Unnamed Tributaries to Bald Creek Stream Restoration Project

Yancey County, North Carolina
EEP Project Number: 92596
SCO Project Number: 070714901

Final Restoration Plan

Prepared for:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

June 2009

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Executive Summary

The North Carolina Ecosystem Enhancement Program (NCEEP) has requested that URS Corporation – North Carolina (URS) provide professional assessment, design, and construction management services for the Unnamed Tributaries to Bald Creek Stream Restoration Project (Project) in Yancey County, North Carolina. The Project is located near Burnsville, NC and consists of approximately 5,124 linear feet of stream and 1.28 acres of wetlands within a 12.74-acre conservation easement. Figure 1 shows the Project Vicinity and Figure 2 shows the Project Study Area.

The Bald Creek watershed is part of the Nolichucky River drainage in the French Broad River Basin. The watershed area is approximately 18 square miles and is represented by US Geological Survey (USGS) Hydrologic Unit Code 06010108080020. It is a small rural watershed characterized by steep ridges and narrow valleys. Vegetation surrounding most of the streams in the valleys has been cleared for homes, gardens, and small farms. Many of the steeper headwater areas remain forested.

The Project was identified by NCEEP during the development of the Bald Creek Local Watershed Plan (LWP) (Equinox Environmental 2006). A Fact Sheet summarizing the Bald Creek LWP and links to additional plan documents can be accessed at: http://www.nceep.net/services/lwps/Bald_Creek/NEW_baldcreek.pdf. The complete Bald Creek LWP can be found at: http://www.nceep.net/services/lwps/Bald_Creek/Bald_Creek_Watershed_Plan-FINAL4.pdf. This Project was identified as "Site H" in the LWP and was identified as "UT to Bald Creek in the Rocky Knob sub-watershed of the Bald Creek watershed" in the Bald Creek LWP Restoration Site Atlas dated January 12, 2006. Sixteen "high priority" reaches were identified in the Bald Creek LWP. Of the 16 reaches, six were selected as projects based on their suitability as restoration and/or enhancement projects. The Project is one of the six selected "high priority" reaches.

The LWP identified a number of water quality and habitat issues within the Bald Creek Watershed. The key stressors identified were: Streambank erosion, lack of adequate forested buffer, stream channelization and incision, livestock access to streams, upland erosion (and elevated turbidity in streams), nutrients, and fecal coliform bacteria. The management strategies recommended to address these stressors included:

A. Targeted stream and riparian buffer restoration/enhancement projects;
B. Preservation of forested headwater stream reaches and surrounding catchments;
C. Straight-pipe elimination and upgrades to faulty septic systems;
D. Fencing to exclude livestock from streams; and
E. County promotion of proper site planning, sediment and erosion control, and best management practices (BMPs) to accompany residential development.

The stressors and management strategies identified in the LWP relate directly to the goals and objectives identified for the Project.

The goals of the proposed Project include:

- Reducing erosion from within the Project Study Area;
- Restoring a channel that is able to properly transport watershed flows and sediment loads efficiently;
- Improving wetland and stream aquatic habitat;
- Enhancing wildlife habitat, and
- Improving overall water quality.

The above goals will be accomplished through the following objectives identified for the proposed Project:

- Excluding livestock from the stream in order to:
  - Reduce direct inputs of nutrients and fecal coliform bacteria into the stream; and
  - Eliminate the stress on streambanks caused by hoof shear;
- Planting a native riparian buffer in order to:
  - Provide woody root mass to stabilize the streambanks;
  - Filter sediment and nutrient pollutants from the agricultural fields and prevent them from entering the stream;
  - Provide shade to the stream channel as a means of reducing water temperatures; and
  - Provide a source for woody debris and leaf litter that will enhance aquatic habitat.
- Enhance existing wetlands by excluding livestock, managing invasive species, and planting native wetland vegetation;
- Restoring the Project Reach to a proper bankfull dimensions and stabilizing steep and eroding streambanks;
- Providing the Project Reach with adequate flood-prone area;
- Repairing headcuts and establishing a more diverse bed morphology with riffle-pool sequences supported by in-stream structures;
- Restoring an impounded reach of stream by removing a small dam and culvert;
- Creating protected riparian corridors for wildlife passage; and
- Preserving high-quality forested headwater streams in the steeper reaches of the Project.

The goals and objectives for this Project directly address the management recommendations A, B and D presented in the LWP. Implementing the Project in this Restoration Plan is likely to have a beneficial effect on the water quality in Bald Creek and its receiving waters.

The Project Reach is comprised of five headwater tributaries originating from mountain seeps and springs that are all contained within the conservation easement. The wetlands consist of two small man-made impoundments and four linear wetland/stream complexes. The five tributaries in the Project have been divided into multiple reaches according to stream type and restoration approach. Table 1A provides detailed reach descriptions, station numbers, and treatment type for each stream reach. Table 1B provides treatment type and/or impacts for each wetland. Table 2 provides a summary of the project components. The Project involves 1,335 feet of Restoration, 522 ft of Enhancement I, 2,622 feet of Enhancement II, 800 feet of Preservation, and 1.23 acres of Wetland Enhancement. The five tributaries are defined as follows:

- Mainstem – Unnamed Tributaries to Bald Creek, shown as a blue line on the USGS topographic map. Originates north of the Turner residence, continues under the driveway and into the large pond. Continues under Sweet Hollow Road to the bottom of the Project Reach.
- Tributary 1 – originates northwest of the Turner residence and flows into the pond.
- Tributary 2 – originates north of the Young residence and flows through the Young property. Enters the Mainstem south of Sweet Hollow Road on the Turner property.
- Tributary 3 – originates west of the Mainstem near a spring box. Disappears at the edge of the field with no visible connection to the Mainstem.
- Tributary 4 – originates west of the Mainstem near the bottom of the Project Reach.

All five tributaries included in the Project Reach are headwater streams that originate within the conservation easement. The upper reaches of the Project are largely forested and stable. The downstream reaches have been impacted by current and historic agricultural activities and have minimal riparian buffer. Photographs of the Project are located in Appendix 1.

Because of the topographic constraints of the confined valley, the small size of the stream reaches, and the relatively undeveloped watershed, enhancement is the most appropriate approach for much of the Project. Full stream restoration will occur only where necessary to repair eroding streambanks and headcuts, restore proper dimension and bed morphology, and provide adequate flood-prone area. Relying more on enhancement techniques will also serve to minimize impacts to existing wetlands. The majority of the wetlands are linear stream/wetland complexes, thus implementation of a typical designed stream channel would alter the hydrology and impact the wetlands. Therefore, these reaches will utilize joint stream enhancement and wetland enhancement techniques to increase the quality of the entire aquatic ecosystem.

The only wetland impacts the Project will have involve the removal of a small earthen dam and pond on Tributary 2 near the Young residence. The dam was built to provide a stream crossing that is no longer needed by the landowner. Removing the dam and culvert will restore the stream to its natural free-flowing condition. This will result in 0.05 acres of wetland impacts. The pond was delineated as Wetland 2 and is described in Chapter 5. The pond is not a significant or high-quality aquatic resource, and the benefits gained include: temperature reduction of the water and regaining sediment, leafy/woody debris, and benthic macroinvertebrate transport which justifies the impact to the wetland.

A Farm Conservation Plan will be implemented in conjunction with the Project. NCEEP is implementing the Plan through the Yancey County Soil and Water Conservation District. The Farm Conservation Plan will detail livestock management practices including exclusion fencing, water supply and watering devices, and designated stream crossings. The Plan includes one well in the vicinity of the barn near the downstream end of the Project, three watering devices, and three stream crossings. A preliminary landowner agreement and figure showing the approximate locations of these items is included in Appendix 2. When the Farm Conservation Plan is finalized it may be attached to this Restoration Plan as an addendum.

Development pressures upstream of the Project are relatively low, and over 10 percent of the watershed will be permanently protected by the conservation easement. Having headwater streams in the Project adds greater confidence in the long-term success of the Project because future unpredictable impacts from upstream are limited. Considering the traditional use of streamside areas in the bottomlands for agriculture, roads, and housing makes protecting these headwater areas that much more critical.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF DESIGNED SHEETS

LIST OF APPENDICES

CHAPTER 1. PROJECT SITE IDENTIFICATION AND LOCATION

The Unnamed Tributaries to Bald Creek Stream Restoration Project (Project) is located in the mountains of western North Carolina approximately 30 miles north of Asheville. The Project lies in western Yancey County in the Bald Creek community near Burnsville. The Project Study Area denotes the immediate area investigated including the Project Reach as well as the adjacent floodplain up to the conservation easement boundary.

1.1 DIRECTIONS TO PROJECT SITE

From Asheville, take US 19/23 North (future I-26 West) to Exit 9. Turn right off of Exit 9 and follow US 19 East toward Burnsville. Travel approximately nine miles and turn left on SR 1349/JR Pate Road. (Note: the sign on the road says JR Pate Road, but online mapping shows it as Samra Road). Go 0.2 miles and turn right on Sweet Hollow Road. Sweet Hollow Road crosses the Project just below a pond near the center of the Project.

1.2 USGS HYDROLOGIC UNIT CODE AND NCDWQ RIVER BASIN DESIGNATIONS

The Project Study Area is located in the French Broad River Basin. The French Broad River Basin is made up of three major drainage areas referred to as USGS cataloging units. These three units are the French Broad, Pigeon, and Nolichucky river systems. Bald Creek is part of the Nolichucky drainage, designated as US Geological Survey (USGS) cataloging unit 06010108. These 8-digit units are further subdivided into smaller watershed units (14-digit hydrologic units). The Bald Creek watershed is designated as hydrologic unit 06010108080020. Bald Creek flows into the Cane River just west of Burnsville, then flows north to join the North Toe River at the Mitchell/Yancey County line. Downstream of the confluence with the Cane River, the North Toe becomes the Nolichucky River which joins the French Broad River in Tennessee.

Within North Carolina, the French Broad River Basin is subdivided by the North Carolina Division of Water Quality (NCDWQ) into seven subbasins represented by six-digit subbasin codes (04-03-01 through 04-03-07). The Project Reach is located within NCDWQ subbasin 04-03-07 (NCDWQ 2005).

1.3 PROJECT VICINITY MAP

The Project Vicinity and Project Study Area are shown on Figures 1 and 2, respectively.

1.4 PROJECT COMPONENTS AND STRUCTURE

The Project restoration structure and objectives include Stream Preservation, Restoration, Enhancement II, Enhancement I, and Wetland Enhancement. See Table 1A for detailed breakdown of stream treatment types and Table 1B for wetland enhancement and impact details. Table 2 shows a summary of all project components. Existing conditions of each reach and the proposed restoration plan is discussed in detail later in the report. Project photographs are located in Appendix 1.

CHAPTER 2. WATERSHED CHARACTERIZATION

2.1 DRAINAGE AREA, PROJECT STUDY AREA, AND EASEMENT ACREAGE

The Project's watershed drains the southern slope of Rocky Knob and is shown on Figure 3 Watershed Map. The drainage area at the downstream limits of the Project is approximately 120 acres or 0.19 square miles. See Table 3 for drainage areas throughout the Project. Land use in the watershed is comprised of approximately 85 percent mixed hardwood forest, 12 percent agricultural (primarily pasture and hay), and 3 percent rural residential (Table 4).

For the purposes of this document, the following terms are used to designate the five tributaries included in the Project. Some of the tributaries are further subdivided into reaches according to stream type and restoration approach.

Project Reach – Denotes the five Unnamed Tributaries to Bald Creek included in the Project. See Figure 4 for Hydrologic Features Map. These tributaries are designated as follows:

- Mainstem – shows as a blue line on the Bald Creek USGS topographic map. Originates north of the Turner residence, continues under the driveway and into the large pond. Continues under Sweet Hollow Road to the bottom of the Project Reach.

- Tributary 1 – originates northwest of the Turner residence and flows into the large pond.

- Tributary 2 – originates north of the Young residence and flows through the Young property. Enters the Mainstem south of Sweet Hollow Road on the Turner property.

- Tributary 3 – originates west of the Mainstem near a spring box. Disappears at the edge of the field.

- Tributary 4 – originates west of the Mainstem near the bottom of the Project Reach.

The Project Reach is limited to the tributaries located within the boundary of the conservation easements recorded between NCEEP and Henry Clay Turner and Elizabeth Turner, and between NCEEP and Charles Lee Young, Jr. and Deana Jane Blanchard. The conservation easement boundary was surveyed by Suttles Surveying, P.A. and sealed on March 18, 2008. The survey plat is included in Appendix 2. The total acreage of conservation easement located on the Turner properties is 10.41 acres and Young properties is 2.33 acres, for a total of 12.74 acres.

2.2 SURFACE WATER CLASSIFICATION/WATER QUALITY

The NCDWQ stream index number for Bald Creek is 7-3-22 from the source to the Cane River. It has a Class C water quality classification, meaning it is protected for general uses such as secondary recreation, fishing, wildlife, and aquatic life (NCDWQ 2005). As of 2005, Bald Creek was listed as supporting its classified uses, though no monitoring sites were located in the watershed (NCDWQ 2005). Bald Creek was not listed on the 2006 303(d) list of impaired waters (NCDENR 2007). Major water quality concerns in the Bald Creek Watershed include streambank erosion, lack of adequate forested buffer, stream channelization and incision, livestock access to streams, upland erosion, nutrients, and fecal coliform bacteria (Equinox Environmental 2006).

2.3 LOCAL WATERSHED PLAN (LWP)

The Project was identified by NCEEP during the development of the Bald Creek LWP. NCEEP developed a local watershed plan in the Bald Creek watershed to assess stream health, identify key water resource and ecological problems, and devise a comprehensive strategy to address those problems and improve stream functions. The LWP included the identification of mitigation opportunities in the form of stream restoration/enhancement and preservation project sites.

A Fact Sheet summarizing the Bald Creek LWP and links to additional plan documents can be accessed at: http://www.nceep.net/services/lwps/Bald_Creek/NEW_baldcreek.pdf. The complete Bald Creek LWP can be found at: http://www.nceep.net/services/lwps/Bald_Creek/Bald_Creek_Watershed_Plan-FINAL4.pdf. This Project was identified as a High-Quality Benefit "Site H" in the LWP. The LWP project atlas identified the "UT to Bald Creek in the Rocky Knob sub-watershed of the Bald Creek watershed" Project (Atlas Reference Designation) as a stream restoration opportunity with the potential to improve water quality and habitat within the Bald Creek watershed. The restoration of these tributaries to Bald Creek will increase bank stability, reduce erosion, and eliminate a direct nutrient source to the stream by excluding livestock.

The local watershed planning process began in 2003 and was completed in 2007. The process included land use analysis, water quality monitoring and stakeholder input to identify problems with water quality, habitat, and hydrology. The Bald Creek watershed is a small rural watershed characterized by steep ridges and narrow valleys. The limited quantity of relatively flat bottomland has caused vegetation within/along most stream valleys to be cleared for homes, gardens, and small farms. Streams in the watershed often have very little woody riparian vegetation and most course through fields or yards. Many of the steeper headwater areas remain forested. The Bald Creek watershed is characterized as primarily agricultural and has a history of water quality problems due to sedimentation, nutrients, and fecal coliform issues.

A combination of GIS analysis, historical data review, field surveys of riparian and stream channel conditions, biological sampling, and physical/chemical water quality monitoring identified the major causes of degradation for streams and riparian buffers within the LWP area. Many streams within the Bald Creek watershed exhibit poor riparian and aquatic habitat and high levels of fecal coliform bacteria, turbidity, and nitrates. The causes/sources of these problems include lack of riparian vegetation, historic and recent stream channelization, direct access of livestock to streams, inadequate or failing sewage systems (including straight-pipe discharges), and a lack of sediment and erosion control measures. The aquatic habitat impacts are generally most pronounced along the lower portions of tributary streams. The forested headwater portions of some tributaries are in much better condition, with healthy riparian buffers and lower levels of land disturbance/clearing.

The key stressors identified in the LWP were: Streambank erosion, lack of adequate forested buffer, stream channelization and incision, livestock access to streams, upland erosion (and elevated turbidity in streams), nutrients, and fecal coliform bacteria. The management strategies recommended to address these stressors included:

A. Restoration or enhancement of selected stream reaches and riparian areas;
B. Preservation of forested headwater stream reaches and surrounding catchments;
C. Straight-pipe elimination and upgrades to faulty septic systems;
D. Fencing to exclude livestock from streams; and
E. County promotion of proper site planning, sediment and erosion control, and best management practices (BMPs) to accompany residential development.

The stressors and management strategies identified in the LWP relate directly to the goals and objectives identified for the Project. The Project will accomplish Recommendations A, B, and D.

2.4 PHYSIOGRAPHY, GEOLOGY, AND SOILS

The Project Study Area is located in the Blue Ridge Level III Ecoregion (66), and the Southern Crystalline Ridges and Mountains (66d) Level IV Ecoregion. The following Ecoregion descriptions are taken directly from *Ecoregions of North Carolina* (Griffith et al. 2002).

> The Blue Ridge Ecoregion ranges from narrow ridges to hilly plateaus to more massive mountainous areas with high peaks. The Blue Ridge is part of one of the richest temperate broadleaf forests in the world, with a high diversity of flora and fauna. The ecoregion within North Carolina is characterized by floristically diverse forested slopes; high gradient, cool, clear streams with rocks and boulders; and rugged terrain on primarily metamorphic bedrock (gneiss, schist, and quartzites). Soils are mostly mesic, udic Dystrudepts and Hapludults. Annual precipitation ranges from 40 inches in the Asheville Basin to more than 100 inches on some of the higher peaks in the wetter areas in the southern part of the state.
>
> The Southern Crystalline Ridges and Mountains occur primarily on Precambrian-age igneous and high-grade metamorphic rocks. The crystalline rock types are mostly gneiss and schist, covered by well-drained, acidic, loamy soils. Some small areas of mafic and ultramafic rocks also occur, producing more basic soils. The heterogeneous region has greater relief and higher elevations than the Broad Basins. This ecoregion is mostly forested, with chestnut oak (*Quercus montana*) and other oaks now dominating on most slopes and ridges. Cove forests are common, and northern hardwoods forests are found at higher elevations. There are a few small areas of pasture, apple orchards, Fraser fir Christmas tree farms, or minor cropland at lower elevations.

According to The Soil Survey of Yancey County, North Carolina (Smith 2003), there are four mapped soil units within the Project Study Area (Figure 5). The dominant soil type is Saunook sandy loam, 8-15 percent slopes, stony (ScC) and extends through much of the open pastureland surrounding the Mainstem and Tributary 2 south of Sweet Hollow Road.

The Saunook series is very deep, well-drained, with moderate permeability and a depth to seasonal high water table of more than six feet. The parent material is Colluvium derived from felsic or mafic, high-grade metamorphic or igneous rock. The landscape is intermountain hills and low and intermediate mountains throughout the county. The landform is coves, colluvial fans, drainageways, and benches. The taxonomic class is fine-loamy, mixed, mesic Humic Hapludults

The headwaters of the Mainstem extend into the Thunder-Saunook (TsE) complex, 30 to 50 percent slopes, very bouldery.

The Thunder Series is a very deep, well-drained soil with an average depth to seasonal high water table of more than six feet. It has moderate permeability in the surface layer and subsoil and moderately rapid in the underlying material. The parent material is colluvium derived from felsic or mafic, high-grade metamorphic or igneous rock. This soil is common in intermountain hills and low and intermediate mountains throughout the county. It is found in coves, colluvial fans, drainageways, and benches, and at head slopes, side slopes, footslopes, and toeslopes. The slope range is two to 50 percent. The taxonomic class is defined as: Loamy-skeletal, mixed, mesic Humic Hapludults.

The soils at the headwaters of Tributary 1 and Tributary 2 are Evard-Cowee complex, 30 to 50 percent slopes, stony (EcE).

Evard-Cowee soils are very deep, well-drained, with moderate permeability and a depth to seasonal high water table of more than six feet. The parent material is residuum affected by soil creep in the upper part, weathered from felsic or mafic, high-grade metamorphic or igneous rock. The landscapes are intermountain hills and low and intermediate mountains dominantly in the northern, eastern, and central parts of the county. It is found on ridges and south- to west-facing hillslopes and mountain slopes and on summits and side slopes. The slope range is from eight to 50 percent. The taxonomic class is fine-loamy, oxidic, mesic Typic Hapludults.

The headwaters of Tributary 3 and 4 are Clifton clay loam (CnE2), 30-50 percent slopes, eroded.

The Clifton Series is very deep, well-drained, with moderate permeability in the surface layer and subsoil and moderately rapid in the underlying material. The depth to seasonal high water table is more than six feet. The parent material is residuum affected by soil creep in the upper part, weathered from mafic, high-grade metamorphic or igneous rock. The series occurs in the landscape on intermountain hills and low mountains dominantly in the Jacks Creek, Green Mountain, and central parts of the county. It is found on ridges and south- to west-facing hillslopes and mountain slopes and on summits and side slopes. Slopes range from eight to 50 percent. The taxonomic class is: Clayey, mixed, mesic Typic Hapludults.

The four soil units mapped for the site are not listed as Hydric A or Hydric B on the Hydric Soils List of the Yancey County Soil Survey (Smith 2003). However, during the field investigations, obvious signs of wetland hydrology and wetland vegetation were visible, so wetland delineations were performed. Complete soil profiling was not conducted throughout the site, but during the course of wetland delineations, hydric soils were found. Additional information on the soils can be found in Chapter 5 – Project Site Wetlands.

2.5 HISTORICAL LAND USE AND DEVELOPMENT TRENDS

The historical land use of the watershed is likely very similar to the current land use. This includes forest, rural residential, and agriculture. The upper reaches of the watershed are quite steep which has limited agricultural practices to the lower gradient areas within the Project Reach. The entire watershed has likely been logged for timber several times in the past century. Historical aerial photographs indicate that the Project Study Area has been in agriculture for at least the past 50 years, and surrounding land use has changed little in this time.

Currently, development pressure in the watershed is relatively low. The Project lies in a small watershed (120 acres) with only a few landowners. The surrounding area is trending toward single-family homes with large lot sizes. Current agricultural practices consist of pastureland and hayfields, and appear to be supplemental in nature rather than a primary source of income. At approximately 12.74 acres, the Project will preserve and protect over 10 percent of the watershed with a permanent conservation easement. The fact that all of the tributaries included in the Project Reach are headwater streams with their origins included in the conservation easement adds greater confidence in the long-term success of the Project because unknown future impacts from upstream will be limited.

Widening of US Highway 19 downstream of the Project is currently underway. The roadway project has been anticipated for many years and is expected to foster economic development in the rural corridor. While the road improvement will likely have an indirect effect on development in the area, it is not likely to have a drastic impact on the Project watershed for the reasons stated above. Even with some increased development in the watershed, the projected growth rate is not anticipated to jeopardize the Project's goals and objectives.

2.6 ENVIRONMENTAL SCREENING

The Unnamed Tributaries to Bald Creek Environmental Resources Technical Report (ERTR) dated October 2008 (URS 2008) details the investigations of existing and potential natural and cultural resources on-site. The findings are documented on the *Categorical Exclusion Form for Ecosystem Enhancement Program Projects* (CE Form) located in Appendix 3. The CE Form received final approval on May 29, 2009 and has no outstanding issues. The Agency correspondence and other supporting documentation for the CE Form is also located in Appendix 3.

2.6.1 THREATENED AND ENDANGERED SPECIES

The potential for federally protected species to occur within the Project Study Area was evaluated and documented in the Unnamed Tributaries to Bald Creek ERTR (URS 2008). The most current list of federally protected species in Yancey County was provided by the online databases of the US Fish and Wildlife Service (USFWS) and North Carolina Natural Heritage Program (NCNHP) websites, accessed on July 23, 2008 (USFWS 2008a, NCNHP 2008). During the field investigations, the Project Study Area was assessed for suitable habitat of federally protected species.

Species with the federal status of Endangered (E), Threatened (T), Proposed Endangered (PE), and Proposed Threatened (PT) are protected under provisions of the Endangered Species Act of 1973 as amended (16 USC 1531 et. seq.). Any action likely to adversely affect a species classified as federally protected will be subject to review by the USFWS.

An assessment of the likelihood for each currently listed species to occur within the Project Study Area is discussed below. Habitat descriptions for each species were obtained from the USFWS and NCNHP websites. Table 5 lists the federally protected species potentially occurring in Yancey County identified by the USFWS and NCNHP online databases.

Clemmys muhlenbergii — Bog turtle

Bog Turtles inhabit damp grassy fields, bogs, and marshes in the mountains and western Piedmont. They are typically found in seepage or spring-fed emergent freshwater wetlands associated with streams and bordered by wooded areas. These wetlands have a variety of micro-habitats that include dry pockets, saturated areas, and areas that are periodically flooded. The turtles depend upon this diversity of micro-habitats for foraging, nesting, basking, hibernation, shelter, and other needs. They are known to thrive in wet pastureland due to the small depressions and microtopography created by livestock traffic and the dominance of low-growing herbaceous vegetation maintained by grazing. The bog turtle is shy and secretive, and will burrow rapidly in mud or debris when disturbed. The bog turtle forages for insects, worms, snails, amphibians, and seeds (NRCS 2006).

The Project Study Area contains groundwater-fed springs and wetlands in open pastureland, which may provide suitable habitat for the bog turtle. These habitats may be impacted by construction activities or altered to a system less favorable for the bog turtle. A more complete assessment of potential impacts will be available as the restoration approach is refined. This approach will be presented in the forthcoming Restoration Plan.

Biological Conclusion: Not Applicable. The species is listed as Threatened due to Similarity of Appearance T(S/A). This is due to its similarity of appearance to the Northern bog turtle, another rare species that is listed for protection. Species classified as T(S/A) are not subject to Section 7 consultation and a biological conclusion for this species is not required. However, because suitable habitat may exist on the Project, NCEEP intends to consult with Project Bog Turtle and/or the North Carolina Wildlife Resources Commission (NCWRC).

Glaucomys sabrinus coloratus Carolina northern flying squirrel

The Carolina northern flying squirrel is found in the vegetation transition zone between hardwood and coniferous forests, above 5,000 feet in elevation. Foraging occurs in both communities with nesting only occurring in the hardwood community type. Northern flying squirrels feed on lichens, fungi, seeds, buds, fruit, staminate cones, insects, and animal flesh. The Project Study Area is located in a stream valley with few trees and does not exceed 2,900 feet in elevation.

Biological Conclusion: Suitable habitat for Carolina northern flying squirrel does not exist in the Project Study Area. No effect.

Corynorhinus townsendii virginianus Virginia big-eared bat

This bat is a year-round cave dweller that emerges to feed over large bodies of water. The Project Study Area is located in a stream valley. There are no caves or large bodies of water in the Project Study Area.

Biological Conclusion: Suitable habitat for the Virginia big-eared bat does not exist in the Project Study Area. No effect.

Alasmidonta raveneliana Appalachian elktoe

The Appalachian elktoe has been reported from relatively shallow, medium-sized creeks and rivers with cool, clean, well-oxygenated, moderate to fast flowing water. The species is most often found in riffles, runs, and shallow flowing pools with stable, relatively silt-free, coarse sand and gravel substrate associated with cobble, boulders, and/or bedrock. Stability of the substrate appears to be critical to the Appalachian elktoe, and the species is seldom found in stream reaches with accumulations of silt or shifting sand, gravel, or cobble. The Project Study Area contains small headwater streams with multiple unstable reaches where bank erosion contributes moderate amounts of sediment. The water quality is also impacted by nutrient inputs from direct livestock access. The streams do not appear to support any mussel or fish populations.

Biological Conclusion: Suitable habitat for Appalachian elktoe does not exist in the Project Study Area. No effect.

Hedyotis purpurea var. montana Roan mountain bluet

The habitat for the Roan mountain bluet consists of crevices of rock outcrops at the summits of high elevation (4,200-6,300 feet) peaks of the southern Blue Ridge Mountains. It may also occur in thin, gravelly soils of grassy balds near summit outcrops. The Project Study Area is located in a lower elevation stream valley with no rock outcrops or summits.

Biological Conclusion: Suitable habitat for Roan mountain bluet does not exist in the Project Study Area. No effect.

Geum radiatum Spreading avens

Spreading avens occurs in the Southern Blue Ridge Mountains on high-elevation cliffs, outcrops, and steep slopes which are exposed to full sun. It is also found in thin, gravelly soils of grassy balds near summit outcrops. The Project Study Area is located in a stream valley, with no high-elevation cliffs or outcrops.

Biological Conclusion: Suitable habitat for spreading avens does not exist in the Project Study Area. No effect.

Gymnoderma lineare Rock gnome lichen

Rock gnome lichen grow on rocks in areas of high humidity either at high elevations (usually vertical cliff faces) or on boulders and large rock outcrops in deep river gorges at lower elevations. The Project Study Area is located in a stream valley, with no high cliff faces nor large boulders in a deep river gorge.

Biological Conclusion: Suitable habitat for rock gnome lichen does not exist in the Project Study Area. No effect.

Spiraea virginiana Virginia spiraea

Virginia spiraea grows in rocky flood-scoured riverbanks in gorges or canyons. The Project Study Area is located in a stream valley, with no high-elevation cliffs or outcrops.

Biological Conclusion: Suitable habitat for Virginia spiraea does not exist in the Project Study Area. No effect.

2.6.2 FEDERALLY DESIGNATED CRITICAL HABITAT

The Appalachian elktoe is found in permanent flowing, cool, clean water with stable stream channels and banks; pool, riffle, and run sequences within the channel; stable sand, gravel, cobble, boulder, and bedrock substrates with no more than low amounts of fine sediment, and moderate to high stream gradient; and periodic natural flooding and appropriate fish hosts with adequate living, foraging, and spawning areas.

The Mainstem of the Cane River in Yancey County, from the NC State Route 1381 Bridge, downstream to its confluence with the Toe River is Designated Critical Habitat for the Appalachian elktoe. Bald Creek flows into the Cane River approximately three miles downstream of the Project, and the Designated Critical Habitat begins another two miles down the Cane River, for a total distance of approximately five miles. The proximity of the Project Study Area to the Cane River is shown on Figure 1.

The Project Study Area contains small headwater streams with multiple unstable reaches where bank erosion contributes moderate amounts of sediment. The water quality is also impacted by nutrient inputs from direct livestock access. The Project streams do not appear to support any mussel or fish populations and do not provide suitable habitat for the Appalachian elktoe.

In addition, construction activities are not expected to impact the Designated Critical Habitat located five miles downstream on the Cane River. Appropriate erosion control measures will be implemented to prevent sediment from leaving the Project. The streams have very low flow and will be constructed in the dry with a pump-around system.

Biological Conclusion: Designated Critical Habitat for the Appalachian elktoe does not exist in the Project Study Area. No effect.

2.6.2.1 USFWS Concurrence

USFWS was notified of the Project and invited to comment. No response was received so it is assumed they have no comment on the Project. Correspondence with USFWS is located in Appendix 3.

A letter was also sent to the NCWRC requesting comment on the proposed Project. No response was received. Correspondence with NCWRC is included in Appendix 3.

2.6.3 CULTURAL RESOURCES

2.6.3.1 Site Evaluation Methodology

On August 11, 2008, Archaeologist Matthew Jorgenson, RPA of URS conducted an archaeological site files check at the North Carolina Office of State Archaeology (NCOSA) to determine if any known archaeological resources were located near the Project Study Area. This records check included consulting the NCOSA copy of the USGS Bald Creek topographic quadrangle (USGS 1984) which depicts the locations of previously recorded archaeological sites, site files providing details about the mapped sites, and reports from previous archaeological work conducted at these sites. This information was used to determine if any significant resources had previously been recorded within the Project Study Area.

The National Park Service (NPS) online database (NPS 2008) of historic resources listed on the National Register of Historic Places (NRHP) was consulted to determine if any NRHP-listed historic structures or historic districts were located within the Project Study Area, or within one mile of the Project Study Area.

2.6.3.2 Field Evaluation

The Project Study Area and surrounding property was visually evaluated for the obvious presence of historic architectural and archaeological resources.

2.6.3.3 Potential for Historic Architectural Resources

No historic architectural structures were observed within the Project Study Area during the site investigations. The Project Study Area has been used for agriculture for many decades. It is unlikely that there are any historic structures associated with the property. No historic structures or districts listed on the NRHP online database are located within one mile of the Project Study Area.

Based on the lack of historic-aged structures near the Project Study Area, it is recommended that additional cultural resources studies not be required in conjunction with the proposed Project.

2.6.3.4 Potential for Archaeological Resources

Based on the archaeological site files check conducted by URS Archaeologist Matthew Jorgenson, RPA on August 11, 2008, it was determined that no previously recorded archaeological resources are located within the Project Study Area. Four previously recorded sites are within two miles of the Project Study Area. These sites are all located along the side of US Highway 19 approximately one-to-two miles east of the Project Study Area. Based on field visits in 1999 in conjunction with the widening of US Highway 19 in Madison and Yancey Counties, archaeologists from the North Carolina Department of Transportation (NCDOT) recommended that no further work be conducted at these four sites.

No archeological artifacts have been observed or noted during the natural resources site investigations. Furthermore, the majority of the Project has historically been disturbed due to agricultural purposes such as tilling (although the Project Study Area has been pasturage in recent years). Finally, topography in the vicinity of the Project is rather steep with narrow flat areas adjacent to the existing stream channels.

Based on the lack of previously recorded archaeological sites in the Project Study Area, topography, and previous disturbances that result in a low probability for the presence of unrecorded, intact archaeological resources, it is recommended that additional cultural resources studies not be required in conjunction with the proposed stream restoration Project.

2.6.3.5 SHPO/THPO Concurrence

The State Historic Preservation Office (SHPO) and the Tribal Historic Preservation Office (THPO) were notified of the proposed Project and invited to comment. SHPO responded in a letter dated September 9, 2008 and indicated that they were not aware of any historic resources which would be affected by the Project. The agency had no further comment. All correspondence with SHPO and THPO is located in Appendix 3.

2.7 POTENTIAL CONSTRAINTS

The Project Study Area was evaluated for any constraints that have the potential to effect the stream and wetland design.

2.7.1 PROPERTY OWNERSHIP AND BOUNDARY

The current Project Study Area is located entirely on properties owned by two parties, Henry Clay Turner, III and wife Elizabeth P. Turner (PIN #s 988000388000000 and 988000481984000) and Charles Lee Young, Jr. and wife Deana Jane Blanchard (PIN # 988000481421000). NCEEP has purchased and recorded conservation easements with both landowners. The survey plat of the conservation easement is located in Appendix 2. Also in Appendix 2 is a preliminary landowner agreement which will be finalized in the forthcoming Farm Conservation Plan being developed through the Yancey County Soil and Water Conservation District.

2.7.2 SITE ACCESS

Site/Project access is provided by Sweet Hollow Road and the driveways to the Turner and Young residences. Construction access is anticipated to be confined to the conservation easement.

2.7.3 UTILITIES

No overhead power lines were observed within the Project Study Area, and personal communication with Mr. Turner confirmed that there are underground power lines on the properties (H. Turner, personal communication, 2008). The lines run primarily along Sweet Hollow Road, which is already excluded from the conservation easement and Project Study Area. However, these utilities will need to be located prior to commencement of construction activities. No municipal water lines or sewer lines are present on the properties.

Sweet Hollow Road passes through the Project Study Area and crosses the Mainstem and Tributary 2. As mentioned above, the conservation easement has already been surveyed and this road was excluded from the easement.

2.7.4 FEMA/HYDROLOGIC TRESPASS

The proposed Project is not anticipated to have hydrologic trespass issues. Streams in the Project Reach originate within the recorded conservation easement and are contained within parcels owned by the two participating landowners. The Project is not located in a detailed Federal Emergency Management Agency (FEMA) flood zone.

2.7.5 OTHER CONSTRAINTS

Other Project conditions that may constrain the design options include:

- Elevations and dimensions of existing culverts under Sweet Hollow Road and private driveways;
- Existing barn on the left bank near the downstream limit of the Project;
- Potential stream crossing locations requested by the landowners; and
- Steep valley slopes.

2.7.6 LANDOWNER COMMITMENTS

A preliminary agreement between the primary landowners, Mr. and Mrs. Turner and NCEEP is included in Appendix 2. This agreement will be finalized with the Farm Conservation Plan being developed with the Yancey County Soil and Water Conservation District. The preliminary plan involves one water supply well in the vicinity of the barn near the downstream end of the Project, three watering devices, and three stream crossings. In addition, the landowner has requested a stream viewing area/picnic spot near the confluence of Tributary 2 and the Mainstem consisting of large flat boulders.

CHAPTER 3. PROJECT SITE STREAMS

3.1 EXISTING CONDITIONS SURVEY

The Mainstem is the primary Unnamed Tributary to Bald Creek as shown as a blue line on the Bald Creek USGS topographic map. It is a perennial, second-order stream with a drainage area of approximately 120 acres at the downstream limits of the Project Study Area. The portion of the Mainstem in the Project Reach is approximately 2,600 linear feet. The stream originates as a perennial spring on the mountainside north of the Turner residence, and has clearly defined bed and banks from its origin. However, there are numerous places along the Project Reach where the stream disappears underground entirely, and then resurfaces further downstream. The channel also becomes braided in some sections, and in others it becomes a linear wetland, full of vegetation with no defined bed or banks. These characteristics may be due in part to the soils and geology of the Project, a decayed tree root creating a piping effect that initiates the subterranean flow, and/or livestock access.

However, it must also be noted that the natural resource investigations were conducted during July and August 2008, during the driest period of the year at a time when the region was in a state of "exceptional drought," the most severe category of drought assigned by the North Carolina Drought Management Advisory Council (NCDMAC 2008). In August 2008, streamflow in the French Broad River at Asheville had reached the lowest level since 1895 when the USGS first began making measurements at the site (USGS 2008). Monthly average streamflows were at all-time record lows for the months of June and July at more than half of the USGS long-term streamflow gages in western North Carolina. A map showing the NCDMAC drought classifications (as of August 11, 2008) and the Project is provided with the NCDWQ stream forms in Appendix 4. The entirety of the Project Reach showed flow during initial evaluation in 2006 (H. Tsomides, personal communication, 2008).

The upper portions of the reach are steep and rocky, with a fully forested riparian buffer dominated by tulip poplar (*Liriodendron tulipifera*), southern red oak (*Quercus falcata*), white oak (*Quercus alba*), American beech (*Fagus grandifolia*), black walnut (*Juglans nigra*), honey locust (*Gleditsia triacanthos*), flowering dogwood (*Cornus florida*), spicebush (*Lindera benzoin*), and jewelweed (*Impatiens capensis*). The average channel dimensions in this segment are approximately six inches deep and one-foot wide. The stream has stable bed and banks with a substrate of cobble and gravel. Aquatic life observed in the upper reach included aquatic snails, crayfish (Decapoda), salamanders, and mayflies (Ephemeroptera). As mentioned above, the channel is not always continuous, and the stream flow periodically disappears and then reappears in another location. Multiple stream origins were delineated in this area, but since the entire headwater reach is designated for preservation and will not experience any impacts, it is being viewed as one perennial stream for purposes of simplicity.

It should be noted that the Turner residence receives their drinking water from the headwaters of the Mainstem, and the conservation easement contains a potable water storage tank and piping to convey water to the house. Also, a new driveway is being constructed for additional homes near the top of the Mainstem. A culvert has been installed at this location. The conservation easement language allows for a crossing in this general location.

As the Mainstem approaches the base of the slope, it becomes braided and two channels enter a small impoundment designated as Wetland 2. When the stream emerges on the downstream side of the dam, it flows a short distance before entering a culvert under the driveway and then flowing into the large pond designated as Wetland 1A. This segment is also characterized by periodic subterranean flow. The slope is less steep and the substrate consists of fine gravel and silt. The left side of the stream abuts a steep slope, with floodplain access available only on the right side. The riparian buffer is fully forested on the left side with large trees (predominately tulip poplar, American beech, white pine (*Pinus alba*), flowering

dogwood, and spicebush) while the buffer on the right side consists of Rhododendron (*Rhoodendron sp.*), witch hazel (*Hamamelis virginiana*), Joe-pye weed (*Eupatorium purpureum*), ironweed (*Vernonia* sp.), elderberry (*Sambucus canadensis*), marigold (*Calendula sp*.), multiflora rose (*Rosa multiflora*), and Japanese honeysuckle (*Lonicera japonica*).

After the Mainstem flows into the pond, it loses definition and does not reappear until several hundred feet below the pond. There is no clear channel emerging from the downstream side of the dam, and no surface water was visible. The pond drainage pipe was well above the water line, and appears to function more as an emergency spillway during times of high flow. The outlet of the pipe was not found, but is presumed to be buried beneath a pile of riprap on the downstream side of the road. The low-lying area where a channel would be was fully vegetated with grasses and rush, and no stream substrate was evident. This area was delineated as a linear wetland (Wetland 4) until stream characteristics re-emerged. Based on the substantial flow of water in the upstream reaches, it could be presumed that the flow is subterranean in this portion. The lack of flow during field evaluation was certainly exacerbated by the current drought. However, the density of the vegetation and the absence of a streambed substrate indicate that this is a relatively permanent condition. Much of this reach is protected from livestock access by fencing on the right "bank" and is very stable with no signs of erosion or degradation.

Several hundred feet below the dam, the fencing crosses the channel and follows the left bank, so that livestock are permitted to access the channel and the stream immediately becomes less stable. There is also a large headcut where water resurfaces from the ground. Below this point, the channel is incised and the banks are badly trampled and eroding. There is very little riparian vegetation in this segment other than fescue (*Festuca sp*.), blackberry (*Rubus sp*.), and multiflora rose. The water was barely flowing at the time of the field visit due to the exceptional drought, and the streambed was primarily muck and manure without typical stream substrate sorting. No aquatic life was observed in this segment.

This highly impaired reach continues for a few hundred feet, until it once again disappears into a linear wetland (Wetland 5). The slope flattens out substantially and the channel is completely filled with vegetation (grass and sedge). The soils are saturated and areas of standing water were observed as well as iron-oxidizing bacteria. This linear wetland continues up Tributary 2 from the confluence.

Shortly below the confluence with Tributary 2, the wetland ends and the channel once again takes on stream characteristics. There is a livestock crossing stabilized with riprap. Just below the crossing there are a series of small headcuts. From this point to the end of the Project Reach, the channel is incised in most areas, with banks up to five feet high. The riparian vegetation consists of a thin line of brambles including blackberry, multiflora rose, and Japanese honeysuckle, with an occasional clump of black willow (*Salix nigra*). Near the bottom of the Project Reach, a dense thicket of eastern cottonwoods (*Populus deltoides*) has been planted and the channel is much more stable in this short section. There is a makeshift crossing just below this thicket where the channel becomes incised again to the end of the Project Reach.

Tributary 1 is a first-order stream that flows from the northwest portion of the Project Study Area and merges with the Mainstem in the large open water pond, Wetland 1A. It originates as an intermittent channel within Wetland 1, and becomes a perennial channel shortly before reaching the pond. The total length of Tributary 1 within the Project Reach is approximately 450 feet. Just below the perennial origin, a series of headcuts causes the channel to become incised. The channel is nearly two feet deep in some areas and almost two feet wide. The channel then disperses entirely before seeping into the pond. The riparian zone is well-vegetated with tulip poplar, spicebush, poison hemlock (*Conium maculatum*), Jack in the pulpit (*Arisaema triphyllum*), jewelweed, and wild ginger (*Asarum canadense*).

Tributary 2 is a first-order stream that originates as an intermittent channel on the mountain above the Young residence and art studio. The upper reach of approximately 600 feet is quite steep, with well-defined bed and banks and a substrate of mixed gravel, silt, and cobble. The average channel dimensions in the upper portion are one to three feet wide and six to 12 inches deep. It has a fully forested riparian zone, dominated by hickory (*Carya sp.),* black walnut, red maple (*Acer rubrum*), white ash (*Fraxinus americana*) and white oak in the overstory, American hornbeam (*Carpinus caroliniana*), flowering dogwood and spicebush in the midstory, and multiflora rose, Japanese honeysuckle, microstegium (*Microstegium vimineum*), Christmas fern (*Polystichum acrostichoides*), jewelweed, wild ginger, and poison ivy (*Toxicodendron radicans*) in the understory. Below the art studio the stream flows alongside the driveway which limits the riparian buffer. The stream becomes perennial midway between the art studio and Young residence. Just below the Young residence, the slope is greatly reduced and the stream passes beneath the driveway via a 12-inch corrugated plastic culvert.

The next section of Tributary 2 is approximately 400 feet long and flows from the driveway culvert to another culvert beneath Sweet Hollow Road. The riparian vegetation in this segment is primarily maintained lawn grasses with little woody vegetation. Immediately below the driveway the stream has a lower gradient and higher sinuosity. The channel is approximately two feet wide and six inches deep with a wide floodplain in the upper portion. As it nears the crossing beneath Sweet Hollow Road, a series of small headcuts cause the channel to become somewhat incised and the banks are much less stable. The stream becomes confined on the left side by a steep slope. Just before it enters the culvert under Sweet Hollow Road, the flow disappeared underground entirely. The channel and culvert were dry during field investigation.

From the culvert outlet below Sweet Hollow Road to the confluence with the Mainstem is approximately 500 feet. The channel in this reach was completely filled with vegetation, with no stream substrate evident and no surface water flow visible. The area was delineated as a linear wetland (Wetland 5). The vegetation in this area was dominated by grasses and sedges, with several large clumps of black willow.

The upper portion of Tributary 3 does not classify (score on the NCDWQ Stream Identification Form) as an intermittent or perennial channel; however, it is a headwater wet seep and water conveyance down the mountain slope in wet periods. An old concrete spring box is located just below the head of the seep. The channel extends approximately 200 feet below the spring box. There is an additional 200 feet between the end of the channel and the Mainstem, which is pastureland with no visible evidence of a historical channel or pipe. This area may have been altered when the pastureland was developed. The area was probed for indications of a pipe or drainage feature below the ground, but none were found. The water coming off this mountain slope is conveying from the spring box and surrounding area through the channel, sheet flow, and/or subterranean flow downstream. There is an indication of flow entering the stream channel downstream of this feature approximately two feet above the main channel's bed elevation. The vegetation around the seep is dominated by red maple, white pine, multiflora rose, and ironweed.

Tributary 4 is a first-order wetland/stream complex that enters the Mainstem from the west at the bottom of the Project Reach. It is approximately 450 feet long and contains two primary springheads with perennial flow. The area is thoroughly trampled by livestock, which disrupts any concentrated channels and disperses the flow, allowing vegetation to fill in the channel. The entire tributary was delineated as a linear wetland (Wetland 3), except the very bottom portion where it enters the Mainstem. While there was a small amount of flowing water in places, the streambed was disturbed by livestock and contained only a mucky substrate. In addition, biology was also lacking due to poor water quality and lack of substrate. The vegetation was mostly grass, with scattered trees, shrubs, and herbs. Species present included: alder (*Alnus serrulata*), eastern cottonwood, multiflora rose, honey locust, cardinal flower (*Lobelia cardinalis*), and fescue.

3.2 CHANNEL CLASSIFICATION

The reaches have been classified utilizing morphologic characteristics including: dimension, longitudinal profile, and plan-form features. The dimensional characteristics influence the entrenchment ratio or vertical containment of the channel, width-to-depth ratio, and dominant channel materials. The longitudinal profile indicates slope and bed features of the system (Rosgen 1994). Finally, the plan-form portrays sinuosity and meander width ratio (beltwidth) or the degree of lateral containment. The Unnamed Tributaries to Bald Creek have the following classifications: Mainstem (Reach A) is a B type channel with multiple spring heads and sections of subterranean flow; Mainstem (Reach B) is typical of a B channel in a headwater area with a somewhat entrenched floodplain and step-pool bed morphology; Mainstem (Reach C) is also a B channel with the exception of the ponded area; Mainstem (Reach D) is a combination of a vegetated swale and linear wetland; Mainstem (Reach E) is an entrenched, low width-to-depth G channel typical of rural streams with livestock access; Tributary 1 (Reach 1A) is a B channel; headcuts have deteriorated Tributary 1 (Reach 1B) into a G channel; Tributary 2 (Reach 2A) is a stable B channel; Tributary 2 (Reach 2B) has incised to a G; Tributary 2 (Reach 1C) mostly resembles a vegetated swale due to landowner activities and livestock; Tributary 3 (Reach 3A) is a spring-fed swale; and Tributary 4 (Reach 4A) resembles a spring-fed swale as well due to livestock trampling the stream channel.

3.3 VALLEY CLASSIFICATION

The headwater valleys of the Unnamed Tributaries to Bald Creek are located in a Type II valley. The valley has moderate relief and is relatively stable with moderate side slope gradients. The valley begins to transition into a Type III valley along the Mainstem below Sweet Hollow Road as it widens and becomes less steep. Type II and III valleys typically contain B channels in stable conditions and G channels under disequilibrium conditions.

3.4 DISCHARGE

Since there are no gages on-site to measure discharge and the drainage areas are well below the North Carolina Rural Mountain Regional Curve (Harman et al. 1999), Equation 1, Manning's equation, was utilized to estimate discharge for the Project (Chow 1959). The Mainstem's bankfull discharge ranges between 20 and 25 cubic feet per second (ft3/s). The discharges for reaches are shown in Table 6.

$$Q = (1.49AR^{2/3}S^{1/2}/n) \qquad \text{(Equation 1)}$$

where: Q = Discharge in cfs,
A = Cross-Sectional Area of the riffle at bankfull stage in sq. ft,
R = Hydraulic Radius of the riffle cross-section at bankfull stage in ft,
S = Average Channel Slope in ft/ft, and
n = Manning's Roughness Coefficient.

3.5 CHANNEL MORPHOLOGY

Channel morphology characterizes the tributaries' entrenchment ratio, width-to-depth ratio, sinuosity, channel slope, and channel materials. These features shape the dimension, pattern, and profile and help characterize the system such that the channel can be described. The entrenchment ratio across the Project is typically moderately entrenched. In reaches where the entrenchment ratio has decreased, indicating an incised channel that has lost access to the floodplain, restoration activities are proposed. The width-to-depth ratio characterizes the shape of the channel. The Project consistently has a moderate width-to-depth ratio (greater than 12). Just as a decrease in entrenchment ratio can be an indicator of an unstable system, where the tributaries are dropping into the low width-to-depth ratio category, they are showing signs of instability. This may not be true for all systems, such as an A type channel; however, on-site the

tributaries are G channels. Sinuosity is an indication of the channel's length in comparison with the valley's length. The tributaries do not have a great deal of sinuosity which is fairly typical of mountain headwater systems. The channel slope and materials on-site are typical of B type streams which step-pool the way down mountain valleys. Full channel morphology values can be found in Table 6.

3.6 CHANNEL EVOLUTION

The tributaries show that a variety of stages of channel evolution exist on-site and have occurred in the past. For example, below Sweet Hollow Road the current landowner explained that when he purchased the property the Mainstem and Tributary 2 were deeply incised channels. Under a stable regime these channels were most likely a B channel; however, human induced pressure such as channelization, clearing, and livestock grazing degraded the channel. From the landowner's description, the steep banks of the channels would be classified as G channels. The landowner filled the channels and formed them into grassed swales. On Tributary 1, a simple fence line separates a channel which has maintained the grassed swale dimension and a channel with unstable banks and headcuts from livestock pressure. Once the channel turns outside the fence, it becomes a linear wetland. Here one stress has taken a channel from vegetated swale to a G type channel. Should the livestock pressure continue, the channel will begin to widen into an F channel. With time and removal of the livestock, the channel may return to a stable system; however, a significant quantity of sediment will impact downstream reaches prior to a stable dynamic being reached.

Downstream of the confluence with Tributary 2, the Mainstem has already cut downward enough to characterize as a G type channel. As the banks continue to erode, this reach will transform into an F type channel. After a significant quantity of sediment moves downstream, the stream is anticipated to stabilize into a B type channel. However, stabilization will come at the cost of many years, a significant amount of sediment, habitat loss at the eroding site and deposition site, and water quality. Restoration will have a short impact to the system and bring it into equilibrium without years of excessive degradation on-site and aggregation downstream. B type channels are stable evolutionary endpoints where the channel and associated watershed are protected from alterations or impacts.

3.7 CHANNEL STABILITY ASSESSMENT

The Project has been broken up into a series of reaches as a result of the channel stability assessment. There are portions of the Project that appear to be stable; however, there are areas of instability that have the potential to move further upstream and/or downstream and jeopardize the stable reaches. Catalysts of instability include removal of streamside vegetation and livestock access to the stream channel. Instability is evident in the reaches by actively eroding areas of streambed and streambanks. In areas where the streambed is experiencing headcuts and/or the streambanks are bare, restoration activities are proposed.

Evaluating the Bank Erosion Hazard Index (BEHI) values for the Project validates the channel stability assessment. Reaches score from very low to very high, mirroring the variety of conditions found on-site. As expected with a good deal of preservation and enhancement proposed, the majority of the Project ranks very low. The BEHI values correspond with the proposed restoration activity. BEHI sediment yield values were derived from streambank study results on the Mitchell River, North Carolina (Rosgen 2001). BEHI, Near Bank Stress, and sediment export estimates are found in Table 7.

Reaches classifying as very low include all or part of the following: Mainstem (Reach A), Mainstem (Reach C), Mainstem (Reach D), Tributary 2 (Reach 2C), and Tributary 3 (Reach 3A). These reaches are experiencing less livestock pressure. Headcuts and bank erosion are not prevalent in these reaches, thus preservation and enhancement level activities are proposed. High and very high BEHI values were found

for reaches Mainstem (Reach E) and Tributary 1 (Reach 1B). These reaches are dominated by headcuts and bank erosion, thus restoration is proposed. The remaining reaches have moderate and low BEHI values.

3.8 BANKFULL VERIFICATION

Often the NC Mountain Rural Regional Curve would be utilized to verify bankfull indicators for the Project; however, the Project Reach has relatively small drainage areas. Since the data used to develop the curve do not contain points with lower drainage areas, it is not appropriate to extrapolate the curve. Field indicators included: vegetation lines, scour lines, and bench features. No gages are located on the Project to verify bankfull; however, there are several stable reaches on-site which were used to verify bankfull determinations.

3.9 VEGETATION COMMUNITY TYPE DESCRIPTIONS AND DISTURBANCE HISTORY

The upper reaches of the Project, along the Mainstem and Tributary 2, are steep, rocky, southern-facing slopes at elevations of less than 3,000 feet. The canopy layer is dominated by tulip poplar, red oak, white oak, American beech, black walnut, hickory, red maple, honey locust, white ash, and white pine. The sub-canopy is dominated by the following: flowering dogwood, spicebush, American hornbeam, Rhododendron, witch hazel, Joe-pye weed, ironweed, elderberry, and marigold. Jewelweed, poison hemlock, Jack in the pulpit, wild ginger, Christmas fern, and poison ivy dominate the understory along with the invasive species multiflora rose, Japanese honeysuckle, and microstegium.

This community most closely resembles the Piedmont/Low Mountain Alluvial Forest as classified by Schafale and Weakley (1990). This community type is a relatively broad category designed for small streams due to the fact that smaller streams generally have more variable vegetative communities. Smaller watersheds result in a more variable flooding regime, which in turn produces a more highly variable mixture of species. The relief and size of the fluvial landforms, which differentiate the communities in large floodplains, become smaller.

The community also contains some characteristics of a Montane Alluvial Forest in that there is a noted absence of some characteristic Piedmont species such as sweetgum (*Liquidambar styraciflua*), boxwood (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*), and winged elm (*Ulmus alata*). However, the Project also lacks many of the typical Mountain species such as Canadian hemlock (*Tsuga canadensis*), yellow birch (*Betula alleghaniensis*), and sweet birch (*Betula lenta*).

The lower reaches of the Project have been disturbed extensively by grazing and no longer represent a natural vegetative community. The riparian area consists primarily of pasture grasses (ie. fescue) with a thin border of shrubs and invasive species along the top of bank. Dominant species include blackberry, multiflora rose, Japanese honeysuckle, and several large clumps of black willow. Near the bottom of the Project Reach, a dense thicket of eastern cottonwoods has been planted and the channel is much more stable in this short section.

Additional species located in the wetland areas include cattail (*Typha latifolia*), woolgrass (*Scirpus cyperinus*), rice cutgrass (*Leersia oryzoides*), sedges (*Carex* spp.), cardinal flower, rush (*Juncus* sp.), and pin cherry (*Prunus pensylvanica*).

CHAPTER 4. REFERENCE STREAMS

A cursory watershed search was conducted to locate appropriate reference reaches for the Project. Stable sections within the Project Study Reach were surveyed and utilized as reference reaches for the design. The benefit of on-site data is an exact match of hydrological and geological conditions between the reference reach and the Project. Cross-sections were taken from stable areas along the Mainstem (Reach C), below the Project, and within Tributary 2 (Reach 2A). Morphological data for the reference reaches are presented in Table 6. Representative cross-section photographs are shown in Appendix 1.

4.1 WATERSHED CHARACTERIZATION

Since the design is based on an on-site reference reach, the watershed is characterized as discussed above in the existing conditions section.

4.2 CHANNEL CLASSIFICATION

The reference channels are classified as type B channels with stable bed features and streambanks. These sections of the Project are functioning well and maintaining stable features. Two areas were surveyed for reference evaluation. The first area was alongside the Turner residence. This section of channel is maintaining dimension, pattern, and profile without noticeable aggregation and/or degradation. Just downstream of the Project, there is a distinctive bankfull bench and stable section of channel. This section will be utilized mainly for the downstream Mainstem reach.

4.3 DISCHARGE

As in the existing conditions, there are no gages on-site to measure discharge and the drainage areas are well below the North Carolina Rural Mountain Regional Curve, thus Manning's equation was utilized to estimate discharge for the Project. Discharges for reference reaches are shown in Table 6.

4.4 CHANNEL MORPHOLOGY

Channel morphology of a reference reach shows stable characteristics. The Unnamed Tributaries on-site that portray reference conditions are B type channels which are moderately entrenched with a moderate width-to-depth ratio. Even within the reference reaches, the Unnamed Tributaries do not have a high deal of sinuosity; however, B type channels typical of mountain headwater systems do not tend to be sinuous. The channel slope and materials on-site are typical of B type channels which step pool down mountain valleys. The reference reaches' bankfull is at the top of bank and the morphology is showing no signs of excessive erosion or aggregation. As the primary reference reaches are on the Project, the morphology is an ideal indicator of the channel dimension and shape that is appropriate for the Project. Fortunately, the Project has three areas where stable cross-sections were evaluated to form the appropriate dimensions for different reaches within the Project.

4.5 CHANNEL STABILITY ASSESSMENT

The reference reaches chosen portray stable areas within the Project. Evaluating the BEHI values for the reference reaches verifies the channel stability assessment. The reference reaches scores are within the very low range as anticipated for a reference reach. BEHI sediment yield values were derived from streambank study results on the Mitchell River, North Carolina (Rosgen 2001) and are very low. BEHI, Near Bank Stress, and sediment export estimates are found in Table 8.

4.6 BANKFULL VERIFICATION

The cross-sections taken within the reference reach all had strong bankfull indicators. In the Mainstem (Reach C) and Tributary 2 (Reach 2A) bankfull is at top of bank with consistent vegetation indicators.

The reference cross section in Mainstem (Reach E) has a definite bench feature and vegetation line consistent with several other bankfull indicators upstream and downstream.

4.7 VEGETATION COMMUNITY TYPES DESCRIPTIONS AND DISTURBANCE HISTORY

The Project is fortunate to have an intact native vegetative community on-site to use as a reference for the riparian plantings. The community in the upstream reaches of the Project most closely resembles a Piedmont/Low Mountain Alluvial Forest. The species present are detailed in Section 3.9.

CHAPTER 5. PROJECT SITE WETLANDS

5.1 JURISDICTIONAL WETLANDS

The presence of jurisdictional wetlands in the Project Study Area was evaluated and documented in the Unnamed Tributaries to Bald Creek ERTR (URS 2008). National Wetlands Inventory (NWI) mapping shows no mapped wetlands within the Project Study Area (USFWS 2008b). The four soil units mapped for the site are not listed as Hydric A or Hydric B on the Hydric Soils List of the Yancey County Soil Survey (Smith 2003). However, during the field investigations, obvious signs of wetland hydrology and wetland vegetation were visible, so wetland delineations were performed. Complete soil profiling was not conducted throughout the site, but during the course of wetland delineations, hydric soils were found. Profiles were dug with a hand auger to depths of approximately 18 inches to confirm hydric/non-hydric status.

Six jurisdictional wetlands were field-delineated within the Project Study Area – Wetland 1, Wetland 1A, Wetland 2, Wetland 3, Wetland 4, and Wetland 5. Their locations are shown on Figure 4. Photographs of the wetlands are located in Appendix 1. The wetland classifications and acreages are summarized in Table 9. Descriptions of both wetland and upland soils can be found on the US Army Corps of Engineers (USACE) Wetland Data Forms located in Appendix 5, including depth, color, and texture of each soil horizon. A Jurisdictional Determination by the USACE was not included in the scope for this Project.

Wetland 1 is a linear wetland that acts as a narrow floodplain for the portion of Tributary 1 north of the large pond. It is approximately 0.18 acres in size and is classified as a palustrine forested, broad-leaved deciduous, seasonally flooded wetland (PFO1C) (Cowardin et al. 1970). The dominant vegetation includes tulip poplar, poison hemlock, jewelweed, Jack in the pulpit, wild ginger, and spicebush. The soils in Wetland 1 are mapped as Saunook sandy loam, 8 to 15 percent slopes. Wetland 1 flows directly into Wetland 1A, an open water pond just south of Wetland 1.

Wetland 1A is a 0.48-acre pond that was formed when Sweet Hollow Road was built in the early 1980s. The dam was built to elevate the road and created the pond in the process. The pond has no riser or outlet other than an emergency spillway above the normal pool elevation. The pond is not lined so water does seep through the dam. Wetland 1A receives hydrology from Wetland 1, Tributary 1, and the Mainstem. Wetland 1A is classified as a palustrine open water (POW) wetland. There is no vegetation within the open water portion of the wetland; however, the fringe of the pond supports black willow, cattail, woolgrass, and ironweed. Wetland 1A is mapped as W (water) in the soil survey.

Wetland 2 is a shallow 0.05-acre open water pond formed by a small vehicular crossing and earthen dam on the Mainstem near the Turner residence. The pond drains via a six-inch pipe to the Mainstem. Wetland 2 is classified as a POW wetland. Vegetation within the open water portion consists of rice cutgrass. Fringe species include jewelweed, black willow, cattail, and sedges. The soils in Wetland 2 are mapped as Thunder-Saunook complex, 30 to 50 percent slopes. The restoration plan for the Project includes removing the dam and restoring the pond to a free-flowing stream, thus producing 0.05 acre of wetland impacts.

Wetland 3 is a linear wetland that forms a narrow floodplain for Tributary 4. It is approximately 0.20 acres in size and is classified as a PFO1C wetland. It is located within an active pasture area and has been largely disturbed by grazing horses and cattle. The dominant vegetation includes alder, eastern cottonwood, multiflora rose, honey locust, cardinal flower, and fescue. The soils in Wetland 3 are mapped as Clifton clay loam, 30 to 50 percent slopes.

Wetland 4 is a linear wetland that forms a narrow floodplain for the Mainstem in the pasture downstream of Sweet Hollow Road (Reach D). It is approximately 0.11 acres in size and is classified as a PFO1C wetland. It is located within an active pasture area and has been largely disturbed by grazing horses and cattle. The dominant vegetation is largely herbaceous, consisting of pasture grasses (Fescue), rush, woolgrass, jewelweed, and ironweed. Scattered multiflora rose, black willow, cottonwood, and pin cherry are concentrated along the channel at the downstream portion of the wetland. The soils in Wetland 4 are mapped as Saunook sandy loam, 8 to 15 percent slopes. Wetland 4 is separated from Wetland 5 by a short stretch of the Mainstem.

Wetland 5 resembles Wetland 4 in soils, hydrology, and vegetation. Wetland 5 is a linear wetland that forms a narrow floodplain for Tributary 2 south of Sweet Hollow Road (Reach C). It is approximately 0.26 acres in size and is classified as a PFO1C wetland. It is located within an active pasture area and has been largely disturbed by grazing horses and cattle. The dominant vegetation is largely herbaceous, consisting of pasture grasses (Fescue), rush, woolgrass, jewelweed, and ironweed. Scattered multiflora rose, black willow, cottonwood, and pin cherry also populate the banks. The soils in Wetland 5 are mapped as Saunook sandy loam, 8 to 15 percent slopes.

CHAPTER 6. REFERENCE WETLANDS

The goal of wetland enhancement activities is to improve the ecological function and habitat value of the wetlands. In order to determine what parameters need to be improved, a reference wetland is used as a model for the enhancement plan. The on-site Wetland 1 has many reference characteristics that would be appropriate for the remaining wetlands on-site. The soils and hydrologic regime are the same as those on-site, and it is located in an area without livestock access so the vegetative community is largely intact and representative of the plants that are likely to grow well on-site. However, because it is located so close to areas of human disturbance, Wetland 1 is not in pristine condition and has some invasive species. For this reason, Wetland 1 is included in the proposed enhancement plan to remove the invasive species and plant supplemental wetland vegetation.

Wetland 1 is a linear wetland that acts as a narrow floodplain for the portion of Tributary 1 north of the large pond. It is approximately 0.18 acres in size and is classified as a palustrine forested, broad-leaved deciduous, seasonally flooded wetland (PFO1C) (Cowardin et al. 1970). The dominant vegetation includes tulip poplar, poison hemlock, jewelweed, Jack in the pulpit, wild ginger, and spicebush. The soils in Wetland 1 are mapped as Saunook sandy loam, 8 to 15 percent slopes. Wetland 1 flows directly into Wetland 1A, an open water pond just south of Wetland 1.

In addition to the parameters utilized from Wetland 1, a published standard classification of a mountainous wetland was used to develop a more diverse and comprehensive planting plan. The on-site wetlands closely resemble the Southern Appalachian Seepage Wetland (CES202.317) identified on the NatureServe Explorer website (NatureServe 2009). The website describes this wetland as follows:

> This system consists of seepage-fed wetlands in the southern Appalachians on gentle slopes, with substantial seepage flow. Vegetation is variable, both within and among examples, but lacks vegetation characteristic of bogs or floodplains. This is a small-patch system occurring over a wide elevational range, nearly to the highest peaks, but is generally lacking from flat valley bottoms…...This system is distinguished from Southern and Central Appalachian Bog and Fen (CES202.300) by occurrence in sloping settings rather than flat valley bottoms, with more rapid flow of water, and by lack of dominance by the characteristic bog or fen flora (though some of it may be present). The only other systems with wetland systems within its range, floodplains and upland pools, are more distinct floristically as well as associated with very different landforms (NatureServe 2009).

CHAPTER 7. PROJECT SITE RESTORATION PLAN

7.1 RESTORATION PROJECT GOALS AND OBJECTIVES

The goals and objectives for the Project are targeted to address the sources of impairment and management recommendations documented in the Bald Creek LWP (Equinox Environmental 2006). A Fact Sheet summarizing the Bald Creek LWP and links to additional plan documents can be accessed at: http://www.nceep.net/services/lwps/Bald_Creek/NEW_baldcreek.pdf. The complete Bald Creek LWP can be found at: http://www.nceep.net/services/lwps/Bald_Creek/Bald_Creek_Watershed_Plan-FINAL4.pdf. This Project was identified as "Site H" in the LWP and was identified as "UT to Bald Creek in the Rocky Knob sub-watershed of the Bald Creek watershed" in the Bald Creek LWP Restoration Site Atlas dated January 12, 2006. Sixteen "high priority" reaches were identified in the Bald Creek LWP. Of the 16 reaches, six were selected for restoration and/or enhancement projects. The Project is one of the six selected "high priority" reaches.

The LWP identified a number of water quality and habitat issues within the Bald Creek Watershed. The key stressors identified were: Streambank erosion, lack of adequate forested buffer, stream channelization and incision, livestock access to streams, upland erosion (and elevated turbidity in streams), nutrients, and fecal coliform bacteria. The management strategies recommended to address these stressors included:

A. Targeted stream and riparian buffer restoration/enhancement projects;
B. Preservation of forested headwater stream reaches and surrounding catchments;
C. Straight-pipe elimination and upgrades to faulty septic systems;
D. Fencing to exclude livestock from streams; and
E. County promotion of proper site planning, sediment and erosion control, and BMPs to accompany residential development.

The stressors and management strategies identified in the LWP relate directly to the goals and objectives identified for the Project.

The goals of the proposed Project include:

- Reducing erosion from within the Project Study Area;
- Restoring a channel that is able to properly transport watershed flows and sediment loads efficiently;
- Improving wetland and stream aquatic habitat;
- Enhancing wildlife habitat, and
- Improving overall water quality.

The above goals will be accomplished through the following objectives identified for the proposed Project:

- Excluding livestock from the stream in order to:
  - Reduce direct inputs of nutrients and fecal coliform bacteria into the stream; and
  - Eliminate the stress on streambanks caused by hoof shear;
- Planting a native riparian buffer in order to:
  - Provide woody root mass to stabilize the streambanks;
  - Filter sediment and nutrient pollutants from the agricultural fields and prevent them from entering the stream;
  - Provide shade to the stream channel as a means of reducing water temperatures; and

  - Provide a source for woody debris and leaf litter that will enhance aquatic habitat.
- Enhance existing wetlands by excluding livestock, managing invasive species, and planting native wetland vegetation;
- Restoring the Project Reach to a proper bankfull dimensions and stabilizing steep and eroding streambanks;
- Providing the Project Reach with adequate flood-prone area;
- Repairing headcuts and establishing a more diverse bed morphology with riffle-pool sequences supported by in-stream structures;
- Restoring an impounded reach of stream by removing a small dam and culvert;
- Creating protected riparian corridors for wildlife passage; and
- Preserving high-quality forested headwater streams in the steeper reaches of the Project.

The goals and objectives for this Project directly address the management recommendations A, B and D presented in the LWP. Implementing the Project in this Restoration Plan is likely to have a beneficial effect on the water quality in Bald Creek and its receiving waters.

7.1.1 DESIGNED CHANNEL CLASSIFICATION

The existing channel and designed channel alignments are shown on Restoration Plan View Proposed Sheets 0-5 in Section 13.0. Table 6 presents the Morphological Data for the existing reaches, proposed design reaches, and reference reaches. The dimensionless ratios developed from the reference reaches were used to build the design parameters for the Project Reach. The existing profiles are shown on Restoration Plan Existing Profile Sheets 6 – 9. For the purpose of restoration type, the Project Reach has been divided into smaller reaches (Table 1 and Chapter 13 – Plan Sheets).

Mainstem

Reach A consists of 800 linear feet of preservation. The reach contains the headwaters of the Mainstem and has stable banks and good bed morphology. Aside from one new driveway crossing, the riparian area consists entirely of mature mixed hardwood forest. Protecting intact headwater catchments was identified as a key recommendation in the LWP (Equinox Environmental 2006) because the benefits associated with the forested headwaters are likely significant and help to offset the many impairments further downstream. The intact forests in the headwaters provide a source of woody debris and organic matter to the streams, and these materials then flow into the lower reaches where they provide habitat and food for aquatic organisms. Heavy rains are also captured by these forests, increasing infiltration and reducing flooding and storm flow surges that can be damaging to vulnerable, exposed streambanks.

Reach B begins at Station 18+00 shortly above the small impoundment delineated as Wetland 2. This reach will be restored by removing the dam, pond, and culvert to return the channel to a free-flowing stream. Wetland 2 is a small man-made pond created when an earthen dam was built to provide a stream crossing. The crossing is no longer needed by the landowner, and the pond is not a significant or high-quality aquatic resource. Removing the dam and culvert would provide substantial benefit to the stream channel allowing it to regain its proper dimension, pattern, and profile similar to the high-quality preservation reach (Reach A) immediately upstream. This restoration approach will result in 0.05 acres of wetland impacts by removing the pond, but the benefit gained by the stream justifies the impact to the wetland.

The new channel will be constructed on-line due to the naturally confined valley type. Below the dam the stream has unstable banks that are very steep and eroding. The banks will be graded to provide a bankfull bench and reduce the bank angle, particularly on the left bank which becomes a steep hillside. The thalweg will be adjusted to the right (facing downstream) slightly to provide relief to the left bank. Several step pool structures will be used to create a stable transition of slope after removing the pond and

tying in to stable reaches upstream and downstream. The step pools will also provide much-needed pool habitat in this heavily riffle-dominated system.

Reach C begins at Station 20+50 where the slope becomes less steep and the floodplain widens. This section is stable and was used to develop reference dimensions for Reach B immediately upstream. There are a few areas in this section where the stream disappears underground for short reaches. The floodplain will be enhanced with riparian plantings. At Station 22+07, the Mainstem enters a culvert under a private driveway. When it re-emerges it enters a large open water pond (designated as Wetland 1A). The pond has a good forested buffer on the right bank but the left bank is primarily grass and cattails. The banks will be enhanced with additional riparian plantings and wetland plants around the perimeter of the pond.

Serious consideration was given to the option of removing the pond and converting it to a free-flowing stream or wetland. However, it was determined that this option would be very costly and yield little, if any, water quality benefit. The dam was constructed by the current landowner, Mr. Turner, in the late 1980s in order to elevate Sweet Hollow Road. Backwater from the pond supports Wetland 1A. The pond is not lined and has no riser or bottom drain. The capped six inch Polyvinyl Chloride (PVC) pipe near the right bank is housing an experiment being conducted by the University of North Carolina at Asheville on lead leaching from shotgun pellets (Turner 2008). There is an overflow spillway above the normal pool elevation that is utilized only during larger rain events. Water in the pond primarily evaporates and seeps through the dam gradually, and there is no defined outlet or channel at the base of the dam. The maximum depth of water in the pond at the time of the survey was approximately seven feet. The elevation difference between the bottom of the pond and the downstream face of the dam is approximately 10 feet. Removing the pond would involve installing a culvert with a 14 percent slope through the dam and disturbing the roadway in the process. Construction would be expensive, and would restore less than 200 feet of stream channel. In addition, the pond does not appear to be having a substantial negative impact on water quality. Thermal warming would be a concern; however, there is shade on one side of the pond and the tributary is too small to support fish or mussels. In fact, the pond supports fish where there would be none otherwise. Also, water from the pond travels over 200 feet underground before it resurfaces, which ameliorates any warming that may have occurred in the pond. For the same reasons, sediment starvation is not a big concern in this situation. The sediment load coming into the pond is assumed to be very low due to the forested watersheds of its two tributaries. And both of these tributaries are included in the conservation easement which will protect the entire headwaters of the pond from future development impacts. Perhaps the biggest impact of the pond, particularly in times of severe drought, comes from evaporation losses that are not available to the downstream reaches or to the groundwater. Additionally, the landowner was opposed to removing the pond because he felt it added value to his property. After considering all of these factors, the Restoration Plan shows the pond in the conservation easement and planting vegetation around the perimeter. In time, the pond will eventually fill and most likely become a wetland. Due to the lack of pressing evidence that installing a culvert would derive substantial water quality benefit, leaving the pond is considered an appropriate use of financial resources. The approach also allows the Project to avoid impacting jurisdictional wetlands.

Reach D extends from the downstream face of the dam below Sweet Hollow Road to the confluence with Tributary 2. This 522-foot reach consists of a vegetated swale and large linear wetland with a short stretch of incised channel in the middle. The section of incised channel is within the livestock area; whereas, the remaining portions upstream and downstream are fenced out of grazing pressures. The entire reach will be enhanced with riparian plantings and fencing to exclude the cattle and horses. A headcut has formed within the livestock grazing section which will be stabilized. All of the banks will be graded back to the same dimension as stable areas just upstream and downstream. Log sills will be installed at the top and bottom of the incised section and at the bottom of the reach above the confluence to provide grade control and prevent headcuts from forming in the soft saturated soils of Wetland 5. The

landowner has requested a permanent vehicular stream crossing in this reach in the vicinity of Station 29+00. The landowner has also requested a stream viewing area and picnic spot near the confluence of the Mainstem and Tributary 2 consisting of several large flat boulders resting up on the floodplain. These boulders will be far enough away from the channel so as not to impact the stream design.

Consideration was given to whether or not the wetlands in this reach should be restored to stream channels. The topography and soils do not indicate ideal conditions for naturally occurring wetlands. Furthermore, the landowner told us that when he bought the property the stream channels were very incised and he was concerned about livestock falling in, so he used a bulldozer to push the banks into the channel. He did this on both the Mainstem and on Tributary 2 below Sweet Hollow Road. Therefore it is tempting to restore the streams to their "natural" state, and excavate a stream channel with appropriate dimension, pattern, and profile. However, because of the altered conditions, we do not know if the hydrology would come back to the streams at the appropriate bed elevation. We suspect that the majority of the flow may be following a pathway at a lower elevation than the constructed bed elevation which would be proposed for a Priority I Restoration. There is no assurance that water would fill the new channel. Furthermore, there would be little to no water quality benefit gained from doing so. While the current conditions may not be entirely natural, they could be improving water quality. There is no erosion occurring in these wetlands and as the water flows underground the temperature is reduced and pollutants are filtered out via the soil medium and microbes. Regardless of the original condition from a water quality perspective, there is little justification for cutting a new channel even if the wetland is not the original condition. This approach also allows the Project to avoid impacting jurisdictional wetlands.

Reach E begins at the confluence of the Mainstem and Tributary 2 at Station 30+66. This reach consists of 587 linear feet of Priority I and Priority II Restoration. The stream will be restored on-line to fit the valley type. This section of stream has become very incised and a series of headcuts provide evidence of active downcutting. In the process of channel evolution, the stream has not yet begun to widen extensively in order to rebuild its floodplain. The streambed invert will be raised to reattach the stream to its original floodplain. This restoration will convert a type G stream to a type B stream. A rock crossvane will be placed near the top of Reach E to hold the new grade and prevent downcutting into the new bed material. Then a series of three constructed riffles followed by log sills and step pools will be constructed to provide habitat diversity, grade control, and energy dissipation. A permanent ford vehicular stream crossing will be placed in the last constructed riffle near the bottom of the reach. The Priority I Restoration will transition to a Priority II Restoration to tie in with the existing streambed elevation below the limits of the Project. Log and rock structures will be utilized to support the transition in grade.

Tributary 1

Reach 1A consists of 240 linear feet of Enhancement II. The riparian zone will receive invasive species removal and riparian plantings in select areas.

Reach 1B begins at Station 12+40 and consists of 220 linear feet of Restoration. The multi-thread channel will be graded out and replaced with a single-thread channel. One large headcut has formed and the channel is attempting to cut down to the elevation of the pond immediately downstream. This headcut will be stabilized with a step-pool structure. An additional structure will be added at the upstream end of the reach for additional grade control and habitat enhancement.

Tributary 2

Reach 2A consists of 826 linear feet of Enhancement II from Station 10+00 to Station 18+26. This reach is a stable B type channel with large trees on the banks, rock step-pools, and good grade control. However, the riparian zone will be treated with invasive species removal and select shrub plantings. The width of the riparian zone is limited on the left bank (facing downstream) by an existing driveway.

The channel has been altered in the immediate vicinity of the driveway crossing, and as the slope becomes less steep the channel also widens causing sediment to drop out immediately upstream of the culvert. The possibility of further restoration on this short segment (approximately 25 feet) was discussed, but it appears that the channel is in the process of narrowing naturally, which will aid sediment transport. The sediment supply to this reach is quite low, since the entire headwaters are forested and protected by a permanent conservation easement. The sediment is not impeding flow through the culvert and does not warrant channel reconstruction. Furthermore, heavy machinery would likely cause severe damage to the blacktop driveway and require expensive repairs.

Reach 2B is a short reach of incised channel between the Young residence driveway and the Sweet Hollow Road crossing. This reach is designated for 123 linear feet of restoration. A Priority 2 approach will be used to excavate additional floodplain for the incised channel. Several step-pool structures will be installed to provide grade control and create habitat diversity. Due to the naturally confined valley, some existing pattern, and existing culvert, the channel will be constructed on line; however, the thalweg will be adjusted away from the steep left bank in order to decrease the bank angle as much as possible.

Reach 2C begins below Sweet Hollow Road and extends to the confluence with the Mainstem. This reach consists of 450 linear feet of Enhancement II. As discussed above, this reach was altered similar to Mainstem (Reach D). Due to the landowner bulldozing the streambanks down into the channel and filling the formerly incised channel, the shape of the channel is similar to a vegetated swale. A wetland has developed in the floodplain. Treatment will consist primarily of riparian plantings along the linear wetland/subterranean stream complex. Grade control structures will be installed just upstream of the confluence to stabilize the drop in grade and prevent headcuts from progressing into the soft, saturated soils. Several existing black willow clumps will be preserved and could potentially be used as a source for harvesting some of the live stakes required for proposed plantings.

Tributary 3

Reach 3A will consist of 300 linear feet of Enhancement II in the form of removing invasive species and planting native woody and herbaceous vegetation. Existing trees on the right slope will be preserved. The concrete spring box near Station 10+50 will not be removed.

Reach 3B will be created to provide a hydrological connection between Reach 3A and the Mainstem. The channel is designed to function as a small stream channel to facilitate surface water drainage of the upstream seep. A small step-pool structure will be installed near the bottom of the reach to provide a stable tie-in to the Mainstem and stabilize the confluence. Livestock will be excluded from the area with fencing and pasture grasses (primarily fescue) will be replaced with a native forested riparian buffer.

Tributary 4

Reach 4A will consist of 428 linear feet of Enhancement II. Livestock will be excluded from the stream and wetland with fencing, and invasive species will be removed. Wetland and upland vegetation will be planted and several log sills will be placed for grade control and habitat enhancement. A small step-pool structure will be installed near the bottom of the reach to provide a stable tie-in to the Mainstem and stabilize the confluence.

7.1.2 WETLAND ENHANCEMENT DESIGN

Wetland enhancement will occur on Wetland 1, Wetland 1A, Wetland 3, Wetland 4, and Wetland 5. Wetland 2 will be removed in the course of restoring the Mainstem (Reach B). Treatment for Wetland 1 and 1A consists solely of removing invasive species and planting wetland vegetation. Treatment for Wetlands 3, 4, and 5 consists of livestock exclusion in addition to removing invasive species and planting

wetland vegetation. Because these last three wetlands are wetland/subterranean stream complexes, several log sills will be installed throughout to provide grade control and prevent the stream from cutting into the soft saturated wetland soils.

Consideration was given to whether or not Wetlands 3, 4, and 5 should be restored to stream channels. The topography and soils do not indicate ideal conditions for naturally occurring wetlands. Furthermore, the landowner told us that when he bought the property the stream channels were very incised and he was concerned about livestock falling in, so he used a bulldozer to push the banks into the channel. He did this on both the Mainstem and on Tributary 2 below Sweet Hollow Road (Wetlands 4 and 5). Therefore it is tempting to restore the streams to their "natural" state, and excavate a stream channel with appropriate dimension, pattern, and profile. However, because of the altered conditions, we do not know if the hydrology would come back to the streams at the appropriate bed elevation. We suspect that the majority of the flow may be following a pathway at a lower elevation than the constructed bed elevation which would be proposed for a Priority I Restoration. There is no assurance that water would fill the new channel. Furthermore, there would be little to no water quality benefit gained from doing so. While the current conditions may not be entirely natural, they could be improving water quality. There is no erosion occurring in these wetlands and as the water flows underground the temperature is reduced and pollutants are filtered out via the soil medium and microbes. Regardless of the original condition, from a water quality perspective, there is little justification for cutting a new channel even if the wetland is not the original condition. This approach also allows the Project to avoid impacting jurisdictional wetlands.

7.1.3 TARGET WETLAND COMMUNITIES/BUFFER COMMUNITIES

The Project Study Area is fortunate to have an intact native vegetative community on-site to use as a reference for the riparian plantings. The community in the upstream reaches of the project most closely resembles a Piedmont/Low Mountain Alluvial Forest. This community type is a relatively broad category designed for small streams due to the fact that smaller streams generally have more variable vegetative communities. Smaller watersheds result in a more variable flooding regime, which in turn produces a more highly variable mixture of species.

The species are detailed in Section 3.9. The planted community will be tailored based on the species that are successfully growing on-site. There will be an emphasis on the bottomland species from this community.

7.2 SEDIMENT TRANSPORT ANALYSIS

7.2.1 METHODOLOGY

A stream's ability to transport sediment load without aggrading or degrading is an indicator of stability. Overall stream power (Equation 2) is evaluated to determine if the proposed design is able to transport the bedload without aggrading or degrading. Stream power is a measure of the rate a stream can do work, or transport its load. As a function of channel slope and discharge, the rate is expressed as power. The bankfull discharge variable of the stream power equation was computed utilizing Equation 3 and 4, Manning's Equation (Chow 1959), for the Unnamed Tributaries. The methodology utilizes a comparison between existing conditions, reference reach conditions, proposed conditions, and the Shields' curve USDA 2007).

Unit Stream Power

$$\omega = \gamma Q S \qquad \text{(Equation 2)}$$

where: ω = unit stream power (lb/ft/s),
γ = specific weight of water = 62.4 lb/ft^3,
Q = discharge ft^3/s, and

S = average water surface slope (ft/ft).

Bankfull Discharge by Manning's Equation

$$Q = (1.49\ A\ R^{2/3}\ S^{1/2}) / n \qquad \text{(Equation 3)}$$

where: Q = discharge ft^3/s,
A = area ft^2,
R = hydraulic radius of riffle cross-section (ft),
S = average water surface slope (ft/ft), and
n = Manning's roughness coefficient.

Manning's Roughness Coefficient

$$(n = n_b + n_1 + n_2 + n_3 + n_4)m \qquad \text{(Equation 4)}$$

where: n = Manning's roughness coefficient,
n_b = base value for n for a straight uniform, smooth channel in natural materials,
n_1 = value added to correct for effect of surface irregularities,
n_2 = value added to correct for variations in shape and size of the channel cross-section,
n_3 = value added to correct for obstructions,
n_4 = value added to correct for vegetation and flow conditions, and
m = correction factor for meandering of the channel.

7.2.2 CALCULATIONS AND DISCUSSION

The reaches are designed such that above-bankfull flows have access to their floodplain. By allowing flood flows access to the floodplain, a great amount of stress is removed from the current scenario of eroding banks and incision. Due to the Project Reach classifying as predominately sand bed channels, the stream power is evaluated. The Project Reach does have gravel, cobble, and even boulders and bedrock within the channel; however, field data from pebble counts show the majority of the channels were sand. The channel beds do not appear to be filled with aggrading materials. Fortunately, there are several stable sections within the Project Reach which provide a good baseline for comparison with proposed conditions. All of the reaches are currently in degradation processes as the stream beds are actively eroding downward, thus proposed stream power values are reduced from the existing condition to values near the reference condition. The reaches proposed for Restoration include: Mainstem (Reach B and E), Tributary 1 (Reach 1B), and Tributary 2 (Reach 2B). Mainstem (Reach B) and Tributary 1 (Reach 1B) were compared with reference conditions from the upstream end of the Mainstem. Tributary 2 (Reach B) was compared with a stable section on Tributary 2. Mainstem (Reach E) was compared with a stable cross-section downstream of the Project. All of the proposed values are within an acceptable tolerance range of the reference condition. See Table 6 for stream power values.

The occasional larger materials in the streambed (gravel, cobble, boulder, and bedrock) combined with the other techniques proposed such as reducing slope angles, providing grade control structures, and introducing a continuously vegetated bank are anticipated to provide a stable system.

7.3 HEC-RAS ANALYSIS

The Project Reach is not located in a detailed FEMA flood zone. Therefore, a flood study is not required for this Project and a Hydrologic Engineering Centers River Analysis System (HEC-RAS) study has not been preformed. The Priority I restoration proposed for Mainstem (Reach E) will raise the elevation of the streambed and may impact the flood elevation. The floodway is anticipated to maintain the same general pattern as the system currently experiences. No hydrologic trespass issues are anticipated from the stream design as the Project is within steep to fairly steep valleys.

7.4 SOIL RESTORATION

7.4.1 SOIL PREPARATION AND AMENDMENT

Much of the soil along the Project Reach has been compacted by horses and cattle. These areas are located in the downstream reaches of the Project south of Sweet Hollow Road. The soil in these areas will need to be amended prior to planting to encourage survival and vitality of the planted vegetation and seeding mix. After the grading and stream channel work is completed, the compacted riparian zones will be ripped and disked. Ripping will be required on the floodplain and will be restricted within the channel and slopes. Restoration activities should be sufficient to loosen soils within the top of bank. Ripping shall be conducted utilizing a "v" ripper tillage tool. Disking will be performed in all areas that have been ripped.

In areas where ripping and disking are not feasible due to space and/or slope constraints (i.e., between existing trees or on steep slopes along the Project), other mechanical or manual means will be used to properly prepare the ground surface.

Upon completion of ripping and disking, soil tests will be conducted to determine the need, if any, of limestone and/or fertilizer prior to planting. At a minimum, the test must provide the acidity of the soil and availability of major nutrients (nitrogen, phosphorous, and potassium). Limestone and/or fertilizer rates should be determined based on the results.

In areas of enhancement, soil preparation may be minimized to the exact area of the plant installation as there are mature trees in some of these areas. However, in areas of pasture ripping and disking are proposed. Streamside plantings will not receive major soil preparation as this community is limited to streambanks.

Amendments will be dictated by soil tests taken across the Project following grading activities such that treatment will match the condition at the time of planting.

7.5 NATURAL PLANT COMMUNITY RESTORATION

Re-establishing a riparian buffer composed of native woody and herbaceous vegetation is critical to the success of a stream restoration project. Vegetated buffers provide shade, input of woody debris and organic matter, and a soil stabilizing root mass for the streambanks.

Native woody and herbaceous species will be used to establish a 30-foot wide riparian buffer on both sides of the Project Reach, where possible. In the vicinity of the pond, the existing driveway will require the buffer to be less than 30 feet wide, so other areas will be extended beyond 30 feet to compensate for the difference. Plantings will be placed from the streamside to within 10 feet of the conservation easement.

Species selected for planting will be dependent upon availability of local seedling sources; however, species will all be native and appropriate to Project Study Area topography and soils. The proposed plantings will cover the constructed streambanks, floodplain, and adjacent slope within the 30-foot buffer and beyond in some areas.

In some areas, remnants of the target natural communities currently exist with mature individuals of the desired species. As much as possible in these areas, the zone of construction activity will be limited to lessen damage to individual stems. Maintaining existing trees in place with intact root masses will contribute to post-construction slope stability and streambank retention. Areas with existing tree canopy will receive primarily herbaceous and shrub plantings.

7.5.1 PLANT COMMUNITY RESTORATION

The designed vegetative communities are presented in Table 10 and the planting plan is shown on Restoration Plan View Proposed Planting Plan Sheets 1 – 5 in Section 13.0. Four planting zones are proposed for the Project. The Streamside zone will occur along all reaches of the Project and will consist of live stake plantings. The Floodplain zone will occur outside the Streamside zone. The target natural community for the Floodplain zone will be Piedmont/Low Mountain Alluvial Forest (Schafale and Weakley 1990). This zone will be present along the Mainstem and the lower reaches of Tributary 2 south of Sweet Hollow Road. The upper reaches of the Mainstem and Tributary 2 as well as the steeper portions of Tributaries 3 and 4 will be planted with a Mountain Slope zone. The Mountain Slope zone is a mixture of Montane Alluvial Forest and Piedmont/Low Mountain Alluvial Forest. The Wetland zone will be planted in all five wetland areas. The Wetland zone will consist of Piedmont/Mountain Bottomland Forest and will require a different permanent seed mixture than the remainder of the Project, to include wetland herbs and ferns.

7.5.2 SEEDING PLAN SUMMARY FOR VEGETATION COMMUNITIES AND ZONES

Temporary seed mixtures shall consist of German millet (*Setaria italica*), browntop millet (*Panicum ramosum*), oats (*Chasmanthium latifolium*), or buckwheat (*Polygonum fagopyrum*) during the summer months, and rye cereal (*Secale cereale*) or winter wheat (*Triticum aestivum*) during the remainder of the year. The exact dates for using each type of seed will be determined during construction such that the current weather regime may be taken into account. Seeded areas will be protected by spreading straw mulch uniformly to form a continuous blanket over seeded areas. Hydro-mulching may be utilized to seed and mulch the Project.

Soil testing will be performed at the time of construction such that final grade may be tested to determine the need, if any, of limestone and/or fertilizer. At a minimum, the testing will provide the acidity and available major nutrients within the soil. Limestone and/or fertilizer rates will be determined based on the results.

Permanent seeding will be required on all disturbed areas and may be applied with temporary seeding where applicable. Permanent seed mixtures shall be applied at a rate of 15 pounds per acre. Seed shall be sown with a spreader or a seeding machine. The herbaceous seed mix is listed in Table 11.

7.5.3 INVASIVE SPECIES MANAGEMENT.

Prior to the re-vegetation phase of the Project, removal of non-native species will be necessary. Exotic species currently occurring within the Project Study Area include: multiflora rose, Japanese honeysuckle, and microstegium. Invasive species eradication and management shall commence in conjunction with Project preparation and will continue through the one-year monitoring period at a minimum. Proposed management procedures described below are based upon recommendations taken from the Southeast Exotic Pest Plant Council Invasive Plant Manual (SE-EPPC 2003). Personnel applying herbicide will be licensed to do so, as required by the North Carolina Pesticide Board and all work will comply with the North Carolina Pesticide Law of 1971 and applicable federal laws (G.S. 143-434, Article 52). Environmental conditions including weather, wind, temperature, and period of the growing season will be evaluated prior to initiation of management efforts. The sequence of removal procedures will be coordinated with planned seeding and planting tasks such that treatment methods do not affect planted species.

The first step of the invasive species removal process will consist of an application of Rodeo®, Accord®, AquaMaster®, or equal herbicide (glyphosate – aquatic label) designated as suitable for extermination of trees and shrubs in riparian and wetland areas. Ideally, application will occur late in the growing season, but prior to dormancy. Ambient air temperature at the time of application will be above 40°F. The

herbicide will be applied at the recommended rate in accordance with label instructions. This application will be completed a minimum of two weeks prior to planting activities. The herbicide will be applied on all identified invasive plants using appropriate application methods to prevent drift into adjacent areas.

Two weeks after spraying, all woody vegetation will be removed by cutting stems and stumps to a maximum height of two inches above ground. A 25 percent glyphosate herbicide solution approved for aquatic applications shall be immediately applied to completely cover the cut surface of each individual stem or stump. After an additional two-week period, woody remnants will be removed, separated from the soil, and disposed of properly (e.g. burning).

The Project Study Area shall be observed throughout the monitoring period to evaluate invasive management effectiveness. If required, additional control steps may be implemented.

CHAPTER 8. PERFORMANCE CRITERIA

8.1 STREAMS

Performance criteria and monitoring protocol will follow that outlined within the NCEEP Site Specific Mitigation Plan and detailed in the USACE Stream Mitigation Guidelines (USACE et al. 2003). Monitoring shall consist of the collection and analysis of stream stability and riparian vegetation survivability data to support the evaluation of the Project in meeting established restoration objectives. Data collection will include measurements of stream dimension, profile, pattern, and bed materials; photo documentation; vegetation survivability sampling: and stream bankfull return interval. Monitoring will be performed each year for a five-year period, with no less than two bankfull flow events documented through the monitoring period. If less than two events occur during the first five years, monitoring will continue until the second bankfull event is documented.

8.2 VEGETATION

The vegetation monitoring will be conducted according to the Carolina Vegetation Survey (CVS) – EEP Protocol for Recording Vegetation (Lee et al 2008). Vegetation monitoring plots will be 100 square meters in size and will be conducted according to the Level I protocol which has a focus on planted stems only. The purpose of this level of monitoring is to determine the pattern of installation of plant material with respect to species, spacing, density, and to monitor the survival and growth of those installed species. The success criteria for the preferred species in the restoration areas will be based on annual and cumulative survival and growth over five years. Survival on preferred species must be at a minimum 320 stems/acre at the end of the three years of monitoring and 260 stems/acre after five years. The number of required plots is based on the mitigation category: stream enhancement, stream restoration, and wetland restoration. A spreadsheet provided by NCEEP was used to calculate the necessary numbers of plots for the stream buffers on the Project. A planting area of 26,709 square meters (6.6 acres) was measured from the Restoration Plan design sheets and inserted into the spreadsheet. According to the spreadsheet calculation, eight plots will be required for the planted area.

8.3 SCHEDULE/REPORTING

URS will prepare a Mitigation Plan in accordance with NCEEP standards (NCEEP 2006) that will include the following sections: introduction, summary, success criteria, monitoring schedule, mitigation type and extent, maintenance/contingency plans, and references. Revisions to the NCEEP standards (since September 20, 2005) may be incorporated into the Mitigation Plan in consultation with NCEEP. Existing data developed during the assessment and design phases of the Project will be used to the extent possible.

Following construction, permanent stream monitoring cross-sections, vegetation plots, and photo reference points will be established along the Project, marked using rebar and cap, for use during subsequent monitoring phases of the Project. The selected construction contractor will survey these points during the execution of the As-Built field survey. The contractor shall supply URS with a complete and properly sealed Project As-built Survey for inclusion in the Mitigation Plan (11” x 17” format). The Mitigation Plan will be formatted and submitted in a three-ring binder format to allow inclusion of yearly Project monitoring reports.

Yearly Project monitoring reports will be prepared and submitted each year after monitoring tasks are completed. The reports will provide the new monitoring data and compare the new data against previously existing conditions. Data, cross-sections, profiles, photographs, and other graphics will be included in the reports as necessary. The reports will include a discussion of any significant deviations from the As-Built Survey, as well as evaluations as to whether the changes indicate stabilizing or de-stabilizing conditions.

Establishment of permanent monitoring cross-sections, vegetation plots, photo reference points, and all subsequent monitoring will be conducted by a firm chosen by NCEEP. URS is not scoped to conduct any monitoring for this Project.

CHAPTER 9. PRELIMINARY MONITORING

No gages, bank pins, permanent cross-sections, vegetation plots or photo reference points have been established at the Project for preliminary monitoring. The monitoring period will begin post-construction.

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CHAPTER 11. TABLES

Table 1A: Project Restoration Structure: Streams
Project Number 92596 Unnamed Tributaries to Bald Creek

Reach		Existing Station Range	Restoration Type	Priority Approach	Existing Linear Feet	Designed Linear Feet	Comment
MAINSTEM	A	10+00 – 18+00	Preservation	--	800	800	Headwater channels in mature hardwood forest.
	B	18+00 – 20+50	Restoration	P2	250	250	Remove earthen dam and small pond. Daylight culverted segment. Tie-in to stable upstream and downstream segments and add grade control. Pull the channel off the left bank and grade bench. Slope back right bank. Tie-in above second poplar. Enhance profile with additional pool habitat.
	C	20+50 – 22+07 [CMP 22+07 – 22+52] 22+52 – 24+73	Enhancement II	--	378	378	Riparian plantings to culvert under driveway. Wetland plantings around pond.
	D	25+44 – 30+66	Enhancement I	P2	522	522	Enhance existing vegetated swale from base of dam to confluence with riparian plantings and livestock exclusion. Short reach of incised channel below headcut will be graded back and stabilized. Log sills placed at top and bottom of incised reach and at bottom of reach above confluence. Include permanent vehicular ford crossing.
	E	30+66 – 36+53	Restoration	P1/P2	587	587	Construct new B channel primarily on existing alignment. Raise channel invert to reconnect with historical floodplain from confluence to the stable cottonwood section. Stabilize with rock cross vanes. Add ford stream crossing below cottonwoods. Below crossing transition to Priority 2 with a step pool and constructed riffle. Restore dimension by excavating bankfull bench on the right, restore profile with step-pool structures. Limited to small meanders due to naturally confined valley type.

Table 1A Continued

Reach		Existing Station Range	Restoration Type	Priority Approach	Existing Linear Feet	Designed Linear Feet	Comment
TRIBUTARY 1	1A	10+00 – 12+40	Enhancement II	--	240	240	Invasive removal and planting.
	1B	12+40 – 14+60	Restoration	P1	220	220	Provide step-pool structure to stabilize headcut and meet pond elevation. Multi-thread channel will be graded out and replaced with single-thread channel. Add log sill for grade control at top.
TRIBUTARY 2	2A	10+00 – 18+26	Enhancement II	--	826	826	Invasive species treatment and riparian plantings.
	2B	18+26 – 19+49	Restoration	P2	123	123	Build step-pool system to stabilize series of severe headcuts. Pull channel off of steep left bank. Tie-in to culvert under Sweet Hollow Road.
	2C	20+00 – 24+50	Enhancement II	P2	450	450	Riparian plantings and selected grade control structures near confluence with Mainstem.
TRIBUTARY 3	3A	10+00 – 13+00	Enhancement II	--	300	300	Enhance spring-fed swale for potential amphibian and reptile habitat. Remove invasive species, preserve existing trees on slope, plant native vegetation.
	3B	13+00 – 14+55	Restoration	P1	0	155	A new channel will be constructed through the pasture to reconnect Tributary 3 to the Mainstem and provide a stable conveyance for higher flows.
TRIB 4	4A	10+00 – 14+28	Enhancement II	--	428	428	Livestock exclusion and riparian planting. Grade control to stabilize tie-in at confluence with Mainstem. Several log sills placed for grade control and habitat enhancement.

Table 1B: Project Restoration Structure: Wetlands
Project Number 92596 Unnamed Tributaries to Bald Creek

Wetland ID	Treatment Type	Existing Acreage	Proposed Acreage	Wetland Impacts	Comment
1	Enhancement	0.18	0.18	--	Wetland plants around fringe of pond and littoral shelf. Riparian plantings on left embankment of pond.
1A	Enhancement	0.48	0.48	--	Invasive species removal and supplemental wetland plantings.
2	Removal	0.05	0.00	0.05	Wetland 2 is a small man-made pond formed by an earthen dam and culvert on the Mainstem Reach A. The dam and culvert will be removed to restore the stream to its natural, free-flowing condition. The pond is not a significant or high-quality aquatic resource and the benefit gained by the stream justifies the impacts to the wetland.
3	Enhancement	0.20	0.20	--	Livestock exclusion, invasive species removal, and supplemental wetland plantings.
4	Enhancement	0.11	0.11	--	Livestock exclusion, invasive species removal, and supplemental wetland plantings.
5	Enhancement	0.26	0.26	--	Livestock exclusion, invasive species removal, and supplemental wetland plantings.
TOTAL		**1.28**	**1.23**	**0.05**	

Table 2: Project Component Summations
Project Number 92596 Unnamed Tributaries to Bald Creek

Restoration Level	Existing Stream (lf)	Proposed Stream (lf)	Existing Riparian Wetland (ac)	Proposed Riparian Wetland (ac)	Non-Riparian Wetland (ac)	Upland * (ac)	Buffer (ac)	BMP
Restoration	1180	1335	--	--	--	0.64	1.63	--
Enhancement I	522	522	--	--	--	0.40	0.72	--
Enhancement II	2622	2622	--	--	--	2.96	3.61	--
Preservation	800	800	--	--	--	1.12	1.10	--
Wetland Enhancement	--	--	1.28	1.23	--	--	--	--
Wetland Impacts	--	--	0.05	0.00	--	--	--	--
TOTAL	**5124**	**5279**	**1.28**	**1.23****	**0**	**5.12**	**7.06**	**0**

*Upland acreage was computed as area outside of the 30-ft stream buffer and wetland boundaries within the conservation easement.
**All existing wetlands will be enhanced except Wetland 2 – an on-line pond that will be removed to restore the stream channel resulting in 0.05 acre of wetland impacts.

Table 3: Drainage Areas
Project Number 92596 Unnamed Tributaries to Bald Creek

Reach	Drainage Area (Acres)	Drainage Area (Sq. Miles)
UT to Bald Creek at Sweet Hollow Road	25	0.039
UT to Bald Creek at Downstream Limit	120	0.188
Tributary 1	16	0.025
Tributary 2	38	0.059
Tributary 3	4	0.006
Tributary 4	3	0.005

Table 4: Land Use of Watershed
Project Number 92596 Unnamed Tributaries to Bald Creek

Land Use	Area (acres)	Percentage
Mixed Forest	102	85
Agriculture/Pasture/Hay	14	12
Rural Residential	4	3

Table 5: Federally Listed Species for Yancey County, NC
Project Number 92596 Unnamed Tributaries to Bald Creek

Common Name	Scientific Name	Federal Status	Record Status
Bog turtle	*Clemmys muhlenbergii*	T(S/A)	Current
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	E	Current
Virginia big-eared bat	*Corynorhinus townsendii virginianus*	E	Current
Appalachian elktoe, also Designated Critical Habitat	*Alasmidonta raveneliana*	E	Current
Roan mountain bluet	*Hedyotis purpurea var. montana*	E	Current
Spreading avens	*Geum radiatum*	E	Current
Virginia spiraea	*Spiraea virginiana*	T	Current
Rock gnome lichen	*Gymnoderma lineare*	E	Current

The following definitions of terms are provided on the USFWS website:

E – Endangered: A taxon "in danger of extinction throughout all or a significant portion of its range."

T – Threatened: A taxon "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

Table 6. Morphological Characteristics Table
Project Number 92596 Unnamed Tributaries to Bald Creek

URS

Site Name: **Unnamed Tributaries to Bald Creek, Yancey County, NC**
Watershed: **French Broad**
Design by: **Melissa Bauguess**
Checked by: **Kathleen McKeithan, PE, CPESC, CPSWQ**

		EXISTING CONDITIONS					DESIGN CONDITIONS					REFERENCE CONDITIONS		
SITE NAME	UNITS	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek	UT to Bald Creek
WATERSHED		French Broad	French Broad	French Broad	French Broad	French Broad	French Broad	French Broad	French Broad	French Broad	French Broad	French Broad	French Broad	French Broad
REACH DESCRIPTION		Mainstem Upstream Reach B	Mainstem Downstream Reach E	Tributary 1 Reach 1B	Tributary 2 Reach 2B	Tributary 3 Reach 3B	Mainstem Upstream Reach B	Mainstem Downstream Reach E	Tributary 1 Reach 1B	Tributary 2 Reach 2B	Tributary 3 Reach 3B	Mainstem Upstream Reach C	Mainstem Downstream Below Reach E	Tributary 2 Reach 2A
ADDITIONAL NOTES		Removing Small Pond, XS downsteam of pond	Incised and Actively Eroding	Incised and Actively Eroding	Incised and Actively Eroding	Subterranean						Stable Section with Consistent Bankfull Indicators	Stable Section with Prominent Bankfull Bench	B Features
STREAM TYPE		B	G5	G5	G5	Subterranean	B5	B5	B5	B5	B5	B5	B5	B5
DRAINAGE AREA (DA)	Ac	25	122	16	38	4	25	122	16	38	4	25	122	38
BANKFULL WIDTH (W_{bkf})	ft	7.1	5.5	1.1	3.4	None Distinct	5.5	5.5	2.5	3.0	1.8	5.8	5.1	2.7
BANKFULL MEAN DEPTH (d_{bkf})	ft	0.4	0.8	0.3	0.5	None Distinct	0.5	0.5	0.2	0.2	0.3	0.5	0.5	0.1
LOWEST BANK HEIGHT RATIO		1.0	2.4	2.5	2.4	None Distinct	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
WIDTH/DEPTH RATIO (W_{bkf}/d_{bkf})		17.8	6.9	3.7	6.8	None Distinct	12.0	12.0	14.0	14.0	6.0	11.6	10.2	27.0
BANKFULL X-SECTION AREA (A_{bkf})	ft^2	2.70	3.90	0.30	1.80	None Distinct	2.50	2.60	0.50	0.50	0.54	2.90	2.60	0.40
BANKFULL MEAN VELOCITY, ft/s	f/s	8.9	5.9	4.1	0.4	None Distinct	9.7	8.9	2.4	1.5		8.5	4.3	2.1
BANKFULL DISCHARGE, cfs	ft^3/s	24	23	1	1	None Distinct	24	23	1	1		25	11	1
BANKFULL MAX DEPTH (d_{max})	ft	0.7	1.1	0.4	0.7	None Distinct	0.6	0.6	0.4	0.3	0.3	0.6	0.8	0.2
WIDTH Flood-Prone Area (W_{fpa})	ft	9	7	2	4	None Distinct	11.0	11.0	4.9	6.0	10.0	10	9	7
ENTRENCHMENT RATIO (ER)		1.2	1.2	1.5	1.2	None Distinct	2.0	2.0	1.9	2.0	5.6	1.8	1.8	2.5
MEANDER LENGTH (Lm)	ft	200 - 245	60 - 220	155	35 - 47	None Distinct	200 - 245	60 - 220	25 - 50	35 - 50	None Distinct	200 - 245	60 - 220	35 - 47
RATIO OF Lm TO W_{bkf}		28.2 - 34.5	10.9 - 40.0	141	10.3 - 13.8	None Distinct	36.4 - 44.5	10.9 - 40.0	10.0 - 20.0	11.7 - 16.7	None Distinct	34 - 42	12 - 43	13 - 17
RADIUS OF CURVATURE	ft	36.0 - 60.0	97.0 - 134.0	134	21.0 - 31.0	None Distinct	36 - 60	97 - 134	6 - 13	21 - 31	None Distinct	36 - 60	97 - 134	21 - 31
RATIO OF Rc TO W_{bkf}		5.1 - 8.5	17.6 - 24.4	122	6.2 - 9.1	None Distinct	6.5 - 10.9	17.6 - 24.4	2.5 - 5.0	7.0 - 10.3	None Distinct	6.2 - 10.3	19.0 - 26.3	7.8 - 11.5
BELT WIDTH	ft	12 - 25	25 - 32	10 - 15	14 - 16	None Distinct	12 - 25	25 - 32	10 - 88	10 - 25	10 - 20	12 - 25	25 - 32	10 - 25
MEANDER WIDTH RATIO		1.7 - 3.5	4.5 - 5.8	9.1 - 13.6	4.1 - 4.7	None Distinct	2.2 - 4.5	4.5 - 5.8	4.0 - 35.0	3.3 - 8.3	5.6 - 11.1	2.1 - 4.3	4.9 - 6.3	3.7 - 9.3
SINUOSITY (K)		1.11	1.05	1.05	1.30	None Distinct	1.09	1.03	1.05	1.04	1.03	1.11	1.05	1.30
VALLEY SLOPE	ft/ft	0.1600	0.0500	0.0700	0.0660	0.1600	0.1579	0.0471	0.0731	0.0871	0.1600	0.1600	0.0500	0.0660
AVERAGE SLOPE (S)	ft/ft	0.1441	0.0476	0.0667	0.0836	0.1548	0.1213	0.0321	0.0589	0.0641	0.1548	0.1441	0.0476	0.0508
RIFFLE SLOPE	ft/ft	0.1441	0.0476	0.0667	0.0836	None Distinct	0.0012	0.0003	0.0648	0.1281	0.1548	0.0014	0.0410	0.0508
POOL SLOPE	ft/ft	None Distinct	None Distinct	None Distinct	None Distinct	None Distinct	0.0000	0.0000	0.0010	0.0000	0.0000	Not availaible	0.0000	0.0000
RATIO OF POOL SLOPE TO AVERAGE SLOPE	ft/ft	None Distinct	None Distinct	None Distinct	None Distinct	None Distinct	0.0	0.0	0.0	0.0	0.0	Not availaible	Not availiable	Not availiable
MAX POOL DEPTH	ft	None Distinct	None Distinct	None Distinct	None Distinct	None Distinct	1.38	1.15	0.71	0.43	0.90	Not availaible	Not availiable	Not availiable
RATIO OF POOL DEPTH TO AVERAGE BANKFULL DEPTH		None Distinct	None Distinct	None Distinct	None Distinct	None Distinct	3.00	2.50	4.00	2.00	3.00	Not availaible	Not availiable	Not availiable
POOL WIDTH	ft	None Distinct	None Distinct	None Distinct	None Distinct	None Distinct	6.6	6.6	3.3	3.9	2.3	Not availaible	Not availiable	Not availiable
RATIO OF POOL WIDTH TO BANKFULL WIDTH		None Distinct	None Distinct	None Distinct	None Distinct	None Distinct	1.2	1.2	1.3	1.3	1.3	Not availaible	Not availiable	Not availiable
POOL TO POOL SPACING	ft	None Distinct	None Distinct	None Distinct	None Distinct	None Distinct	15 - 50	60 - 100	10 - 50	10 - 60	10 - 100	Not availaible	Not availiable	Not availiable
RATIO OF POOL TO POOL SPACING TO BANKFULL WIDTH		None Distinct	None Distinct	None Distinct	None Distinct	None Distinct	2.7 - 9.1	10.9 - 18.2	4.0 - 20.0	3.3 - 20.0	5.6 - 55.6	Not availaible	Not availiable	Not availiable
STREAM POWER	lb/ft/s	217	69	5	4	None Distinct	183	46	4	3	8	222	33	3

Note average slope of existing conditions may have been taken over a specific reach surveyed, thus they may not coorespond with valley slopes taken over the entire reach. Proposed average slopes may exclude controlled grade drops (average slope between niche points). Stream type considers data as well as professional judgement/field calls. Multiple points were utilized to get ranges.

Table 7: BEHI/NBS and Sediment Export Estimates for Project Site Streams
Project Number 92596 Unnamed Tributaries to Bald Creek

Time Point	Reach	Linear Feet	Extreme		Very High		High		Moderate		Low		Very Low		Sediment Export
Pre-Construction			ft	%	ft	%	ft	%	ft	%	ft	%	ft	%	Ton/y
	A	800	--		--	--	--	--	--	--	--	--	800	100	2.0
	B	250	--	--	--	--	--	--	150	60	50	20	50	20	3.0
	C	378	--	--	--	--	--	--	--	--	--	--	378	100	1.4
	D	522	--	--	--	--	--	--	150	29	--	--	372	71	3.8
	E	587	--	--	365	62	147	25	--	--	75	13	--	--	83.9
	1A	240	--	--	--	--	--	--	--	--	240	100	--	--	1.3
	1B	220	--	--	--	--	60	27	110	50	50	23	--	--	8.8
	2A	826	--	--	--	--	--	--	--	--	726	88	100	12	4.2
	2B	123	--	--	--	--	--	--	123	100	--	--	--	--	4.0
	2C	450	--	--	--	--	--	--	50	11	--	--	400	89	1.5
	3A	300	--	--	--	--	--	--	--	--	--	--	300	--	0.4
	4A	428	--	--	--	--	--	--	78	18	350	82	--	--	1.4

Table 8: BEHI/NBS and Sediment Export Estimates for Reference Streams
Project Number 92596 Unnamed Tributaries to Bald Creek

Time Point	Reach	Linear Feet	Extreme		Very High		High		Moderate		Low		Very Low		Sediment Export
Pre-Construction			**ft**	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**ft**	**%**	**Ton/y**
	B (Reference Section)	50	--	--	--	--	--	--	--	--	--	--	50	100	0.1
	Below Reach E	40	--	--	--	--	--	--	--	--	--	--	40	100	0.2
	2A (Reference Section)	100	--	--	--	--	--	--	--	--	--	--	100	100	0.1

Table 9. Wetland Classifications and Acreages
Project Number 92596 Unnamed Tributaries to Bald Creek

Wetland ID	Cowardin Classification[1]	Approximate Area (Acre)
Wetland 1	PFO1C	0.18
Wetland 1A	POW	0.48
Wetland 2	POW	0.05
Wetland 3	PFO1C	0.20
Wetland 4	PFO1C	0.11
Wetland 5	PFO1C	0.26
Total Acreage of Wetlands		**1.28**

[1]Classification of Wetlands and Deepwater Habitat of the United States, Cowardin et al. 1979.

Table 10. Designed Vegetative Communities (by zone)
Project Number 92596 Unnamed Tributaries to Bald Creek

Common Name	Scientific Name	Wetland Indicator
ZONE 1: STREAMSIDE LIVESTAKES		
Elderberry	*Sambucus canadensis*	FACW-
Ninebark	*Physocarpus opulicflius*	FAC-
Silky dogwood	*Cornus amomum*	FAC+
Buttonbush	*Cephalanthus occidentalis*	OBL
Black willow	*Salix nigra*	OBL
ZONE 2: FLOODPLAIN		
River birch	*Betula nigra*	FACW
Smooth alder	*Alnus serrulata*	FACW+
Sugarberry	*Celtis laevigata*	FACW
Cherrybark oak	*Quercus pagoda (falcata var. pagadaefolia)*	FAC+
Swamp chestnut oak	*Quercus michauxii*	FACW-
American elm	*Ulmus americana*	FACW
Green ash	*Fraxinus pennsylvanica*	FACW
Ironwood	*Carpinus caroliniana*	FAC
Spicebush	*Lindera benzoin*	FACW
Yellow root	*Xanthorhiza simplicissima*	FACW-

ZONE 3: MOUNTAIN SLOPE		
American sycamore	*Platanus occidentalis*	FACW-
Boxelder	*Acer negundo*	FACW
Yellow birch	*Betula lutea*	FACU+
Black walnut	*Juglans nigra*	FACU
Flowering dogwood	*Cornus florida*	FACU
Bitternut hickory	*Carya cordiformis*	FAC
Shagbark hickory	*Carya ovata*	FACU
American holly	*Ilex opaca*	FAC-
Pawpaw	*Asimina triloba*	FAC
Southern sugar maple	*Acer floridanum*	N/A
American witchhazel	*Hamamelis virginiana*	FACU
Great laurel	*Rhododendron maximum*	FAC-
ZONE 4: WETLAND		
Black willow	*Salix nigra*	OBL
Smooth alder	*Alnus serrulata*	FACW+
Possumhaw	*Ilex decidua*	FACW-
Mountain holly	*Ilex ambigua*	N/A
Rhododendron	*Rhododendron maximum*	FACW-
Rhododendron	*Rhododendron viscosum*	FACW+
Tag alder	*Alnus serrulata*	FACW-

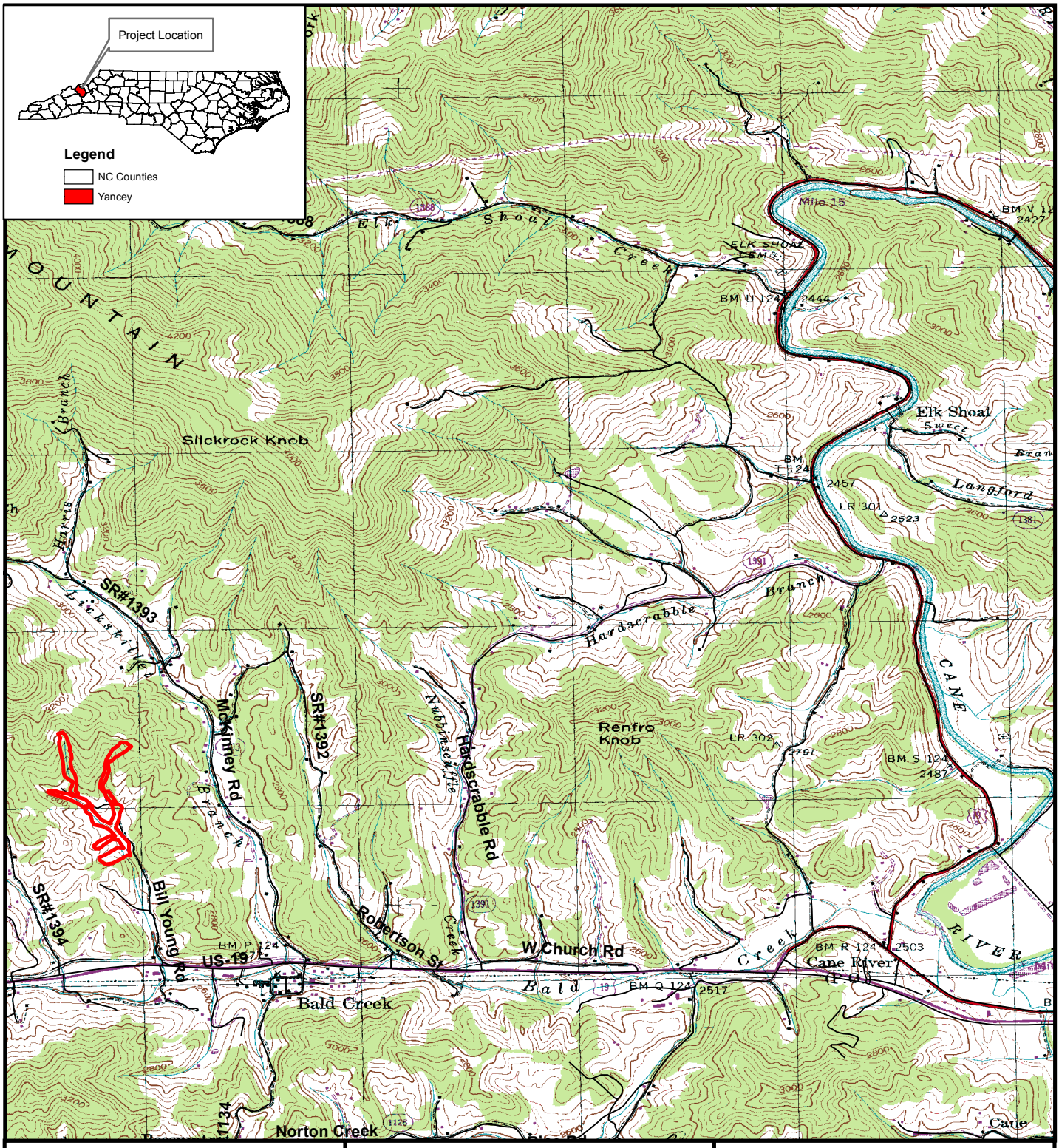
Table 11. Herbaceous/Seed Mix
Project Number 92596 Unnamed Tributaries to Bald Creek

Common Name	Scientific Name	Wetland Indicator
ZONE 1: STREAMSIDE		
Jack in the pulpit	*Arisaema triphyllum*	FACW-
Ironweed	*Vernonia noveboracensis*	FAC+
Swamp milkweed	*Asclepias incarnate*	OBL
Joe-pye-weed	*Eupatorium fistulosus*	FAC+
Tearthumb	*Polygonum sagittatum*	OBL
Bushy beard grass	*Andropogon glomeratus*	FACW+
Deertongue	*Panicum clandestinum*	FACW
Smallspike false nettle	*Boehmeria cylindrica*	FACW+
Soft rush	*Juncus effusus*	FACW+
Swamp rose	*Rosa palustris*	OBL
Fox sedge	*Carex vulpinoidea*	OBL
Leafy bulrush	*Scirpus polyphyllus*	OBL
Sneezeweed	*Helenium autumnale*	FACW
Browntop millet*	*Panicum ramosum*	NA
Rye cereal*	*Secale cereale*	NA
ZONE 2: FLOODPLAIN		
Jack in the pulpit	*Arisaema triphyllum*	FACW-
Ironweed	*Vernonia noveboracensis*	FAC+
Swamp milkweed	*Asclepias incarnate*	OBL
Joe-pye-weed	*Eupatorium fistulosus*	FAC+
Tearthumb	*Polygonum sagittatum*	OBL
Bushy beard grass	*Andropogon glomeratus*	FACW+
Deertongue	*Panicum clandestinum*	FACW
Smallspike false nettle	*Boehmeria cylindrica*	FACW+
Soft rush	*Juncus effusus*	FACW+
Swamp rose	*Rosa palustris*	OBL
Fox sedge	*Carex vulpinoidea*	OBL
Leafy bulrush	*Scirpus polyphyllus*	OBL
Sneezeweed	*Helenium autumnale*	FACW
Browntop millet*	*Panicum ramosum*	NA
Rye cereal*	*Secale cereale*	NA

ZONE 3: MOUNTAIN SLOPE		
Jack in the pulpit	*Arisaema triphyllum*	FACW-
Ironweed	*Vernonia noveboracensis*	FAC+
Swamp milkweed	*Asclepias incarnate*	OBL
Joe-pye-weed	*Eupatorium fistulosus*	FAC+
Tearthumb	*Polygonum sagittatum*	OBL
Bushy beard grass	*Andropogon glomeratus*	FACW+
Deertongue	*Panicum clandestinum*	FACW
Smallspike false nettle	*Boehmeria cylindrica*	FACW+
Soft rush	*Juncus effusus*	FACW+
Swamp rose	*Rosa palustris*	OBL
Fox sedge	*Carex vulpinoidea*	OBL
Leafy bulrush	*Scirpus polyphyllus*	OBL
Sneezeweed	*Helenium autumnale*	FACW
Browntop millet*	*Panicum ramosum*	NA
Rye cereal*	*Secale cereale*	NA
ZONE 4: WETLAND		
Arrowhead	*Sagittaria latifolia*	OBL
Southern blue flag iris	*Iris virginica*	OBL
Cardinal flower	*Lobelia cardinalis*	FACW+
Clearweed	*Pilea pumila*	FACW
Cinnamon fern	*Osmunda cinnamomea*	FACW+
Royal fern	*Osmunda regalis*	OBL
Sensitive fern	*Onoclea sensibilis*	FACW
Southern lady fern	*Athyrium filix-femina*	FAC
River oats	*Chasmanthium latifolium*	FAC-
Browntop millet*	*Panicum ramosum*	NA
Rye cereal*	*Secale cereale*	NA

* Temporary seed mixtures shall consist of German millet, browntop millet, oats, or buckwheat during the summer months, and rye cereal or winter wheat during the remainder of the year. The designer will determine the exact dates for using each type of seed. Temporary seed mixtures shall be applied at a rate of 35 lbs/acre. Seeded areas are to be protected by spreading straw mulch uniformly to form a continuous blanket over seeded areas. Soil testing will take place after grading of the site to determine the need, if any, of limestone and/or fertilizer.

CHAPTER 12. FIGURES



North Carolina
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

UT to Bald Creek (Turner/Young)
Stream Restoration
Yancey County, NC

EEP Project No. 92596

Legend

Project Study Area

N
W E
S

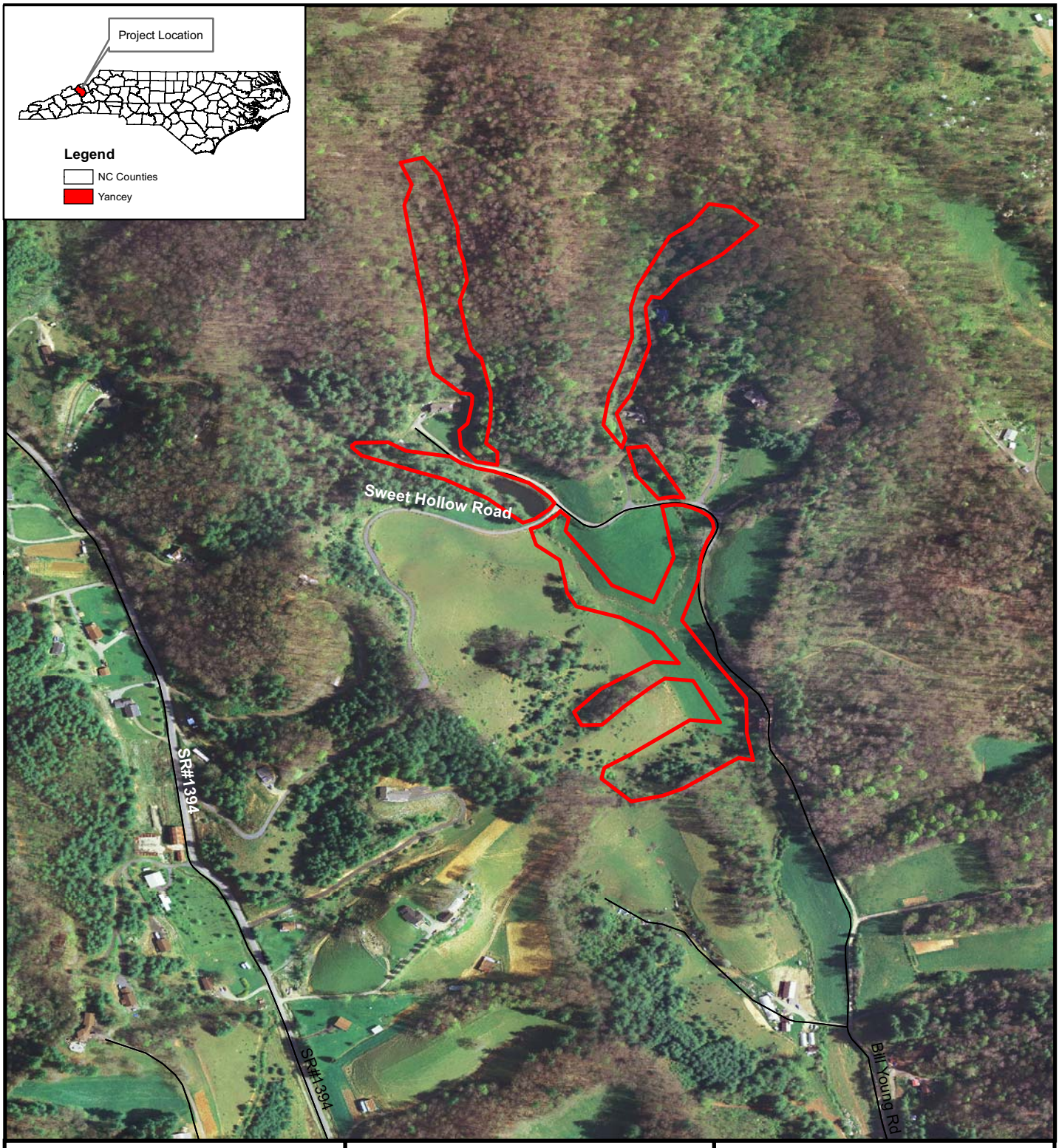
0 0.25 0.5 1
Miles

URS

Figure 1

Project Vicinity Map

Date: August 2008



North Carolina
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

UT to Bald Creek (Turner/Young)
Stream Restoration
Yancey County, NC

EEP Project No. 92596

Legend

Project Study Area

N
W E
S

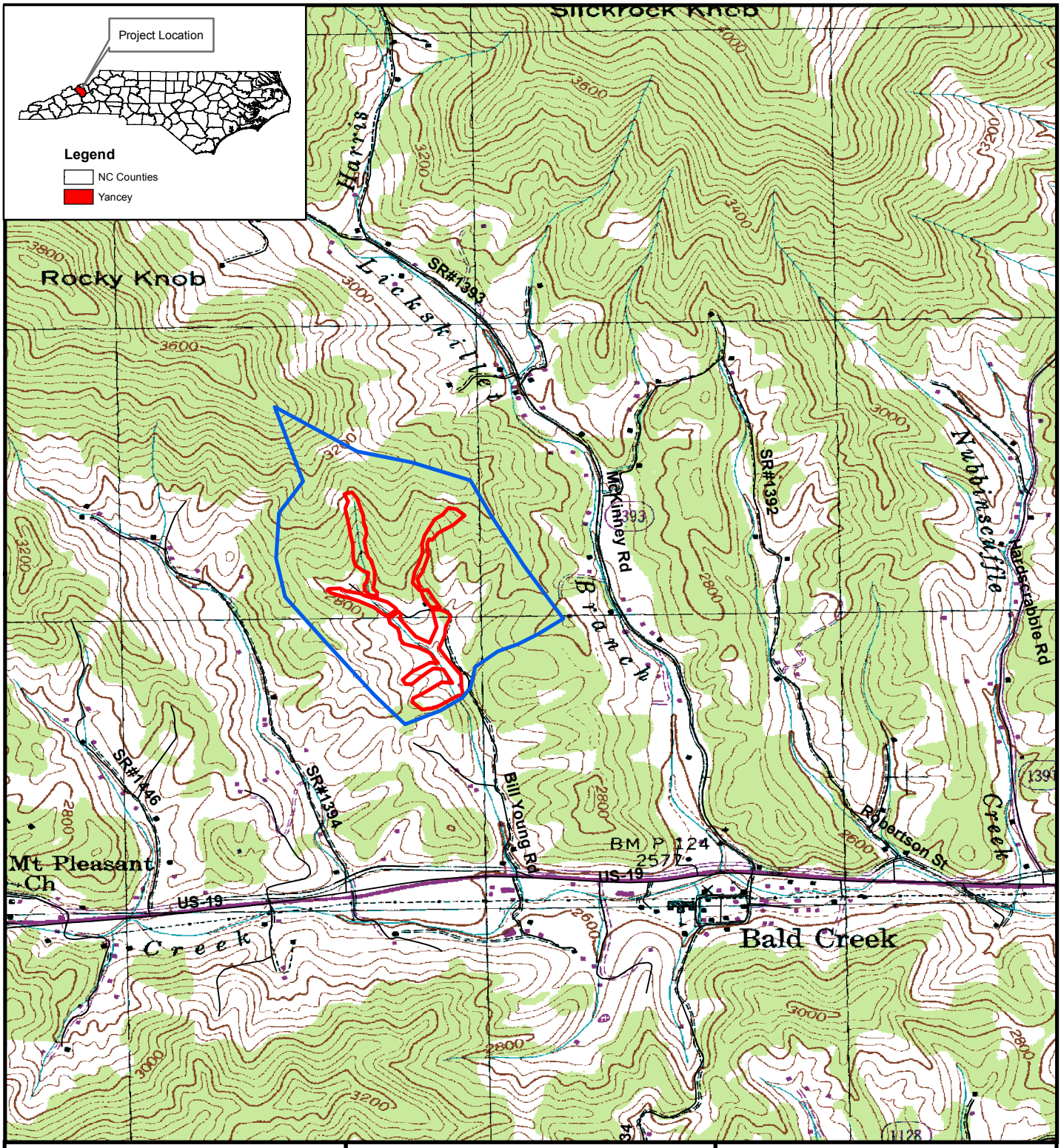
0 250 500 1,000
Feet

URS

Figure 2

Study Area Map

Date: August 2008



North Carolina
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

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Stream Restoration
Yancey County, NC

EEP Project No. 92596

Legend

Watershed Area

Project Study Area

N
W E
S

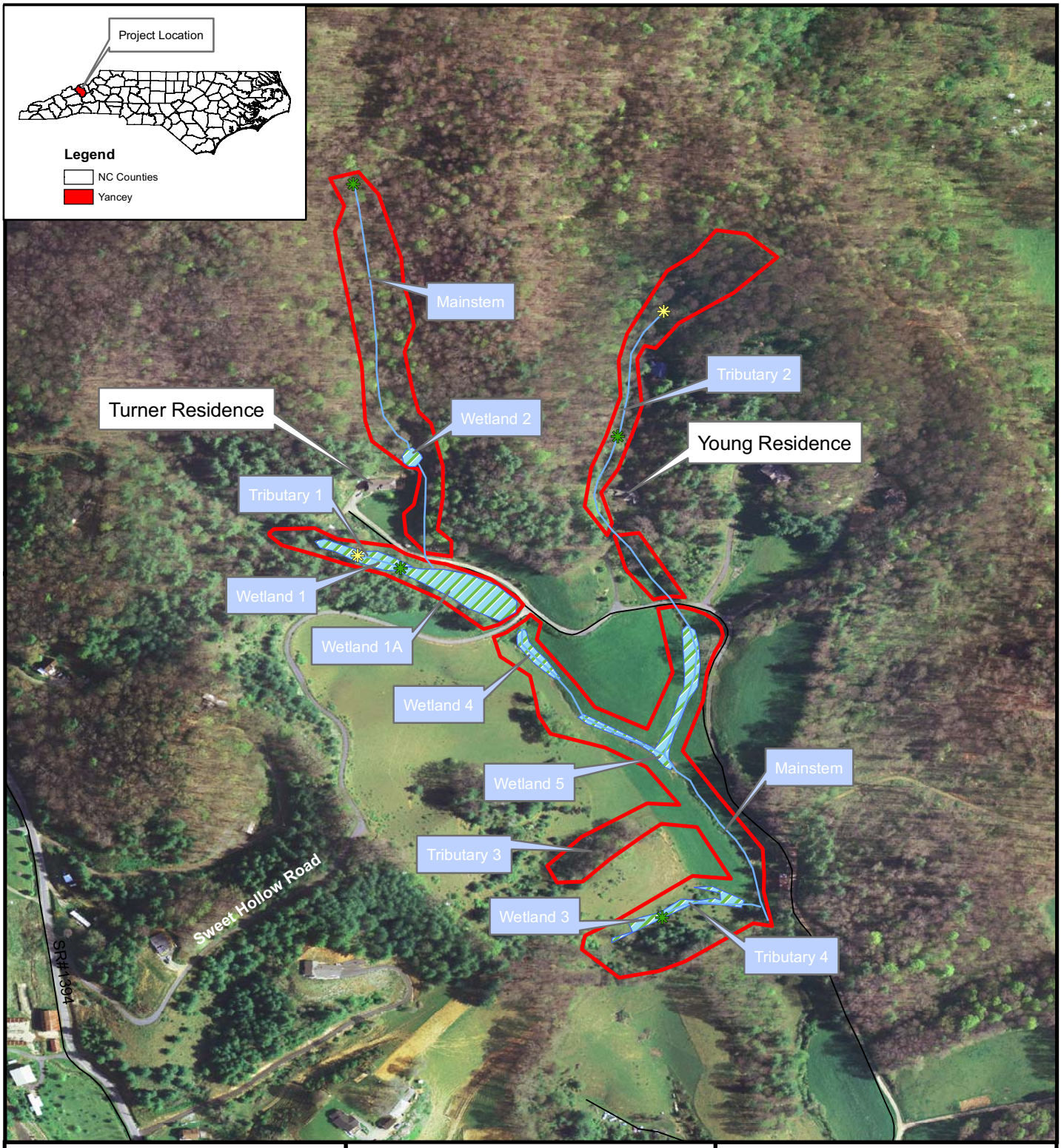
0 0.25 0.5
Miles

URS

Figure 3

Watershed Map

Date: October 2008



North Carolina
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

UT to Bald Creek (Turner/Young)
Stream Restoration
Yancey County, NC

EEP Project No. 92596

Legend

- Intermittent Origin
- Perennial Origin
- Field Delineated Streams
- Field Delineated Wetlands
- Project Study Area

N
W E
S

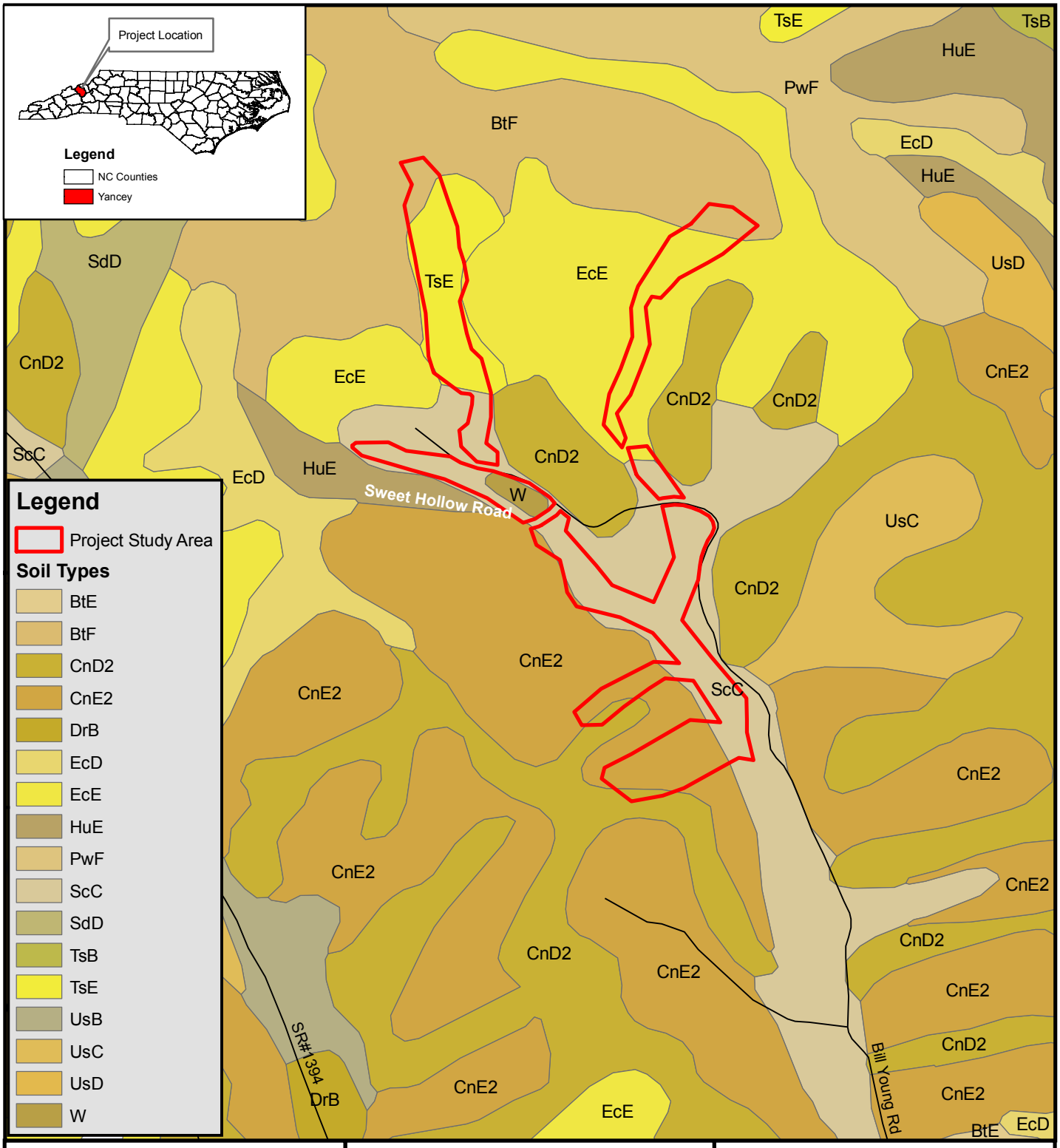
0 250 500
Feet

URS

Figure 4

Hydrologic Features Map

Date: August 2008



North Carolina
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

UT to Bald Creek (Turner/Young)
Stream Restoration
Yancey County, NC

EEP Project No. 92596

N
W E
S

0 250 500 1,000
Feet

URS

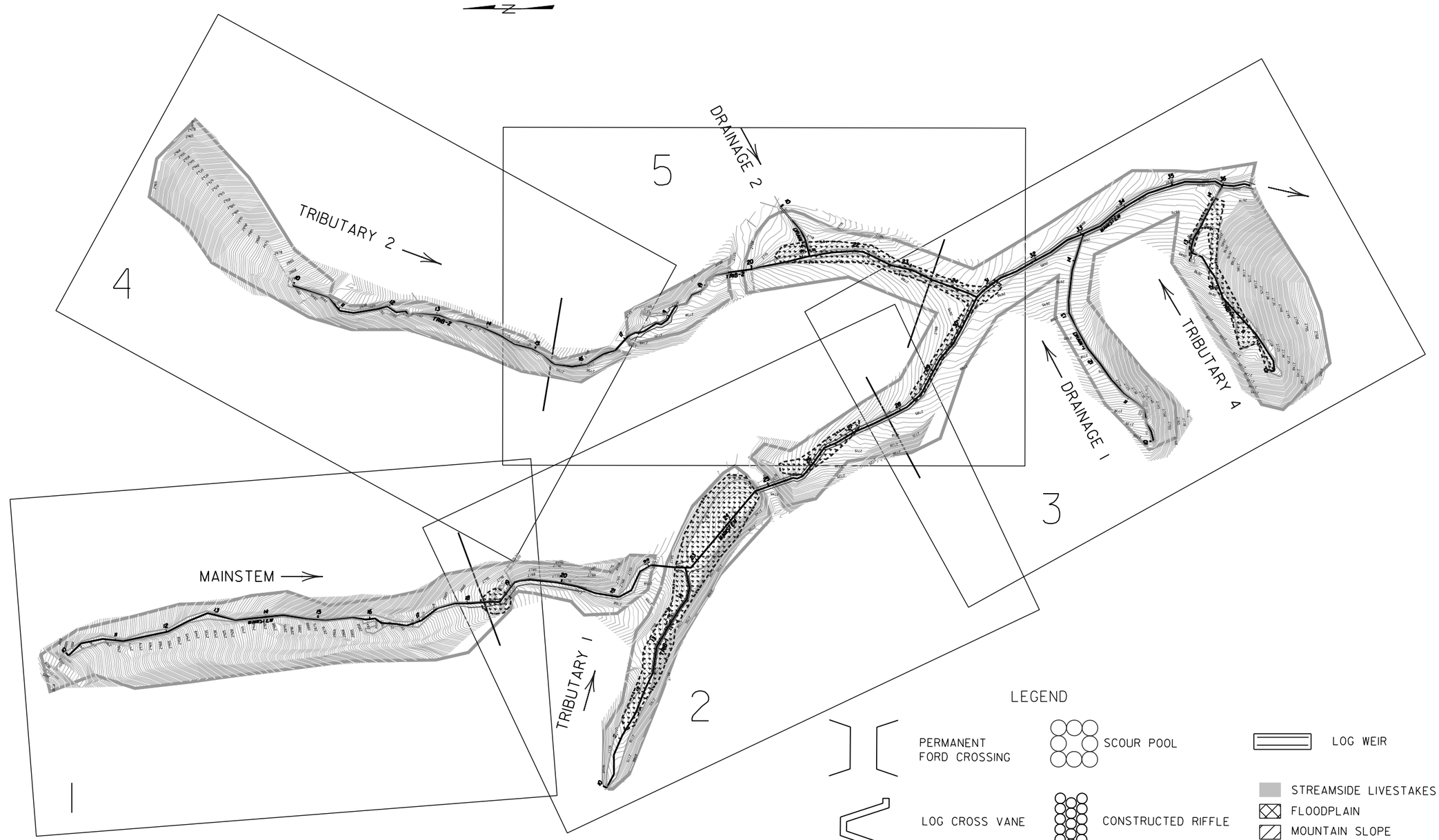
Figure 5

Soil Map

Date: March 2009

Source: Yancy County Soil Data Mart

CHAPTER 13. DESIGNED SHEETS



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PROJECT: UT TO BALD CREEK (TURNER & YOUNG PROPERTIES) STREAM RESTORATION PROJECT

TITLE: RESTORATION PLAN VIEW EXISTING

CLIENT: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Ecosystem Enhancement Program

DATE: JUNE 2009

TECHNICIAN: EHJ

CHECKED BY: KMM

EEP PROJ. NO. 92596
SCO PROJ. NO. 07071490I

0

BEGIN PROJECT MAINSTEM REACH A
STA 10+00

MAINSTEM REACH B
STA 18+00

CONSERVATION EASEMENT

MAINSTEM

MATCHLINE SHEET 2

WETLAND BOUNDARY

CONSERVATION EASEMENT

60 30 0 30 60

REVISIONS

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ECOSYSTEM
ENHANCEMENT PROGRAM

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CHECKED BY: KMM

EEP PROJ. NO.
92596
SCO PROJ. NO.
07071490I

1

MATCHLINE SHEET 1

CONSERVATION EASEMENT

MAINSTEM REACH C
STA 20+50

MAINSTEM
TIE TO EXISTING CMP
STA 22+07

MAINSTEM
STA 22+52

MAINSTEM
DO NOT DISTURB
DRIVEWAY EMBANKMENT
STA 24+73

MAINSTEM REACH D
STA 25+44

WETLAND BOUNDARY

MATCHLINE SHEET 3

CONSERVATION EASEMENT

WETLAND BOUNDARY

TRIBUTARY 1REACH 1B
STA 12+40

BEGIN PROJECT TRIBUTARY 1REACH 1A
STA 10+00

60 30 0 30 60

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CLIENT: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

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FOR
CONSTRUCTION

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SCO PROJ. NO.
07071490I

MAINSTEM REACH E
STA. 30+66

CONSERVATION EASEMENT

END PROJECT
STA. 36+53

MATCHLINE SHEET 5

MAINSTEM

BOULDERS

EXISTING FARM CROSSING

END TRIBUTARY 3/DRAINAGE 1

CONSERVATION EASEMENT

MATCHLINE SHEET 2

PRESERVE EXISTING TREES

PRESERVE EXISTING NON-INVASIVE TREES AND SHRUBS

WETLAND BOUNDARY

DRAIN-1

WETLAND BOUNDARY

BEGIN PROJECT TRIBUTARY 3/DRAINAGE 1
STA 10+00

BEGIN PROJECT TRIBUTARY 4 REACH 4A
STA 10+00

60 30 0 30 60

REVISIONS

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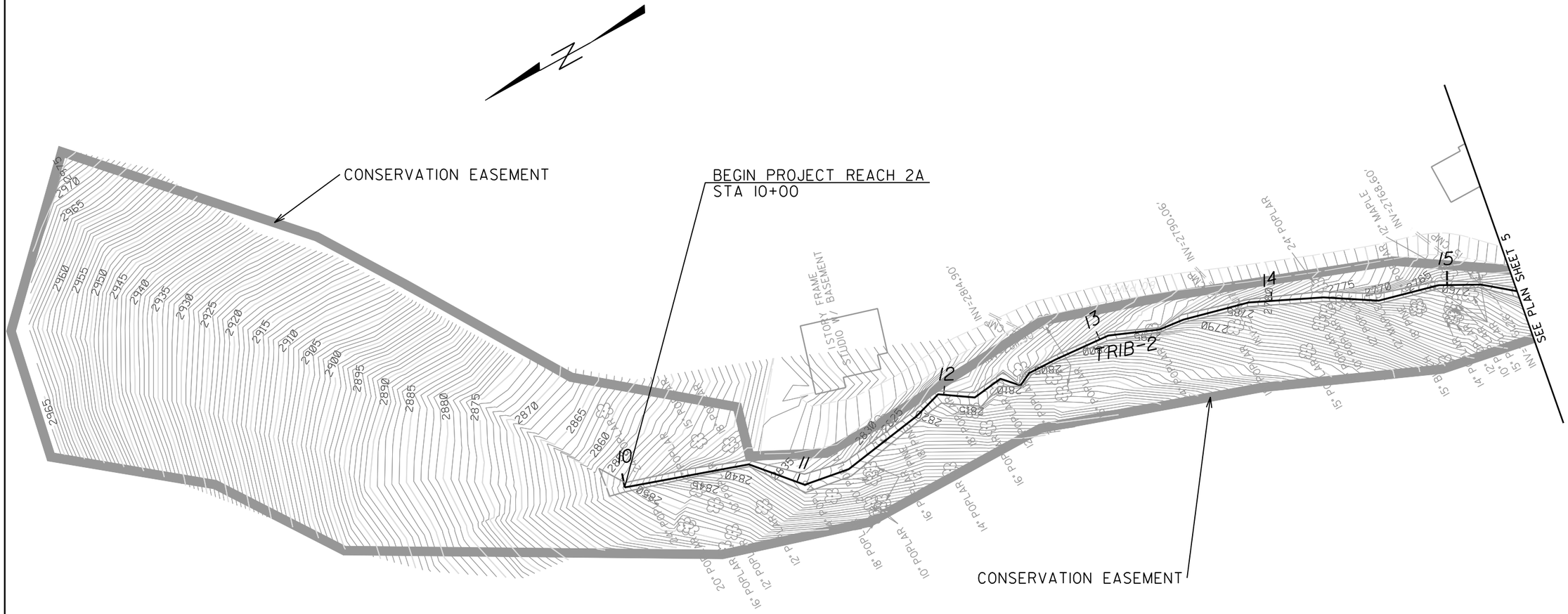
3



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DATE: JUNE 2009

TECHNICIAN: EHJ

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EEP PROJ. NO. 92596
SCO PROJ. NO. 07071490I

BEGIN PROJECT DRAINAGE 2
STA 10+00

TRIBUTARY 2
TIE TO EXISTING HDPE
STA. 19+49

PRESERVE
EXISTING TREES

WETLAND BOUNDARY

CONSERVATION EASEMENT

REACH 2B
STA 18+26

CONSERVATION EASEMENT

REACH 2C
STA 20+00

PRESERVE
EXISTING WILLOWS

MATCHLINE SHEET 3

MATCHLINE SHEET 4

1 STORY FRAME DWELLING

DRIVEWAY

DRAIN-2

TRIB-2

60 30 0 30 60

REVISIONS

NO.	DATE

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Ecosystem Enhancement Program

DATE: JUNE 2009

TECHNICIAN: EHJ

CHECKED BY: KMM

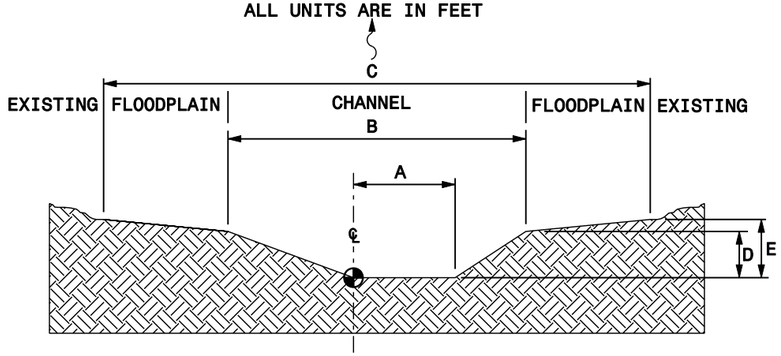
EEP PROJ. NO. 92596
SCO PROJ. NO. 07071490I

5

TYPICAL SECTION - POOL TRIBUTARIES

TRIBUTARY	A	B	C	D	E (MAX)
B	3.5	6.6	11.0	1.4	1.4
E	3.5	6.6	11.0	1.2	1.2
1B	2.0	3.3	5.0	0.7	0.8
2B	2.0	3.9	6.0	0.4	0.4
3B	1.5	2.3	10.0	0.9	0.9
	BOTTOM WIDTH	CHANNEL WIDTH	FLOOD-PLAIN WIDTH	CHANNEL DEPTH	FLOOD-PLAIN DEPTH

ALL UNITS ARE IN FEET



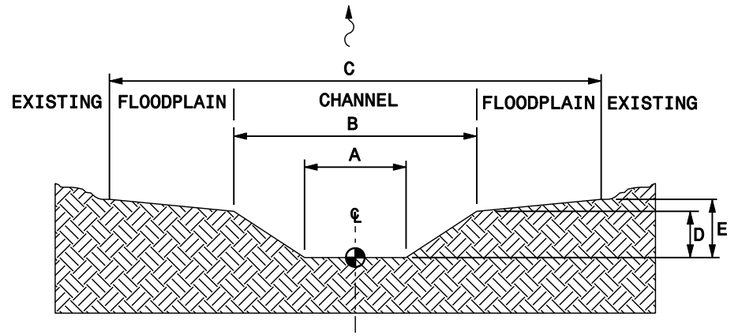
NOTES:
- ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION.
- DIMENSION TOLERANCE TO BE HELD TO +/- 0.1 FT.
- ◔ - GRADE POINT IS THE ELEVATION SHOWN ON THE PROFILE
- ALL SHARP CORNERS SHOULD BE ROUNDED
- POOLS FOR ROCK CROSS VANES SHALL BE CENTERED

SCALE: NTS

TYPICAL SECTION - RIFFLE TRIBUTARY

TRIBUTARY	A	B	C	D	E (MAX)
B	3.3	5.5	11.0	0.6	1.4
E	3.3	5.5	11.0	0.6	1.2
1B	0.4	2.5	5.0	0.4	0.8
2B	1.5	3.0	6.0	0.2	0.4
3B	0.9	1.8	10.0	0.3	0.9
	BOTTOM WIDTH	CHANNEL WIDTH	FLOOD-PLAIN WIDTH	CHANNEL DEPTH	FLOOD-PLAIN DEPTH

ALL UNITS ARE IN FEET



NOTES:
- ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION.
- DIMENSION TOLERANCE TO BE HELD TO +/- 0.1 FT.
- ◔ - GRADE POINT IS THE ELEVATION SHOWN ON THE PROFILE
- ALL SHARP CORNERS SHOULD BE ROUNDED

SCALE: NTS

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PROJECT: UT TO BALD CREEK (TURNER & YOUNG PROPERTIES) STREAM RESTORATION PROJECT

TITLE: RESTORATION PLAN TYPICALS

CLIENT: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

DATE: JUNE 2009

TECHNICIAN: EHJ

CHECKED BY: KMM

EEP PROJ. NO. 92596
SCO PROJ. NO. 07071490I

0

BEGIN PROJECT MAINSTEM REACH A
PRESERVATION
STA 10+00

CONSERVATION EASEMENT

MAINSTEM REACH B
RESTORATION
STA 18+00

MATCHLINE SHEET 2

MAINSTEM

CONSERVATION EASEMENT

60 30 0 30 60

REVISIONS

NO.	DATE

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PROJECT: UT TO BALD CREEK
(TURNER & YOUNG PROPERTIES)
STREAM RESTORATION PROJECT

TITLE: RESTORATION PLAN VIEW
PROPOSED

CLIENT: NORTH CAROLINA
ECOSYSTEM
ENHANCEMENT PROGRAM

Ecosystem Enhancement Program

DATE: JUNE 2009

TECHNICIAN: EHJ

CHECKED BY: KMM

EEP PROJ. NO.
92596
SCO PROJ. NO.
07071490I

1

CONSERVATION EASEMENT

MAINSTEM REACH C
ENHANCEMENT II
STA 20+50

MAINSTEM
TIE TO EXISTING CMP
STA 22+07

MAINSTEM
ENHANCEMENT II
STA 22+52

MAINSTEM
DO NOT DISTURB
DRIVEWAY EMBANKMENT
STA 24+73

MAINSTEM REACH D
ENHANCEMENT I
STA 25+44

WETLAND ENHANCEMENT
BOUNDARY

MATCHLINE SHEET 1

MATCHLINE SHEET 3

WETLAND ENHANCEMENT
BOUNDARY

TRIBUTARY 1REACH 1B
RESTORATION
STA 12+40

CONSERVATION EASEMENT

BEGIN PROJECT TRIBUTARY 1REACH 1A
ENHANCEMENT II
STA 10+00

60 30 0 30 60

REVISIONS

NO.	DATE

Prepared by
URS
URS Corporation – North Carolina
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Morrisville, North Carolina 27560
TELEPHONE (919) 461-1100 FAX (919) 461-1415

PROJECT: UT TO BALD CREEK (TURNER & YOUNG PROPERTIES) STREAM RESTORATION PROJECT

TITLE: RESTORATION PLAN VIEW PROPOSED

CLIENT: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

Ecosystem Enhancement Program

DRAFT
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FOR
CONSTRUCTION

DATE: JUNE 2009

TECHNICIAN: EHJ

CHECKED BY: KMM

EEP PROJ. NO.
92596
SCO PROJ. NO.
07071490I

MAINSTEM REACH E
RESTORATION
STA. 30+66

CONSERVATION EASEMENT

END PROJECT
STA. 36+53

MATCHLINE SHEET 5

MATCHLINE SHEET 2

BOULDERS

CONSERVATION EASEMENT

WETLAND ENHANCEMENT
BOUNDARY

END TRIBUTARY 3/DRAINAGE I

PRESERVE EXISTING
NON-INVASIVE
TREES AND SHRUBS

WETLAND ENHANCEMENT
BOUNDARY

PRESERVE
EXISTING
TREES

BEGIN PROJECT TRIBUTARY 3/DRAINAGE I
REACH 3A ENHANCEMENT II
STA 10+00

BEGIN PROJECT TRIBUTARY 4 REACH 4A
ENHANCEMENT II
STA 10+00

60 30 0 30 60

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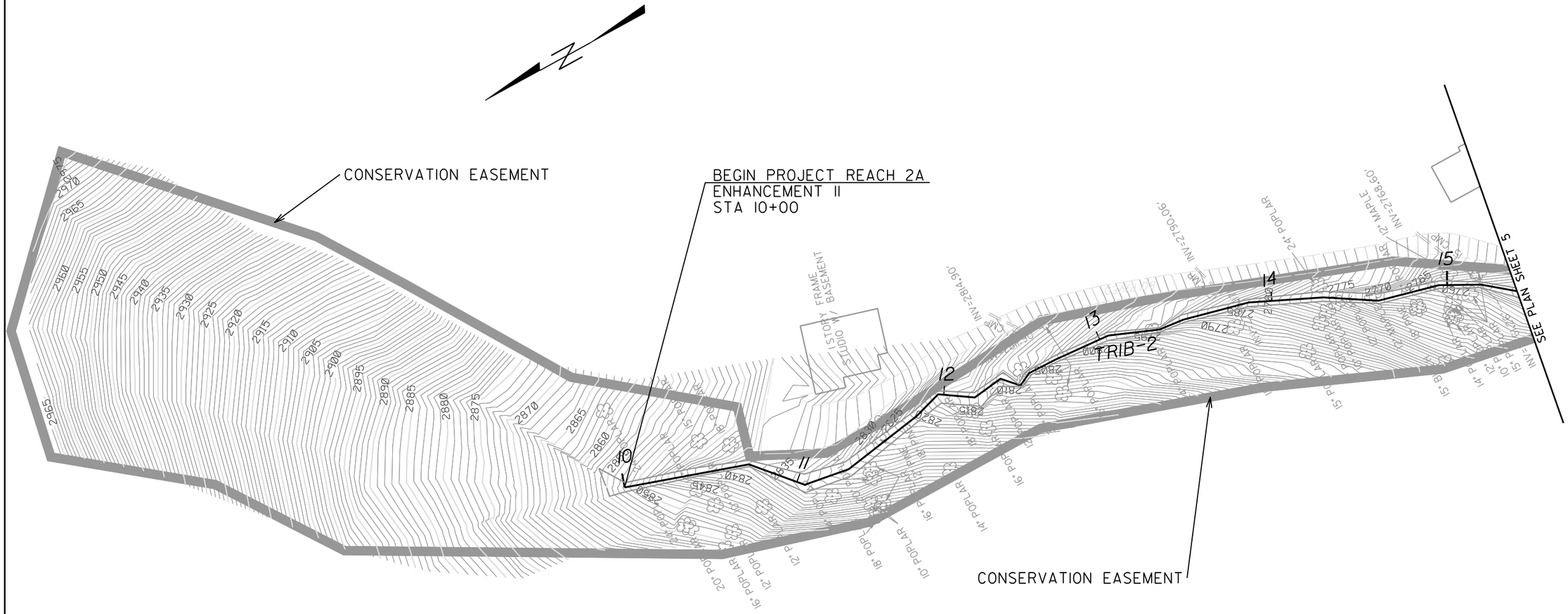

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SCO PROJ. NO. 07071490I

BEGIN PROJECT DRAINAGE 2
REFORESTATION
STA 10+00

TRIBUTARY 2
TIE TO EXISTING HDPE
STA. 19+49

PRESERVE
EXISTING TREES

WETLAND ENHANCEMENT
BOUNDARY

CONSERVATION EASEMENT

REACH 2B
RESTORATION
STA 18+26

REACH 2C
ENHANCEMENT II
STA 20+00

CONSERVATION EASEMENT

PRESERVE
EXISTING WILLOWS

MATCHLINE SHEET 3

MATCHLINE SHEET 4

1 STORY FRAME DWELLING

DRIVEWAY

TRIB-2

DRAIN-2

60 30 0 30 60

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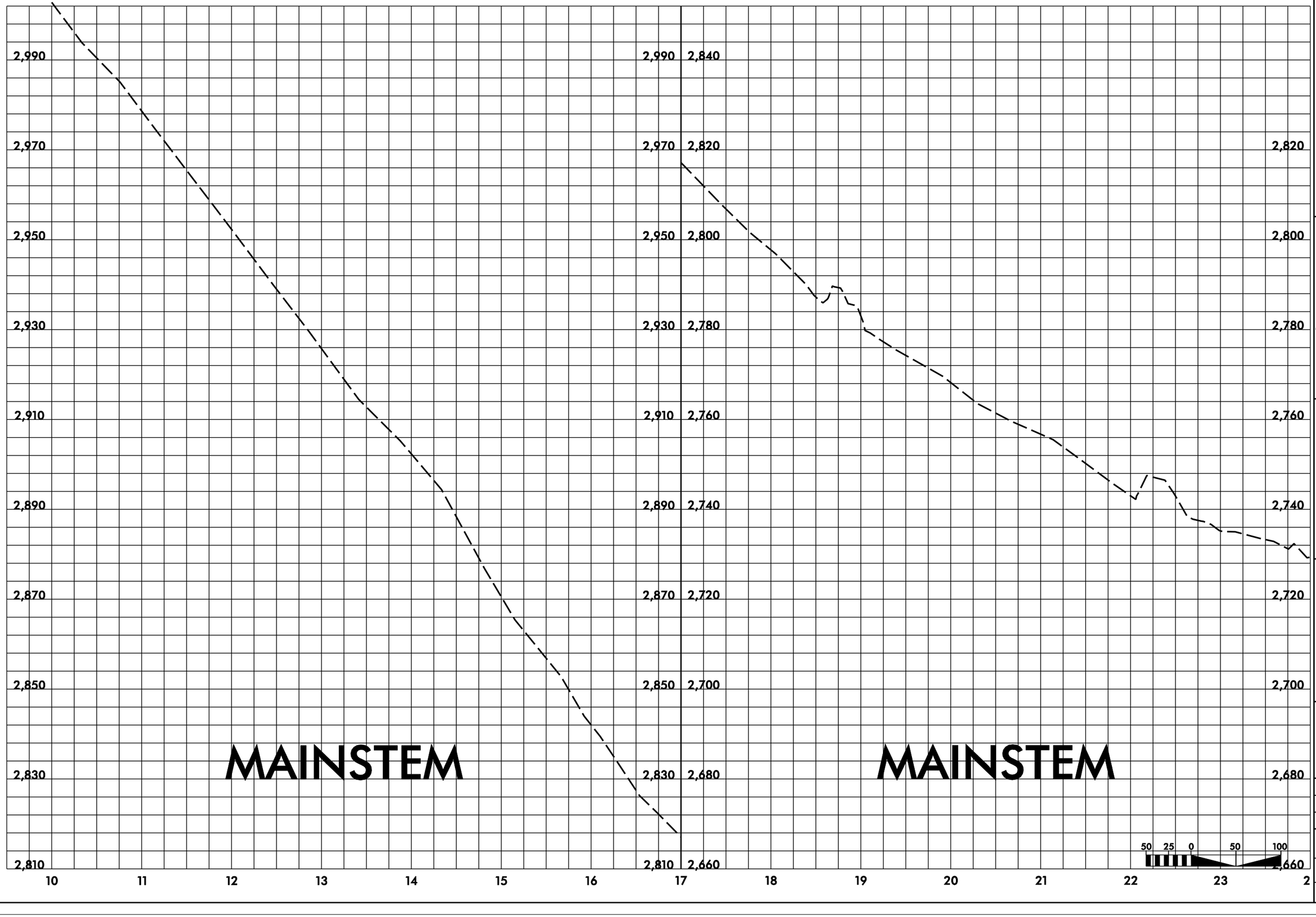

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TITLE: RESTORATION PLAN
EXISTING PROFILE

CLIENT: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

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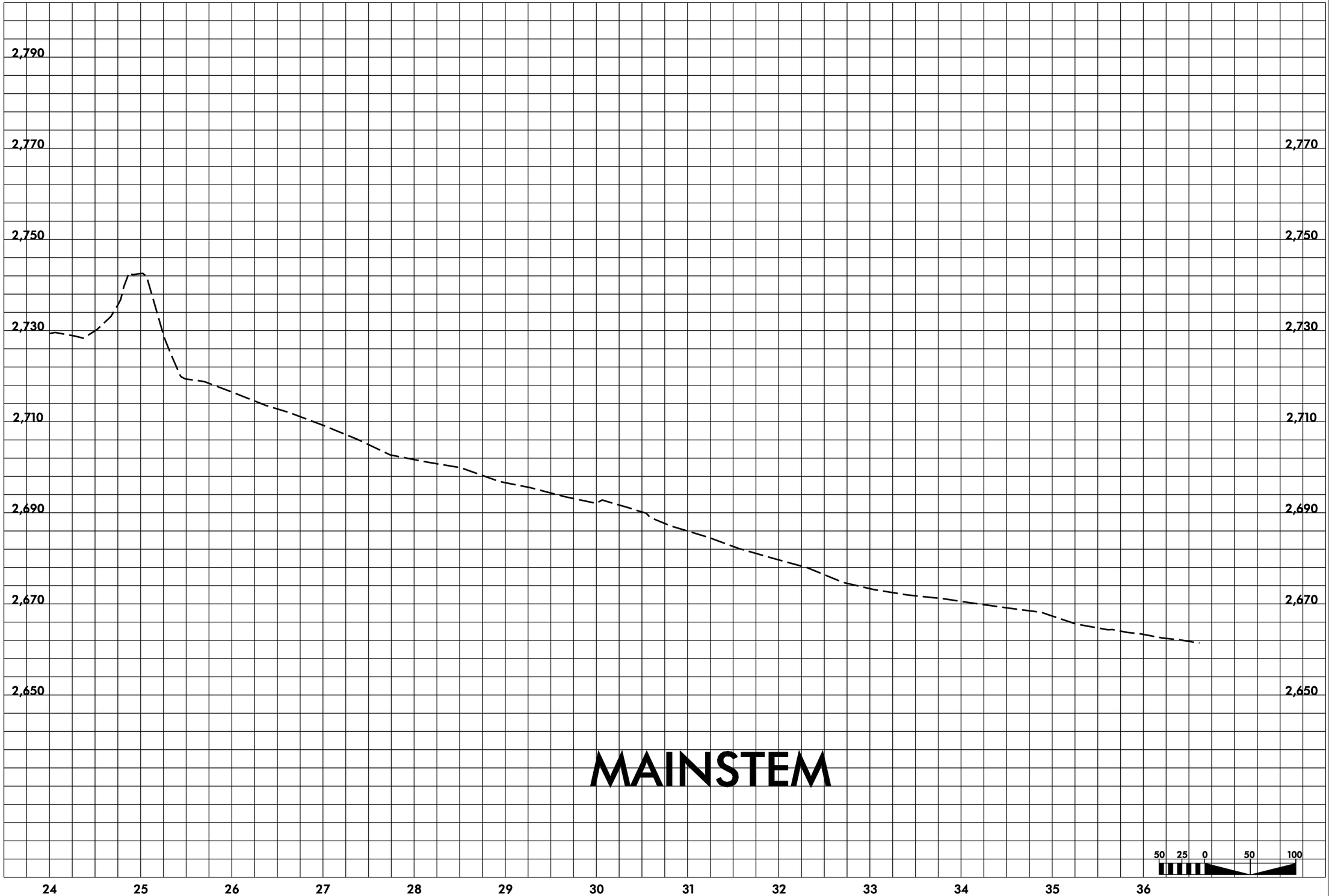
DATE: JUNE 2009

TECHNICIAN: ML

CHECKED BY: KMM

EEP PROJ. NO.
92497
EEP PROJ. NO.
060675001

6



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CLIENT: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

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DATE: JUNE 2009

TECHNICIAN: ML

CHECKED BY: KMM

EEP PROJ. NO. 92497
EEP PROJ. NO. 060675001

REVISIONS

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Morrisville, North Carolina 27560
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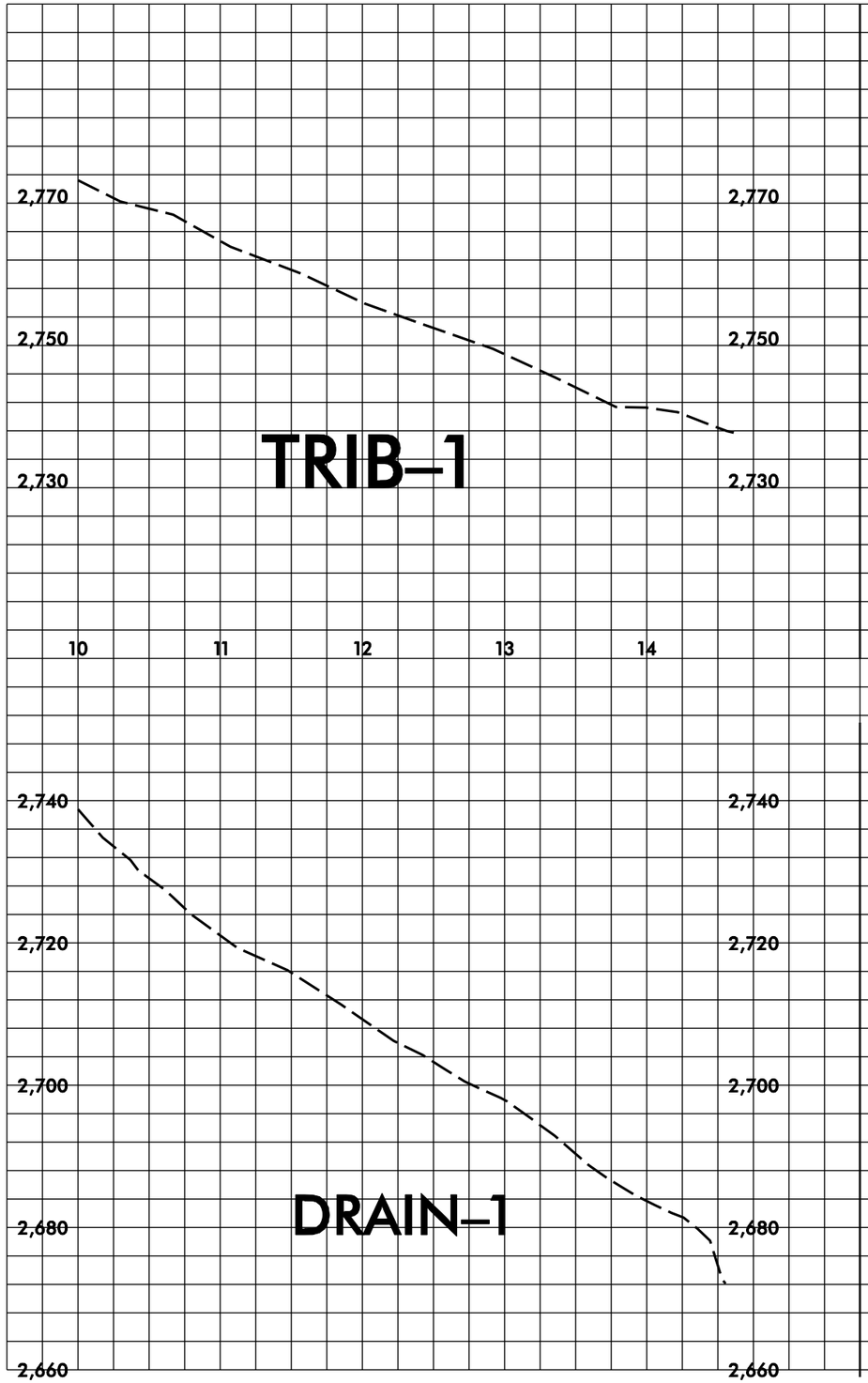
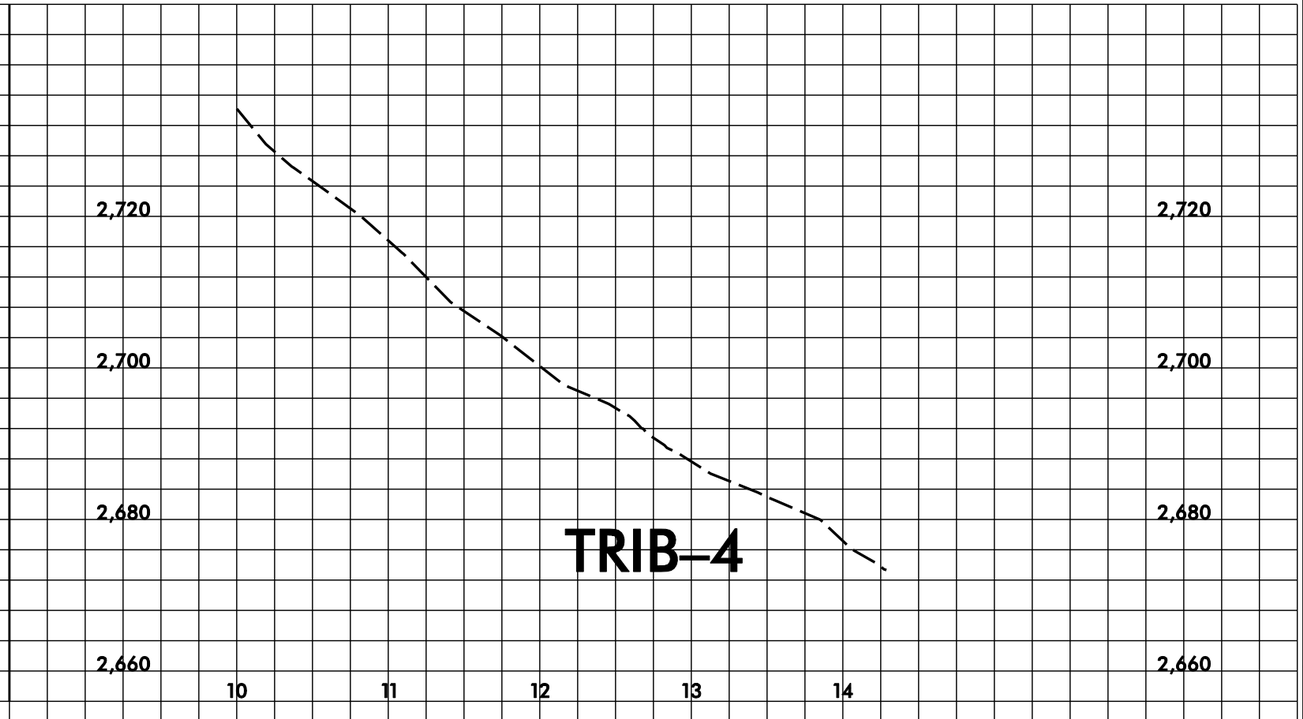
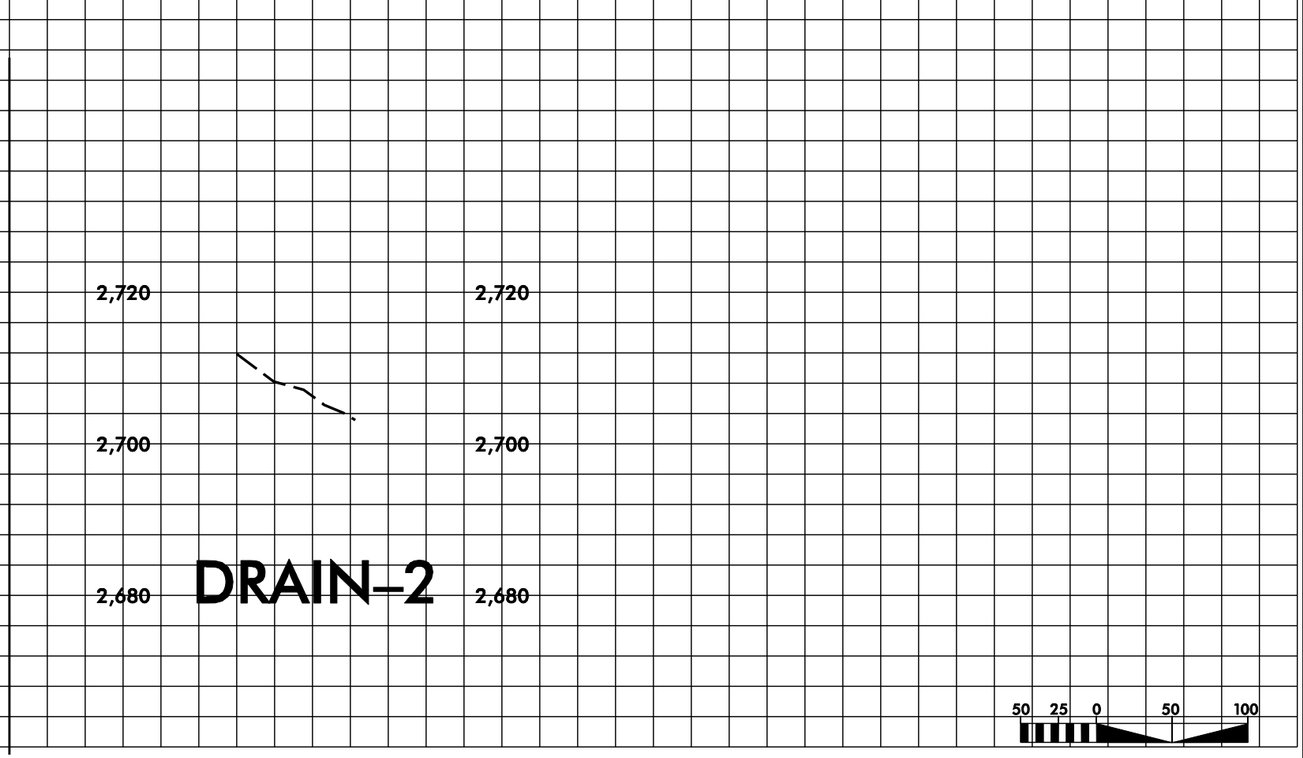
EEP PROJ. NO. 06067500I







50 25 0 50 100

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Prepared by
URS
URS Corporation – North Carolina
1600 Perimeter Park Drive
Morrisville, North Carolina 27560
TELEPHONE (919) 461-1100 FAX (919) 461-1415

PROJECT: NEWFOUND CREEK STREAM RESTORATION PROJECT

TITLE: RESTORATION PLAN EXISTING PROFILE

CLIENT: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM

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CONSTRUCTION

DATE: SEPT 2008

TECHNICIAN: ML

CHECKED BY: KMM

EEP PROJ. NO.
92497
EEP PROJ. NO.
060675001

BEGIN PROJECT MAINSTEM REACH A
PRESERVATION
STA 10+00

CONSERVATION EASEMENT

MAINSTEM REACH B
RESTORATION
STA 18+00

MAINSTEM

MATCHLINE SHEET 2

CONSERVATION EASEMENT

60 30 0 30 60

REVISIONS

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UT TO BALD CREEK
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STREAM RESTORATION PROJECT

TITLE:
RESTORATION PLAN VIEW
PROPOSED PLANTING PLAN

CLIENT:
NORTH CAROLINA
ECOSYSTEM
ENHANCEMENT PROGRAM

Ecosystem Enhancement PROGRAM

DATE: JUNE 2009

TECHNICIAN: EHJ

CHECKED BY: KMM

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92596
SCO PROJ. NO.
07071490I

1

MATCHLINE SHEET 1

CONSERVATION EASEMENT

MAINSTEM REACH C
ENHANCEMENT II
STA 20+50

MAINSTEM
TIE TO EXISTING CMP
STA 22+07

MAINSTEM
ENHANCEMENT II
STA 22+52

MAINSTEM
DO NOT DISTURB
DRIVEWAY EMBANKMENT
STA 24+73

MAINSTEM REACH D
ENHANCEMENT I
STA 25+44

WETLAND ENHANCEMENT
BOUNDARY

MATCHLINE SHEET 3

CONSERVATION EASEMENT

WETLAND ENHANCEMENT
BOUNDARY

TRIBUTARY 1REACH 1B
RESTORATION
STA 12+40

BEGIN PROJECT TRIBUTARY 1REACH 1A
ENHANCEMENT II
STA 10+00

60 30 0 30 60

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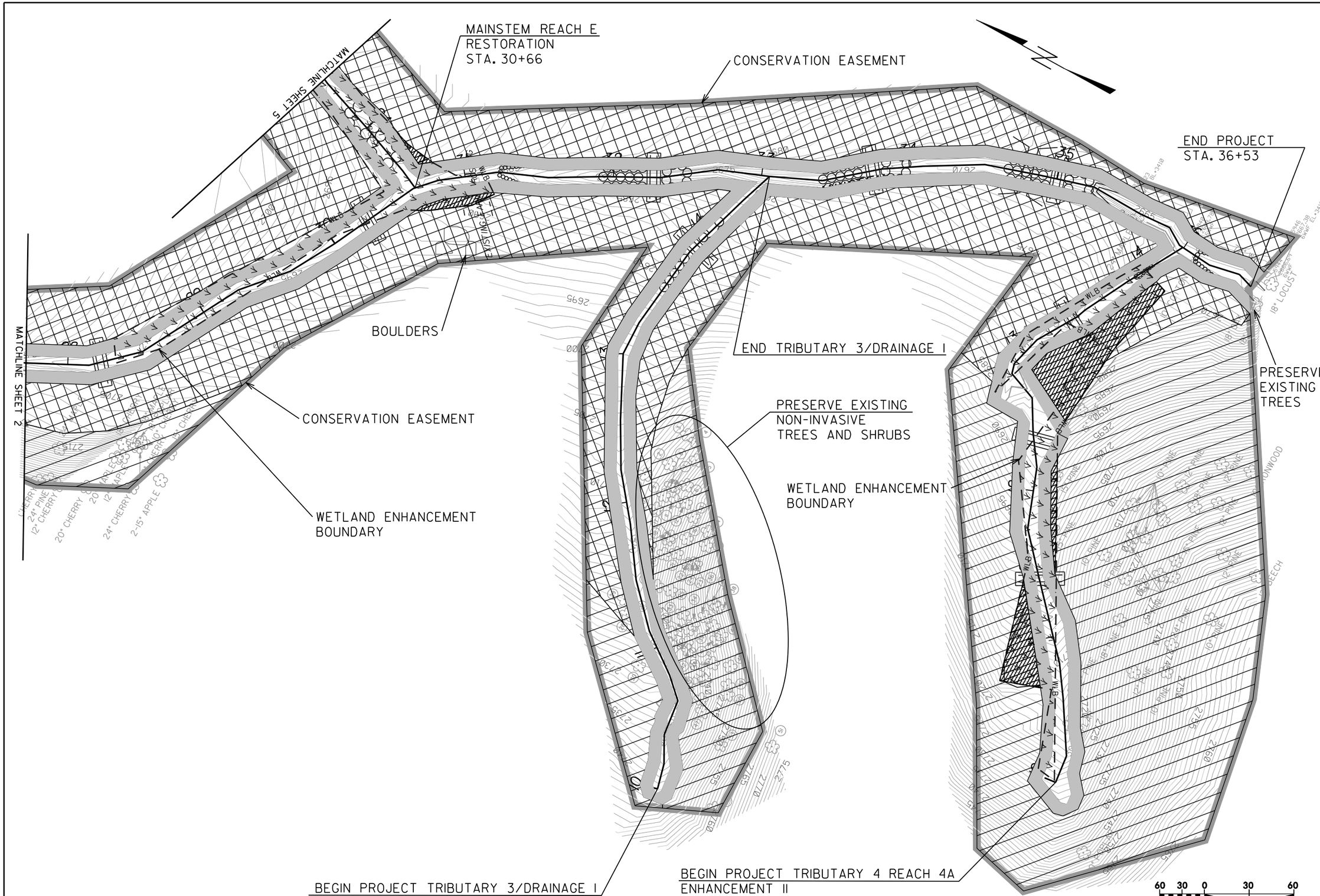

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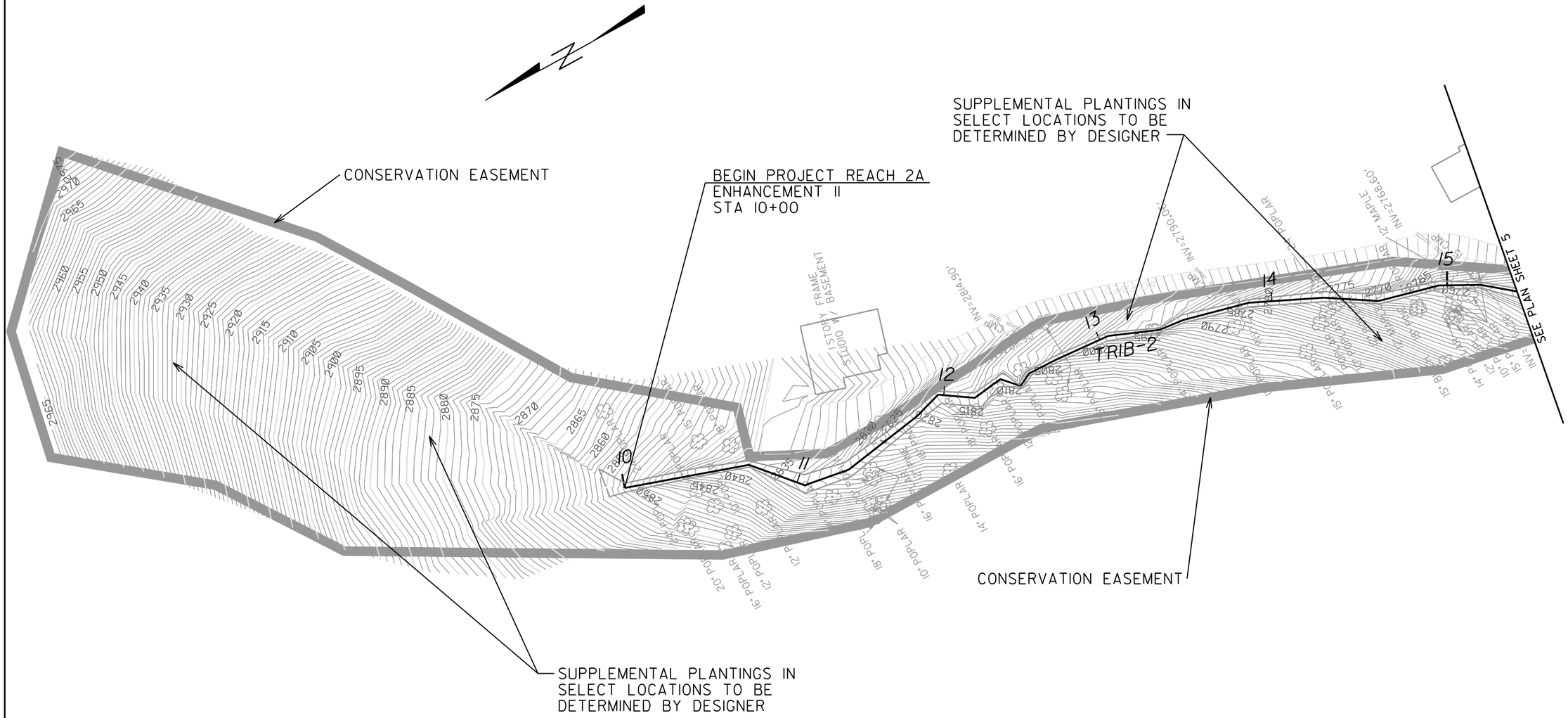

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EEP PROJ. NO. 92596
SCO PROJ. NO. 07071490I

BEGIN PROJECT DRAINAGE 2
REFORESTATION
STA 10+00

TRIBUTARY 2
TIE TO EXISTING HDPE
STA. 19+49

PRESERVE
EXISTING TREES

WETLAND ENHANCEMENT
BOUNDARY

CONSERVATION EASEMENT

REACH 2B
RESTORATION
STA 18+26

CONSERVATION EASEMENT

REACH 2C
ENHANCEMENT II
STA 20+00

PRESERVE
EXISTING WILLOWS

SUPPLEMENTAL PLANTINGS IN
SELECT LOCATIONS TO BE
DETERMINED BY DESIGNER

MATCHLINE SHEET 3

MATCHLINE SHEET 4

1 STORY FRAME DWELLING

60 30 0 30 60

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CHECKED BY: KMM

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92596
SCO PROJ. NO.
07071490I

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BALD CREEK	X-1

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

2755 2750 2745 2740 2735 2730 2725 2720 2715

2719.35
11+23.00

-DRAIN 1-

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BALD CREEK	X-1

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2720
2715
2710
2705

2709.21
10+25.00

-DRAIN 2-

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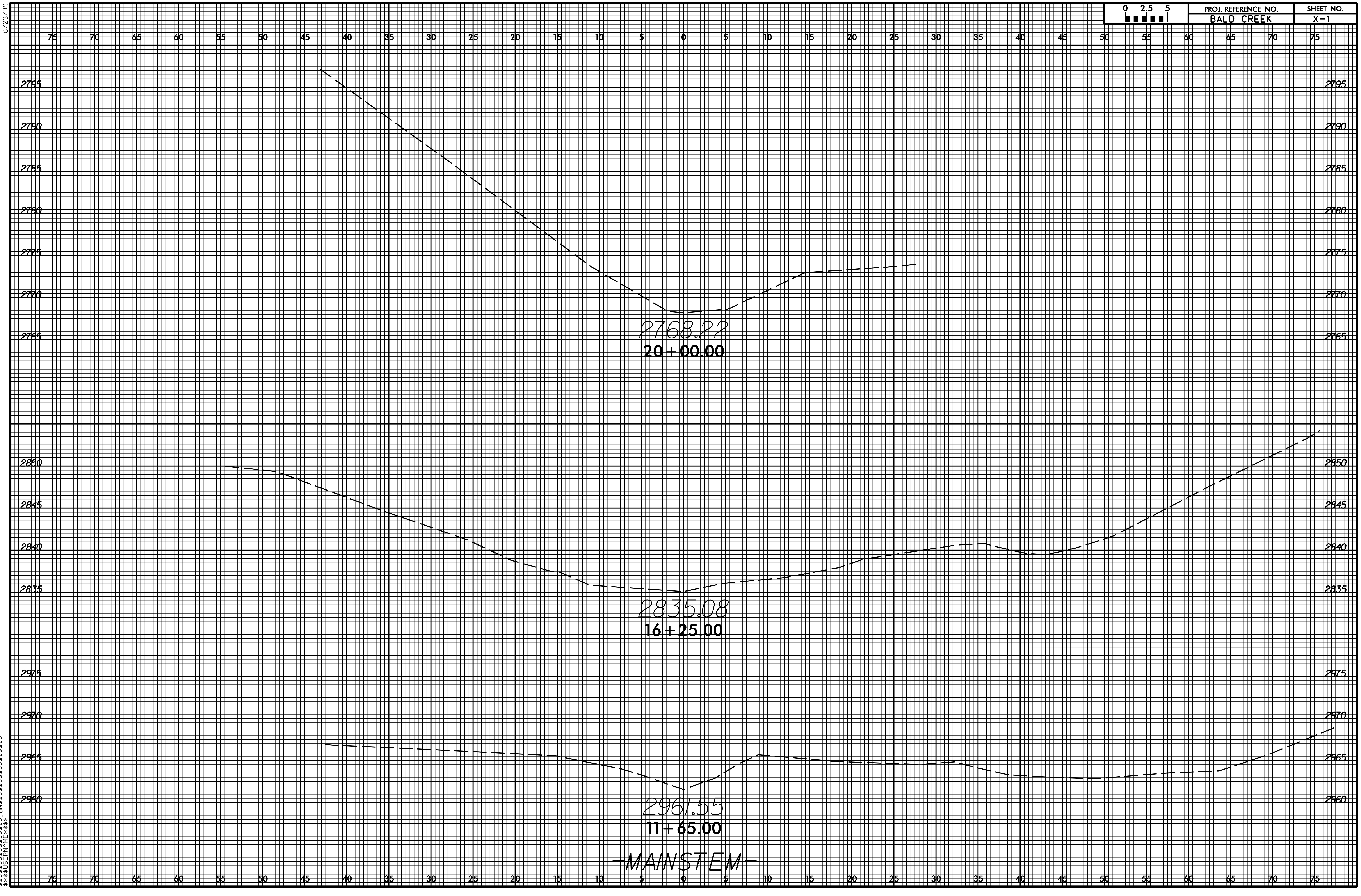

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PROJ. REFERENCE NO.
BALD CREEK
SHEET NO.
X-1
8/23/99
2768.22
20+00.00
2835.08
16+25.00
2961.55
11+65.00
-MAINSTEM-

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BALD CREEK	X-2

2696.61
29+00.00

2716.12
26+05.00

2728.89
24+25.00

-MAINSTEM-

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BALD CREEK	X-3

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2680 2680

2675 2675

2670 2670

2665 2665

2668.23
34+85.00

2690 2690

2685 2685

2680 2680

2675 2675

2670 2670

2673.36
33+00.00

-MAINSTEM-

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

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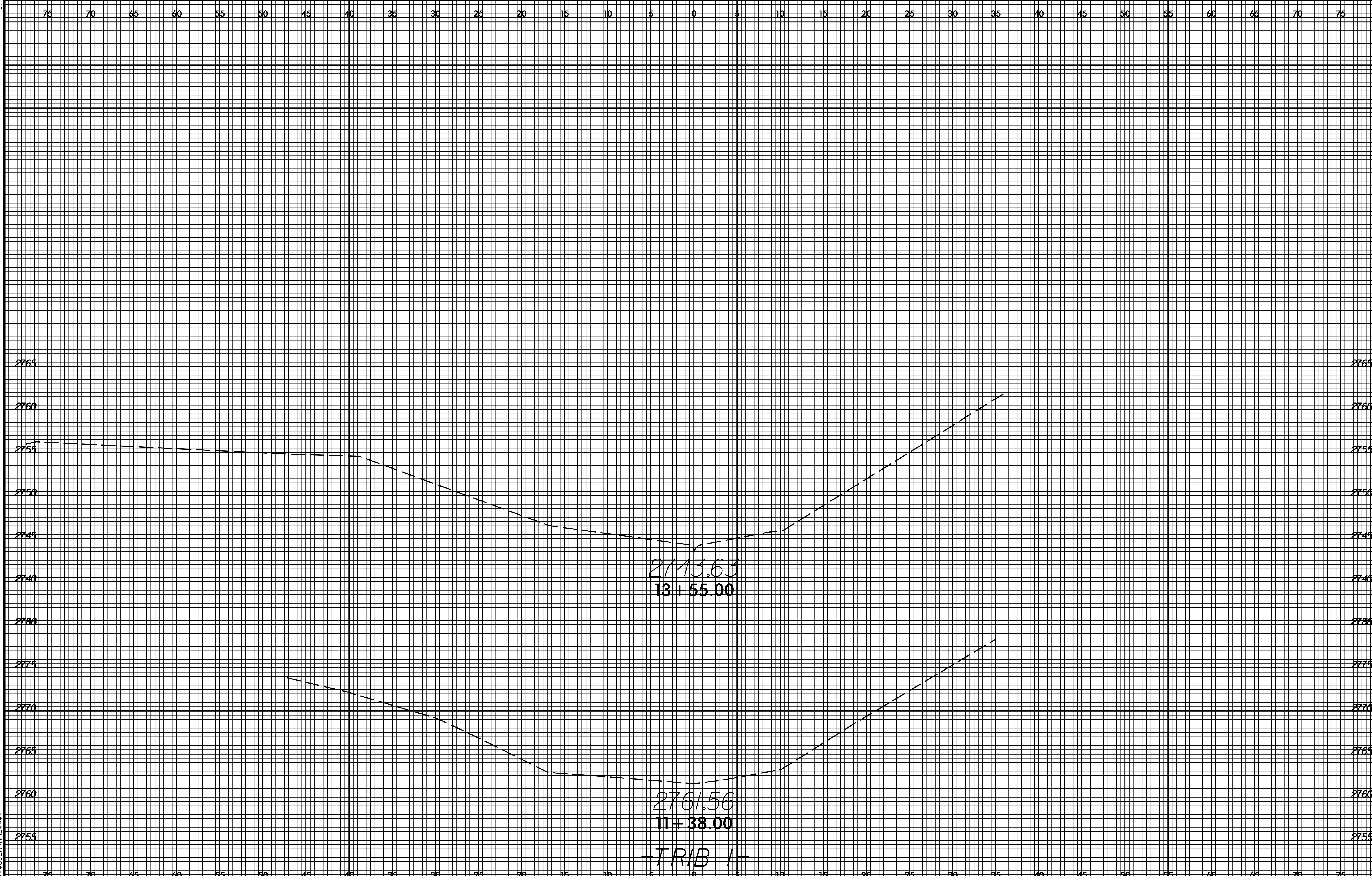
BALD CREEK	X-1



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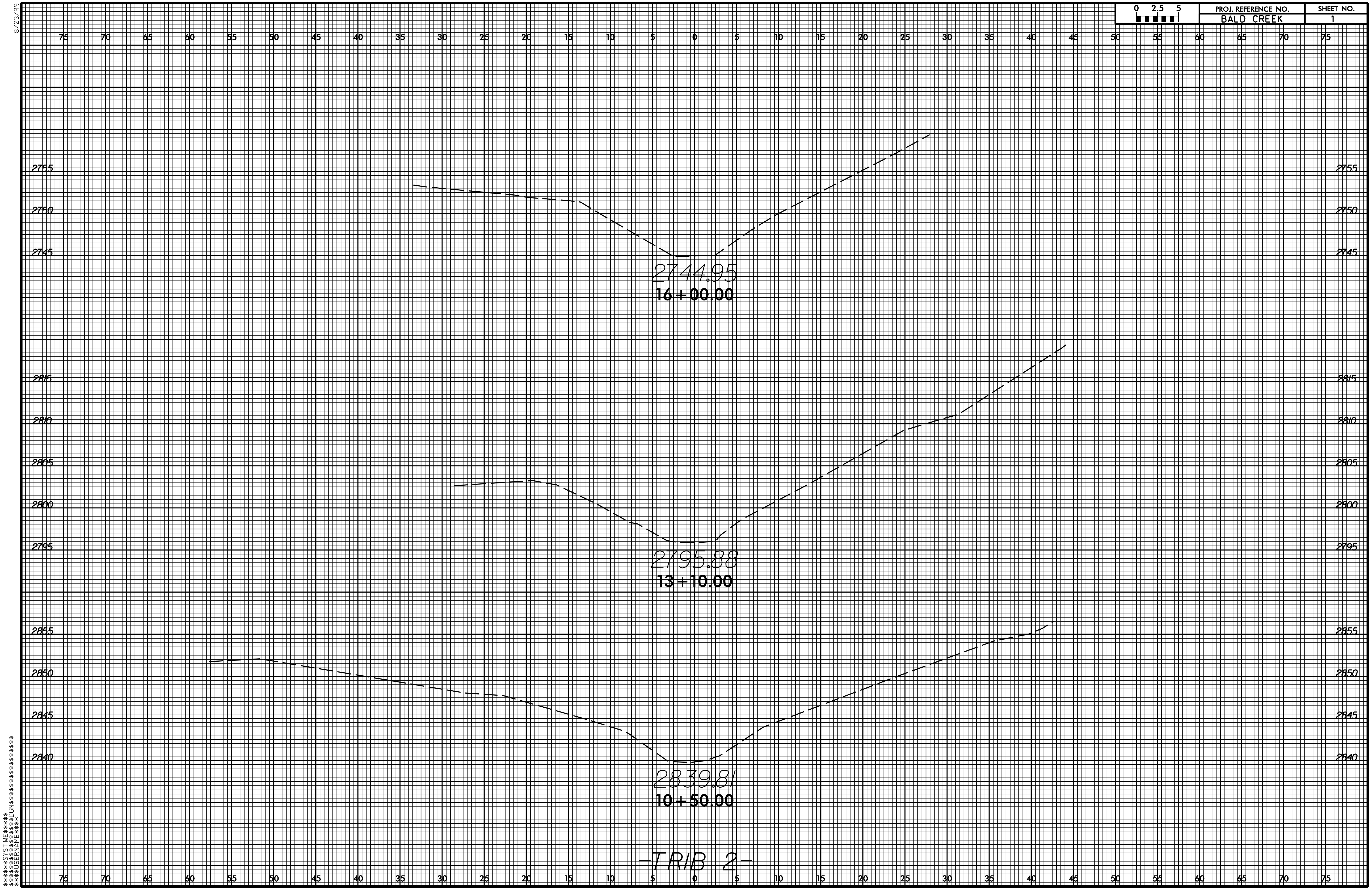

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PROJ. REFERENCE NO.
BALD CREEK
SHEET NO.
1
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2755
2750
2745
2744.95
16+00.00
2815
2810
2805
2800
2795
2795.88
13+10.00
2855
2850
2845
2840
2839.81
10+50.00
-TRIB 2-
$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BALD CREEK	2

2717.66
19+41.00

2726.34
18+50.00

2732.58
17+48.00

-TRIB 2-

$$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BALD CREEK	3

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

2700
2695
2690
2705
2700
2695

2690.80
23+90.00

2697.26
22+66.00

-TRIB 2-

$$$$$$$$SYSTIME$$$$
$$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$$USERNAME$$$$

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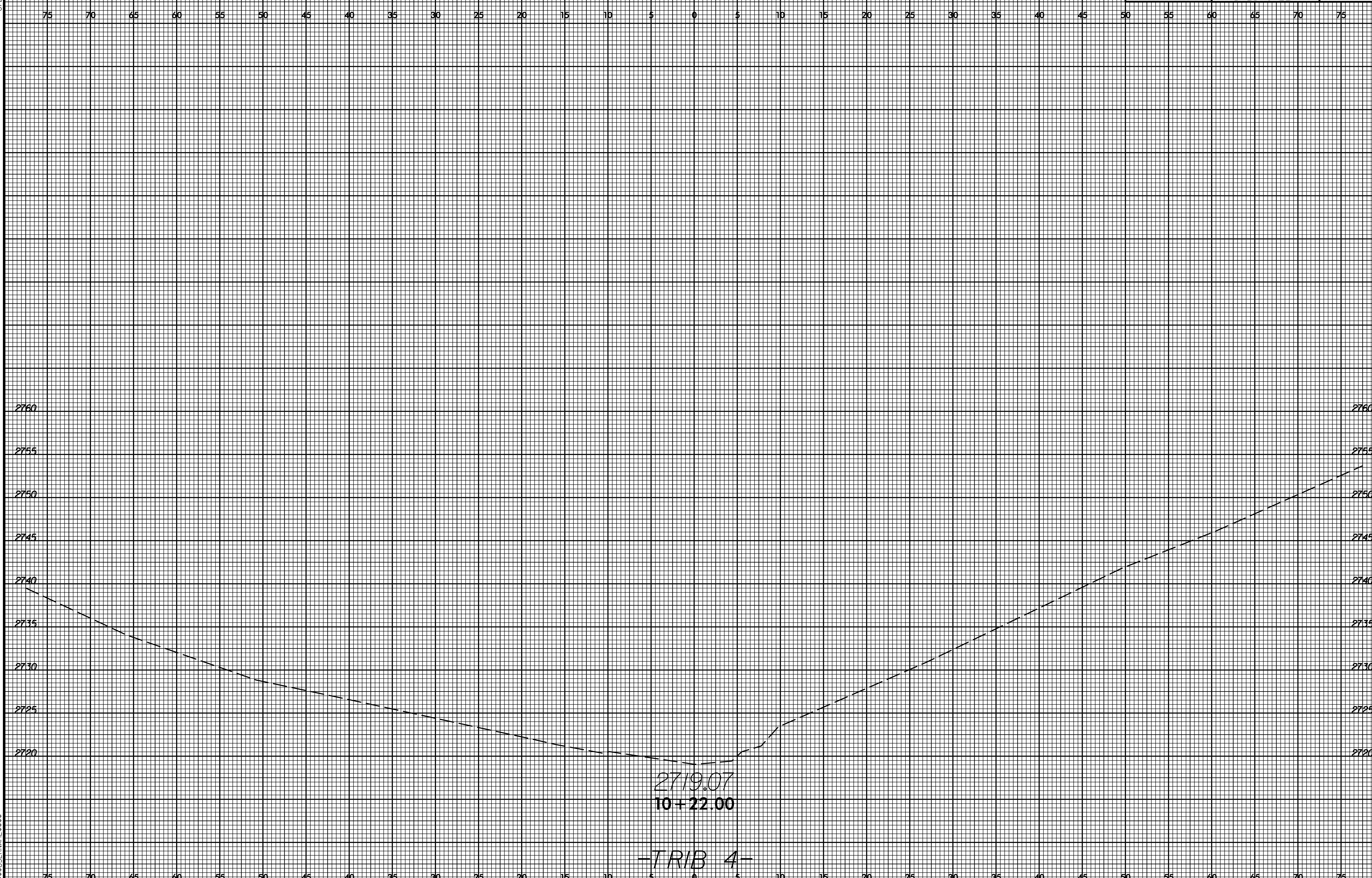

8/23/99

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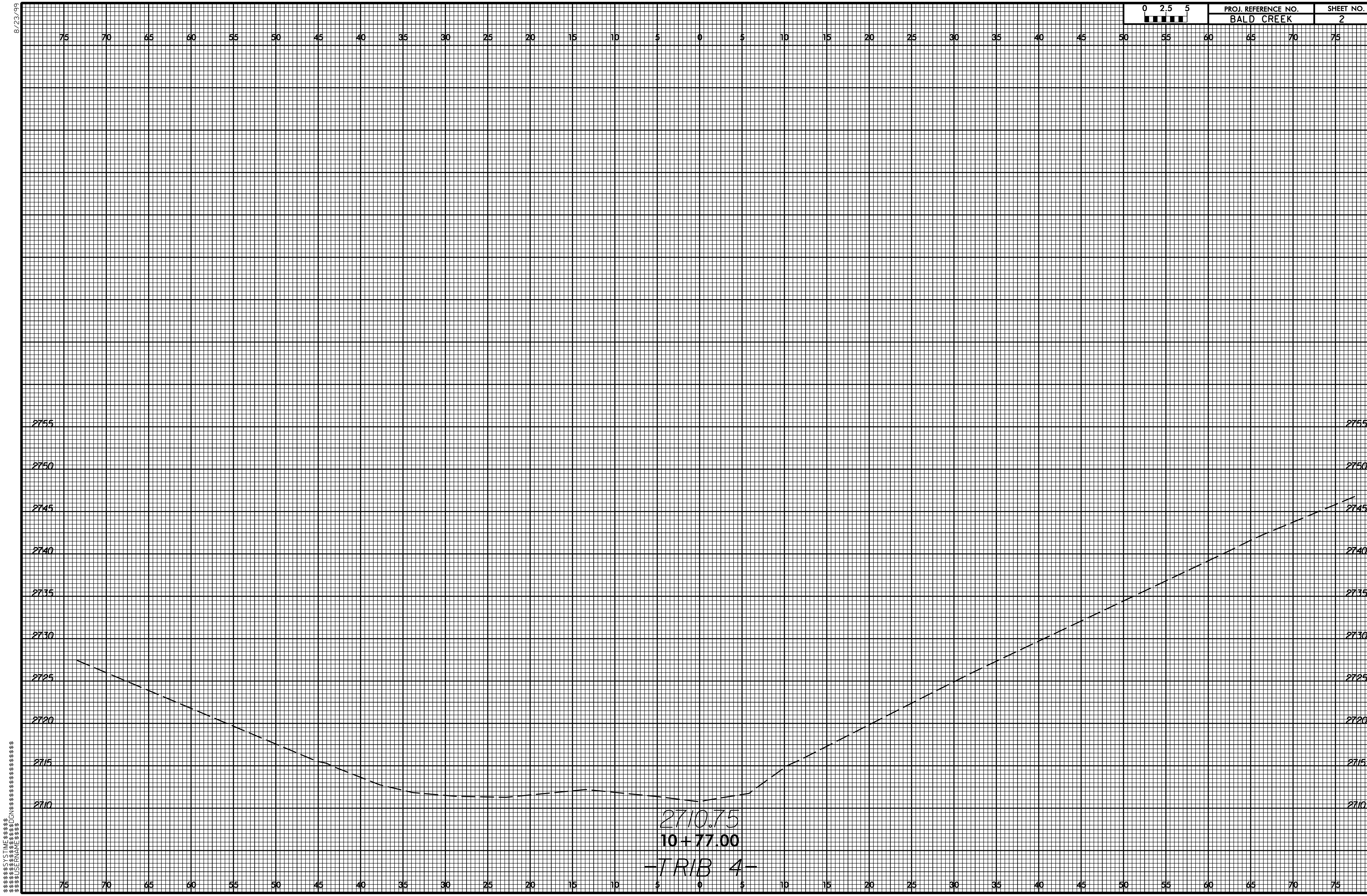
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PROJ. REFERENCE NO.
BALD CREEK
SHEET NO.
2
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10+77.00
-TRIB 4-
8/23/99
$$$$$$SYSTIME$$$$$
$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$$$$$
$$$$USERNAME$$$$

8/23/99

0 2.5 5	PROJ. REFERENCE NO.	SHEET NO.
	BALD CREEK	3

75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

2730
2725
2720
2715
2710
2705
2700
2695
2690

269.02
11+95.00
-TRIB 4-

$$$$$$$SYSTIME$$$$$
$$$$$$$$$$$$$$$$DWG$$$$$$$$$$$$$$$$$$$$$
$$$$$$USERNAME$$$$$

CHAPTER 14. APPENDICES

APPENDIX 1

SITE PHOTOGRAPHS

- **General Site Photos**
- **Existing Stream and Wetland Photos**
- **Existing Cross-section Photos**
- **Reference Stream and Wetland Photos**

GENERAL SITE PHOTOGRAPHS

View of the stream valley entering the property.

Impaired portion of the Mainstem.

Stable portion of Tributary 2 in the upper Project Reach.

View of the confluence of the Mainstem and Tributary 2 from Sweet Hollow Road.

Open water Wetland 1A above Sweet Hollow Road.

Looking up across the Mainstem from Tributary 4 near the bottom of the Project.

UT TO BALD CREEK MAINSTEM PHOTOGRAPHS

New road crossing near the top of the Project Study Area, just below the perennial orgin of the Mainstem.

Wetland 2 is a small impoundment on the Mainstem.

View of Mainstem looking upstream in upper reach.

One instance of the perennial stream reappearing from subterranean flow.

Potable water reservoir located in the conservation easement.

The Mainstem flows through another impoundment, Wetland 1A. Looking downstream at the dam.

UT TO BALD CREEK MAINSTEM PHOTOGRAPHS

Outlet structure (black pipe below the rock) is well above the water line.


Base of the dam below Sweet Hollow Road, showing the absence of a stream channel.


View of Mainstem from the top of the dam/Sweet Hollow Road.


The channel in this reach is linear Wetland 4.


Riprap on downstream side of dam – presumed to be location of pipe outlet.


The Mainstem regains stream characteristics below a headcut.

UT TO BALD CREEK MAINSTEM PHOTOGRAPHS

Looking downstream from the headcut where the stream resurfaces.

The horse is standing at the end of this stream segment. Beyond the fence the channel disperses into Wetland 5.

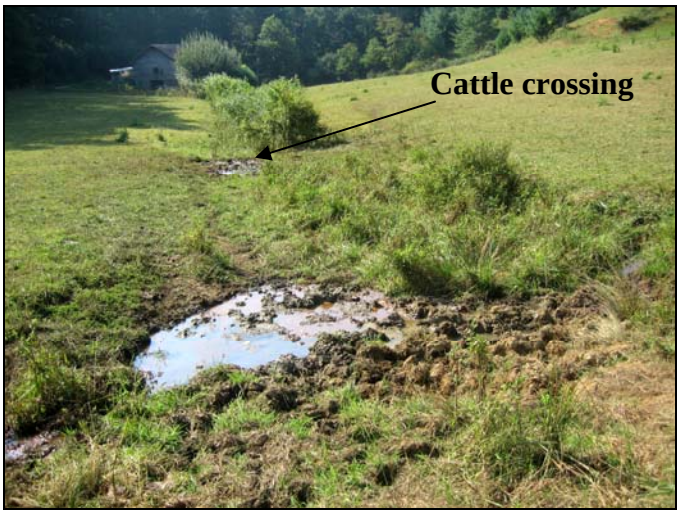
Mainstem looking downstream.

Mainstem/linear Wetland 5 looking downstream.

Mainstem looking upstream toward Wetland 4 and the dam.

Small amount of standing water and iron-oxidizing bacteria in Wetland 5.

UT TO BALD CREEK MAINSTEM PHOTOGRAPHS



Looking downstream at the confluence of Tributary 2 and the Mainstem.

The incised channel at a swath cut through the dense invasive vegetation.

Looking upstream from cattle crossing to the confluence of Tributary 2 and the Mainstem.

As the Mainstem enters a dense stand of cottonwoods, it becomes much less incised.

Below the cattle crossing the Mainstem becomes incised.

A groundwater seep flows into the channel just above the last proposed crossing near the barn.

UT TO BALD CREEK MAINSTEM PHOTOGRAPHS

Location of a proposed crossing just above the barn.

At the end of the Project Reach, the channel becomes larger with more gravel and cobble.

Below the crossing the channel becomes more incised.

UT TO BALD CREEK – TRIBUTARY 1 PHOTOGRAPHS

Intermittent origin of Tributary 1.

Perennial origin of Tributary 1.

Wetland 1 and floodplain of Tributary 1. Stream has subterranean portions.

Headcut below perennial origin of Tributary 1.

Soil profile of Wetland 1.

UT TO BALD CREEK – TRIBUTARY 1 PHOTOGRAPHS

Tributary 1 below headcut.

Looking upstream across Wetland 1A toward Tributary 1.

Tributary 1 disperses and seeps into Wetland 1A.

UT TO BALD CREEK – TRIBUTARY 2 PHOTOGRAPHS

Intermittent origin of Tributary 2 above the Young's art studio.

Culvert carrying Tributary 2 beneath driveway.

Looking downstream from perennial origin of Tributary 2.

Tributary 2 looking downstream from driveway.

Tributary 2 looking upstream from driveway.

Tributary 2 becomes more incised as it approaches Sweet Hollow Road.

UT TO BALD CREEK – TRIBUTARY 2 PHOTOGRAPHS

Surface water disappears from channel just before entering the culvert under Sweet Hollow Road.

Small amount of standing water in Wetland 5 just before the confluence with the Mainstem.

Culvert outlet for Tributary 2 on downstream side of Sweet Hollow Road. No water was present.

Looking upstream in Tributary 2/Wetland 5.

UT TO BALD CREEK – TRIBUTARY 3 PHOTOGRAPHS

Groundwater seep at the headwaters of Tributary 3.

The streambed ends abruptly at a fence line on the edge of the field.

Looking downstream from the spring box.

The Mainstem can be seen in the distance. No connection or pipe could be found.

The streambed became drier as we walked downstream.

UT TO BALD CREEK – TRIBUTARY 4 PHOTOGRAPHS

Wetland 3 and headwaters of Tributary 4 with no defined channel.

An area of more concentrated flow within Wetland 3/Tributary 4.

Perennial origin of Tributary 4 at a groundwater spring.

An area of more concentrated flow within Wetland 3/Tributary 4.

A second spring emerges in Wetland 3.

Tributary 4 is a dry channel where it enters the Mainstem.

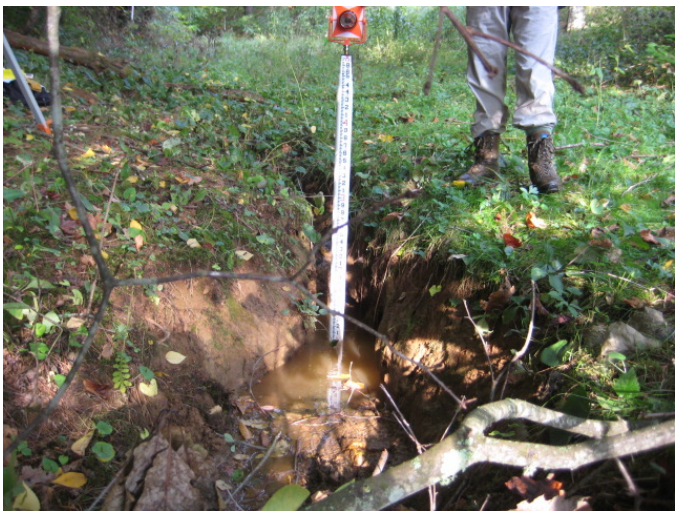
EXISTING CROSS-SECTION PHOTOGRAPHS

Mainstem Reach E XS1 facing downstream.

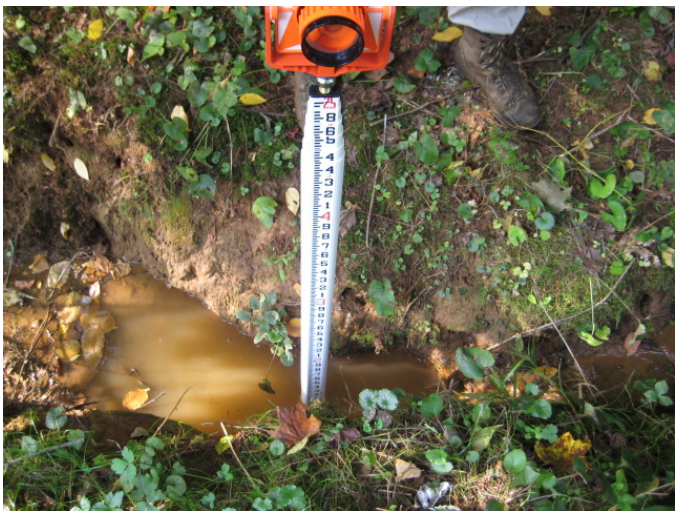
Mainstem Reach E XS1 facing left bank.

Mainstem Reach E XS2 facing left bank.

Reach E XS3 facing upstream.

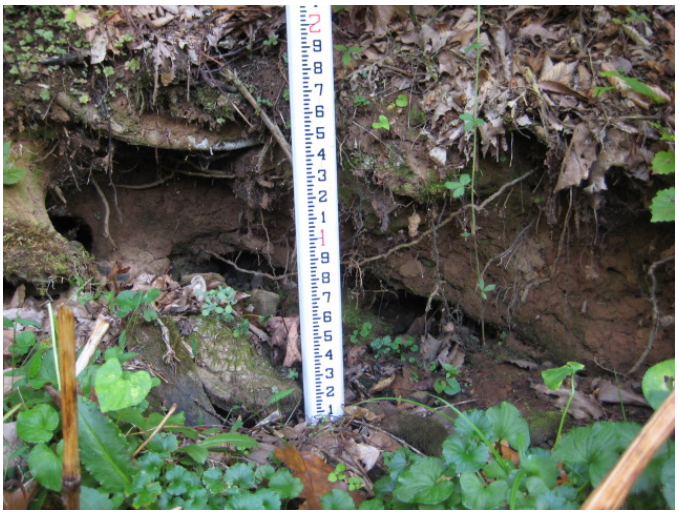


Tributary 1 Reach 1B – large headcut and incised section above pond.



Tributary 1 Reach 1B – large headcut and incised section above pond.

EXISTING CROSS-SECTION PHOTOGRAPHS



Mainstem Reach B – steep and eroding left bank.

Mainstem Reach B – steep and eroding left bank.

Tributary 2 Reach 2B cross-section facing downstream.

Tributary 2 Reach 2B cross-section facing upstream.

STREAM REFERENCE SITE PHOTOGRAPHS

Mainstem Reach C – stable reference section with consistent scour line bankfull indicator.

Tributary 2 Reach 2A reference section facing downstream.

Mainstem Reach E facing upstream. Stable section in the cottonwood stand with prominent bankfull bench.

Tributary 2 Reach 2A reference section facing downstream.

Mainstem reference section downstream of Project with prominent bankfull bench.

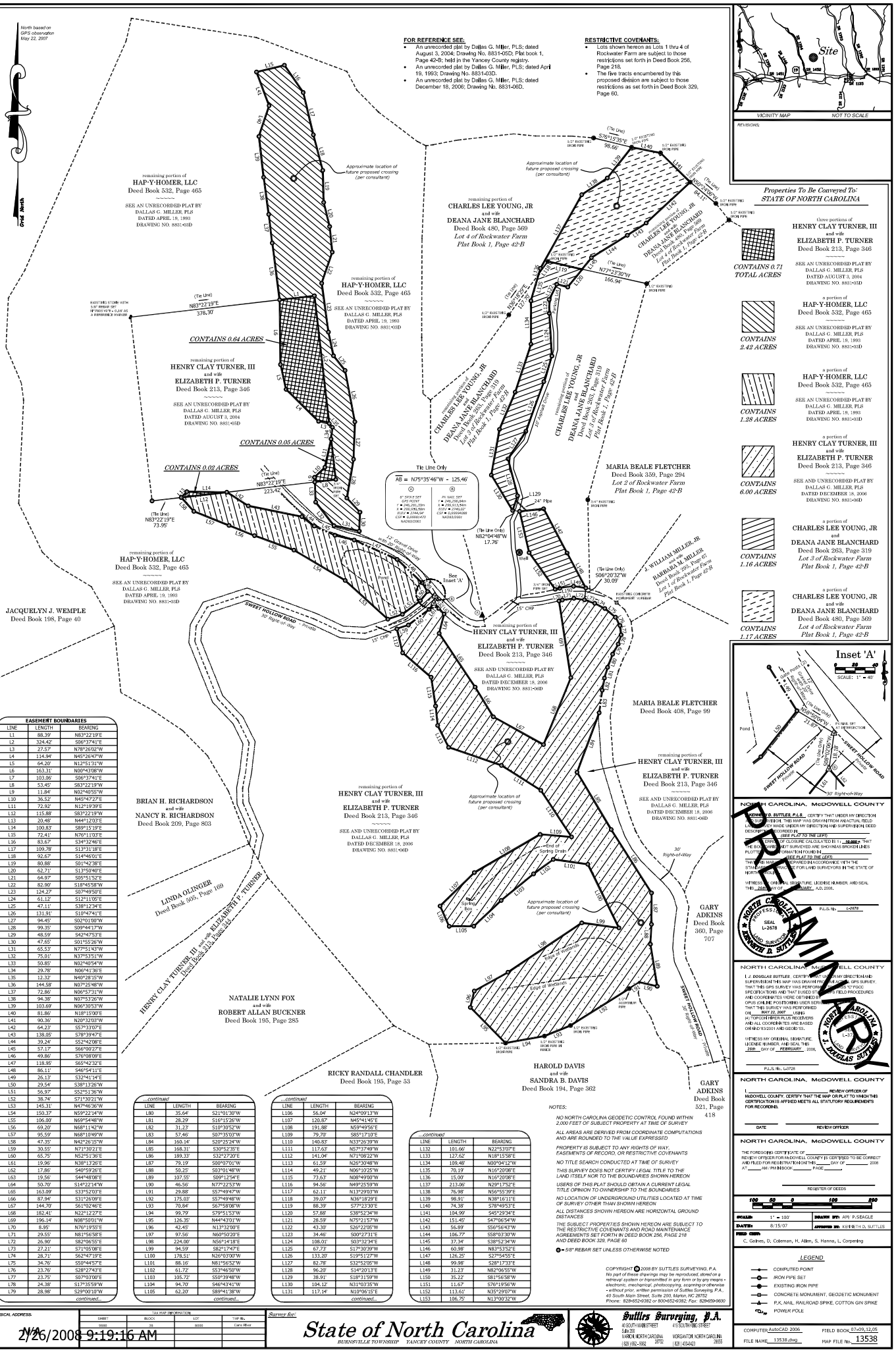
WETLAND REFERENCE SITE PHOTOGRAPHS

Wetland 1 and floodplain of Tributary 1. Stream has subterranean portions.

Soil profile of Wetland 1.

APPENDIX 2

- **Conservation Easement Survey Plat Map**
- **Landowner Agreement**
- **Figure Showing a Preliminary Farm Conservation Plan**



EASEMENT BOUNDARIES		
LINE	LENGTH	BEARING
L1	88.39'	N83°22'19"E
L2	324.42'	S06°37'41"E
L3	27.57'	N78°26'02"W
L4	114.94'	N45°26'47"W
L5	64.20'	N12°51'31"W
L6	163.31'	N00°43'08"W
L7	103.06'	S06°37'41"E
L8	53.45'	S83°22'19"W
L9	11.84'	N02°40'55"W
L10	36.52'	N45°47'27"E
L11	72.92'	N12°19'39"E
L12	115.88'	S83°22'19"W
L13	20.48'	N44°12'03"E
L14	100.83'	S89°15'19"E
L15	72.41'	N76°11'03"E
L16	83.67'	S34°32'46"E
L17	109.78'	S13°31'18"E
L18	92.67'	S14°46'01"E
L19	80.88'	S01°42'38"E
L20	62.71'	S13°50'40"E
L21	64.97'	S05°51'52"E
L22	82.90'	S18°45'58"W
L23	124.27'	S07°49'50"E
L24	61.12'	S12°11'05"E
L25	47.11'	S38°12'34"E
L26	131.91'	S10°47'41"E
L27	94.45'	S02°01'30"W
L28	99.35'	S09°44'17"W
L29	48.59'	S42°47'53"E
L30	47.65'	S01°55'26"W
L31	65.53'	N77°51'43"W
L32	75.01'	N37°53'51"W
L33	50.85'	N02°40'54"W
L34	29.78'	N06°41'36"E
L35	12.32'	N40°28'15"W
L36	144.58'	N07°25'46"W
L37	72.86'	N06°57'31"W
L38	94.38'	N07°53'26"W
L39	103.69'	N06°30'53"W
L40	81.86'	N18°15'00"E
L41	90.36'	N28°32'05"W
L42	64.23'	S57°33'07"E
L43	138.05'	S78°39'47"E
L44	39.24'	S52°42'08"E
L45	57.17'	S66°09'27"E
L46	49.86'	S76°08'09"E
L47	118.95'	S65°42'32"E
L48	86.11'	S46°54'11"E
L49	26.13'	S32°41'14"E
L50	29.54'	S38°13'26"E
L51	56.97'	S52°51'36"W
L52	38.74'	S71°30'21"W
L53	145.31'	N47°46'36"W
L54	150.37'	N59°22'14"W
L55	106.00'	N69°54'48"W
L56	69.20'	N68°11'42"W
L57	95.59'	N68°10'49"W
L58	47.35'	N42°26'15"W
L59	30.55'	N71°30'21"E
L60	65.75'	N52°51'36"E
L61	19.36'	N38°13'26"E
L62	17.86'	S40°59'26"E
L63	19.56'	S44°48'08"E
L64	50.70'	S14°22'14"W
L65	163.09'	S33°52'03"E
L66	87.94'	S31°26'09"E
L67	144.70'	S61°02'46"E
L68	182.41'	N22°12'27"E
L69	196.14'	N08°50'01"W
L70	8.95'	N76°19'55"E
L71	29.55'	N81°56'58"E
L72	26.90'	S82°06'55"E
L73	27.21'	S71°05'08"E
L74	28.71'	S62°47'19"E
L75	34.76'	S50°44'57"E
L76	23.76'	S28°27'47"E
L77	23.75'	S07°03'00"E
L78	24.38'	S17°35'59"W
L79	28.98'	S29°00'10"W

continued...

...continued		
LINE	LENGTH	BEARING
L80	35.64'	S21°01'30"W
L81	28.29'	S16°15'26"W
L82	31.23'	S10°30'52"W
L83	57.46'	S07°35'03"W
L84	160.14'	S20°25'24"W
L85	168.31'	S30°52'35"E
L86	189.33'	S32°27'20"E
L87	79.19'	S00°07'01"W
L88	50.25'	S03°01'46"W
L89	107.55'	S09°12'54"E
L90	46.56'	N77°22'53"W
L91	29.88'	S57°49'47"W
L92	175.03'	S57°49'48"W
L93	70.84'	S67°58'06"W
L94	99.79'	S79°51'53"W
L95	126.35'	N44°43'01"W
L96	42.45'	N13°32'00"E
L97	97.56'	N60°50'20"E
L98	224.00'	N56°14'18"E
L99	94.59'	S82°17'47"E
L100	178.51'	N26°03'00"W
L101	88.16'	N81°56'52"W
L102	61.72'	S53°46'50"W
L103	105.72'	S50°39'48"W
L104	94.70'	S46°43'41"W
L105	62.20'	S89°41'38"W

continued...

...continued		
LINE	LENGTH	BEARING
L106	56.04'	N24°09'13"W
L107	120.87'	N45°41'45"E
L108	191.88'	N59°49'56"E
L109	79.70'	S85°17'10"E
L110	140.83'	N33°26'39"W
L111	117.63'	N57°37'49"W
L112	141.04'	N71°08'22"W
L113	61.59'	N26°30'48"W
L114	49.21'	N06°10'25"W
L115	73.63'	N08°49'00"W
L116	94.56'	N49°25'59"W
L117	62.11'	N13°29'03"W
L118	39.07'	N36°18'29"E
L119	88.39'	S77°23'30"E
L120	57.88'	S38°52'34"W
L121	28.59'	N75°21'57"W
L122	43.30'	S26°22'05"W
L123	34.46'	S00°27'31"E
L124	108.01'	S03°32'34"E
L125	67.73'	S17°30'39"W
L126	133.20'	S19°51'27"W
L127	82.78'	S32°52'05"W
L128	96.20'	S14°20'13"E
L129	38.91'	S18°31'59"W
L130	104.12'	N31°03'35"W
L131	117.14'	N10°06'15"E

continued...

...continued		
LINE	LENGTH	BEARING
L132	101.66'	N22°53'07"E
L133	127.62'	N18°15'58"E
L134	109.48'	N00°04'12"W
L135	70.19'	N16°20'06"E
L136	15.00'	N16°20'06"E
L137	213.06'	N29°17'52"E
L138	76.98'	N56°55'39"E
L139	98.91'	N38°16'11"E
L140	74.38'	S78°49'53"E
L141	104.99'	S45°29'34"E
L142	151.45'	S47°06'54"W
L143	56.89'	S56°56'43"W
L144	106.77'	S58°03'30"W
L145	37.34'	S38°52'34"W
L146	60.98'	N83°53'52"E
L147	126.25'	S27°54'55"E
L148	99.98'	S28°17'33"E
L149	31.23'	N82°06'55"W
L150	35.22'	S81°56'58"W
L151	11.67'	S76°19'56"W
L152	113.61'	N35°29'07"W
L153	106.75'	N13°00'32"W

NOTES:
NO NORTH CAROLINA GEODETIC CONTROL FOUND WITHIN 2,000 FEET OF SUBJECT PROPERTY AT TIME OF SURVEY
ALL AREAS ARE DERIVED FROM COORDINATE COMPUTATIONS AND ARE ROUNDED TO THE VALUE EXPRESSED
PROPERTY IS SUBJECT TO ANY RIGHTS OF WAY, EASEMENTS OF RECORD, OR RESTRICTIVE COVENANTS
NO TITLE SEARCH CONDUCTED AT TIME OF SURVEY
THIS SURVEY DOES NOT CERTIFY LEGAL TITLE TO THE LAND ITSELF NOR THE BOUNDARIES SHOWN HEREON
USERS OF THIS PLAT SHOULD OBTAIN A CURRENT LEGAL TITLE OPINION TO OWNERSHIP TO THE BOUNDARIES
NO LOCATION OF UNDERGROUND UTILITIES LOCATED AT TIME OF SURVEY OTHER THAN SHOWN HEREON
ALL DISTANCES SHOWN HEREON ARE HORIZONTAL GROUND DISTANCES
THE SUBJECT PROPERTIES SHOWN HEREON ARE SUBJECT TO THE RESTRICTIVE COVENANTS AND ROAD MAINTENANCE AGREEMENTS SET FORTH IN DEED BOOK 256, PAGE 218 AND DEED BOOK 329, PAGE 60.
● = 5/8" REBAR SET UNLESS OTHERWISE NOTED

NORTH CAROLINA, McDOWELL COUNTY
I, KENNETH D. SUTTLES, P.L.S., CERTIFY THAT UNDER MY DIRECTION AND SUPERVISION, THIS MAP WAS DRAWN FROM AN ACTUAL FIELD LOCATION MADE UNDER MY DIRECTION AND SUPERVISION, DEED DESCRIPTION RECORDED IN (SEE PLAT TO THE LEFT)
THE RATIO OF PRECISION OF THE UNADJUSTED SURVEY AS CALCULATED IS 1: 10,000+ THAT THE BOUNDARIES NOT SURVEYED ARE SHOWN AS BROKEN LINES. PLOTTED FROM INFORMATION FOUND IN (SEE PLAT TO THE LEFT)
THIS MAP WAS PREPARED IN ACCORDANCE WITH THE STANDARDS OF PRACTICE FOR LAND SURVEYORS IN THE STATE OF NORTH CAROLINA.
WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, AND SEAL THIS 26th DAY OF FEBRUARY, A.D. 2008.
SEAL L-2678
P.L.S. No. L-2678
NORTH CAROLINA, McDOWELL COUNTY
I, J. DOUGLAS SUTTLES, CERTIFY THAT UNDER MY DIRECTION AND SUPERVISION THIS MAP WAS DRAWN FROM AN ACTUAL GPS SURVEY, THAT THIS GPS SURVEY WAS PERFORMED TO SPECIFICATIONS AND THAT I USED ITS FIELD PROCEDURES AND COORDINATES WERE OBTAINED BY OPUS (ONLINE POSITIONING USER SERVICE), THAT THIS SURVEY WAS PERFORMED ON MAY 22, 2007 USING (4) TOPCON HIPER PLUS RECEIVERS AND ALL COORDINATES ARE BASED ON NAD 83/2001 AND GEOID 03.
WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER, AND SEAL THIS 26th DAY OF FEBRUARY, 2008.
SEAL L-3728
P.L.S. No. L-3728
NORTH CAROLINA, McDOWELL COUNTY
I, REVIEW OFFICER OF McDOWELL COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.
DATE
REVIEW OFFICER
NORTH CAROLINA, McDOWELL COUNTY
THE FOREGOING CERTIFICATE OF REVIEW OFFICER FOR McDOWELL COUNTY IS CERTIFIED TO BE CORRECT AND FILED FOR REGISTRATION ON THIS ____ DAY OF ____ 2008 AT ____ AM / PM IN BOOK ____ PAGE ____
REGISTER OF DEEDS
100 50 0 100 200
SCALE: 1" = 100'
DATE: 8/15/07
DRAWN BY: AM/ P.SEAGLE
APPROVED BY: KENNETH D. SUTTLES
FIELD BOOK: C. Gaines, D. Coleman, H. Allen, S. Hanna, L. Corpening
LEGEND
COMPUTED POINT
IRON PIPE SET
EXISTING IRON PIPE
CONCRETE MONUMENT, GEODETIC MONUMENT
P.K. NAIL, RAILROAD SPIKE, COTTON GIN SPIKE
POWER POLE

PRELIMINARY

PHYSICAL ADDRESS: N/A

TAX MAP INFORMATION			
SHEET	BLOCK	LOT	TWP No.
99999	76	9999	Cane River

2/26/2008 9:19:16 AM

Survey for:
State of North Carolina
BURNSVILLE TOWNSHIP YANCEY COUNTY NORTH CAROLINA

Suttles Surveying, P.A.
40 SOUTH MAIN STREET Suite 200 MARION, NORTH CAROLINA 28752 (828) 652-9382
40 SOUTH MAIN STREET MORGANTON, NORTH CAROLINA 28655 (828) 438-6263

COMPUTER: AutoCAD 2006
FIELD BOOK: 07-09,12,05
FILE NAME: 13538.dwg
MAP FILE No. 13538

Attachment B

Landowner Agreement

This document sets forth agreements between the Ecosystem Enhancement Program (EEP) and the landowner regarding the EEP restoration project described below.

PROJECT NAME: UT to Bald Creek - Turner Property

EEP agrees to: *(list only those items that are applicable to the current site):*

- Cattle exclusion fencing along final easement boundary as necessary to protect project streams and wetlands from cattle damage; fence type to be determined in consult with landowner.
- Livestock watering device(s) and water supply as approximately depicted in Attachment A to provide water for cattle on property; built according to NRCS specifications.
- Reserved corridors for cattle/pedestrian/road crossings as indicated in Attachment A, final locations and width allowances to be determined prior to conservation easement agreement.
- Planting of easement areas with native woody vegetation.

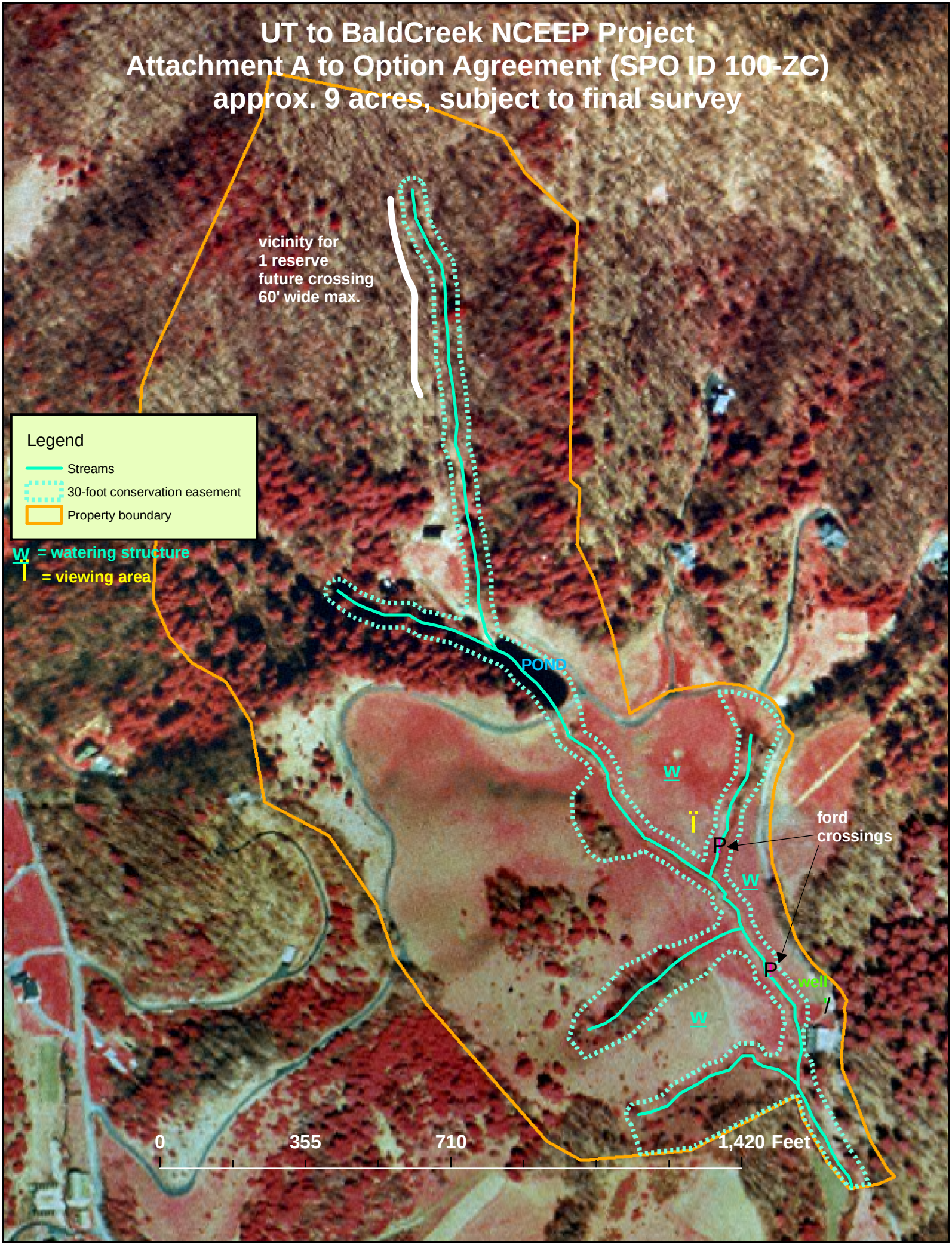
Landowner agrees to:

- Allow access in perpetuity (this is covered in the easement document)

By signature below, landowner has agreed to the terms and conditions of this attachment. This agreement replaces any previous verbal discussions or agreements.

_____

(landowner name) (date)


UT to BaldCreek NCEEP Project
Attachment A to Option Agreement (SPO ID 100-ZC)
approx. 9 acres, subject to final survey
vicinity for
1 reserve
future crossing
60' wide max.
Legend
Streams
30-foot conservation easement
Property boundary
W = watering structure
I = viewing area
POND
W
I
P
ford
crossings
W
P
well
W
0
355
710
1,420 Feet

APPENDIX 3

SIGNED CATEGORICAL EXCLUSION FORM AND SUPPORTING DOCUMENTATION

- USFWS Correspondence
- NCWRC Correspondence
- SHPO Correspondence
- THPO Correspondence
- NRCS Correspondence and form AD-1006

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Part 1: General Project Information	
Project Name:	UT to Bald Creek Stream Restoration
County Name:	Yancey
EEP Number:	92596
Project Sponsor:	NC Ecosystem Enhancement Program
Project Contact Name:	Kathleen M. McKeithan, PE, CPESC, CPSWQ
Project Contact Address:	URS Corporation – North Carolina 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560
Project Contact E-mail:	kathleen_mckeithan@urscorp.com
EEP Project Manager:	Harry Tsomides

Project Description

The Project involves 1,180 linear feet of Restoration, 522 linear feet of Enhancement I, 2,622 linear feet of Enhancement II, 800 linear feet of Preservation, and 1.23 acres of Wetland Enhancement on five unnamed tributaries to Bald Creek.

For Official Use Only

Reviewed By:

5/26/2009
Date

Harry Tsomides
EEP Project Manager

Conditional Approved By:

Date

For Division Administrator
FHWA

☐ **Check this box if there are outstanding issues**

Final Approval By:

5/29/09
Date

For Division Administrator
FHWA

Part 2: All Projects Regulation/Question	Response
Coastal Zone Management Act (CZMA)	
1. Is the project located in a CAMA county?	☐ Yes ☒ No
2. Does the project involve ground-disturbing activities within a CAMA Area of Environmental Concern (AEC)?	☐ Yes ☐ No ☒ N/A
3. Has a CAMA permit been secured?	☐ Yes ☐ No ☒ N/A
4. Has NCDCM agreed that the project is consistent with the NC Coastal Management Program?	☐ Yes ☐ No ☒ N/A
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	
1. Is this a "full-delivery" project?	☐ Yes ☒ No
2. Has the zoning/land use of the subject property and adjacent properties ever been designated as commercial or industrial?	☐ Yes ☐ No ☒ N/A
3. As a result of a limited Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☒ N/A
4. As a result of a Phase I Site Assessment, are there known or potential hazardous waste sites within or adjacent to the project area?	☐ Yes ☐ No ☒ N/A
5. As a result of a Phase II Site Assessment, are there known or potential hazardous waste sites within the project area?	☐ Yes ☐ No ☒ N/A
6. Is there an approved hazardous mitigation plan?	☐ Yes ☐ No ☒ N/A
National Historic Preservation Act (Section 106)	
1. Are there properties listed on, or eligible for listing on, the National Register of Historic Places in the project area?	☐ Yes ☒ No
2. Does the project affect such properties and does the SHPO/THPO concur?	☐ Yes ☐ No ☒ N/A
3. If the effects are adverse, have they been resolved?	☐ Yes ☐ No ☒ N/A
Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)	
1. Is this a "full-delivery" project?	☐ Yes ☒ No
2. Does the project require the acquisition of real estate?	☐ Yes ☐ No ☒ N/A
3. Was the property acquisition completed prior to the intent to use federal funds?	☐ Yes ☐ No ☒ N/A
4. Has the owner of the property been informed: * prior to making an offer that the agency does not have condemnation authority; and * what the fair market value is believed to be?	☐ Yes ☐ No ☒ N/A

Part 3: Ground-Disturbing Activities Regulation/Question	Response
American Indian Religious Freedom Act (AIRFA)	
1. Is the project located in a county claimed as "territory" by the Eastern Band of Cherokee Indians?	☒ Yes ☐ No
2. Is the site of religious importance to American Indians? ***THPO was invited to comment on the project and no response was received. All correspondence is located in Appendix 4.***	☐ Yes ☒ No ☐ N/A
3. Is the project listed on, or eligible for listing on, the National Register of Historic Places?	☐ Yes ☐ No ☒ N/A
4. Have the effects of the project on this site been considered?	☐ Yes ☐ No ☒ N/A
Antiquities Act (AA)	
1. Is the project located on Federal lands?	☐ Yes ☒ No
2. Will there be loss or destruction of historic or prehistoric ruins, monuments or objects of antiquity?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Archaeological Resources Protection Act (ARPA)	
1. Is the project located on federal or Indian lands (reservation)?	☐ Yes ☒ No
2. Will there be a loss or destruction of archaeological resources?	☐ Yes ☐ No ☒ N/A
3. Will a permit from the appropriate Federal agency be required?	☐ Yes ☐ No ☒ N/A
4. Has a permit been obtained?	☐ Yes ☐ No ☒ N/A
Endangered Species Act (ESA)	
1. Are federal Threatened and Endangered species and/or Designated Critical Habitat listed for the county?	☒ Yes ☐ No
2. Is Designated Critical Habitat or suitable habitat present for listed species?	☐ Yes ☒ No ☐ N/A
3. Are T&E species present or is the project being conducted in Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A
4. Is the project "likely to adversely affect" the species and/or "likely to adversely modify" Designated Critical Habitat?	☐ Yes ☐ No ☒ N/A

5. Does the USFWS/NOAA-Fisheries concur in the effects determination? ***No response was received from USFWS. Correspondence is located in Appendix 4.***	☐ Yes ☐ No ☒ N/A
6. Has the USFWS/NOAA-Fisheries rendered a "jeopardy" determination?	☐ Yes ☐ No ☒ N/A
Executive Order 13007 (Indian Sacred Sites)	
1. Is the project located on Federal lands that are within a county claimed as "territory" by the EBCI?	☐ Yes ☒ No
2. Has the EBCI indicated that Indian sacred sites may be impacted by the proposed project?	☐ Yes ☐ No ☒ N/A
3. Have accommodations been made for access to and ceremonial use of Indian sacred sites?	☐ Yes ☐ No ☒ N/A
Farmland Protection Policy Act (FPPA)	
1. Will real estate be acquired?	☒ Yes ☐ No
2. Has NRCS determined that the project contains prime, unique, statewide or locally important farmland?	☐ Yes ☒ No ☐ N/A
3. Has the completed Form AD-1006 been submitted to NRCS? ***Form AD-1006 and associated correspondence with NRCS is included in Appendix 4.***	☐ Yes ☐ No ☐ N/A
Fish and Wildlife Coordination Act (FWCA)	
1. Will the project impound, divert, channel deepen, or otherwise control/modify any water body?	☒ Yes ☐ No
2. Have the USFWS and the NCWRC been consulted? ***USFWS and NCWRC were notified of the project and neither agency has provided comment. Correspondence with USFWS and NCWRC is included in Appendix 4.***	☒ Yes ☐ No ☐ N/A
Land and Water Conservation Fund Act (Section 6(f))	
1. Will the project require the conversion of such property to a use other than public, outdoor recreation?	☐ Yes ☒ No
2. Has the NPS approved of the conversion?	☐ Yes ☐ No ☒ N/A
Magnuson-Stevens Fishery Conservation and Management Act (Essential Fish Habitat)	
1. Is the project located in an estuarine system?	☐ Yes ☒ No
2. Is suitable habitat present for EFH-protected species?	☐ Yes ☐ No ☒ N/A
3. Is sufficient design information available to make a determination of the effect of the project on EFH?	☐ Yes ☐ No ☒ N/A
4. Will the project adversely affect EFH?	☐ Yes ☐ No ☒ N/A
5. Has consultation with NOAA-Fisheries occurred?	☐ Yes ☐ No ☒ N/A

Migratory Bird Treaty Act (MBTA)	
1. Does the USFWS have any recommendations with the project relative to the MBTA? ***USFWS was invited to comment and no response was received. Correspondence is located in Appendix 4.***	☐ Yes ☒ No
2. Have the USFWS recommendations been incorporated?	☐ Yes ☐ No ☒ N/A
Wilderness Act	
1. Is the project in a Wilderness area?	☐ Yes ☒ No
2. Has a special use permit and/or easement been obtained from the maintaining federal agency?	☐ Yes ☐ No ☒ N/A

Version 1.4, 8/18/05

URS

August 15, 2008

Marella Buncick
US Fish and Wildlife Service
160 Zillicoa Street
Asheville, NC 28801

Re: EEP Stream Restoration Project, Yancey County

Dear Ms. Buncick:

URS Corporation – North Carolina (URS) has been contracted by the North Carolina Ecosystem Enhancement Program (NCEEP) to conduct an ecological resources assessment for a potential stream restoration project in Yancey County, North Carolina. The project has been identified for the purpose of providing in-kind mitigation for unavoidable stream impacts. Several sections of the channel are degraded and unstable due to past agricultural activities on the site. The site is located in the French Broad River Basin and is shown on the attached map (Bald Creek NC Quadrangle). Representative site photographs are also attached.

As part of the ecological resources study, URS is scoped to assess the potential impacts to federally protected species as a result of the project. The threatened and endangered species listed for Yancey County were obtained from the US Fish and Wildlife Service website in August 2008 and are listed in the table below.

Common Name	Scientific Name	Federal Status	Record Status
Bog turtle	*Clemmys muhlenbergii*	T (S/A)	Current
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	E	Current
Eastern puma	*Puma concolor cougar*	E	Historic
Virginia big-eared bat	*Corynorhinus townsendii virginianus*	E	Current
Spruce-fir moss spider	*Microhexura montivaga*	E	Historic
Appalachian elktoe, also Designated Critical Habitat	*Alasmidonta raveneliana*	E	Current
Roan mountain bluet	*Hedyotis purpurea var. montana*	E	Current
Spreading avens	*Geum radiatum*	E	Current
Virginia spiraea	*Spiraea virginiana*	T	Current
Rock gnome lichen	*Gymnoderma lineare*	E	Current

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Morrisville, NC 27560
Tel: 919.461.1100
Fax: 919.461.1415
www.urscorp.com

URS

Our initial site investigations, conducted during July and August 2008, indicate that appropriate habitat for these species is not present on site. The project site consists primarily of gently sloping open pastureland, with some higher-gradient forested areas designated for preservation. Our fieldwork coincided with the flowering period for the three vascular plant species (Spreading avens, Virginia spirea, and Roan mountain bluet). While a formal survey was not conducted, these plant species were not observed during the site investigations.

Designated Critical Habitat for the Appalachian elktoe is located downstream of the project site on the mainstem of the Cane River. The project site contains small headwater streams with unstable sections that do not appear to support any freshwater mussel populations.

The USFWS will be contacted if suitable habitat for any listed species is found or if we determine that the project may affect one or more federally listed species or designated critical habitat.

We would appreciate any comments, concerns, or additional information you may have regarding protected species on the UT to Bald Creek stream restoration project in Yancey County. Thank you in advance for your time and participation in this species review. Please feel free to contact us with any questions you may have concerning this project. If we have not heard from you in 30 days we will assume that our species list is correct, and that you do not have any comments or concerns relevant to this project at the current time.

Sincerely,

URS Corporation – North Carolina

Melissa Rose Bauguess
Environmental Scientist

cc:
Harry Tsomides
EEP Project Manager
2090 US 70 Highway
Swannanoa, NC 28778

Enclosure

URS

August 15, 2008

Shannon Deaton,
North Carolina Wildlife Resource Commission
Division of Inland Fisheries
1721 Mail Service Center
Raleigh, NC 27699

Subject: EEP Stream Mitigation Project in Yancey County, NC

Dear Ms. Deaton,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with a potential stream restoration project in Yancey County, NC. The site is located in the French Broad River Basin and is shown on the attached map (Bald Creek NC Quadrangle).

The project has been identified for the purpose of providing in-kind mitigation for unavoidable stream impacts, and would restore reaches of several unnamed tributaries to Bald Creek. These sections of the channel are degraded and unstable due to past agricultural activities on the site.

We would appreciate any comments, concerns, or additional information you may have regarding fish and wildlife issues on the UT to Bald Creek stream restoration project in Yancey County. Thank you in advance for your time and participation in this project review. Please feel free to contact us with any questions you may have concerning this project. If we have not heard from you in 30 days we will assume that you do not have any comments or concerns relevant to this project at the current time.

Sincerely,

URS Corporation – North Carolina

Melissa Rose Bauguess
Environmental Scientist

cc:
Harry Tsomides, EEP Project Manager
2090 US 70 Highway
Swannanoa, NC 28778

Enclosure

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www.urscorp.com

URS

August 15, 2008

Ms. Renee Gledhill-Earley
State Historic Preservation Office
4617 Mail Service Center
Raleigh NC 27699-4617

Subject: EEP Stream Mitigation Project in Yancey County

Dear Ms. Gledhill-Earley:

The Ecosystem Enhancement Program (EEP) requests review and comment on any possible concerns for archaeological or cultural resources associated with a potential stream restoration project. The site is located in Yancey County and is shown on the attached map (Bald Creek, NC quadrangle).

An Unnamed Tributary to Bald Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of channel have been identified as significantly degraded. The Area of Potential Effects (APE) is generally 30-feet on either side of the existing channel with some areas as wide as 60 feet; the total acreage of the project area is 12.74.

No historic architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. Furthermore, the majority of the site has historically been disturbed due to agricultural purposes such as tilling (although the project area has been pasturage in recent years). Finally, topography in the vicinity of the project is rather steep with narrow flat areas adjacent to the existing stream channel. Enclosed are current photos of the site.

Archaeologist Matthew Jorgenson, RPA of URS Corporation conducted an archaeological site files check on the subject property on August 11, 2008 at the North Carolina Office of State Archaeology. No previously recorded archaeological resources are located within the project area. Four previously recorded sites are within two miles of the project area. These sites, 31YC46, 31YC47, 31YC48, and 31YC49, are all located along the side of US 19 approximately one-to-two miles east of the project area. Based on field visits in 1999 in conjunction with widening of US 19 in Madison and Yancey Counties, archaeologists from the North Carolina Department of Transportation recommended that no further work be conducted at these four sites.

Based on (a) the lack of historic-aged structures near the project area, (b) a lack of previously recorded archaeological sites in the project area, and (c) topography and previous disturbances that result in a low probability for the presence of unrecorded, intact archaeological resources, it is URS' opinion that additional cultural resources studies should not be required in conjunction with the proposed stream

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restoration project. We are requesting the North Carolina State Historic Preservation Office's comments on the proposed project.

We thank you in advance for your time and participation in this project review. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

URS Corporation – North Carolina

Matthew Jorgenson, RPA
URS Corporation
1600 Perimeter Park Drive
Suite 400
Morrisville, NC 27560

cc:
Harry Tsomides
EEP Project Manager
2090 US 70 Highway
Swannanoa, NC 28778

Enclosures

URS

August 19, 2008

Tyler Howe
Eastern Band of Cherokee Indians
Tribal Historic Preservation Office
P.O. Box 455
Cherokee, NC 28719

Subject: EEP Stream Mitigation Project in Yancey County

Dear Mr Howe,

The Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or religious resources associated with a potential stream restoration project. An Unnamed Tributary to Bald Creek has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel impacts. Several sections of channel have been identified as significantly degraded. The site is located in Yancey County and is shown on the attached map (Bald Creek, NC quadrangle).

No historic architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. Furthermore, the majority of the site has historically been disturbed due to agricultural purposes such as tilling (although the project area has been pasturage in recent years). Finally, topography in the vicinity of the project is rather steep with narrow flat areas adjacent to the existing stream channel. Enclosed are current photos of the site.

A similar letter has been sent to the North Carolina State Historic Preservation Office for compliance with Section 106 of the Historic Preservation Act. We thank you in advance for your time and participation in this project review. Please feel free to contact us with any questions that you may have concerning this project.

Sincerely,

URS Corporation – North Carolina

Melissa Bauguess

cc:
Harry Tsomides
EEP Project Manager
2090 US 70 Highway
Swannanoa, NC 28778

Enclosures

URS Corporation – North Carolina
1600 Perimeter Park Drive, Suite 400
Morrisville, NC 27560
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Fax: 919.461.1415
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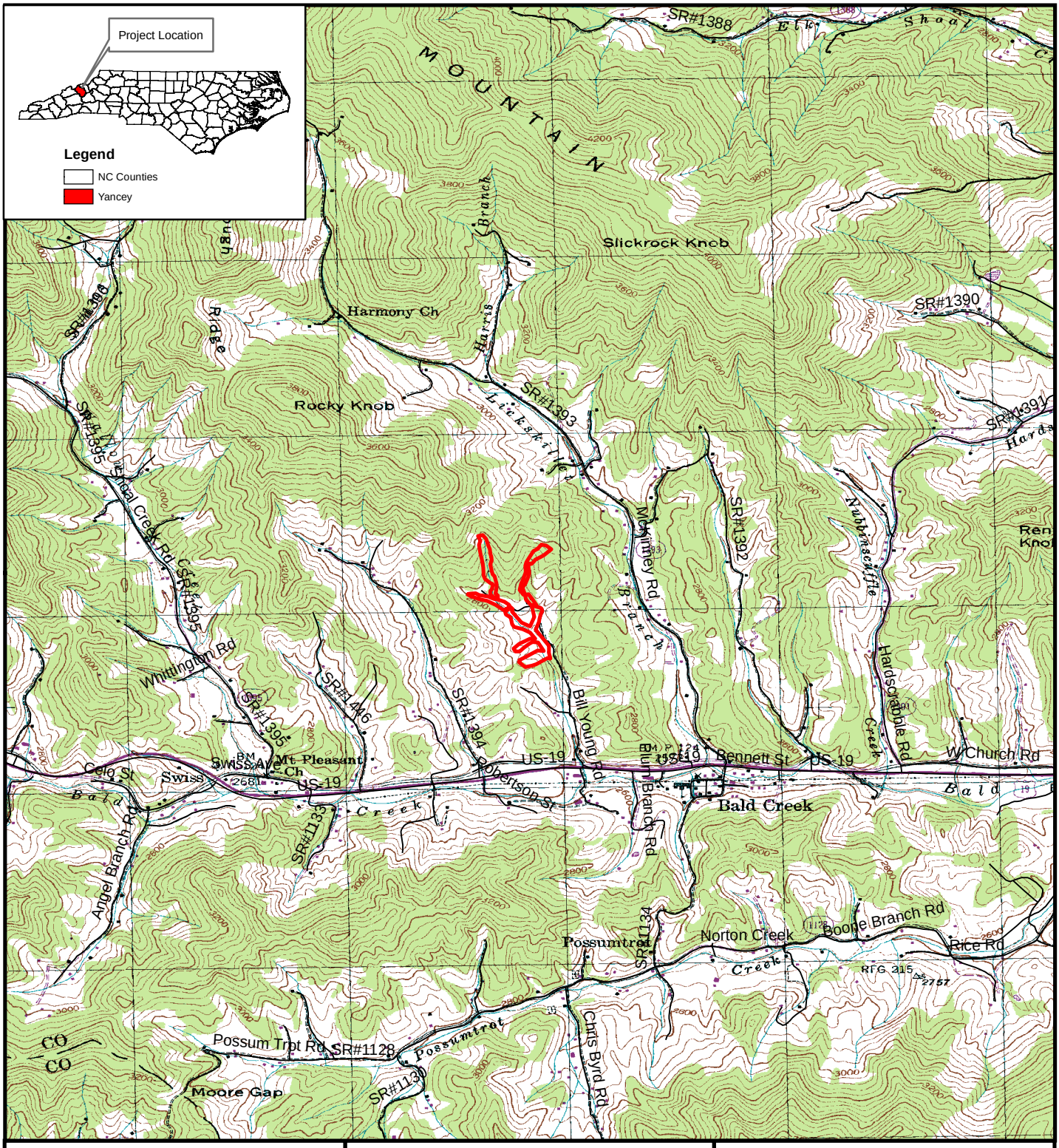

North Carolina
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

UT to Bald Creek (Turner/Young)
Stream Restoration
Yancey County, NC

EEP Project No. 070714901

Legend

Study Area

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Miles

URS

Figure 1

Project Site
Vicinity Map

Date: August 2008

Representative Site Photographs - UT to Bald Creek, Yancey County

North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

September 9, 2008

Matthew Jorgenson
URS Corporation
1600 Perimeter Park Drive
Suite 400
Morrisville, NC 27560

Re: Unnamed Tributary to Bald Creek EEP Stream Mitigation, Yancey County, ER 08-1937

Dear Mr. Jorgenson:

Thank you for your letter of August 15, 2008, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley

Peter Sandbeck

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
589 Raccoon Road, Suite 246
Waynesville, NC 28786
Phone 828 456-6341 ext. 5 FAX 828 452-7031

October 16, 2008

Melissa Rose Bauguess
Environmental Scientist
URS Corporation
1600 Perimeter Park Dr.
Morrisville, NC 27560

Re: USDA Farmland Conversion Impact Rating Form (AD-1006)
Bald Creek Stream Restoration Project – Yancey County, NC

Ms. Bauguess,

Attached you will find the AD-1006 with Part II completed as required of NRCS. Based on the maps that you provided of the 4 proposed project sites, it appears that no prime, state-wide important farmland will be impacted by the proposed project.

If I can be of further assistance, please feel free to contact me.

M. Kent Clary
Area Resource Soil Scientist
USDA-NRCS

cc: Dan Rosenberg, District Conservationist, USDA-NRCS, Spruce Pine, NC

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 9/30/08
Name Of Project UT to Bald Creek Stream Restoration Project	Federal Agency Involved Federal Highway Administration
Proposed Land Use Riparian buffer and conservation easement	County And State Yancey County, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 10/9/08

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).* Yes ☐ No ☑		Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount Of Farmland As Defined in FPPA Acres: %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS 10/16/08	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	6.0			
B. Total Acres To Be Converted Indirectly	0.0			
C. Total Acres In Site	6.0	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160	0	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	0	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side)

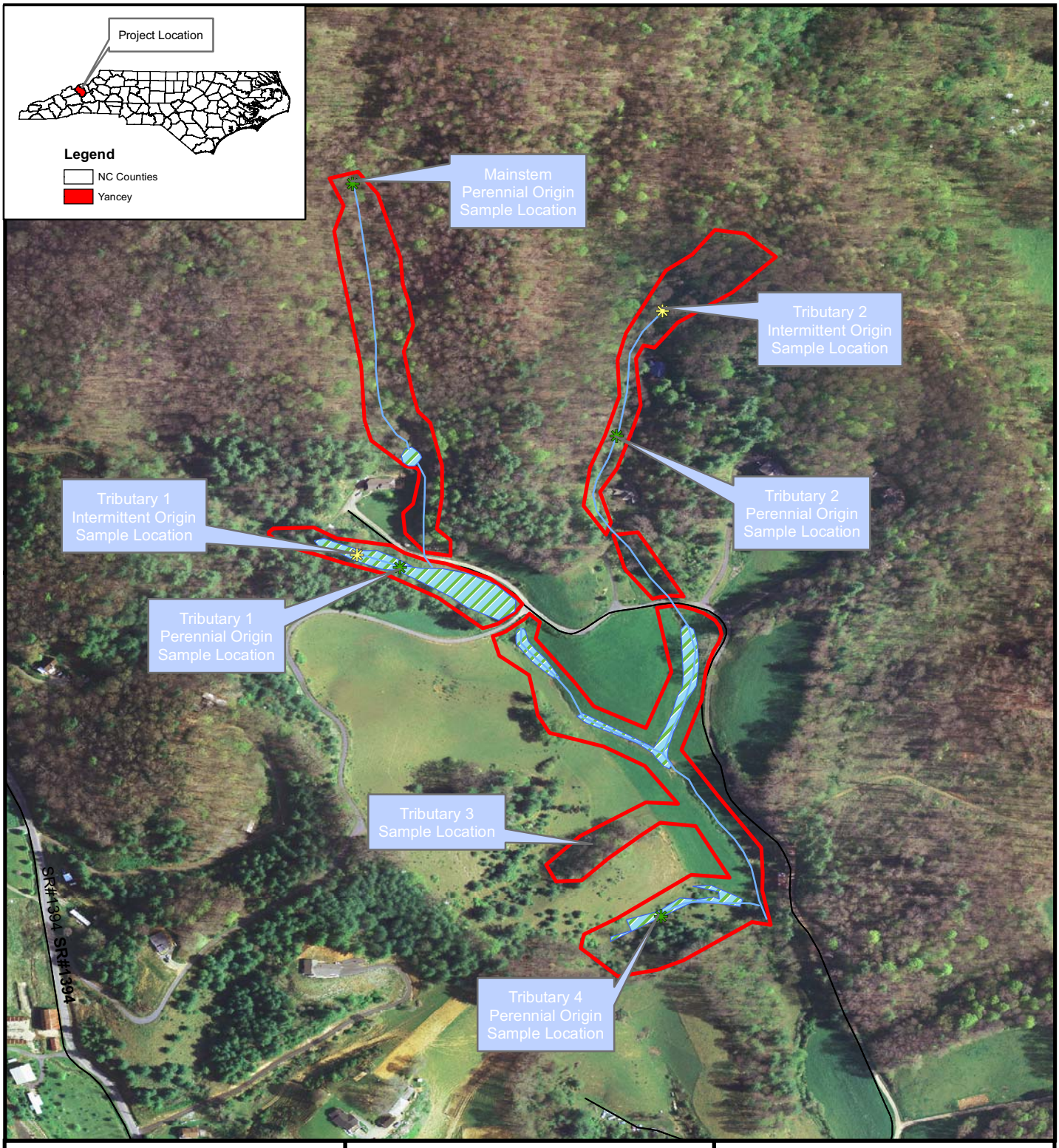
Form AD-1006 (10-83)

This form was electronically produced by National Production Services Staff

APPENDIX 4

NCDWQ STREAM CLASSIFICATION FORMS FOR PROJECT SITE AND REFERENCE SITE

NC DROUGHT MONITOR MAP



North Carolina
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

UT to Bald Creek (Turner/Young)
Stream Restoration
Yancey County, NC

EEP Project No. 92596

Legend

- Project Study Area
- Field Delineated Streams
- Field Delineated Wetlands
- Intermittent Origin
- Perennial Origin

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0 250 500
Feet

URS

NCDWQ Stream Classification Forms Sample Locations

Date: August 2008

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 31 July 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, C. Benton	**Site: UT to Bald Creek Mainstem, perennial origin**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* **32**	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 15.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 7.5)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

Perennial origin begins at a spring.

Observed several crayfish, salamanders, snails, and mayflies.

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 31 July 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, C. Benton	**Site: UT to Bald Creek Mainstem A – intermittent origin**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* ***15.5***	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 6.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 1.5)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

This was the location of a strong flowing groundwater seep at a patch of sedges. While the score is less than 19, we think this is still the intermittent origin, given the exceptional drought the region is experiencing.

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 31 July 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, C. Benton	**Site: UT to Bald Creek Mainstem A – perennial origin**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* **31.5**	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 14.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 8)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 31 July 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, S. Shelingoski	**Site: UT to Bald Creek Tributary 1 – intermittent origin**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* **26**	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 16)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 3.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 6.5)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

There are some subterranean portions of the stream below the intermittent origin. The floodplain of this stream comprises Wetland 1.

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 31 July 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, S. Shelingoski	**Site: UT to Bald Creek Tributary 1 – perennial origin**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* **29.5**	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 14.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 4.5)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 01 August 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, S. Shelingoski	**Site: UT to Bald Creek – Tributary 2 intermittent origin**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* **24.5**	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 14)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 5.5)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 01 August 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, S. Shelingoski	**Site: UT to Bald Creek – Tributary 2 perennial origin**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* **29**	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 16.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 5)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

Score is less than 30, but is believed to be perennial. Region is currently in a state of exceptional drought.

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 01 August 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, S. Shelingoski	**Site: UT to Bald Creek – Tributary 3**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* **13.5**	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 1.5)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 01 August 2008	**Project: UT to Bald Creek, Turner/Young Properties**	**Latitude:**
Evaluator: M. Bauguess, S. Shelingoski	**Site: UT to Bald Creek – Tributary 4 perennial origin**	**Longitude:**
Total Points: *Stream is at least intermittent if > 19 or perennial of > 30* **29**	**County: Yancey**	**Other** *e.g. Quad Name:* **Bald Creek**

A. Geomorphology (Subtotal = 11)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure; riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a]. Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rains, or Water in channel – dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 8)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5; SAV = 2.0; Other = 0			

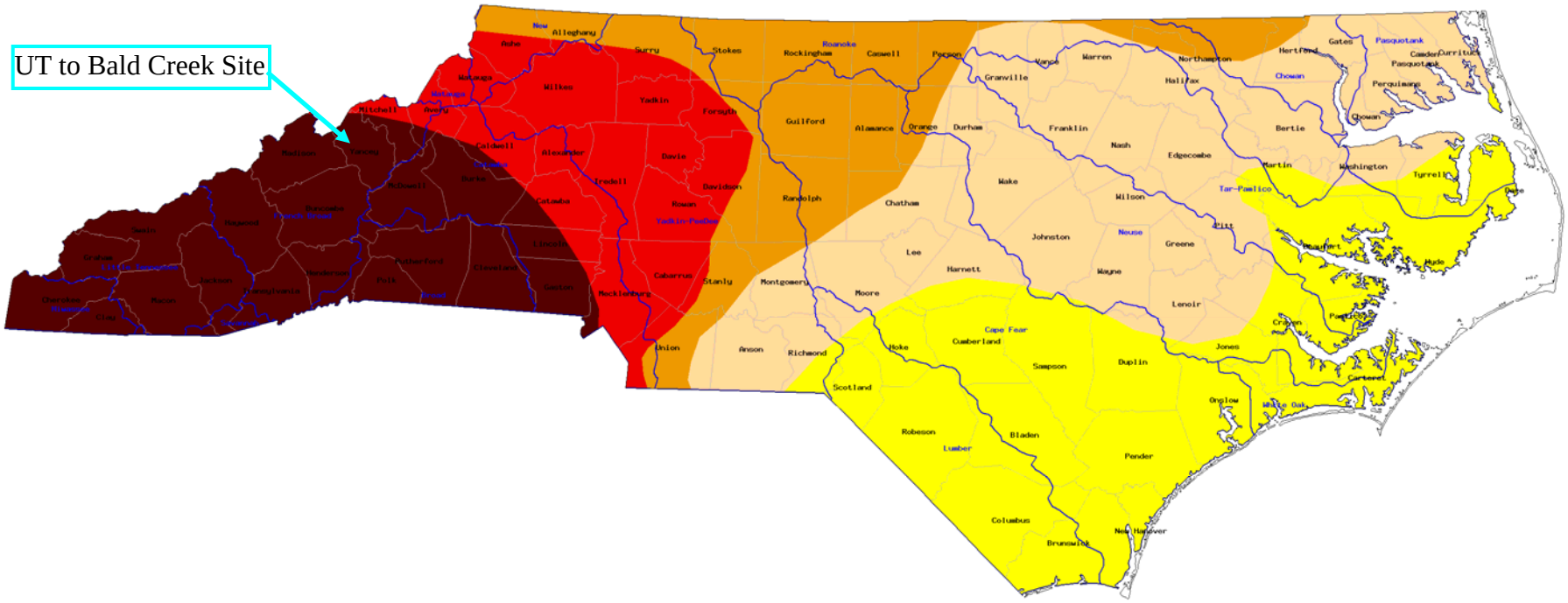
[b] Items 20 and 21 focus on the presence of upland plants, Item 29 focuses on the presence of aquatic or wetland plants

Notes: (use back side of this form for additional notes)

Wetland/stream complex fed by multiple groundwater springs. Perennial origin at flag W3-5.

Sketch:

U.S. Drought Monitor of North Carolina

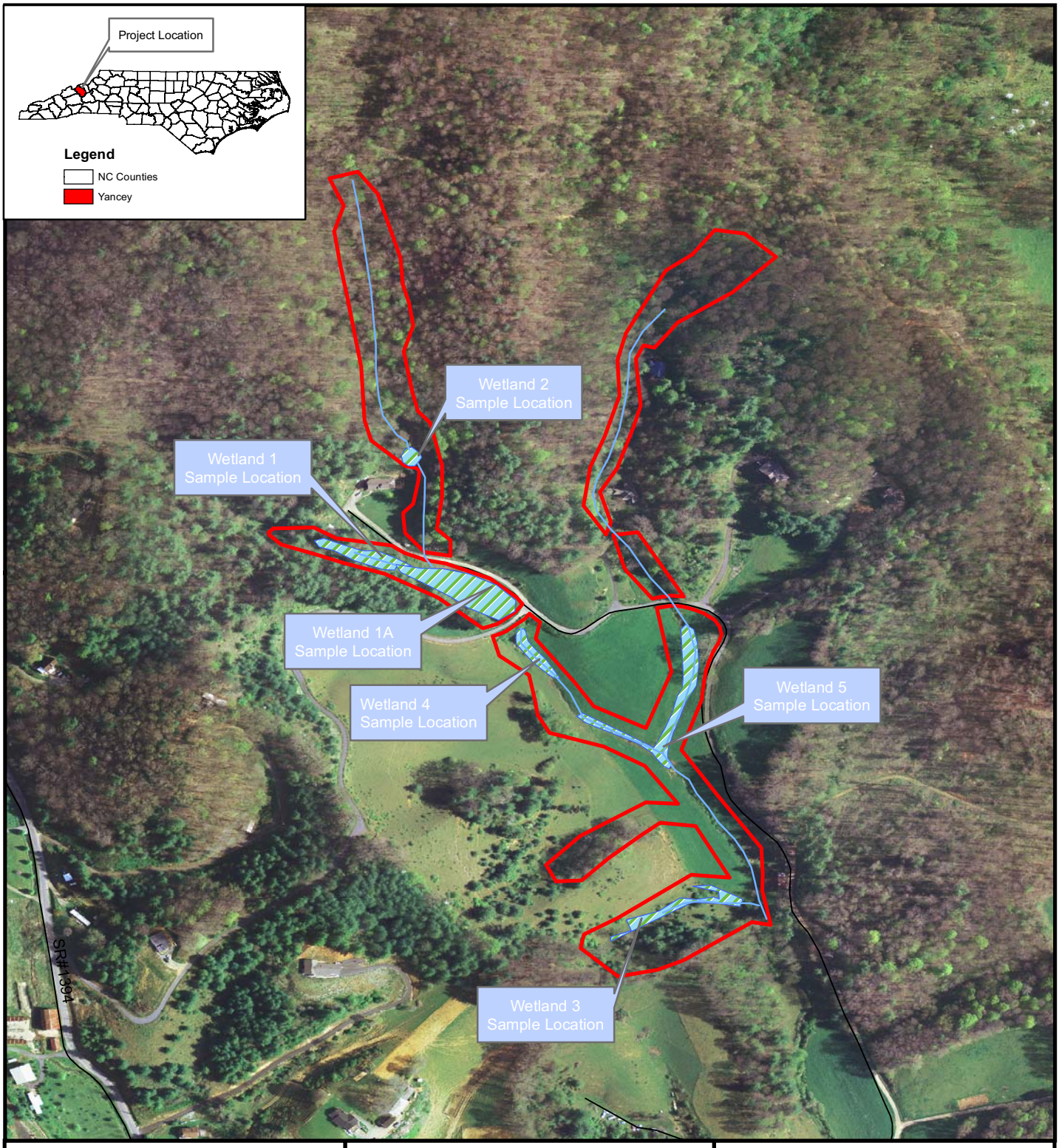


August 19, 2008

Source: http://www.ncdrought.org/

APPENDIX 5

USACE WETLAND DELINEATION FORMS FOR PROJECT SITE AND REFERENCE SITE



North Carolina
Ecosystem Enhancement Program

Ecosystem Enhancement PROGRAM

UT to Bald Creek (Turner/Young)
Stream Restoration
Yancey County, NC

EEP Project No. 92596

Legend

- Project Study Area
- Field Delineated Streams
- Field Delineated Wetlands

N
W E
S

0 250 500
Feet

URS

USACE Wetland Delineation Forms Sample Locations

Date: August 2008

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/19/08
Applicant / Owner: NCEEP			County: Yancey
Investigator: Shelingoski, Bauguess			State: NC
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: Wetland 1
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Liriodendron tulipifera	T	FAC	Juncus sp	H	—
Ansaema triphyllum	H	FACW-	Carex sp	H	—
Lindera melissifolia	S	OBL	Lonicera japonica	V	FAC-
Conium maculatum	S	FACW	Microstegium vimineum	H	FAC+

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 83%

Remarks: Wet depression that drains to WI-A(pond). Various mosses present on tree roots

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	0-3	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	Surface	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [ ] Inundated
- [X] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [X] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [X] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Saunook sandy loam, 8-15%. Drainage Class: Well drained

Taxonomy (Subgroup): Humic Hapludults Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	A	10YR 4/3			loam
2-8	E	10YR 5/3	10YR 6/2	many, faint	loam
			5YR 5/8	few, distinct	
8+	Bt	10YR 4/1			clay

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [ ] Aquic Moisture Regime
- [X] Reducing Conditions
- [X] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(YES)	NO	Is this Sampling Point Within a Wetland? (YES) NO
Wetland Hydrology Present?	(YES)	NO	
Hydric Soil Present?	(YES)	NO	

Remarks:

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/19/08
Applicant / Owner: NCEEP			County: Yancey
Investigator: Shelingoski, Bauguess			State: NC
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: Wetland 1-A
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Veronica sp	H	—	Eupatorium purpureum	H	FAC
Scirpus cyperinus	H	OBL	Juncus sp	H	—
Typha latifolia	H	OBL			
Salix nigra	S	OBL			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 100%

Remarks: Species present around fringe of pond. Open water wetland.

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	120	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	Surface	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [X] Inundated
- [ ] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): W (water) | Drainage Class:

Taxonomy (Subgroup): | Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [ ] Aquic Moisture Regime
- [ ] Reducing Conditions
- [ ] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(YES)	NO	Is this Sampling Point Within a Wetland? (YES) NO
Wetland Hydrology Present?	(YES)	NO	
Hydric Soil Present?	(YES)	NO	

Remarks:

10-12' deep pond. open water wetland that drains to tributary and floodplain below road

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/20/08	
Applicant / Owner: NCEEP			County: Yancey	
Investigator: Shelingoski, Bauguess			State: NC	
Do Normal Circumstances exist on the site?	YES	NO	Community ID: Upland land IA	
Is the site significantly disturbed (Atypical Situation)?	YES	NO	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	NO	Plot ID:	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Pinus strobus	T	FACU	Sassafras albidum	S	FACU
Juglans Nigra	T	FACU	Polystichum acrostichoides	H	FAC
Acer spicatum	T	—	Asclepias sp	H	—
Cornus florida	S	FACU	Parthenocissus quinquefolia	H	FAC

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 33%

Remarks: Steep sloping uplands

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	0	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	18+	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [ ] Inundated
- [ ] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Huntdale clay loam, 30-50% | Drainage Class: Well drained

Taxonomy (Subgroup): Umbric Dystrochrepts | Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8	A	10YR 5/3			sandy loam
8+	B	10YR 4/6			clay loam

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [ ] Aquic Moisture Regime
- [ ] Reducing Conditions
- [ ] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks: very dry

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	NO	Is this Sampling Point Within a Wetland? YES NO
Wetland Hydrology Present?	YES	NO	
Hydric Soil Present?	YES	NO	

Remarks:

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/19/08
Applicant / Owner: NCEEP			County: Yancey
Investigator: Shelingoski, Bauguess			State: NC
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: Wetland 2
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Typha latifolia	H	OBL			
Salix nigra	S	OBL			
Carex sp	H	—			
Impatiens capensis	H	FACW			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 100%

Remarks: Small depressional pond. Species present around the fringe of the pond.

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	36	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	Surface	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [X] Inundated
- [ ] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Thunder-Saunook complex 30-50% Drainage Class: Well drained

Taxonomy (Subgroup): Humic Hapludults Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [ ] Aquic Moisture Regime
- [ ] Reducing Conditions
- [ ] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks: Inundated pond

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(YES)	NO	Is this Sampling Point Within a Wetland? (YES) NO
Wetland Hydrology Present?	(YES)	NO	
Hydric Soil Present?	(YES)	NO	

Remarks:

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/19/08
Applicant / Owner: NCEEP			County: Yancey
Investigator: Snelingoski, Bauguess			State: NC
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: Upland 2
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Pinus strobus	T	FACU	Crataegus sp	S	—
Juglans nigra	T	FACU	Polystichum acrostichoides	H	FAC
Rosa multiflora	S	UPL	Toxicodendron radicans	V	FAC
Quercus velutina	T	—	Cornus florida	S	FACU

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 33%

Remarks:

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	0	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	18+	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [ ] Inundated
- [ ] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Thunder-Saunook Complex 30-50% | Drainage Class: Well drained

Taxonomy (Subgroup): Humic Hapludults | Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-9	A	10YR 4/4			loam
9+	Bt	10YR 5/6			clay loam

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [ ] Aquic Moisture Regime
- [ ] Reducing Conditions
- [ ] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	(NO)	Is this Sampling Point Within a Wetland? YES (NO)
Wetland Hydrology Present?	YES	(NO)	
Hydric Soil Present?	YES	(NO)	

Remarks:

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/20/08	
Applicant / Owner: NCEEP			County: Yancey	
Investigator: Shelingoski, Bauguess			State: NC	
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: Wetland 3	
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:	

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Alnus serrulata	S	FACW+	Veronia sp	H	—
Populus deltoides	T	FAC+	Lobelia cardinalis	H	FACW+
Gleditsia tricanthos	T	FAC-	Juncus sp	H	—
Rosa multiflora	S	UPL	Festuca sp	H	—

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 60%

Remarks: Open, linear wetland that drains through pasture to main tributary

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS

Depth of Surface Water	1	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	Surface	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [ ] Inundated
- [X] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [X] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Clifton Clay loam 30-50%. | Drainage Class: Well drained

Taxonomy (Subgroup): Typic Hapludults | Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 4/2	5YR 4/6	many distinct	loam
4-12	E	10YR 4/2			clay
12+	B	10YR 4/2	10YR 6/6	few distinct	clay

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [X] Aquic Moisture Regime
- [ ] Reducing Conditions
- [X] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(YES)	NO	Is this Sampling Point Within a Wetland? (YES) NO
Wetland Hydrology Present?	(YES)	NO	
Hydric Soil Present?	(YES)	NO	

Remarks:

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/20/08
Applicant / Owner: NCEEP			County: Yancey
Investigator: Shelingoski, Bauguess			State: NC
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: Upland 3
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Carpinus caroliniana	S	FAC	Quercus alba	T	FACU
Pinus strobus	T	FACU	Liriodendron tulipifera	T	FAC
Acer spicatum	T	—	Rosa multiflora	S	UPL
Juglans nigra	T	FACU	Toxicodendron radicans	V	FAC

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 43%

Remarks:

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[ ] No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	0	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	18+	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [ ] Inundated
- [ ] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Clifton clay loam 30-50%. Drainage Class: Well Drained

Taxonomy (Subgroup): Typic Hapludults Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8	A	5YR 4/4			Clay loam
8+	B	5YR 4/6			Gravelly clay loam

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [ ] Aquic Moisture Regime
- [ ] Reducing Conditions
- [ ] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	(NO)
Wetland Hydrology Present?	YES	(NO)
Hydric Soil Present?	YES	(NO)

Is this Sampling Point Within a Wetland? YES (NO)

Remarks:

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/20/08
Applicant / Owner: NCEEP			County: Yancey
Investigator: Shelingoski, Baugucss			State: NC
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: wetland 4
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Festuca sp.	H	—	Veronia sp	H	—
Juncus sp.	H	—	Salix nigra	S	OBL
Scirpus cyperinus	H	OBL	Populus deltoides	S	FAC+
Impatiens capensis	H	FACW	Rosa multiflora	S	UPL

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 80%

Remarks:

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	2-3	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	Surface	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [ ] Inundated
- [X] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [X] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Saunook sandy loam, 8-15% | Drainage Class: Well drained

Taxonomy (Subgroup): Humic Hapludults | Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 4/2	5YR 4/6	many distinct	loam
4-12	E	10YR 4/2			clay
12+	B	10YR 4/2	10YR 6/6	few distinct	clay

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [X] Aquic Moisture Regime
- [ ] Reducing Conditions
- [X] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(YES)	NO	Is this Sampling Point Within a Wetland? (YES) NO
Wetland Hydrology Present?	(YES)	NO	
Hydric Soil Present?	(YES)	NO	

Remarks:

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/20/08
Applicant / Owner: NCEEP			County: Yancey
Investigator: Shelinaoski, Bauguess			State:
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: Wetland 5
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Festuca sp	H	—	Veronia sp	H	—
Juncus sp	H	—	Salix nigra	S	OBL
Scirpus cyperinus	H	OBL	Populus deltoides	S	FAC+
Impatiens capensis	H	FACW	Rosa multiflora	S	UPL

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 80%.

Remarks:

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	3-4	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	Surface	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [ ] Inundated
- [X] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [X] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Saunook sandy loam, 8-15%. Drainage Class: Well drained

Taxonomy (Subgroup): Humic Hapludults Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	A	10YR 4/2	5YR 4/6	Many distinct	loam
4-12	E	10YR 4/2			clay
12+	B	10YR 4/2	10YR 6/6	few distinct	clay

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [X] Aquic Moisture Regime
- [ ] Reducing Conditions
- [X] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(YES)	NO
Wetland Hydrology Present?	(YES)	NO
Hydric Soil Present?	(YES)	NO

Is this Sampling Point Within a Wetland? (YES) NO

Remarks:

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Bald Creek			Date: 8/20/08
Applicant / Owner: NCEEP			County: Yancey
Investigator: Shelingoski, Bauguess			State: NC
Do Normal Circumstances exist on the site?	(YES)	NO	Community ID: Upland 4&5
Is the site significantly disturbed (Atypical Situation)?	YES	(NO)	Transect ID:
Is the area a potential Problem Area? (If needed, explain on reverse)	YES	(NO)	Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Pinus strobus	T	FACU	Rosa multiflora	S	UPL
Acer spicatum	T	–	Liriodendron tulipifera	T	FAC
Cornus florida	S	FACU			
Festuca sp	H	–			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 75%

Remarks:

HYDROLOGY

[ ] Recorded Data (Describe in Remarks)
- [ ] Stream, Lake, or Tide Gauge
- [ ] Aerial Photographs
- [ ] Other

[X] No Recorded Data Available

FIELD OBSERVATIONS		
Depth of Surface Water	0	(in)
Depth of Free Water in Pit	N/A	(in)
Depth to Saturated Soil	18+	(in)

WETLAND HYDROLOGY INDICATORS

Primary Indicators:
- [ ] Inundated
- [ ] Saturated in Upper 12 Inches
- [ ] Water Marks
- [ ] Drift Lines
- [ ] Sediment Deposits
- [ ] Drainage Patterns in Wetlands

Secondary Indicators (2 or more Required)
- [ ] Oxidized Root Channels in Upper 12 inches
- [ ] Water-stained Leaves
- [ ] Local Soil Survey Data
- [ ] FAC-Neutral Test
- [ ] Other (Explain in Remarks)

SOILS

Map Unit Name (Series and Phase): Saunook Sandy loam, 8-15%. | Drainage Class: Well drained

Taxonomy (Subgroup): Humic Hapludult | Field Observations Confirm Mapped Type? YES NO

PROFILE DESCRIPTION

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-9	A	10YR 4/4			loam
9+	B	10YR 4/6			clay loam

HYDRIC SOIL INDICATORS:
- [ ] Histosol
- [ ] Histic Epipedon
- [ ] Sulfidic Odor
- [ ] Aquic Moisture Regime
- [ ] Reducing Conditions
- [ ] Gleyed or Low-Chroma Colors
- [ ] Concretions
- [ ] High Organic Content in Surface Layer in Sandy Soils
- [ ] Organic Streaking in Sandy Soils
- [ ] Listed on Local Hydric Soils List
- [ ] Listed on National Hydric Soils List
- [ ] Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	YES	(NO)	Is this Sampling Point Within a Wetland? YES (NO)
Wetland Hydrology Present?	YES	(NO)	
Hydric Soil Present?	YES	(NO)	

Remarks: