As-built Baseline Monitoring Report
FINAL

Cedar Branch Restoration Site
Monitoring Year 00
DMS Contract 6598
DMS Project Number 97009

DWR #: 20150904
USACE Action ID: 2003-21395
Randolph County, North Carolina

Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699

Baseline Data Collected: April 2018
Date Submitted: August 2018

Monitoring and Design Firm

Prepared by:

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Project Contact: Tim Morris
Email: tim.morris@kci.com

August 2018

KCI ASSOCIATES OF NORTH CAROLINA, PA

ENGINEERS • SCIENTISTS • SURVEYORS • CONSTRUCTION MANAGERS
4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 (919) 783-9214 (919) 783-9266 Fax

MEMORANDUM

Date: August 10, 2018

To: Matthew Reid, DMS Project Manager

From: Tim Morris, Project Manager
KCI Associates of North Carolina, PA

Subject: Cedar Branch Stream Restoration Site
MY-00 Monitoring Report Comments
Yadkin River Basin CU 03040103
Randolph County, North Carolina
NCDMS Project # 97009
Contract # 006598

Please find below our responses in italics to the MY-00 Baseline Monitoring Report comments from NCDMS received on August 1, 2018, for the Cedar Branch Stream Restoration Site.

Project Summary

Table 2 shows planting was completed in April 2018. There are several instances in the report that indicate planting was completed in March 2018 (last paragraph page 1 and 3rd paragraph page 2). Please update text and/or table to the correct date.

- *Site planting was completed on April 6, 2018. The text of the report has been updated to reflect this.*

Please elaborate on the type of stream gauge discussed on page 2. Are the gauges continuous recording? Please include data in future monitoring reports.

- *The stream gauges installed are automatically recording pressure transducers that take a reading every 10 minutes. This information has been added to the report and the data from these gauges will be included in monitoring reports starting with MY01.*

Table 1

There is a 4' linear foot and SMU discrepancy for the project. I am aware that KCI has discussed this issue with the IRT. Please include email correspondence, meeting minutes etc. in appendix to document the acknowledgment of this discrepancy.

- *A footnote has been added to this table and an appendix including correspondence with the IRT has been added to the report.*

Table 2

Planting completed date needs to be verified (comment above).

- *The correct date is April 6, 2018. The report has been updated throughout to reflect this.*

Vegetation Plot Data

Species were unable to be identified during initial vegetation monitoring. Please be sure to update table for MY1 submittal.

- *These species will be identified during MY01.*

Table 7

For future monitoring report submittals, please use the Bankfull Cross-sectional Area data from the MY0 report to determine bankfull elevation when calculating the changes in Bank Height Ratio as discussed in the DMS Technical Workgroup meetings.

- *BHR will be calculated this way in future monitoring reports.*

Profile

Please plot the design profile on the graph with the surveyed MY0 profile.

- *This has been added to the report.*

Cross Sections

Cross sections need to be QA/QC. The majority of XS graphs do not match Summary Data. Multiple instances of bankfull elevation on graph do not correspond to numbers in Summary Data. Other numbers in Summary data are incorrect as a result. Elevation axis labels needs to be revised for several sections. I assume the intervals are in .5' increments, but the current axis shows multiples of the same whole number. Table 7 may need to be updated once this issue has been corrected. Please check all cross sections and revise.

- *All Summary Data has been reviewed and verified. The issue arose from the axis labels being rounded up from 0.5 to 1. This issue has been corrected, and because it was just an issue with the labels on the axis, did not require updates to other sections of the report.*

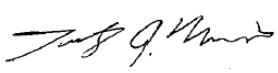
General Comment

As KCI has done in the past, please include a response to the comment letter and how/where the comments were addressed. Please insert this letter directly behind the cover page in the final deliverables (printed and electronic). The IRT has requested that we include this letter with the final deliverables. The response letter will need to be included with all future monitoring deliverables.

- *This letter has been included in the final version of the Baseline Monitoring Report.*

Please contact me if you have any questions or would like clarification concerning these responses.

Sincerely,



Tim Morris
Project Manager

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PROJECT SUMMARY

The Cedar Branch Restoration Site (CBRS) was completed in April 2018 and restored a total of 7,047 linear feet of stream. The CBRS is a riparian system in the Lower Yadkin River Basin (03040103 8-digit cataloging unit) in Randolph County, North Carolina. The site's natural hydrologic regime had been substantially modified through the relocation and straightening of the existing stream channels, impacted by cattle access, and cleared of any riparian buffer. This completed project will restore impacted agricultural lands to a stable stream ecosystem with a functional riparian buffer and floodplain access.

The CBRS is protected by a 20.6 acre permanent conservation easement, held by the State of North Carolina. The site is located approximately 2.8 miles west of Sophia, North Carolina. Specifically, the site is 0.5 mile west on Mt. Olive Church Road from its intersection with Edgar Road (SR-1526).

The North Carolina Ecosystem Enhancement Program (NCEEP) publication in 2009 identified HUC 03040103050040 (Caraway Creek) as a Targeted Local Watershed (TLW). The project is also located within the Upper Uwharrie Local Watershed Plan (LWP) study area. The goals and priorities for the CBRS are based on the information presented in the Lower Yadkin River Basin Restoration Priorities: maintaining and enhancing water quality, restoring hydrology, and improving fish and wildlife habitat (NCEEP, 2009). The project will support the following basin priorities:

- Managing stormwater runoff
- Reducing fecal coliform inputs
- Improving/restoring riparian buffers
- Reducing sediment loading
- Improving stream stability
- Reducing nutrient loading
- Excluding livestock and implementing other agricultural BMP's

The goals for the project are to:

- Restore channelized and livestock-impacted streams to stable C/Cb channels.
- Restore a forested riparian buffer to provide bank stability, filtration, and shading.

The project goals will be addressed through the following objectives:

- Relocate a channelized stream to its historic landscape position.
- Install cross-sections sized to the bankfull discharge.
- Create bedform diversity with pools, riffles, and habitat structures
- Fence out livestock to reduce nutrient, bacterial, and sediment impacts from adjacent grazing and farming practices.
- Plant the site with native trees and shrubs and an herbaceous seed mix.

Project planting and construction were completed in April 2018. The CBRS involved restoration and establishment of a functioning stream ecosystem with 7,047 linear feet of stream restored by re-meandering the stream and by tying the bankfull elevation to the historic floodplain where feasible. This restoration is expected to create wetland pockets throughout the new floodplain and bankfull bench. The entire site was planted to establish a forested riparian buffer. The site was constructed as designed with only a few modifications from the design plan. A riffle at Stationing 16+00 on UTCC was shortened, and the downstream pool and riffle were moved back laterally to avoid bedrock that was encountered during construction. This was also done on T1 near Stationing 58+00 to avoid bedrock and an existing tree. Because there was less concentrated surface runoff than originally thought, two water quality treatment areas were not installed at the bottom of UTCC. On T3-1, the structure at the very beginning of the reach was replaced with an extended plunge pool and towards the bottom of T3, at Stationing 99+80, the second step of a double step pool was not installed due to bedrock.

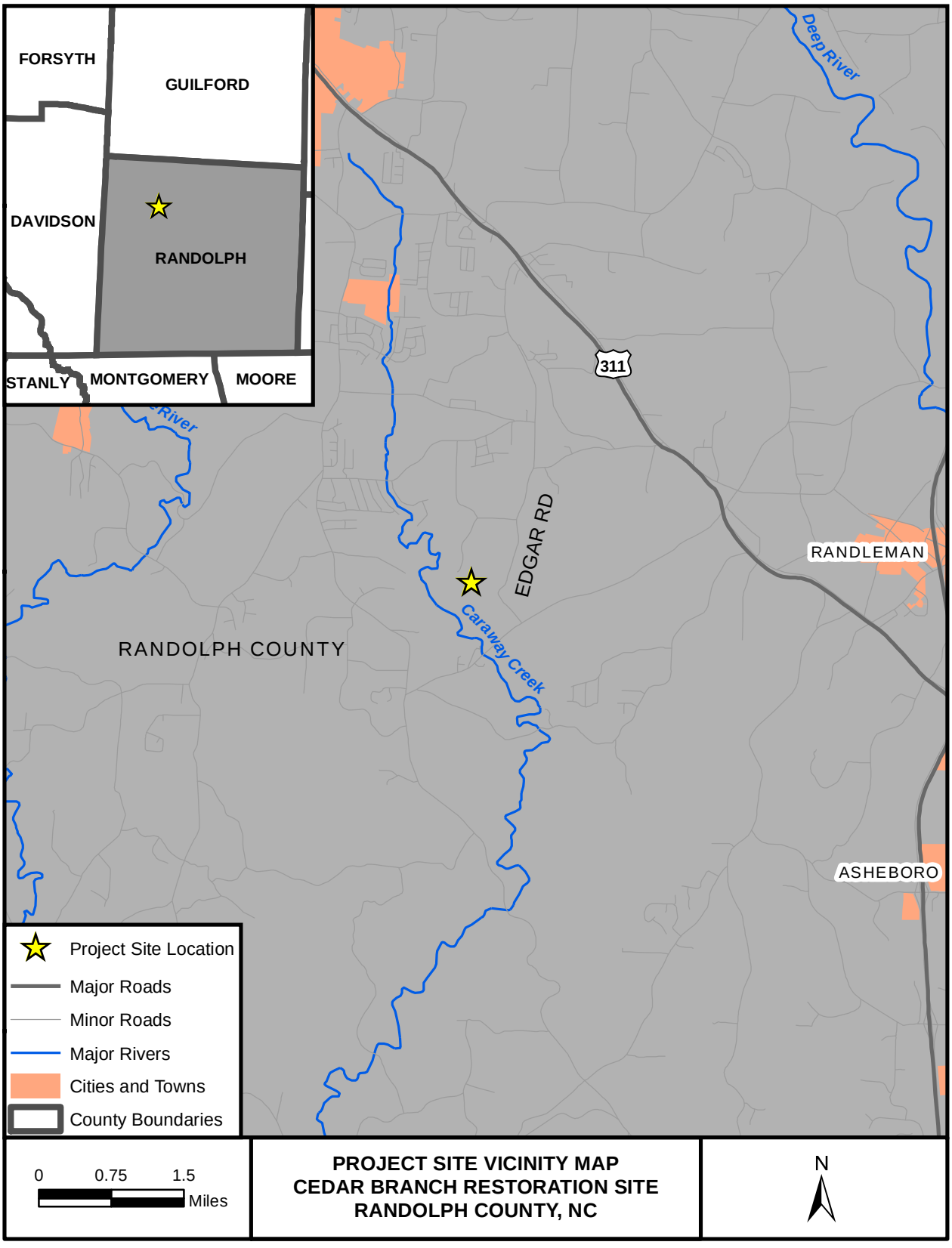
The monitoring components were installed in April 2018. Three groundwater monitoring wells were installed to monitor the development of wetlands in the floodplain along the EI portions of T1 and T3. Four automatically recording pressure transducer stream gauges that take a reading every 10 minutes were installed near the top of T1, T1-1, and T3 to document flow within those reaches. Cameras were installed in the vicinity of each of these gauges and set to record a short video once a day to provide additional verification of flow. An additional stream gauge was installed along UTCC to record the occurrence of bankfull events. To determine the success of the planted mitigation areas, thirteen 10 m x 10 m permanent vegetation monitoring plots were established. The locations of the planted stems relative to the origin within these plots, as well as the species, were recorded and planted stems were grouped into size categories (0-10 cm, 10-50 cm, 50-100 cm, >137 cm). Any volunteers found within the plots were also grouped into size categories by species, but separate from the planted stems. Twelve permanent photo reference points were established and will be taken annually. Fifteen permanent cross-sections (ten riffle cross-sections and five pool cross-sections) were also established and a detailed longitudinal profile of the stream was taken. Wolman pebble counts were performed at all of the riffle cross-sections. The cross-section measurements will be repeated in future monitoring years, but the longitudinal profile will only be repeated if there are concerns about bed elevation adjustments. Reports will be submitted to DMS each year and the first year of monitoring will take place in 2018. First year monitoring data is scheduled to be collected in October 2018, six months after baseline data collection.

Vegetative success criteria for the site is 320 woody stems/acre after three years, 260 woody stems/acre after five years, and 210 woody stems/acre after seven years. A minimum of two bankfull events must also be recorded during the monitoring period. Bank height ratios should not exceed 1.2 and the entrenchment ratios should be 2.2 or greater. Visual assessments will also be used to identify problem areas.

BASELINE CONDITIONS

The site was planted in April 2018 with tree tube protection installed around approximately 20% of the planted stems. The baseline conditions monitoring was conducted April 4 through 11 in 2018. The average plot stem density from the thirteen surveyed plots is 1,024 planted stems/acre. Baseline monitoring was conducted during dormancy, so most of the stems were not identified to species. During MY01, these trees will be identified to species.

The baseline survey found that, other than the changes described above, the stream was constructed as designed and all structures were installed as planned. The profile and cross-section survey found that the dimension and profile of the stream are as designed, with some small variation as is typical for stream restoration projects.


FORSYTH
GUILFORD
DAVIDSON
RANDOLPH
STANLY
MONTGOMERY
MOORE
Deep River
311
EDGAR RD
RANDLEMAN
RANDOLPH COUNTY
Caraway Creek
ASHEBORO
Project Site Location
Major Roads
Minor Roads
Major Rivers
Cities and Towns
County Boundaries
0
0.75
1.5
Miles
PROJECT SITE VICINITY MAP
CEDAR BRANCH RESTORATION SITE
RANDOLPH COUNTY, NC
N

REFERENCES

NCDENR, Ecosystem Enhancement Program. 2009. Yadkin River Basin Restoration Priorities 2009. Raleigh, NC. Last accessed 1/2016 at: http://portal.ncdenr.org/c/document_library/get_file?uuid=705d1b58-cb91-451e-aa58-4ef128b1e5ab&groupId=60329

NCDENR, Ecosystem Enhancement Program. 2014. NCDENR, Ecosystem Enhancement Program. 2014.
Stream and Wetland Mitigation Monitoring Guidelines. Last accessed 1/2016 at: http://portal.ncdenr.org/c/document_library/get_file?p_l_id=60409&folderId=18877169&name=DLFE-86604.pdf

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NC Wetland Functional Assessment Team. 2010. NC Wetland Assessment Method (NC WAM) User Manual, version 4.1. Last accessed 11/2012 at: http://portal.ncdenr.org/c/document_library/get_file?uuid=76f3c58b-dab8-4960-ba43-45b7faf06f4c&groupId=38364

APPENDIX A

Background Tables

Table 1. Project Components and Mitigation Credits
Cedar Branch Restoration Site, DMS Project #97009

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Linear Feet/Acres	5,230	1,813							
Credits†	5,234	966							
TOTAL CREDITS	6,200								

Project Components

Project Component -or- Reach ID	Stationing/ Location	Existing Footage/ Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage/ Acreage	Mitigation Ratio
Tributary 1	50+00 to 55+50	550	Enhancement II	220	550	2.5:1
	55+50 to 58+24	257	Enhancement I	183	274	1.5:1
	58+24 to 61+17	229	Restoration	294	293	1:1
Tributary 1-1	70+00 to 73+13	313	Enhancement II	125	313	2.5:1
Tributary 2	80+00 to 80+49	46	Enhancement II	20	49	2.5:1
	80+49 to 81+27	77	Restoration	78	78	1:1
Tributary 3	90+00 to 96+27	624	Enhancement I	418	627	1.5:1
	96+27 to 101-57	517	Restoration	530	530	1:1
Tributary 3-1	150+00 to 150+78	68	Restoration	78	78	1:1
Tributary 4*	250+00 to 257+42	677	Restoration	692	692	1:1
Tributary 5**	300+00 to 300+95	64	N/A	0	(95)	N/A
UTCC*	10+00 to 46+09	3,246	Restoration	3,562	3,559	1:1

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetlands (Acres)		Non-Riparian Wetlands (Acres)	Buffer (square feet)	Upland (Acres)
		Riverine	Non-Riverine			
Restoration	5,234 lf					
Enhancement						
Enhancement I	901					
Enhancement II	912					
TOTAL CREDITS	6,200					

R= Restoration RE= Restoration Equivalent of Creation or Enhancement
*=Crossings have been removed from creditable linear footage for all project streams.
**=Tributary 5 does not have any mitigation credit, but is included to show its stationing as part of the mitigation project.
†=Changes made during construction resulted in the loss of 4 lf of stream, but per IRT review, this did not result in a loss of credits. Please see Appendix F for additional information.

Table 2. Project Activity & Reporting History Cedar Branch Restoration Sites, DMS Project #97009		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Mitigation Plan		May 2017
Final Design - Construction Plans		March 8, 2017
Construction Grading Completed		March 28, 2018
Planting Completed		April 6, 2018
Baseline Monitoring/Report		May 2018
Vegetation Monitoring	April 10, 2018	
Stream Survey	April 11, 2018	

Table 3. Project Contacts Cedar Branch Restoration Site, DMS Project #97009	
Design Firm	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor	KCI Environmental Technologies and Construction 4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512
Planting Contractor	Conservation Services Inc. 1620 N. Delphine Ave. Waynesboro, VA 22980 Contact: Mr. David Coleman Phone: (540) 941-0067
Monitoring Performers	
	KCI Associates of North Carolina, PC 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4. Project Information **Cedar Branch Restoration Site, DMS Project #97009**						
Project Name	Cedar Branch Restoration Site					
County	Randolph County					
Project Area (acres)	21.3 acres					
Project Coordinates (lat. and long.)	35.823878° N, -79.90855° W					
Project Watershed Summary Information						
Physiographic Province	Piedmont					
River Basin	Yadkin					
USGS Hydrologic Unit 8-digit	03040103		**USGS Hydrologic Unit 14-digit**		03040103050040	
DWQ Sub-basin	13-2-3					
Project Drainage Area (acres)	294 acres					
Project Drainage Area Percentage of Impervious Area	4%					
CGIA Land Use Classification	Managed Herbaceous Cover 59% (173 ac), Mixed Hardwoods/Conifers 34% (100 ac), Low Density Developed 5% (15 ac), Transportation 2% (6 ac)					
Existing Reach Summary Information						
Parameters	**UTCC**	**T1, T1-1**	**T2**	**T3, T3-1**	**T4**	**T5**
Length of reach (linear feet)	3,038	1,349	124	1,209	627	61
Drainage area (acres)	88 acres	30 acres	18 acres	28 acres	30 acres	31 acres
NCDWQ Water Quality Classification	C	C	C	C	C	C
Rosgen Classification	G4c-E4	G4	G4	E4	G4	C4b
Evolutionary trend	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Channelized, Stage III	Stable
Mapped Soil Series	Mecklenburg Clay Loam	Wynott-Enon Complex	Mecklenburg Clay Loam	Mecklenburg Clay Loam	Mecklenburg Clay Loam	Mecklenburg Clay Loam
Drainage class	Well drained	Well drained	Well drained	Well drained	Well drained	Well drained
Soil Hydric status	Hydric	Hydric	Hydric	Hydric	Hydric	Hydric
Slope	1.5%	3.1%	3.1%	3.7%	3.1%	2.7%
FEMA classification	Zone X	Zone X	Zone X	Zone X	Zone X	Zone X
Existing vegetation community	Pasture, Headwater Forest	Pasture, Headwater Forest	Headwater Forest	Pasture	Pasture	Headwater Forest

Existing Wetland Summary Information		
Parameters		
Size of Wetland (acres)	0.02 (WA)	0.03 (WB and WC)
Wetland Type	Bottomland Hardwood Forest	Bottomland Hardwood Forest
Mapped Soil Series	Wynott-Enon Complex	Mecklenburg clay loam
Drainage class	Well Drained	Well Drained
Soil Hydric Status	Hydric	Hydric
Source of Hydrology	Stream Floodplain	Hillside Seepage and Stream Floodplain
Hydrologic Impairment	Ditching and Grazing	Ditching and Grazing
Existing vegetation community	Forested Wetland (Headwater Forest)	Emergent Wetland (Non-Tidal Freshwater Marsh)

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	NWP 27	Jurisdictional Determination
Waters of the United States – Section 401	Yes	NWP 27	Jurisdictional Determination
Endangered Species Act	No	N/A	N/A
Historic Preservation Act	No	N/A	N/A
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

APPENDIX B

Visual Assessment Data

BEGIN UTCC
BEGIN TRIB 2
STREAM GAUGE 1-1 (FLOW CAMERA)
END TRIB 1-1
VP2
WETLAND GAUGE 1
PP1
PP2
XS1
XS2
PP3
PP4
END TRIB 1
END TRIB 2
BEGIN TRIB 1-1
STREAM GAUGE 1 (FLOW CAMERA)
VP1
XS3
XS4
VP3
VP4
VP5
XS5
BEGIN TRIB 1
BEGIN TRIB 3
WETLAND GAUGE 2
STREAM GAUGE 3 (FLOW CAMERA)
VP10
VP11
XS7
XS8
PP5
PP6
XS6
PP7
PP8
END TRIB 3
WETLAND GAUGE 3
TRIB 3-1

NC GRID NAD 83

-60' -30' 0' 60' 120'
GRAPHIC SCALE

LEGEND:

- VEG PLOT
- STREAM GAUGE
- WETLAND GAUGE
- PHOTO POINT
- CROSS-SECTION
- CONSERVATION EASEMENT
- STREAM RESTORATION
- STREAM ENHANCEMENT I
- STREAM ENHANCEMENT II
- NON-CREDIT STREAM LENGTH
- STEP POOL
- RIFFLE CASCADE
- RIFFLE ENHANCEMENT
- RIFFLE GRADE CONTROL
- LIVE LIFT

IMAGE SOURCE: NC 2014 STATEWIDE ORTHOIMAGERY

REVISIONS

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: APRIL 2018
SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

SHEET 1 OF 2

LEGEND:

- VEG PLOT
- STREAM GAUGE
- WETLAND GAUGE
- PHOTO POINT
- CROSS-SECTION
- CONSERVATION EASEMENT
- STREAM RESTORATION
- STREAM ENHANCEMENT I
- STREAM ENHANCEMENT II
- NON-CREDIT STREAM LENGTH
- STEP POOL
- RIFFLE CASCADE
- RIFFLE ENHANCEMENT
- RIFFLE GRADE CONTROL
- LIVE LIFT

IMAGE SOURCE: NC 2014 STATEWIDE ORTHOIMAGERY

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RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

