SMOKESTACK MITIGATION BANK
PROSPECTUS

CITY OF LAKELAND,
SHELBY COUNTY, TENNESSEE

Prepared for:
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Executive Summary

Resource Environmental Solutions (RES), by and through its wholly owned subsidiary, HGS, LLC, (the "Bank Sponsor" or "Sponsor") is proposing to establish the Smokestack Mitigation Bank (the "Bank") located in southwest Tennessee, less than 20 miles from the City of Memphis in Shelby County. The Bank is jointly located within the City of Lakeland and Arlington Township at the convergence of the Loosahatchie River and Cypress Creek (Figure 1). There is one primary access point to the Smokestack LLC Property off Evergreen Road (35.276463, -89.718229).

The Bank will encompass approximately 360 acres. Mitigation activities at this site will occur throughout the property focused on Stream 1, which has an existing 3,848 linear feet (LF) of corridor, but which will be lengthened to more closely resemble its original alignment as part of its pattern restoration. The Bank is located within the Level III Ecoregion 74 – Mississippi Valley Loess Plains, which is typified by low-gradient, fine-grained sediment dominant streams. The Bank site will incorporate approximately 3,848 LF of existing perennial stream channels and it encompasses approximately 5,200 LF of proposed restored stream, 25.6 acres of riparian buffers and 50 acres of nontidal wetlands.

The approximately 220-acre western portion of this site (parcel ID L014100269) is located within the Hydrological Unit Code (HUC)-12 Loosahatchie River–Oliver Creek Watershed (080102090405); however, the approximately 125-acre eastern portion of the site (parcel ID A014100270) is located within the HUC-12 Clear Creek Canal Watershed. Both these HUC-12 watersheds are located within the HUC-8 Loosahatchie Watershed (08010209).

Existing Conditions

The Bank lies along the divide between the urban and suburban development of the Memphis metro area and the more rural agricultural areas within northern Shelby County and into Tipton County. The Bank is adjacent to the Loosahatchie River, which has been severely channelized and dredged throughout the project area primarily for agricultural and drainage purposes. The Bank contains three tributaries that drain directly into the Loosahatchie River, one of which flows into the river just off the Bank property. Clear Creek Canal, which flows south to north into the river bisecting the Bank property, was constructed for a combination of drainage, agriculture, and irrigation purposes.

The site is currently in intensive agricultural production, with soybeans occupying most of the site in 2018. There are 52 delineated wetlands scattered throughout the site totaling 20.648 acres, the majority of which are palustrine emergent (PEM) wetlands. In addition, thirty-three (33) streams and wet weather conveyances, for a total of 18,464 linear feet (5.894 acres), were identified within the project area. Ten (10) of these features are considered stream, the remaining features are wet weather conveyances. No open water aquatic resources were identified within the project area. The site also has a smaller amount of palustrine forested wetland (PFO) and palustrine scrub shrub (PSS), which are primarily located along riparian corridors of the Loosahatchie River and Clear Creek Canal.

The Bank contains 1019 linear feet (LF) of Loosahatchie River along its left-descending bank and it contains 4,196 LF of the Clear Creek Canal. The site contains 7,594 LF of intermittent stream, 1,558 LF of perennial stream (not counting the Loosahatchie River or Clear Creek Canal), 1144 LF of ephemeral stream, and 23 separate wet weather conveyances totaling 2,953 LF. Similar to the Loosahatchie River, the tributaries that drain the Bank property have also been extensively straightened and channelized for agricultural purposes as well as their riparian corridors being largely removed. The streams have virtually no in-stream aquatic habitat to support biological diversity.

It is anticipated that long-term trends will result in continued residential and commercial growth pushing northward from Memphis as is evident from viewing historical aerial mapping from the prior thirty years.

The Bank itself is mostly located within a Regulatory Floodway and is likely to remain in agricultural use. If this restoration project does not proceed, the agricultural operations will continue within close proximity of the stream corridors resulting in further water quality, benthic macro-invertebrate, and fish community impairment, and will contribute to the overall degradation of the watershed.

The overall goal of the Bank is to restore, to the greatest extent possible, the ecological function of the highly degraded aquatic resources within the Bank site. A primary objective of achieving this goal will be to generate stream compensation credits that fully mitigate authorized losses of streams and wetlands, which are Waters of the U.S., in a manner that best contributes to the long-term ecological health of the Loosahatchie Watershed. The Bank will accomplish this objective through the implementation of various mitigation measures, including stream re-establishment, restoration, preservation, and riparian buffer planting as well as wetland restoration and preservation. These activities are intended to produce watershed-scale improvements of ecological services that will replace the chemical, physical, and biological function of stream channels and riparian areas within the proposed service area that are lost as a result of authorized impacts.

Proximity to Other Protected Lands

Most of the parks and other protected lands are in closer proximity to the City of Memphis. No protected lands are adjacent to the Bank site. However, Blue Lagoon Park, an approximately 240-acre park and protected area, lies along the south bank of the Loosahatchie River, approximately 3.5 miles west of the subject property. The Tennessee Board of Regents also owns approximately 336 acres of land along the south bank of the Loosahatchie River in this area. Both the Blue Lagoon Park and the Tennessee Board of Regents properties are located within the same HUC 12 Loosahatchie River–Oliver Creek Watershed. The largest area of protected lands within Shelby County is the Meeman-Shelby Forest State Park at over 13,467 acres, which is located along the Mississippi River and approximately 15 miles west of the Bank mitigation site.

1.0 Bank Sponsor

The Bank Sponsor for the proposed Smokestack Mitigation Bank (referred to herein as the "Bank") is Resource Environmental Solutions (RES), who is the nation's largest and most experienced ecological offset provider. Operating in 14 different states and 26 different Corps Districts across the Country, RES has successfully restored, enhanced and preserved over 294 miles of streams and 45,500 acres of wetlands, including the development and operation of some 350 mitigation sites, more than 50 of which have been successfully closed out. RES's project efforts to date further include more than 58,000 acres of custom, turnkey mitigation solutions, rehabilitation, and preservation of over 9,100 acres of endangered species habitats, 2,843 permits executed, and planting of over 14 million trees across all operating regions with a survival rate of 78.5%.

RES has developed design-build stream and wetland mitigation banks and permittee responsible mitigation sites throughout the U.S. that they have successfully monitored to site closeout. Select projects in the Southeastern U.S. relevant to the scope of this contract include:

Baileyton Stream Mitigation Bank – Greene County, TN (Nolichucky Watershed)
Pending

Walnut Shade Stream Mitigation Bank – Macon County, TN (Barren River Watershed)
Pending

Mud Creek Stream Mitigation Bank – Morgan County, TN (Emory River Watershed)
20,607 Proposed Stream Credits
Pending

Lodi Stream Mitigation Bank – McMinn County, TN (Hiwassee River Watershed)
11,049 Proposed Stream Credits
Pending

Forrest Creek Stream Mitigation Bank - Hillsborough, NC (Neuse 01 Watershed)
8,601 Stream Credits
Mitigation Banking Instrument (MBI) Approval Date: 2007 (Wilmington District)

Cedar Grove Stream Mitigation Bank Hillsborough, NC (Neuse 01 Watershed)
6,862 Stream Credits
MBI Approval Date: 2014 (Wilmington District)

Selma Mill Stream Mitigation Bank - Selma, NC (Neuse 01 Watershed)
7,305 Stream Credits
MBI Approval Date: 2016 (Wilmington District)

Randolph 1 (Cheat River Watershed)
108 acres of wetland creation
20,248 linear feet of stream restoration
MBI Approval Date: 2008 (Pittsburgh District)

Foster Run (Middle Ohio North Watershed)
Wetland credits 2.93

Stream credits 15,489
MBI Approval Date: 2008 (Huntington District)

Blackjack Wetland Mitigation Bank (Rappahannock Watershed)
57 acres of wetland creation
MBI Approval Date: 2001 (Norfolk District)

Northern Virginia Regional Environmental Bank (Potomac Watershed)
87 acres of wetlands restoration on 3 bank sites
MBI Approval Date: 2004 (Norfolk District)

Caeli Farm 4 PRM Stream and Wetland Projects (Potomac Watershed)
3,400 linear feet of stream restoration, 23 acres of riparian buffer establishment, 8 acres of floodplain wetland restoration
MBI Approval Date: 2006 (Norfolk District)

Potomac Regional Environmental Bank at Caeli Farm (Potomac Watershed)
6,800 linear feet of stream restoration
MBI Approval Date: 2007 (Norfolk District)

The Prince William Environmental Bank (Potomac Watershed)
12,000 linear feet of stream restoration and 20,000 stream credits sold
MBI Approval Date: 2007 (Norfolk District)

Trapp Branch 3 PRM Stream and Wetland Projects (Potomac Watershed)
2,500 linear feet of stream restoration, 11 acres of riparian buffer, 4 acres of wetland restoration
MBI Approval Date: 2007 (Norfolk District)

Cannon Regional Environmental Bank (Rappahannock Watershed)
13,000 stream credits from stream restoration, riparian buffer re-establishment and preservation
MBI Approval Date: 2010 (Norfolk District)

Hulls Springs Farm Mitigation Bank (Potomac Watershed)
49 wetland credits and 6,000 stream credits from restoration, enhancement, and preservation
MBI Approval Date: 2013 (Norfolk District)

Piedmont Farms Stream Mitigation Bank (James River Watershed)
19,000 stream credits from stream restoration, enhancement, and preservation
MBI Approval Date: 2013 (Norfolk District)

Robinson Fork Mitigation Bank – Phase I (Robinson Fork Watershed)
54.42 acres of restoration; 48.88 wetland credits
91 acres of upland enhancement; 68,350 trees planted –
146,407 linear feet of stream restored and protected; 77,792 stream credits
MBI Approval Date: 2015 (Pittsburgh District)

2.0 Agent

The Agent for the Sponsor is Julie Bingham, M.S., CERP at EnviroScience, Inc. in Stow, Ohio. Ms. Bingham is the Restoration Practice Area Manager at EnviroScience where she uses her 20 years of hands-on stream and wetland restoration and mitigation experience to manage a multidisciplinary team of staff, develop and oversee work over the Midwest, South, and East Coast Operations. Her background in biology, morphological assessment, restoration design, and implementation makes her an outstanding leader. Ms. Bingham additionally has an extensive level of training in ecological design, having completed all the Rosgen Applied Fluvial Morphology training classes (Level 1 through 4), and as an Ohio EPA certified Level 3 Qualified Data Collector for fish sampling and Qualitative Habitat Evaluation Index (QHEI) analyses.

EnviroScience, Inc. Qualifications and Previous Experience

EnviroScience is a fully licensed engineering and design firm within the State of Tennessee. Since the early 2000s, EnviroScience has completed over 60 design-build ecological restoration projects, including a variety of full-delivery stream and wetland mitigation projects, and an equal number of design-only projects encompassing all manner of restoration approaches, sizes, and complexities. Every single one of our restoration projects have met or exceeded or are on schedule to meet and/or exceed, their pre-construction ecological performance criteria goals and have been released from regulatory oversight on or ahead of schedule.

3.0 Project Location

The Bank is in southwest Tennessee, less than 20 miles from the City of Memphis in Shelby County. The Bank is jointly located within the City of Lakeland and Arlington Township at the convergence of the Loosahatchie River and the Clear Creek Canal (Figure 1).

The approximately 220-acre western portion of this site (parcel ID L014100269) is located within the Hydrological Unit Code (HUC)-12 Loosahatchie River–Oliver Creek Watershed (080102090405); however, the approximately 125-acre eastern portion of the site (parcel ID A014100270) is located within the HUC-12 Clear Creek Canal Watershed. Both these HUC-12 watersheds are located within the HUC-8 Loosahatchie Watershed (08010209).

4.0 Access to Property

There is one primary access point to the Smokestack LLC Property off Evergreen Road (35.276463, -89.718229). The Bank site consists of tax parcels L0141 0029 and Parcel ID A0141 00270 (Figure 2), both of which are wholly owned by Pea Point LLC. RES, by and through a wholly owned subsidiary (HGS, LLC), has entered into an agreement with the landowner to purchase the property in fee simple title. This agreement provides RES and its agents all access and use rights necessary to develop, operate, and maintain the proposed Bank in accordance with applicable regulatory standards. The land ownership map (Figure 3) is presented in Appendix A.

5.0 Project Goals

A primary goal of the Bank is to create a self-sustaining, natural aquatic system that achieves the intended level of aquatic ecosystem functionality with minimal human intervention, including long-term maintenance. A further purpose of the Bank will be to provide stream mitigation credits, and to a lesser extent wetland mitigation credits, to satisfy compensatory mitigation requirements for adverse impacts to streams and wetlands permitted under Section 404/401 of the Clean Water Act in conjunction with the following federal and state agencies: the U.S. Environmental Protection Agency (EPA), the U.S. Fish and Wildlife Service (USFWS), the Natural Resources and Conservation Service, Tennessee Valley Authority, Tennessee Department of Environment and Conservation (TDEC), and the Memphis District of the United States Army Corps of Engineers (USACE); all of which comprise the Interagency Review Team (IRT). The Bank will provide mitigation credits by restoring, preserving, and re-establishing streams and adjacent riparian areas as well as wetlands throughout the site.

The aquatic resources on Bank property have been highly modified and degraded due to past agricultural and drainage purposes. There are three primary waterways on the property, not including the Loosahatchie River and the Clear Creek Canal. Stream 1 is an intermittent stream a total of 3,848 linear feet (LF) in length and for delineation purposes has been broken into two sections, S-1a and S-1b, due to a hydrologic disruption resulting from a culvert crossing installed to provide tractor and vehicular access to the eastern fields. Stream 1 has been ditched and dredged so that it flows exactly south to north into the Loosahatchie River, and it has very little riparian corridor. As evident on the historical aerial maps (Appendix B), Stream 1 was once a highly sinuous, low-gradient stream that likely provided hydrology to an expansive wetland system. An approximately 20-foot section of the stream is culverted for crossing purposes. Due to ditching and dredging activities, proper stream morphology and virtually any semblance of in-stream habitat is lacking. The stream has little to no access to its floodplain and is currently functioning essentially as an over-wide ditch. Water quality is poor, and the water has a highly turbid appearance, likely contributing to Loosahatchie River nutrient and sediment loading issues.

The Clear Creek Canal (Stream Reach 2), which accepts flow from the Cypress Creek Drainage Canal upstream, flows for 4,196 LF on the Bank property. It is heavily entrenched and mostly disconnected from its floodplain; however, it is evident that during large storm events the stream will breach its bank on river left in a couple isolated places. This perennial stream has better morphology, with moderately developed riffle/pool sequencing and in-stream aquatic habitat, including the presence of wood structure, than the other on-site waterbodies. Because in-water work is not proposed for Clear Creek Canal, only abbreviated assessment activities were performed on it.

Other than Clear Creek Canal and portions of the left descending bank of the Loosahatchie River, Stream Reach 3 is the only other perennial waterbody located on the property. It flows from east to west for 1,558 LF within the Bank boundaries. The stream is located within a forested riparian corridor that averages approximately 50 feet in width. The stream has moderate gradient, access to its floodplain, and a more natural morphologic profile, indicating relatively little direct hydromodification over the years. There is an in-stream water crossing constructed of rock material, which acts as a form of grade control for the stream and slightly impounds water upstream. The downstream portions of Stream Reach 3 are exhibiting instability, including the formation of a headcut that is incising upstream, near the confluence with Clear Creek Canal.

Another important hydrologic feature of the site is the abundance of wet weather conveyances, 26 in all, located throughout the Bank site, which flow only in response to a localized precipitation event. The wet weather conveyances are located in both forested areas and agricultural fields; however, they have their greatest adverse impact upon water quality within the agricultural fields. As is evident by the photographs in Appendix D, the wet weather conveyances within the agricultural fields laterally and vertically erode due to the lack of confining vegetation. As such, they contribute large amounts of sediment, and likely nutrients as well, into the intermittent and perennial streams at the Bank and the Loosahatchie River. Restoration of this impairment source will be a priority for the project.

The historic stream hydromodifications also greatly impaired wetland function at the site. As indicated by the wetland delineation, site soils, and the historic topographic maps, most of the site west of the Clear Creek Canal was likely wetland habitat prior to the straightening and ditching of Stream 1. Stream 1 meander scrolls are evident throughout these agricultural fields. Note that a jurisdictional determination site visit has been completed and the formal jurisdictional determination is pending; however, the classification of on-site resources is pending review and confirmation by TDEC.

In total, the goal of the Bank will be to provide a high level of ecological and aquatic functional lift through the restoration, re-establishment, and preservation of stream resulting in the development of an estimated 2,037 functional feet (SQT) credits and wetlands totaling an estimated 50 credits.

The Bank project goals for streams and wetlands are summarized in Table 1.

6.0 Project Objectives

The project objectives will be to return a more natural hydrologic regime to the Bank site by restoring the stream geomorphology, sediment transport capabilities, floodplain connectivity, large woody debris, biology and water chemistry of Stream Reach 1; restoring and enhancing wetlands throughout the site, but particularly within the western agricultural fields; and protecting, expanding, and enhancing the Clear Creek Canal and Stream Reach 3 riparian corridor. Combined, this will improve the ecological function of the Bank's aquatic resources and it will improve water quality entering the Loosahatchie River from the site.

The stream and wetland objectives are to:

- Restore dynamically stable stream channels to improve bedform diversity and lateral stability.
- Restore natural, stream geomorpholgy to stream reaches using natural channel design techniques.
- Restore natural hydrology to the site by removing culverts and reattaching streams back to their relic floodplains.
- Decrease channel shear and velocities by increasing channel sinuosity and improving floodplain connectivity.
- Utilize woody debris and rock, as appropriate, to improve aquatic habitat and lateral stability.
- Improve water quality by reducing farm-related non-point source pollution and in-stream sediment contribution, primarily through the cessation of intensive agricultural activities, the stabilization of highly eroding wet weather conveyances within the agricultural fields and the revegetation of the agricultural fields.
- Increase re-oxygenation zones to improve water quality and biological integrity.
- Establish a minimum 50-foot riparian buffer with native vegetation to provide shade, increase stream bank stability, nutrient filtration, and habitat.
- Where possible, establish and enhance the riparian buffer up to 200 feet in width to improve nutrient filtration, to stabilize wet weather conveyances along the primary stream channels, increase habitat connectivity, and to improve stream shading to minimize the effects of thermal modification.
- Plant trees and shrubs in wetland enhancement areas for habitat improvement.
- Protect streams and riparian zones and wetlands with land use restrictions.
- Establish streams with adjacent floodplain wetlands to provide additional water quality benefits with the understanding that it could generate additional mitigation credits.

Table 1. Stream and Wetland Restoration Goals and Objectives

Stream	Goals	Objectives
Stream 1	Restore natural channel pattern, geomorphology, and improve water quality	Restore natural channel geomorphology (dimension, pattern, profile) and establish natural hydrology and the development of floodplain wetlands
	Improve floodplain connectivity	Reduce the BHR and increase the entrenchment ratio where practical
	Improve bedform diversity	Increase pool depth ratio; Restore natural pool- pool spacing and riffle habitat, as practical in this low

		gradient system
	Improve lateral stability	Achieve dominant BEHI score of moderate or less
	Improve riparian vegetation buffer width and protection	Increase RBP buffer width scores to 9 or higher and vegetation protection to 8 or higher
Clear Creek Canal (STR 2)	Improve riparian vegetation buffer width and protection	Increase RBP buffer width scores to 9 or higher and vegetation protection to 8 or higher. 200' of buffer enhancement on right descending bank (RDB) and 50' of buffer on LDB
	Permanent conservation protection	
STR 3	Improve riparian vegetation buffer width and protection	Increase RBP buffer width scores to 9 or higher and vegetation protection to 8 or higher. 200' of buffer on RDB and 100' on LDB
	Permanent conservation protection	
Loosahatchie River	Improve riparian vegetation buffer width and protection	Increase RBP buffer width scores to 9 or higher and vegetation protection to 8 or higher. 200' of buffer on LDB
Wetland Re-Establishment	Restore hydrology, restore wetland vegetation, maintain wetland conditions	Cease agricultural activity, reconnect floodplain to restored stream channel, plant wetland vegetation, invasive species management
Wetland Enhancement	Improve wetland plant diversity, maintain wetland conditions	Plant native herbaceous and tree species, reconnect floodplain to restored stream channel, invasive species management

7.0 Site Constraints

An overhead transmission line corridor crosses the bank property from east to west and exists at the Bank approximately 150 feet in width and bisects Stream 1 and Clear Creek Canal. This area will be deducted from the restoration and credit yield calculations. Even though it could benefit from restoration activities, the Clear Creek Canal/Cypress Creek Drainage Canal is too entrenched for cost effective restoration. Additionally, since it is an important drainage canal within the region that is a mapped Regulatory Floodway, its degree of potential restoration activity is limited. The Bank property is being purchased in fee simple title, and thus there are no other limitations upon the restoration and long-term protection activities that can occur at the site.

