Addendum #1 – REVISED MITIGATION PLAN

NEIGHBORS BRANCH/WALTON CRAWLEY BRANCH STREAM AND WETLAND RESTORATION SITE

McDowell County, North Carolina
EEP No. 92872
Contract No. 080730801

Prepared for:

NCDENR-Ecosystem Enhancement Program
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EXECUTIVE SUMMARY

The Neighbors Branch/Walton Crawley Branch (Newton and Stroud Properties) Stream and Wetland Restoration Site (Site) is located approximately six (6) miles southeast of the town of Marion (the center of the Site has a latitude and longitude of 35.6599ºN and 81.9002ºW). The Site is situated due south of the intersection of Deer Park Road and Harmony Grove Road in McDowell County, North Carolina, and is located in the United States Geological Survey Hydrologic Unit and Targeted Local Watershed 03050101040010 (North Carolina Division of Water Quality Subbasin 03-08-30) of the Catawba River Basin and will service the USGS 8-digit Cataloging Unit 03050101. The Site was identified to assist the North Carolina Ecosystem Enhancement Program (EEP) in meeting its stream and wetland mitigation goals.

This document details planned stream and wetland restoration activities at the Site. A 33.4-acre conservation easement will be placed on the Site to incorporate all mitigation activities. The Site contains 7,278 existing feet of jurisdictional streams in the form of Walton Crawley Branch, two jurisdictional unnamed tributaries to Walton Crawley Branch (UT 1 and UT 2), Neighbors Branch, two jurisdictional UTs to Neighbors Branch (UT 1 and UT 3), 0.52 acres of hydric soil and 2.89 acres of wetlands, as well as associated floodplains and upland slopes.

The contributing watersheds are characterized primarily by forest land (approximately 84 percent of the total area) with pasture at the lower elevations (approximately 10 percent of the total area) and low-density residential development scattered along the outer fringes of the watersheds. Impervious surfaces appear to account for approximately one percent of the watershed land surface. The removal of riparian vegetation, manipulation of stream channels, hoof shear from livestock on stream banks and floodplain soils, and poor soil conservation practices from the upstream watershed are responsible for degraded water quality and unstable channel characteristics (stream entrenchment, erosion, and bank collapse) within restoration reaches.

GOALS

The primary goals of the project focus on improving water quality and long term stability by reducing nutrient loading from the on-site cattle and horse operation, reducing excess sedimentation input from site channel banks and contributing non-jurisdictional tributaries/drainages, reducing excess sedimentation from site access roads and deteriorated crossings, increasing the attenuation of floodwater flows, reintroducing natural watershed flows to Walton Crawley Branch by removing the pond and restoring the channel through its natural valley, and restoring and enhancing aquatic and riparian habitat. Long term stability will be evidenced by channels maintaining stable inverts and banks over an extended period of time. These goals will be accomplished through the following objectives:

- Reduce point (i.e. cattle/horses directly accessing the channel) and non-point source (i.e. stormwater runoff through pastures) pollution associated with an on-site cattle

and horse operation by exclusionary fencing from the stream and riparian buffer, and by providing a vegetative buffer on stream banks and adjacent floodplains to treat nutrient enriched surface runoff from adjacent pastureland.

- Stabilize degraded portions of on-site streams, eroding ephemeral/stormwater channels, and existing maintained dirt roads to reduce sediment inputs. Stabilization methods will include:
  - Restoring a stable dimension, pattern, and profile to selected sections of channels to ensure the channel will transport and attenuate watershed flows and sediment loads without aggrading or degrading.
  - Stabilize selected channel banks by excavating bankfull benches, placing stream structures to reduce shearing forces on outside meander bends, and planting native vegetative species to provide soil stability.
  - Stabilize ephemeral/stormwater channels by planting native vegetation along eroded banks and floodplain and constructing stabilization weirs through the channel valley to lower facet slopes and decrease erosion.
  - Place gravel along existing degraded soil roads that are situated adjacent to Site streams.
- Reintroduce natural watershed flows to Walton Crawley Branch by restoring the channel through the low point of the natural valley and removing the dam that impedes natural down valley flows.
- Improve aquatic habitat by enhancing stream bed variability, providing shading/cover areas within the stream channel, and introducing woody debris in the form of rootwads, log vanes, and log sills.
- Enhancing fish passage within Neighbors Branch and Walton Crawley Creek. This is accomplished by eliminating the pond and restoring the stream through the natural valley and by restoring Neighbors Branch and replacing an existing perched culvert to allow fish passage upstream.
- Enhancing riparian wildlife habitat by:
  - Fencing cattle out of existing wetlands and planting impacted wetlands with native vegetative species. Wetlands will also be restored by raising site stream inverts to allow groundwater tables to rise throughout the affected valleys.
  - Fencing livestock out of existing and restored riparian buffers as well as installing alternative watering devices that will ensure livestock have sufficient watering areas. This is detailed further in the Farm Management Plans completed for the site by EEP.
  - Vegetating the existing fescue dominated riparian buffers with native trees, shrubs, herbs and grasses. Forest vegetation species were selected by studying a Reference Forest Ecosystem located on-site and reviewing Montane Alluvial Forest species listed in *Classification of the Natural Communities of North Carolina: Third Approximation* (Schafale and Weakley 1990).

- Creating wildlife corridors through agricultural lands which have significantly dissected the landscape. The corridors will provide connectivity to a diversity of habitats including mature forest, early successional forest, stream-side forest, riparian wetlands, and uplands.

Project restoration efforts will result in the following:

- Restore 2,436 linear feet of Site streams.
- Enhancement I of 163 linear feet of Site streams
- Enhancement II of 1,926 linear feet of Site streams.
- Preservation of 3,271 linear feet of Site streams.
- Restoration of 0.52 acres of existing hydric soils to riparian wetlands.
- Enhancement of 1.62 acres of riparian wetlands.
- Preservation of 1.29 acres of riparian wetlands.
- Plant 11.78 acres of floodplain, stream bank, and upland slope buffers.
- Impact approximately 0.17 acres of existing wetlands during construction activities.

The Muddy Creek Restoration Partnership (Partnership) was formed in 1998 to address impacts to the Muddy Creek Watershed. The Partnership completed the Muddy Creek Watershed Restoration Initiative Feasibility Report and Restoration Plan (Watershed Plan) for the Muddy Creek Watershed in December of 2003 (MCRP 2003). Since 2004 the North Carolina Ecosystem Enhancement Program (EEP) has informally participated in the Partnership by implementing priority projects named by the partnership and adopted the 2003 report as part of its Local Watershed Plan (LWP). The EEP's Upper Catawba River Basin Restoration Priorities (2009) identifies North Muddy Creek as a Targeted Local Watershed (TLW). The Site is located within the North Muddy Creek Watershed. In 2008 the EEP contracted with a consulting firm to conduct outreach programs with landowners and identify additional project sites in the Muddy Creek Watershed.

The primary goals identified by the Partnership's Watershed Plan include 1.) Restore the Watershed to its Full Intended Use, 2.) Restore Riparian Buffers, 3.) Enhance Open Space Preservation, 4.)Improve Water Quality, 5.) Restore Physical Habitat, and 6.) Establish a Trout Fishery.

The Watershed Plan listed the following components of watershed restoration to be expected:

- Natural Channel Design Stream Restoration
- Riparian Reforestation
- Livestock Exclusion
- Riparian Forest Preservation

These four components are included within the Site's Restoration Plan. This project will help restore the watershed to its full intended use by restoring a stream, floodplain and riparian

wetland ecosystem through stream and wetland restoration, enhancement and preservation. The project will restore riparian buffers through revegetation of buffer zones with native riparian and wetland species along all Site streams. The project enhances open space preservation by placing Site streams, wetlands, and their buffer into a permanent conservation easement. The overall Site helps improve water quality by reducing sedimentation in on-Site streams and planting a vegetated riparian buffer that filters nutrients from adjacent pasturelands. Additionally, exclusionary fencing and alternate watering devices will remove livestock from accessing on-site channels and their riparian buffers. The project will restore and enhance physical habitat for both aquatic and terrestrial species by planting native vegetation along stream banks and riparian buffers, creating wildlife corridors through a currently dissected landscape, and restoring bedform variability to Site stream. The stabilization of streams and buffers in the project area will enhance water quality in downstream receiving waters which should help in the re-establishment of the watershed's ability to host trout and enhance their ability to propagate.

This document represents a detailed restoration plan summarizing activities proposed for the Site. The plan includes 1) descriptions of existing conditions; 2) reference stream, wetland, and forest studies; 3) restoration plans; and 4) monitoring and success criteria. Upon approval of this plan by the EEP, engineering construction plans will be prepared and activities implemented as outlined. Proposed restoration activities may be modified during the design stage to address constraints such as sediment-erosion control measures, drainage needs (floodway constraints), or other design considerations.

This document is consistent with the requirements of the federal rule for compensatory mitigation project sites as described in the Federal RegisterTitle 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14). Specifically the document addresses the following requirements of the federal rule:

- (2) *Objectives.* A description of the resource type(s) and amount(s) that will be provided, the method of compensation (i.e., restoration, establishment, enhancement, and/or preservation), and the manner in which the resource functions of the compensatory mitigation project will address the needs of the watershed, ecoregion, physiographic province, or other geographic area of interest.
- (3) *Site selection.* A description of the factors considered during the site selection process. This should include consideration of watershed needs, onsite alternatives where applicable, and the practicability of accomplishing ecologically self-sustaining aquatic resource restoration, establishment, enhancement, and/or preservation at the compensatory mitigation project site. (See § 332.3(d).)
- (4) *Site protection instrument.* A description of the legal arrangements and instrument, including site ownership, that will be used to ensure the long-term protection of the compensatory mitigation project site (see § 332.7(a)).
- (5) *Baseline information.* A description of the ecological characteristics of the proposed compensatory mitigation project site and, in the case of an application for a DA permit,

the impact site. This may include descriptions of historic and existing plant communities, historic and existing hydrology, soil conditions, a map showing the locations of the impact and mitigation site(s) or the geographic coordinates for those site(s), and other site characteristics appropriate to the type of resource proposed as compensation. The baseline information should also include a delineation of waters of the United States on the proposed compensatory mitigation project site. A prospective permittee planning to secure credits from an approved mitigation bank or in-lieu fee program only needs to provide baseline information about the impact site, not the mitigation bank or in-lieu fee project site.

- (6) *Determination of credits.* A description of the number of credits to be provided, including a brief explanation of the rationale for this determination. (See § 332.3(f).)
- (7) *Mitigation work plan.* Detailed written specifications and work descriptions for the compensatory mitigation project, including, but not limited to, the geographic boundaries of the project; construction methods, timing, and sequence; source(s) of water, including connections to existing waters and uplands; methods for establishing the desired plant community; plans to control invasive plant species; the proposed grading plan, including elevations and slopes of the substrate; soil management; and erosion control measures. For stream compensatory mitigation projects, the mitigation work plan may also include other relevant information, such as plan form geometry, channel form (e.g. typical channel cross-sections), watershed size, design discharge, and riparian area plantings.
- (8) *Maintenance plan.* A description and schedule of maintenance requirements to ensure the continued viability of the resource once initial construction is completed.
- (9) *Performance standards.* Ecologically-based standards that will be used to determine whether the compensatory mitigation project is achieving its objectives. (See § 332.5.)
- (10) *Monitoring requirements.* A description of parameters to be monitored in order to determine if the compensatory mitigation project is on track to meet performance standards and if adaptive management is needed. A schedule for monitoring and reporting on monitoring results to the district engineer must be included. (See § 332.6.)
- (11) *Long-term management plan.* A description of how the compensatory mitigation project will be managed after performance standards have been achieved to ensure the long-term sustainability of the resource, including long-term financing mechanisms and the party responsible for long-term management. (See § 332.7(d).)
- (12) *Adaptive management plan.* A management strategy to address unforeseen changes in site conditions or other components of the compensatory mitigation project, including the party or parties responsible for implementing adaptive management measures. The adaptive management plan will guide decisions for revising compensatory mitigation plans and implementing measures to address both foreseeable and unforeseen circumstances that adversely affect compensatory mitigation success. (See § 332.7(c).)
- (13) *Financial assurances.* A description of financial assurances that will be provided and how they are sufficient to ensure a high level of confidence that the compensatory mitigation project will be successfully completed, in accordance with its performance standards (see § 332.3(n)).“

1.0 PROJECT SITE IDENTIFICATION AND LOCATION

The Site is located approximately six (6) miles east of the town of Marion (Figure 1). The center of the Site has a latitude and longitude of 35.6599ºN and 81.9002ºW. The Site is situated due south of the intersection of Deer Park Road and Harmony Grove Road.

This document details planned stream and wetland restoration activities at the Site. A 33.40-acre conservation easement will be placed on the Site to incorporate all restoration activities. The Site contains 0.52 acres of hydric soil 2.89 acres of jurisdictional wetlands, Walton Crawley Branch, two jurisdictional unnamed tributaries to Walton Crawley Branch (UT 1 and UT 2), Neighbors Branch, two jurisdictional UTs to Neighbors Branch (UT 1 and UT 3), associated floodplains, and upland slopes.

1.1 Directions to Project Site

Directions to the Site:

- From Interstate 40 take exit 90 (towards Nebo/Lake James) onto Harmony Grove Road (SR1760)
- Head southeast on Harmony Grove Road (SR 1760)
- At the intersection of Harmony Grove Road (SR 1760) and Deer Park Road (SR 1765) go straight onto the gravel road
- Follow the gravel road for approximately 0.5 mile to the Site.
  Site Latitude and Longitude (35.6599ºN, 81.9002ºW)

1.2 USGS Hydrologic Unit Code and NCDWQ River Basin Designation

The Site is located in McDowell County, North Carolina within United States Geological Survey (USGS) Hydrologic Unit (HU) and Targeted Local Watershed 03050101040010 (North Carolina Division of Water Quality [NCDWQ] Subbasin 03-08-30) of the Catawba River Basin and will service the USGS 8-digit Cataloging Unit (CU) 03050101 (USGS 1974, NCEEP 2009).

1.3 Project Components, Restoration Type, and Approach

Proposed Site mitigation activities include the construction of stable stream channels resulting in 2,436 linear feet of stream restoration, stabilizing degraded stream banks using stream structures, bank grading, and vegetation plantings resulting in 163 linear feet of stream enhancement (Level I), matting, planting, and fencing out livestock to stabilize degraded portions of stream bank resulting in 1,926 linear feet of stream enhancement (Level II), and preserving 3,271 linear feet of currently stable streams. Additionally, proposed site plans include restoring 0.52 acres of riparian wetlands, enhancing 1.62 acres of riparian wetlands, and preserving 1.29 acres of riparian wetlands through livestock exclusion, plantings, and raising groundwater hydrology by raising stream inverts.

Table 1. Project Components

Restoration Segment/ Reach ID	Existing LF/AC	Restoration Level	Approach	Designed LF/AC	Station Range	Buffer Acres	Comment
Walton Crawley	2,498	R	PI	1,203	15+33 – 27+36	9.31	Channel returned to natural valley.
		E I		12	29+11 – 29+23 -		Bank grading and stabilization on degraded bank.
		E II		242	27+36 – 29+11 29+23 – 29+90		Fence cattle out of easement area and remove invasive plants.
		P		1,044	10+00 – 15+33 29+90 – 35+01		--
UT 1 Walton Crawley	872	R	PI	188	18+13- 20+01	5.06	Restore channel through existing pond and reconnect to Walton Crawley
		E II		330	14+83 – 18+13		Fence cattle out of easement area and remove invasive plants.
		P		483	10+00 – 14+83		--
UT 2 Walton Crawley	600	R	PI	546	10+00 – 13+75 16+28 – 17+99	3.79	Channel routed to the center of the valley, away from toe of slope of valley.
		E II		253	13+75 – 16+28		Fence cattle out of easement area and remove invasive plants.
Neighbors Branch	2,262	R	PI	499	24+98 – 29+97	9.60	Channel routed through low point of valley and invert raised from perched culvert.
		E I		20	18+89 – 19+09		Place channel structure and stabilize bank.
		EII		951	18+69 – 18+89 19+09 – 24+98 29+97 – 33+39		Fence cattle out of easement area and matt, seed, and plant vegetation on scoured banks.
		P		869	10+00 – 18+69		--
UT 1 Neighbors Branch	281	E I		131	11+50 – 12+81	1.30	Bank grading and stabilization on degraded banks.
		E II		150	10+00 – 11+50		Fence cattle out of easement area and plant vegetation.
UT 3 Neighbors Branch	875	P		875	10+00 – 18+75	3.26	--
Riparian Wetland		R		0.52		--	Restore hydrology to hydric soils

							adjacent to Neighbors Branch.
Riparian Wetland		E		1.62		--	Plant native vegetation on impacted wetlands and fence cattle out.
Riparian Wetland		P		1.29		--	--

Table 1. Project Components (Continued)

Component Summations				
Restoration Level	**Stream (LF)**	**Riparian Wetland (AC)**		**Buffer (AC)**
		Riverine	**Non-riverine**	
Restoration	2,436	0.52	--	8.20
Enhancement	--	1.62	--	1.62
Enhancement I	163	--	--	--
Enhancement II	1,926	--	--	3.94
Preservation	3,271	1.29	--	18.56
Totals	7,783	3.43		32.32*

*****The buffer acreage is smaller than the conservation easement acreage because UT 2 Neighbors Branch is not included in the buffer credit calculations.

1.4 Project History

Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 2 through 4.

Table 2. Project Activity and Reporting History

Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Restoration Plan	April 2009	March 7, 2013
Final Design – Construction Plans		September 3, 2013
Construction		April 1, 2014
Temporary S&E Mix Applied to Entire Project Area		April 1, 2014
Permanent Seed Mix Applied to Entire Project Area		April 1, 2014
Bare root, containerized and B&B plantings for Entire Project Area		April 1, 2014
Mitigation Plan/As-built (Year 0 Monitoring-Baseline)		November 30, 2014
Year 1 Monitoring		November 30, 2015
Year 2 Monitoring		November 30, 2016
Structural maintenance (bench expansion, vane, etc.)		
Year 3 Monitoring		November 30, 2017
Supplemental planting of containerized material		
Year 4 Monitoring		November 30, 2018

Table 4. Project Attributes Table

Project County	McDowell County, North Carolina
Physiographic Region	Blue Ridge
Ecoregion	Northern Inner Piedmont
Project River Basin	Catawba
USGS HUC for Project (14 digit)	03050101040010
NCDWQ Sub-basin for Project	03-08-30
Within extent of EEP Watershed Plan?	Yes – Upper Catawba River Basin Restoration Priorities 2009
WRC Class (Warm, Cool, Cold)	Warm
% of project easement fenced or demarcated	25
Beaver activity observed during design phase?	No

Restoration Component Attributes

	Walton Crawley Branch	UTs to Walton Crawley Branch		Neighbors Branch	UTs to Neighbors Branch	
		UT 1	UT 2		UT 1	UT 3
Drainage Area	458 acres	29 acres	20 acres	220 acres	13 acres	15 acres
Stream Order (USGS topo)	Second	First	Not Shown	First	Not Shown	Not Shown
Restored Length (feet)	1,203	188	546	499	--	--
Perennial (P) or Intermittent (I)	P	P	P	P	I/P	I/P
Watershed Type	Rural	Rural	Rural	Rural	Rural	Rural
Watershed impervious cover	< 1 %	< 1 %	< 1 %	< 1 %	< 1 %	< 1 %
NCDWQ AU/Index number	11-32-1-10	11-32-1-10	11-32-1-10	11-32-1-10-1	11-32-1-10-1	11-32-1-10-1
NCDWQ Classification	C	C	C	C	C	C
303d listed?	No	No	No	No	No	No
Upstream of a 303d listed	No	No	No	No	No	No
Reasons for 303d listed segment	NA	NA	NA	NA	NA	NA
Total acreage of easement	33.40 ac					
Total vegetated acreage of easement	21.62 ac					
Total planted restoration acreage	11.78 ac					
Rosgen Classification of preexisting	B4/5c-G4/5	E5	E5-G5	E5/4-G5/4	E5/4	E5
Rosgen Classification of Proposed	C4	E/C5	E/C5	C4	E5/4	E5
Valley type	VIII	II	II	VIII	II	II
Valley slope	0.0340	0.0380	0.0545	0.0260	0.0820	0.0656
Cowardin classification	R3UB1/2	R3UB1/2/3	R3UB1/2	R3UB1/2	R3UB1/2, R4SB3/4	R3UB1/2
Trout waters designation	No	No	No	No	No	No
Species of concern, endangered etc.	No	No	No	No	No	No
Dominant Soil Series	Elsinboro, Evard, Hayesville	Evard	Evard, Hayesville	Hayesboro, Iotla	Evard	Hayesboro

(NCSHPO). No documented archaeological sites or structures of historical or architectural importance occur within the Site. See the approved Categorical Exclusion document for more information concerning cultural resources.

2.8 Potential Constraints

The presence of conditions or characteristics that have the potential to hinder restoration activities within the Site was evaluated. The evaluation focused primarily on the presence of hazardous materials, utilities and restrictive easements, rare/threatened/endangered species or critical habitats, and the potential for hydrologic trespass. Existing information regarding constraints was acquired and reviewed. In addition, any Site conditions that have the potential to restrict the restoration design and implementation were documented during the field investigation. No constraints, including beaver, bedrock or an overabundance of invasive/nuisance species, that may present fatal flaws for site mitigation were identified. Invasisve/nuisance species included Chinese privet and multi-flora rose. It is anticipated that these species will be eradicated from the Site during construction activities and maintained throughout the 5-year monitoring period. The following are primarily design constraints that have been identified:

- Walton Crawley:
  - Required relocation of the existing pond outside of the bottom of the natural valley, outside of the easement but within the owner's property
  - Existing mature trees within forested areas. Existing trees larger than 10 inches in diameter were located and taken into account during the design process.
- UT 2 Walton Crawley:
  - Existing mature trees within forested areas. Existing trees larger than 10 inches in diameter were located and taken into account during the design process.
  - Sediment load from upstream gully.
- Neighbors Branch:
  - Existing mature trees within forested areas. Existing trees larger than 10 inches in diameter were located and taken into account during the design process.
  - Replace existing crossing with functioning crossing.
- UT 1 Neighbors Branch:
  - Existing mature trees within forested areas. Existing trees larger than 10 inches in diameter were located and taken into account during the design process.

2.8.1 Property Ownership and Boundary

The Site contains parcels that have two owners. The following list property ownership of each parcel:

- Mr. Alvin Newton (NC Parcel ID 1730-87-0795, 1730-89-7275, 1730-98-3404).
- Mr. Douglas Stroud (NC Parcel ID 1730-76-5250)

3.0 PROJECT SITE STREAMS (EXISTING CONDITIONS)

The Site contains six (6) jurisdictional stream channels that were studied for potential mitigation opportunities. The location of these channels and their reaches are depicted on Sheets 2 and 2A. The six jurisdictional streams include Neighbors Branch, UT 1 and UT 3 Neighbors Branch, Walton Crawley Branch, and UT 1 and UT 2 Walton Crawley Branch. UT 3 Neighbors Branch and the majority of UT 1 Walton Crawley Branch are both relatively stable channels and were primarily considered for preservation opportunities. It should be noted that the downstream ends of UT 1 and UT 2 Walton Crawley Branch both are impacted by backwater from the in-line pond on Walton Crawley Branch.

The remaining jurisdictional channels were studied for their restoration and enhancement opportunities, and are detailed in Section 3.2, below. One channel (UT 2 Neighbors Branch) was reviewed for mitigation opportunities; however, it was deemed a non-jurisdictional channel. Existing conditions cross sections and profiles can be found in Appendix 10.

3.1 Existing Conditions Survey

A Rosgen Level II stream survey was conducted along Neighbors Branch, UT 1 Neighbors Branch, Walton Crawley Branch and UT 2 Walton Crawley Branch. The approximate locations of the surveys are shown on Sheets 1 and 1A. The surveys included conducting a longitudinal profile for between 20 and 30 bankfull widths, cross-sectional surveys, measurement of plan form variables, determination of sediment size distributions, photographic logs, vegetation surveys, and general visual assessments of existing channel and watershed conditions.

3.2 Channel Classification

It should be noted that only those channels to be restored or enhanced were surveyed for channel classification purposes. A Rosgen Level II survey was not performed on the stable channels that are proposed for preservation.

