

**Dye Branch II  
Stream Restoration  
Post-Repair Monitoring Report (2017)  
NCDMS Project Number: 92255**



**Submitted to  
North Carolina Division of Mitigation Services  
North Carolina Department of Environmental Quality  
February 2018**

**1652 Mail Service Center  
Raleigh, NC 27699**

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March 12, 2018

Matthew Reid  
Project Manager  
DENR Ecosystem Enhancement Program  
5 Ravenscroft Dr., #102  
Asheville, NC 28801

Subject: Dye Branch Stream Restoration Project #92255 – 2017 Post-Repair Monitoring Report Comments

Dear Mr. Reid:

The North Carolina Division of Mitigation Services (DMS) contracted the services of Equinox Environmental to perform post-repair monitoring services for the Dye Branch Stream Restoration Project Site. Comments provided by DMS are listed below with the red text indicating how each was addressed by Equinox within the final report.

**General**

- Please change Post-Repair Monitoring Report 2018 to 2017 on the title page. **Title page has been changed to say 2017.**

**Section 1.0**

- Please update second sentence in second paragraph to the following: “Multiple stream repairs to the Dye Branch Project were completed in November 2017 followed by a limited supplemental planting in February 2018. **Second sentence in the second paragraph of Section 1.0 has been updated to the previous sentence.**
- Please add “420” before bare root seedlings in last sentence of paragraph. **420 has been added to the last sentence of the paragraph.**
- Please add the following sentence at the end of paragraph 3: “In addition to this Post-Repair Monitoring Report, two additional years of monitoring will be conducted at the site beginning in Fall 2018 and Fall 2019.” **The previous sentence has been added to the report.**
- Please change “rip-rap” to boulders in second paragraph on page 2. **Rip-rap has been changed to boulders in the second paragraph on page 2.**

**Table 2:**

- Please use the attached Table 2 in future submissions. **The provided Table 2 has been added to the report and will be used in future submissions.**

**CCPV:**

- Add locations of Temporary Vegetation Plots to CCPV. **Temporary Vegetation Plot Origins have been added to the CCPV.**



**Temporary Vegetation Plots:**

- Add table with Temporary Vegetation Plot data. Please include species if recorded. See attached example. **An extension of table 9 has been added to the report to better document the Temporary Vegetation Plot data. Specific species per plot were not recorded however species seen in the plots were added as a footnote to the table.**

**Cross-Sections:**

- Please change “Post-Repair 2018” in legend to 2017 in all graphs. **All graphs have been updated to “Post-Repair 2017.”**

The project manager for this project is Mr. Drew Alderman. His contact information is as follows:

Drew Alderman  
Natural Resource Specialist  
Equinox  
37 Haywood Street  
Asheville, NC 28801  
828-253-6856 ext. 213 office  
828-253-8256 fax

Sincerely,

Drew Alderman

# Monitoring Firm



# EQUINOX

*balance through proper planning*

**37 Haywood Street, Suite 100  
Asheville, North Carolina 28801  
Phone: 828-253-6856**

**Project Contact: Drew Alderman  
Email: [drew@equinoxenvironmental.com](mailto:drew@equinoxenvironmental.com)**

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# **Dye Branch II Stream Restoration 2017 Post-Repair Monitoring Report**

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## 1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

The goals and objectives stated in the Dye Branch Stream Restoration Plan (NCEEP 2005) are as follows:

- Provide a stable system of stream channels that neither aggrade nor degrade while maintaining dimension, pattern, and profile with the capacity to transport the watershed's water and sediment load;
- Improve the overall water quality and aquatic habitat by reducing sediment and waste inputs into the stream caused by bank erosion, mass-wasting, and stormwater runoff through stabilization of the stream channel and creation of a stormwater wetland; and
- Improve the overall viability of the riparian vegetative communities through establishment of native species and elimination of invasive exotic species.

This is the first monitoring report for the Dye Branch Stream Restoration Project since the completion of Monitoring Year 5 (MY5) in 2015. Multiple repairs to the Dye Branch Project were completed in November 2017 followed by a limited supplemental planting in February 2018. As a part of the repairs, two small areas were repaired on Upper Dye Branch and five small areas were repaired on Lower Dye Branch. The repairs consisted of repairing failed structures, installation of brush toe, streambank grading, installation of coir matting, riffle construction, and grading of the channel to reestablish the thalweg for proper flow through the new alignment. A supplemental planting was also performed to revegetate the areas that were graded during the repairs. A temporary seed mix and 420 bare root seedlings were planted in areas affected by the repairs to help revegetate.

This report incorporates data that is associated with Post-Repair Monitoring and includes qualitative vegetation and stream assessment including vegetation monitoring of seven (7) annual monitoring plots, four (4) random/ temporary vegetation plots, morphological monitoring of ten (10) cross-sections, and hydrologic monitoring. This report also includes a visual assessment which incorporates multiple photo points, visual assessment of the vegetation, easement, and stream channel to document any problem areas that arise. These problem areas are documented in Tables 5 and 6 and depicted in Figure 2, the Current Condition Plan View. In addition to this Post-Repair Monitoring Report, two additional years of monitoring will be conducted at the site beginning in the fall of 2018 and fall of 2019.

Vegetation monitoring of the Dye Branch Stream Restoration Project includes annual monitoring of seven permanent vegetation plots, four temporary vegetation plots, and visual assessment of the easement as a whole. The site includes a diverse assemblage of 15 planted species of native trees and shrubs. Planted stems range from 4 to 26 per plot with 7 to 62 stems observed when volunteers are included. Based on the Post-Repair vegetation data, the average stem density for planted stems across all plots is approximately 416 stems per acre. This meets the year 7 success criteria of 210 planted stems per acre. When all planted and natural stems are combined, the average stem density is 1,046 stems per acre, and all seven plots meet the year seven success criteria. Four random vegetation plot transects were also performed to evaluate stems throughout the easement as a whole. The stem counts for the random vegetation transects were 10, 27, 26, and 28 which extrapolate out to 500, 1350, 1300, and 1400 stems per acre respectively.

Regarding invasive-exotics, multiple patches of invasive plants have been identified during previous monitoring efforts. A contractor was hired to treat the invasive-exotic vegetation in November 2015. Cut and stump spray, foliar spray and basal bark methods were implemented to treat Japanese honeysuckle (*Lonicera japonica*), Chinese privet (*Ligustrum sinense*), kudzu (*Pueraria lobata*), Japanese privet (*Lonicera japonica*), multiflora rose (*Rosa multiflora*) and mimosa (*Albizia julibrissin*) throughout the conservation easement. Treatments occurred in November 2015 and throughout 2017 and have been very effective. Invasive-exotics will be monitored during future site visits.

Morphologic monitoring of the Post-Repair construction at the Dye Branch Site included ten (10) cross-sections. Cross-sectional overlays are located in Appendix D and the summary of the data is located in Table 11a. The most substantial change that took place between MY5 Monitoring (2015) and the Post-Repair Monitoring (2018) efforts took place at cross-section 5 and cross-section 9. Both of these areas were affected by the repairs. At cross-section 5, the right descending bank (RDB) was excavated to anchor boulders to the bank, this increased the bankfull width by 6.7 ft and increased the bankfull cross-sectional area by 12.2 ft<sup>2</sup>. Cross-vane structures just downstream of cross-section 9 were repaired during the repairs. This helped to realign the thalweg and changed cross-section 9 from a pool to a glide. This change can be seen in the cross-sectional overlay (Appendix D) and in the associated dimensions in Table 11a. Bankfull mean and max depths have decreased 1.1 ft and 1.5 ft respectively. The RDB has also been excavated to allow better access to the floodplain during flood stages. This alteration has resulted in a lowering of the bankfull cross-sectional area by 20.0 ft<sup>2</sup>.

A water level logger was installed in December of 2010 and has since recorded a total of 14 bankfull events. An equipment malfunction led to the loss of pressure transducer between MY5 (2015) and Post-Repair Monitoring (2018). A crest gauge was installed in February 2018 to monitor for evidence of bankfull events. The crest gauge will be monitored in subsequent site visits.

Summary information/data related to the occurrence of items such as beaver or easement 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 mitigation and restoration plan documents available on NCDMS' website. All raw data supporting tables and figures in the appendices are available from NCDMS upon request.

## 2.0 Methodology

The stream monitoring methodologies utilized in Post-Repair Monitoring replicate those employed during the previous monitoring years and are based on standard guidance and procedures documents (Rosgen 1996; USACE 2003).

Geomorphic measurements were taken during low flow conditions using a Nikon NPR 332 Total Station. Three-dimensional coordinates associated with cross-sections were collected in the field and geo-referenced (NAD83 North Carolina State Plane feet FIPS 3200). Geomorphic data included 10 cross-sections.

Vegetation success is being monitored using 7 permanent monitoring plots and 4 random temporary transects. Vegetation monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation, Version 4.2 (Lee et al. 2008) and includes analysis of composition and density of planted species. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with rebar and photos of each plot taken from the origin each monitoring year.

### 3.0 References

- Harrelson, Cheryl, C. Rawlins and J. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Rocky Mountain Forest and Range Experiment Station. USDA Forest Service. Fort Collins, Colorado
- Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. The University of North Carolina at Chapel Hill, Department of Biology.
- NCEEP (North Carolina Ecosystem Enhancement Program). 2005. Dye Branch Stream Restoration Plan. Raleigh.
- Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology Books. Pagosa Springs, Colorado.
- USACE (U.S. Army Corps of Engineers). 2003. Stream Mitigation Guidelines. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, North Carolina Wildlife Resources Commission, North Carolina Department of Environment and Natural Resources-Division of Water Quality. Wilmington District.

**Appendix A**  
**Project Vicinity Map and Background Tables**

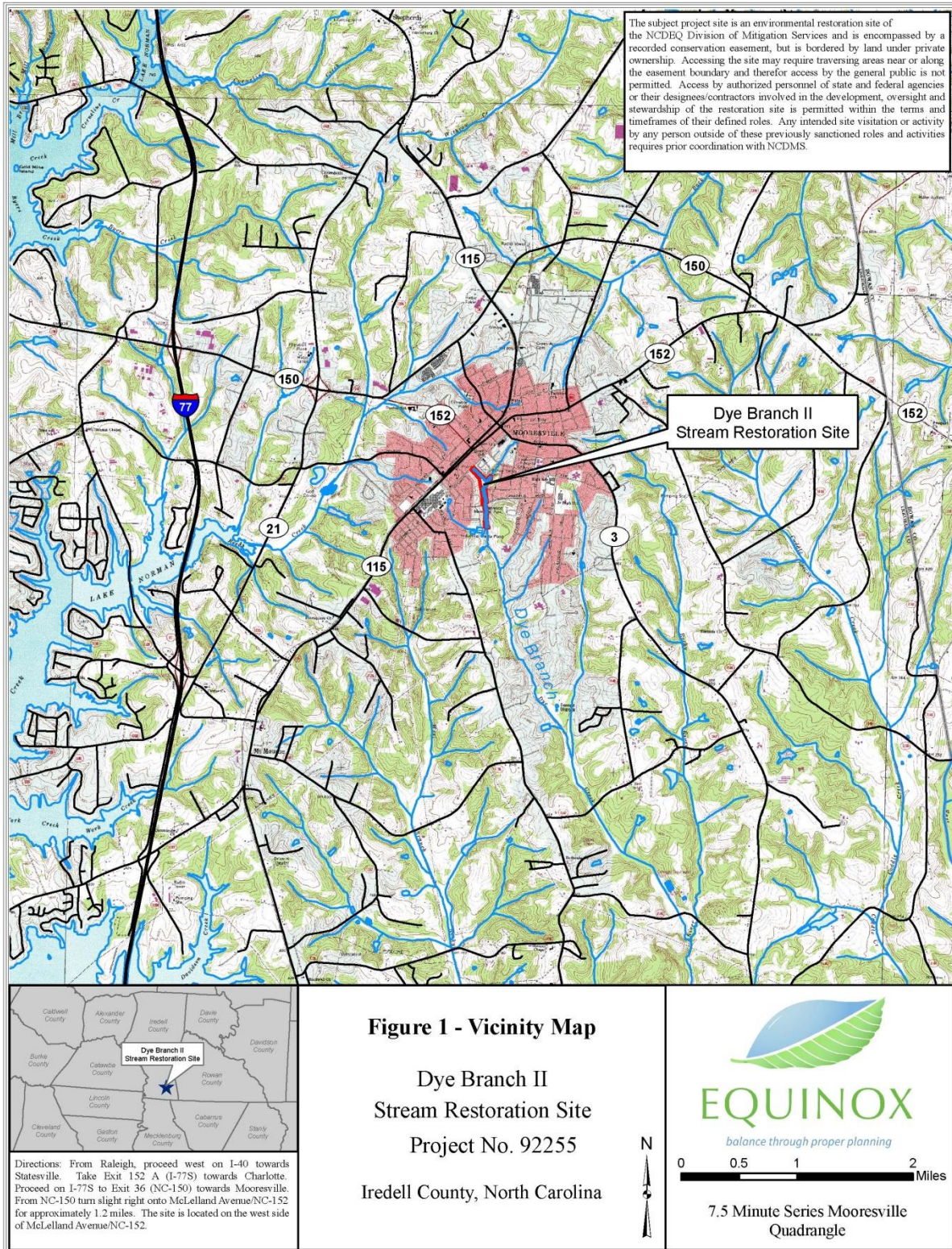


Table 1a. Project Components Dye Branch II / Project No. 92255								
Project Component or Reach ID	Existing Feet/Acres	Restoration Level	Approach	Footage or Acreage	Stationing	Buffer Acres	BMP Elements	Comment
Cemetery Branch	968 lf	R	P3	1,014 lf	0+00 - 10+14		Stormwater wetlands	
Dye Branch Upstream	1,772 lf	R	P2	1,500 lf	0+00 - 15+00		Stormwater wetlands	
Dye Branch Downstream	1,232 lf	R	P2	1,171 lf	16+00 - 27+71			

- Information unavailable  
=Non-Applicable

Table 1b. Component Summations Dye Branch II / Project No. 92255							
Restoration Level	Stream (lf)	Riparian Wetland (ac)		Non-Riparian (ac)	Upland (ac)	Buffer (ac)	BMP
		Riverine	Non-Riverine				
Restoration	3,685	0.0	0.0				
Enhancement		0.0	0.0				
Enhancement I	0						
Enhancement II	0						
Creation		0.0	0.0				
Preservation	0	0.0	0.0				
HQ Preservation	0	0.0	0.0				
		0.0	0.0				
<b>Totals</b>	<b>3,685</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>

=Non-applicable

Table 2. Project Activity & Reporting History Dye Branch II / Project No. 92255		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	-	Oct 2005
Final Design - Construction Plans	-	April 2006
Final Design - Repair Plans	-	July 2010
Construction Repairs	-	Dec 2010
Temporary S&E mix applied	-	Summer 2010
Permanent seed mix applied	-	Summer 2010
Planting	-	Feb 2011
Mitigation Plan / As-built (Year 0 Monitoring - Baseline)	Mar 2011	Aug 2011
Year 1 Monitoring	Nov 2011	Jan 2012
Year 2 Monitoring	Dec 2012	Jan 2013
Year 3 Monitoring	Nov 2013	Dec 2013
Year 4 Monitoring	Dec 2014	Dec 2014
Year 5 Monitoring	Nov 2015	Nov 2015
Invasive-Exotic Vegetation Treatment	-	Nov 2015
Invasive-Exotic Vegetation Treatment	-	Mar 2017
Invasive-Exotic Vegetation Treatment	-	Apr 2017
Invasive-Exotic Vegetation Treatment	-	July 2017
Invasive-Exotic Vegetation Treatment	-	Aug 2017
2017 Repair - Stream	-	Nov 2017
2017 Repair - Planting	-	Feb 2018
2017 Repair Monitoring	Feb 2018	Feb 2018

- Information unavailable.  
N/A - Item does not apply.

<b>Table 3. Project Contacts Dye Branch II / Project No. 92255</b>	
<b>Designer</b>	Mulkey Engineers & Consultants 6750 Tryon Road Cary NC, 27518 Emmett Perdue (919) 858-1874
Primary Project Design POC	
<b>Construction Contractor</b>	Fluvial Solutions P.O. Box 28749 Raleigh, NC 27611 Peter Jelenevsky (919) 605-6134
Construction Contractor POC	
<b>Repair Construction/ Planting Contractor 2018</b>	Baker Grading 970 Bat Cave Rd Old Fort, NC 28762 Charles Baker (828) 668-7659
Repair Construction Contractor POC	
<b>Planting Contractor</b>	Fluvial Solutions P.O. Box 28749 Raleigh, NC 27611 Peter Jelenevsky (919) 605-6134
Planting Contractor POC	
<b>Seeding Contractor</b>	Fluvial Solutions P.O. Box 28749 Raleigh, NC 27611 Peter Jelenevsky (919) 605-6134
Seeding Contractor POC	
Seed Mix Sources	Hanes Geo Components Winston-Salem, NC 27101
Nursery Stock Suppliers	North Carolina Forest Service Goldsboro, NC 27530
<b>Monitoring Performers (MY0-MY5) 2010 - 2015</b>	Equinox Environmental 37 Haywood Street, Suite 100 Asheville, North Carolina 28801
Stream Monitoring POC	Drew Alderman (828) 253-6856
Vegetation Monitoring POC	Drew Alderman (828) 253-6856
<b>Post-Repair Monitoring Performers 2018</b>	Equinox Environmental 37 Haywood Street, Suite 100 Asheville, North Carolina 28801
Stream Monitoring POC	Drew Alderman (828) 253-6856
Vegetation Monitoring POC	Drew Alderman (828) 253-6856



<b>Table 4. Project Attributes</b>		
<b>Dye Branch II / Project No. 92255</b>		
Project County	Iredell	
Physiographic Region	Piedmont	
Ecoregion	Southern Outer Piedmont	
River Basin	Yadkin - Pee Dee	
USGS HUC	03040105010010	
NCDWQ Sub-Basin	03-07-11	
Within Extent of EEP Watershed Plan	Upper Rocky River Local Watershed Plan	
WRC Class	Warm	
% of Project Easement Fenced or Demarcated	100%	
Beaver Activity Observed During Design Phase	No	
<b>Restoration Component Attributes</b>		
	<b>Dye Branch</b>	<b>Cemetery Branch</b>
Drainage Area (sq.mi.)	0.60	0.06
Stream Order	First / Second	First
Restored Length (feet)	2,671	1,014
Perennial or Intermittent	Perennial	Perennial
Watershed Type	Urban	
Watershed LULC Distribution		
	Urban	85%
	Other	15%
Watershed Impervious Cover	-	
NCDWQ AU/Index Number	13-17-2	
NCDWQ Classification	C	
303d Listed	Yes	
Upstream of 303d Listed Segment	Yes	
Reasons for 303d Listing or Stressor	Poor Bioclassification	
Total Acreage of Easement	12.0	
Total Vegetated Acreage within Easement	12.0	
Total Planted Acreage as Part of Restoration	8.9	
Rosgen Classification of Pre-Existing	E4 / G4c	E4
Rosgen Classification of As-Built	C	C
Valley Type	-	-
Valley Slope	0.0097 / 0.0125	0.0217
Valley Side Slope Range	-	-
Valley Toe Slope Range	-	-
Cowardin Classification	N/A	N/A
Trout Waters Designation	No	No
Species of Concern, Endangered, Etc.	None	
Dominant Soil Series and Characteristics		
	Series	Chewacla / Cecil / Colfax
	Depth	-
	Clay%	-
	K	-
	T	-

- Information unavailable.

N/A - Item does not apply.

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# **Appendix B**

## **Visual Assessment Data**

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Insert Figure 2. CCPV

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<b>Table 5. Visual Stream Morphology Stability Assessment</b> <b>Dye Branch II / Project No. 92255 - Cemetery Branch</b> <b>Assessed Length 1,014 feet</b>												
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	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation		
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%					
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%					
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	14	14			100%					
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	15			15				100%	
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).		15	15			100%					
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	15	15			100%					
		2. Thalweg centering at downstream of meander bend (Glide).	14	14			100%					
	2. Bank	1. <u>Scoured / Eroding</u>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.								1	12
2. <u>Undercut</u>		Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.					0	0	100%	0	0	0%
3. <u>Mass Wasting</u>		Bank slumping, calving, or collapse.					0	0	100%	0	0	0%
<b>Totals</b>					1	12	99%	0	0	0%		
3. Engineered Structures	1. <u>Overall Integrity</u>	Structures physically intact with no dislodged boulders or logs.	32	32			100%					
	2. <u>Grade Control</u>	Grade control structures exhibiting maintenance of grade across the sill.	28	28			100%					
	2a. <u>Piping</u>	Structures lacking any substantial flow underneath sills or arms.	28	28			100%					
	3. <u>Bank Protection</u>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	4	4			100%					
	4. <u>Habitat</u>	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio $\geq$ 1.6. Rootwads/logs providing some cover at base-flow.	13	13			100%					

N/A - Item does not apply.

Table 5 cont'd. Visual Stream Morphology Stability Assessment Dye Branch II / Project No. 92255 - Dye Branch - Upstream Assessed Length 1,500 feet										
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	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			1	28	98%			
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	17	17			100%			
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	20	20					
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).		16	20			80%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	17	17			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	16	16			100%			
	2. Bank	1. <u>Scoured / Eroding</u>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			5	137			
2. <u>Undercut</u>		Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
3. <u>Mass Wasting</u>		Bank slumping, calving, or collapse.			1	5	100%	0	0	100%
<b>Totals</b>					6	142	95%	0	0	95%
3. Engineered Structures	1. <u>Overall Integrity</u>	Structures physically intact with no dislodged boulders or logs.	29	30			97%			
	2. <u>Grade Control</u>	Grade control structures exhibiting maintenance of grade across the sill.	7	8			88%			
	2a. <u>Piping</u>	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. <u>Bank Protection</u>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	20	23			87%			
	4. <u>Habitat</u>	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio $\geq$ 1.6. Rootwads/logs providing some cover at base-flow.	5	5			100%			

N/A - Item does not apply.



Table 5 cont'd. Visual Stream Morphology Stability Assessment Dye Branch II / Project No. 92255 - Dye Branch - Downstream Assessed Length 1,171 feet													
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	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation			
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			1	34	97%						
		2. <u>Degradation</u> - Evidence of downcutting.			0	0	100%						
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	11	11			100%						
		3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	10			10				100%		
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).		10	10			100%						
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	10	10			100%						
		2. Thalweg centering at downstream of meander bend (Glide).	10	10			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 <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.					0	0	100%	0	0	0%
3. Mass Wasting			Bank slumping, calving, or collapse.					0	0	100%	0	0	0%
<b>Totals</b>			0		0	100%		0	0	100%			
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	21	22			95%						
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	7	8			88%						
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%						
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	14	14			100%						
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio $\geq$ 1.6. Rootwads/logs providing some cover at base-flow.	5	5			100%						

N/A - Item does not apply.

<b>Table 6. Vegetation Condition Assessment</b> <b>Dye Branch II / Project No. 92255</b> <b>Planted Acreage 9.0</b>					
Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
<b>1. Bare Areas</b>	Very limited cover of both woody and herbaceous material.	Stipple Black Dots White Background	0	0.00	0%
<b>2. Low Stem Density Areas</b>	Woody stem densities clearly below target levels based on MY7 stem count criteria.	N/A	0	0.00	0%
<b>Totals</b>			0	0.00	0%
<b>3. Areas of Poor Growth Rates or Vigor</b>	Areas with woody stems of a size class that are obviously small given the monitoring year.	N/A	0	0.00	0%
<b>Cumulative Totals</b>			0	0.00	0%
<b>Easement Acreage 12.01</b>					
Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
<b>4. Invasive Areas of Concern</b>	Areas or points (if too small to render as polygons at map scale).	Cross Hatch (Red - Dense/Yellow - Present)	0	0.00	0%
<b>5. Easement Encroachment Areas</b>	Areas or points (if too small to render as polygons at map scale).	Stipple Orange Dots White Background	0	0.00	0.0%

N/A - Item does not apply.



Cemetery Branch – Permanent Photo Station 1  
Downstream



Cemetery Branch – Permanent Photo Station 2  
Upstream



Cemetery Branch – Permanent Photo Station 2  
Downstream



Dye Branch – Permanent Photo Station 3  
Downstream



Dye Branch – Permanent Photo Station 4  
Upstream



Dye Branch – Permanent Photo Station 5  
Upstream



Dye Branch – Permanent Photo Station 6  
Upstream



Dye Branch – Permanent Photo Station 7  
Downstream



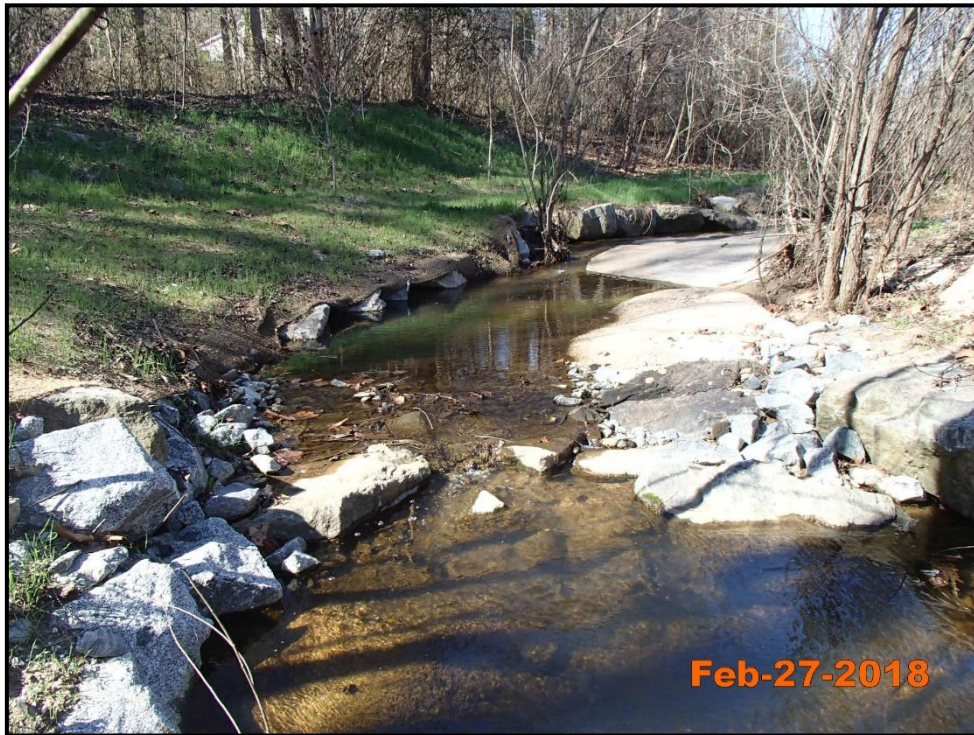
Dye Branch – Permanent Photo Station 8  
Upstream



Dye Branch – Permanent Photo Station 9  
Upstream



Dye Branch – Permanent Photo Station 10  
Upstream Repair Area 6 STA 10+50



Dye Branch – Permanent Photo Station 11  
Downstream Repair Area STA 19+00



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# **Appendix C**

## **Vegetation Plot Data**

<b>Table 7. Vegetation Plot Criteria Attainment Dye Branch II / Project No. 92255</b>		
<b>Vegetation Plot ID</b>	<b>Vegetation Survival Threshold Met?</b>	<b>Tract Mean</b>
1	Yes	100%
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	Yes	



Vegetation Monitoring Plot 1  
Post-Repair Monitoring – February 22<sup>nd</sup>, 2018



Vegetation Monitoring Plot 2  
Post-Repair Monitoring – February 22<sup>nd</sup>, 2018



Vegetation Monitoring Plot 3  
Post-Repair Monitoring – February 22<sup>nd</sup>, 2018



Vegetation Monitoring Plot 4  
Post-Repair Monitoring – February 22<sup>nd</sup>, 2018



Vegetation Monitoring Plot 5  
Post-Repair Monitoring – February 22<sup>nd</sup>, 2018



Vegetation Monitoring Plot 6  
Post-Repair Monitoring – February 22<sup>nd</sup>, 2018



Vegetation Monitoring Plot 7  
Post-Repair Monitoring – February 22<sup>nd</sup>, 2018

<b>Table 8. CVS Vegetation Plot Metadata Dye Branch II / Project No. 92255</b>	
<b>Report Prepared By</b>	Drew Alderman
<b>Date Prepared</b>	2/23/2018 10:11
<b>Database name</b>	Equinox-2018-A-DyeBranch_Post-Repair.mdb
<b>Database location</b>	Z:\ES\NRI&M\EEP Monitoring\Dye Branch\DB-Post_Repair-2018\Data\Veg
<b>Computer name</b>	FIELD-PC
<b>File size</b>	46333952
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj, planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj, total stems</b>	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.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>Planted Stems by Plot and Spp</b>	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
<b>ALL Stems by Plot and spp</b>	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.
<b>PROJECT SUMMARY</b>	
<b>Project Code</b>	92255
<b>project Name</b>	Dye Branch
<b>Description</b>	
<b>River Basin</b>	Yadkin-Pee Dee
<b>Length(ft)</b>	
<b>Stream-to-Edge Width (ft)</b>	
<b>Area (sq m)</b>	
<b>Required Plots (calculated)</b>	
<b>Sampled Plots</b>	7



Table 9. Planted Stem and Total Stem Counts (Species by Plot)																								
Dye Branch / Project No. 92255																								
Scientific Name	Common Name	Species Type	Current Plot Data (Post Repair 2018)																					
			VP1			VP2			VP3			VP4			VP5			VP6			VP7			
			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	
<i>Acer negundo</i>	Boxelder	Tree										1						2						
<i>Acer rubrum</i>	Red Maple	Tree										3							4	4	4	9	9	9
<i>Betula nigra</i>	River Birch	Tree			2	1	1	1											1	1	1	1	1	1
<i>Carpinus caroliniana</i>	American Hornbeam	Tree																				1	1	1
<i>Cercis canadensis</i>	Eastern Redbud	Tree											1	1	1	1	1	1				2	2	2
<i>Cornus florida</i>	Flowering Dogwood	Tree																					1	
<i>Diospyros virginiana</i>	Common Persimmon	Tree			1				1	1	2	1	1	1										
<i>Fraxinus pennsylvanica</i>	Green Ash	Tree				3	3	3	1	1	1						2	5	5	5	9	9	9	
<i>Juglans nigra</i>	Black Walnut	Tree	1	1	1												1		2				3	
<i>Juniperus virginiana var. virginiana</i>	Eastern Redcedar	Tree											1	1	1	2	2	2						
<i>Liquidambar styraciflua</i>	Sweetgum	Tree												34						12			7	
<i>Liriodendron tulipifera</i>	Tuliptree	Tree												4			2			8			14	
<i>Liriodendron tulipifera var. tulipifera</i>	Tulip-tree, Yellow Poplar, Whitewood	Tree				1	1	1																
<i>Pinus virginiana</i>	Virginia Pine	Tree	2	2	2								1	1	1	2	2	2						
<i>Platanus occidentalis</i>	American Sycamore	Tree						1			2						1	1	1	1	4	4	10	
<i>Platanus occidentalis var. occidentalis</i>	Sycamore, Plane-tree	Tree				1	1	1																
<i>Prunus serrulata</i>	Japanese Flowering Cherry	Tree												5			2							
<i>Quercus coccinea</i>	Scarlet Oak	Tree																					5	
<i>Quercus nigra</i>	Water Oak	Tree											2	2	4			1						
<i>Quercus phellos</i>	Willow Oak	Tree				1	1	1	7	7	16								3	3	3			
<i>Quercus velutina</i>	Black Oak	Tree	1	1	1				1	1	1													
<i>Sambucus canadensis</i>	Common Elderberry	Shrub						5																
<b>Stem count</b>			4	4	7	7	7	13	10	10	26	6	6	51	5	5	16	14	14	36	26	26	62	
<b>size (ares)</b>			1			1			1			1			1			1			1			
<b>size (ACRES)</b>			0.02			0.02			0.02			0.02			0.02			0.02			0.02			
<b>Species count</b>			3	3	5	5	5	7	4	4	7	5	5	8	3	3	10	5	5	8	6	6	11	
<b>Stems per ACRE</b>			162	162	283	283	283	526	405	405	1052	243	243	2064	202	202	647	567	567	1457	1052	1052	2509	

<sup>1</sup>PnoLS: No livestakes included in tally; P-all: All planted stems included in tally; T: Total stems including recruitment.

Table 9 Con't. Planted Stems and Total Stem Counts (Annual Means)																				
Dye Branch / Project No. 92255																				
Scientific Name	Common Name	Species Type	Annual Means																	
			Post Repair (2017)			MY5 (2015)			MY4 (2014)			MY3 (2013)			MY2 (2012)			MY1 (2011)		
			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			3			13									1			
Acer negundo var. negundo	Boxelder	Tree									7			7						
Acer rubrum	Red Maple	Tree	13	13	16			4									2			
Acer rubrum var. rubrum	Red Maple	Tree									5			5						
Albizia julibrissin	Silktree	Exotic												2						
Betula nigra	River Birch	Tree	3	3	5	1	1	2	1	1	2	1	1	2	1	1	1	1	1	1
Carpinus caroliniana	American Hornbeam	Tree	1	1	1															
Carya	Hickory	Tree						7			9			4			5			
Carya alba	Mockernut Hickory	Tree																	1	1
Carya ovata	Shagbark Hickory	Tree																	1	
Cercis canadensis	Eastern Redbud	Tree	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	2	2
Cornus amomum	Silky Dogwood	Shrub									3									
Cornus florida	Flowering Dogwood	Tree			1			4												
Cornus kousa	Kousa Dogwood	Tree						6												
Crataegus	Hawthorn	Tree									1									
Diospyros virginiana	Common Persimmon	Tree	2	2	4	2	2	4	1	1	4	1	1	5	1	1	1		1	
Fagus grandifolia var. grandifolia	American Beech	Tree									1									
Fraxinus pennsylvanica	Green Ash	Tree	18	18	20	4	4	8	5	5	9	5	5	5	4	4	4	4	4	4
Hibiscus	Rosemallow	Shrub									1									
Juglans nigra	Black Walnut	Tree	1	1	7	1	1	2	1	1	1	1	1	1	2	2	2	2	2	1
Juniperus virginiana var. virginiana	Eastern Redcedar	Tree	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	9
Liquidambar styraciflua	Sweetgum	Tree			53			51			44			43			14			17
Liriodendron	Tuliptree	Tree						42												
Liriodendron tulipifera	Tuliptree	Tree			28			13												
Liriodendron tulipifera var. tulipifera	Tulip-tree, Yellow Poplar, Whitewood	Tree	1	1	1	3	3	3	2	2	54	3	3	95	3	3	50	4	4	30
Nyssa sylvatica	Blackgum	Tree									1									
Pinus virginiana	Virginia Pine	Tree	5	5	5	5	5	5	6	6	6	7	7	7	10	10	10	11	11	14
Platanus occidentalis	American Sycamore	Tree	5	5	15			9						1			6			
Platanus occidentalis var. occidentalis	Sycamore, Plane-tree	Tree	1	1	1	1	1	3	1	1	8	1	1	3					1	1
Populus deltoides	Eastern Cottonwood	Tree															1			
Prunus	Plum	Shrub or Tree																	5	
Prunus serotina	Black Cherry	Tree															8			
Prunus serotina var. serotina	Black Cherry	Tree									12			6						
Prunus serrulata	Japanese Flowering Cherry	Tree			7			6												
Pyrus calleryana	Callery Pear	Exotic									1								2	
Quercus	Oak	Tree									5			1	1	1	1	9	9	13
Quercus alba	White Oak	Tree									3									
Quercus coccinea	Scarlet Oak	Tree			5															
Quercus falcata	Southern Red Oak	Tree										1	1	1	1	1	1	2	2	2
Quercus nigra	Water Oak	Tree	2	2	5	3	3	12	3	3	9	3	3	3	8	8	9	2	2	2
Quercus pagoda	Cherrybark Oak	Tree									1									
Quercus phellos	Willow Oak	Tree	11	11	20	13	13	23	13	13	18	13	13	13	8	8	26	4	4	7
Quercus rubra	Northern Red Oak	Tree															4			
Quercus velutina	Black Oak	Tree	2	2	2	3	3	3	3	3	3	4	4	15						
Salix caroliniana	Coastal Plain Willow	Tree						6			3									
Sambucus canadensis	Common Elderberry	Shrub			5									8						
Unknown	Shrub or Tree	Shrub or Tree																3	3	3
		Stem count	72	72	211	43	43	233	43	43	218	47	47	234	46	46	153	47	47	107
		size (ares)	7	7		7			7			7			7			7		
		size (ACRES)	0.17			0.17			0.17			0.17			0.17			0.17		
		Species count	15	15	22	12	12	23	12	12	27	13	13	22	12	12	20	12	12	18
		Stems per ACRE	416	416	1220	249	249	1347	249	249	1260	272	272	1353	266	266	885	272	272	619

<sup>1</sup>PnoLS: No livestock included in tally; P-all: All planted stems included in tally; T: Total stems including recruitment.

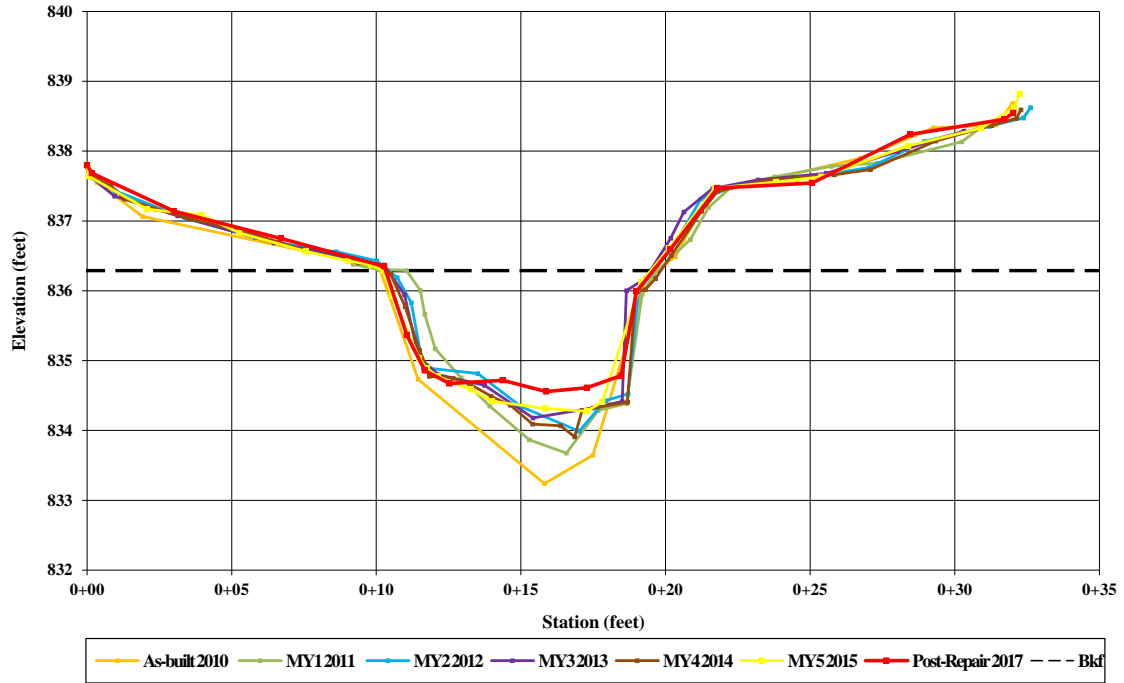
Table 9 Con't. Total Planted and Natural Stem Recruits (Temporary Random Plots)				
Dye Branch II / Project No. 92255				
	Temporary Plot 1 5m x 20m	Temporary Plot 2 10m x 10m	Temporary Plot 3 5m x 20m	Temporary Plot 4 5m x 20m
Stem Count	10	27	26	28
Size (Ares)	1	1	1	1
Size (Acres)	0.02	0.02	0.02	0.02
Stems Per Acre	500	1350	1300	1400

\* Specific species were not collected per plot however the majority of the stems included *Betula Nigra* , *Liriodendron tulipifera* , *Acer rubrum* , *Plantanus occidentalis* , *Acer negundo* , and *Liquidambar styraciflua* .

# **Appendix D**

## **Stream Survey Data**

Cemetery Branch  
Cross-Section 1 - Pool  
Station 1 + 04.27



Left Descending Bank



Right Descending Bank

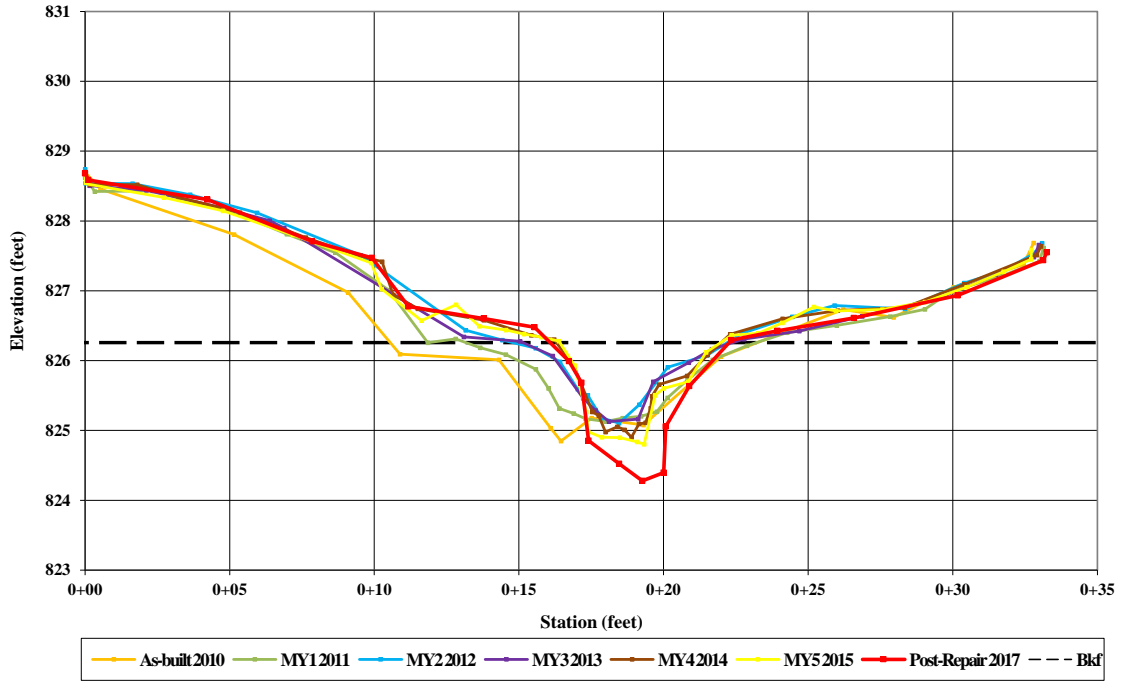


Upstream



Downstream

Cemetery Branch  
Cross-Section 2 - Riffle  
Station 6 + 40.40



Left Descending Bank



Right Descending Bank

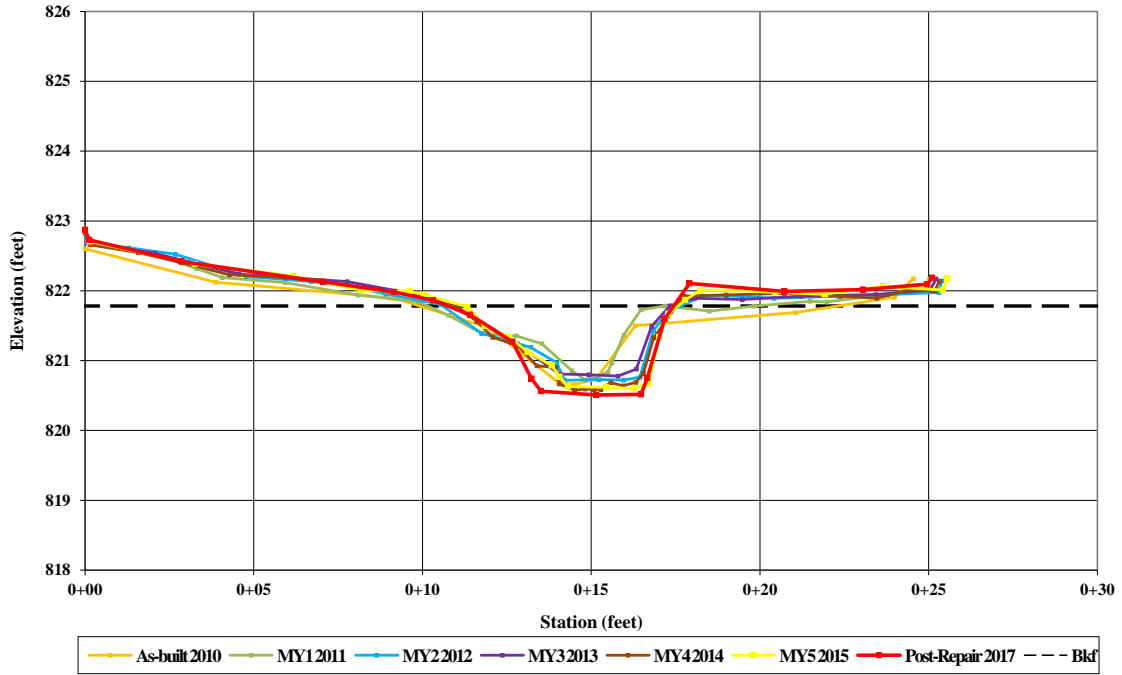


Upstream



Downstream

Cemetery Branch  
Cross-Section 3 - Riffle  
Station 8 + 77.10



Left Descending Bank



Right Descending Bank

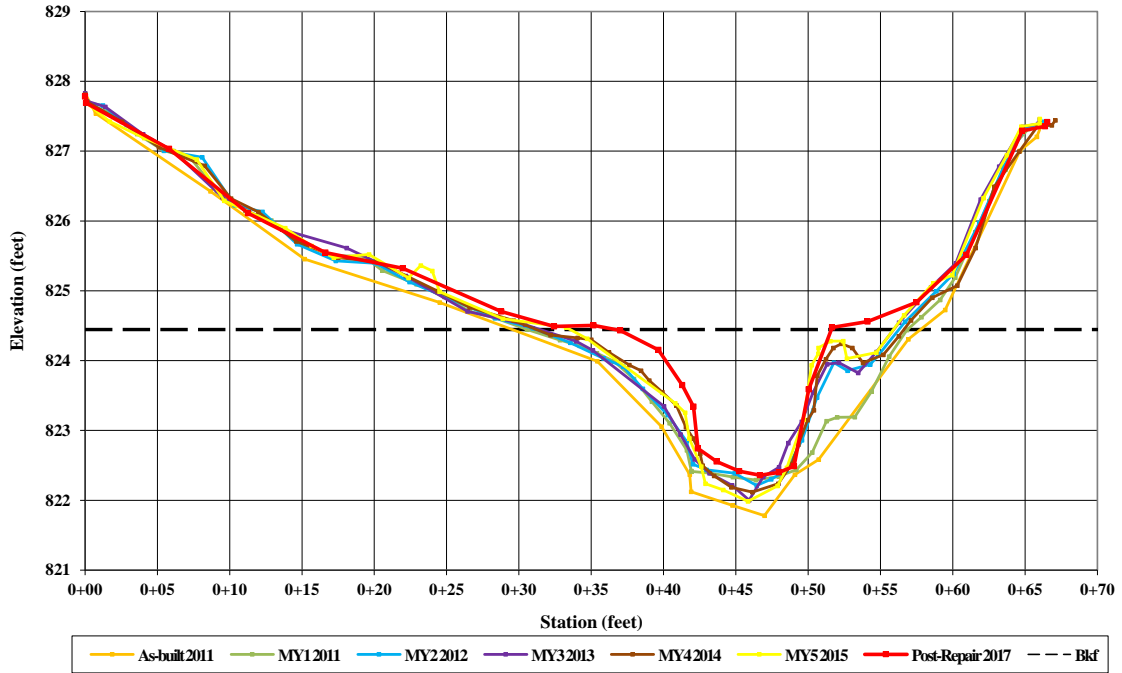


Upstream

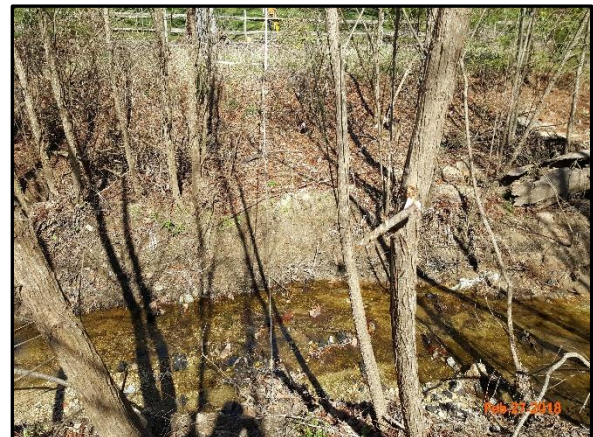


Downstream

Dye Branch - Upstream  
 Cross-Section 4 - Riffle  
 Station 1 + 15.75



Left Descending Bank



Right Descending Bank

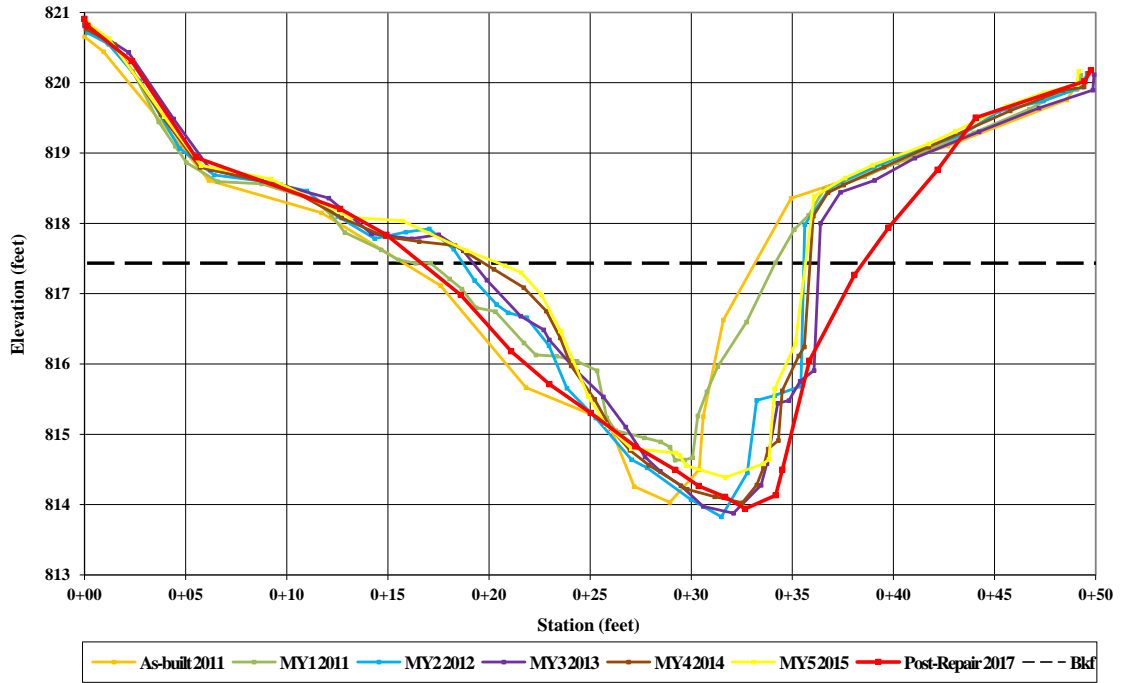


Upstream



Downstream

Dye Branch - Upstream  
 Cross-Section 5 - Pool  
 Station 7 + 74.58



Left Descending Bank



Right Descending Bank



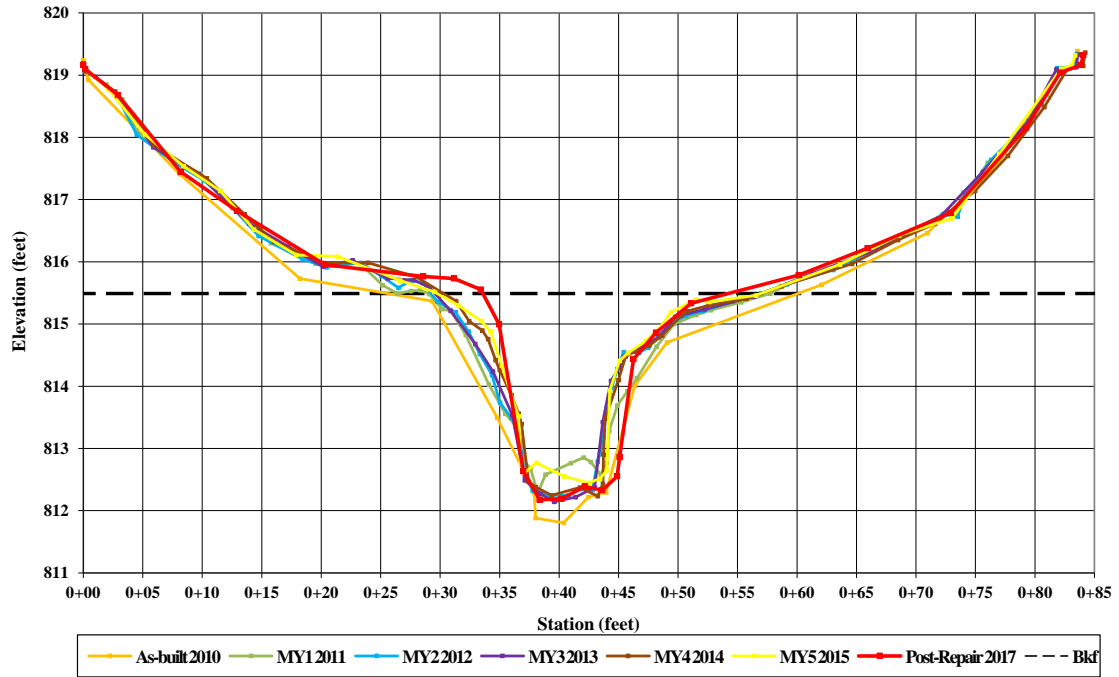
Upstream



Downstream



Dye Branch - Upstream  
 Cross-Section 6 - Riffle  
 Station 10 + 75.57



Left Descending Bank



Right Descending Bank

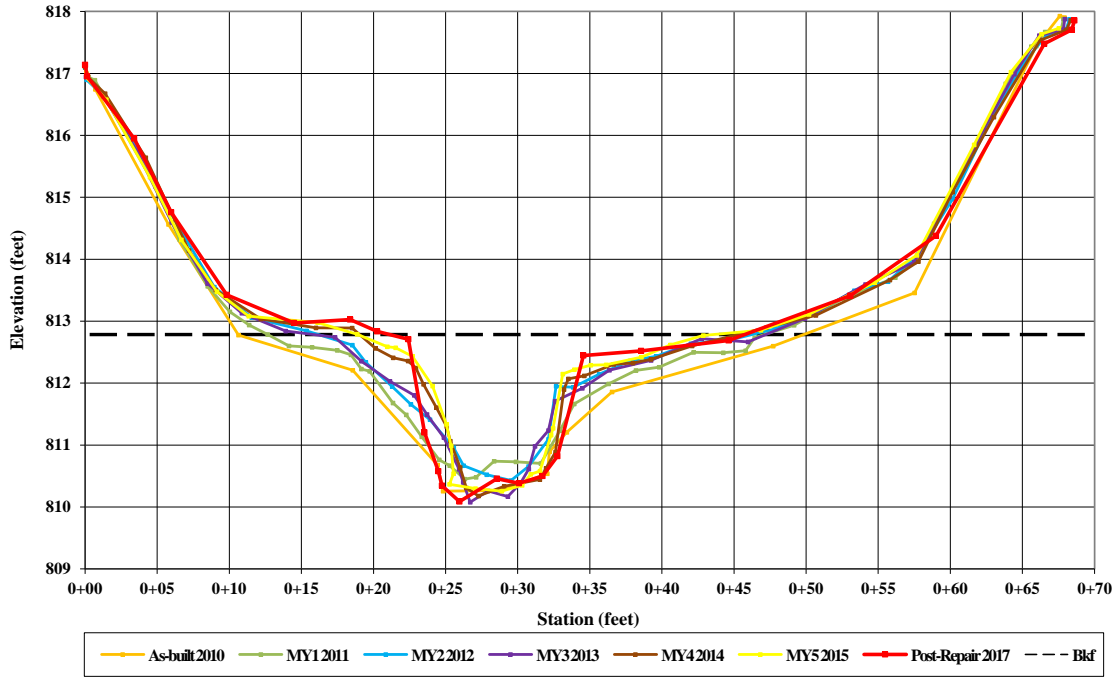


Upstream



Downstream

Dye Branch - Upstream  
 Cross-Section 7 - Riffle  
 Station 13+ 85.87



Left Descending Bank



Right Descending Bank

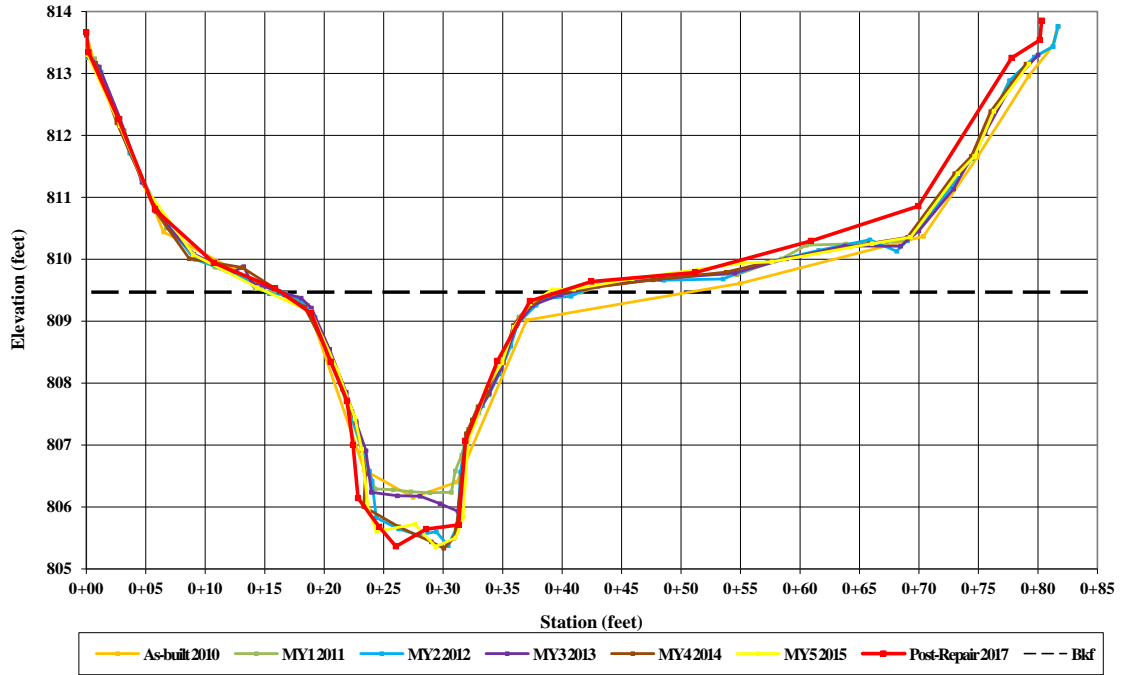


Upstream



Downstream

Dye Branch - Downstream  
 Cross-Section 8 - Riffle  
 Station 17 + 27.43



Left Descending Bank



Right Descending Bank

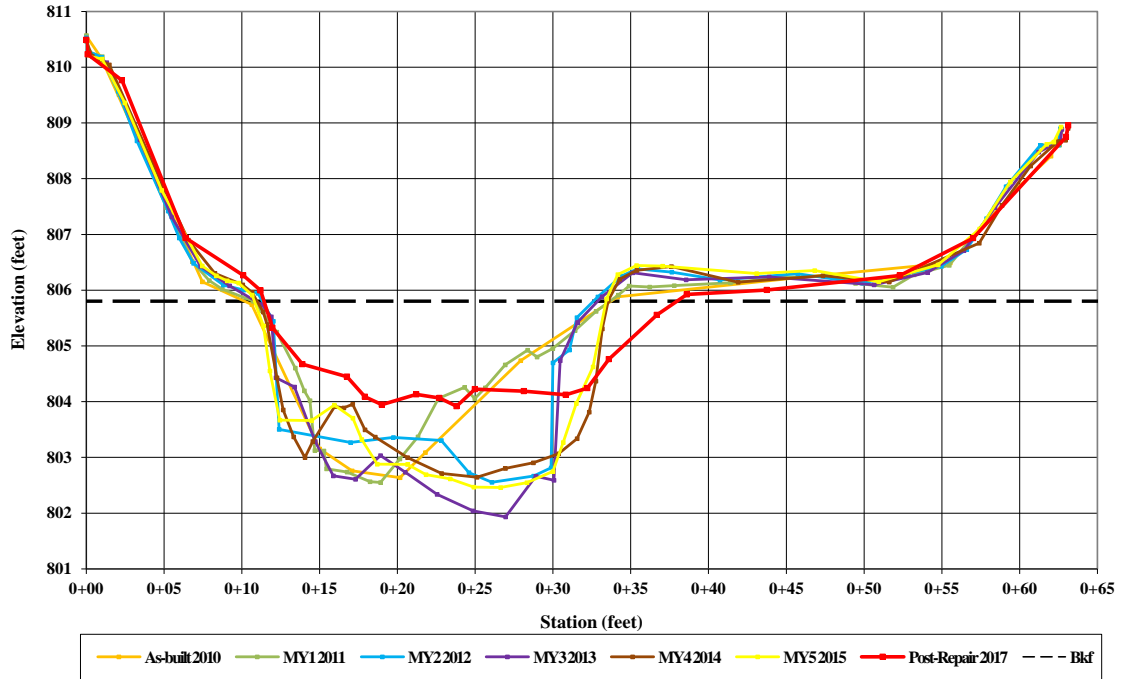


Upstream



Downstream

Dye Branch - Downstream  
 Cross-Section 9 - Pool  
 Station 19 + 80.80



Left Descending Bank



Right Descending Bank

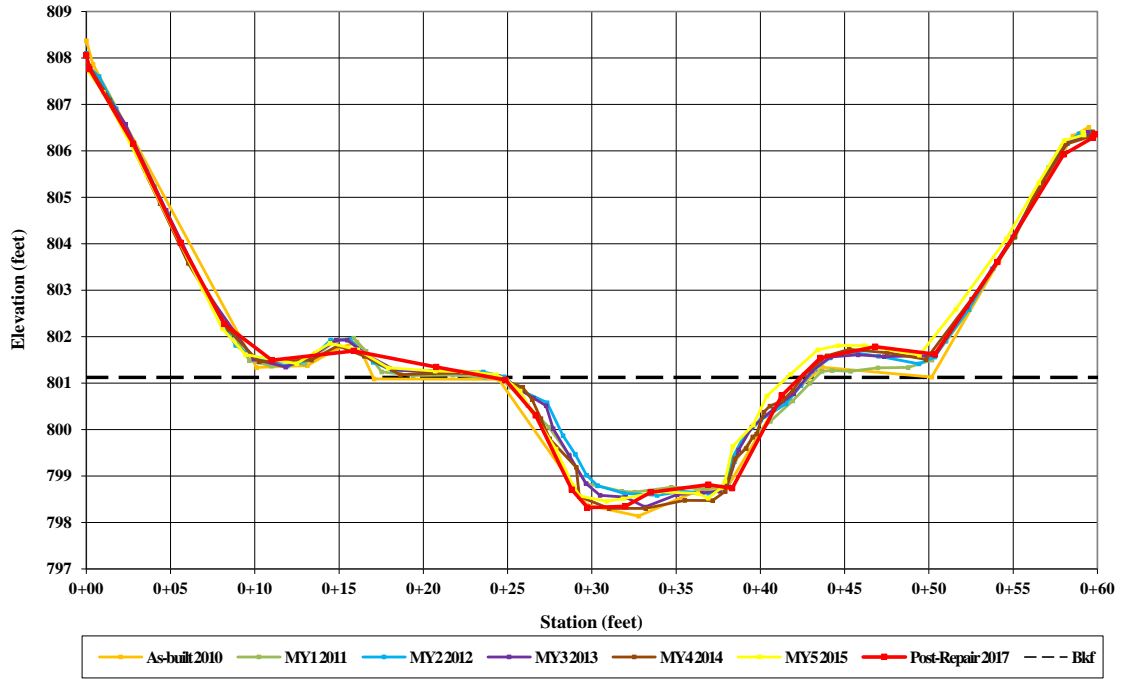


Upstream



Downstream

Dye Branch - Downstream  
 Cross-Section 10 - Riffle  
 Station 24 + 85.22



Left Descending Bank



Right Descending Bank



Upstream



Downstream

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Table 10a. Baseline Stream Data Summary																								
Dye Branch II / Project No. 92255 - Cemetery Branch (977 feet)																								
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			Monitoring Baseline					
	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N
<b>Dimension &amp; Substrate - Riffle</b>																								
Bankfull Width (ft)	-	-	-	7.0	7.0	7.0	7.0	N/A	1	8.9	11.1	11.3	14.1	1.8	7	-	10.0	-	5.5	7.2	7.2	8.9	N/A	2
Floodprone Width (ft)	-	-	-	14.2	14.2	14.2	14.2	N/A	1	19.0	54.0	36.0	100.0	38.1	5	-	28.0	-	>30	>30	>30	>30	N/A	2
Bankfull Mean Depth (ft)	-	-	-	1.0	1.0	1.0	1.0	N/A	1	0.7	0.9	0.8	1.6	0.3	7	-	0.7	-	0.5	0.7	0.7	0.8	N/A	2
Bankfull Max Depth (ft)	-	-	-	1.5	1.5	1.5	1.5	N/A	1	1.0	1.5	1.3	2.4	0.5	7	0.8	1.1	1.6	1.0	1.2	1.2	1.4	N/A	2
Bankfull Cross Sectional Area (ft <sup>2</sup> )	-	-	-	6.8	6.8	6.8	6.8	N/A	1	6.8	9.6	8.4	18.4	3.9	7	-	7.0	-	3.0	5.0	5.0	7.0	N/A	2
Width/Depth Ratio	-	-	-	7.2	7.2	7.2	7.2	N/A	1	6.9	11.2	11.7	15.0	NA	3	-	14.3	-	10.3	10.8	10.8	11.2	N/A	2
Entrenchment Ratio	-	-	-	2.0	2.0	2.0	2.0	N/A	1	3.8	6.8	7.7	8.9	NA	3	-	2.8	-	>3.4	>4.4	>4.4	>5.4	N/A	2
Bank Height Ratio	-	-	-	1.5	1.5	1.5	1.5	N/A	1	1.0	1.1	1.0	1.2	NA	3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	N/A	2
<b>Profile</b>																								
Riffle Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8	23.4	19.5	53.9	14.84	14
Riffle Slope (ft/ft)	-	-	-	0.012	0.034	-	0.088	-	-	0.006	0.027	0.026	0.052	0.016	6	-	0.048	-	0.004	0.023	0.022	0.049	0.01	14
Pool Length (ft)	-	-	-	4.7	8.2	-	11.9	-	-	3.5	19.3	19.6	32.8	11.5	6	13.8	20.7	27.6	5.8	16.2	16.9	39.1	7.17	24
Pool Max Depth (ft)	-	-	-	-	2.6	-	-	-	-	1.8	2.6	2.9	3.2	0.5	7	-	2.0	-	1.8	3.0	2.9	3.7	0.48	18
Pool Spacing (ft)	-	-	-	22.8	86.0	-	228.2	-	-	18.0	52.7	40.2	140.8	41.7	7	18.4	27.6	32.2	4.5	38.7	36.4	111.0	24.40	24
<b>Pattern</b>																								
Channel Belt Width (ft)	-	-	-	5.3	10.8	-	22.6	-	-	26.0	49.1	40.0	119.0	29.8	9	23.0	32.2	41.4	11.3	30.6	37.0	46.7	12.3	16
Radius of Curvature (ft)	-	-	-	3.9	19.6	-	37.0	-	-	5.0	23.8	22.0	48.0	14.6	9	18.4	27.6	36.8	8.3	13.7	12.0	29.9	5.7	16
Rc: Bankfull Width (ft/ft)	-	-	-	0.6	2.8	-	5.3	-	-	0.6	2.1	1.8	4.3	1.3	9	1.8	2.8	3.7	2.4	2.4	2.4	2.4	N/A	1
Meander Wavelength (ft)	-	-	-	13.6	42.0	-	71.0	-	-	26.0	72.9	69.0	155.0	47.6	9	46.0	55.2	64.4	38.8	77.4	79.1	167.0	36.1	11
Meander Width Ratio	-	-	-	0.8	1.5	-	3.2	-	-	2.5	4.7	3.6	10.1	2.7	7	2.3	3.2	4.1	4.9	6.6	6.6	8.2	N/A	2
<b>Transport Parameters</b>																								
Reach Shear Stress (Competency) lb/ft <sup>2</sup>				-						-						-			-					
Max Part Size (mm) Mobilized at Bankfull				45 - 180						-						-			-					
Stream Power (Transport Capacity) W/m <sup>2</sup>				-						-						-			-					
<b>Additional Reach Parameters</b>																								
Rosgen Classification				E4						E4 / C4 / C5						C4			C					
Bankfull Velocity (fps)				6.6 - 7.8						4.1 - 7.0						5.5 - 6.7								
Bankfull Discharge (cfs)				44.3 - 52.8						35.0 - 128.1						38.4 - 46.6								
Valley Length (ft)				-						-						-								
Channel Thalweg Length (ft)				-						-						-			977					
Sinuosity				1.14						1.15 - 2.22						1.14			1.08					
Water Surface Slope (ft/ft)				0.0190						0.0057 - 0.0130						0.0190			-					
Bankfull Slope (ft/ft)				-						-						-			0.0191					
Bankfull Floodplain Area (acres)				-						-						-								
% of Reach with Eroding Banks				-						-						-								
Channel Stability or Habitat Metric				-						-						-								
Biological or Other				-						-						-								

- Information unavailable.  
 N/A - Item does not apply.  
 Non-Applicable.

Table 10a. Baseline Stream Data Summary																									
Dye Branch II / Project No. 92255 - Dye Branch-Upstream (1,465 feet)																									
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data UT to Ostin Creek						Design			Monitoring Baseline						
	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N	
<b>Dimension &amp; Substrate - Riffle</b>																									
Bankfull Width (ft)	-	-	-	-	11.2	-	-	-	-	16.0	18.5	-	20.6	-	-	-	20.1	-	25.7	28.4	26.9	32.7	N/A	3	
Floodprone Width (ft)				-	89.5	-	-	-	-	67.2	70.2	-	72.8	-	-	70.9	76.9	88.8	54.4	64.9	58.6	81.8	N/A	3	
Bankfull Mean Depth (ft)	-	-	-	-	1.6	-	-	-	-	1.6	1.6	-	1.7	-	-		1.5		1.1	1.3	1.3	1.4	N/A	3	
Bankfull Max Depth (ft)				-	2.8	-	-	-	-	1.5	1.9	-	2.4	-	-	1.5	1.8	2.2	2.2	2.8	2.5	3.6	N/A	3	
Bankfull Cross Sectional Area (ft <sup>2</sup> )				-	18.1	20.2	19.7	22.9	NA	3	27.4	30.3	-	33.4	-	-		31.0		29.5	36.3	32.5	46.9	N/A	3
Width/Depth Ratio				6.2	7.0	7.0	7.9	NA	3	9.3	11.4	-	12.7	-	-		13.0		20.3	22.6	22.8	24.6	N/A	3	
Entrenchment Ratio				>3.2	>4.4	>5.0	>5.0	NA	3	3.5	3.8	-	4.4	-	-	3.5	3.8	4.4	2.0	2.3	2.3	2.5	N/A	3	
Bank Height Ratio				-	1.0	-	-	-	-	1.0	1.2	-	1.4	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	N/A	3	
<b>Profile</b>																									
Riffle Length (ft)				-	-	-	-	-	-	6.1	17.6	-	30.2	-	-	6.6	19.1	32.7	20.1	51.6	47.1	97	29.5	8	
Riffle Slope (ft/ft)				0.002	0.014	-	0.042	-	-	0.006	0.028	-	0.066	-	-	0.007	0.030	0.070	0.002	0.006	0.005	0.016	0.005	8	
Pool Length (ft)				-	-	-	-	-	-	18.3	35.1	-	62.9	-	-	19.9	38.1	68.1	8.76	24.6	22.4	66.4	13	20	
Pool Max Depth (ft)				-	-	-	-	-	-	2.2	2.9	-	3.3	-	-	2.1	2.7	3.1	2.1	3.44	3.61	4.48	0.67	20	
Pool Spacing (ft)				-	-	-	-	-	-	50.3	78.9	-	105.8	-	-	54.5	85.5	114.7	24.1	66.8	65.3	125	28.6	19	
<b>Pattern</b>																									
Channel Belt Width (ft)				6.6	24.3	-	56.9	-	-	36.0	67.0	-	150.0	-	-	39.0	72.6	162.6	28.5	45.0	48.4	54.1	8.34	17	
Radius of Curvature (ft)				14.5	52.4	-	148.8	-	-	19.0	49.0	-	115.0	-	-	20.6	53.1	124.6	23.6	31.3	31.2	39.6	4.75	14	
Rc: Bankfull Width (ft/ft)				1.3	4.7	-	13.3	-	-	1.0	2.7	-	6.2	-	-	1.0	2.7	6.2	2.3	2.3	2.3	2.3	N/A	1	
Meander Wavelength (ft)				40.1	79.7	-	172.7	-	-	33.0	94.0	-	155.0	-	-	35.8	102	168.0	100.5	130.0	138.2	153.3	18.2	12	
Meander Width Ratio				0.6	2.2	-	5.1	-	-	1.9	3.6	-	8.1	-	-	1.9	3.6	8.1	1.7	1.9	1.9	2.1	0.21	3	
<b>Transport Parameters</b>																									
Reach Shear Stress (Competency) lb/ft <sup>2</sup>																									
Max Part Size (mm) Mobilized at Bankfull																									
Stream Power (Transport Capacity) W/m <sup>2</sup>																									
<b>Additional Reach Parameters</b>																									
Rosgen Classification																									
Bankfull Velocity (fps)	-																								
Bankfull Discharge (cfs)	-																								
Valley Length (ft)																									
Channel Thalweg Length (ft)																									
Sinuosity																									
Water Surface Slope (Channel) (ft/ft)																									
Bankfull Slope (ft/ft)																									
Bankfull Floodplain Area (acres)																									
% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Channel Stability or Habitat Metric																									
Biological or Other																									

- Information unavailable.  
 N/A - Item does not apply.  
 Non-Applicable.



Table 10a. Baseline Stream Data Summary																									
Dye Branch II / Project No. 92255 - Dye Branch-Downstream (870 feet)																									
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data UT to Ostin Creek						Design			Monitoring Baseline						
	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N	
<b>Dimension &amp; Substrate - Riffle</b>																									
Bankfull Width (ft)	-	-	-	14.8	14.8	14.8	14.8	NA	1	16.0	18.5	-	20.6	-	-	-	20.1	-	18.4	18.6	18.6	18.8	N/A	3	
Floodprone Width (ft)				22.0	22.0	22.0	22.0	NA	1	67.2	70.2	-	72.8	-	-	70.9	76.9	88.8	48.7	61.8	61.8	74.8	N/A	3	
Bankfull Mean Depth (ft)	-	-	-	1.2	1.2	1.2	1.2	NA	1	1.6	1.6	-	1.7	-	-	1.5			1.9	2.0	2.0	2.0	N/A	3	
Bankfull Max Depth (ft)				2.4	2.4	2.4	2.4	NA	1	1.5	1.9	-	2.4	-	-	1.5	1.8	2.2	2.9	3.0	3.0	3.0	3.1	N/A	3
Bankfull Cross Sectional Area (ft <sup>2</sup> )				17.4	17.4	17.4	2.4	NA	1	27.4	30.3	-	33.4	-	-	31.0			34.0	36.1	36.1	38.1	N/A	3	
Width/Depth Ratio				12.5	12.5	12.5	2.4	NA	1	9.3	11.4	-	12.7	-	-	13.0			9.3	9.6	9.6	9.9	N/A	3	
Entrenchment Ratio				1.5	1.5	1.5	2.4	NA	1	3.5	3.8	-	4.4	-	-	3.5	3.8	4.4	2.7	3.4	3.4	4.0	N/A	3	
Bank Height Ratio				4.9	4.9	4.9	2.4	NA	1	1.0	1.2	-	1.4	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	N/A	3	
<b>Profile</b>																									
Riffle Length (ft)				-	-	-	-	-	-	6.1	17.6	-	30.2	-	-	6.6	19.1	32.7	15.7	50.3	55.7	79.3	20.2	7	
Riffle Slope (ft/ft)				0.003	0.021	-	0.121	-	-	0.006	0.028	-	0.066	-	-	0.007	0.030	0.070	0.001	0.006	0.006	0.014	0.004	7	
Pool Length (ft)				2.9	24.8	-	120	-	-	18.3	35.1	-	62.9	-	-	19.9	38.1	68.1	10.1	19.9	15.9	39.6	8.91	14	
Pool Max Depth (ft)				-	3.1	-	-	-	-	2.2	2.9	-	3.3	-	-	2.1	2.7	3.1	3.3	3.91	3.77	5.05	0.59	12	
Pool Spacing (ft)				79.0	162.0	-	261.0	-	-	50.3	78.9	-	105.8	-	-	54.5	85.5	114.7	15.3	57.5	38.8	130	41.5	14	
<b>Pattern</b>																									
Channel Belt Width (ft)				15.6	30.6	-	67.7	-	-	36.0	67.0	-	150.0	-	-	39.0	72.6	162.6	28.3	49.2	57.5	65.4	15.4	9	
Radius of Curvature (ft)				11.0	42.1	-	81.9	-	-	19.0	49.0	-	115.0	-	-	20.6	53.1	124.6	32.7	40.7	42.2	50.1	5.6	7	
Rc: Bankfull Width (ft/ft)				0.7	2.9	-	5.6	-	-	1.0	2.7	-	6.2	-	-	1.0	2.7	6.2	1.7	1.7	1.7	1.7	N/A	1	
Meander Wavelength (ft)				62.0	103.0	-	157	-	-	33.0	94.0	-	155.0	-	-	35.8	102	168.0	138.9	162.2	157.3	210.5	27.2	6	
Meander Width Ratio				1.1	2.1	-	4.6	-	-	1.9	3.6	-	8.1	-	-	1.9	3.6	8.1	2.4	2.8	2.8	3.1	0.51	2	
<b>Transport Parameters</b>																									
Reach Shear Stress (Competency) lb/ft <sup>2</sup>																									
Max Part Size (mm) Mobilized at Bankfull										30 - 100															
Stream Power (Transport Capacity) W/m <sup>2</sup>																									
<b>Additional Reach Parameters</b>																									
Rosgen Classification										G4c						C4			C5					C	
Bankfull Velocity (fps)										6.1 - 7.2						4.2			3.5						
Bankfull Discharge (cfs)										105.4 - 126.0						128			110						
Valley Length (ft)																									
Channel Thalweg Length (ft)																								870	
Sinuosity										1.14						1.46			1.09					1.10	
Water Surface Slope (ft/ft)										0.0110						0.0090			0.0095					-	
Bankfull Slope (ft/ft)																								0.0106	
Bankfull Floodplain Area (acres)																									
% of Reach with Eroding Banks																									
Channel Stability or Habitat Metric																									
Biological or Other																									

- Information unavailable.  
 N/A - Item does not apply.  
 Non-Applicable.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Dye Branch II / Project No. 92255 - Cemetery Branch (977 feet)																											
Parameter	Pre-Existing Condition						Reference Reach Data						Design						Monitoring Baseline								
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35%	4%	42%	13%	7%
SC% / Sa% / G% / C% / B% / Be%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
d16 / D35 / d50 / d84 / d95 / di <sup>p</sup> / di <sup>sp</sup> (mm)	0.9	1.2	2.0	8.0	10.1	88.9	-	0.21	0.5	3.5	13.9	26.6	45.0	-													
Entrenchment Class <1.5 / 1.5 - 1.99 / 2 - 4.9 / 5.0 - 9.9 / >10	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
Incision Class <1.2 / 1.2 - 1.49 / 1.5 - 1.99 / >2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-													

- Information unavailable.  
N/A - Item does not apply.  
Non-Applicable.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Dye Branch II / Project No. 92255 - Dye Branch-Upstream (1,465 feet)																											
Parameter	Pre-Existing Condition						Reference Reach Data						Design						Monitoring Baseline								
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28%	15%	34%	20%	3%
SC% / Sa% / G% / C% / B% / Be%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
d16 / D35 / d50 / d84 / d95 / di <sup>p</sup> / di <sup>sp</sup> (mm)	0.15	0.4	3.3	10.3	13.7	45.7	-	-	-	-	-	-	-	-													
Entrenchment Class <1.5 / 1.5 - 1.99 / 2 - 4.9 / 5.0 - 9.9 / >10	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
Incision Class <1.2 / 1.2 - 1.49 / 1.5 - 1.99 / >2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-													

- Information unavailable.  
Non-Applicable.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) Dye Branch II / Project No. 92255 - Dye Branch-Downstream (870 feet)																											
Parameter	Pre-Existing Condition						Reference Reach Data						Design						Monitoring Baseline								
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43%	6%	34%	13%	3%
SC% / Sa% / G% / C% / B% / Be%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
d16 / D35 / d50 / d84 / d95 / di <sup>p</sup> / di <sup>sp</sup> (mm)	0.15	0.28	0.56	10.7	13.0	45.7	-	-	-	-	-	-	-	-													
Entrenchment Class <1.5 / 1.5 - 1.99 / 2 - 4.9 / 5.0 - 9.9 / >10	-	-	-	-	-	-	-	-	-	-	-	-	-	-													
Incision Class <1.2 / 1.2 - 1.49 / 1.5 - 1.99 / >2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-													

- Information unavailable.  
N/A - Item does not apply.  
Non-Applicable.

Table 11a. Baseline Morphology & Hydraulic Monitoring Summary Dye Branch II / Project No. 92255 - Cemetery Branch (971 Feet)																											
Parameter	Cross Section 1 Pool									Cross Section 2 Riffle									Cross Section 3 Riffle								
	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7
Record Elevation (datum) Used	836.3	836.3	836.3	836.3	836.3	836.3	836.3			826.3	826.3	826.3	826.3	826.3	826.3	826.3			821.7	821.7	821.7	821.7	821.7	821.7	821.7		
Bankfull Width (ft)	9.7	10.2	9.4	9.2	9.2	9.3	9.4			8.9	10.6	8.0	8.4	5.9	6.0	6.4			5.5	6.0	6.5	6.1	5.7	5.8	6.2		
Floodprone Width (ft)	>50	>50	>50	>50	>50	>50	>50			>30	>30	>30	>30	>30	>30	>30			>30	>30	>30	>30	>30	>30	>30		
Bankfull Mean Depth (ft)	1.9	1.5	1.5	1.5	1.6	1.5	1.4			0.8	0.6	0.5	0.5	0.7	0.8	1.0			0.5	0.5	0.6	0.6	0.7	0.7	0.8		
Bankfull Max Depth (ft)	3.1	2.7	2.4	2.2	2.4	2.1	1.8			1.4	1.2	1.2	1.2	1.4	1.5	2.0			1.0	1.0	1.0	0.9	1.1	1.1	1.2		
Bankfull Cross Sectional Area (ft <sup>2</sup> )	18.9	15.2	14.3	14.0	15.1	14.2	13.1			7.0	6.3	3.9	4.1	4.2	4.7	6.6			3.0	2.8	4.0	3.6	4.2	4.3	5.0		
Bankfull Width/Depth Ratio	5.0	6.8	6.2	6.1	5.6	6.2	6.7			11.2	18.1	16.4	17.3	8.3	7.5	6.3			10.3	12.7	10.6	10.4	7.6	7.9	7.7		
Bankfull Entrenchment Ratio	>5.1	>4.9	>5.3	>5.4	>5.5	>5.4	>5.3			>3.4	>2.8	>3.8	>3.6	>5.1	>5.0	>4.7			>5.4	>5.0	>4.6	>4.9	>5.3	>5.1	>4.8		
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	1.0	1.0			1.0	1.0	1.0	1.0	1.0	1.0	1.1		
d50 (mm)	N/A	5.7	4.8	4.1	1.5	1.1	-			N/A	8.4	14.0	2.1	4.7	48	-			N/A	6.0	5.0	6.0	6.2	1.7	-		

N/A - Item does not apply.

\*Ratios calculated using recorded baseline bankfull elevation. Ratios <1 indicate a lowering of the bankfull elevation from baseline conditions. Please refer to the Cross-Sectional Graphs for a visual display.

Table 11a. Baseline Morphology & Hydraulic Monitoring Summary Dye Branch II / Project No. 92255 - Dye Branch-Upstream (1,471 Feet)																																			
Parameter	Cross Section 4 Riffle									Cross Section 5 Pool								Cross Section 6 Riffle								Cross Section 7 Riffle									
	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6
Record Elevation (datum) Used	824.3	824.3	824.3	824.3	824.3	824.3	824.3			817.4	817.4	817.4	817.4	817.4	817.4	817.4			815.5	815.5	815.5	815.5	815.5	815.5	815.5			812.5	812.5	812.5	812.5	812.5	812.5	812.5	
Bankfull Width (ft)	25.7	23.8	22.9	20.8	21.5	20.7	13.2			17.1	17.0	16.8	16.4	15.6	15.1	21.8			32.7	28.7	27.7	26.9	26.7	27.2	17.5			26.9	24.1	21.3	20.1	19.9	17.1	12.0	
Floodprone Width (ft)	>58.6	>52.8	>52.8	>52.8	>52.8	>52.8	>52.8			>50	>47.1	>47.1	>47.1	>47.1	>47.1	>47.1			>81.8	>78.2	.78.2	>78.2	>78.2	>78.2	>78.2			>54.4	>52.6	>52.6	>52.6	>52.6	>52.6	>52.6	
Bankfull Mean Depth (ft)	1.3	1.1	1.0	1.1	1.0	1.0	1.2			1.7	1.4	2.1	2.1	2.1	2.0	1.9			1.4	1.3	1.3	1.3	1.3	1.2	2.0			1.1	1.0	0.9	1.1	1.0	1.0	1.8	
Bankfull Max Depth (ft)	2.5	2.0	2.1	2.3	2.2	2.3	1.9			3.4	2.8	3.6	3.6	3.4	3.0	3.5			3.6	3.2	3.2	3.3	3.3	3.0	3.3			2.2	2.0	2.1	2.4	2.3	2.2	2.4	
Bankfull Cross Sectional Area (ft <sup>2</sup> )	32.5	27.1	23.1	22.4	21.1	21.0	15.8			28.8	23.7	35.0	35.1	33.1	29.7	41.922			46.9	37.5	36.2	36.0	34.2	31.3	34.2			29.5	24.2	19.9	21.3	19.4	17.9	21.1	
Bankfull Width/Depth Ratio	20.3	20.9	22.6	19.3	21.9	20.4	11.0			10.2	12.2	8.1	7.7	7.4	7.7	11.34			22.8	22.0	21.2	20.0	20.8	23.6	9.0			24.6	24.0	22.9	18.9	20.4	16.3	6.8	
Bankfull Entrenchment Ratio	>2.3	>2.2	>2.3	>2.5	>2.5	>2.6	>4.0			>2.9	>2.8	>2.8	>2.9	>3.0	>3.1	>2.2			>2.5	>2.7	>2.8	>2.9	>2.9	>2.9	>4.5			>2.0	>2.2	>2.5	>2.6	>2.6	>3.1	>4.4	
Bankfull Bank Height Ratio*	1.0	1.0	1.0	1.0	1.0	1.0	1.1			1.0	1.0	1.0	1.0	1.0	1.0	1.1			1.0	1.0	1.0	1.0	1.0	1.0	1.1			1.0	1.0	1.0	1.0	1.0	1.0	1.0	
d50 (mm)	N/A	1.2	1.2	1.0	1.9	0.42	-			N/A	6.0	1.7	13.0	1.6	1.9	-			N/A	1.9	4.5	1.6	1.2	1.5	-			N/A	2.7	8.0	7.4	2.4	1.3	-	

N/A - Item does not apply.

\*Ratios calculated using recorded baseline bankfull elevation. Ratios <1 indicate a lowering of the bankfull elevation from baseline conditions. Please refer to the Cross-Sectional Graphs for a visual display.

Table 11a. Baseline Morphology & Hydraulic Monitoring Summary Dye Branch II / Project No. 92255 - Dye Branch-Downstream (869 Feet)																												
Parameter	Cross Section 8 Rifle									Cross Section 9 Pool							Cross Section 10 Rifle											
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7	Base	MY1	MY2	MY3	MY4	MY5	Post- Repair	MY6	MY7	
Record Elevation (datum) Used	809.3	809.3	809.3	809.3	809.3	809.3	809.3			806.1	806.1	806.1	806.1	806.1	806.1	806.1			801.1	801.1	801.1	801.1	801.1	801.1	801.1	801.1		
Bankfull Width (ft)	18.8	18.8	19.6	18.6	19.6	19.6	19.3			26.3	26.3	24.3	24.6	23.8	23.7	27.7			18.4	18.5	17.7	17.9	17.8	16.6	17.4			
Floodprone Width (ft)	>74.8	>73.5	>73.5	>73.5	>73.5	>73.5	>73.5			>70	>70	>70	>70	>70	>70	>70			>48.7	>47.6	>47.6	>47.6	>47.6	>47.6	>47.6			
Bankfull Mean Depth (ft)	2.0	1.9	2.1	2.0	2.2	2.1	2.2			1.8	1.7	2.3	2.6	2.6	2.6	1.5			1.9	1.6	1.6	1.6	1.8	1.8	1.8			
Bankfull Max Depth (ft)	3.1	3.0	3.9	3.3	3.9	3.9	3.9			3.5	3.5	3.5	4.1	3.4	3.6	2.1			2.9	2.4	2.5	2.7	2.8	2.6	2.8			
Bankfull Cross Sectional Area (ft <sup>2</sup> )	38.1	35.9	41.0	36.8	43.2	41.8	42.3			48.4	43.6	55.3	63.5	61.1	62.7	42.1			34.0	29.5	27.8	29.4	31.6	29.4	32.0			
Bankfull Width/Depth Ratio	9.3	9.9	9.3	9.4	8.9	9.2	8.8			14.3	15.9	10.7	9.6	9.3	9.0	18.2			9.9	11.7	11.3	11.0	10.0	9.4	9.4			
Bankfull Entrenchment Ratio	>4.0	>3.9	>3.8	>4.0	>3.8	>3.7	>3.8			>2.7	>2.7	2.9	>2.8	>2.9	>2.9	>2.5			>2.7	>2.6	>2.7	>2.7	>2.7	>2.9	>2.7			
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	1.0	0.9			1.0	1.0	1.0	1.0	1.0	1.0	1.0			
d50 (mm)	N/A	1.3	1.1	0.9	2.0	0.26	-			N/A	0.72	6.4	1.7	1.4	0.32	-			N/A	1.0	0.9	0.1	1.8	2.7	-			

N/A - Item does not apply.

\*Ratios calculated using recorded baseline bankfull elevation. Ratios <1 indicate a lowering of the bankfull elevation from baseline conditions. Please refer to the Cross-Sectional Graphs for a visual display.

Table 11b. Monitoring Data - Stream Reach Data Summary																																											
Dye Branch II / Project No. 92255 - Cemetery Branch (971 feet)																																											
Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5						Post-Repair						
	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	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	
Bankfull Width (ft)	5.5	7.2	7.2	8.9	N/A	2	6.0	8.3	8.3	10.6	N/A	2	6.5	7.3	7.3	8.0	N/A	2	6.1	7.3	7.3	8.4	N/A	2	5.9	6.0	6.0	6.1	N/A	2	5.8	5.9	5.9	6.0	N/A	2	6.2	6.3	6.3	6.4	N/A	2	
Floodprone Width (ft)	>30	>30	>30	>30	N/A	2	>30	>30	>30	>30	N/A	2	>30	>30	>30	>30	N/A	2	>30	>30	>30	>30	N/A	2	>30	>30	>30	>30	N/A	2	>30	>30	>30	>30	N/A	2	30.0	30.0	30.0	30.0	N/A	2	
Bankfull Mean Depth (ft)	0.5	0.7	0.7	0.8	N/A	2	0.5	0.6	0.6	0.6	N/A	2	0.5	0.6	0.6	0.6	N/A	2	0.5	0.6	0.6	0.6	N/A	2	0.7	0.7	0.7	0.7	N/A	2	0.7	0.8	0.8	0.8	N/A	2	0.8	0.9	0.9	1.0	N/A	2	
Bankfull Max Depth (ft)	1.0	1.2	1.2	1.4	N/A	2	1.0	1.1	1.1	1.2	N/A	2	1.0	1.1	1.1	1.2	N/A	2	0.9	1.1	1.1	1.2	N/A	2	1.1	1.3	1.3	1.4	N/A	2	1.1	1.3	1.3	1.5	N/A	2	1.2	1.6	1.6	2.0	N/A	2	
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	3.0	5.0	5.0	7.0	N/A	2	2.8	4.6	4.6	6.3	N/A	2	3.9	4.0	4.0	4.0	N/A	2	3.6	3.9	3.9	4.1	N/A	2	4.2	4.2	4.2	4.2	N/A	2	4.3	4.5	4.5	4.7	N/A	2	5.0	5.8	5.8	6.6	N/A	2	
Width/Depth Ratio	10.3	10.8	10.8	11.2	N/A	2	12.7	15.4	15.4	18.1	N/A	2	10.6	13.5	13.5	16.4	N/A	2	10.4	13.9	13.9	17.3	N/A	2	8.3	8.5	8.5	8.7	N/A	2	7.5	7.7	7.7	7.9	N/A	2	6.3	7.0	7.0	7.7	N/A	2	
Entrenchment Ratio	>3.4	>4.4	>4.4	>5.4	N/A	2	>2.8	>3.9	>3.9	>5.0	N/A	2	>3.8	>4.2	>4.2	>4.6	N/A	2	3.6	4.3	4.3	4.9	N/A	2	4.9	5.0	5.0	5.1	N/A	2	5.0	5.1	5.1	5.1	N/A	2	4.7	4.8	4.8	4.8	N/A	2	
Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.1	1.1	1.1	N/A	2	
<b>Profile</b>																																											
Riffle Length (ft)	6.8	23.4	19.5	53.9	14.8	14	6.9	22.9	22.7	50.3	13.3	17	6.4	24.3	15.2	53.7	17.0	13	8.4	24.4	13.2	53.7	17.8	12	7.7	23.4	18.2	48.8	15.2	12	5.2	27.2	29.1	48.7	17.6	9							
Riffle Slope (ft/ft)	0.004	0.023	0.022	0.049	0.013	14	0.002	0.020	0.018	0.052	0.015	17	0.002	0.027	0.022	0.064	0.020	13	0.005	0.025	0.021	0.057	0.017	12	0.005	0.019	0.018	0.037	0.011	12	0.006	0.017	0.014	0.029	0.009	9							
Pool Length (ft)	5.8	16.2	16.9	39.1	7.2	24	4.9	13.0	12.5	38.9	6.8	25	8.4	16.5	14.8	39.0	6.9	26	6.8	16.6	14.8	39.2	7.2	26	5.1	16.4	14.3	37.5	7.3	26	4.5	16.4	14.7	39.8	7.7	27							
Pool Max Depth (ft)	1.8	3.0	2.9	3.7	0.5	18	1.0	2.8	2.9	3.4	0.6	19	1.0	2.5	2.5	3.6	0.8	24	0.8	2.2	2.4	3.4	0.8	24	1.0	2.2	2.2	3.2	0.7 <sup>1</sup>	25 <sup>1</sup>	1.2	2.5	2.8	3.5	0.8	26							
Pool Spacing (ft)	4.5	38.7	36.4	111.0	24.4	24	12.0	39.1	33.3	110.2	24.0	24	12.0	36.9	30.1	86.7	20.6	25	11.0	36.7	27.9	96.6	22.5	25	14.9	36.6	27.8	89.3	20.9	25	9.9	35.6	28.6	93.4	20.4	26							
<b>Pattern</b>																																											
Channel Belt Width (ft)	11.3	30.6	37.0	46.7	12.26	16																																					
Radius of Curvature (ft)	8.3	13.7	12.0	29.9	5.70	16																																					
Rc: Bankfull Width (ft/ft)	2.4	2.4	2.4	2.4	N/A	1																																					
Meander Wavelength (ft)	38.8	77.4	79.1	167.0	36.08	11																																					
Meander Width Ratio	4.2	5.4	5.4	6.7	N/A	2																																					
<b>Additional Reach Parameters</b>																																											
Rosgen Classification	C						C4						C4						C4						C4						C4												
Channel Thalweg Length (ft)	977						971						970						969						970						958												
Sinuosity (ft)	1.08						1.08						1.08						1.07						1.12						1.06												
Water Surface Slope (Channel) (ft/ft)	-						0.0200						0.0203						0.0203						0.0177						0.0186												
Bankfull Slope (ft/ft)	0.0191						0.0195						0.0198						0.0189						0.0183						0.0190												
Ri% / Ru% / P% / G% / S%	35%	4%	42%	13%	7%		42%	6%	34%	13%	6%		34%	4%	46%	11%	6%		32%	3%	47%	13%	6%		31%	4%	47%	12%	6%		27%	4%	48%	15%	6%								
SC% / SA% / G% / C% / B% / Be%*							0%	38%	54%	7%	0%	0%	0%	30%	67%	3%	0%	0%	1%	41%	53%	4%	0%	0%	0%	49%	45%	6%	0%	0%	0%	52.5%	26.2%	21.1%	0%	0%							
d16 / d35 / d50 / d84 / d95 (mm)																										0.86	1.5	4.1	7.0	28.3	71.7	0.2	1.35	24.85	65	93							
% of Reach with Eroding Banks	0%						0%						0%						0%						1%						1%												
Channel Stability or Habitat Metric	N/A						N/A						N/A						N/A						N/A						N/A												
Biological or Other	N/A						N/A						N/A						N/A						N/A						N/A												

N/A - Information does not apply.  
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step  
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock  
 \*Percentages based on riffle and pool pebble counts.

<sup>1</sup>Corrected Values

Table 11b. Monitoring Data - Stream Reach Data Summary																																										
Dye Branch II / Project No. 92255 - Dye Branch-Upstream (1,471 feet)																																										
Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5						Post-Repair					
	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	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	25.7	28.4	26.9	32.7	N/A	3	23.8	25.5	24.1	28.7	N/A	3	21.3	24.0	22.9	27.7	N/A	3	20.1	22.6	20.8	26.9	N/A	3	19.9	22.6	21.5	26.5	N/A	3	17.1	21.7	20.7	27.2	N/A	3	12.0	14.2	13.2	17.5	3.0	3
Floodprone Width (ft)	54.4	64.9	58.6	81.8	N/A	3	52.6	61.2	52.8	78.2	N/A	3	52.6	61.2	52.8	78.2	N/A	3	52.6	61.2	52.8	78.2	N/A	3	52.6	61.2	52.8	78.2	N/A	3	52.6	61.2	52.8	78.2	N/A	3	52.6	61.2	52.8	78.2	15.0	3
Bankfull Mean Depth (ft)	1.1	1.3	1.3	1.4	N/A	3	1.0	1.1	1.1	1.3	N/A	3	0.9	1.1	1.0	1.3	N/A	3	1.1	1.2	1.1	1.3	N/A	3	1.0	1.1	1.0	1.3	N/A	3	1.0	1.1	1.0	1.2	N/A	3	1.2	1.7	1.8	2.0	0.4	3
Bankfull Max Depth (ft)	2.2	2.8	2.5	3.6	N/A	3	2.0	2.4	2.0	3.2	N/A	3	2.1	2.5	2.1	3.2	N/A	3	2.3	2.7	2.4	3.3	N/A	3	2.2	2.6	2.3	3.3	N/A	3	2.2	2.5	2.3	3.0	N/A	3	1.9	2.5	2.4	3.3	0.7	3
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	29.5	36.3	32.5	46.9	N/A	3	24.2	29.6	27.1	37.5	N/A	3	19.9	26.4	23.1	36.2	N/A	3	21.3	26.6	22.4	36.0	N/A	3	19.4	24.9	21.1	34.2	N/A	3	17.9	23.4	21.0	31.3	N/A	3	15.8	23.7	21.1	34.2	9.5	3
Width/Depth Ratio	20.3	22.6	22.8	24.6	N/A	3	20.9	22.3	22.0	24.0	N/A	3	21.2	22.2	22.6	22.8	N/A	3	18.9	19.4	19.3	20.0	N/A	3	20.4	21.0	20.8	21.9	N/A	3	16.3	20.1	20.4	23.6	N/A	3	6.8	8.9	9.0	11.0	2.1	3
Entrenchment Ratio	2.0	2.3	2.3	2.5	N/A	3	2.2	2.4	2.2	2.7	N/A	3	2.3	2.5	2.5	2.8	N/A	3	2.5	2.7	2.6	2.9	N/A	3	2.5	2.7	2.6	2.9	N/A	3	2.6	2.9	2.9	3.1	N/A	3	4.0	4.3	4.4	4.5	0.3	3
Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	3	1.0	1.0	1.0	1.0	N/A	3	1.0	1.0	1.0	1.0	N/A	3	1.0	1.0	1.0	1.0	N/A	3	1.0	1.0	1.0	1.0	N/A	3	1.0	1.0	1.0	1.0	N/A	3	1.0	1.1	1.1	1.1	0.1	3
<b>Profile</b>																																										
Rifle Length (ft)	20.1	51.6	47.1	97.0	29.5	8	17.5	40.6	33.3	75.1	19.0	11	15.5	37.5	34.6	58.6	14.4	9	16.8	41.4	47.0	54.0	16.2	6	19.4	40.3	39.6	63.9	18.1	6	10.1	32.9	25.6	58.3	21.1	7						
Rifle Slope (ft/ft)	0.002	0.006	0.005	0.016	0.005	8	0.002	0.007	0.005	0.019	0.005	11	0.001	0.007	0.004	0.016	0.005	9	0.002	0.008	0.006	0.016	0.006	6	0.003	0.007	0.005	0.016	0.005	6	0.004	0.011	0.007	0.031	0.010	7						
Pool Length (ft)	8.8	24.6	22.4	66.4	13.0	20	10.7	29.8	27.3	75.6	15.9	20	8.8	29.5	23.2	76.3	18.7	20	7.7	26.2	21.8	81.6	17.7	21	8.9	26.9	20.6	85.8	19.4	21	8.1	28.3	21.7	94.0	19.5	21						
Pool Max Depth (ft)	2.1	3.4	3.6	4.5	0.7	20	1.8	3.3	3.4	4.7	0.8	20	2.2	3.7	3.8	5.0	0.8	20	1.6	3.1	3.1	4.3	0.8	20	1.4	3.0	3.4	4.4	0.9	20	2.00	3.55	3.64	4.88	0.84	20						
Pool Spacing (ft)	24.1	66.8	65.3	124.9	28.6	19	31.7	67.7	69.0	128.2	27.5	19	20.7	62.1	55.7	127.6	29.6	19	13.2	65.1	64.0	127.5	30.7	18	11.7	58.7	48.2	118.6	30.8	20	15.1	57.9	45.8	114.4	30.1	20						
<b>Pattern</b>																																										
Channel Belt Width (ft)	28.5	45.0	48.4	54.1	8.3	17																																				
Radius of Curvature (ft)	23.6	31.3	31.2	39.6	4.7	14																																				
Rc: Bankfull Width (ft/ft)	2.0	2.0	2.0	2.0	N/A	1																																				
Meander Wavelength (ft)	100.5	130.0	138.2	153.3	18.2	12																																				
Meander Width Ratio	1.5	1.7	1.8	1.9	N/A	3																																				
<b>Additional Reach Parameters</b>																																										
Rosgen Classification	C						C5						C4						C4						C4						C4											
Channel Thalweg Length (ft)	1,465						1,471						1,465						1,447						1,448 <sup>1</sup>						1,437											
Sinuosity (ft)	1.15						1.16						1.15						1.14						1.13 <sup>1</sup>						1.13											
Water Surface Slope (Channel) (ft/ft)	-						0.0092						0.0091						0.0092						0.0093						0.0092											
Bankfull Slope (ft/ft)	0.0091						0.0094						0.0095						0.0091						0.0094						0.0093											
Ri% / Ru% / P% / G% / S%	28%	15%	34%	20%	3%		31%	10%	41%	15%	4%		23%	14%	40%	19%	3%		17%	15%	38%	26%	3%		17%	23%	39%	17%	4%		16%	23%	42%	16%	4%							
SC% / SA% / G% / C% / B% / Be%*							0%	50%	47%	3%	0%	0%	2%	45%	50%	3%	0%	0%	3%	43%	48%	6%	0%	0%	5%	58%	35%	2%	0%	0%	2.3%	77.5%	19%	1.1%	0%	0%						
d16 / d35 / d50 / d84 / d95 (mm)																									0.48	1.08	1.8	3.3	6.7	23.0	0.235	0.89	1.07	3.47	23.7							
% of Reach with Eroding Banks	0%						0%						7%						10%						10%																	
Channel Stability or Habitat Metric	N/A						N/A						N/A						N/A						N/A																	
Biological or Other	N/A						N/A						N/A						N/A						N/A																	

N/A - Information does not apply.  
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step  
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock  
 \*Percentages based on riffle and pool pebble counts.  
<sup>1</sup>Corrected Values

**Table 11b. Monitoring Data - Stream Reach Data Summary  
Dye Branch II / Project No. 92255 - Dye Branch-Downstream (869 feet)**

Parameter	Baseline						MY - 1						MY - 2						MY - 3						MY - 4						MY - 5						Post-Repair					
	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	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Bankfull Width (ft)	18.4	18.6	18.6	18.8	N/A	2	18.5	18.7	18.7	18.8	N/A	2	17.7	18.7	18.7	19.6	N/A	2	17.9	20.4	18.6	24.6	N/A	2	17.8	18.7	18.7	19.6	N/A	2	16.60	18.10	18.10	19.60	N/A	2	17.4	18.4	18.4	19.3	N/A	2
Floodprone Width (ft)	48.7	61.8	61.8	74.8	N/A	2	47.6	60.6	60.6	73.5	N/A	2	47.6	60.6	60.6	73.5	N/A	2	47.6	63.7	70.0	73.5	N/A	2	47.6	60.6	60.6	73.5	N/A	2	47.60	60.55	60.55	73.50	N/A	2	47.6	60.6	60.6	73.5	N/A	2
Bankfull Mean Depth (ft)	1.9	2.0	2.0	2.0	N/A	2	1.6	1.8	1.8	1.9	N/A	2	1.6	1.9	1.9	2.1	N/A	2	1.6	2.1	2.0	2.6	N/A	2	1.8	2.0	2.0	2.2	N/A	2	1.80	1.95	1.95	2.10	N/A	2	1.8	2.0	2.0	2.2	N/A	2
Bankfull Max Depth (ft)	2.9	3.0	3.0	3.1	N/A	2	2.4	2.7	2.7	3.0	N/A	2	2.5	3.2	3.2	3.9	N/A	2	2.7	3.4	3.3	4.1	N/A	2	2.8	3.4	3.4	3.9	N/A	2	2.60	3.25	3.25	3.90	N/A	2	2.8	3.4	3.4	3.9	N/A	2
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	34.0	36.1	36.1	38.1	N/A	2	29.5	32.7	32.7	35.9	N/A	2	27.8	34.4	34.4	41.0	N/A	2	29.4	43.2	36.8	63.5	N/A	2	31.6	37.4	37.4	43.2	N/A	2	29.40	35.60	35.60	41.80	N/A	2	32.0	37.2	37.2	42.3	N/A	2
Width/Depth Ratio	9.3	9.6	9.6	9.9	N/A	2	9.9	10.8	10.8	11.7	N/A	2	9.3	10.3	10.3	11.3	N/A	2	9.4	10.0	9.6	11.0	N/A	2	8.9	9.5	9.5	10.0	N/A	2	9.20	9.30	9.30	9.40	N/A	2	8.8	9.1	9.1	9.4	N/A	2
Entrenchment Ratio	2.7	3.4	3.4	4.0	N/A	2	2.6	3.3	3.3	3.9	N/A	2	2.7	3.3	3.3	3.8	N/A	2	2.7	3.2	2.8	4.0	N/A	2	2.7	3.3	3.3	3.8	N/A	2	2.90	3.30	3.30	3.70	N/A	2	2.7	3.3	3.3	3.8	N/A	2
Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.0	1.0	1.0	1.0	N/A	2	1.00	1.00	1.00	1.00	N/A	2	1.0	1.0	1.0	1.0	N/A	2
<b>Profile</b>																																										
Riffle Length (ft)	15.7	50.3	55.7	79.3	20.2	7	14.4	48.7	43.0	87.0	24.1	7	14.7	37.3	39.9	54.7	18.2	4	18.9	42.8	41.0	70.4	23.4	4	18.1	43.4	39.0	77.7	26.5	4	18.7	46.6	44.0	77.2	29.3	3						
Riffle Slope (ft/ft)	0.001	0.006	0.006	0.014	0.004	7	0.001	0.003	0.003	0.006	0.002	7	0.003	0.007	0.007	0.010	0.004	4	0.001	0.005	0.005	0.008	0.004	4	0.0005	0.004	0.001	0.014	0.007	4	0.002	0.007	0.004	0.015	0.007	3						
Pool Length (ft)	10.1	19.9	15.9	39.6	8.9	14	9.7	17.6	17.5	26.1	5.8	15	7.6	26.2	31.4	44.2	13.0	14	8.7	26.6	30.2	56.6	15.7	15	8.0	23.4	23.7	43.3	10.7	16	5.9	23.1	20.2	57.9	15.0	16						
Pool Max Depth (ft)	3.3	3.9	3.8	5.1	0.6	12	3.2	3.9	4.0	4.9	0.5	13	3.0	4.2	3.8	6.7	1.0	13	3.0	3.9	3.8	5.3	0.7	12	1.8	3.4	3.4	5.0	0.8	14	3.4	4.3	4.2	5.8	0.7	14						
Pool Spacing (ft)	15.3	57.5	38.8	130.2	41.5	14	10.8	56.8	40.6	129.1	40.4	14	10.0	60.6	61.6	109.9	34.9	13	12.0	57.3	48.3	114.8	36.8	14	9.7	53.4	39.2	122.8	38.0	15	10.9	53.5	38.4	116.5	36.2	15						
<b>Pattern</b>																																										
Channel Belt Width (ft)	28.3	49.2	57.5	65.4	15.4	9																																				
Radius of Curvature (ft)	32.7	40.7	42.2	50.1	5.6	7																																				
Rc: Bankfull Width (ft/ft)	1.6	1.6	1.6	1.6	N/A	1																																				
Meander Wavelength (ft)	138.9	162.2	157.3	210.5	27.2	6																																				
Meander Width Ratio	3.1	3.1	3.1	3.1	N/A	2																																				
<b>Additional Reach Parameters</b>																																										
Rosgen Classification	C						C5						C5						C5						C5						C5											
Channel Thalweg Length (ft)	870						869						875						867						868						855											
Sinuosity (ft)	1.10						1.09						1.10						1.09						1.09						1.07											
Water Surface Slope (Channel) (ft/ft)	-						0.0099						0.0094						0.0099						0.0098						0.0095											
Bankfull Slope (ft/ft)	0.0106						0.0104						0.0101						0.0089						0.0103						0.0088											
Ri% / Ru% / P% / G% / S%	43%	6%	34%	13%	3%		39%	10%	31%	18%	2%		17%	19%	42%	19%	3%		20%	11%	46%	20%	4%		20%	14%	43%	20%	3%		19%	19%	42%	18%	2%							
SC% / SA% / G% / C% / B% / Be%*							3%	75%	22%	0%	0%	0	3%	59%	38%	0%	0%	0%	12%	52%	36%	0%	0%	0%	5%	56%	38%	1%	0%	0%	24.6%	46.5%	27.9%	0.9%	0%	0%						
d16 / d35 / d50 / d84 / d95 (mm)																									1.1	1.5	1.9	3.9	8.3	31	0.062	0.705	1.48	4.72	8.955							
% of Reach with Eroding Banks	0%						0%						8%						10%						10%						11%											
Channel Stability or Habitat Metric	N/A						N/A						N/A						N/A						N/A						N/A											
Biological or Other	N/A						N/A						N/A						N/A						N/A						N/A											

N/A - Information does not apply.  
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step  
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock  
 \*Percentages based on riffle and pool pebble counts.

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# **Appendix E**

## **Hydrologic Data**

<b>Table 12. Verification of Bankfull Events Dye Branch II / Project No. 92255</b>		
<b>Date of Occurrence</b>	<b>Method</b>	<b>Feet Above Average Bankfull Elevation</b>
7/8/2011	Water level logger	1.07
9/21/2011	Water level logger	1.14
9/24/2011	Water level logger	0.52
5/16/2012	Water level logger	1.63
7/11/2012	Water level logger	0.21
9/29/2012	Water level logger	0.22
4/12/2013	Water level logger	0.08
6/28/2013	Water level logger	0.81
6/30/2013	Water level logger	0.72
7/9/2013	Water level logger	1.62
7/31/2013	Water level logger	0.53
1/11/2014	Water level logger	1.29
5/14/2014	Water level logger	0.07
6/8/2014	Water level logger	0.21
Between 6/5/2015 and 11/7/2015	Wrack Lines	0.5