A review of the Tennessee Historic Commission Viewer (TN-SHPO Survey Map) indicated there are no listed or potentially eligible historic properties that would limit the proposed restoration approach for the site. A review of the USFWS Information for Planning and Consultation (IPaC) report indicated no critical habitat for threatened or endangered species are likely to be affected by the proposed restoration approach at the site.

8.0 Biological Data

Per the TDEC online data viewer, none of the streams proposed for restoration have been assessed regarding the achievement of their water quality standards. However, based upon recently conducted field assessment activities and as shown on the datasheets included in Appendix E, it is apparent that none of the streams to be restored on the subject property are supporting their water quality standards due to the historic hydromodifications and ongoing agricultural activities. Qualitative observations indicate that because of intensive agricultural activity, habitat alteration, and sedimentation, few riffle-pool sequences and available stable substrate exist within Streams 1 and 2 in order to provide the appropriate aquatic habitat necessary for significant macroinvertebrate presence.

The subject tributaries do flow into the Loosahatchie River, which is not supporting its water quality standards per the TDEC online data viewer due to habitat alteration/hydromodification, sedimentation/siltation, and nutrient and fecal coliform pollution. As such, the potential to maximize the functional lift of the streams and benefit the Loosahatchie River water quality is great.

9.0 Baseline Conditions

9.1 Proposed Service Area

The Bank is located within the HUC-8 Loosahatchie River Watershed (08010209), which is within the Level III Ecoregion – Mississippi Valley Loess Plains (74). As such, the primary service area for the Bank will be the Loosahatchie River Watershed (08010209). The secondary service area is comprised of the surrounding HUC-8 watersheds that lie within the same Level III Ecoregion – Mississippi Valley Loess Plains (74) as the subject site. The secondary service area consists of the Wolf River in Tennessee (08010210) and Lower Hatchie River (08010208). The service areas served by the Smokestack Mitigation Bank (Figure 7) will include all or portions of the following counties: Fayette, Hardeman, Haywood, Shelby, and Tipton.

The proposed service area is located within the same EPA Level III Ecoregion 74 except for a small portion along the eastern boundary of the Horn Lake-Nonconnah Watershed. The Mississippi Valley Loess Plains stretches from near the Ohio River in western Kentucky to Louisiana and is distinguished by thick loess (a loosely compacted yellowish-gray deposit of windblown sediment). The region consists primarily of irregular plains, gently rolling hills, and bluffs near the Mississippi River. The western portion of the ecoregion contains soils that are deep, steep, silty, and erosive (reflected in the geology of the Bank site). Dominant natural vegetation in the west of the ecoregion and on the bluffs consists of mixed and southern mesophytic forests. The proposed service area would provide ecologically and environmentally compatible aquatic resources as the Bank site.

9.2 Watershed Assessment

The watershed for the Bank is primarily agricultural with a patchwork of interspersed forest areas (Figure 8). Residential and commercial expansion, farming, livestock, and deforestation have contributed to the degradation of streams within the watershed through habitat alteration, impoundment, siltation, nonpoint source pollution, and loss of productive habitat. It is anticipated that long-term trends will result in continued residential and commercial growth pushing northward from Memphis as is evident from viewing historical aerial mapping from the prior thirty years.

Similar to the Loosahatchie River, the tributaries that drain the Bank property have also been severely channelized and dredged throughout the project area primarily for drainage and agricultural purposes, and much of the riparian corridor has been impacted or removed. The streams have virtually no in-stream aquatic habitat to support biological diversity. Poor overall watershed conditions and lack of riparian vegetation on the site make it a strong candidate for establishing the stream mitigation bank. Furthermore, after conducting a thorough on-site assessment, the lack of floodplain connectivity and in-stream habitat reaffirmed the site's high restoration potential and ability to provide functional lift capable of achieving the proposed performance standards, goals, and objectives. If this restoration project does not proceed, the agricultural operations will continue within close proximity of the stream corridors, resulting in further water quality, benthic macro-invertebrate and fish community impairment. These impacts will further contribute to the overall degradation of the watershed.

The proposed Bank site does have Federal Emergency Management Agency (FEMA) flood data available for the property. The parcel is located on Map Number 47157C0215G: Panel 215 of 635, revised February 6, 2013 (Figure 6). The entirety of the Bank is located within a FEMA Zone AE Floodway Area, which must be kept free of encroachments so that 1% annual chance flood can be carried without substantial increase in flood heights. RES will work with the Shelby County Flood Insurance Program manager to address any FEMA flood related issues.

9.3 Adjacent Land Uses

The Bank is less than 20 miles northeast of the City of Memphis in Shelby County. The Bank is jointly located within the City of Lakeland and Arlington Township at the convergence of the Loosahatchie River and Clear Creek Canal. Adjacent land uses are primarily agriculture with isolated patches of forest throughout, as well as encroaching residential and commercial development. If the Bank is not built, agricultural operations combined with development would continue in the immediate vicinity of the stream reaches, which would continue the impairment of water quality and benthic macro-invertebrate communities, promote head cutting, and further the overall degradation of the watershed. Development on adjacent properties will likely cause alterations to the hydrologic regime within the sub-watershed, which strengthens the needs for a more natural, connected, and adaptive riparian system.

10.0 Proposed Mitigation Approach

10.1 Mitigation Approach

Restoration of unnamed tributary, Stream 1 (STR-1) to the Loosahatchie River will consist of re-establishing natural channel dimensions, morphology, and profiles that will promote a more natural meandering channel with proper riffle-pool complexes. Natural channel stream restoration techniques will be used to establish a new stream channel, which will approximate the relic channel abandoned between the 1950's and 1960's, and the culverted stream crossing will be daylighted. The proposed restoration approach will reconnect the new channel to its floodplain, and it will restore proper sediment transport to this low-gradient stream system. A riparian zone with native plant and tree species will be planted, which will provide shade to cool the stream, nutrient attenuation and filtration, and wildlife connectivity and habitat.

At this time, the proposed stream mitigation approaches will be credited using the Stream Quantification Tool, which is reflected in Table 2 below. Additional stream lengths will be determined during final design in the MBI and later approved by the IRT following the As-Built survey. Sections of stream reaches that have an easement break will not receive mitigation credit, although improvements will be made in these areas to ensure the overall success of the project site. All project areas will be protected with a permanent conservation easement.

Table 2. Proposed Mitigation

Stream Reach	Existing Length (ft)	Proposed Mitigation	Proposed Length (ft)	Total Functional Lift Credits
STR-1	3,280	Stream Restoration/Wetland Complex	5,230	1771.10
Clear Creek Canal (STR-2)	4,177	Enhancement (Buffer Zone – 200')	4,177	143.04
STR-3	1,558	Enhancement I (Buffer Zone – 200')	1,558	122.38
TOTAL				**2036.52**

Wetland ID	Existing Acreage	Proposed Mitigation	Proposed Acreage	Proposed Ratio	Total Credits
EW	7.48	Rehabilitation	7.48	2:1	3.7
PW	0	Restoration	50	1:1	50
TOTAL					**53.7**

10.2 Functional Lift

10.2.1 Streams

The goal of the Bank is to provide maximum ecological and aquatic functional lift while minimizing temporal and land disturbing impacts. The proposed mitigation approach will restore ditched stream and return its pattern to a natural alignment approximating its historic, relic alignment. It will also reconnect the stream to a more functional floodplain, restore natural velocities, improve sediment transport, and reduce erosion and sediment input from wet weather conveyances, particularly within the agricultural fields. Wood and rock will be introduced, as appropriate, for lateral stability and in-stream habitat purposes. Increasing re-oxygenation zones, reducing sedimentation effects, and providing shade with native vegetation will improve the overall water quality of the stream reaches.

Stream Reach 1 is not functioning as a result of stormwater runoff, poor bank height ratio, lack of diversity of riparian vegetation, lack of bedform diversity, water quality and nutrients, and low biological diversity. Each of these functional impairments is a direct result from prior hydromodification and agricultural activities, and they will be greatly improved through restoration of stream geomorphology, and riparian corridor (buffer zone) restoration. Although the biological function was not directly assessed, observations in the field indicate that only pollution tolerant species are present, and that fish presence is absent.

Additional riparian buffer zones will be provided with appropriate credit generation. The additional riparian buffer areas are noted in Figure 5 and extend a minimum of 50 feet and a maximum of 200 feet in the case of Clear Creek Canal and Stream Reach 3, and the west bank of the Loosahatchie River that fall within the parcel boundaries. The added buffer width will provide additional water quality benefits in the immediate watershed and will serve to filter sediment and nutrients before reaching the restored/enhanced streams.

10.2.2 Wetlands

Throughout the site, 20.648 acres of wetlands currently exist. The majority of these wetlands are very low-quality emergent wetlands that exist within or along the periphery of active agricultural fields (17.86 acres), forested wetlands (2.19 acres), and to an even lesser degree shrub swamp wetlands (0.12acres), exist within forested portions of riparian corridors. In conjunction with this project, this 20.648 acres of existing wetlands will be greatly enhanced through revegetation with native hydrophytic plant species, restoration of natural wetland hydrology, and management of invasive vegetation.

Additionally, 50 acres of wetland habitat will be re-established within the agricultural fields west of the Clear Creek Canal. This will be accomplished by restoring a natural hydrology to the western portion of the Bank site and restoration of Stream 1. Proposed Wetland (PW), while historically disturbed as a result of filling for agriculture and disconnection from STR-1 and the Loosahatchie River, has the potential to support a variety of wildlife species, attenuate flooding, provide contaminant filtering and support groundwater recharge.

Existing Wetland (EW), or a combination of all existing wetland between STR-1 and Clear Creek Canal consists of 7.48 acres, which currently meet the USACE definition of a wetland of the United States. The Bank Sponsor is currently requesting credits for the proposed rehabilitation of EW based on the restoration activities associated with PW. Furthermore, restoration activities associated with PW1 would further enhance wetland hydrology and hydrophytic vegetation within EW, would improve overall wetland function, and increase wetland connectivity.

All restored wetlands at the Bank will be permanently protected by the conservation easement. The wetland areas will be vegetated or enhanced with native obligate and facultative wetland herbaceous and tree species at a density of 400 stems/acre with a minimum success criterion of 75%.

11.0 Site Protection

Upon MBI approval, and prior to the initial release of credits, the restored streams, wetlands, and their respective buffers will be perpetually protected by the recordation of a Conservation Easement prepared in accordance with the Memphis District template. Land use activities within riparian and wetland buffers will have restrictions, by protecting the improved aquatic habitats, and restricting future activities that may adversely affect the functions and services of the aquatic resources. The land use restrictions implemented will encompass all stream reaches and wetland areas, although existing power line and access easements will remain in place. RES 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 become available for protection and maintenance of the mitigation site, consistent with the terms and conditions of the Conservation Easement and a long-term steward will be assigned.

12.0 Adaptive Management and Invasive Species

The MBI will include a detailed adaptive management plan addressing how management issues on the site will be resolved. If the site or a specific component of the site fails to achieve the defined success criteria, RES will develop necessary adaptive management plans and/or implement appropriate remedial actions for the site in coordination with the IRT. Remedial action required will be designed to achieve the success criteria and will include identification of the causes of failure, remedial design approach, work schedule, and monitoring criteria that will consider physical and climatic conditions.

The presence of invasive exotic plants within the Bank site can prevent native vegetation from becoming established and has the potential to affect and prolong closeout. While invasive exotic plant treatment is necessary, it is equally necessary to be mindful of realistic outcomes and overall aquatic function. There are currently five invasive species found on-site, including three species could be a direct threat to establishment of native riparian plants: Kudzu (*Kudzu spp.)*, Japanese honeysuckle (*Lonicera japonica*), and Privet (*Ligustrum spp.*). RES will perform invasive exotic vegetation treatment where necessary to achieve the success criteria. This may include herbicide applications and/or mechanical control. RES will conduct invasive species treatments at construction (baseline) and Year 2. Additional treatments will be dependent on monitoring results and regulatory agency guidance. These treatments will be timed in accordance with specific invasive exotic plant phenology for the most effective control.

Considering such factors as the influence of established invasive exotics on adjacent land, it is not feasible to expect complete eradication of the targeted invasive species. However, RES does expect to achieve significant reduction of any targeted invasive exotic species present through this control plan. The goal of the treatment program is control of invasive exotic species such that the target natural communities are present and on a positive colonization trajectory at project closeout.

13.0 Long-Term Management

An endowment fund will be established in an interest-bearing account by the Bank Sponsor through mitigation credit sales to provide funding for the long-term stewardship of the land. A two percent endowment fund will be set aside, funded by mitigation credit sales over the lifetime of the Bank to cover costs associated with the long-term care of the site.

14.0 Historic Properties

A review of the Tennessee Historical Commission Web Service Database (accessed 09 April 2019) indicated zero historical structures on the project area, and no historic impacts are proposed at the Smokestack Mitigation Site.

15.0 Threatened and Endangered Species

A USFWS Information for Planning and Consultation (IPaC) report indicates that there are two federally listed species that could potentially be encountered in the general vicinity of the project. The potential species are the Indiana bat (*Myotis sodalis*; Endangered) and the northern long-eared bat (*Myotis septentrionalis*; Threatened). A Federal Species of Concern, the bald eagle (*Haliaeetus leucocephalus*), and three birds of conservation concern, the prothonotary warbler (*Protonotaria citrea*), the red-headed woodpecker (*Melanerpes erythrocephalus*), and the wood thrush (*Hylocichla mustelina*), were noted within IPaC. Their protection will also be accounted for during site restoration activities. According to the IPaC report, no critical habitat is present within the project site. The USFWS IPaC report (dated 14 April 2019) is in Appendix C.

Appendix A

Figures

- Project Location Map (Figure 1)
- Tax Parcel Map (Figure 2)
- Land Ownership Map (Figure 3)
- Wetland Map (Figure 4)
- Restoration Concept Map (Figure 5)
- FEMA Flood Map (Figure 6)
- Watershed Service Areas (Figure 7)
- Land use/Land cover Map (Figure 8)

Appendix B

Historical Maps

Appendix C

Supporting Documents

- Wetland Delineation Report
- Jurisdictional Determination Letter
- IPaC Report (Natural Resources)

Appendix D

Site Photos

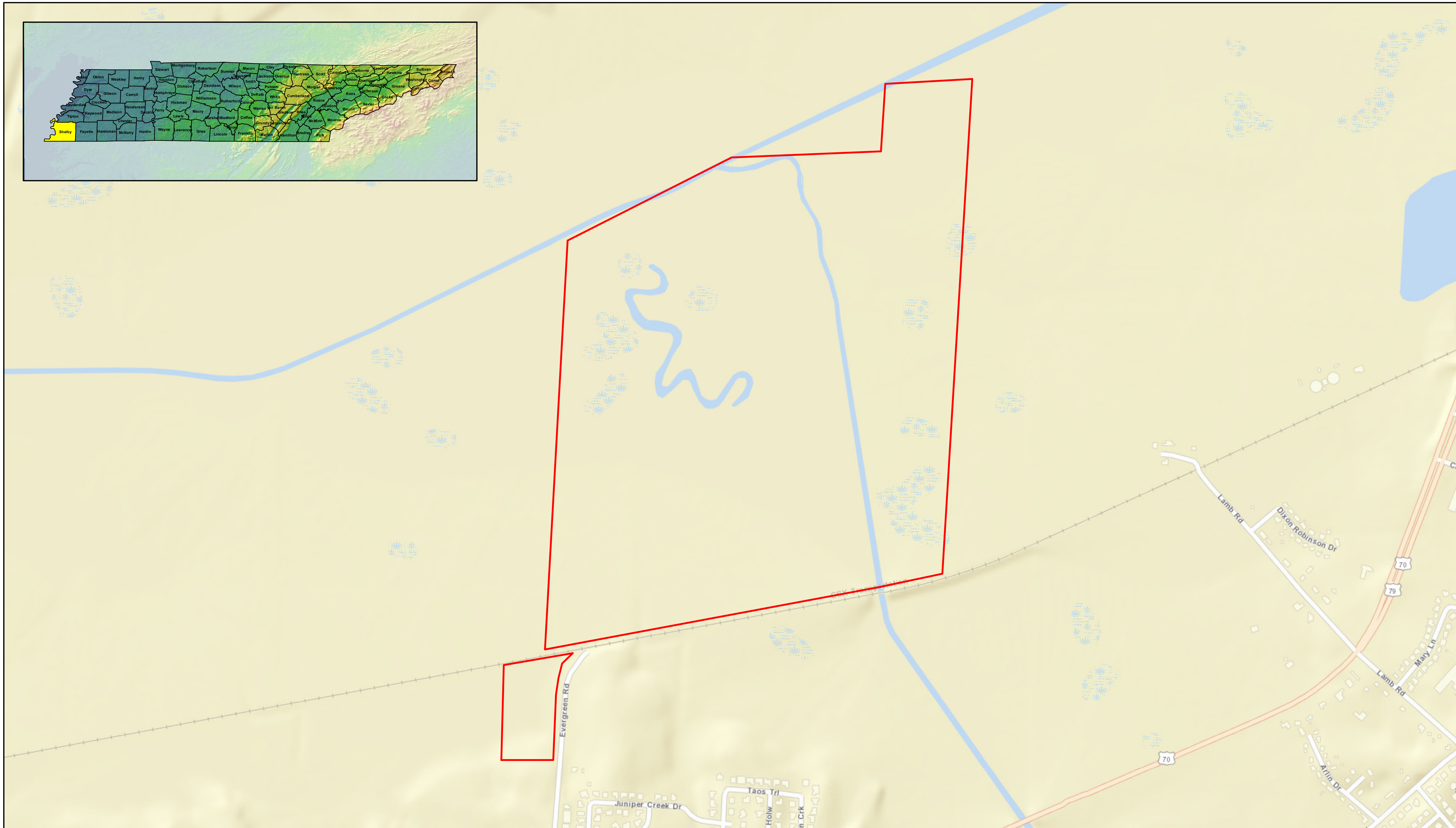

Figure 1. Location of Site on Highway Map of Shelby County, Tennessee. Smokestack Mitigation Bank Site.

Bolton Property

0 500 1,000 2,000 Feet

0 150 300 600 Meters

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Basemap courtesy of Esri.

Path: P:\10_Projects\R\RESV430R\11596_Memphis\Wetland Delineation\GIS\Map1_Location.mxd

Date: 5/14/2019

Figure 2. Tax Map of Site.
Shelby County, Tennessee.
Smokestack Mitigation Bank Site.

Site

0 150 300 600 Feet

0 50 100 200 Meters

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Path: P:\10_Projects\RES\430R\11596_Memphis\Wetland Delineation\GIS\Map2_Tax_P1.mxd

Date: 5/14/2019

Basemap courtesy of Esri.

Figure 3. Land Ownership Map of Site.
Shelby County, Tennessee.
Smokestack Mitigation Bank Site.

Site

0 150 300 600 Feet

0 50 100 200 Meters

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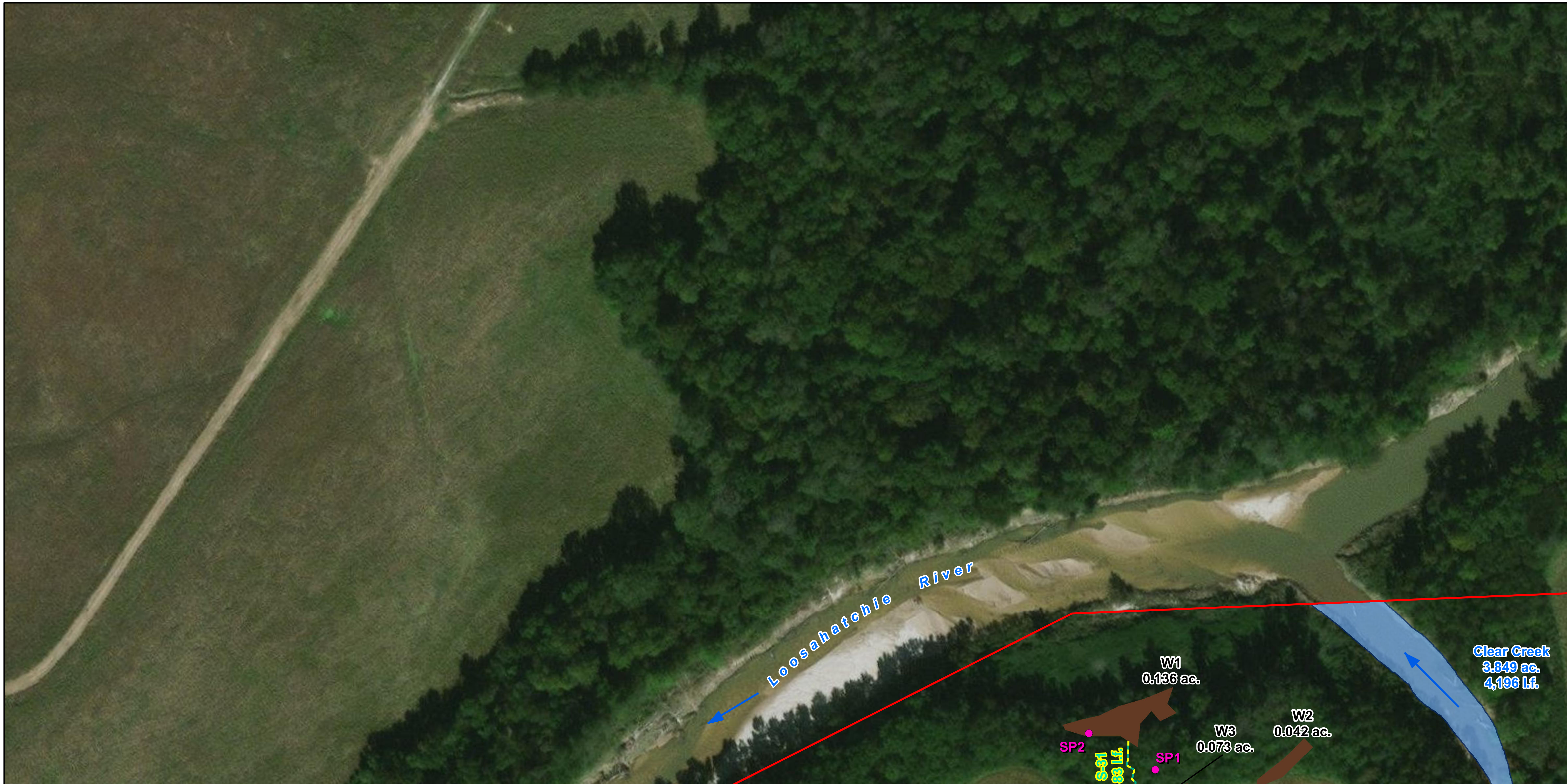
Path: P:\10_Projects\R\RES\430R\11596_Memphis\Wetland Delineation\GIS\Map3_LandOwnership.mxd

Date: 5/14/2019

Basemap courtesy of Esri.



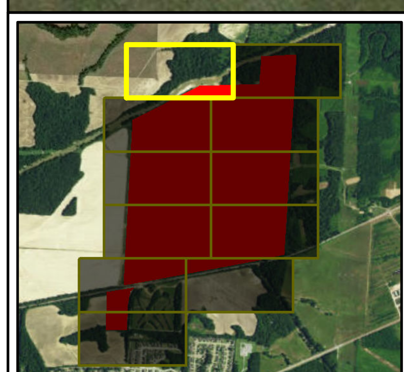


Figure 5.01. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

5.01

Waters of the United States

Tennessee Department of Environmental Conservation Hydrologic Determination

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch
- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

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Date: 6/17/2019

Basemap courtesy of Esri.

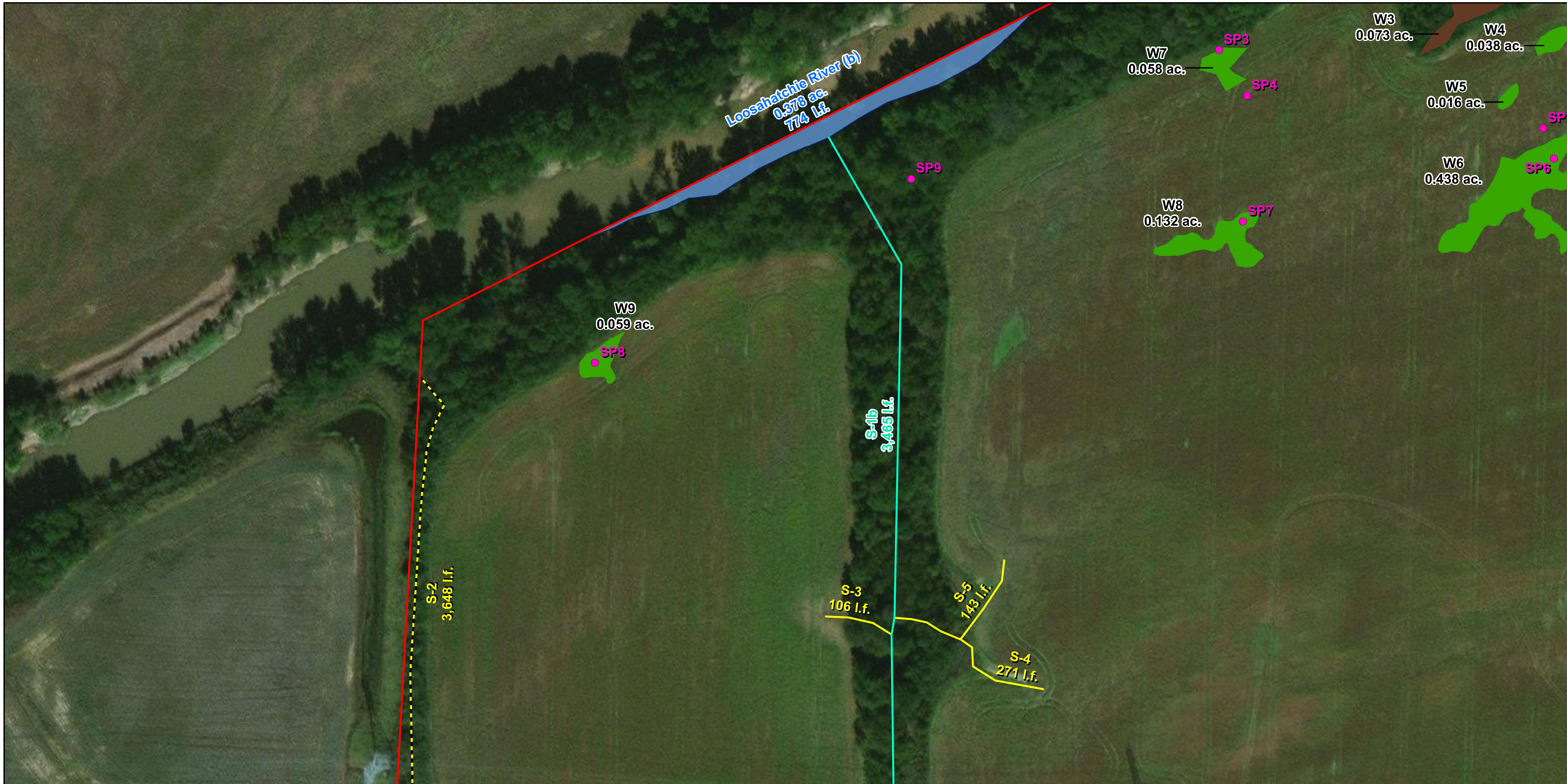

Figure 5.02. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.02

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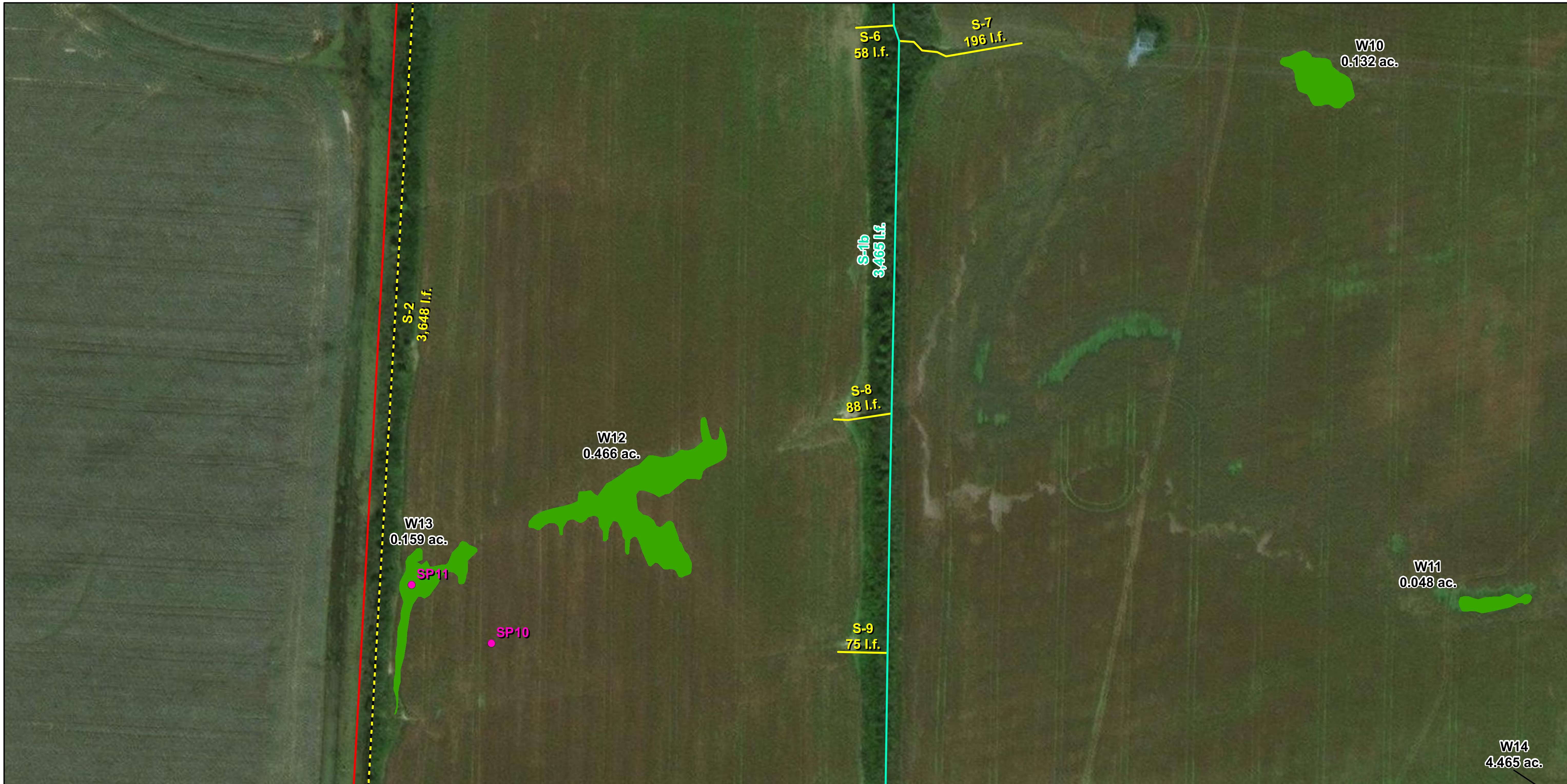
Date: 6/17/2019

Basemap courtesy of Esri.



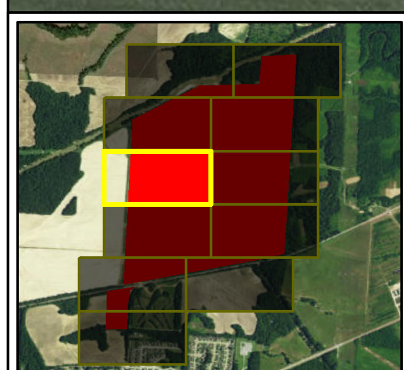


Figure 5.03. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.03

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Date: 6/17/2019

Basemap courtesy of Esri.

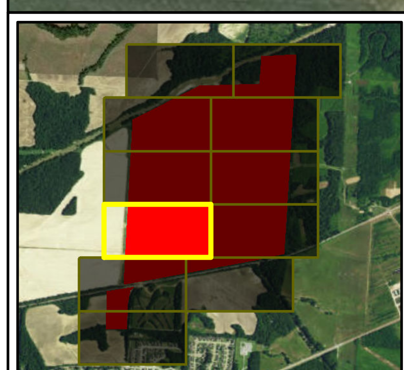

Figure 5.04. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.04

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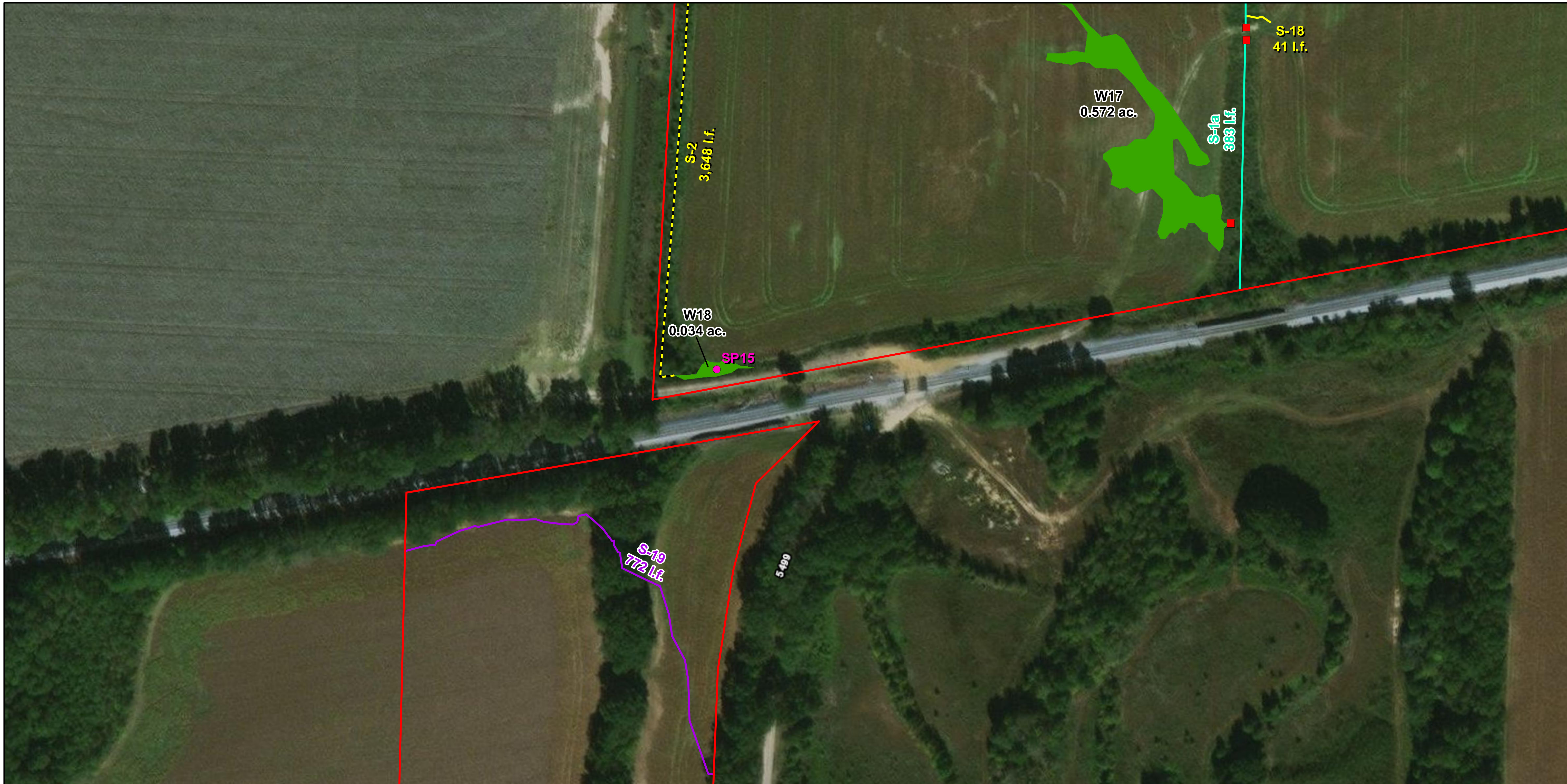

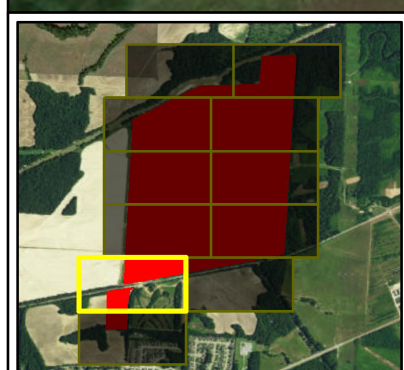

Figure 5.05. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

Tennessee Department of Environmental Conservation Hydrologic Determination

Bolton Property	Wetland (PEM)	Stream (Ephemeral)	Wet Weather Conveyance
Sample Plot	Wetland (PFO)	Stream (Intermittent)	
Culvert	Wetland (PSS)	Stream (Perennial)	
	Stream (Perennial)	Ditch	

0 125 250 500 Feet

0 30 60 120 Meters

5.05

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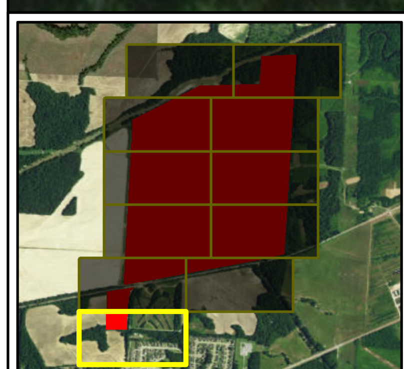

Figure 5.06. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

5.06

Waters of the United States

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

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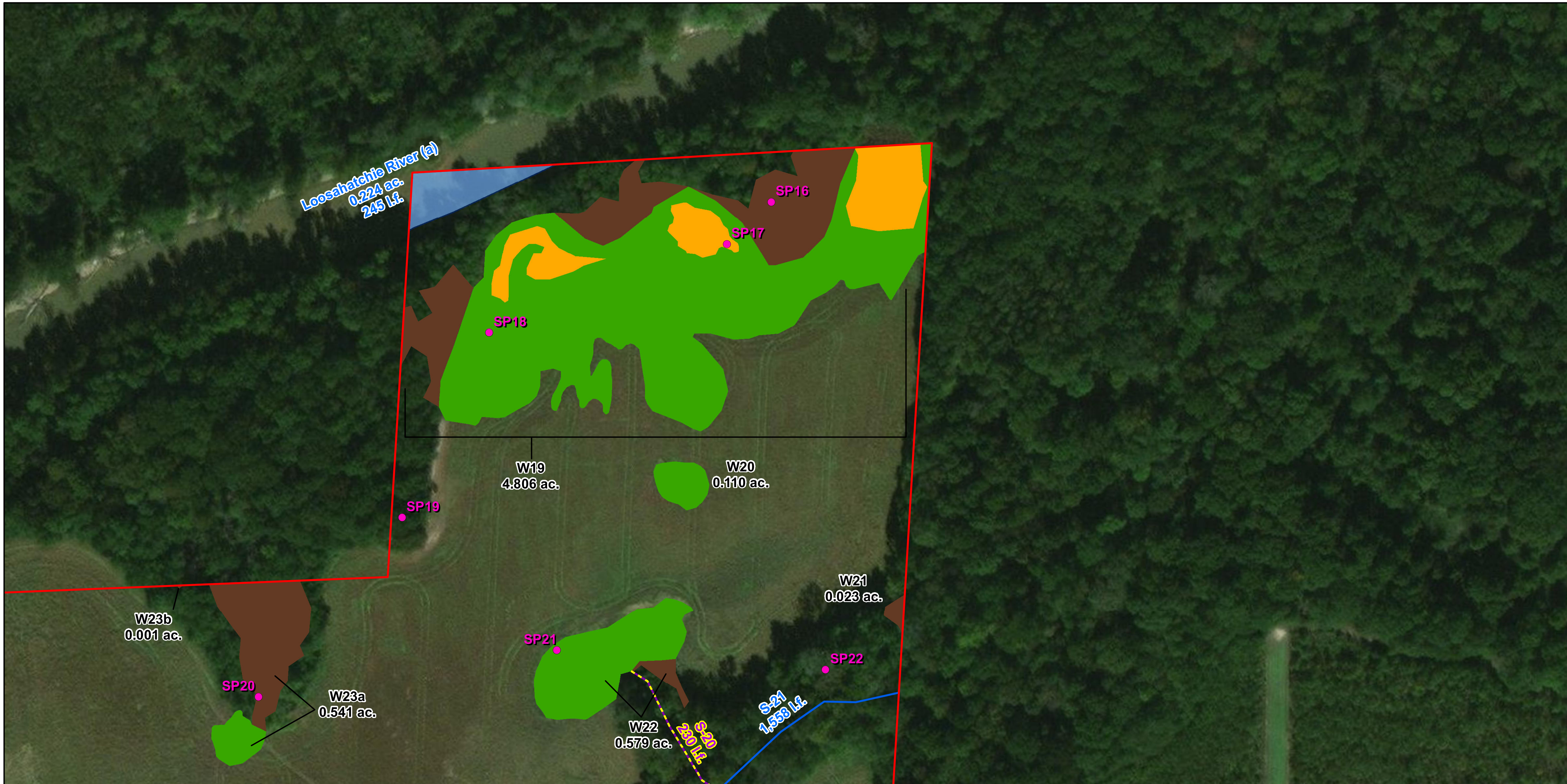
Date: 6/17/2019

Basemap courtesy of Esri.



