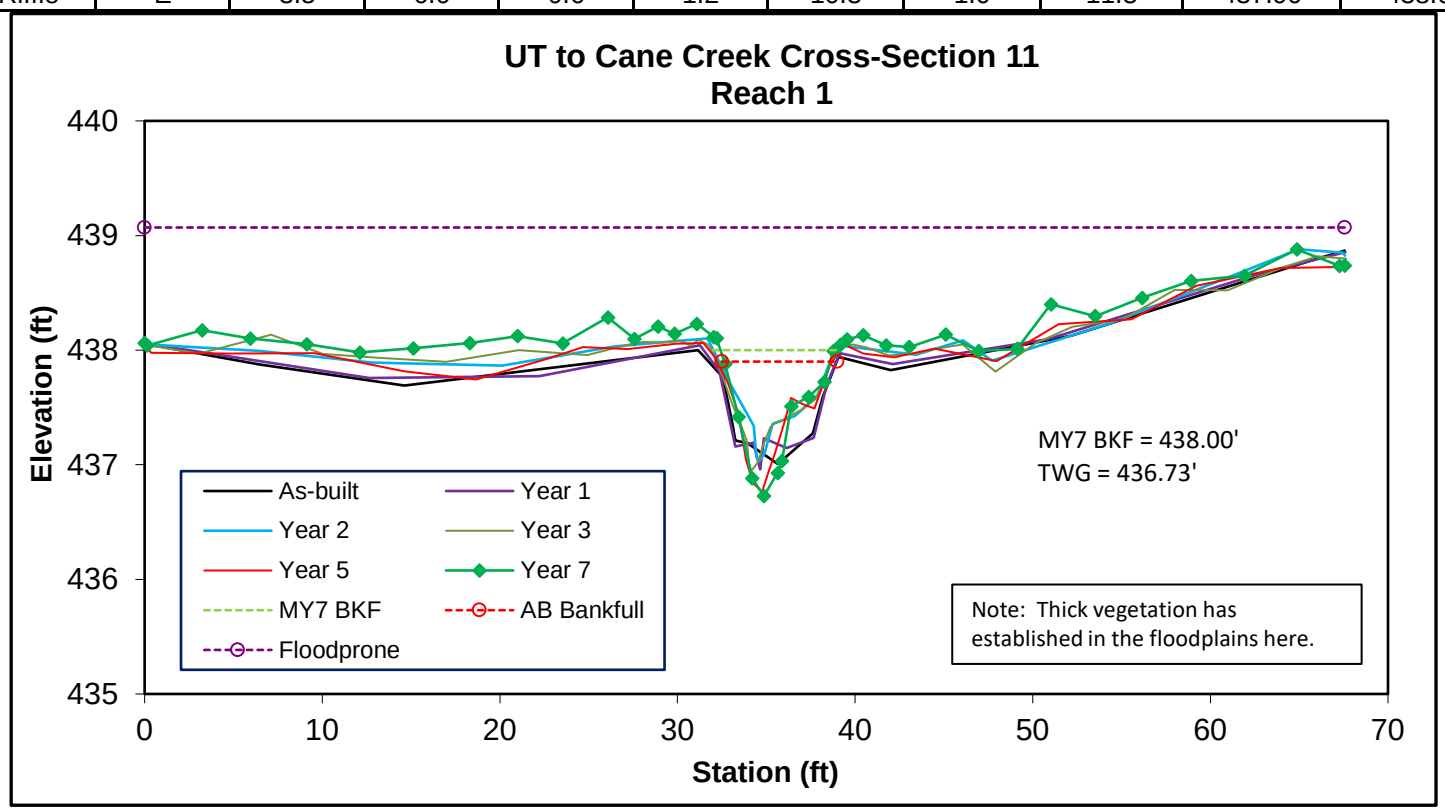
Permanent Cross-Section 11, Reach 1

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Riffle	E	3.5	6.0	0.6	1.2	10.3	1.0	11.3	437.90	438.04



Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the bankfull elevation as determined using the as-built bankfull area. All other values were calculated using the original as-built bankfull elevation, as was done for previous monitoring reports.

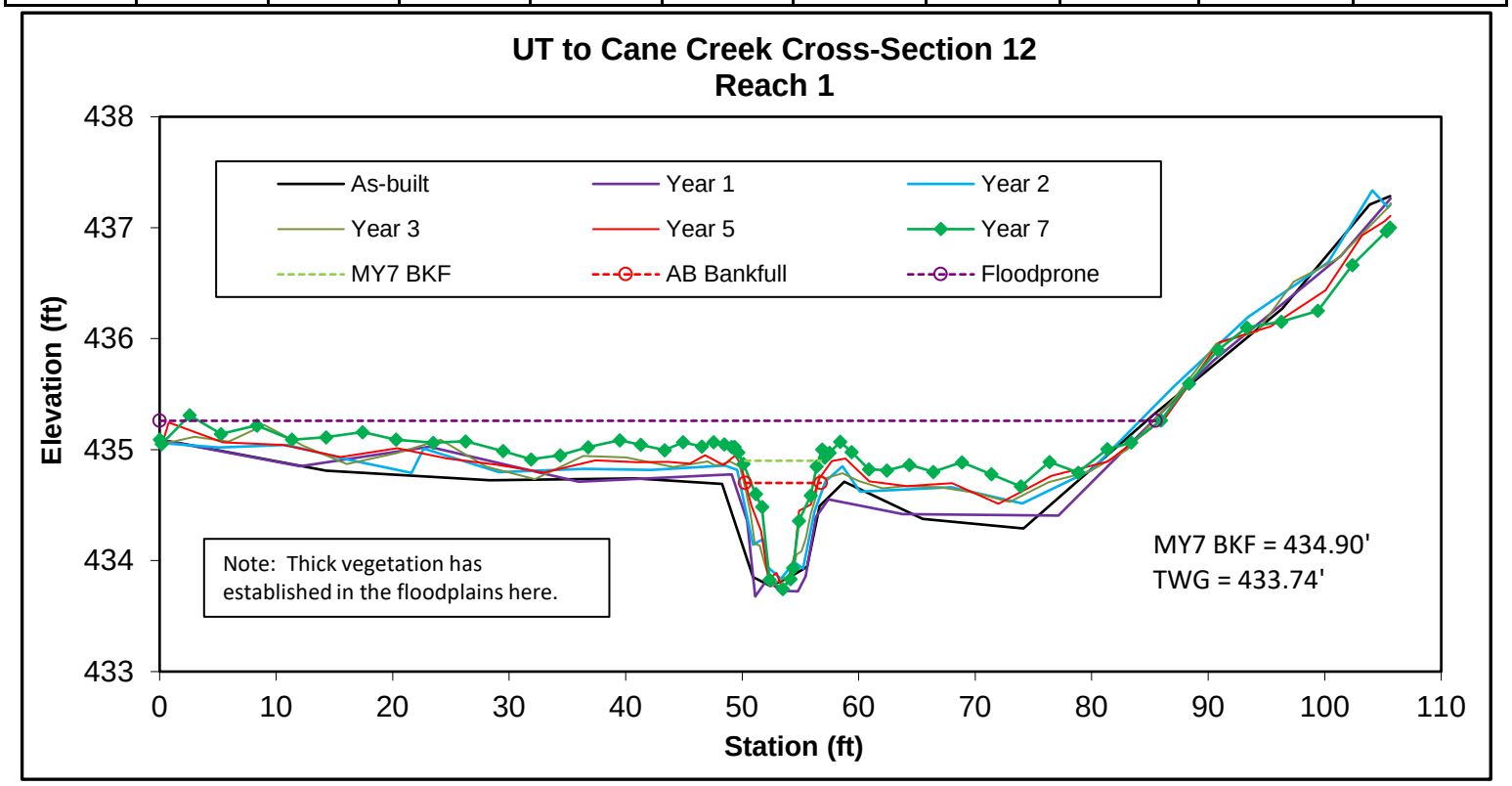
Permanent Cross-Section 12, Reach 1

(Year 7 Data - Collected September 2020)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	AB BKF Elev	TOB Elev
Riffle	E	1.9	3.9	0.5	0.8	8.1	1.1	21.8	434.70	435



Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the bankfull elevation as determined using the as-built bankfull area. All other values were calculated using the original as-built bankfull elevation, as was done for previous monitoring reports.