Neighbors Branch

Three separate reaches of Neighbors Branch (Upstream, Downstream and Discharge Section) were surveyed (Sheet 1) to determine channel classification and overall channel stability. All three reaches are located on the Newton property where cattle and horses have access to the stream channel.

Upstream Reach

The Upstream Reach has somewhat mature trees (approximately 20 – 30 years old) along the stream bank and floodplain. Survey data revealed that the Upstream Reach can be classified as an E4/5 type channel. E type channels are indicative of stable stream endpoints in the succesional stages. However, there is evidence of degradation along the entire reach in the form of hoof shear from cattle and horse access. It is apparent that degradation of the channel banks has been mitigated by dense root systems of vegetation along the stream banks. Additional

evidence of degradation is revealed in a typical Bank Height Ratio of 1.6 which indicates that the bankfull elevation is entrenched in the oversized channel. The 4/5 descriptor indicates that the channel is dominated by gravel (4) and sand (5). It is believed that in an undisturbed state the channel would be dominated by gravel with very little sand influence. However, site conditions and upstream watershed influences have loaded excessive amounts of sand into Neighbors Branch.

Middle Reach

The Middle Reach flows through an open pasture with virtually no trees along the channel banks. Survey data revealed that the Middle Reach can be classified as a G4/5 type channel. G type channels are indicative of an unstable transitional stage in the evolutionary process. G type channels typically display degradation along the channel invert and channel banks (as seen on-site). The 4/5 descriptor indicates that the channel is dominated by gravel (4) and sand (5). Sand dominates large stretches of the Middle Reach with very few areas showing signs of gravel in the substrate. It is believed that in an undisturbed state the channel would be dominated by gravel with very little sand influence. However, site conditions and upstream watershed influences have loaded massive amounts of sand into Neighbors Branch on the Site.

Downstream Reach

The Downstream Reach (Discharge Section in Morphological Tables) is located immediately downstream of the Middle Reach. The Downstream Reach flows through mature existing woodlands with little access by cattle and horses. Survey data revealed that the Downstream Reach can be classified as a stable C5 type channel. C5 type channels are considered stable channels. The channel substrate is dominated by gravel. This reach displayed much less sand/silt than the Upstream and Middle reaches, however, there was still well above normal amounts of fine sediment in the channel.

UT 1 Neighbors Branch

Existing conditions surveys (Sheet 1) of UT 1 Neighbors Branch were obtained up to the point of jurisdiction. Survey data revealed that UT 1 Neighbors Branch can be classified as an E4/5 type channel. E type channels are typically stable endpoints in the stream successional stages. UT 1 Neighbors Branch appears to be stable in some areas and degrading in other areas due to extreme elevation changes at nick points. These nick points cause sudden changes in stream type (channel quickly transitions from and E type channel to a B type channel in these very localized areas, then back to an E type channel) however the channel type typically can be classified as an E type channel. The substrate is dominated by a mixture of scattered gravel, sand and clay. This can be a common occurrence in headwater channels at the upstream end of their jurisdictional limits.

Walton Crawley Branch

The Upstream Reach of Walton Crawley Branch is a stable system that is classified as a B4 type stream, flowing through a relatively steep and confined valley. Additionally, a mature riparian

buffer is located along and adjacent to both banks through the Upstream Reach. The Pond Reach is dominated by backwater from an in-line dam at the downstream end of the reach. The dam has impeded natural valley flows and created an open water habitat on Walton Crawley Branch.

The Downstream Reach is located immediately downstream of the pond dam. Surveys of the Downstream Reach (Sheet 1a) were conducted approximately 200 feet downstream of the inline pond dam. Cattle and horses are actively accessing the channel through this portion of the Site. There are mature trees in the floodplain of the Downstream Reach with scattered trees along the channel banks. However, most rooted vegetation on the channel banks are in the form of shrubs dominated by Chinese privet. Walton Crawley can be classified as a B4/5c type channel transitioning towards a G4/5c type channel through the Downstream Reach. In themselves, B type channels are commonly stable streams, however it is believed that this reach of Walton Crawley is transitioning to a G type channel as evidenced by a very low entrenchment ratio of 1.62 and degradation of the channel banks. Like Neighbors Branch, Walton Crawley's substrate is dominated by gravel and sand.

The Preservation/Enhancement Reach is located immediately downstream of the Downstream Reach. Several mature trees are located along the channel banks and within the floodplain. As Walton Crawley Branch approaches the culvert in the downstream most portion of the Reach, the channel banks become more stable and the bank height ratio approaches 1.0. This reach of Walton Crawley can be classified as an E type channel. The substrate in this portion of the channel is dominated by sand with relatively few riffles exhibiting gravel in the substrate.

UT 1 Walton Crawley Branch

The Preservation Reach of UT 1 Walton Crawley Branch is located upstream of the soil road crossing. UT 1 Walton Crawley is a stable, small jurisdictional stream that flows through a somewhat steep valley. The channel is surrounded by dense, mature vegetation on the stream banks and adjacent valley side slopes. Existing vegetation provides dense shading over the channel and contributes valuable woody debris such as leaves and sticks. It appears that the channel has had little to no impacts from humans or livestock over the last 30 to 50 years (estimated from tree age). UT 1 Walton Crawley is classified as an E5 stream.

The enhancement/restoration reach of UT 1 Walton Crawley begins downstream of the soil road crossing. The first 300 feet of the reach is stable but does not have an established wooded buffer. Therefore this section will be enhanced through plantings. The remaining restoration reach has been affected by backwater effects from the existing pond. As the channel approaches the pond it becomes a braided system, as opposed to the single thread E5 channel upstream. UT 1 Walton Crawley will be restored to a single thread channel that flows directly into Walton Crawley once the pond is relocated. There is access to the channel for livestock due to the absence of fencing.

UT 2 Walton Crawley Branch

Surveys were obtained (Sheet 1a) immediately downstream of the dirt road crossing. This point represents the point of jurisdiction for UT 2 Walton Crawley Branch. There are mature trees adjacent to UT 2 Walton Crawley Branch for the entirety of the reach. However there is a large debris pile that has been pushed into the channel approximately 50 feet downstream of the dirt road that is advancing degradation within the channel from that point downstream. UT 2 Walton Crawley Branch can be classified as a stable E4/5 from its initial point of jurisdiction. However, the channel quickly begins a transition towards a G4/5 type channel shortly thereafter. The channel exhibits typical bank height ratios of 1.0 at its initial point of jurisdiction (in E type channel reach), however, it exhibits typical bank height ratios of 4.2 shortly thereafter in the G type sections of the channel.

The channel is dominated by sand with very little evidence of gravel, as would be expected. Much of the sand is washed into the study reach from upstream ephemeral portions of the site that are unstable due to poor soil stabilization. The channel becomes less degraded as it approaches the pond and could be classified as an E5 type channel. This reach of the channel is approximately 400 feet downstream of the point of jurisdiction.

3.3 Valley Classification

Neighbors Branch and Walton Crawley Branch are situated in somewhat broad valleys that can be classified as a Valley Type VIII. UT 1 Neighbors Branch and UT 1 and UT 2 Walton Crawley Branch are situated in somewhat confined and steep valleys that can be classified as a Valley Type II.

3.4 Discharge

Determined bankfull discharges for the channels to be restored are as follows (see section 3.8 for further details on bankfull discharge determination):

- Walton Crawley: 63 cfs
- UT 1 Walton Crawley: 4 cfs
- UT 2 Walton Crawley: 8 cfs
- Neighbors Branch: 25 cfs

3.5 Channel Morphology

Morphological characteristics of the Site streams were collected during a Rosgen Level II survey. The Morphological Characteristics Tables, shown below, include a summary of existing dimension, profile, and pattern data for the Site streams and references.

Table 10. Morphological Characteristics of Walton Crawley Branch and Reference

Morphological Characteristics of Walton Crawley Branch and Reference												
Restoration Plan:	Walton Crawley and Neighbors Branch Stream and Wetland Restoration Site											
Reach:	Walton Crawley Branch											
County:	McDowell County, NC											
Design by:	RVS											
Checked by:	RKW											
ITEM	Existing Conditions				Existing Conditions				Reference Reach				Proposed Conditions			
LOCATION	Walton Crawley - Upstream of Pond for Discharge				Walton Crawley - Downstream of Pond				Bobs Creek				Walton Crawley			
STREAM TYPE	B4				G4/5				C4				C4			
DRAINAGE AREA, Ac - Sq Mi	408 Ac	-	0.64	Sq Mi	458 Ac	-	0.72	Sq Mi	429 Ac	-	0.67	Sq Mi	458 Ac	-	0.72	Sq Mi
BANKFULL WIDTH (W_{bkf}), ft	9.4	ft			7.9	ft			12.7	ft			15.5	ft		
BANKFULL MEAN DEPTH (d_{bkf}), ft	0.90	ft			0.78	ft			0.90	ft			1.11	ft		
WIDTH/DEPTH RATIO (W_{bkf}/d_{bkf})	10.4				10.2				14.1				14.0			
BANKFULL X-SECTION AREA (A_{bkf}), ft^2	8.42	ft^2			6.22	ft^2			11.4	ft^2			16.6	ft^2		
BANKFULL MEAN VELOCITY, fps	7.5	fps			3.9	fps			6.2	fps			3.8	fps		
BANKFULL DISCHARGE, cfs	63.0	cfs			24.0	cfs			70.0	cfs			63.0	cfs		
BANKFULL MAX DEPTH (d_{max}), ft	1.09	ft			0.92	ft			1.21	ft			1.38	ft		
BANK HEIGHT RATIO	1.00				2.83				1.00				1.00			
TYPICAL BANK HEIGHT ABOVE BANKFULL	1.09	ft			2.60	ft			1.21	ft			1.38	ft		
WIDTH Flood-Prone Area (W_{fpa}), ft	16.8	ft			12.9	ft			150.0	ft			55	-	90.00	ft
ENTRENCHMENT RATIO (ER)	1.78				1.62				11.8				4.5			
MEANDER LENGTH (Lm), ft	103.0	-	121.0	ft	Channelized to Valley Toe				95.0	-	98.0	ft	77.5	-	155.0	ft
RATIO OF Lm TO W_{bkf}	11.0	-	12.9		N/A		N/A		7.5	-	7.7		5.0	-	10.0	
RADIUS OF CURVATURE, ft	5.0	-	14.0	ft	Channelized to Valley Toe				14.5	-	20.0	ft	31.0	-	62.0	ft
RATIO OF Rc TO W_{bkf}	0.5	-	1.5		N/A		N/A		1.1	-	1.6		2.0	-	4.0	
BELT WIDTH, ft	16.0	-	25.0	ft	Channelized to Valley Toe				30.5	-	32.0	ft	38.8	-	93.0	ft
MEANDER WIDTH RATIO	1.7	-	2.7		N/A		N/A		2.4	-	2.5		2.5	-	6.0	
SINUOSITY (K)	1.02				1.01				1.22				1.10			
*VALLEY SLOPE, ft/ft	0.0340	ft/ft			0.0167	ft/ft			0.0250	ft/ft			0.0171	ft/ft		
**AVERAGE SLOPE (S), ft/ft	0.0340	ft/ft			0.0135	ft/ft			0.0205	ft/ft			0.0045	ft/ft		
RIFFLE SLOPE, ft/ft	0.0299	ft/ft			0.0241	ft/ft			0.0344	ft/ft			0.0077	ft/ft		
RATIO OF RIFFLE SLOPE TO AVERAGE SLOPE	0.9				1.8				1.7				1.7			
POOL SLOPE, ft/ft	0.0038	ft/ft			0.0022	ft/ft			0.0015	ft/ft			0.0000	ft/ft		
RATIO OF POOL SLOPE TO AVERAGE SLOPE	0.1				0.2				0.1				0.0			
MAX POOL DEPTH, ft	1.85	ft			2.06	ft			2.16	ft			2.44	ft		
RATIO OF POOL DEPTH TO AVERAGE BANKFULL DEPTH	2.1				2.6				2.4				2.2			
POOL WIDTH, ft	7.65	ft			5.9	ft			8.37	ft			18.60	ft		
RATIO OF POOL WIDTH TO BANKFULL WIDTH	0.81				0.7				0.66				1.20			
POOL TO POOL SPACING, ft	6.0	-	40.8	ft	25.10	-	36.40	ft	38.8	-	64.7	ft	15.5	-	79.2	ft
RATIO OF POOL TO POOL SPACING TO BANKFULL WIDTH	0.6	-	4.3		3.16	-	4.58		3.1	-	5.1		1.0	-	5.1	

* Valley Slope, and Sinuosity were taken from topographical data obtained on the entire site for existing conditions (i.e. data was not taken along reach lengths).

** Average Slope was taken along a reach length for existing conditions.

Table 11. Morphological Characteristics of UT 1 Walton Crawley Branch

Morphological Characteristics of UT 1 Walton Crawley Branch and Reference					
Restoration Plan:	Walton Crawley and Neighbors Branch Stream and Wetland Restoration Site				
Reach:	UT 1 Walton Crawley Branch				
County:	McDowell County, NC				
Design by:	CLS				
Checked by:	RVS				
ITEM	Existing Conditions			Proposed Conditions	
LOCATION	UT 1 Walton Crawley Upstream			UT 1 Walton Crawley	
STREAM TYPE	E5			C5	
DRAINAGE AREA, Ac - Sq Mi	29 Ac - 0.04 Sq Mi			29 Ac - 0.04 Sq Mi	
BANKFULL WIDTH (W_{bkf}), ft	3.3	ft		5.5	ft
BANKFULL MEAN DEPTH (d_{bkf}), ft	0.33	ft		0.46	ft
WIDTH/DEPTH RATIO (W_{bkf}/d_{bkf})	9.9			12.0	
BANKFULL X-SECTION AREA (A_{bkf}), ft^2	1.1	ft^2		2.3	ft^2
BANKFULL MEAN VELOCITY, fps	3.6	fps		1.7	fps
BANKFULL DISCHARGE, cfs	4.0	cfs		4.0	cfs
BANKFULL MAX DEPTH (d_{max}), ft	0.60	ft		0.57	ft
BANK HEIGHT RATIO	1.00			1.00	
TYPICAL BANK HEIGHT ABOVE BANKFULL	0.60	ft		0.57	ft
WIDTH Flood-Prone Area (W_{fpa}), ft	10.0	ft		10.0	ft
ENTRENCHMENT RATIO (ER)	3.0			1.8	
MEANDER LENGTH (Lm), ft	N/A		N/A	27.5 - 55.0	ft
RATIO OF Lm TO W_{bkf}	N/A		N/A	5.0 - 10.0	
RADIUS OF CURVATURE, ft	N/A		N/A	11.0 - 22.0	ft
RATIO OF Rc TO W_{bkf}	N/A		N/A	2.0 - 4.0	
BELT WIDTH, ft	N/A		N/A	13.8 - 33.0	ft
MEANDER WIDTH RATIO	N/A		N/A	2.5 - 6.0	
SINUOSITY (K)	1.00			1.01	
*VALLEY SLOPE, ft/ft	0.0380	ft/ft		0.0380	ft/ft
**AVERAGE SLOPE (S), ft/ft	0.0380	ft/ft		0.0035	ft/ft
RIFFLE SLOPE, ft/ft	N/A		N/A	0.0059	ft/ft
RATIO OF RIFFLE SLOPE TO AVERAGE SLOPE	N/A		N/A	1.7	
POOL SLOPE, ft/ft	N/A		N/A	0.0000	ft/ft
RATIO OF POOL SLOPE TO AVERAGE SLOPE	N/A		N/A	0.0	
MAX POOL DEPTH, ft	N/A		N/A	1.01	ft
RATIO OF POOL DEPTH TO AVERAGE BANKFULL DEPTH	N/A		N/A	2.2	
POOL WIDTH, ft	N/A		N/A	6.60	ft
RATIO OF POOL WIDTH TO BANKFULL WIDTH	N/A		N/A	1.20	
POOL TO POOL SPACING, ft	N/A		N/A	16.9 - 28.1	ft
RATIO OF POOL TO POOL SPACING TO BANKFULL WIDTH	N/A		N/A	3.1 - 5.1	

* Valley Slope, and Sinuosity were taken from topographical data obtained on the entire site for existing conditions (i.e. data was not taken along reach lengths).

** Average Slope was taken along a reach length for existing conditions.

Table 12. Morphological Characteristics of UT 2 Walton Crawley Branch and Reference

Morphological Characteristics of UT 2 Walton Crawley Branch and Reference												
Restoration Plan:	Walton Crawley and Neighbors Branch Stream and Wetland Restoration Site											
Reach:	UT 2 - Walton Crawley											
County:	McDowell County, NC											
Design by:	RVS											
Checked by:	RKW											
ITEM	Existing Conditions				Existing Conditions				Reference Reach				Proposed Conditions			
LOCATION	UT 2 - Walton Crawley - Stable Riffle Upstream				UT 2 - Walton Crawley - Typical				UT 5 Bobs Creek				UT 2 - Walton Crawley			
STREAM TYPE	E5				G5				E/C4				E/C4/5			
DRAINAGE AREA, Ac - Sq Mi	20 Ac	-	0.03	Sq Mi	20 Ac	-	0.03	Sq Mi	24 Ac	-	0.04	Sq Mi	20 Ac	-	0.03	Sq Mi
BANKFULL WIDTH (W_{bkf}), ft	3.2	ft			1.3	ft			5.6	ft			6.5	ft		
BANKFULL MEAN DEPTH (d_{bkf}), ft	0.72	ft			0.70	ft			0.53	ft			0.54	ft		
WIDTH/DEPTH RATIO (W_{bkf}/d_{bkf})	4.4				1.9				10.5				12.0			
BANKFULL X-SECTION AREA (A_{bkf}), ft^2	2.26	ft^2			0.94	ft^2			3.0	ft^2			3.6	ft^2		
BANKFULL MEAN VELOCITY, fps	3.54	fps			8.51	fps			4.5	fps			1.9	fps		
BANKFULL DISCHARGE, cfs	8.0	cfs			8.0	cfs			13.4	cfs			8.0	cfs		
BANKFULL MAX DEPTH (d_{max}), ft	0.93	ft			0.91	ft			0.65	ft			0.70	ft		
BANK HEIGHT RATIO	1.00				4.21				1.00				1.00			
TYPICAL BANK HEIGHT ABOVE BANKFULL	0.93	ft			3.83	ft			0.65	ft			0.70	ft		
WIDTH Flood-Prone Area (W_{fpa}), ft	9.1	ft			2.0	ft			13.0	ft			30.00	ft		
ENTRENCHMENT RATIO (ER)	2.85				1.49				2.3				4.6			
MEANDER LENGTH (Lm), ft	The existing channel follows the bottom of the valley				69	-	75	ft	31.0	-	38.0	ft	32.5	-	65.0	ft
RATIO OF Lm TO W_{bkf}					51.5	-	56.0		5.6	-	6.8		5.0	-	10.0	
RADIUS OF CURVATURE, ft					3	-	5	ft	10.0	-	13.0	ft	13.0	-	26.0	ft
RATIO OF Rc TO W_{bkf}					2.2	-	3.7		1.8	-	2.3		2.0	-	4.0	
BELT WIDTH, ft					11.00	-	13.00	ft	17.0	-	25.0	ft	19.5	-	39.0	ft
MEANDER WIDTH RATIO					8.21	-	9.70	ft	3.1	-	4.5		3.0	-	6.0	
*SINUOSITY (K)	1.00				1.02				1.28				1.12			
*VALLEY SLOPE, ft/ft	0.0205	ft/ft			0.0545	ft/ft			0.0538	ft/ft			0.0545	ft/ft		
**AVERAGE SLOPE (S), ft/ft	0.0205	ft/ft			0.0518	ft/ft			0.0273	ft/ft			0.0040	ft/ft		
RIFFLE SLOPE, ft/ft	0.0205	ft/ft			0.0367	ft/ft			0.0480	ft/ft			0.0060	ft/ft		
RATIO OF RIFFLE SLOPE TO AVERAGE SLOPE	1.0				0.7				1.8				1.5			
POOL SLOPE, ft/ft	N/A		N/A		N/A		N/A		0.0017	ft/ft			0.0000	ft/ft		
RATIO OF POOL SLOPE TO AVERAGE SLOPE	N/A		N/A		N/A		N/A		0.1				0.0			
MAX POOL DEPTH, ft	N/A		N/A		N/A		N/A		0.93	ft			1.63	ft		
RATIO OF POOL DEPTH TO AVERAGE BANKFULL DEPTH	N/A		N/A		N/A		N/A		1.8				3.0			
POOL WIDTH, ft	N/A		N/A		N/A		N/A		5.45	ft			7.15	ft		
RATIO OF POOL WIDTH TO BANKFULL WIDTH	N/A		N/A		N/A		N/A		0.98				1.10			
POOL TO POOL SPACING, ft	N/A		N/A		N/A		N/A		6.1	-	25.9	ft	6.5	-	30.2	ft
RATIO OF POOL TO POOL SPACING TO BANKFULL WIDTH	N/A		N/A		N/A		N/A		1.1	-	4.6		1.0	-	4.6	

* Valley Slope, and Sinuosity were taken from topographical data obtained on the entire site for existing conditions (i.e. data was not taken along reach lengths).

** Average Slope was taken along a reach length for existing conditions.

3.6 Channel Evolution

A discussion of the channel evolution/successional stages will center on only those channels/reaches that are to be restored/enhanced. It is assumed that preserved channels/reaches are currently in a stable state and are not expected to progress through successional trends in the near future.

Neighbors Branch

The proposed restored reach (Middle Reach) of Neighbors Branch is currently an incised G type channel. It is believed that Neighbors Branch's succesional trend has progressed and will continue to progress in one of the following manners (following Rosgen's Stream Type Succession Scenarios):

C→G→F→C
Or
C→G→B

If Neighbors Branch were to remain in its current degraded condition, it is believed that the channel would continue to incise to a point at which the bankfull channel would follow one of the following two successional scenarios:

1. Widen to allow for a larger belt width to create meanders and increase length, ultimately forming a stable C type channel at a lower elevation.
2. Incise and slightly widen its overbank area while creating a pool to pool spacing that would sufficiently dissipate energy through the bed form rather than plan form.

Enhancement II areas (Upstream Reach) of Neighbors Branch upstream of the Middle Reach are currently in stable condition or have scalloped banks due to hoof shear. This reach can be classified as an E type channel. It is believed that fencing out cattle will stop hoof shear on existing banks and deter any channel expansion. Therefore the channel's successional scenario would remain as an E type channel. Enhancement II areas downstream of the restoration reach can be classified as a stable C type channel with no near term succesional stages. Enhancement II areas will be fenced and invasives removed from channel banks and floodplain. Areas with existing hoof shear will be planted with vegetation and matted to expedite bank stability.

UT 1 Neighbors Branch

The majority of UT 1 Neighbors Branch is an E type channel with intermittent head cuts/nick points. It is believed that Neighbors Branch's succesional trend has progressed and will continue to progress in one of the following manners (following Rosgen's Stream Type Succession Scenarios):

E→G→F→B
Or
E→G→F→E

If UT 1 Neighbors Branch were to remain in its current condition with numerous head cuts/nick points, it is believed that the channel will continue to incise. The head cuts are points of incision

and can/could continue to migrate upstream causing a large gully (G type channel) throughout the entire reach until a stable wide slope reach becomes established.

Walton Crawley Branch

The proposed restored reach of Walton Crawley Branch is either influenced by backwater from a pond or a degraded and incised G type channel downstream of the pond dam. It is believed that Walton Crawley Branch's succesional trend has progressed and will continue to progress in one of the following manners (following Rosgen's Stream Type Succession Scenarios):

C→G→F→C

Or

C→G→B

An explanation of the succession would follow that of Neighbors Branch.

The one Enhancement I area along Walton Crawley Branch can be classified as an E type channel. It is believed that this portion of channel will expand its width ratio to a point that it would be classified as a C type channel. However, it is not believed that this small portion of channel would have significant impacts to the stable channel upstream and downstream of this reach due to the current stable condition of the upstream and downstream reaches, and vegetation along the channel banks.

Preservation and Enhancement II areas of Walton Crawley Branch are currently in stable condition. Enhancement II areas are claimed by fencing out cattle and removing invasive species from the channel banks and floodplain.