DATE: APRIL 2018
SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

Photo Reference Photos

PP1 – MY-00 – 4/18/18

PP2 – MY-00 – 4/18/18

PP3 – MY-00 – 4/18/18

PP4 – MY-00 – 4/18/18

PP5– MY-00 – 4/18/18

PP6– MY-00 – 4/18/18

PP7 – MY-00 – 4/18/18

PP8 – MY-00 – 4/18/18

PP9 – MY-00 – 4/18/18

PP10 – MY-00 – 4/18/18

PP11– MY-00 – 4/18/18

PP12– MY-00 – 4/18/18

Vegetation Monitoring Plot Photos

Vegetation Plot 1 – MY-00 – 4/10/2018

Vegetation Plot 2 – MY-00 – 4/10/2018

Vegetation Plot 3 – MY-00 – 4/10/2018

Vegetation Plot 4 – MY-00 – 4/10/2018

Vegetation Plot 5 – MY-00 – 4/11/2018

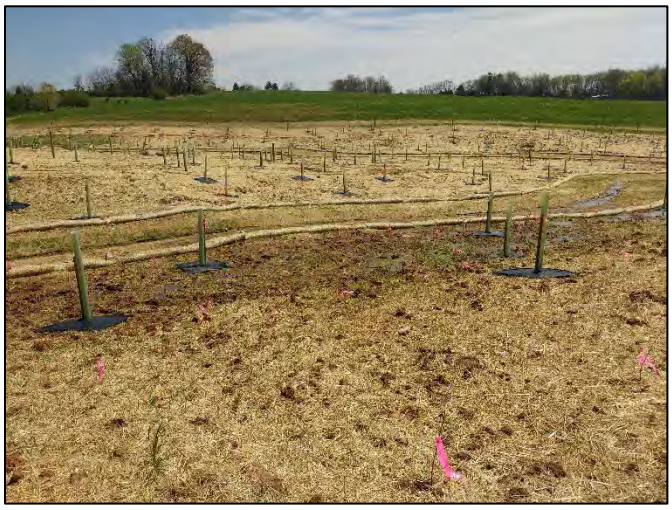
Vegetation Plot 6 – MY-00 – 4/11/2018

Vegetation Plot 7 – MY-00 – 4/11/2018

Vegetation Plot 8 – MY-00 – 4/11/2018

Vegetation Plot 9 – MY00 – 4/11/2018

Vegetation Plot 10 – MY00 – 4/10/2018



Vegetation Plot 11 – MY00 – 4/10/2018

Vegetation Plot 12 – MY00 – 4/11/2018

Vegetation Plot 13 – MY-00 – 4/11/2018

APPENDIX C

Vegetation Plot Data

Table 5. Stem Count by Plot and Species
Cedar Branch Restoration Site, DMS Project #97009

	Current Plot Data (MY00 2018)													
	Plot 01		Plot 02		Plot 03		Plot 04		Plot 05		Plot 06		Plot 07	
Species	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Oak (*Quercus sp.*)	4	4	2	2					3	3	3	3		
River Birch (*Betula nigra*)					2	2								
Tulip Poplar (*Liriodendron tulipifera*)	3	3	3	3			4	4						
Unknown	16	16	17	17	23	23	19	19	18	18	24	24	22	22
Stem count	23	23	22	22	25	25	23	23	21	21	27	27	22	22
size (ares)	1		1		1		1		1		1		1	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.025	
Species count	3	3	3	3	2	2	2	2	2	2	2	2	1	1
Stems per ACRE	931	931	890	890	1012	1012	931	931	850	850	1093	1093	890	890

	Current Plot Data (MY00 2018)												Annual Means	
	Plot 08		Plot 09		Plot 10		Plot 11		Plot 12		Plot 13		MY00 (2018)	
Species	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Oak (*Quercus sp.*)	1	1					9	9	5	5	3	3	30	30
River Birch (*Betula nigra*)					4	4							6	6
Tulip Poplar (*Liriodendron tulipifera*)					2	2	1	1					13	13
Unknown	36	36	25	25	15	15	18	18	23	23	24	24	280	280
Stem count	37	37	25	25	21	21	28	28	28	28	27	27	329	329
size (ares)	1		1		1		1		1		1		13	
size (ACRES)	0.025		0.025		0.025		0.025		0.025		0.025		0.32	
Species count	2	2	1	1	3	3	3	3	2	2	2	2	4	4
Stems per ACRE	1497	1497	1012	1012	850	850	1133	1133	1133	1133	1093	1093	1024	1024

APPENDIX D

Stream Measurement and Geomorphology Data

Table 6a. UTCC Baseline Stream Data Summary
Cedar Branch Restoration Site, DMS Project #97009

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design			As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	UTCC-1	UTCC-2	UTCC-3	Min	Mean	Max	n
Bankfull Width (ft)	7.8	10.5	10.1	13.9	4	9.0	13.3	13.1	17.7	6	11.7	13.2	15.0	11.7	13.4	15.2	5
Floodprone Width (ft)	9.6	31.7	33.5	50.0	4	13.1	55.6	50.0	100.0	6	90	100	105	>40	>40	>50	5
Bankfull Mean Depth (ft)	1.2	1.4	1.4	1.7	4	0.9	1.2	1.2	1.5	6	1.0	1.0	1.1	0.8	1.0	1.1	5
Bankfull Max Depth (ft)	1.7	2.2	2.2	2.8	4	1.3	1.7	1.7	2.0	6	1.5	1.5	1.7	1.4	1.6	1.8	5
Bankfull Cross-Sectional Area (ft^2)	11.3	14.6	15.1	16.9	4	10.4	16.4	14.0	24.7	6	11.3	13.2	16.9	9.6	12.8	15.8	5
Width/Depth Ratio	5.3	7.6	6.9	11.4	4	7.6	11.1	11.5	13.4	6	12.1	13.2	13.2	10.8	14.3	18.1	5
Entrenchment Ratio	1.2	2.9	2.6	5.0	4	1.3	3.8	3.9	5.9	6	>2.2	>2.2	>2.2	2.9	3.6	4.8	5
Bank Height Ratio	1.0	1.9	2.0	2.5	4	1.0	1.0	1.0	1.0	6	1.0	1.0	1.0	1.0	1.0	1.0	5
Pattern																	
Channel Beltwidth (ft)	*					45					41-54	46-58	53-74	41	54	74	47
Radius of Curvature (ft)	*					13-42					25-35	30-35	35-45	25	34	45	47
Rc:Bankfull width (ft/ft)	*					1.3-4.4					2.1-3.0	2.3-2.7	2.3-3.0	2.1	2.6	3.0	47
Meander Wavelength (ft)	*					93-136					101-150	115-155	153-180	101	142	180	47
Meander Width Ratio	*					4.5-5.0					3.5-4.6	3.5-4.4	3.5-4.9	3.5	4.1	4.9	47
Profile																	
Riffle Length (ft)														4.6	34.7	57.4	48
Riffle Slope (ft/ft)	0.021	0.032	0.03	0.048	4	0.013-0.028					0.020-0.037	0.020-0.035	0.020-0.035	0.039	0.023	0.053	48
Pool Length (ft)	*					3-25					19-42	20-49	36-61	4.3	28.5	55.0	47
Pool Spacing (ft)	*					30-59					50-83	67-91	79-105	37.3	77.5	124.0	47
Substrate and Transport Parameters																	
SC% / Sa% / G% / C% / B% /Be%	0%/23%/63%/13%/1%/0%					0.3%/19%/66%/14%/0.7%/0%								3%/6%/67%/23%/0%/0%			
d16 / d35 / d50 / d84 / d95 (mm)	1.5/5.4/16/55/90					1.7/6.4/19/56/93								10/27/37/78/113			
Channel length (ft)	3,246										1,400	512	1,650	3,562			
Drainage Area (SM)	0.45					0.13-0.49					0.22	0.28	0.41	0.41			
Rosgen Classification	G4c-E4					B4c					C4	C4	C4	C4			
Sinuosity	1.0					1.2					1.2	1.2	1.2	1.2			
Water Surface Slope (ft/ft)	0.015					0.013					0.013	0.013	0.013	0.013			

*No data shown due to channelization/lack of bed diversity

Table 6b. T1 Baseline Stream Data Summary
Cedar Branch Restoration Site, DMS Project #97009

Parameter	Pre-Existing Condition					Reference Reach(es) Data (UTCC)					Design				As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Mean	Max	n	Min	Mean	Max	n
Bankfull Width (ft)	5.8					9.0	13.3	13.1	17.7	6	7.8				8.9			
Floodprone Width (ft)	9.0					13.1	55.6	50.0	100.0	6	50				>40			
Bankfull Mean Depth (ft)	0.9					0.9	1.2	1.2	1.5	6	0.6				0.5			
Bankfull Max Depth (ft)	1.2					1.3	1.7	1.7	2.0	6	1.0				1.0			
Bankfull Cross-Sectional Area (ft^2)	5.0					10.4	16.4	14.0	24.7	6	5.0				4.6			
Width/Depth Ratio	6.7					7.6	11.1	11.5	13.4	6	12.1				17.0			
Entrenchment Ratio	1.5					1.3	3.8	3.9	5.9	6	>2.2				4.2			
Bank Height Ratio	2.3					1.0	1.0	1.0	1.0	6	1.0				1.0			
Pattern																		
Channel Beltwidth (ft)	*					45					29-36				29	33	36	14
Radius of Curvature (ft)	*					13-42					15-25				15	20	25	14
Rc:Bankfull width (ft/ft)	*					1.3-4.4					1.9-3.2				1.9	2.6	3.2	14
Meander Wavelength (ft)	*					93-136					72-80				72	76	80	14
Meander Width Ratio	*					4.5-5.0					3.7-4.6				3.7	4.2	4.6	14
Profile																		
Riffle Length (ft)															3.6	20.9	32.9	14
Riffle Slope (ft/ft)	0.018					0.013-0.028					0.025-0.040				0.019	0.042	0.076	14
Pool Length (ft)	*					3-25					8-25				5.1	11.8	20.1	14
Pool Spacing (ft)	*					30-59					42-51				17.1	40.1	58.5	14
Substrate and Transport Parameters																		
SC% / Sa% / G% / C% / B% /Be%	0%/15%/75%/10%/0%/0%					0.3%/19%/66%/14%/0.7%/0%									1%/14%/79%/6%/0%/0%			
d16 / d35 / d50 / d84 / d95 (mm)	2.1/5/12/50/98					1.7/6.4/19/56/93									2.7/15/24/47/77			
Channel length (ft)	1,036										1,118				1,118			
Drainage Area (SM)	0.05					0.13-0.49					0.05				0.05			
Rosgen Classification	G4					B4c					C4b				C4b			
Sinuosity	1.0					1.2					1.3				1.3			
Water Surface Slope (ft/ft)	0.031					0.013					0.025				0.025			

*No data shown due to channelization/lack of bed diversity

Table 6c. T2 Baseline Stream Data Summary
Cedar Branch Restoration Site, DMS Project #97009

Parameter	Pre-Existing Condition					Reference Reach(es) Data (UTCC)					Design				As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Mean	Max	n	Min	Mean	Max	n
Bankfull Width (ft)	**					9.0	13.3	13.1	17.7	6	7.8				**			
Floodprone Width (ft)	**					13.1	55.6	50.0	100.0	6	30				**			
Bankfull Mean Depth (ft)	**					0.9	1.2	1.2	1.5	6	0.6				**			
Bankfull Max Depth (ft)	**					1.3	1.7	1.7	2.0	6	1.0				**			
Bankfull Cross-Sectional Area (ft^2)	**					10.4	16.4	14.0	24.7	6	5.0				**			
Width/Depth Ratio	**					7.6	11.1	11.5	13.4	6	12.1				**			
Entrenchment Ratio	**					1.3	3.8	3.9	5.9	6	>2.2				**			
Bank Height Ratio	**					1.0	1.0	1.0	1.0	6	1.0				**			
Pattern																		
Channel Beltwidth (ft)	*					45					N/A				**			
Radius of Curvature (ft)	*					13-42					15-25				**			
Rc:Bankfull width (ft/ft)	*					1.3-4.4					1.9-3.2				**			
Meander Wavelength (ft)	*					93-136					N/A				**			
Meander Width Ratio	*					4.5-5.0					N/A				**			
Profile																		
Riffle Length (ft)	**														9.4	20.0	24.9	4
Riffle Slope (ft/ft)	**					0.013-0.028					0.026-0.027				0.023	0.025	0.027	4
Pool Length (ft)	**					3-25					12-17				6.4	8.1	9.0	3
Pool Spacing (ft)	**					30-59					38				36.4	37.8	39.1	3
Substrate and Transport Parameters																		
SC% / Sa% / G% / C% / B% /Be%	**					0.3%/19%/66%/14%/0.7%/0%									**			
d16 / d35 / d50 / d84 / d95 (mm)	**					1.7/6.4/19/56/93									**			
Channel length (ft)	123										127				127			
Drainage Area (SM)	0.03					0.13-0.49					0.03				0.03			
Rosgen Classification	G4					B4c					C4				C4			
Sinuosity	1.0					1.2					N/A				N/A			
Water Surface Slope (ft/ft)	0.031					0.013					0.017				0.016			

*No data shown due to channelization/lack of bed diversity
**Data not collected

Table 6d. T3 Baseline Stream Data Summary
Cedar Branch Restoration Site, DMS Project #97009

Parameter	Pre-Existing Condition					Reference Reach(es) Data (UTCC)					Design				As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Mean	Max	n	Min	Mean	Max	n
Bankfull Width (ft)	4.7	5.4		6.0	2	9.0	13.3	13.1	17.7	6	7.8				5.9	5.9	6.0	2
Floodprone Width (ft)	11.3	13.5		15.7	2	13.1	55.6	50.0	100.0	6	30				>25	>25	>25	2
Bankfull Mean Depth (ft)	0.8	0.8		0.8	2	0.9	1.2	1.2	1.5	6	0.6				0.4	0.5	0.5	2
Bankfull Max Depth (ft)	1.3	1.3		1.3	2	1.3	1.7	1.7	2.0	6	1.0				0.7	0.8	0.8	2
Bankfull Cross-Sectional Area (ft^2)	3.9	4.5		5.0	2	10.4	16.4	14.0	24.7	6	5.0				2.5	2.8	3.1	2
Width/Depth Ratio	5.6	6.4		7.1	2	7.6	11.1	11.5	13.4	6	12.1				11.4	12.6	13.8	2
Entrenchment Ratio	1.3	2.4		3.4	2	1.3	3.8	3.9	5.9	6	>2.2				4.4	4.7	5.1	2
Bank Height Ratio	1.6	2.1		2.6	2	1.0	1.0	1.0	1.0	6	1.0				1.0	1.0	1.0	2
Pattern																		
Channel Beltwidth (ft)	*					45					N/A							
Radius of Curvature (ft)	*					13-42					15-25							
Rc:Bankfull width (ft/ft)	*					1.3-4.4					1.9-3.2							
Meander Wavelength (ft)	*					93-136					N/A							
Meander Width Ratio	*					4.5-5.0					N/A							
Profile																		
Riffle Length (ft)															19.7	28.1	68.8	26
Riffle Slope (ft/ft)	0.046	0.067		0.087	2	0.013-0.028					0.025-0.042				0.021	0.034	0.063	26
Pool Length (ft)	*					3-25					11-22				3.6	7.3	11.3	35
Pool Spacing (ft)	*					30-59					32-55				6.8	30.5	85.9	35
Substrate and Transport Parameters																		
SC% / Sa% / G% / C% / B% /Be%	0%/31%/63%/6%/0%/0%					0.3%/19%/66%/14%/0.7%/0%									6%/0%/75%/19%/0%/0%			
d16 / d35 / d50 / d84 / d95 (mm)	1.0/2.4/6.5/33/73					1.7/6.4/19/56/93									18/32/41/71/105			
Channel length (ft)	1,141										1,157				1,157			
Drainage Area (SM)	0.04					0.13-0.49					0.04				0.04			
Rosgen Classification	E4					B4c					C4b				C4b			
Sinuosity	1.0					1.2					N/A				N/A			
Water Surface Slope (ft/ft)	0.037					0.013					0.035				0.035			

*No data shown due to channelization/lack of bed diversity

Table 6e. T4 Baseline Stream Data Summary
Cedar Branch Restoration Site, DMS Project #97009

Parameter	Pre-Existing Condition					Reference Reach(es) Data (UTCC)					Design				As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Mean	Max	n	Min	Mean	Max	n
Bankfull Width (ft)	6.5					9.0	13.3	13.1	17.7	6	7.8				6.7	6.8	6.9	2
Floodprone Width (ft)	7.8					13.1	55.6	50.0	100.0	6	30				>30	>30	>30	2
Bankfull Mean Depth (ft)	0.8					0.9	1.2	1.2	1.5	6	0.6				0.5	0.5	0.5	2
Bankfull Max Depth (ft)	1.0					1.3	1.7	1.7	2.0	6	1.0				0.8	0.8	0.8	2
Bankfull Cross-Sectional Area (ft^2)	5.0					10.4	16.4	14.0	24.7	6	5.0				3.3	3.4	3.5	2
Width/Depth Ratio	8.5					7.6	11.1	11.5	13.4	6	12.1				12.7	13.6	14.6	2
Entrenchment Ratio	1.2					1.3	3.8	3.9	5.9	6	>2.2				4.7	4.9	5.1	2
Bank Height Ratio	4.5					1.0	1.0	1.0	1.0	6	1.0				1.0	1.0	1.0	2
Pattern																		
Channel Beltwidth (ft)	*					45					N/A							
Radius of Curvature (ft)	*					13-42					15-25							
Rc:Bankfull width (ft/ft)	*					1.3-4.4					1.9-3.2							
Meander Wavelength (ft)	*					93-136					N/A							
Meander Width Ratio	*					4.5-5.0					N/A							
Profile																		
Riffle Length (ft)															5.5	21.5	42.1	19
Riffle Slope (ft/ft)	0.038					0.013-0.028					0.030-0.040				0.017	0.040	0.121	19
Pool Length (ft)	*					3-25					13-19				4.0	8.5	12.7	21
Pool Spacing (ft)	*					30-59					34-48				5.5	32.3	55.1	21
Substrate and Transport Parameters																		
SC% / Sa% / G% / C% / B% /Be%	0%/23%/72%/5%/0%/0%					0.3%/19%/66%/14%/0.7%/0%									3%/0%/73%/24%/0%/0%			
d16 / d35 / d50 / d84 / d95 (mm)	1.6/4.0/6.4/35/67					1.7/6.4/19/56/93									28/37/44/78/115			
Channel length (ft)	677										692				692			
Drainage Area (SM)	0.05					0.13-0.49					0.05				0.05			
Rosgen Classification	G4					B4c					C4b				C4b			
Sinuosity	1.0					1.2					N/A				N/A			
Water Surface Slope (ft/ft)	0.031					0.013					0.028				0.028			

*No data shown due to channelization/lack of bed diversity

Table 7. Cross-Section Morphology Data Tables
Cedar Branch Stream Restoration Site, DMS Project #97009

Dimension and Substrate	Cross-Section 1 (Riffle) Station 57+19, T1							Cross-Section 2 (Pool) Station 57+44, T1							Cross-Section 3 (Pool) Station 13+58, UTCC						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	8.9							11.8							13.5						
Floodprone Width (ft)	>40							-							-						
Bankfull Mean Depth (ft)	0.5							1.1							1.5						
Bankfull Max Depth (ft)	1.0							2.1							2.8						
Bankfull Cross-Sectional Area (ft^2)	4.6							13.4							20.2						
Bankfull Width/Depth Ratio	17.0							-							-						
Bankfull Entrenchment Ratio	4.2							-							-						
Bankfull Bank Height Ratio	1.0							-							-						
d50 (mm)	24							-							-						

	Cross-Section 4 (Riffle) Station 13+85, UTCC							Cross-Section 5 (Riffle) Station 22+44, UTCC							Cross-Section 6 (Riffle) Station 96+69, T3						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	12.1							14.5							6.0						
Floodprone Width (ft)	>50							>40							>30						
Bankfull Mean Depth (ft)	1.0							1.1							0.5						
Bankfull Max Depth (ft)	1.7							1.7							0.8						
Bankfull Cross-Sectional Area (ft^2)	12.6							15.8							3.1						
Bankfull Width/Depth Ratio	11.6							13.3							11.7						
Bankfull Entrenchment Ratio	4.6							3.1							4.4						
Bankfull Bank Height Ratio	1.0							1.0							1.0						
d50 (mm)	33							31							41						

Table 7. Cross-Section Morphology Data Tables
Cedar Branch Stream Restoration Site, DMS Project #97009

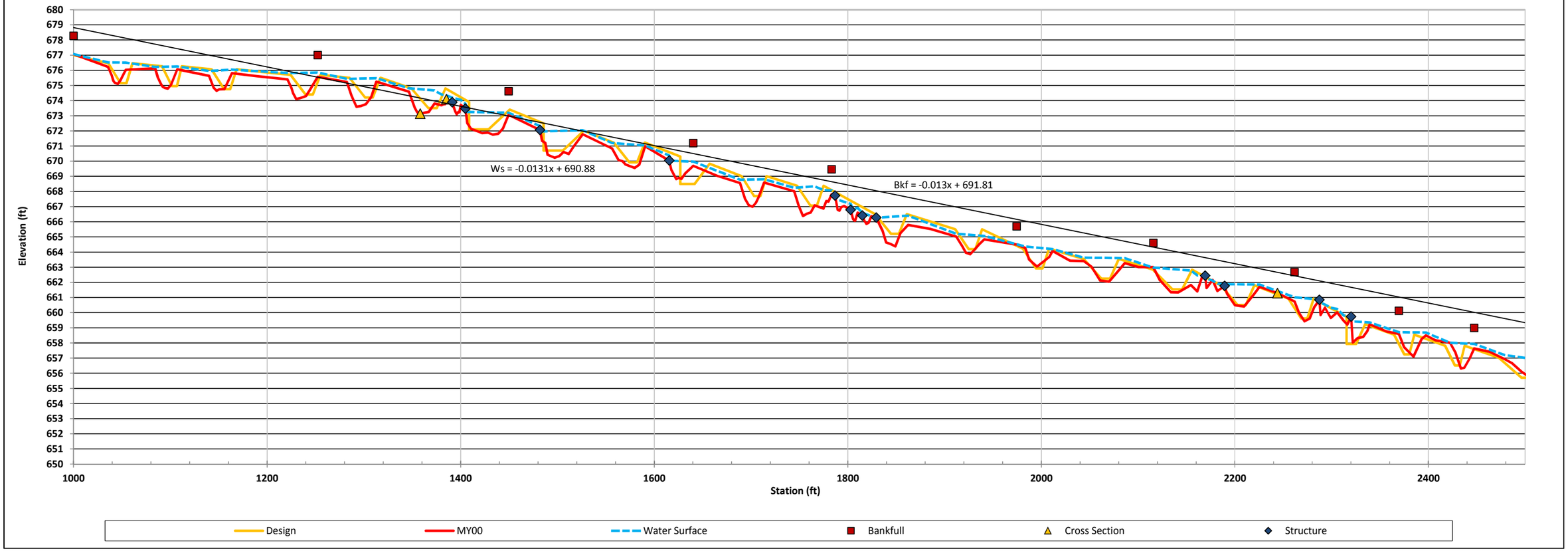
Dimension and Substrate	Cross-Section 7 (Pool) Station 99+07, T3							Cross-Section 8 (Riffle) Station 99+25, T3							Cross-Section 9 (Riffle) Station 26+17, UTCC						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	10.3							6.0							13.2						
Floodprone Width (ft)	-							>30							>40						
Bankfull Mean Depth (ft)	0.7							0.4							1.0						
Bankfull Max Depth (ft)	1.8							0.7							1.8						
Bankfull Cross-Sectional Area (ft^2)	6.9							2.5							13.0						
Bankfull Width/Depth Ratio	-							14.1							13.3						
Bankfull Entrenchment Ratio	-							5.0							3.4						
Bankfull Bank Height Ratio	-							1.0							1.0						
d50 (mm)	-							40							57						

	Cross-Section 10 (Riffle) Station 252+25, T4							Cross-Section 11 (Pool) Station 225+97, T4							Cross-Section 12 (Riffle) Station 226+04, T4						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	7.0							10.2							6.7						
Floodprone Width (ft)	>30							-							>30						
Bankfull Mean Depth (ft)	0.5							1.1							0.5						
Bankfull Max Depth (ft)	0.8							2.1							0.8						
Bankfull Cross-Sectional Area (ft^2)	3.3							10.8							3.5						
Bankfull Width/Depth Ratio	14.9							-							12.9						
Bankfull Entrenchment Ratio	5.1							-							4.7						
Bankfull Bank Height Ratio	1.0							-							1.0						
d50 (mm)	42							-							45						