Table 10. Baseline Stream Summary
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach 1 (1,045 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data												Design						As-built					
											UT to Wells Creek						UT to Varnals Creek																	
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																																		
BF Width (ft)	-----	23.0	80.0	4.9	5.6	-----	-----	7.3	-----	-----	-----	8	-----	-----	-----	-----	-----	9.7	-----	-----	-----	-----	-----	6.9	-----	-----	-----	-----	7.2	-----	-----	9.1	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	6.8	-----	-----	>30	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	>20	-----	-----	-----	-----	65.6	-----	-----	84.4	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	0.8	0.7	-----	-----	0.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.5	-----	-----	-----	-----	0.5	-----	-----	1.0	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	1.1	-----	-----	1.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.7	-----	-----	-----	-----	0.7	-----	-----	1.9	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	5.2	5.1	-----	-----	5.2	-----	-----	-----	5.3	-----	-----	-----	-----	-----	7.9	-----	-----	-----	-----	-----	3.7	-----	-----	-----	-----	4.0	-----	-----	8.7	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	6.1	-----	-----	10.5	-----	-----	7	-----	-----	26	-----	-----	8	-----	-----	18	-----	-----	-----	13.0	-----	-----	-----	-----	9.6	-----	-----	15.2	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	1.2	-----	-----	9.5	-----	-----	2.0	-----	-----	3.4	-----	-----	1.9	-----	-----	3.9	-----	-----	-----	>2.2	-----	-----	-----	-----	6.9	-----	-----	10.8	-----	-----
Bank Height Ratio	-----	-----	-----	-----	1.6	-----	-----	4.3	-----	-----	1.4	-----	-----	2.5	-----	-----	1.1	-----	-----	1.5	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.3	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	25.0	-----	-----	45.0	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	14.0	-----	-----	21.0	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.3	-----	-----	4.0	-----	-----	0.8	-----	-----	2.3	-----	-----	2.0	-----	-----	3.0	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.4	-----	-----	8.8	-----	-----	4.9	-----	-----	6.9	-----	-----	50.0	-----	-----	80.0	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	4.4	-----	-----	1.2	-----	-----	1.8	-----	-----	3.6	-----	-----	6.5	-----	-----	-----	-----	-----	-----	-----	-----
Profile																																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.1	-----	-----	7.9	-----	-----	2.9	-----	-----	5.0	-----	-----	28.0	-----	-----	42.0	-----	-----	-----	-----	-----	-----	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.3	-----	-----	2.7	-----	-----	1.6	-----	-----	2.3	-----	-----	-----	1.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																																		
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----								0.1 / 0.6/ 4.5 / 53 / 96						0.2 / 2.5/ 8 / 92 / 1,536																	---
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																																		
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.125	-----	-----	-----	-----	-----	0.13	-----	-----	-----	-----	-----	0.24	-----	-----	-----	-----	-----	0.125	-----	-----	-----	-----	-----	0.125	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	G5c		-----	E5	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	B4/1a	-----	-----	-----	E4/C4	-----	-----	-----	-----	-----	E4/C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	0.8	-----	-----	1.2	-----	-----	-----	-----	-----	5.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	3.5	-----	-----	-----	-----	-----	3.5	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	19.8	-----	-----	-----	19.8	-----	-----	-----	-----	-----	25.2	-----	-----	-----	-----	-----	46.6	-----	-----	-----	13	-----	-----	-----	-----	-----	13	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	859.4	-----	-----	-----	-----
Channel length (ft)[1]	-----	-----	-----	-----	-----	-----	-----	943	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1044.9	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.09	-----	-----	-----	-----	-----	1.40	-----	-----	-----	-----	-----	1.20	-----	-----	-----	1.20	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0127	-----	-----	-----	-----	-----	0.0197	-----	-----	-----	-----	-----	0.0405	-----	-----	-----	0.012	-----	-----	-----	-----	-----	0.0123	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0135	-----	-----	-----	-----	-----	0.028	-----	-----	-----	-----	-----	0.0458	-----	-----	-----	0.015	-----	-----	-----	-----	-----	0.0150	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10. Baseline Stream Summary (continued)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach 3 (398 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data												Design						As-built					
											UT to Wells Creek						UT to Varnals Creek																	
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																																		
BF Width (ft)	-----	23.0	80.0	5.1	-----	-----	-----	7.6	-----	-----	-----	8	-----	-----	-----	-----	-----	9.7	-----	-----	-----	-----	-----	7.2	-----	-----	-----	-----	8.9	-----	-----	9.0	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	-----	-----	>16.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	12	-----	-----	20.0	-----	-----	24.4	-----	-----	36.3	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	0.8	-----	-----	-----	0.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.6	-----	-----	-----	-----	0.4	-----	-----	0.6	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.7	-----	-----	-----	-----	0.8	-----	-----	1.1	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	5.7	-----	-----	-----	5.6	-----	-----	-----	5.3	-----	-----	-----	-----	-----	7.9	-----	-----	-----	-----	-----	4.0	-----	-----	-----	-----	3.7	-----	-----	5.3	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	-----	-----	9.9	-----	-----	7	-----	-----	26	-----	-----	8	-----	-----	18	-----	-----	-----	13.0	-----	-----	-----	-----	15.3	-----	-----	21.7	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	-----	-----	2.2	-----	-----	2.0	-----	-----	3.4	-----	-----	1.9	-----	-----	3.9	-----	-----	1.8	-----	-----	2.2	-----	-----	2.7	-----	-----	4.0	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	-----	-----	1.5	-----	-----	1.4	-----	-----	2.5	-----	-----	1.1	-----	-----	1.5	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.3	-----	-----	4.0	-----	-----	0.8	-----	-----	2.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.4	-----	-----	8.8	-----	-----	4.9	-----	-----	6.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	4.4	-----	-----	1.2	-----	-----	1.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.1	-----	-----	7.9	-----	-----	2.9	-----	-----	5.0	-----	-----	11	-----	-----	36	-----	-----	-----	-----	-----	-----	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.3	-----	-----	2.7	-----	-----	1.6	-----	-----	2.3	-----	-----	1.5	-----	-----	1.5	-----	-----	-----	-----	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																																		
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----										0.1 / 0.6/ 4.5 / 53 / 96									0.2 / 2.5/ 8 / 92 / 1,536												---
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																																		
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.1	-----	-----	-----	-----	-----	0.13	-----	-----	-----	-----	-----	0.24	-----	-----	-----	0.1	-----	-----	-----	-----	-----	0.1	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	B4c	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	B4/1a	-----	-----	-----	-----	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	5.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	21.7	-----	-----	-----	21.7	-----	-----	-----	-----	-----	25.2	-----	-----	-----	-----	-----	46.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	356.8	-----	-----	-----	-----
Channel length (ft)[2]	-----	-----	-----	-----	-----	-----	-----	425	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	389.1	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.16	-----	-----	-----	-----	-----	1.40	-----	-----	-----	-----	-----	1.20	-----	-----	-----	1.18	-----	-----	-----	-----	-----	1.1	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0195	-----	-----	-----	-----	-----	0.0197	-----	-----	-----	-----	-----	0.0405	-----	-----	-----	0.016	-----	-----	-----	-----	-----	0.0172	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0168	-----	-----	-----	-----	-----	0.028	-----	-----	-----	-----	-----	0.0458	-----	-----	-----	0.018	-----	-----	-----	-----	-----	0.0187	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10. Baseline Stream Summary (continued)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach 4 (2,333 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data												Design						As-built					
