

# **As-built Baseline Monitoring Report**

## **FINAL**

**Sandy Bridge Restoration Site  
DMS Contract 6400  
DMS Project Number 96920**

**DWR #: 15-0414  
USACE Action ID: 201500827  
Rutherford County, North Carolina**



Prepared for:  
NCDMS, 1652 Mail Service Center, Raleigh, NC 27699-1652

**Monitoring Data Collected: March 2017**  
**Date Submitted: April 2017**

## Monitoring and Design Firm

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**March 2017**

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## **PROJECT SUMMARY**

The Sandy Bridge Farm Restoration Site (SBFRS) was completed in March 2017 and restored a total of 6.85 acres of riparian wetland and 1,626 linear feet of stream. The SBFRS is a riparian system located in the Broad River Basin (03050105 8-digit cataloging unit) in Rutherford County, North Carolina that has been substantially modified to maximize the use of the area for grazing. The completed project will restore impacted agricultural lands to a functioning stream and wetland ecosystem with enhanced water quality, restored hydrology, and improved fish and wildlife habitat.

The SBFRS is protected by a 9.5 acre permanent conservation easement, held by the State of North Carolina. The site is located off of Rock Road, approximately 3 miles north of Rutherfordton, North Carolina. The project site is bounded by interspersed pastureland and forested land to the east, agricultural land and Rock Road to the north-northwest, and Catheys Creek to the southwest.

The North Carolina Ecosystem Enhancement Program's (NCEEP) publication in 2009 identified HUC 03050105070020 (Catheys Creek) as a Targeted Local Watershed (TLW). The goals and priorities for SBFRS are based on the information presented in the Broad River Basin Restoration Priorities: to restore wetland and stream functions, to maintain and enhance water quality, to restore hydrology, and to improve fish and wildlife habitat (NCEEP 2009). The project goals are in line with the following basin priorities:

- Reduce sources of sediment and nutrients by restoring riparian buffer vegetation, excluding livestock, and restoring natural geomorphology.
- Prioritize project implementation in the Catheys Creek local watershed planning area.

The goals for the project are to:

- Restore a channelized stream to a meandering C-type channel with a floodplain.
- Buffer and reduce sediment impacts to the project stream.
- Restore a Piedmont Alluvial Forest Community.
- Restore a wetland hydroperiod to drained and livestock-impacted land.

The project goals will be addressed through the following objectives:

- Relocate a channelized stream to its historic landscape position.
- Install an appropriately-sized channel cross-section.
- Install bedform diversity with pools, riffles, and habitat structures.
- Demarcate the project easement boundaries and fence out livestock.
- Plant the site with native trees and shrubs and an herbaceous seed mix that supports the development of a Piedmont Alluvial Forest.
- Fill field ditches and redevelop wetland microtopography to slow the flow of surface and subsurface drainage.

Project planting and construction were completed in March 2017. The SBFRS involved restoration and establishment of a functioning stream and wetland ecosystem with 6.85 acres of riparian wetland restoration (1.29 acres of wetland rehabilitation and 5.56 acres of wetland reestablishment). Select ditches across the site were modified or filled and incoming surface inputs and seeps were integrated to create a stream/wetland complex. In addition, approximately 1,626 linear feet of Tributary 1 to Catheys Creek was improved with Priority 1 stream restoration to re-meander the stream and elevate the groundwater table. The entire site was planted as a Piedmont Alluvial Forest community (Schafale 2012). The site was constructed as designed with no modification from the design plan.

The monitoring components were installed in March 2017. Nine groundwater monitoring wells were installed to evaluate the attainment of jurisdictional wetland hydrology. A stream gauge was installed on

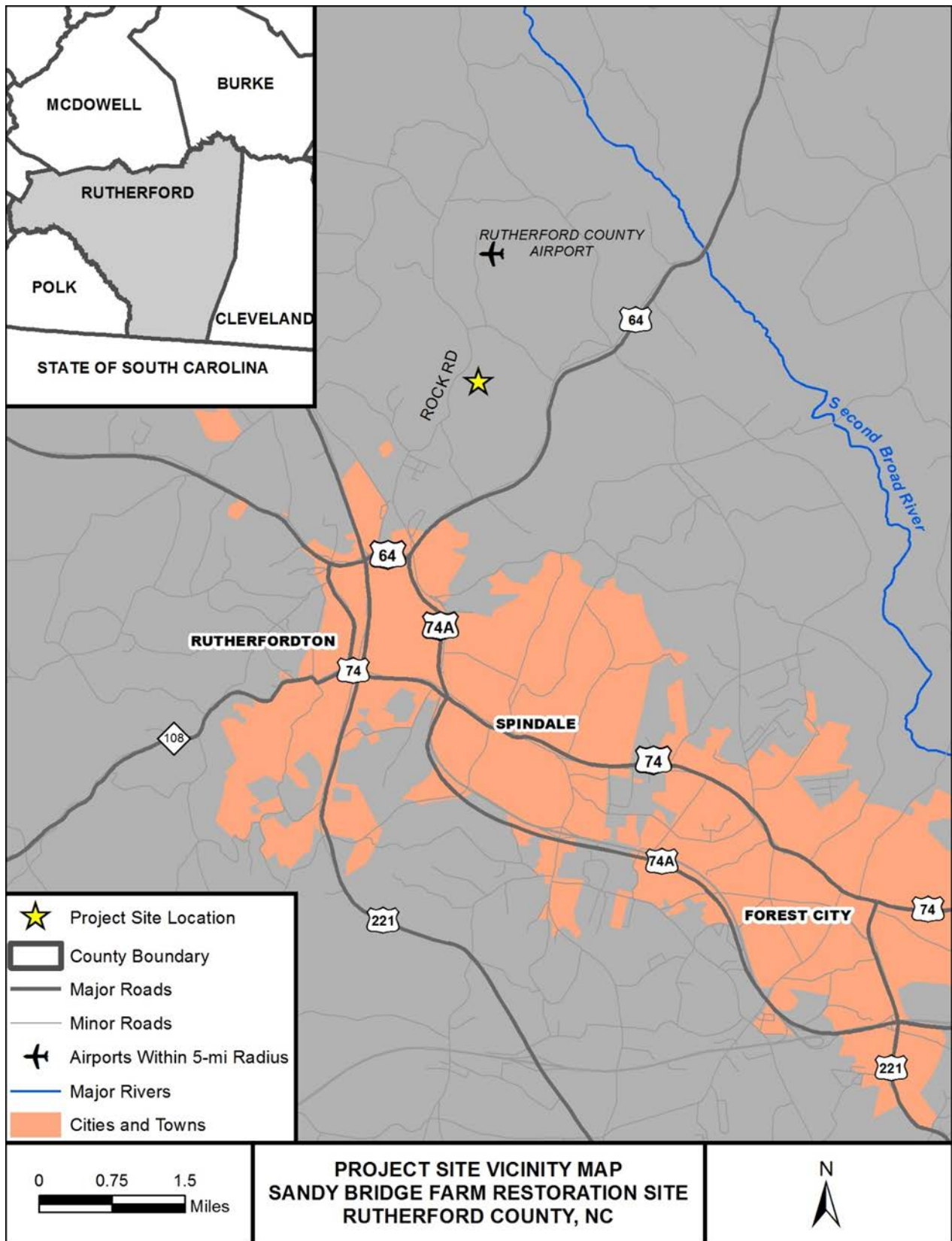
Tributary 1 to Catheys Creek to record the occurrence of bankfull events. To determine the success of the planted mitigation areas, eight 10 m x 10 m permanent vegetation monitoring plots were established. The location of the planted stems relative to the origin within these plots, as well as the species, was 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. Six permanent photo reference points were established and will be taken annually. Four permanent cross-sections (two sets of coupled riffles and pools) were also established and a detailed longitudinal profile of the stream was taken. Wolman pebble counts were performed at both 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 2017.

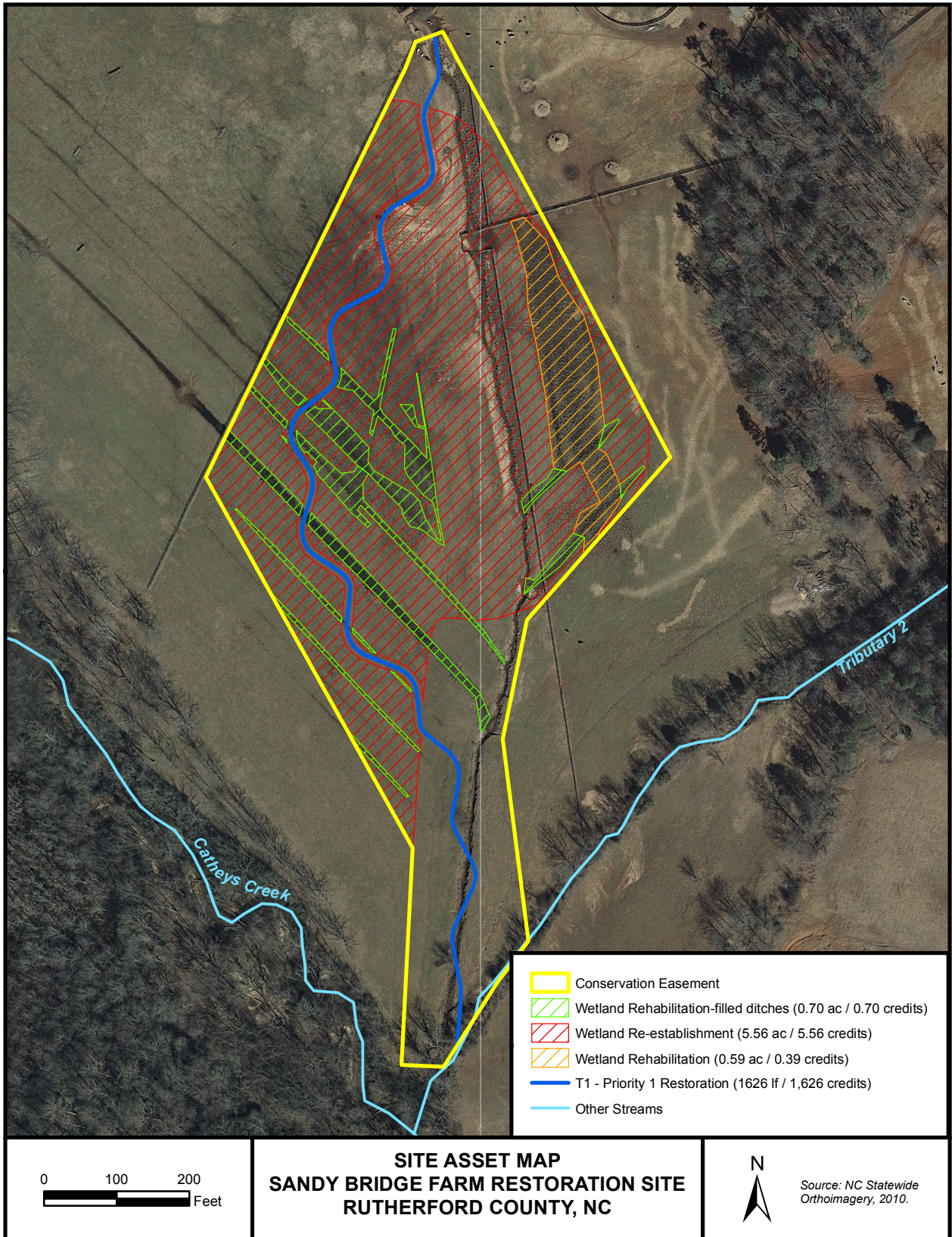
Vegetative success criteria for the site is 320 woody stems/acre after three years, 260 woody stems/acre after five years, and 210 woody stems/acre after seven years. The baseline monitoring counted an average of 728 woody stems/acre. To meet the hydrologic success criteria, the upper 12 inches of the soil profile must have continuously saturated or inundated conditions for at least 10% of the growing season during normal weather conditions. The soil survey for Rutherford County estimates the growing season begins April 4 and ends November 6 (217 days), meaning the water table must be within 12 inches of the surface for at least 22 consecutive days during the growing season. A minimum of two bankfull events must also be recorded during their 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 March 2017 with tree tube protection installed around many of the planted stems. The baseline conditions monitoring was conducted March 20 through 21 in 2017. The average plot stem density from the eight surveyed plots is 728 planted stems/ac. 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 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.





## REFERENCES

NCDENR, Ecosystem Enhancement Program. 2009. Broad 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](http://portal.ncdenr.org/c/document_library/get_file?uuid=705d1b58-cb91-451e-aa58-4ef128b1e5ab&groupId=60329)

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[http://portal.ncdenr.org/c/document\\_library/get\\_file?p\\_l\\_id=60409&folderId=18877169&name=DLFE-86604.pdf](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](http://portal.ncdenr.org/c/document_library/get_file?uuid=76f3c58b-dab8-4960-ba43-45b7faf06f4c&groupId=38364)



# **APPENDIX A**

## Background Tables

<b>Table 1. Project Components and Mitigation Credits Sandy Bridge Farm Restoration Site, DMS Project #96920</b>									
<b>Mitigation Credits</b>									
	<b>Stream</b>		<b>Riparian Wetland</b>		<b>Non-riparian Wetland</b>		<b>Buffer</b>	<b>Nitrogen Nutrient Offset</b>	<b>Phosphorous Nutrient Offset</b>
<b>Type</b>	R	RE	R	RE	R	RE			
<b>Linear Feet/Acres</b>	1,626		6.85						
<b>Credits</b>	1,626		6.65						
<b>Project Components</b>									
<b>Project Component -or- Reach ID</b>	<b>Stationing/ Location</b>	<b>Existing Footage/ Acreage</b>	<b>Approach (PI, PII etc.)</b>	<b>Restoration -or- Restoration Equivalent</b>	<b>Restoration Footage/ Acreage</b>	<b>Mitigation Ratio</b>	<b>Credits</b>		
Tributary 1	10+00 to 26+26	1,470 lf	PI	Restoration	1,626 lf	1:1	1,626		
Wetland Reestablishment				Restoration	5.56 ac	1:1	5.56		
Wetland Rehabilitation*		0.79 ac		Restoration	0.70 ac	1:1	0.70		
Wetland Rehabilitation		0.59 ac		Restoration	0.59 ac	1.5:1	0.39		
<b>Component Summation</b>									
<b>Restoration Level</b>	<b>Stream (linear feet)</b>	<b>Riparian Wetlands (Acres)</b>		<b>Non-Riparian Wetlands (Acres)</b>	<b>Buffer (square feet)</b>	<b>Upland (Acres)</b>			
		Riverine	Non-Riverine						
Restoration	1,626 lf								
Reestablishment		5.56 ac							
Rehabilitation		1.29 ac							
Enhancement									
Creation									
Preservation									
High Quality Preservation									