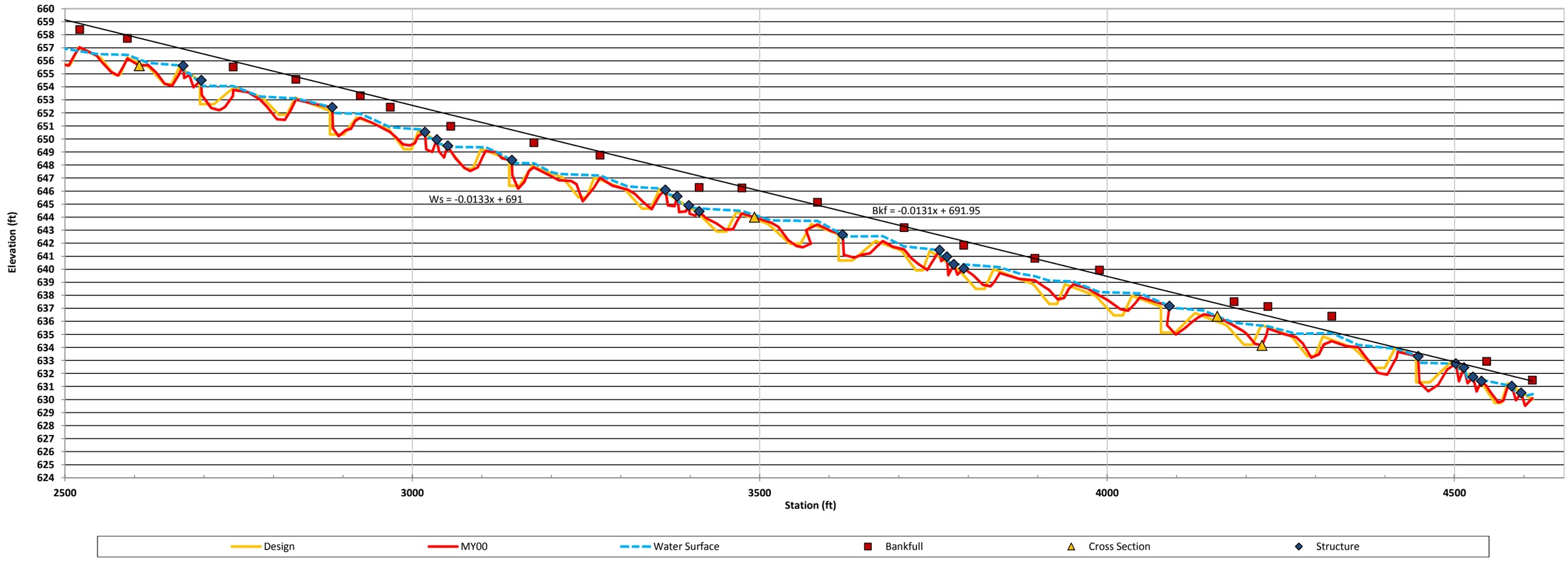
Table 7. Cross-Section Morphology Data Tables
Cedar Branch Stream Restoration Site, DMS Project #97009

Dimension and Substrate	Cross-Section 13 (Riffle) Station 35+12, UTCC							Cross-Section 14 (Riffle) Station 41+94, UTCC							Cross-Section 15 (Pool) Station 42+58, UTCC						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	12.7							15.3							22.5						
Floodprone Width (ft)	>50							>40							-						
Bankfull Mean Depth (ft)	0.8							0.8							1.6						
Bankfull Max Depth (ft)	1.4							1.7							3.4						
Bankfull Cross-Sectional Area (ft^2)	9.6							12.8							35.8						
Bankfull Width/Depth Ratio	16.7							18.3							-						
Bankfull Entrenchment Ratio	3.8							2.8							-						
Bankfull Bank Height Ratio	1.0							1.0							-						
d50 (mm)	16							61							-						

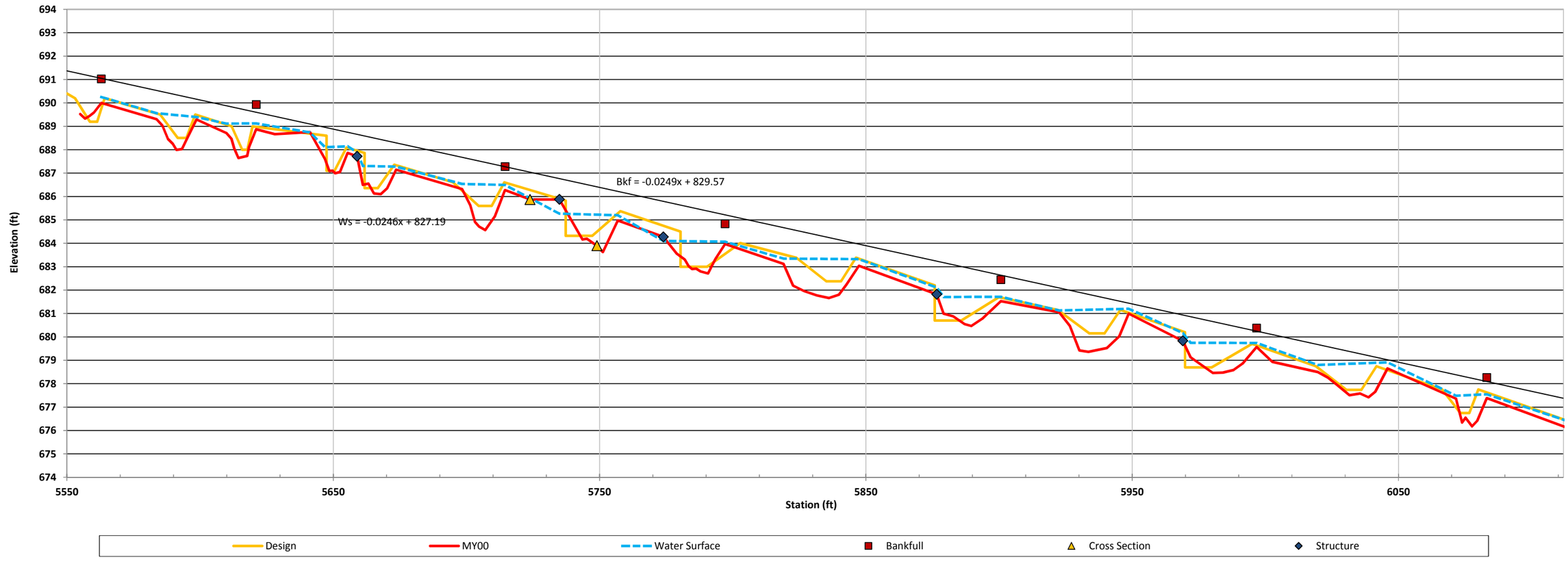
Longitudinal Profile
Cedar Branch- UTCC
Monitoring Year 00, 2018



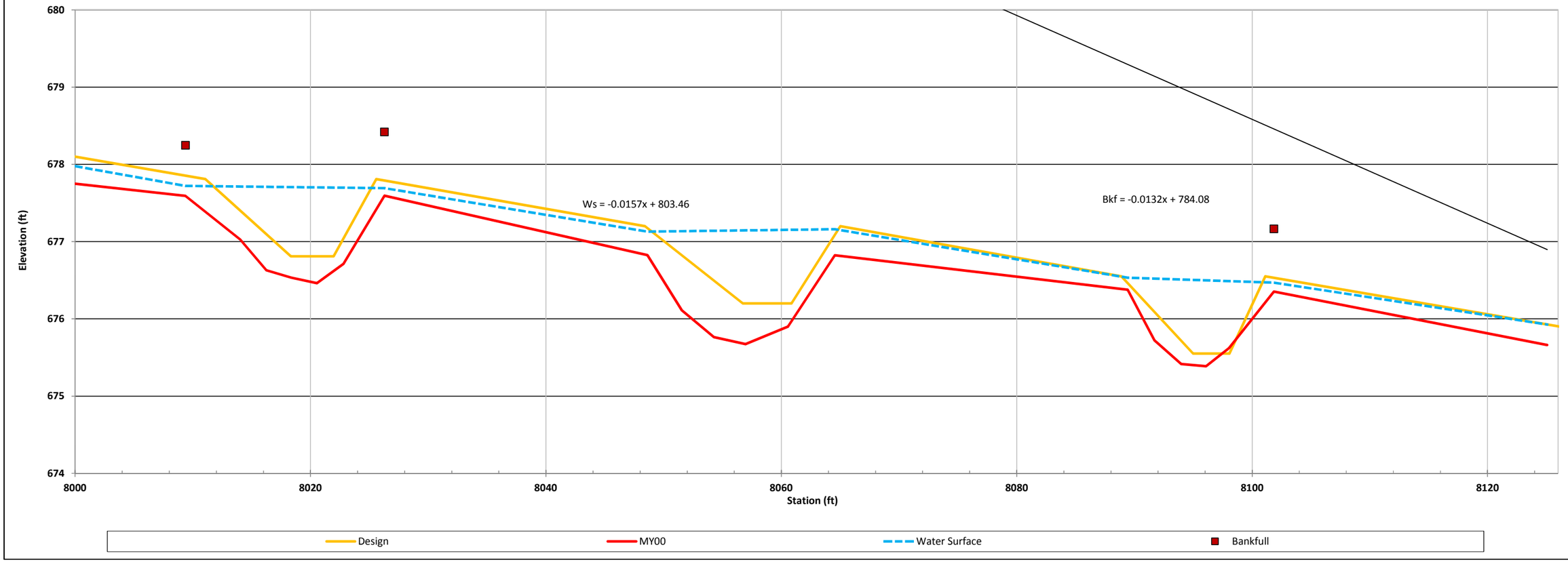
Longitudinal Profile
Cedar Branch- UTCC
Monitoring Year 00, 2018



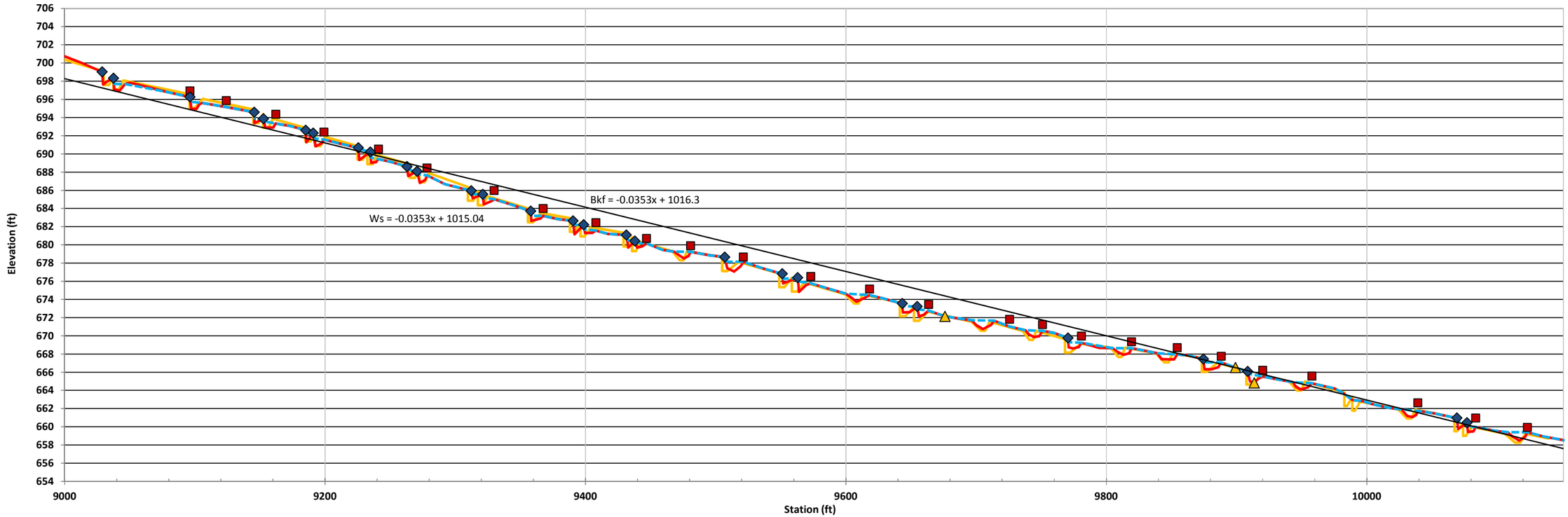
Longitudinal Profile
Cedar Branch - T1
Monitoring Year 00, 2018



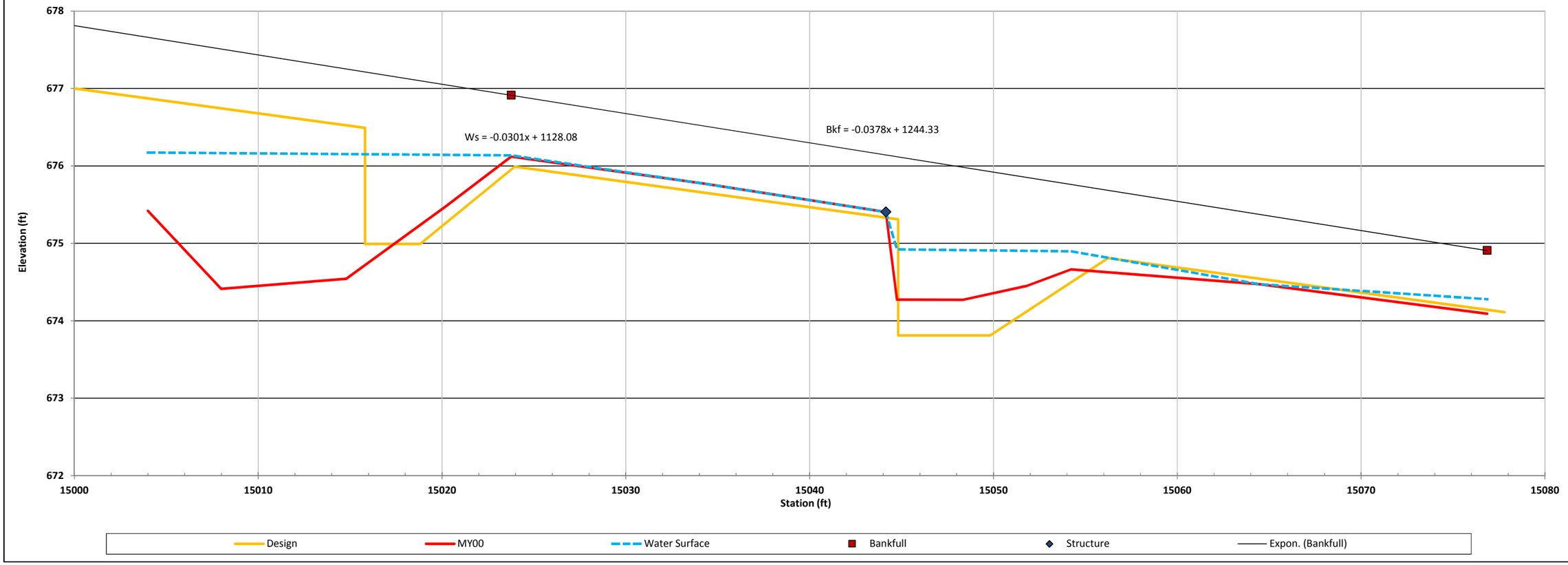
Longitudinal Profile
Cedar Branch - T2
Monitoring Year 00, 2018



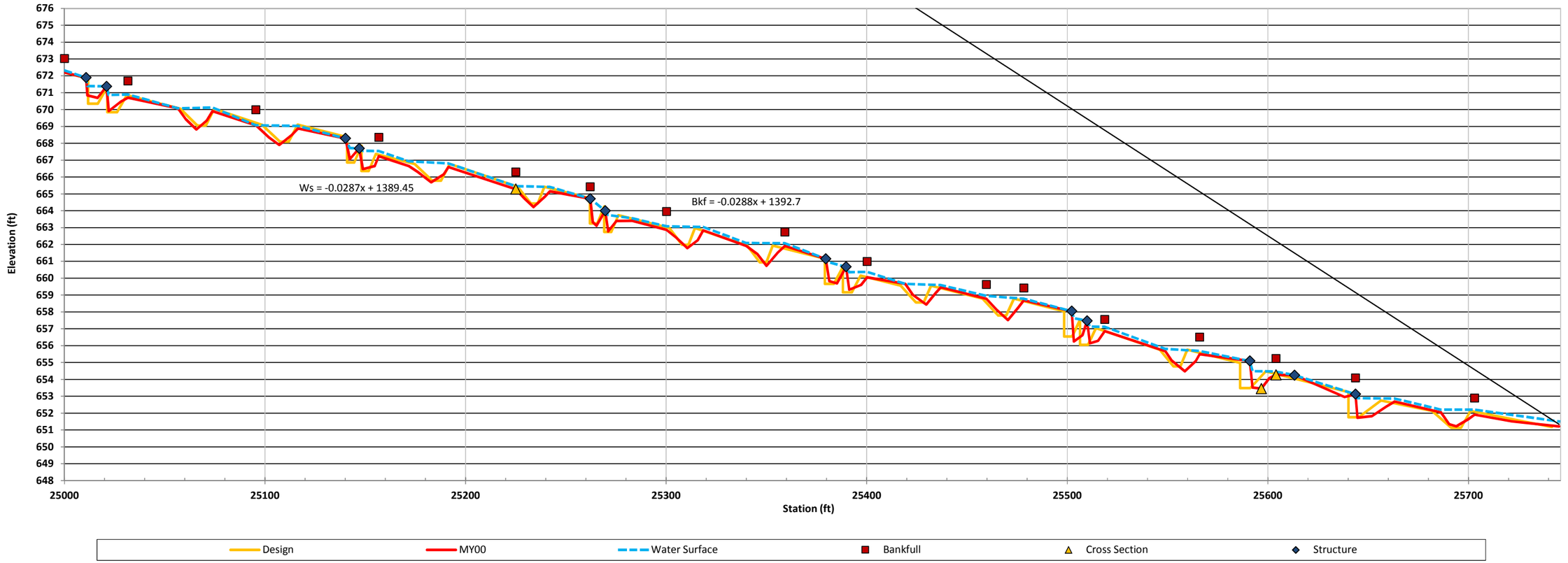
Longitudinal Profile
Cedar Branch- T3
Monitoring Year 00, 2018



Longitudinal Profile
Cedar Branch - T3-1
Monitoring Year 00, 2018



Longitudinal Profile
Cedar Branch - T4
Monitoring Year 00, 2018

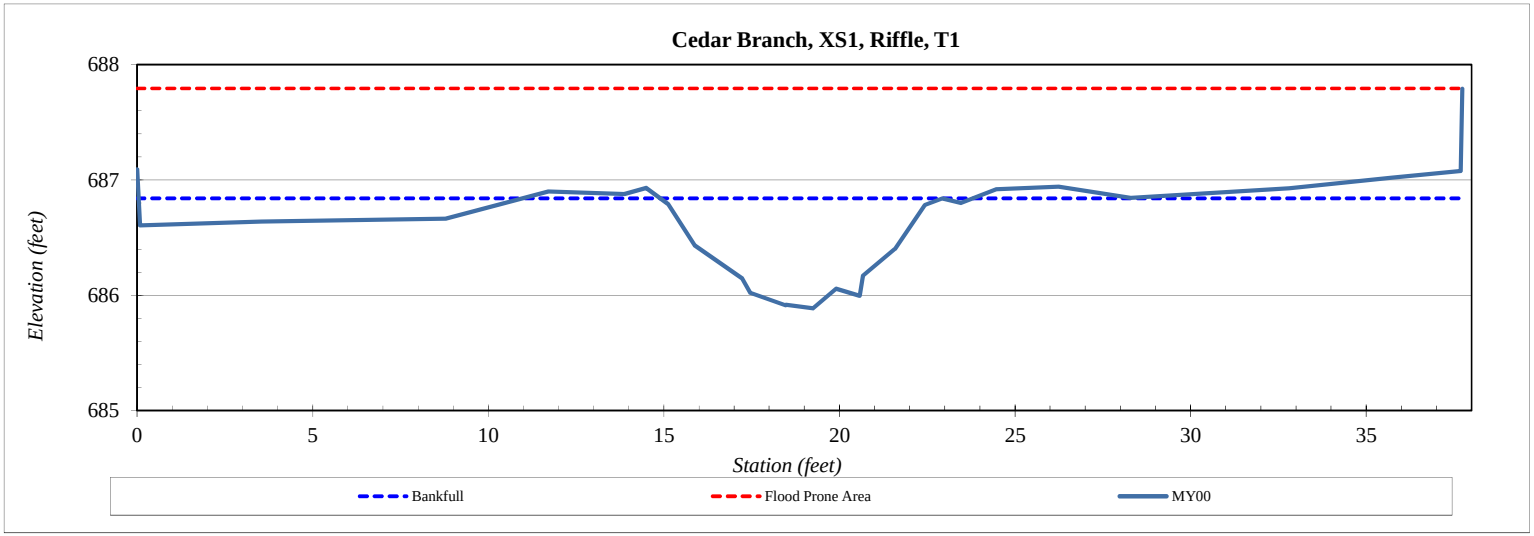


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS1
Drainage Area (sq mi):	0.05
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	687.09
0.09	686.61
3.55	686.64
8.79	686.67
11.71	686.90
13.87	686.88
14.50	686.93
15.12	686.79
15.88	686.44
17.22	686.15
17.46	686.02
18.46	685.91
18.48	685.92
19.25	685.89
19.91	686.06
20.58	686.00
20.67	686.17
21.58	686.40
22.42	686.78
22.93	686.84
23.47	686.80
24.47	686.92
26.24	686.94
28.29	686.84
32.80	686.93
35.72	687.02
37.69	687.08
37.74	687.79

SUMMARY DATA	
Current Bankfull Elevation:	686.84
Bankfull Cross-Sectional Area:	4.6
Total Cross-Sectional Area:	4.6
Bankfull Width:	8.9
Flood Prone Area Elevation:	687.8
Flood Prone Width:	37.7
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.5
W / D Ratio:	17.0
Entrenchment Ratio:	4.2
Bank Height Ratio:	1.0

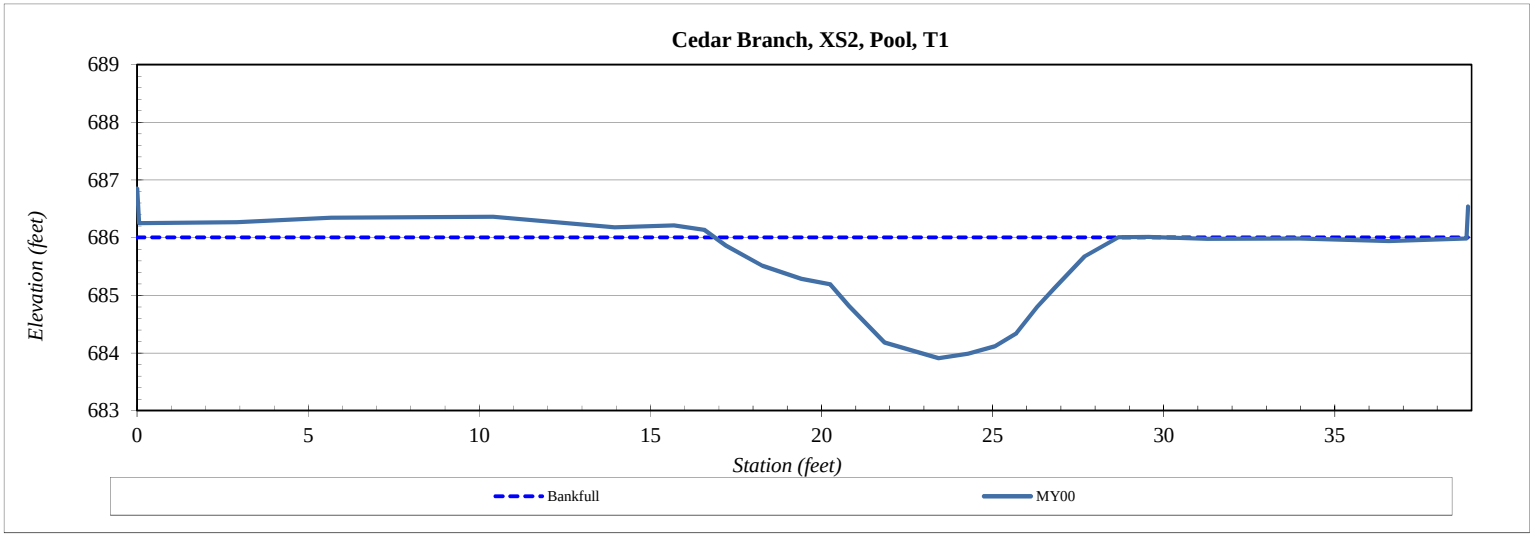


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS2
Drainage Area (sq mi):	0.05
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	686.85
0.06	686.25
2.92	686.27
5.66	686.35
10.41	686.36
13.95	686.18
15.69	686.22
16.58	686.13
17.21	685.86
18.27	685.51
19.42	685.29
20.26	685.19
20.81	684.82
21.85	684.19
23.43	683.91
24.28	683.99
25.06	684.11
25.70	684.34
26.30	684.80
26.81	685.13
27.69	685.67
28.68	686.01
29.56	686.01
31.27	685.98
33.97	685.98
36.58	685.94
38.85	685.99
38.89	686.54

SUMMARY DATA	
Current Bankfull Elevation:	686.01
Bankfull Cross-Sectional Area:	13.4
Total Cross-Sectional Area:	13.4
Bankfull Width:	11.8
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.1
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

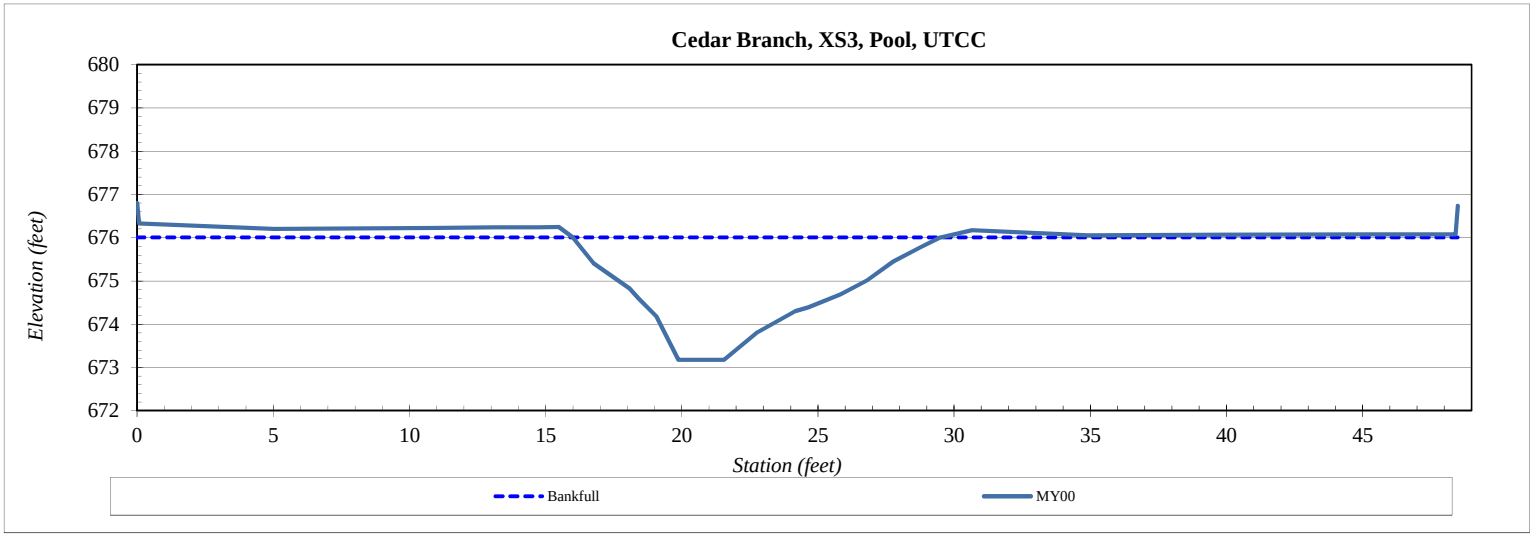


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS3
Drainage Area (sq mi):	0.21
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	676.80
0.07	676.33
5.04	676.20
10.88	676.23
13.15	676.24
14.72	676.24
15.49	676.25
15.98	676.02
16.75	675.41
18.09	674.83
18.40	674.60
19.07	674.18
19.88	673.17
20.75	673.18
21.57	673.18
22.79	673.81
24.16	674.30
24.65	674.39
25.82	674.68
26.81	675.02
27.76	675.45
28.75	675.77
29.49	676.01
30.66	676.17
34.92	676.05
39.89	676.07
45.28	676.08
48.40	676.08
48.49	676.73

SUMMARY DATA	
Current Bankfull Elevation:	676.01
Bankfull Cross-Sectional Area:	20.2
Total Cross-Sectional Area:	20.2
Bankfull Width:	13.5
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.8
Mean Depth at Bankfull:	1.5
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

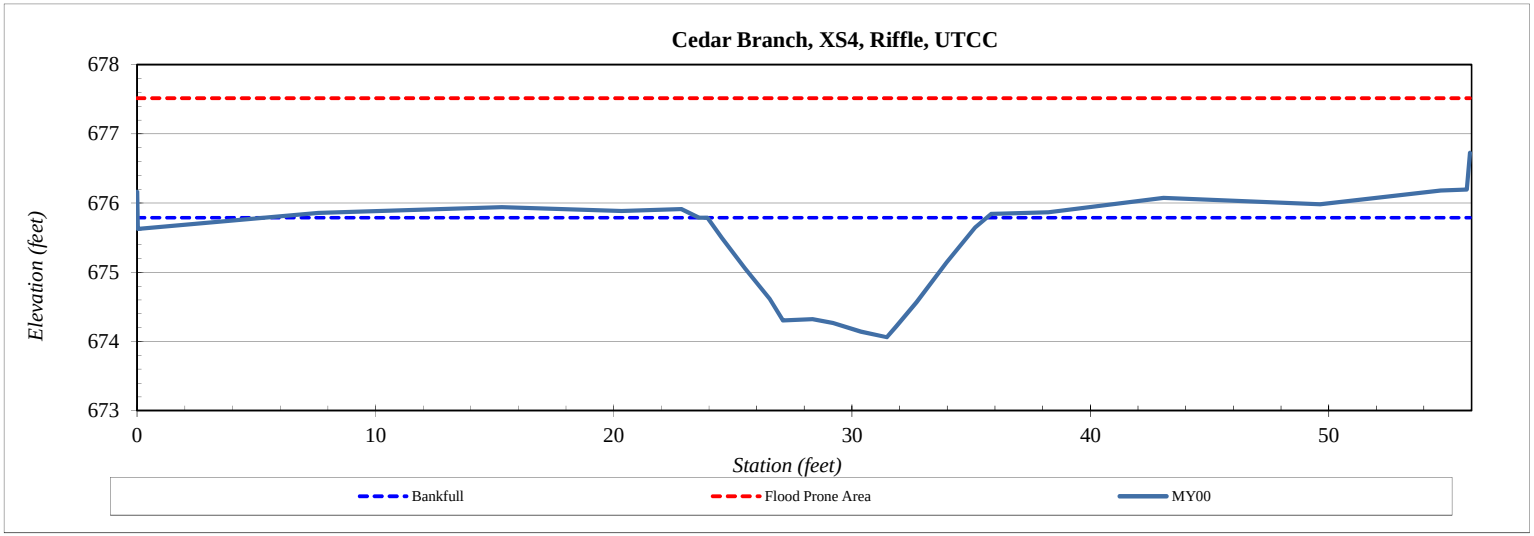


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS4
Drainage Area (sq mi):	0.21
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	676.16
0.03	675.63
7.60	675.86
15.31	675.94
20.33	675.89
22.83	675.91
23.57	675.79
23.92	675.79
24.54	675.50
25.51	675.05
26.54	674.62
27.10	674.30
28.35	674.32
29.21	674.27
30.37	674.14
31.47	674.06
31.87	674.22
32.71	674.57
33.97	675.14
35.17	675.64
35.85	675.84
36.37	675.85
38.25	675.87
43.08	676.08
49.64	675.98
54.71	676.18
55.79	676.19
55.93	676.73

SUMMARY DATA	
Current Bankfull Elevation:	675.79
Bankfull Cross-Sectional Area:	12.6
Total Cross-Sectional Area:	12.6
Bankfull Width:	12.1
Flood Prone Area Elevation:	677.5
Flood Prone Width:	55.9
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.0
W / D Ratio:	11.6
Entrenchment Ratio:	4.6
Bank Height Ratio:	1.0

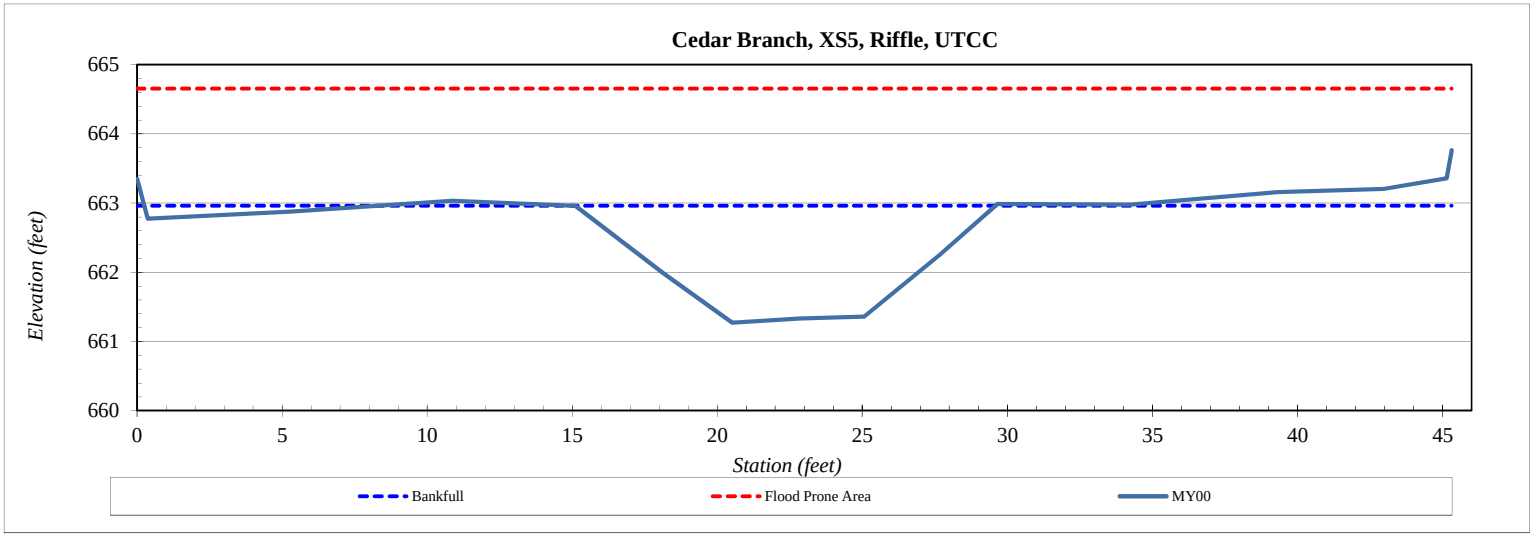


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS5
Drainage Area (sq mi):	0.21
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	663.35
0.36	662.77
5.28	662.87
10.88	663.03
15.11	662.96
18.14	661.99
20.52	661.27
22.84	661.33
25.08	661.36
27.67	662.25
29.66	662.99
34.25	662.98
39.31	663.16
42.97	663.21
45.14	663.36
45.31	663.76

SUMMARY DATA	
Current Bankfull Elevation:	662.96
Bankfull Cross-Sectional Area:	15.8
Total Cross-Sectional Area:	15.8
Bankfull Width:	14.5
Flood Prone Area Elevation:	664.7
Flood Prone Width:	45.3
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	1.1
W / D Ratio:	13.3
Entrenchment Ratio:	3.1
Bank Height Ratio:	1.0

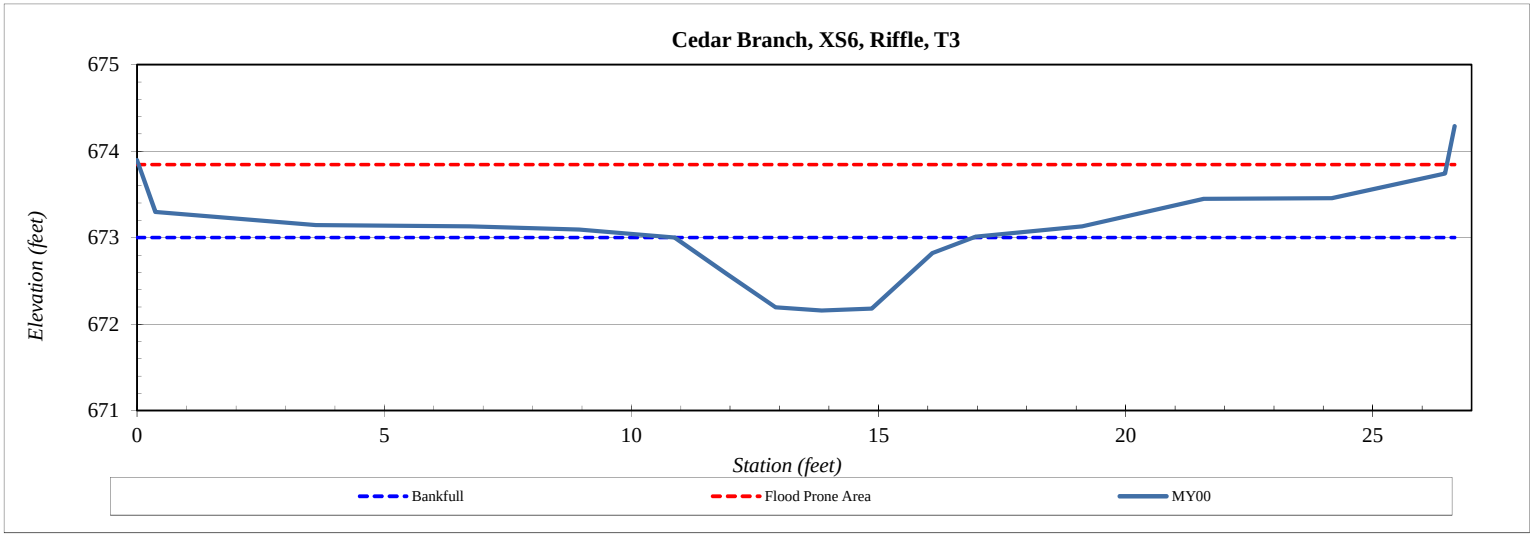


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS6
Drainage Area (sq mi):	0.04
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	673.90
0.37	673.30
3.61	673.15
6.73	673.13
8.95	673.09
10.88	673.00
11.93	672.59
12.91	672.19
13.85	672.16
14.87	672.18
16.09	672.82
16.97	673.01
19.12	673.13
21.58	673.45
24.17	673.46
26.46	673.74
26.66	674.29

SUMMARY DATA	
Current Bankfull Elevation:	673.00
Bankfull Cross-Sectional Area:	3.1
Total Cross-Sectional Area:	3.1
Bankfull Width:	6.0
Flood Prone Area Elevation:	673.8
Flood Prone Width:	26.5
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	11.7
Entrenchment Ratio:	4.4
Bank Height Ratio:	1.0

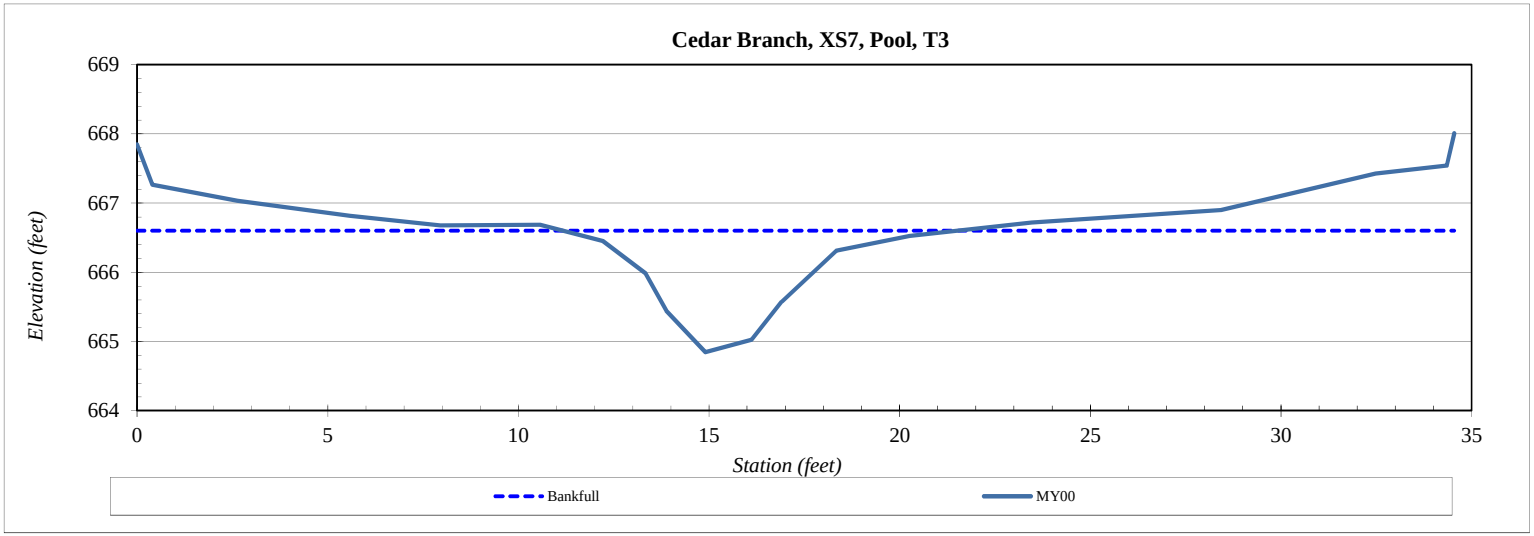


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS7
Drainage Area (sq mi):	0.04
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	667.85
0.40	667.27
2.62	667.03
5.59	666.82
7.95	666.68
10.56	666.69
12.22	666.45
13.33	665.99
13.89	665.44
14.91	664.85
16.12	665.03
16.91	665.57
18.34	666.31
20.26	666.53
23.47	666.72
28.42	666.90
32.48	667.43
34.35	667.54
34.54	668.01

SUMMARY DATA	
Current Bankfull Elevation:	666.60
Bankfull Cross-Sectional Area:	6.9
Total Cross-Sectional Area:	6.9
Bankfull Width:	10.3
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	1.8
Mean Depth at Bankfull:	0.7
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

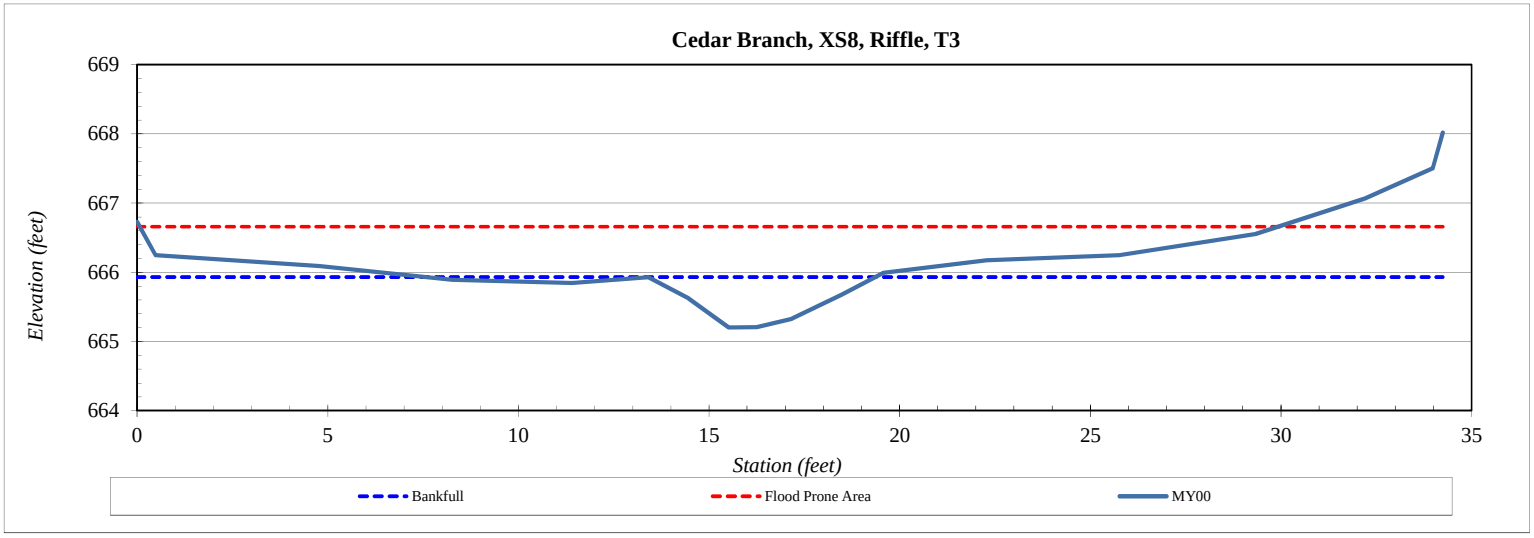


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS8
Drainage Area (sq mi):	0.04
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	666.73
0.48	666.25
4.78	666.09
8.26	665.89
11.40	665.85
13.40	665.93
14.46	665.62
15.52	665.20
16.25	665.21
17.17	665.33
18.48	665.67
19.59	665.99
22.28	666.17
25.76	666.25
29.33	666.55
32.20	667.06
33.98	667.50
34.24	668.02

SUMMARY DATA	
Current Bankfull Elevation:	665.93
Bankfull Cross-Sectional Area:	2.5
Total Cross-Sectional Area:	2.5
Bankfull Width:	6.0
Flood Prone Area Elevation:	666.7
Flood Prone Width:	29.8
Max Depth at Bankfull:	0.7
Mean Depth at Bankfull:	0.4
W / D Ratio:	14.1
Entrenchment Ratio:	5.0
Bank Height Ratio:	1.0

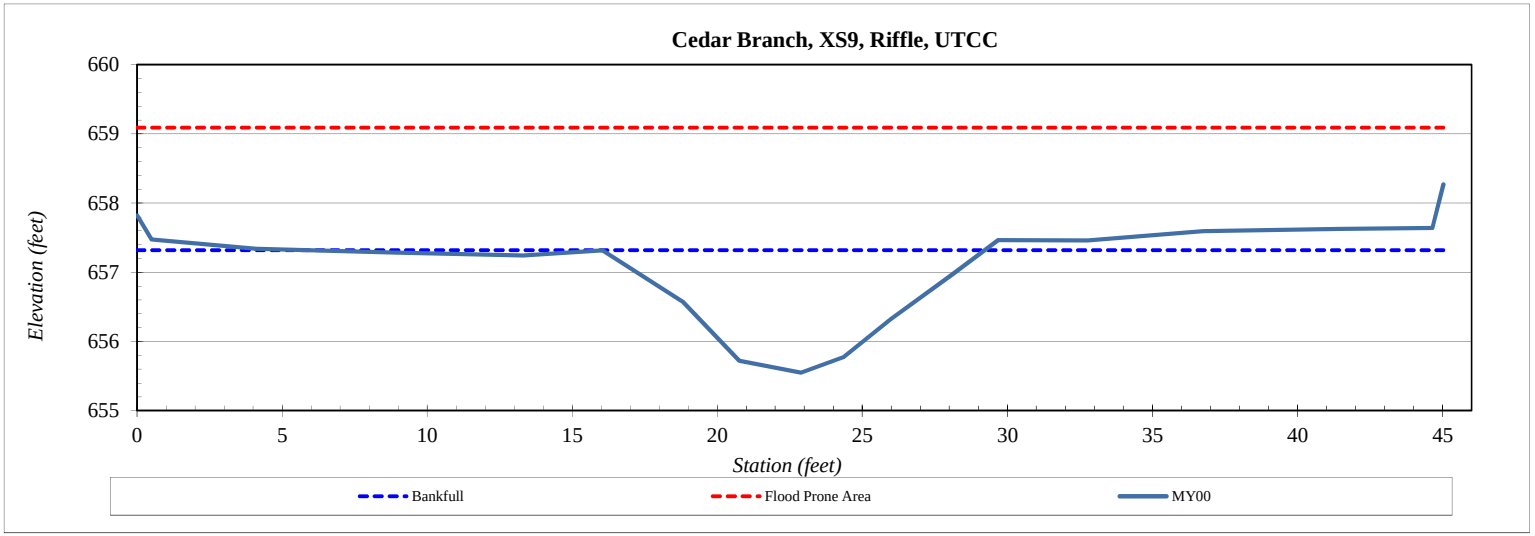


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS9
Drainage Area (sq mi):	0.28
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	657.82
0.50	657.47
4.09	657.34
8.91	657.28
13.31	657.24
16.03	657.32
18.83	656.57
20.76	655.72
22.88	655.55
24.36	655.77
25.98	656.32
28.10	656.97
29.68	657.47
32.77	657.46
36.74	657.59
41.42	657.63
44.65	657.64
45.03	658.27

SUMMARY DATA	
Current Bankfull Elevation:	657.32
Bankfull Cross-Sectional Area:	13.0
Total Cross-Sectional Area:	13.0
Bankfull Width:	13.2
Flood Prone Area Elevation:	659.1
Flood Prone Width:	45.0
Max Depth at Bankfull:	1.8
Mean Depth at Bankfull:	1.0
W / D Ratio:	13.3
Entrenchment Ratio:	3.4
Bank Height Ratio:	1.0

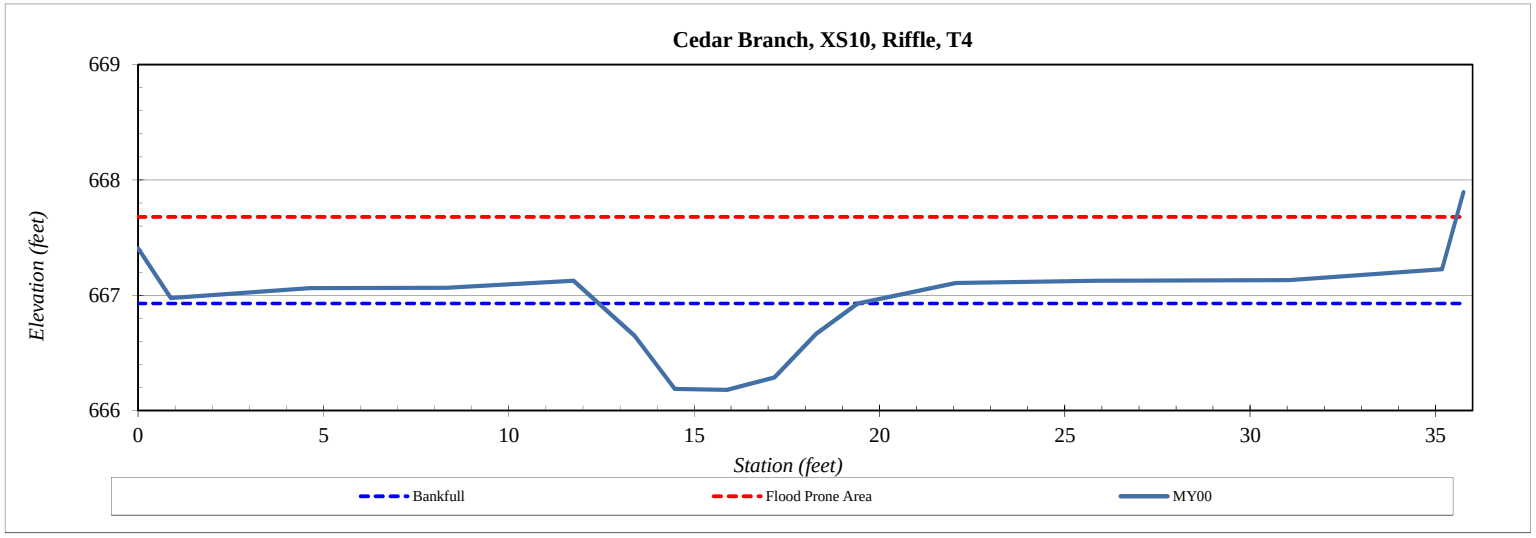


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS10
Drainage Area (sq mi):	0.05
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	667.41
0.88	666.98
4.64	667.06
8.32	667.07
11.74	667.13
13.40	666.64
14.48	666.19
15.88	666.18
17.17	666.29
18.29	666.67
19.41	666.93
22.06	667.11
25.85	667.13
31.06	667.13
35.17	667.23
35.75	667.89

SUMMARY DATA	
Current Bankfull Elevation:	666.93
Bankfull Cross-Sectional Area:	3.3
Total Cross-Sectional Area:	3.3
Bankfull Width:	7.0
Flood Prone Area Elevation:	667.7
Flood Prone Width:	35.6
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	14.9
Entrenchment Ratio:	5.1
Bank Height Ratio:	1.0

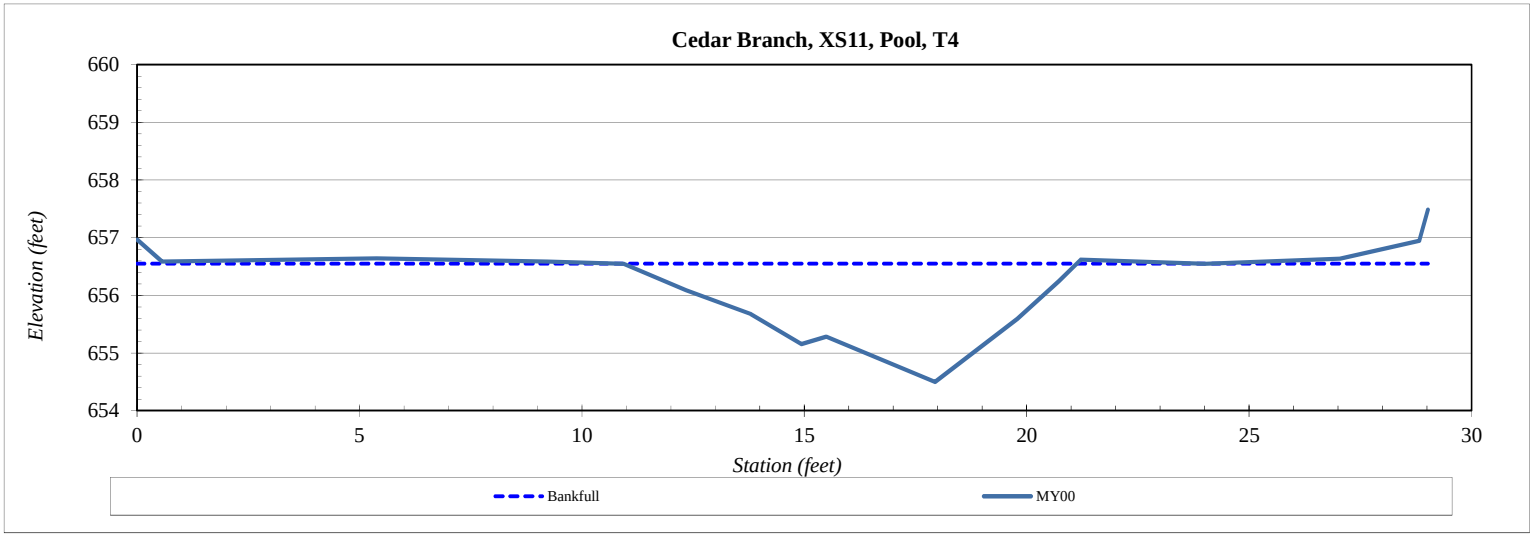


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS11
Drainage Area (sq mi):	0.05
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	656.96
0.56	656.59
5.39	656.64
9.22	656.58
10.93	656.55
12.33	656.08
13.79	655.68
14.93	655.16
15.49	655.28
17.94	654.50
19.79	655.59
20.72	656.24
21.21	656.62
24.01	656.55
27.04	656.64
28.82	656.95
29.02	657.48

SUMMARY DATA	
Current Bankfull Elevation:	656.55
Bankfull Cross-Sectional Area:	10.8
Total Cross-Sectional Area:	10.8
Bankfull Width:	10.2
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	2.1
Mean Depth at Bankfull:	1.1
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---

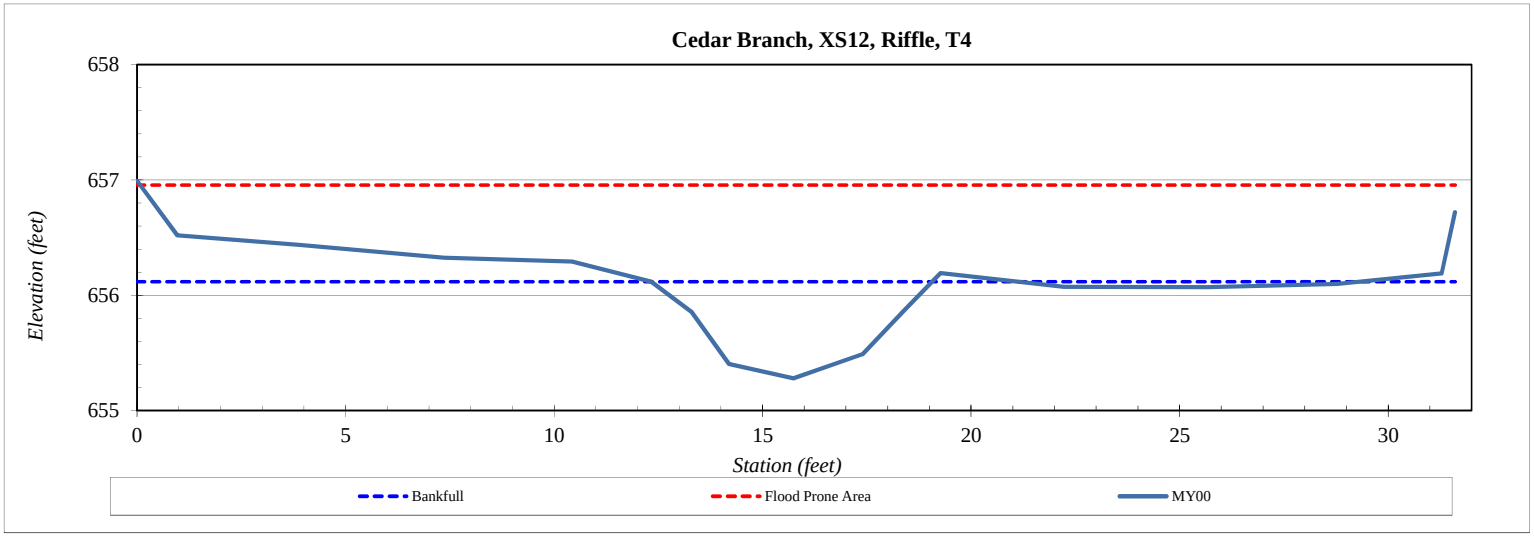


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS12
Drainage Area (sq mi):	0.05
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	656.99
0.96	656.52
3.90	656.44
7.36	656.33
10.43	656.29
12.33	656.12
13.28	655.86
14.19	655.40
15.74	655.28
17.39	655.49
18.40	655.87
19.27	656.19
22.23	656.08
25.66	656.07
28.78	656.10
31.28	656.19
31.60	656.72

SUMMARY DATA	
Current Bankfull Elevation:	656.12
Bankfull Cross-Sectional Area:	3.5
Total Cross-Sectional Area:	3.5
Bankfull Width:	6.7
Flood Prone Area Elevation:	657.0
Flood Prone Width:	31.5
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	12.9
Entrenchment Ratio:	4.7
Bank Height Ratio:	1.0

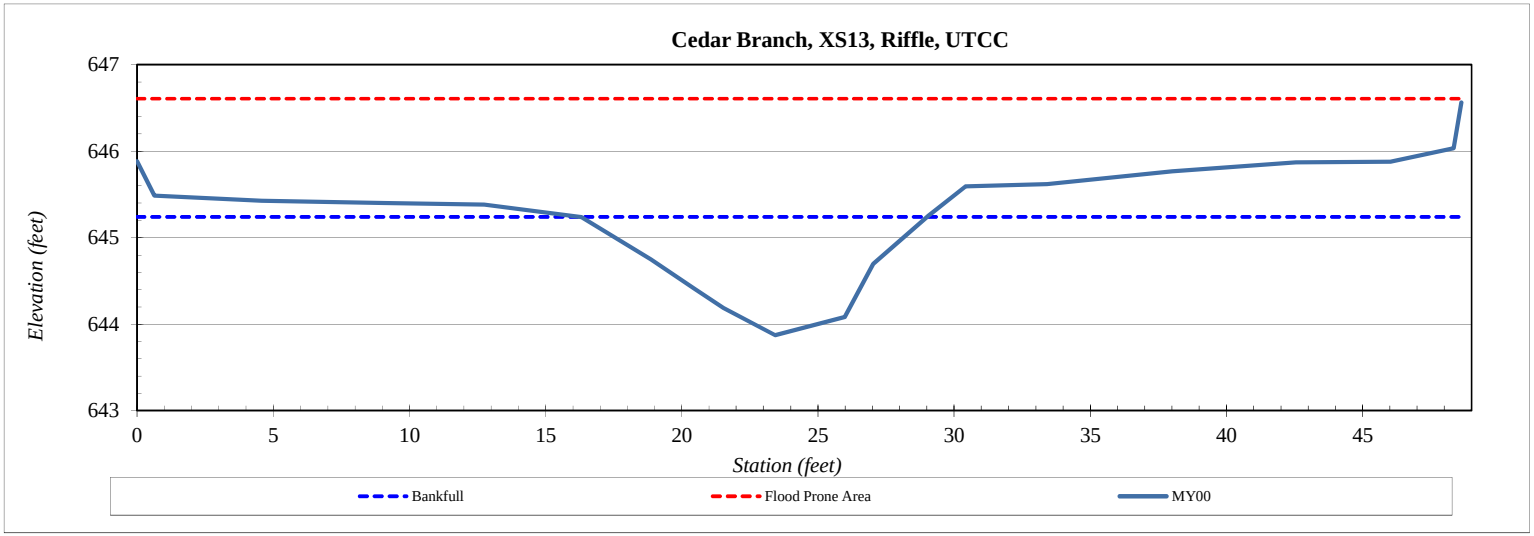


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS13
Drainage Area (sq mi):	0.41
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	645.88
0.64	645.49
4.57	645.43
9.03	645.40
12.75	645.38
16.31	645.24
18.86	644.75
20.45	644.41
21.52	644.19
23.43	643.87
25.99	644.09
27.04	644.70
29.06	645.25
30.43	645.59
33.41	645.62
38.01	645.77
42.54	645.87
46.03	645.88
48.34	646.03
48.63	646.56

SUMMARY DATA	
Current Bankfull Elevation:	645.24
Bankfull Cross-Sectional Area:	9.6
Total Cross-Sectional Area:	9.6
Bankfull Width:	12.7
Flood Prone Area Elevation:	646.6
Flood Prone Width:	48.6
Max Depth at Bankfull:	1.4
Mean Depth at Bankfull:	0.8
W / D Ratio:	16.7
Entrenchment Ratio:	3.8
Bank Height Ratio:	1.0

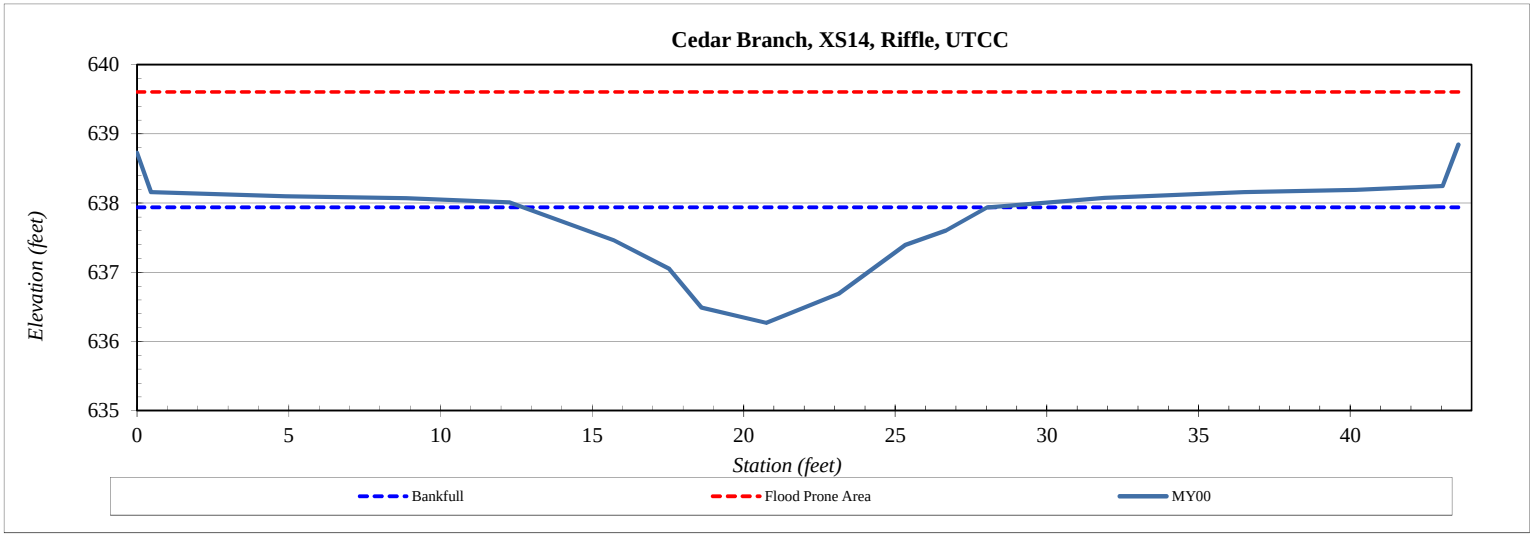


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS14
Drainage Area (sq mi):	0.41
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

Station	Elevation
0.00	638.73
0.45	638.16
4.90	638.10
8.89	638.07
12.26	638.01
15.72	637.46
17.55	637.05
18.61	636.49
20.75	636.27
23.13	636.69
25.34	637.39
26.67	637.60
28.03	637.94
31.89	638.08
36.50	638.16
40.18	638.19
43.05	638.25
43.57	638.85

SUMMARY DATA	
Current Bankfull Elevation:	637.94
Bankfull Cross-Sectional Area:	12.8
Total Cross-Sectional Area:	12.8
Bankfull Width:	15.3
Flood Prone Area Elevation:	639.6
Flood Prone Width:	43.6
Max Depth at Bankfull:	1.7
Mean Depth at Bankfull:	0.8
W / D Ratio:	18.3
Entrenchment Ratio:	2.8
Bank Height Ratio:	1.0

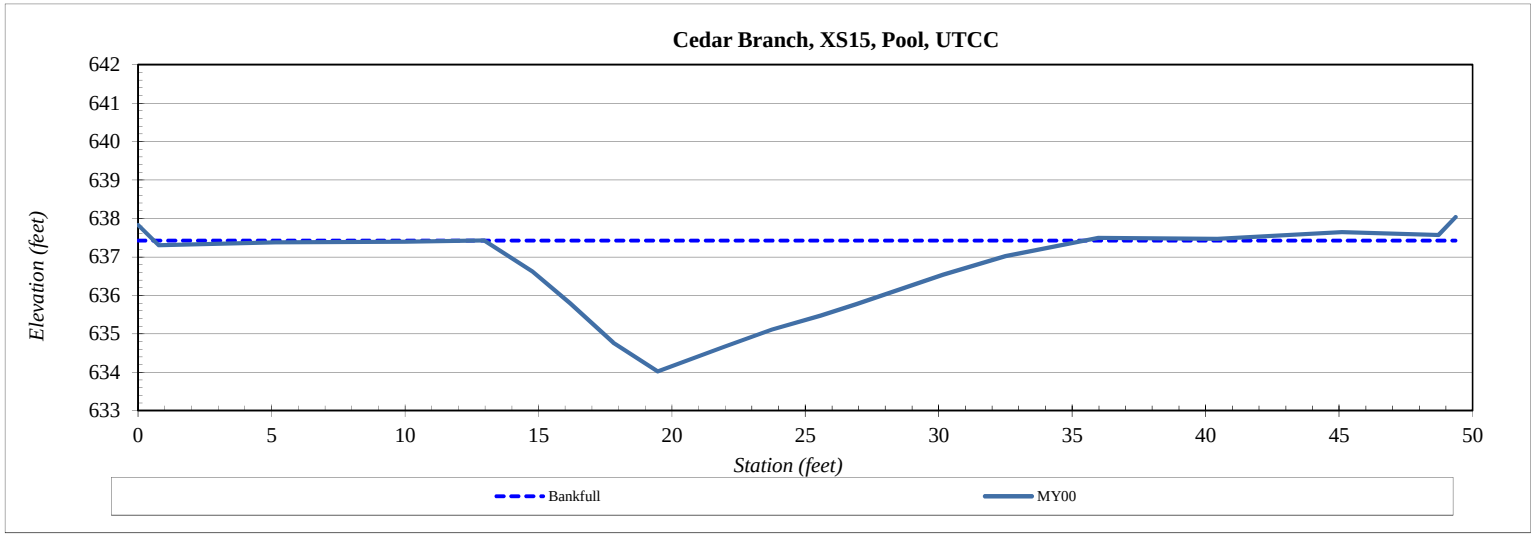


Cross-Section Plots

River Basin:	Yadkin River
Site:	Cedar Branch
XS ID	XS15
Drainage Area (sq mi):	0.41
Date:	4/11/2018
Field Crew:	T. Seelinger, A. French

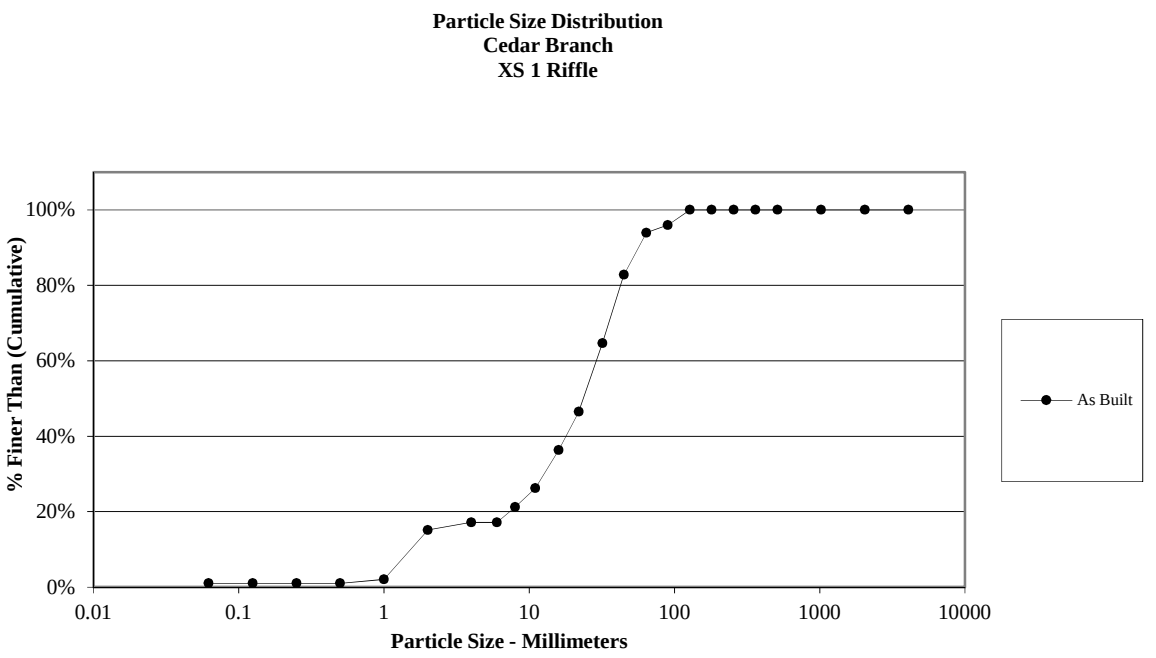
Station	Elevation
0.00	637.83
0.77	637.30
5.14	637.38
9.98	637.39
12.97	637.43
14.77	636.62
16.19	635.79
17.80	634.77
19.46	634.02
21.99	634.67
23.75	635.10
25.58	635.47
26.92	635.78
30.17	636.53
32.51	637.02
35.98	637.49
40.44	637.47
45.11	637.65
48.73	637.57
49.36	638.04

SUMMARY DATA	
Current Bankfull Elevation:	637.43
Bankfull Cross-Sectional Area:	35.8
Total Cross-Sectional Area:	35.8
Bankfull Width:	22.5
Flood Prone Area Elevation:	---
Flood Prone Width:	---
Max Depth at Bankfull:	3.4
Mean Depth at Bankfull:	1.6
W / D Ratio:	---
Entrenchment Ratio:	---
Bank Height Ratio:	---



Cross-Section 1 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	1
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	13
Very Fine	2 - 4		2
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	10
Coarse	16 - 22.6	E	10
Coarse	22.6 - 32	L	18
Very Coarse	32 - 45	S	18
Very Coarse	45 - 64		11
Small	64 - 90	C	2
Small	90 - 128	O	4
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	99

Note:



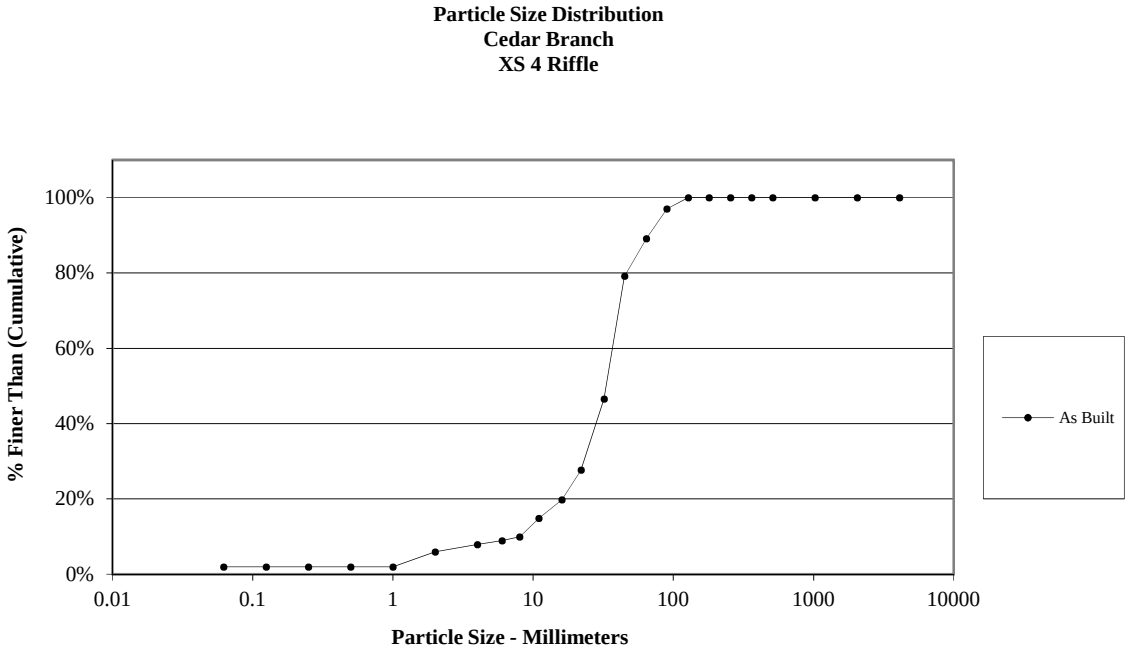
Size (mm)	
D16	2.7
D35	15
D50	24
D65	32
D84	47
D95	77

Size Distribution	
mean	11.3
dispersion	5.4
skewness	-0.29

Type	
silt/clay	1%
sand	14%
gravel	79%
cobble	6%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 4 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	2
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	4
Very Fine	2 - 4		2
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	19
Very Coarse	32 - 45	S	33
Very Coarse	45 - 64		10
Small	64 - 90	C	8
Small	90 - 128	O	3
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



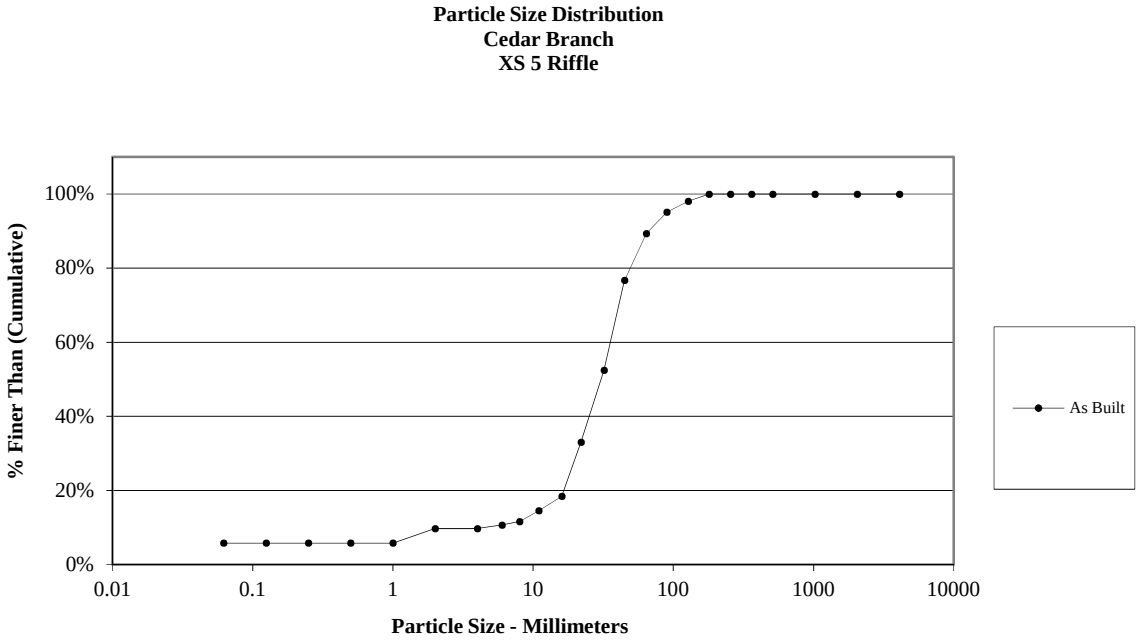
Size (mm)	
D16	12
D35	25
D50	33
D65	39
D84	53
D95	82

Size Distribution	
mean	25.2
dispersion	2.2
skewness	-0.15

Type	
silt/clay	2%
sand	4%
gravel	83%
cobble	11%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	6
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	4
Very Fine	2 - 4		
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	15
Coarse	22.6 - 32	L	20
Very Coarse	32 - 45	S	25
Very Coarse	45 - 64		13
Small	64 - 90	C	6
Small	90 - 128	O	3
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103

Note:



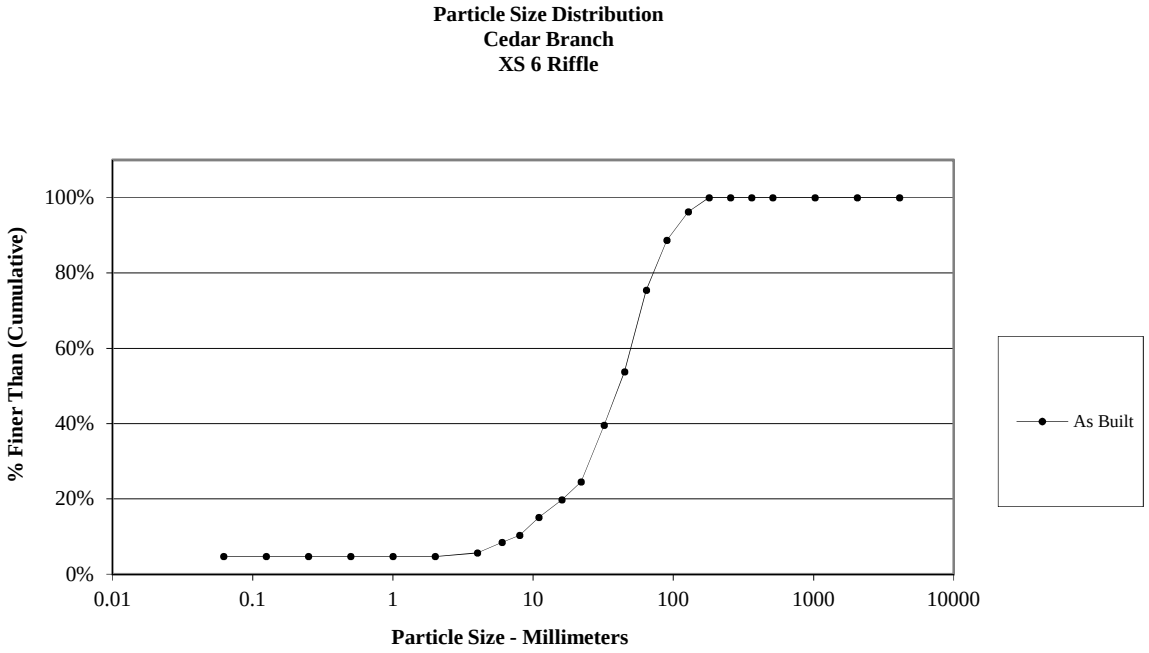
Size (mm)	
D16	13
D35	23
D50	31
D65	38
D84	55
D95	89

Size Distribution	
mean	0.1
dispersion	2.2
skewness	0.18

Type	
silt/clay	6%
sand	4%
gravel	80%
cobble	11%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 Riffle -MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	5
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		1
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	5
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	16
Very Coarse	32 - 45	S	15
Very Coarse	45 - 64		23
Small	64 - 90	C	14
Small	90 - 128	O	8
Large	128 - 180	B	4
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	106

Note:



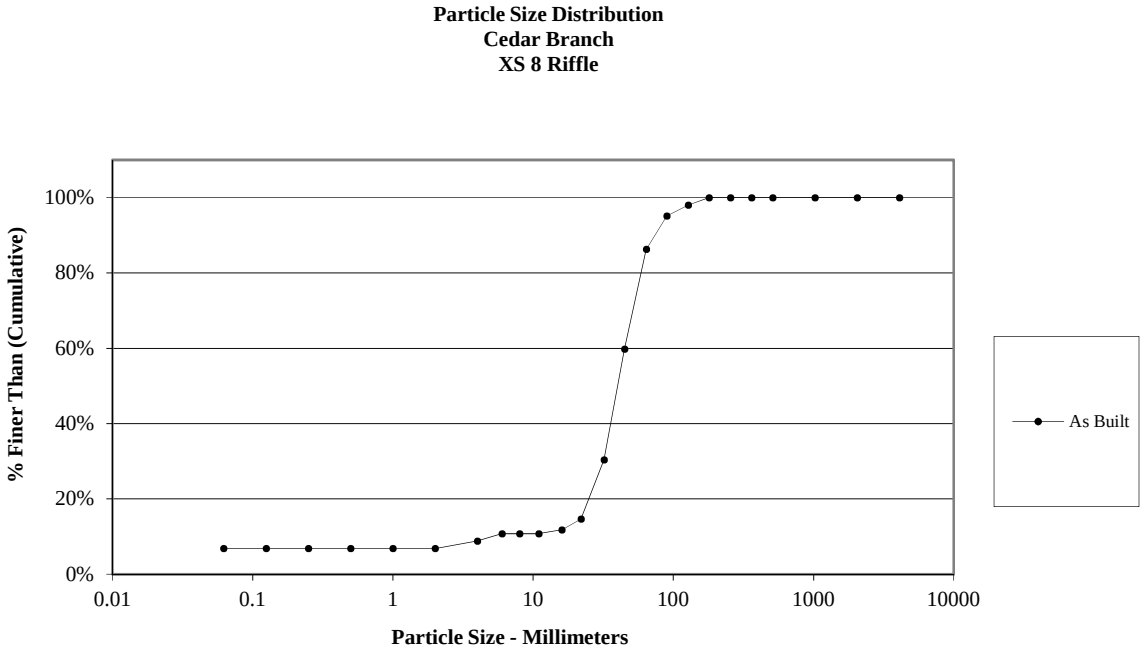
Size (mm)	
D16	12
D35	29
D50	41
D65	54
D84	80
D95	120

Size Distribution	
mean	31.0
dispersion	2.7
skewness	-0.13

Type	
silt/clay	5%
sand	0%
gravel	71%
cobble	25%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	7
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		2
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	3
Coarse	22.6 - 32	L	16
Very Coarse	32 - 45	S	30
Very Coarse	45 - 64		27
Small	64 - 90	C	9
Small	90 - 128	O	3
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	102

Note:



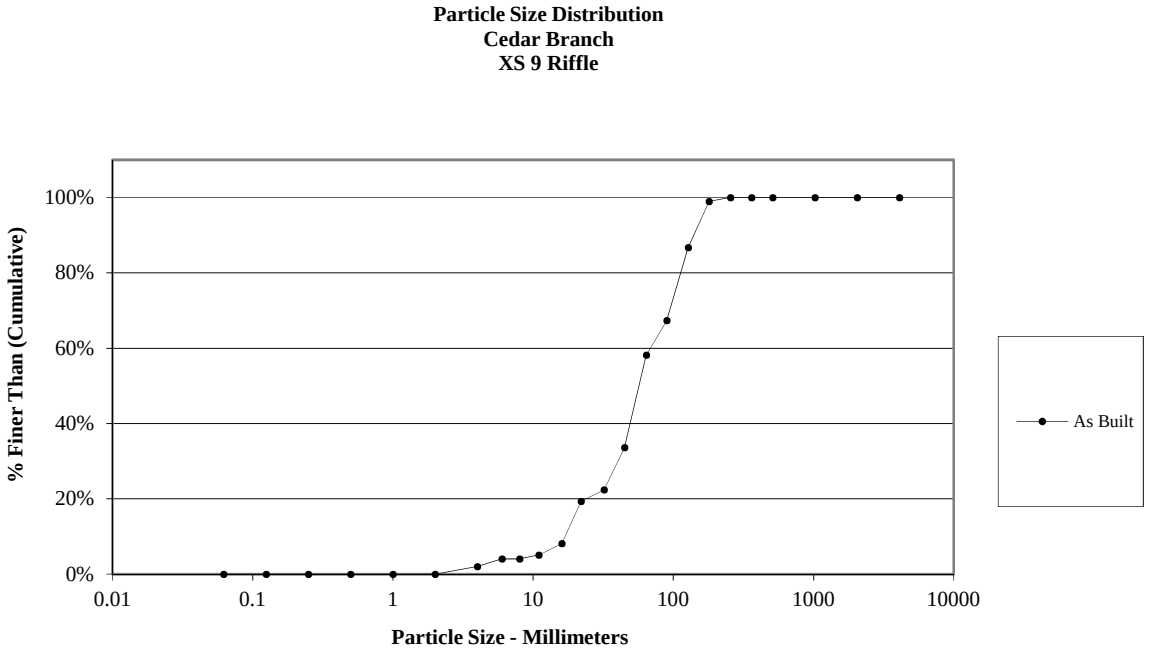
Size (mm)	
D16	23
D35	34
D50	40
D65	48
D84	62
D95	90

Size Distribution	
mean	37.8
dispersion	1.6
skewness	-0.04

Type	
silt/clay	7%
sand	0%
gravel	79%
cobble	14%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 9 Riffle -MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		2
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	11
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	11
Very Coarse	45 - 64		24
Small	64 - 90	C	9
Small	90 - 128	O	19
Large	128 - 180	B	12
Large	180 - 256	L	1
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	98

Note:



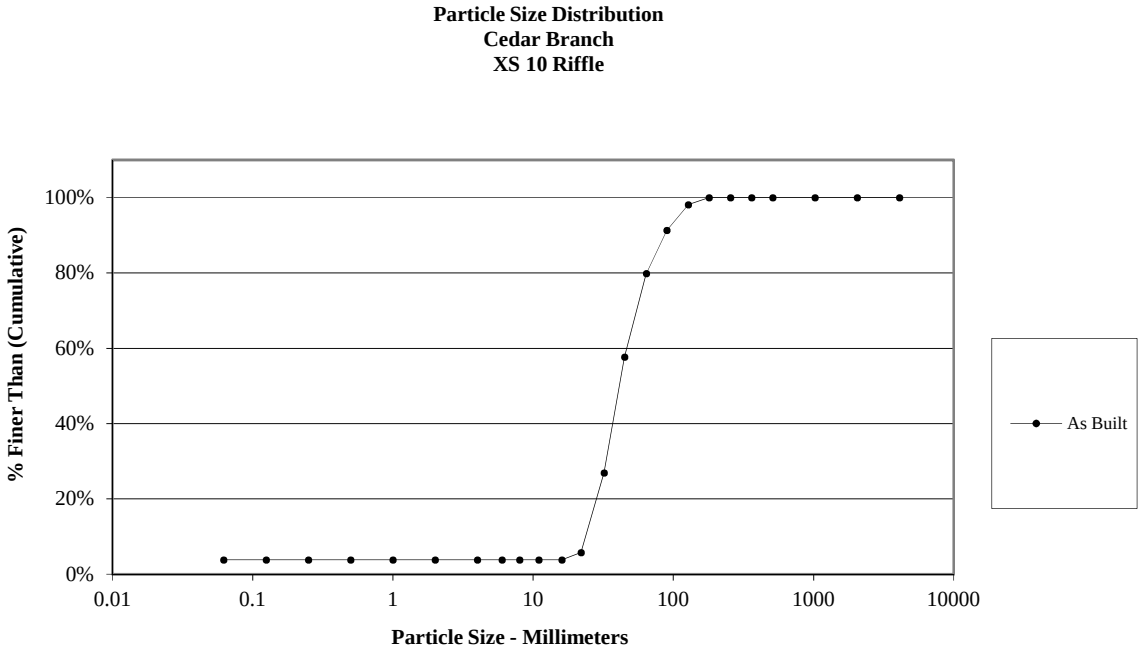
Size (mm)	
D16	20
D35	46
D50	57
D65	82
D84	120
D95	160

Size Distribution	
mean	49.0
dispersion	2.5
skewness	-0.07

Type	
silt/clay	0%
sand	0%
gravel	58%
cobble	42%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	4
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	22
Very Coarse	32 - 45	S	32
Very Coarse	45 - 64		23
Small	64 - 90	C	12
Small	90 - 128	O	7
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	104

Note:



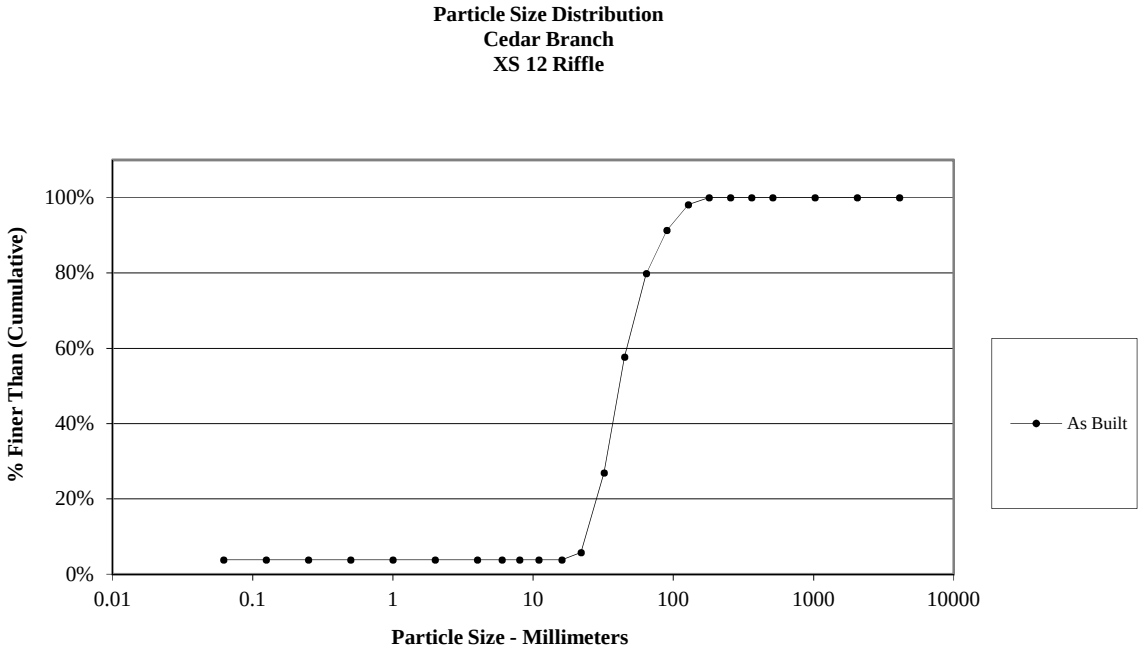
Size (mm)	
D16	26
D35	35
D50	42
D65	51
D84	74
D95	110

Size Distribution	
mean	43.9
dispersion	1.7
skewness	0.03

Type	
silt/clay	4%
sand	0%
gravel	76%
cobble	20%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 12 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	9
Very Coarse	32 - 45	S	32
Very Coarse	45 - 64		23
Small	64 - 90	C	17
Small	90 - 128	O	9
Large	128 - 180	B	2
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	102

Note:



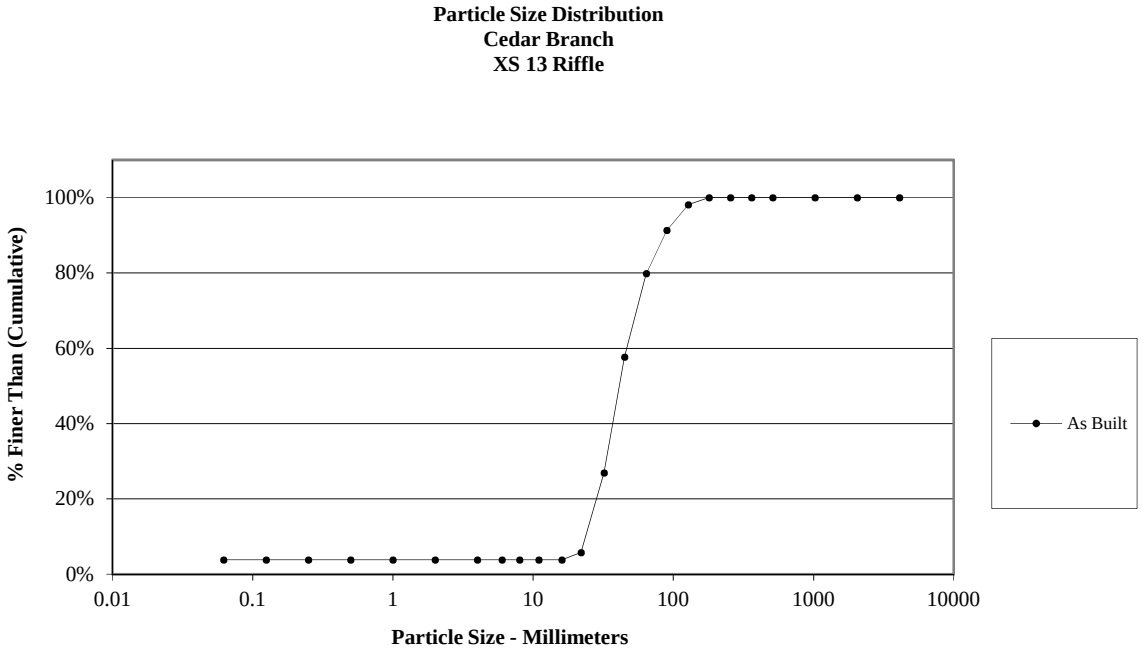
Size (mm)	
D16	29
D35	38
D50	45
D65	57
D84	82
D95	120

Size Distribution	
mean	48.8
dispersion	1.7
skewness	0.05

Type	
silt/clay	3%
sand	0%
gravel	70%
cobble	27%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 13 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	8
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	10
Very Fine	2 - 4		1
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	6
Medium	8 - 11.3	A	9
Medium	11.3 - 16	V	16
Coarse	16 - 22.6	E	5
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	9
Very Coarse	45 - 64		5
Small	64 - 90	C	15
Small	90 - 128	O	4
Large	128 - 180	B	1
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



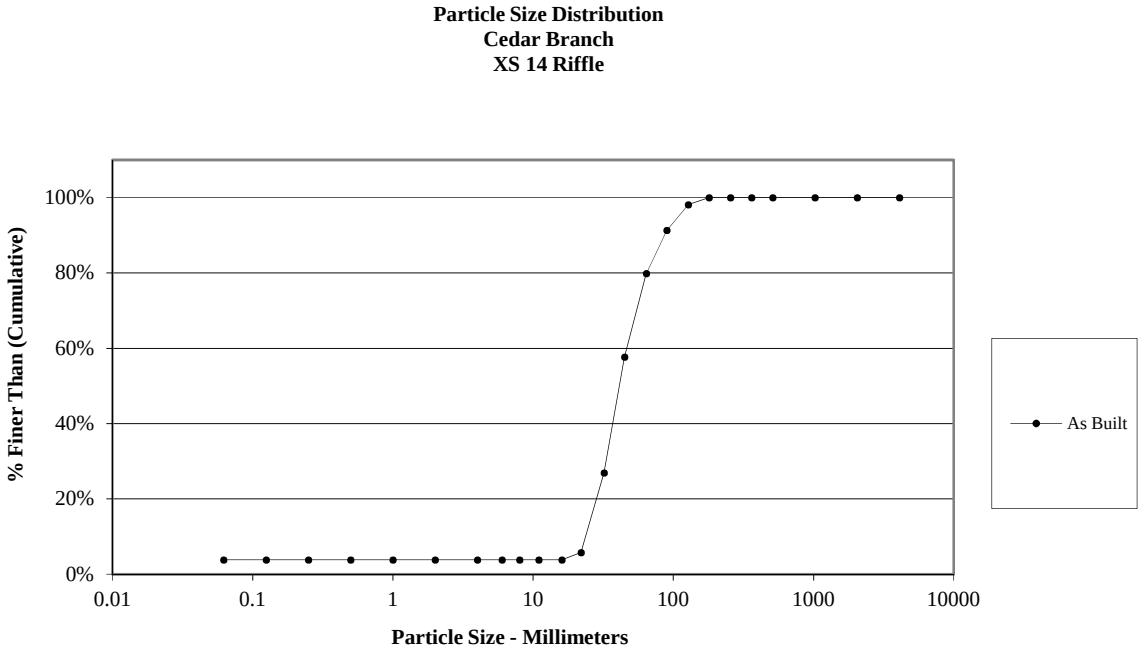
Size (mm)	
D16	1.8
D35	11
D50	16
D65	32
D84	71
D95	98

Size Distribution	
mean	11.3
dispersion	6.7
skewness	-0.12

Type	
silt/clay	8%
sand	10%
gravel	62%
cobble	20%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 14 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	1
Medium	.25 - .50	N	
Coarse	.50 - 1	D	6
Very Coarse	1 - 2	S	
Very Fine	2 - 4		3
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	7
Coarse	16 - 22.6	E	6
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	5
Very Coarse	45 - 64		16
Small	64 - 90	C	13
Small	90 - 128	O	21
Large	128 - 180	B	10
Large	180 - 256	L	4
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



Size (mm)	
D16	12
D35	42
D50	61
D65	90
D84	120
D95	170

Size Distribution	
mean	37.9
dispersion	3.5
skewness	-0.21

Type	
silt/clay	3%
sand	7%
gravel	42%
cobble	48%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

APPENDIX E

As-built Plan Sheets

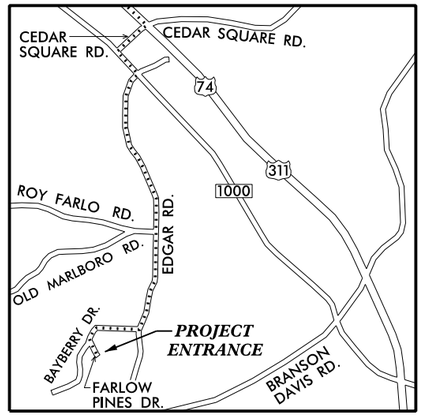
KCI JOB# : 20158591

STATE	DMS PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
N.C.	97009	1	9

NCDEQ DIVISION OF MITIGATION SERVICES

CEDAR BRANCH STREAM RESTORATION SITE

RANDOLPH COUNTY, NORTH CAROLINA

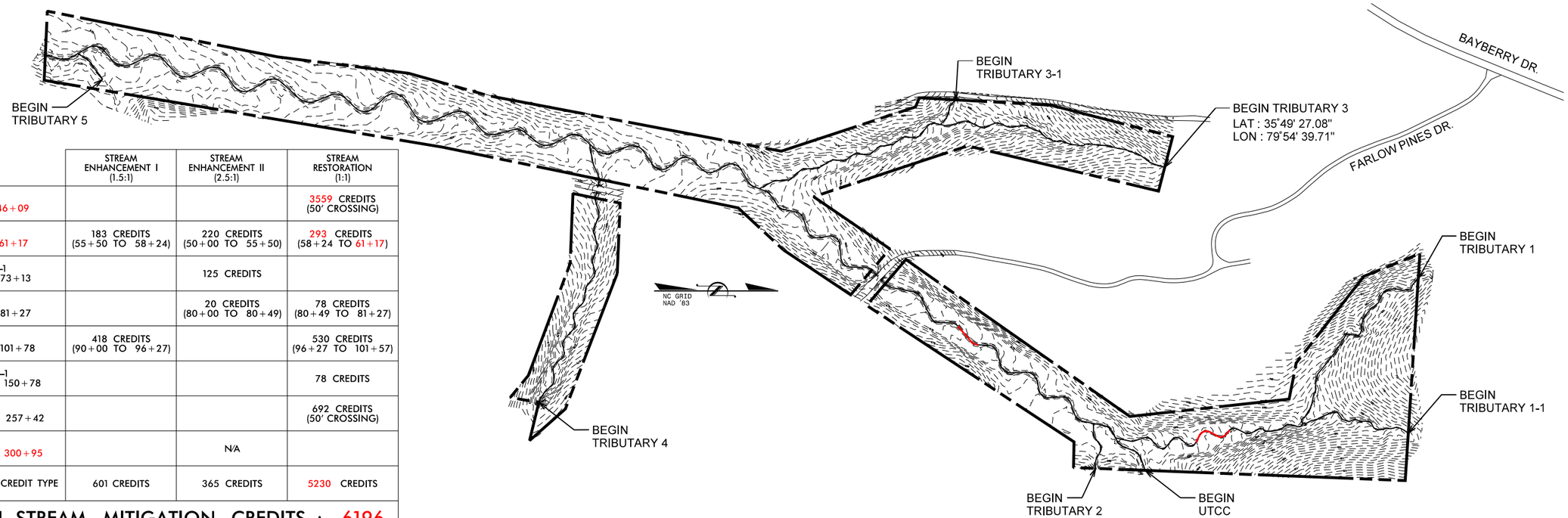


VICINITY MAP
NOT TO SCALE

INDEX OF SHEETS

AS–BUILT PLANS

NOTE:
NO MAJOR CHANGES WERE MADE TO THE ORIGINAL CONSTRUCTION PLANS.



	STREAM ENHANCEMENT I (1.5:1)	STREAM ENHANCEMENT II (2.5:1)	STREAM RESTORATION (1:1)
UTCC 10+00 TO 46+09			3559 CREDITS (50' CROSSING)
TRIBUTARY 1 50+00 TO 61+17	183 CREDITS (55+50 TO 58+24)	220 CREDITS (50+00 TO 55+50)	293 CREDITS (58+24 TO 61+17)
TRIBUTARY 1–1 70+00 TO 73+13		125 CREDITS	
TRIBUTARY 2 80+00 TO 81+27		20 CREDITS (80+00 TO 80+49)	78 CREDITS (80+49 TO 81+27)
TRIBUTARY 3 90+00 TO 101+78	418 CREDITS (90+00 TO 96+27)		530 CREDITS (96+27 TO 101+57)
TRIBUTARY 3–1 150+00 TO 150+78			78 CREDITS
TRIBUTARY 4 250+00 TO 257+42			692 CREDITS (50' CROSSING)
TRIBUTARY 5 300+00 TO 300+95		N/A	
TOTALS PER CREDIT TYPE	601 CREDITS	365 CREDITS	5230 CREDITS

TOTAL STREAM MITIGATION CREDITS : 6196

DIRECTIONS TO SITE

From Raleigh, follow I–40 West. Meerge left to take the I–85 South. Take exit 113B and follow signs for 74 East /US 311 South. Take exit 79 for Cedar Square Road. Take a right onto Cedar Square Rd and then a quick left onto State Road 1009 and then a quick right onto Edgar Rd. Follow Edgar Rd for 3 miles then take a right onto Mt. Olive Church Rd. Follow for about a half mile then take a left onto Farlow Pines Drive. The site will be at the end of the gravel road.

Prepared in the Office of:

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

GARY M. MRYNCZA, PE
PROJECT ENGINEER

ALEX FRENCH
PROJECT DESIGNER

Prepared for:

NCDEQ - DIVISION OF MITIGATION SERVICES

MATTHEW REID
DMS PROJECT MANAGER

LIN XU
DMS REVIEW COORDINATOR

PROJECT SURVEYOR

P.E.
SIGNATURE:

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

P.E.
SIGNATURE:

GENERAL NOTES:

THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARENT TRACTS. THE PARENT TRACT BOUNDARIES ADJACENT TO THIS EASEMENT ARE NOT CHANGED BY THIS PLAT.

DISTANCES SHOWN ARE HORIZONTAL GROUND DISTANCES IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.

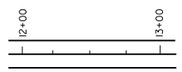
THE BASIS OF THE MERIDIANS AND COORDINATES FOR THIS PLAT IS THE NORTH CAROLINA STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 (NAD 83), BASED ON DIFFERENTIAL GPS OBSERVATIONS. ALL DISTANCES ARE GROUND UNLESS OTHERWISE NOTED.

NO UNDERGROUND UTILITY LOCATING PERFORMED DURING THE COURSE OF THIS SURVEY.

CONTROL POINTS

POINT	NORTHING	EASTING	ELEV
KCI#5	755366.41	1730226.86	667.68
KCI#10	756707.20	1730478.67	711.23
KCI#11	756146.00	1730544.57	694.53
KCI#12	756494.18	1730600.11	692.08
KCI#13	756406.21	1730654.21	694.70
KCI#14	756110.12	1730661.90	680.21
KCI#15	755981.55	1730569.27	680.73
KCI#16	755829.59	1730478.27	675.43
KCI#60	753336.65	1729563.95	635.82
KCI#61	753761.53	1729675.94	641.03
KCI#62	755625.54	1729907.38	687.14
KCI#63	755470.80	1729952.13	680.24
KCI#64	755119.17	1730063.07	663.17
KCI#65	753280.38	1729730.88	638.89
KCI#66	754260.03	1729739.70	650.45

PROJECT LEGEND:

New Thalweg w/Approximate Bankfull Limits ..... 

Step Pool ..... 

Riffle Enhancement ..... 

Riffle Grade Control ..... 

Riffle Cascade ..... 

Live Lift ..... 

Filled Channel ..... 

Tree Line ..... 

Minor Contour Line .....

Major Contour Line .....

PROJECT ENGINEER

PROJECT SURVEYOR

REVISIONS

SYM	DESCRIPTION	DATE

NCDEQ - DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4505 FALLS OF NEUSE ROAD, SUITE 400
RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE
AS-BUILT PLANS
RANDOLPH COUNTY, NORTH CAROLINA

DATE: JUNE 2018
SCALE: N.T.S.

GENERAL NOTES & PROJECT LEGEND

PROJECT SURVEYOR

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS

DESCRIPTION	DATE

BEGIN UTCC

BEGIN TRIB 2

INSTALLED 'LIVE LIFT'

INSTALLED 'CASCADING RIFFLE'

INSTALLED 'RIFFLE ENHANCEMENT'

INSTALLED 'STEP POOL'

(1) 5.0' DIA. x 24' LONG HDPE STREAM CULVERT (CONCRETE BOX) - 1' EMBEDDED
(2) 12" DIA., 24' LONG FLOODPLAIN CULVERTS (PEP)

CONSERVATION EASEMENT

MATCHLINE - SEE SHEET 4

MATCHLINE - SEE SHEET 6 FOR TRIBUTARY 1

END TRIB 1

END TRIB 2

NEW WOVEN WIRE FENCING INSTALLED ALONG CONSERVATION EASEMENT

FILLED CHANNEL

CHANNEL ADJUSTED SLIGHTLY TO AVOID BEDROCK

50' WIDE EASEMENT EXCEPTION

INSTALLED 'RIFFLE GRADE CONTROL'

CHANNEL ADJUSTED SLIGHTLY TO AVOID BEDROCK AND TREE

ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON JUNE 14, 2018.

NC GRID NAD 83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

NCDEQ - DIVISION OF MITIGATION SERVICES

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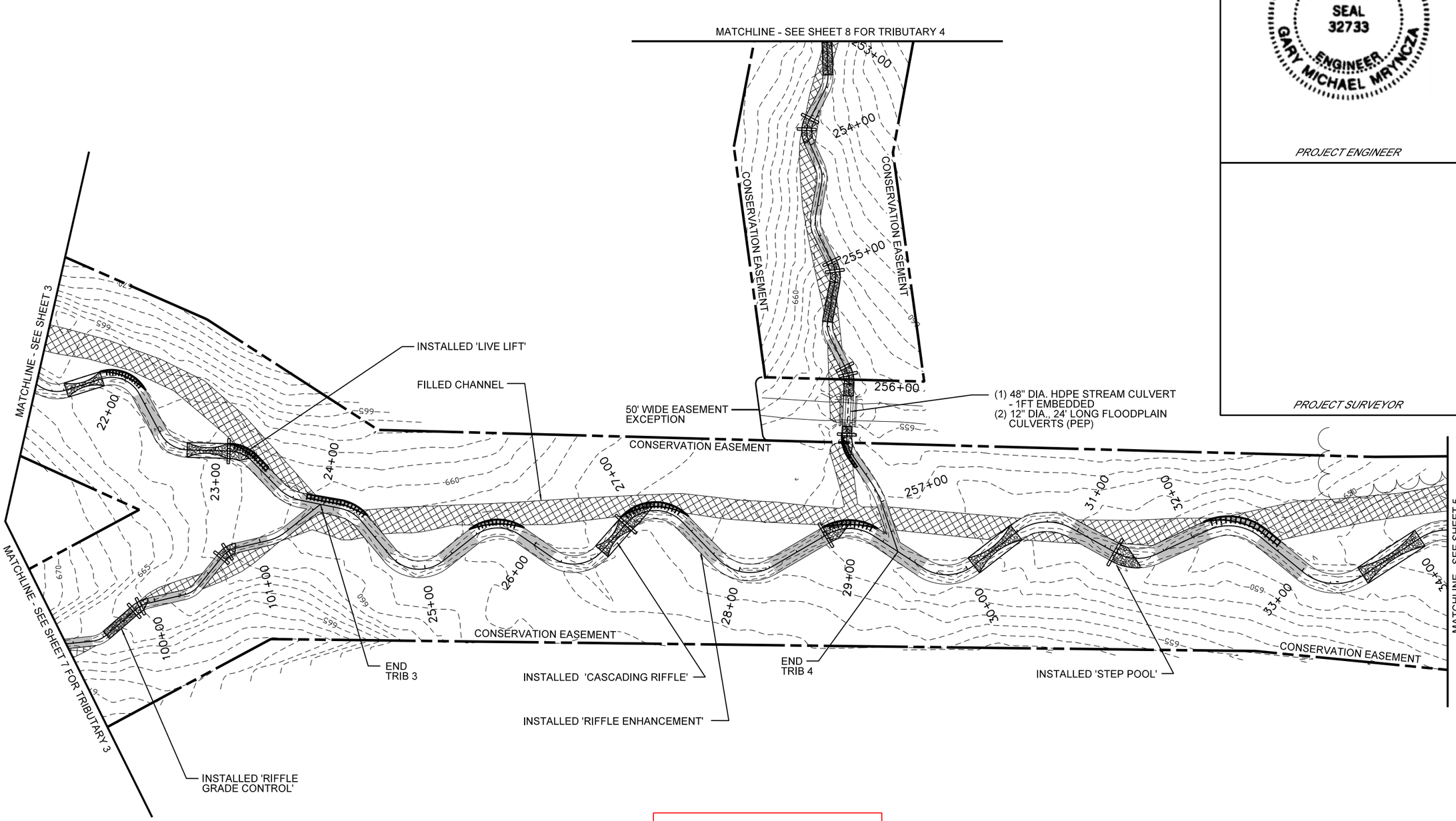
CEDAR BRANCH
STREAM RESTORATION SITE
AS-BUILT PLANS
RANDOLPH COUNTY, NORTH CAROLINA

DATE: JUNE 2018
SCALE: GRAPHIC

SITE PLAN

REACH: UTCC



ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON JUNE 14, 2018.

NC GRID NAD '83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

PROJECT ENGINEER

PROJECT SURVEYOR

STM.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

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RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH
STREAM RESTORATION SITE
AS-BUILT PLANS
RANDOLPH COUNTY, NORTH CAROLINA

DATE: JUNE 2018
SCALE: GRAPHIC

SITE PLAN

REACH: UTCC

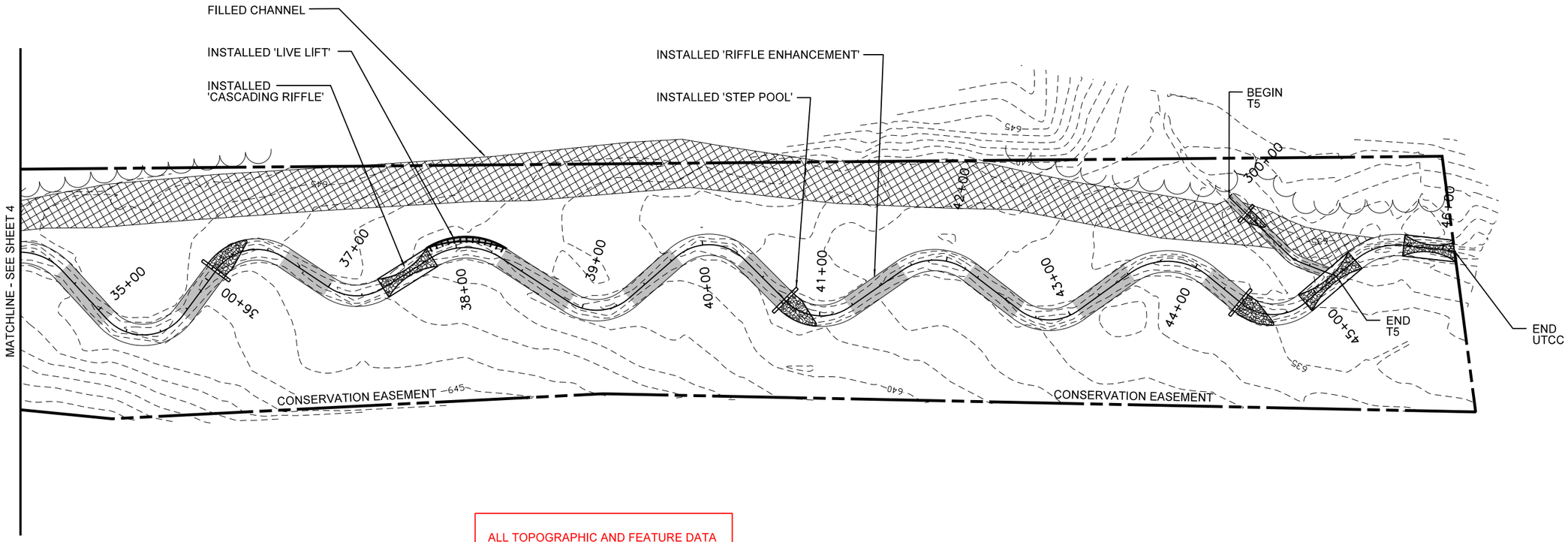
SHEET 4 OF 9

PROJECT SURVEYOR

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

DATE	DESCRIPTION	STAL
	REVISIONS	



ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON JUNE 14, 2018.

NC GRID NAD '83

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

NCDEQ - DIVISION OF MITIGATION SERVICES

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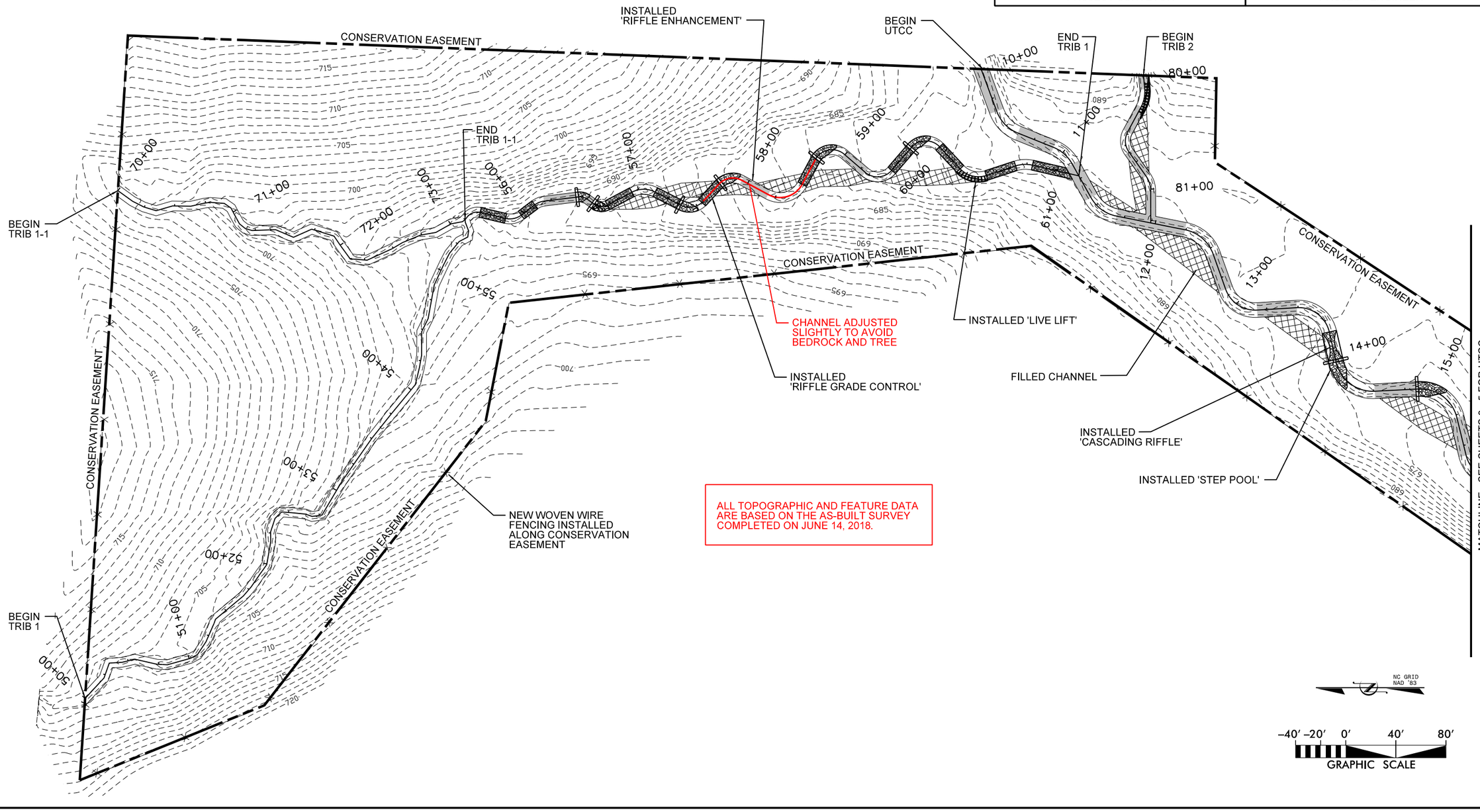
CEDAR BRANCH
STREAM RESTORATION SITE
AS-BUILT PLANS
RANDOLPH COUNTY, NORTH CAROLINA

DATE: JUNE 2018
SCALE: GRAPHIC

SITE PLAN

REACH: UTCC

SHEET 5 OF 9



ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON JUNE 14, 2018.

PROJECT SURVEYOR

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

REVISIONS			
STAL	DESCRIPTION	DATE	

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RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH STREAM RESTORATION SITE

AS-BUILT PLANS

RANDOLPH COUNTY, NORTH CAROLINA

DATE: JUNE 2018
SCALE: GRAPHIC

SITE PLAN

REACH: TRIB 1 & 1-1

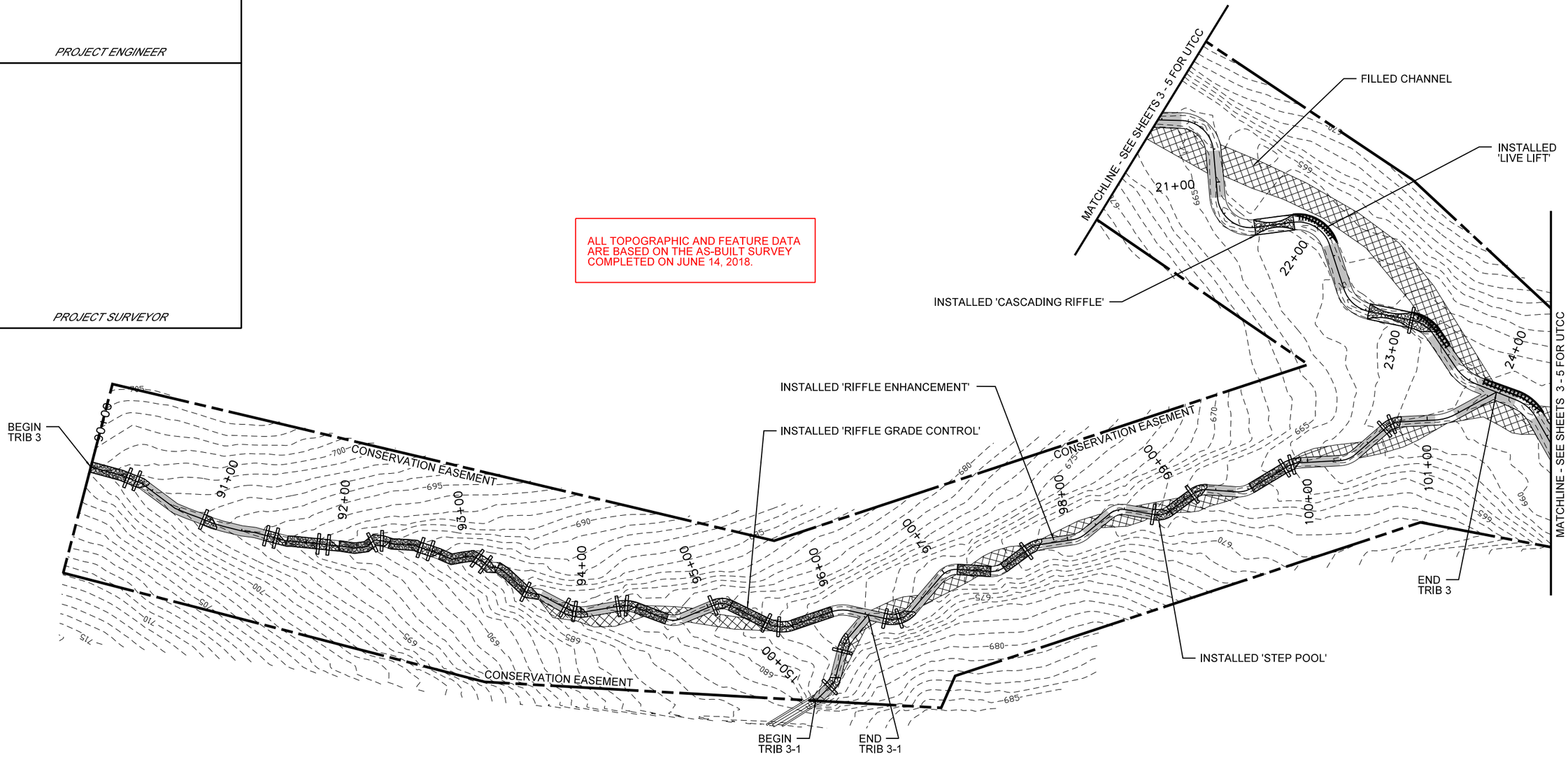
SHEET 6 OF 9

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

PROJECT ENGINEER

PROJECT SURVEYOR

ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON JUNE 14, 2018.



NO.	DESCRIPTION	DATE
	REVISIONS	

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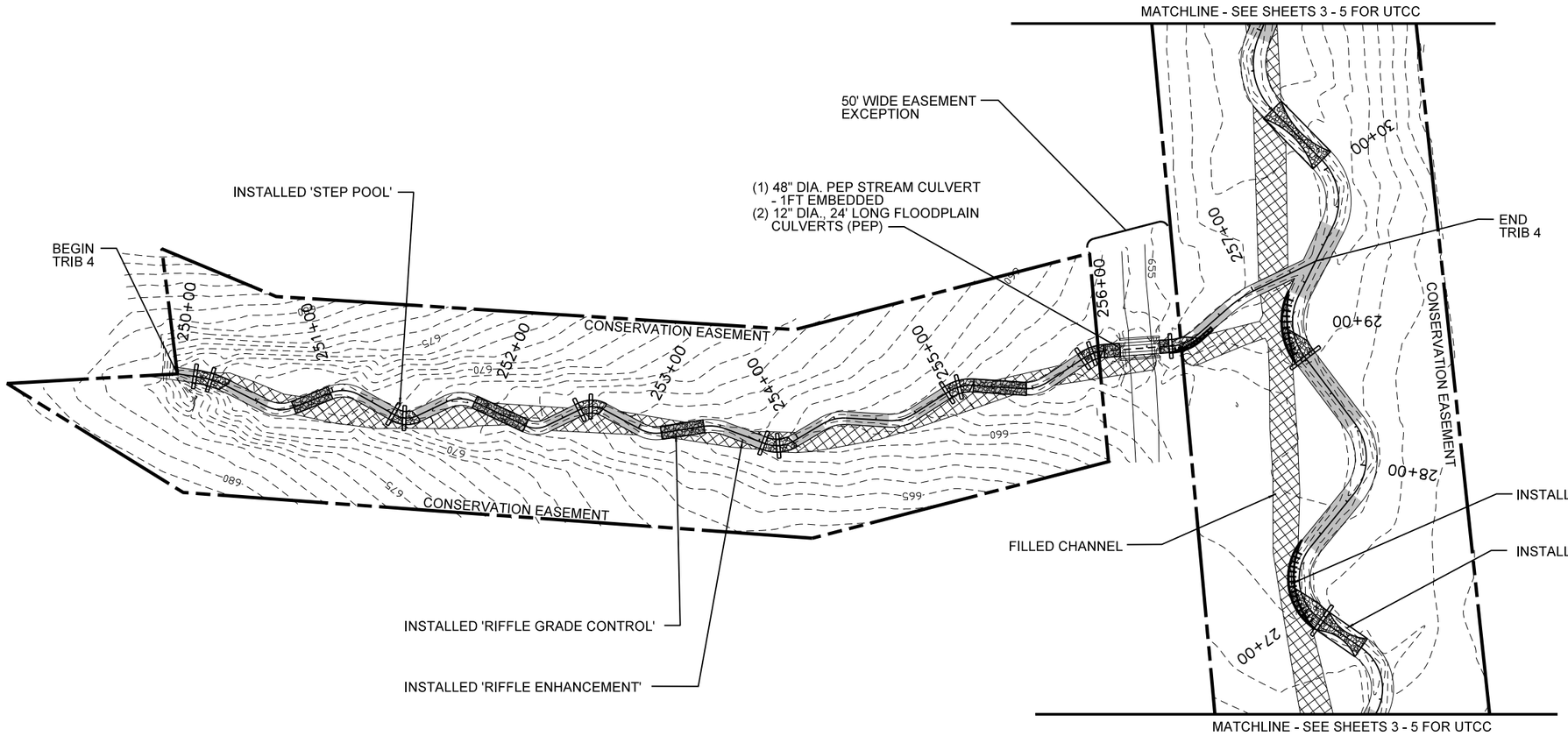
CEDAR BRANCH
STREAM RESTORATION SITE
AS-BUILT PLANS
RANDOLPH COUNTY, NORTH CAROLINA

DATE: JUNE 2018
SCALE: GRAPHIC

SITE PLAN

REACH:
TRIB 3 & 3-1

SHEET 7 OF 9



ALL TOPOGRAPHIC AND FEATURE DATA ARE BASED ON THE AS-BUILT SURVEY COMPLETED ON JUNE 14, 2018.

NC NAD 1983 FEET

–40′ –20′ 0′ 40′ 80′

GRAPHIC SCALE

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

PROJECT ENGINEER

PROJECT SURVEYOR

NO.	DESCRIPTION	DATE
	REVISIONS	

NCDEQ - DIVISION OF MITIGATION SERVICES

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RALEIGH, NORTH CAROLINA 27609

CEDAR BRANCH STREAM RESTORATION SITE

AS-BUILT PLANS

RANDOLPH COUNTY, NORTH CAROLINA

DATE: JUNE 2018
SCALE: GRAPHIC

SITE PLAN

REACH: TRIB 4

NC GRID
NAD '83

–130′ –65′ 0′ 130′ 260′

GRAPHIC SCALE

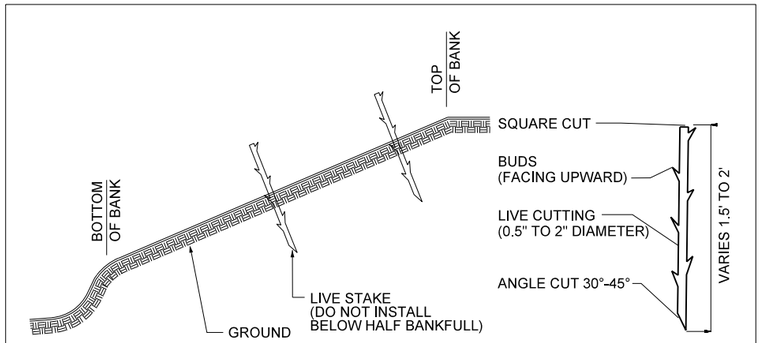
PROJECT SURVEYOR

NORTH CAROLINA PROFESSIONAL SEAL 32733 ENGINEER GARY MICHAEL MRYNCZA

PROJECT ENGINEER

NO.	DESCRIPTION	DATE
A	SUBMITTED FOR LAND QUALITY PERMIT	MARCH 2017

REVISIONS



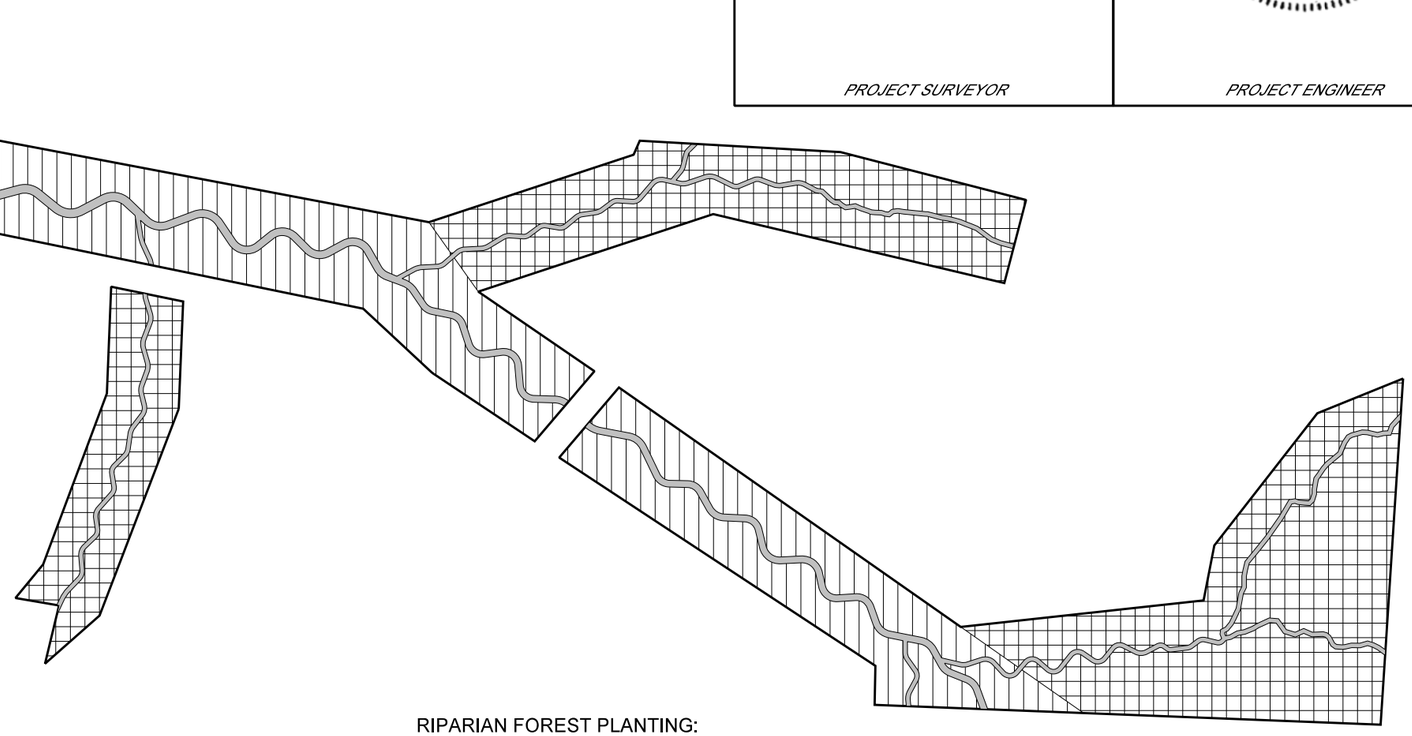
PLANTING NOTES:

UTCC:
RIFFLES - 2 ROWS OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 2 ROWS ON OUTER BENDS.

ALL OTHER TRIBUTARIES:
RIFFLES - 1 ROW OF LIVE STAKES ON BOTH SIDES OF CHANNEL.
POOLS - NO LIVE STAKES ON INNER BENDS, 1 ROWS ON OUTER BENDS.

LIVE STAKES

SCALE: NTS



STREAM ZONE :

STREAM ZONE
LIVE STAKES: 1.5' TO 2' LENGTHS, 1/2' TO 2" DIAMETER,
PLANT AT 3' SPACING, RANDOM SPECIES PLACEMENT.

COMMON NAME	SCIENTIFIC NAME
BLACK WILLOW	SALIX NIGRA
SILKY WILLOW	SALIX SERICEA
SILKY DOGWOOD	CORNUS AMOMUM

RIPARIAN FOREST PLANTING:

PLANTING ZONE 1 = 10.5 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
RIVER BIRCH	BETULA NIGRA	FACW	20	2100
GREEN ASH	FRAXINUS PENNSYLVANICA	FACW	20	2100
SWAMP CHESTNUT OAK	QUERCUS MICHAUXII	FACW	20	2100
WILLOW OAK	QUERCUS PHELLOS	FAC	10	1050
AMERICAN SYCAMORE	PLATANUS OCCIDENTALIS	FACW	20	2100
YELLOW POPLAR	LIRIODENDRON TULIPIFERA	FACU	10	1050
				10,500

PLANTING ZONE 2 = 9.1 ACRES

12" - 18" BARE ROOT MATERIAL
968 STEMS/ACRE (9' X 5' SPACING), RANDOM SPECIES PLACEMENT

COMMON NAME	SCIENTIFIC NAME	STATUS	% OF TOTAL	# OF PLANTS
YELLOW POPLAR	LIRIODENDRON TULIPIFERA	FACU	20	1800
SOUTHERN RED OAK	QUERCUS FALCATA	FACU	25	2200
WILLOW OAK	QUERCUS PHELLOS	FAC	20	1800
WHITE OAK	QUERCUS ALBA	FACU	20	1800
AMERICAN PERSIMMON	DIOSPYROS VIRGINIANA	FAC	8	700
PIN OAK	QUERCUS PALUSTRIS	FACW	7	600
				8,900

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CEDAR BRANCH
STREAM RESTORATION SITE
AS-BUILT PLANS
RANDOLPH COUNTY, NORTH CAROLINA

DATE: JUNE 2018
SCALE: GRAPHIC

PLANTING PLAN

SHEET 9 OF 9

APPENDIX F

Additional Information

Tommy Seelinger

From: Tim Morris
Sent: Friday, August 03, 2018 2:55 PM
To: Tommy Seelinger
Subject: FW: Discrepancy Between As-Built and Mitigation Plan

-----Original Message-----
From: Hughes, Andrea W CIV USARMY CESAW (US) [mailto:Andrea.W.Hughes@usace.army.mil]
Sent: Monday, July 2, 2018 2:45 PM
To: Tim Morris <Tim.Morris@kci.com>
Subject: RE: Discrepancy Between As-Built and Mitigation Plan

For 4 credits? Don't worry about it since it's a reduction. We have too much on our desks right now.

Andrea W. Hughes
Mitigation Project Manager
Regulatory Division, Wilmington District
11405 Falls of Neuse Road
Wake Forest, North Carolina 27587
Phone: (843) 566-3857

-----Original Message-----
From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Monday, July 02, 2018 2:43 PM
To: Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] RE: Discrepancy Between As-Built and Mitigation Plan

reduction

-----Original Message-----
From: Hughes, Andrea W CIV USARMY CESAW (US) [mailto:Andrea.W.Hughes@usace.army.mil]
Sent: Monday, July 2, 2018 2:37 PM
To: Tim Morris <Tim.Morris@kci.com>
Subject: RE: Discrepancy Between As-Built and Mitigation Plan

Jeff S is familiar. You have to do a cover page requesting a modification of the credits and include documentation to support your request with the as-built. You are requesting an increase of 4 credits or reduction?

Andrea W. Hughes
Mitigation Project Manager
Regulatory Division, Wilmington District
11405 Falls of Neuse Road
Wake Forest, North Carolina 27587
Phone: (843) 566-3857

-----Original Message-----
From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Monday, July 02, 2018 2:19 PM
To: Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] RE: Discrepancy Between As-Built and Mitigation Plan

How do we make that request?

-----Original Message-----
From: Hughes, Andrea W CIV USARMY CESAW (US) [mailto:Andrea.W.Hughes@usace.army.mil]
Sent: Monday, July 2, 2018 2:15 PM
To: Tim Morris <Tim.Morris@kci.com>
Subject: RE: Discrepancy Between As-Built and Mitigation Plan

If you are asking for a change to the mitigation credits proposed in the mitigation plan that was approved, then yes, it is a modification request.

Andrea W. Hughes
Mitigation Project Manager
Regulatory Division, Wilmington District
11405 Falls of Neuse Road
Wake Forest, North Carolina 27587
Phone: (843) 566-3857

-----Original Message-----
From: Tim Morris [mailto:Tim.Morris@kci.com]
Sent: Monday, July 02, 2018 1:59 PM
To: Hughes, Andrea W CIV USARMY CESAW (US) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] Discrepancy Between As-Built and Mitigation Plan

Andrea - We have a 4 credit disparity (deficit) between our as-built plan and mitigation plan credit numbers on the Cedar Branch job. This is primarily due to two areas where we were avoiding a couple of specimen trees. Will we have to do some kind of formal amendment to our mitigation plan to recognize this discrepancy?