											UT to Wells Creek						UT to Varnals Creek																	
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																																		
BF Width (ft)	-----	23.0	80.0	10.2	15.4	-----	-----	16.7	-----	-----	-----	8	-----	-----	-----	-----	-----	9.7	-----	-----	-----	-----	-----	14.0	-----	-----	-----	-----	10.1	-----	-----	13.8	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	18.4	-----	-----	26.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	>30	-----	-----	-----	-----	80.1	-----	-----	105.0	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	1.3	0.9	-----	-----	1.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.0	-----	-----	-----	-----	0.6	-----	-----	1.2	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	1.3	-----	-----	1.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.2	-----	-----	-----	-----	1.1	-----	-----	2.0	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	16.9	14.8	-----	-----	15.5	-----	-----	-----	5.3	-----	-----	-----	-----	-----	7.9	-----	-----	-----	-----	-----	14.0	-----	-----	-----	-----	7.5	-----	-----	12.3	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	15.4	-----	-----	19.0	-----	-----	7	-----	-----	26	-----	-----	8	-----	-----	18	-----	-----	-----	14.0	-----	-----	-----	-----	8.3	-----	-----	19.4	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	1.2	-----	-----	1.6	-----	-----	2.0	-----	-----	3.4	-----	-----	1.9	-----	-----	3.9	-----	-----	-----	>2.2	-----	-----	-----	-----	7.9	-----	-----	9.4	-----	-----
Bank Height Ratio	-----	-----	-----	-----	1.3	-----	-----	2.8	-----	-----	1.4	-----	-----	2.5	-----	-----	1.1	-----	-----	1.5	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.1	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	38.0	79.0	-----	120.0	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	21.0	26.0	-----	31.0	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.3	-----	-----	4.0	-----	-----	0.8	-----	-----	2.3	-----	-----	-----	-----	-----	-----	-----	-----	38.0	79.0	-----	120.0	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.4	-----	-----	8.8	-----	-----	4.9	-----	-----	6.9	-----	-----	-----	-----	-----	-----	-----	-----	72.0	104.0	-----	124.0	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	4.4	-----	-----	1.2	-----	-----	1.8	-----	-----	-----	-----	-----	-----	-----	-----	3.5	6.0	-----	8.0	-----	-----
Profile																																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.0046	0.0043	-----	0.0039	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.1	-----	-----	7.9	-----	-----	2.9	-----	-----	5.0	-----	-----	42	-----	-----	84	-----	-----	41	-----	72	57	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.3	-----	-----	2.7	-----	-----	1.6	-----	-----	2.3	-----	-----	-----	2.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																																		
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----			24.2 / 50.6 / 69.4 / 50.6 / 24.2						0.1 / 0.6 / 4.5 / 53 / 96						0.2 / 2.5 / 8 / 92 / 1,536																	
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																																		
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.7	-----	-----	-----	-----	-----	0.13	-----	-----	-----	-----	-----	0.24	-----	-----	-----	-----	-----	0.7	-----	-----	-----	-----	-----	0.7	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	B3c	-----	-----	F5	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	B4/1a	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	4.4	-----	-----	4.6	-----	-----	-----	-----	-----	5.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.0	-----	-----	-----	-----	-----	3.0	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	69.2	-----	-----	-----	69.2	-----	-----	-----	-----	-----	25.2	-----	-----	-----	-----	-----	46.6	-----	-----	-----	56.0	-----	-----	-----	-----	-----	56.0	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	349	-----	-----	-----	-----
Channel length (ft)[1]	-----	-----	-----	-----	-----	-----	-----	2,783	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	386	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.04	-----	-----	-----	-----	-----	1.40	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.10	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0169	-----	-----	-----	-----	-----	0.0197	-----	-----	-----	-----	-----	0.0405	-----	-----	-----	0.015	-----	-----	-----	-----	-----	0.0074	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0148	-----	-----	-----	-----	-----	0.028	-----	-----	-----	-----	-----	0.0458	-----	-----	-----	0.017	-----	-----	-----	-----	-----	0.0082	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10. Baseline Stream Summary (continued)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach 5 (1,461 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data												Design						As-built					
											UT to Wells Creek						UT to Varnals Creek																	
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																																		
BF Width (ft)	-----	23.0	80.0	8.4	-----	-----	-----	8.9	-----	-----	-----	8	-----	-----	-----	-----	-----	9.7	-----	-----	-----	-----	-----	10.8	-----	-----	-----	-----	10.2	-----	-----	12.0	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	-----	-----	11.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	>25	-----	-----	-----	-----	76.0	-----	-----	103.7	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	1.2	-----	-----	-----	1.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.8	-----	-----	-----	-----	0.7	-----	-----	1.4	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	1.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.1	-----	-----	-----	-----	1.2	-----	-----	2.8	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	12.5	-----	-----	-----	10.9	-----	-----	-----	5.3	-----	-----	-----	-----	-----	7.9	-----	-----	-----	-----	-----	9.0	-----	-----	-----	-----	7.1	-----	-----	15.8	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	-----	-----	7.2	-----	-----	7	-----	-----	26	-----	-----	8	-----	-----	18	-----	-----	-----	13.0	-----	-----	-----	-----	8.0	-----	-----	17.8	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	2.0	-----	-----	3.4	-----	-----	1.9	-----	-----	3.9	-----	-----	-----	>2.2	-----	-----	-----	-----	3.2	-----	-----	9.2	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	-----	-----	2.6	-----	-----	1.4	-----	-----	2.5	-----	-----	1.1	-----	-----	1.5	-----	-----	-----	1.0	-----	-----	-----	-----	1.0	-----	-----	1.0	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.3	-----	-----	4.0	-----	-----	0.8	-----	-----	2.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.4	-----	-----	8.8	-----	-----	4.9	-----	-----	6.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	4.4	-----	-----	1.2	-----	-----	1.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.1	-----	-----	7.9	-----	-----	2.9	-----	-----	5.0	-----	-----	32.0	-----	65.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.3	-----	-----	2.7	-----	-----	1.6	-----	-----	2.3	-----	-----	-----	2.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																																		
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----				16.6/31.2/47.0/85.3/116.1						0.1 / 0.6/ 4.5 / 53 / 96						0.2 / 2.5/ 8 / 92 / 1,536												6.74 / 20.49 / 29.79 / 63.73 / 118.25				
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																																		
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.5	-----	-----	-----	-----	-----	0.13	-----	-----	-----	-----	-----	0.24	-----	-----	-----	-----	-----	0.5	-----	-----	-----	-----	-----	0.5	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	G4	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	B4/1a	-----	-----	-----	C4	-----	-----	-----	-----	-----	C4	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	4.5	-----	-----	-----	-----	-----	5.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.4	-----	-----	-----	-----	-----	4.4	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	50.0	-----	-----	-----	50	-----	-----	-----	-----	-----	25.2	-----	-----	-----	-----	-----	46.6	-----	-----	-----	40	-----	-----	-----	-----	-----	40	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)[4]	-----	-----	-----	-----	-----	-----	-----	1848	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.07	-----	-----	-----	-----	-----	1.40	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0144	-----	-----	-----	-----	-----	0.0197	-----	-----	-----	-----	-----	0.0405	-----	-----	-----	0.014	-----	-----	-----	-----	-----	0.014	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0128	-----	-----	-----	-----	-----	0.028	-----	-----	-----	-----	-----	0.0458	-----	-----	-----	0.017	-----	-----	-----	-----	-----	0.017	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 10. Baseline Stream Summary (continued)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach 5a (145 LF)

Parameter	USGS Gauge	Regional Curve Interval (Harman et al, 1999)*			Pre-Existing Condition[1]						Reference Reach(es) Data												Design						As-built					
											UT to Wells Creek						UT to Varnals Creek																	
		LL	UL	Eq.	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension and Substrate - Riffle																																		
BF Width (ft)	-----	23.0	80.0	2.4	-----	-----	-----	13.6	-----	-----	-----	8	-----	-----	-----	-----	-----	9.7	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Floodprone Width (ft)	-----	-----	-----	-----	-----	-----	-----	16.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Mean Depth (ft)	-----	2.3	5.8	0.5	-----	-----	-----	0.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	0.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Cross-sectional Area (ft²)	-----	80.0	300.0	1.7	-----	-----	-----	4.2	-----	-----	-----	5.3	-----	-----	-----	-----	-----	7.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Width/Depth Ratio	-----	-----	-----	-----	-----	-----	-----	45.0	-----	-----	7	-----	-----	26	-----	-----	8	-----	-----	18	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Entrenchment Ratio	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	2.0	-----	-----	3.4	-----	-----	1.9	-----	-----	3.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bank Height Ratio	-----	-----	-----	-----	-----	-----	-----	2.3	-----	-----	1.4	-----	-----	2.5	-----	-----	1.1	-----	-----	1.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d50 (mm)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rc:Bankfull width (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.3	-----	-----	4.0	-----	-----	0.8	-----	-----	2.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	4.4	-----	-----	8.8	-----	-----	4.9	-----	-----	6.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1.3	-----	-----	4.4	-----	-----	1.2	-----	-----	1.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.1	-----	-----	7.9	-----	-----	2.9	-----	-----	5.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Max Depth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.3	-----	-----	2.7	-----	-----	1.6	-----	-----	2.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Volume (ft³)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																																		
Ri% / Ru% / P% / G% / S%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
SC% / Sa% / G% / B% / Be%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.1 / 0.6/ 4.5 / 53 / 96	-----	-----	-----	-----	-----	0.2 / 2.5/ 8 / 92 / 1,536	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Reach Shear Stress (competency) lb/ft²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Max part size (mm) mobilized at bankfull (Rosgen Curve)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m²	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																																		
Drainage Area (SM)	-----	-----	-----	-----	-----	-----	-----	0.025	-----	-----	-----	-----	-----	0.13	-----	-----	-----	-----	-----	0.24	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Impervious cover estimate (%)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rosgen Classification	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	C4/1	-----	-----	-----	-----	-----	B4/1a	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Velocity (fps)	-----	-----	-----	-----	-----	-----	-----	1.7	-----	-----	-----	-----	-----	5.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF Discharge (cfs)	-----	290.0	2000.0	6.2	-----	-----	-----	7.1	-----	-----	-----	-----	-----	25.2	-----	-----	-----	-----	-----	46.6	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Valley Length	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel length (ft)[2]	-----	-----	-----	-----	-----	-----	-----	144	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	-----	-----	-----	-----	-----	-----	1.19	-----	-----	-----	-----	-----	1.40	-----	-----	-----	-----	-----	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Water Surface Slope (Channel) (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0236	-----	-----	-----	-----	-----	0.0197	-----	-----	-----	-----	-----	0.0405	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	0.0224	-----	-----	-----	-----	-----	0.028	-----	-----	-----	-----	-----	0.0458	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Bankfull Floodplain Area (acres)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BEHI VL% / L% / M% / H% / VH% / E%	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Channel Stability or Habitat Metric	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Biological or Other	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