R= Restoration RE= Restoration Equivalent of Creation or Enhancement  
 \*=wetland rehabilitation associated with filled ditches

<b>Table 2. Project Activity &amp; Reporting History Sandy Bridge Farm Restoration Sites, DMS Project #96920</b>		
<b>Activity or Report</b>	<b>Data Collection Complete (Veg plot and morphological data)</b>	<b>Actual Completion or Delivery</b>
Mitigation Plan		June 16
Final Design - Construction Plans		June 16
Construction Grading Completed		Aug 29, 2016
Planting Completed		March 11, 2017
Baseline Monitoring/Report	March 21, 2017	April 17

<b>Table 3. Project Contacts Sandy Bridge Farm Restoration Sites, DMS Project #96920</b>	
<b>Design Firm</b>	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
<b>Construction Contractor</b>	KCI Environmental Technologies and Construction 4505 Falls of Neuse Road, Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512
<b>Planting Contractor</b>	Conservation Services Inc. 1620 N. Delphine Ave. Waynesboro, VA 22980 Contact: Mr. David Coleman Phone: (540) 941-0067
<b>Monitoring Performers</b>	
	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









<b>Table 4. Project Information</b> <b>Sandy Bridge Farm Restoration Site, DMS Project #96920</b>			
<b>Project Name</b>	Sandy Bridge Farm Restoration Site		
<b>County</b>	Rutherford County		
<b>Project Area (acres)</b>	9.45 acres		
<b>Project Coordinates (lat. and long.)</b>	35.407997° N, -81.937000° W		
<b>Project Watershed Summary Information</b>			
<b>Physiographic Province</b>	Piedmont		
<b>River Basin</b>	Broad		
<b>USGS Hydrologic Unit 8-digit</b>	03050105	<b>USGS Hydrologic Unit 14-digit</b>	03050105070020
<b>DWQ Sub-basin</b>	9-41-13-(0.5)		
<b>Project Drainage Area (acres)</b>	837 acres		
<b>Project Drainage Area Percentage of Impervious Area</b>	8%		
<b>CGIA Land Use Classification</b>	Mixed Hardwoods/Conifers 42% (350.0 ac), Managed Herbaceous Cover 39% (329.3 ac), Mountain Conifers 12% (99.5 ac), Mixed Shrubland 5% (43.5 ac), Low Intensity Developed 1% (11.0 ac)		
<b>Existing Reach Summary Information</b>			
<b>Parameters</b>	<b>T1</b>		
Length of reach (linear feet)	1,470 lf		
Valley classification	Valley Type VIII		
Drainage area (acres)	837 acres		
NCDWQ Water Quality Classification	WS-V (Water Supply – upstream)		
Morphological Description (stream type)	Ditched channel		
Evolutionary trend	Channelized		
Mapped Soil Series	Wehadkee-Chewacla Association		
Drainage class	Poorly drained; Somewhat poorly drained		
Soil Hydric status	Drained hydric		
Slope	0-1%		
FEMA classification	Zone AE		
Existing vegetation community	N/A (Pasture)		
Percent composition of exotic invasive vegetation	5%		
<b>Existing Wetland Summary Information</b>			
<b>Parameters</b>			
Size of Wetland (acres)	0.59 acres (Wetland Rehabilitation Area)		
Wetland Type	Headwater Seep		
Mapped Soil Series	Wehadkee-Chewacla Association		
Drainage class	Poorly drained; Somewhat poorly drained		
Soil Hydric Status	Drained Hydric		
Source of Hydrology	Seepage/ Precipitation		
Hydrologic Impairment	Ditching and Grazing		
Existing vegetation community	Emergent Wetland		
Percent composition of exotic invasive vegetation	5%		

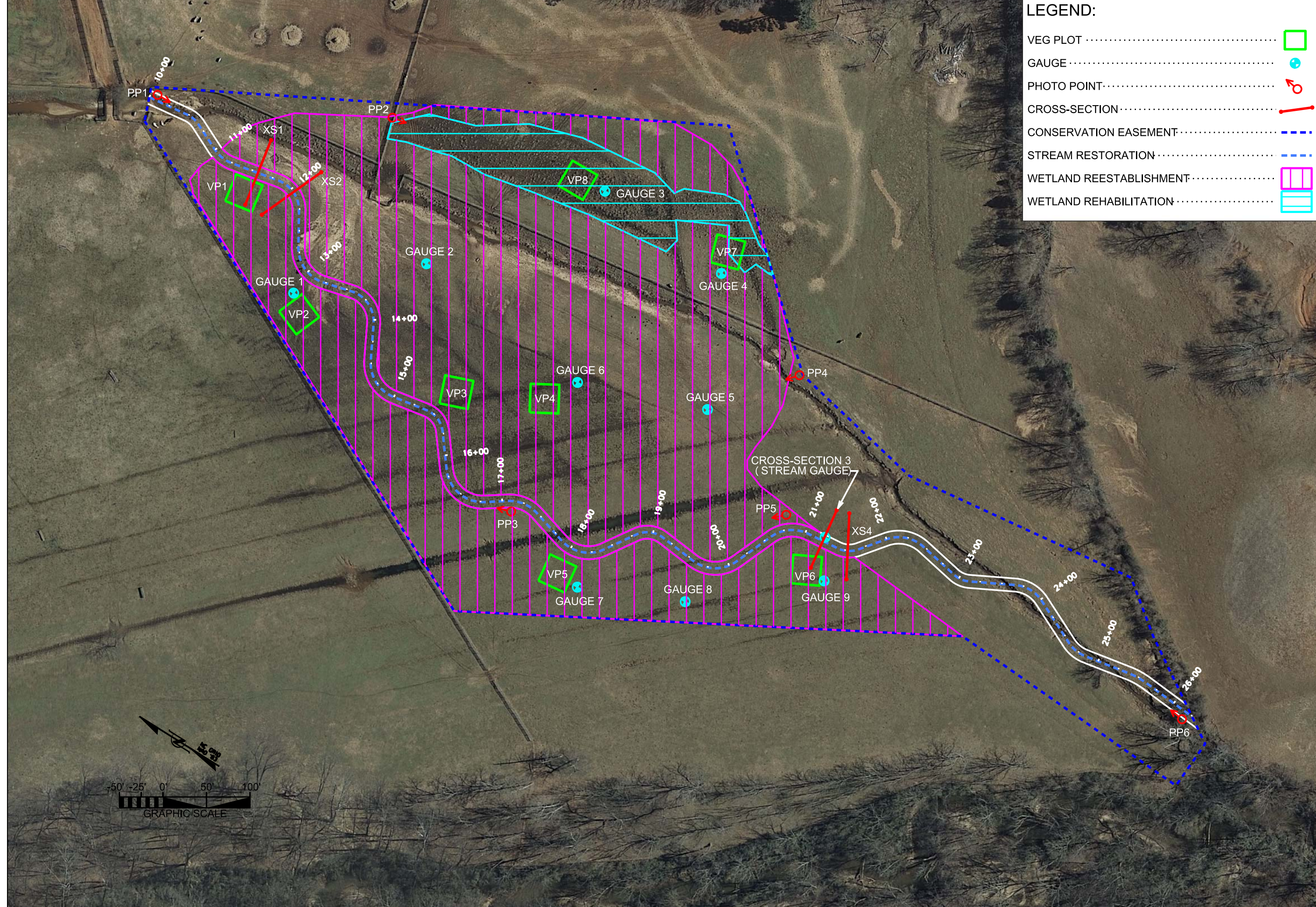
<b>Regulatory Considerations</b>			
<b>Regulation</b>	<b>Applicable?</b>	<b>Resolved?</b>	<b>Supporting Documentation</b>
Waters of the United States – Section 404	Yes	DWR# 15-0414 USACE Action ID# 201500827	Jurisdictional Determination
Waters of the United States – Section 401	Yes	DWR# 15-0414 USACE Action ID# 201500827	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
FEMA Floodplain Compliance	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

# **APPENDIX B**

## Visual Assessment Data

**LEGEND:**

- VEG PLOT ..... 
- GAUGE ..... 
- PHOTO POINT ..... 
- CROSS-SECTION ..... 
- CONSERVATION EASEMENT ..... 
- STREAM RESTORATION ..... 
- WETLAND REESTABLISHMENT ..... 
- WETLAND REHABILITATION ..... 



NO.	DESCRIPTION	DATE

**NCDEQ DIVISION OF MITIGATION SERVICES**

**KCI**  
ASSOCIATES OF NC  
 ENGINEERS • PLANNERS • SCIENTISTS  
 4506 FALLS OF NEUSE RD., SUITE 400  
 RALEIGH, NORTH CAROLINA 27609

**SANDY BRIDGE FARM  
 STREAM AND RIPARIAN WETLAND SITE**  
 RUTHERFORD COUNTY, NORTH CAROLINA

DATE: APRIL 2017  
 SCALE: GRAPHIC

CCPV

**Photo Reference Photos**



PP1 – MY-00 – 3/21/17



PP2 – MY-00 – 3/21/17



PP3 – MY-00 – 3/21/17



PP4 – MY-00 – 3/21/17



PP5 – MY-00 – 3/21/17



PP6 – MY-00 – 3/21/17



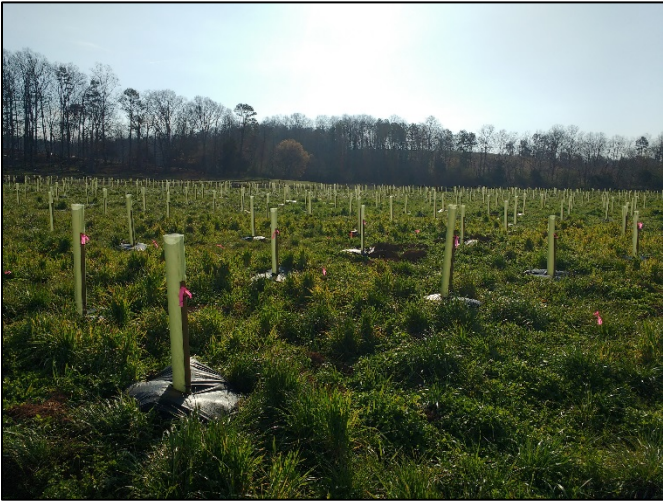
## Vegetation Monitoring Plot Photos



Vegetation Plot 1 – MY-00 – 3/21/17



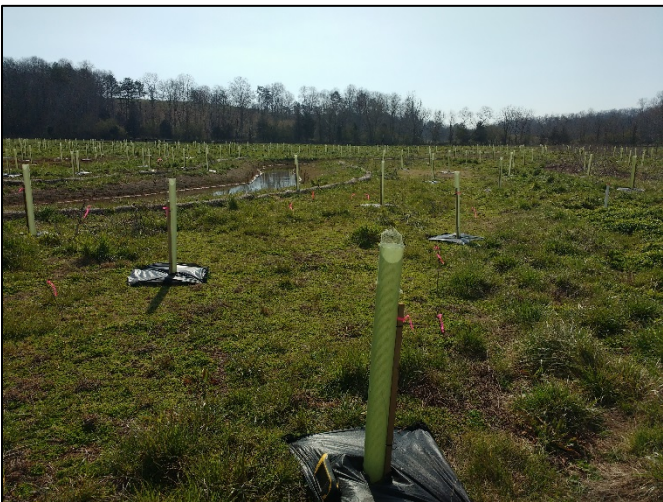
Vegetation Plot 2 – MY-00 – 3/21/17



Vegetation Plot 3 – MY-00 – 3/21/17



Vegetation Plot 4 – MY-00 – 3/21/17



Vegetation Plot 5 – MY-00 – 3/21/17



Vegetation Plot 6 – MY-00 – 3/21/17



Vegetation Plot 7 – MY-00 – 3/21/17



Vegetation Plot 8 – MY-00 – 3/21/17

# **APPENDIX C**

## Vegetation Plot Data

<b>Table 5. Stem Count by Plot and Species</b>										
<b>Sandy Bridge Farm Restoration Site, DMS Project #96920</b>										
<b>Species</b>	<b>Current Plot Data (MY00 2017)</b>									
	<b>Plot 01</b>		<b>Plot 02</b>		<b>Plot 03</b>		<b>Plot 04</b>		<b>Plot 05</b>	
	<b>Planted</b>	<b>Total</b>	<b>Planted</b>	<b>Total</b>	<b>Planted</b>	<b>Total</b>	<b>Planted</b>	<b>Total</b>	<b>Planted</b>	<b>Total</b>
Oak ( <i>Quercus sp.</i> )							1	1		
Tulip Poplar ( <i>Liriodendron tulipifera</i> )					2	2	1	1		
Unknown	18	18	16	16	17	17	24	24	18	18
<b>Stem count</b>	18	18	16	16	19	19	26	26	18	18
<b>size (ares)</b>	1		1		1		1		1	
<b>size (ACRES)</b>	0.025		0.025		0.025		0.025		0.025	
<b>Species count</b>	1	1	1	1	2	2	3	3	1	1
<b>Stems per ACRE</b>	728	728	647	647	769	769	1052	1052	728	728
<b>Species</b>	<b>Current Plot Data (MY00 2017)</b>						<b>Annual Means</b>			
	<b>Plot 06</b>		<b>Plot 07</b>		<b>Plot 08</b>		<b>MY00 (2017)</b>			
	<b>Planted</b>	<b>Total</b>	<b>Planted</b>	<b>Total</b>	<b>Planted</b>	<b>Total</b>	<b>Planted</b>	<b>Total</b>		
Oak ( <i>Quercus sp.</i> )							1	1		
Tulip Poplar ( <i>Liriodendron tulipifera</i> )	1	1					4	4		
Unknown	18	18	15	15	13	13	139	139		
<b>Stem count</b>	19	19	15	15	13	13	144	144		
<b>size (ares)</b>	1		1		1		8			
<b>size (ACRES)</b>	0.025		0.025		0.025		0.20			
<b>Species count</b>	2	2	1	1	1	1	3	3		
<b>Stems per ACRE</b>	769	769	607	607	526	526	728	728		

# **APPENDIX D**

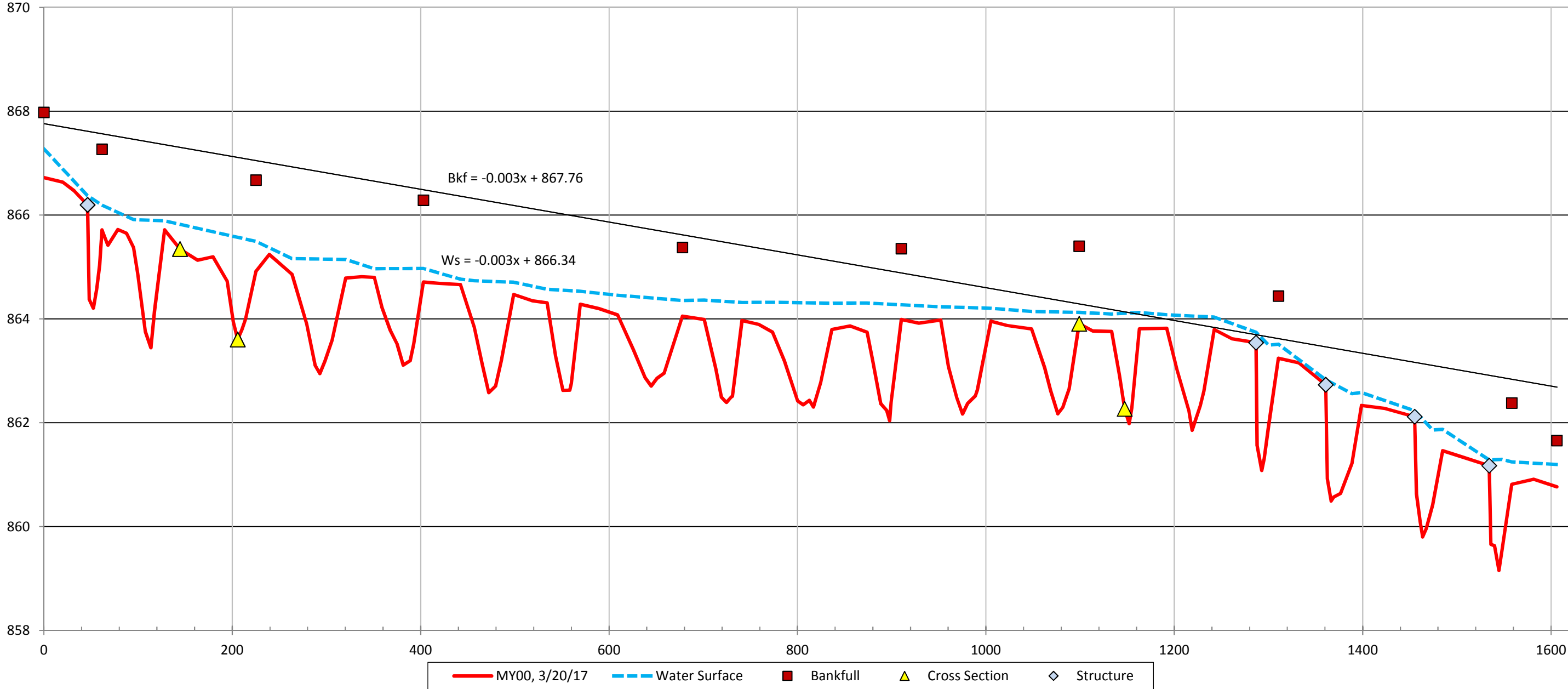
## Stream Measurement and Geomorphology Data

<b>Table 6. Baseline Stream Data Summary</b>															
<b>Sandy Bridge Farm Stream Restoration Site, DMS Project #96920</b>															
<b>Parameter</b>	<b>Pre-Existing Condition</b>					<b>Reference Reach(es) Data</b>					<b>Design</b>	<b>As-built</b>			
<b>Dimension - Riffle</b>	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Proposed	Min	Mean	Max	n
Bankfull Width (ft)	31.5	32.9	33.0	34.0	4	14.8	16.7		18.6	2	15.0	15.4	17.2	18.9	2
Floodprone Width (ft)	60.9	72.9	69.3	92.0	4	>40	>47		>55	2	>38	>60	>68	>70	2
Bankfull Mean Depth (ft)	2.1	2.2	2.2	2.5	4	1.3	1.5		1.7	2	0.9	0.7	0.8	0.9	2
Bankfull Max Depth (ft)	3.1	3.4	3.4	3.7	4	1.9	2.2		2.4	2	1.3	1.5	1.5	1.5	2
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	66.6	73.2	71.2	84.0	4	25.0	25.1		25.1	2	12.7	13.2	13.5	13.8	2
Width/Depth Ratio	13.5	14.8	14.9	16.0	4	8.8	11.3		13.8	2	17.7	17.3	22.1	27.0	2
Entrenchment Ratio	1.9	2.2	2.2	2.7	4	>2.5	>2.5		>2.5	2	>2.5	3.8	4.0	4.1	2
Bank Height Ratio	1.1	1.4	1.3	1.7	4	1.2	1.4		1.5	2	1.0	1.0	1.0	1.0	2
<b>Pattern</b>															
Channel Beltwidth (ft)			*			60				1	35-60	35		60	1
Radius of Curvature (ft)			*			16			87	1	30-50	30		50	1
Rc:Bankfull width (ft/ft)			*			0.9			5.9	1	2.0-3.3	2.0		3.3	1
Meander Wavelength (ft)			*			66			191	1	134-160	134		160	1
Meander Width Ratio			*			4.1				1	8.9-10.7	8.9		10.7	1
<b>Profile</b>															
Riffle Length (ft)												23	40	56	20
Riffle Slope (ft/ft)	0.000			0.010	2	0.013			0.035	2	0.002-0.008	0.000	0.006	0.014	20
Pool Length (ft)	*					14			33	2	17-55	11	22	39	20
Pool Spacing (ft)	*					50			105	2	55-90	25.9	78.3	102.2	19
<b>Substrate and Transport Parameters</b>															
SC% / Sa% / G% / C% / B% / Be%	18%/39%/43%/1%/0%/0%										66%/2%/22%/10%/1%/0%				
d16 / d35 / d50 / d84 / d95 (mm)	0.076/1.2/3.3/5.2/9.4/18										0.062/0.5/17.5/25.5/40/90				
Channel length (ft)	1,470										1,626	1,626			
Drainage Area (SM)	1.31					1.49					1.31	1.31			
Rosgen Classification	E4-G4					C4					C4	C4			
Sinuosity	1.0					1.3					1.2	1.2			
Water Surface Slope (ft/ft)	0.0043					0.0050					0.0038	0.0027			

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

<b>Table 7. Cross-Section Morphology Data Tables</b>														
<b>Sandy Bridge Farm Stream Restoration Site, DMS Project #96920</b>														
Dimension and Substrate	Cross-Section 1 (Riffle) Station 14+75							Cross-Section 2 (Pool) Station 16+40						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
<b>Based on fixed baseline elevation</b>														
Bankfull Width (ft)	15.4							18.8						
Floodprone Width (ft)	>60							-						
Bankfull Mean Depth (ft)	0.9							1.4						
Bankfull Max Depth (ft)	1.5							2.7						
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	13.8							26.8						
Bankfull Width/Depth Ratio	17.3							-						
Bankfull Entrenchment Ratio	4.1							-						
Bankfull Bank Height Ratio	1.0							-						
d50 (mm)	35							-						
Dimension and Substrate	Cross-Section 3 (Riffle) Station 101+73							Cross-Section 4 (Pool) Station 105+67						
	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
<b>Based on fixed baseline elevation</b>														
Bankfull Width (ft)	15.7							18.7						
Floodprone Width (ft)	>70							-						
Bankfull Mean Depth (ft)	0.8							1.5						
Bankfull Max Depth (ft)	1.5							3.0						
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	13.1							28.8						
Bankfull Width/Depth Ratio	18.8							-						
Bankfull Entrenchment Ratio	4.6							-						
Bankfull Bank Height Ratio	1.0							-						
d50 (mm)	0.062							-						

Longitudinal Profile  
Sandy Bridge Farm Restoration Site  
DMS Project Number - 96920  
Station 10+00 - 16+26





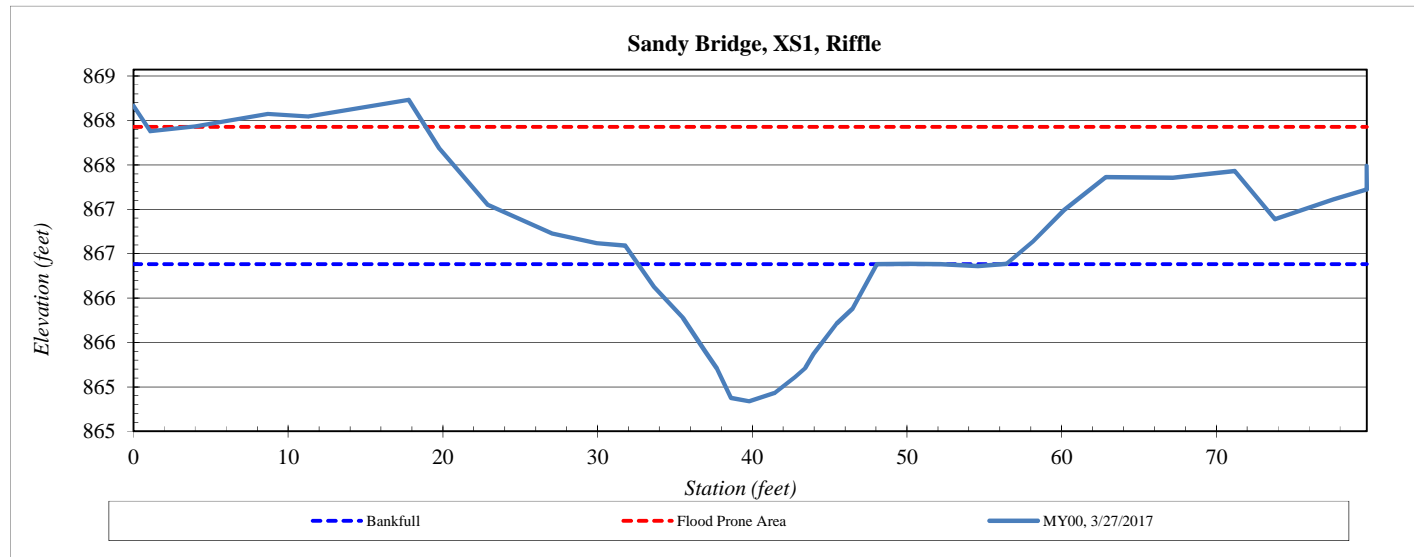
## Cross-Section Plots

<b>River Basin:</b>	Broad
<b>Site:</b>	Sandy Bridge
<b>XS ID</b>	XS1, Riffle
<b>Drainage Area:</b>	837 acres
<b>Date:</b>	3/27/2017
<b>Field Crew:</b>	T. Seelinger, Kevin O'Briant



Station	Elevation
0.0	868.5
1.1	868.2
4.0	868.3
8.7	868.4
11.3	868.4
17.8	868.6
19.8	868.0
22.9	867.4
27.1	867.1
30.0	867.0
31.8	866.9
33.7	866.5
35.5	866.1
36.9	865.7
37.7	865.5
38.6	865.2
39.8	865.2
41.4	865.3
42.8	865.4
43.4	865.5
44.0	865.7
45.4	866.1
46.5	866.2
48.1	866.7
50.1	866.7
52.2	866.7
56.4	866.7
58.2	867.0
60.2	867.3
62.9	867.7
67.2	867.7
71.2	867.8
73.8	867.2
79.7	867.6
79.7	867.8

SUMMARY DATA	
<b>Bankfull Elevation:</b>	866.72
<b>Bankfull Cross-Sectional Area:</b>	13.8
<b>Bankfull Width:</b>	15.4
<b>Flood Prone Area Elevation:</b>	868.3
<b>Flood Prone Width:</b>	63.6
<b>Max Depth at Bankfull:</b>	1.5
<b>Mean Depth at Bankfull:</b>	0.9
<b>W / D Ratio:</b>	17.3
<b>Entrenchment Ratio:</b>	4.1
<b>Bank Height Ratio:</b>	1.0



## Cross-Section Plots

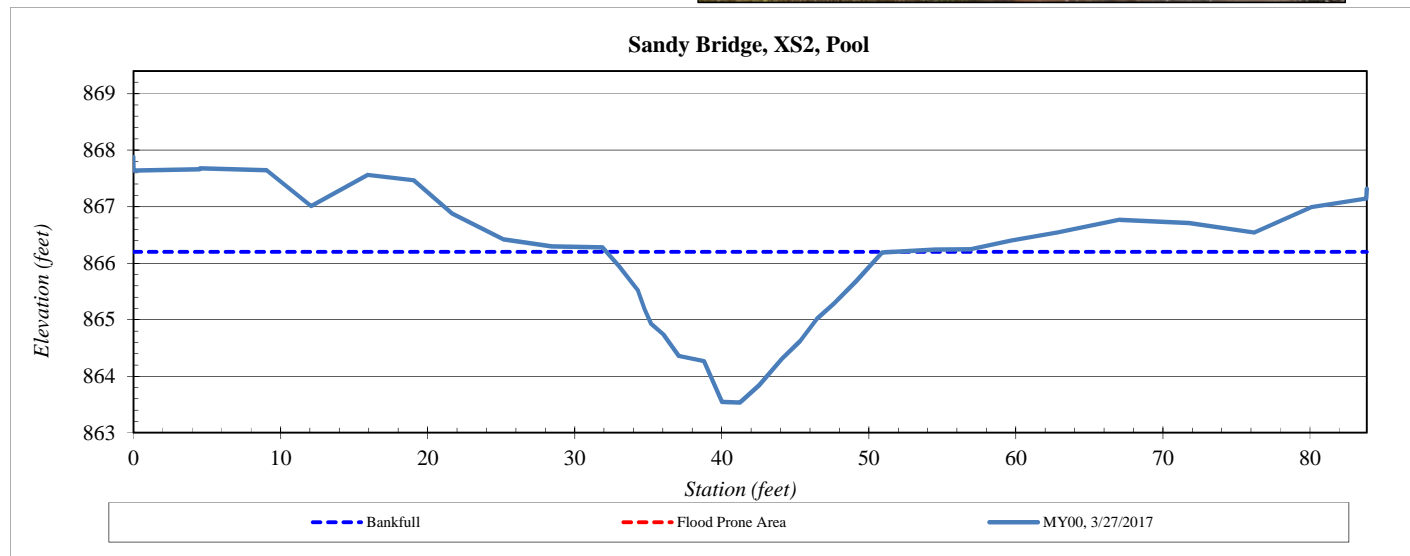
<b>River Basin:</b>	Broad
<b>Site:</b>	Sandy Bridge
<b>XS ID</b>	XS2, Pool
<b>Drainage Area:</b>	837 acres
<b>Date:</b>	3/27/2017
<b>Field Crew:</b>	T. Seelinger, Kevin O'Briant



Station	Elevation
0.0	868.3
0.0	868.1
4.5	868.1
4.5	868.1
9.1	868.1
12.1	867.5
15.9	868.0
19.1	867.9
21.7	867.3
28.4	866.8
31.9	866.7
34.8	865.7
35.2	865.4
36.0	865.2
37.1	864.8
40.0	864.0
41.2	864.0
42.5	864.3
44.1	864.8
45.3	865.1
46.5	865.5
47.6	865.7
49.1	866.1
50.9	866.7
51.7	866.7
54.5	866.7
57.0	866.7
59.7	866.9
62.8	867.0
67.0	867.2
71.8	867.2
76.2	867.0
80.1	867.5
83.8	867.6
83.9	867.8

SUMMARY DATA	
<b>Bankfull Elevation:</b>	866.66
<b>Bankfull Cross-Sectional Area:</b>	26.8
<b>Bankfull Width:</b>	18.8
<b>Flood Prone Area Elevation:</b>	-
<b>Flood Prone Width:</b>	-
<b>Max Depth at Bankfull:</b>	2.7
<b>Mean Depth at Bankfull:</b>	1.4
<b>W / D Ratio:</b>	-
<b>Entrenchment Ratio:</b>	-
<b>Bank Height Ratio:</b>	1.0

**Sandy Bridge, XS2, Pool**



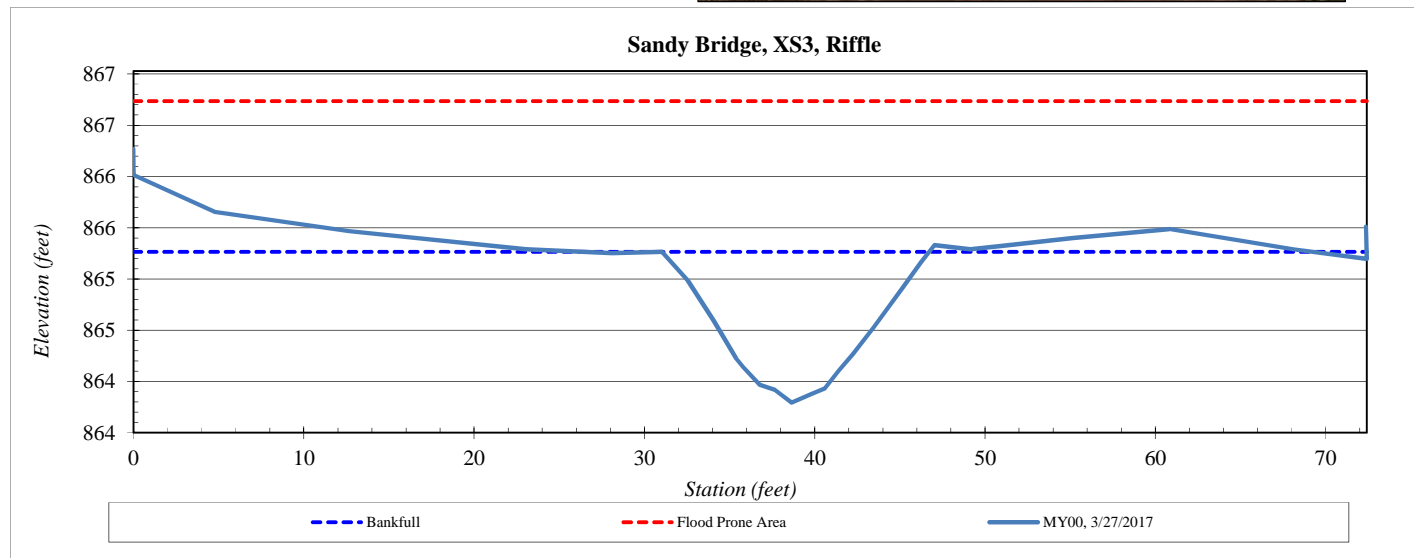
## Cross-Section Plots

<b>River Basin:</b>	Broad
<b>Site:</b>	Sandy Bridge
<b>XS ID</b>	XS3, Riffle
<b>Drainage Area:</b>	837 acres
<b>Date:</b>	3/27/2017
<b>Field Crew:</b>	T. Seelinger, Kevin O'Briant



Station	Elevation
0.0	866.3
0.0	866.0
4.8	865.7
12.7	865.5
23.1	865.3
28.1	865.3
31.0	865.3
32.6	865.0
34.1	864.6
35.4	864.3
35.8	864.2
36.8	864.0
37.7	863.9
38.6	863.8
39.8	863.9
40.6	864.0
41.4	864.1
42.3	864.3
43.5	864.6
45.1	864.9
46.2	865.2
47.0	865.4
49.1	865.3
51.2	865.4
55.1	865.4
60.8	865.5
68.2	865.3
72.4	865.2
72.4	865.5

SUMMARY DATA	
<b>Bankfull Elevation:</b>	865.29
<b>Bankfull Cross-Sectional Area:</b>	13.1
<b>Bankfull Width:</b>	15.7
<b>Flood Prone Area Elevation:</b>	866.8
<b>Flood Prone Width:</b>	72.4
<b>Max Depth at Bankfull:</b>	1.5
<b>Mean Depth at Bankfull:</b>	0.8
<b>W / D Ratio:</b>	18.8
<b>Entrenchment Ratio:</b>	4.6
<b>Bank Height Ratio:</b>	1.0



## Cross-Section Plots

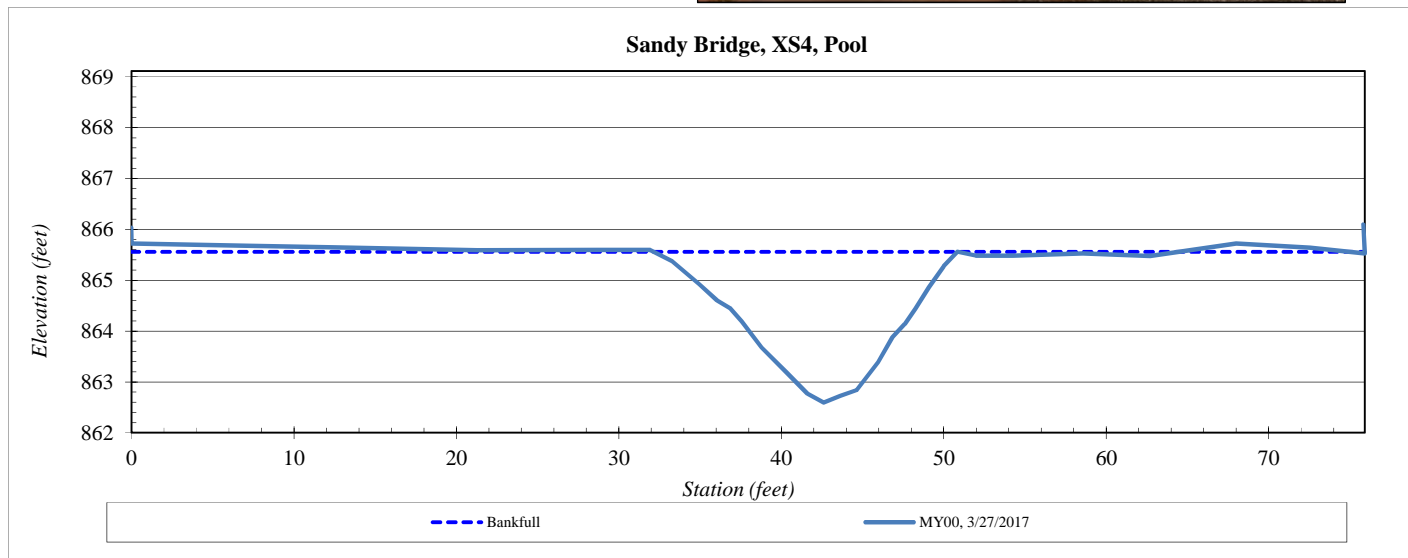
<b>River Basin:</b>	Broad
<b>Site:</b>	Sandy Bridge
<b>XS ID</b>	XS4, Pool
<b>Drainage Area:</b>	837 acres
<b>Date:</b>	3/27/2017
<b>Field Crew:</b>	T. Seelinger, Kevin O'Briant



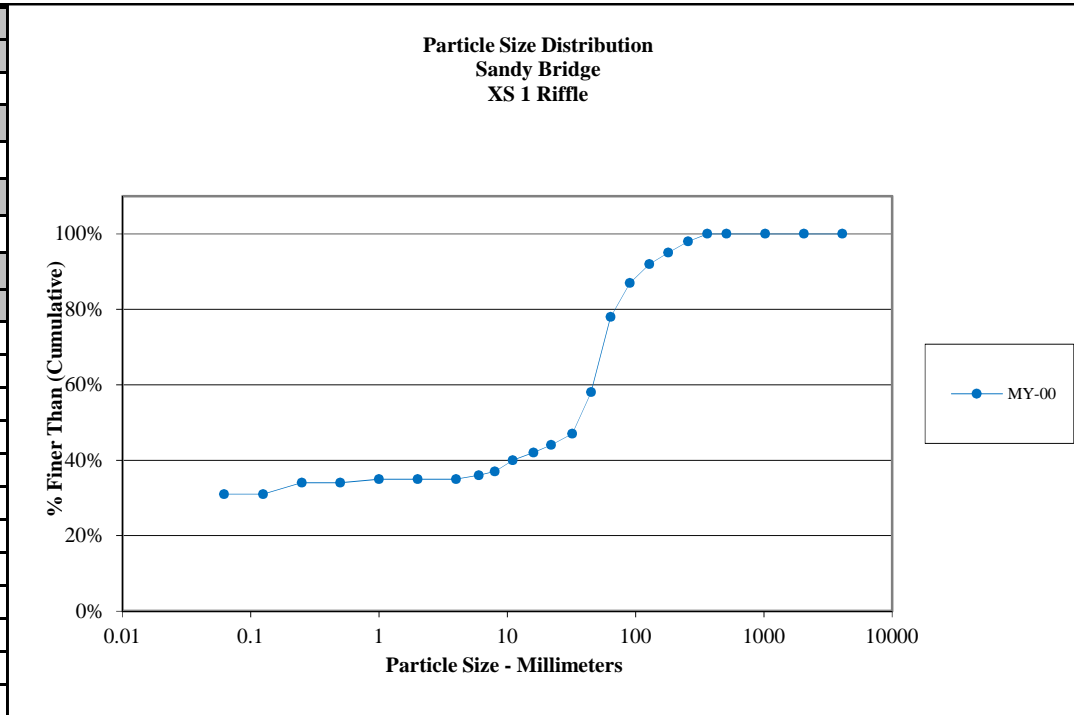
Station	Elevation
0.0	865.7
0.0	865.4
7.1	865.4
12.5	865.4
21.3	865.3
28.7	865.3
31.9	865.3
33.3	865.1
35.0	864.6
36.1	864.3
36.8	864.2
37.6	863.9
38.8	863.4
40.3	862.9
41.6	862.5
42.6	862.3
43.6	862.4
44.6	862.5
46.0	863.1
46.9	863.6
47.6	863.8
48.2	864.1
49.1	864.6
50.0	865.0
50.8	865.3
52.0	865.2
54.2	865.2
58.6	865.2
62.7	865.2
68.0	865.4
72.5	865.3
75.9	865.2
75.8	865.8

SUMMARY DATA	
<b>Bankfull Elevation:</b>	865.26
<b>Bankfull Cross-Sectional Area:</b>	28.8
<b>Bankfull Width:</b>	18.7
<b>Flood Prone Area Elevation:</b>	-
<b>Flood Prone Width:</b>	-
<b>Max Depth at Bankfull:</b>	3.0
<b>Mean Depth at Bankfull:</b>	1.5
<b>W / D Ratio:</b>	-
<b>Entrenchment Ratio:</b>	-
<b>Bank Height Ratio:</b>	1.0

**Sandy Bridge, XS4, Pool**

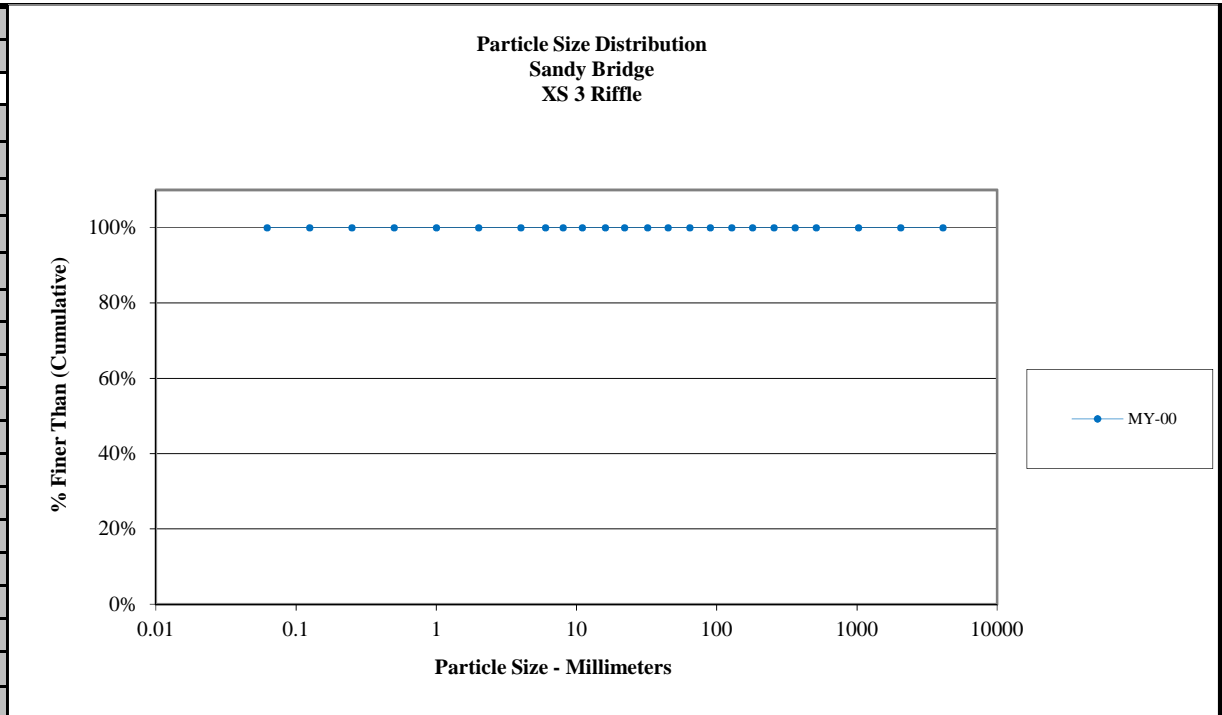


Cross-Section 1 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	31
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	3
Medium	.25 - .50	N	
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	3
Very Coarse	32 - 45	S	11
Very Coarse	45 - 64		20
Small	64 - 90	C	9
Small	90 - 128	O	5
Large	128 - 180	B	3
Large	180 - 256	L	3
Small	256 - 362	B	2
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	100
Note:			



Size (mm)		Type	
D16	0.062	silt/clay	31%
D35	1	sand	4%
D50	35	gravel	43%
D65	51	cobble	20%
D84	80	boulder	2%
D95	180	bedrock	0%
		hardpan	0%
		wood/det	0%
		artificial	0%

Cross-Section 3 Riffle - MY-00			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
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	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45		
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
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	
		<b>Total</b>	100
Note:			



Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%