UT 2 Walton Crawley Branch

The proposed restored reaches of UT 2 Walton Crawley Branch are either influenced by backwater from a pond or an incised G type channel (upstream of the pond). The anticipated successional trend of the backwater reach is not listed below. It is believed that UT 2 Walton Crawley Branch's succesional trend has progressed and will continue to progress in one of the following manners (following Rosgen's Stream Type Succession Scenarios):

C→G→F→C

Or

C→G→B

An explanation of the succession would follow that of Neighbors Branch.

Enhancement II areas of UT 2 Walton Crawley Branch are currently in stable condition. Enhancement II areas will be fenced and invasives removed from channel banks and floodplain.

The downstream 120 feet of UT 2 Walton Crawley Branch could be classified as a D (braided) channel due to cattle access and backwater from the pond. It is believed that the channel may

BEHI values range from High to Very High and NBS values were all Very High through the reach. The model predicts that a total 0.05 tons/yr/ft of sediment are lost off of the studied banks leading to a total predicted loss of 5 tons of sediment lost per year.

UT 2 Neighbors Branch (Newton Property)

UT 2 Neighbors Branch is not a jurisdictional channel; however it appears to carry substantial enough flow to transport large amounts of fine sediment from its watershed into Neighbors Branch. A defined bed and bank are intermittent, however many areas of defined bed and bank appear scoured due to active erosion throughout most of the reach. Cattle have access to UT 2 Neighbors Branch and appear to use its forested, wooded floodplain for shading purposes. Additionally, it appears that human disturbance of the channel and the adjacent buffer is prevalent as evidenced by numerous relic tree stumps that have been dumped into the valley. The valley has scattered young trees (approximately 5 to 10 years old) through the valley floor but more mature trees along the valley side slopes (approximately 30 to 50 years old).

BEHI and NBS were not estimated through UT 2 Neighbors Branch because a defined bed and bank are intermittent. Overall however, it appears that the BEHI for the channel and wash areas could be considered Very High to Extreme for most of the reach.

UT 3 Neighbors Branch (Stroud Property)

UT 3 Neighbors Branch is a stable, small jurisdictional stream that flows through a somewhat steep valley. The channel is surrounded by dense, vegetation on the stream banks and adjacent valley side slopes. Existing vegetation provides dense shading over the channel and contributes valuable woody debris such as leaves and sticks. It appears that the channel has had little to no impacts from humans or livestock over the last 15 to 30 years (estimated from tree age).

BEHI and NBS values were not determined through UT 3 Neighbors Branch because it is a stable reach that appears to lose low amounts of sediment on an annual basis.

Walton Crawley Branch

Walton Crawley Branch has four distinct reaches (Upstream, Pond, Downstream, and Preservation/Enhancement Reaches).

Upstream Reach

The Upstream Reach of Walton Crawley Branch is a stable B type channel. The valley is somewhat confined and steep with gravel dominating the substrate. Large amounts of sand were noted in the substrate of the reach, suggesting that the sediment has been washed in from the upstream watershed. Sand loading has filled some pools and riffles, degrading habitat for fish and other macroinvertebrates. Vegetation on the stream bank and along the side slopes of the valley is thick and somewhat mature (approximately 30 to 50 years old), which allows the channel to remain stable in such a high slope setting. Existing vegetation also provides dense shading over the channel and contributes valuable woody debris such as leaves and sticks.

BEHI and NBS values were not determined through the Upstream Reach because it is a stable reach that appears to lose low amounts of sediment on an annual basis.

A small drainage approximately 150 feet in length and 25 feet wide enters the Upstream Reach from the right bank near the downstream end of the channel. The drainage is adjacent to a dirt road and has no vegetative cover or other soil stabilizing devices. The drainage appears to be experiencing severe erosion during storm events. Sediment lost from the drainage is washed into the Upstream Reach and transported downstream to the Pond Reach.

Pond Reach

The Pond Reach is dominated by an approximately one (1) acre pond in-line with Walton Crawley Branch. The pond blocks Walton Crawley Branch for almost 400 linear feet. The pond's water surface elevation is controlled by a riser barrel and spillway. The spillway has been undermined which allows large amounts of water to continuously flow from the pond from under the spillway. The upstream end of the pond is characterized by a large depositional area of fine sediments. Thickets of dense vegetation have established themselves through the depositional area apparently due to fluctuations in the ponds water surface elevation.

The pond serves as a blockage to fish passage and disrupts natural watershed flows through Walton Crawley Branch. Using data from existing conditions surveys, it was determined that the estimated bankfull discharge immediately upstream of the pond is approximately 63 cfs.

BEHI and NBS values were not determined through the Pond Reach because the channel is largely underwater and exposed channel areas appear to be aggrading from backwater effects of the pond.

Downstream Reach

The Downstream Reach is characterized by a degraded channel downstream of the pond. The channel can be classified as a G4/5 type channel for much of the reach. The reach is distinguished by an incised bankfull channel, degraded channel banks through many riffle (straight) areas, lateral channel expansion, channelization and relocation to the toe of valley, spoil along banks and invasive vegetation (privet) along channel banks.

Cattle have open access to the channel and appear to utilize it as a watering source and shading. Fecal matter near channel banks and in the adjacent floodplain indicates unobstructed washing of fecal coliform and nutrient inputs into the channel. The floodplain is characterized by mature (approximately 30 to 50 years old) vegetation for the majority of the reach, however hoof shear and grazing has disturbed the understory and root system of many trees.

BEHI values range from High to Extreme and NBS values range from Low to Extreme through the reach. The model predicts that a total 0.18 tons/yr/ft of sediment are lost off of the studied banks leading to a total predicted loss of 106 tons of sediment lost per year.

Preservation/Enhancement Reach

The Preservation/Enhancement Reach is immediately downstream of the Downstream Reach. The channel of the degraded Downstream Reach transitions into a channel with stable banks as it approaches a soil road crossing. The channel in this section of the Reach could be classified as an E5 type channel. Although the banks are stable due to dense vegetation along the channel banks and floodplain, it appears that the channel invert may be aggrading due to the fine sediment inputs from the Downstream Reach. There are few areas along this section of the Reach that display gravel in the substrate. It is believed that the majority of the fine sediments are loading in from the degraded Downstream Reach because many of the fine sediments from the upstream watershed are being captured in the pond. Pools and riffles through this section have become filled with the fine sediments, creating a profile that approaches being planar. The loss of pool function and riffle aggradation due to sedimentation has drastically degraded aquatic habitat for the propagation of fish and benthic communities.

Downstream of the soil road crossing, the channel flows through a unique geological feature between two steep hill slopes. The channel invert through this section of the reach is dominated by bedrock with numerous invert drops. The channel still displays increased amounts of fine sediments; however the channel appears to have the capacity to transport much of the excess sediment through the system due to a high slope. The channel could be classified as a C1 type channel through this section of the reach. The channel banks are very stable through this section of the reach due to mature trees along the channel banks and along the hill slopes.

BEHI and NBS values were not determined through the majority of this reach because it is a stable reach that appears to lose low amounts of sediment on an annual basis. One small section of bank however was assessed which revealed a BEHI of Extreme and NBS of Extreme.

UT 1 Walton Crawley Branch

UT 1 Walton Crawley Branch is a stable, small jurisdictional stream that flows through a somewhat steep valley. The channel is surrounded by dense, mature vegetation on the stream banks and adjacent valley side slopes. Existing vegetation provides dense shading over the channel and contributes valuable woody debris such as leaves and sticks. It appears that the channel has had little to no impacts from humans or livestock over the last 30 to 50 years (estimated from tree age). BEHI and NBS values were not determined through UT 1 Walton Crawley Branch because it is a stable reach that appears to lose low amounts of sediment on an annual basis.

UT 1's channel slope lowers substantially as flow approaches backwater effects from the pond dam, causing a nearly braided channel as flow enters the pond.

UT 2 Walton Crawley Branch

UT 2 Walton Crawley Branch has three distinct reaches (Upstream, Middle and Downstream Reaches) described below. It should be noted that a soil road is situated near UT 2 Walton

Downstream Reach

The Downstream Reach is defined by a bankfull channel that is entrenched inside of an incised valley. The channel appears to have stabilized itself into a stable B type channel for the majority of the reach. Numerous large, mature trees have rooted on the bank, providing protection from erosive forces. Large amounts of fine sediments from the Upstream and Middle Reaches and adjacent soil road have washed into the channel, filling the substrate and creating a planar profile.

Cattle have open access to the channel because there is no fencing through this reach. It appears that the cattle congregate in the lower 120 feet of the channel as it approaches the pond. This area has been trampled to the point that there is no defined bed and bank. Instead the channel fans out and water braids down to the pond.

BEHI and NBS values were not determined through the majority of this reach because it is overall a stable reach that appears to lose low amounts of sediment on an annual basis. If anything this reach is an aggrading reach due to sediment loading from upstream.

3.8 Bankfull Verification

Bankfull indicators were identified along all studied reaches during field inspections. Existing conditions surveys were conducted which included surveying representative riffle cross-sections, representative hydraulic (bankfull) slope, and determining an existing Manning's n coefficient for the surveyed reaches. The surveyed data and calculated Manning's n coefficient were correlated with identified bankfull indicators to estimate bankfull cross-sectional area and velocity, and consequently bankfull discharge. The estimated bankfull cross-sectional area and discharge were compared with a calculated bankfull cross-sectional area and discharge using both the *Bankfull Hydraulic Geometry Relationships for North Carolina Streams* (Harman, W. H. et al., 1999) (Piedmont Regional Curve) and *Bankfull Regional Curves for North Carolina Mountain Streams* (Harman, W. H. et al.) (Mountain Regional Curve).

Table 12. Site Stream Discharges and Areas

	Discharge BKF (cfs)			Area BKF (sq ft)		
	Piedmont Regional Curve	Mountains Regional Curve	Site Conditions	Piedmont Regional Curve	Mountains Regional Curve	Site Conditions
Walton Crawley	69.9	77.6	63.0	17.6	17.2	8.4
UT 2 Walton Crawley	7.5	7.2	8.0	2.1	2.1	2.3
UT 1 Walton Crawley	10.1	9.5	4.0	2.7	2.6	1.1
Neighbors Branch Upstream	37.4	40.3	25.0	9.5	9.5	6.5
Neighbors Branch Middle	38.9	41.9	25.0	9.8	9.9	4.9
Neighbors Branch Downstream	41.3	44.7	27.0	10.4	10.5	7.6

Three distinctly different locations were surveyed along Neighbors Branch to determine the bankfull discharge. The three locations revealed very similar discharges. Two locations (Neighbors Branch Upstream and Neighbors Branch Downstream) were located in somewhat to severely degraded reaches. A third reach (Neighbors Branch Discharge Section) was taken within the Site in a very stable reach immediately downstream of the proposed restoration reach. All three reaches displayed similar discharges which were below the Piedmont Regional Curve, however there is a high level of confidence in the discharge rates that were computed because each reach corresponded so closely.

Data collected for Walton Crawley Branch and UT 2 Walton Crawley corresponded closely with the Piedmont Regional Curve. It should be noted that two substantially different discharges were calculated for existing conditions on Walton Crawley Branch. Data collected for discharge estimation was collected in the Upstream Reach and the Downstream Reach. Estimated discharges were 63 cfs and 24 cfs, respectively. It is believed that data collected upstream of the pond (Upstream Reach) depicts a more accurate estimate of bankfull conditions because flows are not influenced by the pond. Data collected downstream of the pond is influenced by routing of flows through the pond. Additionally, channel conditions of the Downstream Reach are not stable throughout which lessens confidence in bankfull discharge estimates in this reach. Consequently, the design discharge for Walton Crawley Branch was set to reflect estimates of discharge from the Upstream Reach (63 cfs), which corresponds closely with the Piedmont Regional Curve.

UT 1 Walton Crawley exhibited site conditions that produced a bankfull discharge and an area that differed from the regional curves. The existing channel is stable with an established buffer.

3.9 Vegetation

Distribution and composition of plant communities reflect landscape-level variations in topography, soils, hydrology, and past or present land use practices. The Site is composed of pasture, a pond, scrub/shrub, and mature forest.

Pastureland is currently dominated by fescue (*Festuca* sp.), which was planted for grazing, in addition to opportunistic herbaceous species, and maintains little vegetative diversity. The relic pond bed on a tributary to Neighbors Branch and wet scrub/shrub areas near the existing man-made ponds on Walton Crawley Branch are primarily vegetated by early successional species such as tag alder *(Alnus serrulata*), red maple (*Acer rubrum*), polygonum *(Polygnum* sp.), black willow (S*alix nigra),* cattail (*Typha latifolia*), seedbox *(Ludwigia alternifolia),* woolgrass *(Scirpus cyperinus*), and common rush *(Juncus effusus).*

Forested areas adjacent to stream channels include forest ranging from disturbed areas to more diverse mature forest areas at the upper reaches. Species within forested areas include sourwood *(Oxydendrum arboreum*), red maple, blackjack oak *(Quercus marilandica*), ironwood (*Carpinus caroliniana*), tag alder, sycamore (*Platanus occidentalis*), eastern red cedar (*Juniperus*

4.0 REFERENCE STREAMS

Two reference streams were used to assist in establishing project design parameters. Their descriptions are as follows.

4.1 Bobs Creek

A stable reach of Bobs Creek was surveyed on the Patton Property as a reference channel to be used for the design of Neighbors Branch and Walton Crawley Branch. Bobs Creek is located within the Muddy Creek Watershed approximately 3.0 miles southwest of the center of the Walton Crawley and Neighbors Branch Site. The valley type for Bobs Creek, like Walton Crawley and Neighbors Branch, is classified a Valley Type VIII in the Rosgen Classification system. All three channels (Bob's Creek, Walton Crawley and Neighbors Branch) display increased valley slopes consistent with their similar landscape positions.

4.1.1 Watershed Characterization

Bobs Creek's watershed is dominated by mature forest on hill slopes. The watershed is predominantly wooded with scattered areas of recently harvested timber and haul roads.

4.1.2 Channel Classification

Bobs Creek is classified as a C4 type channel.

4.1.3 Discharge

The bankfull discharge for Bobs Creek within the reference reach survey section was determined to be 70 cfs.

4.1.4 Channel Morphology

A Rosgen Level II stream assessment was completed for Bobs Creek. Surveys included profile and cross-sectional analysis, plan form analysis, bed material evaluation, and buffer assessment. A summary of morphological characteristics can be found in Morphological Characteristics Tables (Tables 8 through 11). These tables include a summary of dimension, profile, and pattern data to assist with the establishment of design parameters.

4.1.5 Channel Stability Assessment

The major components for stability assessment include determining if the channel is conveying its discharge and sediment load without aggrading or degrading. Evidence that a channel does not fit these criteria includes: bank degradation, channel incision, channel widening, channel aggradation, sediment loading within and/or outside of the channel banks, channel armoring, and sparse vegetation on the channel's banks.

A visual assessment accompanied by a morphological assessment using data collected during a Rosgen Level II survey was used to determine channel stability. These data can be found in the

7.0 PROJECT SITE RESTORATION PLAN

7.1 Stream Design

Sheets 3 through 3e and Sheet 4 depict the proposed mitigation actions.

Neighbors Branch

Stroud Property

Neighbors Branch flowing through the Stroud Property will be preserved. This reach is a stable stream and has a wooded buffer for the majority of the reach. The only portion of the reach that does not display a mature wooded buffer is the downstream 100 feet of the reach. Although not mature, there are numerous saplings that have sprouted through the floodplain, adjacent hill slope, and channel banks, which if allowed to grow undisturbed should provide soil stabilization, stream shading, bank stabilization (for the stream and hill slope) and cover and forage for terrestrial biota.

The only adverse conditions on the channel appear to be the soil road fill and culverted crossing at the downstream end of this reach. The proposed plan is to stabilize soils along the road traversing the site by placing gravel along the existing alignment, remove the existing failed pipe and road embankment crossing the valley and stabilize the channel using a series of structures to step channel elevation down.

An additional source of sediment loading through this reach comes from soil grading activities that have occurred adjacent to the proposed easement on the Stroud Property. These grading activities have left large portions of the property devoid of proper ground cover soil stabilization. It is recommended that the landowners be approached to educate them about soil conservation and economical ways that their disturbed lands are required to be stabilized such as permanent seeding and planting of vegetation after grading activities have been completed.

Upstream Reach (Newton Property)

The proposed plan for the Upstream Reach of Neighbors Branch is to enhance (Enhancement II) the channel using matting and vegetation plantings. Additionally, sedimentation from upstream sources on the Stroud Property will be decreased by replacing the failed pipe and dirt road crossing.

Two design scenarios were considered for the Upstream Reach. The first scenario was to either realign the existing channel or cut a bankfull bench at the bankfull elevation along the entire reach. This would have allowed bankfull and higher discharges access to the historic floodplain or an excavated floodplain. However, if this scenario were to occur the existing mature vegetation in the floodplain and corresponding wetlands and seeps would be decimated during construction activities.

The second scenario, which is the proposed scenario, is to mat and vegetate the existing banks that have been degraded by hoof shear. This scenario is much less intrusive to the existing vegetation and wetlands when compared with the first scenario. Although the existing channel is somewhat entrenched, as evidenced by a bank height ratio of almost 1.6, vegetation on the channel banks is thick, mature, and has an established dense root system through the banks and floodplain. These root systems appear to be stabilizing the banks and subsequently the channel invert. It is believed that areas of degradation within this reach will begin the rehabilitation process when the cattle are fenced out of the channel and planted/existing vegetation will have the opportunity to stabilize soil along the degraded banks.

Middle Reach (Newton Property)

The proposed action for the Middle Reach is to restore a more natural pattern, profile and dimension that will transport its sediment and watershed flows without aggrading or degrading. Additionally, a native vegetative buffer will be planted adjacent to the channel, which will stabilize side slopes and barren soil as well as filter nutrients from adjacent active pasture land. A fence will be placed along the proposed easement to exclude cattle and horses from accessing the channel as a water source and cooling location.

A new pattern, profile and dimension is proposed because the current channel condition exhibits gross failure of channel banks and invert throughout the entire reach. Additionally, the existing bankfull discharge is well below the existing top of bank which only promotes the continued degradation of the channel The designed channel is primarily a Priority I restoration where the bankfull elevation will be at or very close to existing ground, which will allow flood flows to access the historic floodplain. Restored riffles will be over excavated and seeded with native channel bed material to immediately introduce an active hyporheic zone and to prevent head cuts.

Existing vegetation is dominated by pasture grasses and early successional vegetative species, which allows for the realignment of a new channel without disturbing much mature vegetation. Additionally, this reach exhibits a large amount of hydric soils throughout the floodplain. These hydric soils are indicate that a wetland may have existed prior to channel incision. It is anticipated that raising the invert of the channel to the point that the bankfull elevation is at existing ground will rehydrate hydric soils by raising the groundwater table, and in turn restoring historic riparian wetlands throughout the floodplain.

Downstream Reach (Newton Property)

The downstream reach will be enhanced (Enhancement II) by fencing the proposed easement to ensure that cattle and horses are excluded from the existing stable stream channel. There are no plantings or other channel stabilizing measures proposed for this reach.

Walton Crawley Branch

Upstream Reach

The Upstream Reach is a stable, perennial stream that will be preserved in perpetuity. A conservation easement will be placed along and adjacent to the channel to ensure long term protection of the channel and its adjacent riparian buffer.

Pond /Downstream Reaches

The proposed action for the Pond/Downstream Reaches is to restore a more natural pattern, profile and dimension along the stream channel that will transport its sediment and watershed flows without aggrading or degrading. Additionally, a native vegetative buffer will be planted adjacent to the realigned channel to stabilize side slopes and barren soil and filter nutrients from adjacent active pasture land. A fence will be placed along the proposed easement to exclude cattle and horses from accessing the channel for a water source and cooling location.

A new pattern, profile and dimension along the stream channel is proposed because the current channel flows through an in-line pond (Pond Reach) and exhibits gross failure of channel banks and invert instability downstream of the pond. The proposed channel will be relocated to the low point of the valley where the pond currently exists. The dam will be removed and a new pattern, profile and dimension will be constructed within the low point of the natural valley.

The channel will be restored using Priority I concepts where the bankfull elevation will be at or near existing ground and the historic floodplain. A series of invert control structures (i.e. rock and log cross vanes, log/rock combination structures, log sills, etc.) will be installed to stabilize the channel invert, assist in pool formation and energy dissipation, drop elevation through steep portions of the valley and provide habitat for fish and macrobenthos. It is anticipated that some historic sediments deposited within the pond's backwater footprint may be excavated to reach natural valley grades. Additionally, soil lifts may be placed in areas along the channel alignment to stabilize soils in high stress areas, with an emphasis on areas that may have accumulated fine sediments within the valley because of backwater from the pond. Restored riffles will be over excavated and seeded with native channel bed material to immediately introduce an active hyporheic zone and to prevent head cuts.

A new pond will be built on the east side of the channel, outside of the conservation easement, to replace the existing pond, as a requirement by the landowner.

The channel will be relocated through the natural low point of the valley downstream of the pond as well. Many mature trees are growing in the floodplain within the Downstream Reach. The mature trees were located during surveys and efforts were taken to avoid impacts to the majority of the trees within the proposed location of the designed channel. Utilizing these trees will encourage root stabilization along channel banks, provide channel shading for temperature regulation, and will provide needed biomass into the channel to enhance aquatic propagation of benthics and fish.

Preservation/Enhancement Reach

A conservation easement will be placed along the Preservation/Enhancement Reach to ensure long term protection of the channel and its adjacent riparian buffer. Exclusionary fencing will take place upstream of the soil road to ensure cattle and horses do not access the channel as a watering and cooling source. The channel downstream of the dirt road currently has a mature riparian buffer with no influence from livestock or man, therefore fencing is not proposed.

Invasive vegetation such as Chinese privet will be removed from the channel banks and the floodplain. The Chinese privet has become relatively thick through many areas and will require intensive clearing during construction. Physical bank enhancement will be minimal through this reach because the banks are stable for the most part. There is one area of bank stabilization that will occur in the downstream portions of the reach. This small area will require slope stabilization through bank grading and planting native vegetation along the side slopes for root stabilization.

UT 1 Walton Crawley Branch

The majority of UT 1 Walton Crawley Branch is currently a stable stream that will be preserved in perpetuity. A conservation easement will be placed along and adjacent to the channel to ensure long term protection of the channel and its adjacent riparian buffer.

The lower portions of UT 1 Walton Crawley will be restored to a natural pattern, profile and dimension that will transport its sediment and watershed flows without aggrading or degrading. This portion of the stream must be restored because of the removal of backwater effects from the pond dam. Restoration of the channel will allow flow from UT 1 to converge with the restored reach of Walton Crawley Branch at the low point of the valley. The channel will be restored using Priority I concepts where the bankfull elevation will be at or near existing ground and the historic floodplain. Several step structures will be utilized in the design to drop channel invert through the valley, create pools, dissipate energy and provide shading and habitat for fish and macrobenthos. Restored riffles will be over excavated and seeded with native channel bed material to immediately introduce an active hyporheic zone and to prevent head cuts. Additionally, supplemental native vegetation will be planted adjacent to the realigned channel to stabilize side slopes and barren soil.

UT 2 Walton Crawley Branch

The soil road adjacent to UT 2 Walton Crawley Branch will be stabilized by placing gravel along the road in steep slope areas. The majority of steep slope sections of the soil road are immediately adjacent to UT 2 Walton Crawley Branch. Stormwater runoff from the soil road has loaded excessive amounts of sand and clay into UT 2 Walton Crawley Branch's channel, causing base flow to migrate under the sediment. Erosion along the soil road should be mitigated by the placement of gravel in the steep slope sections.

Downstream Reach

The upper portions of the Downstream Reach are relatively stable. No physical manipulation to this portion of the Reach is proposed. The stable portion of the Reach will be preserved within the conservation easement. The lower portions of UT 2 Walton Crawley will be restored to a natural pattern, profile and dimension that will transport its sediment and watershed flows without aggrading or degrading. This portion of the stream must be restored because of the removal of backwater effects from the pond dam. Restoration of the channel will allow flow from UT 2 to converge with the restored reach of Walton Crawley Branch at the low point of the valley. The channel will be restored using Priority I concepts where the bankfull elevation will be at or near existing ground and the historic floodplain. Several step structures will be utilized in the design to drop channel invert through the valley, create pools, dissipate energy and provide shading and habitat for fish and macrobenthos. Restored riffles will be over excavated and seeded with native channel bed material to immediately introduce an active hyporheic zone and to prevent head cuts. Additionally, supplemental native vegetation will be planted adjacent to the realigned channel to stabilize side slopes and barren soil.

