DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

14 September, 2015

Regulatory Division

Re: NCIRT Review and USACE Approval of the Henry Fork Draft Mitigation Plan; SAW-2014-00538; DMS Project #96306

Mr. Tim Baumgartner
North Carolina Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

Dear Mr. Baumgartner:

The purpose of this letter is to provide the North Carolina Division of Mitigation Services (NCDMS) with all comments generated by the North Carolina Interagency Review Team (NCIRT) during the 30-day comment period for the Henry Fork Draft Mitigation Plan, which closed on 25 July, 2015. These comments are attached for your review.

Based on our review of these comments, we have determined that no major concerns have been identified with the Draft Mitigation Plan, which is considered approved with this correspondence. However, several minor issues were identified, as described in the attached comment memo, which must be addressed in the Final Mitigation Plan. Please note that until the IRT has approved an expanded service area, this mitigation site must comply with the geographic service area as approved for DMS mitigation projects.

The Final Mitigation Plan is to be submitted with the Preconstruction Notification (PCN) application for Nationwide permit approval of the project along with a copy of this letter. Issues identified above must be addressed in the Final Mitigation Plan. All changes made to the Final Mitigation Plan should be summarized in an errata sheet included at the beginning of the document. If it is determined that the project does not require a Department of the Army permit, you must still provide a copy of the Final Mitigation Plan, along with a copy of this letter, to the appropriate USACE field office at least 30 days in advance of beginning construction of the project. Please note that this approval does not preclude the inclusion of permit conditions in the permit authorization for the project, particularly if issues mentioned above are not satisfactorily addressed. Additionally, this letter provides initial approval for the Mitigation Plan, but this does not guarantee that the project will generate the requested amount of mitigation credit. As you are aware, unforeseen issues may arise during construction or monitoring of the project that may require maintenance or reconstruction that may lead to reduced credit.

Thank you for your prompt attention to this matter. If you have questions regarding this letter, the mitigation plan review process, or the requirements of the Mitigation Rule, please call me at 919-846-2564.

Sincerely,

HUGHES.ANDREA.WADE.1258339165

Digitally signed by HUGHES.ANDREA.WADE.1258339165
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=HUGHES.ANDREA.WADE.1258339165
Date: 2015.09.14 13:48:27 -04'00'

Andrea Hughes
Special Projects Manager

Enclosures

Electronic Copies Furnished:
NCIRT Distribution List
Paul Wiesner, NCDMS
Jake McLean, Wildlands Engineering

September 2, 2015

Matthew Reid
N.C. DENR- Division of Mitigation Services (DMS)
5 Ravenscroft Drive, Suite 102
Asheville, NC 28801

RE: NCIRT Review Portal Comments for Draft Mitigation Plan
Henry Fork Mitigation Site (DMS #96306)
Catawba 03050103 Expanded Service Area, Catawba County, NC

Dear Mr. Reid,

We have reviewed the comments on the Draft Mitigation Plan for the above referenced project dated August 18, 2015, and have revised the Mitigation Plan and plan set based on these comments. The revised documents are submitted with this letter as a final deliverable for DMS review. Below are responses to each of the IRT comments. The comments are reprinted with our response in italics.

Todd Bowers, USEPA, 23 July 2015

1. Page 17, Table 8

Recommend including overall wetland ratings per NCWAM score.

Response: The NCWAM score and ratings have been added to Table 8.

2. Page 20

Wetland R and S classification should be changed from "non-freshwater marsh" to "non-tidal freshwater marsh".

Response: The change has been made in Section 5.1, page 20.

3. Page 41, Section 10.2

Recommend adding language that clarifies that the addition of the 100-foot wide buffer along Henry Fork is to account for acreage lost due to wetland overlap into riparian areas of UT2 and UT1.

Response: This clarification has been added to the end of paragraph 1 in Section 10.2.

4. Page 41, Section 10.2

Recommend adding language that states that culverts, outbuildings, cart paths, utilities, dams etc. will be removed.

Response: This language has been added to the last paragraph in Section 10.2.

5. Page 56, Section 11

Recommend adding language to provide for contingencies due to beaver activity.

Response: This language has been added to the maintenance plan for streams: "Beaver activity will be monitored and beaver dams on project streams will typically be removed during the monitoring period to allow for bank stabilization and stream development outside of this type of influence.*"*

6. Page 58, Section 12.2

Recommend adding the 100' buffer along the Henry Fork under the auspices of monitoring for vegetation success criteria. This is justified by the lack of specific UT1 and UT2 riparian buffer success in the areas that overlap with wetland monitoring.

Response: The 100' buffer has been added to monitoring efforts as indicated by monitoring sections in the plan, and as depicted on Figure 11.

7. Page 61, Section 13.2.6

Recommend monitoring of 100' buffer along Henry Fork for same reasons stated above.

Response: Monitoring this buffer has been added, with specific mention as part of the monitoring effort.

8. General Comment (Appendices/Plans)

The 100' riparian buffer along Henry Fork right bank should be included in detail plans located in the appendices.

Response: A Plan Sheet, 4.4, has been added to depict the 100' buffer planting.

9. General Comment (Adaptive Management)

Recommend some contingency plan to deal with unplanned wetland acreage that may be inadvertently created by plugging the ditches that drain UT2 and the western portion of the site into Henry Fork. While full credit for this cannot be awarded without monitoring wells and planting, some credit may be justified if wetland function is established.

Response: The following language has been added to the Mitigation Plan in Section 8.2 pertaining to Wetland Mitigation Credits: "DMS reserves the right to request additional wetland credits created by the project. Wetland credits will be proposed based upon additional gauge data and/or wetland delineation."

Ginny Baker, NCDWR, 24 July 2015

1. Henry Fork Buffer

The additional buffer plantings along Henry Fork are an excellent voluntary measure for uplift. Please included this planted buffer area in the planting plans.

Response: A Plan Sheet, 4.4, has been added to depict the 100' buffer planting.

2. Wetland Hydrology Criteria

NCDWR is concerned that the proposed 7.2% of consecutive days of water table elevation within 12 inches of the surface is low for a bottomland hardwood wetland system (Section 12.3, Page 58). Section 7.2.1 referred to the analysis of a reference well located in a reference wetland meeting the 7.2% hydrology criteria. What was the reference well performance for each year it was monitored, 2012-2014, and did the local area experience normal rainfall conditions?

Response: During the evaluated years (2012 – 2014) reference well data was within the upper 12 inches of the surface for extended periods during the growing season with a minimum of 47 consecutive days (23% of growing season). Assessment of the hydrology data was focused on the response of the water table elevations to precipitation as opposed to setting minimum hydrology criteria based on the reference hydrology. In addition, during the DMS review period there was concern expressed about the depth of grading on site and the potential for the system to become more emergent with extended periods of surface water as opposed to a bottomland hardwood system with fluctuating groundwater hydrology. Wildlands considered this information, as well as experience with past wetland mitigation projects and site specific hydrologic modeling to set the hydrologic criteria for the system. A revised explanation of how hydrologic criteria was selected has been prepared as part of the revised mitigation plans, Section 5.3.1.4. Previous projects, associated growing seasons, and performance criteria are displayed in the table below. Based on all this information Wildlands believes that an inundation period of 7.2% (17 days out of a 236 day growing season) along with the proposed grading will provide sufficient soil wetness to develop appropriate hydric soils within the upper twelve inches of the soil surface to establish a forested bottomland hardwood system.

Site	Consecutive Day Criteria	Growing Season Days	% of Growing Seasons	Growing Season	County	Proposed System
Lyle Creek	14	204	7.0%	April 7 to October 28	Catawba	Bottomland Hardwood Forest
Owl's Den Mitigation Site	18	222	8.1%	March 28 to November 4	Lincoln	Piedmont Bottomland Forest
Foust Creek Mitigation Site	20	230	8.5%	March 24 to November 9	Alamance	Bottomland Hardwood Forest
Underwood Mitigation Site	14	216	6.5%	April 1 to November 3	Chatam	Bottomland Hardwood Forest
Devil's Racetrack Stream and Wetland Mitigation Site	20	230	8.5%	March 21 to November 16	Johnston	Coastal Plain Small Stream Swamp and Bottomland Hardwood
Crooked Creek #2 Restoration Project	17	228	7.5%	March 23 to November 6	Union	Palustrine Emergent Wetland

3. Bank Pin Stability Measurement at Erosional Areas

The three location bank pin survey described in Section 13.2 is a quick and useful method to monitor dimension stability. NCDWR recommends adding additional bank pins to any significant erosion areas that are observed during the visual monitoring. This will help avoid concerns about whether observed bank erosion at closeout is active or stable.

Response: Expansion of bank pin monitoring has been written into section 13.2.1 to include areas of moderate bank erosion within project streams.

Andrea Hughes, USACE, 17 August 2015

1. Wetland Hydrology Criteria

The draft mitigation plan proposes a wetland hydrology performance standard of saturation within 12 inches of the soil surface for 7.2% of the growing season. Wetland areas receiving credit for restoring/enhancing wetland hydrology should demonstrate saturation within 12 inches of the soil surface for at least 8.5% of the growing season.

Response: Please see the response to comment 2 above by Ginny Baker, NCDWR*.*

2. Wetland Hydrology Monitoring

Please include a description of the monitoring protocols for wetland hydrology in the monitoring plan (Section 13).

Response: Section 13.3.1 has been added to discuss wetland hydrology monitoring.

3. Invasive Species Management

The field notes from the site visit indicate a high level of invasive species located immediately offsite and a recommendation to address contingency actions for on-site invasive species issues in the Adaptive Management section of the mitigation plan.

Response: The Performance Standards for Vegetation (Section 12.2) state that "The extent of invasive species coverage will also be monitored and controlled as necessary throughout the required monitoring period."

4. Long Term Management Plan

The Long-Term Management Plan should include a list of long-term management activities required for site sustainability, annual cost for each activity, the party responsible for conducting these activities, and details regarding the funding of these activities. If no long-term management activities are anticipated for this site, please include a statement to this effect in the mitigation plan along with an explanation.

Response: Section 14.0 of the Mitigation Plan has been updated to address anticipated maintenance activities. Due to the nature of the site, there are minimal anticipated maintenance activities.

5. Roads/Paths/Trails/Crossings Post-Construction

The survey plat included with the conservation easement depicts a series of roads/paths throughout the mitigation site. Several of these appear to be located in close proximity to mitigation areas and/or cross these areas. Please provide a map depicting any roads/paths/trails and/or crossings that will remain post-construction.

Response: The plat shows existing cart paths. All cart paths within the planting areas associated with streams and wetlands and within the footprint of wetland mitigation activities will be removed. There are no plans to maintain permanent roads, paths or crossings post-construction.

6. Request for Stream Gaging on Intermittent Streams

We request that a surface water gauge be installed in all intermittent stream reaches proposed for restoration in order to demonstrate sufficient flow throughout the monitoring period to maintain an Ordinary High Water Mark (OHWM).

Response: Section 12.1.5 and Section 13.2.5 have been revised to include performance standards and monitoring of intermittent stream hydrology as requested.

7. Temporary and Permanent Impacts

All temporary and permanent impacts to existing wetlands and streams must be accounted for in the PCN and the loss or conversion of those waters must be replaced on-site. Please include a map depicting the location of all impacts with the PCN.

Response: A map is being included in the PCN. Section 6.1 also describes these impacts.

8. General Comment (Appendices/Plans)

Typically we do not recommend inclusion of *Acer rubrum* in planting plans as this species may currently be present onsite. Please be aware that adaptive management may be required if *Acer rubrum* is determined to be a dominant species at any time during the monitoring period.

Response: Acer rubrum is limited to 5% of the bare root species proposed for planting and will be managed as necessary to prevent dominance.

9. General Comment (Adaptive Management)

According to the information provided, this mitigation site is located in the Catawba River Basin HUC 03050102. The mitigation plan (page 1) states the site is being submitted for mitigation credit in the Catawba River Basin HUC 03050103 within the expanded service area of this HUC. Please be aware that the IRT has not approved a DMS request to expand the service area for HUC 03050103 to include CT03, CT02, and CT01. If you would like to request that the IRT consider an expanded service area for the Henry Fork mitigation site, please provide a map depicting the boundaries for the proposed service area you are requesting.

Response: The service area for HUC03050102 has been plotted on Figure 1 of the Mitigation Plan.

Please let me know if you have any additional comments.

Sincerely,

Jacob P. McLean, PE, CFM

CC:
Paul Wiesner
paul.wiesner@ncdenr.gov

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

REPLY TO
ATTENTION OF:

CESAW-RG/Hughes August 18, 2015

MEMORANDUM FOR RECORD

SUBJECT: Henry Fork Mitigation Site - NCIRT Comments During 30-day Mitigation Plan Review

PURPOSE: The comments listed below were posted to the NCDMS Mitigation Plan Review Portal during the 30-day comment period in accordance with Section 332.8(g) of the 2008 Mitigation Rule.

NCDMS Project Name: Henry Fork Mitigation Site, Catawba County, NC

USACE AID#: SAW-2014-00538
NCDMS #: 96306

30-Day Comment Deadline: 25 July 2015

Todd Bowers, USEPA, 23 July 2015:

1. Page 17, Table 8: Recommend including overall wetland ratings per NCWAM score.
2. Page 20: Wetland R and S classification should be changed from “non-freshwater marsh” to “non-tidal freshwater marsh”
3. Page 41, Section 10.2: Recommend adding language that clarifies that the addition of the 100-foot wide buffer along Henry Fork is to account for acreage lost due to wetland overlap into riparian areas of UT2 and UT1.
4. Page 41, Section 10.2: Recommend adding language that states that culverts, outbuildings, cart paths, utilities, dams etc. will be removed.
5. Page 56, Section 11: Recommend adding language to provide for contingencies due to beaver activity.
6. Page 58, Section 12.2: Recommend adding the 100’ buffer along the Henry Fork under the auspices of monitoring for vegetation success criteria. This is justified by the lack of specific UT1 and UT2 riparian buffer success in the areas that overlap with wetland monitoring.
7. Page 61, Section 13.2.6: Recommend monitoring of 100’ buffer along Henry Fork for same reasons stated above.
8. The 100’ riparian buffer along Henry Fork right bank should be included in detail plans located in the appendices.
9. Recommend some contingency plan to deal with unplanned wetland acreage that may be inadvertently created by plugging the ditches that drain UT2 and the western portion

of the site into Henry Fork. While full credit for this cannot be awarded without monitoring wells and planting, some credit may be justified if wetland function is established.

Ginny Baker, NCDWR, 24 July, 2015:

1. The additional buffer plantings along Henry Fork are an excellent voluntary measure for uplift. Please included this planted buffer area in the planting plans.
2. NCDWR is concerned that the proposed 7.2% of consecutive days of water table elevation within 12 inches of the surface is low for a bottomland hardwood wetland system (Section 12.3, Page 58). Section 7.2.1 referred to the analysis of a reference well located in a reference wetland meeting the 7.2% hydrology criteria. What was the reference well performance for each year it was monitored, 2012-2014, and did the local area experience normal rainfall conditions?
3. The three location bank pin survey described in Section 13.2 is a quick and useful method to monitor dimension stability. NCDWR recommends adding additional bank pins to any significant erosion areas that are observed during the visual monitoring. This will help avoid concerns about whether observed bank erosion at closeout is active or stable.

Andrea Hughes, USACE, 17 August, 2015:

1. The draft mitigation plan proposes a wetland hydrology performance standard of saturation within 12 inches of the soil surface for 7.2% of the growing season. Wetland areas receiving credit for restoring/enhancing wetland hydrology should demonstrate saturation within 12 inches of the soil surface for at least 8.5% of the growing season.
2. Please include a description of the monitoring protocols for wetland hydrology in the monitoring plan (Section 13).
3. The field notes from the site visit indicate a high level of invasive species located immediately offsite and a recommendation to address contingency actions for on-site invasive species issues in the Adaptive Management section of the mitigation plan.
4. The Long-Term Management Plan should include a list of long-term management activities required for site sustainability, annual cost for each activity, the party responsible for conducting these activities, and details regarding the funding of these activities. If no long-term management activities are anticipated for this site, please include a statement to this effect in the mitigation plan along with an explanation.
5. The survey plat included with the conservation easement depicts a series of roads/paths throughout the mitigation site. Several of these appear to be located in close proximity to mitigation areas and/or cross these areas. Please provide a map depicting any roads/paths/trails and/or crossings that will remain post-construction.
6. We request that a surface water gauge be installed in all intermittent stream reaches proposed for restoration in order to demonstrate sufficient flow throughout the monitoring period to maintain an Ordinary High Water Mark (OHWM).
7. All temporary and permanent impacts to existing wetlands and streams must be accounted for in the PCN and the loss or conversion of those waters must be replaced on-site. Please include a map depicting the location of all impacts with the PCN.

8. Typically we do not recommend inclusion of *Acer rubrum* in planting plans as this species may currently be present onsite. Please be aware that adaptive management may be required if *Acer rubrum* is determined to be a dominant species at any time during the monitoring period.
9. According to the information provided, this mitigation site is located in the Catawba River Basin HUC 03050102. The mitigation plan (page 1) states the site is being submitted for mitigation credit in the Catawba River Basin HUC 03050103 within the expanded service area of this HUC. Please be aware that the IRT has not approved a DMS request to expand the service area for HUC 03050103 to include CT03, CT02, and CT01. If you would like to request that the IRT consider an expanded service area for the Henry Fork mitigation site, please provide a map depicting the boundaries for the proposed service area you are requesting.

HUGHES.ANDREA.WADE.1258339165

Digitally signed by HUGHES.ANDREA.WADE.1258339165
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=HUGHES.ANDREA.WADE.1258339165
Date: 2015.08.18 13:29:51 -04'00'

Andrea Hughes
Mitigation Project Manager
Regulatory Division

MITIGATION PLAN

Final

September 2, 2015

HENRY FORK MITIGATION SITE

Catawba County, NC
DENR Contract No. 005782
DMS ID No. 96306

Catawba River Basin
HUC 03050103 Expanded Service Area

USACE Action ID No. 2014-00538

PREPARED FOR:

NC Department of Environment and Natural Resources
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

MITIGATION PLAN

HENRY FORK MITIGATION SITE

Catawba County, NC
DENR Contract No. 005782
DMS ID No. 96306

Catawba River Basin
HUC 03050103 Expanded Service Area

USACE Action ID No. 2014-00538

PREPARED FOR:

NC DENR- Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

PREPARED BY:

Wildlands Engineering, Inc.
167-B Haywood Road
Asheville, NC 28806
Phone: (828) 774-5547

September 2, 2015

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) is completing a full-delivery project for the NC DENR Division of Mitigation Services (DMS) to restore and enhance 3,057 linear feet (LF) of perennial streams and 2,626 LF of intermittent streams, enhance 0.68 acres of existing wetlands, rehabilitate 0.25 acres of existing wetlands, and re-establish 3.71 acres of wetlands in Catawba County, NC. The streams proposed for restoration and enhancement include four unnamed tributaries to Henry Fork on the site of a former golf course, referred to herein as UT1, UT2, UT1A, and UT1B. The project is being completed to provide stream mitigation units (SMUs) and wetland mitigation units (WMUs) in the Catawba River Basin. The proposed activities will result in the development of 4,808 SMUs and 4.22 WMUs, as detailed in Section 8.0.

The Henry Fork Mitigation Site is located within the Catawba River Basin Hydrologic Unit Code (HUC) 03050102010030 and the North Carolina Division of Water Resources (NCDWR) Subbasin 03-08-35. The project's compensatory mitigation credits will be used in accordance with the In-Lieu Fee (ILF) Program Instrument dated July 28, 2010, the expanded service area as defined under the September 12, 2006 PACG memorandum, and/or DMS acceptance and regulatory permit conditions associated with Division of Mitigation Services ILF requirements. Hydrologic Unit Code (HUC) 03050102010030, Lower Henry Fork, was identified as a Targeted Local Watershed (TLW) in DMS' 2007 Catawba River Basin Restoration Priority (RBRP) Plan. The RBRP identifies a restoration goal for all streams within HUC 03050102 of removing conditions which cause sediment impairments, including mitigating stressors from stormwater runoff. The site is approximately 15 miles upstream of the South Fork Catawba River (Lincolnton) WS-IV, CA water supply watershed. The Henry Fork watershed was also identified in the 2005 North Carolina Wildlife Resource Commission's Wildlife Action Plan as a priority area, which calls for conservation and restoration of streams and riparian zones. In addition, the 2010 NC DWQ Catawba River Basin Plan indicated that the section of Henry Fork that drains the project area is impaired for high turbidity, among other stressors.

Decommissioning the existing golf course, with the targeted efforts of establishing a permanent conservation easement to buffer the streams and Henry Fork floodplain, removing golf course ponds, revegetating the site, and restoring streams and wetlands, will help address identified stressors in the watershed, specifically those related to urban runoff and potential sediment sources. The project will place approximately 48 acres of land that was historically used for agriculture, and subsequently as a golf course, under permanent conservation easement and establish a 100-foot buffer along Henry Fork as part of the site improvements. These efforts will provide site and corridor scale habitat benefits in the form of improved aquatic and terrestrial habitat, including enhanced connectivity and diversity of habitat. Goals, objectives, and expected outcomes of the proposed project are enumerated in this plan.

This mitigation plan has been written in conformance with the requirements of the following documents that govern DMS operations and procedures for the delivery of compensatory mitigation.

- Federal rule for compensatory mitigation project sites, as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14).
- NCDENR Division of Mitigation Services In-Lieu Fee Instrument signed and dated July 28, 2010.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 Restoration Project Goals and Objectives

The Henry Fork Mitigation Site (site) is a stream and wetland project located in Catawba County approximately one mile southwest of the City of Hickory (Figure 1). The site is located in the Catawba River Basin HUC 03050102010030 and NCDWR Subbasin 03-08-35. The project's compensatory mitigation credits will be used in accordance with the In-Lieu Fee (ILF) Program Instrument dated July 28, 2010, the expanded service area for HUC 03050103 as defined under the September 12, 2006 PACG memorandum, and/or DMS acceptance and regulatory permit conditions associated with Division of Mitigation Services ILF requirements. The site is within the Lower Henry Fork Targeted Local Watershed (TLW) identified in DMS' 2007 Catawba River Basin Restoration Priority (RBRP) Plan which can be accessed at:

http://portal.ncdenr.org/c/document_library/get_file?uuid=5e2e048d-0bd4-4e0f-8657-bf607eb8930c&groupId=60329

The RBRP identifies a restoration goal for all streams within HUC 03050102 of removing conditions which cause sediment impairments, including mitigating stressors from stormwater runoff. The Lower Henry Fork watershed was one of a handful that were identified by local resource professionals (which includes municipal planners, state and federal resource agency representatives, and soil & water conservation district representatives) as an area where DMS should prioritize mitigation projects. The Henry Fork watershed was also identified in the 2005 North Carolina Wildlife Resource Commission's Wildlife Action Plan as a priority area for freshwater habitat conservation and restoration to protect rare and endemic aquatic fauna and enhance species diversity. The Wildlife Action Plan calls for "(s)upport of conservation and restoration of streams and riparian zones in priority areas (acquisition, easements, and buffer)." The 2010 NC DWQ Catawba River Basin Plan indicated that the section of Henry Fork that drains the project area is impaired for high turbidity and low pH, which are likely the result of non-point inputs during rainfall events. Restoration at the site will address high turbidity by creating stable stream banks, restoring a riparian/wetland corridor, and placing approximately 48 acres of land historically used for agriculture and as a golf course under permanent conservation easement.

Project goals are desired project outcomes and are verifiable through visual assessment and/or measurement. Objectives are activities that will result in the accomplishment of goals. The project will be monitored after construction to demonstrate success as described in Section 12. The project goals and related objectives are described in Table 1.

Table 1: Mitigation Goals and Objectives – *Henry Fork Mitigation Site*

Goal	Objective	Expected Outcomes
Permanently protect the project site from harmful uses.	Decommission existing golf course and establish a conservation easement on the site.	On-going detrimental maintenance activities will be halted. The threat of potential redevelopment, particularly along upper tributaries that are outside of the regulated floodplain, will be prevented. An additional 30+ acres above the required buffers will be acquired and permanently protected.
Correct modifications to streams, wetlands and buffers.	Resize and realign channels to address stream dredging and ditching, and prior relocation away from the valley low point. Plant native woody species in riparian	By correcting prior modifications, channels and floodplains will provide a suite of hydrologic and biological functions that have been degraded due to prior use and manipulation. The resulting restored systems will realize a cumulative benefit through

Goal	Objective	Expected Outcomes
	zones which have been maintained through mowing.	interconnecting and reestablishing all of the natural components of this type of ecosystem.
Improve hydrology and function of previously cleared wetlands adversely affected by ditching and dredging of adjacent streams.	Restore appropriate stream dimensions and juxtaposition of streams and wetlands on the landscape.	Restore and reestablish hydrologic interplay between streams and wetlands. Wetlands will be enhanced through more frequent overbank flooding, and also by reducing the drawdown effect that current ditched channels have on wetland hydrology, thereby enhancing wetland connectivity to the local water table. The project will extend existing wetland zones into adjacent areas and support wetland functions.
Re-establish wetland hydrology and function in relic wetland areas.	Remove historic overburden to uncover relic hydric soils. Roughen wetland re-establishment. Restore streams for wetland benefit.	Bring local water table elevations closer to the ground surface. Create overbank flooding, and depressional storage for overland and overbank flow retention. Decrease direct runoff, and increase infiltration.
Re-establish riparian buffer and wetland vegetation communities.	A native vegetation community will be planted on the site to revegetate the riparian buffers and wetlands. Conduct soil restoration through topsoil harvesting and reapplication, and leaf litter harvesting and application from adjacent forested areas.	Return functions associated with buffers and forested floodplains. Enhance soil productivity and bring native biological activity and seed into the disturbed areas.
Reduce current erosion and sedimentation, and the risk of future sedimentation from channel avulsion and/or dam failures	Stabilize incised streams that are incising or widening. Relocate streams to appropriate location in valley. Remove dams.	Existing erosion and risks of erosion will be mitigated resulting in protection of on-site and downstream aquatic resources.
Reduce nutrient inputs to streams and wetlands, and to downstream water bodies.	Decommissioning the site from its most recent use as an active golf course, routinely maintained by the application of these chemicals. Establish functioning buffers.	Direct chemical fertilizer, pesticide, and herbicide inputs will be eliminated. Natural filtration capacity of restored buffers, floodplain areas and wetlands will be reestablished.
Improve instream habitat.	Construct diverse and stable channel form with varied stream bedform. Install habitat features such as undercut logs, brush toe, wood and stone-based riffles, and establish native stream bank	Aquatic habitat quality and connectivity will be significantly enhanced.

Goal	Objective	Expected Outcomes
	vegetation and shading. Four inline ponds and thirteen existing concrete culverts throughout the site function as barriers to aquatic migration; these will be removed, or abandoned offline.	
Provide and improve terrestrial habitat, and native floodplain forest.	Place a portion of right bank Henry Fork floodplain under a conservation easement. Plant all stream buffers and wetlands with native species. Within the project limits, a 100-foot-wide corridor of wooded riparian buffer will be established off the top of right bank of Henry Fork as a non-credited activity, and the remaining protected floodplain will be allowed to naturally regenerate over time. Topsoil and leaf litter harvesting and application to the project area will help facilitate this goal.	Reestablishment of native plant communities, connectivity of habitat within site and to adjoining natural areas along river corridor. Reuse of site resources (soil, seed source) to provide for better recovery success.

2.0 Project Site Location and Selection

2.1 Directions to Project Site

The site is located in western Catawba County, NC, as shown in Figure 1. The site is southwest of the City of Hickory. The project is located on the old Henry River Golf Course.

From Asheville, NC, take US-40 East approximately 75 miles to US-321 in Hickory, NC. Take exit 42 for US-321 South and continue approximately 1.2 miles. Take exit for NC-127 South – continue on NC-127 South for 0.3 miles, then turn right on Fleetwood Drive. Follow to the end (approximately 0.2 miles) and turn right onto State Road 1192, Mountain View Road. The entrance to the Henry Fork site is at the end of the road, approximately 0.7 miles on Mountain View Road.

2.2 Site Selection and Project Components

The site has been selected to provide SMUs and WMUs in the Catawba River Basin. The site was selected based on the current degraded condition of streams and wetlands and the potential for functional restoration. In addition, the site provides a prime opportunity to restore floodplain habitat and buffers on the larger Henry Fork.

The project includes a combination of stream restoration, stream enhancement, wetland rehabilitation, wetland re-establishment, and wetland enhancement. The streams proposed for restoration include UT1, UT1A, UT1B, and UT2, as illustrated on Figure 2. The surrounding floodplain is composed of jurisdictional wetlands planned for rehabilitation or enhancement and relic wetland areas planned for re-establishment.

3.0 Site Protection Instrument

The land required for construction, management, and stewardship of this mitigation project is located on a single parcel owned by one landowner, WEI-Henry Fork, LLC, as summarized in Table 2. The recorded conservation easement and plat (site protection instrument) is included in Appendix 1. Figure 2 shows the recorded conservation easement accepted by the NC State Property Office.

Table 2: Site Protection Instrument - *Henry Fork Mitigation Site*

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage to be Protected
WEI – Henry Fork, LLC	2791-0888-3819	Catawba	Conservation Easement	Bk. 03247, Pg. 0476-0488	48.06

All site protection instruments require 60-day advance notification to the Corps and the State prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

4.0 Baseline Information – Project Site and Watershed Summary

Table 3 presents the project information and baseline watershed information. The watershed areas were delineated using two-foot topographic LiDAR data and are shown on Figure 3.

Table 3: Project and Watershed Information - *Henry Fork Mitigation Site*

Project County	Catawba
Project Area (acres)	48.06
Project Coordinates	35°42'12.98"N, 81°21'53.20"W
Physiographic Region	Inner Piedmont
Ecoregion	Northern Inner Piedmont
River Basin	Catawba
USGS HUC (8 digit, 14 digit)	03050102, 03050102010030 (Expanded Service Area for 03050103)
NCDWR Sub-basin	03-08-35

Reaches	UT1 Reach 1 (Upper & Lower)	UT1 Reach 2[1]	UT1A	UT1B	UT2[1]
Drainage Area at Outlet (acres)	106	129	23	31	49
Drainage Area at Outlet (square miles)	0.165	0.201	0.036	0.048	0.077
CGIA Land Use Classification					
Impervious	5.9%	5.3%	6.1%	7.9%	2.4%
Herbaceous	26.8%	36.7%	76.5%	23.6%	13.5%

Reaches	UT1 Reach 1 (Upper & Lower)	UT1 Reach 2[1]	UT1A	UT1B	UT2[1]
Forested	34.8%	31.5%	13.5%	47.9%	45.0%
Pasture	2.4%	2.0%	0.0%	0.0%	23.8%
Developed, Low Intensity	29.1%	23.7%	3.9%	19.9%	15.3%
Water	1.0%	0.8%	0.0%	0.7%	0.0%

[1] Drainage area for UT1 Reach 2 is for existing condition. Proposed condition is to reroute UT2 into UT1. The proposed drainage area presented later in report is higher as a result.

4.1 Watershed Historical Land Use and Development Trends

Land use within the site's watershed is a mix of single family home residential, herbaceous fields, and forest and is currently approximately 37% herbaceous and 32% forested. A review of historical aerials from 1939, 1951, 1961, 1966, 1976, 1984, 1993, 1998, 2005, 2006, 2008, 2009, 2010, and 2012 was conducted. Historic aerial photos are included in Appendix 2. Aerials show the existing streams in a ditched network similar to the current site condition, and indicate the persistent presence of these features on the landscape. From 1939 to 1961, several single family homes were constructed within the watershed. From 1961 until 1984, a few more homes developed. Since 1984, land use in the watershed has remained relatively consistent. The site use was a mix of farmland and forest from at least 1939 to the late 1960's. During the 1960's and early 1970's, farming appears to have steadily decreased on the site and one by one the fields were left fallow. In 1978, the site was developed into a golf course. As part of the golf course construction, the streams appear to have been significantly modified and relocated, and four inline ponds were constructed. These pond are denoted as Ponds 1, 2, 3, and 4 (Figure 2). The site was actively maintained as a golf course from 1978 until 2012, at which point the course closed and was listed for sale. The owners have continued to mow the site over the past year in an effort to maintain the greens despite the closure of the facility, anticipating that the site will be sold and restored to a fully functional golf course by new owners.

The site is part of the West-Central Planning Area in section three of Catawba County's Strategic Growth Study, Current Conditions Report http://www.catawbacountync.gov/Planning/Plans/Growth/section3.pdf (Benchmark Incorporated, 1999). The plan notes that the improvements to US321, which is just east of the project area, will result in increased developmental pressure for the area. Mr. Chris Timberlake, a planner with the Catawba County Planning Department, reviewed the site and watershed conditions and was unaware of specific development pressure in the Henry Fork watershed (Timberlake, 2014). Mr. Cal Overby, the principal planner with City of Hickory, also reviewed the site and noted that the Comprehensive Plan for Hickory calls for the watershed to remain low density residential. He noted that, despite limited strip commercial development along NC 127 South, growth in the watershed has been very slow (Overby, 2014). The conservation easement will prohibit future development in the immediate riparian zone of the onsite streams, the majority of which are also located in the regulated floodplain of Henry Fork.

4.2 Watershed Assessment

On September 13, 2014, Wildlands conducted a watershed assessment to verify current land uses observed from the aerial photography and to identify potential stressors. The project's watersheds are relatively small, with little to no active land disturbances. Watershed streams include four unnamed tributaries to Henry Fork (UT1, UT1A, UT1B, and UT2).

UT1A and UT1B originate on the project site. Field observations were conducted on UT1 and UT2 upstream of the project boundary to or beyond their intermittent limits, and based on windshield survey of the watershed.

The USEPA's STEPL pollutant loading watershed model was used to estimate sediment load delivered to the project area from the watershed. The model uses the Revised Universal Soil Loss Equation (RUSLE), rainfall data for the county, watershed-wide stream conditions, and land use data to estimate sediment load from the watershed.

Sediment supply estimates from the STEPL method are empirical, based on qualitative channel condition, channel soil texture, and land use assessment, and the quantitative factor of channel bank height. Our assessment indicated that these factors were at the "low" end of the scale of values, and the resulting sediment supply value of 14 tons of sediment per year to the project area is consequently considered "low". Manual calculations suggest that 2%, or 0.3 tons of sediment per year, originate in the UT2 watershed; the remainder (13.7 ton/year) is generated from the UT1 watershed. Conditions on streams within the project site are generally worse than upstream conditions in the watershed, owing to significant prior manipulation. Ditching and instability within the project site itself is a function of maintenance practices which are site-specific in order to maintain conditions favorable to the prior use as a golf course.

The assessment is a watershed-wide assessment and channel were walked to their origins throughout the watersheds of interest. Channel condition upstream of the project site was almost universally classified as have "slight" lateral erosion potential (out of the potential values of "slight", "moderate", or "severe"). Land uses in these headwater areas were consistent with that observed on recent aerial images, and no recent disturbances were noted in either watershed. The forested areas in these watersheds are best described as Piedmont Headwater Forest (Schafale & Weakley, 1990). UT1 is a steep, relatively stable step/pool channel flowing through a narrow wooded valley. Beyond the wooded buffer, the uplands contributing to the UT1 watershed are primarily low density residential. UT2 is a relatively flat, ditched system that drains a mix of agricultural, low density residential, and forested areas west of the project. The agricultural areas are used for horse pasture with no visible erosion.

Based on watershed conditions observed during the assessment for both UT1 and UT2, it appears that the project streams have low sediment supply, primarily due to stable drainages and low impact land uses in the contributing watersheds.

Pond 2, which is the upstream most pond on UT1, effectively functions as a trap for any sediment originating from this watershed. Most sediment that settles in the pond is sand and gravel, and settles at the pond inlet, where velocities drop markedly. This settling, over the estimated 35 years that the pond has been in place, has resulted in wetland formation - a wetland area 0.15 acres in size has developed at the head of the pond. Site investigation suggests that an estimated 25% of the deposition in this wetland area may be a result of prior on-site erosion. This estimate was developed based on observed areas of valley scour, as well as from observed evidence of prior fairway repairs in the natural valley bottom of UT1, upstream of the pond. Discounting this on-site erosion which has resulted from UT1 attempting to return to its natural valley, the average depth of deposition in the wetland (which ranges on average from 1 to 2.5') confirms that the watershed loading estimate is reasonable. The estimated volume of deposition suggests that the estimate produced by the model is accurate to within a factor of one to two times the actual average loading rate.

4.3 Physiography, Geology, and Soils

The Henry Fork Mitigation Site is located in the Inner Piedmont Belt of the Piedmont physiographic province. The Piedmont is characterized by gently rolling, well-rounded hills with long low ridges, with elevations ranging anywhere from 300 to 1500 feet above sea level. The Inner Piedmont consists of metamorphosed igneous and sedimentary rock, including gneiss and schist that has been intruded by younger granitic rocks (NCGS, 2013). The underlying geology of the proposed restoration site is mapped as late Proterozoic to Cambrian age (900 to 500 million years in age) amphibolite and biotite gneiss (CZab) (NCGS, 1985). This unit is described as interlayered beds of hornblende gneiss, metagabbro, mica schist, and granitic rock. Bedrock was observed on the bed of UT1 Reach 1 during the existing conditions assessment work. Because the channel will be relocated to the valley bottom, this bedrock is not anticipated to be a factor in restoration implementation.

The floodplain areas of the proposed project are mapped by the Catawba County Soil Survey. Soils in the project area floodplain are mapped as Codorus loam, Dan River loam, Hatboro loam, and the steeper valleys on the site primarily flow through Woolwine-Fairview complex. These soils are described below in Table 4. A soils map is provided in Figure 4.

Table 4: Project Soil Types and Descriptions - *Henry Fork Mitigation Site*

Soil Name	Description
Codorus loam	Codorus loam soils consist of nearly level, very deep, somewhat poorly drained soils. They are typically found in floodplain areas. Shrink swell potential is low. These soils are frequently flooded.
Dan River loam	Dan River soils are typically found in floodplains of the Piedmont and are derived from igneous and metamorphic rock. They are very deep, well-drained soils with moderately high permeability. This soil is frequently flooded.
Hatboro loam	Hatboro soils are typically found in depressions of floodplains and are derived from igneous and metamorphic rock. They are very deep, well-drained soils with moderately high permeability. This soil is frequently flooded.
Poplar Forest gravelly sandy loam, 2-6 % slopes	Poplar Forest soils at 2-6 % slopes are found in interfluves at the top of slopes. They are well drained and consist of residuum derived from mica schist and/or other micaceous metamorphic rock. This soil is very deep with a water table more than 80 inches from the surface. Poplar Forest soils are not frequently flooded.
Woolwine- Fairview complex	Woolwine- Fairview complex is found in hillslopes on ridges. This soil is well drained and consists of saprolite derived from schist and/or gneiss. This soil is moderately shallow and is formed 80 inches above the water table. Woolwine-Fairview soils are not frequently flooded.

Source: Catawba County Soil Survey, USDA-NRCS, http://efotg.nrcs.usda.gov

4.4 Valley Classification

The Henry Fork project area is located in the Inner Piedmont Belt and the surrounding fluvial landforms are typical of this region. The upper valley topography is moderate, sloping south towards Henry Fork. These valleys are somewhat confined with narrow, alluvial bottoms. A significant component of the project is within the floodplain of the Henry Fork and, as a result, is broad and flat. The Henry Fork floodplain is alluvial. Henry Fork is currently influenced by a dam, located approximately 1-2 miles downstream of the project. Under this influence, the river floods at an estimated return interval of once every 5-10 years, statistically speaking. Floodplain velocities range from 0.6-0.9 feet per second for the 10-percent-annual-chance flood, to 0.9-1.2 feet per second for the 1-percent-annual-chance flood. Review of available aerials show visible sand deposition results from Henry Fork river flooding, but that visible deposition is limited to the immediate overbank region of the river. Roughening the immediate overbank region through planting of a 100-foot-wide buffer along the right bank of Henry Fork, as proposed under the mitigation plan, will enhance the sediment drop-out rate which will further protect the remaining floodplain from deposition. Overall, the flooding of the wider valley is not expected to affect the stream restoration components that flow on the floodplain of the larger river. Monitoring of similar project sites suggests that flows and sediment from riverine flooding on the mainstem do not present a risk to project performance. Reference reaches from similar settings were used to guide stream design

The upper valleys most closely resemble a Rosgen Valley Type VIII(b) while the flat floodplain of Henry Fork most closely resembles a Rosgen Valley Type VIII(c), although valley formation and processes are dominated by the larger Henry Fork (210-VI-NEH, August 2007).

4.5 Surface Water Classification and Water Quality

On April 3 and 4, 2014, Wildlands investigated on-site jurisdictional waters of the U.S. using the U.S. Army Corps of Engineers (USACE) Routine On-Site Determination Method. This method is defined in the 1987 Corps of Engineers Wetlands Delineation Manual and subsequent Eastern Mountain and Piedmont Regional Supplement. Determination methods included stream classification utilizing USACE guidance and the NCDWR Stream Identification Form. In addition, the USACE Stream Quality Assessment Worksheet was also utilized to further evaluate on-site channels. Potential jurisdictional wetland areas as well as typical upland areas were classified using the USACE Wetland Determination Data Form.

The results of the on-site field investigation indicate that there are four jurisdictional stream channels within the proposed project area that are all unnamed tributaries to Henry Fork (UT1, UT1A, UT1B, and UT2). UT1 and UT1B were determined to be perennial by Wildlands personnel while UT1A and UT2 were classified as intermittent. The USACE conducted a site walk on August 20, 2014, and issued a jurisdictional verification on September 2, 2014, (Action ID 2014-00538), included as Appendix 3.

Nineteen jurisdictional wetland areas were identified within the proposed project area (Wetlands A – S) and are located within the floodplains of on-site stream channels, as shown in Figure 2. Appendix 3 contains a figure showing the overview of the site assessment data points. Wetland Determination Data Forms representative of on-site jurisdictional wetlands as well as non-jurisdictional upland areas have been enclosed in Appendix 3 (DP1-DP36). Four manmade impoundments (Ponds 1-4) were also included in the site review for jurisdictional features. These features ranged from 0.2 acres to 0.8 acres in size. Pond 1 is online with UT1B and Ponds 2 through 4 are online with UT1. Site photographs are included in Appendix 4.

The North Carolina Division of Water Resources (NCDWR) assigns best usage classifications to State Waters that reflect water quality conditions and potential resource usage. The project drains to Henry Fork (DWR Index No. 11-129-1(12.5)), which has been classified as Class C waters for aquatic life and secondary recreation.

4.6 Existing Stream Conditions

On-site existing conditions assessments were conducted by Wildlands between April and July 2014. The locations of the project reaches and surveyed cross sections are shown in Figure 6. A gravelometer is used to conduct pebble counts and measure particles greater than 2 mm. Smaller particle sizes are estimated based on best professional judgment, on the continuum from very fine sand to very coarse sand, as well as silt and clay. All data, from silts and clays, to very large boulders, are plotted on a particle size distribution curve based on the median diameter for the corresponding size class, and standard values are extracted from the curve for reporting. For pavement and subpavement samples, grain sizes are sieved down to the smallest sieve size (0.075 mm), and the remaining sediment is classified using a hydrometer. Existing geomorphic survey data (cross sections, profiles, and sediment data) are included in Appendix 5. Table 5 presents the reach summary information.

In addition, due to prior golf course activity, existing pond sediments were tested for organochlorine pesticides at the request of the Interagency Review Team (IRT). The results did not reflect any contamination, and as such, there are no special considerations that will be made during pond removal and pond-related grading activities. A summary is provided in Appendix 10.

Table 5: Reach Summary Information - *Henry Fork Mitigation Site*

	UT1 Reach 1 Upper & Lower	**UT1 Reach 2**	**UT1A**	**UT1B**	**UT2**
Existing Length (LF)	1,392	1,499[1]	353	478	1,915
Rosgen Valley Type	VIII(b)	VIII(c)	VIII(c)	VIII(b)	VIII(c)
NCDWR stream ID score	39.5	32.5	27.25	31.25	27
Perennial or Intermittent	P	P	I	P	I
NCDWR Classification	C	C	C	C	C
Rosgen Classification of Pre-Project Reach	Modified Low W/D B4a / E4b[2]	Modified B6c[2]	Modified B6c[2]	Modified B5a/E5b[2]	Modified F6[2]
Simon Evolutionary Stage	III	IV/V	IV/V	III	IV/V
FEMA classification	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]

Notes:

1. Does not include last 150’ to tie-in to Henry Fork.
2. The Rosgen classification system is for natural streams. These channels have been heavily manipulated by man and therefore the Rosgen classification system is not applicable. These classifications are provided for illustrative purposes only.
3. Tributaries are not regulated, however, are fully or partially in the zone AE floodplain of the Henry Fork.

Table 6: Existing Stream Conditions - *Henry Fork Mitigation Site*

	Notation	Units	UT 1 Reach 1		UT1 Reach 2		UT1A		UT1B		UT2	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
stream type			Modified Low W/D B4a / E4b[1]		Modified B4c[1]		Modified B6c[1]		Modified B5a / E5b[1]		Modified F6[1]	
drainage area	DA	sq mi	0.17		0.2		0.036		0.048		0.077	
bankfull discharge	Q	cfs	8.5	11.4	18.3		6.1		7.6		10.2	
bankfull cross-sectional area	A_{bkf}	SF	1.8	2.1	6.1		2.8		1.9	2.0	7.5	7.8
average velocity during bankfull event	v_{bkf}	fps	4.8	5.3	3.0		2.2		3.8	4.1	1.3	1.5
CROSS-SECTION												
Applicable Cross Sections (See Appendix 5):			XS3, XS4[2]		XS9		XS8		XS1, XS2		XS5, XS6	
width at bankfull	w_{bkf}	feet	3.2	3.3	9.4		12.5		2.7	3.1	15.2	16.3
maximum depth at bankfull	d_{max}	feet	0.7	1.0	1.4		0.7		0.7	0.9	0.6	0.6
mean depth at bankfull	d_{bkf}	feet	0.6	0.7	0.7		0.2		0.6	0.7	0.5	0.5
bankfull width to depth ratio	w_{bkf}/d_{bkf}		5.1	5.7	14.4		56		3.7	5.1	30.7	34.4
low bank height		feet	0.7	3.1	3.8		1.4		1.8	2.0	1.7	4.2
bank height ratio	BHR		1.0	3.1	2.7		1.9		1.7	2.2	2.9	7.5
floodprone area width	w_{fpa}	feet	6.7	11.4	17.9		23.1		5.1	6.9	17.5	19.8
entrenchment ratio	ER		2.0	3.6	1.9		1.8		1.7	2.5	1.2	1.2
SLOPE												
valley slope	S_{valley}	feet/ foot	0.024[3]	0.056[3]	0.0067[3,6]	0.017[3,6]	0.013[3]		0.047[3]		0.0033[3,5]	
channel slope	$S_{channel}$	feet/ foot	0.024	0.056	0.0043[4,6]	0.017[4,6]	0.0095	0.016	0.015	0.077	0.0032	

	Notation	Units	UT 1 Reach 1		UT1 Reach 2		UT1A		UT1B		UT2	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
PROFILE												
riffle slope	S_{riffle}	feet/ foot	0.041	0.21	0.4	1.5	0.086		N/A[7]		N/A[7]	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.7	3.3	0.4	1.7	6.7		N/A[7]		N/A[7]	
pool slope	S_{pool}	feet/ foot	0.057		0.35	1.0	N/A[7]		N/A[7]		N/A[7]	
pool slope ratio	$S_{pool}/S_{channel}$		0.9		0.4	1.1	N/A[7]		N/A[7]		N/A[7]	
pool-to-pool spacing	L_{p-p}	feet	10.4	20.5	38.1		N/A[7]		N/A[7]		N/A[7]	
pool spacing ratio	L_{p-p}/w_{bkf}		3.2	6.3	4.1		N/A[7]		N/A[7]		N/A[7]	
pool cross-sectional area	A_{pool}	SF	N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
pool area ratio	A_{pool}/A_{bkf}		N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
maximum pool depth	d_{pool}	feet	N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
pool depth ratio	d_{pool}/d_{bkf}		N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
pool width at bankfull	w_{pool}	feet	N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
pool width ratio	w_{pool}/w_{bkf}		N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
PATTERN												
Sinuosity	K		1.0		1.5[8]		1.05		1.1		1.03	
belt width	w_{blt}	feet	N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
meander width ratio	w_{blt}/w_{bkf}		N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
meander length	L_m	feet	N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
meander length ratio	L_m/w_{bkf}		N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
radius of curvature	R_c	feet	N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	
radius of curvature ratio	R_c/w_{bkf}		N/A[7]		N/A[7]		N/A[7]		N/A[7]		N/A[7]	

	Notation	Units	UT 1 Reach 1		UT1 Reach 2		UT1A		UT1B		UT2	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
PARTICLE SIZE DISTRIBUTION FROM REACH WIDE WEIGHTED PEBBLE COUNT												
	d_{50} Description:		*Very Fine Gravel*		*Very Fine Gravel*		*Silt-Clay*		*Fine Sand*		*Silt-Clay*	
	d_{16}	mm	Silt-Clay		Silt-Clay		Silt-Clay		Silt-Clay		Silt-Clay	
	d_{35}	mm	0.18		0.18		Silt-Clay		Silt-Clay		Silt-Clay	
	d_{50}	mm	2.80		2.80		Silt-Clay		0.14		Silt-Clay	
	d_{84}	mm	38		38		0.25		8.9		Silt-Clay	
	d_{95}	mm	62		62		4.0		45		8.0	
	D_{100}	mm	128-180		128-180		11.3-16		128-180		45-64	
PARTICLE SIZE DISTRIBUTION FROM PAVEMENT AND GRAB OR SUBPAVEMENT SAMPLE (Pavement / Subpavement)												
	d_{16}	mm	0.06 / 0.43		0.13 / N/A		0.13 / 0.08		0.57 / 0.24		Silt-Clay / 0.03	
	d_{35}	mm	7.4 / 2.9		2.4 / N/A		0.19 / 0.22		4.6 / 1.3		Silt-Clay / 0.03	
	d_{50}	mm	16 / 8.3		5.3 / N/A		0.28 / 0.34		6.9 / 5.3		Silt-Clay / 0.04	
	d_{84}	mm	44 / 34		51 / N/A		2.7 / 1.2		45 / 29		Silt-Clay / 0.07	
	d_{95}	mm	85 / 44		76 / N/A		12.5 / 3.9		138 / 35		8.0 / 0.21	
	D_{100}	mm	90-128 / 50		128-180 / N/A		11.3-16 / 8.2		128-180 / 37.5		32-45 / 0.55	

Notes:
1. The Rosgen classification system is for natural streams and project streams have been heavily manipulated. These classifications are for illustrative purposes only.
2. XS7 is located in UT1 Reach 1, but under existing conditions is it only representative of a short segment below Pond 2 and upstream of a cart path culvert. It was not incorporated, but data for the cross section is in the appendix and data falls in-line with the continuum of change from the upper reach to the floodplain reach.
3. Existing valley slopes are subjective since streams are perched on hillslopes, affected by impoundments, ditched and otherwise modified. The average valley slope is presented, but local slope variation is substantial and, where appropriate, local slopes were used in discharge analysis of existing conditions cross sections.
4. Does not include drop down to Henry Fork at end of UT1 (last 150 feet).
5. Does not include section that turns and runs perpendicular to Henry Fork, dropping to meet the Henry Fork invert (this section to be abandoned as part of design).
6. There is a slope break on UT1 Reach 2 at station 124+43; the slope from there to the end of project (126+99) is steeper because the valley is dropping fast to Henry Fork.
7. Due to the highly manipulated condition of the streams resulting in ditched streams with little profile diversity, no profile or pattern data was assessed on UT1A, UT2, UT1 Reach 2, and UT1B.
8. Sinuosity on UT1 Reach 2 is calculated by drawing a valley length line that follows the proposed valley; the existing valley is poorly defined.

There are four unnamed tributaries located on the site: two main tributaries (UT1 and UT2) that have separate outlets into the Henry Fork under existing conditions, and two smaller tributaries that feed into UT1 (UT1A and UT1B). Each of the tributaries have been altered and maintained to assist with irrigation and drainage of the surrounding golf course. Vegetative clearing and mowing, ditching and maintenance dredging, herbicide and pesticide application, and other manipulation have resulted in streams with poor form and function. In addition, four ponds are present (on UT1 and UT1B).

4.6.1 UT1

UT1 originates at the southern end of the project site and generally flows south to north before entering the Henry Fork floodplain, turning east, and ultimately joining Henry Fork. As UT1 drains north it is fed by UT1B, a tributary that originates on-site at a forest seep. After being fed by UT1B, UT1 makes its way into a 0.8 acre pond with an earthen dam (Pond 2). Below the pond, it enters the floodplain of the larger river, and continues into two more floodplain ponds (Ponds 3 and 4, 0.2 and 0.4 acres, respectively) before making its way to Henry Fork.

Upstream of Pond 2, UT1 is characterized by its descent within an artificially perched channel that is located far from the center of the valley on the side slope of a moderately steep and confined valley. The valley floor was previously converted to a fairway. There is an obvious location where the stream overtops and is attempting to avulse and return to the low point in the valley, resulting in erosion and maintenance efforts by the golf course. Along the rest of this subreach, the 5- to 10-year flood event is held within the incised channel, which has coarsened the bed considerably and resulted in bank instability and down-cutting. This segment of UT1 has some defined bed and bank features, but banks are unstable. As the stream continues toward the pond; the bank heights continue to increase. Pond 2 has been partially breached by one or more prior flood events. The dam lacks an adequate spillway and is at risk of future failure. Canopy species along the upstream section of UT1 include American beech (*Fagus grandifolia*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), tulip poplar (*Liriodendron tulipifera*), and white oak (*Quercus alba*). The understory contains American holly (*Ilex opaca*), Chinese privet (*Ligustrum sinense*), sourwood (*Oxydendrum arboreum*), and tag alder (*Alnus serrulata*).

Downstream of Pond 2, UT1 is in variable condition, including a section of piped channel 110 LF in length. Below the pipe, UT1 shows poor bank formation and substrate as the result of ditching and dredging, and no vegetative (woody) buffer. UT1 also has inconsistent local slopes and bed features as a result of maintenance dredging. The tributary flows through two floodplain ponds (3 & 4) and follows a ditched channel to a steep tie-in reach to the Henry Fork. Additionally, in its present condition and location, the stream is exacerbating the drawdown of the local water table from adjacent disturbed wetlands and relic wetlands which the project proposes to restore. Instream and stream bank vegetation is dominated by wetland species, including arrowhead duck potato (*Sagittaria* spp.), Asiatic dayflower (*Murdannia keisak*), jewelweed (*Impatiens capensis*), rice cut grass (*Leersia oryzoides*), soft stem rush (*Juncus effusus*), and tearthumb (*Polygonum sagittatum*).

4.6.2 UT1A

UT1A begins at the confluence of two hillslope seeps at the edge of the Henry Fork floodplain, near the eastern portion of the site, and flows out into the flat Henry Fork floodplain before joining UT1 (Reach 2).

UT1A is a small tributary that has been ditched (straightened) and dredged; therefore, it lacks natural stream bed material and bed profile and habitat features. The banks of this tributary are unstable due to maintenance practices, including mowing and dredging. Adjacent areas are built up with side-cast material restricting floodplain access and hindering stream-wetland interaction from overbank flooding. Streamside vegetation is similar to UT1. Maintained golf course grasses dominate the floodplain vegetation beyond top of bank.

Example of Ditching

4.6.3 UT1B

UT1B begins just upstream of a 0.2 acre pond with an earthen dam. The channel begins at a groundwater spring and is relatively stable before entering the pond. The pond is not outfitted with a spillway and the dam has been allowed to grow up with trees. Downstream of the pond, the stream is ditched off of the valley center. The UT1B channel is incised and lacks a woody riparian buffer as it traverses the fairway to its confluence with UT1. Stream bank vegetation is dominated by herbaceous species, including blackberry (*Rubus* spp.), goldenrod (*Solidago* spp.), jewelweed, Japanense honeysuckle (*Lonicera japonica*), joe pye weed (*Euthrochium purpureum*), and tearthumb. The floodplain beyond top of bank is vegetated with golf course grasses.

4.6.4 UT2

UT2 is fed by a forested wetland complex located in a heavily wooded parcel west of the site. It flows east and currently makes a 90-degree bend to the north near UT1, and has its own outlet to the Henry Fork.

UT2 has been severely affected by ditching. Dredging and low valley slope have resulted in a condition with poor sediment transport continuity, and have resulted in siltation and herbaceous vegetative growth and decay within the channel bottom. Adjacent relic wetlands have been filled by side-cast dredge material. Over time, this conveyance has been choked out by vegetation and contains no substrate or bed form. The channel bed and lower stream banks are covered in wetland species, including arrowhead duck potato, Asiatic dayflower, cardinal flower (*Lobelia cardinalis*), jewelweed, rice cut grass, river birch (*Betula nigra*) saplings, soft stem rush, straw-colored flatsedge (*Cyperus strigosus*) and tearthumb. The upper bank species include burdock (*Arctium* spp.), dogfennel (*Eupatorium capillifolium*), goldenrod, joe pye weed, and wingstem (*Verbesina alternifolia*). Outside of the dredged banks is the typical grassed fairway condition.

4.7 Channel Evolution

Channel evolution trends are evaluated in the existing streams to justify the proposed activities in the context of the current condition in the channel's adjustment to direct or indirect changes to the landscape. The typical lens for this assessment is Simon's model termed the Channel Evolution Model for Incised Rivers (1989), which describes how alluvial streams typically respond to channelization, or landscape scale changes that alter the hydrologic and sediment regime. The stages in Simon's model are Stage I – Equilibrium, Stage II – Channelization, Stage III – Degradation, or down-cutting, Stage IV – Degradation and Widening Stage V – Aggradation and Widening involving the formation of new bankfull features at a lower position relative to the original valley floor, and eventual return to a state of quasi-equilibrium (Stage VI) at this new lowered position in the landscape.

The streams on this site are not within this typical trajectory of recovery described. Instead, they are being perpetually maintained in Stage II (steeper tributaries) through channelizationand dredging as part of golf course maintenance. In addition, other manipulation, such as impoundment, are not self-resolving. These ongoing impacts negatively influencing stream function. UT1 Reaches 1 and 2 are trending towards avulsion (returning to the low point in the valley).

Intervention will help prevent channel avulsion, re-establish natural streams in impounded reaches, re-connect streams that are depressed in the landscape due to dredging and incision to their adjacent wetlands. Proposed intervention is justified given that a natural evolution would either not be possible, or would result in significant detriment to habitat and water quality.

4.8 Channel Stability

Wildlands utilized a modified version of the Rapid Assessment of Channel Stability, as described in Hydrologic Engineering Circular HEC-20 (Lagasse, 2001). The method is semi-quantitative and incorporates 13 stability indicators that are evaluated in the field. In a 2007 publication, the Federal Highway Administration (FHWA) updated the method for HEC-20 by modifying the metrics included in the assessment and incorporating a stream type determination. The result is an assessment method that can be rapidly applied on a variety of stream types in different physiographic settings with a range of bed and bank materials.

The Channel Stability Assessment protocol was designed to evaluate 13 parameters: watershed land use, status of flow, channel pattern, entrenchment/channel confinement, bed substrate material, bar development, presence of obstructions and debris jams, bank soil texture and coherence, average bank angle, bank vegetation, bank cutting, mass wasting/bank failure, and upstream distance to bridge. Each parameter is individually rated on a scale of Excellent, Good, Fair, or Poor per FHWA guidelines. Lower scores are indicative of increased stability. Ratings are as follows:

- Excellent (1-3 points);
- Good (4-6 points);
- Fair (7-9 points); and
- Poor (10-12 points).

Once all parameters are scored, the overall stability of the stream is then classified with similar scoring adjectives (Excellent, Good, Fair, or Poor). The adjectives assigned to the streams are as follows:

- Excellent (< 41);
- Good (41 to less than 70);
- Fair (70 to less than 98); and
- Poor (98 or higher).

As the protocol was designed to assess stream channel stability near bridges, two minor modifications were made to the methodology to make it more applicable to project specific conditions. The first modification involved adjusting the scoring so that naturally meandering streams score lower (better condition) than straight and/or engineered channels. Because straight, engineered channels are hydraulically efficient and necessary for bridge protection, they score low (excellent to good rating) with the original methodology. Secondly, the last assessment parameter – upstream distance to bridge – was removed from the protocol, because it relates directly to the potential effects of instability on a bridge and should not influence stability ratings for the streams assessed for this project. The final scores and corresponding ratings were based on the 12 remaining parameters.

The HEC-20 manual also describes both lateral and vertical components of overall channel stability, which can be separated with this assessment methodology. Some of the 13 parameters described above relate specifically to either vertical or horizontal stability. When all parameter scores for the vertical category or all parameter scores for the horizontal category are summed and normalized by the total possible scores for their respective categories, a vertical or horizontal fraction is produced. These fractions may then be compared to one another determine if the channel is more vertically or horizontally unstable.

The assessment results for the streams on the Henry Fork Site indicate that the majority of streams rated in the second to the lowest category: good. Parameters that scored poorly include watershed characteristics, channel pattern, bed material, and bank protection. The lateral fraction was slightly higher than the vertical fraction for UT1 Reach 1 and UT1B, indicating lateral instability is a greater problem for these channels than vertical instability. UT1 Reach 2, UT1A, and UT2 had higher vertical fraction than lateral fraction values indicating vertical stability is a greater problem. Total scores, stability ratings, and vertical and horizontal fractions are provided in Table 7.

Table 7: Existing Conditions Channel Stability Assessment Results - *Henry Fork Mitigation Site*

Parameter	UT1 Reach 1	UT1 Reach 2	UT1A	UT1B	UT2
1. Watershed characteristics	9	9	7	8	7
2. Flow habit	2	1	2	1	2
3. Channel pattern	8	9	7	9	9
4. Entrenchment	7	5	4	4	7
5. Bed material	9	9.5	10	5	10
6. Bar development	2	2	1	1	1
7. Obstructions	5	3	2	3	3
8. Bank soil texture and coherence	4	3	3	5	4
9. Average bank slope angle	8	4.5	3	5	5
10. Bank protection	7	10	10	10	10
11. Bank cutting	7	3	1	4	2
12. Mass wasting or bank failure	6	3	1	2	1
Score	74	63	51	57	61
Rating	Fair	Good	Good	Good	Good
Lateral Fraction	0.53	0.39	0.30	0.43	0.37
Vertical Fraction	0.50	0.46	0.42	0.28	0.50

4.9 Utilities and Site Access

The project site is accessible from Henry Fork Road via a permanent driveway easement to State Road 1192 (Mountain View Road). No easement exclusions, such as from crossings or utilities, are present within the stream corridors.

An existing electrical line and transformer(s) will be removed during construction by Duke Energy. Golf course drainage and irrigation pipe will be removed as encountered during construction. All utilities will be located prior to construction by using location service provided by NC 811.

5.0 Wetland Summary

Table 8 presents the baseline wetland information for the wetland areas on site.

Table 8: Wetland Summary Information - *Henry Fork Mitigation Site*

	Wetland A	Wetland B	Wetland C	Wetland D
Size of Wetland (acres)	0.182	0.013	0.003	0.094
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Hatboro loam	Hatboro loam	Hatboro loam	Hatboro loam and Woolwine-Fairview complex
Drainage Class	Well drained	Well drained	Well drained	Well drained
Soil Hydric Series	N/A	N/A	N/A	N/A
Source of Hydrology	Groundwater	Groundwater	Precipitation	Groundwater
Hydrologic Impairment	Ditching	N/A	N/A	Ditching
Native vegetation community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest
% exotic invasive vegetation	0%	0%	0%	0%
NCWAM Wetland Rating	Low	Low	Low	High
	Wetland E	**Wetland F**	**Wetland G**	**Wetland H**
Size of Wetland (acres)	0.004	0.067	0.021	0.056
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Hatboro loam and Woolwine-Fairview complex	Woolwine-Fairview complex	Hatboro loam and Woolwine-Fairview complex	Hatboro loam and Woolwine-Fairview complex
Drainage Class	Well drained	Well drained	Well drained	Well drained
Soil Hydric Series	N/A	N/A	N/A	N/A
Source of Hydrology	Groundwater	Groundwater	Groundwater	Groundwater
Hydrologic Impairment	Ditching	Ditching	Ditching	N/A

Native vegetation community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest
% exotic invasive vegetation	0%	0%	0%	0%
NCWAM Wetland Rating	High	Low	Low	Low
	Wetland I	**Wetland J**	**Wetland K**	**Wetland L**
Size of Wetland (acres)	0.078	0.036	0.062	0.003
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Hatboro loam and Woolwine-Fairview complex	Hatboro loam	Hatboro loam	Hatboro loam
Drainage Class	Well drained	Well drained	Well drained	Well drained
Soil Hydric Series	N/A	N/A	N/A	N/A
Source of Hydrology	Groundwater	Groundwater	Groundwater	Groundwater
Hydrologic Impairment	N/A	Ditching	N/A	N/A
Native vegetation community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest
% exotic invasive vegetation	0%	0%	0%	0%
NCWAM Wetland Rating	Low	Low	Low	Low
	Wetland M	**Wetland N**	**Wetland O**	**Wetland P**
Size of Wetland (acres)	0.131	0.084	0.028	0.023
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian	Riparian	Riparian	Riparian
Mapped Soil Series	Dan River loam and Hatboro loam	Codorus loam and Hatboro loam	Hatboro loam and Woolwine-Fairview complex	Hatboro loam
Drainage Class	Well drained	Somewhat poorly to well drained	Well drained	Well drained
Soil Hydric Series	N/A	Codorus	N/A	N/A
Source of Hydrology	Groundwater	Groundwater	Groundwater	Groundwater
Hydrologic Impairment	N/A	Ditching	Ditching	N/A

Native vegetation community	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest	Piedmont Alluvial Forest
% exotic invasive vegetation	0%	0%	0%	0%
NCWAM Wetland Rating	Low	Low	Low	Medium

	Wetland Q	Wetland R	Wetland S
Size of Wetland (acres)	0.069	0.059	0.159
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian	Riparian	Riparian
Mapped Soil Series	Hatboro loam	Hatboro loam	Woolwine-Fairview complex
Drainage Class	Well drained	Well drained	Well drained
Soil Hydric Series	N/A	N/A	N/A
Source of Hydrology	Groundwater	Groundwater	Groundwater
Hydrologic Impairment	N/A	N/A	N/A
Native vegetation community	Piedmont Alluvial Forest	Piedmont Marsh	Piedmont Marsh
% exotic invasive vegetation	0%	0%	0%
NCWAM Wetland Rating	Medium	Medium	Medium

5.1 Jurisdictional Wetlands

On April 3 and 4, 2014, Wildlands delineated jurisdictional waters of the U.S. within the project easement area. Potential jurisdictional areas were delineated using the USACE Routine On-Site Determination Method. This method is defined by the 1987 Corps of Engineers Wetlands Delineation Manual and subsequent Eastern Mountain and Piedmont Regional Supplement. The results of the on-site jurisdictional determination indicate that there are 19 jurisdictional wetlands located within, or partially within, the project easement. These wetlands (Wetland A – S) range in size from 0.003 to 0.18 acres (see Table 8). The majority of on-site wetlands are located within the previously maintained golf course however a few are located within the thin wooded buffer near the toe of an adjacent hillside (Wetlands D, E, and F) (Figure 6). On-site wetlands exhibited pockets of inundation typically less than three inches deep, saturation within the upper 12 inches of the soil profile, water stained leaves, and low-chroma soils (including 7.5YR 4/2 to 2.5Y 4/2) with distinct mottles (5YR 4/6 to 10YR 4/6). The majority of wetlands were dominated by herbaceous species, including marsh American-aster

(*Symphyotrichum elliottii*), Pennsylvania bittercress (*Cardamine pensylvanica*), shallow sedge (*Carex lurida*), and soft stem rush (*Juncus effusus*). Bermuda grass (*Cynodon dactylon*) was also common in several on-site wetlands. Routine On-Site Data Forms have been included in Appendix 3.

Based on the North Carolina Wetland Assessment Method (NCWAM) classification key and best professional judgment as to what the wetlands would become if the area were maintained, the majority of on-site wetlands (A-Q) were classified as headwater forest. Wetlands R and S are located on the upstream edge of ponds and were classified as non-tidal freshwater marsh. NCWAM was used to evaluate the level of hydrologic function, water quality, and habitat condition for each wetland on the site. The majority of on-site wetlands scored as low functioning systems when compared to reference conditions due to the historic agricultural impacts and more recent grading, ditching, and vegetation management associated with the golf course. Low-scoring functional parameters include the effects of ditching and soil compaction on surface and subsurface storage, reduced aquatic and terrestrial habitat quality, and poor connection to adjacent natural habitats. NCWAM Wetland Rating Sheets representative of these jurisdictional wetland areas are enclosed in Appendix 3.

5.2 Soil Characterization

A preliminary investigation of the existing soils within the project area was performed by a licensed soil scientist (LSS) on July 25, 2013 (report dated September, 2013). Soil cores were analyzed at locations across the site to provide data to refine Natural Resource Conservation Service (NRCS) soils mapping units and establish areas suitable for wetland restoration. Hydric soil status at each location was noted based upon the NRCS Field Indicator of Hydric Soils in the United States – A guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010). Soils were also assigned a rating of relatively undisturbed hydric soil, hydric soil buried by fill material with existing hydric indicators, hydric soil buried by non-hydric fill material, and non-hydric soil (no evidence of buried hydric soil).

On April 29, 2014, a more detailed soils investigation was completed (report dated May 2014). A LSS took 72 hand-turned auger borings on a 75-foot by 75-foot grid across preliminary areas of wetland re-establishment. Six soil units (Table 9) were created based on the data collected.

Table 9: Summary of Soils Boring Classification and Hydric Indicator - Henry Fork Mitigation Site

Soil Unit	Classification	Hydric Indicator
1	Undisturbed Hydric Soil	F3
2	Undisturbed Non-Hydric Soils	n/a
3	Hydric Overburden/Buried Hydric Soil	F3
4	Non-Hydric Overburden/Buried Hydric Soil	F3
5	Non-Hydric Overburden/Buried Non-Hydric Soil	n/a
6	Hydric Overburden/Non-Hydric Soil	F3

Depth of fill material was noted at each boring, when applicable. Soils unit classification, as well as the depth to hydric indicators, aided the development of a wetland grading plan. Figures and data from the two investigations are included in Appendix 6.

5.2.1 Taxonomic Classification

The area within the wetland re-establishment boundary is mapped as Hatboro loam (HaA) by the NRCS Soil Survey (NRCS, 2013). Analysis of the soil core samples collected from the project site, along with consideration of site topography, indicated that soil classifications match with the mapped soil units.

Soil borings also indicated that mapped hydric soils have been buried and manipulated by fill material placed over a majority of the site. As discussed and confirmed with the IRT on the preliminary site walk, fill depths over hydric soils varied from eight to 45 inches, with an average depth of 24 inches across the site. Portions of the fill material have developed enough hydric indicators to classify as hydric.

Hatboro loam (HaA), Dan River loam (DaA), and Codorus loam (CsA) all meet hydric soil criteria. All of the wetland re-establishment is being proposed within the Hatboro Loam soil series boundary. Hatboro loam is listed as meeting hydric criteria two, according to the NRCS Soil Survey. Wetland re-establishment design is outlined in Section 10.7.

5.2.2 Profile Description

The Hatboro series is described in the NRCS official series description as a floodplain soil that is very deep, poorly drained, and found on zero to three percent slopes. The typical texture profile of the Hatboro loam is a dark grayish brown silt loam from zero to nine inches, a gray silt loam from nine to 44 inches, a sandy clay loam from 44 to 56 inches, and a gravelly sandy loam from 56 to 70 inches.

5.2.3 Hydraulic Conductivity

The Hatboro series has a moderate to high permeability and consists of poorly-drained soils. Saturated hydraulic conductivity for this series is moderately high to high. The NRCS soil survey lists saturated hydraulic conductivity as 9.0 micrometers/second (3.2 cm/hr) from zero to eighty centimeters in depth, 23 micrometers/second (4.5 cm/hr) from 80 to 160 cm in depth, and 28 micrometers/second (10.1 cm/hr) depths greater than 160 cm.

5.3 Hydrologic Characterization

In order to develop a wetland restoration design for the Henry Fork Site, an analysis of the existing and proposed conditions for surface and groundwater hydrology was necessary. DrainMod (version 6.1) was used to model existing and proposed groundwater hydrology at the site. DrainMod simulates water table depth over time and produces statistics describing long term water table characteristics and an annual water budget. DrainMod was selected for this application because it is a well-documented modeling tool for assessing wetland hydrology (NCSU, 2010) and is commonly used in wetland creation and restoration projects. For more information on DrainMod and its application to high water table soils, see Skaggs (1980).

5.3.1 Groundwater Modeling

For the Henry Fork wetlands, five total models were developed and calibrated to represent the existing and proposed conditions at five different groundwater monitoring gage locations across the site. The locations of the monitoring wells are shown in Figure 6. Resulting model output was used to validate and direct the wetland restoration plan and to develop a water budget for the site. The modeling procedures are described below.

5.3.1.1 Data Collection

DrainMod models are built using site hydrology, soil, climate, and crop data. Prior to building the models, an on-site soils investigation was completed to confirm areas of potentially hydric soils. Further explanation of the site soils can be found in Section 5.3 of this report. Precipitation and temperature data were obtained from a nearby weather station located at the Hickory Regional Airport (GHCN USW00003810). Hickory Regional Airport is approximately three miles northwest of the Henry Fork Site, as shown on Figure 1. Short periods of missing precipitation and temperature data were supplemented with data from the Rhodhiss Hydro Plant weather station (USC00317229) located approximately six and a half miles northwest of the Henry Fork Site. Both stations are operated by the National Oceanic and Atmospheric Administration (NOAA) National Weather Service. The data sets for these stations were obtained from the National Climatic Data Center (NCDC) from January 1949 through December 2014. These data were used to calibrate the models and perform the long term simulations.

5.3.1.2 Existing Conditions Base Model Set up and Calibration

Six groundwater monitoring gages were installed on the site on March 20, 2014 (Figure 6). Gage locations were chosen to estimate existing site hydrology and identify potential wetland restoration boundaries. Data from the installed groundwater gages were analyzed to ensure it would be beneficial for design input. Wildlands created models to represent five of the six installed gages (gage 1, 2, 4, 5, and 6). Groundwater gage 3 was not modeled because the hydrology was heavily influenced by an adjacent channel and groundwater seep which limited fluctuations in hydrology. The models were developed using the conventional drainage option with the hydrologic analysis of wetlands feature incorporated to best simulate the drainage of the site. Each of the four gages was installed in April 2014 and recorded groundwater depth twice per day with In-situ Level TROLL® 100 or 300 pressure transducers. The period from April through late December 2014 was used as the calibration period for the groundwater models.

After the necessary input files for the existing models were created, calibration runs for each model were conducted. To calibrate the models, soil parameters not measured in the field were adjusted within the limits typically encountered under similar soil and geomorphic conditions. In addition, the effective drain spacing in the model drainage design parameters for groundwater gages 1, 4, 5, and 6 were adjusted. Adjusting the effective drain spacing is a recommended calibration method for modeling gages with irregular drainage spacing (Northcott, 2001; Skaggs, 2012). Irregular drain spacing applies when a gage is adjacent to only one ditch or channel or the gage is not in the center between two adjacent channels. After calibration of each of the models was complete, the calibrated models were used as the basis for the proposed conditions models. Further information about model setup and plots showing the calibration results are included in Appendix 6.

Trends in the observed data are well-represented by the calibration simulations. Although hydrograph peaks between plots of observed and simulated data do not match exactly and the model results under-predict and over-predict water levels during some periods, relative responses in water table hydrology as a result of precipitation events correspond well between observed data and model results and under predictions indicate that proposed conditions model results will be conservative.

5.3.1.3 Proposed Conditions Model Setup

The proposed conditions models were developed based on the calibrated existing conditions models to predict whether wetland criteria would be met over a long period of historical climate data (1949 to 2013). Proposed plans for the site include realigning the streams to increase sinuosity, linking two previously separated drainages, and raising stream bed inverts. In addition, existing oversized ditches that currently drain the site will be filled and grading is proposed for the wetland design within the wetland re-establishment areas.

The proposed grading will decrease the surface elevation of the existing site to bring hydric soils within the top 12 inches of the soil surface. Cut depths vary across the site based on the estimated amount of overburden material above the buried hydric soils. Overburden depths were estimated based on the boring study performed by a LSS outlined in Section 5.2. Settings for the proposed conditions model were altered to reflect these changes to the site. Once the proposed conditions models were developed, each model was run for a 65-year period from January 1949 through December 2013 using temperature and precipitation data collected from the stations outlined above.

5.3.1.4 Modeling Results and Conclusions

DrainMod was used to determine the effect of proposed practices on site hydrology for wetland areas 1 and 2 (Figure 9). Groundwater gages 1 and 2 were used to analyze hydrology within Wetland 1 and groundwater gages 4, 5, and 6 were used to analyze hydrology within Wetland 2. For the purpose of establishing a performance standard, an 80% success rate was identified as an appropriate break point for the proposed wetland areas. In other words, the performance standard was chosen at the point at which on average all gauges would meet the performance standard a minimum of 80% of the model years (52 out of the 65 years simulated). Model simulations were run starting at a 5% consecutive standard. The consecutive standard was then increased by approximately ½ percent increments in subsequent model runs to determine at what performance standard the proposed wetland areas would meet the minimum success rate (80% of modeled years). Using this approach, a performance standard of 7.2% was chosen.

The wetland performance standard used to evaluate site hydrology was that the water table must be within 12 inches of the ground surface at each gage for a minimum of 7.2% (17 consecutive days) of the 236-day growing season (March 20 through November 11). The growing season was determined from the long-term records from the National Weather Service provided in the WETS table for the Hickory Regional Airport. Each gage location was evaluated to determine success rates for the established performance standard. Table 10 presents model results and depicts the number of years out of the 65-year monitoring period that each gage is expected to meet the performance standard and the target hydroperiod.

Gages 4, 5, and 6 all have performance standard success rates at or below 15% based on the existing site conditions. After the incorporation of the proposed site changes including raising stream bed elevations, re-aligning stream channels, and grading to lower ground surface, all three gage performance standard success rates increase to over 90%.

The existing conditions modeling results show that gages 1 and 2 currently only meet the success criteria approximately 37% of the modeled period. These results align with site observations. The areas near gages 1 and 2 are rarely ponded, show borderline hydric formations within overburden material, and are adjacent to some areas which are currently jurisdictional. By incorporating proposed site changes to the model, the performance standard success rates for gages 1 and 2 increase by 25% and 49%, respectively. The performance standard success rate for Gage 1 is below the minimum success rate determined for the performance standard. However, the performance standard success rate was deemed acceptable due to the location of Gage 1 along the boundary of the re-establishment area. In addition, Gages 2, 4, 5, and 6 greatly exceeded the performance standard success rate of 60% and it was determined better to have Gage 1 fall below the success rate as opposed to decreasing the performance standard and risking inadequate soil wetness and hydroperiod to reach goals of the proposed wetland areas.

Based on these model results it is anticipated that the proposed site changes will increase water table elevations and inundation periods within wetland areas 1 and 2. The associated hydrologic uplift will result in the re-establishment of wetland function and development of hydric soils.

Table 10: Modeling Results Showing Expected Performance by Gage Location - *Henry Fork Mitigation Site*

Gage ID	Existing Conditions		Proposed Conditions	
	Number of Years Meeting Performance Standard (7.2%)	Performance Standard Success Rate	Number of Years Meeting Performance Standard (7.2%)	Performance Standard Success Rate
1	24	37%	40	62%
2	24	37%	56	86%
4	5	8%	59	91%
5	1	2%	59	91%
6	10	15%	59	91%

5.4 Vegetation Community Type Descriptions and Disturbance History

The existing vegetation communities within the proposed project area are predominantly fallow field. The closed golf course was still being mowed until the spring of 2014. Based on historical aerials, agriculture and forest were the primary land uses of the project area until the late 1960's when farming began to steadily decrease. In 1978, farming ceased and the site was developed into a golf course. Golf course construction involved significantly modification and relocation of streams and included the installation of four inline ponds. Course construction and subsequent vegetation management over the past several decades has removed several major strata from the area resulting in a dominant herbaceous layer with intact canopy or understory. The project area is dominated by Bermuda grass however other herbaceous species including asters (*Aster* spp.), buttercup (*Ranunculus* sp.), dogfennel (*Eupatorium capilifolium*), horseweed (*Conyza* Less.), plantain (*Plantago* sp.), and wild onion (*Allium ascalonicum*) are present. Mature trees including red maple (*Acer rubrum*), river birch (*Betula nigra*), and sycamore (*Platanus occidentalis*) are scattered on the lower western half of the project along the edge of old fairways.

6.0 Regulatory Considerations

A Categorical Exclusion has been completed and approved to satisfy federal funding requirements. This package is included in Appendix 7. Table 11 summarizes regulatory considerations for the project.

Table 11: Regulatory Considerations - *Henry Fork Mitigation Site*

	Applicable?	Resolved?	Supporting Documentation
Waters of the US – Section 404	Yes	PCN prepared	Appendix 3 & 8
Waters of the US – Section 401	Yes	PCN prepared	Appendix 3 & 8
Endangered Species Act	Yes	Yes	Appendix 7
Historic Preservation Act	Yes	Yes	Appendix 7
Coastal Zone Management Act/Coastal Area Management Act	No	N/A	N/A
FEMA Floodplain Compliance	Yes	No impact application to be prepared for local review	Appendix 9
Essential Fisheries Habitat	No	N/A	Appendix 7

6.1 401/404

As discussed in Section 4.5, the results of the onsite field investigation indicate that four channels UT1, UT1A, UT1B, and UT2 are jurisdictional within the project limits. Additionally there are 19 jurisdictional wetland areas (Wetland A - S) located in the proposed project area (Figure 6) totaling 1.2 acres, and four golf course ponds totaling 1.58 acres. The project streams and the majority of delineated wetlands will be protected under the conservation easement placed on the property. A copy of the Jurisdictional Determination is included in Appendix 3 and includes a map at the end labeling each wetland.

Impacts to existing wetland areas related to the site design were avoided to the maximum extent possible during the design phase. Particular efforts were made to grade around wetlands and also to maintain or design for hydrologic connectivity to existing wetlands. All existing wetlands that will remain, and which are not currently forested will be enhanced with planting in order to replace fairway grass and establish forested conditions.

In some areas, impacts due to grading were unavoidable for design purposes. Soil investigations provided in Appendix 6 indicated the formation of hydric soil morphology in fill soils for a number of the jurisdictional wetlands; many also had buried topsoil and hydric soil horizons. Wetlands A – C, which compromise two-thirds of the proposed impacts, were among those wetlands with hydric fill. These three wetlands will have their hydric fill soils removed to rehabilitate the wetlands and to establish the new topography just above the original native topsoil and hydric layers. Moreover, this grading is necessary, because adjacent areas will be graded down significantly to re-establish Wetland 1. This grading would adversely affect hydrology in Wetlands A – C, unless those wetlands are graded to their pre-disturbance elevation.

Approximately 0.29 acres of existing wetlands will be disturbed by grading activities related to re-establishment of Wetland 1, including removal of hydric fill in Wetlands A – C, tie-in grading affecting portions of Wetlands D, G and J, and grading of the margins of Pond 3 (Wetland R) to bring that area down to the elevation of the adjacent Wetland 1 and improve its hydrologic connectivity, rather than leaving it perched. These impacts are all necessary, and generally considered beneficial to the long term viability and enhancement of these existing wetlands. The majority of these wetland features that will be impacted are currently mowed bermudagrass, excepting Wetland R and parts of Wetland D. Due to the amount of proposed grading, these disturbances will be listed as permanent impacts on the Pre-Construction Notification, included with the Final Mitigation Plan.

Approximately 0.02 acres of Wetland S, 0.003 acres of Wetland F, and less than 0.001 acres of Wetland O, will be converted to stream channel as part of the stream restoration and will be listed as permanent impacts. Wetland S will also have some unavoidable disturbance associated with stream channel construction, the footprint of this disturbance will be no more than 0.065 additional acres and efforts will be made to minimize this amount. An additional 0.79 acres of existing wetlands (Wetlands C, H – Q except O, and S) are proposed for planting which is not considered an impact on this site where only foot-traffic will be required to plant the wetland areas. Based on prior discussions with the USACE, impacts to the four existing ponds will be treated as stream impacts for quantification purposes. Ponds 1 and 2 will be breached for proposed stream restoration. Stream restoration in the floodplain of Henry Fork will realign UT1 and take Ponds 3 and 4 offline. The majority of Ponds 3 and 4 will be filled, however, existing wetlands delineated within pond margins of Pond 3 will be incorporated into wetland restoration activities.

Impact to existing wetlands will be necessary, but ultimately will benefit the site by improving hydrology and vegetation upon completion of the restoration project. The project proposes a net gain of wetland acreage and uplift in wetland function.

6.2 Threatened and Endangered Species

6.2.1 Site Evaluation Methodology

The Endangered Species Act (ESA) of 1973, amended (16 U.S.C. 1531 et seq.), defines protection for species with the Federal Classification of Threatened (T) or Endangered (E). An "Endangered Species" is defined as "any species which is in danger of extinction throughout all or a significant portion of its range" and a "Threatened Species" is defined as "any species which is likely to become an Endangered Species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. 1532).

Wildlands utilized the US Fish and Wildlife Service (USFWS) and NC Natural Heritage Program (NHP) databases were searched for federally listed threatened and endangered plant and animal species for Catawba County, NC. Four federally listed species, the bald eagle (*Hailaeetus leucocephalus*), northern long-eared bat (*Myotis septentrionalis),* the dwarf-flowered heartleaf (*Hexastylis naniflora*), and Schweinitz's sunflower (*Helianthus schweintzii*) are currently listed in Catawba County (Table 12).

Table 12: Listed Threatened and Endangered Species in Catawba County, NC - *Henry Fork Mitigation Site*

Species	Federal Status	Habitat
Vertebrate		
Bald eagle (*Haliaeetus leucocephalus)*	BGPA	Near large open water bodies: lakes, marshes, seacoasts, and rivers
Northern long-eared bat* *(Myotis septentrionalis)*	T	Roost in cavities/crevices and under peeling bark of live/dead trees during summer season and hibernate in caves/mines during winter.
Vascular Plant		
Dwarf-flowered heartleaf (*Hexastylis naniflora*)	T	Along bluffs and adjacent slopes, in boggy areas next to streams and creek heads, and along the slopes of nearby hillsides and ravines.
Schweinitz's sunflower (*Helianthus schweinitzii*)	E	Full to partial sun in areas with poor soils, such as thin clays that vary from wet to dry.

BGPA = Bald and Golden Eagle Protection Act; E = Endangered; T=Threatened

6.2.2 Threatened and Endangered Species Descriptions

Bald Eagle

The bald eagle is a very large raptor species, typically 28 to 38 inches in length. Adult individuals are brown in color with a very distinctive white head and tail. Bald eagles typically live near large bodies of open water with suitable fish habitat including: lakes, marshes, seacoasts, and rivers. This species generally requires tall, mature tree species for nesting and roosting. Bald eagles were de-listed from the Endangered Species List in June 2007; however, this species remains under the protection of the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGPA). This species is known to occur in every U.S. state except Hawaii.

Northern Long-Eared Bat

The northern long-eared bat is a medium-sized insectivore bat that reaches 3-4" in length, with a 9-10" wingspan and average weight of 7 grams. They have distinctive long ears that reach past their muzzle when laid flat and also have an obvious pointed tragus. They have a medium-dark pelage on dorsal and light brown ventral. They live within and along forest areas with access to a water source such as a creek, river or pond where they forage. The condition of their microclimates is indicative of their roosting and hibernating preferences. They roost in the cavities and crevices of dead and alive trees, as well as under peeling bark during the summer and hibernate in caves or mines during the winter. Their range consists of 37 states, including North Carolina. The major threat to this species is the White-Nose Syndrome, which has been identified in North Carolina monitored sites. This species was listed as federally threatened as of May 4, 2015.

Dwarf-Flowered Heartleaf
Dwarf-flowered heartleaf is a low-growing evergreen perennial plant. It has heart-shape leaves that are four to five inches (10.2 to 12.7 centimeters) long, dark green and leathery, supported by long thin leaf stems connecting it to an underground stem. The jug-shaped flowers are usually beige to dark brown or purple and appear from mid-March to early June. The flowers are small and inconspicuous and are found near the base of the leaf stems, often buried beneath the leaf litter. Dwarf-flowered heartleaf grows in acidic soils along bluffs and adjacent slopes, in boggy areas next to streams and creek heads, and along the slopes of nearby hillsides and ravines. Known population occurrences of dwarf-flowered heartleaf have been observed in Catawba County within the past 50 years.

Schweinitz's Sunflower
Schweinitz's sunflower is a perennial herb, usually growing one to two meters tall with yellow disk and ray flowers. This species is found in semi-sunny to sunny open areas where disturbance has occurred, such as roadsides, power line clearings, old pastures, and woodland openings. This species is generally found growing in shallow, poor, clayey and/or rocky soils. Known population occurrences of Schweinitz's sunflower have been observed in Catawba County within the past 50 years.

6.2.3 Biological Conclusion

A pedestrian survey conducted on September 3, 2013, indicated the site has no potential bald eagle habitat and minor areas of potential dwarf-flowered heartleaf and Schweinitz's sunflower habitat. Field review of the potential habitat areas at that time found no individual species or populations of Schweinitz's sunflower. A second site walk was conducted on March 17, 2014, during the bloom season for the dwarf-flowered heartleaf. No individuals or populations were observed. It was determined that the project would result in "no effect" on any of the three listed species.

Previous field walks pre-date the 2015 listing of the northern long-eared bat as threatened. An additional assessment of the site was performed May 7, 2015. Because of the limited suitable habitat and minimal clearing associated with the project, it was determined that the project would "not likely to adversely affect" the listed species.

6.2.4 USFWS and NCWRC Concurrence

Wildlands requested review and comment from the USFWS and NCWRC on February 25, 2014, regarding the results of the site investigation and the project's potential impacts on threatened or endangered species. NCWRC responded on March 14, 2014, and stated they "do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources." The USFWS has not responded at this time. We assume our site determination of "no effect" is correct and that no additional, relevant information is available for this site. All correspondence is included in Appendix 7.

Earlier USFWS correspondence pre-dates the 2015 listing of the northern long-eared bat as federally threatened. Wildlands sent a second letter to the USFWS requesting comment on this species May 7, 2015. The USFWS responded June 5, 2015, and stated "not likely to adversely affect" is the proper determination for the project in regards to the northern long eared bat, that they have no objection to the proposed project and that obligations under Section 7 are fulfilled.

6.3 Cultural Resources

6.3.1 Site Evaluation Methodology

The National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470), defines the policy of historic preservation to protect, restore, and reuse districts, sites, structures, and objects significant in American history, architecture, and culture. Section 106 of the NHPA mandates that federal agencies take into account the effect of an undertaking on any property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

6.3.2 SHPO/THPO Concurrence

Wildlands did not observe any architectural structures or archeological artifacts during surveys of the site. Letters were sent to the North Carolina State Historic Preservation Office (SHPO) and the North Carolina Tribal Historic Preservation Office (THPO) on February 25, 2014, requesting review and comment on cultural resources potentially affected by the project. SHPO responded on March 24, 2014, and stated they were aware of no historic resources that would be affected by the project. Since no response was received from the THPO within a 30-day time frame, it is assumed that they are unaware of potential historic resources that would be affected by the project. All correspondence is included in Appendix 7.

6.4 FEMA Floodplain Compliance and Hydrologic Trespass

Henry Fork is mapped in a Zone AE Special Flood Hazard Area (SFHA) on Catawba County Flood Insurance Rate Map Panel 2791J, as depicted in Figure 10. Base flood elevations have been defined and non-encroachment limits have been published in the Catawba County Flood Insurance Study (FIS). UT1A, UT1 Reach 1 Lower, UT1 Reach 2, and UT2 do not have designated SFHAs, but do lie partly or entirely within the SFHA of Henry Fork. UT1 Reach 1 Upper, and UT1B do not have a designated SFHA and do not lie within the SFHA of Henry Fork. Effective hydraulic modeling for Henry Fork has been obtained from the NC Floodplain Mapping Program. The DMS Floodplain Requirements Checklist is included in Appendix 9. The project will be designed to avoid adverse floodplain impacts within the Henry Fork floodplain or on adjacent parcels.

There are no hydrologic trespass concerns or risks associated with the proposed project activities.

7.0 Reference Sites

7.1 Reference Streams

Six regional reference reaches and one reference reach immediately upstream of UT1, adjacent to the Henry Fork Project Site, were used to support the design of the project reaches (Figure 7). Reference reaches can be used as a basis for design or, more appropriately, as one source of information on which to base a stream restoration design. Most, if not all, reference reaches identified in the North Carolina Piedmont are in heavily wooded areas and the mature vegetation contributes greatly to their stability. Design parameters for this project were also developed based on the design discharge along with dimensionless ratio values associated with successful restoration designs of streams in the North Carolina Piedmont. Reference reach data for similar streams were obtained from existing data sets and used to verify design parameters. These reference streams were chosen because of similarities to the project streams including drainage area, valley slope and morphology, and bed material.

7.1.1 Channel Morphology and Classification of Reference Streams

For low sloped, smaller tributaries flowing within the floodplain of a larger stream, similar to the relationship of UT1 Reach 2, UT2, and UT1A to Henry Fork, three reference reaches were selected to support design: Vile Preserve, UT to Lyle Creek, and UT to Catawba River.

Vile Preserve is a perennial stream located in the floodplain of the South Fork Catawba River south of the project site. The site has a broad forested wetland floodplain. The stream and wetland complex receives runoff from adjacent uplands. The stream is completely connected to the floodplain wetlands with a bank height ratio of 1.0 and an entrenchment ratio over 30.0. The reach has a low slope with a sandy substrate and classifies as a Rosgen E5 stream type (1994). The channel dimension, interaction with the floodplain wetland, proximity to the project site, and similar stream substrate make it an applicable reference reach.

UT to Lyle Creek is a perennial stream located in the floodplain of Lyle Creek. The stream receives drainage from the adjacent wooded uplands and is fully connected to the floodplain with a bank height ratio of 1.0 and an entrenchment ratio of over 2.5. The width-to-depth ratio is 31.7 and the overall channel slope is approximately 0.4%. UT to Lyle Creek has a sinuosity of 1.7 and is part of a large floodplain wetland complex. In-stream habitat features within this reach include shallow pools, woody debris, and small sections of tree roots. This channel classifies as a Rosgen C5 stream type.

UT to Catawba River is a perennial stream that flows into the relatively flat Catawba River floodplain from the adjacent steep wooded valley, east of NC Highway 10. The channel is well connected to the floodplain with an entrenchment ratio over 5.8 and a bank height ratio of 1.0. This reach exhibited a sinuosity of 1.3, well-established pools at the outside of channel bends, several well-developed riffles, and habitat features such as woody debris jams, fallen logs across the channel, and root mats along the banks. This stream classifies as a Rosgen E5 stream type. The reference data collected also includes a tie in reach to the Catawba River that is steep with coarse bed material.

For streams flowing within their own valleys, similar to UT1 Reach 1 and UT1B, three additional regional reference reaches were selected to support design: UT to South Crowders, Group Camp Tributary, and UT to Gap Branch. An additional reference reach was identified adjacent to the project site, immediately upstream of UT1 Reach 1.

UT to South Crowders is a perennial stream located in Crowder Mountain State Park and receives drainage from the forested mountain side. The stream is quite sinuous with a sinuosity of 2.2. The width to depth ratio ranges from 5.7 to 8.2 and it has a high entrenchment ratio ranging from 3.7 to 4.2. Habitat features include root mats, deep meander pools, rock riffles, and woody debris in the channel. This stream classifies as a Rosgen E4 stream type.

Group Camp Tributary is located in Lake Norman State Park and receives drainage from a predominantly forested watershed and portions of two park shelters. The stream has a sinuosity of 1.6 and an entrenchment ratio ranging from 1.9 to 2.5. The width to depth ratio is 5.2 to 5.5. The channel slope is 1.7%. Group Camp tributary is classified as a Rosgen E5b.

UT to Gap Branch is located in the Box Creek Wilderness in Union Mills, NC. This stream flows through a confined valley with an alluvial bottom, much like UT1 Reach 2. The overall stream slope is 6.8% and the width to depth ratio is 10.1. The entrenchment ratio is 3.4, and Rosgen classification for this reach unclear: this reach could be classified either as a slightly entrenched B4a or a slightly entrenched A4. Available habitats at UT to Gap Branch include boulder/cobble steps, pools, rock riffles, runs, root mats, and undercut banks.

The Upstream UT1 to Henry Fork is located immediately upstream of UT1 Reach 1 adjacent to the project site. This stream flows through a steep confined valley and has many similarities to Reach 1 and UT1B. The stream flows through a confined alley with small intermittent flood benches. The channel slope of the surveyed reach is 4.2% (other steeper segments exist in vicinity but mainly on bedrock) and the width to depth ratio varies from 5.0 to 16.0. The entrenchment ratio is 1.7 to 2.0, typical of a B type stream. Rosgen classification is a B4a. Boulder/cobble and bedrock steps, pools, rock riffles, and other stable physical and habitat structure exist.

Geomorphic conditions and dimensionless ratios for all the reference sites are summarized below in Tables 13a and 13b.

Table 13a: Summary of Reference Reach Geomorphic Parameters - *Henry Fork Mitigation Site*

	Notation	Units	UT to Catawba River Reach 1		UT to Catawba River Reach 2		UT to Lyle Creek		Vile Preserve	
			min[1]	max[1]	min[1]	max[1]	min[1]	max[1]	min[1]	max[1]
stream type			E5		E3b/C3b		C5		E5	
drainage area	DA	sq mi	1.6		1.6		0.25		1.09	
Q Mannings (average)		cfs	58		83		8		16	
Riffle Cross Section										
cross section			XS2	XS3	XS4		XS1	XS3	XS1	XS3
bankfull cross-sectional area	A_{bkf}	SF	17.6	11.4	13.2		4.1	3.5	5.3	4.5
average velocity during bankfull event	v_{bkf}	fps	3.9	3.5	6.3		2.0	2.1	3.3	3.2
width at bankfull	w_{bkf}	feet	12.4	9.7	12.3		8.6	7.0	6.2	5.7
maximum depth at bankfull	d_{max}	feet	1.7	1.7	1.7		1.1	1.0	1.3	1.4
mean depth at bankfull	d_{bkf}	feet	1.4	1.2	1.1		0.5	0.5	0.8	0.8
bankfull width to depth ratio	w_{bkf}/d_{bkf}		8.7	8.2	11.5		18.3	13.9	7.4	7.2
depth ratio	d_{max}/d_{bkf}		1.2	1.5	1.6		2.4	2.0	1.6	1.7
low bank height			2.0	2.5	1.7		1.1	1.0	1.3	1.4
bank height ratio	BHR		1.1	1.4	1.0		1.0	1.0	1.0	1.0
floodprone area width	w_{fpa}	feet	79	52	53		48.9	45.2	200+	200+
entrenchment ratio	ER		6.3	5.3	4.3		5.7	6.5	32+	35+
Slopes										
valley slope	S_{valley}	feet/ foot	0.0058		0.0296		0.0045	0.0057	0.0074	
channel slope	$S_{channel}$	feet/ foot	0.0051		0.0287		0.0042	0.0056	0.0068	
riffle slope	S_{riffle}	feet/ foot	0.0114	0.0605	0.0142	0.3451	0.0055	0.0597	0.0063	
riffle slope ratio	$S_{riffle}/S_{channel}$		2.5	13.3	0.5	12.0	1.1	11.7	0.9	
step slope	S_{step}	feet/ foot	N/A		N/A		N/A		N/A	
step slope ratio	$S_{step}/S_{channel}$		N/A		N/A		N/A		N/A	

	Notation	Units	UT to Catawba River Reach 1		UT to Catawba River Reach 2		UT to Lyle Creek		Vile Preserve	
			min[1]	max[1]	min[1]	max[1]	min[1]	max[1]	min[1]	max[1]
pool slope	S_{pool}	feet/ foot	0.0012	0.0030	0.002	0.022	0.0000	0.0013	0.0048	
pool slope ratio	$S_{pool}/S_{channel}$		0.3	0.7	0.1	0.8	0.0	0.3	0.7	
Pools										
pool-to-pool spacing	L_{p-p}	feet	31	60	19	46	15	28	44.8	
pool spacing ratio	L_{p-p}/w_{bkf}		2.8	5.4	1.6	3.8	1.9	3.6	7.2	10
maximum pool depth at bankfull	d_{pool}	feet	2.5		N/A		1.3		1.4	
pool depth ratio	d_{pool}/d_{bkf}		1.8	2.1	N/A		2.8		1.6	
pool width at bankfull	w_{pool}	feet	10.4		N/A		6.1		4.5	
pool width ratio	w_{pool}/w_{bkf}		0.8	1.1	N/A		0.8		0.7	
pool cross-sectional area at bankfull	A_{pool}	SF	18.1		N/A		4.0		4.5	
pool area ratio	A_{pool}/A_{bkf}		1.0	1.6	N/A		1.0	1.1	0.9	1.0
Pattern										
Sinuosity	K		1.15		1.1		1.1		1.1	
belt width	w_{blt}	feet	55		23		21		19	
meander width ratio	w_{blt}/w_{bkf}		4.4	5.7	1.8		2.4	3.0	3.1	4.2
meander length	L_m	feet	65	107	52	79	39	44	29	45
meander length ratio	L_m/w_{bkf}		5.2	11.0	4.2	6.4	5.1	7.0	4.7	7.9
radius of curvature	R_c	feet	31	56	29	52	19	32	27	50
radius of curvature ratio	R_c/ w_{bkf}		2.8	5.1	2.4	4.2	2.2	4.6	4.4	8.8
Particle Size Distribution from Reachwide Count										
	d_{50}		Very Coarse Sand		Small Cobble		Very Coarse Sand		Medium Sand	
	d_{16}	mm	0.3		0.5		-		0.2	
	d_{35}	mm	0.4		29.8		0.1		0.3	
	d_{50}	mm	1.8		75.9		0.2		0.4	
	d_{84}	mm	12.8		170.8		0.5		0.9	
	d_{95}	mm	25.2		332.0		4.0		2	
	d_{99}	mm	90.0		>2048.0		8.0		-	

[1] Min and max values may appear backwards for ratios. When this is the case, ratio values have been left in the column associated with a particular cross section.

Table 13b: Summary of Reference Reach Geomorphic Parameters - *Henry Fork Mitigation Site*

	Notation	Units	UT to South Crowders		Group Camp Tributary		UT to Gap Branch		Upstream UT1 to Henry Fork	
			min[1]	max[1]	min[1]	max[1]	min[1]	max[1]	min[1]	max[1]
stream type			E4		E5b		Slightly entrenched B4a/ A4		B4a	
drainage area	DA	sq mi	0.22		0.10		0.04		0.05	
Q Mannings (average)		cfs	25		12		19		12	
Riffle Cross Section										
cross section			XS1	XS2	XS3	XS4	XS2		XS1	XS2
bankfull cross-sectional area	A_{bkf}	SF	6.4	8.7	3.6	3.4	3.8		1.9	3.6
average velocity during bankfull event	v_{bkf}	fps	3.3	4.4	3.6	3.4	5.0		5.4	3.8
width at bankfull	w_{bkf}	feet	6.1	8.4	4.4	4.2	6.2		3.2	7.7
maximum depth at bankfull	d_{max}	feet	1.4	1.4	1.0	1.2	1.0		0.8	0.7
mean depth at bankfull	d_{bkf}	feet	1.1	1.0	0.8	0.8	0.6		0.6	0.5
bankfull width to depth ratio	w_{bkf}/d_{bkf}		5.7	8.2	5.5	5.2	10.1		5.2	16.4
depth ratio	d_{max}/d_{bkf}		1.3	1.3	1.3	1.4	1.7		1.3	1.5
low bank height			2.2	1.4	1.0	1.2	1.0		0.8	0.9
bank height ratio	BHR		1.6	1.0	1.0	1.0	1.0		1.0	1.3
floodprone area width	w_{fpa}	feet	25.5	31.2	8.6	10.6	20.9		6.3	13.3
entrenchment ratio	ER		4.2	3.7	1.9	2.5	3.4		2.0	1.7
Slopes										
valley slope	S_{valley}	feet/ foot	0.0257		0.0229		N/A		0.046	
channel slope	$S_{channel}$	feet/ foot	0.0091		0.0167		0.068		0.042	
riffle slope	S_{riffle}	feet/ foot	0.0202	0.0664	0.0105	0.1218	0.0110	0.1400	0.05	0.07
riffle slope ratio	$S_{riffle}/S_{channel}$		2.2	7.3	0.6	7.3	0.2	2.1	1.3	1.8
step slope	S_{step}	feet/ foot	N/A		N/A		0.1200	0.5500	N/A	
step slope ratio	$S_{step}/S_{channel}$		N/A		N/A		10.9	50.0	N/A	
pool slope	S_{pool}	feet/ foot	0.0000	0.006	0.0000	0.0104	0.0041	0.0610	0.000	0.016
pool slope ratio	$S_{pool}/S_{channel}$		0.03	0.61	0.0	0.6	0.1	0.9	0.0	0.4
Pools										
pool-to-pool spacing	L_{p-p}	feet	28	63	8.5	57.8	18.4	26.8	14.1	24.9
pool spacing ratio	L_{p-p}/w_{bkf}		3.9	8.7	2.0	13.4	3.0	4.4	2.6	4.6
maximum pool depth at bankfull	d_{pool}	feet	1.3	3.0	1.8	2.8	1.5		N/A	

	Notation	Units	UT to South Crowders		Group Camp Tributary		UT to Gap Branch		Upstream UT1 to Henry Fork	
			min[1]	max[1]	min[1]	max[1]	min[1]	max[1]	min[1]	max[1]
pool depth ratio	d_{pool}/d_{bkf}		1.2	2.9	2.3	3.4	2.5		N/A	
pool width at bankfull	w_{pool}	feet	8.0		N/A		6.1		N/A	
pool width ratio	w_{pool}/w_{bkf}		1.0	1.3	N/A		1.0		N/A	
pool cross-sectional area at bankfull	A_{pool}	SF	9.2		N/A		7.1		N/A	
pool area ratio	A_{pool}/A_{bkf}		1.1	1.4	N/A		1.9		N/A	
Pattern										
sinuosity	K		2.2		1.6		N/A		1.1	
belt width	w_{blt}	feet	81		15.5	16.5	N/A		N/A	
meander width ratio	w_{blt}/w_{bkf}		9.6	13.3	3.6	3.8	N/A		N/A	
meander length	L_m	feet	45	72	31	34	N/A		N/A	
meander length ratio	L_m/w_{bkf}		7.4	8.6	7.2	7.9	N/A		N/A	
radius of curvature	R_c	feet	9	20	8.0	11.8	N/A		N/A	
radius of curvature ratio	R_c/ w_{bkf}		1.5	2.4	1.9	2.7	N/A		N/A	
Particle Size Distribution from Reachwide Count										
		d_{50}	Coarse Gravel		Sand		Coarse Gravel		Cobble *(Riffle only count)*	
	d_{16}	mm	0.8		Silt/Clay		0.4		2.8	
	d_{35}	mm	12.1		0.1		8.0		16	
	d_{50}	mm	19.7		0.3		19.0		34	
	d_{84}	mm	49.5		16.0		102.3		64	
	d_{95}	mm	75.9		55.6		256.0		101	
	d_{99}	mm	180.0		128.0		>2048		128-180	

[1] Min and max values may appear backwards for ratios. When this is the case, ratio values have been left in the column associated with a particular cross section.

7.2 Reference Wetland

A reference wetland was identified approximately 13.5 miles to the east in the floodplain of Lyle Creek. The property is a good condition, mature Piedmont Bottomland Forest (Schafale & Weakley, 1990). The proximity of the reference site to the project area and its location along a smaller tributary in the floodplain of a larger system provides a very good reference for the proposed restoration site. The vegetation at the reference site will be used as a basis to develop the planting plan for the wetland restoration on the project site. The reference wetland site has been used for other wetland restoration projects and a groundwater monitoring gage has been installed on the reference site since November of 2010 to document the reference wetland hydrology.

7.2.1 Hydrological Characterization

Climatic conditions of the reference site are the same as those described for the project site. A reference groundwater monitoring gage was installed on November 11, 2010, and has continually recorded groundwater levels for the reference site. In analyzing hydrology data for the reference site, growing seasons for 2012, 2013, and 2014 were investigated. The reference site is a jurisdictional wetland and is therefore expected to meet the established wetland hydrology criteria for the project site: water table elevation within 12 inches of the soil surface for a continuous 7.2% of the growing season (March 20 through November 11). The gage utilizes a LevelTroll™ pressure transducer to measure and record water table depth twice a day. Analysis of the current gage data collected shows that based on the proposed wetland hydrology criteria and assigned growing season the reference well met hydrologic criteria in all investigated years (2012 – 2014). These data confirm that the reference site has the appropriate hydrologic regime to serve as the reference condition. The reference gage as well as the groundwater monitoring gages on the project site will continue to record water table depth throughout the post-construction monitoring period. In the event of unusual weather during the post-construction monitoring period, the reference well performance will be used as a check for the mitigation site performance.

7.2.2 Soil Characterization and Taxonomic Classification

The soils on the reference site are mapped as Chewacla loam according to the NRCS soil mapping. Chewalca loam is listed on the NC hydric soil list. The Chewacla series is described in the NRCS official series description as a floodplain soil that is very deep, somewhat poorly drained found on zero to two percent slopes. The typical texture profile of the Chewacla loam is a fine sandy loam at zero to four inches, a silt loam to clay loam from four to 38 inches, and silt loam to silt clay loam from 38 to 60 inches.

7.3 Reference Vegetation Community Descriptions

Historical aerials reveal no recent disturbances to the reference property and no disturbances were observed in the field. The existing vegetation communities are typical of a Bottomland Hardwood Forest and include mature canopy tree species, moderate subcanopy and shrub species, as well as a somewhat sparse herbaceous layer. Dominant canopy species include willow oak, water oak, red oak, sweetgum, American sycamore, tuliptree, and red maple. Sub-canopy and shrub species include ironwood, red elm, red maple, sweetgum, and few small pockets of Chinese privet along perimeter upland areas. The herbaceous layer through the wetland is relatively sparse due to dense overhead canopy and sub-canopy species; however, the reference wetland maintained small amounts of strawcolored flatsedge, soft stem rush, and green arrow arum (Peltandra virginica).

8.0 Determination of Credits

8.1 Stream Mitigation Credits

Mitigation credits presented in Table 14 are projections based upon site design. The site is submitted for mitigation credit in the Catawba 03050103 expanded service area. Upon completion of site construction, the project components and credits data will be revised to be consistent with the as-built condition.

A credit ratio of 1:1 is proposed for the stream restoration involving perennial streams. Two streams (UT2 and UT1A) are being proposed for enhancement at a credit ratio of 1.5:1. These streams will receive a full restoration approach, but due to their intermittent hydrology coupled with their overlap with wetland reestablishment areas, only enhancement credit is being pursued.

8.2 Wetland Mitigation Credits

Mitigation credits presented in Table 14 are projections based upon site design of wetland rehabilitation in established jurisdictional areas and re-establishment in adjacent areas, as well as enhancement of existing jurisdictional wetlands through planting. While wetland enhancement activities were not originally proposed as part of the proposal, subsequent investigations have yielded a substantial acreage of existing wetlands, most of which are biologically affected by prior deforestation and maintenance of golf course vegetation. Planting these wetlands is a valuable activity to enhance habitat and water quality through establishment of a forested canopy. This intervention is warranted given their current condition, and should be credited at an enhancement level. Wetlands that are already forested have not been included for enhancement and will be preserved to the extent that they lie within the easement area.

A credit ratio of 1:1 is proposed for the re-establishment work on site due to the significant improvement to wetland functions proposed related to hydrology, soils, and vegetation. Fills soils will be removed to near the level of the buried topsoil and hydric horizons. A detailed soil boring grid was used to identify areas of non-hydric overburden that will be removed to uncover wetland soils. Due to history of the site as a golf course, is it recognized that floodplain manipulation was drastic on the site and wetlands were filled and drained to create associated infrastructure for the golf course. In addition to adding drainage ditches to remove water from wetland areas, large amounts of fill material were added to fairways, greens, and tee boxes in an effort to dry out wetland areas for use as a golf course. Hydrology will be restored to wetland areas by plugging ditches and raising adjacent stream channels that currently have a draining effect on the area. Restored streams will have appropriate cross section dimension and bank height to allow for frequent overbank flooding of riparian wetland areas. Invasive species will be removed and a riparian wetland vegetation community will be established. This vegetation community will support habitat and will also provide shade for cooling of surface water and groundwater recharge sources. The proposed re-establishment work will address the floodplain manipulation and will result in a gain of aquatic resources in both area and function.

A credit ratio of 1.5:1 is proposed for the rehabilitation work on site due to significant improvement to wetland functions as a result of positive improvements to site hydrology, soils, and vegetation. Fill soils will be removed and the original hydric soils reestablished as the hydric horizon. Wetland hydrology will be enhanced and restored to wetland areas by raising adjacent stream channels that currently have a draining effect on jurisdictional wetlands, and by reducing the elevation of the wetlands by removing overburden. The stream channels will be restored to an appropriate cross section dimension to allow for frequent overbank flooding of riparian wetland areas creating a stream-wetland interaction that is not present under current conditions. Invasive species will be removed and a riparian wetland vegetation community will be established. This vegetation community will support habitat and will also provide shade for cooling of surface water and groundwater recharge sources.

A credit ratio of 2:1 is proposed for wetland enhancement work on site to recognize the restoration of native vegetation and a forest canopy, as well as treatment of invasive species. This vegetation community will support habitat and will also provide shade for cooling of surface water and groundwater recharge sources.

DMS reserves the right to request additional wetland credits created by the project. Wetland credits will be proposed based upon additional gauge data and/or wetland delineation.

Table 14: Determination of Credits - *Henry Fork Mitigation Site*

Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient
Type	R	RE	R	RE	R	RE			
Totals	4808	N/A	3.88	0.34	N/A	N/A	N/A	N/A	N/A

Project Components							
Project Component or Reach ID	Existing Footage / Acreage	Proposed Stationing/ Location	Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage or Acreage	Mitigation Ratio	Proposed Credit
UT1 Reach 1	1392	100+00 to 103+02	P1	R	302	1:1	302 SMU
		103+02 to 114+71	P1	R	1169	1:1	1169 SMU
UT1 Reach 2	1499	114+71 to 126+99	P1	R	1228	1:1	1228 SMU
UT1A	353	180+00 to 186+57	P1	R (Enhancement)	657	1.5:1	438 SMU
UT1B	478	150+00 to 153+58	P1	R	358	1:1	358 SMU
UT2	1915	200+00 to 219+69	P1	R (Enhancement)	1969	1.5:1	1313 SMU
Wetland 1	N/A	Floodplain near UT1 Reach 2	Planting, hydrologic improvement	R (Re-establishment)	2.48 AC	1:1	2.48 WMU
Wetland 2	N/A	Floodplain near UT2	Planting, hydrologic improvement	R (Re-establishment)	1.23 AC	1:1	1.23 WMU
Wetland A	0.182 AC	Floodplain between UT1 Reach 2 and	Planting, hydrologic improvement	R (Rehabilitation)	0.18 AC	1.5:1	0.12 WMU
Wetland B	0.013 AC	Floodplain between UT1 Reach 2 and	Planting, hydrologic improvement	R (Rehabilitation)	0.013 AC	1.5:1	0.01 WMU
Wetland C	0.003 AC	Floodplain between UT1 Reach 2 and	Planting, hydrologic improvement	R (Rehabilitation)	0.003 AC	1.5:1	0.00 WMU[1]
Wetland G	0.021 AC	Floodplain near UT1A	Planting	RE (Enhancement)	0.018 AC	2:1	0.01 WMU

Wetland H	0.056 AC	East hillslope near UT1A	Planting	RE (Enhancement)	0.056 AC	2:1	0.03 WMU
Wetland I	0.078 AC	East hillslope near UT1A	Planting	RE (Enhancement)	0.078 AC	2:1	0.04 WMU
Wetland J	0.036 AC	East hillslope near UT1 Reach 2	Planting	RE (Enhancement)	0.036 AC	2:1	0.02 WMU
Wetland K	0.062 AC	East hillslope near UT1 Reach 2	Planting	RE (Enhancement)	0.056 AC	2:1	0.03 WMU
Wetland M	0.131 AC	East hillslope near UT1 Reach 2	Planting	RE (Enhancement)	0.13 AC	2:1	0.06 WMU
Wetland N	0.084 AC	Floodplain towards river from UT2	Planting	RE (Enhancement)	0.084 AC	2:1	0.04 WMU
Wetland P	0.023 AC	Floodplain upslope of UT2	Planting	RE (Enhancement)	0.023 AC	2:1	0.01 WMU
Wetland Q	0.069 AC	Floodplain upslope of UT2	Planting	RE (Enhancement)	0.069 AC	2:1	0.03 WMU
Wetland R	0.059 AC	Floodplain in footprint of Pond 3 near head of UT1 Reach 2	Significant improvement to wetland functions	R (Rehabilitation)	0.059 AC	1.5:1	0.04 WMU
Wetland S	0.159 AC	UT1 Reach 1 Valley (Pond 1)	Planting	RE (Enhancement)	0.131 AC	2:1	0.07 WMU

Component Summation

Restoration Level	Stream (LF)	Riparian Wetland (AC)	Non-Riparian Wetland (AC)	Buffer (sq. ft.)	Upland (AC)
Restoration	3,057	N/A	N/A	N/A	N/A
Enhancement I	2,626	N/A	N/A	N/A	N/A
Wetland Re-Establishment	N/A	3.71 AC	N/A	N/A	N/A

Wetland Rehabilitation	N/A	0.25 AC	N/A	N/A	N/A
Wetland Enhancement	N/A	0.68 AC[2]	N/A	N/A	N/A
Preservation	N/A	N/A	N/A	N/A	N/A

[1]Due to the size (0.003 Acre) of Wetland C, no mitigation credit is being claimed for this area.
[2] Existing wetlands, or parts of existing wetlands, that are excluded from table are not being planted because they are either already wooded, or because they fall partly or fully outside of the conservation easement.

9.0 Credit Release Schedule

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary DA authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the IRT, will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows:

Table 15a: Credit Release Schedule – Forested Wetlands Credits - *Henry Fork Mitigation Site*

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met	10%	70%
5	Fifth year monitoring report demonstrates performance standards are being met; Provided that all performance standards are met, the IRT may allow the DMS to discontinue hydrologic monitoring after the fifth year, but vegetation monitoring must continue for an additional two years after the fifth year for a total of seven years.	10%	80%
6	Sixth year monitoring report demonstrates performance standards are being met	10%	90%
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received closeout approval	10%	100%

Table 15b: Credit Release Schedule – Stream Credits - *Henry Fork Mitigation Site*

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met (additional 10% released at second bankfull event in a separate year)	10%	50% (60%)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (70%)
4	Fourth year monitoring report demonstrates performance standards are being met	5%	65% (75%)
5	Fifth year monitoring report demonstrates performance standards are being met	10%	75% (85%)
6	Sixth year monitoring report demonstrates performance standards are being met	5%	80% (90%)
7	Seventh year monitoring report demonstrates performance standards are being met and project has received closeout approval	10%	90% (100%)

9.1 Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by DMS without prior written approval of the DE upon satisfactory completion of the following activities:

a. Approval of the final Mitigation Plan;
b. Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property;
c. Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; per the DMS Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits; and
d. Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

9.2 Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 10% of a site's total stream credits shall be released after two bankfull events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bankfull events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the DMS will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

10.0 Project Site Mitigation Plan

10.1 Justification for Proposed Intervention

Based on assessments of the watershed and existing channels, the project design has been developed to correct system wide channel manipulation that has resulted in habitat loss, hydrologic modification and alteration of streams, wetlands and valleys; removal of woody riparian vegetation, and historical channel straightening and periodic dredging. Due to the extent of manipulation, allowing the system and progress through the evolutionary process without intervention would likely result in highly undesirable consequences including channel avulsion, dam breaching, and excessive sediment loading to Henry Fork and downstream waters. Intervention is required to restore aquatic, benthic, and riparian habitat.

The current condition of the streams, and prior manipulation of floodplains and wetlands further detracts from the potential of the site to support forested wetlands without restoration activities to reconnect these systems. Restoration of streams allows for the re-establishment of stream-wetland complexes that create a unique synergy of aquatic habitats. Relic wetland soils have been buried by agricultural operations, golf course creation, and maintenance activities. Ditches were established and maintained and existing streams were dredged to assist in maintaining a well-drained golf course. The restoration intervention proposed is the only means by which to re-establish forested bottomland wetlands.

The project offers the opportunity to meet many goals established in the DMS watershed planning documents, including the establishment of a large forested buffer along the Henry Fork to be included as part of the uncredited site activities. Reestablishment of a natural forested condition will help reduce accumulation of nutrients in the site soils from golf course and agricultural activities and reduce the erosion of that same nutrient rich sediment downstream.

10.2 Proposed Stream Restoration and Enhancement Design Overview

UT1 Reaches 1 and 2, UT2, UT1B and UT1A will be restored (full restoration of intermittent streams is being proposed for crediting as enhancement) based on their topographic setting within the surrounding landscape, hydrologic and climatic conditions, and natural vegetation communities. The proposed restoration of stream-wetland complex conditions along UT1 Reach 2, UT1A, and UT2 warrants a design approach that is tailored towards restoring ecologically beneficial hydrologic conditions in both the streams and the adjacent floodplain wetland resources. All project site streams will be planted with sod mat transplants harvested from existing streambanks. These transplants include juncus, sedges and a diversity of other herbaceous species, well-tailored to the proposed site conditions. Furthermore, river cane (*Arundaria gigantia*) and tag alder (*Alnus serrulata)*) are prevalent on the project site and will be used as transplants. Sourwood (*Oxydendrum arboretum)* transplants have also been identified. The project will take advantage of native seed sources in adjacent woodland leaf litter to supplement project mulching. Topsoil and leaf litter harvesting will ensure that a well-balanced soil profile is established in riparian and wetland corridors. Figure 9 illustrates the proposed concept design for the site. In addition to typical required buffers, an additional 100-foot wide buffer will be added along the right bank of Henry Fork which will help compensate for the overlap of UT2 and UT1 stream buffers with wetland acreage.

All stream restoration reaches included in the design for this project will be constructed as C/E or B type streams according to the Rosgen classification system (Rosgen, 1996). C/E streams are meandering streams with well-developed floodplains and average gradients of 2% or less. C/E streams occur within a wide range of valley types and are appropriate for UT1 Reach 2, UT1A, and UT2. B streams occur within headwater and 2nd order streams in steeper, more confined valley settings and have narrow floodplains with average gradients typically steeper than 2%. Construction of B-type step-pool channels in UT1B and UT1 Reach 1 valleys is appropriate and similar to channel conditions further upstream in the UT1 watershed. The stream restoration elements of the project will be constructed as Priority 1 restoration. There will be a short transitional reach at the downstream end of UT1 Reach 2 that will be constructed as a Priority 2 reach to tie into the tie-in channel to the Henry Fork at the downstream project limits.

Due to historic agricultural impacts, golf course impacts, and maintenance practices, the onsite streams are not free-formed or self-maintaining. UT2 and UT1A are particularly lacking in sediment supply. UT1 Reaches 1 and 2, and UT1B are significantly impacted by online ponds, channel avulsion, erosion of pond spillways, and other events. Intervention with Priority 1 restoration is the appropriate design approach to re-establish functions offered by lotic systems with restored habitat diversity on the site.

The stream restoration construction will result in meandering and step-pool channels sized to convey design discharges. In meandering channels, flows larger than the design discharge will frequently flood the adjacent floodplain and wetlands. The reconstructed channel banks will be built with stable side slopes, planted with native materials, matted, and seeded for stability. The sinuous plan form of the channel will be built to mimic a natural Piedmont stream.

In meandering channels, deeper pools will be constructed, and are expected to self-maintain, in the outside of the meander bends. Shallow riffles and runs will dominate the straight sections of channel between meanders. For these channels, pools will provide energy dissipation and aquatic habitat. In-stream structures will be constructed primarily of logs and brush and will include constructed riffles, log sills, log vanes, and log J-hooks. These structures will provide grade control and habitat improvements. Grade control will be used at key points, including the downstream transition of UT1 Reach 2 as the creek transitions to its tie-in to Henry Fork.

There are no crossings or utility easement exclusions from the conservation easement. There is a site access and parking area that has been established outside of the conservation easement at the terminus of the permanent deeded access to SR 1192. The project site includes additional buffer acreage on streams beyond the typical 50-foot requirement. Within the project site, abandoned channels and ditches will be plugged and filled, and a 100-foot-wide buffer will be established on the right bank of Henry Fork. Dams, culverts, and outbuildings will be removed within the site. Cart paths will be removed within all of the stream and wetland corridors.

10.3 Design Discharge Development

Several methods were used to develop bankfull discharge estimates of the project reaches. The resulting values were compared and best professional judgment was used to determine the specific design discharge for each project reach.

The methods to estimate discharge included:

1. The published North Carolina rural Piedmont drainage area – discharge relationships (Harman, et al., 1999);
2. The recently completed provisional North Carolina rural Piedmont/ mountain drainage area-discharge relationships (Walker, unpublished);
3. Drainage area-discharge relationships developed from reference reaches selected for this project, including a site on UT1 immediately upstream of the project area;
4. Regional flood frequency analysis developed for this project;
5. USGS flood frequency equations for rural watersheds in the North Carolina Piedmont region (Weaver, et al., 2009);

6. Discharge estimates of existing channels at top of bank to estimate an upper limit discharge; and
7. Site specific observations and observations of the immediate upstream reference reach on UT1.

10.3.1 NC Rural Piedmont Regional Curve Predictions

The published NC rural Piedmont curve was used to estimate discharge based on drainage area using regional relationships (Harman, et al., 1999). Figure 8 illustrates the NC Piedmont curve along with other data used for these analyses.

10.3.2 Provisional Updated NC Piedmont/Mountain Regional Curve Predictions

The draft updated curve for rural Piedmont and mountain stream channels was used to estimate discharge based on drainage area using regional relationships (Walker, unpublished). The original rural curve was developed using both gaged and ungaged sites. The methods used to develop discharge estimations for the ungaged sites are believed to have over-estimated the points on the discharge curve (Walker, 2013). In addition, some of the gaged sites used in the original rural curve may have been somewhat incised, with bank height ratios up to 1.5. This enlargement may have contributed to larger discharge values used in development of the curve (Harman, 2013). The updated curves appear to be a better predictor of bankfull parameters for many streams. This updated curve is also plotted on Figure 8.

10.3.3 Drainage Area- Discharge Relationships from Reference Reaches

Reference reaches for this project included seven sites utilized for discharge reference data and included a reference section taken on UT1 upstream of the project limits. The sites surveyed as discharge references are presented in Table 16, below. These data were used as a comparison to the bankfull discharge estimations derived from regional discharge relationships described above. Bankfull features were surveyed at each site and Manning's equation was used to estimate a discharge corresponding to the bankfull stage of each. These estimates of bankfull discharge were plotted on Figure 8 for comparison to regional curves and other methods of estimating discharge. The reference reach discharge estimates plot near or below the other data sets. Two of these points, UT to South Crowders and UT to South Fork Catawba at Vile Preserve, plot below the lower 95% confidence interval of the published regional curves. The other points plot within the 95% confidence intervals for the published regional curve and appear to be similar to the unpublished updated regional curve trend, except for UT to Gap Branch which appears to plot above the unpublished curve trend. More information about reference reaches and their geomorphology is provided in Section 7.0 of this report.

Table 16: Reference Reaches Drainage Area-Discharge Relationships - *Henry Fork Mitigation Site*

Reference Reach	Drainage Area (sq. mi.)	Discharge (cfs)
UT to Gap Branch	0.04	19
UT1 to Henry Fork (Upstream)	0.05	12
Group Camp Tributary	0.10	12
UT to South Crowders	0.22	25
UT to Lyle Creek	0.25	8
UT to South Fork Catawba at Vile Preserve	1.09	16
UT to Catawba, Reach 1 / Reach 2	1.60	58 / 83

10.3.4 Regional Flood Frequency Analysis

Five USGS stream gage sites were identified within reasonable proximity of the project site for use in development of a project specific regional flood frequency analysis. Data from these gages were used to develop a regional flood frequency curve as described by Dalrymple (1960). The gages used were:

- 2142000 - Lower Little River near All Healing Springs , NC (drainage area 28.2 square miles);
- 2143040 - Jacob Fork at Ramsey, NC (drainage area 25.7 square miles);
- 2143000 - Henry Fork near Henry River, NC (drainage area 83.2 square miles);
- 2152100 - First Broad River near Casar, NC (drainage area 60.5 square miles); and
- 2143500 - Indian Creek near Laboratory, NC (drainage area 69.2 square miles).

The five gages passed the homogeneity test. While each of these gages represents a larger drainage area than the project reaches, the analysis was used as a reference point that is typically prepared for this type of analysis. The extrapolated 1.2, 1.5 and 1.8-year events were considered and incorporated in design discharge summary (see Table 17).

10.3.5 USGS Flood Frequency Equations

USGS flood frequency equations are published for ungaged rural streams in North Carolina (USGS, 2009), and for small ungaged rural streams in Georgia, South Carolina, and North Carolina (USGS, 2014). These equations carry limitations of not less than one square mile, and not less than 0.1 square mile, respectively. For both publications, streams at Henry Fork are at the limits of data validity. As these equations are reference points, and not being used for design per se, data limitations were documented, and predictions were developed using both sets of equations.

Peak discharge estimates were developed for each reach for floods with a recurrence interval of two, five, ten, twenty-five years. The two-year event for each method was considered and incorporated in design discharge summary (see Table 17).

10.3.6 Discharge Analysis of Existing Channel Top of Bank

The existing streams are in an unnatural condition due to historic manipulation, maintenance, and golf-course related activities. Known anthropogenic impacts include stream relocation and straightening (ditching), periodic dredging of channels, mowing and other vegetation management, and pond installation (impoundment). As a result, reliable bankfull features were either difficult to identify, or difficult to rely upon.

Manning’s equation was used to calculate the discharge in each of the project reaches for the channel-filling flow at existing tops of the banks. Based on conditions present, it can be assumed that these values provide an upper limit on the possible range of design discharges (see Table 17). Other discharges were evaluated in the existing channels, corresponding with bankfull indicators, where present. In general, bankfull indicators that were present showed some coincidence with the expected discharge frequency. Best estimates of the bankfull flow and corresponding geomorphic data were provided in Table 6 for existing conditions.

10.3.7 Site Specific Considerations

Wildlands has worked on several stream and wetland complexes on mitigation sites previously. The hydrology in these diverse systems differs from the hydrology in a stream-only scenario. An increased amount of storage capacity is available in floodplains of the project streams during large events. In addition, part of the wetland re-establishment goal is restoring a natural flooding regime to the system which relies heavily on floodplain connection. Available wetland storage capacity and the desired floodplain inundation were considered when developing design discharge for the site reaches.

10.3.8 Design Discharge Selection

In consideration of each of these discharge estimates, low baseflow characteristics, size of contributing watersheds, desired restoration of a natural flooding regime, and experience designing stream and wetland complexes, Wildlands selected the design discharge values in the lower range that can be supported by available data. Design values were selected most similar to the provisional updated Walker curve predictions and to the reference reach estimates corresponding with similar slope regimes. Table 17 summarizes the results of each of the discharge analyses described in this section and the final selected design discharge for each of the project reaches.

Table 17: Design Discharge Analysis Summary - *Henry Fork Mitigation Site*

Discharge Estimation Method	UT1 Reach 1 Upper	UT1 Reach 1 Lower	UT1 Reach 2	UT1A	UT1B	UT2
Drainage Area (sq. mi.)	0.07	0.17	0.28	0.04	0.05	0.08
NC Piedmont Regional Curve (cfs)	12	24	35	8	10	14
Draft Walker NC Regional Curve (cfs)	7	14	20	4	5	7
Reference Reach Analysis (cfs) Normal to High Slope	15	23	N/A	11	13	N/A
Reference Reach Analysis (cfs) Low Slope	N/A	N/A	7.5	1.1[2]	N/A	1.5[2]
Regional Flood Frequency Analysis 1.2-year event (cfs)	22	39	54	15	18	24
Regional Flood Frequency Analysis 1.5-year event (cfs)	29	52	73	21	24	33
Regional Flood Frequency Analysis 1.8-year event (cfs)	36	63	88	25	30	40
USGS (2009) Rural Regression Equation 2-year event (cfs)	27	49	68	18	22	30
USGS (2014) Small Rural Regression Equation 2-year event (cfs)	30	56	61	19	24	29
Existing Condition Top of Bank Upper Range Max (cfs)	8	14-42	240	42	24-53	9-80
Design Discharge (cfs)	**7-13**	**14-16**	**8-20[1]**	**4-7**	**5-13**	**7-11**

[1] Discharge analysis data tended to indicate that a higher discharge may have been appropriate for UT1 Reach 2, except for low slope reference reach data and prior stream-wetland complex design. Cross-sectional area and low slope reference reach data were given higher weight in the analysis. It is also intended that Reach 2 flood more frequently. In addition, overbank pilot channels, typical of floodplain wetland systems, have been designed to carry a flow of 1-2 cfs.

[2] Discharges at the low end of the best fit curve are given less weight in the analysis. No streams below 0.25- square miles were included in the low slope reference reach data set.

10.4 Design Channel Morphologic Parameters

The morphologic design parameters, as shown in Table 17, fall within the ranges specified for C/E and B streams (Rosgen, 1996). Type C streams are slightly entrenched, meandering streams with access to the floodplain (entrenchment ratios >2.2), and channel slopes of 2% or less. They occur within a wide range of valley types and are appropriate for the project landscape. Type B streams are moderately entrenched streams with minimal floodplain relief and slopes in excess of 2%. They occur in steeper headwater valleys and characteristically have a step-pool morphology with variable pattern based on the valley constraints. The design morphological parameters are shown in Table 18.

The specific values for the design parameters were selected based on design bankfull discharge, designer experience and judgment and were supported by morphologic data from reference reach data sets. The width to depth ratios range from 12 to 13 on C/E type streams (with the exception of the Pond reach on UT1 Reach 1 (Lower)) and 14 to 15 on B type streams. On these small streams, very minor changes to dimension yield large changes in width to depth ratio so these numbers have been rounded to the nearest whole number. We expect that over time as vegetation is established, the channels may narrow more toward dimensions characteristic of an E channel (<12). This narrowing over time would not be seen as an indicator of instability in and of itself. For B stream types, narrowing may also occur with the growth of streambank vegetation and corresponding roughening of the channel margins, although higher velocities due to channel slope may help to maintain higher W/D ratios. Design stream sinuosity is reflective of Type E and B channel morphology.

Table 18: Design Morphologic Parameters - *Henry Fork Mitigation Site*

	Notation	Units	UT1 Reach 1		UT1 Reach 2	
			Upper	Lower	Min	Max
stream type			B4a	B4a (C4b[1])	C6	
drainage area	DA	sq mi	0.07 - 0.17		0.24 - 0.28	
design discharge	Q	cfs	10	15	14	
bankfull cross-sectional area	A_{bkf}	SF	2.4	3.4	8.3	
average velocity during bankfull event	v_{bkf}	fps	4.6	4.1	1.7	
Cross-Section						
riffle width at bankfull	w_{bkf}	ft	6.0	7.0	10.1	
maximum riffle depth at bankfull	d_{max}	ft	0.60	0.70	1.30	
mean riffle depth at bankfull	d_{bkf}	ft	0.40	0.49	0.82	
maximum depth ratio	d_{max}/d_{bkf}		1.5	1.4	1.6	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		15		12.3	
pool cross-sectional area	A_{pool}	SF	3	7	9	17
pool area ratio	A_{pool}/A_{bkf}		1.1	2.0	1.1	2.0
pool width at bankfull	W_p	ft	6.6	10.5	10.1	15.2
pool width ratio	W_p/w_{bkf}		1.1	1.5	1.0	1.5
low bank height		ft	0.60	0.70	1.30	
bank height ratio	BHR		1.0		1.0	
floodprone area width	w_{fpa}	feet	15	20 (40[1])	23	46
entrenchment ratio	ER		2.5	2.9 (5.7[1])	2.3	4.6

	Notation	Units	UT1 Reach 1		UT1 Reach 2	
			Upper	Lower	Min	Max
Profile						
valley slope	S_{valley}	ft/ft	0.062		0.0024	
channel slope	S_{chnl}	ft/ft	0.0527	0.0477	0.0018	0.0016
riffle slope	S_{riffle}	ft/ft	0.056	0.092	0.002	0.008
riffle slope ratio	S_{riffle}/S_{chnl}		1.1	1.8	1.1	5
pool slope	S_p	ft/ft	0.0000	0.0204	0.000	0.0003
pool slope ratio	S_p/S_{chnl}		0.00	0.40	0.00	0.20
pool-to-pool spacing	L_{p-p}	ft	12	35	20	86
pool spacing ratio	L_{p-p}/w_{bkf}		2	5	2	8.5
maximum pool depth	D_{maxp}	ft	0.6	1.5	1.3	2.5
pool depth ratio	D_{maxp}/d_{bkf}		1.5	3.0	1.6	3.0
Pattern						
sinuosity	K		1.11	1.16	1.39	
belt width	w_{blt}	ft	18	42	30	61
meander width ratio	w_{blt}/w_{bkf}		3.0	6.0	3.0	6.0
meander length	L_m	ft	30	77	51	111
meander length ratio	L_m/w_{bkf}		5.0	11.0	5.0	11.0
radius of curvature	R_c	ft	12	28	18	35
radius of curvature ratio	R_c/ w_{bkf}		2.0	4.0	1.8	3.5

[1] UT1 Reach 1 (Lower) is a hybrid reach that goes through what is presently a pond and then drops rapidly down what is presently a dam embankment and drop to master stream floodplain. Through the pond, slopes and floodprone width is more typical of a C.

[2] UT1 Reach 2 is classified in existing conditions as a gravel bed stream because the reachwide sediment sample was a combined sample of reaches 1 and 2. It is expected that reach 2 will be similar to UT2 and UT1A, and will be a fine grain dominated stream.

	Notation	Units	UT1A		UT1B		UT2	
			Min	Max	Min	Max	Min	Max
stream type			C6		B4a[1]		C6	
drainage area	DA	sq mi	0.036		0.048		0.077	
design discharge	Q	cfs	6		9		5	
bankfull cross-sectional area	A_{bkf}	SF	3.2		2.1		4.4	
average velocity during bankfull event	v_{bkf}	fps	2.0		4.3		1.2	
Cross-Section								
riffle width at bankfull	w_{bkf}	ft	6.2		5.5		7.5	
maximum riffle depth at bankfull	d_{max}	ft	0.85		0.55		0.95	
mean riffle depth at bankfull	d_{bkf}	ft	0.51		0.4		0.58	
maximum depth ratio	d_{max}/d_{bkf}		1.7		1.5		1.6	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		12.1		14.7		12.9	
pool cross-sectional area	A_{pool}	SF	3	6	2	4.4	5	9
pool area ratio	A_{pool}/A_{bkf}		1.1	2.0	1.1	2.2	1.1	2.0
pool width at bankfull	W_p	ft	6.2	9.3	6.1	8.3	7.5	11.3

	Notation	Units	UT1A		UT1B		UT2	
			Min	Max	Min	Max	Min	Max
pool width ratio	W_p/w_{bkf}		1.0	1.5	1.1	1.5	1.0	1.5
low bank height		ft	0.85		0.55		0.95	
bank height ratio	BHR		1.0		1.0		1.0	
floodprone area width	w_{fpa}	ft	150	200	10	15	60	110
entrenchment ratio	ER		24.2	32.37	1.8	2.7	8.0	14.7
Profile								
valley slope	S_{valley}	ft/ft	0.0056		0.065		0.0025	
channel slope	S_{chnl}	ft/ft	0.0043	0.0037	0.0565	0.0500	0.0019	0.0016
riffle slope	S_{riffle}	ft/ft	0.005	0.021	0.067	0.110	0.002	0.008
riffle slope ratio	S_{riffle}/S_{chnl}		1.1	5	1.1	1.8	1.1	5
pool slope	S_p	Ft/ft	0.000	0.0007	0.000	0.0200	0.0000	0.0003
pool slope ratio	S_p/S_{chnl}		0.0	0.2	0.0	0.4	0.0	0.2
pool-to-pool spacing	L_{p-p}	ft	12	53	11	28	15	68
pool spacing ratio	L_{p-p}/w_{bkf}		2	8.5	2	5	2	9
maximum pool depth	D_{maxp}	ft	0.8	1.5	0.7	1.3	0.0	1.8
pool depth ratio	D_{maxp}/d_{bkf}		1.6	3.0	2.0	3.5	1.6	3.0
Pattern								
sinuosity	K		1.06		1.30		1.65	
belt width	w_{blt}	ft	19	37	19	37	19	50
meander width ratio	w_{blt}/w_{bkf}		3.0	6.0	3.0	6.0	3.0	8.0
meander length	L_m	ft	31	68.2	28	60	30	82.5
meander length ratio	L_m/w_{bkf}		5.0	11.0	5.0	11.0	4.0	11.0
radius of curvature	R_c	ft	11	25	11	22	14	30
radius of curvature ratio	R_c/ w_{bkf}		1.8	4.0	2.0	4.0	1.8	4.0

[1] UT1B is classified in existing conditions as a sand bed stream. This is thought to be reflective of manipulation (impoundment and channelization resulting in a less steep stream). The restored stream, with slopes exceeding 2% grade throughout the reach, will be a gravel dominated stream, and is classified as such.

10.5 Sediment Transport Analysis for Proposed Restoration Channels

A sediment transport analysis was performed for the restoration reaches. Steeper project reaches are being designed as threshold channels. This is appropriate for steep headwater streams with low sediment supply and where grade control is a large factor in stability. In less steep gravel bed channel segments, both sediment transport competence and capacity are assessed. In floodplain channels, gravel particle sizes will have limited mobility and deposition is expected. In other areas of the floodplain, sand particles will be mobilized at flows near and often well below bankfull (Knighton, 1998), so competence is assumed and capacity is analyzed to assess sediment continuity and capacity relative to supply.

The steeper project reaches, UT1 Reach 1 and UT1B, with slopes of 4-5% or greater and historically narrow valleys are naturally coarse bed systems. However, manipulation of streams has led to gravel and sand dominated materials in these reaches. The natural channel morphology for the restored UT1 Reach 1 and UT1B valleys is a B-type step-pool channel. Competency calculations have been performed to guide the suitability of existing channel material for reuse as grade control, as well as to calculate a recommended size range of imported riffle substrate and to size rock drop and cascade cobble and boulder material. Using the calculated shear stress to plot the upper and lower bounds of movable particles based on the Leopold, Wolman and Miller data (1964) provides guidance as to the primary range of riffle material sizes that will be near the mobility threshold under full bank flow conditions. Using the same shear stress to plot the particle size mobility threshold using the Colorado curve gives an upper bound that may also be used for sizing of low-mobility grade control features. We are electing to use smaller boulders than suggested by the Colorado curve based on prior project experience in the Southeast, and based on the use of construction practices that interlock particles.

UT1 Reach 2, UT2, and UT1A are "floodplain tributaries" which flow on the floodplain of the Henry Fork. These streams, in their present manipulated state, are silt bed channels with adjacent wetlands and are characterized by shallow slopes, although UT1A and the tie-in reach of UT1 Reach 2 exceed 1% to tie into their incised master streams. Given the drastic reduction in slope from the steeper UT1 valley to the flat valley of Henry Fork, and the corresponding loss of capacity and competency, it is a reasonable assumption that something resembling a deltaic morphology may have naturally occurred at the junction. Maintenance efforts by the golf course were partly focused on dredging to create deeper, more competent, channels in order to compensate for the natural reduction in energy and tendency towards a depositional sediment regime. Photographic records and existing conditions suggest that even dredging was ineffective over time at accomplishing sediment continuity. Loss of sediment transport capacity, competency, sediment load, and flow continuity are a natural condition when steeper valleys flow into broad, flat alluvial floodplains. A natural geomorphic condition in such settings includes coarse material deposition resulting in braided alluvial fan development. Due to widespread manipulation of channels and floodplains for prior agriculture, few intact examples of natural alluvial fan conditions are found in the Piedmont landscape. Within the project, construction of ponds, in particular Pond 2 on UT1 Reach 1, has resulted in a stable example of braided channel development. This is the closest design analog as could be found for reference-like conditions. The resulting habitat is diverse and appears to offer favorable conditions for a variety of aquatic species, as shown in the photograph below. Sediment analyses are further discussed in the following subsections.

10.5.1 Competence Analysis

A competence analysis was performed for each reach using HEC-RAS models to calculate shear stress for existing and proposed conditions. The existing average shear stress along the channel, for the channel flowing full condition, was compared to the proposed average shear for the bankfull (channel flowing full) condition. The channel flowing full condition represents a larger flow for the existing conditions case on most of the tributaries, owing to the incised and dredged conditions present. However, this comparison is a suitable analysis of the maximum shear stress imposed on the channel bed and banks.

Multiple Channel Threads at Head of Pond 2 as a Result of Loss of Sediment Transport

The existing and proposed shear stresses can be compared with the critical shear stresses based on the existing conditions particle size distribution data collected. Critical shear is obtained from the revised Shields diagram (Rosgen, 2013), and is shown in Table 19 to allow for a comparison of the degree to which shear stress in the proposed stream will be able to move the bed material relative to existing conditions. This comparison shows that the restored channels will still move the majority of the existing bed particle sizes without moving particles that are an order of magnitude larger than those presently found in the system. This reduction in bedload mobility will allow for greater bed feature stability and a more diverse armoring layer. The existing armoring layer, where present, is large and uniform since only the largest of the available particle sizes are large enough to be maintained within the existing ditched and incised reaches. This is particularly true for the steep reaches.

Results in Table 19 indicate that restoration activities will reduce the ability of UT1 Reach 1 Upper and Lower to move bed material. The analysis suggests that the stream will be able to move small cobble under proposed conditions, versus large cobble under existing conditions. Ten percent of the pebble count, representative of the armor layer, was small cobble. No particles were larger than small cobble. Existing conditions have excessive competency and the reduced competency of the design channel is likely to benefit stability of bed features and habitat.

In UT1 Reach 2, the analysis suggests that fine gravel will be mobile versus cobble under existing conditions. It is expected that gravel and sand riffles will develop in areas currently dominated by silt and clay particles that have deposited as a result of dredging as well as upstream impoundment.

In UT2 and UT1A, a similar conclusion may be reached, although the watersheds are very small and may not supply enough gravel to replenish material imported or relocated from existing reaches to construct the project. As such, import material will be designed near the mobility threshold to provide a coarse substrate that provides for a greater diversity of habitat. In addition, brush and woody riffles will be used to create bed stability and habitat diversity.

In Reach 1B, small to large cobble was collected during pebble count sampling as 10% of the sample; the largest material size (~180 mm) was mobile under existing conditions. Under proposed conditions, the majority of the cobble is not mobile. This will mean that some of the available on-site material can be reused to provide stable bed forms in this steeper channel.

The combination of proposed increased width-depth ratios, slope modifications, and channel dimension modifications suggests stabilizing benefits for the stream systems proposed. Reduced shear will translate to reduced bank stresses and erosion, reduced bed instability and downcutting, and more natural braiding and floodplain tributary formation. Pilot channels will be excavated in the floodplain stream-wetland systems that will mimic channel braiding and create floodplain diversity as well as areas for deposition during the initial project stabilization period where more sediment supply is likely due to shifting and settling of loose bed material. Pilot channels and future natural braiding that may occur will result in diverse floodplains that add habitat value to the proposed wetland complexes.

Minimal change in sediment supply is anticipated in the upper reaches (above golf course ponds), and reestablishment of a natural sediment regime will be part of the restoration process in UT1 Reach 2 which is currently impaired by manmade ponds.

Table 19: Sediment Transport Competence Analysis – Channel Flowing Full – *Henry Fork Mitigation Site*

Parameter	UT1 Reach 1 Upper & Lower	UT1 Reach 2	UT1A	UT1B	UT2
D50 of subpavement sediment sample (mm)	8.3	N/A[1]	0.34	5.3	0.04
D84 of subpavement sediment sample (mm)	34	N/A[1]	1.2	29	0.07
D100 subpavement particle sampled (mm)	50	N/A[1]	8.2	37.5	0.55
Shear Stress required to move :					
D50 particle	0.12	N/A[1]	0.005	0.063	<0.001
D84 Particle	0.44	N/A[1]	0.015	0.31	0.0012
D100 particle	0.65	N/A[1]	0.12	0.49	0.0087
Existing Shear Stress	2.3-3.1	0.8-1.6	0.7	1.3-2.4	0.18-0.25+[3]
Movable Particle Size (mm) Shield curve	186-253	62-128	54	102-194	13-18+
Proposed Shear Stress	1.0-1.2	0.06	0.13	0.91	0.05
Movable Particle Size (mm) Shield curve	78-94	4.1	9.3	70.7	3.4

[1] No subpavement sample taken in Reach 2. Material very similar to UT2 and UT1A.
[2] Existing shear stress based on 5 to 25-event required to fill channel.
[3] The 25-year event was the largest event modeled; it does not fill the channel.

10.5.2 Capacity Analysis

In order to assess whether capacity or supply-limiting conditions are applicable, a sediment transport capacity analysis begins with an assessment of the existing watershed and stream channels, as well as a determination of expected changes to the watershed. The result of such an assessment yields a qualitative understanding of sediment supply based on existing and future channel and watershed conditions. This understanding guides the type, sophistication and interpretation of sediment transport analyses required to properly design the system.

In unstable or rapidly changing watersheds, or for streams with visual signs of high bedload supply, detailed analysis including field data collection may be necessary to ensure a proper design. A watershed assessment was conducted for this project as described in Sections 4.1 and 4.2 of this document. Historical land use changes within the watershed were analyzed through aerial photo review, and the existing conditions were evaluated on the ground. UT1, UT1B, and UT1A watersheds are relatively stable, and essentially nearly built-out given the terrain conditions and urban growth patterns that are to be expected in this residential/suburban setting. The UT2 watershed is held by fewer landowners with some agricultural operations on-going. Although unlikely, the potential for sale and development of these parcels is present. Additional residential construction in any of the contributing watesheds, if it were to occur, would be most likely to take occur on existing grassed landscapes, rather than forested. The change in runoff and sediment loading would be likely inconsequential.

The STEPL analysis estimates an annual loading rate of 14 tons/year for existing conditions, 98% of this total is generated from UT1 (13.7 tons/year), and the remained from UT2 (0.3 tons/year).

For comparison, the average bankfull transport capacity for multiple methods tested is approximately 3.9 tons/day for UT1 Reach 2, and 12 tons/day for UT2. Given that annual loading from the watershed is going to occur over many, or dozens, of events, and that lesser flows, such as half bankfull, also move substantial percentages (e.g. 25%) of the bankfull load, it is likely that supply-limiting conditions are more frequent than capacity-limiting conditions. In the steeper project tributaries (UT1 Reach 1 and UT1B), the transport rates are more than an order of magnitude higher owing the influence of slope on transport rate calculations – e.g. the bankfull capacity for UT1 Reach 1 is approximately 600-700 tons/day of gravel alone, using the MPM bedload transport equation. These tributaries are certainly supply-limited, although a more interesting analysis of transport capacity sorted by particle size is presented below. No other capacity analysis is proposed for steep step-pool reaches.

For floodplain tributaries, an appropriate transport capacity analysis is to compare the capacity of the existing channels to that of the proposed to understand the impact of the project. If proposed channels do not have excessively low capacity (compared to reference conditions or watershed loading rate estimates), channels will have the capacity to move sediment supply and the existing channels will not experience long-term aggradation. If capacity is greater than supply, this condition does not present a concern to the restoration project - excess capacity can be tempered by grade control structures. Grade control is designed into all of the project reaches using methods that consider competency calculations in order to maintain stable grade control within each reach.

For floodplain tributaries, UT2, UT1A, and UT1 Reach 2), multiple flows were modeled for hydraulics and sediment transport capacity using the hydraulic design function in HEC-RAS. HEC-RAS models were built for representative existing and proposed conditions. The sediment transport capacity module uses the hydraulic modeling output, along with bed material data (from bulk and subpavement sample results), to estimate capacity using selected sediment transport functions. Various sediment transport functions are available, and applicable functions were selected with consideration of channel size and slope, bed material size ranges, channel velocities, and other variables. The functions used for each reach are summarized in the tabular summary. Information on these equations is available in the HEC-RAS user's manual (Hydrologic Engineering Center, 2010). These average results for each reach comparing existing and proposed hydraulic conditions, are shown in Table 20.

Table 20: Sediment Transport Capacity of Floodplain Tributaries Existing and Proposed Reaches - *Henry Fork Mitigation Site*

Sediment Transport Capacity[1]		
	Existing (tons/day, average)	**Proposed (tons/day, average)**
UT2[2]	16.8	12.3
UT1A[3]	1317	163
UT1 Reach 2[4]	17.5	3.9

[1] Values reported are for Bankfull flow event at a representative cross section in the model
[2] The Ackers-White, Englund-Hansen, and Yang sediment transport functions were used to calculate average transport capacity for UT2 existing and proposed.
[3] The Ackers-White and Yang sediment transport functions were used to calculate average transport capacity for UT1A existing and proposed.
[4] The Ackers-White, MPM, and Yang sediment transport functions were used to calculate average transport capacity for UT1 Reach 2 existing and proposed.

The results show that for UT2 the proposed capacity is 80% of existing capacity for the bankfull flow. The minor reduction in slope is the primary cause of the reduced capacity, but this slope reduction is necessary for wetland re-establishment efforts. Deposition on banks is possible and will result in a more efficient cross-section than the design cross-section which has an intentionally high width-to-depth ratio. The more efficient section will result in transport similar to existing conditions in the middle third of UT2, which has an adequate low flow channel that has formed within the dredged ditch.

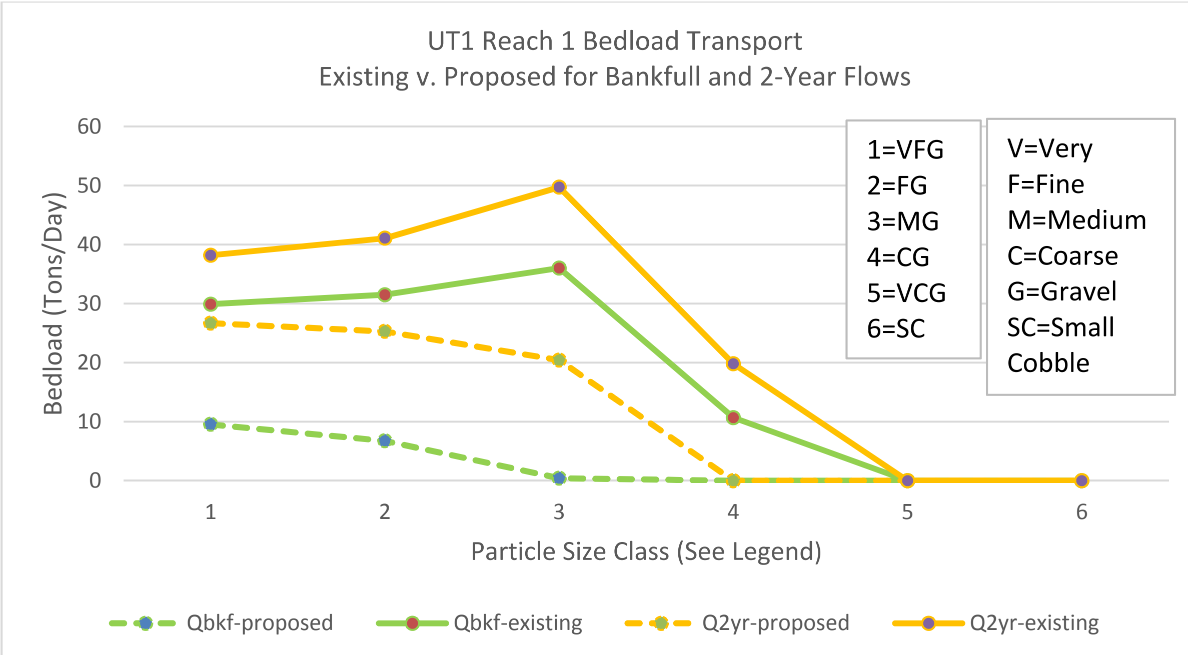
The results show that, for UT1A, the proposed capacity is approximately 10-20% of existing capacity for the bankfull flow. The reduction is in large part related to the slope being reduced by half. The reach has a very limited sediment supply since it is mostly fed by hillslope seepage, and its catchment is small. A reduction in capacity is not a concern for this supply-limited tributary, and grade control features will ensure that the proposed conditions do not result in long-term degradation.

The results for UT1 Reach 2 show that the proposed capacity is 25% of the existing value. The reduction is a result of the reduced slope and a higher width-to-depth ratio for the design channel. The proposed capacity of 3.9 tons/day is still expected to be a condition that is limited by supply rather than capacity. The restored UT1 Reach 1 vastly exceeds this capacity, but delivery to UT1 Reach 1 is limited by watershed conditions. During flow events where incompetent particles are brought into the reach and cause a condition where cross-sectional area is reduced and supply exceeds capacity (which is expected to occur in this position on the landscape), pilot channels have been designed into the project to provide flood relief, and delivery of sediment to the floodplain. Channels will move sand through the system over time, however, gravels are expected to deposit and form grade control features and potentially lead to greater channel bifurcation common in deltaic settings.

In all of the alluvial channels, deposition on banks is possible as one mechanism by which the channel may naturally narrow to form a more efficient cross-section. The design cross-sections have intentionally high width-to-depth ratio, a typical restoration practice intended to allow for self-adjustment (narrowing).

While the results in Table 20 indicate that the sediment transport capacity for the restored alluvial stream reaches will be significant reduced from existing conditions, Wildlands has recently completed similar projects with valley slope breaks. Our assessment is that the reduced capacity is inevitable and that a combination of low watershed sediment supply, and a design that incorporates braided floodplain pilot channels will result in the development of stable and diverse stream-wetland systems in the floodplain tributaries.

Lastly, the steeper UT1 Reach 1 was modeled, and is a suitable analog for Reach 1 Upper and Lower, as well as for UT1B. An analysis of various flows was conducted to compare the existing and proposed sediment transport capacity in this steeper reach that has a channel slope of approximately 5%. The sediment transport rating curves and shear stress rating curves show that the proposed design will result in reductions to capacity and shear for flows exceeding the bankfull design storm which is a positive outcome in this high energy supply-limited stream. Oversized channels with excessive capacity and shear lead to increased incision and over-widening as part of channel evolution. One interesting outcome from modeling is that gravel and cobble transport capacity was reviewed and shows the expected size of material that will contribute to riffle armor layer development. The modeling predicts that medium to coarse gravel will be low mobility in the proposed stream, where-as coarse gravel and cobble is a more dominant armoring material size in the existing stream. Modeling data is supported by observation of riffles, and by pebble count data. The greater diversity of riffle particle sizes is expected to create more heterogeneous habitat niches.



Shows that the proposed design will retain more medium and coarse gravel for the bankfull and 2-year flow events based on the MPM bedload transport function

10.6 Project Implementation

10.6.1 Grading, Soil Restoration, Vegetation and Installation of Stream Structures

All tributaries on the Henry Fork site will be improved through restoration techniques. Because UT1A and UT2 are intermittent and part of wetland-stream complexes, Enhancement I crediting is being sought for these tributaries. Soil restoration through topsoil harvesting, and through the harvesting and application of leaf litter from adjacent forested areas will be used to enhance soil productivity and vegetative success.

There is currently little or no buffer along the proposed restoration corridors (where streams should run within their valleys), and activities will include planting a minimum of 50 feet wide riparian buffer on each side of the channel with native tree species, and treating any invasive species. In addition, the right bank of Henry Fork will be planted within the easement with a 100-foot-wide riparian buffer as part of the overall site treatment.

Streams in the steeper valleys incorporate Priority 1 restoration techniques and streams in the floodplain use a hybrid approach, since fill must first be removed to recreate the stream valleys. Where necessary, the floodplains will be reshaped to improve functioning in overbank events. Steeper tributaries will have concave floodplains, while floodplain tributaries will have flat floodplains that are conducive to delivering water to adjacent wetlands. The streambeds will be composed of alternating step-pool and riffle-pool sequences to provide habitat and flow diversity. The cross-sectional dimensions of the channels will be reconstructed as designed with stable side slopes that are matted and planted with native vegetation, or stabilized with harvested sod mats consisting of native herbaceous material, for long-term stability. Brush toe built from on-site materials will be used to protect banks and provide aquatic habitat.

Instream structures will primarily include constructed riffles and various types of log and rock drops (sills). Several types of constructed riffles will be utilized in the restoration reaches to establish a varied flow pattern, habitat, and grade control, while providing a source of carbon for nutrient cycling. Native rock of various sizes (cobble, gravel, and fines) harvested on site will be used as much as possible to create these types of riffles. Types of riffles proposed for this site include:

- Chunky riffles with larger (small boulder and large cobble) rock embedded throughout the length of the native rock riffle to provide additional habitat as well as grade control for steeper riffles;
- Native material riffles to re-establish a large gravel substrate to the channels;
- Woody riffles with brush and logs compacted into the bed of native rock to increase woody material in the channel; and
- Jazz riffles to incorporate larger woody debris and meander the thalweg within longer riffles.

10.7 Proposed Wetland Design Overview

The wetland design will include rehabilitation and enhancement of several currently jurisdictional areas and the re-establishment of two larger historically altered wetland areas. The wetland re-establishment design will include filling oversized drainage ditches, grading to increase surface drainage into wetland areas from upland areas, removal of overburden to uncover hydric soils, raising stream beds, creating surface roughness, and planting of native vegetation. The rehabilitation design includes raising stream beds and planting of native vegetation, as well as grading which was necessary as discussed under Section 6.1. Grading was avoided where possible within jurisdictional wetlands. The enhancement design includes planting of native vegetation and the treatment of invasive species within jurisdictional wetlands. Current jurisdictional wetlands are mostly grassed with golf course vegetation, and trees have been removed. Enhancement efforts will significantly improve the quality of vegetation in existing wetlands.

Wetland 1 (Figure 9) will be restored by removing the existing drainage and retention features, such as ditches and ponds, grading to remove overburden from relic hydric areas, and realigning and restoring natural channel features. Currently, site hydrology is impaired by a series of ponds and straightened channels designed to limit overbank events and encourage drainage of the area around Wetland 1. To restore hydrology, the current impoundments will be removed and drainage ditches will be filled and re-aligned to natural meandering channels. By removing the ponds and restoring the natural dimension, pattern, and profile to the adjacent channels, the frequency of overbank events will increase. By combining the drainages of UT2 and UT1 and re-routing the proposed channel through Wetland 1, the natural flooding regime of the system will be restored. In addition, the bed elevation of UT1A will be raised and the channel will be given a meandering pattern to encourage stream and floodplain interaction.

Similar to Wetland 1, Wetland 2 will be restored by reestablishing a natural hydrologic interaction with UT2 and through grading to remove overburden from relic hydric areas (Figure 9). UT2 will be restored to a shallow meandering channel which will flood Wetland 2 frequently and restore a natural flooding regime to the system. The existing UT2, which has been straightened and oversized to promote drainage of Wetland 2, will be filled to decrease current drainage effects.

Grading to remove the overburden layer from the relic hydric areas is proposed for Wetlands 1 and 2. Using the information from the detailed hydric soils investigations (Section 6.3), depths of overburden removal to uncover hydric soils were determined for the wetland re-establishment areas. Average depth of overburden removal is approximately 24 inches within Wetland 1 and 11 inches within Wetland 2. Depths of overburden were previously discussed with members of the IRT on an assessment site walk.

As previously mentioned, the site is a former golf course that has been heavily graded and sculpted to create raised tee boxes and greens and flat fairways among other features. This manipulation of the land, in addition to prior agricultural activities, has resulted in relic wetlands buried by fill material. The grading plan was developed to remove the overburden with the intention of bringing the buried A horizon within 12 inches of the soil surface.

The overall grading plan was developed with consideration of overburden removal depths, current jurisdictional wetland delineations (Section 6.1), and information obtained from existing and proposed Drainmod groundwater models (Section 6.2.1). As discussed with the IRT, average removal varies from 6-24". Upon completion of grading, wetland zones will be roughened to coarsen the soil surface. Irregularities in the soil surface will create localized storage areas for surface water, allowing for infiltration of surface water into the soil.

Current invasive vegetation in wetland areas will be removed and a native riparian wetland community will be established. In order to alleviate compaction and promote vegetation success, soil mixing and roughening will be completed as a surface treatment after completion of grading. Sod mats will be harvested on site to stabilize graded area, where applicable. Current jurisdictional wetland areas will benefit from the treatment of invasive vegetation and establishment of a forested community over time.

The goal for the two wetland areas is to create a stream/wetland complex similar to the reference wetland community at Lyle Creek, outlined in Section 7.2. Increased floodplain inundation and higher water tables near stream channels will improve vegetation in current jurisdictional areas as well as proposed wetland re-establishment areas. The removal of overburden will promote the re-establishment of hydric soils within top twelve inches of the soil surface. The restoration of associated channels will promote wetland hydrology. Overall, site changes will produce higher water tables and ultimately serve to re-establish a Piedmont Bottomland Forest stream and wetland complex, which will resemble the conditions of the site prior to manipulation.

10.8 Target Plant Communities

The target communities for the restored riparian buffer and wetland areas will be based on the following:

- Vegetation listed for these community types in Classification of the Natural Communities of North Carolina (Schafale and Weakley,1990);
- Native trees with proven success in early successional restoration sites; and
- Consultation with native tree suppliers.

As a final stage of construction, riparian stream buffers and wetlands will be planted and restored with native trees and herbaceous plants representative of the natural plant community that exists within the project watershed with an emphasis on early successional commercially available species. Individual tree and shrub species will be planted throughout the project easement including stream banks, tops of banks, and floodplain zones. These species will be planted as bare root and live stakes and will provide additional stabilization to the outsides of constructed meander bends and side slopes. Live stakes will be planted on channel banks in tangent sections and outer meander bends. Point bars will not be planted with live stakes. Low growing permanent herbaceous seed will be placed on stream banks, floodplains, and additional disturbed areas within the conservation easement. Areas disturbed within temporary construction easements will be seeded to achieve ground cover with seed type agreed to by owner. Proposed plant lists and limits of planting are included in the preliminary plan set.

The total acreage of proposed riparian and wetland planting is less than 15 acres. Of this, approximately 4.7 acres is wetland planting and the remainder is riparian planting. Additional acreage is being planted along the right bank of Henry Fork (mainstem) as a voluntary, uncredited, activity that will none-the-less be monitored for achievement of success criteria.

11.0 Maintenance Plan

The site shall be monitored on a regular basis and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

Table 21: Maintenance Plan - *Henry Fork Mitigation Site*

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank erosion. Beaver activity will be monitored and beaver dams on project streams will typically be removed during the monitoring period to allow for bank stabilization and stream development outside of this type of influence.
Wetlands	Routine wetland maintenance and repair activities may include supplemental installations of target vegetation within the wetland. Areas where storm water and floodplain flows intercept the wetland may also require maintenance to prevent scour.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis.

12.0 Performance Standards

The stream and wetland performance criteria for the project site will follow approved performance criteria presented in the DMS Mitigation Plan Template (version 2.2, 6/8/2012), the DMS Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011), and the Stream Mitigation Guidelines issued in April 2003 by the USACE and NCDWQ. Annual monitoring and semi-annual site visits will be conducted to assess the condition of the finished project. The stream restoration sections of the project will be assigned specific performance criteria components for stream morphology, hydrology, and vegetation. Wetland rehabilitation and re-establishment areas will be assigned specific performance criteria for wetland hydrology and vegetation. Performance criteria will be evaluated throughout the seven-year post-construction monitoring. If all performance criteria have been successfully met and two bankfull events have occurred during separate years, Wildlands may propose to terminate stream and/or vegetation monitoring after year five, in accordance with the Early Closure Provision in the DMS Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011).

An outline of the performance criteria components follows.

12.1 Streams

12.1.1 Dimension

Riffle cross-sections on the restoration reaches should be stable and should show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Per DMS guidance, bank height ratios shall not exceed 1.2 and entrenchment ratios shall be at least 2.2 for restored C- and E- type channels to be considered stable. All riffle cross-sections should fall within the parameters defined for channels of the appropriate stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability. It is important to note that in fine-grained and sand bed channels pools and bed forms (ripples, dunes, etc.) may migrate over time as a natural function of the channel hydraulics. These sorts of bed changes do not constitute a problem or indicate a need for remedial actions.

12.1.2 Pattern and Profile

Visual assessments and photo documentation should indicate that streams are remaining stable and do not indicate a trend toward vertical or lateral instability. As mentioned above, migration of pools and bed forms in fine-grained channels are expected and do not require remedial action.

12.1.3 Substrate

Channel substrate materials will be collected along UT1 Reach 1 and UT1B, which are dominated by cobble and gravel. The remaining streams within the project site are dominated by sand and silt-size particles. Pebble count and/or bulk sampling procedures along these fine-grained streams would not show a significant change in bed material size or distribution over the monitoring period.

UT1 Reach 1 and UT1B restoration reaches should indicate a progression towards or the maintenance of coarser materials in the riffle features and smaller particles in the pool features. A reach-wide pebble count will be performed in each restoration reach each year for classification purposes. A pebble count will be performed at each surveyed riffle to characterize the pavement.

12.1.4 Photo Documentation

Photographs should illustrate the site's vegetation and morphological stability on an annual basis. Cross-section photos should demonstrate no excessive erosion or degradation of the banks. Longitudinal photos should indicate the absence of persistent bars within the channel or vertical incision. Grade control structures should remain stable. Deposition of sediment on the bank side of vane arms is preferable. Maintenance of scour pools on the channel side of vane arms is expected.

12.1.5 Bankfull Events and Intermittent Stream Hydrology

Two bankfull flow events must be documented on the restoration and enhancement reaches, within the seven-year monitoring period. The two bankfull events must occur in separate years. Stream monitoring will continue until success criteria in the form of two bankfull events in separate years have been documented.

Adequate hydrology for intermittent streams must be documented. Direct measurements of continuous interval stream flow data will be made with a gage. The flow regime should indicate sufficient flow to maintain an Ordinary High Water Mark (OHWM). Photographic evidence of streamflow coupled with rainfall gage data from the project site will be used to help support this assessment.

12.2 Vegetation

The final vegetative success criteria will be the survival of 210 planted stems per acre in the planted riparian and wetland areas at the end of the required monitoring period (year seven). The interim measure of vegetative success for the site will be the survival of at least 320 planted stems per acre at the end of the third monitoring year and at least 260 stems per acre at the end of the fifth year of monitoring. Planted vegetation must average 10 feet in height in each plot at the end of the seventh year of monitoring. If this performance standard is met by year five and stem density is trending towards success (i.e., no less than 260 five year old stems/acre), monitoring of vegetation on the site may be terminated provided written approval is provided by the USACE in consultation with the NC IRT. The extent of invasive species coverage will also be monitored and controlled as necessary throughout the required monitoring period (year five or seven). This effort will also include the 100-foot buffer along Henry Fork.

12.3 Wetlands

The preliminary wetland performance standard used to evaluate site hydrology is that the water table must be within 12 inches of the ground surface at each gage for a minimum of 17 consecutive days (7.2%) of the 236 day growing season (March 20 through November 11) for Catawba County. The process used to determine the wetland performance standard is outlined in Section 5.3.1.4 of this report. The growing season was determined from the long-term records from the National Weather Service provided in the WETS table for the Hickory Regional Airport and may be evaluated at the project site during the monitoring period using soil temperature loggers in order to base growing season on the measured data.

12.4 Visual Assessments

Visual assessments should support the specific performance standards for each metric as described above.

13.0 Monitoring Plan

Using the DMS Baseline Monitoring Plan Template (version 2.0, 10/14/10), a baseline monitoring document and as-built record drawings of the project will be developed within 60 days of the planting completion and monitoring installation on the restored site. Annual monitoring data will be reported using the DMS Monitoring Report template (version 1.5, 6/8/12). The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of DMS databases for analysis, research purposes, and assist in decision making regarding close-out. The monitoring period will extend seven years beyond completion of construction or until performance criteria have been met per the criteria stated in the DMS Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011). All survey will be tied to grid.

13.1 Site Specific Monitoring

Project monitoring requirements are listed in more detail in Table 22. Approximate locations of the proposed vegetation plots and groundwater gage monitoring components are illustrated in Figure 11.

Table 22: Monitoring Requirements - *Henry Fork Mitigation Site*

Parameter	Monitoring Feature	Quantity/ Length by Reach					Frequency	Notes
		UT1	UT1A	UT1B	UT2	Wetlands 1 & 2		
Dimension	Riffle Cross Sections	3	1	1	2	N/A	Year 1, 2, 3, 5 and 7	
	Pool Cross Section	3	1	1	2	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	1
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	
Substrate	Reach wide (RW), Riffle (RF) 100 pebble count	RW-2, RF-2	N/A	RW-1, RF-1	N/A	N/A	N/A	2
Stream Hydrology	Crest Gage/ Transducer	1	1	1	1	N/A	N/A	3
Wetland Hydrology	Groundwater Gages	n/a	n/a	n/a	n/a	7	Quarterly	
Vegetation	CVS Level 2	15					Year 1, 2, 3, 5 and 7	4
Exotic and nuisance vegetation							Annual	5
Project Boundary							Annual	6
Reference Photos	Photographs	29					Annual	

Notes:

1. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during as-built baseline monitoring survey only, unless observations indicate lack of stability and profile survey is warranted in additional years.
2. Riffle pebble counts will be conducted on UT1 Reach 1 upper and lower cross sections only, but not on UT1 Reach 2.
3. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers will be set to record stage once every hour or more frequently if deemed necessary. Device will be inspected and downloaded semi-annually. Transducers will be used on intermittent streams to evaluate flow regime.
4. 13 plots were required based on the 14.9 acres to be planted within required project stream buffers and wetlands. An additional 2 vegetation plots have been added within the 100-foot planting buffer on Henry Fork.
5. Locations of exotic and nuisance vegetation will be mapped.
6. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

13.2 Streams

13.2.1 Dimension

In order to monitor the channel dimension, one permanent cross-section will be installed per 1000 LF along the stream restoration and enhancement level 1 reaches, with riffle and pool sections in proportion to DMS guidance. Each cross-section will be permanently marked with pins to establish its location. Cross-section surveys will include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg. If moderate bank erosion is observed within permanent cross-sections, or in other sections of the project streams, during the monitoring period, an array of bank pins will be installed in the permanent cross-section where erosion is occurring for reaches with a bankfull width of greater than three feet. Bank pins will be installed on the outside bend of the cross-section in at least three locations (one in upper third of the pool, one at the permanent cross-section, and one in the lower third of the pool). Bank pins will be monitored by measuring exposed rebar and maintaining pins flush to bank to capture bank erosion progression. Cross-section and bank pin survey (if applicable) will be conducted in monitoring years one, two, three, five, and seven.

13.2.2 Pattern and Profile

To ensure accordance with design plans, a longitudinal profile will be performed as part of the baseline monitoring document and as-built record drawings of the project. This will be developed within 60 days of the planting completion and monitoring installation on the restored site. Longitudinal profile surveys will not be conducted during the seven year monitoring period, unless other indicators during the annual monitoring indicate a trend toward vertical and lateral instability. If a longitudinal profile is deemed necessary, monitoring will follow standards as described in the DMS Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011) and the 2003 USACE and NCDWQ Stream Mitigation Guidance for the necessary reaches.

13.2.3 Substrate

Because UT1A, UT2, and UT1 Reach 2 are dominated by sand and silt-size particles, pebble count and/or bulk sampling procedures would not be expected to show a significant change in bed material size or distribution over the monitoring period; therefore, bed material analyses will not be conducted for this project. Channel substrate distribution will not be a component of project success criteria for these stream reaches.

For UT1 Reach 1 Upper and Lower, and for UT1B, these channels are being designed as step-pool channels. Substrate materials in these reaches should indicate a progression towards maintenance of coarser materials in the riffle features and smaller particles in the pool features. A reach-wide pebble count will be performed in each reach each year for classification purposes. A pebble count will be performed at each surveyed riffle to characterize the pavement layer.

13.2.4 Photo Documentation

Permanent reference photographs will be taken once a year to visually document stability for seven years following construction. Permanent markers will be established and located with GPS equipment so the same locations and view directions on the site are photographed each year. Photos will be used to monitor restoration and enhancement stream reaches, as well as vegetation plots and wetland areas.

Longitudinal reference photos will be established at the tail of riffles approximately every 200 LF along the channel by taking a photo looking upstream and downstream. Permanent cross-section photos, looking upstream and downstream, and vegetation plot reference photos will be taken at the same time as the stream and vegetation surveys are conducted (years one, two, three, five, and seven). Reference photos will also be taken within wetland areas on an annual basis during the visual site assessment. The photographer will make every effort to consistently maintain the same area in each photo over time.

13.2.5 Bankfull Events and Intermittent Stream Hydrology

Bankfull events will be documented using a crest gage or transducer, photographs, and visual assessments such as debris lines. The gages will be installed within a permanent surveyed riffle cross-section on the restored channels. The gages will be checked at each site visit to determine if a bankfull event has occurred. Photographs will be used to document the occurrence of debris lines and sediment deposition.

Stream hydrology of intermittent tributaries (UT2 and UT1A) will be monitored using a transducer or other suitable surface water gage. The purpose will be to demonstrate a flow regime that would be expected to maintain an Ordinary High Water Mark (OHWM). Photographs of current stream conditions on intermittent tributaries will be taken during site visits. Photographs will be used to document the occurrence of staining and debris and/or sediment deposition.

13.2.6 Vegetation

Vegetation monitoring plots will be installed and evaluated within the stream and wetland areas, as well as within the 100-foot buffer along Henry Fork, to measure the survival of the planted trees. The number of monitoring quadrants required is based on the DMS monitoring guidance documents (version 1.4, 11/7/11). The size of individual quadrants will be 100 square meters for woody tree species and shrubs. Vegetation assessments will be conducted following the Carolina Vegetation Survey (CVS) Level 2 Protocol for Recording Vegetation (2006).

The initial baseline survey will be conducted within 21 days from completion of site planting and used for subsequent monitoring year comparisons. The first annual vegetation monitoring activities will commence at the end of the first growing season, during the month of September. The restoration and enhancement sites will then be evaluated in monitoring years two, three, five, and seven between June 1 and September 31. Species composition, density, and survival rates will be evaluated on an annual basis by plot and for the entire site. Individual plot data will be provided and will include height, density, vigor, damage (if any), and survival. Planted woody stems will be marked annually, as needed, and given a coordinate, based off of a known origin, so they can be found in succeeding monitoring years. Mortality will be determined from the difference between the previous year’s living planted stems and the current year’s living planted stems.

13.3 Wetlands

13.3.1 Hydrology

In order to monitor the wetland rehabilitation and re-establishment areas, wetland hydrology will be monitored using groundwater monitoring wells (gages) installed according to USACE recommended procedures. The gages used for this activity are typically In-situ Level TROLL® 100 or 300 pressure transducers. An additional gage will be established in an adjacent reference wetland and will be utilized to compare the hydrologic response within the restored wetland areas at the Site. The proposed location of monitoring gages and the proposed reference gage are denoted in Figure 11. All gages will be set to record the ground water level two times per day. An onsite rain gage will be established to record daily rainfall, and will be utilized to assess whether typical weather conditions occur during the monitoring period. If a particular groundwater gage does not meet the performance standard for a given monitoring year, rainfall patterns will be analyzed and the hydrograph will be compared to that of the reference wetlands to assess whether atypical weather conditions occurred during the monitoring period.

13.4 Visual Assessments

Visual assessments will be performed along all stream and wetland areas on a semi-annual basis during the seven year monitoring period. Problem areas will be noted, such as channel instability (i.e. lateral and/or vertical instability, in-stream structure failure/instability and/or piping, headcuts), vegetated health (i.e. low stem density, vegetation mortality, invasive species or encroachment), beaver activity, or livestock access. Areas of concern will be mapped and photographed, accompanied by a written description in the annual report. Problem areas with be re-evaluated during each subsequent visual assessment. Should remedial actions be required, recommendations will be provided in the annual monitoring report.

14.0 Long-Term Management Plan

The site will be transferred to the NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

The NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program currently houses DMS stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The NCDENR Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation sites. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

The Stewardship Program will periodically install signage as needed to identify boundary markings. There are no livestock, or associated fencing, to maintain. There are no permanent crossings or other site features that will warrant long-term maintenance.

15.0 Adaptive Management Plan

Upon completion of site construction, DMS will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed, as described previously in this document. If, during the course of annual monitoring, it is determined the site's ability to achieve site performance standards are jeopardized, DMS will notify the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized DMS will:

- Notify the USACE as required by the Nationwide 27 permit general conditions;

- Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE;
- Obtain other permits as necessary;
- Implement the Corrective Action Plan; and
- Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

16.0 Financial Assurances

Pursuant to Section IV H and Appendix III of the Division of Mitigation Services' In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the US Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by DMS. This commitment provides financial assurance for all mitigation projects implemented by the program.

17.0 References

Andrews, E. D., 1983. Entrainment of gravel from naturally sorted river bed material, Geological Society of America Bulletin, 94, 1225-1231.

Benchmark Incorporated. Strategic Growth Study, Current Conditions Report. March 1999. http://www.catawbacountync.gov/Planning/Plans/Growth/section3.pdf

Environmental Bank and Exchange (EBX), 2002. Neu-Con Umbrella Wetland and Stream Mitigation Bank Westbrook Lowgrounds Site Specific Mitigation Plan. Cary, NC

Harman, Will. Personal communication, April 26, 2013.

Harman, W.H., et al. 1999. Bankfull Hydraulic Geometry Relationships for North Carolina

Streams. AWRA Wildland Hydrology Symposium Proceedings. Edited By: D.S. Olsen and

J.P. Potyondy. AWRA Summer Symposium. Bozeman, MT.

Interagency Advisory Committee on Water Data, 1981. Guidelines for Determining Flood Flow Frequency. Bulletin 17B. Washington, D.C.

Knighton, David, 1998. Fluvial Forms and Processes. New York, NY: John Wiley & Sons, 383 pp.

Lagasse, P.F., Schall, J.D., Johnson, F., Richardson, E.V., Richardson, J.R., and Chang, F., 2001. Stream Stability at Highway Structures, Second Edition. U.S. Department of Transportation, Report No. FHWA-IP-90-014, HEC-20-ED-2. Washington, DC: Federal Highway Administration, 132 p.

Multi-Resolution Land Characteristics Consortium (MRLC), 2001. National Land Cover Database. http://www.mrlc.gov/nlcd.php

Natural Resources Conservation Service (NRCS), 2011. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Natural Resources Conservation Service (NRCS), 2006. Catawba County Soil Survey. http://soils.usda.gov/survey/online_surveys/north_carolina/

Natural Resources Conservation Service (NRCS), August 2007. Part 654 National Engineering Handbook, Technical Supplement 3E. http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17833.wba

North Carolina Center for Geographic Information and Analysis (NC CGIA), 2001. Landcover GIS layer. http://data.nconemap.com/geoportal/catalog/main/home.page

North Carolina Division of Water Quality (NCDWQ), 2011. Surface Water Classifications. http://portal.ncdenr.org/web/wq/ps/csu/classifications

North Carolina Division of Water Quality (NCDWQ), 2012. North Carolina 303(d) List - Category 5. August 24, 2012. http://portal.ncdenr.org/c/document_library/get_file?uuid=9d45b3b4-d066-4619-82e6-ea8ea0e01930&groupId=38364

North Carolina Division of Mitigation Services (DMS), 2007. Catawba River Basin Restoration Priorities. http://www.nceep.net/services/restplans/RBRPCatawba2007.pdf

North Carolina Geological Survey (NCGS), 1985. Geologic map of North Carolina 1:500,000 scale.

North Carolina Division of Mitigation Services (DMS), 2010. Indian and Howards Creek Local Watershed Plan. http://www.nceep.net/services/lwps/Indian_Howards_Creek/INDIAN_HOWARD_CREEKS.html

North Carolina Geological Survey (NCGS), 1985. Geologic map of North Carolina 1:500,000 scale. Compiled by Philip M. Brown at el. Raleigh, NC, NCGS.

North Carolina Geological Survey (NCGS), 2013. Mineral Resources. http://www.geology.enr.state.nc.us/Mineral%20resources/mineralresources.html

North Carolina Natural Heritage Program (NHP), 2009. Natural Heritage Element Occurrence Database, Catawba County, NC. http://149.168.1.196/nhp/county.html

North Carolina State University (NCSU), 2010. DrainMod Related Publications. Accessed July 10, 2013, http://www.bae.ncsu.edu/soil_water/drainmod/drainmod_papers.html#wetland

North Carolina Wildlife Resources Commission. 2005. North Carolina Wildlife Action Plan. Raleigh, NC.

Northcott, W.J., Cooke, R.A., Walker, S.E., Mitchell, J.K., and Hirschi, M.C. 2001. Application of DRAINMOD-N to Fields with Irregular Drainage Systems. Transactions of the American Society of Agricultural Engineers (ASAE). Vol. 44(2): 241-249

Overby, Cal, City of Hickory Principal Planner. Personal communication, September 17, 2014.

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

Rosgen, D.L. 1997. A Geomorphological Approach to Restoration of Incised Rivers. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision. Center For Computational Hydroscience and Bioengineering, Oxford Campus, University of Mississippi, Pages 12-22.

Rosgen, D.L. 2001. A stream channel stability assessment methodology. Proceedings of the Federal Interagency Sediment Conference, Reno, NV, March 2001.

Rosgen, D.L. 2013. DRAFT Natural Channel Design for River Restoration. Wildland Hydrology, Fort Collins, CO.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina, 3rd approx. North Carolina Natural Heritage Program, Raleigh, North Carolina.

Simon, A. 1989. A model of channel response in disturbed alluvial channels. Earth Surface Processes and Landforms 14(1):11-26.

Simon, A., Rinaldi, M. 2006. Disturbance, stream incision, and channel evolution: The roles of excess transport capacity and boundary materials in controlling channel response. Geomorphology 79: 361-383.

Simon, A. 2006. Flow energy, time, and evolution of dynamic fluvial systems: implications for stabilization and restoration of unstable systems. In: Proceedings of the 2006 World Environmental and Water Resources Congress (R. Graham, Ed.), May 21-25, 2006, Omaha, Nebraska. CDROM.

Shields, D. F., Copeland, R. R, Klingman, P. C., Doyle, M. W., and Simon, A. 2003. Design for Stream Restoration. Journal of Hydraulic Engineering 129(8): 575-582.

Skaggs, R. W. 1980. DrainMod Reference Report: Methods for design and evaluation of drainage-water management systems for soils with high water tables. U. S. Department of Agriculture, Soil Conservation Service. 329 pp.

Skaggs, R.W., Youssef, M.A., and Chescheir, G.M. 2012. DRAINMOD: Model Use, Calibration, and Validation. Transactions of the American Society of Agricultural and Biological Engineers (ASABE). Vol. 55(4): 1509-1522

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey database for Catawba County, North Carolina. http://websoilsurvey.nrcs.usda.gov/.

Timberlake, Chris, Catawba County Planner. Personal communication, September 15, 2014.

U.S. Army Corps of Engineers, Hydrologic Engineering Center (HEC), 2010. HEC-RAS River Analysis System User's Manual, Version 4.1. Accessed online at: http://www.hec.usace.army.mil/software/hec-ras/documentation/HEC-RAS_4.1_Users_Manual.pdf

United States Department of Transportation, Federal Highway Administration (FHWA), 2006. Assessing Stream Channel Stability at Bridges in Physiographic Regions. Publication no. FHWA-HRT-05-072. McLean, VA.: Federal Highway Administration Office of Infrastructure Research and Development, 147 p.

United States Environmental Protection Agency (EPA), 2010. Spreadsheet Tool for Estimating Pollutant Load, version 4.1. http://it.tetratech-ffx.com/steplweb/models$docs.htm

United States Fish and Wildlife Service (USFWS), 2014. Endangered Species, Threatened Species, Federal Species of Concern and Candidate Species, Catawba County, NC. http://www.fws.gov/raleigh/species/cntylist/catawba.html

United States Geological Survey (USGS), 2009. Magnitude and Frequency of Rural Floods in the Southeastern United States, through 2006: Volume 2, North Carolina. Scientific Investigations Report (SIR) 2009-5158. USGS, Reston, VA.

United States Geological Survey (USGS), March 2014. Magnitude and Frequency of Floods for Urban and Small, Rural Streams in Georgia, South Carolina, and North Carolina, 2011. Scientific Investigations Report (SIR) 2014-5030, Version 1.1. USGS, Reston, VA.

URS Corporation, 2007. Unnamed Tributary to Cane Creek Restoration Plan. Morrisville, NC.

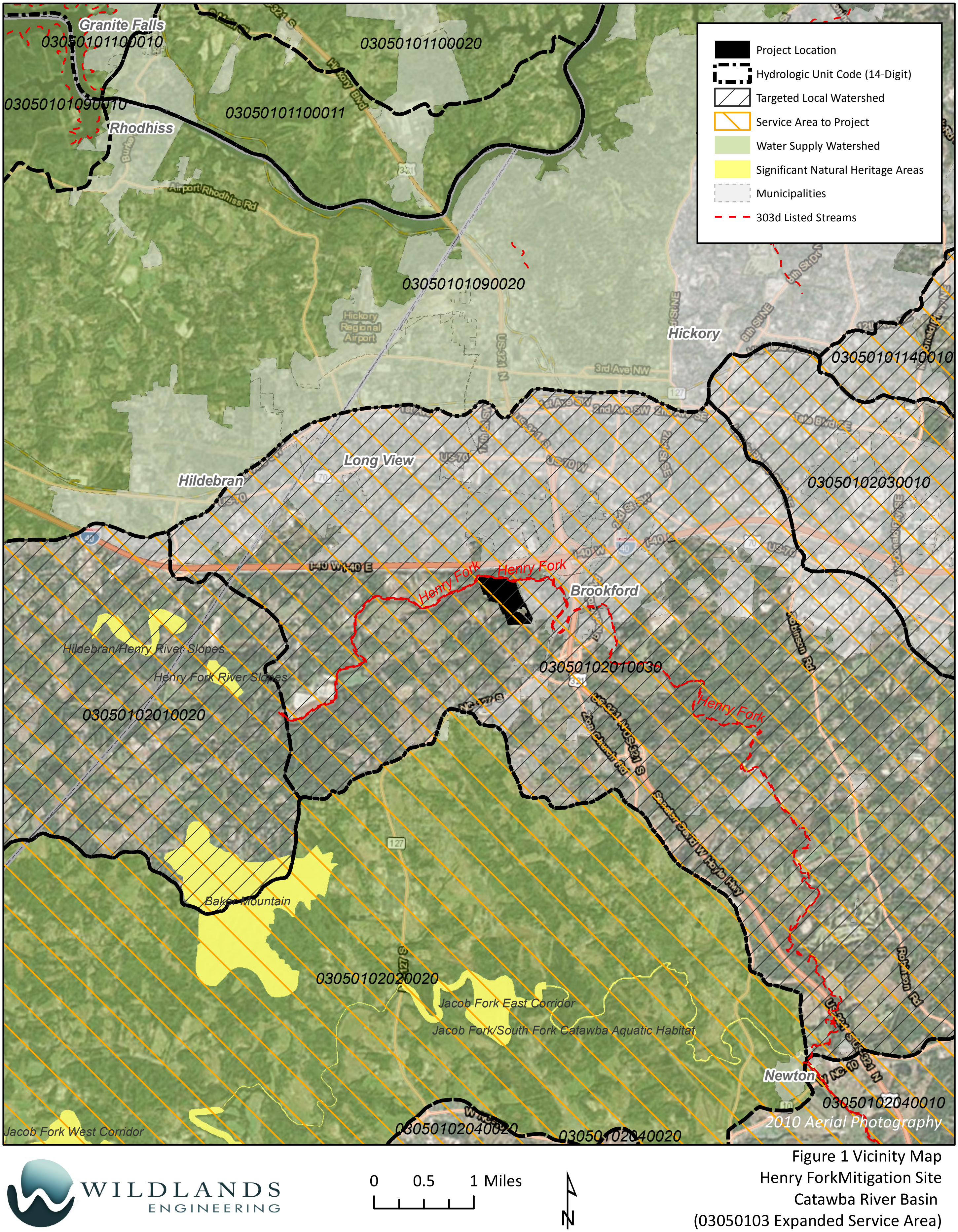
Walker, Alan, unpublished. NC Rural Mountain and Piedmont Regional Curve.

Walker, Alan. Personal communication, April 26, 2013.

Weaver, J.C., et al. 2009. Magnitude and Frequency of Rural Floods in the Southeastern United States, through 2006: Volume 2, North Carolina. U.S. Geological Survey Scientific Investigations Report 2009-5158, 111 p.

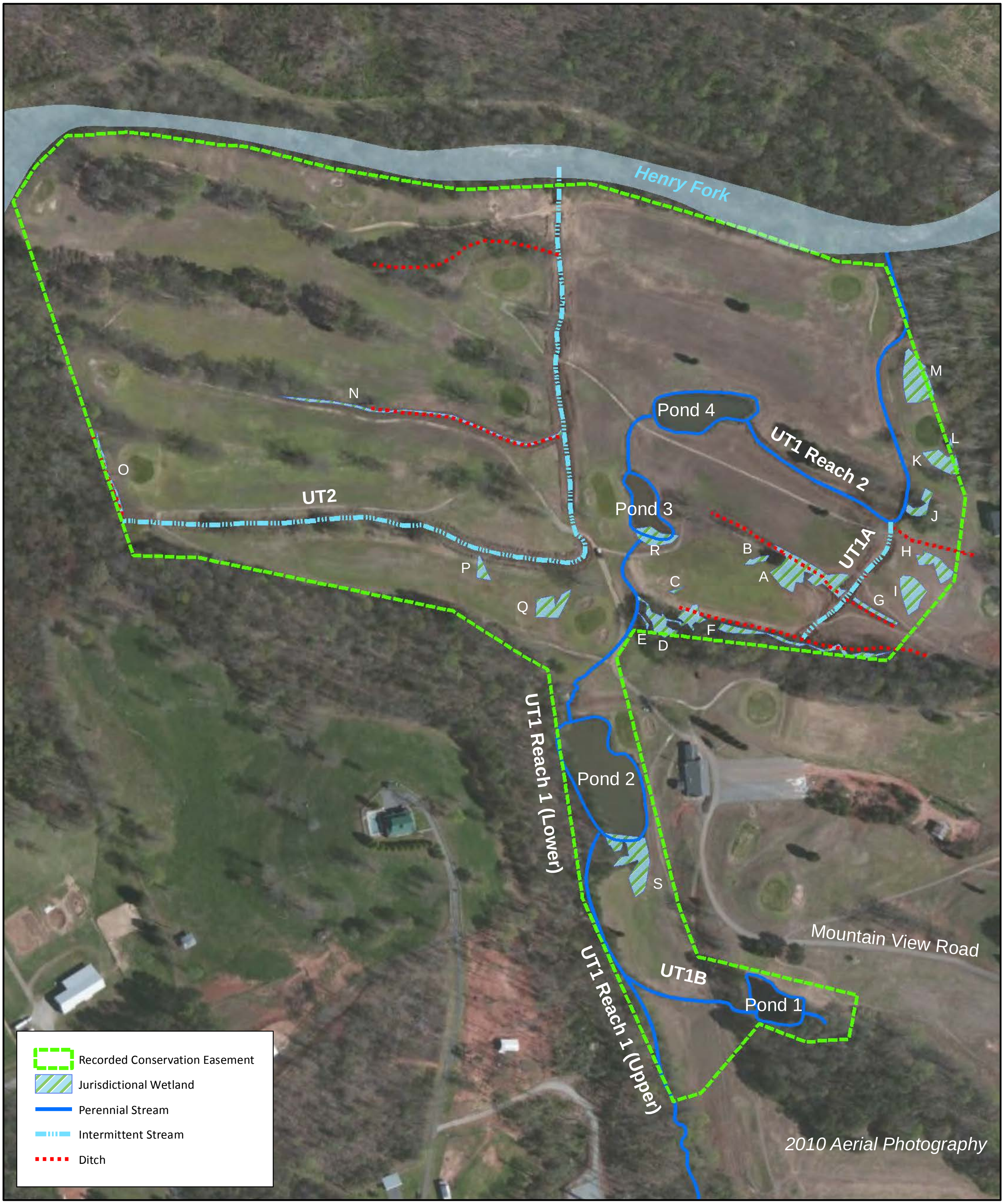
Wilcock, P., et al., 2009. Sediment Transport Primer: Estimating Bed-Material Transport in Gravel Bed Rivers. Gen. Tech. Rep. RMRS-GTR-226. Fort Collins, Co: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 78 p.

Figures



WILDLANDS ENGINEERING

Figure 1 Vicinity Map
Henry ForkMitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

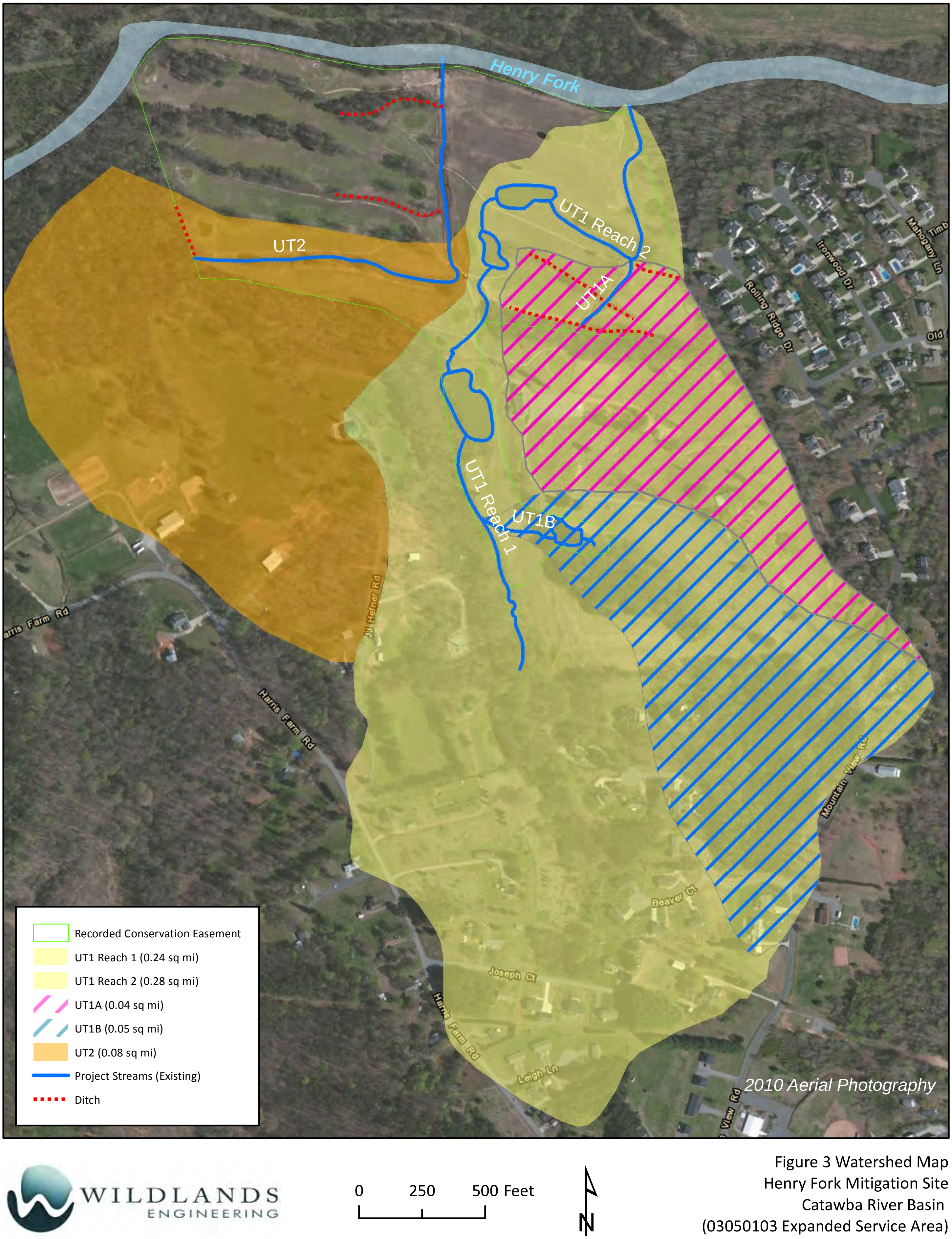


WILDLANDS ENGINEERING

0 150 300 Feet

N

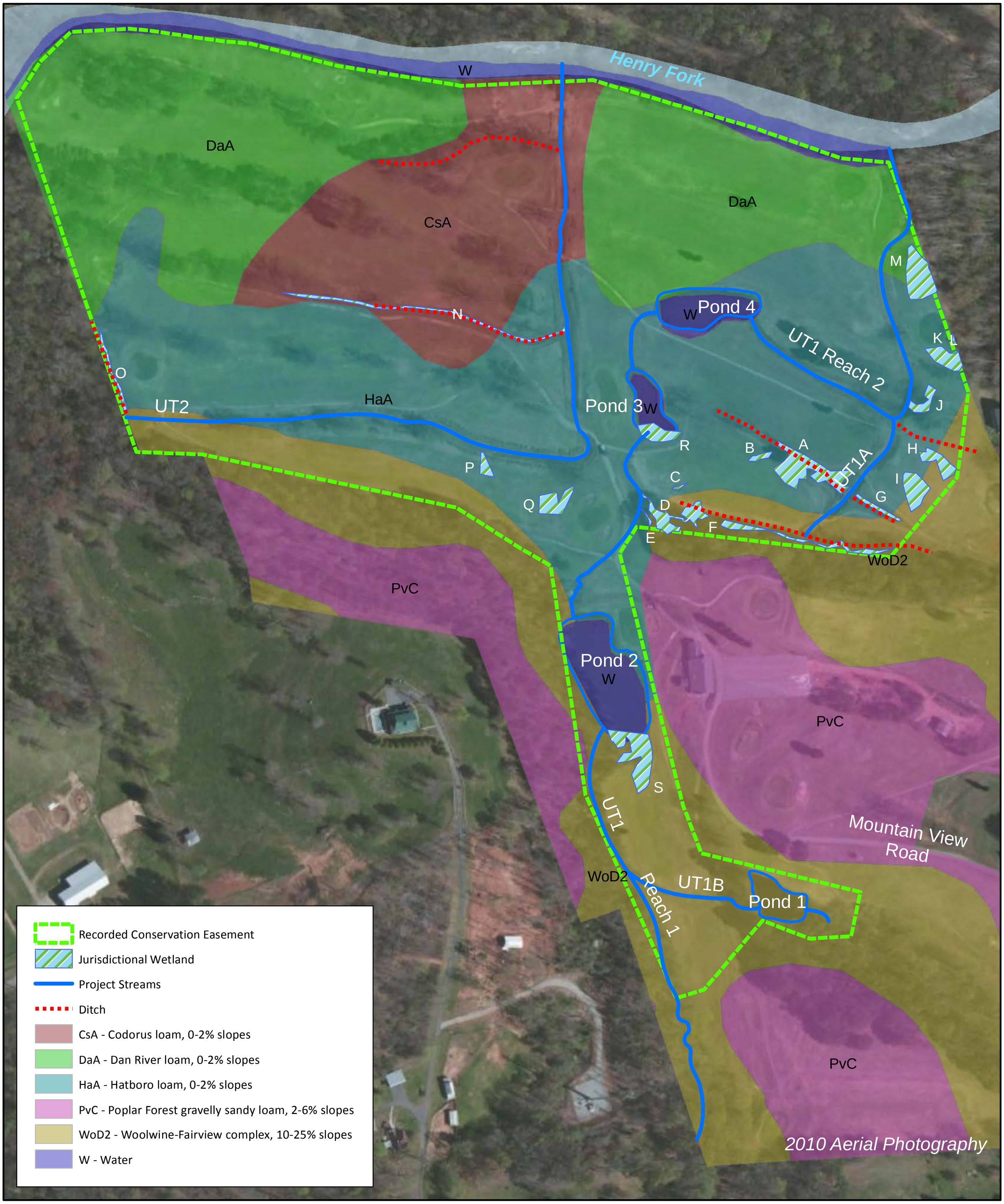
Figure 2 Site Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC



WILDLANDS ENGINEERING

Figure 3 Watershed Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)

Catawba County, NC



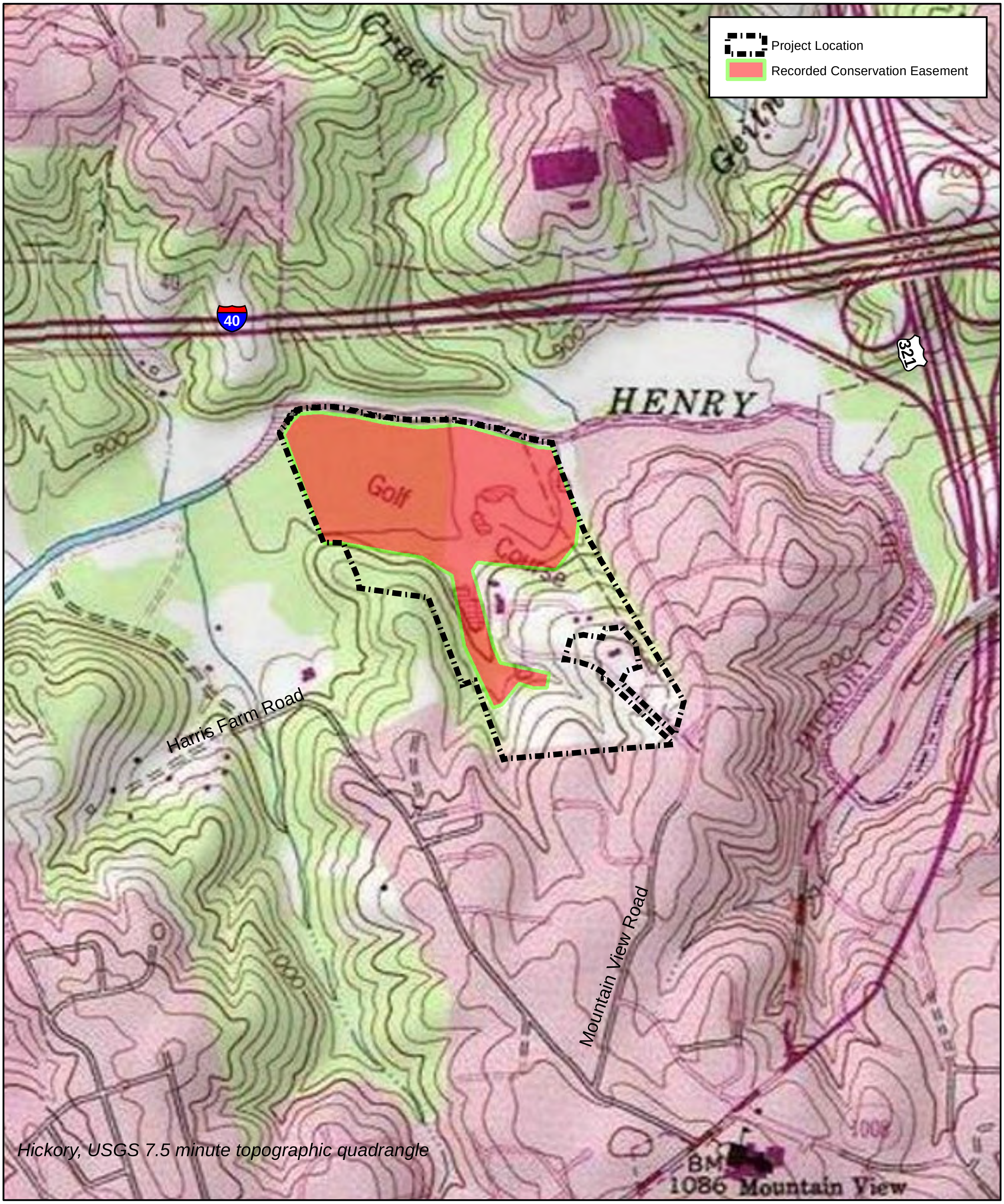
WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 4 Soils Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)

Catawba County, NC



WILDLANDS ENGINEERING

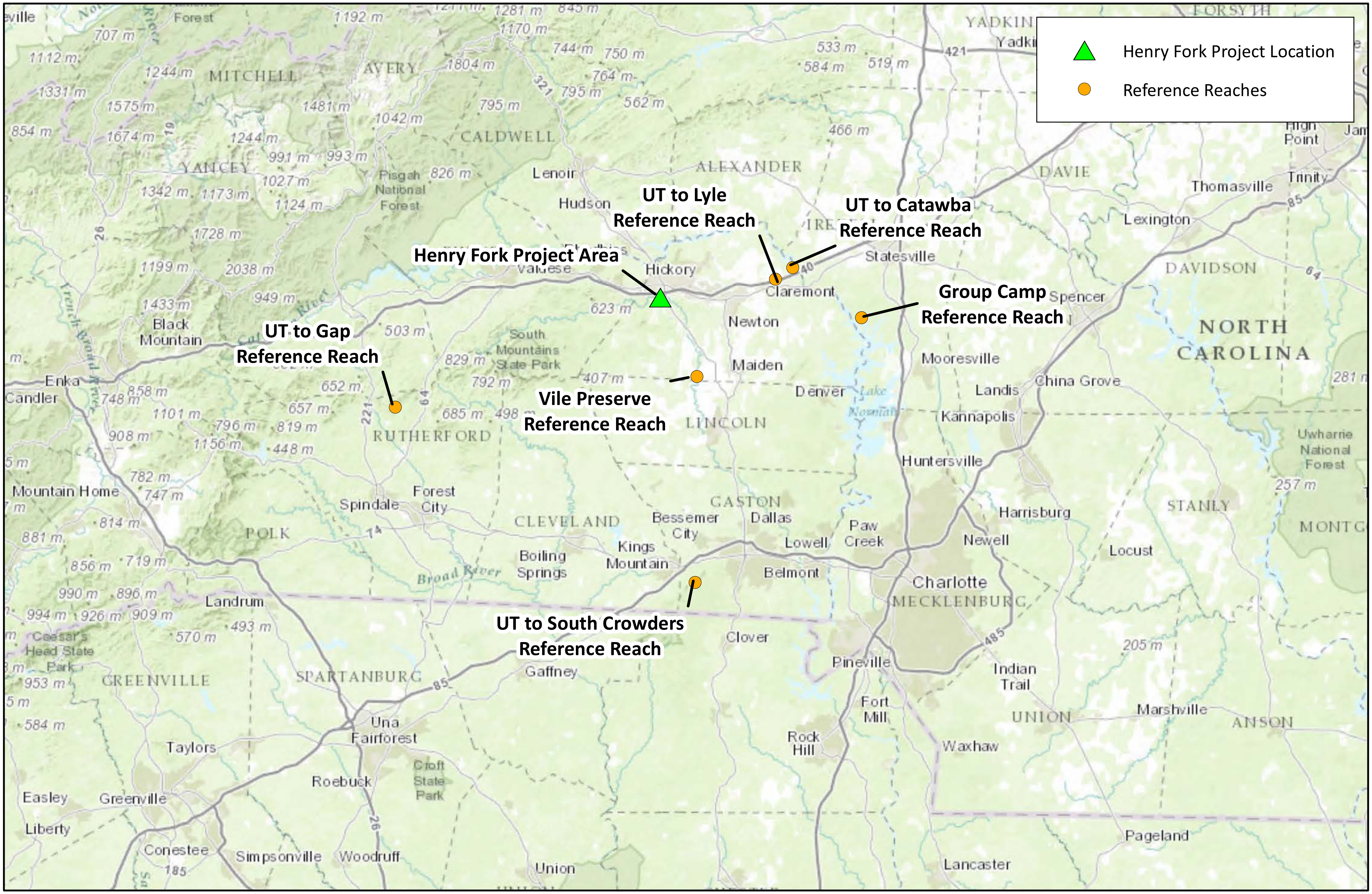
Figure 5 USGS Topographic Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 6 Hydrologic Features Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC



WILDLANDS ENGINEERING

Figure 7 Reference Reach Vicinity Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

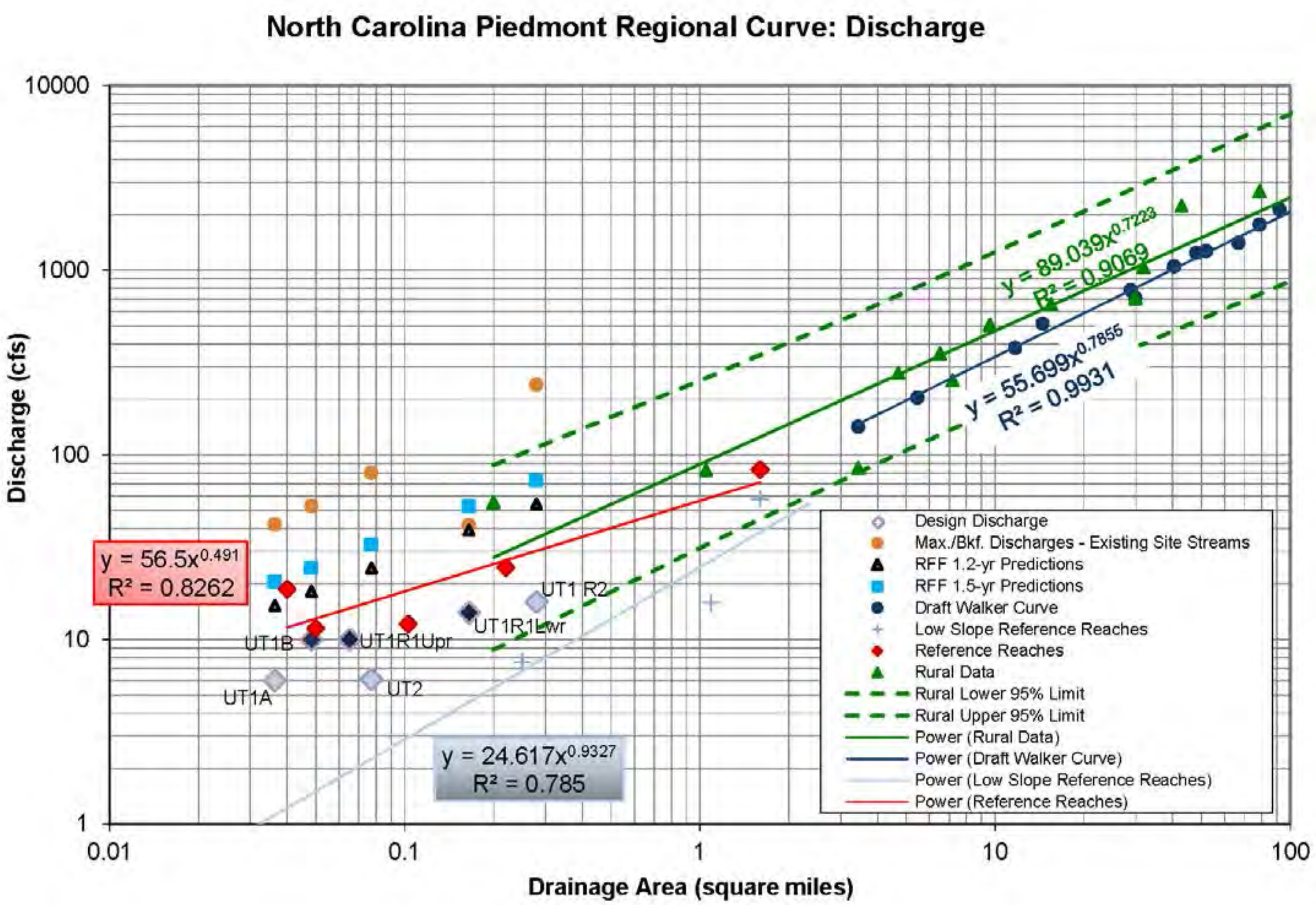
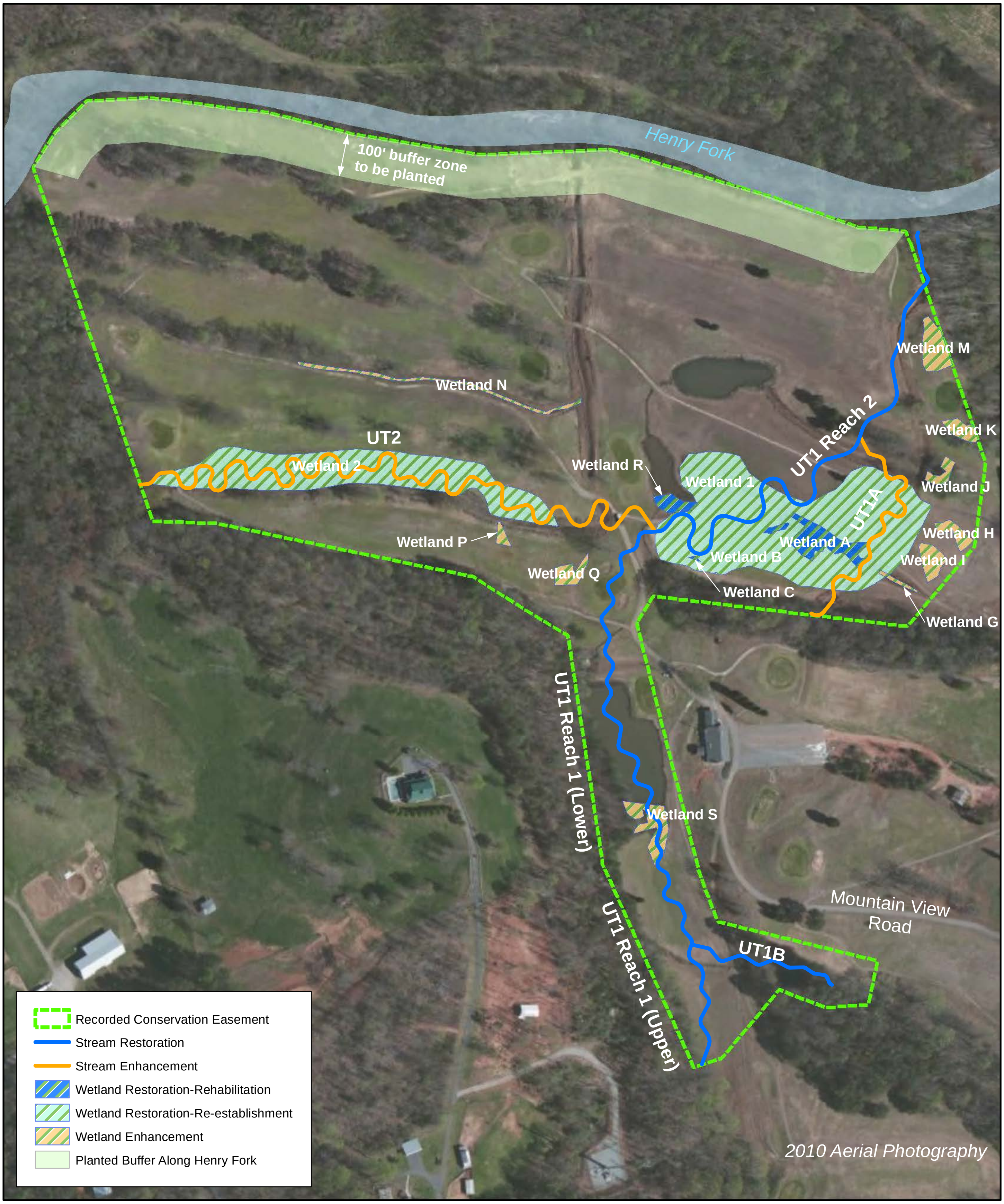


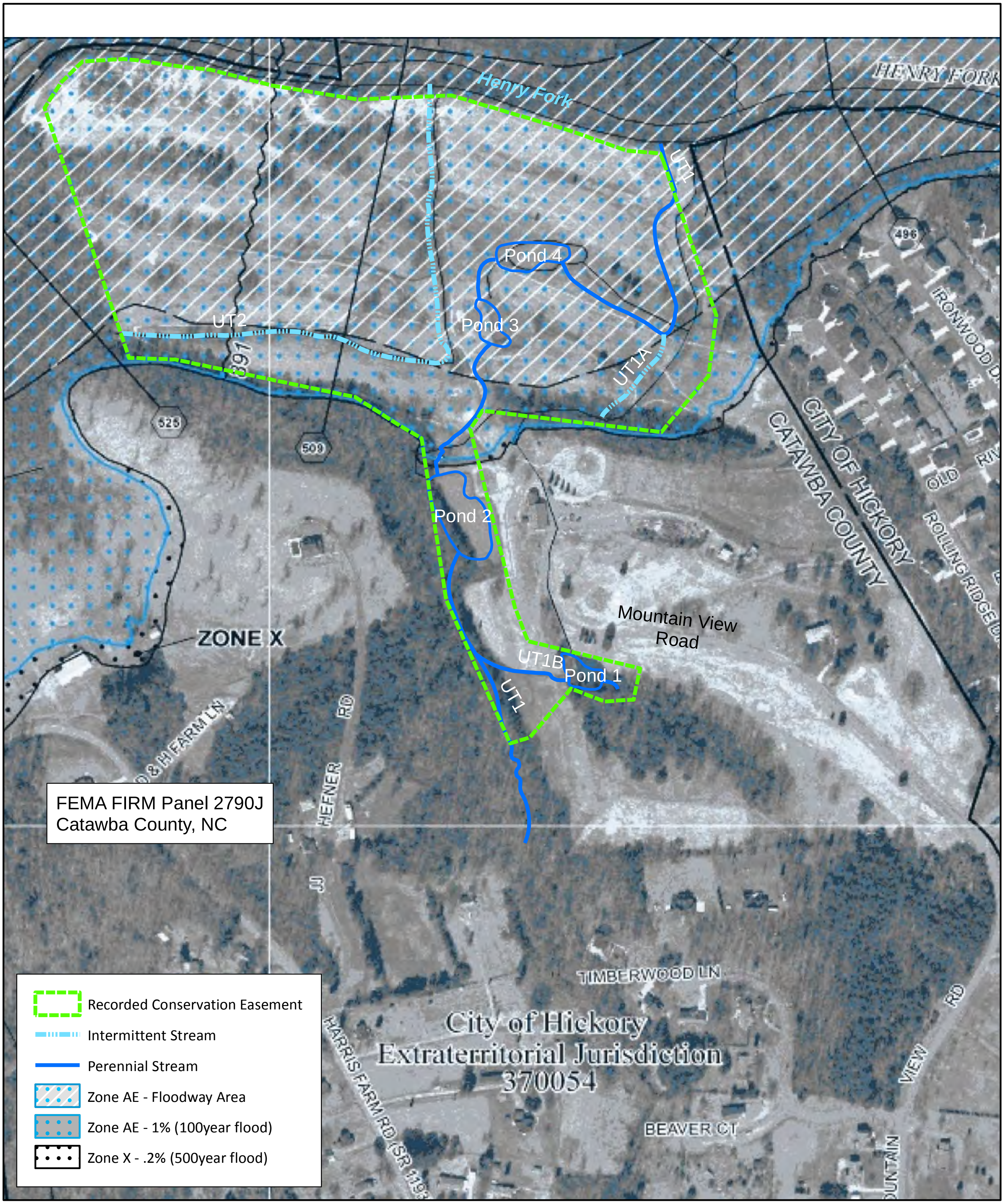
Figure 8 NC Piedmont Regional Curves with Project Data Overlay
Henry Fork Stream & Wetland Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

WILDLANDS ENGINEERING



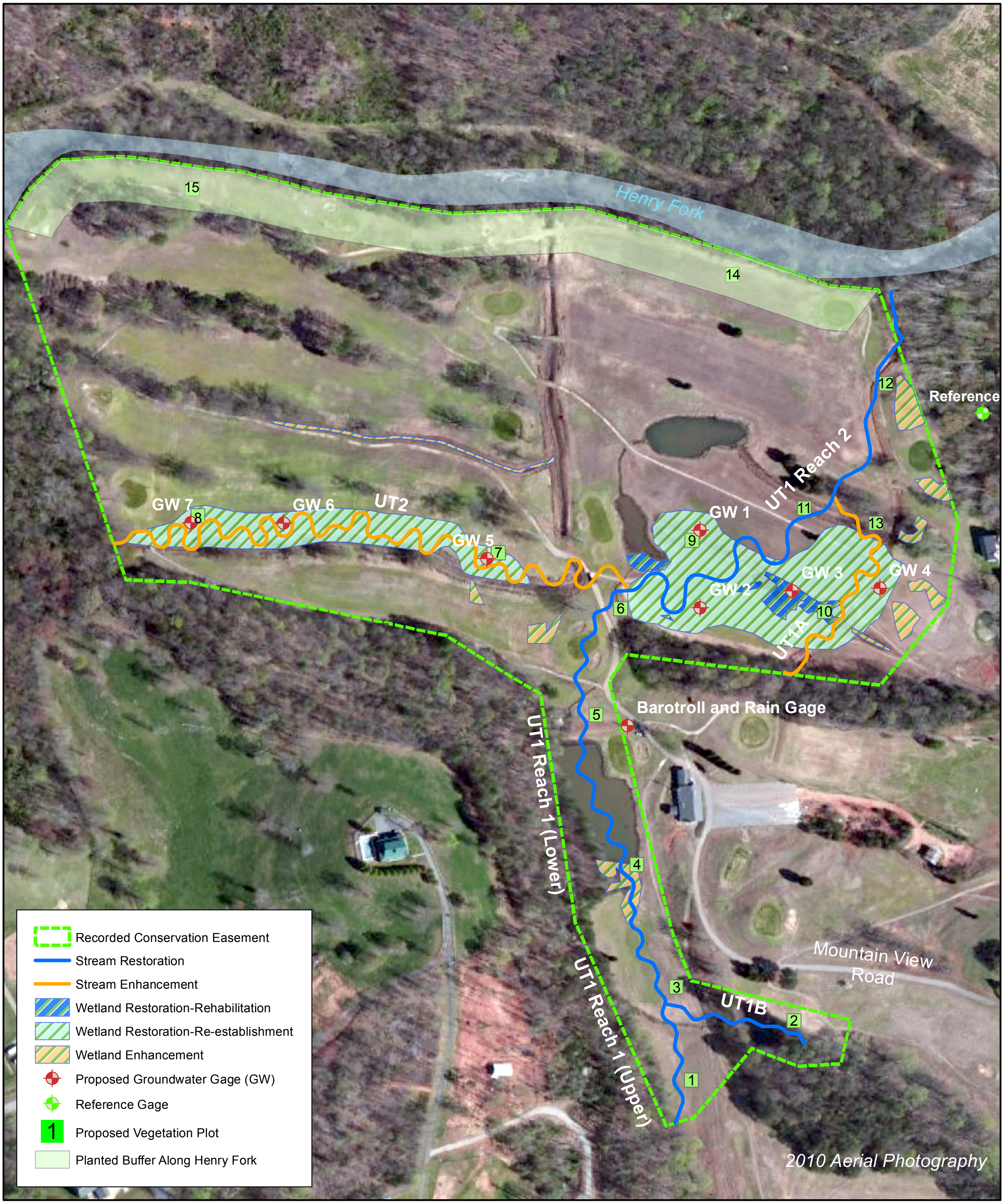
WILDLANDS ENGINEERING

Figure 9 Concept Design Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC



WILDLANDS ENGINEERING

Figure 10 FEMA Flood Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC



WILDLANDS ENGINEERING

Figure 11 Proposed Monitoring Components Map
Henry Fork Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

Appendices

Appendix 1: Recorded Conservation Easement and Plat (Site Protection Instrument)

FILED Catawba County
on Jul 02, 2014 at 12:21:00 pm
Excise Tax $0.00 (AT)
INST. #09828
DONNA HICKS SPENCER,
Register of Deeds
BK 03247 Pg 0476-0488

STATE OF NORTH CAROLINA

DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS PROVIDED PURSUANT TO FULL DELIVERY MITIGATION CONTRACT

CATAWBA COUNTY

SPO File Number: 18-0
EEP Project Number: 96306

No revenue

Prepared by: Office of the Attorney General
Property Control Section
Return to: NC Department of Administration
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

THIS DEED OF CONSERVATION EASEMENT AND RIGHT OF ACCESS, made this 1st day of July, 2014, by *WEI - Henry Fork, LLC* , ("**Grantor**"), whose mailing address is *1430 South Mint Street, Suite 104 Charlotte, NC 28203*, to the State of North Carolina, ("**Grantee**"), whose mailing address is State of North Carolina, Department of Administration, State Property Office, 1321 Mail Service Center, Raleigh, NC 27699-1321. The designations of Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine, or neuter as required by context.

WITNESSETH:

WHEREAS, pursuant to the provisions of N.C. Gen. Stat. § 143-214.8 et seq., the State of North Carolina has established the Ecosystem Enhancement Program (formerly known as the Wetlands Restoration Program) within the Department of Environment and Natural Resources for the purposes of acquiring, maintaining, restoring, enhancing, creating and preserving wetland and riparian resources that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; and

WHEREAS, this Conservation Easement from Grantor to Grantee has been negotiated, arranged and provided for as a condition of a full delivery contract between *Wildlands Engineering, Inc.* and the North Carolina Department of Environment and Natural Resources, to provide stream, wetland and/or buffer mitigation pursuant to the North Carolina Department of Environment and Natural Resources Purchase and Services Contract Number 5782. 0477

WHEREAS, The State of North Carolina is qualified to be the Grantee of a Conservation Easement pursuant to N.C. Gen. Stat. § 121-35; and

WHEREAS, the Department of Environment and Natural Resources and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Understanding, (MOU) duly executed by all parties on November 4, 1998. This MOU recognized that the Wetlands Restoration Program was to provide effective compensatory mitigation for authorized impacts to wetlands, streams and other aquatic resources by restoring, enhancing and preserving the wetland and riparian areas of the State; and

WHEREAS, the Department of Environment and Natural Resources, the North Carolina Department of Transportation and the United States Army Corps of Engineers, Wilmington District entered into a Memorandum of Agreement, (MOA) duly executed by all parties in Greensboro, NC on July 22, 2003, which recognizes that the Ecosystem Enhancement Program is to provide for compensatory mitigation by effective protection of the land, water and natural resources of the State by restoring, enhancing and preserving ecosystem functions; and

WHEREAS, the Department of Environment and Natural Resources, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the North Carolina Wildlife Resources Commission, the North Carolina Division of Water Quality, the North Carolina Division of Coastal Management, and the National Marine Fisheries Service entered into an agreement to continue the In-Lieu Fee operations of the North Carolina Department of Natural Resources' Ecosystem Enhancement Program with an effective date of 28 July, 2010, which supersedes and replaces the previously effective MOA and MOU referenced above; and

WHEREAS, the acceptance of this instrument for and on behalf of the State of North Carolina was granted to the Department of Administration by resolution as approved by the Governor and Council of State adopted at a meeting held in the City of Raleigh, North Carolina, on the 8th day of February 2000; and

WHEREAS, the Ecosystem Enhancement Program in the Department of Environment and Natural Resources, which has been delegated the authority authorized by the Governor and Council of State to the Department of Administration, has approved acceptance of this instrument; and

WHEREAS, Grantor owns in fee simple certain real property situated, lying, and being in Hickory Township, Catawba County, North Carolina (the "**Property**"), and being more particularly described as that certain parcel of land containing approximately 49.623 acres and being conveyed to the Grantor by deed as recorded in **Deed Book 03238 at Page 1625** of the Catawba County Registry, North Carolina; and 0478

WHEREAS, Grantor is willing to grant a Conservation Easement and Right of Access over the herein described areas of the Property, thereby restricting and limiting the use of the areas of the Property subject to the Conservation Easement to the terms and conditions and purposes hereinafter set forth, and Grantee is willing to accept said Easement and Access Rights. The Conservation Easement shall be for the protection and benefit of the waters of ***the Henry River***.

NOW, THEREFORE, in consideration of the mutual covenants, terms, conditions, and restrictions hereinafter set forth, Grantor unconditionally and irrevocably hereby grants and conveys unto Grantee, its successors and assigns, forever and in perpetuity, a Conservation Easement along with a general Right of Access.

The Conservation Easement Area consists of the following:

Total Conservation Easement Area containing a total of 48.06 **acres** as shown on the plats of survey entitled "Final Plat, Conservation Easement for North Carolina Ecosystem Enhancement Program, Project Name: Henry Fork Stream & Wetland Mitigation Project, SPO File No. 18-0, EEP Project ID: 96306, Property of WEI – Henry Fork, LLC," dated 04/03/14 – 05/20/14, 2014 by *Nolan R. Carmack*, PLS Number NC 5076 and recorded in the Catawba County, North Carolina Register of Deeds at **Plat Book** 74 **Pages** 3.

See attached "**Exhibit A**", Legal Description of area of the Property hereinafter referred to as the "Conservation Easement Area"

The purposes of this Conservation Easement are to maintain, restore, enhance, construct, create and preserve wetland and/or riparian resources in the Conservation Easement Area that contribute to the protection and improvement of water quality, flood prevention, fisheries, aquatic habitat, wildlife habitat, and recreational opportunities; to maintain permanently the Conservation Easement Area in its natural condition, consistent with these purposes; and to prevent any use of the Easement Area that will significantly impair or interfere with these purposes. To achieve these purposes, the following conditions and restrictions are set forth:

I. DURATION OF EASEMENT

Pursuant to law, including the above referenced statutes, this Conservation Easement and Right of Access shall be perpetual and it shall run with, and be a continuing restriction upon the use of, the Property, and it shall be enforceable by the Grantee against the Grantor and against Grantor's heirs, successors and assigns, personal representatives, agents, lessees, and licensees.

II. GRANTOR RESERVED USES AND RESTRICTED ACTIVITIES

The Conservation Easement Area shall be restricted from any development or usage that would impair or interfere with the purposes of this Conservation Easement. Unless expressly reserved as a compatible use herein, any activity in, or use of, the Conservation Easement Area by the Grantor is prohibited as inconsistent with the purposes of this Conservation Easement. Any rights not expressly reserved hereunder by the Grantor have been acquired by the Grantee. Any rights not expressly reserved hereunder by the Grantor, including the rights to all mitigation credits, including, but not limited to, stream, wetland, and riparian buffer mitigation units, derived from each site within the area of the Conservation Easement, are conveyed to and belong to the Grantee. Without limiting the generality of the foregoing, the following specific uses are prohibited, restricted, or reserved as indicated:

A. Recreational Uses. Grantor expressly reserves the right to undeveloped recreational uses, including hiking, bird watching, hunting and fishing, and access to the Conservation Easement Area for the purposes thereof.

B. Motorized Vehicle Use. Motorized vehicle use in the Conservation Easement Area is prohibited except within a Crossing Area(s) or Road or Trail as shown on the recorded survey plat **or as specifically allowed within a fence maintenance zone as described in section D or a Road or Trail described in section H**.

C. Educational Uses. The Grantor reserves the right to engage in and permit others to engage in educational uses in the Conservation Easement Area not inconsistent with this Conservation Easement, and the right of access to the Conservation Easement Area for such purposes including organized educational activities such as site visits and observations. Educational uses of the property shall not alter vegetation, hydrology or topography of the site.

D. Damage to Vegetation. Except within Crossing Area(s) as shown on the recorded survey plat and as related to the removal of non-native plants, diseased or damaged trees, or vegetation that destabilizes or renders unsafe the Conservation Easement Area to persons or natural habitat, all cutting, removal, mowing, harming, or destruction of any trees and vegetation in the Conservation Easement Area is prohibited with the following exception:

Notwithstanding the foregoing, if there is a fence within the Conservation Easement Area, the Grantor reserves the right to mow and maintain vegetation within 10 feet of the Conservation Easement boundary ***as shown on the Survey Plat*** and extending along the entire length of the fence. The Grantor, his successors or assigns shall be solely responsible for maintenance of the fence for as long as there is livestock on the Grantor's property adjacent to the Conservation Easement Area.

E. Industrial, Residential and Commercial Uses. All industrial, residential and commercial uses are prohibited in the Conservation Easement Area.

F. Agricultural Use. All agricultural uses are prohibited within the Conservation Easement Area including any use for cropland, waste lagoons, or pastureland.

G. New Construction. There shall be no building, facility, mobile home, antenna, utility pole, tower, or other structure constructed or placed in the Conservation Easement Area. 0480

H. Roads and Trails. There shall be no construction or maintenance of roads, trails, walkways, or paving in the Conservation Easement Area with the following exception:

Only roads and trails located within the Conservation Easement Area prior to completion of the construction of the restoration project and within crossings shown on the recorded survey plat may be maintained by Grantor, successors or assigns to allow for access to the interior of the Property, and must be repaired and maintained to prevent runoff and degradation to the Conservation Easement Area. Such roads and trails shall be covered with pervious materials such as loose gravel or permanent vegetation in order to minimize runoff and prevent sedimentation.

I. Signs. No signs shall be permitted in the Conservation Easement Area except interpretive signs describing restoration activities and the conservation values of the Conservation Easement Area, signs identifying the owner of the Property and the holder of the Conservation Easement, signs giving directions, or signs prescribing rules and regulations for the use of the Conservation Easement Area.

J. Dumping or Storing. Dumping or storage of soil, trash, ashes, garbage, waste, abandoned vehicles, appliances, machinery, or any other material in the Conservation Easement Area is prohibited.

K. Grading, Mineral Use, Excavation, Dredging. There shall be no grading, filling, excavation, dredging, mining, drilling, hydraulic fracturing, removal of topsoil, sand, gravel, rock, peat, minerals, or other materials.

L. Water Quality and Drainage Patterns. There shall be no diking, draining, dredging, channeling, filling, leveling, pumping, impounding or diverting, causing, allowing or permitting the diversion of surface or underground water in the Conservation Easement Area. No altering or tampering with water control structures or devices, or disruption or alteration of the restored, enhanced, or created drainage patterns is allowed. All removal of wetlands, polluting or discharging into waters, springs, seeps, or wetlands, or use of pesticide or biocides in the Conservation Easement Area is prohibited. In the event of an emergency interruption or shortage of all other water sources, water from within the Conservation Easement Area may temporarily be withdrawn for good cause shown as needed for the survival of livestock on the Property.

M. Subdivision and Conveyance. Grantor voluntarily agrees that no further subdivision, partitioning, or dividing of the Conservation Easement Area portion of the Property owned by the Grantor in fee simple ("fee") that is subject to this Conservation Easement is allowed. Any future transfer of the Property shall be subject to this Conservation Easement and Right of Access and to the Grantee's right of unlimited and repeated ingress and egress over and across the Property to the Conservation Easement Area for the purposes set forth herein.

N. Development Rights. All development rights are permanently removed from the Conservation Easement Area and are non-transferrable. 0481

O. Disturbance of Natural Features. Any change, disturbance, alteration or impairment of the natural features of the Conservation Easement Area or any intentional introduction of non-native plants, trees and/or animal species by Grantor is prohibited.

The Grantor may request permission to vary from the above restrictions for good cause shown, provided that any such request is not inconsistent with the purposes of this Conservation Easement, and the Grantor obtains advance written approval from the N.C. Ecosystem Enhancement Program, whose mailing address is 1652 Mail Services Center, Raleigh, NC 27699-1652.

III. GRANTEE RESERVED USES

A. Right of Access, Construction, and Inspection. The Grantee, its employees and agents, successors and assigns, receive a perpetual Right of Access to the Conservation Easement Area over the Property at reasonable times to undertake any activities to restore, construct, manage, maintain, enhance, protect, and monitor the stream, wetland and any other riparian resources in the Conservation Easement Area, in accordance with restoration activities or a long-term management plan. Unless otherwise specifically set forth in this Conservation Easement, the rights granted herein do not include or establish for the public any access rights.

B. Restoration Activities. These activities include planting of trees, shrubs and herbaceous vegetation, installation of monitoring wells, utilization of heavy equipment to grade, fill, and prepare the soil, modification of the hydrology of the site, and installation of natural and manmade materials as needed to direct in-stream, above ground, and subterraneous water flow.

C. Signs. The Grantee, its employees and agents, successors or assigns, shall be permitted to place signs and witness posts on the Property to include any or all of the following: describe the project, prohibited activities within the Conservation Easement, or identify the project boundaries and the holder of the Conservation Easement.

D. Fences. The Grantee, its employees and agents, successors or assigns, shall be permitted to place fencing on the Property within the Conservation Easement Area to restrict livestock access. Although the Grantee is not responsible for fence maintenance, the Grantee reserves the right to maintain, repair or replace the fence at the sole discretion of the Grantee and at the expense of the Grantor, who agrees to indemnify the Grantee for any costs incurred as a result of maintenance, repair or replacement of the fence if such costs are required to protect the Conservation Easement Area from repeated incidents of grazing or other prohibited activities.

E. Crossing Area(s). The Grantee is not responsible for maintenance of crossing area(s), however, the Grantee, its employees and agents, successors or assigns, reserve the right to repair crossing area(s), at its sole discretion and to recover the cost of such repairs from the Grantor if such repairs are needed as a result of activities of the Grantor, his successors or assigns.

IV. ENFORCEMENT AND REMEDIES

A. Enforcement. To accomplish the purposes of this Conservation Easement, Grantee is allowed to prevent any activity within the Conservation Easement Area that is inconsistent with the purposes of this Conservation Easement and to require the restoration of such areas or features in the Conservation Easement Area that may have been damaged by such unauthorized activity or use. Upon any breach of the terms of this Conservation Easement by Grantor, the Grantee shall, except as provided below, notify the Grantor in writing of such breach and the Grantor shall have ninety (90) days after receipt of such notice to correct the damage caused by such breach. If the breach and damage remains uncured after ninety (90) days, the Grantee may enforce this Conservation Easement by bringing appropriate legal proceedings including an action to recover damages, as well as injunctive and other relief. The Grantee shall also have the power and authority, consistent with its statutory authority: (a) to prevent any impairment of the Conservation Easement Area by acts which may be unlawful or in violation of this Conservation Easement; (b) to otherwise preserve or protect its interest in the Property; or (c) to seek damages from any appropriate person or entity. Notwithstanding the foregoing, the Grantee reserves the immediate right, without notice, to obtain a temporary restraining order, injunctive or other appropriate relief, if the breach is or would irreversibly or otherwise materially impair the benefits to be derived from this Conservation Easement, and the Grantor and Grantee acknowledge that the damage would be irreparable and remedies at law inadequate. The rights and remedies of the Grantee provided hereunder shall be in addition to, and not in lieu of, all other rights and remedies available to Grantee in connection with this Conservation Easement.

B. Inspection. The Grantee, its employees and agents, successors and assigns, have the right, with reasonable notice, to enter the Conservation Easement Area over the Property at reasonable times for the purpose of inspection to determine whether the Grantor is complying with the terms, conditions and restrictions of this Conservation Easement.

C. Acts Beyond Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee to bring any action against Grantor for any injury or change in the Conservation Easement Area caused by third parties, resulting from causes beyond the Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken in good faith by the Grantor under emergency conditions to prevent, abate, or mitigate significant injury to life or damage to the Property resulting from such causes.

D. Costs of Enforcement. Beyond regular and typical monitoring expenses, any costs incurred by Grantee in enforcing the terms of this Conservation Easement against Grantor, including, without limitation, any costs of restoration necessitated by Grantor's acts or omissions in violation of the terms of this Conservation Easement, shall be borne by Grantor.

E. No Waiver. Enforcement of this Easement shall be at the discretion of the Grantee and any forbearance, delay or omission by Grantee to exercise its rights hereunder in the event of any breach of any term set forth herein shall not be construed to be a waiver by Grantee.

V. MISCELLANEOUS

A. This instrument sets forth the entire agreement of the parties with respect to the Conservation Easement and supersedes all prior discussions, negotiations, understandings or agreements relating to the Conservation Easement. If any provision is found to be invalid, the remainder of the provisions of the Conservation Easement, and the application of such provision to persons or circumstances other than those as to which it is found to be invalid, shall not be affected thereby.

B. Grantor is responsible for any real estate taxes, assessments, fees, or charges levied upon the Property. Grantee shall not be responsible for any costs or liability of any kind related to the ownership, operation, insurance, upkeep, or maintenance of the Property, except as expressly provided herein. Upkeep of any constructed bridges, fences, or other amenities on the Property are the sole responsibility of the Grantor. Nothing herein shall relieve the Grantor of the obligation to comply with federal, state or local laws, regulations and permits that may apply to the exercise of the Reserved Rights.

C. Any notices shall be sent by registered or certified mail, return receipt requested to the parties at their addresses shown herein or to other addresses as either party establishes in writing upon notification to the other.

D. Grantor shall notify Grantee in writing of the name and address and any party to whom the Property or any part thereof is to be transferred at or prior to the time said transfer is made. Grantor further agrees that any subsequent lease, deed, or other legal instrument by which any interest in the Property is conveyed is subject to the Conservation Easement herein created.

E. The Grantor and Grantee agree that the terms of this Conservation Easement shall survive any merger of the fee and easement interests in the Property or any portion thereof.

F. This Conservation Easement and Right of Access may be amended, but only in writing signed by all parties hereto, or their successors or assigns, if such amendment does not affect the qualification of this Conservation Easement or the status of the Grantee under any applicable laws, and is consistent with the purposes of the Conservation Easement. The owner of the Property shall notify the State Property Office and the U.S. Army Corps of Engineers in writing sixty (60) days prior to the initiation of any transfer of all or any part of the Property or of any request to void or modify this Conservation Easement. Such notifications and modification requests shall be addressed to:

Ecosystem Enhancement Program Manager
State Property Office
1321 Mail Service Center
Raleigh, NC 27699-1321

and

General Counsel
US Army Corps of Engineers
69 Darlington Avenue
Wilmington, NC 28403

G. The parties recognize and agree that the benefits of this Conservation Easement are in gross and assignable provided, however, that the Grantee hereby covenants and agrees, that in the event it transfers or assigns this Conservation Easement, the organization receiving the interest will be a qualified holder under N.C. Gen. Stat. § 121-34 et seq. and § 170(h) of the Internal Revenue Code, and the Grantee further covenants and agrees that the terms of the transfer or assignment will be such that the transferee or assignee will be required to continue in perpetuity the conservation purposes described in this document.

VI. QUIET ENJOYMENT

Grantor reserves all remaining rights accruing from ownership of the Property, including the right to engage in or permit or invite others to engage in only those uses of the Conservation Easement Area that are expressly reserved herein, not prohibited or restricted herein, and are not inconsistent with the purposes of this Conservation Easement. Without limiting the generality of the foregoing, the Grantor expressly reserves to the Grantor, and the Grantor's invitees and licensees, the right of access to the Conservation Easement Area, and the right of quiet enjoyment of the Conservation Easement Area.

TO HAVE AND TO HOLD, the said rights and easements perpetually unto the State of North Carolina for the aforesaid purposes.

AND Grantor covenants that Grantor is seized of said premises in fee and has the right to convey the permanent Conservation Easement herein granted; that the same is free from encumbrances and that Grantor will warrant and defend title to the same against the claims of all persons whomsoever.

IN TESTIMONY WHEREOF, the Grantor has hereunto set his hand and seal, the day and year first above written. 0485

_______________________ (SEAL)
Shawn D. Wilkerson, Member/Manager

NORTH CAROLINA
COUNTY OF MECKLENBURG

I, Charlotte P. Kinney, a Notary Public in and for the County and State aforesaid, do hereby certify that Shawn D. Wilkerson, Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and Notary Seal this the 1st day of July, 2014

UNVERIFIED

____
Notary Public

My commission expires:
1/31/2016

CHARLOTTE P. KINNEY
NOTARY PUBLIC
Mecklenburg County, North Carolina

COPY

Exhibit A

A Conservation Easement for
The State of North Carolina,
Ecosystem Enhancement Program,
Henry Fork Stream & Wetland Mitigation Project
Property of: WEI-Henry Fork, LLC
SPO FILE NUMBER: 18-O EEP PROJECT ID: 96306

The following conservation easement area containing 48.06 acres, being the same more or less, is located off of Mountain View Road (SR: 1192) within the Hickory Township, Catawba County, North Carolina and being on a portion of that property conveyed to WEI-Henry Fork, LLC as described in Deed Book 3238 Page 1625 as recorded in the Catawba County Register of Deeds and being more particularly described as follows:

BEGINNING AT AN EXISTING 1/2" REBAR, said rebar being a common corner of Deed Book 3238 Page 1625 and Deed Book 2643 Page 303 of the Catawba County Registry, and located N 56°00'21" E a horizontal ground distance of 297.34 feet from a 1" iron pipe set with a Kee control cap, said iron pipe having North Carolina State Plane Coordinates (2011) of Northing: 717726.83 feet and Easting: 1298405.63 feet;

Thence with the common line of Deed Book 3238 Page 1625 and Deed Book 2643 Page 303 of the Catawba County Registry and with the conservation easement area the following (9) courses and distances:

1. S 86°30'46" W a distance of 93.01 feet to an existing 1/2" rebar;
2. N 69°04'27" W a distance of 114.79 feet to an existing 1/2" rebar;
3. S 40°07'47" W a distance of 203.69 feet to an existing 1/2" rebar;
4. S 72°37'11" W a distance of 65.72 feet to an existing 1/2" rebar;
5. N 24°03'48" W a distance of 502.67 feet to an existing 1/2" rebar;
6. N 08°41'24" W a distance of 523.03 feet to an existing 1/2" rebar;
7. N 59°48'29" W a distance of 77.75 feet to an existing 1/2" rebar ;
8. N 57°31'25" W a distance of 172.32 feet to an existing 1/2" rebar ;
9. N 78°12'44" W a distance of 586.62 feet to an existing 3/4" iron pipe, said iron pipe being a common corner of Deed Book 3238 Page 1625, Deed Book 2643 Page 303 and Deed Book 3180 Page 1856 of the Catawba County Registry;

Thence leaving the aforementioned common line and with the common line of Deed Book 3238 Page 1625 and Deed Book 3180 Page 1856 of the Catawba County Registry and continuing with the conservation easement area N 87°53'52" W a distance of 148.08 feet to an existing 3/4" iron pipe, said iron pipe being a common corner of Deed Book 3238 Page 1625, Deed Book 3180 Page 1856 and Deed Book 2010E Page 85; 0487

Thence leaving the aforementioned common line and with the common line of Deed Book 3238 Page 1625 and Deed Book 2010E Page 85 of the Catawba County Registry and continuing with the conservation easement area N 18°40'10" W the following (2) distances:

1. 832.61 feet to an existing 1 1/2" iron pipe;
2. 10.73 feet to a point, said point being at the intersection of the aforementioned common line and the ordinary high water line along Henry Fork;

Thence leaving the aforementioned common line and with the ordinary high water line of Henry Fork and continuing with the conservation easement area the following (13) courses and distances:

1. N 32°59'08" E a distance of 98.38 feet to a calculated point;
2. N 45°46'35" E a distance of 94.95 feet to a calculated point;
3. N 86°39'55" E a distance of 130.41 feet to a calculated point;
4. S 85°01'05" E a distance of 45.97 feet to a calculated point;
5. S 81°43'30" E a distance of 164.41 feet to a calculated point;
6. S 84°52'47" E a distance of 69.41 feet to a calculated point;
7. S 75°36'18" E a distance of 199.84 feet to a calculated point;
8. S 80°46'15" E a distance of 283.89 feet to a calculated point;
9. N 87°30'06" E a distance of 297.07 feet to a calculated point;
10. S 73°32'08" E a distance of 378.64 feet to a calculated point;
11. S 70°42'41" E a distance of 208.87 feet to a calculated point;
12. S 84°59'21" E a distance of 107.97 feet to a calculated point;
13. S 22°09'55" E a distance of 27.59 feet to a 5/8" rebar set with an EEP cap, said rebar being the Northwest corner of an overlap area between Deed Book 3238 Page 1625 and Deed Book 2657 Page 612 of the Catawba County Registry;

Thence leaving the ordinary high water line of Henry Fork and with the western side of the aforesaid overlap area and continuing with conservation easement area S 18°58'17" E the following (2) distances:

1. 480.14 feet to an existing 1/2" rebar, said rebar being the Northwest corner of lot #7 of Section #1 of the Old River Falls development as recorded in Plat Book 46 Page 93 of the Catawba County Registry;
2. 40.59 feet to a 5/8" rebar set with an EEP cap, said rebar being in a common line of Deed Book 3238 Page 1625 and Deed Book 2643 Page 303 of the Catawba county registry and located N 18°58'17" W a distance of 97.28 feet from an existing 3/4" iron pipe, said iron pipe being a common corner of Deed Book 2643 Page 303 and the aforementioned Old River Falls Development;

Thence leaving the aforementioned common line and with the common line of Deed Book 3238 Page 1625 and Deed Book 2643 Page 303 and continuing with the conservation easement area 0488 the following (3) courses and distances:

1. S 07°23'33" W a distance of 193.98 feet to an existing 1/2" rebar;
2. S 39°55'56" W a distance of 235.32 feet to an existing 1/2" rebar ;
3. N 83°11'37" W a distance of 463.17 feet to an existing 1/2" rebar;

Thence leaving the aforementioned common line and with a new line of the conservation easement area the following (3) courses and distances:

1. N 83°08'10" W a distance of 113.26 feet to a 5/8" rebar set with an EEP cap;
2. S 32°50'52" W a distance of 70.70 feet to a 5/8" rebar set with an EEP cap;
3. S 14°04'47" E a distance of 116.80 feet to an existing 1/2" rebar, said rebar being a common corner of Deed Book 3238 Page 1625 and Deed Book 2643 Page 303 of the Catawba County Registry;

Thence with the common line of Deed Book 3238 Page 1625 and Deed Book 2643 Page 303 and continuing with the conservation easement area the following (4) courses and distances:

1. S 14°04'24" E a distance of 469.92 feet to an existing 1/2" rebar;
2. S 21°00'52" E a distance of 116.05 feet to an existing 1/2" rebar;
3. S 76°19'36" E a distance of 369.40 feet to an existing 1/2" rebar;
4. S 12°00'27" W a distance of 102.03 feet to the TRUE POINT OF BEGINNING;

Being all of that area of land containing a total of 48.06 Acres, being the same more or less.
The above descriptions of land were prepared from an actual survey performed between the dates of 04/03/14 – 05/20/14 and under the supervision of Nolan R Carmack, NC PLS (License # L-5076) and shown on a Plat of survey entitled "A Conservation Easement for: The State of North Carolina, Ecosystem Enhancement Program, Henry Fork Stream & Wetland Mitigation Project", on the property of WEI-Henry Fork, LLC; Job# 140213-CE as recorded in Plat Book 74 Page 3 of the Catawba County Register of Deeds.

TOGETHER WITH:
The right to use a 50 foot wide access easement for the purpose of ingress, egress and regress to the conservation easement area from Mountain View Road (SR 1192) as described in Deed Book 3238 Page 1625 and shown in Plat Book 73 Page 131 of the Catawba County Register of Deeds.
The right to use a 12 foot wide non-exclusive easement for the purpose of ingress, egress and regress to the conservation easement areas as shown and described on the above referenced plat of survey prepared by Kee Mapping and Surveying, PA and being more particularly described in Section IIIA of the conservation easement agreement.

I, Shannon Mynatt, REVIEW OFFICER FOR CATAWBA COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED, MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

_________ 7-2-14
REVIEW OFFICER DATE

I CERTIFY TO THE BEST OF MY ABILITY THAT I HAVE DETERMINED THAT THE PLAT SHOWN HEREON IS EXEMPT FROM CATAWBA COUNTY SUBDIVISION REGULATIONS.

_________ 7-2-14
DIRECTOR OF PLANNING OR DESIGNEE DATE

CERTIFICATE OF OWNERSHIP AND DEDICATION:

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY AS SHOWN AND DESCRIBED HEREON. I ALSO HEREBY ACCEPT AND ADOPT THIS RECORD PLAT AND CONSERVATION EASEMENT WITH MY FREE CONSENT AND DEDICATED ALL EASEMENTS, RIGHT OF WAYS AND ACCESS ROADS TO PUBLIC AND/OR PRIVATE USE AS NOTED ON SAID PLAT.

_________ 7/2/2014
WEI-HENRY FORK, LLC DATE
BY: SHAWN D. WILKERSON (MEMBER/MANAGER)

STATE OF NORTH CAROLINA
COUNTY OF CATAWBA
I CERTIFY THE FOLLOWING PERSON(S) PERSONALLY APPEARED BEFORE ME THIS DAY, EACH ACKNOWLEDGING TO ME THAT HE OR SHE IS Shawn D. Wilkerson OF WEI-HENRY FORK LLC AND VOLUNTARILY SIGNED THE FOREGOING DOCUMENT FOR THE PURPOSE STATED HEREIN AND IN THE CAPACITY INDICATED: Member/Manager

DATE: 7-2-14

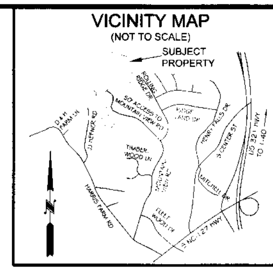
____
(OFFICIAL SIGNATURE OF NOTARY)
Robert W. Bugg
(NOTARY'S PRINTED OR TYPED NAME)
MY COMMISSION EXPIRES: 8/23/16

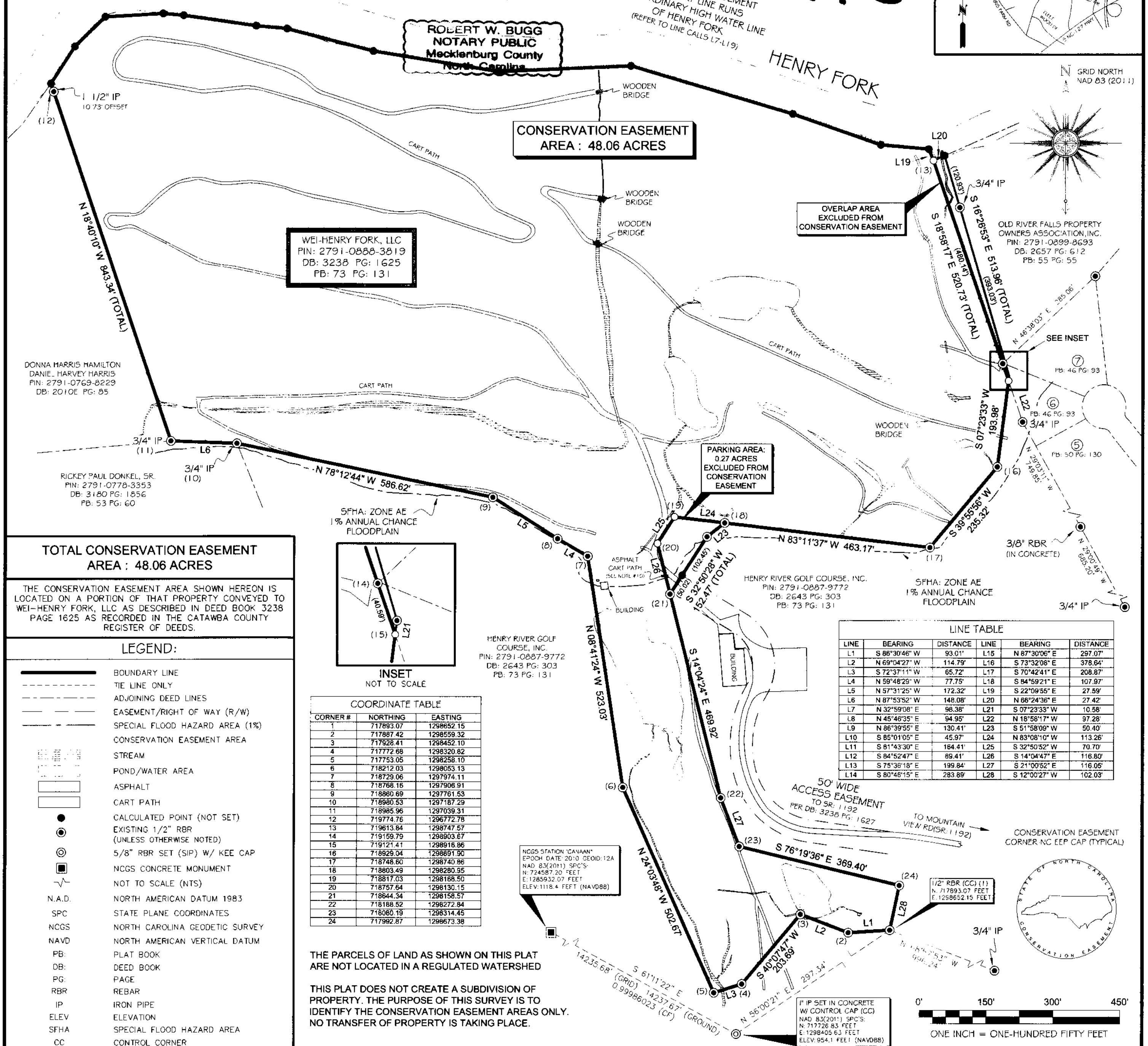
ROBERT W. BUGG
NOTARY PUBLIC
Mecklenburg County
North Carolina

FILED Jul 02, 2014 12:09 pm
BOOK 00074
PAGE 0003
INST # 09827
CATAWBA COUNTY NC
DONNA HICKS SPENCER
REGISTER OF DEEDS

REGISTER OF DEEDS

74-3





TOTAL CONSERVATION EASEMENT
AREA : 48.06 ACRES

THE CONSERVATION EASEMENT AREA SHOWN HEREON IS LOCATED ON A PORTION OF THAT PROPERTY CONVEYED TO WEI-HENRY FORK, LLC AS DESCRIBED IN DEED BOOK 3238 PAGE 1625 AS RECORDED IN THE CATAWBA COUNTY REGISTER OF DEEDS.

LEGEND:

	BOUNDARY LINE
	TIE LINE ONLY
	ADJOINING DEED LINES
	EASEMENT/RIGHT OF WAY (R/W)
	SPECIAL FLOOD HAZARD AREA (1%)
	CONSERVATION EASEMENT AREA
	STREAM
	POND/WATER AREA
	ASPHALT
	CART PATH
	CALCULATED POINT (NOT SET)
	EXISTING 1/2" RBR (UNLESS OTHERWISE NOTED)
	5/8" RBR SET (SIP) W/ KEE CAP
	NCGS CONCRETE MONUMENT
	NOT TO SCALE (NTS)
N.A.D.	NORTH AMERICAN DATUM 1983
SPC	STATE PLANE COORDINATES
NCGS	NORTH CAROLINA GEODETIC SURVEY
NAVD	NORTH AMERICAN VERTICAL DATUM
PB:	PLAT BOOK
DB:	DEED BOOK
PG:	PAGE
RBR	REBAR
IP	IRON PIPE
ELEV	ELEVATION
SFHA	SPECIAL FLOOD HAZARD AREA
CC	CONTROL CORNER

COORDINATE TABLE

CORNER #	NORTHING	EASTING
1	717893.07	1298652.15
2	717887.42	1298559.32
3	717928.41	1298452.10
4	717772.68	1298320.82
5	717753.05	1298258.10
6	718212.03	1298053.13
7	718729.06	1297974.11
8	718768.16	1297906.91
9	718860.69	1297761.53
10	718980.53	1297187.29
11	718985.96	1297039.31
12	719774.76	1296772.78
13	719613.84	1298747.57
14	719159.79	1298903.67
15	719121.41	1298916.86
16	718929.04	1298891.90
17	718748.60	1298740.86
18	718803.49	1298280.95
19	718817.03	1298168.50
20	718757.64	1298130.15
21	718644.34	1298158.57
22	718188.52	1298272.84
23	718080.19	1298314.45
24	717992.87	1298673.38

LINE TABLE

LINE	BEARING	DISTANCE	LINE	BEARING	DISTANCE
L1	S 86°30'46" W	93.01'	L15	N 87°30'06" E	297.07'
L2	N 69°04'27" W	114.79'	L16	S 73°32'08" E	378.64'
L3	S 72°37'11" W	65.72'	L17	S 70°42'41" E	208.87'
L4	N 59°48'29" W	77.75'	L18	S 84°59'21" E	107.97'
L5	N 57°31'25" W	172.32'	L19	S 22°09'55" E	27.59'
L6	N 87°53'52" W	148.08'	L20	N 66°24'36" E	27.42'
L7	N 32°59'08" E	98.38'	L21	S 07°23'33" W	10.58'
L8	N 45°46'35" E	94.95'	L22	N 18°58'17" W	97.28'
L9	N 86°39'55" E	130.41'	L23	S 51°58'09" W	50.40'
L10	S 85°01'05" E	45.97'	L24	N 83°08'10" W	113.26'
L11	S 81°43'30" E	164.41'	L25	S 32°50'52" W	70.70'
L12	S 84°52'47" E	69.41'	L26	S 14°04'47" E	116.80'
L13	S 75°36'18" E	199.84'	L27	S 21°00'52" E	116.05'
L14	S 80°46'15" E	283.89'	L28	S 12°00'27" W	102.03'

THE PARCELS OF LAND AS SHOWN ON THIS PLAT ARE NOT LOCATED IN A REGULATED WATERSHED

THIS PLAT DOES NOT CREATE A SUBDIVISION OF PROPERTY. THE PURPOSE OF THIS SURVEY IS TO IDENTIFY THE CONSERVATION EASEMENT AREAS ONLY. NO TRANSFER OF PROPERTY IS TAKING PLACE.

CERTIFICATE OF SURVEY AND ACCURACY:

I, NOLAN R. CARMACK, CERTIFY THAT THIS PLAT WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTION RECORDED IN DB: 3238 PG: 1625 AND PB: 73 PG: 131); THAT DASHED LINES INDICATE LINES NOT SURVEYED; THAT THE RATIO OF PRECISION AS CALCULATED DOES NOT EXCEED 1:10,000 ; AND THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I ALSO HEREBY CERTIFY THAT THIS PLAT IS OF ONE OF THE FOLLOWING: GS 47-30 F(11) D; THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION.

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER, AND SEAL THIS 30TH DAY OF JUNE, A.D., 2014.

NORTH CAROLINA PROFESSIONAL SEAL L-5076 LAND SURVEYOR NOLAN R. CARMACK

THIS DOCUMENT IS NOT VALID UNLESS SIGNED AND SEALED.

____
NOLAN R CARMACK, PLS NC-5076

SURVEYOR'S NOTES:

1. ALL DISTANCES ARE GROUND MEASUREMENTS IN US SURVEY FEET UNLESS OTHERWISE NOTED.
2. AREAS CALCULATED BY THE COORDINATE METHOD.
3. PROPERTY SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS AND RESTRICTIONS THAT ARE RECORDED, UNRECORDED, WRITTEN AND UNWRITTEN.
4. CATAWBA COUNTY GIS WEBSITE USED TO IDENTIFY ADJOINING PROPERTY OWNERS AND ZONING DISTRICT.
5. THE PROFESSIONAL SURVEYOR HAS MADE NO INVESTIGATION OR INDEPENDENT SEARCH FOR EASEMENTS, RIGHT OF WAYS, ENCUMBRANCES, RESTRICTIVE COVENANTS, CORRECT OWNERSHIP OR ANY OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE. A NC LICENSED ATTORNEY SHOULD BE CONSULTED.
6. BY GRAPHIC DETERMINATION, A PORTION OF THE SUBJECT PROPERTY APPEARS TO LIE IN A SPECIAL FLOOD HAZARD AREA (SFHA) (ZONE AE) AS DETERMINED BY THE F.E.M.A. MAP# 3710279100J DATED 09/05/07.
7. REFER TO THE CITY OF HICKORY ZONING ORDINANCE FOR INFORMATION ON SETBACKS, BUILDING RESTRICTIONS, ETC..
8. GRID COORDINATES AND BEARINGS WERE DERIVED FROM GLOBAL POSITIONING SYSTEM OBSERVATIONS THAT WERE OBSERVED ON (04/03/14) AND WERE PERFORMED TO THE GEOSPATIAL POSITIONING ACCURACY STANDARDS (CLASS A HORIZONTAL AND CLASS C VERTICAL); AT THE 95% CONFIDENCE LEVEL USING GPS L1 STATIC OBSERVATIONS WITH MAGELLAN PROMARK 3 & 800 RECEIVERS.
9. UTILITIES WERE LOCATED BASED ON VISIBLE ABOVE GROUND STRUCTURES, THEREFORE THE LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE OR MAY BE PRESENT AND NOT SHOWN HEREON. CALL 1-800-632-4949 BEFORE DIGGING.
10. THE STATE OF NORTH CAROLINA RESERVES THE RIGHT TO USE A 12' WIDE NON-EXCLUSIVE EASEMENT FOR THE PURPOSE OF INGRESS, EGRESS AND REGRESS FROM PATHS AND ROADS, WHICH ARE SHOWN HEREON IN APPROXIMATE LOCATIONS, FOR ACCESS TO CONSERVATION EASEMENT AREAS. ACCESS IS ALSO PERMITTED BETWEEN ALL STREAM CROSSINGS. SEE SECTION IIIA IN THE CONSERVATION EASEMENT AGREEMENT.

FINAL PLAT OF A CONSERVATION EASEMENT FOR:

THE STATE OF NORTH CAROLINA, ECOSYSTEM ENHANCEMENT PROGRAM,

HENRY FORK STREAM & WETLAND MITIGATION PROJECT

SPO FILE #: 18-O EEP PROJECT ID: 96306

CURRENT OWNERS LISTED AS: WEI-HENRY FORK, LLC
ADDRESS: 1430 S MINT STREET SUITE 104, CHARLOTTE, NC 28203

PARCEL IDENTIFICATION #: 2791-0888-3819
SITE ADDRESS: 2575 MOUNTAIN VIEW RD, HICKORY, NC 28602

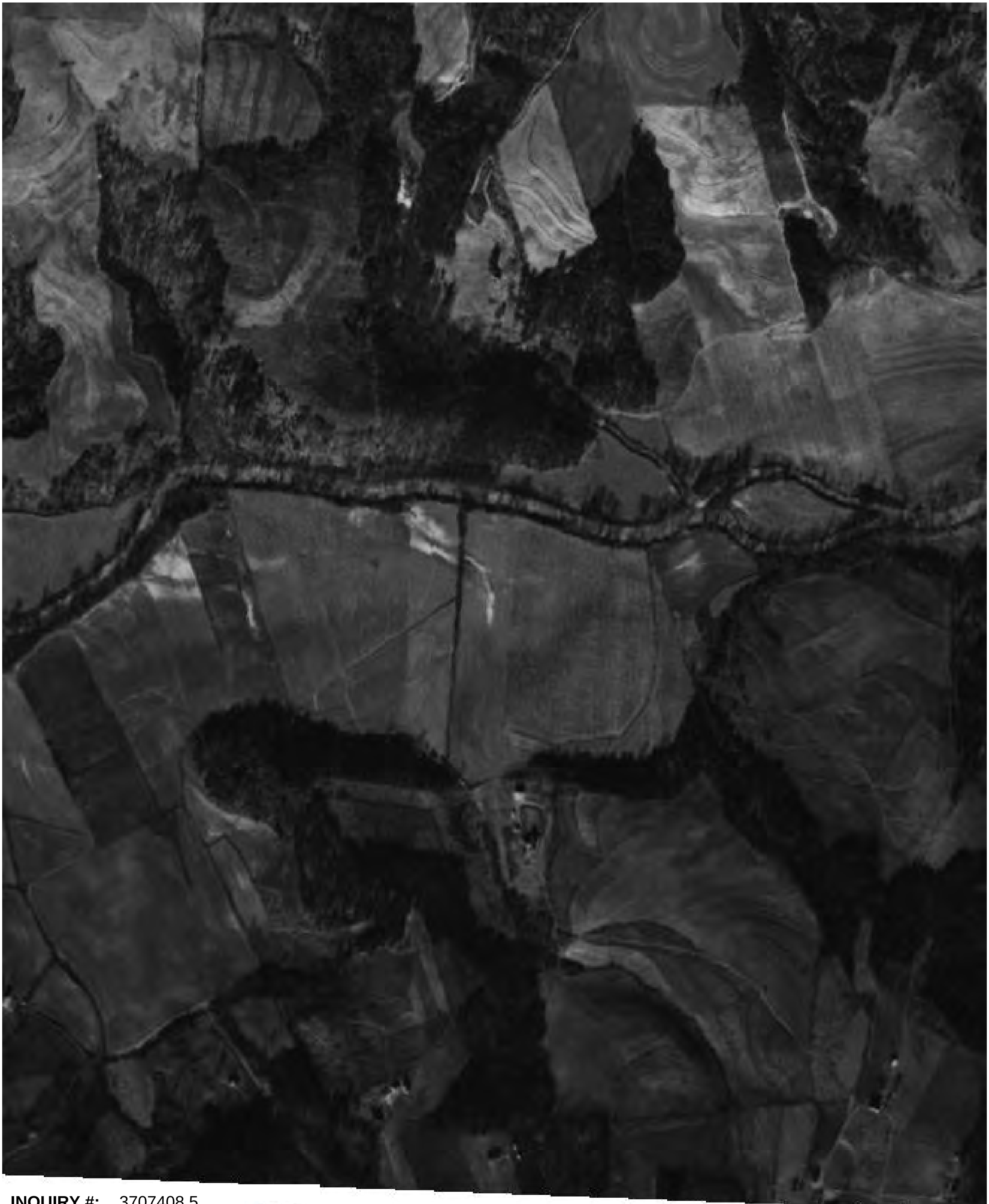
DEED REFERENCE: BOOK: 3238 PAGE: 1625
HICKORY TOWNSHIP, CATAWBA COUNTY, NORTH CAROLINA

SURVEY CREW: NC,BK,NH,KP,JA,DD		*DRAWN BY: EC*
SURVEY DATE(S): 04/03/14-05/20/14		*JOB #140213-CE*
SHEET SIZE: 18"X24"	*SHEET #: 1 OF 1*	*SCALE: 1"=150'*

Kee MAPPING & SURVEYING

P.O. Box 2566
Asheville, NC 28802
(828) 575-9021
www.keemap.com
License # C-3039

Appendix 2: Historical Aerials



INQUIRY #: 3707408.5

YEAR: 1939

= 500'

N

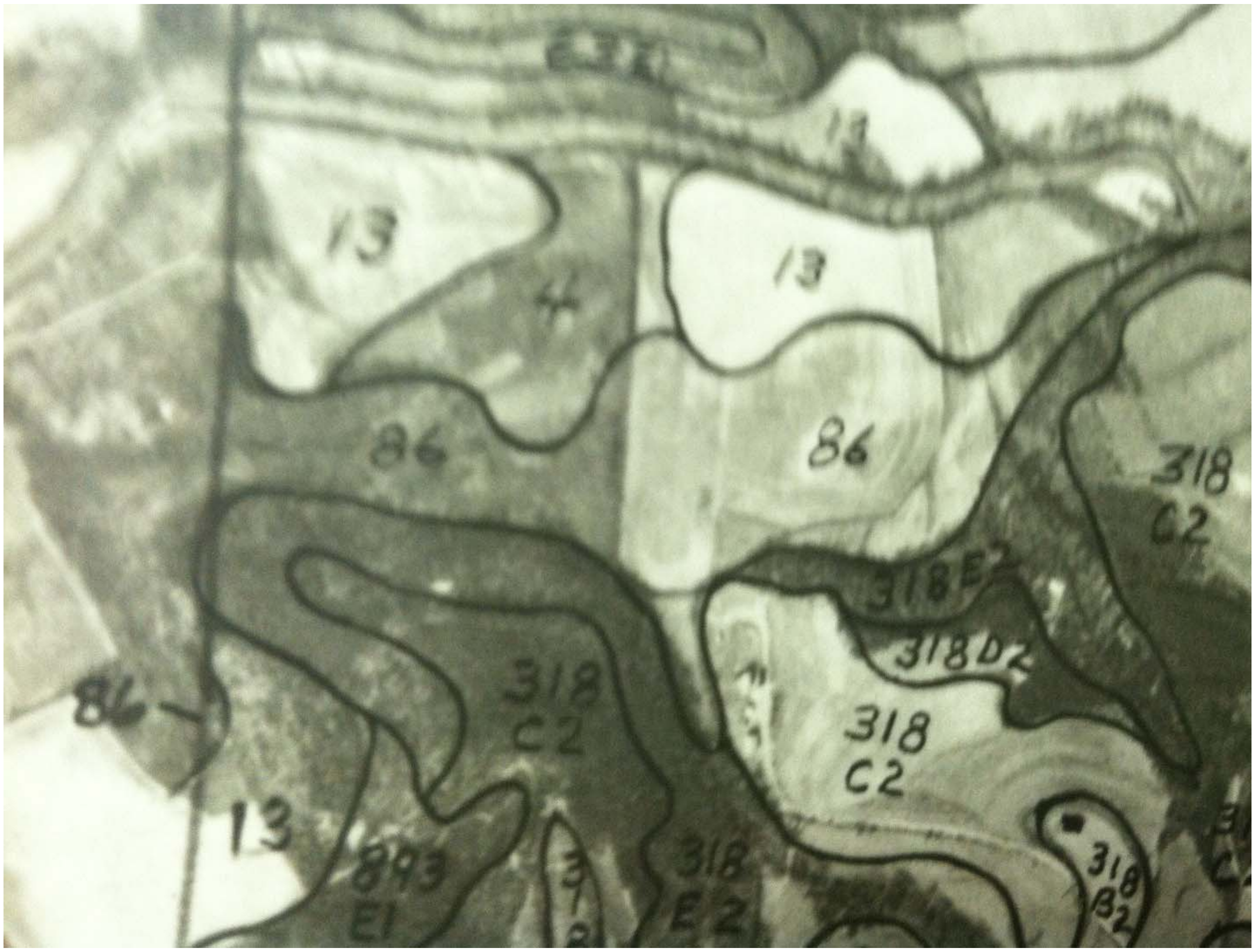

INQUIRY #: 3707408.5
YEAR: 1951
= 750'
N

1951 Aerial Image – photograph taken by Wildlands of aerial on file at the Catawba County courthouse

1956 Aerial Image - photograph taken by Wildlands of aerial on file at the Catawba County courthouse


INQUIRY #: 3707408.5
YEAR: 1961
= 1000'
N

1963 Aerial Image - photograph taken by Wildlands of aerial on file at the Catawba County courthouse



1967 Aerial Image - photograph taken by Wildlands of aerial on file at the Catawba County courthouse

INQUIRY #: 3707408.5

YEAR: 1976

= 1000'

INQUIRY #: 3707408.5

YEAR: 1993

= 500'

N

Appendix 3: Project Site USACE Routine Wetland Determination Data Forms Jurisdictional Determination

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP1

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.702817 Long: W 81.363500 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?	✓	

Is the Sampled Area within a Wetland? **Yes** ___ **No** ✓

Remarks:

Sampling point located near the top of a shallow depression on a former golf course. The course is still maintained (mowed).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	✓		1
Water Table Present?		✓	-
Saturation Present? (includes capillary fringe)	✓		<12

Wetland Hydrology Present? **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP1

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Allium canadense	30	Yes	FACU
2. Juncus effusus	10	Yes	FACW
3. Cyndon dactylon	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	45		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	10	x 2 = 20
FAC species	0	x 3 = 0
FACU species	35	x 4 = 140
UPL species	0	x 5 = 0
Column Totals:	45 (A)	160 (B)

Prevalence Index = B/A = 3.56

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained former golf course. Routine maintenance has removed tree strata.

SOIL

Sampling Point: Upland - DP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	7.5YR 4/1	100					silty loam	
1-5	7.5Y 4/3	85	10YR 5/2	15	C	PL	loam	
5-12	7.5YR 4/4	95	10YR 4/3	5	C	PL	clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ______ **No** ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland A - DP2

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.702434 Long: W 81.362746 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓ No ___	
Wetland Hydrology Present?	Yes ✓ No ___	

Remarks:

Sampling point located near the lower end of a shallow depression within a former golf course. The course is still maintained (mowed).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ✓ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓ No ___	Depth (inches): 6	
Water Table Present?	Yes ___ No ✓	Depth (inches): -	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12	**Wetland Hydrology Present? Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland A - DP2

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	10	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	10 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Herb Stratum (Plot size: 5')			
1. Juncus effusus	50	Yes	FACW
2. Carex sp.	20	Yes	Unknown
3. Ludwigia alternifolia	10	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained former golf course. Routine maintenance has removed the majority of tree strata.

SOIL

Sampling Point: Wetland A - DP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	98	10YR 5/8	2	C	PL	silt loam	
3-12	10YR 3/1	98	10YR 4/4	2	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP3

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.702323 Long: W 81.362669 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	___	✓
Hydric Soil Present?	___	✓
Wetland Hydrology Present?	___	✓

Is the Sampled Area within a Wetland? **Yes** ___ **No** ✓

Remarks:

Sampling point located on a former golf course. The course is still maintained (mowed).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?	___	✓	-
Water Table Present?	___	✓	-
Saturation Present? (includes capillary fringe)	___	✓	-

Wetland Hydrology Present? Yes ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP3

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyndon dactylon	90	Yes	FACU
2. Allium canadense	10	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	100	x 4 =	400
UPL species	0	x 5 =	0
Column Totals:	100 (A)		400 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained former golf course. Routine maintenance has removed tree strata.

SOIL

Sampling Point: Upland - DP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 4/3	90	10YR 4/2	10	C	PL	loam	
3-5	7.5YR 4/3	70	5YR 4/6	30	C	PL	loam	
5-12	7.5YR 4/4	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5)
__ 2 cm Muck (A10) **(LRR N)**
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Dark Surface (S7)
__ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
__ Thin Dark Surface (S9) **(MLRA 147, 148)**
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
__ Umbric Surface (F13) **(MLRA 136, 122)**
__ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10) **(MLRA 147)**
__ Coast Prairie Redox (A16) **(MLRA 147, 148)**
__ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF12)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ____ **No** ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland B - DP4

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.702521 Long: W 81.363245 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___
Hydric Soil Present?	Yes ✓	No ___
Wetland Hydrology Present?	Yes ✓	No ___

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ___

Remarks:

Sampling point located in a shallow depression within a former golf course. The course is still maintained (mowed).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓	No ___	Depth (inches): 3
Water Table Present?	Yes ___	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12

Wetland Hydrology Present? **Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland B - DP4

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cardamine pensylvanica	30	Yes	FACW
2. Cynodon dactylon	5	No	FACU
3. Rumex crispus	1	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	36 = Total Cover		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ✓ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained former golf course. Routine maintenance has removed the tree strata.

SOIL

Sampling Point: Wetland B - DP4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-3	10YR 4/2	95	7.5YR 4/4	5	C	PL	silt	
3-8	7.5YR 4/3	80	7.5YR 4/6	2	C	PL	loam	
8-12	7.5YR 4/4	95	5YR 4/6	5	C	PL	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site   City/County: Catawba   Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering   State: NC   Sampling Point: Upland - DP5

Investigator(s): Ian Eckardt & Alea Tuttle   Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain   Local relief (concave, convex, none): none   Slope (%): 0

Subregion (LRR or MLRA): MLRA 136   Lat: N 35.702455   Long: W 81.363157   Datum: ______

Soil Map Unit Name: Hatboro loam (HaA)   NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ✓

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? **Yes** ______ **No** ✓

Remarks:

Sampling point located on a former golf course. The course is still maintained (mowed).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	-
Water Table Present?		✓	-
Saturation Present? (includes capillary fringe)		✓	-

Wetland Hydrology Present? Yes ______ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP5

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyndon dactylon	90	Yes	FACU
2. Conyza canadensis	5	No	FACU
3. Taraxacum officinale	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	100	x 4 = 400
UPL species	0	x 5 = 0
Column Totals:	100 (A)	400 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Feature is located in a maintained former golf course. Routine maintenance has removed tree strata.

SOIL

Sampling Point: Upland - DP5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/3	100					silt loam	
2-7	10YR 4/3	90	7.5YR 4/6	10	C	PL	silt loam	
7-12	7.5YR 4/4	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site   City/County: Catawba   Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering   State: NC   Sampling Point: Wetland C - DP6

Investigator(s): Ian Eckardt & Alea Tuttle   Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain   Local relief (concave, convex, none): concave   Slope (%): 0

Subregion (LRR or MLRA): MLRA 136   Lat: N 35.702417   Long: W 81.363725   Datum: ______

Soil Map Unit Name: Hatboro loam (HaA)   NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed?   Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___
Hydric Soil Present?	Yes ✓	No ___
Wetland Hydrology Present?	Yes ✓	No ___

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ___

Remarks:

Sampling point located in a small shallow depression within a former golf course. The course is still maintained (mowed).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): -
Water Table Present?	Yes ✓	No ___	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland C - DP6

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	90	Yes	FACU
2. Cardamine pensylvanica	2	No	FACW
3. Ranunculus arbotivus	2	No	FACW
4. Trifolium repens	2	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	96		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

The "Problematic Hydrophytic Vegetation" indicator is being used because the area exhibits hydric soil and wetland hydrology indicators but plant management practices have replaced native species with primarily Bermuda grass (Cynodon dactylon).

SOIL

Sampling Point: Wetland C - DP6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/3						silt loam	
2-8	10YR 4/2	90	5YR 4/6	10	C	PL	loam	
8-12	10YR 4/2	75	7.5YR 4/6	25	C	PL	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP7

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.702485 Long: W 81.363777 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ✓

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? **Yes** ______ **No** ✓

Remarks:

Sampling point located within a former golf course. The course is still maintained (mowed).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	-
Water Table Present?		✓	-
Saturation Present? (includes capillary fringe)		✓	-

Wetland Hydrology Present? **Yes** ______ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP7

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	100	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	100	x 4 = 400
UPL species	0	x 5 = 0
Column Totals:	100 (A)	400 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Previous plant management practices have replaced native species with primarily Bermuda grass (Cynodon dactylon) for the former golf course.

SOIL

Sampling Point: Upland - DP7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 4/3						loam	
3-7	10YR 4/4	80	2.5YR 4/3	20	C	PL	loam	
7-9	2.5Y 4/3	80	10YR 4/6	20	C	PL	loam	
9-12	5YR 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland E - DP8

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.702059 Long: W 81.364126 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ______
Hydric Soil Present?	Yes ✓	No ______
Wetland Hydrology Present?	Yes ✓	No ______

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ______

Remarks:

Sampling point located in a linear feature that appears to receive groundwater discharge from the adjacent hillside.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓	No ______	Depth (inches): 3
Water Table Present?	Yes ______	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ✓	No ______	Depth (inches): <12

Wetland Hydrology Present? Yes ✓ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland E - DP8

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	40	Yes	FAC
2. Platanus occidentalis	20	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	60 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Ligustrum sinense	10	Yes	FAC
2. Alnus serrulata	5	Yes	FACW
3. Carpinus caroliniana	5	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	20 = Total Cover		
Herb Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wetland E - DP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	95	7.5YR 4/6	5	C	PL	silt loam	
4-12	10YR 3/2	95	7.5YR 4/4	5	C	PL	clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP9

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.702044 Long: W 81.364146 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	✓	
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? **Yes** ______ **No** ✓

Remarks:

Sampling point is the corresponding upland data point to Wetland E.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	-
Water Table Present?		✓	-
Saturation Present? (includes capillary fringe)		✓	-

Wetland Hydrology Present? **Yes** ______ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP9

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Ligustrum sinense	5	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	10 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Rubus sp.	50	Yes	Unknown
2. Allium canadense	10	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1. Lonicera japonica	90	Yes	FAC
2.			
3.			
4.			
5.			
6.			
	90 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Upland - DP9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 4/6	100					loam	
3-9	7.5YR 4/6	90	2.5YR 4/8	10	C	PL	loam	
9-12	5YR 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ **No** ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland D - DP10

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7021787 Long: W 81.367124 Datum: ______

Soil Map Unit Name: Woolwinde-Fairview complex (WoD2) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓ No ___	
Wetland Hydrology Present?	Yes ✓ No ___	

Remarks:

Sampling point located in a wetland complex feature that appears to receive groundwater discharge from the adjacent hillside.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___ No ✓	Depth (inches): ___	
Water Table Present?	Yes ___ No ✓	Depth (inches): -	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12	**Wetland Hydrology Present? Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland D - DP10

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland D - DP10

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	40	Yes	FAC
2. Liriodendron tulipifera	30	Yes	FACU
3. Celtis laevigata	20	Yes	FACW
4.			
5.			
6.			
7.			
8.			
	90 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Acer negundo	10	Yes	FAC
2. Prunus serotina	10	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	20 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Symphyotrichum elliottii	10	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wetland D - DP10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2	10YR 3/2	100					silt loam	
2-8	10YR 3/1	98	10YR 5/8	2	C	PL	silt loam	
8-12	10YR 3/2	98	10YR 4/6	2	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP11

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7022301 Long: W 81.3636128 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✓
Hydric Soil Present?	Yes ___	No ✓
Wetland Hydrology Present?	Yes ___	No ✓

Is the Sampled Area within a Wetland? **Yes** ___ **No** ✓

Remarks:

Sampling point is the corresponding upland data point to Wetland F. Sampling point is in the maintained fairway of an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): -
Water Table Present?	Yes ___	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): -

Wetland Hydrology Present? **Yes** ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP11

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	90	Yes	FACU
2. Trifolium repens	5	No	FACU
3. Taraxacum sp.	5	No	unknown
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species	95	x 4 = 380
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Upland - DP11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/3	100					loam	
2-9	10YR 4/3	95	5YR 4/6	5	C	PL	loam	
9-12	5YR 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ___ No ✓

Remarks:

Sampling point is in the maintained fairway of an old golf course, and vegetation is periodically mowed.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP12

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7022301 Long: W 81.3636128 Datum: ______

Soil Map Unit Name: Woolwine-Fairfew complex (WoD2) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No ✓	Is the Sampled Area within a Wetland?	Yes ___ No ✓
Hydric Soil Present?	Yes ___ No ✓		
Wetland Hydrology Present?	Yes ___ No ✓		

Remarks:

Sampling point is the corresponding upland data point to Wetland F. Sampling point is in the maintained fairway of an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): -

Water Table Present? Yes ___ No ✓ Depth (inches): -

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): -

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP12

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Liriodendron tulipifera	5	Yes	FACU
2. Platanus occidentalis	5	Yes	FACW
3. Acer rubrum	5	Yes	FAC
4.			
5.			
6.			
7.			
8.			
	15 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	90	Yes	FACU
2. Trifolium repens	5	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95 = Total Cover		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 =
FACW species	5	x 2 = 10
FAC species	5	x 3 = 15
FACU species	100	x 4 = 400
UPL species		x 5 =
Column Totals:	110 (A)	425 (B)

Prevalence Index = B/A = 3.8

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is in the maintained fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	7.5YR 3/4	100					loam	
4-12	5YR 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ **No** ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland F - DP13

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7020635 Long: W 81.3631363 Datum: ______

Soil Map Unit Name: Woolwinde-Fairview complex (WoD2) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ______	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ______
Hydric Soil Present?	Yes ✓ No ______	
Wetland Hydrology Present?	Yes ✓ No ______	

Remarks:

Sampling point located in a linear feature that appears to receive groundwater discharge from the adjacent hillside.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓ No ______	Depth (inches): 1	
Water Table Present?	Yes ______ No ✓	Depth (inches): -	
Saturation Present? (includes capillary fringe)	Yes ✓ No ______	Depth (inches): <12	**Wetland Hydrology Present? Yes** ✓ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland F - DP13

Tree Stratum (Plot size: 30')

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Liquidambar styraciflua	20	Yes	FAC
2.	Liriodendron tulipifera	20	Yes	FACU
3.	Pinus virginiana	20	Yes	NI
4.	Betula nigra	20	Yes	FACW
5.				
6.				
7.				
8.				
		80 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Hamamelis virginiana	50	Yes	FACU
2.	Acer negundo	10	No	FAC
3.	Liriodendron tulipifera	10	No	FACU
4.	Liquidambar styraciflua	10	No	FAC
5.	Betula nigra	10	Yes	FACW
6.				
7.				
8.				
9.				
10.				
		90 = Total Cover		

Herb Stratum (Plot size: 5')

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
		= Total Cover		

Woody Vine Stratum (Plot size: 30')

	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Lonicera japonica	20	Yes	FAC
2.				
3.				
4.				
5.				
6.				
		20 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.57 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wetland F - DP13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 4/3	100					sand	
3-12	7.5YR 3/1	95	7.5YR 4/4	5	C	PL	sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/3/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: DP14

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7022564 Long: W 81.3631082 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are “Normal Circumstances” present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?	✓	

Is the Sampled Area within a Wetland? Yes ___ No ✓

Remarks:

Sampling point is in a muddy depression in the fairway of an old golf course. Vegetation is periodically mowed. Soil is developing hydric indicators but does not meet the requirements of a Depleted Matrix (F3). Did not meet hydric soils criteria, but presented primary indicators of hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	-
Water Table Present?		✓	-
Saturation Present? (includes capillary fringe)	✓		2

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP14

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	10		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is in the maintained fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: DP14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 4/1	100					silty sand	
1-7	10YR 3/6	95	5YR 5/2	5	C	PL	loam	
7-12	7.5YR 4/6	90	10YR 5/3	10	C	PL	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No ✓

Remarks:

Soil is developing hydric indicators but does not meet the requirements of a Depleted Matrix (F3).

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland G - DP15

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7022564 Long: W 81.3624007 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?**	**Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓ No ___		
Wetland Hydrology Present?	Yes ✓ No ___		

Remarks:

Sampling point located in a linear feature that appears to receive groundwater discharge from the adjacent hillside.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓ No ___	Depth (inches): 3	
Water Table Present?	Yes ___ No ✓	Depth (inches): -	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12	**Wetland Hydrology Present? Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland G - DP15

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Carex lurida	60	Yes	OBL
2. Juncus effusus	5	No	FACW
3. Ludwigia alternifolia	2	No	FACW
4. Schizachyrium scoparium	1	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	68		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ________ (A)

Total Number of Dominant Species Across All Strata: ________ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ________ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ________

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
__ 2 - Dominance Test is >50%
__ 3 - Prevalence Index is ≤3.0[1]
__ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wetland G - DP15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-1	10YR 4/2	100					organic	
1-6	10YR 4/2	98	7.5YR 4/6	2	C	PL	silty loam	
6-12	7.5YR 4/2	90	5YR 4/6	10	C	PL	silty sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP16

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ____

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7022934 Long: W 81.3623344 Datum: ____

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? **Yes** ____ **No** ✓

Remarks:

Sampling point is the corresponding upland data point to Wetland G. Sampling point is in the maintained fairway of an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ✓	Depth (inches): -
Water Table Present?	Yes ____	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ____	No ✓	Depth (inches): -

Wetland Hydrology Present? **Yes** ____ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP16

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	90	Yes	FACU
2. Microstegium vimineum	6	No	FAC
3. Plantago lanceolata	2	No	UPL
4. Allium canadense	2	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 =
FACW species	0	x 2 =
FAC species	6	x 3 = 18
FACU species	92	x 4 = 368
UPL species	2	x 5 = 10
Column Totals:	100 (A)	396 (B)

Prevalence Index = B/A = 3.96

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is in the maintained fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 4/4	100					loam	
2-6	7.5YR 4/4	95	5YR 4/6	5	C	M	loam	
6-12	5YR 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5)
__ 2 cm Muck (A10) **(LRR N)**
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Dark Surface (S7)
__ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
__ Thin Dark Surface (S9) **(MLRA 147, 148)**
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
__ Umbric Surface (F13) **(MLRA 136, 122)**
__ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10) **(MLRA 147)**
__ Coast Prairie Redox (A16) **(MLRA 147, 148)**
__ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF12)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ____ **No** ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland I - DP17

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7024353 Long: W 81.3621027 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✓	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ✓	No ___	

Remarks:

Sampling point located in concave hillslope and at base of slope, and appears to be receiving groundwater inputs from hillslope. Area appears to be periodically mowed. Maintained former golf course. Area did not meet hydrophytic vegetation criteria (dominated by Bermuda grass) but exhibited primary hydrology indicators and hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ___
Water Table Present?	Yes ✓	No ___	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland I - DP17

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	95	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95 = Total Cover		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Old golf course, still maintained. Area did not meet hydrophytic vegetation criteria (dominated by Bermuda grass) but exhibited primary hydrology indicators and hydric soil indicators.

SOIL

Sampling Point: Wetland I - DP17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	95	7.5YR 4/6	5	C	PL	silty loam	
3-4	10YR 3/1	100					silty loam	
4-7	10YR 4/2	80	5YR 4/6	20	C	PL	loam	
7-12	5YR 4/6	90	7.5YR 4/3	10	C	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP18

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7024854 Long: W 81.3620704 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No ✓	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** ✓
Hydric Soil Present?	Yes ___ No ✓	
Wetland Hydrology Present?	Yes ___ No ✓	

Remarks:

Sampling point is the corresponding upland data point to both Wetland H and Wetland I. Sampling point is in the maintained lawn next to an old golf course, and vegetation is periodically mowed. Soil is developing hydric indicators but does not meet the requirements of a depleted matrix (F3)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): -
Water Table Present?	Yes ___	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): -

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP18

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	95	Yes	FACU
2. Plantago lanceolata	5	No	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is maintained as a lawn next to an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/4	100					loam	
2-4	10YR 4/6	100					loam	
4-8	2.5Y 4/2	98	10YR 5/8	2	C	PL	loam	
8-12	10YR 4/3	95	7.5YR 4/6	5	C	PL	loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

Soil is developing hydric indicators but does not meet the hydric soil requirements yet.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland H - DP19

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7025842 Long: W 81.3619386 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	Is the Sampled Area within a Wetland?	Yes ✓ No ___
Hydric Soil Present?	Yes ✓ No ___		
Wetland Hydrology Present?	Yes ✓ No ___		

Remarks:

Sampling point located in concave hillslope and at base of slope, incorporates a linear drainage pattern, and appears to be receiving groundwater inputs from hillslope. Area appears to be periodically mowed. Maintained former golf course.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓ No ___	Depth (inches): 1	
Water Table Present?	Yes ✓ No ___	Depth (inches): 5	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12	**Wetland Hydrology Present? Yes ✓ No ___**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland H - DP19

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cardamine pensylvanica	30	Yes	OBL
2. Cynodon dactylon	25	Yes	FACU
3. Symphyotrichum elliottii	3	No	OBL
4. Rumex crispus	1	No	FAC
5. Juncus effusus	1	No	FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	60		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	33	x 1 =	33
FACW species	1	x 2 =	2
FAC species	1	x 3 =	3
FACU species	25	x 4 =	100
UPL species		x 5 =	
Column Totals:	60 (A)		138 (B)

Prevalence Index = B/A = 2.3

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ✓ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Old golf course, still maintained.

SOIL

Sampling Point: Wetland H - DP19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 4/2	100					silty sand	
2-8	10YR 4/1	95	7YR 4/6	5	C	PL	sandy loam	
8-12	10YR 4/6	75	7YR 4/6	25	C	PL	sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland J- DP20

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7028712 Long: W 81.3620143 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	Is the Sampled Area within a Wetland?	Yes ✓ No ___
Hydric Soil Present?	Yes ✓ No ___		
Wetland Hydrology Present?	Yes ✓ No ___		

Remarks:

Sampling point located is a linear drainage pattern, and appears to be receiving groundwater inputs from hillslope. Area appears to be periodically mowed. Maintained former golf course.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓ No ___	Depth (inches): 1	
Water Table Present?	Yes ___ No ✓	Depth (inches): --	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12	**Wetland Hydrology Present?** Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland J- DP20

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula nigra	30	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	30 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Liquidambar styraciflua	2	Yes	FAC
2. Nyssa sylvatica	1	No	FAC
3. Populus deltoides	1	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	4 = Total Cover		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	50	Yes	FACW
2. Carex sp.	25	Yes	unknown
3. Ludwigia alternifolia	5	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ✓ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Old golf course, still maintained.

SOIL

Sampling Point: Wetland J- DP20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/2	100					silty loam	
2-12	10YR 4/2	95	10YR 4/6	5	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP21

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7029338 Long: W 81.3620498 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ✓

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? **Yes** ______ **No** ✓

Remarks:

Sampling point is the corresponding upland data point to Wetland J. Sampling point is in the maintained lawn next to an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	-
Water Table Present?		✓	-
Saturation Present? (includes capillary fringe)		✓	-

Wetland Hydrology Present? Yes ______ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP21

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	75	Yes	FACU
2. Unknown	19	No	unknown
3. Trifolium repens	2	No	FACU
4. Viola sp.	2	No	unknown
5. Allium canadense	2	No	FACU
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	79	x 4 = 316
UPL species	0	x 5 = 0
Column Totals:	79 (A)	316 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is maintained as a lawn next to an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/4	100					loam	
4-7	5YR 4/6	100					loam	
7-12	7.5YR 4/4	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland K- DP22

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7031615 Long: W 81.3617869 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✓	Is the Sampled Area within a Wetland? Yes ✓ No ___
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ✓	No ___	

Remarks:

Sampling point located in on a maintained former golf course fairway and appears to have a hydrological connection to groundwater. Area appears to be periodically mowed. Area did not meet hydrophytic vegetation criteria (dominated by Bermuda grass) but exhibited primary hydrology indicators and hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ______
Water Table Present?	Yes ___	No ✓	Depth (inches): --
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland K- DP22

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	93	Yes	FACU
2. Carex lurida	5	No	OBL
3. Juncus effusus	1	No	FACW
4. Rumex Crispus	1	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species	5	x 1 = 5
FACW species	1	x 2 = 2
FAC species	1	x 3 = 3
FACU species	93	x 4 = 372
UPL species	0	x 5 = 0
Column Totals:	100 (A)	382 (B)

Prevalence Index = B/A = 3.82

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Old golf course, still maintained. Area did not meet hydrophytic vegetation criteria (dominated by Bermuda grass) but exhibited primary hydrology indicators and hydric soil indicators. Some OBL and FACW species present.

SOIL

Sampling Point: Wetland K- DP22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-1	10YR 2/2	100					silt loam	
1-7	2.5Y 4/2	85	7.5YR 4/6	15	C	PL	silt loam	
7-12	10YR 3/2	80	10YR 4/6	20	C	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP23

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7032439 Long: W 81.3617893 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No ✓	**Is the Sampled Area within a Wetland? Yes ___ No ✓**
Hydric Soil Present?	Yes ___ No ✓	
Wetland Hydrology Present?	Yes ___ No ✓	

Remarks:

Sampling point is the corresponding upland data point to both Wetland L and Wetland K. Sampling point is in the maintained fairway in an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Moss Trim Lines (B16)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Microtopographic Relief (D4)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): -	
Water Table Present?	Yes ___	No ✓	Depth (inches): -	
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): -	**Wetland Hydrology Present? Yes ___ No ✓**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP23

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	96	Yes	FACU
2. Allium canadense	3	No	FACU
3. Plantago lanceolata	1	No	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is within the fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 4/4	100					loam	
3-12	7.5YR 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ______ **No** ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland L- DP24

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ____

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7033214 Long: W 81.3617579 Datum: ____

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ✓

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?**	**Yes ✓ No ____**
Hydric Soil Present?	Yes ✓ No ____		
Wetland Hydrology Present?	Yes ✓ No ____		

Remarks:

Sampling point located in a concave depression (perhaps a former sand trap) on a maintained former golf course fairway and appears to have a hydrological connection to groundwater. Area appears to be periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): -

Water Table Present? Yes ____ No ✓ Depth (inches): -

Saturation Present? (includes capillary fringe) Yes ✓ No ____ Depth (inches): <12

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland L- DP24

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	50	Yes	FACW
2. Cynodon dactylon	5	No	FACU
3. Rumex Crispus	1	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	56		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Old golf course, still maintained.

SOIL

Sampling Point: Wetland L- DP24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 3/2	100					sand	
1-12	2.5Y 5/2	90	10YR 4/6	10	C	PL	sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** ✓ **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland M- DP25

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7036293 Long: W 81.3620364 Datum: ______

Soil Map Unit Name: Dan River loam (DaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ✓	No ___	

Remarks:

Wetland is in a drained former wet pond in an old golf course, and appears to still have a hydrological connection to groundwater.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)	___ True Aquatic Plants (B14)
___ High Water Table (A2)	___ Hydrogen Sulfide Odor (C1)
✓ Saturation (A3)	___ Oxidized Rhizospheres on Living Roots (C3)
___ Water Marks (B1)	___ Presence of Reduced Iron (C4)
___ Sediment Deposits (B2)	___ Recent Iron Reduction in Tilled Soils (C6)
✓ Drift Deposits (B3)	___ Thin Muck Surface (C7)
___ Algal Mat or Crust (B4)	___ Other (Explain in Remarks)
___ Iron Deposits (B5)	
___ Inundation Visible on Aerial Imagery (B7)	
✓ Water-Stained Leaves (B9)	
___ Aquatic Fauna (B13)	

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ______
Water Table Present?	Yes ___	No ✓	Depth (inches): --
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland M- DP25

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra	5	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	5 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		

Herb Stratum (Plot size: 5')			
1. Polygonum hydropiperoides	90	Yes	OBL
2. Juncus effusus	5	No	FACW
3. Carex sp.	5	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ✓ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

Wetland is in a drained former wet pond in an old golf course.

SOIL

Sampling Point: Wetland M- DP25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 3/2	100					sand	
1-12	2.5Y 5/2	90	10YR 4/6	10	C	PL	sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP26

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7035002 Long: W 81.3620327 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	___	✓
Hydric Soil Present?	___	✓
Wetland Hydrology Present?	___	✓

Is the Sampled Area within a Wetland? **Yes** ___ **No** ✓

Remarks:

Sampling point is the corresponding upland data point to both Wetland L and Wetland K. Sampling point is in the maintained fairway in an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	___	✓	-
Water Table Present?	___	✓	-
Saturation Present? (includes capillary fringe)	___	✓	-

Wetland Hydrology Present? **Yes** ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP26

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
		= Total Cover	
Herb Stratum (Plot size: 5')			
1. Cynodon dactylon	96	Yes	FACU
2. Allium canadense	3	No	FACU
3. Plantago lanceolata	1	No	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	
FACW species	0	x 2 =	
FAC species	0	x 3 =	
FACU species	99	x 4 =	396
UPL species	1	x 5 =	5
Column Totals:	100 (A)		401 (B)

Prevalence Index = B/A = 4.01

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is within the fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 4/4	100					loam	
3-12	7.5YR 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________________

Depth (inches): ________________

Hydric Soil Present? Yes ______ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland N- DP27

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.703233 Long: W 81.364872 Datum: ______

Soil Map Unit Name: Codorus loam (CsA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?**	**Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓ No ___		
Wetland Hydrology Present?	Yes ✓ No ___		

Remarks:

Wetland is a linear feature, and appears to have a hydrological connection to groundwater from surrounding hillslope areas. Area is near the fairway of an old golf course and is mowed up to the edge of the linear feature.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ✓ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓ No ___	Depth (inches): 2	
Water Table Present?	Yes ___ No ✓	Depth (inches): --	
Saturation Present? (includes capillary fringe)	Yes ✓ No ___	Depth (inches): <12	**Wetland Hydrology Present? Yes** ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland N- DP27

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Polygonum hydropiperoides	50	Yes	OBL
2. Juncus effusus	20	Yes	FACW
3. Carex sp.	5	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75 = Total Cover		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ✓ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ______

Remarks: (Include photo numbers here or on a separate sheet.)

Area is near the fairway of an old golf course and is mowed up to the edge of the linear feature.

SOIL

Sampling Point: Wetland N- DP27

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 2/2	100					organic	
1-7	10YR 4/1	95	10YR 5/8	5	C	PL	silt loam	
7-12	5Y 4/1	95	10YR 5/8	5	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP28

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.703189 Long: W 81.364853 Datum: ______

Soil Map Unit Name: Codorus loam (CsA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ___ No ✓

Remarks:

Sampling point is the corresponding upland data point to Wetland N. Sampling point is in the maintained fairway in an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	-
Water Table Present?		✓	-
Saturation Present? (includes capillary fringe)		✓	-

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP28

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	85	Yes	FACU
2. Digitaria sanguinalis	5	No	FAC
3. Plantago lanceolata	5	No	UPL
4. Taraxacum sp.	5	No	unknown
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 =
FACW species	0	x 2 =
FAC species	5	x 3 = 15
FACU species	85	x 4 = 340
UPL species	5	x 5 = 25
Column Totals:	95 (A)	380 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is within the fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP28

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/5	100					loam	
4-12	10YR 4/3	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5)
__ 2 cm Muck (A10) **(LRR N)**
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Dark Surface (S7)
__ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
__ Thin Dark Surface (S9) **(MLRA 147, 148)**
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
__ Umbric Surface (F13) **(MLRA 136, 122)**
__ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10) **(MLRA 147)**
__ Coast Prairie Redox (A16) **(MLRA 147, 148)**
__ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF12)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ____ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland O- DP29

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7029684 Long: W 81.3681828 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?** **Yes ✓ No ___**
Hydric Soil Present?	Yes ✓ No ___	
Wetland Hydrology Present?	Yes ✓ No ___	

Remarks:

Wetland is a linear ditched feature at the edge of a forested parcel..

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ✓ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 6

Water Table Present? Yes ___ No ✓ Depth (inches): --

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): <12

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland O- DP29

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Platanus occidentalis	33	Yes	FACW
2. Betula nigra	33	Yes	FACW
3. Acer rubrum	33	Yes	FAC
4.			
5.			
6.			
7.			
8.			
= Total Cover	99		

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Ligustrum sinense	40	Yes	FACU
2. Lindera benzoin	30	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover	70		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover			

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

Area is at the edge of a forested parcel.

SOIL

Sampling Point: Wetland O- DP29

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	10YR 4/2	98	10YR 5/8	2	C	PL	silt loam	
4-12	10YR 4/2	95	10YR 4/6	5	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP30

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7030137 Long: W 81.3681168 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?**	**Yes** ___ **No** ✓
Hydric Soil Present?	Yes ___ No ✓		
Wetland Hydrology Present?	Yes ___ No ✓		

Remarks:

Sampling point is the corresponding upland data point to Wetland O. Sampling point is in the maintained fairway in an old golf course, and vegetation is periodically mowed. Hydric vegetation in canopy is associated with adjacent wetland.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): -
Water Table Present?	Yes ___	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): -

Wetland Hydrology Present? **Yes** ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP30

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Platanus occidentalis	33	Yes	FACW
2. Betula nigra	33	Yes	FACW
3. Acer rubrum	33	Yes	FACW
4.			
5.			
6.			
7.			
8.			
	99 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Herb Stratum (Plot size: 5')			
1. Allium canadense	10	Yes	FACU
2. Viola sp.	5	No	unknown
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✓ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is within the fairway of an old golf course, and vegetation is periodically mowed. Hydric vegetation in canopy is associated with adjacent wetland.

SOIL

Sampling Point: Upland - DP30

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/4	100					loam	
4-12	7.5YR 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland P- DP31

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7023732 Long: W 81.3653016 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?	✓	
Wetland Hydrology Present?	✓	

Is the Sampled Area within a Wetland? Yes ✓ No ___

Remarks:

Wetland is a muddy depression within a maintained former golf course fairway. Area appears to be periodically mowed. Area did not meet hydrophytic vegetation criteria (dominated by Bermuda grass) but exhibited primary hydrology indicators and hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		✓	
Water Table Present?		✓	--
Saturation Present? (includes capillary fringe)	✓		<12

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland P- DP31

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
		= Total Cover	
Herb Stratum (Plot size: 5')			
1. Cynodon dactylon	95	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- __ 1 - Rapid Test for Hydrophytic Vegetation
- __ 2 - Dominance Test is >50%
- __ 3 - Prevalence Index is ≤3.0[1]
- __ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Area is maintained as a former golf course fairway and is periodically mowed. Area did not meet hydrophytic vegetation criteria (dominated by Bermuda grass) but exhibited primary hydrology indicators and hydric soil indicators.

SOIL

Sampling Point: Wetland P- DP31

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/2	95	5YR 4/6	5	C	PL	silt loam	
3-6	10YR 4/1	95	5YR 4/6	5	C	PL	silt loam	
6-12	10YR 4/4	70	5YR 4/6	30	C	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP32

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7023194 Long: W 81.3650979 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✓
Hydric Soil Present?	Yes ___	No ✓
Wetland Hydrology Present?	Yes ___	No ✓

Is the Sampled Area within a Wetland? Yes ___ No ✓

Remarks:

Sampling point is the corresponding upland data point to Wetland P and Wetland Q. Sampling point is in the maintained fairway in an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ✓ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): -
Water Table Present?	Yes ___	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): -

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP32

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Herb Stratum (Plot size: 5')			
1. Cynodon dactylon	100	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is within the fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP32

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR 4/4	100					loam	
3-12	7.5YR 5/8	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ______ **No** ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland Q- DP33

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7022134 Long: W 81.3647579 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No ✓	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓ No ___	
Wetland Hydrology Present?	Yes ✓ No ___	

Remarks:

Wetland is a rutted muddy depression within a maintained former golf course fairway. Area appears to be periodically mowed. Area did not meet hydrophytic vegetation criteria (dominated by Bermuda grass) but exhibited primary hydrology indicators and hydric soil indicators.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): ___
Water Table Present?	Yes ___	No ✓	Depth (inches): --
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): <12

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland Q- DP33

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cynodon dactylon	95	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	95		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ✓ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ______ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Area is maintained as a former golf course fairway and is periodically mowed. Area did not meet hydrophytic vegetation criteria (dominated by Bermuda grass) but exhibited primary hydrology indicators and hydric soil indicators.

SOIL

Sampling Point: Wetland Q- DP33

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/2	95	7.5YR 4/6	5	C	PL	loam	
2-4	10YR 4/2	85	7.5YR 4/6	15	C	PL	loam	
4-12	5YR 4/4	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Stratified Layers (A5)
__ 2 cm Muck (A10) **(LRR N)**
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Dark Surface (S7)
__ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
__ Thin Dark Surface (S9) **(MLRA 147, 148)**
__ Loamy Gleyed Matrix (F2)
✓ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)
__ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
__ Umbric Surface (F13) **(MLRA 136, 122)**
__ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10) **(MLRA 147)**
__ Coast Prairie Redox (A16) **(MLRA 147, 148)**
__ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF12)
__ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ✓ **No** ____

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland R- DP34

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): littoral bench backwater Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7026982 Long: W 81.3641319 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ______	Is the Sampled Area within a Wetland?	Yes ✓ No ______
Hydric Soil Present?	Yes ✓ No ______		
Wetland Hydrology Present?	Yes ✓ No ______		

Remarks:

Wetland is the littoral bench and backwater area of an inline pond on an unnamed tributary (UT1) to Henry Fork.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓ No ______	Depth (inches): 3	
Water Table Present?	Yes ______ No ✓	Depth (inches): --	
Saturation Present? (includes capillary fringe)	Yes ✓ No ______	Depth (inches): <12	**Wetland Hydrology Present? Yes ✓ No ______**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland R- DP34

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus serrulata	5	Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover	5		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Symphyotrichum elliottii	70	Yes	OBL
2. Juncus effusus	20	Yes	FACW
3. Cyperus strigosus	5	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	95		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wetland R- DP34

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 3/4	100					mucky silt	
1-12	10YR 3/2	90	7.5YR 4/4	10	C	PL	silt	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP35

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7026612 Long: W 81.3641982 Datum: ______

Soil Map Unit Name: Hatboro loam (HaA) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ______ No ✓

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ______	No ✓	**Is the Sampled Area within a Wetland?** **Yes** ______ **No** ✓
Hydric Soil Present?	Yes ______	No ✓	
Wetland Hydrology Present?	Yes ______	No ✓	

Remarks:

Sampling point is the corresponding upland data point to Wetland R. Sampling point is in the maintained fairway in an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ______	No ✓	Depth (inches): -
Water Table Present?	Yes ______	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ______	No ✓	Depth (inches): -

Wetland Hydrology Present? Yes ______ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP35

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
		= Total Cover	
Herb Stratum (Plot size: 5')			
1. Cynodon dactylon	100	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ____ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is within the fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP35

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/3	100					loam	
3-4	10YR 3/2	85	7.5YR 4/6	15	C	M	loam	
4-12	7.5YR 4/4	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Wetland S- DP36

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): littoral bench backwater Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7005229 Long: W 81.3640684 Datum: ______

Soil Map Unit Name: Woolwine-Fairview complex (WoD2) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ______	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ______
Hydric Soil Present?	Yes ✓	No ______	
Wetland Hydrology Present?	Yes ✓	No ______	

Remarks:

Wetland Data Point is within a somewhat linear drainage feature within a wetland complex including the littoral bench and backwater area of an inline pond on an unnamed tributary (UT1) to Henry Fork.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ✓ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ✓ Algal Mat or Crust (B4)
- ✓ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✓	No ______	Depth (inches): 2
Water Table Present?	Yes ______	No ✓	Depth (inches): --
Saturation Present? (includes capillary fringe)	Yes ✓	No ______	Depth (inches): <12

Wetland Hydrology Present? Yes ✓ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland S- DP36

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover	5		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Symphyotrichum elliottii	30	Yes	OBL
2. Juncus effusus	5	No	FACW
3. Carex sp.	5	No	unknown
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	40		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ______ (A)

Total Number of Dominant Species Across All Strata: ______ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ______ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

✓ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: Wetland S- DP36

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3	100					sandy loam	
4-7	10YR 4/1	95	10YR 4/6	5	C	PL	sandy loam	
7-12	10YR 4/1	90	10YR 4/6	10	C	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Henry Fork Mitigation Site City/County: Catawba Sampling Date: 4/4/14

Applicant/Owner: Wildlands Engineering State: NC Sampling Point: Upland - DP37

Investigator(s): Ian Eckardt & Alea Tuttle Section, Township, Range: ______

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR or MLRA): MLRA 136 Lat: N 35.7004864 Long: W 81.3639662 Datum: ______

Soil Map Unit Name: Woolwine-Fairview complex (WoD2) NWI classification: ______

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ___ No ✓

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___ No ✓	Is the Sampled Area within a Wetland?	Yes ___ No ✓
Hydric Soil Present?	Yes ___ No ✓		
Wetland Hydrology Present?	Yes ___ No ✓		

Remarks:

Sampling point is the corresponding upland data point to Wetland S Sampling point is in the maintained fairway in an old golf course, and vegetation is periodically mowed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✓	Depth (inches): -
Water Table Present?	Yes ___	No ✓	Depth (inches): -
Saturation Present? (includes capillary fringe)	Yes ___	No ✓	Depth (inches): -

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland - DP37

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
		= Total Cover	
Herb Stratum (Plot size: 5')			
1. Cynodon dactylon	90	Yes	FACU
2. Taraxacum sp.	10	No	unknown
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** ✓

Remarks: (Include photo numbers here or on a separate sheet.)

Sampling point is within the fairway of an old golf course, and vegetation is periodically mowed.

SOIL

Sampling Point: Upland - DP37

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	5YR 4/4	100					loam	
2-12	5Y/R 4/6	100					loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes ____ No ✓

Remarks:

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland A	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
[x] **Yes** [ ] **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.702434N/-81.362746W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[ ] A	[ ] A	Not severely altered
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[ ] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[x] C	[x] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[x] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[ ] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[x] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[ ] C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☒ B	☒ B	☒ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☒ F	☒ F	☒ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☒ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐ Yes ☒ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☒ G	☒ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric
Answer for assessment area dominant landform.
- [x] A Evidence of short-duration inundation (< 7 consecutive days)
- [ ] B Evidence of saturation, without evidence of inundation
- [ ] C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric
Consider recent deposition only (no plant growth since deposition).
- [x] A Sediment deposition is not excessive, but at approximately natural levels.
- [ ] B Sediment deposition is excessive, but not overwhelming the wetland.
- [ ] C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric
Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
[ ] A	[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	[ ] D	From 25 to < 50 acres
[ ] E	[ ] E	[ ] E	From 10 to < 25 acres
[ ] F	[ ] F	[ ] F	From 5 to < 10 acres
[ ] G	[ ] G	[ ] G	From 1 to < 5 acres
[ ] H	[ ] H	[ ] H	From 0.5 to < 1 acre
[x] I	[x] I	[ ] I	From 0.1 to < 0.5 acre
[ ] J	[ ] J	[ ] J	From 0.01 to < 0.1 acre
[ ] K	[ ] K	[x] K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)
- [ ] A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- [ ] B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric
13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	From 10 to < 50 acres
[ ] E	[ ] E	< 10 acres
[x] F	[x] F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
[ ] Yes [ ] No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)
May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.
- [ ] A No artificial edge within 150 feet in all directions
- [ ] B No artificial edge within 150 feet in four (4) to seven (7) directions
- [x] C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)
- [ ] A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- [ ] B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- [x] C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)
- [ ] A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- [ ] B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- [ ] C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☒ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☒ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☐ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank and overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland A	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland B	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
[ ] **Yes** [x] **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	35.702521N/-81.363245W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[ ] A	[ ] A	Not severely altered
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[x] A	[x] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[x] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[ ] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☒ B	☒ B	☒ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☒ F	☒ F	☒ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric

7a. Is assessment area within 50 feet of a tributary or other open water?

☐ Yes ☒ No If Yes, continue to 7b. If No, skip to Metric 8.

Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☒ E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

☐ ≤ 15-feet wide ☐ > 15-feet wide ☒ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

☐ Yes ☒ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☒ G	☒ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- [x] A Evidence of short-duration inundation (< 7 consecutive days)
- [ ] B Evidence of saturation, without evidence of inundation
- [ ] C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- [x] A Sediment deposition is not excessive, but at approximately natural levels.
- [ ] B Sediment deposition is excessive, but not overwhelming the wetland.
- [ ] C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
[ ] A	[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	[ ] D	From 25 to < 50 acres
[ ] E	[ ] E	[ ] E	From 10 to < 25 acres
[ ] F	[ ] F	[ ] F	From 5 to < 10 acres
[ ] G	[ ] G	[ ] G	From 1 to < 5 acres
[ ] H	[ ] H	[ ] H	From 0.5 to < 1 acre
[ ] I	[ ] I	[ ] I	From 0.1 to < 0.5 acre
[x] J	[x] J	[ ] J	From 0.01 to < 0.1 acre
[ ] K	[ ] K	[x] K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- [ ] A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- [ ] B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	From 10 to < 50 acres
[ ] E	[ ] E	< 10 acres
[x] F	[x] F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

[ ] Yes [ ] No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- [ ] A No artificial edge within 150 feet in all directions
- [ ] B No artificial edge within 150 feet in four (4) to seven (7) directions
- [x] C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- [ ] A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- [ ] B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- [x] C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- [ ] A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- [ ] B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- [ ] C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☒ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☒ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank and overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland B	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	NO
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland C	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
[ ] **Yes** [x] **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	35.702417N/-81.363725W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[x] A	[ ] A	Not severely altered
[ ] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[x] A	[x] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[x] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[ ] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- [ ] A Sandy soil
- [x] B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- [ ] C Loamy or clayey soils not exhibiting redoximorphic features
- [ ] D Loamy or clayey gleyed soil
- [ ] E Histosol or histic epipedon

4b.
- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

4c.
- [x] A No peat or muck presence
- [ ] B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[x] A	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[ ] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[ ] C	[ ] C	[ ] C	Confined animal operations (or other local, concentrated source of pollutants)
[ ] D	[ ] D	[ ] D	≥ 20% coverage of pasture
[ ] E	[ ] E	[ ] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of clear-cut land
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
[ ] Yes [x] No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [ ] A ≥ 50 feet
- [ ] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [x] E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
[ ] ≤ 15-feet wide [ ] > 15-feet wide [x] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
[ ] Yes [x] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[ ] C	[ ] C	From 50 to < 80 feet
[ ] D	[ ] D	From 40 to < 50 feet
[ ] E	[ ] E	From 30 to < 40 feet
[ ] F	[ ] F	From 15 to < 30 feet
[x] G	[x] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☒K	☒K	☒K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☒F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐A No artificial edge within 150 feet in all directions
☐B No artificial edge within 150 feet in four (4) to seven (7) directions
☒C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☒ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☒ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank and overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland C	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	NO
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland D	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
[x] **Yes** [ ] **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	35.7021787N/-81.367124W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[x] A	[x] A	Not severely altered
[ ] B	[ ] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[ ] A	Water storage capacity and duration are not altered.
[x] B	[x] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[x] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[ ] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- [ ] A Sandy soil
- [x] B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- [ ] C Loamy or clayey soils not exhibiting redoximorphic features
- [ ] D Loamy or clayey gleyed soil
- [ ] E Histosol or histic epipedon

4b.
- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

4c.
- [x] A No peat or muck presence
- [ ] B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[x] A	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[ ] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[ ] C	[ ] C	[ ] C	Confined animal operations (or other local, concentrated source of pollutants)
[ ] D	[ ] D	[ ] D	≥ 20% coverage of pasture
[ ] E	[ ] E	[ ] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of clear-cut land
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
[x] Yes [ ] No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [x] A ≥ 50 feet
- [ ] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [ ] E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
[x] ≤ 15-feet wide [ ] > 15-feet wide [ ] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
[x] Yes [ ] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[ ] C	[ ] C	From 50 to < 80 feet
[x] D	[x] D	From 40 to < 50 feet
[ ] E	[ ] E	From 30 to < 40 feet
[ ] F	[ ] F	From 15 to < 30 feet
[ ] G	[ ] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- [ ] A Evidence of short-duration inundation (< 7 consecutive days)
- [x] B Evidence of saturation, without evidence of inundation
- [ ] C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- [x] A Sediment deposition is not excessive, but at approximately natural levels.
- [ ] B Sediment deposition is excessive, but not overwhelming the wetland.
- [ ] C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
[ ] A	[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	[ ] D	From 25 to < 50 acres
[ ] E	[ ] E	[ ] E	From 10 to < 25 acres
[ ] F	[ ] F	[ ] F	From 5 to < 10 acres
[ ] G	[ ] G	[ ] G	From 1 to < 5 acres
[ ] H	[ ] H	[ ] H	From 0.5 to < 1 acre
[ ] I	[ ] I	[ ] I	From 0.1 to < 0.5 acre
[x] J	[x] J	[x] J	From 0.01 to < 0.1 acre
[ ] K	[ ] K	[ ] K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- [ ] A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- [ ] B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	From 10 to < 50 acres
[x] E	[x] E	< 10 acres
[ ] F	[ ] F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

[ ] Yes [ ] No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- [ ] A No artificial edge within 150 feet in all directions
- [x] B No artificial edge within 150 feet in four (4) to seven (7) directions
- [ ] C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- [x] A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- [ ] B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- [ ] C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- [ ] A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- [ ] B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- [ ] C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- [ ] A ≥ 25% coverage of vegetation
- [ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	[ ] A	[x] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	[x] B	[ ] B	Canopy present, but opened more than natural gaps
	[ ] C	[ ] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[x] B	[x] B	Moderate density mid-story/sapling layer
	[ ] C	[ ] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[x] B	Moderate density shrub layer
	[x] C	[ ] C	Shrub layer sparse or absent
Herb	[ ] A	[ ] A	Dense herb layer
	[x] B	[ ] B	Moderate density herb layer
	[ ] C	[x] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

- [x] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- [ ] B Not A

19. Diameter Class Distribution – wetland type condition metric

- [ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
- [x] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
- [ ] C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

- [ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
- [x] B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [ ] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- [x] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- [ ] B Overbank flow is severely altered in the assessment area.
- [ ] C Overland flow is severely altered in the assessment area.
- [ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland D	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**MEDIUM**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**HIGH**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**MEDIUM**

Overall Wetland Rating **HIGH**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland E	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
[x] **Yes** [ ] **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.702059N/-81.364126W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[ ] A	[x] A	Not severely altered
[x] B	[ ] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[ ] A	Water storage capacity and duration are not altered.
[x] B	[x] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[x] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[ ] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[ ] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☒ B	☒ B	☒ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☒ F	☒ F	☒ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric

7a. Is assessment area within 50 feet of a tributary or other open water?

☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.

Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☒ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

☒ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☒ G	☒ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. **Inundation Duration – assessment area condition metric**
Answer for assessment area dominant landform.
- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ☒ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric**
Consider recent deposition only (no plant growth since deposition).
- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. **Wetland Size – wetland type/wetland complex condition metric**
Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☒ J	☒ J	☒ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**
- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. **Connectivity to Other Natural Areas – landscape condition metric**
13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☒ E	☒ E	< 10 acres
☐ F	☐ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric (skip for all marshes)**
May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.
- ☐ A No artificial edge within 150 feet in all directions
- ☒ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☐ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. **Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)**
- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☒ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☐ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**
- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☒ B	☐ B	Canopy present, but opened more than natural gaps
	☐ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☒ B	☒ B	Moderate density mid-story/sapling layer
	☐ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☒ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☒ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☐ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☐ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland E	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**MEDIUM**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **HIGH**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name Wetland F | **Date** 8/6/14
Wetland Type Headwater Forest | **Assessor Name/Organization** I. Eckardt/Wildlands
Level III Ecoregion Piedmont | **Nearest Named Water Body** Henry Fork
River Basin Catawba | **USGS 8-Digit Catalogue Unit** 03050103
☒ **Yes** ☐ **No** **Precipitation within 48 hrs?** | **Latitude/Longitude (deci-degrees)** 35.7020635N/-81.3631363W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ☒ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☐ A	☒ A	Not severely altered
☒ B	☐ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐ A	☐ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☒ C	☒ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒ D	☒ D	Depressions able to pond water < 3 inches deep

3b.	☐ A	Evidence that maximum depth of inundation is greater than 2 feet
	☐ B	Evidence that maximum depth of inundation is between 1 and 2 feet
	☒ C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- [ ] A Sandy soil
- [x] B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- [ ] C Loamy or clayey soils not exhibiting redoximorphic features
- [ ] D Loamy or clayey gleyed soil
- [ ] E Histosol or histic epipedon

4b.
- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

4c.
- [x] A No peat or muck presence
- [ ] B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[x] A	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[ ] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[ ] C	[ ] C	[ ] C	Confined animal operations (or other local, concentrated source of pollutants)
[ ] D	[ ] D	[ ] D	≥ 20% coverage of pasture
[ ] E	[ ] E	[ ] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of clear-cut land
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
[x] Yes [ ] No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [x] A ≥ 50 feet
- [ ] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [ ] E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
[x] ≤ 15-feet wide [ ] > 15-feet wide [ ] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
[x] Yes [ ] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[ ] C	[ ] C	From 50 to < 80 feet
[ ] D	[ ] D	From 40 to < 50 feet
[ ] E	[ ] E	From 30 to < 40 feet
[ ] F	[ ] F	From 15 to < 30 feet
[x] G	[x] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☒ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☒ J	☒ J	☒ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☒ E	☒ E	< 10 acres
☐ F	☐ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☒ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☐ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☒ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☐ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☒ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- ☐ A ≥ 25% coverage of vegetation
- ☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☒ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☐ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☒ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

- ☒ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- ☐ B Not A

19. Diameter Class Distribution – wetland type condition metric

- ☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
- ☒ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
- ☐ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

- ☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
- ☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- ☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- ☐ B Overbank flow is severely altered in the assessment area.
- ☐ C Overland flow is severely altered in the assessment area.
- ☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland F	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	NO
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland G	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
[x] **Yes** [ ] **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.7022564N/-81.3624007W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)

- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)

- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[ ] A	[ ] A	Not severely altered
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[ ] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[x] C	[x] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[x] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[ ] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[x] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[ ] C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☒ B	☒ B	☒ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☒ F	☒ F	☒ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☒ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐ Yes ☒ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☒ H	☒ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

☒A Evidence of short-duration inundation (< 7 consecutive days)
☐B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☒J	☒J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☒K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☒F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐A No artificial edge within 150 feet in all directions
☐B No artificial edge within 150 feet in four (4) to seven (7) directions
☒C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☒B	Moderate density mid-story/sapling layer
	☒C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☒B	Moderate density shrub layer
	☒C	☐C	Shrub layer sparse or absent
Herb	☒A	☐A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☒C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland G	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland H	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
[x] **Yes** [ ] **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	35.7025842N/-81.3619386W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[x] A	[ ] A	Not severely altered
[ ] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[x] A	[x] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[x] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[ ] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☑ B	☑ B	☑ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☑ F	☑ F	☑ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☐ Yes ☒ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☒ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐ Yes ☒ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☒ F	☒ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☒ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☒ J	☒ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☒ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☒ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐A ≥ 25% coverage of vegetation
☐B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐A	☒A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐B	☐B	Canopy present, but opened more than natural gaps
	☒C	☐C	Canopy sparse or absent
Mid-Story	☐A	☐A	Dense mid-story/sapling layer
	☐B	☒B	Moderate density mid-story/sapling layer
	☒C	☐C	Mid-story/sapling layer sparse or absent
Shrub	☐A	☐A	Dense shrub layer
	☐B	☒B	Moderate density shrub layer
	☒C	☐C	Shrub layer sparse or absent
Herb	☒A	☐A	Dense herb layer
	☐B	☐B	Moderate density herb layer
	☐C	☒C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒B Not A

19. Diameter Class Distribution – wetland type condition metric

☐A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐A ☐B ☐C ☐D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐B Overbank flow is severely altered in the assessment area.
☐C Overland flow is severely altered in the assessment area.
☐D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland H	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	NO
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland I	**Date**	8/6/14
Wetland Type	Headw ater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Cataw ba	**USGS 8-Digit Catalogue Unit**	03050103
☒ **Yes** ☐ **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.7024353N/-81.3621027W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☒ A	☐ A	Not severely altered
☐ B	☒ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒ D	☒ D	Depressions able to pond water < 3 inches deep

3b.	☐ A	Evidence that maximum depth of inundation is greater than 2 feet
	☐ B	Evidence that maximum depth of inundation is between 1 and 2 feet
	☒ C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☑ B	☑ B	☑ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☑ F	☑ F	☑ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☐ Yes ☒ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☒ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐ Yes ☒ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☒ G	☒ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☒B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select “K” for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☒J	☒J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☒K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☒F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐A No artificial edge within 150 feet in all directions
☐B No artificial edge within 150 feet in four (4) to seven (7) directions
☒C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☒ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☒ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☐ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank and overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland I	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	NO
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland J	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
☒ **Yes** ☐ **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.7028712N/-81.3620143W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☐ A	☐ A	Not severely altered
☒ B	☒ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐ A	☐ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☒ C	☒ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☒ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐ D	☒ D	Depressions able to pond water < 3 inches deep

3b.	☐ A	Evidence that maximum depth of inundation is greater than 2 feet
	☐ B	Evidence that maximum depth of inundation is between 1 and 2 feet
	☒ C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. [ ] A Sandy soil
[x] B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
[ ] C Loamy or clayey soils not exhibiting redoximorphic features
[ ] D Loamy or clayey gleyed soil
[ ] E Histosol or histic epipedon

4b. [x] A Soil ribbon < 1 inch
[ ] B Soil ribbon ≥ 1 inch

4c. [x] A No peat or muck presence
[ ] B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[x] A	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[ ] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[ ] C	[ ] C	[ ] C	Confined animal operations (or other local, concentrated source of pollutants)
[ ] D	[ ] D	[ ] D	≥ 20% coverage of pasture
[ ] E	[ ] E	[ ] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of clear-cut land
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
[x] Yes [ ] No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
[ ] A ≥ 50 feet
[ ] B From 30 to < 50 feet
[ ] C From 15 to < 30 feet
[ ] D From 5 to < 15 feet
[x] E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
[x] ≤ 15-feet wide [ ] > 15-feet wide [ ] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
[ ] Yes [x] No

7e. Is tributary or other open water sheltered or exposed?
[x] Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
[ ] Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[ ] C	[ ] C	From 50 to < 80 feet
[ ] D	[ ] D	From 40 to < 50 feet
[ ] E	[ ] E	From 30 to < 40 feet
[ ] F	[ ] F	From 15 to < 30 feet
[x] G	[x] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☒ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☒ J	☒ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☒ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☒ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- ☐ A ≥ 25% coverage of vegetation
- ☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☒ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☒ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☐ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

- ☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- ☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

- ☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
- ☒ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
- ☐ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

- ☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
- ☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- ☒ A Overbank and overland flow are not severely altered in the assessment area.
- ☐ B Overbank flow is severely altered in the assessment area.
- ☐ C Overland flow is severely altered in the assessment area.
- ☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland J	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name Wetland K | **Date** 8/6/14
Wetland Type Headw ater Forest | **Assessor Name/Organization** I. Eckardt/Wildlands
Level III Ecoregion Piedmont | **Nearest Named Water Body** Henry Fork
River Basin Cataw ba | **USGS 8-Digit Catalogue Unit** 03050103
☐ **Yes** ☒ **No** **Precipitation within 48 hrs?** | **Latitude/Longitude (deci-degrees)** 35.7031615N/-81.3617869W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☐ A	☐ A	Not severely altered
☒ B	☒ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒ D	☒ D	Depressions able to pond water < 3 inches deep

3b.	☐ A	Evidence that maximum depth of inundation is greater than 2 feet
	☐ B	Evidence that maximum depth of inundation is between 1 and 2 feet
	☒ C	Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- [ ] A Sandy soil
- [x] B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- [ ] C Loamy or clayey soils not exhibiting redoximorphic features
- [ ] D Loamy or clayey gleyed soil
- [ ] E Histosol or histic epipedon

4b.
- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

4c.
- [x] A No peat or muck presence
- [ ] B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[x] A	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[ ] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[ ] C	[ ] C	[ ] C	Confined animal operations (or other local, concentrated source of pollutants)
[ ] D	[ ] D	[ ] D	≥ 20% coverage of pasture
[ ] E	[ ] E	[ ] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of clear-cut land
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric

7a. Is assessment area within 50 feet of a tributary or other open water?

[ ] Yes [x] No If Yes, continue to 7b. If No, skip to Metric 8.

Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [ ] A ≥ 50 feet
- [ ] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [x] E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

[ ] ≤ 15-feet wide [ ] > 15-feet wide [x] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

[ ] Yes [x] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[ ] C	[ ] C	From 50 to < 80 feet
[ ] D	[ ] D	From 40 to < 50 feet
[ ] E	[ ] E	From 30 to < 40 feet
[ ] F	[ ] F	From 15 to < 30 feet
[x] G	[x] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. Inundation Duration – assessment area condition metric
Answer for assessment area dominant landform.
- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☒ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric
Consider recent deposition only (no plant growth since deposition).
- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric
Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select “K” for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☒ J	☒ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☒ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)
- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☒ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)
May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.
- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)
- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)
- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- [ ] A ≥ 25% coverage of vegetation
- [ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	[ ] A	[x] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	[ ] B	[ ] B	Canopy present, but opened more than natural gaps
	[x] C	[ ] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[ ] B	[x] B	Moderate density mid-story/sapling layer
	[x] C	[ ] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[x] B	Moderate density shrub layer
	[x] C	[ ] C	Shrub layer sparse or absent
Herb	[x] A	[ ] A	Dense herb layer
	[ ] B	[ ] B	Moderate density herb layer
	[ ] C	[x] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

- [ ] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- [x] B Not A

19. Diameter Class Distribution – wetland type condition metric

- [ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
- [ ] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
- [x] C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

- [ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
- [x] B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [ ] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- [x] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- [ ] B Overbank flow is severely altered in the assessment area.
- [ ] C Overland flow is severely altered in the assessment area.
- [ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland K	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	NO
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name Wetland L **Date** 8/6/14
Wetland Type Headwater Forest **Assessor Name/Organization** I. Eckardt/Wildlands
Level III Ecoregion Piedmont **Nearest Named Water Body** Henry Fork
River Basin Catawba **USGS 8-Digit Catalogue Unit** 03050103
☐ **Yes** ☒ **No** **Precipitation within 48 hrs?** **Latitude/Longitude (deci-degrees)** 35.7033214N/-81.3617579W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☒ A	☐ A	Not severely altered
☐ B	☒ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒ D	☒ D	Depressions able to pond water < 3 inches deep

3b.	☐ A	Evidence that maximum depth of inundation is greater than 2 feet
	☐ B	Evidence that maximum depth of inundation is between 1 and 2 feet
	☒ C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☑ B	☑ B	☑ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☑ F	☑ F	☑ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☐ Yes ☒ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☒ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☐ ≤ 15-feet wide ☐ > 15-feet wide ☒ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐ Yes ☒ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☒ G	☒ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. **Inundation Duration – assessment area condition metric**

Answer for assessment area dominant landform.

- [ ] A Evidence of short-duration inundation (< 7 consecutive days)
- [x] B Evidence of saturation, without evidence of inundation
- [ ] C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric**

Consider recent deposition only (no plant growth since deposition).

- [x] A Sediment deposition is not excessive, but at approximately natural levels.
- [ ] B Sediment deposition is excessive, but not overwhelming the wetland.
- [ ] C Sediment deposition is excessive and is overwhelming the wetland.

11. **Wetland Size – wetland type/wetland complex condition metric**

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
[ ] A	[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	[ ] D	From 25 to < 50 acres
[ ] E	[ ] E	[ ] E	From 10 to < 25 acres
[ ] F	[ ] F	[ ] F	From 5 to < 10 acres
[ ] G	[ ] G	[ ] G	From 1 to < 5 acres
[ ] H	[ ] H	[ ] H	From 0.5 to < 1 acre
[ ] I	[ ] I	[ ] I	From 0.1 to < 0.5 acre
[ ] J	[ ] J	[ ] J	From 0.01 to < 0.1 acre
[x] K	[x] K	[x] K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**

- [ ] A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- [ ] B Pocosin is < 90% of the full extent of its natural landscape size.

13. **Connectivity to Other Natural Areas – landscape condition metric**

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	From 10 to < 50 acres
[ ] E	[ ] E	< 10 acres
[x] F	[x] F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

[ ] Yes [ ] No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric (skip for all marshes)**

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- [ ] A No artificial edge within 150 feet in all directions
- [ ] B No artificial edge within 150 feet in four (4) to seven (7) directions
- [x] C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. **Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)**

- [ ] A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- [ ] B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- [x] C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**

- [ ] A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- [ ] B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- [ ] C Vegetation is dominated by exotic species (>50% cover of exotics).

17. **Vegetative Structure – assessment area/wetland type condition metric**

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- [ ] A ≥ 25% coverage of vegetation
- [ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	[ ] A	[x] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	[ ] B	[ ] B	Canopy present, but opened more than natural gaps
	[x] C	[ ] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[ ] B	[x] B	Moderate density mid-story/sapling layer
	[x] C	[ ] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[x] B	Moderate density shrub layer
	[x] C	[ ] C	Shrub layer sparse or absent
Herb	[x] A	[ ] A	Dense herb layer
	[ ] B	[ ] B	Moderate density herb layer
	[ ] C	[x] C	Herb layer sparse or absent

18. **Snags – wetland type condition metric**

- [ ] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- [x] B Not A

19. **Diameter Class Distribution – wetland type condition metric**

- [ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
- [ ] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
- [x] C Majority of canopy trees are < 6 inches DBH or no trees.

20. **Large Woody Debris – wetland type condition metric**

Include both natural debris and man-placed natural debris.

- [ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
- [x] B Not A

21. **Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)**

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [ ] B [ ] C [ ] D

22. **Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)**

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- [x] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- [ ] B Overbank flow is severely altered in the assessment area.
- [ ] C Overland flow is severely altered in the assessment area.
- [ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland L	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	NO
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland M	**Date**	8/6/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
☐ **Yes** ☒ **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.7036293N/-81.3620364W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☒ A	☐ A	Not severely altered
☐ B	☒ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☒ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐ D	☒ D	Depressions able to pond water < 3 inches deep

3b.	☒ A	Evidence that maximum depth of inundation is greater than 2 feet
	☐ B	Evidence that maximum depth of inundation is between 1 and 2 feet
	☐ C	Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☒B	☒B	☒B	< 10% impervious surfaces
☐C	☐C	☐C	Confined animal operations (or other local, concentrated source of pollutants)
☐D	☐D	☐D	≥ 20% coverage of pasture
☐E	☐E	☐E	≥ 20% coverage of agricultural land (regularly plowed land)
☒F	☒F	☒F	≥ 20% coverage of maintained grass/herb
☐G	☐G	☐G	≥ 20% coverage of clear-cut land
☐H	☐H	☐H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric

7a. Is assessment area within 50 feet of a tributary or other open water?
☐Yes ☒No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☐A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☐D From 5 to < 15 feet
☒E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☐≤ 15-feet wide ☐> 15-feet wide ☒Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐Yes ☒No

7e. Is tributary or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☒C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☐G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☐A Evidence of short-duration inundation (< 7 consecutive days)
- ☐B Evidence of saturation, without evidence of inundation
- ☒C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒A Sediment deposition is not excessive, but at approximately natural levels.
- ☐B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☒I	☒I	☐I	From 0.1 to < 0.5 acre
☐J	☐J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☒K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☒D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☐F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- ☐A No artificial edge within 150 feet in all directions
- ☐B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☒ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☒ B	☐ B	Moderate density herb layer
	☐ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland M	Date	8/6/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	NO
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name Wetland N — **Date** 8/7/14
Wetland Type Headwater Forest — **Assessor Name/Organization** I. Eckardt/Wildlands
Level III Ecoregion Piedmont — **Nearest Named Water Body** Henry Fork
River Basin Catawba — **USGS 8-Digit Catalogue Unit** 03050103
[x] **Yes** [ ] **No** **Precipitation within 48 hrs?** — **Latitude/Longitude (deci-degrees)** 35.703233N/-81.364872W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
   Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[ ] A	[ ] A	Not severely altered
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
   Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[ ] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[x] C	[x] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
   Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[x] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[ ] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[x] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[ ] C	Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐A Sandy soil
☒B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐C Loamy or clayey soils not exhibiting redoximorphic features
☐D Loamy or clayey gleyed soil
☐E Histosol or histic epipedon

4b. ☒A Soil ribbon < 1 inch
☐B Soil ribbon ≥ 1 inch

4c. ☒A No peat or muck presence
☐B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒A	☒A	Little or no evidence of pollutants or discharges entering the assessment area
☐B	☐B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐C	☐C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐A	☐A	☐A	≥ 10% impervious surfaces
☑B	☑B	☑B	< 10% impervious surfaces
☐C	☐C	☐C	Confined animal operations (or other local, concentrated source of pollutants)
☐D	☐D	☐D	≥ 20% coverage of pasture
☐E	☐E	☐E	≥ 20% coverage of agricultural land (regularly plowed land)
☑F	☑F	☑F	≥ 20% coverage of maintained grass/herb
☐G	☐G	☐G	≥ 20% coverage of clear-cut land
☐H	☐H	☐H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric

7a. Is assessment area within 50 feet of a tributary or other open water?
☒Yes ☐No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☒A ≥ 50 feet
☐B From 30 to < 50 feet
☐C From 15 to < 30 feet
☐D From 5 to < 15 feet
☐E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒≤ 15-feet wide ☐> 15-feet wide ☐Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒Yes ☐No

7e. Is tributary or other open water sheltered or exposed?
☒Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
☐Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐A	☐A	≥ 100 feet
☐B	☐B	From 80 to < 100 feet
☐C	☐C	From 50 to < 80 feet
☐D	☐D	From 40 to < 50 feet
☐E	☐E	From 30 to < 40 feet
☐F	☐F	From 15 to < 30 feet
☒G	☒G	From 5 to < 15 feet
☐H	☐H	< 5 feet

9. **Inundation Duration – assessment area condition metric**
Answer for assessment area dominant landform.
☒ A Evidence of short-duration inundation (< 7 consecutive days)
☐ B Evidence of saturation, without evidence of inundation
☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric**
Consider recent deposition only (no plant growth since deposition).
☒ A Sediment deposition is not excessive, but at approximately natural levels.
☐ B Sediment deposition is excessive, but not overwhelming the wetland.
☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. **Wetland Size – wetland type/wetland complex condition metric**
Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☒ J	☒ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☒ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**
☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. **Connectivity to Other Natural Areas – landscape condition metric**
13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☒ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric (skip for all marshes)**
May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.
☐ A No artificial edge within 150 feet in all directions
☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. **Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)**
☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**
☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☒ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☒ B	Moderate density shrub layer
	☒ C	☐ C	Shrub layer sparse or absent
Herb	☒ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☐ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland N	Date	8/7/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland O	**Date**	8/7/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
☒ **Yes** ☐ **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	35.7029684N/-81.3681828W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☐ A	☐ A	Not severely altered
☒ B	☒ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☐ A	☐ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☒ C	☒ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☒ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐ D	☒ D	Depressions able to pond water < 3 inches deep

3b. ☐ A Evidence that maximum depth of inundation is greater than 2 feet
☒ B Evidence that maximum depth of inundation is between 1 and 2 feet
☐ C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☒ B	☒ B	☒ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☒ F	☒ F	☒ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric

7a. Is assessment area within 50 feet of a tributary or other open water?

☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.

Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☒ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

☒ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☒ G	☒ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ○ A Evidence of short-duration inundation (< 7 consecutive days)
- ○ B Evidence of saturation, without evidence of inundation
- ◉ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ◉ A Sediment deposition is not excessive, but at approximately natural levels.
- ○ B Sediment deposition is excessive, but not overwhelming the wetland.
- ○ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
○ A	○ A	○ A	≥ 500 acres
○ B	○ B	○ B	From 100 to < 500 acres
○ C	○ C	○ C	From 50 to < 100 acres
○ D	○ D	○ D	From 25 to < 50 acres
○ E	○ E	○ E	From 10 to < 25 acres
○ F	○ F	○ F	From 5 to < 10 acres
○ G	○ G	○ G	From 1 to < 5 acres
○ H	○ H	○ H	From 0.5 to < 1 acre
○ I	○ I	○ I	From 0.1 to < 0.5 acre
◉ J	◉ J	○ J	From 0.01 to < 0.1 acre
○ K	○ K	◉ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ○ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ○ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
○ A	○ A	≥ 500 acres
○ B	○ B	From 100 to < 500 acres
○ C	○ C	From 50 to < 100 acres
◉ D	◉ D	From 10 to < 50 acres
○ E	○ E	< 10 acres
○ F	○ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

○ Yes ○ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- ○ A No artificial edge within 150 feet in all directions
- ◉ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ○ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ○ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ◉ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ○ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ○ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ○ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ○ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- ☐ A ≥ 25% coverage of vegetation
- ☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☒ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☒ B	☐ B	Canopy present, but opened more than natural gaps
	☐ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☒ B	Moderate density mid-story/sapling layer
	☒ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☒ B	☒ B	Moderate density shrub layer
	☐ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☒ C	☒ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

- ☒ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- ☐ B Not A

19. Diameter Class Distribution – wetland type condition metric

- ☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
- ☒ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
- ☐ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

- ☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
- ☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only)

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- ☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- ☐ B Overbank flow is severely altered in the assessment area.
- ☐ C Overland flow is severely altered in the assessment area.
- ☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland O	Date	8/7/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland P	**Date**	8/7/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
[x] **Yes** [ ] **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	35.7023732N/-81.3653016W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Regulatory Considerations (select all that apply to the assessment area)
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

Does the assessment area experience overbank flooding during normal rainfall conditions? [x] Yes [ ] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[ ] A	[ ] A	Not severely altered
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[x] A	[x] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
	[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	[x] D	[x] D	Depressions able to pond water < 3 inches deep

3b.	[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
	[ ] B	Evidence that maximum depth of inundation is between 1 and 2 feet
	[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a. ☐ A Sandy soil
☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
☐ C Loamy or clayey soils not exhibiting redoximorphic features
☐ D Loamy or clayey gleyed soil
☐ E Histosol or histic epipedon

4b. ☒ A Soil ribbon < 1 inch
☐ B Soil ribbon ≥ 1 inch

4c. ☒ A No peat or muck presence
☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☑ B	☑ B	☑ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☑ F	☑ F	☑ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☐ A ≥ 50 feet
☒ B From 30 to < 50 feet
☐ C From 15 to < 30 feet
☐ D From 5 to < 15 feet
☐ E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
☒ Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
☐ Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☒ E	☒ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☒ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☒ J	☒ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☒ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☒ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- [ ] A ≥ 25% coverage of vegetation
- [ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	[ ] A	[x] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	[ ] B	[ ] B	Canopy present, but opened more than natural gaps
	[x] C	[ ] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[ ] B	[x] B	Moderate density mid-story/sapling layer
	[x] C	[ ] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[x] B	Moderate density shrub layer
	[x] C	[ ] C	Shrub layer sparse or absent
Herb	[ ] A	[ ] A	Dense herb layer
	[ ] B	[ ] B	Moderate density herb layer
	[x] C	[x] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

- [ ] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- [x] B Not A

19. Diameter Class Distribution – wetland type condition metric

- [ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
- [ ] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
- [x] C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

- [ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
- [x] B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [ ] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- [ ] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- [x] B Overbank flow is severely altered in the assessment area.
- [ ] C Overland flow is severely altered in the assessment area.
- [ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland P	Date	8/7/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **MEDIUM**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland Q	**Date**	8/7/14
Wetland Type	Headwater Forest	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
☒ **Yes** ☐ **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	35.7022134N/-81.3647579W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☐ A	☐ A	Not severely altered
☒ B	☒ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☒ D	☒ D	Depressions able to pond water < 3 inches deep

3b. ☐ A Evidence that maximum depth of inundation is greater than 2 feet
☐ B Evidence that maximum depth of inundation is between 1 and 2 feet
☒ C Evidence that maximum depth of inundation is less than 1 foot

4. Soil Texture/Structure – assessment area condition metric

Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- [ ] A Sandy soil
- [x] B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- [ ] C Loamy or clayey soils not exhibiting redoximorphic features
- [ ] D Loamy or clayey gleyed soil
- [ ] E Histosol or histic epipedon

4b.
- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

4c.
- [x] A No peat or muck presence
- [ ] B A peat or muck presence

5. Discharge into Wetland – opportunity metric

Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[x] A	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[ ] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. Land Use – opportunity metric

Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[ ] C	[ ] C	[ ] C	Confined animal operations (or other local, concentrated source of pollutants)
[ ] D	[ ] D	[ ] D	≥ 20% coverage of pasture
[ ] E	[ ] E	[ ] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of clear-cut land
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric

7a. Is assessment area within 50 feet of a tributary or other open water?

[x] Yes [ ] No If Yes, continue to 7b. If No, skip to Metric 8.

Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [ ] A ≥ 50 feet
- [x] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [ ] E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.

[x] ≤ 15-feet wide [ ] > 15-feet wide [ ] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?

[ ] Yes [x] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)

Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[ ] C	[ ] C	From 50 to < 80 feet
[ ] D	[ ] D	From 40 to < 50 feet
[ ] E	[ ] E	From 30 to < 40 feet
[x] F	[x] F	From 15 to < 30 feet
[ ] G	[ ] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

☐A Evidence of short-duration inundation (< 7 consecutive days)
☒B Evidence of saturation, without evidence of inundation
☐C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

☒A Sediment deposition is not excessive, but at approximately natural levels.
☐B Sediment deposition is excessive, but not overwhelming the wetland.
☐C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select “K” for the FW column.

WT	WC	FW (if applicable)	
☐A	☐A	☐A	≥ 500 acres
☐B	☐B	☐B	From 100 to < 500 acres
☐C	☐C	☐C	From 50 to < 100 acres
☐D	☐D	☐D	From 25 to < 50 acres
☐E	☐E	☐E	From 10 to < 25 acres
☐F	☐F	☐F	From 5 to < 10 acres
☐G	☐G	☐G	From 1 to < 5 acres
☐H	☐H	☐H	From 0.5 to < 1 acre
☐I	☐I	☐I	From 0.1 to < 0.5 acre
☒J	☒J	☐J	From 0.01 to < 0.1 acre
☐K	☐K	☒K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐A	☐A	≥ 500 acres
☐B	☐B	From 100 to < 500 acres
☐C	☐C	From 50 to < 100 acres
☐D	☐D	From 10 to < 50 acres
☐E	☐E	< 10 acres
☒F	☒F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐Yes ☐No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐A No artificial edge within 150 feet in all directions
☐B No artificial edge within 150 feet in four (4) to seven (7) directions
☒C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☒C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
☐B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

[ ] A ≥ 25% coverage of vegetation
[ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	[ ] A	[x] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	[ ] B	[ ] B	Canopy present, but opened more than natural gaps
	[x] C	[ ] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[ ] B	[x] B	Moderate density mid-story/sapling layer
	[x] C	[ ] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[x] B	Moderate density shrub layer
	[x] C	[ ] C	Shrub layer sparse or absent
Herb	[ ] A	[ ] A	Dense herb layer
	[ ] B	[ ] B	Moderate density herb layer
	[x] C	[x] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

[ ] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
[x] B Not A

19. Diameter Class Distribution – wetland type condition metric

[ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
[ ] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
[x] C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

[ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
[x] B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [ ] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

[ ] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
[x] B Overbank flow is severely altered in the assessment area.
[ ] C Overland flow is severely altered in the assessment area.
[ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland Q	Date	8/7/14
Wetland Type	Headwater Forest	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**MEDIUM**
	Condition/Opportunity	**MEDIUM**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **MEDIUM**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland R	**Date**	8/7/14
Wetland Type	Non-Tidal Freshwater Marsh	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
☒ **Yes** ☐ **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	35.7026982N/-81.3641319W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☒A	☒A	Not severely altered
☐B	☐B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒A	☒A	Water storage capacity and duration are not altered.
☐B	☐B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐C	☐C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐A	☐A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐B	☐B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐C	☐C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐D	☐D	Depressions able to pond water < 3 inches deep

3b.	☐A	Evidence that maximum depth of inundation is greater than 2 feet
	☐B	Evidence that maximum depth of inundation is between 1 and 2 feet
	☐C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- [ ] A Sandy soil
- [x] B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- [ ] C Loamy or clayey soils not exhibiting redoximorphic features
- [ ] D Loamy or clayey gleyed soil
- [ ] E Histosol or histic epipedon

4b.
- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

4c.
- [x] A No peat or muck presence
- [ ] B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[x] A	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[ ] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[ ] C	[ ] C	[ ] C	Confined animal operations (or other local, concentrated source of pollutants)
[ ] D	[ ] D	[ ] D	≥ 20% coverage of pasture
[ ] E	[ ] E	[ ] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of clear-cut land
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
[x] Yes [ ] No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [ ] A ≥ 50 feet
- [x] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [ ] E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
[ ] ≤ 15-feet wide [ ] > 15-feet wide [x] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
[x] Yes [ ] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[ ] C	[ ] C	From 50 to < 80 feet
[ ] D	[ ] D	From 40 to < 50 feet
[x] E	[x] E	From 30 to < 40 feet
[ ] F	[ ] F	From 15 to < 30 feet
[ ] G	[ ] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

☐ A Evidence of short-duration inundation (< 7 consecutive days)
☐ B Evidence of saturation, without evidence of inundation
☒ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

☒ A Sediment deposition is not excessive, but at approximately natural levels.
☐ B Sediment deposition is excessive, but not overwhelming the wetland.
☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select “K” for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☒ J	☒ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☒ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☒ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☒ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

☐ A No artificial edge within 150 feet in all directions
☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
☐ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
☒ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☒ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	☐ A	☐ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	☐ B	☐ B	Canopy present, but opened more than natural gaps
	☐ C	☐ C	Canopy sparse or absent
Mid-Story	☐ A	☐ A	Dense mid-story/sapling layer
	☐ B	☐ B	Moderate density mid-story/sapling layer
	☐ C	☐ C	Mid-story/sapling layer sparse or absent
Shrub	☐ A	☐ A	Dense shrub layer
	☐ B	☐ B	Moderate density shrub layer
	☐ C	☐ C	Shrub layer sparse or absent
Herb	☐ A	☐ A	Dense herb layer
	☐ B	☐ B	Moderate density herb layer
	☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☒ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland R	Date	8/7/14
Wetland Type	Non-Tidal Freshwater Marsh	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	NA
	Sub-Surface Storage and Retention	Condition	NA
Water Quality	Pathogen Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Particulate Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Physical Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**HIGH**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**MEDIUM**
	Condition/Opportunity	**MEDIUM**
	Opportunity Presence? (Y/N)	**NO**
Habitat	Conditon	**MEDIUM**

Overall Wetland Rating **MEDIUM**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland S	**Date**	8/7/14
Wetland Type	Non-Tidal Freshwater Marsh	**Assessor Name/Organization**	I. Eckardt/Wildlands
Level III Ecoregion	Piedmont	**Nearest Named Water Body**	Henry Fork
River Basin	Catawba	**USGS 8-Digit Catalogue Unit**	03050103
☒ **Yes** ☐ **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	35.7005229N/-81.3640684W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note on last page if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Regulatory Considerations (select all that apply to the assessment area)
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

Does the assessment area experience overbank flooding during normal rainfall conditions? ☒ Yes ☐ No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☒ A	☒ A	Not severely altered
☐ B	☐ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric (answer for non-marsh wetlands only)
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

	AA	WT	
3a.	☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
	☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
	☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
	☐ D	☐ D	Depressions able to pond water < 3 inches deep

3b. ☐ A Evidence that maximum depth of inundation is greater than 2 feet
☐ B Evidence that maximum depth of inundation is between 1 and 2 feet
☐ C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

4a.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoximorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoximorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

4b.
- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

4c.
- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☑ B	☑ B	☑ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☐ D	☐ D	☐ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☑ F	☑ F	☑ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of clear-cut land
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area/wetland complex condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ A ≥ 50 feet
- ☒ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric (evaluate for riparian wetlands only)**
Check a box in each column. Select the average width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☒ E	☒ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ☒ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☒ I	☒ I	☐ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☒ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous metric naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, regularly maintained utility line corridors the width of a four-lane road or wider, urban landscapes, fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☒ D	☒ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☐ F	☐ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☒ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric (skip for all marshes)

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include non-forested areas ≥ 40 feet wide such as fields, development, roads, regularly maintained utility line corridors and clear-cuts. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☐ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☐ C Vegetation severely altered from reference in composition. Expected species are unnaturally absent (planted stands of non-characteristic species or at least one stratum inappropriately composed of a single species). Exotic species are dominant in at least one stratum.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☒ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of assessment area vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

- [x] A ≥ 25% coverage of vegetation
- [ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

	AA	WT	
Canopy	[ ] A	[ ] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
	[ ] B	[ ] B	Canopy present, but opened more than natural gaps
	[ ] C	[ ] C	Canopy sparse or absent
Mid-Story	[ ] A	[ ] A	Dense mid-story/sapling layer
	[ ] B	[ ] B	Moderate density mid-story/sapling layer
	[ ] C	[ ] C	Mid-story/sapling layer sparse or absent
Shrub	[ ] A	[ ] A	Dense shrub layer
	[ ] B	[ ] B	Moderate density shrub layer
	[ ] C	[ ] C	Shrub layer sparse or absent
Herb	[ ] A	[ ] A	Dense herb layer
	[ ] B	[ ] B	Moderate density herb layer
	[ ] C	[ ] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

- [ ] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
- [x] B Not A

19. Diameter Class Distribution – wetland type condition metric

- [ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
- [ ] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
- [x] C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

- [ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
- [x] B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [x] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric (evaluate for riparian wetlands only]

Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

- [x] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
- [ ] B Overbank flow is severely altered in the assessment area.
- [ ] C Overland flow is severely altered in the assessment area.
- [ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 4.1
Rating Calculator Version 4.1

Wetland Site Name	Wetland S	Date	8/7/14
Wetland Type	Non-Tidal Freshwater Marsh	Assessor Name/Organization	I. Eckardt/Wildlands

Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO
Assessment area experiences overbank flooding during normal rainfall conditions (Y/N)	YES
Assessment area is on a coastal island (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	NA
	Sub-Surface Storage and Retention	Condition	NA
Water Quality	Pathogen Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Particulate Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Physical Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**HIGH**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**MEDIUM**
	Condition/Opportunity	**MEDIUM**
	Opportunity Presence? (Y/N)	**NO**
Habitat	Conditon	**MEDIUM**

Overall Wetland Rating **MEDIUM**

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Henry Fork Mitigation Site - UT1 and Wetlands B, C, D, E, J, K, L, M, R, and S, and Ponds 2, 3, &4.

State:NC County/parish/borough: Catawba City: Hickory
Center coordinates of site (lat/long in degree decimal format): Lat. 35.702893° **N**, Long. -81.364436° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Henry Fork
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): Catawba River 03050103

- ☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
- ☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

- ☐ Office (Desk) Determination. Date:
- ☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

- ☐ Waters subject to the ebb and flow of the tide.
- ☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**

   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
   - ☐ TNWs, including territorial seas
   - ☐ Wetlands adjacent to TNWs
   - ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   - ☐ Non-RPWs that flow directly or indirectly into TNWs
   - ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   - ☒ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   - ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   - ☒ Impoundments of jurisdictional waters
   - ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: 2,750linear feet: 10-20width (ft) and/or acres.
   Wetlands: 0.564 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   - ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 130**acres**
Drainage area: 130 **acres**
Average annual rainfall: 45.07 inches
Average annual snowfall: 5.1 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **2** tributaries before entering TNW.

Project waters are **30 (or more)** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **30 (or more)** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: No.

Identify flow route to TNW[5]: UT1 to Henry Fork flows into Henry Fork as it leaves the project site. Henry Fork joins Jacob Fork to form the South Fork Catawba River. The South Fork Catawba River flows into the Catawba River (the

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

TNW) in Lake Wylie. The Catawba continues into South Carolina where it joins with the Santee Cooper River before entering the Atlantic Ocean.
Tributary stream order, if known: Second.

(b) General Tributary Characteristics (check all that apply):
Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: UT1 has been historically manipulated first for agricultural purposes and more recently drainage through a golf course. The stream has been extensively channelized.

Tributary properties with respect to top of bank (estimate):
Average width: 10-20 feet
Average depth: 3-6 feet
Average side slopes: **Vertical (1:1 or less).**

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☒ Cobbles	☒ Gravel	☐ Muck
☒ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: The reach exhibits bank instability in the form of scour and raw banks along portions of the project reach but other areas are fairly stable.
Presence of run/riffle/pool complexes. Explain: Bedform features including riffle/run/pool sequences were present and common in the upstream portion of the channel but absent throughout much of the project reach.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 0-2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **1**
Describe flow regime: The channel exhibited strong perennial baseflow.
Other information on duration and volume: N/A.

Surface flow is: **Discrete and confined.** Characteristics: Baseflow is easily observed and occupies the entire channel bed.

Subsurface flow: **Unknown**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank	☒ the presence of litter and debris
☒ changes in the character of soil	☒ destruction of terrestrial vegetation
☐ shelving	☒ the presence of wrack line
☒ vegetation matted down, bent, or absent	☒ sediment sorting
☒ leaf litter disturbed or washed away	☒ scour
☒ sediment deposition	☒ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: UT1 to Henry Fork drains a partially developed watershed. Land use within the watershed includes residential, forest, and recreational (golf course). The water was clear the day of the delineation.

Identify specific pollutants, if known: .

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size:0.233 acres

Wetland type. Explain:Using the NCWAM key Wetlands B, C, K, L, and M were determined to be headwater forest wetlands. Wetland type is based on observers best professional judgement of what the wetlands would become if the area wasn't maintained.

Wetland quality. Explain:Wetlands have been impacted primarily by golf course maintanence (mowing and historic grading).

Project wetlands cross or serve as state boundaries. Explain: No.

(b) General Flow Relationship with Non-TNW:

Flow is: **Ephemeral flow**. Explain: During large rainfall events adjacemt wetlands capture out of bankfull stream flows from UT1 to Henry Fork.

Surface flow is**: Not present**

Characteristics: .

Subsurface flow: **Unknown**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

☒ Directly abutting

☒ Not directly abutting

☒ Discrete wetland hydrologic connection. Explain: Wetlands D, E, J, R, and S directly abut UT1 while Wetlands B, C, K, L, and M are adjacent to UT1 but are located in its geomorphic floodplain.

☐ Ecological connection. Explain: .

☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **30 (or more)** river miles from TNW.

Project waters are **30 (or more)** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **2 - 5-year** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: Surface waters were clear during the delineation. Vegetation maintenance has resulted in the removal of the tree strata in most on-site wetlands.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☒ Vegetation type/percent cover. Explain:Wetlands B, C, J, L, M, R, and S consist entirely of herbaceous vegetation including FAC, FACW and OBL wetland ratings. Wetalnds D and E are wooded.
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **10**

Approximately (0.587) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland B - N	0.01	Wetland M - N	0.13
Wetland C - N	0.003	Wetland R - Y	0.06
Wetland D - Y	0.09	Wetland S - Y	0.16
Wetland E - Y	0.004		
Wetland J - Y	0.04		
Wetland K - N	0.06		
Wetland L - N	0.003		

Summarize overall biological, chemical and physical functions being performed: Wetland features provide water treatment and flood storage. In addtion they serve as aquatic habitat for organisms within the UT1 and Henry Fork floodplains .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: Wetland B, C, K, L, and M don't directly abut UT1 to Henry Fork but are located in its geomorphic floodplain. These wetlands have the ability to capture and treat water before it enters UT1. Being located in the floodplain of UT1 these wetlands also provide flood storage for out of bank flows and habitat for aquatic fauna washed out into the floodplain during storm events..

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**

☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT1 to Henry Fork exhibited average bankfull widths of 10 to 20 feet, well-defined bed and bank, and soil-based evidence of a high water (hydric soils). During biological sampling within the channel amphibians, crayfish, macroinvertebrates and algae were present. UT1 to Henry Fork scored 54 and 44 out of a possible 100 points on the USACE Stream Assessment Form and scored a 39.5 and 32.5 out of 61.5 possible points on the NCDWQ Stream Classification Form, indicating perennial status (SCP1&2).

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):

☒ Tributary waters: **2,750** linear feet **10-20**width (ft).

☒ Other non-wetland waters: **1.3**acres.

Identify type(s) of waters: **Impoundments - Pond A, B, and C. These are online ponds that UT1 flows through**.

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**

☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **Wetlands D, E, J, R, and S directly drain into UT1. Wetlands D, E, and J have been ditched to connect to UT1. Wetlands R and S are on the fringe of existing ponds that UT1 drains through.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: **0.354** acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**

☒ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **0.233**acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☒ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

---

[8]See Footnote # 3.

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Hickory, NC 7.5 Quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Catawba County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

- ☐ FEMA/FIRM maps: .
- ☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
- ☒ Photographs: ☒ Aerial (Name & Date): .
  or ☒ Other (Name & Date):see attached report.
- ☐ Previous determination(s). File no. and date of response letter: .
- ☐ Applicable/supporting case law: .
- ☐ Applicable/supporting scientific literature: .
- ☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Henry Fork Mitigation Site - UT1A and Wetlands A,F, G, H, and I

State:NC County/parish/borough: Catawba City: Hickory
Center coordinates of site (lat/long in degree decimal format): Lat. 35.702893° **N**, Long. -81.364436° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Henry Fork
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): Catawba River 03050103

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☒ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 340linear feet: 5-10width (ft) and/or acres.
      Wetlands: 0.41 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 23 **acres**
Drainage area: 23 **acres**
Average annual rainfall: 45.07 inches
Average annual snowfall: 5.1 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **3** tributaries before entering TNW.

Project waters are **30 (or more)** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **30 (or more)** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: No.

Identify flow route to TNW[5]: UT1A flows into UT1 within the project area. UT1 flows into Henry Fork as it leaves the project site. Henry Fork joins Jacob Fork to form the South Fork Catawba River. The South Fork Catawba River flows

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

into the Catawba River (the TNW) in Lake Wylie. The Catawba continues into South Carolina where it joins with the Santee Cooper River before entering the Atlantic Ocean.
Tributary stream order, if known: Second.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
- ☐ Natural
- ☐ Artificial (man-made). Explain: .
- ☒ Manipulated (man-altered). Explain: UT1A has been manipulated to improve site drainage. Likely first for agricultural purposes and more recently for a golf course. The stream has been extensively channelized.

Tributary properties with respect to top of bank (estimate):
Average width: 5-10 feet
Average depth: 2-3 feet
Average side slopes: **2:1.**

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: The reach doesn't exhibit bank instability because the banks have been sloped and grassed.
Presence of run/riffle/pool complexes. Explain: Bedform features including riffle/run/pool sequences were absent throughout much of the project reach.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 0-2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **2-5**
Describe flow regime: The channel exhibited strong baseflow.
Other information on duration and volume: N/A.

Surface flow is: **Discrete and confined.** Characteristics: Baseflow is easily observed and occupies the channel bed.

Subsurface flow: **Unknown**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank	☒ the presence of litter and debris
☒ changes in the character of soil	☒ destruction of terrestrial vegetation
☐ shelving	☒ the presence of wrack line
☒ vegetation matted down, bent, or absent	☐ sediment sorting
☒ leaf litter disturbed or washed away	☐ scour
☒ sediment deposition	☐ multiple observed or predicted flow events
☒ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: UT1A to Henry Fork drains part of an old golf course. The water had an oily film from an abundance of iron oxidizing bacteria.

Identify specific pollutants, if known: .

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .

☐ Wetland fringe. Characteristics: .

☐ Habitat for:

- ☐ Federally Listed species. Explain findings: .
- ☐ Fish/spawn areas. Explain findings: .
- ☐ Other environmentally-sensitive species. Explain findings: .
- ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size:0.41acres

Wetland type. Explain:Using the NCWAM key Wetlands A F, G, H and I were determined to be headwater forest wetlands. Wetland type is based on observers best professional judgement of what the wetlands would become if the area wasn't maintained.

Wetland quality. Explain:Wetlands have been impacted primarily by golf course maintanence (mowing and historic grading).

Project wetlands cross or serve as state boundaries. Explain: No.

(b) General Flow Relationship with Non-TNW:

Flow is: **Ephemeral flow**. Explain: During large rainfall events adjacemt wetlands capture out of bankfull stream flows from UT1A.

Surface flow is**: Not present**

Characteristics: .

Subsurface flow: **Unknown**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

☒ Directly abutting

☒ Not directly abutting

- ☒ Discrete wetland hydrologic connection. Explain: Wetlands A, F, and G directly abut UT1A while Wetlands H and I are adjacent to UT1A but are located in its geomorphic floodplain.
- ☐ Ecological connection. Explain: .
- ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **30 (or more)** river miles from TNW.

Project waters are **30 (or more)** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **2 - 5-year** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: Surface waters had an oily film due to an abundance of iron oxidizing bacteria. Vegetation maintenance has resulted in the removal of the tree strata.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .

☒ Vegetation type/percent cover. Explain:Wetlands A, G, H and I consist entirely of herbaceous vegetation. Wetalnds F is entirely wooded.

☐ Habitat for:

- ☐ Federally Listed species. Explain findings: .
- ☐ Fish/spawn areas. Explain findings: .
- ☐ Other environmentally-sensitive species. Explain findings: .
- ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **5**

Approximately (0.41) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland A - Y	0.18		
Wetland F - Y	0.07		
Wetland G - Y	0.02		
Wetland H - N	0.06		
Wetland I - N	0.08		

Summarize overall biological, chemical and physical functions being performed: Wetland features provide water treatment and flood storage. In addtion they serve as aquatic habitat for organisms within the UT1A and Henry Fork floodplains .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: Wetland H and I don't directly abut UT1A to Henry Fork but are located in its geomorphic floodplain. These wetlands have the ability to capture and treat water before it enters UT1A. Being located in the floodplain of UT1A these wetlands also provide flood storage for out of bank flows and habitat for aquatic fauna washed out into the floodplain during storm events..

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT1A to Henry Fork exhibited average bankfull widths of 5 to 10 feet, well-defined bed and bank, and soil-based evidence of a high water (hydric soils). During biological sampling within the channel fish, amphibians, and

macroinvertebrates were observed. UT1A to Henry Fork scored 49 out of a possible 100 points on the USACE Stream Assessment Form and scored a 27.25 out of 61.5 possible points on the NCDWQ Stream Classification Form, indicating intermittent status (SCP5).

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **340** linear feet **5-10** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.

☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☒ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: Wetlands A, F, and G have been directly connected to UT1A by ditching efforts.

Provide acreage estimates for jurisdictional wetlands in the review area: **0.27**acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.

☒ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **0.14**acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

---

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Hickory, NC 7.5 Quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Catawba County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .

---

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

or ☒ Other (Name & Date):see attached report.

☐ Previous determination(s). File no. and date of response letter: .

☐ Applicable/supporting case law: .

☐ Applicable/supporting scientific literature: .

☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Henry Fork Mitigation Site - UT1B and Pond D
State:NC County/parish/borough: Catawba City: Hickory
Center coordinates of site (lat/long in degree decimal format): Lat. 35.702893° **N**, Long. -81.364436° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Henry Fork

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): Catawba River 03050103
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☒ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 382 linear feet: 4-6 width (ft) and/or acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **acres**
Drainage area: **acres**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

---

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT1B to Henry Fork exhibited average bankfull widths of 4-6 feet, well-defined bed and bank, and soil-based evidence of a high water (hydric soils). During biological sampling within the channel amphibians, macroinvertebrates and algae were present. UT1B to Henry Fork scored 49 out of a possible 100 points on the USACE Stream Assessment Form and scored a 31.25 out of 61.5 possible points on the NCDWQ Stream Classification Form, indicating perennial status (SCP4).

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):

☒ Tributary waters: **382** linear feet **4-6** width (ft).

☒ Other non-wetland waters: **0.15** acres.

Identify type(s) of waters: **Impoundments - Pond D. This is an online ponds that UT1B flows through**.

3. Non-RPWs[8] that flow directly or indirectly into TNWs.

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☒ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

---

[8]See Footnote # 3.

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Hickory, NC 7.5 Quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Catawba County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD):

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Henry Fork Mitigation Site - UT2 and Wetlands N, O, P, and Q.
State:NC County/parish/borough: Catawba City: Hickory
Center coordinates of site (lat/long in degree decimal format): Lat. 35.702893° **N**, Long. -81.364436° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Henry Fork
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Catawba River
Name of watershed or Hydrologic Unit Code (HUC): Catawba River 03050103
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☐ Field Determination. Date(s):

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
   ☐ TNWs, including territorial seas
   ☐ Wetlands adjacent to TNWs
   ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   ☐ Non-RPWs that flow directly or indirectly into TNWs
   ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   ☒ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   ☐ Impoundments of jurisdictional waters
   ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: 1,953linear feet: 15-20 width (ft) and/or acres.
   Wetlands: 0.22 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 66 **acres**
Drainage area: 66 **acres**
Average annual rainfall: 45.07 inches
Average annual snowfall: 5.1 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **3** tributaries before entering TNW.

Project waters are **30 (or more)** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **30 (or more)** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: No.

Identify flow route to TNW[5]: UT2 flows into the Henry Fork as it leaves the project site. Henry Fork joins Jacob Fork to form the South Fork Catawba River. The South Fork Catawba River flows into the Catawba River (the TNW) in Lake

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

Wylie. The Catawba continues into South Carolina where it joins with the Santee Cooper River before entering the Atlantic Ocean.
Tributary stream order, if known: First.

(b) General Tributary Characteristics (check all that apply):

Tributary is:
- ☐ Natural
- ☐ Artificial (man-made). Explain: .
- ☒ Manipulated (man-altered). Explain: UT2 has been manipulated to improve site drainage. Likely first for agricultural purposes and more recently for a golf course. The stream has been extensively channelized.

Tributary properties with respect to top of bank (estimate):
Average width: 15-20 feet
Average depth: 4-6 feet
Average side slopes: **2:1.**

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: The reach doesn't exhibit bank instability because the banks have been sloped and grassed.
Presence of run/riffle/pool complexes. Explain: Bedform features including riffle/run/pool sequences were absent throughout much of the project reach.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 0-2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **1**
Describe flow regime: The channel exhibited moderate baseflow.
Other information on duration and volume: N/A.

Surface flow is: **Discrete and confined.** Characteristics: Baseflow occupies the channel bed.

Subsurface flow: **Unknown**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
- ☒ Bed and banks
- ☒ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank	☒ the presence of litter and debris
☒ changes in the character of soil	☒ destruction of terrestrial vegetation
☐ shelving	☒ the presence of wrack line
☒ vegetation matted down, bent, or absent	☐ sediment sorting
☒ leaf litter disturbed or washed away	☐ scour
☒ sediment deposition	☐ multiple observed or predicted flow events
☒ water staining	☐ abrupt change in plant community
☐ other (list):	

- ☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).

Explain: UT2 to Henry Fork drains part of an old golf course. The water had an oily film from an abundance of iron oxidizing bacteria.

Identify specific pollutants, if known: .

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size:022acres

Wetland type. Explain:Using the NCWAM key Wetlands N, O, P and Q were determined to be headwater forest wetlands. Wetland type is based on observers best professional judgement of what the wetlands would become if the area wasn't maintained.

Wetland quality. Explain:Wetlands have been impacted primarily by golf course maintanence (mowing and historic grading).

Project wetlands cross or serve as state boundaries. Explain: No.

(b) General Flow Relationship with Non-TNW:

Flow is: **Ephemeral flow**. Explain: During large rainfall events adjacemt wetlands capture out of bankfull stream flows from UT1 to Henry Fork.

Surface flow is**: Not present**

Characteristics: .

Subsurface flow: **Unknown**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

☒ Directly abutting

☒ Not directly abutting

☒ Discrete wetland hydrologic connection. Explain: Wetlands N and O are ditched linear features that connect directly to UT2 while Wetlands P and Q are adjacent to UT2 but are located in its geomorphic floodplain.

☐ Ecological connection. Explain: .

☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **30 (or more)** river miles from TNW.

Project waters are **30 (or more)** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **2 - 5-year** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: Surface waters had an oily film due to an abundance of iron oxidizing bacteria. Vegetation maintenance has resulted in the removal of the tree strata.

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☒ Vegetation type/percent cover. Explain:Wetlands N, P and Q consist entirely of herbaceous vegetation. Wetalnds O is wooded.
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **4**

Approximately (0.22) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland N - Y	0.08		
Wetland O - Y	0.03		
Wetland P - N	0.04		
Wetland Q - N	0.07		

Summarize overall biological, chemical and physical functions being performed: Wetland features provide water treatment and flood storage. In addtion they serve as aquatic habitat for organisms within the UT2 and Henry Fork floodplains .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: Wetland P and Q don't directly abut UTA1 to Henry Fork but are located in its geomorphic floodplain. These wetlands have the ability to capture and treat water before it enters UT2. Being located in the floodplain of UT2 these wetlands also provide flood storage for out of bank flows and habitat for aquatic fauna washed out into the floodplain during storm events..

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT2 to Henry Fork exhibited average bankfull widths of 15 to 20 feet, well-defined bed and bank, and soil-based evidence of a high water (hydric soils). During biological sampling within the channel amphibians, macroinvertebrates, and algae were observed. UT2 to Henry Fork scored 43 out of a possible 100 points on the USACE

Stream Assessment Form and scored a 27 out of 61.5 possible points on the NCDWQ Stream Classification Form, indicating intermittent status (SCP3).

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):

☒ Tributary waters: **1,953** linear feet **15-20** width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.

☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☒ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: Wetlands N and O have been directly connected to UT1A by ditching efforts.

Provide acreage estimates for jurisdictional wetlands in the review area: **0.11**acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.

☒ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **0.11**acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

---

[8]See Footnote # 3.

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based <u>solely</u> on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the <u>sole</u> potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

<u>SECTION IV: DATA SOURCES</u>.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Hickory, NC 7.5 Quadrangle.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Catawba County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .

- ☐ Applicable/supporting case law: .
- ☐ Applicable/supporting scientific literature: .
- ☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action ID: 2014-00538 County: Catawba U.S.G.S. Quad: Hickory

NOTIFICATION OF JURISDICTIONAL DETERMINATION

Property Owner: WEI – Henry Fork, LLC / Attn.: Shawn Wilkerson
Address: 1430 South Mint Street, Suite 104
Charlotte, NC 28203
Telephone Number: 704-332-3306

Size (acres): 48 Nearest Town: Hickory
Nearest Waterway: UTs to Henry Fork and Henry Fork Coordinates: 35.703751 N, 81.364880 W
River Basin/ HUC: South Fork Catawba (03050102)

Location description: The site is located on a tract of land (parcel ID 279108883819) which was a part of the former Henry River Golf Course at 2575 Mountain View Road in Hickory, Catawba County North Carolina.

Indicate Which of the Following Apply:

A. Preliminary Determination

_ Based on preliminary information, there may be wetlands on the above described property. We strongly suggest you have this property inspected to determine the extent of Department of the Army (DA) jurisdiction. To be considered final, a jurisdictional determination must be verified by the Corps. This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD.

B. Approved Determination

_ There are Navigable Waters of the United States within the above described property subject to the permit requirements of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

X There are waters of the U.S. including wetlands on the above described property subject to the permit requirements of Section 404 of the Clean Water Act (CWA)(33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ We strongly suggest you have the wetlands on your property delineated. Due to the size of your property and/or our present workload, the Corps may not be able to accomplish this wetland delineation in a timely manner. For a more timely delineation, you may wish to obtain a consultant. To be considered final, any delineation must be verified by the Corps.

X The waters of the U.S. including wetlands on your property have been delineated and the delineation has been verified by the Corps. We strongly suggest you have this delineation surveyed. Upon completion, this survey should be reviewed and verified by the Corps. Once verified, this survey will provide an accurate depiction of all areas subject to CWA jurisdiction on your property which, provided there is no change in the law or our published regulations, may be relied upon for a period not to exceed five years.

_ The waters of the U.S. including wetlands have been delineated and surveyed and are accurately depicted on the plat signed by the Corps Regulatory Official identified below on _____. Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ There are no waters of the U.S., to include wetlands, present on the above described project area which are subject to the permit requirements of Section 404 of the Clean Water Act (33 USC 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

_ The property is located in one of the 20 Coastal Counties subject to regulation under the Coastal Area Management Act (CAMA). You should contact the Division of Coastal Management to determine their requirements.

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://regulatory.usacesurvey.com/.

Copy furnished:
Wildlands Engineering, Inc., Attn.: Ian Eckardt, 1430 South Mint Street, Suite 104, Charlotte, NC 28203

NCDENR – Ecosystem Enhancement Program, Attn.: Paul Wiesner, 5 Ravenscroft Drive, Suite 102, Asheville, NC 28801

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division,** **Attn: David Brown** **828-271-7980**	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

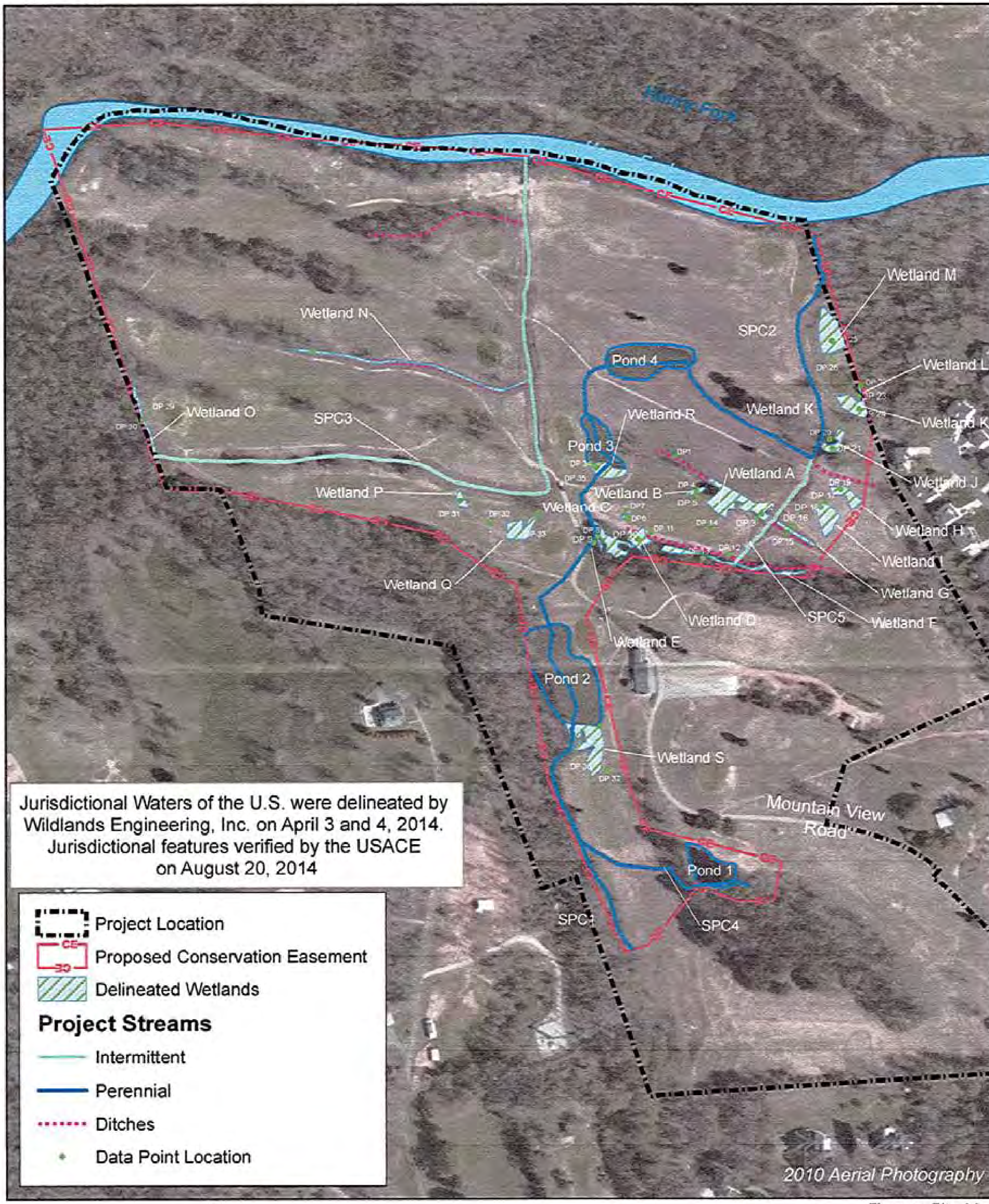
Signature of appellant or agent.	Date:	Telephone number:

For appeals on Initial Proffered Permits send this form to:

District Engineer, Wilmington Regulatory Division, Attn.: David Brown, 69 Darlington Avenue, Wilmington, North Carolina 28403

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

Division Engineer, Commander, U.S. Army Engineer Division, South Atlantic, Attn: Mr. Jason Steele, Administrative Appeal Officer, CESAD-PDO, 60 Forsyth Street, Room 10M15, Atlanta, Georgia 30303-8801 Phone: (404) 562-5137



WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3 Site Map
Henry Fork Stream & Wetland Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

Table 1. Henry Fork Stream and Wetland Mitigation Project
Summary of On-Site Jurisdictional Waters

Jurisdictional Feature	Classification	Length (LF)*	Acreage	Watershed (ac)	NCDWQ Stream Scores	USACE Stream Scores
UT1	Perennial RPW	3,071	-	130	39.5/32.5	54/44
UT1A	Intermittent RPW	353	-	23	27.25	49
UT1B	Perennial RPW	491	-	31	31.25	49
UT2	Intermittent RPW	1,945	-	66	27	43
Wetland A	Headwater Forest	-	0.182	-	-	-
Wetland B	Headwater Forest	-	0.013	-	-	-
Wetland C	Headwater Forest	-	0.003	-	-	-
Wetland D	Headwater Forest	-	0.094	-	-	-
Wetland E	Headwater Forest	-	0.004	-	-	-
Wetland F	Headwater Forest	-	0.067	-	-	-
Wetland G	Headwater Forest	-	0.021	-	-	-
Wetland H	Headwater Forest	-	0.056	-	-	-
Wetland I	Headwater Forest	-	0.078	-	-	-
Wetland J	Headwater Forest	-	0.036	-	-	-
Wetland K	Headwater Forest	-	0.062	-	-	-
Wetland L	Headwater Forest	-	0.003	-	-	-
Wetland M	Headwater Forest	-	0.131	-	-	-
Wetland N	Headwater Forest	-	0.084	-	-	-
Wetland O	Headwater Forest	-	0.028	-	-	-
Wetland P	Headwater Forest	-	0.023	-	-	-
Wetland Q	Headwater Forest	-	0.069	-	-	-
Wetland R	Non-tidal Freshwater Marsh	-	0.059	-	-	-
Wetland S	Non-tidal Freshwater Marsh	-	0.159	-	-	-
Pond 1**	-	-	0.20	-	-	-
Pond 2**	-	-	0.81	-	-	-
Pond 3**	-	-	0.20	-	-	-
Pond 4**	-	-	0.37	-	-	-

*Linear footage includes stream length through ponds.
**Ponds are manmade impoundments and prior discussion with Corps indicates that they will be treated as streams for quantification of impacts.

Appendix 4: Site Photographs

Clubhouse and Pond 2 (8/22/2013)

Pond 2 (2/20/2014)

Irrigation pump house (2/2/2014)

Cart path and maintained fairways (8/22/2013)

Aerial shot of lower eastern project area (6/20/2014)

Pond 3 (8/22/2013)

	
Pond 4 (8/22/2013)	Maintained fairways (8/23/2013)
	
Maintained fairways (8/23/2013)	Upper end of UT1 (8/22/2013)
	
Valley scour adjacent to UT1 (8/22/2013)	Upper UT1 valley and cart path (8/22/2013)

Sediment deposition along UT1A (8/22/2013)

Additional scour in UT1 valley (8/22/2013)

UT1 at confluence with UT1B (8/22/2013)

UT1 culvert crossing below UT1B (8/22/2013)

Incision along UT1 (8/22/2013)

Bank failure along UT1 (8/22/2013)

	
UT1 immediately above Pond 2 (8/22/2013)	Bank scour along UT1 above Pond 2 (8/22/2013)
	
Pond 2 and cart path (8/23/2013)	Eroding spillway below Pond 2 (8/22/2013)
	
Car path crossing over UT1 below Pond 2 (8/22/2013)	UT1 facing downstream (DS) below Pond 2 (8/22/2013)

UT looking DS near confluence with UT1A (8/22/2013)

UT1 looking upstream (US) below UT1B (8/22/2013)

Cart path crossing on lower UT1 (8/22/2013)

UT1 looking US of confluence w/Henry Fork (8/22/2013)

Henry Fork adjacent to project site (2/18/2014)

Upstream end of UT1A (8/23/2014)

UT1A (8/23/2013)

UT1A looking US (8/23/2013)

Groundwater seep at US end of UT1B (8/22/2013)

UT1B above Pond 1 (8/22/2013)

UT1B entering Pond 1 (8/22/2013

Pond 1 (8/22/2013

	
Pond 1 outlet (8/23/2013)	UT1B immediately below Pond 1 (8/23//2013)
	
Cart path crossing on lower UT1B (8/22/2013	UT1B below cart path (8/22/2013)
	
UT1B looking US above confluence with UT1 (8/22/2013)	UT2 looking DS near upper end (4/17/2014)

UT2 looking US above 90 degree bend (2/21/2014)

UT2 looking US below 90 bend (8/22/2013)

Culvert crossing on lower UT2 (8/22/2013)

UT2 above confluence with Henry Fork (8/22/2013)

XS1 US (4/14/2014)

XS3 DS (4/14/2014)

XS2 US (4/14/2014)

XS2 DS (4/14/2014)

XS3 US (4/14/2014)

XS3 DS (4/14/2014)

XS4 US (4/14/2014)

XS4 DS (4/14/2014)

	
XS5 US (4/16/2014)	XS5 DS (4/16/2014)
	
XS6 US (4/16/2014)	XS6 DS (4/16/2014)
	
XS7 US (4/16/2014)	XS7 DS (4/16/2014)

XS8 US (4/16/2014)

XS8 DS (4/16/2014)

XS9 US (4/16/2014)

XS9 DS (4/16/2014)

UT1 floodplain (8/21/2013)

UT1 floodplain (8/21/2013)

	
UT1 floodplain recent mowed (2/20/2014)	Ditched Wetland A (4/3/2014)
	
Wetland B (4/3/2014)	Wetland D (4/3/2014)
	
Groundwater gauge installed in Wetland D (3/18/2014)	Wetland F (4/3/2014)

Ditched Wetland G (4/4/2014)

Wetland J (4/4/2014)

Painted turtle in Wetland J (4/4/2014)

Wetland I (4/4/2014)

Wetland M (4/4/2014)

Ditched Wetland N (4/4/2014)

	
Wetland Q (4/4/2014)	Wetland R (4/4/2014)

Appendix 5: Existing Geomorphic Survey Data

Reference Reach Data

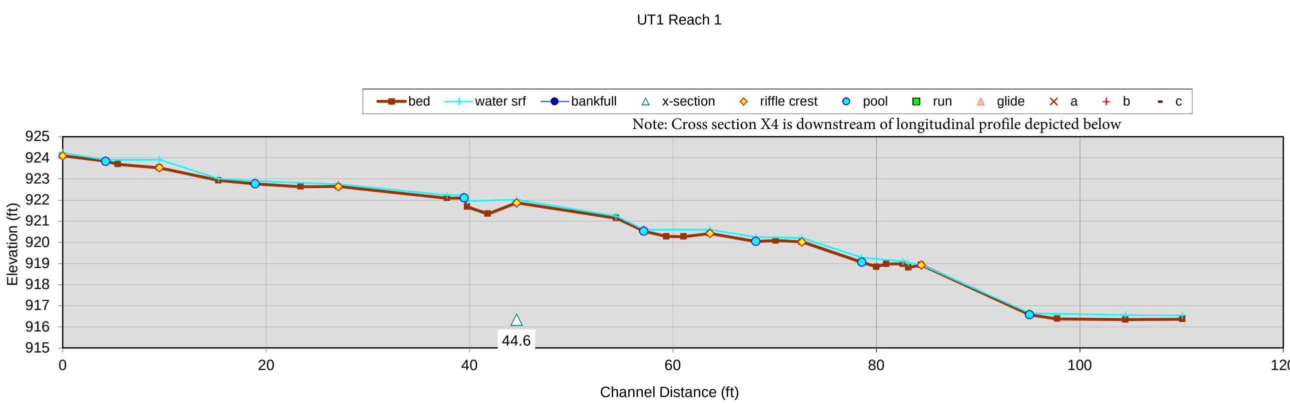
WILDLANDS ENGINEERING

Henry Fork Stream & Wetland Mitigation Site
Site Map
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

UT1 Reach 1 Existing
Thalweg Profile

Q:\ActiveProjects\005-02143 Henry Fork\Cadd\Void\02143-Design_for_mitplan_profile_printing.dwg

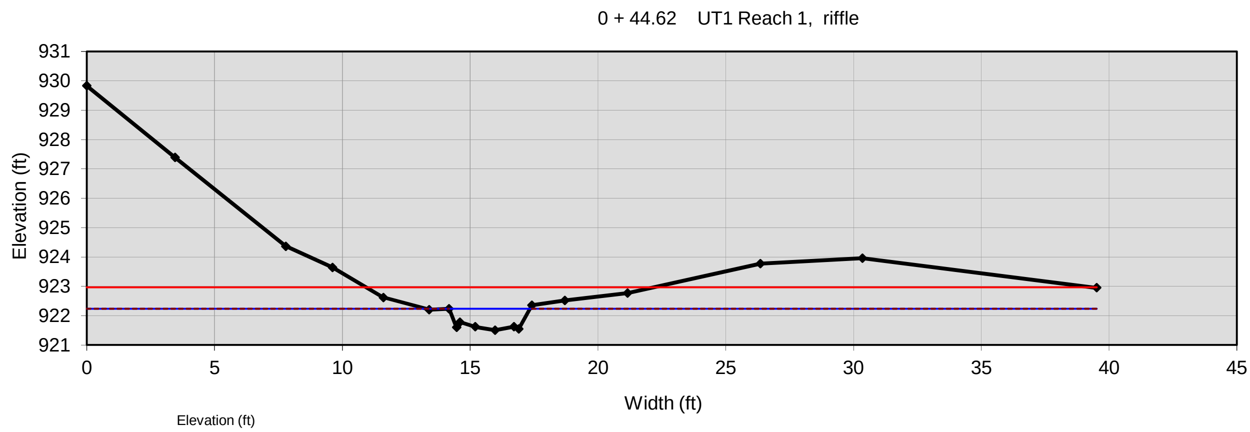
Longitudinal Slope Profile



	slope (%)		slope ratio		length (ft)		length ratio		pool-pool spacing (ft)		p-p ratio	
reach	6.3		---		110.1	(34 channel widths)	---		---		---	
riffle	11	(4.1 - 21)	1.7	(0.7 - 3.3	8.5	(4.2 - 12.5)	2.6	(1.3 - 3.9)	---		---	
pool	2.1	(0 - 5.7)	0.3	(0 - 0.9)	5.9	(4.5 - 8.2)	1.8	(1.4 - 2.5)	15.1	(10.4 - 20.	4.7	(3.2 - 6.3)
	---		---		---		---		---		---	
	---		---		---		---		---		---	

notes	cross section ID	bed feature	BkF channel centerline easting (ft)	northing (ft)	station	ELEV centerline	ELEV thalwag	water	ELEV bankfull	user defined ELEV a	ELEV b	ELEV c
TWG\HOR		R	1298224.684	717874.2803	0.0		924.09028	924.24178				
TWG\TOR		P	1298223.329	717878.2658	4.2		923.83514	923.90852				
TWG			1298222.566	717879.2345	5.4		923.69378					
TWG\HOR		R	1298221.448	717883.1397	9.5		923.52834	923.91982				
TWG			1298221.23	717888.9636	15.3		922.92789	923.0127				
TWG\TOR		P	1298218.944	717891.7174	18.9		922.76594	922.8992				
TWG			1298218.029	717896.1266	23.4		922.62842					
TWG\HOR		R	1298218.414	717899.7866	27.1		922.63825	922.74665				
TWG\TOR			1298212.805	717908.902	37.8		922.08413	922.22992				
TWG-DEBRI		P	1298212.134	717910.4139	39.5		922.10546	922.24603				
TWG			1298211.954	717910.6987	39.8		921.67862	921.94625				
TWG\MAX POOL			1298210.892	717912.3908	41.8		921.3405					
TWG\HOR	3	R	1298211.153	717915.215	44.6		921.86978	922.02726				
TWG			1298205.112	717922.9105	54.4		921.14929	921.22929				
TWG\TOR		P	1298203.231	717924.8673	57.1		920.52691	920.60392				
TWG\MAX POOL			1298202.084	717926.7803	59.4		920.27673					
TWG			1298200.932	717928.0196	61.0		920.26689					
TWG\HOR		R	1298199.098	717929.8408	63.6		920.42196	920.59665				
TWG\TOR		P	1298196.743	717933.6977	68.1		920.0422	920.25234				
TWG			1298196.329	717935.6221	70.1		920.08032					
TWG\HOR B-ROCK		R	1298195.668	717938.0723	72.7		920.01902	920.208				
TWG\TOR B-ROCK		P	1298191.128	717941.8333	78.5		919.05835	919.27585				
TWG\MAX POOL			1298190.428	717943.1045	80.0		918.83888					
TWG			1298189.92	717943.9481	81.0		918.97256					
TWG-DEBRI			1298189.099	717945.3401	82.6		918.97566	919.0959				
TWG			1298188.575	717945.4338	83.1		918.8051	919.03685				
TWG\HOR B-ROCK		R	1298187.404	717945.9257	84.4		918.92389	918.94041				
TWG\TOR B-ROCK		P	1298183.548	717955.8455	95.0		916.57249	916.65232				
TWG\MAX POOL			1298182.176	717958.22	97.8		916.37981					
TWG			1298180.221	717964.6131	104.5		916.34005	916.55514				
TWG			1298176.407	717968.7464	110.1		916.35736	916.54087				
					0.0							
					0.0							

Cross Section 3



Bankfull Dimensions

1.8	x-section area (ft.sq.)
3.2	width (ft)
0.6	mean depth (ft)
0.7	max depth (ft)
4.1	wetted parimeter (ft)
0.4	hyd radi (ft)
5.7	width-depth ratio

Flood Dimensions

11.4	W flood prone area (ft)
3.6	entrenchment ratio
0.7	low bank height (ft)
1.0	low bank height ratio

Materials

16	D50 Riffle (mm)
44	D84 Riffle (mm)
84	threshold grain size (mm):

Bankfull Flow

4.8	velocity (ft/s)
8.5	discharge rate (cfs)
1.28	Froude number

Flow Resistance

0.045	Manning's roughness
0.31	D'Arcy-Weisbach fric.
6.0	resistance factor u/u*
3.9	relative roughness

Forces & Power

6.3	channel slope (%)
1.71	shear stress (lb/sq.ft.)
0.94	shear velocity (ft/s)
10.5	unit strm power (lb/ft/s)

Bankfull Checks

0.462	depth WSF to BKF

Cross Section

reference ID	3	
longitudinal station		44.6
alignment	straight line	
feature		

Bankfull Stage

elevation	922.238	---

Low Bank Height

elevation	922.2383

Flood Prone Area

width fpa	11.4	11.4

Channel Slope

percent slope	6.3	6.3

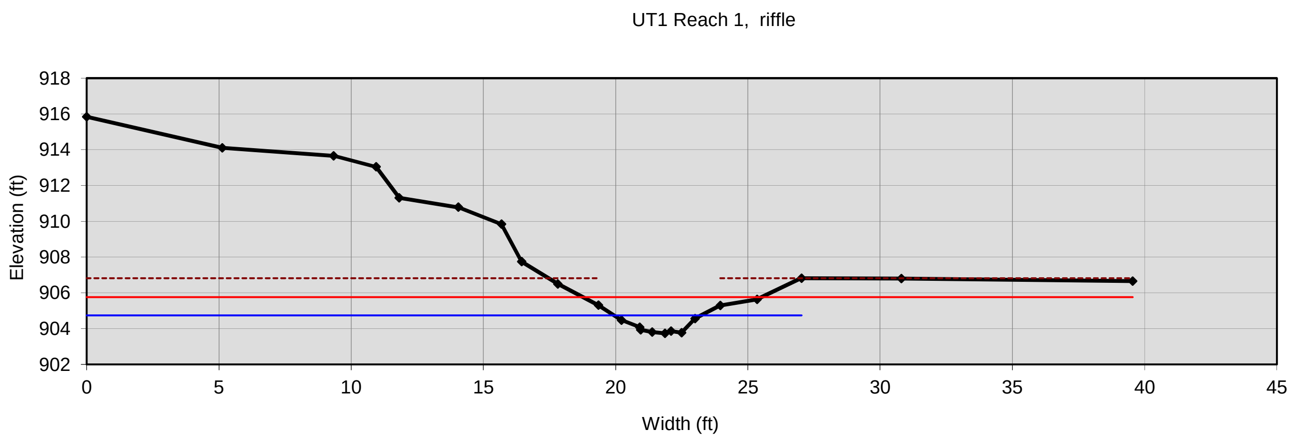
Flow Resistance

Manning's "n"	0.045	0.038
D'Arcy - Weisbach "f"		0.22

Note:
This XS was taken above confluence with UT1B

	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
921.776	1298195.793	717908.6208	0.00	929.8313	☐	XS3
921.776	1298198.154	717911.3794	3.45	927.3896	☐	XS3
921.776	1298201.843	717913.6461	7.78	924.3667	☐	XS3
921.776	1298203.39	717914.612	9.61	923.6464	☐	XS3
921.776	1298205.149	717915.5686	11.61	922.6154	☐	XS3
921.776	1298206.693	717916.4658	13.39	922.2051	☑	XS3
921.776	1298207.315	717916.9362	14.17	922.2383	☐	XS3 LTB
921.776	1298207.517	717917.1752	14.47	921.5984	☐	XS3 LCH
921.776	1298207.635	717917.241	14.60	921.7761	☐	XS3 WSF
921.776	1298208.158	717917.5322	15.20	921.6224	☐	XS3
921.776	1298208.606	717918.2817	15.97	921.5073	☐	XS3 TWG
921.776	1298209.175	717918.7789	16.72	921.6277	☐	XS3
921.776	1298209.338	717918.8697	16.90	921.554	☐	XS3 RCH
921.776	1298209.79	717919.1174	17.42	922.3537	☐	XS3 RTB
921.776	1298211.025	717919.5688	18.71	922.5202	☐	XS3
921.776	1298213.098	717920.8832	21.16	922.7736	☐	XS3
921.776	1298217.555	717923.5544	26.36	923.7741	☐	XS3
921.776	1298220.815	717925.8602	30.34	923.961	☐	XS3
921.776	1298228.642	717930.6441	39.52	922.9524	☐	XS3
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Cross Section 4



Bankfull Dimensions

2.1	x-section area (ft.sq.)
3.3	width (ft)
0.7	mean depth (ft)
1.0	max depth (ft)
4.2	wetted parimeter (ft)
0.5	hyd radi (ft)
5.1	width-depth ratio

Flood Dimensions

6.7	W flood prone area (ft)
2.0	entrenchment ratio
3.1	low bank height (ft)
3.1	low bank height ratio

Materials

16	D50 Riffle (mm)
44	D84 Riffle (mm)
99	threshold grain size (mm):

Bankfull Flow

5.3	velocity (ft/s)
11.4	discharge rate (cfs)
1.31	Froude number

Flow Resistance

0.045	Manning's roughness
0.29	D'Arcy-Weisbach fric.
6.6	resistance factor u/u*
4.5	relative roughness

Forces & Power

6.3	channel slope (%)
2.01	shear stress (lb/sq.ft.)
1.02	shear velocity (ft/s)
13.6	unit strm power (lb/ft/s)

Bankfull Checks

0.671	depth WSF to BKF

Cross Section

reference ID	4	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	904.75	---

Low Bank Height

elevation	906.825	

Flood Prone Area

width fpa	6.7	6.7

Channel Slope

percent slope	6.3	6.3

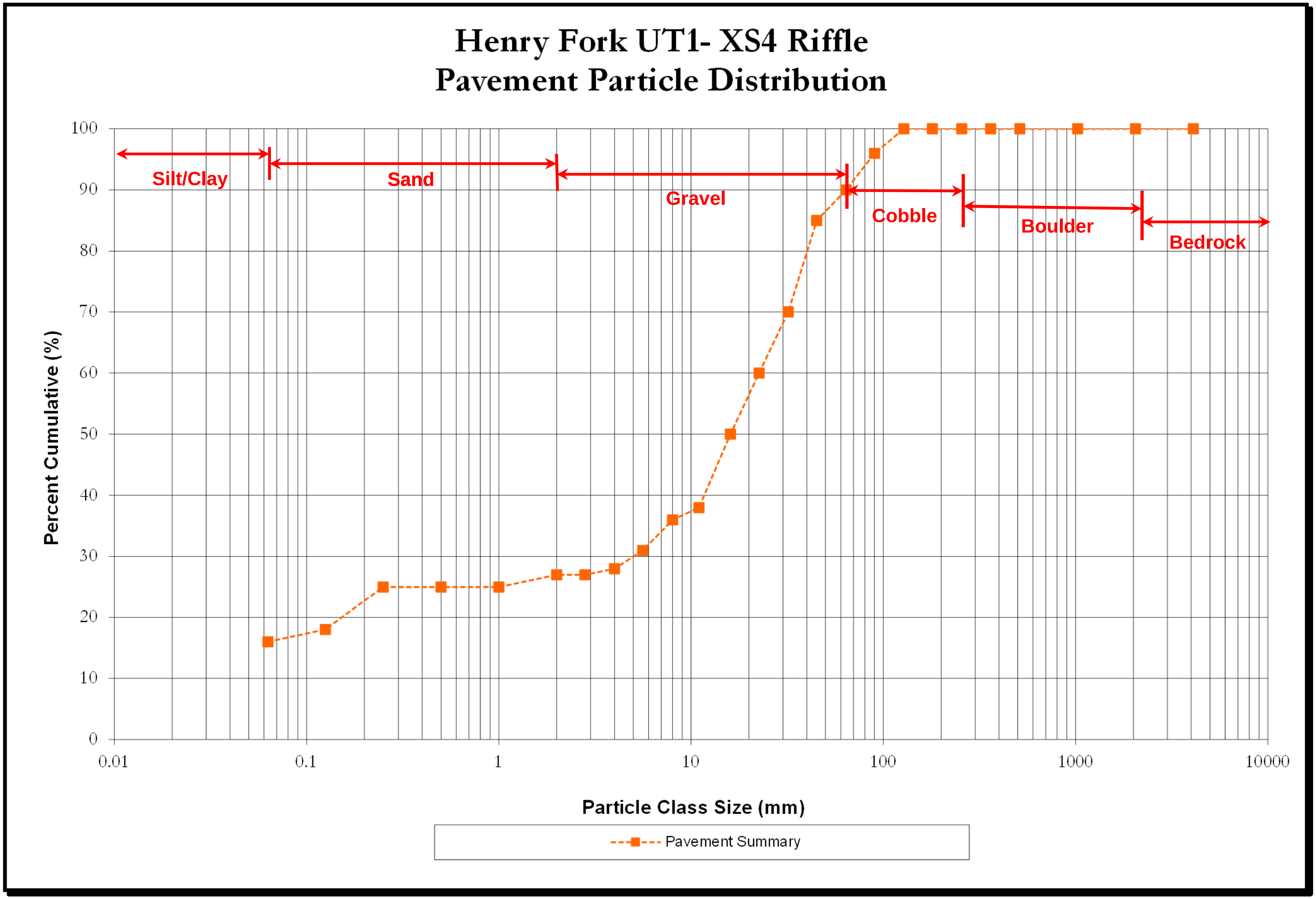
Flow Resistance

Manning's "n"	0.045	0.036
D'Arcy - Weisbach "f"		0.19

Note:

XS shot below the confluence with UT1B

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
904.079	1298056.388	718174.6832	0.00	915.8464	☐	XS4
904.079	1298061.606	718174.7087	5.13	914.1078	☐	XS4
904.079	1298065.745	718175.4678	9.34	913.657	☐	XS4
904.079	1298067.32	718175.7395	10.94	913.0449	☐	XS4
904.079	1298068.198	718175.7989	11.81	911.3212	☐	XS4
904.079	1298070.352	718176.4664	14.05	910.7871	☐	XS4
904.079	1298071.911	718176.9854	15.68	909.8384	☐	XS4 LTB
904.079	1298072.74	718176.7182	16.45	907.7429	☐	XS4
904.079	1298074.048	718177.1859	17.82	906.4948	☐	XS4
904.079	1298075.518	718177.6931	19.36	905.3092	☐	XS4
904.079	1298076.385	718177.7538	20.22	904.4828	☐	XS4
904.079	1298077.057	718177.912	20.91	904.0793	☐	XS4 WSF
904.079	1298077.103	718177.8809	20.95	903.9341	☐	XS4 LCH
904.079	1298077.538	718177.8956	21.38	903.8103	☐	XS4
904.079	1298078.022	718177.9447	21.86	903.7442	☐	XS4 TWG
904.079	1298078.235	718178.0597	22.09	903.8706	☐	XS4
904.079	1298078.671	718177.9456	22.50	903.7722	☐	XS4 RCH
904.079	1298079.103	718178.3512	23.00	904.5685	☐	XS4
904.079	1298079.996	718178.7952	23.96	905.3008	☐	XS4
904.079	1298081.428	718178.6944	25.35	905.646	☐	XS4
904.079	1298083.072	718179.0225	27.03	906.825	☐	XS4 RTB
904.079	1298086.676	718180.2721	30.80	906.7992	☑	XS4
904.079	1298095.269	718181.9283	39.55	906.6635	☑	XS4
					☐	
					☐	
					☐	



Henry Fork UT1- XS4 Riffle
Pavement Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Pavement Summary

PEBBLE COUNT ANALYSIS WORKSHEET

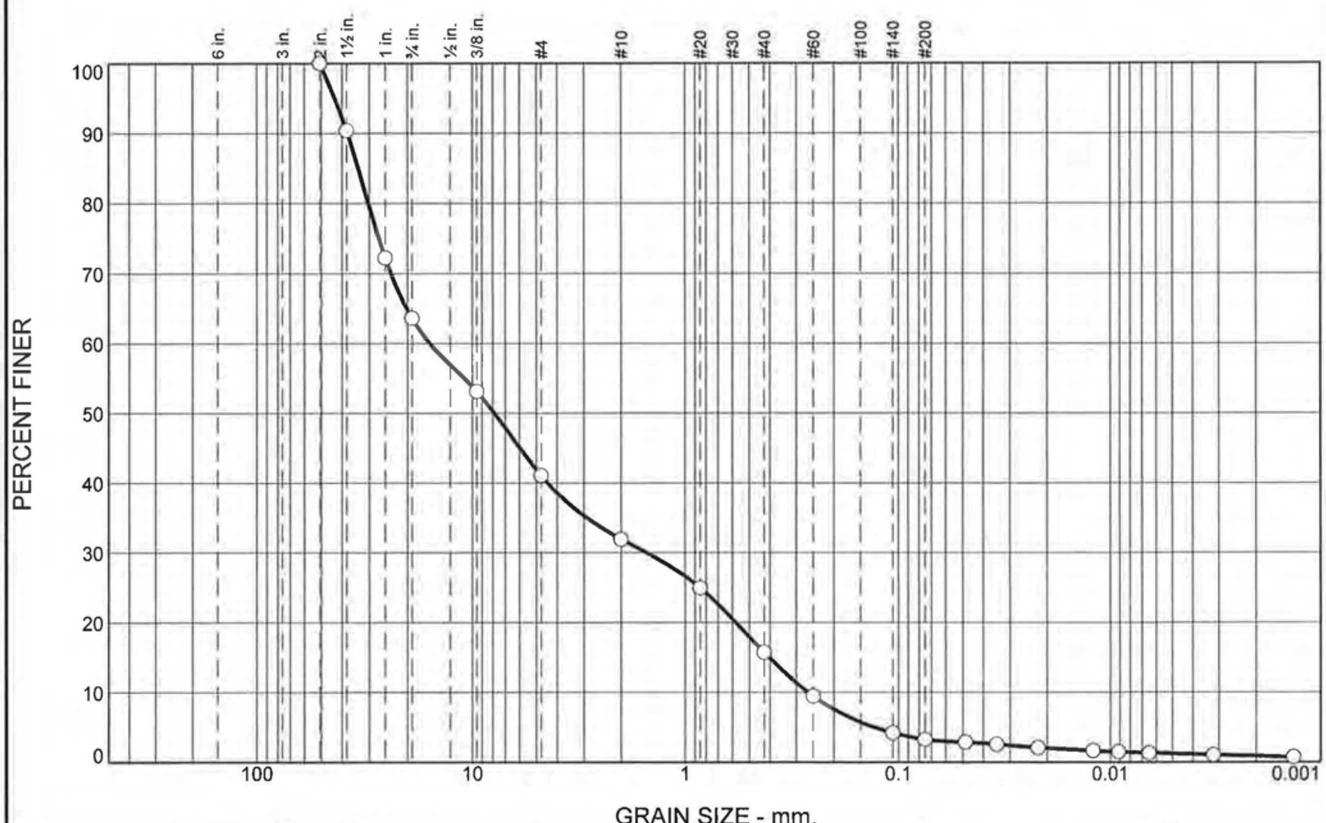
Project Name:	Henry Fork Stream and Wetland Mitigation Site	**Data Collected By:**	KB, IE
Location:	Catawba County, NC	**Data Collected On:**	4/17/2014
Job #:	005-02143	**Reach:**	Henry Fork UT1
Date:	4/17/2014	**Cross Section #:**	XS4

Particle Class		Diameter (mm) min	Diameter (mm) max	Particle Count Pavement	Particle Count Subpavement	Particle Count Total	Pavement Summary Class Percentage	Pavement Summary Percent Cumulative	Subpavement Summary Class Percentage	Subpavement Summary Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	16		16	16.0	16		#DIV/0!		
SAND	Very fine	0.062	0.125	2		2	2.0	18		#DIV/0!		
	Fine	0.125	0.250	7		7	7.0	25		#DIV/0!		
	Medium	0.250	0.500					25		#DIV/0!		
	Coarse	0.5	1.0					25		#DIV/0!		
	Very Coarse	1.0	2.0	2		2	2.0	27		#DIV/0!		
GRAVEL	Very Fine	2.0	2.8					27		#DIV/0!		
	Very Fine	2.8	4.0	1		1	1.0	28		#DIV/0!		
	Fine	4.0	5.7	3		3	3.0	31		#DIV/0!		
	Fine	5.7	8.0	5		5	5.0	36		#DIV/0!		
	Medium	8.0	11.3	2		2	2.0	38		#DIV/0!		
	Medium	11.3	16.0	12		12	12.0	50		#DIV/0!		
	Coarse	16.0	22.6	10		10	10.0	60		#DIV/0!		
	Coarse	22.6	32	10		10	10.0	70		#DIV/0!		
	Very Coarse	32	45	15		15	15.0	85		#DIV/0!		
	Very Coarse	45	64	5		5	5.0	90		#DIV/0!		
COBBLE	Small	64	90	6		6	6.0	96		#DIV/0!		
	Small	90	128	4		4	4.0	100		#DIV/0!		
	Large	128	180					100		#DIV/0!		
	Large	180	256					100		#DIV/0!		
BOULDER	Small	256	362					100		#DIV/0!		
	Small	362	512					100		#DIV/0!		
	Medium	512	1024					100		#DIV/0!		
	Large/Very Large	1024	2048					100		#DIV/0!		
BEDROCK	Bedrock	2048	>2048					100		#DIV/0!		
			Total	**100**	**0**	**100**	**100**	**100**	**0**	**#DIV/0!**		

Largest Particle (mm): ___________________

Pavement Channel materials (mm)		Subpavement Channel materials	
D_{16} =	0.06	D_{16} =	Silt/Clay
D_{35} =	7.45	D_{35} =	#N/A
D_{50} =	16.00	D_{50} =	#N/A
D_{84} =	43.99	D_{84} =	#N/A
D_{95} =	85.03	D_{95} =	#N/A
D_{100} =	128	D_{99} =	#N/A

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	36.4	22.5	9.2	16.2	12.5	2.0	1.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	90.4		
1	72.2		
0.75	63.6		
0.375	53.1		
#4	41.1		
#10	31.9		
#20	24.9		
#40	15.7		
#60	9.4		
#140	4.2		
#200	3.2		

* (no specification provided)

Material Description

Brown Sandy Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 37.7372 D_{85}= 33.6820 D_{60}= 15.7519
D_{50}= 7.8682 D_{30}= 1.5266 D_{15}= 0.4041
D_{10}= 0.2651 C_u= 59.42 C_c= 0.56

Classification

USCS= GP AASHTO=

Remarks

Location: Subpavement UT-1 above pond

Date: 06-27-14

Summit Engineering **Ft. Mill, South Carolina**	**Client:** Wildlands Engineering, Inc. **Project:** Henry Fork **Project No:** SL-262-11 **Figure**

Tested By: Mimi Hourani

GRAIN SIZE DISTRIBUTION TEST DATA

6/27/2014

Client: Wildlands Engineering, Inc.
Project: Henry Fork
Project Number: SL-262-11
Location: Subpavement UT-1 above pond
Material Description: Brown Sandy Gravel
Date: 06-27-14
USCS Classification: GP
Tested by: Mimi Hourani

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
1201.86	0.00	0.00	2	0.00	100.0
			1.5	115.52	90.4
			1	333.52	72.2
			0.75	437.24	63.6
			0.375	563.42	53.1
			#4	708.43	41.1
			#10	818.23	31.9
106.00	0.00	0.00	#20	23.17	24.9
			#40	53.94	15.7
			#60	74.71	9.4
			#140	92.14	4.2
			#200	95.27	3.2

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 31.9
Weight of hydrometer sample = 106.00
Table of composite correction values:

Temp., deg. C:	27.6	25.9	21.8	20.5
Comp. corr.:	-4.0	-4.5	-5.5	-6.0

Meniscus correction only = 1.0
Specific gravity of solids = 2.70
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	21.8	15.0	9.5	0.0131	16.0	13.7	0.0486	2.8
2.00	21.8	14.0	8.5	0.0131	15.0	13.8	0.0346	2.5
5.00	21.8	12.5	7.0	0.0131	13.5	14.1	0.0221	2.1
17.00	21.8	11.0	5.5	0.0131	12.0	14.3	0.0121	1.6
30.00	21.6	10.5	4.9	0.0132	11.5	14.4	0.0091	1.5
60.00	21.6	10.0	4.4	0.0132	11.0	14.5	0.0065	1.3
250.00	21.9	9.0	3.5	0.0131	10.0	14.7	0.0032	1.0
1440.00	21.6	8.0	2.4	0.0132	9.0	14.8	0.0013	0.7

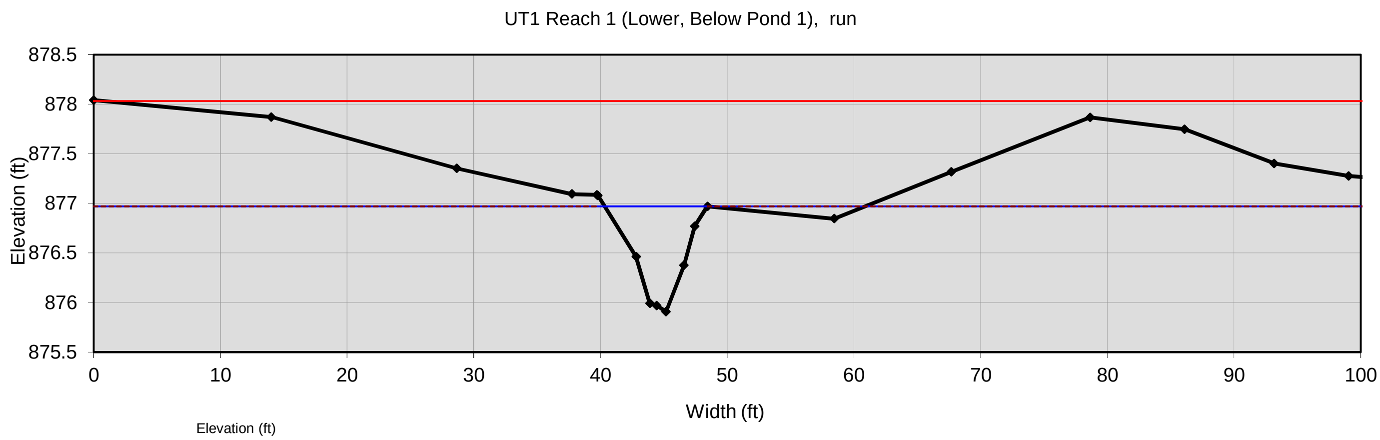
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	36.4	22.5	58.9	9.2	16.2	12.5	37.9	2.0	1.2	3.2

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.2651	0.4041	0.5790	1.5266	7.8682	15.7519	30.2823	33.6820	37.7372	43.2473

Fineness Modulus	C_u	C_c
5.53	59.42	0.56

Cross Section 7



Bankfull Dimensions	
4.3	x-section area (ft.sq.)
8.1	width (ft)
0.5	mean depth (ft)
1.1	max depth (ft)
8.4	wetted parimeter (ft)
0.5	hyd radi (ft)
15.2	width-depth ratio

Flood Dimensions	
105.0	W flood prone area (ft)
13.0	entrenchment ratio
1.1	low bank height (ft)
1.0	low bank height ratio

Materials	
5	D50 (mm)
20	D84 (mm)
14	threshold grain size (mm):

Bankfull Flow	
2.6	velocity (ft/s)
11.2	discharge rate (cfs)
0.64	Froude number

Flow Resistance	
0.035	Manning's roughness
0.18	D'Arcy-Weisbach fric.
8.6	resistance factor u/u*
8.1	relative roughness

Forces & Power	
0.9	channel slope (%)
0.29	shear stress (lb/sq.ft.)
0.39	shear velocity (ft/s)
0.78	unit strm power (lb/ft/s)

Bankfull Checks	
0.505	depth WSF to BKF

Cross Section

reference ID: 7
longitudinal station: ---
alignment: straight line
feature:

Bankfull Stage

elevation: 876.9699 ---

Low Bank Height

elevation: 876.9699

Flood Prone Area

width fpa: 105 105.2

Channel Slope

percent slope: 0.9 ---

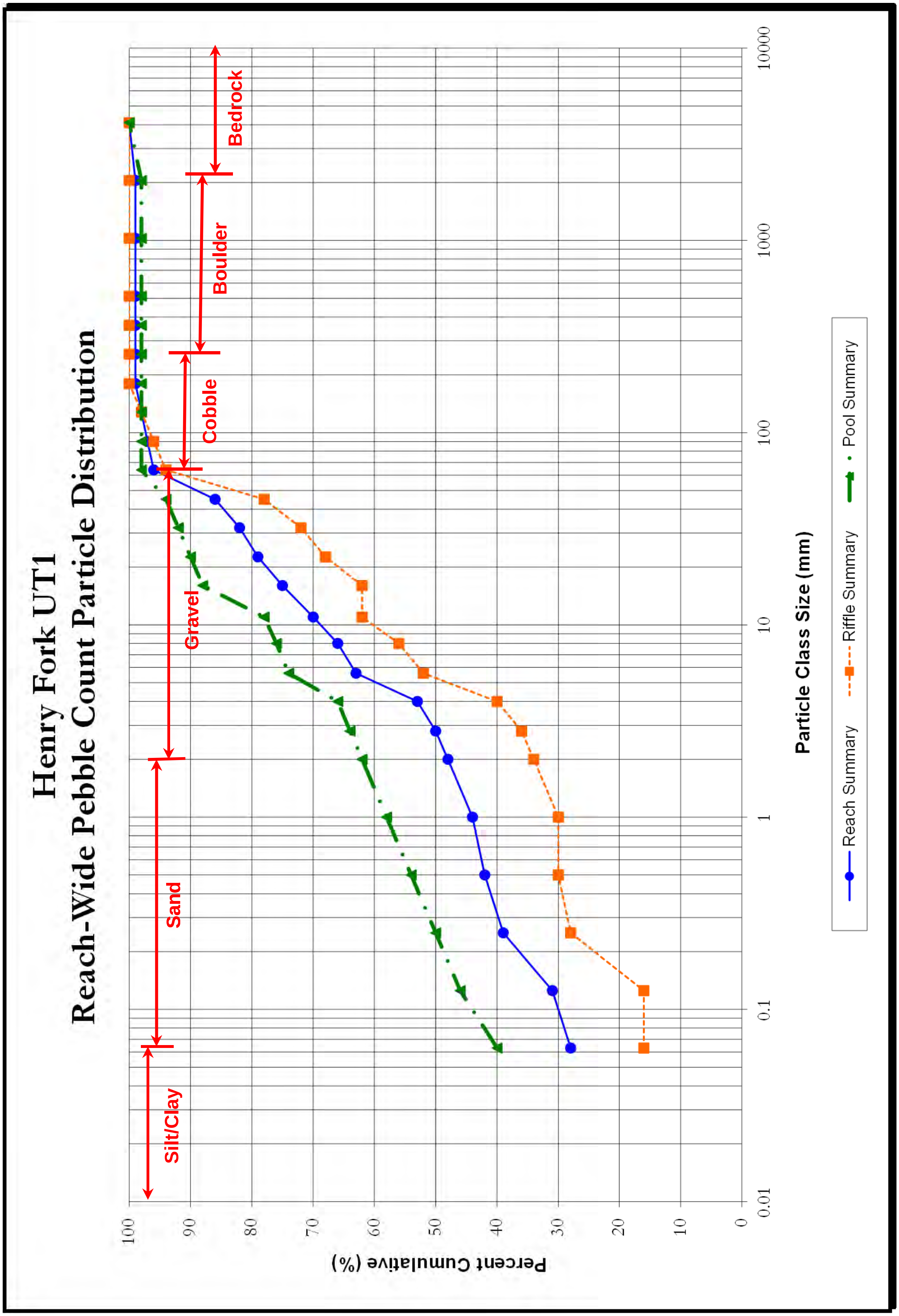
Flow Resistance

Manning's "n": 0.035 0.027
D'Arcy - Weisbach "f": 0.11

Note:

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
876.465	1298103.244	718942.6627	0.00	878.0421		XS7
876.465	1298117.202	718943.9311	14.01	877.8703		XS7
876.465	1298131.762	718945.3819	28.65	877.3528		XS7
876.465	1298140.815	718946.2348	37.74	877.095		XS7
876.465	1298142.787	718946.4144	39.72	877.0873		XS7 LTB
876.465	1298142.85	718946.4539	39.79	877.0813		XS7
876.465	1298145.871	718946.556	42.80	876.4651		XS7 WSF
876.465	1298146.965	718946.5592	43.89	875.9924		XS7 LCH
876.465	1298147.499	718946.6675	44.43	875.969		XS7 TWG
876.465	1298148.218	718946.8452	45.17	875.9075		XS7 RCH
876.465	1298149.629	718946.9735	46.58	876.3756		XS7
876.465	1298150.467	718947.1563	47.44	876.7712		XS7
876.465	1298151.479	718947.1057	48.44	876.9699		XS7 RTB
876.465	1298161.419	718948.2663	58.44	876.8464	✓	XS7
876.465	1298170.597	718949.2098	67.67	877.3179		XS7
876.465	1298181.518	718950.2777	78.64	877.8675		XS7
876.465	1298188.912	718951.1005	86.08	877.7489		XS7
876.465	1298195.942	718951.9399	93.16	877.4023		XS7
876.465	1298201.779	718952.5232	99.03	877.2768		XS7
876.465	1298208.698	718953.4274	106.00	877.2063		XS7

Applies to Reaches 1 & 2



PEBBLE COUNT ANALYSIS WORKSHEET

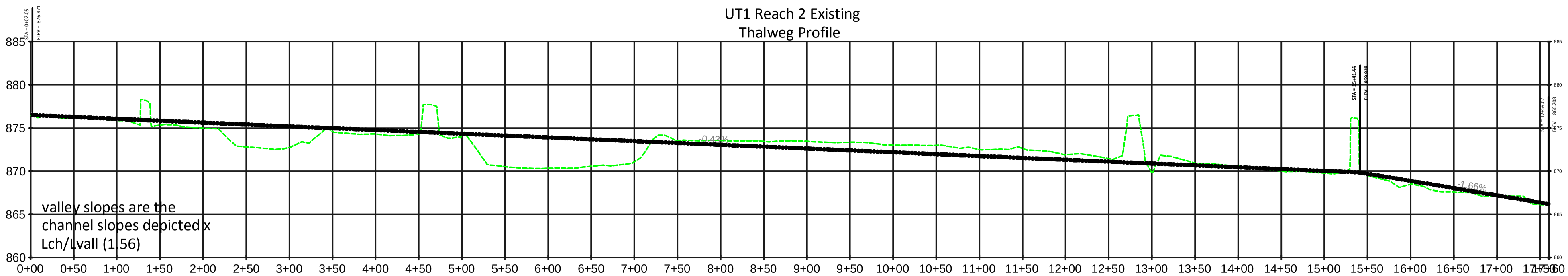
Project Name:	Henry Fork Stream and Wetland Mitigation Site	**Data Collected By:**	KB, IE
Location:	Catawba County, NC	**Data Collected On:**	4/16/2014
Job #:	005-02143	**Reach:**	UT1
Date:	4/16/2014	**Cross Section #:**	Reachwide

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	8	20	28	16.0	16	40	40	28	28
SAND	Very fine	0.062	0.125		3	3		16	6	46	3	31
	Fine	0.125	0.250	6	2	8	12.0	28	4	50	8	39
	Medium	0.250	0.500	1	2	3	2.0	30	4	54	3	42
	Coarse	0.5	1.0		2	2		30	4	58	2	44
	Very Coarse	1.0	2.0	2	2	4	4.0	34	4	62	4	48
GRAVEL	Very Fine	2.0	2.8	1	1	2	2.0	36	2	64	2	50
	Very Fine	2.8	4.0	2	1	3	4.0	40	2	66	3	53
	Fine	4.0	5.7	6	4	10	12.0	52	8	74	10	63
	Fine	5.7	8.0	2	1	3	4.0	56	2	76	3	66
	Medium	8.0	11.3	3	1	4	6.0	62	2	78	4	70
	Medium	11.3	16.0		5	5		62	10	88	5	75
	Coarse	16.0	22.6	3	1	4	6.0	68	2	90	4	79
	Coarse	22.6	32	2	1	3	4.0	72	2	92	3	82
	Very Coarse	32	45	3	1	4	6.0	78	2	94	4	86
	Very Coarse	45	64	8	2	10	16.0	94	4	98	10	96
COBBLE	Small	64	90	1		1	2.0	96		98	1	97
	Small	90	128	1		1	2.0	98		98	1	98
	Large	128	180	1		1	2.0	100		98	1	99
	Large	180	256					100		98		99
BOULDER	Small	256	362					100		98		99
	Small	362	512					100		98		99
	Medium	512	1024					100		98		99
	Large/Very Large	1024	2048					100		98		99
BEDROCK	Bedrock	2048	>2048		1	1		100	2	100	1	100
			Total	**50**	**50**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): ____________

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	0.13	D_{16} =	Silt/Clay	D_{16} =	Silt/Clay
D_{35} =	2.37	D_{35} =	Silt/Clay	D_{35} =	0.18
D_{50} =	5.29	D_{50} =	0.25	D_{50} =	2.80
D_{84} =	51.35	D_{84} =	13.77	D_{84} =	37.95
D_{95} =	75.89	D_{95} =	49.14	D_{95} =	61.79
D_{100} =	180	D_{99} =	>2048	D_{99} =	>2048

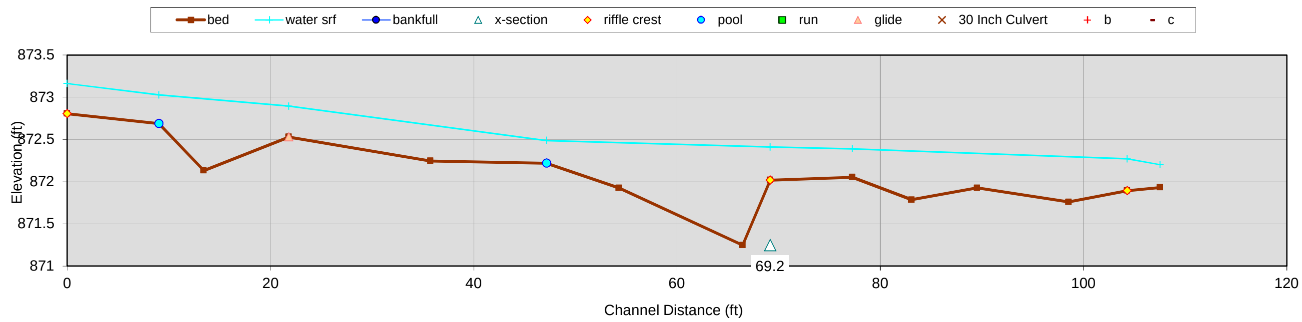
UT1 Reach 2 Existing
Thalweg Profile



Q:\ActiveProjects\005-02143 Henry Fork\Cadd\Void\02143-Design_for_mitplan_profile_printing.dwg

Longitudinal Slope Profile

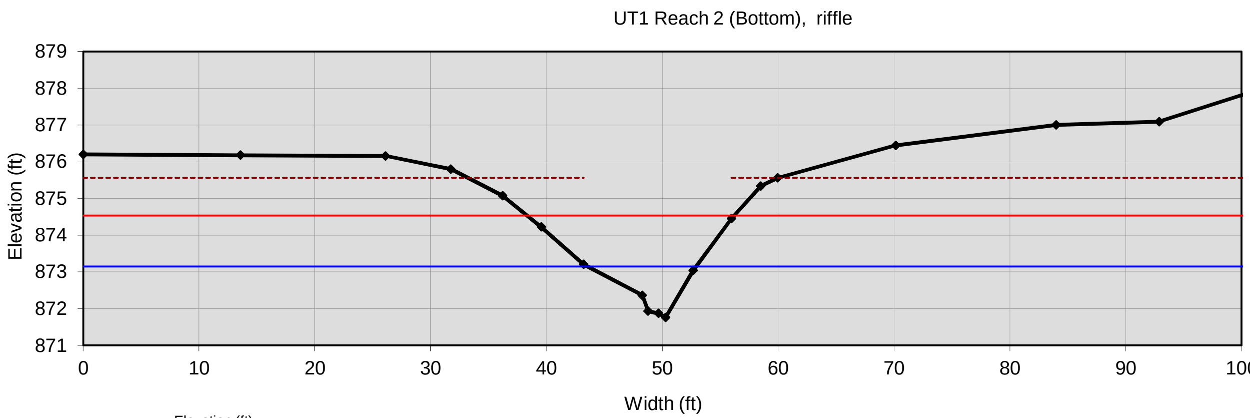
UT1 Reach 2 (Bottom)



	slope (%)		slope ratio		length (ft)		length ratio		pool-pool spacing (ft)	p-p ratio
reach	0.89		---		107.5	(11.5 channel widths)	---		---	---
riffle	0.94	(0.4 - 1.5)	1.1	(0.4 - 1.7	22.1	(9 - 35.1)	2.4	(1 - 3.8)	---	---
pool	0.69	(0.35 - 1)	0.8	(0.4 - 1.1	17.4	(12.8 - 22)	1.9	(1.4 - 2.4)	38.1	4.1
	---		---		---		---		---	---
glide	1.6		1.8		25.4		2.7		---	---

notes	cross section ID	bed feature	BkF channel centerline easting (ft)	northing (ft)	station	ELEV centerline	ELEV thalwag	water	ELEV bankfull	user defined ELEV 0 Inch Culve	ELEV b	ELEV c
TWG HOR		R	1298760.843	719066.199	0.0		872.80593	873.16158				
TWG TOR		P	1298766.604	719073.1451	9.0		872.68931	873.02745				
TWG MP			1298767.424	719077.4787	13.4		872.13162					
TWG GLIDE START		G	1298768.035	719085.8237	21.8		872.52837	872.89488				
TWG			1298773.847	719098.5092	35.8		872.24442					
TWG GLIDE END		P	1298781.509	719106.9557	47.2		872.21795	872.48796				
TWG			1298784.905	719113.2057	54.3		871.92586					
TWG MP			1298785.676	719125.387	66.5		871.24739					
TWG HOR	9	R	1298786.68	719127.8901	69.2		872.01863	872.41089				
TWG TOR			1298787.054	719135.9608	77.3		872.05149	872.38886				
TWG			1298787.133	719141.7961	83.1		871.78571					
TWG			1298787.729	719148.2103	89.5		871.92542					
TWG			1298786.053	719157.0433	98.5		871.75826					
TWG HOR		R	1298784.202	719162.5111	104.3		871.89331	872.2707				
TWG TOR			1298783.577	719165.6902	107.5		871.93214	872.19994				

Cross Section 9



Elevation (ft)

Bankfull Dimensions

6.1	x-section area (ft.sq.)
9.4	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
9.9	wetted parimeter (ft)
0.6	hyd radi (ft)
14.4	width-depth ratio

Flood Dimensions

17.9	W flood prone area (ft)
1.9	entrenchment ratio
3.8	low bank height (ft)
2.7	low bank height ratio

Materials

	D50 (mm)
	D84 (mm)
18	threshold grain size (mm):

Bankfull Flow

3.0	velocity (ft/s)
18.3	discharge rate (cfs)
0.68	Froude number

Flow Resistance

0.035	Manning's roughness
0.17	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

0.96	channel slope (%)
0.37	shear stress (lb/sq.ft.)
0.44	shear velocity (ft/s)
1.17	unit strm power (lb/ft/s)

Bankfull Checks

0.788	depth WSF to BKF

Cross Section

reference ID	9	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	873.15	---

Low Bank Height

elevation	875.563

Flood Prone Area

width fpa		17.9

Channel Slope

percent slope	0.96	#REF!

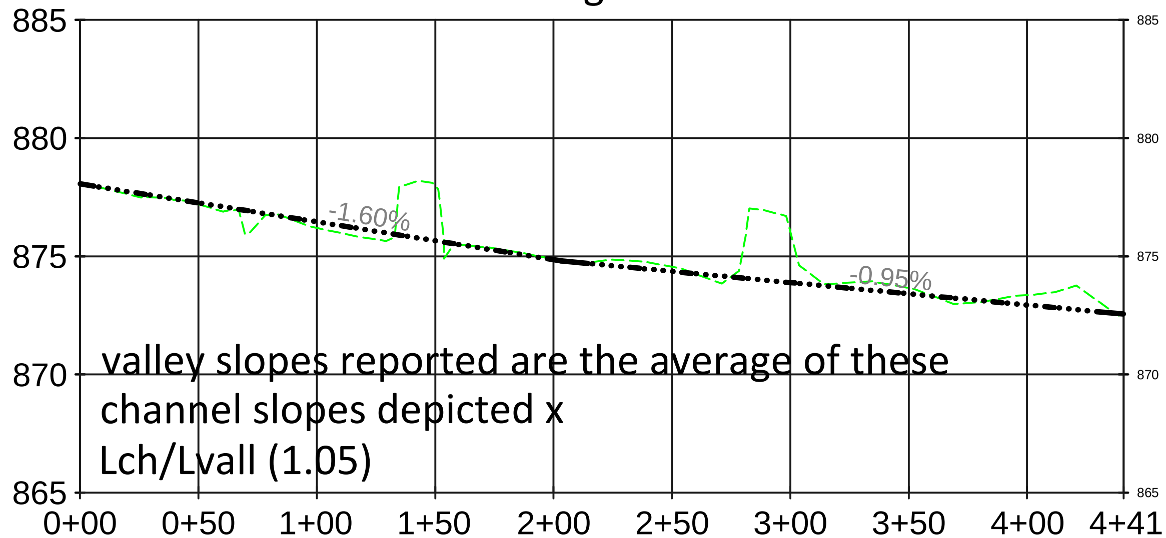
Flow Resistance

Manning's "n"	0.035	---
D'Arcy - Weisbach "f"		---

Note:

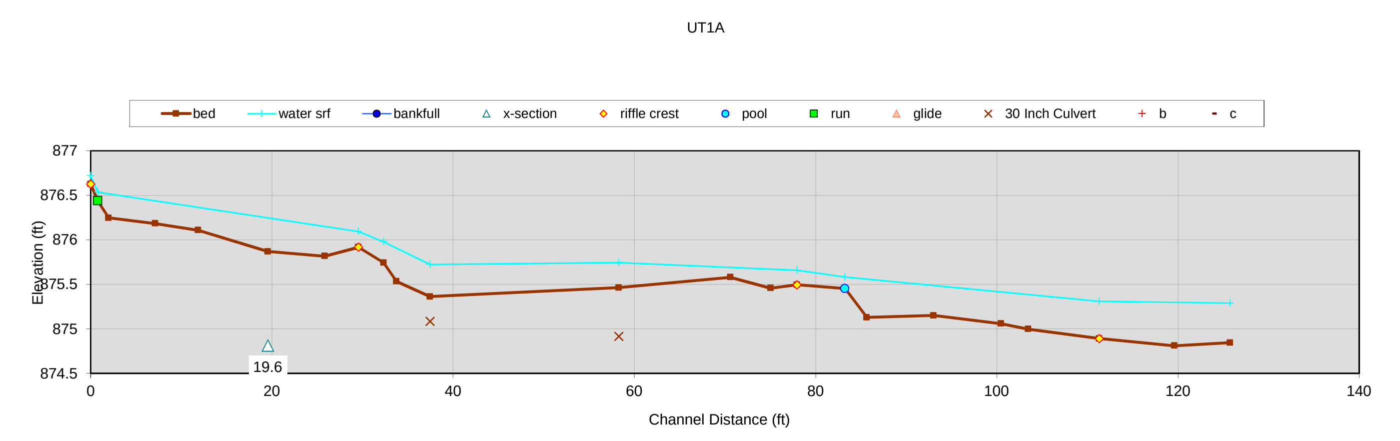
Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
872.362	1298737.851	719143.4145	0.00	876.2056	☐	XS9
872.362	1298751.288	719141.5488	13.57	876.1832	☐	XS9
872.362	1298763.717	719139.9179	26.10	876.1577	☐	XS9
872.362	1298769.277	719139.0553	31.73	875.8011	☐	XS9 LTB
872.362	1298773.702	719138.3953	36.20	875.0769	☐	XS9
872.362	1298776.989	719137.7608	39.54	874.2289	☐	XS9
872.362	1298780.616	719137.3109	43.20	873.207	☐	XS9
872.362	1298785.655	719136.7503	48.27	872.3625	☐	XS9 WSF
872.362	1298786.16	719136.7441	48.77	871.9371	☐	XS9 LCH
872.362	1298787.041	719136.5806	49.66	871.8713	☐	XS9 TWG
872.362	1298787.696	719136.75	50.29	871.7656	☐	XS9 RCH
872.362	1298790.011	719136.2264	52.65	873.0458	☐	XS9
872.362	1298793.266	719135.5335	55.97	874.458	☐	XS9
872.362	1298795.746	719135.0446	58.50	875.3397	☐	XS9
872.362	1298797.215	719135.0274	59.95	875.563	☐	XS9 RTB
872.362	1298807.328	719133.681	70.16	876.4505	☐	XS9
872.362	1298821.029	719131.7417	83.99	877.0088	☐	XS9
872.362	1298829.953	719131.3423	92.88	877.0938	☐	XS9
872.362	1298841.368	719129.3797	104.46	878.2662	☐	XS9
872.362	1298851.716	719127.5137	114.97	878.6526	☐	XS9
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

UT1A Existing
Thalweg Profile



Q:\ActiveProjects\005-02143 Henry Fork\Cadd\Void\02143-Design_for_mitplan_profile_printing.dwg

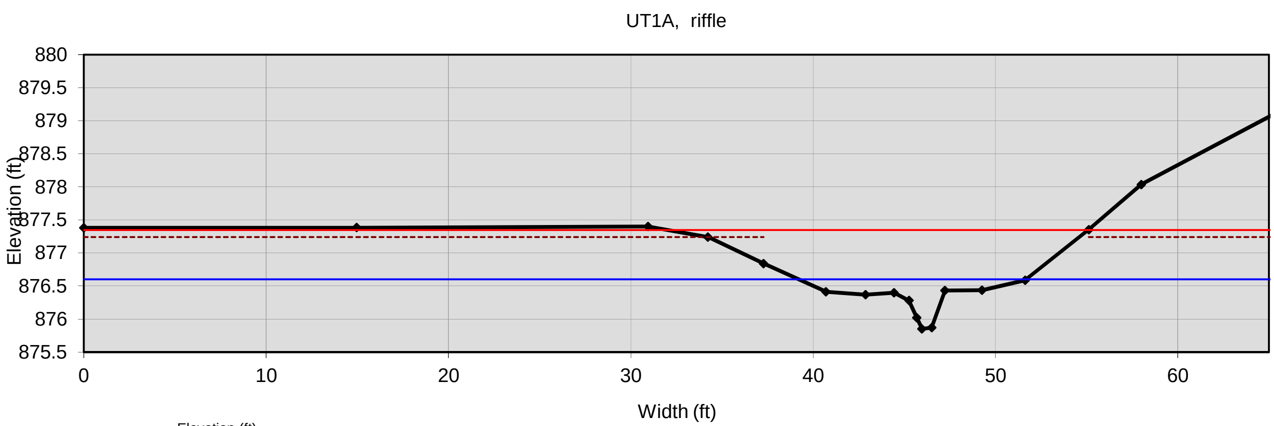
Longitudinal Slope Profile



	slope (%)	slope ratio	length (ft)	length ratio	pool-pool spacing (ft)	p-p ratio
reach	1.1	---	125.7 (10.1 channel widths)	---	---	---
riffle	8.6 (1 - 23)	7.8 (0.9 - 20.	17.2 (0.8 - 45.5)	1.4 (0.1 - 3.6)	---	---
pool	0.97	0.9	28.1	2.3	---	---
run	1.5	1.4	28.8	2.3	---	---
	---	---	---	---	---	---

notes	cross section ID	bed feature	BkF channel centerline easting (ft)	northing (ft)	station	ELEV centerline	ELEV thalwag	water	ELEV bankfull	user defined ELEV 30 Inch Culve	ELEV b	ELEV c
TWG HOR		R	1298557.828	718794.3114	0.0		876.6248	876.72034				
TWG TOR		N	1298558.621	718794.3402	0.8		876.434	876.53558				
TWG			1298559.391	718795.2498	2.0		876.24662					
TWG			1298562.945	718798.9689	7.1		876.18377					
TWG			1298566.144	718802.4623	11.9		876.10779					
TWG	8		1298572.121	718807.3062	19.6		875.86871					
TWG			1298577.252	718810.9272	25.8		875.81721					
TWG HOR		R	1298579.611	718813.8049	29.6		875.91672	876.09247				
TWG TOR			1298581.469	718815.8683	32.3		875.74311	875.97819				
TWG			1298582.249	718817.0502	33.8		875.53327					
TWG			1298582.973	718820.6787	37.5		875.36305	875.72258		875.0847		
TWG			1298596.808	718836.2422	58.3		875.4632	875.74546		874.91587		
TWG			1298606.21	718844.1934	70.6		875.57891					
TWG			1298608.557	718847.9677	75.0		875.45687					
TWG HOR		R	1298611.12	718849.3597	78.0		875.4952	875.65897				
TWG TOR		P	1298616.19	718850.9115	83.3		875.45217	875.58096				
TWG			1298618.344	718851.9759	85.7		875.12913					
TWG			1298623.01	718857.6828	93.0		875.14945					
TWG			1298626.839	718864.0828	100.5		875.0593					
TWG			1298628.936	718866.203	103.5		874.99705					
TWG		R	1298634.148	718872.0618	111.3		874.89176	875.30953				
TWG			1298639.32	718878.5283	119.6		874.81122					
TWG			1298641.79	718884.1692	125.7		874.84541	875.28912				

Cross Section 8



Elevation (ft)

Bankfull Dimensions	
2.8	x-section area (ft.sq.)
12.5	width (ft)
0.2	mean depth (ft)
0.7	max depth (ft)
12.8	wetted parimeter (ft)
0.2	hyd radi (ft)
56.0	width-depth ratio

Flood Dimensions	
23.0	W flood prone area (ft)
1.8	entrenchment ratio
1.4	low bank height (ft)
1.9	low bank height ratio

Materials	
0.062	D50 Riffle (mm)
0.29	D84 Riffle (mm)
10	threshold grain size (mm):

Bankfull Flow	
2.2	velocity (ft/s)
6.1	discharge rate (cfs)
0.83	Froude number

Flow Resistance	
0.030	Manning's roughness
0.17	D'Arcy-Weisbach fric.
17.4	resistance factor u/u*
234.3	relative roughness

Forces & Power	
1.5	channel slope (%)
0.20	shear stress (lb/sq.ft.)
0.32	shear velocity (ft/s)
0.46	unit strm power (lb/ft/s)

Bankfull Checks	
0.320	depth WSF to BKF

Cross Section

reference ID	8	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	876.6	---

Low Bank Height

elevation	877.2413	

Flood Prone Area

width fpa	23	23.1

Channel Slope

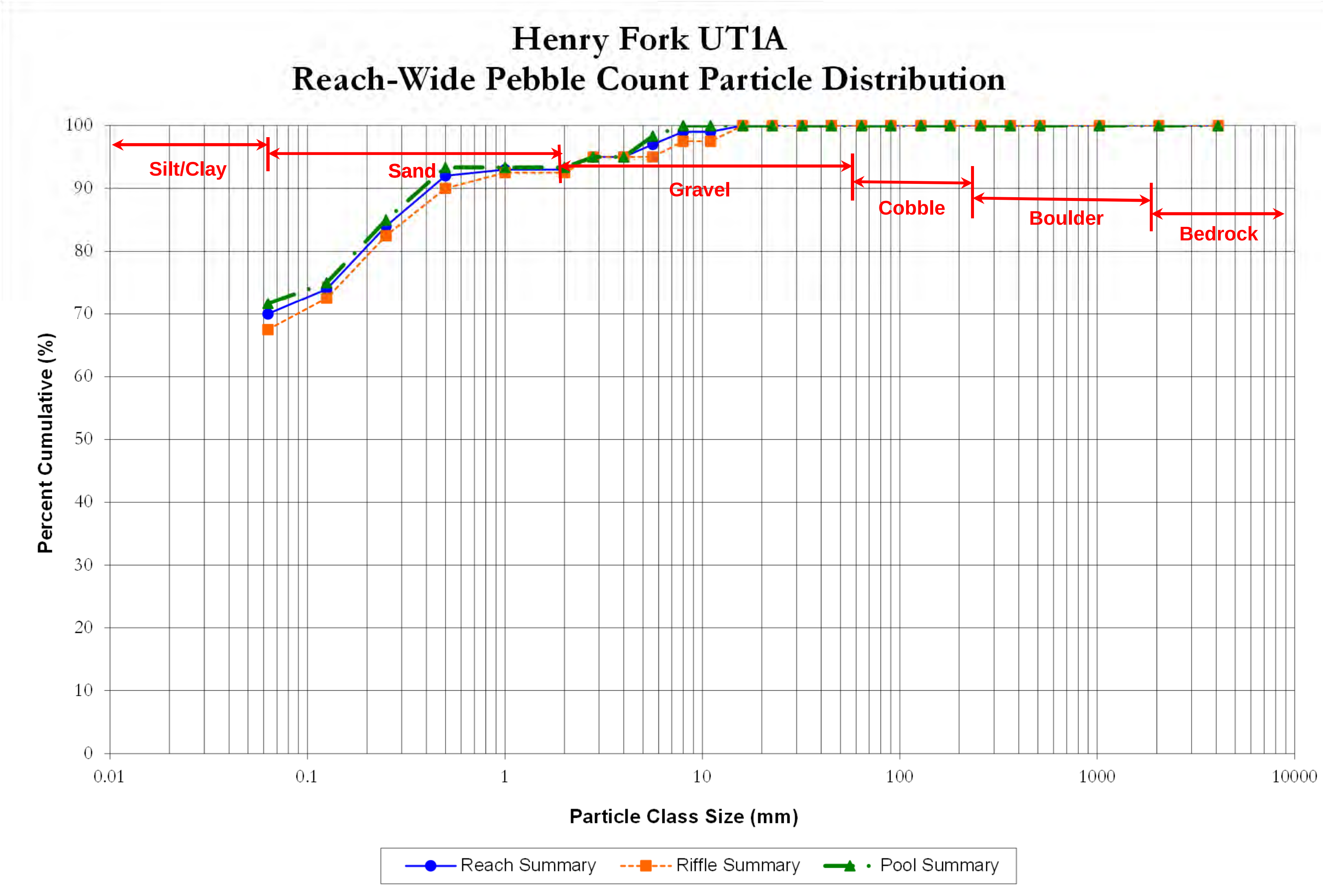
percent slope	1.5	#REF!

Flow Resistance

Manning's "n"	0.03	0.012
D'Arcy - Weisbach "f"		0.03

Note:

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
876.280	1298541.325	718841.3646	0.00	877.3822	☐	XS8
876.280	1298551.499	718830.3953	14.96	877.3848	☐	XS8
876.280	1298562.456	718818.7597	30.94	877.4019	☐	XS8
876.280	1298564.831	718816.4793	34.23	877.2413	☐	XS8 LTB
876.280	1298566.827	718814.1643	37.29	876.8396	☐	XS8
876.280	1298569.111	718811.6123	40.71	876.4124	☐	XS8
876.280	1298570.712	718810.1439	42.88	876.3708	☐	XS8
876.280	1298571.667	718808.9046	44.43	876.3992	☐	XS8
876.280	1298572.44	718808.5	45.26	876.2803	☐	XS8 WSF
876.280	1298572.559	718808.019	45.69	876.019	☐	XS8 LCH
876.280	1298572.775	718807.8422	45.97	875.8519	☐	XS8 TWG
876.280	1298573.039	718807.3538	46.50	875.8707	☐	XS8 RCH
876.280	1298573.575	718806.8526	47.23	876.4339	☐	XS8
876.280	1298575.025	718805.4218	49.27	876.4389	☐	XS8
876.280	1298576.744	718803.7977	51.63	876.5868	☐	XS8
876.280	1298579.142	718801.2637	55.12	877.3534	☐	XS8
876.280	1298581.006	718799.0674	58.00	878.0361	☐	XS8 RTB
876.280	1298589.1	718790.4014	69.85	879.7683	☐	XS8


Henry Fork UT1A
Reach-Wide Pebble Count Particle Distribution
Percent Cumulative (%)
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Reach Summary
Riffle Summary
Pool Summary

PEBBLE COUNT ANALYSIS WORKSHEET

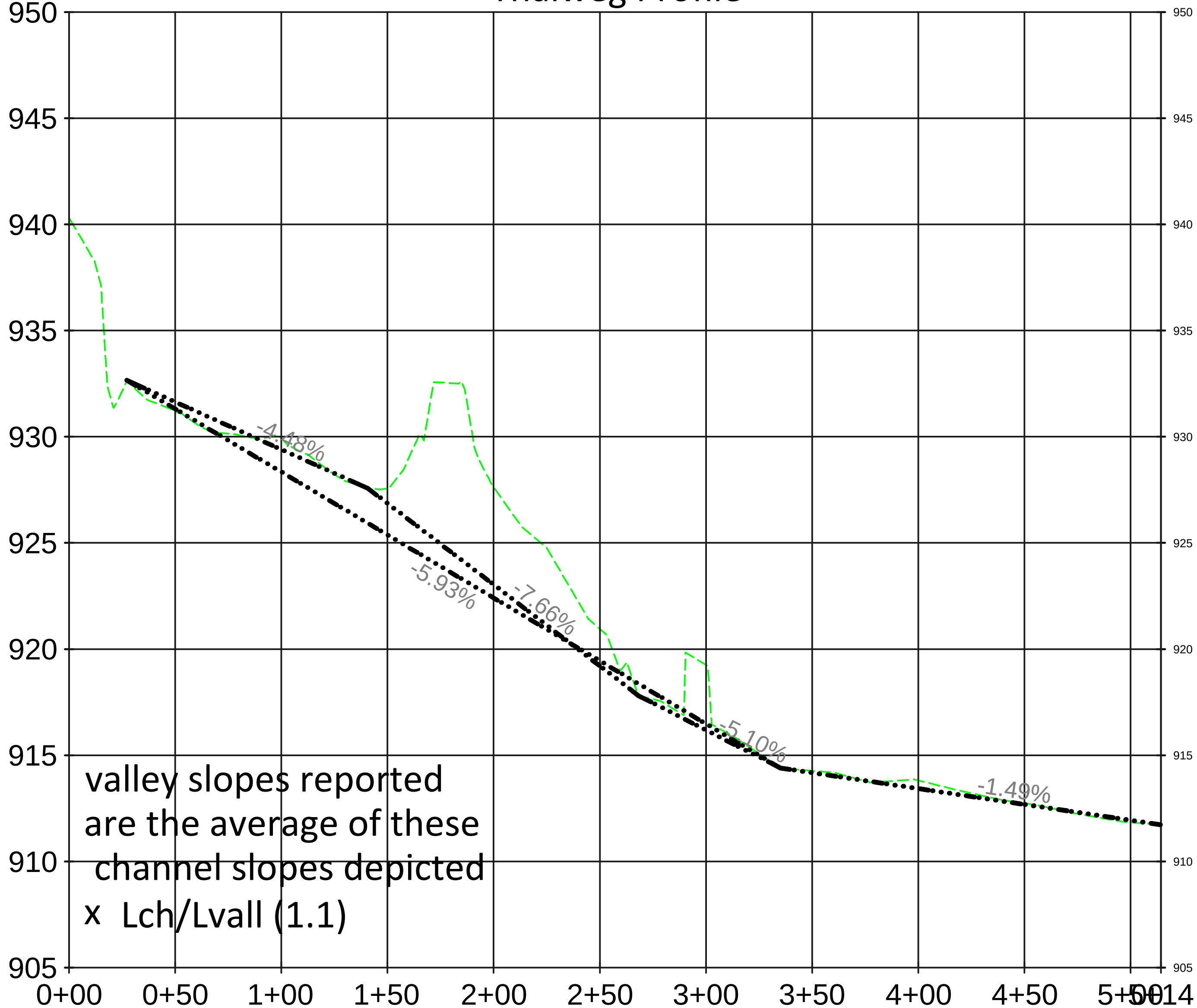
Project Name:	Henry Fork Mitigation Site	**Data Collected By:**	KB, IE
Location:	Catawba County, NC	**Data Collected On:**	4/17/2014
Job #:	005-02143	**Reach:**	UT1A
Date:	4/17/2014	**Cross Section #:**	Reachwide

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	27	43	70	67.5	68	72	72	70	70
SAND	Very fine	0.062	0.125	2	2	4	5.0	73	3	75	4	74
	Fine	0.125	0.250	4	6	10	10.0	83	10	85	10	84
	Medium	0.250	0.500	3	5	8	7.5	90	8	93	8	92
	Coarse	0.5	1.0	1		1	2.5	93		93	1	93
	Very Coarse	1.0	2.0					93		93		93
GRAVEL	Very Fine	2.0	2.8	1	1	2	2.5	95	2	95	2	95
	Very Fine	2.8	4.0					95		95		95
	Fine	4.0	5.7		2	2		95	3	98	2	97
	Fine	5.7	8.0	1	1	2	2.5	98	2	100	2	99
	Medium	8.0	11.3					98		100		99
	Medium	11.3	16.0	1		1	2.5	100		100	1	100
	Coarse	16.0	22.6					100		100		100
	Coarse	22.6	32					100		100		100
	Very Coarse	32	45					100		100		100
	Very Coarse	45	64					100		100		100
COBBLE	Small	64	90					100		100		100
	Small	90	128					100		100		100
	Large	128	180					100		100		100
	Large	180	256					100		100		100
BOULDER	Small	256	362					100		100		100
	Small	362	512					100		100		100
	Medium	512	1024					100		100		100
	Large/Very Large	1024	2048					100		100		100
BEDROCK	Bedrock	2048	>2048					100		100		100
			Total	**40**	**60**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): ______________

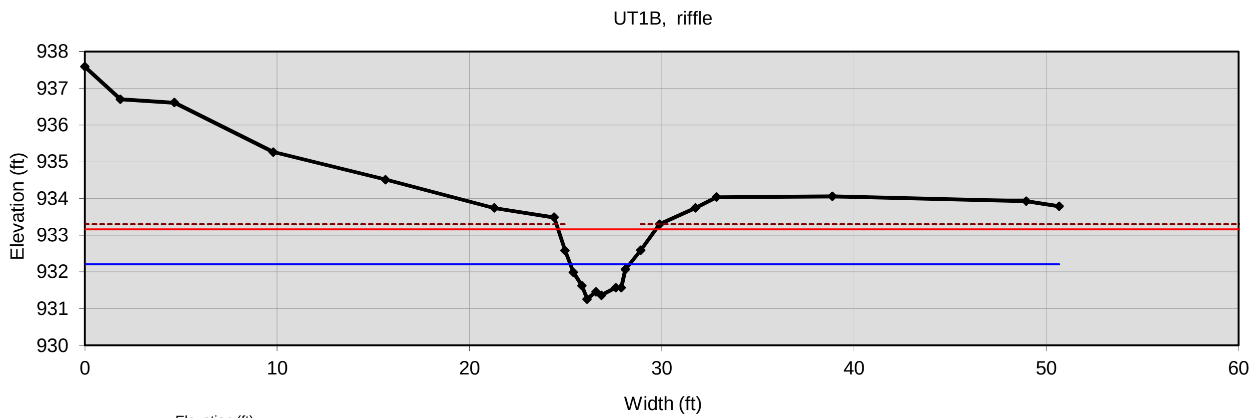
Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	Silt/Clay	D_{16} =	Silt/Clay	D_{16} =	Silt/Clay
D_{35} =	Silt/Clay	D_{35} =	Silt/Clay	D_{35} =	Silt/Clay
D_{50} =	Silt/Clay	D_{50} =	Silt/Clay	D_{50} =	Silt/Clay
D_{84} =	0.29	D_{84} =	0.23	D_{84} =	0.25
D_{95} =	5.60	D_{95} =	4.00	D_{95} =	4.00
D_{100} =	16	D_{99} =	8	D_{99} =	16

UT1B Existing Thalweg Profile



Q:\ActiveProjects\005-02143 Henry Fork\Cadd\Void\02143-Design_for_mitplan_profile_printing.dwg

Cross Section 1



Elevation (ft)

Bankfull Dimensions

1.9	x-section area (ft.sq.)
3.1	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
4.0	wetted parimeter (ft)
0.5	hyd radi (ft)
5.1	width-depth ratio

Flood Dimensions

5.1	W flood prone area (ft)
1.7	entrenchment ratio
2.0	low bank height (ft)
2.2	low bank height ratio

Materials

0.86	D50 Riffle (mm)
15	D84 Riffle (mm)
32	threshold grain size (mm):

Bankfull Flow

3.8	velocity (ft/s)
7.1	discharge rate (cfs)
0.98	Froude number

Flow Resistance

0.035	Manning's roughness
0.18	D'Arcy-Weisbach fric.
9.1	resistance factor u/u*
12.3	relative roughness

Forces & Power

2.2	channel slope (%)
0.64	shear stress (lb/sq.ft.)
0.58	shear velocity (ft/s)
3.2	unit strm power (lb/ft/s)

Bankfull Checks

0.582	depth WSF to BKF

Cross Section

- reference ID: 1
- longitudinal station: ---
- alignment: straight line
- feature:

Bankfull Stage

- elevation: 932.21 ---

Low Bank Height

- elevation: 933.303

Flood Prone Area

- width fpa: 5.1 5.1

Channel Slope

- percent slope: 2.2 ---

Flow Resistance

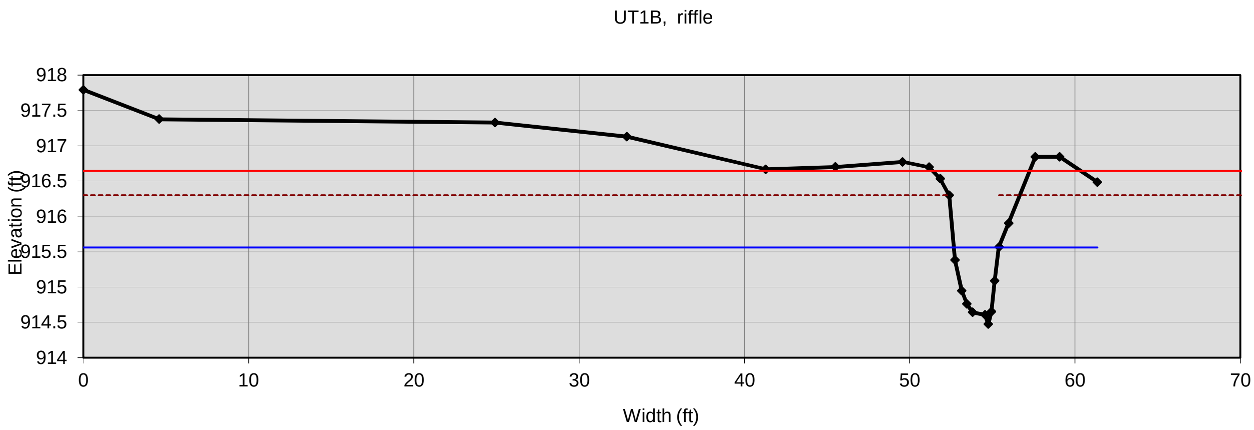
- Manning's "n": 0.035 0.026
- D'Arcy - Weisbach "f": 0.10

Note:

Upstream of UT1B pond

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
931.628	1298557.876	717912.3575	0.00	937.5901	☐	XS1
931.628	1298558.261	717914.1738	1.84	936.7067	☐	XS1
931.628	1298559.225	717916.8173	4.66	936.6137	☐	XS1
931.628	1298560.893	717921.6811	9.80	935.2651	☐	XS1
931.628	1298562.771	717927.2042	15.63	934.5167	☐	XS1
931.628	1298564.345	717932.6379	21.28	933.7418	☐	XS1
931.628	1298565.158	717935.6571	24.40	933.488	☐	XS1 LTB
931.628	1298565.467	717936.1465	24.96	932.5857	☐	XS1
931.628	1298565.577	717936.5712	25.40	931.9934	☐	XS1
931.628	1298565.851	717936.9477	25.85	931.6276	☐	XS1 WSF
931.628	1298565.981	717937.1883	26.12	931.2618	☐	XS1 LCH
931.628	1298566.113	717937.6247	26.57	931.4556	☐	XS1
931.628	1298566.211	717937.8936	26.86	931.3625	☐	XS1 TWG
931.628	1298566.284	717938.6661	27.61	931.5715	☐	XS1
931.628	1298566.419	717938.9203	27.90	931.5699	☐	XS1 RCH
931.628	1298566.421	717939.1497	28.11	932.0719	☐	XS1
931.628	1298566.899	717939.8276	28.91	932.5934	☐	XS1
931.628	1298566.949	717940.8475	29.89	933.3028	☐	XS1 RTB
931.628	1298567.71	717942.5516	31.75	933.7436	☑	XS1
931.628	1298568.073	717943.5977	32.86	934.0382	☐	XS1
931.628	1298570.117	717949.2628	38.88	934.0583	☐	XS1
931.628	1298573.116	717958.8887	48.96	933.9302	☐	XS1
931.628	1298573.807	717960.4601	50.67	933.7925	☐	XS1
					☐	
					☐	
					☐	
					☐	

Cross Section 2



Bankfull Dimensions	
2.0	x-section area (ft.sq.)
2.7	width (ft)
0.7	mean depth (ft)
1.1	max depth (ft)
3.8	wetted parimeter (ft)
0.5	hyd radi (ft)
3.7	width-depth ratio

Flood Dimensions	
6.9	W flood prone area (ft)
2.5	entrenchment ratio
1.8	low bank height (ft)
1.7	low bank height ratio

Materials	
0.86	D50 Riffle (mm)
15	D84 Riffle (mm)
35	threshold grain size (mm):

Bankfull Flow	
4.1	velocity (ft/s)
8.1	discharge rate (cfs)
1.00	Froude number

Flow Resistance	
0.035	Manning's roughness
0.18	D'Arcy-Weisbach fric.
9.4	resistance factor u/u*
14.7	relative roughness

Forces & Power	
2.2	channel slope (%)
0.72	shear stress (lb/sq.ft.)
0.61	shear velocity (ft/s)
4.1	unit strm power (lb/ft/s)

Bankfull Checks	
0.799	depth WSF to BKF

Cross Section

reference ID	2	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	915.56	---

Low Bank Height

elevation	916.2977

Flood Prone Area

width fpa	6.9	6.9

Channel Slope

percent slope	2.2	---

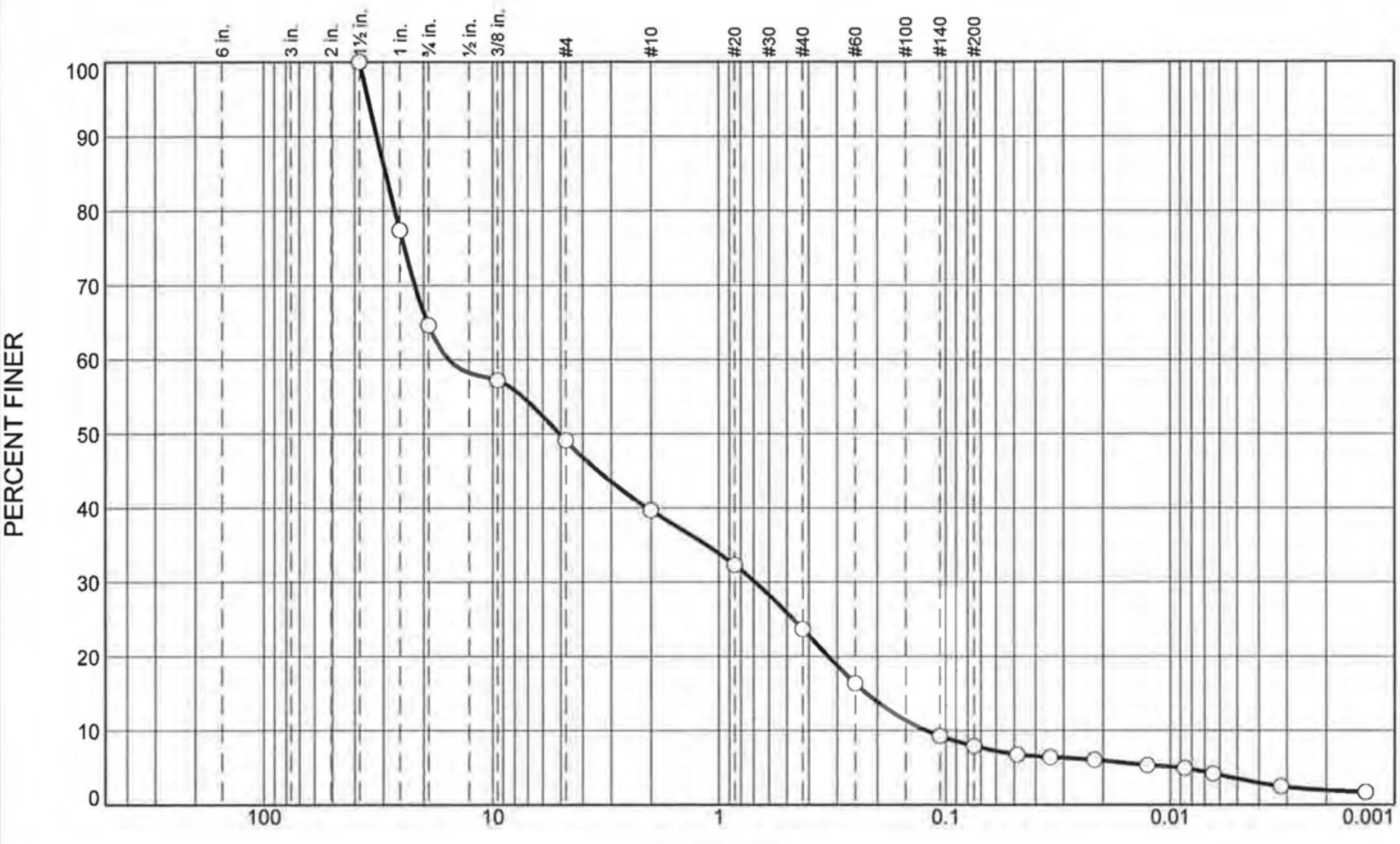
Flow Resistance

Manning's "n"	0.035	0.025
D'Arcy - Weisbach "f"		0.09

Note:
Downstream of UT1B pond

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
914.761	1298303.288	717924.8719	0.00	917.7933	☐	XS2
914.761	1298304.112	717929.3981	4.60	917.3768	☐	XS2
914.761	1298306.257	717949.6142	24.92	917.3297	☐	XS2
914.761	1298307.253	717957.5184	32.88	917.1297	☐	XS2
914.761	1298308.126	717965.8789	41.29	916.6665	☐	XS2
914.761	1298308.678	717970.0484	45.49	916.7019	☐	XS2
914.761	1298309.178	717974.0932	49.57	916.7711	☐	XS2
914.761	1298309.422	717975.6759	51.17	916.6979	☐	XS2
914.761	1298309.517	717976.3401	51.84	916.5375	☐	XS2
914.761	1298309.616	717976.8807	52.39	916.2977	☐	XS2 LTB
914.761	1298309.699	717977.2301	52.75	915.3816	☐	XS2
914.761	1298309.58	717977.6523	53.15	914.9501	☐	XS2
914.761	1298309.796	717977.9258	53.45	914.7608	☐	XS2 WSF\L(
914.761	1298309.747	717978.2873	53.80	914.6426	☐	XS2
914.761	1298309.755	717979.043	54.55	914.6087	☐	XS2
914.761	1298309.636	717979.2547	54.75	914.4765	☐	XS2 TWG
914.761	1298309.747	717979.4485	54.95	914.6539	☐	XS2 RCH
914.761	1298309.859	717979.6219	55.14	915.0868	☐	XS2
914.761	1298309.686	717979.9089	55.40	915.5694	☐	XS2
914.761	1298309.944	717980.4597	55.98	915.9059	☐	XS2
914.761	1298310.31	717982.038	57.59	916.8456	☐	XS2 RTB
914.761	1298310.578	717983.4901	59.07	916.8441	☐	XS2
914.761	1298310.602	717985.7952	61.36	916.4866	☐	XS2
					☐	XS2
					☐	XS2
					☐	XS2
					☐	XS2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	35.4	15.5	9.5	16.0	15.7	4.4	3.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	77.4		
0.75	64.6		
0.375	57.2		
#4	49.1		
#10	39.6		
#20	32.3		
#40	23.6		
#60	16.3		
#140	9.2		
#200	7.9		

* (no specification provided)

Material Description

Brown Sandy Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 31.9815 D_{85}= 29.2453 D_{60}= 15.5783
D_{50}= 5.0697 D_{30}= 0.6906 D_{15}= 0.2232
D_{10}= 0.1231 C_u= 126.56 C_c= 0.25

Classification

USCS= AASHTO=

Remarks

Location: UT 1b XS-2 Subpavement

Date: 06-27-14

Summit Engineering

Ft. Mill, South Carolina

Client: Wildlands Engineering, Inc.
Project: Henry Fork

Project No: SL-262-11 **Figure**

Tested By: Mimi Hourani

GRAIN SIZE DISTRIBUTION TEST DATA

6/27/2014

Client: Wildlands Engineering, Inc.
Project: Henry Fork
Project Number: SL-262-11
Location: UT 1b XS-2 Subpavement
Material Description: Brown Sandy Gravel
Date: 06-27-14
Tested by: Mimi Hourani

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
729.39	0.00	0.00	1.5	0.00	100.0
			1	164.79	77.4
			0.75	258.18	64.6
			0.375	312.15	57.2
			#4	371.27	49.1
			#10	440.31	39.6
55.67	0.00	0.00	#20	10.30	32.3
			#40	22.48	23.6
			#60	32.74	16.3
			#140	42.74	9.2
			#200	44.60	7.9

Hydrometer Test Data

Hydrometer test uses material passing#10
Percent passing #10 based upon complete sample =39.6
Weight of hydrometer sample =55.67
Table of composite correction values:

Temp., deg. C:	27.6	25.9	21.8	20.5
Comp. corr.:	-4.0	-4.5	-5.5	-6.0

Meniscus correction only =1.0
Specific gravity of solids =2.70
Hydrometer type =152H
Hydrometer effective depth equation: L =16.294964 - 0.164 **x Rm**

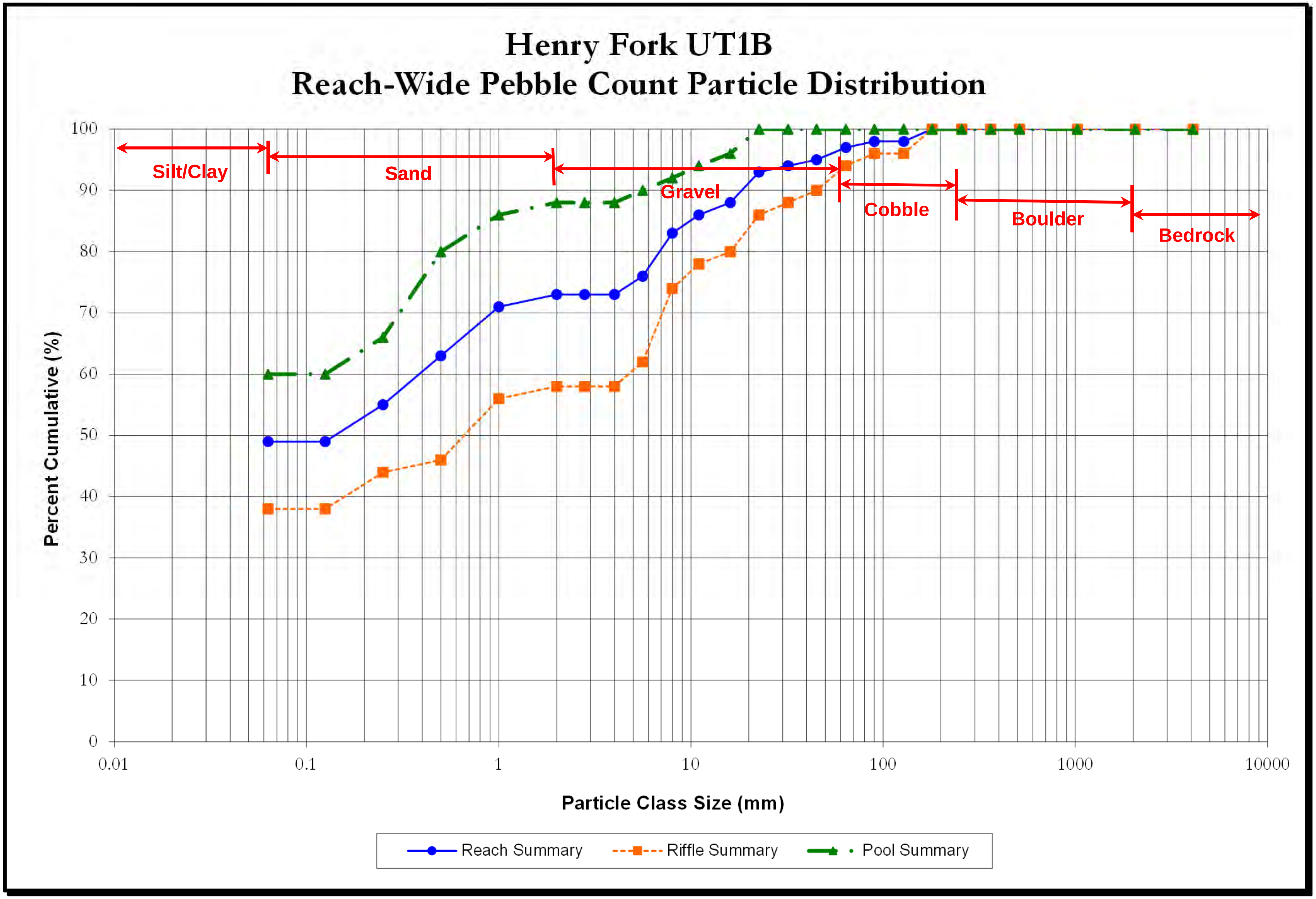
Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	22.1	15.0	9.6	0.0131	16.0	13.7	0.0484	6.7
2.00	22.1	14.5	9.1	0.0131	15.5	13.8	0.0344	6.4
5.00	22.1	14.0	8.6	0.0131	15.0	13.8	0.0218	6.0
15.00	22.0	13.0	7.5	0.0131	14.0	14.0	0.0127	5.3
33.00	21.7	12.5	7.0	0.0132	13.5	14.1	0.0086	4.9
60.00	21.6	11.5	5.9	0.0132	12.5	14.2	0.0064	4.2
250.00	21.8	9.0	3.5	0.0131	10.0	14.7	0.0032	2.5
1440.00	21.6	8.0	2.4	0.0132	9.0	14.8	0.0013	1.7

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	35.4	15.5	50.9	9.5	16.0	15.7	41.2	4.4	3.5	7.9

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.1231	0.2232	0.3294	0.6906	5.0697	15.5783	26.6767	29.2453	31.9815	34.9198

Fineness Modulus	C_u	C_c
4.94	126.56	0.25



Henry Fork UT1B
Reach-Wide Pebble Count Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
Particle Class Size (mm)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Reach Summary
Riffle Summary
Pool Summary

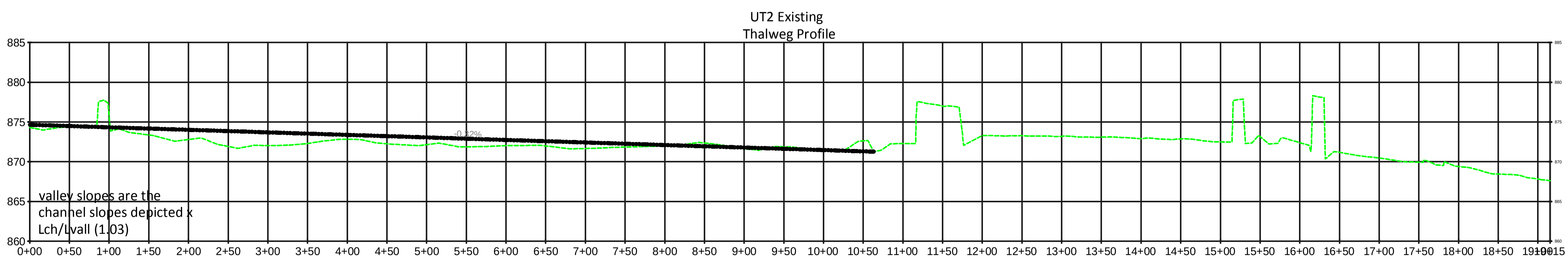
PEBBLE COUNT ANALYSIS WORKSHEET

Project Name:	Henry Fork Mitigation Site	**Data Collected By:**	KB, IE
Location:	Catawba County, NC	**Data Collected On:**	4/14/2014
Job #:	005-02143	**Reach:**	UT1B
Date:	4/14/2014	**Cross Section #:**	Reachwide

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	19	30	49	38.0	38	60	60	49	49
SAND	Very fine	0.062	0.125					38		60		49
	Fine	0.125	0.250	3	3	6	6.0	44	6	66	6	55
	Medium	0.250	0.500	1	7	8	2.0	46	14	80	8	63
	Coarse	0.5	1.0	5	3	8	10.0	56	6	86	8	71
	Very Coarse	1.0	2.0	1	1	2	2.0	58	2	88	2	73
GRAVEL	Very Fine	2.0	2.8					58		88		73
	Very Fine	2.8	4.0					58		88		73
	Fine	4.0	5.7	2	1	3	4.0	62	2	90	3	76
	Fine	5.7	8.0	6	1	7	12.0	74	2	92	7	83
	Medium	8.0	11.3	2	1	3	4.0	78	2	94	3	86
	Medium	11.3	16.0	1	1	2	2.0	80	2	96	2	88
	Coarse	16.0	22.6	3	2	5	6.0	86	4	100	5	93
	Coarse	22.6	32	1		1	2.0	88		100	1	94
	Very Coarse	32	45	1		1	2.0	90		100	1	95
	Very Coarse	45	64	2		2	4.0	94		100	2	97
COBBLE	Small	64	90	1		1	2.0	96		100	1	98
	Small	90	128					96		100		98
	Large	128	180	2		2	4.0	100		100	2	100
	Large	180	256					100		100		100
BOULDER	Small	256	362					100		100		100
	Small	362	512					100		100		100
	Medium	512	1024					100		100		100
	Large/Very Large	1024	2048					100		100		100
BEDROCK	Bedrock	2048	>2048					100		100		100
			Total	**50**	**50**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

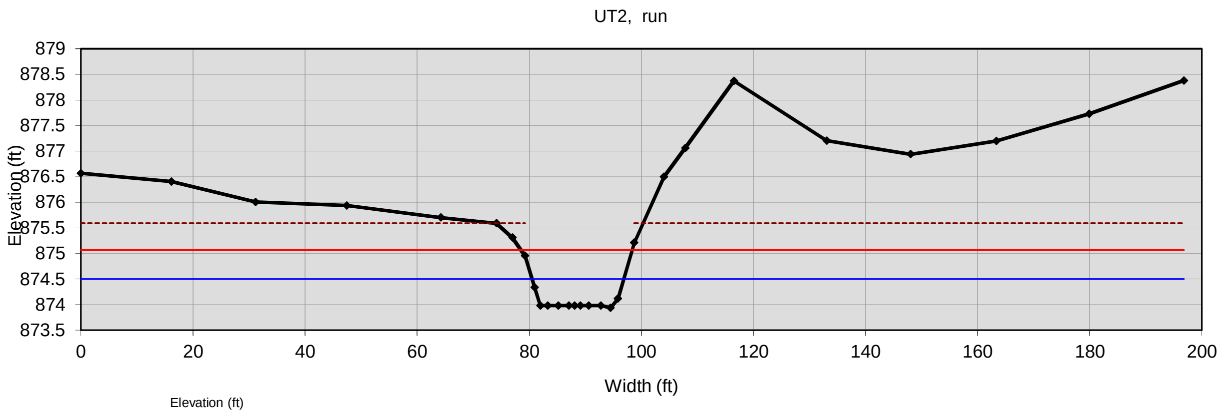
Largest Particle (mm): ____________

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	Silt/Clay	D_{16} =	Silt/Clay	D_{16} =	#N/A
D_{35} =	Silt/Clay	D_{35} =	Silt/Clay	D_{35} =	#N/A
D_{50} =	0.66	D_{50} =	Silt/Clay	D_{50} =	0.14
D_{84} =	20.14	D_{84} =	0.79	D_{84} =	8.90
D_{95} =	75.89	D_{95} =	13.27	D_{95} =	45.00
D_{100} =	180	D_{99} =	22.6	D_{99} =	180



Q:\ActiveProjects\005-02143 Henry Fork\Cadd\Void\02143-Design_for_mitplan_profile_printing.dwg

Cross Section 5



Bankfull Dimensions

7.8	x-section area (ft.sq.)
16.3	width (ft)
0.5	mean depth (ft)
0.6	max depth (ft)
16.5	wetted parimeter (ft)
0.5	hyd radi (ft)
34.4	width-depth ratio

Flood Dimensions

19.8	W flood prone area (ft)
1.2	entrenchment ratio
1.7	low bank height (ft)
2.9	low bank height ratio

Materials

	D50 (mm)
	D84 (mm)
4	threshold grain size (mm):

Bankfull Flow

1.3	velocity (ft/s)
10.2	discharge rate (cfs)
0.34	Froude number

Flow Resistance

0.035	Manning's roughness
0.18	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

0.26	channel slope (%)
0.08	shear stress (lb/sq.ft.)
0.20	shear velocity (ft/s)
0.1	unit strm power (lb/ft/s)

Bankfull Checks

0.521	depth WSF to BKF

Cross Section

reference ID	5	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	874.5	---

Low Bank Height

elevation	875.5904

Flood Prone Area

width fpa		19.8

Channel Slope

percent slope	0.26	---

Flow Resistance

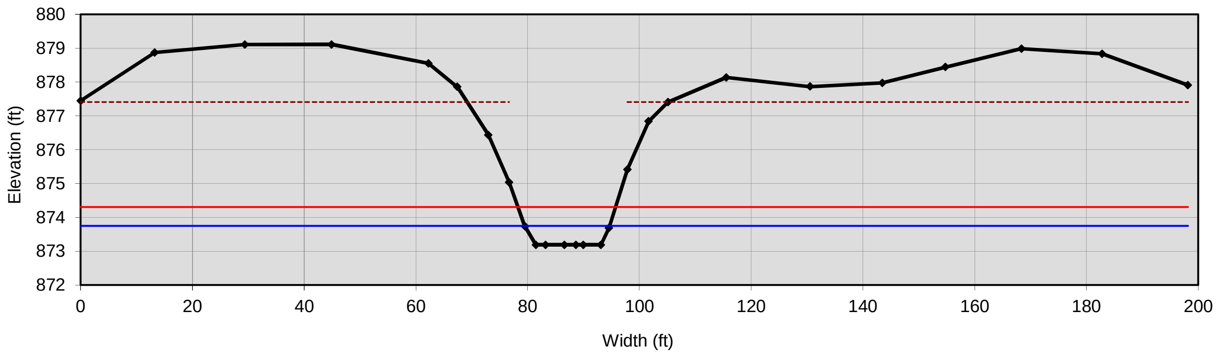
Manning's "n"	0.035	---
D'Arcy - Weisbach "f"		---

Note:

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
873.979	1297438.495	719152.58	0.00	876.569	☐	XS5
873.979	1297440.147	719136.5135	16.15	876.4056	☐	XS5
873.979	1297441.519	719121.5343	31.19	876.0076	☐	XS5
873.979	1297443.14	719105.3468	47.46	875.9379	☐	XS5
873.979	1297444.747	719088.676	64.21	875.7029	☑	XS5
873.979	1297445.374	719078.729	74.17	875.5904	☐	XS5 LTB
873.979	1297446.072	719075.9593	76.99	875.3095	☐	XS5
873.979	1297446.049	719073.7171	79.22	874.955	☐	XS5
873.979	1297446.345	719072.0078	80.95	874.3406	☐	XS5
873.979	1297446.22	719070.9706	81.97	873.9792	☐	XS5 WSF
873.979	1297446.457	719069.6627	83.30	873.9792	☐	XS5
873.979	1297446.794	719067.8294	85.16	873.9792	☐	XS5 LCH
873.979	1297446.991	719065.9222	87.07	873.9792	☐	XS5
873.979	1297447.514	719064.9368	88.11	873.9792	☐	XS5
873.979	1297447.7	719063.9084	89.15	873.9792	☐	XS5 TWG
873.979	1297447.786	719062.4504	90.61	873.9792	☐	XS5
873.979	1297447.896	719060.2923	92.77	873.9792	☐	XS5 RCH
873.979	1297448.236	719058.5692	94.51	873.9362	☐	XS5
873.979	1297448.416	719057.287	95.81	874.1186	☐	XS5
873.979	1297448.68	719054.3752	98.73	875.2093	☐	XS5
873.979	1297449.131	719049.0983	104.03	876.4998	☐	XS5
873.979	1297449.615	719045.3213	107.83	877.0636	☐	XS5
873.979	1297450.317	719036.6774	116.50	878.3736	☐	XS5 RTB
873.979	1297451.878	719020.175	133.08	877.2079	☐	XS5
873.979	1297453.373	719005.2798	148.05	876.9396	☐	XS5
873.979	1297454.497	718990.0023	163.36	877.1966	☐	XS5
873.979	1297456.189	718973.5529	179.90	877.7319	☐	XS5
873.979	1297458.129	718956.7836	196.78	878.3779	☐	XS5
					☐	
					☐	

Cross Section 6

UT2, run



Bankfull Dimensions

7.5	x-section area (ft.sq.)
15.2	width (ft)
0.5	mean depth (ft)
0.6	max depth (ft)
15.4	wetted parimeter (ft)
0.5	hyd radi (ft)
30.7	width-depth ratio

Flood Dimensions

17.5	W flood prone area (ft)
1.2	entrenchment ratio
4.2	low bank height (ft)
7.5	low bank height ratio

Materials

	D50 (mm)
	D84 (mm)
4	threshold grain size (mm):

Bankfull Flow

1.3	velocity (ft/s)
10.1	discharge rate (cfs)
0.34	Froude number

Flow Resistance

0.035	Manning's roughness
0.18	D'Arcy-Weisbach fric.
---	resistance factor u/u*
---	relative roughness

Forces & Power

0.26	channel slope (%)
0.08	shear stress (lb/sq.ft.)
0.20	shear velocity (ft/s)
0.11	unit strm power (lb/ft/s)

Bankfull Checks

0.559	depth WSF to BKF

Cross Section

reference ID	6	
longitudinal station		---
alignment	straight line	
feature		

Bankfull Stage

elevation	873.75	---

Low Bank Height

elevation	877.4093

Flood Prone Area

width fpa		17.5

Channel Slope

percent slope	0.26	---

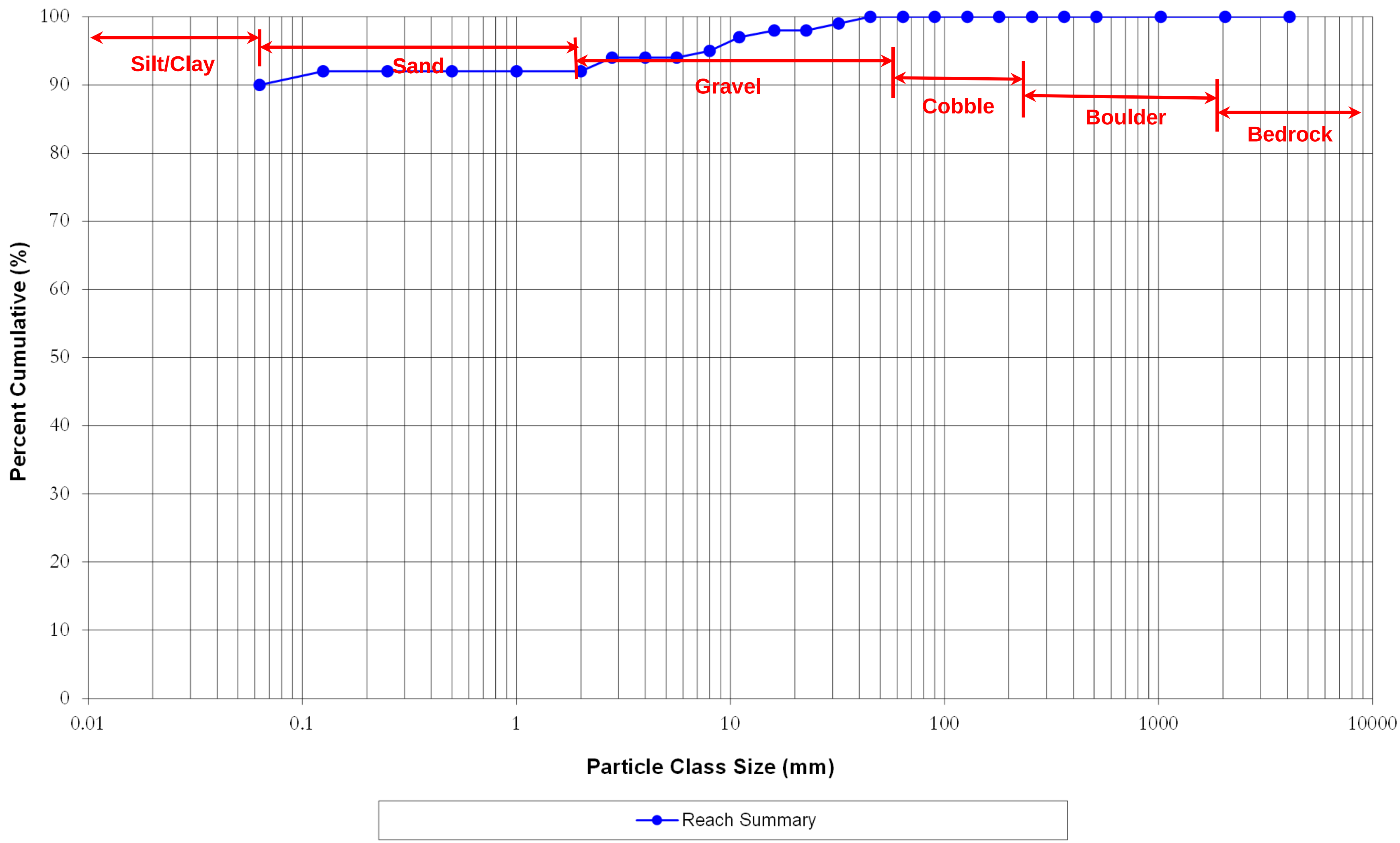
Flow Resistance

Manning's "n"	0.035	---
D'Arcy - Weisbach "f"		---

Note:

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
873.191	719171.9314	1297934.575	0.00	877.448	☐	XS6
873.191	719173.398	1297947.756	13.26	878.8756	☐	XS6
873.191	719175.9228	1297963.68	29.37	879.1064	☐	XS6
873.191	719177.7043	1297979.125	44.92	879.1129	☐	XS6
873.191	719179.9077	1297996.315	62.25	878.5543	☐	XS6
873.191	719180.7666	1298001.403	67.40	877.8575	☐	XS6 LTB
873.191	719181.4072	1298006.927	72.96	876.4402	☐	XS6
873.191	719181.5266	1298010.646	76.67	875.0346	☐	XS6
873.191	719181.8767	1298013.461	79.51	873.7377	☐	XS6
873.191	719182.016	1298015.4	81.45	873.1913	☐	XS6 WSF
873.191	719182.1447	1298017.145	83.20	873.1913	☐	XS6 LCH
873.191	719182.8285	1298020.444	86.55	873.1913	☐	XS6
873.191	719182.9399	1298022.503	88.61	873.1913	☐	XS6 TWG
873.191	719183.2561	1298023.813	89.95	873.1913	☐	XS6
873.191	719184.4249	1298026.848	93.10	873.1913	☐	XS6 RCH
873.191	719183.8971	1298028.365	94.54	873.6924	☐	XS6
873.191	719184.1702	1298031.647	97.84	875.4152	☐	XS6
873.191	719185.0075	1298035.38	101.64	876.8378	☐	XS6
873.191	719185.3396	1298038.829	105.10	877.4093	☐	XS6 RTB
873.191	719186.6595	1298049.197	115.56	878.1405	☐	XS6
873.191	719188.5704	1298064.039	130.52	877.8668	☐	XS6
873.191	719190.5091	1298076.861	143.48	877.9773	☐	XS6
873.191	719191.1157	1298088.136	154.75	878.443	☐	XS6
873.191	719193.1366	1298101.585	168.34	878.9855	☐	XS6
873.191	719194.7958	1298115.953	182.80	878.8362	☐	XS6
873.191	719194.8235	1298131.403	198.15	877.9091	☐	XS6
					☐	
					☐	
					☐	
					☐	

Henry Fork UT2
Reach-Wide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

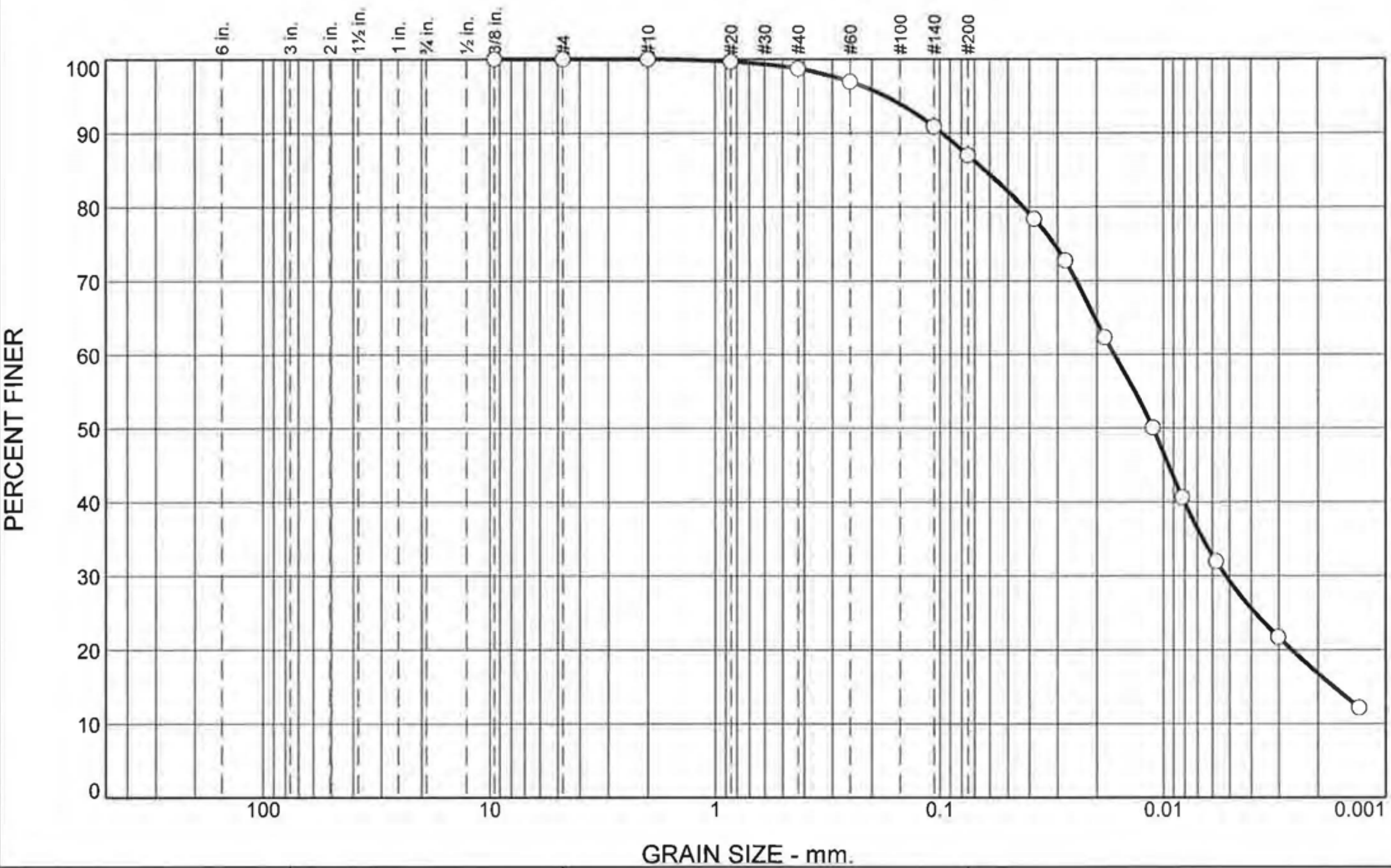
Project Name:	Henry Fork Mitigation Site	**Data Collected By:**	KB, IE
Location:	Catawba County, NC	**Data Collected On:**	4/17/2014
Job #:	005-02143	**Reach:**	UT2
Date:	4/17/2014	**Cross Section #:**	Reachwide

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		90	90		#DIV/0!	90	90	90	90
SAND	Very fine	0.062	0.125		2	2		#DIV/0!	2	92	2	92
	Fine	0.125	0.250					#DIV/0!		92		92
	Medium	0.250	0.500					#DIV/0!		92		92
	Coarse	0.5	1.0					#DIV/0!		92		92
	Very Coarse	1.0	2.0					#DIV/0!		92		92
GRAVEL	Very Fine	2.0	2.8		2	2		#DIV/0!	2	94	2	94
	Very Fine	2.8	4.0					#DIV/0!		94		94
	Fine	4.0	5.7					#DIV/0!		94		94
	Fine	5.7	8.0		1	1		#DIV/0!	1	95	1	95
	Medium	8.0	11.3		2	2		#DIV/0!	2	97	2	97
	Medium	11.3	16.0		1	1		#DIV/0!	1	98	1	98
	Coarse	16.0	22.6					#DIV/0!		98		98
	Coarse	22.6	32		1	1		#DIV/0!	1	99	1	99
	Very Coarse	32	45		1	1		#DIV/0!	1	100	1	100
	Very Coarse	45	64					#DIV/0!		100		100
COBBLE	Small	64	90					#DIV/0!		100		100
	Small	90	128					#DIV/0!		100		100
	Large	128	180					#DIV/0!		100		100
	Large	180	256					#DIV/0!		100		100
BOULDER	Small	256	362					#DIV/0!		100		100
	Small	362	512					#DIV/0!		100		100
	Medium	512	1024					#DIV/0!		100		100
	Large/Very Large	1024	2048					#DIV/0!		100		100
BEDROCK	Bedrock	2048	>2048					#DIV/0!		100		100
			Total	**0**	**100**	**100**	**0**	**#DIV/0!**	**100**	**100**	**100**	**100**

Largest Particle (mm): ______________

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	#N/A	D_{16} =	Silt/Clay	D_{16} =	Silt/Clay
D_{35} =	#N/A	D_{35} =	Silt/Clay	D_{35} =	Silt/Clay
D_{50} =	#N/A	D_{50} =	Silt/Clay	D_{50} =	Silt/Clay
D_{84} =	#N/A	D_{84} =	Silt/Clay	D_{84} =	Silt/Clay
D_{95} =	#N/A	D_{95} =	8.00	D_{95} =	8.00
D_{100} =	#N/A	D_{99} =	45	D_{99} =	45

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.3	11.7	57.8	29.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	100.0		
#10	100.0		
#20	99.7		
#40	98.7		
#60	96.9		
#140	90.9		
#200	87.0		

* (no specification provided)

Material Description

Grey Sandy Clayey Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0977 D_{85}= 0.0632 D_{60}= 0.0167
D_{50}= 0.0112 D_{30}= 0.0052 D_{15}= 0.0017
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Location: UT 2 Grab Sample XS-6 KB/IE

Date: 06-27-14

Summit Engineering

Ft. Mill, South Carolina

Client: Wildlands Engineering, Inc.
Project: Henry Fork

Project No: SL-262-11 **Figure**

Tested By: Mimi Hourani

GRAIN SIZE DISTRIBUTION TEST DATA

6/27/2014

Client: Wildlands Engineering, Inc.
Project: Henry Fork
Project Number: SL-262-11
Location: UT 2 Grab Sample XS-6 KB/IE
Material Description: Grey Sandy Clayey Silt
Date: 06-27-14
Tested by: Mimi Hourani

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
338.06	0.00	0.00	0.375	0.00	100.0
			#4	0.00	100.0
			#10	0.00	100.0
52.38	0.00	0.00	#20	0.18	99.7
			#40	0.69	98.7
			#60	1.60	96.9
			#140	4.79	90.9
			#200	6.81	87.0

Hydrometer Test Data

Hydrometer test uses material passing#10
Percent passing #10 based upon complete sample =100.0
Weight of hydrometer sample =52.38
Table of composite correction values:

Temp., deg. C:	27.6	25.9	21.8	20.5
Comp. corr.:	-4.0	-4.5	-5.5	-6.0

Meniscus correction only =1.0
Specific gravity of solids =2.70
Hydrometer type =152H
Hydrometer effective depth equation: L =16.294964 - 0.164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer
1.00	21.9	47.0	41.5	0.0131	48.0	8.4	0.0381	78.4
2.00	21.9	44.0	38.5	0.0131	45.0	8.9	0.0277	72.7
5.00	21.9	38.5	33.0	0.0131	39.5	9.8	0.0184	62.3
15.00	21.9	32.0	26.5	0.0131	33.0	10.9	0.0112	50.1
30.00	21.8	27.0	21.5	0.0131	28.0	11.7	0.0082	40.6
65.00	21.6	22.5	16.9	0.0132	23.5	12.4	0.0058	31.9
253.00	21.8	17.0	11.5	0.0131	18.0	13.3	0.0030	21.7
1440.00	21.6	12.0	6.4	0.0132	13.0	14.2	0.0013	12.1

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.0	0.0	0.0	1.3	11.7	13.0	57.8	29.2	87.0

D_{10}	D_{15}	D_{20}	D_{30}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0017	0.0026	0.0052	0.0112	0.0167	0.0426	0.0632	0.0977	0.1749

Fineness Modulus
0.09

Geomorphic Data UT1 Reference Reach Immediately Upstream of Project

Reference Reach Photographs

UT1 Immediately Upstream of Project

UT1 Immediately Upstream of Project

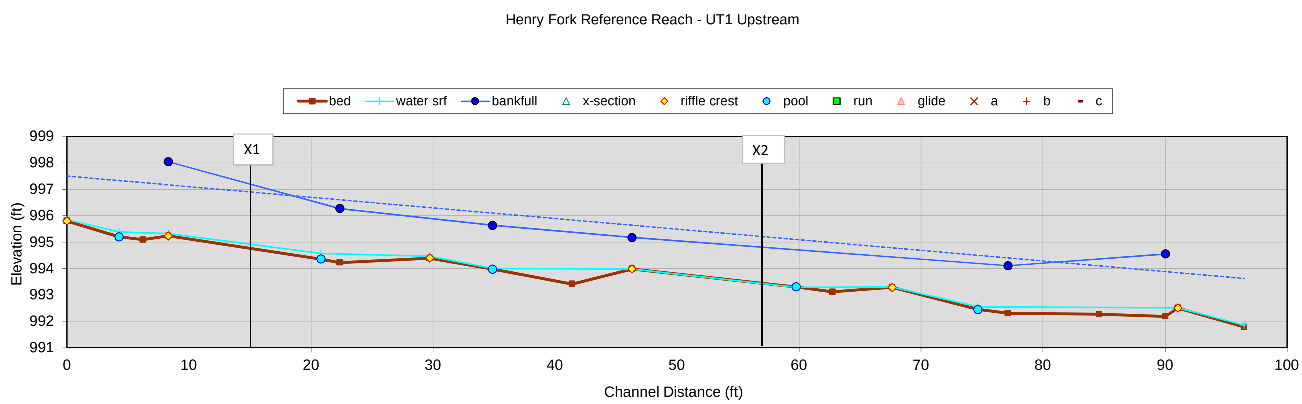
UT1 Immediately Upstream of Project

UT1 Immediately Upstream of Project

UT1 Immediately Upstream of Project

Another Nearby Catchment with similar features

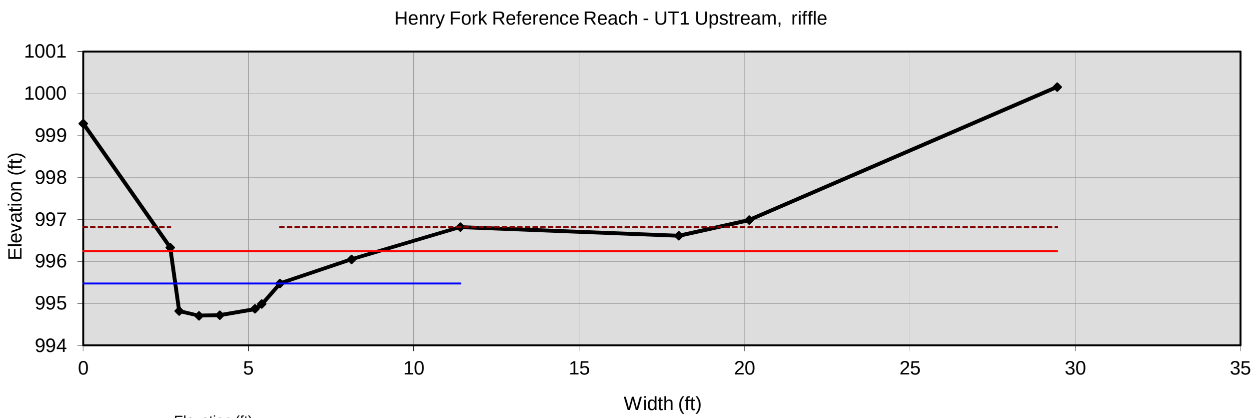
Longitudinal Slope Profile



	slope (%)		slope ratio		length (ft)		length ratio		pool-pool spacing (ft)		p-p ratio	
reach	4.1		---		96.5	(17.8 channel widths)	---		---		---	
riffle	8.3	(5.1 - 11)	2	(1.2 - 2.7	8.5	(4.3 - 13.4)	1.6	(0.8 - 2.5)	---		---	
pool	0.62	(0 - 1.6)	0.2	(0 - 0.4)	9.7	(4 - 16.4)	1.8	(0.7 - 3)	17.6	(14.1 - 24.	3.3	(2.6 - 4.6)
	---		---		---		---		---		---	
	---		---		---		---		---		---	

notes	cross section ID	bed feature	BkF channel centerline easting (ft)	northing (ft)	station	ELEV centerline	ELEV thalwag	water	ELEV bankfull	user defined ELEV a	ELEV b	ELEV c
TWG-HOR B ROCK		R	4988.568777	5009.278681	0.0		995.79416	995.85091				
TWG-TOR B ROCK		P	4986.178084	5012.806207	4.3		995.19788	995.387				
TWG			4985.314272	5014.596857	6.2		995.08785					
TWG-HOR		R	4983.685079	5015.841116	8.3		995.23614	995.32269	998.04375			
TWG-TOR		P	4977.495483	5026.713405	20.8		994.35819	994.5672				
TWG			4976.744874	5028.062385	22.4		994.21989		996.26849			
TWG-HOR B ROCK		R	4977.828136	5035.364401	29.7		994.39203	994.46767				
TWG-TOR B ROCK		P	4980.653176	5039.659059	34.9		993.97592	994.00573	995.63603			
TWG-MAX POOL			4978.132085	5045.682775	41.4		993.40861					
TWG-HOR		R	4979.522032	5050.395405	46.3		993.98144	993.97198	995.17447			
TWG-TOR		P	4980.186653	5063.826887	59.8		993.30042	993.28955				
TWG			4979.354614	5066.684165	62.7		993.1115					
TWG-HOR		R	4975.293492	5069.391388	67.6		993.28428	993.29787				
TWG-TOR		P	4975.864914	5076.408482	74.7		992.44625	992.55189				
TWG			4977.661732	5078.088514	77.1		992.29902		994.1019			
TWG			4980.346223	5085.060246	84.6		992.26355					
TWG			4983.125257	5089.736223	90.0		992.18826		994.55031			
TWG-HOR B ROCK		R	4983.168654	5090.749974	91.0		992.50474	992.51567				
TWG-TOR B ROCK			4981.959712	5096.057405	96.5		991.77471	991.85014				

Reference Cross Section 1



Elevation (ft)

Bankfull Dimensions	
1.9	x-section area (ft.sq.)
3.2	width (ft)
0.60	mean depth (ft)
0.8	max depth (ft)
4.0	wetted parimeter (ft)
0.5	hyd radi (ft)
5.2	width-depth ratio

Flood Dimensions	
6.3	W flood prone area (ft)
2.0	entrenchment ratio
2.1	low bank height (ft)
2.7	low bank height ratio

Materials	
34	D50 Riffle (mm)
64	D84 Riffle (mm)
104	threshold grain size (mm):

Bankfull Flow	
5.4	velocity (ft/s)
10.4	discharge rate (cfs)
1.37	Froude number

Flow Resistance	
0.045	Manning's roughness
0.28	D'Arcy-Weisbach fric.
5.3	resistance factor u/u*
2.9	relative roughness

Forces & Power	
7	channel slope (%)
2.12	shear stress (lb/sq.ft.)
1.05	shear velocity (ft/s)
14.3	unit strm power (lb/ft/s)

WSF
994.8692

Cross Section
reference ID: 1
longitudinal station: ---
alignment: straight line
feature

Bankfull Stage
elevation: 995.4762 ---

Low Bank Height
elevation: 996.8186

Flood Prone Area
width fpa: 6.3

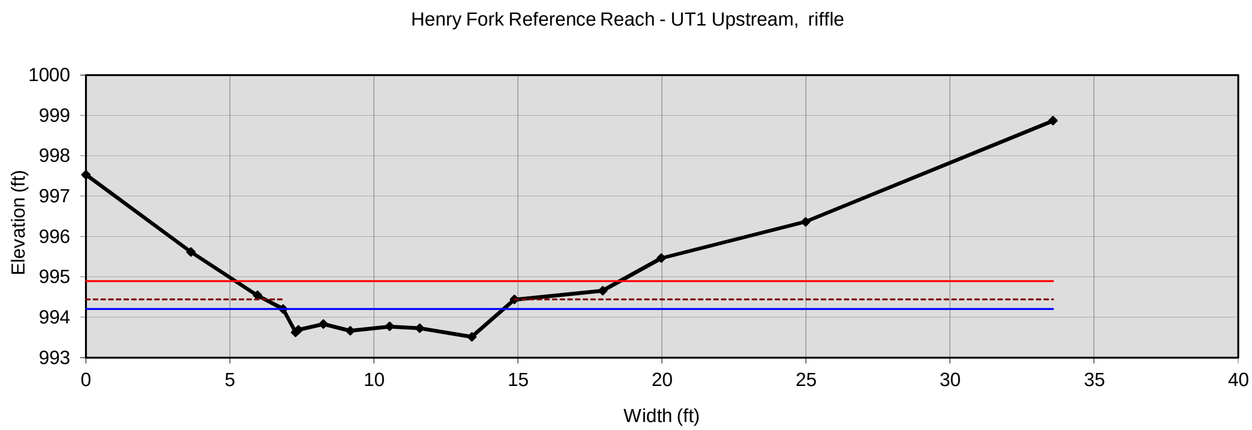
Channel Slope
percent slope: 7 4.1

Flow Resistance
Manning's "n": 0.044
D'Arcy - Weisbach "f": 0.28

Note:

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
994.869	4974.309058	5019.039418	0.00	999.2867	☐	XS1
994.869	4976.6144	5020.310288	2.63	996.3313	☐	XS1
994.869	4976.950008	5020.26239	2.90	994.8208	☐	XS1-LCH
994.869	4977.484285	5020.528067	3.50	994.7085	☐	XS1-TWG
994.869	4977.975271	5020.939483	4.13	994.7211	☐	XS1
994.869	4978.958939	5021.367979	5.20	994.8692	☐	XS1-WSF
994.869	4979.1082	5021.511243	5.40	994.9836	☐	XS1-RCH
994.869	4979.619633	5021.738341	5.95	995.4762	☐	XS1
994.869	4981.515156	5022.771749	8.11	996.0488	☐	XS1
994.869	4984.388374	5024.384644	11.41	996.8186	☐	XS1-RTB
994.869	4990.14595	5027.630144	18.02	996.6118	☑	XS1
994.869	4992.017135	5028.642335	20.14	996.9895	☑	XS1
994.869	5000.373834	5032.755068	29.45	1000.158	☑	XS1

Reference Cross Section 2



Bankfull Dimensions

3.6	x-section area (ft.sq.)
7.7	width (ft)
0.47	mean depth (ft)
0.7	max depth (ft)
8.2	wetted parimeter (ft)
0.4	hyd radi (ft)
16.4	width-depth ratio

Flood Dimensions

13.3	W flood prone area (ft)
1.7	entrenchment ratio
0.9	low bank height (ft)
1.3	low bank height ratio

Materials

34	D50 Riffle (mm)
64	D84 Riffle (mm)
67	threshold grain size (mm):

Bankfull Flow

3.8	velocity (ft/s)
13.6	discharge rate (cfs)
1.02	Froude number

Flow Resistance

0.050	Manning's roughness
0.31	D'Arcy-Weisbach fric.
5.1	resistance factor u/u*
2.2	relative roughness

Forces & Power

5	channel slope (%)
1.35	shear stress (lb/sq.ft.)
0.84	shear velocity (ft/s)
5.5	unit strm power (lb/ft/s)

Water Surf
993.6252

Cross Section

reference ID: 2
longitudinal station: ---
alignment: straight line
feature

Bankfull Stage

elevation: 994.2084 ---

Low Bank Height

elevation: 994.4433

Flood Prone Area

width fpa: 13.3

Channel Slope

percent slope: 5 4.1

Flow Resistance

Manning's "n": 0.045
D'Arcy - Weisbach "f": 0.31

Note:

Water Surface (ft)	easting (ft)	northing (ft)	Distance (ft)	Elevation (ft)	Omit Bkf	Notes
993.625	4968.326172	5056.465829	0.00	997.5329	☐	XS2
993.625	4971.847429	5057.395394	3.64	995.6209	☐	XS2
993.625	4974.067288	5058.082813	5.95	994.546	☐	XS2-LTB
993.625	4974.952681	5058.198829	6.84	994.2084	☐	XS2
993.625	4975.387185	5058.260389	7.28	993.6252	☐	XS2-WSF
993.625	4975.496756	5058.204794	7.38	993.6946	☐	XS2-LCH
993.625	4976.342804	5058.416584	8.25	993.8368	☐	XS2
993.625	4977.244104	5058.626891	9.17	993.6662	☐	XS2-TWG
993.625	4978.593214	5058.866159	10.54	993.7759	☐	XS2
993.625	4979.589186	5059.193392	11.59	993.7341	☐	XS2
993.625	4981.350993	5059.623501	13.40	993.5186	☐	XS2-RCH
993.625	4982.800981	5059.895711	14.87	994.4433	☐	XS2-RTB
993.625	4985.749656	5060.765926	17.94	994.661	☐	XS2
993.625	4987.783946	5061.002998	19.98	995.4672	☐	XS2
993.625	4992.750154	5061.704673	24.98	996.3682	☐	XS2
993.625	5001.147991	5063.543837	33.58	998.8718	☐	XS2

1) Individual Pebble Count

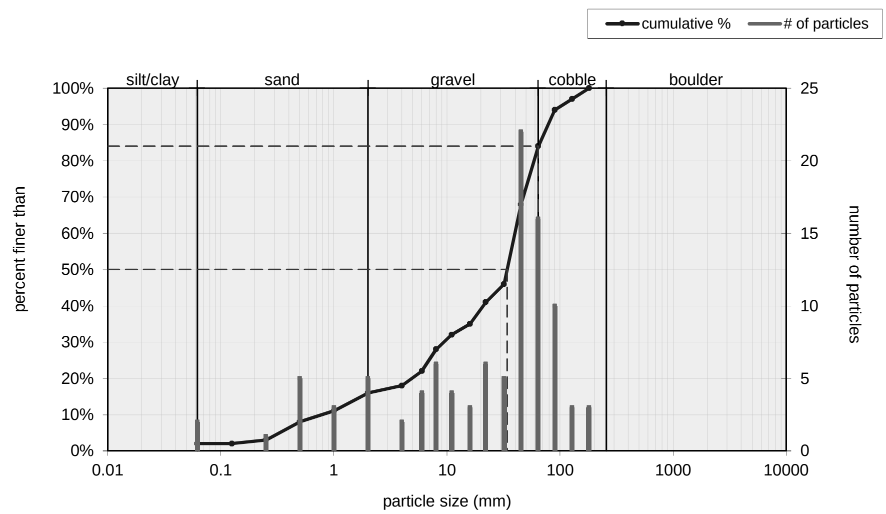
Two individual samples may be entered below. Select sample type for each.

Riffle Surface

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	**2**
very fine sand	0.062 - 0.125	
fine sand	0.125 - 0.25	**1**
medium sand	0.25 - 0.5	**5**
coarse sand	0.5 - 1	**3**
very coarse sand	1 - 2	**5**
very fine gravel	2 - 4	**2**
fine gravel	4 - 6	**4**
fine gravel	6 - 8	**6**
medium gravel	8 - 11	**4**
medium gravel	11 - 16	**3**
coarse gravel	16 - 22	**6**
coarse gravel	22 - 32	**5**
very coarse gravel	32 - 45	**22**
very coarse gravel	45 - 64	**16**
small cobble	64 - 90	**10**
medium cobble	90 - 128	**3**
large cobble	128 - 180	**3**
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	-------------	
clay hardpan	-------------	
detritus/wood	-------------	
artificial	-------------	
	total count:	100

Note: XS2

Riffle Surface Pebble Count, Henry Fork Reference Reach - UT1 Upstream



Size (mm)	
D16	2
D35	16
D50	34
D65	43
D84	64
D95	100

Size Distribution	
mean	11.3
dispersion	9.4
skewness	-0.39

Type	
silt/clay	2%
sand	14%
gravel	68%
cobble	16%
boulder	0%

Appendix 6: HEC-20 Channel Stability Assessment Data
DrainMod Wetland Model Data
Hydric Soil Evaluation September 9, 2013 (Proposal Phase)
Hydric Soil Investigation May 13, 2014 (Design Phase)

Stream: UT1
Reach: Reach 1
Date: 10-13-14
Weather: Overcast, 65°, recent rainfall
Location: Above clubhouse

Observers: IE/KH
Project: Henry Fork
Drainage Area:
Stream Type

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	9
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	2
3. Channel pattern	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	8
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	7
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	9
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	2
7. Obstructions, including bedrock outcrops, armor layer, LED jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	5

Trees; roots causing minor cross currents

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	4
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	8
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	7
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	7
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	6
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 74

Stream: UT1
Reach: Reach 2
Date: 10-13-14
Weather: Overcast, 65°, recent rainfall
Location: Lower floodplain

Observers: IE/KH
Project: Henry Fork
Drainage Area:
Stream Type

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	9
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	1
3. Channel pattern	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	9
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	5
5. Bed material F_s = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. $F_s < 20\%$	Moderately packed with some overlapping. Very small amounts of material < 4 mm. $20 < F_s < 50\%$	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. $50 < F_s < 70\%$	Very loose assortment with no packing. Large amounts of material < 4 mm. $F_s > 70\%$	10
6. Bar development	For $S < 0.02$ and $w/y > 12$, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For $S > 0.02$ and w/y are < 12, no bars are evident	For $S < 0.02$ and $w/y > 12$, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For $S > 0.02$ and w/y <12, no bars are evident	For $S < 0.02$ and $w/y > 12$, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for $S > 0.02$ and $w/y < 12$	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for $S < 0.02$ and $w/y > 12$	2
7. Obstructions, including bedrock outcrops, armor layer, LED jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	3

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	3
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	5
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	10
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	3
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	3
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 63

51

Stream: UT 1A - Henry Fork
Reach:
Date: 10-13-14
Weather: Overcast - 60° - Recent overnight rain
Location:

Observers: IE/KH
Project: Henry Fork
Drainage Area:
Stream Type

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score	
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	7	
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	2	not perennial but not flashy
3. Channel pattern	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	7	
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	4	
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	10	All muck no sand
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	1	no bars observed
7. Obstructions, including bedrock outcrops, armor layer, LED jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	2	Dense herbaceous but no debris. 2 culvert not causing instability
					33	

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	3
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	3
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	10
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	1
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	1
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

2 trees along reach. Rest is fallow herbaceous

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 18

Stream: UT1B
Reach:
Date: 10/13/14
Weather: 65° Overcast, recent rain
Location:

Observers: IE/KH
Project: Henry Fork
Drainage Area:
Stream Type

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	8
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	1
3. Channel pattern	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	9
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	4
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	5
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	1
7. Obstructions, including bedrock outcrops, armor layer, LED jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	3

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	5
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	5
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	10
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	4
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	2
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 57

61

Stream: UT2
Reach: –
Date: 10/13/14
Weather: Overcast, 65°, recent rain
Location:

Observers: IE/KH
Project: Henry Fork
Drainage Area:
Stream Type

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score	
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	7	
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	2	Intermittent not flashy
3. Channel pattern	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	9	
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	7	
5. Bed material Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	10	All muck
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	1	
7. Obstructions, including bedrock outcrops, armor layer, LED jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	3	Few culverts & lots of herbaceous veg
					39	Minor cross-currents

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	4
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	5
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	10
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	2
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	1
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score 61

DrainMod Wetland Model Data

Groundwater Modeling Setup (Subsequent information for Section 5.3.1)

The first step in developing the model was to prepare input files from various data sources. A baseline soil input file was developed using published soil survey data collected for the mapped soils found on-site (NRCS, 2011). The soil files were refined by adjusting certain parameters for each of the mapped soils using in-situ soil profiles and characterizations. Temperature and precipitation data from nearby weather stations, described in Section 5.3.1.1 were used to produce weather input files for each model. After the necessary input files for the existing models were created, the project settings were adjusted for this application and then calibration runs for each model were conducted. Lateral seepage was incorporated as part of the drainage design parameters for the proposed model of gage 2 and the existing and proposed models of gages 4, 5, and 6 because of the close proximity of the gages to the adjacent channel. Surface runoff was incorporated for the proposed and existing models of gages 1 and 2 to represent increased drainage from changes in topography. To calibrate the models, soil parameters not measured in the field were adjusted within the limits typically encountered under similar soil and geomorphic conditions. In addition, the effective drain spacing in the model drainage design parameters for groundwater gages 1, 4, 5, and 6 were adjusted. Adjusting the effective drain spacing is a recommended calibration method for modeling gages with irregular drainage spacing (Northcott, 2001; Skaggs, 2012). Irregular drain spacing applies when a gage is adjacent to only one ditch or channel or the gage is not in the center between two adjacent channels. A factor of the drain spacing was used to calibrate existing models to ensure consistency when evaluating the long term proposed models and ensure a conservative estimate of wetland hydrology. After calibration of each of the models was complete, the calibrated models were used as the basis for the proposed conditions models. Plots showing the calibration results are shown below.

Surface Water Modeling and Lateral Seepage at Restoration Site

Surface water runoff contributions are minimal for groundwater gages 4, 5, and 6 therefore the wetland models were simulated as precipitation and lateral seepage only contributions. Groundwater gages 1 and 2 currently receive a minimal amount of overland flow but will receive substantially more as a result of proposed grading changes. To account for the additional water input into the system, the surface water contributing area runoff utility in DrainMod was utilized. Existing contributing areas for groundwater gages 1 and 2 were determined as 389 ft^2 and 671 ft^2, respectively. As a result of proposed grading, contributing areas for groundwater gages 1 and 2 increase to 1,470 ft^2 and 5,381 ft^2, respectively.

Generally the site will benefit from overbank flooding as a result of the raised adjacent stream beds, modified stream dimensions, and increased stream sinuosity. Restoring the natural flooding regime of the site through channel restoration will increase periods of inundation particularly in Wetland 2 which is currently effectively drained by the adjacent oversized and straightened channel. To represent the hydrologic changes at gages within this area, the lateral seepage utility was implemented within DrainMod. The lateral seepage utility allows the user to define a distance to an adjacent ditch or channel and specify the head within the channel to determine groundwater drawdown and channel overflows. When model parameters were edited to represent the proposed design within Wetland 2, the resulting groundwater elevations increased and periods of inundation lengthened. Overall, implementation of the surface water and lateral seepage utilities in DrainMod allowed for better representation of the proposed hydrologic changes.

Hydrologic Budget for the Restoration Site

DrainMod computes daily water balance information and outputs summaries that describe the loss pathways for rainfall over the model simulation period. Tables 9a – 9e summarize the average annual amount of rainfall, seepage, infiltration, drainage, runoff, and evapotranspiration estimated for the five modeled locations onsite. Infiltration represents the amount of water that percolates into the soil. Surface water or runon represents overland flow that contributes to the gage before infiltrating or draining. Lateral seepage represents the amount of water either removed or contributed based on the distance and head of an adjacent channel. Drainage is the loss of infiltrated water that travels through the soil profile and is discharged to the drainage ditches or to underlying aquifers. Runoff is water that flows overland and reaches the drainage ditches before infiltration. Evapotranspiration is water that is lost by the direct evaporation of water from the soil or through the transpiration of plants.

The proposed water budgets for gages 1 and 2 characterize the hydrologic changes that will occur to Wetland 1 as a result of the proposed design (Figure 9). Runon increases in both scenarios because of proposed wetland grading. Lateral seepage was incorporated to the proposed models to represent the modifications to channel dimension and re-alignment. The combination of restoring UT1 to its natural channel dimension, pattern, and profile along with increased runon due to grading changes result in an overall hydrologic uplift of Wetland 1. The overall hydrologic uplift is affirmed by the increase in the number of years meeting the performance standard from existing to proposed conditions shown in Table 9 in Section 5.3.1.4.

The proposed water budgets for gages 4, 5, and 6 characterize the hydrologic changes that will occur to the Wetland 2 area as a result of the proposed design (Figure 9). The water budgets in the associated tables show that the drainage in all three gages decreases by an average of approximately 14%. Additionally, runoff for gages 4, 5, and 6 decreases by an average of 6%. Decreased drainage and runoff is a direct result of the reduction of channel dimension. Currently, UT2 is incised, over widened, and straightened to drain the associated floodplain. By restoring a more natural channel dimension, the drainage effects of the adjacent channel are reduced and groundwater table in wetland 2.

In all of the modeled gages, infiltration and evapotranspiration increase due to increased surface storage. Surface storage within the wetland areas will increase because of the proposed disking and roughening of the wetland surface. The roughened surface results in small storage areas which create longer retention times within the wetland area. The longer retention times increase the amount of free water on site which leads to greater values of potential evapotranspiration and infiltration into groundwater.

Table 6-1: Summary Water Balance for Gage 1 - *Henry Fork Mitigation Site*

Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Precipitation	120.9	92%	120.9	87%
Runon	10.3	8%	17.9	13%
Lateral Seepage	0.0	0%	0.0	0%
Drainage	11.1	8%	14.4	10%
Drainage + Lat Seepage	11.1	8%	14.4	10%

Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Evapotranspiration	101.5	77%	102.6	74%
Infiltration	112.6	86%	117.0	84%
Runoff	18.6	14%	21.7	16%

Table 6-2: Summary Water Balance for Gage 2 - *Henry Fork Mitigation Site*

Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Precipitation	120.9	76%	120.9	63%
Runon	38.0	24%	72.1	37%
Lateral Seepage	0.0	0%	-67.3	35%
Drainage	19.8	13%	92.6	48%
Drainage + Lat Seepage	19.8	13%	25.2	13%
Evapotranspiration	83.3	52%	91.8	48%
Infiltration	103.1	65%	117.0	61%
Runoff	55.7	35%	76.0	39%

Table 6-3: Summary Water Balance for Gage 4 - *Henry Fork Mitigation Site*

Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip)
Precipitation	120.9	100%	120.9	100%
Runon	0.0	0%	0.0	0%
Lateral Seepage	-19.3	16%	-6.7	6%
Drainage	42.0	35%	30.1	25%
Drainage + Lat Seepage	22.8	19%	23.4	19%
Evapotranspiration	85.6	71%	91.2	75%
Infiltration	108.3	90%	114.6	95%
Runoff	12.6	10%	6.2	5%

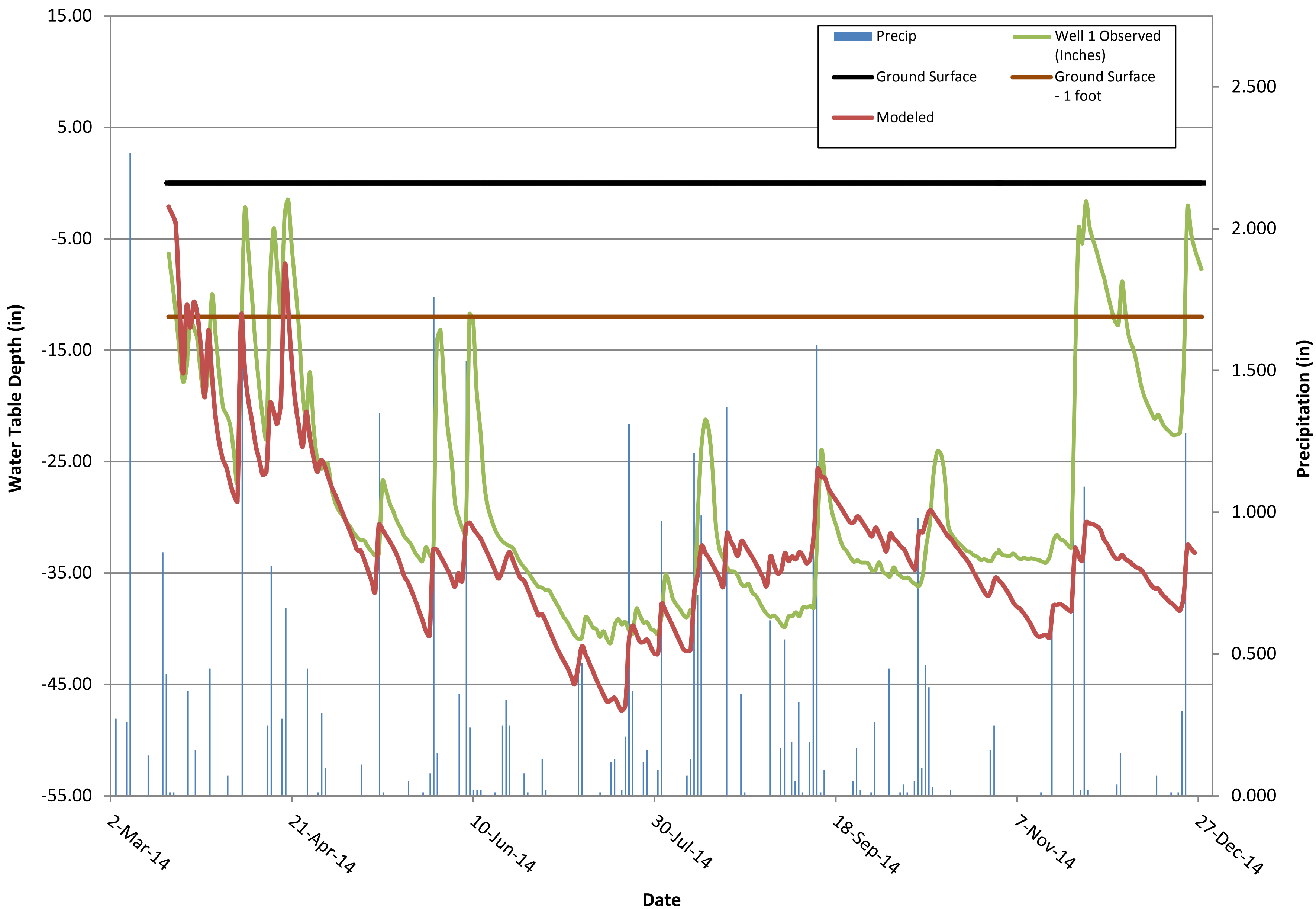
Table 6-4: Summary Water Balance for Gage 5 - *Henry Fork Mitigation Site*

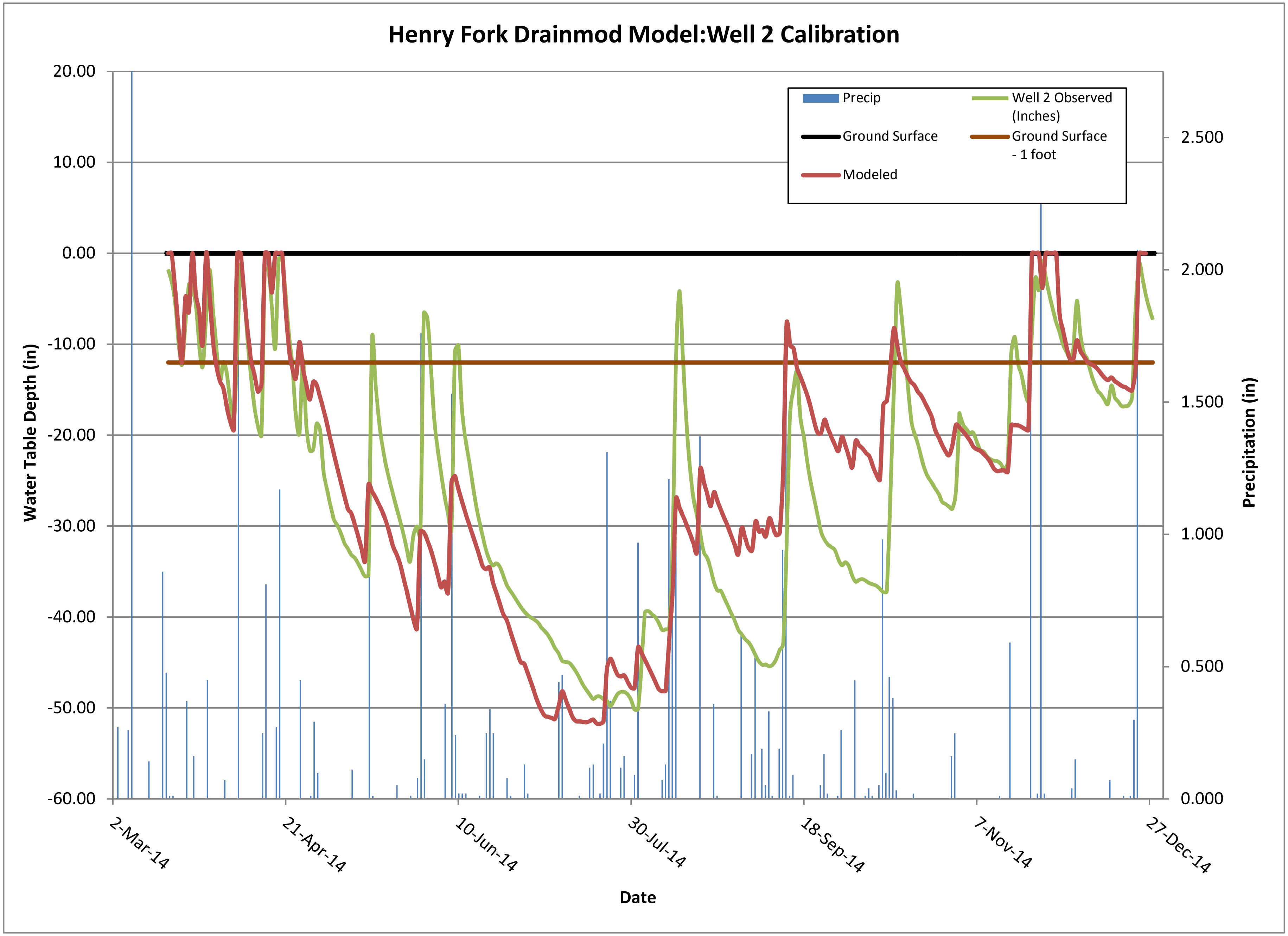
Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Precipitation	120.9	100%	120.9	100%
Runon	0.0	0%	0.0	0%
Lateral Seepage	-27.7	23%	-5.5	5%
Drainage	46.7	39%	30.6	25%
Drainage + Lat Seepage	19.0	16%	25.1	21%
Evapotranspiration	91.7	76%	91.7	76%
Infiltration	110.7	92%	116.8	97%
Runoff	10.2	8%	4.0	3%

Table 6-5: Summary Water Balance for Gage 6 - *Henry Fork Mitigation Site*

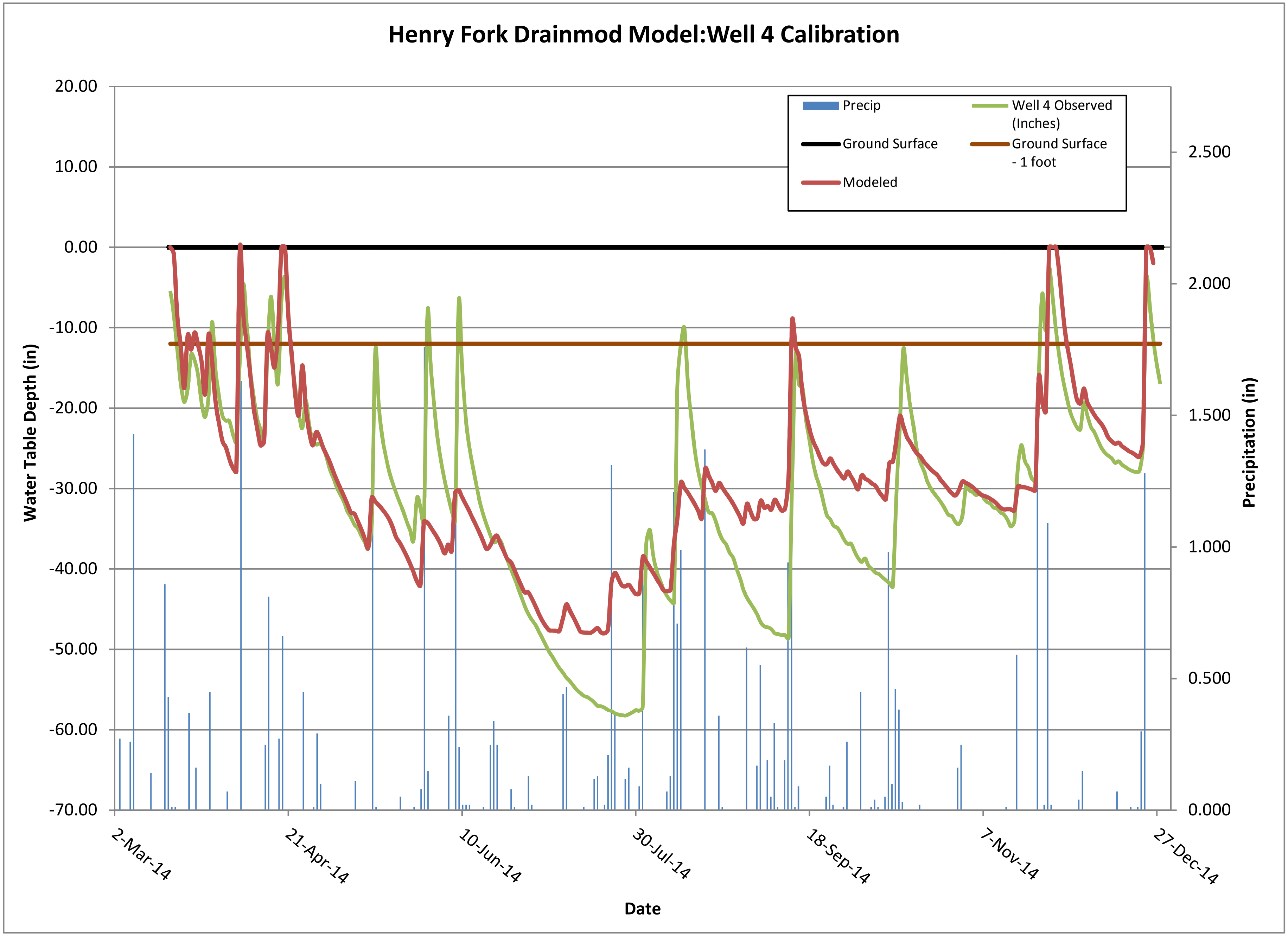
Hydrologic Parameter	Existing Conditions		Proposed Conditions	
	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)	Average Annual Amount (cm of water)	Average Annual Amount (% of precip + runon)
Precipitation	120.9	100%	120.9	100%
Runon	0	0%	0	0%
Lateral Seepage	-36.5	30%	-7.8	6%
Drainage	55.8	46%	32.9	27%
Drainage + Lat Seepage	19.3	16%	25.0	21%
Evapotranspiration	89.6	74%	91.8	76%
Infiltration	108.9	90%	116.8	97%
Runoff	11.9	10%	4.0	3%

Henry Fork Drainmod Model:Well 1 Calibration

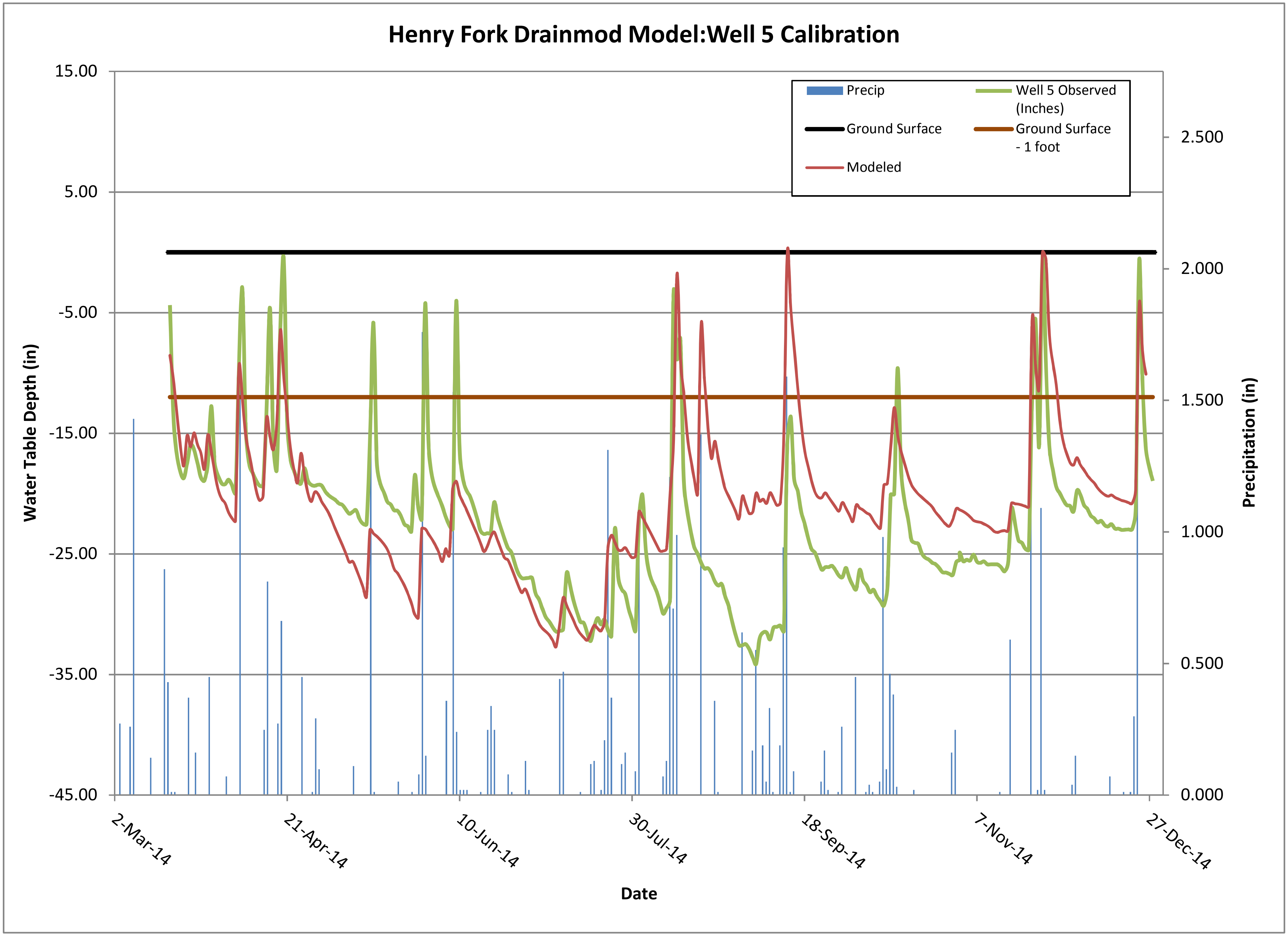




Henry Fork Drainmod Model:Well 2 Calibration
Precip
Well 2 Observed (Inches)
Ground Surface
Ground Surface - 1 foot
Modeled
Water Table Depth (in)
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
Precipitation (in)
2.500
2.000
1.500
1.000
0.500
0.000
2-Mar-14
21-Apr-14
10-Jun-14
30-Jul-14
18-Sep-14
7-Nov-14
27-Dec-14
Date

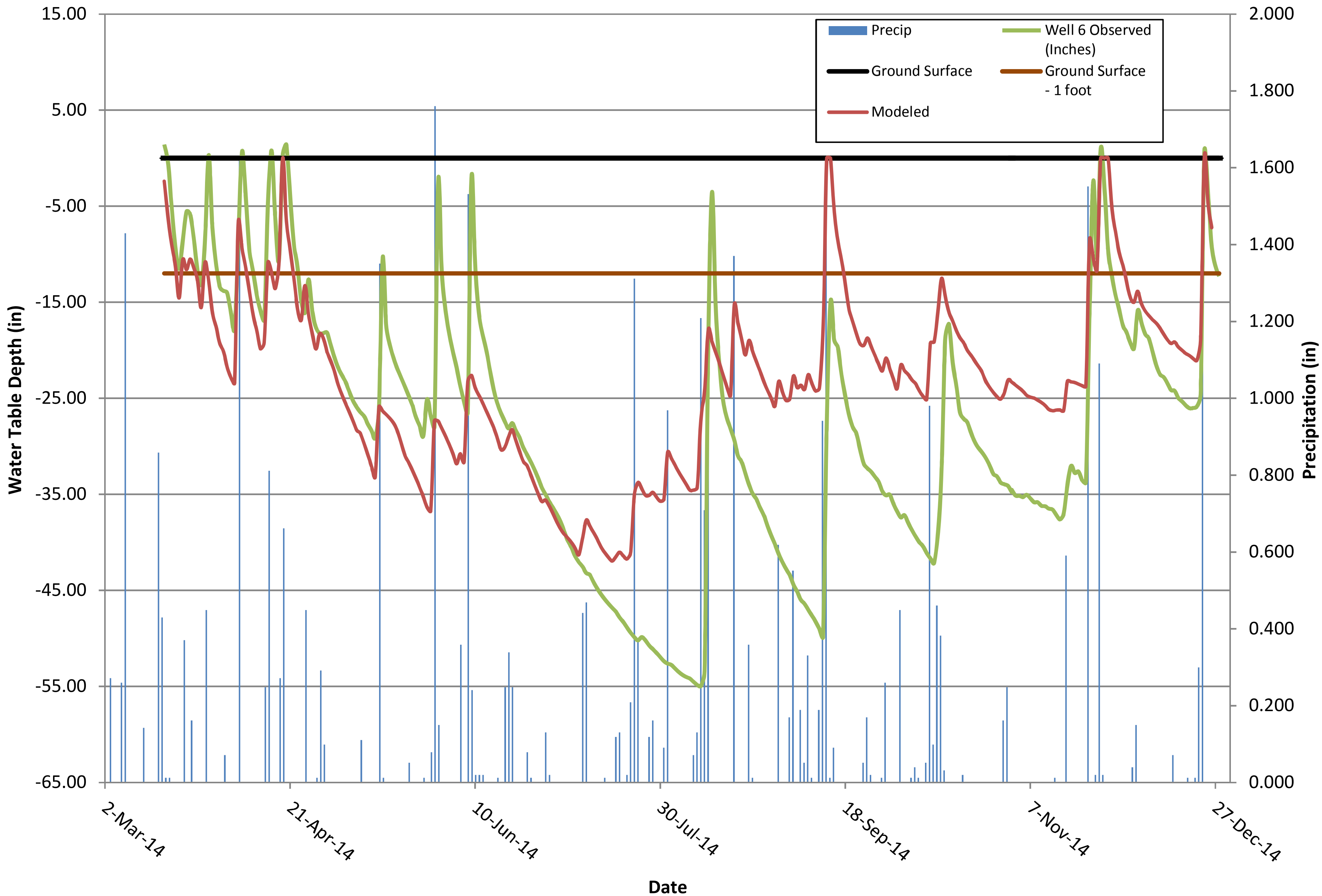


Henry Fork Drainmod Model:Well 4 Calibration
Precip
Well 4 Observed (Inches)
Ground Surface
Ground Surface - 1 foot
Modeled
Water Table Depth (in)
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
-70.00
Precipitation (in)
2.500
2.000
1.500
1.000
0.500
0.000
2-Mar-14
21-Apr-14
10-Jun-14
30-Jul-14
18-Sep-14
7-Nov-14
27-Dec-14
Date



Henry Fork Drainmod Model:Well 5 Calibration
Precip
Well 5 Observed (Inches)
Ground Surface
Ground Surface - 1 foot
Modeled
Water Table Depth (in)
15.00
5.00
-5.00
-15.00
-25.00
-35.00
-45.00
Precipitation (in)
2.500
2.000
1.500
1.000
0.500
0.000
2-Mar-14
21-Apr-14
10-Jun-14
30-Jul-14
18-Sep-14
7-Nov-14
27-Dec-14
Date

Henry Fork Drainmod Model:Well 6 Calibration



HYDRIC SOIL EVALUATION

FOR THE PROPOSED HENRY RIVER MITIGATION SITE

CATAWBA COUNTY, NORTH CAROLINA

Prepared for:

Wildlands Engineering, Inc.

Prepared by:

Jason A. Payne
NC Licensed Soil Scientist #1308

September 9, 2013

TABLE OF CONTENTS

PURPOSE OF REPORT

This report has been prepared to assist Wildlands Engineering during planning and design for the proposed mitigation site located at the Henry River Golf Course in Catawba County, NC. A detailed evaluation was conducted to characterize soils across the site, with a focus on identifying hydric soils.

SITE LOCATION

The site is located on an approximately 90-acre property, southwest of the intersection of Highway 321 and Interstate 40, at 2575 Mountain View Road (Parcel# 279108883819), in Hickory, NC. The evaluation area is situated in the floodplain of, and south of the Henry Fork River, north of the terminus of Mountain View Road.

METHODOLOGY

The hydric soil evaluation began with a cursory review of NRCS soils maps, recent aerial photos and a USGS topographic map for the area. The site analysis was performed on July 25, 2013. Soil auger borings were advanced throughout the study area. The hydric soil status at each location was noted, and is based upon the NRCS Field Indicators of Hydric Soils in the United States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010). During the site evaluation, each soil boring was assigned to one of four different soil types or units:

- Soil Unit 1 (S1) – Hydric, relatively undisturbed
- Soil Unit 2 (S2) – Hydric soil that has been buried, with hydric indicators in the fill material
- Soil Unit 3 (S3) – Hydric soil that has been buried. Fill material is non-hydric
- Soil Unit 4 (S4) – Non-hydric soil (no evidence of buried hydric soil)

Following the site investigation, field data were compiled to prepare the hydric soil map for the project.

FINDINGS

Evidence of anthropogenic site manipulation is abundant throughout the study area. One finds much evidence of ditching and/or channelization of streams across the site. Additionally, fill material has been placed over a majority of the floodplain area during past construction for the golf course. The soil beneath is generally undisturbed.

The Soil Units are briefly discussed below and representative soil profile descriptions using the USDA - NRCS standard nomenclature are appended for hydric soil areas S1, S2 & S3. The attached "Henry River Project Hydric Soils Evaluation" map illustrates the approximate location of soil borings and soil map units across the site. Two, separate hydric soil areas were mapped during the evaluation. The western hydric soil area occupies approximately 1.49-acres, and consists only of S2 and S3 borings. The eastern hydric soil area occupies 3.03-acres, and consists of S1, S2 and S3 borings.

Soil Unit 1 (S1) – Hydric Soil

Soils in this area had no fill material and generally had typical diagnostic soil horizons. While several hydric soil indicators were present, indicator F3 was the most common.

Indicator F3 - Depleted Matrix. A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:

a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or

b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.

This soil typically had a silt loam textured surface horizon that ranged from 4 to 8 inches with oxidized rhizoshperes present. The subsurface textures were generally clay loam, grading to silty clay, with a matrix color of chroma 2 or less.

Soil Unit 2 (S2) – Hydric Fill Over Hydric Soil

Soil Unit 2 had fill material deposited during construction of the golf course. The soil beneath the fill was relatively undisturbed. Depth of fill was variable, but ranged from 6-to-12-inches. The buried soil had a loam textured surface horizon underlain by either loam, clay loam, or sandy clay loam subsurface horizons and met hydric indicator F3 Depleted Matrix.

Here, the affects of hydrologic manipulation on the site are less pronounced and fill material has been on-site long enough to develop hydric indicators. While some of the fill material may have been hydric in origin (deposited from adjoining wetland or dredge from the ditches), most fill material was sourced from upland areas. There was evidence of active reduction and oxidation reactions in all borings. The soil either met indicator F3 Depleted Matrix or F6;

Indicator F6 - Redox Dark Surface. A layer that is at least 10 cm (4 inches) thick, is entirely within the upper 30 cm (12 inches) of the mineral soil, and has:

a. Matrix value of 3 or less and chroma of 1 or less and 2 percent or more distinct or prominent redox concentration occurring as soft masses or pore lining, or

b. Matrix value of 3 or less and chroma of 2 or less and 5 percent or more distinct or prominent redox concentrations occurring as soft masses or pore linings.

Soil Unit 3 (S3) – Non-Hydric Fill Over Hydric Soil

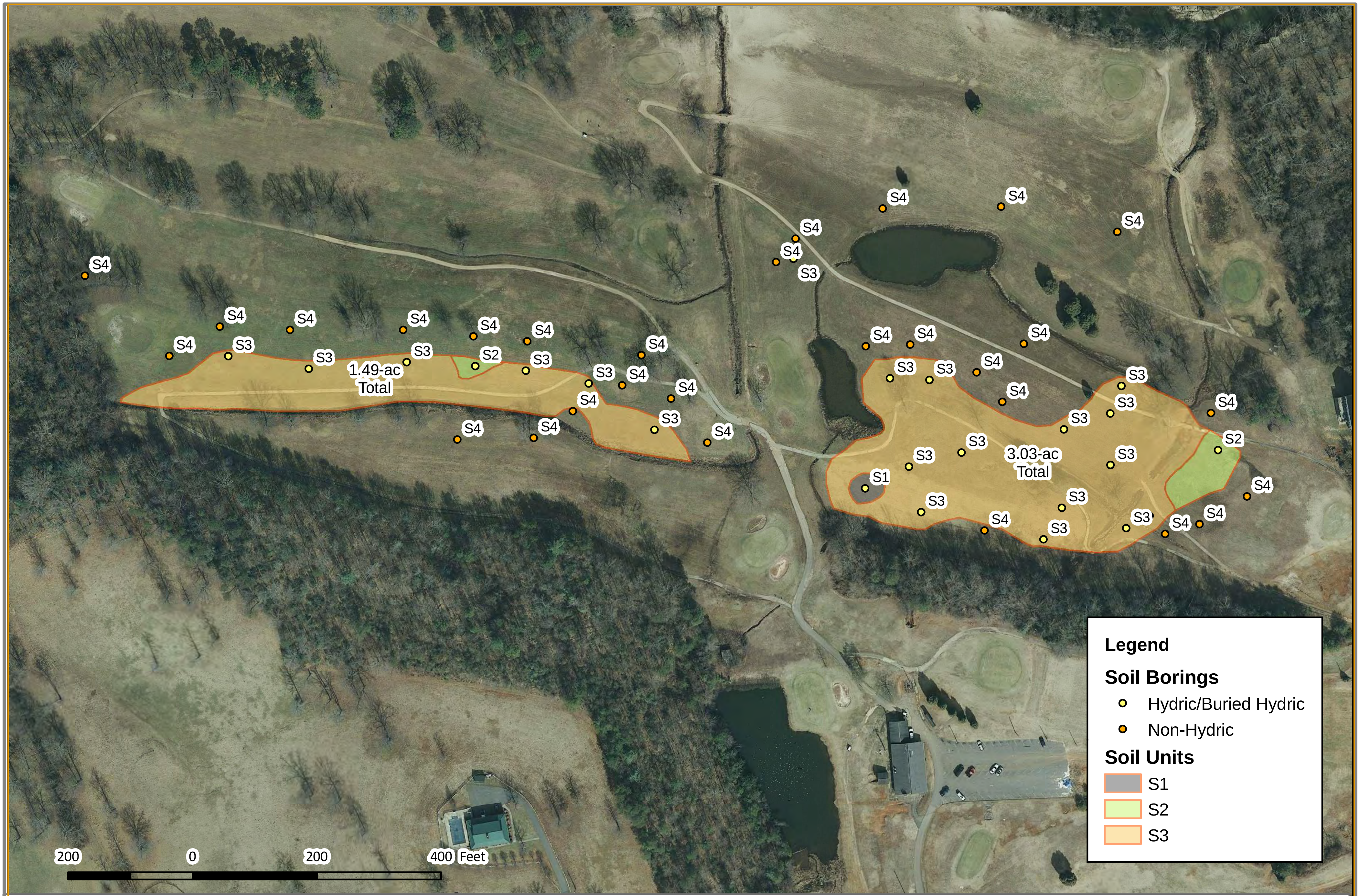
Soil Unit 3 clearly had fill material deposited during construction of the golf course. The soil beneath the fill was relatively undisturbed. Depth of fill was quite variable, but ranges from 12-to-26-inches. The buried soil had a silty clay loam surface horizon underlain by clay, silty clay or clay loam subsurface horizons. These areas met hydric indicator F3 - Depleted Matrix. While there was some evidence of recent reduction and oxidations reactions within some fill, it did not meet any of the hydric indicators.

Soil Unit 4 (S4) – No Evidence of Buried Hydric Soil

Most of Soil Unit 4 evidenced fill material, but in all cases neither the fill material nor the original soil met any hydric soil indicators within a depth reasonable for remediation. For example, some borings exhibited fill depths of greater than 36-inches, and were terminated. Since these areas contained mostly fill material without hydric soil indicators, a representative soil profile description was omitted.

CONCLUSION

This report presents information that may be used as reference for planning and design for the proposed work at the Henry River Mitigation site. Specifically, soil borings provide evidence of areas where hydric soils are either present or present below fill material. Soil units for each of these areas were delineated on the attached map. The site hydrology has been altered by ditching and/or channelization of streams and the addition of the fill material. Subsequently, opportunities exist for wetland restoration. These findings represent a professional opinion based on Hydric Soil Investigation and knowledge of the current regulations regarding wetland mitigation in North Carolina and national criteria for determining hydric soil.



Henry River Project
Hydric Soils Evaluation
Catawba County, NC

Unique Places

September 9, 2013

State Plane North Carolina, NAD 1983; This map is for informational purposes and was not prepared for, and is not suitable for legal, engineering, or surveying purposes.Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This is not a survey.

Prepared by: Jason A. Payne, RF, LSS

Henry River Mit Site 7/25/13

Profile	Horizon	Horizon Depth (in)	Structure / Texture	Consistence	Matrix Color	Mottle Colors (Quantity, Size, Contrast, Color)
S3	A	2	gr/SiCl	fr	10YR 3/4	
	B	10	SBK/Clay	fi	7.5YR 3/4	7.5YR 5/2, large, Distinct, many
	A_b	14	gr/SiCl	fr	7.5YR 3/~~4~~	7.5 YR 3/1, large, Distinct, many
	Bgb_1	18	SBK/Clay	fi	7.5YR 7/1	—
	Bgb_2	24	SBK/SiCl	fi	7.5YR 4/2	—
S2	A	4	SBK/CL	fi	10YR 4/2	
	A_{bg}	10	gr/siloam	fr	10YR 4/2	Common mica flakes
	Bg_1	16	SBK/Silo	fi	10YR 5/1	Common mica flakes
	Bg_2	20	SBK/SiClLo	fi	7.5YR 5/2	
S_1	A	6	gr/Silo	fr	10YR 4/2	common mica flakes
	Bg_1	14	SBK/Silo	fi	7.5YR 3/2	common mica flakes
	Bg_2	24	SBK/SiClLo	fi	7.5YR 5/1	

LICENSED SOIL SCIENTIST
JASON A. PAYNE
1308
STATE OF NORTH CAROLINA

HYDRIC SOIL INVESTIGATION

Henry Fork Mitigation Site

Catawba County, North Carolina

Prepared for:

Wildlands Engineering, Inc.
5605 Chapel Hill Road, Suite 122
Raleigh, NC 27607

Prepared by:

The Catena Group

410-B Millstone Drive
Hillsborough, NC 27278

LICENSED SOIL SCIENTIST
MICHAEL G. WOOD
1219
STATE OF NORTH CAROLINA

May 13, 2014

INTRODUCTION

Wildlands Engineering, Inc. is considering mitigating a section of the Henry Fork project site in the Catawba River Basin (03050101). The site is accessed off Mountain View Road (SR 1192) in Hickory, Catawba County, NC. The Catena Group, Inc. (Catena) was retained to perform a detailed soil investigation that would, in part, determine the depth of fill material that was previously observed during a preliminary soil and site.

METHODOLOGY

The field investigation was performed on April 29, 2014. Seventy-two (72) hand-turned auger borings were advanced throughout the study area on a seventy-five ft by seventy-five ft grid (Figure 1). Each soil boring was marked in the field with a red pin flag noting the boring number, soil unit number, and either depth of fill material or depth boring was terminated. Hydric soil status was based upon the NRCS Field Indicators of Hydric Soils in the Unities States - A Guide for Identifying and Delineating Hydric Soils (Version 7.0, 2010).

RESULTS

There is clear evidence of human manipulation throughout the study area. In addition to ditching and/or channelization of streams, fill material has been placed over the majority of the study area. Six Soil Units were created based on data collected from soil borings and are described below and summarized in Table 1. Table 2 lists the classification and fill depth when applicable for each soil boring (appended).

Soil Unit 1. Soil Unit 1 had a typical surface diagnostic horizon that met hydric soil indicator F3.

F3 Depleted Matrix. A layer that has a depleted matrix with 60 percent or more chroma of 2 or less and that has a minimum thickness of either:
a. 5 cm (2 inches) if the 5 cm is entirely within the upper 15 cm (6 inches) of the soil, or 5 cm (6 inches), or
b. 15 cm (6 inches), starting within 25 cm (10 inches) of the soil surface.

Soil Unit 2. Soil Unit 2 consists of non-hydric soil that appeared to be undisturbed.

Soil Unit 3. Soil Unit 3 clearly has overburden material deposited as a result of human manipulation. The soil material below the overburden was relatively undisturbed and met hydric indicator F3 Depleted Matrix. The overburden was classified as hydric and met hydric indicator F3 Depleted Matrix.

Soil Unit 4. Soil Unit 4 clearly has overburden material deposited as a result of human manipulation. The soil material below the overburden was relatively undisturbed other than a compressed soil structure and a truncated profile, remnants of past surface manipulations. This material still appeared to be hydric and met indicator F3 Depleted Matrix. The overburden did not meet any hydric soil indicator. A typical soil profile for Soil Unit 4 is appended. Soil Unit 4 comprised the majority of the study site.

Soil Unit 5. Soil Unit 5 clearly has overburden material deposited as a result of human manipulation. The overburden material and the soil beneath did not meet any hydric soil indicator.

Soil Unit 6. Soil Unit 6 clear has overburden material deposited as a result of human manipulation. The surface of the overburden material currently meets hydric indicator F3 Depleted Matrix. The material below the surface did not currently meet any hydric soil indicator.

Table 1. Summary of Soil Boring Classification and Hydric Indicator (if applicable).

Soil Unit	Classification	Hydric Indicator
1	Undisturbed Hydric Soil	F3
2	Undisturbed Non-Hydric Soil	n/a
3	Hydric Overburden/Buried Hydric Soil	F3
4	Non-Hydric Overburden/Buried Hydric Soil	F3
5	Non-Hydric Overburden/Buried Non-Hydric Soil	n/a
6	Hydric Overburden/Non-Hydric Soil	F3

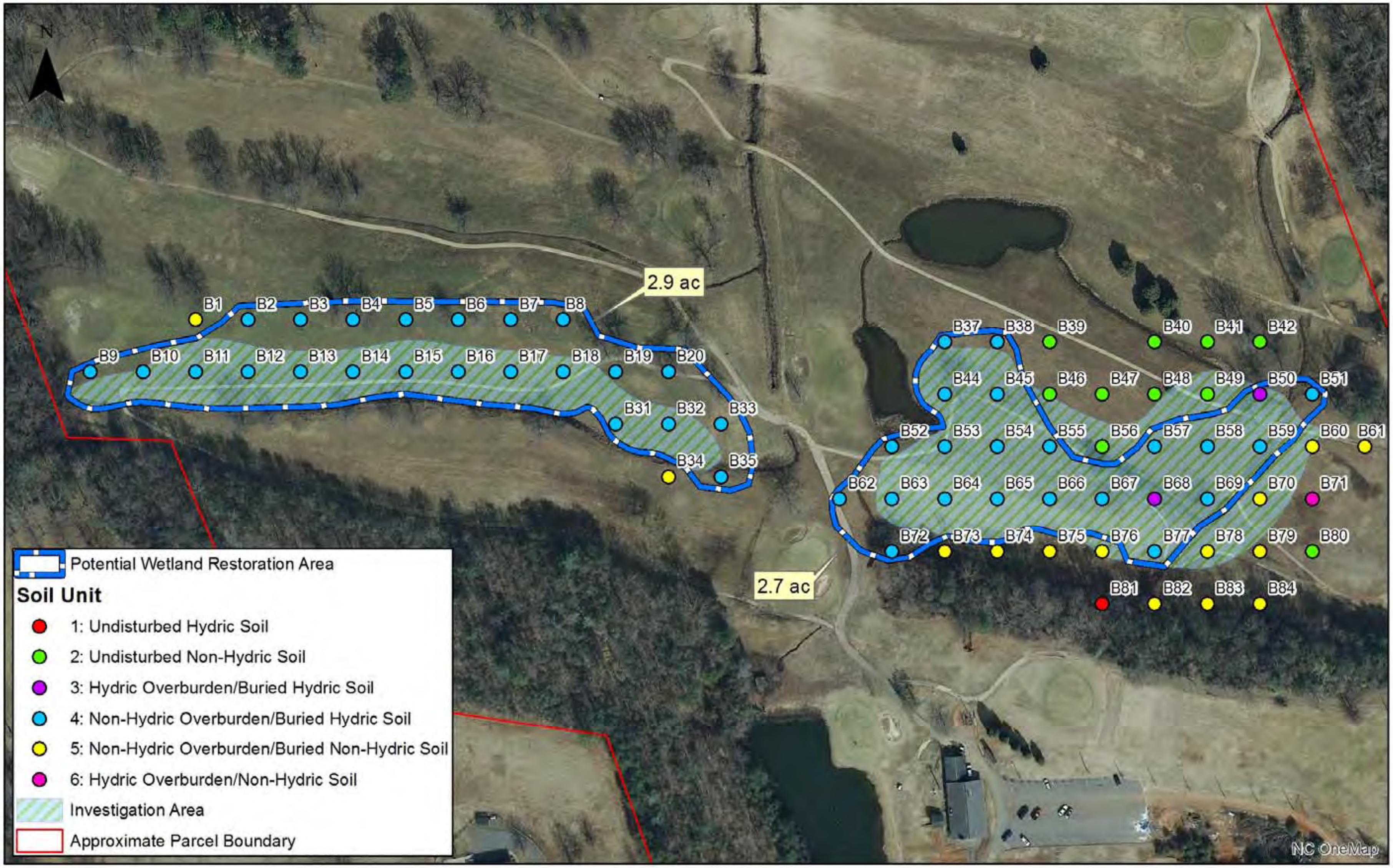
CONCLUSION

Seventy-two (72) soil borings were advanced throughout the study area. Borings were placed into one of six Soil Units. The depth of fill material was noted at each boring when applicable. It is anticipated that Priority 1 stream restoration, combined with limited soil manipulation, has the potential to re-establish approximately 5.6 acres of wetlands (Figure 1).

The findings presented herein represent Catena's professional opinion based on our Hydric Soil Investigation and knowledge of the current regulations regarding wetland mitigation in North Carolina and national criteria for determining hydric soil.

Table 2. Classification of Each Soil Boring and Depth of Fill Material (if applicable).

Boring No.	Soil Unit	Depth of Fill	Boring No.	Soil Unit	Depth of Fill
1	5	N/A	49	2	N/A
2	4	34	50	3	22
3	4	24	51	4	14
4	4	26	52	4	38
5	4	24	53	4	36
6	4	34	54	4	31
7	4	32	55	4	32
8	4	34	56	2	N/A
9	4	27	57	4	27
10	4	13	58	4	15
11	4	18	59	4	8
12	4	16	60	5	N/A
13	4	20	61	5	N/A
14	4	18	62	4	28
15	4	19	63	4	25
16	4	19	64	4	17
17	4	13	65	4	27
18	4	21	66	4	30
19	4	27	67	4	20
20	4	23	68	3	17
31	4	16	69	4	12
32	4	15	70	5	N/A
33	4	24	71	6	N/A
34	5	40	72	4	28
35	4	24	73	5	N/A
37	4	45	74	5	N/A
38	4	29	75	5	N/A
39	2	N/A	76	5	N/A
40	2	N/A	77	4	22
41	2	N/A	78	5	N/A
42	2	N/A	79	5	N/A
44	4	38	80	2	N/A
45	4	38	81	1	N/A
46	2	N/A	82	5	N/A
47	2	N/A	83	5	N/A
48	2	N/A	84	5	N/A



The Catena Group

Client:

WILDLANDS ENGINEERING

Proposed Henry Fork Mitigation Site

Hydric Soil Investigation

Catawba County, North Carolina

Date: May 2014

Scale: 0 50 100 Feet

Job No.: 4172

Figure 1

SOIL EVALUATION FORM

The Catena Group, Inc
410-B Millstone Drive
Hillsborough, NC 27278
919.732.1300

Catena Job: 4172 Henry Fork Hyd. Soil Inv.
County: Catawba
Date: 4/29/14
Sheet: 1 of 1

Profile #	***Horizon***	***Horizon Depth (In)***	***Structure / Texture***	***Consistence / Mineralogy***	***Matrix Color***	***Mottle Colors (Quantity, Size, Contrast, Color)***
1	Fill	13	O,M parting to 1,M,SBK / C, CL	FI / S, P	Variegated	
	Ab	18	1,M, SBK parting to 1,M,GR / SL	FR / SS, SP	10YR 3/1	m,2,D 7.5YR 4/4
	Bt	28	1,M,SBK / CL	FI / SS, SP	2.5Y 4/1	m,2,P 10YR 4/4; m,2,P 7.5YR 5/6
	BC	36	1,CO,SBK / C	FI / SS,SP	2.5Y 5/2	m,2,P 10YR 4/6; m,2,P 2.5Y 4/6

Evaluated by: MW JR

Appendix 7: Categorical Exclusion with Resource Agency Correspondence IRT Correspondence

Categorical Exclusion Form for Ecosystem Enhancement Program Projects
Version 1.4

Note: Only Appendix A should to be submitted (along with any supporting documentation) as the environmental document.

Part 1: General Project Information	
Project Name:	Henry Fork Stream and Wetland Mitigation Site
County Name:	Catawba County
EEP Number:	EEP # 96306, Contract #5782
Project Sponsor:	Wildlands Engineering, Inc.
Project Contact Name:	Andrea S. Eckardt
Project Contact Address:	1430 S. Mint Street, Suite 104, Charlotte, NC 28203
Project Contact E-mail:	aeckardt@wildlandseng.com
EEP Project Manager:	Paul Weisner

Project Description

The Henry Fork Stream and Wetland Mitigation Site is a stream and wetland mitigation project located in Catawba County, NC. The project is on the Henry River and its tributaries approximately 1 mile southwest of the Town of Hickory. The project will provide stream and wetland mitigation units to NCEEP in the Catawba River Basin (03050103 Expanded Service Area).

For Official Use Only

Reviewed By:

4-21-14

Date

Paul Weisner

EEP Project Manager

Conditional Approved By:

Date

For Division Administrator FHWA

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

Final Approval By:

4-16-14

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?	☐ 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?	☐ 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?	☑ 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?	☑ 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?	☐ 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

Henry Fork Stream and Wetland Mitigation Site

Categorical Exclusion

Summary

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.

As the Henry Fork Stream and Wetland Mitigation Site is a full-delivery project; an EDR Radius Map Report with Geocheck was ordered for the site through Environmental Data Resources, Inc on August 26, 2013. The property is zoned by the county as residential, but has functioned as a golf course for many years until it was closed in 2009. The Mountain View Golf Club (target property) was identified in the NC Facility Index System (FINDS) and Underground Storage Tank (UST) databases. According to the EDR report, in the past there were three underground storage tanks located on the golf course property that were previously monitored by the State of NC. All three tanks identified in the UST database have been removed: two in 1999 and one in 2006. The EDR report does not include an exact location of the tanks, but according to an interview with the property owner (Mr. Gene Miller on April 2, 2014), the tanks were located in areas by the club house and garage which are located outside the conservation easement area (see Site Map). A pedestrian survey of the conservation easement performed by Wildlands supports this information.

Overall, based on the UST database noting the removal of the tanks, plus the communication with the property owner about the former locations of the tanks, Wildlands concludes that the assessment revealed no evidence of any "recognized environmental conditions" in connection with the conservation easement area. The Executive Summary of the EDR report is included in the Appendix. The full report is available if needed.

National Historic Preservation Act (Section 106)

The National Historic Preservation Act declares a national policy of historic preservation to protect, rehabilitate, restore, and reuse districts, sites, buildings, structures, and objects significant in American architecture, history, archaeology, and culture, and Section 106 mandates that federal agencies take into account the effect of an undertaking on a property that is included in, or is eligible for inclusion in, the National Register of Historic Places.

Wildlands Engineering, Inc. (Wildlands) requested review and comment from the State Historic Preservation Office (SHPO) with respect to any archeological and architectural resources related to the Henry Fork Stream and Wetland Mitigation Site on February 25, 2014. SHPO responded on March 24, 2014 and stated they were aware of no historic resources that would be affected by the project. All correspondence related to Section 106 is included in the Appendix.

Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act)

These acts, collectively known as the Uniform Act, provide for uniform and equitable treatment of persons displaced from their homes, businesses, non-profit associations, or farms by federal and federally-assisted programs, and establish uniform and equitable land acquisition policies.

Henry Fork Stream and Wetland Mitigation Site is a full-delivery project that includes land acquisition. Notification of the fair market value of the project property and the lack of condemnation authority by

Wildlands was included in a letter sent to the property owner. A copy of the letter is included in the Appendix.

American Indian Religious Freedom Act (AIRFA)

The American Indian Religious Freedom Act provides for the protection and preservation of places of religious importance to American Indians, Eskimos, and Native Hawaiians.

Wildlands requested review and comment from the Eastern Band of Cherokee Indians Tribal Historic Preservation Office (THPO) with respect to any archeological or religious resources related to the Henry Fork Stream and Wetland Mitigation Site on February 25, 2014. At this time there has been no response from the THPO. All correspondence related to AIRFA is included in the Appendix.

Endangered Species Act (ESA)

Section 7 of the ESA requires federal agencies, in consultation with and with the assistance of the Secretary of the Interior or of Commerce, as appropriate, to ensure that actions they authorize, fund or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species.

The Catawba County listed endangered species include the bald eagle (*Haliaeetus leucocephalus*) (BGPA), the dwarf-flowered heartleaf (*Ptilimnium nodosum*), and Schweinitz's sunflower (*Helianthus schweinitzii*). Wildlands requested review and comment from the United States Fish and Wildlife Service (USFWS) on February 25, 2014 in respect to the Henry Fork Stream and Wetland Mitigation Site and its potential impacts on threatened or endangered species. No response from USFWS has been received at this time. All correspondence with USFWS is included in the Appendix. The USFWS does not currently list any Critical Habitat Designations for any of the Federally-listed species within Catawba County.

Bald Eagle

The bald eagle is a very large raptor species, typically 28 to 38 inches in length. Adult individuals are brown in color with a very distinctive white head and tail. Bald eagles typically live near large bodies of open water with suitable fish habitat including: lakes, marshes, seacoasts, and rivers. This species generally requires tall, mature tree species for nesting and roosting. Bald eagles were de-listed from the Endangered Species List in June 2007; however, this species remains under the protection of the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGPA). This species is known to occur in every U.S. state except Hawaii.

Dwarf-Flowered Heartleaf

Dwarf-flowered heartleaf is a low-growing, evergreen perennial herb that spreads via rhizomes. This herb exhibits heart-shaped, leathery leaves supported by long thin petioles. These plants are found along north-facing slopes, bluffs, and boggy areas containing acidic sandy loam soils within deciduous forests. Known population occurrences of dwarf-flowered heartleaf have been observed in Catawba County within the past 20 years.

Schweinitz's Sunflower

Schweinitz's sunflower is found in open areas where disturbance has occurred such as roadsides, power line clearings, old pastures and woodland openings. This species is generally found growing in shallow, poor, clayey and/or rocky soils.

As a result of a pedestrian survey conducted on September 3, 2013, no individual species, critical habitat or suitable habitat were found to exist on the site for the bald eagle. The site has been maintained for many years as a golf course, even after the course closed in 2009. The site lacks large open bodies of water that bald eagles typically need as a food source. It was determined by Wildlands that the project would result in "no effect" on the bald eagle.

During the same pedestrian survey potential Schweinitz's sunflower habitat was present in the form of maintained field edges but no individuals were observed. The survey was performed within the recommended survey window the USFWS has identified for the sunflower species (late August – October). It was determined by Wildlands that the project would result in "no effect" on the Schweinitz's sunflower.

A second survey was performed March 17, 2014 of the upland north-facing slopes, which is considered suitable habitat for the dwarf-flowered heartleaf. No individual species were found in these areas. Golf course management and heavy foot traffic in these areas has stunted any opportunity for the plant to colonize. The survey was performed during within the range of which the USFWS has identified as the best search time for the sunflower species (mid-March-early June). It was determined by Wildlands that the project would result in "no effect" on the dwarf-flowered heartleaf.

Farmland Protection Policy Act (FPPA)

The FPPA requires that, before taking or approving any federal action that would result in conversion of farmland, the agency must examine the effects of the action using the criteria set forth in the FPPA, and, if there are adverse effects, must consider alternatives to lessen them.

The Henry Fork Stream and Wetland Mitigation Site includes the conversion of prime farmland. As such, Form AD-1006 has been completed and submitted to the Natural Resources Conservation Service (NRCS). The completed form and correspondence documenting its submittal is included in the Appendix.

Fish and Wildlife Coordination Act (FWCA)

The FWCA requires consultation with the USFWS and the appropriate state wildlife agency on projects that alter or modify a water body. Reports and recommendations prepared by these agencies document project effects on wildlife and identify measures that may be adopted to prevent loss or damage to wildlife resources.

The Henry Fork Stream and Wetland Mitigation Site includes stream restoration. Wildlands requested comment on the project from both the USFWS and the North Carolina Wildlife Resources Commission (NCWRC) on February 25, 2014. NCWRC responded on March 14, 2014 and stated they "do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources". The USFWS has not responded at this time. All correspondence with the two agencies is included in the Appendix.

Migratory Bird Treaty Act (MBTA)

The MBTA makes it unlawful for anyone to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird. The indirect killing of birds by destroying their nests and eggs is covered by the MBTA, so construction in nesting areas during nesting seasons can constitute a taking.

Wildlands requested comment on the Henry Fork Stream and Wetland Mitigation Site from the USFWS in regards to migratory birds on February 25, 2014. USFWS has not responded at this time. All correspondence with USFWS is included in the Appendix.

Henry Fork Stream and Wetland Mitigation Site

Categorical Exclusion

Appendix

Henry River
2575 Mountain View Rd
Hickory, NC 28602

Inquiry Number: 3707408.2s
August 26, 2013

The EDR Radius Map™ Report with GeoCheck®

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-05) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

2575 MOUNTAIN VIEW RD
HICKORY, NC 28602

COORDINATES

Latitude (North):	35.7028000 - 35˚ 42' 10.08''
Longitude (West):	81.3646000 - 81˚ 21' 52.56''
Universal Tranverse Mercator:	Zone 17
UTM X (Meters):	467015.8
UTM Y (Meters):	3950847.0
Elevation:	879 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	35081-F3 HICKORY, NC
Most Recent Revision:	1996
West Map:	35081-F4 LONGVIEW, NC
Most Recent Revision:	1993

AERIAL PHOTOGRAPHY IN THIS REPORT

Photo Year:	2012
Source:	USDA

TARGET PROPERTY SEARCH RESULTS

The target property was identified in the following records. For more information on this property see page 7 of the attached EDR Radius Map report:

Site	Database(s)	EPA ID
MTN VIEW GOLF CLUB 2575 MOUNTAIN VIEW ROAD HICKORY, NC	FINDS	N/A
MOUNTAIN VIEW GOLF CLUB 2575 MOUNTAIN VIEW ROAD HICKORY, NC 28602	UST	N/A

EXECUTIVE SUMMARY

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL - National Priority List
Proposed NPL - Proposed National Priority List Sites
NPL LIENS - Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL - National Priority List Deletions

Federal CERCLIS list

CERCLIS - Comprehensive Environmental Response, Compensation, and Liability Information System
FEDERAL FACILITY - Federal Facility Site Information listing

Federal CERCLIS NFRAP site List

CERC-NFRAP - CERCLIS No Further Remedial Action Planned

Federal RCRA CORRACTS facilities list

CORRACTS - Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF - RCRA - Treatment, Storage and Disposal

Federal RCRA generators list

RCRA-LQG - RCRA - Large Quantity Generators
RCRA-SQG - RCRA - Small Quantity Generators
RCRA-CESQG - RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

US ENG CONTROLS - Engineering Controls Sites List
US INST CONTROL - Sites with Institutional Controls
LUCIS - Land Use Control Information System

Federal ERNS list

ERNS - Emergency Response Notification System

EXECUTIVE SUMMARY

State- and tribal - equivalent NPL

NC HSDS------------------- Hazardous Substance Disposal Site

State and tribal landfill and/or solid waste disposal site lists

SWF/LF--------------------- List of Solid Waste Facilities
OLI--------------------------- Old Landfill Inventory

State and tribal leaking storage tank lists

LUST------------------------- Regional UST Database
LUST TRUST---------------- State Trust Fund Database
LAST------------------------- Leaking Aboveground Storage Tanks
INDIAN LUST--------------- Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

AST-------------------------- AST Database
INDIAN UST---------------- Underground Storage Tanks on Indian Land
FEMA UST------------------ Underground Storage Tank Listing

State and tribal institutional control / engineering control registries

INST CONTROL------------ No Further Action Sites With Land Use Restrictions Monitoring

State and tribal voluntary cleanup sites

VCP-------------------------- Responsible Party Voluntary Action Sites
INDIAN VCP---------------- Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

BROWNFIELDS------------ Brownfields Projects Inventory

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS-------- A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

DEBRIS REGION 9-------- Torres Martinez Reservation Illegal Dump Site Locations
ODI--------------------------- Open Dump Inventory
HIST LF--------------------- Solid Waste Facility Listing
SWRCY--------------------- Recycling Center Listing
INDIAN ODI---------------- Report on the Status of Open Dumps on Indian Lands

Local Lists of Hazardous waste / Contaminated Sites

US CDL--------------------- Clandestine Drug Labs
US HIST CDL-------------- National Clandestine Laboratory Register

EXECUTIVE SUMMARY

Local Land Records

LIENS 2 CERCLA Lien Information

Records of Emergency Release Reports

HMIRS Hazardous Materials Information Reporting System
IMD Incident Management Database
SPILLS 90 SPILLS 90 data from FirstSearch
SPILLS 80 SPILLS 80 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR RCRA - Non Generators
DOT OPS Incident and Accident Data
DOD Department of Defense Sites
FUDS Formerly Used Defense Sites
CONSENT Superfund (CERCLA) Consent Decrees
ROD Records Of Decision
UMTRA Uranium Mill Tailings Sites
US MINES Mines Master Index File
TRIS Toxic Chemical Release Inventory System
TSCA Toxic Substances Control Act
FTTS FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
HIST FTTS FIFRA/TSCA Tracking System Administrative Case Listing
SSTS Section 7 Tracking Systems
ICIS Integrated Compliance Information System
PADS PCB Activity Database System
MLTS Material Licensing Tracking System
RADINFO Radiation Information Database
RAATS RCRA Administrative Action Tracking System
RMP Risk Management Plans
UIC Underground Injection Wells Listing
DRYCLEANERS Drycleaning Sites
NPDES NPDES Facility Location Listing
INDIAN RESERV Indian Reservations
SCRD DRYCLEANERS State Coalition for Remediation of Drycleaners Listing
US AIRS Aerometric Information Retrieval System Facility Subsystem
PRP Potentially Responsible Parties
2020 COR ACTION 2020 Corrective Action Program List
EPA WATCH LIST EPA WATCH LIST
US FIN ASSUR Financial Assurance Information
PCB TRANSFORMER PCB Transformer Registration Database
COAL ASH Coal Ash Disposal Sites
COAL ASH DOE Steam-Electric Plant Operation Data
COAL ASH EPA Coal Combustion Residues Surface Impoundments List
Financial Assurance Financial Assurance Information Listing
LEAD SMELTERS Lead Smelter Sites

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP EDR Proprietary Manufactured Gas Plants

EXECUTIVE SUMMARY

EDR US Hist Auto Stat - - - - - - - EDR Exclusive Historic Gas Stations
EDR US Hist Cleaners - - - - - - - - EDR Exclusive Historic Dry Cleaners

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

State- and tribal - equivalent CERCLIS

SHWS: The State Hazardous Waste Sites records are the states' equivalent to CERCLIS. These sites may or may not already be listed on the federal CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. The data come from the Department of Environment & Natural Resources' Inactive Hazardous Sites Program.

A review of the SHWS list, as provided by EDR, and dated 05/24/2013 has revealed that there is 1 SHWS site within approximately 1 mile of the target property.

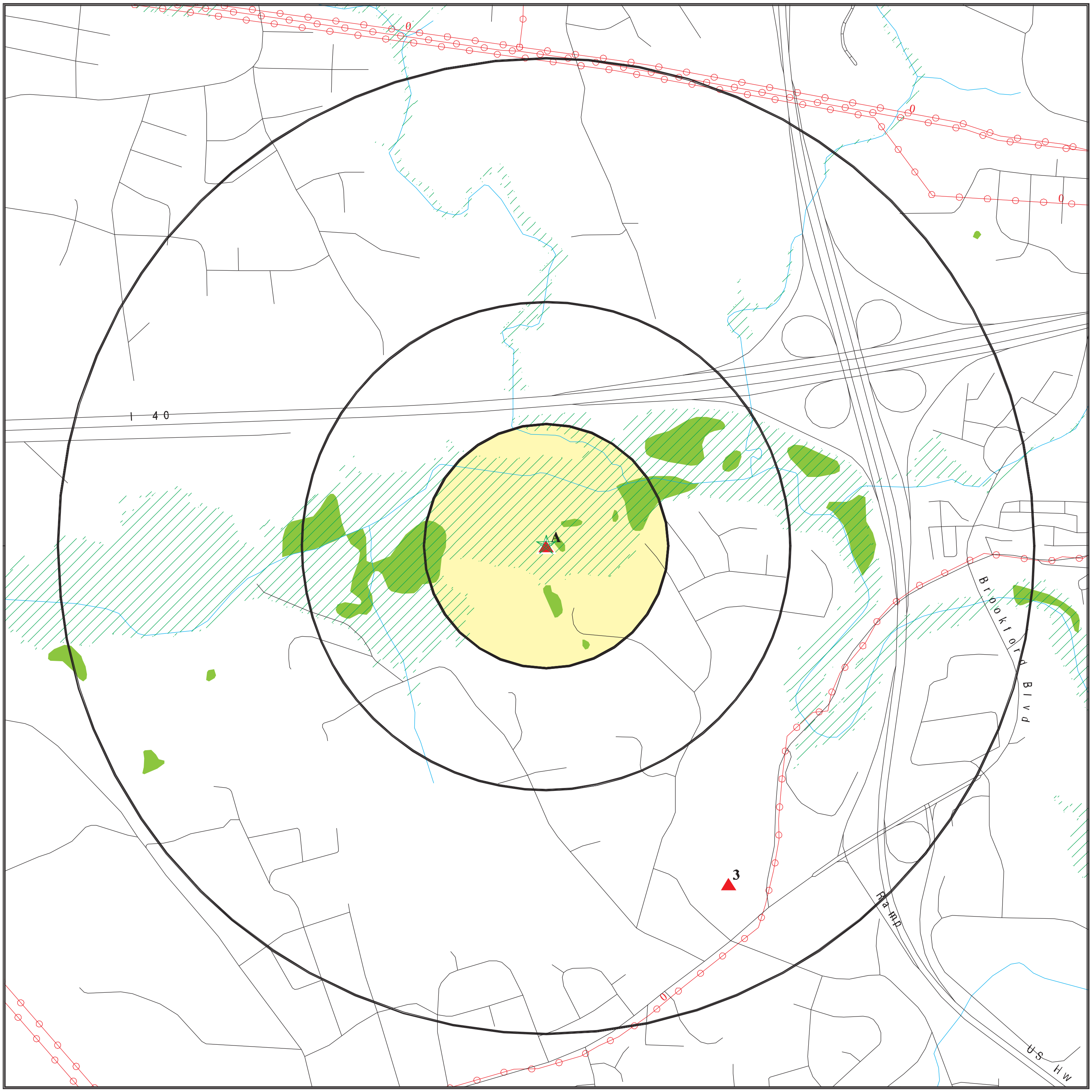
Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
MOUNTAIN VIEW MARKETPLACE	***2341 ROCKSHIRE LANE (OF***	***SSE 1/2 - 1 (0.787 mi.)***	***3***	***8***

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 29 records.

Site Name	Database(s)
HICKORY AIRPORT	IMD, LUST, LAST
CATAWBA VALLEY BANK	IMD, LAST
3-WAY YANCEY'S SUPERETTE	UST, Financial Assurance
MOUNTAIN VIEW CENTRAL OFFICE	UST, Financial Assurance
HUFFMAN GRADING	SWF/LF, HIST LF
WILSON SEPTIC PITS	SHWS, IMD
PERFECT IMAGE (THE)	SHWS
LANE COMPANY, INC.	SHWS
FRYRE CREEK @ US 321 N	SHWS
SUNOX, INC.	IMD, LUST
MCDONALD'S	LUST
SUN MART FUEL CENTER #1	IMD, LUST
OLD SEALTEST DAIRY	IMD, LUST
SCHLOTZSKY-HICKORY	IMD, LUST
POLLY MART SUNOCO	LUST TRUST
VILLAGE KWIK STOP	LUST TRUST
JACK B. QUICK #3	LUST TRUST
OLD DOMINION FREIGHT LINES	UST
JACK BURLESON-ADVENT JIFFY SH	UST
BLUE RIDGE OIL CO. INC.	AST
CVS PHARMACY #2521	RCRA-LQG
AAMCO TRANSMISSIONS	RCRA NonGen / NLR, FINDS
PRO AUTO COLLISION	RCRA-CESQG, FINDS
RITE AID #11543	RCRA-CESQG
MERCHANTS TIRE & AUTO #425	RCRA-CESQG
CITY OF HICKORY, HENRY FORK WWTP	FINDS
WHISNANT FARM	IMD
CALDWELL AND ROWE SERVICE STAT	IMD
FOOTHILLS TRUCKING, INC.	IMD

OVERVIEW MAP - 3707408.2s

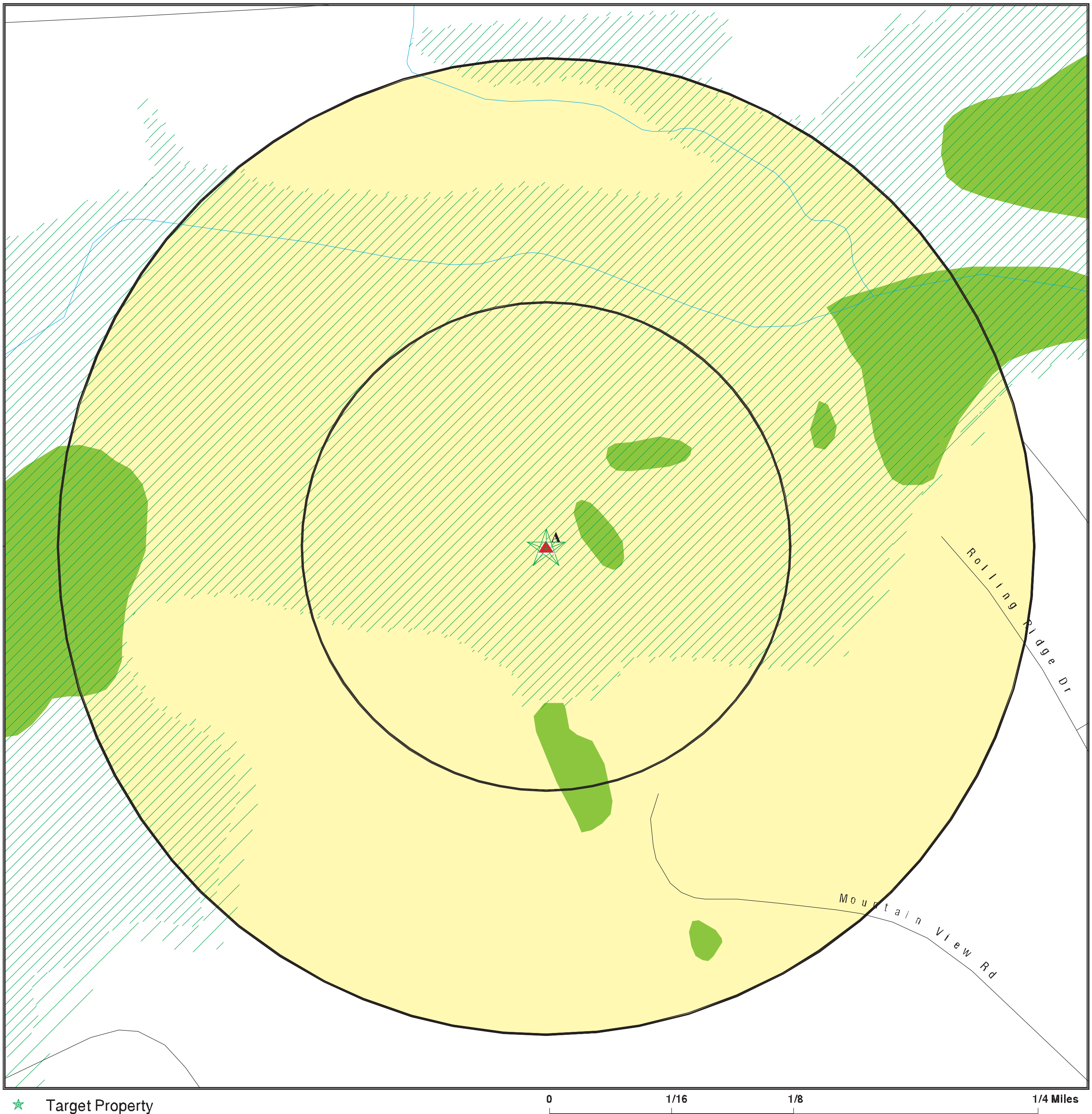


- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Henry River	CLIENT:	Wildlands Eng, Inc.
ADDRESS:	2575 Mountain View Rd Hickory NC 28602	CONTACT:	Andrea Eckardt
		INQUIRY #:	3707408.2s
LAT/LONG:	35.7028 / 81.3646	DATE:	August 26, 2013 6:08 pm

DETAIL MAP - 3707408.2s



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- Sensitive Receptors
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Oil & Gas pipelines from USGS
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Hazardous Substance Disposal Sites

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME:	Henry River	CLIENT:	Wildlands Eng, Inc.
ADDRESS:	2575 Mountain View Rd	CONTACT:	Andrea Eckardt
	Hickory NC 28602	INQUIRY #:	3707408.2s
LAT/LONG:	35.7028 / 81.3646	DATE:	August 26, 2013 6:09 pm

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	TP		NR	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
CERCLIS	0.500		0	0	0	NR	NR	0
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site List								
CERC-NFRAP	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	0	NR	NR	NR	0
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
LUCIS	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	TP		NR	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
NC HSDS	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
SHWS	1.000		0	0	0	1	NR	1
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
OLI	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
LUST TRUST	0.500		0	0	0	NR	NR	0
LAST	0.500		0	0	0	NR	NR	0
INDIAN LUST	0.500		0	0	0	NR	NR	0
State and tribal registered storage tank lists								
UST	0.250	1	0	0	NR	NR	NR	1
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
FEMA UST	0.250		0	0	NR	NR	NR	0
State and tribal institutional control / engineering control registries								
INST CONTROL	0.500		0	0	0	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
HIST LF	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US CDL	TP		NR	NR	NR	NR	NR	0
US HIST CDL	TP		NR	NR	NR	NR	NR	0
Local Land Records								
LIENS 2	TP		NR	NR	NR	NR	NR	0
Records of Emergency Release Reports								
HMIRS	TP		NR	NR	NR	NR	NR	0
IMD	0.500		0	0	0	NR	NR	0
SPILLS 90	TP		NR	NR	NR	NR	NR	0
SPILLS 80	TP		NR	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
DOT OPS	TP		NR	NR	NR	NR	NR	0
DOD	1.000		0	0	0	0	NR	0
FUDS	1.000		0	0	0	0	NR	0
CONSENT	1.000		0	0	0	0	NR	0
ROD	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
TRIS	TP		NR	NR	NR	NR	NR	0
TSCA	TP		NR	NR	NR	NR	NR	0
FTTS	TP		NR	NR	NR	NR	NR	0
HIST FTTS	TP		NR	NR	NR	NR	NR	0
SSTS	TP		NR	NR	NR	NR	NR	0
ICIS	TP		NR	NR	NR	NR	NR	0
PADS	TP		NR	NR	NR	NR	NR	0
MLTS	TP		NR	NR	NR	NR	NR	0
RADINFO	TP		NR	NR	NR	NR	NR	0
FINDS	TP	1	NR	NR	NR	NR	NR	1
RAATS	TP		NR	NR	NR	NR	NR	0
RMP	TP		NR	NR	NR	NR	NR	0
UIC	TP		NR	NR	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
NPDES	TP		NR	NR	NR	NR	NR	0
INDIAN RESERV	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US AIRS	TP		NR	NR	NR	NR	NR	0
PRP	TP		NR	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
EPA WATCH LIST	TP		NR	NR	NR	NR	NR	0
US FIN ASSUR	TP		NR	NR	NR	NR	NR	0
PCB TRANSFORMER	TP		NR	NR	NR	NR	NR	0
COAL ASH	0.500		0	0	0	NR	NR	0
COAL ASH DOE	TP		NR	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
Financial Assurance	TP		NR	NR	NR	NR	NR	0
LEAD SMELTERS	TP		NR	NR	NR	NR	NR	0

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
EDR MGP	1.000		0	0	0	0	NR	0
EDR US Hist Auto Stat	0.250		0	0	NR	NR	NR	0
EDR US Hist Cleaners	0.250		0	0	NR	NR	NR	0

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

A1 Target Property	**MTN VIEW GOLF CLUB 2575 MOUNTAIN VIEW ROAD HICKORY, NC**	**FINDS**	**1007713817 N/A**

Site 1 of 2 in cluster A

Actual: 879 ft.

FINDS:

Registry ID: 110018704179

Environmental Interest/Information System
NC-FITS (North Carolina - Facility Identification Template For States) is North Carolina Department of Environment and Natural Resources' (NCDENR) Facility Identification Template for States that provides a common facility identifier in order to improve accessibility to comprehensive information about environmental regulated entities in the state of North Carolina.

A2 Target Property	**MOUNTAIN VIEW GOLF CLUB 2575 MOUNTAIN VIEW ROAD HICKORY, NC 28602**	**UST**	**U003145876 N/A**

Site 2 of 2 in cluster A

Actual: 879 ft.

UST:

Facility Id:	00-0-0000023332
Contact:	JESAWHIT ENT., INC.
Contact Address1:	2575 MTN VIEW RD
Contact Address2:	Not reported
Contact City/State/Zip:	HICKORY, NC 28602
FIPS County Desc:	Catawba
Latitude:	35.70151
Longitude:	-81.36373

Tank Id:	1
Tank Status:	Removed
Installed Date:	04/20/1984
Perm Close Date:	03/08/1999
Product Key:	3
Product Name:	Gasoline, Gas Mix
Tank Capacity:	1000
Root Tank Id:	Not reported
Main Tank:	No
Compartment Tank:	No
Manifold Tank:	Not reported
Commercial:	Yes
Regulated:	Yes
Tank Construction:	Single Wall Steel
Piping Construction:	Unknown
Piping System Key:	Unknown
Other CP Tank:	Not reported

Tank Id:	2
Tank Status:	Removed
Installed Date:	04/20/1985
Perm Close Date:	03/08/1999
Product Key:	3
Product Name:	Gasoline, Gas Mix

MOUNTAIN VIEW GOLF CLUB (Continued) **U003145876**

Tank Capacity:	550
Root Tank Id:	Not reported
Main Tank:	No
Compartment Tank:	No
Manifold Tank:	Not reported
Commercial:	Yes
Regulated:	Yes
Tank Construction:	Single Wall Steel
Piping Construction:	Unknown
Piping System Key:	Unknown
Other CP Tank:	Not reported

Tank Id:	A1
Tank Status:	Removed
Installed Date:	03/10/1999
Perm Close Date:	02/01/2006
Product Key:	3
Product Name:	Gasoline, Gas Mix
Tank Capacity:	1000
Root Tank Id:	Not reported
Main Tank:	No
Compartment Tank:	No
Manifold Tank:	Not reported
Commercial:	Yes
Regulated:	Yes
Tank Construction:	Single Wall Steel/FRP
Piping Construction:	Other
Piping System Key:	Unknown
Other CP Tank:	Not reported

3
SSE
1/2-1
0.787 mi.
4157 ft.

MOUNTAIN VIEW MARKETPLACE
2341 ROCKSHIRE LANE (OFF 127 S
HICKORY, NC

SHWS **S106349508**
IMD **N/A**
LAST

Relative:
Higher

Actual:
1059 ft.

SHWS:

Facility ID:	NONCD0002103
Lat/Longitude:	35.69274 / -81.35794
Geolocation Method:	Unknown

IMD:

Region:	MOR
Facility ID:	86951
Date Occurred:	11/26/2003
Submit Date:	7/15/2005
GW Contam:	No data entered (data entry person submitted a blank field
Soil Contam:	Not reported
Incident Desc:	O&G > action level near former waste oil drum; chromium elevated above background at one location too. Listed RP is actually executor of estate of former proper
Operator:	Sudderth, Walt
Contact Phone:	828-879-9028
Owner Company:	Not reported
Operator Address:	Not reported
Operator City:	Not reported

MOUNTAIN VIEW MARKETPLACE (Continued) **S106349508**

Oper City,St,Zip: NC 828-879-9028
Ownership: Federal
Operation: 8
Material: Not reported
Qty Lost 1: Not reported
Qty Recovered 1: Not reported
Source: Spill-surface
Type: Other petroleum product
Location: Not reported
Setting: Not reported
Risk Site: Not reported
Site Priority: Not reported
Priority Code: NOD
Priority Update: Not reported
Dem Contact: A Pitner
Wells Affected: No
Num Affected: Not reported
Wells Contam: Not reported
Sampled By: Not reported
Samples Include: Not reported
7.5 Min Quad: Not reported
5 Min Quad: Not reported
Latitude: 35.69274
Longitude: -81.35794
Latitude Number: Not reported
Longitude Number: Not reported
Latitude Decimal: Not reported
Longitude Decimal: Not reported
GPS: EST
Agency: DWQ
Facility ID: 86951
Last Modified: 7/15/2005
Incident Phase: RE
NOV Issued: Not reported
NORR Issued: Not reported
45 Day Report: Not reported
Public Meeting Held: Not reported
Corrective Action Planned: Not reported
SOC Sighned: Not reported
Reclassification Report: Not reported
RS Designation: Not reported
Closure Request Date: Not reported
Close-out Report: Not reported

LAST:
Facility ID: Not reported
UST Number: MO-86951
Incident Number: 86951
Contamination Type: SL
Source Type: 19
Product Type: N
Date Reported: Not reported
Date Occur: Not reported
Cleanup: Not reported
Closure Request: Not reported
Close Out: 03/02/2004

MOUNTAIN VIEW MARKETPLACE (Continued) **S106349508**

Level Of Soil Cleanup Achieved: Not reported
Tank Regulated Status: Not reported
Of Supply Wells: 0
Commercial/NonCommercial UST Site: Not reported
Risk Classification: U
Risk Class Based On Review: L
Corrective Action Plan Type: Not reported
NOV Issue Date: Not reported
NORR Issue Date: Not reported
Site Priority: Not reported
Phase Of LSA Req: Not reported
Site Risk Reason: Not reported
Land Use: Not reported
MTBE: No
MTBE1: Unknown
Flag: Yes
Flag1: No
LUR Filed: Not reported
Release Detection: 0
Current Status: A
RBCA GW: Not reported
PETOPT: Not reported
RPL: False
CD Num: 316
Reel Num: 0
RPOW: False
RPOP: False
Error Flag: 0
Error Code: Not reported
Valid: False
Lat/Long: 35 41 81 21
Lat/Long Decimal: 35.69250 81.358220
Testlat: Not reported
Regional Officer Project Mgr: BCN
Region: MOR
Company: Not reported
Contact Person: Walt Sudderth
Telephone: Not reported
RP Address: Not reported
RP City,St,Zip: NC
RP County: Not reported
Comments: O chromium elevated above background at one location too. Listed RP is actually executor of estate of former property owner. 3/04: Soil has been excavated.
5 Min Quad: Not reported

PIRF:
Facility Id: 86951
Date Occurred: Not reported
Date Reported: Not reported
Description Of Incident: Not reported
Owner/Operator: Not reported
Ownership: 5
Operation Type: 8
Type: Not reported
Location: Not reported
Site Priority: NOD
Priority Update: Not reported

MOUNTAIN VIEW MARKETPLACE (Continued) **S106349508**

Wells Affected Y/N:	Not reported
Samples Include:	Not reported
7#5 Minute Quad:	Not reported
5 Minute Quad:	Not reported
Pirf/Min Soil:	Not reported
Release Code:	Not reported
Source Code:	Not reported
Err Type:	Not reported
Cause:	Not reported
Source:	Not reported
Ust Number:	0

Last Modified:	3/2/2004
Incident Phase:	**CO**
NOV Issued:	Not reported
NORR Issued:	Not reported
45 Day Report:	Not reported
Public Meeting Held:	Not reported
Corrective Action Planned:	Not reported
SOC Signed:	Not reported
Reclassification Report:	Not reported
RS Designation:	Not reported
Closure Request Date:	Not reported
Close-out Report:	Not reported

WILDLANDS
ENGINEERING

February 25, 2014

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

Subject: EEP Stream mitigation project in Catawba County, NC
Henry Fork Stream and Wetland Mitigation Site

Dear Ms. Gledhill-Earley,

The Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream and wetland restoration project on the attached site (USGS site map and aerial map with approximate areas of potential ground disturbance are enclosed).

The Henry Fork 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 site has historically been disturbed due to its use as an active golf course. No architectural structures or archaeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner
aeckardt@wildlandseng.com

North Carolina Department of Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

March 24, 2014

Andrea Eckardt
Wildlands Engineering
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Re: Henry Fork Stream Restoration and Wetland Mitigation Site, Catawba County, ER14-0413

Dear Ms. Eckardt:

Thank you for your letter of February 25, 2014, 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, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or renee.gledhill-earley@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

WILDLANDS
ENGINEERING

March 24, 2014

Mr. Gene A. Miller
Henry River Golf Course, Inc.
P.O. Box 7605
Charlotte, NC 28241

Via E-mail and Certified Mail

Dear Mr. Miller,

As you know, Wildlands Engineering, Inc. ("WEI") entered into the purchase and sale agreement with Henry River Golf Course, Inc. for an approximate 49 acres of real property located at 2575 Mountain View Road, Hickory, North Carolina (the "Property"). As part of our process, and in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, we must notify you that WEI, as purchaser of the real estate, does not have the power of eminent domain. Therefore, WEI's purchase of the Property was negotiated on a voluntary basis between both parties. We must also notify you that our estimated fair market value for the property is $310,850.00, which is the price of the Property under the purchase and sale agreement. If you have any questions, please feel free to contact Lee Knight Caffery, WEI's General Counsel, at 704-332-7754 ex. 117.

Sincerely,

Robert Bugg
Wildlands Engineering, Inc.
rbugg@wildlandseng.com
o) 704-332-7754 ex. 105
m) 704-719-2100

cc: Lee Knight Caffery, Wildlands Engineering
Randall P. Bozard, Office Properties

WILDLANDS
ENGINEERING

February 25, 2014

Tyler Howe, Tribal Historic Preservation Specialist
Eastern Band of Cherokee Indians
Tribal Historic Preservation Office
PO Box 455
Cherokee, NC 28719

Subject: EEP stream and wetland mitigation project in Catawba County.
Henry Fork Stream and Wetland Mitigation Project

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 wetland and stream restoration project on the attached site (a USGS site map using the Hickory, NC 7.5 Minute Topographic Quadrangle is enclosed). An aerial photograph has also been attached. The figures show the area of potential ground disturbance. A similar letter has been sent to the North Carolina State Preservation Office for compliance with Section 106 of the Historic Preservation Act.

The Henry Fork Mitigation 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. No architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. The majority of the site has historically been disturbed due to the site being used as an active golf course.

We ask that you review this site based on the attached information to determine if you know of any existing resources that we need to know about. In addition, please let us know the level your future involvement with this project needs to be (if any).

We thank you in advance for your timely response and cooperation. Please feel free to contact the EEP Project Manager (Donnie Brew, 919-747-7017) with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

WILDLANDS
ENGINEERING

February 25, 2014

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

Subject: **Henry Fork Stream and Wetland Mitigation Site**
Catawba County, North Carolina

Dear Ms. Buncick,

The Henry Fork Stream and Wetland Mitigation Site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of stream channels throughout the site have been identified as significantly degraded as a result of the sites use as an active golf course.

We have already obtained an updated species list for Catawba County from your web site (http://www.fws.gov/raleigh/species/cntylist/nc_counties.html). The threatened or endangered species for this county are: the bald eagle (*Haliaeetus leucocephalus*) (BGPA), the dwarf-flowered heartleaf (*Ptilimnium nodosum*), and Schweinitz's sunflower (*Helianthus schweinitzii)*. We are requesting that you please provide any known information for each species in the county. 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.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds or other trust resources from the construction of a stream and wetland restoration project on the subject property. A USGS map showing the approximate area of potential ground disturbance is enclosed. The figure was prepared from the Hickory, 7.5-Minute USGS Topographic Quadrangle. An aerial map is also attached.

If we have not heard from you in 30 days we will assume that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 2/25/2014
Name of Project Henry Fork Stream and Wetland Mitigatic	Federal Agency Involved FHWA - NCEEP
Proposed Land Use Stream and Wetland Restoration	County and State Catawba County, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 03/03/2014 — Person Completing Form: Milton Cortes

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 N/A	Average Farm Size 98 acres
Major Crop(s) Corn	Farmable Land In Govt. Jurisdiction Acres: 87 % 229,021		Amount of Farmland As Defined in FPPA Acres: 73 % 191,761
Name of Land Evaluation System Used Catawba Co., NC LESA	Name of State or Local Site Assessment System N/A		Date Land Evaluation Returned by NRCS 03/10/2014

	Maximum Points	Site A	Site B	Site C	Site D
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		43.46			
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site		43.46			
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		21.20			
B. Total Acres Statewide Important or Local Important Farmland		0.03			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		0.0111			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		63			
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)		71			
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	7			
2. Perimeter In Non-urban Use	(10)	13			
3. Percent Of Site Being Farmed	(20)	0			
4. Protection Provided By State and Local Government	(20)	0			
5. Distance From Urban Built-up Area	(15)	5			
6. Distance To Urban Support Services	(15)	0			
7. Size Of Present Farm Unit Compared To Average	(10)	8			
8. Creation Of Non-farmable Farmland	(10)	0			
9. Availability Of Farm Support Services	(5)	5			
10. On-Farm Investments	(20)	0			
11. Effects Of Conversion On Farm Support Services	(10)	0			
12. Compatibility With Existing Agricultural Use	(10)	0			
TOTAL SITE ASSESSMENT POINTS	160	38	0	0	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	71	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	38	0	0	0
TOTAL POINTS ***(Total of above 2 lines)***	260	109	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

Andrea Eckardt

From:	Andrea Eckardt
Sent:	Monday, March 24, 2014 10:37 AM
To:	'Cortes, Milton - NRCS, Raleigh, NC'
Subject:	RE: Henry Fork
Attachments:	Henry Fork Stream and Wetland Mitigation Site AD1006-signed.pdf
Sensitivity:	Confidential

Milton-
Attached is the completed AD1006 form for the Henry Fork Stream and Wetland Mitigation Site for your files. I completed Parts 6 and 7.

Thanks for your help.

Andrea

Andrea S. Eckardt
Wildlands Engineering, Inc.
704-332-7754 ext 101

From: Cortes, Milton - NRCS, Raleigh, NC [mailto:Milton.Cortes@nc.usda.gov]
Sent: Monday, March 10, 2014 4:22 PM
To: Andrea Eckardt
Subject: RE: Henry Fork
Sensitivity: Confidential

Andrea:

Attached is the AD1006 for the Henry Fork Stream and Wetland Mitigation Site. The discrepancy on the final acres (total acres) is because we do not count "Water" when we run the evaluations. Total water was deleted.

If I can be of further assistance let me know.

Milton Cortés
Assistant State Soil Scientist/
NC NRCS Hispanic Special Emphasis Program Manager
USDA **Natural Resources Conservation Service**
4407 Bland Rd., Suite 117
Raleigh, NC 27609
(919) 873-2171/Fax (919) 873-2157
milton.cortes@nc.usda.gov
Helping People Help the Land...

From: Andrea Eckardt [mailto:aeckardt@wildlandseng.com]
Sent: Monday, March 03, 2014 10:30 AM
To: Cortes, Milton - NRCS, Raleigh, NC
Subject: Henry Fork
Sensitivity: Confidential

Milton-

WILDLANDS ENGINEERING

February 25, 2014

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

Subject: **Henry Fork Stream and Wetland Mitigation Site**
Catawba County, North Carolina

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 and wetland restoration project on the attached site. A USGS map and an aerial map showing the approximate area of potential ground disturbance are enclosed. The topographic figure was prepared from the Hickory, 7.5-Minute USGS Topographic Quadrangles.

The Henry Fork Mitigation Site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. There several stream channels located on the site that have been identified as significantly degraded as a result of the site's use as an active golf course.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

Attachment:
USGS Topographic Map
Aerial Map

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

14 March 2014

Andrea Eckardt, Senior Environmental Planner
Wildlands Engineering
1430 South Mint Street, Suite 104
Charlotte, North Carolina 28203

Subject: Henry Fork Stream and Wetland Mitigation Site, Catawba County

Dear Ms. Eckardt:

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the subject information. Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667e) and North Carolina General Statutes (G.S. 113-131 et seq.).

The proposed project would provide in-kind mitigation for unavoidable stream and wetland impacts. Several stream channels have been identified as significantly degraded due to the site's use as an active golf course. The project site includes Henry Fork and unnamed tributaries to Henry Fork in the Catawba River basin. Also, there are four ponds within the project boundaries.

It is unclear whether the ponds will be removed during restoration activities. Removing the dams for each of these ponds would improve hydrology within the watershed and reconnect aquatic habitat. Stream restoration projects often improve water quality and aquatic habitat. Establishing native, forested buffers in riparian areas will help protect water quality, improve aquatic and terrestrial habitats, and provide a travel corridor for wildlife species. Provided measures are taken to minimize erosion and sedimentation from construction/restoration activities, we do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources.

Thank you for the opportunity to review this proposed project. If we can provide further assistance, please contact our office at (336) 449-7625 or shari.bryant@ncwildlife.org.

Sincerely,

Shari L Bryant

Shari L. Bryant
Piedmont Region Coordinator
Habitat Conservation Program

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

Henry Fork Stream and Wetland Mitigation Site

Categorical Exclusion

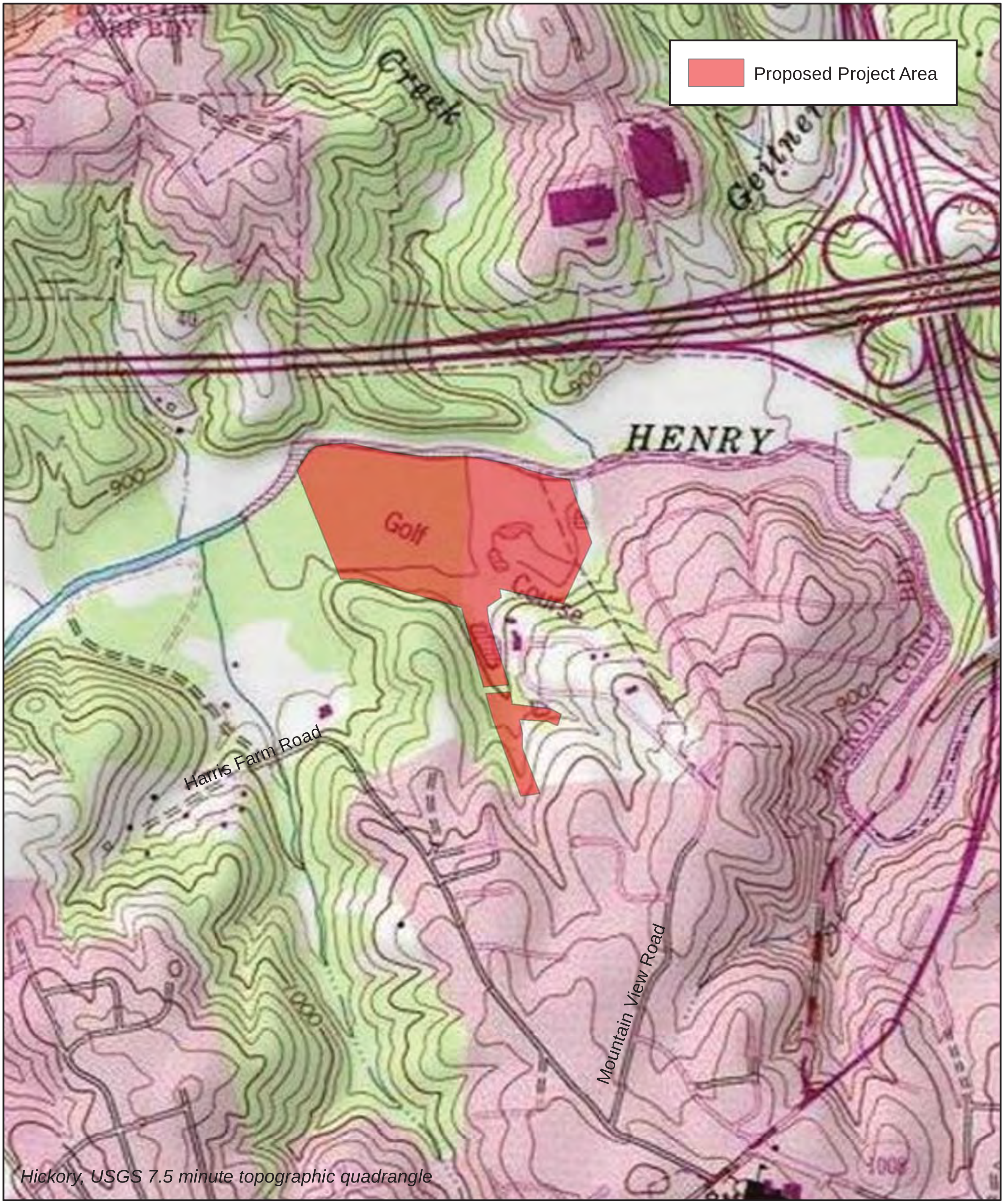
Figures

WILDLANDS ENGINEERING

0 150 300 Feet

N

Site Map
Henry Fork Stream & Wetland Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

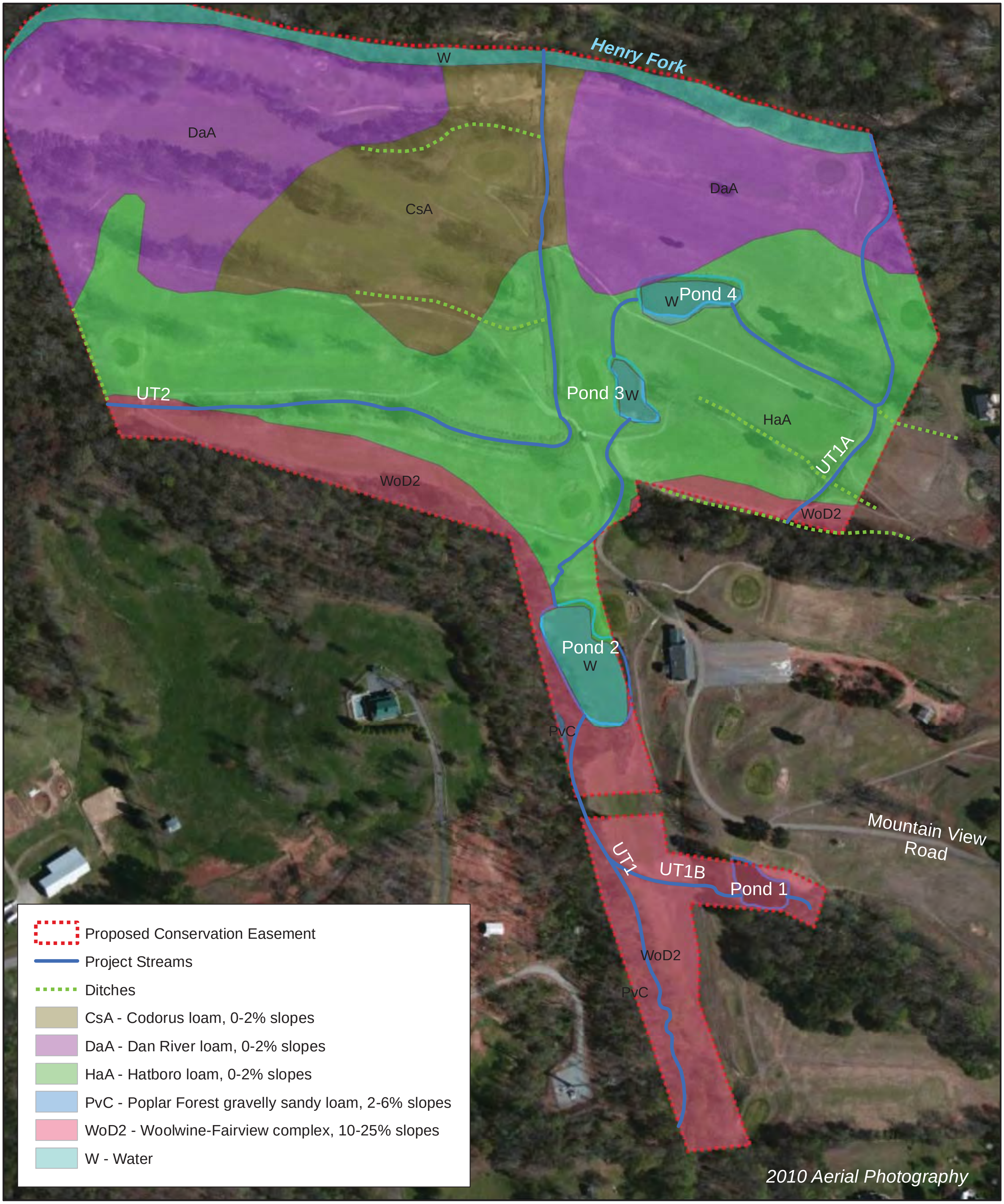


WILDLANDS
ENGINEERING

0 600 1,200 Feet

N

USGS Topographic Map
Henry Fork Stream & Wetland Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC



WILDLANDS ENGINEERING

0 150 300 Feet

N

Soils Map
Henry Fork Stream & Wetland Mitigation Site
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

WILDLANDS
ENGINEERING

May 7, 2015

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

Subject: **Henry Fork Stream and Wetland Mitigation Site**
Division of Mitigation Services Full Delivery Project
Catawba County, North Carolina

Dear Ms. Buncick,

The purpose of this letter is to request comment from the USFWS with regard to the recent status change of the Northern long-ear bat (*Myotis septentrionalis)* and the Henry Fork Stream and Wetland Mitigation Site. Construction of the project, located at Latitude: 35°42'8.77"N; Longitude: 81°21'52.84"W, is scheduled to begin August 2015.

Currently, we have an approved Categorical Exclusion from DMS (formerly EEP). We are in the process of obtaining the necessary 401/404 permits for this stream restoration project. We had not received any previous comments from your office with regard to the listed species referenced in our original letter to USFWS dated February 25, 2014.

Please review the attached map, which indicates the .57 acre area to be cleared of trees during construction and provide comments on any possible issues that might emerge with respect to the newly listed bat and this particular stream and wetland restoration project. If we have not heard from you in 30 days we will assume that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Ruby Davis
Environmental Scientist

Attachment:
NLEB Disturbance map

WILDLANDS ENGINEERING

Henry Fork Stream & Wetland Mitigation Site
NLEB Disturbance Map
Catawba River Basin
(03050103 Expanded Service Area)
Catawba County, NC

Andrea Eckardt

From: Ruby Davis
Sent: Friday, June 05, 2015 1:23 PM
To: Andrea Eckardt
Cc: Jake McLean
Subject: Fw: Henry Fork Stream and Wetland Mitigation Site.

Received response from USFWS. See below.

Ruby

From: Tompkins, Bryan <bryan_tompkins@fws.gov>
Sent: Friday, June 5, 2015 12:56:43 PM
To: Ruby Davis
Subject: Re: Henry Fork Stream and Wetland Mitigation Site.

Hey Ruby! Hope you are well.
I've looked over the proposal for the Henry Fork Stream and Mitigation site. Because 1) the limited suitable habitat; 2) the minimal amount of clearing associated with the project (.57 acre); and 3) the fact that construction will not begin until August, the USFWS believes that "not likely to adversely affect" is the proper determination for the project in regards to northern long eared bat (currently federally listed as a threatened species). The USFWS has no objection to the proposed actions and support any efforts to restore and protect the water quality in the project area. Therefore, we believe the requirements under section 7 of the Act are fulfilled. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.
If you have any questions or if I can be of any assistance please contact me and reference project file #15-295.
Have a great weekend!
Thanks,

Bryan Tompkins
US Fish and Wildlife Service
160 Zillicoa Street
Asheville, North Carolina 28801
828/258-3939 ext.240

On Fri, Jun 5, 2015 at 7:28 AM, Ruby Davis <rdavis@wildlandseng.com> wrote:

> Good morning Bryan,
>
> Wanted to follow up with you about our Henry Fork project. Were there any concerns or issues after reviewing our letter and map that was sent on May 7th?
>
> Thanks.

Ruby

From: Ruby Davis
Sent: Thursday, May 7, 2015 3:37 PM
To: bryan_tompkins@fws.gov
Subject: Henry Fork Stream and Wetland Mitigation Site.

Please review our attached letter and map for comment.
Thank you.

Ruby M. Davis | *Environmental Scientist*
O: 704.332.7754 x119 **M**: 704.877.3037

Wildlands Engineering, Inc.
1430 S. Mint St, Suite 104
Charlotte, NC 28203

Appendix 8: Project Site Stream Forms (NCDWR Stream Identification Forms and USACE Stream Assessment Forms)

NC DWQ Stream Identification Form Version 4.11

Date: 8-21-13	Project/Site: Henry Fork	Latitude: 35.698681°N
Evaluator: I. Eckardt	County: Catawba	Longitude: 81.363487°W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 39.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	Other *e.g. Quad Name:* SCP1 UT1 Upstream

(Reach 1 Upr & Lwr)

A. Geomorphology (Subtotal = 20)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 11)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

- Observed 3+ salamanders & 3+ crayfish.
- Macros included several mayflys, one caddisfly, & several aquitic worms

NC DWQ Stream Identification Form Version 4.11

Date: 8/21/13	**Project/Site:** Henry Fork	**Latitude:** 35.703709°N
Evaluator: I. Eckardt	**County:** Catawba	**Longitude:** 81.362344°W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 32.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** SCP2 - UT1 *e.g. Quad Name:* Downstream

(Reach 2)

A. Geomorphology (Subtotal = 11.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 11)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 10)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 8-21-13	**Project/Site:** Henry Fork	**Latitude:** 35.703036°N
Evaluator: I. Eckardt	**County:** Catawba	**Longitude:** 81.364689°W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 27	**Stream Determination (circle one)** Ephemeral **Intermittent** Perennial	**Other** *e.g. Quad Name:* SCP 3 - UT2

A. Geomorphology (Subtotal = 7.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9.5)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

10+ tadpoles

NC DWQ Stream Identification Form Version 4.11

Date: 8-21-13	Project/Site: Henry Fork	Latitude: 35.699799°N
Evaluator: I. Eckardt	County: Catawba	Longitude: 81.363559°W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 31.25	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** SCP4-UT1B *e.g. Quad Name:*

A. Geomorphology (Subtotal = 13.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = ______)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch: Observed hydropsychid nets (caddisfly) on boulder/bedrock substrate.

NC DWQ Stream Identification Form Version 4.11

Date: 9/3/13	Project/Site: Henry Fork	Latitude: 35.702161°N
Evaluator: I. Eckardt	County: Catawba	Longitude: 81.362688°W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 27.25	**Stream Determination (circle one)** **Ephemeral Intermittent Perennial**	**Other** *e.g. Quad Name:* SCP5-UT1A

A. Geomorphology (Subtotal = ________)	Absent	Weak	Moderate	Strong
1[a]. Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = ________)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = ________)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

OFFICE USE ONLY: USACE AID#________________ DWQ #________________

SCP 1 – UT1 to Henry Fork (Upstream Reach - Perennial)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering, Inc
2. Evaluator's Name: Ian Eckardt
3. Date of Evaluation: 4/3/2014
4. Time of Evaluation: 9:00 AM
5. Name of Stream: UT1 to Henry Fork
6. River Basin: Catawba 03050103
7. Approximate Drainage Area: 130 Acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Catawba
11. Location of reach under evaluation (include nearby roads and landmarks): From the junction of I-40 and US-321, in Hickory, NC travel south on US-321 to Exit 42, NC-127. Take a right onto NC-127 and continue to the first stop light at Fleetwood Drive. Take a right onto Fleetwood Drive and continue 0.2 miles to stop sign. Take right onto Mountain View Road and continue 0.5 miles to end of road at project site.
12. Site Coordinates (if known): N 35.698681°, W 81.363487°
13. Proposed Channel Work (if any): restoration
14. Recent Weather Conditions: Small amount of recent rainfall in previous 48 hours.
15. Site conditions at time of visit: partly sunny, 75°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:__
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: 50 % Residential ___% Commercial ___% Industrial ___% Agricultural 25 % Forested ___% Cleared / Logged 25 % Other (golf course)
21. Bankfull Width: 5-10'
22. Bank Height (from bed to top of bank): 3-5'
23. Channel slope down center of stream: ___Flat (0 to 2%) X Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)
24. Channel Sinuosity: ____Straight X Occasional Bends ___Frequent Meander ___Very Sinuous ___Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 54 **Comments:**________________

Evaluator's Signature Ian Eckardt **Date** 4/7/14

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	0
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	3
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	4
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	3
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	3
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				54

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#________________________ DWQ #______________________________

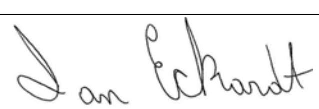
SCP 2 – UT1 to Henry Fork (Downstream Reach - Perennial)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering, Inc
2. Evaluator's Name: Ian Eckardt
3. Date of Evaluation: 4/3/2014
4. Time of Evaluation: 10:00 AM
5. Name of Stream: UT1 to Henry Fork
6. River Basin: Catawba 03050103
7. Approximate Drainage Area: 130 Acres
8. Stream Order: Second
9. Length of Reach Evaluated: 200 lf
10. County: Catawba
11. Location of reach under evaluation (include nearby roads and landmarks): From the junction of I-40 and US-321, in Hickory, NC travel south on US-321 to Exit 42, NC-127. Take a right onto NC-127 and continue to the first stop light at Fleetwood Drive. Take a right onto Fleetwood Drive and continue 0.2 miles to stop sign. Take right onto Mountain View Road and continue 0.5 miles to end of road at project site.
12. Site Coordinates (if known): N 35.703709°, W 81.362344°
13. Proposed Channel Work (if any): restoration
14. Recent Weather Conditions: Small amount of recent rainfall in previous 48 hours.
15. Site conditions at time of visit: partly sunny, 75°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: 0.5 acres
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: 25 % Residential ____% Commercial ____% Industrial ___% Agricultural 10 % Forested ____% Cleared / Logged 65 % Other (golf course)
21. Bankfull Width: 15-20'
22. Bank Height (from bed to top of bank): 4-6'
23. Channel slope down center of stream: X Flat (0 to 2%) ____Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ____Straight X Occasional Bends ___Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 44 **Comments:**______________________________

Evaluator's Signature  **Date** 4/7/14

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	2
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	4
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	1
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	0
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	4
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	1
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	3
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				44

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY:	USACE AID#__________	DWQ #__________

SCP 3 – UT2 to Henry Fork (Intermittent)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering, Inc
2. Evaluator's Name: Ian Eckardt
3. Date of Evaluation: 4/3/2014
4. Time of Evaluation: 11:00 AM
5. Name of Stream: UT2 to Henry Fork
6. River Basin: Catawba 03050103
7. Approximate Drainage Area: 66 Acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Catawba
11. Location of reach under evaluation (include nearby roads and landmarks): From the junction of I-40 and US-321, in Hickory, NC travel south on US-321 to Exit 42, NC-127. Take a right onto NC-127 and continue to the first stop light at Fleetwood Drive. Take a right onto Fleetwood Drive and continue 0.2 miles to stop sign. Take right onto Mountain View Road and continue 0.5 miles to end of road at project site.
12. Site Coordinates (if known): N 35.703036°, W 81.364689°
13. Proposed Channel Work (if any): enhancement
14. Recent Weather Conditions: Small amount of recent rainfall in previous 48 hours.
15. Site conditions at time of visit: partly sunny, 75°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:________
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: 10 % Residential ____% Commercial ____% Industrial 10 % Agricultural 20 % Forested ____% Cleared / Logged 60 % Other (golf course)
21. Bankfull Width: 15-20'
22. Bank Height (from bed to top of bank): 4-6'
23. Channel slope down center of stream: X Flat (0 to 2%) ____Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: X Straight ____Occasional Bends ___Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 43 **Comments:**__________

Evaluator's Signature Ian Eckardt **Date** 4/7/14

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	3
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	2
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	4
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	1
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	0
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	4
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	4
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	0
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	1
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	2
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	3
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				43

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#________________________ DWQ #____________________________

SCP 4 – UT1B to Henry Fork (Perennial)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering, Inc
2. Evaluator's Name: Ian Eckardt
3. Date of Evaluation: 4/3/2014
4. Time of Evaluation: 1:00 PM
5. Name of Stream: UT1B to Henry Fork
6. River Basin: Catawba 03050103
7. Approximate Drainage Area: 31 Acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Catawba
11. Location of reach under evaluation (include nearby roads and landmarks): From the junction of I-40 and US-321, in Hickory, NC travel south on US-321 to Exit 42, NC-127. Take a right onto NC-127 and continue to the first stop light at Fleetwood Drive. Take a right onto Fleetwood Drive and continue 0.2 miles to stop sign. Take right onto Mountain View Road and continue 0.5 miles to end of road at project site.
12. Site Coordinates (if known): N 35.699799°, W 81.363559°
13. Proposed Channel Work (if any): restoration
14. Recent Weather Conditions: Small amount of recent rainfall in previous 48 hours.
15. Site conditions at time of visit: partly sunny, 75°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: 0.25 acres
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: 10 % Residential ____% Commercial ____% Industrial ___% Agricultural 20 % Forested ____% Cleared / Logged 70 % Other (golf course)
21. Bankfull Width: 4-6'
22. Bank Height (from bed to top of bank): 2-3'
23. Channel slope down center of stream: X Flat (0 to 2%) ____Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: X Straight ____Occasional Bends ___Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 49 **Comments:**____

Evaluator's Signature Ian Eckardt **Date** 4/7/14

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	1
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	3
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	3
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	2
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	2
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	1
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	3
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				49

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#______________________ DWQ #__________________________

SCP 5 – UT1A to Henry Fork (Intermittent)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering, Inc
2. Evaluator's Name: Ian Eckardt
3. Date of Evaluation: 4/3/2014
4. Time of Evaluation: 2:00 PM
5. Name of Stream: UT1A to Henry Fork
6. River Basin: Catawba 03050103
7. Approximate Drainage Area: 23 Acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Catawba
11. Location of reach under evaluation (include nearby roads and landmarks): From the junction of I-40 and US-321, in Hickory, NC travel south on US-321 to Exit 42, NC-127. Take a right onto NC-127 and continue to the first stop light at Fleetwood Drive. Take a right onto Fleetwood Drive and continue 0.2 miles to stop sign. Take right onto Mountain View Road and continue 0.5 miles to end of road at project site.
12. Site Coordinates (if known): N 35.702161°, W 81.362688°
13. Proposed Channel Work (if any): enhancement
14. Recent Weather Conditions: Small amount of recent rainfall in previous 48 hours.
15. Site conditions at time of visit: partly sunny, 75°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:__________
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: 15 % Residential ____% Commercial ____% Industrial ___% Agricultural 20 % Forested ____% Cleared / Logged 65 % Other (golf course)
21. Bankfull Width: 5-10'
22. Bank Height (from bed to top of bank): 2-3'
23. Channel slope down center of stream: X Flat (0 to 2%) ____Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: X Straight ____Occasional Bends ___Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 49 **Comments:**______________________________________

Evaluator's Signature Ian Eckardt **Date** 4/7/14

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	0
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	1
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	4
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	0
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	4
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	4
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	4
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	0
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				49

* These characteristics are not assessed in coastal streams.

Appendix 9: EEP Floodplain Requirements Checklist

EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Henry Fork Mitigation Site
Name if stream or feature:	UT to Henry Fork (multiple)
County:	Catawba County
Name of river basin:	Catawba, HUC 03050102010030
Is project urban or rural?	Urban
Name of Jurisdictional municipality/county:	City of Hickory (ETJ)* *City has verified that they hold jurisdiction
DFIRM panel number for entire site:	2791J (Henry Fork)
Consultant name:	Wildlands Engineering
Phone number:	828-545-3865
Address:	15 Possum Trot, Suite 1 Asheville, NC 28806

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1” = 500”.

Summarize stream reaches or wetland areas according to their restoration priority.

Wildlands Engineering, Inc. (Wildlands) is completing a full-delivery project for the North Carolina Ecosystem Enhancement Program (EEP) to restore and enhance 5,683 linear feet (LF) of perennial streams, enhance 0.68 acres of existing wetlands, rehabilitate 0.25 acres of existing wetlands, and re-establish 3.71 acres of wetlands in Catawba County, NC. The streams proposed for restoration include four unnamed tributaries to Henry Fork, as shown on Figures 9 & 10 on the site of the former Henry River Golf Course.

Henry Fork is mapped in a Zone AE Special Flood Hazard Area (SFHA) on Catawba County Flood Insurance Rate Map Panel 2791J. Base flood elevations have been defined and non-encroachment limits have been published in the Catawba County Flood Insurance Study (FIS). UT1, UT1A, and UT2 do not have designated SFHAs but do lie fully or partially within the SFHA of Henry Fork. UT1B does not have a designated SFHA and does not lie within the SFHA of Henry Fork.

Reach	**Length**	**Priority**
UT1, Reach 1	1471 LF	Priority 1 Restoration
UT1, Reach 2	1169 LF	Priority 1 Restoration[1]
UT2	1969 LF	Priority 1 Restoration[1]
UT1A	657 LF	Priority 1 Restoration[1]
UT1B	358 LF	Priority 1 Restoration

[1] Priority 1 restoration on these streams involves a hybrid approach. Wetland re-establishement grading adjacent to these stream reaches involves removal of fill soil overburden. This floodplain lowering is characteristic of a Priority 2 technique. However, because of the extensive area of fill, the new floodplain and wetlands through which these channels run will be wide, and characteristic of natural alluvial valleys, achieving what is in effect Priority 1 restoration.

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

(●) Yes ( ) No

If project is located in a SFHA, check how it was determined:

- [ ] Redelineation
- [x] Detailed Study
- [ ] Limited Detail Study
- [ ] Approximate Study
- [ ] Don't know

List flood zone designation:

Check if applies:

☑ AE Zone

◉ Floodway

○ Non-Encroachment

○ None

☐ A Zone

○ Local Setbacks Required

○ No Local Setbacks Required

If local setbacks are required, list how many feet:

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

◉ Yes ○ No

Land Acquisition (Check)

☐ State owned (fee simple)

☐ Conservation easment (Design Bid Build)

☑ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

◉ Yes ○ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000)

Name of Local Floodplain Administrator: Mr. Cal Overby (Hickory has jurisdiction)
Phone Number: (828) 323-7422

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

☐ No Action

☑ No Rise

☐ Letter of Map Revision

☐ Conditional Letter of Map Revision

☐ Other Requirements

List other requirements: Local floodplain development permit application to be filed with no-rise certification and flood impact assessment report. Flood reductions are less than 0.1' change from existing conditions. There are no proposed changes to the floodway or channel alignment on the studied stream.

Comments:

Name: Jacob McLean Signature: ____________________

Title: Water Resources Engineer, PE, CFM Date: 3/4/2015

Appendix 10: Dredge Sampling Results for Golf Course Pond Sediments

Summary and Conclusions

At the request of Interagency Review Team, surface sediment samples were collected from pond beds at the Henry Fork Mitigation site. The site, located in Hickory, Catawba County, North Carolina, was a golf course facility from 1978 to 2012. Concerns of previous land use practices and potential sediment contamination is the reason for collection.

Collection occurred on Wednesday, September 10, 2014 between 12:00pm and 3:30pm. The ambient temperature was approximately 78 degrees Fahrenheit and partly cloudy. The surface samples were collected from Ponds 1, 2, 3, and 4 located within the site (Figure 2).

Equipment used for collection consisted of a Ponar Type Grab Sampler, hand trowel and five gallon bucket. The hand dredge was submerged in the two deeper ponds (Ponds 2 and 4) and a hand trowel was used with the two shallow ponds (Ponds 1 and 3). For a thorough collection, the hand dredge was submerged multiple times in deep areas at different points of the ponds. Hand trowel samples were collected throughout the shallow pond bottoms at different points.

Samples collected at each pond were placed in the bucket and mixed to distribute evenly. The bucket was rinsed between each pond collection. The sediment samples were sealed in glass jars for lab submission. Each jar was documented with the date and time of collection and placed in a cooler to preserve.

The sample kit was submitted to Prism Laboratories, Inc. in Charlotte, North Carolina at approximately 5:00pm the day of collection. Method 8081B (Organochlorine pesticides by gas chromatography) was conducted to exam the samples. The results did not reflect any pesticide contamination.

Appendix 11: Meeting Minutes of Interagency Review Team (IRT) Site Walk 3/17/2014 and Email Clarification

March 18, 2014

Mr. Todd Tugwell
Special Projects Manager, Regulatory Division
U.S. Army Corps of Engineers - Wilmington District
11405 Falls of Neuse Road
Wake Forest, NC 27587
sent via e-mail: Todd.Tugwell@usace.army.mil

RE: Henry Fork Mitigation Site
Meeting Minutes of IRT Site Walk 3/17/2014
Catawba River Basin Cataloging Unit 03050103 Expanded Service Area; Catawba County, NC

Dear Mr. Tugwell,

This letter is a follow up to our site walk with EEP and the Interagency Review Team (IRT) at the Henry Fork Mitigation Site on Monday, March 17, 2014. The following representatives attended the site walk:

USACE: Todd Tugwell, David Brown, Scott Jones, Tasha McCormick
USEPA: Todd Bowers
USFWS: Marella Buncick
NCDENR: Eric Kulz
NC EEP: Mike McDonald, Harry Tsomides, Paul Weisner (EEP PM), Guy Pearce, Mac Haupt
Wildlands Engineering: John Hutton, Shawn Wilkerson (Project Principal), Jake McLean (PM)

The group walked the site and discussed the proposed restoration approaches outlined in Wildlands Engineering's technical proposal dated September 12, 2013. Particular discussions around stream and wetland jurisdiction and mitigation treatment types included:

1. Stream restoration and enhancement 1 credit will be pursued as stated in the Wildlands Proposal. While streams UT2 and UT1A will be fully restored, enhancement I credit is proposed. These components will be part of stream-wetland complexes and may have a more intermittent hydrologic regime.

2. Wetland restoration will be pursued as stated in the Wildlands Proposal. All agencies were in agreement that pursuing wetland restoration was appropriate given the history of site grading and manipulation associated with the past agricultural practices and golf course construction. It was discussed that overburden depths vary across the site but typically range from 6"-24". Soil cores were examined and there was agreement that soil profiles generally matched the

description from the soil scientist's report included with the proposal. More detailed soil analysis grid work will dictate grading depth.

3. There was no concern expressed with conversion of ponds to stream habitat in terms of regulatory impacts. However, the concern for deleterious sediments (from prior potential herbicide/pesticide application) to be released or re-exposed from pond removal was raised. It was agreed that a prudent course of action would be to test pond sediments and incorporate findings into the design approach, and document the same in the mitigation plan.

4. There were no objections to either of the two alternatives presented for UT1. There was some agreement that the option that parallels Wetland 1 may be preferable to reduce site grading and compaction (under present conditions, this area is topographically more suitable to routing the stream through). Wildlands intends to pursue this option.

   The downstream tie-in of this option (below where UT1 and UT1A) is more flexible now that the property has been surveyed and the existing stream was found to be entirely within the parcel.

5. Wildlands stated that native wetland vegetation transplants will be used in lieu of coir fiber matting wherever possible.

6. Wildlands stated that a 100' buffer will be planted along the Henry Fork. Other areas outside of the buffer and required stream and wetland buffers will be allowed re-vegetate naturally.

7. USACE recommended that a plan for siting of monitoring wells be included as information provided in the mitigation plan.

8. USACE recommended that newer guidance allowing for buffers in excess of the minimum to be given additional (stream) credit or an enhanced ratio would be applicable to this site. (The plan is to place the entire site under conservation easement).

If you have any questions or revisions to these meeting notes, please contact me at jmclean@wildlandseng.com or 828-545-3865.

Sincerely,

Jacob P. McLean

Jacob P. McLean, PE, CFM
Project Manager

cc:
Todd Tugwell, USACE; David Brown, USACE; Scott Jones, USACE; Tasha McCormick, USACE; Todd Bowers, USEPA; Mike McDonald, NC EEP; Harry Tsomides, NC EEP; Paul Weisner, NC EEP; Guy Pearce, NC EEP; Mac Haupt, NC EEP; Marella Buncick, USFWS; Eric Kulz, NCDENR; John Hutton, Wildlands Engineering; Shawn Wilkerson, Wildlands Engineering

From:	Tugwell, Todd SAW
To:	Jake McLean; marella_buncick@fws.gov; eric.kulz@ncdenr.gov; Mac.Haupt@ncdenr.gov; Mike.McDonald@ncdenr.gov; Guy.Pearce@ncdenr.gov; bowers.todd@epa.gov; Brown, David W SAW; Harry.Tsomides@ncdenr.gov; Paul.Wiesner@ncdenr.gov; McCormick, Tasha L SAW; Jones, Scott SAW
Cc:	Shawn Wilkerson; John Hutton; Crumbley, Tyler SAW
Subject:	RE: IRT Site Visit Henry Fork 3-17-14 (UNCLASSIFIED)
Date:	Wednesday, March 19, 2014 12:57:15 PM

Classification: UNCLASSIFIED
Caveats: NONE

Jake, the minutes look good to me. I would like to expand on one thing, which is the comment on allowing additional credits for wider stream buffers. It may be possible to increase stream credits for wider buffers (in excess of 75 per the most recent version), but this would not apply to streams that are part of a wetland complex (where the adjacent wetland is already generating credit) or streams that only have an easement on one side. Also, keep in mind that the applicable guidance is still in its draft form, so we would need to approve the method used to determine the widths and appropriate increase as a case-by-case approval for this site. This would also be subject to IRT comment during the mitigation plan review process. If you do not have the most recent tables showing buffer widths and credit increases, please let me know.

Thanks,

Todd Tugwell
Special Projects Manager
Wilmington District, US Army Corps of Engineers
11405 Falls of the Neuse Road
Wake Forest, NC 27587
Office: 919-846-2564
Mobile: 919-710-0240

-----Original Message-----
From: Jake McLean [mailto:jmclean@wildlandseng.com]
Sent: Tuesday, March 18, 2014 10:13 AM
To: Tugwell, Todd SAW; marella_buncick@fws.gov; eric.kulz@ncdenr.gov; Mac.Haupt@ncdenr.gov; Mike.McDonald@ncdenr.gov; Guy.Pearce@ncdenr.gov; bowers.todd@epa.gov; Brown, David W SAW; Harry.Tsomides@ncdenr.gov; Paul.Wiesner@ncdenr.gov; McCormick, Tasha L SAW; Jones, Scott SAW
Cc: Shawn Wilkerson; John Hutton; Jake McLean
Subject: [EXTERNAL] IRT Site Visit Henry Fork 3-17-14

Here are yesterday's meeting minutes for your review and reference

Thanks,

Jake McLean, PE, CFM

Water Resources Engineer

Asheville Team Leader

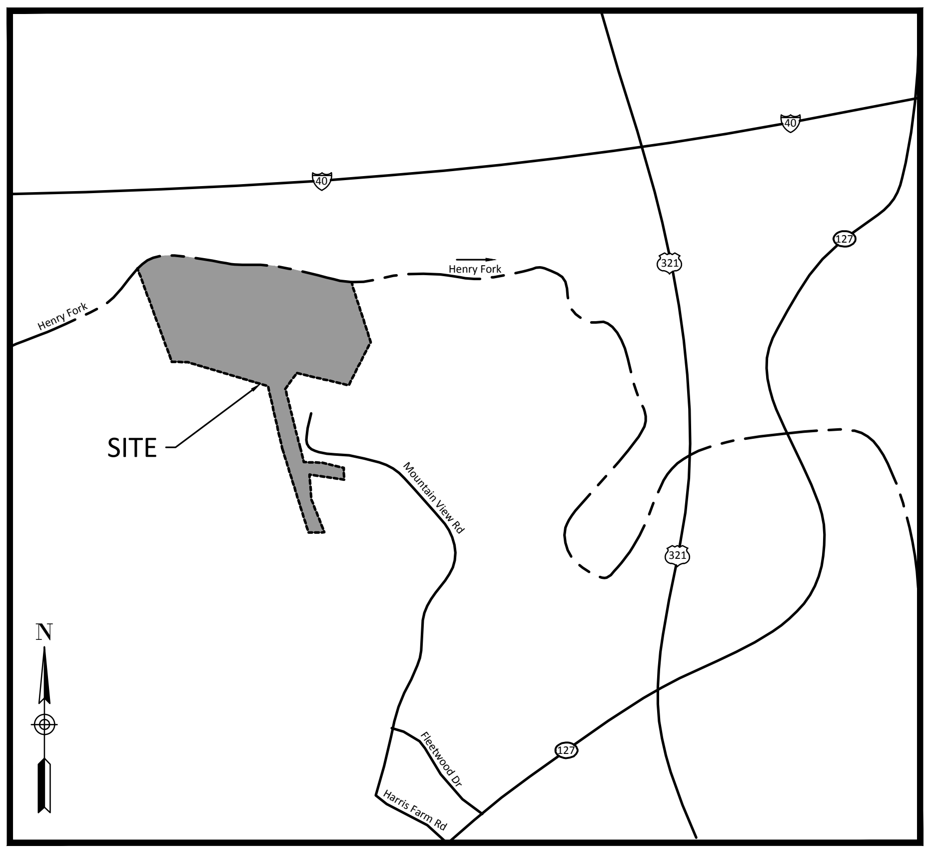
Henry Fork Mitigation Site

Catawba County, North Carolina

for

NC DENR

Division of Mitigation Services



Vicinity Map
Not to Scale

BEFORE YOU DIG!
CALL 1-800-632-4949
N.C. ONE-CALL CENTER
IT'S THE LAW!

BIDDING SET
ISSUED JULY 31, 2015

Sheet Index

Project Directory

Engineering:
Wildlands Engineering, Inc
License No. F-0831
167-B Haywood Rd
Asheville, NC 28806
Jake McLean, PE, CFM
828-774-5547

Surveying:
Kee Mapping and Surveying
111 Central Avenue
Asheville, NC 28801
Brad Kee, PLS
828-645-8275

Owner:
NC DENR Division of Mitigation Services
5 Ravenscroft Dr, Suite 102
Asheville, NC 28801
DMS Project Manager:
Matthew Reid
828-231-7912

DENR Contract No. 5782

DMS ID No. 96306

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

Title Sheet

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 0.1

August 25, 2015

Existing Features

- Existing Property Line
- Right of Way
- Existing Major Contour (5' Interval) (contour labels not shown on overview sheets) — 100
- Existing Minor Contour (contour labels may be shown in flatter areas)
- Existing Top of Bank — TB
- Existing Overhead Electric — OHE
- Existing Easement
- Existing Fence — X
- Existing Trail
- FEMA Floodplain — FEMA FP
- FEMA Floodway — FEMA FW
- Existing Tree Line
- Existing Golf Cart Path
- Existing Wetland
- Existing Tree
- Existing Power Pole
- Henry Fork (Open Water)
- Existing Building

Proposed Features

- Temporary Construction Easement — TCE
- Conservation Easement / Property Line — CE/PL
- Proposed Thalweg Alignment — 10+00
- Proposed Bankfull
- Proposed Major Contour (5' Interval) — 100
- Proposed Minor Contour — 101
- Temporary Construction Easement — TCE
- Proposed Floodplain Pilot Channel — 1/6.4
- Proposed Tree Removal
- Proposed Tree Protection — SAF
- Proposed Post Project Parking Area
- Proposed Wetland Re-establishment
- Proposed Wetland Rehabilitation
- Proposed Wetland Enhancement
- Proposed Channel Plug — 3/6.4
- Demolition of Existing Cart Path

Stream Features (NTS)

2/6.3	Proposed Rock Step
1/6.3, 3/6.3, 4/6.3	Proposed Log Step
4/6.2	Proposed Root Wad
1/6.2	Proposed Brush Toe
2/6.4	Proposed Ephemeral Pool
3/6.2	Proposed Lunker Log
3/6.1	Log Vane

Stream Features (NTS)

1/6.0	CR-CR	Constructed Riffle
2/6.0	CR-WR	Woody Riffle
3/6.0	CR-JZ	Jazz Riffle
4/6.0	CR-CH	Chunky Riffle
1/6.1	CR-BR	Brush Riffle
2/6.1	CR-RR	Rock and Roll Riffle
4/6.1	CASC	Log-Rock Cascade Riffle

Proposed Constructed Riffle Varies.

Erosion Control (NTS)

2/6.6	Proposed Construction Entrance
3/6.1	Proposed Access Roads
4/6.6, 6/6.6	Silt Fence / Straw Wattle*
2,3/6.7	Temporary Stream Crossings
5/6.4	Safety Fence
	Permanent Disposal Area
5/6.6	Proposed Check Dam

* Straw Wattles may be substituted for silt fence at the toe of fill slopes 3:1 or gentler and also in sensitive areas, such as adjacent to wetlands, where trenching is more invasive. Areas subject to larger drainage areas or greater potential for sediment load shall use silt fence.

PROJECT NOTES:

Topographic survey was completed by Kee Mapping and Survey on June 2, 2014. Boundary survey provided by Bradshaw Surveying Company dated March 18, 2014.

WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

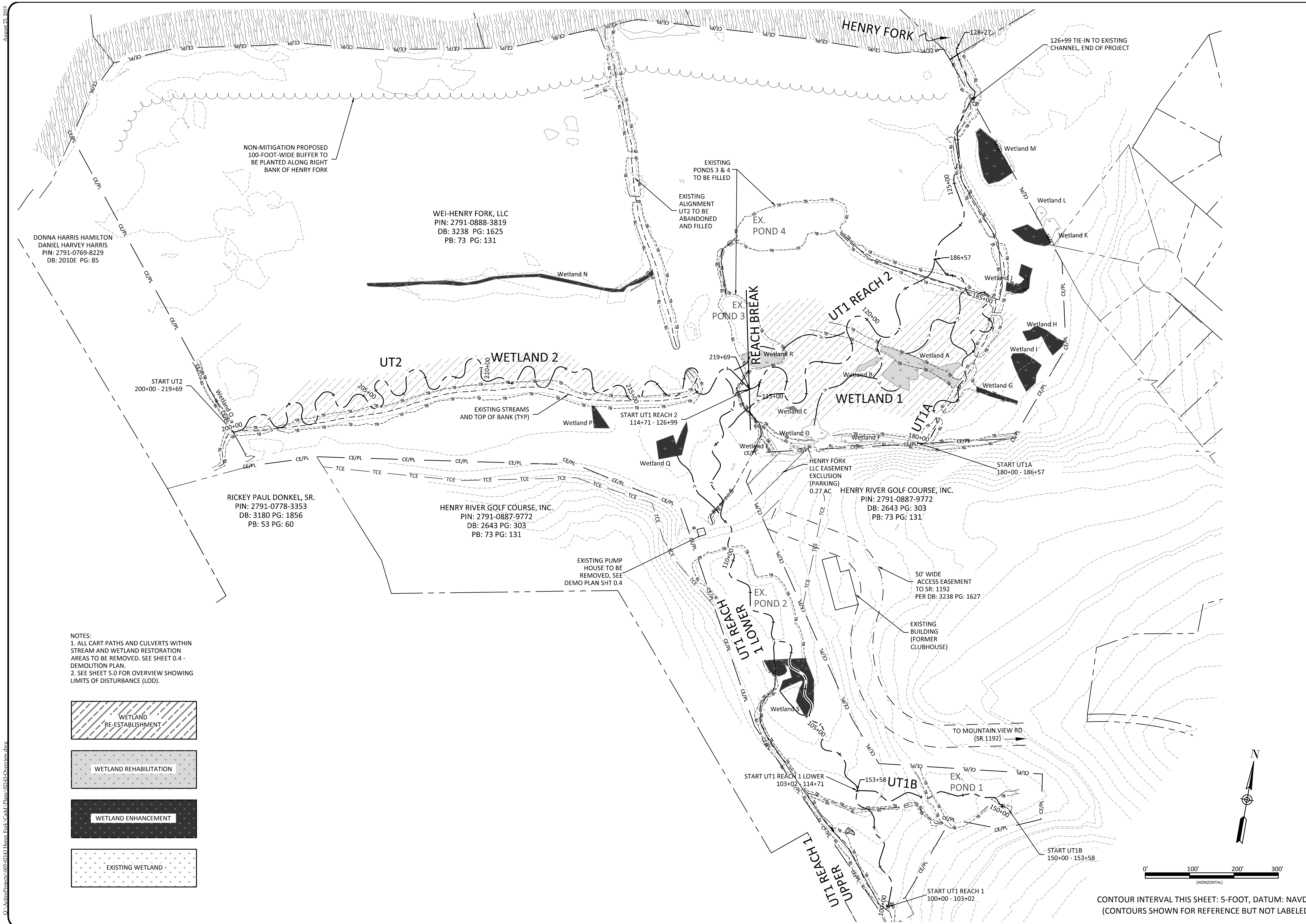
NORTH CAROLINA PROFESSIONAL SEAL 033578 ENGINEER JACOB McLEAN

Henry Fork Mitigation Site
Catawba County, North Carolina
General Notes and Symbols

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

0.2
Sheet



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

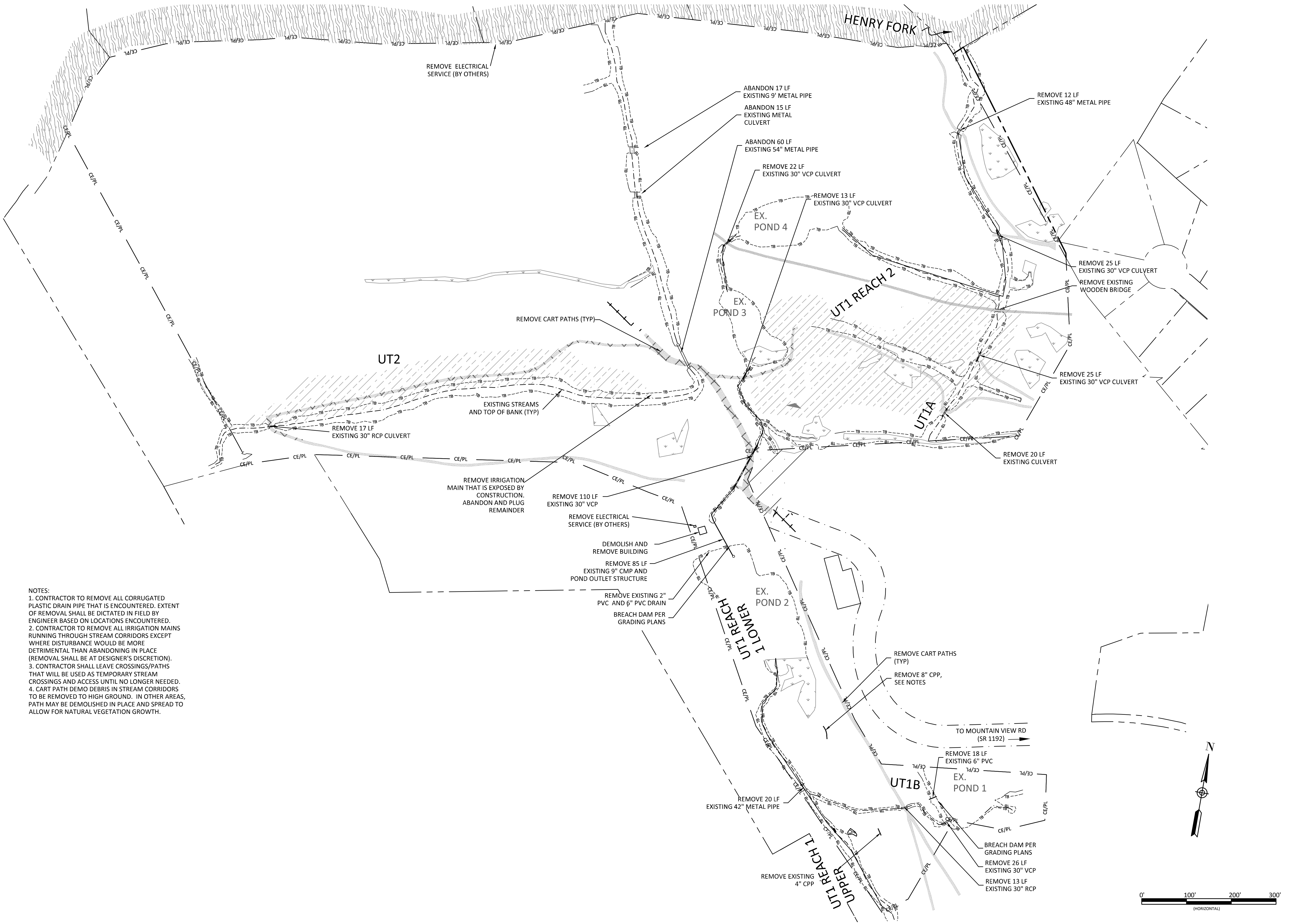
Henry Fork Mitigation Site
Catawba County, North Carolina

Project Components
Project Overview

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 0.3



NOTES:
1. CONTRACTOR TO REMOVE ALL CORRUGATED PLASTIC DRAIN PIPE THAT IS ENCOUNTERED. EXTENT OF REMOVAL SHALL BE DICTATED IN FIELD BY ENGINEER BASED ON LOCATIONS ENCOUNTERED.
2. CONTRACTOR TO REMOVE ALL IRRIGATION MAINS RUNNING THROUGH STREAM CORRIDORS EXCEPT WHERE DISTURBANCE WOULD BE MORE DETRIMENTAL THAN ABANDONING IN PLACE (REMOVAL SHALL BE AT DESIGNER'S DISCRETION).
3. CONTRACTOR SHALL LEAVE CROSSINGS/PATHS THAT WILL BE USED AS TEMPORARY STREAM CROSSINGS AND ACCESS UNTIL NO LONGER NEEDED.
4. CART PATH DEMO DEBRIS IN STREAM CORRIDORS TO BE REMOVED TO HIGH GROUND. IN OTHER AREAS, PATH MAY BE DEMOLISHED IN PLACE AND SPREAD TO ALLOW FOR NATURAL VEGETATION GROWTH.

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

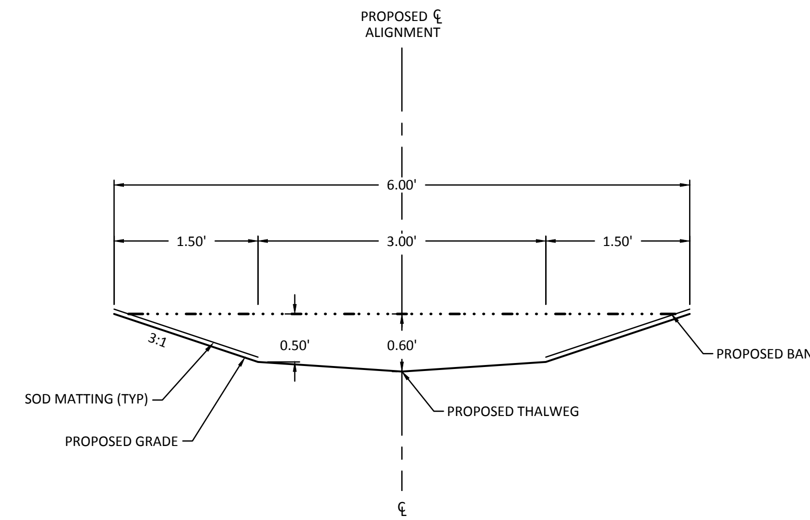
Demolition Plan
Project Overview

Revisions:

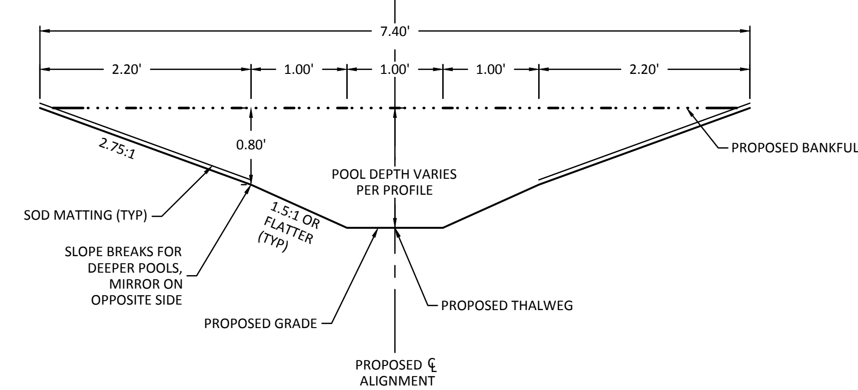
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 0.4

August 25, 2015
Q:\ActiveProjects\005-02143 Henry Fork\CADD\Plans\02143-Overview.dwg



UT1 Reach 1 Upper - Riffle
STA: 100+00 - 103+02



UT1 Reach 1 Upper - Pool
STA: 100+00 - 103+02

NOTES:
1. TYPICAL BANK TREATMENT IS TO INSTALL TRANSPLANT SOD MATS. ADDITIONAL COIR FIBER EROSION CONTROL MATTING MAY BE REQUIRED IN SOME AREAS BASED ON ENGINEER'S FIELD DIRECTIVES.
2. POOL IS SYMMETRIC ABOUT ℄.
3. NARROW POOL BOTTOM WIDTH AS NECESSARY TO COMPLY WITH SIDE SLOPE REQUIREMENTS FOR DEEPER POOLS, WHERE APPLICABLE.

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT1 Reach 1 Upper
Typical Sections

Revisions:

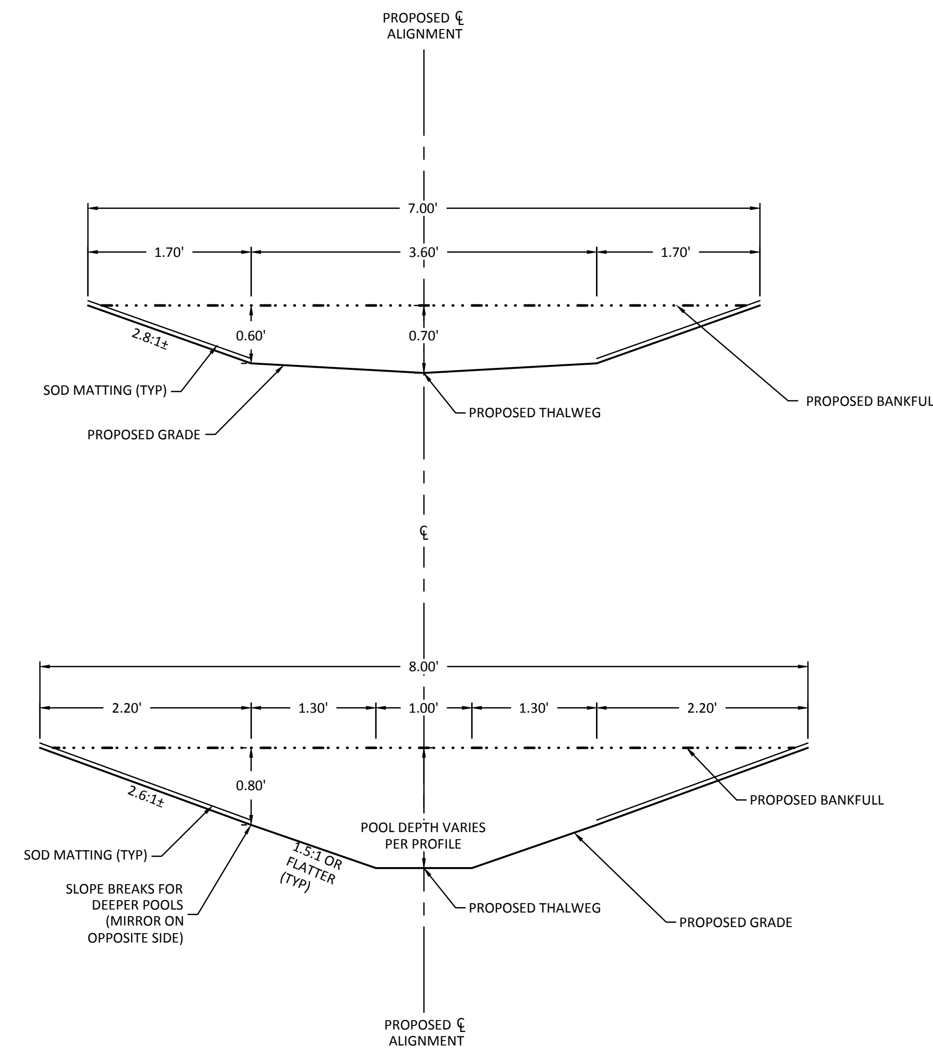
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 1.1

August 25, 2015

UT1 Reach 1 Lower - Riffle
STA: 103+02 - 114+71

UT1 Reach 1 Lower - Pool
STA: 103+02 - 114+71



NOTES:
1. TYPICAL BANK TREATMENT IS TO INSTALL TRANSPLANT SOD MATS. ADDITIONAL COIR FIBER EROSION CONTROL MATTING MAY BE REQUIRED IN SOME AREAS BASED ON ENGINEER'S FIELD DIRECTIVES.
2. POOL IS SYMMETRIC ABOUT ℄.
3. NARROW POOL BOTTOM WIDTH AS NECESSARY TO COMPLY WITH SIDE SLOPE REQUIREMENTS FOR DEEPER POOLS, WHERE APPLICABLE.

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT1 Reach 1 Lower
Typical Sections

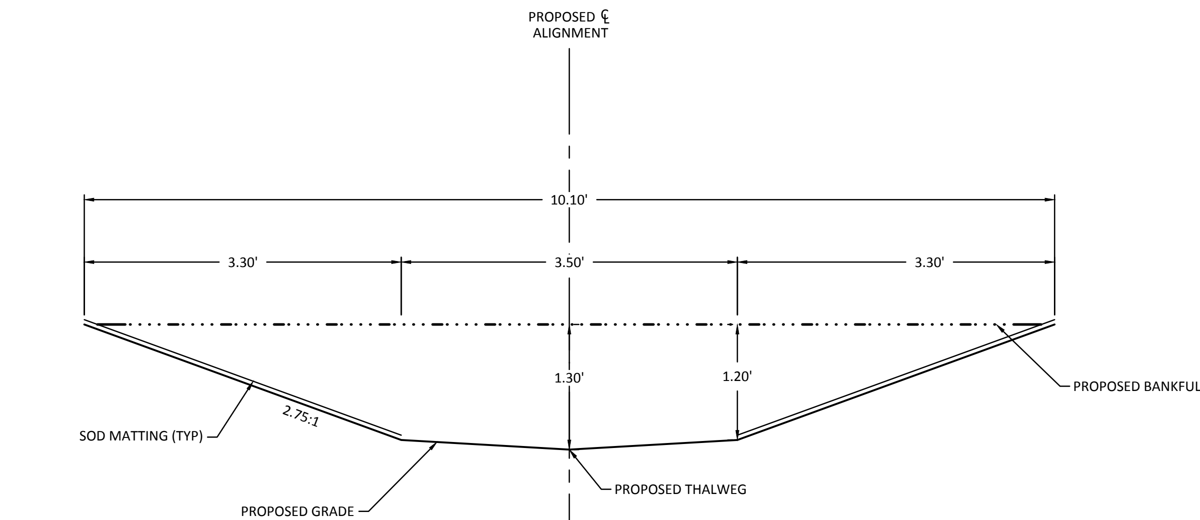
Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 1.2

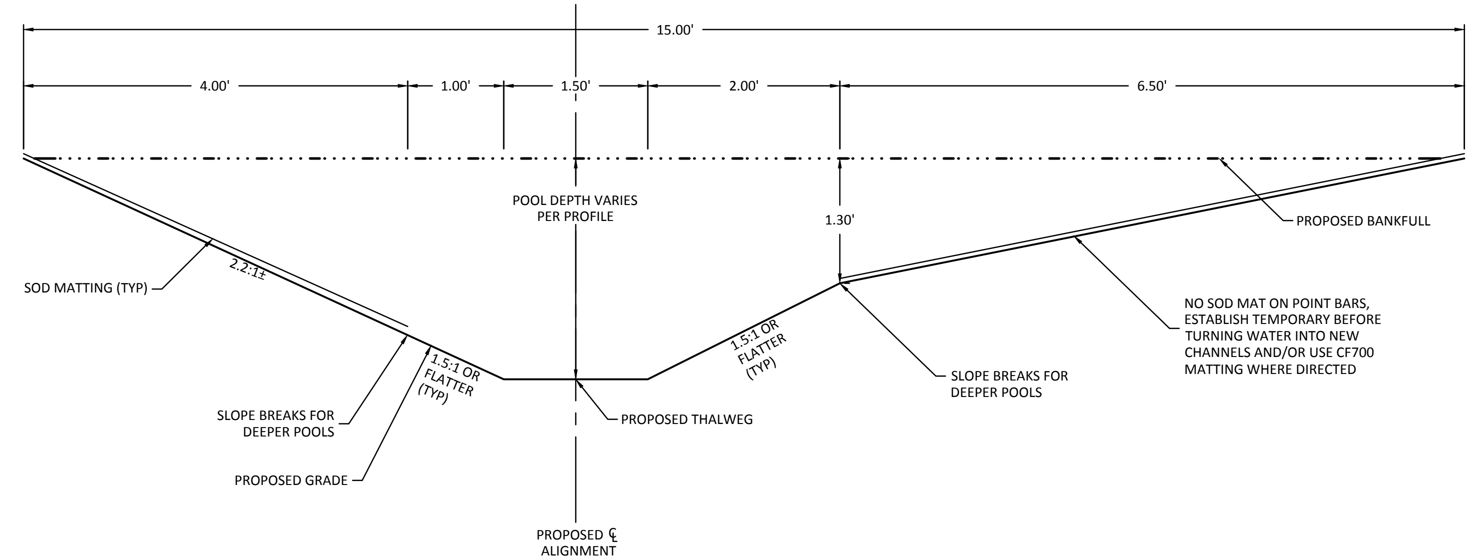
Q:\ActiveProjects\005-02143 Henry Fork\CADD\Plans\02143-CoverNotes.dwg

UT1 Reach 2 - Riffle
STA: 114+71 - 126+99



NOTES:
1. TYPICAL BANK TREATMENT IS TO INSTALL TRANSPLANT SOD MATS. ADDITIONAL COIR FIBER EROSION CONTROL MATTING MAY BE REQUIRED IN SOME AREAS BASED ON ENGINEER'S FIELD DIRECTIVES.
2. POOL TYPICAL IS FOR RIGHT MEANDERING POOL (LOOKING DOWNSTREAM) AT/NEAR MIDDLE OF POOL, CENTERED ON APEX OF BEND. LEFT MEANDER POOL TO MIRROR.
3. CONSTRUCT SMOOTH TRANSITIONS BETWEEN RIFFLE CROSS SECTION AT PC AND PT TO MIDDLE OF POOL.
4. NARROW POOL BOTTOM WIDTH AS NECESSARY TO COMPLY WITH SIDE SLOPE REQUIREMENTS FOR DEEPER POOLS, WHERE APPLICABLE.

UT1 Reach 2 - Pool
STA: 114+71 - 126+99



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

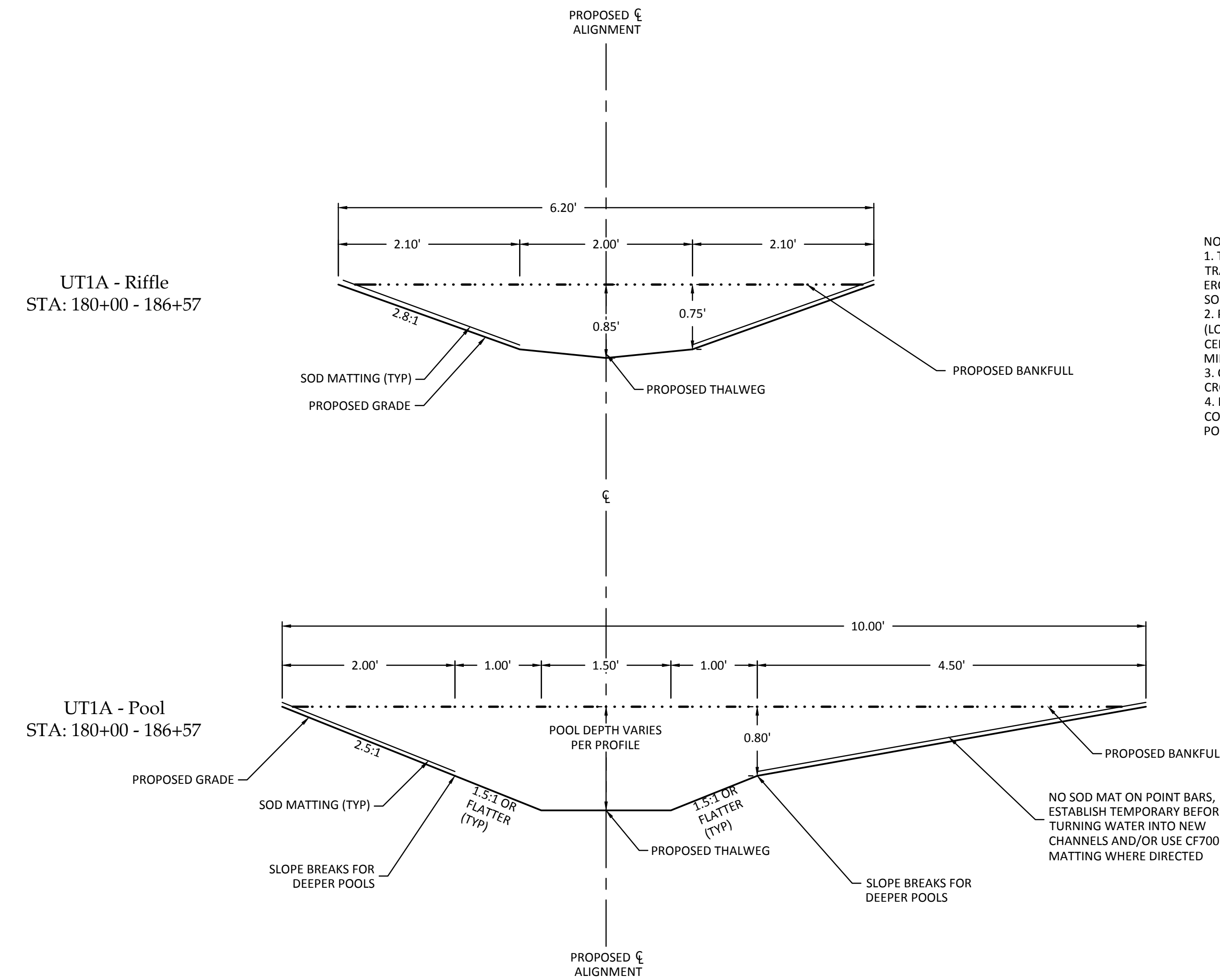
Henry Fork Mitigation Site
Catawba County, North Carolina

UT1 Reach 2
Typical Sections

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 1.3



NOTES:
1. TYPICAL BANK TREATMENT IS TO INSTALL TRANSPLANT SOD MATS. ADDITIONAL COIR FIBER EROSION CONTROL MATTING MAY BE REQUIRED IN SOME AREAS BASED ON ENGINEER'S FIELD DIRECTIVES.
2. POOL TYPICAL IS FOR RIGHT MEANDERING POOL (LOOKING DOWNSTREAM) AT/NEAR MIDDLE OF POOL, CENTERED ON APEX OF BEND. LEFT MEANDER POOL TO MIRROR.
3. CONSTRUCT SMOOTH TRANSITIONS BETWEEN RIFFLE CROSS SECTION AT PC AND PT TO MIDDLE OF POOL.
4. NARROW POOL BOTTOM WIDTH AS NECESSARY TO COMPLY WITH SIDE SLOPE REQUIREMENTS FOR DEEPER POOLS, WHERE APPLICABLE.

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT1A
Typical Sections

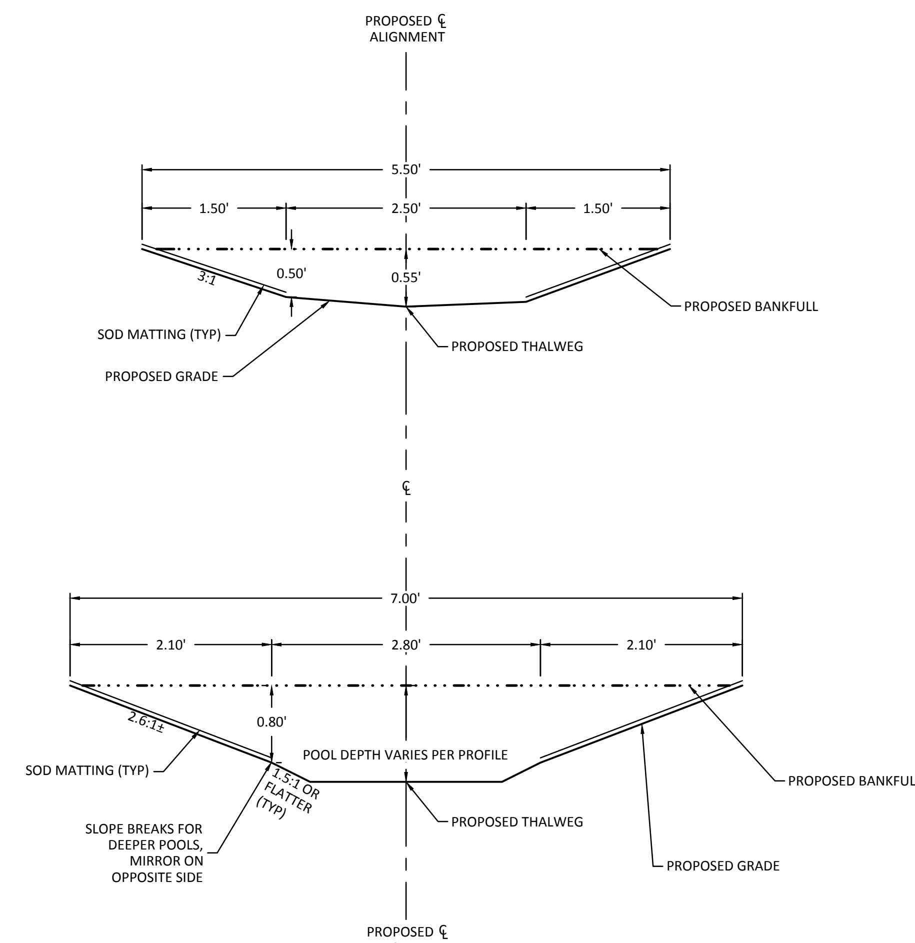
Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 1.4

UT1B - Riffle
STA: 150+00 - 153+58

UT1B - Pool
STA: 150+00 - 153+58



NOTES:
1. TYPICAL BANK TREATMENT IS TO INSTALL TRANSPLANT SOD MATS. ADDITIONAL COIR FIBER EROSION CONTROL MATTING MAY BE REQUIRED IN SOME AREAS BASED ON ENGINEER'S FIELD DIRECTIVES.
2. POOL IS SYMMETRIC ABOUT ℄.
3. NARROW POOL BOTTOM WIDTH AS NECESSARY TO COMPLY WITH SIDE SLOPE REQUIREMENTS FOR DEEPER POOLS, WHERE APPLICABLE.

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

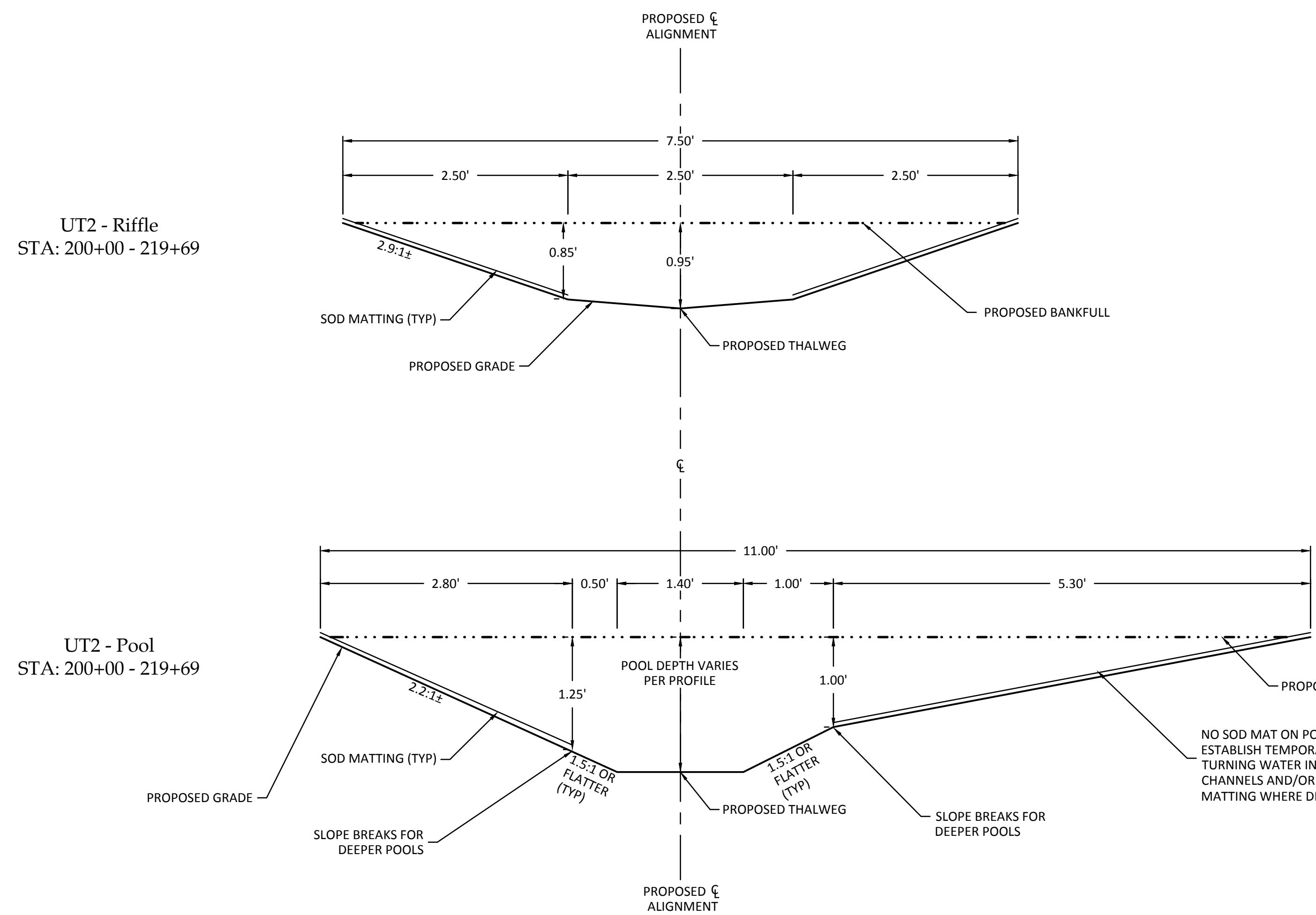
Henry Fork Mitigation Site
Catawba County, North Carolina

UT1B
Typical Sections

Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 1.5



NOTES:
1. TYPICAL BANK TREATMENT IS TO INSTALL TRANSPLANT SOD MATS. ADDITIONAL COIR FIBER EROSION CONTROL MATTING MAY BE REQUIRED IN SOME AREAS BASED ON ENGINEER'S FIELD DIRECTIVES.
2. POOL TYPICAL IS FOR RIGHT MEANDERING POOL (LOOKING DOWNSTREAM) AT/NEAR MIDDLE OF POOL, CENTERED ON APEX OF BEND. LEFT MEANDER POOL TO MIRROR.
3. CONSTRUCT SMOOTH TRANSITIONS BETWEEN RIFFLE CROSS SECTION AT PC AND PT TO MIDDLE OF POOL.
4. NARROW POOL BOTTOM WIDTH AS NECESSARY TO COMPLY WITH SIDE SLOPE REQUIREMENTS FOR DEEPER POOLS, WHERE APPLICABLE.

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

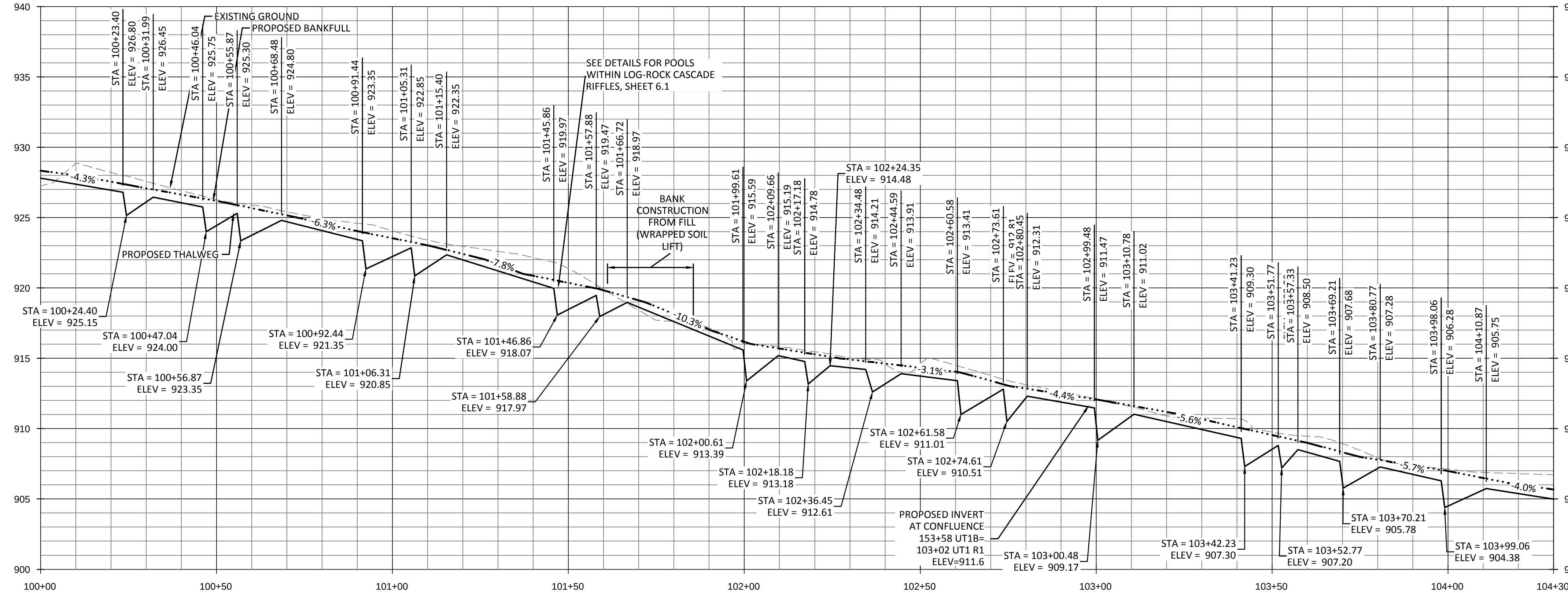
UT2
Typical Sections

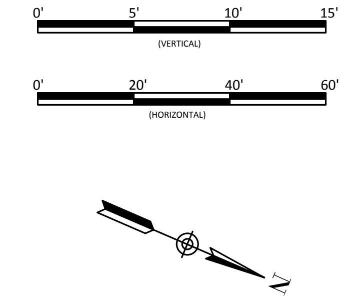
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

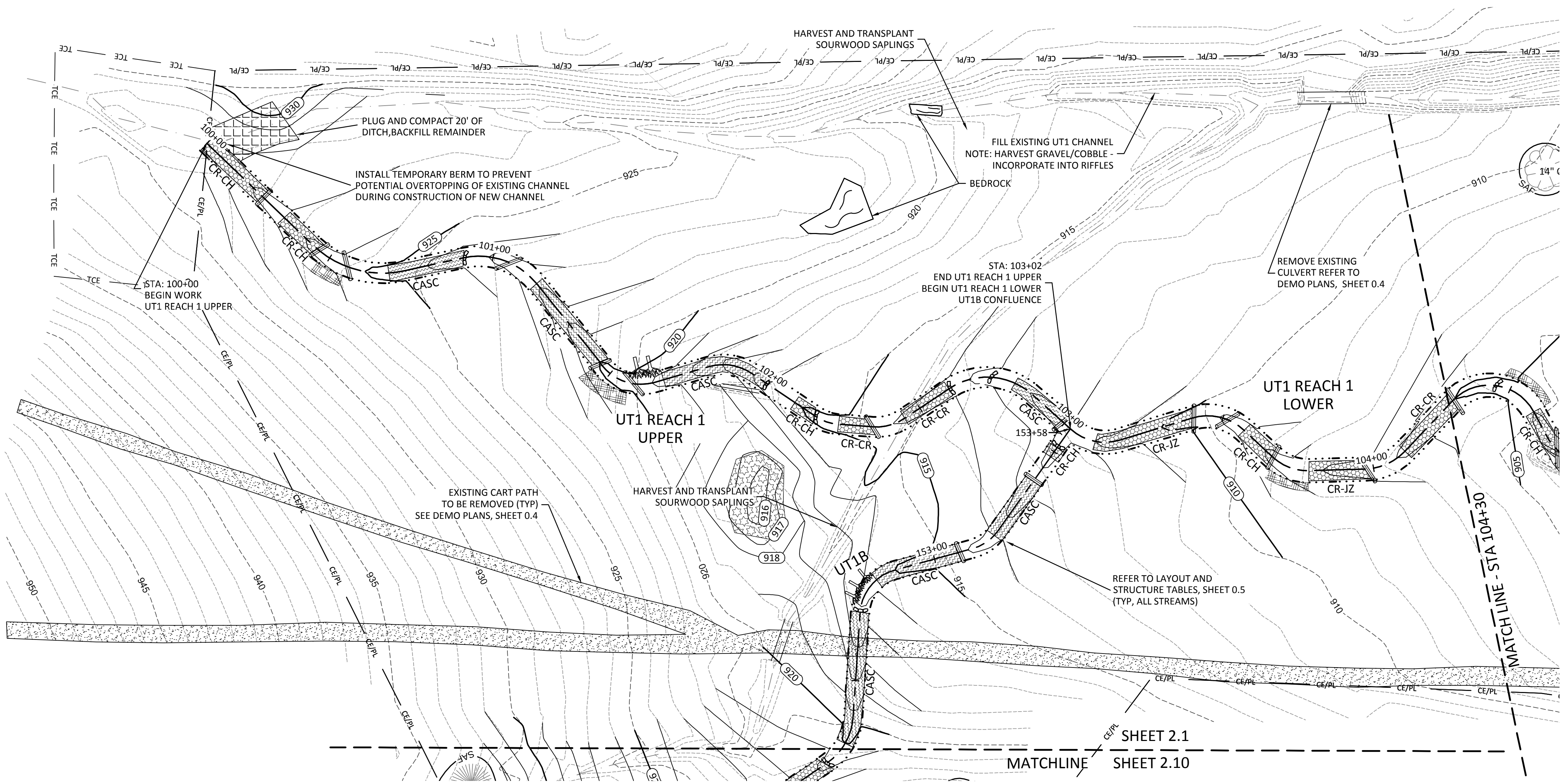
Revisions:

Sheet 1.6

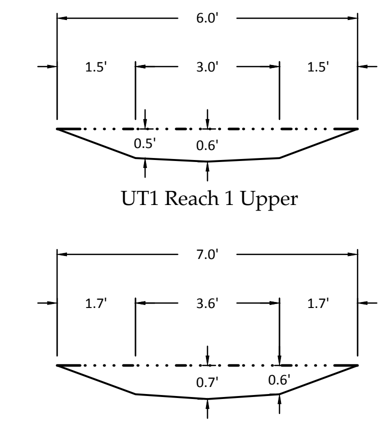
August 25, 2015



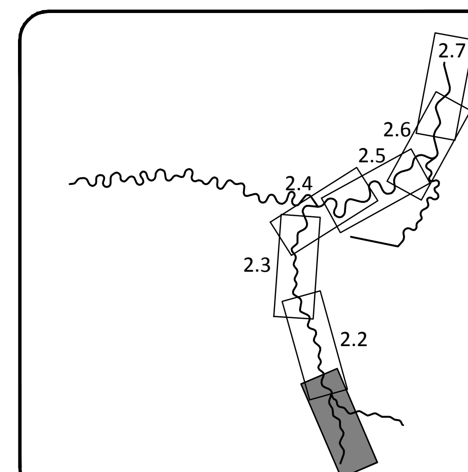




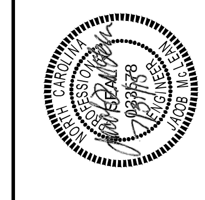
Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831



Henry Fork Mitigation Site
Catawba County, North Carolina

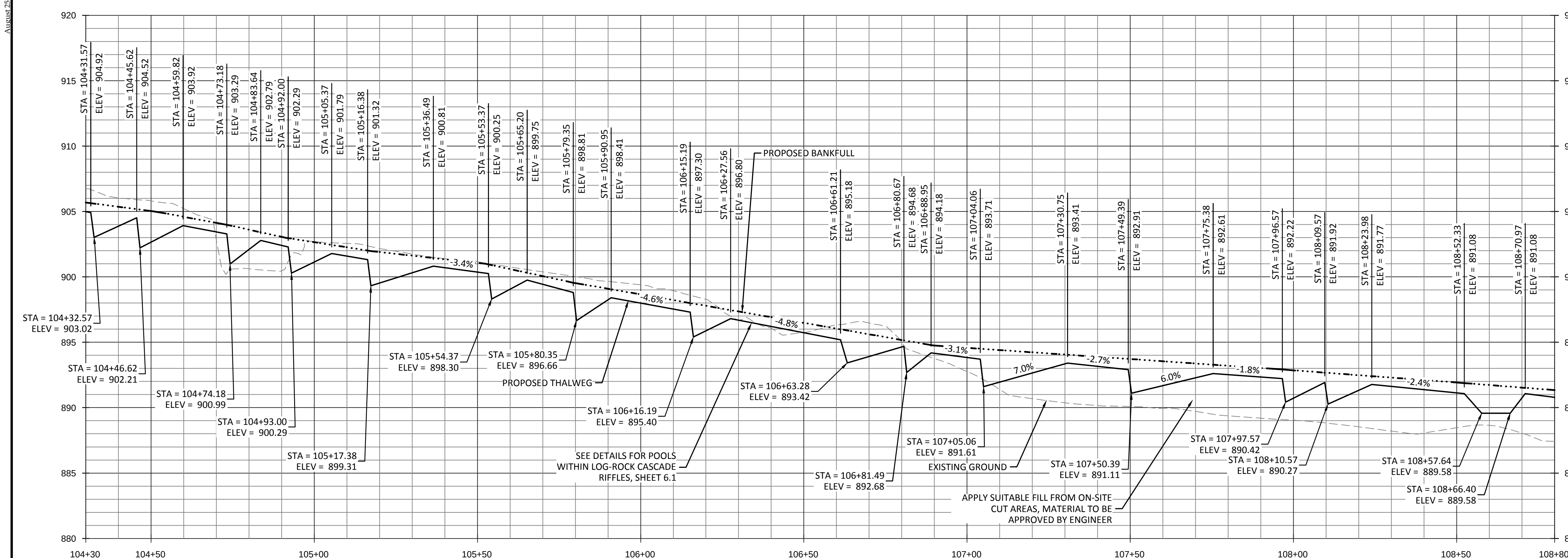
UT1 Reach 1 Upper & Lower
Stream Plan and Profile

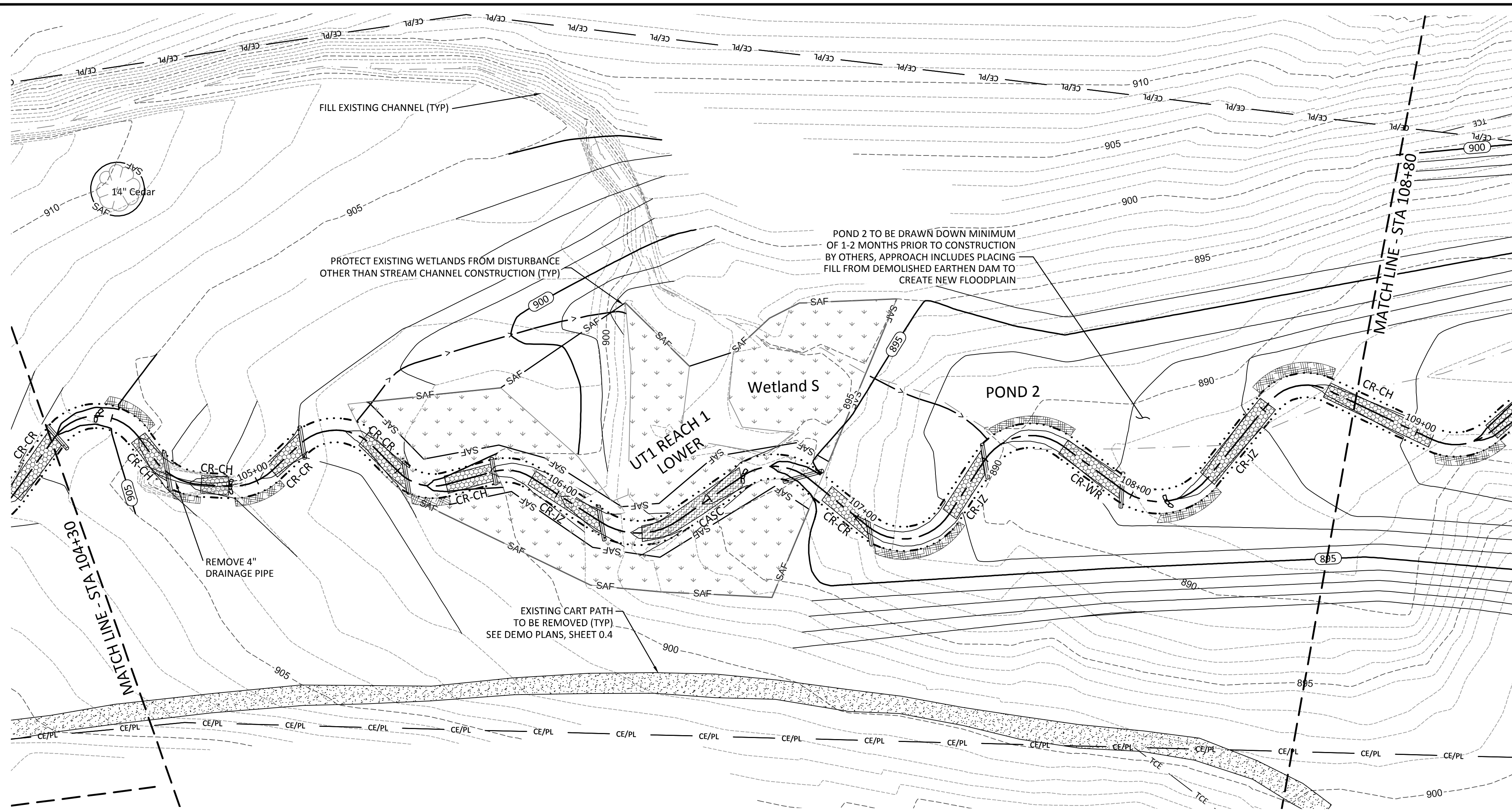
Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

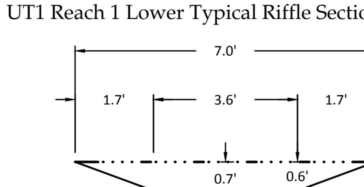
Sheet 2.1

August 25, 2015

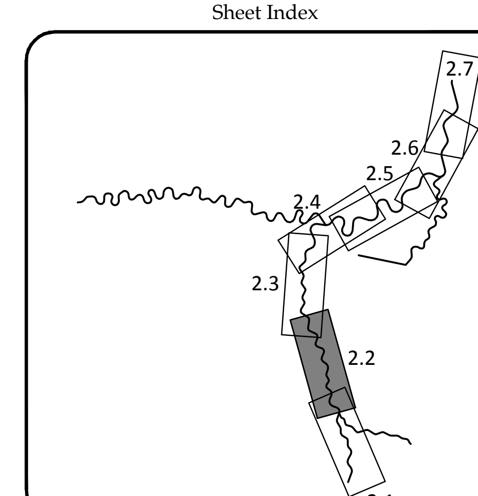




UT1 Reach 1 Lower Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT1 Reach 1 Lower
Stream Plan and Profile

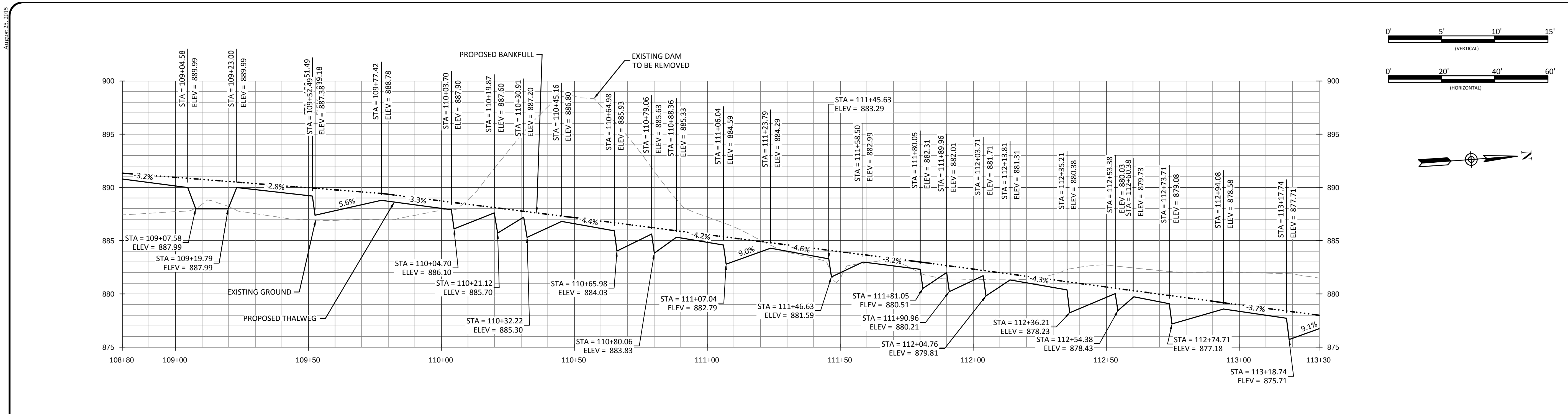
Revisions:

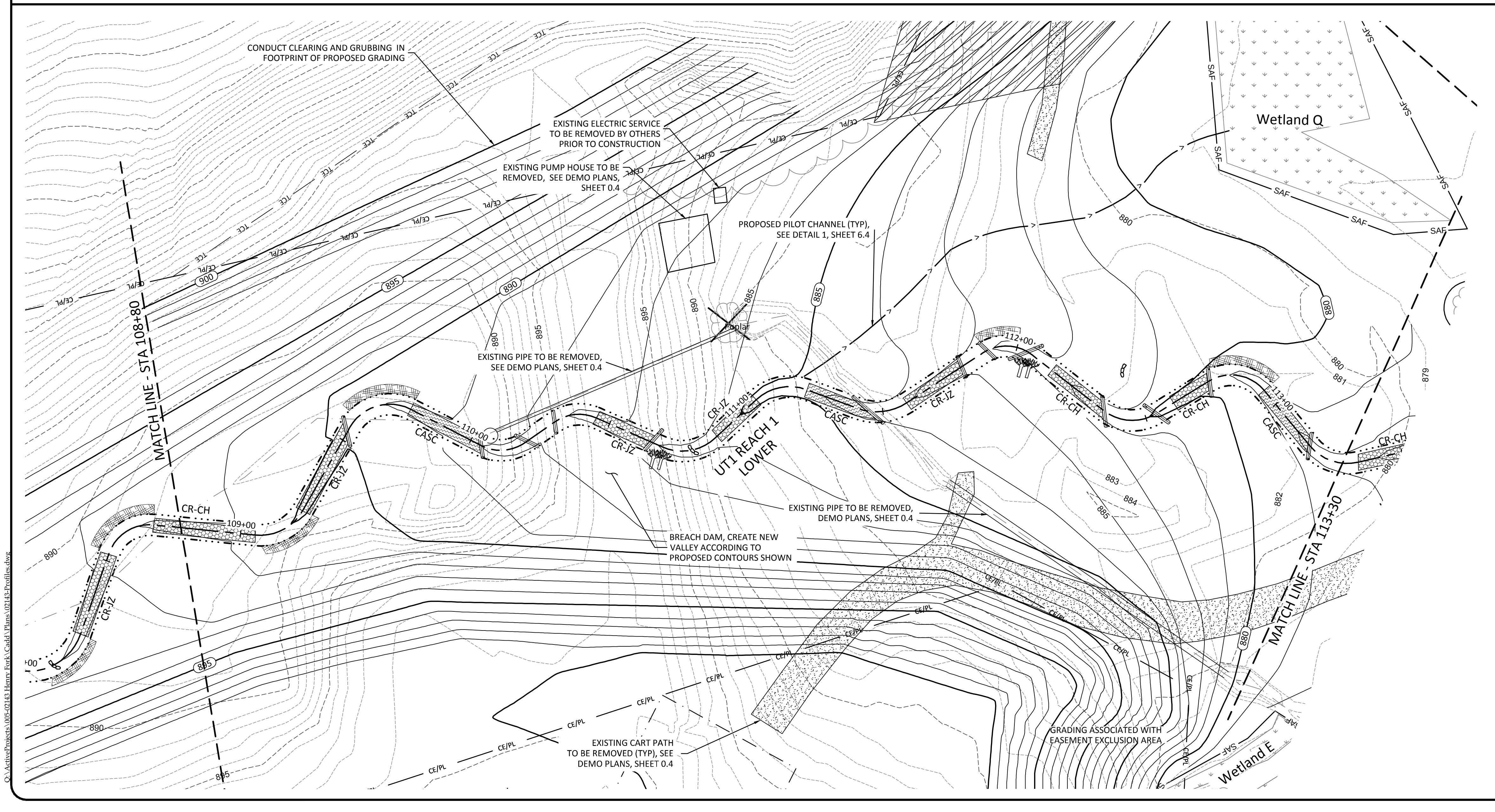
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 2.2

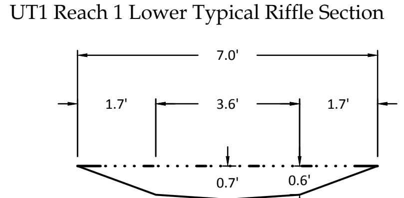
Q:\ActiveProjects\005-02143 Henry Fork\CadD\Plans\02143-Profiles.dwg

August 25, 2015

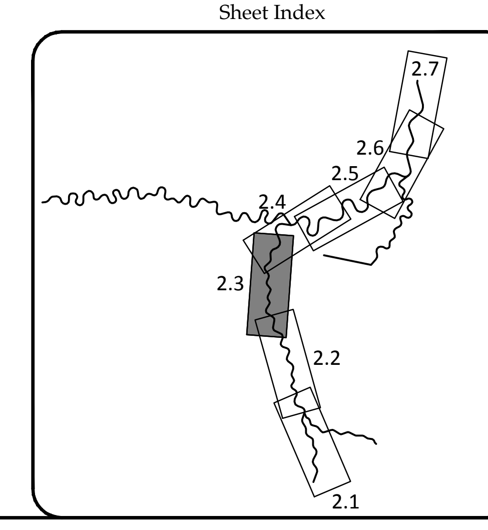




UT1 Reach 1 Lower Typical Riffle Section



Sheet Index



Q:\ActiveProjects\005-02143 Henry Fork\CadD\Plans\02143-Profiles.dwg

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

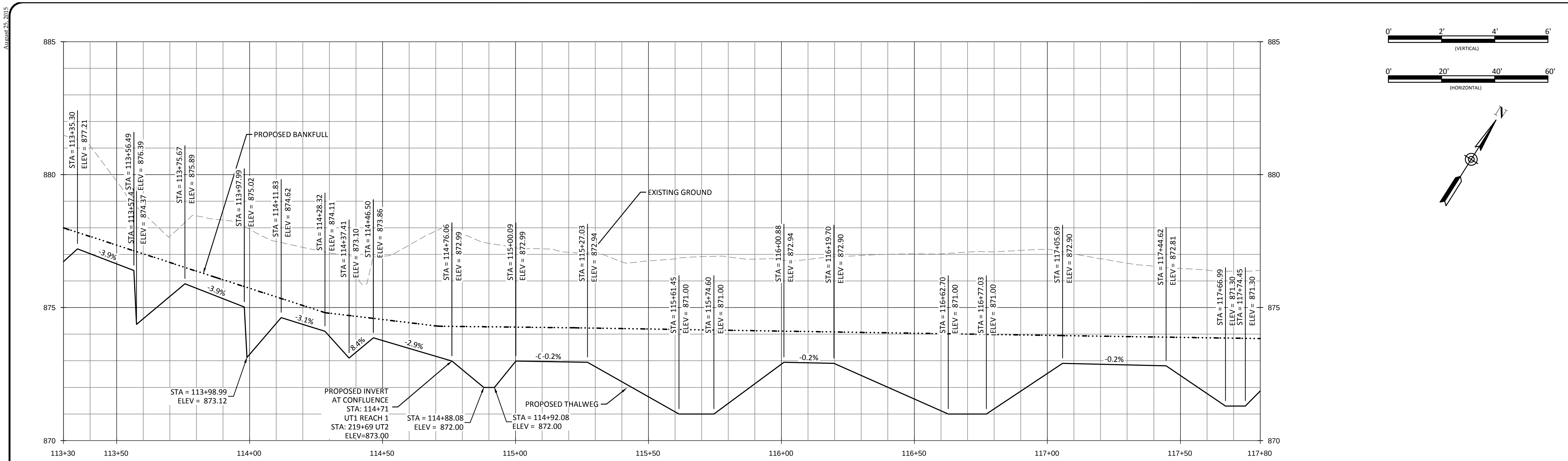
Henry Fork Mitigation Site
Catawba County, North Carolina

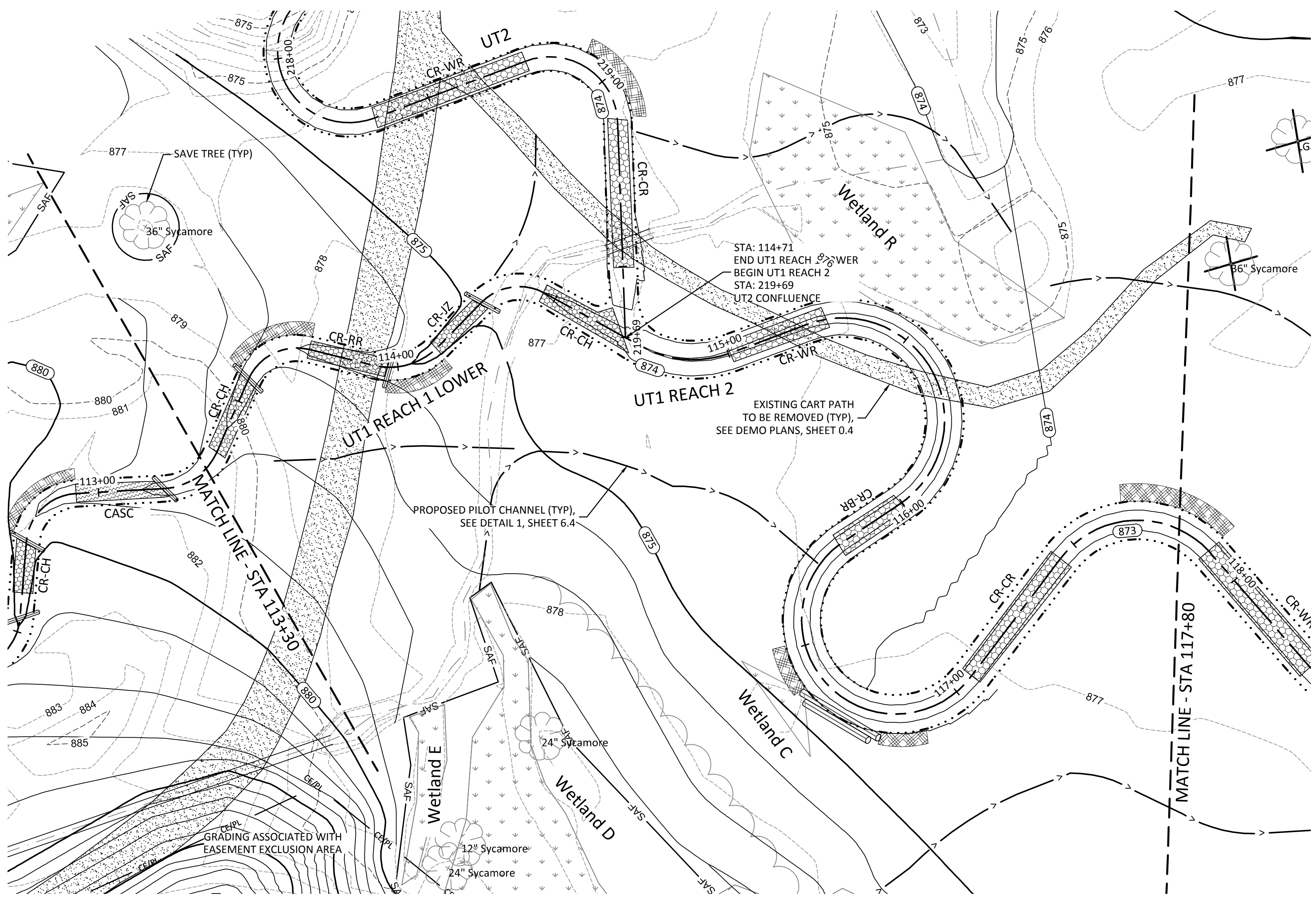
UT1 Reach 1 Lower
Stream Plan and Profile

Revisions:

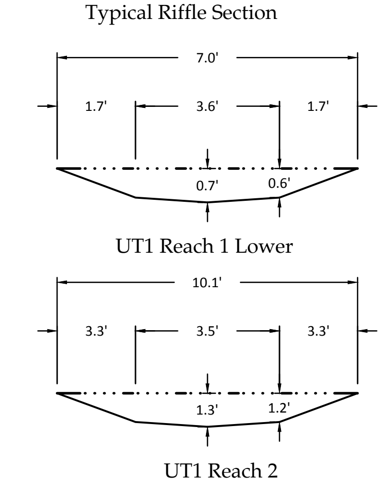
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 2.3

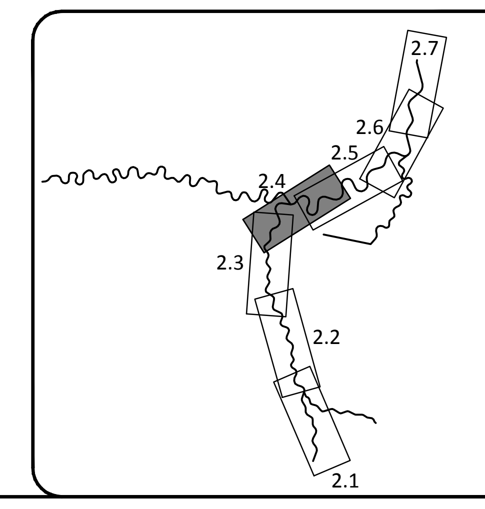




Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT1 Reach 1 Lower & UT1 Reach 2
Stream Plan and Profile

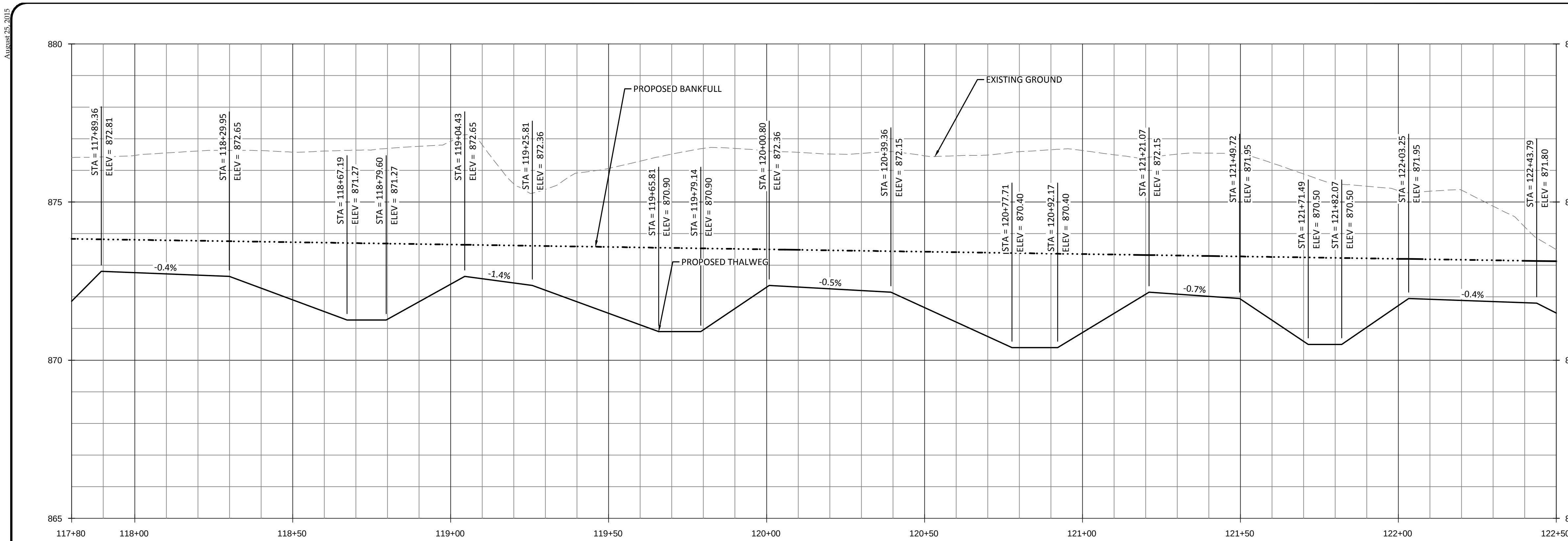
Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 2.4

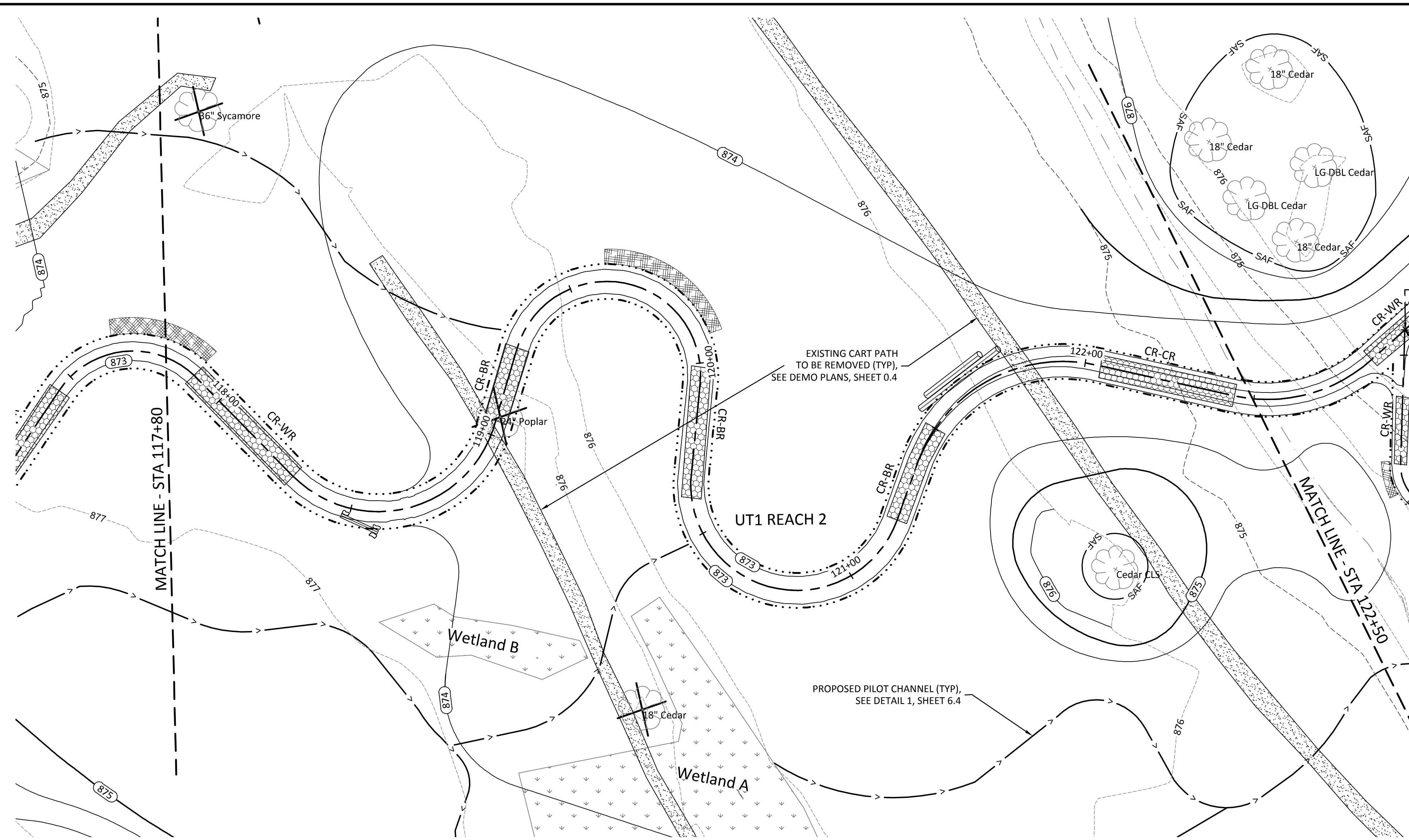
August 25, 2015

Q:\ActiveProjects\005-02143 Henry Fork\CadD\Plans\02143-Profiles.dwg

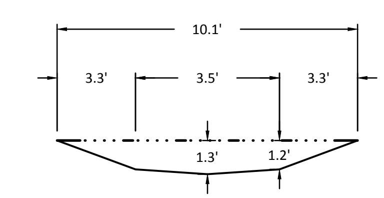


0' 2' 4' 6'
(VERTICAL)

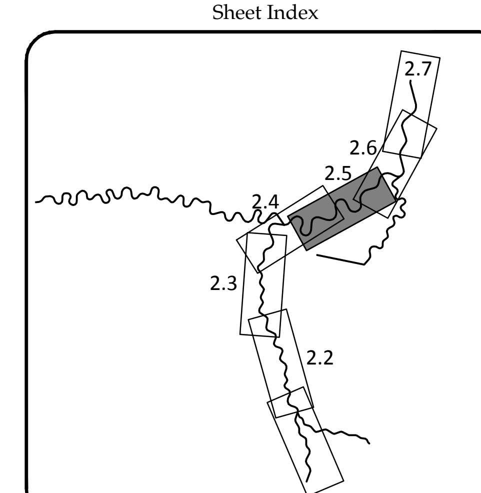
0' 20' 40' 60'
(HORIZONTAL)



UT1 Reach 2 Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT1 Reach 2
Stream Plan and Profile

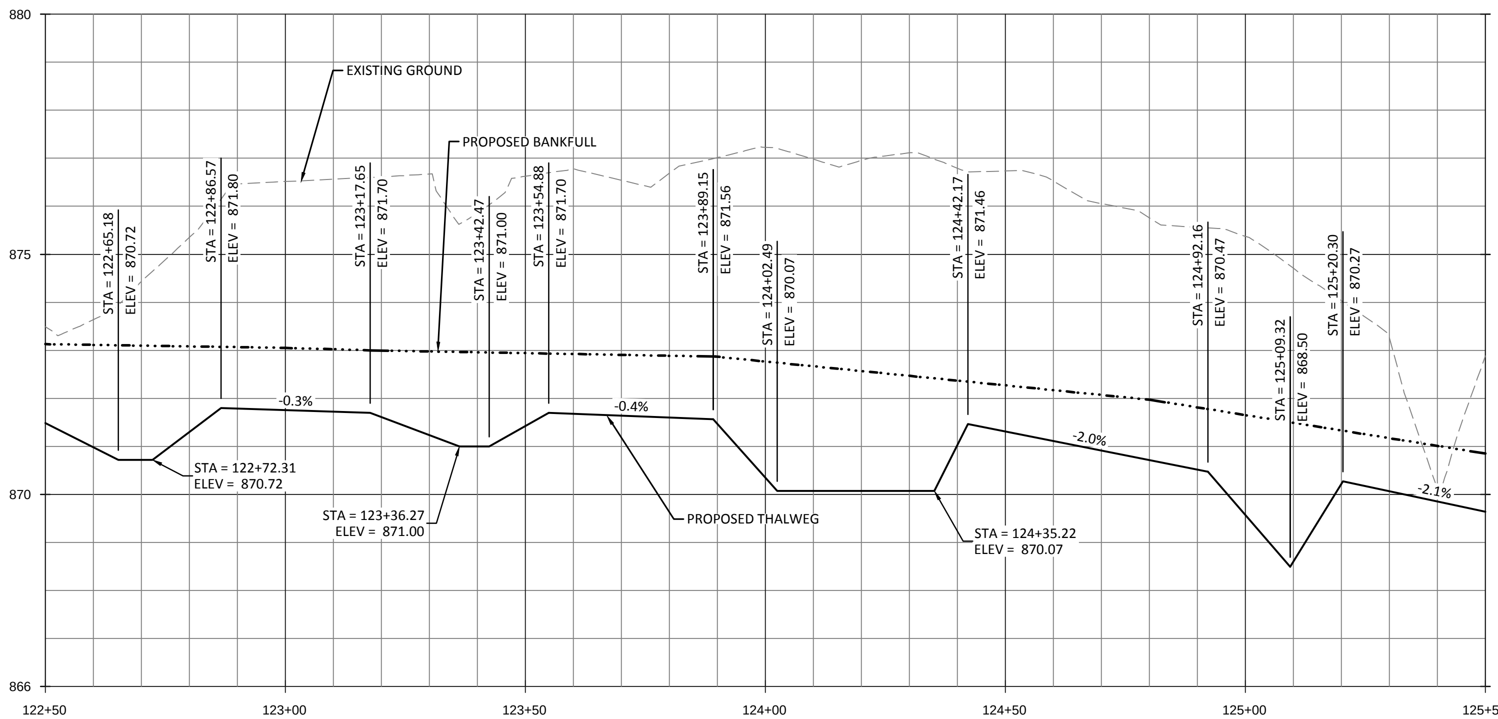
Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 2.5

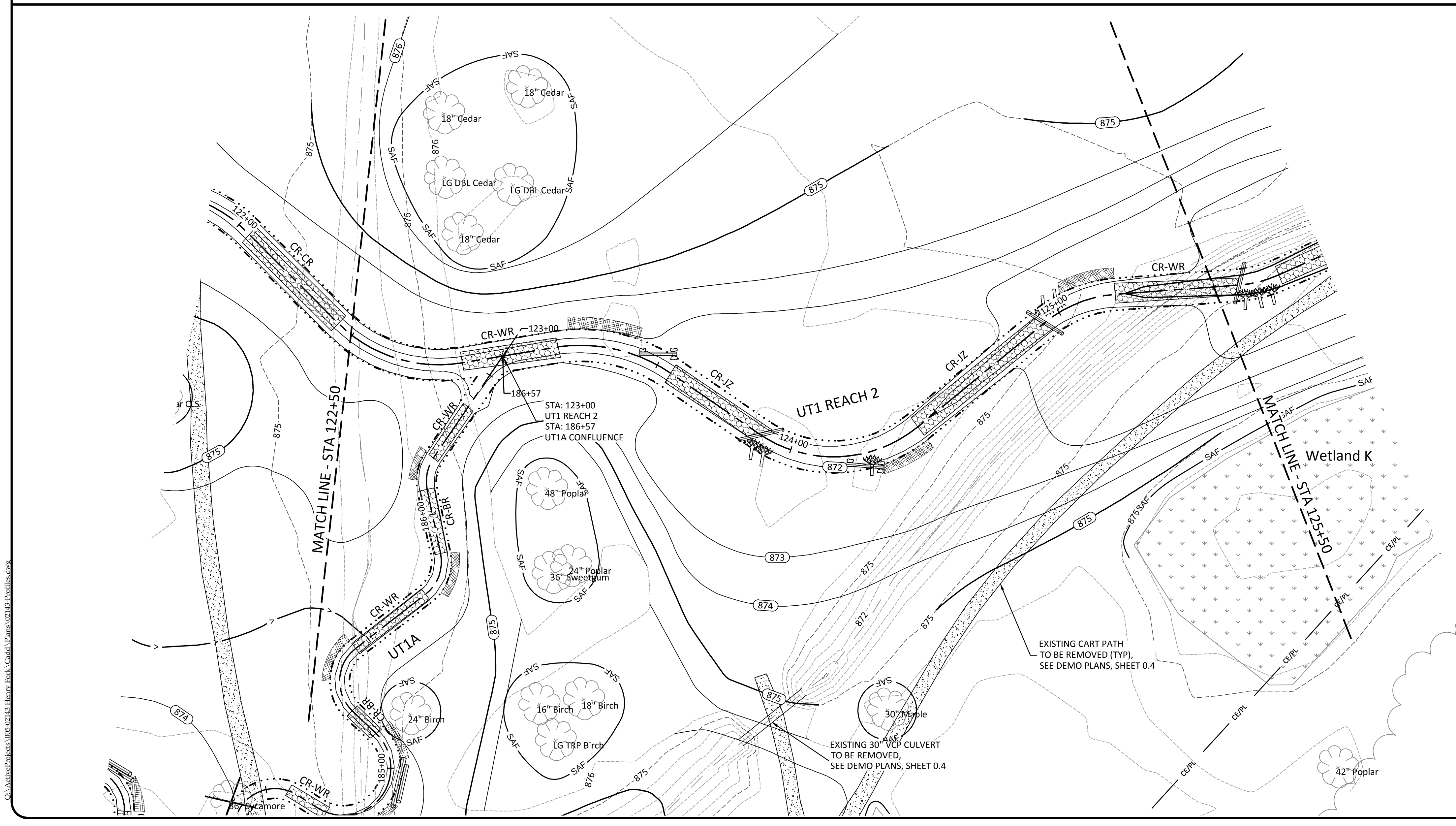
August 25, 2015

Q:\ActiveProjects\005-02143 Henry Fork\CadD\Plans\02143-Profiles.dwg

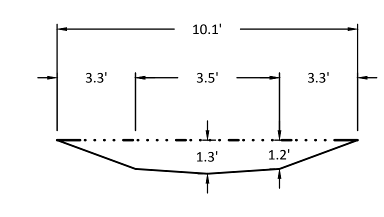


0' 2' 4' 6'
(VERTICAL)

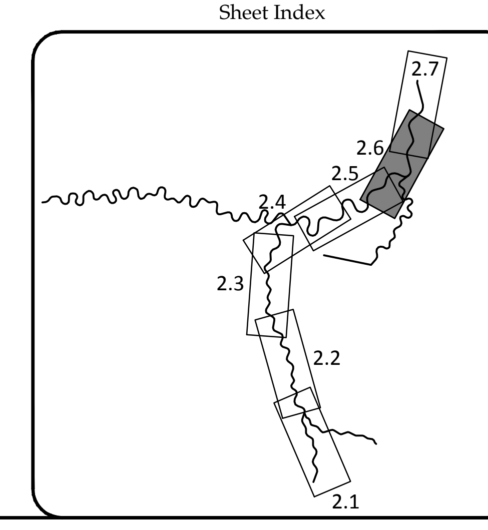
0' 20' 40' 60'
(HORIZONTAL)



UT1 Reach 2 Typical Riffle Section



Sheet Index



WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

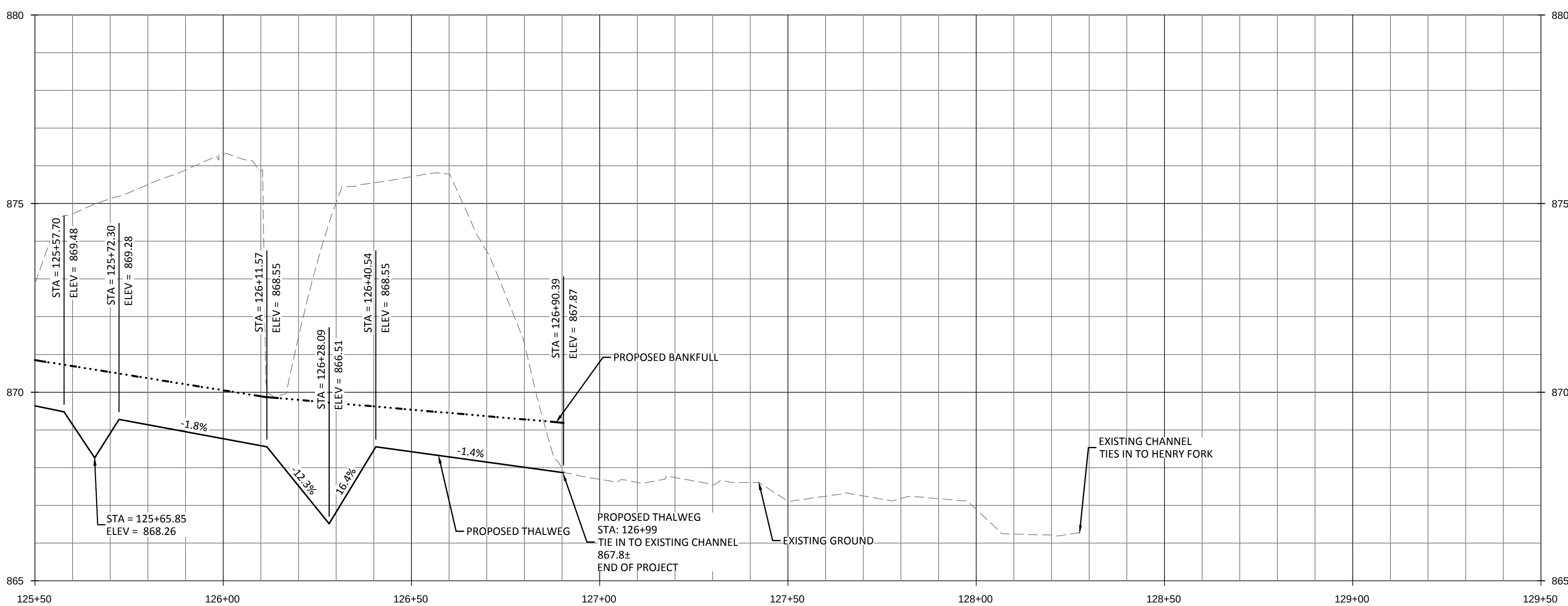
UT1 Reach 2
Stream Plan and Profile

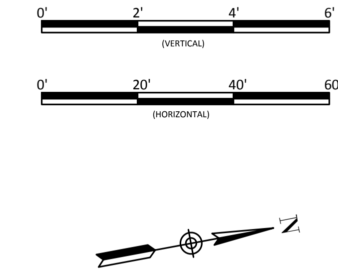
Revisions:

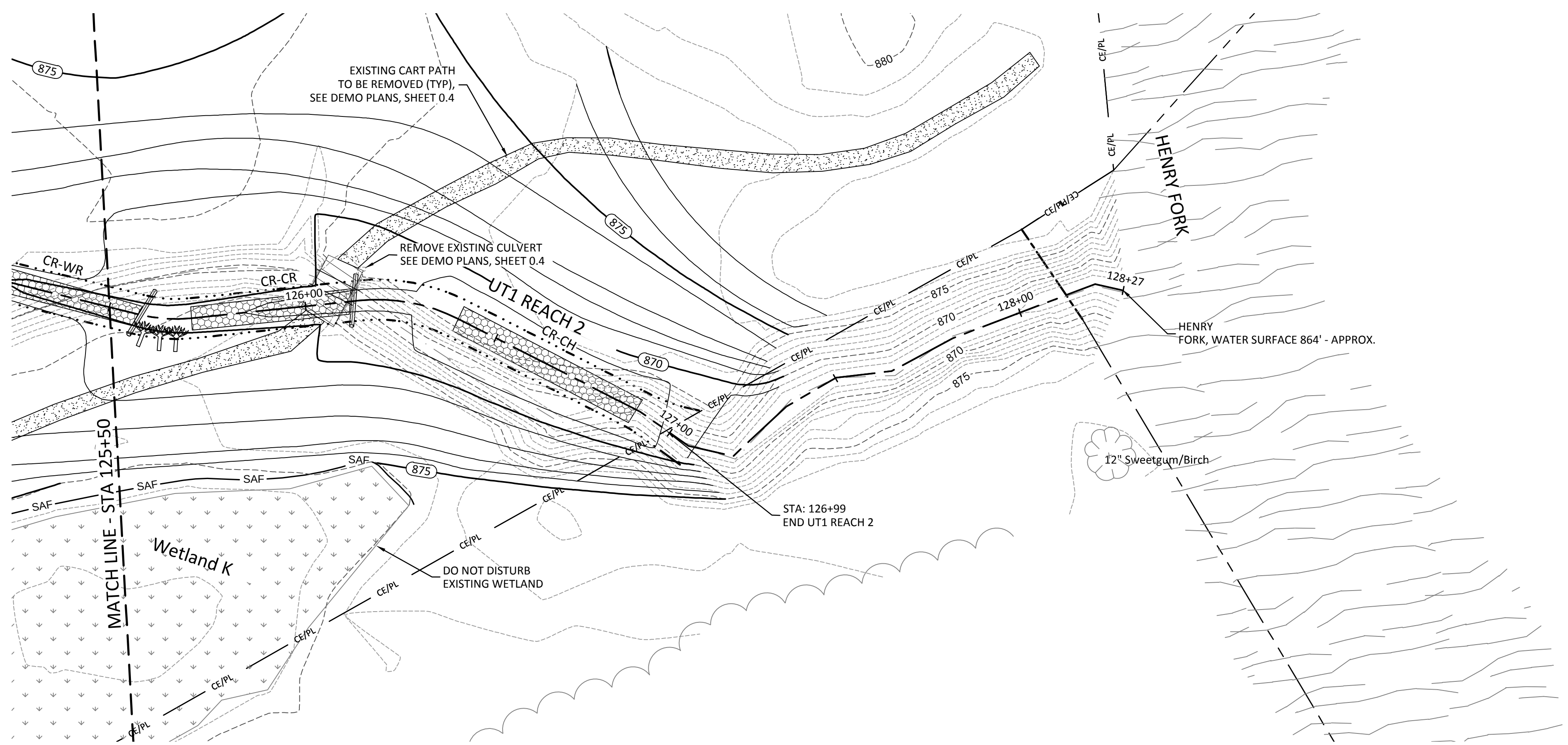
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet

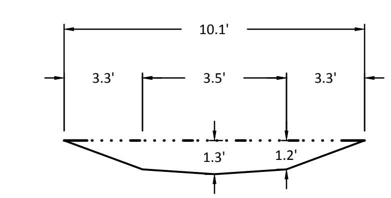
2.6



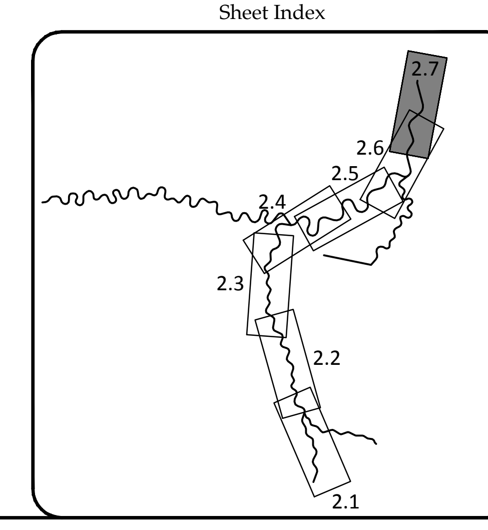




UT1 Reach 2 Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

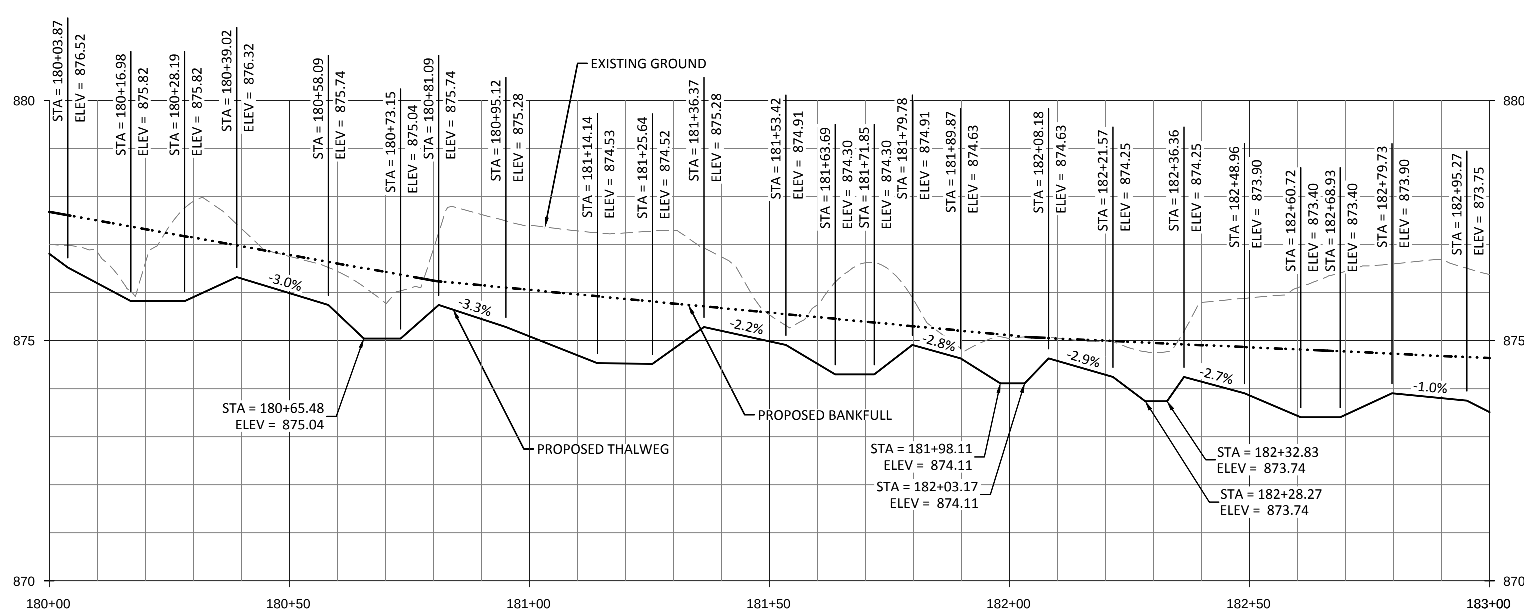
UT1 Reach 2
Stream Plan and Profile

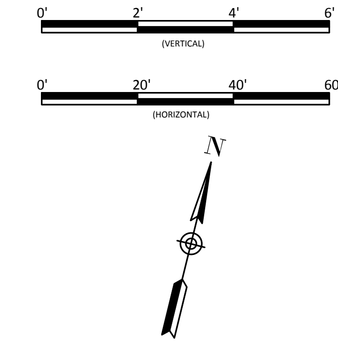
Revisions:

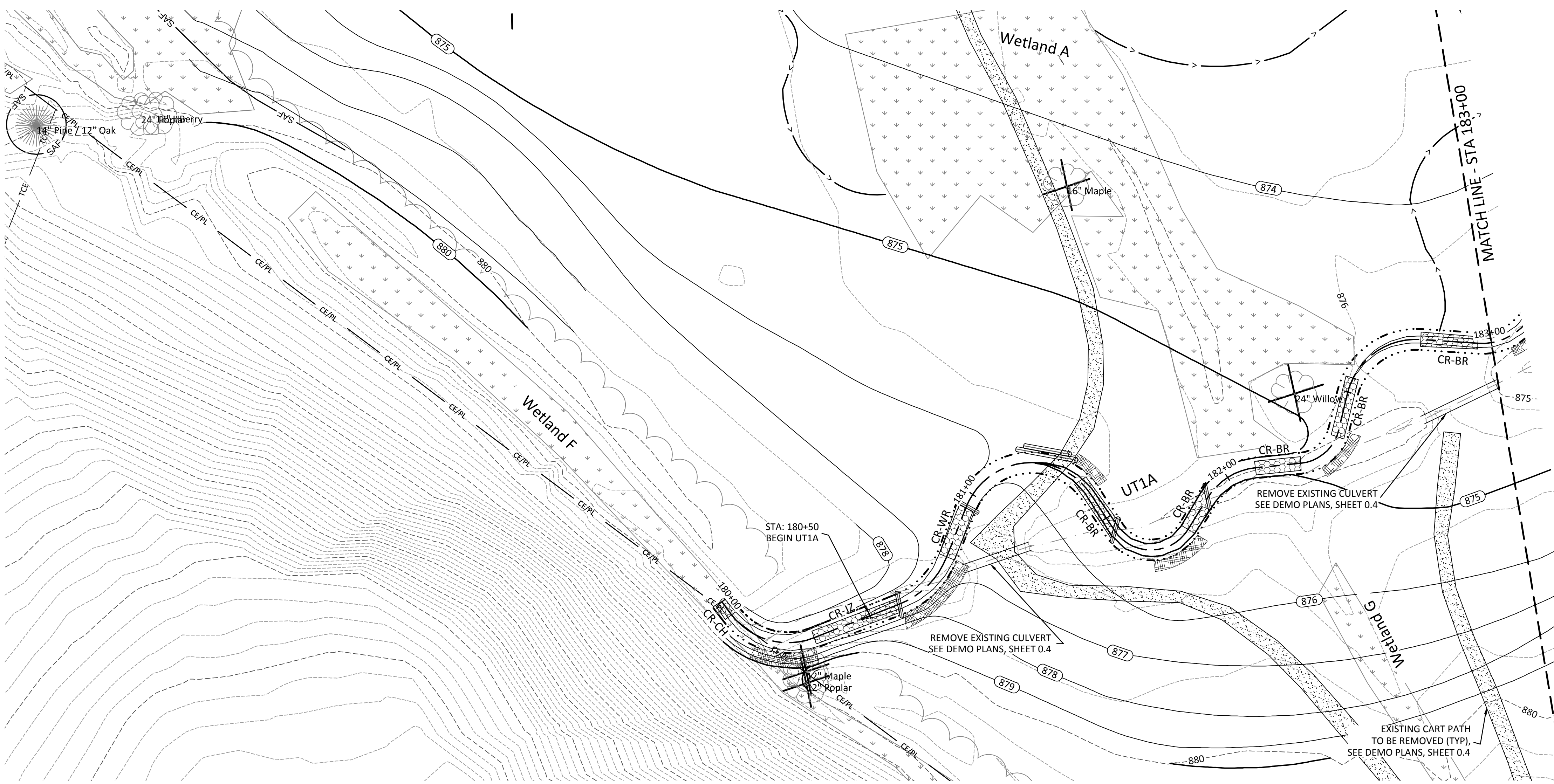
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

2.7

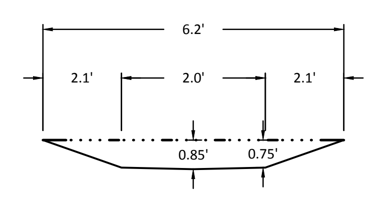
Sheet



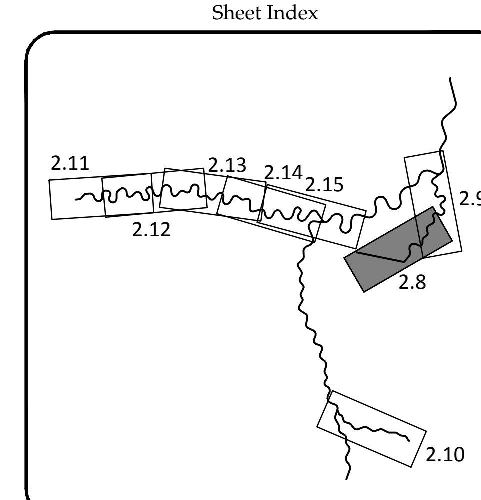




UT1A Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

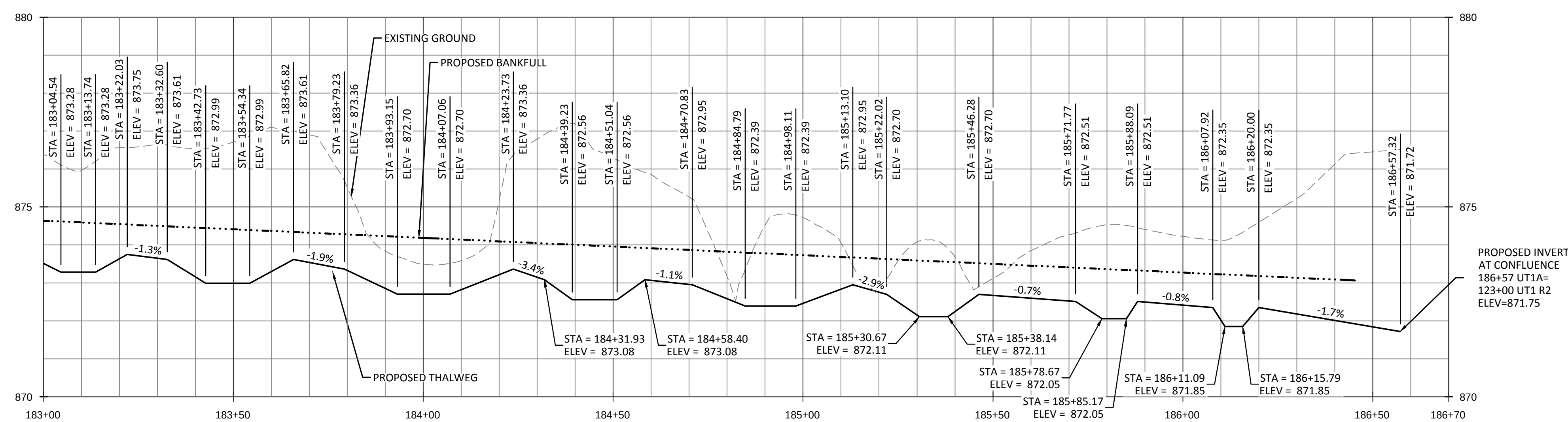
Henry Fork Mitigation Site
Catawba County, North Carolina

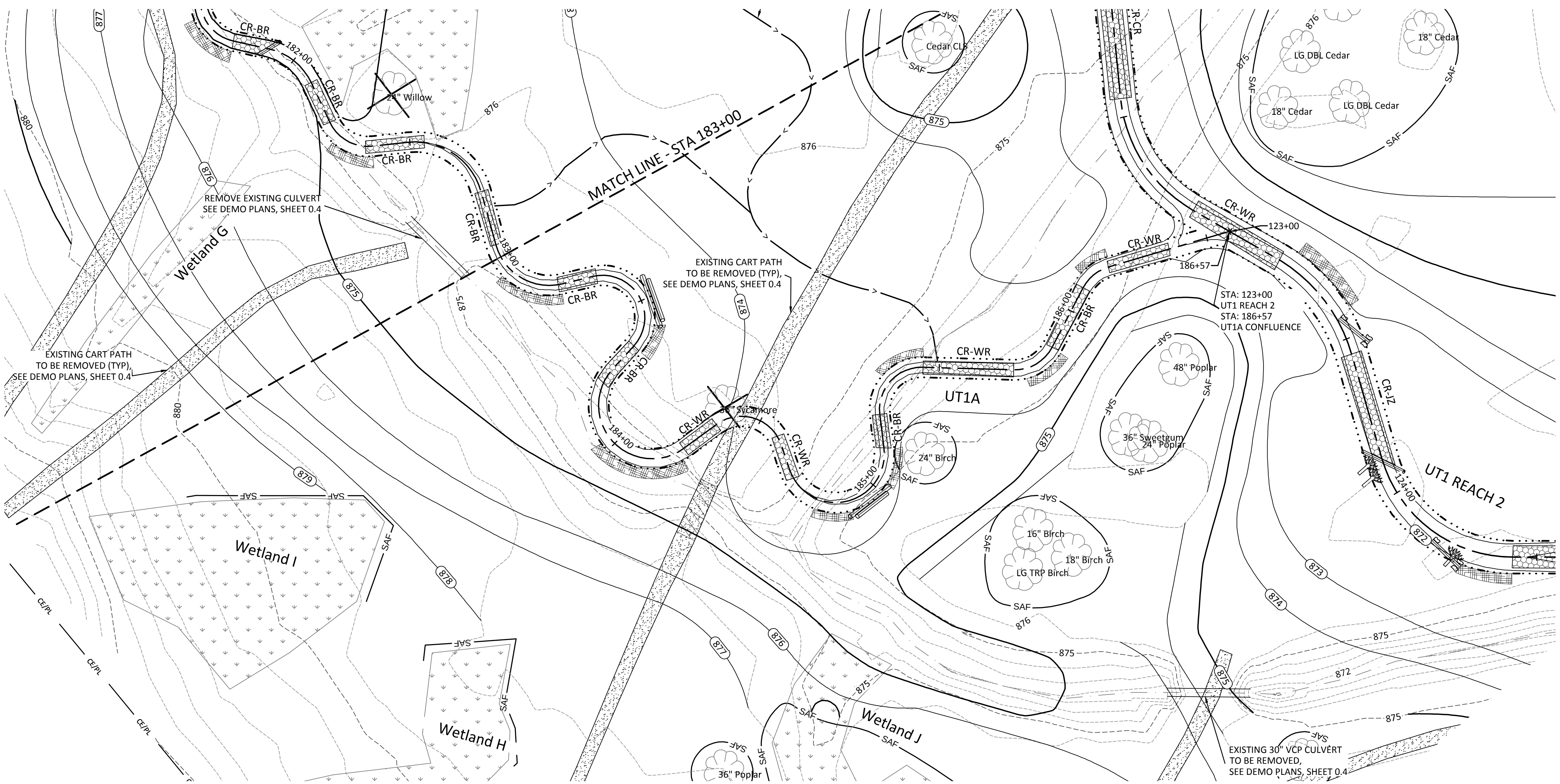
UT1A
Stream Plan and Profile

Revisions:

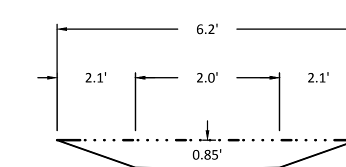
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 2.8

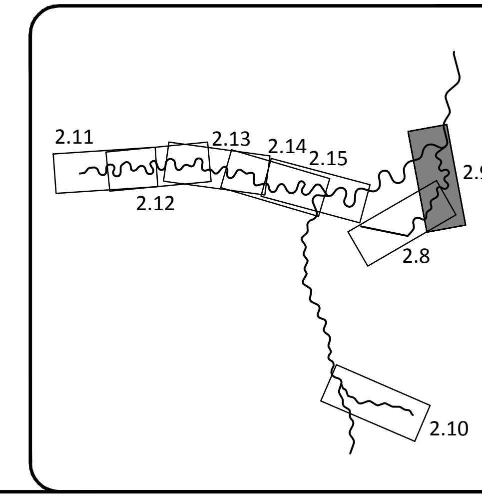




UT1A Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

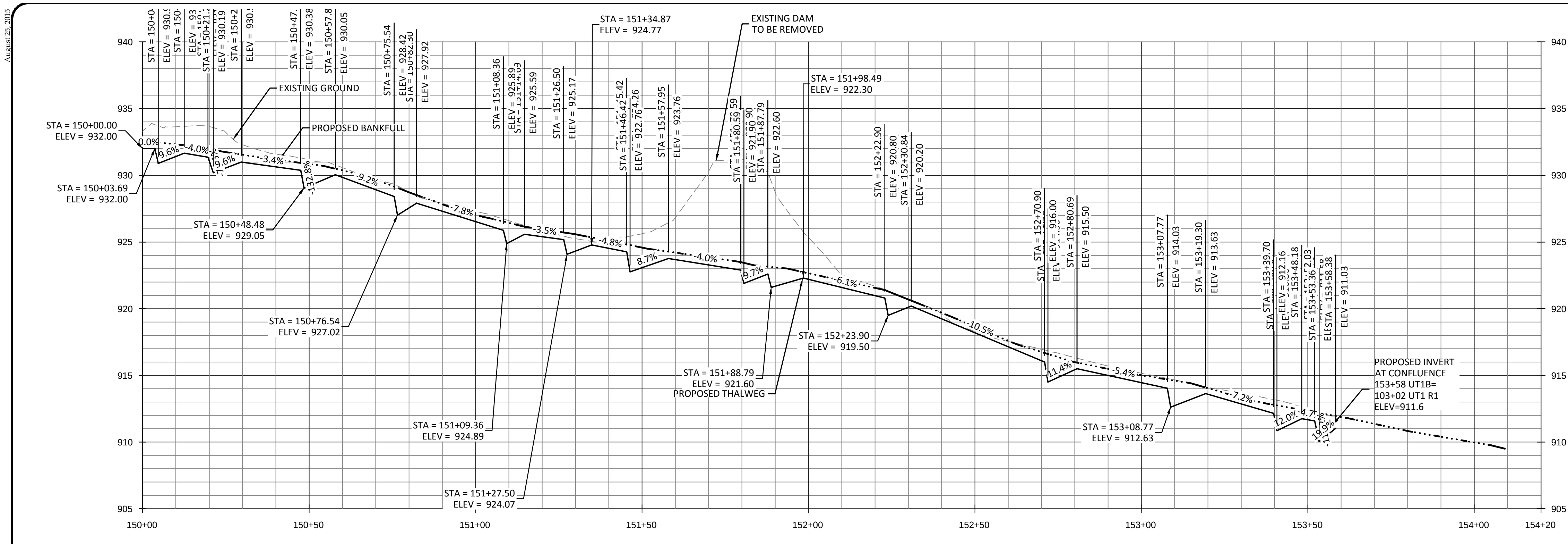
Henry Fork Mitigation Site
Catawba County, North Carolina

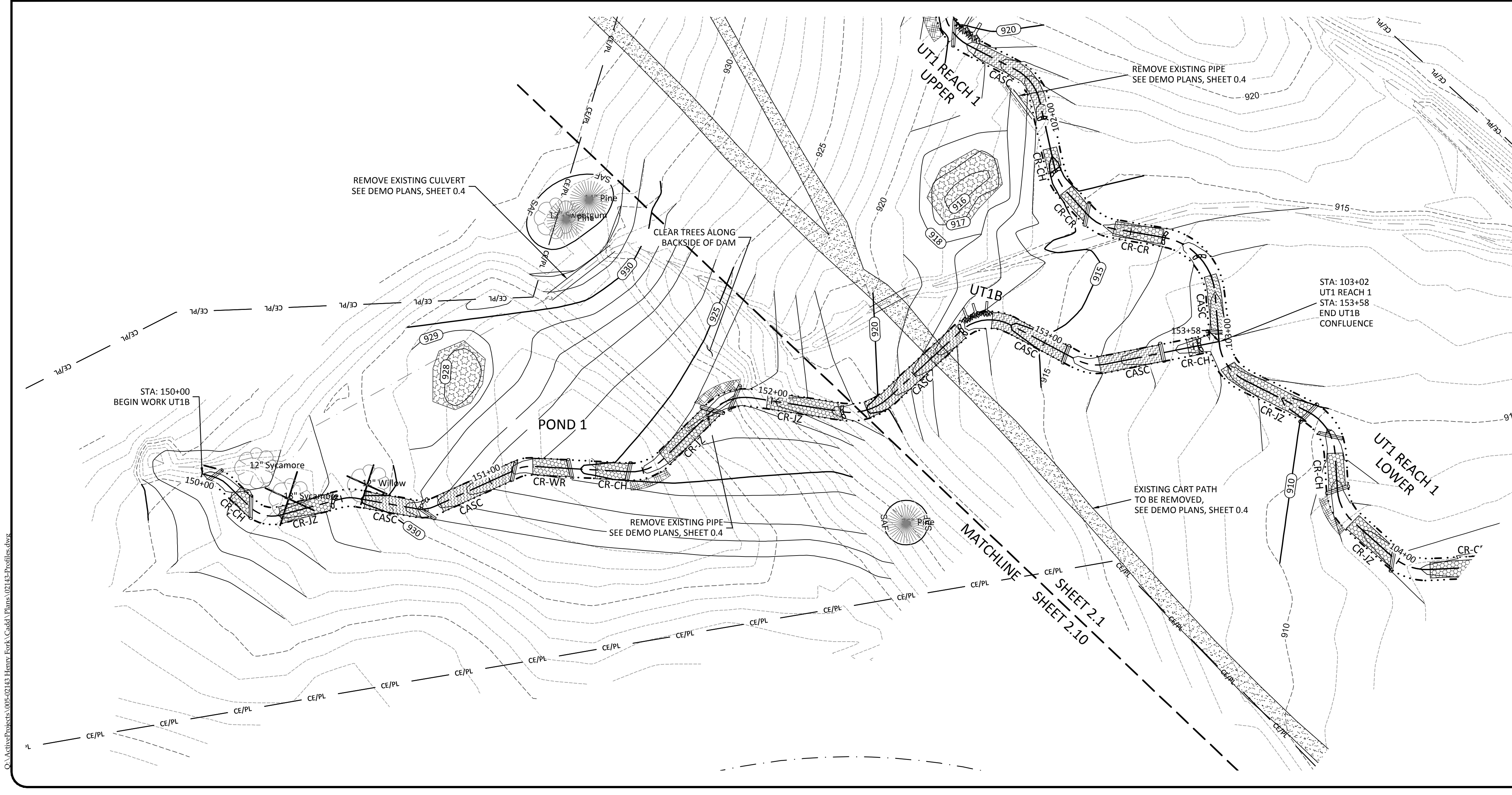
UT1A
Stream Plan and Profile

Revisions:

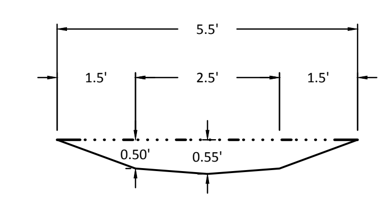
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet **2.9**

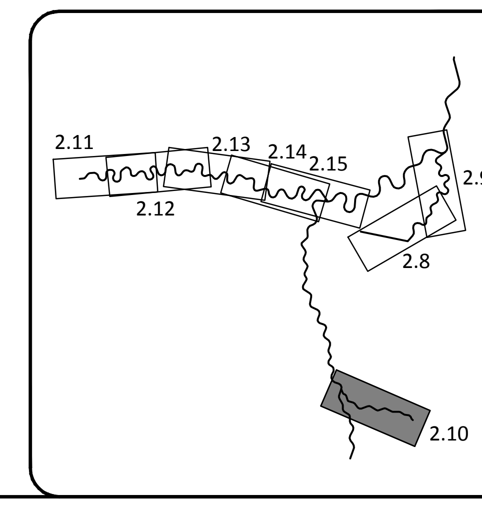




UT1B Typical Riffle Section



Sheet Index



WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

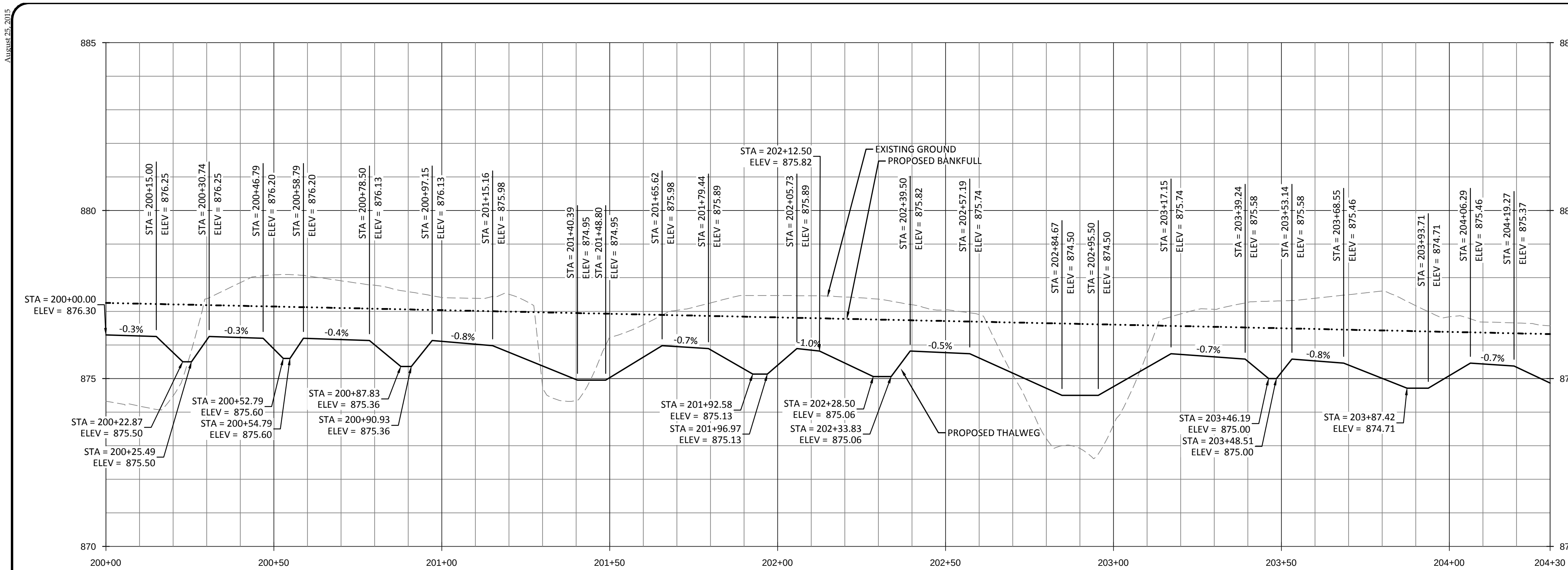
Henry Fork Mitigation Site
Catawba County, North Carolina

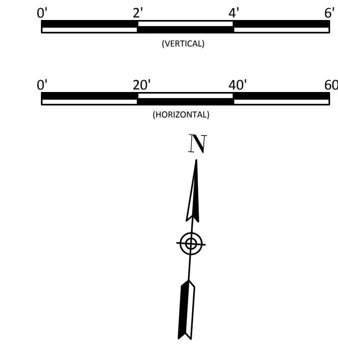
UT1B
Stream Plan and Profile

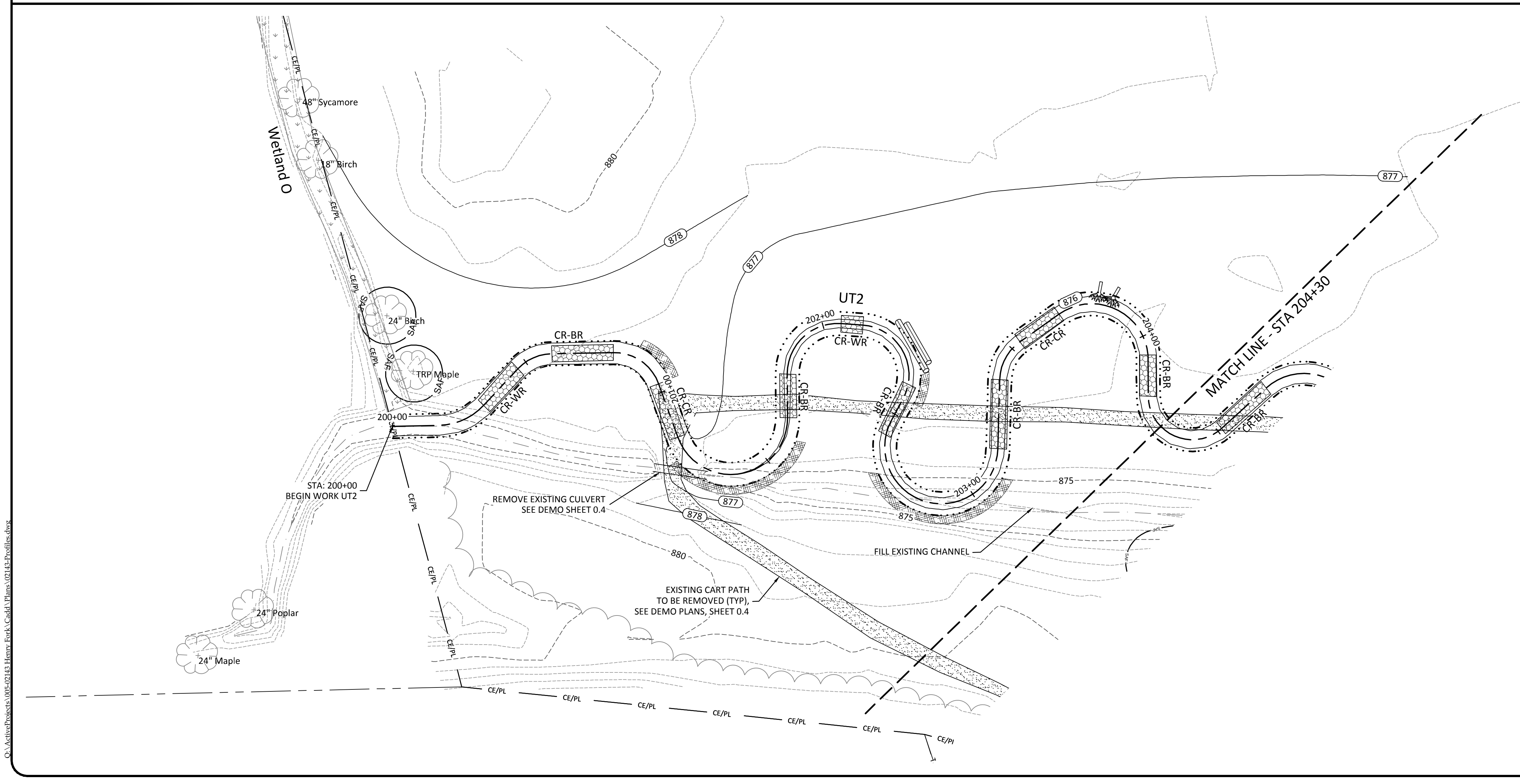
Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

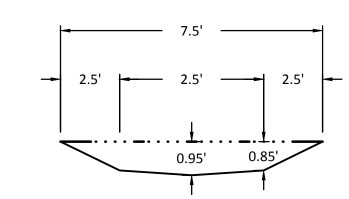
Sheet 2.10



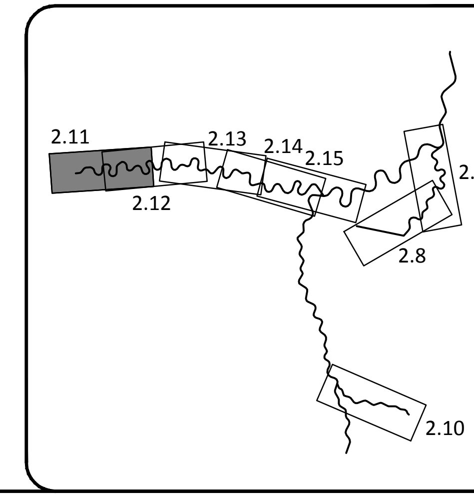




UT2 Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT2
Stream Plan and Profile

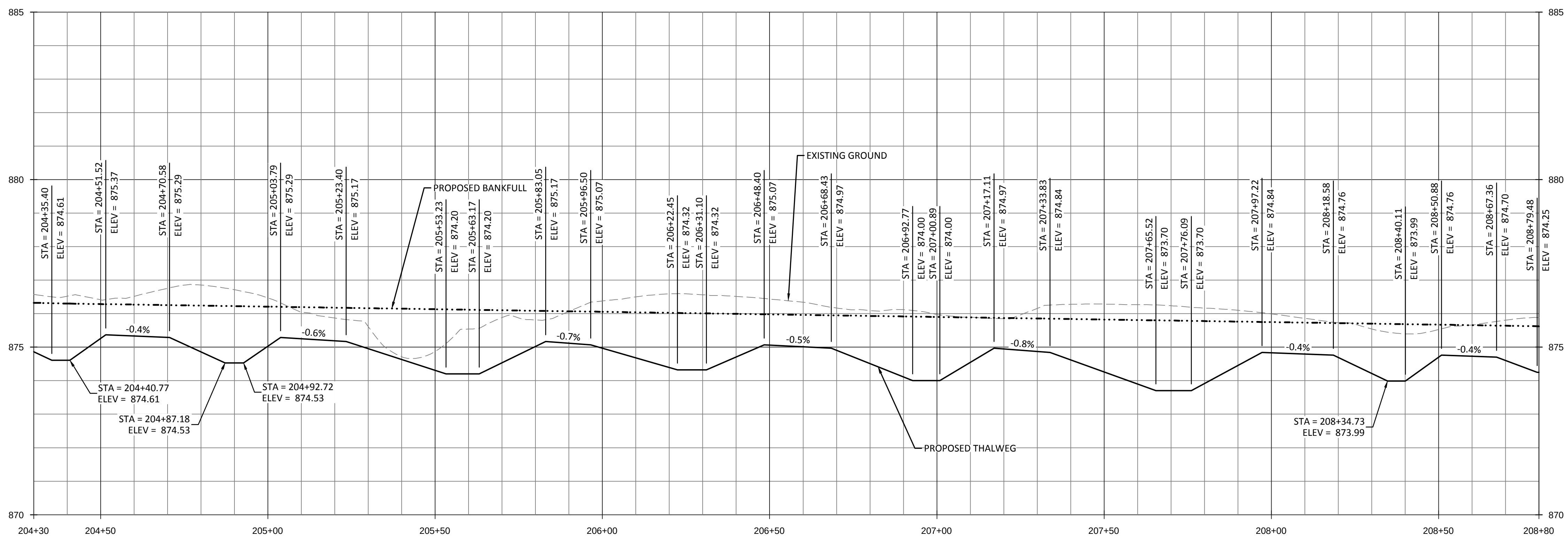
Revisions:

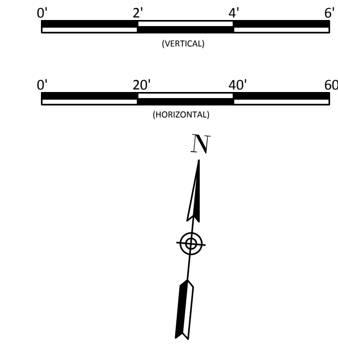
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

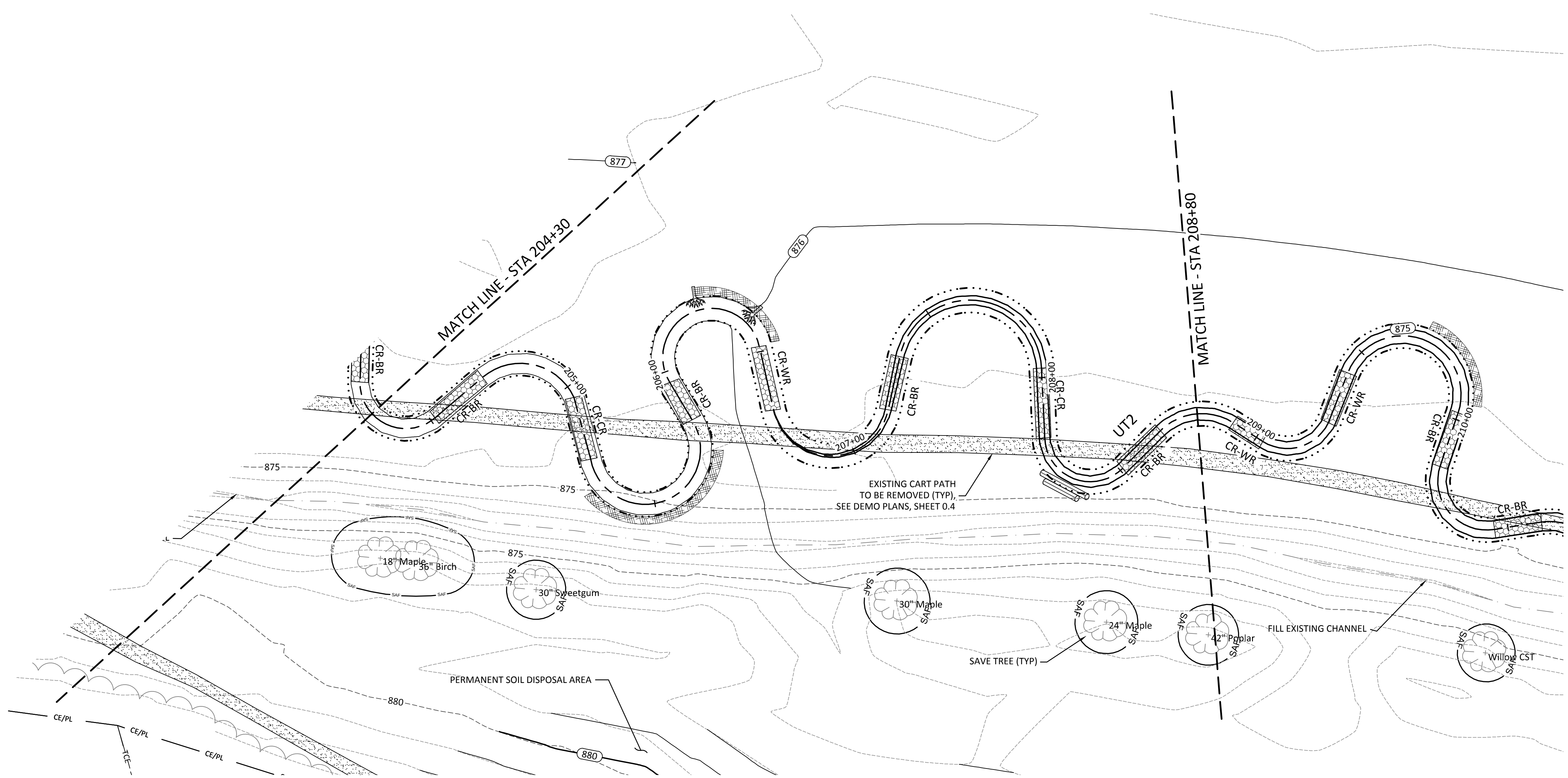
2.11
Sheet

August 25, 2015
Q:\ActiveProjects\005-02143 Henry Fork\CADD\Plans\02143-Profiles.dwg

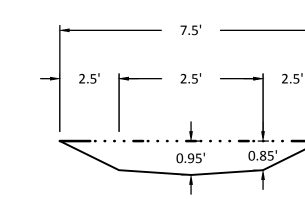
August 25, 2015



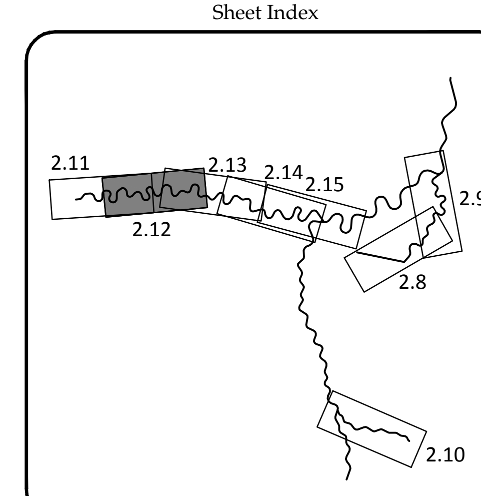




UT2 Typical Riffle Section



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

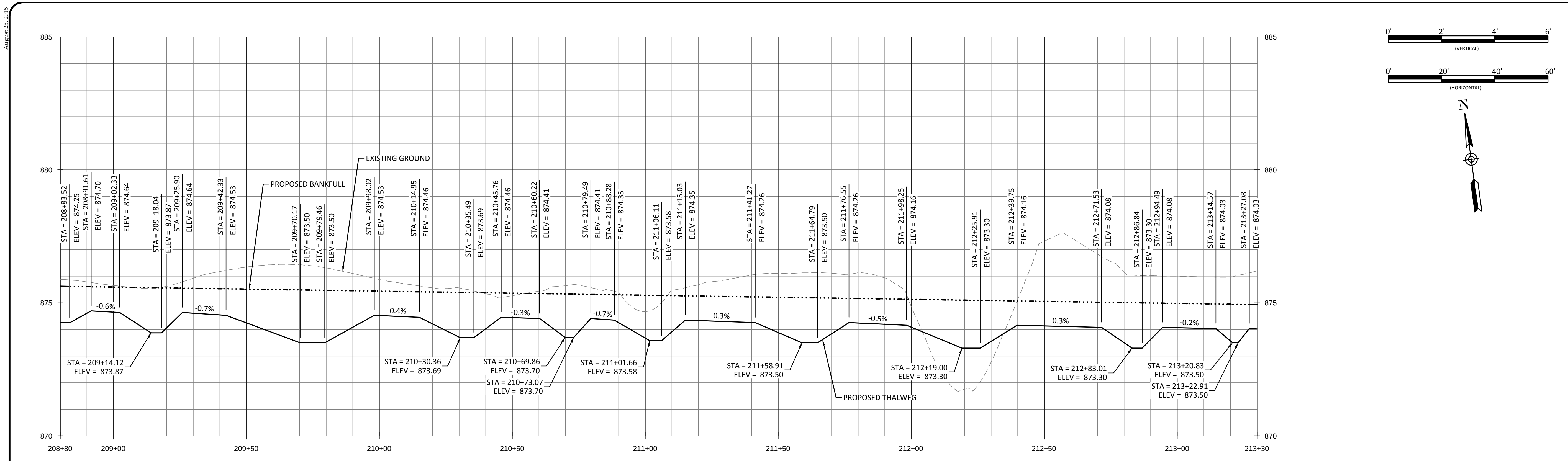
UT2
Stream Plan and Profile

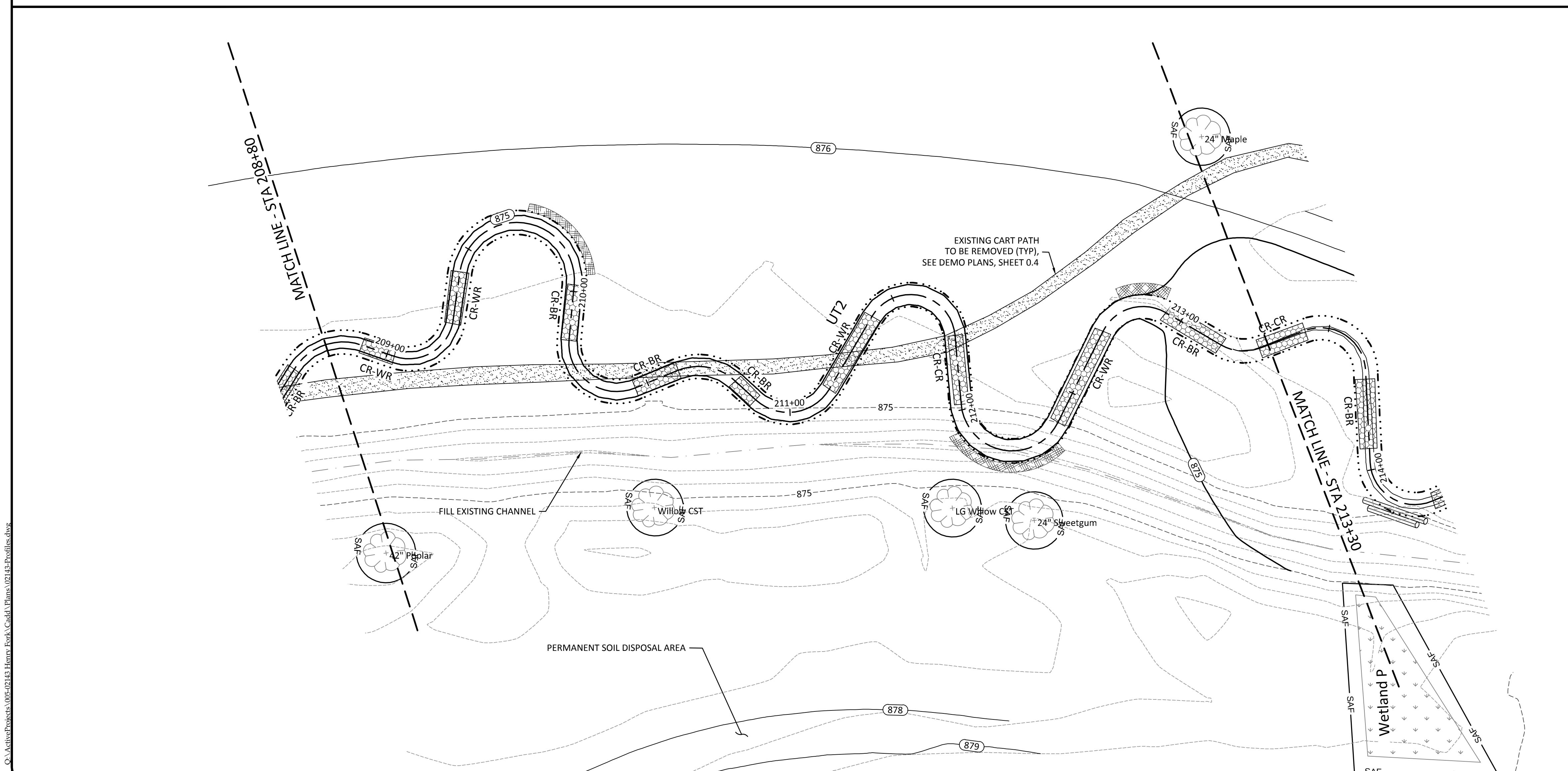
Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

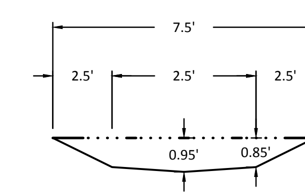
Sheet 2.12

Q:\ActiveProjects\005-02143 Henry Fork\CADD\Plans\02143-Profiles.dwg

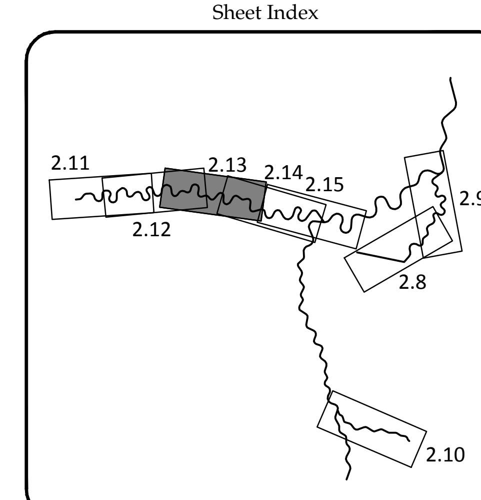




UT2 Typical Riffle Section



Sheet Index



WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT2
Stream Plan and Profile

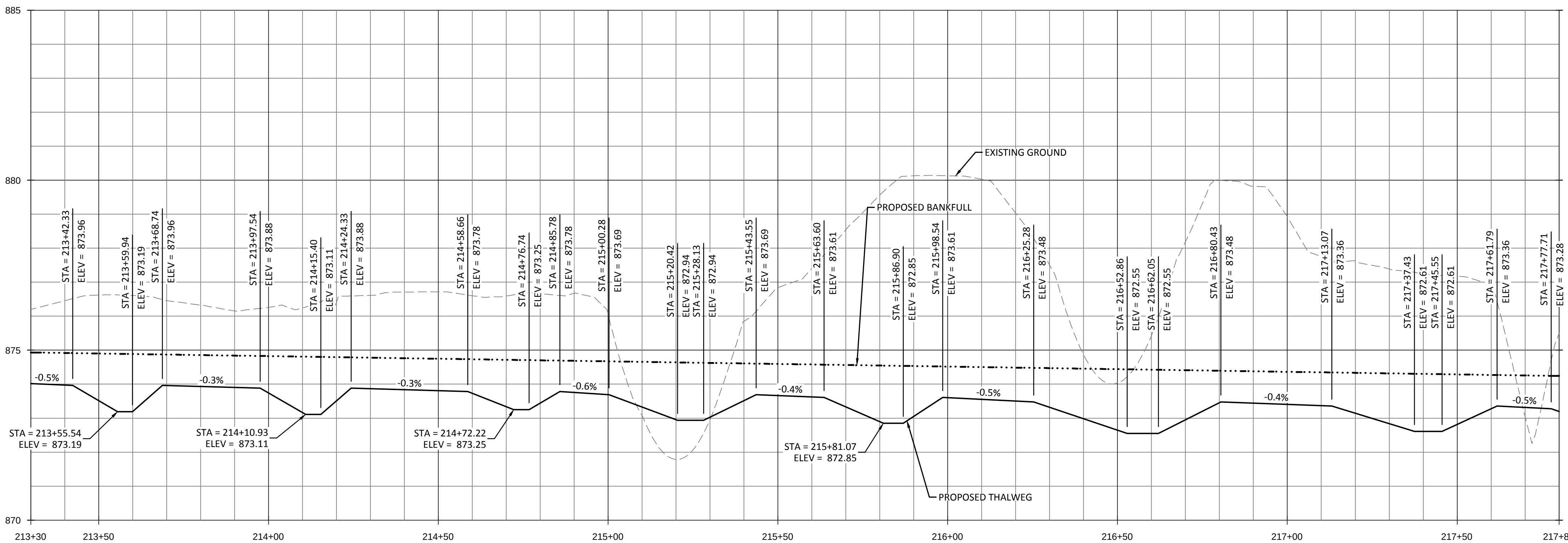
Revisions:

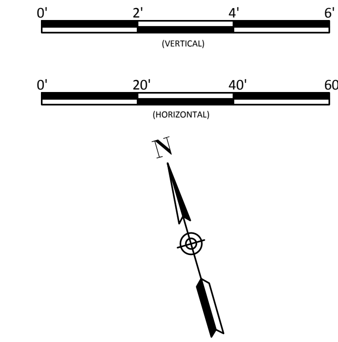
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

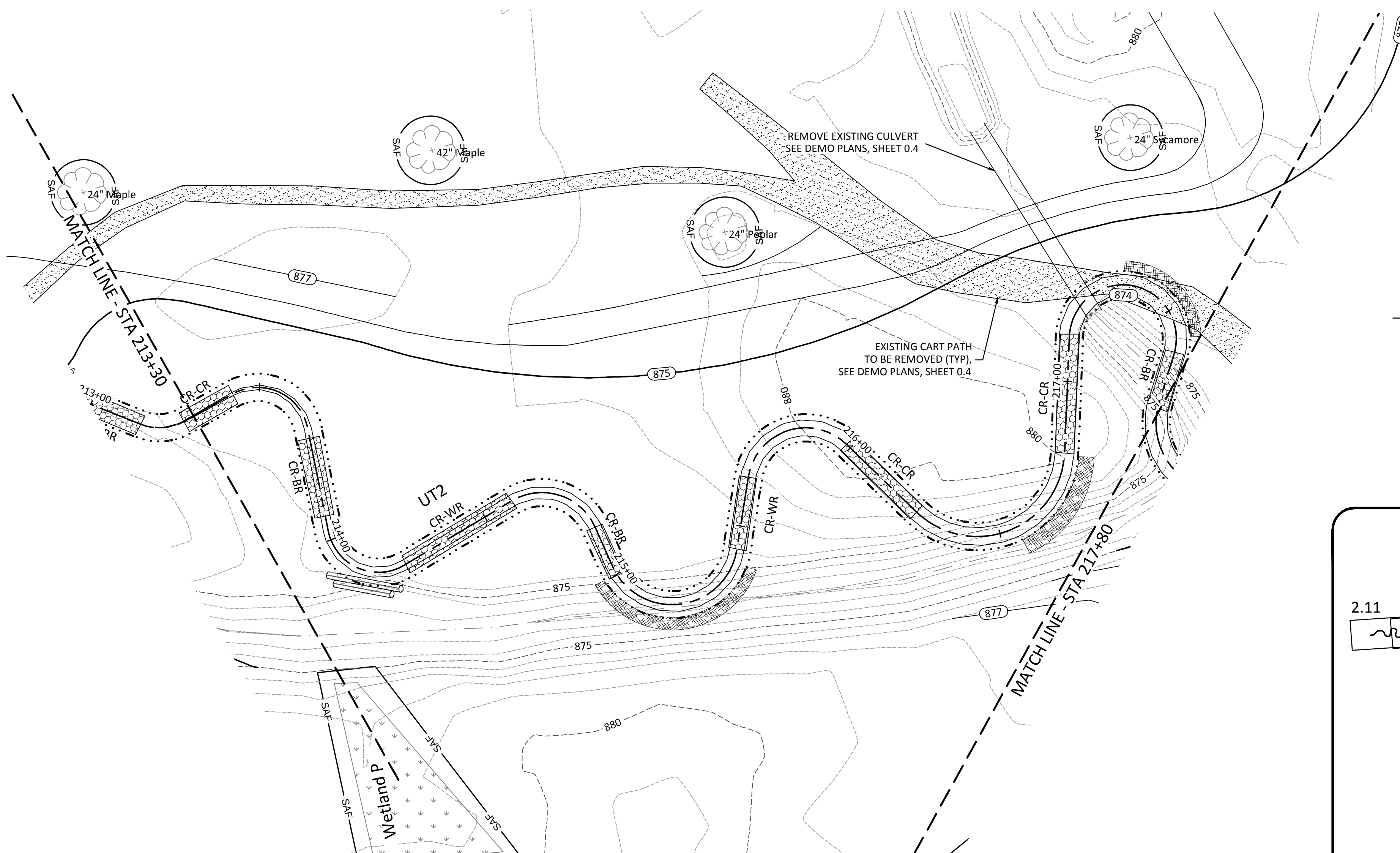
2.13
Sheet

August 25, 2015

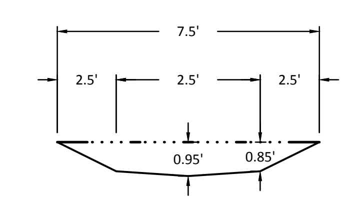
Q:\ActiveProjects\005-02143 Henry Fork\CadD\Plans\02143-Profiles.dwg



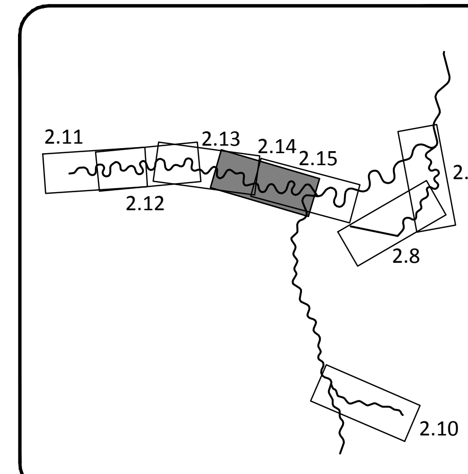




UT2 Typical Riffle Section



Sheet Index



WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

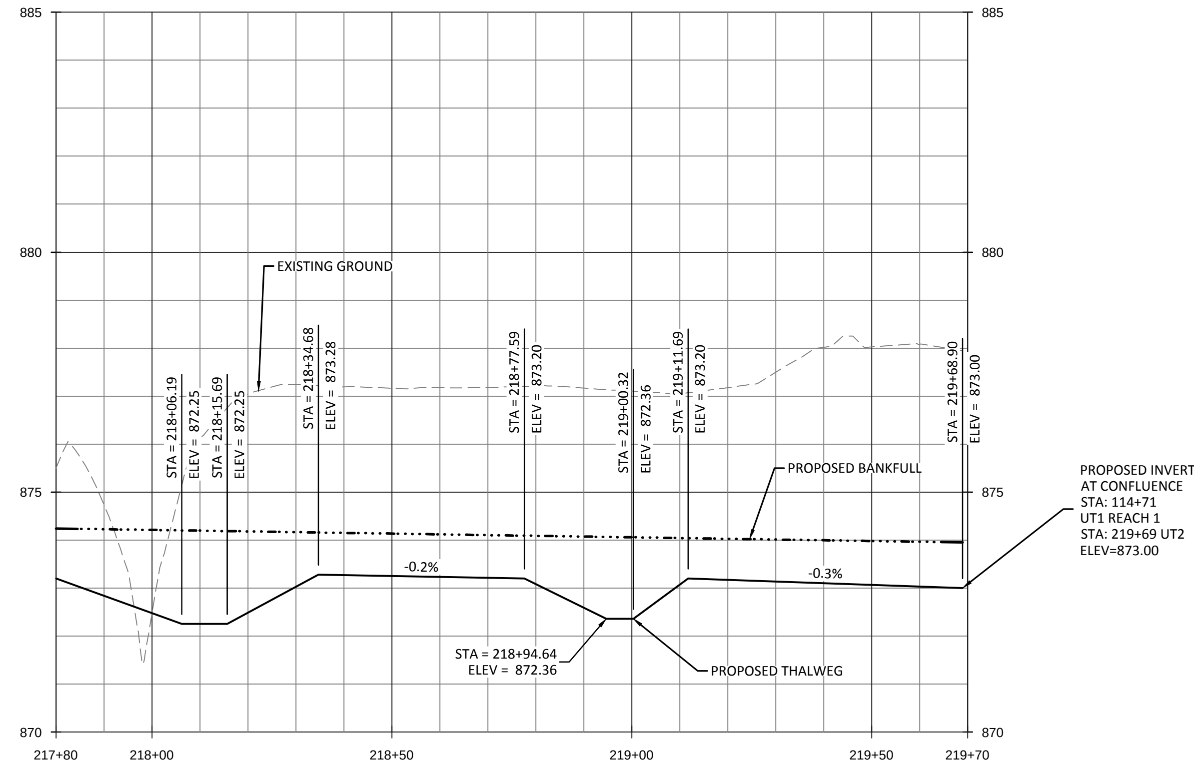
UT2
Stream Plan and Profile

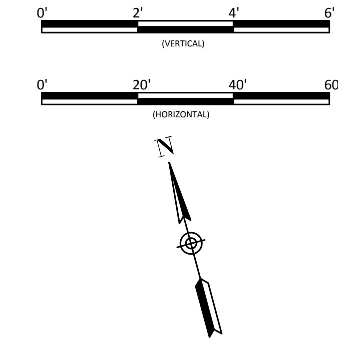
Revisions:

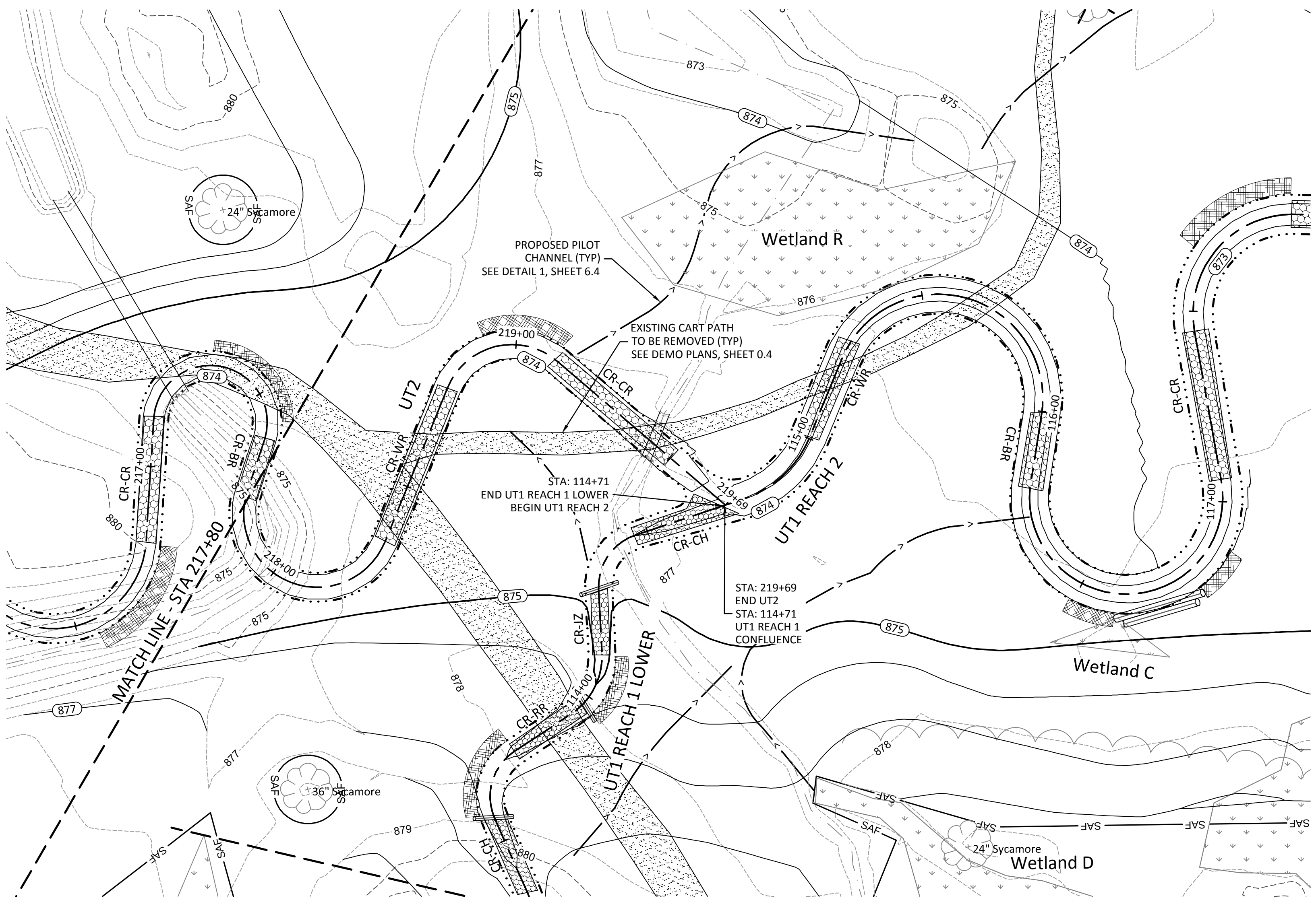
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet **2.14**

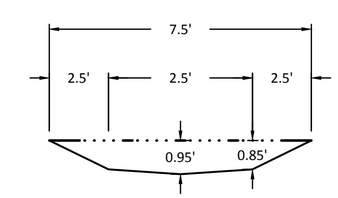
August 25, 2015



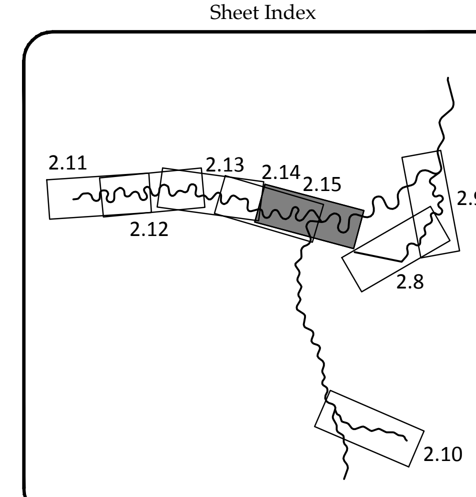




UT2 Typical Riffle Section



Sheet Index



WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

UT2
Stream Plan and Profile

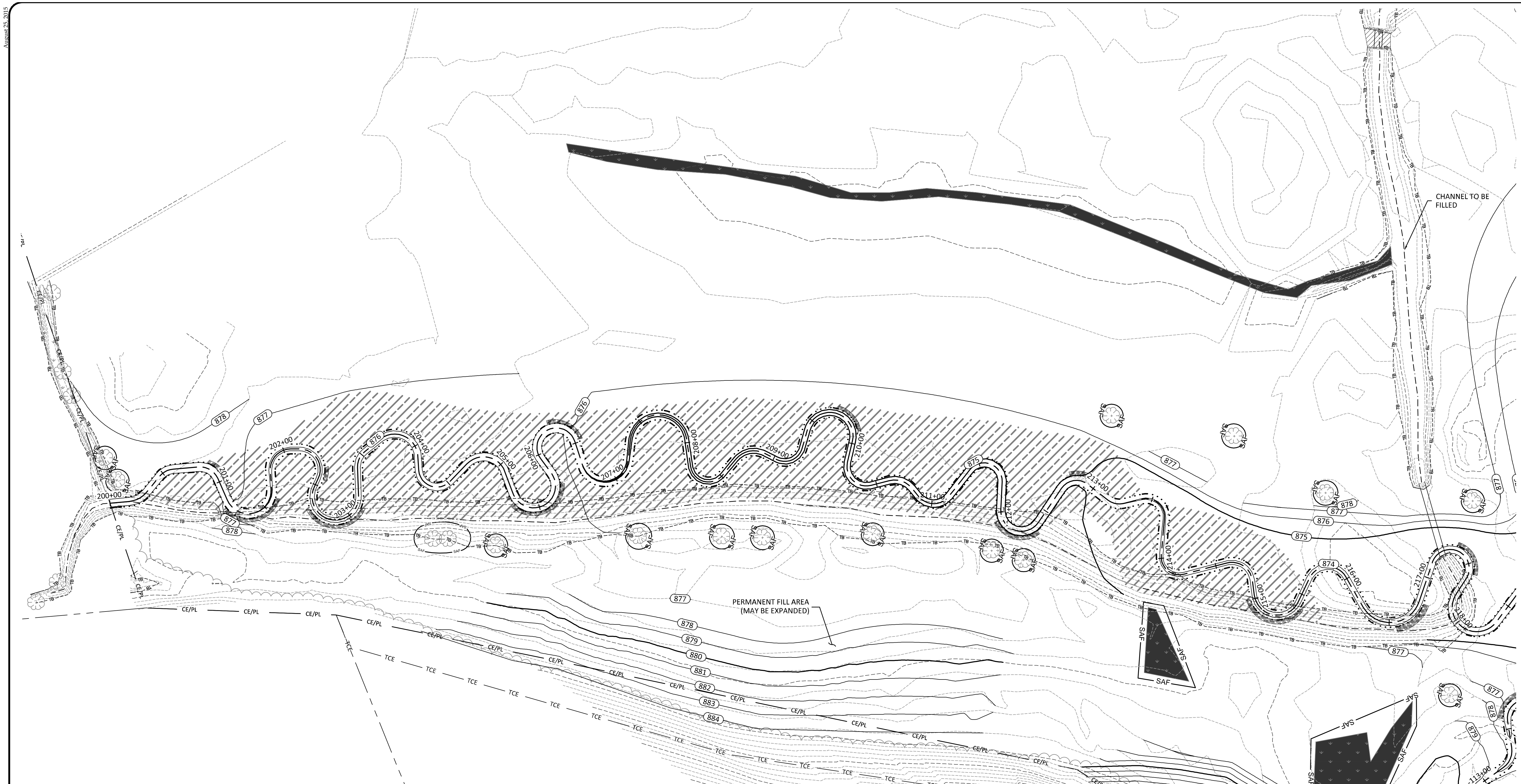
Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet

2.15

Q:\ActiveProjects\005-02143 Henry Fork\CadD\Plans\02143-Profiles.dwg



WETLAND RE-ESTABLISHMENT

WETLAND RE-HABILITATION

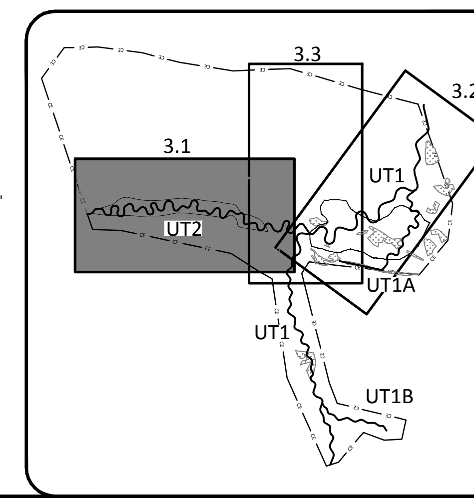
WETLAND ENHANCEMENT

EXISTING WETLAND

N

0' 40' 80' 120' (HORIZONTAL)

Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

Wetland Grading

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 3.1

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

Wetland Grading

Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 3.2

WETLAND RE-ESTABLISHMENT

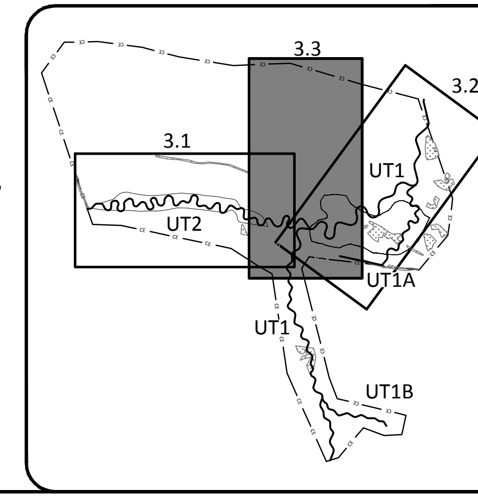
WETLAND RE-HABILITATION

WETLAND ENHANCEMENT

EXISTING WETLAND

0' 40' 80' 120'
(HORIZONTAL)

Sheet Index



Henry Fork Mitigation Site
Catawba County, North Carolina

Wetland Grading

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 3.3

NOTE:
"PERMANENT SEEDING" IS FOR ALL DISTURBED AREAS WITHIN CONSERVATION EASEMENT. ALL DISTURBED AREAS SHALL RECEIVE TEMPORARY SEEDING AND MULCHING PER DETAIL 3/6.6 IN ADDITION TO PERMANENT SEEDING.

Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%
Populus deltoides	Eastern Cottonwood	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%
Populus deltoides	Eastern Cottonwood	10%

NOTE:
ON SLOPING UPLANDS, PLANTING CONTRACTOR SHALL REDUCE ALL RIPARIAN BARE ROOT SPECIES PERCENTAGE, AND SUBSTITUTE AS 50% UPLAND SPECIES SUCH AS WHITE OAK, SOURWOOD, AMERICAN BEECH AND OTHER AVAILABLE UPLAND SPECIES APPROVED BY DESIGNER. THIS APPLICABLE FOR UT1 REACH 1, UT1B, AND ALSO UPSLOPE OF UT2. APPLICABLE AREAS REPRESENT 1 ACRE ON THIS SHEET.

Herbaceous Plugs

Scientific Name	Common Name	Max Spacing	Indiv. Spacing	Min. Size
Juncus effusus	Common Rush	3ft	3ft	1"-2" plug
TBD	Sedge	3ft	3ft	1"-2" plug

Live Stake

Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

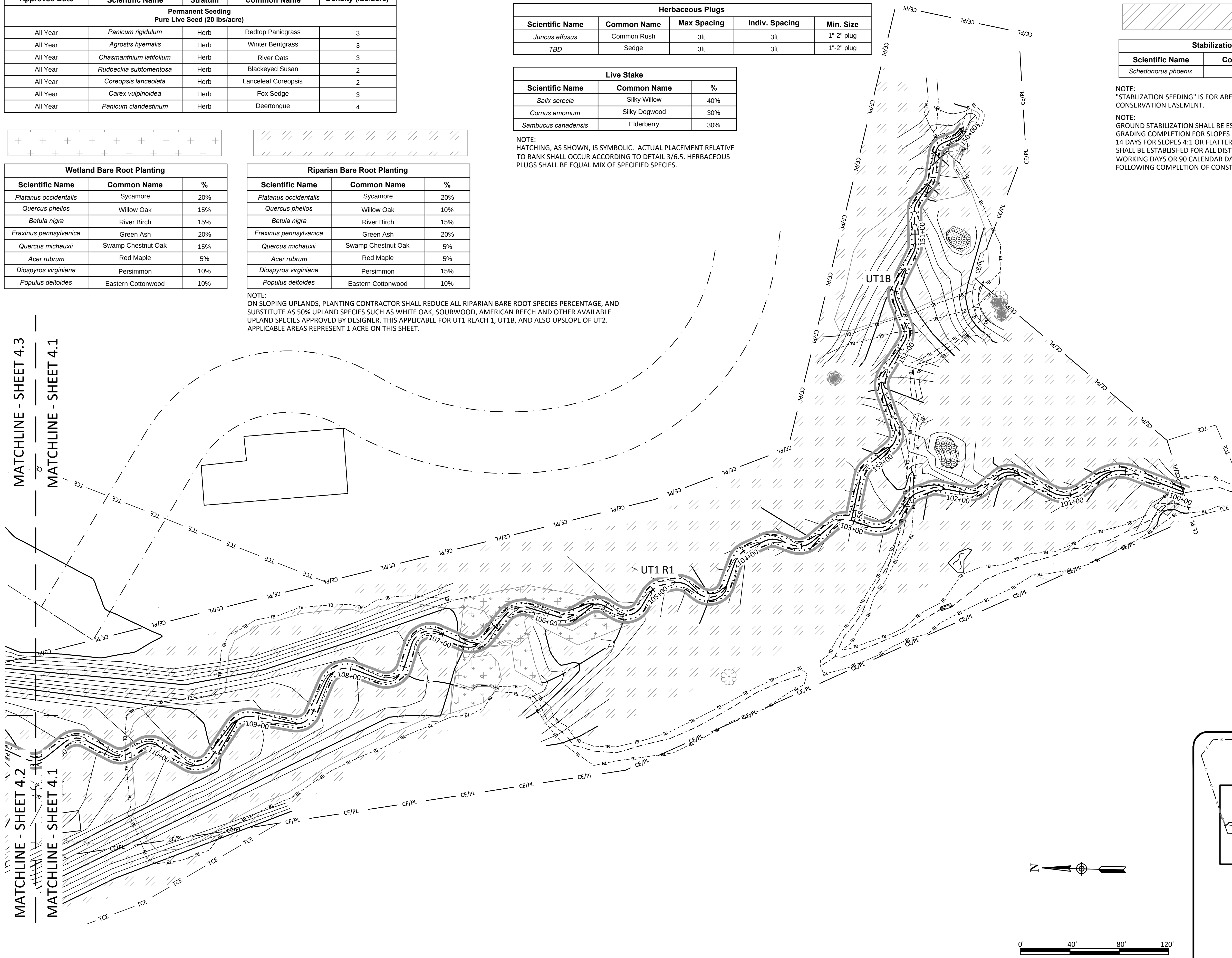
NOTE:
HATCHING, AS SHOWN, IS SYMBOLIC. ACTUAL PLACEMENT RELATIVE TO BANK SHALL OCCUR ACCORDING TO DETAIL 3/6.5. HERBACEOUS PLUGS SHALL BE EQUAL MIX OF SPECIFIED SPECIES.

Stabilization Seeding

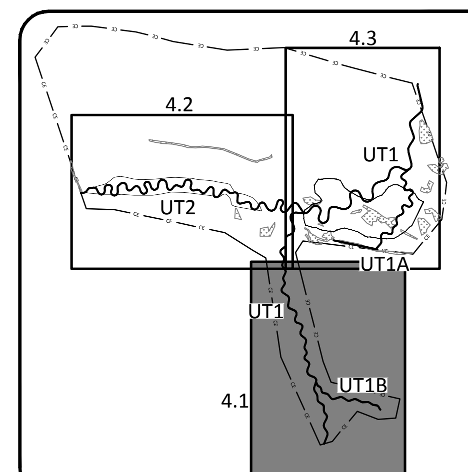
Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

NOTE:
"STABLIZATION SEEDING" IS FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

Planting Plan

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 4.1

NOTE:
"PERMANENT SEEDING" IS FOR ALL DISTURBED AREAS WITHIN CONSERVATION EASEMENT. ALL DISTURBED AREAS SHALL RECEIVE TEMPORARY SEEDING AND MULCHING PER DETAIL 3/6.6 IN ADDITION TO PERMANENT SEEDING.

Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%
Populus deltoides	Eastern Cottonwood	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%
Populus deltoides	Eastern Cottonwood	10%

NOTE:
ON SLOPING UPLANDS, PLANTING CONTRACTOR SHALL REDUCE ALL RIPARIAN BARE ROOT SPECIES PERCENTAGE, AND SUBSTITUTE AS 50% UPLAND SPECIES SUCH AS WHITE OAK, SOURWOOD, AMERICAN BEECH AND OTHER AVAILABLE UPLAND SPECIES APPROVED BY DESIGNER. THIS APPLICABLE FOR UT1 REACH 1, UT1B, AND ALSO UPSLOPE OF UT2. APPLICABLE AREAS REPRESENT 2/3 ACRE ON THIS SHEET.

Herbaceous Plugs

Scientific Name	Common Name	Max Spacing	Indiv. Spacing	Min. Size
Juncus effusus	Common Rush	3ft	3ft	1"-2" plug
TBD	Sedge	3ft	3ft	1"-2" plug

Live Stake

Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

NOTE:
HATCHING, AS SHOWN, IS SYMBOLIC. ACTUAL PLACEMENT RELATIVE TO BANK SHALL OCCUR ACCORDING TO DETAIL 3/6.5. HERBACEOUS PLUGS SHALL BE EQUAL MIX OF SPECIFIED SPECIES.

Stabilization Seeding

Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

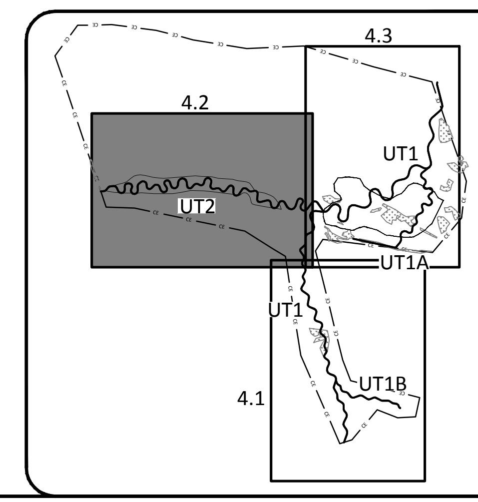
NOTE:
"STABLIZATION SEEDING" IS FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.

N

0' 40' 80' 120'
(HORIZONTAL)

Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

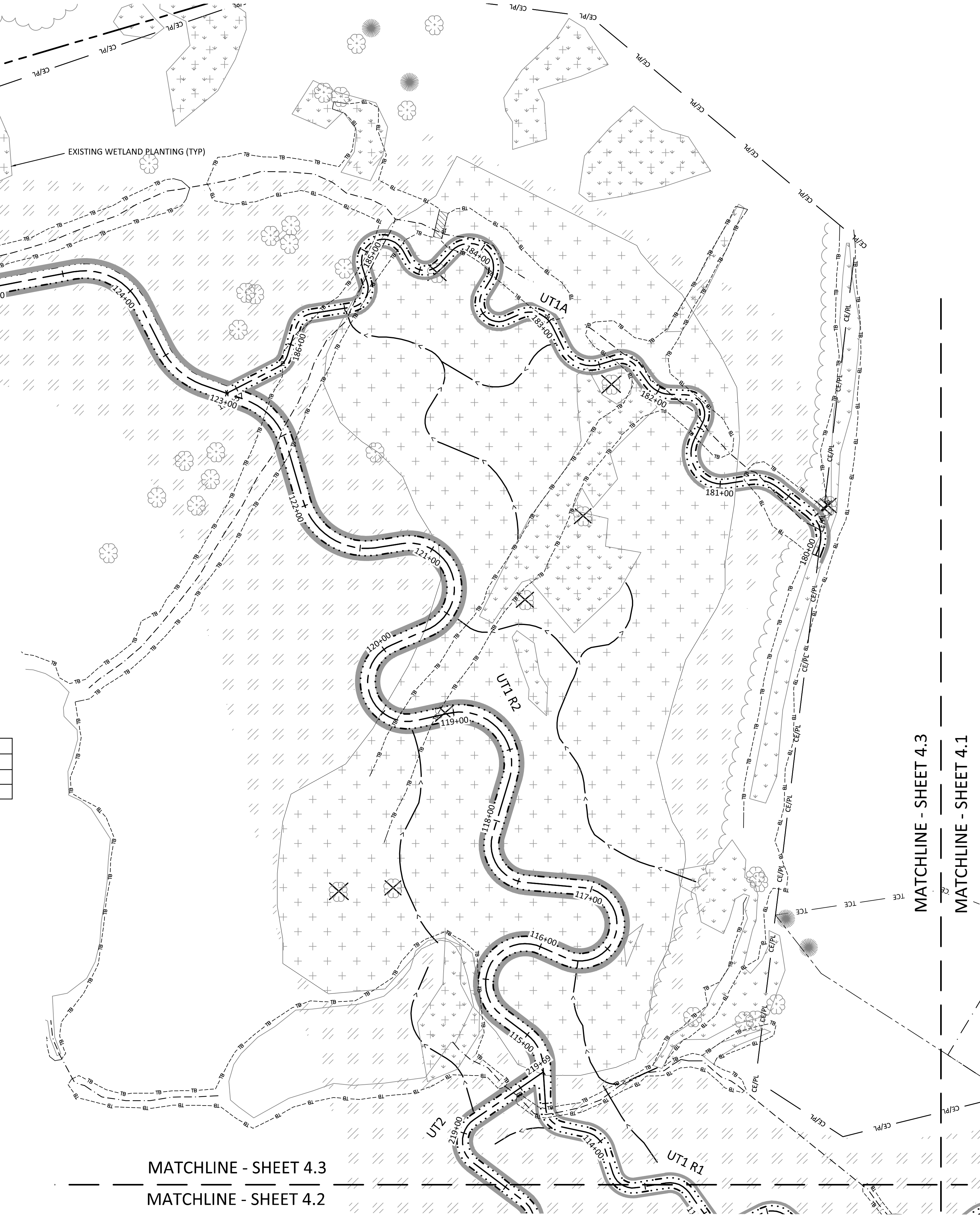
Henry Fork Mitigation Site
Catawba County, North Carolina
Planting Plan

Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet
4.2

August 25, 2015
Q:\ActiveProjects\005-02143 Henry Fork\Cadd\Plans\02143-Planting.dwg



NOTE:
"PERMANENT SEEDING" IS FOR ALL DISTURBED AREAS WITHIN CONSERVATION EASEMENT. ALL DISTURBED AREAS SHALL RECEIVE TEMPORARY SEEDING AND MULCHING PER DETAIL 3/6.6 IN ADDITION TO PERMANENT SEEDING.

Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%
Populus deltoides	Eastern Cottonwood	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%
Populus deltoides	Eastern Cottonwood	10%

Stabilization Seeding

Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

NOTE:
"STABLIZATION SEEDING" IS FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.

Herbaceous Plugs

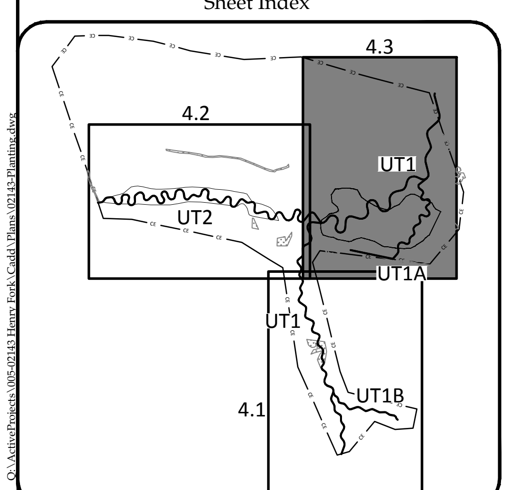
Scientific Name	Common Name	Max Spacing	Indiv. Spacing	Min. Size
Juncus effusus	Common Rush	3ft	3ft	1"-2" plug
TBD	Sedge	3ft	3ft	1"-2" plug

Live Stake

Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

NOTE:
HATCHING, AS SHOWN, IS SYMBOLIC. ACTUAL PLACEMENT RELATIVE TO BANK SHALL OCCUR ACCORDING TO DETAIL 3/6.5. HERBACEOUS PLUGS SHALL BE EQUAL MIX OF SPECIFIED SPECIES.

Sheet Index



N

0' 40' 80' 120'
(HORIZONTAL)

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

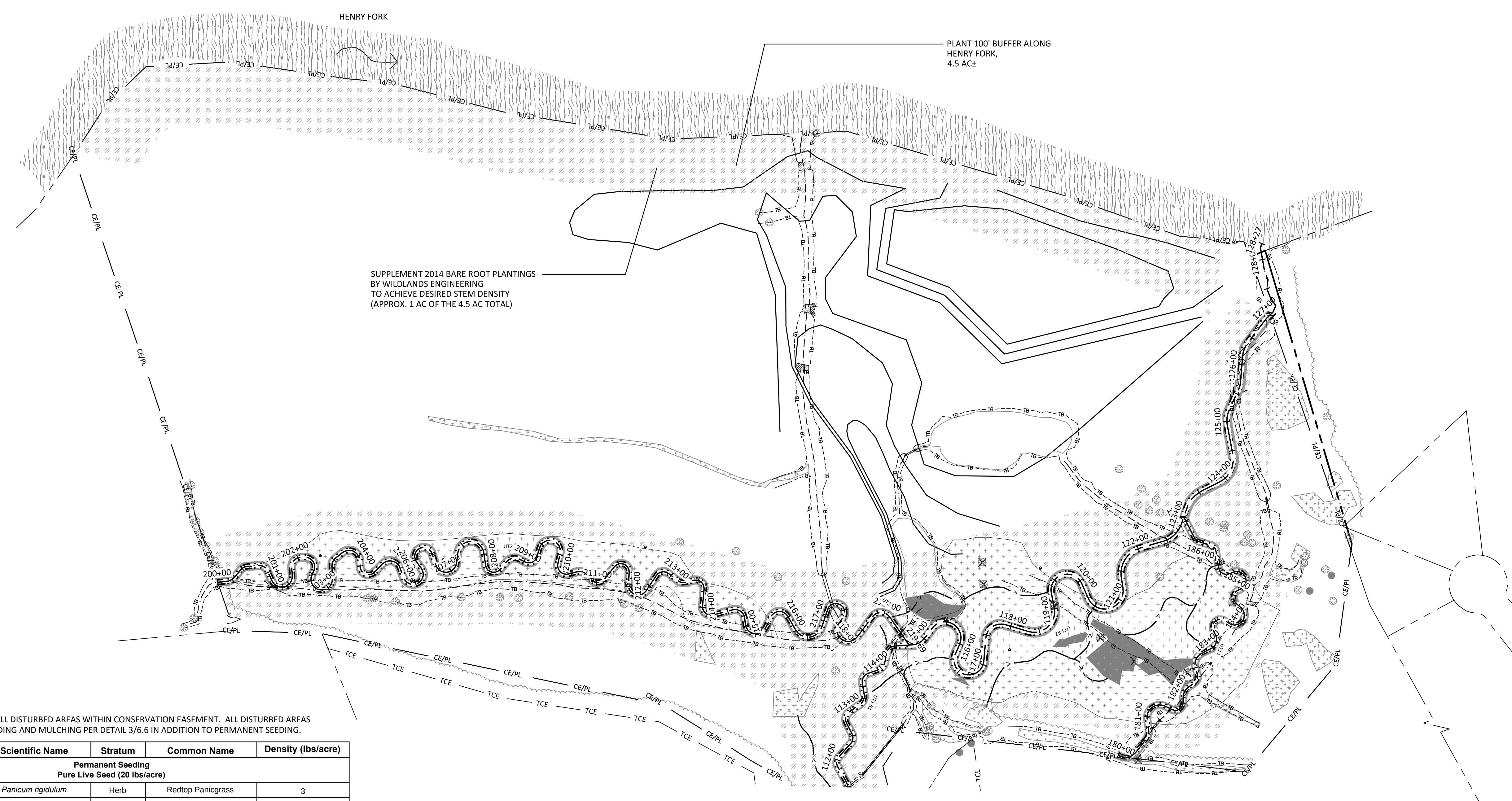
Planting Plan

Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 4.3

August 25, 2015
Q:\ActiveProjects\005-02143 Henry Fork\CADD\Plans\02143-Planting.dwg



NOTE:
"PERMANENT SEEDING" IS FOR ALL DISTURBED AREAS WITHIN CONSERVATION EASEMENT. ALL DISTURBED AREAS SHALL RECEIVE TEMPORARY SEEDING AND MULCHING PER DETAIL 3/6.6 IN ADDITION TO PERMANENT SEEDING.

Approved Date	Scientific Name	Stratum	Common Name	Density (lbs/acre)
Permanent Seeding Pure Live Seed (20 lbs/acre)				
All Year	*Panicum rigidulum*	Herb	Redtop Panicgrass	3
All Year	*Agrostis hyemalis*	Herb	Winter Bentgrass	3
All Year	*Chasmanthium latifolium*	Herb	River Oats	3
All Year	*Rudbeckia subtomentosa*	Herb	Blackeyed Susan	2
All Year	*Coreopsis lanceolata*	Herb	Lanceleaf Coreopsis	2
All Year	*Carex vulpinoidea*	Herb	Fox Sedge	3
All Year	*Panicum clandestinum*	Herb	Deertongue	4

Wetland Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	15%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	15%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	10%
Populus deltoides	Eastern Cottonwood	10%

Riparian Bare Root Planting

Scientific Name	Common Name	%
Platanus occidentalis	Sycamore	20%
Quercus phellos	Willow Oak	10%
Betula nigra	River Birch	15%
Fraxinus pennsylvanica	Green Ash	20%
Quercus michauxii	Swamp Chestnut Oak	5%
Acer rubrum	Red Maple	5%
Diospyros virginiana	Persimmon	15%
Populus deltoides	Eastern Cottonwood	10%

NOTE:
ON SLOPING UPLANDS, PLANTING CONTRACTOR SHALL REDUCE ALL RIPARIAN BARE ROOT SPECIES PERCENTAGE, AND SUBSTITUTE AS 50% UPLAND SPECIES SUCH AS WHITE OAK, SOURWOOD, AMERICAN BEECH AND OTHER AVAILABLE UPLAND SPECIES APPROVED BY DESIGNER. THIS APPLICABLE FOR UT1 REACH 1, UT1B, AND ALSO UPSLOPE OF UT2. APPLICABLE AREAS REPRESENT 2/3 ACRE ON THIS SHEET.

Herbaceous Plugs

Scientific Name	Common Name	Max Spacing	Indiv. Spacing	Min. Size
Juncus effusus	Common Rush	3ft	3ft	1"-2" plug
TBD	Sedge	3ft	3ft	1"-2" plug

Live Stake

Scientific Name	Common Name	%
Salix serecia	Silky Willow	40%
Cornus amomum	Silky Dogwood	30%
Sambucus canadensis	Elderberry	30%

NOTE:
HATCHING, AS SHOWN, IS SYMBOLIC. ACTUAL PLACEMENT RELATIVE TO BANK SHALL OCCUR ACCORDING TO DETAIL 3/6.5. HERBACEOUS PLUGS SHALL BE EQUAL MIX OF SPECIFIED SPECIES.

Stabilization Seeding

Scientific Name	Common Name	lb/acre
Schedonorus phoenix	Tall Fescue	100

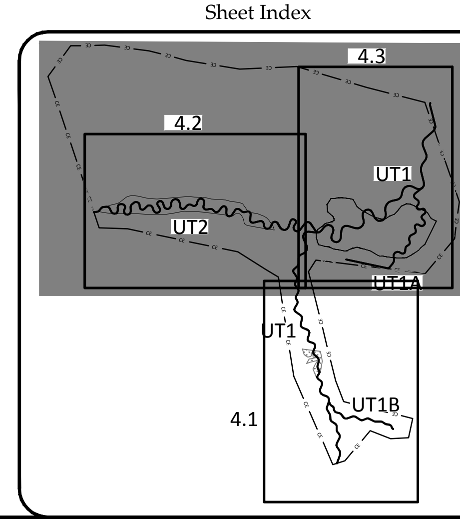
NOTE:
"STABLIZATION SEEDING" IS FOR AREAS OF DISTURBANCE OUTSIDE CONSERVATION EASEMENT.

NOTE:
GROUND STABILIZATION SHALL BE ESTABLISHED WITHIN 7 DAYS OF GRADING COMPLETION FOR SLOPES STEEPER THAN 4:1 AND WITHIN 14 DAYS FOR SLOPES 4:1 OR FLATTER. PERMANENT GROUND COVER SHALL BE ESTABLISHED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION.

N

0' 100' 200' 300'
(HORIZONTAL)

Sheet Index



WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 033578 JACOB McLEAN

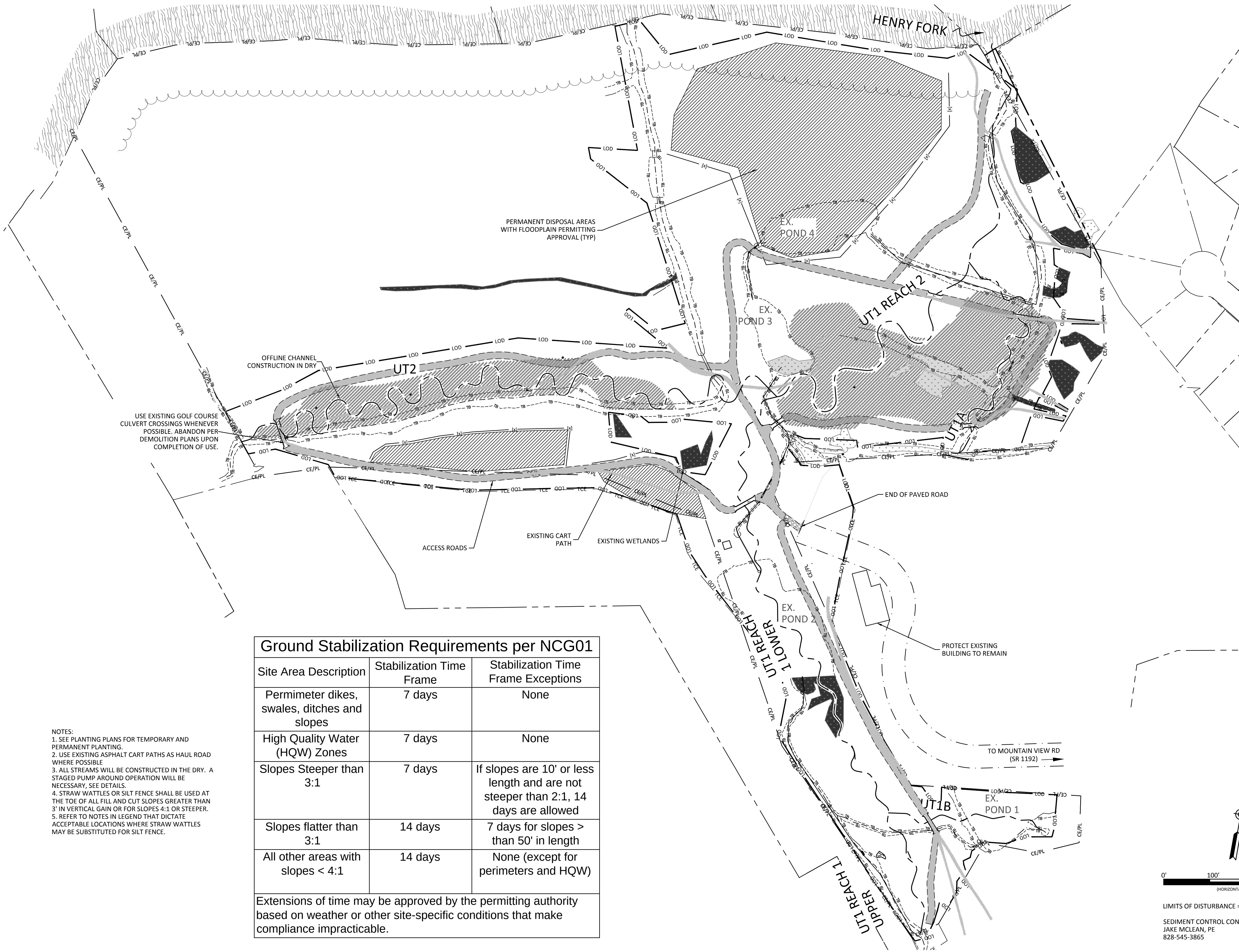
Henry Fork Mitigation Site
Catawba County, North Carolina

Planting Plan

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Revisions:
8-19-2015 - Sheet added to address IRT comment

4.4
Sheet



Ground Stabilization Requirements per NCG01		
Site Area Description	Stabilization Time Frame	Stabilization Time Frame Exceptions
Perimeter dikes, swales, ditches and slopes	7 days	None
High Quality Water (HQW) Zones	7 days	None
Slopes Steeper than 3:1	7 days	If slopes are 10' or less length and are not steeper than 2:1, 14 days are allowed
Slopes flatter than 3:1	14 days	7 days for slopes > than 50' in length
All other areas with slopes < 4:1	14 days	None (except for perimeters and HQW)
Extensions of time may be approved by the permitting authority based on weather or other site-specific conditions that make compliance impracticable.		

NOTES:
1. SEE PLANTING PLANS FOR TEMPORARY AND PERMANENT PLANTING.
2. USE EXISTING ASPHALT CART PATHS AS HAUL ROAD WHERE POSSIBLE
3. ALL STREAMS WILL BE CONSTRUCTED IN THE DRY. A STAGED PUMP AROUND OPERATION WILL BE NECESSARY, SEE DETAILS.
4. STRAW WATTLES OR SILT FENCE SHALL BE USED AT THE TOE OF ALL FILL AND CUT SLOPES GREATER THAN 3' IN VERTICAL GAIN OR FOR SLOPES 4:1 OR STEEPER.
5. REFER TO NOTES IN LEGEND THAT DICTATE ACCEPTABLE LOCATIONS WHERE STRAW WATTLES MAY BE SUBSTITUTED FOR SILT FENCE.

LIMITS OF DISTURBANCE = 30 ACRES

SEDIMENT CONTROL CONTACT:
JAKE MCLEAN, PE
828-545-3865

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

Erosion and Sediment Control Overview
Erosion & Sediment Control

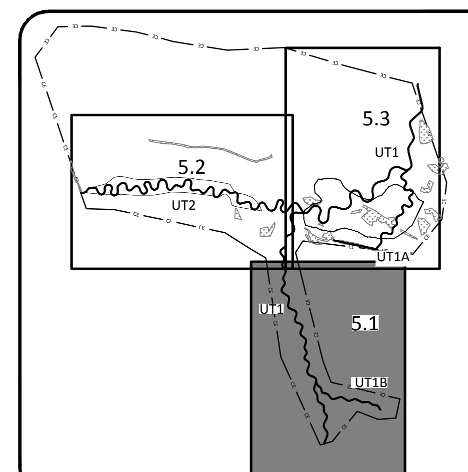
Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 5.0

August 25, 2015

Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 033578 JACOB McLEAN

Henry Fork Mitigation Site
Catawba County, North Carolina

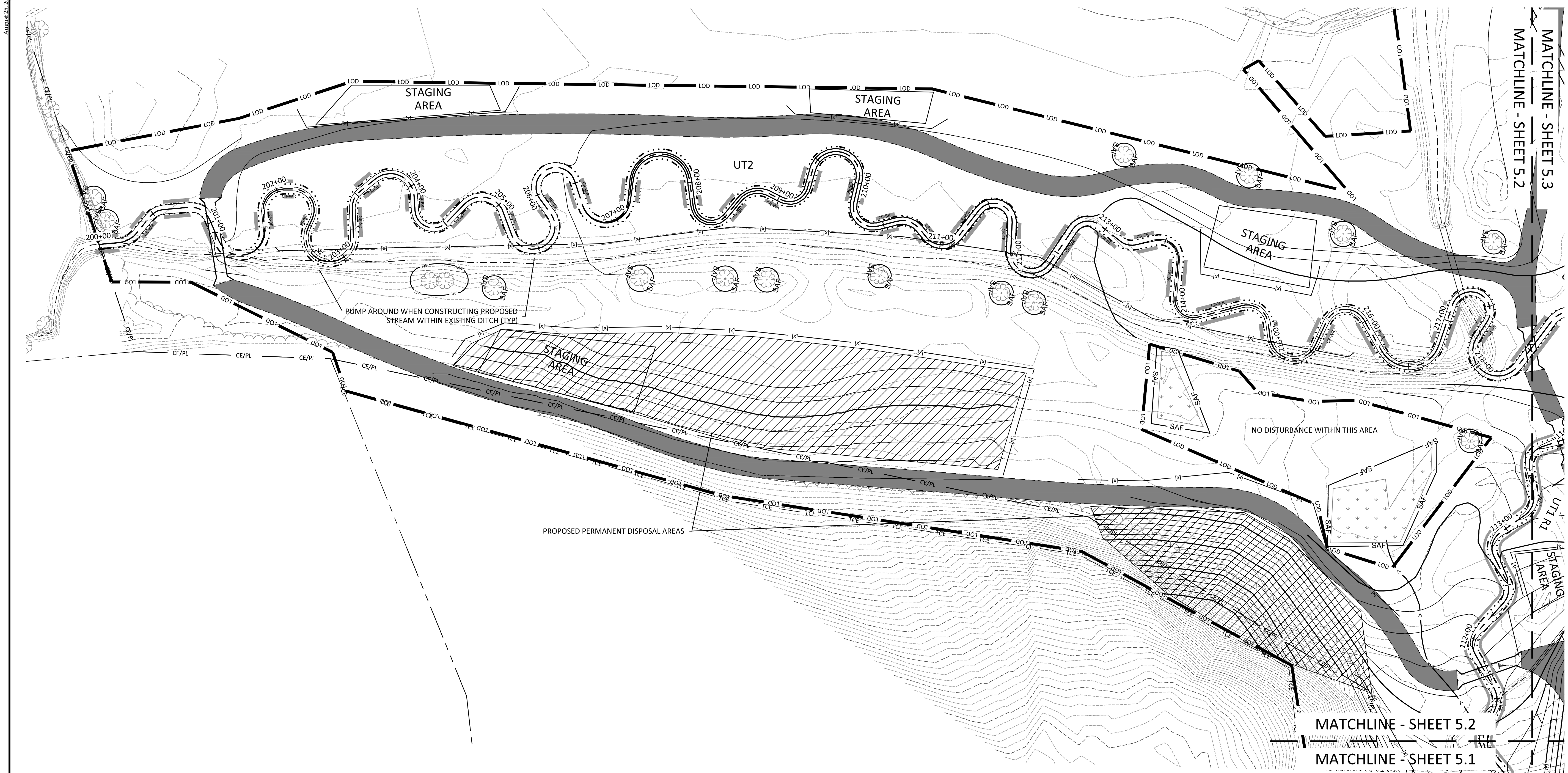
Erosion and Sediment Control

Revisions:

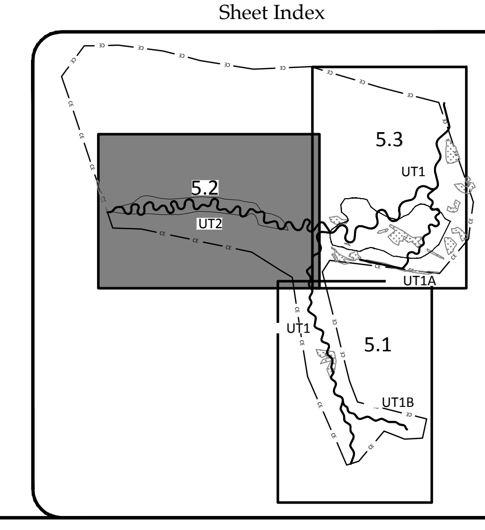
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 5.1

Q:\ActiveProjects\005-02143 Henry Fork\CadA\Plans\02143-ESC.dwg



Sheet Index



WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

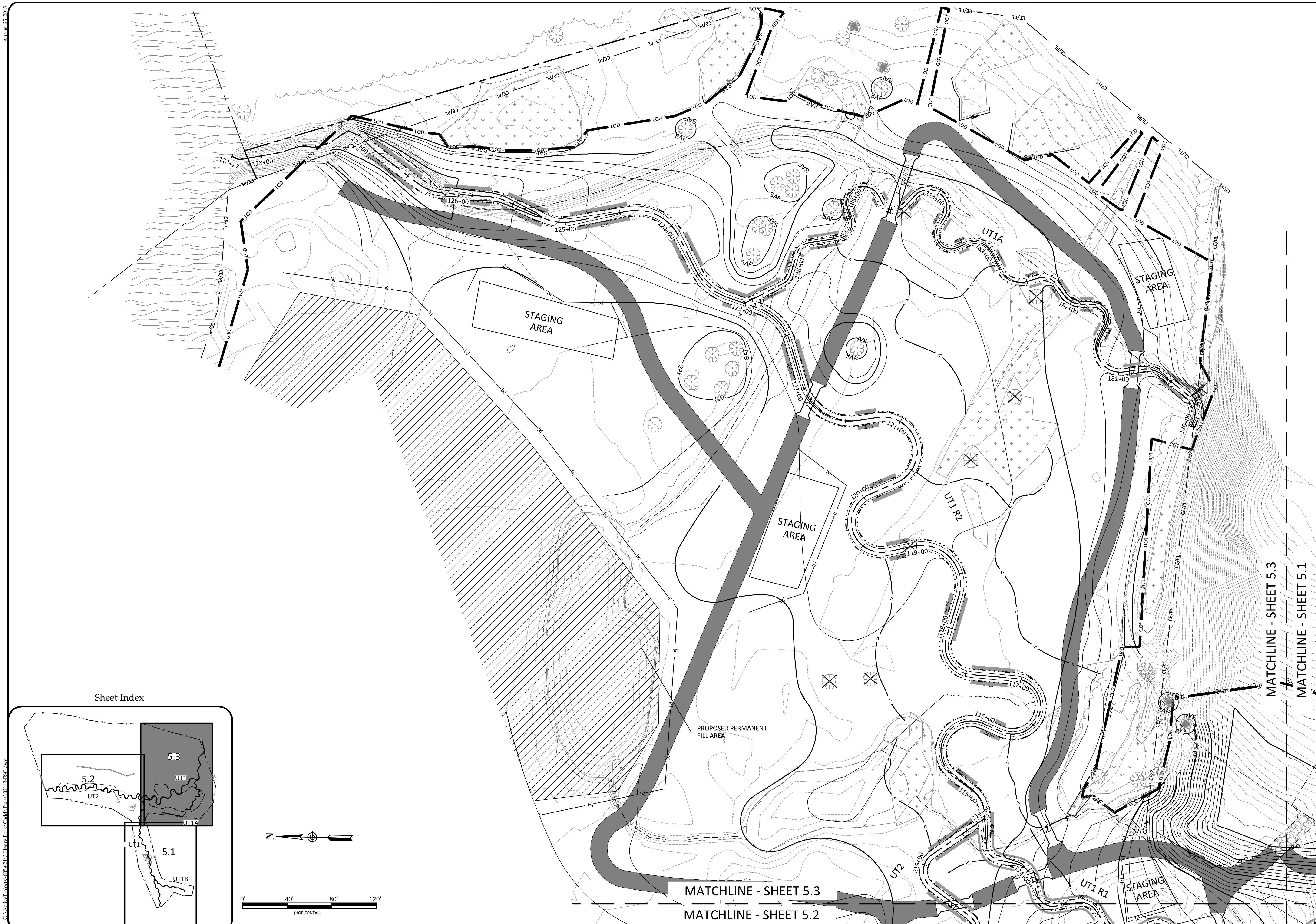
Henry Fork Mitigation Site
Catawba County, North Carolina

Erosion and Sediment Control

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 5.2



Henry Fork Mitigation Site
Catawba County, North Carolina

Erosion and Sediment Control

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Revisions:

Sheet 5.3

PROJECT RIFFLE TABLE FOR ALL RIFFLE TYPES:

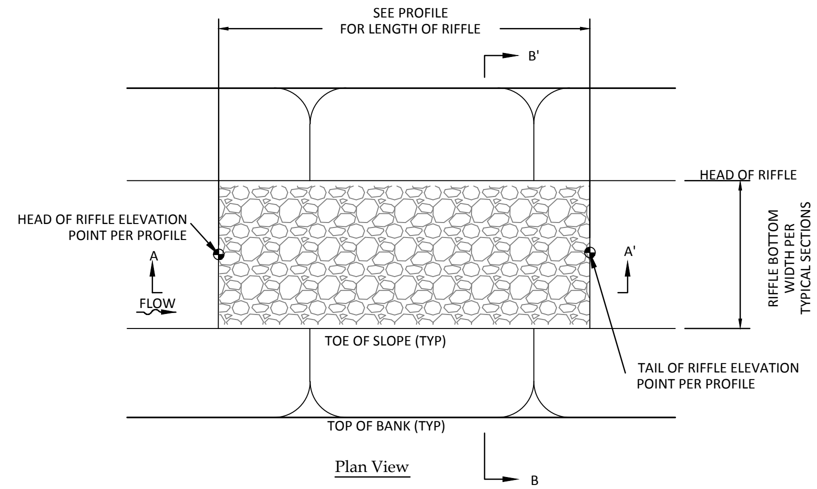
	UT1 Reach 1 Upper & Lower	UT1 Reach 2	UT1 Reach 2 Tie-in Reach[1]	UT1B	UT2	UT1A
Total Riffle Depth	10"	6"	10"	10"	6"	6"

[1] Tie-in reach is station 124+42 to end of project

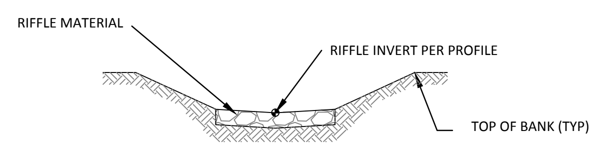
QUARRIED STONE TYPE/PERCENTAGE BY REACH:

	UT1 Reach 1 Upper & Lower	UT1 Reach 2	UT1 Reach 2 Tie-in Reach	UT1B	UT2	UT1A
57 Stone	5%	5%	10%	5%	5%	5%
No. 4 Stone (1-4")	10%	15%	20%	10%	10%	15%
Finer Gravel/Sand	15%	80%	20%	15%	85%	80%
Class A (2-6")	20%		30%	30%		
Class B (5-12")	30%		20%	30%		
Class I (5-17")	20%			10%		

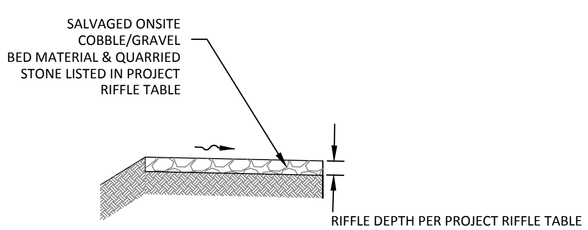
Notes:
1. Quarried stone shall be mix specified in table below or approved by Designer.
2. UT1 Reach 2 Tie-in Reach 124+42 to end of project
3. Where specified in the riffle detail, other sizes of stone and/or wood shall be used to augment the primary riffle matrix.
4. All salvaged and quarried stone in riffle table shall be well mixed to create uniform matrix
5. Unwashed quarry stone is subject to approval by designer.
6. Salvaged stone shall be sorted, and supplemented as necessary, to make reasonable approximation of percentages listed above



Plan View

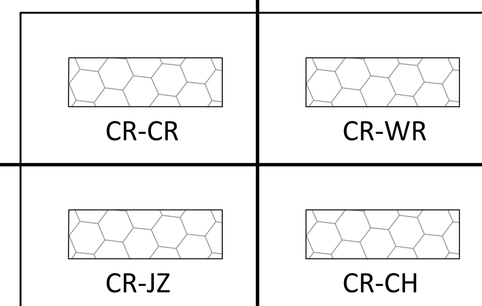


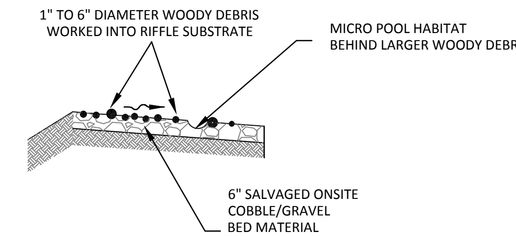
Section B-B'



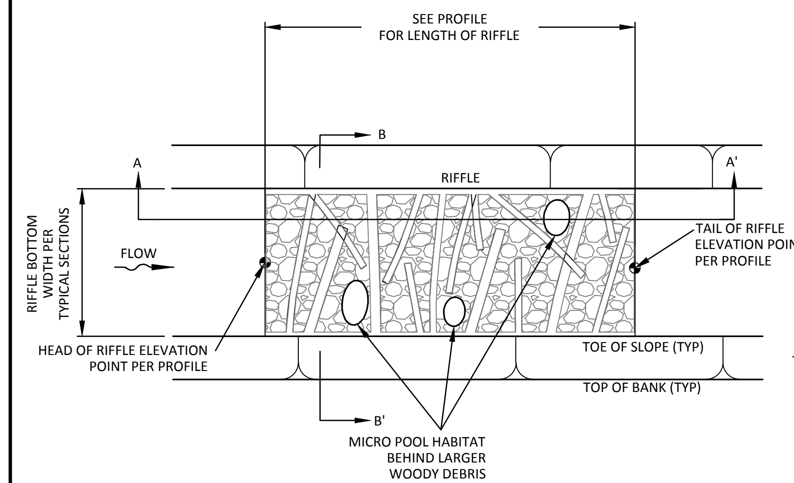
Profile A-A'

1 / 6.0 Constructed Riffle
Not to Scale

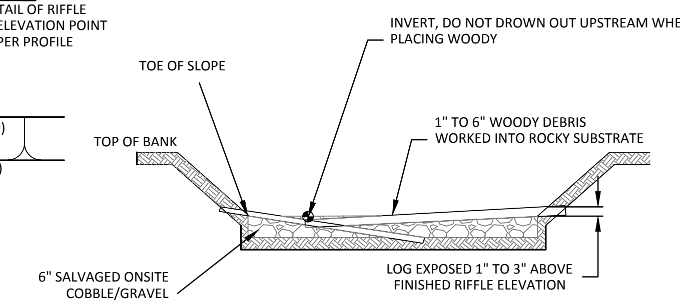




Section A-A'

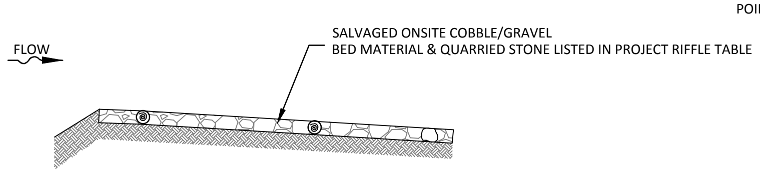


Plan View

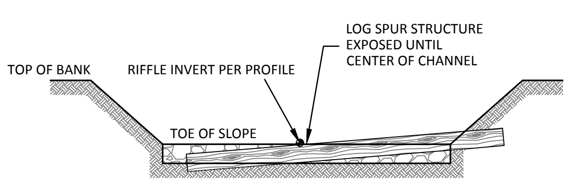


Section B-B'

2 / 6.0 Woody Riffle
Not to Scale



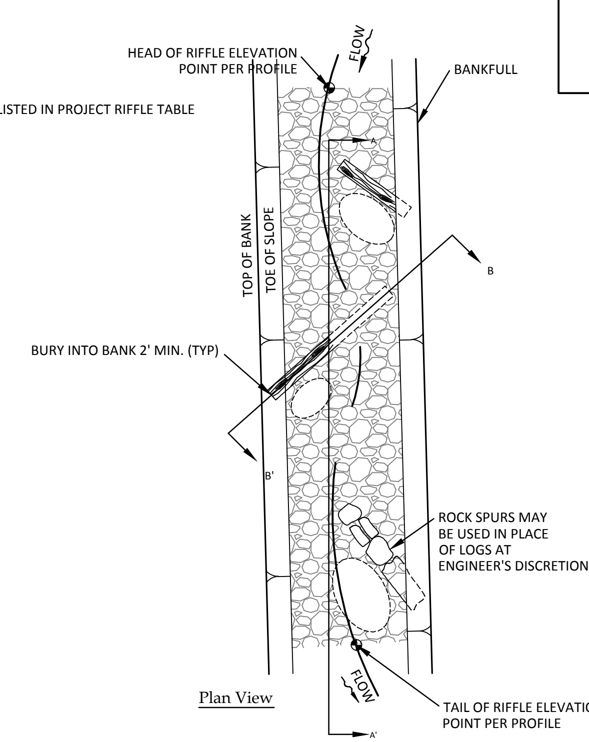
Profile View
A-A'



Log Section B-B'

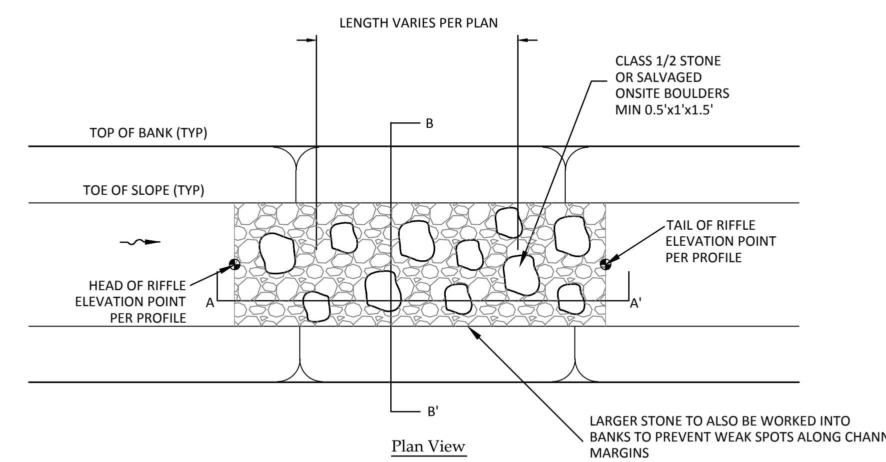
NOTES:

- LOG AND ROCK SPURS SHOULD VARY IN SIZE (6-8" DIA) WITHIN EACH RIFFLE.
- ROCK MAY BE SUBSTITUTED FOR LOGS AT ENGINEER'S DISCRETION.

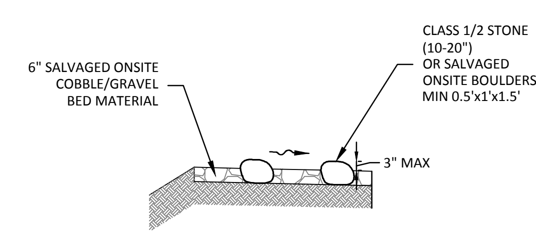


Plan View

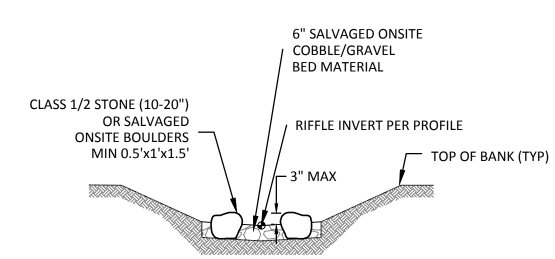
3 / 6.0 Jazz Riffle Structure
Not to Scale



Plan View



Section A-A'

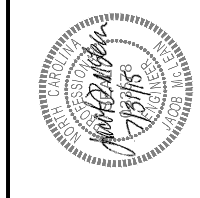


Section B-B'

NOTE: EMBED LARGE STONE AS REQUIRED TO KEEP MOST OF STONE BELOW WATER SURFACE, UP TO 3" MAY BE EXPOSED IN SMALLER STREAMS

4 / 6.0 Chunky Riffle
Not to Scale

WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831



Henry Fork Mitigation Site
Catawba County, North Carolina

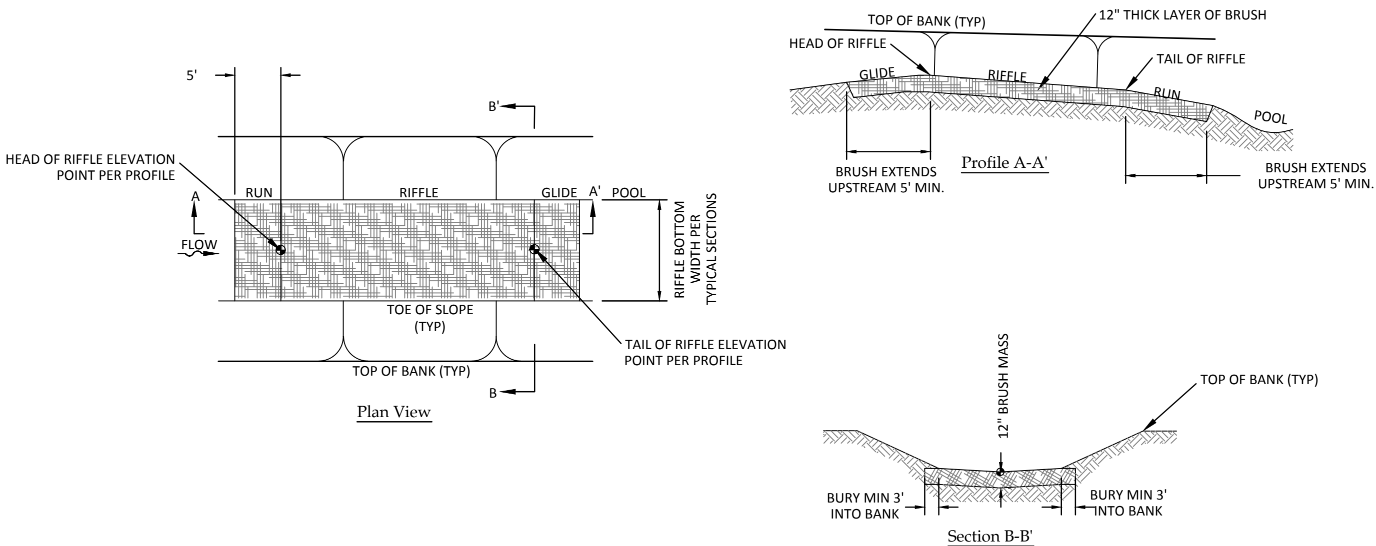
Stream and Site Work
Details

Revisions:

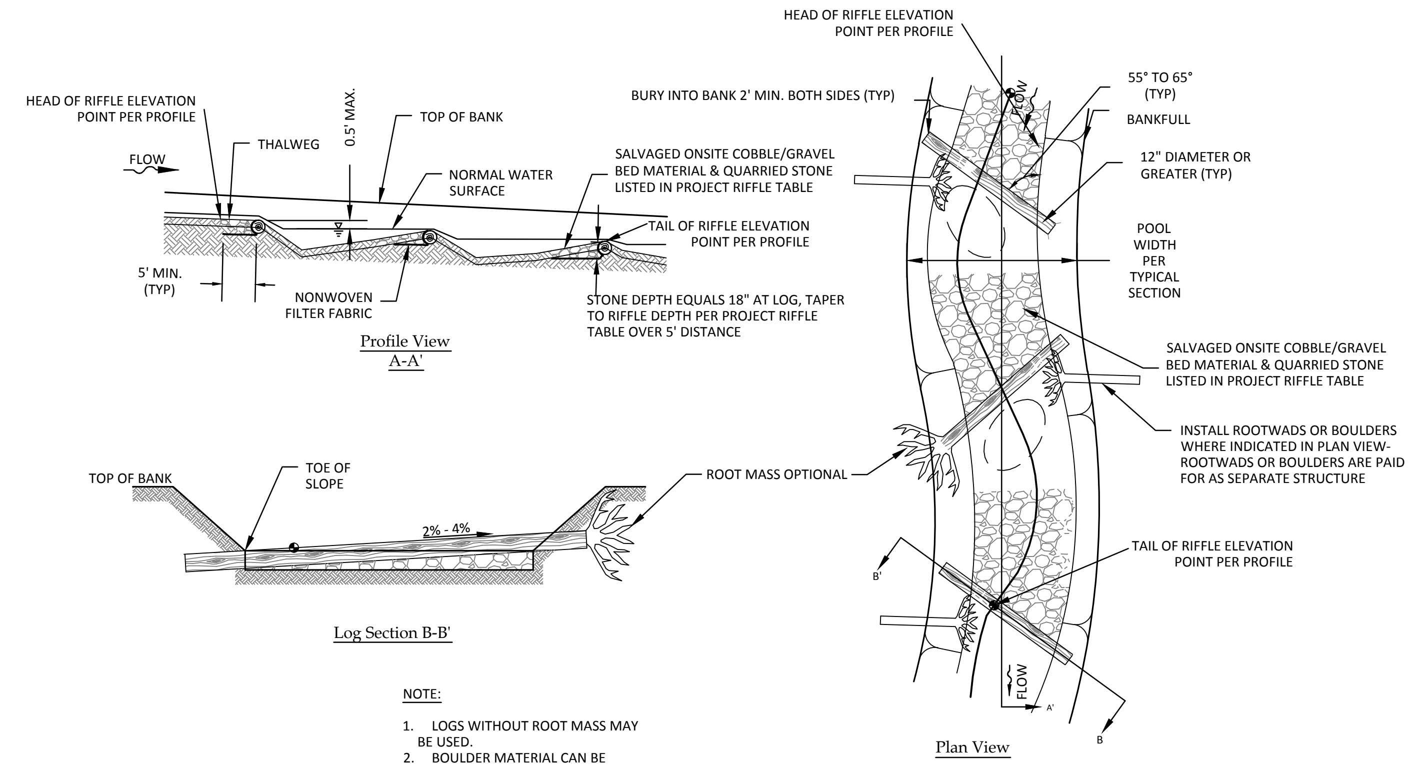
Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 6.0

March 7, 2012



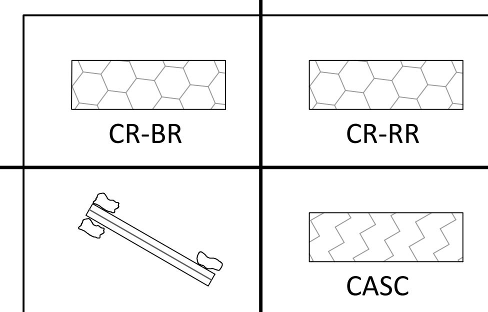
1
6.1
Brush Riffle
Not to Scale

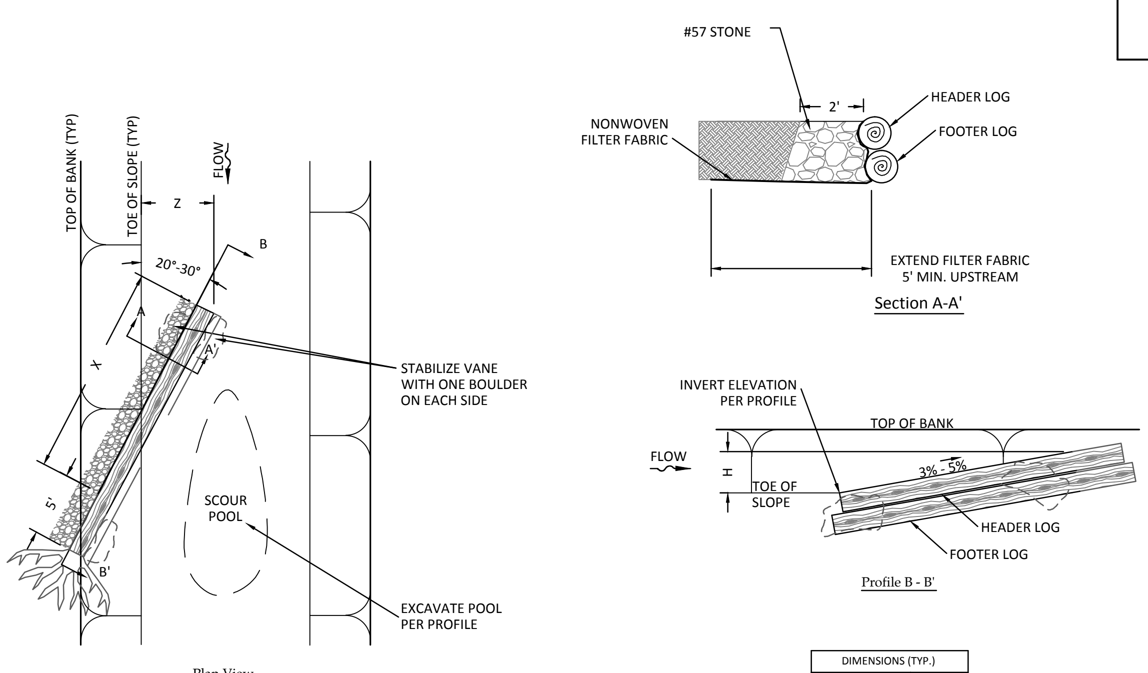


NOTE:

1. LOGS WITHOUT ROOT MASS MAY BE USED.
2. BOULDER MATERIAL CAN BE SUBSTITUTED IN PLACE OF ANGLED LOGS WITH APPROVAL OF ENGINEER.

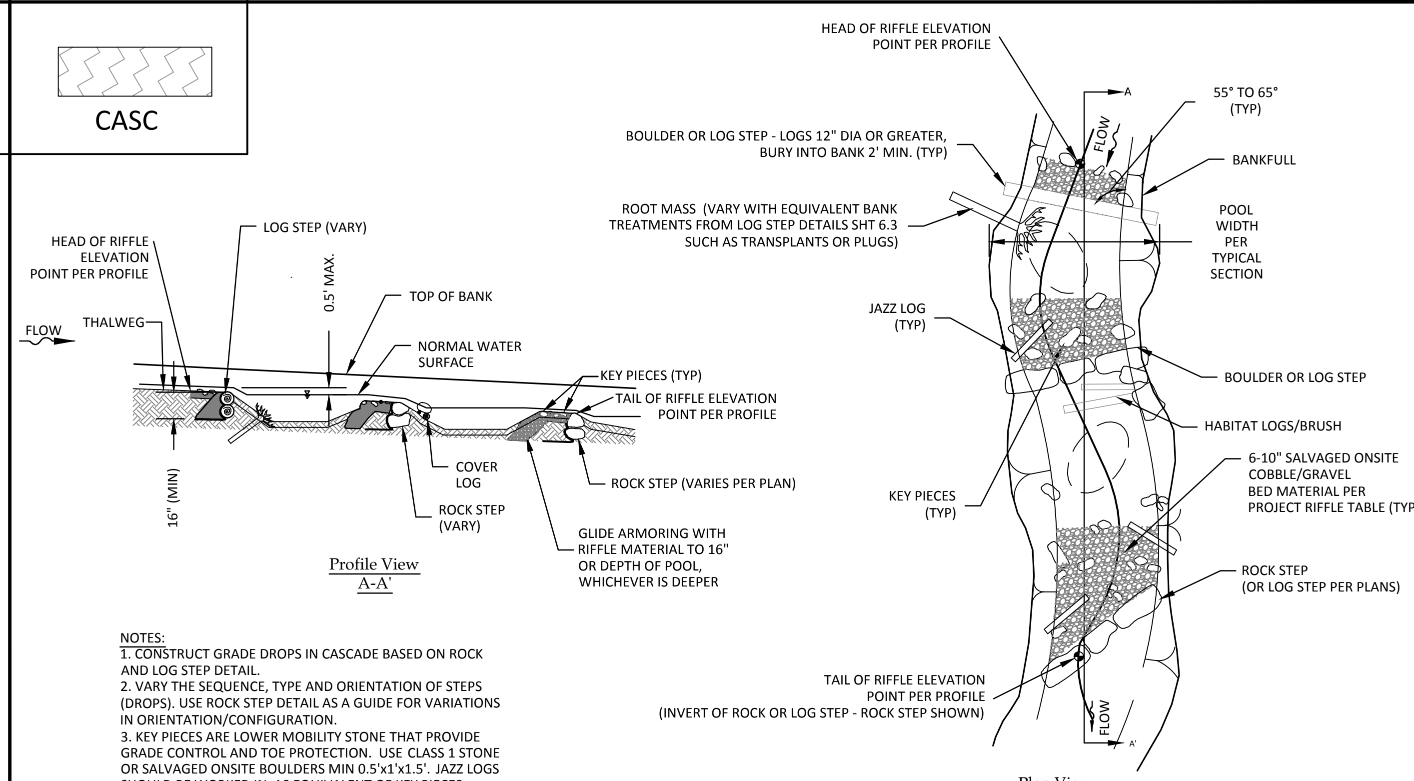
2
6.1
Rock and Roll Riffle
Not to Scale





DIMENSIONS (TYP.)	
X (FT)	16.6
H (FT)	1.1
Z (FT)	3.7
θ (°)	25
S (%)	6.6

3
6.1
Log Vane
Not to Scale



NOTES:
1. CONSTRUCT GRADE DROPS IN CASCADE BASED ON ROCK AND LOG STEP DETAIL.
2. VARY THE SEQUENCE, TYPE AND ORIENTATION OF STEPS (DROPS). USE ROCK STEP DETAIL AS A GUIDE FOR VARIATIONS IN ORIENTATION/CONFIGURATION.
3. KEY PIECES ARE LOWER MOBILITY STONE THAT PROVIDE GRADE CONTROL AND TOE PROTECTION. USE CLASS 1 STONE OR SALVAGED ONSITE BOULDERS MIN 0.5'x1'x1.5'. JAZZ LOGS SHOULD BE WORKED IN AS EQUIVALENT OF KEY PIECES.
4. ROCK STEP OR LOG STEP AT END OF CASCADE RIFFLE PAID SEPARATE. THESE ARE DEPICTED ON PLAN VIEW.
5. NUMBER OF INTERNAL STEPS (INCLUDING STEPS AT THE BEGINNING OF A CASCADE SEQUENCE) VARIES BASED ON LENGTH AND SLOPE. RIFFLES SHALL BE 1.2 - 1.8 TIMES THE AVERAGE CHANNEL SLOPE. STEP DROPS SHALL BE BETWEEN 0.2-0.5' MEASURED AT THE WATER SURFACE.
6. FOOTER ROCK OR LOG SHOWN. FOOTER ONLY REQUIRED WHEN MINIMUM UNFOOTERED DIMENSION OF ROCK OR LOG IS NOT MET. A MINIMUM OF 16" OF RIFFLE MATERIAL SHALL BE PLACED OVER FILTER FABRIC TO PROTECT.

4
6.1
Log-Rock Cascade Riffle with Rock Step
Not to Scale

Q:\ActiveProjects\005-02143 Henry Fork\Cadd\Plans\02143-Details.dwg

WILDLANDS
ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

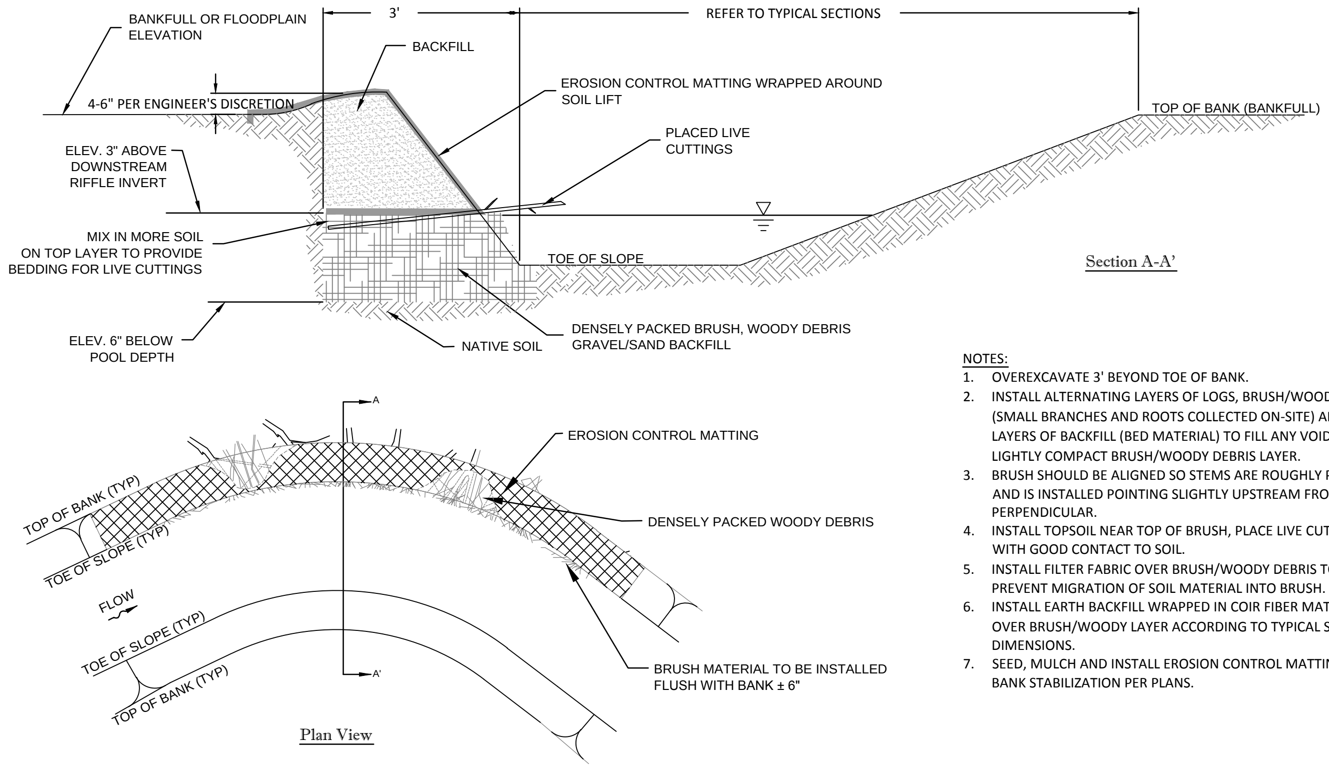
Henry Fork Mitigation Site
Catawba County, North Carolina

Stream and Site Work
Details

Revisions:

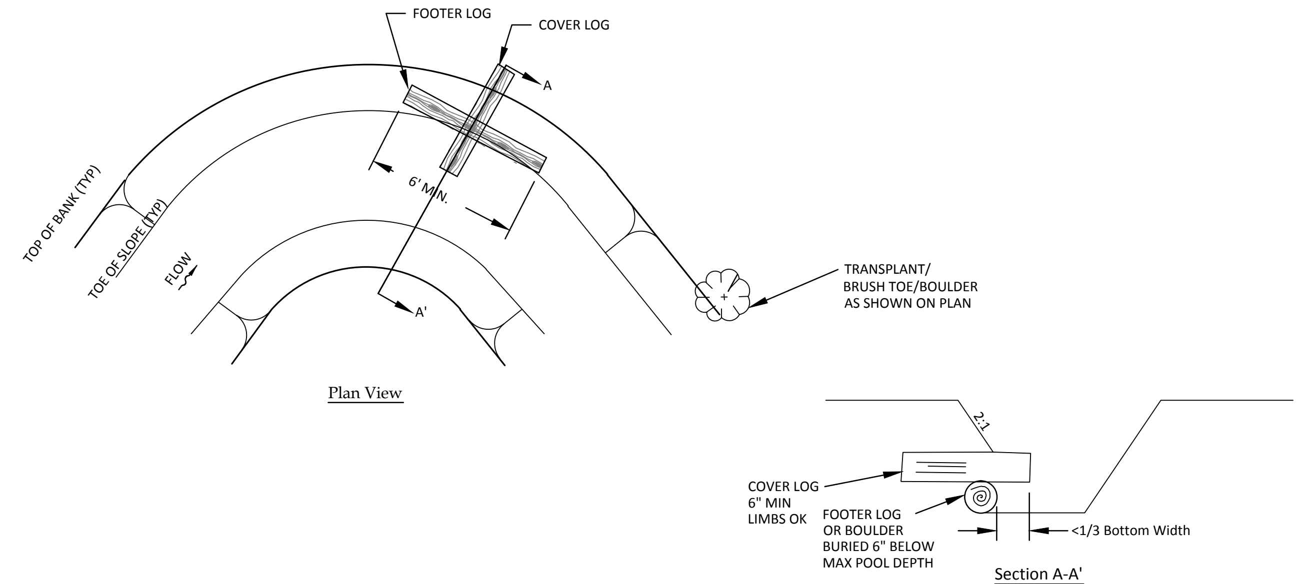
Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet
6.1



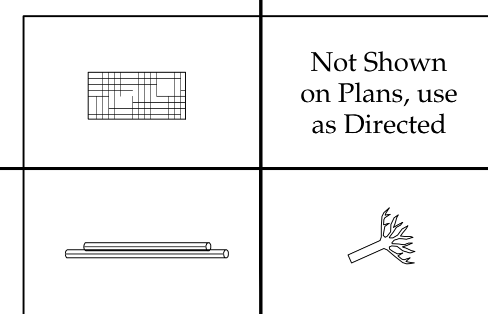
NOTES:
1. OVEREXCAVATE 3' BEYOND TOE OF BANK.
2. INSTALL ALTERNATING LAYERS OF LOGS, BRUSH/WOODY DEBRIS (SMALL BRANCHES AND ROOTS COLLECTED ON-SITE) AND LAYERS OF BACKFILL (BED MATERIAL) TO FILL ANY VOID SPACE. LIGHTLY COMPACT BRUSH/WOODY DEBRIS LAYER.
3. BRUSH SHOULD BE ALIGNED SO STEMS ARE ROUGHLY PARALLEL AND IS INSTALLED POINTING SLIGHTLY UPSTREAM FROM PERPENDICULAR.
4. INSTALL TOPSOIL NEAR TOP OF BRUSH, PLACE LIVE CUTTINGS WITH GOOD CONTACT TO SOIL.
5. INSTALL FILTER FABRIC OVER BRUSH/WOODY DEBRIS TO PREVENT MIGRATION OF SOIL MATERIAL INTO BRUSH.
6. INSTALL EARTH BACKFILL WRAPPED IN COIR FIBER MATTING OVER BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS.
7. SEED, MULCH AND INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.

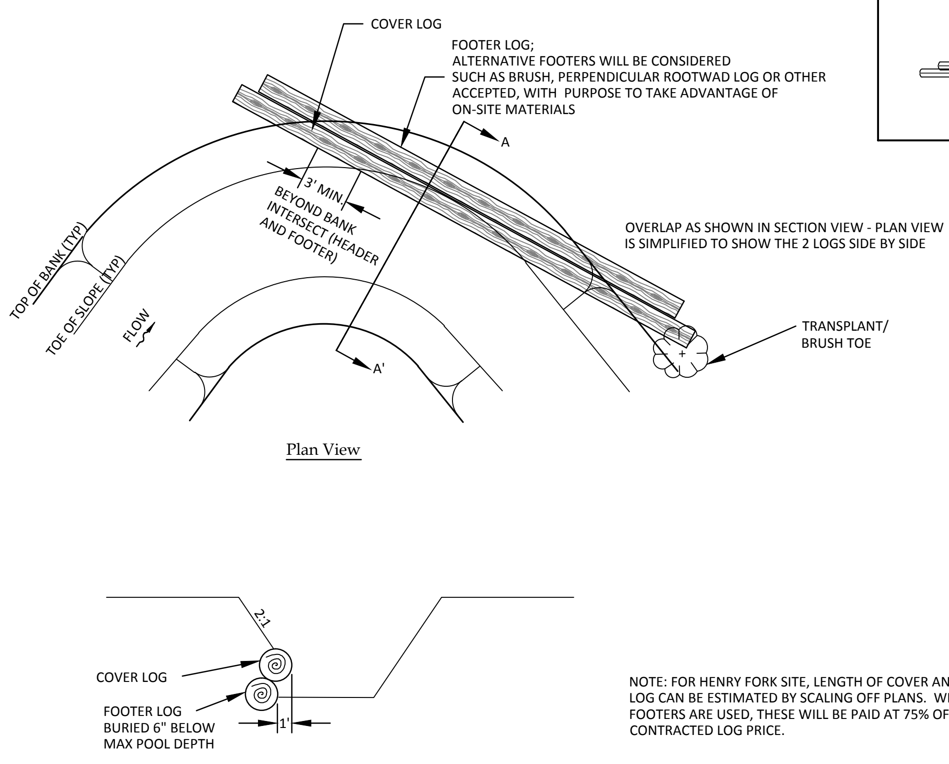
1 / 6.2 **Brush Toe**
Not to Scale



NOTE:
1. COVER LOGS ARE NOT SHOWN ON PLANS, THEY SHALL BE INSTALLED WHERE DIRECTED IN FIELD
2. WHEN COVER LOG USED IN CONJUNCTION WITH STRUCTURE, NO FOOTER IS REQUIRED AND TYPICAL INSTALLATION IS TO WEDGE COVER LOG UNDER FOOTERS OR BETWEEN OTHER HARD ELEMENTS (ROOTWADS, BOULDERS, ETC)
3. COVER LOGS AND FOOTER LOGS SHALL BE 6' MINIMUM LENGTH AND 6" MIN. DIAMETER

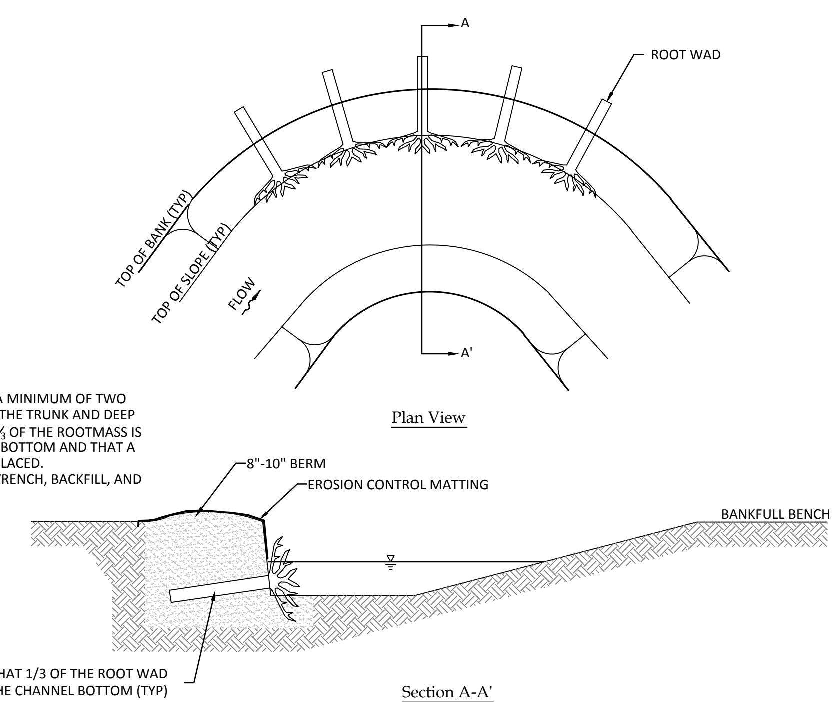
2 / 6.2 **Cover Log**
Not to Scale





NOTE: FOR HENRY FORK SITE, LENGTH OF COVER AND FOOTER LOG CAN BE ESTIMATED BY SCALING OFF PLANS. WHERE ALTERNATE FOOTERS ARE USED, THESE WILL BE PAID AT 75% OF THE CONTRACTED LOG PRICE.

3 / 6.2 **Lunker Log**
Not to Scale



ROOT WAD INSTALLATION:
1. EXCAVATE A TRENCH A MINIMUM OF TWO TIMES THE WIDTH OF THE TRUNK AND DEEP ENOUGH SUCH THAT 1/3 OF THE ROOTMASS IS BELOW THE CHANNEL BOTTOM AND THAT A FOOTER LOG CAN BE PLACED.
2. PLACE ROOT WAD IN TRENCH, BACKFILL, AND COMPACT.

INSTALL ROOT WAD SUCH THAT 1/3 OF THE ROOT WAD MASS IS BURIED BELOW THE CHANNEL BOTTOM (TYP)

4 / 6.2 **Root Wad**
Not to Scale

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

Details

Revisions:

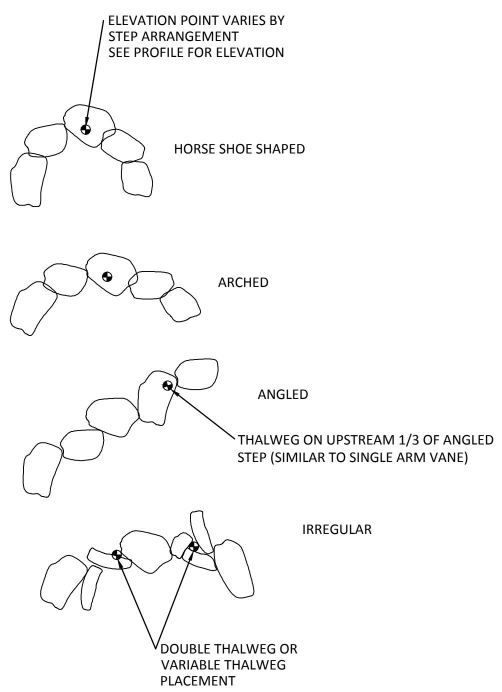
Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 6.2

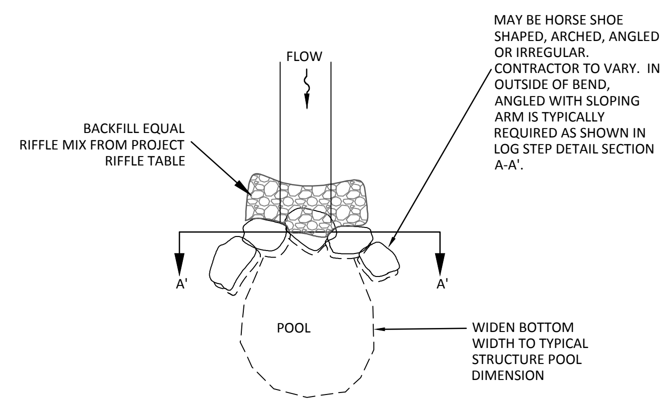
March 7, 2012

Q:\ActiveProjects\005-02143 Henry Fork\CadD\Plans\02143-Details.dwg

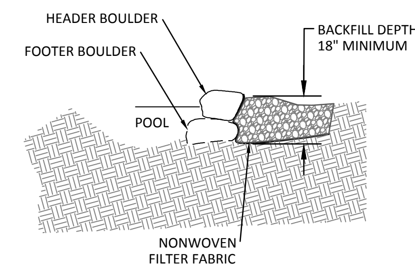
March 7, 2012



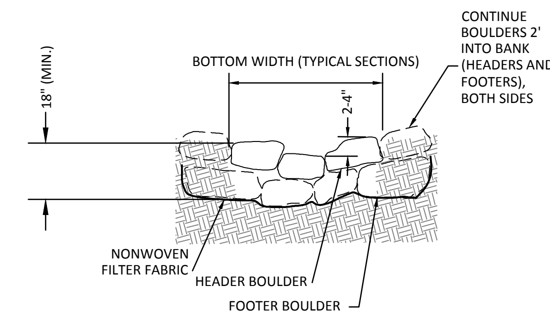
Types of Step Configurations



Plan View

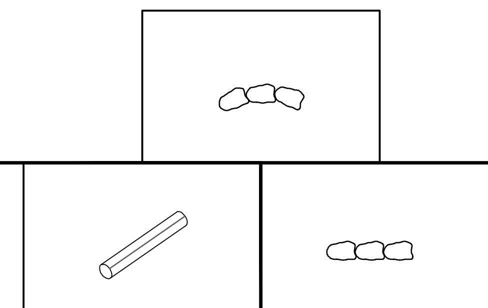


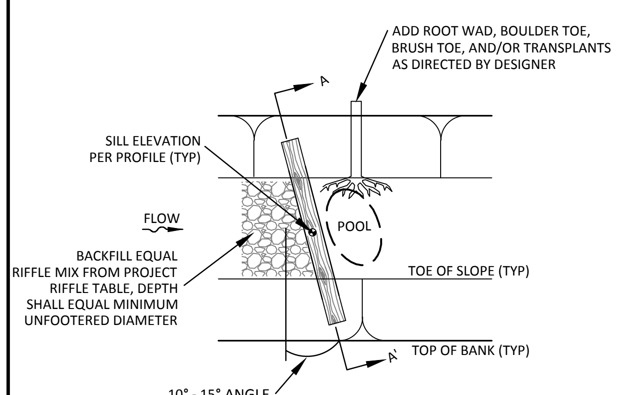
Profile View



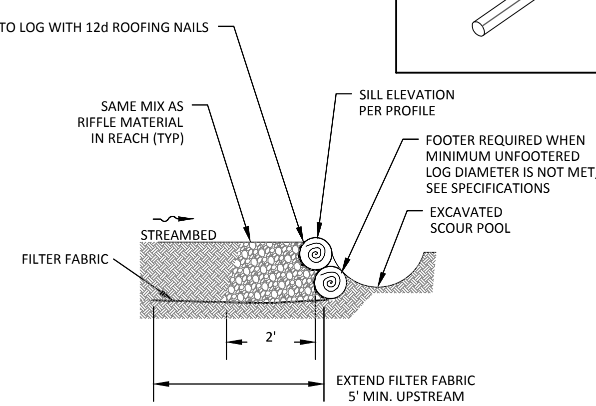
Section View (Section A-A')

1 / 6.3 **Rock Step**
Not to Scale

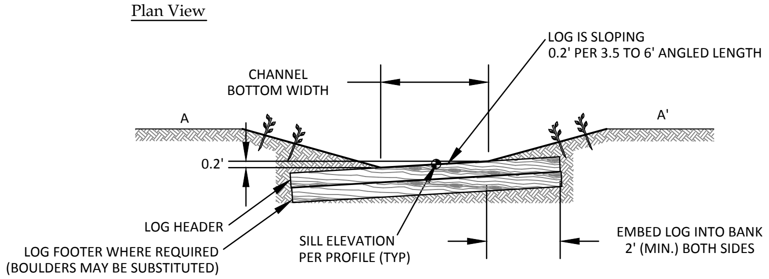




Plan View

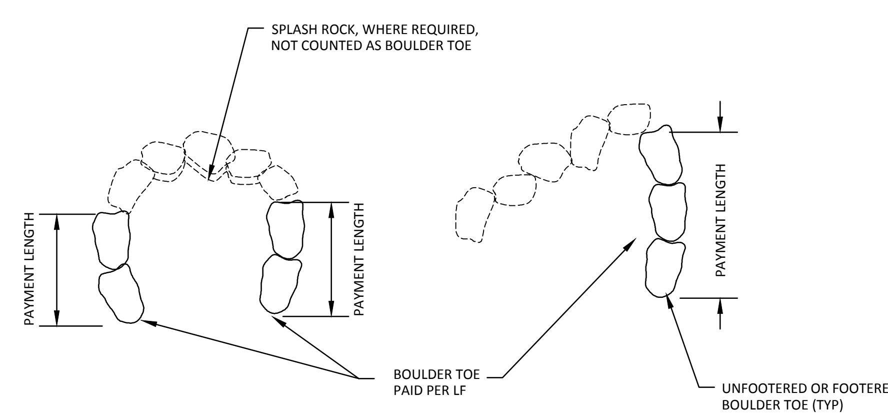


Profile View

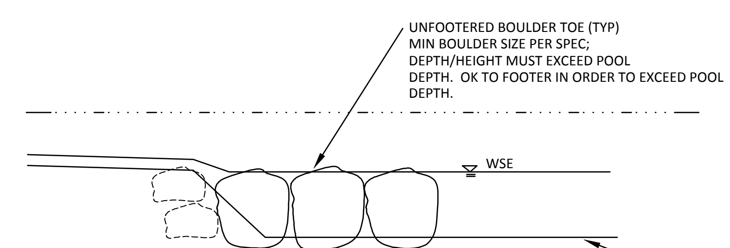


Section View (Section A-A')

2 / 6.3 **Log Step**
Not to Scale



NOTES:
1. BOULDER TOE TO CONFORM TO OTHER STRUCTURES (SUCH AS ROCK STEP SHOWN) AND BANK AT UPSTREAM AND DOWNSTREAM TIE-IN POINTS.
2. APPLY AS SHOWN IN DETAILS AND/OR AS DIRECTED IN FIELD.
3. EXAMPLES OF PAYMENT DETERMINATION SHOWN.
4. SPLASH ROCK OR ROCK USED TO PINCH OR HOLD DOWN ROOTWADS BRUSH OR COVER LOGS WILL NOT BE COUNTED AS BOULDER TOE.



Profile View

3 / 6.3 **Boulder Toe**
Not to Scale

Q:\ActiveProjects\005-02143 Henry Fork\CadD\Plans\02143-Details.dwg

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

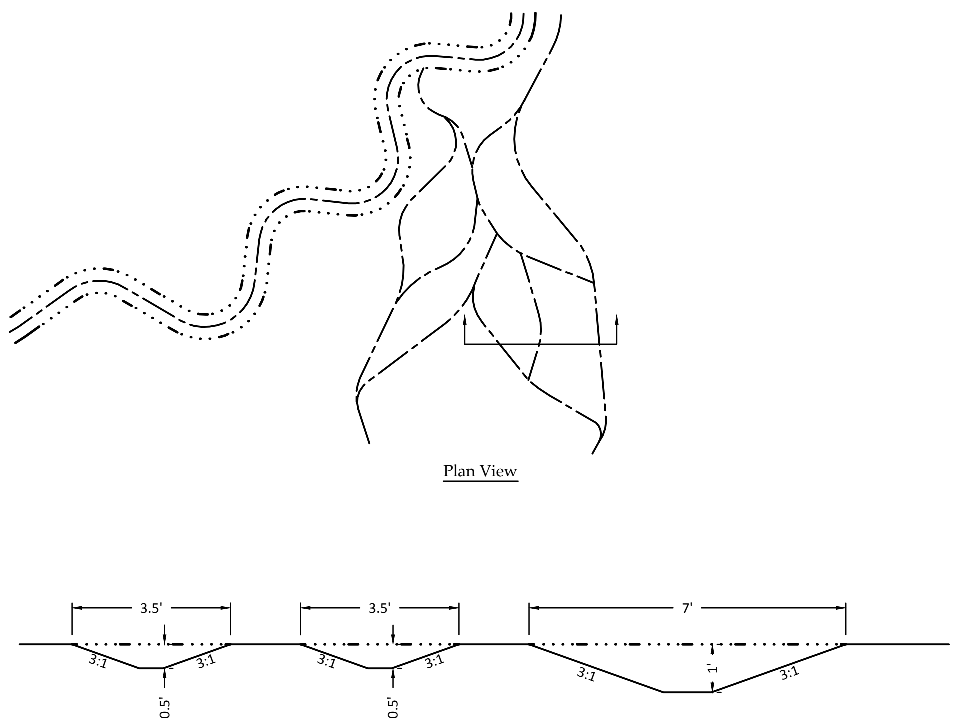
Henry Fork Mitigation Site
Catawba County, North Carolina

Details

Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 6.3

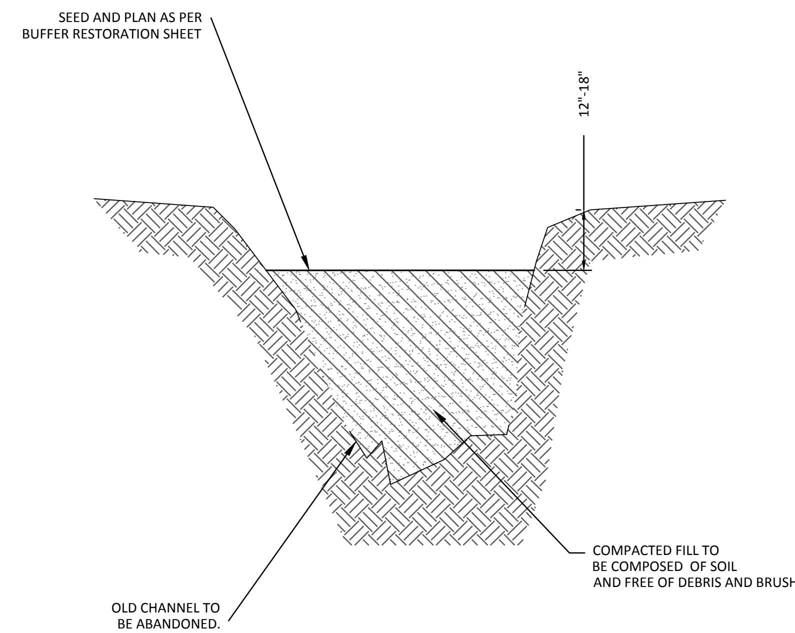


NOTES:

1. REPRESENTATIVE CROSS SECTION SHOWS MAXIMUM CHANNEL CROSS SECTIONAL AREA TO BE PROVIDED THROUGH BRAIDED WETLAND.
2. ACTUAL WORK TO BE COORDINATED IN THE FIELD.
3. SOD MAT TO BE INSTALLED ON BANKS.

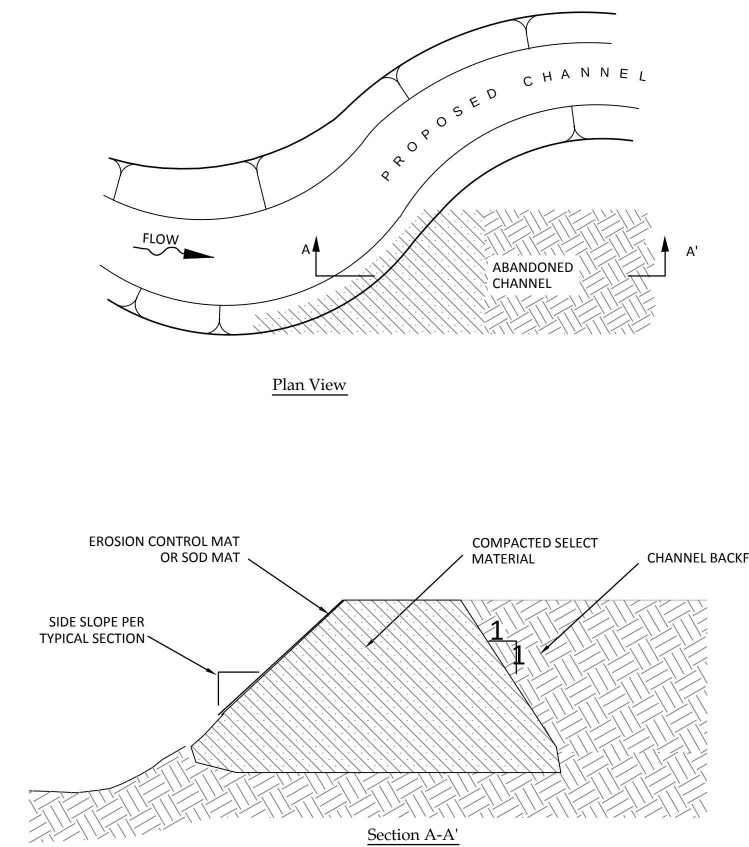
Typical Section - Pilot Channel

1 / 6.4 Not to Scale



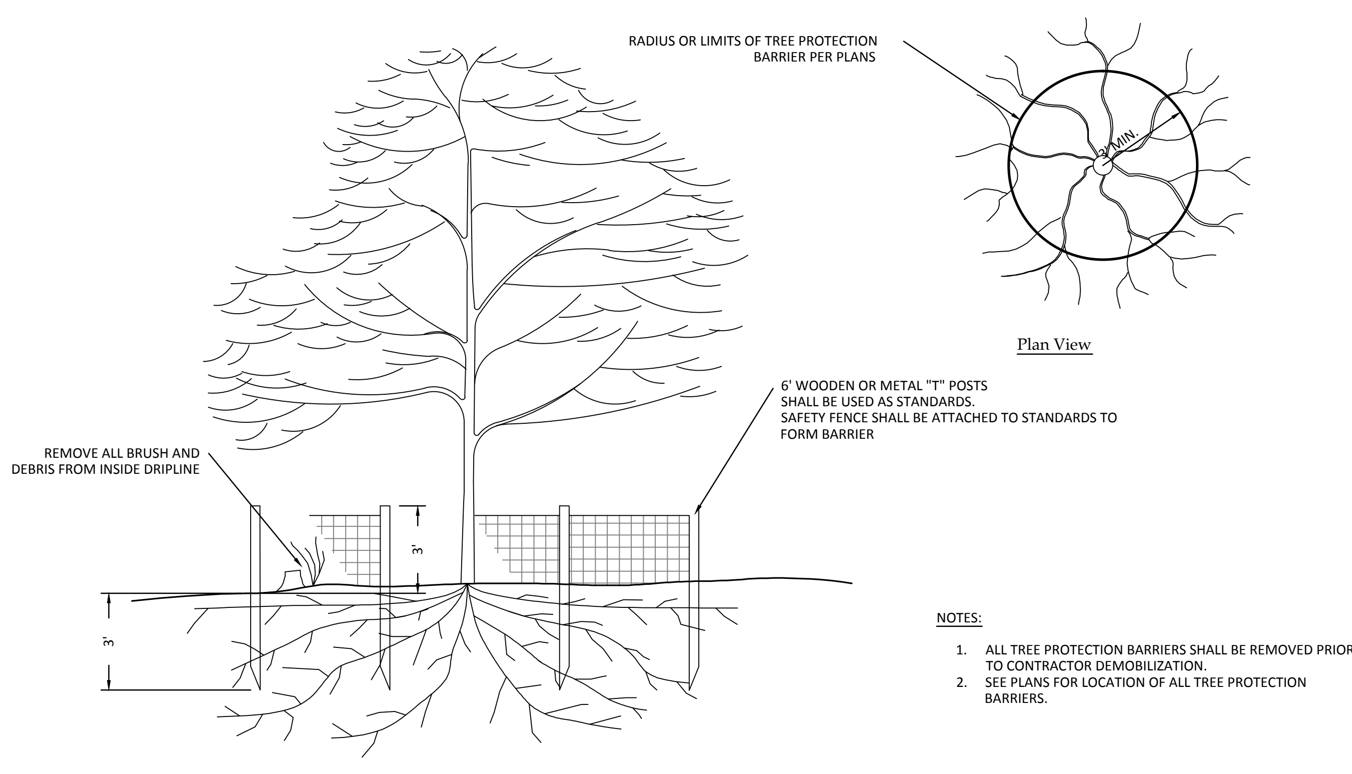
Ephemeral Pool

2 / 6.4 Not to Scale



Channel Plug

3 / 6.4 Not to Scale



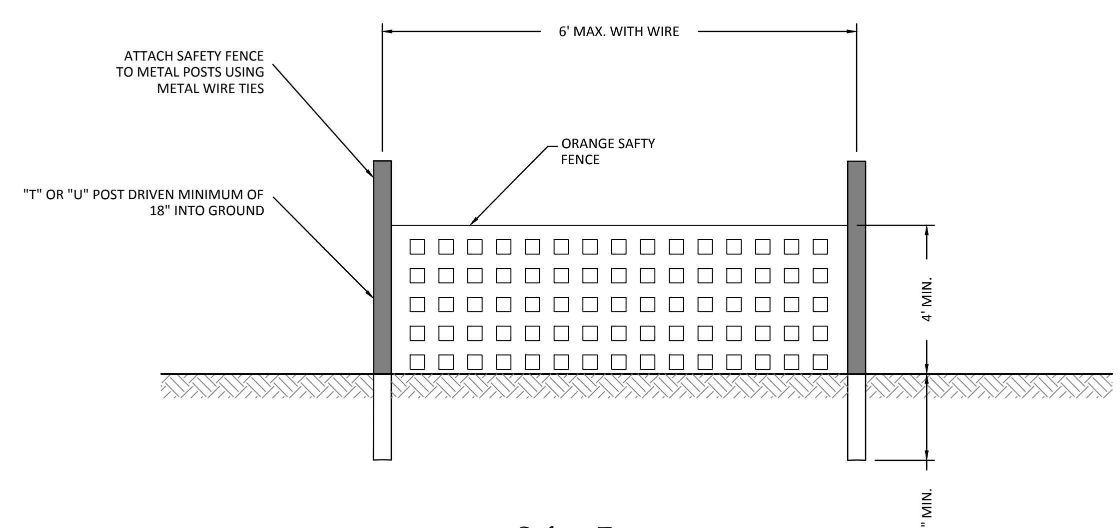
NOTES:

1. ALL TREE PROTECTION BARRIERS SHALL BE REMOVED PRIOR TO CONTRACTOR DEMOBILIZATION.
2. SEE PLANS FOR LOCATION OF ALL TREE PROTECTION BARRIERS.

Tree Protection

4 / 6.4 Not to Scale

MATERIAL SPECIFICATIONS		
PHYSICAL PROPERTY	TESTS	REQUIREMENTS
MATERIAL	N/A	POLYETHYLENE
RECOMENDED COLOR	N/A	"INTERNATIONAL ORANGE"
TENSILE YIELD	ASTM D638	AVE. 2000 LBS. PER 4' WIDE
ULTIMATE TENSILE STRENGTH	ASTM D638	AVE. 2900 LBS. PER 4' WIDE
ELONGATION AT BREAK (%)	ASTM D638	GREATER THAN 1000%
CHEMICAL RESISTANCE	N/A	INERT TO MOST CHEMICALS AND ACIDS



Safety Fence

5 / 6.4 Not to Scale

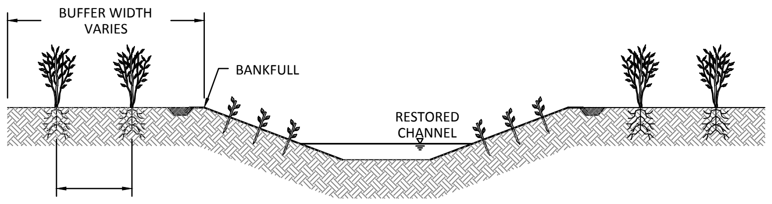
WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina
Details

Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

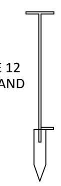
Sheet 6.4



Section View

DIBBLE BAR

PLANTING BAR SHALL HAVE A BLADE WITH A TRIANGULAR CROSS-SECTION, AND SHALL BE 12 INCHES LONG, 4 INCHES WIDE AND 1 INCH THICK AT CENTER.

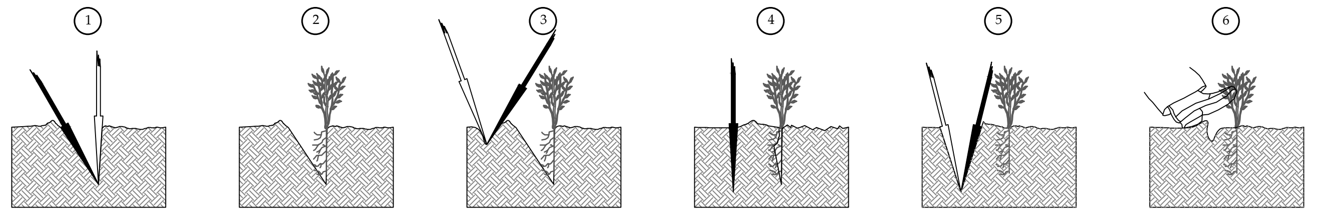


ROOTING PRUNING

ALL ROOTS SHALL BE PRUNED TO AN APPORIATE LENGTH TO PREVENT J-ROOTING.

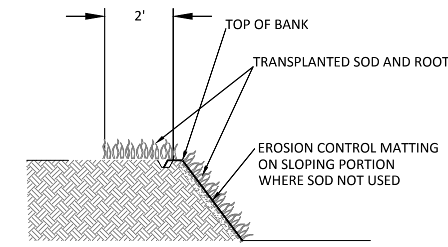
NOTES:

1. ALL SOILS WITHIN THE BUFFER PLANTING AREA SHALL BE DISKED, AS REQUIRED, PRIOR TO PLANTING.
2. ALL PLANTS SHALL BE PROPERLY HANDLED PRIOR TO INSTALLATION TO INSURE SURVIVAL.

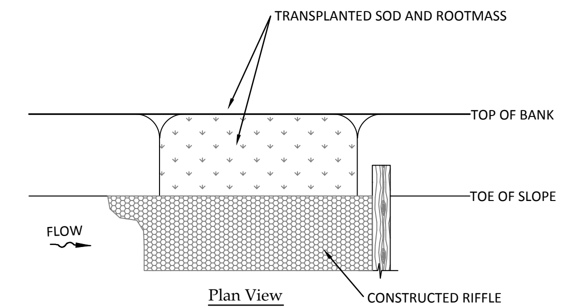


1. INSERT THE DIBBLE, OR SHOVEL, STRAIGHT DOWN INTO THE SOIL TO THE FULL DEPTH OF THE BLADE AND PULL BACK ON THE HANDLE TO OPEN THE PLANTING HOLE. (DO NOT ROCK THE SHOVEL BACK AND FORTH AS THIS CAUSES SOIL IN THE PLANTING HOLE TO BE COMPACTED, INHIBITING ROOT GROWTH.
2. REMOVE THE DIBBLE, OR SHOVEL, AND PUSH THE SEEDLING ROOTS DEEP INTO THE PLANTING HOLE. PULL THE SEEDLING BACK UP TO THE CORRECT PLANTING DEPTH (THE ROOT COLLAR SHOULD BE 1 TO 3 INCHES BELOW THE SOIL SURFACE). GENTLY SHAKE THE SEEDLING TO ALLOW THE ROOTS TO STRAIGHTEN OUT. DO NOT TWIST OR SPIN THE SEEDLING OR LEAVE THE ROOTS J-ROOTED.
3. INSERT THE DIBBLE, OR SHOVEL, SEVERAL INCHES IN FRONT OF THE SEEDLING AND PUSH THE BLADE HALFWAY INTO THE SOIL. TWIST AND PUSH THE HANDLE FORWARD TO CLOSE THE TOP OF THE SLIT TO HOLD THE SEEDLING IN PLACE.
4. PUSH THE DIBBLE, OR SHOVEL, DOWN TO THE FULL DEPTH OF THE BLADE.
5. PULL BACK ON THE HANDLE TO CLOSE THE BOTTOM OF THE PLANTING HOLD. THEN PUSH FORWARD TO CLOSE THE TOP, ELIMINATING AIR POCKETS AROUND THE ROOT.
6. REMOVE THE DIBBLE, OR SHOVEL, AND CLOSE AND FIRM UP THE OPENING WITH YOUR HEEL. BE CAREFUL TO AVOID DAMAGING THE SEEDLING.

1 / 6.5 **Bare Root Planting**
Not to Scale



Section View
Riffle Installation

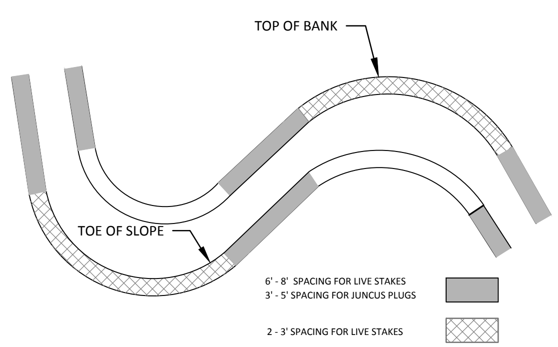


Plan View
Riffle Installation

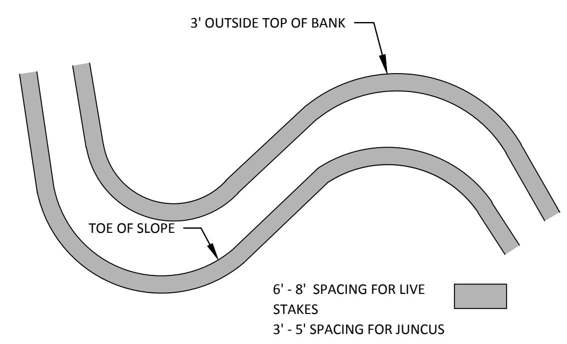
NOTES:

1. PREPARE THE BANK WHERE THE SOD MAT WILL BE TRANSPLANTED BY RAKING & FERTILIZING.
2. OVEREXCAVATE BANK AS NECESSARY TO ACHIEVE TYPICAL SECTION DIMENSIONS AFTER SOD MAT PLACEMENT.
3. EXCAVATE TRANSPLANT SOD MATS WITH A WIDE BUCKET AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE. SOD MATS WITH NATIVE AND WET OR FACULTATIVE SPECIES ARE STRONGLY PREFERRED AND SHALL BE USED WHERE AVAILABLE.
4. PLACE TRANSPLANT ON THE BANK TO BE STABILIZED.
5. SOD STAPLES MAY BE REQUIRED AT DIRECTION OF ENGINEER.
6. USE OF TINES OF TRACKHOE MAY BE REQUIRED AT DIRECTION OF ENGINEER TO SECURE SOD MAT TO EXISTING SUBSOIL.
7. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
8. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
9. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.
10. OVERSEED ANY BARE OR SEMI-BARE AREAS WITH NATIVE SEED MIX, AND APPLY TEMPORARY SEEDING AND MULCHING TO SUCH AREAS.

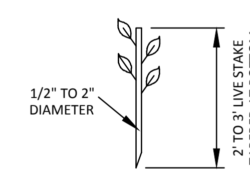
2 / 6.5 **Transplanted Sod Mats**
Not to Scale



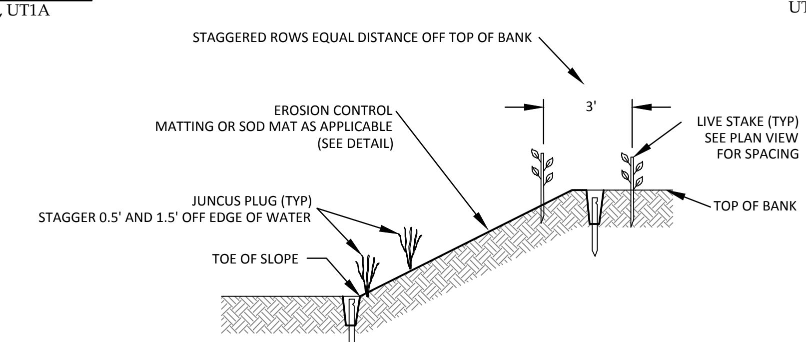
Plan View - Less Steep Streams (<2%)
UT2, UT1 Reach 2, UT1A



Plan View - Steeper Streams (>2%)
UT1B, UT1 Reach 1



Live Stake Detail



Section View - All Streams

NOTE:

1. LIVE STAKES TO BE PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.

3 / 6.5 **Live Staking & Juncus Plugs**
Not to Scale

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina

Details

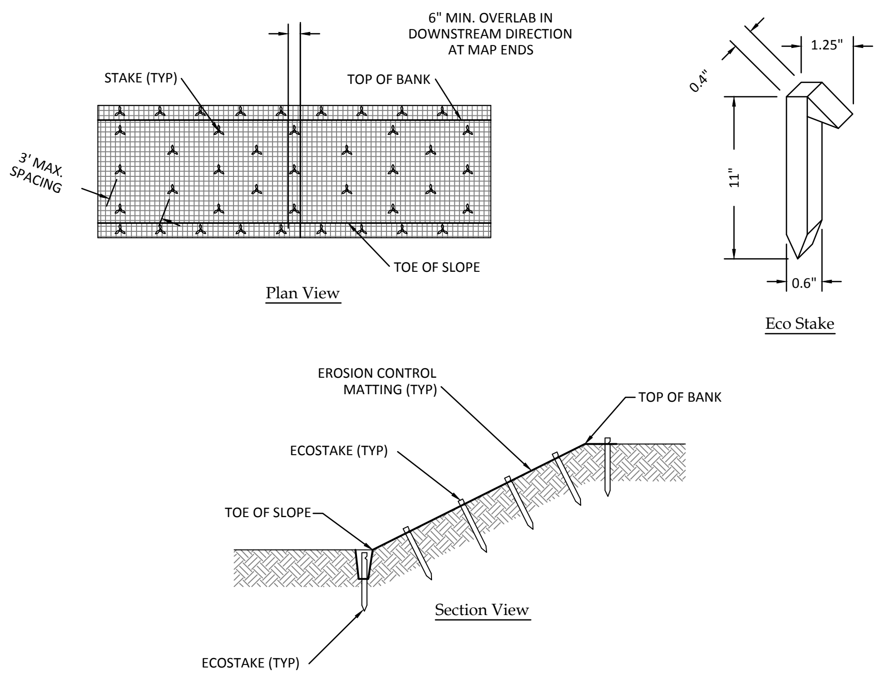
Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

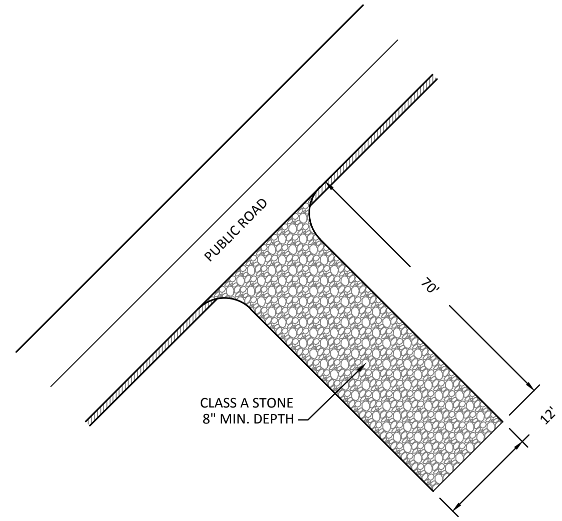
Sheet 6.5

March 7, 2012

Q:\ActiveProjects\005-02143 Henry Fork\Cadd\Plans\02143-Details.dwg



1/6.6 Erosion Control Matting
Not to Scale



NOTES:

1. PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
5. LOCATE CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
6. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING WITH STONE WILL BE NECESSARY.
7. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED IMMEDIATELY.
8. USE CLASS A STONE OR OTHER COARSE AGGREGATE APPROVED BY THE ENGINEER.
9. PLACE FILTER FABRIC BENEATH STONE.

2/6.6 Construction Entrance
Not to Scale

Table 6.24a Temporary Seeding Recommendations

Common Name	Scientific Name	Rate per Acre	Optimal Planting Dates		
			Mountains	*Piedmont*	*Coastal Plain*
Rye grain	Secale cereale	30 lbs	Aug. 15 - May 15	Aug. 15 - May 1	Aug. 15 - Apr. 15
Wheat	Triticum aestivum	30 lbs	Aug. 15 - May 15	Aug. 15 - May 1	Aug. 15 - Apr. 15
German millet	Setaria italica	10 lbs	May 15 - Aug. 15	May 1 - Aug. 15	Apr. 15 - Aug. 15
Browntop millet	Urochloa ramosa	10 lbs	May 15 - Aug. 15	May 1 - Aug. 15	Apr. 15 - Aug. 15

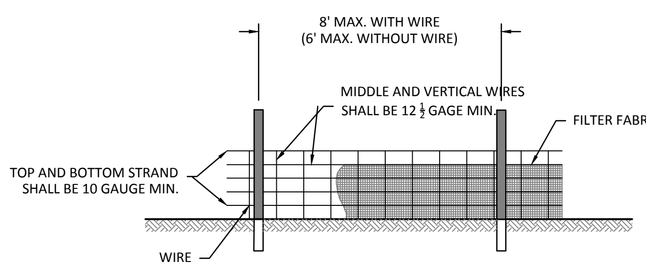
SEEDING:

1. SEEDBED WILL BE AMENDED WITH TOPSOIL APPLICATION.
2. PH LEVEL OF SOIL SHALL BE 5.5 TO 7
3. SEEDBED SHALL BE LOOSE AND FREE OF ROCKS AND DEBRIS PRIOR TO SEEDING AND MULCHING
4. FOR PERMANENT SEEDING, REFER TO NOTES ON SHEET 1.1. TEMPORARY AND PERMANENT SEED SHOULD BE APPLIED TOGETHER IF PLANTING DATES ALLOW.

MULCHING:

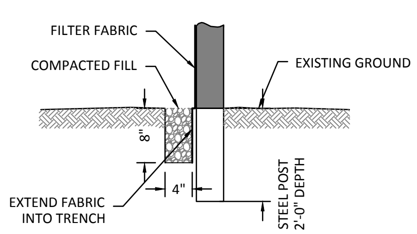
1. 2 TONS PER ACRE
2. GRAIN STRAW PREFERED, NCDOT ALTERNATIVES WILL BE CONSIDERED UPON REQUEST, AS WILL LEAVES
3. SEEDBED SHALL BE LOOSE AND FREE OF ROCKS AND DEBRIS PRIOR TO SEEDING AND MULCHING

3/6.6 Temporary Seeding and Mulching
Not to Scale

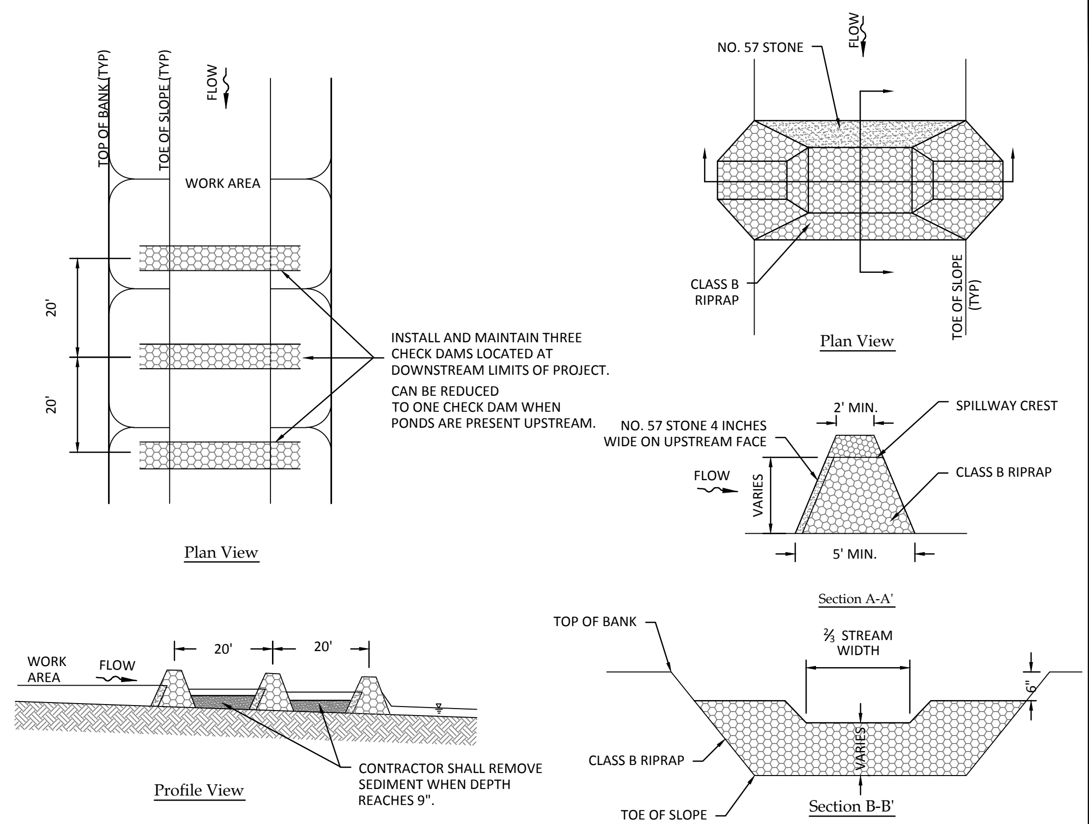


NOTES:

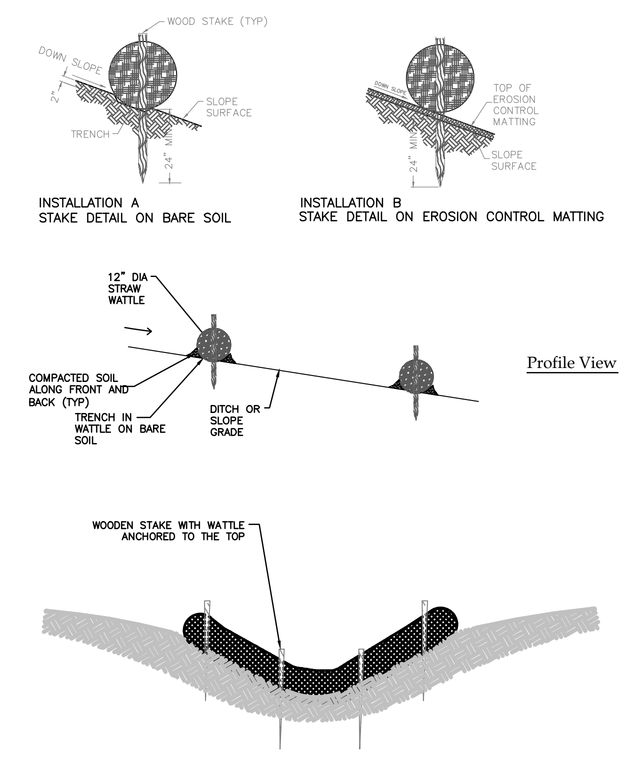
1. USE WIRE A MINIUM OF 32" IN WIDTH AND WITH A MINIMUM OF 6 LINES OF WIRES WITH 12" STAY SPACING.
2. USE FILTER FABRIC A MINIMUM OF 36" IN WIDTH AND FASTEN ADEQUATELY TO THE WIRES AS DIRECTED BY THE ENGINEER.
3. PROVIDE 5' STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE. ANGLE STEEL TYPE.



4/6.6 Temporary Silt Fence
Not to Scale



5/6.6 Rock Silt Check Dams
Not to Scale



6/6.6 Straw Wattles
Not to Scale

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

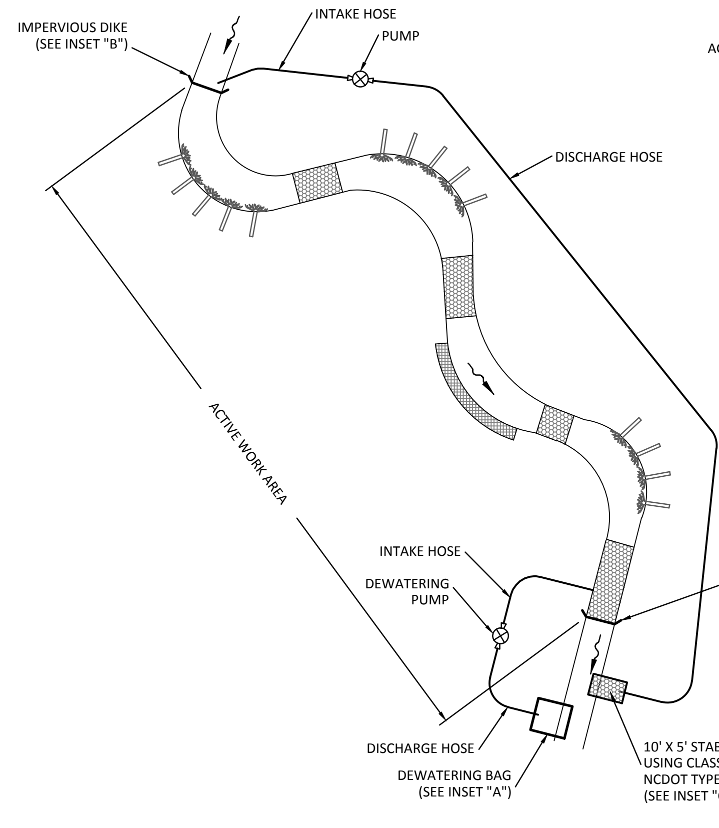
Henry Fork Mitigation Site
Catawba County, North Carolina

Details

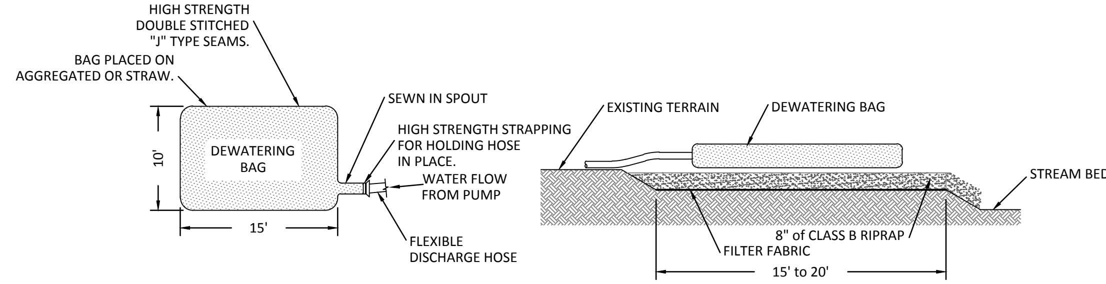
Revisions:

Date: July 31, 2015
Job Number: 005-02143
Project Engineer: JM
Drawn By: JCK, KJH, JM
Checked By: ER, SW

Sheet 6.6



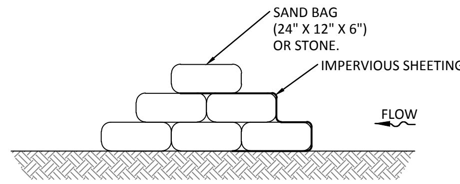
Plan View



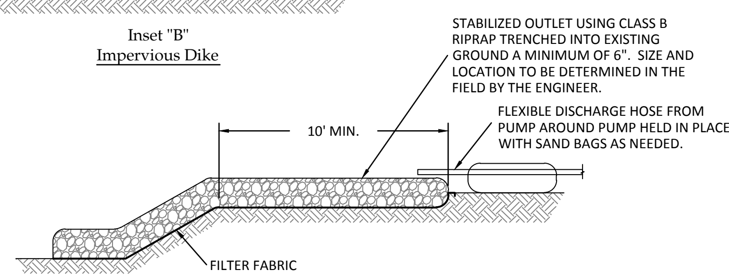
Inset "A"
Dewatering Bag

NOTE:

1. PROVIDE STABILIZED OUTLET TO STREAMBED.

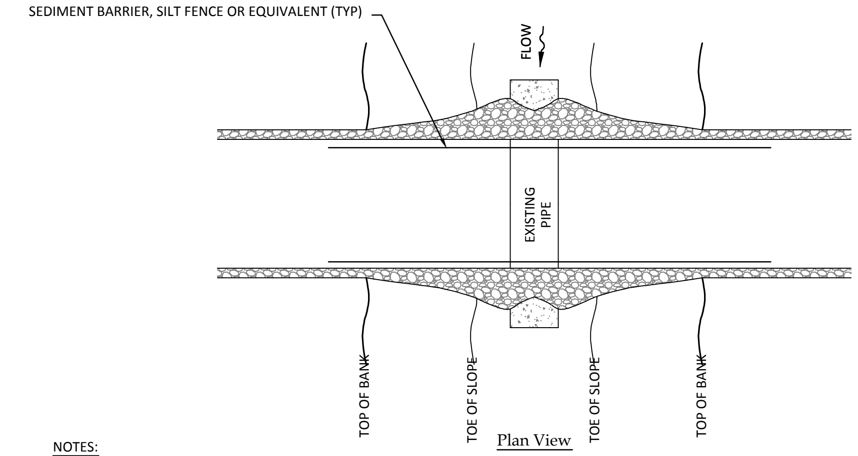


Inset "B"
Impervious Dike



Inset "C"
Stabilized Outlet

1/6.7 Pump Around System
Not to Scale

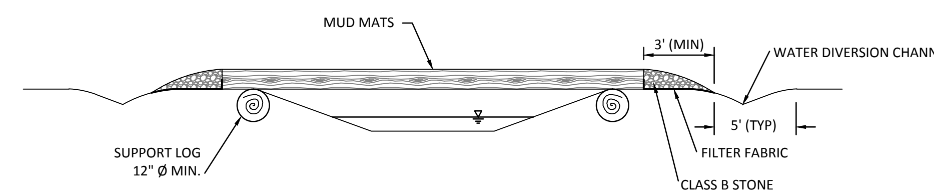


Plan View

NOTES:

1. THIS TYPE OF CROSSING IS SITE SPECIFIC FOR HENRY FORK
2. REMOVE CULVERT UPON COMPLETION OF USE
3. USE SILT BARRIER AROUND MARGINS OF CROSSING TO PROTECT DIRECT RUNOFF INTO STREAM

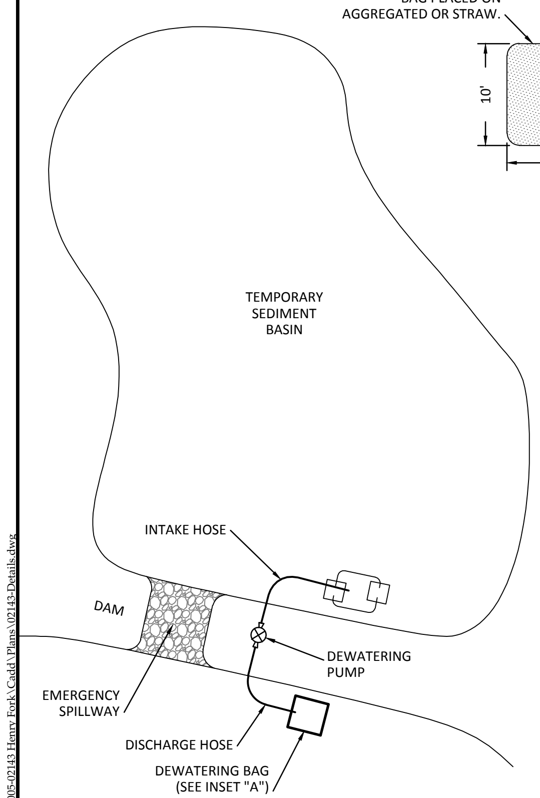
2/6.7 Temporary Stream Crossing - Existing Culvert
Not to Scale



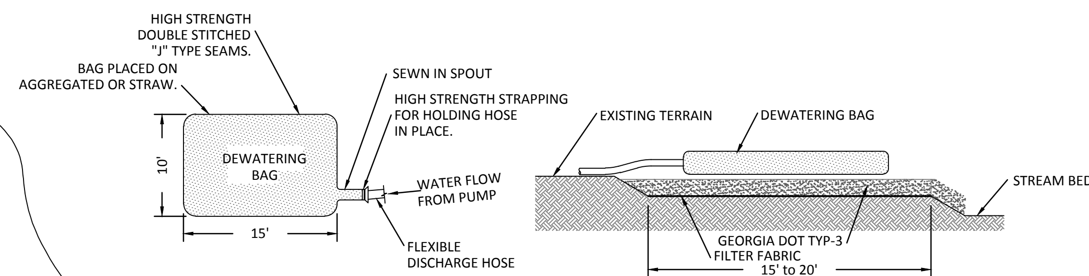
NOTE:

1. CONSTRUCT STREAM CROSSING WHEN FLOW IS AT NORMAL BASEFLOW.
2. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM.
3. INSTALL STREAM CROSSING PERPENDICULAR TO THE FLOW.
4. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
5. STABILIZE AN ACCESS RAMP OF CLASS B STONE TO THE EDGE OF THE MUD MAT.
6. CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED.

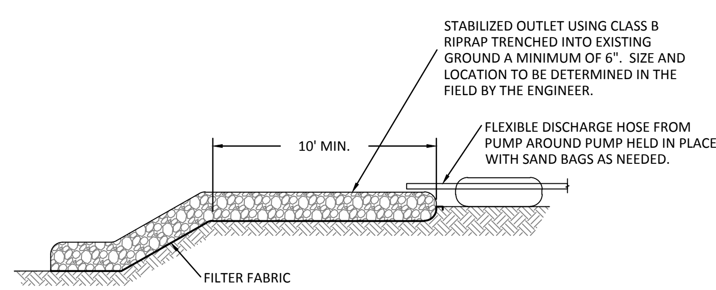
3/6.7 Temporary Stream Crossing - Mud Mat
Not to Scale



Plan View

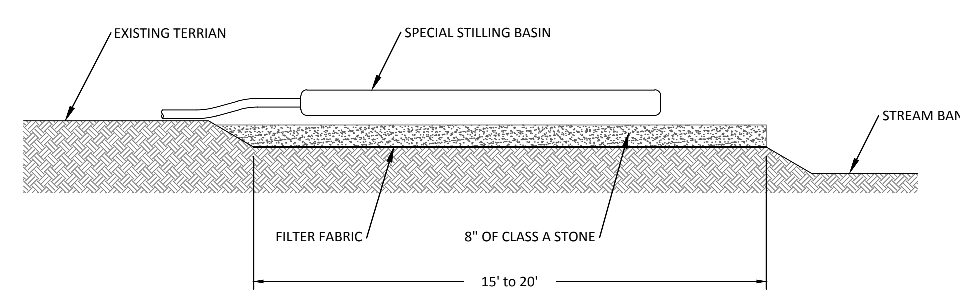


Inset "A"
Dewatering Bag



Inset "B"
Stabilized Outlet

4/6.7 Sediment Basin Pumping System
Not to Scale



5/6.7 Special Stilling Basin
Not to Scale

WILDLANDS ENGINEERING
167-B Haywood Road
Asheville, NC 28806
Tel: 828.774.5547
Fax: 704.332.3306
Firm License No. F-0831

Henry Fork Mitigation Site
Catawba County, North Carolina
Details

Revisions:

Date:	July 31, 2015
Job Number:	005-02143
Project Engineer:	JM
Drawn By:	JCK, KJH, JM
Checked By:	ER, SW

Sheet 6.7