POPLIN RIDGE STREAM RESTORATION PROJECT
BASELINE MONITORING REPORT

UNION COUNTY, NORTH CAROLINA
PROJECT # 95359
CONTRACT #004672

Prepared for:

Division of Mitigation Services
North Carolina Department of Environment and Natural Resources
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Poplin Ridge
Union County, North Carolina
DMS Project ID 95359

Yadkin River Basin
HUC 03040105070050

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EXECUTIVE SUMMARY

The Poplin Ridge Stream Restoration Project is located within an agricultural watershed in Union County, North Carolina, approximately six miles north of Monroe. The stream channels were heavily impacted by channelization and agricultural practices. The project involved the restoration and protection of streams in the Stewarts Creek watershed. The purpose of this restoration project was to restore and enhance a stream complex located within the Yadkin River Basin.

The project lies within USGS Hydrologic Unit Code 03040105070050 (USGS, 1998) and within the North Carolina Division of Water Quality (NCDWQ) Yadkin River Subbasin 03-07-14 (NCDENR, 2002). The project is split into two tributary systems (UT1 and UT2). The western system (UT1) is divided into seven reaches along four unnamed tributaries to East Fork Stewarts Creek. The eastern system (UT2) is divided into five reaches, all unnamed tributaries of East Fork Stewarts Creek. UT1-Reach 1 begins at the start of the restoration project (STA 1+20) and extends southeast to STA 12+58. UT1-Reach 2 begins at STA 12+58 and extends to STA 24+96. UT1-Reach 3 begins at STA 24+96 and extends to STA 34+50. UT1-Reach 4 is the downstream section of UT1 (STA 34+50 to 46+73). Reach UT1-A flows south directly into UT1 at the break between Reaches 1 and 2. UT1-B flows south to the break between UT1 Reaches 2 and 3. UT1-C flows east to the break between UT1 Reaches 3 and 4. UT2-Reach 1 begins at the start of the UT2 portion of the restoration project (STA 0+00) and extends southwest to STA 4+90. UT2-Reach 2 begins at STA 4+90 and extends to STA 13+97. UT2-Reach 3 begins at STA 13+97 and extends to STA 19+18. UT2-Reach 4 begins at STA 19+18 and extends to STA 22+07. Reach UT2-A flows east into UT2 at the break between Reaches 2 and 3.

Land uses within and immediately adjacent to the project area include row crops, hay fields, pasture, concentrated animal feeding operations (CAFO), and wooded areas. The total easement area is 27.17 acres, approximately 4.69 acres of which are wooded and the remaining 22.48 acres is agricultural fields and pasture. Land use immediately surrounding the project consists of row crops and forestry. Previous adjacent cattle pastures have been converted into cultivated fields. Stream conditions along the project's restoration reaches demonstrated significant habitat degradation as a result of impacts from livestock and channelization performed to promote agricultural activities. Additionally, the riparian buffer was in poor condition throughout most of the project area. Much of the riparian buffer was devoid of trees or shrubs, was active pasture and/or crops were present up to the edge of the channel. Little habitat was available to support aquatic life, and the channels were not maximizing their potential to filter nutrients because they were entrenched.

The goal for the Poplin Ridge project is to restore the channelized streams based on reference reach conditions, enrich the aquatic ecosystem through stream restoration and riparian buffer habitat improvements, and provide ecological uplift within the Yadkin River Basin. The design was based on reference conditions, USACE guidance (USACE, 2005), and criteria that are developed during this project to achieve success.

The objective for this restoration project is to restore a natural waterway through a stream complex with appropriate cross-sectional dimension and slope that will provide function and meet the appropriate success criteria for the existing streams. Accomplishing this objective entails the restoration of natural stream characteristics, such as stable cross sections, planform, and in-stream habitat. The floodplain areas will be hydrologically reconnected to the channel to provide natural exchange and storage during flooding events. Additional project objectives, such as restoring the riparian buffer with native vegetation, ensuring hydraulic stability, and eradicating invasive species, are listed in Section 1.2 along with several other project objectives.

All construction and planting activities have been completed, therefore the site will be monitored on a regular basis, and a physical inspection of the site will be conducted a minimum of twice per year throughout the seven year post-construction monitoring period, or until performance standards are met. These site inspections will identify site components and features that require routine maintenance. Annual monitoring data will be reported using the DMS (EEP) monitoring template.

Upon approval for closeout by the Interagency Review Team (IRT), the site will be transferred to the NCDENR - Stewardship. The State shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

The as-built survey drawings indicate that the Poplin Ridge site was constructed to the mitigation plan design. Profile and dimension parameters are within the tolerances for stream mitigation construction. UT-1 and tributaries to UT-1 were all constructed to design plans and specifications. During construction activities, UT-2 had minimal modifications. Proposed cattle fencing along UT-2 was not installed due to the landowner converting the adjacent land use. The cattle pastures that were previously adjacent to UT-2 have been converted to row-crop fields. The landowner has assured RES that he no longer plans to have cattle on his property. Two rock cross vanes were substituted along UT2-R2 with log cross vanes at stations 11+38 and 13+53. Along UT2-R3, a proposed rock cross vane at station 16+59 was omitted due to bedrock presence. All changes were approved by the design engineer and are documented on the as-built drawings.

The original DMS (NCEEP) full delivery contact was for 6,944 SMUs. Due to project constraints and landowner negotiations the final design and construction plans included 6,345 SMUs. This reduction was primarily due to a change in approach at the downstream end of UT2-R4 where the landowner withdrew from the project. Following construction, the as-built survey indicated 9,179 linear feet of channel within the easement generating 6,365 SMUs.

Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**

*As-Built length does not include channel in easement breaks.

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1 PROJECT GOALS, BACKGROUND AND ATTRIBUTES

1.1 Location and Setting

The Poplin Ridge Stream Site is located in Union County approximately 6 miles north of Monroe, NC. The project lies within USGS Hydrologic Unit Code 03040105070050 (USGS, 1998) and within the North Carolina Division of Water Quality (NCDWQ) Yadkin River Subbasin 03-07-14 (NCDENR, 2002). To access the Site from the city of Monroe, travel west on West Roosevelt Boulevard, then turn north onto Secrest Short Cut Road. To access UT1, travel 3.6 miles on Secrest Short Cut Road, then turn right onto a gravel farm road and drive approximately 0.6 miles. To access UT2, travel north on Secrest Short Cut Road for 2.8 miles, then turn right onto Roanoke Church Road. After 0.8 miles, turn left onto a gravel farm road. This private road will split just past the pond on the left. At the split, stay to the left and travel approximately 800 feet to access the downstream end of UT2.

1.2 Project Goals and Objectives

The Poplin Ridge stream mitigation project will provide numerous ecological and water quality benefits within the Yadkin River Basin. While many of these benefits are limited to the project area, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects. Expected improvements to water quality, hydrology, and habitat are outlined below.

Design Goals and Objectives

Benefits Related to Water Quality	
Nutrient removal	Benefit will be achieved through filtering of runoff from adjacent CAFOs through buffer areas, the conversion of active farm fields to forested buffers, improved denitrification and nutrient uptake through buffer zones, and installation of BMPs at the headwaters of selected reaches and ditch outlets.
Sediment removal	Benefit will be achieved through the stabilization of eroding stream banks and reduction of sediment loss from field areas due to lack of vegetative cover. Channel velocities will also be decreased through a reduction in slope, therefore decreasing erosive forces.
Increase dissolved oxygen concentration	Benefit will be achieved through the construction of instream structures to increase turbulence and dissolved oxygen concentrations and lower water temperature to increase dissolved oxygen capacity.
Runoff filtration	Benefit will be achieved through the restoration of buffer areas that will receive and filter runoff, thereby reducing nutrients and sediment concentrations reaching water bodies downstream.
Benefits to Flood Attenuation	
Water storage	Benefit will be achieved through the restoration of buffer areas which will infiltrate more water during precipitation events than under current site conditions.
Improved groundwater recharge	Benefit will be achieved through the increased storage of precipitation in buffer areas, ephemeral depressions, and reconnection of existing floodplain. Greater storage of water will lead to improved infiltration and groundwater recharge.
Improved/restored hydrologic connections	Benefit will be achieved by restoring the stream to a natural meandering pattern with an appropriately sized channel, such that the channel's floodplain will be flooded more frequently at flows greater than the bankfull stage.
Benefits Related to Ecological Processes	
Restoration of habitats	Benefit will be achieved by restoring riparian buffer habitat to appropriate bottomland hardwood ecosystem.
Improved substrate and instream cover	Benefit will be achieved through the construction of instream structures designed to improve bedform diversity and to trap detritus. Substrate will become coarser as a result of the stabilization of stream banks and an overall decrease in the amount of fine materials deposited in the stream.

Addition of large woody debris	Benefit will be achieved through the addition of wood structures as part of the restoration design. Such structures may include log vanes, root wads, and log weirs.
Reduced temperature of water due to shading	Benefit will be achieved through the restoration of canopy tree species to the stream buffer areas.
Restoration of terrestrial habitat	Benefit will be achieved through the restoration of riparian buffer bottomland hardwood habitats.

1.3 Project Structure

Table 1. Poplin Ridge Project Components

Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
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UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**

*As-Built length does not include channel in easement breaks.

1.3.1 Restoration Type and Approach

Stream restoration efforts along the unnamed tributaries to East Fork Stewarts Creek were accomplished through analyses of geomorphic conditions and watershed characteristics. The design approach applied a combination of analytical and reference reach based design methods that meet objectives commensurate with both ecological and geomorphic improvements. Performed treatment activities range from minor bank grading and planting to re-establishing stable planform and hydraulic geometry. Stream reaches requiring full restoration, natural design concepts were applied and verified through rigorous engineering analyses and modeling. The objective of this approach was to design a geomorphically stable channel that provides habitat improvements and ties into the existing landscape.

The Poplin Ridge Site includes Priority Level I stream restoration, stream Enhancement Levels I and II, and Stream Preservation and Buffer Enhancement. Priority Level I stream restoration incorporated the design and construction of a single-thread meandering channel, with parameters based on data taken from the reference site, published empirical relationships, NC Rural Piedmont Regional Curves, and hydrologic and hydraulic analyses. 3,696 linear feet of stream channel has been reconstructed. Enhancement Level I was applied to 3,340 linear feet of channel that required stabilization and bank improvements, and buffer restoration. Enhancement Level II has been applied to an additional 951 linear feet of channel that required buffer enhancement and/or minimal bank and habitat improvements. Additionally, Stream Preservation and Buffer Enhancement was performed on 1,192 feet of channel.

The Poplin Ridge Site design approach began with a thorough study of existing conditions, including the onsite streams and ditches, valleys, and watershed. Design parameters, included active channel, habitat and floodplain features were developed from analyses performed at the reference site. Analytical design techniques were used to determine the design discharge and to verify the design as a whole.

Engineering analyses were performed concurrently to geomorphic and habitat studies. While the stream design was verified by simulations of hydrology and fluvial processes, analogs of desirable habitat features were derived from reference sites and integrated into the project design. Both riparian habitat features and in-stream structures such as riffle grade controls, cross weirs, log toes, and step pools were used throughout the project to act as grade control and for bank stabilization by dissipating and redirecting the stream's energy. Bank stability was also enhanced through the installation of cuttings bundles and live stakes that included native species (e.g. black willow (*Salix nigra*) and silky dogwood (*Cornus amomum*)).

In-stream habitat is highly dependent on available cover and organic material. A quantitative habitat assessment method was used to measure type, location, and quantity of habitat in the reference streams. During design, the habitat assessment results were scaled appropriately to the design parameters such that the quantity and placement of the habitat features along the restored channel mimics reference conditions. This process provided a natural channel design that addressed aquatic function improvements in addition to stability.

Sections of abandoned stream channel have been backfilled to the elevation of the floodplain in areas adjacent to the new channel with material excavated onsite and by installing channel plugs where necessary. The floodplains were planted with native species creating a vegetated buffer, which will

provide numerous water quality and ecological benefits. Stream banks were stabilized using a combination of grading, erosion control matting, bare-root plantings, native material revetment techniques (i.e. bioengineering), structure placement, and sod transplants where possible. The stream and adjacent riparian areas have been protected by a minimum 50-foot permanent conservation easement, which will be fenced as needed to exclude livestock. However, an approximately 100-foot section along the east side of Reach UT1-R4 is proposed where the minimum 50-foot conservation easement cannot be met due to a Union Power Cooperative 100-foot right-of-way. At this location, the conservation easement will be extended to a width that varies between 75 and 100 feet along the west side of the channel to offset the loss of easement on the opposite side. Additionally, areas within the power easement that fall within the 50-foot buffer have been planted with herbaceous/shrub vegetation. No loss in stream credit is expected at this location since the buffer width will be increased along the west side to offset the encroachment of the powerline easement as was discussed with the IRT on July 11, 2012.

When all of these components are combined, a functional and stable channel with diverse habitat will be restored. According to Stream Mitigation Guidelines (2003) published by the US Army Corps of Engineers, the US Environmental Protection Agency, The North Carolina Wildlife Resources Commission, and the NCDWR, the proposed restoration design has met the guidelines of stream restoration and will be subject to a mitigation ratio of 1:1. Note: UT2-R3 has a proposed mitigation ratio of 1.5:1 per communication with USACE. The lower mitigation ratio accounts for minor unpermitted impacts to the channel by the landowner.

Throughout the project area, there are several breaks within the conservation easement where stream credits are not generated to account either for 60-foot farm crossings or for existing Union Power overhead utility crossings. Along UT1, one existing crossing was moved outside of the project, one new culvert crossing has been installed, and three culvert crossings have been removed and replaced, two of which remained outside of the project. Along UT2, the two previous existing culvert crossings have been removed and upgraded at their original location, and there are two 30-foot easement breaks associated with Union Power easements. These two easement breaks will be planted with herbaceous/shrub vegetation within the 50-foot buffer.

Poplin Ridge has been broken into the following reaches:

UT1-R1 (STA 1+20 to 12+58) – Upper-most portion of UT1 totaling 572 linear feet of Stream Preservation and Buffer Enhancement and 566 linear feet of Enhancement Level I. The upper portion of this reach is stable and has a mature hardwood buffer. The lower portion was partially forested and flowed through cultivated fields. This lower portion was experiencing active erosion and had a disturbed buffer. Stabilization/enhancement activities performed on UT1-R1 included performing minor bank grading, installing grade control and habitat structures, and planting a riparian stream buffer.

An additional level of protection to prevent channel down cutting and incision is provided from the natural bedrock observed throughout reach UT1 and the proposed grade control structures proposed throughout the project.

UT1-R2 (STA 12+58 to 24+96) – Upper of the two middle reaches along UT1 totaling 1,178 linear feet of Priority I Restoration. This reach flows through cultivated fields and had highly unstable banks with a highly disturbed buffer. Restoration activities involved constructing a meandering channel, installing habitat and grade control structures, filling and plugging the abandoned channel, and re-vegetating the buffer with native plants. A 60-foot conservation easement break is located at the

upstream portion of UT2-R2 to allow agricultural access across the stream. Within the easement break, a stream crossing was constructed using a 48" HDPE culvert.

UT1-R3 (STA 24+96 to 34+50) – Lower of the two middle reaches along UT1 totaling 893 linear feet of Priority I Restoration. This reach flows through cultivated fields and had highly unstable banks with a highly disturbed buffer. Restoration activities performed along UT1-R3 included constructing a meandering channel, installing habitat and grade control structures, filling and plugging the abandoned channel, and planting the stream buffer with native vegetation. A stream crossing was installed at STA 25+50 within the 60-foot easement break using a 42" RCP culvert to allow access to the adjacent agriculture fields.

UT1-R4 (STA 34+50 to 46+73) – Downstream-most portion of UT1 totaling 1,223 linear feet of Enhancement Level I. This reach flows through cultivated fields, had moderately unstable banks and a highly disturbed buffer. Enhancement activities included laying back banks, enhancing existing stream benches, installing grade control and habitat structures, and replanting the buffer. The existing culvert crossing just downstream of the project at STA 47+50 was removed and replaced with twin 54" RCP culverts.

UT1-A (STA 0+73 to 2+89) – Upper-most tributary to UT1 totaling 216 linear feet of Enhancement Level I. This stream reach originates just downstream of a forested area, flows through cultivated fields, and exhibited minor bank erosion. Enhancement activities included reshaping the channel banks, removing an existing culvert crossing, and installing habitat structures. A gravel ford crossing has been installed just upstream of the project near STA 0+50 to allow the landowner continued access across the property.

UT1-B (STA 0+09 to 11+45) – Tributary of UT1 that flows north to south totaling 620 linear feet of Stream Preservation and Buffer Enhancement and 455 linear feet of Enhancement Level I. The upper portion of this reach was stable and had an intact riparian buffer throughout. Below STA 6+29, the channel flowed through a cultivated field, had no buffer, and exhibited channel incision along the downstream section. Enhancement activities performed along UT1-B included reshaping the channel banks, upgrading an existing culvert crossing, re-vegetating the buffer and installing habitat and grade control structures.

UT1-C (STA 1+21 to 10+01) – Southern-most tributary to UT1 totaling 880 linear feet of Enhancement Level I. This reach flows west to east through cultivated fields and lacked a riparian buffer. Stabilization/enhancement activities along UT1-C included bank grading and channel reshaping, installing grade control and habitat structures, and planting a riparian buffer. An existing culvert crossing was removed and replaced with a 48" RCP culvert just upstream of the conservation easement at STA 0+76.

UT2-R1 (STA 0+00 to 4+90) – Upper-most portion of UT2 totaling 490 linear feet of Enhancement Level II. This reach flows between cultivated fields. The stream buffer, which lacks mature hardwoods, had previously been disturbed by agricultural practices and cattle access. The adjacent cattle pasture land has been converted to row crop fields; therefore, cattle no longer have access to the stream channel. Stream enhancement activities included reshaping the channel, invasive species treatment, riparian buffer plantings, and installing grade control structures at the downstream end of the reach.

UT2-R2 (STA 4+90 to 13+97) – Upper of the two middle reaches along UT2 totaling 847 linear feet of Priority I Restoration. This stream reach was previously a 1.3 acre farm pond with a drainage area

of 723 acres and is surrounded by cultivated fields. Restoration activities involved draining the farm pond and removing the perched culverts within the dam crossing. A 60" CMP culvert was installed at a lower elevation to maintain normal flow as well as one over flow 36" CMP culvert. A baseflow channel has formed passively in the pond bottom. Following sufficient drying, the baseflow channel has been enhanced and stabilized as needed. Habitat and grade control structures have been installed. The riparian stream buffer has been planted with native vegetation. The existing pond dam has been upgraded to a stream crossing inside a 60-foot conservation easement break.

UT2-R3 (STA 13+97 to 19+18) – Lower of the two middle reaches along UT2 totaling 521 linear feet of Priority I Restoration. This reach is a perennial channel that lies between cultivated fields. Previously, a cattle pasture was adjacent along the right stream bank. The pasture has recently been converted to a cultivated field; therefore, cattle access is no longer a threat. This stream reach was generally straight and had little to no stream buffer within the project area. The upper portion of this reach was experiencing active erosion of the bed and banks. The lower portion of the reach had a stable bed with moderate bank erosion. Priority I stream restoration activities performed along UT2-R3 included constructing a meandering channel, installing habitat and grade control structures, filling and plugging the abandoned channel, and planting a riparian buffer with native vegetation.

UT2-R4 (STA 19+18 to 22+07) – Downstream-most portion of UT2 totaling 257 linear feet of Priority I Restoration. This reach is a perennial channel that currently flows through cultivated fields. Like UT2-R3, the previous cattle pasture along the right bank has been removed and converted to cultivated fields. This reach was generally straight and had a highly disturbed buffer with invasive species present. Stream restoration involved constructing a meandering channel, installing habitat and grade control structures, filling and plugging the abandoned channel, and planting a riparian buffer with native vegetation.

UT2-A (STA 0+45 to 5+06) – The only tributary to UT2 totaling 461 linear feet of Enhancement Level II. UT2-A is an intermittent channel that flows into UT2-R2 (previously farm pond). This reach flows through cultivated fields which were previously cattle pasture. UT2-R3 lacked a vegetated stream buffer. Stabilization/enhancement activities performed along UT2-R3 included minor bank grading, installing grade control and habitat structures, and replanting a riparian stream buffer.

1.4 Project History, Contacts and Attribute Data

1.4.1 Project History

The Poplin Ridge Stream Restoration Site was restored by Resource Environmental Solutions, LLC (RES) through a full-delivery contract awarded by DMS in 2011. Tables 2, 3, and 4 provide a time sequence and information pertaining to the project activities, history, contacts, and baseline information.

1.4.2 Project Watersheds

The easement totals 27.17 acres and is split into two tributary systems (UT1 and UT2). The western system (UT1) is divided into seven reaches along four unnamed tributaries to East Fork Stewarts Creek. The eastern system (UT2) is divided into five reaches, all unnamed tributaries of East Fork Stewarts Creek. UT1-Reach 1 has a drainage area of 0.21 square miles (136 acres); it begins at the start of the restoration project (STA 0+00) and extends southeast to STA 12+58. UT1-Reach 2 has a

drainage area of 0.39 square miles (248 acres); it begins at STA 12+58 and extends to STA 24+96. UT1-Reach 3 has a drainage area of 0.60 square miles (384 acres); it begins at STA 24+96 and extends to STA 34+50. UT1-Reach 4 is the downstream section of UT1 (STA 34+50 to 46+73), and has a drainage area of 1.14 square miles (728 acres). Reach UT1-A has a drainage area of 0.14 square miles (88 acres) and flows south directly into UT1 at the break between Reaches 1 and 2. UT1-B has a drainage area of 0.19 square miles (120 acres) and flows south to the break between UT1 Reaches 2 and 3. UT1-C has a drainage area of 1.35 square miles (861 acres) and flows east to the break between UT1 Reaches 3 and 4. UT2-Reach 1 has a drainage area of 0.99 square miles (631 acres); it begins at the start of the UT2 portion of the restoration project (STA 0+00) and extends southwest to STA 4+90. UT2-Reach 2 has a drainage area of 1.13 square miles (726 acres); it begins at STA 4+90 and extends to STA 13+97. UT2-Reach 3 has a drainage area of 1.24 square miles (792 acres); it begins at STA 13+97 and extends to STA 19+18. UT2-Reach 4 has a drainage area of 1.35 square miles (861 acres); it begins at STA 19+18 and extends to STA 22+07. Reach UT2-A has a drainage area of 0.08 square miles (49 acres) and flows east into UT2 at the break between Reaches 2 and 3.

The land use in the project watershed is approximately 68 percent managed herbaceous and cultivated crops, 26 percent deciduous and evergreen forest, and six percent developed (mix of low, medium and high densities) and water bodies. Current land use around the project is primarily agricultural and forestry. Land use immediately surrounding the project consists of livestock grazing, row crops, and forestry. Future land use is projected to become more developed in the future due to the proximity to the Charlotte area. The Lower Yadkin Pee-Dee River Basin Restoration Plan (RBRP) indicates that urban land use may increase by over 350 percent with a population growth of 184 percent in Union County by the year 2030.

2 SUCCESS CRITERIA

The success criteria for the Poplin Ridge Site stream restoration will follow accepted and approved success criteria presented in the USACE Stream Mitigation Guidelines and subsequent NCEEP and agency guidance. Specific success criteria components are presented below.

2.1 Stream Restoration

2.1.1 Bankfull Events

Two bankfull flow events must be documented within the seven-year monitoring period. The two bankfull events must occur in separate years. Otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years. Bankfull events will be documented using crest gauges, auto-logging crest gauges, photographs, and visual assessments for evidence of debris rack lines.

2.1.2 Cross Sections

There should be little change in as-built cross-sections. If changes do take place, they should be evaluated to determine if they represent a movement toward a less stable condition (for example down-cutting or erosion), or are minor changes that represent an increase in stability (for example settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio). Cross-sections shall be classified using the Rosgen stream classification method, and all monitored cross-sections should fall within the quantitative parameters defined for channels of the design stream type.

2.1.3 Bank Pin Arrays

Bank pin arrays will be used as a supplemental method to monitor erosion on selected meander bends where there is not a cross section. Bank pin arrays will be installed along the outer bend of the meander. Bank pins will be installed just above the water surface and every two feet above the lowest pin. Bank pin exposure will be recorded at each monitoring event, and the exposed pin will be driven flush with the bank.

2.1.4 Digital Image Stations

Digital images will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal images should not indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral images should not indicate excessive erosion or continuing degradation of the banks over time. A series of images over time should indicate successional maturation of riparian vegetation.

2.2 Vegetation

Vegetative monitoring success criteria for plant density within the riparian buffers on the site will follow NCEEP Guidance dated 7 November 2011. Vegetation monitoring plots will be a minimum of 0.02 acres in size, and cover a minimum of two percent of the planted area. The following data will be recorded for all trees in the plots: species, height, planting date (or volunteer), and grid location. Monitoring will occur each year during the monitoring period. The interim measures of vegetative success for the site will be the survival of at least 320 three-year old trees per acre at the end of Year 3 and 260 five-year old trees per acre at the end of Year 5. The final vegetative success criteria will be the survival of 210 trees per acre at the end of Year 7 of the monitoring period.

Invasive and noxious species will be monitored and controlled so that none become dominant or alter the desired community structure of the site. If necessary, RES will develop a species-specific control plan.

2.3 Scheduling/Reporting

The monitoring program will be implemented to document system development and progress toward achieving the success criteria. The restored stream morphology will be assessed to determine the success of the mitigation. The monitoring program will be undertaken for seven years or until the final success criteria are achieved, whichever is longer.

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to NCEEP. The monitoring reports will include all information, and will be in the format required by NCEEP in Version 2.0 of the NCEEP Monitoring Report Template.

3 MONITORING PLAN

Annual monitoring shall be conducted for stream and vegetation monitoring parameters as noted below for seven years following the completion of construction or until success criteria have been met.

3.1 Stream Restoration

3.1.1 As-Built Survey

An as-built survey was conducted following construction to document channel size, condition, and location. The survey includes a complete profile of thalweg, top of bank, and in stream channel structures to compare with future geomorphic data. Longitudinal profiles will not be required in annual monitoring reports unless requested by NCEEP or USACE.

3.1.2 Bankfull Events

Three sets of manual and auto-logging crest gauges were installed on the site, one along UT1-R2, one along UT1-R4, and one along UT2-R3. The auto logging crest gauges were installed within the channel and will continuously record flow conditions at an hourly interval. Manual crest gauges were installed on the bank at bankfull elevation. Crest gauges will be checked during each site visit to determine if a bankfull event has occurred since the last site visit. Crest gauge readings and debris rack lines will be photographed to document evidence of bankfull events.

3.1.3 Cross Sections

A total of 29 permanent cross sections were installed to monitor channel dimensions and stability. Two cross sections were installed along UT1-R1 of the enhancement section. Four cross sections (two pools and two riffles) were installed along UT1-R2 and two pool and two riffle cross sections were installed along UT1-R3. Reach 4 of UT1 has a total of 4 cross sections installed throughout its length. Stream segment UT1-A has one cross section installed and UT1-B has a total of two cross sections along its length. Two riffle/pool pair cross sections were installed along UT1-C for a total of four cross sections. On the UT2 side of the project, a total of eight cross sections were installed. Two permanent cross sections were installed along UT2-R2, four along UT2-R3, and two along UT2-A. Cross sections were typically located at representative riffle and pool sections along each stream reach. Each cross section was permanently marked with 3/8 rebar pin to establish a monument location at each end. A marker pole was also installed at both ends of each cross section to allow ease locating during monitoring activities. Cross section surveys will be performed once a year during annual monitoring and will include all breaks in slope including top of bank, bottom of bank, streambed, edge of water, and thalweg.

3.1.4 Digital Image Stations

Digital photographs will be taken at least once a year to visually document stream and vegetation conditions. This monitoring practice will continue for seven years following construction and planting. Permanent photo point locations at cross sections and vegetation plots have been established so that the same directional view and location may be repeated each monitoring year. Monitoring photographs will also be used to document any stream and vegetation problematic areas such as erosion, stream and bank instability, easement encroachment and vegetation damage.

3.1.5 Bank Pin Arrays

Six bank pin arrays have been installed at random meander pools throughout the project. These bank pin arrays were installed in the center of the outside stream bank. Four bank pin arrays are located on the UT1 side of the project at reaches UT1-R2, UT1-R3, UIT1-R4, and UT1-C. The remaining two bank pin arrays are located on stream reach UT2-R3. Bank pins are a minimum of three feet long, and have been installed just above the water surface and every two feet above the lowest pin. Bank pin exposure will be recorded at each monitoring event, and the exposed pin will be driven flush with the bank.

3.1.6 Visual Assessment Monitoring

Visual monitoring of all mitigation areas will be conducted a minimum of twice per monitoring year by qualified individuals. The visual assessments will include vegetation density, vigor, invasive species, and easement encroachments. Visual assessments of stream stability will include a complete stream walk and structure inspection. Digital images will be taken at fixed representative locations to record each monitoring event as well as any noted problem areas or areas of concern. Results of visual monitoring will be presented in a plan view exhibit with a brief description of problem areas and digital images. Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures. Longitudinal photos should indicate the absence of developing bars within the channel or an excessive increase in channel depth. Lateral photos should not indicate excessive erosion or continuing degradation of the banks over time. A series of photos over time should indicate successional maturation of riparian vegetation.

3.2 Vegetation

A total of 13 vegetation plots were randomly established within the planted stream riparian buffer easement. Vegetation plots measure 10 meters by 10 meters or 5 meters by 20 meters (0.02 acres) and has all four corners marked with metal posts. Planted woody vegetation was assessed within each plot to establish a baseline dataset. Within each vegetation plot, each planted stem was identified for species, “X” and “Y” origin located, and measured for height. Reference digital photographs were also captured to document baseline conditions. Species composition, density, growth patterns, damaged stems, and survival ratios will be measured and reported on an annual basis. Vegetation plot data will be reported for each plot as well as an overall site average.

4 MAINTENANCE AND CONTINGENCY PLAN

All identified problematic areas or areas of concern such as stream bank erosion/instability, aggradation/degradation, lack of targeted vegetation, and invasive/exotic species which prevent the site from meeting performance success criteria will be evaluated on a case by case basis. These areas will be documented and remedial actions will be discussed amongst DMS staff to determine a plan of action. If it is determined remedial action is required, a plan will be provided.

4.1 Stream

Any stream problem areas which are identified during post construction monitoring activities will be documented and mapped on the Current Conditions Plan View (CCPV) as part of the annual stream monitoring report. Stream problem areas or areas of concern may include bank erosion, aggradation/degradation, structure failure or not performing as designed, beaver dams, cattle encroachment due to fence damage, etc. If it is determined through DMS correspondence that remedial action is required to repair an area, a proposed work plan will be submitted for remediation.

4.2 Vegetation

Any vegetation problem areas which are identified during post construction monitoring activities will be documented and mapped on the Current Conditions Plan View (CCPV) as part of the annual stream monitoring report. Vegetation problem areas or areas of concern may include vegetation plot not meeting success criteria, invasive species abundance, sparse vegetation areas, etc. If it is determined through DMS correspondence that remedial action is required to repair an area, a proposed work plan will be submitted for remediation.

5 AS-BUILT CONDITIONS (BASELINE)

The Poplin Ridge Stream Restoration as-built survey was completed between May and June 2015 by Turner Land Surveying, PLLC. A topographic survey on the constructed stream channel and adjacent floodplain areas was performed to document post construction conditions. The survey involved locating the stream channel thalweg, top of bank, stream structures, culvert crossings, woody debris bundles, monitoring cross sections, vegetation plots, crest gauges, and a rain gauge.

The as-built survey drawings indicate that the Poplin Ridge site was constructed to the mitigation plan design. Profile and dimension parameters are within the tolerances for stream mitigation construction. UT-1 and tributaries to UT-1 were all constructed to design plans and specifications. During construction activities, UT-2 had minimal modifications. Proposed cattle fencing along UT-2 was not installed due to the landowner converting the adjacent land use. The cattle pastures that were previously adjacent to UT-2 have been converted to row-crop fields. The landowner has assured RES that he no longer plans to have cattle on his property. Two rock cross vanes were substituted along UT2-R2 with log cross vanes at stations 11+38 and 13+53. Along UT2-R3, a proposed rock cross vane at station 16+59 was omitted due to bedrock presence. All changes were approved by the design engineer and are documented on the as-built drawings.

5.1 As-Built Drawings

The Poplin Ridge Stream Restoration As-Built Drawing is located in Appendix D which documents post construction conditions for the project.

The original DMS (NCEEP) full delivery contact was for 6,944 SMUs. Due to project constraints and landowner negotiations the final design and construction plans included 6,345 SMUs. This reduction was primarily due to a change in approach at the downstream end of UT2-R4 where the landowner withdrew from the project. Following construction, the as-built survey indicated 9,179 linear feet of channel within the easement generating 6,365 SMUs.

5.2 Baseline Data Collection

5.2.1 Morphological State of the Channel

All morphological stream data for the as-built profile and dimensions were collected during the as-built survey performed during May and June 2015. Appendix B includes summary data tables, morphological parameters, and stream photographs.

Profile
The baseline (MY-0) profiles closely matches the proposed design profiles. The plotted longitudinal profiles can be found on the As-Built Drawings in Appendix D and morphological summary data tables can be found in Appendix B.

Dimension
The baseline (MY-0) cross sectional dimensions closely matches the proposed design cross section parameters. All cross section plots and data tables can be found in Appendix B.

Sediment Transport
The as-built conditions show that shear stress and velocities have been reduced for all restoration and enhancement reaches. Pre-construction conditions documented that both primary stream features (UT1 and UT2) were gravel bed channels prior to construction activities. Pebble count and substrate

analysis from evaluated onsite stream reaches document the dominate bed material remains classified as gravel bed channels post-construction. Pebble counts were sampled at all riffle cross section locations and data can be found in Appendix B. Visual assessment shows the channel is transporting sediment as designed and will continue to be monitored for aggradation and degradation.

5.2.2 Vegetation

The baseline monitoring (MY-0) vegetation survey was completed in late April 2015. The baseline vegetation monitoring on the Poplin Ridge Stream Restoration Site resulted in an average of 1,058 planted stems per acre, which is greater than the required 680 stems per acre density. The average stems per vegetation plot was 26.2 planted stems. The minimum planted stems per plots was 20 stems and the maximum was 34 stems per plot. Vegetation summary data tables and vegetation plot photos can be found in Appendix C.

5.2.3 Photo Documentation

Permanent photo point locations have been established at cross sections, vegetation plots, stream crossings, and stream structures by Resource Environmental Solutions staff. Any additional problem areas or areas of concern will also be document with a digital photograph during monitoring activities. Stream digital photographs can be found in Appendix B and Appendix C for vegetation photos.

5.2.4 Hydrology

Three sets of manual and auto-logging crest gauges were installed on the site, one along UT1-R2, one along UT1-R4, and one along UT2-R3. The auto logging crest gauges were installed within the channel and will continuously record flow conditions at an hourly interval. Manual crest gauges were installed on the bank at bankfull elevation. Crest gauges will be checked during each site visit to determine if a bankfull event has occurred since the last site visit. Crest gauge readings and debris rack lines will be photographed to document evidence of bankfull events. Crest gauge data will be reported in the Year 1 monitoring report.

6 REFERENCES

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APPENDIX A

General Tables and Figures

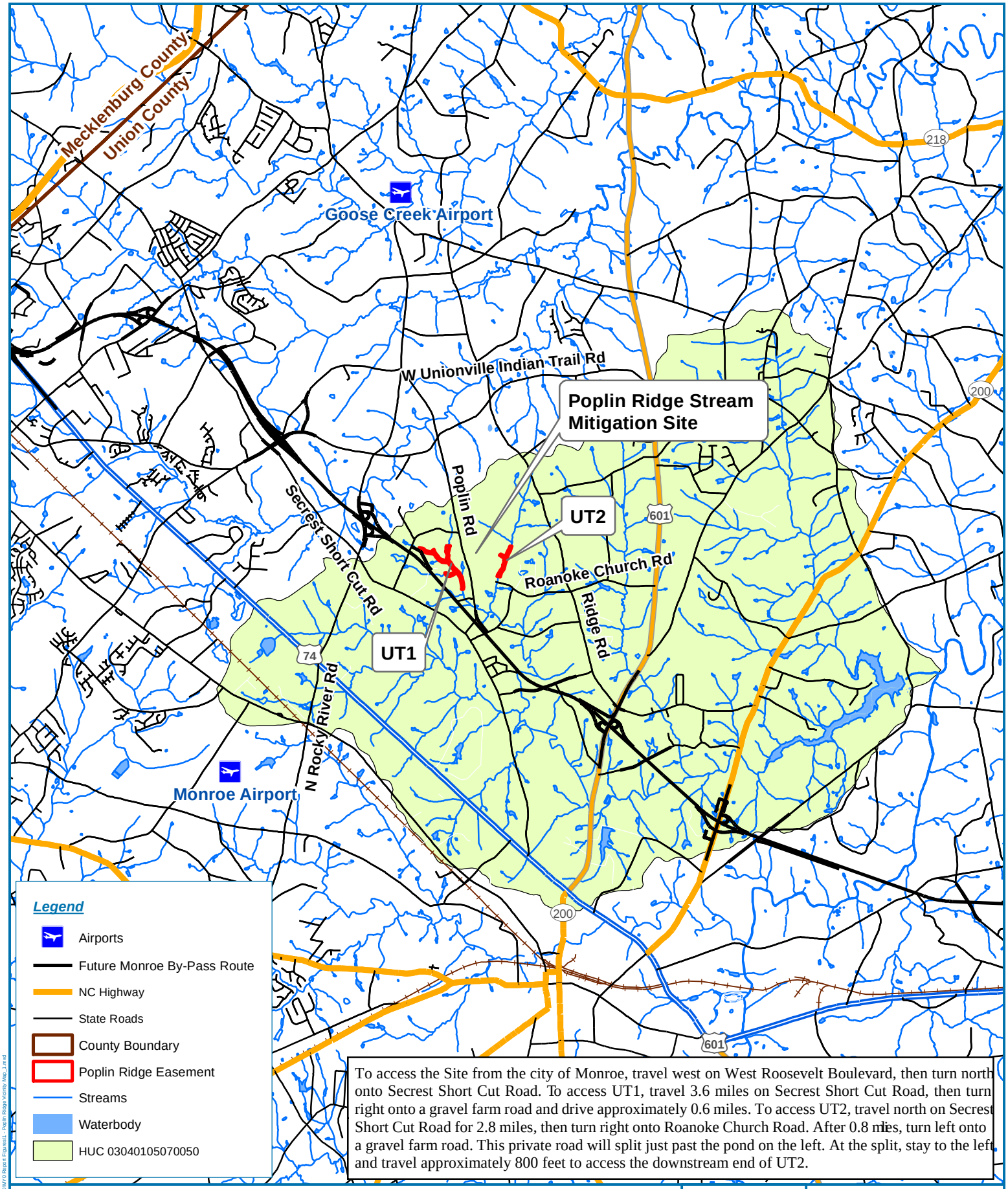

Figure1
Project Vicinity Map
Poplin Ridge Stream Restoration Site
Union County, North Carolina

Date: 7/27/2015

Drawn by: BSH

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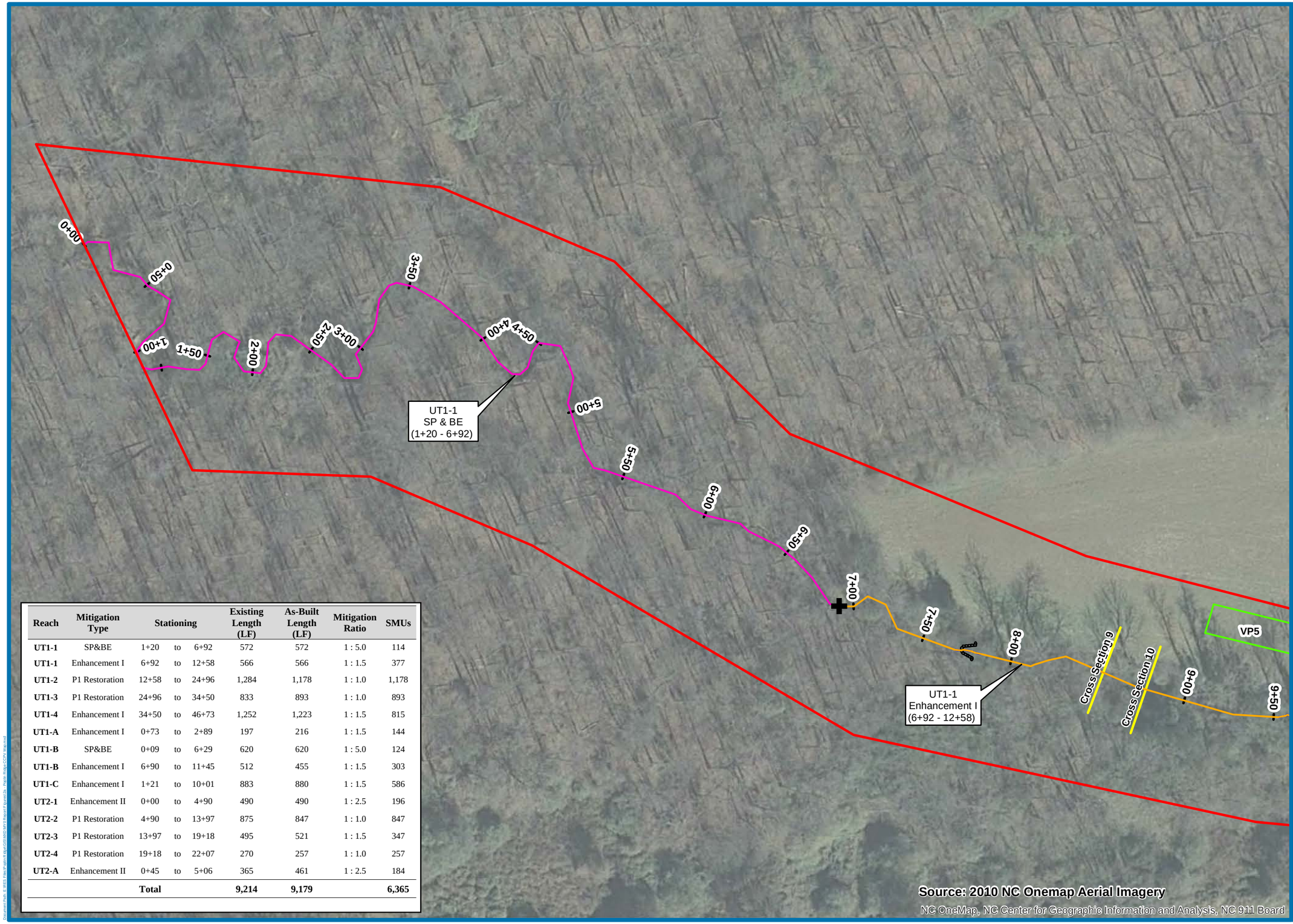
Document Path: E:\RES Files\Poplin Ridge\GIS\MXD\MYD Report Figures\1 - Poplin Ridge Vicinity Map_1.mxd



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**

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Feet

1 inch = 50 feet

Figure 2a.

Poplin Ridge Stream Restoration Project

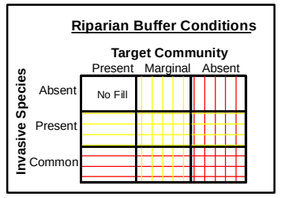
UT1-1 Current Conditions Plan View Map

Date: 7/27/2015	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
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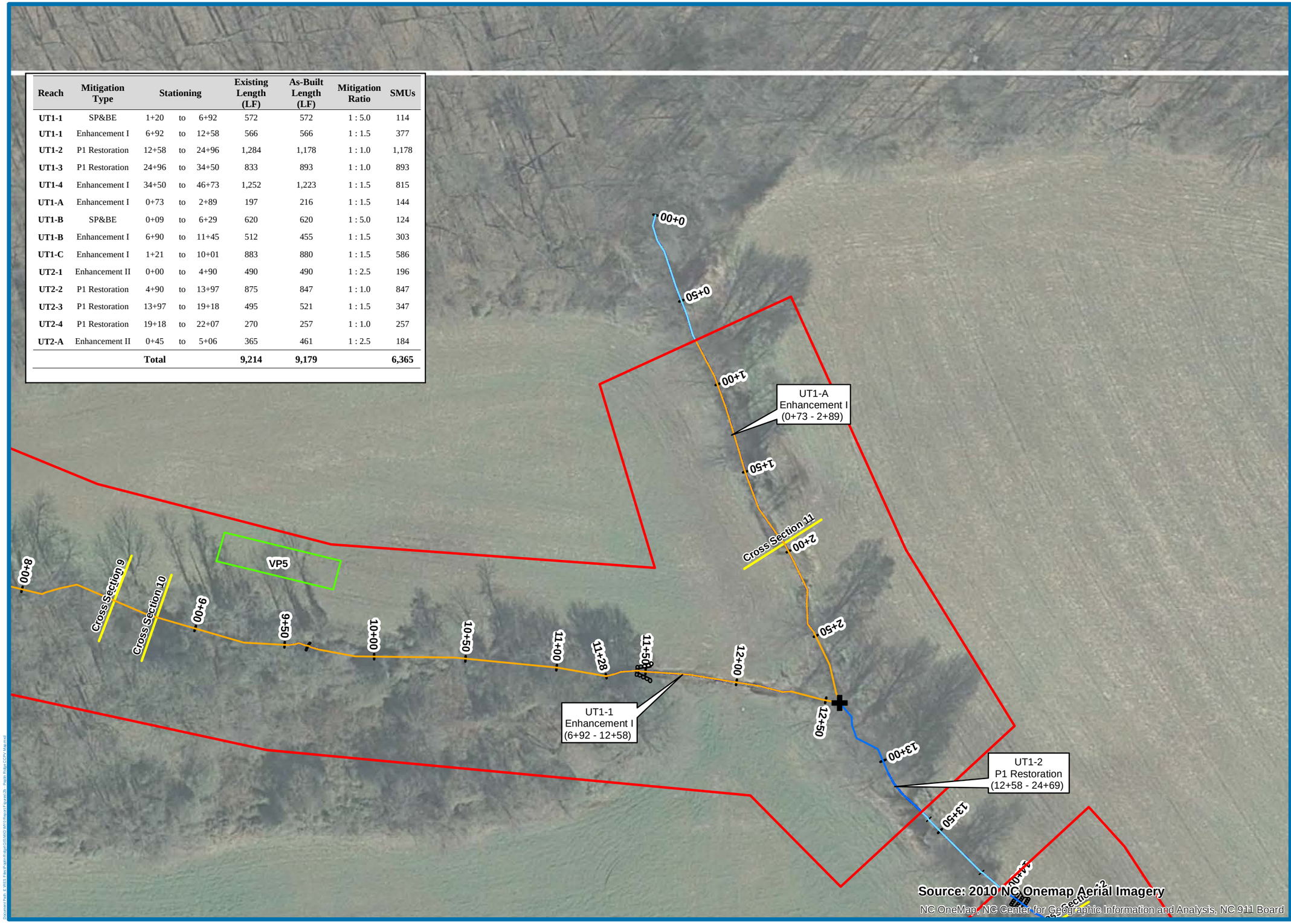
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**



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Feet

1 inch = 50 feet

Figure 2b.

Poplin Ridge Stream Restoration Project

UT1-1 & UT1-A Current Conditions Plan View Map

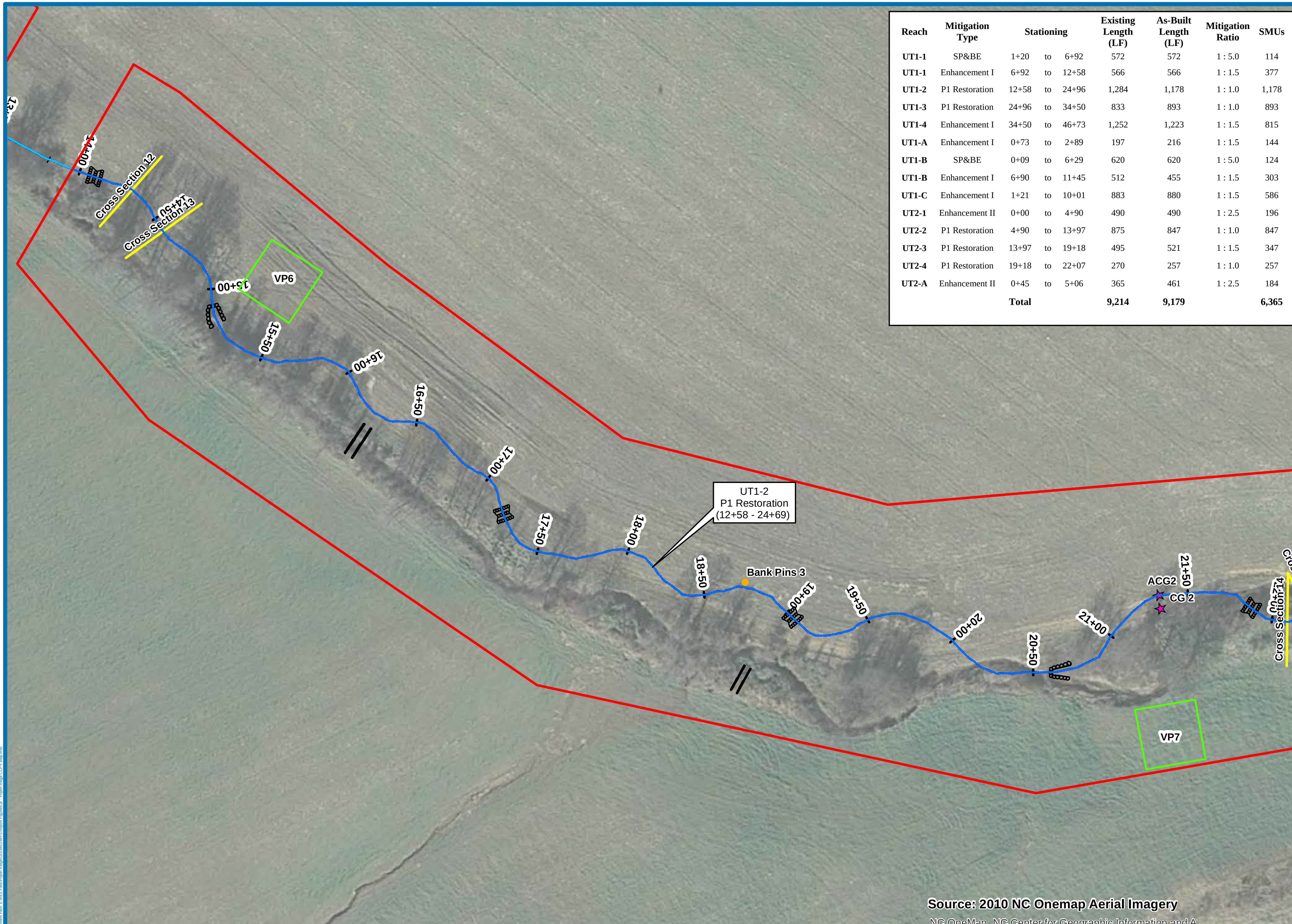
Date: 8/18/2015	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			
Common			



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			9,214	9,179		6,365

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Feet

1 inch = 50 feet

Figure 2c.

Poplin Ridge Stream Restoration Project

UT1-2 Current Conditions Plan View Map

Date: 8/18/2015 | Drawn by: BSH

LEGEND

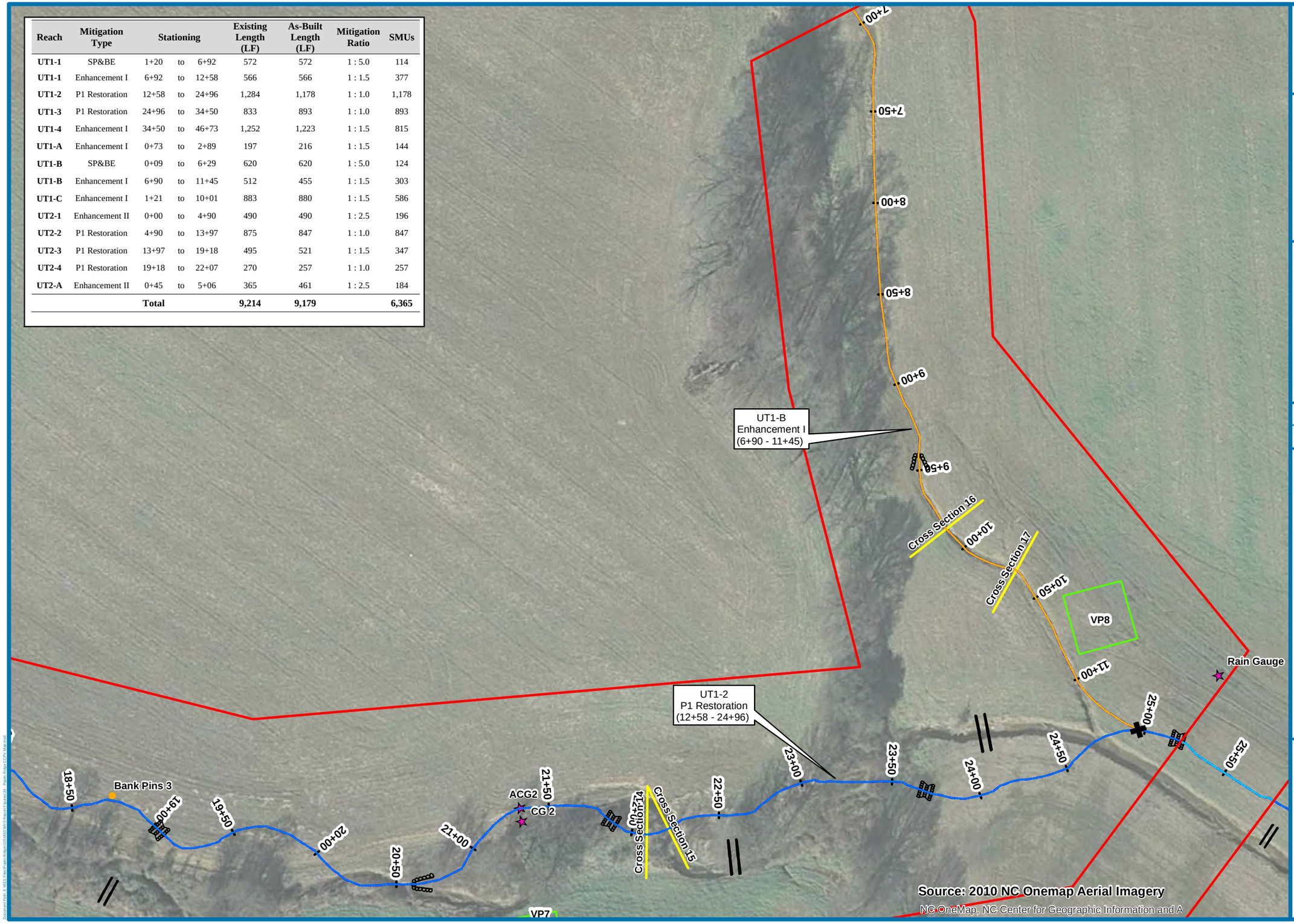
- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions

Target Community

Invasive Species	Present	Marginal	Absent
Absent	No Fill		
Present			
Common			

Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**



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Feet

1 inch = 50 feet

Figure 2d.

Poplin Ridge Stream Restoration Project

UT1-2 & UT1-B Current Conditions Plan View Map

Date: 8/18/2015	Drawn by: BSH

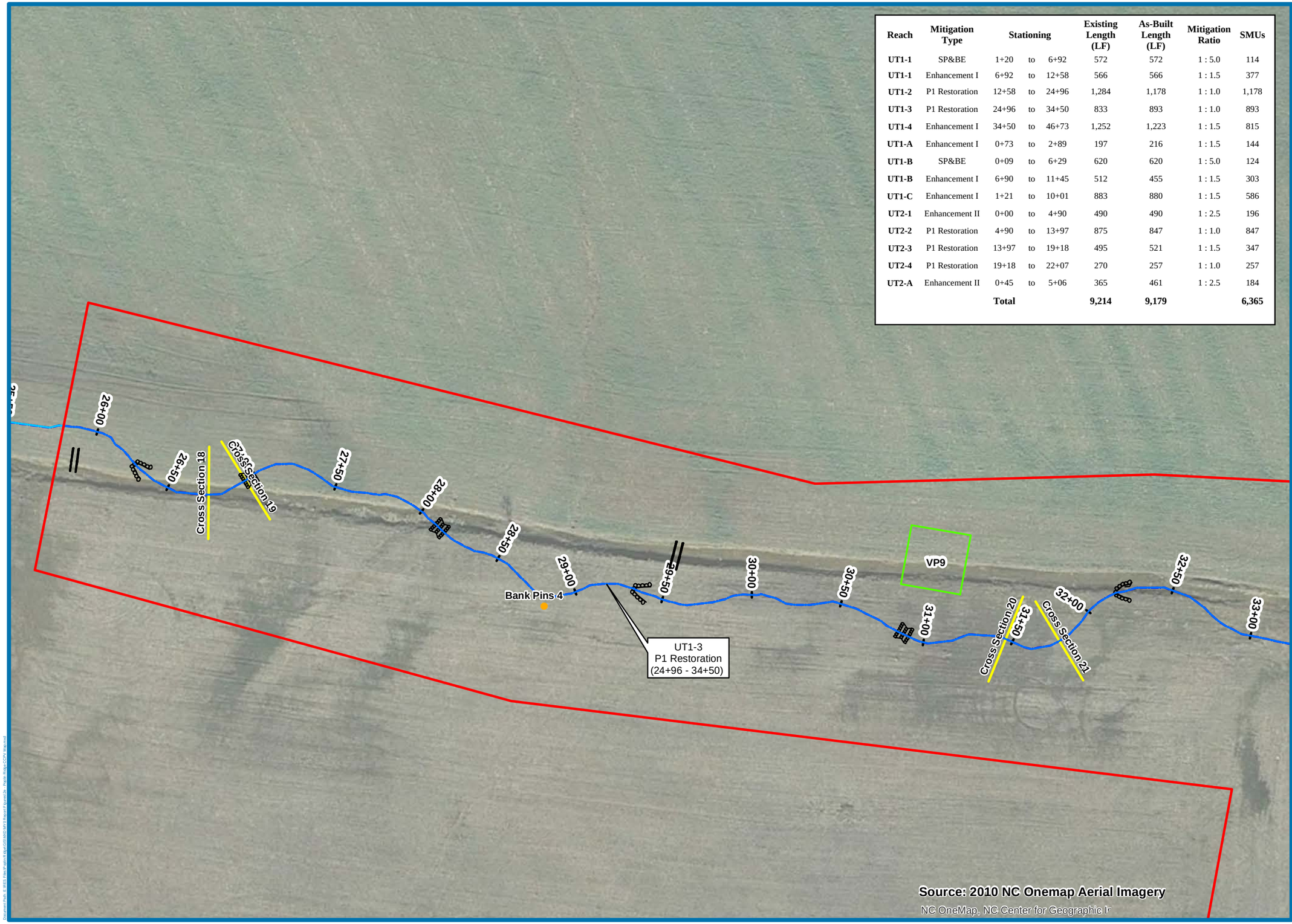
LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			
Common			

Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**



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Feet

1 inch = 50 feet

Figure 2e.

Poplin Ridge Stream Restoration Project

UT1-3 Current Conditions Plan View Map

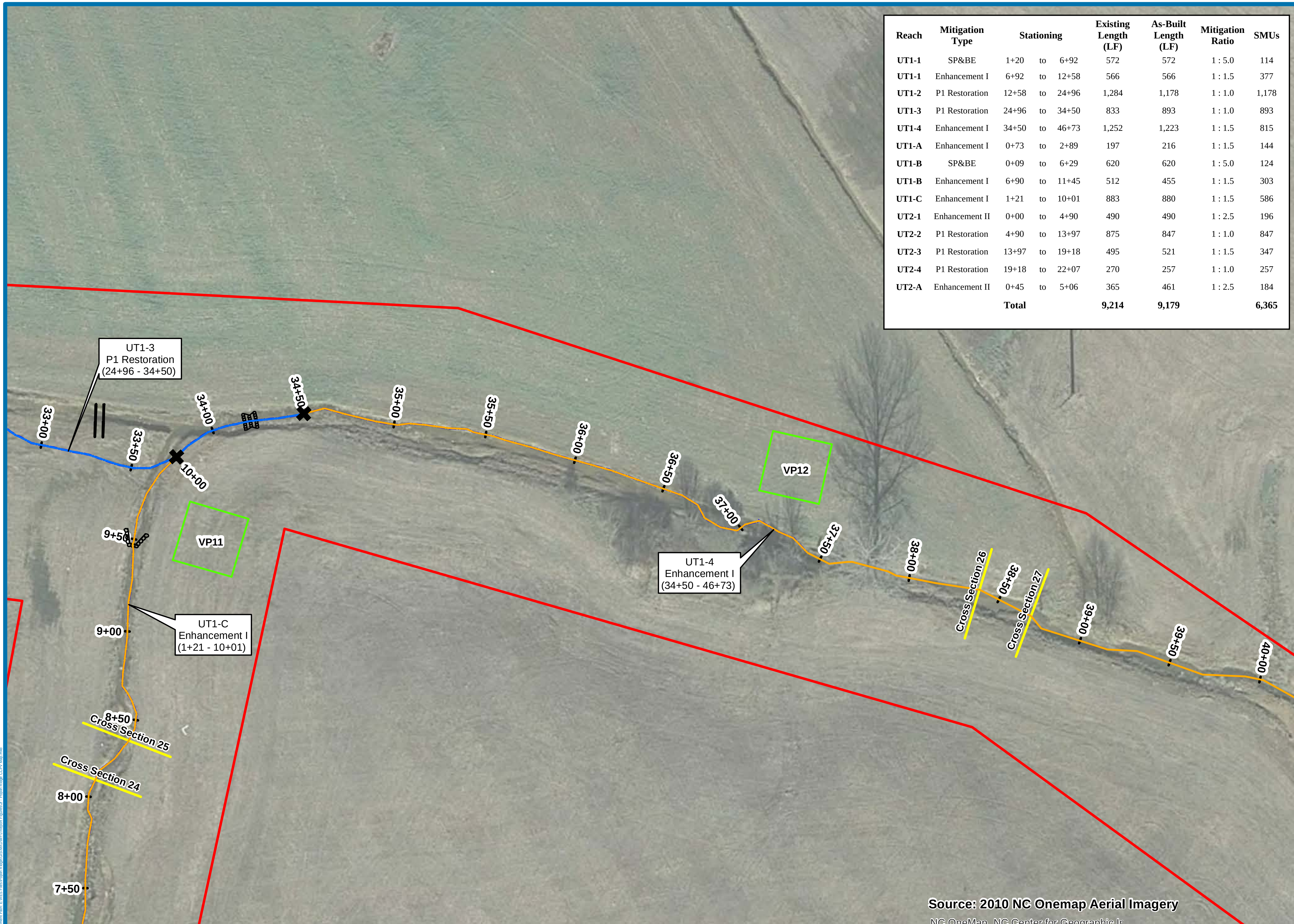
Date: 8/18/2015 | Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions

Invasive Species \ Target Community	Present	Marginal	Absent
Absent	No Fill		
Present			
Common			



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			9,214	9,179		6,365

0 25 50
Feet
1 inch = 50 feet

Figure 2f.

Poplin Ridge Stream Restoration Project

UT1-3 & UT1-4 Current Conditions Plan View Map

Date: 7/27/2015 | Drawn by: BSH

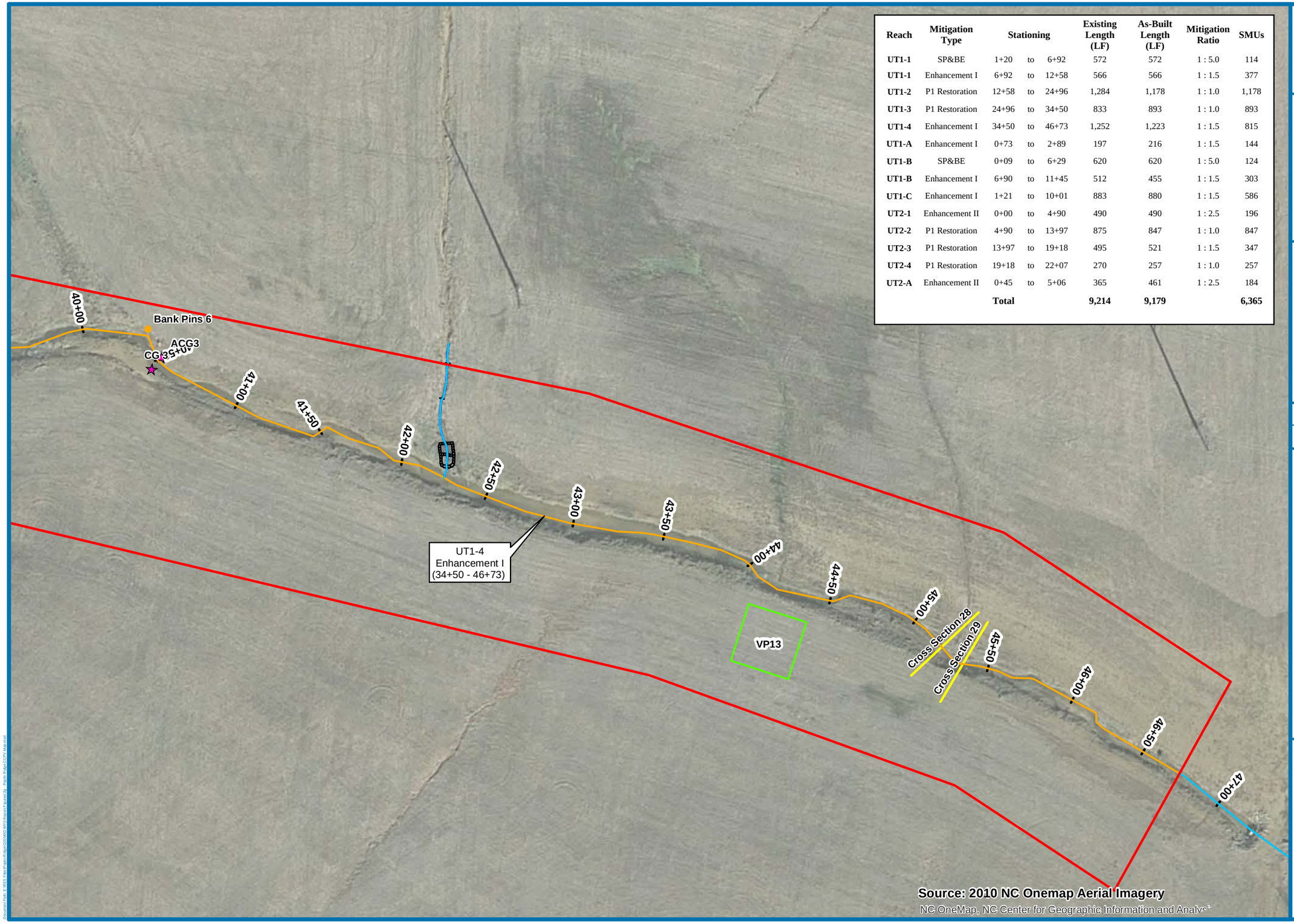
LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			
Common			

Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**



res

0 25 50
Feet

1 inch = 50 feet

Figure 2g.

Poplin Ridge Stream Restoration Project

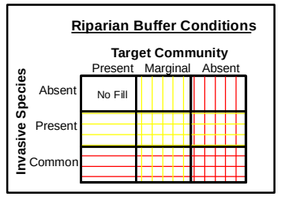
UT1-4 Current Conditions Plan View Map

Date: 8/18/2015	Drawn by: BSH

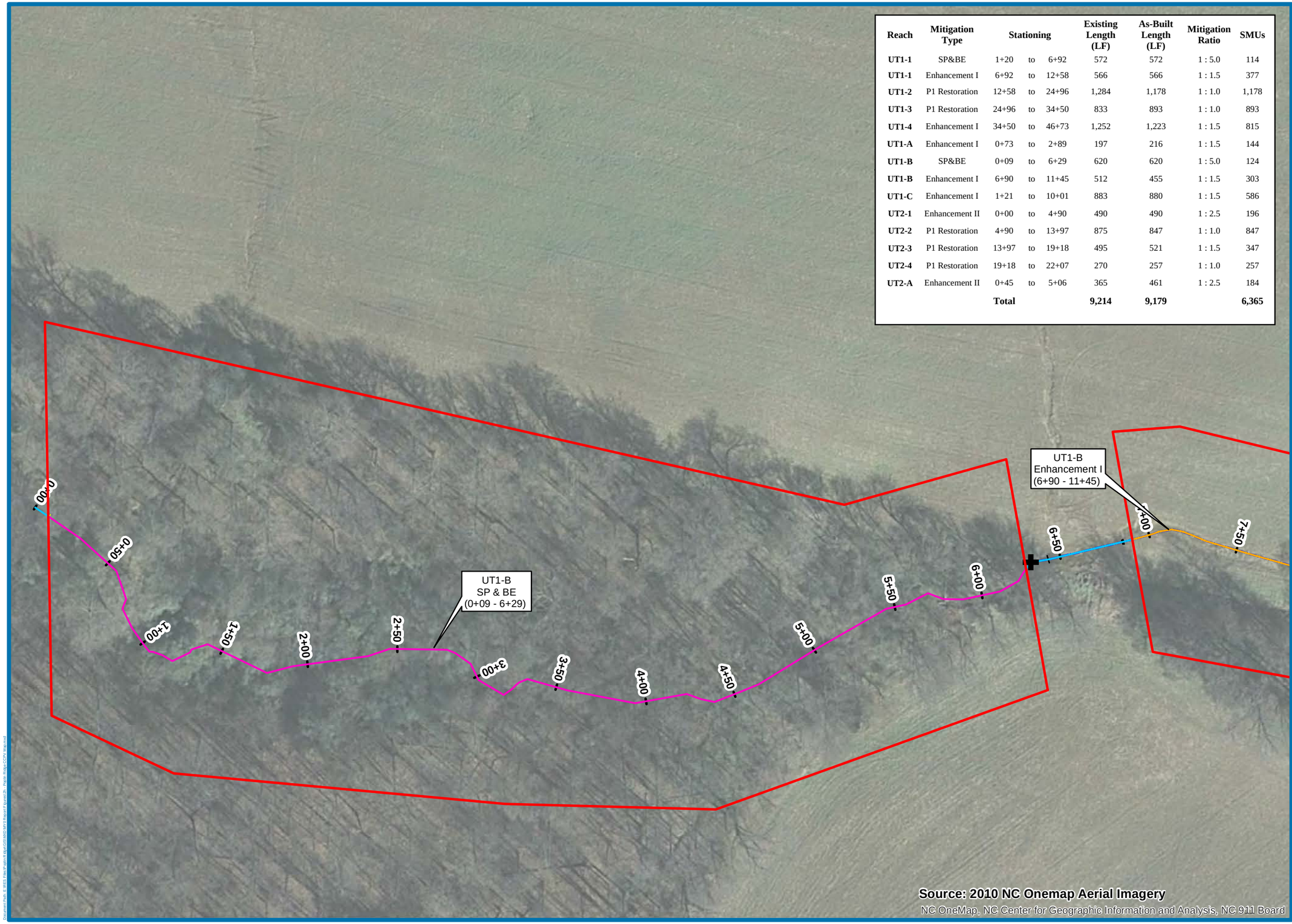
LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**



res

N E S W

0 25 50

Feet

1 inch = 50 feet

Figure 2h.

Poplin Ridge Stream Restoration Project

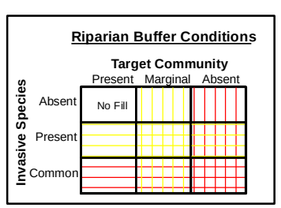
UT1-B Current Conditions Plan View Map

Date: 8/18/2015	Drawn by: BSH

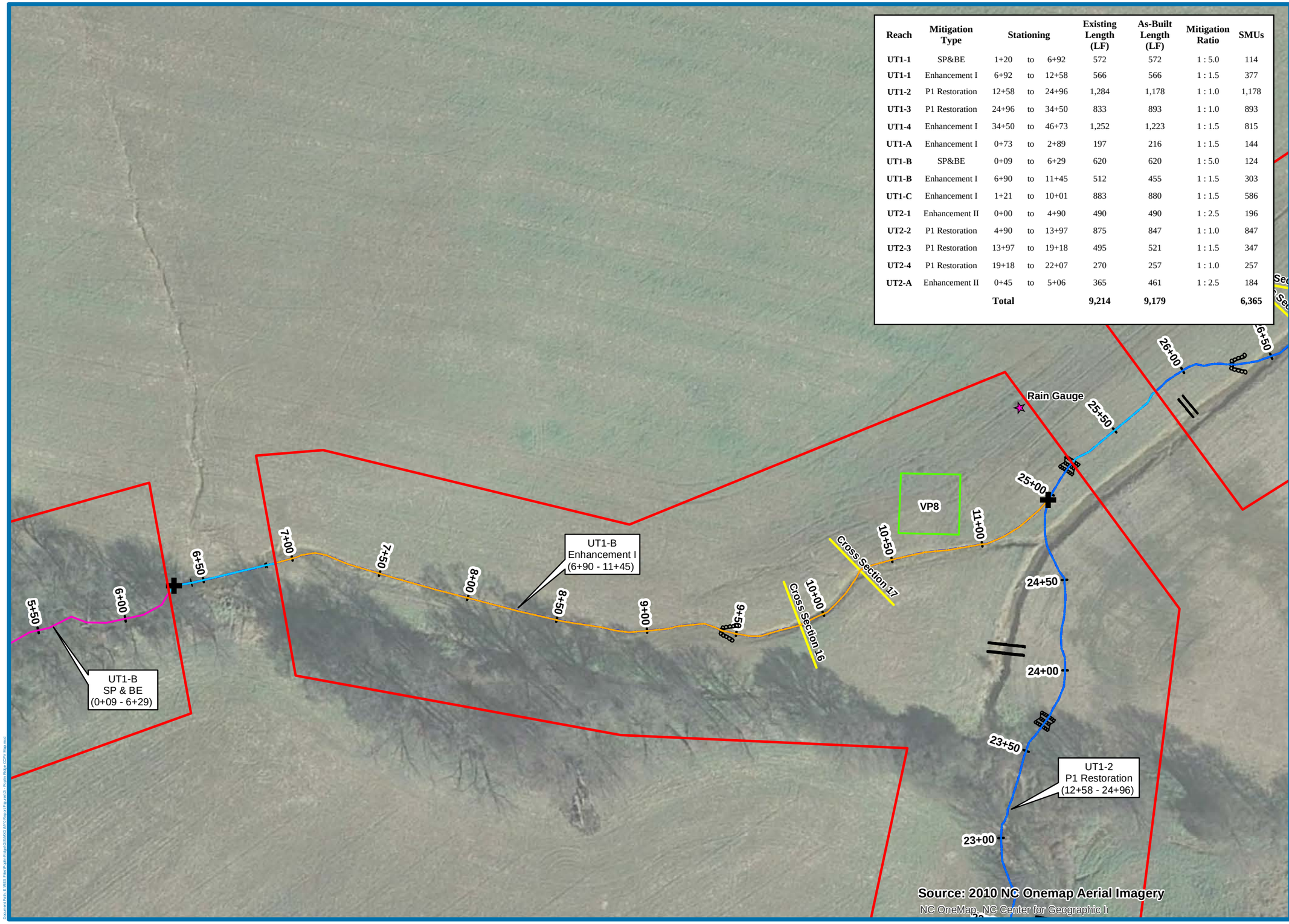
LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**



res

0 25 50
Feet

1 inch = 50 feet

Figure 2i.

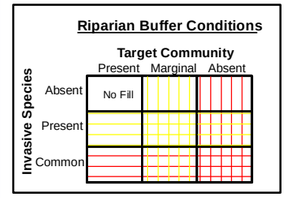
Poplin Ridge Stream Restoration Project

UT1-B Current Conditions Plan View Map

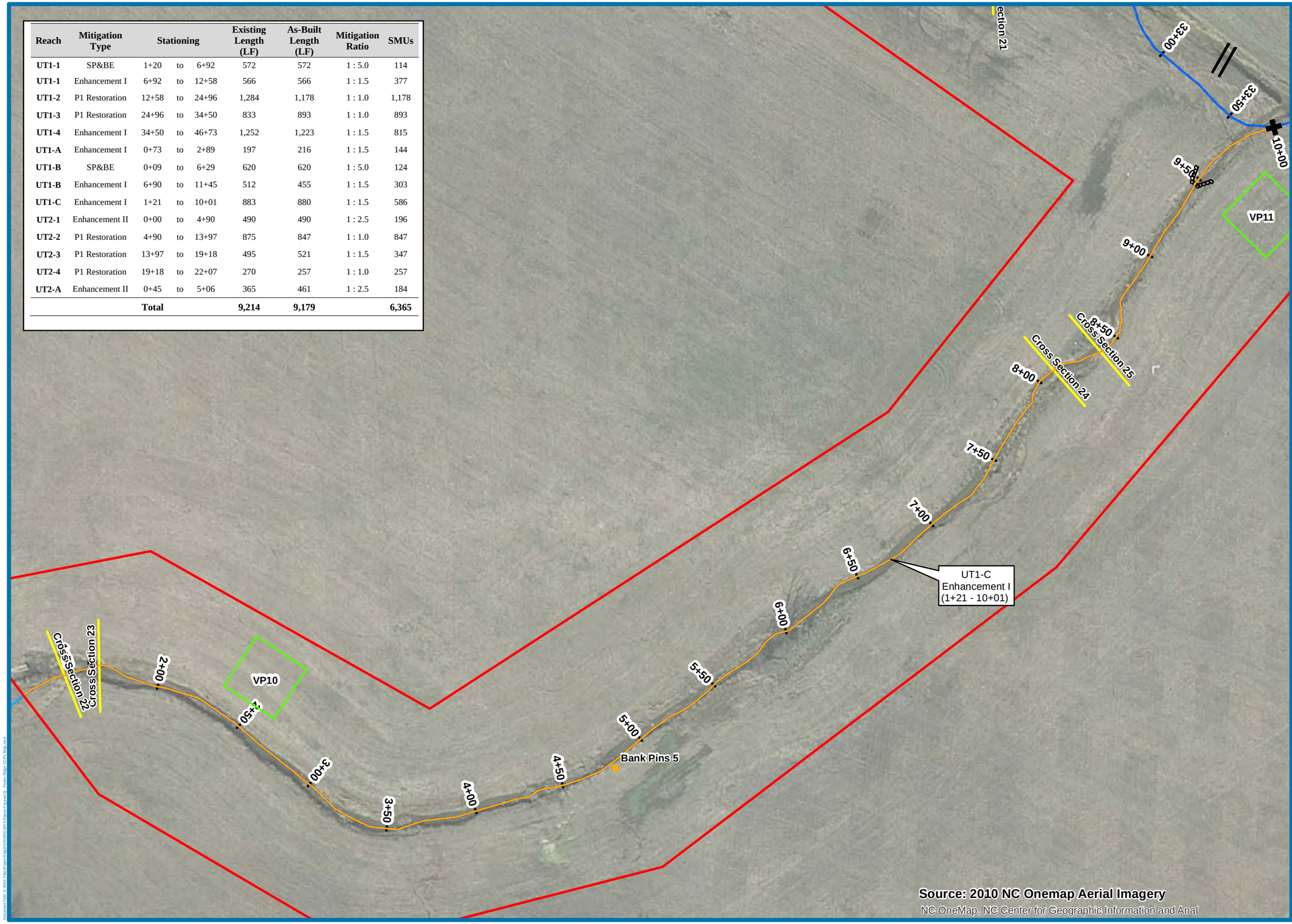
Date: 8/18/2015	Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**



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0 25 50
Feet

1 inch = 50 feet

Figure 2j.

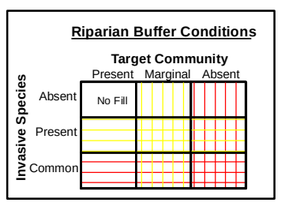
Poplin Ridge Stream Restoration Project

UT1-C Current Conditions Plan View Map

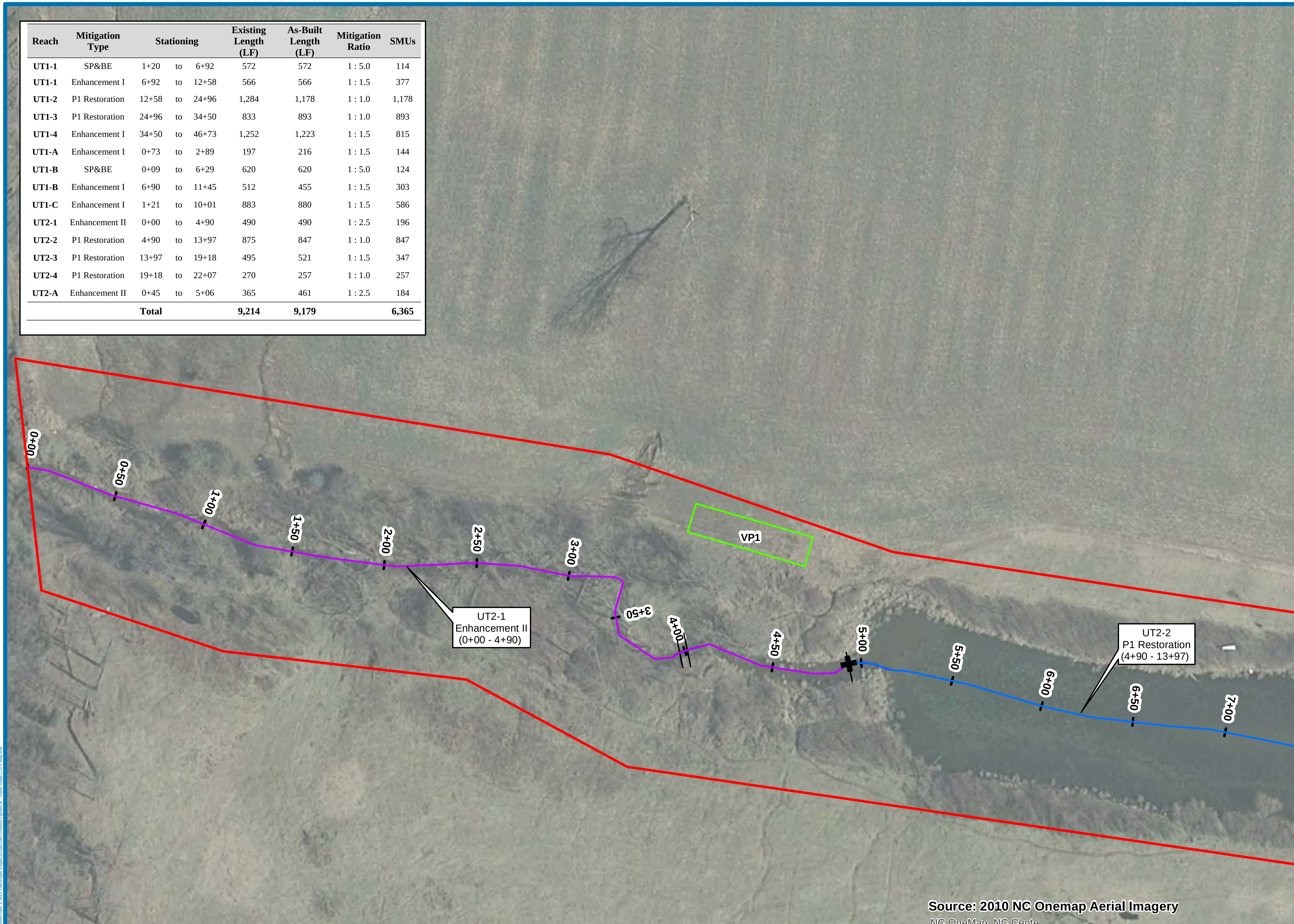
Date: 8/18/2015 | Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			**9,214**	**9,179**		**6,365**



0 25 50
Feet
1 inch = 50 feet

Figure 2k.

Poplin Ridge Stream Restoration Project

UT2-1 & UT2-2 Current Conditions Plan View Map

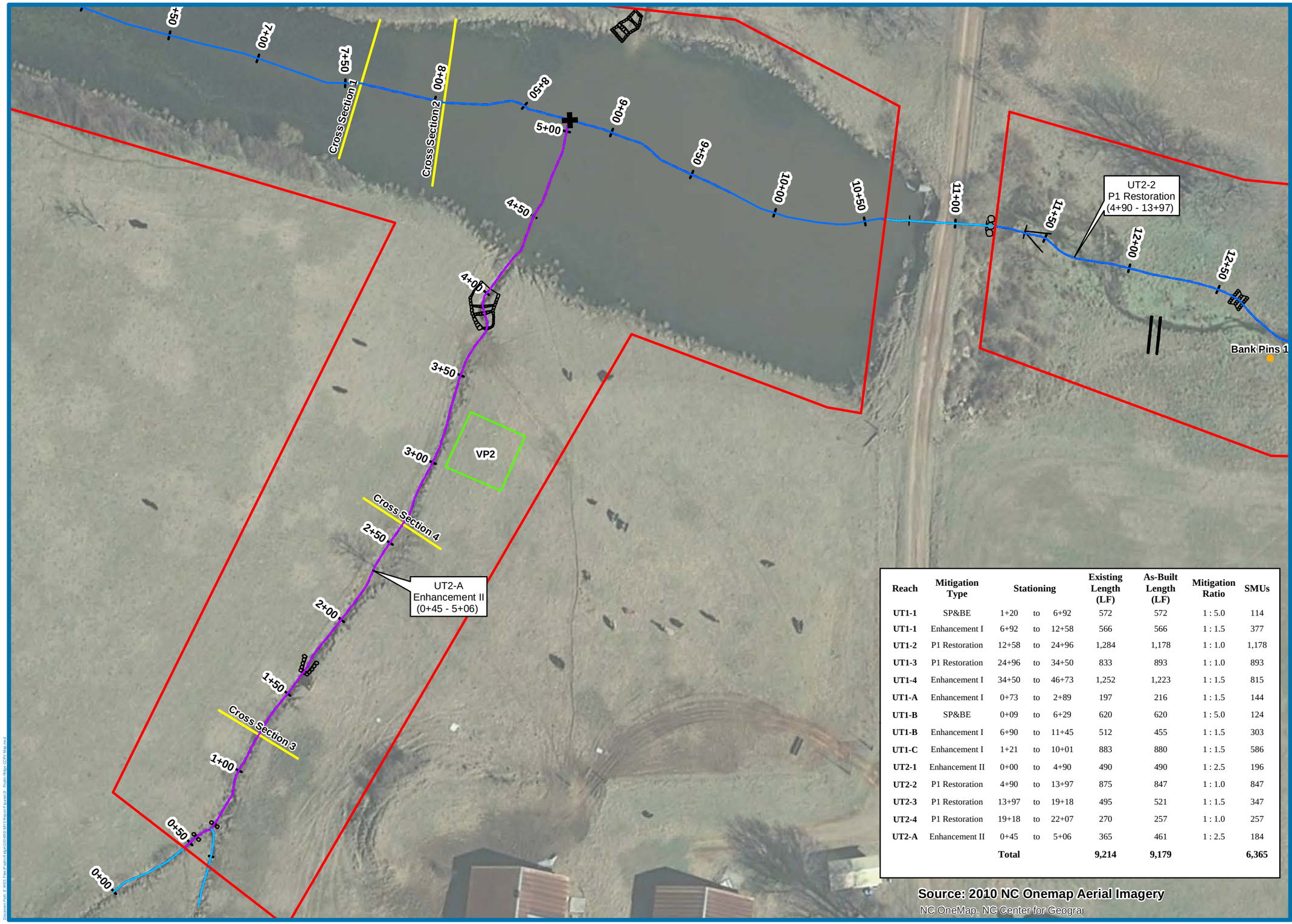
Date: 7/28/2015 | Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions

Invasive Species \ Target Community	Present	Marginal	Absent
Absent	No Fill		
Present			
Common			



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
		Total			9,214	9,179		6,365

Source: 2010 NC Onemap Aerial Imagery
NC OneMap, NC Center for Geogra

ires

0 25 50
Feet

1 inch = 50 feet

Figure 2I.

Poplin Ridge Stream Restoration Project

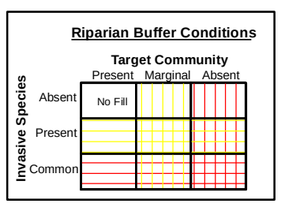
UT2-2 & UT2-A Current Conditions Plan View Map

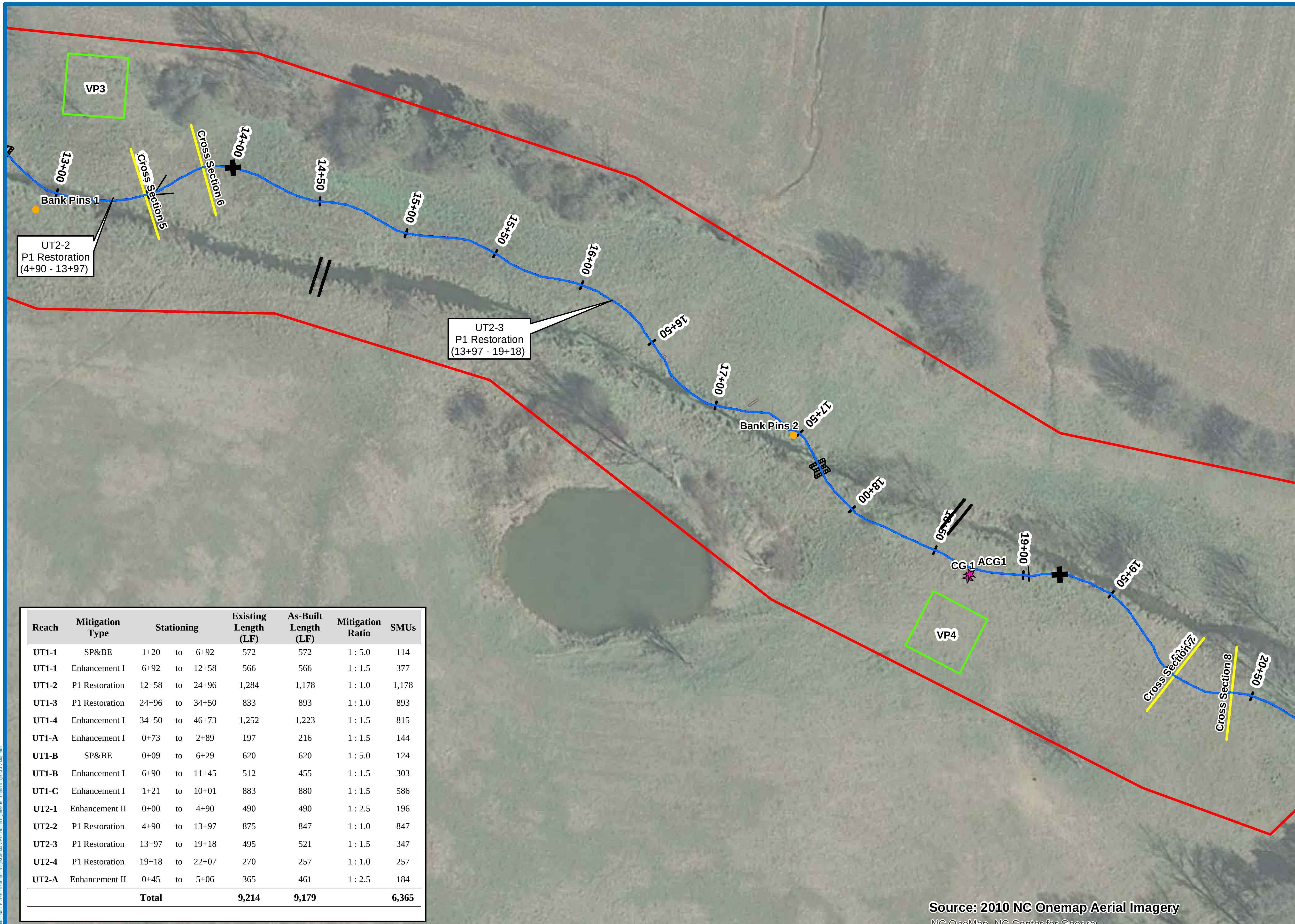
Date: 8/18/2015 | Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions





Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
	Total				9,214	9,179		6,365

res

0 25 50
Feet
1 inch = 50 feet

Figure 2m.

Poplin Ridge Stream Restoration Project

UT2-2 & UT2-3 Current Conditions Plan View Map

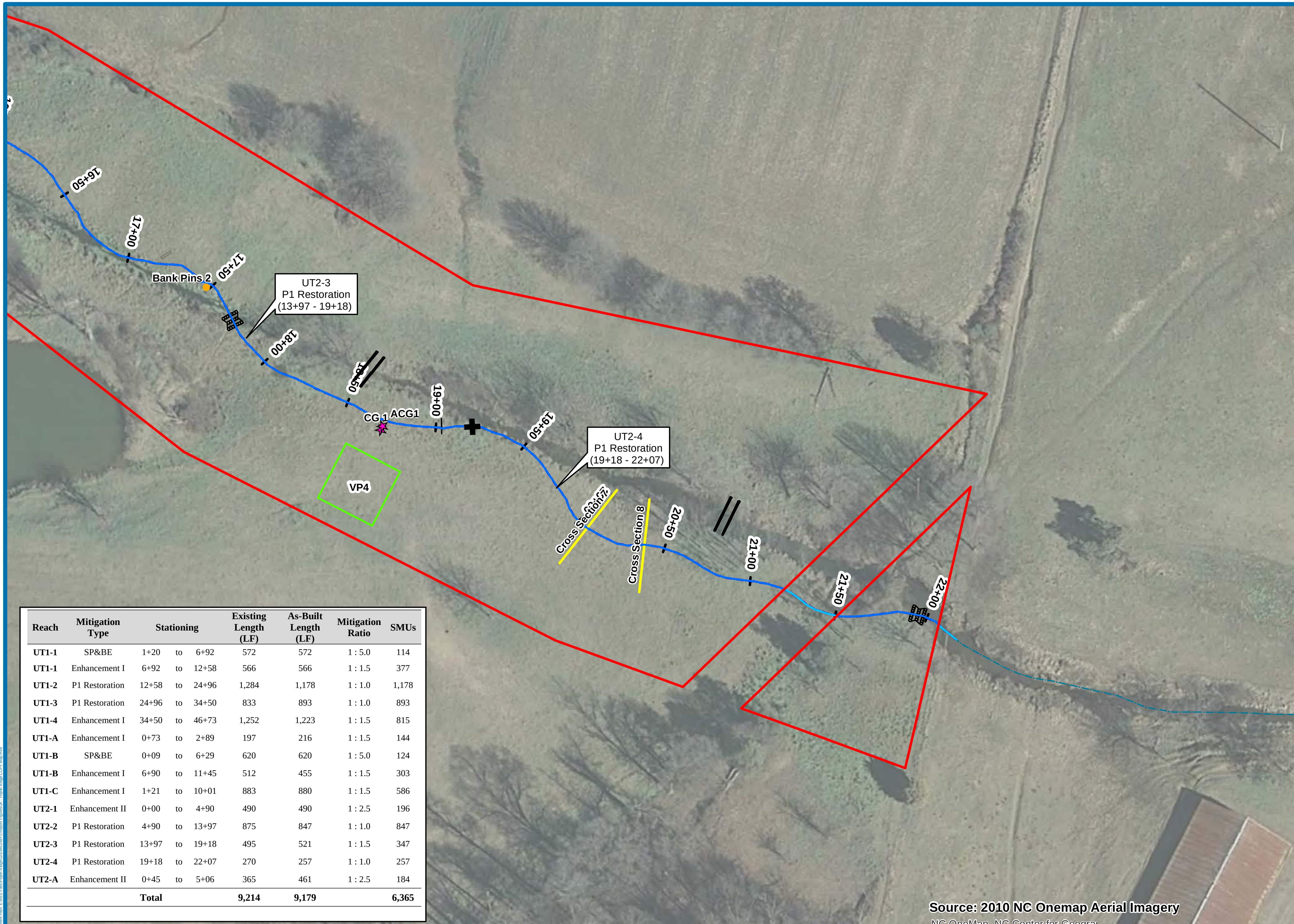
Date: 7/28/2015 | Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			
Common			



Reach	Mitigation Type	Stationing			Existing Length (LF)	As-Built Length (LF)	Mitigation Ratio	SMUs
UT1-1	SP&BE	1+20	to	6+92	572	572	1 : 5.0	114
UT1-1	Enhancement I	6+92	to	12+58	566	566	1 : 1.5	377
UT1-2	P1 Restoration	12+58	to	24+96	1,284	1,178	1 : 1.0	1,178
UT1-3	P1 Restoration	24+96	to	34+50	833	893	1 : 1.0	893
UT1-4	Enhancement I	34+50	to	46+73	1,252	1,223	1 : 1.5	815
UT1-A	Enhancement I	0+73	to	2+89	197	216	1 : 1.5	144
UT1-B	SP&BE	0+09	to	6+29	620	620	1 : 5.0	124
UT1-B	Enhancement I	6+90	to	11+45	512	455	1 : 1.5	303
UT1-C	Enhancement I	1+21	to	10+01	883	880	1 : 1.5	586
UT2-1	Enhancement II	0+00	to	4+90	490	490	1 : 2.5	196
UT2-2	P1 Restoration	4+90	to	13+97	875	847	1 : 1.0	847
UT2-3	P1 Restoration	13+97	to	19+18	495	521	1 : 1.5	347
UT2-4	P1 Restoration	19+18	to	22+07	270	257	1 : 1.0	257
UT2-A	Enhancement II	0+45	to	5+06	365	461	1 : 2.5	184
	Total				9,214	9,179		6,365

res

0 25 50
Feet
1 inch = 50 feet

Figure 2n.

Poplin Ridge Stream Restoration Project

UT2-4 Current Conditions Plan View Map

Date: 8/18/2015 | Drawn by: BSH

LEGEND

- Conservation Easement
- Vegetation Plots
- Reach Breaks
- BE & Preservation
- Restoration
- Enhancement I
- Enhancement II
- No Credit Generated
- Stream Structures
- Cross Sections
- Crest Gauge/RG Locations
- Bankpin Locations

Riparian Buffer Conditions

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			
Common			

Appendix A. General Tables and Figures
Table 1 Project Components and Mitigation Credits
Baseline Monitoring Report Year 0

Table 1. Project Components and Mitigation Credits
Poplin Ridge Stream Restoration/DMS Project # 95359

Mitigation Credits

	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	6,127	238	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Project Components

Project Component -or- Reach ID	As-Built Stationing/Location (LF)	Existing Footage/Acreage	Approach (PI, PII etc.)	Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio	SMUs
UT1-1	1+20 to 6+92	572	Preservation	RE	572	1 : 5.0	114
UT1-1	6+92 to 12+58	566	EI	R	566	1 : 1.5	377
UT1-2	12+58 to 24+96	1,284	PI	R	1,178	1 : 1.0	1,178
UT1-3	24+96 to 34+50	833	PI	R	893	1 : 1.0	893
UT1-4	34+50 to 46+73	1,252	EI	R	1,223	1 : 1.5	815
UT1-A	0+73 to 2+89	197	EI	R	216	1 : 1.5	144
UT1-B	0+09 to 6+29	620	Preservation	RE	620	1 : 5.0	124
UT1-B	6+90 to 11+45	512	EI	R	455	1 : 1.5	303
UT1-C	1+21 to 10+01	883	EI	R	880	1 : 1.5	586
UT2-1	0+00 to 4+90	490	EII	R	490	1 : 2.5	196
UT2-2	4+90 to 13+97	875	PI	R	847	1 : 1.0	847
UT2-3	13+97 to 19+18	495	PI	R	521	1 : 1.5	347
UT2-4	19+18 to 22+07	270	PI	R	257	1 : 1.0	257
UT2-A	0+45 to 5+06	365	EII	R	461	1 : 2.5	184

Component Summation

Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-riparian Wetland	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	3,696					
Enhancement I	3,340					
Enhancement II	951					
Creation						
Preservation	1,192					
High Quality Preservation						

BMP Elements

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

BMP Elements

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

Table 2. Project Activity and Reporting History

Project Activity and Reporting History Poplin Ridge Stream Restoration / DMS Project #95359		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Mitigation Plan	NA	July 2014
Final Design – Construction Plans	NA	October 2014
Construction Completed	April 2015	April 2015
Site Planting Completed	April 2015	April 2015
Baseline Monitoring Document (Year 0 Monitoring – baseline)	April 2015	July 2015
Year 1 Monitoring		
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		
Year 6 Monitoring		
Year 7 Monitoring		

Table 3. Project Contacts

Project Contacts Table Poplin Ridge Stream Restoration /EEP Project # 95359	
Designer	WK Dickson and Co., Inc. 720 Corporate Center Drive Raleigh, NC 27607 (919) 782-0495 Frasier Mullen, PE
Construction Contractor	Wright Contracting PO Box 545 Siler City, NC 27344 (919) 663-0810 Joseph Wright
Planting Contractor	Resource Environmental Solutions, LLC 302 Jefferson Street, Suite 110 Raleigh, NC 27605 (919) 209-1061 David Godley
Seeding Contractor	Wright Contracting PO Box 545 Siler City, NC 27344 (919) 663-0810 Joseph Wright
Seed Mix Sources	Green Resource
Nursery Stock Suppliers	Arbogen, NC Forestry Services Nursery
Full Delivery Provider Project Manager:	Resource Environmental Solutions, LLC 302 Jefferson Street, Suite 110 Raleigh, NC 27605 (919) 209-1061 Daniel Ingram
Monitoring Performers Project Manager:	Resource Environmental Solutions, LLC 302 Jefferson Street, Suite 110 Raleigh, NC 27605 (919) 209-1061 Brian Hockett, PLS

Table 4. Project Information

Project Information

Project Name	Poplin Ridge Stream Restoration Project
County	Union
Project Area (acres)	27.17
Project Coordinates (latitude and longitude)	UT1: 35° 03' 15.97" N 80° 34' 21.64" W UT2: 35° 03' 17.99" N 80° 33' 46.77" W

Project Watershed Summary Information

Physiographic Province	Piedmont
River Basin	Yadkin
USGS Hydrologic Unit 8-digit	03040105
USGS Hydrologic Unit 14-digit	03040105070050
DWQ Sub-basin	03-07-14
Project Drainage Area (acres)	UT1: 1.14 square miles (728 acres) UT2: 1.35 square miles (861 acres)
Project Drainage Area Percentage of Impervious Area	UT1: 8% UT2: 5%
CGIA Land Use Classification	developed (open space, low density, med. density, high density), cultivated crops, pasture/hay, deciduous forest, evergreen forest

Reach Summary Information

Parameters	UT1-R1	UT1-R2	UT1-R3	UT1-R4	UT1-A	UT1-B
Length of reach (linear feet)	1,138	1,178	893	1,223	216	1,075
Valley Classification	VIII	VIII	VIII	VIII	VIII	VIII
Drainage area (acres)	136	248	384	728	88	120
NCDWQ stream identification score	35.0	22.5	30.0	31.0	35.0	35.0
NCDWQ Water Quality Classification	WS-III	WS-III	WS-III	WS-III	WS-III	WS-III
Morphological Description (stream type)	E4	E4	E4	C4	E4	E4/C4
Evolutionary trend	Stage I	Stage II	Stage II	Stage V	Stage I	Stage I/III
Underlying mapped soils	CmB	CmB, TbB2	CmB, TbB2	ChA	CmB	CmB
Drainage class	mod. well	mod. well; well	mod. well; well	somewhat poorly	mod. well	mod. well
Soil Hydric status	Not Hydric	Not Hydric	Not Hydric	Partially Hydric	Not Hydric	Not hydric
Slope	0.48%	0.70%	0.40%	0.50%	1.20%	1.80%
FEMA classification	N/A	N/A	N/A	Zone AE	N/A	N/A
Native vegetation community	mixed hardwood forest, cultivated	cultivated	cultivated	cultivated	cultivated	mixed hardwood forest, cultivated
Percent composition of exotic invasive vegetation	10%	0%	0%	0%	5%	15%

Reach Summary Information (continued)

Parameters	UT1-C	UT2-R1	UT2-R2	UT2-R3	UT2-R4	UT2-A
Length of reach (linear feet)	880	490	847	521	257	461
Valley Classification	VIII	VIII	VIII	VIII	VIII	VIII
Drainage area (acres)	250	631	726	792	861	49
NCDWQ stream identification score	35.0	33.5	33.5	22.5	33.5	33.5
NCDWQ Water Quality Classification	WS-III	WS-III	WS-III	WS-III	WS-III	WS-III
Morphological Description (stream type)	E4	C4c	N/A	E4	E4	C4
Evolutionary trend	Stage IV	Stage VI	N/A	Stage II	Stage II	Stage IV
Underlying mapped soils	TbB2	ChA	ChA	ChA, BaB	ChA	ChA, CmA
Drainage class	well	somewhat poorly	somewhat poorly	somewhat poorly; well	somewhat poorly	somewhat poorly; mod. well
Soil Hydric status	Not Hydric	Partially Hydric	Partially Hydric	Partially Hydric	Partially Hydric	Not Hydric
Slope	0.80%	0.27%	0.10%	0.57%	0.31%	1.30%
FEMA classification	N/A	Zone AE	Zone AE	Zone AE	Zone AE	N/A
Native vegetation community	cultivated	woody cover, cultivated	cultivated	cultivated	cultivated	cultivated
Percent composition of exotic invasive vegetation	0%	20%	0%	0%	0%	0%

Regulatory Considerations

Regulation	Applicable?	Resolved?	Supporting Documentation
Waters of the United States - Section 404	Yes	Yes	SAW-2012-01079
Waters of the United States - Section 401	Yes	Yes	DWR # 13-1087
Endangered Species Act	Yes	Yes	USFWS (Corr. Letter)
Historic Preservation Act	Yes	Yes	SHPO (Corr. Letter)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	NA	N/A
FEMA Floodplain Compliance	Yes	Yes	EEP Floodplain Requirements Checklist
Essential Fisheries Habitat	No	NA	N/A

APPENDIX B

Morphological Summary Data and Plots

Table 5. Morphological Parameters Summary Data
Table 6. Dimensional Morphology Summary – Cross Sections Data
Cross Section Plots
Pebble Count/Substrate Analysis Charts
Stream Photos

Appendix B. Table 5 - Morphological Parameters Summary (Reach UT1)

Project Name/Number: Poplin Ridge Stream Restoration Project/95359

	Reference Reach		Existing[1]									Design				As-Built MY0			
			UT1-R1	UT1-R1	UT1-R2	UT1-R3	UT1-R4	UT1-A	UT1-B	UT1-B	UT1-C	UT1-R2		UT1-R3		UT1-R2		UT1-R3	
			Pres.	Enh. I	Rest.	Rest.	Enh. I	Enh. I	Pres.	Enh. I	Enh. I	Rest.		Rest.		Rest.		Rest.	
Feature	Riffle	Pool	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool
Drainage Area (ac)	426	426	136	136	248	384	728	88	120	120	250	248		384		248		384	
NC Regional Curve Discharge (cfs)	69		31	31	47	64	100	22	28	28	47	47		64		47		64	
Design/Approx. Bankfull Discharge (cfs)	50		22	22	35	55	65	20	15	30	50	35		52		35		52	
Dimension																			
BF Width (ft)	13.7	15.0	7.9	7.5	9.9	12.8	17.5	6.9	11.2	6.0	10.0	11.8	12.8	13.6	14.8	12.95	14.85	15.35	15.15
Floodprone Width (ft)	>50	NA	>50	>50	>50	>50	>50	>50	>50	>50	>40	>50	NA	>50	>50	>50	>50	>50	NA
BF Cross Sectional Area (ft^2)	18.1	23.4	10.1	10.4	14.2	22.2	21.9	6.8	6.1	5.5	10.0	14.5	19.9	18.8	26.9	17.3	19.15	22.4	21.45
BF Mean Depth (ft)	1.4	1.6	1.3	1.4	1.4	1.7	1.2	1.0	0.5	0.9	1.0	1.2	1.6	1.4	1.8	1.3	1.25	1.45	1.45
BF Max Depth (ft)	1.7	2.7	2.0	1.8	2.0	2.4	2.3	1.4	1.0	1.1	1.3	1.8	2.4	1.9	2.8	2.1	2.35	2.25	2.55
Width/Depth Ratio	9.8	9.6	6.2	5.4	7.0	7.4	14.0	6.9	20.4	6.6	10.0	9.8	8.2	9.9	8.1	9.7	11.65	10.5	10.75
Entrenchment Ratio	>2.2	NA	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	>2.2	NA	>2.2	NA	>2.2	>2.2	>2.2	>2.2
Wetted Perimeter (ft)	14.9	16.8	10.4	9.1	11.6	14.5	19.0	8.2	11.8	7.5	11.1	12.6	14	14.7	16.2	13.9	15.95	16.35	16.4
Hydraulic Radius (ft)	1.2	1.4	1.0	1.1	1.2	1.5	1.2	0.8	0.5	0.7	0.9	1.1	1.4	1.4	1.7	1.25	1.15	1.4	1.3
Substrate																			
D16 (mm)	2.8		0.062	0.062	0.062	2	3	0.062	2	3	2	2		2		0.062		1.7	
D50 (mm)	11.0		0.062	16.0	2	8	25	0.1	29	12	11	8		8		0.062		25	
D84 (mm)	16.0		0.062	63.0	7	25	51	0.4	60	27	45	25		25		26		60	
Pattern																			
	Min	**Max**	**Med**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Channel Beltwidth (ft)	26.3	55.5	37.3	---	---	---	---	---	---	---	---	38	57	44	65	35	60	42	65
Radius of Curvature (ft)	13.5	103.3	41.2	---	---	---	---	---	---	---	---	18	89	20	103	15	75	17	80
Radius of Curvature Ratio	1.0	7.6	3.0	---	---	---	---	---	---	---	---	1.5	7.6	1.5	7.6	1.5	7.6	1.5	7.6
Meander Wavelength (ft)	49.4	66.0	59.7	---	---	---	---	---	---	---	---	38	57	44	65	35	52	37	56
Meander Width Ratio	3.6	4.8	4.4	---	---	---	---	---	---	---	---	3.2	4.8	3.2	4.8	2.7	4.0	2.7	4.3
Profile																			
	Min	**Max**	**Med**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Riffle Length (ft)	6	18	9	---	---	---	---	---	---	---	---	5	16	6	18	6	18	7	22
Riffle Slope (%)	1.1	3.4	2.3	---	---	---	---	---	---	---	---	1.1	3.4	1.1	3.4	1.0	3.6	1.0	3.7
Run Length (ft)	7	15	8	---	---	---	---	---	---	---	---	6	13	7	15	6	15	8.0	18.0
Run Slope (%)	4.8	11.5	8.2	---	---	---	---	---	---	---	---	4.8	11.5	4.8	11.5	4.6	12.0	5.0	11.0
Glide Length (ft)	5	13	9	---	---	---	---	---	---	---	---	4	11	5	13	4	12	6.0	13.2
Glide Slope (%)	4.8	9.2	7.0	---	---	---	---	---	---	---	---	4.8	9.2	4.8	9.2	4.7	10.0	5.0	10.9
Pool Length (ft)	5	42	15	---	---	---	---	---	---	---	---	4	36	5	42	6	42	8.0	50.0
Pool Slope (%)	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1.1	2.5	1.1	2.4
Pool-to-Pool Spacing (ft)	18.0	64.0	30.0	---	---	---	---	---	---	---	---	16	55	18	64	20	60	20	70
Additional Reach Parameters																			
Valley Length (ft)	279		622	534	1173	731	1294	264	573	434	908	---		---		1,070		1,115	
Channel Length (ft)	318		716	541	1197	738	1340	270	618	449	921	---		---		1,178		1,223	
Sinuosity	1.14		1.2	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.1		1.1		1.1		1.1	
Water Surface Slope (ft/ft)	0.0048		NA	NA	NA	0.003	0.004	NA	NA	NA	NA	---		---		NA		NA	
Channel Slope (ft/ft)	0.0047		0.0048	0.011	0.007	0.004	0.005	0.012	0.012	0.018	0.008	0.0059		0.0046		0.0066		0.0041	
Rosgen Classification	E4		E4	E4	E4	E4	C4	E5	C4	E4	E4	E4		E4		E4		E4	

[1] Bankfull stage was estimated using NC Regional Curve equations and existing conditions data

Appendix B. Table 5 - Morphological Parameters Summary (Reach UT2)

Project Name/Number: Poplin Ridge Stream Restoration Project/95359

	Reference Reach			Existing[1]					Design				As-Built MY0			
				UT2-R1	UT2-R2	UT2-R3	UT2-R4	UT2-A	UT1-R2		UT1-R3/R4		UT1-R2		UT1-R3/R4	
				Enh. II	Rest.	Rest.	Rest.	Enh. II	Rest.		Rest.		Rest.		Rest.	
Feature	Riffle	Pool		Riffle	Pond	Riffle	Riffle	Riffle	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool
Drainage Area (ac)	426	426		634	723	742	864	51	723		864		723		864	
NC Regional Curve Discharge (cfs)	69								100		113		100		113	
Design/Approx. Bankfull Discharge (cfs)	50			---	---	---	---	---	52		70		52		70	
Dimension																
BF Width (ft)	13.7	15.0		25.6	---	16.2	12.1	6.1	17.2	18.6	18.2	19.6	21	19.6	17.4	21.1
Floodprone Width (ft)	>50	NA		>50	---	>50	>50	>50	>50	NA	>50	NA	>50	>50	>50	>50
BF Cross Sectional Area (ft^2)	18.1	23.4		19.6	---	22.4	12.6	3.0	31.5	42	34.8	47.6	26.5	32.6	30.8	34.4
BF Mean Depth (ft)	1.4	1.6		0.8	---	1.4	1.0	0.5	1.8	2.3	1.9	2.4	1.3	1.7	1.8	1.6
BF Max Depth (ft)	1.7	2.7		1.7	---	2.6	1.6	1.2	2.5	3.5	2.6	3.8	2.2	3.1	2.5	3.5
Width/Depth Ratio	9.8	9.6		33.5	---	11.8	11.6	12.2	9.4	8.2	9.5	8.1	16.6	11.7	9.8	12.9
Entrenchment Ratio	>2.2	NA		>2.2	---	>2.2	>2.2	>2.2	>2.2	NA	>2.2	NA	>2.2	>2.2	>2.2	>2.2
Wetted Perimeter (ft)	14.9	16.8		26.2	---	17.9	13.1	7.0	18.5	20.3	19.5	21.5	21.7	21.2	18.5	22.9
Hydraulic Radius (ft)	1.2	1.4		0.7	---	1.3	1.0	0.4	1.7	2.1	1.8	2.2	1.2	1.5	1.7	1.5
Substrate																
D16 (mm)	2.8			0.062	---	0.062	1.5	0.062	1.5		1.5		0.062		0.062	
D50 (mm)	11.0			0.062	---	0.062	7.8	0.062	7.8		7.8		0.062		28	
D84 (mm)	16.0			0.72	---	4.8	15.0	0.57	15		15		24		61	
Pattern																
	Min	**Max**	**Med**	---	---	---	---	---	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Channel Beltwidth (ft)	26	56	37	---	---	---	---	---	55	83	58	87	67	101	56	84
Radius of Curvature (ft)	13	103	41	---	---	---	---	---	26	130	27	138	32	160	26	132
Radius of Curvature Ratio	1.0	7.6	3.0	---	---	---	---	---	1.5	7.6	1.5	7.6	1.5	7.6	1.5	7.6
Meander Wavelength (ft)	49	66	60	---	---	---	---	---	55	83	58	87	67	101	56	84
Meander Width Ratio	1.9	4.1	2.7	---	---	---	---	---	3.2	4.8	3.2	4.8	3.2	4.8	3.2	4.8
Profile																
	Min	**Max**	**Med**	---	---	---	---	---	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Riffle Length (ft)	6	18	9						8	23	8	24	9.0	25.0	8.2	26.5
Riffle Slope (%)	1.1	3.4	2.3	---	---	---	---	---	1.1	3.4	1.1	3.4	1.1	3.6	1.2	3.8
Run Length (ft)	7	15	8						9	19	9	20	11.0	17.0	10.2	21.0
Run Slope (%)	4.8	11.5	8.2	---	---	---	---	---	4.8	11.5	4.8	11.5	4.2	12.0	3.8	11.2
Glide Length (ft)	5	13	9						6	16	7	17	6.2	18.2	7.5	16.3
Glide Slope (%)	4.8	9.2	7.0	---	---	---	---	---	4.8	9.2	4.8	9.2	5.1	9.6	4.8	9.1
Pool Length (ft)	5	42	15						6	53	7	56	7.8	47.0	8.5	60.0
Pool Slope (%)	---	---	---	---	---	---	---	---	---	---	---	---	3.5	10.0	4.1	10.1
Pool-to-Pool Spacing (ft)	18.0	64.0	30.0	---	---	---	---	---	23	81	24	85	18.0	90.0	20.5	92.0
Additional Reach Parameters																
Valley Length (ft)	279			410	641	779	1015	427	---		---		785		710	
Channel Length (ft)	318			443	641	781	1032	437	---		---		847		778	
Sinuosity	1.14			1.1	1.0	1.0	1.0	1.0	1.1		1.1		1.08		1.1	
Water Surface Slope (ft/ft)	0.0048			NA	NA	NA	0.0027	NA	---		---		---		---	
Channel Slope (ft/ft)	0.0047			0.0027	0.001	0.0057	0.0031	0.013	0.0029		0.0028		0.0061		0.002	
Rosgen Classification	E4			C5c	NA	E5	E4	C5	E4		E4		E4		E4	

[1] Bankfull stage was estimated using NC Regional Curve equations and existing conditions data

Appendix B. Table 6 - Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Project Name/Number: Poplin Ridge Stream Restoration Project/95359

	Cross Section 1							Cross Section 2							Cross Section 3 (Riffle)							Cross Section 4 (Riffle)							Cross Section 5 (Run)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	577.2							577.1							586.4							585.0							576.3						
Bankfull Width (ft)	3.2							3.0							8.2							11.0							21.0						
Floodprone Width (ft)	17.2							15.2							50.0							44.4							50.0						
Bankfull Mean Depth (ft)	0.5							0.4							1.0							0.7							1.3						
Bankfull Max Depth (ft)	0.9							0.6							1.7							1.3							2.2						
Bankfull Cross Sectional Area (ft^2)	0.6							1.1							7.9							7.4							26.5						
Bankfull Width/Depth Ratio	6.4							7.9							8.5							16.4							16.6						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

	Cross Section 6 (Pool)							Cross Section 7 (pool)							Cross Section 8 (Riffle)							Cross Section 9 (Riffle)							Cross Section 10 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	576.5							575.0							575.0							602.1							602.3						
Bankfull Width (ft)	19.6							21.1							17.4							11.7							15.2						
Floodprone Width (ft)	50.0							50.0							50.0							50.0							50.0						
Bankfull Mean Depth (ft)	1.7							1.6							1.8							1.1							1.4						
Bankfull Max Depth (ft)	3.1							3.5							2.5							1.8							2.6						
Bankfull Cross Sectional Area (ft^2)	32.6							34.4							30.8							13.0							21.0						
Bankfull Width/Depth Ratio	11.7							12.9							9.8							10.4							11.1						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

	Cross Section 11 (Riffle)							Cross Section 12 (Pool)							Cross Section 13 (Riffle)							Cross Section 14 (Pool)							Cross Section 15 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	599.1							596.3							596.0							591.2							591.5						
Bankfull Width (ft)	10.0							17.4							12.5							12.3							13.4						
Floodprone Width (ft)	50.0							50.0							50.0							50.0							50.0						
Bankfull Mean Depth (ft)	1.0							1.4							1.2							1.1							1.4						
Bankfull Max Depth (ft)	1.7							2.5							1.9							2.2							2.3						
Bankfull Cross Sectional Area (ft^2)	10.5							24.4							15.6							13.9							19.0						
Bankfull Width/Depth Ratio	9.6							12.4							10.0							10.9							9.4						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

	Cross Section 16 (Riffle)							Cross Section 17 (pool)							Cross Section 18 (Pool)							Cross Section 19 (Riffle)							Cross Section 20 (Riffle)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	591.8							590.9							588.0							588.2							586.2						
Bankfull Width (ft)	11.7							14.2							14.5							15.2							15.5						
Floodprone Width (ft)	50.0							50.0							50.0							50.0							50.0						
Bankfull Mean Depth (ft)	1.1							0.7							1.5							1.5							1.4						
Bankfull Max Depth (ft)	1.8							1.4							2.6							2.4							2.1						
Bankfull Cross Sectional Area (ft^2)	12.3							10.2							21.5							23.0							21.9						
Bankfull Width/Depth Ratio	11.2							19.7							9.8							10.1							11.0						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with DMS. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Appendix B. Table 6 - Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Project Name/Number: Poplin Ridge Stream Restoration Project/95359

	Cross Section 21 (Pool)							Cross Section 22 (Riffle)							Cross Section 23 (Pool)							Cross Section 24 (Riffle)							Cross Section 25 (Pool)						
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	585.6							592.0							591.8							586.3							585.8						
Bankfull Width (ft)	15.8							13.2							14.6							14.2							12.0						
Floodprone Width (ft)	50.0							50.0							50.0							46.6							50.0						
Bankfull Mean Depth (ft)	1.4							1.3							1.3							1.0							1.3						
Bankfull Max Depth (ft)	2.5							1.9							2.1							1.7							2.3						
Bankfull Cross Sectional Area (ft^2)	21.4							16.8							19.1							14.0							15.5						
Bankfull Width/Depth Ratio	11.7							10.4							11.1							14.3							9.4						
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2							>2.2						
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0							1.0						

	Cross Section 26 (Pool)							Cross Section 27 (Riffle)							Cross Section 28 (Riffle)							Cross Section 29 (Pool)													
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used	581.7							582.2							579.7							579.8													
Bankfull Width (ft)	14.8							16.5							15.9							20.3													
Floodprone Width (ft)	47.0							50.0							50.0							50.0													
Bankfull Mean Depth (ft)	1.2							1.3							1.5							1.6													
Bankfull Max Depth (ft)	2.1							2.1							2.6							3.1													
Bankfull Cross Sectional Area (ft^2)	17.6							21.5							24.2							33.2													
Bankfull Width/Depth Ratio	12.5							12.7							10.4							12.5													
Bankfull Entrenchment Ratio	>2.2							>2.2							>2.2							>2.2													
Bankfull Bank Height Ratio	1.0							1.0							1.0							1.0													

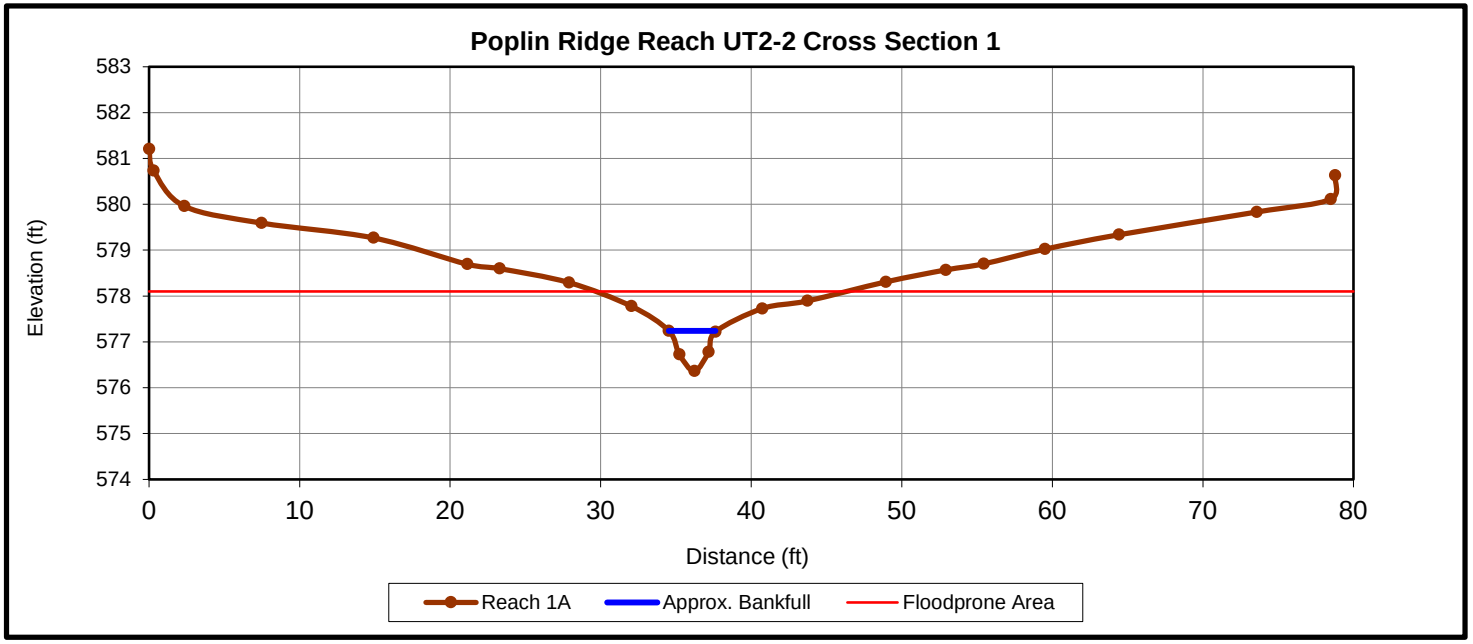
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			

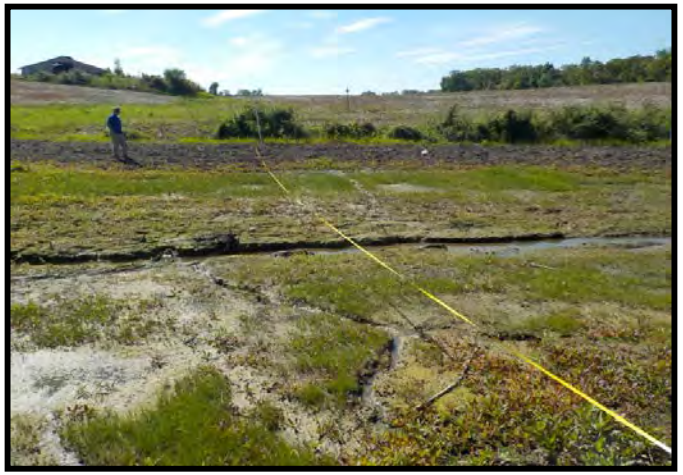
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+	Base	MY1	MY2	MY3	MY5	MY7	MY+
Record elevation (datum) used																																			
Bankfull Width (ft)																																			
Floodprone Width (ft)																																			
Bankfull Mean Depth (ft)																																			
Bankfull Max Depth (ft)																																			
Bankfull Cross Sectional Area (ft^2)																																			
Bankfull Width/Depth Ratio																																			
Bankfull Entrenchment Ratio																																			
Bankfull Bank Height Ratio																																			

1 = Widths and depths for annual measurements will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Upstream

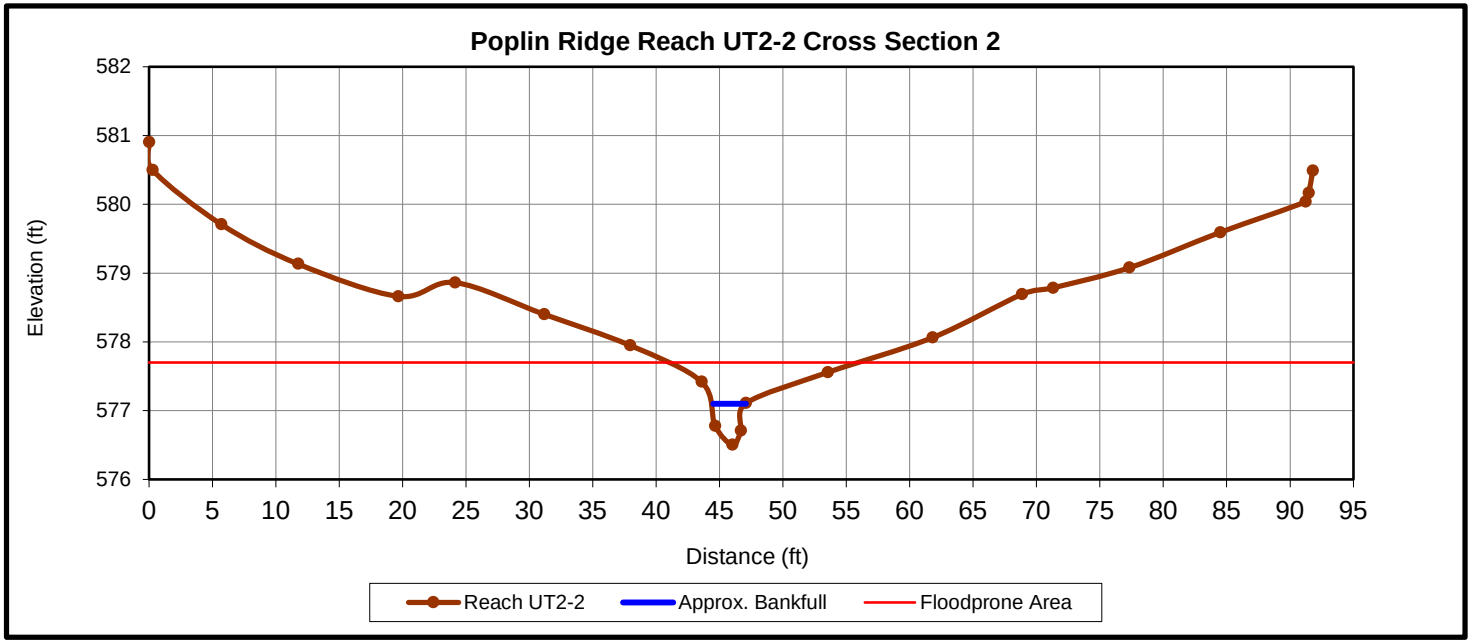
Downstream





Upstream

Downstream



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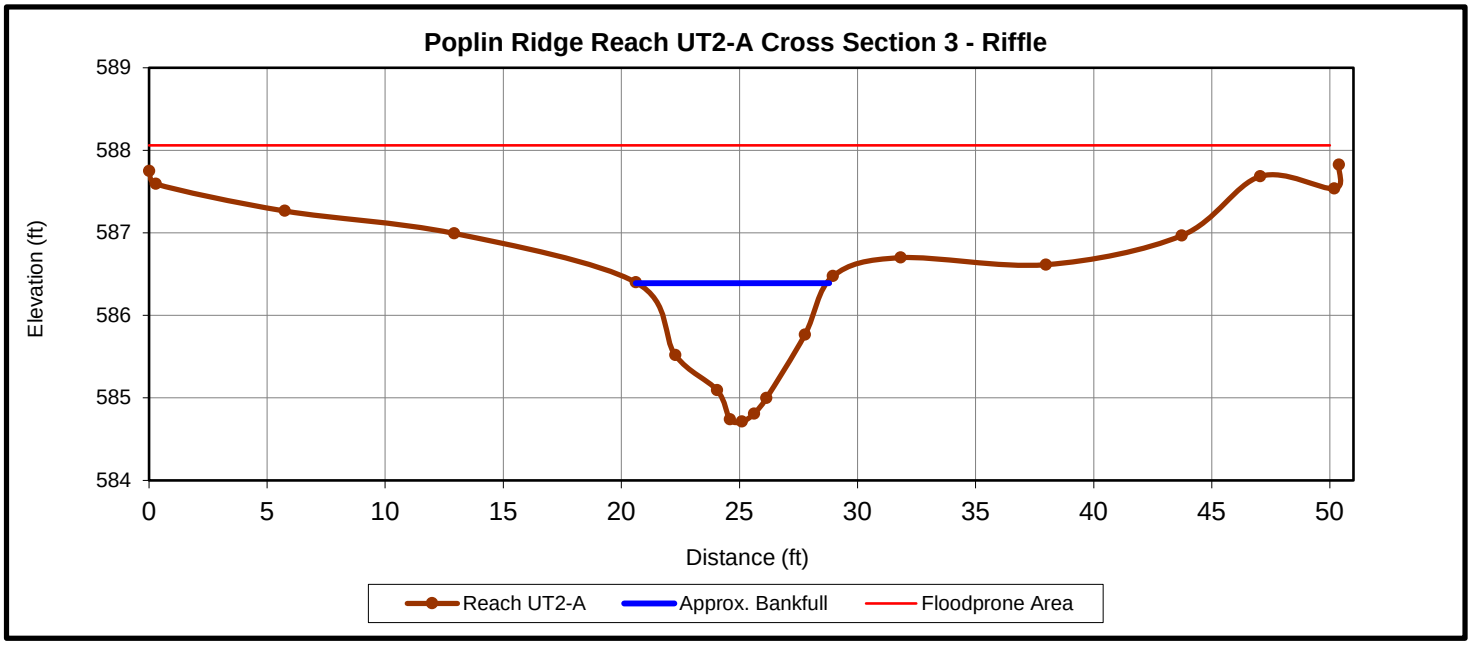
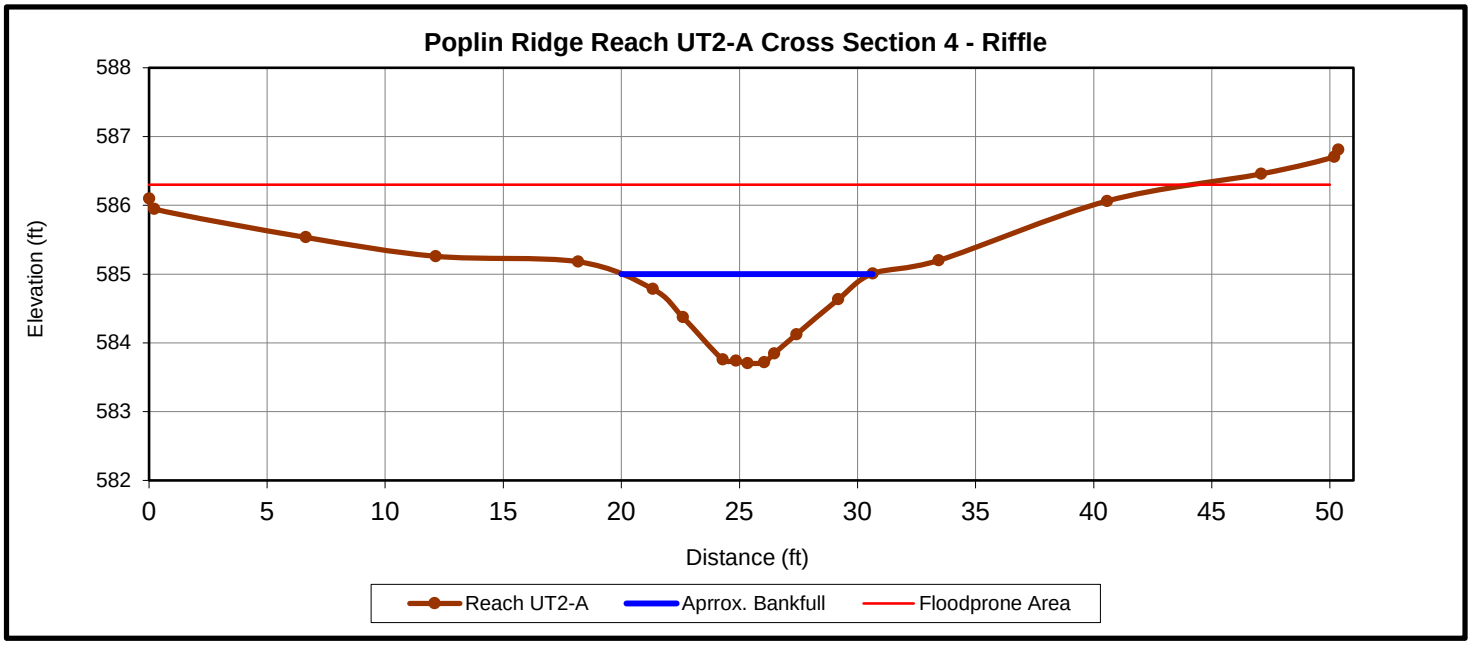


Upstream

Downstream



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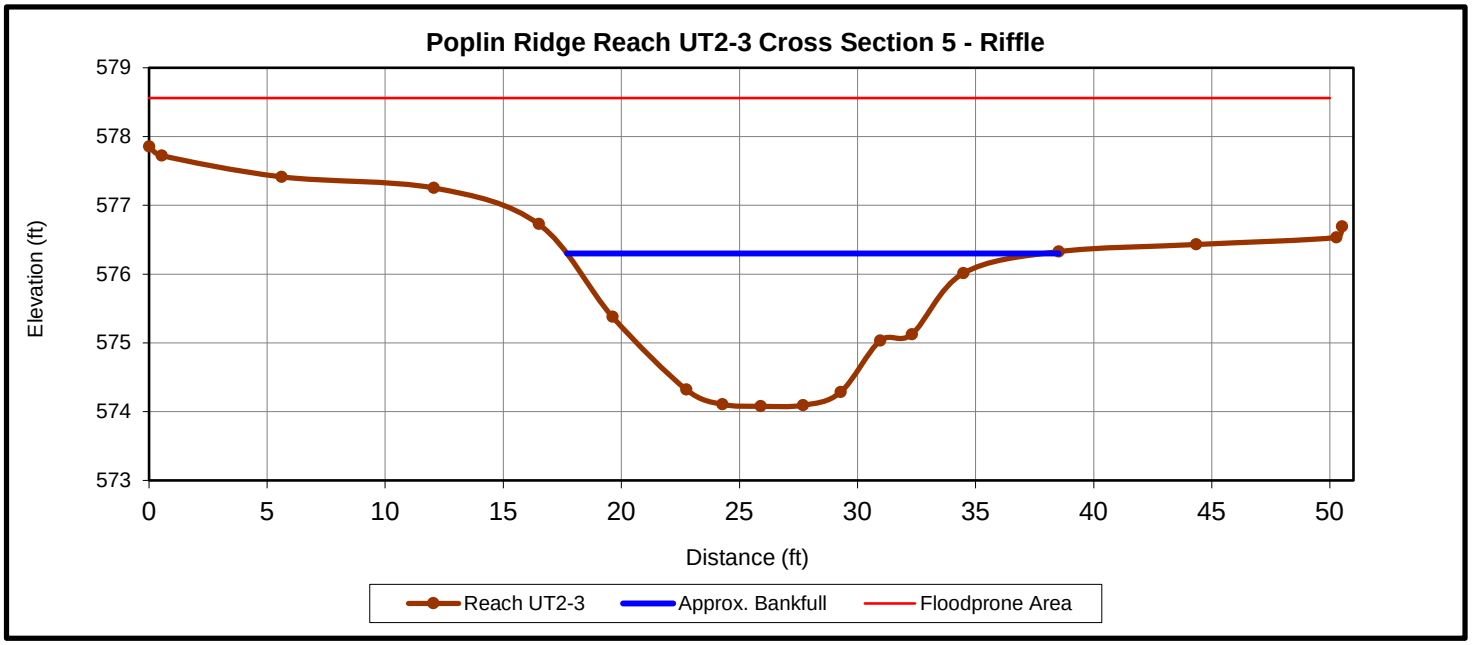
Downstream



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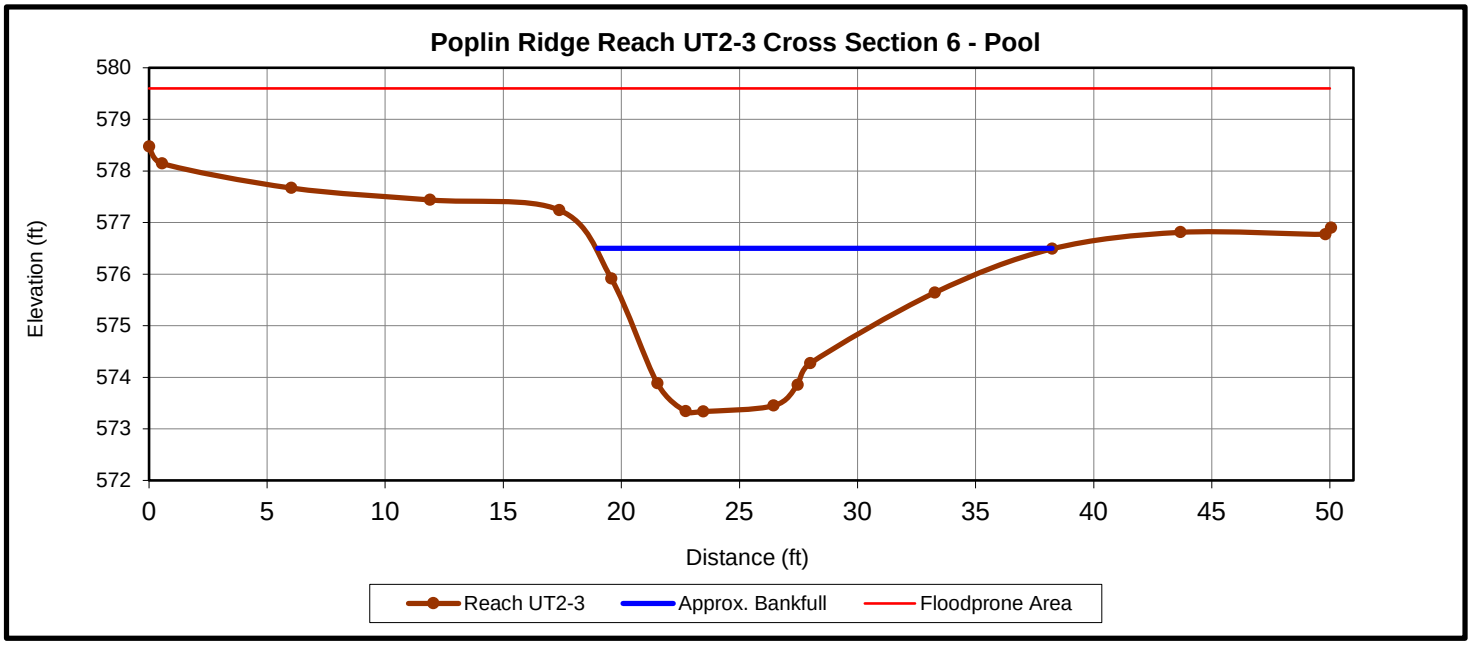

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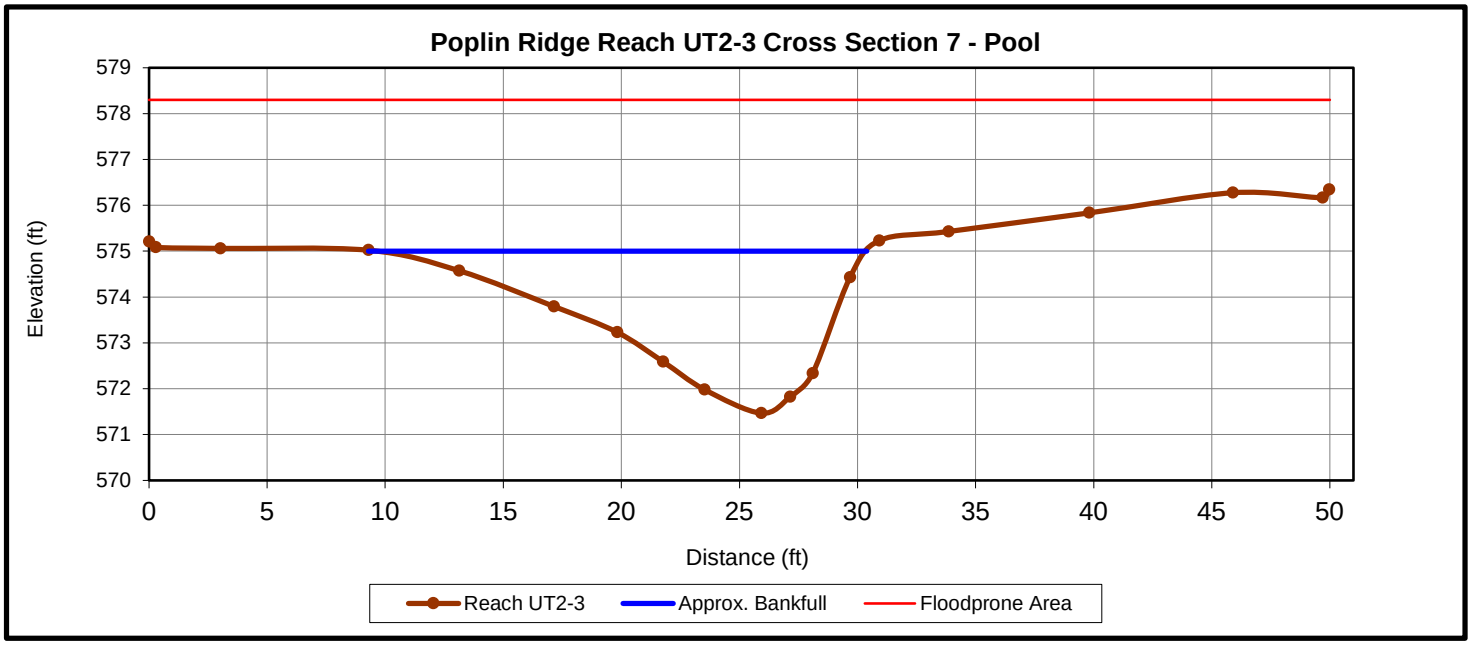

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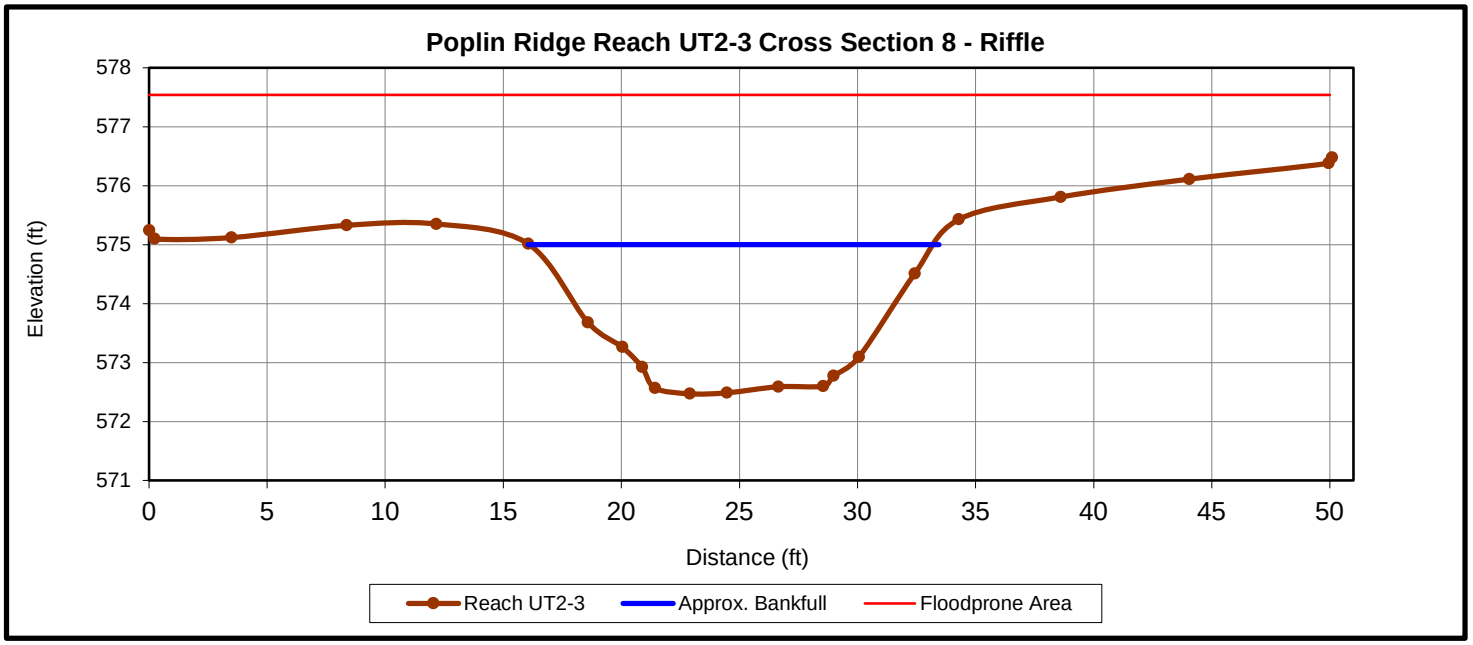
Downstream



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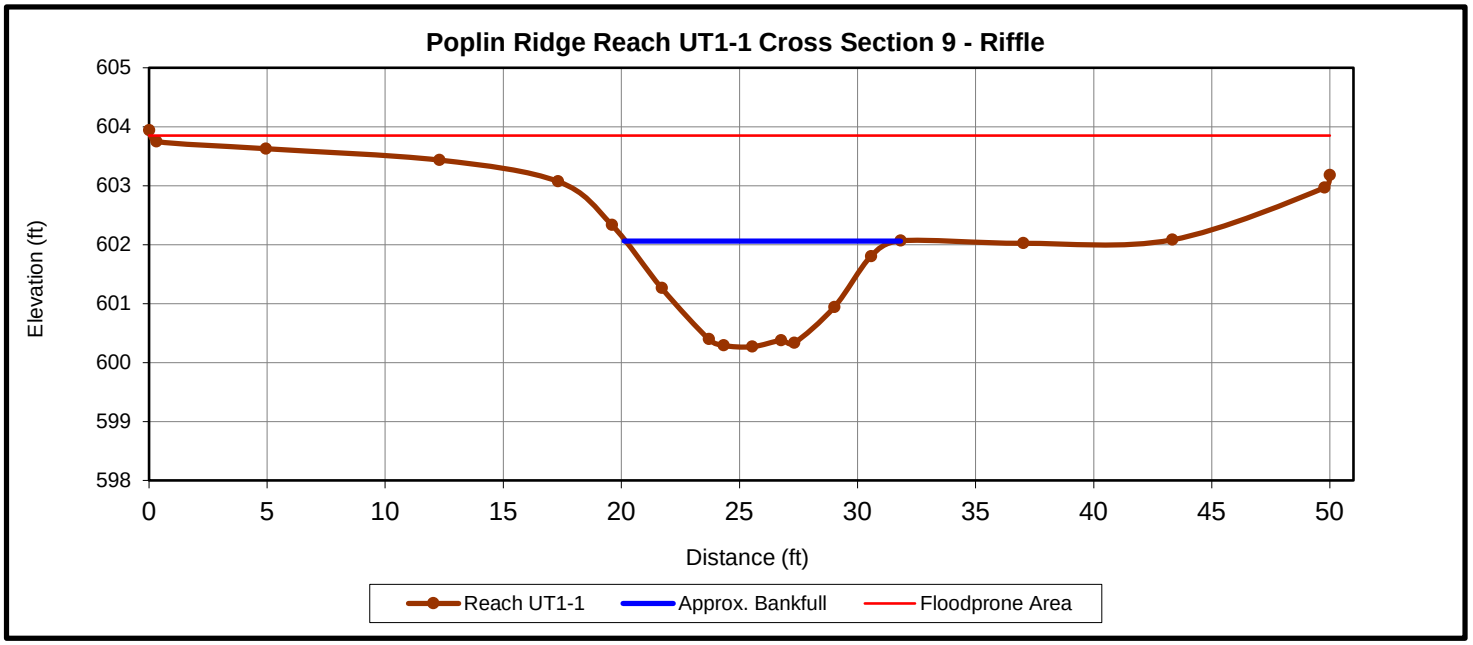

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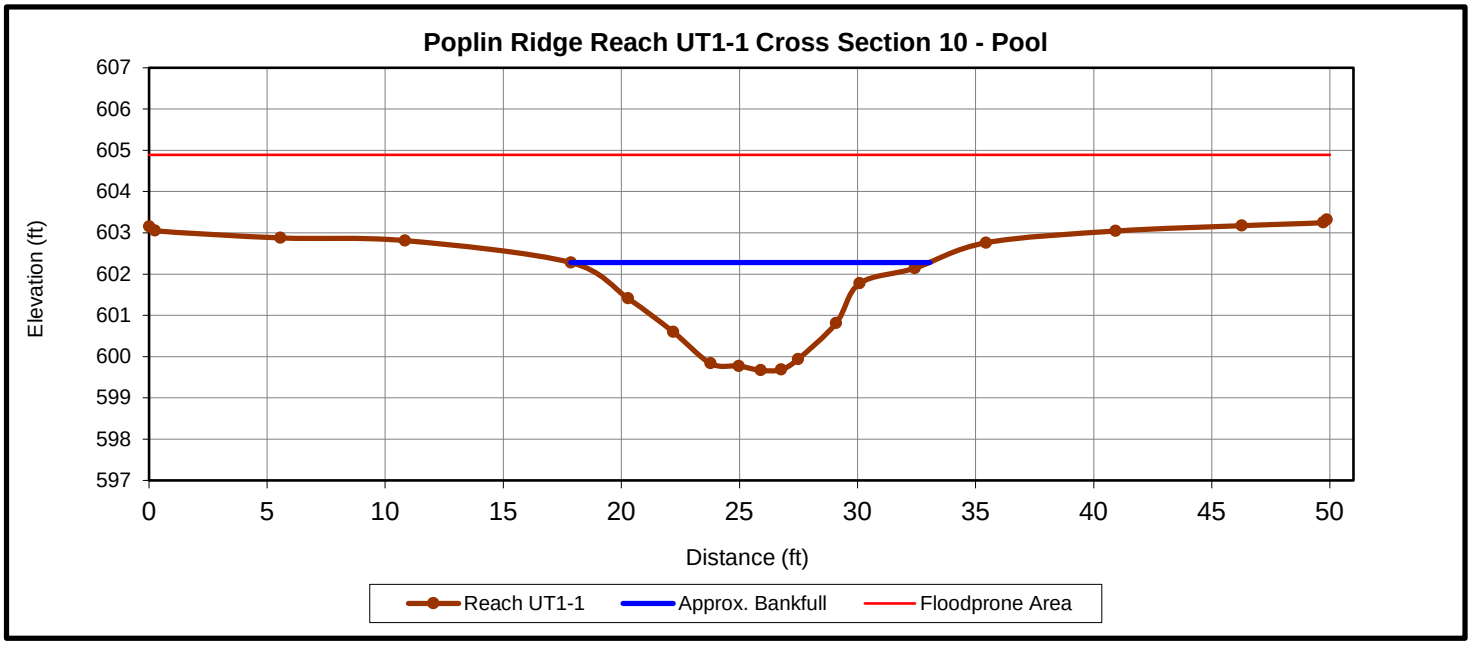

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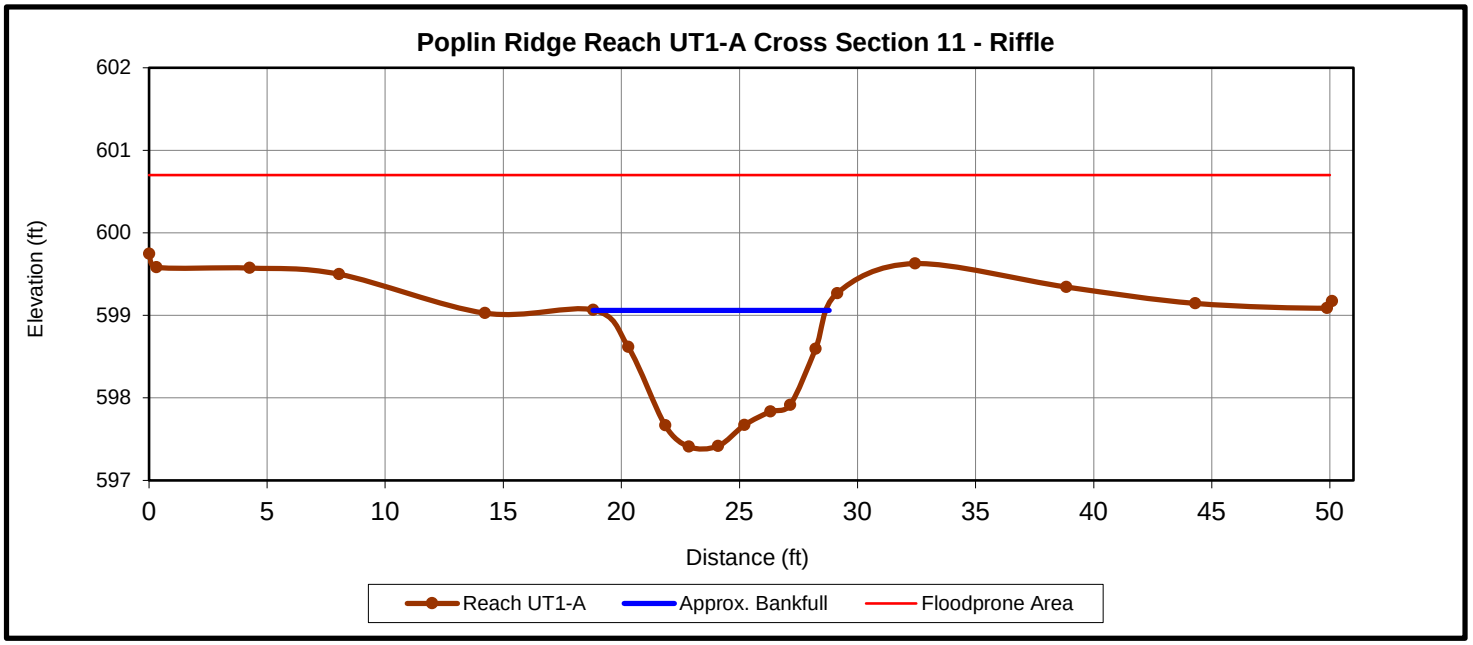

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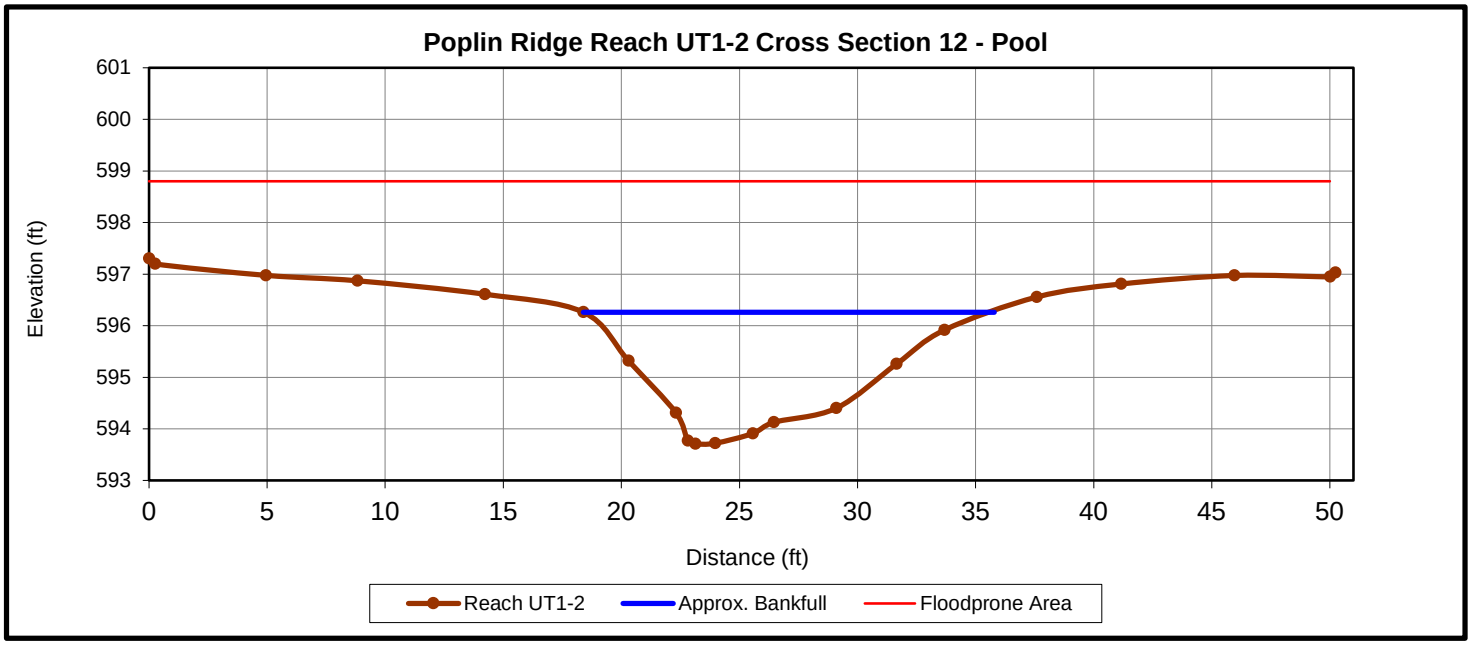
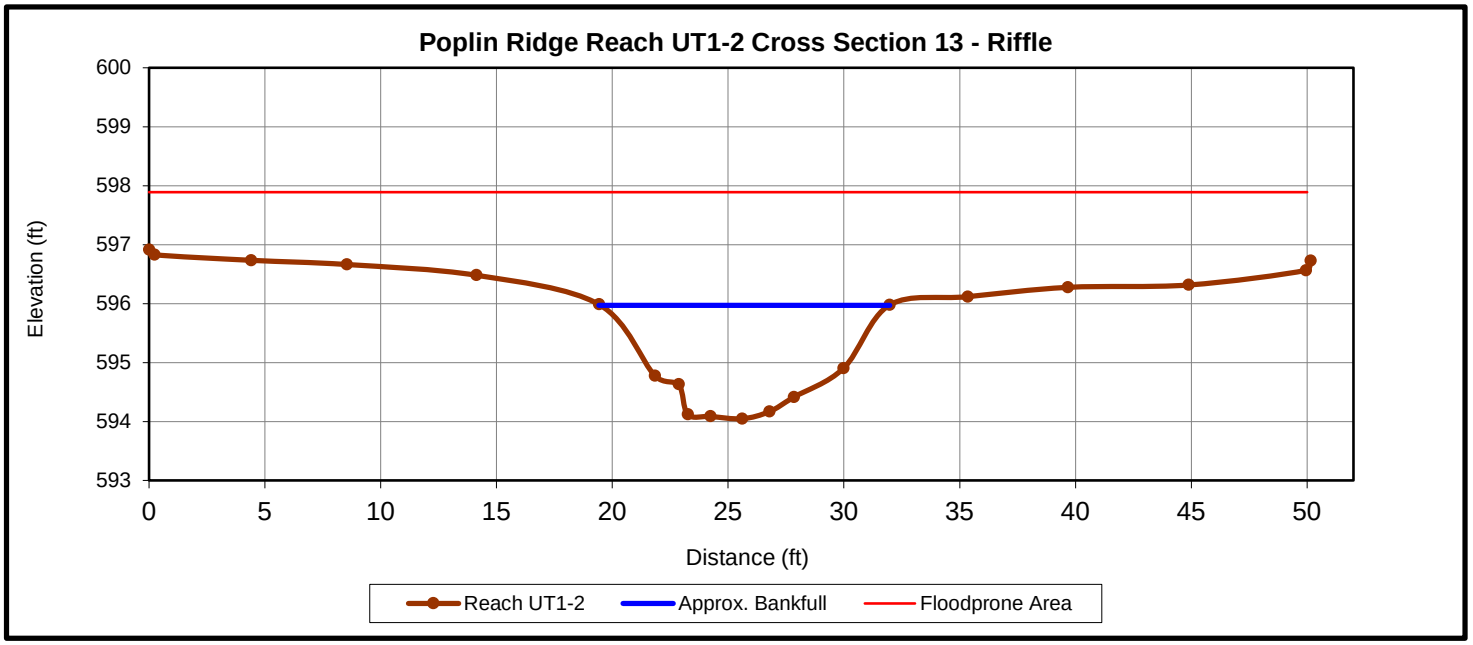
Downstream



Upstream

Downstream



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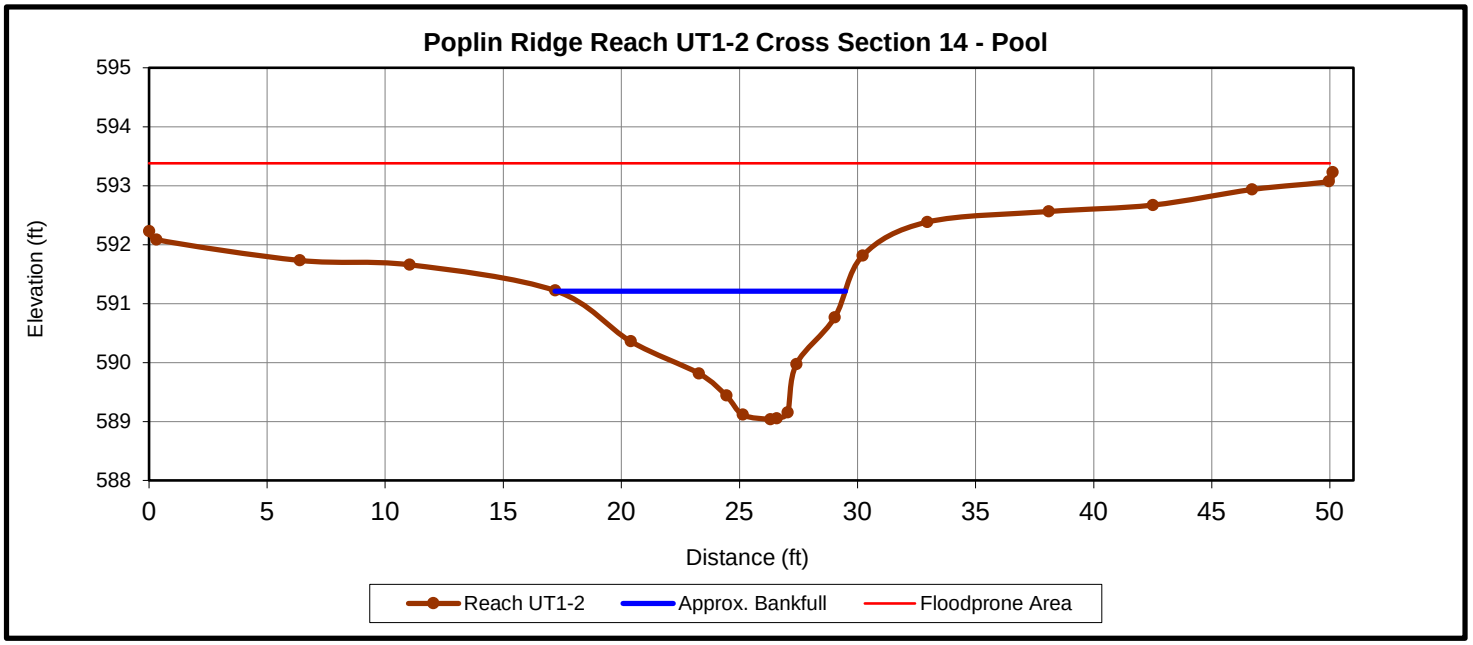
Downstream



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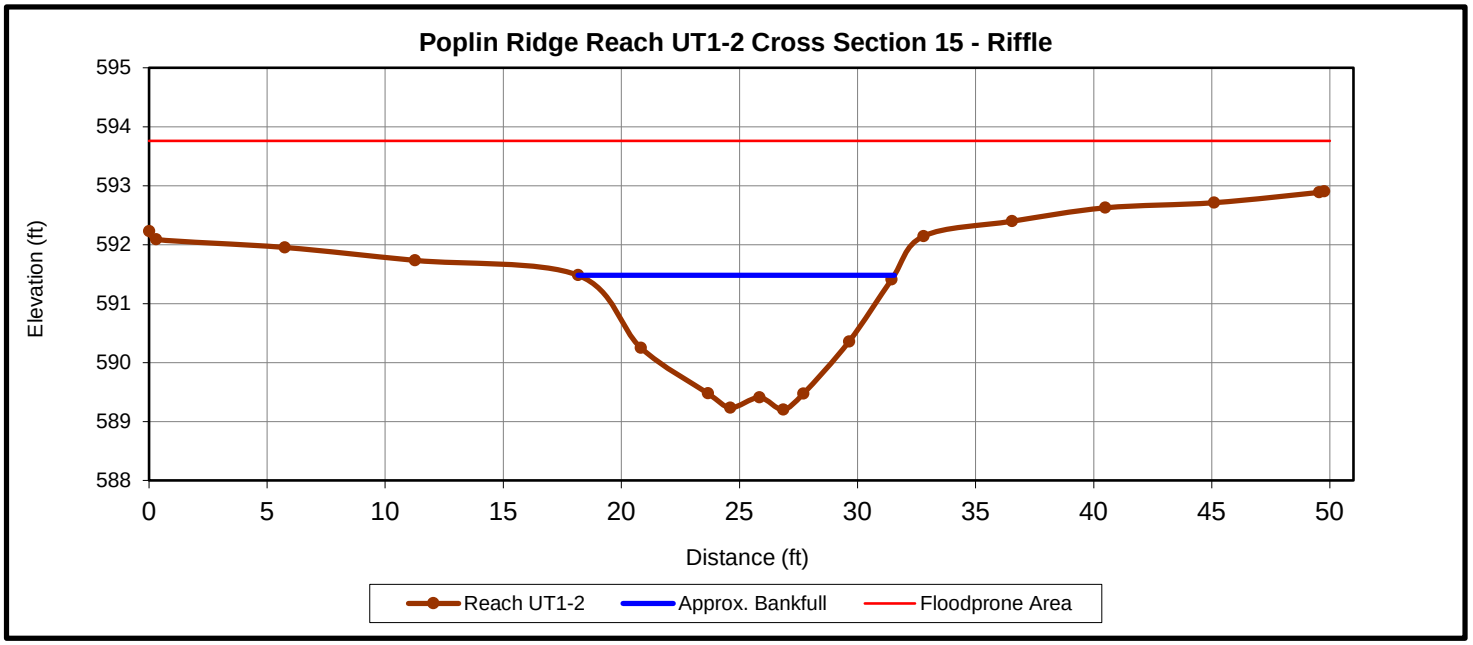

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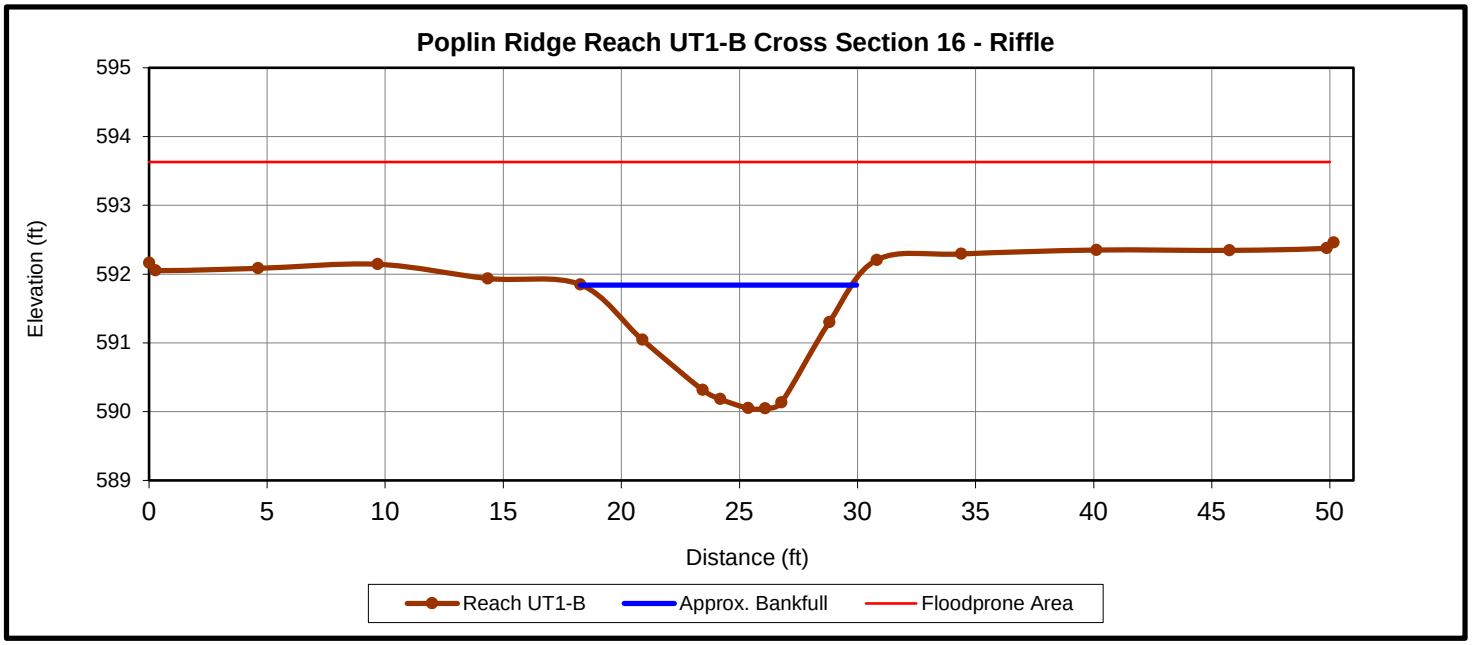
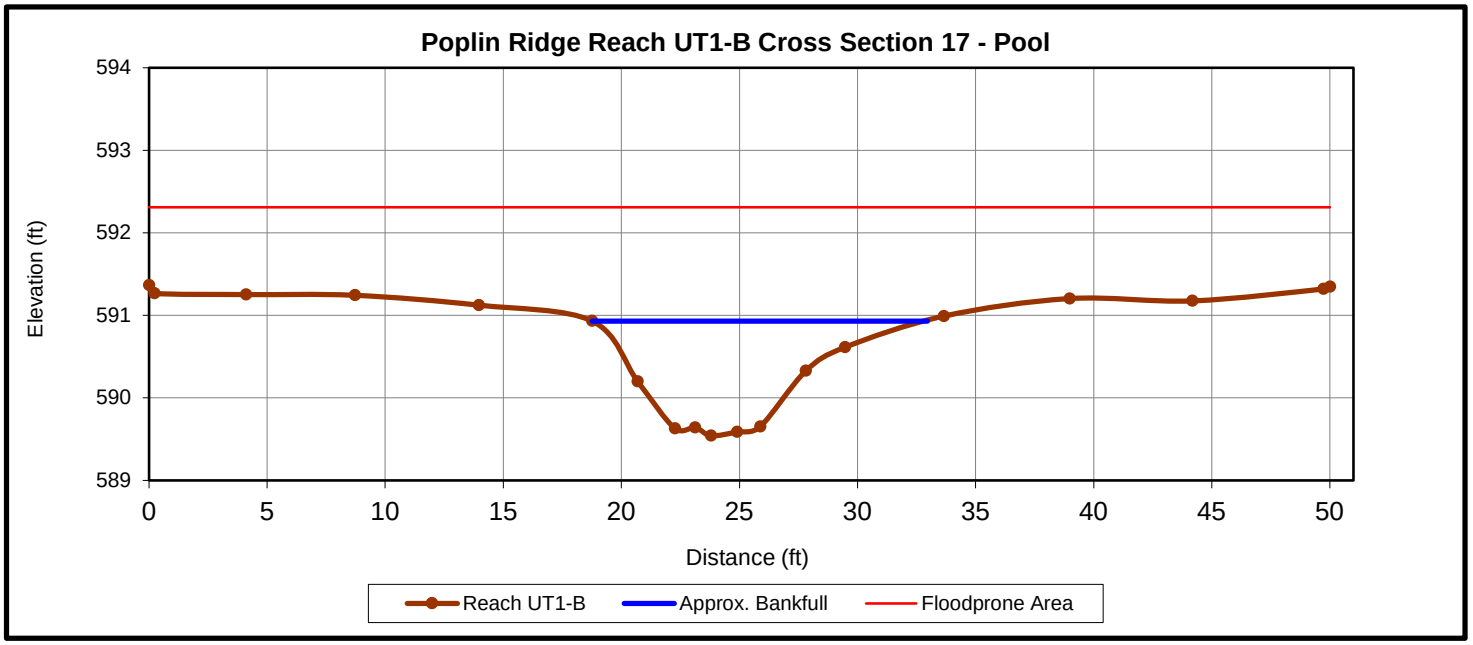


Upstream

Downstream



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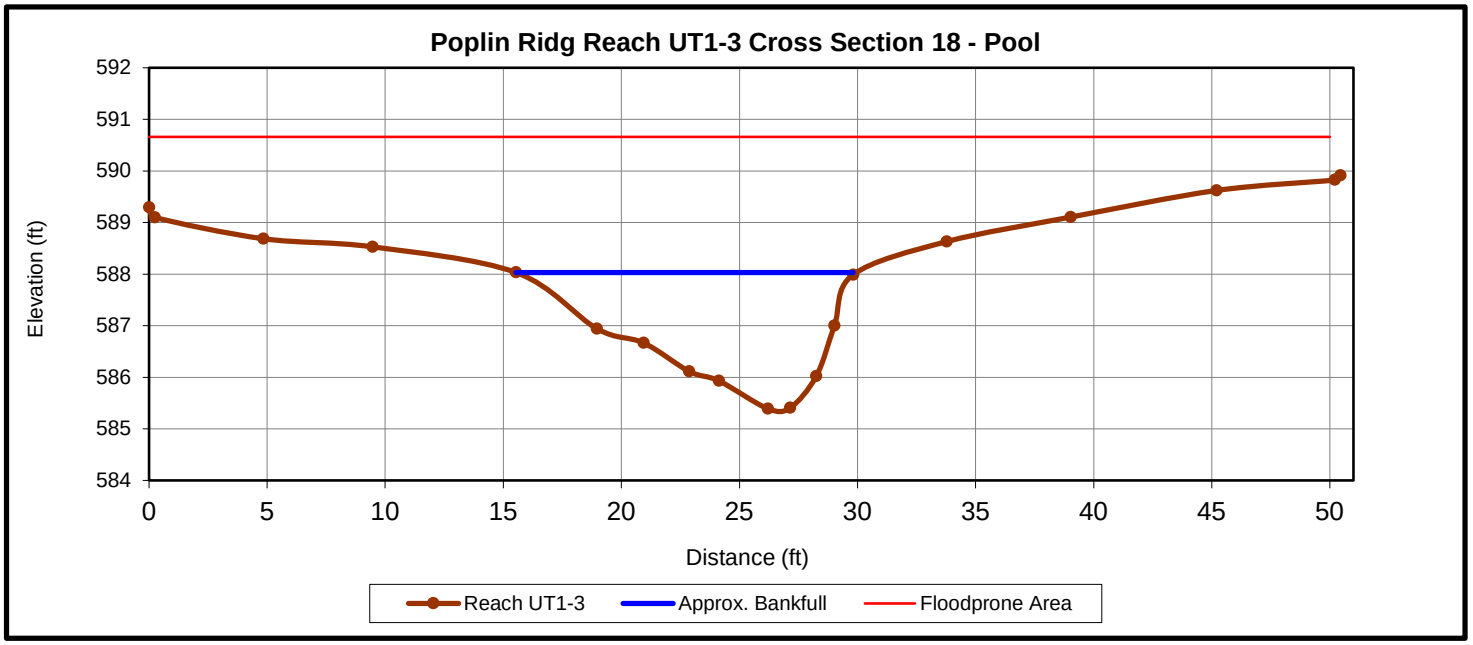
Downstream



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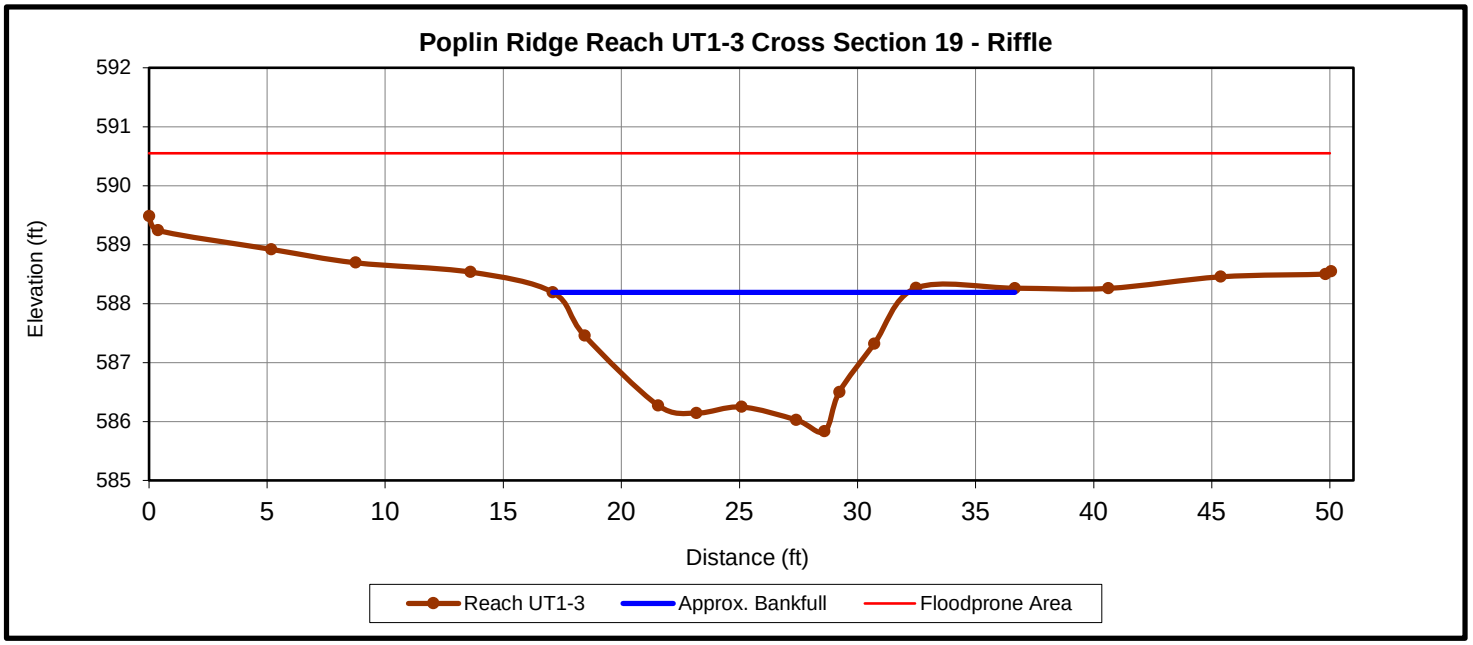
Downstream



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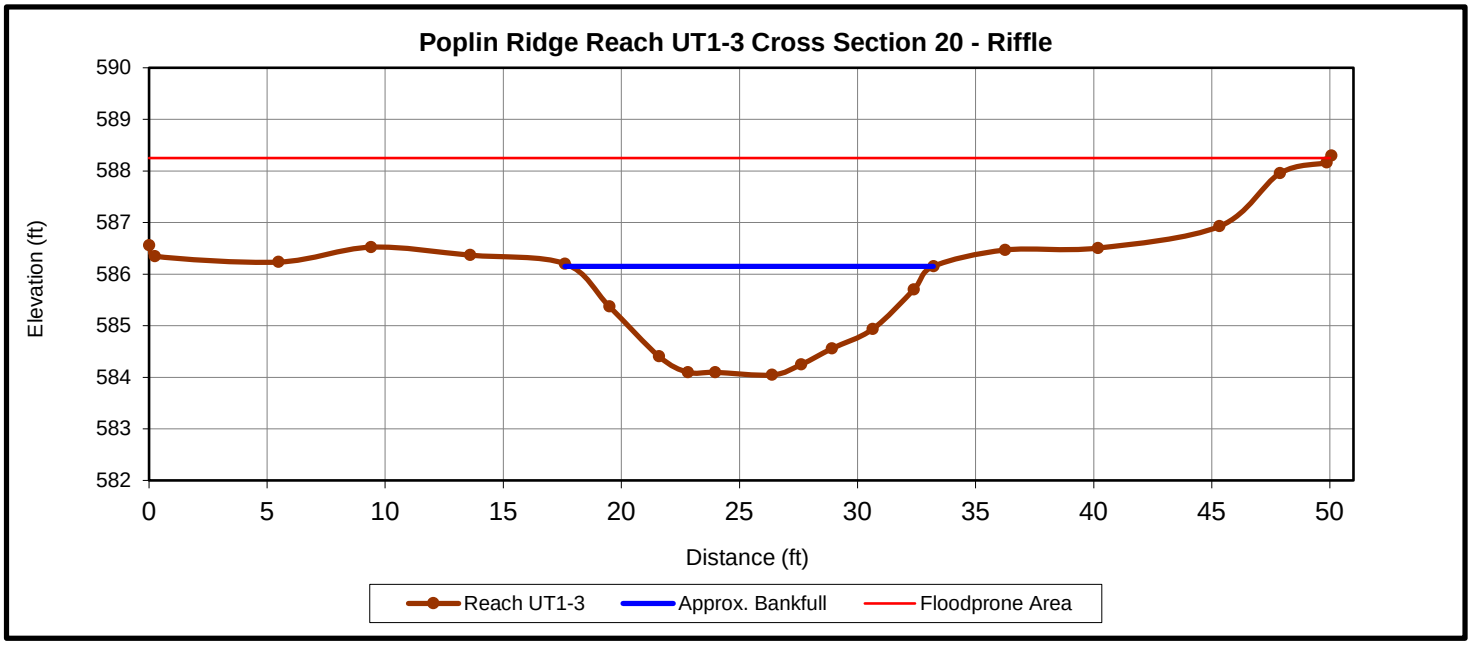
Downstream



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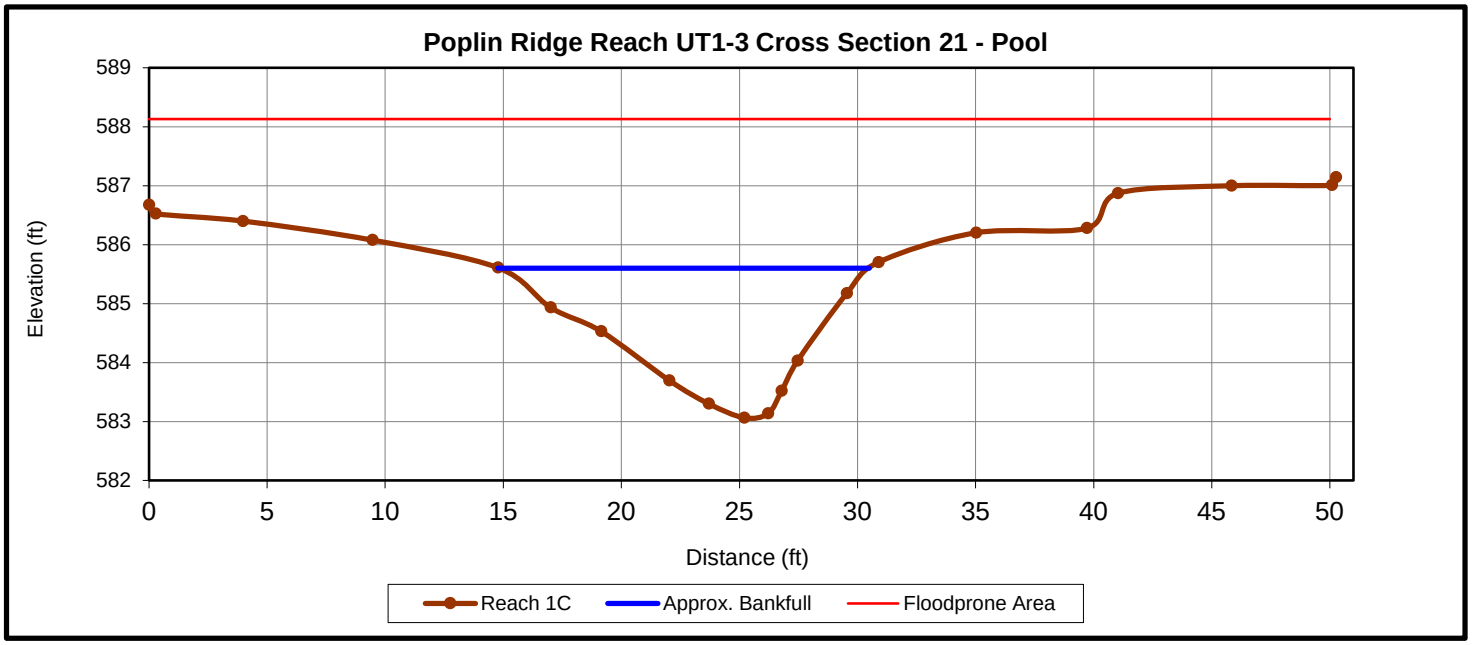

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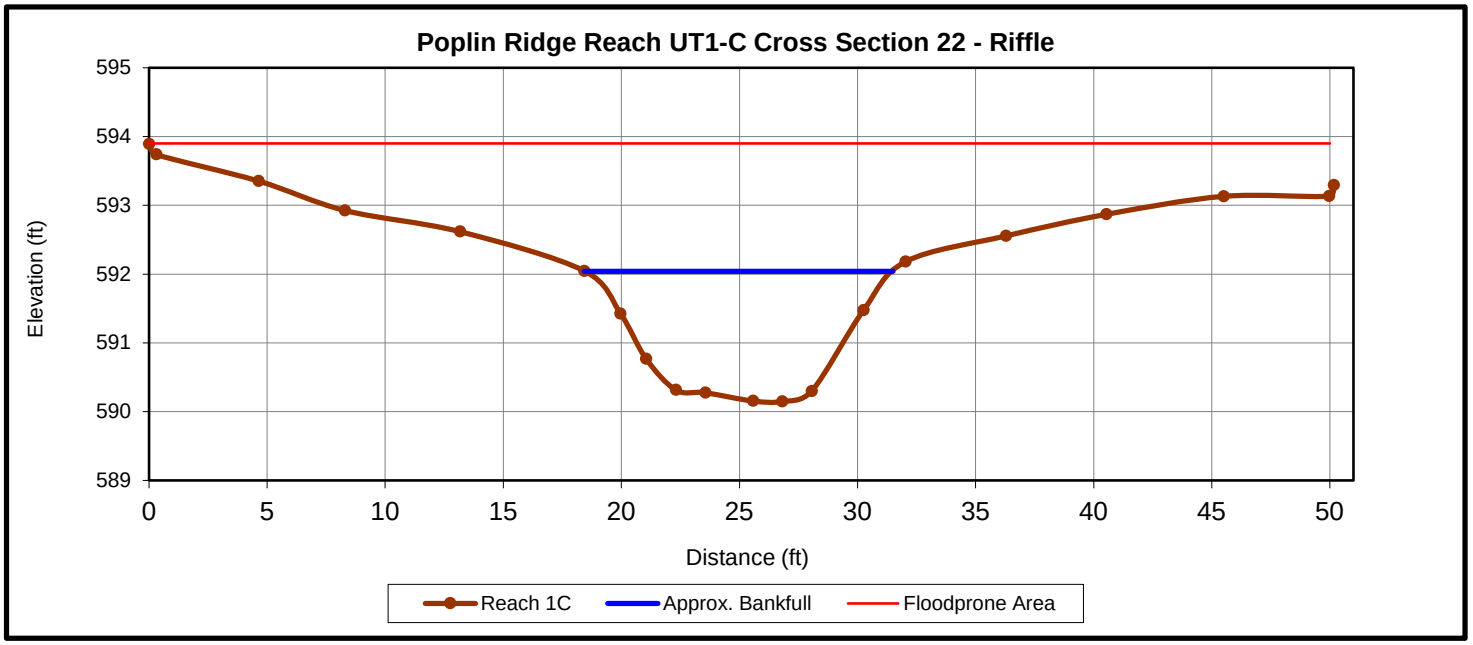

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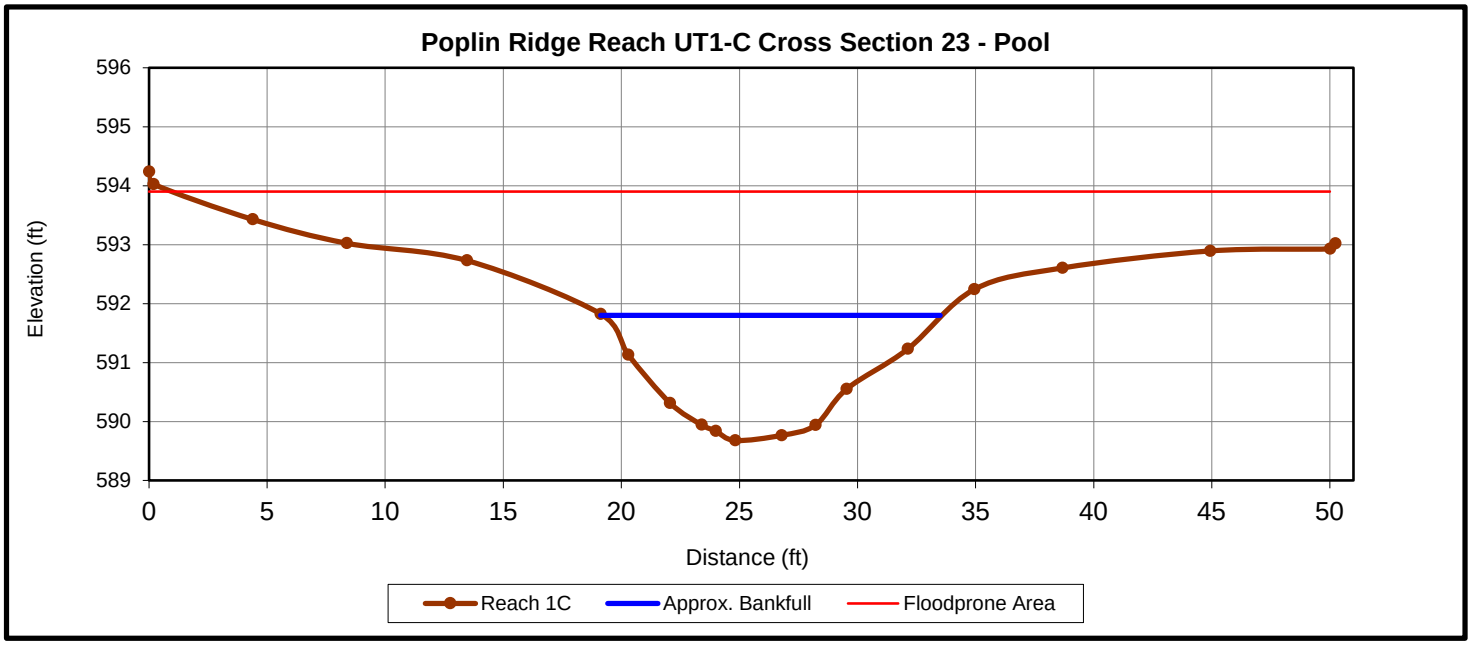
Downstream



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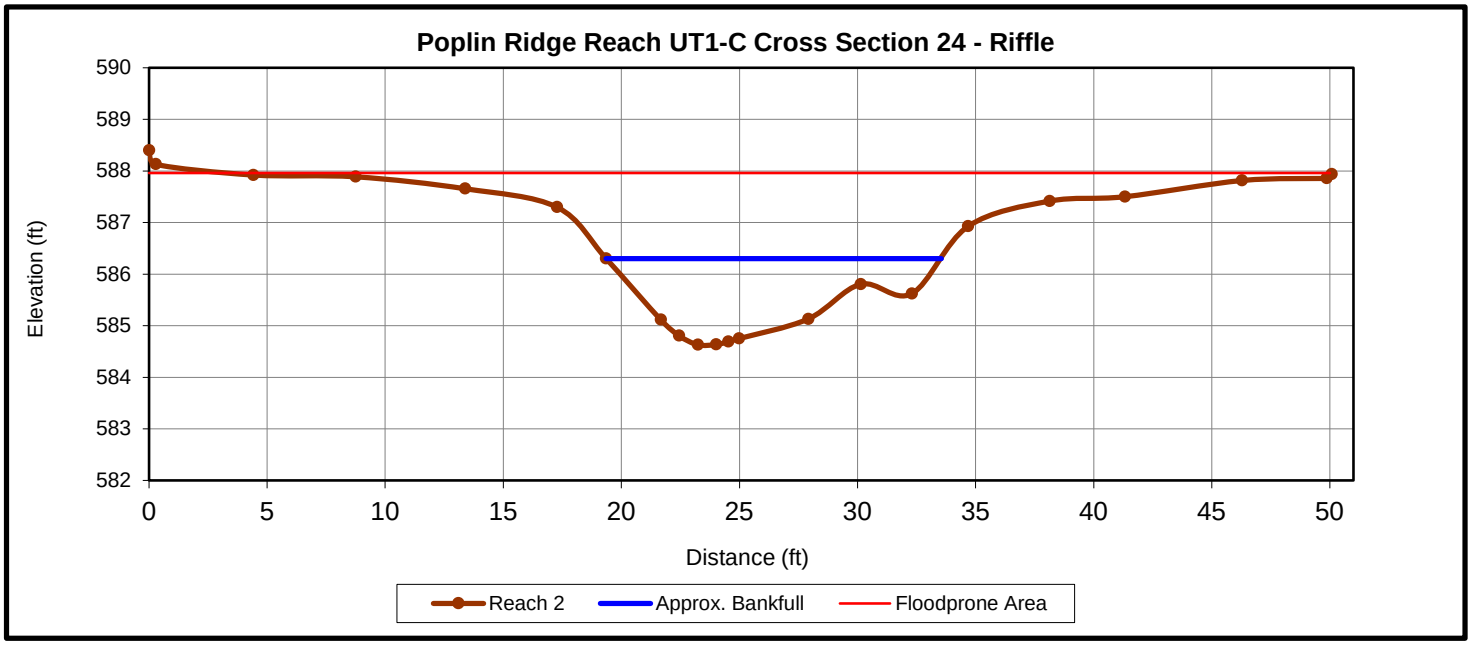
Downstream



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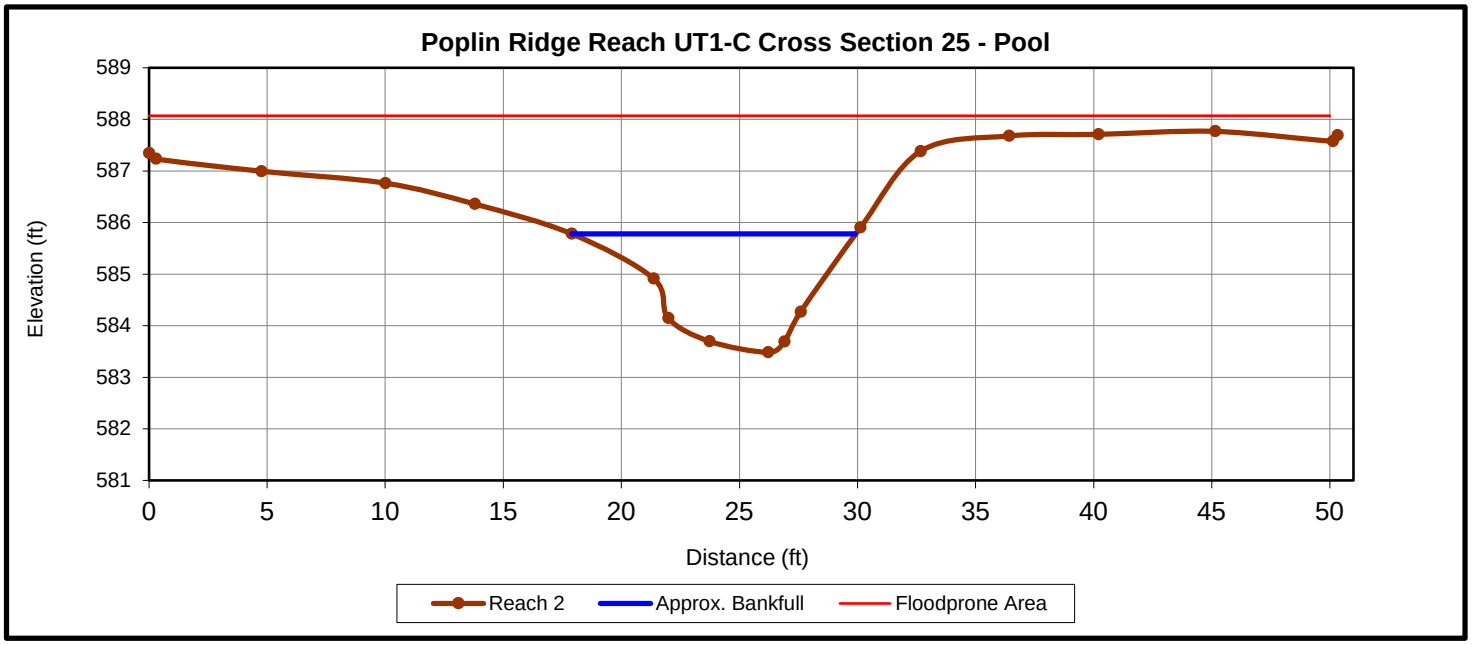
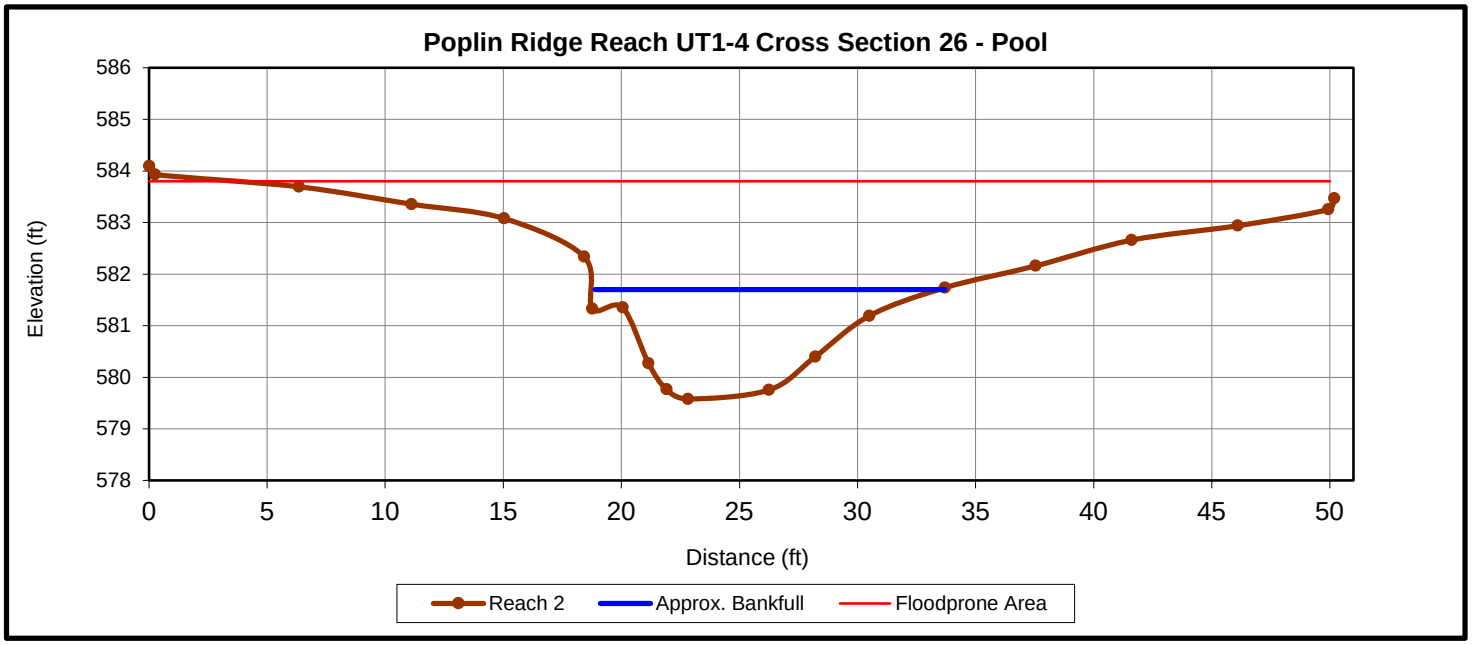
Downstream



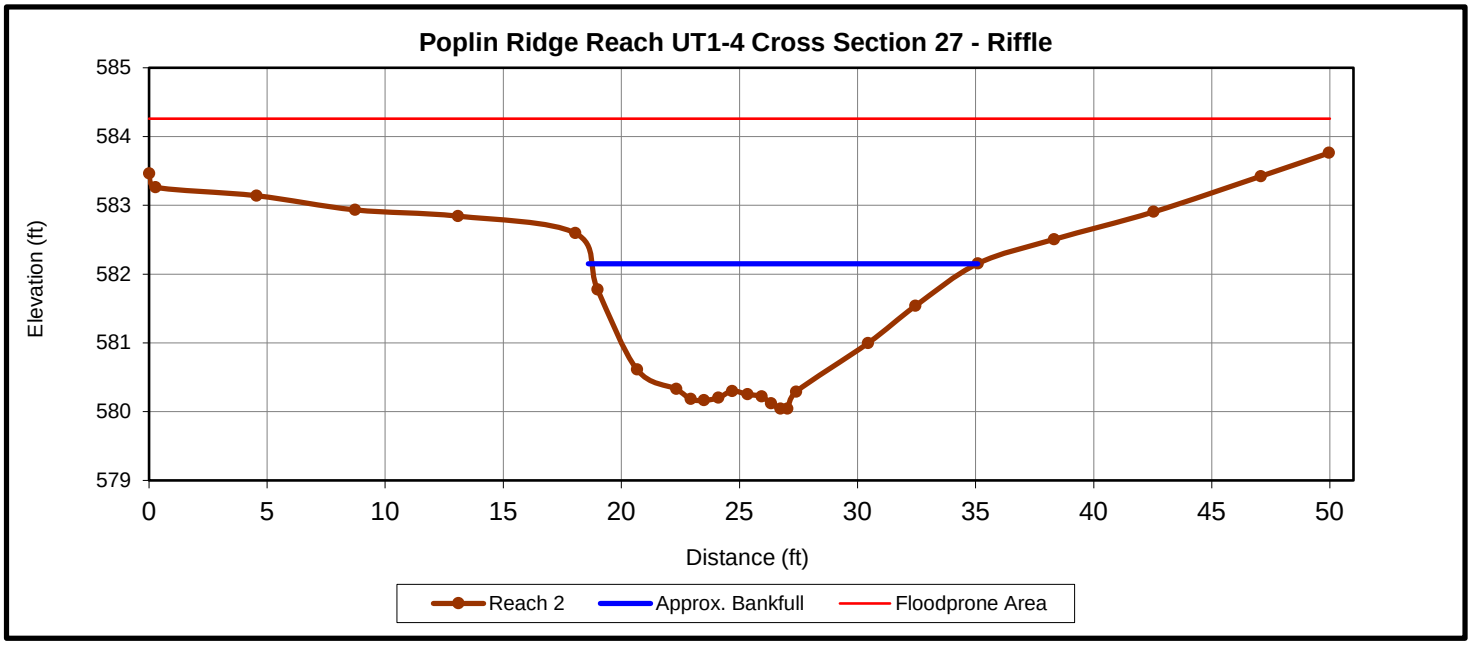
Upstream

Downstream



Upstream

Downstream



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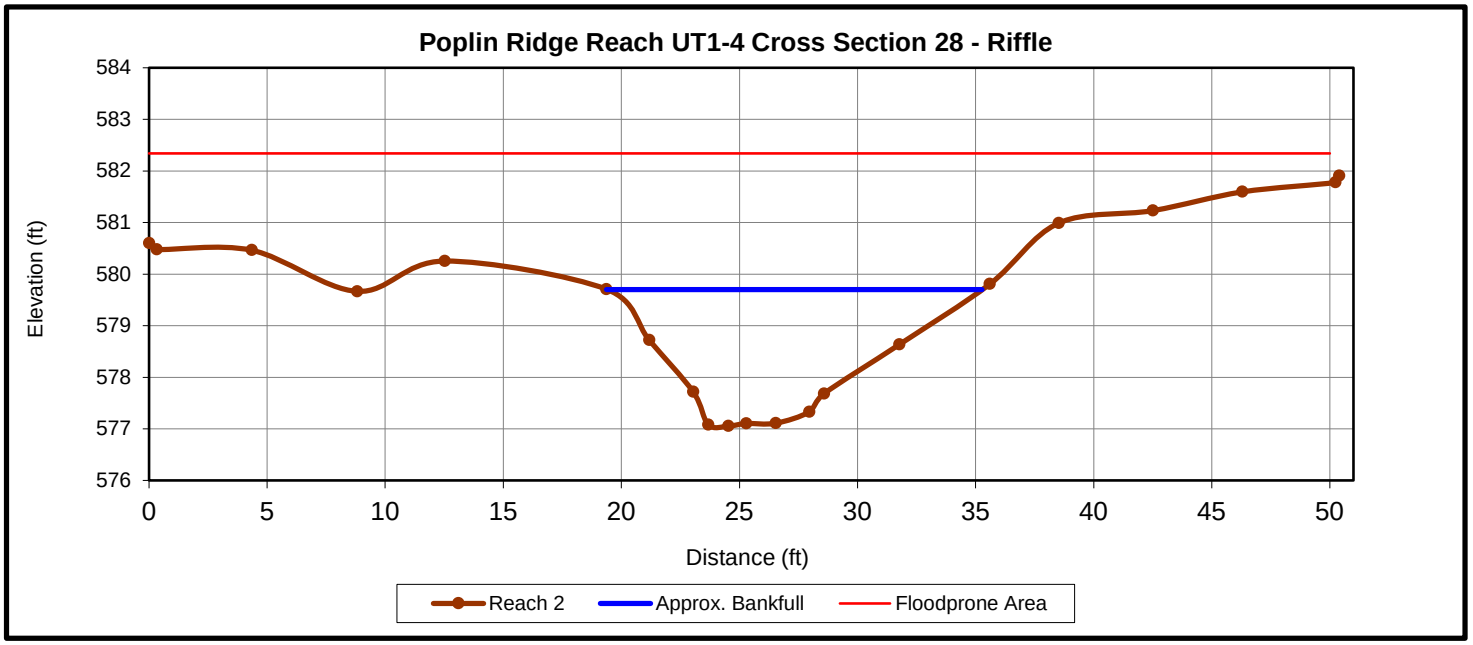
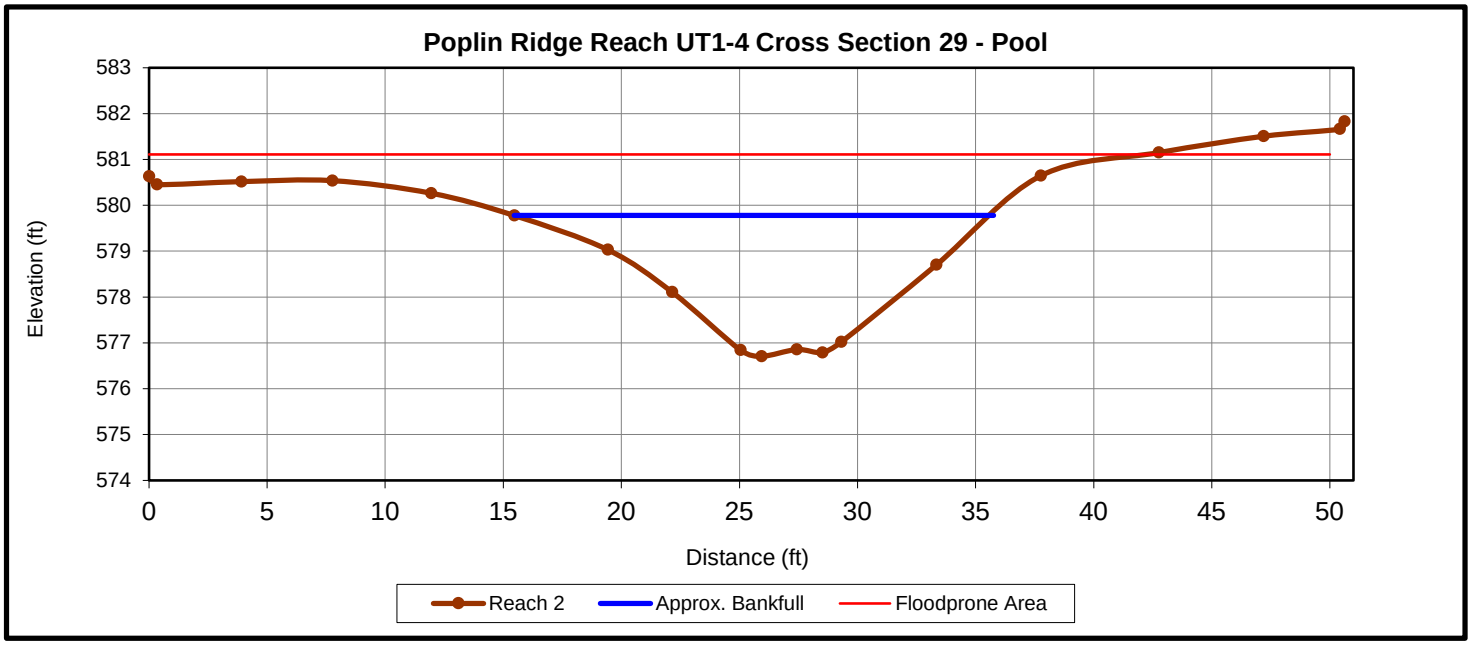
Downstream



Upstream

Downstream



Pebble Count Data Summary

Stream Reach	Substrate Sample From Cross Sections	As-Built - MY0 - 2015 Pebble Count		MY1 - 2015 Pebble Count		MY2 - 2016 Pebble Count		MY3 - 2017 Pebble Count		MY5 - 2019 Pebble Count		MY7 - 2021 Pebble Count	
		D_{50} (mm)	D_{84} (mm)	D_{50} (mm)	D_{84} (mm)	D_{50} (mm)	D_{84} (mm)	D_{50} (mm)	D_{84} (mm)	D_{50} (mm)	D_{84} (mm)	D_{50} (mm)	D_{84} (mm)
UT1-1	9	15	59										
UT1-2	13, 15	0.062	26										
UT1-3	19, 20	25	60										
UT1-4	27, 28	14	32										
UT1-A	11	1.1	7.9										
UT1-B	16	26	56										
UT1-C	22, 24	24	60										
UT2-3	5, 8	6.4	52										
UT2-A	3, 4	13	30										

Charts 1-10. MY0 Stream Reach Substrate Composition Charts

Chart 1.

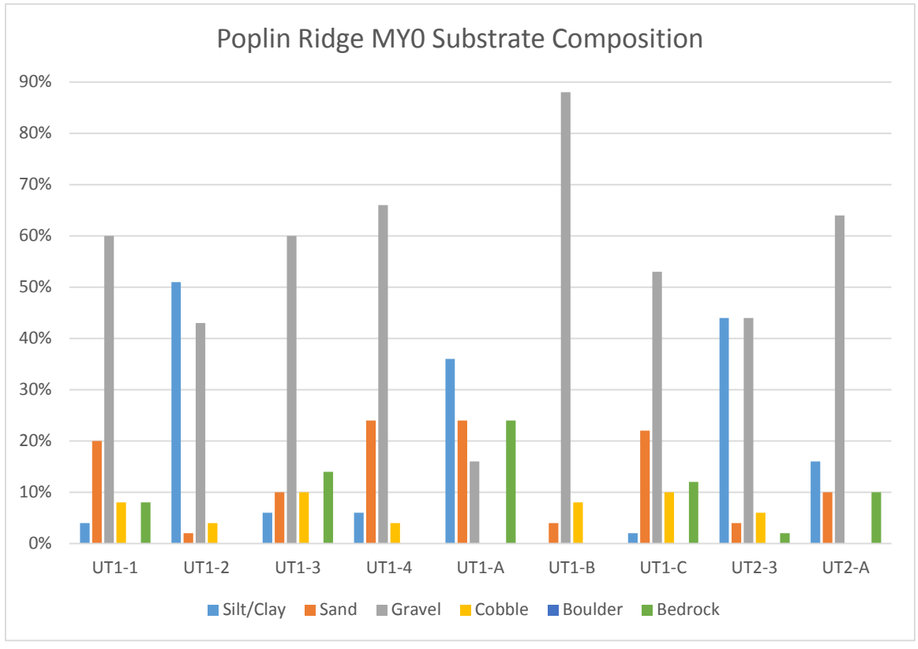


Chart 2.

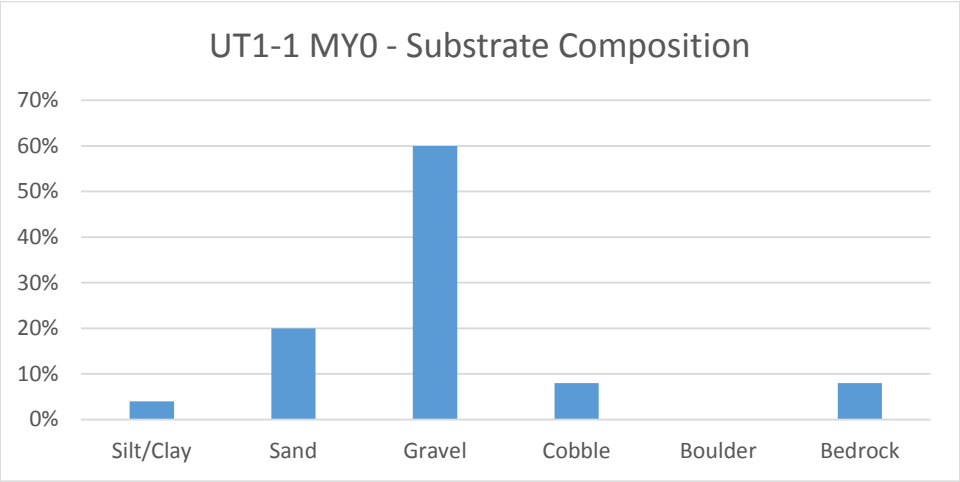
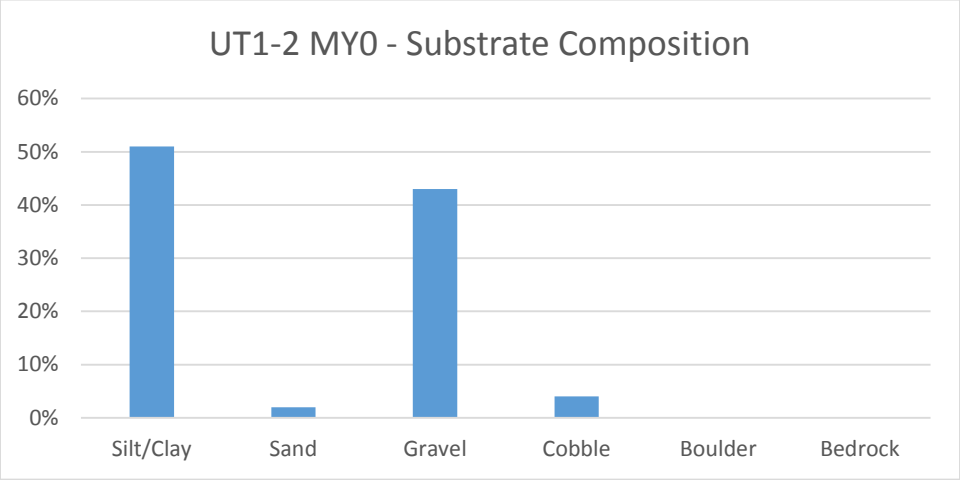


Chart 3.



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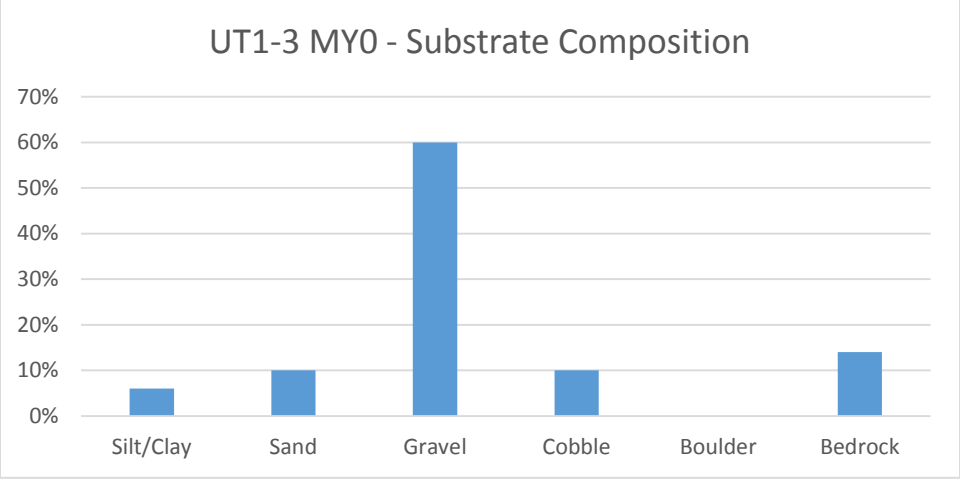


Chart 5.

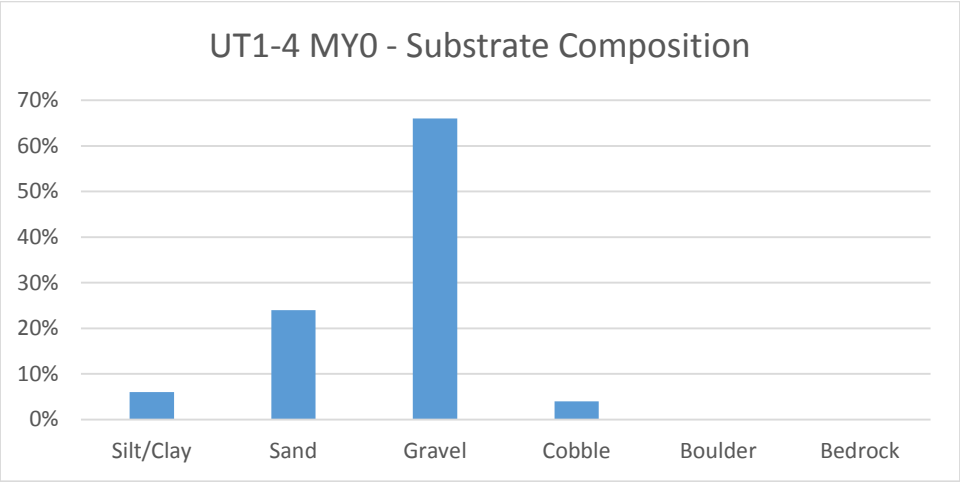


Chart 6.

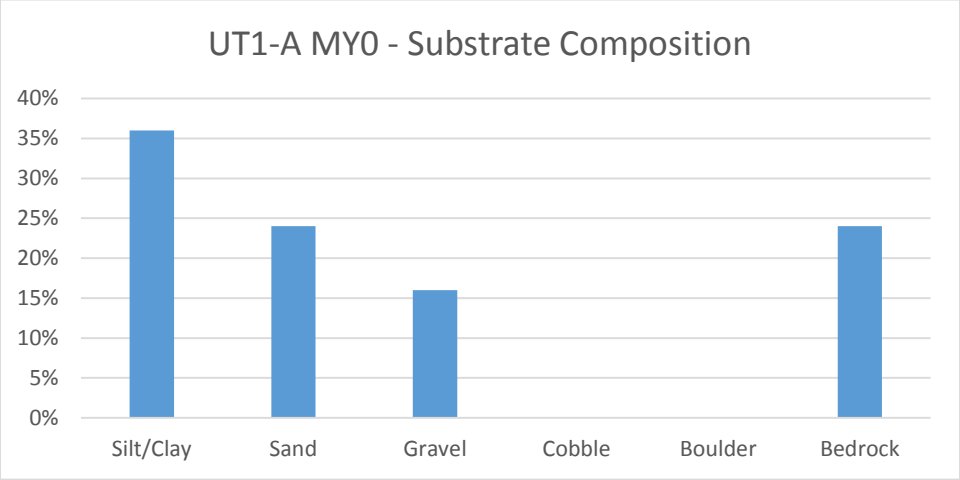


Chart 7.

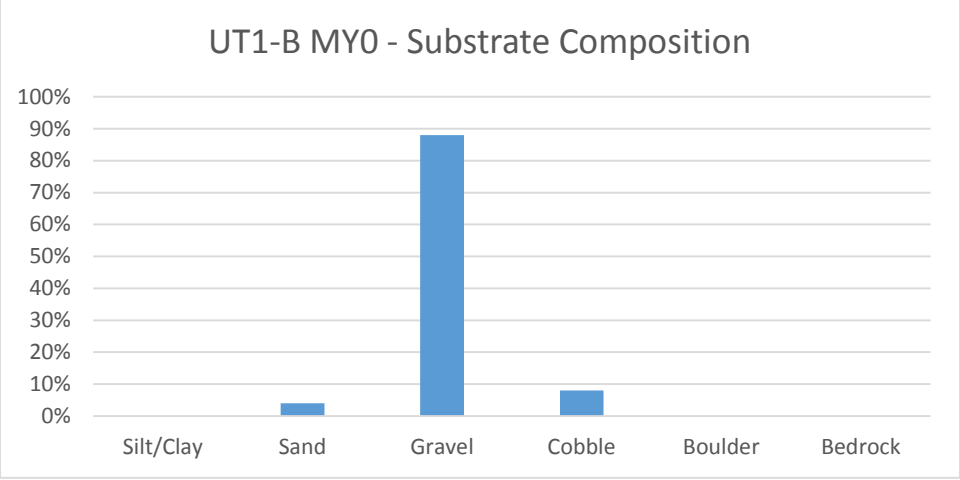


Chart 8.

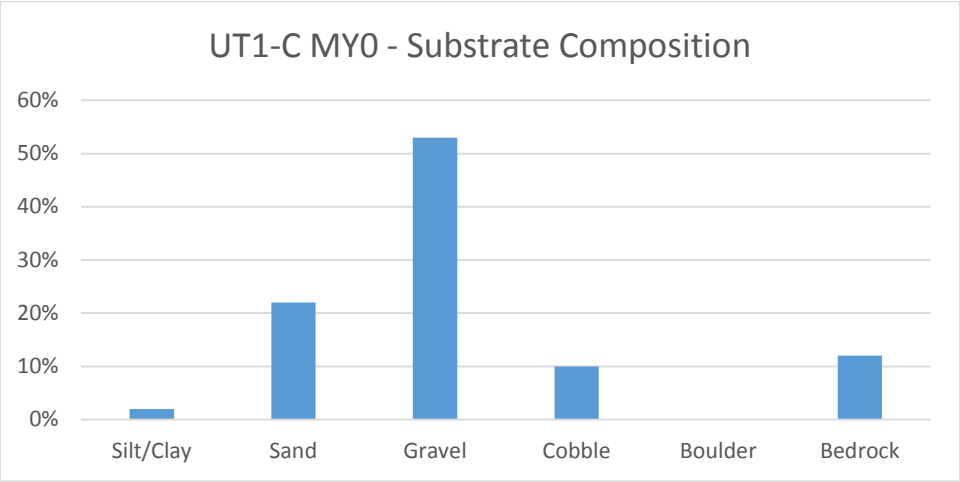


Chart 9.

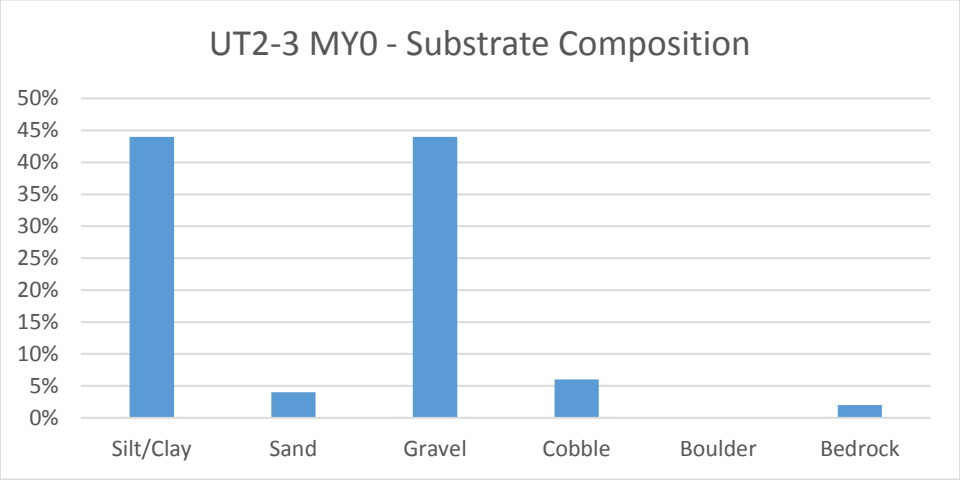
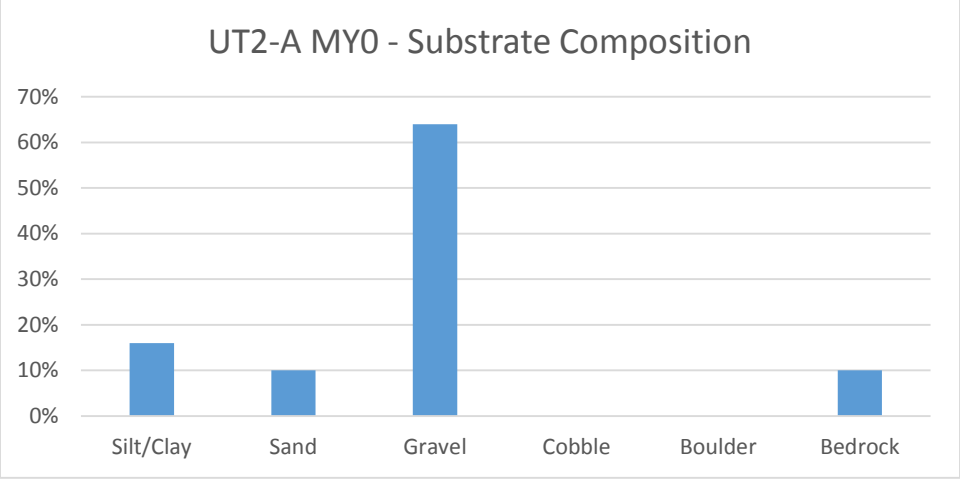


Chart 10.



Appendix B.
Poplin Ridge Stream Photos

UT1-1 STA 8+53 Looking Upstream (4/29/2015)

UT1-2 STA 14+58 at Crossing (4/29/2015)


UT1-2 STA 21+50 Looking Upstream (4/29/2015)


UT1-3 STA 26+50 at Crossing (4/29/2015)

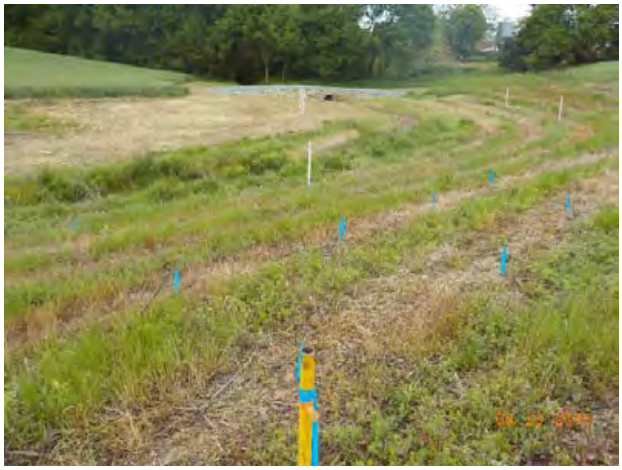
UT1-3 STA 27+50 Looking Downstream (4/29/2015)

UT1-4 STA 47+20 Looking Upstream (4/29/2015)

Poplin Ridge Stream Photos


UT1-A STA 2+00 Looking Downstream (4/29/2015)


UT1-B STA 9+86 Looking Downstream (4/29/2015)


UT1-C STA 2+50 Looking Upstream (4/29/2015)


UT2-1 STA 4+50 Looking Upstream (4/29/2015)


UT2-2 STA 11+00 Pond Bottom (US) (4/29/2015)


UT2-2 STA 11+00 Looking Downstream (4/29/2015)

Poplin Ridge Stream Photos


UT2-2 STA 7+59 Looking Downstream (4/29/2015)


UT2-3 STA 13+83 Looking Downstream (4/29/2015)


UT2-4 STA 20+39 Looking Downstream (4/29/2015)


UT2-A STA 1+22 Looking Upstream (4/29/2015)


UT2-A STA 2+62 Looking Downstream (4/29/2015)


Poplin Ridge Typical Easement Marker (4/29/2015)

Poplin Ridge Stream Photos
Crest Gauges, Rain Gauge and Bank Pins


Crest Gauge 1 (4/29/2015)


Crest Gauge 2 (4/29/2015)


Crest Gauge 3 (4/29/2015)


Rain Gauge/Ambient (4/29/2015)


Bank Pin Array 1 UT2-2 STA 13+10 (4/29/2015)


Bank Pin Array 2 UT2-3 STA 17+50 (4/29/2015)

Poplin Ridge Bank Pin Array Photos

Bank Pin Array 3 UT1-2 STA 18+75 (4/29/2015)

Bank Pin Array 4 UT1-3 STA 28+75 (4/29/2015)

Bank Pin Array 5 UT1-C STA 4+60 (4/29/2015)

Bank Pin Array 6 UT1-4 STA 40+10 (4/29/2015)

APPENDIX C

Vegetation Data and Tables

Table 7a. Baseline Planted Species Summary
Table 7b. Vegetation Plot Mitigation Success Criteria Summary
Table 7c. Vegetation Plot Data Summary (Species by Plot)
Vegetation Plot Photos

Table 7a. Baseline Planted Species Summary
Planted Date: April 14, 2015

Scientific Name	Common Name	Species Type	Total Stems Planted
Asimina triloba	Pawpaw	Bare Root	800
Betula nigra	River Birch	Bare Root	1,000
Cephalanthus occidentalis	Common Buttonbush	Bare Root	200
Liriodendron tulipifera	Tuliptree	Bare Root	1,000
Malus angustifolia	Crab Apple	Bare Root	100
Morella cerifera	Wax Myrtle	Bare Root	200
Nyssa sylvatica	Blackgum	Bare Root	200
Platanus occidentalis	American sycamore	Bare Root	2,000
Quercus falcata	Southern Red Oak	Bare Root	3,500
Quercus michauxii	Swamp Chestnut Oak	Bare Root	500
Quercus nigra	Water Oak	Bare Root	1,000
Quercus phellos	Willow Oak	Bare Root	2,500
Quercus rubra	Northern Red Oak	Bare Root	2,500
		Total	**15,500**
Salix nigra	Black Willow	Live Stake	3,000
Populus deltoides	Cottonwood	Live Stake	2,500
Cornus amomum	Silky Dogwood	Live Stake	2,000
		Total	**7,500**

Table 7b. Vegetation Plot Mitigation Success Criteria Summary

Plot #	Stream/ Wetland Stems/Acre	Volunteers	Total Stems/Acre (Including Unknown Species)	Success Criteria Met?
1	1093	0	1093	Yes
2	769	0	809	Yes
3	1012	0	1012	Yes
4	1093	0	1093	Yes
5	1295	0	1295	Yes
6	1012	0	1052	Yes
7	1052	0	1052	Yes
8	890	0	890	Yes
9	971	0	971	Yes
10	931	0	931	Yes
11	1093	0	1214	Yes
12	931	0	971	Yes
13	1335		1376	Yes
Project Average	**1037**	**0**	**1058**	**Yes**

Table 7c. Vegetation Plot Data Summary (Species by Plot)

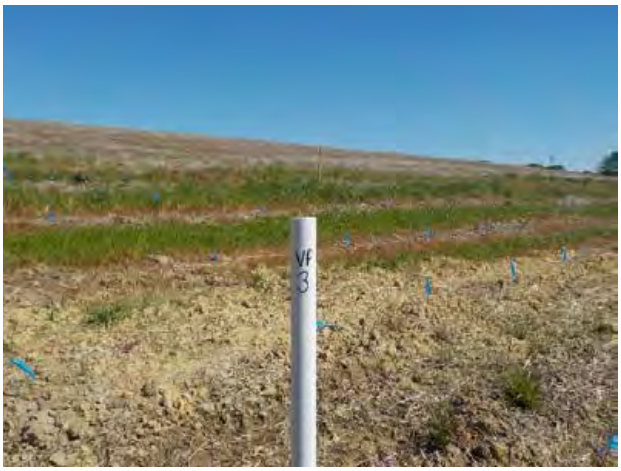
			Current Plot Data (MY0 2015)																			Annual Means		
			95359-01-0001			95359-01-0002			95359-01-0003			95359-01-0004			95359-01-0005			95359-01-0006			95359-01-0007			MY0 (2015)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Asimina triloba	pawpaw	Tree				1	1	1				4	4	4										21	21	21
Betula nigra	river birch	Tree	8	8	8				6	6	6										1	1	1	27	27	27
DONTKNOW: unsure record						1	1	1										1	1	1				7	7	7
Liriodendron tulipifera	tuliptree	Tree	1	1	1	12	12	12	6	6	6				3	3	3	1	1	1				34	34	34
Platanus occidentalis	American sycamore	Tree										2	2	2	3	3	3	3	3	3	7	7	7	26	26	26
Quercus	oak	Tree				6	6	6				18	18	18	12	12	12	14	14	14	10	10	10	126	126	126
Quercus alba	white oak	Tree																						9	9	9
Quercus falcata	southern red oak	Tree													3	3	3							10	10	10
Quercus michauxii	swamp chestnut oak	Tree													2	2	2	1	1	1	2	2	2	8	8	8
Quercus nigra	water oak	Tree	14	14	14				4	4	4										1	1	1	22	22	22
Quercus phellos	willow oak	Tree	4	4	4				9	9	9	3	3	3	9	9	9	6	6	6	5	5	5	50	50	50
		Stem count	27	27	27	20	20	20	25	25	25	27	27	27	32	32	32	26	26	26	26	26	26	340	340	340
		size (ares)	1			1			1			1			1			1			1			13		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.32		
		Species count	4	4	4	4	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	6	11	11	11
		Stems per ACRE	1093	1093	1093	809.4	809.4	809.4	1012	1012	1012	1093	1093	1093	1295	1295	1295	1052	1052	1052	1052	1052	1052	1058	1058	1058

			Current Plot Data (MY0 2015) (Continued)																			Annual Means		
			95359-01-0008			95359-01-0009			95359-01-0010			95359-01-0011			95359-01-0012			95359-01-0013			MY0 (2015)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Asimina triloba	pawpaw	Tree	2	2	2	7	7	7							5	5	5	2	2	2	21	21	21			
Betula nigra	river birch	Tree							7	7	7							5	5	5	27	27	27			
DONTKNOW: unsure record												3	3	3	1	1	1	1	1	1	7	7	7			
Liriodendron tulipifera	tuliptree	Tree				5	5	5										6	6	6	34	34	34			
Platanus occidentalis	American sycamore	Tree							2	2	2	3	3	3	3	3	3	3	3	3	26	26	26			
Quercus	oak	Tree	18	18	18	8	8	8	7	7	7	17	17	17	12	12	12	4	4	4	126	126	126			
Quercus alba	white oak	Tree				1	1	1	7	7	7	1	1	1							9	9	9			
Quercus falcata	southern red oak	Tree	1	1	1	1	1	1				1	1	1				4	4	4	10	10	10			
Quercus michauxii	swamp chestnut oak	Tree																3	3	3	8	8	8			
Quercus nigra	water oak	Tree	1	1	1													2	2	2	22	22	22			
Quercus phellos	willow oak	Tree				2	2	2				5	5	5	3	3	3	4	4	4	50	50	50			
		Stem count	22	22	22	24	24	24	23	23	23	30	30	30	24	24	24	34	34	34	340	340	340			
		size (ares)	1			1			1			1			1			1			13					
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.32					
		Species count	4	4	4	6	6	6	4	4	4	6	6	6	5	5	5	10	10	10	11	11	11			
		Stems per ACRE	890.3	890.3	890.3	971.2	971.2	971.2	930.8	930.8	930.8	1214	1214	1214	971.2	971.2	971.2	1376	1376	1376	1058	1058	1058			

Appendix C.
Poplin Ridge Vegetation Plot Photos

Vegetation Plot 1 (4/28/2015)


Vegetation Plot 2 (4/28/2015)



Vegetation Plot 3 (4/28/2015)


Vegetation Plot 4 (4/28/2015)

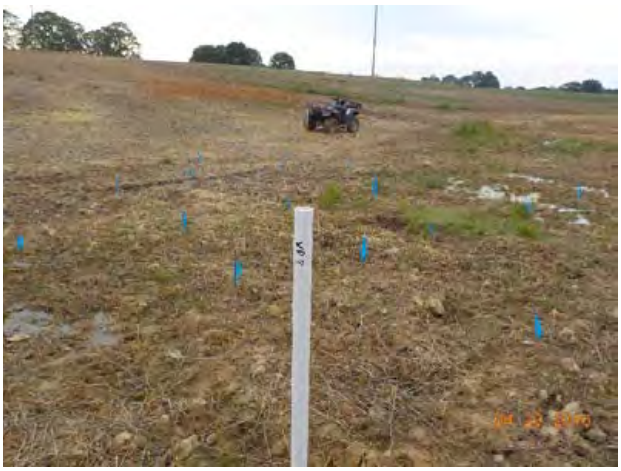
Vegetation Plot 5 (4/29/2015)

Vegetation Plot 6 (4/29/2015)

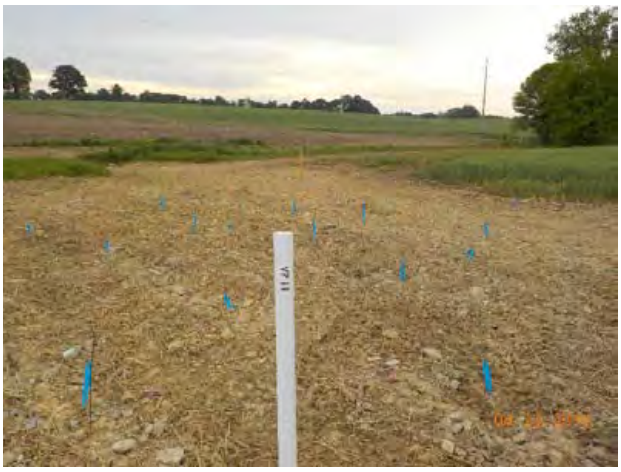
Poplin Ridge Vegetation Plot Photos


Vegetation Plot 7 (4/29/2015)


Vegetation Plot 8 (4/29/2015)

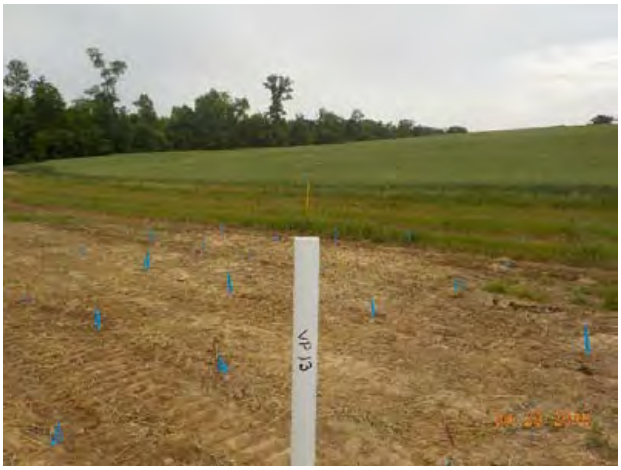

Vegetation Plot 9 (4/29/2015)


Vegetation Plot 10 (4/29/2015)


Vegetation Plot 11 (4/29/2015)


Vegetation Plot 12 (4/29/2015)

Poplin Ridge Vegetation Plot Photos



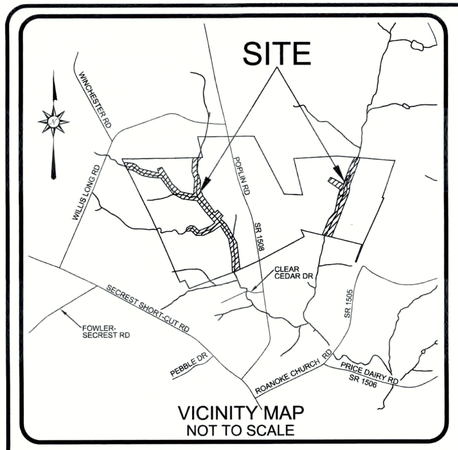
Vegetation Plot 13 (4/29/2015)

APPENDIX D

Poplin Ridge As-Built Survey

As-Built Survey Plan Sheets

AS-BUILT SURVEY OF
POPLIN RIDGE STREAM RESTORATION PROJECT
UNION COUNTY, NC
NCEEP PROJECT# 95359



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 19th DAY OF JULY, 2015.

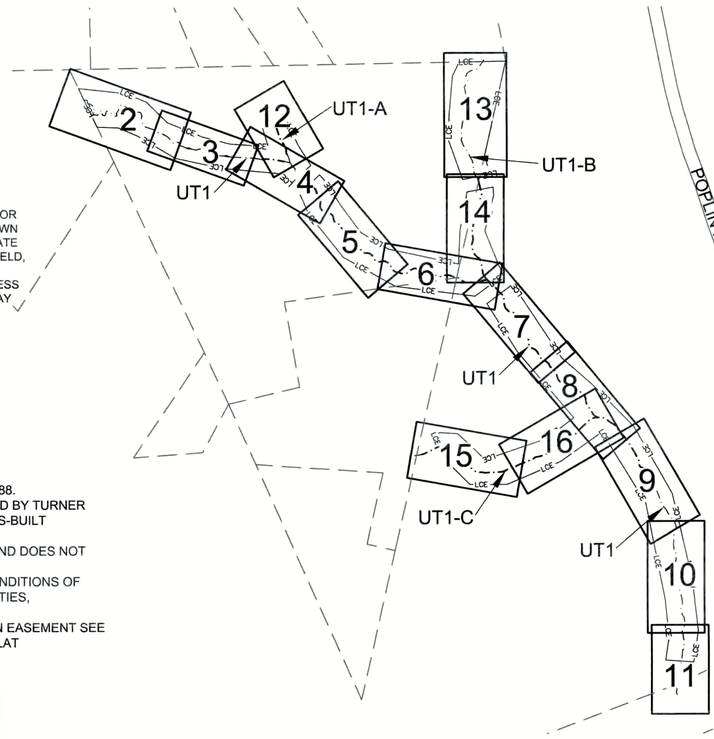
DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 07/19/15 LAND SURVEYOR DAVID S. TURNER

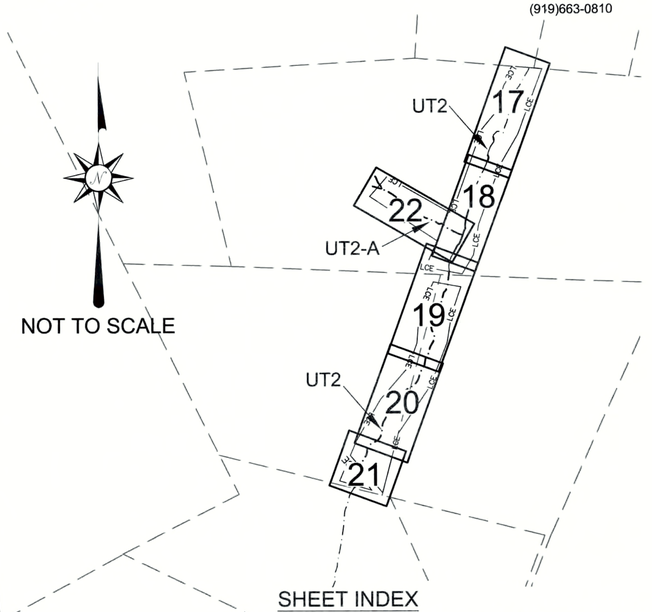
GENERAL NOTES:
1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. HORIZONTAL DATUM IS NAD83/2007 AND VERTICAL DATUM IS NAVD88.
3. AS-BUILT SURVEY BASED ON EXISTING GPS CONTROL ESTABLISHED BY TURNER LAND SURVEYING FOR CONSTRUCTION AND VERIFIED DURING THE AS-BUILT SURVEYS. SEE CONTROL POINT LIST FOR COORDINATES.
4. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
5. THE PURPOSE OF THIS MAP IS TO SHOW POST CONSTRUCTION CONDITIONS OF THE STREAM RESTORATION AND MAY NOT SHOW ALL EXISTING UTILITIES, STRUCTURES, AND BOUNDARIES.
6. NO PROPERTY RESEARCH WAS PERFORMED. FOR CONSERVATION EASEMENT SEE PLATS RECORDED IN UNION COUNTY REGISTER OF DEEDS OFFICE PLAT CABINET/SLIDE M, PAGES 255-256.

AS-BUILT CONTROL POINTS:

Point#	Northing(Y)	Easting(X)	Elevation(Z)	Description
1	479136.74	1532320.91	594.12	TLS#1RBC
2	479096.11	1532556.49	593.13	TLS#2RBC
3	479573.37	1532118.97	588.55	TLS#3NL
4	479556.81	1532511.06	588.93	TLS#4NL
5	479917.88	1532670.92	593.12	TLS#5NL
6	480088.31	1532887.71	586.11	TLS#6RBC
7	479675.88	1532714.76	585.11	TLS#7NL
8	479350.58	1532603.63	585.92	TLS#8NL
9	478736.13	1532404.29	579.42	TLS#9NL
10	478439.15	1532243.27	579.31	TLS#10NL
11	478124.82	1532077.95	575.72	TLS#11NL
12	477838.88	1532038.29	578.18	TLS#12NL
13	477439.70	1531930.14	573.98	TLS#13RBC
14	477615.57	1531823.54	577.26	TLS#14RBC
15	478033.42	1531948.50	584.58	TLS#15NL
16	478332.64	1532039.49	576.56	TLS#16NL
17	478620.01	1532120.52	583.86	TLS#17NL
18	478896.31	1532279.14	580.80	TLS#18NL
19	479756.97	1527712.64	602.60	TLS#19RBC
20	479879.13	1527920.72	605.59	TLS#20RBC
21	479603.76	1527898.85	600.94	TLS#21DSC
22	479456.45	1528166.69	597.02	TLS#22NL
23	479163.80	1528244.61	597.70	TLS#23NL
24	479198.48	1528592.73	594.34	TLS#24NL
25	479034.38	1528804.48	591.41	TLS#25DSC
26	479567.94	1528766.73	598.47	TLS#26RBC
27	479301.35	1528891.03	595.74	TLS#27NL
28	478870.41	1529117.48	591.22	TLS#28NL
29	478511.64	1529233.57	587.62	TLS#29RBC
30	478428.25	1529539.95	589.58	TLS#30RBC
31	478282.43	1528637.02	594.60	TLS#31NL
32	478291.60	1528835.93	596.73	TLS#32NL
33	478243.81	1529155.95	594.02	TLS#33NL
34	477243.75	1529671.29	587.08	TLS#34NL
35	477350.60	1529870.39	581.91	TLS#35RBC-TBM



NOT TO SCALE



CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS1 RIGHTBANK	479457.66	1532518.35	580.63
XS1 LEFTBANK	479431.07	1532592.51	581.21
XS2 RIGHTBANK	479407.52	1532500.51	580.49
XS2 LEFTBANK	479389.68	1532590.55	580.90
XS3 RIGHTBANK	479498.03	1532192.03	587.82
XS3 LEFTBANK	479539.50	1532220.65	587.75
XS4 RIGHTBANK	479413.83	1532302.09	586.81
XS4 LEFTBANK	479454.38	1532331.95	586.10
XS5 RIGHTBANK	478890.32	1532362.00	576.69
XS5 LEFTBANK	478902.93	1532410.92	577.86
XS6 RIGHTBANK	478859.09	1532373.15	576.90
XS6 LEFTBANK	478869.73	1532422.06	578.47
XS7 RIGHTBANK	478373.91	1532079.47	576.35
XS7 LEFTBANK	478340.87	1532116.96	575.21
XS8 RIGHTBANK	478331.96	1532061.63	576.48
XS8 LEFTBANK	478323.71	1532111.04	575.24
XS9 RIGHTBANK	479688.36	1527542.78	603.18
XS9 LEFTBANK	479735.08	1527560.58	603.94
XS10 RIGHTBANK	479677.49	1527566.07	603.32
XS10 LEFTBANK	479724.58	1527582.47	603.16
XS11 RIGHTBANK	479727.89	1527895.16	599.17
XS11 LEFTBANK	479754.71	1527937.46	599.75
XS12 RIGHTBANK	479519.51	1528040.67	597.03
XS12 LEFTBANK	479545.83	1528083.45	597.30
XS13 RIGHTBANK	479499.25	1528049.06	596.72
XS13 LEFTBANK	479515.19	1528096.61	596.91
XS14 RIGHTBANK	479106.84	1528582.86	593.23
XS14-15 LEFTBANK	479154.58	1528598.10	592.23
XS15 RIGHTBANK	479105.51	1528606.35	592.90
XS16 RIGHTBANK	479232.71	1528772.08	592.46
XS16 LEFTBANK	479250.57	1528818.96	592.16
XS17 RIGHTBANK	479190.60	1528806.43	591.35
XS17 LEFTBANK	479225.35	1528842.38	591.37
XS18 RIGHTBANK	478948.55	1528939.76	589.91
XS18 LEFTBANK	478985.53	1528974.08	589.29
XS19 RIGHTBANK	478933.87	1528971.82	588.54
XS19 LEFTBANK	478983.07	1528980.95	589.48
XS20 RIGHTBANK	478604.01	1529201.79	588.30
XS20 LEFTBANK	478625.58	1529246.96	586.56
XS21 RIGHTBANK	478569.68	1529240.49	587.14
XS21 LEFTBANK	478618.98	1529250.22	586.67
XS22 RIGHTBANK	478320.33	1528663.38	593.29
XS22 LEFTBANK	478370.09	1528657.00	593.89
XS23 RIGHTBANK	478320.41	1528674.32	593.02
XS23 LEFTBANK	478369.34	1528685.68	594.24
XS24 RIGHTBANK	478349.98	1529236.23	587.93
XS24 LEFTBANK	478394.64	1529213.57	588.40
XS25 RIGHTBANK	478355.13	1529262.46	587.69
XS25 LEFTBANK	478400.26	1529240.18	587.35
XS26 RIGHTBANK	478114.03	1529621.12	583.47
XS26 LEFTBANK	478139.76	1529664.20	584.09
XS27 RIGHTBANK	478088.38	1529634.79	583.88
XS27 LEFTBANK	478111.17	1529679.41	583.46
XS28 RIGHTBANK	477500.71	1529742.83	581.91
XS28 LEFTBANK	477481.84	1529789.55	580.60
XS29 RIGHTBANK	477480.17	1529736.57	581.83
XS29 LEFTBANK	477475.00	1529786.93	580.63

REFERENCES:
OWNER:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
302 JEFFERSON STREET, SUITE 110
RALEIGH, NC 27605

DESIGNER:
WK DICKSON
720 CORPORATE CENTER DR
RALEIGH, NC 27607
(919) 782-0495

CONTRACTOR:
WRIGHT CONTRACTING
LAWNDALE,NC
(919)663-0810

SHEET INDEX

TURNER LAND SURVEYING
3719 BENSON DRIVE
RALEIGH, NC 27609
P-0702 (919) 827-0745
www.turnerlandsurveying.com
Certified DBE/WBE

REVISIONS, DATE AND INITIAL:

TITLE, VICINITY MAP, & SHEET INDEX
POPLIN RIDGE STREAM RESTORATION PROJECT
NCEEP PROJECT # 95359
UNION COUNTY
MONROE
NORTH CAROLINA

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
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 19th DAY OF JULY, 2015.

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

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER 07/19/15

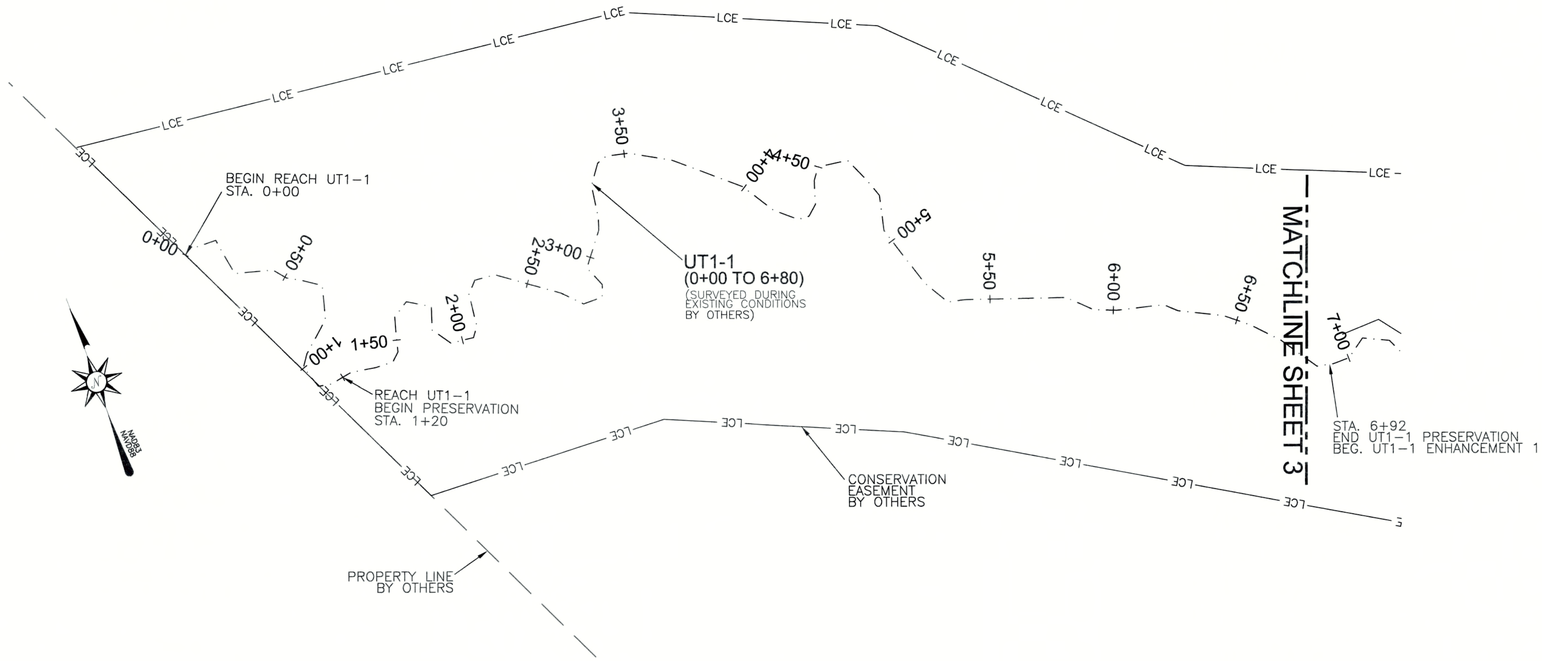
LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
- LOG STRUCTURE
- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'



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6. NO PROPERTY RESEARCH WAS PERFORMED.

REVISIONS, DATE AND INITIAL:

TURNER LAND SURVEYING
3719 BENSON DRIVE
RALEIGH, NC 27609
P-0702 (919) 827-0745
www.turnerlandsurveying.com
Certified DBE/WBE

UT1-1 STA 0+00 TO 6+80

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

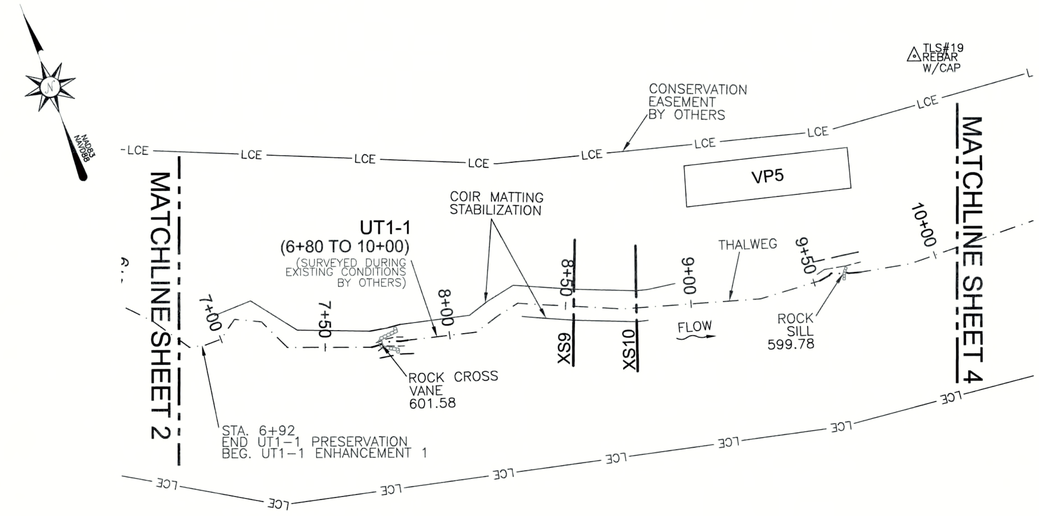
DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
SCALE: AS SHOWN

SHEET 2 of 22

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 19th DAY OF JULY, 2015.

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

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



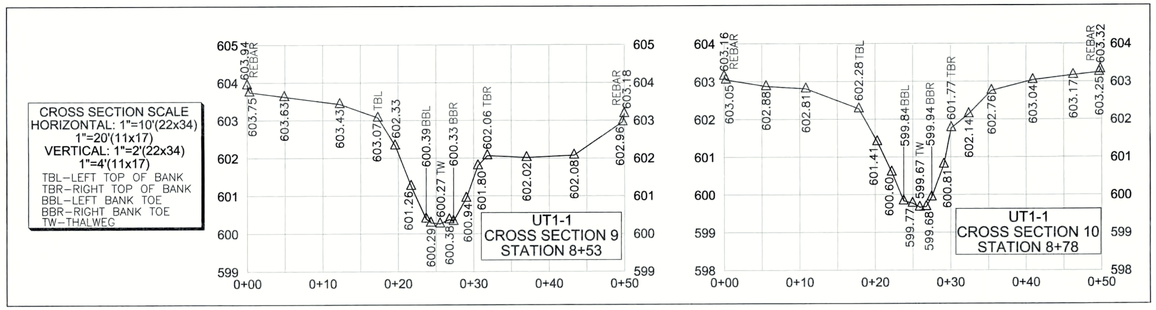
LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
- LOG STRUCTURE
- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'



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CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS9 RIGHTBANK	479688.36	1527542.78	603.18
XS9 LEFTBANK	479735.08	1527560.58	603.94
XS10 RIGHTBANK	479677.49	1527566.07	603.32
XS10 LEFTBANK	479724.58	1527582.47	603.16

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REVISIONS, DATE AND INITIAL:

UT1-1 STA 6+80 TO 10+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

MONROE

NORTH CAROLINA

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
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SCALE: AS SHOWN

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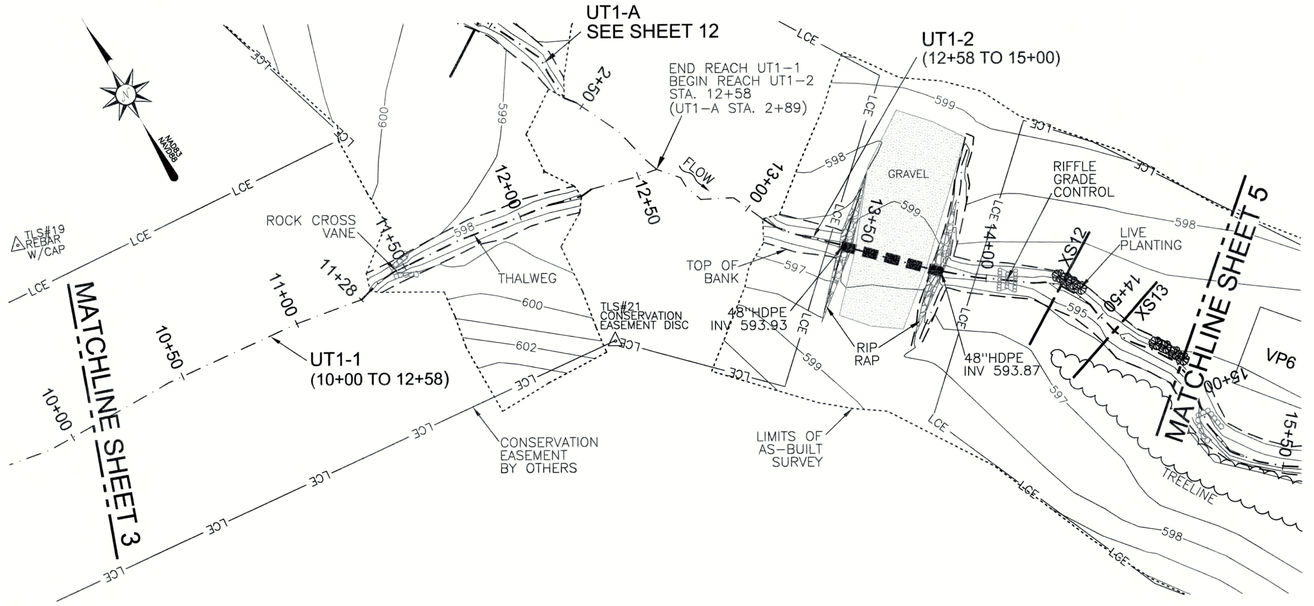
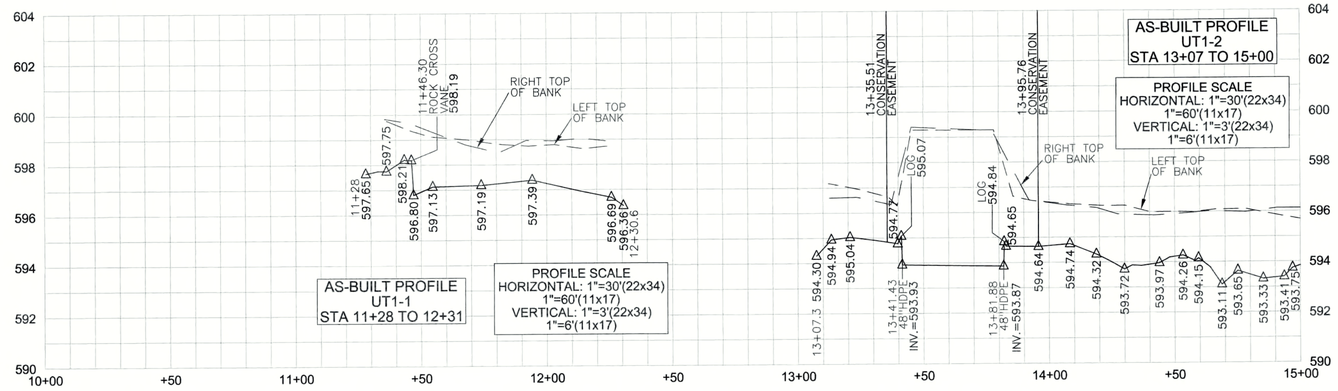
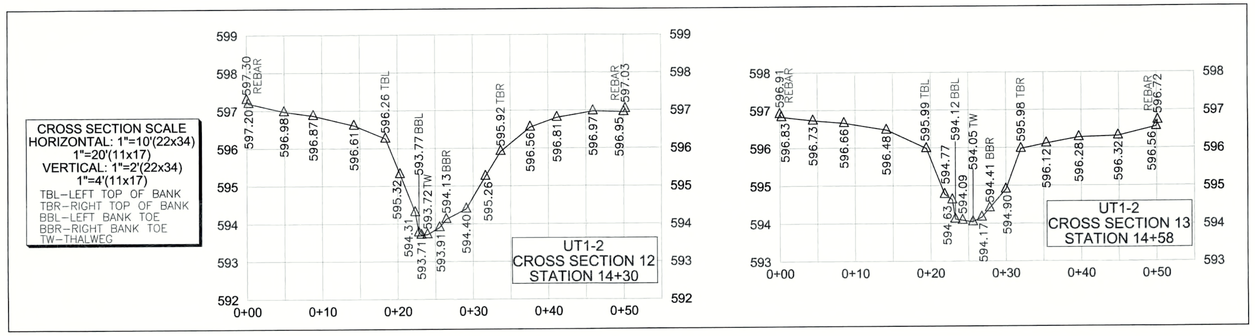
DAVID S. TURNER, P.L.S. #L-4551

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







LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
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- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
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- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'

GENERAL NOTES:

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CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS12 RIGHTBANK	479519.51	1528040.67	597.03
XS12 LEFTBANK	479545.83	1528083.45	597.30
XS13 RIGHTBANK	479499.25	1528049.06	596.72
XS13 LEFTBANK	479515.19	1528096.61	596.91

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REVISIONS, DATE AND INITIAL:

UT1-1 & UT1-2 STA 10+00 TO 15+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

MONROE

NORTH CAROLINA

DATE:	04/27/2015
SURVEYED BY:	DST/JAP/DTH
DRAWN BY:	ROB/DST
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-029
FILE:	POPLIN RIDGE_95359_AB_TLS_F
SCALE:	AS SHOWN

SHEET 4 of 22

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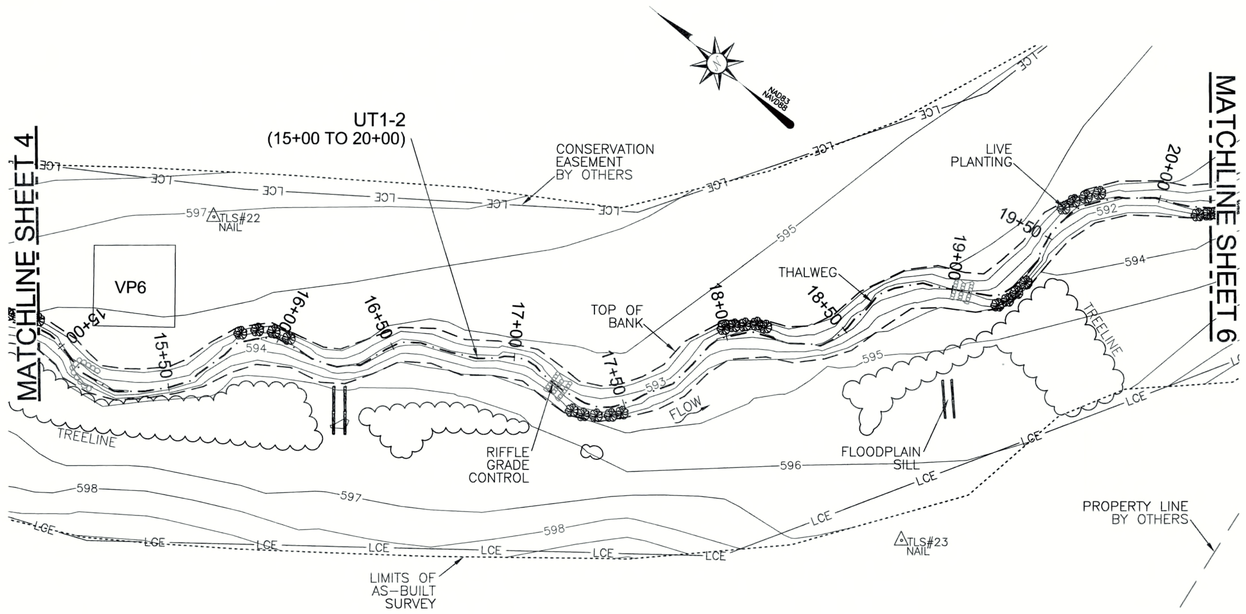
DAVID S. TURNER, P.L.S. #L-4551

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER 07/19/15



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AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

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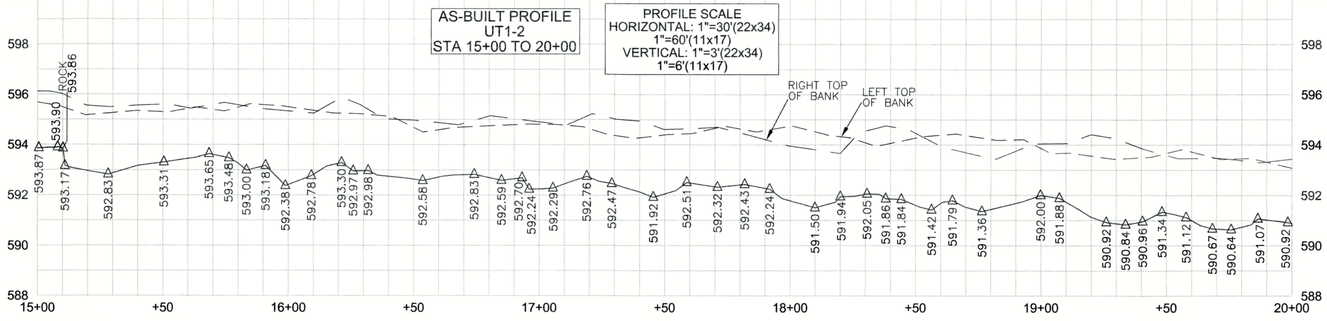

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NCEEP PROJECT # 95359

UNION COUNTY

MONROE

NORTH CAROLINA

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FILE: POPLIN RIDGE_95359_AB_TLS_F
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SHEET 5 of 22

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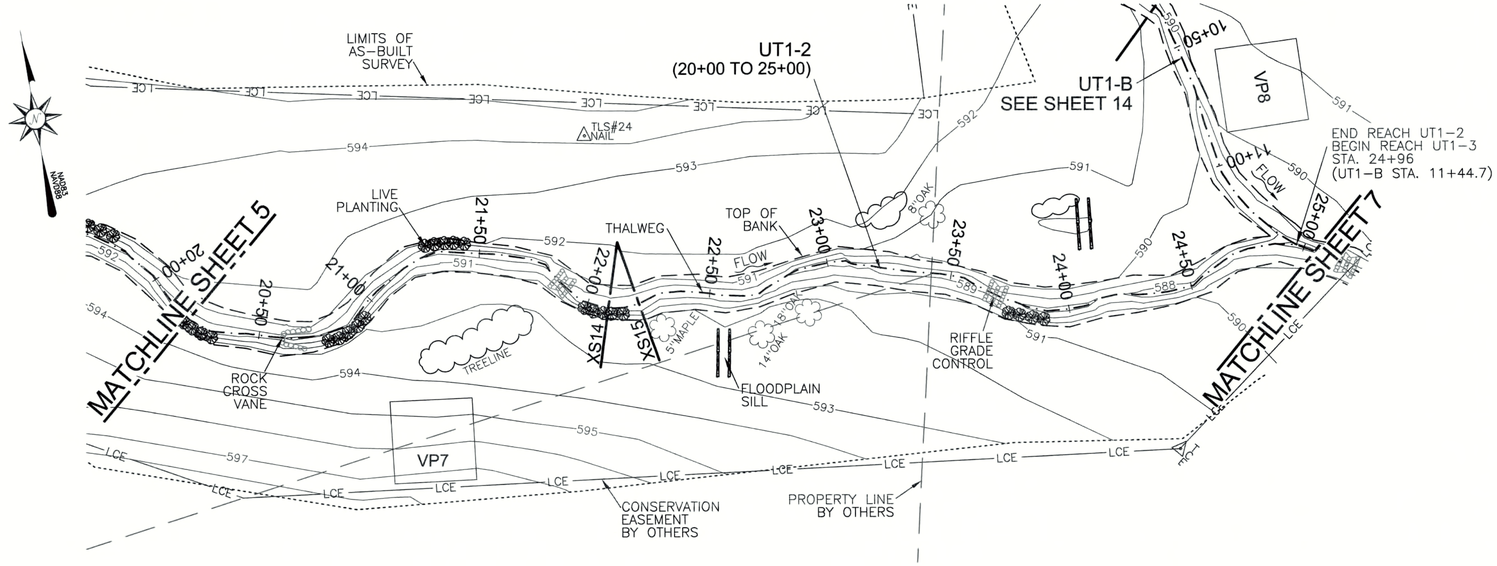

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AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

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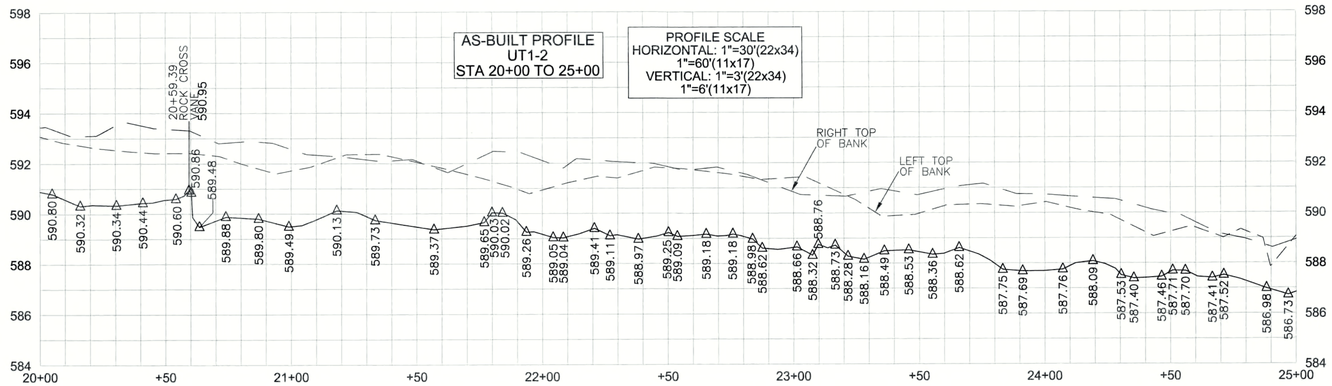

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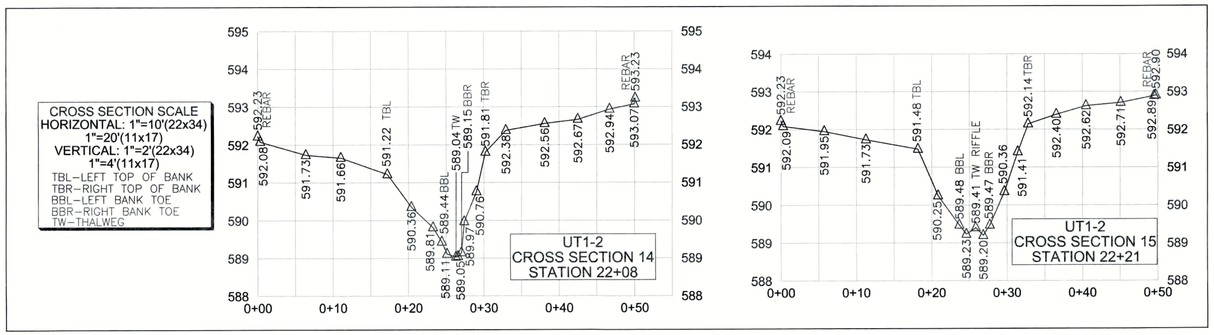
CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS14 RIGHTBANK	479106.84	1528582.86	593.23
XS14–15 LEFTBANK	479154.58	1528598.10	592.23
XS15 RIGHTBANK	479105.51	1528606.35	592.90



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TURNER LAND SURVEYING

REVISIONS, DATE AND INITIAL:

UT1-2 STA 20+00 TO 25+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
SCALE: AS SHOWN

SHEET 6 of 22

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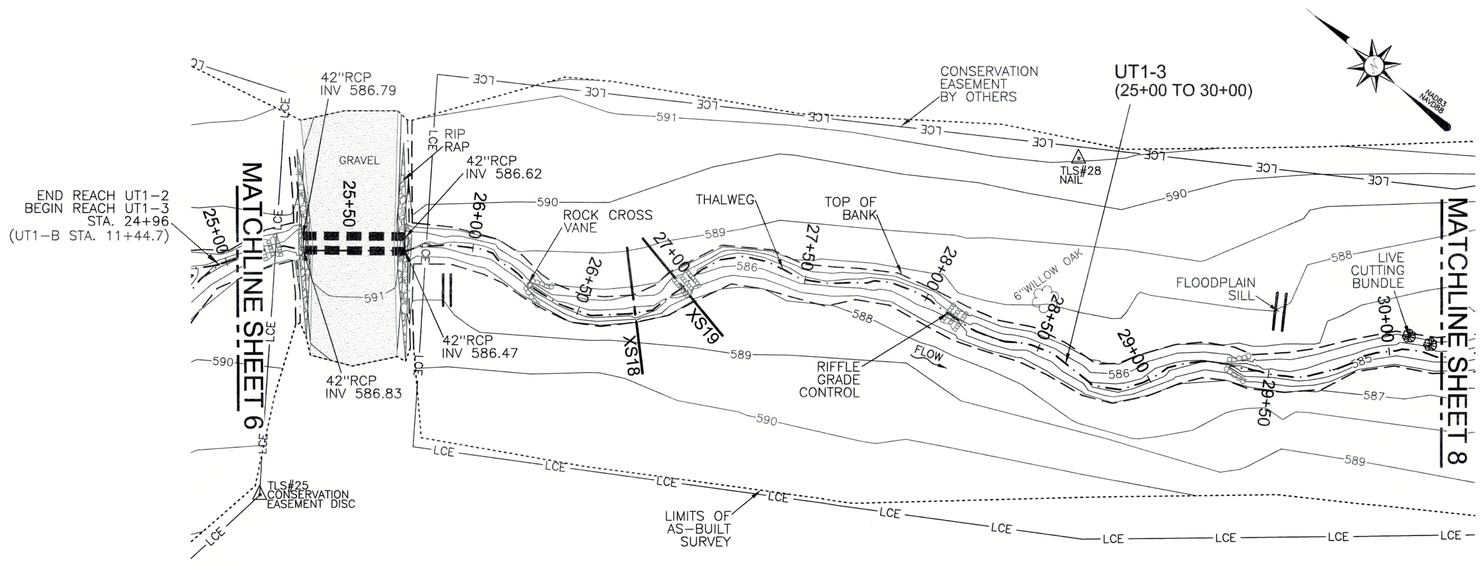

LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
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AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

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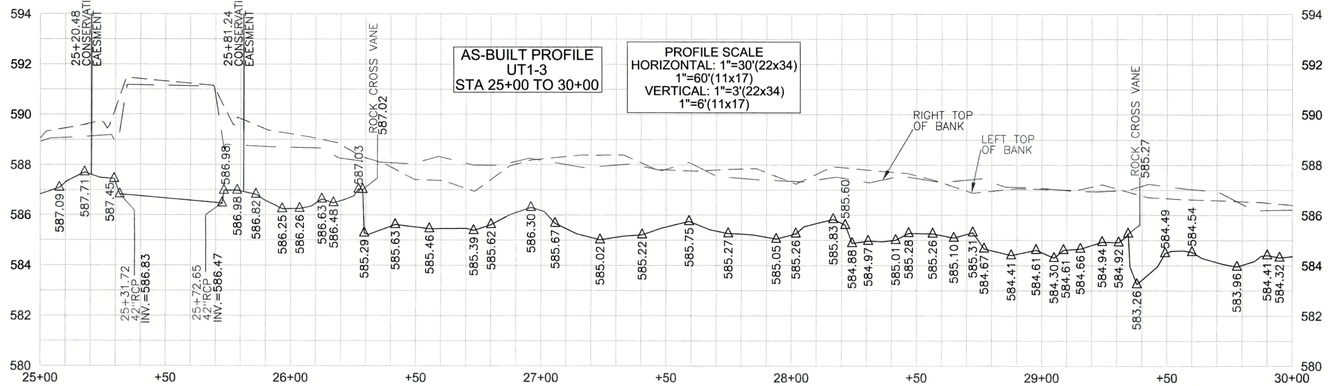

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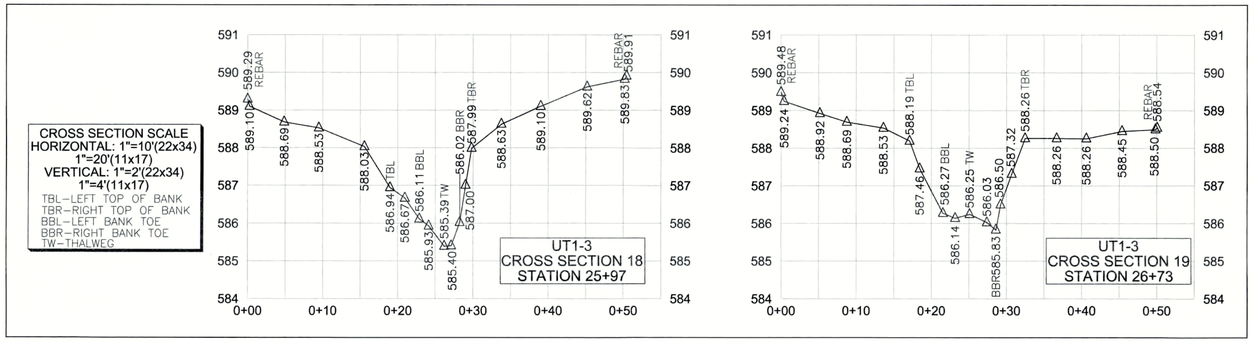
CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS18 RIGHTBANK	478948.55	1528939.76	589.91
XS18 LEFTBANK	478985.53	1528974.08	589.29
XS19 RIGHTBANK	478933.87	1528971.82	588.54
XS19 LEFTBANK	478983.07	1528980.95	589.48



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REVISIONS, DATE AND INITIAL:

UT1-3 STA 25+00 TO 30+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
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PROJECT: TLS-14-029
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David S Turner

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

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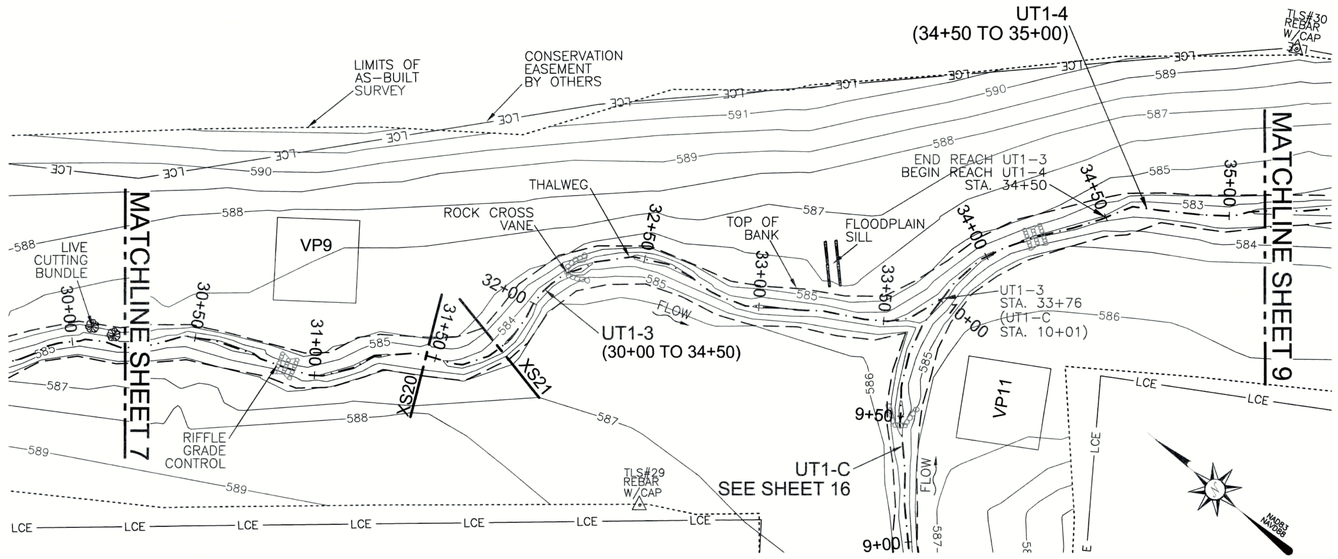

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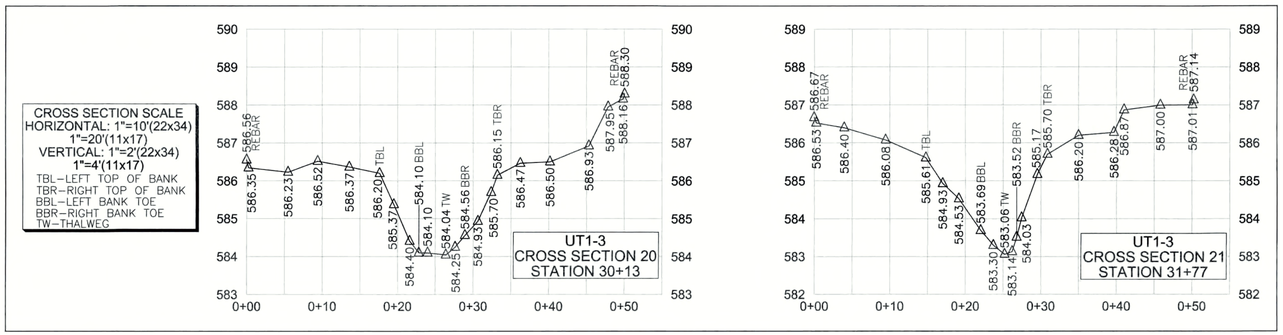

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CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS20 RIGHTBANK	478604.01	1529201.79	588.30
XS20 LEFTBANK	478625.58	1529246.96	586.56
XS21 RIGHTBANK	478569.68	1529240.49	587.14
XS21 LEFTBANK	478618.98	1529250.22	586.67

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TURNER LAND SURVEYING

REVISIONS, DATE AND INITIAL:

UT1-3 STA 30+00 TO 35+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

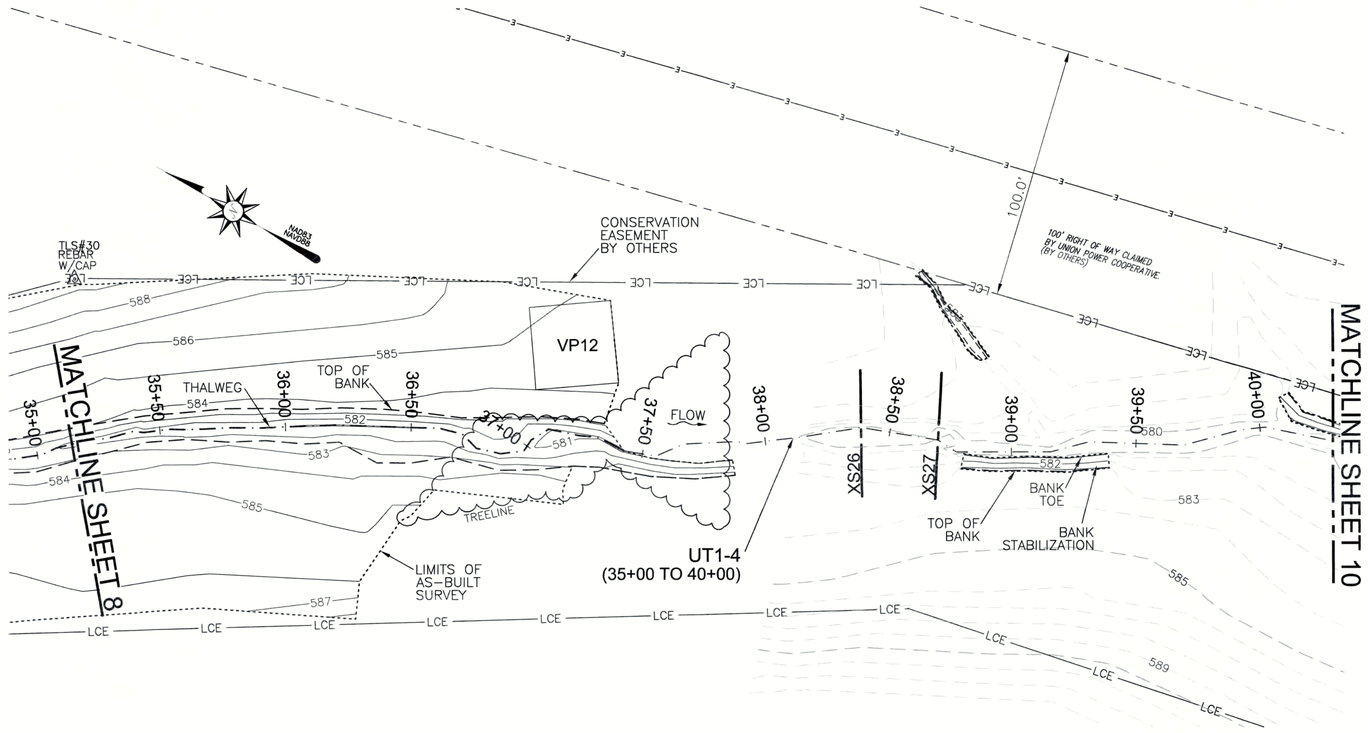
MONROE

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
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 19th DAY OF JULY, 2015.

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

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER 07/19/15



LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
- LOG STRUCTURE
- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

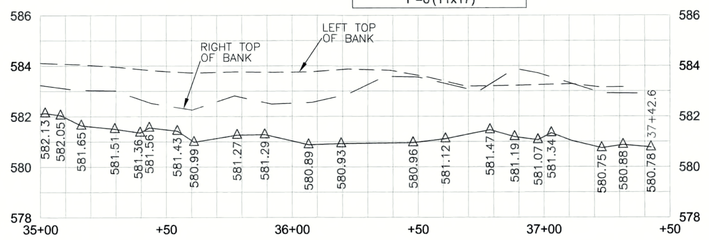
AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'

AS-BUILT PROFILE
UT1-4
STA 35+00 TO 37+42

PROFILE SCALE
HORIZONTAL: 1"=30'(22x34)
1"=60'(11x17)
VERTICAL: 1"=3'(22x34)
1"=6'(11x17)



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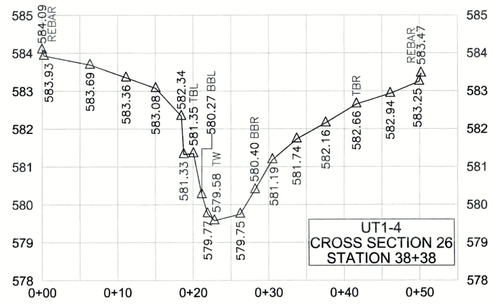

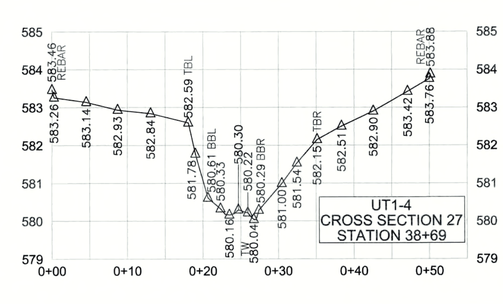

GENERAL NOTES:
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6. NO PROPERTY RESEARCH WAS PERFORMED.

CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS26 RIGHTBANK	478114.03	1529621.12	583.47
XS26 LEFTBANK	478139.76	1529664.20	584.09
XS27 RIGHTBANK	478088.38	1529634.79	583.88
XS27 LEFTBANK	478111.17	1529679.41	583.46

REVISIONS, DATE AND INITIAL:

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UT1-4 STA 35+00 TO 40+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
SCALE: AS SHOWN

SHEET 9 of 22

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

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

LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
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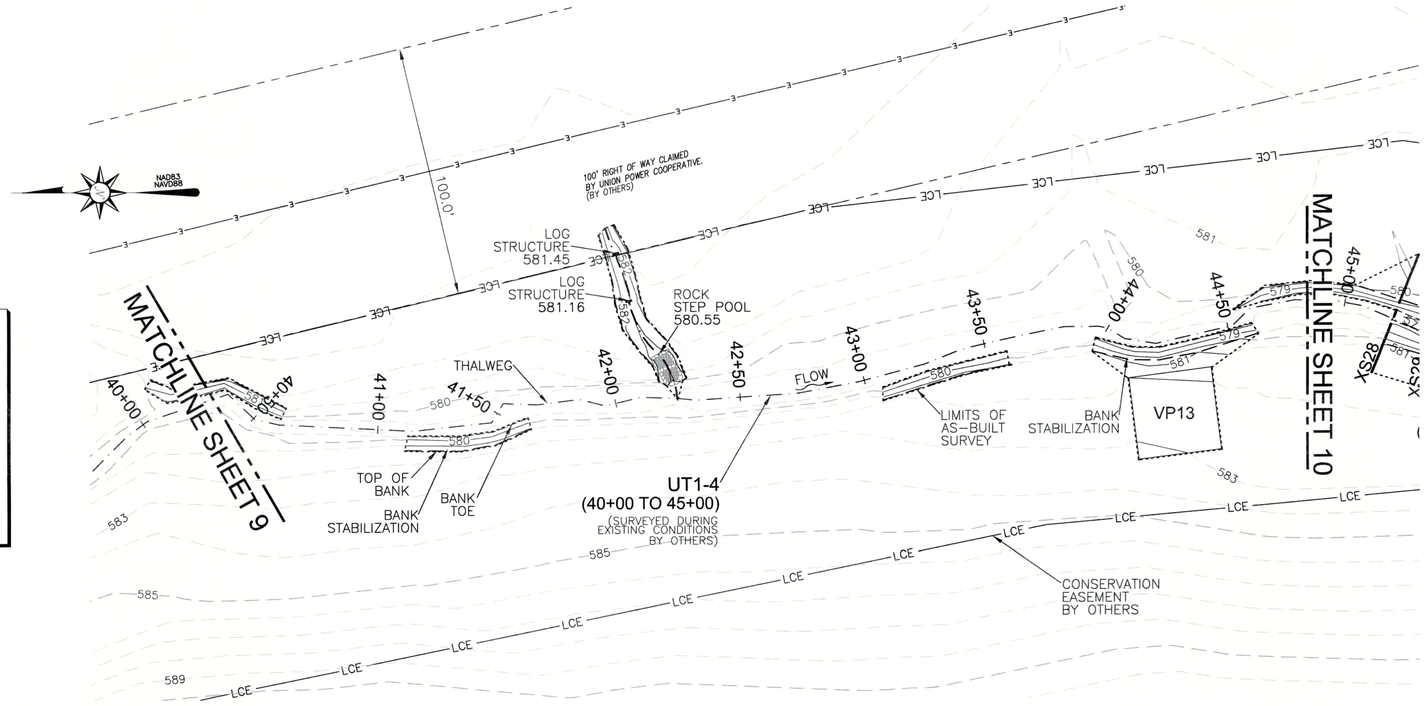
- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'



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POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY NORTH CAROLINA

MONROE

DATE:	04/27/2015
SURVEYED BY:	DST/JAP/DTH
DRAWN BY:	ROB/DST
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-029
FILE:	POPLIN RIDGE_95359_AB_TLS_F
SCALE:	AS SHOWN
SHEET	10 of 22

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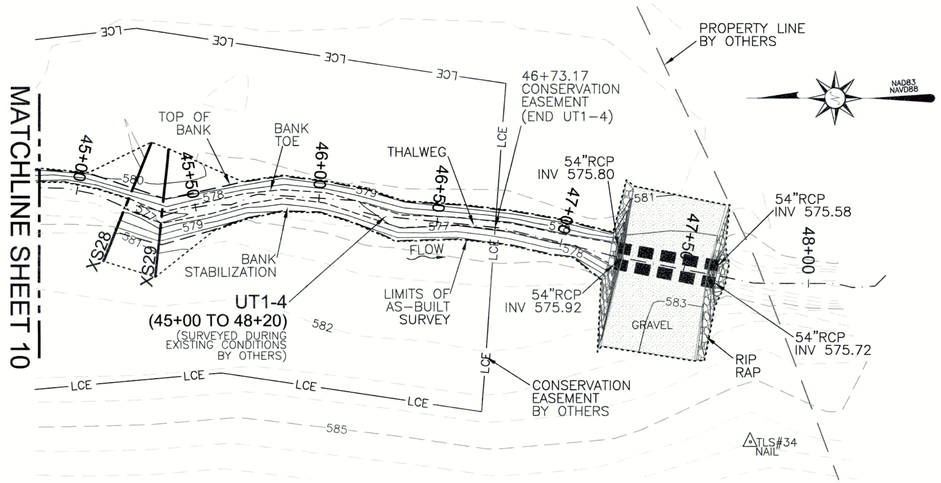
NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER



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- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

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CONTOUR INTERVAL = 1'

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CROSS SECTION SCALE
HORIZONTAL: 1"=10'(22x34)
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BBR–RIGHT BANK TOE
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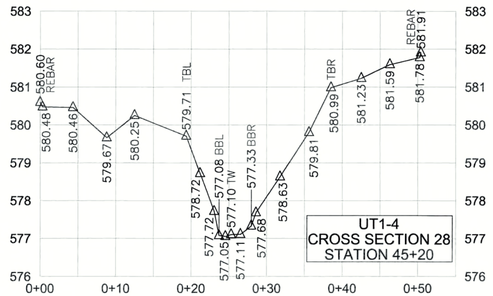

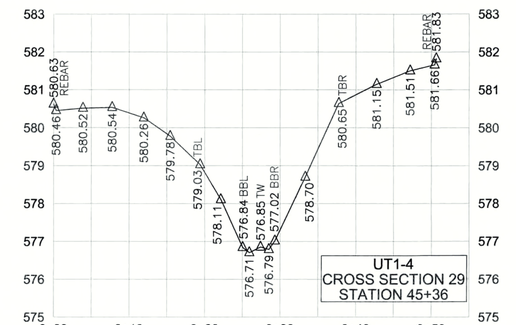

CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS28 RIGHTBANK	477500.71	1529742.83	581.91
XS28 LEFTBANK	477481.84	1529789.55	580.60
XS29 RIGHTBANK	477480.17	1529736.57	581.83
XS29 LEFTBANK	477475.00	1529786.93	580.63

REVISIONS, DATE AND INITIAL:

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UT1-4 STA 45+00 TO 48+20

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY NORTH CAROLINA

MONROE

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
SCALE: AS SHOWN

SHEET 11 of 22

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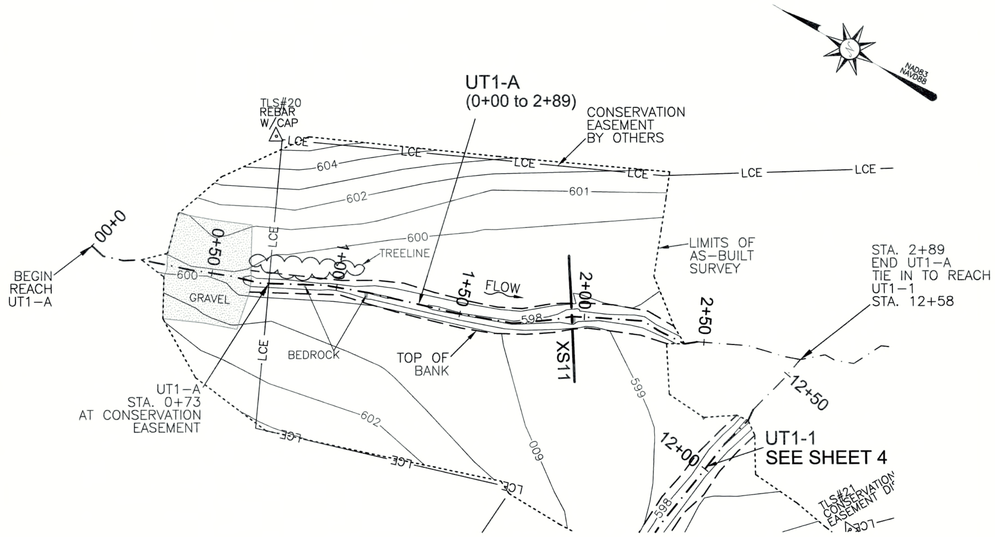
DAVID S. TURNER, P.L.S. #L-4551

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



LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
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- BEDROCK
- RIP RAP
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- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'

AS-BUILT PROFILE
UT1-A
STA 0+00 TO 2+47

PROFILE SCALE
HORIZONTAL: 1"=30'(22x34)
1"=60'(11x17)
VERTICAL: 1"=3'(22x34)
1"=6'(11x17)

CROSS SECTION SCALE
HORIZONTAL: 1"=10'(22x34)
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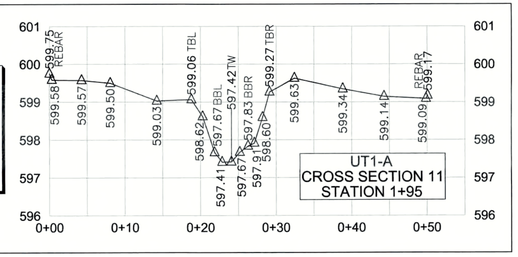

CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS11 RIGHTBANK	479727.89	1527895.16	599.17
XS11 LEFTBANK	479754.71	1527937.46	599.75

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POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

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SHEET 12 of 22

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

LEGEND:

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- TOP OF BANK
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- LCE — CONSERVATION EASEMENT
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AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

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1"=60' (11x17)
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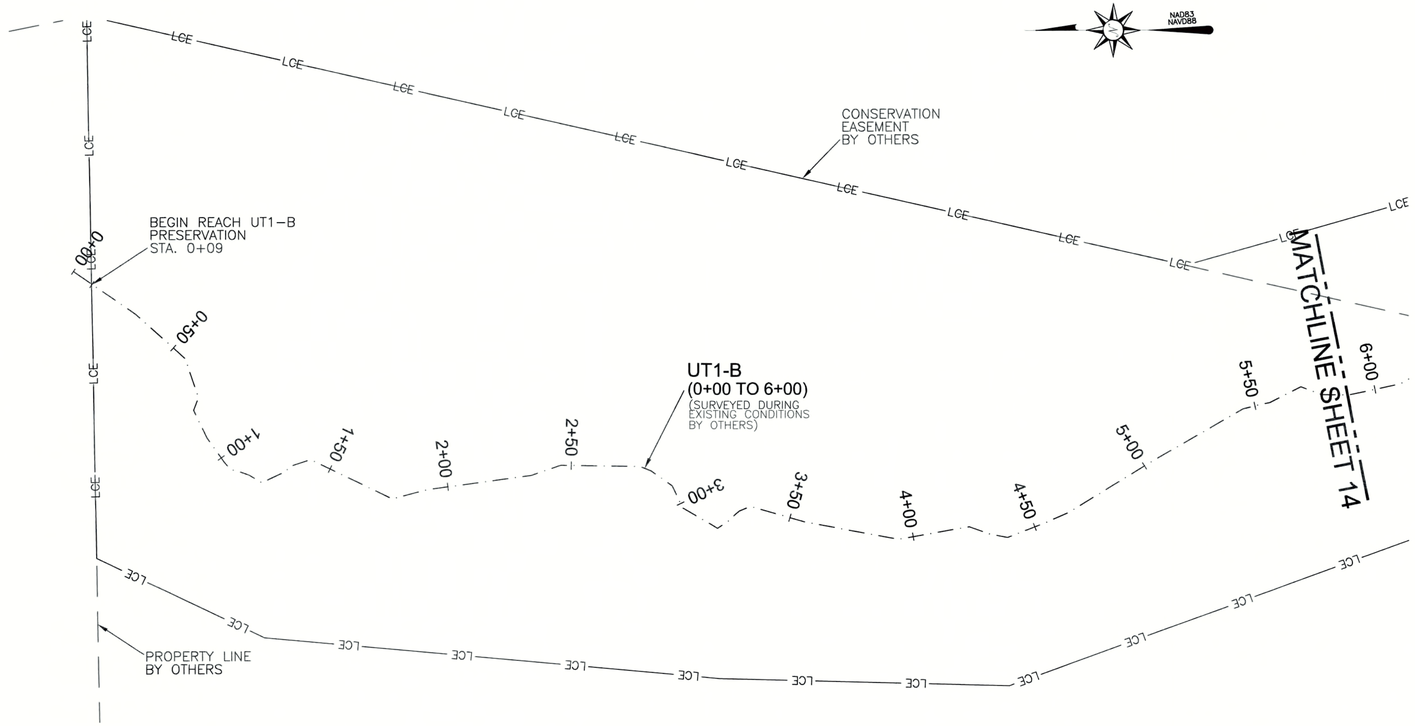

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David S. Turner

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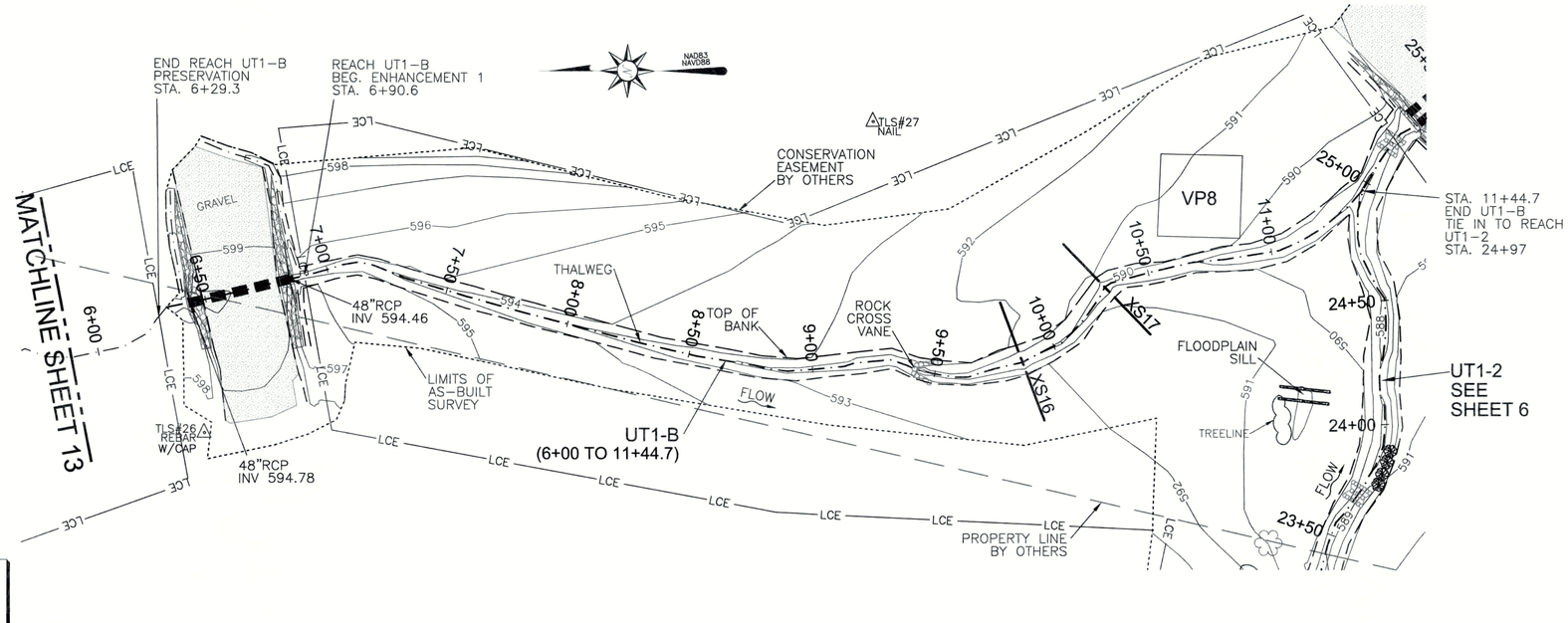

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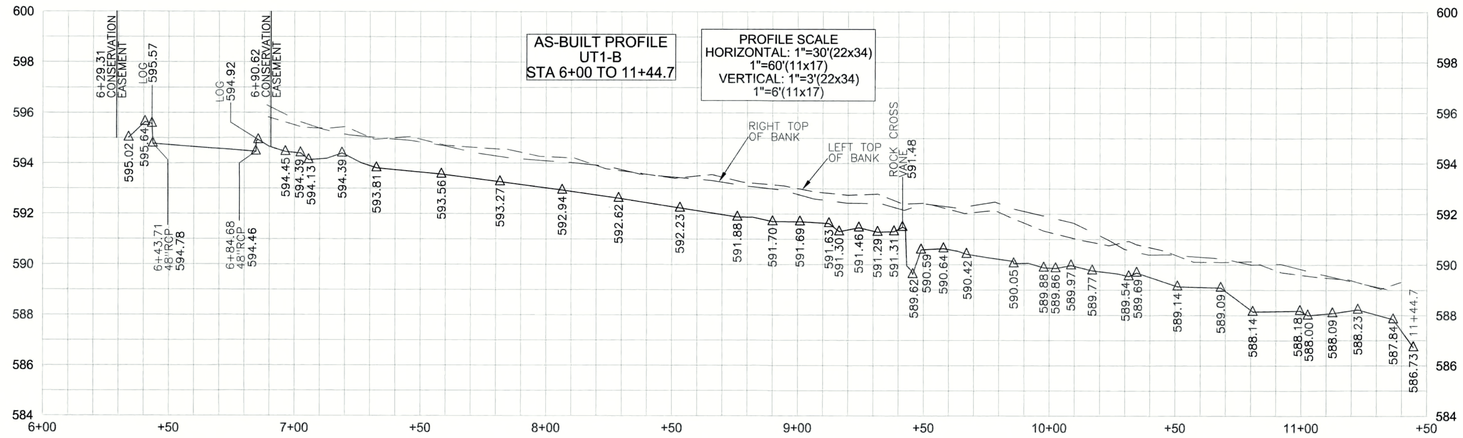

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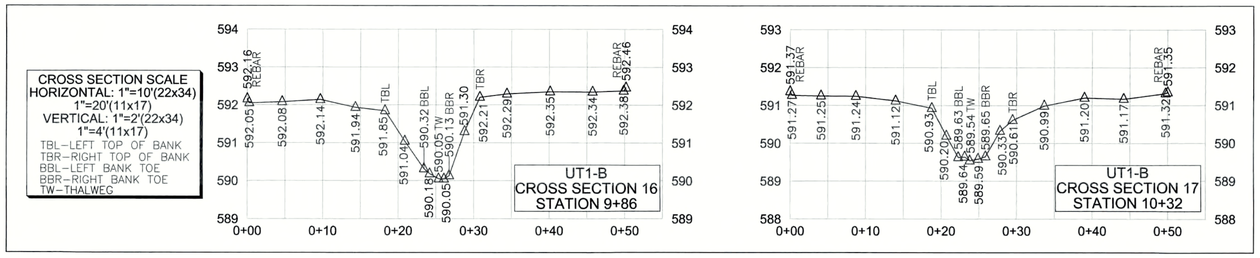
6. NO PROPERTY RESEARCH WAS PERFORMED.

CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS16 RIGHTBANK	479232.71	1528772.08	592.46
XS16 LEFTBANK	479250.57	1528818.96	592.16
XS17 RIGHTBANK	479190.60	1528806.43	591.35
XS17 LEFTBANK	479225.35	1528842.38	591.37



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TURNER LAND SURVEYING

REVISIONS, DATE AND INITIAL:

UT1-B STA 6+00 TO 11+44.7

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

DATE:	04/27/2015
SURVEYED BY:	DST/JAP/DTH
DRAWN BY:	ROB/DST
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-029
FILE:	POPLIN RIDGE_95359_AB_TLS_F
SCALE:	AS SHOWN

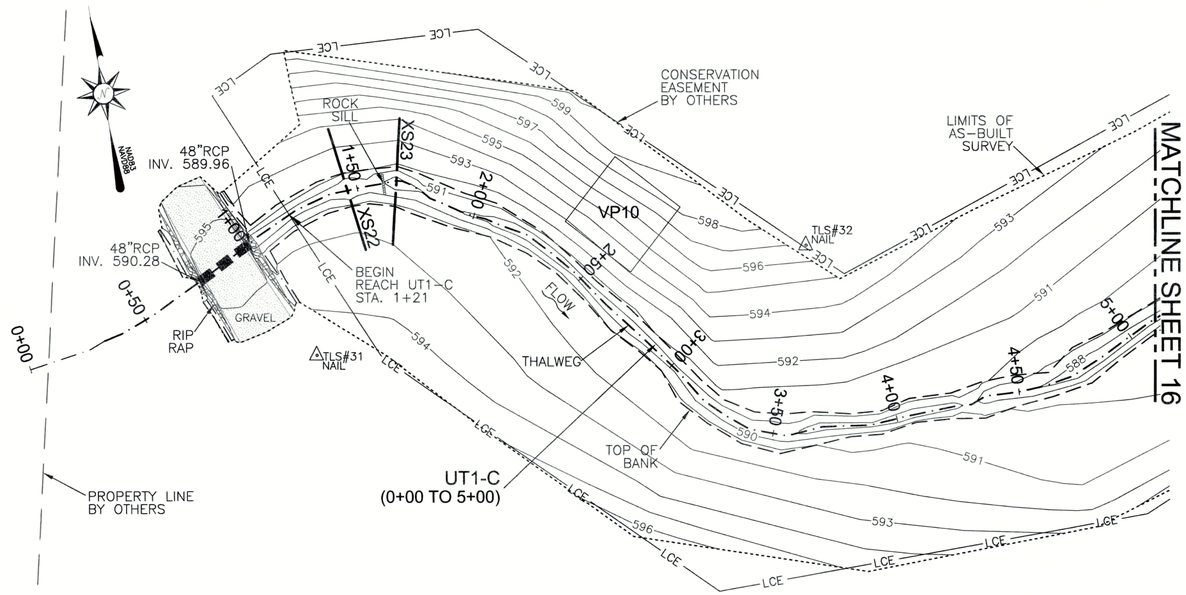
SHEET 14 of 22

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 19th DAY OF JULY, 2015.

David S Turner

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

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



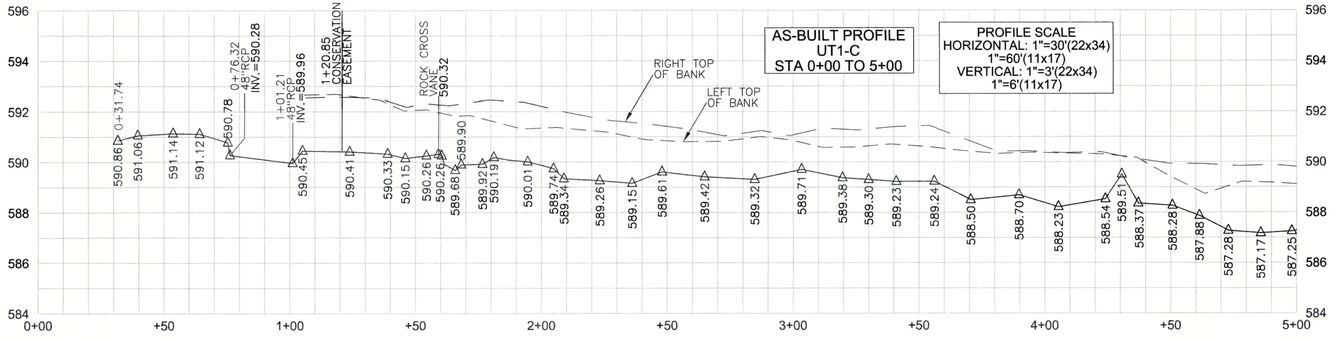
LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
- LOG STRUCTURE
- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'



GENERAL NOTES:

1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. HORIZONTAL DATUM IS NAD83/2007 AND VERTICAL DATUM IS NAVD88.
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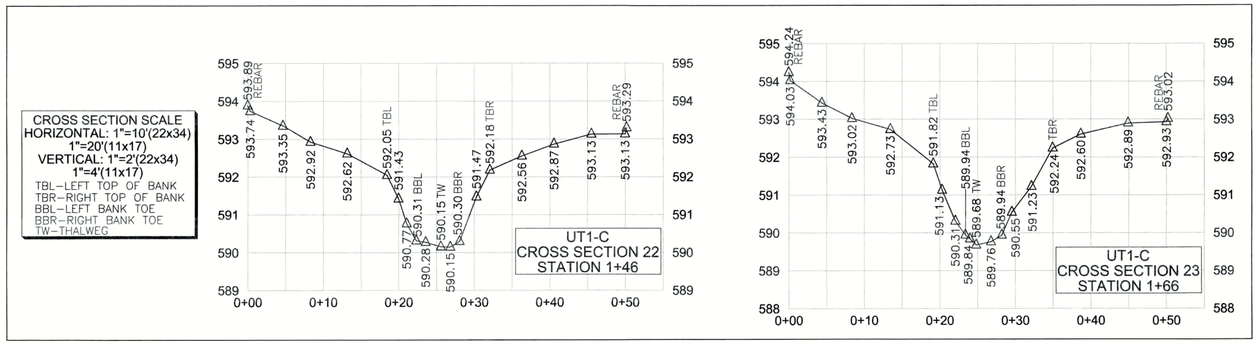
6. NO PROPERTY RESEARCH WAS PERFORMED.

CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS22 RIGHTBANK	478320.33	1528663.38	593.29
XS22 LEFTBANK	478370.09	1528657.00	593.89
XS23 RIGHTBANK	478320.41	1528674.32	593.02
XS23 LEFTBANK	478369.34	1528685.68	594.24



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TURNER LAND SURVEYING

REVISIONS, DATE AND INITIAL:

UT1-C STA 0+00 TO 5+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

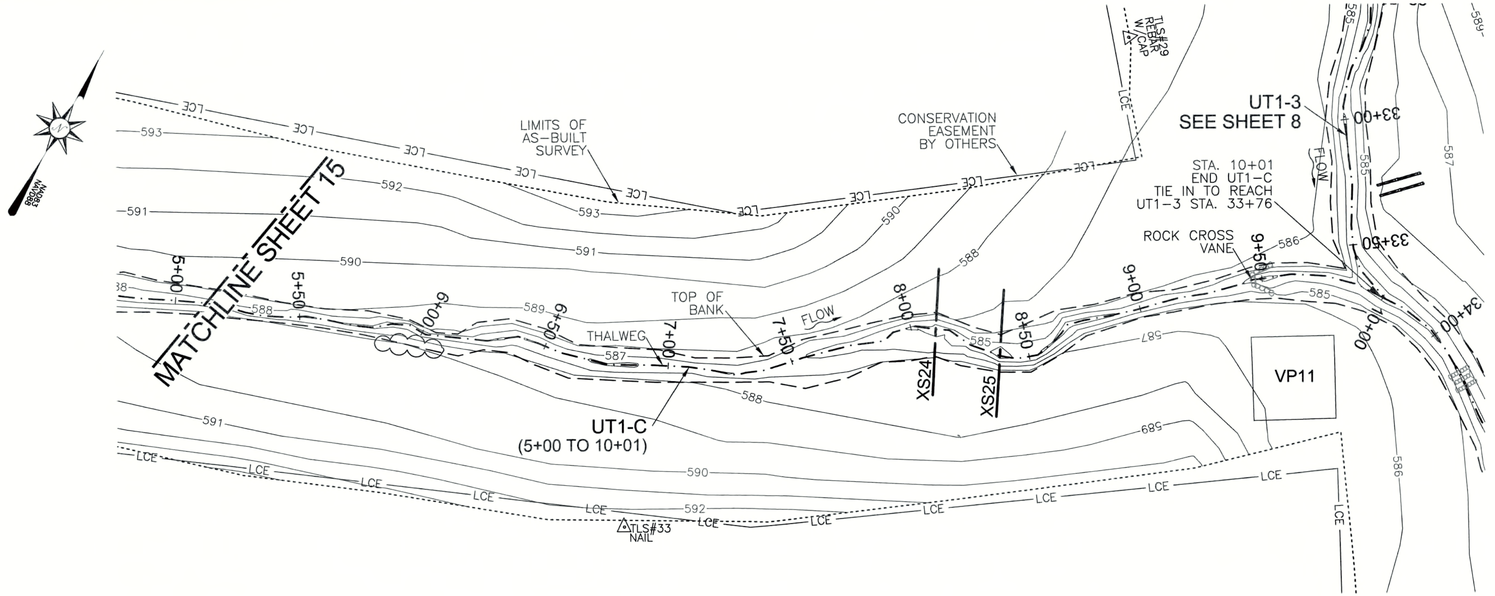
DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
SCALE: AS SHOWN

SHEET 15 of 22

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 19th DAY OF JULY, 2015.

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

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



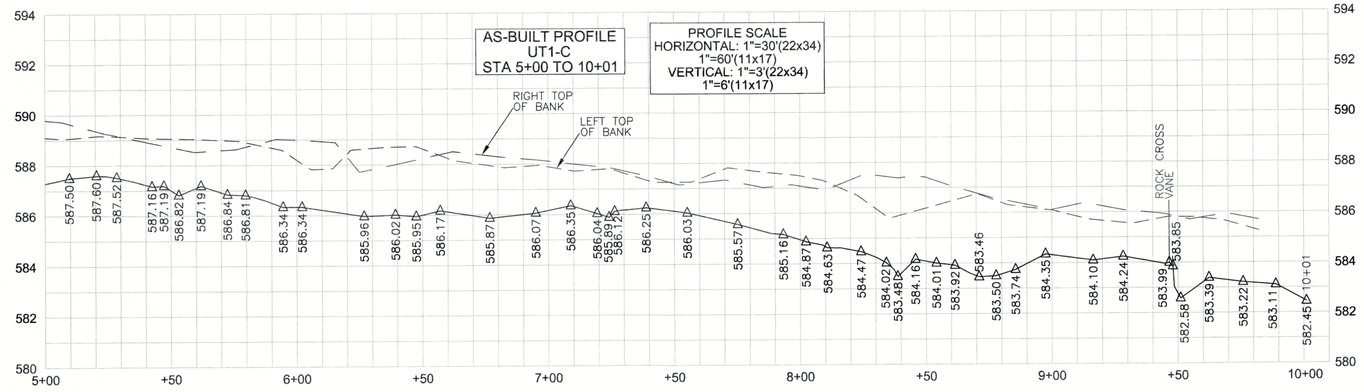
LEGEND:

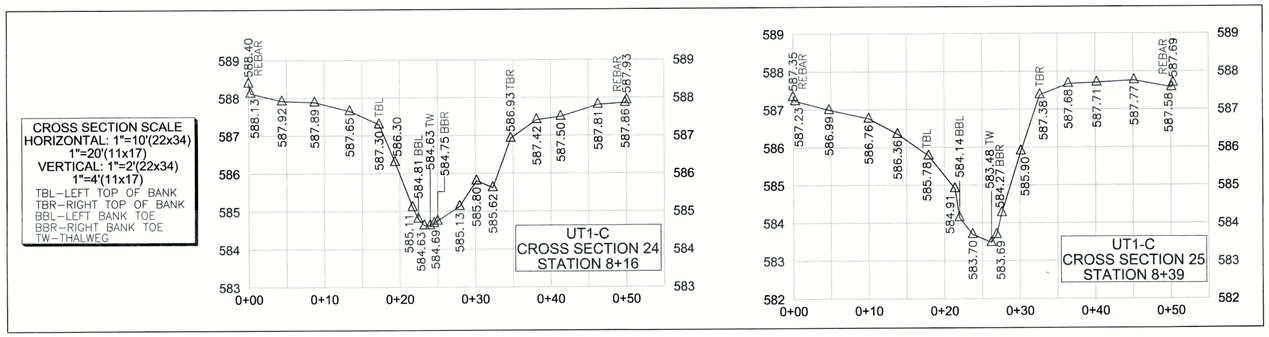
- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
- LOG STRUCTURE
- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'





GENERAL NOTES:

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CROSS SECTION REBAR COORDINATES:

Description		Northing	Easting	Elevation
XS24	RIGHTBANK	478349.98	1529236.23	587.93
XS24	LEFTBANK	478394.64	1529213.57	588.40
XS25	RIGHTBANK	478355.13	1529262.46	587.69
XS25	LEFTBANK	478400.26	1529240.18	587.35

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REVISIONS, DATE AND INITIAL:

UT1-C STA 5+00 TO 10+01

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

DATE:	04/27/2015
SURVEYED BY:	DST/JAP/DTH
DRAWN BY:	ROB/DST
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-029
FILE:	POPLIN RIDGE_95359_AB_TLS_F
SCALE:	AS SHOWN

SHEET 16 of 22

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 19th DAY OF JULY, 2015.

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

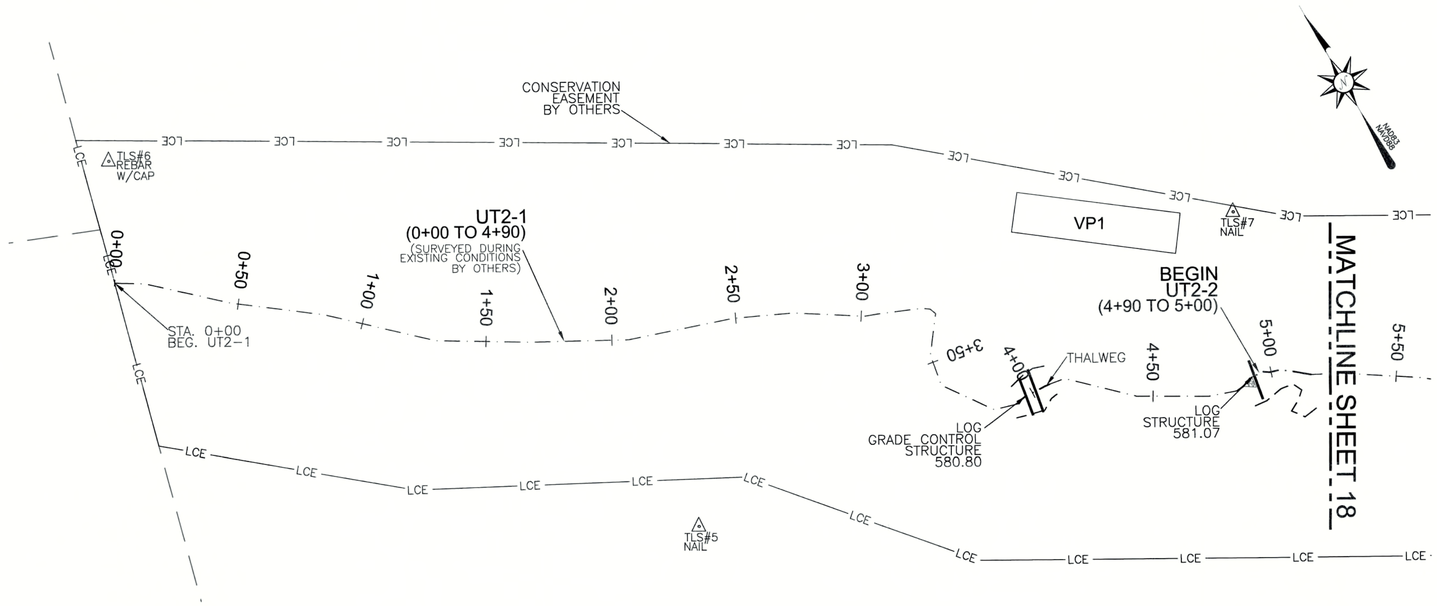
NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER

LEGEND:
- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
- LOG STRUCTURE
- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'



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UT2-1 STA 0+00 TO 5+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY NORTH CAROLINA

MONROE

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
SCALE: AS SHOWN

SHEET 17 of 22

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

NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER 07/19/15

LEGEND:
- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
- LOG STRUCTURE
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- RIFFLE GRADE CONTROL
- ROCK SILL
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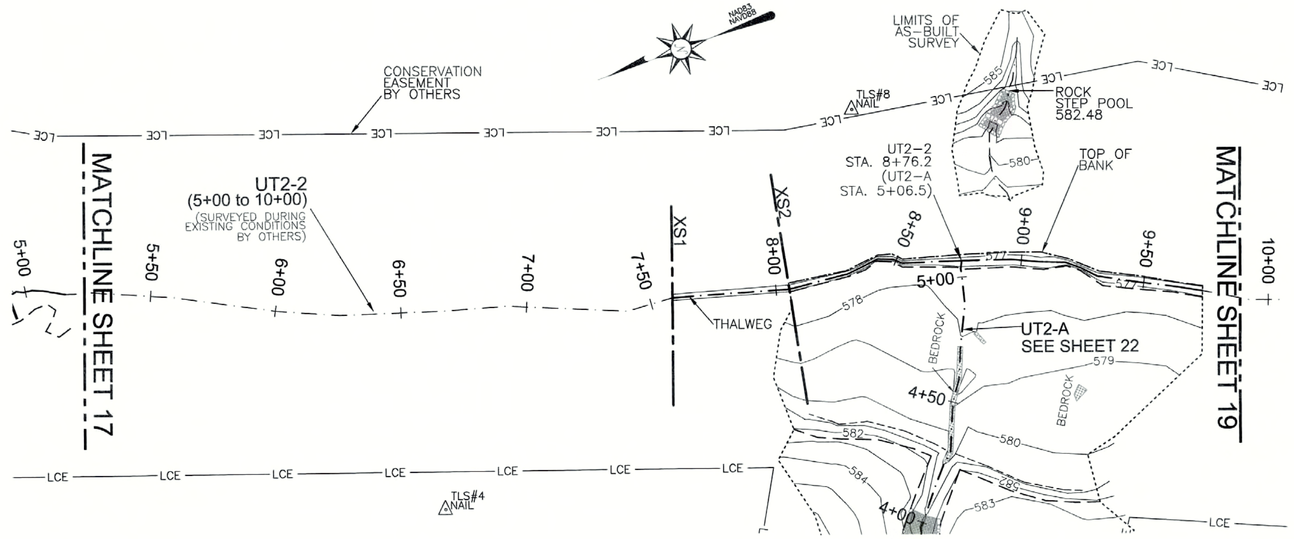
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'



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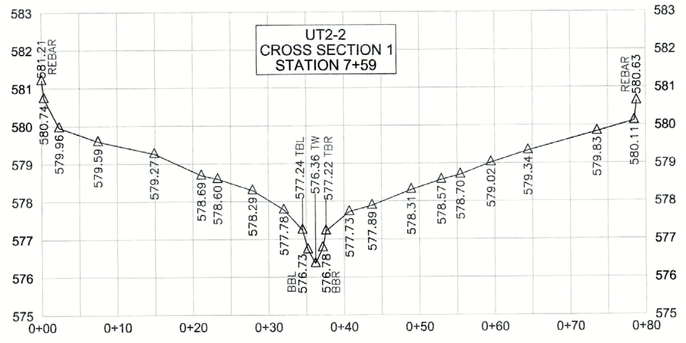
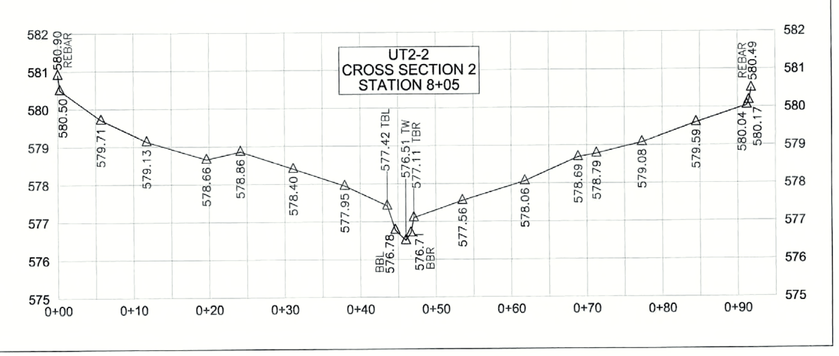
CROSS SECTION SCALE
HORIZONTAL: 1"=10'(22x34)
1"=20'(11x17)
VERTICAL: 1"=2'(22x34)
1"=4'(11x17)
TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG





CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS1 RIGHTBANK	479457.66	1532518.35	580.63
XS1 LEFTBANK	479431.07	1532592.51	581.21
XS2 RIGHTBANK	479407.52	1532500.51	580.49
XS2 LEFTBANK	479389.68	1532590.55	580.90

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REVISIONS, DATE AND INITIAL:

UT2-2 STA 5+00 TO 10+00

POPLIN RIDGE STREAM RESTORATION PROJECT
NCEEP PROJECT # 95359
UNION COUNTY NORTH CAROLINA
MONROE

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
SCALE: AS SHOWN

SHEET 18 of 22

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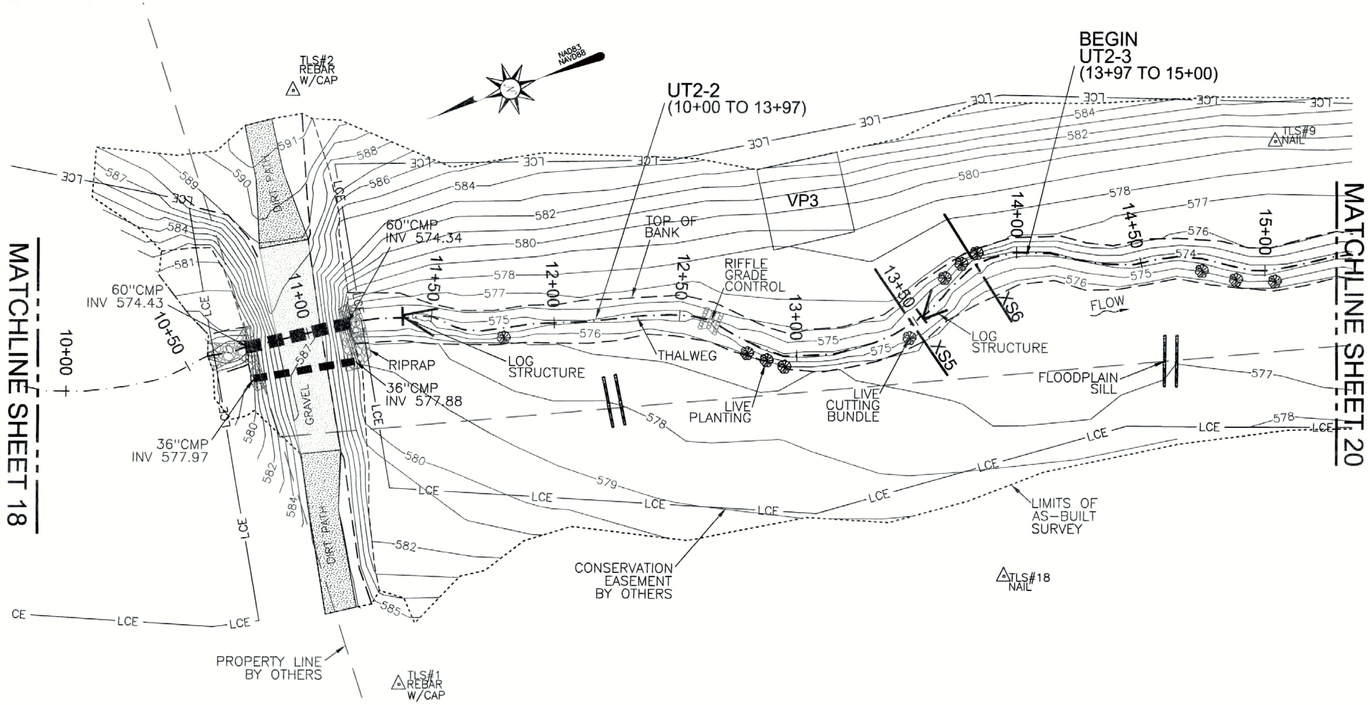

LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
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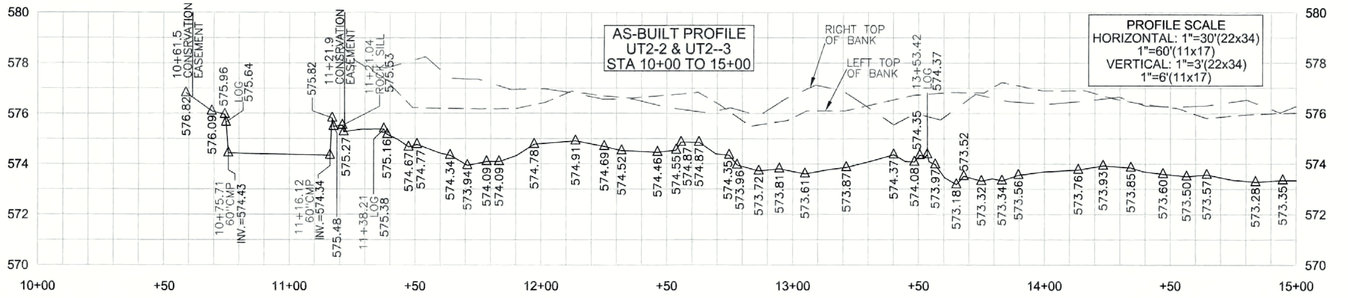
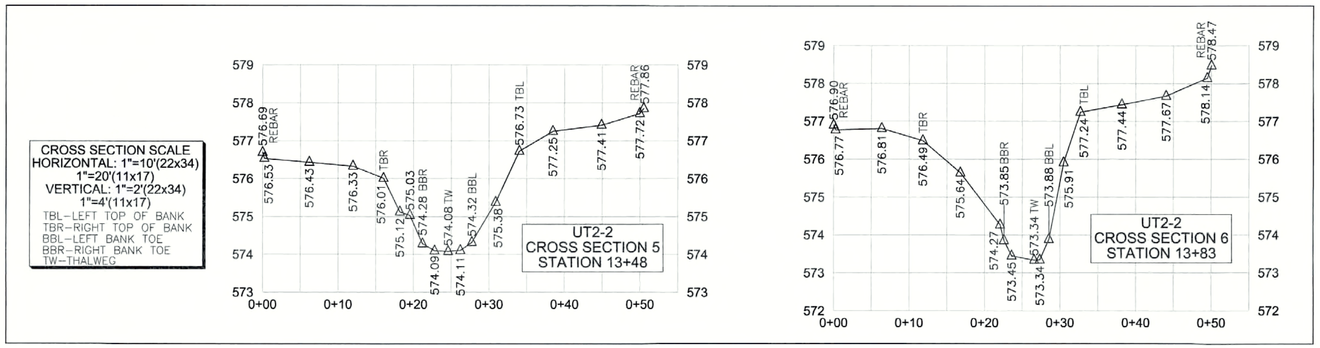
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'





GENERAL NOTES:

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CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS5 RIGHTBANK	478890.32	1532362.00	576.69
XS5 LEFTBANK	478902.93	1532410.92	577.86
XS6 RIGHTBANK	478859.09	1532373.15	576.90
XS6 LEFTBANK	478869.73	1532422.06	578.47

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TURNER LAND SURVEYING

REVISIONS, DATE AND INITIAL:

UT2-2 & UT2-3 STA 10+00 TO 15+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY NORTH CAROLINA

MONROE

DATE:	04/27/2015
SURVEYED BY:	DST/JAP/DTH
DRAWN BY:	ROB/DST
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FILE:	POPLIN RIDGE_95359_AB_TLS_F
SCALE:	AS SHOWN

SHEET 19 of 22

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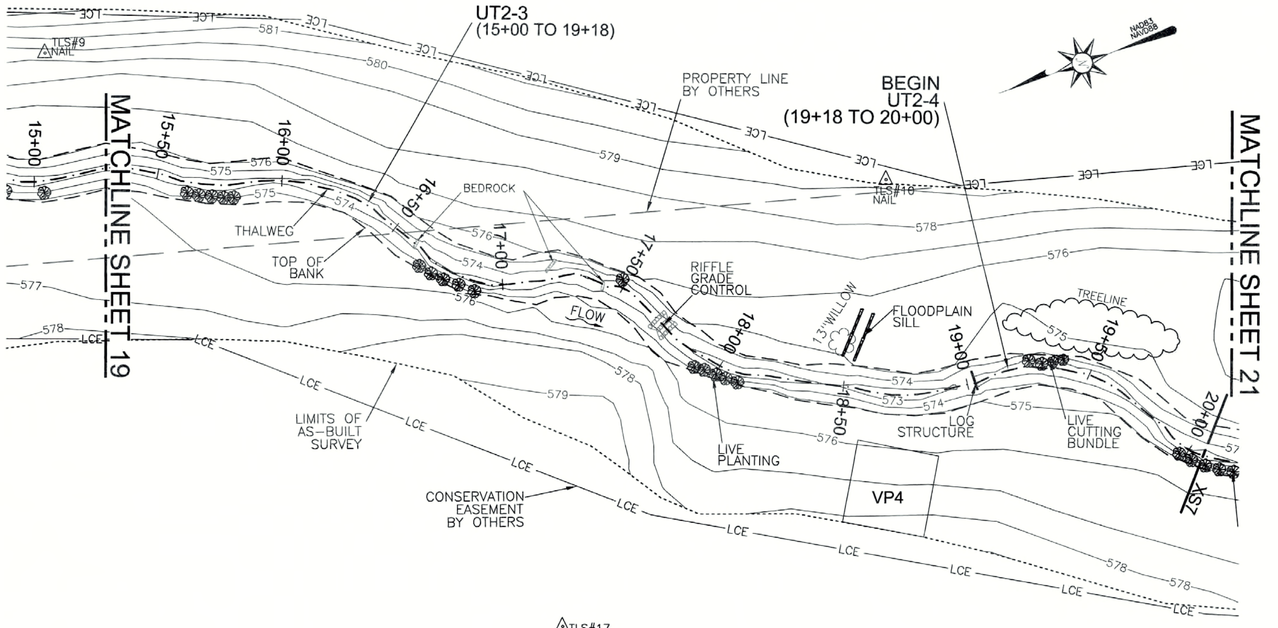

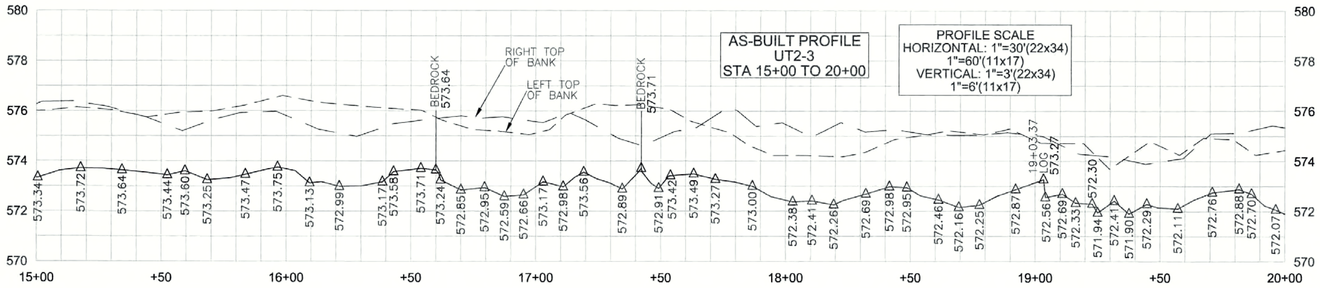

LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
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- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

SCALE: 1"=30' (22x34)
1"=60' (11x17)
CONTOUR INTERVAL = 1'

GENERAL NOTES:

1. ALL DISTANCES ARE HORIZONTAL UNLESS OTHERWISE NOTED.
2. HORIZONTAL DATUM IS NAD83/2007 AND VERTICAL DATUM IS NAVD88.
3. AS-BUILT SURVEY BASED ON EXISTING GPS CONTROL ESTABLISHED BY TURNER LAND SURVEYING FOR CONSTRUCTION AND VERIFIED DURING THE AS-BUILT SURVEYS. SEE CONTROL POINT LIST FOR COORDINATES.
4. THIS MAP IS NOT FOR RECORDATION, SALES, OR CONVEYANCES AND DOES NOT COMPLY WITH G.S. 47-30 MAPPING REQUIREMENTS.
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6. NO PROPERTY RESEARCH WAS PERFORMED.

TURNER LAND SURVEYING
3719 BENSON DRIVE
RALEIGH, NC 27609
P-0702 (919) 827-0745
www.turnerlandsurveying.com
Certified DBE/WBE

REVISIONS, DATE AND INITIAL:

UT2-3 & UT2-4 STA 15+00 TO 20+00

POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY NORTH CAROLINA

MONROE

DATE:	04/27/2015
SURVEYED BY:	DST/JAP/DTH
DRAWN BY:	ROB/DST
REVIEWED BY:	DST/EGT
PROJECT:	TLS-14-029
FILE:	POPLIN RIDGE_95359_AB_TLS_F
SCALE:	AS SHOWN

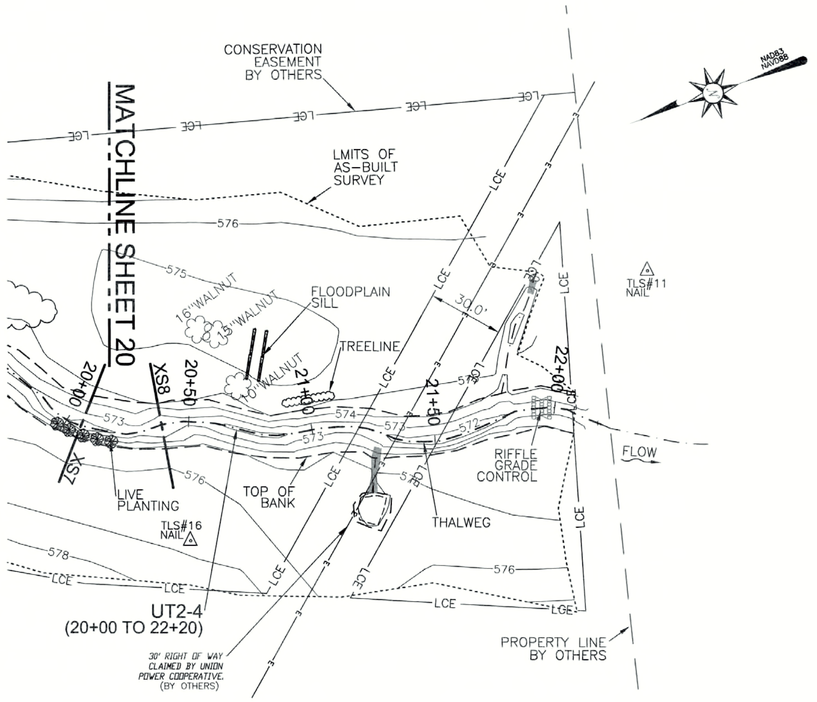
SHEET 20 of 22

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 19th DAY OF JULY, 2015.

David S. Turner

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

NORTH CAROLINA PROFESSIONAL SEAL L-4551 07/19/15 LAND SURVEYOR DAVID S. TURNER



LEGEND:

- THALWEG
- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
- EX. THALWEG (BY OTHERS)
- EX. PROPERTY LINE (NOT SURVEYED)
- BEDROCK
- RIP RAP
- LOG STRUCTURE
- LOG GRADE CONTROL STRUCTURE
- FLOODPLAIN SILL
- ROCK STEP POOL
- RIFFLE GRADE CONTROL
- ROCK SILL
- ROCK CROSS VANE
- LIVE CUTTING BUNDLE/ LIVE PLANTING
- VP VEGETATION PLOT

AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

30' 0' 30' 60'

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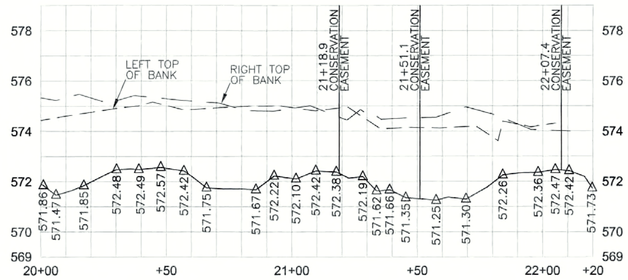
1"=60' (11x17)
CONTOUR INTERVAL = 1'

AS-BUILT PROFILE
UT2-4
STA 20+00 TO 22+20

PROFILE SCALE
HORIZONTAL: 1"=30'(22x34)
1"=60'(11x17)
VERTICAL: 1"=3'(22x34)
1"=6'(11x17)



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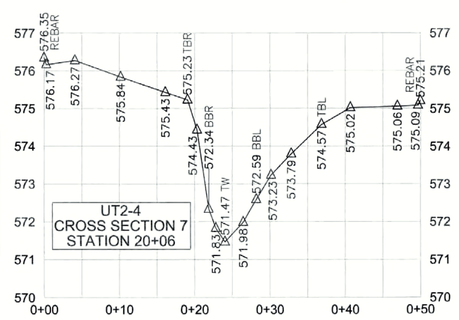
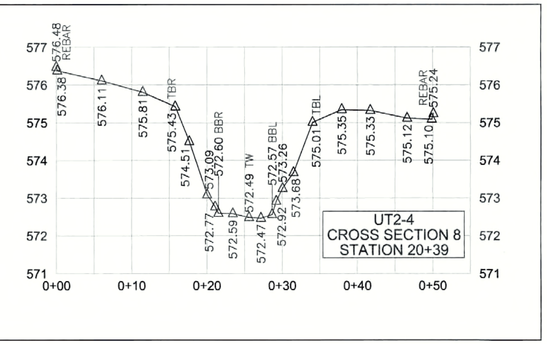
CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS7 RIGHTBANK	478373.91	1532079.47	576.35
XS7 LEFTBANK	478340.87	1532116.96	575.21
XS8 RIGHTBANK	478331.96	1532061.63	576.48
XS8 LEFTBANK	478323.71	1532111.04	575.24

CROSS SECTION SCALE
HORIZONTAL: 1"=10'(22x34)
1"=20'(11x17)
VERTICAL: 1"=2'(22x34)
1"=4'(11x17)
TBL–LEFT TOP OF BANK
TBR–RIGHT TOP OF BANK
BBL–LEFT BANK TOE
BBR–RIGHT BANK TOE
TW–THALWEG





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POPLIN RIDGE STREAM RESTORATION PROJECT

NCEEP PROJECT # 95359

UNION COUNTY

NORTH CAROLINA

MONROE

DATE: 04/27/2015
SURVEYED BY: DST/JAP/DTH
DRAWN BY: ROB/DST
REVIEWED BY: DST/EGT
PROJECT: TLS-14-029
FILE: POPLIN RIDGE_95359_AB_TLS_F
SCALE: AS SHOWN

SHEET 21 of 22

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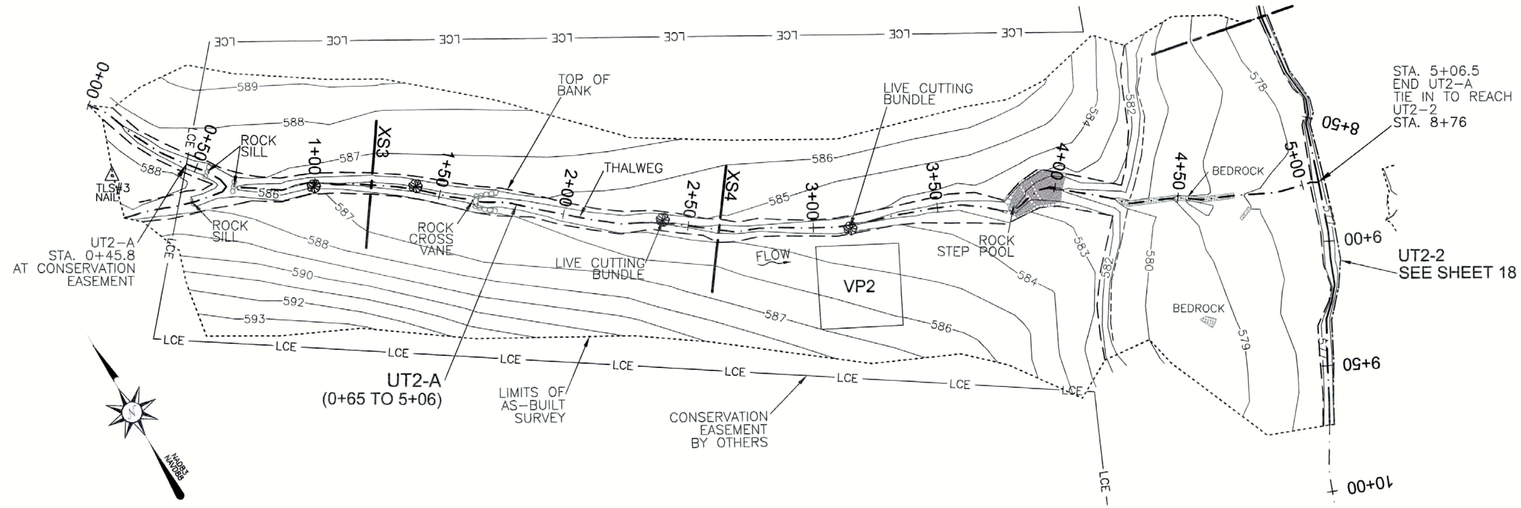
NORTH CAROLINA PROFESSIONAL SEAL L-4551 LAND SURVEYOR DAVID S. TURNER 07/17/15



LEGEND:

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- TOP OF BANK
- BANK TOE
- LCE — CONSERVATION EASEMENT
- LIMITS OF AS-BUILT SURVEY
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AS-BUILT SURVEY BY:
TURNER LAND SURVEYING, PLLC
SURVEYED APR. 2015

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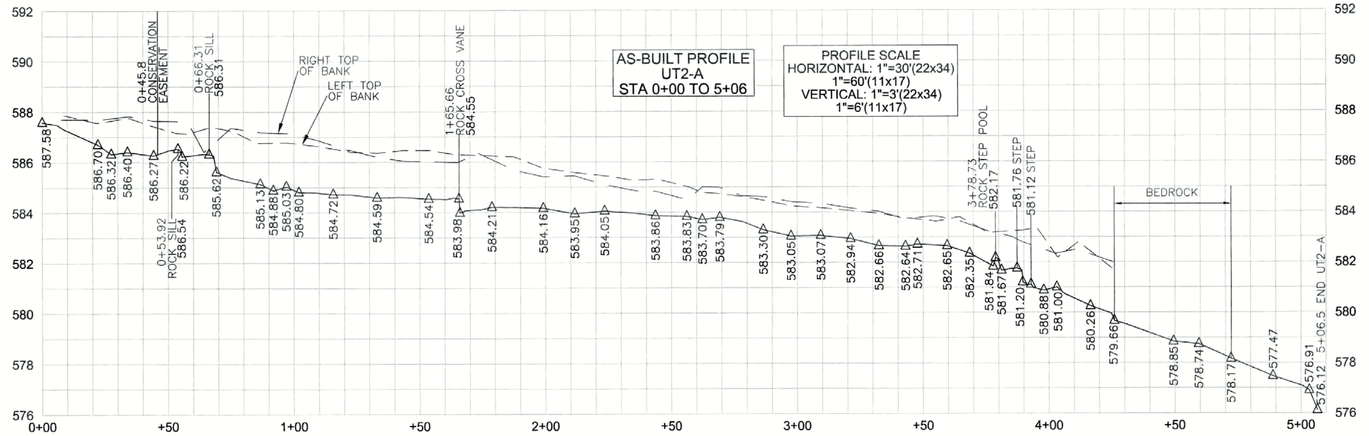

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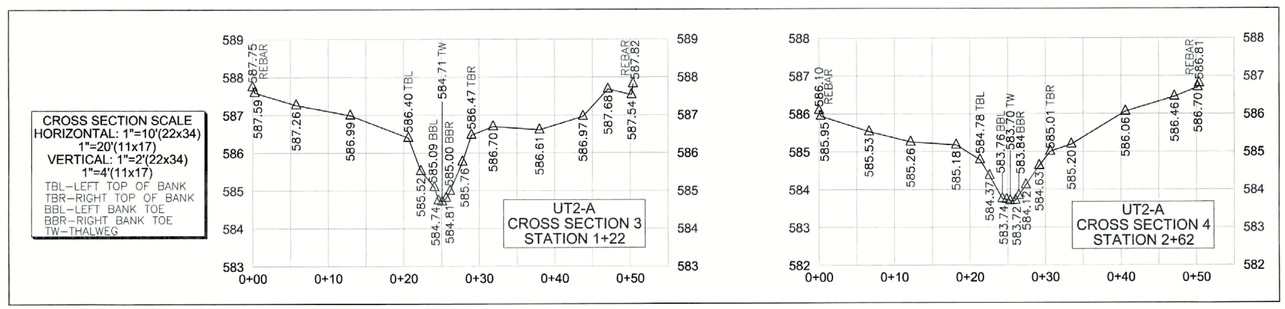
CROSS SECTION REBAR COORDINATES:

Description	Northing	Easting	Elevation
XS3 RIGHTBANK	479498.03	1532192.03	587.82
XS3 LEFTBANK	479539.50	1532220.65	587.75
XS4 RIGHTBANK	479413.83	1532302.09	586.81
XS4 LEFTBANK	479454.38	1532331.95	586.10



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