As-Built Baseline Monitoring Report
Moores Fork Stream Mitigation Project

DMS Project Number: 94709
DEQ Contract Number: 6500
USACE Action ID: SAW-2011-02257
DWR Project Number: 12-0396
SCO# 09-08-56701

Surry County, North Carolina
Data Collected: June -July, 2016
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Submitted to:

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1.0 PROJECT SUMMARY

The NCDEQ Division of Mitigation Services (DMS) restored, enhanced, and preserved approximately 19,677 linear feet (LF) of Moores Fork and thirteen previously unnamed tributaries (UTs), provided livestock fencing and alternative water sources to keep livestock out of the streams, removed invasive plant species across the project, and established native riparian buffers. The restoration project was developed to fulfill stream mitigation requirements accepted by the DMS for the Upper Yadkin River Basin (HUC 03040101). The Moores Fork Stream Restoration Project will net 11,736 stream mitigation credits through a combination of restoration, enhancement I and II, and preservation. This report documents the results of the As-Built Baseline monitoring efforts (MY0).

1.1 Project Goals

The project goals identified in the Mitigation Plan (Confluence, 2012) include:

- Improve water quality in Moores Fork and the UTs through reductions in sediment and nutrient inputs from local sources;
- Create conditions for dynamic equilibrium of water and sediment movement between the supply reaches and project reaches;
- Promote floodwater attenuation and secondary functions associated with more frequent and extensive floodwater contact times;
- Improve in-stream habitat by increasing the diversity of bedform features;
- Enhance and protect native riparian vegetation communities; and
- Reduce fecal, nutrient, and sediment loads to project streams by promoting and implementing livestock best management practices.

1.2 Project Performance Standards

The performance of the project will be evaluated in accordance with the geomorphic, visual, hydrology, and vegetation components outlined in the Stream Mitigation Guidelines (USACE 2003). The following are specific performance standards from the approved Mitigation Plan (Confluence, 2012).

Performance Standards	
Parameter	**Metrics/Success Criteria**
Channel Stability	a. Bank height ratio for reaches where BHR is corrected through design and construction shall not exceed 1.2. b. Entrenchment ratio for reaches where ER is corrected through design and construction shall be no less than 2.2. c. The stream project shall remain stable and all other performance standards shall be met through two separate bankfull events, occurring in separate years, during the monitoring years 1 through 7.

Riparian Buffer Vegetation	a. Density of 320 live, planted stems/acre at year 3; 260 live, planted stems/acre at year 5; 210 live planted stems/acre at year 7. b. Planted vegetation must average 8 feet in height at year 7.

1.3 Project Setting and Background

The site is located in the Piedmont physiographic province (NCGS 2004). The Piedmont is characterized by gently rolling, well rounded hills and long low ridges. Moores Fork is a tributary to Stewarts Creek in the Upper Yadkin River Basin (HUC 03040101). The site is located approximately 0.25 mile north of NC 89 on Horton Road. The project site is located on both sides of Horton Road. Latitude and longitude for the site are 36.506671 N and -80.704115 W, respectively. A site location map is included in Appendix A as Figure 1.

Agriculture is the primary land use in the watershed (36% agriculture land cover). Degraded buffers and livestock operations were identified as major stressors to water quality within the watershed. The site assessment phase of the project identified other stressors as well, including elevated water temperatures, excessive nutrient inputs, channel incision, bank erosion, and sediment deposition. Dairy and farming operations on the site have deforested riparian buffers and allowed direct livestock access to the stream, leading to elevated temperatures and nutrients. Channel straightening and dredging throughout much of the project has also contributed to channel degradation.

1.4 Project Components and Approach

Stream restoration was accomplished using a natural channel design approach to restore appropriate channel dimension, pattern, and profile (Table 1; Figure 2). These improved conditions will promote water and sediment transport equilibrium between the stream and its watershed, reconnect the stream to its floodplain, and promote healthy in-stream and riparian habitats. The project goals were addressed through the following project objectives:

- Restoration of the dimension, pattern, profile of approximately 1,875 LF of Moores Fork Reach 2 and 243 LF of the Pond Tributary;
- Restoration of the dimension and profile (Enhancement I) of the channel for approximately 2,885 LF of Moores Fork Reach 3, 900 LF of Silage Reach 1, 2,448 LF of Silage Reach 2, 350 LF of Barn Reach 1 and 112 LF of Corn Reach 2;
- Limited channel work coupled with livestock exclusion, gully stabilization, invasive species control and buffer planting (Enhancement II) on approximately 761 LF of Moores Fork Reach 1, 167 LF of Cow Tributary 1, 767 LF of Cow Tributary 2, 3,084 LF of Barn Reach 2, 1,340 LF of Corn Reach 1, and 466 LF of UT 1;
- Livestock exclusion fencing and other best management practice installations;

- Invasive plant species control measures across the entire project wherever necessary; and
- Preservation of approximately 4,279 LF of relatively un-impacted forested streams (UTs 2, 3,6,7,8,9,10) in a permanent conservation easement.

The target stream type for Moores Fork was a moderately sinuous, moderate width-depth ratio C4, which was appropriate for the relatively flat and wide alluvial valley. Reach 2 of Moores Fork was constructed mainly off-line to position the channel in the low point of the valley and provide much improved floodplain access on both banks. Reach 3 was constructed largely within the existing channel with modest pattern shifts where existing pattern was unstable. In-stream structures were incorporated in Reach 3 to promote sediment transport equilibrium, riffle and pool formation, and enhanced bank stability. The overall approach can be described as a hybrid Rosgen Priority 2/3 restoration.

Due to the slope and confined valley, Reach 1 of the Silage Tributary was designed as a step-pool, B4 stream type. Because of the highly confined nature of the Silage Tributary and the desire to preserve mature upland trees, addressing eroding banks and incised conditions through bank sloping was not practical. The design solution was to create a new step pool profile within the original channel and stabilize the upper banks with facsinces, a bioengineering technique that involves placing dormant woody cuttings in shallow, contour-line trenches.

Reach 2 of the Silage Tributary, the Corn Reach, and the Barn Reach were similar in terms of morphology; each was a relatively steep alluvial channel with significant incision and bank erosion problems with little length to transition to a stable profile end point. The design approaches for these streams was also similar. The channels were left in their current alignments, banks were graded to stable slopes, bankfull benches were constructed, and in-stream structures were used to promote bed and bank stability. Reference cross-sections on stable reaches of the Corn and Barn Reaches were used to size the design cross-sections for these streams.

The target stream type for the Pond Tributary was a moderately sinuous, moderate width-depth ratio C4. The project reach begins at the outlet of the culvert where flow drops approximately two feet to a small plunge pool at the existing thalweg. The design profile started at this existing thalweg elevation, taking advantage of the energy dissipating effects of the pool, and then abandoned the badly trampled channel for a new alignment across the floodplain to the east. The downstream end of the profile included a 1.5-foot high transition to the Moores Fork thalweg, which was constructed using a grade control structure.

The project also included filling and stabilizing gullies at the headwaters of the Silage Tributary, the Cow 1 and Cow 2 Tributaries, UT1 and two runoff conveyances entering Moores Fork Reach 3. The proposed gully stabilization included upland measures such as temporary silt fences, swales and vegetation to divert and/or redirect runoff away from gullies. Check dams made from riprap, woody brush, recycled crushed concrete, decay resistant logs, and other on-site materials were used to reduce erosive

stresses in the gullies and promote healing. Stabilized areas were planted with native species at densities specified for buffer areas.

The final design was completed in June of 2013. Construction activities and as-built surveys were completed in December of 2014. Planting of the site took place in March of 2015. A large flood event with an estimated return interval of 50 to 100 years occurred at the site on April 18-19, 2015, causing damage to the main stem of Moores Fork. This damage was repaired in March and April 2016, and a second as-built survey was performed on the repaired areas in April 2016. The baseline monitoring efforts began in June of 2016 and monitoring year one efforts are scheduled for the end of October 2016. More detailed information related to the project activity, history, and contacts can be found in Appendix A Tables 1 and 2.

Monitoring will consist of collecting morphological, vegetative, and hydrological data to assess the project success based on the restoration goals and objectives on an annual basis for seven years or until the success criteria is met. The success of the project will be assessed using measurements of the stream channel's dimension, substrate composition permanent photographs, vegetation, surface water hydrology, and visual assessments. Monitoring requirements include:

Monitoring Requirements													
Parameter	Monitoring Feature	Quantity Length By Reach (ft)											
		Moores R1	Pond Trib.	Moores R2	Moores R3	Silage R1	Silage R2	UT1	Cow 1	Cow 2	Barn 1	Barn 2	Frequency
Dimension	Riffle XS			2	4	1	3						Years 1, 2, 3, 5, 7
	Pool XS			1	2	1	2						Years 1, 2, 3, 5, 7
Substrate	100 Pebble Count			2	4	1	3						Annual
Hydrology	Crest Gauge			1			1						Semi-Annual
Vegetation	Vegetation Plots			4	3	1	2			1	1		Annual
Visual Assessment	Project Site			Y	Y	Y	Y			Y	Y		Semi-Annual
Reference Photos	Permanent Photo Points	2	2	12	19	8	8	2	2	4	2	2	Annual

1.5 Project Performance

The Moores Fork as-built data showed some deviation from the design values, particularly for cross-sectional area and bankfull width in Reach 3 where the majority of the repair work was conducted in early 2016. Observations of the repair areas over the past three months indicate the site is on a trajectory toward increased stability and improved function as compared to pre-repair conditions. One cross-section (XSM7) that was originally intended to serve as a riffle is actually more representative of a run feature and will be treated as such going forward. Data from this cross-section have been omitted from the riffle parameters reported herein. Pebble count data from Moores Fork indicate a modest coarsening of the substrate, which is consistent with observations of bed materials following the major flood event in April 2015.

As-built data from both reaches of the Silage Tributary also show some deviations from the design values. On a small channel such as this, slight differences in bankfull dimensions translate to what appear to be significant differences in parameters such as bankfull cross-sectional area and width-to-depth ratio. These being enhancement reaches where targeted (as opposed to reach-wide) bank sloping, benching and in-stream structures were used, matching the precise design values was less critical than, for example, on a new off-line restoration reach. In Reach 1, the fascines on the upper slopes

are robust on the left side and less robust on the right side. We believe that the primary cause of this was drought conditions which began after the left bank fascines were installed, just as right bank installations were beginning. Another contributing factor may be stormwater runoff originating from a pasture on the right terrace. There do not appear to be significant stability issues at this time, however.

The MY0 vegetation plot data indicate that the project is on track to meet the interim criterion for survival and growth of 320 stems per acre at the end of the year three monitoring period. Ten of the 12 vegetation plots have stem densities of 320 or more stems per acre and the mean stem density for planted stems is 497 stems per acre. Vegetation plots 2 and 3, each with a density of 280 stems per acre, did not meet the interim success criteria. The site includes a diverse assemblage of nine species of native trees. Herbicide treatments of exotic invasive plants were conducted during the initial construction phase, with a focus on the buffers along the Barn, Corn and Silage Tributaries. Recent observations indicate that the extent of invasive plants has been greatly reduced but that buffer areas, including those along Moores Fork, will need to be treated for exotic invasive plants again in the future.

Summary data 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 can be found in the mitigation plan document. All raw data presented in the appendices are available upon request.

2.0 METHODOLOGY

The stream monitoring methodologies utilized in 2015 are based on standard guidance and procedures documents (Rosgen 1996 and USACE 2003).

- Cross-section data were collected throughout four reaches using a total station survey. Sixteen cross-sections were surveyed. Cross-sections were permanently marked with capped rebar and PVC conduit.
- Sixty-seven permanent photo points were established throughout the project to visually monitor stream stability and vegetation.
- Wolman pebble counts were conducted at ten representative riffle cross-sections to evaluate particle size distribution over time. A minimum of 100 particles were selected at random and measured (Harrelson 1994).
- Vegetation monitoring included documenting species composition and survival of planted stems within twelve randomly located vegetation plots. Each 0.025 acre vegetation plot was permanently marked with rebar and PVC conduit at all four corners.
- Two crest gauges were installed and will be checked during semi-annual visits to determine if a bankfull event has occurred. The crest gauges were installed and surveyed at riffles on Moores Fork and Silage Tributary.
- Visual assessments will be performed on all stream and buffer restoration areas on a semi-annual basis. Problem areas will be noted, including channel instability (lateral and/or vertical instability, structure failure/instability and/or piping,

headcuts), vegetation health (low stem density, vegetation mortality, invasive species or encroachment), beaver activity, and livestock access. Areas of concern will be mapped, photographed, and described in future monitoring reports.

3.0 REFERENCES

Confluence Engineering, PC. 2012. Moores Fork Stream Mitigation Plan. NCEEP, Raleigh, NC.

Harrelson, Cheryl, C. Rawlins and J. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. Gen. Tech. Rep. RM-245. Rocky Mountain Forest and Range Experiment Station. USDA Forest Service. Fort Collins, Colorado.

NCCRONOS (North Carolina Climate Retrieval and Observations Network of the Southeast Database). 2016. State Climate Office of North Carolina. Version 2.7.2. MT Airy 2 W. Station ID No. 315890. Accessed July 2016.

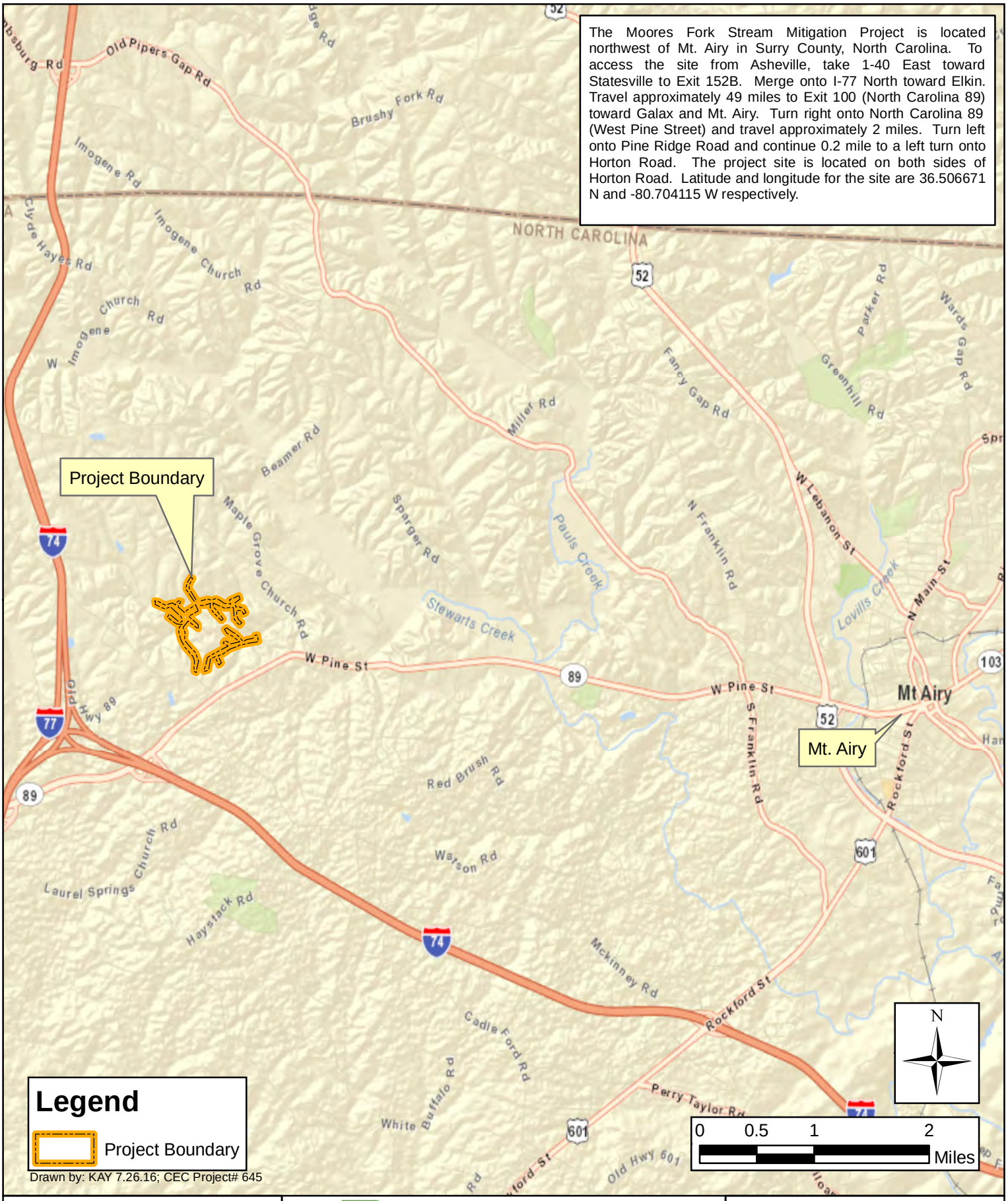
NCGS (North Carolina Geological Survey). 2004. Physiography of North Carolina. Map compiled by the Division of Land Resources. Raleigh.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology. Pagosa Springs, Colorado.

USACE (U.S. Army Corps of Engineers). 2003. Stream Mitigation Guidelines. U.S. Army Corps of Engineers – Wilmington District, U.S. Environmental Protection Agency, North Carolina Wildlife Resources Commission, and North Carolina Department of Environment and Natural Resources Division of Water Quality. Wilmington, North Carolina.

Appendix A
Figures and Background Tables

Moores Fork Stream Mitigation/ DMS Project No. 94709



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Site Vicinity

Figure 1

Table 1. Project Components and Mitigation Credits
Moores Fork Stream Mitigation/ DMS Project No. 94709

Mitigation Credit Summaries

Type	Restoration	Enhancement I	Enhancement II	Preservation				
Total	2,118	5,879	2,883	856				

Project Components

Project Component or Reach ID	Stationing	Pre-project Footage or Acreage	Restoration Footage or Acreage	Restoration Level	Restoration or Rest Equiv.	Mitigation Ratio	Mitigation Credits	Notes
Moores Reach 1	STA 989-1750	761	761	N/A	EII	2.5:1	304	-
Moores Reach 2	STA 1750-3625	1,636	1,875	P2	R	1:1	1,875	-
Moores Reach 3	STA 3640-6525	2,856	2,885	P2/3	EI	1:1	2,885	-
Silage Reach 1	STA 1000-1900	900	900	P1	EI	1:1	900	-
Silage Reach 2	STA 1900-4348	2,448	2,448	P3	EI	1.5:1	1,632	-
Cow Trib 1	STA 1219-1386	167	167	P4	EII	1.5:1	111	-
Cow Trib 2	STA 1331-2098	767	767	P4	EII	1.5:1	511	-
Pond Trib	STA 1000-1243	194	243	P2	R	1:1	243	-
Barn Reach 1	STA 1000-1350	300	350	P3	EI	1:1	350	-
Barn Reach 2	STA 1350-3746; STA 4069-4757	3,134	3,084	N/A	EII	2.5:1	1,234	-
Corn Reach 1	STA 1000-2340	1,350	1,340	N/A	EII	2.5:1	536	-
Corn Reach 2	STA 2350-2462	112	112	P3	EI	1:1	112	-
UT1	STA 1000-1466	466	466	N/A	EII	2.5:1	186	-
Preservation Reaches	UTs 2,3,6,7,8,9,10	4,279	4,279	N/A	P	5:1	856	-

Length and Area Summations

Restoration Level	Stream (Linear Feet)	Riparian Wetland (acres)		Non-riparian Wetland (acres)	Buffer (Square feet)		Upland (acres)	
		Riverine	Non-Riverine					
		-						
Restoration	2,118	-	-	-	-	-	-	-
Enhancement		-	-	-	-	-	-	-
Enhancement I	6,695							
Enhancement II	6,585							
Creation		-	-	-			-	-
Preservation	4,279	-	-	-			-	-
High Quality Preservation	-	-	-	-			-	-
	-	-	-	-			-	-

BMP Element

Element	Location	Purpose/Function		Notes				
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-

N/A - Not Applicable

Table 2. Project Activity and Reporting History Moores Fork Stream Mitigation/ DMS Project No. 94709		
Activity or Deliverable	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	Dec-11	Nov-12
Final Design – Construction Plans		Jun-13
Construction (Repairs)		Dec-14 (Apr-16)
Temporary S&E Mix Applied		Dec-14 (Apr-16)
Permanent Seed Mix Applied		Dec-14 (Apr-16)
Containerized, bare root and B&B plantings for reach/segments		Feb-15 (Apr-16)
Baseline Monitoring Document (Year 0 Monitoring - Baseline)	Jun-16	Aug-16
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

N/A - Not Applicable

Table 3. Project Contacts Table Moores Fork Stream Mitigation/ DMS Project No. 94709	
Designer	Wildlands Engineering, Inc. 167-B Haywood Road Asheville, NC 28806
Primary project design POC	Andrew Bick 828-606-0306
Construction Contractor	Carolina Environmental Contracting, Inc. 150 Pine Ridge Road Mount Airy, NC 27030
Construction contractor POC	Wayne Taylor 336-341-6489
Survey Contractor	Turner Land Surveying, PLLC PO Box 41023 Raleigh, NC 27629
Survey Contractor POC	David Turner 919-623-5095
Planting Contractor	Keller Environmental, LLC 7921 Haymarket Lane Raleigh, NC 27615
Planting Contractor POC	Jay Keller 919-749-8259
Seeding Contractor	Carolina Environmental Contracting, Inc. 150 Pine Ridge Road Mount Airy, NC 27030
Seeding Contractor POC	Wayne Taylor 336-341-6489
Seed Mix Sources	Green Resources 336-855-6363
Nursery Stock Suppliers	Foggy Mountain Nursery 336-384-5323
Monitoring Performers	Wildlands Engineering, Inc. 167-B Haywood Road Asheville, NC 28806 ClearWater Environmental Consultants, Inc. 32 Clayton Street Asheville, NC 28801
Stream Monitoring POC	Andrew Bick 828-606-0306
Vegetation Monitoring POC	Andrew Bick 828-606-0306

Table 4a. Project Baseline Information and Attributes	
Moores Fork Stream Mitigation/ DMS Project No. 94709	
County	Surry
Project Area (acres)	~140
Project Coordinates (latitude and longitude)	36.506671 N, 80.704115 W
Project Watershed Summary Information	
Physiographic Province	Piedmont
River Basin	Yadkin
USGS Hydrologic Unit 8-digit	03040101
USGS Hydrologic Unit 14-digit	03040101100010
DWR Sub-basin	Pee Dee River Subbasin 03-07-02
Project Drainage Area (acres)	1,527 ac (2.39 mi^2)
Project Drainage Area Percentage of Impervious Area	<5%
CGIA Land Use Classification	Cropland and Pasture, Confined Animal Operations

Reach Summary Information

Parameters	Reach 1/2 Moores Fork	Reach 3 Moores Fork	Silage Trib	Cow Trib 1	Cow Trib 2
Length of Reach Post Construction (LF)	2,636	2,885	3,348	167	767
Valley classification (Rosgen)	VIII	VIII	II/IV	II	II
Drainage area (acres)	1,193	1,527	156	4	16
NCDWQ stream identification score	35	34.5	23.5	20	23.5
NCDWQ Water Quality Classification	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV
Morphological Description (Rosgen stream type)	C4	C4	G4/C4	G5	G5
Evolutionary trend	C-F	C-F	G-F	G	G
Underlying mapped soils	CsA, FsE	CsA, FsE	FeD2	FeD2	FeD2
Drainage class	well drained	well drained	well drained	well drained	well drained
Soil Hydric status	not hydric	not hydric	not hydric	not hydric	not hydric
Slope	0.008	0.006	0.030	0.056	0.038
FEMA classification	Not in SFHA	Not in SFHA	Not in SFHA	Not in SFHA	Not in SFHA
Native vegetation community	Felsic Mesic Forest	Felsic Mesic Forest	Felsic Mesic Forest	Felsic Mesic Forest	Felsic Mesic Forest
Percent composition of exotic invasive vegetation	0	0	0	0	0

Wetland Summary Information

Parameters	Wetland 1	Wetland 2	Wetland 3	Wetland 4
Size of Wetland (acres)	0.49	0.04	0.08	0.15
Wetland Type	riparian non-riverine	riparian non-riverine	riparian non-riverine	riparian non-riverine
Mapped Soil Series	FsE	FsE	CsA	FsE & CsA
Drainage class	well drained	well drained	well drained	well drained
Soil Hydric Status	not hydric	not hydric	not hydric	not hydric
Source of Hydrology	UT9 & UT10	UT8	Toe seep	Toe seep
Hydrologic Impairment	none	none	none	none
Native vegetation community	Dist. Small Stream/ Narrow FP Forest	Dist. Small Stream/ Narrow FP Forest	Dist. Small Stream/ Narrow FP Forest	Dist. Small Stream/ Narrow FP Forest
Percent composition of exotic invasive vegetation	0	0	0	0

Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States – Section 404	Y	Y	02257
Waters of the United States – Section 401	Y	Y	NCDWR # 12-0396
Endangered Species Act	Y	Y	CE Approved 12/21/11
Historic Preservation Act	N	N/A	-
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	N	N/A	-
FEMA Floodplain Compliance	N	N/A	-
Essential Fisheries Habitat	N	N/A	-

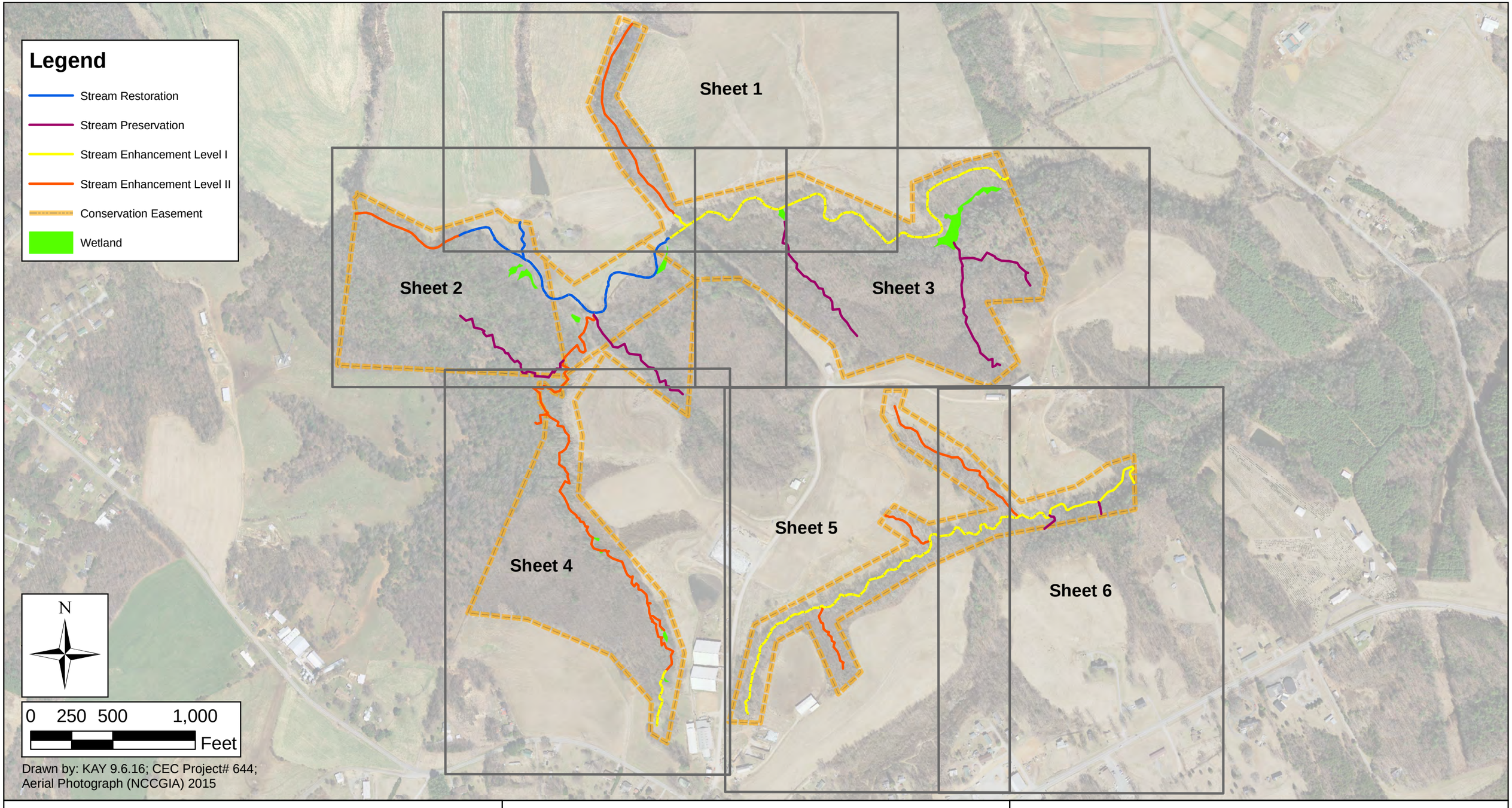
N/A Not-applicable

Table 4b. Project Baseline Information and Attributes					
Moores Fork Stream Mitigation/ DMS Project No. 94709					
County	Surry				
Project Area (acres)	~140				
Project Coordinates (latitude and longitude)	36.506671 N, 80.704115 W				
Project Watershed Summary Information					
Physiographic Province	Piedmont				
River Basin	Yadkin				
USGS Hydrologic Unit 8-digit	03040101				
USGS Hydrologic Unit 14-digit	03040101100010				
DWR Sub-basin	Pee Dee River Subbasin 03-07-02				
Project Drainage Area (acres)	1,527 ac (2.39 mi^2)				
Project Drainage Area Percentage of Impervious Area	<5%				
CGIA Land Use Classification	Cropland and Pasture, Confined Animal Operations				
Reach Summary Information					
Parameters	**Pond Trib**	**Barn Reach**	**Corn Reach**	**UT1**	
Length of Reach Post Construction (LF)	243	3,434	1,452	466	
Valley classification (Rosgen)	VIII	IV	IV	IV	
Drainage area (acres)	27	184	30	6	
NCDWQ stream identification score	20	36.5	21	23	
NCDWQ Water Quality Classification	WS-IV	WS-IV	WS-IV	WS-IV	
Morphological Description (Rosgen stream type)	B4/5	G4	G4	B4	
Evolutionary trend	B-C-F	G-F	G-F	-	
Underlying mapped soils	CsA	FeD2, FsE	CsA, FsE	FeD2	
Drainage class	well drained	well drained	well drained	well drained	
Soil Hydric status	not hydric	not hydric	not hydric	not hydric	
Slope	0.029	0.025	0.057	0.040 +/-	
FEMA classification	Not in SFHA	Not in SFHA	Not in SFHA	Not in SFHA	
Native vegetation community	Felsic Mesic Forest	Felsic Mesic Forest	Felsic Mesic Forest	Felsic Mesic Forest	
Percent composition of exotic invasive vegetation	0	0	0	0	
Wetland Summary Information					
Parameters	**Wetland 5**	**Wetland 6**			
Size of Wetland (acres)	0.03	0.06			
Wetland Type	riparian non-riverine	riparian non-riverine			
Mapped Soil Series	FeD2	FsE & FeD2			
Drainage class	well drained	well drained			
Soil Hydric Status	not hydric	not hydric			
Source of Hydrology	Toe Seep	Toe Seep			
Hydrologic Impairment	none	none			
Native vegetation community	Dist. Small Stream/ Narrow FP Forest	Dist. Small Stream/ Narrow FP Forest			
Percent composition of exotic invasive vegetation	0	0			

N/A Not-applicable

Appendix B
Visual Assessment Data

Moores Fork Stream Mitigation/DMS Project No. 94709



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Integrated Current Condition Plan View
DMS Project No. 94709

Figure 2

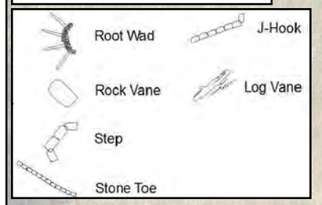
Moores Fork Stream Mitigation/DMS Project No. 94709

Legend

- Photo Point
- Crest Gauge
- Cross-Section
- Top of Bank
- Stream Restoration
- Stream Preservation
- Stream Enhancement Level I
- Stream Enhancement Level II
- Conservation Easement
- Wetland
- Vegetation Plot - Criteria Met
- Vegetation Plot - Criteria Not Met

Structures

- Constructed Riffle
- Brushmat
- Geolift
- Debris Plug
- Bridge
- Gully Stabilization
- Facines



N

0 125 250 500 Feet

Drawn by: KAY 9.6.16; CEC Project# 644;
Aerial Photograph (NCCGIA) 2015

Moores Reach 1
Moores Reach 2
Moores Reach 3
Corn Reach 1
Corn Reach 2
Pond Tributary
UT8

VP1 = 480/480
VP2
VP4
VP5 = 560/560
VP6 = 840/840
VP7 = 560/560

PP3 PP4 PP5 PP6 PP7 PP16 PP17 PP18 PP19 PP20 PP21 PP22 PP23 PP24 PP25 PP26 PP34 PP35 PP36

10+00 11+00 12+00 18+00 19+00 20+ 36+00 37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00 46+00 47+00 48+00 49+00 50+00 51+00 52+00 53+

M4 M5 M6 M7

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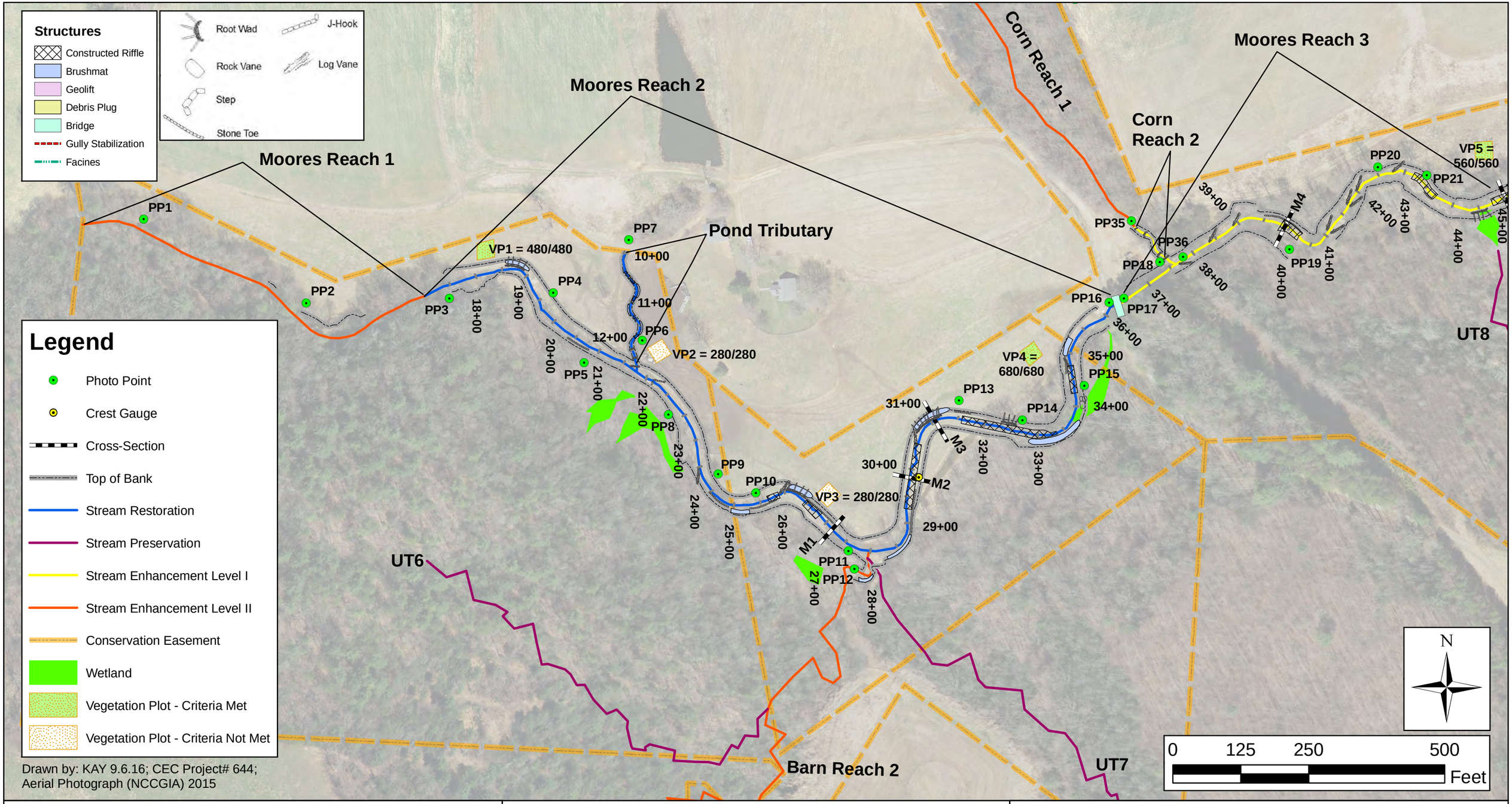
WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806

ClearWater
32 Clayton Street
Asheville, North Carolina 28801

Integrated Current Condition Plan View
DMS Project No. 94709

Figure 2 Sheet 1

Moores Fork Stream Mitigation/DMS Project 94709



Drawn by: KAY 9.6.16; CEC Project# 644;
Aerial Photograph (NCCGIA) 2015

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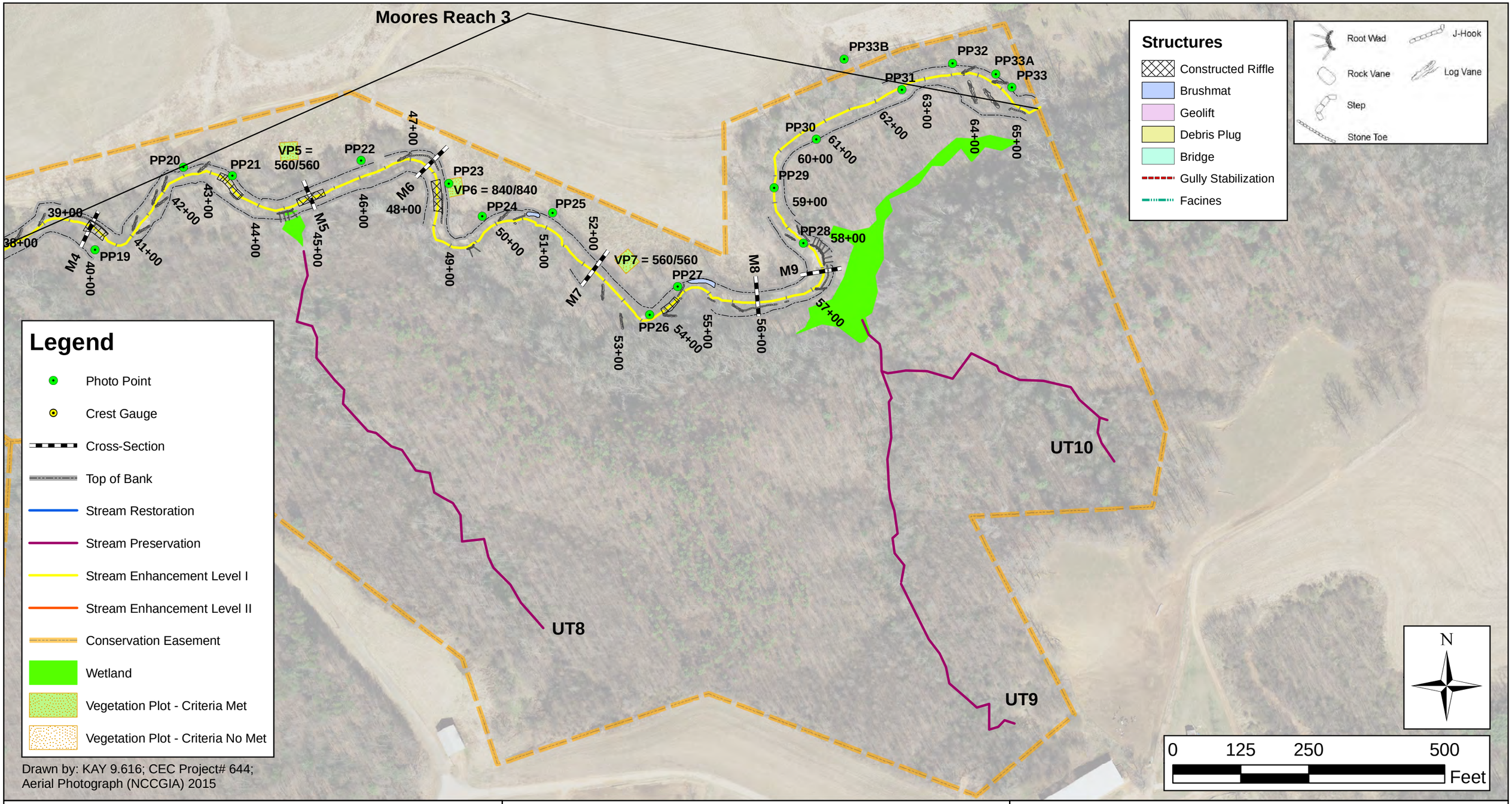
Asheville, North Carolina 28801

Integrated Current Condition Plan View
DMS Project No. 94709
Figure 2 Sheet 2

Moores Fork Stream Mitigation/DMS Project 94709



Drawn by: KAY 9.616; CEC Project# 644;
Aerial Photograph (NCCGIA) 2015

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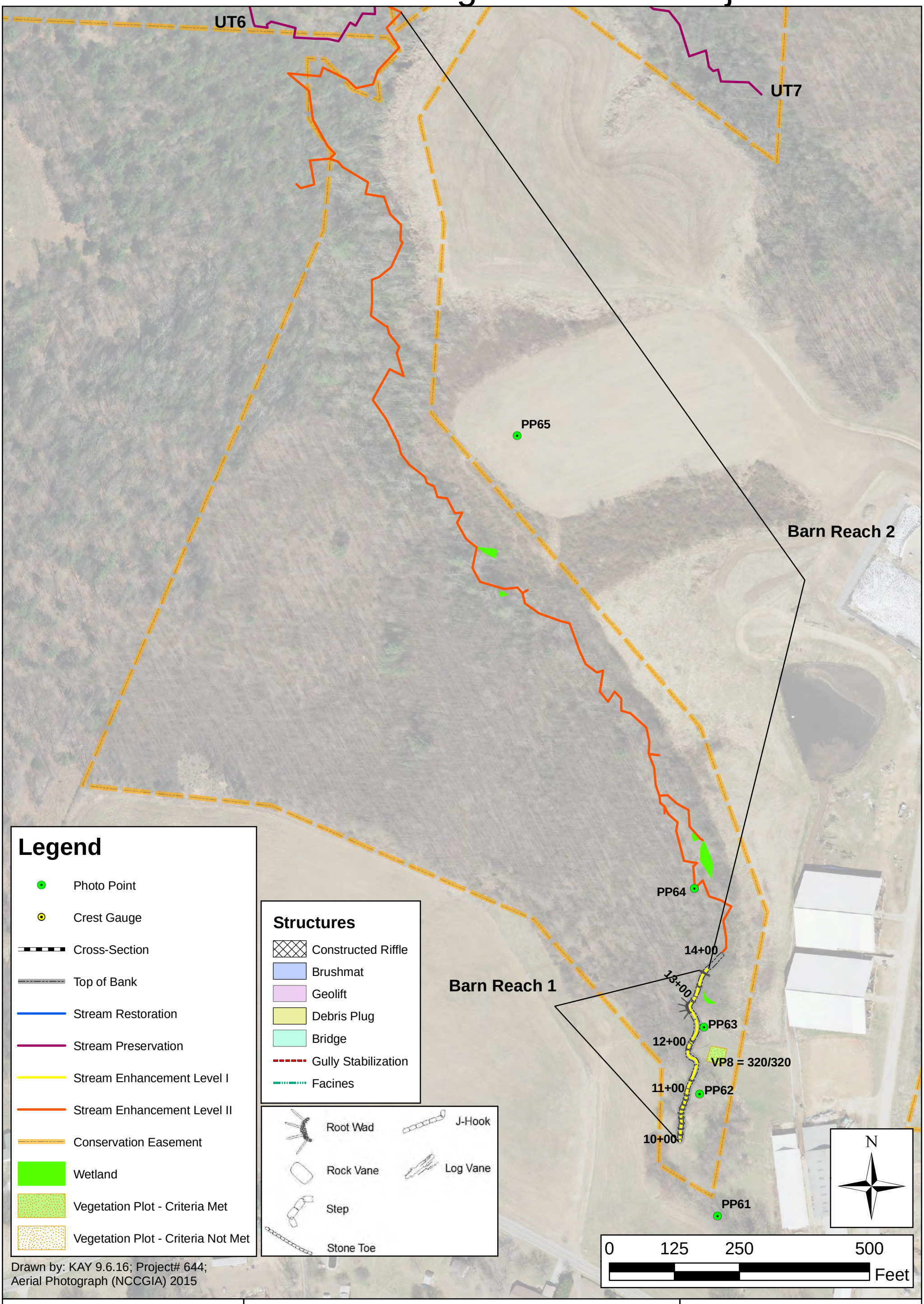
Integrated Current Condition Plan View
DMS Project No. 94709
Figure 2 Sheet 3

Moores Fork Stream Mitigation/DMS Project 94709



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Asheville, NC 28806

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Asheville, North Carolina 28801

Integrated Current Condition
Plan View
DMS Project No. 94709
Figure 2 Sheet 4

Moores Fork Stream Mitigation/DMS Project 94709

Legend

- Photo Point
- Crest Gauge
- Cross-Section
- Top of Bank
- Stream Restoration
- Stream Preservation
- Stream Enhancement Level I
- Stream Enhancement Level II
- Conservation Easement
- Wetland
- Vegetation Plot - Criteria Met
- Vegetation Plot - Criteria Not Met

Structures

- Constructed Riffle
- Brushmat
- Geolift
- Debris Plug
- Bridge
- Gully Stabilization
- Facines

- Root Wad
- J-Hook
- Rock Vane
- Log Vane
- Step
- Stone Toe

Drawn by: KAY 9.6.16; Project# 644;
Aerial Photograph (NCCGIA) 2015

Cow Tributary 2
VP12 = 480/480
PP46
PP45
PP44
Cow Tributary 1
PP43
PP40
ST6
PP41
34+00
PP50
ST5
29+00
30+00
PP42
33+00
32+00
PP47
31+00
PP49
28+00
PP48
ST4
PP51
27+00
PP52
ST3
26+00
25+00
VP9 =
640/640
PP53
24+00
23+00
PP54
22+00
21+00
20+00
19+00
Silage Reach 2
PP56
18+00
PP55
PP57
17+00
16+00
PP58
15+00
14+00
ST2
ST1
13+00
UT1
PP67
12+00
Silage Reach 1
PP59
11+00
PP60
10+00
PP66

N

0 125 250 500
Feet

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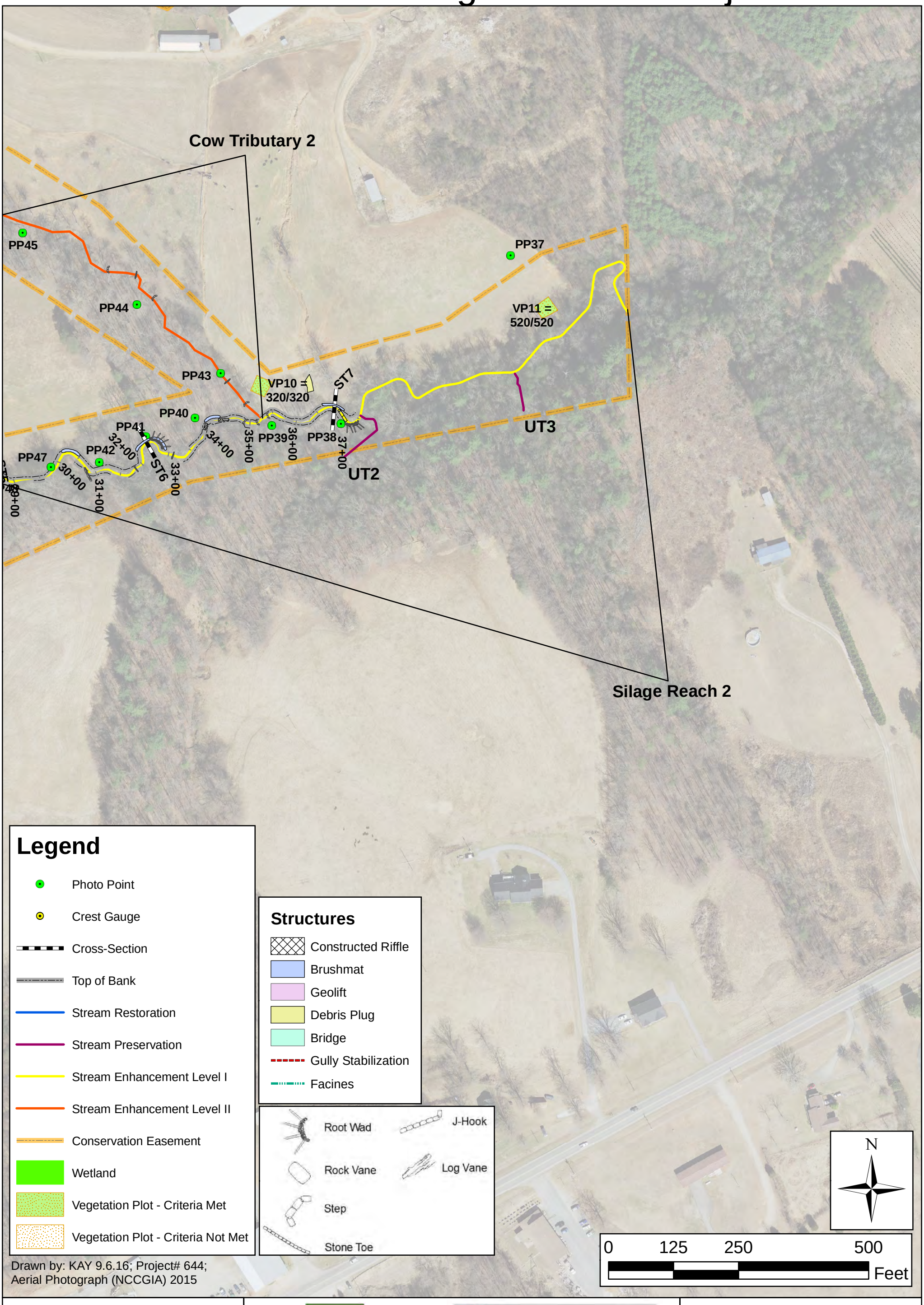
Integrated Current Condition
Plan View
DMS Project No. 94709
Figure 2 Sheet 5

Moores Fork Stream Mitigation/DMS Project 94709



Surry County,
North Carolina

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Raleigh, NC 27699-1652

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Integrated Current Condition
Plan View
DMS Project No. 94709
Figure 2 Sheet 6

Photo Point 1 – Moores Reach 1, Upstream

Photo Point 2 – Moores Reach 1, Downstream

Photo Point 3 – Moores Reach 2, Downstream

Photo Point 4 – Moores Reach 2, Downstream

Photo Point 5 – Moores Reach 2, Downstream

Photo Point 6 – Pond Tributary, Downstream

Photo Point 7 – Pond Tributary, Downstream

Photo Point 8 – Moores Reach 2, Downstream

Photo Point 9 – Moores Reach 2, Downstream

Photo Point 10 – Moores Reach 2, Downstream

Photo Point 11 – Moores Reach 2, Downstream

Photo Point 12 – Barn Reach 2, Upstream

Photo Point 13 – Moores Reach 2, Downstream

Photo Point 14 – Moores Reach 2, Downstream

Photo Point 15 – Moores Reach 2, Downstream

Photo Point 16 – Moores Reach 2, Upstream

Photo Point 17 – Moores Reach 3, Downstream

Photo Point 18 – Moores Reach 3, Downstream

Photo Point 19 – Moores Reach 3, Downstream

Photo Point 20 – Moores Reach 3, Downstream

Photo Point 21 – Moores Reach 3, Downstream

Photo Point 22 – Moores Reach 3, Downstream

Photo Point 23 – Moores Reach 3, Downstream

Photo Point 24 – Moores Reach 3, Downstream

Photo Point 25 – Moores Reach 3, Downstream

Photo Point 26 – Moores Reach 3, Downstream

Photo Point 27 – Moores Reach 3, Downstream

Photo Point 28 – Moores Reach 3, Downstream

Photo Point 29 – Moores Reach 3, Downstream

Photo Point 30 – Moores Reach 3, Downstream

Photo Point 31 – Moores Reach 3, Downstream

Photo Point 32 – Moores Reach 3, Downstream

Photo Point 33 –Moores Reach 3, Downstream

Photo Point 33a – Moores Reach 3, Upstream

Photo Point 33b – Moores Reach 3, Downstream

Photo Point 34 – Corn Reach 1, Downslope

Photo Point 35 – Corn Reach 2, Downstream

Photo Point 36 – Corn Reach 2, Upstream

Photo Point 37 – Silage Reach 2, Downslope

Photo Point 38 – Silage Reach 2, Downstream

Photo Point 39 – Silage Reach 2, Upstream

Photo Point 40 – Silage Reach 2, Downstream

Photo Point 41 – Silage Reach 2, Downstream

Photo Point 42 – Silage Reach 2, Downstream

Photo Point 43 – Cow Tributary 2, Downstream

Photo Point 44 – Cow Tributary 2, Downstream

Photo Point 45 – Cow Tributary 2, Downstream

Photo Point 46 – Cow Tributary 2, Upstream

Photo Point 47 – Silage Reach 2, Downstream

Photo Point 48 – Silage Reach 2, Upstream

Photo Point 49 – Cow Tributary 1, Upstream

Photo Point 50 – Cow Tributary 1, Upstream

Photo Point 51 – Silage Reach 2, Downstream

Photo Point 52 – Silage Reach 2, Upstream

Photo Point 53 – Silage Reach 2, Downstream

Photo Point 54 – Silage Reach 2, Upstream

Photo Point 55 – UT1, Upstream

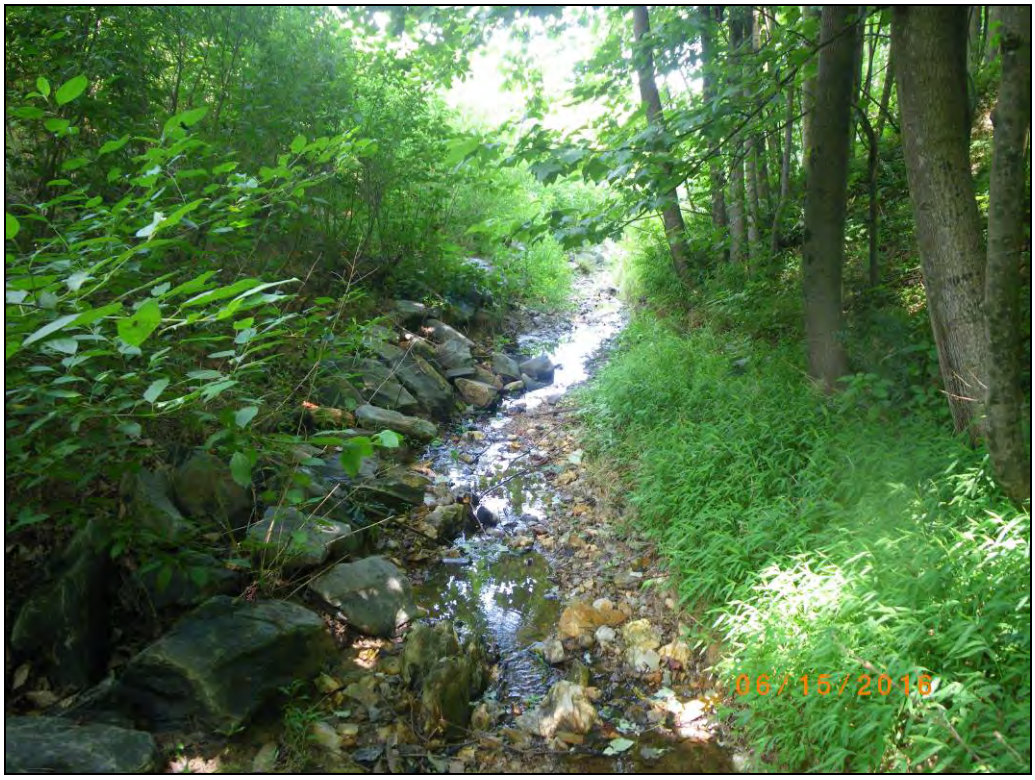


Photo Point 56 – Silage Reach 1, Downstream

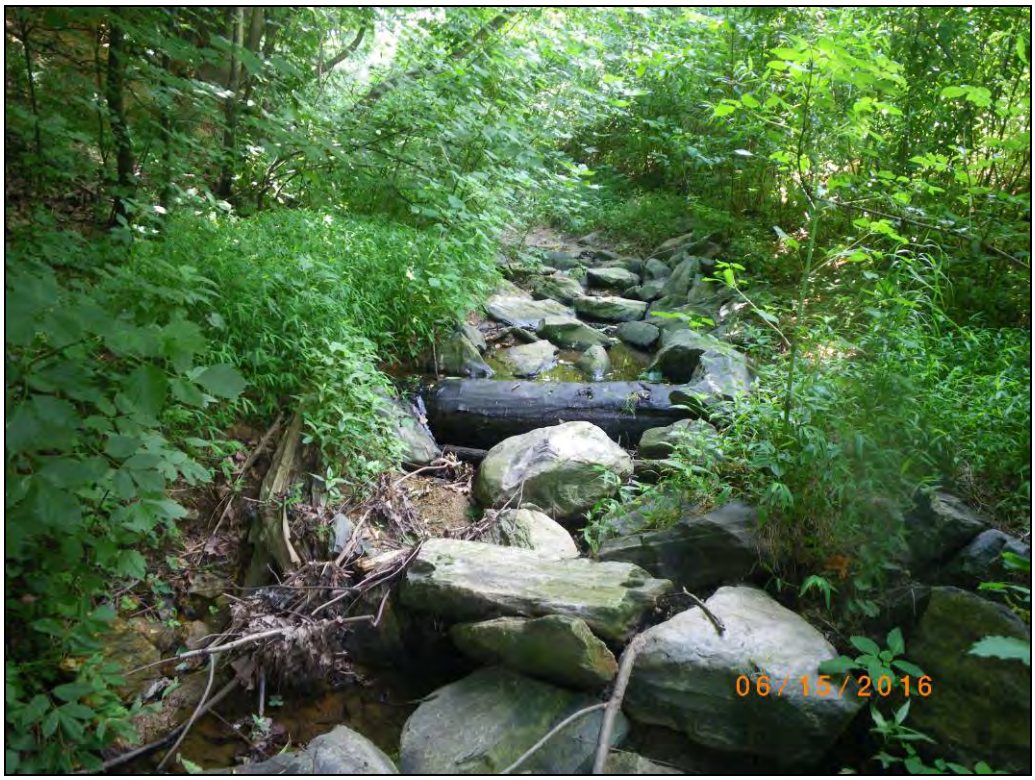


Photo Point 57 – Silage Reach 1, Upstream

Photo Point 58 – Silage Reach 1, Upstream

Photo Point 59 – Silage Reach 1, Downstream

Photo Point 60 – Silage Reach 1, Downstream

Photo Point 61 – Barn Reach 1, Downslope

Photo Point 62 – Barn Reach 1, Downstream

Photo Point 63 – Barn Reach 1, Downstream

Photo Point 64 – Barn Reach 2, Downstream

Photo Point 65 – Barn Reach 2, Downslope

Photo Point 66 – Silage Reach 1, Upslope

Photo Point 67 – UT1, Downstream

Appendix C
Vegetation Plot Data

Table 5. Vegetation Plot Results (All Stems)			Current Data (MY0 2016)																						Annual Means	
	Common		Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12		MY0 (2016)	
	Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Fraxinus pennsylvanica	Green ash	Tree	0	0	0	0	0	0	8	8	2	2	0	0	2	2	0	0	0	0	0	0	0	0	2	2	14	14
Diosypyros occidentalis	Persimmon	Tree	2	2	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3	3	1	1	6	6	14	14
Liriodendron tulipifera	Tulip poplar	Tree	0	0	0	0	3	3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	4	4
Nyssa sylvatica	Black gum	Tree	0	0	0	0	0	0	0	0	0	0	2	2	4	4	3	3	2	2	3	3	5	5	0	0	19	19
Platanus occidentalis	American sycamore	Tree	0	0	0	0	1	1	4	4	9	9	4	4	7	7	0	0	0	0	0	0	0	0	1	1	26	26
Quercus lyrata	Overcup oak	Tree	7	7	4	4	0	0	2	2	0	0	3	3	0	0	4	4	6	6	0	0	0	0	3	3	29	29
Quercus montana	Chestnut oak	Tree	0	0	1	1	3	3	0	0	0	0	10	10	1	1	0	0	2	2	0	0	5	5	0	0	22	22
Quercus nigra	Water oak	Tree	3	3	1	1	0	0	1	1	1	1	0	0	0	0	1	1	5	5	2	2	0	0	0	0	14	14
Quercus phellos	Willow oak	Tree	0	0	0	0	0	0	2	2	2	2	0	0	0	0	0	0	1	1	0	0	2	2	0	0	7	7
	Plot area (acres)		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.30	
	Species count		3	3	4	4	3	3	5	5	4	4	6	6	4	4	3	3	5	5	3	3	4	4	4	4	9	9
	Stem Count		12	12	7	7	7	7	17	17	14	14	21	21	14	14	8	8	16	16	8	8	13	13	12	12	149	149
	Stems per Acre		480	480	280	280	280	280	680	680	560	560	840	840	560	560	320	320	640	640	320	320	520	520	480	480	497	497

Meets Success Criteria

Fails to Meet Interim Success Criteria

Type = Tree, Shrub, Livestake

P = Planted

T = Total Planted and Volunteer

Vegetation Monitoring Plot 1
Monitoring Year 0 – June 1, 2016

Vegetation Monitoring Plot 2
Monitoring Year 0 – June 1, 2016

Vegetation Monitoring Plot 3
Monitoring Year 0 – June 1, 2016

Vegetation Monitoring Plot 4
Monitoring Year 0 – June 1, 2016

Vegetation Monitoring Plot 5
Monitoring Year 0 – June 1, 2016

Vegetation Monitoring Plot 6
Monitoring Year 0 – June 1, 2016

Vegetation Monitoring Plot 7
Monitoring Year 0 – June 1, 2016

Vegetation Monitoring Plot 8
Monitoring Year 0 – June 2, 2016

Vegetation Monitoring Plot 9
Monitoring Year 0 – June 2, 2016

Vegetation Monitoring Plot 10
Monitoring Year 0 – June 2, 2016

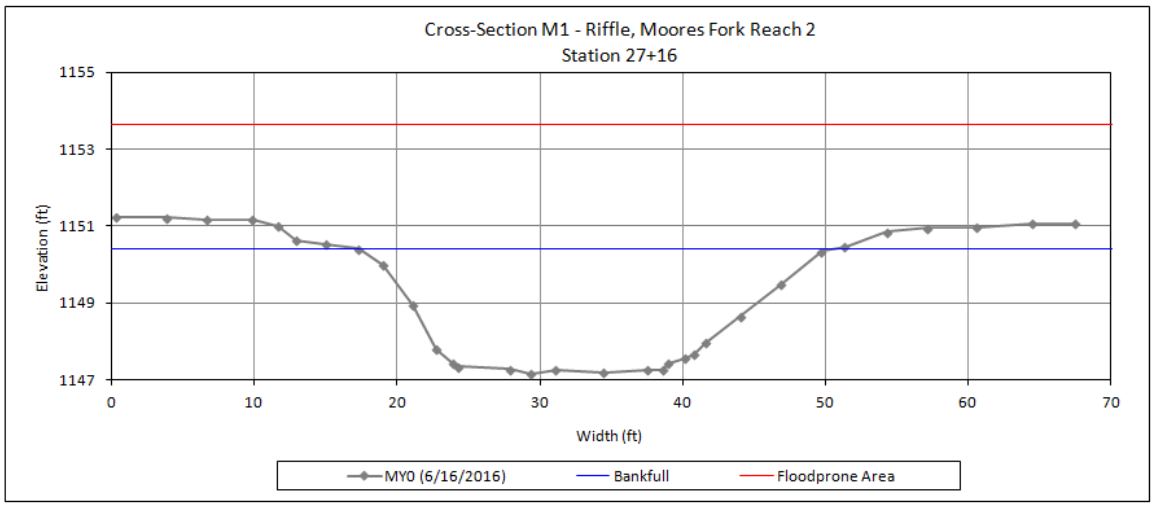
Vegetation Monitoring Plot 11
Monitoring Year 0 – June 2, 2016

Vegetation Monitoring Plot 12
Monitoring Year 0 – June 2, 2016

Appendix D
Stream Survey Data

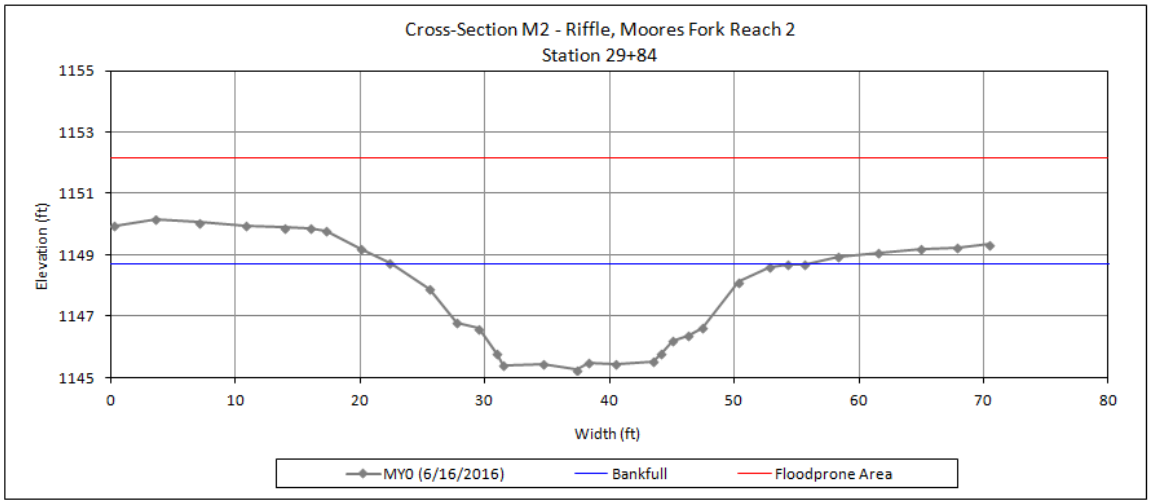
Cross-Section M1 – Downstream

Cross-Section M1 – Upstream



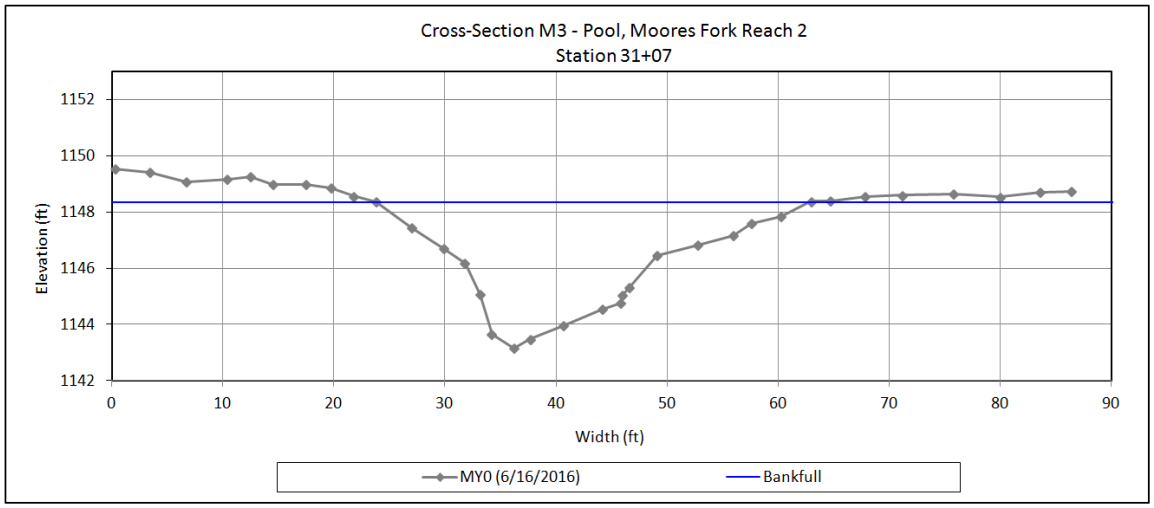
Cross-Section M2 – Downstream

Cross-Section M2 – Upstream



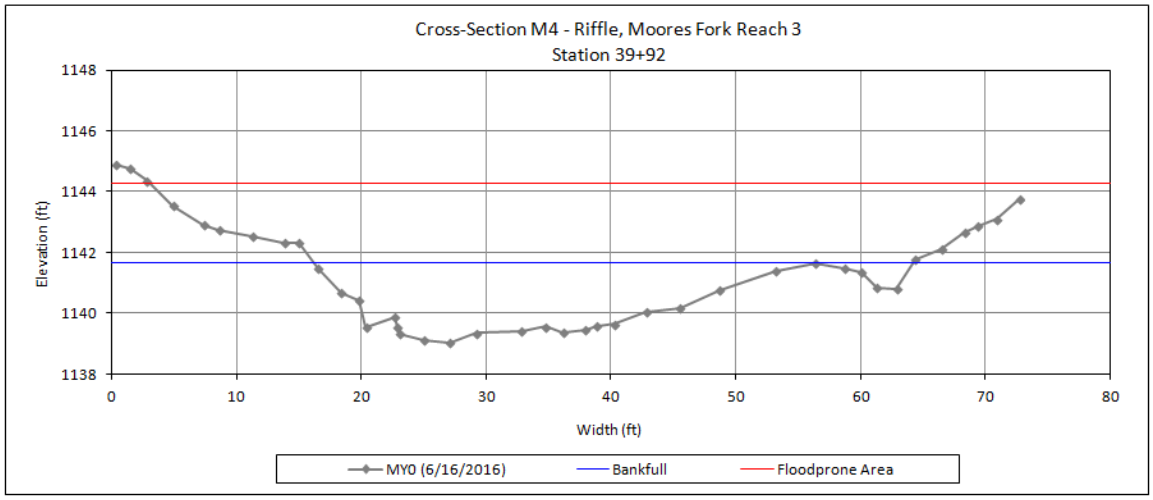
Cross-Section M3 – Downstream

Cross-Section M3 – Upstream



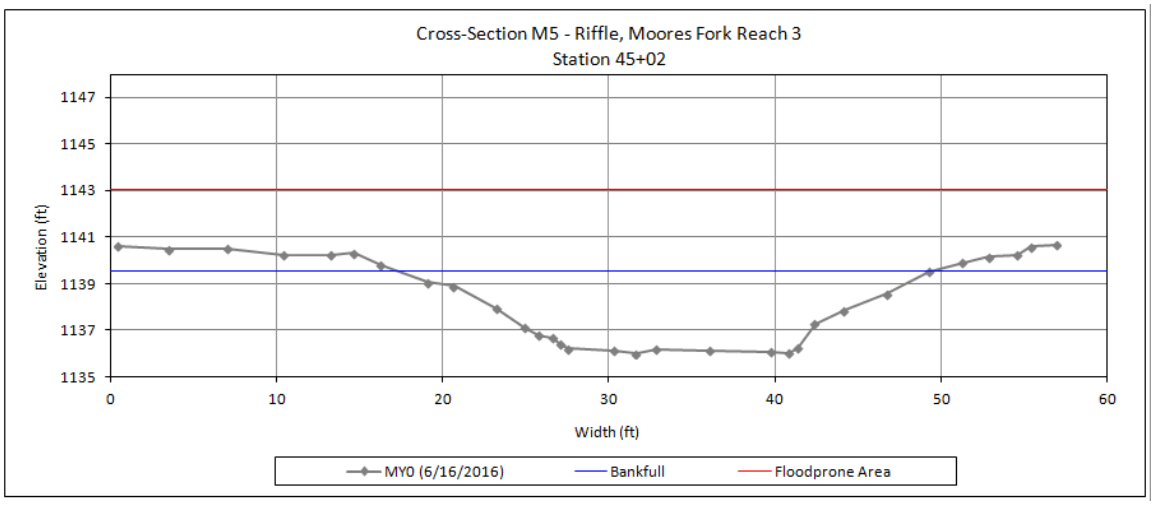
Cross-Section M4 – Downstream

Cross-Section M4 – Upstream



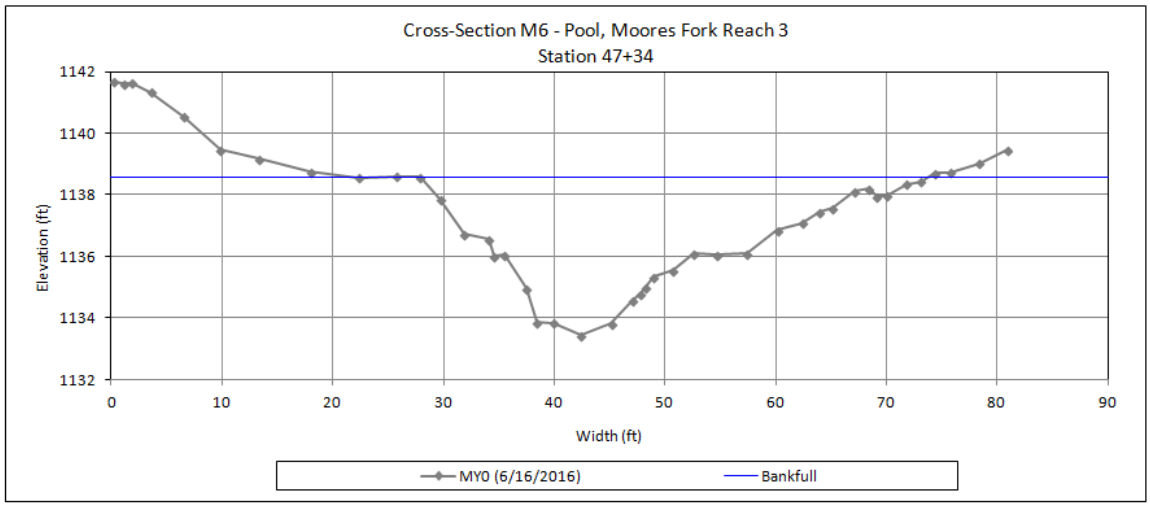
Cross-Section M5 – Downstream

Cross-Section M5 – Upstream



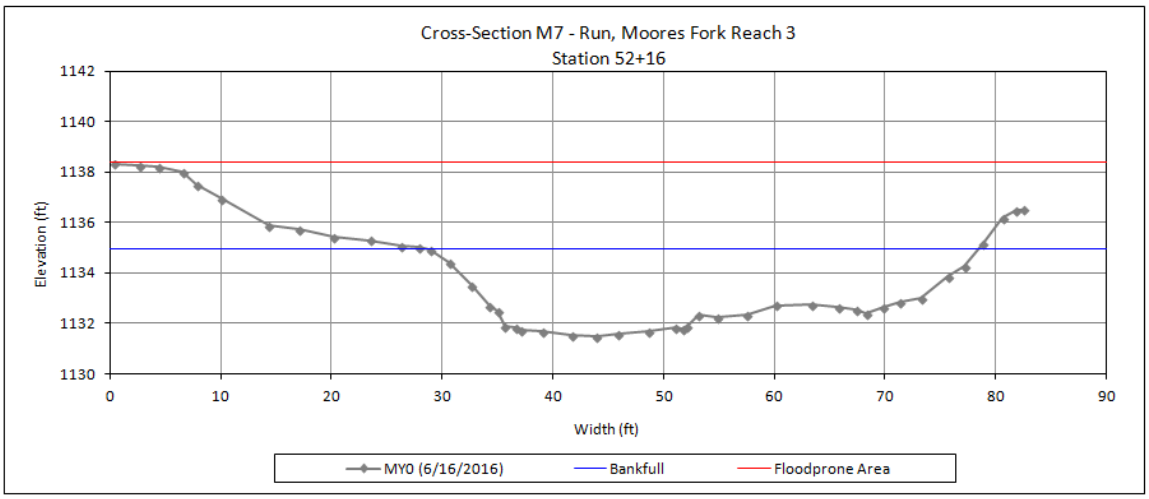
Cross-Section M6 – Downstream

Cross-Section M6 – Upstream



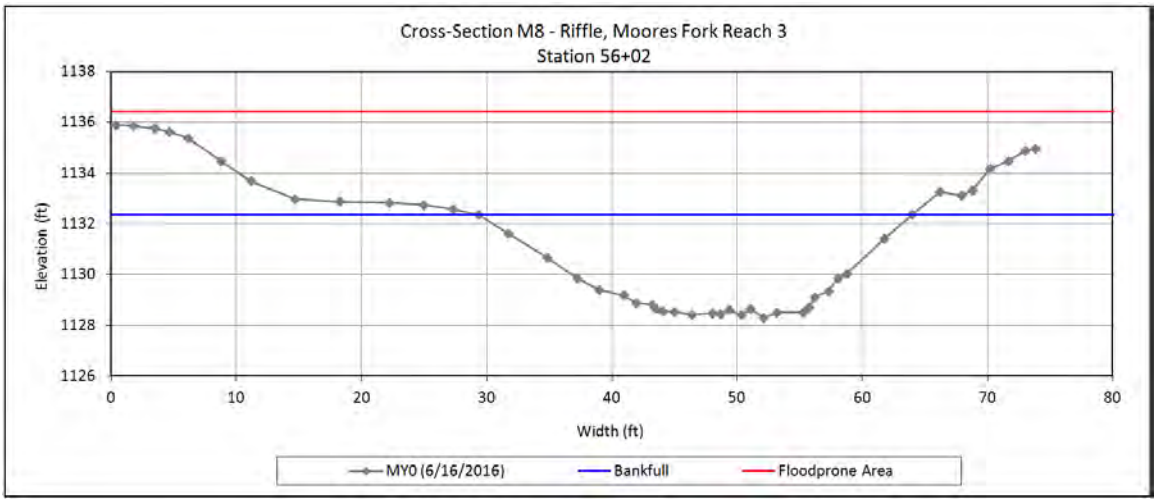
Cross-Section M7 – Downstream

Cross-Section M7 – Upstream



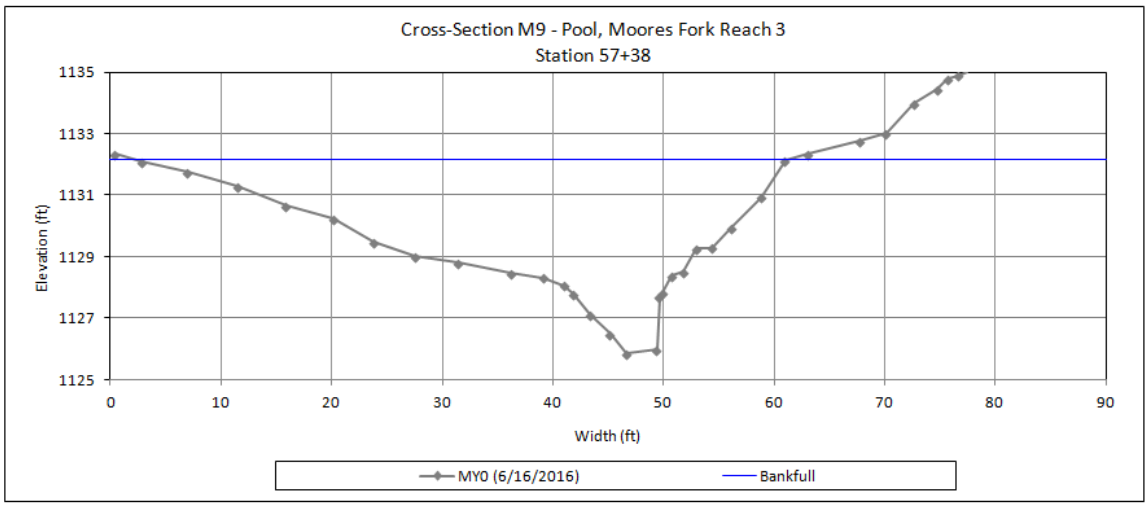
Cross-Section M8 – Downstream

Cross-Section M8 – Upstream



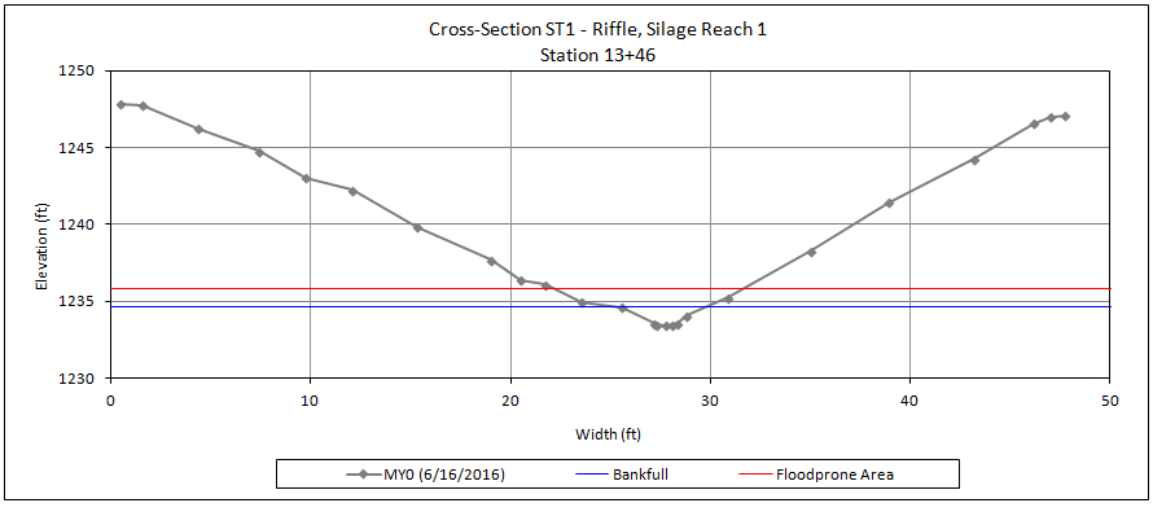
Cross-Section M9 – Downstream

Cross-Section M9 – Upstream



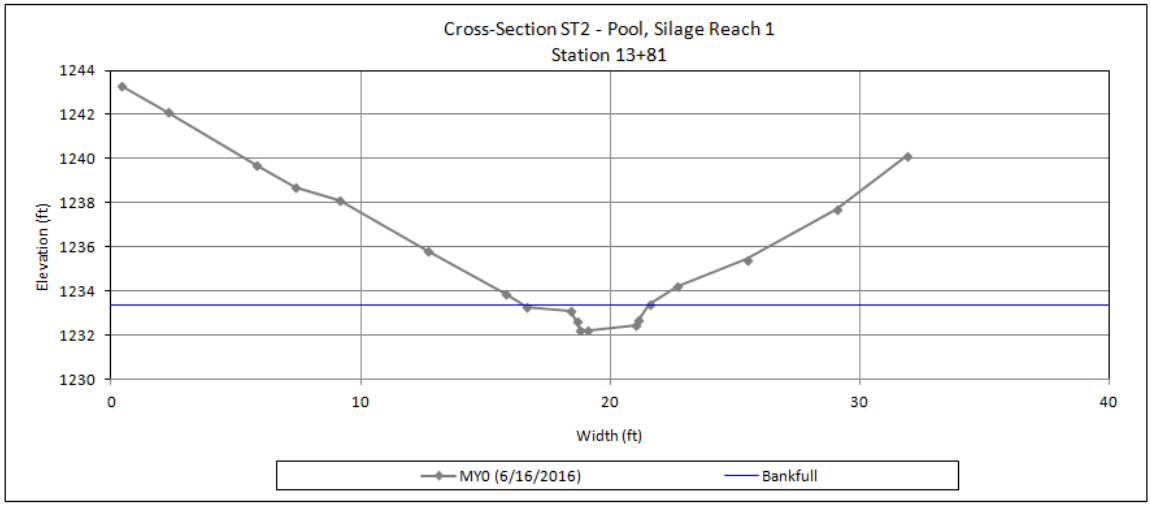
Cross-Section ST1 – Downstream

Cross-Section ST1 – Upstream



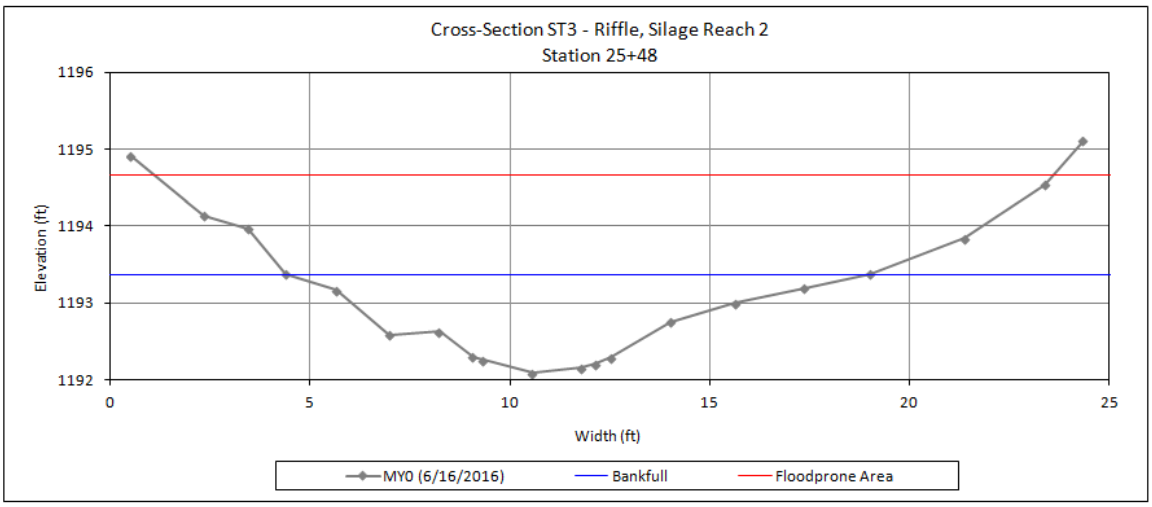
Cross-Section ST2 – Downstream

Cross-Section ST2 – Upstream



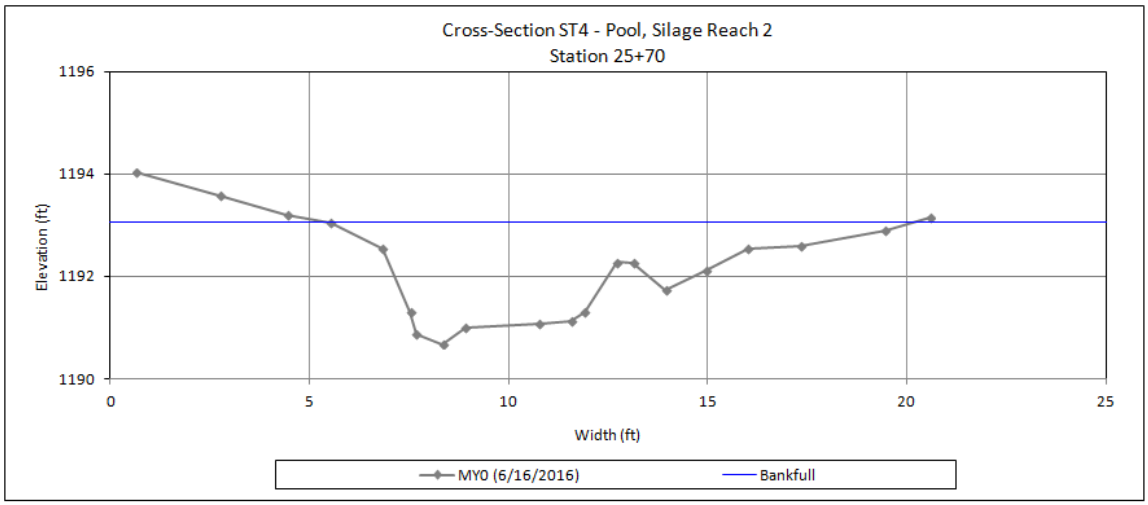
Cross-Section ST3 – Downstream

Cross-Section ST3 – Upstream



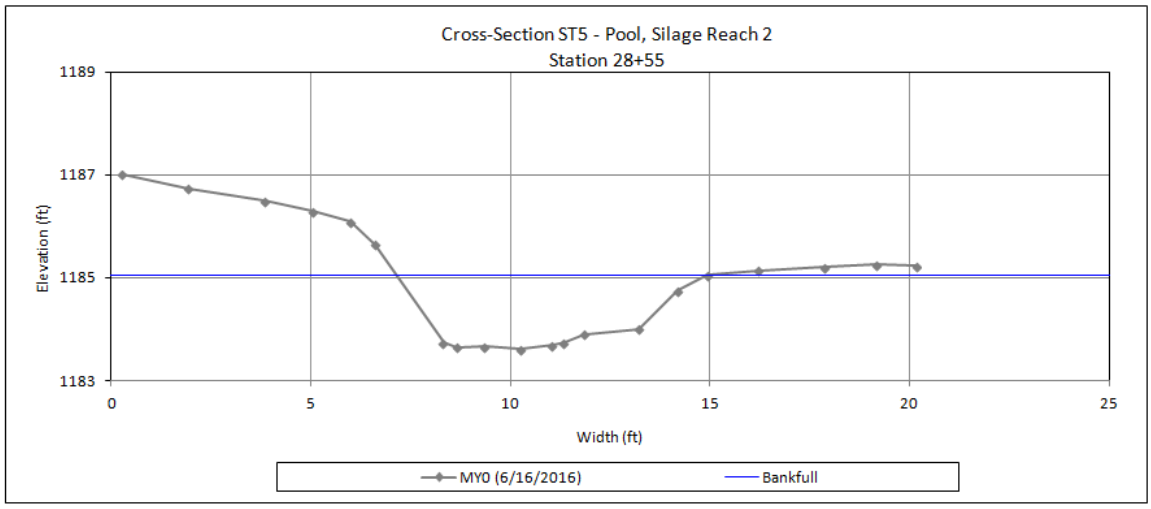
Cross-Section ST4 – Downstream

Cross-Section ST4 – Upstream



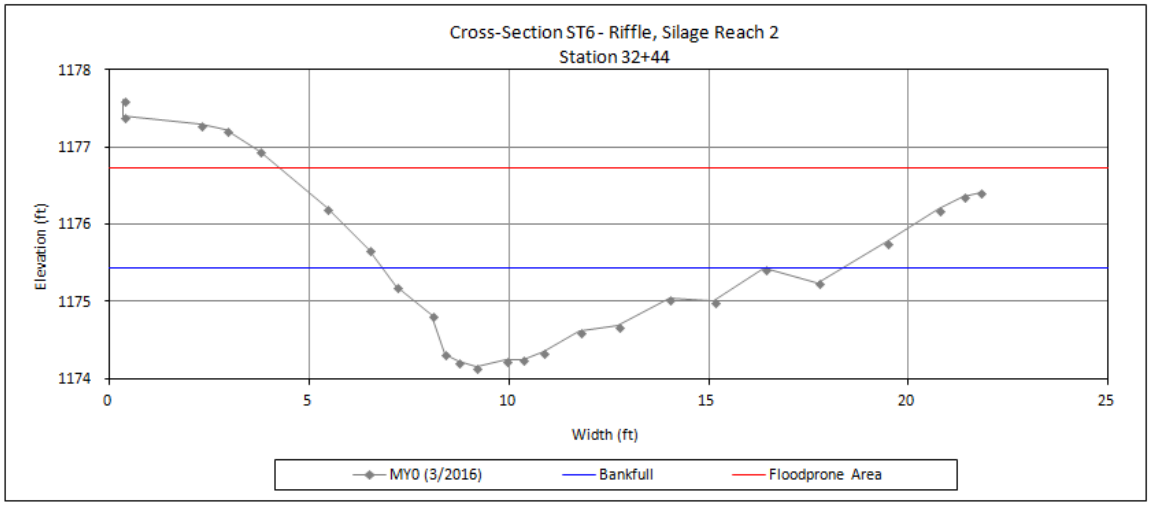
Cross-Section ST5 – Downstream

Cross-Section ST5 – Upstream



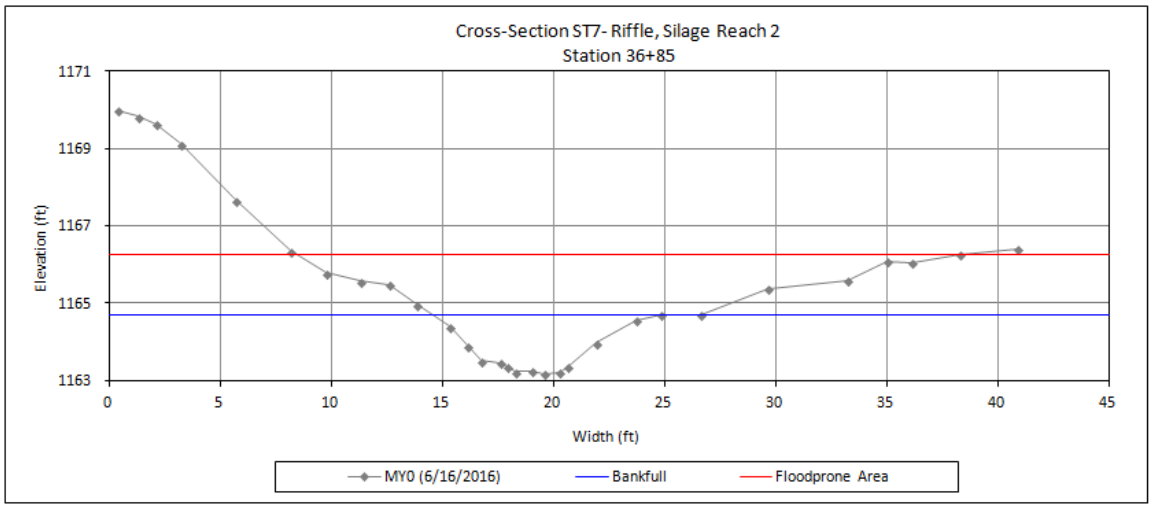
Cross-Section ST6 – Downstream

Cross-Section ST6 – Upstream



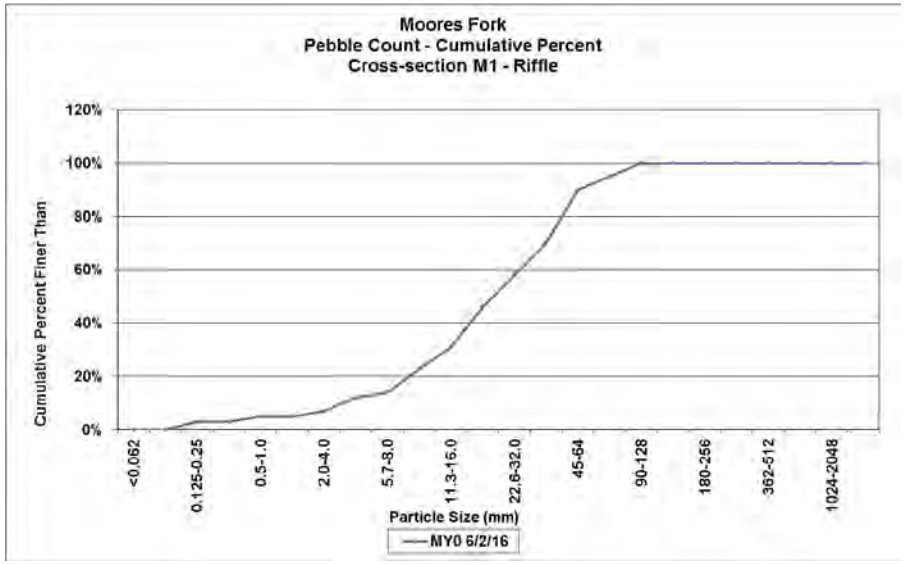
Cross-Section ST7 – Downstream

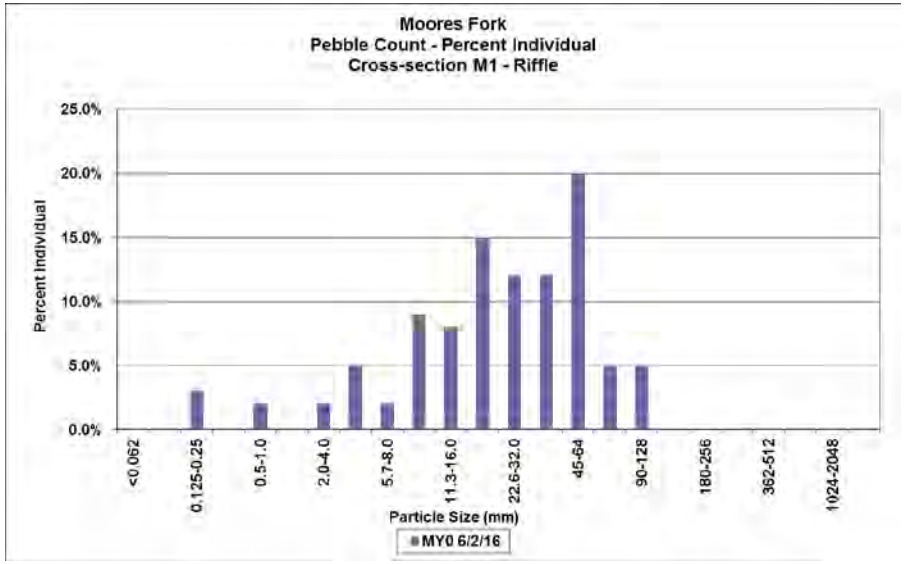
Cross-Section ST7 – Upstream



Moores Fork Mitigation / 94709 Cross Section M1 - Riffle Moores Reach 2				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	3	3.0%	3%
medium sand	0.25-0.5		0.0%	3%
coarse sand	0.5-1.0	2	2.0%	5%
very coarse sand	1.0-2.0		0.0%	5%
very fine gravel	2.0-4.0	2	2.0%	7%
fine gravel	4.0-5.7	5	5.0%	12%
fine gravel	5.7-8.0	2	2.0%	14%
medium gravel	8.0-11.3	9	9.0%	23%
medium gravel	11.3-16.0	8	8.0%	31%
coarse gravel	16.0-22.6	15	15.0%	46%
coarse gravel	22.6-32.0	12	12.0%	58%
very coarse gravel	32-45	12	12.0%	70%
very coarse gravel	45-64	20	20.0%	90%
small cobble	64-90	5	5.0%	95%
medium cobble	90-128	5	5.0%	100%
large cobble	128-180		0.0%	100%
very large cobble	180-256		0.0%	100%
small boulder	256-362		0.0%	100%
small boulder	362-512		0.0%	100%
medium boulder	512-1024		0.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

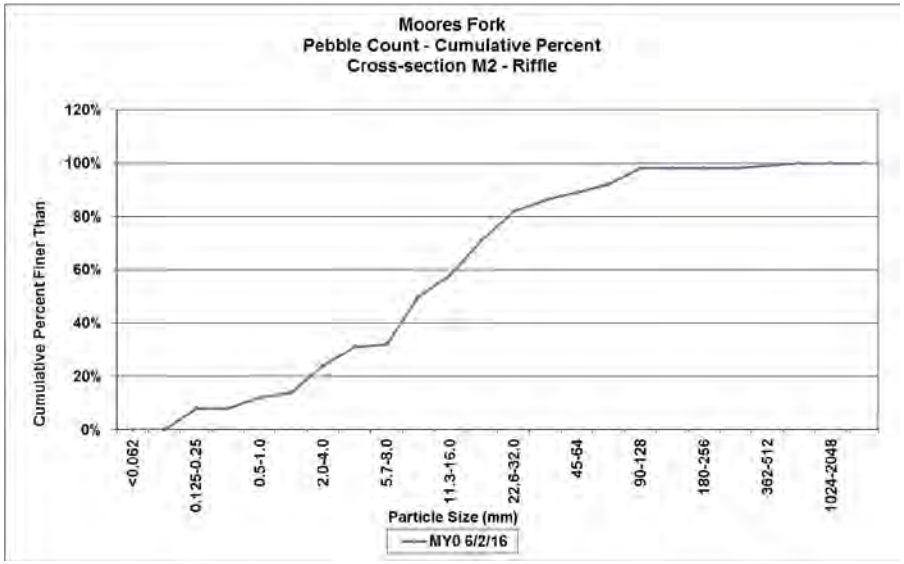
Summary Data	
D50	**25**
D84	**58**
D95	**90**

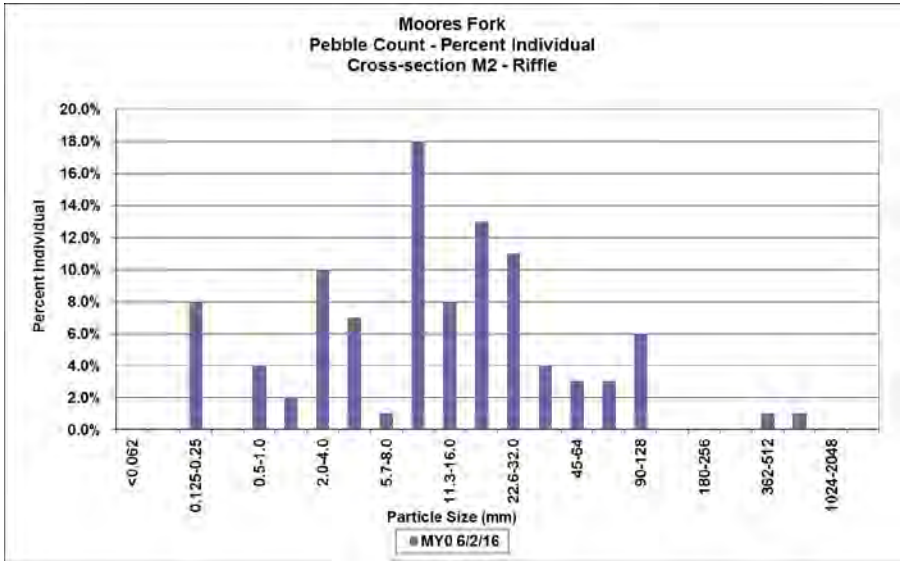




Moores Fork Stream Mitigation / 94709 Cross Section M2 - Riffle Moores Reach 2				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	8	8.0%	8%
medium sand	0.25-0.5		0.0%	8%
coarse sand	0.5-1.0	4	4.0%	12%
very coarse sand	1.0-2.0	2	2.0%	14%
very fine gravel	2.0-4.0	10	10.0%	24%
fine gravel	4.0-5.7	7	7.0%	31%
fine gravel	5.7-8.0	1	1.0%	32%
medium gravel	8.0-11.3	18	18.0%	50%
medium gravel	11.3-16.0	8	8.0%	58%
coarse gravel	16.0-22.6	13	13.0%	71%
coarse gravel	22.6-32.0	11	11.0%	82%
very coarse gravel	32-45	4	4.0%	86%
very coarse gravel	45-64	3	3.0%	89%
small cobble	64-90	3	3.0%	92%
medium cobble	90-128	6	6.0%	98%
large cobble	128-180		0.0%	98%
very large cobble	180-256		0.0%	98%
small boulder	256-362		0.0%	98%
small boulder	362-512	1	1.0%	99%
medium boulder	512-1024	1	1.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

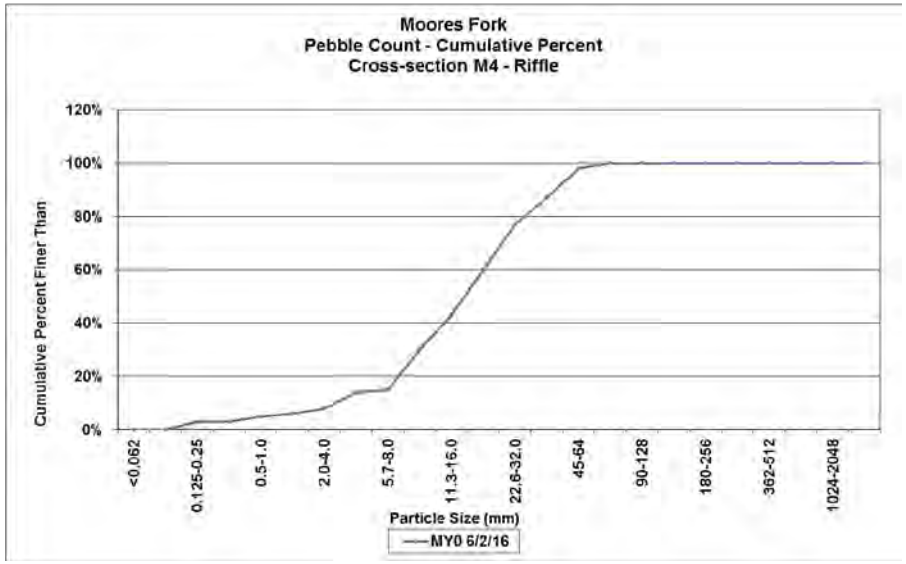
Summary Data	
D50	**11**
D84	**38**
D95	**110**

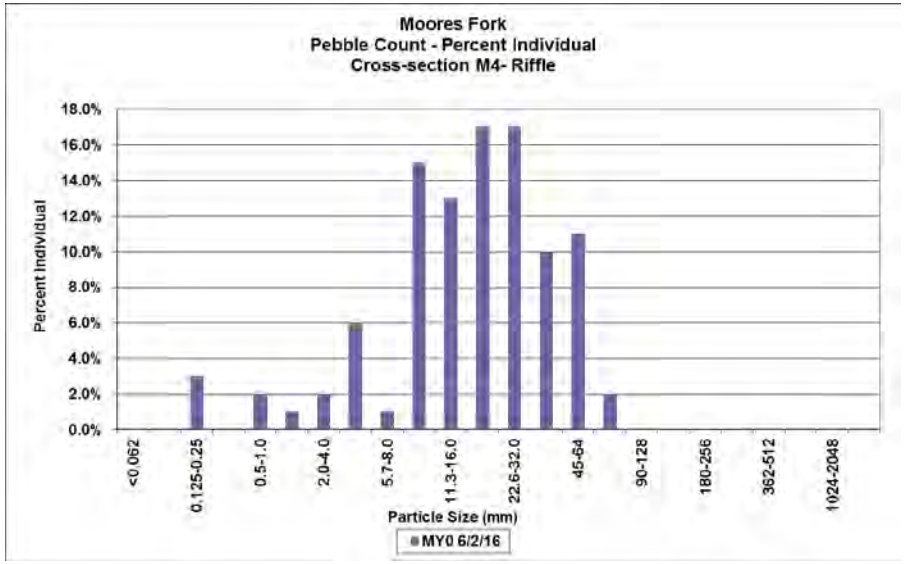




Moores Fork Stream Mitigation / 94709 Cross Section M4 - Riffle Moores Reach 3				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	3	3.0%	3%
medium sand	0.25-0.5		0.0%	3%
coarse sand	0.5-1.0	2	2.0%	5%
very coarse sand	1.0-2.0	1	1.0%	6%
very fine gravel	2.0-4.0	2	2.0%	8%
fine gravel	4.0-5.7	6	6.0%	14%
fine gravel	5.7-8.0	1	1.0%	15%
medium gravel	8.0-11.3	15	15.0%	30%
medium gravel	11.3-16.0	13	13.0%	43%
coarse gravel	16.0-22.6	17	17.0%	60%
coarse gravel	22.6-32.0	17	17.0%	77%
very coarse gravel	32-45	10	10.0%	87%
very coarse gravel	45-64	11	11.0%	98%
small cobble	64-90	2	2.0%	100%
medium cobble	90-128		0.0%	100%
large cobble	128-180		0.0%	100%
very large cobble	180-256		0.0%	100%
small boulder	256-362		0.0%	100%
small boulder	362-512		0.0%	100%
medium boulder	512-1024		0.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

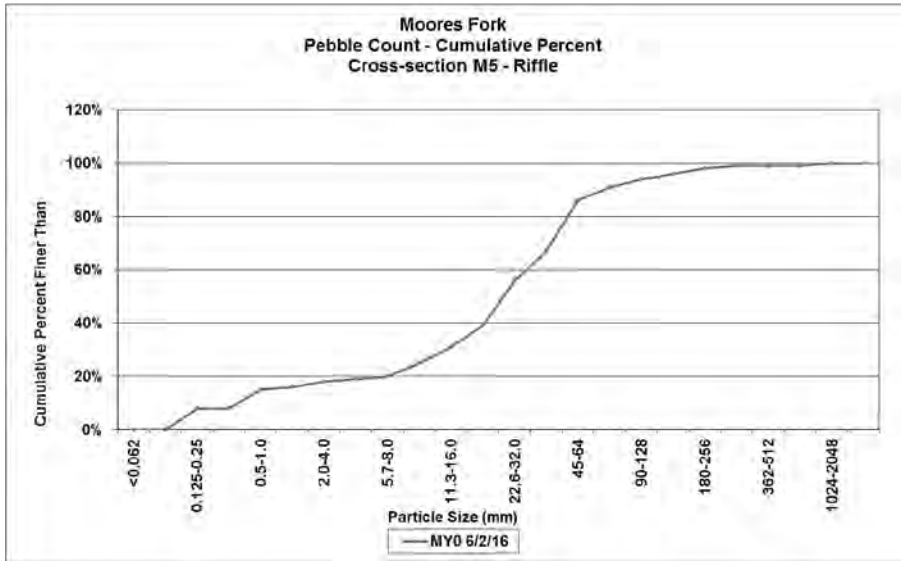
Summary Data	
D50	**18**
D84	**41**
D95	**58**

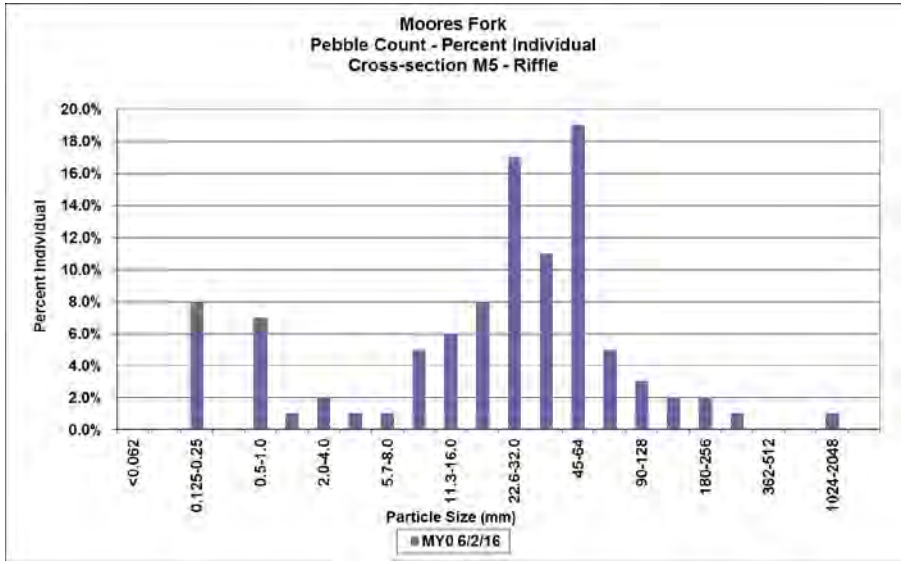




Moores Fork Stream Mitigation / 94709 Cross Section M5 - Riffle Moores Reach 3				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	8	8.0%	8%
medium sand	0.25-0.5		0.0%	8%
coarse sand	0.5-1.0	7	7.0%	15%
very coarse sand	1.0-2.0	1	1.0%	16%
very fine gravel	2.0-4.0	2	2.0%	18%
fine gravel	4.0-5.7	1	1.0%	19%
fine gravel	5.7-8.0	1	1.0%	20%
medium gravel	8.0-11.3	5	5.0%	25%
medium gravel	11.3-16.0	6	6.0%	31%
coarse gravel	16.0-22.6	8	8.0%	39%
coarse gravel	22.6-32.0	17	17.0%	56%
very coarse gravel	32-45	11	11.0%	67%
very coarse gravel	45-64	19	19.0%	86%
small cobble	64-90	5	5.0%	91%
medium cobble	90-128	3	3.0%	94%
large cobble	128-180	2	2.0%	96%
very large cobble	180-256	2	2.0%	98%
small boulder	256-362	1	1.0%	99%
small boulder	362-512		0.0%	99%
medium boulder	512-1024		0.0%	99%
large boulder	1024-2048	1	1.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

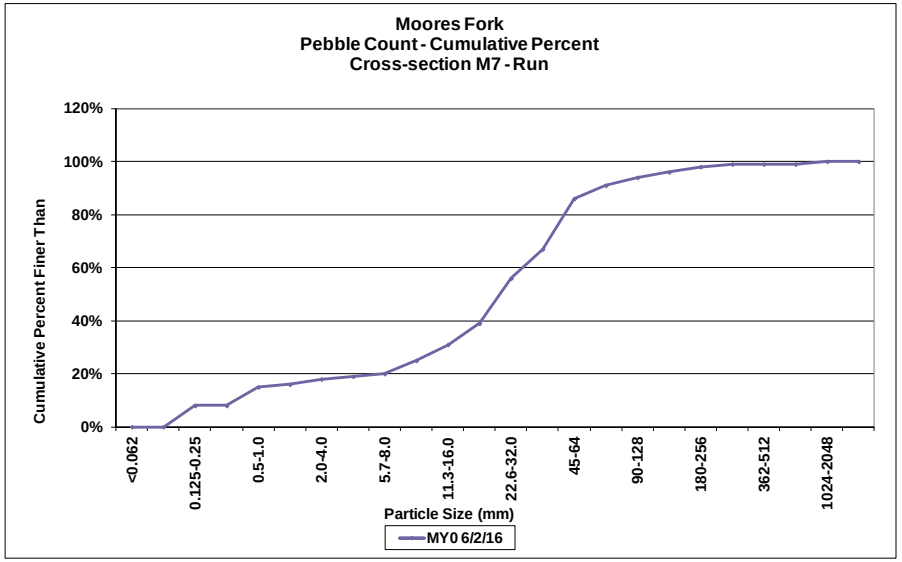
Summary Data	
D50	**28**
D84	**62**
D95	**150**

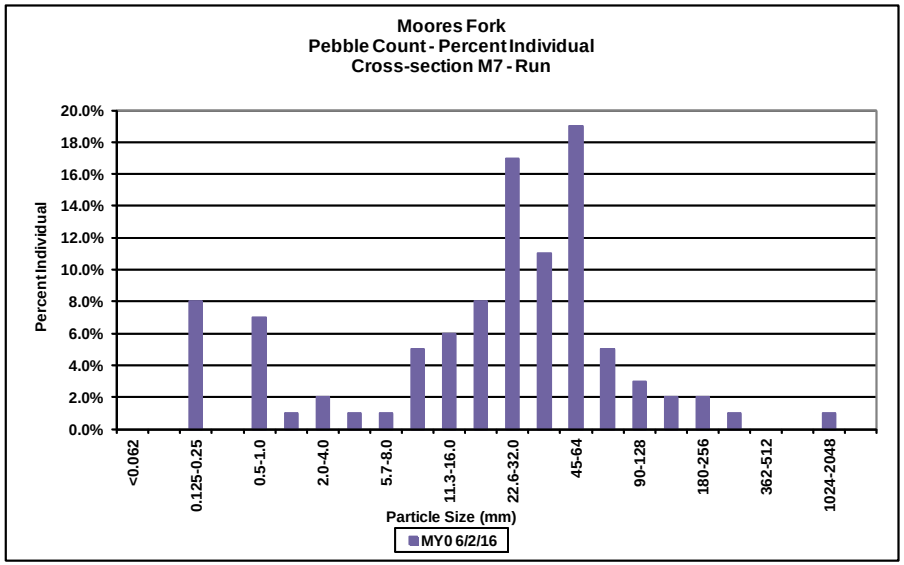




Moores Fork Stream Mitigation / 94709 Cross Section M7 - Run Moores Reach 3				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	22	22.0%	22%
medium sand	0.25-0.5		0.0%	22%
coarse sand	0.5-1.0	1	1.0%	23%
very coarse sand	1.0-2.0		0.0%	23%
very fine gravel	2.0-4.0	1	1.0%	24%
fine gravel	4.0-5.7	1	1.0%	25%
fine gravel	5.7-8.0	3	3.0%	28%
medium gravel	8.0-11.3	16	16.0%	44%
medium gravel	11.3-16.0	16	16.0%	60%
coarse gravel	16.0-22.6	20	20.0%	80%
coarse gravel	22.6-32.0	6	6.0%	86%
very coarse gravel	32-45	8	8.0%	94%
very coarse gravel	45-64	3	3.0%	97%
small cobble	64-90	3	3.0%	100%
medium cobble	90-128		0.0%	100%
large cobble	128-180		0.0%	100%
very large cobble	180-256		0.0%	100%
small boulder	256-362		0.0%	100%
small boulder	362-512		0.0%	100%
medium boulder	512-1024		0.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

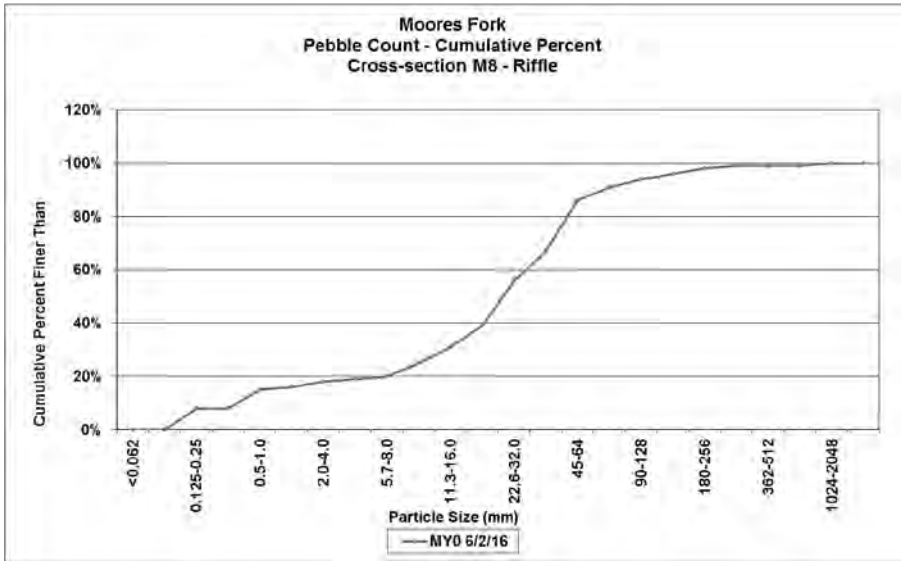
Summary Data	
D50	**13**
D84	**28**
D95	**51**

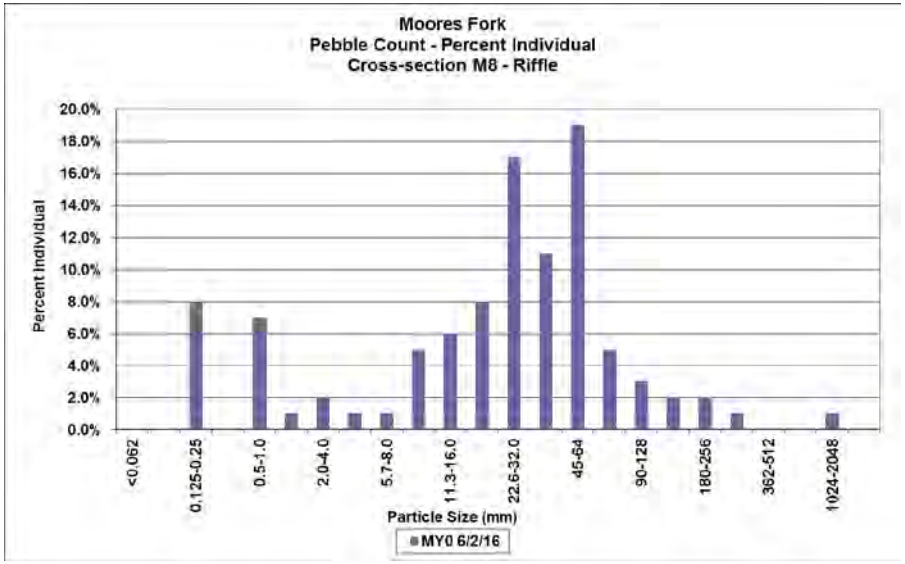




Moores Fork Stream Mitigation / 94709 Cross Section M8 - Riffle Moores Reach 3				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	2	2.0%	2%
medium sand	0.25-0.5		0.0%	2%
coarse sand	0.5-1.0	2	2.0%	4%
very coarse sand	1.0-2.0	1	1.0%	5%
very fine gravel	2.0-4.0	3	3.0%	8%
fine gravel	4.0-5.7	8	8.0%	16%
fine gravel	5.7-8.0	5	5.0%	21%
medium gravel	8.0-11.3	13	13.0%	34%
medium gravel	11.3-16.0	4	4.0%	38%
coarse gravel	16.0-22.6	15	15.0%	53%
coarse gravel	22.6-32.0	18	18.0%	71%
very coarse gravel	32-45	7	7.0%	78%
very coarse gravel	45-64	12	12.0%	90%
small cobble	64-90	7	7.0%	97%
medium cobble	90-128	2	2.0%	99%
large cobble	128-180	1	1.0%	100%
very large cobble	180-256		0.0%	100%
small boulder	256-362		0.0%	100%
small boulder	362-512		0.0%	100%
medium boulder	512-1024		0.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

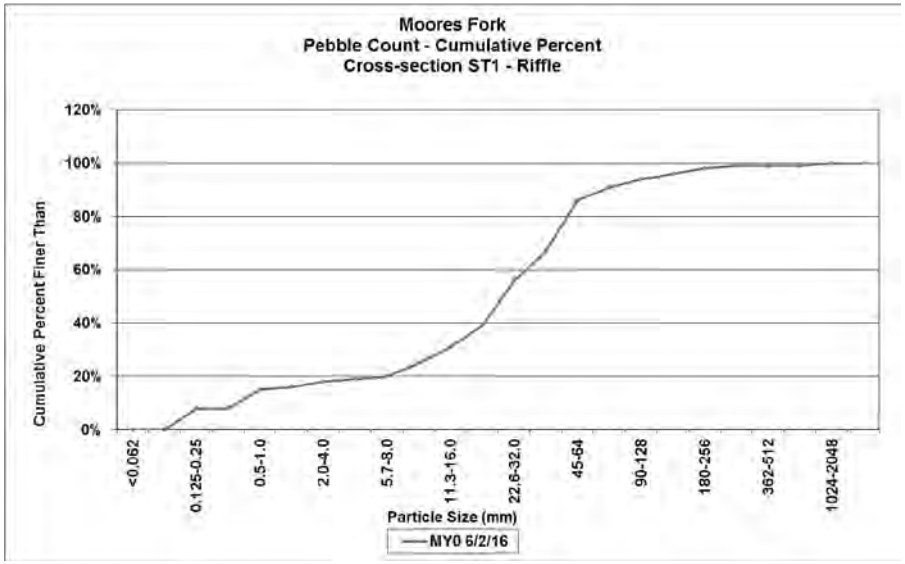
Summary Data	
D50	**21**
D84	**54**
D95	**82**

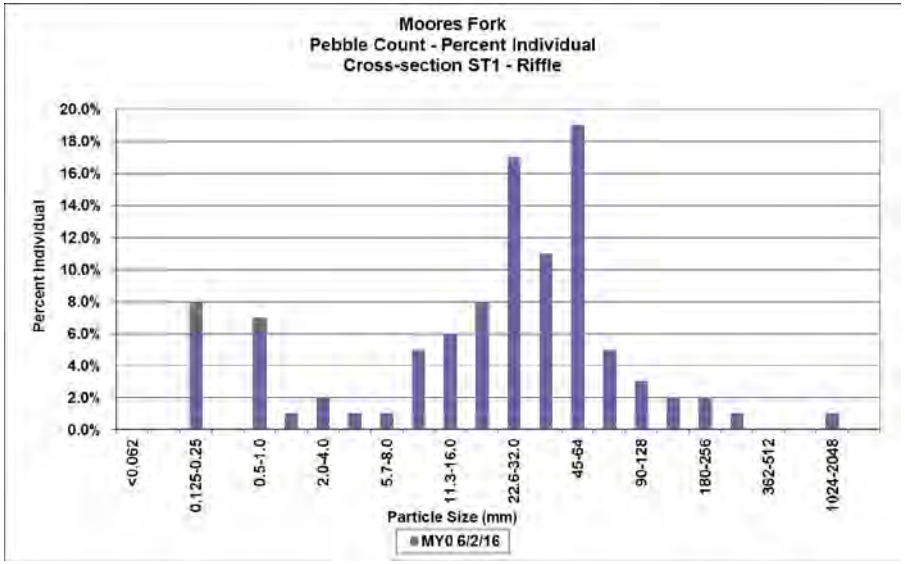




Moores Fork Stream Mitigation / 94709 Cross Section ST1 - Riffle Silage Reach 1				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	9	9.0%	9%
medium sand	0.25-0.5		0.0%	9%
coarse sand	0.5-1.0	2	2.0%	11%
very coarse sand	1.0-2.0	1	1.0%	12%
very fine gravel	2.0-4.0	6	6.0%	18%
fine gravel	4.0-5.7	7	7.0%	25%
fine gravel	5.7-8.0	4	4.0%	29%
medium gravel	8.0-11.3	14	14.0%	43%
medium gravel	11.3-16.0	6	6.0%	49%
coarse gravel	16.0-22.6	17	17.0%	66%
coarse gravel	22.6-32.0	16	16.0%	82%
very coarse gravel	32-45	7	7.0%	89%
very coarse gravel	45-64	7	7.0%	96%
small cobble	64-90	2	2.0%	98%
medium cobble	90-128		0.0%	98%
large cobble	128-180		0.0%	98%
very large cobble	180-256	2	2.0%	100%
small boulder	256-362		0.0%	100%
small boulder	362-512		0.0%	100%
medium boulder	512-1024		0.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

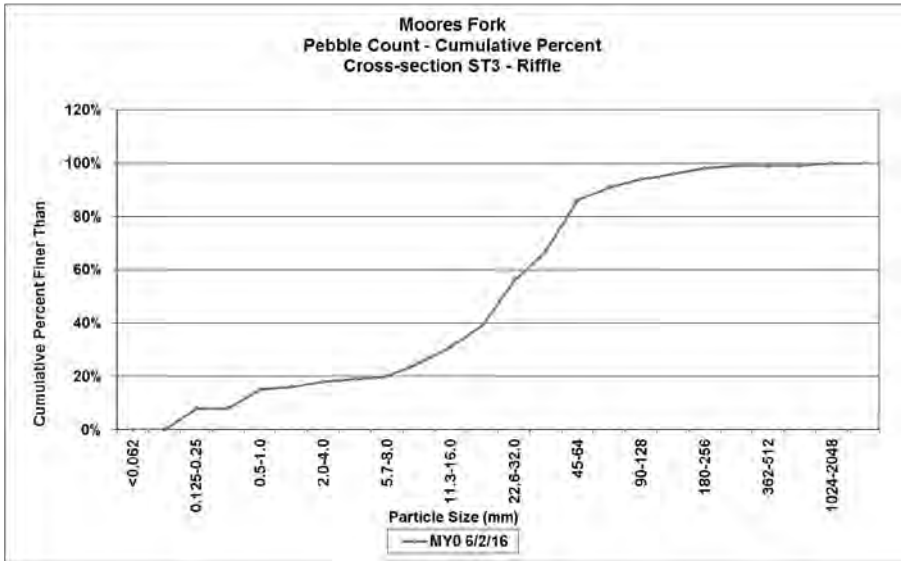
Summary Data	
D50	**16**
D84	**35**
D95	**61**

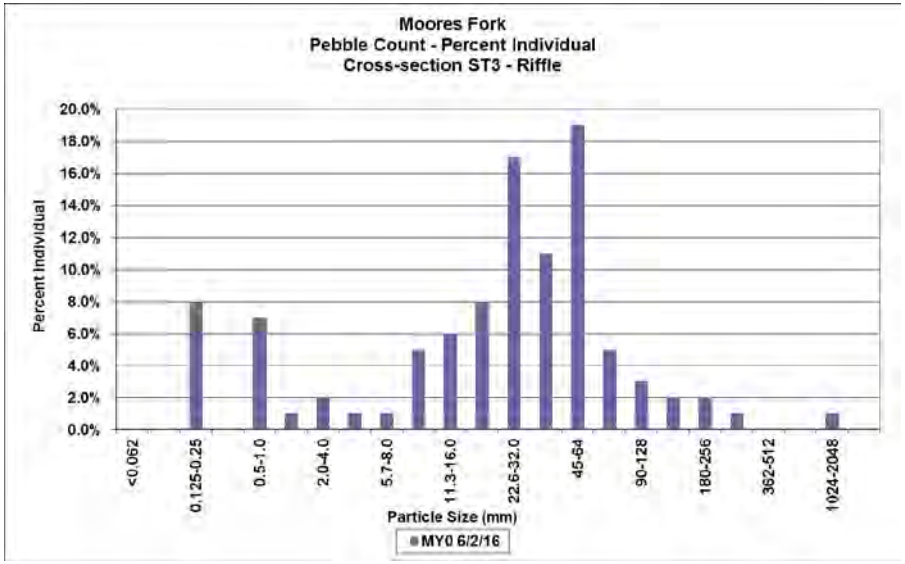




Moores Fork Stream Mitigation / 94709 Cross Section ST3 - Riffle Silage Reach 2				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	22	22.0%	22%
medium sand	0.25-0.5	2	2.0%	24%
coarse sand	0.5-1.0		0.0%	24%
very coarse sand	1.0-2.0	1	1.0%	25%
very fine gravel	2.0-4.0	6	6.0%	31%
fine gravel	4.0-5.7	3	3.0%	34%
fine gravel	5.7-8.0	1	1.0%	35%
medium gravel	8.0-11.3	23	23.0%	58%
medium gravel	11.3-16.0	1	1.0%	59%
coarse gravel	16.0-22.6	12	12.0%	71%
coarse gravel	22.6-32.0	9	9.0%	80%
very coarse gravel	32-45	9	9.0%	89%
very coarse gravel	45-64	6	6.0%	95%
small cobble	64-90	2	2.0%	97%
medium cobble	90-128	2	2.0%	99%
large cobble	128-180		0.0%	99%
very large cobble	180-256	1	1.0%	100%
small boulder	256-362		0.0%	100%
small boulder	362-512		0.0%	100%
medium boulder	512-1024		0.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

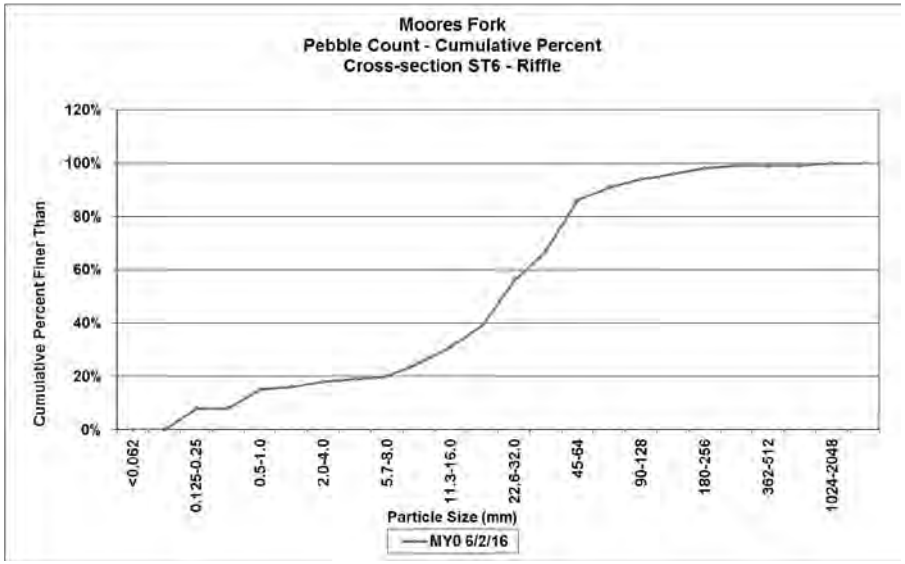
Summary Data	
D50	**9.8**
D84	**37**
D95	**64**

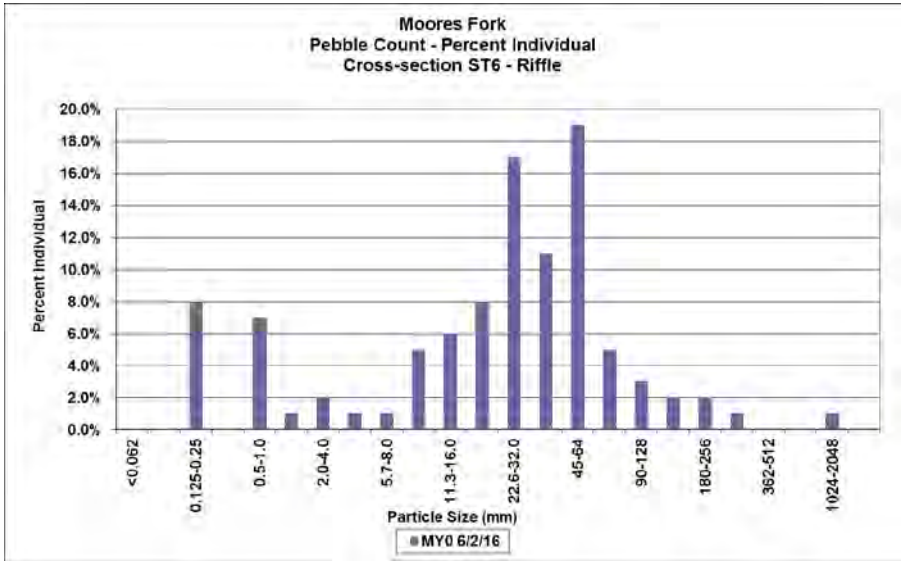




Moores Fork Stream Mitigation / 94709 Cross Section ST6 - Riffle Silage Reach 2				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125	3	3.0%	3%
fine sand	0.125-0.25	14	14.0%	17%
medium sand	0.25-0.5		0.0%	17%
coarse sand	0.5-1.0	6	6.0%	23%
very coarse sand	1.0-2.0	5	5.0%	28%
very fine gravel	2.0-4.0	14	14.0%	42%
fine gravel	4.0-5.7	8	8.0%	50%
fine gravel	5.7-8.0	3	3.0%	53%
medium gravel	8.0-11.3	11	11.0%	64%
medium gravel	11.3-16.0	8	8.0%	72%
coarse gravel	16.0-22.6	2	2.0%	74%
coarse gravel	22.6-32.0	11	11.0%	85%
very coarse gravel	32-45	6	6.0%	91%
very coarse gravel	45-64	3	3.0%	94%
small cobble	64-90	3	3.0%	97%
medium cobble	90-128	1	1.0%	98%
large cobble	128-180		0.0%	98%
very large cobble	180-256		0.0%	98%
small boulder	256-362	1	1.0%	99%
small boulder	362-512	1	1.0%	100%
medium boulder	512-1024		0.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

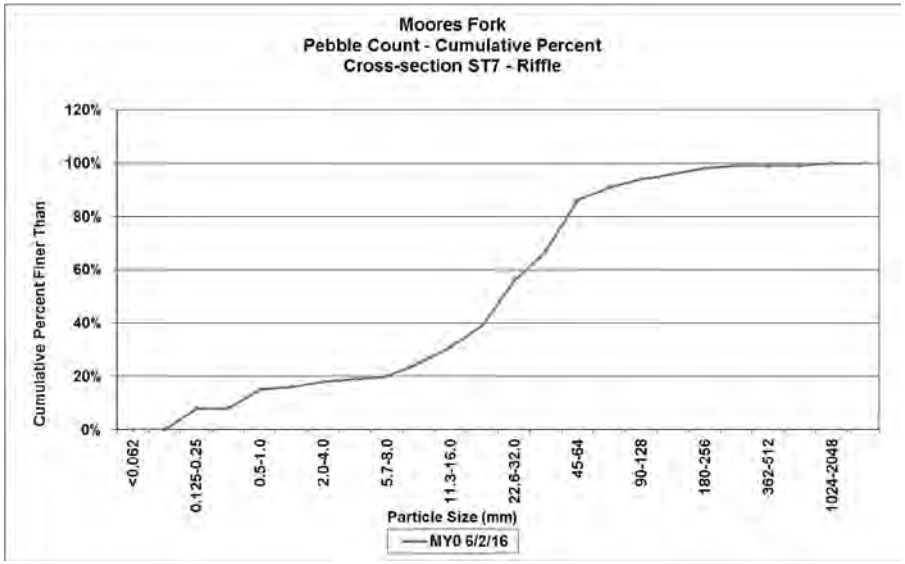
Summary Data	
D50	**6**
D84	**31**
D95	**72**





Moores Fork Stream Mitigation / 94709 Cross Section ST7 - Riffle Silage Reach 2				
Material	**Particle Size Class (mm)**	**Total**	**% Individual**	**% Cumulative**
silt/clay	<0.062		0.0%	0%
very fine sand	0.62-0.125		0.0%	0%
fine sand	0.125-0.25	2	2.0%	2%
medium sand	0.25-0.5		0.0%	2%
coarse sand	0.5-1.0	5	5.0%	7%
very coarse sand	1.0-2.0	3	3.0%	10%
very fine gravel	2.0-4.0	5	5.0%	15%
fine gravel	4.0-5.7	6	6.0%	21%
fine gravel	5.7-8.0	3	3.0%	24%
medium gravel	8.0-11.3	18	18.0%	42%
medium gravel	11.3-16.0	13	13.0%	55%
coarse gravel	16.0-22.6	18	18.0%	73%
coarse gravel	22.6-32.0	16	16.0%	89%
very coarse gravel	32-45	5	5.0%	94%
very coarse gravel	45-64	5	5.0%	99%
small cobble	64-90	1	1.0%	100%
medium cobble	90-128		0.0%	100%
large cobble	128-180		0.0%	100%
very large cobble	180-256		0.0%	100%
small boulder	256-362		0.0%	100%
small boulder	362-512		0.0%	100%
medium boulder	512-1024		0.0%	100%
large boulder	1024-2048		0.0%	100%
bedrock	>2048		0.0%	100%
Total		**100**	**100.0%**	**100%**

Summary Data	
D50	**14**
D84	**28**
D95	**48**



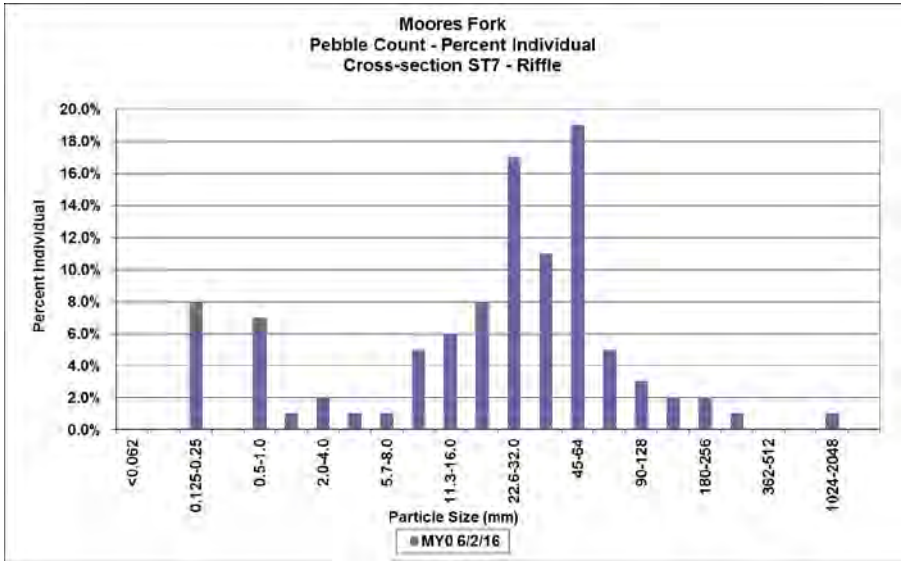


Table 6a. Baseline Stream Data Summary /Moores Fork DMS Project No. 94709

Parameter	Gage	PRE-RESTORATION CONDITION								REFERENCE REACH DATA		DESIGN								AS-BUILT/BASELINE							
		Moores Fork Reaches 1/2		Moores Fork Reach 3		Silage Trib Reach 1		Silage Trib Reach 2		Mill Branch		Moores Fork Reaches 1/2		Moores Fork Reach 3		Silage Trib Reach 1		Silage Trib Reach 2		Moores Fork Reaches 1/2		Moores Fork Reach 3		Silage Trib Reach 1		Silage Trib Reach 2	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																											
Bankfull Width (ft)		27.3	30.6	24.9	34.2	6.7	6.9	18.2		27.2	33.6	36.5		37.0		8.8		12.5		31.8	33.2	30.2	52.2	4.2		10.6	14.6
Floodprone Width (ft)		109.0	137.7	104.0	125.0	11	16.0	100.0		72.1	72.5	145		124		19		28		145		124		9.4		23	30
Bankfull Mean Depth		1.7	2.6	2.3	2.9	0.8	1.2	1.7		1.9	2.2	2.2		2.3		0.6		1.00		2.1	2.2	1.9	2.6	0.7		0.6	0.8
Bankfull Max Depth		3.0	3.4	4.0		1.2	1.7	2.3		2.4	2.7	3.5		3.6		0.8		1.50		3.3	3.5	3.3	4.1	1.2		1.3	1.5
Bankfull Cross-sectional Area (ft^2)	N/A	46.9	78.2	73.3	77.6	5.6	8.4	31.6		50.8	72.4	82.1		85.3		5.1		13.1		67.2	74.1	72.5	101.1	2.8		6.9	9.3
Width/Depth Ratio		12.0	15.9	8.4	15.1	5.7	8.0	10.5		14.5	15.6	16.2		16.0		15.1		11.9		14.9	15	12.5	26.9	6.4		16.2	22.7
Entrenchment Ratio		4.0	4.5	3.7	4.2	1.6	2.3	5.5		2.7		5.0		4.0		2.2		2.2		4.4	4.6	2.5	4.1	4.5		1.3	2.6
Bank Height Ratio		1.2	1.4	1.2	1.9	1.0	1.6	3.1		1.0	1.1	1.0		1.0		1.0		1.5		1.0		1.0		1.0		1.0	
D50 (mm)		29		30		4		23		20		29		30		4		23		11	25	13	28	16		6	14
Riffle Length (ft)		---		---		---		---		---		50	70	10	195	---		16	63	32	178	26.0	199.0	---		13.12	55.95
Riffle Slope (ft/ft)		---		---		---		---		---		0.0059	0.0180	0.0038	0.02	---		0.0492	0.0514	0.0045	0.0158	0.0027	0.0180	---		0.0017	0.0554
Pool Length (ft)	N/A	---		---		---		---		---		42	140	40	112	---		15	35	63	170	81.0	139.0	---		10	19
Pool Max Depth (ft)		---		---		---		---		---		5.0		5.5		---		---		3.0	6.0	4.3	8.5	1.2		1.4	2.4
Pool Spacing (ft)		---		---		---		---		---		130	270	78	334	20	23	15	75	118	295	106	325	13.3	171.5	21	79
Pattern																											
Channel Beltwidth (ft)		52	161	43	208	---		---		86		55	165	53	267	---		---		7	84	8	59	7	36	8	59
Radius of Curvature (ft)		65.8	102.7	41	94	---		---		19.6	25.8	53	124	58	74	---		---		25	58	13	24	9	25	13	24
Rc:Bankfull Width (ft/ft)	N/A	2.4	3.4	1.7	2.8	---		---		0.7	0.9	2.0	6.0	1.7	4.0	---		---		0.8	1.8	0.4	0.8	2.1	6.0	1.2	2.3
Meander Length (ft)		N/A		N/A		---		---		N/A		N/A		N/A		---		---		123	210	63	158	61	100	63	158
Meander Width Ratio		1.9	5.3	1.7	6.1	---		---		3.2		1.9	5.7	1.7	8.6	---		---		3.9	6.6	2.1	5.2	14.5	23.8	5.9	14.9
Substrate, Bed and Transport Parameters																											
Ri%/Ru%/P%/G%/S%																											
SC%/Sa%/G%/C%/B%/Be%																											
d50/d84/d95	N/A	28/67/89 and 29/43/56		---		---		---		40/89/133		---		---		---		---		25/58/90 and 11/38/110		1/58; 28/62/150; 13/28/51; 21/		16/35/61		9.8/37/64 and 6/31/72	
Max part size (mm) mobilized at bankfull																											
Stream Power (Capacity) W/m^2																											
Additional Reach Parameters																											
Drainage Area (SM)		1.9		2.39		0.070		0.24		5		1.90		2.34		0.070		0.24		1.90		2.34		0.070		0.24	
Watershed Impervious Cover Estimate (%)		<5%		<5%		<5%		<5%		---		<5%		<5%		<5%		<5%		<5%		<5%		<5%		<5%	
Rosgen Classification		C4		C4		G4/B4		E4		C4		C4		C4		B4		E4		C4		C4		B4		E4	
Bankfull Velocity (fps)		4.1	5.3	4.6	5.2	5.4	6.6	6.3		5.0	5.5	5.0		4.9		4.5		4.5		4.4	4.6	4.2	5.1	5.0		4.5	5.1
Bankfull Discharge (cfs)		193.9	411.4	380.1	358.4	30.2	55.1	197.5		N/A		250-260		260		24		60		297.6	340.8	348.4	468.7	13.8		31.2	44.3
Q-USGS NC HR1 (2-yr)	N/A	237-278		278		29		63		385		237-278		278		29		63		237-278		278		29		63	
Valley Length (ft)		2227		2234		1079		1200		4730		2227		2234		1079		1200		2227		2234		1079		1200	
Channel Thalweg Length (ft)		2393		2847		1198		1441		327		2578		2825		1198		1441		2,628		2,856		1,198		1,441	
Sinuosity		1.07		1.27		1.11		1.20		1.26		1.16		1.26		1.11		1.20		1.2		1.3		1.11		1.20	
Water Surface Slope (ft/ft)^2		0.0077		0.0067		0.0357		0.0294		0.0101		0.0076		0.0064		0.0357		0.0294		0.005541		0.005511		0.0389		0.02758	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		---		---		0.005265		0.006112		0.0404		0.02740	

(---): Data was not provided
N/A: Not Applicable

Table 6b. Baseline Stream Data Summary/Moores Fork DMS Project No. 94709

Parameter	Gage	PRE-RESTORATION CONDITION						REFERENCE REACH DATA				DESIGN						AS-BUILT/BASELINE					
		Barn		Corn		Pond		Barn Trib Pres Rch		Corn Trib Pres Rch		Barn (Reach 1)		Corn		Pond		Barn (Reach 1)		Corn (Reach 2)		Pond	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																							
Bankfull Width (ft)	N/A	1.6		4.6		16.3		7.0		4.1		6.0		6.6		8.0		---		---		---	
Floodprone Width (ft)		4.0		7.8		50.0		9.9		13.7		19		20		25		---		---		---	
Bankfull Mean Depth		0.6		0.5		1.5		0.7		0.4		0.5		0.4		0.7		---		---		---	
Bankfull Max Depth		0.8		0.7		2.6		1.1		0.5		0.8		0.6		1.0		---		---		---	
Bankfull Cross-sectional Area (ft^2)		0.9		2.4		24.4		4.6		1.5		3.2		2.9		5.5		---		---		---	
Width/Depth Ratio		2.9		8.9		10.9		10.6		11.2		11.3		15.1		11.6		---		---		---	
Entrenchment Ratio		2.5		1.7		3.1		1.4		3.3		3.2		3.0		3.1		---		---		---	
Bank Height Ratio		7.6		3.8		1.1		1.6		1.7		1.0		1.0		1.0		---		---		---	
D50 (mm)		---		---		---		46		46		---		---		---		---		---		---	
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		5	31	---		12.0		8.4	27.3
Riffle Slope (ft/ft)		---		---		---		---		---		---		---		0.02	0.0538	---		0.0498		0.0136	0.0241
Pool Length (ft)		---		---		---		---		---		8	13	---		10	30	---		17.5	32.9	27.8	37.9
Pool Max Depth (ft)		---		---		---		---		---		---		---		---		---		2.6	3.6	0.7	1.4
Pool Spacing (ft)		---		---		---		---		---		8	10	---		15	54	6.11	77.7	9	56	22	43
Pool Volume (ft^3)		---		---		---		---		---		---		---		---							
Pattern																							
Channel Beltwidth (ft)	N/A	---		---		---		---		---		---		---		---		13	26	20	22	24	24
Radius of Curvature (ft)		---		---		---		---		---		---		---		---		12	30	12	29	15	21
Rc:Bankfull Width (ft/ft)		---		---		---		---		---		---		---		---		---		---		---	
Meander Length (ft)		---		---		---		---		---		---		---		---		71	85	49	61	66	78
Meander Width Ratio		---		---		---		---		---		---		---		---		---		---		---	
Substrate, Bed and Transport Parameters																							
Ri%/Ru%/P%/G%/S%	N/A																						
SC%/Sa%/G%/C%/B%/Be%																							
d50/d84/d95																							
Max part size (mm) mobilized at bankfull																							
Stream Power (Capacity) W/m^2																							
Additional Reach Parameters																							
Drainage Area (SM)	N/A	0.01		0.05		0.04		0.08		0.05		0.01		0.05		0.040		0.01		0.05		0.040	
Watershed Impervious Cover Estimate (%)		<5%		<5%		<5%		<5%		<5%		<5%		<5%		<5%		<5%		<5%		<5%	
Rosgen Classification		G4		G4		C4b (trampled)		B4		E4b		E4b		B4		C4b		E4b		B4		C4b	
Bankfull Velocity (fps)		2.70		5.01		7.4		3.84		2.7		3.31		4.7		3.93		---		---		---	
Bankfull Discharge (cfs)		2.5		12.0		181.4		17.7		4.0		11		---		19		---		---		---	
Q-USGS NC HR1 (2-yr)		8		---		20		---		---		8		---		20							
Q-Mannings		11		---		19		---		---		11		---		19		11		---		19	
Valley Length (ft)		622		84		187		622		---		330		84		187		330		84		187	
Channel Thalweg Length (ft)		250		97		194		84		28		350		97		243		350		112		243	
Sinuosity		0.40		1.15		1.04		0.14		---		1.06		1.15		1.30		1.06		1.3		1.3	
Water Surface Slope $(ft/ft)^2$		0.0206		0.0567		0.029		0.0211		0.0243		0.0206		0.0567		0.0176		0.0478	0.1124	0.0425		0.0118	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		---		0.0463	0.1005	0.0478		0.0129	

(---): Data was not provided
N/A: Not Applicable

Table 7a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section) Moores Fork DMS Project No. 94709 - Moores Fork

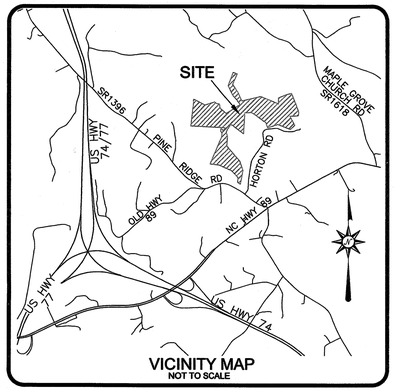
	Cross-Section 1 (Riffle)								Cross-Section 2 (Riffle)								Cross-Section 3 (Pool)								Cross-Section 4 (Riffle)								Cross-Section 5 (Riffle)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
based on fixed bankfull elevation	1150.4								1148.7								1148.4								1142.3								1139.5							
Bankfull Width (ft)	33.2								31.8								33.2								52.2								30.2							
Floodprone Width (ft)	145.0								145.0								---								124.0								124.0							
Bankfull Mean Depth (ft)	2.2								2.1								2.7								1.9								2.4							
Bankfull Max Depth (ft)	3.3								3.5								5.2								3.3								3.5							
Bankfull Cross-Sectional Area (ft^2)	74.1								67.2								89.6								101.1								72.5							
Bankfull Width/Depth Ratio	14.9								15.0								12.3								26.9								12.5							
Bankfull Entrenchment Ratio	4.4.								4.6								---								2.4								4.1							
Bankfull Bank Height Ratio	1.0								1.0								---								0.8								1.0							

	Cross-Section 6 (Pool)								Cross-Section 7 (Run)								Cross-Section 8 (Riffle)								Cross-Section 9 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
based on fixed bankfull elevation	1138.6								1134.9								1132.4								1132.1							
Bankfull Width (ft)	37.4								49.5								34.6								30.6							
Floodprone Width (ft)	---								124.0								124.0								---							
Bankfull Mean Depth (ft)	2.8								2.4								2.6								4.0							
Bankfull Max Depth (ft)	5.1								3.5								4.1								6.3							
Bankfull Cross-Sectional Area (ft^2)	104.7								118.1								91.5								122.0							
Bankfull Width/Depth Ratio	13.3								20.8								13.1								7.7							
Bankfull Entrenchment Ratio	---								2.5								3.6								---							
Bankfull Bank Height Ratio	---								1.0								1.0								---							

Table 7b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section) Moores Fork/DMS Project No. 94709 - Silage Tributary																														
	Cross-Section 1 (Riffle)								Cross-Section 2 (Pool)								Cross-Section 3 (Riffle)								Cross-Section 4 (Pool)							
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY12**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
based on fixed bankfull elevation	1234.6								1233.4								1193.4								1193.1							
Bankfull Width (ft)	4.2								5.1								14.6								9.8							
Floodprone Width (ft)	9.4								---								22.5								---							
Bankfull Mean Depth (ft)	0.7								0.6								0.6								1.4							
Bankfull Max Depth (ft)	1.2								1.2								1.3								2.4							
Bankfull Cross-Sectional Area (ft^2)	2.8								3.2								9.3								13.7							
Bankfull Width/Depth Ratio	6.4								8.0								22.7								7.0							
Bankfull Entrenchment Ratio	2.2								---								1.5								---							
Bankfull Bank Height Ratio	1.0								---								1.0								---							
	Cross-Section 5 (Pool)								**Cross-Section 6 (Riffle)**								**Cross-Section 7 (Riffle)**															
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**								
based on fixed bankfull elevation	1185.1								1175.4								1164.7															
Bankfull Width (ft)	5.9								10.6								11.3															
Floodprone Width (ft)	---								28.0								29.6															
Bankfull Mean Depth (ft)	1.2								0.7								0.8															
Bankfull Max Depth (ft)	1.4								1.3								1.5															
Bankfull Cross-Sectional Area (ft^2)	7.0								6.9								8.7															
Bankfull Width/Depth Ratio	5.0								16.2								14.6															
Bankfull Entrenchment Ratio	---								2.6								2.6															
Bankfull Bank Height Ratio	---								1.0								1.0															

Appendix E

As-Built Plan Sheet



VICINITY MAP
NOT TO SCALE

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 6th DAY OF NOVEMBER, 2014.

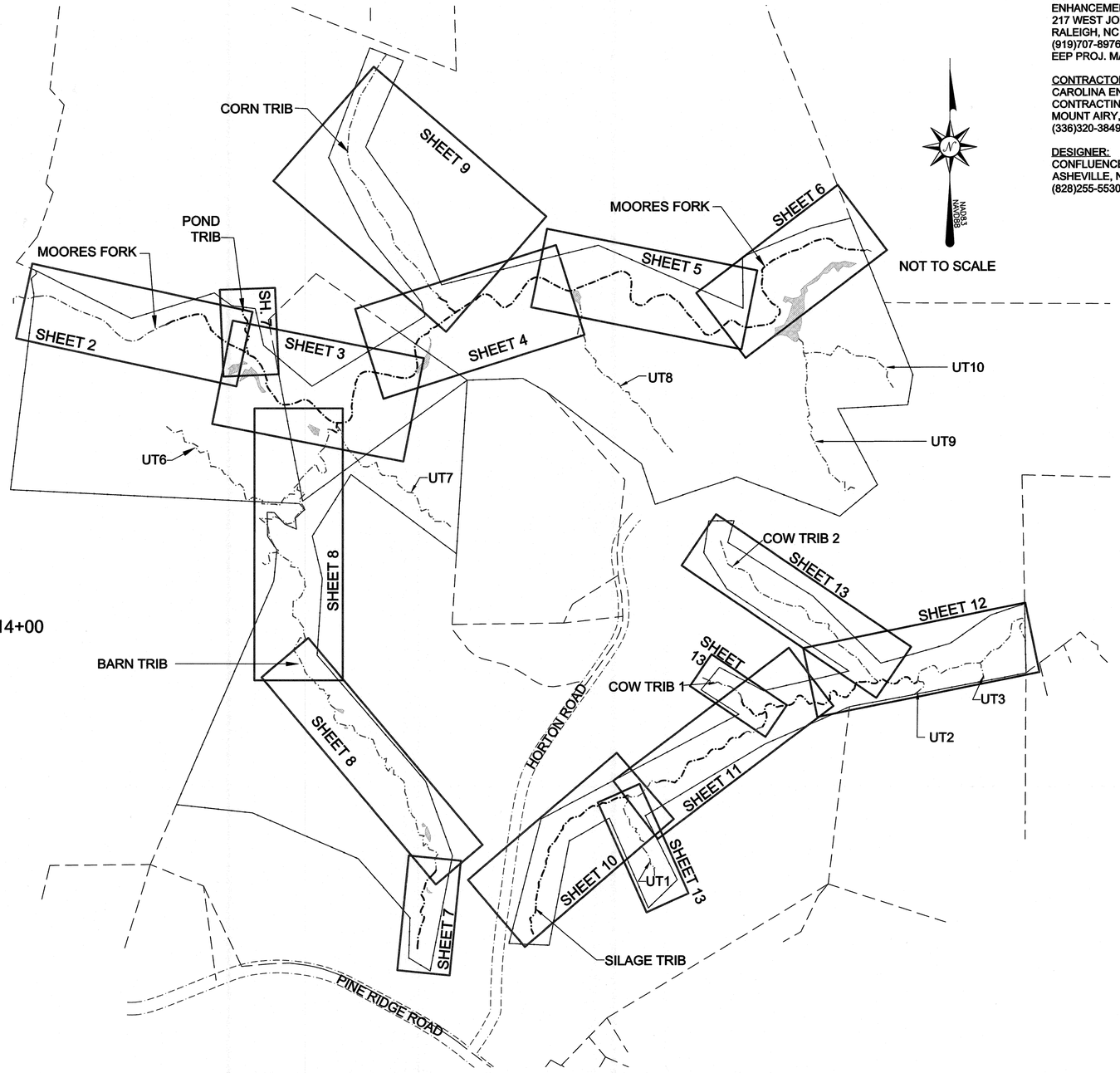
David S. Turner

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL L-4551 SEAL DAVID S. TURNER SURVEYOR

AS-BUILT SURVEY OF
MOORES FORK RESTORATION PROJECT

SURRY COUNTY, NC
SCO PROJECT #090856701
EEP PROJECT ID #94709



NOT TO SCALE

SHEET INDEX

GENERAL NOTES:
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88 (GEOID12).
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 (NSRS 2011) DATUM.
4. CONTROL ESTABLISHED USING VRS RTK GPS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 2.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE MOORES FORK STREAM AND WETLAND RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE AS-BUILT LIMITS OF DISTURBANCE WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.

REFERENCES:

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(919)707-8976
EEP PROJ. MANAGER: JULIE CAHILL

CONTRACTOR:
CAROLINA ENVIRONMENTAL CONTRACTING, INC.
MOUNT AIRY, NC
(336)320-3849

DESIGNER:
CONFLUENCE ENGINEERING, PC
ASHEVILLE, NC
(828)255-5530

REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING, PLLC
3719 Benson Drive, Raleigh, NC 27609 – (919)827-0745
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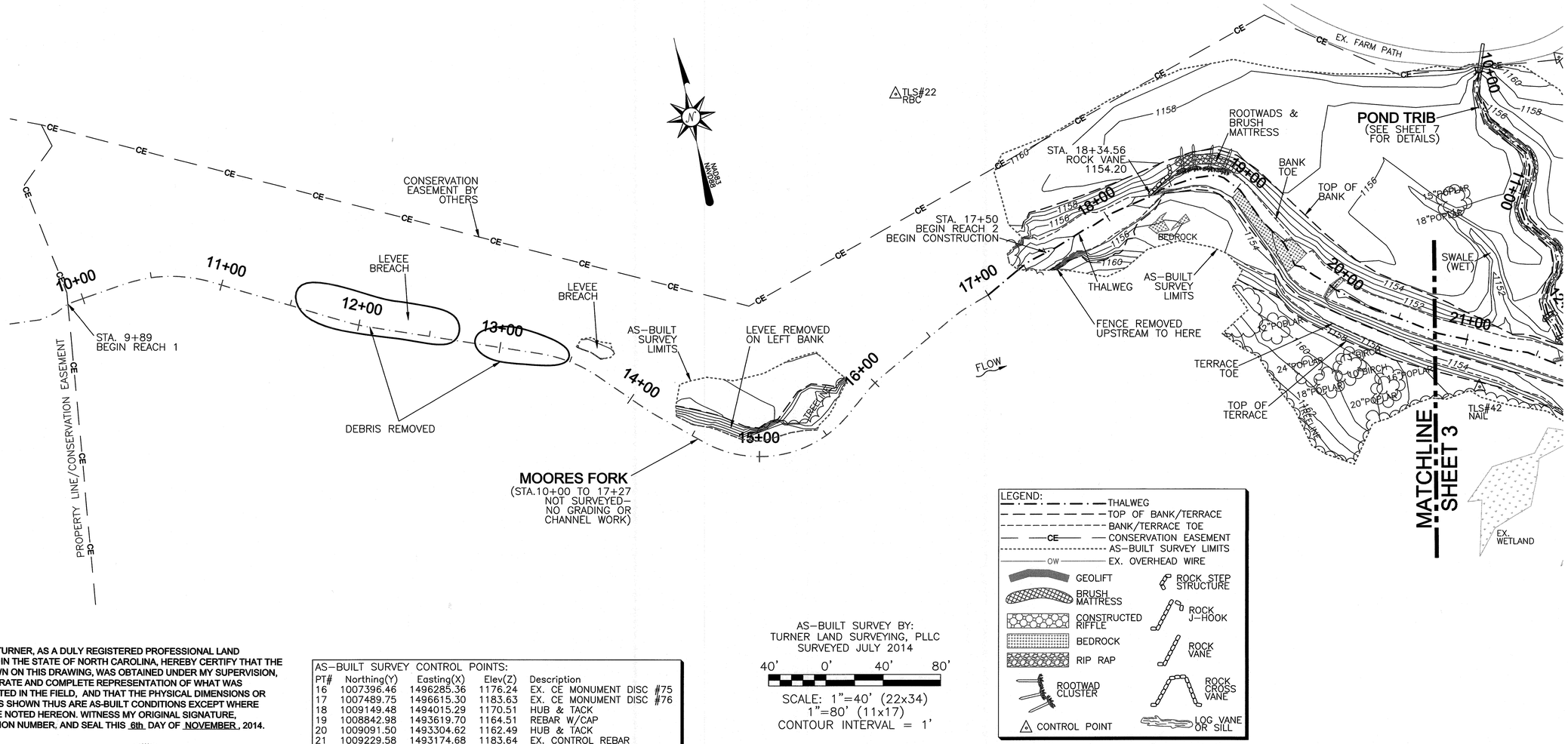
www.TURNERLANDSURVEYING.com

TITLE, VICINITY MAP, & SHEET INDEX

MOORES FORK RESTORATION PROJECT
SCO PROJECT #090856701
EEP PROJECT ID #94709
SURRY COUNTY
MOUNT AIRY
NORTH CAROLINA

DATE:	09/05/2014
SURVEYED BY:	MWB/DST
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-003
FILE:	MOORES FORK_94709_AB_TLS_F.dwg
SCALE:	AS SHOWN

SHEET 1 of 13



LEGEND:

- THALWEG
- TOP OF BANK/TERRACE
- BANK/TERRACE TOE
- CE — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- OW — EX. OVERHEAD WIRE
- GEOLIFT
- BRUSH MATTRESS
- CONSTRUCTED RIFFLE
- BEDROCK
- RIP RAP
- ROOTWAD CLUSTER
- CONTROL POINT
- ROCK STEP STRUCTURE
- ROCK J-HOOK
- ROCK VANE
- ROCK CROSS VANE
- LOG VANE OR SILL

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 6th DAY OF NOVEMBER, 2014.

David S. Turner

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

GENERAL NOTES:

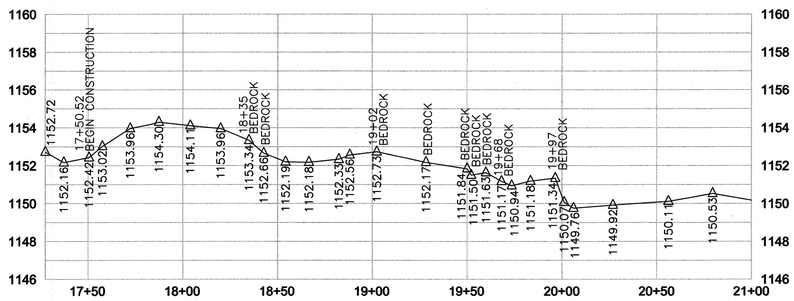
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. THE VERTICAL DATUM IS NAVD88 (GEOID12).
3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 (NSRS 2011) DATUM.
4. CONTROL ESTABLISHED USING VRS RTK GPS AND CONFIRMED DURING AS-BUILT SURVEY. AS-BUILT CONTROL POINTS ARE LISTED ON SHEET 2.
5. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
6. THE SOLE PURPOSE OF THIS SURVEY IS TO SHOW THE CONSTRUCTED STREAM AND GRADING RELATED TO THE MOORES FORK STREAM AND WETLAND RESTORATION PROJECT.
7. INFORMATION SHOWN OUTSIDE THE AS-BUILT LIMITS OF DISTURBANCE WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.

AS-BUILT SURVEY CONTROL POINTS:

PT#	Northing(Y)	Easting(X)	Elev(Z)	Description
16	1007396.46	1496285.36	1176.24	EX. CE MONUMENT DISC #75
17	1007489.75	1496615.30	1183.63	EX. CE MONUMENT DISC #76
18	1009149.48	1494015.29	1170.51	HUB & TACK
19	1008842.98	1493619.70	1164.51	REBAR W/CAP
20	1009091.50	1493304.62	1162.49	HUB & TACK
21	1009229.58	1493174.68	1183.64	EX. CONTROL REBAR
22	1009165.78	1492846.19	1166.51	REBAR W/CAP
24	1006302.87	1494209.58	1251.77	HUB & TACK
25	1006152.66	1494180.54	1263.83	HUB & TACK
26	1006075.99	1494008.49	1269.12	REBAR W/CAP
28	1009231.64	1494364.60	1161.89	HUB & TACK
29	1009341.49	1494656.74	1150.66	REBAR W/CAP
31	1009218.99	1495298.58	1143.37	HUB & TACK
32	1009088.51	1495628.39	1135.03	EX. CE MONUMENT DISC #24
34	1009468.91	1495954.38	1135.69	EX. CE MONUMENT DISC #26
36	1006028.04	1494076.52	1259.19	NAIL
37	1006313.07	1494126.98	1239.79	NAIL
39	1008603.20	1493648.81	1150.59	NAIL
40	1008673.96	1493419.07	1150.04	NAIL
42	1008878.57	1493201.10	1156.57	NAIL
46	1009234.56	1494907.20	1139.76	NAIL
47	1009253.45	1495116.01	1140.18	NAIL
49	1008999.08	1495464.07	1135.47	NAIL
51	1009072.06	1495737.40	1134.02	NAIL
52	1009277.17	1495761.14	1130.90	NAIL
53	1009325.00	1495882.17	1131.34	NAIL
55	1007285.73	1496189.87	1173.52	NAIL
56	1007279.50	1496031.98	1183.31	NAIL
57	1007270.27	1495867.31	1192.07	NAIL
58	1007176.21	1495709.16	1192.45	NAIL
59	1007043.11	1495517.02	1203.36	NAIL
60	1006878.75	1495227.08	1221.17	NAIL
61	1006804.24	1495046.72	1227.41	NAIL
62	1006795.23	1494939.89	1238.67	NAIL
63	1006692.19	1494761.47	1239.69	NAIL
64	1006476.73	1494666.66	1246.61	NAIL
65	1006240.08	1494595.20	1260.47	NAIL

AS-BUILT LONGITUDINAL PROFILE MOORES FORK STA 17+27 TO 21+00

PROFILE SCALE
HORIZONTAL: 1"=40'(22x34)
1"=80'(11x17)
VERTICAL: 1"=4'(22x34)
1"=8'(11x17)



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P-0702 – info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

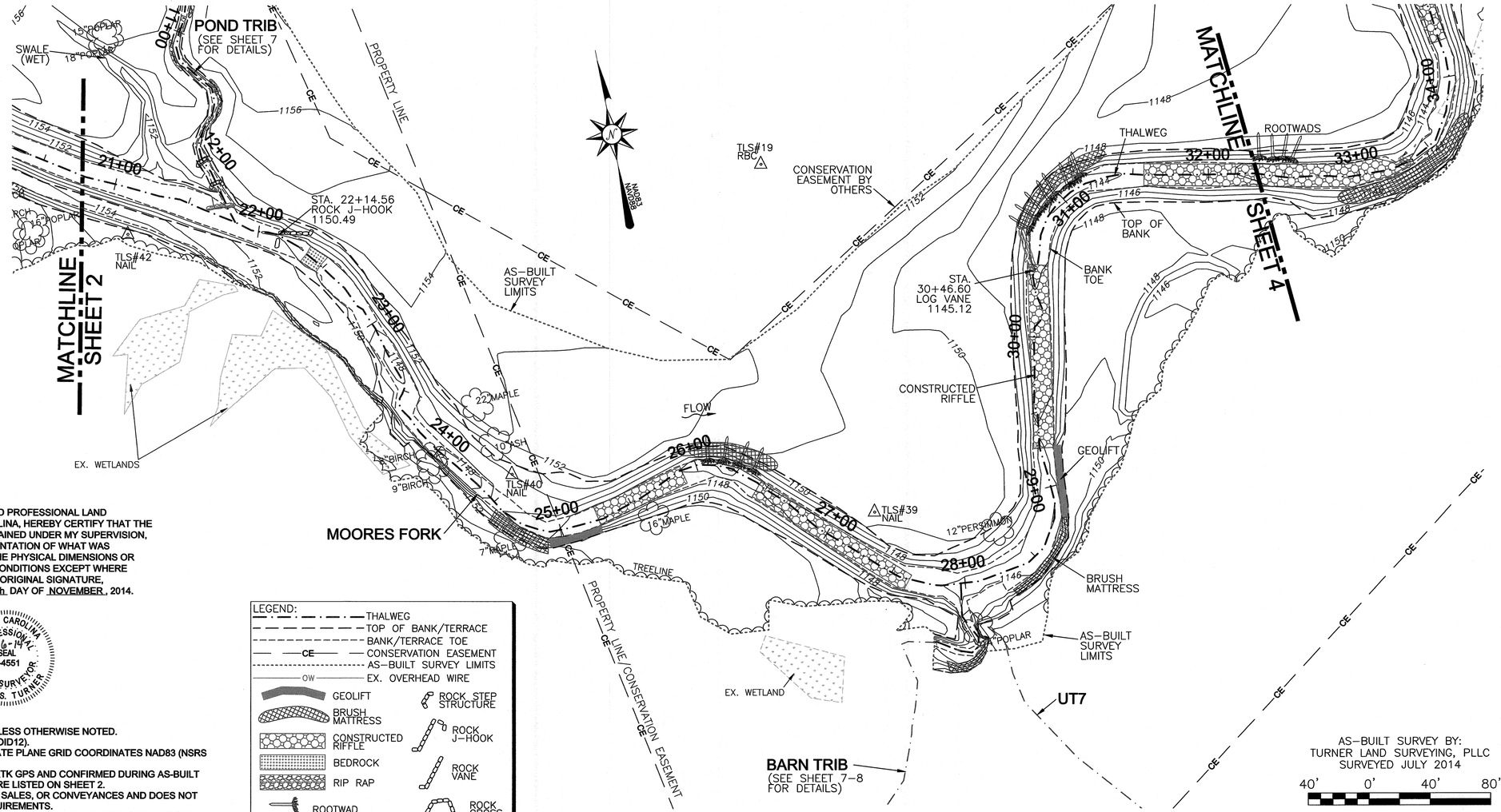
REVISIONS, DATE AND INITIAL:

MOORES FORK STA. 10+00 TO 21+00

MOORES FORK RESTORATION PROJECT
SCO PROJECT #09085670
EEP PROJECT ID #94709
SURRY COUNTY
MOUNT AIRY
NORTH CAROLINA

DATE: 09/05/2014
SURVEYED BY: MWB/DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-003
FILE: MOORES FORK_94709_AB_TLS_F.dwg
SCALE: AS SHOWN

SHEET 2 of 13



I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 6th DAY OF NOVEMBER, 2014.

David S. Turner
DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL 11-6-14 SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

GENERAL NOTES:

1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
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3. THE BASIS OF BEARINGS IS NCGS STATE PLANE GRID COORDINATES NAD83 (NSRS 2011) DATUM.
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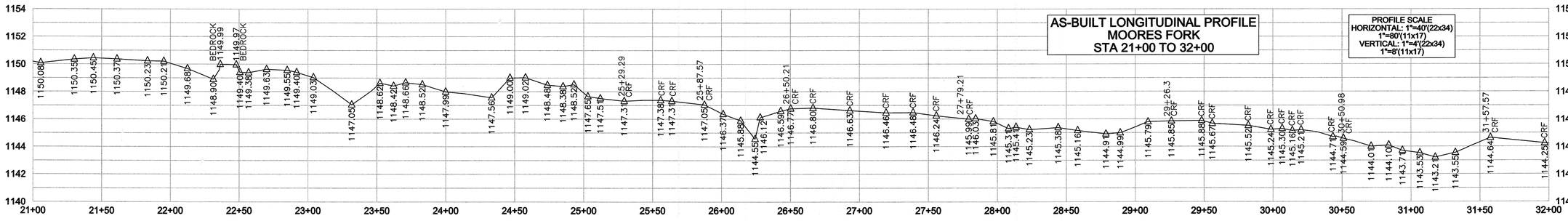
LEGEND:
- THALWEG
- TOP OF BANK/TERRACE
- BANK/TERRACE TOE
- CE — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- OW — EX. OVERHEAD WIRE
- GEOLIFT
- BRUSH MATTRESS
- CONSTRUCTED RIFFLE
- BEDROCK
- RIP RAP
- ROOTWAD CLUSTER
- CONTROL POINT
- ROCK STEP STRUCTURE
- ROCK J-HOOK
- ROCK VANE
- ROCK CROSS VANE
- LOG VANE OR SILL

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'



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MOORES FORK STA. 21+00 TO 32+00

MOORES FORK RESTORATION PROJECT

SCO PROJECT #09085670
EEP PROJECT ID #94709

MOUNT AIRY — SURRY COUNTY — NORTH CAROLINA

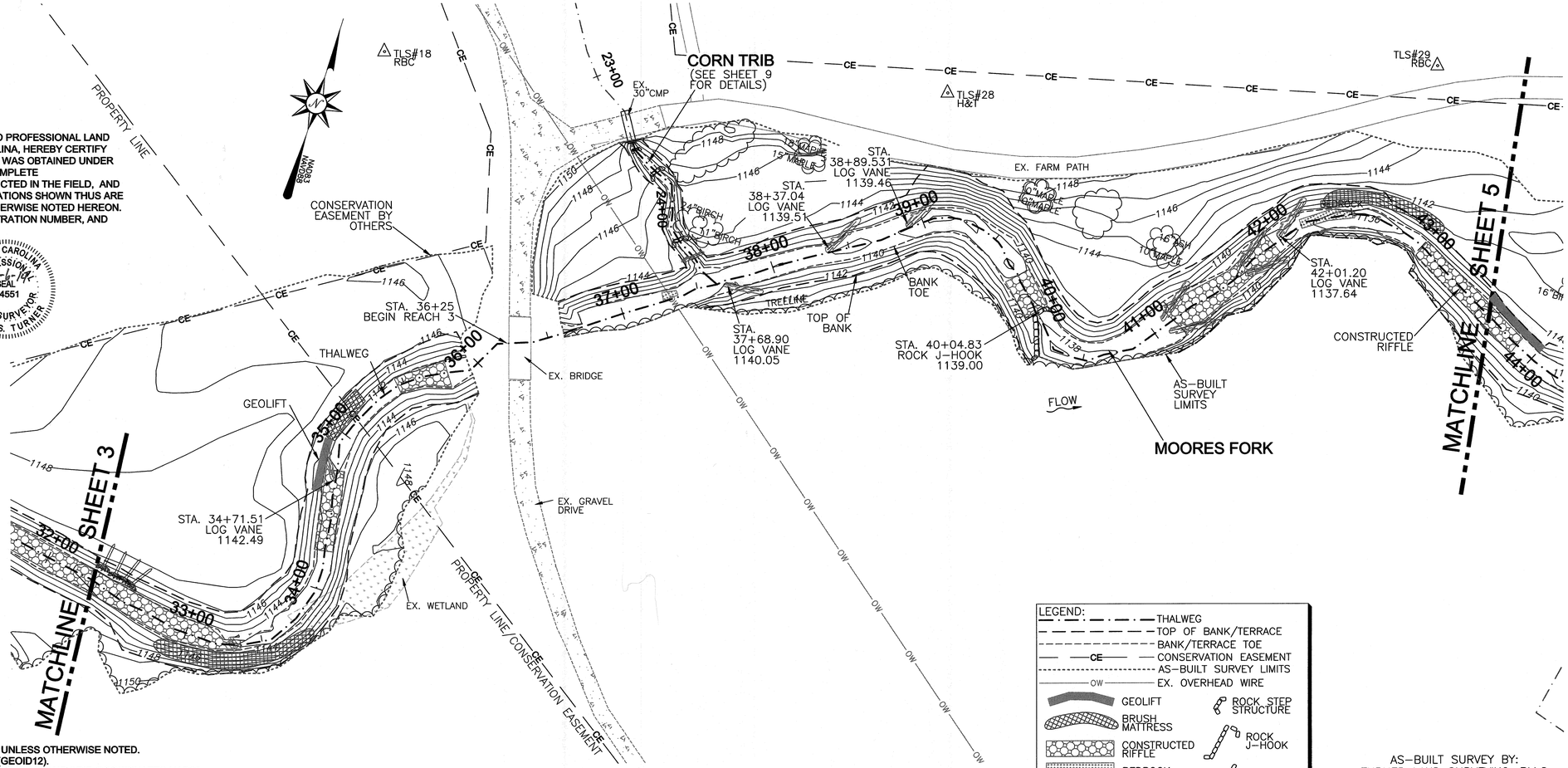
DATE:	09/05/2014
SURVEYED BY:	MWB/DST
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-003
FILE:	MOORES FORK 94709_AB_TLS_F.dwg
SCALE:	AS SHOWN

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 6th DAY OF NOVEMBER, 2014.

David S. Turner

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER



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LEGEND:
- THALWEG
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- CE — CONSERVATION EASEMENT
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- CONTROL POINT
- ROCK STEP STRUCTURE
- ROCK J-HOOK
- ROCK VANE
- ROCK CROSS VANE
- LOG VANE OR SILL

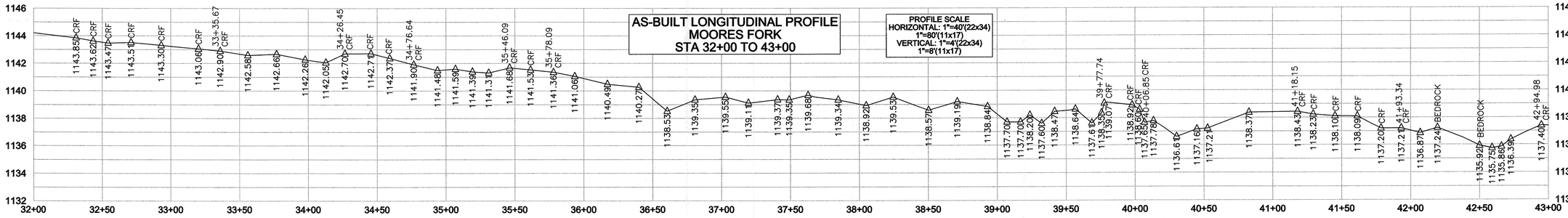
AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'

AS-BUILT LONGITUDINAL PROFILE
MOORES FORK
STA 32+00 TO 43+00

PROFILE SCALE
HORIZONTAL: 1"=40'(22x34)
1"=80'(11x17)
VERTICAL: 1"=4'(22x34)
1"=8'(11x17)



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MOORES FORK STA. 32+00 TO 43+00

MOORES FORK RESTORATION PROJECT

SCO PROJECT #090856701
EEP PROJECT ID #94709

SURRY COUNTY
NORTH CAROLINA
MOUNT AIRY

DATE: 09/05/2014
SURVEYED BY: MWB/DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-003
FILE: MOORES FORK_94709_AB_TLS_F.dwg
SCALE: AS SHOWN

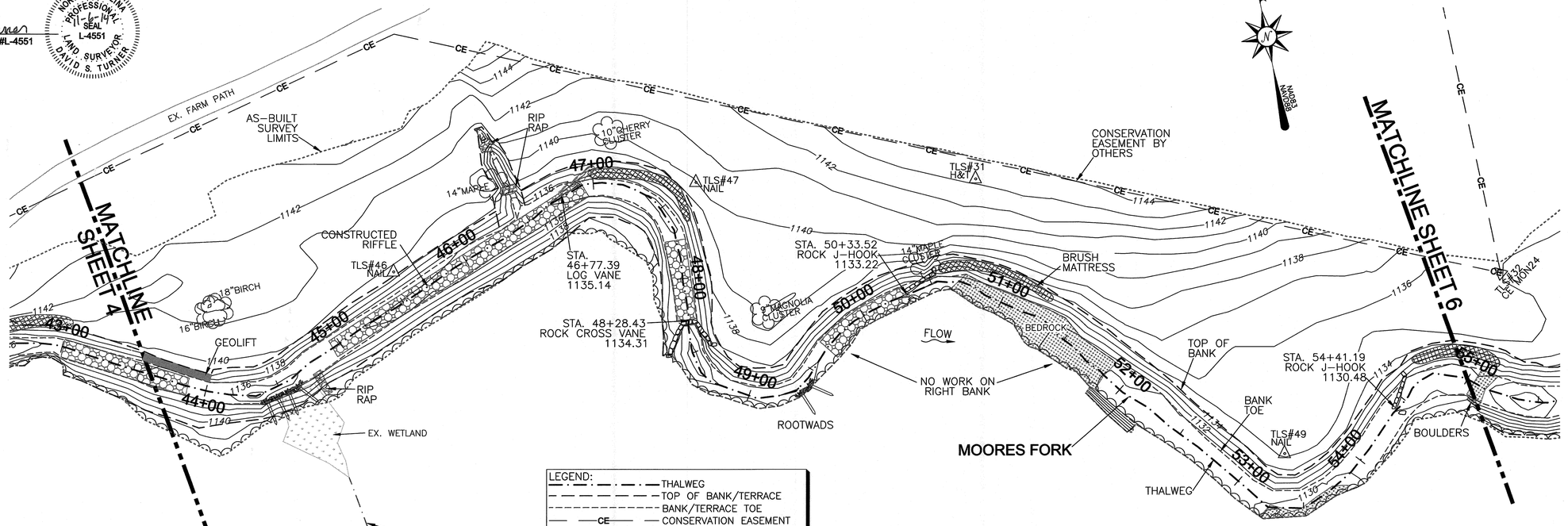
SHEET 4 of 13

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 6th DAY OF NOVEMBER, 2014.

David S. Turner

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER



LEGEND:

- THALWEG
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- AS-BUILT SURVEY LIMITS
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- ROCK STEP STRUCTURE
- ROCK J-HOOK
- ROCK VANE
- ROCK CROSS VANE
- LOG VANE OR SILL

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'

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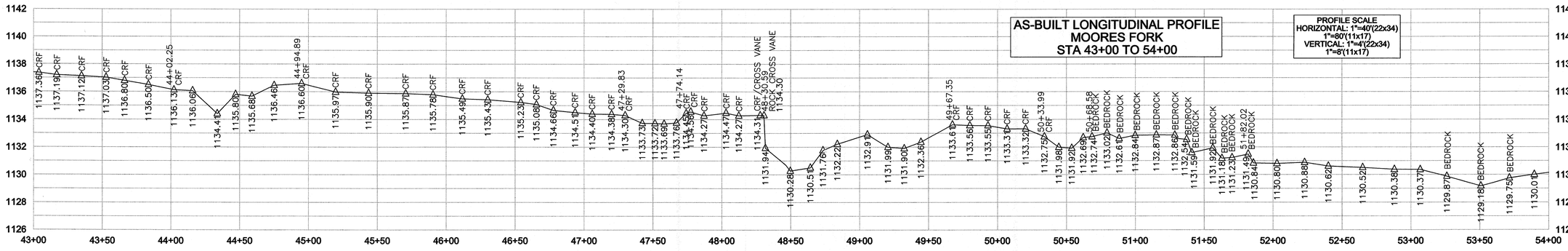

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REVISIONS, DATE AND INITIAL:

MOORES FORK STA. 43+00TO 54+00

MOORES FORK RESTORATION PROJECT
SCO PROJECT #09085670
EEP PROJECT ID #94709
SURRY COUNTY
MOUNT AIRY
NORTH CAROLINA

DATE:	09/05/2014
SURVEYED BY:	MWB/DST
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-003
FILE:	MOORES FORK 94709_AB_TLS_F.dwg
SCALE:	AS SHOWN

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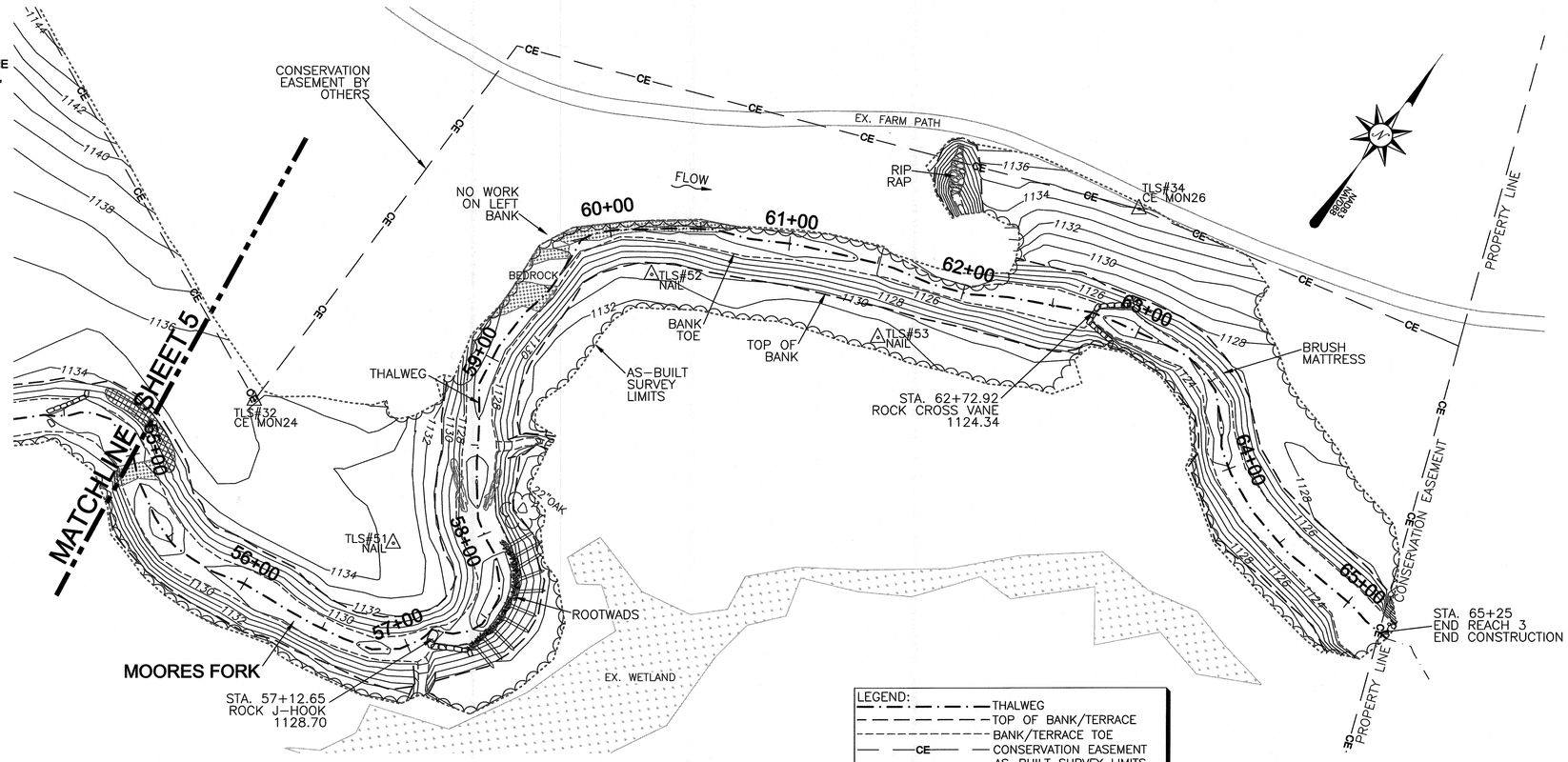
David S. Turner
DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER



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- BRUSH MATTRESS
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AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

40' 0' 40' 80'

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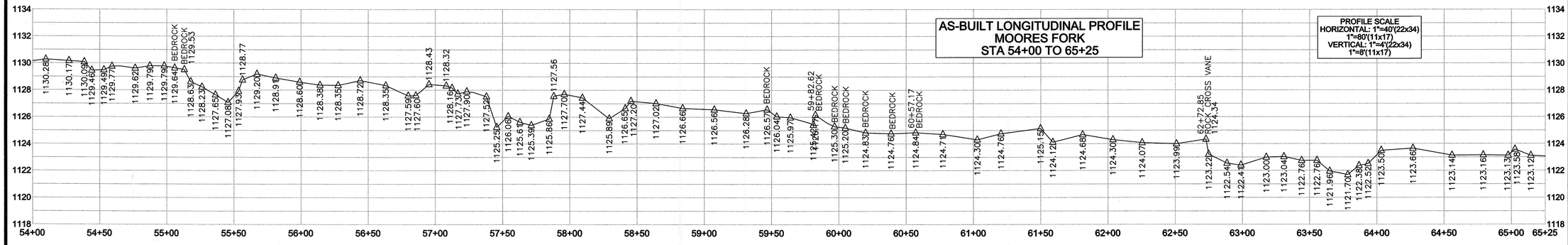
CONTOUR INTERVAL = 1'



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MOORES FORK RESTORATION PROJECT

SCO PROJECT #090856701
EEP PROJECT ID #94709

SURRY COUNTY NORTH CAROLINA

MOUNT AIRY

MOORES FORK STA. 54+00 TO 65+25

DATE:	09/05/2014
SURVEYED BY:	MWB/DST
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-003
FILE:	MOORES FORK 94709_AB_TLS_F.dwg
SCALE:	AS SHOWN

SHEET 6 of 13

I, DAVID S. TURNER, AS A DULY REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF NORTH CAROLINA, HEREBY CERTIFY THAT THE DATA SHOWN ON THIS DRAWING, WAS OBTAINED UNDER MY SUPERVISION, IS AN ACCURATE AND COMPLETE REPRESENTATION OF WHAT WAS CONSTRUCTED IN THE FIELD, AND THAT THE PHYSICAL DIMENSIONS OR ELEVATIONS SHOWN THUS ARE AS-BUILT CONDITIONS EXCEPT WHERE OTHERWISE NOTED HEREON. WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 6th DAY OF NOVEMBER, 2014.

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DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

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- ROOTWAD CLUSTER
- LOG VANE/SILL
- BEDROCK
- GEOLIFT
- RIP RAP
- WOODY DEBRIS
- CONTROL POINT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
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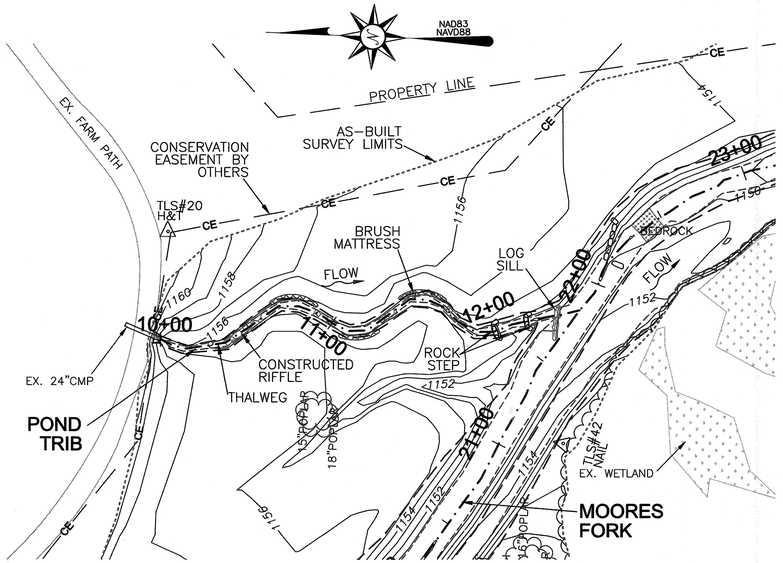
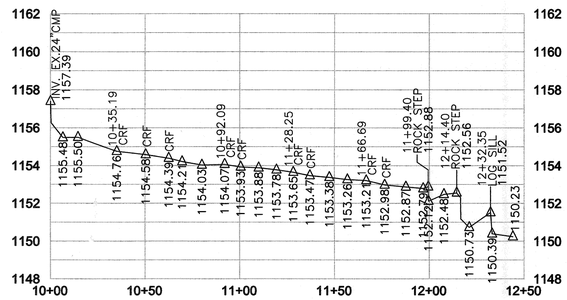
CONTOUR INTERVAL = 1'

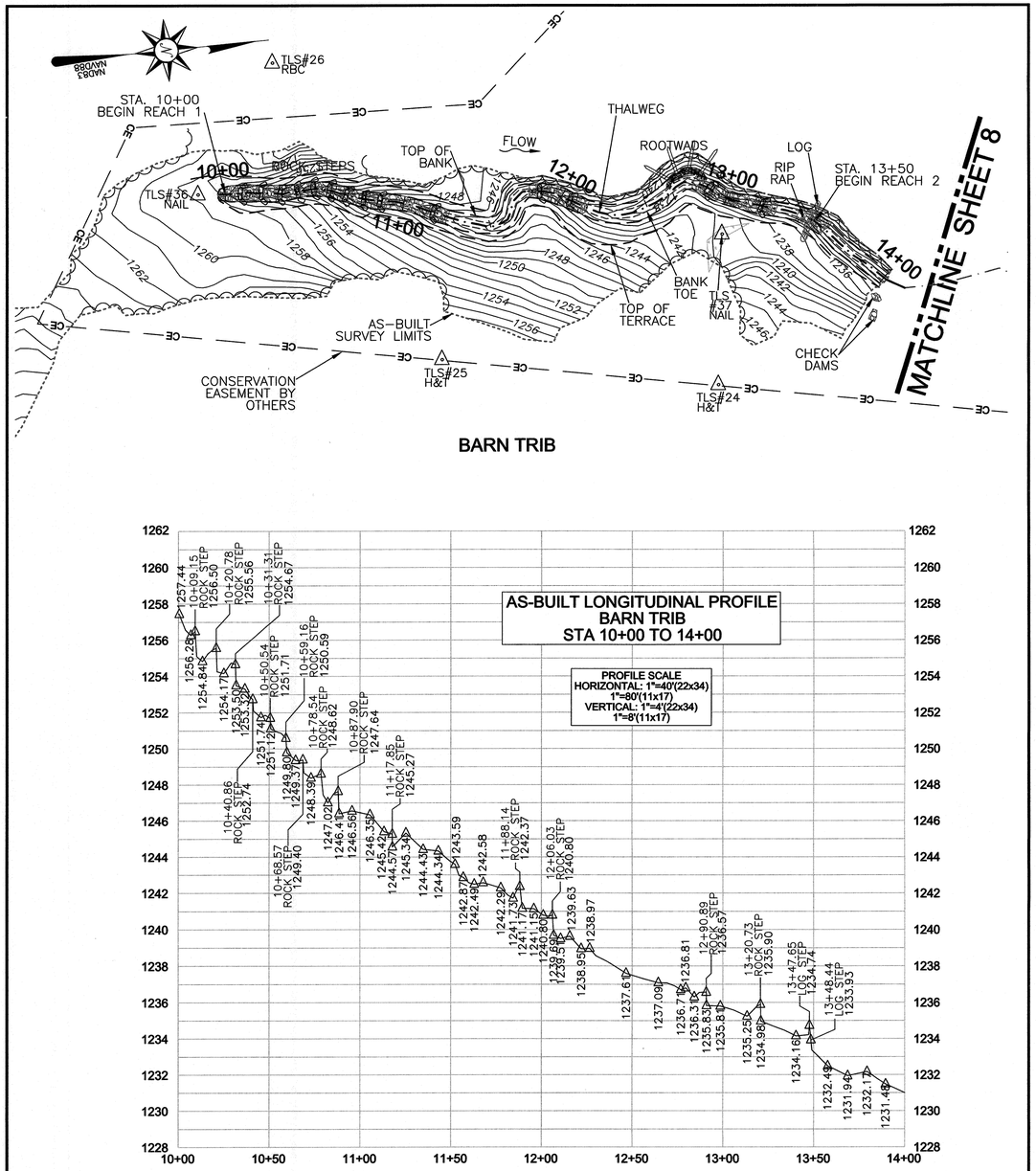


AS-BUILT LONGITUDINAL PROFILE
POND TRIB
STA 10+00 TO 12+44

PROFILE SCALE
HORIZONTAL: 1"=40'(22x34)
1"=80'(11x17)
VERTICAL: 1"=4'(22x34)
1"=3'(11x17)



POND TRIB



BARN TRIB

BARN TRIB

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REVISIONS, DATE AND INITIAL:

POND TRIB AND BARN TRIB 10+00 TO 14+00

MOORES FORK RESTORATION PROJECT
SCO PROJECT #090856701
EEP PROJECT ID #94709
SURRY COUNTY
NORTH CAROLINA
MOUNT AIRY

DATE: 09/05/2014
SURVEYED BY: MWB/DST
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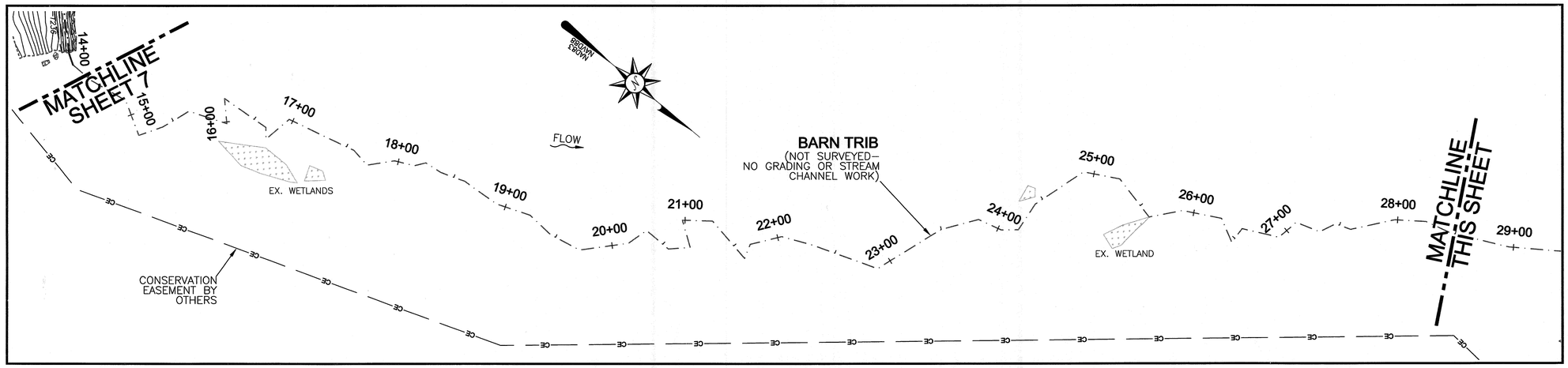
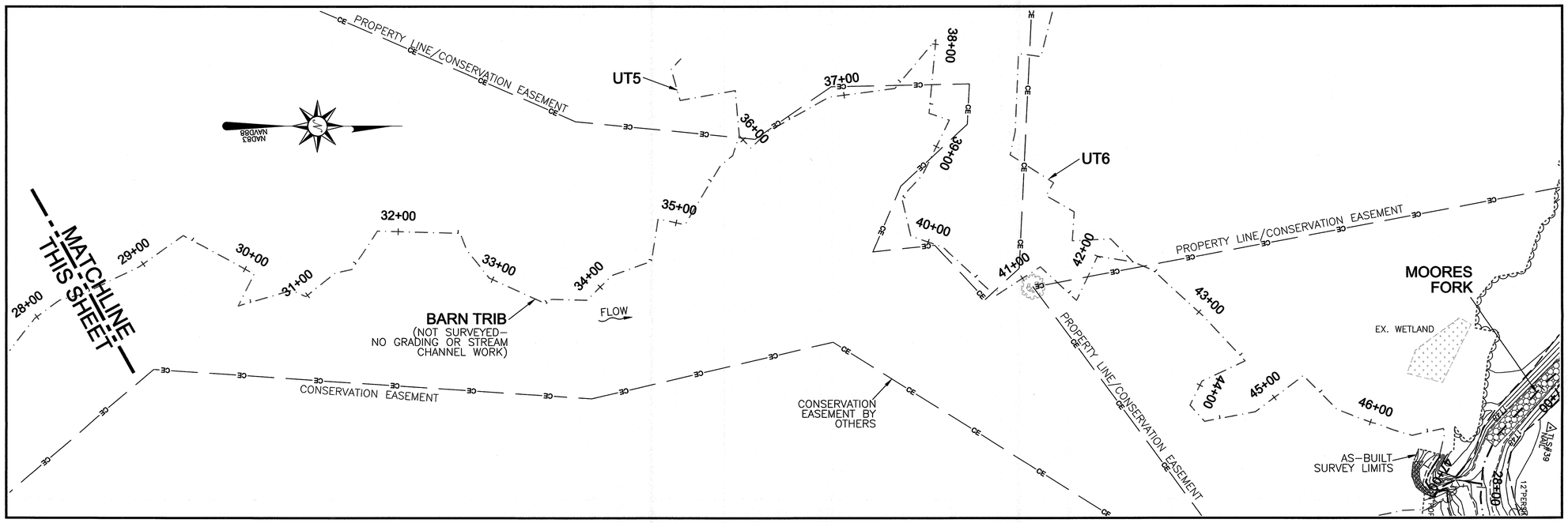
SCALE: AS SHOWN

SHEET 7 of 13





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David S. Turner

DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

GENERAL NOTES:
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7. INFORMATION SHOWN OUTSIDE THE AS-BUILT LIMITS OF DISTURBANCE WAS TAKEN FROM THE EXISTING CONDITIONS & DESIGN DATA PROVIDED BY THE DESIGNER AND NOT VERIFIED BY TURNER LAND SURVEYING, PLLC.

LEGEND:
- EX. THALWEG
- TOP OF BANK/TERRACE
- BANK/TERRACE TOE
- CE — CONSERVATION EASEMENT
- AS–BUILT SURVEY LIMITS

AS–BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

50' 0' 50' 100'

SCALE: 1"=50' (22x34)
1"=100' (11x17)
CONTOUR INTERVAL = 1'

REVISIONS, DATE AND INITIAL:

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3719 Benson Drive, Raleigh, NC 27609 -- (919)827-0745
P-0702 -- info@turnerlandsurveying.com
www.TURNERLANDSURVEYING.com

BARN TRIB STA. 14+00 TO 47+30

MOORES FORK RESTORATION PROJECT

SCO PROJECT #090856701
EEP PROJECT ID #94709

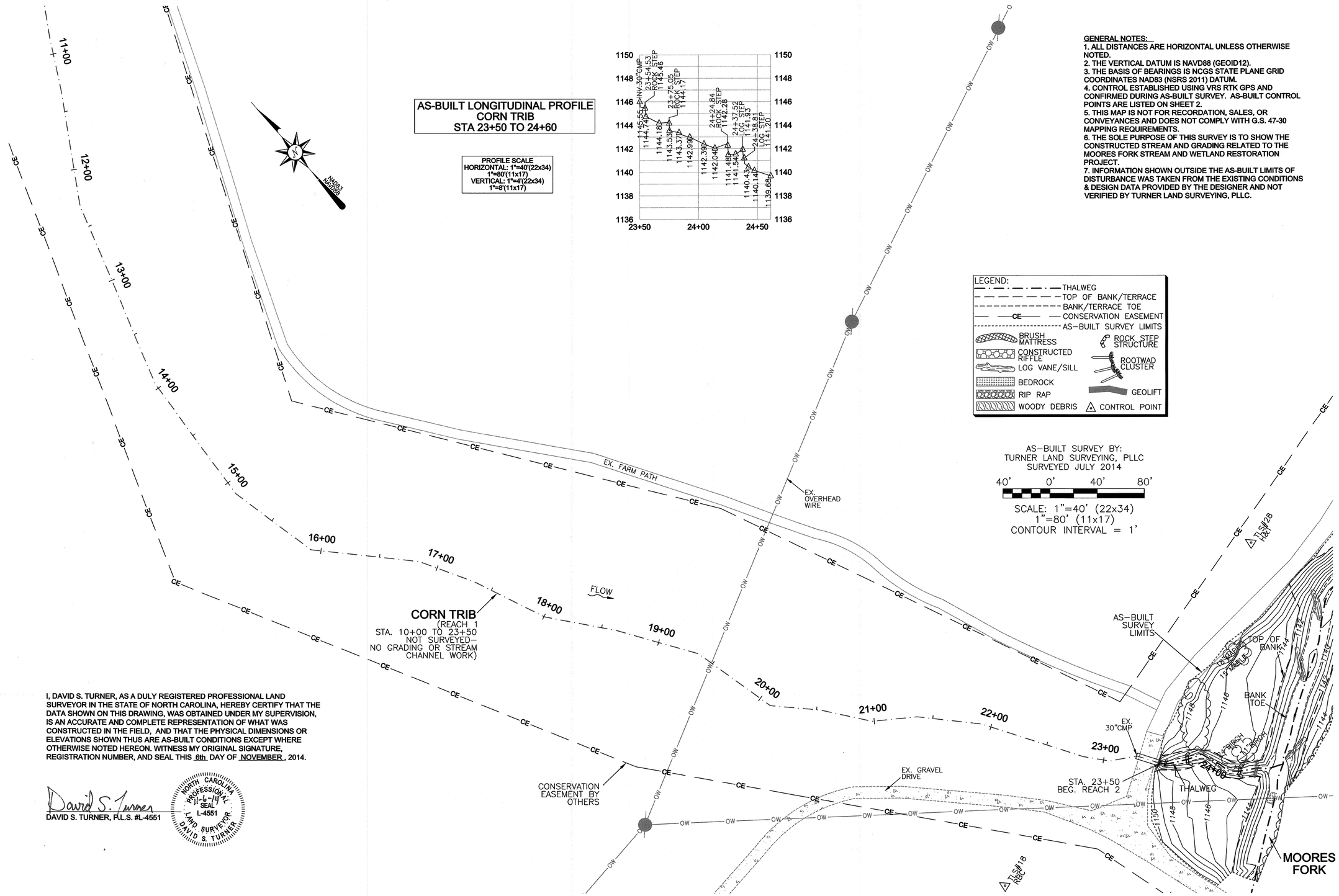
SURRY COUNTY
NORTH CAROLINA
MOUNT AIRY

DATE: 09/05/2014
SURVEYED BY: MWB/DST
DRAWN BY: DST/EGT
REVIEWED BY: DST/EGT
PROJECT: TLS-14-003
FILE: MOORES FORK_94709_AB_TLS_F.dwg
SCALE: AS SHOWN

SHEET 8 of 13

AS-BUILT LONGITUDINAL PROFILE
CORN TRIB
STA 23+50 TO 24+60

PROFILE SCALE
HORIZONTAL: 1"=40'(22x34)
1"=80'(11x17)
VERTICAL: 1"=4'(22x34)
1"=8'(11x17)



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- LOG VANE/SILL
- BEDROCK
- RIP RAP
- WOODY DEBRIS
- ROCK STEP STRUCTURE
- ROOTWAD CLUSTER
- GEOLIFT
- CONTROL POINT

AS–BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'

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MOORES FORK RESTORATION PROJECT
SCO PROJECT #090856701
EEP PROJECT ID #94709

MOUNT AIRY — SURRY COUNTY — NORTH CAROLINA

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SHEET 9 of 13

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NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER 11-6-14

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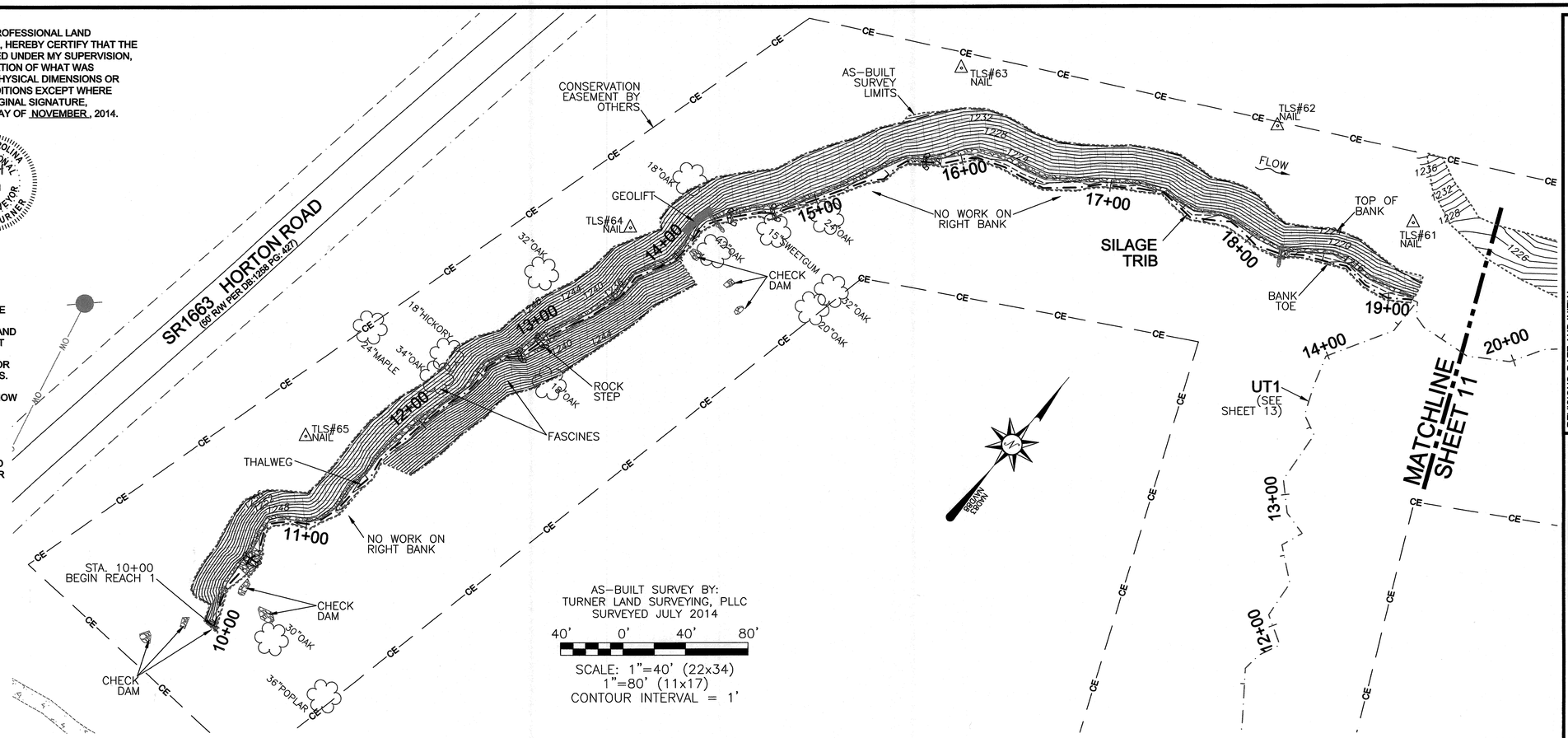

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED JULY 2014

40' 0' 40' 80'

SCALE: 1"=40' (22x34)
1"=80' (11x17)
CONTOUR INTERVAL = 1'

LEGEND:

- THALWEG
- TOP OF BANK/TERRACE
- BANK/TERRACE TOE
- CE — CONSERVATION EASEMENT
- AS-BUILT SURVEY LIMITS
- BRUSH MATTRESS
- CONSTRUCTED RIFFLE
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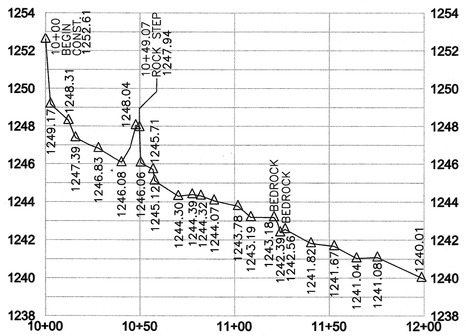
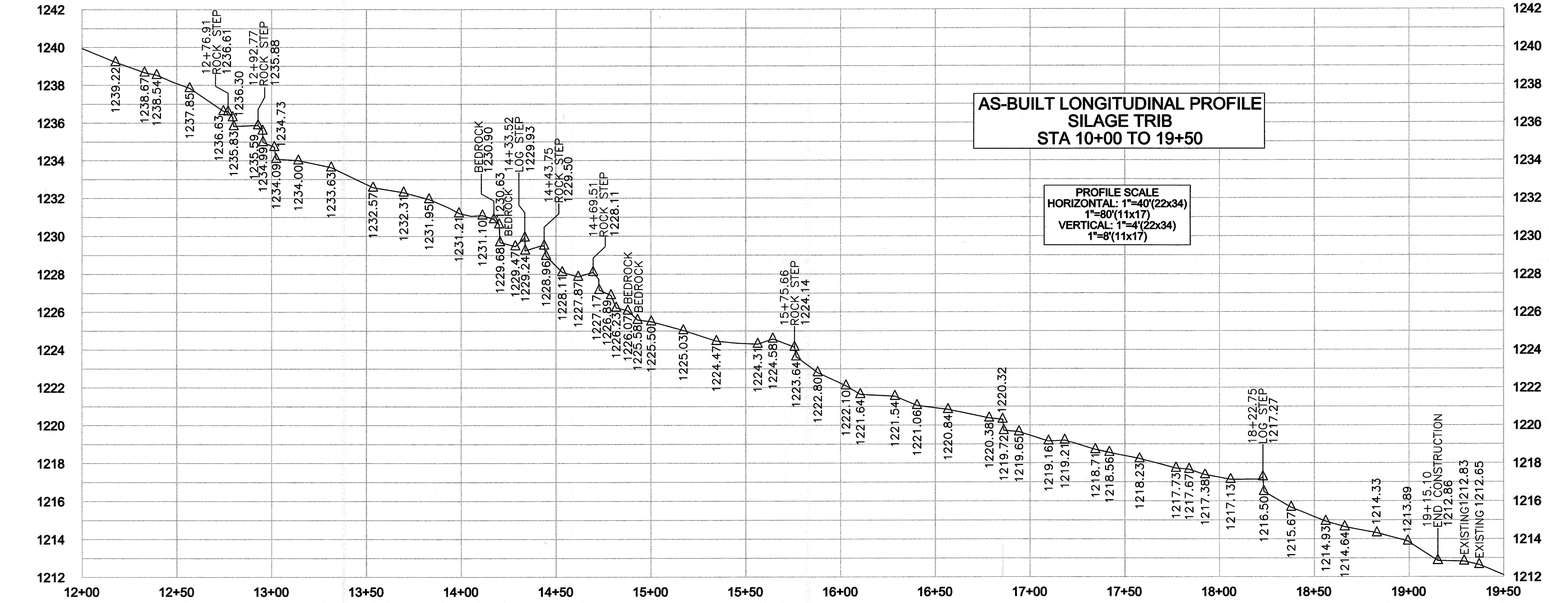
- BEDROCK
- RIP RAP
- WOODY DEBRIS
- ROCK STEP STRUCTURE
- ROOTWAD CLUSTER
- GEOLIFT
- CONTROL POINT





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REVISIONS, DATE AND INITIAL:

SILAGE TRIB STA. 10+00 TO 19+50

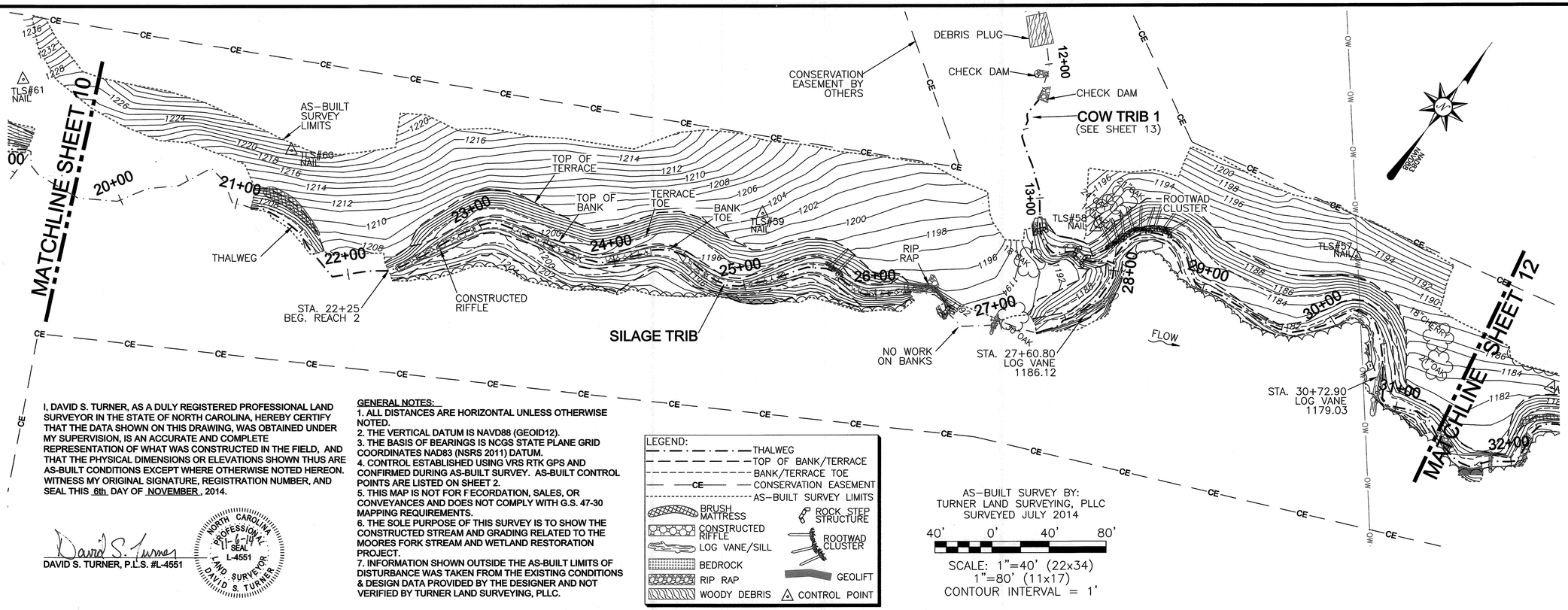
MOORES FORK RESTORATION PROJECT

SCO PROJECT #09085670
EEP PROJECT ID #94709

MOUNT AIRY — SURRY COUNTY — NORTH CAROLINA

DATE:	09/05/2014
SURVEYED BY:	MWB/DST
DRAWN BY:	DST/EGT
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-003
FILE:	MOORES FORK 94709_AB_TLS_F.dwg
SCALE:	AS SHOWN

SHEET
10 of 13



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David S. Turner

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NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

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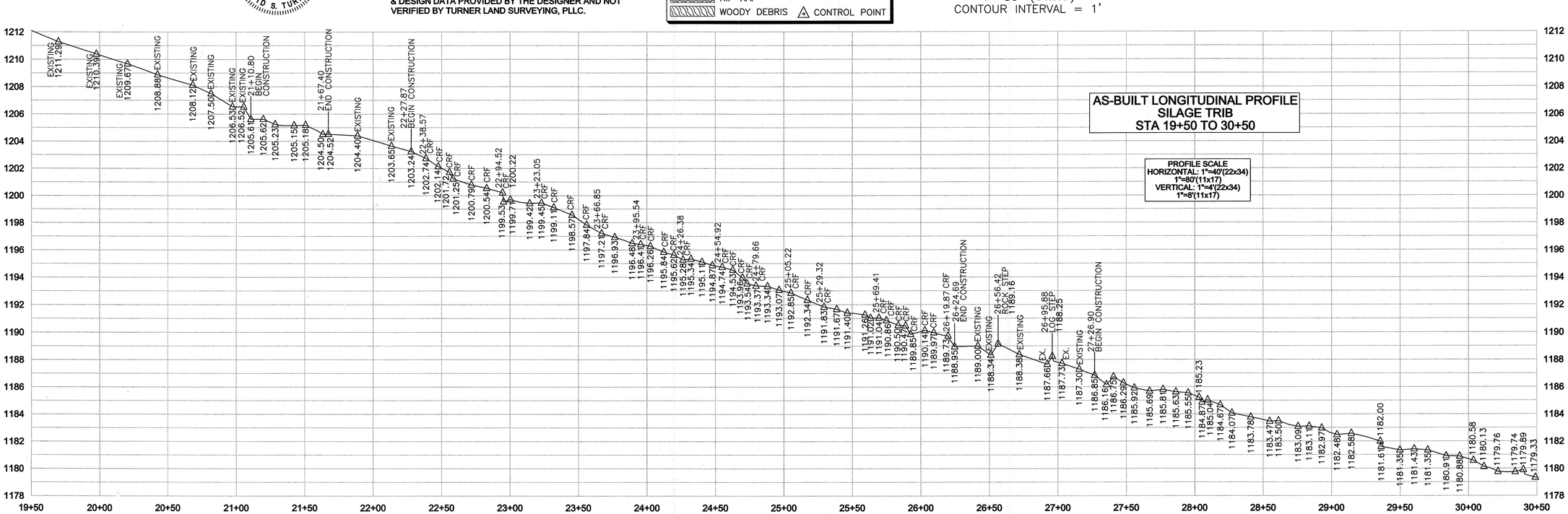

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SILAGE TRIB STA. 19+50 TO 30+50

MOORES FORK RESTORATION PROJECT

SCO PROJECT #090856701
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MOUNT AIRY — SURRY COUNTY — NORTH CAROLINA

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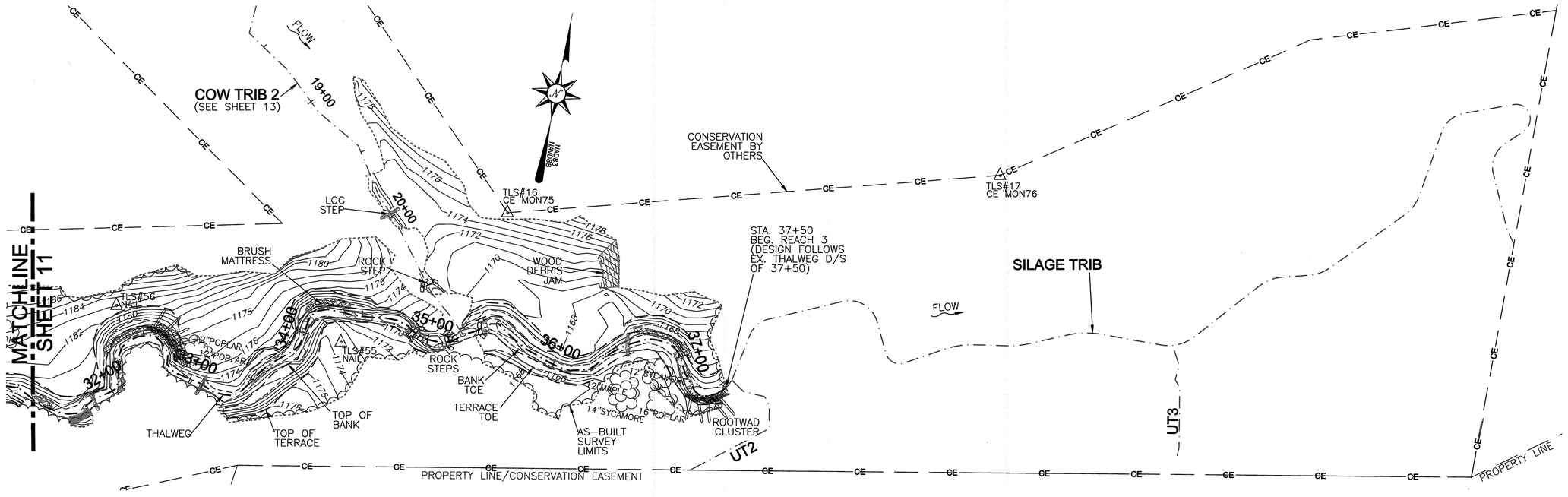
SHEET 11 of 13



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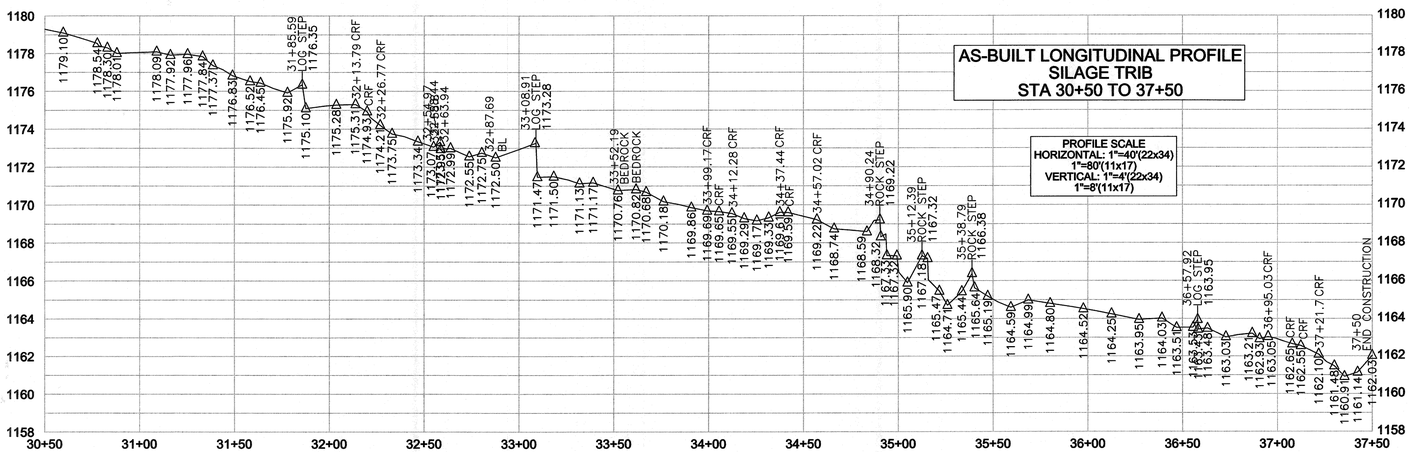

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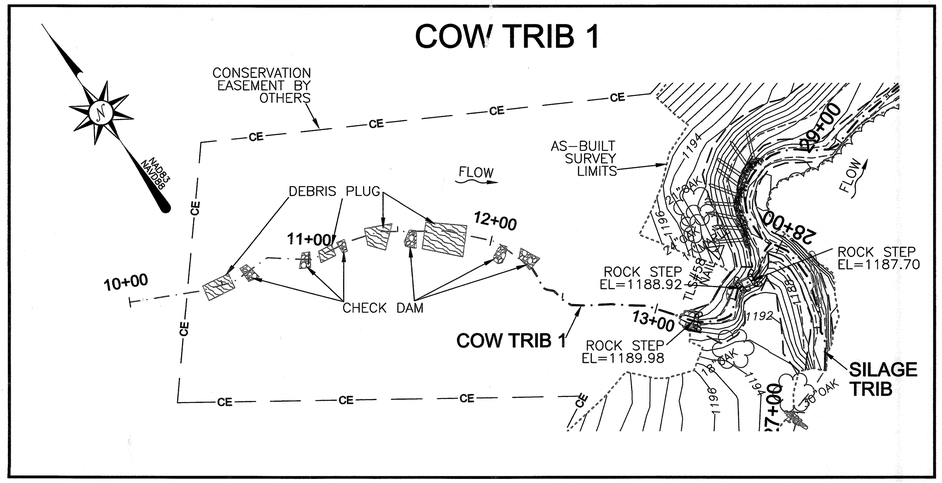
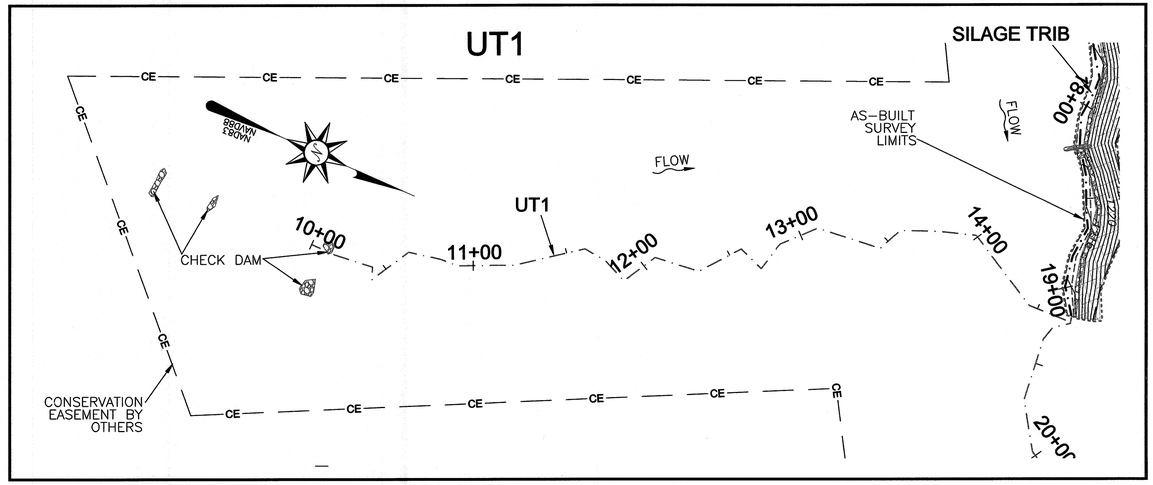
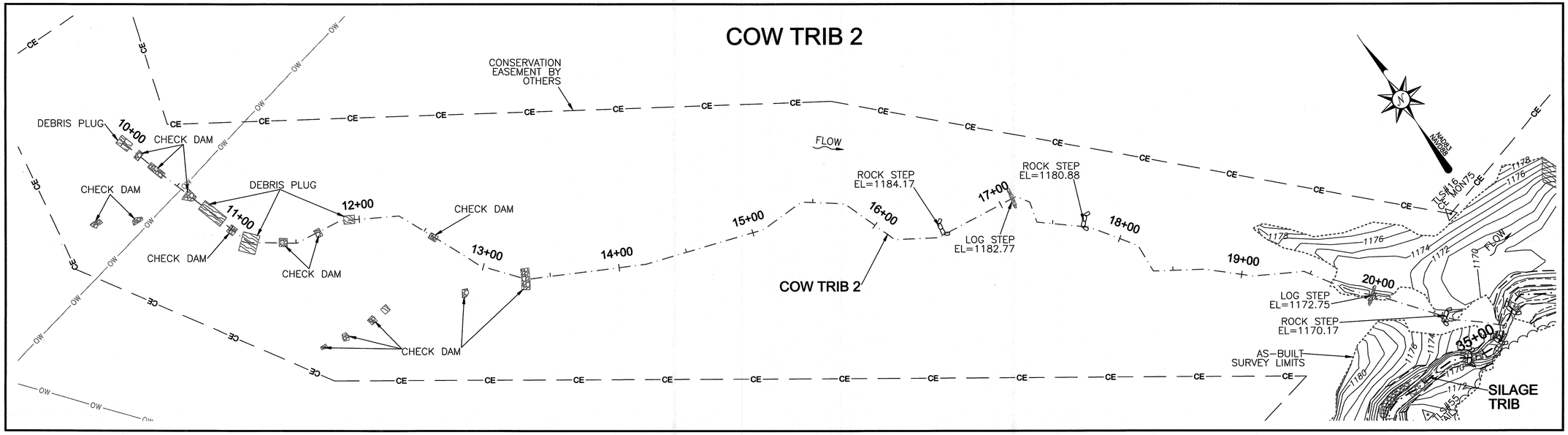
SHEET 12 of 13







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COW TRIBS 1 & 2 AND UT1

MOORES FORK RESTORATION PROJECT

SCO PROJECT #090856701
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SHEET 13 of 13