

FINAL
YEAR 1 (2016) ANNUAL
MONITORING REPORT

**NEIGHBORS BRANCH/WALTON CRAWLEY BRANCH
STREAM & WETLAND RESTORATION SITE**

NCDMS Project No. 92872
Contract No. D09023S
USACE Action ID No. SAW-2009-917 & NCDWR Project No. 10-0122
SCO No. 08-07308-01
McDowell County, North Carolina

Data Collection: May-November 2016
Submission: January 2017



PREPARED FOR:

N.C. DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
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PREPARED BY:

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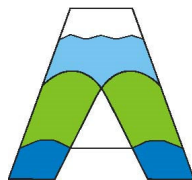


TABLE OF CONTENTS

| | | |
|-----|-----------------------|---|
| 1.0 | PROJECT SUMMARY | 1 |
| 2.0 | METHODS | 4 |
| 3.0 | REFERENCES | 6 |

APPENDICES

APPENDIX A. SITE LOCATION MAP AND BACKGROUND TABLES

- Figure 1. Site Location
- Table 1. Project Components and Mitigation Units
- Table 2. Project Activity and Reporting History
- Table 3. Project Contacts Table
- Table 4. Project Attributes Table

APPENDIX B. VISUAL ASSESSMENT DATA

- Figures 2, 2A-2B. Current Conditions Plan View
- Figures 3, 3A-3B. Project Assets
- Tables 5A-5E. Visual Stream Morphology Stability Assessment
- Table 6. Vegetation Condition Assessment
- Stream Fixed Station Photo Points
- Vegetation Plot Photographs

APPENDIX C. VEGETATION DATA

- Table 7. Vegetation Plot Success Summary
- Table 8. CVS Vegetation Plot Metadata
- Table 9. Total Planted Stems by Plot and Species

APPENDIX D. STREAM MEASUREMENT AND GEOMORPHOLOGY DATA

- Cross-section Plots
- Longitudinal Profile Plots
- Substrate Plots
- Tables 10A-10B. Baseline Morphology and Hydraulic Summary
- Tables 11A-11D. Morphology and Hydraulic Monitoring Summary

APPENDIX E. HYDROLOGY DATA

- Table 12. Verification of Bankfull Events
- Table 13. Wetland Hydrology Criteria Attainment Summary
- Figure E1. 30-70 Percentile Graph for Rainfall
- Groundwater Gauge Graphs

1.0 PROJECT SUMMARY

The North Carolina Division of Mitigation Services (NCDMS) has established the Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site (Site). The primary goals of the project focused 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 a 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 were 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 included:
 - 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 a 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.
- Enhance fish passage within Neighbors Branch and Walton Crawley Creek. This was accomplished by eliminating a 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.
- Enhance riparian wildlife habitat by:
 - Fencing cattle out of existing wetlands and planting impacted wetlands with native vegetative species. Wetlands were also 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 NCDMS.
 - 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.

The Site is located approximately six miles southeast of the town of Marion (Figure 1, Appendix B). The Site is situated due southwest of the intersection of Deer Park Road and Harmony Grove Road in McDowell County, North Carolina and is located within the United States Geological Survey (USGS) 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 USGS 8-digit Cataloging Unit 03050101.

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 watershed. Impervious surfaces appear to account for approximately one percent of the watershed land surface. Prior to Site construction, riparian vegetation had been removed, stream channels were manipulated, and hoof shear from livestock on stream banks and floodplain soils was responsible for degraded water quality and unstable channel characteristics (stream entrenchment, erosion, and bank collapse).

Project mitigation efforts resulted in the following:

- Restore 2456 linear feet of Site streams
- Enhance (Level I) 202 linear feet of Site streams
- Enhance (Level II) 1863 linear feet of Site streams
- Preserve 3139 linear feet of Site streams
- Restore 0.52 acre of existing hydric soils to riparian wetlands
- Enhance 1.62 acres of riparian wetlands
- Preserve 1.29 acres of riparian wetlands

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 NCDMS 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 NCDMS'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 NCDMS 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 the following.

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
6. Establish a Trout Fishery

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

1. Natural Channel Design Stream Restoration

2. Riparian Reforestation
3. Livestock Exclusion
4. Riparian Forest Preservation

These four components were included within the *Neighbors Branch/Walton Crawley Branch Site Mitigation Plan* (NCDMS 2013). The project restored 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 restored riparian buffers through revegetation of buffer zones with native riparian and wetland species along all Site streams. The project enhanced open space preservation by placing Site streams, wetlands, and their buffers into a permanent conservation easement. The overall Site helps improve water quality by reducing sedimentation in on-Site streams and planted a vegetated riparian buffer that filters nutrients from adjacent pasturelands. Additionally, exclusionary fencing and alternate watering devices removed livestock from accessing on-site channels and riparian buffers. The project restored and enhanced physical habitat for both aquatic and terrestrial species by planting native vegetation along stream banks and riparian buffers, creating wildlife corridors through a dissected landscape, and restoring bedform variability to Site streams. The stabilization of streams and buffers in the project area enhanced 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.

Site design was completed on March 7, 2013. Site construction and planting were completed in December 2015. Completed project activities, reporting history, completion dates, project contacts, and project attributes are summarized in Tables 1-4 (Appendix A).

Stream Success Criteria: Success criteria for stream restoration will include 1) successful classification of the reach as a functioning stream system (Rosgen 1996) and 2) channel variables indicative of a stable stream system.

Collected data will be utilized to determine the success in restoring stream channel stability. Specifically, the width-to-depth ratio and bank-height ratios should be indicative of a stable or moderately unstable channel with minimal changes in cross-sectional area, channel width, and/or bank erosion along the monitoring reach. In addition, channel abandonment and/or shoot cutoffs must not occur and sinuosity values must remain relatively constant. Visual assessment of instream structures will be conducted to determine if failure has occurred. Failure of a structure may be indicated by collapse of the structure, undermining of the structure, abandonment of the channel around the structure, and/or stream flow beneath the structure.

Stream Dimension: General maintenance of a stable cross-section and hydrologic access to the floodplain features over the course of the monitoring period will generally represent success in dimensional stability. Some changes in dimension (such as lowering of bankfull width) should be expected. Riffle cross-sections should generally maintain a bank-height ratio approaching 1.0, with some variation in this ratio naturally occurring. Pool cross-sections naturally adjust based on recent flows and time between flows, therefore more leeway on pool cross-section geometry is expected.

Stream Pattern and Profile: The profile should not demonstrate significant trends towards degradation or aggradation over a significant portion of a reach. Additionally, bed form variables should remain noticeably intact and consistent with original design parameters that were based off of reference conditions. Pattern features should show little adjustment over the standard 5-year monitoring period and will be monitored to ensure adjustment is minor prior to close out.

Substrate: Substrate measurements should indicate the progression towards or the maintenance of the known distributions from the design phase.

Sediment Transport: There should be an absence of any significant trend in the aggradational or depositional potential of the channel.

Hydraulics: A minimum of two bankfull events must be documented within the standard 5-year monitoring period. The two bankfull events shall occur within separate years.

Vegetation Success Criteria: Success criteria have been established to verify that the vegetation component supports community elements necessary for forest development. Success criteria are dependent upon the density and growth of characteristic forest species. An average density of 320 stems per acre of planted stems must be surviving in the first three monitoring years. Subsequently, 290 planted stems per acre must be surviving in year 4 and 260 planted stems per acre in year 5.

Wetland Hydrology Success Criteria: Target hydrological characteristics include saturation or inundation for 5 to 12.5 percent of the growing season, during average climatic conditions. During growing seasons with atypical climatic conditions, groundwater gauges in reference wetlands may dictate threshold hydrology success criteria (75 percent of reference). These areas are expected to support hydrophytic vegetation. If wetland parameters are marginal as indicated by vegetation and/or hydrology monitoring, a jurisdictional determination will be performed.

2.0 METHODS

Monitoring of restoration efforts will be performed for five years, or until success criteria are fulfilled. Monitoring is proposed for the stream channel, vegetation, and wetland hydrology. In general, the restoration success criteria, and required remediation actions, are based on the *Stream Mitigation Guidelines* (USACE et al. 2003). Monitoring features are described below and are depicted on Figures 2A-B (Appendix B).

Streams

The restored stream reaches are proposed to be monitored for geometric activity as follows.

- 1750 linear feet of stream profile
- 5 riffle cross-sections
- 3 pool cross-section

The data will be presented in graphic and tabular format. Data to be presented will include 1) cross-sectional area, 2) bankfull width, 3) average depth, 4) maximum depth, 5) width-to-depth ratio, 6) meander wavelength, 7) belt-width, 8) water surface slope, and 9) sinuosity. Substrate analysis will be evaluated through pebble counts at five cross sections and data presented as a D50 for stream classification and tracking purposes. The stream will subsequently be classified according to stream geometry and substrate (Rosgen 1996). Significant changes in channel morphology will be tracked and reported by comparing data in each successive monitoring year. Annual photographs will include 43 fixed station photographs (Appendix B). In addition, the Site contains two stream crest gauges to assist with documentation of bankfull events. One bankfull event has been documented to date during monitoring year 1 (2016) (Table 12, Appendix E).

Early in Year 1 (2016), several structures were damaged by significant storm events that occurred shortly after Site construction. Warranty repair work was completed in October 2016 to address these issues. The repaired structures currently appear stable. They will be monitored throughout the remainder of the monitoring period to determine if the repair work sufficiently resolved the issues and if any additional repairs will be required. Currently, stream measurements are meeting success criteria.

Vegetation

Restoration monitoring procedures for vegetation will monitor plant survival and species diversity. Planted areas within the Site include approximately 12.3 acres. After planting of the area was completed, eight vegetation plots were installed and monitored at the Site; annual monitoring results can be found in Appendix C. Annual measurements of vegetation will consist of 8 CVS vegetation plots.

A photographic record of plant growth should be included in each annual monitoring report; baseline photographs are included in Appendix B. During the first year, vegetation will receive a cursory, visual evaluation on a periodic basis to ascertain the degree of overtopping of planted elements by nuisance species. Subsequently, quantitative sampling of vegetation will be performed as outlined in the *CVS-EEP Protocol for Recording Vegetation, Version 4.2* (Lee et al. 2008) in September of the first monitoring year and annually between June 1 and September 30 for the remainder of the monitoring period until vegetation success criteria are achieved.

Year 1 stem count measurements indicate planted stem densities are well above the required 320 stems per acre. Planted stem density across the Site is 506 planted stems per acre (Table 9, Appendix C). In addition, all eight individual CVS plots met success criteria based on planted stems alone (Table 7, Appendix C). Therefore, the Site is currently meeting vegetation success criteria.

Wetland Hydrology

Two groundwater monitoring gauges were installed to take measurements after hydrological modifications were performed at the Site. Hydrological sampling will occur quarterly throughout the growing season (March 26 to November 5). Approximate locations of gauges are depicted on Figure 2 (Appendix B) and hydrology data can be found in Appendix E.

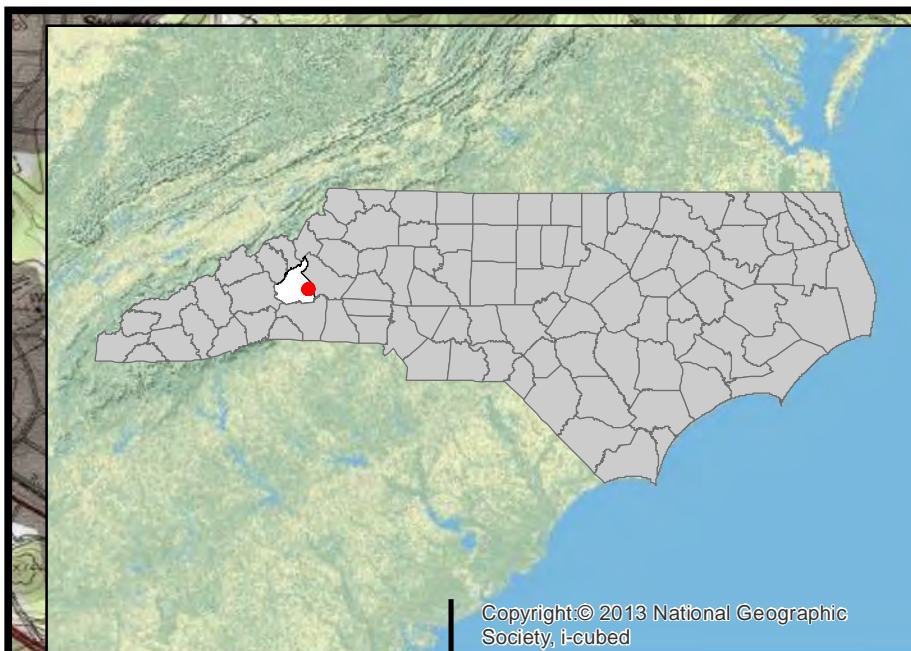
Both gauges were saturated or inundated for well over 12.5 percent of the growing season. The gauges were installed on April 12, 2016, 17 days after the start of the growing season. The groundwater level at gauge 1 remained within 12 inches of the surface for the remainder of the growing season (208 days). Gauge 2 malfunctioned just 2 days after it was installed. It began taking readings again on May 26, 2016 and the groundwater level remained within 12 inches of the surface for the remainder of the growing season (164 days). Wetland hydrology is currently meeting success criteria.

3.0 REFERENCES

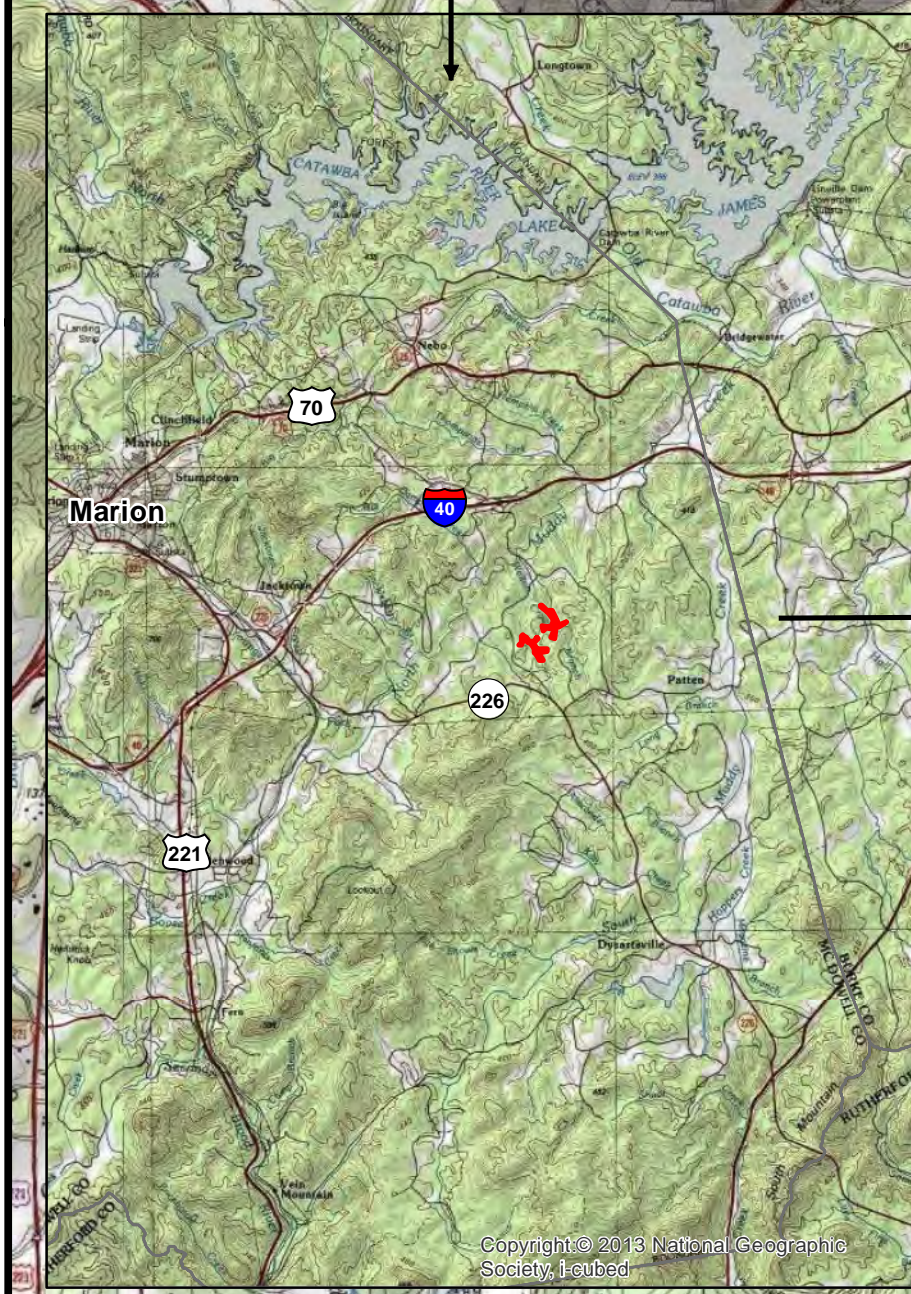
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- United States Army Corps of Engineers (USACE), United States Environmental Protection Agency (USEPA), North Carolina Wildlife Resources Commission (NCWRC), Natural Resources Conservation Service (NRCS), and North Carolina Division of Water Quality (NCDWQ). 2003. Stream Mitigation Guidelines. State of North Carolina.
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Appendix A.
Site Location Map and Background Tables

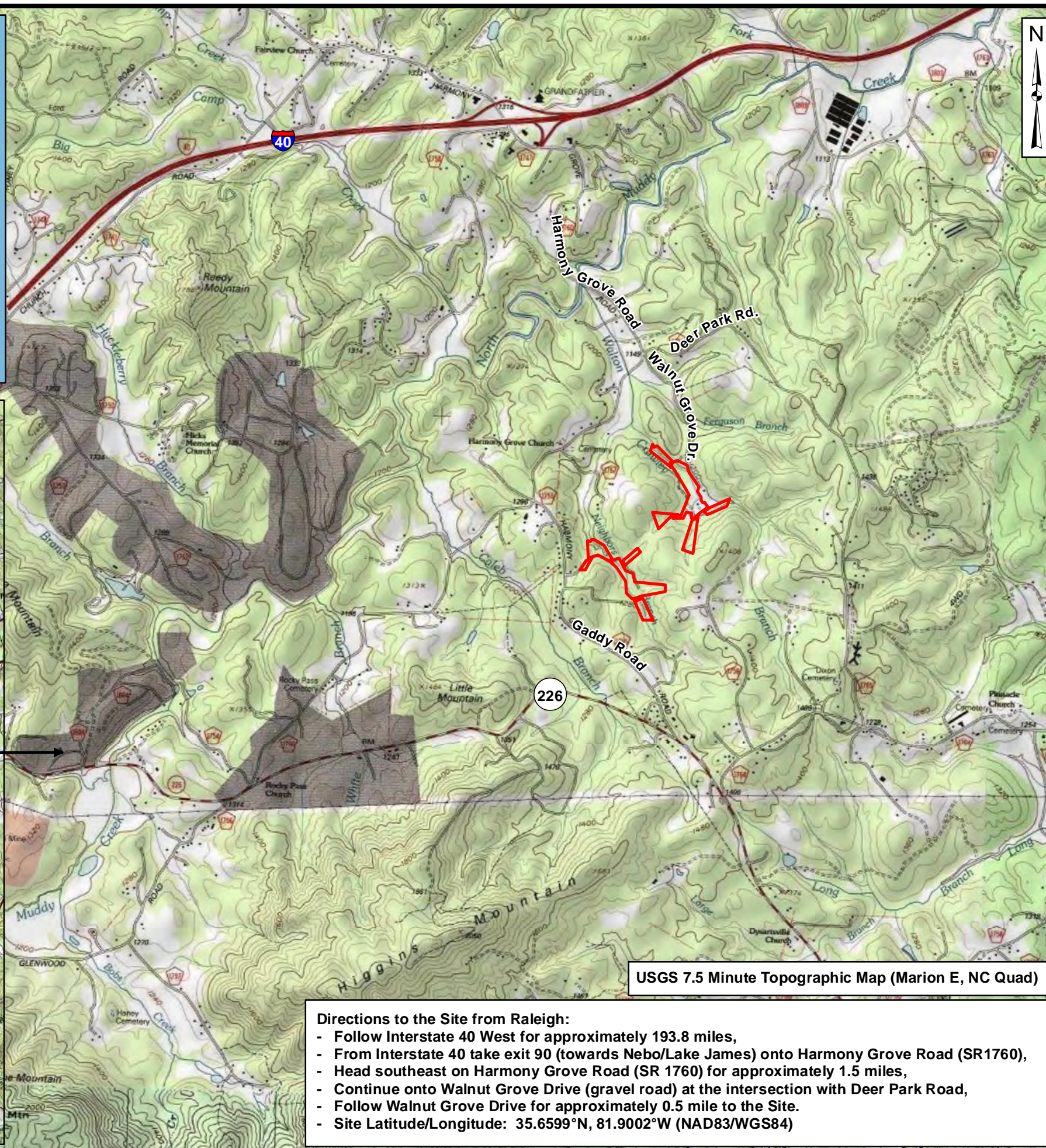
- Figure 1. Site Location
Table 1. Project Mitigation Components
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Attributes Table



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Axiom Environmental, Inc.

Prepared for:
NC Department of Environmental Quality
 Division of Mitigation Services

Project:
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site

DMS Project # 92872

McDowell County, NC

Title:
Site Location

Drawn by: **KRJ**

Date: **JUN 2016**

Scale: **1:30000**

Project No.: **12-004.21**

Directions to the Site from Raleigh:

- Follow Interstate 40 West for approximately 193.8 miles,
- From Interstate 40 take exit 90 (towards Nebo/Lake James) onto Harmony Grove Road (SR1760),
- Head southeast on Harmony Grove Road (SR 1760) for approximately 1.5 miles,
- Continue onto Walnut Grove Drive (gravel road) at the intersection with Deer Park Road,
- Follow Walnut Grove Drive for approximately 0.5 mile to the Site.
- Site Latitude/Longitude: 35.6599°N, 81.9002°W (NAD83/WGS84)

USGS 7.5 Minute Topographic Map (Marion E, NC Quad)

FIGURE 1

Table 1. Project Components and Mitigation Credits

Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site/ DMS Number 92872

| Mitigation Credit Summations | | | | | | | |
|---|--|-----------------------------|--------------------------------|------------------------------|------------------|--------------------|---|
| Stream | Riparian Wetland | Nonriparian Wetland | Buffer | | | Nitrogen Offset | Phosphorous Offset |
| 3964 | 1.59 | --- | --- | | | --- | --- |
| Projects Components | | | | | | | |
| Project Component –or–Reach ID | Stationing | Existing Footage or Acreage | Restoration Footage or Acreage | Restoration Level/Equivalent | Mitigation Ratio | Mitigation Credits | Comment |
| Walton Crawley | 15+40 – 27+36 (09+37 – 21+68) | 2498 | 1196 1231-35 = 1196 | Restoration (PI) | 1:1 | 1196 | Channel returned to natural valley. The easement break at the road crossing has been removed from credit summation. Removed 35 feet from credit calculations for road crossing. |
| Walton Crawley | 29+11 – 29+23 | | 12 | Enhance I | 1.5:1 | 8 | Bank grading and stabilization. |
| Walton Crawley | 27+36 – 29+11 29+23 – 29+90 | | 242 | Enhance II | 2.5:1 | 97 | Fence cattle out of easement area and remove invasive plants. The easement break at 29+90 has been removed from credit summation. |
| Walton Crawley | 10+00 – 15+40 29+90 – 35+01 | | 1051 | Preservation | 5:1 | 210 | The easement break has been removed from credit summation. |
| UT 1 Walton Crawley As-built Plan Stationing | 18+13 – 20+01 (10+00 – 11+88) | 872 | 188 188 | Restoration (PI) | 1:1 | 188 | Restore channel through existing pond and reconnect to Walton Crawley. |
| UT 1 Walton Crawley | 14+83 – 18+13 | | 330 | Enhance II | 2.5:1 | 132 | Fence cattle out of easement area and remove invasive plants. |
| UT 1 Walton Crawley | 10+00 – 14+83 | | 483 | Preservation | 5:1 | 97 | The easement break has been removed from credit summation. |
| UT 2 Walton Crawley As-built Plan Stationing | 10+00 – 13+83 (10+00 – 13+83) 16+36 – 18+02 (10+00 – 11+66) | 600 | 549 549 | Restoration (PI) | 1:1 | 549 | Channel routed to the center of the valley, away from toe of slope. |
| UT 2 Walton Crawley | 13+83 – 16+36 | | 253 | Enhance II | 2.5:1 | 101 | Fence cattle out of easement area and remove invasive plants. |
| Neighbors Branch As-built Plan Stationing | 24+74 – 29+97 (09+93 – 15+52) | 2262 | 523 559 – 36 = 523 | Restoration (PI) | 1:1 | 523 | Channel routed through low point of valley and invert raised from perched culvert. The easement break at the road crossing has been removed from credit summation. Removed 36 feet from credit calculations for road crossing. |
| Neighbors Branch | 18+89 – 19+09 | | 20 | Enhance I | 1.5:1 | 13 | Place channel structure and stabilize bank. The easement break has been removed from credit summation. |

| Neighbors Branch | 18+69 – 18+89 19+09 – 24+74 29+97 – 33+39 | | 927 | Enhance II | 2.5:1 | 371 | Fence cattle out of easement area and matt, seed, and plant vegetation on scoured banks. |
|---|--|----------------------------|------------------|-------------------------------|----------------------|----------------|--|
| Neighbors Branch | 09+67 – 18+69 | | 902 | Preservation | 5:1 | 180 | The easement break has been removed from credit summation. |
| UT 1 Neighbors Branch As-built Plan Stationing | 10+56 – 10+95 11+50 – 12+81 (10+06 – 10+44 10+77 – 12+09) | 281 | 170 170 | Enhance I | 1.5:1 | 113 | Bank grading and stabilization. |
| UT 1 Neighbors Branch | 10+00 – 10+56 10+95 – 11+50 | | 111 | Enhance II | 2.5:1 | 44 | Fence cattle out of easement area and plant vegetation. |
| UT 3 Neighbors Branch | 11+72 – 18+75 | 703 | 703 | Preservation | 5:1 | 141 | --- |
| Riparian Wetland | --- | 0.0 | 0.52 | Restoration | 1:1 | 0.52 | Restore hydrology to hydric soils adjacent to Neighbors Branch. |
| Riparian Wetland | --- | 1.62 | 1.62 | Enhancement | 2:1 | 0.81 | Plant native vegetation on impacted wetlands and fence cattle. |
| Riparian Wetland | --- | 1.29 | 1.29 | Preservation | 5:1 | 0.26 | --- |
| Length and Area Summations | | | | | | | |
| Restoration Level | Stream (linear footage) | Riparian Wetland (acreage) | | Nonriparian Wetland (acreage) | Buffer (square feet) | Upland (acres) | |
| | | Riverine | Non-Riverine | | | | |
| Restoration | 2,456 | 0.52 | | -- | | | |
| Enhancement (Level I) | 202 | 1.62 | | -- | | | |
| Enhancement (Level II) | 1,863 | -- | | -- | | | |
| Preservation | 3,139 | 1.29 | | -- | | | |
| Totals | 7,660 | 3.43 | | -- | | | |
| Mitigation Units | 3,964 SMUs | 1.59 Riparian WMUs | | 0.00 Nonriparian WMUs | | | |
| BMP Elements | | | | | | | |
| Element | Location | | Purpose/Function | | Notes | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Table 2. Project Activity and Reporting History**Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site / DMS Number 92872**

| Activity or Deliverable | Data Collection Complete | Completion or Delivery |
|---|---------------------------------|-------------------------------|
| Project Institution | | |
| Mitigation Plan | April 2009 | March 7, 2013 |
| Permits Issued | | |
| Final Design – Construction Plans | | April 2014 |
| Construction | -- | December 2015 |
| Temporary S&E Mix applied to Entire Project Site | -- | December 2015 |
| Permanent Seed Mix applied to the Entire Project Site | -- | December 2015 |
| Bare Root; Containerized; and B&B Plantings for the Entire Project Site | -- | December 2015 |
| Baseline Monitoring Document (Year 0 Monitoring Baseline) | April 2016 | July 2016 |
| Repair | -- | October 2016 |
| Year 1 Monitoring | November 2016 | January 2017 |
| Year 2 Monitoring | | |
| Year 3 Monitoring | | |
| Year 4 Monitoring | | |
| Year 5 Monitoring | | |

Table 3. Project Contact Table**Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site / DMS Number 92872**

| | |
|--|--|
| Designer | Florence & Hutcheson Engineering (Now HDR) 5121 Kingdom Way, Suite 100 Raleigh, NC 27607 Kevin Williams (919) 851-6066 |
| Construction Plans and Sediment and Erosion Control Plans | Florence & Hutcheson Engineering (Now HDR) 5121 Kingdom Way, Suite 100 Raleigh, NC 27607 Kevin Williams (919) 851-6066 |
| Construction Contractor | Carolina Environmental Contracting, Inc. Mount Airy, NC (336) 320-3849 |
| Planting Contractor | Keller Environmental 7291 Haymarket Lane Raleigh, NC 27615 Jay Keller (919) 749-8259 |
| As-built Surveyor | Turner Land Surveying, PLLC 3719 Benson Drive Raleigh, NC 27609 Elisabeth Turner (919) 827-0745 |
| Baseline Data Collection | Axiom Environmental, Inc. 218 Snow Avenue Raleigh, NC 27603 Grant Lewis (919) 215-1693 |

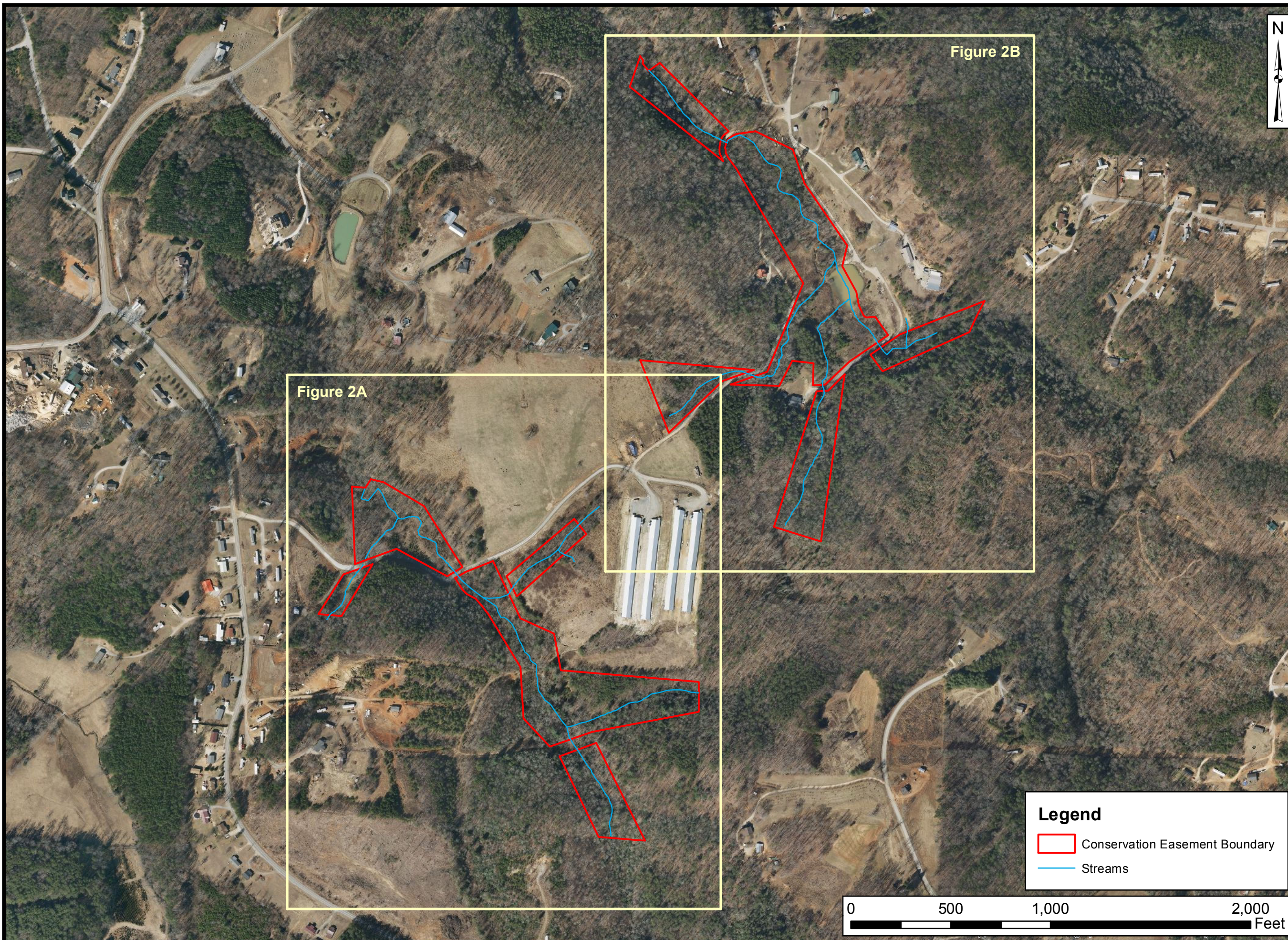
Table 4. Project Baseline Information and Attributes**Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site / DMS Number 92872**

| Project Information | | | | | | |
|--|--|---------------------------------|-------------------|---------------------|----------------------------|------------|
| Project name | Neighbors Branch/Walton Crawley Branch Mitigation Site | | | | | |
| Project county | McDowell County, North Carolina | | | | | |
| Project area (Acres) | 33.4 | | | | | |
| Project coordinates (lat/long) | 35.6599°N, 81.9002°W | | | | | |
| Project Watershed Summary Information | | | | | | |
| Physiographic region | Blue Ridge | | | | | |
| Project river basin | Catawba River Basin | | | | | |
| USGS hydrologic unit (8 digit) | 03050101 | | | | | |
| NCDWQ Sub-basin | 03-08-30 | | | | | |
| Project drainage area (acres) | 678 | | | | | |
| % Drainage area impervious | < 1% | | | | | |
| CGIA land use classification | ---- | | | | | |
| Reach Summary Information | | | | | | |
| Parameters | Walton Crawley Branch | UTs to Walton Crawley Branch | | Neighbors Branch | UTs to Neighbors Branch | |
| | | UT 1 | UT 2 | | UT 1 | UT 3 |
| Length of reach (linear feet) | 2529 | 1001 | 802 | 2339 | 281 | 875 |
| Valley classification | VIII | II | II | VIII | II | II |
| Drainage area (acres) | 458 | 29 | 20 | 220 | 13 | 15 |
| NCDWQ stream identification score | 18.5 | 25 | 25 | 33.5 | 23.5 | 16.5 |
| NCDWQ water quality classification | C | C | C | C | C | C |
| Morphological description (stream type) | B4/5c-G4/5 | E5 | E5-G5 | E5/4-G5/4 | E5/4 | E5 |
| Design Rosgen stream type | C4 | E/C5 | E/C5 | C4 | E5/4 | E5 |
| Evolutionary trend | | | | | | |
| Design approach (P1, P2, P3, E, etc.) | PI, EI, EII, & P | PI, EII, & P | PI & EII | PI, EI, EII, & P | EI & EII | P |
| Underlying mapped soils | Elsinboro, Evard, Hayesville | Evard | Evard, Hayesville | Hayesville, Iotla | Evard | Hayesville |
| Drainage class | Well | Well | Well | Well / SW Poorly | Well | Well |
| Soil hydric status | Nonhydric | Nonhydric | Nonhydric | Nonhydric / Hydric | Nonhydric | Nonhydric |
| Slope | 0.0340 | 0.0380 | 0.0545 | 0.0260 | 0.0820 | 0.0656 |
| FEMA classification | Not Mapped | Not Mapped | Not Mapped | Not Mapped | Not Mapped | Not Mapped |
| Native vegetation community | Forest / Pasture | Forest | Forest | Forest / Pasture | Forest | Forest |
| % Composition of exotic invasive spp. | <5 | <5 | <5 | <5 | <5 | <5 |

| Wetland Summary Information | | | | | | |
|--|--------------------------------------|---|-------------|-------------------------------------|------------------------------------|-------------|
| Parameters | Walton Crawley Branch | UTs to Walton Crawley Branch | | Neighbors Branch | UTs to Neighbors Branch | |
| | | UT 1 | UT 2 | | UT 1 | UT 3 |
| Size of wetland (acres) | 0.95 | 0.37 | N/A | 1.88 | 0.23 | N/A |
| Wetland type | Riparian Riverine | Riparian Riverine | N/A | Riparian Riverine | Riparian Riverine | N/A |
| Mapped soil series | Wehadkee | Wehadkee | N/A | Wehadkee | Wehadkee | N/A |
| Drainage class | poorly | poorly | N/A | poorly | poorly | N/A |
| Soil hydric status | hydric | hydric | N/A | hydric | hydric | N/A |
| Source of hydrology | Overbank and springs | Overbank and springs | N/A | Overbank and springs | Overbank and springs | N/A |
| Hydrologic impairment | Cleared | Invasives | N/A | Drained/ Cleared/ Invasives | Invasives | N/A |
| Native vegetation community | Forest / Pasture | Forest | N/A | Forest / Pasture | Forest | N/A |
| % Composition of exotic invasive spp. | <5 | <5 | N/A | <5 | <5 | N/A |
| Regulatory Considerations | | | | | | |
| Regulation | Applicable? | Resolved? | | Supporting Documentation | | |
| Waters of the US – Section 404 | Yes | Yes | | SAW-2009-917 | | |
| Waters of the US – Section 401 | Yes | Yes | | SAW-2009-917 | | |
| Endangered Species Act | Yes | Yes | | No Effect – CE Document | | |
| Historic Preservation Act | Yes | Yes | | CE Document | | |
| Coastal Zone Management Act (CZMA/CAMA) | No | NA | | NA | | |
| FEMA Floodplain Compliance | No | NA | | NA | | |
| Essential Fisheries Habitat | No | NA | | NA | | |

Appendix B
Visual Assessment Data

Figures 2, 2A-2B. Current Conditions Plan View
Figures 3, 3A-3B. Project Assets
Tables 5A-5E. Visual Stream Morphology Stability Assessment
Table 6. Vegetation Condition Assessment
Stream Fixed Station Photo Points
Vegetation Plot Photos



Prepared for:
**NC Department of
 Environmental
 Quality**
**Division of
 Mitigation
 Services**

Project:
**Neighbors Branch/
 Walton Crawley
 Branch Stream
 and Wetland
 Restoration Site**

**DMS Project
 # 92872**

McDowell County, NC



Title:
**Current Conditions
 Plan View**

Drawn by: KRJ

Date: DEC 2016

Scale: 1:5500

Project No.: 12-004.21

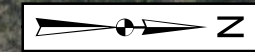
Legend
 Conservation Easement Boundary
 Streams

0 500 1,000 2,000
 Feet

FIGURE
2

Legend

- Conservation Easement Boundary
- Streams
- Structures
- Wetland Restoration - 0.52 ac
- Wetland Enhancement - 0.30 ac
- Wetland Preservation - 1.29 ac
- Stream Monitoring Reach
- Cross-Sections
- Groundwater Gauges
- ★ Photo Point Locations
- Crest Gauge
- CVS Plots Meeting Success Criteria During MY1 (2016)



Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services

Project:
**Neighbors Branch/
 Walton Crawley
 Branch Stream
 and Wetland
 Restoration Site**

**DMS Project
 # 92872**

McDowell County, NC

Title:
**Current Conditions
 Plan View**

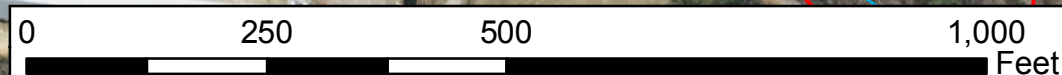
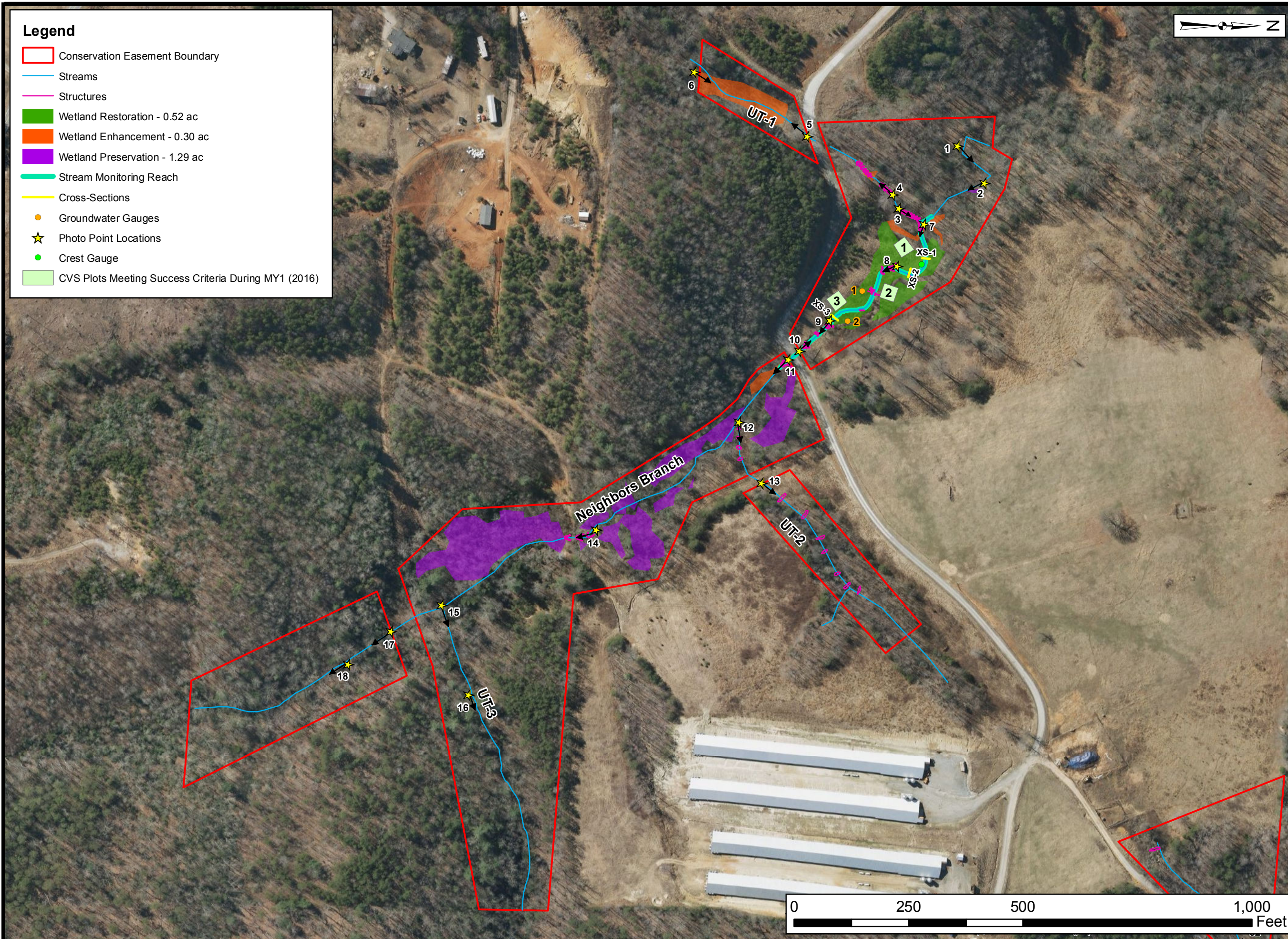
Drawn by: KRJ

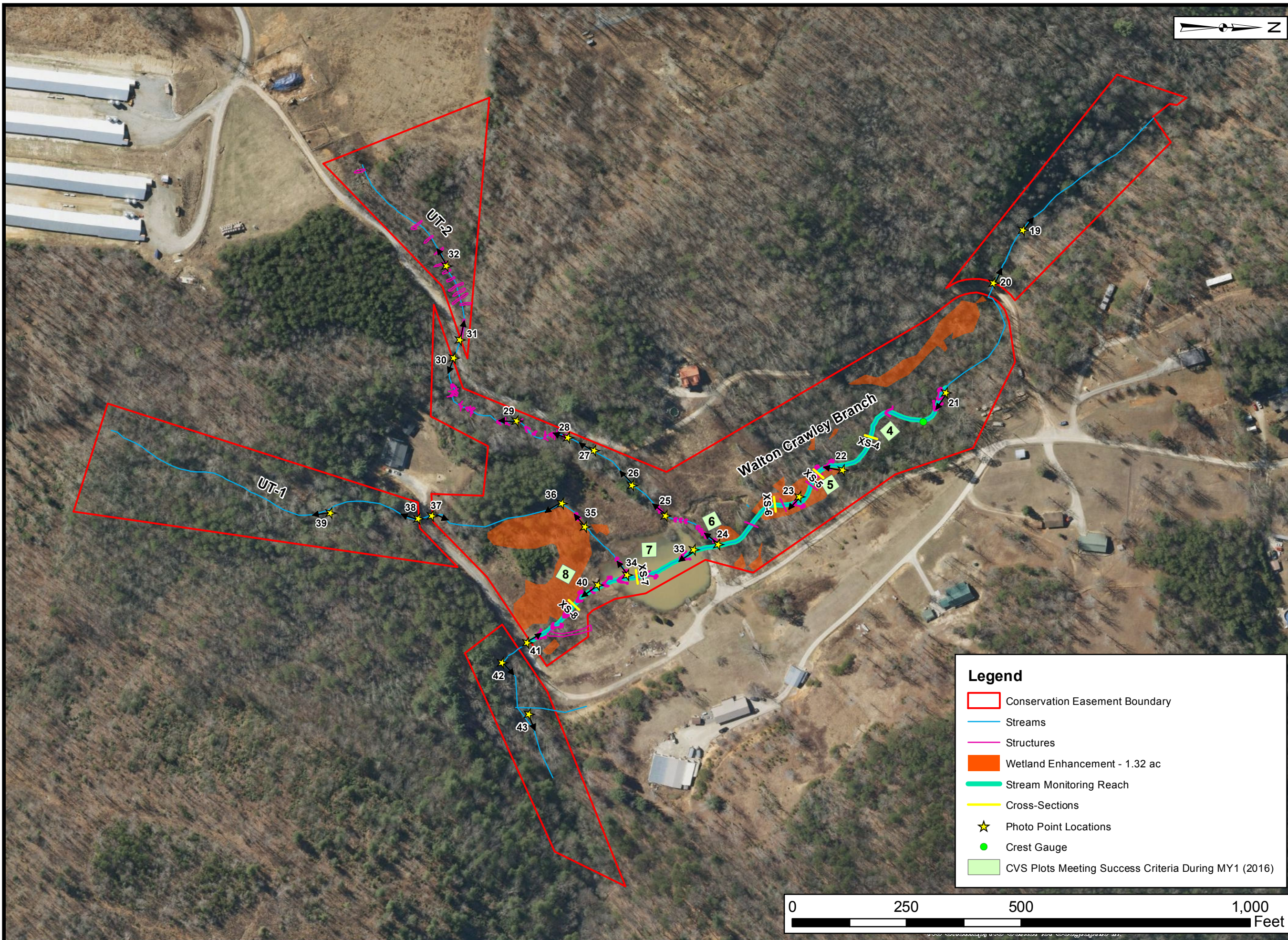
Date: DEC 2016

Scale: 1:2400

Project No.: 12-004.21

FIGURE
2A





Prepared for:
NC Department of Environmental Quality
 Division of Mitigation Services

Project:
**Neighbors Branch/
 Walton Crawley
 Branch Stream
 and Wetland
 Restoration Site**

**DMS Project
 # 92872**
 McDowell County, NC

Title:
**Current Conditions
 Plan View**

Drawn by:
 KRJ

Date:
 DEC 2016

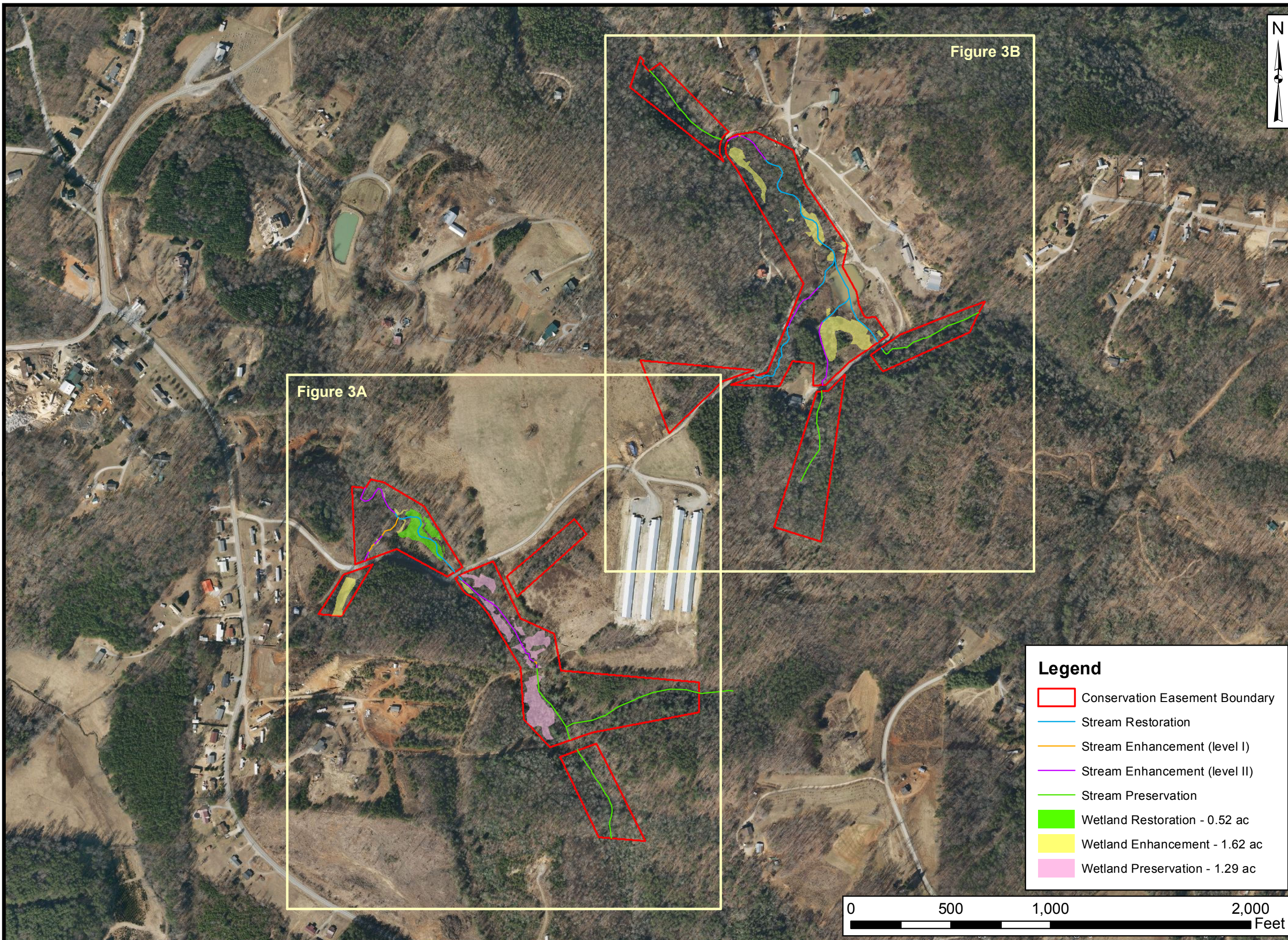
Scale:
 1:2400

Project No.:
 12-004.21

Legend

- Conservation Easement Boundary
- Streams
- Structures
- Wetland Enhancement - 1.32 ac
- Stream Monitoring Reach
- Cross-Sections
- ★ Photo Point Locations
- Crest Gauge
- CVS Plots Meeting Success Criteria During MY1 (2016)

FIGURE
2B



Prepared for:
**NC Department of
 Environmental
 Quality**
**Division of
 Mitigation
 Services**

Project:
**Neighbors Branch/
 Walton Crawley
 Branch Stream
 and Wetland
 Restoration Site**

**DMS Project
 # 92872**

McDowell County, NC

Title:
Project Assets

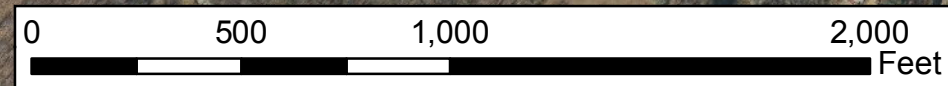
Drawn by: **KRJ**

Date: **JUL 2016**

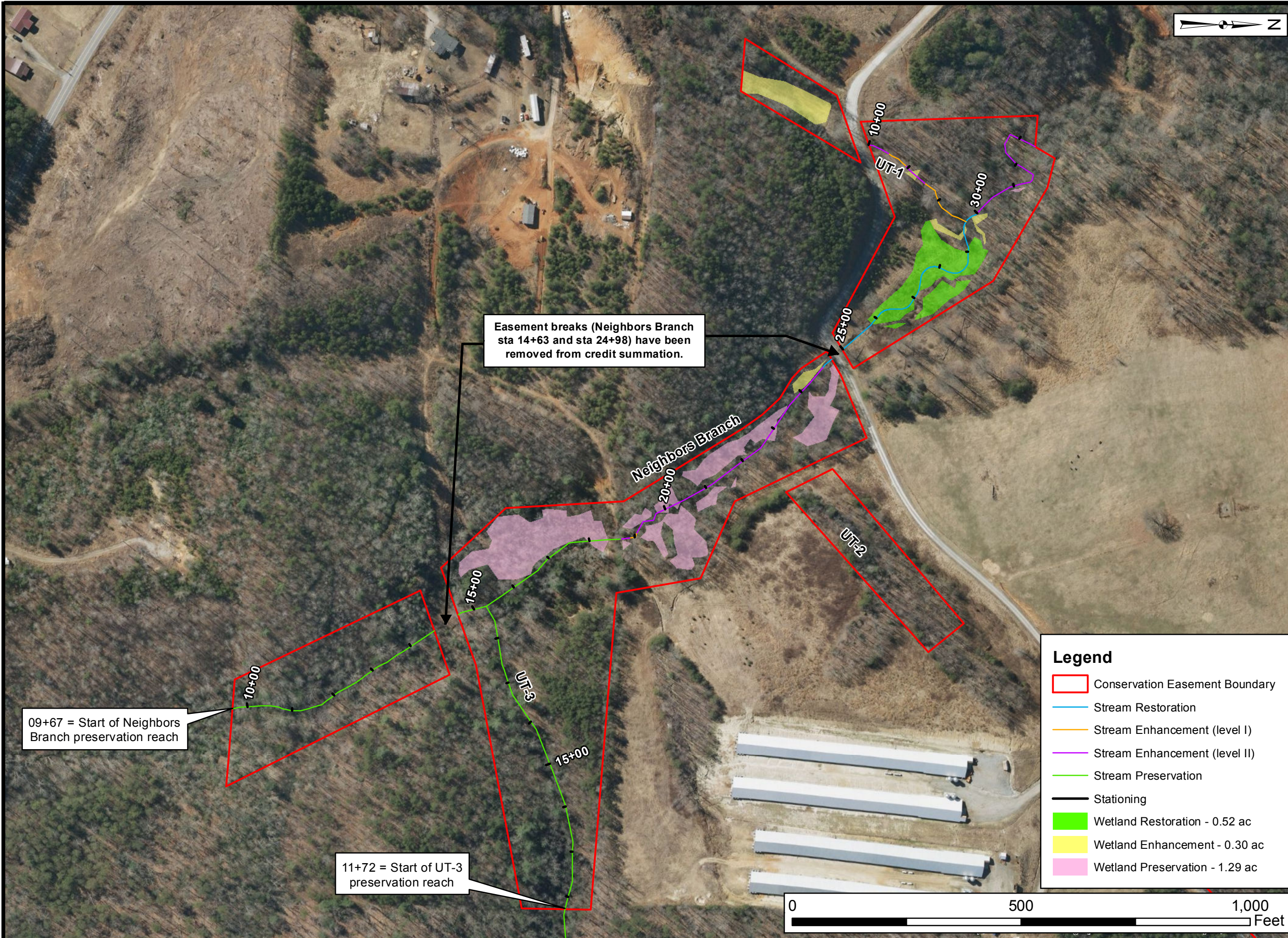
Scale: **1:5500**

Project No.: **12-004.21**

- Legend**
- Conservation Easement Boundary
 - Stream Restoration
 - Stream Enhancement (level I)
 - Stream Enhancement (level II)
 - Stream Preservation
 - Wetland Restoration - 0.52 ac
 - Wetland Enhancement - 1.62 ac
 - Wetland Preservation - 1.29 ac



**FIGURE
 3**



Prepared for:
NC Department of Environmental Quality
 Division of Mitigation Services

Project:
Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site
 DMS Project # 92872

McDowell County, NC

Title:
Project Assets

Drawn by: KRJ

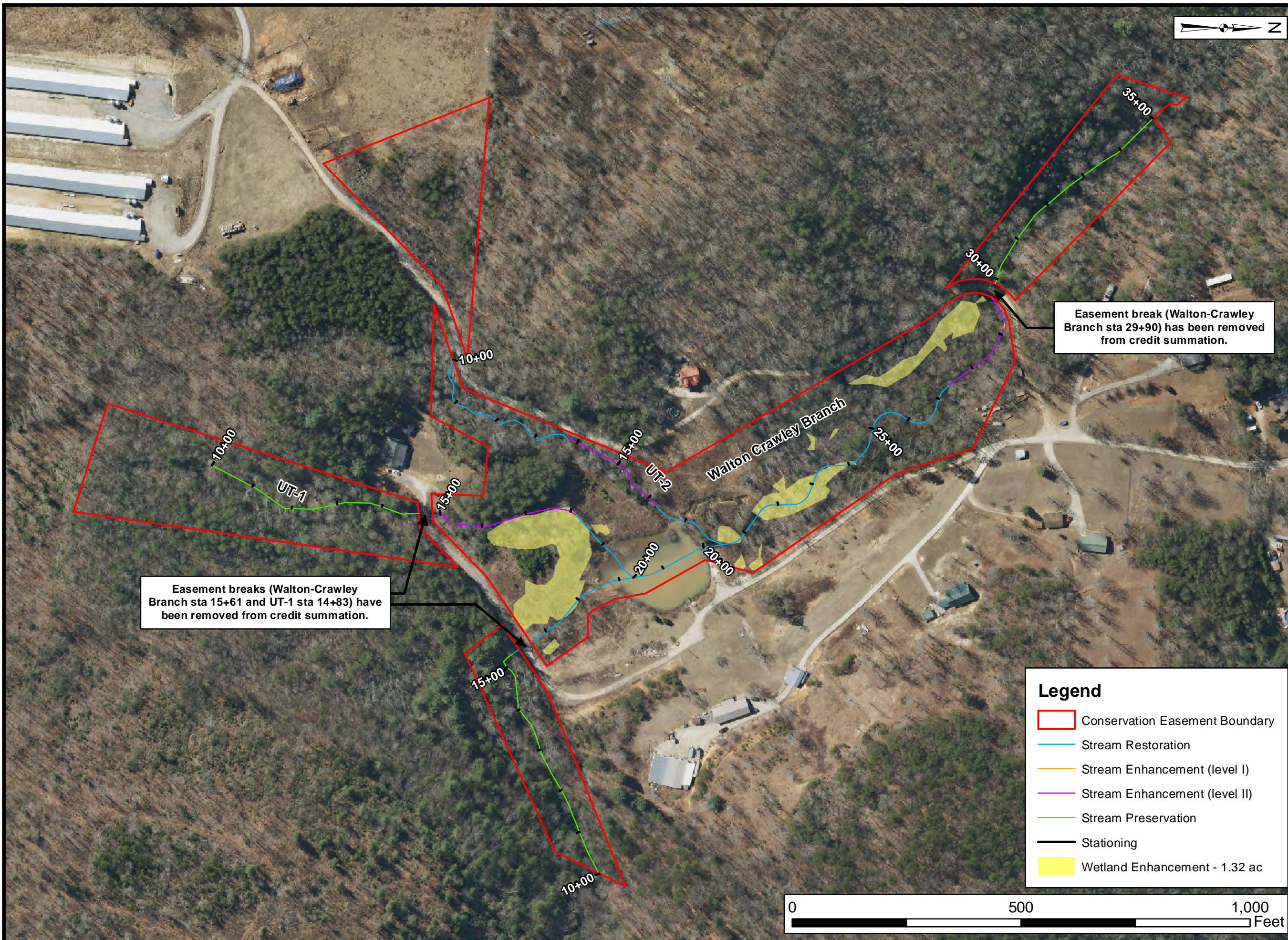
Date: JUL 2016

Scale: 1:2400

Project No.: 12-004.21

- Legend**
- Conservation Easement Boundary
 - Stream Restoration
 - Stream Enhancement (level I)
 - Stream Enhancement (level II)
 - Stream Preservation
 - Stationing
 - Wetland Restoration - 0.52 ac
 - Wetland Enhancement - 0.30 ac
 - Wetland Preservation - 1.29 ac

FIGURE
3A



Prepared for:
NC Department of Environmental Quality
 Division of Mitigation Services

Project:
**Neighbors Branch/
 Walton Crawley
 Branch Stream
 and Wetland
 Restoration Site**

**DMS Project
 # 92872**

McDowell County, NC

Title:
Project Assets

Drawn by: KRJ

Date: JUL 2016

Scale: 1:2400

Project No.: 12-004.21

FIGURE
3B

Table 5A
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Walton Crawley Branch
 1450

| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
|---|--|---|---------------------------------------|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|
| 1. Bed | 1. Vertical Stability (Riffle and Run units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars) | | | 0 | 0 | 100% | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting | | | 0 | 0 | 100% | | | |
| | 2. Riffle Condition | 1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate | 26 | 26 | | | 100% | | | |
| | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6) | 25 | 25 | | | 100% | | | |
| | | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) | 25 | 25 | | | 100% | | | |
| | 4. Thalweg Position | 1. Thalweg centering at upstream of meander bend (Run) | 25 | 25 | | | 100% | | | |
| 2. Thalweg centering at downstream of meander (Glide) | | 25 | 25 | | | 100% | | | | |
| Totals | | | | | | | | | | |
| 2. Bank | 1. Scoured/Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | 0 | 0 | 100% | | | 100% |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 0 | 100% | | | 100% |
| | 3. Mass Wasting | Bank slumping, calving, or collapse | | | 0 | 0 | 100% | | | 100% |
| Totals | | | | | | | | | | |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 24 | 24 | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 24 | 24 | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 24 | 24 | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document) | 24 | 24 | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow. | 24 | 24 | | | 100% | | | |

Table 5B
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 UT1 to Walton Crawley Branch
 518

| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
|---|--|---|---------------------------------------|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|
| 1. Bed | 1. Vertical Stability (Riffle and Run units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars) | | | 0 | 0 | 100% | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting | | | 0 | 0 | 100% | | | |
| | 2. Riffle Condition | 1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate | 8 | 8 | | | 100% | | | |
| | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6) | 7 | 7 | | | 100% | | | |
| | | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) | 7 | 7 | | | 100% | | | |
| | 4. Thalweg Position | 1. Thalweg centering at upstream of meander bend (Run) | 7 | 7 | | | 100% | | | |
| 2. Thalweg centering at downstream of meander (Glide) | | 7 | 7 | | | 100% | | | | |
| Totals | | | | | 0 | 0 | 100% | 0 | 0 | 100% |
| 2. Bank | 1. Scoured/Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | 0 | 0 | 100% | | | 100% |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 0 | 100% | | | 100% |
| | 3. Mass Wasting | Bank slumping, calving, or collapse | | | 0 | 0 | 100% | | | 100% |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 10 | 10 | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 10 | 10 | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 10 | 10 | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document) | 10 | 10 | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow. | 10 | 10 | | | 100% | | | |

Table 5C
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 UT2 to Walton Crawley Branch
 802

| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
|---|--|---|---------------------------------------|----|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|
| 1. Bed | 1. Vertical Stability (Riffle and Run units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars) | | | | 0 | 0 | 100% | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting | | | | 0 | 0 | 100% | | | |
| | 2. Riffle Condition | 1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate | 12 | 12 | | | | 100% | | | |
| | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6) | 11 | 11 | | | | 100% | | | |
| | | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) | 11 | 11 | | | | 100% | | | |
| | 4. Thalweg Position | 1. Thalweg centering at upstream of meander bend (Run) | 11 | 11 | | | | 100% | | | |
| 2. Thalweg centering at downstream of meander (Glide) | | 11 | 11 | | | | 100% | | | | |
| Totals | | | | | | 0 | 0 | 100% | 0 | 0 | 100% |
| 2. Bank | 1. Scoured/Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | | 0 | 0 | 100% | | | 100% |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | | 0 | 0 | 100% | | | 100% |
| | 3. Mass Wasting | Bank slumping, calving, or collapse | | | | 0 | 0 | 100% | | | 100% |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 12 | 12 | | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 12 | 12 | | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 12 | 12 | | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document) | 12 | 12 | | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow. | 12 | 12 | | | | 100% | | | |

Table 5D
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 Neighbors Branch
 1470

| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
|---|--|---|---------------------------------------|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|
| 1. Bed | 1. Vertical Stability (Riffle and Run units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars) | | | 0 | 0 | 100% | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting | | | 0 | 0 | 100% | | | |
| | 2. Riffle Condition | 1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate | 22 | 22 | | | 100% | | | |
| | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6) | 21 | 21 | | | 100% | | | |
| | | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) | 21 | 21 | | | 100% | | | |
| | 4. Thalweg Position | 1. Thalweg centering at upstream of meander bend (Run) | 21 | 21 | | | 100% | | | |
| 2. Thalweg centering at downstream of meander (Glide) | | 21 | 21 | | | 100% | | | | |
| Totals | | | | | 0 | 0 | 100% | 0 | 0 | 100% |
| 2. Bank | 1. Scoured/Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | 0 | 0 | 100% | | | 100% |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 0 | 100% | | | 100% |
| | 3. Mass Wasting | Bank slumping, calving, or collapse | | | 0 | 0 | 100% | | | 100% |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 16 | 16 | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 16 | 16 | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 16 | 16 | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document) | 16 | 16 | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow. | 16 | 16 | | | 100% | | | |

Table 5E
 Reach ID
 Assessed Length

Visual Stream Morphology Stability Assessment
 UT1 to Neighbors Branch
 281

| Major Channel Category | Channel Sub-Category | Metric | Number Stable, Performing as Intended | | Total Number in As-built | Number of Unstable Segments | Amount of Unstable Footage | % Stable, Performing as Intended | Number with Stabilizing Woody Vegetation | Footage with Stabilizing Woody Vegetation | Adjusted % for Stabilizing Woody Vegetation |
|---|--|---|---------------------------------------|----|--------------------------|-----------------------------|----------------------------|----------------------------------|--|---|---|
| 1. Bed | 1. Vertical Stability (Riffle and Run units) | 1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars) | | | | 0 | 0 | 100% | | | |
| | | 2. <u>Degradation</u> - Evidence of downcutting | | | | 0 | 0 | 100% | | | |
| | 2. Riffle Condition | 1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate | 20 | 20 | | | | 100% | | | |
| | 3. Meander Pool Condition | 1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6) | 19 | 19 | | | | 100% | | | |
| | | 2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle) | 19 | 19 | | | | 100% | | | |
| | 4. Thalweg Position | 1. Thalweg centering at upstream of meander bend (Run) | 19 | 19 | | | | 100% | | | |
| 2. Thalweg centering at downstream of meander (Glide) | | 19 | 19 | | | | 100% | | | | |
| Totals | | | | | | 0 | 0 | 100% | 0 | 0 | 100% |
| 2. Bank | 1. Scoured/Eroding | Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion | | | | 0 | 0 | 100% | | | 100% |
| | 2. Undercut | Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | | 0 | 0 | 100% | | | 100% |
| | 3. Mass Wasting | Bank slumping, calving, or collapse | | | | 0 | 0 | 100% | | | 100% |
| 3. Engineered Structures | 1. Overall Integrity | Structures physically intact with no dislodged boulders or logs. | 20 | 20 | | | | 100% | | | |
| | 2. Grade Control | Grade control structures exhibiting maintenance of grade across the sill. | 20 | 20 | | | | 100% | | | |
| | 2a. Piping | Structures lacking any substantial flow underneath sills or arms. | 20 | 20 | | | | 100% | | | |
| | 3. Bank Protection | Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document) | 20 | 20 | | | | 100% | | | |
| | 4. Habitat | Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow. | 20 | 20 | | | | 100% | | | |

Table 6

Vegetation Condition Assessment

Neighbors Branch/Walton Crawley Branch Mitigation Project

Planted Acreage¹

11.78

| Vegetation Category | Definitions | Mapping Threshold | CCPV Depiction | Number of Polygons | Combined Acreage | % of Planted Acreage |
|--|-------------|-------------------|----------------|--------------------|------------------|----------------------|
| 1. Bare Areas | None | 0.1 acres | none | 0 | 0.00 | 0.0% |
| 2. Low Stem Density Areas | None | 0.1 acres | none | 0 | 0.00 | 0.0% |
| 2B. Low Planted Stem Density Areas | None | 0.1 acres | none | 0 | 0.00 | 0.0% |
| Total | | | | 0 | 0.00 | 0.0% |
| 3. Areas of Poor Growth Rates or Vigor | None | 0.25 acres | N/A | 0 | 0.00 | 0.0% |
| Cumulative Total | | | | 0 | 0.00 | 0.0% |

Easement Acreage²

33.4

| Vegetation Category | Definitions | Mapping Threshold | CCPV Depiction | Number of Polygons | Combined Acreage | % of Easement Acreage |
|---|-------------|-------------------|----------------|--------------------|------------------|-----------------------|
| 4. Invasive Areas of Concern ⁴ | None | 1000 SF | none | 0 | 0.00 | 0.0% |
| 5. Easement Encroachment Areas ³ | None | none | none | 0 | 0.00 | 0.0% |

¹ = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

² = The acreage within the easement boundaries.

³ = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1, 2 or 3) as well as a parallel tally in item 5.

⁴ = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern species are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by DMS such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likely trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly early in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolizing invasives polygons, particularly for situations where the condition for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

**Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
November 2016**



Photo Point 1 –
Neighbors Branch

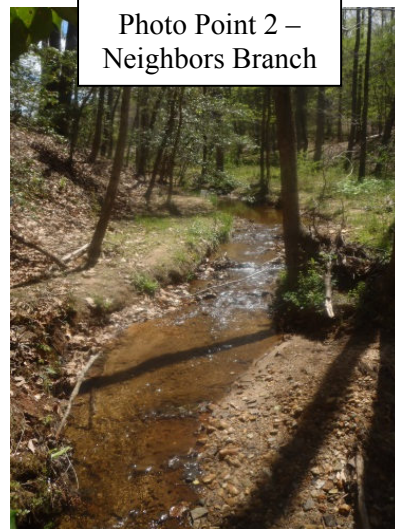


Photo Point 2 –
Neighbors Branch



Photo Point 3 – UT-1
to Neighbors Branch



Photo Point 4 – UT-1
to Neighbors Branch



Photo Point 5 – UT-1
to Neighbors Branch



Photo Point 6 – UT-1
to Neighbors Branch

**Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
November 2016
(continued)**



Photo Point 7 –
Neighbors Branch



Photo Point 8 –
Neighbors Branch



Photo Point 9 –
Neighbors Branch



Photo Point 10 –
Neighbors Branch



Photo Point 11 –
Neighbors Branch

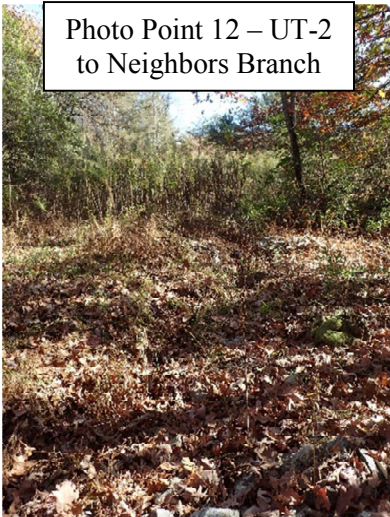


Photo Point 12 – UT-2
to Neighbors Branch

**Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
November 2016
(continued)**



Photo Point 13 – UT-2
to Neighbors Branch



Photo Point 14 –
Neighbors Branch



Photo Point 15 – UT-3
to Neighbors Branch



Photo Point 16 – UT-3
to Neighbors Branch

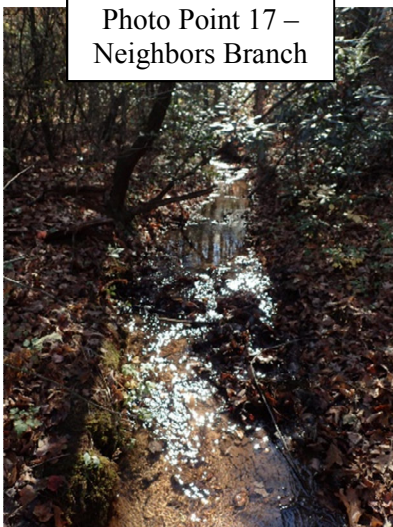


Photo Point 17 –
Neighbors Branch

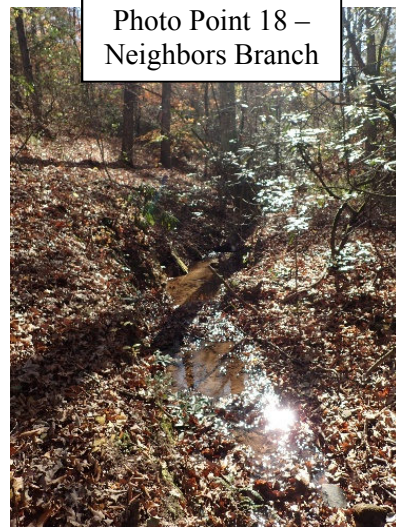


Photo Point 18 –
Neighbors Branch

**Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
November 2016
(continued)**



Photo Point 19 – Walton
Crawley Branch

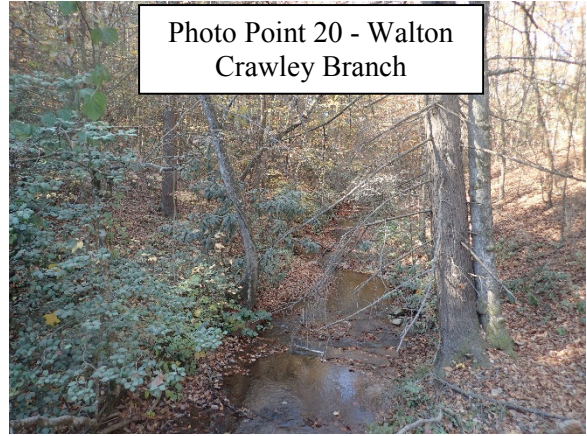


Photo Point 20 - Walton
Crawley Branch

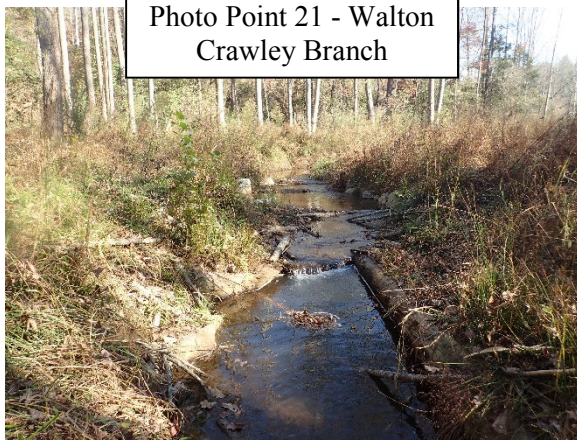


Photo Point 21 - Walton
Crawley Branch

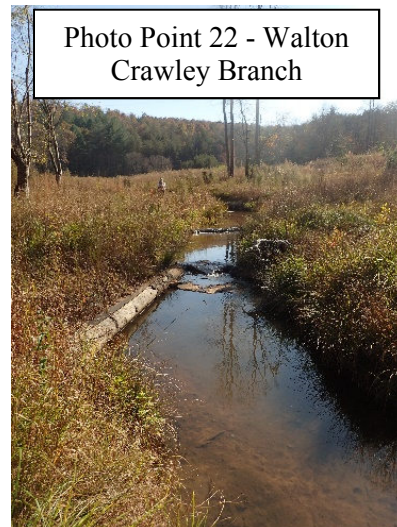


Photo Point 22 - Walton
Crawley Branch



Photo Point 23 - Walton
Crawley Branch



Photo Point 24 – UT-2 to
Walton Crawley Branch

**Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
November 2016
(continued)**

Photo Point 25 – UT-2 to
Walton Crawley Branch

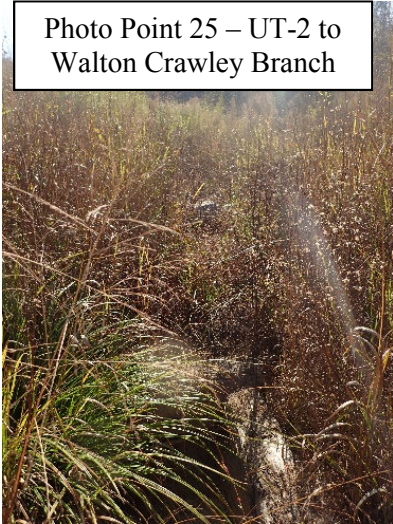


Photo Point 26 – UT-2 to
Walton Crawley Branch

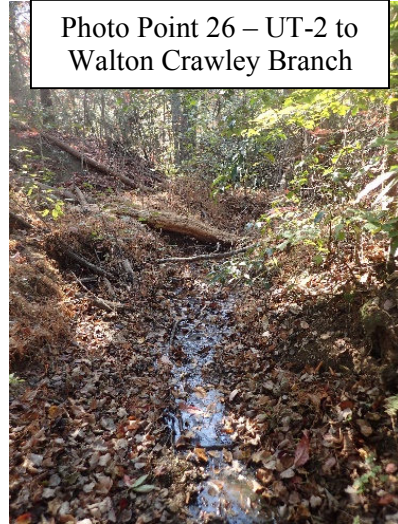


Photo Point 27 – UT-2 to
Walton Crawley Branch



Photo Point 28 – UT-2 to
Walton Crawley Branch

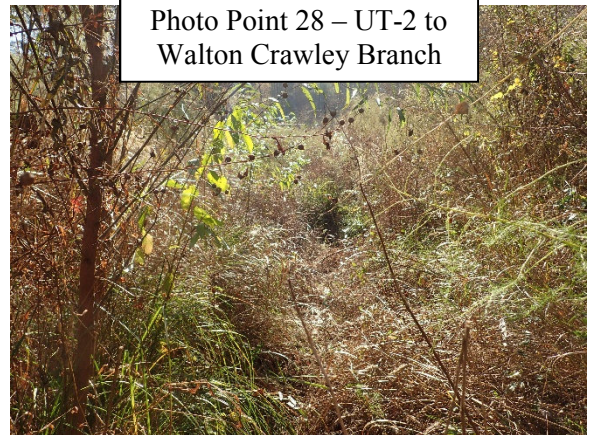


Photo Point 29 – UT-2 to
Walton Crawley Branch

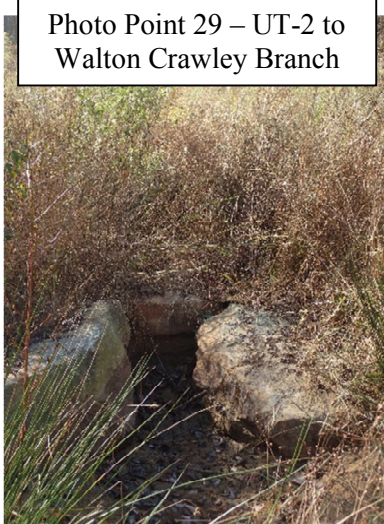
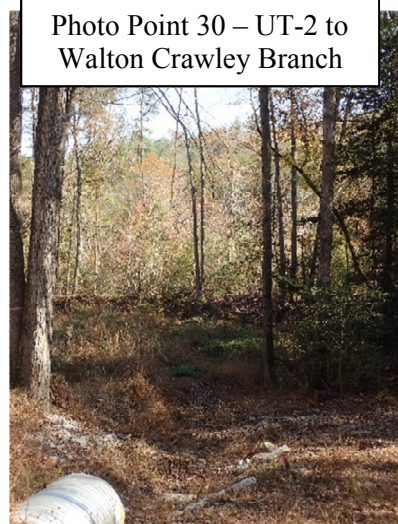


Photo Point 30 – UT-2 to
Walton Crawley Branch



**Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
November 2016
(continued)**

Photo Point 31 – UT-2 to
Walton Crawley Branch

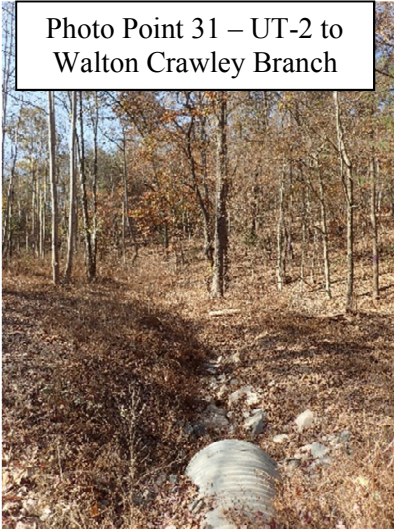


Photo Point 32 – UT-2 to
Walton Crawley Branch

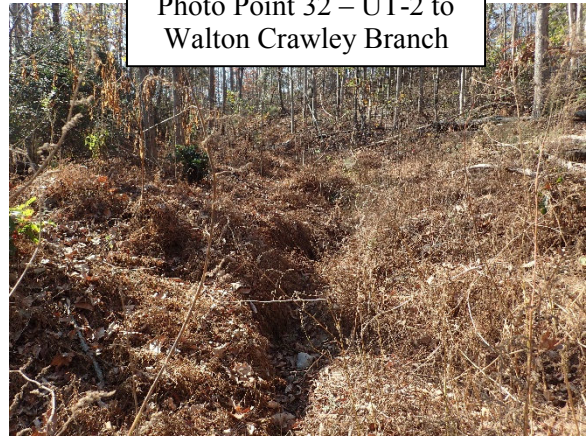


Photo Point 34 – UT-1 to
Walton Crawley Branch

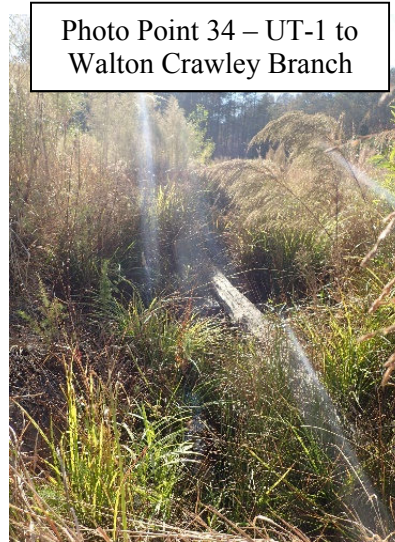


Photo Point 33 - Walton
Crawley Branch



Photo Point 35 – UT-1 to
Walton Crawley Branch

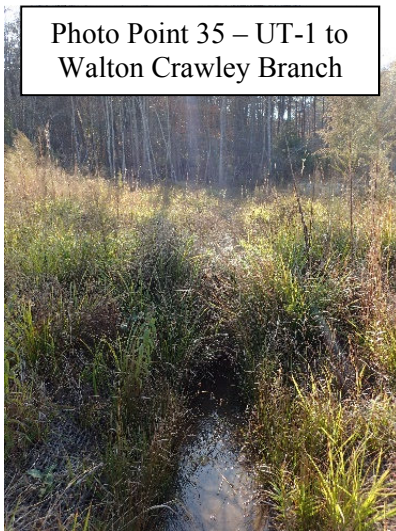
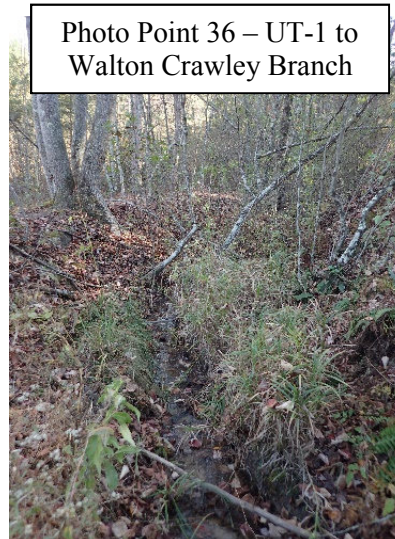


Photo Point 36 – UT-1 to
Walton Crawley Branch



Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site
Baseline Fixed Station Photographs
Taken April 12, 2016
(continued)

Photo Point 37 – UT-1 to
Walton Crawley Branch

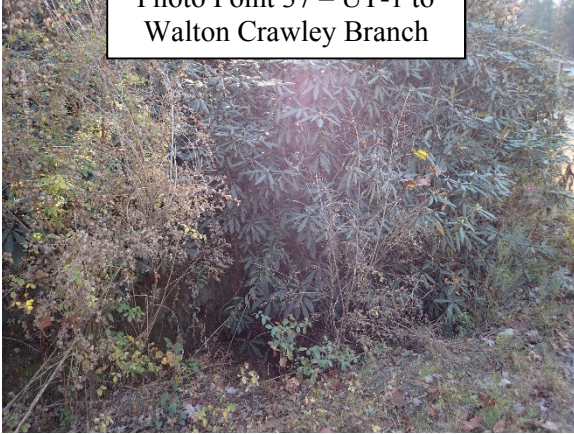


Photo Point 38 – UT-1 to
Walton Crawley Branch

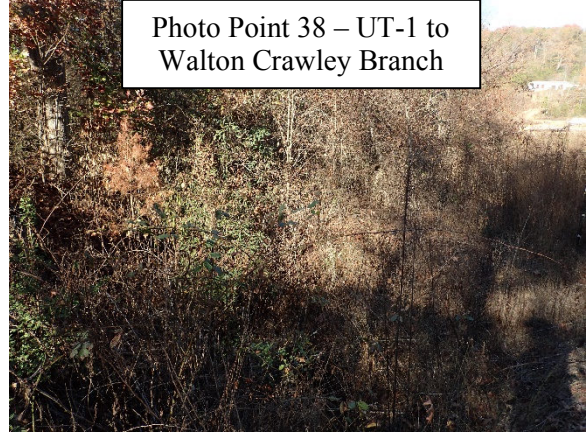


Photo Point 39 – UT-1 to
Walton Crawley Branch

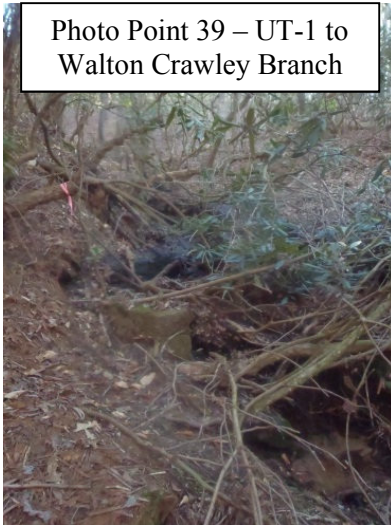


Photo Point 40 - Walton
Crawley Branch

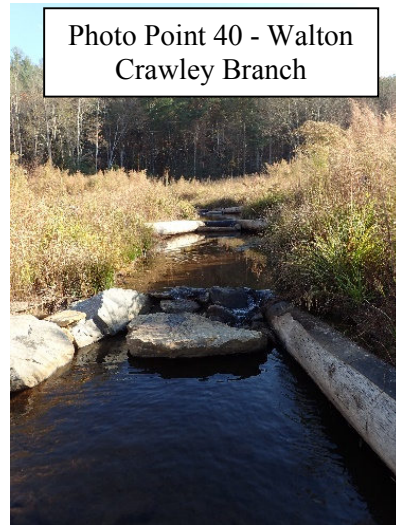
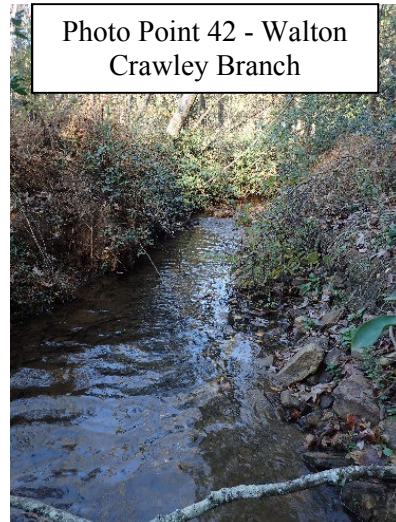


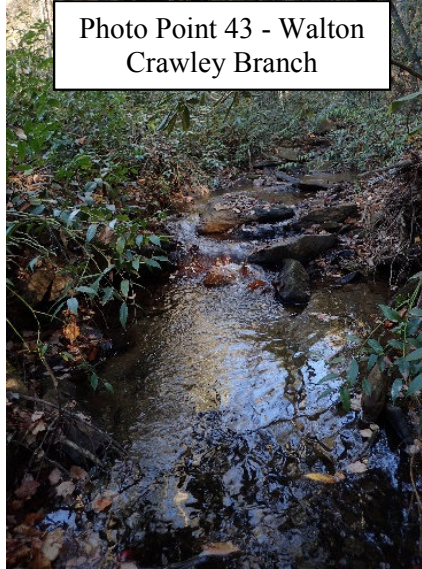
Photo Point 41 - Walton
Crawley Branch



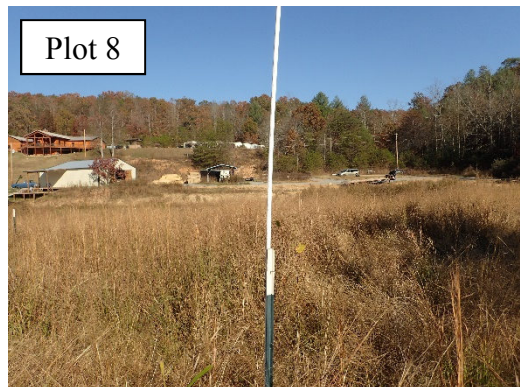
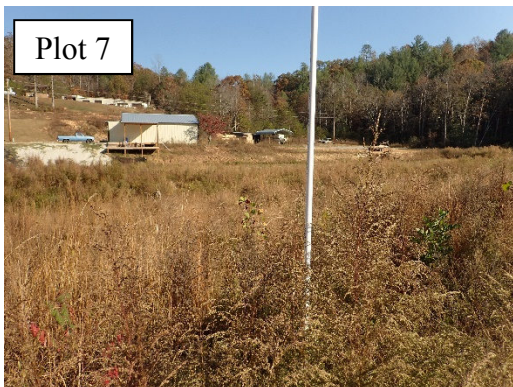
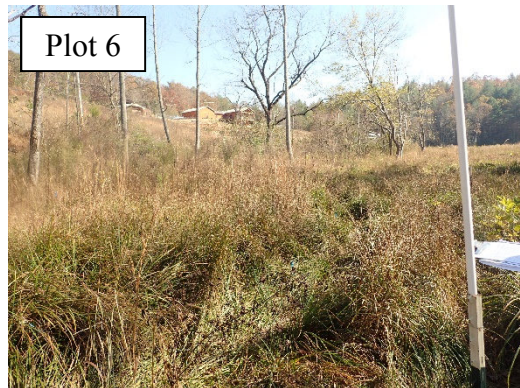
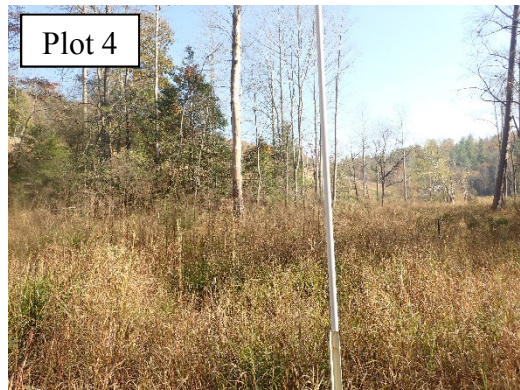
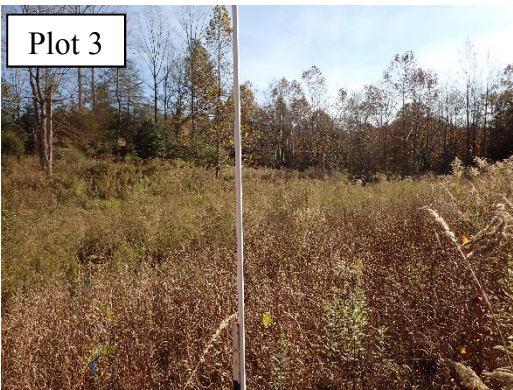
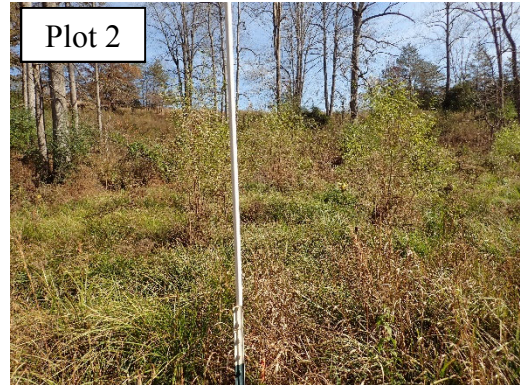
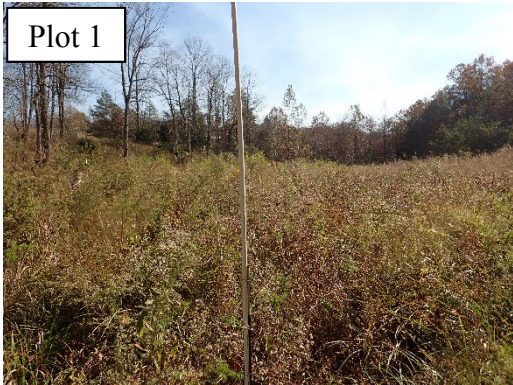
Photo Point 42 - Walton
Crawley Branch



**Neighbors Branch/Walton Crawley Branch
Fixed Station Photographs
November 2016
(continued)**



**Neighbors Branch/Walton Crawley Branch
Vegetation Monitoring Photographs Taken November 2016**



Appendix C.
Vegetation Data

- Table 7. Vegetation Plot Success Summary
Table 8. CVS Vegetation Plot Metadata
Table 9. Total Planted Stems by Plot and Species

Table 7. Vegetation Plot Success Summary

| Vegetation Plot ID | Vegetation Survival Threshold Met? | Tract Mean |
|--------------------|------------------------------------|------------|
| 1 | Yes | 100% |
| 2 | Yes | |
| 3 | Yes | |
| 4 | Yes | |
| 5 | Yes | |
| 6 | Yes | |
| 7 | Yes | |
| 8 | Yes | |

Table 8. CVS Vegetation Plot Metadata

| | |
|--|---|
| Report Prepared By | Phillip Perkinson |
| Date Prepared | 11/9/2016 14:56 |
| database name | Axiom-NeighborsWaltonCrawleyBranch-2016-A-v2.3.1.mdb |
| database location | S:\Business\Projects\12\12-004 EEP Monitoring\12-004.21 Neighbors Bob\Neighbors Branch and Walton Crawley Branch\MY-01\CVS |
| computer name | CORRI2-PC |
| file size | 58728448 |
| DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----- | |
| Metadata | Description of database file, the report worksheets, and a summary of project(s) and project data. |
| Proj, planted | Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes. |
| Proj, total stems | Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. |
| Plots | List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.). |
| Vigor | Frequency distribution of vigor classes for stems for all plots. |
| Vigor by Spp | Frequency distribution of vigor classes listed by species. |
| Damage | List of most frequent damage classes with number of occurrences and percent of total stems impacted by each. |
| Damage by Spp | Damage values tallied by type for each species. |
| Damage by Plot | Damage values tallied by type for each plot. |
| Planted Stems by Plot and Spp | A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded. |
| ALL Stems by Plot and spp | A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded. |
| PROJECT SUMMARY----- | |
| Project Code | 92872 |
| project Name | Neighbors Branch/ Walton Crawley Branch |
| River Basin | Catawba |
| length(ft) | |
| stream-to-edge width (ft) | |
| Required Plots (calculated) | |
| Sampled Plots | 8 |

Table 9. Total and Planted Stems by Plot and Species

DMS Project Code 92872. Project Name: Neighbors Branch/ Walton Crawley Branc

| Scientific Name | Common Name | Species Type | Current Plot Data (MY1 2016) | | | | | | | | | | | | | | | | | | | | | | | | Annual Means | | | | | | | | | | | |
|-------------------------|-------------------|--------------|------------------------------|-------|------|---------------|-------|-----|---------------|-------|------|---------------|-------|-----|---------------|-------|------|---------------|-------|-----|---------------|-------|-----|---------------|-------|-----|--------------|-------|-----|------------|-------|-----|-------|-------|----|---|---|----|
| | | | 92872-01-0001 | | | 92872-01-0002 | | | 92872-01-0003 | | | 92872-01-0004 | | | 92872-01-0005 | | | 92872-01-0006 | | | 92872-01-0007 | | | 92872-01-0008 | | | MY1 (2016) | | | MY0 (2016) | | | | | | | | |
| | | | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | PnoLS | P-all | T | | | |
| Acer rubrum | red maple | Tree | 4 | 4 | 4 | | | | 2 | 2 | 2 | 4 | 4 | 4 | 1 | 1 | 1 | | | | | | | | | | | | | | | | 11 | 11 | 11 | 6 | 6 | 17 |
| Betula nigra | river birch | Tree | 1 | 1 | 1 | 2 | 2 | 2 | 5 | 5 | 5 | 4 | 4 | 4 | | | | | | | 2 | 2 | 2 | 1 | 1 | 1 | | | | 15 | 15 | 15 | 16 | 16 | 16 | | | |
| Cornus amomum | silky dogwood | Shrub | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Diospyros virginiana | common persimmon | Tree | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Fraxinus pennsylvanica | green ash | Tree | | | | | | | 4 | 4 | 4 | 2 | 2 | 2 | 6 | 6 | 6 | 9 | 9 | 9 | 2 | 2 | 2 | 1 | 1 | 1 | | | | 24 | 24 | 24 | 31 | 31 | 31 | | | |
| Liriodendron tulipifera | tuliptree | Tree | | | | | | 1 | | | | | | 2 | | | | | | | | | | | | | | | | | | 3 | | | | | | |
| Nyssa | tupelo | Tree | | | | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | |
| Nyssa sylvatica | blackgum | Tree | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | | 1 | 1 | 1 | | | | | | | | | | | | | 3 | 3 | 3 | 6 | 6 | 6 | | | |
| Platanus occidentalis | American sycamore | Tree | 8 | 8 | 27 | 6 | 6 | 10 | 5 | 5 | 16 | | | | | | 19 | | | | 6 | 6 | 6 | 3 | 3 | 3 | | | | 28 | 28 | 81 | 29 | 29 | 29 | | | |
| Quercus | oak | Tree | | | | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | |
| Quercus nigra | water oak | Tree | | | | | | | | | | 1 | 1 | 1 | | | | 1 | 1 | 1 | | | | | | | | | | 2 | 2 | 2 | 4 | 4 | 4 | | | |
| Quercus phellos | willow oak | Tree | 1 | 1 | 1 | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | | | | 12 | 12 | 12 | 12 | 12 | 12 | | | |
| Quercus rubra | northern red oak | Tree | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Salix nigra | black willow | Tree | | | | | | 3 | | | | | | | | | | | | | | | | | | | | | | | | 3 | | | 10 | | | |
| Sambucus canadensis | Common Elderberry | Shrub | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4 | | | |
| Stem count | | | 14 | 14 | 33 | 9 | 9 | 17 | 18 | 18 | 29 | 14 | 14 | 16 | 9 | 9 | 28 | 13 | 13 | 13 | 12 | 12 | 12 | 11 | 11 | 11 | 100 | 100 | 159 | 107 | 107 | 132 | | | | | | |
| size (ares) | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 1 | | | 8 | | | 8 | | | | | | | | | | | |
| size (ACRES) | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.02 | | | 0.20 | | | 0.20 | | | | | | | | | | | |
| Species count | | | 4 | 4 | 4 | 3 | 3 | 5 | 6 | 6 | 6 | 7 | 7 | 8 | 4 | 4 | 5 | 3 | 3 | 3 | 4 | 4 | 4 | 6 | 6 | 6 | 12 | 12 | 14 | 10 | 10 | 12 | | | | | | |
| Stems per ACRE | | | 567 | 567 | 1335 | 364 | 364 | 688 | 728 | 728 | 1174 | 567 | 567 | 647 | 364 | 364 | 1133 | 526 | 526 | 526 | 486 | 486 | 486 | 445 | 445 | 445 | 506 | 506 | 804 | 541 | 541 | 668 | | | | | | |

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

PnoLS = Planted excluding livestakes

P-all = Planting including livestakes

T = All planted and natural recruits including livestakes

T includes natural recruits

Appendix D.
Stream Measurements and Geomorphology Data

Cross Section Plots
Longitudinal Profile Plots
Substrate Plots

Tables 10A-10B. Baseline Stream Data Summary
Tables 11A-11D. Monitoring Data-Dimensional Data Summary

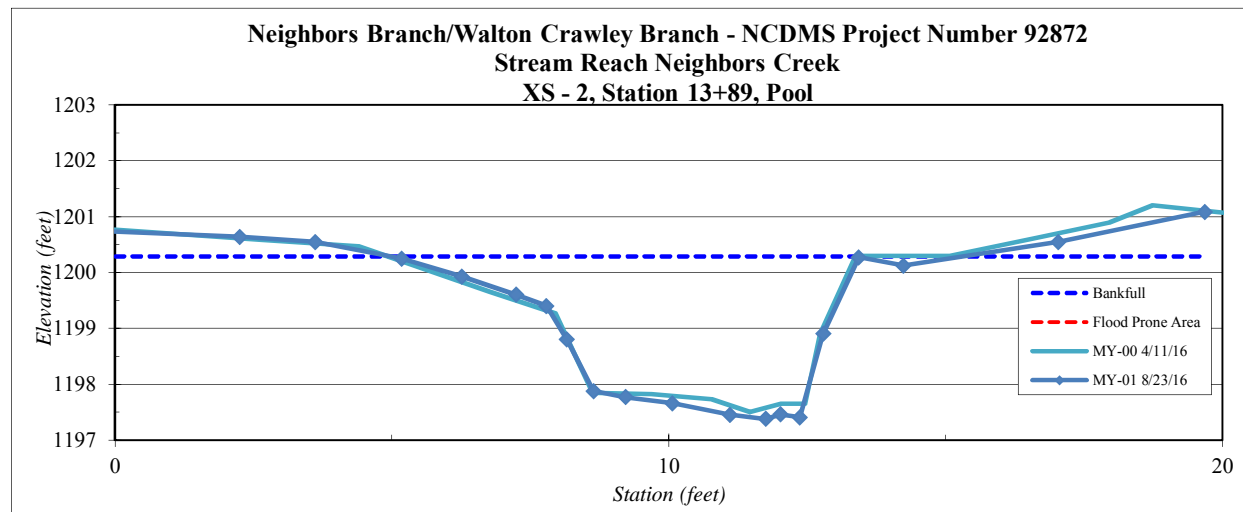
| | |
|------------------------|----------------------------------|
| Site | Neighbors Br./Walton Crawley Br. |
| Project Number: | 92872 |
| XS ID | XS - 2, Pool |
| Reach | Neighbors Branch |
| Date: | 8/23/2016 |
| Field Crew: | Perkinson, Jernigan |

| Station | Elevation |
|---------|-----------|
| -0.3 | 1200.7 |
| 2.2 | 1200.6 |
| 3.6 | 1200.5 |
| 5.2 | 1200.2 |
| 6.3 | 1199.9 |
| 7.2 | 1199.6 |
| 7.8 | 1199.4 |
| 8.2 | 1198.8 |
| 8.6 | 1197.9 |
| 9.2 | 1197.8 |
| 10.1 | 1197.7 |
| 11.1 | 1197.5 |
| 11.7 | 1197.4 |
| 12.0 | 1197.5 |
| 12.4 | 1197.4 |
| 12.8 | 1198.9 |
| 13.4 | 1200.3 |
| 14.2 | 1200.1 |
| 17.0 | 1200.5 |
| 19.7 | 1201.1 |
| | |

| SUMMARY DATA | |
|---------------------------------------|--------|
| Bankfull Elevation: | 1200.3 |
| Bankfull Cross-Sectional Area: | 14.1 |
| Bankfull Width: | 10.4 |
| Flood Prone Area Elevation: | NA |
| Flood Prone Width: | NA |
| Max Depth at Bankfull: | 2.9 |
| Mean Depth at Bankfull: | 1.4 |
| W / D Ratio: | NA |
| Entrenchment Ratio: | NA |
| Bank Height Ratio: | 1.0 |



| | |
|--------------------|---|
| Stream Type | E |
|--------------------|---|



| | |
|------------------------|----------------------------------|
| Site | Neighbors Br./Walton Crawley Br. |
| Project Number: | 92872 |
| XS ID | XS - 4, Riffle |
| Reach | Walton Crawley Branch |
| Date: | 8/23/2016 |
| Field Crew: | Perkinson, Jernigan |

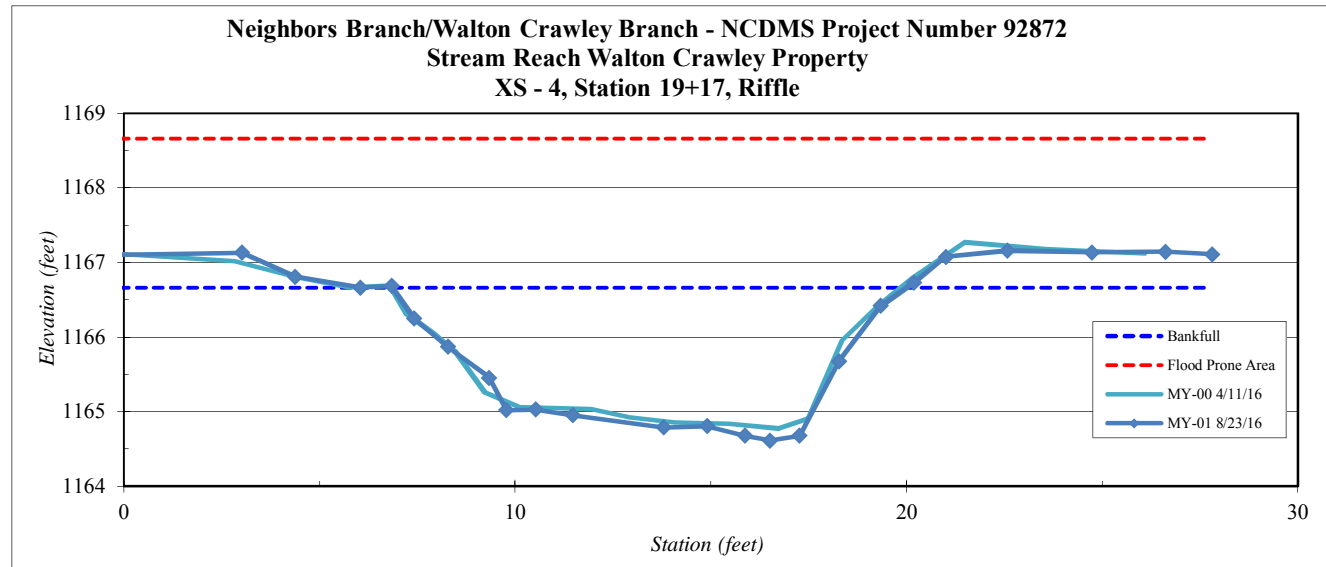


XS 4 Looking Upstream

| | |
|--------------------|---|
| Stream Type | E |
|--------------------|---|

| Station | Elevation |
|---------|-----------|
| -0.10 | 1167.10 |
| 3.02 | 1167.13 |
| 4.38 | 1166.81 |
| 6.05 | 1166.66 |
| 6.84 | 1166.68 |
| 7.42 | 1166.25 |
| 8.28 | 1165.87 |
| 9.34 | 1165.45 |
| 9.78 | 1165.02 |
| 10.52 | 1165.03 |
| 11.47 | 1164.95 |
| 13.80 | 1164.79 |
| 14.90 | 1164.81 |
| 15.88 | 1164.68 |
| 16.51 | 1164.61 |
| 17.3 | 1164.68 |
| 18.3 | 1165.67 |
| 19.3 | 1166.42 |
| 20.2 | 1166.73 |
| 21.0 | 1167.08 |
| 22.6 | 1167.16 |
| 24.7 | 1167.13 |
| 26.6 | 1167.14 |
| 27.8 | 1167.11 |

| SUMMARY DATA | |
|---------------------------------------|--------|
| Bankfull Elevation: | 1166.7 |
| Bankfull Cross-Sectional Area: | 18.2 |
| Bankfull Width: | 13.1 |
| Flood Prone Area Elevation: | 1168.7 |
| Flood Prone Width: | 100.0 |
| Max Depth at Bankfull: | 2.0 |
| Mean Depth at Bankfull: | 1.4 |
| W / D Ratio: | 9.4 |
| Entrenchment Ratio: | 7.6 |
| Bank Height Ratio: | 1.0 |



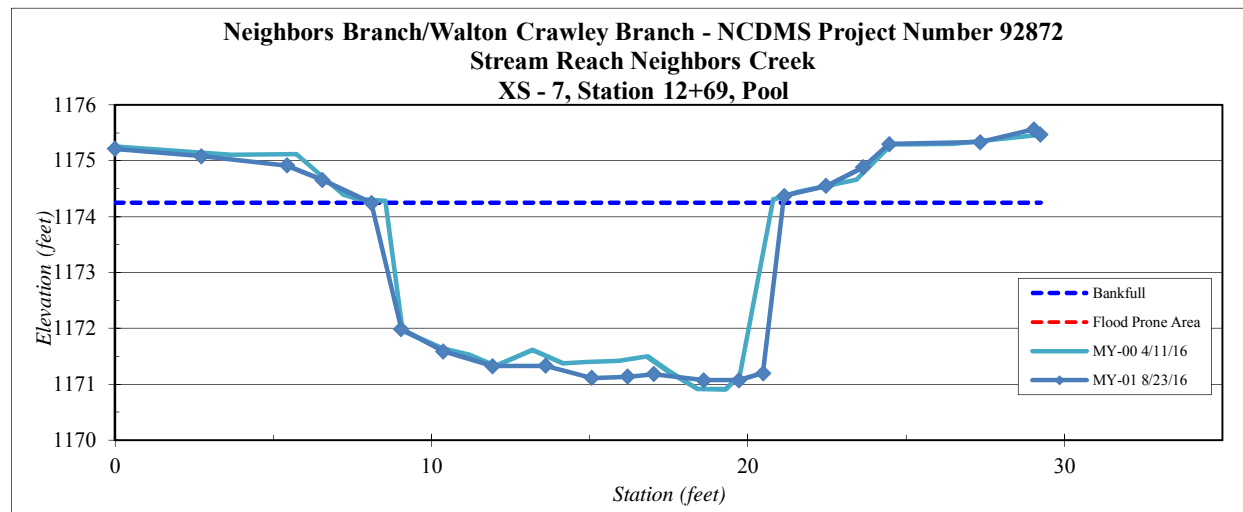
| | |
|------------------------|----------------------------------|
| Site | Neighbors Br./Walton Crawley Br. |
| Project Number: | 92872 |
| XS ID | XS - 7, Pool |
| Reach | Walton Crawley Branch |
| Date: | 8/23/2016 |
| Field Crew: | Perkinson, Jernigan |

| Station | Elevation |
|---------|-----------|
| 0.0 | 1175.2 |
| 2.7 | 1175.1 |
| 5.4 | 1174.9 |
| 6.5 | 1174.7 |
| 8.1 | 1174.2 |
| 9.0 | 1172.0 |
| 10.4 | 1171.6 |
| 11.9 | 1171.3 |
| 13.6 | 1171.3 |
| 15.1 | 1171.1 |
| 16.2 | 1171.1 |
| 17.0 | 1171.2 |
| 18.6 | 1171.1 |
| 19.7 | 1171.1 |
| 20.5 | 1171.2 |
| 21.1 | 1174.4 |
| 22.5 | 1174.5 |
| 23.6 | 1174.9 |
| 24.5 | 1175.3 |
| 27.3 | 1175.3 |
| 29.0 | 1175.6 |
| 29.3 | 1175.5 |
| | |
| | |
| | |

| SUMMARY DATA | |
|---------------------------------------|--------|
| Bankfull Elevation: | 1174.3 |
| Bankfull Cross-Sectional Area: | 35.9 |
| Bankfull Width: | 13.0 |
| Flood Prone Area Elevation: | NA |
| Flood Prone Width: | NA |
| Max Depth at Bankfull: | 3.2 |
| Mean Depth at Bankfull: | 2.8 |
| W / D Ratio: | NA |
| Entrenchment Ratio: | NA |
| Bank Height Ratio: | 1.0 |



| | |
|--------------------|---|
| Stream Type | E |
|--------------------|---|

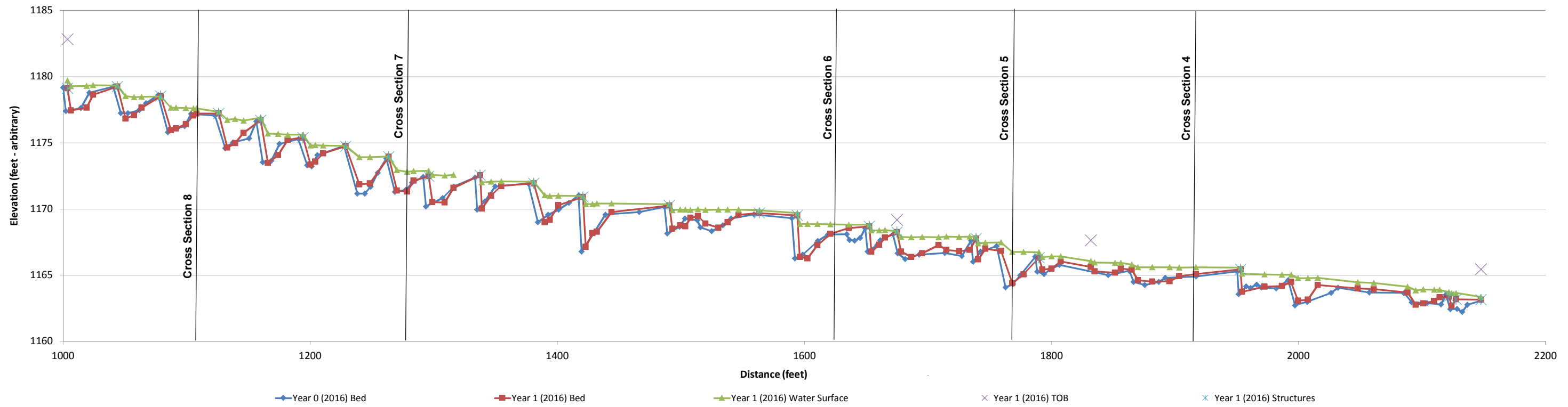


Project Name Neighbors Branch/Walton Crawley Branch - Profile
Reach Walton Crawley Branch, Station 10+00 - 22+00
Feature Profile
Date 8/23/16
Crew Perkinson, Jernigan

| 2016 Year 0 Monitoring \Survey | | | 2016 Year 1 Monitoring \Survey | | | 2017 Year 2 Monitoring \Survey | | | 2018 Year 3 Monitoring \Survey | | | 2019 Year 4 Monitoring \Survey | | |
|-----------------------------------|---------------|-----------------|-----------------------------------|---------------|-----------------|-----------------------------------|---------------|-----------------|-----------------------------------|---------------|-----------------|-----------------------------------|---------------|-----------------|
| Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation |
| 2147.7 | 1163.1 | 1163.3 | 2147.7 | 1163.1 | 1163.4 | | | | | | | | | |
| 2136.7 | 1162.8 | 1163.4 | 2127.6 | 1163.2 | 1163.6 | | | | | | | | | |
| 2132.5 | 1162.2 | 1163.3 | 2123.9 | 1162.7 | 1163.6 | | | | | | | | | |
| 2128.3 | 1162.5 | 1163.3 | 2121.6 | 1163.4 | 1163.7 | | | | | | | | | |
| 2122.8 | 1162.4 | 1163.5 | 2114.1 | 1163.3 | 1163.9 | | | | | | | | | |
| 2119.2 | 1163.5 | 1163.7 | 2109.9 | 1163.0 | 1163.9 | | | | | | | | | |
| 2115.3 | 1162.8 | 1163.7 | 2101.0 | 1162.9 | 1163.9 | | | | | | | | | |
| 2104.0 | 1162.9 | 1163.8 | 2094.9 | 1162.8 | 1163.8 | | | | | | | | | |
| 2091.7 | 1162.9 | 1163.8 | 2088.3 | 1163.7 | 1164.1 | | | | | | | | | |
| 2085.1 | 1163.6 | 1163.9 | 2060.8 | 1163.9 | 1164.4 | | | | | | | | | |
| 2057.2 | 1163.7 | 1164.3 | 2048.0 | 1164.0 | 1164.4 | | | | | | | | | |
| 2031.9 | 1164.0 | 1164.5 | 2015.6 | 1164.3 | 1164.8 | | | | | | | | | |
| 2026.5 | 1163.7 | 1164.6 | 2007.5 | 1163.1 | 1164.8 | | | | | | | | | |
| 2007.1 | 1163.0 | 1164.6 | 1999.5 | 1163.1 | 1164.8 | | | | | | | | | |
| 1997.2 | 1162.7 | 1164.6 | 1993.9 | 1164.5 | 1165.0 | | | | | | | | | |
| 1991.6 | 1164.6 | 1165.0 | 1986.7 | 1164.2 | 1165.0 | | | | | | | | | |
| 1981.9 | 1164.0 | 1164.9 | 1972.6 | 1164.1 | 1165.0 | | | | | | | | | |
| 1969.8 | 1164.1 | 1164.9 | 1954.3 | 1163.7 | 1165.1 | | | | | | | | | |
| 1966.1 | 1164.3 | 1164.9 | 1953.1 | 1165.4 | 1165.6 | | | | | | | | | |
| 1961.1 | 1164.0 | 1165.0 | 1916.9 | 1165.1 | 1165.6 | | | | | | | | | |
| 1957.7 | 1164.1 | 1164.9 | 1903.5 | 1164.9 | 1165.6 | | | | | | | | | |
| 1951.6 | 1163.6 | 1165.0 | 1895.6 | 1164.5 | 1165.6 | | | | | | | | | |
| 1950.3 | 1165.3 | 1165.4 | 1881.5 | 1164.5 | 1165.6 | | | | | | | | | |
| 1916.9 | 1164.9 | 1165.5 | 1870.0 | 1164.6 | 1165.6 | | | | | | | | | |
| 1892.2 | 1164.8 | 1165.5 | 1864.9 | 1165.4 | 1165.8 | | | | | | | | | |
| 1886.9 | 1164.5 | 1165.5 | 1856.2 | 1165.5 | 1165.9 | | | | | | | | | |
| 1875.7 | 1164.2 | 1165.5 | 1851.4 | 1165.2 | 1165.9 | | | | | | | | | |
| 1866.4 | 1164.5 | 1165.5 | 1835.0 | 1165.3 | 1166.0 | | | | | | | | | |

| | 2016 | 2016 | 2017 | 2018 | 2019 |
|--------------------------|--------|--------|------|------|------|
| Avg. Water Surface Slope | 0.0145 | 0.0143 | | | |
| Riffle Length | 24 | 24 | | | |
| Avg. Riffle Slope | 0.0032 | 0.0055 | | | |
| Pool Length | 25 | 23 | | | |
| Pool to Pool Spacing | 43 | 42 | | | |

Walton Crawley Branch Year 1 (2014) Profile - Station 10+00 to 22+00

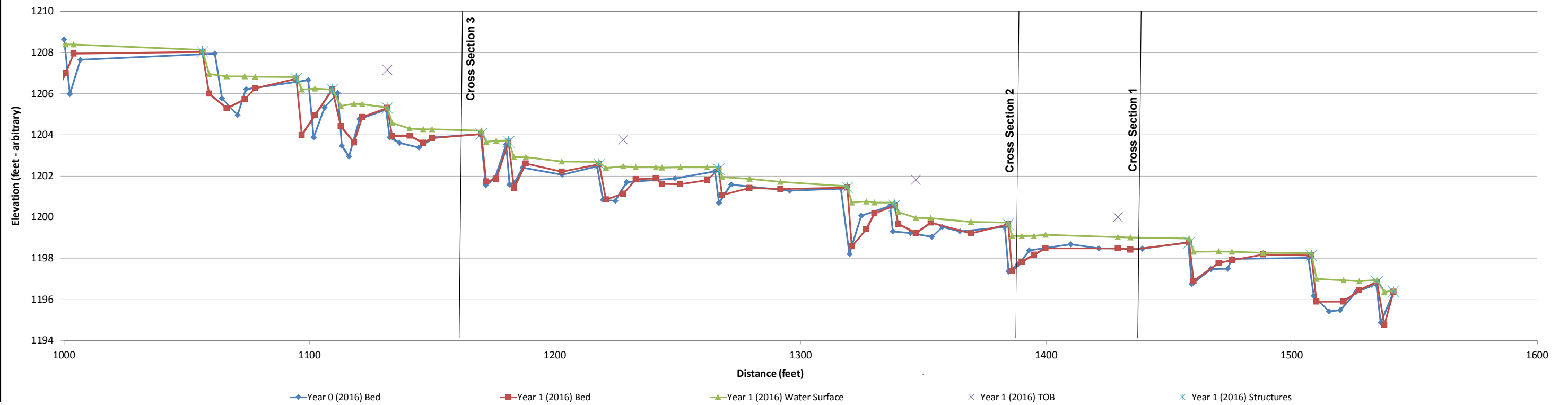


Project Name Neighbors Branch/Walton Crawley Branch - Profile
Reach Neighbors Branch, Station 10+00 - 16+00
Feature Profile
Date 8/23/16
Crew Perkinson, Jernigan

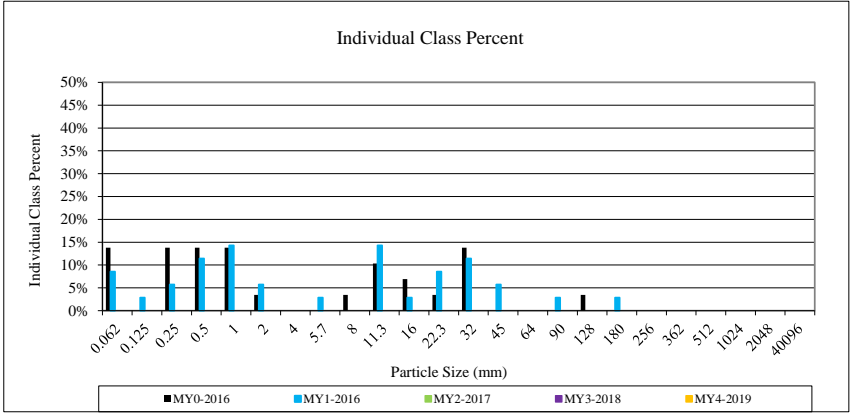
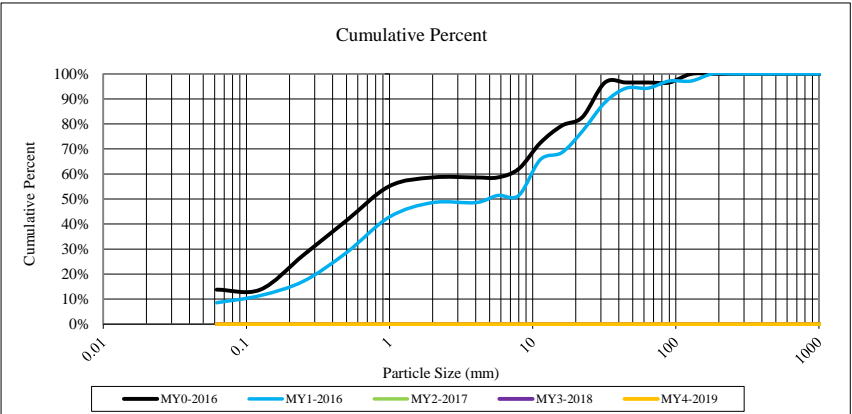
| 2016 Year 0 Monitoring \Survey | | | 2016 Year 1 Monitoring \Survey | | | 2017 Year 2 Monitoring \Survey | | | 2018 Year 3 Monitoring \Survey | | | 2019 Year 4 Monitoring \Survey | | |
|-----------------------------------|---------------|-----------------|-----------------------------------|---------------|-----------------|-----------------------------------|---------------|-----------------|-----------------------------------|---------------|-----------------|-----------------------------------|---------------|-----------------|
| Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation | Station | Bed Elevation | Water Elevation |
| 1541.4 | 1196.4 | 1196.4 | 1541.4 | 1196.4 | 1196.4 | | | | | | | | | |
| 1536.2 | 1194.9 | 1196.4 | 1537.7 | 1194.8 | 1196.4 | | | | | | | | | |
| 1534.4 | 1196.7 | 1196.9 | 1534.6 | 1196.8 | 1196.9 | | | | | | | | | |
| 1526.1 | 1196.4 | 1196.9 | 1527.5 | 1196.5 | 1196.9 | | | | | | | | | |
| 1519.8 | 1195.5 | 1196.9 | 1521.1 | 1195.9 | 1196.9 | | | | | | | | | |
| 1515.2 | 1195.4 | 1196.9 | 1510.1 | 1195.9 | 1197.0 | | | | | | | | | |
| 1508.9 | 1196.2 | 1197.0 | 1507.9 | 1198.1 | 1198.3 | | | | | | | | | |
| 1506.7 | 1198.0 | 1198.2 | 1488.4 | 1198.2 | 1198.3 | | | | | | | | | |
| 1475.6 | 1198.0 | 1198.3 | 1475.6 | 1197.9 | 1198.3 | | | | | | | | | |
| 1473.9 | 1197.5 | 1198.3 | 1470.3 | 1197.8 | 1198.3 | | | | | | | | | |
| 1467.1 | 1197.5 | 1198.3 | 1460.0 | 1196.9 | 1198.3 | | | | | | | | | |
| 1459.3 | 1196.8 | 1198.4 | 1458.2 | 1198.8 | 1199.0 | | | | | | | | | |
| 1457.8 | 1198.8 | 1198.9 | 1434.3 | 1198.4 | 1199.0 | | | | | | | | | |
| 1439.1 | 1198.5 | 1199.0 | 1429.2 | 1198.5 | 1199.0 | | | | | | | | | |
| 1421.5 | 1198.5 | 1199.0 | 1399.7 | 1198.5 | 1199.1 | | | | | | | | | |
| 1410.0 | 1198.7 | 1199.0 | 1395.0 | 1198.2 | 1199.1 | | | | | | | | | |
| 1393.1 | 1198.4 | 1199.1 | 1390.1 | 1197.8 | 1199.1 | | | | | | | | | |
| 1388.5 | 1197.7 | 1199.0 | 1386.0 | 1197.4 | 1199.1 | | | | | | | | | |
| 1384.7 | 1197.4 | 1199.0 | 1384.5 | 1199.7 | 1199.7 | | | | | | | | | |
| 1383.2 | 1199.5 | 1199.7 | 1369.3 | 1199.2 | 1199.8 | | | | | | | | | |
| 1364.9 | 1199.3 | 1199.8 | 1353.1 | 1199.7 | 1199.9 | | | | | | | | | |
| 1357.6 | 1199.5 | 1199.9 | 1346.9 | 1199.2 | 1200.0 | | | | | | | | | |
| 1353.4 | 1199.0 | 1199.9 | 1339.7 | 1199.7 | 1200.2 | | | | | | | | | |
| 1344.8 | 1199.2 | 1199.9 | 1338.2 | 1200.6 | 1200.7 | | | | | | | | | |
| 1337.5 | 1199.3 | 1200.3 | 1330.0 | 1200.2 | 1200.7 | | | | | | | | | |
| 1336.4 | 1200.5 | 1200.7 | 1326.7 | 1199.4 | 1200.8 | | | | | | | | | |
| 1324.7 | 1200.1 | 1200.7 | 1320.8 | 1198.6 | 1200.7 | | | | | | | | | |
| 1319.9 | 1198.2 | 1200.7 | 1318.9 | 1201.4 | 1201.5 | | | | | | | | | |

| | 2016 | 2016 | 2017 | 2018 | 2019 |
|--------------------------|--------|--------|------|------|------|
| Avg. Water Surface Slope | 0.0222 | 0.0220 | | | |
| Riffle Length | 28 | 26 | | | |
| Avg. Riffle Slope | 0.0043 | 0.0046 | | | |
| Pool Length | 12 | 15 | | | |
| Pool to Pool Spacing | 36 | 34 | | | |

Neighbors Branch Year 1 (2016) Profile - Station 10+00 to 16+00

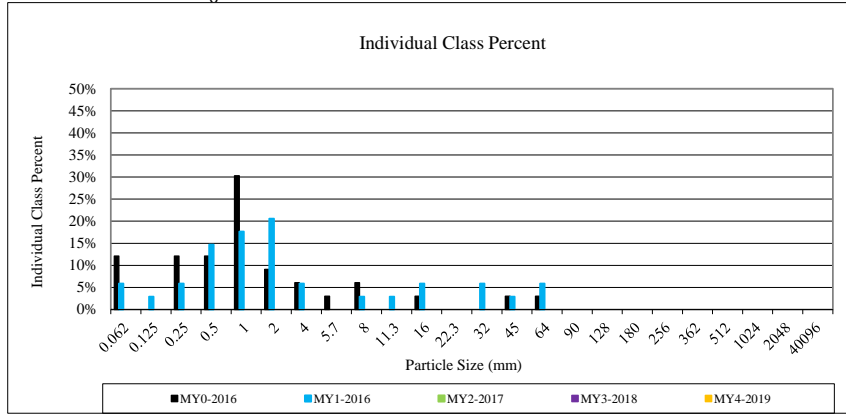
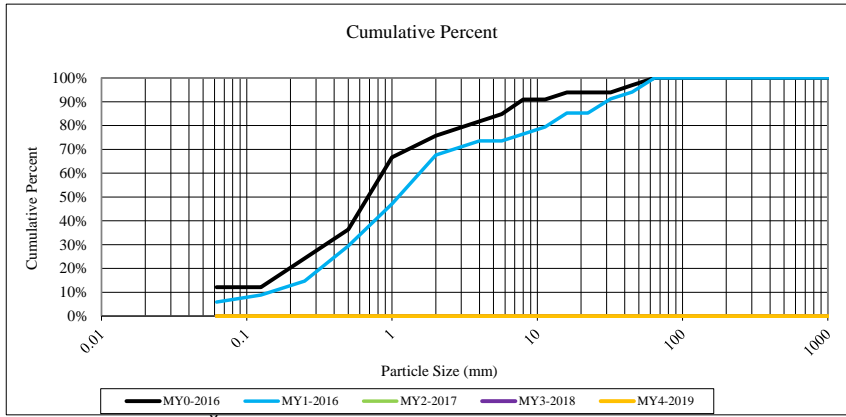


| Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site | | | | | |
|--|--------------------|-----------|---------|--------|-------|
| Cross-Section: 1 | | | | | |
| Feature: Riffle | | | | | |
| | | 2016 | | | |
| Description | Material | Size (mm) | Total # | Item % | Cum % |
| Silt/Clay | silt/clay | 0.062 | 3 | 9% | 36% |
| | | | | | |
| Sand | very fine sand | 0.125 | 1 | 3% | 44% |
| | fine sand | 0.250 | 2 | 6% | 48% |
| | medium sand | 0.50 | 4 | 11% | 48% |
| | coarse sand | 1.00 | 5 | 14% | 56% |
| | very coarse sand | 2.0 | 2 | 6% | 60% |
| Gravel | very fine gravel | 4.0 | 0 | 0% | 68% |
| | fine gravel | 5.7 | 1 | 3% | 72% |
| | fine gravel | 8.0 | 0 | 0% | 84% |
| | medium gravel | 11.3 | 5 | 14% | 92% |
| | medium gravel | 16.0 | 1 | 3% | 92% |
| | course gravel | 22.3 | 3 | 9% | 96% |
| | course gravel | 32.0 | 4 | 11% | 96% |
| | very coarse gravel | 45 | 2 | 6% | 96% |
| | very coarse gravel | 64 | 0 | 0% | 100% |
| Cobble | small cobble | 90 | 1 | 3% | 100% |
| | medium cobble | 128 | 0 | 0% | 100% |
| | large cobble | 180 | 1 | 3% | 100% |
| | very large cobble | 256 | 0 | 0% | 100% |
| Boulder | small boulder | 362 | 0 | 0% | 100% |
| | small boulder | 512 | 0 | 0% | 100% |
| | medium boulder | 1024 | 0 | 0% | 100% |
| | large boulder | 2048 | 0 | 0% | 100% |
| Bedrock | bedrock | 40096 | 0 | 0% | 100% |
| TOTAL % of whole count | | | 35 | 100% | 100% |
| Summary Data | | | | | |
| D50 | 4.9 | | | | |
| D84 | 28 | | | | |
| D95 | 70 | | | | |



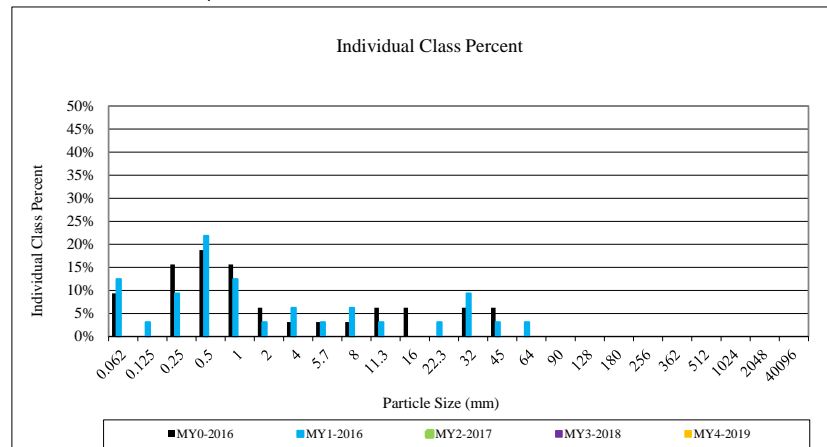
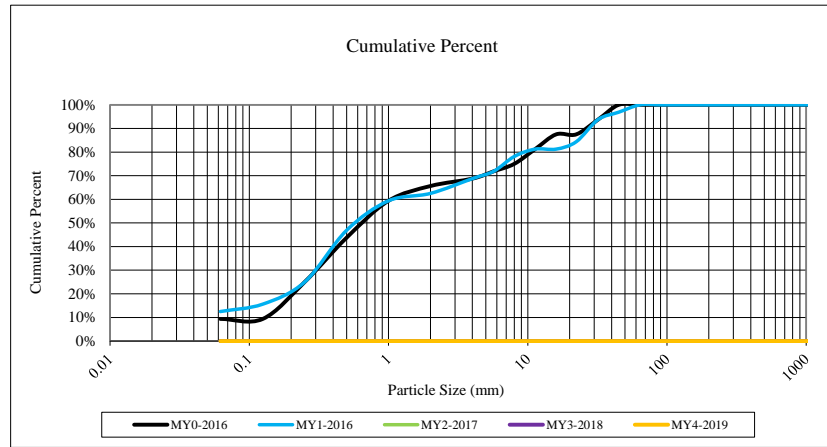
| Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site | | | | | | |
|--|--------------------|---------------|---------|--------|-------|------|
| Cross-Section: 3 | | | | | | |
| Feature: Riffle | | | | | | |
| | | | 2016 | | | |
| Description | Material | Size (mm) | Total # | Item % | Cum % | |
| Silt/Clay | silt/clay | 0.062 | 2 | 6% | 33% | |
| | very fine sand | 0.125 | 1 | 3% | 43% | |
| Sand | fine sand | 0.250 | 2 | 6% | 48% | |
| | medium sand | 0.50 | 5 | 15% | 52% | |
| | coarse sand | 1.00 | 6 | 18% | 62% | |
| | very coarse sand | 2.0 | 7 | 21% | 67% | |
| | very fine gravel | 4.0 | 2 | 6% | 67% | |
| Gravel | fine gravel | 5.7 | 0 | 0% | 67% | |
| | fine gravel | 8.0 | 1 | 3% | 71% | |
| | medium gravel | 11.3 | 1 | 3% | 76% | |
| | medium gravel | 16.0 | 2 | 6% | 86% | |
| | course gravel | 22.3 | 0 | 0% | 90% | |
| | course gravel | 32.0 | 2 | 6% | 95% | |
| | very coarse gravel | 45 | 1 | 3% | 95% | |
| | very coarse gravel | 64 | 2 | 6% | 95% | |
| | Cobble | small cobble | 90 | 0 | 0% | 100% |
| | | medium cobble | 128 | 0 | 0% | 100% |
| large cobble | | 180 | 0 | 0% | 100% | |
| very large cobble | | 256 | 0 | 0% | 100% | |
| Boulder | | small boulder | 362 | 0 | 0% | 100% |
| | small boulder | 512 | 0 | 0% | 100% | |
| | medium boulder | 1024 | 0 | 0% | 100% | |
| | large boulder | 2048 | 0 | 0% | 100% | |
| Bedrock | bedrock | 40096 | 0 | 0% | 100% | |
| TOTAL % of whole count | | | 34 | 100% | 100% | |

| Summary Data | |
|--------------|-----|
| D50 | 1.1 |
| D84 | 15 |
| D95 | 47 |



| Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site | | | | | | |
|--|--------------------|---------------|---------|--------|-------|------|
| Cross-Section: 4 | | | | | | |
| Feature: Riffle | | | | | | |
| | | | 2016 | | | |
| Description | Material | Size (mm) | Total # | Item % | Cum % | |
| Silt/Clay | silt/clay | 0.062 | 4 | 13% | 24% | |
| | very fine sand | 0.125 | 1 | 3% | 32% | |
| Sand | fine sand | 0.250 | 3 | 9% | 44% | |
| | medium sand | 0.50 | 7 | 22% | 48% | |
| | coarse sand | 1.00 | 4 | 13% | 56% | |
| | very coarse sand | 2.0 | 1 | 3% | 60% | |
| | very fine gravel | 4.0 | 2 | 6% | 68% | |
| Gravel | fine gravel | 5.7 | 1 | 3% | 72% | |
| | fine gravel | 8.0 | 2 | 6% | 80% | |
| | medium gravel | 11.3 | 1 | 3% | 80% | |
| | medium gravel | 16.0 | 0 | 0% | 84% | |
| | course gravel | 22.3 | 1 | 3% | 96% | |
| | course gravel | 32.0 | 3 | 9% | 96% | |
| | very coarse gravel | 45 | 1 | 3% | 96% | |
| | very coarse gravel | 64 | 1 | 3% | 100% | |
| | Cobble | small cobble | 90 | 0 | 0% | 100% |
| | | medium cobble | 128 | 0 | 0% | 100% |
| large cobble | | 180 | 0 | 0% | 100% | |
| very large cobble | | 256 | 0 | 0% | 100% | |
| Boulder | | small boulder | 362 | 0 | 0% | 100% |
| | small boulder | 512 | 0 | 0% | 100% | |
| | medium boulder | 1024 | 0 | 0% | 100% | |
| | large boulder | 2048 | 0 | 0% | 100% | |
| | Bedrock | bedrock | 40096 | 0 | 0% | 100% |
| TOTAL % of whole count | | | 32 | 100% | 100% | |

| Summary Data | |
|--------------|-----|
| D50 | 0.6 |
| D84 | 21 |
| D95 | 37 |



Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site

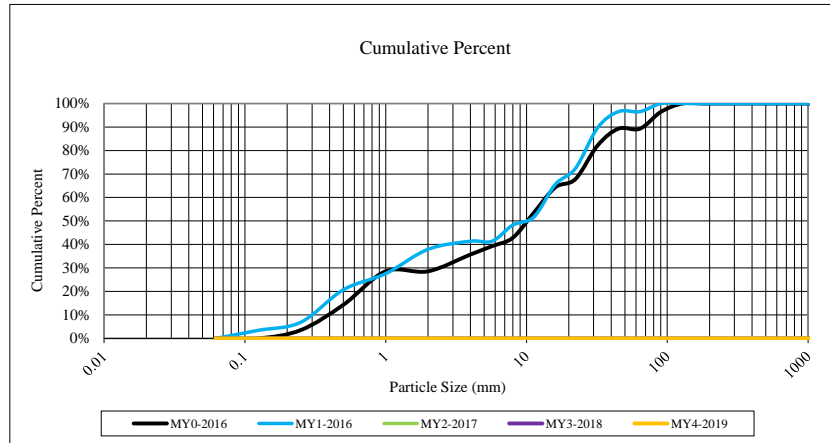
Cross-Section: 6

Feature: Riffle

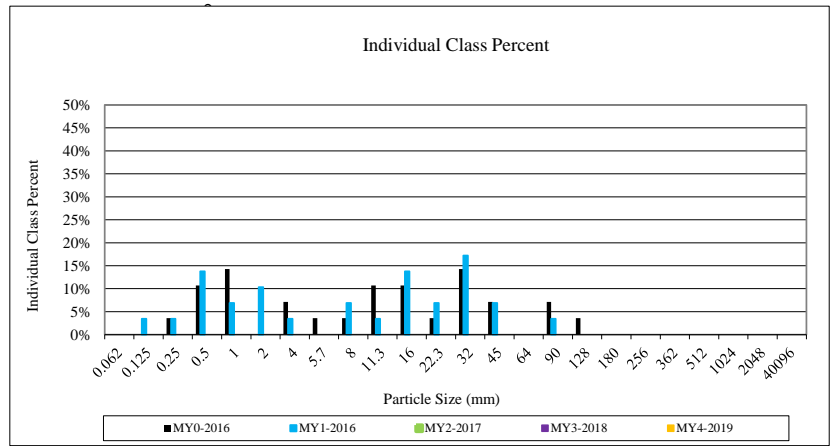
| Description | Material | Size (mm) | 2016 | | |
|-------------------------------|--------------------|-----------|---------|--------|-------|
| | | | Total # | Item % | Cum % |
| Silt/Clay | silt/clay | 0.062 | 0 | 0% | 68% |
| Sand | very fine sand | 0.125 | 1 | 3% | 72% |
| | fine sand | 0.250 | 1 | 3% | 84% |
| | medium sand | 0.50 | 4 | 14% | 84% |
| | coarse sand | 1.00 | 2 | 7% | 88% |
| | very coarse sand | 2.0 | 3 | 10% | 92% |
| Gravel | very fine gravel | 4.0 | 1 | 3% | 100% |
| | fine gravel | 5.7 | 0 | 0% | 100% |
| | fine gravel | 8.0 | 2 | 7% | 100% |
| | medium gravel | 11.3 | 1 | 3% | 100% |
| | medium gravel | 16.0 | 4 | 14% | 100% |
| | course gravel | 22.3 | 2 | 7% | 100% |
| | course gravel | 32.0 | 5 | 17% | 100% |
| | very coarse gravel | 45 | 2 | 7% | 100% |
| | very coarse gravel | 64 | 0 | 0% | 100% |
| | very coarse gravel | 90 | 0 | 0% | 100% |
| Cobble | small cobble | 90 | 1 | 3% | 100% |
| | medium cobble | 128 | 0 | 0% | 100% |
| | large cobble | 180 | 0 | 0% | 100% |
| | very large cobble | 256 | 0 | 0% | 100% |
| Boulder | small boulder | 362 | 0 | 0% | 100% |
| | small boulder | 512 | 0 | 0% | 100% |
| | medium boulder | 1024 | 0 | 0% | 100% |
| | large boulder | 2048 | 0 | 0% | 100% |
| Bedrock | bedrock | 40096 | 0 | 0% | 100% |
| TOTAL % of whole count | | | 29 | 100% | 100% |

Summary Data

| | |
|-----|-----|
| D50 | 9.4 |
| D84 | 28 |
| D95 | 42 |



4



| Project Name: Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site | | | | | |
|--|--------------------|-----------|---------|--------|-------|
| Cross-Section: 8 | | | | | |
| Feature: Riffle | | | | | |
| | | | 2016 | | |
| Description | Material | Size (mm) | Total # | Item % | Cum % |
| Silt/Clay | silt/clay | 0.062 | 0 | 0% | 68% |
| | very fine sand | 0.125 | 0 | 0% | 72% |
| Sand | fine sand | 0.250 | 0 | 0% | 84% |
| | medium sand | 0.50 | 1 | 3% | 84% |
| | coarse sand | 1.00 | 3 | 9% | 88% |
| | very coarse sand | 2.0 | 3 | 9% | 92% |
| | very fine gravel | 4.0 | 2 | 6% | 100% |
| Gravel | fine gravel | 5.7 | 0 | 0% | 100% |
| | fine gravel | 8.0 | 1 | 3% | 100% |
| | medium gravel | 11.3 | 1 | 3% | 100% |
| | medium gravel | 16.0 | 3 | 9% | 100% |
| | course gravel | 22.3 | 1 | 3% | 100% |
| | course gravel | 32.0 | 6 | 19% | 100% |
| | very coarse gravel | 45 | 3 | 9% | 100% |
| | very coarse gravel | 64 | 3 | 9% | 100% |
| | small cobble | 90 | 4 | 13% | 100% |
| | medium cobble | 128 | 0 | 0% | 100% |
| Cobble | large cobble | 180 | 1 | 3% | 100% |
| | very large cobble | 256 | 0 | 0% | 100% |
| | small boulder | 362 | 0 | 0% | 100% |
| | small boulder | 512 | 0 | 0% | 100% |
| Boulder | medium boulder | 1024 | 0 | 0% | 100% |
| | large boulder | 2048 | 0 | 0% | 100% |
| | bedrock | 40096 | 0 | 0% | 100% |
| TOTAL % of whole count | | | 32 | 100% | 100% |

| Summary Data | |
|--------------|------|
| D50 | 23.4 |
| D84 | 63 |
| D95 | 86 |

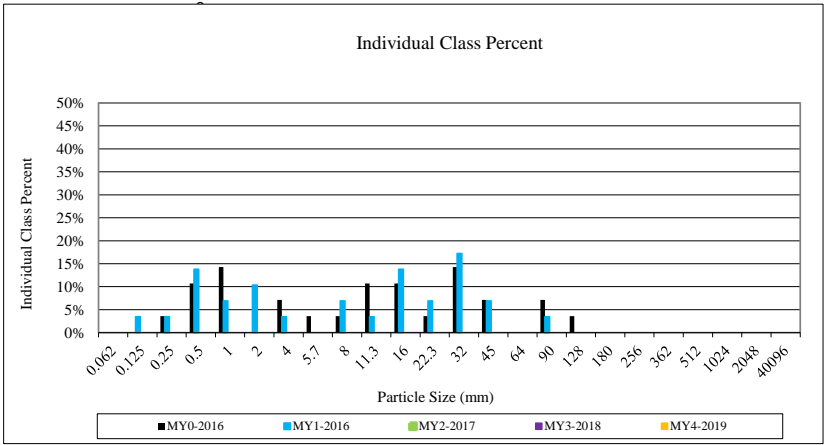
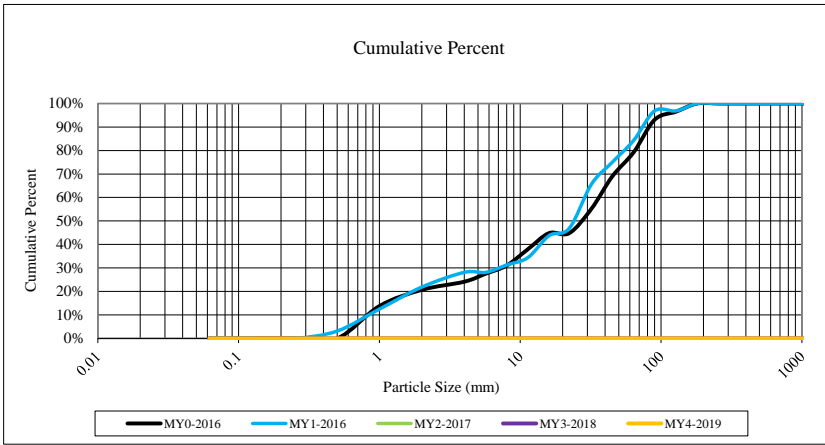


Table 10a. Baseline Stream Data Summary (Neighbors Creek)
 Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site - NCDMS Project Number 92872

| Parameter | Gauge | Regional Curve | | | Pre-Existing Condition (Neighbors Cr) | | | | | Reference Reach(es) Data | | | | | Design (Neighbors Cr) | | | Monitoring Baseline (Neighbors Cr) | | | | | | | | |
|---|-------|----------------|----|-----|---------------------------------------|------|-----|-------|----|--------------------------|--------|-----|-----|----|-----------------------|-----|--------|------------------------------------|--------|--------|--------|--------|------|------|------|----|
| | | LL | UL | Eq. | Min | Mean | Med | Max | SD | Min | Mean | Med | Max | SD | Min | Max | Med | Min | Mean | Med | Max | SD | n | | | |
| Dimension and Substrate - Riffle Only | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BF Width (ft) | | | | | 5.4 | | | 5.9 | | | 12.7 | | | | | | 11.0 | 9.6 | | 11.1 | 12.5 | | 2 | | | |
| Floodprone Width (ft) | | | | | 7.4 | | | 17.1 | | | 150 | | | | | | 70 | | | 100 | | | 2 | | | |
| BF Mean Depth (ft) | | | | | 0.9 | | | 1.1 | | | 0.9 | | | | | | 0.8 | 0.8 | | 0.8 | 0.8 | | 2 | | | |
| BF Max Depth (ft) | | | | | 1.2 | | | 1.5 | | | 1.2 | | | | | | 1.1 | 1.5 | | 1.7 | 1.8 | | 2 | | | |
| BF Cross Sectional Area (ft ²) | | | | | 4.9 | | | 6.5 | | | 11.4 | | | | | | 8.3 | 8.0 | | 9.0 | 9.9 | | 2 | | | |
| Width/Depth Ratio | | | | | 5.3 | | | 5.8 | | | 14.1 | | | | | | 14.0 | 12.0 | | 13.8 | 15.6 | | 2 | | | |
| Entrenchment Ratio | | | | | 1.4 | | | 2.9 | | | 11.8 | | | | | | 6.4 | 8.0 | | 9.2 | 10.4 | | 2 | | | |
| Bank Height Ratio | | | | | 1.6 | | | 2.6 | | | 1.0 | | | | | | 1.0 | | | 1.0 | | | 2 | | | |
| Profile | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Riffle length (ft) | | | | | | | | | | | | | | | | | | | 5.4 | 28.3 | 25.5 | 64.7 | 18.2 | 13 | | |
| Riffle slope (ft/ft) | | | | | 0.025 | | | 0.035 | | | 0.0344 | | | | | | 0.0120 | 0.0000 | 0.0043 | 0.0022 | 0.0121 | 0.0046 | | 13 | | |
| Pool length (ft) | | | | | | | | | | | | | | | | | | | 6.5 | 11.9 | 10.4 | 21.3 | 5.2 | 15 | | |
| Pool Max depth (ft) | | | | | 1.7 | | | 1.8 | | | 2.2 | | | | | | 2.0 | 2.8 | | 2.8 | 2.8 | | | 1 | | |
| Pool spacing (ft) | | | | | 16.4 | | | 99.2 | | | 38.8 | | | | | | 64.7 | 33.0 | 56.1 | | 7.0 | 36.1 | 37.9 | 74.7 | 19.8 | 15 |
| Pattern | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | | | | 8 | | | 22 | | | 30.5 | | | | | 32 | | 27.5 | 66 | | 27.5 | | | 66 | 2 | |
| Radius of Curvature (ft) | | | | | 5 | | | 22 | | | 14.5 | | | | | 20 | | 22 | 44 | | 22 | | | 44 | 2 | |
| Rc:Bankfull width (ft/ft) | | | | | 0.9 | | | 1.5 | | | 1.1 | | | | | 1.6 | | 2 | 4 | | 2 | | | 4 | 2 | |
| Meander Wavelength (ft) | | | | | 30 | | | 128 | | | 95 | | | | | 98 | | 44 | 110 | | 44 | | | 110 | 2 | |
| Meander Width ratio | | | | | 1.5 | | | 4.1 | | | 2.4 | | | | | 2.5 | | 4 | 10 | | 4 | | | 10 | 2 | |
| Transport parameters | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reach Shear Stress (competency) lbs/ft ² | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Max part size (mm) mobilized at bankfull | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stream Power (transport capacity) W/m ² | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | | | | | G5/4 - E5/4 | | | | | C | | | | | C | | | E/C | | | | | | | | |
| Bankfull Velocity (fps) | | | | | 3.86 - 5.09 | | | | | | | | | | | | | | | | | | | | | |
| Bankfull Discharge (cfs) | | | | | 25 | | | | | | | | | | | | | | | | | | | | | |
| Valley Length (ft) | | | | | ---- | | | | | ---- | | | | | | | | | | | | | | | | |
| Channel Thalweg Length (ft) | | | | | ---- | | | | | ---- | | | | | | | | 541 | | | | | | | | |
| Sinuosity | | | | | 1.01 - 1.21 | | | | | 1.22 | | | | | 1.18 | | | 1.18 | | | | | | | | |
| Water Surface Slope (ft/ft) | | | | | 0.019 - 0.0204 | | | | | 0.0205 | | | | | 0.008 | | | 0.0222 | | | | | | | | |
| BF slope (ft/ft) | | | | | ---- | | | | | ---- | | | | | | | | | | | | | | | | |
| Bankfull Floodplain Area (acres) | | | | | ---- | | | | | ---- | | | | | | | | | | | | | | | | |
| % of Reach with Eroding Banks | | | | | ---- | | | | | ---- | | | | | | | | | | | | | | | | |
| Channel Stability or Habitat Metric | | | | | ---- | | | | | ---- | | | | | | | | | | | | | | | | |
| Biological or Other | | | | | ---- | | | | | ---- | | | | | | | | | | | | | | | | |

Table 10b. Baseline Stream Data Summary (Walton Crawley Property)
 Neighbors Branch/Walton Crawley Branch Stream and Wetland Restoration Site - NCDMS Project Number 92872

| Parameter | Gauge | Regional Curve | | | Pre-Existing Condition (WC Property) | | | | | Reference Reach(es) Data | | | | | Design (WC Property) | | | Monitoring Baseline (WC Property) | | | | |
|---|-------|----------------|----|-----|--------------------------------------|------|-----|-------|----|--------------------------|--------|-----|-----|----|----------------------|--------|--------|-----------------------------------|--------|--------|--------|----|
| | | LL | UL | Eq. | Min | Mean | Med | Max | SD | Min | Mean | Med | Max | SD | Min | Max | Med | Min | Mean | Med | Max | SD |
| Dimension and Substrate - Riffle Only | | | | | | | | | | | | | | | | | | | | | | |
| BF Width (ft) | | | | | 7.9 | | | 9.4 | | | 12.7 | | | | | 15.5 | 13.2 | | 14.3 | 16.8 | | 3 |
| Floodprone Width (ft) | | | | | 12.9 | | | 16.8 | | | 150 | | | | 55 | 90 | | | 100 | | | 3 |
| BF Mean Depth (ft) | | | | | 0.8 | | | 0.9 | | | 0.9 | | | | | | 1.1 | 1.3 | 1.4 | 1.5 | | 3 |
| BF Max Depth (ft) | | | | | 0.9 | | | 1.1 | | | 1.2 | | | | | | 1.4 | 1.9 | 2.0 | 2.0 | | 3 |
| BF Cross Sectional Area (ft ²) | | | | | 6.2 | | | 8.4 | | | 11.4 | | | | | | 16.6 | 17.6 | 19.4 | 25.0 | | 3 |
| Width/Depth Ratio | | | | | 10.2 | | | 10.4 | | | 14.1 | | | | | | 14.0 | 10.2 | 10.2 | 11.2 | | 3 |
| Entrenchment Ratio | | | | | 1.6 | | | 1.8 | | | 11.8 | | | | | | 4.5 | 6.0 | 7.0 | 7.6 | | 3 |
| Bank Height Ratio | | | | | 1.0 | | | 2.8 | | | 1.0 | | | | | | 1.0 | | 1.0 | | | 3 |
| Profile | | | | | | | | | | | | | | | | | | | | | | |
| Riffle length (ft) | | | | | | | | | | | | | | | | | 6.7 | 23.9 | 16.2 | 58.1 | 18 | 20 |
| Riffle slope (ft/ft) | | | | | 0.024 | | | 0.030 | | | 0.0344 | | | | | 0.0077 | 0.0000 | 0.0032 | 0.0018 | 0.0113 | 0.0036 | 20 |
| Pool length (ft) | | | | | | | | | | | | | | | | | 7.9 | 24.8 | 24.8 | 63.1 | 10.8 | 27 |
| Pool Max depth (ft) | | | | | 1.9 | | | 2.1 | | | 2.2 | | | | | 2.4 | 1.3 | | 1.4 | 1.5 | | 2 |
| Pool spacing (ft) | | | | | 6.0 | | | 40.8 | | | 38.8 | | | | | | 15.5 | 79.2 | | 14.9 | 42.5 | 27 |
| Pattern | | | | | | | | | | | | | | | | | | | | | | |
| Channel Beltwidth (ft) | | | | | 16 | | | 25 | | | 30.5 | | | | 32 | | 38.8 | 93 | | 38.8 | | 2 |
| Radius of Curvature (ft) | | | | | 5 | | | 14 | | | 14.5 | | | | 20 | | 31 | 62 | | 31 | | 2 |
| Rc:Bankfull width (ft/ft) | | | | | 0.5 | | | 1.5 | | | 1.1 | | | | 1.6 | | 2 | 4 | | 2 | | 2 |
| Meander Wavelength (ft) | | | | | 103 | | | 121 | | | 95 | | | | 98 | | 77.5 | 155 | | 77.5 | | 2 |
| Meander Width ratio | | | | | 11 | | | 12.9 | | | 2.4 | | | | 2.5 | | 5 | 10 | | 5 | | 2 |
| Transport parameters | | | | | | | | | | | | | | | | | | | | | | |
| Reach Shear Stress (competency) lbs/ft ² | | | | | | | | | | | | | | | | | | | | | | |
| Max part size (mm) mobilized at bankfull | | | | | | | | | | | | | | | | | | | | | | |
| Stream Power (transport capacity) W/m ² | | | | | | | | | | | | | | | | | | | | | | |
| Additional Reach Parameters | | | | | | | | | | | | | | | | | | | | | | |
| Rosgen Classification | | | | | B/G | | | | | C | | | | | C | | | E/C | | | | |
| Bankfull Velocity (fps) | | | | | 3.9-7.5 | | | | | | | | | | | | | | | | | |
| Bankfull Discharge (cfs) | | | | | 24-63 | | | | | | | | | | | | | | | | | |
| Valley Length (ft) | | | | | ---- | | | | | ---- | | | | | | | | | | | | |
| Channel Thalweg Length (ft) | | | | | ---- | | | | | ---- | | | | | | | | 1148 | | | | |
| Sinuosity | | | | | 1.01-1.2 | | | | | 1.22 | | | | | 1.1 | | | 1.1 | | | | |
| Water Surface Slope (ft/ft) | | | | | 0.0135-0.0340 | | | | | 0.0205 | | | | | 0.0045 | | | 0.0145 | | | | |
| BF slope (ft/ft) | | | | | ---- | | | | | ---- | | | | | ---- | | | ---- | | | | |
| Bankfull Floodplain Area (acres) | | | | | ---- | | | | | ---- | | | | | ---- | | | ---- | | | | |
| % of Reach with Eroding Banks | | | | | ---- | | | | | ---- | | | | | ---- | | | ---- | | | | |
| Channel Stability or Habitat Metric | | | | | ---- | | | | | ---- | | | | | ---- | | | ---- | | | | |
| Biological or Other | | | | | ---- | | | | | ---- | | | | | ---- | | | ---- | | | | |

**Appendix E.
Hydrology Data**

Table 12. Verification of Bankfull Events
Table 13. Wetland Hydrology Criteria Attainment Summary
Figure E1. 30-70 Percentile Graph for Rainfall
Groundwater Gauge Graphs

**Table 12. Verification of Bankfull Events
Neighbors Branch/Walton Crawley Branch Site (DMS Project Number 92872)**

| Date of Data Collection | Date of Occurrence | Method | Photo (if available) |
|-------------------------|--------------------|---|----------------------|
| August 19, 2016 | July 4, 2016 | Crest gauge data indicates a bankfull event after approximately 1.88 inches of rain documented* in one day. | --- |

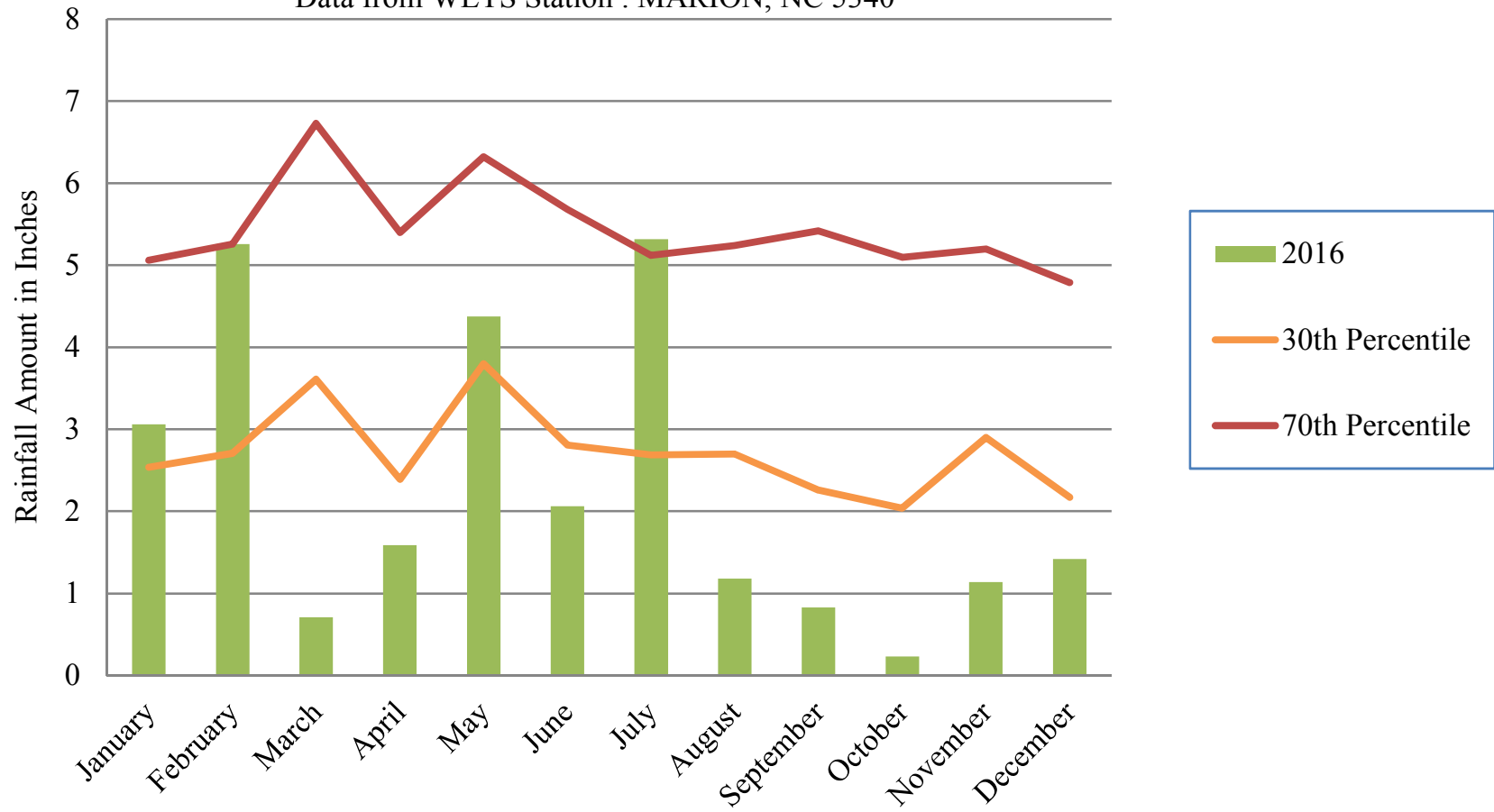
*Weather Underground 2016

**Table 13. Wetland Hydrology Criteria Attainment Summary
Neighbors Branch/Walton Crawley Branch Site (DMS Project Number 92872)**

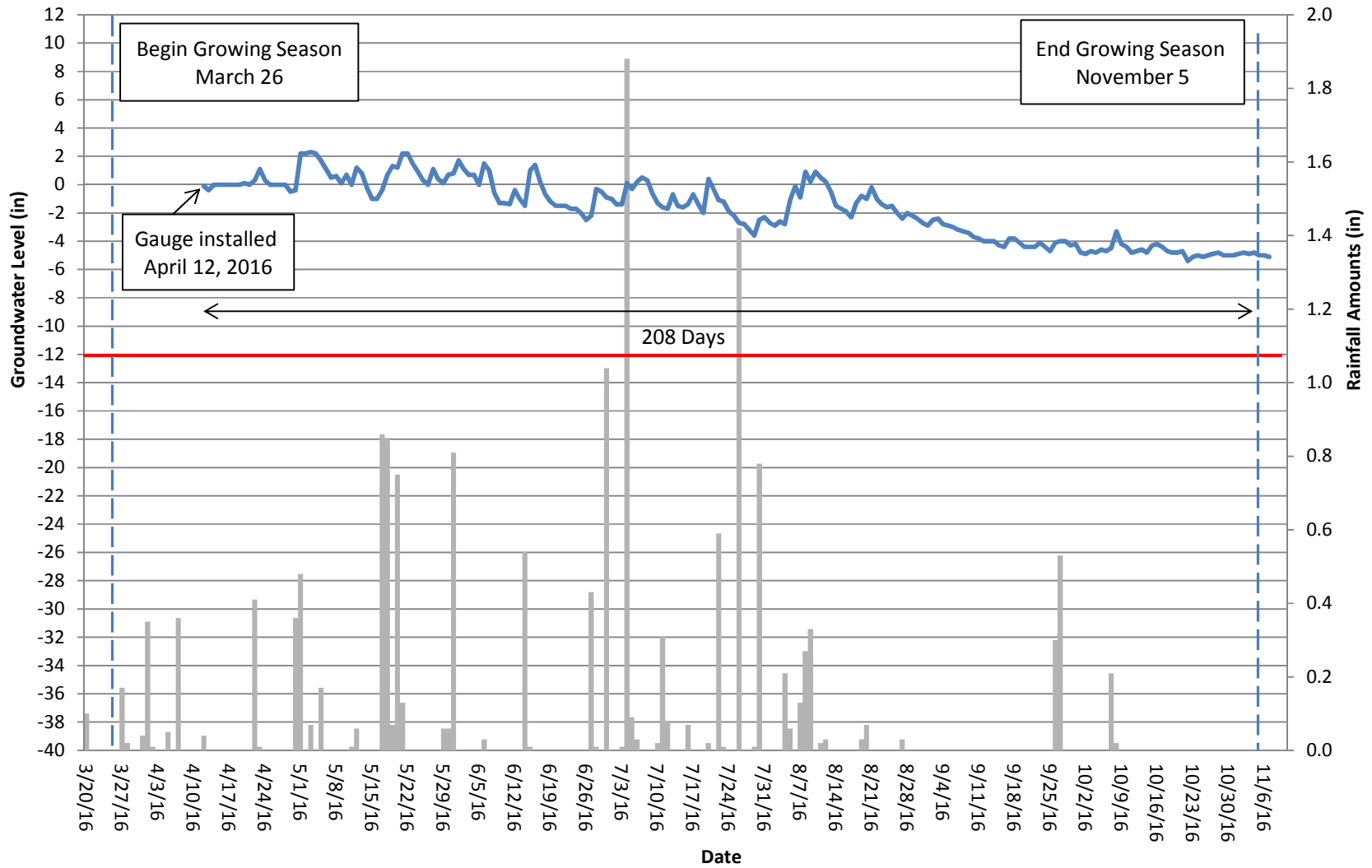
| Gauge | Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage) | | | | |
|-------|---|---------------|---------------|---------------|---------------|
| | Year 1 (2016) | Year 2 (2017) | Year 3 (2018) | Year 4 (2019) | Year 5 (2020) |
| 1 | Yes/208 Days (92.4%) | | | | |
| 2 | Yes/164 Days (72.9%) | | | | |

Figure E1: Neighbors Branch/Walton Crawley Branch 30-70 Percentile Graph for Rainfall

Data from WETS Station : MARION, NC 5340



Neighbors Branch Groundwater Gauge 1 Year 1 (2016 Data)



Tate Farm Groundwater Gauge 2 Year 5 (2016 Data)

