# <u>FINAL</u> <u>YEAR 2 (2015) ANNUAL MONITORING REPORT</u> MARTIN'S CREEK II MITIGATION PROJECT Cherokee County, North Carolina DMS Project No. 92633 (Contract No. 005717)

USACE Action ID No. SAW – 2009-00209/DWR Project No. 10-0952 SCO No. 08-07251-01

# **Data Collection – March-November 2015**

Hiwassee River Basin Cataloging Unit 06020002170010



SUBMITTED TO/PREPARED FOR:

North Carolina Department of Environmental Quality Division of Mitigation Services 217 West Jones Street, Suite 3000A Raleigh, North Carolina 27603

December 2015

# <u>FINAL</u> <u>YEAR 2 (2015) ANNUAL MONITORING REPORT</u> MARTIN'S CREEK II MITIGATION PROJECT

Cherokee County, North Carolina DMS Project No. 92633 (Contract No. 005717) USACE Action ID No. SAW – 2009-00209/DWR Project No. 10-0952 SCO No. 08-07251-01

## **Data Collection – March-November 2015**

Hiwassee River Basin Cataloging Unit 06020002170010



## SUBMITTED TO/PREPARED FOR:

North Carolina Department of Environmental Quality Division of Mitigation Services 217 West Jones Street, Suite 3000A Raleigh, North Carolina 27603

## **SUBMITTED BY:**



December 2015

# **Table of Contents**

1.0	PROJECT SUMMARY	1
2.0	METHODOLOGY	3
2.1	Streams	4
2.2		5
2.3	Wetland Hydrology	5
3.0 RI	EFERENCES	6

# Appendices

APPENDIX A. PROJECT BACKGROUND DATA AND MAPS
Figure 1. Vicinity Map
Table 1. Project Components and Mitigation Credits
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Baseline Information and Attributes
APPENDIX B. VISUAL ASSESSMENT DATA
Figures 2 and 2A-2C. Current Conditions Plan View
Tables 5A-5E. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment
Stream Fixed-Station Photographs
Vegetation Monitoring Photographs
APPENDIX C. VEGETATION PLOT DATA
Table 7. Vegetation Plot Criteria Attainment
Table 8. CVS Vegetation Plot Metadata
Table 9. Total and Planted Stems by Plot and Species
APPENDIX D. STREAM SURVEY DATA
Cross-section Plots
Longitudinal Profile Plots
Substrate Plots
Table 10a-10f. Baseline Stream Data Summary
Table 11a-11f. Monitoring Data
APPENDIX E. HYDROLOGY DATA
Table 12. Verification of Bankfull Events
Table 13. Wetland Hydrology Criteria Attainment Summary
Figure E1. Martin's Creek II 30-70 Percentile Graph for Rainfall
Groundwater Gauge Graphs

# 1.0 PROJECT SUMMARY

The North Carolina Department of Environmental Quality - Division of Mitigation Services (DMS) has established the Martin's Creek II Mitigation Project (Site) located in Cherokee County, just south of the town of Murphy. The Site includes a 93.87-acre easement encompassed within 14-digit Cataloging Unit 06020002170010 of the Hiwassee River Basin (Figure 1, Appendix B and Table 4, Appendix A). Land use at the Site, prior to mitigation activities, was composed of livestock pasture, open land, a residence, and forested areas. Martin's Creek and its tributaries were impaired by historical and current land management practices, which included timber harvesting, pasture, channelization, and livestock grazing. Completed project activities, reporting history, completion dates, project contacts, and project attributes are summarized in Tables 1-4 (Appendix A).

The Site is located along Martin's Creek and several unnamed tributaries, which have been assigned Stream Index Number 1-49 and Best Usage Classification of C. Site streams are listed on the NCDWQ draft 2014 and final 2012 Section 303(d) list of impaired streams due to a fair bioclassification for reduced ecological/biological integrity and fish communities, and elevated levels of fecal coliform bacteria. The Site is located within a Targeted Local Watershed that has been identified for stream and buffer restoration opportunities (NCDMS 2008).

The Site lies within the focus area of the *Peachtree-Martins Creek Local Watershed Plan* (LWP) and roughly corresponds to Restoration site #1 & Preservation site #1 of the LWP project atlas (NCDMS 2007). Goals of the LWP include implementation of wetland and stream restoration projects that reduce sources of sediment and nutrients by restoring riparian buffers, stabilizing stream banks, and restoring natural channel geomorphology, particularly in headwater streams.

The project goals will directly address stressors identified in the Peachtree-Martins Creek LWP, namely lack of riparian vegetation, channel modification, excess sediment inputs, excess nutrient inputs, and bacterial contamination as follows.

- Restore geomorphically stable stream channels within the Site;
- Restore or enhance wetlands;
- Exclude livestock from accessing project streams, wetlands, and riparian zones;
- Improve and restore hydrologic connections and achieve uplift of ecosystem functions;
- Improve water quality within the Site by reducing bank erosion, improving nutrient and sediment removal, and stabilizing stream banks;
- Restore and preserve headwater tributaries to the Peachtree-Martins Creek Watershed and the Hiwassee River; and
- Improve aquatic and terrestrial habitat by improving substrate and in-stream cover, adding woody debris, reducing water temperatures, and restoring riparian habitat.

The Site mitigation plan was completed in March 2010 with the final design and construction plans completed in November 2010 (Table 2, Appendix A). Project construction was completed between October 2012 and July 2013. The implemented mitigation is as follows (Figure 2, Appendix B and Table 1, Appendix A).

- 8817 Stream Mitigation Units
  - Restoring approximately 3486 linear feet of stream channel through construction of stable channel at the historic floodplain elevation.
  - Enhancing (level I) approximately 832 linear feet of stream channel through cessation of current land use practices, installing grade control structures, repairing bank erosion, restoring proper channel dimension, and planting with native forest vegetation.
  - Enhancing (level II) approximately 1903 linear feet of stream channel through cessation of current land use practices, removing invasive species, and planting with native forest vegetation.
  - Preserving 21,327 linear feet of stream channel.
- 5.97 Riparian Wetland Mitigation Units
  - Restoring approximately 5.20 acres of riparian wetland by removing spoil castings, restoring stream inverts to historic elevations rehydrating stream-side wetlands, removing drain tile, eliminating land use practices, and planting with native forest vegetation.
  - Enhancing approximately 1.61 acres of riparian wetland by fencing livestock and supplemental planting.
- Planting a native woody riparian buffer (at least 30 feet in width) adjacent to restored/enhanced streams and wetlands within the Site.
- Protecting the Site in perpetuity with a conservation easement.

# Stream Success Criteria

Stream restoration success criteria for the Site are based on the *Stream Mitigation Guidelines* issued in April 2003 by the USACE and NCDWQ. Success criteria for stream restoration will include 1) documentation of two bankfull events, 2) little change in the channel cross-section from as-built conditions, 3) stable longitudinal profile, 4) substrate consistency, and 5) photographic evidence of stability.

# Bankfull Events

Two bankfull flow events in separate years must be documented within the 5-year monitoring period. Otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years.

# Cross-sections

Riffle cross-sections on restoration and enhancement reaches should be stable and should show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Riffle cross-sections should generally fall within the parameters defined for channels of the appropriate Rosgen stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-todepth ratio in meandering channels or an increase in pool depth.

## Longitudinal Profile

Longitudinal profile data for the stream reach should show that bedform features are remaining stable. The riffles should be steeper and shallower than the pools, while the pools should be deep with flat water surface slopes. The relative percentage of riffles and pools should not change significantly from the design parameters.

# Bed Material Analysis

Substrate materials in restoration reaches should indicate a progression towards or the maintenance of coarser materials in the riffle features and smaller particles in the pool features.

# Photo Reference Sites

Photographs will be used to evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures subjectively. Lateral photos should not indicate excessive erosion or continuing degradation of the banks. A series of photos over time should indicate successive maturation of riparian vegetation.

# Vegetation Success Criteria

Success criteria have been established to verify that the vegetation component supports community elements necessary for forest development. Success criteria for this project includes an average density of 320 planted stems per acre must be surviving in the first three monitoring years. Subsequently, 290 planted stems per acre must be surviving in year 4, and 260 planted stems per acre in year 5.

# Wetland Success Criteria

Hydrologic success will be based on conditions of on-site reference wetlands. Success will be determined by the following criteria.

# Years One Through Three

Hydrologic success criteria will be met if the Site demonstrates groundwater table levels within 12 inches of the soil surface for a minimum of 13% of the growing season (this criterion reflects a deviation of 50% from the duration of saturation expected for this type of wetland system ( $\sim$ 25%). Success for monitoring years one through three will be determined based on this 50% tolerance of deviation from the duration of wetland hydrology at the reference sites.

# Years Four and Five

Success for monitoring years four and five will be determined based on a 20% tolerance of deviation from the duration of wetland hydrology at the reference sites. Therefore, it is expected that in years four and five the site will achieve a minimum of 20% saturation. Based on reference conditions and the criterion stated above, it is expected that reference soil saturation for years one through five will continue to exceed the regulatory 12.5% minimum requirement of the growing season for Cherokee County. In order to attain conditions suitable for the formation of wetland vegetation and hydric soils, the Site should be saturated within 12 inches of the surface or inundated for consecutive period equal to 24 days. However, to meet hydrologic success criteria and mimic the reference wetland hydrology, the site should demonstrate wetland hydrology for a minimum of 25 days in years one through three. In years four and five, this will increase to a minimum of 38 days. Overbank flooding from the adjacent channel will also be noted during monitoring.

Reference areas will be monitored for a minimum of five years.

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 tables and figures within this report's appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on the Division of Mitigation Services (DMS) website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

# 2.0 METHODOLOGY

Monitoring of the Site's restoration efforts will be performed until agreed upon success criteria are fulfilled. Monitoring is proposed for the stream channel, riparian vegetation, and hydrology for a period of five years (Figures 2 & 2A-2C, Appendix A). Monitoring reports of collected data will be submitted no later than December of each monitoring year.

# 2.1 Streams

Post-restoration monitoring will be conducted for five years following the completion of construction to evaluate the effectiveness of the restoration practices. Measurements were taken using a Topcon GTS 303 total station and Recon data collector. The raw total station file was processed using Carlson Survey Software into a Computer Aided Design (CAD) file. Coordinates were exported as a text/ASCII file to Microsoft Excel for processing and presentation of data, and are not georeferenced. Pebble counts were completed using the modified Wolman method (Rosgen 1993). Monitored stream parameters include stream dimension (cross-sections), pattern (longitudinal survey), profile (profile survey), and photographic documentation. Stream data can be found in Appendix D.

# Bankfull Events

The occurrence of bankfull events within the monitoring period will be documented by the use of a crest gauge and photographs. One crest gauge was installed to record the highest watermark between site visits; the gauge will be checked each Site visit to determine if a bankfull event has occurred (Figure 2A, Appendix B). Photographs will be used to document the occurrence of debris lines and sediment deposition on the floodplain during monitoring site visits.

Five bankfull events have been documented to date during monitoring year 2 (2015) for a total of eleven bankfull events during years 1 (2014) and 2 (2015).

# Cross-sections

A total of 19 permanent cross-sections, 12 riffle and 7 pool, were established and will be used to evaluate stream dimension; locations are depicted on Figures 2, 2A, and 2B (Appendix B) Because riffle cross-sections are critical in determining bankfull design parameters, the number of riffle cross-sections established will generally outnumber pool cross-sections. Each cross-section will be marked on both banks with permanent pins to establish the exact transect used. A common benchmark will be used for cross-sections and consistently used to facilitate easy comparison of year-to-year data. The annual cross-section survey will include points measured at all breaks in slope, including top of bank, bankfull, inner berm, edge of water, and thalweg, if the features are present. Riffle cross-sections will be classified using the Rosgen Stream Classification System.

No areas of concern or indicators of instability were observed during year 2 (2015) monitoring; therefore, stream dimension measurements are currently meeting success criteria.

## Longitudinal Profile

After Site construction, approximately 4493 linear feet of longitudinal profile was completed to document baseline conditions. Longitudinal profile will be resurveyed annually for the duration of the five-year monitoring period. Measurements include thalweg, water surface, bankfull, and top of low bank. Each of these measurements will be taken at the head of each channel unit (e.g., riffle, pool) and at the maximum pool depth. The survey will be tied to a permanent benchmark.

No areas of concern or indicators of bedform instability were observed during year 2 (2015) monitoring; therefore, stream longitudinal profile measurements are currently meeting success criteria.

# Bed Material Analysis

Pebble counts will be conducted annually on one permanent riffle cross-section (100-counts) at the time cross-section and longitudinal surveys are performed during the five year monitoring period. These samples will reveal changes in sediment gradation over time as the stream adjusts to upstream sediment loads.

Year 2 (2015) pebble counts indicate the maintenance of coarser materials in the measured riffle feature; therefore, bed material is currently meeting success criteria.

# Photo Reference Sites

A total of 26 photographs will be used to visually document restoration success for at least five years following construction. Photographs will be taken from a height of approximately five to six feet. Photo locations will be recorded using sub-meter GPS to ensure that the same locations (and view directions) on the Site are monitored in each monitoring period.

Year 2 (2015) photo reference sites show no channel aggradation or degradation, or bank erosion. In addition, riparian vegetation is meeting success criteria based on stem counts across the Site; however, it is too early in the monitoring period to show successive maturation of riparian vegetation.

# 2.2 Vegetation

After planting was completed, an initial evaluation was performed to verify planting methods were successful and to determine initial species composition and density. Fifteen sample vegetation plots (10-meter by 10-meter) were installed and measured within the Site as per guidelines established in *CVS-DMS Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008). Vegetation plots are permanently monumented with 6-foot metal t-posts at each corner. In each sample plot, vegetation parameters to be monitored include species composition and species density. Visual observations of the percent cover of shrub and herbaceous species will also be documented by photograph. Vegetation plot data can be found in Appendix C.

Supplemental planting occurred at the Site in early 2015 with 3000 bare root stems as follows (Figures 2A-2C (Appendix A).

500 river birch (*Betula nigra*)
500 sycamore (*Platanus occidentalis*)
500 tulip poplar (*Liriodendron tulipifera*)
500 black gum (*Nyssa sylvatica*)
500 northern red oak (*Quercus rubra*)
500 Shumard's oak (*Quercus shumardii*)
3000

Year 2 stem count measurements indicate an average of 459 planted stems per acre (excluding livestakes) across the Site; therefore, the Site is currently meeting vegetation success criteria. In addition, all fifteen individual vegetation plots met success criteria based on planted stems alone.

# 2.3 Wetland Hydrology

Thirteen RDS Ecotone WM groundwater monitoring gauges were installed within Site wetland restoration areas to monitor groundwater hydrology (Figure 2A, Appendix A). Hydrological sampling will continue for five years with gauges recording daily and downloaded at a minimum of quarterly throughout the growing season (April 14-October 21). In addition, an on-site rain gauge will document rainfall data for comparison of groundwater conditions with extended drought conditions. Finally, groundwater gauges located within riverine wetlands adjacent to restored stream reaches will supplement crest gauge measurements to confirm overbank flooding events.

Twelve of the thirteen groundwater gauges met or exceeded wetland success criteria for the Year 2 (2015) monitoring year. Although it is too early in the monitoring period to determine the extent of wetland that is currently meeting wetland hydrology success criteria, Year 2 (2015) data indicates that the majority of the Site wetland area is successful.

## **3.0 REFERENCES**

- ACIS-NOAA Regional Climate Centers. WETS Table Murphy, NC6001. Available online at: <u>http://agacis.rcc-acis.org/37039/wets/results</u>[November 20, 2015].
- Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-DMS Protocol for Recording Vegetation, Levels 1-2 Plot Sampling Only, Version 4.2. Available online at <u>http://cvs.bio.unc.edu/methods.htm</u>.
- North Carolina Division of Water Quality (NCDWQ). 2012. Final North Carolina Water Quality Assessment and Impaired Waters List (NC 2012 Integrated Report Category 5, 303(d) List) (online). Available: <u>http://portal.ncdenr.org/c/document\_library/get\_file?uuid=9d45b3b4-d066-4619-82e6-ea8ea0e01930&groupId=38364</u> [February 17, 2014]. North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina.
- North Carolina Division of Water Quality (NCDWQ). 2014. Draft 2014 NC 303(d) List-Category 5 Assessments Requiring TMDLs (online). Available: <u>http://portal.ncdenr.org/c/document\_library/get\_file?uuid=096fb2ff-296b-4bd8-8b88-e83bb5984be6&groupId=38364</u> [February 17, 2014]. North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina.
- North Carolina Division of Mitigation Services (NCDMS) and Equinox Environmental Consultation and Design. 2007. Peachtree-Martins Creek Local Watershed Plan (Phase3), Hiwassee River Basin, Cherokee and Clay Counties, North Carolina. October 2007 Watershed Management Plan. [Online WWW]. Available URL: <a href="http://www.hrwc.net/pmcplan/pmc\_plan\_executive\_summary.pdf">http://www.hrwc.net/pmcplan/pmc\_plan\_executive\_summary.pdf</a>.
- North Carolina Division of Mitigation Services (NCDMS). 2010. Martin's Creek II Mitigation Plan. NC Department of Environment and Natural Resources. Available online at <u>http://its.enr.state.nc.us/WebLink8/0/doc/140433/Page2.aspx</u>
- North Carolina Division of Mitigation Services (NCDMS). 2014. Annual Monitoring and Closeout Reporting Format, Data Requirements, and Content Guidance, dated February 2014. NC Department of Environment and Natural Resources. Available online at http://portal.ncdenr.org/c/document\_library/get\_file?p\_1\_id=60409&folderId=18877169&name= DLFE-86604.pdf
- North Carolina Division of Mitigation Services (NCDMS). 2008. Hiwassee River Basin Restoration Priorities 2008 (online). Available: <u>http://portal.ncdenr.org/c/document\_library/get\_file?uuid=</u> <u>ea2df99d-3031-4c7b-87ea-79d56a3e4a1e&groupId=60329</u>. North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina.
- Rosgen. 1993. Applied Fluvial Geomorphology, Training Manual. River Short Course, Wildland Hydrology, Pagosa Springs, CO.
- United States Army Corps of Engineers, United States Environmental Protection Agency, North Carolina Wildlife Resources Commission, North Carolina Division of Water Quality (USACE et al.). 2003. Stream Mitigation Guidelines.

United States Geological Survey (USGS). 1974. Hydrologic Unit Map - 1974. State of North Carolina.

Weakley, Alan S. 2012. Flora of the Southern and Mid-Atlantic States. Available online at: <a href="http://www.herbarium.unc.edu/WeakleysFlora.pdf">http://www.herbarium.unc.edu/WeakleysFlora.pdf</a> [September 28, 2012]. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.

# APPENDIX A

# PROJECT BACKGROUND DATA AND MAPS

Figure 1. Vicinity Map

- Table 1. Project Components and Mitigation Credits
- Table 2. Project Activity and Reporting History
- Table 3. Project Contacts Table
- Table 4. Project Baseline Information and Attributes



#### Table 1. Project Components and Mitigation Credits Martin's Creek II Mitigation Site

	-			Mitigati	on Credit Summation	ns				
Stream			Riparian Wetland					Nonriparian Wetland		
8817			5.97							
			1	Pr	ojects Components	I		I		
Stati	on Range	Existing Linear Footage/Acreage	Priority Approach	Restoration/ Restoration Equivalent	Restoration Linear Footage/Acreage	Mitigation Ratio	Mitigation Credits	Comment		
Right Prong Ma	rtin's Creek and UTs	17,234		Preservation	17,234-203= <b>17,031</b>	5:1	3406.2	Three short reaches in upstream portion of RP UT1 do not have adequate buffer to claim credit and therefore have been removed from the total linear footage and calculated mitigation credits.		
Right Prong Ma	rtin 's Creek and UTs	971		Enhance II	971	2.5:1	388.4	Enhancement Level II - invasive species controls and localized erosion stabilization.		
Martin'	s Creek UTs	4296		Preservation	4296	5:1	859.2			
Martin	n's Creek*	857		Enhance II	857	5:1*	171.4	Enhancement Level II - invasive species controls and		
UT-2 to M	Martin's Creek	75		Enhance II	75	2.5:1	30.0	localized erosion stabilization.		
	b) to Martin's Creek 0+00 to 03+37	337		Enhance I	337	1.5:1	224.7	Level I stream enhancement - grade control structures, repair bank erosion, and restore proper dimension.		
UT 1-3 (Reach 1) to Martin's Creek Station 00+00 to 04+95		495		Enhance I	495	1.5:1	330.0	Level I stream enhancement - grade control structures, repair bank erosion, and restore proper dimension.		
	UT 1 (Reach 2) to Martin's Creek Station 00+00 to 10+52		Ι	Restoration	1052	1:1	1052	Construction of a new channel on the existing floodplain.		
UT 1 (Reach 4) to Martin's Creek	05+46 to 05+91 05+91 to 06+35** 06+35 to 15+75 15+75 to 16+75**	332	II	Restoration	51 37 941 100	1:1 2:1** 1:1 2:1**	51.0 18.5 941.0 50.0	Construction of a new channel in a low slope valley.		
UT 1-3 (Reach 2) to Martin's Creek	05+54 to 05+90 05+90 to 06+10*** 06+10 to 18+59	1068	II	Restoration	35 20 1250	1:1 2:1*** 1:1	35.0 10.0 1250.0	Construction of a new channel in a low slope valley.		
Wetland Restoration				Restoration	5.14	1:1 2:1^	5.14	Restoration of riparian wetlands through stream restoration activities, filling abandoned channels and drain tiles,		
Wetland Enhancement		1.61		Enhancement	1.604 0.006	2:1 2:1 4:1 <sup>+</sup>	0.802 0.002	removing spoil castings, and planting. Enhancement of existing riparian wetlands by fencing livestock and planting.		
				Сог	nponent Summation			· ·		
Restorat	<b>Restoration</b> Level		otage)	Riparian Wetland (acreage)			Nonriparian Wetland (acreage)			
Restoration		3486			5.20					
Enhancement (Level I)		832						-		
Enhancement (Level II)		1903	1.61		1.61					
Prese	Preservation									
	Totals			6.81						
	ion Units	8817 SMUs		5.97 Riparian WMUs			0.00 Nonriparian WMUs			

\* Martin's Creek proper is located beneath a power line; therefore, a credit ratio of 5:1 has been used to calculate mitigation units.
 \*\* UT1 (Reach 4) stations 05+91 to 06+35 and 15+75 to 16+75 are located beneath a power line; therefore, a credit ratio of 2:1 has been used to calculate mitigation units.

\*\*\* UTI-3 (Reach 2) station 05+90 to 06+10 is located beneath a power line; therefore, a credit ratio of 2:1 has been used to calculate mitigation units.

<sup>4</sup>0.06 acres of wetland restoration is located beneath a power line; therefore, a credit ratio of 2:1 has been used to calculate mitigation units. <sup>4</sup>0.006 acres of wetland enhancement is located beneath a power line; therefore, a credit ratio of 4:1 has been used to calculate mitigation units.

Axiom Environmental, Inc.

Table 2.	<b>Project Activity and Reporting History</b>
Martin's	Creek II Mitigation Site

	Data Collection	Completion
Activity or Deliverable	Complete	or Delivery
Mitigation Plan	January 2010-July	September 2010
	2010	
Final Design – Construction Plans	September 2010-	March 2011
	March 2011	
Construction		October 2012-July 2013
Temporary S&E Mix applied to Entire Project Site		October 2012-July 2013
Permanent Seed Mix applied to the Entire Project Site		October 2012-July 2013
Bare Root; Containerized; and B&B Plantings for the		March 2014
Entire Project Site		
Mitigation Plan/ As-Built (Year 0 Monitoring	April 2014	April 2014
Baseline)		
Year 1 Monitoring	October 2014	December 2014
Warranty Supplemental Planting		March 2015
Year 2 Monitoring	November 2015	December 2015
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

# Table 3. Project Contacts Table Martin's Creek II Mitigation Site

Martin's Creek II Mitigation Site			
Designer	Michael Baker Engineering, Inc.		
	797 Haywood Road, Suite 201		
	Asheville, NC 28806		
	Micky Clemmons 828-350-1408		
<b>Construction Plans and Sediment and</b>	Michael Baker Engineering, Inc.		
<b>Erosion Control Plans</b>	797 Haywood Road, Suite 201		
	Asheville, NC 28806		
	Micky Clemmons 828-350-1408		
<b>Construction Contractor</b>	River Works, Inc.		
	6105 Chapel Hill Rd.		
	Raleigh, NC 27607		
	919-582-3574		
Planting Contractor	Carolina Silvics, Inc.		
C	908 Indian Trail Road		
	Edenton, NC 27932		
	(252) 482-8491		
As-built Surveyor	Turner Land Surveying. PLLC		
	3201 Glenridge Drive		
	Raleigh, NC 27604		
	919-875-1378		
<b>Baseline Data Collection</b>	Axiom Environmental, Inc.		
	218 Snow Avenue		
	Raleigh, NC 27603		
	Grant Lewis 919-215-1693		

# Table 4. Project Attribute TableMartin's Creek II Mitigation Site

Martin's Creek II Mitigation S Project County	lite		Charal	aa Caunt	North	Carolin	2		
5	Cherokee County, North Carolina								
Physiographic Region	Blue Ridge								
Ecoregion Project River Basin		Broad Basins Hiwassee							
5					assee 02170010	2			
USGS HUC for Project (14 digit)						J			
NCDWQ Sub-basin for Project			V.z. D.		)5-02		(7D)		
Planning Area			Yes – Pe		old	reek Lv	VP		
WRC Class (Warm, Cool, Cold)				C	old				
% of project easement fenced or demarcated				1	00				
Beaver activity observed during design phase?				1	No				
design phase.	-	ong Martin's reek			Ма	rtin's Ci	reek		
			MC U	JT1	MCU	JT1-3			
	RP UT1	RP		PI	LI	PI	MC UT2	MC	
	10 011	Mainstem	LII Enh	Rest	Enh	Rest		Mainstem	
Drainage Area	.17	0.6	0.02 -			- 0.08	0.39	6.81	
Stream Order (USGS topo)	1st	3rd	2nd			st	1st	3rd	
Restored Length (feet)									
Perennial or Intermittent	I/P	I/P	Р	Р	Р	Р	Р	Р	
Watershed Type	Rural								
Watershed impervious cover					0%				
NCDWQ AU/Index number		1-49 (Martin's Creek), 1-49-3 (Right Prong Martins Creek)							
NCDWQ Classification		C					C		
303d listed?		<u> </u>		١	No	<u> </u>			
Upstream of a 303d listed									
Reasons for 303d listed segment		No NA							
Total acreage of easement	93.87								
Total existing vegetated acreage				//	,				
of easement					-				
Total planted restoration acreage				17	acres				
Rosgen Classification of	В	В	Eb/Fb/B	Cb/G	Eb/B	C/F	В	С	
preexisting			/G						
Rosgen Classification of As-built	В	В	B/C	B/C	В	С	B	<u>C</u>	
Valley type		II	II		VIII		VIII	VIII	
Valley slope	N/A		0.015 - 0.05		0.007 - 0.04		N/A	N/A	
Cowardin classification of proposed	N/A		N/A		N/A		N/A	N/A	
Trout waters designation				1	No				
Species of concern, endangered etc.	No								
Dominant Soil Series	Cullowhee fine sandy loam		Thurmont- Dillard Complex Arkaqua loam		Dillard loam Arkaqua loam		Arkaqua loam	Arkaqua loam	

# APPENDIX B

## VISUAL ASSESSMENT DATA

Figures 2 and 2A-2C. Current Conditions Plan View (CCPV)Tables 5A-5E. Visual Stream Morphology Stability AssessmentTable 6. Vegetation Condition AssessmentStream Station PhotographsVegetation Plot Photographs



Raleigh, NC 27603 (919) 215-1693 Axiom Environmental, Inc.

DMS PROJECT # 92633 Cherokee County, North Carolina

Dwn. by. KRJ	FIGURE
Date: Nov 2015	2
Project:	
12-004.16	



Nov	201	5



TE UTILE			
JT1R2	00+5	A ST BEB	00+00

# Legend

- Easement Boundary
- ----- Streams
- Stream Stationing
- 🔪 Instream Structures
- Constructed Riffles
- Monitoring Reach
  - Cross Sections
  - CVS Plots Meeting Success Criteria in year 2 (2015)
  - CVS Plots Not Meeting Success Criteria in year 2 (2015)
- 🛠 Photo Points

Dwn. by.	KR
Date:	

Nov 2015

Project:

12-004.16

2B





Dwn. by. KRJ	FIGURE
Date: Nov 2015	2C
Project:	
12-004.16	

#### Table 5A Reach ID

Assessed Length

#### Visual Stream Morphology Stability Assessment UT1 Reach 4

1129

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	Stabilizing Woody	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	<ol> <li><u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	23	23			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6)	25	25			100%			
		<ol> <li>Length appropriate (&gt;30% of centerline distance between tail of upstream riffle and head of downstrem riffle)</li> </ol>	25	25			100%			
	4.Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	25	25			100%			
		2. Thalweg centering at downstream of meander (Glide)	25	25			100%			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
			-	Totals	0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	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%. (See guidance for this table in EEP monitoring guidance document)	8	8			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.	8	8			100%			

#### Table 5B Reach ID

### Visual Stream Morphology Stability Assessment

Reach ID Assessed Length UT1 Reach 3 337

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	Stabilizing Woody	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	<ol> <li><u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			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	10	10			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth $\ge$ 1.6)	10	10			100%			
		<ol> <li>Length appropriate (&gt;30% of centerline distance between tail of upstream riffle and head of downstrem riffle)</li> </ol>	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 (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%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	4	4			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.	4	4			100%			

### Table 5C Reach ID Assessed Length

#### <u>Visual Stream Morphology Stability Assessment</u> UT1-3 Reach 2 1305

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	Stabilizing Woody	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	<ol> <li><u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			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	32	32			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth $\ge$ 1.6)	32	32			100%			
		<ol> <li>Length appropriate (&gt;30% of centerline distance between tail of upstream riffle and head of downstrem riffle)</li> </ol>	32	32			100%			
	4.Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	32	32			100%			
		2. Thalweg centering at downstream of meander (Glide)	32	32			100%			
			<u>1</u>		<u>n</u>		<u>n</u>	8		
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
	-			Totals	0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	10	10			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	10	10			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	10	10			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	10	10			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.	10	10			100%			

#### Table 5D Reach ID

#### Visual Stream Morphology Stability Assessment UT1-3 Reach 1

495

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	Stabilizing Woody	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	<ol> <li><u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			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	16	16			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6)	22	22			100%			
		<ol> <li>Length appropriate (&gt;30% of centerline distance between tail of upstream riffle and head of downstrem riffle)</li> </ol>	22	22			100%			
	4.Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	22	22			100%			
		2. Thalweg centering at downstream of meander (Glide)	22	22			100%			
		•								
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
	-			Totals	0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	21	21			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	21	21			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	21	21			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	21	21			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.	21	21			100%			

Reach ID Assessed Length

### Table 5E Reach ID

#### Visual Stream Morphology Stability Assessment UT1 Reach 2 1051

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)	<ol> <li><u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)</li> </ol>			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	55	55			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth $\ge$ 1.6)	55	55			100%			
		<ol> <li>Length appropriate (&gt;30% of centerline distance between tail of upstream riffle and head of downstrem riffle)</li> </ol>	55	55			100%			
	4.Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	55	55			100%			
		2. Thalweg centering at downstream of meander (Glide)	55	55			100%			
		•					-	-		
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			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%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	57	57			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	57	57			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	57	57			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	57	57			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.	57	57			100%			

Assessed Length

#### Table 6 Vegetation Condition Assessment

17

#### Martins Creek II Mitigation Project

Planted Acreag	e <sup>1</sup>
----------------	----------------

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	None	0.1 acres	none	0	0.00	0.0%
2. Low Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
2B. Low Planted Stem Density Areas	None	0.1 acres	none	0	0.00	0.0%
			Total	0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	None	0.25 acres	N/A	0	0.00	0.0%
		Cu	mulative Total	0	0.00	0.0%

Easement Acreage <sup>2</sup>	93.87					
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern <sup>4</sup>	Dense Chinese privet adjacent to UT1R3.	1000 SF	Blue Polygon	1	0.04	0.0%
5. Easement Encroachment Areas <sup>3</sup>	None	none	none	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1.2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by DMS such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have vet to be observed across the state with any frequency. Those in red italics are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

# Martin's Creek II Year 2 Fixed Station Photographs Taken July 2015













Axiom Environmental, Inc.

Monitoring Year 2 of 5 (2015) December 2015 Appendices

# Martin's Creek II Year 2 Fixed Station Photographs (continued) Taken July 2015













# Martin's Creek II Year 2 Fixed Station Photographs (continued) Taken July 2015













Martin's Creek II Year 2 Fixed Station Photographs (continued) Taken July 2015













# Martin's Creek II Year 2 Fixed Station Photographs (continued) Taken July 2015





Martin's Creek II Year 2 Vegetation Monitoring Photographs Taken July 12-13, 2015













Martin's Creek II Year 2 Vegetation Monitoring Photographs Taken July 12-13, 2015 (continued)







Axiom Environmental, Inc.

Martin's Creek II Year 2 Vegetation Monitoring Photographs Taken July 12-13, 2015 (continued)







Axiom Environmental, Inc.

# APPENDIX C

# VEGETATION PLOT DATA

Table 7. Vegetation Plot Criteria Attainment

Table 8. CVS Vegetation Plot Metadata

Table 9. Total and Planted Stems by Plot and Species

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	
2	Yes	
3	Yes	
4	Yes	
5	Yes	
6	Yes	
7	Yes	
8	Yes	100%
9	Yes	
10	Yes	
11	Yes	
12	Yes	
13	Yes	
14	Yes	
15	Yes	

 Table 7. Vegetation Plot Criteria Attainment Based on Planted Stems

 Martin's Creek II Mitigation Site (DMS Project Number 92633)
# Table 8. CVS Vegetation Plot MetadataMartin's Creek II Mitigation Site (DMS Project Number 92633)

viarum s Creek II winugation Si	te (DMS Project Number 92033)
<b>Report Prepared By</b>	Corri Faquin
Date Prepared	7/29/2015 12:41
database name	Axiom-EEP-2015-A-v2.3.1.mdb
database location	C:\Axiom\Business\CVS
computer name	CORRI-PC
file size	50962432
DESCRIPTION OF WORKSHE	ETS 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.
	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all
Proj, total stems	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.
	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead
ALL Stems by Plot and spp	and missing stems are excluded.
PROJECT SUMMARY	
Project Code	92633
project Name	Martin's Creek II
Description	Stream and Wetland Restoration
River Basin	Hiwassee
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	15

# Table 9. Total and Planted Stems by Plot and SpeciesDMS Project Code 92633. Project Name: Martin's Creek II

																	Current	: Plot D	ata (M)	/2 2015	)													
			926	633-01-0	0001	926	33-01-0	0002	92633-01-	0003	926	33-01-00	04	9263	3-01-00	005	92633-01-	0006	926	33-01-0	0007	926	33-01-0008	92	633-01	-0009	9	2633-01·	-0010	92£	33-01-001	11	92633-01-	0012
Scientific Name	Common Name	Species Type	PnoLS	P-all	Т	PnoLS	P-all	Т	PnoLS P-all	Т	PnoLS	P-all T		PnoLS	P-all 1	Г	PnoLS P-all	Т	PnoLS	P-all	т	PnoLS	P-all T	PnoL	S P-all	т	Pnol	LS P-all	т	PnoLS	P-all T	P	noLS P-all	Т
Acer rubrum	red maple	Tree								6	5		2								5			4			1							
Alnus serrulata	hazel alder	Shrub						1										4									2							
Betula nigra	river birch	Tree							1 1	1 1	L			2	2	2	2 2	2	2	2	2	. 1	1	1	2	2	2	4	4 4	F 2	2	2		
Carpinus caroliniana	American hornbeam	Tree																														7		
Carya	hickory	Tree																																
Carya alba	mockernut hickory	Tree																																
Carya glabra	pignut hickory	Tree																				1	1	1						1	1	1		
Diospyros virginiana	common persimmon	Tree																				3	3	3										
Fagus grandifolia	American beech	Tree																																
Fraxinus pennsylvanica	green ash	Tree																																
Juglans nigra	black walnut	Tree																																
Liriodendron tulipifera	tuliptree	Tree	1	. 1	1	. 3	3	3			3	3	3	1	1	1	1 1	1				2	2	2	4	4	4	3	3 3	5 1	1	3		
Malus	apple	Tree																																
Nyssa	tupelo	Tree	1	. 1	1	. 1	1	1	1 1	1	1 2	2	2	1	1	1			1	1	1	. 2	2	2										
Pinus strobus	eastern white pine	Tree																																
Platanus occidentalis	American sycamore	Tree	4	4	4	4 4	4	5			3	3	3	1	1	1	7 7	7	1	1	1	. 4	4	4	2	2	2	3	3 3	3	3	3	1 1	1
Quercus	oak	Tree									1	1	1	1	1	1	2 2	2	2	2	2													
Quercus alba	white oak	Tree																																
Quercus coccinea	scarlet oak	Tree																	1	1	1				1	1	1	1	1 :	L			1 1	1
Quercus michauxii	swamp chestnut oak	Tree																																
Quercus nigra	water oak	Tree				3	3	3	1 1	1	L			1	1	1	4 4	4	1	1	1													
Quercus pagoda	cherrybark oak	Tree																	1	1	1							-						1
Quercus rubra	northern red oak	Tree	4	4	4	1	1	1	6 6	6 6	5 3	3	3	4	4	4			1	1	1	. 2	2	2	3	3	3	1	1 :	1	1	1	6 6	ô
Quercus shumardii	Shumard's oak	Tree																																
Salix nigra	black willow	Tree																3																
Unknown		Shrub or Tree						1																										
		Stem count	10	10	10	12	12	14	9 9	9 15	5 12	12	14	11	11	11	16 16	23	10	10	15	5 15	15 1	9 1	2 1	2 1	.5	12 1	2 19	8 6	8	17	8 8	8
		size (ares)		1			1		1			1			1		1			1			1		1			1			1		1	
		size (ACRES)		0.02		1	0.02		0.02		1	0.02			0.02		0.02			0.02			0.02		0.02			0.02		1	0.02		0.02	
		Species count	4	4	4	5	5	6	4 4	1 5	5 5	5	6	7	7	7	5 5	7	8	8	9	7	7	8	5	5	7	5	5 6	5 ز	5	6	3 3	3
		Stems per ACRE	404.7	404.7	404.7	485.6	485.6	566.6	364.2 364.2	2 607	485.6	485.6	566.6	445 2	445.2	445.2	647.5 647.5	930.8	404 7	404 7	607	607	607 768.	9 485.	6 485.	6 60	7 485	6 485	6 768.9	323.7	323.7	688	323.7 323.7	7 322

Color for Density

Exceeds requirements by 10% Exceeds requirements, but by less than 10% Fails to meet requirements, by less than 10% Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes

P-all = Planting including livestakes

T = All planted and natural recruits including livestakes

T includes natural recruits

# Table 9. Total and Planted Stems by Plot and Species (continued)DMS Project Code 92633. Project Name: Martin's Creek II

					Curi	rent Plo	t Data	(MY2 2	015)						Anı	nual M	eans			
			926	33-01-0	013	926	33-01-0	0014	926	33-01-0	0015	М	Y2 (201	L5)	M	IY1 (20	14)	Μ	IYO (201	4)
Scientific Name	Common Name	Species Type	PnoLS	P-all	т	PnoLS	P-all	Т	PnoLS	P-all	Т	PnoLS	P-all	Т	PnoLS	P-all	Т	PnoLS	P-all	т
Acer rubrum	red maple	Tree												18			4			-
Alnus serrulata	hazel alder	Shrub						40			17			71			25			
Betula nigra	river birch	Tree	2	2	2	1	1	1				19	19	19	9	ç	9 9	9	9	ç
Carpinus caroliniana	American hornbeam	Tree												7			1			
Carya	hickory	Tree							1	1	1	1	1	1	1	1	. 2	2	2	2
Carya alba	mockernut hickory	Tree													3	(1)	3	3	3	÷.,
Carya glabra	pignut hickory	Tree										2	2	2	3	(1)	3			
Diospyros virginiana	common persimmon	Tree										3	3	3						
Fagus grandifolia	American beech	Tree															5			۲.,
Fraxinus pennsylvanica	green ash	Tree															1			
Juglans nigra	black walnut	Tree			4									4						2
Liriodendron tulipifera	tuliptree	Tree							1	1	2	20	20	23	20	20	20	24	24	24
Malus	apple	Tree						1						1						
Nyssa	tupelo	Tree										9	9	9	4	4	4			
Pinus strobus	eastern white pine	Tree						1			2			3						
Platanus occidentalis	American sycamore	Tree	2	2	2	4	4	4				39	39	40	27	27	27	27	27	27
Quercus	oak	Tree										6	6	6	8	8	8 8	40	40	40
Quercus alba	white oak	Tree															1			
Quercus coccinea	scarlet oak	Tree				3	3	3				7	7	7	7	7	' 7	3	3	3
Quercus michauxii	swamp chestnut oak	Tree	1	1	1							1	1	1	1	1	. 1	4	4	2
Quercus nigra	water oak	Tree										10	10	10	14	14	14	17	17	17
Quercus pagoda	cherrybark oak	Tree							1	1	1	2	2	2	2	2	2 2	. 1	1	1
Quercus rubra	northern red oak	Tree	5	5	5	3	3	3	10	10	10	50	50	50	25	25	25	2	2	2
Quercus shumardii	Shumard's oak	Tree	1	1	1							1	1	1						
Salix nigra	black willow	Tree												3						
Unknown		Shrub or Tree																2	2	2
		Stem count	11	11	15	11	11	53	13	13	33	170	170	281	124	124	162	134	134	142
		size (ares)		1			1			1			15			15			15	
		size (ACRES)		0.02			0.02			0.02			0.37			0.37			0.37	
		Species count	5	5	6	4	4	7	4		6	14	14		-					15
		Stems per ACRE	445.2	445.2	607	445.2	445.2	2145	526.1	526.1	1335	458.6	458.6	758.1	334.5	334.5	437.1	361.5	361.5	383.1

Color for Density

Exceeds requirements by 10% Exceeds requirements, but by less than 10% Fails to meet requirements, by less than 10% Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes

P-all = Planting including livestakes

T = All planted and natural recruits including livestakes

T includes natural recruits

## APPENDIX D

## STREAM SURVEY DATA

**Cross-section Plots** 

Longitudinal Profile Plots

Substrate Plots

Tables 10a-f. Baseline Stream Data Summary

Tables 11a-f. Monitoring Data

te		Martins Creek II		
oject Num	ber:	92633		the state of the state of the
S ID		XS - 1, Riffle		and the second se
each		UT 1- 4		
ate:		7/22/2015		
eld Crew:		Perkinson, Jernigan		II at Annual at the second
Station	Elevation	SUMMARY DATA		and the second sec
			05.1	
0.00	95.42	Bankfull Elevation:	95.1	A STATE OF A
2.26	95.38	Bankfull Cross-Sectional Area:		
3.65	94.63	Bankfull Width:	11.9	
4.66	94.29	Flood Prone Area Elevation:	96.1	and the second
5.46	94.11	Flood Prone Width:	100.0	
6.58 7.57	94.18 94.19	Max Depth at Bankfull:	1.0	
8.53		Mean Depth at Bankfull:	0.7	
	94.24	W / D Ratio:		A DATE OF A
9.70 10.50	94.25 94.47	Entrenchment Ratio: Bank Height Ratio:	8.4 d	S 1 Looking Upstream
		bank Height Ratio:	u a	
11.38	94.26			
11.96	94.56		Stream Type	E
12.98	94.80			
14.60	95.14		Martins Creek II - NCDMS Project Num	lber 92633
17.10	95.20		Stream Reach UT 1-4	
			XS - 1, Station 15+32, Riffle	
		97	,,,,,,	
		96		
		Elevation (feet)		
		$\frac{\mathfrak{H}}{\mathfrak{h}}$		
		.0 95		
		ava 🔪	_	Bankfull
		Elí		Flood Prone Area
		94		MY-00 4/1/14
				MY-01 9/10/14
		-		MY-02 7/22/15
				M1-02 //22/15
		93	10	
		0	10 Station (feet)	20

te		Martins Creek II	
roject Num	ber:	92633	
S ID		XS - 2, Riffle	the an duli
each		UT 1- 4	
ate:		7/22/2015	
ield Crew:		Perkinson, Jernigan	
Station	Elevation	SUMMARY DATA	
0.00	96.12	Bankfull Elevation:	95.6
2.99	96.12	Bankfull Cross-Sectional Area:	8.2
4.18	95.61	Bankfull Width:	11.3
5.49	95.01	Flood Prone Area Elevation:	96.6
6.38	94.98	Flood Prone Width:	100.0
8.30	94.63	Max Depth at Bankfull:	1.0
10.29	94.63	Mean Depth at Bankfull:	0.7
11.80	94.66	W / D Ratio:	15.6
12.75	94.83	Entrenchment Ratio:	8.8
14.03	95.26	Bank Height Ratio:	1.0 XS 2 Looking Upstream
15.25	95.62		
17.48	95.68		Stream Type E
		Provide the second seco	Stream Reach UT 1-4 XS - 2, Station 14+72, Riffle
		94 0	10 Station (feet) MY-01 9/10/14 MY-02 7/22/15 20

Site	Martins Creek II				Thirds
Project Number:	92633			A Start A	Seller and the
XS ID	XS - 3, Riffle		Sector and a sector		AND
Reach	UT 1- 3, Reach 2				
Date:	7/22/2015			Contraction of the second	and the second
Field Crew:	Perkinson, Jernigan		A STATISTICS		And the State of the State
			THE REAL OF	ALC ALCONT OF ALT OF	and the second second second
Station Elevation	SUMMARY DATA		N. A. Val	一本 正正 加加力上的 化清	
0.00 96.82	Bankfull Elevation:	96.5	S		
1.46 96.87	Bankfull Cross-Sectional Area:	2.5	<b>这个五人出在这个</b>		
2.76 96.49	Bankfull Width:	6.5			
3.89 96.01	Flood Prone Area Elevation:	97.0			
5.69 95.96	Flood Prone Width:	100.0	SX TARA MAR		and the second second
7.00 96.05	Max Depth at Bankfull:	0.5	AS INCLUSION	Autor X Long	
8.39 96.17	Mean Depth at Bankfull:	0.4		and the second second	
9.86 96.72	W / D Ratio:	16.9			
11.09 96.83	Entrenchment Ratio:	15.4			
	Bank Height Ratio:	1.0		XS 3 Looking Upstream	
			a tall		
			Stream Type	E	
			-		
	N	Aartins Creek II	- NCDMS Project 1	Number 92633	
			Reach UT 1-3 Rea		
			8, Station 16+54, Rif		
	98	A6 - 5	, Station 10+34, Kn		
	Percention (feet)				
	35				
	li ii				
	A A A A A A A A A A A A A A A A A A A		_		Bankfull
	96				Flood Prone Area
					MY-00 4/1/14
					My-01 9/10/14
					My-01 9/10/14
					WI 1-02 //22/13
	95	1			J
	0			10	
			Station (feet)		

Site	Martins Creek II
Project Number:	92633
XS ID	XS - 4, Pool
Reach	UT 1- 3, Reach 2
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan

Station	Elevation
-0.3	96.8
2.0	96.8
3.3	96.1
4.1	95.6
5.2	95.1
6.1	95.2
6.9	95.7
7.7	96.1
8.9	96.3
10.0	96.7
11.3	96.9
13.4	97.2

SUMMARY DATA	
Bankfull Elevation:	96.7
Bankfull Cross-Sectional Area:	6.4
Bankfull Width:	7.8
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.6
Mean Depth at Bankfull:	0.8
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.0



Martins Creek II - NCDMS Project Number 92633 Stream Reach UT 1-3 Reach 2 XS - 4, Station 16+03, Pool 98 97 Elevation (feet) 96 🗕 🗕 🗕 • Bankfull MY-00 4/1/14 95 MY-01 9/10/14 MY-02 7/22/15 94 10 0 Station (feet)

<u>0:4-</u>	Martine Crash II
Site Project Number:	Martins Creek II 92633
XS ID	92033           XS - 5, Riffle
Reach	UT 1- 3, Reach 2
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan
	I CIKINGON, COMINGUN
Station Elevation	SUMMARY DATA
0.00 97.38	Bankfull Elevation: 97.3
2.28 97.27	Bankfull Cross-Sectional Area: 4.3
3.22 96.92	Bankfull Width: 7.6
4.13 96.46	Flood Prone Area Elevation: 98.3
5.60 96.28	Flood Prone Width: 100.0
6.93 96.48	Max Depth at Bankfull: 1.0
7.94 96.69	Mean Depth at Bankfull: 0.6
9.14 97.14	W / D Ratio: 13.4
10.52 97.39	Entrenchment Ratio: 13.2
12.31 97.49	Bank Height Ratio: 1.0 XS 5 Looking Upstream
	Stream Type E
	Martins Creek II - NCDMS Project Number 92633
	Stream Reach UT 1-3 Reach 2
	29 XS - 5, Station 14+24, Riffle
	98 97 97
	97 Flood Prone Area
	MY-00 4/1/14
	MY-01 9/10/14
	MY-02 7/22/15
	96
	0 10
I	Station (feet)

<b>C!</b> 4			
Site Project Numb	or:	Martins Creek II 92633	
XS ID		XS - 6, Pool	
Reach		UT 1- 3, Reach 2	
Date:		7/22/2015	
Field Crew:		Perkinson, Jernigan	
Ficia Crew.		i erkinson, Jenngan	
Station	Elevation	SUMMARY DATA	
0.00	97.71	Bankfull Elevation:	96.7
2.75	97.71	Bankfull Cross-Sectional Area:	9.1
3.32	97.23	Bankfull Width:	9.0
5.23	94.44	Flood Prone Area Elevation:	NA NA
6.07	94.58	Flood Prone Width:	NA
7.18	95.09	Max Depth at Bankfull:	2.3
7.94	95.08	Mean Depth at Bankfull:	1.0
8.61	95.19	W / D Ratio:	NA
9.28	96.06	Entrenchment Ratio:	NA
10.17	96.68	Bank Height Ratio:	1.0 XS 6 Looking Upstream
12.65	96.71		
14.74	96.96		Stream Type E
16.72	97.31		
		99 98 96 95 95	Martins Creek II - NCDMS Project Number 92633 Stream Reach UT 1-3 Reach 2 XS - 6, Station 13+85, Pool
		94 +0	10 20 Station (feet)

Site Project Num XS ID Reach	ber:	Martins Creek II 92633 XS - 7, Pool UT 1- 3, Reach 2	
Date:		7/22/2015	
Field Crew:		Perkinson, Jernigan	The second s
Station	Elevation	SUMMARY DATA	
-0.10	98.66	Bankfull Elevation: 98.2	
3.57	98.79	Bankfull Cross-Sectional Area: 6.1	
4.87	96.31	Bankfull Width: 9.5	
6.23	96.71	Flood Prone Area Elevation: NA	
8.15	97.77	Flood Prone Width: NA	A A A A A A A A A A A A A A A A A A A
9.10	98.01	Max Depth at Bankfull: 1.9	
10.70	98.11	Mean Depth at Bankfull: 0.6	
13.38	98.23	W / D Ratio: NA	
		Entrenchment Ratio: NA	
		Bank Height Ratio: 1.0	XS 7 Looking Upstream
			Stream Type E
			reek II - NCDMS Project Number 92633 Stream Reach UT 1-3 Reach 2 XS - 7, Station 10+75, Pool
		99 ( <i>i</i> =9) 98	
		Elevation (feet)	Bankfull
			- Flood Prone Area
		96	MY-00 4/1/14
			MY-01 9/10/14
			MY-02 7/22/15
		95	
		0	10
			Station (feet)
			•

Site Project Num XS ID Reach Date:	ber:	Martins Creek II           92633           XS - 8, Riffle           UT 1- 3, Reach 2           7/22/2015	
Field Crew:		Perkinson, Jernigan	
Station           0.20           1.41           2.05           2.61           3.19           3.99           4.69           5.25           5.84           6.31           6.82           7.59           8.67           9.86           10.45	Elevation 99.91 99.82 99.81 99.62 99.51 99.44 99.34 99.33 99.18 99.40 99.71 99.90 100.09 100.02	SUMMARY DATA Bankfull Elevation: Bankfull Cross-Sectional Area: Bankfull Width: Flood Prone Area Elevation: Flood Prone Width: Max Depth at Bankfull: Mean Depth at Bankfull: W / D Ratio: Entrenchment Ratio: Bank Height Ratio:	99.8         1.8         5.7         100.4         100.0         0.6         0.3         18.1         17.5         1.0         E
10.45	100.02		Stream Reach UT 1-3 Reach 2
		101 100 100 98 0 0	XS - 8, Station 09+59, Riffle

Site	Martins Creek II
Project Number:	92633
XS ID	XS - 9, Pool
Reach	UT 1-3, Reach 2
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan
Field Crew	r erkinson, seringun
Station Elevation	SUMMARY DATA
-0.30 101.64	Bankfull Elevation: 101.3
1.84 101.58	Bankfull Cross-Sectional Area: 7.2
3.55 101.38	Bankfull Width: 8.5
4.75 100.00	Flood Prone Area Elevation: NA
6.25 99.40	Flood Prone Width: NA
7.14 99.59	Max Depth at Bankfull: 1.9
7.83 100.41	Mean Depth at Bankfull: 0.8
8.92 100.59	W / D Ratio: NA
10.25 100.97	Entrenchment Ratio: NA
12.23 101.27	Bank Height Ratio: 1.0 XS 9 Looking Upstream
14.56 101.13	
	<b>Stream Type</b> E
	Martins Creek II - NCDMS Project Number 92633 Stream Reach UT 1-3 Reach 2 XS - 9, Station 08+79, Pool
	101 101 100 100 Elevation Flood Prone Area
	Bankfull
	99 MY-00 4/1/14
	MY-01 9/10/14
	MY-02 7/22/15
	98
	0 10
	Station (feet)

Site	Martins Creek II
Project Number:	92633
XS ID	XS - 10, Pool
Reach	UT 1- 3, Reach 2
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan

Station	Elevation
0.00	105.68
2.11	105.66
3.83	105.55
5.00	105.36
5.83	104.34
6.62	103.98
8.01	104.02
9.07	105.18
10.39	105.67
12.73	105.70

SUMMARY DATA	
Bankfull Elevation:	105.5
Bankfull Cross-Sectional Area:	5.1
Bankfull Width:	6.2
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.6
Mean Depth at Bankfull:	0.8
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.0





Site Project Number: XS ID Reach	Martins Creek II       92633       XS - 11, Riffle       UT 1- 3, Reach 1
Date: Field Crew:	7/22/2015 Perkinson, Jernigan
Station         Elevation           0.00         113.76           2.91         113.96           4.05         113.81           4.72         113.42           6.32         113.18           7.49         113.43           8.79         113.77           13.90         114.47	SUMMARY DATA         Bankful Elevation:       113.9         Bankful Cross-Sectional Area:       2.0         Bankful Width:       5.7         Flood Prome Area Elevation:       114.6         Flood Prome Width:       25.0         Max Depth at Bankfull:       0.7         Max Depth at Bankfull:       0.7         Max Depth at Bankfull:       0.4         W / D Ratio:       16.2         Entrenchment Ratio:       4.4         Bank Height Ratio:       1.0         Stream Type       E
	Erean type     E       Image: Stream Seach UT 1-3 Reach 1 SS - 11, Station 03+86, Riffle       Image: Stream Seach UT 1-3 Reach 1 SS - 11, Station 03+86, Riffle       Image: Stream Seach UT 1-3 Reach 1 Stream Seach UT 1-3 Reach 1 Stream Seach UT 1-3 Reach 1 Stream Seach UT 1-3 Reach 1 Station 03+86, Riffle       Image: Stream Seach UT 1-3 Reach 1 Stream Seach UT 1-3 Reach 1 Station (feet)

Site	Martins Creek II
Project Number:	92633
XS ID	XS - 12, Riffle
Reach	UT 1- 3, Reach 1
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan

Station	Elevation
0.00	125.09
2.82	124.91
4.30	124.62
4.69	124.44
5.59	124.35
6.18	124.33
6.93	124.36
8.57	124.95
9.92	125.47
12.17	125.67

SUMMARY DATA	
Bankfull Elevation:	124.9
Bankfull Cross-Sectional Area:	2.0
Bankfull Width:	5.6
Flood Prone Area Elevation:	125.5
Flood Prone Width:	14.0
Max Depth at Bankfull:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	15.7
Entrenchment Ratio:	2.5
Bank Height Ratio:	1.0





Site	Martins Creek II
Project Number:	92633
XS ID	XS - 13, Riffle
Reach	UT 1, Reach 4
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan
Station Elevation	SUMMARY DATA
0.00 99.78	Bankfull Elevation: 99.2
2.38 99.56	Bankfull Cross-Sectional Area: 3.0
3.60 99.08	Bankfull Width: 6.6
5.52 98.80	Flood Prone Area Elevation: 100.1
6.58 98.60	Flood Prone Width: 25.0
7.49 98.24	Max Depth at Bankfull: 0.9
9.05 98.71	Mean Depth at Bankfull: 0.5
9.91 99.18	W / D Ratio: 14.5
10.69 99.46	Entrenchment Ratio: 3.8
13.85 99.64	Bank Height Ratio:   1.0     XS 13 Looking Upstream
	Stream Type E
	Martins Creek II - NCDMS Project Number 92633
	Stream Reach UT 1 Reach 4
	101 XS - 13, Station 12+38, Riffle
	Bankfull
	Bankfull
	Image: second
	MY-00 4/1/14
	MT 01 /10/17
	0 10
	Station (feet)

Site	Martins Creek II
Project Number:	92633
XS ID	XS - 14, Riffle
Reach	UT 1, Reach 4
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan

Station	Elevation
0.00	101.13
1.66	101.02
3.29	100.41
4.09	100.07
5.37	99.77
6.61	99.79
7.44	99.78
8.64	100.12
9.96	100.63
11.07	100.69
12.08	100.73

SUMMARY DATA	
Bankfull Elevation:	100.4
Bankfull Cross-Sectional Area:	2.7
Bankfull Width:	6.1
Flood Prone Area Elevation:	101.0
Flood Prone Width:	25.0
Max Depth at Bankfull:	0.6
Mean Depth at Bankfull:	0.4
W / D Ratio:	13.8
Entrenchment Ratio:	4.1
Bank Height Ratio:	1.0





Site	Martins Creek II
Project Number:	92633
XS ID	XS - 15, Pool
Reach	UT 1, Reach 4
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan

Station	Elevation
0.30	101.05
2.42	101.18
3.44	100.99
4.41	100.22
5.32	99.83
6.13	99.60
6.68	99.91
7.64	100.31
9.07	100.61
11.34	100.65
13.70	100.78
16.65	101.07

SUMMARY DATA	
Bankfull Elevation:	101.0
Bankfull Cross-Sectional Area:	6.2
Bankfull Width:	12.4
Flood Prone Area Elevation:	NA
Flood Prone Width:	NA
Max Depth at Bankfull:	1.4
Mean Depth at Bankfull:	0.5
W / D Ratio:	NA
Entrenchment Ratio:	NA
Bank Height Ratio:	1.0





Site		Martins Creek II	
Project Num	ber:	92633	the second s
XS ID		XS - 16, Riffle	
Reach		UT 1, Reach 4	
Date:		7/22/2015	
Field Crew:		Perkinson, Jernigan	
Station	Elevation	SUMMARY DATA	
0.00	102.04	Bankfull Elevation:	101.8
1.74	102.05	Bankfull Cross-Sectional Area:	4.9
2.37	101.79	Bankfull Width:	7.4
4.11	100.95	Flood Prone Area Elevation:	102.8
5.08	100.97	Flood Prone Width:	25.0
6.22	100.83	Max Depth at Bankfull:	
7.33	100.87	Mean Depth at Bankfull:	0.7
8.14	101.15	W / D Ratio:	11.2
9.70	101.82	Entrenchment Ratio:	3.4 1.0 XS 16 Looking Upstream
12.50	101.93	Bank Height Ratio:	1.0 XS 16 Looking Upstream
			Stream Type E
			Martins Creek II - NCDMS Project Number 92633
			Stream Reach UT 1 Reach 4
			XS - 16, Station 09+53, Riffle
		103	AD - 10, Station 07 - 55, Kink
		-	
		<b>F</b> 102	
		101 [eet]	
		ava a	Bankfull
		<u><u><u></u></u> 101 <u></u></u>	Flood Prone Area
			MY-004/1/14
		-	
			MY-02 7/22/15
		100	
		100 +	10
		0	10
			Station (feet)
		L	

Site		Martins Creek II	
Project Num	ber:	92633	
XS ID		XS - 17, Pool	
Reach		UT 1, Reach 4	
Date:		7/22/2015	
Field Crew:		Perkinson, Jernigan	
Station	Elevation	SUMMARY DATA	
0.15	106.04	<b>Bankfull Elevation:</b>	105.8
2.53	105.88	Bankfull Cross-Sectional Area:	10.6
4.17	105.79	Bankfull Width:	7.8
5.62	104.90	Flood Prone Area Elevation:	NA
6.61	104.63	Flood Prone Width:	NA
7.74	104.24	Max Depth at Bankfull:	2.7
9.17	103.97	Mean Depth at Bankfull:	1.4
10.01	104.11	W / D Ratio:	NA
11.32	103.71	Entrenchment Ratio:	NA
11.54	103.12	Bank Height Ratio:	1.0 XS 17 Looking Upstream
12.13	106.26		
13.43	106.48		Stream Type E
15.44	106.49		
			Martins Creek II - NCDMS Project Number 92633
			Stream Reach UT 1 Reach 4
			XS - 17, Station 07+41, Pool
		107	AS - 17, Station 07+41, Foor
		106	
		105 (jeet) 104 (jeet)	
		tion	
		a 104	Bankfull
		Ele	Flood Prone Area
			MY-00 4/1/14
		103	MY-01 9/10/14
<u> </u>			MY-02 7/22/15
		102	
		102	10
		0	
			Station (feet)
		L	

Site	Martins Creek II
Project Number:	92633
XS ID	XS - 18, Riffle
Reach	MC UT 1, Reach 2
Date:	7/22/2015
Field Crew:	Perkinson, Jernigan
	r en moon, veringen
Station Elevation	SUMMARY DATA
0.10 75.45	Bankfull Elevation: 75.2
2.67 75.50	Bankfull Cross-Sectional Area: 4.7
4.02 74.85	Bankfull Width: 8.2
5.18 74.66	Flood Prone Area Elevation: 76.1
6.00 74.59	Flood Prone Width: 25.0
6.97 74.33	Max Depth at Bankfull: 0.9
8.07 74.34	Mean Depth at Bankfull: 0.6
8.72 74.29	W / D Ratio: 14.3
9.86 74.76	Entrenchment Ratio: 3.0
11.34 75.22	Bank Height Ratio:     1.0       XS 18 Looking Upstream
12.64 75.41	
13.77 75.49	Stream Type E
	Martins Creek II - NCDMS Project Number 92633 Stream Reach MC UT 1 Reach 2 XS - 18, Station 08+74, Riffle 7 7 7 7 7 7 7 7 7 7 7 7 7

Site	Martins Creek II	
Project Number:	92633	
XS ID	XS - 19, Riffle	
Reach	MC UT 1, Reach 2	
Date:	7/22/2015	
Field Crew:	Perkinson, Jernigan	

Station	Elevation
0.00	102.49
2.45	102.56
3.50	102.21
4.37	101.99
5.01	101.54
6.22	101.59
7.06	101.66
8.03	101.66
8.86	101.62
9.78	101.96
10.46	102.15
12.15	103.24
13.77	103.26
	1
	1

SUMMARY DATA	
Bankfull Elevation:	102.6
Bankfull Cross-Sectional Area:	5.8
Bankfull Width:	8.6
Flood Prone Area Elevation:	103.6
Flood Prone Width:	25.0
Max Depth at Bankfull:	1.0
Mean Depth at Bankfull:	0.7
W / D Ratio:	12.8
Entrenchment Ratio:	2.9
Bank Height Ratio:	1.0





Project Name	Martins Creek II
Reach	UT 1 - 3 Reach 1 and 2, Station 00+00 - 10+00

Reach Project Number Date Crew 92633 7/22/15

iii c	//22/13														
ew	Perkinson, Jernigar	1	-												
	2014			2014			2015			2016			2017		
	Year 0 Monitoring \Survey		Year 1 Monitoring \Survey				Year 2 Monitoring \Survey			Year 3 Monitoring \Survey			Year 4 Monitoring \Survey		
Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevatio	
996.5	98.7	99.1	1016.0	98.2	98.3	1016.9	98.2	98.5							
990.2	97.9	99.1	996.9	98.6	99.0	992.6	98.4	99.1							
983.6	97.5	99.1	991.3	97.7	99.0	990.2	97.4	99.2							
977.2	98.1	99.1	980.6	97.9	99.0	979.8	97.7	99.2							
972.7	99.1	99.4	973.8	99.1	99.4	976.9	98.9	99.4							
958.7	99.2	99.7	952.9	99.6	100.0	954.7	99.4	100.1							
952.1	99.6	100.0	949.0	99.0	100.0	951.8	98.8	100.1							
948.5	98.7	100.0	942.2	98.7	100.0	943.5	98.7	100.1							
944.4	98.6	100.0	941.0	99.5	100.0	941.6	99.5	100.1							
941.0	98.6	100.0	922.8	99.8	100.4	925.3	99.9	100.4							
937.6	99.7	100.0	919.3	98.7	100.3	921.4	99.0	100.5							
921.8	100.2	100.4	917.1	98.9	100.3	917.1	98.7	100.4							
919.2	99.3	100.4	913.2	100.0	100.3	914.0	100.0	101.2							
914.8	99.2	100.3	890.4	100.7	101.1	889.8	100.4	101.3							
911.0	100.1	100.5	884.2	99.8	101.1	886.8	99.7	101.3							
889.7	100.7	101.1	877.4	99.4	101.2	875.5	99.7	101.3							
882.6	99.7	101.2	867.7	100.2	101.1	869.0	100.2	101.3							
876.7	99.3	101.2	863.0	101.0	101.2	845.9	101.1	102.1							
867.3	100.1	101.2	846.9	101.5	101.9	835.2	100.0	102.1							
861.5	100.7	101.3	839.9	100.8	101.9	832.5	100.4	102.1							
846.0	101.4	101.8	830.6	99.7	102.0	828.3	101.4	102.1							
839.0	100.2	101.8	825.8	101.4	102.0	799.1	102.3	103.1							
829.8	100.4	101.8	797.2	102.3	102.8	795.5	101.6	103.1							
824.9	101.5	101.9	791.6	101.8	102.9	779.4	101.5	103.1							
814.6	102.0	102.4	776.1	101.5	102.9	775.9	101.9	103.2							
796.9	102.4	102.9	771.2	102.7	103.0	755.2	102.8	103.4							
792.1	101.8	102.9	743.5	102.8	103.5	722.0	103.8	104.3							



	2014	2014	2015	2016	2017
Avg. Water Surface Slope	0.0161	0.0162	0.0174		
Riffle Length	20	20	22		
Avg. Riffle Slope	0.0185	0.0209	0.0163		
Pool Length	14	16	13		
Pool to Pool Spacing	34	34	35		

Project Name	Martins Creek II

UT 1 - 3 Reach 2, Station 10+00 - 20+00 Reach 92633

**Project Number** 7/22/15 Date

Crew Perkinson, Jernigan 2014 2014 2015 2016 2017 Year 0 Monitoring \Survey Year 1 Monitoring \Survey Year 2 Monitoring \Survey Year 3 Monitoring \Survey Year 4 Monitoring \Survey Bed Elevation Water Elevation Bed Elevation Water Elevation Station Bed Elevation Water Elevation Bed Elevation Water Elevation Bed Elevation Water Elevation Station Station Station Station 1855.8 95.4 95.9 1856.9 94.6 95.7 1829.0 95.1 96.0 1852.5 94.6 95.8 1853.2 94.5 95.7 1791.8 95.5 96.0 1848.3 94.5 95.9 1850.5 95.3 95.8 1784.6 95.0 96.0 95.9 1828.7 95.1 95.7 95.0 1844.3 95.3 1766.2 96.1 1841.9 94.9 95.9 1806.0 95.5 95.8 1761.4 95.4 96.1 1834.0 94.4 95.8 1797.1 95.0 95.8 1736.6 95.5 96.1 1830.6 95.1 95.9 1784.6 95.0 95.8 1732.7 94.9 96.1 1814.5 95.4 1775.5 95.6 95.8 1722.3 94.7 96.0 96.1 1752.2 95.4 95.9 95.6 95.9 1719.2 95.6 1799.6 96.1 1794.8 95.2 96.0 1746.3 94.1 95.9 1682.4 95.8 96.3 94.2 1784.4 94.9 96.0 1738.4 95.9 1674.4 95.1 96.3 1777.9 95.1 96.0 1731.8 95.6 95.9 1665.0 95.0 96.3 1770.2 95.6 96.0 1694.6 95.8 96.1 1660.4 95.6 96.3 1746.1 95.6 96.0 1688.2 95.3 96.1 1634.7 95.8 96.3 94.7 1741.1 93.9 95.0 96.0 1681.4 96.2 1633.5 96.4 96.1 95.6 94.9 1732.1 94.5 1673.0 96.1 1623.5 96.3 1726.8 95.5 96.0 1646.9 95.9 96.1 1622.6 95.8 96.3 1690.1 95.8 96.2 1644.5 94.0 96.2 1599.6 95.9 96.4 95.4 96.2 1641.4 94.7 96.1 1595.8 94.8 1684.6 96.4 95.1 96.2 1635.7 95.8 95.3 1673 3 96.1 1588.4 96.4 1669.0 95.7 96.2 1610.2 96.0 96.3 1583.4 95.9 96.4 1656.8 95.9 96.2 1608.3 94.6 96.4 1557.9 95.9 96.6 1643.3 95.9 96.3 1599.6 95.1 96.3 1552.4 95.2 96.6 95.2 94.6 96.3 96.0 96.3 1542.8 1596.1 1641.8 96.6 95.8 1634.6 94.5 96.3 1570.6 96.0 96.5 1538.4 96.6 95.8 96.3 1563.3 95.0 96.5 1507.0 1630.6 96.1 97.0 1606.4 96.0 96.4 1556.6 94.7 96.5 1501.9 95.3 96.9 1604.7 94.9 96.4 1547.2 96.1 96.5 1485.2 95.7 96.9



Martins Creek II, Project Number 92633

1800

	2014	2014	2015	2016	2017	
Avg. Water Surface Slope	0.0161	0.0162	0.0174			
Riffle Length	20	20	22			
Avg. Riffle Slope	0.0185	0.0209	0.0163			
Pool Length	14	16	13			
Pool to Pool Spacing	34	34	35			
B			20			

1900

Project Name	Martins Creek II	-										-		
Reach	MC UT 1 Reach 2,	Station 00+00 - 06+0	0											
Project Number	92633													
Date	7/22/15													
Crew	Perkinson, Jernigar	1												
1	2014			2014			2015			2016			2017	
Ye	ear 0 Monitoring \Su	rvey		Year 1 Monitoring \	Survey		Year 2 Monitoring \S	Survey		Year 3 Monitoring \	Survey		Year 4 Monitoring	g \Survey
Station	<b>Bed Elevation</b>	Water Elevation	Station	Bed Elevation	Water Elevation	Station	<b>Bed Elevation</b>	Water Elevation	Station	Bed Elevation	Water Elevation	Station	<b>Bed Elevation</b>	Water Elevation
603.4	90.7	91.5	603.8	91.2		600.5	92.0	92.0						
601.2	92.0	92.2	600.7	90.5		575.8	92.7	93.1						
583.1	92.7	92.9	597.8	92.0		572.8	92.1	93.1						
575.4	92.8	93.0	582.4	92.2		569.7	92.3	93.0						
573.4	92.1	93.0	572.9	92.7		568.7	93.6	93.7						
570.9	92.3	93.0	570.7	91.9		541.7	94.6	94.9						
569.9	93.7	93.8	568.5	91.9		538.1	94.0	94.9						
556.2	94.0	94.3	566.6	93.5		536.0	95.2	95.3						
544.5	94.8	95.0	540.0	94.7		523.2	95.9	96.2						
539.5	94.1	95.0	536.8	93.9		515.5	96.0	96.2						
537.3	95.2	95.3	534.7	95.2		512.6	95.5	96.2						
525.6	95.9	96.2	523.2	95.8		509.3	95.4	96.2						
517.2	96.1	96.3	514.2	96.0		507.6	97.0	96.9						
514.1	95.6	96.3	511.5	95.7	96.1	495.3	97.8	97.9						
510.6	95.6	96.3	508.4	95.5	96.1	477.2	98.6	98.9						
507.6	96.7	97.1	505.3	96.8		472.7	97.3	98.9						
495.4	97.8	98.0	493.9	97.6	97.7	471.3	99.5	99.5						
478.4	98.7	99.0	477.0	98.7		461.4	99.7	100.0						
476.3	97.8	99.0	473.3	97.6	98.8	458.2	99.4	100.0						
473.4	97.7	99.0	470.9	97.5	98.8	455.7	100.3	100.3						
472.2	99.6	99.7	469.7	99.4		440.9	101.1	101.2						
462.6	99.9	100.1	459.3	99.6		429.7	101.4	101.8						
460.0	99.4	100.1	456.5	99.1	99.6	427.0	100.9	101.8						
457.1	99.2	100.1	454.5	99.0	99.6	425.3	102.2	102.2						
							102.5	102.8				1		
455.9	100.3	100.4	453.8	100.2		409.3	102.5	102.8						
455.9 445.4		100.4 100.9	453.8 443.5	100.2 100.6		409.3	102.5	102.8						



0.0577

0.0457

**2015** 0.0582 17 0.0447

NA\*

NA\*

Project Name Reach	Martins Creek II MC UT 1 Reach 2,	Station 06+00 - 12+0	0									-		
Project Number	92633													
Date	7/22/15													
Crew	Perkinson, Jernigan	l												
	2014			2014			2015			2016			2017	
V	2014 ear 0 Monitoring \Sur			2014 Year 1 Monitoring \	C		Year 2 Monitoring \	Summer		Year 3 Monitorin	a \Summar		Year 4 Monitorin	a \Sumou
Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevatio		Station		Water Elevation
1170.7	58.4	58.5	1169.9	58.4	58.4	1175.6	57.7	58.0	Station	Det Lievano		Station	Dea Bievanon	fruiter Elevation
1137.5	59.4	59.6	1153.8	58.8	58.9	1167.4	58.5	2 0.0						
1134.1	58.7	59.5	1138.0	59.2	59.3	1134.6	59.5							
1132.5	60.4	60.5	1135.4	58.8	59.3	1131.7	58.7	59.4						
1119.6	60.3	60.6	1133.5	58.7	59.3	1130.6	60.5							
1116.2	61.8	61.8	1132.4	60.4		1122.9	60.4							
1099.7	61.8	62.1	1124.3	60.2		1120.3	60.1							
1081.3	62.3	62.4	1122.3	60.0		1117.4	60.1							
1077.3	62.2	62.5	1118.7	60.3		1114.0	61.7							
1074.5	62.7	62.9	1115.6	61.7		1094.3	61.9							
1064.6	63.4	63.3	1091.2	62.0		1077.2	62.3							
1049.9	64.3	64.5	1079.4	62.3		1074.4	62.1							
1047.7	63.9	64.5	1077.1	62.0		1072.2	62.6							
1041.2	63.9	64.5	1075.5	61.9		1066.1	62.8							
1040.6	64.8	64.9	1074.1	62.6		1063.5	62.7							
1031.8	65.0	65.4	1068.2	62.8		1061.7	63.3							
1030.0	65.0	65.4	1066.6	62.6		1052.3	63.9							
1026.5	65.0	65.4	1064.6	62.6		1046.0	64.3							
1025.8	65.8	65.8	1063.6	63.2		1042.4	63.9							
1017.7	65.8	66.0	1053.6	63.9		1038.1	63.9							
1013.8	66.0	66.2	1048.0	64.2		1036.8	64.7							
1012.6	65.7	66.2	1044.7	63.7		1025.7	65.2							
1011.0	66.5	66.7	1039.2	63.8		1022.9	64.8							
984.7	67.6 67.2	67.9 67.9	1038.1 1027.3	64.9		1022.3 1014.1	65.8 66.0							
980.6 978.9	67.2 68.5	67.9 68.7	1027.3	65.1 64.7		1014.1	66.0 65.4							
967.1	69.2	69.4	1023.8	65.7		1007.8	66.3							
955.4	69.6	69.9	1012.0	66 1		989.8	67.4					1		





Project Name	Martins Creek II

UT 1 Reach 3, Station 00+00 - 03+50 92633 7/22/15

Reach Project Number Date Crew

	2014			2014			2015			2016			2017	
	ear 0 Monitoring \Su			Year 1 Monitoring \S	•		Year 2 Monitoring \S			Year 3 Monitoring \			Year 4 Monitoring	
Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevation	Station	Bed Elevation	Water Elevatio
336.4	91.4	91.5	339.1	91.4	91.5	335.5	91.6	91.7						
323.6	91.8	92.1	326.0	91.7	92.0	313.4	92.1	92.5						
320.5	90.9	92.1	322.7	91.0	92.0	294.4	92.6	93.0						
317.3	91.2	92.0	320.3	91.7	92.0	291.9	92.5	93.0						
311.2	92.2	92.6	299.9	92.5	92.8	286.5	92.5	93.0						
299.7	92.5	92.8	296.9	92.4	92.8	282.3	93.0	93.3						
295.8	92.5	92.9	292.0	92.3	92.8	261.5	93.7	94.0						
292.0	92.3	92.8	286.9	92.7	93.0	254.1	93.3	94.0						
288.2	92.3	92.8	268.6	93.6	93.8	245.7	93.5	94.0						
284.7	92.8	93.1	262.1	93.4	93.8	239.6	93.3	94.0						
265.6	93.6	93.8	254.3	93.3	93.8	237.7	94.4	94.8						
255.6	93.3	93.8	245.8	93.3	93.8	225.0	94.9	95.2						
245.2	93.3	93.8	241.3	92.8	93.8	203.2	95.7	96.0						
239.5	93.1	93.8	236.7	94.4	94.7	200.0	95.6	96.0						
235.9	94.2	94.9	229.6	94.8	95.0	195.9	95.6	96.1						
229.6	94.8	95.3	225.4	94.5	95.1	193.5	96.0	96.3						
227.0	94.6	95.3	222.1	94.9	95.1	183.1	96.1	96.5						
222.6	94.6	95.3	203.3	95.5	95.7	179.2	96.0	96.5						
216.1	95.0	95.3	191.6	96.0	96.2	175.3	95.9	96.5						
205.3	95.4	95.8	188.0	95.7	96.3	169.2	96.6	96.9						
202.6	95.3	95.8	179.6	95.7	96.3	152.5	96.8	97.3						
199.9	95.3	95.8	173.6	96.2	96.4	149.7	96.7	97.3						
195.5	95.7	96.0	152.1	96.8	97.1	141.6	96.9	97.3						
182.7	95.9	96.3	147.3	96.7	97.1	138.7	97.7	97.7						
168.2	96.5	96.8	144.2	96.9	97.1	135.0	97.6	97.8						
153.0	96.8	97.0	135.3	97.5	97.8	133.2	97.2	97.8						
151.3	96.4	97.0	132.9	97.0	97.8	126.4	97.3	97.8						
144.4	96.5	97.0	129.9	97.1	97.7	123.5	97.7	98.0						



	2014	2014	2015	2016	2017
Avg. Water Surface Slope	0.0305	0.0304	0.0305		
Riffle Length	17	21	21		
Avg. Riffle Slope	0.0388	0.0395	0.0310		
Pool Length	13	13	14		
Pool to Pool Spacing	31	34	44		

Project Name	Martins Creek II	

UT 1 Reach 4, Station 05+50 - 17+00 Reach

Project Number 92633

Date	7/22/15
Crew	Perkinson, Jernigan

Ye	2014 ear 0 Monitoring \Su	rvey	,	2014 Year 1 Monitoring \S	Survey		2015 Year 2 Monitoring \S	Survey		2016 Year 3 Monitoring \/	Survey	,	2017 Year 4 Monitoring	
Station	Bed Elevation	Water Elevation	Station	<b>Bed Elevation</b>	Water Elevation									
1651.4	95.9	96.3	1672.7	94.9	95.6	1683.1	95.5	95.8						
1644.5	95.0	96.3	1652.2	96.0	96.1	1664.7	95.8	96.3						
1638.0	94.2	96.4	1643.3	94.7	96.2	1646.4	94.8	96.3						
1634.4	96.3	96.4	1638.9	94.1	96.2	1640.1	94.7	96.3						
1630.0	96.0	96.4	1636.1	95.0	96.2	1632.3	96.2	96.4						
1624.0	94.5	96.4	1634.1	96.2	96.3	1630.1	95.9	96.5						
1614.7	94.6	96.4	1623.8	94.8	96.3	1625.2	94.5	96.5						
1611.1	96.7	96.8	1617.9	94.3	96.3	1618.0	94.8	96.5						
1591.5	96.7	97.0	1611.2	94.8	96.3	1609.3	96.6	96.8						
1571.8	97.0	97.2	1609.1	96.4	96.6	1606.4	96.8	97.4						
1567.2	95.9	97.3	1570.4	96.9	97.1	1567.1	95.7	97.4						
1563.9	95.7	97.3	1564.9	95.9	97.1	1561.2	95.8	97.3						
1555.3	95.9	97.3	1557.1	95.9	97.1	1551.2	96.9	97.4						
1551.1	97.0	97.2	1551.1	97.0	97.2	1547.3	97.4	97.9						
1515.5	97.3	97.8	1515.2	97.5	97.6	1511.8	95.9	97.8						
1512.7	96.4	97.8	1511.4	96.2	97.6	1506.9	95.8	97.9						
1505.9	95.4	97.8	1502.7	95.6	97.6	1497.8	97.1	97.8						
1500.0	96.8	97.7	1498.0	96.7	97.6	1487.5	98.0	98.4						
1497.4	96.3	97.7	1493.6	96.1	97.6	1446.9	96.3	98.4						
1495.0	96.3	97.8	1488.2	97.3	97.6	1436.9	96.4	98.4						
1491.6	97.1	97.7	1448.8	98.0	98.2	1431.6	97.8	98.4						
1450.2	98.1	98.3	1444.2	96.8	98.3	1427.8	98.5	98.9						
1446.5	97.1	98.4	1435.5	96.2	98.2	1391.2	97.1	99.0						
1440.5	96.4	98.3	1432.4	96.8	98.3	1385.5	96.3	99.0						
1435.8	96.2	98.4	1424.8	98.0	98.2	1380.2	98.2	99.0						
1429.6	97.9	98.3	1402.7	98.5	98.6	1371.8	98.4	99.1						
1336.8	98.3	98.8	1398.5	97.8	98.7	1353.1	97.8	99.1						
1320.1	98.3	98.9	1394.5	96.4	98.7	1348.6	97.7	99.2						



# Martins Creek II, Project Number 92633

	2014	2014	2015	2016	2017
Avg. Water Surface Slope	0.0135	0.0123	0.0116		
Riffle Length	21	23	6		
Avg. Riffle Slope	0.0166	0.0161	0.1220		
Pool Length	22	19	40		
Pool to Pool Spacing	42	40	46		

Pro	ject Name: UT to M	artins Creek (C	Contreras)				
	Cross-Se	ection: 5					
	Feature	e: Riffle	-				
	1			2015		Cumulative Percent	
Description	Material	Size (mm)	Total #		Cum %		
Silt/Clay	silt/clay	0.062	6	11%	11%		
	very fine sand	0.125	2	4%	14%	90%	
	fine sand	0.250		0%	14%	80%	
Sand	medium sand	0.50	1	2%	16%	50% 50% 50% 50% 50% 50% 50% 50% 50% 50%	
	coarse sand	1.00		0%	16%		
	very coarse sand	2.0	2	4%	19%		
	very fine gravel	4.0		0%	19%	30% 50% 40%	
	fine gravel	5.7		0%	19%		
	fine gravel	8.0	3	5%	25%	20%	
	medium gravel	11.3	5	9%	33%	10%	
Gravel	medium gravel	16.0	3	5%	39%		
	course gravel	22.3	7	12%	51%	0.1	1000
	course gravel	32.0	12	21%	72%	Particle Size (mm)	
	very coarse gravel	45	8	14%	86%	MY0-2014MY1-2014MY2-2015	
	very coarse gravel	64	3	5%	91%		
	small cobble	90	2	4%	95%		
Cobble	medium cobble	128	2	4%	98%	Individual Class Percent	
CODDIE	large cobble	180	1	2%	100%	Individual Class Percent	
	very large cobble	256		0%	100%	100%	
	small boulder	362		0%	100%	90%	
Boulder	small boulder	512		0%	100%	80%	
Doulder	medium boulder	1024		0%	100%	5 70%	
	large boulder	2048		0%	100%	5 60%	
Bedrock	bedrock	40096		0%	100%	50%	
TOTAL % of v	whole count		57	100%	100%		
		•				70%         70%           60%         70%           30%         70%           20%         70%	_
Summary	Data						
D16	1.042						
D35	12.39	4				60, 12 02 02 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2	.gb
D50 D84	21.5 43	4					\$ <sup>2</sup>
D95	92	1				Particle Size (mm)	
		4				MY0-2014 MY1-2014 MY2-2015	

## Table 10a. Baseline Stream Data Summary (UT -1 to Martin's Creek) Martin's Creek II Mitigation Project - DMS Project Number 92633

Parameter	Gauge		Regional C	urve	Pre-l	Existing	Condit	ion (UT	-1)		Reference	Reach(	es) Data		Des	ign (UT-	-1)	Moni	toring B	aseline (	UT-1 Rea	ach 4)
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Max	Med	Min	Mean	Med	Max	SD
BF Width (ft)					5.9	8.5	7.6	14.0	3.0	11.7			21.7		7.7	8.5		6.4	7.1	6.6	8.4	1.1
Floodprone Width (ft)					9.0	17.0	16.2	30.8	8.2	20			410		16	100		25	25	25	25	0
BF Mean Depth (ft)					0.3	0.6	0.6	0.8	0.2	0.6			1.0		0.5	0.7		0.5	0.6	0.6	0.8	0.2
BF Max Depth (ft)					0.6	0.9	1.0	1.1	0.2	0.9			2.5		0.7	0.9		0.8	1.0	0.9	1.2	0.2
BF Cross Sectional Area (ft <sup>2</sup> )					3.6	4.7	4.3	6.2	1.2	10.2			13.1		4.1	6.0		3.2	4.5	3.8	6.4	1.7
Width/Depth Ratio					7.6	18.8	12.6	55.0	18.0	10.7			17.0		12.0	14.3		10.5	11.4	11.0	12.8	1.2
Entrenchment Ratio					1.2	2.0	2.0	2.9	0.6	1.7			32.0		2.0	11.8		1.5	1.5	1.5	1.6	0.1
Bank Height Ratio					1.0	2.0	1.8	4.1	1.1	1.0			1.0		1.0	1.0		1.0	1.0	1.0	1.0	0.0
Profile								•														
Riffle length (ft)						1	1	1									1	5	21	20	40	8
Riffle slope (ft/ft)					0.025			0.170		0.2000			1.9000		0.0100	0.1600		0.0009	0.0166	0.0148	0.0337	0.0111
Pool length (ft)																		8.0	22.0	22.0	37.0	9.5
Pool Max depth (ft)										2.2			2.5		1.6	2.0		2.1	2.3	2.3	2.4	0.2
Pool spacing (ft)					30.0			85.0		48.0			231.0		12.0	45.0		27.0	42.0	40.0	61.0	11.0
Pattern							•										•		•			
Channel Beltwidth (ft)						1	1	1		16			55				40	I		40	1	
Radius of Curvature (ft)										28			47		30	40		30			40	
Rc:Bankfull width (ft/ft)										2			3		3.8	4.7		3.8			4.7	
Meander Wavelength (ft)										70			260		15	30		15			30	
Meander Width ratio										1.1			4.1				4.7			4.7		
Transport parameters																						
Reach Shear Stress (competency) lbs/ft2																						
Max part size (mm) mobilized at bankfull																						
Stream Power (transport capacity) W/m2																						
Additional Reach Parameters																						
Rosgen Classification							Fb/B/G/0	Cb			1	Aa/Bc				B/C				B/C		
Bankfull Velocity (fps)						4	4.2-4.4									3.9-4.3						
Bankfull Discharge (cfs)							16 - 25															
Valley Length (ft)							1565		_		_		_	-								
Channel Thalweg Length (ft)							1747		_		_		_	-			_		_	781		
Sinuosity							06 - 1.18		_			1.19	_	-		1.05-1.4	_		_	1.05-1.4		
Water Surface Slope (ft/ft)						0.0	15 - 0.0	5			(	).0333		_		.01057				0.0135		
BF slope (ft/ft)																						
Bankfull Floodplain Area (acres)					ļ																	
% of Reach with Eroding Banks										l												
Channel Stability or Habitat Metric																						_
Biological or Other																						

### Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)

#### Martin's Creek II Mitigation Project - DMS Project Number 92633

Parameter			Pre-Exis	ting Condi	tion			Referen	ce Reach(e	s) Data			Design			Mo	nitori	ng Base	line	
Ri%/RU%P%G%/S%																				
SC%/SA%/G%/C%/B%BE%																				
d16/d35/d50/d84/d95	.68	2-4.4	3.6-8.7	15.9-28	66.8-															
Entrainment Class <1.5/1.5-1.99/2.0-4.9/5.0-																				
Incision Class <1.2/1.2-1.49/1.5-1.99/>2.0																				

## Table 10c. Baseline Stream Data Summary (UT -1 to Martin's Creek) Martin's Creek II Mitigation Project - DMS Project Number 92633

Parameter	Gauge	1	Regional C	urve	Pre-l	Existing	Condit	ion (UT	`-1)		Reference	Reach(	es) Data		Des	sign (UT	-1)	Moni	toring B	aseline (	UT-1 Rea	ach 2)
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Max	Med	Min	Mean	Med	Max	SD
BF Width (ft)					5.9	8.5	7.6	14.0	3.0	11.7			21.7		7.7	8.5		8.0			8.7	
Floodprone Width (ft)					9.0	17.0	16.2	30.8	8.2	20			410		16	100			25			
BF Mean Depth (ft)					0.3	0.6	0.6	0.8	0.2	0.6			1.0		0.5	0.7			0.7			
BF Max Depth (ft)					0.6	0.9	1.0	1.1	0.2	0.9			2.5		0.7	0.9			1.1			
BF Cross Sectional Area (ft <sup>2</sup> )					3.6	4.7	4.3	6.2	1.2	10.2			13.1		4.1	6.0		5.2			5.9	
Width/Depth Ratio					7.6	18.8	12.6	55.0	18.0	10.7			17.0		12.0	14.3		12.3			12.8	
Entrenchment Ratio					1.2	2.0	2.0	2.9	0.6	1.7			32.0		2.0	11.8		2.9			3.1	
Bank Height Ratio					1.0	2.0	1.8	4.1	1.1	1.0			1.0		1.0	1.0			1.0			
Profile			1					•														
Riffle length (ft)					Γ	1	l –	1	1	1		l –		-			1	5	21	20	40	8
Riffle slope (ft/ft)					0.025	1	I	0.170	l –	0.2000		İ	1.9000		0.0100	0.1600	1	0.0009	0.0166	0.0148		0.0111
Pool length (ft)						1	I		l –			İ					1	8.0	22.0	22.0	37.0	9.5
Pool Max depth (ft)										2.2			2.5		1.6	2.0		2.1	2.3	2.3	2.4	0.2
Pool spacing (ft)					30.0			85.0		48.0			231.0		12.0	45.0		27.0	42.0	40.0	61.0	11.0
Pattern							•					•										
Channel Beltwidth (ft)				1		1	1	1	ſ	16		1	55				40	I	I	40	[	
Radius of Curvature (ft)										28			47		30	40		30			40	
Rc:Bankfull width (ft/ft)										2			3		3.8	4.7		3.8			4.7	
Meander Wavelength (ft)										70			260		15	30		15			30	
Meander Width ratio										1.1			4.1				4.7			4.7		
Transport parameters					-			-	-	-												
Reach Shear Stress (competency) lbs/ft2																						
Max part size (mm) mobilized at bankfull																						
Stream Power (transport capacity) W/m2																						
Additional Reach Parameters																						
Rosgen Classification						Eb/F	Fb/B/G/C	Cb			1	Aa/Bc				B/C				С		
Bankfull Velocity (fps)							4.2-4.4									3.9-4.3						
Bankfull Discharge (cfs)							16 - 25															
Valley Length (ft)							1565															
Channel Thalweg Length (ft)							1747													1176		
Sinuosity							06 - 1.18					1.19				1.05-1.4				1.05-1.4		
Water Surface Slope (ft/ft)						0.0	15 - 0.0	5			(	0.0333				.01057				0.0577		
BF slope (ft/ft)					ļ													ļ				
Bankfull Floodplain Area (acres)																						
% of Reach with Eroding Banks																_				_		
Channel Stability or Habitat Metric																						
Biological or Other																						

### Table 10d. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)

#### Martin's Creek II Mitigation Project - DMS Project Number 92633

Parameter			Pre-Exis	ting Condi	tion			Referen	ce Reach(e	s) Data			Design			Mo	nitori	ng Base	line	
Ri%/RU%P%G%/S%																				
SC%/SA%/G%/C%/B%BE%																				
d16/d35/d50/d84/d95	.68	2-4.4	3.6-8.7	15.9-28	66.8-															
Entrainment Class <1.5/1.5-1.99/2.0-4.9/5.0-																				
Incision Class <1.2/1.2-1.49/1.5-1.99/>2.0																				

#### Table 10e. Baseline Stream Data Summary (UT 1-3 to Martin's Creek) Martin's Creek II Mitigation Project - DMS Project Number 92633

Parameter	Gauge		Regional C	urve		Pre-Ex	isting C	onditior	ı		Reference	e Reach(	es) Data			Design		М	onitorin	g Baselir	ne (UT 1-	-3)
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Max	Med	Min	Mean	Med	Max	SD
BF Width (ft)					5.0	7.5	6.9	11.4	2.7	11.7			21.7		6.0	6.5		5.1	8.0	6.8	11.4	2.5
Floodprone Width (ft)					10.3	15.4	12.6	26.2	7.3	20			410		11	100		14	77	100	100	39
BF Mean Depth (ft)					0.3	0.4	0.4	0.6	0.1	0.6			1.0		0.5	0.5		0.3	0.6	0.5	0.9	0.2
BF Max Depth (ft)					0.9	0.9	0.9	1.0	0.1	0.9			2.5				0.6	0.5	0.9	0.9	1.2	0.3
BF Cross Sectional Area (ft <sup>2</sup> )					2.9	3.0	3.0	3.3	0.2	10.2			13.1		2.9	3.2		1.7	5.1	3.0	9.9	3.5
Width/Depth Ratio					8.6	19.9	15.6	39.7	13.6	10.7			17.0				12.5	11.9	15.5	14.3	22.7	3.8
Entrenchment Ratio					1.5	2.1	2.0	2.7	0.6	1.7			32.0		3.8	15.4		2.7	9.4	9.4	15.4	5.0
Bank Height Ratio					1.0	1.7	1.4	3.0	0.9	1.0			1.0		1.0	1.0		1.0	1.0	1.0	1.0	0.0
Profile						•													•			
Riffle length (ft)					I	1	1			I			1					7	19	18	51	10
Riffle slope (ft/ft)					0.013			0.100		0.2000			1.9000		0.0100	0.1800		0.0215	0.0457	0.0445	0.0667	0.0125
Pool length (ft)																		3.0	6.0	6.0	10.0	2.0
Pool Max depth (ft)										2.2			2.5				1.6					
Pool spacing (ft)					20.0			100.0		48.0			231.0		10.0	60.0		15.0	25.0	23.0	58.0	10.0
Pattern																						
Channel Beltwidth (ft)					22			46		16			55		26	50				40	[	
Radius of Curvature (ft)					14			28		28			47		15	40		30			40	
Rc:Bankfull width (ft/ft)					1.2			5.6		2			3		2.5	6.7		3.8			4.7	
Meander Wavelength (ft)					56			81		70			260		65	110		15			30	
Meander Width ratio					1.9			9.2		1.1			4.1		4.3	8.3				4.7		
Transport parameters		1				1	1			1		1	1	-				1	1	1	1	_
Reach Shear Stress (competency) lbs/ft <sup>2</sup>		ļ																				
Max part size (mm) mobilized at bankfull																						
Stream Power (transport capacity) W/m <sup>2</sup>																						
Additional Reach Parameters																						
Rosgen Classification				1			Eb/B/C/	F				Aa/Bc				B/C				E		
Bankfull Velocity (fps)		I			I		6-Feb	_								3.8 - 4.9						
Bankfull Discharge (cfs)				L	L	1	1.0 - 14	.0														
Valley Length (ft)							1320															
Channel Thalweg Length (ft)					ļ		1584											I		2092		
Sinuosity					ļ		1.2					1.19				.26-1.42		I		1.2		
Water Surface Slope (ft/ft)						(	0.007-0.0	)4		I		0.0333			0.	005-0.05	4			0.0161		
BF slope (ft/ft) Bankfull Floodplain Area (acres)																						
% of Reach with Eroding Banks										l							_				_	_
Channel Stability or Habitat Metric										-												-
Biological or Other					1					1												

#### Table 10f. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions)

#### Martin's Creek II Mitigation Project - DMS Project Number 92633

Parameter			Pre-Exist	ing Conditi	ion			Refere	nce Reach(	es) Data			Design			Mo	nitori	ng Bas	eline	
Ri%/RU%P%G%/S%																				
SC%/SA%/G%/C%/B%BE%																				
d16/d35/d50/d84/d95	0.3	1.1	3.5	12.1	15.7															
Entrainment Class <1.5/1.5-1.99/2.0-4.9/5.0-																				
Incision Class <1.2/1.2-1.49/1.5-1.99/>2.0																				

## Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections) Martin's Creek II Mitigation Project - DMS Project Number 92633

Martin's Creek II Mitigation Project - I	DMS Pro														-																												
			Cross Sec	ction 1 (UT 1 F	Reach 4	)				Cross Sec		UT 1 Reach	4)				(		ection 3 (UT	1-3)				Cros		4 (UT 1-3)					Cross	Section 5						Ci		16 (UT 1-3)			
Parameter				Riffle							Riff	le							Riffle						Poo	ol						Riffle							Po	ol			-
Dimension	MY0	MY1	MY2	MY3 N	MY4	MY5	MY5+	MY0	MY1	MY2	MY.	'3 MY4	MY5	MY5+	MY	) MY	/1 N	MY2	MY3 N	Y4 M	Y5 N	MY5+ MY0	MY	1 MY2	2 MY3	3 MY4	MY5	MY5+	MY0	MY1	MY2	MY3	MY4	MY5	MY5+	MY0	MY1	MY	2 MY	'3 MY	4 MY	Y5 M	MY5+
BF Width (ft)	11.4	11.2	11.9					11.4	11.8	11.3					6.8	6.	8	6.5				7.7	7.7	7.8					8.3	9.3	7.6					9.2	8.3	9.0					
Floodprone Width (ft) (approx)	100.0	100.0	100.0					100.0	100.0	100.0					100.	0 100	0.0 1	100.0				NA	NA	NA					100.0	100.0	100.0					NA	NA	NA					-
BF Mean Depth (ft)	0.8	0.8	0.7					0.9	0.9	0.7	1		1	1	0.4	0.4	4	0.4				0.9	0.9	0.8			1		0.7	0.7	0.6		1	1		13	13	1.0					
BF Max Depth (ft)	1.2	1.2	1.0					12	13	1.0	1		1	1	0.6		6	0.5				2.0	19	1.6			1		12	1.2	1.0		1	1		2.7	2.6	2.3					
BF Cross Sectional Area (ft <sup>2</sup> )	9.6	9.4	8.2					9.9	10.2	8.2					2.8	2.1	8	2.5				7.3	7.3	6.4					6.2	6.3	4.3					12.0	11.1	9.1					
Width/Depth Ratio	13.5	13.3	173					13.1	13.7	15.6					16.5	16	5	16.9				NA	NA	NA					11.1	13.7	13.4					NΔ	NA	NA				-	
Entrenchment Ratio		8.9	8.4					8.8	8.5	8.8					14.7			15.4				NA	NA						12.0	10.8	13.4					NA	NA	NA				-	
Bank Height Ratio	0.0	1.0	1.0					1.0	1.0	1.0					1.0			1.0				1.0	1.0						12.0	1.0	10					1.0	1.0	10					
d50 (mm)								15.0		9.4	-		-				~																										
uto (mm)				Section 7 (UT	1-3)		1	10.0	10.7		Section	8 (UT 1-3)							ection 9 (UT	-3)						10 (UT 1-3)		1		1		Section 11	(UT 1-3)		1		1			12 (UT 1-3)			
Parameter			01055	Pool	10)					01055	Riff						```	01035151	Pool					0105	Poo	. (					01055	Riffle	( /					0.	Rif				
Dimension	MY0	MY1	MY2	MY3 N	MY4	MY5	MY5+	MY0	MY1	MY2	MY	3 MY4	MY5	MY5+	MY	) MY	/1 N	MY2	MY3 N	Y4 M	Y5 N	MY5+ MY0	MY	1 MY2	2 MY	3 MY4	MY5	MY5+	MY0	MY1	MY2	MY3	MY4	MY5	MY5+	MY0	MY1	MY	2 MY	'3 MY	4 MY	IY5 M	MY5+
BF Width (ft)	6.5	8.1	9.5					6.5	6.7	5.7					10.6	10.	.6	8.5				5.3	4.1	6.2					6.8	6.0	5.7					5.1	5.4	5.6					
Floodprone Width (ft) (approx)	NA	NA	NA					100.0	100.0	100.0					NA	NA	A	NA				NA	NA	NA					25.0	25.0	25.0					14.0	14.0	14.0	L				
BF Mean Depth (ft)	1.1	0.8	0.6					0.5	0.4	0.3					0.9	0.	8	0.8				0.6	0.7	0.8					0.3	0.4	0.4					0.3	0.3	0.4					
BF Max Depth (ft)	2.7	2.1	1.9					0.9	0.7	0.6					2.0	1.	8	1.9				1.2	1.4	1.6					0.6	0.7	0.7					0.5	0.6	0.6					
BF Cross Sectional Area (ft <sup>2</sup> )	7.1	6.8	6.1					3.0	2.8	1.8					9.3	8.0	0	7.2				3.3	2.7	5.1				1	2.3	2.5	2.0					1.7	1.7	2.0					
Width/Depth Ratio	NA	NA	NA					14.1	16.0	18.1	1				NA	NA	A	NA				NA	NA	NA					20.1	14.4	16.2					15.3	17.2	15.7					
Entrenchment Ratio		NA	NA					15.4	14.9	17.5	1				NA	NA	A	NA				NA	NA	NA					3.7	4.2	4.4					2.7	2.6	2.5					
Bank Height Ratio		1.0	1.0					1.0	1.0	1.0					1.0	1.0	0	1.0				1.0	1.0	1.0					1.0	1.0	1.0					1.0	1.0	1.0					
d50 (mm)																																											

#### Table 11b. Monitoring Data - Stream Reach Data Summary Martin's Creek II Mitigation Project - DMS Project Number 92633

Martin's Creek II Mitigation Project - Parameter	0.010 110		eline (UT			r	м	/-1 (UT 1	2)		T	м	Y-2 (UT 1-	2)		r	м	Y-3 (UT 1	2)		1	м	Y-4 (UT 1	1 2)		1	м	Y-5 (UT 1	(2)	
r ai anietei		Das	enne (01	1-3)			IVI	1-1 (011	-3)			IVI	1-2 (011	-3)			IVI	1-5 (011	(-3)			IVI	1-4(011	1-3)				1-3(011	-3)	
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD
Dimension and Substrate - Kine Only			incu		55			incu		00			incu		00			incu		0.0			incu		55			incu		50
BF Width (ft)	5.1	8.0	6.8	11.4	2.5	5.4	8.2	6.8	11.8	2.6	5.6	7.8	6.5	11.9	2.7															
Floodprone Width (ft)	14	77	100	100	39	14	77	100	100	39	14	77	100	100	39															
BF Mean Depth (ft)	0.3	0.6	0.5	0.9	0.2	0.3	0.6	0.4	0.9	0.2	0.3	0.5	0.4	0.7	0.2															
BF Max Depth (ft)	0.5	0.9	0.9	1.2	0.3	0.6	0.9	0.7	1.3	0.3	0.5	0.8	0.7	1.0	0.2															
BF Cross Sectional Area (ft <sup>2</sup> )	1.7	5.1	3.0	9.9	3.5	1.7	5.1	2.8	10.2	3.5	1.8	4.1	2.5	8.2	2.9															
Width/Depth Ratio	11.9	15.5	14.3	22.7	3.8	13.1	15.3	15.0	18.0	2.0	12.7	15.6	16.1	19.0	2.1															
Entrenchment Ratio	2.7	9.4	9.4	15.4	5.0	2.6	9.2	9.2	14.9	4.7	2.5	10.0	10.0	17.5	5.6															
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0															
Profile						-					-					-					-					-				
Riffle length (ft)	4	20	19	41	8.9	4	20	20	44	9	4.1	22.2	22.7	63.5	11.5															
Riffle slope (ft/ft)	0.0000	0.0185	0.0166	0.0550	0.0145	0.0000	0.0209	0.0183	0.0578	0.0153	0.0000	0.0163	0.0154	0.0418	0.0123															
Pool length (ft)	3	14	12	33	9	3	16	12	37	10	3	13	10	30	8															
Pool Max depth (ft)	1.2	2.1	2.0	2.7	0.6	1.4	2.0	1.9	2.6	0.4	1.6	1.9	1.9	2.3	0.3															
Pool spacing (ft)	7	34	31	63	15	7	34	33	75	16	7	35	35	71	15															
Pattern																														
Channel Beltwidth (ft)	26			50																										
Radius of Curvature (ft)	15			40																										
Rc:Bankfull width (ft/ft)	2.5			6.7																										
Meander Wavelength (ft)	65			110																										
Meander Width ratio	4.3			8.3																										
Additional Reach Parameters	-		F (			1		E (			1		E (			1					1					-				
Rosgen Classification			E-type 2092					E-type 2099					E-type 1833								-									
Channel Thalweg Length (ft) Sinuosity			1.3										1833																	
Water Surface Slope (Channel) (ft/ft)			0.0161					1.3 0.0162					0.0174																	
1											-																			
BF slope (ft/ft)		1			1							1			1		1					1	r	1	-		1			
Ri%/RU%P%G%/S%																													───	-
SC%/SA%/G%/C%/B%BE%					-							-													-	-			┝───	+
d16/d35/d50/d84/d95																			I										L	
% of Reach with Eroding Banks											<u> </u>										l									
Channel Stability or Habitat Metric																														
Biological or Other						1					1					1					1									

# Table 11c. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections) Martin's Creek II Mitigation Project - DMS Project Number 92633

			Cross Sect	tion 13 (U	Г 1 Reach	ı 4)			C	ross Secti	on 14 (U	Г 1 Reach	4)			C	ross Sect	ion 15 (UI	1 Reach	4)			C	ross Secti	ion 16 (UT	1 Reach	4)				Cross S	ection 17 (U	T 1 Reach 4	)	
Parameter				Riffle							Riffle							Pool							Riffle							Pool			
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY5+	MY0	MY1	MY2	MY3	MY4	MY5	MY5+	MY0	MY1	MY2	MY3	MY4	MY5	MY5+	MY0	MY1	MY2	MY3	MY4	MY5	MY5+	MY0	MY1	MY2	MY3	MY4	MY5	MY5+
BF Width (ft)	6.6	6.6	6.6					6.4	6.3	6.1					13.4	13.6	12.4					8.4	8.6	7.4					9.7	9.9	7.8				
Floodprone Width (ft) (approx)	25.0	25.0	25.0					25.0	25.0	25.0					NA	NA	NA					25.0	25.0	25.0					NA	NA	NA				
BF Mean Depth (ft)	0.6	0.5	0.5					0.5	0.5	0.4					0.8	0.8	0.5					0.8	0.7	0.7					1.4	1.4	1.4				
BF Max Depth (ft)	0.9	0.9	0.9					0.8	0.8	0.6					2.1	2.1	1.4					1.2	1.2	1.0					2.4	2.7	2.7				
BF Cross Sectional Area (ft <sup>2</sup> )	3.8	3.3	3.0					3.2	2.9	2.7					10.9	10.2	6.2					6.4	6.1	4.9					13.2	13.9	10.6				
Width/Depth Ratio	11.5	13.2	14.5					12.8	13.7	13.8					NA	NA	NA					11.0	12.1	11.2					NA	NA	NA				
Entrenchment Ratio	3.8	3.8	3.8					3.9	4.0	4.1					NA	NA	NA					3.0	2.9	3.4					NA	NA	NA				
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				
d50 (mm)																																			

#### Table 11d. Monitoring Data - Stream Reach Data Summary Martin's Creek II Mitigation Project - DMS Project Number 92633

Parameter		Baselii	ne (UT 1 F	Reach 4)			MY-1	(UT 1 Re	each 4)			MY-2	(UT 1 Rea	ach 4)			MY-3	6 (UT 1 Re	each 4)			MY-4	UT 1 Re	each 4)			MY-5	(UT 1 Re	ach 4)	
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD
BF Width (ft)	6.4	7.1	6.6	8.4	1.1	6.3	7.2	6.6	8.6	1.3	6.1	6.7	6.6	7.4	0.7															
Floodprone Width (ft)	25	25	25	25	0	25	25	25	25	0	25	25	25	25	0															
BF Mean Depth (ft)	0.5	0.6	0.6	0.8	0.2	0.5	0.6	0.5	0.7	0.1	0.4	0.5	0.5	0.7	0.2															
BF Max Depth (ft)	0.8	1.0	0.9	1.2	0.2	0.8	1.0	0.9	1.2	0.2	0.6	0.8	0.9	1.0	0.2															
BF Cross Sectional Area (ft <sup>2</sup> )	3.2	4.5	3.8	6.4	1.7	2.9	4.1	3.3	6.1	1.7	2.7	3.5	3.0	4.9	1.2															
Width/Depth Ratio	10.5	11.4	11.0	12.8	1.2	12.3	12.7	12.6	13.2	0.5	10.6	13.0	13.2	15.3	2.3															
Entrenchment Ratio	1.5	1.5	1.5	1.6	0.1	2.9	3.6	3.6	4.0	0.6	3.4	3.8	3.8	4.1	0.4															
Bank Height Ratio	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	0.0															
Profile - Upstream																														
Riffle length (ft)	5	21	20	40	8	3	23	22	43	9	0.4	5.8	4.1	20.9	4.9															
Riffle slope (ft/ft)	0.0009	0.0166	0.0148	0.0337	0.0111	0.0000	0.0161	0.0192	0.0426	0.0131	0.0031	0.1220	0.0556	1.0788	0.2138															
Pool length (ft)	8	22	22	37	10	6	19	18	34	8	21	40	39	57	11															
Pool Max depth (ft)	2.1	2.3	2.3	2.4	0.2	2.1	2.4	2.4	2.7	0.4	1.4	2.1	2.1	2.7	0.9															
Pool spacing (ft)	27	42	40	61	11	15	40	42	57	12	23	46	49	66	11															
Pattern																														
Channel Beltwidth (ft)			40																											
Radius of Curvature (ft)	30			40																										
Rc:Bankfull width (ft/ft)	3.8			4.7																										
Meander Wavelength (ft)	15			30																										
Meander Width ratio			4.7																											
Additional Reach Parameters																														
Rosgen Classification			B/C - Typ	e				Cb-Type					Cb-Type																	
Channel Thalweg Length (ft)			781					786					1107																	
Sinuosity			1.2					1.2					1.2													_				
Water Surface Slope (Channel) (ft/ft)			0.0135					0.0123					0.0116																	
BF slope (ft/ft)																														
Ri%/RU%P%G%/S%																														
SC%/SA%/G%/C%/B%BE%																														
d16/d35/d50/d84/d95																														
% of Reach with Eroding Banks																														
Channel Stability or Habitat Metric																														
Biological or Other																														

#### Table 11e. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross Sections) Martin's Creek II Mitigation Project - DMS Project Number 92633

Martin's Creek II Miligation Project - DM	is i luje													
		0	ross Secti	on 18 (UT	1 Reach	2)			0	ross Secti	on 19 (UT	1 Reach	2)	
Parameter				Riffle							Riffle			
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY5+	MY0	MY1	MY2	MY3	MY4	MY5	MY5+
BF Width (ft)	8.0	7.9	8.2					8.7	8.0	8.6				
Floodprone Width (ft) (approx)	25.0	25.0	25.0					25.0	25.0	25.0				
BF Mean Depth (ft)	0.7	0.7	0.6					0.7	0.6	0.7				
BF Max Depth (ft)	1.1	1.1	0.9					1.1	1.0	1.0				
BF Cross Sectional Area (ft <sup>2</sup> )	5.2	5.5	4.7					5.9	5.0	5.8				
Width/Depth Ratio	12.3	11.3	14.3					12.8	12.8	12.8				
Entrenchment Ratio	3.1	3.2	3.0					2.9	3.1	2.9				
Bank Height Ratio	1.0	1.0	1.0					1.0	1.0	1.0				
d50 (mm)														

### Table 11f. Monitoring Data - Stream Reach Data Summary

### Martin's Creek II Mitigation Project - DMS Project Number 92633

Parameter		Baselin	e (UT 1 R	Reach 2)			MY-1			MY-2	(UT 1 Re	each 2)		MY-3 (UT 1 Reach 2)					MY-4 (UT 1 Reach 2)						MY-5 (UT 1 Reach 2)					
Dimension and Substrate - Riffle Only	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	Max	SD	Min	Mean	Med	ed Ma	SD	Min	Mean	Med	Max	SD
BF Width (ft)	) 8.0			8.7		7.9			8		8.2			8.6																
Floodprone Width (ft)	)	25					25					25																		
BF Mean Depth (ft)	)	0.7				0.6			0.7		0.6			0.7																
BF Max Depth (ft)	)	1.1				1.0			1.1		0.9			1.0																
BF Cross Sectional Area (ft <sup>2</sup> )	5.2			5.9		5.0			5.5		4.7			5.8																
Width/Depth Ratio	12.3			12.8		11.4			12.5		12.7			14.3																
Entrenchment Ratio				3.1		3.1			3.2		2.9			3.1																
Bank Height Ratio	)	1.0					1.0					1.0																		
Profile		•	•							•		•	•			•						•								
Riffle length (ft)	) 7	19	18	51	10	4	16	12	37	9	4.3	16.5	12.8	46.7	9.4															
Riffle slope (ft/ft)	0.0215	0.0457	0.0445	0.0667	0.0125	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*															
Pool length (ft)	) 3	6	6	10	2	3	6	5	12	2	3	6	6	14	2															
Pool Max depth (ft)	)																													
Pool spacing (ft)	) 15	25	23	58	10	9	22	19	45	9	9	24	19	55	11															
Pattern	-				-									-			-		-											
Channel Beltwidth (ft)	)		40																											
Radius of Curvature (ft)	30			40																										
Rc:Bankfull width (ft/ft)	) 3.8			4.7																										
Meander Wavelength (ft)	) 15			30																										
Meander Width ratio	)		4.7																											
Additional Reach Parameters	-																													
Rosgen Classification						C - Type					C - Type																			
Channel Thalweg Length (ft)						1167					1176																			
Sinuosity	/		1.2			1.2					1.2																			
Water Surface Slope (Channel) (ft/ft)	)		0.0577			NA*					0.0582														1					
BF slope (ft/ft)	)					1										1					I									
Ri%/RU%P%G%/S%																														
SC%/SA%/G%/C%/B%BE%	, D																		1		I									
d16/d35/d50/d84/d95																														
% of Reach with Eroding Banks																												-		
Channel Stability or Habitat Metric	;																													
Biological or Other						1										1					İ									
NA* No water i		dunin a fi al	d anna caria																							1				

NA\* No water in channel during field surveys.
## APPENDIX E

## HYDROLOGY DATA

 Table 12.
 Verification of Bankfull Events

Table 13. Wetland Hydrology Criteria Attainment Summary

Figure E1. Martin's Creek II 30-70 Percentile Graph for Rainfall

Groundwater Gauge Graphs

Date of Data Collection	Date of Occurrence	Method	Photo (if available)	
August 25, 2014	April 7, 2014	Crest gauge data indicates a bankfull event after approximately 2.4 inches of rain documented in one day at an onsite rain gauge.		
August 25, 2014	July 1, 2014	Crest gauge data indicates a bankfull event after approximately 2.02 inches of rain was documented over two days at an onsite rain gauge.		
August 25, 2014	August 24, 2014	Crest gauge data indicates a bankfull event after approximately 1.39 inches of rain documented over two days at an onsite rain gauge.		
October 27, 2014	September 3, 2014	Crest gauge data indicates a bankfull event after approximately 1.67 inches of rain documented in one day at an onsite rain gauge.		
October 27, 2014	October 14, 2014	Crest gauge data and laid back vegetation indicate a bankfull event after approximately 2.5 inches of rain documented in one day at an onsite rain gauge.	1	
April 12, 2015	November 17, 2014	Crest gauge data indicates a bankfull event after approximately 1.44 inches of rain documented in one day at an onsite rain gauge.		
July 13, 2015	June 11, 2015	Crest gauge data indicates a bankfull event after approximately 1.68 inches of rain documented in one day at an onsite rain gauge.		
July 13, 2015	June 26, 2015	Crest gauge data indicates a bankfull event after approximately 1.57 inches of rain was documented in one day at an onsite rain gauge.		
September 11, 2015	August 19, 2015	Crest gauge data indicates a bankfull event after approximately 2.94 inches of rain was documented over three days at an onsite rain gauge.		
November 18, 2015	September 26, 2015	Crest gauge data indicates a bankfull event after approximately 2.65 inches of rain was documented over two days at an onsite rain gauge.		
November 18, 2015	October 3, 2015	Crest gauge data indicates a bankfull event after approximately 4.50 inches of rain was documented over three days at an onsite rain gauge.		

Table 12. Verification of Bankfull EventsMartin's Creek II Mitigation Site (DMS Project Number 92633)



Marun s	Martin's Creek II Mitigation Site (DMS Project Number 92633)								
	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)								
Gauge									
	Year 1 (2014)	Year 2 (2015)	Year 3 (2016)	Year 4 (2017)	Year 5 (2018)				
1	Yes/75 Days	Yes/118 Days							
	(39%)	(61.8%)							
2	No/21 Days	Yes/36 Days							
	(11%)	(18.8%)							
3	Yes/52 Days	Yes/72 Days							
	(27%)	(37.7%)							
4	No/21 Days	Yes/27 Days							
	(11%)	(14.1%)							
5	No/15 Days	Yes/25 Days							
	(7.8%)	(13.1%)							
6	Yes/58 Days	Yes/69 Days							
	(30%)	(36.1%)							
7	Yes/85 Days	Yes/69 Days							
	(44%)	(36.1%)							
8	Yes/65Days	Yes/72 Days							
	(34%)	(37.7%)							
9	No/22 Days	Yes/27 Days							
	(11.5%)	(14.1%)							
10	No/24 Days	Yes/28 Days							
	(12.5%)	(14.7%)							
11	No/18 Days	No/22 Days							
	(9%)	(11.5%)							
12	No/20 Days	Yes/27 Days							
	(10%)	(14.1%)							
13	Yes/116 Days	Yes/117 Days							
	(61%)	(61.2%)							

 Table 13. Wetland Hydrology Criteria Attainment Summary

 Martin's Creek II Mitigation Site (DMS Project Number 92633)



























