UT ALTAMAHAW SITE
DMS Project No. 92837

MONITORING YEAR 5 (2016)
Construction Completed February 2011

Alamance County, NC
State Construction Project No. 09-0762301

Prepared for the
NC Department of Environmental Quality
Division of Mitigation Services

217 West Jones St.
Raleigh, NC 27603

Environmental Quality

North Carolina Department of Environmental Quality

Final Report-October 2016

Prepared by:

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This assessment and report are consistent with NCDEQ Division of Mitigation Services Template Version 1.3 (1/15/10) for DMS Monitoring Reports.

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Note: Tables 5, 10 and 11 are not included as part of this monitoring assessment and report due to the required protocols associated with the monitoring of this project.

1.0 EXECUTIVE SUMMARY/ PROJECT ABSTRACT

The UT Altamahaw Site is located within HUC 03030002 and sub-basin 03-06-02 of the Cape Fear River Basin in Alamance County, North Carolina (Figure 1). It includes portions of two unnamed tributaries (UTs) to Altamahaw Creek. The enhancement lengths of the main and secondary channels are 1,347 and 130 linear feet, respectively. In addition, 0.026 acres of wetlands were enhanced as part of the overall project. The UT Altamahaw Site is protected for perpetuity under a conservation easement purchased from Mr. Charles Hursey Sr., Charles Hursey II, Christopher Hursey and Carey Hursey in 2008. Project restoration components, activity and reporting history, contacts and attribute data are all provided in Appendix A.

1.1 Goals and Objectives

The Project's goals were to:

- reduce nutrient and sediment water quality stressors,
- provide for uplift in water quality functions,
- improve instream and wetland aquatic habitats, including riparian terrestrial habitats, and
- provide for greater overall instream and wetland habitat complexity and quality.

Stream enhancement, the primary project component, served as the dominant input for achieving these goals.

These goals were consistent with the Travis and Tickle Creek Local Watershed Plan (LWP). The LWP, completed in 2008, identified six goals; two of which are met by the Project. These are (1) to improve water quality through stormwater management and (2) to identify and rank parcels for retrofits, stream repair, preservation and/or conservation. The Project improved the existing emergency spillway associated with a large pond immediately upstream of the Project Site. Prior to improvement (stabilization), this spillway was severely eroded and contributed sediment into the main stream channel. The existing stream crossing was also stabilized to further prevent erosion into the main stream channel. The Project also included the design and installation of a modified level spreader to diffuse surface flows from the nearby pasture through a vegetated buffer. In addition, the Site was also one of the specific areas identified through the stakeholder process associated with the LWP.

The LWP process identified nine key watershed stressors and their corresponding management strategies. These stressors were identified via local stakeholder groups including DMS, Piedmont Land Conservancy, Haw River Assembly, Piedmont Triad Council of Governments, Alamance and Guilford Counties, Natural Resources Conservation Service, Cities of Burlington and Graham, Towns of Elon and Gibsonville, NC Division of Water Resources, NC Wildlife Resources Commission and Resource Conservation & Development. The UT to Altamahaw Stream Enhancement Project combats six of those stressors with the following strategies:

Key Watershed Stressors	Management Strategies
Stream bank erosion	Riparian buffers & livestock exclusion
Lack of adequate buffer	Riparian buffers & livestock exclusion
Stormwater runoff	Stormwater BMPs
Livestock access to streams	Livestock exclusion
Nutrients	Agricultural BMPs, riparian buffers & stormwater BMPs
Fecal coliform	Agricultural BMPs & stormwater BMPs

The objectives were to completely exclude livestock from the easement area and to install plantings designed to maintain vertical stability, lateral stability and habitat, as well as re-vegetate and supplement those areas lacking suitable vegetation along the easement area. An alternative livestock water supply was provided and the existing crossing was improved to prevent further erosion. In addition, enhancement of the auxiliary spillway associated with the pond immediately upstream of the Site and construction of a modified level spreader to combat surface flows from the pasture were also completed as part of implementation activities. Ultimately, this supplemental planting will provide increased opportunities for the filtration of pollutants and nutrients prior to entering the stream channel, as well as the stabilization of sediment along the associated stream banks.

1.2 Vegetation Condition and Comparison to Success Criteria

Vegetation success criteria at the Site are consistent with the USACE Wilmington Regulatory District's guidance for wetland mitigation which documents the survival of a minimum of 320 planted woody stems/acre after Monitoring Year 3 (MY3). The mortality rate of 10% is allowed after MY4 assessments (288 stems/acre) and correspondingly, MY5 assessments (260 stems/are). Invasive, exotic species were present prior to implementation and criteria also include the removal of all such species prior to project closeout. DMS is treating invasive species. Privet and multiflora rose were treated on 10/24/2013, 5/21/2014, and 6/8/2015.

Vegetation is currently being assessed using plot layouts consistent with the DMS/Carolina Vegetation Survey (CVS) Level II Vegetation Protocol. Stem count data is ascertained from five permanently placed 10-meter^2 vegetation plots (Figure 2). Assessments include counts of both planted and natural stems. Based on this year's monitoring effort, four of the five vegetation plots met the minimum success criteria. Stem counts ranged from approximately 202 to 647 planted stems per acre and approximately 728 to 1,416 total stems per acre across the Site. Prior to baseline assessments and as previously reported, it was discovered that cattle had accessed the easement area between the completion of implementation activities and baseline assessments, damaging planted stems. Supplemental planting was performed in November 2013.

Appendices B and C depict more detailed information regarding the vegetation condition, including annual comparative photographs.

1.3 Stream Stability/Condition and Comparison to Success Criteria

No in-channel enhancement activities were conducted as part of this project. Annual assessments include comparative photographs and monitoring of channel hydrology. A minimum of two bankfull events must be documented within the standard five-year monitoring period. In order for the hydrology-based monitoring to be considered complete, the two events must occur in separate monitoring years.

During the previous year's monitoring (MY2, MY3 & MY4), at least one bankfull event was documented in each year. A bankfull event was not documented during the 2016 monitoring period. Annual comparative photographs of the stream channels are depicted in Appendix B and hydrologic data associated with this year's monitoring assessment are provided in Appendix D.

1.4 Other Information

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

Two of the issues from MY4 were still present in during the MY5 period. These issues included (1) surface erosion along the existing cattle crossing and (2) erosion along the auxiliary spillway immediately outside the Project Site.

The surface erosion at the cattle crossing is continuing and is a result of repeated livestock trampling and compaction. This has ultimately resulted in surface waters bypassing the existing modified level spreader and erosion around the pipe along the downstream side of the crossing.

The lower portion of the auxiliary spillway immediately adjacent to the easement area was repaired in late August 2015 by Backwater Environmental. Rock sills were installed and rip rap was placed between the sills. The large rip rap had moved down the slope and was partially in the unnamed tributary during the February 2016 site visit. The displaced rip rap does not appear to have migrated further into the channel as of September 2016. The rock sills are stable but the geotextile fabric is showing.

The other two issues noted during the MY4 period were not present during the MY5 site visit; mowing along the fence line within the easement and a beaver dam off-site was causing a backwater effect onto the project.

There was not recent evidence of mowing along the fence line. The herbaceous vegetation along the fence line was thinner due to past mowing. The apparent purpose of the past mowing was to remove and control vegetation along the existing fence lines. Past mowing extended inward approximately four to five feet from the woven wire. As documented in the attached Letter of Intent and Conservation Easement Agreement (Appendix E), mowing is allowed.

There is no longer a beaver dam downstream of the project easement. The backwater effect from the dam has dissipated.

2.0 METHODOLOGY

This monitoring report follows methodology consistent with DMS's Procedural Guidance and Content Requirements for DMS Monitoring Reports (Version 1.3, dated 1/15/10), available at DMS's website (http://portal.ncdenr.org/web/eep).

Vegetation assessments were conducted using the CVS-DMS protocol (Version 4.2). As part of this protocol, vegetation is assessed using 100-meter^2 plots, or modules. The scientific method requires that measurements be as unbiased as possible, and that they be repeatable. Plots are designed to achieve both of these objectives; in particular, different people should be able to inventory the same plot and produce similar data (Lee et. al., 2006).

According to Lee et. al. (2006), there are many different goals in recording vegetation, and both time and resources for collecting plot data are extremely variable. To provide appropriate flexibility in

project design, the CVS-DMS protocol supports five distinct types of vegetation plot records, which are referred to as levels in recognition of the increasing level of detail and complexity across the sequence. The lower levels require less detail and fewer types of information about both vegetation and environment, and thus are generally sampled with less time and effort (Lee et. al., 2006). Level 1 (Planted Stem Inventory Plots) and Level 2 (Total Woody Stem Inventory Plots) inventories were completed on all five of the vegetation plots at the Project Site.

Level 1 plots are applicable only for restoration areas with planted woody stems. The primary purpose is to determine the pattern of installation of plant material with respect to species, spacing, and density, and to monitor the survival and growth of those installed plants. Level 1 plots are one module in size (Lee et. al., 2006).

Level 2 plots also are designed specifically for restoration areas and represent a superset of information collected for Level 1 plots. In these plots planted woody stems are recorded exactly as for Level 1, but in addition all woody stems resulting from natural regeneration are recorded by size class using separate datasheets. These plots allow an accurate and rapid assessment of the overall trajectory of woody-plant restoration and regeneration on a site. Level 2 plots are one module in size (Lee et. al., 2006).

A crest gage was installed near the downstream end of the Site along the main UT. This gage will verify the on-site occurrences of bankfull events. In addition to the crest gage, observations of wrack and deposition will also serve to validate gage observations, as necessary. Documentation of the highest stage during the monitoring interval will be assessed during each Site visit and the gage will be reset. The data related to bankfull verification will be summarized in each year's report. Based on the elevation of the crest gage, any readings observed higher than 12 inches on the gage will reflect a bankfull or above bankfull event.

3.0 REFERENCES

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

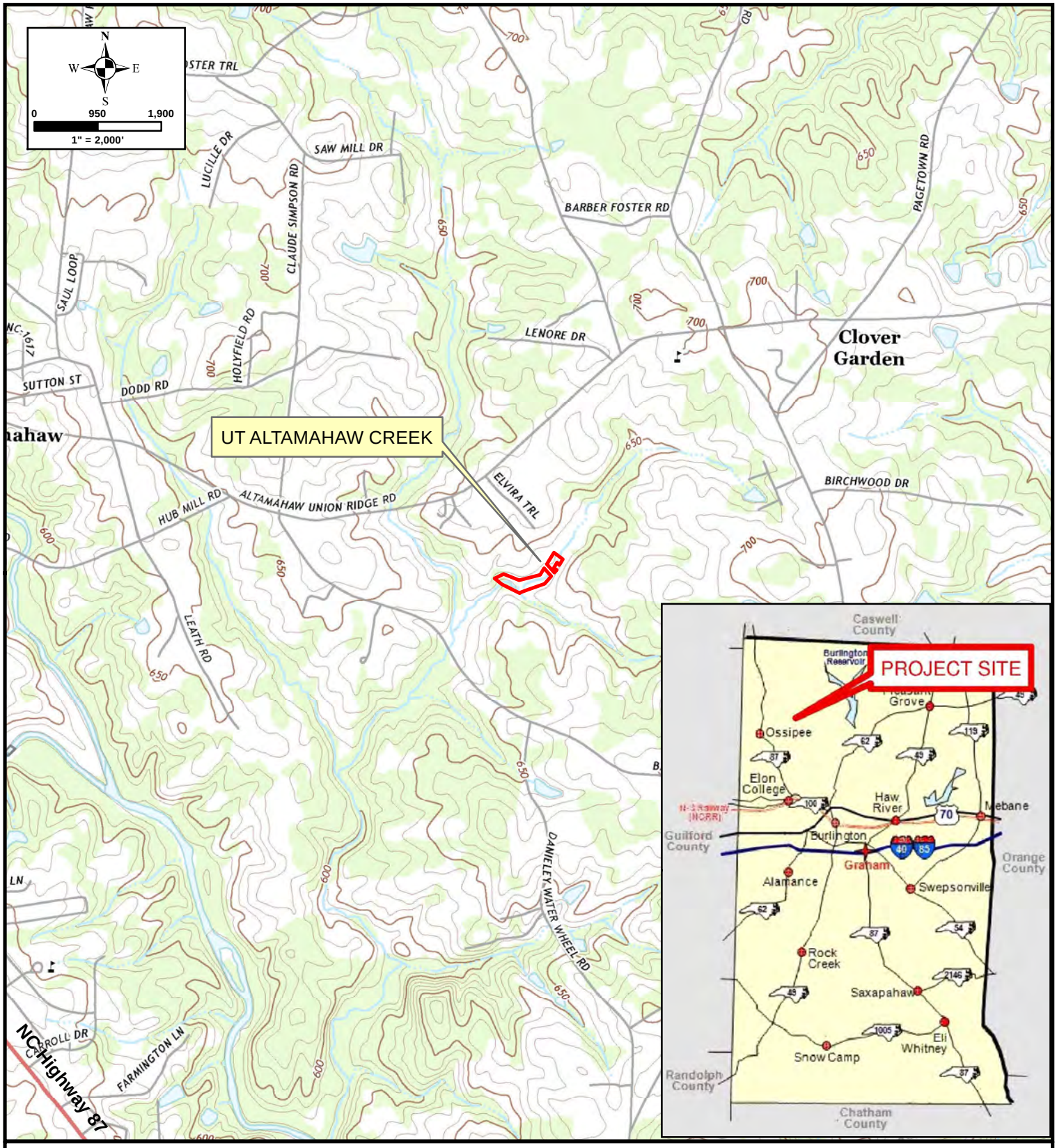
NCDENR Ecosystem Enhancement Program, 2012. UT Altamahaw Creek Baseline Monitoring Document and As-built Baseline Report. Prepared by Ecological Engineering, LLP.

NC State Climate Office, 2014. Daily Precipitation Data from Burlington/Alamance Airport (KBUY), Alamance County (www.nc-climate.ncsu.edu).

US Army Corps of Engineers, US Environmental Protection Agency, NC Wildlife Resources Commission and NC Department of Environment Division of Water Quality, 2003. Stream Mitigation Guidelines.

APPENDIX A

Project Vicinity Map and Background Tables



DIRECTIONS FROM I-85/I-40 IN ALAMANCE COUNTY:
Exit 140 (University Drive) - Proceed north for approximately 2.5 miles. Left onto Shallowford Church Road - Proceed approximately one mile. Left onto NC 87 - Proceed approximately 2.5 miles. Right onto Hub Mill Road - Proceed approximately 0.75 mile. Right onto Altamahaw Union Ridge Road - Proceed approximately one mile. Turn right onto unnamed gravel roadway - Proceed approximately 0.25 mile. Enter site at metal gate on right.

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PROJECT SITE VICINITY MAP
UT to Altamahaw Site - DMS Project No. 92837

Alamance Co., NC

October 2016

Map Source:

2013 Lake Burlington and Ossipee USGS Quadrangles

FIGURE 1

Table 1. Project Components and Mitigation Credits
UT Altamahaw/ 92837

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	738.5			0.013					

Project Components

Project Component	Stationing/Location	Existing Footage/ Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Rip. Non-riverine	Northwest boundary	0.026 acres	E	0.013	0.013 acres	2 to 1
UT Altamahaw Creek	Center of Project Area	1,347 linear feet	EII	673.5	673.5 lf	2 to 1
UT to UT Altamahaw Creek	Southwest boundary	130 linear feet	EII	65	65 lf	2 to 1

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-riverine			
Restoration						
Enhancement			0.026 acres			
Enhancement I						
Enhancement II	1,477 linear feet					
Creation						
Preservation						
HQ Preservation						

BMP Elements

Element	Location	Purpose/Function	Notes

BMP Elements

BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Dentention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer.

Table 2. Project Activity and Reporting History UT Altamahaw/ 92837		
Activity or Report	Data Collection Complete	Completion or Delivery
Mitigation Plan	May 2010	May 2010
Final Design - Construction Plans	June 2010	June 2010
Construction		February 2011
Temporary S&E Mix Applied to Entire Project Area		February 2011
Permanent Seed Mix Applied to Entire Project Area		February 2011
Bare Root, Live Stake and Tubling Plantings Applied		February 2011
Baseline Monitoring Document	January 2012	February 2012
Year 1 Monitoring	August 2012	December 2012
Year 2 Monitoring	July 2013	November 2013
Supplemental Bare Root and Tubling Plantings Applied		November 2013
Year 3 Monitoring	July 2014	November 2014
Year 4 Monitoring	June 2015	November 2015
Year 5 Monitoring	September 2016	October 2016

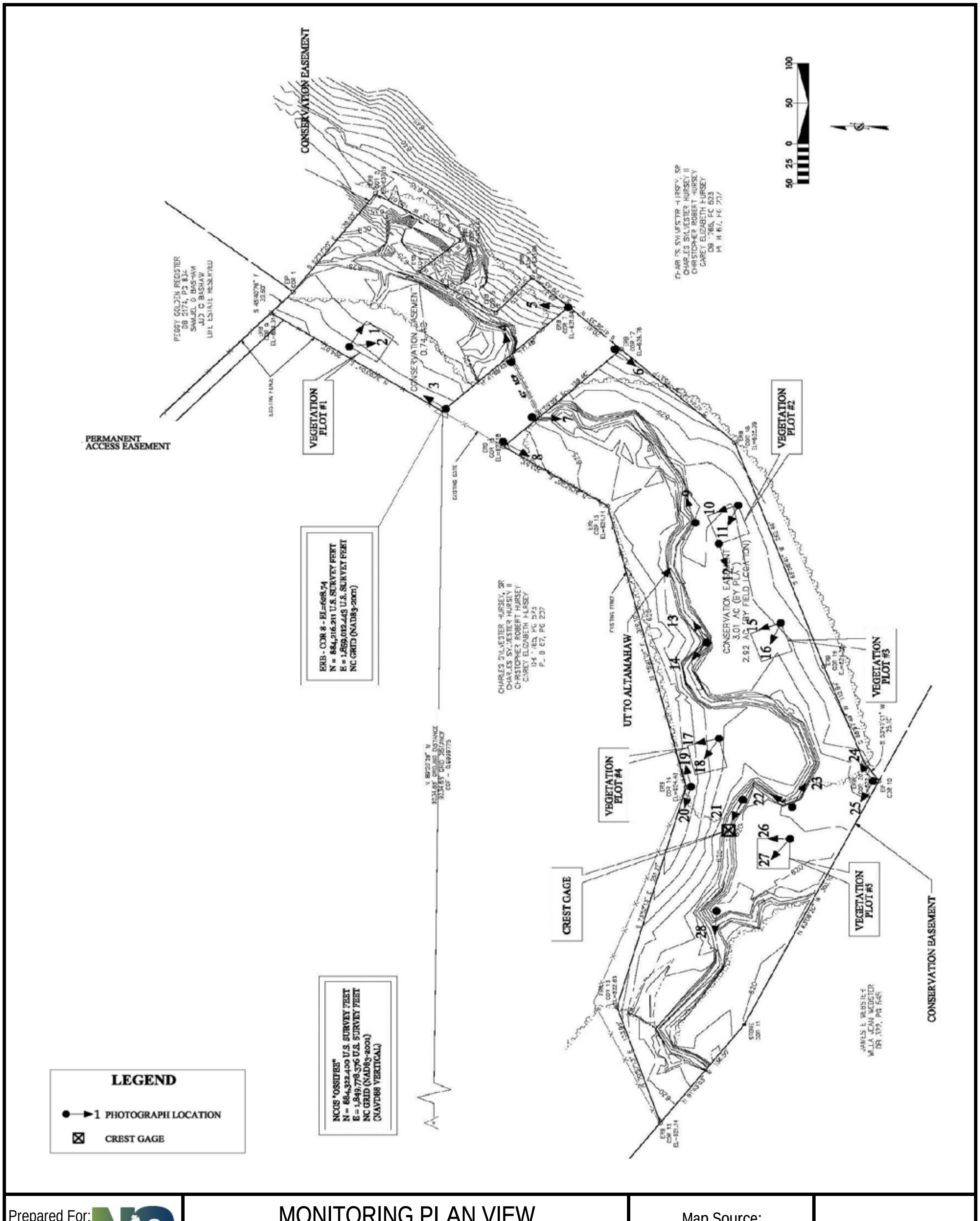
Table 3. Project Contact Table UT Altamahaw/ 92837	
Designer	Firm Information/ Address
Ecological Engineering, LLP	1151 SE Cary Parkway, Suite 101, Cary, NC 27518
Jenny S. Fleming, PE	(919) 557-0929
Construction Contractor	Firm Information/ Address
Backwater Environmental	288 East St. Suite 2003, Pittsboro, NC 27312
Wes Newell	(919) 545-2000
Construction Contractor	Firm Information/ Address
Riverworks, Inc.	8000 Regency Parkway, Suite 800, Cary, NC 27518
Bill Wright	(919) 459-9001
Planting Contractor	Firm Information/ Address
Riverworks, Inc.	8000 Regency Parkway, Suite 800, Cary, NC 27518
George Morris	(919) 459-9001
Supplemental Planting Contractor	Firm Information/ Address
Carolina Silvics, Inc.	908 Indian Trail Rd., Edenton, NC 27932
Mary-Margaret S. McKinney	(252) 482-8491
Seeding Contractor	Firm Information/ Address
Riverworks, Inc.	8000 Regency Parkway, Suite 800, Cary, NC 27518
George Morris	(919) 459-9001
Seed Mix Sources	Green Resource (336) 855-6363
Nursery Stock Suppliers	ArborGen (843) 851-4129 Cure Nursery (919) 542-6186 Foggy Mountain Nursery (336) 384-5323 Mellow Marsh Farm (919) 742-1200 Native Roots Nursery (910) 385-8385 Superior Tree (850) 971-5159
Monitoring Performer	Firm Information/ Address
Ecological Engineering, LLP	1151 SE Cary Parkway, Suite 101, Cary, NC 27518
Heather Smith, David Cooper (stream, vegetation & wetland)	(919) 557-0929

Table 4. Project Baseline Information and Attributes
UT Altamahaw/ 92837

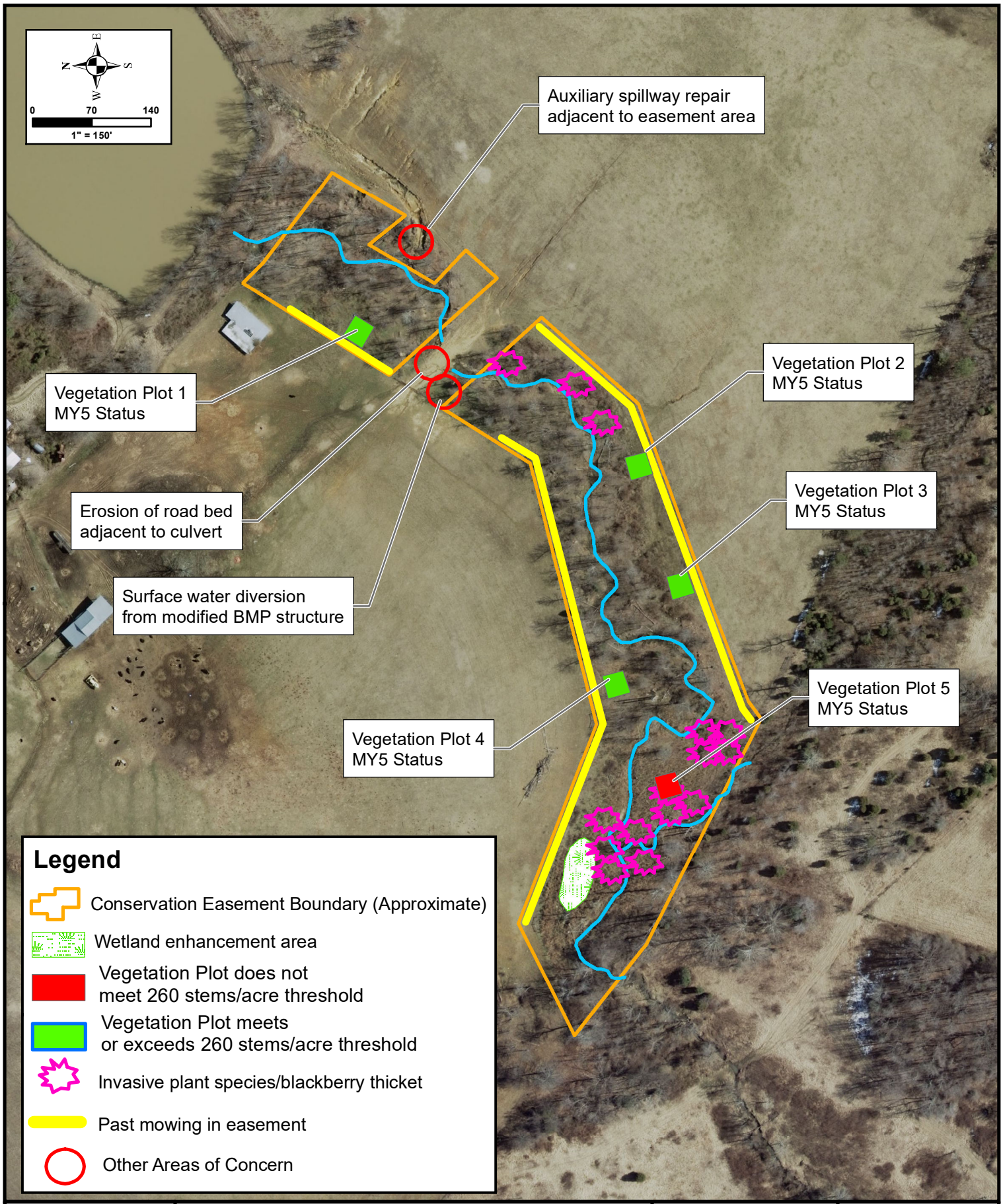
Project Information			
Project Name	UT Altamahaw		
County	Alamance		
Project Area	3.6 acres		
Project Coordinates (latitude and longitude)	36°10'43.56" North/ 79°28'37.91" West		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Cape Fear		
USGS Hydrologic Unit 8-digit	3030002	USGS Hydrologic Unit 14-digit	3030002030010
DWQ Subbasin	03.06.02		
Project Drainage Area	0.51 sq. mi. (334 acres)		
Project Drainage Area Percentage of Impervious Area	Less than 1%		
CGIA Land Use Classification	Agricultural Land		
Reach Summary Information			
Parameters	Reach 1	Reach 2	
Length of Reach	1,347 linear feet	130 linear feet	
Valley Classification	Valley Type VIII	Valley Type VIII	
Drainage Area	0.51 sq. mi. (334 acres)	0.39 sq. mi. (251 acres)	
NCDWQ Stream ID Score	46.75	39.25	
NCDWQ Water Quality Classification	C NSW	C NSW	
Morphological Description (stream type)	C/E 5	C/E 5	
Evolutionary Trend	E-C-G-F-E-C	E-C-G-F-E-C	
Underlying Mapped Soils	Worsham sandy loam	Worsham sandy loam	
Drainage Classification	Poorly drained	Poorly drained	
Soil Hydric Status	Hydric A	Hydric A	
Slope	0 to 3%	0 to 3%	
FEMA Classification	Zone AE - lower end	Zone AE - lower end	
Native Vegetation Community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	
Percent Composition of Exotic Invasive Species	Less than 5%	Less than 5%	
Wetland Summary Information			
Size of Wetland	0.026 acres		
Wetland Type	Seepage		
Mapped Soil Series	Worsham sandy loam		
Drainage Classification	Poorly drained		
Soil Hydric Status	Hydric A		
Source of Hydrology	Groundwater		
Hydrologic Impairment	None		
Native Vegetation Community	Piedmont Alluvial Forest		
Percent Composition of Exotic Invasive Species	Less than 5%		
Regulatory Considerations			
Waters of the United States - Section 404	Resolved		
Waters of the United States - Section 401	Resolved		
Endangered Species Act	Resolved		
Historic Preservation Act	Resolved		
Coastal Zone/Area Management Acts (CZMA/CAMA)	Not Applicable		
FEMA Floodplain Compliance	Resolved		
Essential Fisheries Habitat	Not Applicable		

APPENDIX B

Visual Assessment Data



Prepared For: Environmental Quality	MONITORING PLAN VIEW UT to Altamahaw Site - DMS Project No. 92837 Alamance County, NC October, 2016	Map Source: Ecological Engineering, LLP Baseline Monitoring Figure	**FIGURE 2**



Prepared For:

NC Environmental Quality

CURRENT CONDITIONS PLAN VIEW
UT to Altamahaw Site - DMS Project No. 92837

Alamance Co., NC

October 2016

Map Source:

2010 Aerial from NCOneMap.com

FIGURE 3

Table 6. Vegetation Condition Assessment UT Altamahaw DMS Project No. 92837

Planted Acreage 4.6

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material	0.1 ac	n/a	0	0	0
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY 3, 4, or 5 stem count criteria	0.1 ac	n/a	0	0	0.0%
			Total	0	0	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that is obviously small given the monitoring year	0.25 ac	n/a	0	0	0%
			Cumulative Total	0	0	0.0%

NOTES:

One of five vegetation plots did not meet the required success criteria for planted stems but met with volunteer stems.

Easement Acreage 4.6

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% Planted Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale)	0.1 ac	Yes	7	0.1 ac	1.5%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	0.1 ac	Yes	0	0.2 ac	0.0%

Photostation Comparison

UT Altamahaw Site - Monitoring Year 5 (2016)

Photo # and Location	Baseline Condition 2012	MY 1 2012	MY 2 2013	MY 3 2014	MY 4	MY 5 2016 (9/20/2016)
Photostation 1. Facing south east along y-axis of Vegetation Plot 1.						
Photostation 2. Facing south across Vegetation Plot 1.						
Photostation 3. Facing northeast towards Vegetation Plot 1.						
Photostation 4. Facing east (upstream) along UT Altamahaw Creek.						

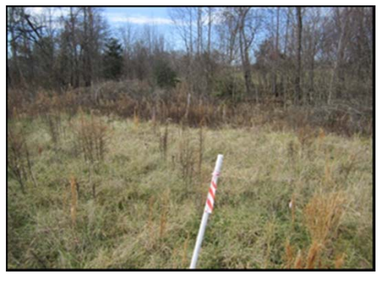
Photostation Comparison - Page 2

	Baseline Condition 2012	MY 1 2012	MY 2 2013	MY 3 2014	MY 4	MY 5 2016 (9/20/2016)
Photostation 5. Facing north from souteast corner of existing crossing.						
Photostation 6. Facing southwest from southwest corner of existing crossing.						
Photostation 7. Facing south along UT Altamhaw Creek from existing crossing.						
Photostation 8. Facing southwest from northwest corner of existing crossing.						

Photostation Comparison - Page 3

	Baseline Condition 2012	MY 1 2012	MY 2 2013	MY 3 2014	MY 4	MY 5 2016 (9/20/2016)
Photostation 9. Facing upstream along UT Altamahaw Creek north of Vegetation Plot 2.						
Photostation 10. Facing north along x-axis of Vegetation Plot 2.						
Photostation 11. Facing northwest across Vegetation Plot 2.						
Photostation 12. Facing west at riparian area from Vegetation Plot 2.						

Photostation Comparison - Page 4

	Baseline Condition 2012	MY 1 2012	MY 2 2013	MY 3 2014	MY 4	MY 5 2016 (9/20/2016)
Photostation 13. Facing upstream along UT Altamahaw Creek.						
Photostation 14. Facing downstream along UT Altamahaw Creek.						
Photostation 15. Facing north along x-axis of Vegetation Plot 3.						
Photostation 16. Facing northwest across Vegetation Plot 3.						

Photostation Comparison - Page 5

	Baseline Condition 2012	MY 1 2012	MY 2 2013	MY 3 2014	MY 4	MY 5 2016 (9/20/2016)
Photostation 17. Facing north along x-axis of Vegetation Plot 4.						
Photostation 18. Facing northwest across Vegetation Plot 4.						
Photostation 19. Facing northwest along easement boundary.						
Photostation 20. Facing northeast along easement boundary.						

Photostation Comparison - Page 6

	Baseline Condition 2012	MY 1 2012	MY 2 2013	MY 3 2014	MY 4	MY 5 2016 (9/20/2016)
Photostation 21. Facing downstream along UT Altamahaw Creek at the crest gage.						
Photostation 22. Facing downstream along UT Altamahaw Creek.						
Photostation 23. Facing upstream along UT Altamahaw Creek.						
Photostation 24. Facing northeast along southern easement boundary.						

Photostation Comparison - Page 7

	Baseline Condition 2012	MY 1 2012	MY 2 2013	MY 3 2014	MY 4	MY 5 2016 (9/20/2016)
Photostation 25. Facing northwest along southern easement boundary.						
Photostation 26. Facing north along x-axis of Vegetation Plot 5.						
Photostation 27. Facing northwest across Vegetation Plot 5.						
Photostation 28. Facing downstream from confluence of two unnamed tributaries.						

APPENDIX C

Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment UT Altamahaw/ 92837		
Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	80%
2	Yes	80%
3	Yes	80%
4	Yes	80%
5	No	80%

Table 8. CVS Vegetation Metadata
UT to Altamahaw Creek (DMS Project No. 92837)

Report Prepared By	Heather Smith
Date Prepared	9/29/2016 10:46
database name	EcologicalEngineering-2016-UTAltamahawYear 5.mdb
database location	P:\50000 State\EEP 50512\50512-001 EEP Altamahaw Creek\MONITORING\UT Altamahaw Year 5 2016
computer name	WKST7
file size	45092864

DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.

PROJECT SUMMARY----------	
Project Code	92837
project Name	UT ALTAMAHAW
Description	
River Basin	Cape Fear
length(ft)	1347
stream-to-edge width (ft)	50
area (sq m)	12512.77
Required Plots (calculated)	5
Sampled Plots	5

Table 9: DMS Project Code 92837
Project Name: UT ALTAMAHAW

			Current Plot Data (MY5 2016)														
			92837-LS-0001			92837-LS-0002			92837-LS-0003			92837-LS-0004			92837-LS-0005		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree	1	1	1												
Acer rubrum	red maple	Tree						6			2						
Asimina triloba	pawpaw	Tree	1	1	1												
Betula nigra	river birch	Tree	2	2	2				2	2	2			3			
Carpinus caroliniana	American hornbeam	Tree															3
Carya	hickory	Tree															
Carya ovata	shagbark hickory	Tree															
Celtis laevigata	sugarberry	Tree			3												
Cercis canadensis	eastern redbud	Tree															
Cornus amomum	silky dogwood	Shrub															
Cornus florida	flowering dogwood	Tree										2	2	2			
Diospyros virginiana	common persimmon	Tree						1									
Fraxinus pennsylvanica	green ash	Tree	3	3	3			2	2	2	2	3	3	3	1	1	1
Ilex verticillata	common winterberry	Shrub						1									
Juglans nigra	black walnut	Tree			3												5
Ligustrum sinense	Chinese privet	Exotic															
Liquidambar styraciflua	sweetgum	Tree									3			6			6
Liriodendron tulipifera	tuliptree	Tree							2	2	2	1	1	1			6
Nyssa sylvatica	blackgum	Tree	2	2	2	1	1	1									
Ostrya virginiana	hophornbeam	Tree															
Oxydendrum arboreum	sourwood	Tree															
Platanus occidentalis	American sycamore	Tree	1	1	1	3	3	3						2	1	1	9
Prunus serotina	black cherry	Tree															
Quercus	oak	Tree															
Quercus lyrata	overcup oak	Tree	3	3	3												
Quercus michauxii	swamp chestnut oak	Tree				1	1	1	2	2	2	1	1	1			
Quercus pagoda	cherrybark oak	Tree	1	1	1	2	2	2	1	1	1	3	3	3	2	2	2
Quercus phellos	willow oak	Tree										3	3	6	1	1	1
Rhus	sumac	shrub															
Salix nigra	black willow	Tree			2												
Sambucus canadensis	Common Elderberry	Shrub			3												
Sambucus nigra	European black elderberry	Shrub															
Ulmus alata	winged elm	Tree															
Ulmus americana	American elm	Tree	2	2	2	1	1	1	1	1	7						
Ulmus rubra	slippery elm	Tree															2
		Stem count	16	16	27	8	8	18	10	10	21	13	13	27	5	5	35
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	9	9	13	5	5	9	6	6	8	6	6	9	4	4	9
		Stems per ACRE	647.5	647.5	1092.7	323.7	323.7	728.4	404.7	404.7	849.8	526.1	526.1	1092.7	202.3	202.3	1416.4

Scientific Name	Common Name	Species Type	Annual Means																	
			MY5 (2016)			MY4 (2016)			MY3 (2014)			MY2 (2013)			MY1 (2012)			MY0 (2012)		
Acer negundo	boxelder	Tree	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree	1	1	1	1	1	1	1	1	1						1			
Asimina triloba	pawpaw	Tree			8			4			3			3			3			
Betula nigra	river birch	Tree	1	1	1	1	1	1	1	1	1	1	1	1						
Carpinus caroliniana	American hornbeam	Tree	4	4	7	5	5	5	6	6	6			9	1	1	19	1	1	1
Carya	hickory	Tree			3			4			13									
Carya ovata	shagbark hickory	Tree						1			1									
Celtis laevigata	sugarberry	Tree										1	1	1						
Cercis canadensis	eastern redbud	Tree			3			5			3									
Cornus amomum	silky dogwood	Shrub						3												
Cornus florida	flowering dogwood	Tree						1												
Diospyros virginiana	common persimmon	Tree	2	2	2	3	3	4	2	2	2	1	1	1	1	1	1	2	2	2
Fraxinus pennsylvanica	green ash	Tree			1															
Ilex verticillata	common winterberry	Shrub	9	9	11	7	7	9	12	12	13	10	10	10	7	7	7	7	7	7
Juglans nigra	black walnut	Tree			1			5			2									
Ligustrum sinense	Chinese privet	Exotic			8			8			7									
Liquidambar styraciflua	sweetgum	Tree												1			1			
Liriodendron tulipifera	tuliptree	Tree			15			10			12			6			8			
Nyssa sylvatica	blackgum	Tree	3	3	9	4	4	8	5	5	7						1			
Ostrya virginiana	hophornbeam	Tree	3	3	3	3	3	3	1	1	1									
Oxydendrum arboreum	sourwood	Tree									16									
Platanus occidentalis	American sycamore	Tree																1	1	1
Prunus serotina	black cherry	Tree	5	5	15	2	2	5	7	7	7	5	5	5	3	3	3	3	3	3
Quercus	oak	Tree												4						
Quercus lyrata	overcup oak	Tree				2	2	2			1							1	1	1
Quercus michauxii	swamp chestnut oak	Tree	3	3	3	2	2	2												
Quercus pagoda	cherrybark oak	Tree	4	4	4	6	6	6	6	6	6	4	4	4	3	3	3	4	4	4
Quercus phellos	willow oak	Tree	9	9	9	11	11	11	10	10	10	9	9	9	8	8	8	11	11	11
Rhus	sumac	shrub	4	4	7	3	3	5	5	5	5									
Salix nigra	black willow	Tree												4			2			
Sambucus canadensis	Common Elderberry	Shrub			2						2			1			1			2
Sambucus nigra	European black elderberry	Shrub			3			4						2						
Ulmus alata	winged elm	Tree									4									
Ulmus americana	American elm	Tree						1			2									
Ulmus rubra	slippery elm	Tree	4	4	10	4	4	10	6	6	7	7	7	7				2	2	2
Unknown		Shrub or Tree			2			1												
															2	2	2	3	3	3
			52	52	128	54	54	119	62	62	132	38	38	68	25	25	60	35	35	37
			5			5			5			5			5			5		
			0.12			0.12			0.12			0.12			0.12			0.12		
			13	13	23	14	14	26	12	12	24	8	8	16	7	7	14	10	10	11
			420.9	420.9	1036.0	437.1	437.1	963.2	501.8	501.8	1068.4	307.6	307.6	550.4	202.3	202.3	485.6	283.3	283.3	299.5

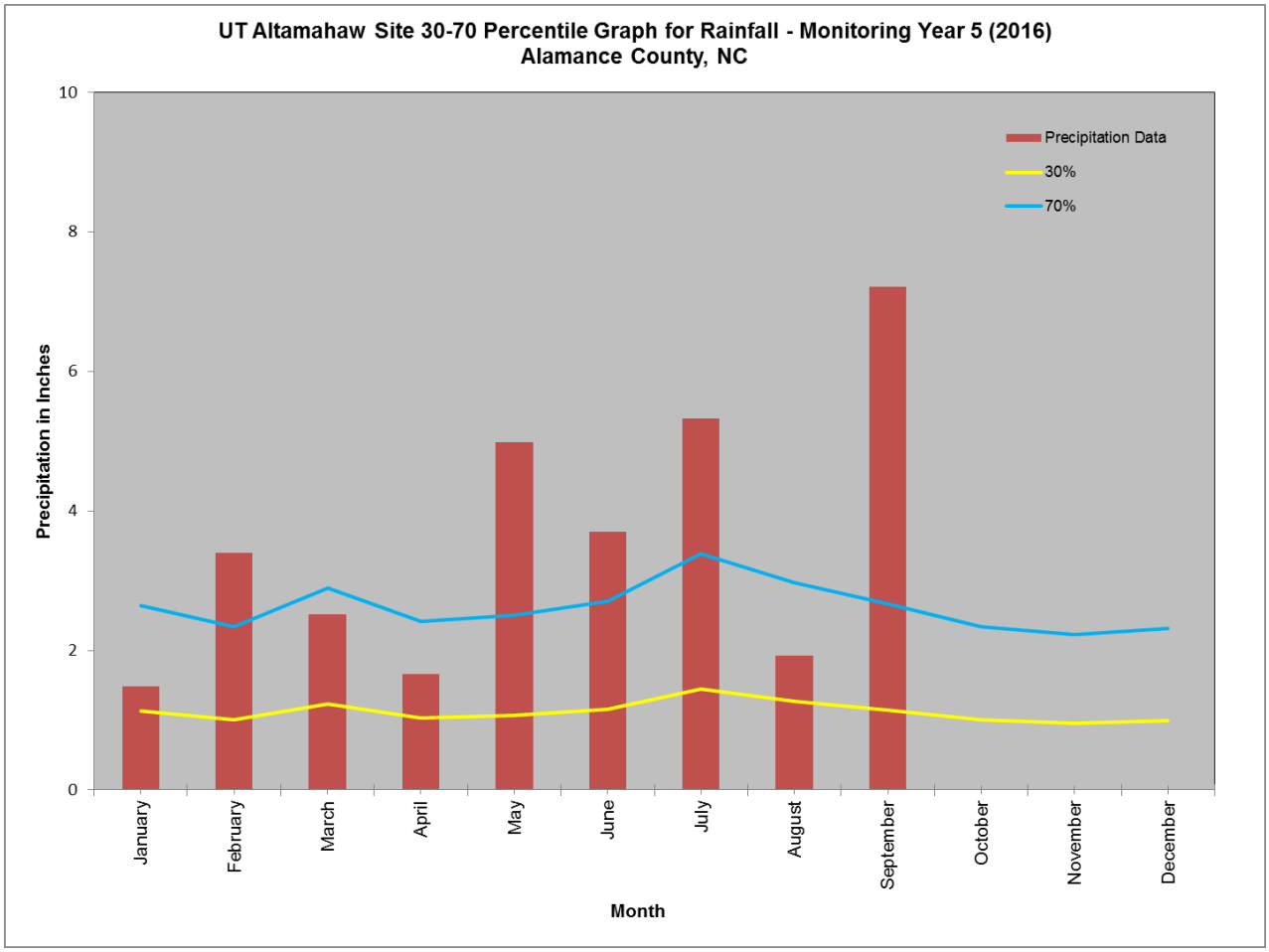
APPENDIX D

Hydrology Data

Table 12. Verification of Bankfull Events UT Altamahaw/ 92837			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo # (if available)**
n/a*	November 3 & 4, 2012	NC State Climate Office	None
7/31/2013	June 5-13 and June 28-July 14, 2013	NC State Climate Office, Crest Gage & Visual Assessment	None
7/15/2014	Prior to 7/15/2014	Wrack line observations	None
7/15/2014	7/15/2014	Observed rainfall in excess of 3" in less than 12 hours	None
6/5/2015	Prior to 6/5/2015	Crest Gauge	None

* Based on daily rainfall data prior to installation of Crest Gage. Approximately 2.4 inches of rain was recorded over a span of two days.

Table 13. Monthly Rainfall Data Summary - UT Altamahaw Site 2016			
Month	**Amount (in.)**	**30%**	**70%**
January	1.4821	1.13	2.65
February	3.4039	1.01	2.35
March	2.5235	1.24	2.89
April	1.6621	1.04	2.42
May	4.9861	1.07	2.51
June	3.7018	1.16	2.70
July	5.3322	1.45	3.39
August	1.9236	1.28	2.98
September	7.2138	1.15	2.67
October	Not Evaluated	1.01	2.35
November	Not Evaluated	0.96	2.23
December	Not Evaluated	0.99	2.32



APPENDIX E

Letter of Intent and Conservation Easement Agreement

Kristine

Ecosystem Enhancement Program

Review of Letter of Intent and
Conservation Easement Agreement

Project Tracking System # 92837
SPO File #: 001-P

County: Alamance

Property: Conservation Easement (+/- 4 acres)
Tract PIN# 8858849144

Project: UT to Altamahaw Stream Enhancement Project

Owner(s): Charles S. Hursey Sr. & ETAL

Property owner(s) complete the section below.
Please return this form in the enclosed envelope.

I have reviewed the letter of intent and conservation easement document.

✓ I am in agreement with the letter of intent; temporary construction easement and conservation easement template for future access in reference to the above mentioned property.

✓ I have reviewed the letter of intent and conservation easement and have the following concerns:

Signed: Charles Hursey Date: 3-19-2010

Signed: _____ Date: _____

Letter of Intent
Proposed EEP Stream Restoration Project

This document sets forth agreements between the N.C. Ecosystem Enhancement Program (EEP) and the landowner regarding the proposed EEP restoration project described below. EEP is proposing a stream enhancement project on an unnamed tributary to Altamahaw Creek located on a farm owned by Charles Hursey in Alamance County. EEP is hereby providing a letter of intent regarding proposed responsibilities of EEP as they relate to the "UT to Altamahaw" enhancement project.

PROJECT NAME: **UT to Altamahaw** **EEP # 92837**

EEP intends to enhance, or preserve stream and wetland areas on this site. As part of these efforts, EEP intends pay for the installation and design of agricultural BMPs (best management practices) necessary to protect the streams. BMPs will include exclusionary cattle fencing, one alternative water supply well and one watering station and two gates.

Exclusionary fencing will be installed along, and approximately 1-foot outside of, the easement boundary as it generally occurs on the tributary which occurs in the current pasture area. A 5-foot grassy clearance zone inside the exclusionary fencing and on the conservation easement will be allowed to be managed by mowing, or other manual means, to keep this area open and clear of woody vegetation.

EEP will provide grading and stone for the existing emergency spillway of the farm pond. EEP will provide stone cover for the existing culvert crossing.

NOTE:
Donations of land or conservation easements may be tax deductible, however, please be aware that any amenities, such as fencing or bridges, built on your land may have property tax implications. Please check with your tax attorney regarding the effects of any improvements.

The completion of this project and the items described in this letter are subject to budget and timing constraints.

Funding is available only for land that is protected by the restrictions described in the attached permanent conservation easement agreement.

Suzanne Klimek
Director of Operations
Ecosystem Enhancement Program