June 2019

PROSPECTUS

# Gilead Spring Stream and Wetland Mitigation Bank

## North Fork Forked Deer Watershed

PROSPECTUS | JUNE 2019

# Gilead Spring Stream and Wetland Mitigation Bank

## NORTH FORK FORKED DEER WATERSHED
## HUC 08010204

**Sponsor:**
Wetland and Stream Restoration Services, LLC
Attn: Tom Rice
713 Melpark Drive
Nashville, TN 37204

**Submitted to:**
Interagency Review Team
*Representing:*
U.S. Army Corps of Engineers, Memphis District
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
Tennessee Department of Environmental Quality
Tennessee Wildlife Resources Agency
Natural Resources Conservation Service
Tennessee Valley Authority

**Prepared By:**
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Jackson, Tennessee 38301
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## Appendices

## 1.0 Owner

### Project Sponsor

**Wetland and Stream Restoration Services, LLC (WSRS)**
713 Melpark Drive
Nashville, TN 37204
Attn: Tom Rice

### Landowner

**Tom Rice**
5304 General Forrest Court
Nashville, TN 37215

## 2.0 Agent

**Kimley-Horn**
115 N. Liberty Street
Jackson, TN 38301
Contact: Dusty Mays
Dusty.Mays@Kimley-Horn.com

For this project, WSRS has hired Kimley-Horn to provide assessment, design, oversight and construction services. Kimley-Horn has completed the design of over 450,000 linear feet of stream restoration and enhancement projects over the past 20 years. They have successfully completed mitigation plans, construction drawings, and construction phase oversight in TN, VA, NC, SC, OK, and TX. These restoration projects have also included more than 2,000 acres of wetland restoration and enhancement. In addition to having this depth of experience on the upfront assessment, design and construction portion of mitigation projects they also currently provide stream and wetland monitoring services on 10 separate mitigation sites.

## 3.0 Project Location

The Gilead Spring Stream and Wetland Mitigation Bank (GSSWMB) Site (hereinafter referred to as the "Bank" or the "Site") is in western Tennessee, approximately 24 miles northeast of Jackson in Henderson County. The Site lies adjacent to Interstate 40 (I-40) and can be accessed from Mt Gilead Ln (35.750462, -88.552753). The Site location is described more specifically in the following table and shown in Table 1.

## 4.0 Access To Property

The Bank is on privately owned property and can be accessed from the terminus of Mt. Gilead Lane. Mt. Gilead Lane is at Exit 101 off Interstate 40, approximately 1.5 miles north of the exit. Access to the property should be coordinated with the Bank Sponsor or Agent.

## 5.0 Project Goals

A primary goal of the Bank is to improve ecological functions within the ecosystem by creating a healthy and self-sustaining aquatic environment with minimal human intervention, including long-term maintenance. Another purpose of the Bank is to provide stream and wetland mitigation credits to satisfy compensatory mitigation requirements for adverse impacts to Waters of the United States (hereinafter, "WOUS") and/or Waters of the State (hereinafter, "WOS"), that result from activities permitted under Section 404/401 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, and/or the Tennessee Water Quality Act provided such activities have met all applicable requirements and are authorized by the U.S. Army

| Table 1: Project Information | |
|---|---|
| Level III Ecoregion | Southeastern Plains |
| Level IV Ecoregion | 65e – Southeastern Plains and Hills |
| Watershed (8-digit HUC) | North Fork Forked Deer (HUC 08010204) |
| Watershed (12-digit HUC) | Middle Fork Forked Deer River-Griffen Creek (HUC 080102040102) |
| Location | Mt Gilead Ln (35.750462, -88.552753) |
| 303d Status | N/A |
| Existing Stream Total Length (feet) | Approximately 891LF |
| Proposed Stream Total Length (feet) | Approximately 1,691 LF |
| Existing Wetland Total Area (acres) | Approximately 34.3 acres |
| Proposed Wetland Total Area (acres) | Approximately 27.8 acres |
| Project Area (acres) | Approximately 53 acres |

Corps of Engineers, in conjunction with the following federal and state agencies: the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, the Natural Resources and Conservation Service, Tennessee Valley Authority, Tennessee Department of Environment and Conservation, and the U.S. Army Corps of Engineers, Memphis District; all of which comprise the Interagency Review Team (IRT). The Bank will provide mitigation credits by restoring an unnamed tributary, enhancing, restoring, and preserving wetlands, and restoring riparian areas on the Site. Credits will be used as compensatory mitigation within the established Service Area (Figure 2) and described in Section 14.1.

## 6.0 Project Objectives

The Bank Site sits within the floodplain of the Middle Fork of the Forked Deer River and consists of one degraded unnamed tributary and impaired wetlands. Project objectives aim to improve overall ecological function and stability of the unnamed tributary and provide ecological and water quality benefits within the Middle Fork Forked Deer River – Griffen Creek (080102040102) watershed within the Middle Fork of the Forked Deer River basin. The Bank will consist of the restoration of the unnamed tributary using natural channel design techniques to provide functional lift capable of restoring natural channel hydrology, hydraulic, geomorphic, physicochemical, and biological characteristics. The project goals and objectives outlined below will address the impairments listed above for the proposed project.

### 6.1 Streams

- Restore dynamically stable stream channel to improve bedform diversity, lateral stability, and floodplain connectivity along project streams that have been channelized and trampled by cattle.
- Restore natural, stable dimensions, patterns, and profiles to stream reaches using natural channel design techniques.
- Remove hydrologic modifications (floodplain drainage ditches, berms, levees, farm spoil areas) to improve overland and subsurface water exchange and sediment transport continuity.
- Increase channel sinuosity to reduce flow velocities, promote the formation of natural riffles and pools, and improve lateral and vertical stability; install large woody debris (LWD) and rock structures to improve aquatic habitat and protect lateral stability.
- Improve water quality by reducing non-point source pollution and in-stream sediment contribution by providing livestock exclusion.
- Increase re-oxygenation zones to improve water quality and biological integrity.
- Establish a minimum 50-foot riparian buffer of planted native bottomland hardwood forest community to provide shade, increase stream bank stability, nutrient filtration, and habitat.
- Permanently protect restored streams, wetlands and riparian areas in a conservation easement.

Table 2: Stream Goals and Objectives

| Area | Goals | Objectives |
|---|---|---|
| Unnamed Tributary | Improve riparian vegetation buffer width and protection | Increase RBP buffer width scores to 8 or higher and vegetation protection to 8 or higher. |
| | Improve floodplain connectivity | Reduce the Bank Height Ratio (BHR) and increase the entrenchment ratio where practical |
| | Improve bedform diversity | Increase pool depth ratio; Restore natural pool-pool spacing and riffle habitat |
| | Restore natural channel geomorphology and improve water quality | Restore natural channel dimensions, pattern, and profile |
| | Enhance Physiochemical properties by reducing E. Coli | Install fencing for cattle exclusion along the conservation easement boundary to reduce E. coli. |
| | Improve biological function and available habitat | Utilize brush, log, and rock structures to create habitat, improve bedform diversity, and reduce sedimentation to encourage fish and macroinvertebrate colonization |

### 6.2 Wetlands

- Restore bottomland hardwood forests incorporating small open pools to provide habitat and refugia.
- Create microtopographic relief to provide habitat and higher water retention.
- Improve hydrologic regime and wetland stability by grading areas impacted by historic land use and plugging drainage ditches.
- Plant native tree and shrub species to re-establish riparian hardwood vegetation.
- Improve water quality through increased sediment storage, filtration, and adsorption.
- Protect restored, enhanced, and preserved stream and wetland areas with land use restrictions.

## 7.0 Site Constraints

The Site is bisected by Interstate 40, which runs east to west, and bordered by the Middle Fork of the Forked Deer River to the west. The southern portion of the Site contains a powerline corridor running from the southwest to the northeast corner. While each of these features may provide some constraints to project design, the project can improve water quality of the river by filtering runoff from the ditch adjacent to I-40 and by changing the land type from active cattle pasture to forested wetland. Neither the I-40 right of way or the powerline easements will be included in the mitigation credit calculations.

The property was purchased in 2018. No known title encumbrances or contradictory interests are known to exist. No federally listed threatened or endangered species are known to occur in Henderson County.

Table 3: Wetland Goals and Objectives

| Area | Goals | Objectives |
|---|---|---|
| Wetland Restoration | Increase habitat diversity | Restore bottomland hardwood forest |
| | Increase species diversity | Survival rate of 220 stems/acre of native tree and shrub species |
| | Improve/Restore hydrologic regime | Plug and/or fill drainage ditches and increase overbank flooding |
| | Improve water quality | Increase hydrologic retention |
| | Protect wetland areas from future alteration | Install conservation easement along wetland boundaries |
| Wetland Enhancement | Increase habitat diversity | Establish bottomland hardwood forest habitats incorporating smaller scrub-shrub areas |
| | Increase species diversity | Survival rate of 220 stems/acre of native tree and shrub species |
| | Protect wetland areas from future alteration | Install conservation easement along wetland boundaries |
| Wetland Preservation | Protect wetland areas from future alteration | Install conservation easement along wetland boundaries |

## 8.0 Stream and Wetland Assessment

Representatives from Tioga Environmental Consultants conducted a preliminary assessment of the Site on September 15, 2017 and a delineation of aquatic resources on June 12, 2018. Tioga's full report is included in the appendices.

### 8.1 Catchment Assessment Form (Stream-Specific Information)

See the assessment forms in Appendix D.

### 8.2 Wetland Assessment — (Wetland-Specific Information)

A site assessment was conducted in June of 2018 and soil, vegetation, and hydrology data was recorded at various locations throughout the Site. Existing wetland boundaries can be found in the figures in the appendices. Wetland Determination Data Forms for the Atlantic and Gulf Coastal Plain were completed at multiple locations on site and are included in Appendix D.

## 9.0 Existing and Proposed Reach-Level Stream Function-Based Rapid Assessment Field Data Form

See the Stream Function-Based Rapid Assessment Field Data Forms and Hydraulic and Geomorphic Assessment Data Forms in Appendix C. More detailed field data will be collected using the SQT Data Collection methods and will be conducted during the mitigation plan phase, following approval of the prospectus. The SQT spreadsheet was informed by data collected using the SQT rapid data assessment method where possible.

## 10.0 Biological Data

Macroinvertebrate samples will be collected at a future date to establish baseline conditions regarding TMI and NCBI scores for the project streams. No data is currently available for physicochemical and biological function based on a review of available resources in the SQT rapid data collection methodology.

## 11.0 Visual Habitat Assessment

See the Visual Habitat Assessment field data sheets in the Appendix C.

## 12.0 Maps

See all project maps in Appendix A.

## 13.0 Site Photos

See Site photos in Appendix B.

## 14.0 Baseline Conditions

Hydrology within the Site has been heavily impacted by cattle grazing, some ditching and the levy along the river. Vegetation within the Site has also been heavily impacted by agricultural activities, including cattle grazing. Currently the Site has very limited woody vegetation and is dominated by herbaceous wetland species within the delineated wetland area and pasture grasses outside the wetland area. In an undisturbed or restored condition, it is anticipated that this wetland would be semi permanently flooded. The site has been fallow since at least June 2018.

Most of the Site is underlain by Beechy silt loam soils, which have a 100 percent hydric rating. These soils are located adjacent to the Middle Fork of the Forked Deer River. The delineated wetland area, which has a Cowardin classification of PFO1C, conformed with the Beech soil mapping with the exception that the wetland area does not extend all the way to the river's edge due to the presence of a levy. Also, the southwest corner of the Site does not currently meet wetland criteria.

### 14.1 Service Area Description

The Bank's Service Area (Figure 2) has been prepared in accordance with the Memphis District's policy and practice and includes the full resident 8-digit HUC (North Fork Forked Deer) as the primary service area. The secondary service area includes the adjacent 8-digit HUCs that are also within the Hatchie-Obion watershed (HUC 080102).

The Bank is located in the Southeastern Plains Level III Ecoregion, which is characterized by generally flat elevation, sands, silts, and clays, and a mosaic land use of cropland, pasture, woodland, and forest. Portions of the HUCs within the Service Area are within the Mississippi Alluvial Plain Level III Ecoregion, which is similar to the Southeastern Plains ecology but differentiated by its predominance of riverine bottomland hardwood composition, and the Mississippi Valley Loess Plains Level III Ecoregion, differentiated by oak-hickory and southern floodplain forests with slightly gentler stream gradients. Because the Bank is located within a river floodplain and coastal plain ecosystem, there is not likely to be an ecological difference between permitted impacts to resources and mitigation credits from the Bank to warrant an exclusion of the adjacent ecoregion.

Table 4: Service Area

| | |
|---|---|
| Primary Service Area | North Fork Forked Deer (08010204) |
| Secondary Service Areas | South Fork Forked Deer (08010205) |
| | Forked Deer (08010206) |
| | Obion (08010202) |
| | South Fork Obion (08010203) |
| Level III Ecoregions: | Southeastern Plains (65); Mississippi Alluvial Plain (73); Mississippi Valley Loess Plains (74) |
| Level IV Ecoregion: | Southeastern Plains and Hills (65e) |
| Service Area Counties | Henderson, Dyer, Crockett, Gibson, Madison, Carroll |

## 14.2 Adjacent Land Use

Both stream and wetland mitigation areas fall between adjacent agricultural fields and the I-40 corridor. Immediately adjacent land use has been dominated by agricultural practices for at least the last approximately 50+ years and has little potential for development due to much of it being in a mapped floodplain. Immediately surrounding areas are also very unlikely to be developed due to the presence of existing wetlands and its proximity to the Middle Fork of the Forked Deer River and consequent flooding hazards.

## 14.3 Stream

### *14.3.1 Summary of Catchment Assessment and Rapid Functional Assessments*

The Site lies within a largely agricultural watershed that consists primarily of row crop and animal production with some forested areas. Intense agricultural practices have contributed to the degradation of streams within the Middle Fork of the Forked Deer watershed through increased peak runoff, channelization, siltation, and loss of productive habitat. The unnamed tributary on Site has been impacted by cattle, straightened, and channelized to expedite drainage for agricultural purposes. Poor overall watershed conditions and lack of lateral stability and riparian vegetation of the Site made it a candidate for establishing the proposed mitigation bank. For more details see the Stream Function-Based Rapid Assessment Field Data Forms located in Appendix C. Additional data was collected using the SQT Rapid Data Collection Method desktop review approach for hydrology, hydraulics, biology and physicochemical function, per the guidance.

## 14.4 Wetland

### *14.4.1 Current Wetland Habitat*

The Site is divided into two sections separated by Interstate 40. The northern parcel of the Site is 27.5 acres, consisting of 16.3 acres of palustrine scrub shrub (PSS) wetlands within previously maintained farm fields along the riparian floodplain terrace of the Middle Fork of the Forked Deer river. In areas that have not recently been maintained, vegetation in the herbaceous layer consists of Lizards Tail (Saururus cernuus), sedges (Carex frankii), smartweed (Polygnoum sp.) and rush (Juncus effusus). The shrub layer contains black willow (Salix nigra) and red maple (Acer rubrum). Where the land has more recently been cleared for agricultural use, vegetation consists mainly of the juncus species and red maple saplings. Based on conditions on adjacent parcels, including the southern parcel of the Site, it is likely that this wetland area was historically a Palustrine bottomland-hardwood forested wetland (PFW) system. The remaining 11.2 acres consist of a combination of cleared and forested uplands. Species located in these areas include river birch (Betula nigra), sycamore (Plantanus occidentalis), and various species of oak (Quercus sp.).

The southern parcel of the Site is 25.8 acres, consisting of 14.0 acres of palustrine bottomland hardwood forested wetlands and 4 acres of palustrine scrub shrub wetlands maintained within the crossing power easement. The species diversity of the easement is similar to the scrub shrub wetland system of the northern parcel. The remaining bottomland hardwood areas are dominated by a majority of red maple, with transitional areas including additional species such as false nettle (Boehmeria cylindrica), sweetgum (Liquidambar styraciflua), and Grays sedge (Carex grayi), among others. The remaining 7.8 acres consist of a combination of cleared and forest uplands consistent with those on the northern parcel.

### *14.4.2 Hydrology*

Primary hydrologic sources for existing and proposed wetlands consist of overbank flow from MFFD and its unnamed tributaries, elevated groundwater, and precipitation.

# 15.0 Proposed Mitigation Approach

## 15.1 Stream

### *15.1.1 Mitigation Approach*

The proposed stream mitigation activities on-site will consist of the re-establishment of nearly 1,691 linear feet of stream that has been impacted by cattle and ditching. To restore the stream channel to its adjacent floodplain the following will be completed:

- Fence cattle out of the conservation easement including the seep area, entire wetland enhancement area and stream re-establishment area to protect stream bank stability and riparian vegetation, and to remove a source of E. coli. The seep and existing watering troughs for cattle are located on the northeast corner of the Site;
- Plug the existing ditch that currently drains water from the seep on the northeast corner of the Site, flows west along the north property boundary, and joins the Middle Fork of the Forked Deer River channel on the northwest corner of

the Site. The ditch should be fully plugged just west of the seep and the rest of the ditch can remain in place so that existing drainage patterns on the property to the north of the Site are maintained;

- Reconnect existing wetlands and drainage in the southeast corner of the Site with onsite resources by grading new connections onto the Site and plugging on-site drainage features connecting flow to the ditch along I-40;
- Perform Priority 1 stream restoration by constructing an appropriately sized stream channel from the seep down to MFFD. Channel construction will include:
  - Restore Channel Dimension
    - The re-established channel will be re-connected with its adjacent floodplain so that it has a bank height ratio of 1.0.
    - The low flow channel will be narrowed as compared to the existing ditch so that baseflow is maintained and appropriate stream power is restored. It will be sized to the appropriate dimension, pattern and profile for the size watershed draining to the system.
  - Restore Channel Pattern
    - The proposed channel will be meandered away from the existing ditch and re-connected with the adjacent wetlands. The existing channel has been straightened and ditched. The proposed channel design will use the contributing drainage area to size appropriate radius of curvature, belt width and meander lengths.
    - Log vanes, log cross vanes and toe wood will be used to ensure channel stability immediately after construction until mature vegetation is re-established adjacent to the channel.
  - Restore Channel Profile
    - Riffles and pools will be constructed within the re-established channel and pool to pool spacing will be sized based on the contributing watershed area.
    - Log Cross vanes and log/brush riffles will be added to the system to provide grade control and provide enough scour to maintain pools in bends.
  - Installation of log vanes, brush and log riffles, log cross vanes and toe wood for stability and in-stream habitat, as well as an uplift to biological function and fish/ macroinvertebrate colonization.
  - Planting of a riparian hardwood buffer along the stream channel.

The following credit tables are proposed based on the functional assessments and restoration potential for the stream reach. Table 5A outlines the functional lift based on the Stream Quantification Tool, and Table 5B highlights proposed credit calculations based on the credit ratio method. Both approaches have been included for comparison, and credits will be debited according to the approved ARAP permitting process for impacts. Proposed lengths and credits associated with the proposed channel restoration are estimates based on the conceptual design approach as shown in the Proposed Mitigation figure in the appendices. These values were informed by a desktop analysis based on the SQT rapid data collection method for hydrology, hydraulics, biology, and physicochemical functional parameters. The SQT will be modified as the project progresses. Additional field data will be collected using the SQT Data Collection Method during the mitigation plan phase.

Table 5A: Functional Lift Summary (TN SQT in Appendix E)

| Reach ID | Existing Stream Length (feet) | Proposed Stream Length (feet) | Change in Functional Condition (PCS - ECS) | Functional Lift (Credits) |
|---|---|---|---|---|
| UT1 | 891.00 | 1691.00 | 0.75 | 1332.25 |
| | **Total Stream Length** | **1,691** | **Total Potential Credits** | **1,332.25** |

Table 5B: Functional Lift Summary (Credit Ratio Method)

| Reach Name | Mitigation Type | Stream Length | Ratio | Potential Credits |
|---|---|---|---|---|
| UT to MFFD | Re-establishment | 1,691 | 1:1 | 1,691 |
| | **Total Stream Length** | **1,691** | **Total Potential Credits** | **1,691** |

*15.1.2 Proposed Functional Lift*

The proposed mitigation approach will provide significant functional lift to hydrology, hydraulics, channel geomorphology and habitat.

Hydrology – The existing stream wetland system has been impacted by ditching and cattle access. The existing ditched system drains the seep area located at the northeast corner of the Site. This prevents the surface flow from this seep from recharging the wetlands southwest of the seep. Additionally, the existing ditch cuts off surface flow from the property to the north. Proposed improvements will include plugging the ditch to an elevation that improves surface water hydrology while at the same time maintaining drainage from the adjacent property.

Hydraulics – Due to the ditched and incised condition of the existing channel, flows greater than bankfull are confined within the channel contributing to further degradation of the system. Existing bank height ratios along the existing channel are approximately 2.0, the newly re-established stream channel will have bank height ratios of 1.0, thus allowing flood flows to access the adjacent wetland system. A Rosgen C Type channel is proposed which will gradually narrow into an E Type stream. Functional lift related to the hydraulics of the restored stream will be achieved by providing a channel with properly sized bankfull dimension that is stable and has an appropriate stream power to transport sediment.

Geomorphology – Restoration of the UT to MFFD will provide lift by improving several geomorphologic channel dimensions of dimension, pattern and profile. In addition to restoring the geomorphology of the system a riparian buffer will be re-established along the stream channel. The existing riparian buffer conditions are “Not Functioning” in terms of buffer width throughout the existing reach. Vegetation has been cleared to the top of bank in several reaches while a single row of trees separates the cattle pastures from the stream in others. A riparian buffer width will be increased to a minimum of 50 feet from the top of bank along the re-established stream channel. Vegetative protection along the stream banks yielded poor and marginal scores resulting in “Not Functioning” and “Functioning-at-Risk” functional ratings along the channel.

Physicochemical and Biology – Establishment of a 50-foot-wide riparian buffer along the left side (south side) and along the right side (north side) of the stream, stabilization of the eroding banks to prevent excess sediment, and exclusion of cattle from the conservation easement will improve water quality by managing sediment, erosion, and a source of E. Coli bacteria in the system. In-stream habitat will be improved by the installation of both woody and rock structures, but no biological functional parameters are being measured as part of this proposed restoration.

## 15.2 Wetland

*15.2.1 Mitigation Approach*

Wetlands currently present within the northern portion of the Site have been historically drained, clear-cut, and altered for agricultural purposes. Areas that are historically wetlands but are not currently functioning, identified by hydric soil conditions and topography, are proposed for restoration that will re-establish the natural hydrologic and vegetative characteristics commonly found in bottomland hardwood forests through a combination of grading, ditch removal along the outer edges of the Site, and panting. The existing wetlands on Site will be enhanced to reestablish bottomland hardwood vegetative communities to improve the biodiversity and stability of the riparian wetland system and provide continuity of habitat and hydrologic function that has been disturbed by regular agricultural use and clearing.

The wetlands on the southern portion of the property is proposed as preservation in accordance with the federal Mitigation Rule (33 CFR 332.3 (h)) which allows for preservation credit where the following criteria are met:

- Important biological functions to the watershed – the early successional riverine wetlands in this area enable flood storage adjacent to the interstate, filtering of surface water before it enters the adjacent river, groundwater recharge, and important wildlife refuge in a developing corridor.
- Significant contribution to ecological sustainability of the watershed (qualitative) – this area will mature into an established bottomland hardwood system with close monitoring as the Bank is operated and under long-term management, which will enable the management of invasive species should they become prevalent and also permanent protection that would not be afforded if the property were left unprotected.
- Is appropriate and practicable – as part of the overall mitigation property, it is both appropriate and practical to include this area.

- Resources are under threat – land adjacent to an interstate such as I-40 and in close proximity to developing areas, such as Jackson and in the path between Memphis and Nashville, is prime for development unless otherwise protected.
- Permanently protected – the preservation area will be protected by a conservation easement as will the entire Site.

The preservation credits are being proposed in conjunction with the restoration and enhancement of the northern portion of the Site.

*15.2.2 Functional Lift*

The GSSWMB will restore, enhance, and protect the wetland conditions that make up a large piece of the riparian buffer around the Middle Fork of the Forked Deer River. Through the implementation of this project, the bank sponsor will improve vegetative biodiversity and continuity of riparian habitat along a major river in the watershed, enhance regular floodplain functionality along an I-40 corridor that is prone to flooding, and protect natural habitat from future development or alteration.

While wetland conditions exist for a large portion of the Site, the existing scrub-shrub wetland is not consistent in quality or biodiversity with the hardwood communities that frame the Middle Fork of the Forked Deer River to the north, south, and west of the Site. Reestablishing the proper wetland vegetative community will restore the natural historic function of the wetland system and the continuity of habitat along the riparian buffer corridor of the river. Research suggests that the existing scrub-shrub communities, if allowed to dominate the space, will not transition to hardwood communities naturally. This is especially true in the presence of cattle grazing, which disrupts the development of a canopy to shade out dense scrub-shrub vegetation and support growth of shade-tolerant hardwood saplings. Where restoration or enhancement is proposed, the Bank Sponsor intends to remove cattle grazing, enhance hydrologic and soil conditions, and manage the transition of vegetative communities from the post-disturbance scrub-shrub wetland type to a high value bottomland hardwood wetland with vegetative diversity to match adjacent hardwood communities and historic conditions.

*15.2.3 Reference Site*

No reference site was located onsite or nearby at this time. A reference site will be chosen at a future date to establish baseline conditions for the project wetlands. Performance standards will be based on meeting wetland hydrology, soil, and vegetation criteria of the reference site and/or those criteria commonly found in riparian bottomland hardwood forests.

## 16.0 Site Protection

A Conservation Easement will be placed on the Site that will restrict conflicting activities within the mitigation area that may compromise the functions and services of the aquatic resources. WSRS will maintain financial responsibility of the mitigation site throughout the monitoring phase until final approval and closure of the Site by the IRT. Once final approval is granted, and the Site is closed, an endowment fund will be available for protection and maintenance of the mitigation Site, consistent with the Conservation Easement.

## 17.0 Long-Term Management

After the required monitoring period is complete, performance standards are met, and the project is formally closed out, the long-term stewardship of this project will be the responsibility of WSRS. The long-term steward will focus on ensuring easement integrity is maintained and that the landowner is observing the established restrictions for the easement. Long-term management consists of annual inspection of projects to assure that conservation easements or other site protection management agreements are not being violated. Sufficient funds have been retained to cover the costs of the annual site inspections, and for enforcing land use restrictions through litigation if necessary.

Table 6: Wetland Mitigation Approach

| Mitigation Type | Wetland Area (Ac) | Ratio | Potential Credits |
|---|---|---|---|
| Restoration | 1.7 | 1:1 | 1.7 |
| Enhancement | 12.2 | 2.5:1 | 4.8 |
| Preservation | 14.0 | 6:1 | 2.3 |
| **Total Area** | **35.8** | **Total Potential Credits** | **8.8** |

## 18.0 Historic Properties

According to the National Register of Historic Places, there are no properties listed within or near the mitigation site. A search of the Tennessee Historical Commission database did not identify any records for historic properties on the mitigation site. Due to the type of work being done and the location of the streams (open agricultural fields), impacts to potential historic properties not identified by these organizations are unlikely to occur.

## 19.0 Threatened and Endangered Species

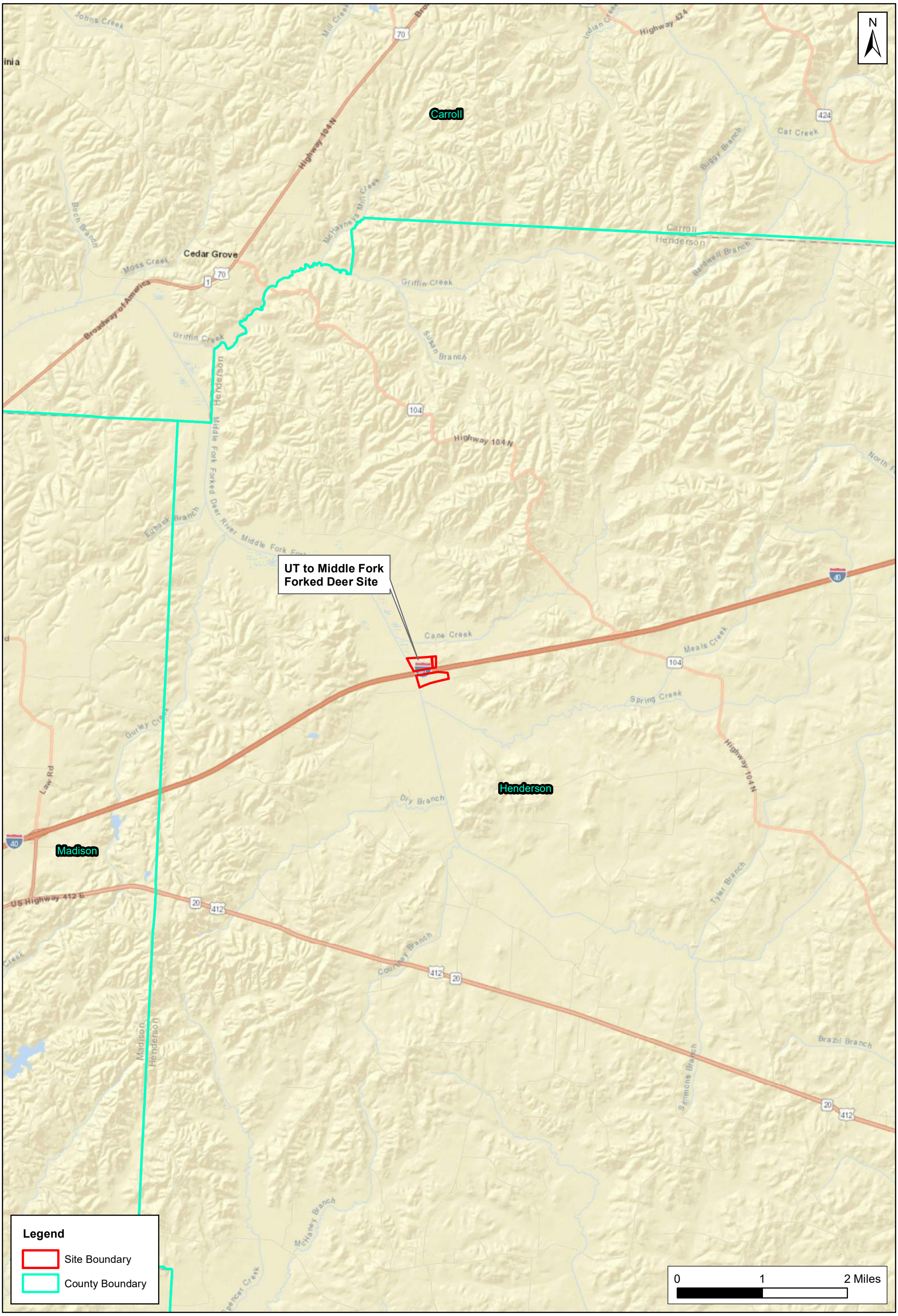
A review of the Tennessee Department of Environment and Conservation Rare Species database identified no federally endangered or threatened species in Henderson County. There are two species listed as endangered or threatened by the state for Henderson County, and these are listed in the table below.

Table 7: Threatened and Endangered Species

| Type | Category | Scientific Name | Common Name | Federal Status | State Status |
|---|---|---|---|---|---|
| Vertebrate Animal | Bird | Peucaea aestivalis | Backman's Sparrow | - | E |
| Vertebrate Animal | Reptile | Pituophis melanoleucus | Northern Pinesnake | - | T |

# Appendix A

## Figures




Prepared By:

Kimley»Horn

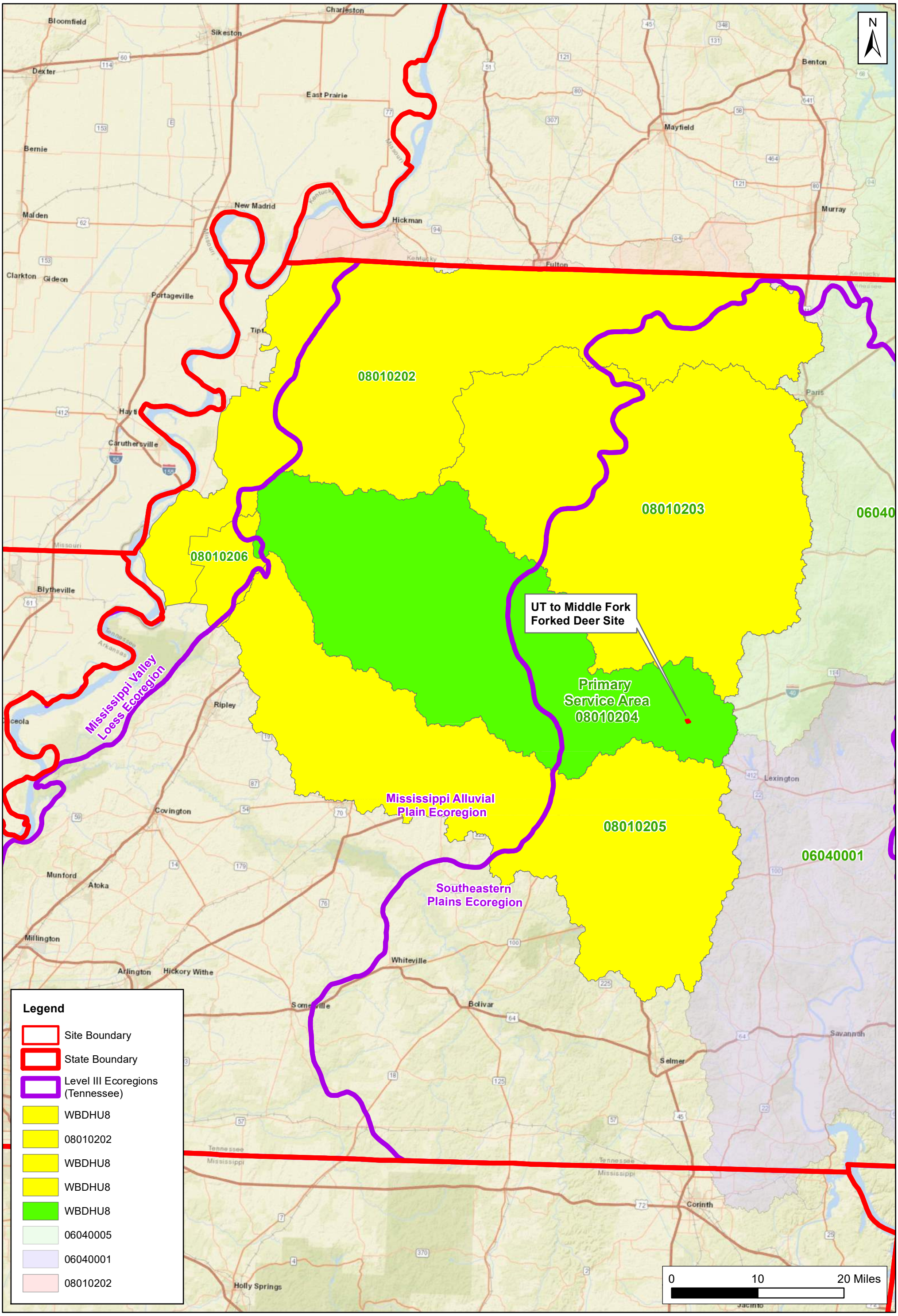
Prepared For:

Stream and Wetland Restoration Services LLC

# Gilead Spring
# Stream and Wetland Mitigation Bank

## Site Vicinity

Figure 1
Henderson County, TN

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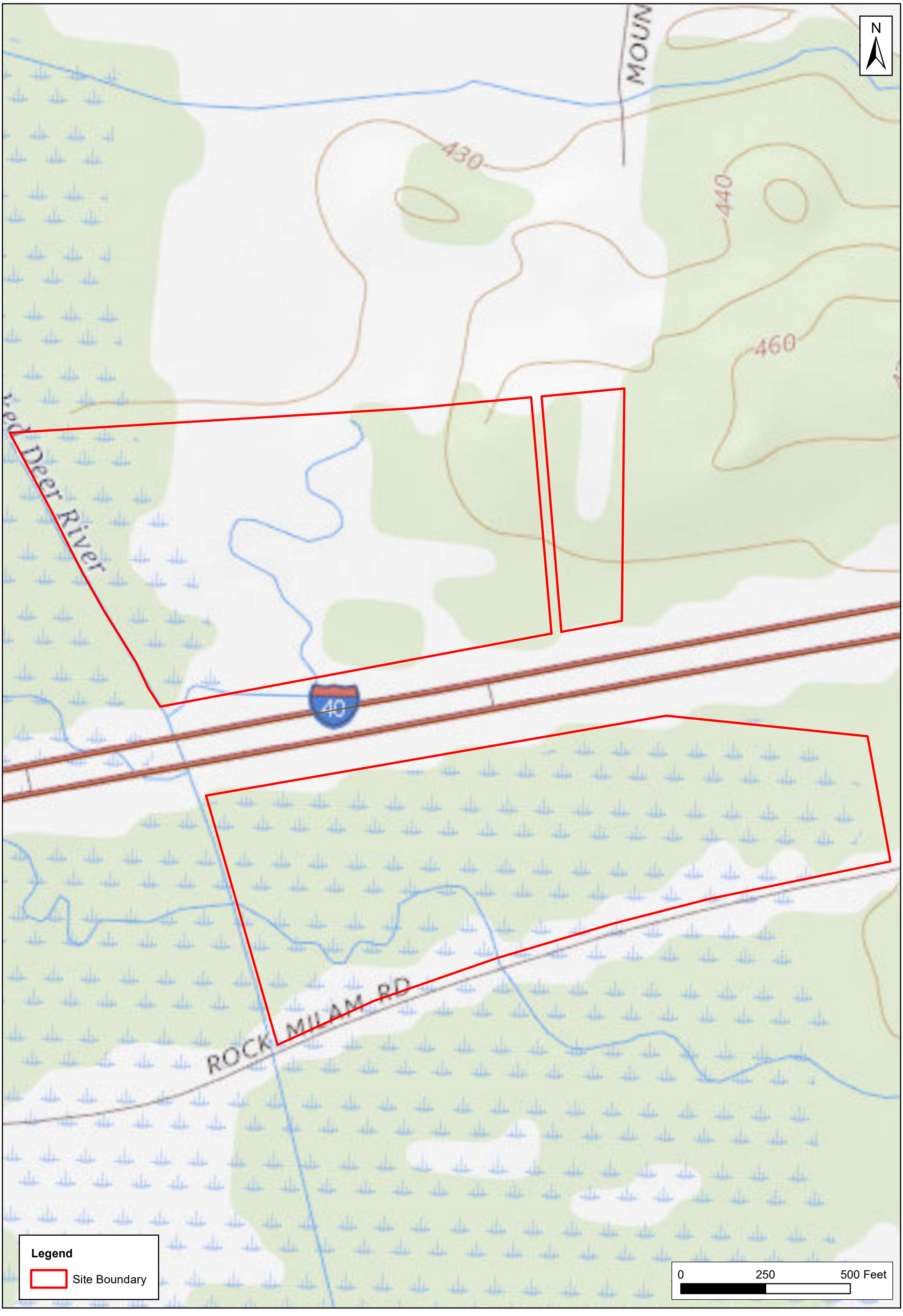
# Gilead Spring
# Stream and Wetland Mitigation Bank

## Service Area

Figure 2
Henderson County, TN

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Stream and Wetland Restoration Services LLC

# Gilead Spring
# Stream and Wetland Mitigation Bank

## USGS Topography

Figure 3
Henderson County, TN

1952

1978

N

1993

2012

Legend

Property Boundary

0 600 1,200 Feet

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Stream and Wetland Restoration Services LLC

# Gilead Spring
# Stream and Wetland Mitigation Bank

## Historic Aerials

Figure 4
Henderson County, TN

| Map Unit Symbol | Map Unit Name | Hydric Rating |
|---|---|---|
| Bb | Beechy Silt Loam | 100 |
| Dlg | Dulac and Tippah silty clay loams, severely eroded sloping phases complex | 0 |
| Fg | Freeland silt loam, eroded sloping phase | 0 |
| Fh | Freeland silt loam, severely eroded sloping phase | 0 |
| Fk | Freeland silt loam, severely eroded strongly sloping phase | 0 |


Prepared By:

Kimley»Horn

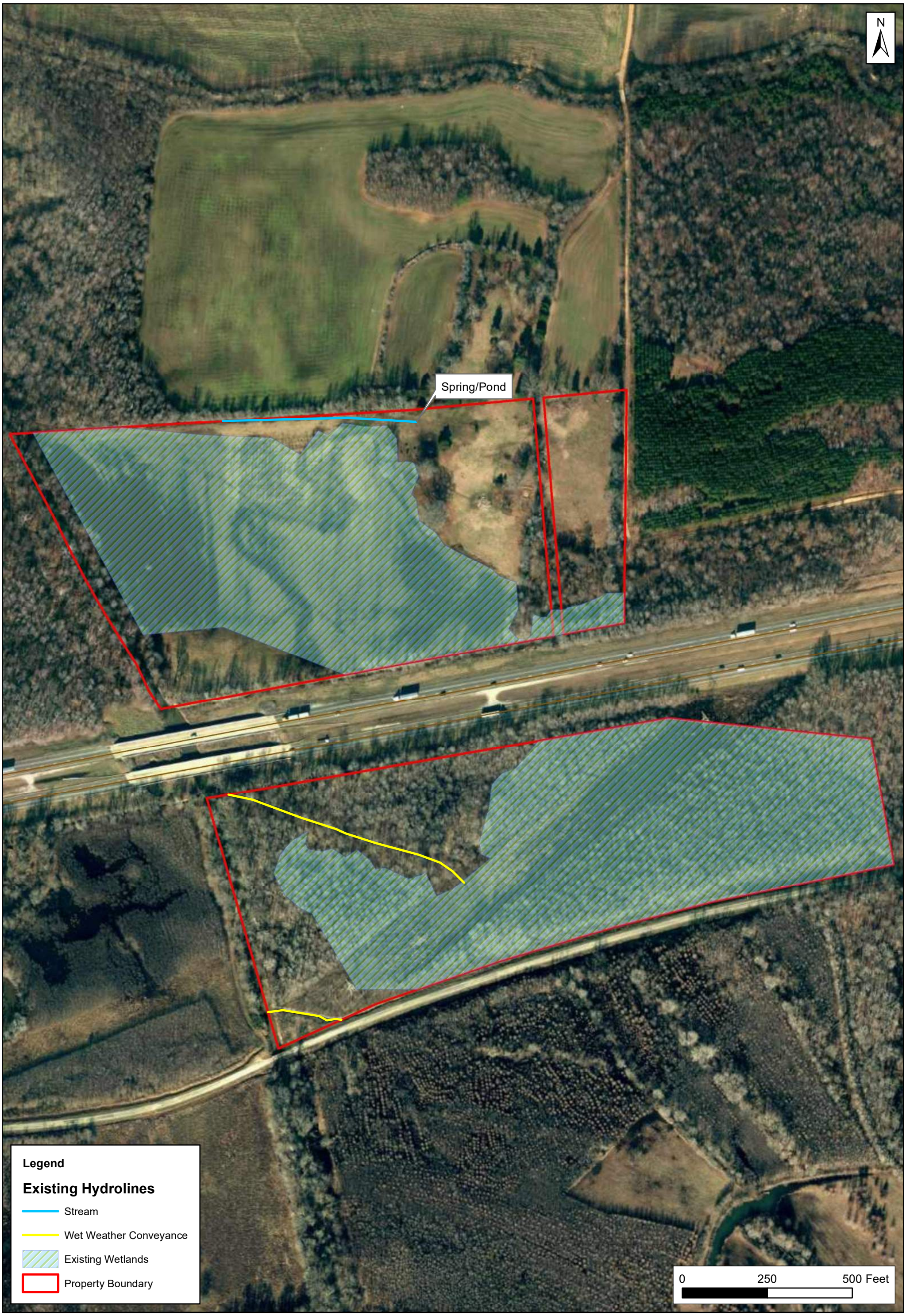
Prepared For:

**Stream and Wetland Restoration Services LLC**

# Gilead Spring
# Stream and Wetland Mitigation Bank

## NRCS Soil Survey

Figure 5
Henderson County, TN

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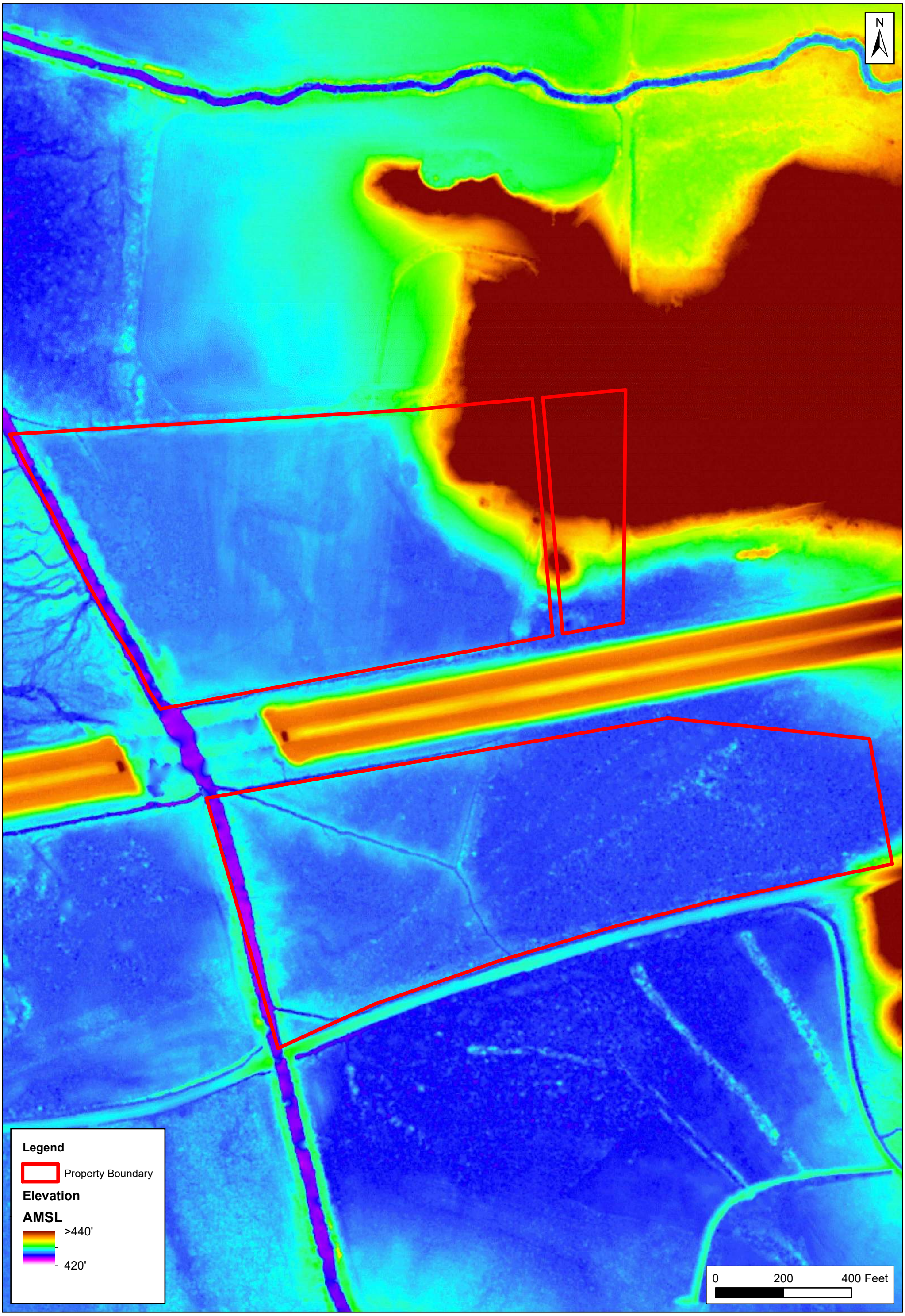
# Gilead Spring
# Stream and Wetland Mitigation Bank

## Existing Conditions

Figure 6
Henderson County, TN

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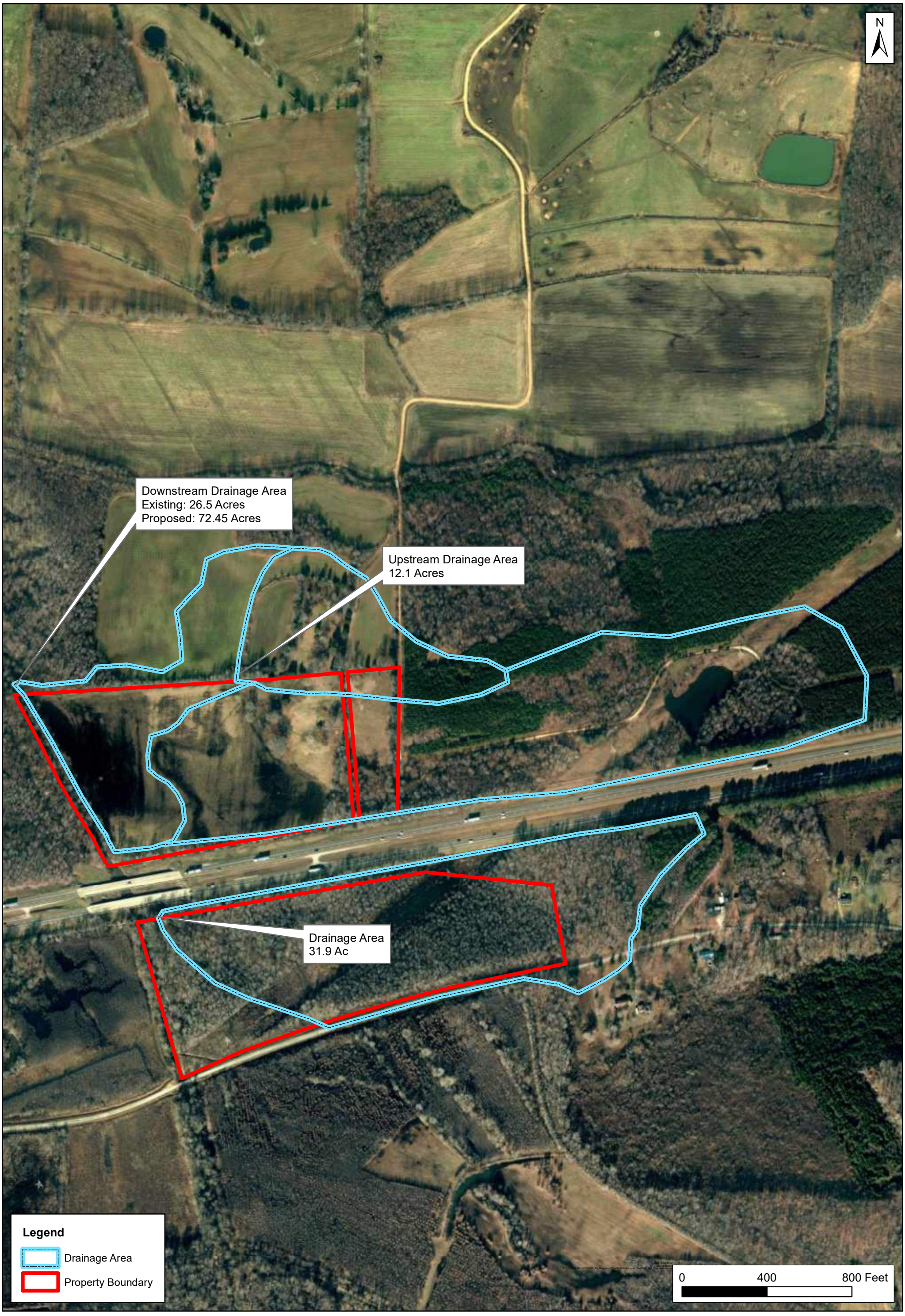
**Gilead Spring**
**Stream and Wetland Mitigation Bank**

**Lidar Imagery**

Figure 7
Henderson County, TN

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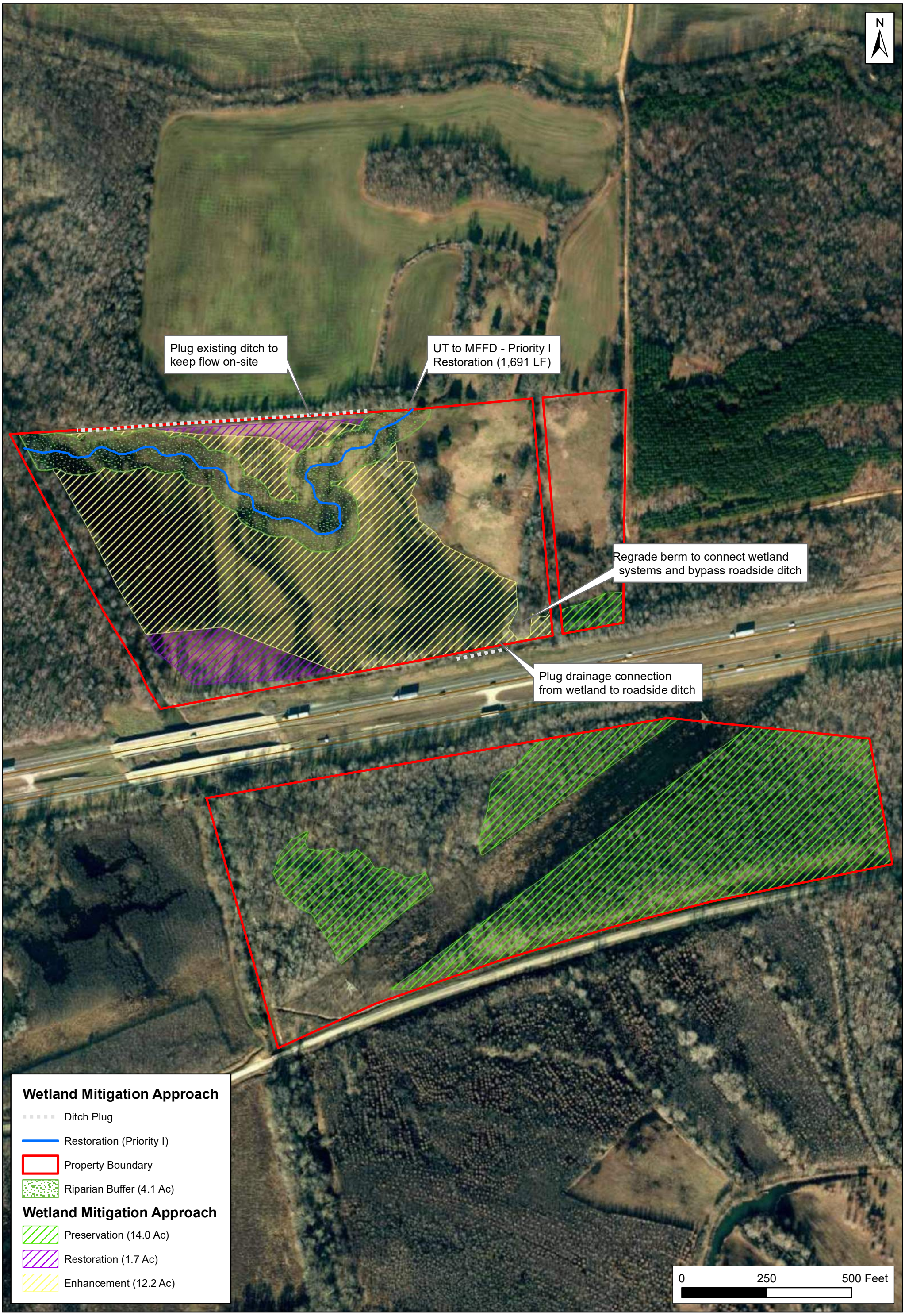
# Gilead Spring
# Stream and Wetland Mitigation Bank

## Drainage Area

Figure 8
Henderson County, TN

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# Gilead Spring
# Stream and Wetland Mitigation Bank

## Proposed Mitigation

Figure 9
Henderson County, TN

# Appendix B

## Site Photos

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# Gilead Spring Stream and Wetland Mitigation Bank
## Photograph Sheet

KHA Job No.: 115250005
KHA Rep.: KJH/DMP
Date: 1/4/2019
Page: 1 of 3

Photo No. 1

Remarks: Hillside seepage (acting as cattle watering hole) at beginning of UT to MFFD

Photo No. 2

Remarks: Cattle disturbance in stream headwaters

Photo No. 3

Remarks: Stream bed during Summer

Photo No. 4

Remarks: Stream headwaters

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# Gilead Spring Stream and Wetland Mitigation Bank
## Photograph Sheet

KHA Job No.: 115250005
KHA Rep.: KJH/DMP
Date: 1/4/2019


Photo No. 5

Remarks: UT to MFFD confluence with MFFD

Photo No. 6

Remarks: Ditch along I-40

Photo No. 7

Remarks: Wetland field

Photo No. 8

Remarks: Wetland field

Kimley»Horn

# Gilead Spring Stream and Wetland Mitigation Bank
## Photograph Sheet

KHA Job No.: 115250005
KHA Rep.: KJH/DMP
Date: 1/4/2019
Page: 3 of 3

Photo No. 9

Remarks: Cattle disturbance in wetlands

Photo No. 10

Remarks: Wetland field

# Appendix C

Catchment Assessment Form

Reach-Level Function-Based Form

Geomorphic Assessment Form

Habitat Assessment Form

Appendix A. Catchment Assessment Form

Rater(s): KHA

Date: June 2018

Purpose: This form is used to determine the project's restoration potential.

**Overall Watershed Conditon** Fair

## CATCHMENT ASSESSMENT

| | Categories | Description of Catchment Condition | | | Rating (P/F/G) |
|---|---|---|---|---|---|
| | | Poor | Fair | Good | |
| 1 | Concentrated Flow (Hydrology) | Potential for concentrated flow/impairments to reach restoration site and no treatments are in place | Some potential for concentrated flow/impairments to reach restoration site, however, measures are in place to protect resources | No potential for concentrated flow/impairments from adjacent land use | F |
| 2 | Impervious cover (Hydrology) | Greater than 15% | Between 7% and 15% | Less than 7% | G |
| 3 | Land Use Change (Hydrology) | Rapidly urbanizing/urban | Single family homes/suburban | Rural communities/slow growth or primarily forested | G |
| 4 | Distance to Roads (Hydrology) | Roads located in or adjacent to project reach and/or major roads proposed in 10 year DOT plans | No roads in or adjacent to project reach. No more than one major road proposed in 10 year DOT plans. | No roads in or adjacent to project reach. No proposed roads in 10 year DOT plans. | P |
| 5 | Watershed Hydrology (e.g., flow regime, basin characteristics) (Hydrology) | Flashy flow regime as a result of land use, rainfall patterns, geology, and soils. | Moderate flashy flow regime as a result of land use, rainfall patterns, geology, and soils. | Not Flashy flow regime as a result of land use, rainfall patterns, geology, and soils. | F |
| 6 | Percent Forested (Watershed) (Hydrology) | <= 20% | >20% and <70% | >=70% | P |
| 7 | Riparian Vegetation (Geomorphology) | <50% of contributing stream length has > 25 ft corridor width | 50-80% of contributing stream length has > 25 ft corridor width | >80% of contributing stream length has > 25 ft corridor width | P |
| 8 | Sediment Supply (Geomorphology) | High sediment supply from upstream bank erosion and surface runoff | Moderate sediment supply from upstream bank erosion and surface runoff | Low sediment supply. Upstream bank erosion and surface runoff is minimal | F |
| 9 | Located on or downstream of a 303(d) listed stream TMDL list (Physicochemical) | On, upstream, or downstream of 303(d) and no TMDL/WS Mgmt plan to address deficiencies | On, upstream, or downstream of 303(d) and TMDL/WS Mgmt plan addressing deficiencies | Not on 303(d) list | G |
| 10 | Agricultural Land Use (Physicochemical) | Livestock access to stream and/or intensive cropland immediately upstream of project reach. | Livestock access to stream and/or intensive cropland upstream of project reach. A sufficient reach of stream is between Ag. land use and project reach. | There is little to no agricultural land uses or the livestock or cropland is far enough away from project reach to cause no impact to water quality or biology. | F |
| 11 | NPDES Permits | Many NPDES permits within watershed or some within one mile of project reach | A few NPDES permits within watershed and none within one mile of project reach | No NPDES permits within watershed and none within one mile of project reach | G |
| 13 | Watershed impoundments (Biology) | Impoundment(s) located within 1 mile upstream or downstream of project area and/or has a negative effect on project area and fish passage | No impoundment within 1 mile upstream or downstream of project area OR impoundment does not adversely affect project area but a blockage could exist outside of 1 mile and impact and fish passage | No impoundment upstream or downstream of project area OR impoundment provides beneficial effect on project area and allows for fish passage | G |
| 14 | Organism Recruitment (Biology) | Channel immediately upstream or downstream of project reach is concrete, piped, or hardened. | Channel immediately upstream or downstream of project reach has native bed and bank material, but is impaired. | Channel immediately upstream or downstream of project reach has native bed and bank material. | F |
| 15 | Percent of Catchment being Enhanced or Restored | Less than 40% of the total catchment area is within the project reach. | 40 to 60% of the total catchment area is within the project reach. | Greater than 60% of the total catchment area is within the project reach. | F |
| 16 | Other | | | | * |

# EXISTING and PROPOSED REACH LEVEL STREAM FUNCTION-BASED RAPID ASSESSMENT FIELD DATA FORM

| | | | |
|---|---|---|---|
| Watershed: | MFFD | Rater(s): | KHA |
| Stream: | UT to MFFD | Date: | June 2018 |
| Reach Length: | 1195 | Latitude: | |
| Photo(s): | See appendices | Longitude: | |
| Reach ID: | 1 | | |

## Function-based Rapid Reach Level Stream Assessment

| Assessment Parameter | Measurement Method | Category: Functioning | Functioning-at-Risk | Not Functioning |
|---|---|---|---|---|
| **Stream Function Pyramid Level 1 Hydrology** | | | | |
| Runoff | 1. Concentrated Flow | No potential for concentrated flow/impairments from adjacent land use | Some potential for concentrated flow/impairments to reach restoration site, however, measures are in place to protect resources | Potential for concentrated flow/impairments to reach restoration site and no treatments are in place |
| | Existing Condition | | X | |
| | Proposed Condition | | X | |
| | 2. Flashiness | Non-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover less than 6% | Semi-flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover 7 - 15% | Flashy flow regime as a result of rainfall patterns, geology, and soils, impervious cover greater than 15% |
| | Existing Condition | X | | |
| | Proposed Condition | X | | |
| | If existing runoff is FAR or NF, provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason | | | |
| **Stream Function Pyramid Level 2 Hydraulics** | | | | |
| Floodplain Connectivity (Vertical Stability) | 3. Bank Height Ratio (BHR) | 1.0-1.2 | 1.21 - 1.50 | >1.50 |
| | Existing Condition | | | X |
| | Proposed Condition | X | | |
| | 4a. Entrenchment (Meandering streams in alluvial valleys or Rosgen C, E, DA Streams) | >2.2 | 2.2 - 2.0 | <2.0 |
| | Existing Condition | | | X |
| | Proposed Condition | X | | |
| | 4b. Entrenchment (Non meandering streams in colluvial valleys or Rosgen B Streams) | = or >1.4 | 1.3 - 1.2 | <1.2 |
| | Existing Condition | | | |
| | Proposed Condition | | | |
| | 5. Floodplain Drainage | no concentrated flow; runoff is primarily sheet flow; hillslopes < 10%; hillslopes >200 ft from stream; ponding or wetland areas and litter or debris jams are well represented | runoff is equally sheet and concentrated flow (minor gully and rill erosion occurring); hillslopes 10 - 40%; hillslopes 50 - 200 ft from stream; ponding or wetland areas and litter or debris jams are minimally represented | concentrated flows present (extensive gully and rill erosion); hillslopes >40%; hillslopes <50 ft from stream; ponding or wetland areas and litter or debris jams are not well represented or absent |
| | Existing Condition | | X | |
| | Proposed Condition | X | | |
| | 6. Vertical Stability Extent | Stable: <5% of bottom affected by localized vertical channel down-cutting | Localized Instability: 5-50% of bottom affected by localized vertical stream channel down-cutting or scouring | Widespread Instability: 50% of bottom affected by widespread vertical down-cutting; head cuts present |
| | Existing Condition | | X | |
| | Proposed Condition | X | | |
| | Provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason | | | |

| Reach ID: | 1 |
|---|---|

**Function-based Rapid Reach Level Stream Assessment**

| Assessment Parameter | Measurement Method | Category | | |
|---|---|---|---|---|
| | | Functioning | Functioning-at-Risk | Not Functioning |
| **Stream Function Pyramid Level 3 Geomorphology** | | | | |
| Riparian Vegetation | 7. Buffer Width (ft) from top of bank | >50 | 30 - 49 ft | < 30 ft |
| | Left Bank Existing | | | X |
| | Left Bank Proposed | X | | |
| | Right Bank Existing | | | X |
| | Right Bank Proposed | X | | |
| | 8. Riparian Vegetation Zone (EPA, RBP Habitat Assessment) | Good vegetation community diversity and density; human activities do not impact zone(optimal score 9-10) | Human activities impacted zone minimally (sub-optimal, score 6-8); width of riparian zone 20-40 feet (6-12 meters); human activities have impacted zone a great deal (marginal, score 3-5) | Little or no riparian vegetation due to human activities (poor score 0-2) |
| | Left Bank Existing | | | X |
| | Left Bank Proposed | X | | |
| | Right Bank Existing | | | X |
| | Right Bank Proposed | X | | |
| | 9. Vegetative Protection | More than 90% of the bank covered by undisturbed vegetation. All 4 classes (mature trees, understory trees, shrubs, groundcover) are represented and allowed to grow naturally. (optimal score 9-10) | 70-90% of the bank covered by undisturbed vegetation. One class may not be well represented. Disruption evident but not effecting full plant growth. (sub-optimal score 6-8); 50-70% of the bank covered by undisturbed vegetation. Two classes of vegetation may not be well represented. (marginal, score 3-5) | Less than 50% of the bank covered by undisturbed vegetation or more than 2 classes are not well represented or most vegetation has been cropped. (poor score 0-2) |
| | Left Bank Existing | | | X |
| | Left Bank Proposed | X | | |
| | Right Bank Existing | | | X |
| | Right Bank Proposed | X | | |
| | 10.Riparian Zone Invasive Species | Invasive species not present or sparse | Invasive species well represented and alter the community | Majority of vegetation is invasive |
| | Left Bank Existing | | X | |
| | Left Bank Proposed | X | | |
| | Right Bank Existing | | X | |
| | Right Bank Proposed | X | | |
| | Provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason | | | |

| | | | | |
|---|---|---|---|---|
| **Stream Function Pyramid Level 3 Geomorphology** | | | | |
| Lateral Stability | 11. Dominant BEHI/NBS Rating | L/VL, L/L, L/M, L/H, L/VH, M/VL | M/L, M/M, M/H, L/Ex, H/L, M/VH, M/Ex, H/L, H/M, VH/VL, Ex/VL | H/H, H/Ex, VH/H, Ex/M, Ex/H, Ex/VH, VH/VH, Ex/Ex |
| | Existing Condition (Right bank) | | X | |
| | Proposed Condition (Right Bank) | X | | |
| | Existing Condition (Left bank) | | X | |
| | Proposed Condition (Left Bank) | X | | |
| | 12. Dominant Bank Erosion | Dominate bank erosion rate is low 10% | Dominate bank erosion rate is moderate 10-25% | Dominate bank erosion rate is high >25% |
| | Existing Condition | | X | |
| | Proposed Condition | X | | |
| | Provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason | | | |

**Function-based Rapid Reach Level Stream Assessment**

| Assessment Parameter | Measurement Method | Category | | |
|---|---|---|---|---|
| | | Functioning | Functioning-at-Risk | Not Functioning |
| Bedform Diversity | 13. Shelter for Fish and Macroinvertebrates (EPA 1999) | Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, rubble, gravel, cobble and large rocks, or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient) | 20-70% mix of stable habitat; suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale) | Less than 20% mix of stable habitat; lack of habitat availability less than desirables obvious; substrate unstable or lacking |
| | Existing Condition | | | 8 |
| | Proposed Condition | 8 | | |
| | 14. Large Woody Debris Index (LWDI) | LWDI of project reach equals LWDI of reference reach | LWDI of project reach does not equal reference reach, but is trending towards reference | LWDI of project reach does not equal LWDI of reference reach and is not trending towards reference |
| | Exisiting Condition | | | 8 |
| | Proposed Condition | 8 | | |
| | **Streams in Alluvial Valleys (C, E)** | | | |
| | 15. Percent Riffle <3% slope | >60 - <70 | 70 - 80 or 40 - 60 | > 80 or < 40 |
| | Existing Condition | | | 8 |
| | Proposed Condition | 8 | | |
| | 16a. Pool-to-Pool Spacing Ratio (Watersheds < 10 $mi^2$) | >4.0 - <5.0 | 3.0 - 4.0 or 5.0 - 7.0 | < 3.0 or >7.0 |
| | Existing Condition | | | 8 |
| | Proposed Condition | 8 | | |
| | 16b. Pool-to-Pool Spacing Ratio (Watersheds > 10 $mi^2$) | >5.0 - <7.0 | 3.5 - 5.0 or 7.0 - 8.0 | <3.5 or >8.0 |
| | Existing Condition | | | |
| | Proposed Condition | | | |
| | 17a. Pool Max Depth Ratio/Depth Variability (Gravel Bed Streams) | >1.5 | 1.2 - 1.5 | <1.2 |
| | Existing Condition | | | |
| | Proposed Condition | | | |
| | 17b. Pool Max Depth Ratio/Depth Variability (Sand Bed Streams) | >1.2 | 1.1 - 1.2 | <1.1 |
| | Existing Condition | | | 8 |
| | Proposed Condition | 8 | | |
| | **Moderate Gradient Streams in Colluvial Valleys** | | | |
| | 18. Pool-to-Pool Spacing Ratio (3-5% Slope) | 0.5- 4.0 | 4.0 - 6.0 | >6.0 |
| | Existing Condition | | | |
| | Proposed Condition | | | |
| | 19. Pool Max Depth Ratio/Depth Variability | >1.5 | 1.2 - 1.5 | <1.2 |
| | Existing Condition | | | |
| | Proposed Condition | | | |
| | 20a. Percent Riffle 3% - 10% slope | >50 - <60 | 50 - 40 or 60 - 70 | > 70 or < 40 |
| | Existing Condition | | | |
| | Proposed Condition | | | |
| | 20b. Percent Riffle >10% slope | >75 - 80 | 70 - 75 | < 70 |
| | Existing Condition | | | |
| | Proposed Condition | | | |
| | Provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason | | | |

| Reach ID: | 1 |
|---|---|

**Function-based Rapid Reach Level Stream Assessment**

| Assessment Parameter | Measurement Method | Category | | |
|---|---|---|---|---|
| | | Functioning | Functioning-at-Risk | Not Functioning |
| **Stream Function Pyramid Level 4 Physicochemical** | | | | |
| Water Quality and Nutrients (Do not complete if stream is ephemeral) | 21. Water Appearance and Nutrient Enrichment (USDA 1999) | Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks. Clear water along entire reach; diverse aquatic plant community includes low quantities of many species of macrophytes; little algal growth present | Frequent cloudiness especially after storm events; objects visible to depth 0.5 to 3.0 ft; may have slight green color; no oil sheen on water surface. Fairly clear or slightly greenish water along entire reach; moderate algal growth on stream substrate | Very turbid or muddy appearance most of the time; objects visible at depth< 0.5 ft; slow moving water maybe bright green; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface; or strong odor of chemicals, oil, sewage, or other pollutants. Pea-green, gray, or brown water along entire reach; dense stands of macrophytes clogging stream; severe algal blooms creating thick algal mats in stream |
| | Existing Condition | | | X |
| | Proposed Condition | X | | |
| | 22. Detritus (Petersen, 1992) | Mainly consisting of leaves and wood without sediment covering it | Leaves and wood scarce; fine organic debris without sediment | Fine organic sediment - black in color and foul odor (anaerobic) or detritus absent |
| | Existing Condition | | X | |
| | Proposed Condition | X | | |
| | Provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason | | | |
| **Stream Function Pyramid Level 5 Biology** | | | | |
| Biology (Do not complete if stream is ephemeral) | 23. Macroinvertebrate Index Semi Quantitative Single Habitat (SQSH) Macroinvertebrate Sample (as defined in 2011 TN State QSSOP for macroinvertebrate surveys) | SQSH Score: >34 (Ecoregion 73A; >24) | SQSH Score: 30-34 (Ecoregion 73A; 20-24) | SQSH Score: <30 (Ecoregion 73A; <20) |
| | Existing Condition | | | X |
| | Proposed Condition | X | | |
| | 24. Macroinvertebrate Tolerance from NCBI Metric Score (as defined in the 2011 TN State QSSOP for macroinvertebrate surveys) | Abundant intolerant species 6 | Limited intolerant species 4 | Only tolerant species <4 |
| | Existing Condition | | | X |
| | Proposed Condition | X | | |
| | 25. Fish Presence | Abundant | Rare | Not present |
| | Existing Condition | | | X |
| | Proposed Condition | X | | |
| | Provide description of cause (s) and stability trend and if F can not be potentially achieved, provide reason | | | |

# Hydraulic and Geomorphic Assessment Data Form

Form created by Stream Mechanics and modified by Corps on 5/17/2016

## I. Bankfull Verification

| | | | |
|---|---|---|---|
| A. | Regional Curve | Ecoregion 65/74 | |
| B. | Drainage Area | 0.041 | sq. miles |
| C. | Difference between bankfull stage and water surface | 0.80 | feet |
| D. | Bankfull Width (Measured) | ~7.00 | feet |
| E. | Bankfull Area (Measured) | 5.60 | sq. feet |
| F. | Bankfull Mean Depth (Area/Width) | 0.80 | feet |
| G. | Bankfull Width (Regional Curve) | 5.40 | feet |
| H. | Bankfull Area (Regional Curve) | 2.32 | sq. feet |
| I. | Bankfull Mean Depth (Regional Curve) | 0.43 | feet |

**Area Calculations**

## II. Stream Classification

| | | | |
|---|---|---|---|
| A. | Bankfull W/D, calculate as $\frac{Bankfull\ Width}{Bankfull\ Mean\ Depth}$ | 8.75 | ft/ft. |
| B. | Bankfull Max Riffle Depth (Dmax) | 0.80 | feet |
| C. | Floodprone Area Width | 8.60 | feet |
| D. | Entrenchment Ratio, calculate as $\frac{Floodprone\ Area\ Width}{Bankfull\ Width}$ | 1.23 | ft/ft. |
| E. | Slope Estimate | 0.0023 | ft/ft. |
| F. | Channel Material Estimate | Silt/ | |
| G. | Rosgen Stream Type | G6c | |

## III. Floodplain Connectivity

A. Bank Height/Riffle Data

| | $R_1$ | $R_2$ | $R_3$ | $R_4$ |
|---|---|---|---|---|
| Low Bank Height (LBH) | None | | | |
| Dmax | | | | |
| Bank Height Ratio (LBH/Dmax) | | | | |
| Riffle Length | | | | |

B. Weighted Bank Height Ration, calculate as $\frac{\Sigma(Bank\ Height\ Ratio_i \text{ x Riffle Length}_i)}{\Sigma Riffle\ Length}$ N/A ft/ft.

C. Entrenchment Ratio from Riffle N/A ft/ft.

## IV. Bedform Diversity

A. Pool Data

| | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $P_5$ |
|---|---|---|---|---|---|
| Station | None | | | | |
| Pool to Pool Spacing | | | | | |
| Pool Spacing Ratio, $\frac{Pool\ Spacing}{Bankfull\ Width}$ | | | | | |
| Pool Depth (max depth at bankfull) | | | | | |
| Pool Depth Ratio, $\frac{Pool\ Depth}{Bankfull\ Mean\ Depth}$ | | | | | |

B. Average Pool Spacing Ratio N/A ft/ft.

C. Average Pool Depth Ratio N/A ft/ft.

## V. Large Woody Debris[4]

A. Number of Pieces per 100m N/A

B. Large Woody Debris Index N/A

[4] Davis, Jeffrey C., G. Wayne Minshall, Christopher T. Robinson, Peter Landres. Monitoring Wilderness Stream Ecosystems. USDA Forest Service General Technical Report RMRS-GTR-70 (January 2001). http://www.fs.fed.us/rm/pubs/rmrs_gtr070.pdf

## VI. Lateral Stability

A. Bank Data

| BEHI/NBS[5] Score | Bank Length |
|---|---|
| High | 200 |
| | |
| | |
| | |
| | |
| | |

B. Total Eroding Bank Length 200 ft.

C. Total Bank Length 1195 ft.

D. Dominant BEHI/NBS Score High

E. Percent of Bank Erosion, calculate as $\frac{Total\ Eroding\ Bank\ Length}{Total\ Bank\ Length}$ 16 %

## VI. Riparian Vegetation

A. Riparian Vegetation Data

| | Left | Right |
|---|---|---|
| Riparian/Buffer Width | None | <10ft |
| RBP Score | 0 | 0 |

## VII. Channel Evolution

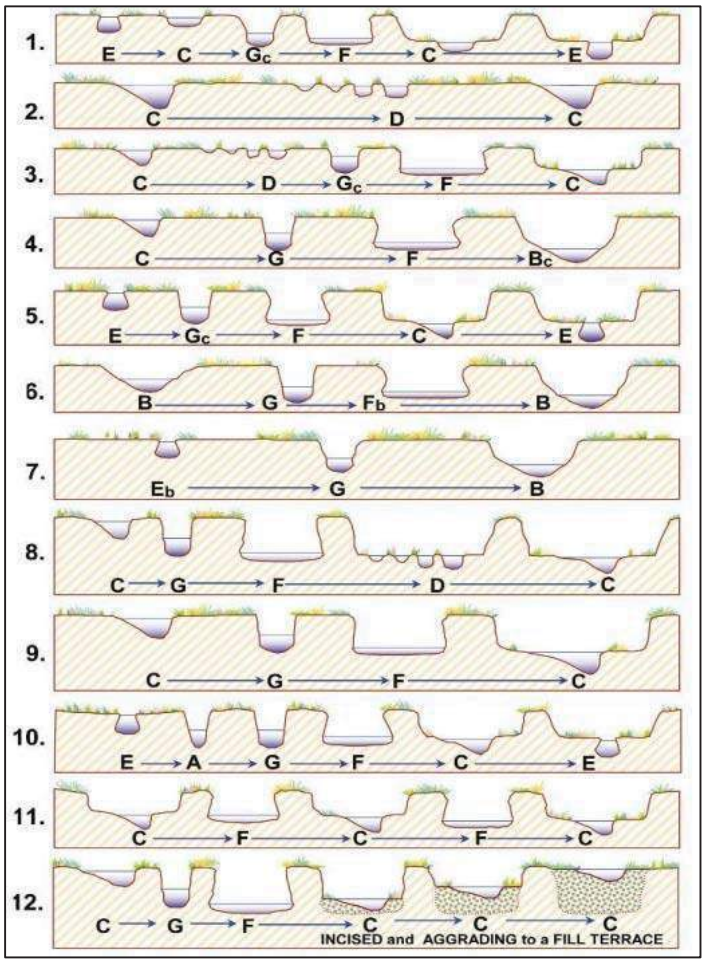
A. Rosgen Channel Type Succession 5

B. Simon Channel Evolution Model (Stage) II or III

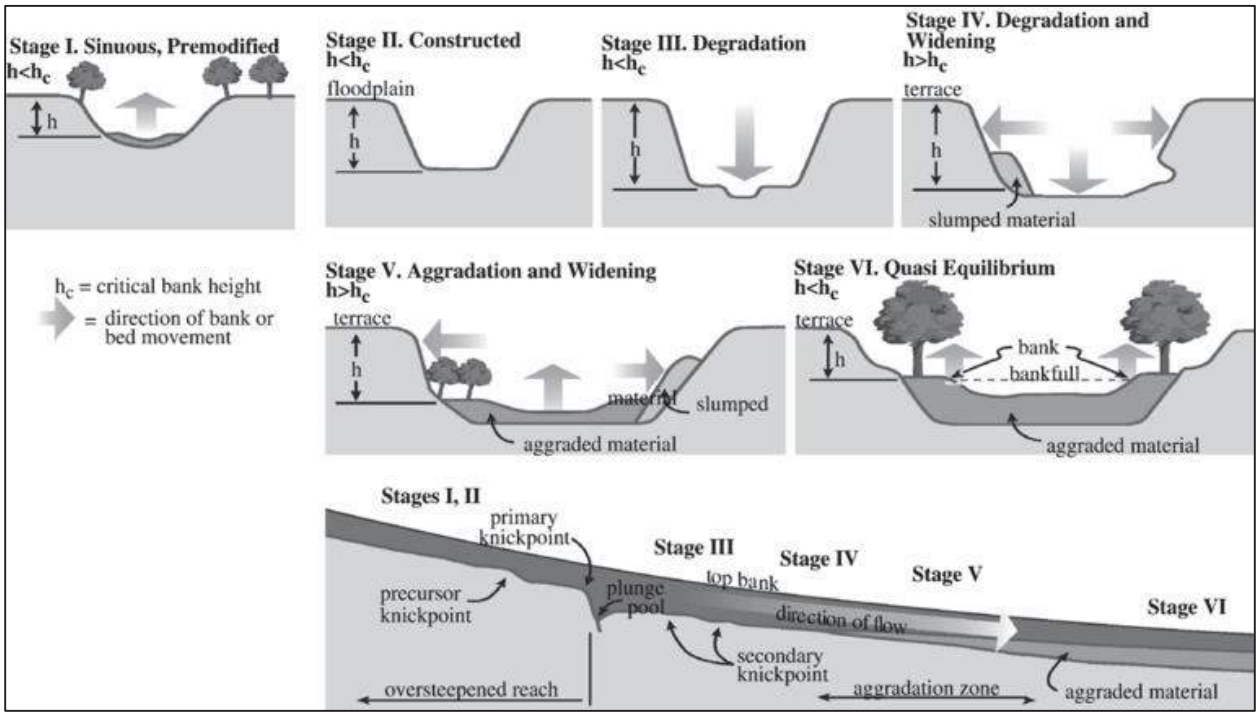
C. Provide a brief narrative describing the channel evolution trend.

[5] Rosgen, D. 2014. River Stability Field Guide (Second Edition). Wildland Hydrology, Fort Collins, CO.

**Rosgen Channel Type Succession Scenarios**



## Simon Channel Evolution Model



**HABITAT ASSESSMENT FIELD SHEET- LOW GRADIENT STREAMS (FRONT)**
**(Revised 06-09-17 – See Protocol E for detailed description and rank information)**

| | | | |
|---|---|---|---|
| **DWR Station ID:** UT to MFFD | | **Habitat Assessment By:** KHA | |
| Monitoring Location Name: | | **Date:** June 2018 | **Time:** |
| Monitoring Location: | | **Field Log Number:** | |
| HUC: | WS Group: | Ecoregion: 65e | QC: ☐ Duplicate ☐ Consensus |

| | **Optimal** | **Suboptimal** | **Marginal** | **Poor** |
|---|---|---|---|---|
| **1. Epifaunal Substrate/ Available Cover** | Over 50% of reach has natural, stable habitat for colonization by macroinvertebrates and/or fish. Three or more productive habitats are present. | Natural stable habitat covers 30-50% of stream reach or less than three habitats are present. | Natural stable habitat 10-30% of stream reach. Availability less than desirable, substrate frequently disturbed or removed. Habitat diversity is reduced. | Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking. |
| **SCORE** 6 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 |
| **Comments** | | | | |
| **2. Channel Substrate Characterization** | Good mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common. | Mixture of soft sand, mud or clay; or substrate is fissured bedrock, some root mats and submerged vegetation present. | All mud, clay, soft sand or fissured bedrock bottom, little or no root mat, no submerged vegetation present. | Hard-pan clay, conglomerate or predominantly flat bedrock; no root mat or submerged vegetation. |
| **SCORE** 6 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 |
| **Comments** | | | | |
| **3. Pool Variability** | Even mix of large-shallow, large-deep, small-shallow, small-deep pools present. | Majority of pools are large-deep very few shallow. | Shallow pools much more prevalent than deep pools. | Majority of pools small-shallow or pools absent. |
| **SCORE** 1 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 |
| **Comments** | | | | |
| **4. Sediment Deposition** | Sediment deposition affects less than 20% of stream bottom in quiet areas. New deposition on islands and point bars is absent or minimal. | Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of bottom affected. Slight deposition in pools. | Moderate deposition of fine material on old and new bars, 50-80% of bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition of pools. | Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. |
| **SCORE** 4 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 |
| **Comments** | | | | |
| **5. Channel Flow Status.** If water backed up by obstructions ( beaver dam, log jams, bedrock during low flow) move assessment reach above or below affected area or consider postponing sampling until accurate assessment of stream can be achieved. | Water reaches base of both lower banks throughout reach. Streambed is covered. Minimal productive habitat is exposed. | Water covers > 75% of streambed and/or < 25% of productive habitat is exposed. | Water covers 25-75% of streambed and/or stable habitat is mostly exposed. | Very little water in channel and mostly present as standing pools. Little or no productive habitat due to lack of water. |
| **SCORE** 1 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 |
| **Comments** | | | | |

**HABITAT ASSESSMENT FIELD SHEET- LOW GRADIENT STREAMS (BACK)**

DWR Station ID_____ Date_____ Assessor:_____

| | Optimal | Suboptimal | Marginal | Poor |
|---|---|---|---|---|
| **6. Channel Alteration** | Channelization, dredging or 4-wheel activity absent or minimal; natural meander pattern. NO artificial structures in reach. Upstream or downstream structures do not affect reach. | Channelization, dredging or 4-wheel activity up to 40%. Channel has stabilized. If larger reach, channelization is historic and stable. Artificial structures in or out of reach do not affect natural flow patterns. | Channelization, dredging or 4-wheel activity 40-80% (or less that has not stabilized.) Artificial structures in or out of reach may have slight affect. | Over 80% of reach channelized, dredged or affected by 4-wheelers. Instream habitat greatly altered or removed. Artificial structures may have greatly affected flow pattern. |
| **SCORE** 3 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 |
| **Comments** | | | | |
| **7. Channel Sinuosity** (Entire meander sequence not limited to sampling reach) | The bends in the stream increase the stream length 3-4 times longer than if it was in a straight line. | The bends in the stream increase the stream length 2-3 times longer than if it was in a straight line. | The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line. | Channel straight; waterway has been channelized for a long distance. |
| **SCORE** 1 | 20 19 18 17 16 | 15 14 13 12 11 | 10 9 8 7 6 | 5 4 3 2 1 |
| **Comments** | | | | |
| **8. Bank Stability** (score each bank) Determine left or right side by facing downstream. | Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected. | Moderately stable; infrequent, small areas of erosion 5-30% of bank eroded. If approaching 30% score marginal if banks steep. | Moderately unstable; 30-60 % of bank in reach has areas of erosion; high erosion potential during floods, If approaching 60% score poor if banks steep. | Unstable; many eroded area; raw areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars. |
| SCORE___(LB) 3 | Left Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| SCORE___(RB) 6 | Right Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| **Comments** | | | | |
| **9. Vegetative Protective** (score each bank) includes vegetation from top of bank to base of bank. Determine left or right side by facing downstream | More than 90% of the bank covered by undisturbed vegetation. All 4 classes (mature trees, understory trees, shrubs, groundcover) are represented and allowed to grow naturally. All plants are native. | 70-90% of the bank covered by undisturbed vegetation. One class may not be well represented. Disruption evident but not effecting full plant growth. Non-natives are rare (< 30%) | 50-70% of the bank covered by undisturbed vegetation. Two classes of vegetation may not be well represented. Non-native vegetation may be common (30-50%). | Less than 50% of the bank covered by undisturbed vegetation or more than 2 classes are not well represented or most vegetation has been cropped. Non-native vegetation may dominate (> 50%) |
| SCORE___(LB) 3 | Left Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| SCORE___(RB) 5 | Right Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| **Comments** | | | | |
| **10. Riparian Vegetative Zone Width** (score each bank.) Zone begins at top of bank. | Average width of riparian zone > 18 meters. Unpaved footpaths may score 9 if run-off potential is negligible. | Average width of riparian zone 12-18 meters. Score high if areas < 18 meters are small or are minimally disturbed. | Average width of riparian zone 6-11 meters. Score high if areas less than 12 meters are small or are minimally disturbed. | Average width of riparian zone <6 meters. Score high if areas less than 6 meters are small or are minimally disturbed. |
| SCORE___(LB) 1 | Left Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| SCORE___(RB) 1 | Right Bank 10 9 | 8 7 6 | 5 4 3 | 2 1 0 |
| **Comments** | | | | |

**Total Score** 41 **Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW**

**If score below guidelines, result of (circle): Natural Conditions or Human Disturbance**

**Describe**

# Appendix D

## Jurisdictional Determination

Tioga
ENVIRONMENTAL CONSULTANTS

June 22, 2018

Mr. Dusty Mays
Kimley-Horn and Associates, Inc.
6750 Poplar Avenue, Suite 600
Memphis, Tennessee 38138

RE: Middle Fork Tracts – Henderson County, TN
Jurisdictional Waters Delineation
Tioga Project 54904.00

Dear Mr. Mays,

Tioga Environmental Consultants, Inc. is pleased to provide the enclosed Jurisdictional Waters Delineation Report for the above referenced project. This report is preliminary and should not be interpreted as a final jurisdictional delineation or an authorization to perform any soil disturbance on the site. The local USACE District and TDEC field office are the only agencies authorized to make the final jurisdictional classification of the preliminary wetland and waters identified in this report.

If you have any questions or if additional information is needed, please contact me at (901) 791-2432.

Sincerely,
TIOGA ENVIRONMENTAL CONSULTANTS, INC.

Ben S. Day
Senior Environmental Scientist

CC: 54904.00


357 North Main Street, Memphis, TN 38103 | Phone: 901.791.2432 | Fax: 901.791.2442 | tiogaenv.com

# Jurisdictional Waters Delineation Report

**Middle Fork Tracts**

**Lexington, Henderson County, TN**

June 2018

Project No. 54904.00

Prepared For:

Kimley-Horn and Associates, Inc.
6625 Lenox Park Drive, Suite 117
Memphis, TN 38115

Prepared By:

Tioga
ENVIRONMENTAL CONSULTANTS
357 North Main Street
Memphis, Tennessee 38103

# Table of Contents



**APPENDICES**

# 1.0 INTRODUCTION

This report describes the results of a preliminary jurisdictional waters delineation, including wetlands, within the project area. The project area consists of two tracts east adjacent to the Middle Fork Forked Deer River (MFFD) in Henderson County, TN. The northern tract (Henderson County parcel 035 020.00, 28 acres) and southern tract (parcel 035 020.01, 26.5 acres) are separated by Interstate 40. The project area is detailed in Figures 1 and 2 (a topographic and aerial map respectively). Henderson County records indicate the properties are owned as follows:

Tommie F. Campbell, et al.
Jason Bruce White
75 Stonecrest Drive
Jackson, TN 38305

Both tracts are accessed from Exit 101 (Highway 104) off Interstate 40, with the MFFD forming the western boundary of each. The northern tract is located south of Mount Gilead Lane, immediately north of Interstate 40 and west of Exit 101. The tract is an approximately 28 acre agricultural parcel, currently used for grazing. The northeastern edge of the site is rolling hills while the remainder of the site is level floodplains.

The southern tract is located between Interstate 40 to the north and Rock Milam Road to the south. An overhead power right-of-way (ROW) diagonally bisects the tract. The tract is flat and, outside the maintained ROW, is fallow and undeveloped with some wooded portions.

Ben Day and William Gray of Tioga Environmental Consultants, Inc. (Tioga) conducted a preliminary assessment on the northern tract on September 15, 2017, and a full delineation was conducted on both tracts on June 12, 2018. The purpose of the delineation was: (1) to determine the presence and approximate extent of jurisdictional wetlands and other waters of the US (streams, lakes, water bodies) under authority of the United State Army Corps of Engineers (USACE) as defined in Section 404 of the Clean Water Act; and (2) to determine the presence and approximate extent of jurisdictional waters of the State of Tennessee (streams, wet weather conveyances, water bodies) under authority of the Tennessee Department of Environmental and Conservation (TDEC). Delineated features are represented on Figures 3 and 4 and summarized in Table 4-1.

This report is not “held out” to represent that prepared by a licensed surveyor or engineer. Boundaries and other habitat features depicted in this report are the opinions of the author and should not be misconstrued as a legal survey or engineering design.

# 2.0 METHODOLOGY

## 2.1 DESKTOP EVALUATION

Prior to conducting field activities, the project area was assessed via a desktop evaluation to identify potential jurisdictional features requiring field verification. Sources evaluated included:

- The current USGS topographic map(s) covering the site;
- Natural Resources Conservation Service (NRCS) soil mapping of the site (Appendix C);
- National Wetland Inventory (NWI) mapping of the site (Appendix D); and,
- Historical aerial imagery, as available.

The USGS map indicates that the tracts are mostly level, except for the northeastern corner of the northern tract that elevates up a hill slope. The map also shows single low-order streams crossing each property. The NRCS soils map indicates that the low-lying areas onsite are comprised of the hydric, clay based Beechy (Waverly) soils. These soils are considered to be hydric throughout their reach, indicating that they have low permeability and will retain water on the surface. The available National Wetlands Inventory (NWI) map denotes that the western third of the northern tract is a temporarily flooded scrub/shrub wetland (PSS1A), while the entirety of the southern tract is a seasonally flooded forested wetland (PFO1C).

## 2.2 ONSITE EVALUATION

Ben Day and William Gray of Tioga Environmental Consultants, Inc. (Tioga) conducted a preliminary assessment on the northern tract on September 15, 2017, and a full delineation was conducted on both tracts on June 12, 2018. The project area was thoroughly inspected to determine if any jurisdictional wetlands, streams, drains or water bodies occur within the area.

### 2.2.1 Wetlands

Wetlands are those areas satisfying the technical criteria contained in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987) as amended, and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0))*, November 2010. The field investigation included an inspection of the entire project area to identify areas exhibiting wetland criteria. The criteria used are based on the identification of the following characteristics:

1. The presence of wetland hydrology;
2. The prevalence of hydrophytic vegetation; and,
3. The presence of hydric soils.

Representative data plots were established during the onsite evaluation and the hydrology, vegetation, and soils in each radius plot were sampled and documented on an *Atlantic and Gulf Coastal Plain Region Data Form*. These data points are

referenced on the Figures. Copies of the Data Forms are attached for review in Appendix E.

### 2.2.2 Water Conveyances

The presence of an "ordinary high water mark" (OHWM), as indicated by the following flow characteristics, was used as a primary guide to determine USACE jurisdiction over water conveyances: natural line impressed on the bank; the presence of litter and debris; changes in the character of soil; destruction of terrestrial vegetation; shelving; the presence of a wrack line; vegetation matted down, bent, or absent; sediment sorting; leaf litter disturbed or washed away; scour; sediment deposition; multiple observed or predicted flow events; water staining; and abrupt change in plant community. Three USACE documents were used as secondary guides to help determine jurisdictional status of potential "other waters"; the *Approved Jurisdictional Determination Form* ("JD form" / Appendix B / 30 May 2007), *Regulatory Guidance Letter (RGL) 07-01* (5 June 2007), and *RGL 05-05* (7 December 2005).

In continuation of USACE guidelines, ditches (including roadside ditches) excavated wholly in and draining only uplands that do not carry a relatively permanent flow of water, are not tributaries, and do not have a significant nexus to navigable waters would not be considered jurisdictional waters of the US. Swales and erosional features (e.g., gullies, small washes characterized by low volume, infrequent, and short duration flow) would, likewise, not be considered jurisdictional if they were not tributaries and did not have a significant nexus to a navigable water.

Water conveyances that may be considered jurisdictional waters of the State of Tennessee were evaluated in the field using the methodology described in the *Guidance for Making Hydrologic Determinations*. This guidance is intended as a supplement to the State of Tennessee standard operating procedures for making stream and wet weather conveyance determinations, as found in Rule 1200-4-03-.05(9) as provided for in Public Chapter 464 of 2009. For the purposes of classifying waters of the State of Tennessee, a stream is defined as "a surface water that is not a wet weather conveyance." Wet weather conveyances are defined as "man-made or natural watercourses, including natural watercourses that have been modified by channelization: that flow only in direct response to precipitation runoff in their immediate locality; whose channels are at all times above the ground water table; that are not suitable for drinking water supplies; and in which hydrological and biological analyses indicate that, under normal weather conditions, due to naturally occurring ephemeral or low flow there is not sufficient water to support fish, or multiple populations of obligate lotic aquatic organisms whose life cycle included an aquatic phase of at least two months." Furthermore, waters of the State are "any and all water, public or private, on or beneath the surface of the ground, that are contained within, flow through, or border upon Tennessee or any portion thereof, except those bodies of water confined to and retained within the limits of private property in single ownership that do not combine or effect a junction with natural surface or underground waters." *Hydrologic Determination Field Data Sheet(s)* were prepared to document data associated with water conveyances that may be potential waters of the State of Tennessee, and are attached for review in Appendix F.

### 2.2.3 Other Waters

Manmade ponds, sediment control basins, borrow pits and other non-flowing open water areas would be considered jurisdictional waters of the US if they had a significant nexus to a jurisdictional water. These water bodies would not be considered jurisdictional if they were separated from a jurisdictional water by non-jurisdictional uplands and the use, degradation or destruction of which will not affect interstate commerce.

## 2.3 MARKING OF FEATURES

A 'WAAS' enabled Global Positioning System (GPS) was used to determine the latitude and longitude of the plots where data was collected and where site photographs were taken. GPS data collected in the field was also used to generate track lines representing the wetland boundaries and the path of water features. Accuracy of the track lines and positions shown is to within 1-3 meters.

Large, obvious water bodies, such as major named rivers, borrow pits or lakes, are not commonly surveyed in the field. The point of jurisdiction for these water bodies was assumed to be the crest of top-bank. In situations where access to the wetland or water boundary is not accessible, for instance where only one side of a linear feature can be reached, available points are recorded and desktop interpretation made to determine the additional boundary lines. In other instances, for example when the delineated feature is less than approximately one meter in width, the centerline of the feature was recorded with later desktop interpretation.

## 2.4 PHOTOGRAPHIC DOCUMENTATION

Photographs were taken at representative sites within the project area (see Appendix B). The photographs are included to provide a visual representation of the typical habitat, soil characteristics and landmarks found therein.

# 3.0 WETLAND CRITERIA EVALUATION

## 3.1 HYDROLOGY

The hydrology of the majority of the project area has been significantly disturbed as a result of site historical development, including extensive grading, ditching and channelization to drain historically wet areas. The primary source of water onto the project area is from direct precipitation, although out-of-bank events from the Middle Fork Forked Deer River will flood most of the area.

### 3.1.1 Northern Tract

The southeastern and western portions of the tract were inundated during the preliminary September 2017 site visit, with depths of 18+ inches on the western portion of the site. The tract was somewhat dryer during the June 2018 delineation, but standing water in pools and depressions was still noted throughout the site. Other hydrologic indicators noted were Sediment Deposits, Inundation Visible on Aerial Imagery, Crayfish Burrows, Geomorphic Position, and Shallow Aquitard. The USGS map, historical imagery and the NWI map indicate that a low order stream used to pass through the center of the site north to south, but site development has apparently eliminated this feature. A drainage conveyance was noted just outside the northern edge of the parcel, draining to the river. This conveyance stems from a headwater area that has an artesian well installed to provide a water pool for the onsite cattle. The pooled water discharges into the conveyance, forming a small stream channel before the water dries and / or seeps into the subsurface.

### 3.1.2 Southern Tract

On the western portion of the southern tract near the MFFD, the primary hydrologic indicators were Drift Deposits and Water-Stained Leaves. The central portion of the tract along the ROW was generally noted to have shallow inundation and saturated soils, while the eastern third of the property was shallowly inundated and forested. The hydrologic indicators in these areas included Surface Water, High Water Table, Inundation Visible on Aerial Imagery, Sediment Deposits, Crayfish Burrows and Geomorphic Position.

The USGS map indicates that a low order stream passes through the southwest edge of the tract, but this feature was not noted in the field. A linear conveyance that cuts off the southwest corner of the site and ties the roadside linear wetlands to the MFFD was noted. It is possible that historical development of the Rock Milam roadway and the powerline ROW removed or re-routed this historical stream.

A linear channel cuts diagonally to the northwest across the western center of the tract. The channel is generally just part of the overall wetland feature, but does dry to the northwest, forming a wet weather conveyance. This feature may have caused drainage of the soils in this northwest area, leading to their non-hydric condition.

## 3.2 VEGETATION

Wetland vegetation noted on each tract was similar in overall composition, varying by specific location. Generally, the eastern forested areas were comprised almost exclusively of red maple (*Acer rubrum*) trees with no understory. Open areas that have not been recently farmed or cleared tended to form emergent scrub/shrub wetlands dominated by Lizards Tail (*Saururus cernuus*), sedges (*Carex frankii*), smartweed (*Polygonum sp.)* and rush (*Juncus effuses*) in the herb layer and black willow (*Salix nigra*) and red maple (*Acer rubrum*) in the shrub layer. The open areas that have been more recently farmed or maintained were dominated by the *Juncus* species and red maple saplings. Other species noted in the transitional areas included false nettle (*Boehmeria cylindrica*), sweetgum (*Liquidambar styraciflua*), and Grays sedge (*Carex grayi*), among others.

Vegetation in elevated areas or areas lacking significant hydrology was noted to include river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), and various oak species (*Quercus sp.*), particularly along the river margins.

## 3.3 SOILS

Table 3-1 represents the significant soil series present and the corresponding hydric rating within the project area, as exhibited in the 2015 NRCS Web Soil Survey of Henderson County, TN. The Web Soil Surveys for the project area is included in Appendix C.

**Table 3-1: Soil Series within Project Area**

| Soil Series | % of Project Area | % Hydric Rating |
|---|---|---|
| North Tract | | |
| Beechy silt loam (Bb) | 71.5 | 100 |
| Freeland silt loam (F) | 28.5 | 0 |
| South Tract | | |
| Beechy silt loam (Bb) | 99.5 | 100 |
| Freeland silt loam (F) | 0.5 | 0 |

### 3.3.1 Classified Hydric Soils

**Beechy Soils**

The hydric Beechy soils comprise the entirety of the lower floodplain elevations of the project area. These areas correlate with the strongest indicators of hydrology and wetland features that were field located during the delineation efforts.

These soils are disturbed from the many years of cultivation and ROW maintenance and have formed a hardpan that acts as an aquitard, contributing to

the site hydrology and the hydric indicator of depleted matrix.

Representative examples are Sample Points 1 and 2, as detailed in the data sheets in Appendix E.

### 3.3.2 Other Soils

The hillslope soils, primarily located on the eastern margins of the project area, are comprised of the Freeland series. These soils are not noted to have hydric inclusions and were not specifically characterized during the delineation efforts as no hydrologic indicators were present in these areas.

## 4.0 SUMMARY OF JURISDICTIONAL FEATURES

The site delineation identified jurisdictional features within the project area. Tabular summary of the identified features is provided, with supporting location and extent diagrams attached (see Figures 2 through 4 in Appendix A). The GPS coordinates of each feature are provided. For large features such as open waters and wetlands the coordinates listed provide a generalized central location of the feature. The coordinates provided for linear features are for the "start point" and "end point" of the feature.

Cowardin and USACE classification are used by the Regulatory Branch of the Memphis District of the USACE to categorize various wetland and other waters of the US types. The State of Tennessee classification is likewise provided for categorization purposes. The water conveyances in the Tennessee classification are also described in parentheses by the type of field indicators present: Primary = feature is classified based on primary indicators; Numerical score = feature is classified based on secondary indicator scoring, where 19 or above is classified as a stream and below 19 is classified as a wet weather conveyance.

**Table 4-1: Jurisdictional Features**

| Feature ID (Sample Point) | Length / Area | Start Point | End Point | Cowardin Class | USACE Class | TN Class |
|---|---|---|---|---|---|---|
| | | Latitude, °N Longitude, °W | Latitude, °N Longitude, °W | | | |
| Wetland 1 (SP-1) | 16.37 acres | 35.14400 89.81064 | N/A | PEM / PFO / PSS | Wetland | N/A |
| Wetland 2 (SP-2) | 18.62 acres | 35.14551 89.80858 | N/A | PEM / PFO / PSS | Wetland | N/A |
| | | | | | | |
| Middle Fork Forked Deer (West Boundary) | 902 feet (North Tract)<br>747 feet (South Tract) | 35.74766 88.55609<br>35.74492 88.55486 | 35.74978 88.55757<br>35.74689 88.55554 | R2UB2 | Perennial Stream | Stream (Primary) |
| Stream 1 (NC-1) | 557 feet | 35.75013 88.55368 | 35.75000 88.55555 | R4SB5 | Intermittent Stream | Stream (Primary) |
| | | | | | | |
| WWC 1 (C-1) | 696 feet | 35.74630 88.55307 | 35.74695 88.55528 | N/A | WWC | WWC (Primary) |
| WWC 2 (C-2) | 215 feet | 35.74516 88.55419 | 35.74518 88.55488 | N/A | WWC | WWC (6.5) |

## 5.0 ADDITIONAL CONSIDERATIONS

This report is intended as a preliminary delineation and should not be interpreted as a final jurisdictional delineation nor an authorization to perform any soil disturbance on the site evaluated. The USACE and the TDEC are the only agencies authorized to make the final jurisdictional classification of the preliminary wetland and waters identified in this report.

## 6.0 REFERENCES

The wetland delineation method used followed the procedures outlined in the following:

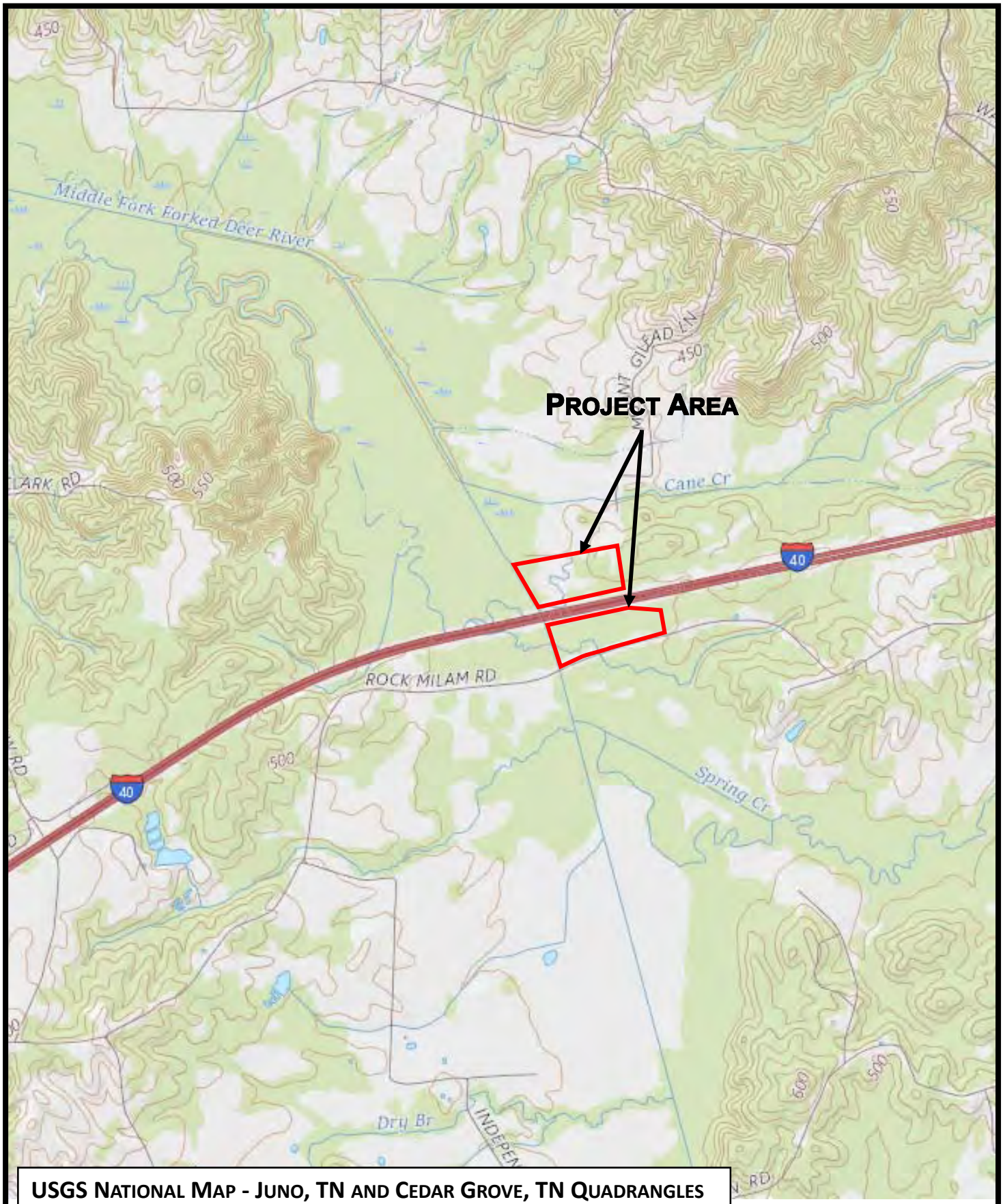
- Part IV of the *USACE Wetland Delineation Manual* dated 1987;
- *USACE Regulatory Guidance Letter No. 05-05 dated December 2005;*
- *USACE Regulatory Guidance Letter No. 07-01 dated June 2007;*
- *USACE Regulatory Guidance Letter No. 16-01 dated October 2016*; and,
- *ERDC/EL TR-10-20 (Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0))*, November 2010.

Other sources of information utilized in this delineation include the following:

- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) 2015. Henderson County, Tennessee WEB Soil Survey;
- U.S. Fish and Wildlife Service, National Wetlands Inventory. NWI Mapper. 2018.
- *Redoximorphic Features for Identifying Aquic Conditions*, North Carolina Agricultural Research Service, Technical Bulletin 301;
- Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-1;
- U.S. Geological Survey, The National Map. https://viewer.nationalmap.gov/advanced-viewer/; and,
- Google Earth. Available [online] Aerial Photograph. http://googleearth.com/.

# APPENDIX A

# FIGURES




**USGS NATIONAL MAP - JUNO, TN AND CEDAR GROVE, TN QUADRANGLES**

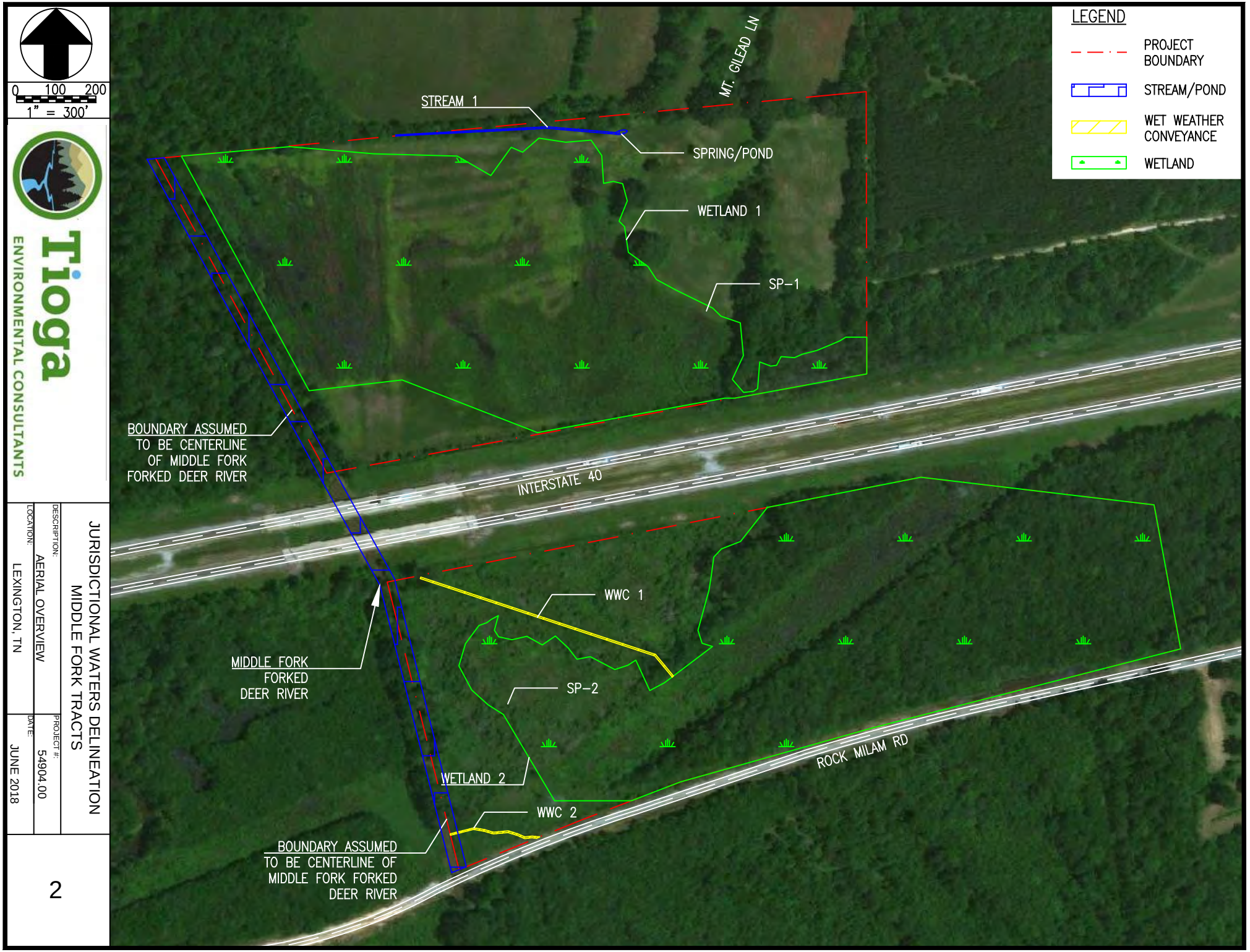
1:24k

Tioga
ENVIRONMENTAL CONSULTANTS

JURISDICTIONAL WATERS DELINEATION
MIDDLE FORK TRACTS

| DESCRIPTION: | PROJECT #: |
|---|---|
| TOPOGRAPHIC MAP | 54904.00 |
| LOCATION: | DATE: |
| LEXINGTON, TN | JUNE 2018 |

1



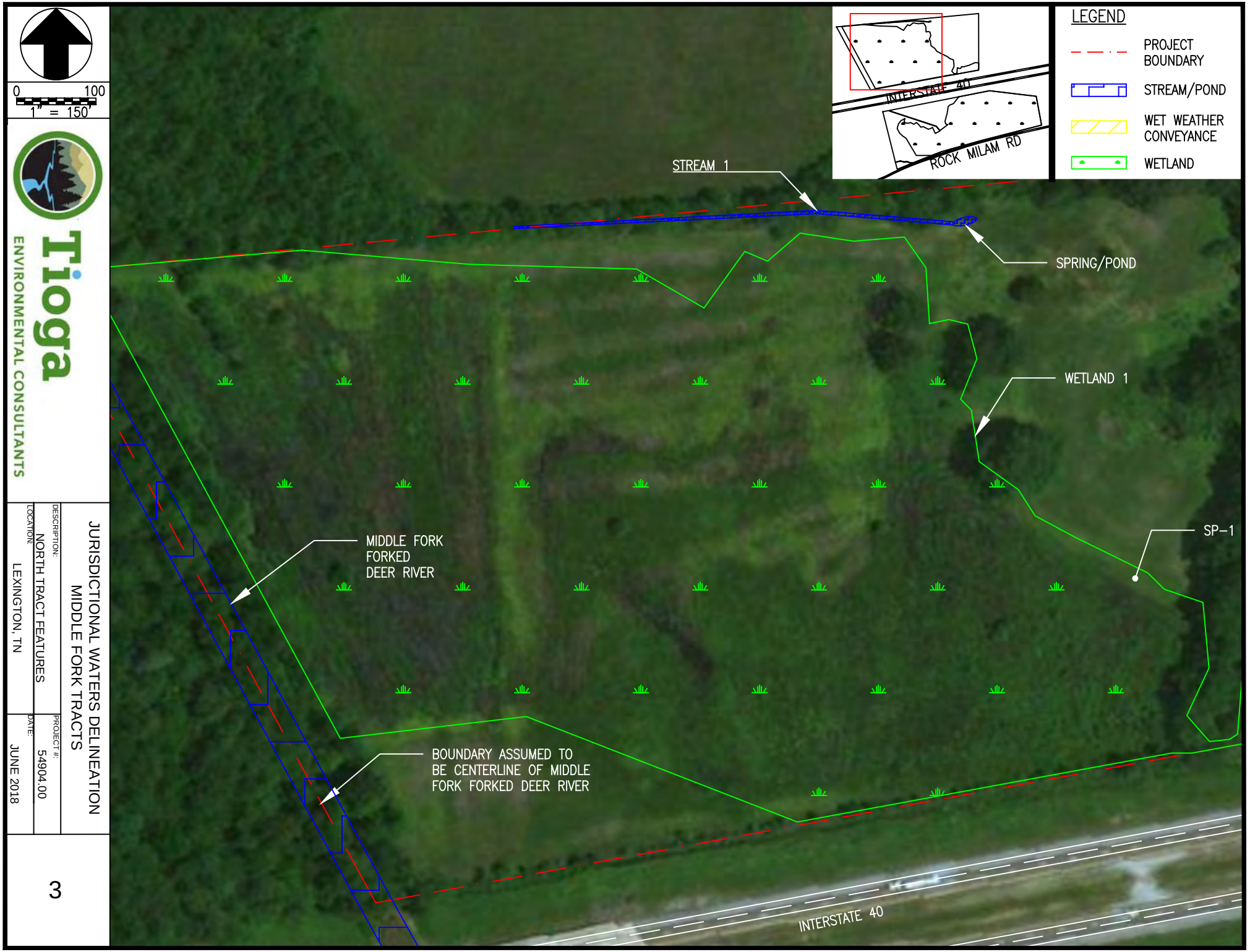

0 100 200
1" = 300'

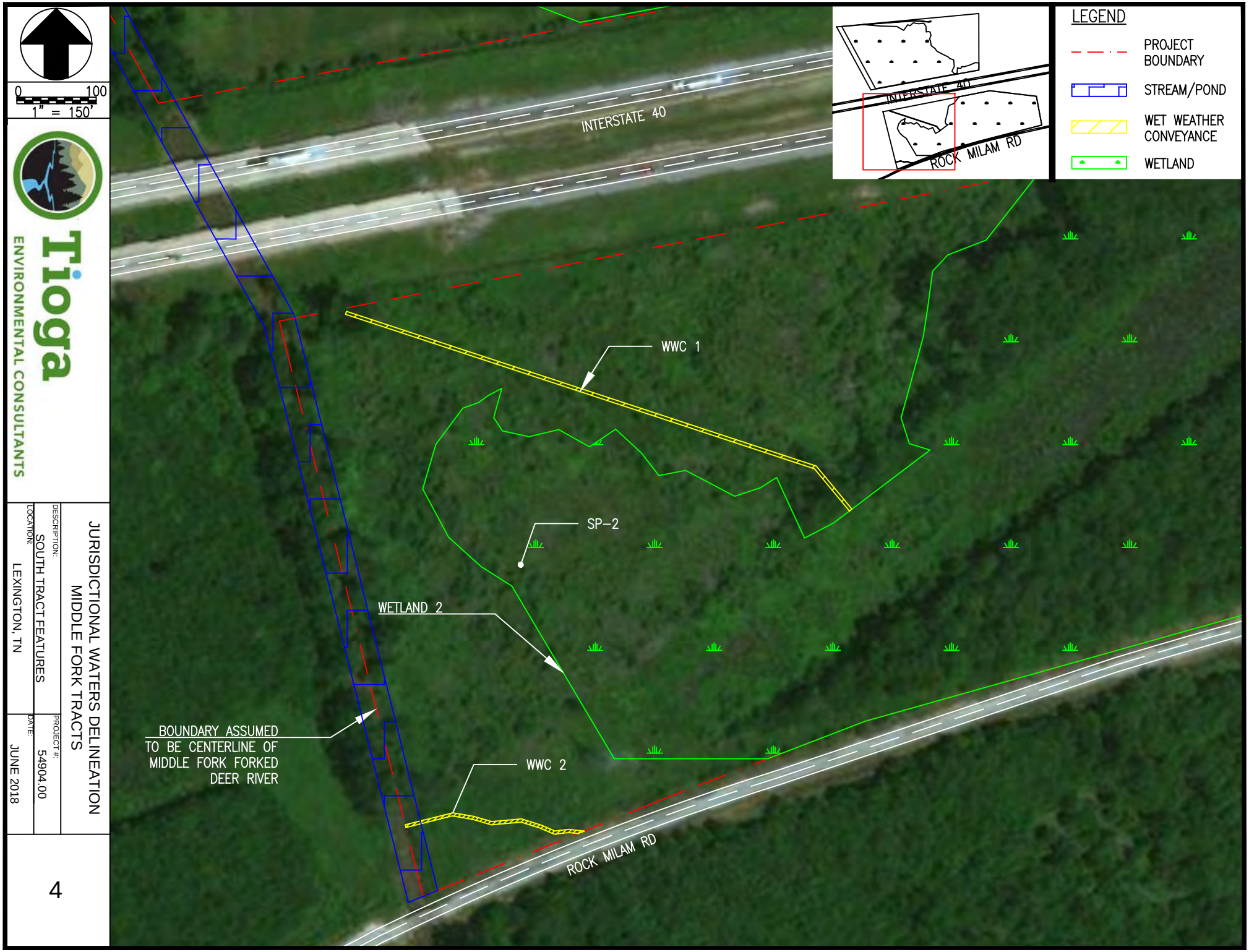
Tioga
ENVIRONMENTAL CONSULTANTS

JURISDICTIONAL WATERS DELINEATION
MIDDLE FORK TRACTS

DESCRIPTION: AERIAL OVERVIEW
LOCATION: LEXINGTON, TN
PROJECT #: 54904.00
DATE: JUNE 2018

2


0
100
1" = 150'
Tioga
ENVIRONMENTAL CONSULTANTS
JURISDICTIONAL WATERS DELINEATION
MIDDLE FORK TRACTS
DESCRIPTION:
NORTH TRACT FEATURES
LOCATION:
LEXINGTON, TN
PROJECT #:
54904.00
DATE:
JUNE 2018
3
LEGEND
PROJECT BOUNDARY
STREAM/POND
WET WEATHER CONVEYANCE
WETLAND
INTERSTATE 40
ROCK MILAM RD
STREAM 1
SPRING/POND
WETLAND 1
SP-1
MIDDLE FORK FORKED DEER RIVER
BOUNDARY ASSUMED TO BE CENTERLINE OF MIDDLE FORK FORKED DEER RIVER
INTERSTATE 40

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ENVIRONMENTAL CONSULTANTS

JURISDICTIONAL WATERS DELINEATION
MIDDLE FORK TRACTS

DESCRIPTION: SOUTH TRACT FEATURES
LOCATION: LEXINGTON, TN
PROJECT #: 54904.00
DATE: JUNE 2018

# APPENDIX B

# PHOTOGRAPHIC LOG

# PHOTOGRAPHIC LOG

| | | |
|---|---|---|
| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |

| **Photo No.** | **Date:** |
|---|---|
| **1** | 6/12/2018 |

**Direction Photo Taken:**

North

**Description:**

North tract

Existing wetland area on southeast portion of site

| **Photo No.** | **Date:** |
|---|---|
| **2** | 09/15/2017 |

**Direction Photo Taken:**

East

**Description:**

North Tract

From north central portion of the site looking east

Pockets of the central portion of the site are inundated

Tioga
ENVIRONMENTAL CONSULTANTS

# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** | **Date:** |
|---|---|
| **3** | 09/15/2017 |

**Direction Photo Taken:**

North

**Description:**

North Tract

Inundation from September 2017 on western third of site

| **Photo No.** | **Date:** |
|---|---|
| **4** | 06/12/2018 |

**Direction Photo Taken:**

South

**Description:**

North Tract

A reverse view of the area from the previous photo, from the June 2018 delineation

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ENVIRONMENTAL CONSULTANTS

# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** **5** | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

Southwest

**Description:**

North tract

Typical wetland herbaceous layer plants on site

| **Photo No.** **6** | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

North

**Description:**

North Tract

Red maple dominated wetland area on southeastern boundary of the north tract

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# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 7 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

North

**Description:**

North Tract

Artesian well that forms a pooled drinking area for cattle on the north edge of the tract

| **Photo No.** 8 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

N/A

**Description:**

North Tract

Discharge channel (Stream 1) from the artesian well pool area

Channel flows along north property boundary, eventually drying out

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# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 9 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

N/A

**Description:**

North Tract

Crayfish burrows located along wet margins of site

| **Photo No.** 10 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

South

**Description:**

North Tract

Middle Fork Forked Deer River flowing along west boundary of site

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# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 11 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

South

**Description:**

North Tract

Sample point (SP-1) for northern tract located on eastern third of site near northern edge of wetland

| **Photo No.** 12 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

N/A

**Description:**

North Tract

Soils form wetland sample point SP-1 on northern tract

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**PHOTOGRAPHIC LOG**

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 13 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

North

**Description:**

South Tract

Typical view of the western portion of the wetland area on the south tract, near the river

| **Photo No.** 14 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

West

**Description:**

South Tract

Drift deposits, typical along the outer western margins of the southern tract wetland

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# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 15 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

N/A

**Description:**

South Tract

Drift deposits with snail shells along boundaries of the southern tract wetland

| **Photo No.** 16 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

Northeast

**Description:**

South Tract

Typical view of wetland areas within powerline right-of-way

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ENVIRONMENTAL CONSULTANTS

# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 17 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

North

**Description:**

South Tract

Boundary between cleared powerline and red maple bottomland hardwoods

Note the sediment deposition on herbaceous layer

| **Photo No.** 18 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

East

**Description:**

South Tract

Inundated red maple bottomland hardwood wetland on the eastern portion of the southern tract

# PHOTOGRAPHIC LOG

Tioga ENVIRONMENTAL CONSULTANTS

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 19 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

North

**Description:**

South Tract

Sample point (SP-2) from western edge of tract near the river, just inside the western edge of the wetland feature

| **Photo No.** 20 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

N/A

**Description:**

South Tract

Soils from the southern tract wetland sample point (SP-2)

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# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 21 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

Southeast

**Description:**

South Tract

Up valley view of dry channel crossing northwestern corner of the tract

(WWC 1)

| **Photo No.** 22 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

Northwest

**Description:**

South Tract

Down valley view of dry channel crossing northwestern corner of the tract

(WWC 1)

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ENVIRONMENTAL CONSULTANTS

# PHOTOGRAPHIC LOG

| **Client Name:** Kimley-Horn & Associates | **Site Location:** Middle Fork Tracts - Lexington, TN | **Project No.** 54904.00 |
|---|---|---|

| **Photo No.** 23 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

Southeast

**Description:**

Up valley view of dry channel cutting across southwest corner of the south tract

(WWC 2)

| **Photo No.** 24 | **Date:** 06/12/2018 |
|---|---|

**Direction Photo Taken:**

Northwest

**Description:**

Down valley view of dry channel cutting across southwest corner of the south tract

(WWC 2)

# APPENDIX C

# NRCS SOIL MAP

Hydric Rating by Map Unit—Henderson County, Tennessee
(Middle Fork Site Soils)


Map Scale: 1:3,160 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 45 90 180 270

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Soil Rating Lines**

- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Soil Rating Points**

- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Water Features**

Streams and Canals

**Transportation**

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**

Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Henderson County, Tennessee
Survey Area Data: Version 11, Sep 24, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 6, 2011—Jun 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Hydric Rating by Map Unit

| Hydric Rating by Map Unit— Summary by Map Unit — Henderson County, Tennessee (TN077) | | | | |
|---|---|---|---|---|
| **Map unit symbol** | **Map unit name** | **Rating** | **Acres in AOI** | **Percent of AOI** |
| Bb | Beechy silt loam (Bibb) | 100 | 22.3 | 71.5% |
| Fg | Freeland silt loam, eroded sloping phase | 0 | 4.8 | 15.4% |
| Fh | Freeland silt loam, severely eroded sloping phase | 0 | 2.2 | 7.2% |
| Fk | Freeland silt loam, severely eroded strongly sloping phase | 0 | 1.9 | 5.9% |
| **Totals for Area of Interest** | | | **31.2** | **100.0%** |

## Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

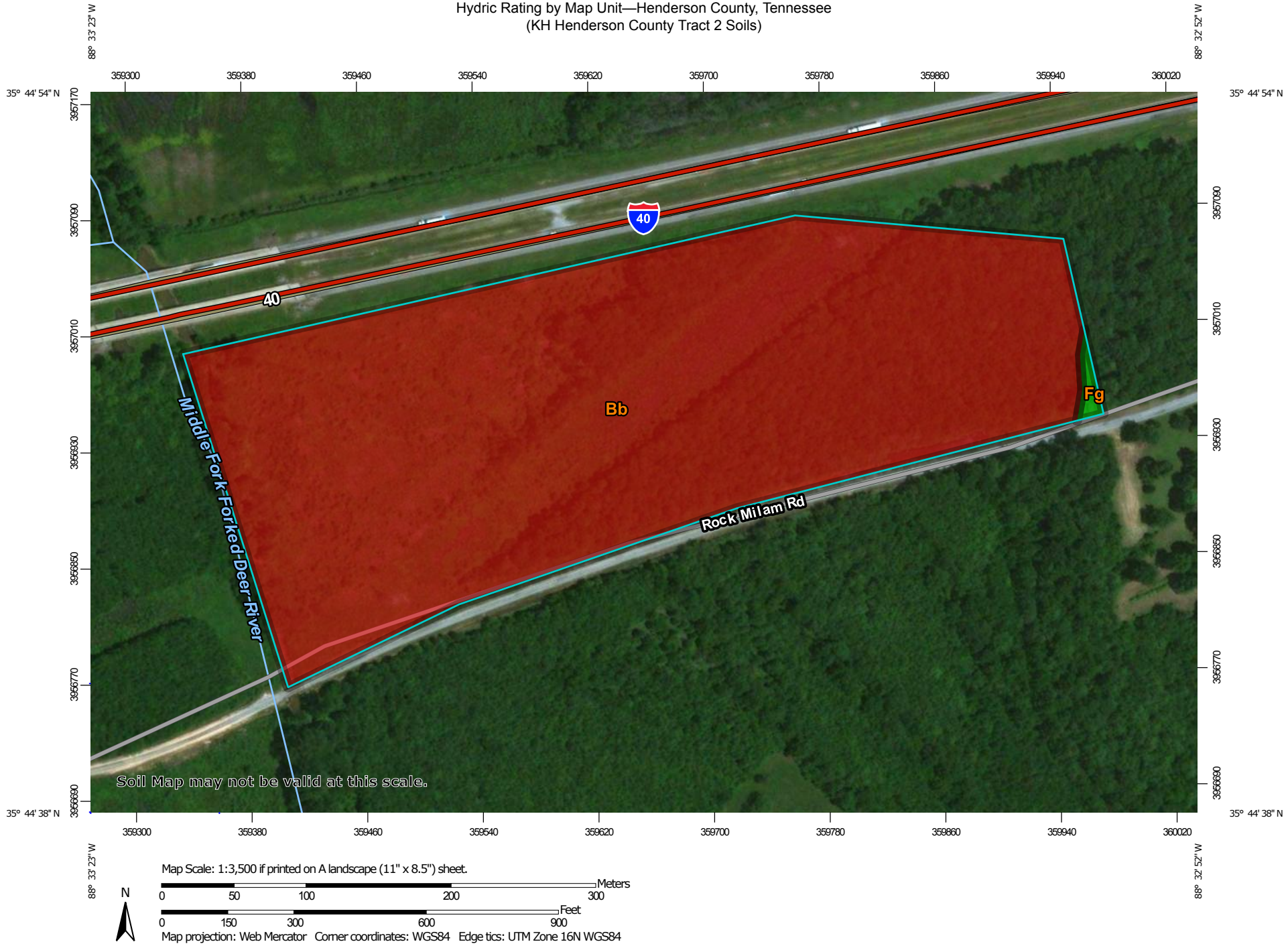
## Rating Options

*Aggregation Method:* Percent Present

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Lower

Hydric Rating by Map Unit—Henderson County, Tennessee
(KH Henderson County Tract 2 Soils)




Map Scale: 1:3,500 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Soil Rating Lines**
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Soil Rating Points**
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Henderson County, Tennessee
Survey Area Data: Version 12, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 2, 2015—Jan 27, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Hydric Rating by Map Unit

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| Bb | Beechy silt loam (Bibb) | 100 | 28.3 | 99.5% |
| Fg | Freeland silt loam, eroded sloping phase | 0 | 0.1 | 0.5% |
| **Totals for Area of Interest** | | | **28.4** | **100.0%** |

## Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

## Rating Options

*Aggregation Method:* Percent Present

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Lower

LOCATION BIBB AL+AR FL GA KY LA MD MS NC OK SC TN TX VA

Established Series
Rev. DMH: PGM; GRB
03/2014

# BIBB SERIES

The Bibb series consists of very deep, poorly drained, moderately permeable soils on flood plains of streams in the Southern Coastal Plain (133A) Major Land Resource Area. They formed in stratified loamy and sandy alluvium that are commonly and frequently flooded and water runs off the surface very slowly. Near the type location, the average annual air temperature is about 65 degrees F. and the average annual precipitation is about 54 inches. Slopes range from 0 to 2 percent.

**TAXONOMIC CLASS:** Coarse-loamy, siliceous, active, acid, thermic Typic Fluvaquents

**TYPICAL PEDON:** Bibb sandy loam, in a forested area (Colors are for moist soil).

**A**--0 to 4 inches; brown (10YR 4/3) sandy loam; weak fine granular structure; friable; common fine roots and pores; strongly acid; abrupt wavy boundary. (2 to 6 inches thick)

**Ag**--4 to 12 inches; variegated dark gray (N 4/) and dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; friable; few fine roots and pores; common fine strong brown (7.5YR 5/6) areas of iron accumulation around old root channels; strongly acid; clear wavy boundary. (0 to 19 inches thick)

**Cg1**--12 to 37 inches; gray (5Y 5/1) sandy loam; massive; friable; few fine roots and pores; common medium strong brown (7.5YR 5/6) areas of iron accumulation around old root channels; common thin strata of loamy sand to silt loam; some strata contain few to common imbedded partially decomposed organic material; very strongly acid; clear wavy boundary. (5 to 40 inches thick)

**Cg2**--37 to 60 inches; gray (N 5/) silt loam; massive; slightly sticky; common strata of sandy loam and loamy sand; common thin strata with imbedded partially decomposed organic material; strongly acid.

**TYPE LOCATION:** Autauga County, Alabama; 300 yards north of where Martin Boulevard crosses Pine Creek in Prattville; SE1/4, SW1/4, SW1/4 of Sec. 26, T. 13 N., R. 16 E.

**RANGE IN CHARACTERISTICS:** Reaction ranges from extremely acid to strongly acid throughout. Content of mica flakes ranges from none to common. Content of rounded gravel typically ranges from 0 to 10 percent throughout, but may range to 50 percent in thin strata below a depth of 40 inches. Buried soil horizons, present in many pedons, have the same range in color and texture as the Ag horizon.

The A or Ap horizon has hue of 7.5YR or 10YR, value of 2 to 5, and chroma of 1 to 3; or it is neutral with value of 2.5 to 4. Texture is sand, loamy sand, loamy fine sand, fine sandy loam, sandy loam, loam or silt loam.

The Ag horizon, present in most pedons, has hue of 10YR or 2.5Y, value of 3 to 7, and chroma of 2 or less; or it is neutral with value of 2.5 to 7. The combined thickness of the A and Ag horizons with value of 3 or less is less than 7 inches. Iron and organic matter concentrations in shades of brown and yellow range from none to common. Texture is sand, loamy sand, loamy fine sand, fine sandy loam, sandy loam, loam or silt loam.

The Cg horizon has hue of 10YR through 5BG, value of 3 to 7, and chroma of 2 or less; or it is neutral with

value of 3 to 7. Masses of iron accumulations in shades of red, yellow and brown range from none to many. Texture of the upper part of the Cg horizon is sandy loam, fine sandy loam, loam, or silt loam; or is stratified with these textures. Thin strata of finer or coarser textured material are in most pedons. Texture of the lower part of the Cg horizon includes coarse sand, sand, fine sand, loamy sand, and loamy fine sand in addition to those of the upper part.

**COMPETING SERIES:** There are no known series in the same family. Competing series in closely similar families are the Keechi and Muckalee series. Keechi soils are non-acid and superactive. Muckalee soils are nonacid.

**GEOGRAPHIC SETTING:** Bibb soils are on flood plains of streams in the Coastal Plain. Slopes are generally less than 2 percent. They formed in loamy and sandy alluvium. They flood frequently unless protected, and are subject to scouring and uneven deposition of overwash. The climate is humid subtropical. The average annual air temperature ranges from 59 to 72 degrees F., and the average annual precipitation ranges from 40 to 60 inches.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Iuka, Johnston, Kinston, Mantachie, Myatt, Ochlockonee and Osier soils. The moderately well drained Iuka soils are on higher positions near stream channels. Johnston soils . The somewhat poorly drained Mantachie soils are on slightly higher adjacent positions and have fine-loamy control sections. Myatt soils have fine-loamy argillic horizons. The well drained Ochlockonee soils are on higher natural levee positions along stream channels. Osier soils are sandy throughout.

**DRAINAGE AND PERMEABILITY:** Poorly drained; very slow runoff; moderate permeability. The water table is within 8 inches of the surface from 6 to 11 months each year.

**USE AND VEGETATION:** Most areas of Bibb soils are used for wildlife habitat and watershed protection. The dominant over story vegetation consists of sweetgum, scattered loblolly pine, red maple, water oak, willow oak, green ash, baldcypress, swamp tupelo, and black willow. A few areas have been cleared, drained and used for pasture.

**DISTRIBUTION AND EXTENT:** Coastal Plain of Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, New Jersey, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. The series is of large extent.

**MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE:** Auburn, Alabama.

**SERIES ESTABLISHED:** Pike County, Mississippi; 1910.

**REMARKS:** Diagnostic horizons and features recognized in this pedon:

Ochric epipedon: The zone from 0 to 12 inches (A and Ag horizons).

Fluvaquentic features: Low chroma colors in the matrix, irregular decrease in organic carbon and presence of thin strata of contrasting textures.

Bibb soils are in MLRA 133A.

**ADDITIONAL DATA:** Laboratory data is available on the National Soil Survey website at: http;://ncsslabdatamart.sc.egov.usda.gov/querypage.aspx

Laboratory data was provided by Auburn University, Soil Characterization laboratory, Auburn AL.

The following laboratory characterization data are available on the NSSL web site:

S84AL-011-7-pgm
S88AL-131-5-pgm

SIR = AL0033, AL0141

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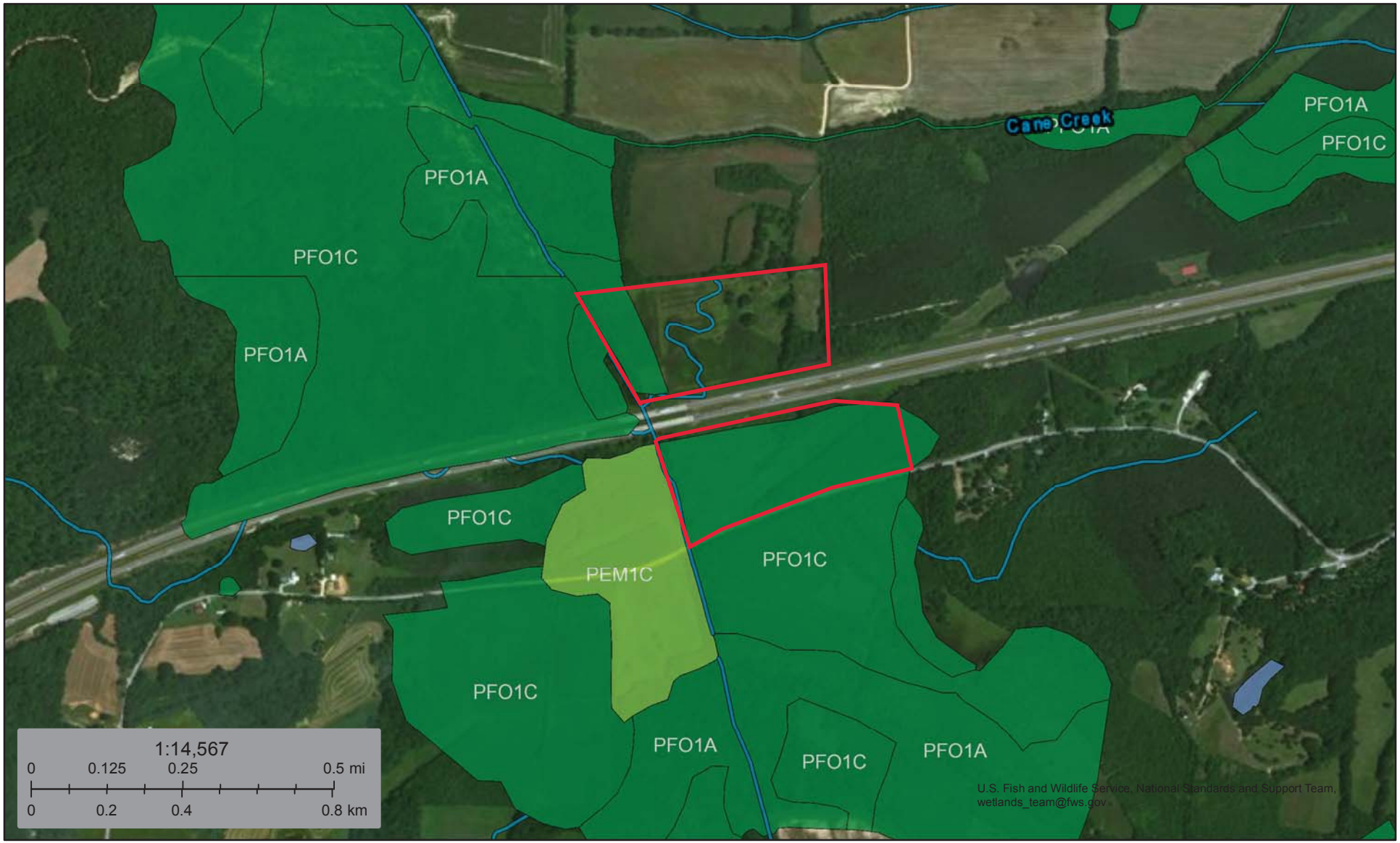
National Cooperative Soil Survey
U.S.A.

# APPENDIX D

# NATIONAL WETLANDS INVENTORY MAP

U.S. Fish and Wildlife Service
National Wetlands Inventory

# MFFD Tracts




June 18, 2018

**Wetlands**

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

# APPENDIX E

# WETLANDS DATA FORMS

## WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Middle Fork Site - North Tract City/County: Lexington / Henderson Sampling Date: 6-12-2018

Applicant/Owner: Kimley-Horn and Associates State: TN Sampling Point: SP-1

Investigator(s): Ben Day, William Gray / Tioga Env. Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain, toeslope Local relief (concave, convex, none): level Slope (%): 0-1

Subregion (LRR or MLRA): 133A Lat: 35.74885 Long: -88.55287 Datum: NAD83

Soil Map Unit Name: Beechy sandy loam NWI classification: none

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

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? [ ] Are "Normal Circumstances" present? Yes [✓] No [ ]

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

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

| | | | | | |
|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes [✓] | No [ ] | **Is the Sampled Area within a Wetland?** | **Yes** [✓] | **No** [ ] |
| Hydric Soil Present? | Yes [✓] | No [ ] | | | |
| Wetland Hydrology Present? | Yes [✓] | No [ ] | | | |

Remarks:

North Tract.
Sample point located just inside edge of wetland area. Wetland characteristics increase south of sample point.

### HYDROLOGY

**Wetland Hydrology Indicators:**

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

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [✓] Saturation (A3)
- [ ] Water Marks (B1)
- [✓] Sediment Deposits (B2)
- [ ] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [ ] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [✓] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [✓] Geomorphic Position (D2)
- [✓] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

**Field Observations:**

| | | | | |
|---|---|---|---|---|
| Surface Water Present? | Yes [ ] | No [✓] | Depth (inches): | |
| Water Table Present? | Yes [ ] | No [✓] | Depth (inches): | |
| Saturation Present? (includes capillary fringe) | Yes [✓] | No [ ] | Depth (inches): 0 | **Wetland Hydrology Present?** **Yes** [✓] **No** [ ] |

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

Remarks:

Surface water present just south of sample point, varying pools based on microtopography.

**VEGETATION (Five Strata) –** Use scientific names of plants. Sampling Point: SP-1

| | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| **Tree Stratum** (Plot size: _____) | | | |
| 1. _____ | | | |
| 2. _____ | | | |
| 3. _____ | | | |
| 4. _____ | | | |
| 5. _____ | | | |
| 6. _____ | | | |
| | _____ = Total Cover | | |
| 50% of total cover: _____ | 20% of total cover: _____ | | |
| **Sapling Stratum** (Plot size: _____) | | | |
| 1. _____ | | | |
| 2. _____ | | | |
| 3. _____ | | | |
| 4. _____ | | | |
| 5. _____ | | | |
| 6. _____ | | | |
| | _____ = Total Cover | | |
| 50% of total cover: _____ | 20% of total cover: _____ | | |
| **Shrub Stratum** (Plot size: _____) | | | |
| 1. Salix nigra | 20 | Y | OBL |
| 2. Acer rubrum | 30 | Y | FAC |
| 3. _____ | | | |
| 4. _____ | | | |
| 5. _____ | | | |
| 6. _____ | | | |
| | 50 = Total Cover | | |
| 50% of total cover: 25 | 20% of total cover: 10 | | |
| **Herb Stratum** (Plot size: _____) | | | |
| 1. Juncus effuses | 50 | Y | OBL |
| 2. Saururus cernuus | 25 | Y | OBL |
| 3. Carex frankii | 15 | N | OBL |
| 4. Polygonum sp. | 40 | Y | OBL |
| 5. Juncus sp. | 25 | Y | OBL |
| 6. _____ | | | |
| 7. _____ | | | |
| 8. _____ | | | |
| 9. _____ | | | |
| 10. _____ | | | |
| 11. _____ | | | |
| | 155 = Total Cover | | |
| 50% of total cover: 77.5 | 20% of total cover: 31 | | |
| **Woody Vine Stratum** (Plot size: _____) | | | |
| 1. _____ | | | |
| 2. _____ | | | |
| 3. _____ | | | |
| 4. _____ | | | |
| 5. _____ | | | |
| | _____ = Total Cover | | |
| 50% of total cover: _____ | 20% of total cover: _____ | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

**Prevalence Index worksheet:**

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

Prevalence Index = B/A = _____

**Hydrophytic Vegetation Indicators:**

- [x] 1 - Rapid Test for Hydrophytic Vegetation
- [ ] 2 - Dominance Test is >50%
- [ ] 3 - Prevalence Index is ≤3.0[1]
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

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

**Definitions of Five Vegetation Strata:**

**Tree** – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

**Sapling** – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

**Shrub** – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

**Herb** – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

**Woody vine** – All woody vines, regardless of height.

**Hydrophytic Vegetation Present?** Yes [x] No [ ]

Remarks: (If observed, list morphological adaptations below). Eastern area is dominated by Acer rubrum trees, merging into emergent scrub/shrub wetland westward.

**SOIL**

Sampling Point: SP-1

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

| Depth (inches) | Matrix Color (moist) | % | Redox Features Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-4 | 10YR 4/3 | 95 | 10YR 6/1 | 5 | C | M | SiL | |
| 4-8 | 10YR 6/1 | 85 | 10YR 5/8 | 15 | C | M | SL | Fragipan |
| 8+ | 10YR 6/1 | 65 | 10YR 5/8 | 35 | C | M | SL | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

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

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

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

**Restrictive Layer (if observed):**

Type: Harppan

Depth (inches): 4

**Hydric Soil Present?** Yes ☑ No ☐

Remarks:

## WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Middle Fork Site - South Tract City/County: Lexington / Henderson Sampling Date: 6-12-2018

Applicant/Owner: Kimley-Horn and Associates State: TN Sampling Point: SP-2

Investigator(s): Ben Day, William Gray / Tioga Env. Section, Township, Range:

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): level Slope (%): 0-1

Subregion (LRR or MLRA): 133A Lat: 35.74608 Long: -88.55447 Datum: NAD83

Soil Map Unit Name: Beechy sandy loam NWI classification: PFO1C

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

Are Vegetation [ ] Soil [ ] or Hydrology [ ] significantly disturbed? [ ] Are "Normal Circumstances" present? Yes [✓] No [ ]

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

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

| | | | | | |
|---|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes [✓] | No [ ] | **Is the Sampled Area within a Wetland?** | Yes [✓] | No [ ] |
| Hydric Soil Present? | Yes [✓] | No [ ] | | | |
| Wetland Hydrology Present? | Yes [✓] | No [ ] | | | |

Remarks:

South Tract
Sample point located just inside edge of wetland area. Wetland characteristics increase east of sample point.

### HYDROLOGY

**Wetland Hydrology Indicators:**

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

- [ ] Surface Water (A1)
- [ ] High Water Table (A2)
- [ ] Saturation (A3)
- [ ] Water Marks (B1)
- [ ] Sediment Deposits (B2)
- [✓] Drift Deposits (B3)
- [ ] Algal Mat or Crust (B4)
- [ ] Iron Deposits (B5)
- [ ] Inundation Visible on Aerial Imagery (B7)
- [✓] Water-Stained Leaves (B9)
- [ ] Aquatic Fauna (B13)
- [ ] Marl Deposits (B15) **(LRR U)**
- [ ] Hydrogen Sulfide Odor (C1)
- [ ] Oxidized Rhizospheres along Living Roots (C3)
- [ ] Presence of Reduced Iron (C4)
- [ ] Recent Iron Reduction in Tilled Soils (C6)
- [ ] Thin Muck Surface (C7)
- [ ] Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- [ ] Surface Soil Cracks (B6)
- [ ] Sparsely Vegetated Concave Surface (B8)
- [ ] Drainage Patterns (B10)
- [ ] Moss Trim Lines (B16)
- [ ] Dry-Season Water Table (C2)
- [✓] Crayfish Burrows (C8)
- [ ] Saturation Visible on Aerial Imagery (C9)
- [✓] Geomorphic Position (D2)
- [ ] Shallow Aquitard (D3)
- [ ] FAC-Neutral Test (D5)
- [ ] Sphagnum moss (D8) **(LRR T, U)**

**Field Observations:**

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

**Wetland Hydrology Present?** Yes [✓] No [ ]

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

Remarks:

Surface water present just east of sample point, varying pools based on microtopography.

**VEGETATION (Five Strata) –** Use scientific names of plants.

Sampling Point: SP-2

| Tree Stratum (Plot size: ) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| | = Total Cover | | |
| 50% of total cover: | 20% of total cover: | | |
| **Sapling Stratum** (Plot size: ) | | | |
| 1. Salix nigra | 60 | Y | OBL |
| 2. Acer rubrum | 40 | N | FAC |
| 3. Platanus occidentalis | 20 | N | FACW |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| | 120 = Total Cover | | |
| 50% of total cover: 60 | 20% of total cover: 24 | | |
| **Shrub Stratum** (Plot size: ) | | | |
| 1. Salix nigra | 10 | Y | OBL |
| 2. Acer rubrum | 5 | N | FAC |
| 3. Liquidambar styraciflua | 5 | N | FAC |
| 4. Cephalanthus occidentalis | 5 | N | OBL |
| 5. | | | |
| 6. | | | |
| | 20 = Total Cover | | |
| 50% of total cover: 10 | 20% of total cover: 4 | | |
| **Herb Stratum** (Plot size: ) | | | |
| 1. Juncus effuses | 50 | Y | OBL |
| 2. Saururus cernuus | 25 | Y | OBL |
| 3. Carex frankii | 15 | N | OBL |
| 4. Acer rubrum | 10 | N | FAC |
| 5. Boehmeria cylindrica | 10 | N | FACW |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| | 110 = Total Cover | | |
| 50% of total cover: 55 | 20% of total cover: 22 | | |
| **Woody Vine Stratum** (Plot size: ) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| | = Total Cover | | |
| 50% of total cover: | 20% of total cover: | | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

**Prevalence Index worksheet:**

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

Prevalence Index = B/A =

**Hydrophytic Vegetation Indicators:**

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

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

**Definitions of Five Vegetation Strata:**

**Tree** – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).

**Sapling** – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.

**Shrub** – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.

**Herb** – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.

**Woody vine** – All woody vines, regardless of height.

**Hydrophytic Vegetation Present?** Yes ☑ No ☐

Remarks: (If observed, list morphological adaptations below).

Eastern area is dominated by Acer rubrum trees, merging into emergent scrub/shrub wetland westward.

**SOIL**

Sampling Point: SP-2

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

| Depth (inches) | Matrix Color (moist) | Matrix % | Redox Features Color (moist) | Redox Features % | Type[1] | Loc[2] | Texture | Remarks |
|---|---|---|---|---|---|---|---|---|
| 0-1 | 10YR 4/2 | 100 | | | | | | |
| 1-4 | 10YR 5/2 | 95 | 10YR 6/6 | 5 | C | M | SiL | |
| 4-6 | 10YR 5/2 | 80 | 10YR 6/6 | 20 | C | M | SiCL | |
| 6+ | 10YR 5/1 | 60 | 10YR 5/6 | 40 | C | M | SiCL | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

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

**Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)**

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☑ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

**Indicators for Problematic Hydric Soils[3]:**

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

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

**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** Yes ☑ No ☐

Remarks:

# APPENDIX F

# HYDROLOGIC DETERMINATION DATA FORMS

Stream 1

## Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

| | | |
|---|---|---|
| County: Henderson | Named Waterbody: Middle Fork Forked Deer | Date/Time: 6/12/2018 12:00 |
| Assessors/Affiliation: Ben Day, William Gray / Tioga Environmental | | Project ID : 54904.00 |
| Site Name/Description: Middle Fork Tracts - North Tract | | |
| Site Location: North Channel 1 (NC-1) | | |
| USGS quad: Juno, TN | HUC (12 digit): 080102040102 | Lat/Long: 35.75013 88.55368 |
| Previous Rainfall (7-days) : 0.00 | | |
| Precipitation this Season vs. Normal : very wet wet average dry drought unknown<br>Source of recent & seasonal precip data : NOAA | | |
| Watershed Size : 38.83 sq miles (for Middle Fork) | Photos: (Y) or N (circle) Number : 7, 8 | |
| Soil Type(s) / Geology : Beechy silt loam | | Source: NRCS |
| Surrounding Land Use : Fallow, floodplain | | |
| Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) :<br>Severe (Moderate) Slight Absent | | |

## Primary Field Indicators Observed

| Primary Indicators | NO | YES |
|---|---|---|
| 1. Hydrologic feature exists solely due to a process discharge | ☐ | WWC |
| 2. Defined bed and bank absent, dominated by upland vegetation / grass | ☐ | WWC |
| 3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions | ☐ | WWC |
| 4. Daily flow and precipitation records showing feature only flows in direct response to rainfall | ☐ | WWC |
| 5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase | ☐ | Stream |
| 6. Presence of fish (except *Gambusia*) | ☐ | Stream |
| 7. Presence of naturally occurring ground water table connection | ☐ | Stream |
| 8. Flowing water in channel and 7 days since last precipitation in local watershed | ☑ | Stream |
| 9. Evidence watercourse has been used as a supply of drinking water | ☐ | Stream |

**NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.**

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

**Overall Hydrologic Determination =** Stream (Primary)

**Secondary Indicator Score (if applicable) =**

**Justification / Notes :** flowing water, supplied by artesian well / pool

NC-1
Stream 1

# Secondary Field Indicator Evaluation

| A. **Geomorphology** (Subtotal = ) | Absent | Weak | Moderate | Strong |
|---|---|---|---|---|
| 1. Continuous bed and bank | 0 | 1 | 2 | 3 |
| 2. Sinuous channel | 0 | 1 | 2 | 3 |
| 3. In-channel structure: riffle-pool sequences | 0 | 1 | 2 | 3 |
| 4. Sorting of soil textures or other substrate | 0 | 1 | 2 | 3 |
| 5. Active/relic floodplain | 0 | 1 | 2 | 3 |
| 6. Depositional bars or benches | 0 | 1 | 2 | 3 |
| 7. Braided channel | 0 | 1 | 2 | 3 |
| 8. Recent alluvial deposits | 0 | 0.5 | 1 | 1.5 |
| 9. Natural levees | 0 | 1 | 2 | 3 |
| 10. Headcuts | 0 | 1 | 2 | 3 |
| 11. Grade controls | 0 | 0.5 | 1 | 1.5 |
| 12. Natural valley or drainageway | 0 | 0.5 | 1 | 1.5 |
| 13. At least second order channel on existing USGS or NRCS map | No = 0 | | Yes = 3 | |

| B. **Hydrology** (Subtotal = ) | Absent | Weak | Moderate | Strong |
|---|---|---|---|---|
| 14. Subsurface flow/discharge into channel | 0 | 1 | 2 | 3 |
| 15. Water in channel and >48 hours since sig. rain | 0 | 1 | 2 | 3 |
| 16. Leaf litter in channel (January – September) | 1.5 | 1 | 0.5 | 0 |
| 17. Sediment on plants or on debris | 0 | 0.5 | 1 | 1.5 |
| 18. Organic debris lines or piles (wrack lines) | 0 | 0.5 | 1 | 1.5 |
| 19. Hydric soils in stream bed or sides of channel | No = 0 | | Yes = 1.5 | |

| C. **Biology** (Subtotal = ) | Absent | Weak | Moderate | Strong |
|---|---|---|---|---|
| 20. Fibrous roots in channel [1] | 3 | 2 | 1 | 0 |
| 21. Rooted plants in channel [1] | 3 | 2 | 1 | 0 |
| 22. Crayfish in stream (exclude in floodplain) | 0 | 0.5 | 1 | 1.5 |
| 23. Bivalves/mussels | 0 | 1 | 2 | 3 |
| 24. Amphibians | 0 | 0.5 | 1 | 1.5 |
| 25. Macrobenthos (record type & abundance) | 0 | 1 | 2 | 3 |
| 26. Filamentous algae; periphyton | 0 | 1 | 2 | 3 |
| 27. Iron oxidizing bacteria/fungus | 0 | 0.5 | 1 | 1.5 |
| 28.Wetland plants in channel [2] | 0 | 0.5 | 1 | 2 |

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = _____

*Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points*

**Notes :**

## Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

| | | |
|---|---|---|
| County: Henderson | Named Waterbody: Middle Fork Forked Deer | Date/Time: 6/12/2018 12:00 |
| Assessors/Affiliation: Ben Day, William Gray / Tioga Environmental | | Project ID : 54904.00 |
| Site Name/Description: Middle Fork Tracts - South Tract | | |
| Site Location: South Channel 1 (C-1) | | |
| USGS quad: Juno, TN | HUC (12 digit): 080102040102 | Lat/Long: 35.74672 -88.55441 |
| Previous Rainfall (7-days) : 0.00 | | |
| Precipitation this Season vs. Normal : very wet wet average dry drought unknown<br>Source of recent & seasonal precip data : NOAA | | |
| Watershed Size : 38.83 sq miles (for Middle Fork) | Photos: (Y) or N (circle) Number : 21, 22 | |
| Soil Type(s) / Geology : Beechy silt loam | | Source: NRCS |
| Surrounding Land Use : Fallow, floodplain | | |
| Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) :<br>(Severe) Moderate Slight Absent | | |

### Primary Field Indicators Observed

| Primary Indicators | NO | YES |
|---|---|---|
| 1. Hydrologic feature exists solely due to a process discharge | ☐ | WWC |
| 2. Defined bed and bank absent, dominated by upland vegetation / grass | ☐ | (WWC) |
| 3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions | ☐ | WWC |
| 4. Daily flow and precipitation records showing feature only flows in direct response to rainfall | ☐ | WWC |
| 5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase | ☐ | Stream |
| 6. Presence of fish (except *Gambusia*) | ☐ | Stream |
| 7. Presence of naturally occurring ground water table connection | ☐ | Stream |
| 8. Flowing water in channel and 7 days since last precipitation in local watershed | ☐ | Stream |
| 9. Evidence watercourse has been used as a supply of drinking water | ☐ | Stream |

**NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.**

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

**Overall Hydrologic Determination =** WWC (primary)

**Secondary Indicator Score (if applicable) =**

**Justification / Notes :** See photographs (#21 and #22)

C-1

## Secondary Field Indicator Evaluation

| A. **Geomorphology** (Subtotal = ) | Absent | Weak | Moderate | Strong |
|---|---|---|---|---|
| 1. Continuous bed and bank | 0 | 1 | 2 | 3 |
| 2. Sinuous channel | 0 | 1 | 2 | 3 |
| 3. In-channel structure: riffle-pool sequences | 0 | 1 | 2 | 3 |
| 4. Sorting of soil textures or other substrate | 0 | 1 | 2 | 3 |
| 5. Active/relic floodplain | 0 | 1 | 2 | 3 |
| 6. Depositional bars or benches | 0 | 1 | 2 | 3 |
| 7. Braided channel | 0 | 1 | 2 | 3 |
| 8. Recent alluvial deposits | 0 | 0.5 | 1 | 1.5 |
| 9. Natural levees | 0 | 1 | 2 | 3 |
| 10. Headcuts | 0 | 1 | 2 | 3 |
| 11. Grade controls | 0 | 0.5 | 1 | 1.5 |
| 12. Natural valley or drainageway | 0 | 0.5 | 1 | 1.5 |
| 13. At least second order channel on existing USGS or NRCS map | No = 0 | | Yes = 3 | |

| B. **Hydrology** (Subtotal = ) | Absent | Weak | Moderate | Strong |
|---|---|---|---|---|
| 14. Subsurface flow/discharge into channel | 0 | 1 | 2 | 3 |
| 15. Water in channel and >48 hours since sig. rain | 0 | 1 | 2 | 3 |
| 16. Leaf litter in channel (January – September) | 1.5 | 1 | 0.5 | 0 |
| 17. Sediment on plants or on debris | 0 | 0.5 | 1 | 1.5 |
| 18. Organic debris lines or piles (wrack lines) | 0 | 0.5 | 1 | 1.5 |
| 19. Hydric soils in stream bed or sides of channel | No = 0 | | Yes = 1.5 | |

| C. **Biology** (Subtotal = ) | Absent | Weak | Moderate | Strong |
|---|---|---|---|---|
| 20. Fibrous roots in channel [1] | 3 | 2 | 1 | 0 |
| 21. Rooted plants in channel [1] | 3 | 2 | 1 | 0 |
| 22. Crayfish in stream (exclude in floodplain) | 0 | 0.5 | 1 | 1.5 |
| 23. Bivalves/mussels | 0 | 1 | 2 | 3 |
| 24. Amphibians | 0 | 0.5 | 1 | 1.5 |
| 25. Macrobenthos (record type & abundance) | 0 | 1 | 2 | 3 |
| 26. Filamentous algae; periphyton | 0 | 1 | 2 | 3 |
| 27. Iron oxidizing bacteria/fungus | 0 | 0.5 | 1 | 1.5 |
| 28.Wetland plants in channel [2] | 0 | 0.5 | 1 | 2 |

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = _____

*Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points*

**Notes :**

## Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

| | | |
|---|---|---|
| County: Henderson | Named Waterbody: Middle Fork Forked Deer | Date/Time: 6/12/2018 12:00 |
| Assessors/Affiliation: Ben Day, William Gray / Tioga Environmental | | Project ID : 54904.00 |
| Site Name/Description: Middle Fork Tracts - South Tract | | |
| Site Location: South Channel 2 (C-2) | | |
| USGS quad: Juno, TN | HUC (12 digit): 080102040102 | Lat/Long: 35.74521 -88.55468 |
| Previous Rainfall (7-days) : 0.00 | | |
| Precipitation this Season vs. Normal : very wet wet X average dry drought unknown<br>Source of recent & seasonal precip data : NOAA | | |
| Watershed Size : 38.83 sq miles (for Middle Fork) | Photos: (Y) or N (circle) Number : 23, 24 | |
| Soil Type(s) / Geology : Beechy silt loam | | Source: NRCS |
| Surrounding Land Use : Fallow, floodplain | | |
| Degree of historical alteration to natural channel morphology & hydrology (circle one & describe fully in Notes) :<br>(Severe) Moderate Slight Absent | | |

## Primary Field Indicators Observed

| Primary Indicators | NO | YES |
|---|---|---|
| 1. Hydrologic feature exists solely due to a process discharge | ☑ | WWC |
| 2. Defined bed and bank absent, dominated by upland vegetation / grass | ☑ | WWC |
| 3. Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions NA | ☐ | WWC |
| 4. Daily flow and precipitation records showing feature only flows in direct response to rainfall | ? ☐ | WWC |
| 5. Presence of multiple populations of obligate lotic organisms with ≥ 2 month aquatic phase | ☑ | Stream |
| 6. Presence of fish (except *Gambusia*) | ☑ | Stream |
| 7. Presence of naturally occurring ground water table connection | ☑ | Stream |
| 8. Flowing water in channel and 7 days since last precipitation in local watershed | ☑ | Stream |
| 9. Evidence watercourse has been used as a supply of drinking water | ☑ | Stream |

**NOTE : If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contradictory evidence, determination is complete.**

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary & secondary indicators is provided in *TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4*

**Overall Hydrologic Determination =** WWC

**Secondary Indicator Score (if applicable) =** 10

**Justification / Notes :** see back

C-2

## Secondary Field Indicator Evaluation

| A. **Geomorphology** (Subtotal = 3) | Absent | Weak | Moderate | Strong | |
|---|---|---|---|---|---|
| 1. Continuous bed and bank | 0 | 1 | 2 | 3 | 2.5 |
| 2. Sinuous channel | 0 | 1 | 2 | 3 | |
| 3. In-channel structure: riffle-pool sequences | 0 | 1 | 2 | 3 | |
| 4. Sorting of soil textures or other substrate | 0 | 1 | 2 | 3 | |
| 5. Active/relic floodplain | 0 | 1 | 2 | 3 | |
| 6. Depositional bars or benches | 0 | 1 | 2 | 3 | |
| 7. Braided channel | 0 | 1 | 2 | 3 | |
| 8. Recent alluvial deposits | 0 | 0.5 | 1 | 1.5 | |
| 9. Natural levees | 0 | 1 | 2 | 3 | |
| 10. Headcuts | 0 | 1 | 2 | 3 | 0.5 |
| 11. Grade controls | 0 | 0.5 | 1 | 1.5 | |
| 12. Natural valley or drainageway | 0 | 0.5 | 1 | 1.5 | |
| 13. At least second order channel on existing USGS or NRCS map | No = 0 | | Yes = 3 | | |

| B. **Hydrology** (Subtotal = 2.5) | Absent | Weak | Moderate | Strong | |
|---|---|---|---|---|---|
| 14. Subsurface flow/discharge into channel | 0 | 1 | 2 | 3 | |
| 15. Water in channel and >48 hours since sig. rain | 0 | 1 | 2 | 3 | 0.5 |
| 16. Leaf litter in channel (January – September) NA | 1.5 | 1 | 0.5 | 0 | |
| 17. Sediment on plants or on debris | 0 | 0.5 | 1 | 1.5 | |
| 18. Organic debris lines or piles (wrack lines) | 0 | 0.5 | 1 | 1.5 | 0.5 |
| 19. Hydric soils in stream bed or sides of channel | No = 0 | | Yes = 1.5 | | 1.5 |

No overstory

only near the river

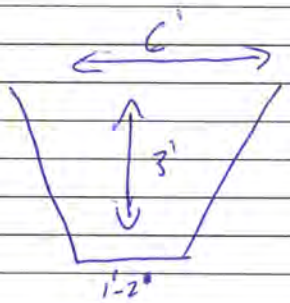
| C. **Biology** (Subtotal = 4.5) | Absent | Weak | Moderate | Strong | |
|---|---|---|---|---|---|
| 20. Fibrous roots in channel [1] | 3 | 2 | 1 | 0 | 1.5 |
| 21. Rooted plants in channel [1] | 3 | 2 | 1 | 0 | 2 |
| 22. Crayfish in stream (exclude in floodplain) | 0 | 0.5 | 1 | 1.5 | |
| 23. Bivalves/mussels | 0 | 1 | 2 | 3 | |
| 24. Amphibians | 0 | 0.5 | 1 | 1.5 | |
| 25. Macrobenthos (record type & abundance) | 0 | 1 | 2 | 3 | |
| 26. Filamentous algae; periphyton | 0 | 1 | 2 | 3 | 1 |
| 27. Iron oxidizing bacteria/fungus | 0 | 0.5 | 1 | 1.5 | |
| 28.Wetland plants in channel [2] | 0 | 0.5 | 1 | 2 | |

[1] Focus is on the presence of upland plants. [2] Focus is on the presence of aquatic or wetland plants.

Total Points = 10

*Under Normal Conditions, Watercourse is a Wet Weather Conveyance if Secondary Indicator Score < 19 points*

**Notes :**




Channel recieves waters from roadside and runoff from ~~adjacent~~ nearby wetlands.

# Appendix E

## Stream Quantification Tool Spreadsheet

| Reach Information and Reference Standard Stratification | |
|---|---|
| Project Name: | Gilead Springs Stream and Wetland Mitigation Bank |
| Reach ID: | UT1 |
| Upstream Latitude: | 35.750175 |
| Upstream Longitude: | -88.553435 |
| Downstream Latitude: | 35.750323 |
| Downstream Longitude: | -88.557956 |
| Existing Stream Type: | Gc |
| Proposed Stream Type: | C |
| Ecoregion: | 65abei |
| Drainage Area (sqmi): | 0.04 |
| Proposed Bed Material: | Sand |
| Existing Stream Length (feet): | 891 |
| Proposed Stream Length (feet): | 1691 |
| Proposed Stream Slope (%): | 0.15% |
| Proposed Flow Type: | Perennial/Intermittent |
| Data Collection Season: | July - December |
| Macro Collection Method: | |
| Valley Type: | Unconfined Alluvial |

| Notes |
|---|
| 1. Users input values that are highlighted based on restoration potential |
| 2. Users select values from a pull-down menu |
| 3. Leave values blank for field values that were not measured |
| 4. These field values do not apply to ephemeral channels. |

| FUNCTIONAL LIFT SUMMARY | |
|---|---|
| Exisiting Condition Score (ECS) | 0.08 |
| Proposed Condition Score (PCS) | 0.83 |
| Change in Functional Condition (PCS - ECS) | 0.75 |
| Existing Stream Length (feet) | 891 |
| Proposed Stream Length (feet) | 1691 |
| Additional Stream Length (feet) | 800 |
| Existing Stream Functional Feet (FF) | 71 |
| Proposed Stream Functional Feet (FF) | 1404 |
| Functional Lift (Proposed FF - Existing FF) | 1332 |

| MITIGATION SUMMARY | |
|---|---|
| 1332 | Credits |

| FUNCTION BASED PARAMETERS SUMMARY | | | |
|---|---|---|---|
| Functional Category | Function-Based Parameters | Existing Parameter | Proposed Parameter |
| Hydrology | Catchment Hydrology | 0.28 | 0.80 |
| | Reach Runoff | 0.09 | 0.77 |
| Hydraulics | Floodplain Connectivity | 0.00 | 1.00 |
| Geomorphology | Large Woody Debris | 0.16 | 0.82 |
| | Lateral Migration | 0.40 | 1.00 |
| | Riparian Vegetation | 0.20 | 0.94 |
| | Bed Material | | |
| | Bed Form Diversity | 0.02 | 0.75 |
| | Sinuosity | 0.00 | 1.00 |
| Physicochemical | Bacteria | 0.00 | 0.70 |
| | Organic Enrichment | | |
| | Nitrogen | | |
| | Phosphorus | | |
| Biology | Macroinvertebrates | 0.00 | 1.00 |
| | Fish | 0.08 | 0.50 |

| FUNCTIONAL CATEGORY REPORT CARD | | | |
|---|---|---|---|
| Functional Category | ECS | PCS | Functional Lift |
| Hydrology | 0.19 | 0.79 | 0.60 |
| Hydraulics | 0.00 | 1.00 | 1.00 |
| Geomorphology | 0.16 | 0.90 | 0.74 |
| Physicochemical | 0.00 | 0.70 | 0.70 |
| Biology | 0.04 | 0.75 | 0.71 |

| EXISTING CONDITION ASSESSMENT | | | | | Roll Up Scoring | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Functional Category | Function-Based Parameters | Measurement Method | Field Value | Index Value | Parameter | Category | Category | ECS | ECS |
| Hydrology | Catchment Hydrology | Watershed Land Use Runoff Score | 0.27 | 0.28 | 0.28 | 0.19 | Not Functioning | 0.08 | Not Functioning |
| | Reach Runoff | Stormwater Infiltration | 0.09 | 0.09 | 0.09 | | | | |
| Hydraulics | Floodplain Connectivity | Bank Height Ratio | 2.4 | 0.00 | 0.00 | 0.00 | Not Functioning | | |
| | | Entrenchment Ratio | 1.8 | 0.00 | | | | | |
| Geomorphology | Large Woody Debris | Large Woody Debris Index | | | 0.16 | 0.16 | Not Functioning | | |
| | | # Pieces | 3 | 0.16 | | | | | |
| | Lateral Migration | Erosion Rate (ft/yr) | | | 0.40 | | | | |
| | | Dominant BEHI/NBS | H/H | 0.20 | | | | | |
| | | Percent Streambank Erosion (%) | 60 | 0.00 | | | | | |
| | | Percent Armoring (%) | 0 | 1.00 | | | | | |
| | Riparian Vegetation | Left - Average Diameter at Breast Height (DBH; in) | 2 | 0.22 | 0.20 | | | | |
| | | Right - Average DBH (in) | 6 | 0.65 | | | | | |
| | | Left - Buffer Width (feet) | 0 | 0.00 | | | | | |
| | | Right - Buffer Width (feet) | 10 | 0.06 | | | | | |
| | | Left - Tree Density (#/acre) | 2 | 0.01 | | | | | |
| | | Right - Tree Density (#/acre) | 15 | 0.11 | | | | | |
| | | Left - Native Herbaceous Cover (%) | 20 | 0.27 | | | | | |
| | | Right - Native Herbaceous Cover (%) | 20 | 0.27 | | | | | |
| | | Left - Native Shrub Cover (%) | 0 | 0.00 | | | | | |
| | | Right - Native Shrub Cover (%) | 20 | 0.38 | | | | | |
| | Bed Material Characterization | Size Class Pebble Count Analyzer (p-value) | 0.1 | FALSE | | | | | |
| | Bed Form Diversity | Pool Spacing Ratio | 10 | 0.00 | 0.02 | | | | |
| | | Pool Depth Ratio | 1.1 | 0.07 | | | | | |
| | | Percent Riffle (%) | 75 | 0.00 | | | | | |
| | | Aggradation Ratio | | | | | | | |
| | Plan Form | Sinuosity | 1 | 0.00 | 0.00 | | | | |
| Physicochemical | Bacteria | E. Coli (Cfu/100 mL) | 1000 | 0.00 | 0.00 | 0.00 | Not Functioning | | |
| | Organic Enrichment | Percent Nutrient Tolerant Macroinvertebrates (%) | | | | | | | |
| | Nitrogen | Nitrate-Nitrite (mg/L) | | | | | | | |
| | Phosphorus | Total Phosphorus (mg/L) | | | | | | | |
| Biology | Macroinvertebrates | Tennessee Macroinvertebrate Index | 0 | 0.00 | 0.00 | 0.04 | Not Functioning | | |
| | | Percent Clingers (%) | | | | | | | |
| | | Percent EPT - Cheumatopsyche (%) | | | | | | | |
| | | Percent Oligochaeta and Chironomidae (%) | | | | | | | |
| | Fish | Native Fish Score Index | 0 | 0.00 | 0.08 | | | | |
| | | Catch per Unit Effort Score | 1 | 0.15 | | | | | |

| PROPOSED CONDITION ASSESSMENT | | | | | Roll Up Scoring | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Functional Category | Function-Based Parameters | Measurement Method | Field Value | Index Value | Parameter | Category | Category | PCS | PCS |
| Hydrology | Catchment Hydrology | Watershed Land Use Runoff Score | 0.76 | 0.80 | 0.80 | 0.79 | Functioning | 0.83 | Functioning |
| | Reach Runoff | Stormwater Infiltration | 0.77 | 0.77 | 0.77 | | | | |
| Hydraulics | Floodplain Connectivity | Bank Height Ratio | 1 | 1.00 | 1.00 | 1.00 | Functioning | | |
| | | Entrenchment Ratio | 10 | 1.00 | | | | | |
| Geomorphology | Large Woody Debris | Large Woody Debris Index | | | 0.82 | 0.90 | Functioning | | |
| | | # Pieces | 20 | 0.82 | | | | | |
| | Lateral Migration | Erosion Rate (ft/yr) | | | 1.00 | | | | |
| | | Dominant BEHI/NBS | L/L | 1.00 | | | | | |
| | | Percent Streambank Erosion (%) | 0 | 1.00 | | | | | |
| | | Percent Armoring (%) | 0 | 1.00 | | | | | |
| | Riparian Vegetation | Left - Average Diameter at Breast Height (DBH; in) | 12 | 1.00 | 0.94 | | | | |
| | | Right - Average DBH (in) | 12 | 1.00 | | | | | |
| | | Left - Buffer Width (feet) | 50 | 0.70 | | | | | |
| | | Right - Buffer Width (feet) | 50 | 0.70 | | | | | |
| | | Left - Tree Density (#/acre) | 150 | 1.00 | | | | | |
| | | Right - Tree Density (#/acre) | 150 | 1.00 | | | | | |
| | | Left - Native Herbaceous Cover (%) | 75 | 1.00 | | | | | |
| | | Right - Native Herbaceous Cover (%) | 75 | 1.00 | | | | | |
| | | Left - Native Shrub Cover (%) | 50 | 1.00 | | | | | |
| | | Right - Native Shrub Cover (%) | 50 | 1.00 | | | | | |
| | Bed Material Characterization | Size Class Pebble Count Analyzer (p-value) | 0.1 | FALSE | | | | | |
| | Bed Form Diversity | Pool Spacing Ratio | 4 | 1.00 | 0.75 | | | | |
| | | Pool Depth Ratio | 2.5 | 1.00 | | | | | |
| | | Percent Riffle (%) | 0 | 0.00 | | | | | |
| | | Aggradation Ratio | 1 | 1.00 | | | | | |
| | Plan Form | Sinuosity | 1.2 | 1.00 | 1.00 | | | | |
| Physicochemical | Bacteria | E. Coli (Cfu/100 mL) | 487 | 0.70 | 0.70 | 0.70 | Functioning | | |
| | Organic Enrichment | Percent Nutrient Tolerant Macroinvertebrates (%) | | | | | | | |
| | Nitrogen | Nitrate-Nitrite (mg/L) | | | | | | | |
| | Phosphorus | Total Phosphorus (mg/L) | | | | | | | |
| Biology | Macroinvertebrates | Tennessee Macroinvertebrate Index | 42 | 1.00 | 1.00 | 0.75 | Functioning | | |
| | | Percent Clingers (%) | | | | | | | |
| | | Percent EPT - Cheumatopsyche (%) | | | | | | | |
| | | Percent Oligochaeta and Chironomidae (%) | | | | | | | |
| | Fish | Native Fish Score Index | 3 | 0.50 | 0.50 | | | | |
| | | Catch per Unit Effort Score | 3 | 0.50 | | | | | |