* Harman, W.A., G.D. Jennings, J.M. Patterson, D.R. Clinton, L.O. Slate, A.G. Jessup, J.R. Everhart, and R.E. Smith. 1999. Bankfull hydraulic geometry relationships for North Carolina streams. Wildland Hydrology. AWRA Symposium Proceedings. D.S. Olsen and J.P. Potyondy, eds. American Water Resources Association. June 30-July 2, 1999. Bozeman, MT.

Table 11. Morphology and Hydraulic Monitoring Summary
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach 1 (1,045 LF)

	Cross-section X-10 (Pool)								Cross-section X-11 (Riffle)								Cross-section X-12 (Riffle)							
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Based on fixed baseline bankfull elevation																								
BF Width (ft)	9.1	9.0	8.1	7.8	-	8.0	-	7.7	7.2	7.0	6.2	6.4	-	6.4	-	6.0	7.8	7.1	7.2	6.3	-	6.2	-	3.9
BF Mean Depth (ft)	0.95	1.05	0.88	0.94	-	1.00	-	1.2	0.57	0.57	0.41	0.46	-	0.50	-	0.6	0.51	0.56	0.55	0.59	-	0.50	-	0.5
Width/Depth Ratio	9.6	8.6	9.1	8.3	-	8.2	-	6.5	12.8	12.3	15.1	13.9	-	12.2	-	10.3	15.2	12.6	13.2	10.7	-	12.6	-	8.1
BF Cross-sectional Area (ft²)	8.7	9.4	7.1	7.3	-	7.9	-	9.1	4.1	4.0	2.6	2.9	-	3.3	-	3.5	4.0	4.0	4.0	3.8	-	3.1	-	1.9
BF Max Depth (ft)	1.9	1.8	1.7	1.9	-	1.7	-	2.0	0.9	0.9	0.9	0.9	-	1.0	-	1.2	0.7	0.8	0.9	0.9	-	1.0	-	0.8
Width of Floodprone Area (ft)	65.6	61.9	61.2	62.1	-	61.5	-	62.5	65.9	67.2	63.1	67.6	-	67.6	-	67.6	84.4	85.9	87.2	88.3	-	88.9	-	85.5
Entrenchment Ratio	-	-	-	-	-	-	-	-	9.1	9.6	10.1	10.6	-	10.6	-	11.3	10.8	12.1	12.0	13.9	-	14.3	-	21.8
Bank Height Ratio	-	-	-	-	-	-	-	-	1.0	1.1	1.2	1.1	-	1.0	-	1.0	1.3	1.1	1.0	1.1	-	1.1	-	1.1
Wetted Perimeter (ft)	11.0	11.1	9.8	9.7	-	9.4	-	9.2	8.4	8.1	7.1	7.3	-	7.0	-	6.9	8.9	8.2	8.3	7.5	-	6.7	-	4.4
Hydraulic Radius (ft)	0.8	0.8	0.7	0.8	-	0.8	-	1.0	0.5	0.5	0.4	0.4	-	0.5	-	0.6	0.5	0.5	0.5	0.5	-	0.5	-	0.4
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft^2)																								
d50 (mm)																								

Table 11. Morphology and Hydraulic Monitoring Summary (continued)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729
Reach 3 (398 LF)

	Cross-section X-5 (Riffle)								Cross-section X-6 (Pool)							
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Based on fixed baseline bankfull elevation																
BF Width (ft)	8.9	9.6	7.1	5.4	-	6.2	-	6.0	9.0	8.7	6.2	7.3	-	6.9	-	6.7
BF Mean Depth (ft)	0.41	0.35	0.32	0.36	-	0.50	-	0.4	0.59	0.59	0.61	0.78	-	0.80	-	0.8
Width/Depth Ratio	21.7	27.3	22.4	15.0	-	13.0	-	13.9	15.3	14.7	10.2	9.3	-	9.2	-	8.5
BF Cross-sectional Area (ft²)	3.7	3.3	2.2	2.0	-	3.0	-	2.6	5.3	5.2	3.7	5.7	-	5.2	-	5.3
BF Max Depth (ft)	0.8	0.6	0.6	0.6	-	0.7	-	0.6	1.1	1.2	1.0	1.2	-	1.1	-	1.2
Width of Floodprone Area (ft)	24.4	22.7	22.2	21.8	-	23.5	-	23.0	36.3	36.3	33.5	41.5	-	41.7	-	42.5
Entrenchment Ratio	2.7	2.4	3.1	4.0	-	3.8	-	3.6	-	-	-	-	-	-	-	-
Bank Height Ratio	1.0	0.9	1.2	1.0	-	1.0	-	0.9	-	-	-	-	-	-	-	-
Wetted Perimeter (ft)	9.8	10.3	7.7	6.2	-	6.6	-	6.3	10.2	9.9	7.4	8.8	-	7.4	-	7.4
Hydraulic Radius (ft)	0.4	0.3	0.3	0.3	-	0.5	-	0.4	0.5	0.5	0.5	0.6	-	0.7	-	0.7
Based on current/developing bankfull feature																
BF Width (ft)																
BF Mean Depth (ft)																
Width/Depth Ratio																
BF Cross-sectional Area (ft²)																
BF Max Depth (ft)																
Width of Floodprone Area (ft)																
Entrenchment Ratio																
Bank Height Ratio																
Wetted Perimeter (ft)																
Hydraulic Radius (ft)																
Cross Sectional Area between end pins (ft^2)																
d50 (mm)																

Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the as-built bankfull area. All other values were calculated using the as-built bankfull elevation, as was done for previous monitoring reports.

Table 11. Morphology and Hydraulic Monitoring Summary (continued)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Reach 4 (2,333 LF)

	Cross-section X-7 (Riffle)								Cross-section X-8 (Pool)								Cross-section X-9 (Riffle)							
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Based on fixed baseline bankfull elevation																								
BF Width (ft)	18.7	17.3	16.0	16.3	-	17.2	-	16.2	17.1	16.1	13.4	11.8	-	13.5	-	12.2	13.8	13.7	13.0	11.1	-	10.1	-	10.3
BF Mean Depth (ft)	0.79	0.81	0.62	0.95	-	0.90	-	1.0	1.45	0.96	1.33	1.31	-	1.40	-	1.5	1.02	0.97	0.72	0.61	-	0.80	-	0.9
Width/Depth Ratio	23.7	21.5	25.7	17.2	-	18.9	-	16.3	11.8	16.8	10.1	9.0	-	9.8	-	8.3	13.5	14.1	18.1	18.1	-	13.3	-	11.8
BF Cross-sectional Area (ft²)	14.8	14.0	10.0	15.5	-	15.6	-	16.1	24.7	15.5	17.8	15.5	-	18.7	-	18.0	14.1	13.3	9.3	6.8	-	7.8	-	8.9
BF Max Depth (ft)	1.24	1.23	1.01	1.72	-	1.80	-	1.8	3.41	2.18	2.73	2.30	-	2.40	-	2.1	1.85	1.52	1.22	1.00	-	1.20	-	1.3
Width of Floodprone Area (ft)	56.1	57.3	30.2	59.7	-	60.8	-	60.0	72.5	45.2	59.0	46.3	-	54.1	-	46.5	33.9	32.1	29.4	28.4	-	29.4	-	29.50
Entrenchment Ratio	3.0	2.0	1.9	3.7	-	3.5	-	3.7	-	-	-	-	-	-	-	-	2.5	2.4	2.3	2.6	-	2.9	-	2.8
Bank Height Ratio	1.9	1.0	1.0	1.0	-	0.9	-	1.0	-	-	-	-	-	-	-	-	1.1	1.1	1.1	1.0	-	1.1	-	0.9
Wetted Perimeter (ft)	20.3	19.0	17.2	18.2	-	18.4	-	17.9	20.0	18.1	16.0	14.4	-	15.0	-	13.6	15.8	15.6	14.5	12.3	-	10.7	-	10.8
Hydraulic Radius (ft)	0.7	0.7	0.6	0.8	-	0.9	-	0.9	1.2	0.9	1.1	1.1	-	1.2	-	1.3	0.9	0.9	0.6	0.6	-	0.7	-	0.8
Based on current/developing bankfull feature																								
BF Width (ft)																								
BF Mean Depth (ft)																								
Width/Depth Ratio																								
BF Cross-sectional Area (ft²)																								
BF Max Depth (ft)																								
Width of Floodprone Area (ft)																								
Entrenchment Ratio																								
Bank Height Ratio																								
Wetted Perimeter (ft)																								
Hydraulic Radius (ft)																								
Cross Sectional Area between end pins (ft²)																								
d50 (mm)																								

Table 11. Morphology and Hydraulic Monitoring Summary (continued)
UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Reach 5 (1,461 LF)

	Cross-section X-1 (Riffle)								Cross-section X-2 (Pool)								Cross-section X-3 (Riffle)								Cross-section X-4 (Riffle)							
Dimension and substrate	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Based on fixed baseline bankfull elevation																																
BF Width (ft)	10.4	10.1	9.0	8.8	-	9.4	-	8.7	11.2	11.3	10.8	10.8	-	11.5	-	11.2	12.0	11.2	10.0	10.4	-	15.0	-	10.3	10.2	11.7	9.0	10.3	-	12.5	-	11.7
BF Mean Depth (ft)	0.68	0.71	0.65	0.62	-	0.7	-	0.70	1.41	1.37	1.35	1.45	-	1.4	-	1.4	0.68	0.65	0.61	0.61	-	0.5	-	0.7	0.81	0.70	0.69	0.70	-	0.80	-	0.8
Width/Depth Ratio	15.2	14.2	14.0	14.1	-	13.4	-	13.1	8.0	8.3	8.0	7.4	-	8.0	-	7.9	17.8	17.3	16.6	17.0	-	29.2	-	15.5	12.5	16.7	13.1	14.7	-	16.3	-	14.3
BF Cross-sectional Area (ft²)	7.1	7.2	5.8	5.4	-	6.7	-	5.8	15.8	15.4	14.5	15.7	-	16.4	-	15.9	8.1	7.2	6.1	6.4	-	7.8	-	6.9	8.3	8.1	6.2	7.2	-	9.5	-	9.5
BF Max Depth (ft)	1.19	1.33	1.04	1.07	-	1.30	-	1.1	2.79	2.66	2.39	2.50	-	2.70	-	2.60	1.16	1.16	1.08	1.08	-	1.20	-	1.10	1.33	1.44	1.10	1.28	-	1.60	-	1.30
Width of Floodprone Area (ft)	85.1	85.0	85.1	85.1	-	85.1	-	85.0	103.7	103.7	103.7	103.6	-	103.6	-	103.6	76.0	76.5	76.0	76.2	-	76.3	-	76.3	32.2	34.3	30.1	33.2	-	37.5	-	35.0
Entrenchment Ratio	8.2	8.5	9.4	9.7	-	9.0	-	9.8	-	-	-	-	-	-	-	-	6.3	6.9	7.6	7.3	-	5.1	-	7.4	3.2	2.9	3.3	7.3	-	3.0	-	2.8
Bank Height Ratio	1.0	1.0	1.0	1.1	-	1.0	-	1.0	-	-	-	-	-	-	-	-	1.0	1.0	1.0	1.1	-	1.0	-	0.9	1.0	0.9	1.0	1.1	-	1.1	-	1.0
Wetted Perimeter (ft)	11.8	11.5	10.3	10.0	-	9.8	-	9.2	14.1	14.0	13.5	13.7	-	13.5	-	13.0	13.4	12.5	11.3	11.7	-	15.4	-	10.8	11.8	13.1	10.4	11.7	-	13.9	-	121.5
Hydraulic Radius (ft)	0.6	0.6	0.6	0.5	-	0.7	-	0.6	1.1	1.1	1.1	1.1	-	1.2	-	1.2	0.6	0.6	0.5	0.5	-	0.5	-	0.6	0.7	0.6	0.6	0.6	-	0.7	-	0.8
Based on current/developing bankfull feature																																
BF Width (ft)																																
BF Mean Depth (ft)																																
Width/Depth Ratio																																
BF Cross-sectional Area (ft²)																																
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Width of Floodprone Area (ft)																																
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Wetted Perimeter (ft)																																
Hydraulic Radius (ft)																																
Cross Sectional Area between end pins (ft²)																																
d50 (mm)																																

Note: Per DMS/IRT request, the bank height ratio for MY7 has been calculated using the as-built bankfull area. All other values were calculated using the as-built bankfull elevation, as was done for previous monitoring reports.

Appendix E

Hydrologic Data

Table 12. Verification of Bankfull Events

UT to Cane Creek Restoration Project: DMS Project ID No. 95729

Date of Data Collection	Crest Gauge 1 (Reach 5)	Crest Gauge 2 (Reach 3)	Estimated Occurrence of Bankfull Event	Method of Data Collection
Year 1 Monitoring				
10/01/2014	NA	0.18	07/16/2014	Crest Gauge
Year 2 Monitoring				
03/25/2015	0.33	NA	03/06/2015	Crest Gauge
10/13/2015	0.62	0.79	10/03/2015	Crest Gauge
Year 3 Monitoring				
07/27/2016	1.21	NA	02/17/2016	Crest Gauge
09/30/2016	1.31	1.12	09/19/2016	Crest Gauge
11/09/2016	0.75	0.66	10/09/2016	Crest Gauge
Year 4 Monitoring				
05/03/2017	0.76	0.46	04/24/2017	Crest Gauge
Year 5 Monitoring				
09/24/2018	1.22	1.08	09/17/2018 (Hurricane Florence)	Crest Gauge
Year 6 Monitoring				
06/06/2019	0.83	0.46	04/14/2019	Crest Gauge
Year 7 Monitoring				
08/28/2020	N/A (ants removed the cork overbank indicator)	0.67	8/4/20 to 8/5/20 (2.47" total)	Crest Gauge

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