General Comments

It is apparent that not only site stressors but also watershed stressors have caused increased loading of fine sediments and nutrients throughout on-site streams. The proposed restorative activities detailed in this plan constitute a progressive step forward in reducing sediment loading and nutrients within site streams and the larger Muddy Creek Watershed. However, these proposed activities will not completely remove excessive sedimentation within the Site streams because of poor soil conservation within the upstream watersheds. It appears that continued education of landowners about soil conservation and enacting the Muddy Creek Watershed Restoration Initiative may be the only long term solutions to eliminating excessive sediments within site streams.

7.2 Restoration Site Goals and Objectives

The Muddy Creek Restoration Partnership (Partnership) was formed in 1998 to address impacts to the Muddy Creek Watershed. The Partnership completed the Muddy Creek Watershed Restoration Initiative Feasibility Report and Restoration Plan (Watershed Plan) for the Muddy Creek Watershed in December of 2003. Since 2004 the North Carolina Ecosystem Enhancement Program (EEP) has informally participated in the Partnership by implementing priority projects named by the partnership and adopted the 2003 report as part of its Local Watershed Plan (LWP). The EEP's Upper Catawba River Basin Restoration Priorities (2009) identifies North Muddy Creek as a Targeted Local Watershed (TLW). The Site is located within the North Muddy Creek Watershed. In 2008 the EEP contracted with a consulting firm to conduct outreach programs with landowners and identify additional project sites in the Muddy Creek Watershed. The Site was identified as part of that effort.

The primary goals of the project focus on improving water quality by reducing nutrient loading from the on-site cattle and horse operation, reducing excess sedimentation input from site channel banks and contributing non-jurisdictional tributaries/drainages, reducing excess

sedimentation from site access roads and deteriorated crossings, increasing the attenuation of floodwater flows, reintroducing natural watershed flows to Walton Crawley Branch by removing the pond and restoring the channel through its natural valley, and restoring and enhancing aquatic and riparian habitat. These goals will be accomplished through the following objectives:

- Reduce point (i.e. cattle/horses directly accessing the channel) and non-point source (i.e. stormwater runoff through pastures) pollution associated with an on-site cattle and horse operation by exclusionary fencing from the stream and riparian buffer, and by providing a vegetative buffer on stream banks and adjacent floodplains to treat nutrient enriched surface runoff from adjacent pastureland.
- Stabilize degraded portions of on-site streams, eroding ephemeral/stormwater channels, and existing maintained dirt roads to reduce sediment inputs. Stabilization methods will include:
  - Restoring a stable dimension, pattern, and profile to selected sections of channels to ensure the channel will transport and attenuate watershed flows and sediment loads without aggrading or degrading.
  - Stabilize selected channel banks by excavating bankfull benches, placing stream structures to reduce shearing forces on outside meander bends, and planting native vegetative species to provide soil stability.
  - Stabilize ephemeral/stormwater channels by planting native vegetation along eroded banks and floodplain and constructing stabilization weirs through the channel valley to lower facet slopes and decrease erosion.
  - Place gravel along existing degraded soil roads that are situated adjacent to Site streams.
- Reintroduce natural watershed flows to Walton Crawley Branch by restoring the channel through the low point of the natural valley and removing the dam that impedes natural down valley flows.
- Improve aquatic habitat by enhancing stream bed variability, providing shading/cover areas within the stream channel, and introducing woody debris in the form of rootwads, log vanes, and log sills.
- Enhancing fish passage within Neighbors Branch and Walton Crawley Creek. This is accomplished by eliminating the pond and restoring the stream through the natural valley and by restoring Neighbors Branch and replacing an existing perched culvert to allow fish passage upstream.
- Enhancing riparian wildlife habitat by fencing cattle out of existing wetlands and planting impacted wetlands with native vegetative species. Wetlands will also be restored by raising site stream inverts to allow groundwater tables to rise throughout the affected valleys.
- Enhancing riparian wildlife habitat by fencing livestock out of existing and restored riparian buffers as well as installing alternative watering devices that will ensure livestock have sufficient watering areas. This is detailed further in the Farm Management Plans completed for the site by EEP.

- Enhance wildlife habitat by vegetating the existing fescue dominated riparian buffers with native trees, shrubs, herbs and grasses. Forest vegetation species were selected by studying a Reference Forest Ecosystem located on-site and reviewing Montane Alluvial Forest species listed in *Classification of the Natural Communities of North Carolina: Third Approximation* (Schafale and Weakley 1990).
- Create wildlife corridors through agricultural lands which have significantly dissected the landscape. The corridors will provide connectivity to a diversity of habitats including mature forest, early successional forest, stream-side forest, riparian wetlands, and uplands.

Restoring site streams will result in 0.17 acres of impacts to existing wetlands. Primary impacts to site wetlands are from the realignment of Walton Crawley Branch to the downstream end of the valley and associated existing pocket wetlands.

7.2.1 Designed Channel Classification

All streams were designed using Natural Channel Design principals. The Morphological Characteristics Tables detail channel classification and variables used to classify the design channels.

Neighbors Branch and Walton Crawley Branch

Both the Neighbors Branch and Walton Crawley Branch are designed as C4 type stream channels with moderately high width-to-depth ratios (14). This channel type is consistent with the reference stream's (Bobs Creek) channel type. Additionally, Neighbors Branch, Walton Crawley Branch and the reference Bobs Creek are all flowing through a Valley Type VIII. C type channels are typically found in a Valley Type VIII. The 4 denotes that sediment in the channel will be dominated by gravel. It is anticipated that gravel will be the dominant sediment however it appears inevitable that large amounts of fine sediments from the upstream watersheds will be washed into the Site. Washing of fine sediments into the site may not cease until conservation practices in the upstream watershed stabilize exposed soils. Restored riffles will be over excavated and seeded with native channel bed material to immediately introduce an active hyporheic zone and to prevent head cuts.

UT 1 and 2 Walton Crawley Branch

UT 1 and 2 Walton Crawley Branch are designed as E/C 4/5 type channels with a moderate width-to-depth ratio of 12.0. This channel type is consistent with the reference stream's (UT 5 Bobs Creek) channel type. Additionally, both UT 1 and 2 Walton Crawley Branch and UT 5 Bobs Creek are flowing through a Valley Type II. C type channels with relatively low entrenchment ratios and low pool to pool spacing can be found within a Valley Type II. It should be noted that UT 1 Walton Crawley Branch is predominantly sand through most of its reaches, so substantial coarsening of bed materials is not anticipated. It is anticipated that sand influences from the upstream ephemeral channel on UT 2 Walton Crawley may continue through

monitoring. Restored riffles will be over excavated and seeded with native channel bed material to immediately introduce an active hyporheic zone and to prevent head cuts.

7.2.2 Target Wetland Communities/Buffer Communities

Onsite wetland and buffer areas targeted for restoration and enhancement have endured significant disturbance from land use activities such as land clearing, livestock grazing, and other anthropogenic maintenance. These areas will be revegetated with native forest species typical of wetland and buffer communities that are currently found on-site. Emphasis will focus on developing a diverse plant assemblage in each restored or enhanced wetland. The following is a list of the target wetland type followed by restoration/enhancement activities:

Wetland 1 – Nontidal Freshwater Marsh
Wetlands 4 through 8 – Headwater Forest
Wetlands 22 through 24 – Seep
Wetlands 25 through 27 – Bottomland Hardwood Forest.

There are two target buffer communities (Montane Alluvial Forest and Streamside Assemblage). These communities are consistent with reference communities that were found within the site boundaries.

7.3 Sediment Transport Analysis

One of the primary goals of this Project is to construct a stable channel that will transport its sediment and flow such that, over time, the stream system neither aggrades nor degrades. This stability is achieved when the sediment input to the design reach equals the sediment output. The following are discussions of the sediment transport analysis conducted on Neighbors Branch, Walton Crawley Branch, and UT 2 Walton Crawley Branch.

Neighbors Branch and Walton Crawley Branch

It is common practice in gravel bed streams to study the competency of the stream's ability to entrain the largest sized particle during bankfull flows for stability analysis. The primary factor studied is shear stress of the bankfull channel. The bankfull mean depth and slope are the two primary variables used to determine if the channel has the competency to entrain its largest particle size under bankfull flows. Entrainment calculations for both existing and proposed conditions on Neighbors Branch and Walton Crawley Branch are included as Appendix 9.

In summary, Neighbors Branch's existing conditions exhibits an excess amount of shear stress (1.13 lb/ft^2) during bankfull flows as evidenced by an average slope that is too steep (2.04 percent) and mean depth that is too deep (1.10 ft). The proposed design substantially lowers the shear stress to 0.39 lb/ft^2, by lowering the bankfull slope to 0.76 percent, and lowering the mean depth to 0.75 ft. The proposed shear stress will entrain a particle size between 30 and 77 mm as predicted by the Shields Diagram and Revised Shields Diagram by Rosgen, respectively. The site's largest particle size is 65 mm, which would indicate that the proposed channel dimensions and slope are adequate to transport sediment input through the reach.

Walton Crawley Branch's existing conditions exhibits an excess amount of shear stress (0.60 lb/ft^2) during bankfull flows as evidenced by an average slope that is too steep (1.35 percent). The proposed design lowers the shear stress to 0.28 lb/ft^2 by lowering the bankfull slope to 0.45 percent. The proposed shear stress will entrain a particle size between 20.9 and 60 mm as predicted by the Shields Diagram and Revised Shields Diagram by Rosgen, respectively. The site's largest particle size is 55 mm which would indicate that the proposed channel dimensions and slope are adequate to transport sediment input through the reach.

UT 1 Walton Crawley and UT 2 Walton Crawley Branch

Both UT 1 and UT 2 Walton Crawley Branch's substrates are dominated by sand, which is not typical of stream channels in this physiographic region. It is believed that the sand is dominant due to erosion in the upstream watershed and off of adjacent soil roads washing into the channel. There are traces of small gravel through the different reaches, however the majority of sediment is currently sand. It is believed that as the channel and upstream watershed stabilize, sediment sorting will begin to bring larger (small gravel) materials to the invert surface. So, the sediment transport analysis for the design of UT 1 and UT 2 Walton Crawley concentrated on fine particle movement (sand) rather than gravel transport and the capacity of the channel to transport the load washing through the reach. Because the channel's substrate is composed of sand materials, a pavement/subpavement analysis was not necessary. Below is a discussion of both sediment concentration and stream power and their relation to stability in the design.

Sediment Concentration

The Engelund-Hansen function was used to analyze sediment transport capacity through the designed channel. The basic principal of the Engelund-Hansen function is to determine if sediment input to the design stream equals the sediment output from the design stream. If sediment input equals or is adequately close to sediment output then the channel is considered a stable channel in equilibrium. Below is the Engelund-Hansen function:

$$g = 0.535\, D^{1/2}\, S^{3/2}\, V\, Q / d$$

where:

g = sediment discharge (lbs/s)
D = water depth (ft)
S = channel slope (ft/ft)
V = average velocity (ft/s)
Q = discharge (cubic ft/s)
d = median particle diameter of stream bed material (ft)

There were no stable sand dominated streams that could be found in the vicinity of the site to compare sediment discharge, so two stable sand bed streams located in the Coastal Plain and Sand Hills physiographic regions were used (UT to Wildcat Branch and Mill Creek). Both

channels have similar slopes (2.4 percent slope and 2.6 percent slope respectively) as the designed stream and all four channels displayed sand particles of approximately the same diameter (1.0 mm). A stable sediment comparison stream can be used because the sediment input is in balance with sediment output over geologic time. In most cases, the bankfull discharge of a comparison stream is different from that of the design reach so, instead of using sediment discharge (lbs/s) for the comparison, sediment concentration (lbs/ft^3) is used in the analysis because the discharge function is given in pounds (lbs) per cubic foot (ft^3).

Below is the equation for sediment concentration:

$SC = g/Q$

where:

SC = sediment concentration (lbs/ft^3)
g = sediment discharge (lbs/s)
Q = discharge (ft^3/s)

Sediment output (sediment concentration) throughout existing UT 1 and UT 2 Walton Crawley Branch is calculated to be 10.1 lbs/ ft^3 and 13.7 lbs/ft^3, respectively. The degraded gully throughout UT 2 Walton Crawley Branch is indicative that that the channel's sedimentation concentration is too high for the channel to maintain stability.

The sediment concentration input and output for the comparison streams were deemed to be in equilibrium (because both channels are stable). Their sediment outputs are 0.019 lbs/ft^3 and 0.022 lbs/ft^3 respectively. The designed sediment output for UT 1 and UT 2 Walton Crawley Branch is 0.034 lbs/ft^3 and 0.059 lbs/ft^3, respectively, which correlates closely with the two comparison streams. The proposed design sediment output is similar to those of the stable comparison streams and substantially lower than the output calculation from the gully reach of existing conditions; therefore, the design channel sediment concentration (capacity) is considered stable and in equilibrium.

Stream Power

A stream power analysis was used as a tool to study the capacity of the design channel to transport its sediment load. An analysis of sediment comparison stream powers and proposed conditions stream power were completed to determine if the restoration design stream power will adequately convey its sediment load at the bankfull discharge.

The existing unit stream power through the restored reach of UT 1 Walton Crawley Branch is unknown because of the back water effects from the existing pond. Therefore, the design for unit stream power of UT 1 Walton Crawley was only compared to the reference stream. Existing unit stream power through the gully reach of UT 2 Walton Crawley Branch was calculated to be

19.30 lbs/ft-s. Degrading conditions through the gully reach indicates that 19.3 lbs/ft-s is exerting too much stress on the existing bank, therefore indicating unstable conditions.

The UT to Wildcat Branch and Mill Creek have calculated unit stream powers of 0.15 lbs/ft-s and 0.45 lbs/ft-s, respectively. As previously stated, both comparison streams are stable channels that are in equilibrium and adequately convey their sediment load. So, it can be assumed that the UT to Wildcat Branch's and Mill Creek's unit stream powers are adequate to transport their sediment loads. UT 1 and UT 2 Walton Crawley Branch's design displays a unit stream power of 0.16 lbs/ft-s and 0.31 lbs/ft-s, respectively, which corresponds closely to both comparison streams' unit stream powers. Using the comparison stream, it was determined that the UT 1 and UT 2 Walton Crawley Branch designs have an adequate capacity to transport its sediment load at the bankfull discharge.

7.3.1 Methodology

See section 7.3 Sediment Transport Analysis for a discussion of methodologies.

7.3.2 Calculations and Discussion

See section 7.3 Sediment Transport Analysis for a summary of calculations and a discussion of results. See Appendix 9 for sediment transport calculations.

7.4 HEC-RAS Analysis

Given that the project involves modifications to a stream channel, it is important to analyze the effect of these changes on flood elevations. Floodwater elevations were analyzed using HEC-RAS. HEC-RAS is a software package designed to perform one-dimensional, steady flow, analysis of water surface profiles for a network of natural and constructed channels.

HEC-RAS uses two equations, energy and/or momentum, depending upon the water surface profile. The model is based on the energy equation. The energy losses are evaluated by friction (Manning's equation) and contraction/expansion (coefficient multiplied by the change in velocity head). The momentum equation is used in situations where the water surface profile rapidly varies, such as hydraulic jumps and stream junctions.

Backwater analysis was performed for the existing and proposed conditions for both bankfull and 100-year discharges. In addition to steady flow data, geometric data is also required to run HEC-RAS. Geometric data consists of establishing the connectivity of the river system, which includes cross-section data, reach lengths, energy loss coefficients (friction losses, contraction, and expansion losses), and stream junction information.

7.4.1 Bankfull Discharge Analysis

Bankfull indicators were identified along all restored reaches during field inspections. Existing conditions surveys were conducted which included surveying representative riffle cross-sections, representative hydraulic (bankfull) slope, and determining an existing Manning's n coefficient for the surveyed reaches. The surveyed data and calculated Manning's n were correlated with

Table 15. Planting Plan

Montane Alluvial Forest										**Acres**	**5.16**
Species	**Common Name**	**Max Space (Ft)**	**Unit Type***	**Size****	**Stratum**	**Indiv. Space (Ft)**	**% of Total**	**# of Stems**	**lbs per Acre**	**Total lbs**	
Betula nigra	River birch	8	R	2 -3'	Canopy	8	15	527			
Carpinus caroliniana	Ironwood	8	R	2 -3'	Subcanopy	8	15	527			
Cornus amomum	Silky dogwood	8	R	2 -3'	Shrub	8	5	176			
Fagus grandifolia	American beech	8	R	2 -3'	Canopy	8	15	527			
Kalmia latifolia	Mountain laurel	8	R	2 -3'	Shrub	8	5	176			
Leucothoe fontanesiana	Doghobble	8	R	2 -3'	Shrub	8	10	351			
Platanus occidentalis	Sycamore	8	R	2 -3'	Canopy	8	20	702			
Rhodedendron maximum	Great laurel	8	R	2 -3'	Shrub	8	15	527			
Panicum virgatum	Switchgrass		S		Herb		15		30	23	
Sorghastum nutans	Indiangrass		S		Herb		20		30	31	
Andropogon gerardii	Big bluestem		S		Herb		15		30	23	
Andropogon virginicius	Broomsedge bluestem		S		Herb		15		30	23	
Tripsicum dactyloides	Gamagrass		S		Herb		15		30	23	
Tridens flavus	Purpletop		S		Herb		20		30	31	
						Subtotal		**3513**		**154**	

Table 15. Planting Plan (Continued)

Montane Alluvial Forest - Supplemental Plantings									**Acres**	**4.35**
Species	**Common Name**	**Max Space (Ft)**	**Unit Type***	**Size****	**Stratum**	**Indiv. Space (Ft)**	**% of Total**	**# of Stems**	**lbs per Acre**	**Total lbs**
Betula nigra	River birch	12	R	2 -3'	Subcanopy	12	15	197		
Carpinus caroliniana	Ironwood	12	R	2 -3'	Canopy	12	15	197		
Cornus amomum	Silky dogwood	12	R	2 -3'	Shrub	12	5	66		
Fagus grandifolia	American beech	12	R	2 -3'	Subcanopy	12	15	197		
Kalmia latifolia	Mountain laurel	12	R	2 -3'	Canopy	12	5	66		
Leucothoe fontanesiana	Doghobble	12	R	2 -3'	Canopy	12	10	132		
Platanus occidentalis	Sycamore	12	R	2 -3'	Canopy	12	20	263		
Rhodedendron maximum	Great laurel	12	R	2 -3'	Canopy	12	15	197		
Panicum virgatum	Switchgrass		S		Herb		15		30	20
Sorghastum nutans	Indiangrass		S		Herb		20		30	26
Andropogon gerardii	Big bluestem		S		Herb		15		30	20
Andropogon virginicius	Broomsedge bluestem		S		Herb		15		30	20
Tripsicum dactyloides	Gamagrass		S		Herb		15		30	20
Tridens flavus	Purpletop		S		Herb		20		30	26
						Subtotal		**1315**		**132**

Table 15. Planting Plan (Continued)

Montane Alluvial Forest - Wetland Plantings									**Acres**	**1.84**
Species	**Common Name**	**Max Space (Ft)**	**Unit Type***	**Size****	**Stratum**	**Indiv. Space (Ft)**	**% of Total**	**# of Stems**	**lbs per Acre**	**Total lbs**
Betula nigra	River birch	8	R	2 -3'	Canopy	8	20	702		
Carpinus caroliniana	Ironwood	8	R	2 -3'	Subcanopy	8	20	702		
Cornus amomum	Silky dogwood	8	R	2 -3'	Shrub	8	20	702		
Leucothoe fontanesiana	Doghobble	8	R	2 -3'	Shrub	8	15	527		
Platanus occidentalis	Sycamore	8	R	2 -3'	Canopy	8	25	878		
Carex vulpinoidea	Fox sedge		S		Herb		20		20	7
Andropogon gerardii	Big bluestem		S		Herb		20		30	11
Elymus virgatum	Virginia wildrye		S		Herb		15		30	8
Panicum virgatum	Switchgrass		S		Herb		15		30	8
Juncus effusus	Soft rush		S		Herb		10		30	6
Dichanthelium clandestinum	Deetrongue		S		Herb		20		30	11
						Subtotal		**3511**		**51**

Table 15. Planting Plan (Continued)

Streamside Assemblage										**Acres**	**0.43**
Species	**Common Name**	**Max Space (Ft)**	**Unit Type***	**Size****	**Stratum**	**Indiv. Space (Ft)**	**% of Total**	**# of Stems**	**lbs per Acre**	**Total lbs**	
Cornus amomum	Silky dogwood	4	R	2'	Subcanopy	4	25	516			
Leucothoe fontanesiana	Doghobble	4	R	2'	Shrub	4	25	516			
Alnus Serrulata	Tag alder	4	L	2'	Subcanopy	4	25	516			
Salix nigra	Black willo	4	R	2'	Subcanopy	4	25	516			
Carex vulpinoidea	Fox sedge		S		Herb		20		30	6	
Andropogon gerardii	Big bluestem		S		Herb		20		30	6	
Elymus virgatum	Virginia wildrye		S		Herb		15		30	5	
Panicum virgatum	Switchgrass		S		Herb		15		30	5	
Juncus effusus	Soft rush		S		Herb		10		30	3	
Dichanthelium clandestinum	Deetrongue		S		Herb		20		30	6	
						Subtotal		**2062**		**31**	
						Total					**11.78**

* Unit Type choices inlcude: Transplant (T), Lives stake (L), Ball and Burlap (B), Pot (P), Tubling (T), Bare Root (R), Mechanically Planted (M), and Seed (S)

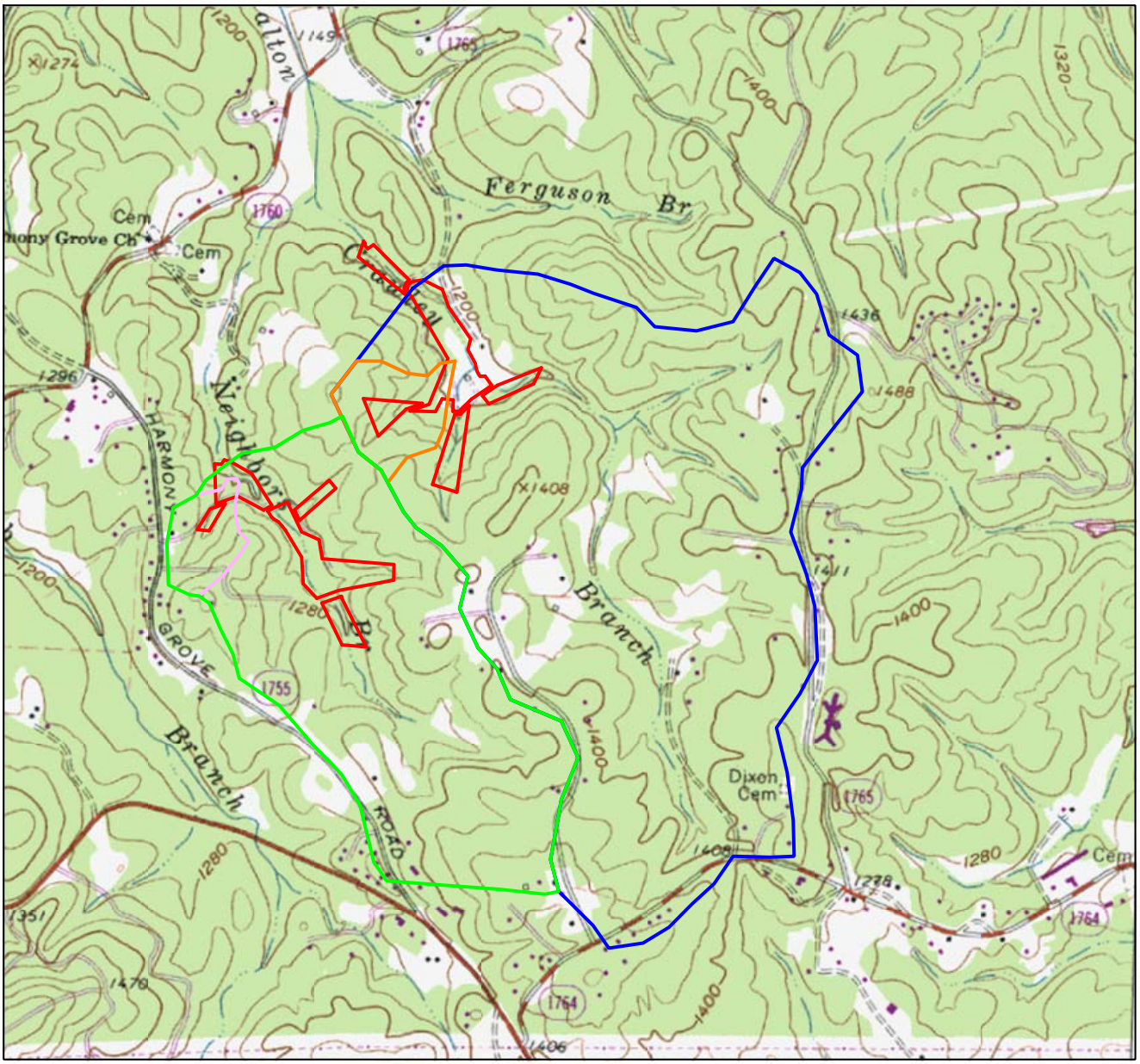
** Size units may vary, but must be stated.

7.8.2 Nuisance Species Management

Beavers, nonnative floral species, and other potential nuisance species will be monitored over the course of the 5-year monitoring period. Appropriate actions will be taken to ameliorate any negative impacts regarding vegetation development and/or water management on an as-needed basis.

7.9 Farm Management Plan and Watering Devices

EEP has completed a farm management plan that will assist the land owner in managing his property in a more environmentally sensitive manner. Included in the farm management plan is exclusionary fencing to remove and keep livestock from accessing on-site stream channels and wetlands. Additionally, alternative watering devices are to be installed within the pastures to ensure livestock are able to access water without entering on-site streams.



McDowell County
North Carolina

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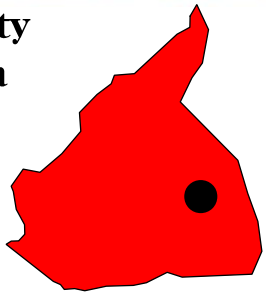
FEET



LEGEND

- Walton Crawley Branch Watershed (0.71 Sq. Miles)
- Neighbors Branch Watershed (0.32 Sq. Miles)
- UT–1 Neighbors Branch Watershed (0.02 Sq. Miles)
- UT–2 Walton Crawley Branch Watershed (0.03 Sq. Miles)
- Proposed Easement

Ecosystem Enhancement Program

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Consulting Engineers
A Florence & Hutcheson, Inc. Company
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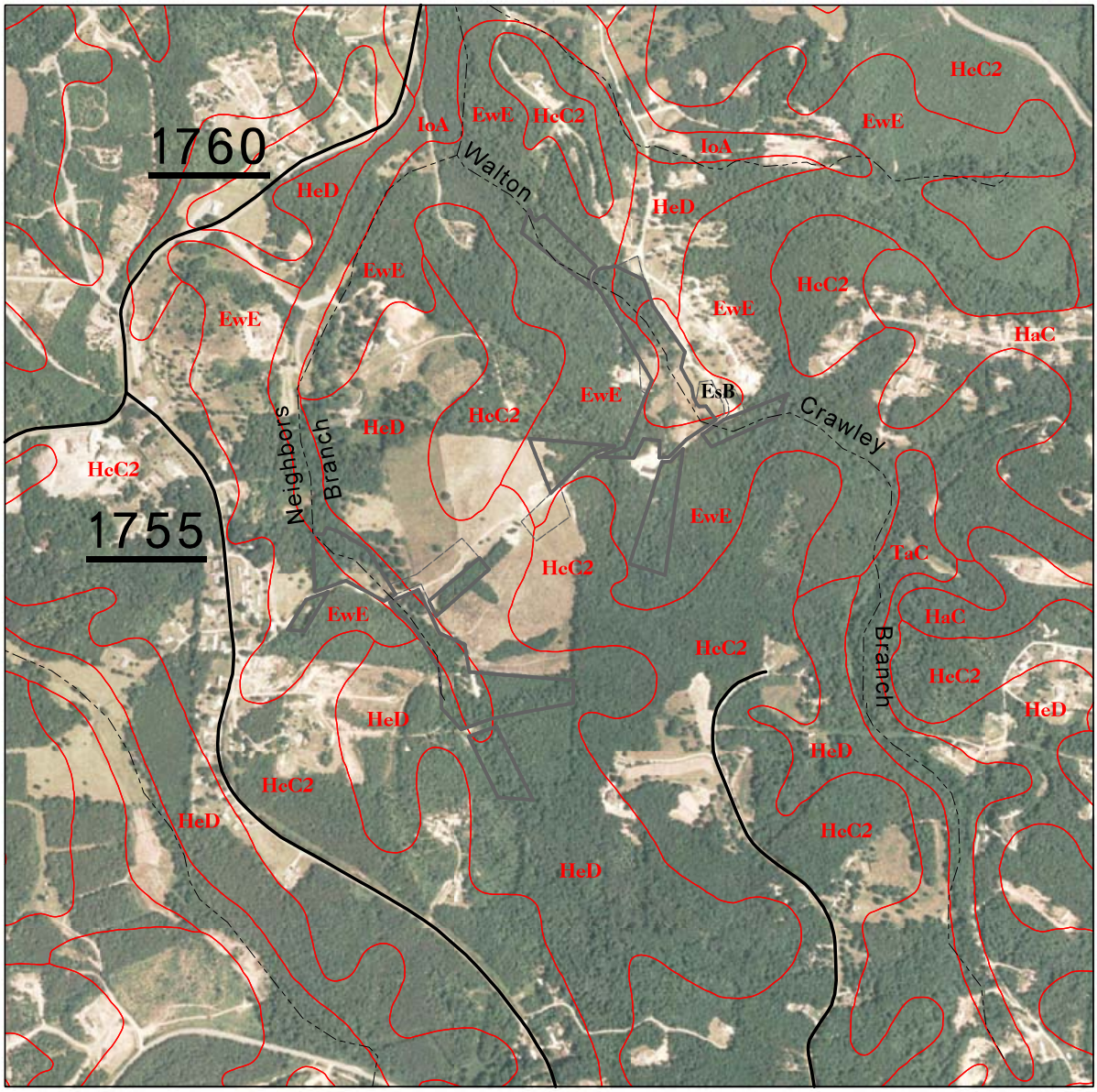
Watershed Map

Walton Crawley & Neighbors Branch Stream & Wetland Restoration Plan
McDowell County, North Carolina

Date: 02/27/13

Figure: 2



0 1000 2000

FEET

LEGEND

Symbol	Name
EsB -	Elsinboro
EwE -	Evard - Cowee
HeD -	Hayesville - Evard
IoA -	Iotla
-	Proposed Easement

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Soil Survey Map

Walton Crawley & Neighbors Branch Stream & Wetland Restoration Plan McDowell County, North Carolina

Date: 02/27/13

Figure: 3

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UT2 WALTON CRAWLEY

UT1 WALTON CRAWLEY

Flow Direction

Flow Direction

SOIL ROAD

BRANCH

SOIL ROAD

DITCH

18

CRAWLEY

20

19

DITCH

26

25

POND

23

21

Flow Direction

SOIL ROAD

SOIL ROAD

27

24

22

WALTON

LEGEND

- Proposed Easement
- Existing Conditions Level II Survey
- Existing Wetlands
- Tree

100 0 100 200

SCALE

Existing Conditions

(Hydrological Features & Wetland Delineation)

Walton Crawley Branch
Stream & Wetland Restoration Plan
McDowell County, North Carolina

Date: 02/27/13

Sheet 1A

Ecosystem Enhancement PROGRAM

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BEGIN UT2 WALTON CRAWLEY UPSTREAM REACH

END UT2 WALTON CRAWLEY UPSTREAM REACH
BEGIN UT2 WALTON CRAWLEY MIDDLE REACH

END UT2 WALTON CRAWLEY MIDDLE REACH
BEGIN UT2 WALTON CRAWLEY DOWNSTREAM REACH

END WALTON CRAWLEY DOWNSTREAM REACH
BEGIN WALTON CRAWLEY PRESERVATION/ ENHANCEMENT REACH

BEGIN UT1 WALTON CRAWLEY UPSTREAM REACH

END UT1 WALTON CRAWLEY UPSTREAM REACH
BEGIN UT1 WALTON CRAWLEY DOWNSTREAM

END UT1 WALTON CRAWLEY DOWNSTREAM REACH

END WALTON CRAWLEY UPSTREAM REACH
BEGIN WALTON CRAWLEY POND REACH

END UT2 WALTON CRAWLEY DOWNSTREAM REACH

END WALTON CRAWLEY POND REACH
BEGIN WALTON CRAWLEY DOWNSTREAM REACH

END WALTON CRAWLEY PRESERVATION/ ENHANCEMENT REACH

BEGIN WALTON CRAWLEY UPSTREAM REACH

UT2 WALTON CRAWLEY
UT1 WALTON CRAWLEY
WALTON CRAWLEY
BRANCH
CRAWLEY
DITCH
DITCH
POND
SOIL ROAD
SOIL ROAD
SOIL ROAD
SOIL ROAD
SOIL ROAD
Flow Direction
Flow Direction
Flow Direction

LEGEND

Proposed Easement

Tree

100 0 100 200
SCALE

Stream Reaches

Walton Crawley Branch
Stream & Wetland Restoration Plan
McDowell County, North Carolina

Date: 02/27/13

Sheet 2A

BEGIN UT2 WALTON CRAWLEY
UPSTREAM REACH

UT 1 WALTON CRAWLEY BRANCH
BEGIN STA. 10+00.00
BEGIN UT1 WALTON CRAWLEY UPSTREAM REACH

10+00

UT2 WALTON CRAWLEY BRANCH
BEGIN STA. 10+00.00
END UT2 WALTON CRAWLEY UPSTREAM REACH
BEGIN UT2 WALTON CRAWLEY MIDDLE REACH

UT1 WALTON
CRAWLEY

Flow Direction

UT2 WALTON
CRAWLEY

10+00

Flow Direction

UT2 WALTON CRAWLEY BRANCH
BEGIN STA. 13+74.91
END UT2 WALTON CRAWLEY MIDDLE REACH
BEGIN UT2 WALTON CRAWLEY DOWNSTREAM REACH

15+00

UT 1 WALTON CRAWLEY BRANCH
END STA. 14+82.98
END UT1 WALTON CRAWLEY UPSTREAM REACH

UT 1 WALTON CRAWLEY BRANCH
BEGIN STA. 14+82.98
BEGIN UT1 WALTON CRAWLEY MIDDLE REACH

-MATCHLINE- SHEET 3D

-MATCHLINE- SHEET 3D

LEGEND

- Double Step Rock L–Vane
- Log Step Structure
- Rock L–Vane
- Double Step Log Vane
- Log Sill
- A–Vane
- Stabilization Weir
- Proposed Easement
- Proposed Restoration
- Preservation
- Enhancement II
- Wetland Enhancement
- Tree

50 0 50 100
SCALE

Proposed Conditions

Walton Crawley Branch
Stream & Wetland Restoration Plan
McDowell County, North Carolina

Date: 05/13/13

Sheet 3C

Ecosystem Enhancement PROGRAM

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UT 1 WALTON CRAWLEY BRANCH
END STA. 18+12.52
END UT1 WALTON CRAWLEY MIDDLE REACH
BEGIN UT1 WALTON CRAWLEY DOWNSTREAM REACH

1-95"x67" CMP ARCH
2- 42" CMP

WALTON CRAWLEY BRANCH
END STA. 15+33.18
END WALTON CRAWLEY UPSTREAM REACH
BEGIN WALTON CRAWLEY DOWNSTREAM REACH

UT1 WALTON CRAWLEY

-MATCHLINE- SHEET 3C

-MATCHLINE- SHEET 3C

15+00

CRAWLEY

WALTON

Flow Direction

Flow Direction

Flow Direction

36"CMP

A 20+00

20+00

UT2 WALTON CRAWLEY

UT 2 WALTON CRAWLEY BRANCH
END STA. 16+28.47
END UT2 WALTON CRAWLEY MIDDLE REACH -ENHANCEMENT
BEGIN UT2 WALTON CRAWLEY DOWNSTREAM REACH

SOIL ROAD

UT 2 WALTON CRAWLEY BRANCH
END STA. 17+99.42
END UT2 WALTON CRAWLEY
DOWNSTREAM REACH

25+00

BRANCH

-MATCHLINE- SHEET 3E

PROPOSED
POND
HALF BANKFULL
POND CHANNEL

RISER

A

SOIL ROAD

PROPOSED
DAM

POND BARREL
OUTLET

SOIL ROAD

UT 1 WALTON CRAWLEY BRANCH
END STA. 20+00.12
END UT1 WALTON CRAWLEY
DOWNSTREAM REACH

10+00

WALTON CRAWLEY BRANCH
BEGIN STA. 10+00.00
BEGIN WALTON CRAWLEY UPSTREAM REACH

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LEGEND

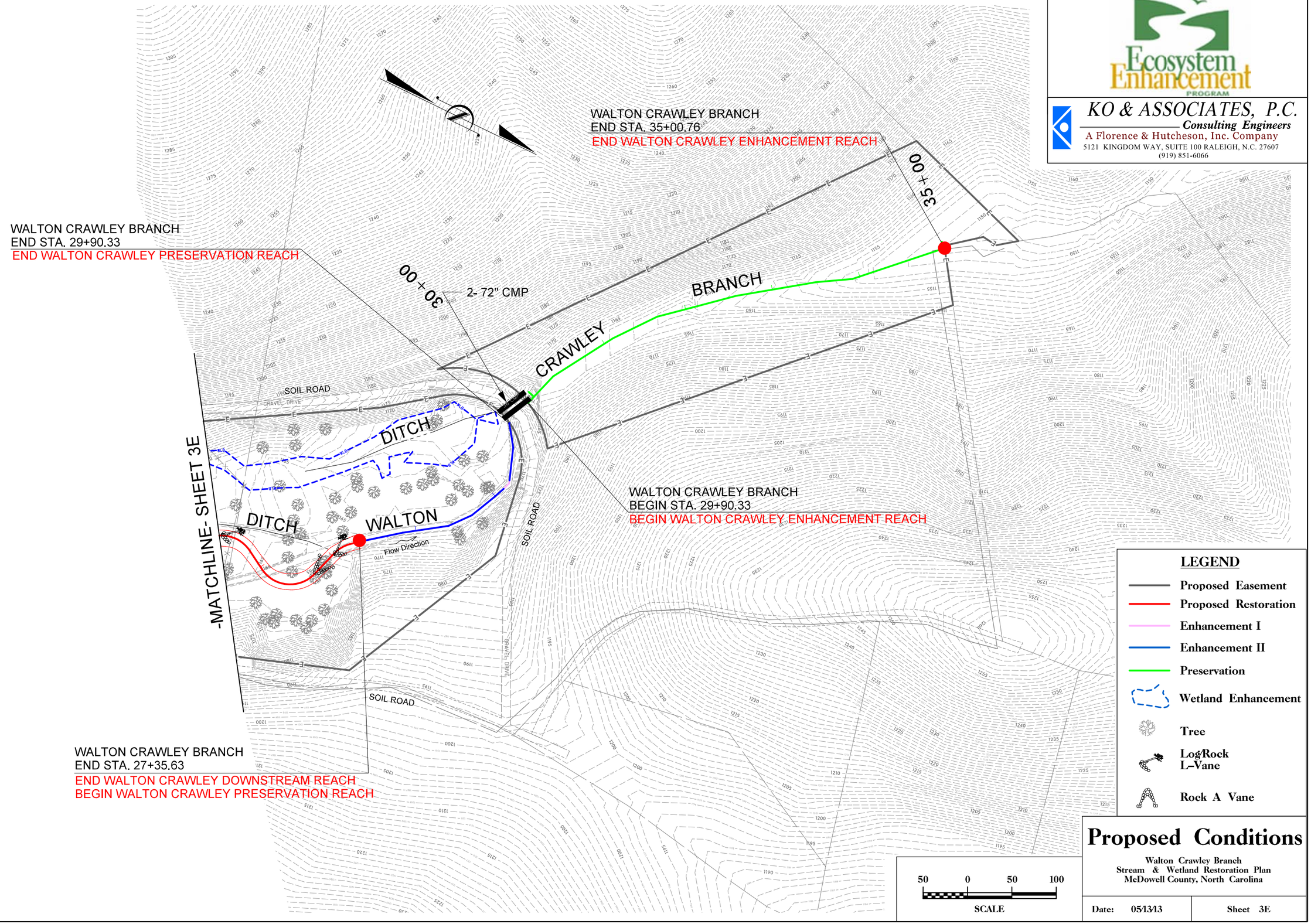
- Rock Cross Vane
- Rock A Vane
- Rock Step Structure
- Log/Rock L-Vane
- Log Vane w/Sill
- Double Step Log Cross Vane
- Log Step Structure
- Log Cross Vane
- Log Sill
- Proposed Easement
- Proposed Restoration
- Enhancement II
- Preservation
- Wetland Enhancement
- Tree

50 0 50 100
SCALE

Proposed Conditions

Walton Crawley Branch
Stream & Wetland Restoration Plan
McDowell County, North Carolina

Date: 05/13/13 | Sheet 3D



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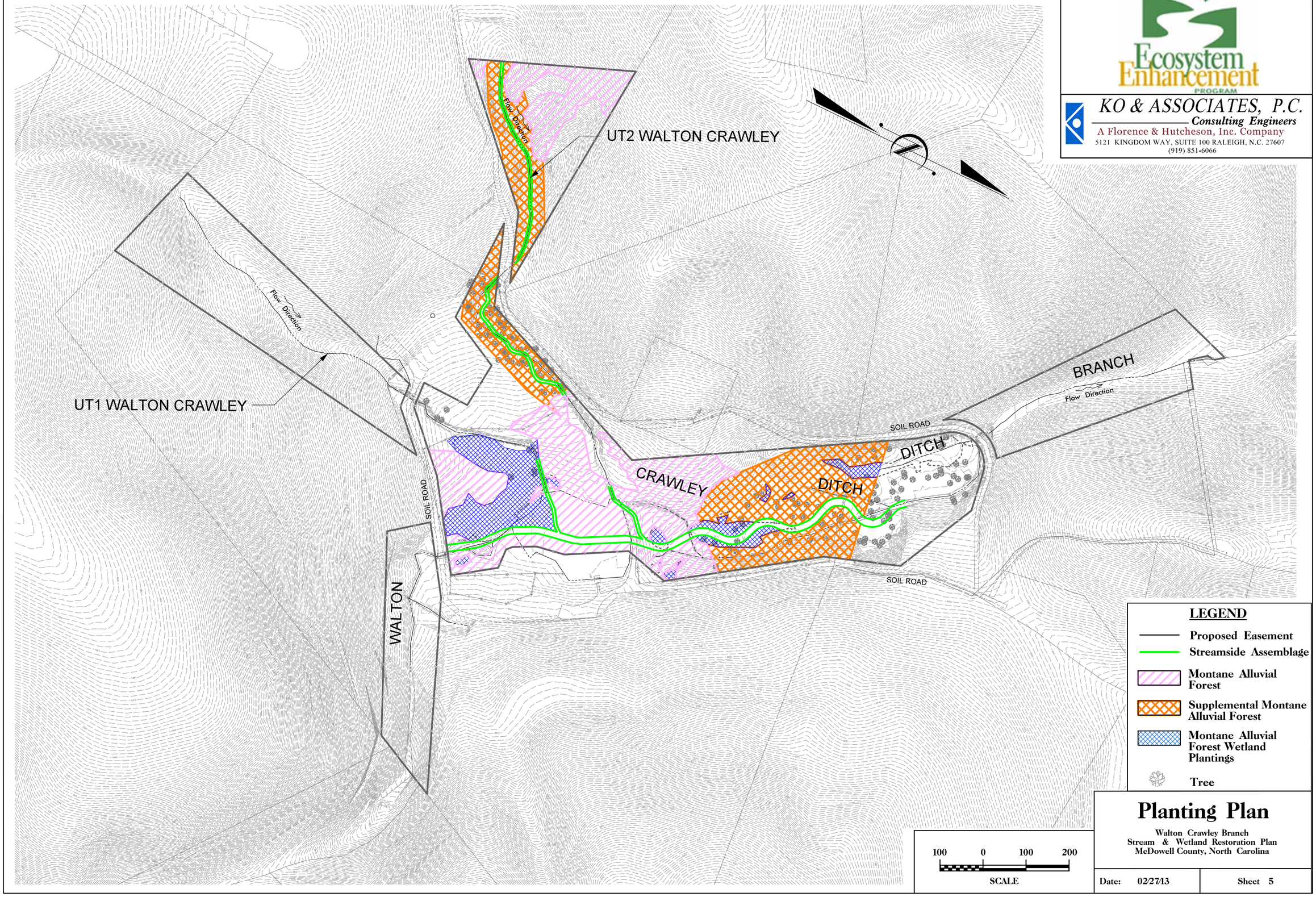
Proposed Conditions

Walton Crawley Branch
Stream & Wetland Restoration Plan
McDowell County, North Carolina

Date: 05/13/13

Sheet 3E



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LEGEND

- Proposed Easement
- Streamside Assemblage
- Montane Alluvial Forest
- Supplemental Montane Alluvial Forest
- Montane Alluvial Forest Wetland Plantings
- Tree

100 0 100 200
SCALE

Planting Plan

Walton Crawley Branch
Stream & Wetland Restoration Plan
McDowell County, North Carolina

Date: 02/27/13

Sheet 5

Ecosystem Enhancement PROGRAM

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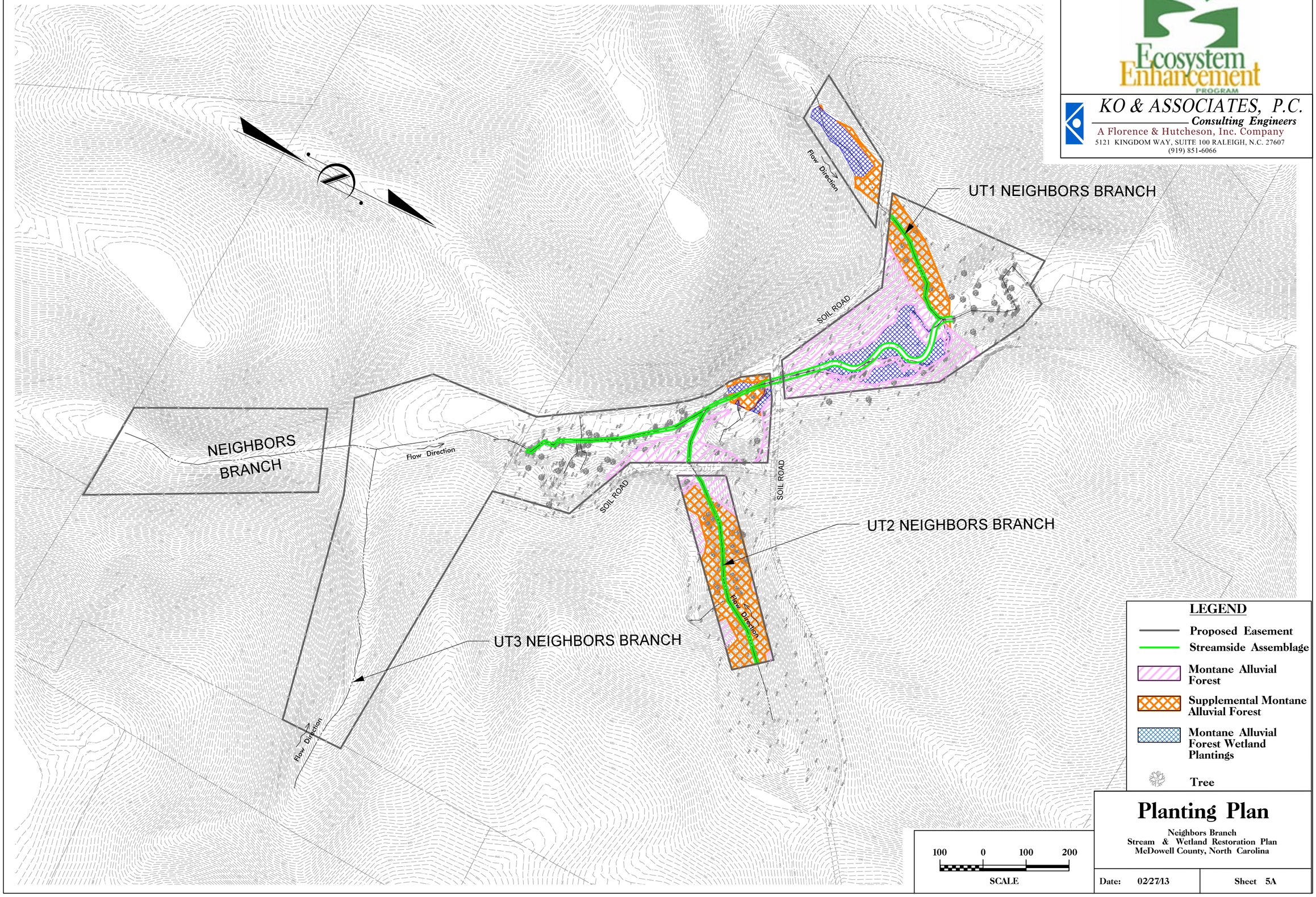

LEGEND

- Proposed Easement
- Streamside Assemblage
- Montane Alluvial Forest
- Supplemental Montane Alluvial Forest
- Montane Alluvial Forest Wetland Plantings
- Tree

100 0 100 200
SCALE

Planting Plan

Neighbors Branch
Stream & Wetland Restoration Plan
McDowell County, North Carolina

Date: 02/27/13

Sheet 5A

5/28/99

LONGITUDINAL PROFILE

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(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
NEIGHBOR BOB	4
PROJECT ENGINEER	

BEGIN WALTON
CRAWLEY BRANCH
STA 9+37.00
ELEV = 1182.38

END WALTON
CRAWLEY BRANCH
STA 21+74.45
ELEV = 1163.38

EXISTING GROUND
ALONG THALWEG

PROPOSED
1–95″x 67″ CMP ARCH
2–42″ CMP

PROPOSED
THALWEG INVERT

PROPOSED BANKFULL
GRADELINE

PROPOSED
2–72″ CMP

1,190
1,180
1,170
1,160
1,150

9 10 11 12 13 14 15 16 17 18 19 20 21 22

LONGITUDINAL PROFILE

BEGIN UT 1 WALTON
CRAWLEY BRANCH
STA 10+00.00
ELEV = 1180.57

EXISTING GROUND
ALONG THALWEG

PROPOSED
BANKFULL
GRADELINE

PROPOSED
THALWEG INVERT

END UT 1 WALTON
CRAWLEY BRANCH
STA 11+87.60
ELEV = 1175.20

BEGIN UT 2 WALTON
CRAWLEY BRANCH
STA 10+15.10
ELEV = 1210.90

END UT 2 WALTON
CRAWLEY BRANCH
STA 13+74.91
ELEV = 1192.70

PROPOSED BANKFULL
GRADELINE

EXISTING GROUND
ALONG THALWEG

PROPOSED
THALWEG INVERT

1,190 1,220
1,180 1,210
1,170 1,200
1,160 1,190

10 11 12 10 11 12 13 14

3/12/2013
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Florence & Hutcheson, Inc.

5/28/99

LONGITUDINAL PROFILE

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Consulting Engineers
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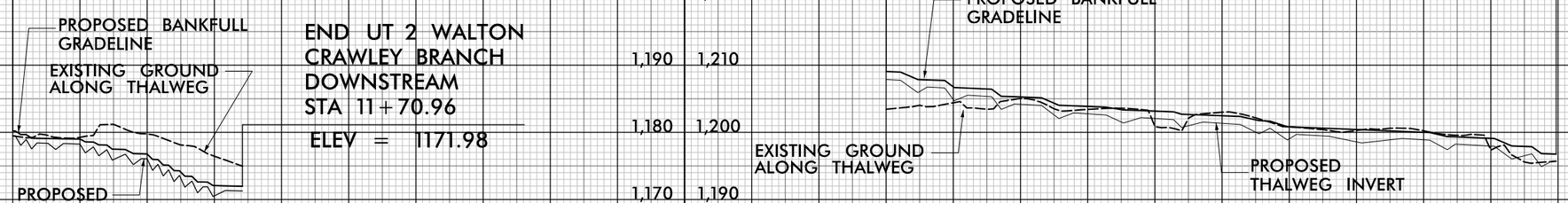
PROJECT REFERENCE NO.	SHEET NO.
NEIGHBOR BOB	4A
PROJECT ENGINEER	

BEGIN UT 2 WALTON CRAWLEY BRANCH DOWNSTREAM
STA 10+00.00
ELEV = 1180.20

END UT 2 WALTON CRAWLEY BRANCH DOWNSTREAM
STA 11+70.96
ELEV = 1171.98

BEGIN NEIGHBORS BRANCH
STA 24+98.01
ELEV = 1209.07

END NEIGHBORS BRANCH
STA 29+96.64
ELEV = 1196.76



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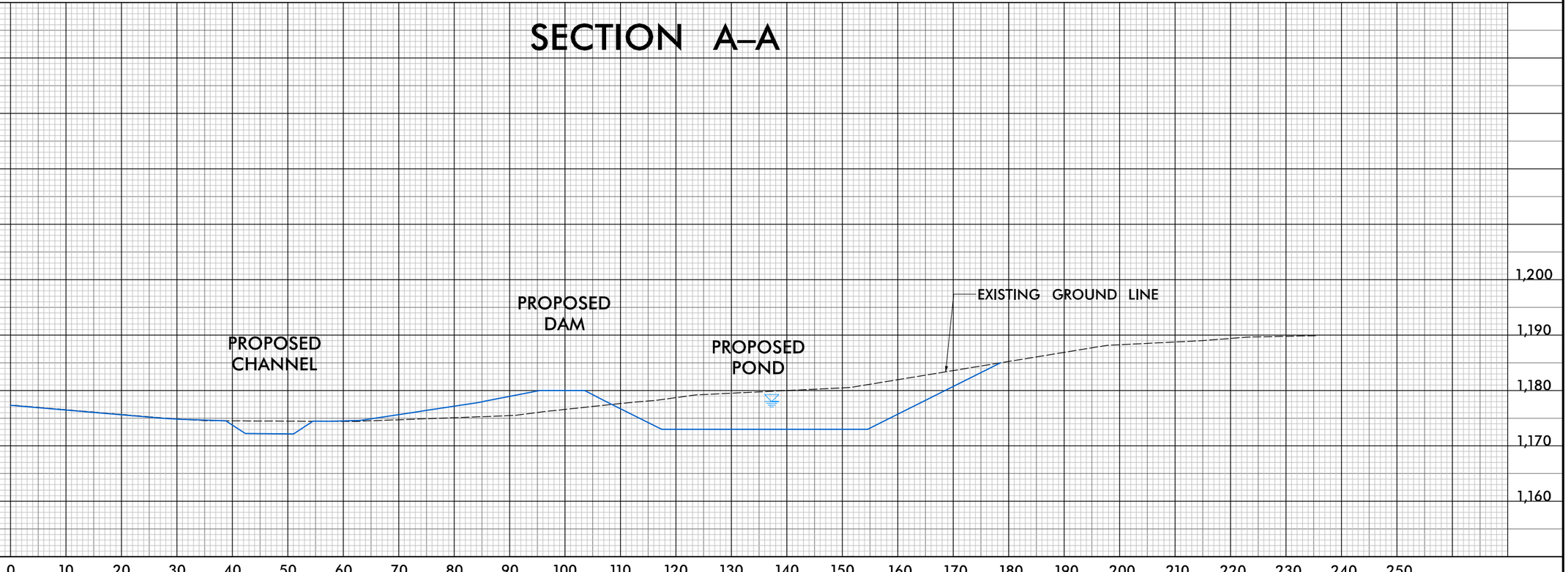

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Florence & Hutcheson, Inc.

WALTON CRAWLEY
HEC-RAS ANALYSIS

River Station	Storm Event	Discharge (cfs)	Existing WSEL (ft)	Proposed WSEL (ft)	Backwater (ft)
Upstream End of Project					
2555	BKF	68	1185.63	1182.66	-2.97
2555	100 YR	604	1186.76	1186.51	-0.25
2505	BKF	68	1185.63	1182.58	-3.05
2505	100 YR	604	1186.73	1186.46	-0.27
2488		Culvert			
2470.62	BKF	68	1182.09	1181.74	-0.35
2470.62	100 YR	604	1185.31	1184.21	-1.10
2458.62	BKF	68	1182.18	1181.31	-0.87
2458.62	100 YR	604	1184.24	1184.02	-0.22
2437.62	BKF	68	1182.2	1181.09	-1.11
2437.62	100 YR	604	1183.1	1183.79	0.69
2432.62	BKF	68	1182.21	1180.88	-1.33
2432.62	100 YR	604	1183	1183.28	0.28
2418.62	BKF	68	1182.2	1180.48	-1.72
2418.62	100 YR	604	1182.96	1183.01	0.05
2398.62	BKF	68	1182.2	1180.26	-1.94
2398.62	100 YR	604	1182.69	1182.92	0.23
2393.62	BKF	68		1180.11	
2393.62	100 YR	604		1182.84	
2382.62	BKF	68		1179.7	
2382.62	100 YR	604		1182.21	
2368.62	BKF	68		1179.32	
2368.62	100 YR	604		1182.2	
2363.62	BKF	68		1179.16	
2363.62	100 YR	604		1181.65	
2337.62	BKF	68	1182.2	1178.61	-3.59
2337.62	100 YR	604	1182.76	1180.61	-2.15
2317.62	BKF	68		1178.27	
2317.62	100 YR	604		1180.77	
2312.62	BKF	68		1178.01	
2312.62	100 YR	604		1180.78	

WALTON CRAWLEY
HEC-RAS ANALYSIS

River Station	Storm Event	Discharge (cfs)	Existing WSEL (ft)	Proposed WSEL (ft)	Backwater (ft)
2304.62	BKF	68		1177.7	
2304.62	100 YR	604		1180.77	
2284.62	BKF	68		1177.28	
2284.62	100 YR	604		1180.77	
2279.62	BKF	68		1177.08	
2279.62	100 YR	604		1180.77	
2269.62	BKF	68		1176.72	
2269.62	100 YR	604		1179.4	
2250.62	BKF	68		1176.36	
2250.62	100 YR	604		1179.21	
2245.62	BKF	68		1176.16	
2245.62	100 YR	604		1178.55	
2236.62	BKF	68		1175.81	
2236.62	100 YR	604		1178.36	
2216.62	BKF	68		1175.41	
2216.62	100 YR	604		1178.06	
2211.62	BKF	68		1175.23	
2211.62	100 YR	604		1177.47	
2200.62	BKF	68		1174.83	
2200.62	100 YR	604		1177.34	
2180.62	BKF	68		1174.51	
2180.62	100 YR	604		1177.27	
2175.62	BKF	68		1174.31	
2175.62	100 YR	604		1177	
2170.62	BKF	68		1174	
2170.62	100 YR	604		1176.64	
2150.62	BKF	68		1174.13	
2150.62	100 YR	604		1176.81	
2145.62	BKF	68	1182.21	1173.96	-8.25
2145.62	100 YR	604	1182.94	1176.49	-6.45
2130.62	BKF	68		1173.53	
2130.62	100 YR	604		1175.99	

WALTON CRAWLEY
HEC-RAS ANALYSIS

River Station	Storm Event	Discharge (cfs)	Existing WSEL (ft)	Proposed WSEL (ft)	Backwater (ft)
2110.62	BKF	68		1173.64	
2110.62	100 YR	604		1176.22	
2105.62	BKF	68		1173.48	
2105.62	100 YR	604		1175.94	
2090.62	BKF	68		1173.05	
2090.62	100 YR	604		1175.41	
2070.62	BKF	68		1172.88	
2070.62	100 YR	604		1175.55	
2065.62	BKF	68		1172.72	
2065.62	100 YR	604		1175.23	
2048.62	BKF	68		1172.26	
2048.62	100 YR	604		1174.73	
2028.62	BKF	68	1177.63	1172.22	-5.41
2028.62	100 YR	604	1181.76	1175.01	-6.75
2023.62	BKF	68	1177.5	1172.07	-5.43
2023.62	100 YR	604	1181.02	1174.3	-6.72
1977.62	BKF	68	1176.54	1171.33	-5.21
1977.62	100 YR	604	1177.82	1173.89	-3.93
1956.49	BKF	68	1176.35	1171.38	-4.97
1956.49	100 YR	604	1177.34	1173.92	-3.42
1941.34	BKF	68	1175.8	1171.16	-4.64
1941.34	100 YR	604	1177.02	1173.24	-3.78
1910.62	BKF	68		1170.89	
1910.62	100 YR	604		1172.69	
1909.62	BKF	68		1170.9	
1909.62	100 YR	604		1172.66	
1880.62	BKF	68		1170.31	
1880.62	100 YR	604		1171.83	
1858.4	BKF	68	1169.69	1170.36	0.67
1858.4	100 YR	604	1172.19	1171.88	-0.31
1840.82	BKF	68	1169.59	1170.1	0.51
1840.82	100 YR	604	1172.08	1171.71	-0.37

WALTON CRAWLEY
HEC-RAS ANALYSIS

River Station	Storm Event	Discharge (cfs)	Existing WSEL (ft)	Proposed WSEL (ft)	Backwater (ft)
1819.62	BKF	68		1169.81	
1819.62	100 YR	604		1171.58	
1818.62	BKF	68		1169.83	
1818.62	100 YR	604		1171.57	
1797.7	BKF	68	1168.74	1169.34	0.60
1797.7	100 YR	604	1171.92	1171.15	-0.77
1775.08	BKF	68	1168.31	1169.14	0.83
1775.08	100 YR	604	1171.39	1170.65	-0.74
1752.45	BKF	68	1168.17	1169.13	0.96
1752.45	100 YR	604	1170.7	1170.37	-0.33
1734.62	BKF	68		1169.11	
1734.62	100 YR	604		1170.23	
1733.62	BKF	68		1168.84	
1733.62	100 YR	604		1170.21	
1714.92	BKF	68	1167.93	1168.39	0.46
1714.92	100 YR	604	1170.63	1170.12	-0.51
1695.62	BKF	68	1167.59	1168.22	0.63
1695.62	100 YR	604	1170.61	1170.07	-0.54
1685.62	BKF	68		1167.81	
1685.62	100 YR	604		1169.99	
1665.62	BKF	68		1167.71	
1665.62	100 YR	604		1169.74	
1660.62	BKF	68	1166.89	1167.51	0.62
1660.62	100 YR	604	1170.02	1169.44	-0.58
1640.04	BKF	68		1167.33	
1640.04	100 YR	604		1169.47	
1624.43	BKF	68	1166.46	1167.44	0.98
1624.43	100 YR	604	1169.3	1169.5	0.20
1608.82	BKF	68	1166.43	1167.4	0.97
1608.82	100 YR	604	1168.98	1169.41	0.43
1583.78	BKF	68		1167.36	
1583.78	100 YR	604		1168.45	

WALTON CRAWLEY
HEC-RAS ANALYSIS

River Station	Storm Event	Discharge (cfs)	Existing WSEL (ft)	Proposed WSEL (ft)	Backwater (ft)
1574.78	BKF	68		1167.36	
1574.78	100 YR	604		1168.75	
1565.77	BKF	68		1167.17	
1565.77	100 YR	604		1168.74	
1523.88	BKF	68	1166.1	1166.41	0.31
1523.88	100 YR	604	1168.57	1168.55	-0.02
1516.62	BKF	68		1166.55	
1516.62	100 YR	604		1168.54	
1488.62	BKF	68		1166.1	
1488.62	100 YR	604		1168.49	
1470.62	BKF	68	1166.06	1165.95	-0.11
1470.62	100 YR	604	1168.57	1168.49	-0.08
1453.6	BKF	68	1166.06	1165.67	-0.39
1453.6	100 YR	604	1168.61	1168.5	-0.11
1428.7	BKF	68	1166.08	1165.45	-0.63
1428.7	100 YR	604	1168.64	1168.5	-0.14
1394.57	BKF	68	1166.08	1165.57	-0.51
1394.57	100 YR	604	1168.64	1168.51	-0.13
1360.44	BKF	68	1166.08	1165.06	-1.02
1360.44	100 YR	604	1168.64	1168.51	-0.13
1340.62	BKF	68		1164.47	
1340.62	100 YR	604		1168.47	
1335.62	BKF	68		1164.24	
1335.62	100 YR	604		1168.46	
1327.62	BKF	68	1166.07	1163.91	-2.16
1327.62	100 YR	604	1168.58	1168.44	-0.14
1313.62	BKF	68	1166.07	1164.09	-1.98
1313.62	100 YR	604	1168.57	1168.43	-0.14
1307.62	BKF	68		1164.03	
1307.62	100 YR	604		1168.42	
1296.17	BKF	68	1166.07	1164.03	-2.04
1296.17	100 YR	604	1168.56	1168.42	-0.14
1247.78	BKF	68	1166.07	1163.73	-2.34
1247.78	100 YR	604	1168.56	1168.42	-0.14

WALTON CRAWLEY
HEC-RAS ANALYSIS

River Station	Storm Event	Discharge (cfs)	Existing WSEL (ft)	Proposed WSEL (ft)	Backwater (ft)
1209.27	BKF	68	1166.07	1163.65	-2.42
1209.27	100 YR	604	1168.56	1168.41	-0.15
1173.11	BKF	68	1166.07	1163.52	-2.55
1173.11	100 YR	604	1168.56	1168.41	-0.15
1135.48	BKF	68	1166.07	1163.22	-2.85
1135.48	100 YR	604	1168.55	1168.40	-0.15
1087.98	BKF	68	1166.07	1162.48	-3.59
1087.98	100 YR	604	1168.53	1168.38	-0.15
1032.80	BKF	68	1166.06	1162.43	-3.63
1032.80	100 YR	604	1168.07	1167.92	-0.15
1020.00		Culvert			
1000.00	BKF	68	1161.89	1161.93	0.04
1000.00	100 YR	604	1166.98	1166.79	-0.19
900.00	BKF	68	1161.47	1161.47	0.00
900.00	100 YR	604	1165.75	1165.75	0.00
Downstream End of Project					

May 7, 2009

Ms. Liz Hair
US Army Corps of Engineers
Asheville Regulatory Field Office
151 Patton Avenue, Room 208
Asheville, North Carolina 28801-5006

RE: Jurisdictional Wetland/Hydric Soil Delineations for Neighbor Bob Stream and Wetland Restoration Project 09-003

Dear Ms. Hair,

Ko/Florence & Hutcheson, Inc. has been contracted by the North Carolina Ecosystem Enhancement Program (EEP) to conduct jurisdictional wetland and stream delineations for the Neighbor Bob Stream and Wetland Restoration Project within a 42.8-acre proposed conservation easement located on two sites: the Newton/Stroud and Patton properties. The Project is proposed for wetland and stream preservation, enhancement, and restoration. Jurisdictional wetland/hydric soil areas and streams were delineated and located with a Trimble GeoXT GPS unit with reported sub-meter accuracy. The EEP has requested that we obtain regulatory agency verification of our wetland/hydric soil and stream delineation. To this end, I am providing you with information concerning the Project.

The Neighbor Bob Stream and Wetland Restoration Project (Project) is located approximately five miles southwest of the town of Marion (see Figure 1 attached). The Project is located on two properties, Newton/Stroud and Patton, situated in McDowell County, North Carolina within United States Geological Survey Hydrologic Unit and Targeted Local Watershed 03050101040010 (North Carolina Division of Water Quality Subbasin 03-08-30) of the Catawba River Basin and will service the USGS 8-digit Cataloging Unit (CU) 03050101. The Project was identified to assist the EEP in meeting its stream and wetland restoration goals.

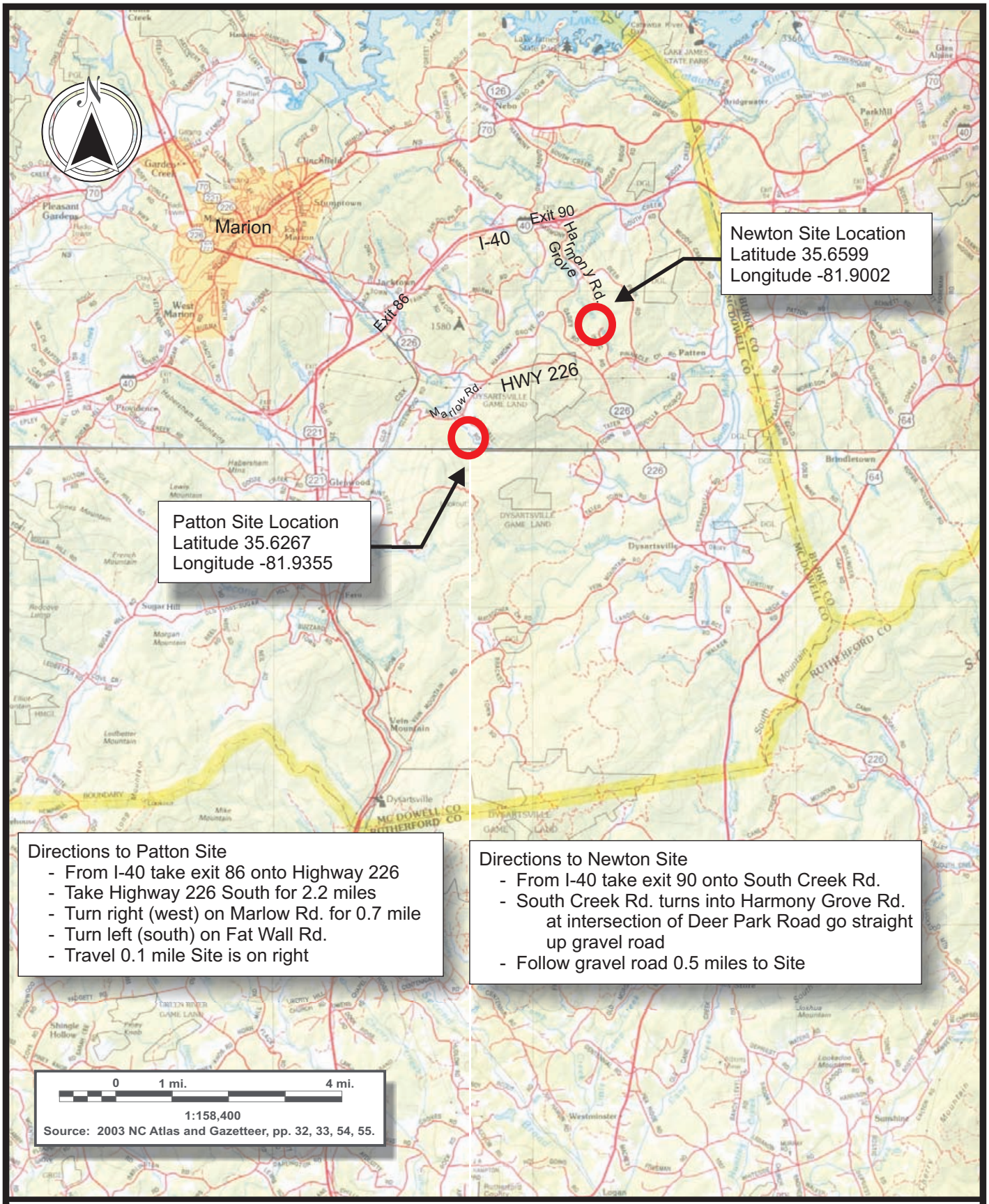
Figure 2 (attached) shows an overview of the Project on a topographic map as well as a key to sheets (Sheets 1-5), which depict wetlands/hydric soils boundaries on 2008 aerial photography. Also included with Project figures are completed USACE Approved Jurisdictional Determination Forms (2007), completed U.S. Army Corps of Engineers (USACE) Routine Wetland Determination Data Forms (1987), USACE Stream Quality Assessment Worksheets, and NCDWQ Stream Identification Forms (Version 3.1). Locations where data forms were completed are depicted on Sheets 1-5. Locations where USACE worksheets and NCDWQ forms were completed are depicted on the attached stream form location maps.

Again, we are interested in obtaining USACE verification of on wetland/hydric soil delineations. Please let us know if you would like for us to join you in a visit to the project site, or if you need any further information. Ko/Florence & Hutcheson will coordinate with NCDWQ to arrange that they attend the on-site meeting as well.

Sincerely,

Ko/Florence & Hutcheson, Inc.

Ryan V. Smith, CPESC, PWS

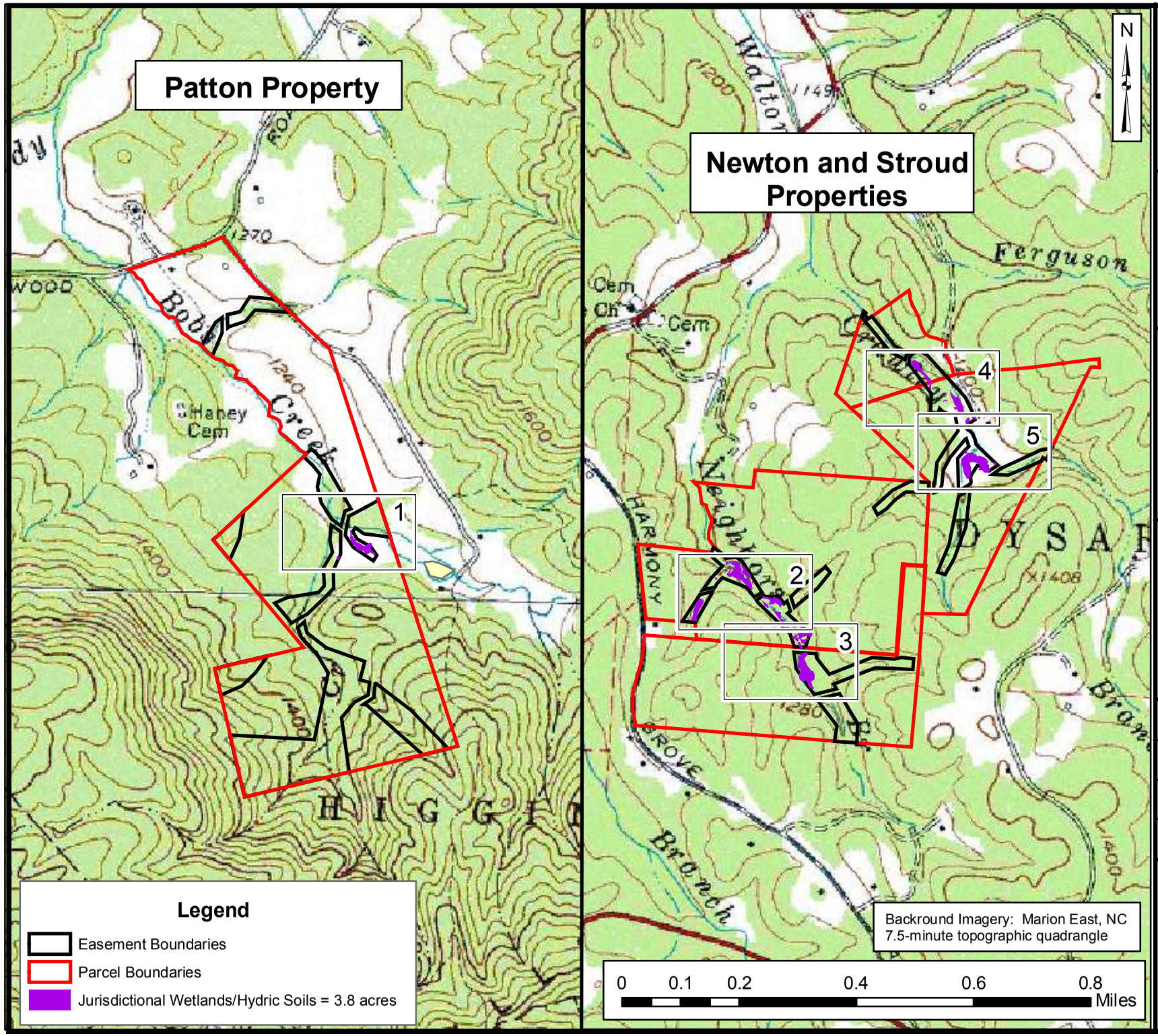


Axiom Environmental
20 Enterprise St. #7
Raleigh, NC 27607
(919) 215-1693
(919) 341-3839 fax

SITE LOCATION
NEIGHBOR BOB RESTORATION SITE
McDowell County, North Carolina

Dwn. by:	WGL
Ckd by:	WGL
Date:	Feb 2009
Project:	09-003

FIGURE
1



Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

NEIGHBOR BOB RESTORATION SITE

McDowell County, NC

Title:

SITE TOPOGRAPHY AND KEY TO SHEETS

Drawn by: CLF

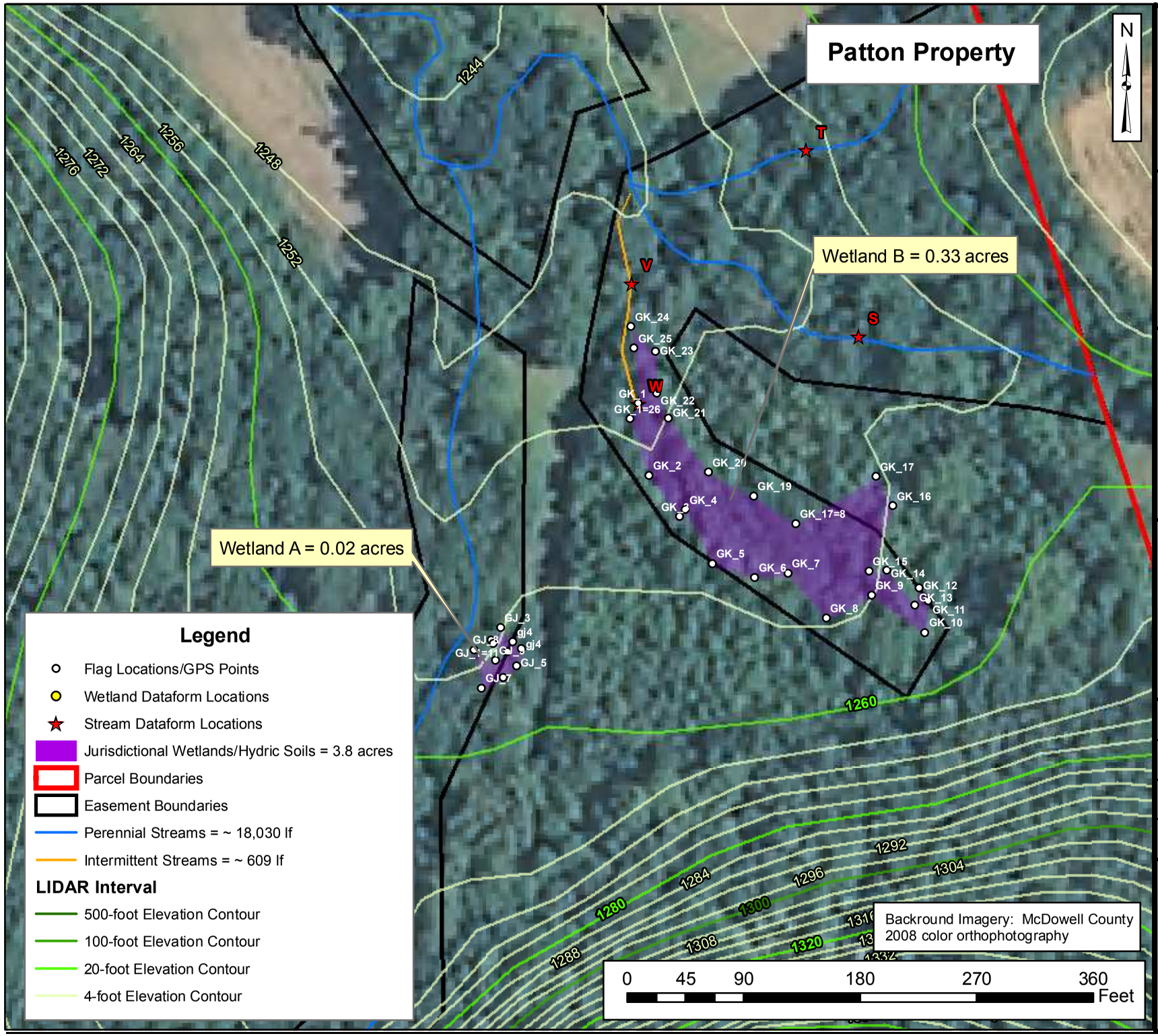
Date: MAR 2009

Scale: 1:14,000

Project No.: 09-003

FIGURE

2



Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

NEIGHBOR BOB RESTORATION SITE

McDowell County, NC

Title:

WETLAND DELINEATION

Drawn by: CLF

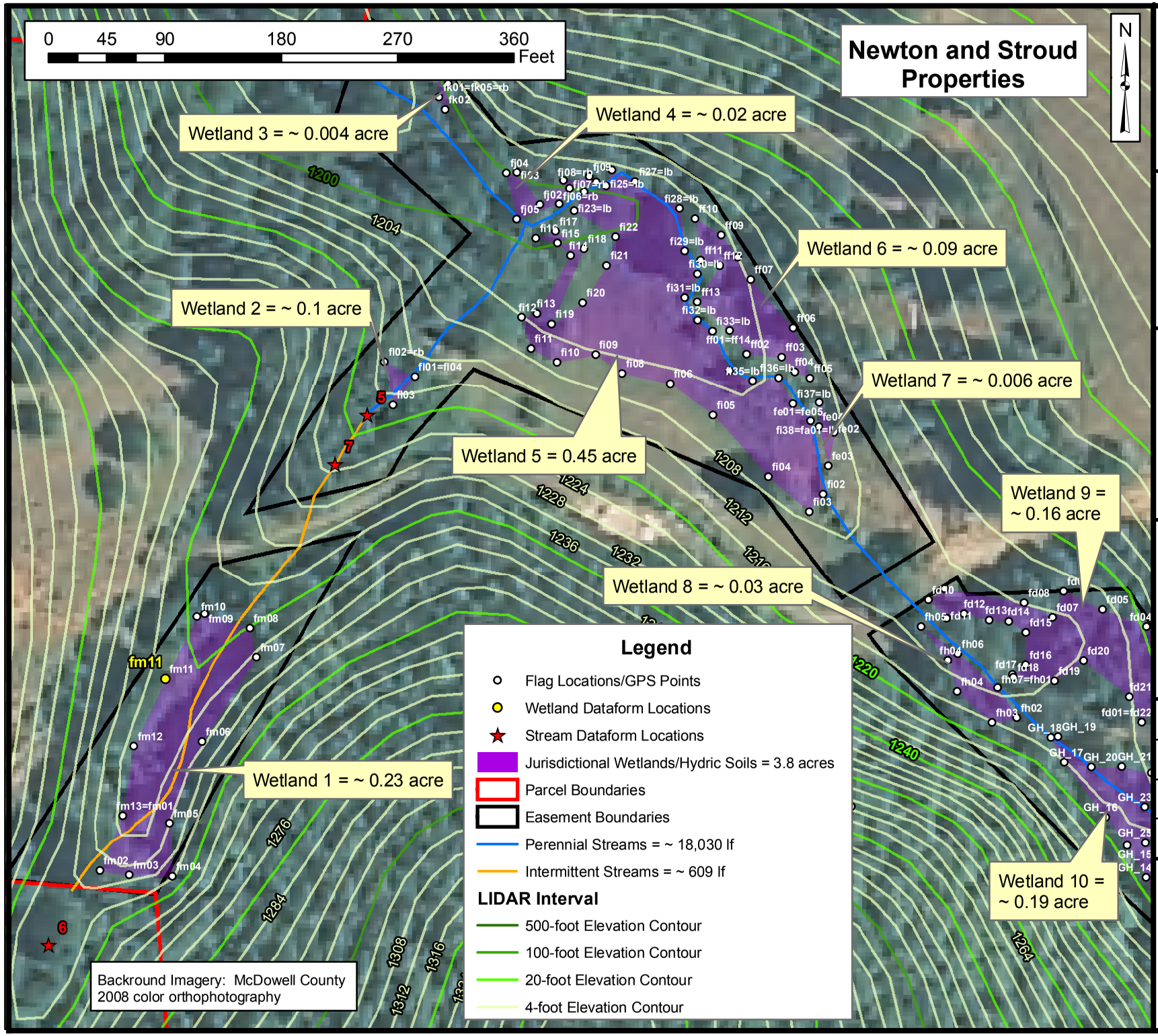
Date: MAR 2009

Scale: 1:1200

Project No.: 09-003

SHEET

1



Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

NEIGHBOR BOB RESTORATION SITE

McDowell County, NC

Title:

WETLAND DELINEATION

Drawn by: CLF

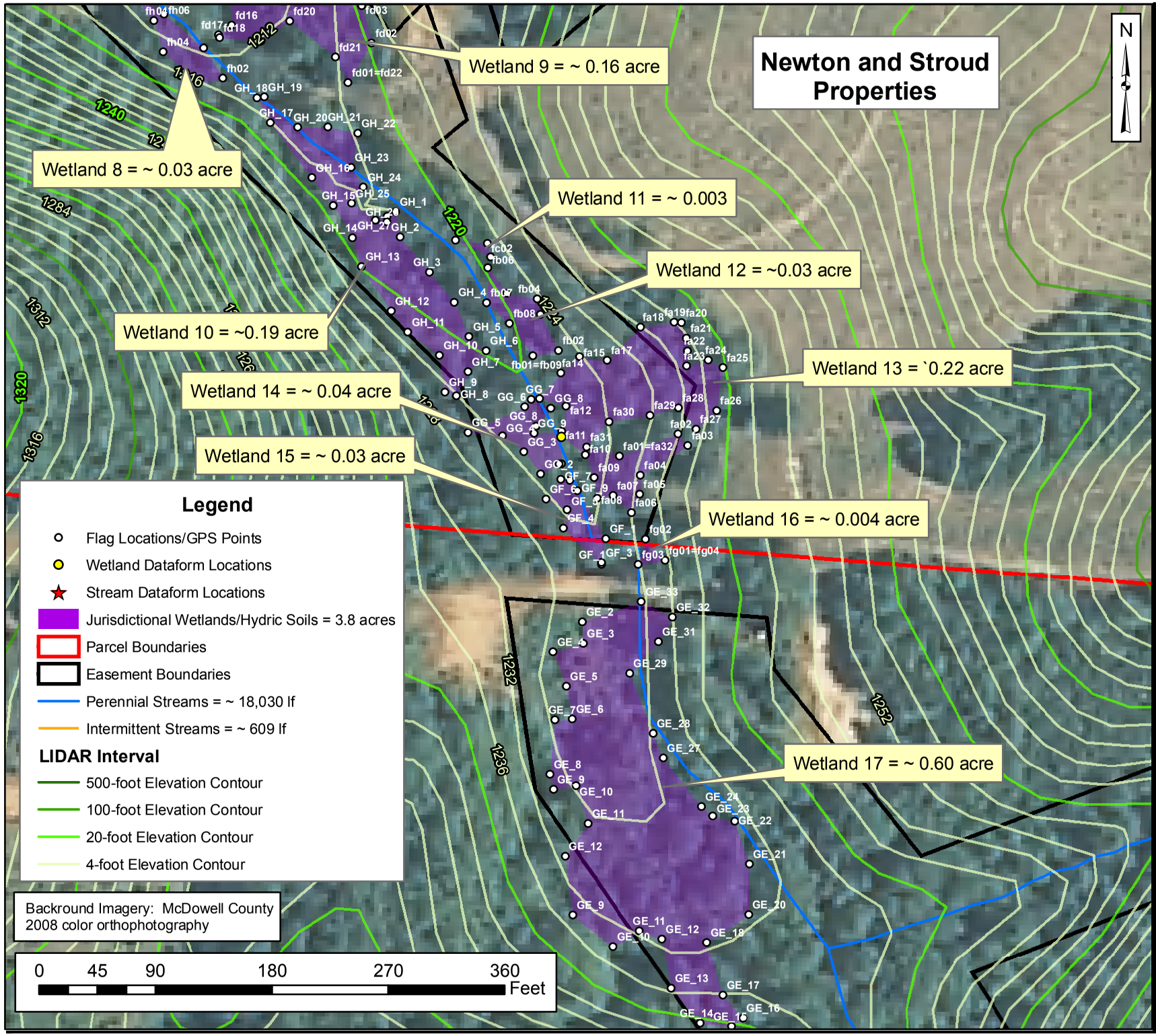
Date: MAR 2009

Scale: 1:1200

Project No.: 09-003

SHEET

2



Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

NEIGHBOR BOB RESTORATION SITE

McDowell County, NC

Title:

WETLAND DELINEATION

Drawn by: CLF

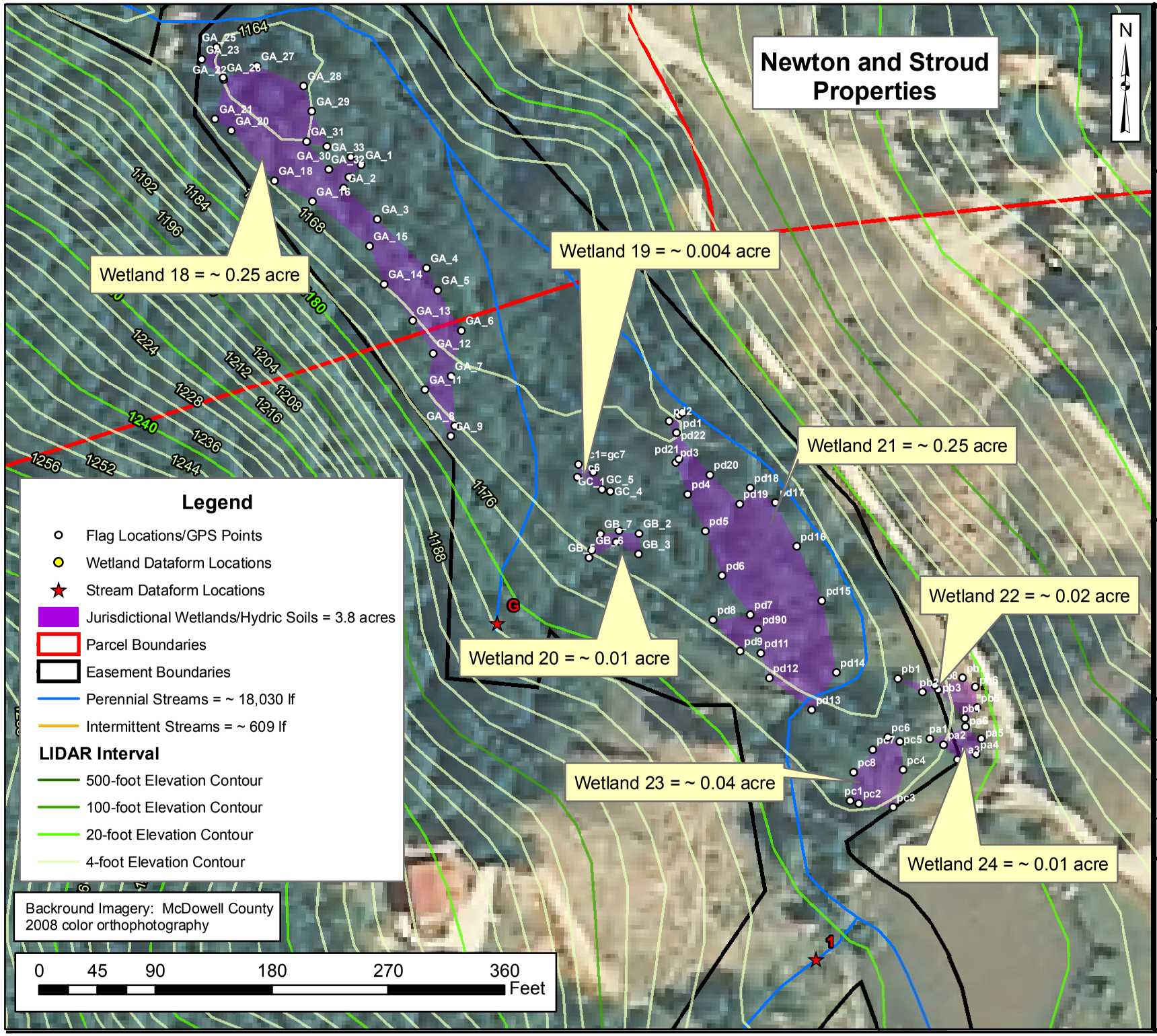
Date: MAR 2009

Scale: 1:1200

Project No.: 09-003

SHEET

3



Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

NEIGHBOR BOB RESTORATION SITE

McDowell County, NC

Title:

WETLAND DELINEATION

Drawn by: CLF

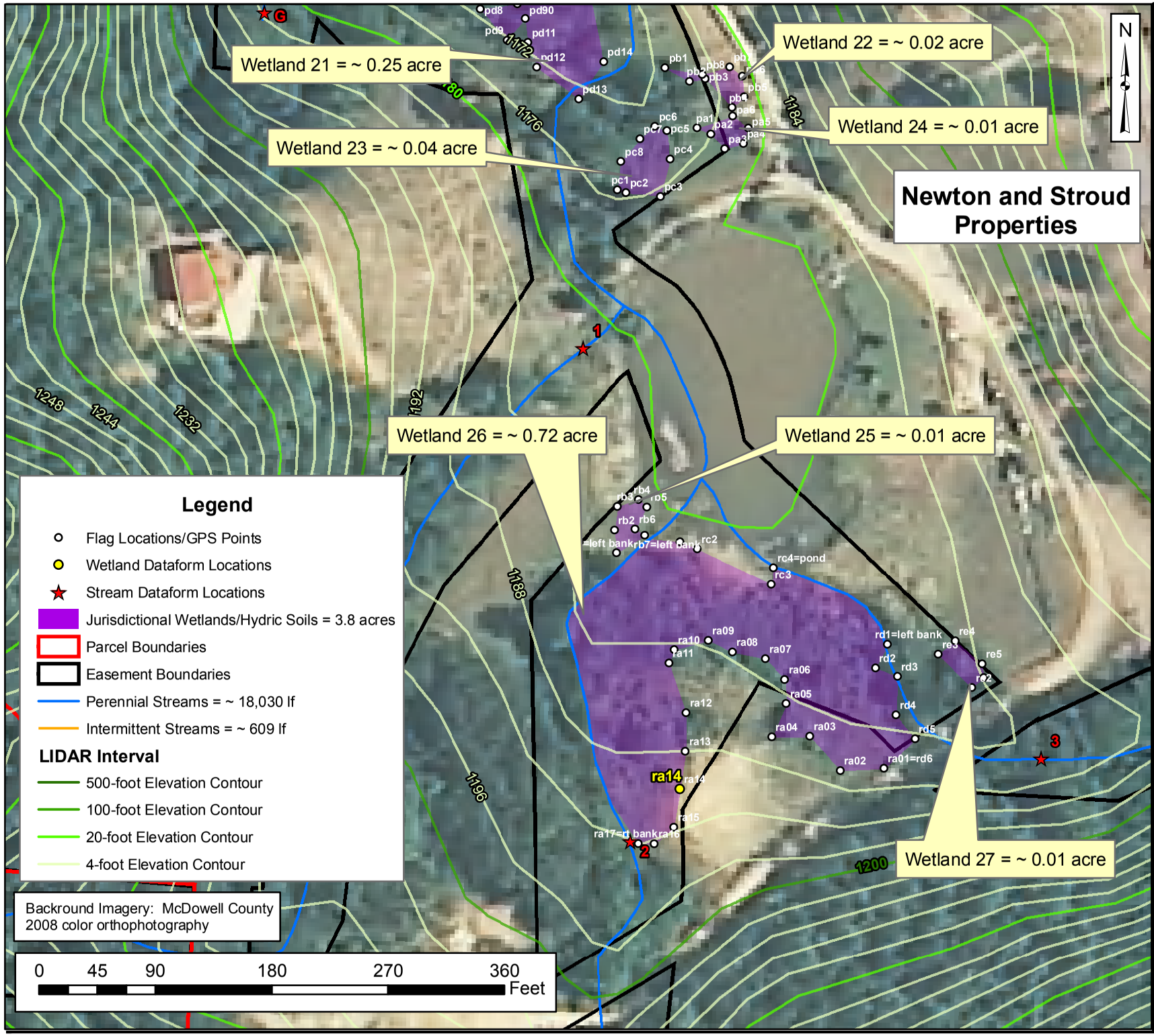
Date: MAR 2009

Scale: 1:1200

Project No.: 09-003

SHEET

4



Axiom Environmental, Inc.

Prepared for:

Ecosystem Enhancement Program

Project:

NEIGHBOR BOB RESTORATION SITE

McDowell County, NC

Title:

WETLAND DELINEATION

Drawn by: CLF

Date: MAR 2009

Scale: 1:1200

Project No.: 09-003

SHEET

5

NEIGHBOR BOB STREAM AND WETLAND RESTORATION PROJECT

Newton Property

Newton Property

Walton Crawley Wetland Dataforms

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:
State:NC County/parish/borough: McDowell City: Marion
Center coordinates of site (lat/long in degree decimal format): Lat. 35.6599° **N**, Long. 81.9002° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Walton Crawley Branch
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: North Muddy Creek
Name of watershed or Hydrologic Unit Code (HUC): Catawba HUC 03050101040010
☒ 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 **Appear to be 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: 5477 linear feet: 2-8 width (ft) and/or acres.
      Wetlands: 1.3 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: 2200**square miles**
Drainage area: 450 **acres**
Average annual rainfall: 56.09 inches
Average annual snowfall: 13.1 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 **1 (or less)** 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]: Walton Crawley Branch to North Muddy Creek.
Tributary stream order, if known: 2nd.

[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: A small reach of the tributary in the center of the reach within the Site has been ponded for a livestock water hole.

Tributary properties with respect to top of bank (estimate):
Average width: 8 feet
Average depth: 1 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: relatively stable in natural section; incised above manipulated section.
Presence of run/riffle/pool complexes. Explain: Regular presence.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): 2-4 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **2-5**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Discrete.** Characteristics: .

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:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: good water clarity.
Identify specific pollutants, if known: livestock are present within the Site.

[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): forested in downstream and upstream reaches and old field/scrub/shrub in middle reach near pond.

☒ Wetland fringe. Characteristics: Wetlands scattered in floodplain and surrounding pond.

☐ 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:1.3 acres

Wetland type. Explain:NCWAM Headwater Forest and Bottomland Forest.

Wetland quality. Explain:disturbed near pond, good in forested area.

Project wetlands cross or serve as state boundaries. Explain: NA.

(b) General Flow Relationship with Non-TNW:

Flow is: **Perennial flow**. Explain: .

Surface flow is**: Discrete**

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: .
- ☒ Ecological connection. Explain: Floodplain wetlands.
- ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **1 (or less)** river miles from TNW.

Project waters are **1 (or less)** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **2-year or less** 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: livestock are present within the Site.

(iii) Biological Characteristics. Wetland supports (check all that apply):

☒ Riparian buffer. Characteristics (type, average width):forested in downstream and upstream reaches and old field/scrub/shrub in middle reach near pond.

☒ Vegetation type/percent cover. Explain:mature hardwood forested in downstream and upstream reaches and old field/scrub/shrub in middle reach near pond.

☐ 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 (1.3) 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)
GC line (N)	0.004	GA line (N)	0.25
RA line (Y)	0.71	PA line (N)	0.01
RE line (N)	0.01	PB line (N)	0.02
RB line (Y)	0.01	PD line (Y)	0.25
PC line (N)	0.04	GB line (N)	0.01

Summarize overall biological, chemical and physical functions being performed: sediment, nutrient, and pollutant removal prior to entering tribuataries.

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: .
   - ☐ 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: **5477** linear feet **2-8** width (ft).
☐ Other non-wetland waters: **0.9** acres.
Identify type(s) of waters: **pond**.

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: **1.0** 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: **0.3** 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.
☐ 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: .

[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.*

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:Marion East 24k quad.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ 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): .
☐ 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: .

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Neighbor Bob - Newton Site
Applicant / Owner: EEP
Investigator: Axiom

Date: 3/4/09
County: McDowell
State: NC

Do normal circumstances exist on the site? Yes ✓ No ___
Is the site significantly disturbed (Atypical situation)? Yes ___ No ✓
Is the area a potential problem area? Yes ___ No ✓
(explain on reverse if needed)

Community ID: old field
Transect ID: RA14
Plot ID: upland

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Rubus argutus	herb	FACU+
2. Eupatorium capillifolium	herb	FACU
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 0%

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: No wetland hydrology indicators.

SOILS

RA14 upland

Map Unit Name (Series and Phase): Elsinboro loam Drainage Class: well-drained

Taxonomy (Subgroup): Typic Hapludults Confirm Mapped Type? Yes ___ No ✓

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8		2.5Y 5/4	—	—	Sandy loam
8-12+		10YR 5/8	—	—	Sandy loam

Hydric Soil Indicators:

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

Remarks: No hydric soil indicators

WETLAND DETERMINATION

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

Is the Sampling Point Within a Wetland? Yes ___ No ✓

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Neighbor Bob - Newton Site Applicant / Owner: EEP Investigator: Axiom	Date: 3/4/09 County: McDowell State: NC
Do normal circumstances exist on the site? Yes ✓ No ___ Is the site significantly disturbed (Atypical situation)? Yes ___ No ✓ Is the area a potential problem area? Yes ___ No ✓ (explain on reverse if needed)	Community ID: scrub/shrub Transect ID: RA14 Plot ID: wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Juncus effusus	herb	FACW+	9.		
2. Salix nigra	sapling	OBL	10.		
3. Alnus serrulata	sapling	FACW+	11.		
4. Pinus taeda	shrub	FAC	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

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

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: ___ (in.)

Depth to Free Water in Pit: ___ (in.)

Depth to Saturated Soil: 9 (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- X Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- X Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

RA14 wetland

Map Unit Name (Series and Phase): Wehadkee fine sandy loam Drainage Class: poorly to very poorly drained

Taxonomy (Subgroup): Fluvaquentic Endoaquepts Confirm Mapped Type? Yes ___ No ✓

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8		2.5Y 5/1	2.5Y 5/6	5%	sandy loam
8-12+		2.5Y 4/2	2.5Y 5/6	2%	sandy loam
			2.5Y 5/1	30%	

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

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

Is the Sampling Point Within a Wetland? Yes ✓ No ___

Remarks:

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: Ko/Florence & Hutcheson

2. Evaluator's name: Ryan Smith

3. Date of evaluation: 4/2/2009

4. Time of evaluation: 3:00pm

5. Name of stream: Walton Crawley UT 1

6. River basin: Catawba

7. Approximate drainage area: 0.05 AC

8. Stream order: I

9. Length of reach evaluated: 729 FT

10. County: McDowell

11. Site coordinates (if known): prefer in decimal degrees.

12. Subdivision name (if any):_____

Latitude (ex. 34.872312): 35.6596839N Longitude (ex. –77.556611): 81.8979245W

Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other_____

13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):_____

SE of intersection of Harmony Grove Rd and Gaddy Rd on Newton property, approx. 1 mi. N of 226.

14. Proposed channel work (if any):_____

15. Recent weather conditions: Light rain

16. Site conditions at time of visit: Light rain

17. 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)

18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:_____

19. Does channel appear on USGS quad map? YES NO

20. Does channel appear on USDA Soil Survey? YES NO

21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural 100 % Forested ___% Cleared / Logged ___% Other (_____)

22. Bankfull width: 3.0FT

23. Bank height (from bed to top of bank): 0.3FT

24. Channel slope down center of stream: ___Flat (0 to 2%) X Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

25. Channel sinuosity: ____Straight ___Occasional bends X 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): 68 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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 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 06/03. 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	4
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	5
	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	1
	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	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	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	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	4
	15	**Impact by agriculture, livestock, or timber production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	3
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	4
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	5
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	5
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	3
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	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	4
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						68

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: Ko/Florence & Hutcheson

2. Evaluator's name: Ryan Smith

3. Date of evaluation: 4/2/2009

4. Time of evaluation: 3:00pm

5. Name of stream: Walton Crawley UT 2

6. River basin: Catawba

7. Approximate drainage area: 0.03 AC

8. Stream order: I

9. Length of reach evaluated: 819 FT

10. County: McDowell

11. Site coordinates (if known): prefer in decimal degrees.

12. Subdivision name (if any):_____

Latitude (ex. 34.872312): 35.6618222N Longitude (ex. –77.556611): 81.8980297W

Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other_____

13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):_____

SE of intersection of Harmony Grove Rd and Gaddy Rd on Newton property, approx. 1 mi. N of 226.

14. Proposed channel work (if any):_____

15. Recent weather conditions: Light rain

16. Site conditions at time of visit: Light rain

17. 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)

18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:_____

19. Does channel appear on USGS quad map? YES NO

20. Does channel appear on USDA Soil Survey? YES NO

21. Estimated watershed land use: 10 % Residential ___% Commercial ___% Industrial ___% Agricultural 80 % Forested 10 % Cleared / Logged ___% Other (_____)

22. Bankfull width: 3.0FT

23. Bank height (from bed to top of bank): 0.3FT

24. Channel slope down center of stream: X Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

25. 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): 40 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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 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 06/03. 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	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3
	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	1
	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	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	1
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	1
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	2
	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, livestock, or timber production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	2
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	5
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	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	3
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						40

* These characteristics are not assessed in coastal streams.

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

Date: 4/2/2009	**Project:** Neighbor Bob	**Latitude:** 35.6619428N
Evaluator: Ryan Smith	**Site:** Walton Crawley	**Longitude:** 81.8948733W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 18.5	**County:** McDowell	**Other** *e.g. Quad Name*: Marion East

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

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

B. Hydrology (Subtotal = 6)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

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

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

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

Sketch:

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

Date: 4/2/2009	**Project:** Neighbor Bob	**Latitude:** 35.6596839N
Evaluator: Ryan Smith	**Site:** Walton Crawley UT 1	**Longitude:** 81.8979245W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 25	**County:** McDowell	**Other** *e.g. Quad Name*: Marion East

A. Geomorphology (Subtotal = 13.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9 [a] Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

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

B. Hydrology (Subtotal = 6.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

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

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

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

Sketch:

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

Date: 4/2/2009	**Project:** Neighbor Bob	**Latitude:** 35.6618222N
Evaluator: Ryan Smith	**Site:** Walton Crawley UT 2	**Longitude:** 81.8980297W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 25	**County:** McDowell	**Other** *e.g. Quad Name*: Marion East

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

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

B. Hydrology (Subtotal = 6)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 6)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29 [b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

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

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

Sketch:

Newton/Stroud Property

Neighbors Branch Wetland Dataforms

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:
State:NC County/parish/borough: McDowell City: Marion
Center coordinates of site (lat/long in degree decimal format): Lat. 35.6599° **N**, Long. 81.9002° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Neighbors Branch
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: North Muddy Creek
Name of watershed or Hydrologic Unit Code (HUC): Catawba HUC 03050101040010
☒ 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 **Appear to be 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: 4342 linear feet: 2-8 width (ft) and/or acres.
      Wetlands: 2.3 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: 2200**square miles**
Drainage area: 215 **acres**
Average annual rainfall: 56.09 inches
Average annual snowfall: 13.1 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **2** tributaries before entering TNW.

Project waters are **1-2** 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]: Neighbors Branch to Walton Crawley Branch to North Muddy Creek.
Tributary stream order, if known: 1st.

---

[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: A small reach of the northwest most tributary is sheet flow in an area that was once a small pond.

Tributary properties with respect to top of bank (estimate):
Average width: 5 feet
Average depth: 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: relatively stable in natural section; incised above manipulated section.
Presence of run/riffle/pool complexes. Explain: Regular presence.
Tributary geometry: **Meandering**
Tributary gradient (approximate average slope): 2-4 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **2-5**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Discrete.** Characteristics: .

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:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: good water clarity.
Identify specific pollutants, if known: livestock are present within the Site.

[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): primarily forested with old field in a short reach near downstream of Site.

☒ Wetland fringe. Characteristics: Wetlands scattered in floodplain adjacent to tributaries.

☐ 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:2.3 acres

Wetland type. Explain:NCWAM Headwater Forest .

Wetland quality. Explain:disturbed in old pond footprint and old field, good in forested area.

Project wetlands cross or serve as state boundaries. Explain: NA.

(b) General Flow Relationship with Non-TNW:

Flow is: **Perennial flow**. Explain: .

Surface flow is**: Discrete**

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: .
- ☐ Ecological connection. Explain: Floodplain wetlands.
- ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **1-2** river miles from TNW.

Project waters are **1-2** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **2-year or less** 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: livestock are present outside the Site.

(iii) Biological Characteristics. Wetland supports (check all that apply):

☒ Riparian buffer. Characteristics (type, average width):primarily forested with old field in a short reach near downstream of Site.

☒ Vegetation type/percent cover. Explain:primarily mature hardwood forested with old field/scrub/shrub in middle reach near pond.

☐ 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: **15-20**

Approximately (2.3) 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)
FM line (Y)	0.23	FL line (Y)	0.01
FK line (Y)	0.004	FJ line (Y)	0.02
FF line (Y)	0.09	FI line (Y)	0.45
FE line (Y)	0.01	FD line (Y)	0.16
FH line (Y)	0.13	FC line (Y)	0.003
FB line (Y)	0.13	FA line (Y)	0.22
GG line (Y)	0.04	GF line (Y)	0.03
FG line (Y)	0.004	GE line (Y)	0.60
GH line (Y)	0.19		

Summarize overall biological, chemical and physical functions being performed: sediment, nutrient, and pollutant removal prior to entering tribuataries.

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: .

☐ 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: **4342** linear feet **2-8** 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: .

Provide acreage estimates for jurisdictional wetlands in the review area: **2.3** 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:Marion East 24k quad.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ 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): .
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Neighbor Bob-Newton Site Applicant / Owner: EEP Investigator: Axiom	Date: 3/5/09 County: McDowell State: NC
Do normal circumstances exist on the site? Yes ✓ No ___ Is the site significantly disturbed (Atypical situation)? Yes ___ No ✓ Is the area a potential problem area? Yes ___ No ✓ (explain on reverse if needed)	Community ID: bottomland forest Transect ID: FA1Ø Plot ID: upland

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Acer rubrum	tree	FAC
2. Ilex opaca	sapling	FAC-
3. Kalmia latifolia	shrub	FACU
4. Cornus amomum	sapling	FACW+
5.		
6.		
7.		
8.		

Dominant Plant Species	Stratum	Indicator
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 50%

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

No wetland hydrology indicators.

SOILS

FA10 upland

Map Unit Name (Series and Phase): Jotla sandy loam Drainage Class: somewhat poorly drained

Taxonomy (Subgroup): Aquic Udifluvents Confirm Mapped Type? Yes ___ No ✓

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4		10YR 4/4	10YR 4/3	30%	sandy loam
4-12+		5YR 4/6	10YR 4/1	20%	sandy loam

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

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

Is the Sampling Point Within a Wetland? Yes ___ No ✓

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Neighbor Bob - Newton site
Applicant / Owner: EEP
Investigator: Axiom

Date: 3/5/09
County: McDowell
State: NC

Do normal circumstances exist on the site? Yes ✓ No ___
Is the site significantly disturbed (Atypical situation)? Yes ___ No ✓
Is the area a potential problem area? Yes ___ No ✓
(explain on reverse if needed)

Community ID: bottomland hardwoods
Transect ID: FA10
Plot ID: wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Acer rubrum	tree	FAC
2. Cornus amomum	sapling	FACW+
3. Microstegium vimineum	herb	FAC+
4.		
5.		
6.		
7.		
8.		

Dominant Plant Species	Stratum	Indicator
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

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

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: 0-0.1 (in.)

Depth to Free Water in Pit: 0-4 (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- X Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- X Drainage Patterns in Wetlands

Secondary Indicators:
- X Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain In Remarks)

Remarks:

SOILS

FA10 wetland

Map Unit Name (Series and Phase): Wehadkee fine sandy loam Drainage Class: poorly to very poorly drained

Taxonomy (Subgroup): Fluvaquentic Endoaquepts Confirm Mapped Type? Yes ___ No ✓

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12+		10YR 5/1	—	—	sandy loam

Hydric Soil Indicators:

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

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes ✓ No ___

Wetland Hydrology Present? Yes ✓ No ___

Hydric Soils Present? Yes ✓ No ___

Is the Sampling Point Within a Wetland? Yes ✓ No ___

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Neighbor Bob - Newton Site
Applicant / Owner: EEP
Investigator: Axiom

Date: 3/5/09
County: McDowell
State: NC

Do normal circumstances exist on the site? Yes ✓ No ___
Is the site significantly disturbed (Atypical situation)? Yes ✓ No ___
Is the area a potential problem area? Yes ___ No ✓
(explain on reverse if needed)

Community ID: early successional/ scrub shrub
Transect ID: FM11
Plot ID: wetland

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Alnus serrulata	shrub	FACW+
2. Salix nigra	shrub	OBL
3. Ludwigia alternifolia	herb	OBL
4. Typha latifolia	shrub	OBL
5. Polygonum sp.	herb	FAC to OBL
6. Scirpus cyperinus	shrub	OBL
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

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

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: — (in.)

Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- X Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- X Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

FM11 wetland

Map Unit Name (Series and Phase): unknown-Hayesville SDII w/upland sediment deposition from up slope **Drainage Class:** _____

Taxonomy (Subgroup): _____ **Confirm Mapped Type? Yes** ___ **No** ✓

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-24		7.5YR 4/6	—	—	silty loam
24+	see remarks				

Hydric Soil Indicators:

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

Remarks: Soils become gray in color below 24 in. however due to water in pit at ~16 in. it was very difficult to obtain a sample to color. Sediment deposition appears to be occurring as the result of an ~20-25 ft headcut just upstream of old pond. Clearing of veg has occurred above the headcut.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	**Yes** ✓	**No** ___	**Is the Sampling Point**		
Wetland Hydrology Present?	**Yes** ✓	**No** ___	**Within a Wetland?**	**Yes** ✓	**No** ___
Hydric Soils Present?	**Yes** ___	**No** ✓			

Remarks: wetland occurs in an old pond footprint. A berm still exists around the perimeter and the area is fed by an intermittent stream. Early successional hydrophytic vegetation is establishing.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Determination Manual)

Project / Site: Neighbor Bob - Newton site
Applicant / Owner: EEP
Investigator: Axiom

Date: 3/5/09
County: McDowell
State: NC

Do normal circumstances exist on the site? Yes ✓ No ___
Is the site significantly disturbed (Atypical situation)? Yes ___ No ✓
Is the area a potential problem area? Yes ___ No ✓
(explain on reverse if needed)

Community ID: headwood forest
Transect ID: FM II
Plot ID: upland

VEGETATION

Dominant Plant Species	Stratum	Indicator
1. Liriodendron tulipifera	tree	FAC
2. Juniperus virginiana	tree	FACU-
3. Rosa multiflora	vine	NI
4. Lonicera japonica	vine	FAC-
5.		
6.		
7.		
8.		

Dominant Plant Species	Stratum	Indicator
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		

Percent of Dominant Species that are OBL, FACW, or FAC excluding FAC-). 25%

Remarks:

HYDROLOGY

___ Recorded Data (Describe In Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12"
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators:
- ___ Oxidized Roots Channels in Upper 12"
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: No wetland hydrology indicators.

SOILS

FM11 upland

Map Unit Name (Series and Phase): Evard-Cowee complex Drainage Class: well-drained

Taxonomy (Subgroup): Typic Hapludults Confirm Mapped Type? Yes ___ No ✓

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12+		5YR 4/6	—	—	loam

Hydric Soil Indicators:

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

Remarks:

No hydric soil indicators.

WETLAND DETERMINATION

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

Is the Sampling Point Within a Wetland? Yes ___ No ✓

Remarks:

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: Ko/Florence & Hutcheson

2. Evaluator's name: Ryan Smith

3. Date of evaluation: 4/2/2009

4. Time of evaluation: 3:00pm

5. Name of stream: Neighbors Branch

6. River basin: Catawba

7. Approximate drainage area: 0.24 AC

8. Stream order: I

9. Length of reach evaluated: 357 FT

10. County: McDowell

11. Site coordinates (if known): prefer in decimal degrees.

12. Subdivision name (if any):_____

Latitude (ex. 34.872312): 35.6567866N Longitude (ex. –77.556611): 81.9023435W

Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other_____

13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):

SE of intersection of Harmony Grove Rd and Gaddy Rd on Newton property, approx. 1 mi. N of 226.

14. Proposed channel work (if any):_____

15. Recent weather conditions: Light rain

16. Site conditions at time of visit: Light rain

17. 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)

18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:_____

19. Does channel appear on USGS quad map? YES NO

20. Does channel appear on USDA Soil Survey? YES NO

21. Estimated watershed land use: ___% Residential ___% Commercial ___% Industrial ___% Agricultural 90 % Forested 10 % Cleared / Logged ___% Other (_____)

22. Bankfull width: 7.0FT

23. Bank height (from bed to top of bank): 1.0FT

24. Channel slope down center of stream: X Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

25. Channel sinuosity: ____Straight ___Occasional bends X 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): 57/38 **Comments:** Up (wooded)/low (no woods)

Evaluator's Signature_____ **Date**_____

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 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 06/03. 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	5
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	4
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	5/0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3
	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	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1/0
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2/0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	2/1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	1
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	1
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	2
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	4/1
	15	**Impact by agriculture, livestock, or timber production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	2
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	4/2
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	4/2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	5/2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	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	1
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						57/38

* These characteristics are not assessed in coastal streams.

USACE AID#_____ DWQ #_____ Site #____ (indicate on attached map)

STREAM QUALITY ASSESSMENT WORKSHEET

Provide the following information for the stream reach under assessment:

1. Applicant's name: Ko/Florence & Hutcheson

2. Evaluator's name: Ryan Smith

3. Date of evaluation: 4/2/2009

4. Time of evaluation: 3:00pm

5. Name of stream: Neighbors Branch UT 1

6. River basin: Catawba

7. Approximate drainage area: 0.03 AC

8. Stream order: I

9. Length of reach evaluated: 303 FT

10. County: McDowell

11. Site coordinates (if known): prefer in decimal degrees.

12. Subdivision name (if any):_____

Latitude (ex. 34.872312): 35.6582352N Longitude (ex. –77.556611): 81.9052261W

Method location determined (circle): GPS Topo Sheet Ortho (Aerial) Photo/GIS Other GIS Other_____

13. Location of reach under evaluation (note nearby roads and landmarks and attach map identifying stream(s) location):

SE of intersection of Harmony Grove Rd and Gaddy Rd on Newton property, approx. 1 mi. N of 226.

14. Proposed channel work (if any):_____

15. Recent weather conditions: Light rain

16. Site conditions at time of visit: Light rain

17. 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)

18. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:_____

19. Does channel appear on USGS quad map? YES NO

20. Does channel appear on USDA Soil Survey? YES NO

21. Estimated watershed land use: 10 % Residential ___% Commercial ___% Industrial ___% Agricultural 70 % Forested 20 % Cleared / Logged ___% Other (_____)

22. Bankfull width: 3.0FT

23. Bank height (from bed to top of bank): 0.4FT

24. Channel slope down center of stream: ___Flat (0 to 2%) X Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

25. 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): 56 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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 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 06/03. 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	3
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	3
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3
	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	1
	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	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	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	3
	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	4
	15	**Impact by agriculture, livestock, or timber 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	4
	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	3
BIOLOGY	20	**Presence of stream invertebrates** (see page 4) (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	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)						56

* These characteristics are not assessed in coastal streams.

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

Date: 4/2/2009	**Project:** Neighbor Bob	**Latitude:** 35.6567866N
Evaluator: Ryan Smith	**Site:** Neighbors Branch	**Longitude:** 81.9023435W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 33.5	**County:** McDowell	**Other** *e.g. Quad Name*: Marion East

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

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

B. Hydrology (Subtotal = 8.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 8.5)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

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

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

Sketch:

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

Date: 4/2/2009	**Project:** Neighbor Bob	**Latitude:** 35.6582352N
Evaluator: Ryan Smith	**Site:** Neighbors Branch UT 1	**Longitude:** 81.9052261W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 23.5	**County:** McDowell	**Other** *e.g. Quad Name*: Marion East

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

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

B. Hydrology (Subtotal = 5.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 4)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29 [b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

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

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

Sketch:

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

Date: 4/2/2009	**Project:** Neighbor Bob	**Latitude:** 35.6589249N
Evaluator: Ryan Smith	**Site:** Neighbors Branch UT 2	**Longitude:** 81.9015649W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 16.5	**County:** McDowell	**Other** *e.g. Quad Name*: Marion East

A. Geomorphology (Subtotal = 12.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9 [a] Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

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

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

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

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

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

Sketch:

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

Date: 4/2/2009	**Project:** Neighbor Bob	**Latitude:** 35.6321174N
Evaluator: Ryan Smith	**Site:** Bobs Creek UT 8	**Longitude:** 81.9369988W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* 33.5	**County:** McDowell	**Other** *e.g. Quad Name*: Marion East

A. Geomorphology (Subtotal = 17.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9 [a] Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

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

B. Hydrology (Subtotal = 8.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

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

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

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

Sketch: