Jacob's Ladder
Stream Restoration Monitoring Report
DMS Project # 95023
DMS Contract # 003983
Monitoring Year 02

Submitted to:

NCDEQ-DMS, 1652 Mail Service Center, Raleigh, NC 27699-1652

Construction Completed: January 2014
Data Collection: 2015
Submitted: January 2016

Design and Monitoring Firm

Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609
Phone: (919) 278-2514
Fax: (919) 783-9266

Project Manager: Adam Spiller
Email: adam.spiller@kci.com
Project No: 20110669

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1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

The Jacob's Ladder Stream Restoration Site is a full-delivery project that was developed for the North Carolina Division of Mitigation Services (DMS). Construction was completed in January 2014. The site restored a total of 4,971 linear feet and enhanced 446 linear feet along three tributaries to Irish Buffalo Creek in the Yadkin-Pee Dee River Basin. The project is located west of China Grove and north of Kannapolis off of Saw Road in Rowan County (Figure 1, Appendix A). This project will expand aquatic and terrestrial habitat in the Rocky River Watershed (03040105). The project is within the 03040105020040 Irish Buffalo Creek Local Watershed Unit (14-digit HUC) (NCDENR, EEP 2009). In the North Carolina Division of Mitigation Services' (DMS) most recent publication of excluded and Targeted Local Watersheds/Hydrologic Units, the 03040105020040 14-digit HUC has been identified as a Targeted Local Watershed. The project is located in the Piedmont Physiographic Province and the project streams initiate as headwater systems out of moderately-sloped, forested hills before reaching the floodplain of Irish Buffalo Creek. The site's 1.07-square mile project watershed is comprised predominantly of pasture and mixed hardwoods, with an area of rural residential development in the northeastern corner. Prior to construction, the site was actively used for timber and cattle production for over five generations.

The project goals and objectives are listed below.

Project Goals

- Restore a diverse riparian corridor that connects forested stream systems upstream and downstream of the project.
- Reduce the sediment supply entering Irish Buffalo Creek.

Project Objectives

- Restore stable channel planforms to streams that have been straightened and modified.
- Reshape and stabilize eroding stream banks.
- Plant the site with native trees to help reestablish a diverse riparian corridor.
- Install exclusion fencing and alternative watering options to keep livestock out of the project streams.

Vegetation success is based on the criteria established in the USACE Stream Mitigation Guidelines (2003). This document states that vegetation monitoring results should have the following planted stem density minimums in the corresponding monitoring years: 320 stems/acre through Year Three, 288 stems/acre in Year Four, and 260 stems/acre in Year Five. The second-year vegetation monitoring was based on the Level 2 CVS-EEP vegetation monitoring protocol. The site's average density for this monitoring period is 510 planted stems/acre, with none of the plots having live stakes in them. Thirteen of the sixteen plots had greater than 320 planted stems/acre. There are three monitoring plots that have calculated planted stem densities less than 320 stems/acre (Plots 6, 11, and 16). This is not seen as problematic given the high potential for desirable volunteers to become established in the plots and across the site. Like natural vegetative communities, some areas will have slightly higher densities than others, but the data from the vegetation monitoring plots reveal that the site has an adequate average stem density. To ensure continued vegetative success, some parts of the site received supplemental planting in early 2015. Including volunteers, the monitoring plots averaged 723 total stems/acre. The overall vegetation assessment found the site to be on track to meeting the vegetative success criterion.

Second-year monitoring found the Jacob's Ladder streams to be stable, with only minor changes from the as-built conditions. No areas show signs of serious bank erosion. The monitoring components were installed in February/March 2014. An automatic recording gauge has been installed on both T1 and T2. Both gauges recorded bankfull events in 2015. Additionally, during the end of year site visit, many clear signs of a recent bankfull event were observed. The monitoring plan for each tributary is as follows: T1 has a 1,500 foot longitudinal profile, 3

riffle cross-sections and 2 pool cross-sections; T2 has a 1,500 foot longitudinal profile, 4 riffle cross-sections and 1 pool cross-section; T1A is being monitored visually since it is small, partially intermittent, and a mix of mitigation types. Pebble counts were conducted at all ten cross-sections. Nine permanent photo points have been established with a total of nineteen photos to be taken annually. Monitoring year 2 found T1 functioning as designed with little change from the baseline conditions. Several areas along the upper and middle portion of T2 show signs of bed degradation compared to last year. This is likely a result of yearly fluctuations in bed elevation due to the large amount of sand input to the stream from upstream of the project. These areas will continue to be monitored closely to ensure they are not a threat to the stability of the system.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report and in the Mitigation Plan documents available on the DMS website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

2.0 METHODOLOGY

The survey data were collected with a total station instrument between August 4 and August 12, 2015.

The CVS-EEP protocol, Level 2 (http://cvs.bio.unc.edu/methods.htm) was used to collect vegetation data from the site. The vegetation monitoring was completed on July 28, 2015

3.0 REFERENCES

Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation, Version 4.2 (http://cvs.bio.unc.edu/methods.htm)

NCDENR, Ecosystem Enhancement Program. 2009. Lower Yadkin Pee-Dee River Basin Priorities 2009. Raleigh, NC. http://www.nceep.net/services/restplans/Yadkin_Pee_Dee_RBRP_2009_Final.pdf

USACE. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

Appendix A

Project Vicinity Map and Background Tables

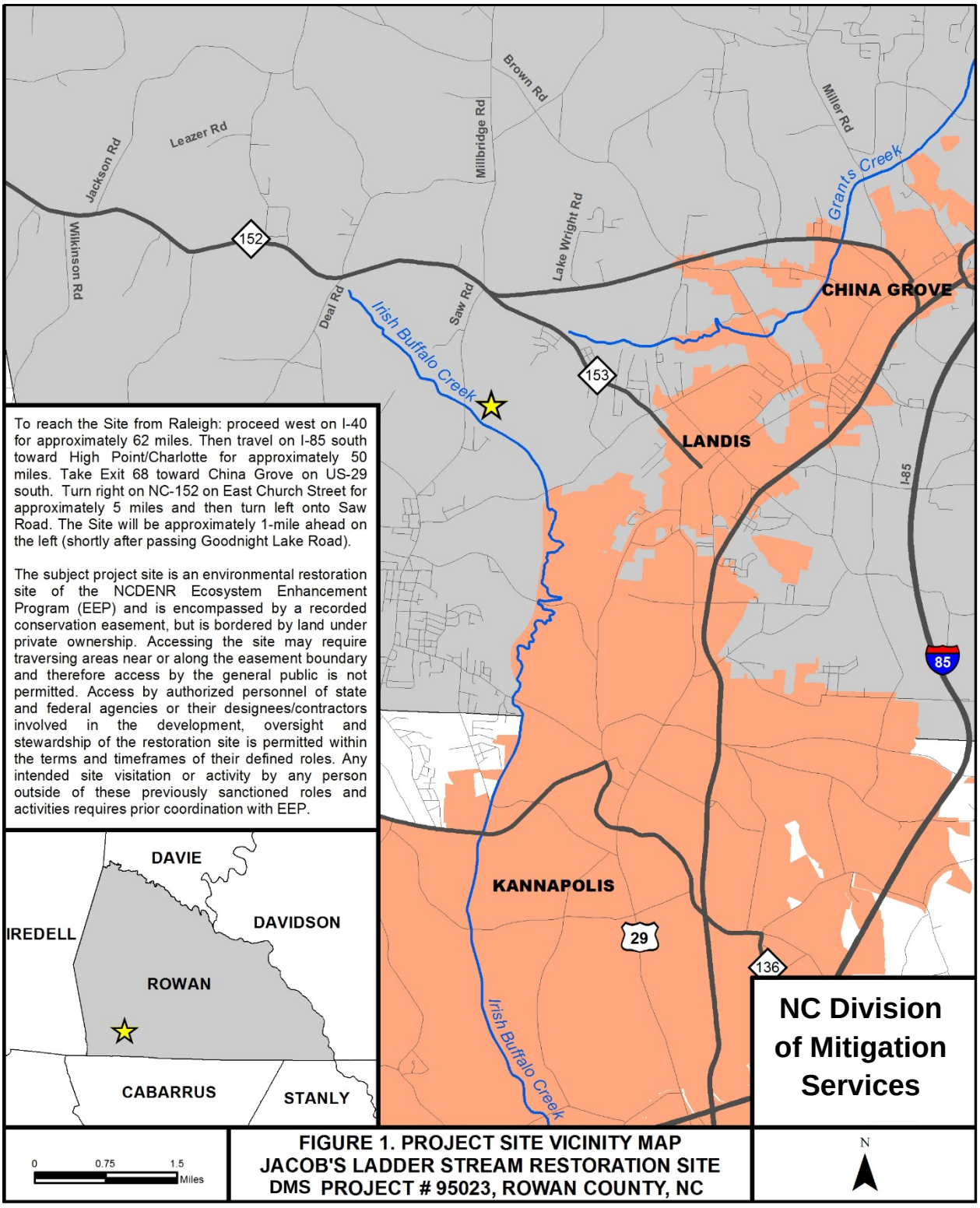


FIGURE 1. PROJECT SITE VICINITY MAP
JACOB'S LADDER STREAM RESTORATION SITE
DMS PROJECT # 95023, ROWAN COUNTY, NC

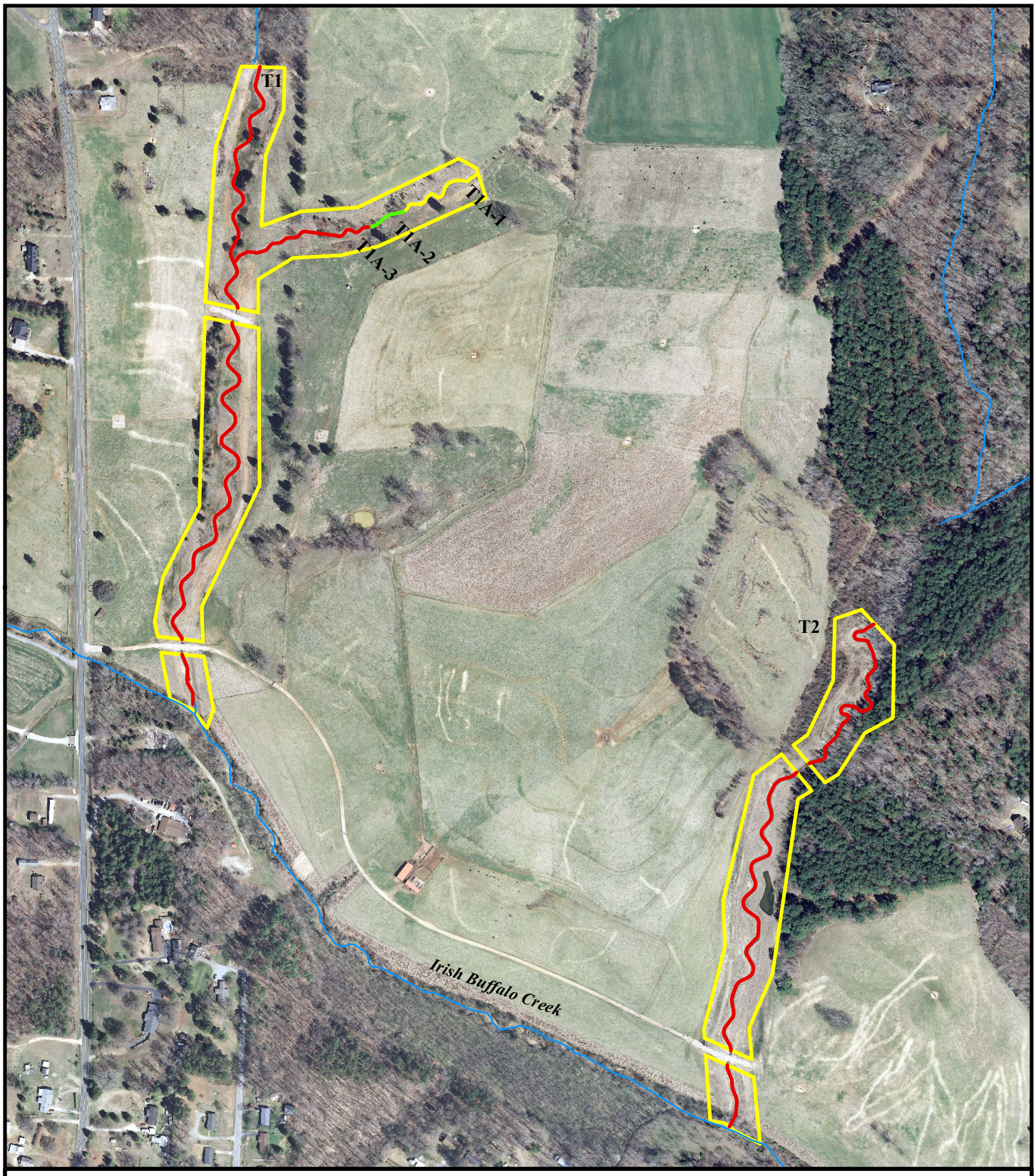


Figure 2. Site Asset Map

KCI

- Restoration
- Enhancement I
- Enhancement II
- Other Streams
- Conservation Easement

1:5,400
1 inch = 450 feet

N

440 220 0 440 Feet

Image Source: NC State Orthoimagery, 2014

Table 1. Project Components and Mitigation Credits
Jacob's Ladder Stream Restoration Site, DMS Project # 95023

Mitigation Credits							
	Stream			Riparian Wetland	Non-riparian Wetland	Buffer	Nitrogen Nutrient Offset
Type	R	EI	EII				
Length	4,971	306	140				
Credits	4,971	204	56				
TOTAL CREDITS	5,231						

Project Components						
Project Component -or- Reach ID	**Design Stationing/ Location**	**Existing Footage**	**Approach (P1, P2 etc.)**	**Restoration -or- Restoration Equivalent**	**Restoration Footage**	**Mitigation Ratio**
T1	10+00-34+89*	1,809	P1	Restoration	2,389*	1:1
T1A-1	50+00-53+06	306	-	Enhancement I	306	1:1.5
T1A-2	53+06-54+46	140	-	Enhancement II	140	1:2.5
T1A-3	54+46-59+44	470	P1	Restoration	498	1:1
T2	99+75-121+60*	1,246	P1	Restoration	2,084*	1:1

Component Summation		
Restoration Level	**Stream (linear feet)**	**Mitigation Units (SMU)**
Restoration	4,971	4,971
Enhancement I	306	204
Enhancement II	140	56

*Mitigation units have been calculated to exclude the easement exceptions and water utility easements.

There were no BMP elements included in this project.

Table 2. Project Activity & Reporting History Jacob's Ladder Stream Restoration Site, DMS Project # 95023		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Mitigation Plan		Sept 12
Final Design - Construction Plans		Dec 12
Construction		Aug 13
Planting		Jan 14
Baseline Monitoring/Report	Feb/March 14	April 14
Year 1 Monitoring	Nov 14	Jan 15
Supplemental Planting		March 15
Year 2 Monitoring	August 15	Dec 15

Table 3. Project Contacts Jacob's Ladder Stream Restoration Site, DMS Project # 95023	
Design Firm	KCI Associates of North Carolina, PC Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor	Wright Contracting, LLC 160 Walker Road Lawndale, NC 28090 Contact: Mr. Stephen James Phone: (704) 692-4633
Planting Contractor	Forestree Management Co. 1280 Maudis Road Bailey, NC 27807 Contact: Mr. Tony Cortez Phone: (252) 243-2513
Monitoring Performers	
MY00- MY02	KCI Associates of North Carolina, PC Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4. Project Information **Jacob's Ladder Stream Restoration Site, DMS Project # 95023**			
Project Name	Jacob's Ladder Stream Restoration Site		
County	Rowan County		
Project Area (acres)	17.2 acres		
Project Coordinates (lat. and long.)	35.552956 N, 80.653116 W		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Yadkin-Pee Dee		
USGS Hydrologic Unit 8-digit	03040105	USGS Hydrologic Unit 14-digit	03040105020040
DWQ Sub-basin	13-17-09		
Project Drainage Area	682 acres/1.06 square miles		
Project Drainage Area Percentage of Impervious Area	1.1%/8 acres		
CGIA Land Use Classification	15.8% Cultivated, 35.1% Managed Herbaceous Cover, 41.6% Mixed Upland Hardwoods, 6.9% Mixed Hardwoods/Conifers, and 0.5% Southern Yellow Pine		
Reach Summary Information (Post-Restoration)			
Parameters	**T1**	**T1A-1, T1A-2, T1A-3**	**T2**
Length of reach (linear feet)	2,389	944	2,084
Valley classification	VIII	VIII	VIII
Drainage area (acres)	231.6 acres	34.5 acres	450.1 acres
NCDWQ Water Quality Classification	Class C, WSIII	Class C, WSIII	Class C, WSIII
Morphological Description (stream type)	C4	B4c/C4	C4
Evolutionary trend	Stage II (Constructed)	Stage II (Constructed)	Stage II (Constructed)
Mapped Soil Series	Chewacla loam	Pacolet sandy loam	Pacolet sandy loam & Chewacla loam
Drainage class	Poorly drained	Well drained	Well drained
Soil Hydric status	Non hydric	Non hydric	Non hydric
Slope	0-2%	0-2%	0-2%
FEMA classification	AE (portion in backwater of Irish Buffalo Creek only)	N/A	AE (portion in backwater of Irish Buffalo Creek only)
Native vegetation community	Piedmont Alluvial Forest	Mesic Mixed Hardwood Forest & Piedmont Alluvial Forest	Piedmont Alluvial Forest
Percent composition of exotic invasive vegetation	0%	0%	0%
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Yes, received 404 permit	N/A
Waters of the United States – Section 401	Yes	Yes, received 401 permit	N/A
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	Yes	Floodplain development permit completed through Rowan County	N/A
Essential Fisheries Habitat	No	N/A	N/A

Appendix B

Visual Assessment Data

REVISIONS		
SYM.	DESCRIPTION	DATE

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

JACOB'S LADDER STREAM MITIGATION PROJECT MONITORING YEAR 2

CHINA GROVE, ROWAN COUNTY, NORTH CAROLINA

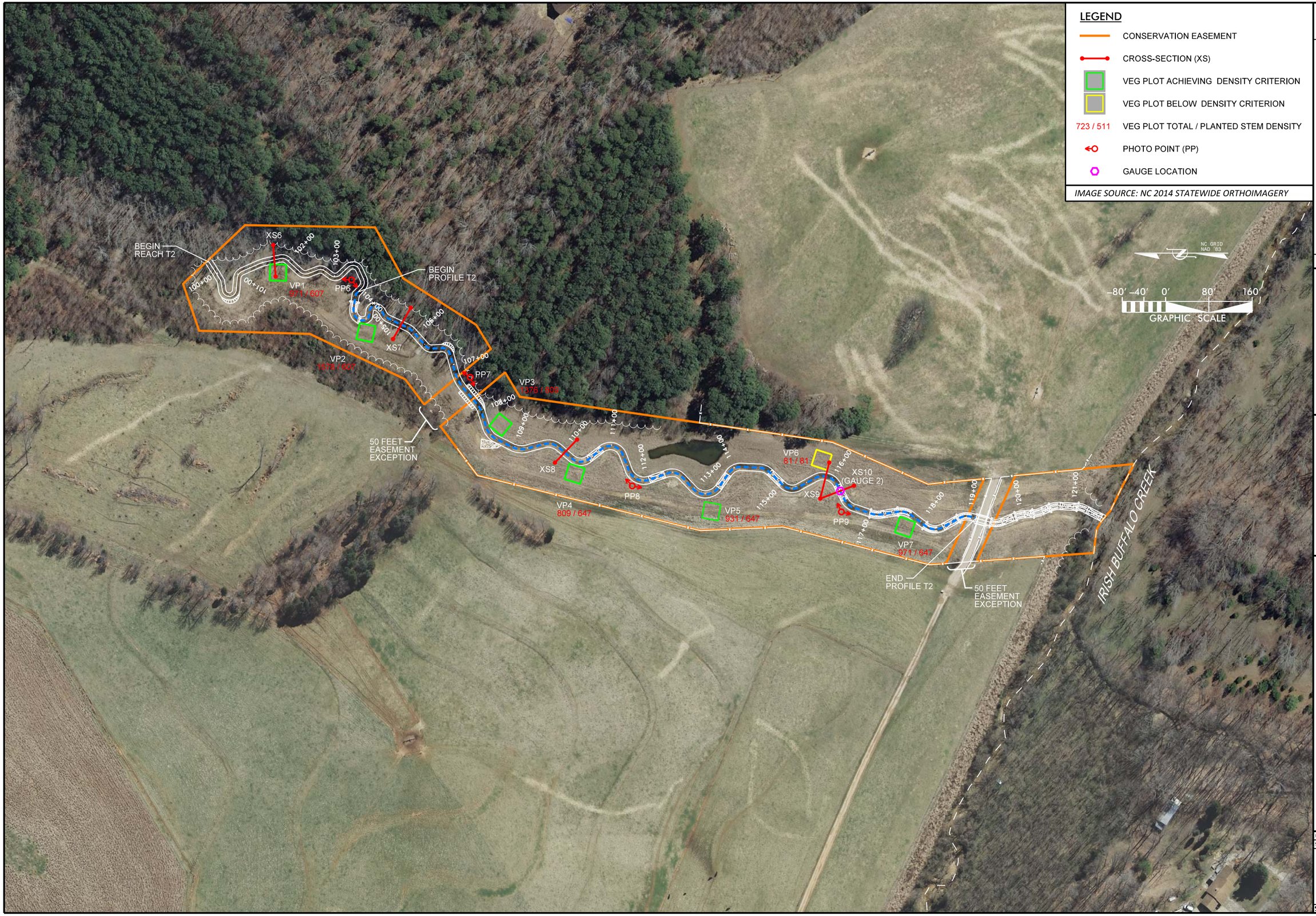
REACH T1

DATE: DEC 2015

SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

SHEET 1 OF 2



REVISIONS

SYM.	DESCRIPTION	DATE

NCDEQ DIVISION OF MITIGATION SERVICES

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4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

JACOB'S LADDER STREAM MITIGATION PROJECT MONITORING YEAR 2

CHINA GROVE, ROWAN COUNTY, NORTH CAROLINA

REACH T2

DATE: DEC 2015

SCALE: GRAPHIC

CURRENT CONDITION PLAN VIEW

Table 5. Visual Stream Morphology Stability Assessment
Jacob's Ladder Stream Restoration Site, DMS Project # 95023

Assessed Length 2,389 **Reach - T1**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			0	0	100%
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	21	22			95%
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	16	21			76%
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	16	21			76%
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	11	11			100%
		2. Thalweg centering at downstream of meander (Glide)	11	11			100%
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
				Totals	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	9	9			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	9	9			100%
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	2	2			100%
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			N/A

Table 5. Visual Stream Morphology Stability Assessment
Jacob's Ladder Stream Restoration Site, DMS Project # 95023
Assessed Length 2,084 **Reach - T2**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%
		2. Degradation - Evidence of downcutting			3	139	93%
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	20	20			100%
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	7	11			64%
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	7	11			64%
	4.**Thalweg Position**[+]	1. Thalweg centering at upstream of meander bend (Run)	10	10			N/A
		2. Thalweg centering at downstream of meander (Glide)	10	10			N/A
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%
				Totals	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	6	6			100%
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	6	6			100%
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	0	0			N/A
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	3	3			100%
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	0	0			N/A

Table 6. Vegetation Condition Assessment
Jacob's Ladder Stream Restoration Site, DMS Project # 95023

Planted Acreage 15.9 **Easement Acreage 17.2**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acre	Pattern and Color	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acre	Pattern and Color	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acre	Pattern and Color	0	0.00	0.0%
			Cumulative Total	0	0.00	0.0%
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1,000 SF	Pattern and Color	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

Photo Reference Points

PP1U – MY-00 – 3/11/14

PP1U – MY02 – 12/17/15

PP1D – MY-00 – 3/11/14

PP1D – MY02 – 12/17/15

PP2U – MY-00 – 3/11/14

PP2U – MY02 – 12/17/15

PP2D – MY-00 – 3/11/14

PP2D – MY02 – 12/17/15

PP3 Tributary – MY-00 – 3/11/14

PP3 Tributary – MY02 – 12/17/15

PP3U – MY-00 – 3/11/14

PP3U – MY02 – 12/17/15

PP3D – MY-00 – 3/11/14

PP3D – MY02 – 12/17/15

PP4U – MY-00 – 3/11/14

PP4U – MY02 – 12/17/15

PP4D – MY-00 – 3/11/14

PP4D – MY02 – 12/17/15

PP5U – MY-00 – 3/11/14

PP5U – MY02 – 12/17/15

PP5D – MY-00 – 3/11/14

PP5D – MY02 – 12/17/15

PP6U – MY-00 – 3/11/14

PP6U – MY02 – 12/17/15

PP6D – MY-00 – 3/11/14

PP6D – MY02 – 12/17/15

PP7U – MY-00 – 3/11/14

PP7U – MY02 – 12/17/15

PP7D – MY-00 – 3/11/14

PP7D – MY02 – 12/17/15

PP8U – MY-00 – 3/11/14

PP8U – MY02 – 12/17/15

PP8D – MY-00 – 3/11/14

PP8D – MY02 – 12/17/15

PP9U – MY-00 – 3/11/14

PP9U – MY02 – 12/17/15

PP9D – MY-00 – 3/11/14

PP9D – MY02 – 12/17/15

Vegetation Monitoring Plot Photos

Plot 1 Photo: 7/28/15 – MY02

Plot 2 Photo: 7/28/15 – MY02

Plot 3 Photo: 7/28/15 – MY02

Plot 4 Photo: 7/28/15 – MY02

Plot 5 Photo: 7/28/15 – MY02

Plot 6 Photo: 7/28/15 – MY02

Plot 7 Photo: 7/28/15 – MY02

Plot 8 Photo: 7/28/15 – MY02

Plot 9 Photo: 7/28/15 – MY02

Plot 10 Photo: 7/28/15 – MY02

Plot 11 Photo: 7/28/15 – MY02

Plot 12 Photo: 7/28/15 – MY02

Plot 13 Photo: 7/28/15 – MY02

Plot 14 Photo: 7/28/15 – MY02

Plot 15 Photo: 7/28/15 – MY02

Plot 16 Photo: 7/28/15 – MY02

Appendix C

Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment Jacob's Ladder Stream Restoration Site, DMS Project # 95023			
Vegetation Plot ID	**Vegetation Survival Threshold Met?**	**Monitoring Year 02 Planted Stem Density (stems/acre)**	**Monitoring Year 02 Total Stem Density (stems/acre)**
1	Yes	607	971
2	Yes	607	1,578
3	Yes	809	1,376
4	Yes	647	809
5	Yes	647	931
6	No	81	81
7	Yes	647	971
8	Yes	324	324
9	Yes	486	486
10	Yes	769	1093
11	No	162	162
12	Yes	688	809
13	Yes	567	647
14	Yes	486	688
15	Yes	405	405
16	No	243	243

Table 8. CVS Vegetation Plot Metadata Jacob's Ladder Stream Restoration Site, DMS Project # 95023	
Report Prepared By	Bethany Williams
Date Prepared	7/31/2015 13:20
database name	KCI-2014-J.mdb
database location	M:\2011\20110669-Jacobs Ladder\Monitoring\Vegetaton CVS Database
computer name	12-3ZV4FP1
file size	61652992
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	95023
project Name	Jacobs Ladder
Description	Stream Restoration Site
River Basin	Yadkin-Pee Dee
length(ft)	5417
area (sq m)	1.06
Required Plots (calculated)	16
Sampled Plots	16

Table 9. CVS Stem Count Total and Planted by Plot and Species

			Current Plot Data (MY2 2015)																									
			95023-01-0001			95023-01-0002			95023-01-0003			95023-01-0004			95023-01-0005			95023-01-0006			95023-01-0007			95023-01-0008			95023-01-0009		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder	Tree						5																				
Acer rubrum	Red Maple	Tree			1																							
Alnus serrulata	Hazel Alder	Shrub				1	1	1							1	1	1										2	2	2
Baccharis halimifolia	Eastern Baccharis	Shrub						2																				
Betula nigra	River Birch	Tree				7	7	7	6	6	6				3	3	3	1	1	1	1	1	1	2	2	2	2	2	2
Callicarpa americana	American Beautyberry	Shrub										2	2	2							1	1	1				1	1	1
Diospyros virginiana	Common Persimmon	Tree			4	1	1	1																				
Fraxinus pennsylvanica	Green Ash	Tree	5	5	5	1	1	1	5	5	5	10	10	10	3	3	3				6	6	6	4	4	4	5	5	5
Liquidambar styraciflua	Sweetgum	Tree			2			1			2			2														
Liriodendron tulipifera	Tuliptree	Tree	5	5	5	2	2	2	5	5	5	2	2	2	5	5	5	1	1	1	1	1	1						
Pinus taeda	Loblolly Pine	Tree						1			1																		
Platanus occidentalis	American Sycamore	Tree			1				1	1	1	1	1	1							1	1	1	1	1	1			
Populus deltoides	Eastern Cottonwood	Tree						1													2	2	2						
Quercus	Oak	Tree																											
Quercus alba	White Oak	Tree																											
Quercus michauxii	Swamp Chestnut Oak	Tree																											
Quercus nigra	Water Oak	Tree																											
Quercus palustris	Pin Oak	Tree																											
Quercus phellos	Willow Oak	Tree	5	5	5				1	1	1	1	1	1										1	1	1	1	1	1
Quercus rubra	Northern Red Oak	Tree																									1	1	1
Salix nigra	Black Willow	Tree			1	2	2	15	2	2	13			2	4	4	11				4	4	12						
Sambucus canadensis	Common Elderberry	Shrub				1	1	2																					
Unknown		Shrub or Tree																											
	Stem count		15	15	24	15	15	39	20	20	34	16	16	20	16	16	23	2	2	2	16	16	24	8	8	8	12	12	12
	size (ares)		1			1			1			1			1			1			1			1			1		
	size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
	Species count		3	3	8	7	7	12	6	6	8	5	5	7	5	5	5	2	2	2	7	7	7	4	4	4	6	6	6
	Stems per ACRE		607	607	971	607	607	1578	809	809	1376	647	647	809	647	647	931	81	81	81	647	647	971	324	324	324	486	486	486

Table 9. CVS Stem Count Total and Planted by Plot and Species cont'd.

Scientific Name	Common Name	Species Type	Current Plot Data (MY2 2015)																					Annual Means								
			95023-01-0010			95023-01-0011			95023-01-0012			95023-01-0013			95023-01-0014			95023-01-0015			95023-01-0016			MY2 (2015)			MY1 (2014)			MY0 (2014)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	Boxelder	Tree												1												6	1	1	2			
Acer rubrum	Red Maple	Tree																								1			1			
Alnus serrulata	Hazel Alder	Shrub							5	5	5													9	9	9	7	7	7			
Baccharis halimifolia	Eastern Baccharis	Shrub																								2						
Betula nigra	River Birch	Tree																1	1	1				23	23	23	17	17	24	39	39	39
Callicarpa americana	American Beautyberry	Shrub										7	7	7										11	11	11	9	9	9			
Diospyros virginiana	Common Persimmon	Tree	5	5	5						2													6	6	12	6	6	8	1	1	1
Fraxinus pennsylvanica	Green Ash	Tree	3	3	3	4	4	4	6	6	6	4	4	4	4	4	4	2	2	2	4	4	4	66	66	66	32	32	32			
Liquidambar styraciflua	Sweetgum	Tree			8						1			1			3									20			7			
Liriodendron tulipifera	Tuliptree	Tree										2	2	2				3	3	3				26	26	26	15	15	15	40	40	40
Pinus taeda	Loblolly Pine	Tree																								2						
Platanus occidentalis	American Sycamore	Tree										1	1	1	5	5	5				2	2	2	12	12	13	15	15	17	62	62	62
Populus deltoides	Eastern Cottonwood	Tree															1							2	2	4	2	2	8			
Quercus	Oak	Tree																									1	1	1	2	2	2
Quercus alba	White Oak	Tree	1	1	1										1	1	2							2	2	3			1			
Quercus michauxii	Swamp Chestnut Oak	Tree																1	1	1				1	1	1						
Quercus nigra	Water Oak	Tree																												1	1	1
Quercus palustris	Pin Oak	Tree	10	10	10																			10	10	10	7	7	7			
Quercus phellos	Willow Oak	Tree							6	6	6				2	2	2	2	2	2				19	19	19	17	17	17	24	24	24
Quercus rubra	Northern Red Oak	Tree																						1	1	1	1	1	1			
Salix nigra	Black Willow	Tree																						12	12	54	14	14	26	13	13	13
Sambucus canadensis	Common Elderberry	Shrub																						1	1	2			2			
Unknown		Shrub or Tree																1	1	1				1	1	1	6	6	6	51	51	51
Stem count			19	19	27	4	4	4	17	17	20	14	14	16	12	12	17	10	10	10	6	6	6	202	202	286	150	150	191	233	233	233
size (ares)			1			1			1			1			1			1			1			16			16			16		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.40			0.40			0.40		
Species count			4	4	5	1	1	1	3	3	5	4	4	6	4	4	6	6	6	6	2	2	2	16	16	21	15	15	19	9	9	9
Stems per ACRE			769	769	1093	162	162	162	688	688	809	567	567	647	486	486	688	405	405	405	243	243	243	511	511	723	379	379	483	589.3	589.3	589.3

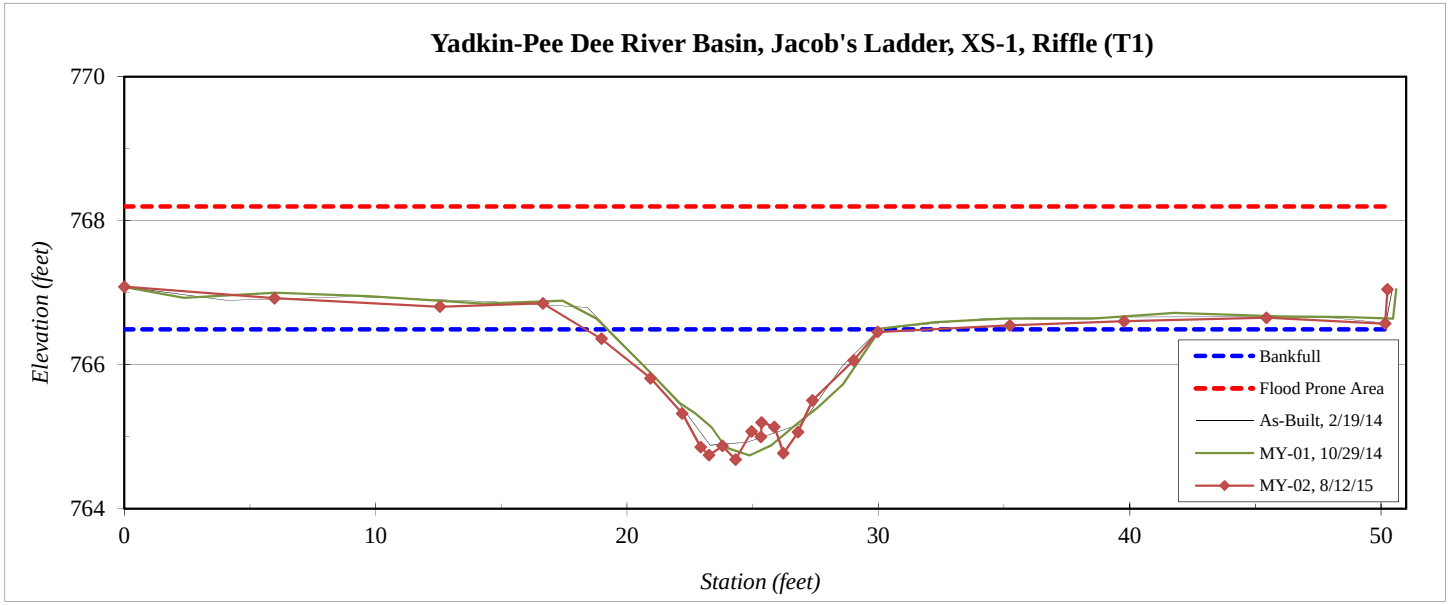
Appendix D

Stream Survey Data

River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-1, Riffle (T1)
Drainage Area (sq mi):	0.21
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	767.18
6.0	767.02
12.6	766.90
16.7	766.95
19.0	766.46
20.9	765.91
22.2	765.42
22.9	764.96
23.3	764.84
23.8	764.97
24.3	764.78
25.0	765.17
25.3	765.10
25.4	765.30
25.9	765.24
26.2	764.87
26.8	765.16
27.4	765.60
29.0	766.16
30.0	766.55
35.2	766.65
39.8	766.70
45.4	766.75
50.2	766.67
50.3	767.15

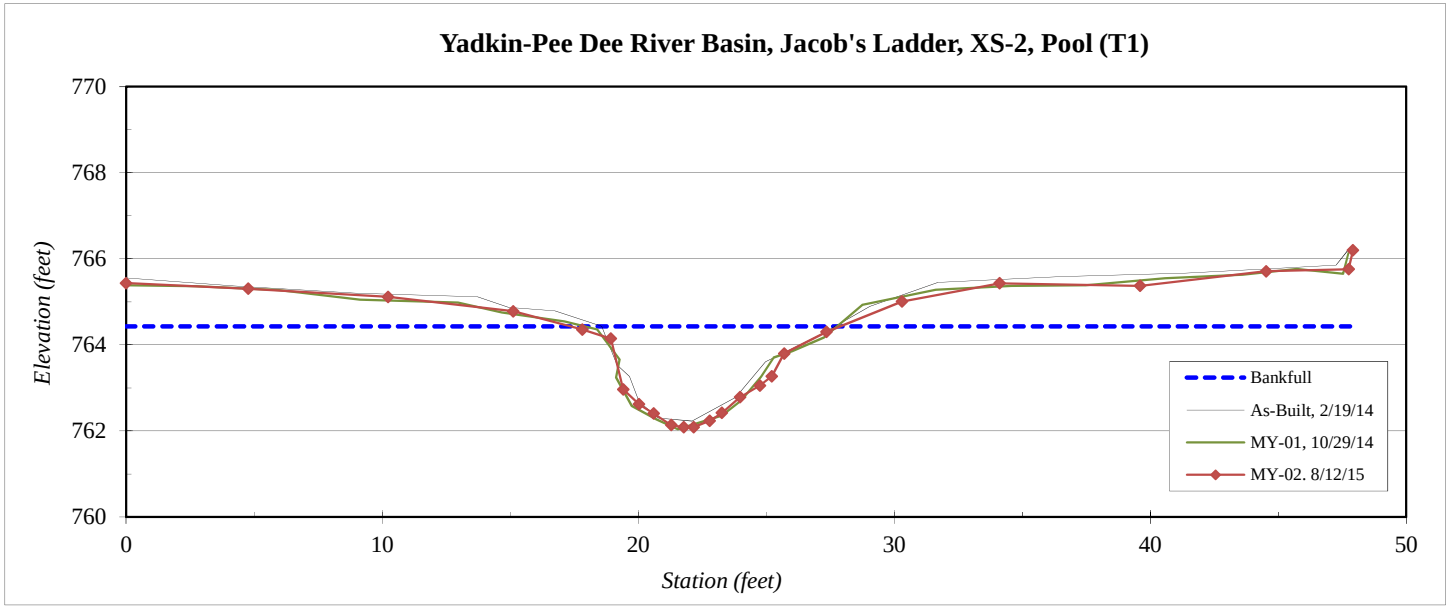
SUMMARY DATA	
Bankfull Elevation (ft):	766.5
Bankfull Cross-Sectional Area (ft^2):	10.1
Bankfull Width (ft):	11.0
Flood Prone Area Elevation (ft):	768.2
Flood Prone Width (ft):	>50
Max Depth at Bankfull (ft):	1.7
Mean Depth at Bankfull (ft):	0.9
W / D Ratio:	12.0
Entrenchment Ratio:	4.5
Bank Height Ratio:	1.0



River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-2, Pool (T1)
Drainage Area (sq mi):	0.21
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	765.43
4.8	765.30
10.2	765.11
15.1	764.78
17.8	764.36
18.9	764.14
19.4	762.97
20.0	762.62
20.6	762.41
21.3	762.14
21.8	762.09
22.2	762.09
22.8	762.24
23.3	762.42
24.0	762.79
24.8	763.05
25.2	763.27
25.7	763.80
27.4	764.30
30.3	765.01
34.1	765.43
39.6	765.37
44.5	765.71
47.7	765.76
47.9	766.20

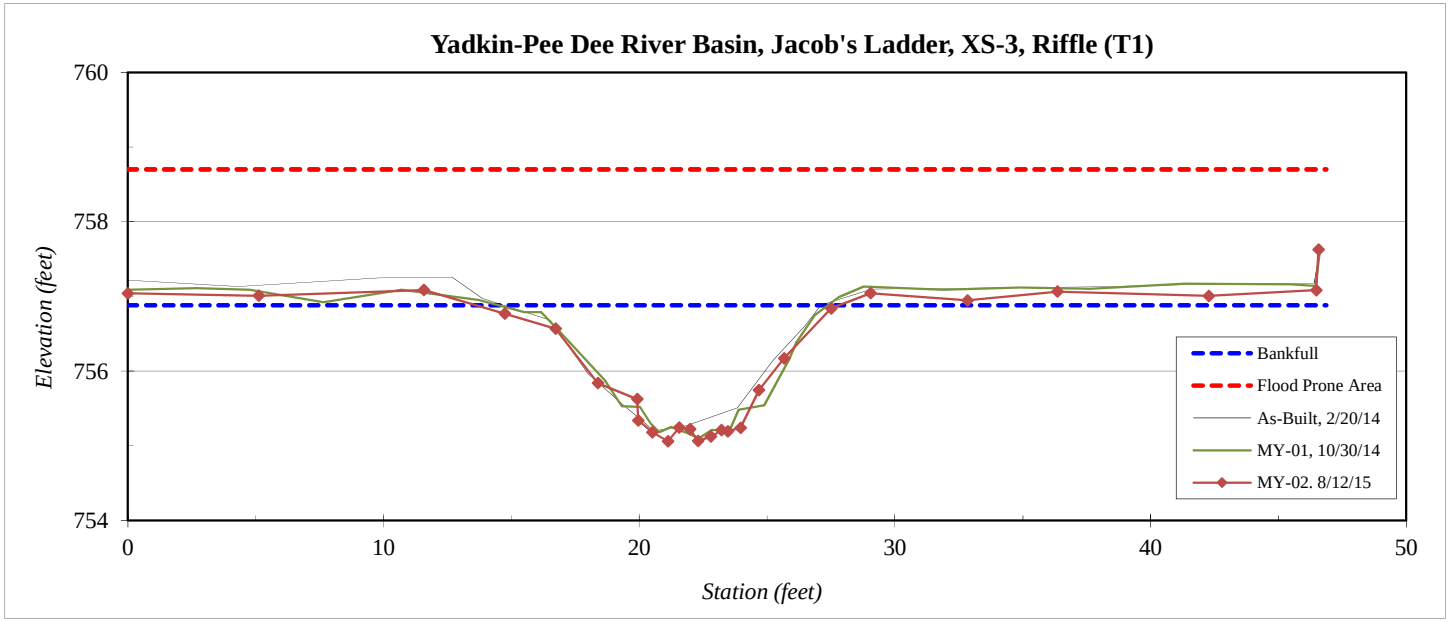
SUMMARY DATA	
Bankfull Elevation (ft):	764.4
Bankfull Cross-Sectional Area (ft^2):	12.8
Bankfull Width (ft):	10.5
Flood Prone Area Elevation (ft):	-
Flood Prone Width (ft):	-
Max Depth at Bankfull (ft):	2.3
Mean Depth at Bankfull (ft):	1.2
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-



River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-3, Riffle (T1)
Drainage Area (sq mi):	0.36
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	757.04
5.4	757.01
11.9	757.08
15.0	756.77
17.0	756.57
18.7	755.84
20.2	755.62
20.3	755.34
20.8	755.18
21.4	755.06
21.9	755.24
22.3	755.22
22.6	755.06
23.1	755.13
23.5	755.21
23.8	755.19
24.3	755.24
25.0	755.75
26.0	756.17
27.8	756.84
29.3	757.04
33.1	756.95
36.7	757.06
42.6	757.01
46.8	757.08
46.9	757.63

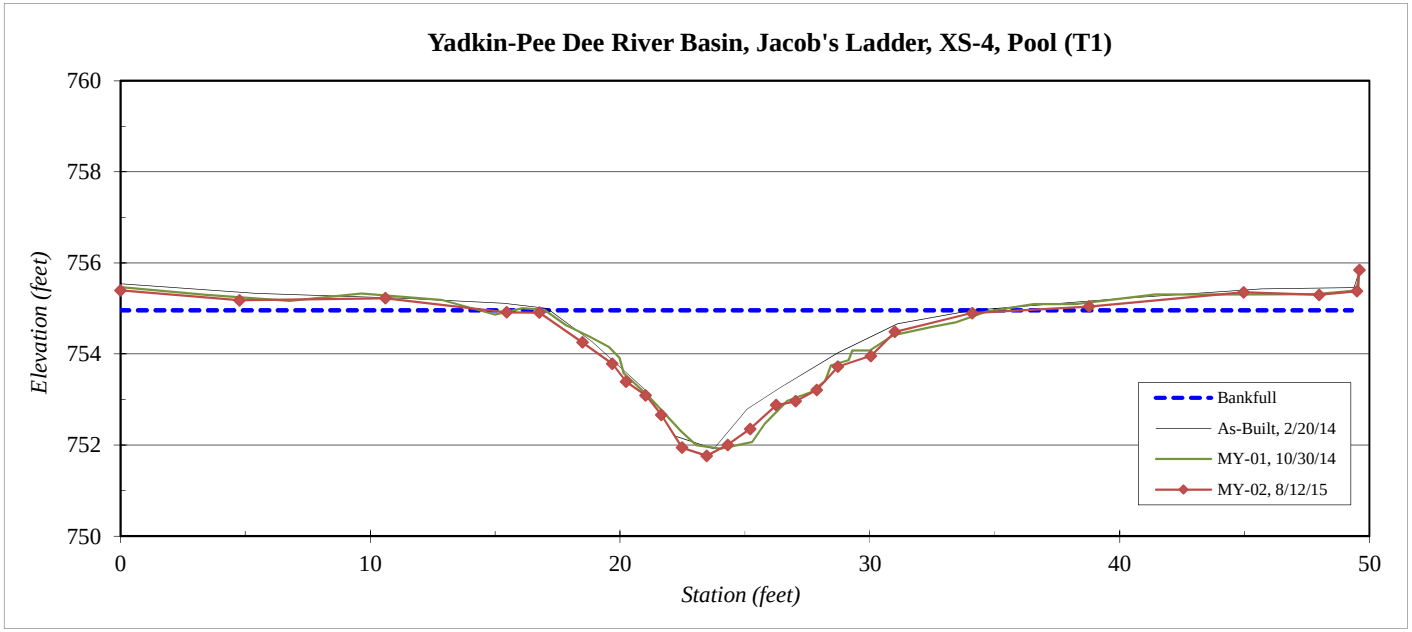
SUMMARY DATA	
Bankfull Elevation (ft):	756.9
Bankfull Cross-Sectional Area (ft^2):	12.9
Bankfull Width (ft):	14.2
Flood Prone Area Elevation (ft):	758.7
Flood Prone Width (ft):	>45
Max Depth at Bankfull (ft):	1.8
Mean Depth at Bankfull (ft):	0.9
W / D Ratio:	15.6
Entrenchment Ratio:	3.2
Bank Height Ratio:	1.0



River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-4, Pool (T1)
Drainage Area (sq mi):	0.36
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	755.40
4.5	755.18
10.3	755.23
15.2	754.92
16.5	754.91
18.2	754.25
19.4	753.78
19.9	753.39
20.7	753.09
21.3	752.66
22.2	751.95
23.2	751.77
24.0	752.00
24.9	752.35
25.9	752.88
26.7	752.96
27.6	753.21
28.4	753.72
29.7	753.96
30.7	754.49
33.8	754.90
38.5	755.05
44.7	755.36
47.7	755.30
49.2	755.38
49.3	755.84

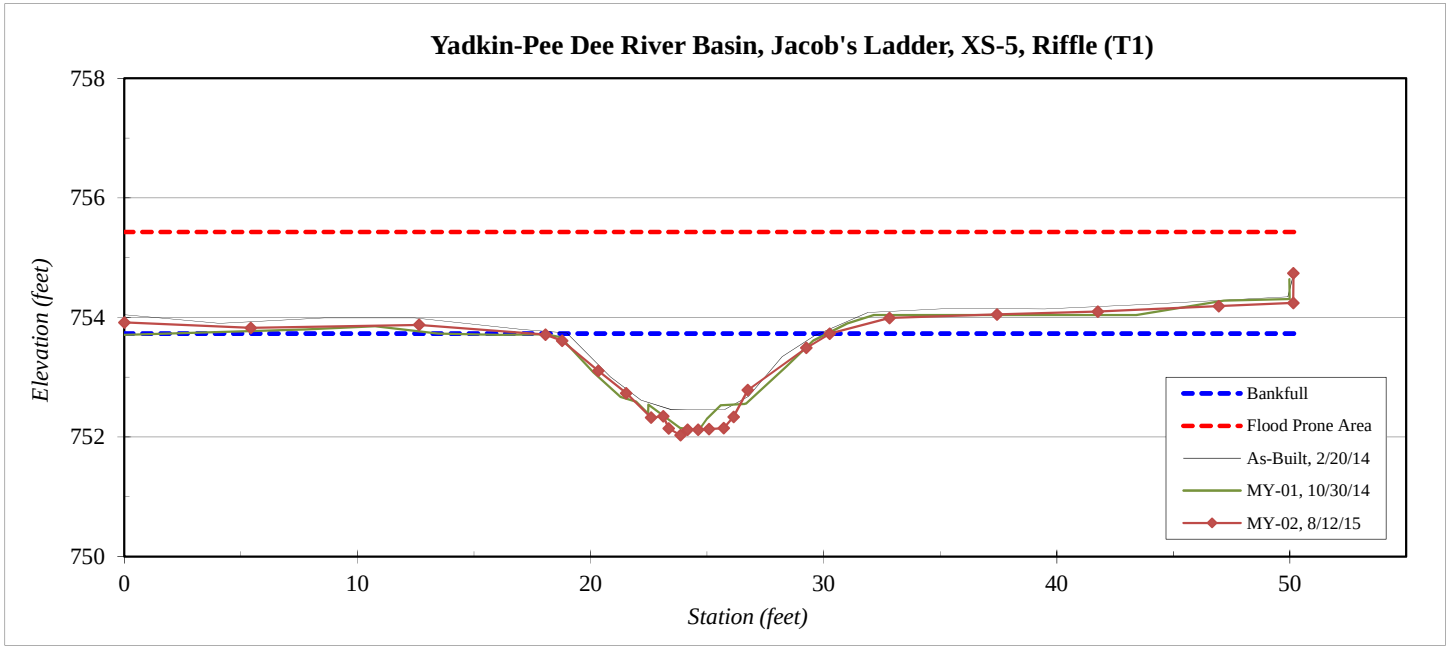
SUMMARY DATA	
Bankfull Elevation (ft):	755.0
Bankfull Cross-Sectional Area (ft^2):	25.4
Bankfull Width (ft):	17.3
Flood Prone Area Elevation (ft):	-
Flood Prone Width (ft):	-
Max Depth at Bankfull (ft):	3.2
Mean Depth at Bankfull (ft):	1.5
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-



River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-5, Riffle (T1)
Drainage Area (sq mi):	0.36
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	753.92
5.6	753.82
12.8	753.88
18.3	753.71
19.0	753.61
20.5	753.11
21.7	752.73
22.8	752.32
23.3	752.35
23.6	752.14
24.1	752.03
24.4	752.12
24.8	752.12
25.3	752.13
25.9	752.15
26.3	752.34
26.9	752.78
29.5	753.49
30.5	753.73
33.0	753.99
37.6	754.05
42.0	754.10
47.2	754.19
50.4	754.24
50.4	754.74

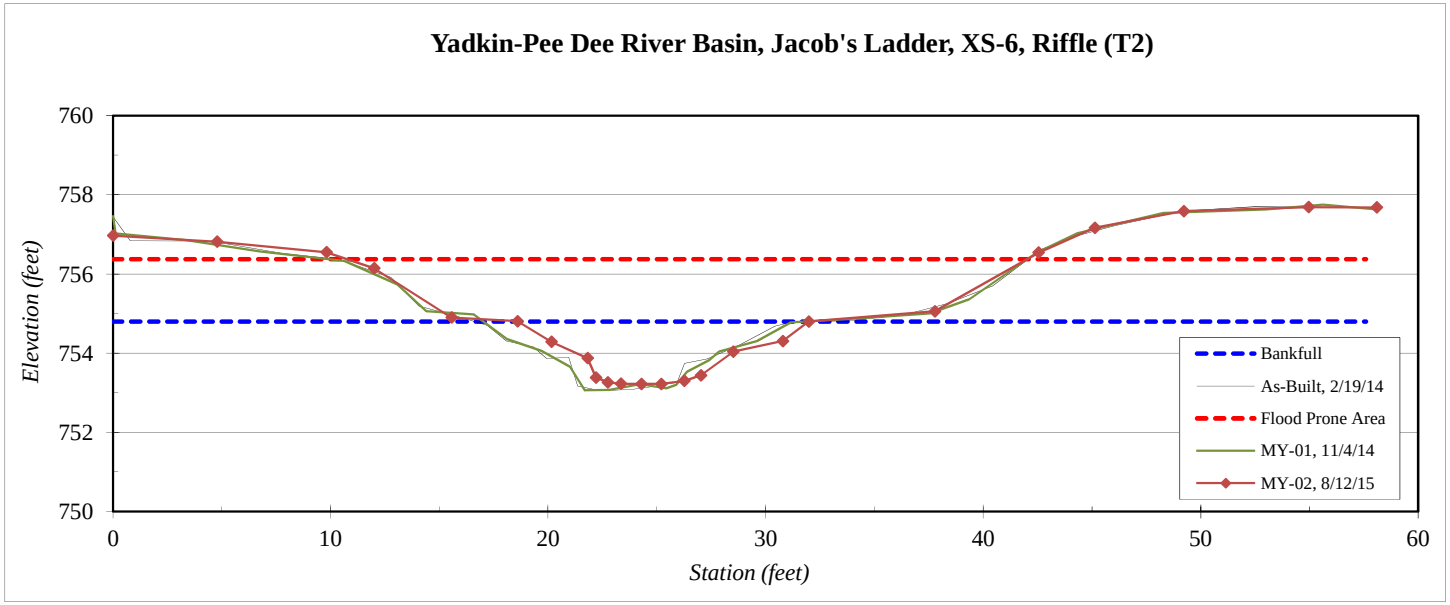
SUMMARY DATA	
Bankfull Elevation (ft):	753.7
Bankfull Cross-Sectional Area (ft^2):	10.7
Bankfull Width (ft):	12.8
Flood Prone Area Elevation (ft):	755.4
Flood Prone Width (ft):	>50
Max Depth at Bankfull (ft):	1.7
Mean Depth at Bankfull (ft):	0.8
W / D Ratio:	15.3
Entrenchment Ratio:	3.9
Bank Height Ratio:	1.0



River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-6, Riffle (T2)
Drainage Area (sq mi):	0.67
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	756.97
4.3	756.82
9.3	756.55
11.5	756.14
15.1	754.90
18.1	754.81
19.7	754.28
21.3	753.87
21.7	753.39
22.2	753.26
22.8	753.23
23.8	753.22
24.7	753.23
25.8	753.30
26.5	753.44
28.0	754.04
30.3	754.31
31.5	754.80
37.3	755.06
42.1	756.54
44.6	757.17
48.7	757.59
54.5	757.69
57.6	757.68

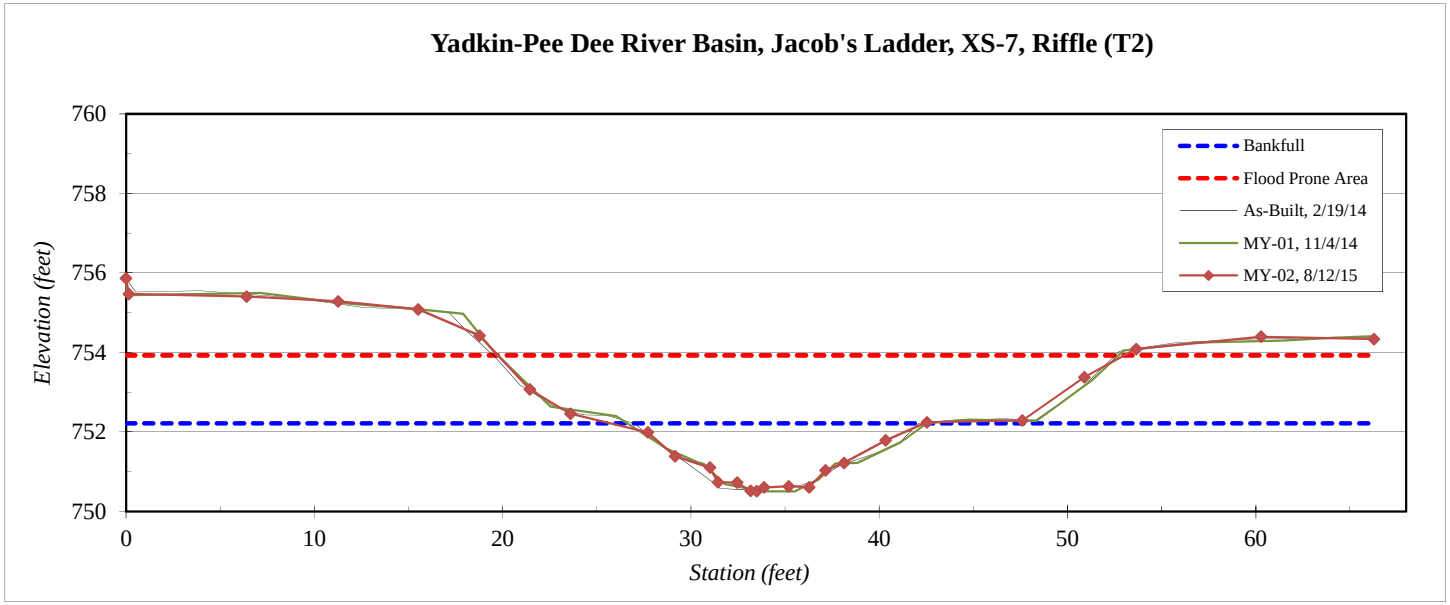
SUMMARY DATA	
Bankfull Elevation (ft):	754.8
Bankfull Cross-Sectional Area (ft^2):	12.7
Bankfull Width (ft):	13.4
Flood Prone Area Elevation (ft):	756.4
Flood Prone Width (ft):	31.3
Max Depth at Bankfull (ft):	1.6
Mean Depth at Bankfull (ft):	0.9
W / D Ratio:	14.1
Entrenchment Ratio:	2.3
Bank Height Ratio:	1.0



River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-7, Riffle (T2)
Drainage Area (sq mi):	0.67
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	755.87
0.1	755.47
6.4	755.41
11.3	755.28
15.5	755.09
18.8	754.42
21.4	753.07
23.6	752.46
27.7	751.99
29.2	751.39
31.0	751.10
31.4	750.74
32.5	750.73
33.2	750.52
33.5	750.51
33.9	750.61
35.2	750.63
36.3	750.61
37.1	751.03
38.1	751.22
40.3	751.79
42.5	752.24
47.6	752.29
50.9	753.38
53.7	754.08
60.3	754.40
66.3	754.34

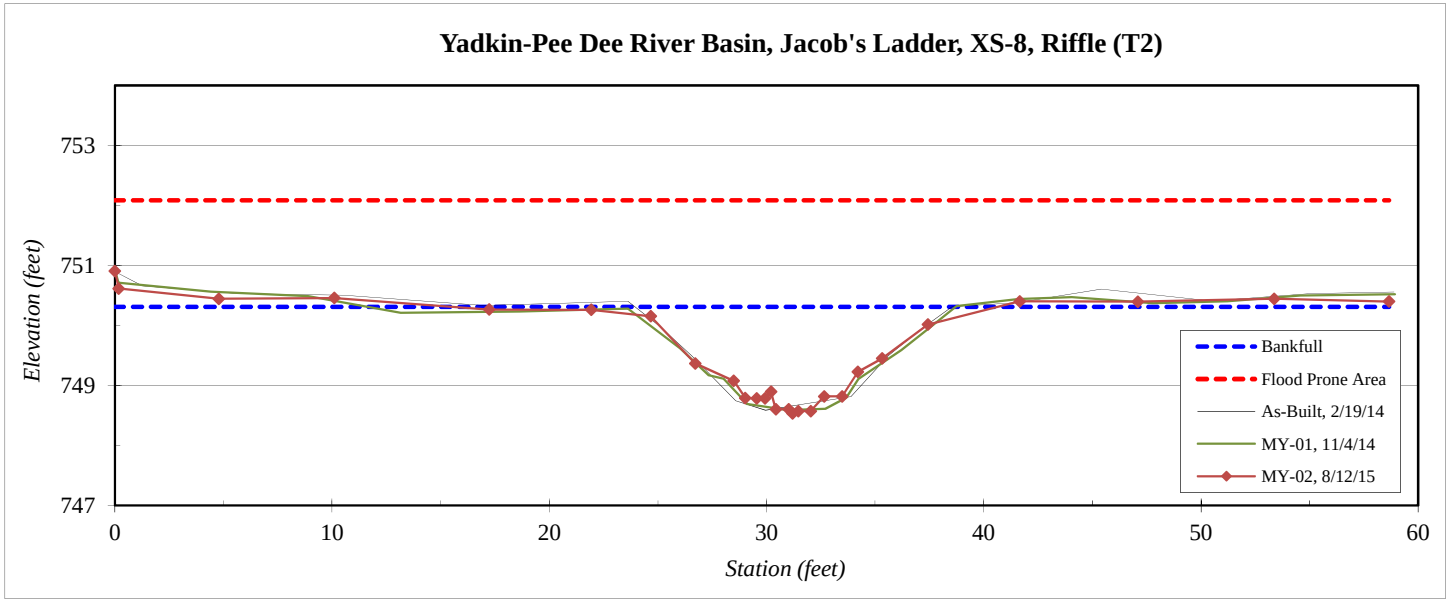
SUMMARY DATA	
Bankfull Elevation (ft):	752.2
Bankfull Cross-Sectional Area (ft^2):	15.4
Bankfull Width (ft):	16.7
Flood Prone Area Elevation (ft):	753.9
Flood Prone Width (ft):	33
Max Depth at Bankfull (ft):	1.7
Mean Depth at Bankfull (ft):	0.9
W / D Ratio:	18.1
Entrenchment Ratio:	2.0
Bank Height Ratio:	1.0



River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-8, Riffle (T2)
Drainage Area (sq mi):	0.70
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	750.91
0.2	750.62
4.8	750.45
10.1	750.46
17.2	750.27
21.9	750.26
24.7	750.15
26.7	749.37
28.5	749.08
29.0	748.79
29.6	748.79
29.9	748.79
30.2	748.90
30.4	748.60
31.0	748.61
31.2	748.54
31.5	748.57
32.0	748.57
32.7	748.82
33.5	748.82
34.2	749.22
35.3	749.45
37.4	750.02
41.7	750.40
47.1	750.40
53.4	750.44
58.7	750.40

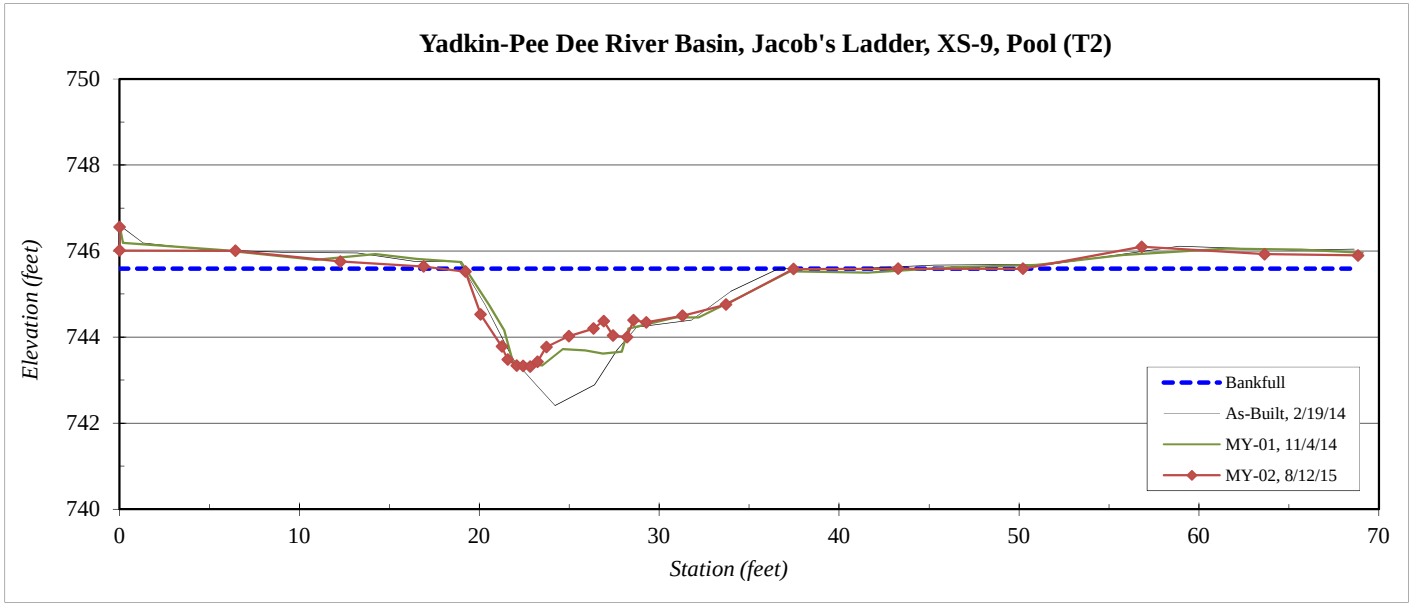
SUMMARY DATA	
Bankfull Elevation (ft):	750.3
Bankfull Cross-Sectional Area (ft^2):	14.6
Bankfull Width (ft):	16.0
Flood Prone Area Elevation (ft):	752.1
Flood Prone Width (ft):	>59
Max Depth at Bankfull (ft):	1.8
Mean Depth at Bankfull (ft):	0.9
W / D Ratio:	17.5
Entrenchment Ratio:	3.8
Bank Height Ratio:	1.0



River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-9, Pool (T2)
Drainage Area (sq mi):	0.70
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	746.56
0.0	746.01
6.4	746.01
12.3	745.76
16.9	745.64
19.2	745.52
20.1	744.53
21.3	743.78
21.6	743.48
22.1	743.34
22.4	743.33
22.8	743.32
23.2	743.43
23.7	743.77
25.0	744.02
26.4	744.20
26.9	744.37
27.4	744.04
28.2	744.00
28.6	744.39
29.3	744.35
31.3	744.50
33.7	744.76
37.5	745.58
43.3	745.59
50.2	745.59
56.8	746.10
63.6	745.93
68.8	745.90

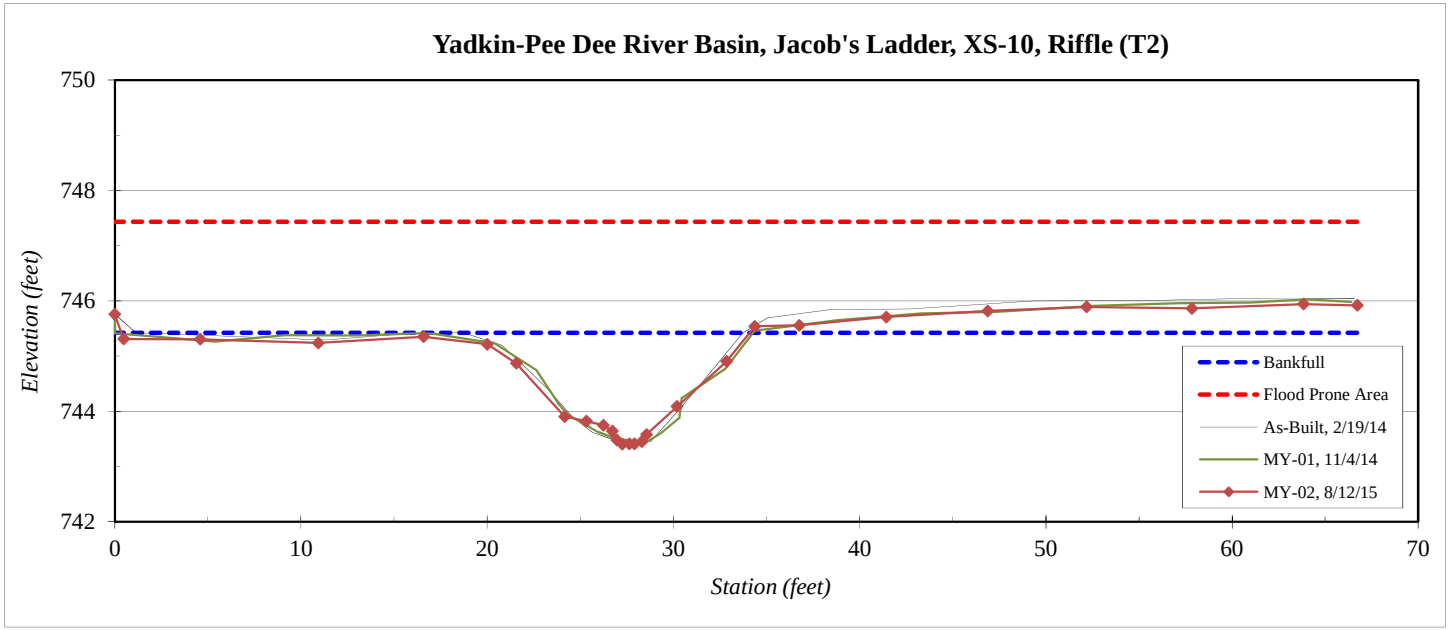
SUMMARY DATA	
Bankfull Elevation (ft):	745.6
Bankfull Cross-Sectional Area (ft^2):	21.9
Bankfull Width (ft):	18.2
Flood Prone Area Elevation (ft):	-
Flood Prone Width (ft):	-
Max Depth at Bankfull (ft):	2.3
Mean Depth at Bankfull (ft):	1.2
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-



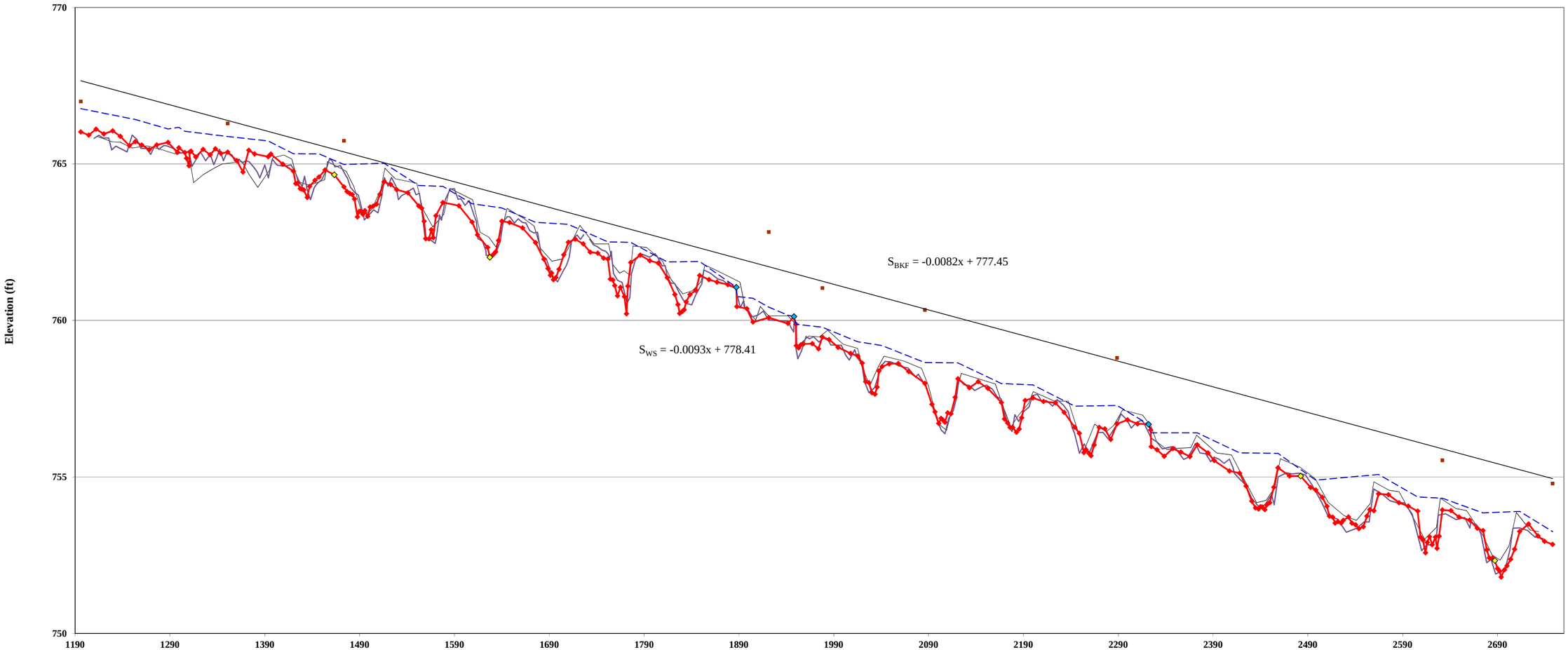
River Basin:	Yadkin-Pee Dee
Watershed:	Jacob's Ladder
XS ID	XS-10, Riffle (T2)
Drainage Area (sq mi):	0.70
Date:	8/12/2015
Field Crew:	T. Seelinger and B. Williams

Station (ft)	Elevation (ft)
0.0	745.76
0.5	745.31
4.6	745.30
10.9	745.24
16.6	745.35
20.0	745.22
21.6	744.87
24.2	743.90
25.3	743.82
26.2	743.75
26.7	743.64
27.0	743.48
27.2	743.41
27.6	743.41
27.9	743.41
28.3	743.45
28.6	743.58
30.2	744.09
32.9	744.90
34.4	745.54
36.8	745.56
41.4	745.71
46.9	745.82
52.2	745.89
57.8	745.86
63.9	745.94
66.7	745.92

SUMMARY DATA	
Bankfull Elevation (ft):	745.4
Bankfull Cross-Sectional Area (ft^2):	16.9
Bankfull Width (ft):	17.5
Flood Prone Area Elevation (ft):	747.4
Flood Prone Width (ft):	>65
Max Depth at Bankfull (ft):	2.0
Mean Depth at Bankfull (ft):	1.0
W / D Ratio:	18.1
Entrenchment Ratio:	3.8
Bank Height Ratio:	1.0



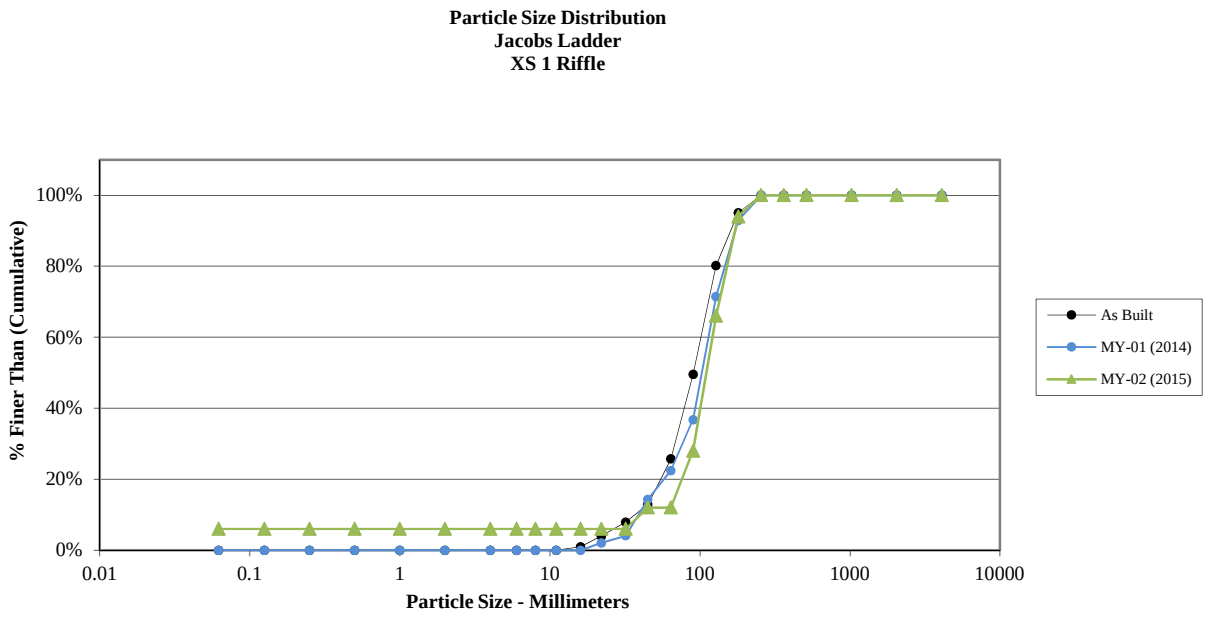
Jacob's Ladder Stream Restoration Site
Longitudinal Profile
T1 MY-02



Jacob's Ladder Stream Restoration Site
Longitudinal Profile
T2 MY-02

Cross-Section 1 Riffle - MY-02			
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	
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	S	6
Very Coarse	45 - 64		
Small	64 - 90	C	16
Small	90 - 128	O	38
Large	128 - 180	B	28
Large	180 - 256	L	6
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



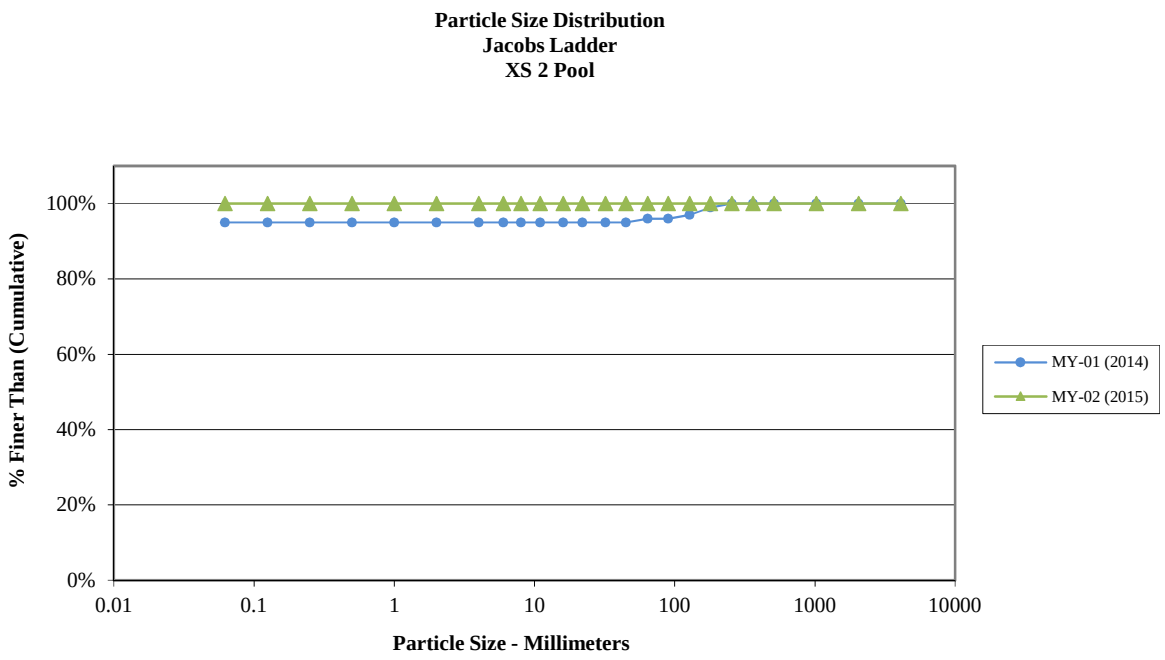
Size (mm)	
D16	70
D35	96
D50	110
D65	130
D84	160
D95	190

Size Distribution	
mean	105.8
dispersion	1.5
skewness	-0.03

Type	
silt/clay	6%
sand	0%
gravel	6%
cobble	88%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 2 Pool - MY-02			
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	S	
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	
		Total	100

Note:



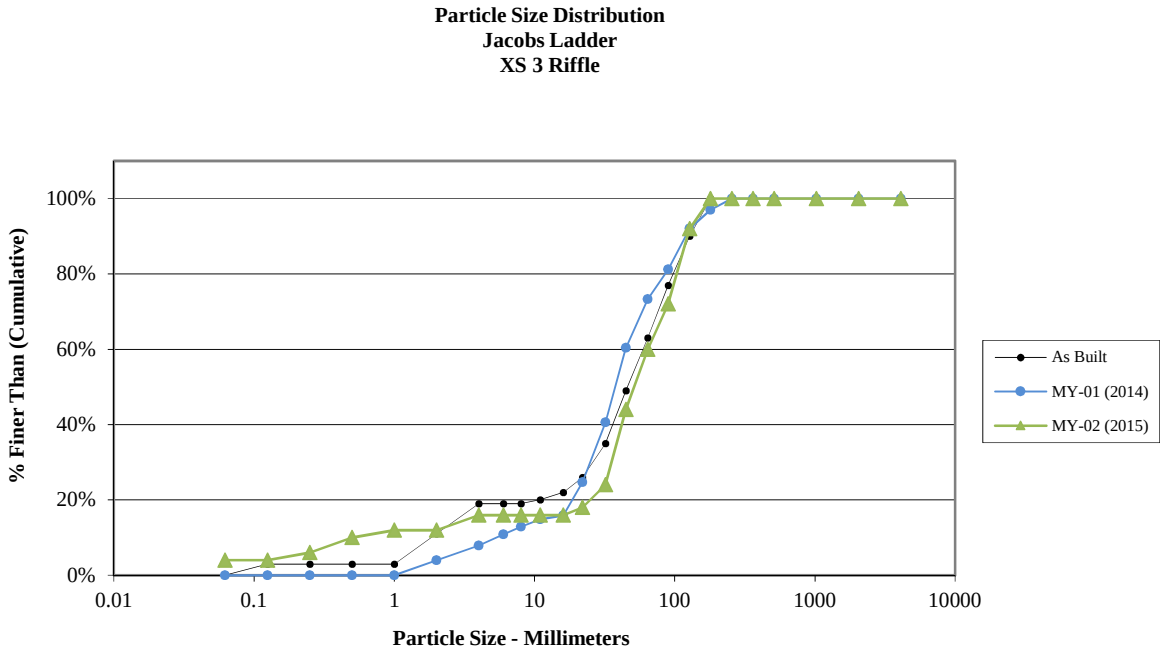
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

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%

Cross-Section 3 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	4
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	2
Medium	.25 - .50	N	4
Coarse	.50 - 1	D	2
Very Coarse	1 - 2	S	
Very Fine	2 - 4		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	6
Very Coarse	32 - 45	S	20
Very Coarse	45 - 64		16
Small	64 - 90	C	12
Small	90 - 128	O	20
Large	128 - 180	B	8
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:



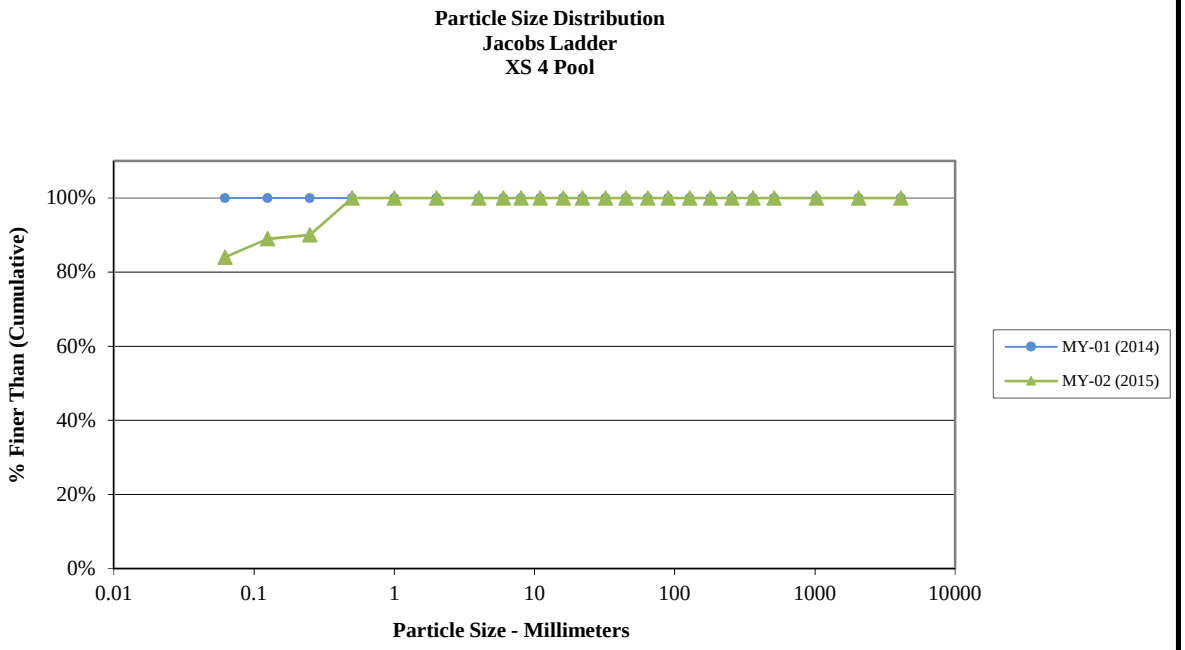
Size (mm)	
D16	16
D35	39
D50	51
D65	74
D84	110
D95	150

Size Distribution	
mean	42.0
dispersion	2.7
skewness	-0.09

Type	
silt/clay	4%
sand	8%
gravel	48%
cobble	40%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 4 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	84
Very Fine	.062 - .125	S	5
Fine	.125 - .25	A	1
Medium	.25 - .50	N	10
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	S	
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	
		Total	100

Note:



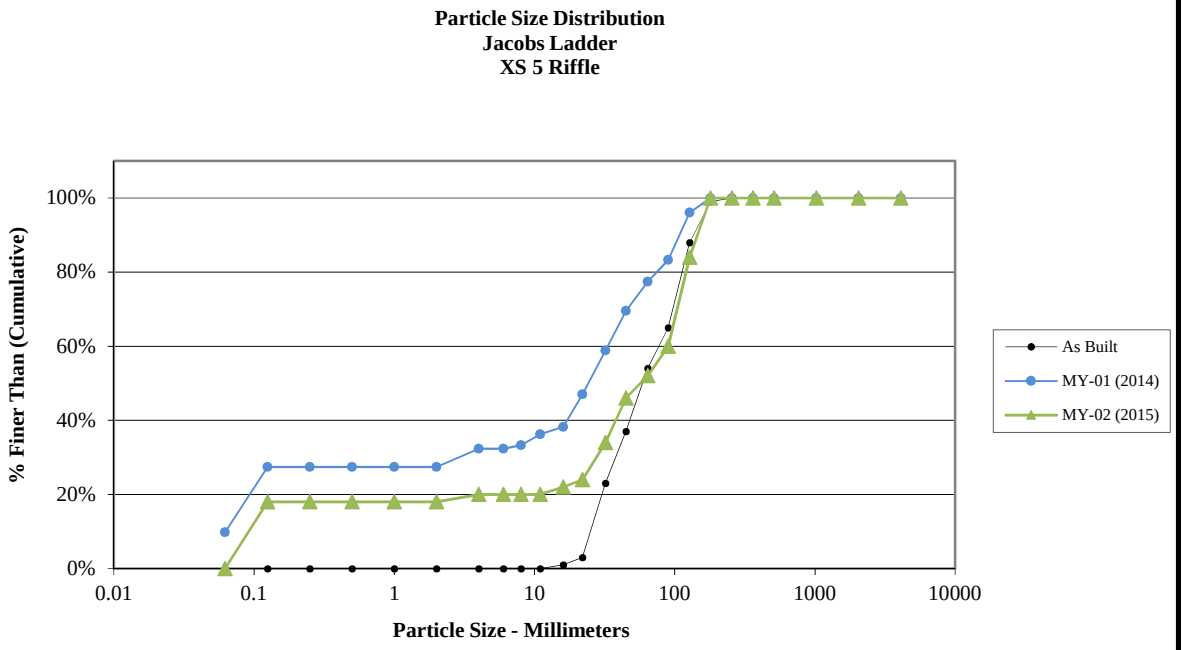
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.35

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	84%
sand	16%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	18
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	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	12
Very Coarse	45 - 64		6
Small	64 - 90	C	8
Small	90 - 128	O	24
Large	128 - 180	B	16
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:



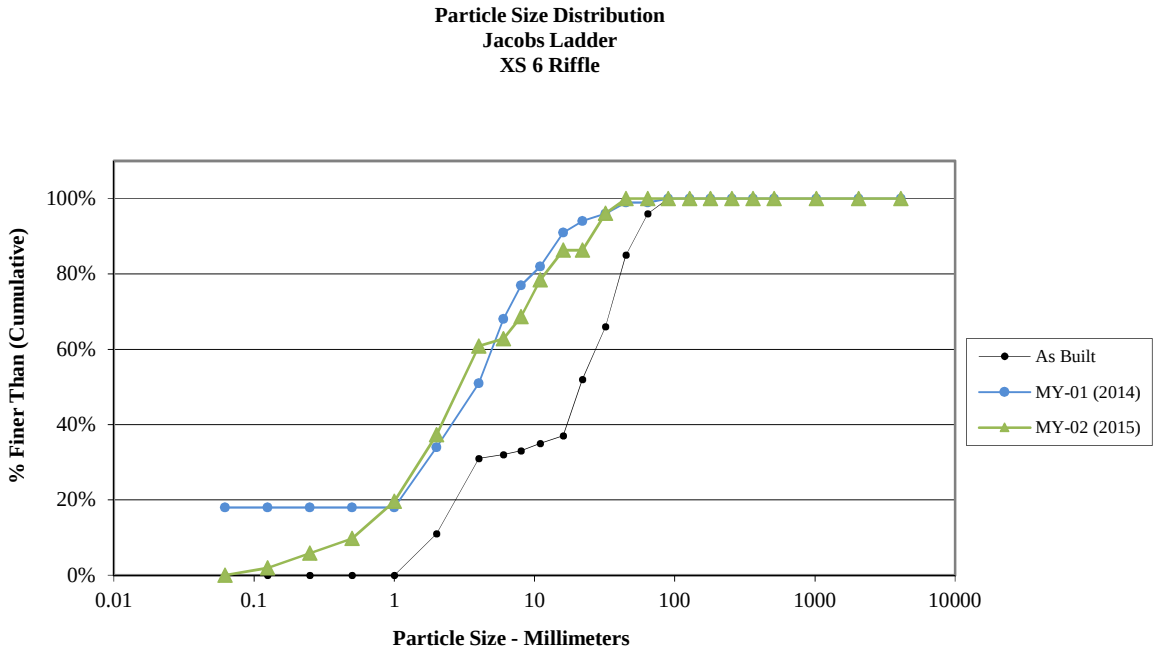
Size (mm)	
D16	0.12
D35	33
D50	57
D65	97
D84	130
D95	160

Size Distribution	
mean	3.9
dispersion	238.6
skewness	-0.67

Type	
silt/clay	0%
sand	18%
gravel	34%
cobble	48%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 Riffle -MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	4
Medium	.25 - .50	N	4
Coarse	.50 - 1	D	10
Very Coarse	1 - 2	S	18
Very Fine	2 - 4		24
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	6
Medium	8 - 11.3	A	10
Medium	11.3 - 16	V	8
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	10
Very Coarse	32 - 45	S	4
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	
		Total	102

Note:



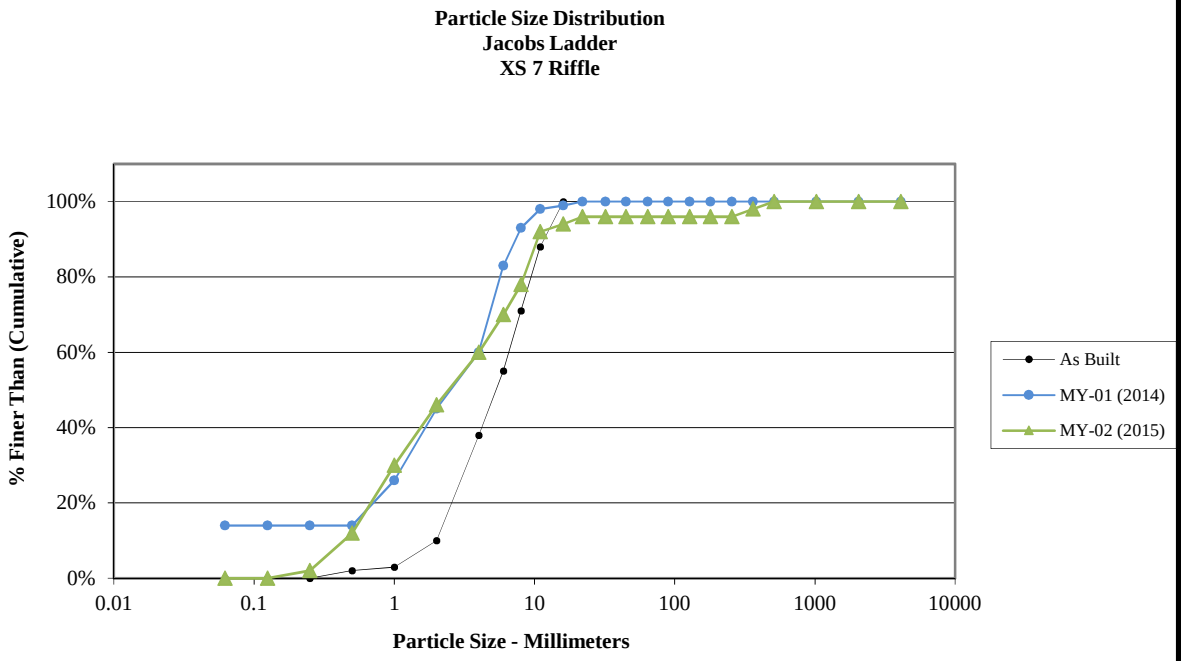
Size (mm)	
D16	0.77
D35	1.8
D50	2.9
D65	6.7
D84	14
D95	31

Size Distribution	
mean	3.3
dispersion	4.3
skewness	0.05

Type	
silt/clay	0%
sand	37%
gravel	63%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 7 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	2
Medium	.25 - .50	N	10
Coarse	.50 - 1	D	18
Very Coarse	1 - 2	S	16
Very Fine	2 - 4		14
Fine	4 - 5.7	G	10
Fine	5.7 - 8	R	8
Medium	8 - 11.3	A	14
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	2
Small	362 - 512	L	2
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



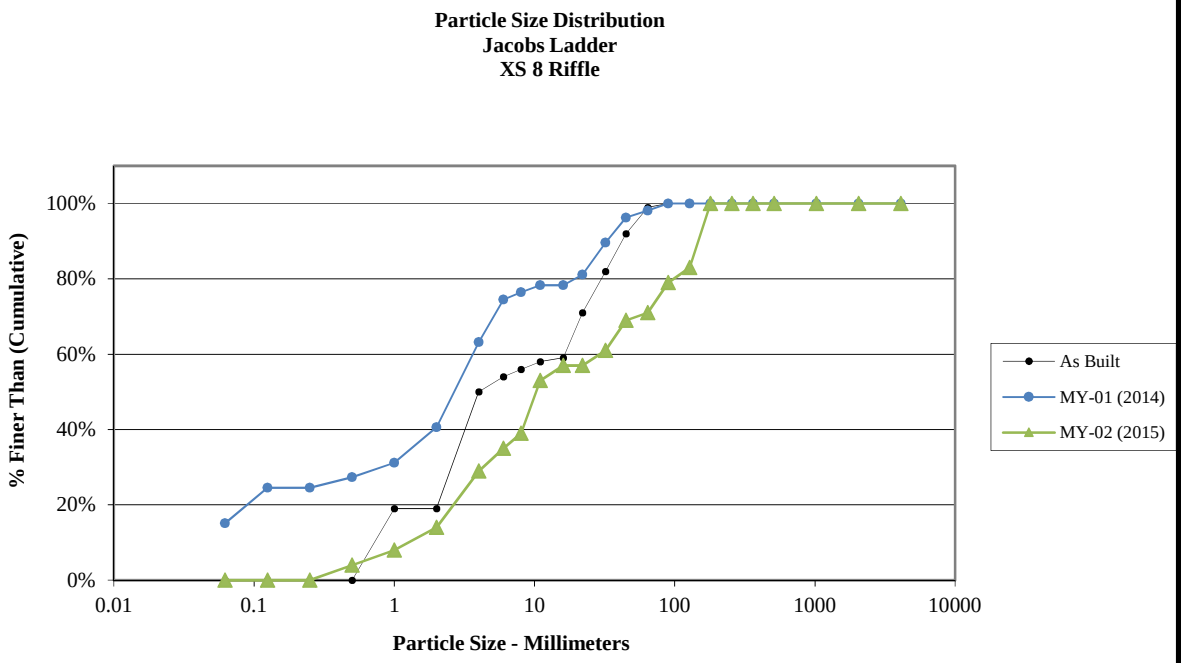
Size (mm)	
D16	0.58
D35	1.2
D50	2.4
D65	4.9
D84	9.2
D95	19

Size Distribution	
mean	2.3
dispersion	4.0
skewness	-0.02

Type	
silt/clay	0%
sand	46%
gravel	50%
cobble	0%
boulder	4%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 Riffle -MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	4
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	6
Very Fine	2 - 4		15
Fine	4 - 5.7	G	6
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	14
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	4
Very Coarse	32 - 45	S	8
Very Coarse	45 - 64		2
Small	64 - 90	C	8
Small	90 - 128	O	4
Large	128 - 180	B	17
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:



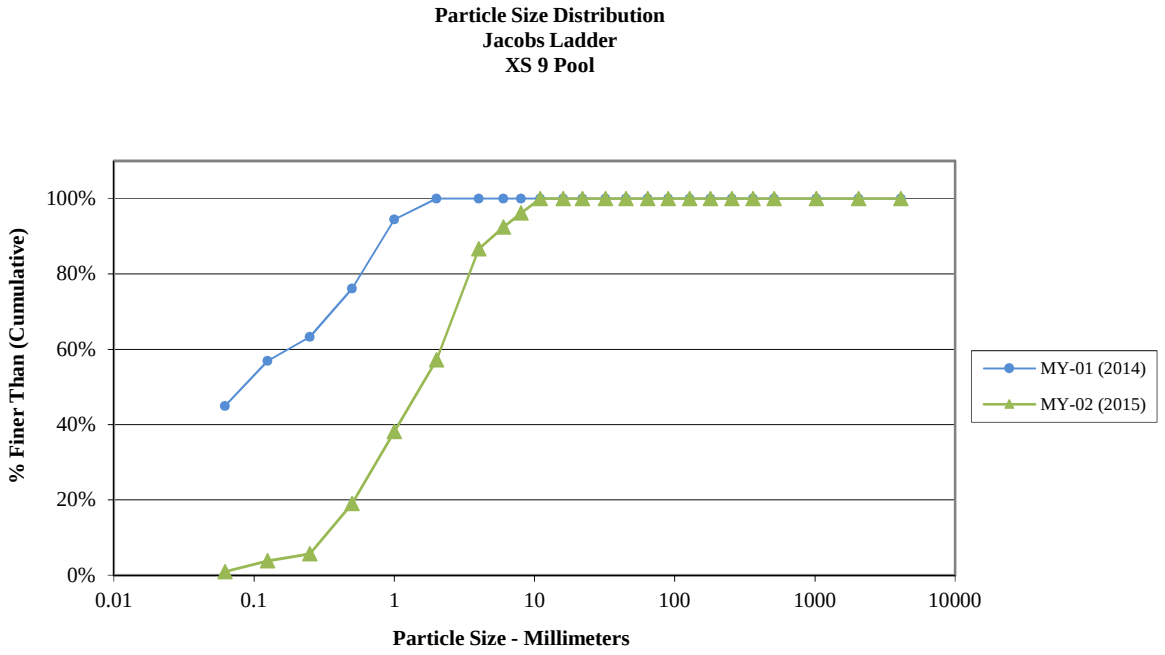
Size (mm)	
D16	2.2
D35	6
D50	10
D65	38
D84	130
D95	160

Size Distribution	
mean	16.9
dispersion	8.8
skewness	0.17

Type	
silt/clay	0%
sand	14%
gravel	57%
cobble	29%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 9 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	1
Very Fine	.062 - .125	S	3
Fine	.125 - .25	A	2
Medium	.25 - .50	N	14
Coarse	.50 - 1	D	20
Very Coarse	1 - 2	S	20
Very Fine	2 - 4		31
Fine	4 - 5.7	G	6
Fine	5.7 - 8	R	4
Medium	8 - 11.3	A	4
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
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	
		Total	105

Note:



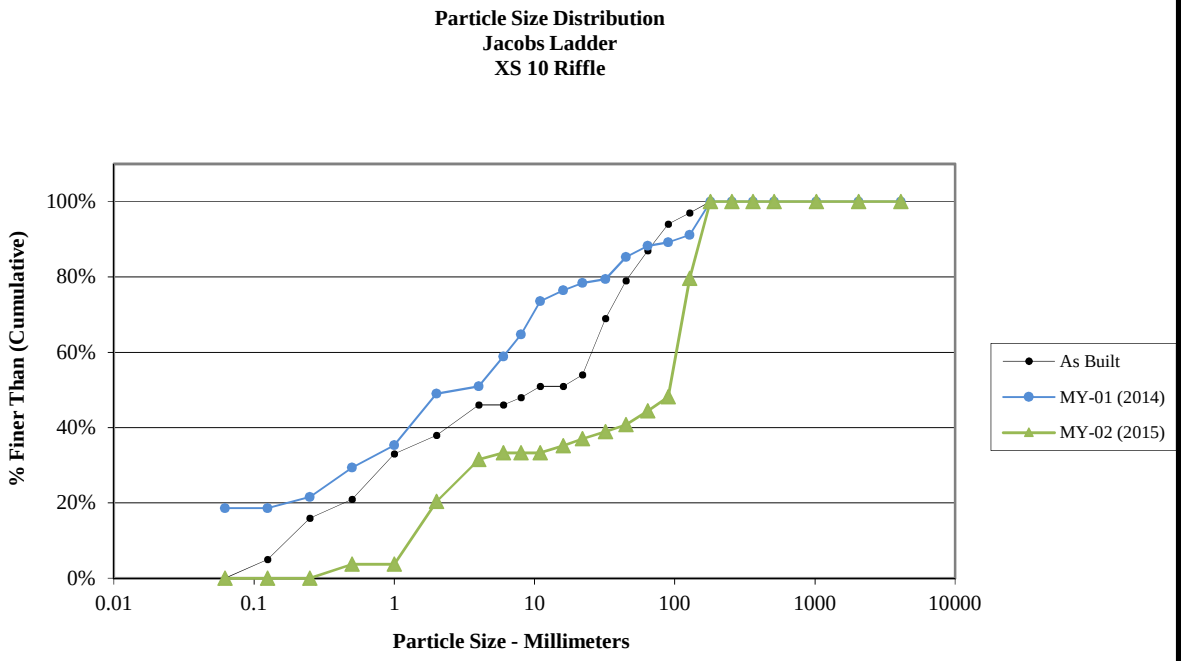
Size (mm)	
D16	0.43
D35	0.89
D50	2
D65	2.4
D84	3.8
D95	7.3

Size Distribution	
mean	1.3
dispersion	3.0
skewness	-0.07

Type	
silt/clay	1%
sand	56%
gravel	43%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	4
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	18
Very Fine	2 - 4		12
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		4
Small	64 - 90	C	4
Small	90 - 128	O	34
Large	128 - 180	B	22
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	108

Note:



Size (mm)	
D16	1.7
D35	15
D50	92
D65	110
D84	140
D95	170

Size Distribution	
mean	15.4
dispersion	27.8
skewness	-0.56

Type	
silt/clay	0%
sand	20%
gravel	24%
cobble	56%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Table 10a. T1 Baseline Stream Data Summary
Jacob's Ladder Stream Restoration Site, DMS Project # 95023

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	6.7	8.2		9.6	2	6.9				1	10.3	11.5	10.8	11.3	12.4	3
Floodprone Width (ft)	12	14		16	2	23				1	23	70	>45	>48	>50	3
Bankfull Mean Depth (ft)	1.1	1.3		1.5	2	1.1				1	0.9	1.0	0.8	0.9	1.0	3
Bankfull Max Depth (ft)	1.7	2.1		2.4	2	1.6				1	1.4	1.5	1.3	1.5	1.7	3
Bankfull Cross-Sectional Area (ft^2)	9.8	10.2		10.5	2	7.4				1	9.0	11.0	8.8	10.3	11.6	3
Width/Depth Ratio	4.6	6.7		8.8	2	6.4				1	12.0	12.0	11.2	12.6	13.3	3
Entrenchment Ratio	1.3	1.8		2.2	2	3.4				1	2.2	6.0	3.6	4.3	4.6	3
Bank Height Ratio	2.3	2.8		3.3	2	1.0				1	1.0	1.0	1.0	1.0	1.0	3
Pattern																
Channel Beltwidth (ft)	*					14	26		38	2	25	70	25	48	70	
Radius of Curvature (ft)	*					12	19		25	2	20	45	20	33	45	
Rc:Bankfull width (ft/ft)	*					1.7	2.7		3.6	2	2	4	2	3	4	
Meander Wavelength (ft)	*					43	73		102	2	65	140	65	103	140	
Meander Width Ratio	*					2.0	3.8		5.5	2	2.4	5.8	2.4	4.0	5.8	
Profile																
Riffle Length (ft)													20	31	40	21
Riffle Slope (ft/ft)	0.010			0.035		0.011			0.025	2	0.004	0.017	0.003	0.015	0.022	21
Pool Length (ft)						16			23		12	40	18	28	49	19
Pool Spacing (ft)						28			57		47	95	54	76	95	19
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 21% / 79% / 0% / 0% / 0%												0% / 4% / 44% / 52% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	1 / 6 / 8 / 11 / 17 / 22												27 / 49 / 65 / 89/ 123 / 163			
Additional Reach Parameters																
Channel length (ft)	2,179										2,361		2,389			
Drainage Area (SM)	0.36					0.16					0.36		0.36			
Rosgen Classification	G4					E4					C4		C4			
Sinuosity	1.03					1.18					1.14-1.18		1.14-1.18			
Water Surface Slope (ft/ft)	0.011					0.007					0.011		0.008			

*Not a meandering channel and mostly composed of riffles and runs; therefore no pattern data or pool data was shown

Table 10b. T2 Baseline Stream Data Summary
Jacob's Ladder Stream Restoration Site, DMS Project # 95023

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	10.6	12.6		16.5	3	6.9				1	13.5	13.5	14.6	14.9	15.2	4
Floodprone Width (ft)	16	24		35	3	23				1	30	70	33	34	66	4
Bankfull Mean Depth (ft)	1.2	1.7		2.3	3	1.1				1	1.1	1.1	0.9	1.1	1.1	4
Bankfull Max Depth (ft)	2.1	2.6		3.4	3	1.6				1	1.8	1.8	1.7	1.7	1.8	4
Bankfull Cross-Sectional Area (ft^2)	18.5	21.4		25.0	3	7.4				1	15.3	15.3	13.9	15.4	16.3	4
Width/Depth Ratio	4.7	8.0		13.2	3	6.4				1	12.0	12.0	13.9	14.4	15.5	4
Entrenchment Ratio	1.5	1.8		2.1	3	3.4				1	2.2	5.2	2.2	3.3	4.4	4
Bank Height Ratio	1.9	2.0		2.0	3	1.0				1	1.0	1.0	1.0	1.0	1.0	4
Pattern																
Channel Beltwidth (ft)	20	40		60	3	14	26		38	2	20	70	20	45	70	
Radius of Curvature (ft)	5	10		15	3	12	19		25	2	20	54	20	37	54	
Rc:Bankfull width (ft/ft)	0.5	1.0		1.4	3	1.7	2.7		3.6	2	2	4	2	3	4	
Meander Wavelength (ft)	23	87		150	3	43	73		102	2	58	140	58	99	140	
Meander Width Ratio	1.8	3.8		5.8	3	2.0	3.8		5.5	2	2.2	5.2	2.2	4.0	5.2	
Profile																
Riffle Length (ft)													5	15	23	23
Riffle Slope (ft/ft)	0.004			0.018	3	0.011			0.025	2			0.001	0.011	0.041	23
Pool Length (ft)						16			23				13	26	49	16
Pool Spacing (ft)						28			57				52	69	92	16
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	4% / 21% / 75% / 0% / 0% / 0%												0% / 20% / 76% / 5% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)	1 / 2 / 3 / 6 / 11 / 19												1 / 5 / 10 / 22 / 36 / 57			
Additional Reach Parameters																
Channel length (ft)	2,083										2,084		2,084			
Drainage Area (SM)	0.70					0.16					0.70		0.70			
Rosgen Classification	G4					E4					C4		C4			
Sinuosity	1.00-1.47					1.18					1.16-1.45		1.16-1.45			
Water Surface Slope (ft/ft)	0.006-0.013					0.007					0.007-0.012		0.008			

Table 10c. T1A-1, T1A-2 Baseline Stream Data Summary
Jacob's Ladder Stream Restoration Site, DMS Project # 95023

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	12.7				1	7.7	9.3		10.8	2	7.0					
Floodprone Width (ft)	30				1	13	15		16	2	0.9					
Bankfull Mean Depth (ft)	0.4				1	0.7	0.8		0.9	2	0.6					
Bankfull Max Depth (ft)	0.9				1	1.3	1.5		1.7	2	0.9					
Bankfull Cross-Sectional Area (ft^2)	4.5				1	6.1	7.5		8.8	2	3.9					
Width/Depth Ratio	35.8				1	8.5	9.9		11.4	2	12.5					
Entrenchment Ratio	2.4				1	1.6	1.8		2.1	2	2.2					
Bank Height Ratio	1.0				1	1.0				1	1.0					
Pattern																
Channel Beltwidth (ft)	*					22				1	10	30				
Radius of Curvature (ft)	*					11			23	2	12	25				
Rc:Bankfull width (ft/ft)	*					1			3	2	2	4				
Meander Wavelength (ft)	*					49			59	2	55	95				
Meander Width Ratio	*					2			3	2	1.0	4.3				
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.013			0.018	2	0.012			0.028	2	0.006	0.020				
Pool Length (ft)						5			9		7	11				
Pool Spacing (ft)											22	63				
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%						0%, 18%, 82%, 1%, 0%, 0%										
d16 / d35 / d50 / d84 / d95 (mm)						3, 7, 9, 13, 17, 25										
Additional Reach Parameters																
Channel length (ft)	446										446					
Drainage Area (SM)	0.05					0.15					0.05					
Rosgen Classification	C4					B4c					B4c/C4					
Sinuosity	1.11					1.20					1.11					
Water Surface Slope (ft/ft)	0.015					0.012					0.012					

*Not a meandering channel and mostly composed of riffles and runs; therefore no pattern data or pool data was shown

Table 10d. T1A-3 Baseline Stream Data Summary
Jacob's Ladder Stream Restoration Site, DMS Project # 95023

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	9.3				1	9.0	9.5		10.0	2	6.0					
Floodprone Width (ft)	10				1	13	17		21	2	14					
Bankfull Mean Depth (ft)	0.5				1	1.1	1.1		1.2	2	0.5					
Bankfull Max Depth (ft)	0.7				1	1.3	1.4		1.5	2	0.9					
Bankfull Cross-Sectional Area (ft^2)	4.3				1	10.4	10.5		10.7	2	3.2					
Width/Depth Ratio	20.1				1	8.0	9.0		10.0	2	11.2					
Entrenchment Ratio	1.1				1	1.3	1.8		2.3	2	2.2					
Bank Height Ratio	8.6				1	1.0				1	1.0					
Pattern																
Channel Beltwidth (ft)	*					45				1	15	30				
Radius of Curvature (ft)	*					13			42	2	12	27				
Rc:Bankfull width (ft/ft)	*					1.3			4.4	2	2.0	4.5				
Meander Wavelength (ft)	*					93			136	2	50	80				
Meander Width Ratio	*					4.5			5.0	2	2.5	5.0				
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)						0.013			0.028	2	0.020	0.030				
Pool Length (ft)						3			25	2	6	12				
Pool Spacing (ft)						30			39	2	20	40				
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%																
d16 / d35 / d50 / d84 / d95 (mm)																
Additional Reach Parameters																
Channel length (ft)	470										498					
Drainage Area (SM)	0.05					0.40					0.05					
Rosgen Classification	F4					B4c					B4c/C4					
Sinuosity	1.06					1.20					1.09					
Water Surface Slope (ft/ft)	0.018					0.013					0.017					

*Not a meandering channel and mostly composed of riffles and runs; therefore no pattern data or pool data was shown

Table 11. Cross-Section Morphology Data Tables
Jacob's Ladder Stream Restoration Site, DMS Project # 95023

Dimension and Substrate	Cross-Section 1 (T1-Riffle) Station 14+75							Cross-Section 2 (T1-Pool) Station 16+40							Cross-Section 3 (T1-Riffle) Station 24+88							Cross-Section 4 (T1-Pool) Station 26+98							Cross-Section 5 (T1-Riffle) Station 28+75						
Based on fixed baseline elevation	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	10.8	10.9	11.0					9.1	9.9	10.5					12.4	12.9	14.2					17.0	18.0	17.3					10.8	12.1	12.8				
Floodprone Width (ft)	>50	>50	>50					-	-	-					>45	>45	>45					-	-	-					>50	>50	>50				
Bankfull Mean Depth (ft)	1.0	1.0	0.9					1.3	1.3	1.2					0.9	1.0	0.9					1.3	1.4	1.5					0.8	0.9	0.8				
Bankfull Max Depth (ft)	1.6	1.8	1.7					2.2	2.4	2.3					1.7	1.8	1.8					3.0	3.0	3.2					1.3	1.6	1.7				
Bankfull Cross-Sectional Area (ft^2)	10.4	10.8	10.1					11.5	12.9	12.8					11.6	12.4	12.9					21.4	24.5	25.4					8.8	10.6	10.7				
Bankfull Width/Depth Ratio	11.2	11.0	12.0					-	-	-					13.3	13.4	15.6					-	-	-					13.3	13.8	15.3				
Bankfull Entrenchment Ratio	4.6	4.6	4.5					-	-	-					3.6	3.5	3.2					-	-	-					4.6	4.1	3.9				
Bankfull Bank Height Ratio	1.0	1.0	1.0					-	-	-					1.0	1.0	1.0					-	-	-					1.0	1.0	1.0				
d50 (mm)	91	100	110					-	-	-					46	38	51					-	-	-					59	24	57				

	Cross-Section 6 (T2-Riffle) Station 101+73							Cross-Section 7 (T2-Riffle) Station 105+67							Cross-Section 8 (T2-Riffle) Station 110+00							Cross-Section 9 (T2-Pool) Station 115+88							Cross-Section 10 (T2-Riffle) Station 116+28						
Based on fixed baseline elevation	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Bankfull Width (ft)	14.7	14.1	13.4					15.2	15.9	16.7					14.6	15.1	16.0					17.5	18.1	18.2					15.0	17.1	17.5				
Floodprone Width (ft)	35.0	35.0	31.3					33.0	33.0	33.3					>60	>60	>59					-	-	-					>66	>66	>65				
Bankfull Mean Depth (ft)	0.9	1.0	0.9					1.1	1.0	0.9					1.0	1.0	0.9					1.5	1.3	1.2					1.1	1.0	1.0				
Bankfull Max Depth (ft)	1.8	1.7	1.6					1.7	1.7	1.7					1.7	1.7	1.8					3.2	2.3	2.3					2.0	2.0	2.0				
Bankfull Cross-Sectional Area (ft^2)	13.9	14.2	12.7					16.3	16.2	15.4					15.2	15.6	14.6					26.5	23.1	21.9					16.2	16.7	16.9				
Bankfull Width/Depth Ratio	15.5	15.4	14.1					14.2	15.6	18.1					14.0	14.6	17.5					-	-	-					13.9	17.5	18.1				
Bankfull Entrenchment Ratio	2.4	2.4	2.3					2.2	2.1	2.0					4.1	4.0	3.8					-	-	-					4.4	3.9	3.8				
Bankfull Bank Height Ratio	1.0	1.0	1.0					1.0	1.0	1.0					1.0	1.0	1.0					-	-	-					1.0	1.0	1.0				
d50 (mm)	21	4	2.9					5	2.5	2.4					4	2.7	10					-	-	-					10	2.8	92				

Table 11b. Stream Reach Morphology Data Tables
Jacob's Ladder Stream Restoration Site, DMS Project # 95023
Reach: T1 (2,389 ft.)

Parameter	MY01 (2014)						MY02 (2015)						MY03 (2016)						MY04 (2017)						MY05 (2018)					
Dimension	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	9.9	11.5	11.5	12.9	1.1	4	10.5	12.1	11.9	14.2	1.5	4																		
Floodprone Width (ft)	45.0	49.1	50.0	50.0	1.8	3	46.9	49.1	50.0	50.3	1.5	3																		
Bankfull Mean Depth (ft)	0.9	1.0	1.0	1.3	0.2	4	0.8	1.0	0.9	1.2	0.1	4																		
Bankfull Max Depth (ft)	1.6	1.9	1.8	2.4	0.3	4	1.7	1.9	1.8	2.3	0.3	4																		
Bankfull Cross-Sectional Area (ft^2)	10.6	11.7	11.6	12.9	1.0	4	10.1	11.6	11.8	12.9	1.2	4																		
Width/Depth Ratio	11.0	12.7	13.4	13.8	1.2	3	12.0	14.3	15.3	15.6	1.7	3																		
Entrenchment Ratio	3.5	4.1	4.1	4.6	0.5	3	3.2	3.9	3.9	4.5	0.6	3																		
Bank Height Ratio	1.0	1.0	1.0	1.0	0	3	1.0	1.0	1.0	1.0	0	3																		
Pattern																														
Channel Beltwidth (ft)	25	48		70																										
Radius of Curvature (ft)	20	33		45																										
Rad. of Curv. : Bankfull Width (ft/ft)	2	3		4																										
Meander Wavelength (ft)	65	103		140																										
Meander Width Ratio	234.0	4		5.8																										
Profile																														
Riffle Length (ft)	17	34	35	46	7.00	20	6.4	35.7	37.9	56.2	12.2	20																		
Riffle Slope (ft/ft)	0.009	0.02	0.02	0.06	0.01	21	0.006	0.02	0.02	0.02	0.004	20																		
Pool Length (ft)	8.0	28.3	27.1	49.6	10.8	16	4.8	20.2	18.2	49.4	10.8	17																		
Pool Max Depth (ft)	2.4	2.7		3.0		2	2.3	2.8		3.2		2																		
Pool Spacing (ft)	38.5	50.8	45.5	99.0	14.6	15	54.1	85.7	75.0	175.8	30.8	16																		
Additional Reach Parameters																														
Channel Thalweg Length (ft)	2,389						2,389																							
Sinuosity	0.36						0.36																							
Water Surface Slope (ft/ft)	0.0093						0.0093																							
Bankfull Slope (ft/ft)	0.0092						0.0082																							
Rosgen Classification	C4						C4																							
SC% / Sa% / G% / C% / B% / Be%	41%/4%/29%/26%/0%/0%						39%/8%/18%/35%/0%/0%																							
d16/d35/d50 / d84 / d95	10/19/25/50/64						17/34/44/80/100																							
% of Reach with Eroding Banks	0%						0%																							

Table 11c. Stream Reach Morphology Data Tables
Jacob's Ladder Stream Restoration Site, DMS Project # 95023
Reach: T2 (2,084 ft.)

Parameter	MY01 (2014)						MY02 (2015)						MY03 (2016)						MY04 (2017)						MY05 (2018)					
Dimension	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	14.8	16.2	15.9	18.1	1.2	5	13.4	17.6	16.7	24.3	3.6	5																		
Floodprone Width (ft)	33.0	48.4	47.1	66.0	14.5	4	31.3	47.5	46.1	66.0	15.4	4																		
Bankfull Mean Depth (ft)	1.0	1.1	1.0	1.3	1.1	5	0.9	0.9	0.9	1.0	0.9	5																		
Bankfull Max Depth (ft)	1.7	1.9	1.7	2.3	1.9	5	1.6	1.9	1.8	2.3	1.9	5																		
Bankfull Cross-Sectional Area (ft^2)	14.2	17.2	16.2	23.1	3.1	5	12.7	16.3	15.4	22.0	3.1	5																		
Width/Depth Ratio	14.6	15.8	15.5	17.5	1.1	4	14.1	17.0	17.8	18.1	1.7	4																		
Entrenchment Ratio	2.1	3.1	3.1	4.0	0.9	4	2.0	3.0	3.0	3.8	0.8	4																		
Bank Height Ratio	1.0	1.0	1.0	1.0	0	4	1.0	1.0	1.0	1.0	0.0	4																		
Pattern																														
Channel Beltwidth (ft)	20	45		70																										
Radius of Curvature (ft)	20	37		54																										
Rad. of Curv. : Bankfull Width (ft/ft)	2	3		4																										
Meander Wavelength (ft)	58	99		140																										
Meander Width Ratio	2.2	4		5.2																										
Profile																														
Riffle Length (ft)	9.1	37.9	31.1	133.6	28.9	20	5.8	25.8	24.7	44.5	12.9	20																		
Riffle Slope (ft/ft)	0.003	0.01	0.01	0.05	0.01	20	0.002	0.02	0.01	0.04	0.01	20																		
Pool Length (ft)	1.7	3.9	0.8	19.3	5.6	14	4.7	8.1	7.1	17.0	3.5	16																		
Pool Max Depth (ft)	2.3	2.3		2.3		1	1.2	1.2		1.2		1																		
Pool Spacing (ft)	22.5	44.4	47.3	237.7	74.9	13	16.4	94.7	51.4	279.5	89.0	15																		
Additional Reach Parameters																														
Channel Thalweg Length (ft)	2,084						2,084																							
Sinuosity	1.16-1.45						1.16-1.45																							
Water Surface Slope (ft/ft)	0.0088						0.0083																							
Bankfull Slope (ft/ft)	0.0078						0.0074																							
Rosgen Classification	C4						C4																							
SC% / Sa% / G% / C% / B% / Be%	22%/32%/43%/3%/0%/0%						0%/35%/47%/17%/1%/0%																							
d16 / d35 / d50 / d84 / d95	0.2/1/2/17/46						1.1/5/22/59/77																							
% of Reach with Eroding Banks	0%						0%																							

Appendix E

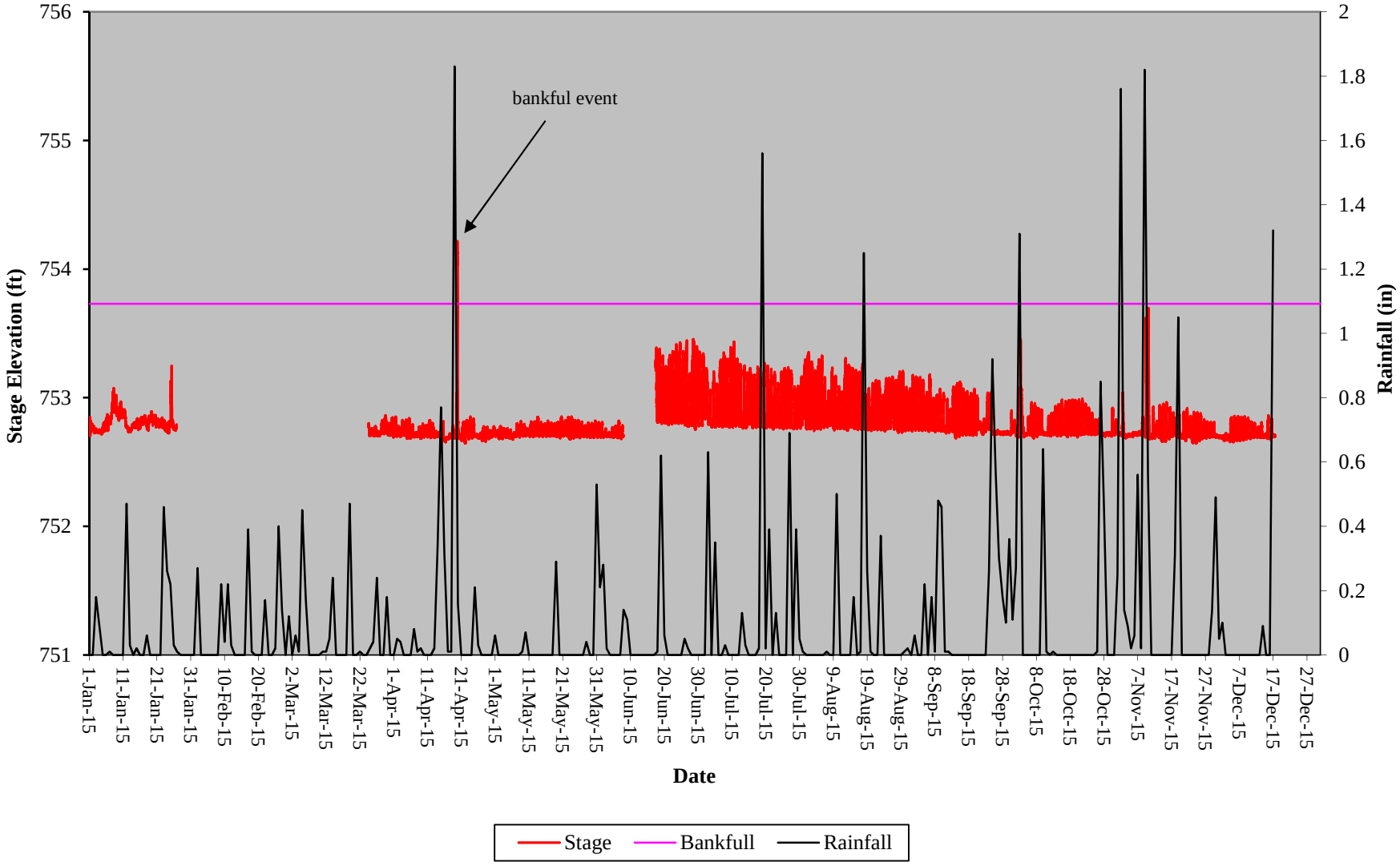
Hydrologic Data

Table 12. Verification of Bankfull Events Jacob's Ladder Stream Restoration Site, DMS Project # 95023			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo Number**
4/20/2015	4/20/2015	Automatic gauge on-site	N/A
12/17/2015	Unknown	Wracklines and flattened vegetation observed at bankfull, stream observed above bankfull	1 - 2

Photo 1. Bankfull indicators along T1, 12/17/15

Photo 2. T2 at bankfull, 12/17/15

Jacob's Ladder Restoration Site
Stage Hydrograph
Stream Gauge 1



Jacob's Ladder Restoration Site
Stage Hydrograph
Stream Gauge 2