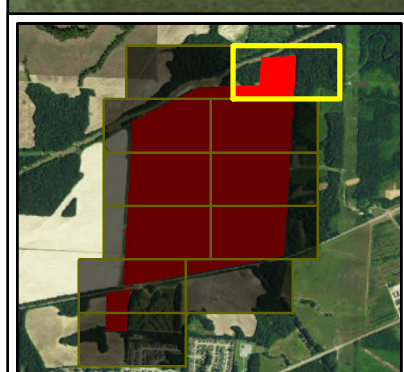


Figure 5.07. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

	Waters of the United States		Tennessee Department of Environmental Conservation Hydrologic Determination
Bolton Property	Wetland (PEM)	Stream (Ephemeral)	Wet Weather Conveyance
Sample Plot	Wetland (PFO)	Stream (Intermittent)	
Culvert	Wetland (PSS)	Stream (Perennial)	
	Stream (Perennial)	Ditch	

0 125 250 500 Feet

0 30 60 120 Meters

5.07

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Date: 6/17/2019

Basemap courtesy of Esri.

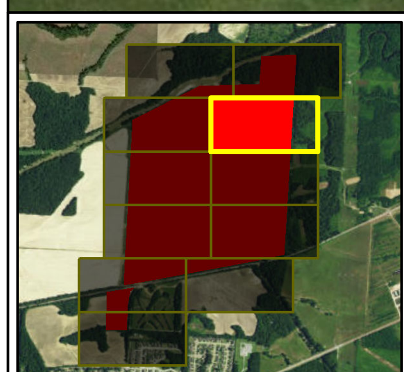

Figure 5.08. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

Tennessee Department of Environmental Conservation Hydrologic Determination

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch
- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.08

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Date: 6/17/2019

Basemap courtesy of Esri.

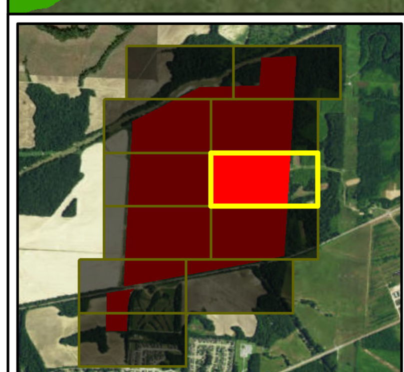

Figure 5.09. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

Tennessee Department of Environmental Conservation Hydrologic Determination

Bolton Property
Sample Plot
Culvert
Wetland (PEM)
Wetland (PFO)
Wetland (PSS)
Stream (Perennial)
Stream (Ephemeral)
Stream (Intermittent)
Stream (Perennial)
Ditch
Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.09

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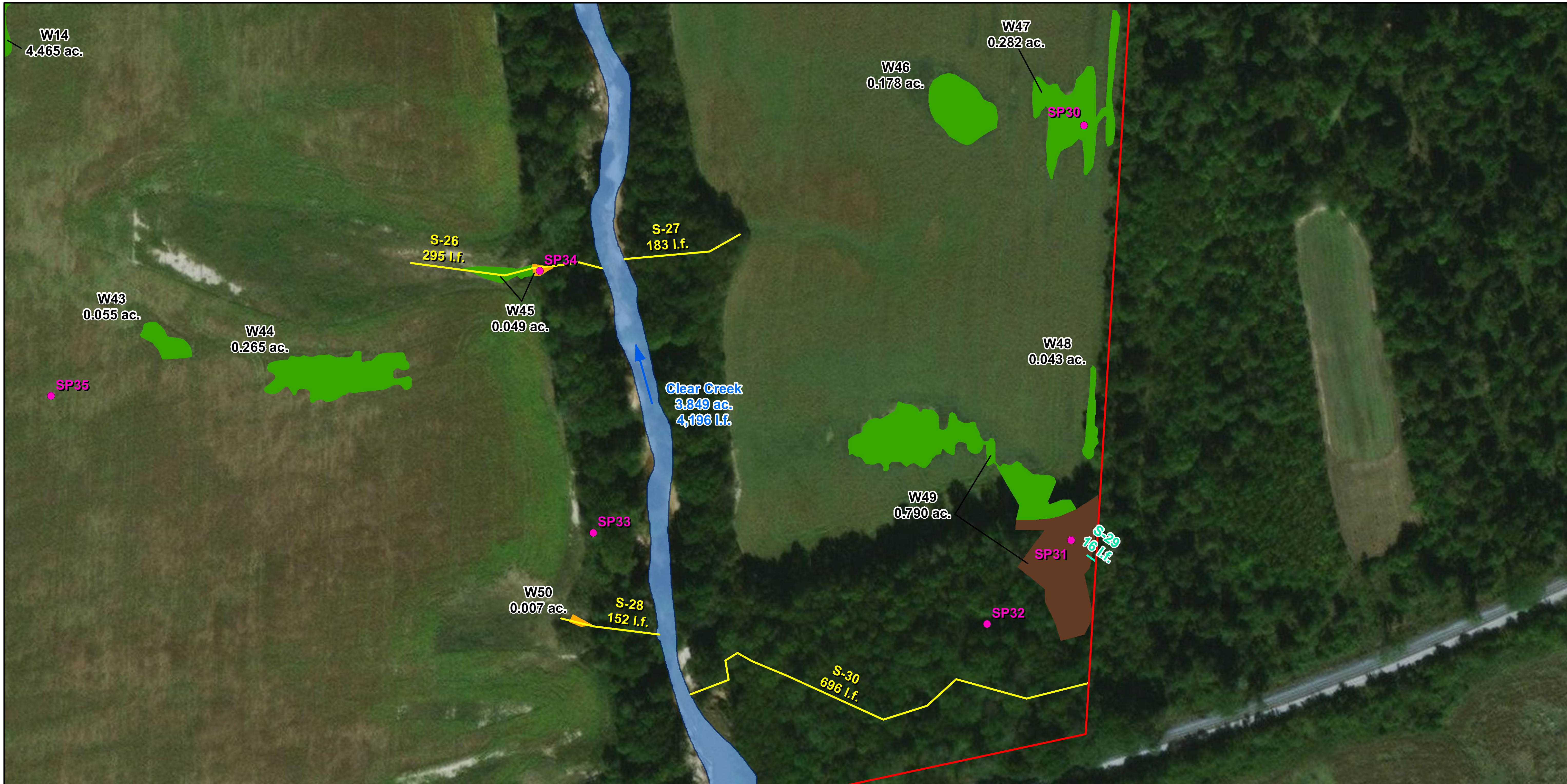
Date: 6/17/2019

Basemap courtesy of Esri.



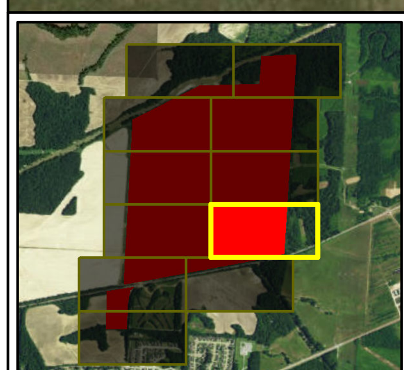


Figure 5.10. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.10

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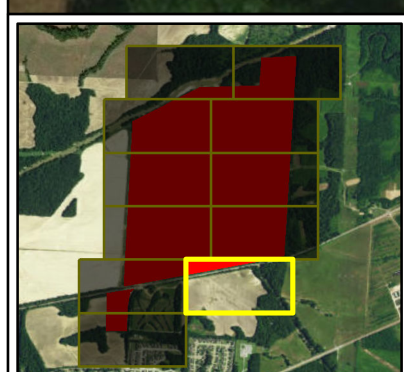

Figure 5.11. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

Bolton Property
Sample Plot
Culvert
Wetland (PEM)
Wetland (PFO)
Wetland (PSS)
Stream (Perennial)
Stream (Ephemeral)
Stream (Intermittent)
Stream (Perennial)
Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.11

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res

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SMOKESTACK STREAM MITIGATION BANK

EXISTING CONDITIONS

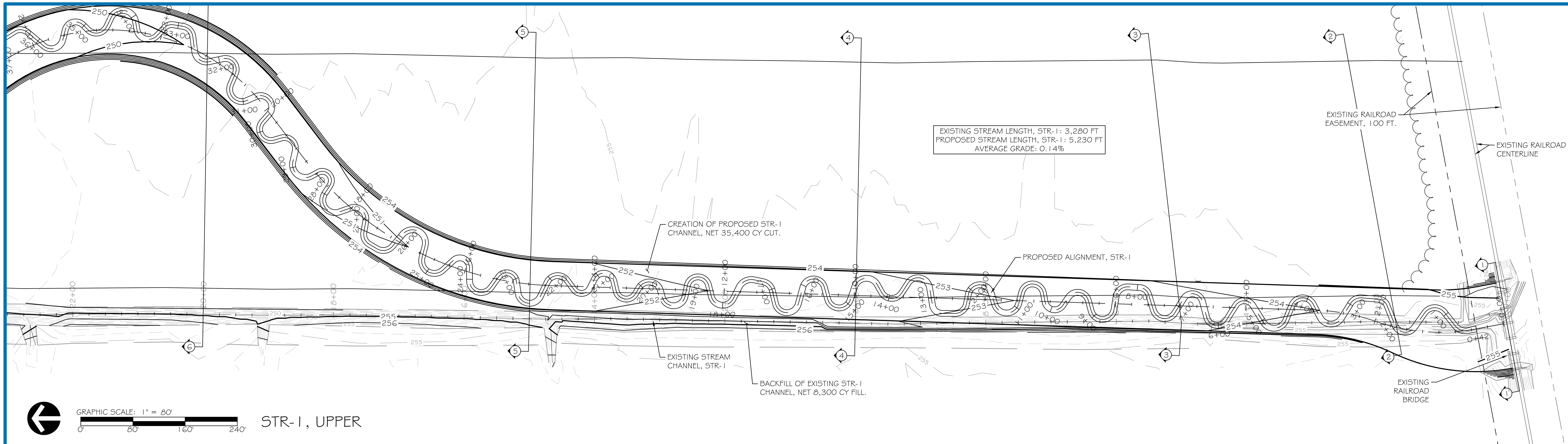
SHELBY COUNTY, TENNESSEE

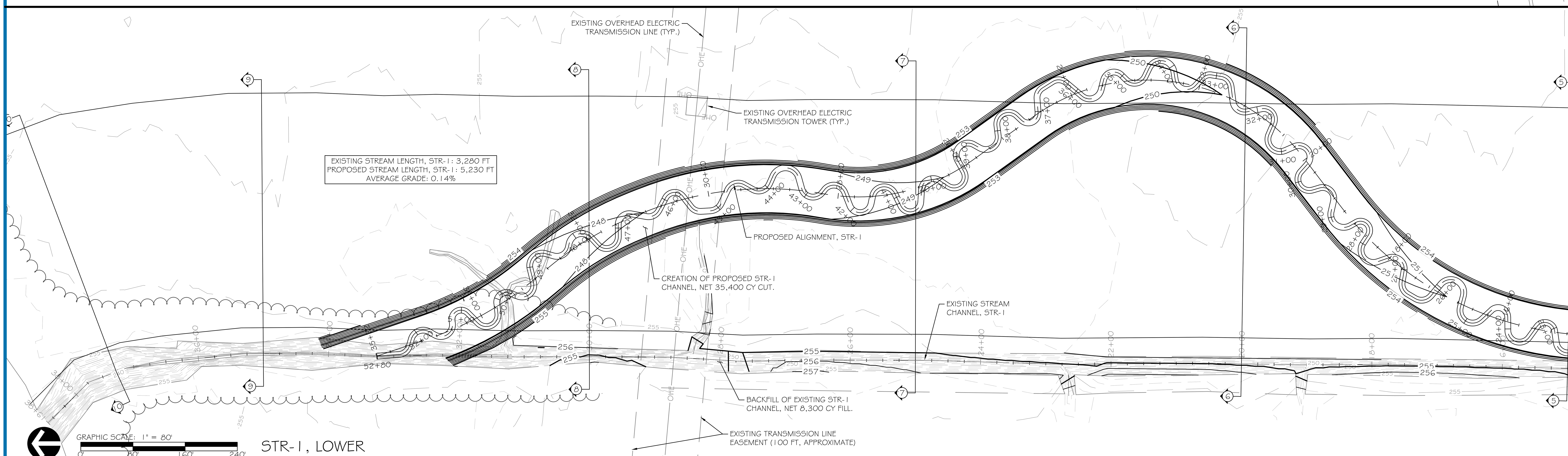
REVISIONS:

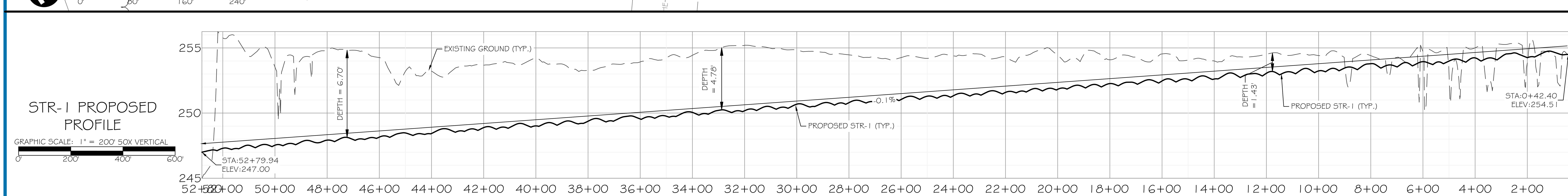
PROJECT STATUS:

CONCEPTUAL

PROJECT MANAGER:	BW
DESIGNED:	AH
DRAWN:	AB
JOB NUMBER:	0670
DESIGN TYPE:	CONCEPTUAL
DATE:	05/24/19
SHEET NO:	1 of 3







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SMOKESTACK STREAM MITIGATION BANK

CONCEPTUAL PLAN

SHELBY COUNTY, TENNESSEE

REVISIONS:

PROJECT STATUS:

CONCEPTUAL

PROJECT MANAGER:	BW
DESIGNED:	AH
DRAWN:	AB
JOB NUMBER:	0670
DESIGN TYPE:	CONCEPTUAL
DATE:	05/24/19
SHEET NO:	2 of 3

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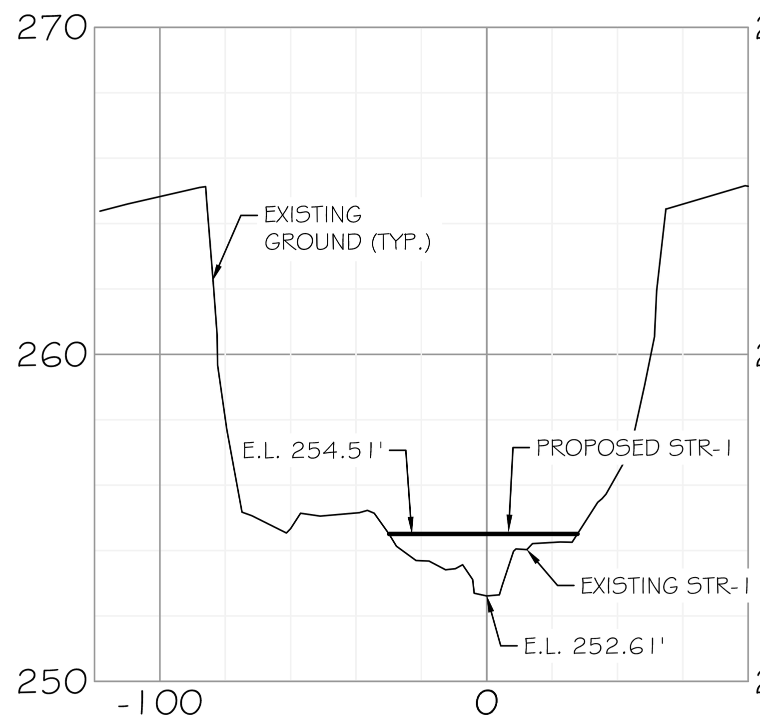

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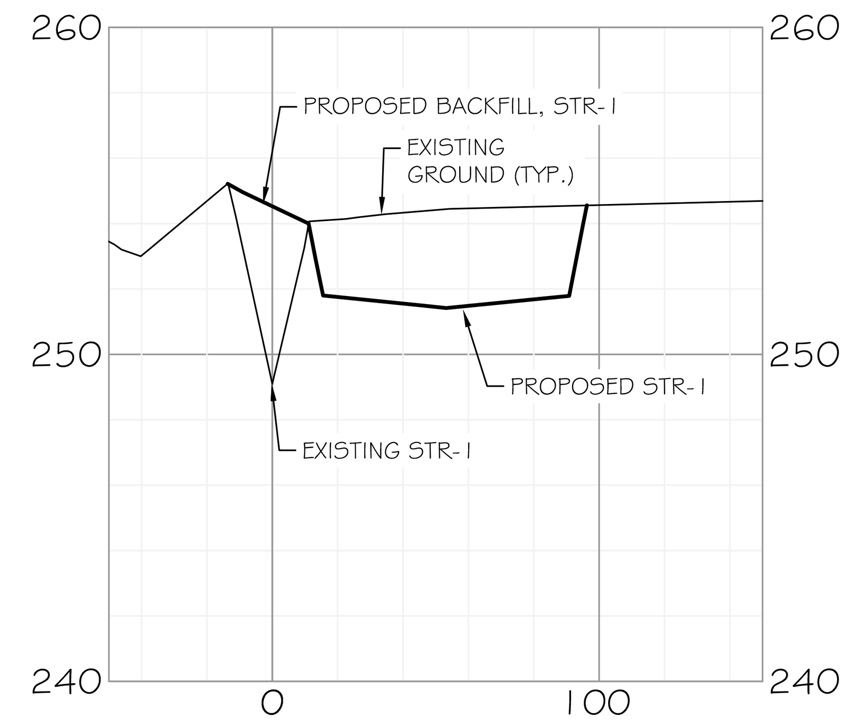

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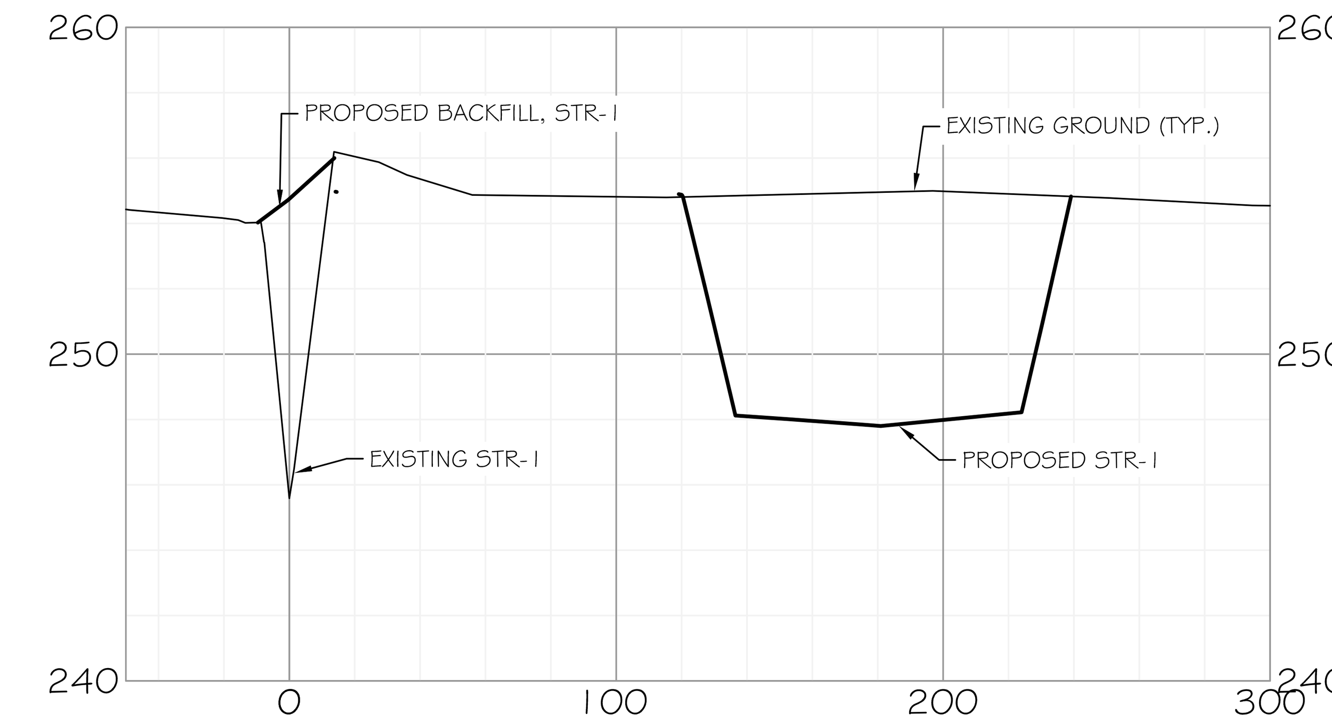

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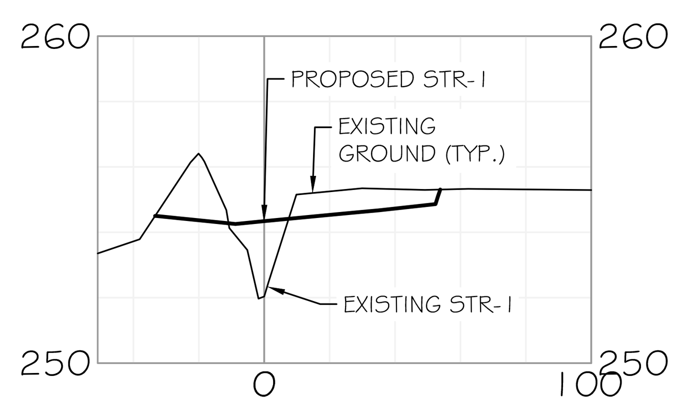

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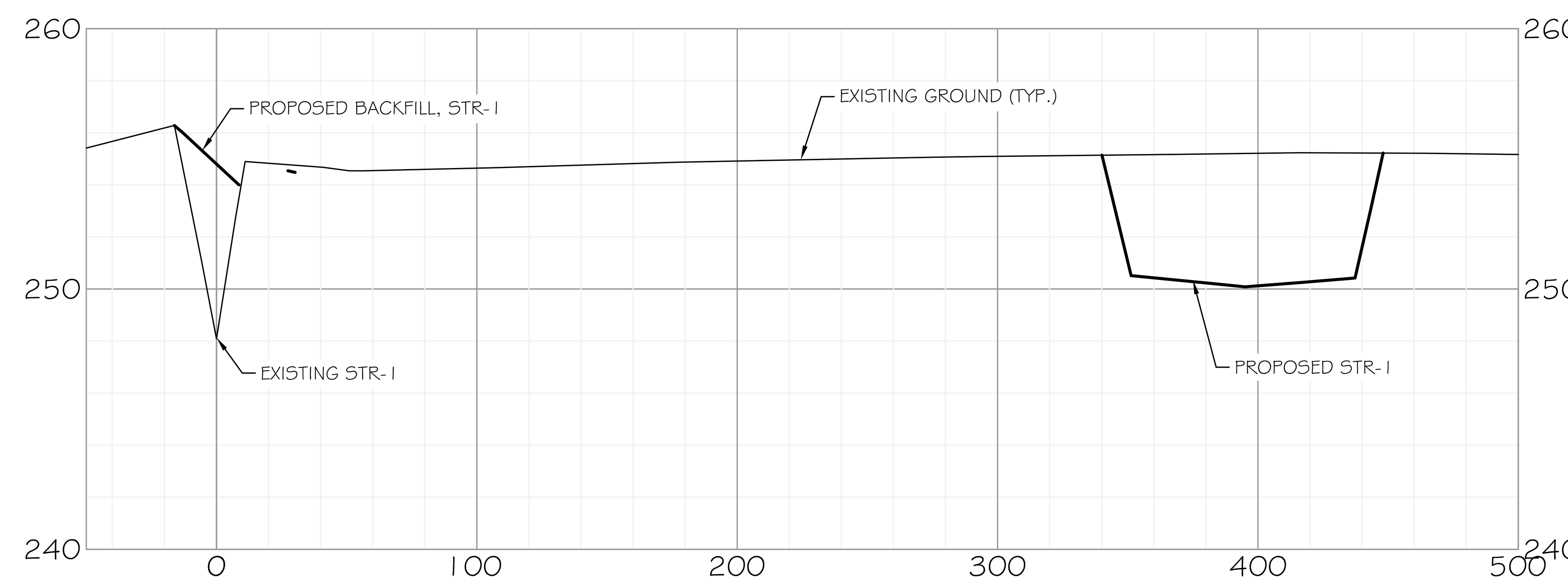

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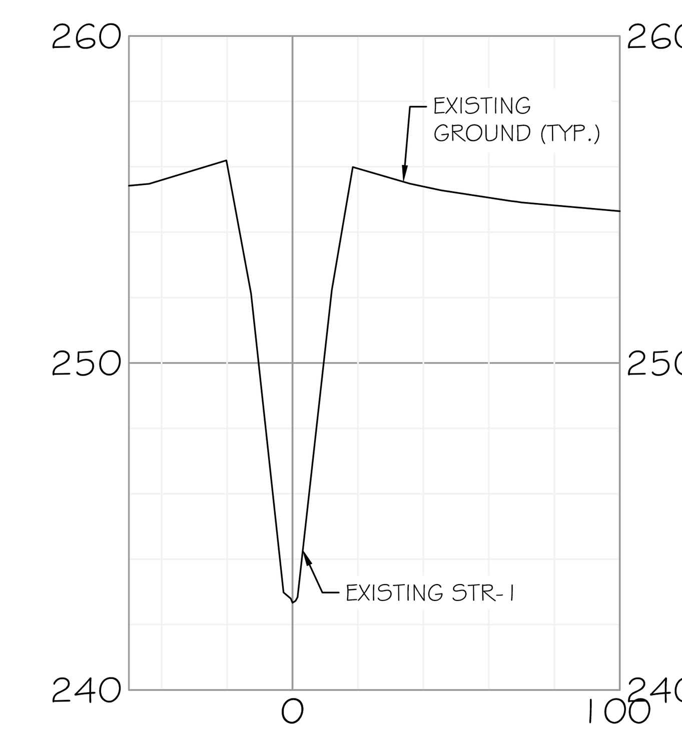

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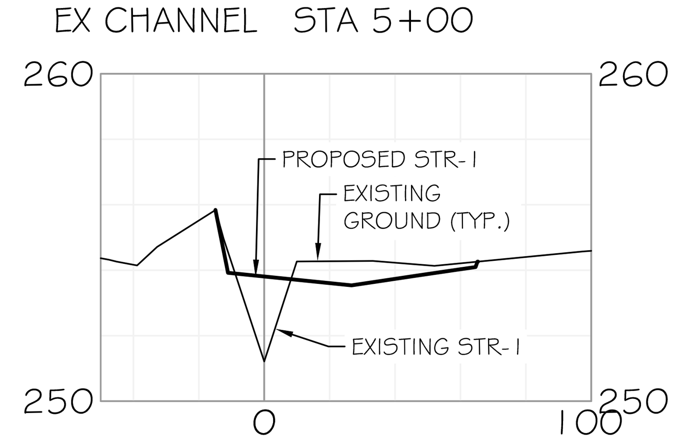

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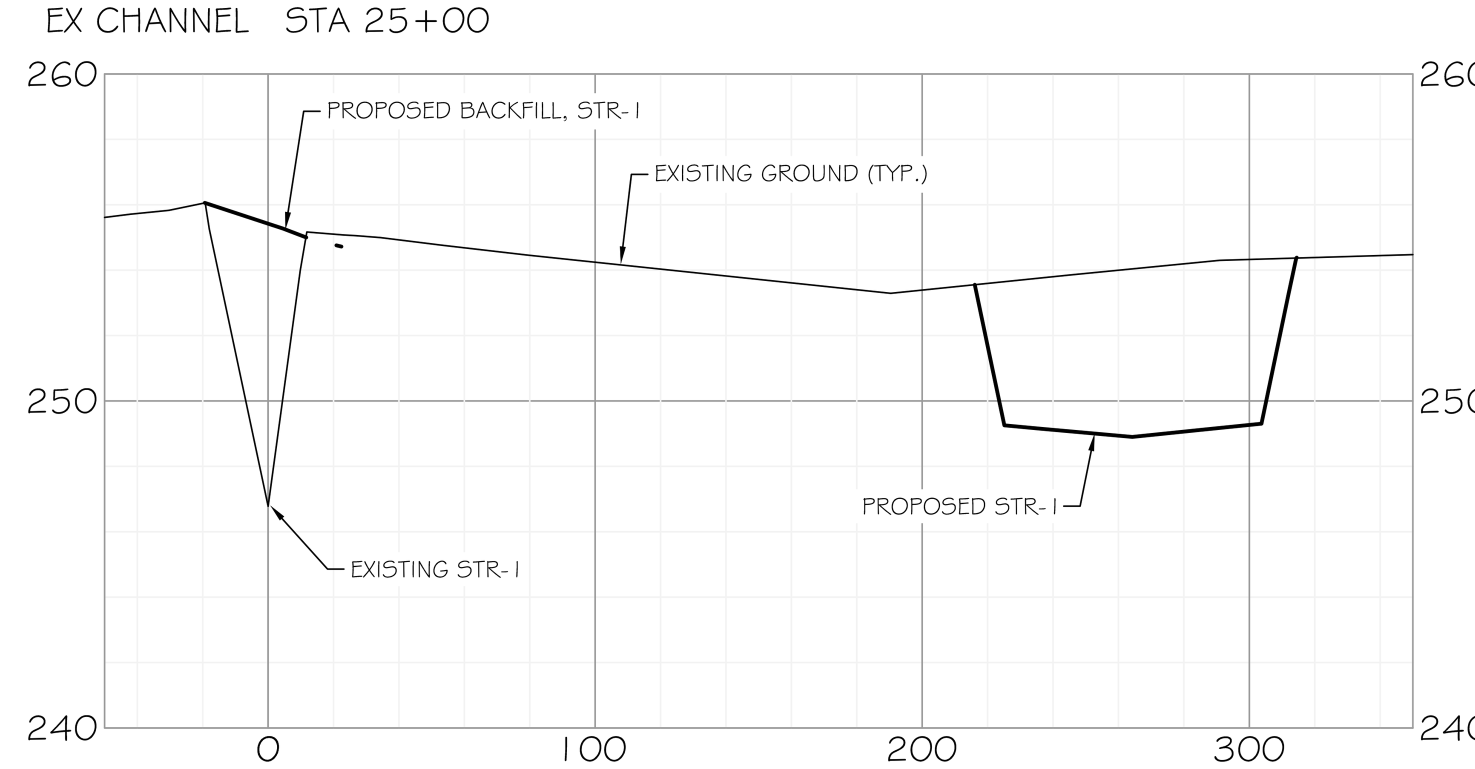

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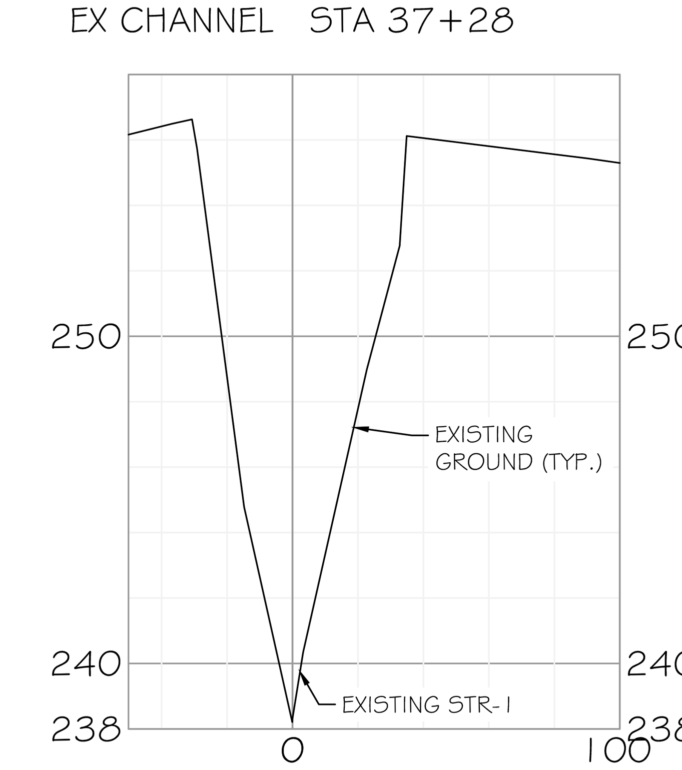

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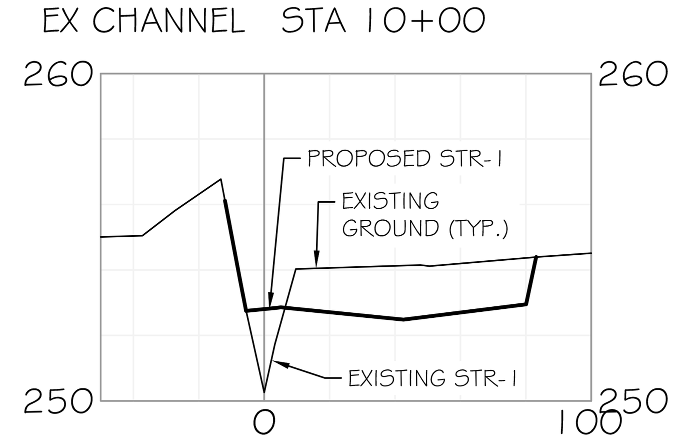

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SMOKESTACK STREAM MITIGATION BANK

CONCEPTUAL SECTION

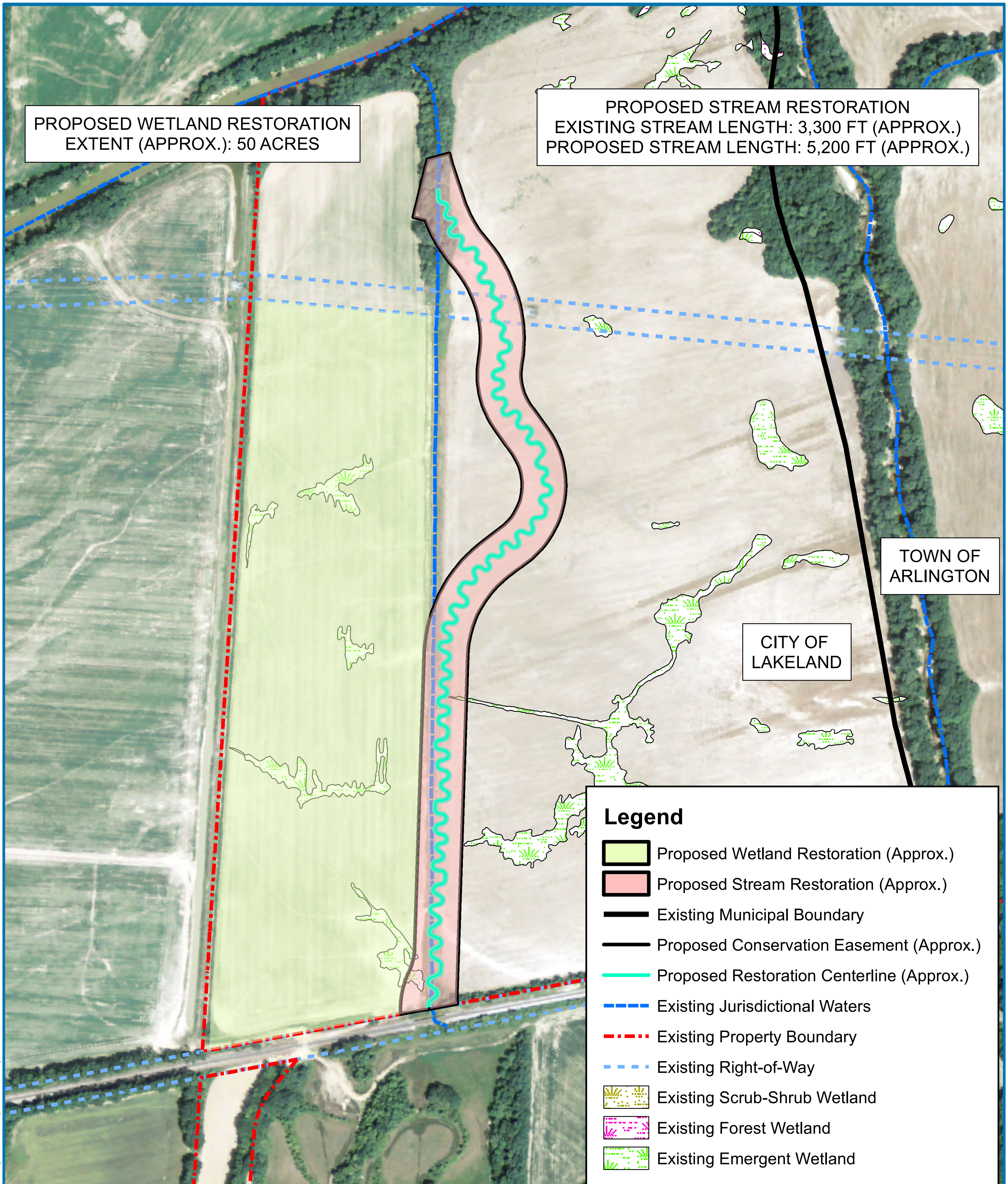
SHELBY COUNTY, TENNESSEE

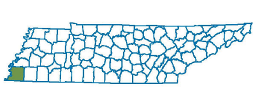
REVISIONS:

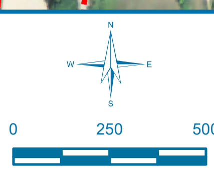
PROJECT STATUS:

CONCEPTUAL

PROJECT MANAGER:	BW
DESIGNED:	AH
DRAWN:	AB
JOB NUMBER:	0670
DESIGN TYPE:	CONCEPTUAL
DATE:	05/24/19
SHEET NO:	3 of 3







Stream/Wetland Conceptual Plan

Smokestack Mitigation Bank

Shelby County, Tennessee

Date: 7/9/2019

Drawn by: AB

Checked by: BW

1 inch = 500 feet

Document Path: C:\Users\abrais\Dropbox (RES)\TN Projects\0670_Smokestack\GIS\Maps\Smokestack Conceptual Plan-Detail.mxd

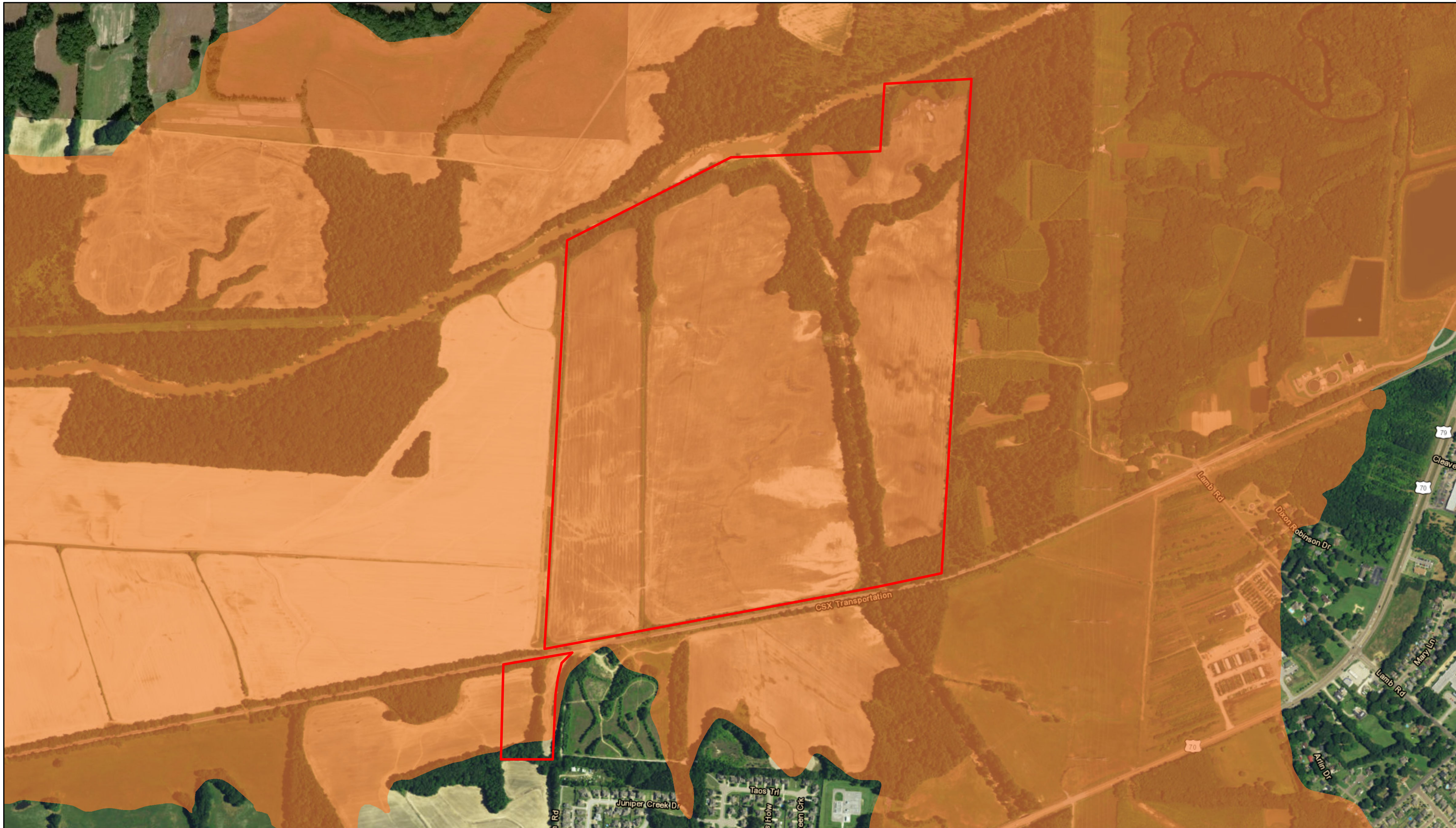


Figure 6.
FEMA Map of Site in Shelby County, Tennessee.
Smokestack Mitigation Bank Site.

Bolton Property

0 500 1,000 2,000 Feet

0 150 300 600 Meters

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Path: P:\10_Projects\R\RESV430R\11596_Memphis\Wetland Delineation\GIS\Map6_FEMA.mxd

Date: 5/14/2019

Basemap courtesy of Esri. Flood data courtesy of FEMA.

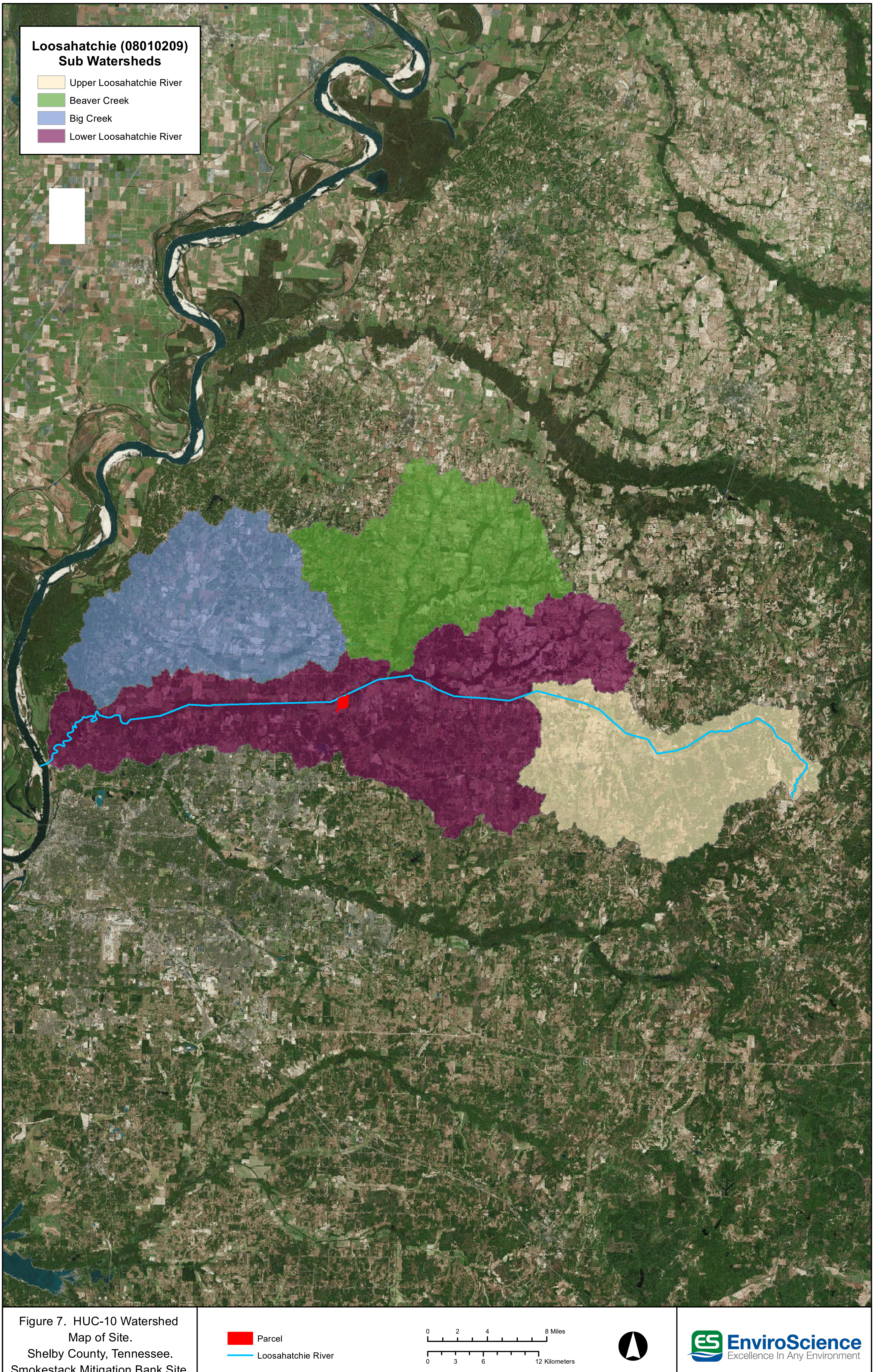

Figure 7. HUC-10 Watershed Map of Site.
Shelby County, Tennessee.
Smokestack Mitigation Bank Site.

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Date: 5/14/2019 Path: P:\10_Projects\R\RES\430R\11596_Memphis\Wetland Delineation\GIS\Map7_Watershed.mxd

Basemap courtesy of Esri.

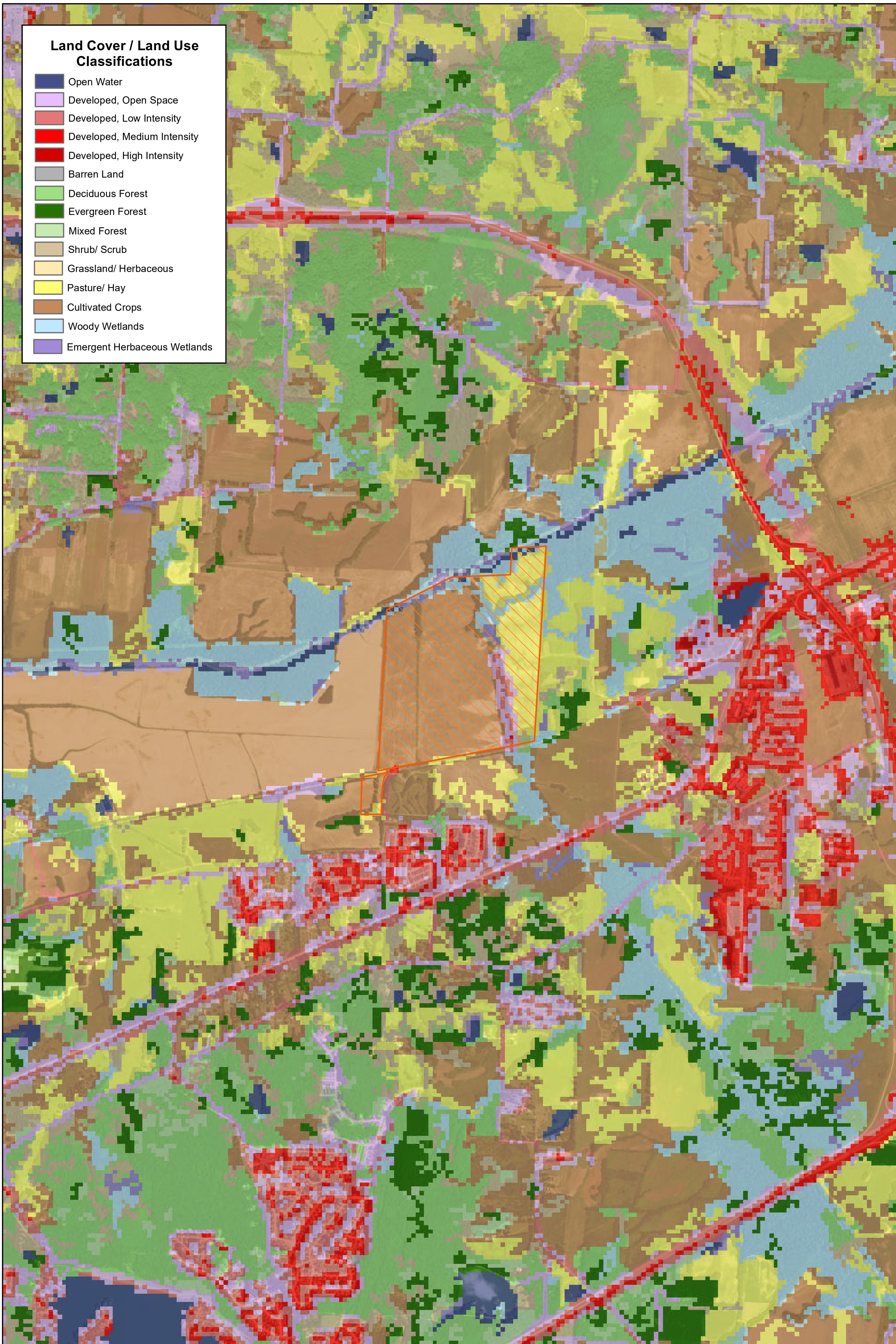

Figure 8. Land Cover / Land Use Map of Site.
Shelby County, Tennessee.
Smokestack Mitigation Bank Site.

Parcel

0 0.125 0.25 0.5 Miles
0 0.2 0.4 0.8 Kilometers

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Date: 5/14/2019 Path: P:\10_Projects\R\RES\430R\11596_Memphis\Wetland Delineation\GIS\Map8_LandCover.mxd

Basemap courtesy of Esri. Land Cover data courtesy of TNGIS.

Appendix A. Catchment Assessment Form

Rater(s): Niehaus, Brown

Date: 7/09/18

Bolton: Stream 1
Reach 2

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

Overall Watershed Conditon Poor

CATCHMENT ASSESSMENT

	Categories	Description of Catchment Condition: Poor	Fair	Good	Rating (P/F/G)
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	Poor
2	Impervious cover (Hydrology)	Greater than 15%	Between 7% and 15%	Less than 7%	Fair
3	Land Use Change (Hydrology)	Rapidly urbanizing/urban	Single family homes/suburban	Rural communities/slow growth or primarily forested	Fair
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.	Good
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.	Fair
6	Percent Forested (Watershed) (Hydrology)	<= 20%	>20% and <70%	>=70%	Poor
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	Poor
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	Poor
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	Poor
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.	Poor
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	Good
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	
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.	Fair
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.	Poor
16	Other				

Appendix B. Existing and Proposed Reach-Level Stream Function-Based Rapid Assessment Field Data Form
Page 1 of 4

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

Watershed:	Loosahatchie	Rater(s):	Niehaus
Stream:	Unnamed Tributary	Date:	7/9/18
Reach Length:	300 ft.	Latitude:	35.2852
Photo(s):	6-12	Longitude:	-89.7169
Reach ID:	BOLTONS1R2		

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning	Category: Functioning-at-Risk	Category: 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			
	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			
	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			
	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			
	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			
	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			
	Provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason			

Reach ID:	BOLTONS1R2			
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			
	Right Bank Existing	X		
	Right Bank Proposed			
	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			
	Right Bank Existing		X	
	Right Bank Proposed			
	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			
	Right Bank Existing			X
	Right Bank Proposed			
	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			
	Right Bank Existing	X		
	Right Bank Proposed			
	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)			
	Existing Condition (Left bank)		X	
	Proposed Condition (Left Bank)			
	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			
	Provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason	High bank height to bankfull height ratio, low root density, low surface protection		

Appendix B. Existing and Proposed Reach-Level Stream Function-Based Rapid Assessment Field Data Form

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			X
	Proposed Condition			
	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			
	Proposed Condition			
	Streams in Alluvial Valleys (C, E)			
	15. Percent Riffle <3% slope	>60 - <70	70 - 80 or 40 - 60	> 80 or < 40
	Existing Condition			X
	Proposed Condition			
	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			X
	Proposed Condition			
	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	X		
	Proposed Condition			
	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:	BOLTON S1R2			
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			
	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			
	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			
	Proposed Condition			
	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			
	25. Fish Presence	Abundant	Rare	Not present
	Existing Condition		X	
	Proposed Condition			
	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 ______
B. Drainage Area 0.43 sq. miles
C. Difference between bankfull stage and water surface 1.48 feet
D. Bankfull Width (Measured) 9.76 feet
E. Bankfull Area (Measured) 12.0 sq. feet
F. Bankfull Mean Depth (Area/Width) 1.23 feet
G. Bankfull Width (Regional Curve) ______ feet
H. Bankfull Area (Regional Curve) ______ sq. feet
I. Bankfull Mean Depth (Regional Curve) ______ feet

Area Calculations

II. Stream Classification

A. Bankfull W/D, calculate as $\frac{Bankfull\ Width}{Bankfull\ Mean\ Depth}$ 7.93 ft/ft.
B. Bankfull Max Riffle Depth (Dmax) 2.11 feet
C. Floodprone Area Width 14 feet
D. Entrenchment Ratio, calculate as $\frac{Floodprone\ Area\ Width}{Bankfull\ Width}$ 1.43 ft/ft.
E. Slope Estimate 0.0016 ft/ft.
F. Channel Material Estimate ______
G. Rosgen Stream Type G5c

III. Floodplain Connectivity

A. Bank Height/Riffle Data

	R_1	R_2	R_3	R_4
Low Bank Height (LBH)	10.53	10.21		
Dmax	2.11	1.95		
Bank Height Ratio (LBH/Dmax)	4.99	5.24		
Riffle Length	11'	10'		

B. Weighted Bank Height Ration, calculate as $\frac{\Sigma(Bank\ Height\ Ratio_i \text{ x Riffle Length}_i)}{\Sigma Riffle\ Length}$ 3.26 ft/ft.

C. Entrenchment Ratio from Riffle 1.43 ft/ft.

IV. Bedform Diversity

A. Pool Data

	P_1	P_2	P_3	P_4	P_5
Station					
Pool to Pool Spacing	100	144			
Pool Spacing Ratio, $\frac{Pool\ Spacing}{Bankfull\ Width}$	10.25	14.75			
Pool Depth (max depth at bankfull)	2.86	3.07			
Pool Depth Ratio, $\frac{Pool\ Depth}{Bankfull\ Mean\ Depth}$	2.33	2.5			

B. Average Pool Spacing Ratio 25 ft/ft.

C. Average Pool Depth Ratio 2.41 ft/ft.

V. Large Woody Debris[4]

A. Number of Pieces per 100m 6

B. Large Woody Debris Index ____________

[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

Both banks fairly uniform in BEHI / NBS throughout reach

BEHI/NBS[5] Score	Bank Length
High / Mod	600 ft.

B. Total Eroding Bank Length 600 ft.

C. Total Bank Length 600 ft.

D. Dominant BEHI/NBS Score High / Moderate

E. Percent of Bank Erosion, calculate as $\frac{Total\ Eroding\ Bank\ Length}{Total\ Bank\ Length}$ 100 %

VI. Riparian Vegetation

A. Riparian Vegetation Data

Measure from Aerial

	Left	Right
Riparian/Buffer Width	20'	80'
RBP Score	10	4

VII. Channel Evolution

A. Rosgen Channel Type Succession 5

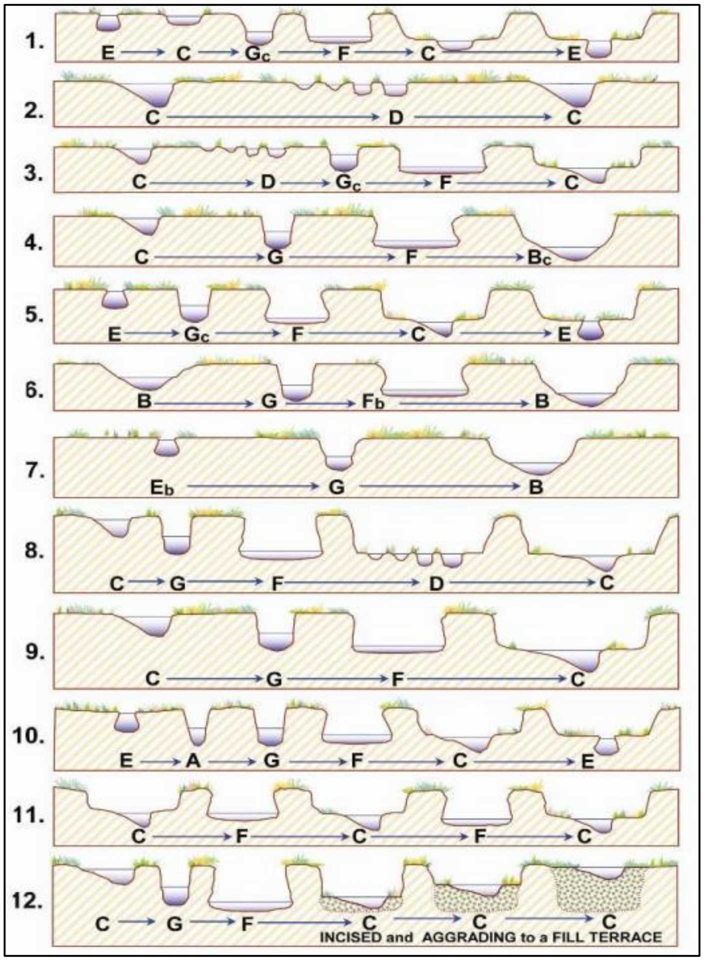
B. Simon Channel Evolution Model (Stage) Stage 3 degradation

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

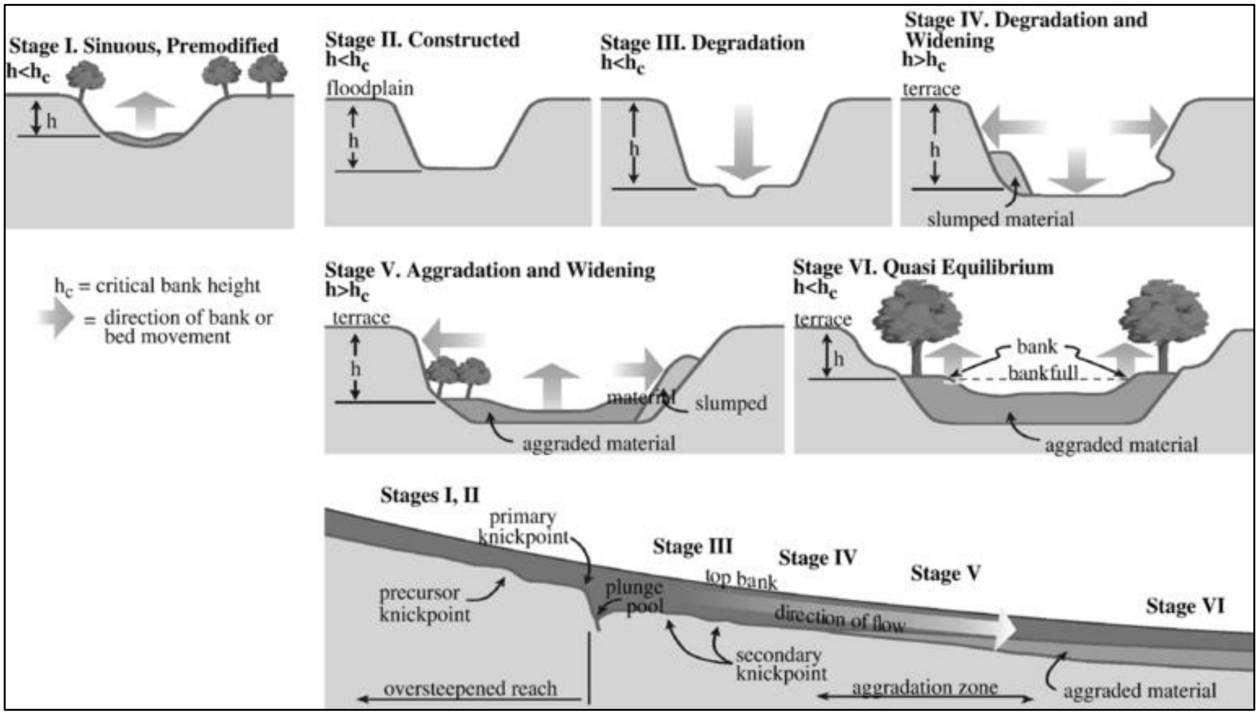
Channel has been modified to condition where floodplain is not accessible, resembling a low-gradient gully.

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

Rosgen Channel Type Succession Scenarios



Simon Channel Evolution Model



Large Woody Debris Field Form

Name:

Stream Name: Stream 2 Reach 2

Stream Type:

Reach ID:

Avg. Slope:

Reach Length: 100 m

Bed material:

Bankfull Width:

Reach Descriptions:

	Score					
Pieces	**1**	**2**	**3**	**4**	**5**	**Total**
Length/Bankfull Width						
Diameter	4"	5"	4"	4"	5-6"	6"
Location	above stream	instream	instream	1/3 in 1/3 out	above stream	above stream
Type						
Structure						
Stability	Secured					
Orientation	~45° to ⊥	90° to ⊥	90° to ⊥	135° to ⊥	135° to ⊥	⊥
Total						
Debris Dams						
Length						
Height						
Structure						
Location						
Stability						
Total						

Notes:

LWD Key

	Score				
Pieces	**1**	**2**	**3**	**4**	**5**
Length/Bankfull Width	0.2 to 0.4	0.4 to 0.6	0.6 to 0.8	0.8 to 1.0	> 1.0
Diameter (Cm)	10 to 20	20 to 30	30 to 40	40 to 50	>50
Location	Zone 4		Zone 3	Zone 2	Zone 1
Type	Bridge		Ramp	Submersed	Buried
Structure	Plain		Intermediate		Sticky
Stability	Moveable		Intermediate		Secured
Orientation(degrees)	0 to 20	20 to 40	40 to 60	60 to 80	80 to 90
Debris Dams					
Length (% of bankfull width)	0 to 20	20 to 40	40 to 60	60 to 80	80 to 100
Height (% of bankfull depth)	0 to 20	20 to 40	40 to 60	60 to 80	80 to 100
Structure	Coarse		Intermediate		Fine
Location	Partially high flow	In high flow	Partially low flow	Mid low flow	In low flow
Stability	Moveable		Intermediate		Secured

Diameter Conversion

10 cm	0.33	feet
20 cm	0.66	feet
30 cm	0.98	feet
40 cm	1.3	feet
50 cm	1.6	feet

HABITAT ASSESSMENT FIELD SHEET- MODERATE TO HIGH GRADIENT STREAMS (FRONT)
(See Protocol E for detailed descriptions and rank information)

STATION ID:	HABITAT ASSESSED BY:
STREAM NAME:	DATE: TIME:
STATION LOCATION:	ECOREGION: QC: Consensus Duplicate
WBID/HUC: GROUP:	ASSOCIATED LOG #:

	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Over 70% of stream reach has natural stable habitat suitable for colonization by fish and/or macroinvertebrates. Four or more productive habitats are present.	Natural stable habitat covers 40-70% of stream reach. Three or more productive habitats present. (If near 70% and more than 3 go to optimal.)	Natural stable habitat covers 20 -40% of stream reach or only 1-2 productive habitats present. (If near 40% and more than 2 go to suboptimal.)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments				
2.Embeddedness of Riffles	Gravel, cobble, and boulders 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. If near 25% drop to suboptimal if riffle not layered cobble.	Gravel, cobble and boulders 25-50% surrounded by fine sediment. Niches in bottom layers of cobble compromised. If near 50% & riffles not layered cobble drop to marginal.	Gravel, cobble, and boulder s are 50-75% surrounded by fine sediment. Niche space in middle layers of cobble is starting to fill with fine sediment.	Gravel, cobble, and boulders are more than 75% surrounded by fine sediment. Niche space is reduced to a single layer or is absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments				
3. Velocity/ Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing score lower). If slow-deep missing score 15.	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime. Others regimes too small or infrequent to support aquatic populations.
SCORE	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 5% of stream bottom in quiet areas. New deposition on islands and point bars is absent or minimal.	Sediment deposition affects 5-30% of stream bottom. Slight deposition in pool or slow areas. Some new deposition on islands and point bars. Move to marginal if build-up approaches 30%.	Sediment deposition affects 30-50% of stream bottom. Sediment deposits at obstruction, constrictions and bends. Moderate pool deposition.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	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. .	Water reaches base of both lower banks and streambed is covered by water throughout reach. Minimal productive habitat is exposed.	Water covers > 75% of streambed or 25% of productive habitat is exposed.	Water covers 25-75% of streambed and/or productive 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	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- MODERATE TO HIGH GRADIENT STREAMS (BACK)

Station ID________ Date________ Initials________

	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization, dredging rock removal or 4-wheel activity (past or present) 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 have greatly affected flow pattern.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments				
7. Frequency of re-oxygenation zones. Use frequency of riffle or bends for category. Rank by quality.	Occurrence of re-oxygenation zones relatively frequent; ratio of distance between areas divided by average stream width <7:1.	Occurrence of re-oxygenation zones infrequent; distance between areas divided by average stream width is 7 - 15.	Occasional re-oxygenation area. The distance between areas divided by average stream width is over 15 and up to 25.	Generally all flat water or flat bedrock; little opportunity for re-oxygenation. Distance between areas divided by average stream width >25.
SCORE	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 mostly healed over. 5-30% of bank in reach has areas of erosion. 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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
Comments				

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

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

Describe

HABITAT ASSESSMENT FIELD SHEET- LOW GRADIENT STREAMS (FRONT)
(See Protocol E for detailed descriptions and rank information)

STATION ID: Bolton S1R2	HABITAT ASSESSED BY: Brown
STREAM NAME: Stream 1 Reach 2	DATE: 7/9/18 TIME: 1500
STATION LOCATION:	ECOREGION: 74 QC: Consensus Duplicate
WBID/HUC: GROUP:	ASSOCIATED LOG #:

	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	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	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments			Hardpan small gravel present in some areas	
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	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	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	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)

Station ID Bolton S2R2 Date 7/9/18 Initials Brown

	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	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	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 o 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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
Comments				

Total Score 55 **Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW**

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

Describe

Appendix A. Catchment Assessment Form

Rater(s): Joel Bingham

Date: 7/9/18

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

Bolton: Stream 1
Reach 1

Overall Watershed Conditon	Poor

CATCHMENT ASSESSMENT

	Categories	Description of Catchment Condition: Poor	Fair	Good	Rating (P/F/G)
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	Poor
2	Impervious cover (Hydrology)	Greater than 15%	Between 7% and 15%	Less than 7%	Poor
3	Land Use Change (Hydrology)	Rapidly urbanizing/urban	Single family homes/suburban	Rural communities/slow growth or primarily forested	Fair
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.	Good
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.	Fair
6	Percent Forested (Watershed) (Hydrology)	<= 20%	>20% and <70%	>=70%	Fair
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	Poor
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	Poor
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	Poor
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.	Poor
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	Good
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	
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.	Fair
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.	Good
16	Other				

Appendix B. Existing and Proposed Reach-Level Stream Function-Based Rapid Assessment Field Data Form
Page 1 of 4

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

Watershed:	Loosahatchie	Rater(s):	Niehaus
Stream:	Stream 1 Reach 1	Date:	7/9/18
Reach Length:	582'	Latitude:	35.2784
Photo(s):	1-5	Longitude:	-89.7166
Reach ID:	BOLTONS1R1		

Function-based Rapid Reach Level Stream Assessment

Assessment Parameter	Measurement Method	Category: Functioning	Category: Functioning-at-Risk	Category: 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			
	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			
	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			
	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			
	4b. Entrenchment (Non meandering streams in colluvial valleys or Rosgen B Streams)	= or >1.4	1.3 - 1.2	<1.2
	Existing Condition	X		
	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			
	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			
	Provide description of cause(s) and stability trend and if F can not be potentially achieved, provide reason			

Reach ID:	BOLTON S1R1			
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			
	Right Bank Existing			X
	Right Bank Proposed			
	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			
	Right Bank Existing			X
	Right Bank Proposed			
	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			
	Right Bank Existing			X
	Right Bank Proposed			
	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			
	Right Bank Existing		X	
	Right Bank Proposed			
	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	M/L	
	Proposed Condition (Right Bank)			
	Existing Condition (Left bank)	X	M/L	
	Proposed Condition (Left Bank)			
	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			
	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	Category: Functioning-at-Risk	Category: 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			X
	Proposed Condition			
	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			No LWD
	Proposed Condition			
	Streams in Alluvial Valleys (C, E)			
	15. Percent Riffle <3% slope	>60 - <70	70 - 80 or 40 - 60	> 80 or < 40
	Existing Condition			X
	Proposed Condition			
	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			X
	Proposed Condition			
	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	X		
	Proposed Condition			
	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:	BOLTON S1R1			
Function-based Rapid Reach Level Stream Assessment				
Assessment Parameter	**Measurement Method**	**Category: Functioning**	**Category: Functioning-at-Risk**	**Category: 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			
	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			
	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			
	Proposed Condition			
	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			
	25. Fish Presence	Abundant	Rare	Not present
	Existing Condition		X	
	Proposed Condition			
	Provide description of cause (s) and stability trend and if F can not be potentially achieved, provide reason	Fish present: top minnow or minnow species observed snails, leeches in pools		

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 ______

B. Drainage Area 0.16 sq. miles

C. Difference between bankfull stage and water surface No water in riffles feet

D. Bankfull Width (Measured) 5.1 feet

E. Bankfull Area (Measured) 2.5 sq. feet

F. Bankfull Mean Depth (Area/Width) 0.5 feet

G. Bankfull Width (Regional Curve) ______ feet

H. Bankfull Area (Regional Curve) ______ sq. feet

I. Bankfull Mean Depth (Regional Curve) ______ feet

Area Calculations

II. Stream Classification

A. Bankfull W/D, calculate as $\frac{Bankfull\ Width}{Bankfull\ Mean\ Depth}$ 10.14 ft/ft.

B. Bankfull Max Riffle Depth (Dmax) 0.83 feet

C. Floodprone Area Width 14.14 feet

D. Entrenchment Ratio, calculate as $\frac{Floodprone\ Area\ Width}{Bankfull\ Width}$ 2.79 ft/ft.

E. Slope Estimate 0.0015 ft/ft.

F. Channel Material Estimate ______

G. Rosgen Stream Type E5

III. Floodplain Connectivity

A. Bank Height/Riffle Data

	R_1	R_2	R_3	R_4
Low Bank Height (LBH)	3.16	3.86	3.43	
Dmax	0.94	1.13	1.01	
Bank Height Ratio (LBH/Dmax)	3.36	3.42	3.40	
Riffle Length	98'	31'	23'	

B. Weighted Bank Height Ration, calculate as $\frac{\Sigma(Bank\ Height\ Ratio_i \text{ x Riffle Length}_i)}{\Sigma Riffle\ Length}$ 3.38 ft/ft.

C. Entrenchment Ratio from Riffle 2.79 ft/ft.

IV. Bedform Diversity

A. Pool Data

	P_1	P_2	P_3	P_4	P_5
Station	22	130	196	273	432
Pool to Pool Spacing	108	66	77	59	71
Pool Spacing Ratio, $\frac{Pool\ Spacing}{Bankfull\ Width}$	16.62	10.15	11.85	9.08	10.92
Pool Depth (max depth at bankfull)	1.88	1.65	1.39	2.05	1.29
Pool Depth Ratio, $\frac{Pool\ Depth}{Bankfull\ Mean\ Depth}$	3.76	3.3	2.78	4.1	2.58

B. Average Pool Spacing Ratio 1.59 ft/ft.

C. Average Pool Depth Ratio 3.30 ft/ft.

V. Large Woody Debris[4]

A. Number of Pieces per 100m No qualifying LWD

B. Large Woody Debris Index ---

[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
Left	Low / Low	582.7'
Right	Low / Low	582.7'

B. Total Eroding Bank Length 0 ft.

C. Total Bank Length 1165.4 ft.

D. Dominant BEHI/NBS Score Low / Low

E. Percent of Bank Erosion, calculate as $\frac{Total\ Eroding\ Bank\ Length}{Total\ Bank\ Length}$ 0 %

VI. Riparian Vegetation

A. Riparian Vegetation Data

	Left	Right
Riparian/Buffer Width	30'	10'
RBP Score	2	2

VII. Channel Evolution

A. Rosgen Channel Type Succession 5

B. Simon Channel Evolution Model (Stage) 3

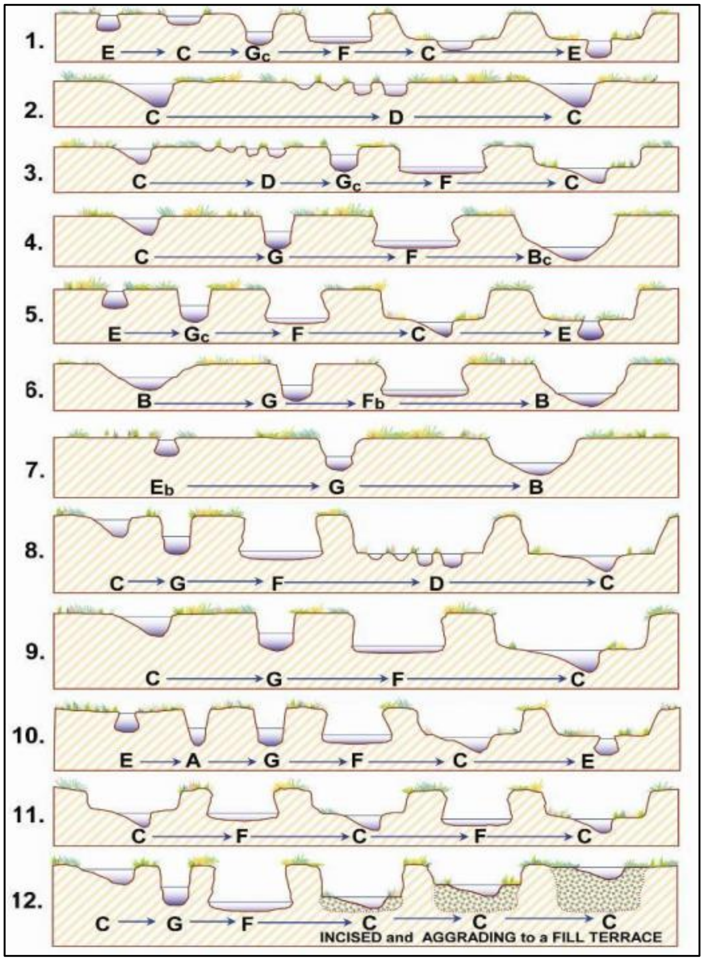
C. Provide a brief narrative describing the channel evolution trend.

Little to no access to floodplain.

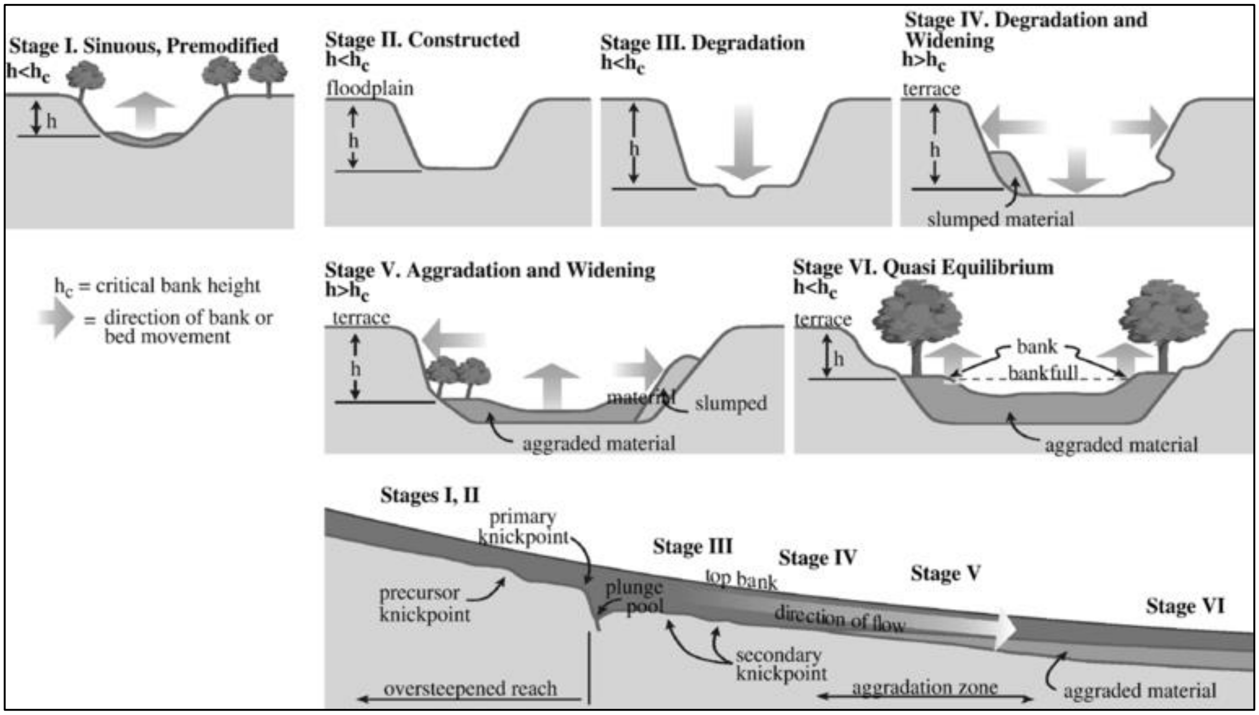
Channel has been modified to condition resembling a low gradient. The existing channel has partially recovered to a Type E within and overwide ditch.

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

Rosgen Channel Type Succession Scenarios



Simon Channel Evolution Model



Large Woody Debris Field Form

Name:

Stream Name: Stream Type:

Reach ID: Avg. Slope:

Reach Length: Bed material:

Bankfull Width:

Reach Descriptions:

	Score					
Pieces	**1**	**2**	**3**	**4**	**5**	**Total**
Length/Bankfull Width						
Diameter						
Location						
Type						
Structure						
Stability						
Orientation						
Total						
Debris Dams						
Length						
Height						
Structure						
Location						
Stability						
Total						

Notes:

LWD Key

	Score				
Pieces	**1**	**2**	**3**	**4**	**5**
Length/Bankfull Width	0.2 to 0.4	0.4 to 0.6	0.6 to 0.8	0.8 to 1.0	> 1.0
Diameter (Cm)	10 to 20	20 to 30	30 to 40	40 to 50	>50
Location	Zone 4		Zone 3	Zone 2	Zone 1
Type	Bridge		Ramp	Submersed	Buried
Structure	Plain		Intermediate		Sticky
Stability	Moveable		Intermediate		Secured
Orientation(degrees)	0 to 20	20 to 40	40 to 60	60 to 80	80 to 90
Debris Dams					
Length (% of bankfull width)	0 to 20	20 to 40	40 to 60	60 to 80	80 to 100
Height (% of bankfull depth)	0 to 20	20 to 40	40 to 60	60 to 80	80 to 100
Structure	Coarse		Intermediate		Fine
Location	Partially high flow	In high flow	Partially low flow	Mid low flow	In low flow
Stability	Moveable		Intermediate		Secured

Diameter Conversion

10 cm	0.33	feet
20 cm	0.66	feet
30 cm	0.98	feet
40 cm	1.3	feet
50 cm	1.6	feet

HABITAT ASSESSMENT FIELD SHEET- MODERATE TO HIGH GRADIENT STREAMS (FRONT)
(See Protocol E for detailed descriptions and rank information)

STATION ID:	HABITAT ASSESSED BY:
STREAM NAME:	DATE: TIME:
STATION LOCATION:	ECOREGION: QC: Consensus Duplicate
WBID/HUC: GROUP:	ASSOCIATED LOG #:

	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Over 70% of stream reach has natural stable habitat suitable for colonization by fish and/or macroinvertebrates. Four or more productive habitats are present.	Natural stable habitat covers 40-70% of stream reach. Three or more productive habitats present. (If near 70% and more than 3 go to optimal.)	Natural stable habitat covers 20 -40% of stream reach or only 1-2 productive habitats present. (If near 40% and more than 2 go to suboptimal.)	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments				
2.Embeddedness of Riffles	Gravel, cobble, and boulders 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. If near 25% drop to suboptimal if riffle not layered cobble.	Gravel, cobble and boulders 25-50% surrounded by fine sediment. Niches in bottom layers of cobble compromised. If near 50% & riffles not layered cobble drop to marginal.	Gravel, cobble, and boulder s are 50-75% surrounded by fine sediment. Niche space in middle layers of cobble is starting to fill with fine sediment.	Gravel, cobble, and boulders are more than 75% surrounded by fine sediment. Niche space is reduced to a single layer or is absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments				
3. Velocity/ Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing score lower). If slow-deep missing score 15.	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime. Others regimes too small or infrequent to support aquatic populations.
SCORE	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 5% of stream bottom in quiet areas. New deposition on islands and point bars is absent or minimal.	Sediment deposition affects 5-30% of stream bottom. Slight deposition in pool or slow areas. Some new deposition on islands and point bars. Move to marginal if build-up approaches 30%.	Sediment deposition affects 30-50% of stream bottom. Sediment deposits at obstruction, constrictions and bends. Moderate pool deposition.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	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.	Water reaches base of both lower banks and streambed is covered by water throughout reach. Minimal productive habitat is exposed.	Water covers > 75% of streambed or 25% of productive habitat is exposed.	Water covers 25-75% of streambed and/or productive 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	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- MODERATE TO HIGH GRADIENT STREAMS (BACK)

Station ID________________ Date__________ Initials__________

	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel Alteration	Channelization, dredging rock removal or 4-wheel activity (past or present) 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 have greatly affected flow pattern.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
Comments				
7. Frequency of re-oxygenation zones. Use frequency of riffle or bends for category. Rank by quality.	Occurrence of re-oxygenation zones relatively frequent; ratio of distance between areas divided by average stream width <7:1.	Occurrence of re-oxygenation zones infrequent; distance between areas divided by average stream width is 7 - 15.	Occasional re-oxygenation area. The distance between areas divided by average stream width is over 15 and up to 25.	Generally all flat water or flat bedrock; little opportunity for re-oxygenation. Distance between areas divided by average stream width >25.
SCORE	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 mostly healed over. 5-30% of bank in reach has areas of erosion. 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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
Comments				

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

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

Describe

HABITAT ASSESSMENT FIELD SHEET- LOW GRADIENT STREAMS (FRONT)
(See Protocol E for detailed descriptions and rank information)

STATION ID: Bolton	HABITAT ASSESSED BY: J. Bingham
STREAM NAME: Stream 1	DATE: 7/9/18 TIME: 0800
STATION LOCATION: Reach 1	ECOREGION: 74 QC: Consensus Duplicate
WBID/HUC: GROUP:	ASSOCIATED LOG #:

	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	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	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	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	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	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)

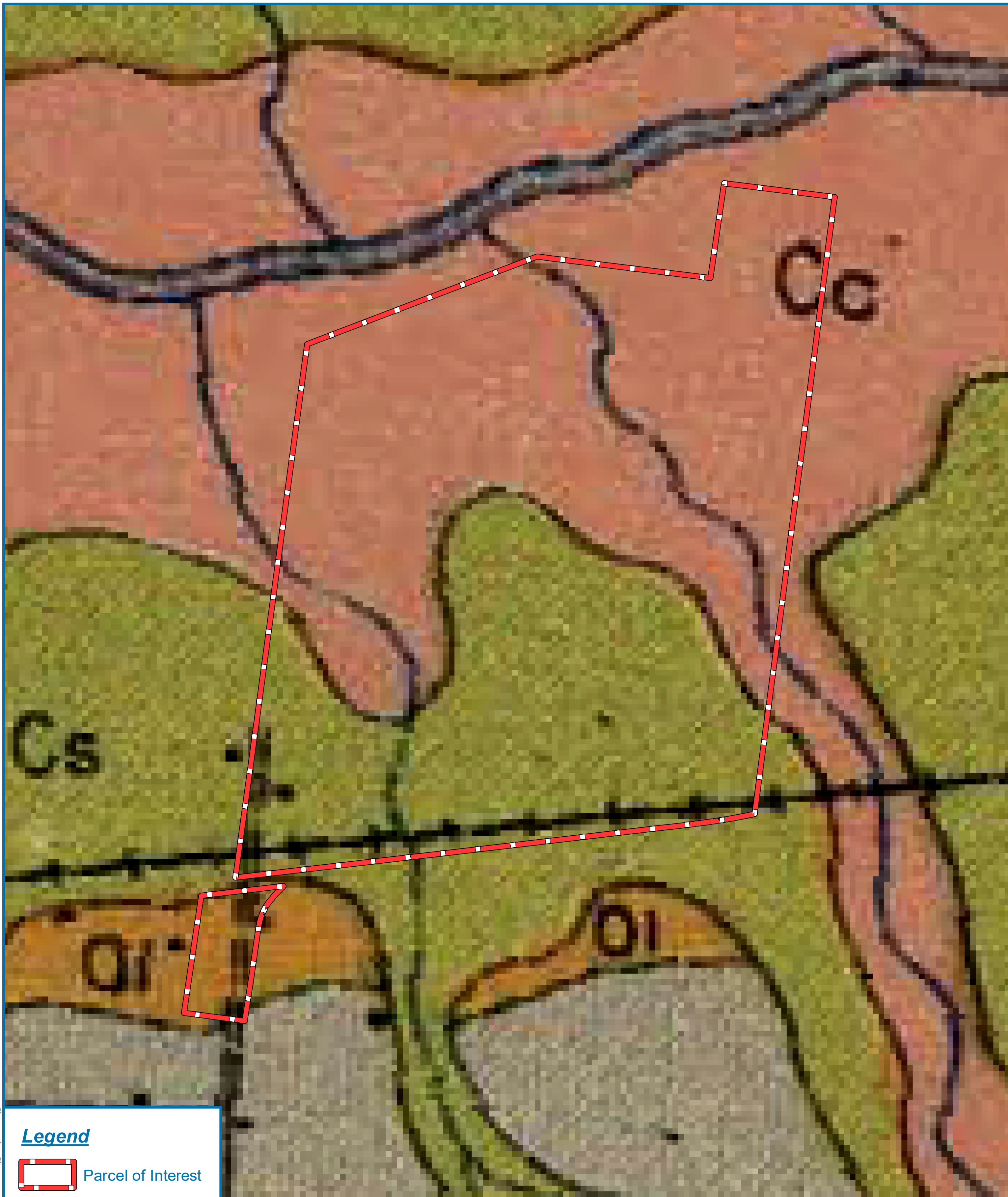
Station ID BoltonS1R1 Date 7/9/18 Initials JB

	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	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	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 o 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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	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)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
Comments				

Total Score 57 **Comparison to Ecoregion Guidelines (circle): ABOVE or BELOW**

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

Describe



Legend

Parcel of Interest

N
W E
S

0 450 900

Feet

1919 NRCS Soil Survey

Landowner: Pea Point LLC

Shelby County, Tennessee

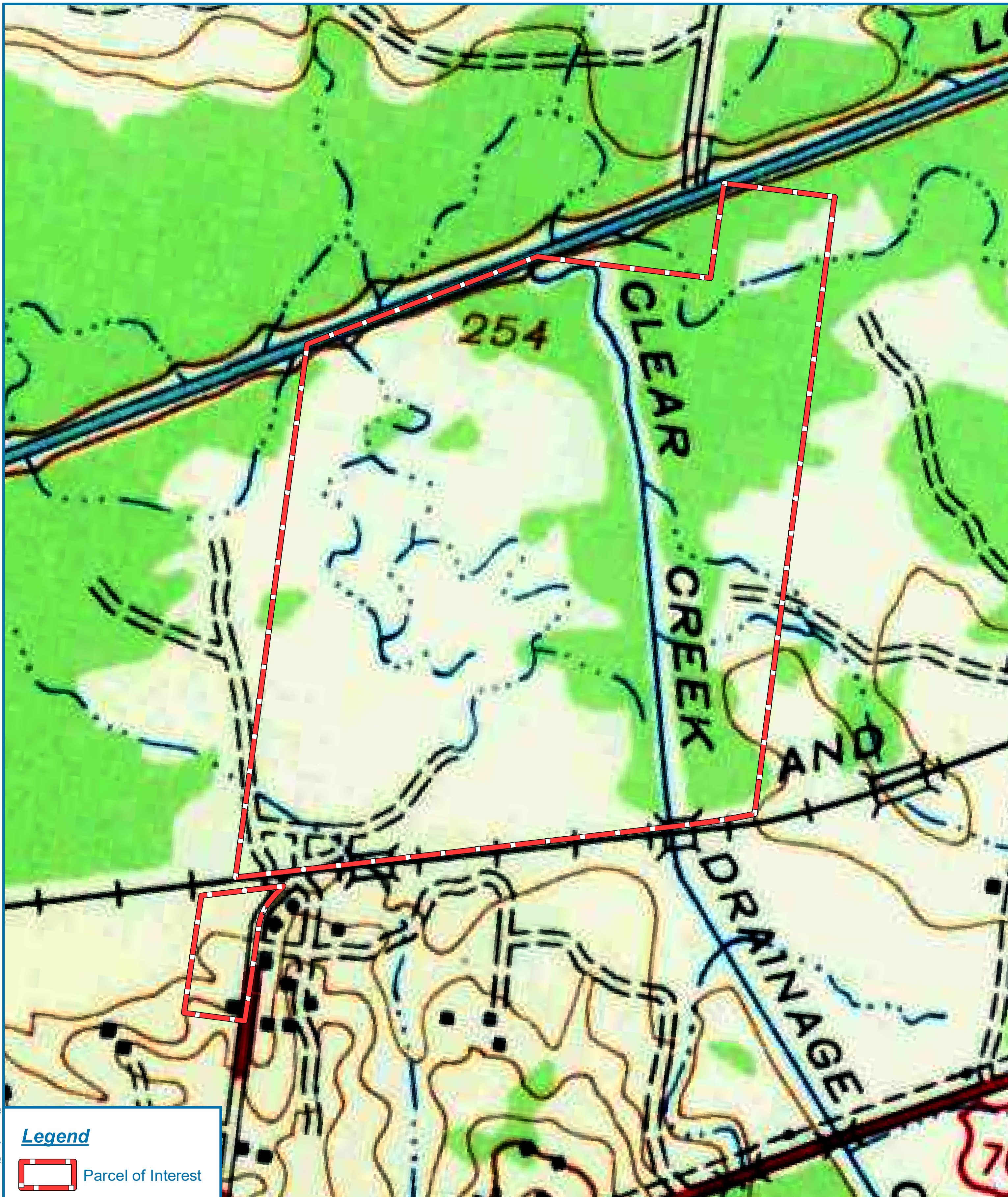
Date: 6/13/2018

Drawn by: MDE

Checked by: xxx

1 inch = 900 feet

res



Legend

Parcel of Interest

0 450 900
Feet

1954 USGS Quadrangle: Mason

Landowner: Pea Point LLC

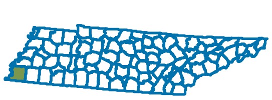
Shelby County, Tennessee

Date: 6/13/2018

Drawn by: MDE

Checked by: xxx

1 inch = 900 feet



N
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0 450 900
Feet

1963 Historic Aerial Imagery

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018

Drawn by: MDE

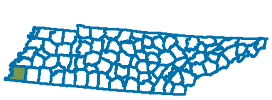
Checked by: xxx

1 inch = 900 feet

res

Legend

Parcel of Interest



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Feet

1969 USGS Quadrangle: Mason

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018

Drawn by: MDE

Checked by: xxx

1 inch = 900 feet

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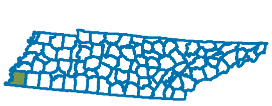

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Feet

1970 NRCS Soil Survey

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018

Drawn by: MDE

Checked by: xxx

1 inch = 900 feet

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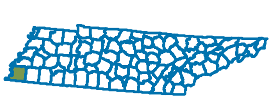
Parcel of Interest



1973 Historic Aerial Imagery

Landowner: Pea Point LLC

Shelby County, Tennessee

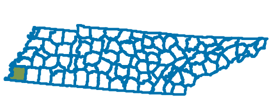
Date: 6/13/2018

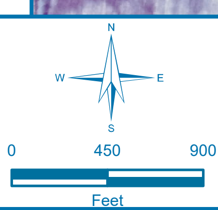
Drawn by: MDE

Checked by: xxx

1 inch = 900 feet

res





1980 Historic Aerial Imagery

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018

Drawn by: MDE

Checked by: xxx

1 inch = 900 feet

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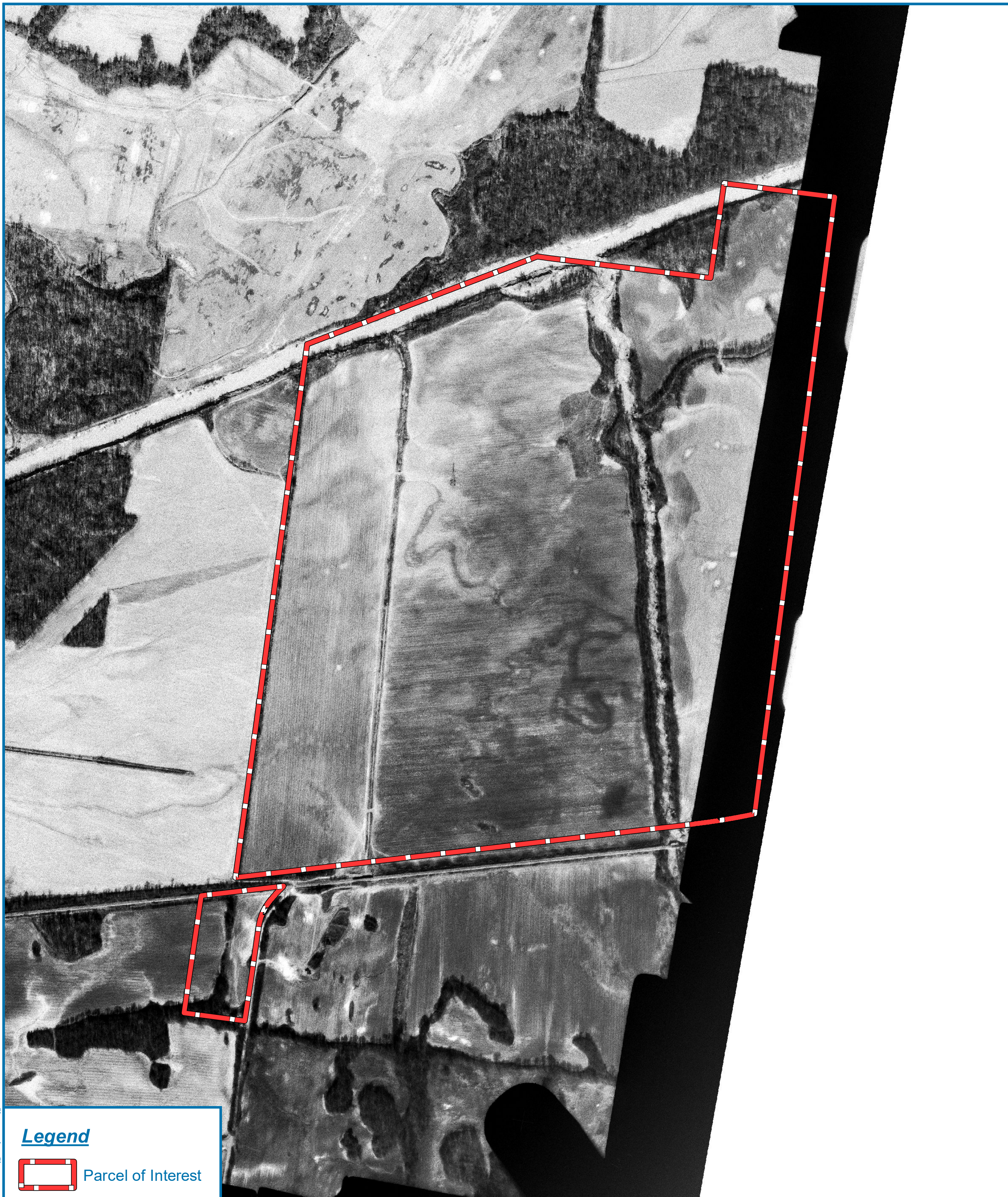

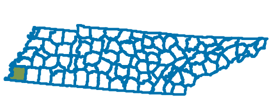

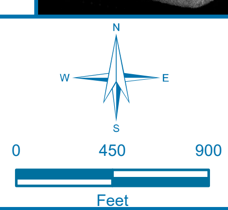

1990 Historic Aerial Imagery

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018	
Drawn by: MDE	
Checked by: xxx	
1 inch = 900 feet	

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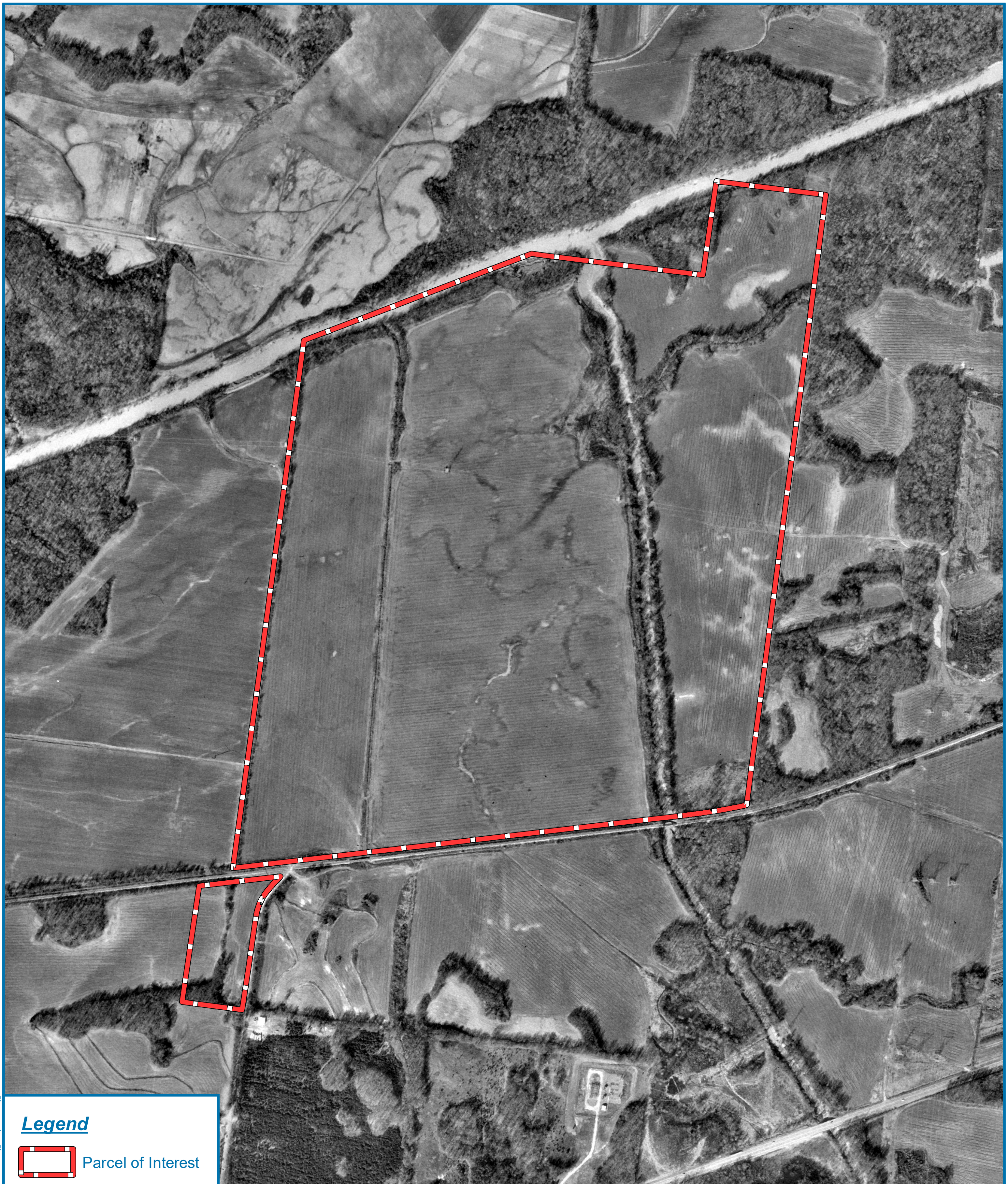

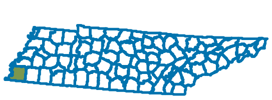

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Feet

1997 Aerial Imagery

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018

Drawn by: MDE

Checked by: xxx

1 inch = 900 feet

res

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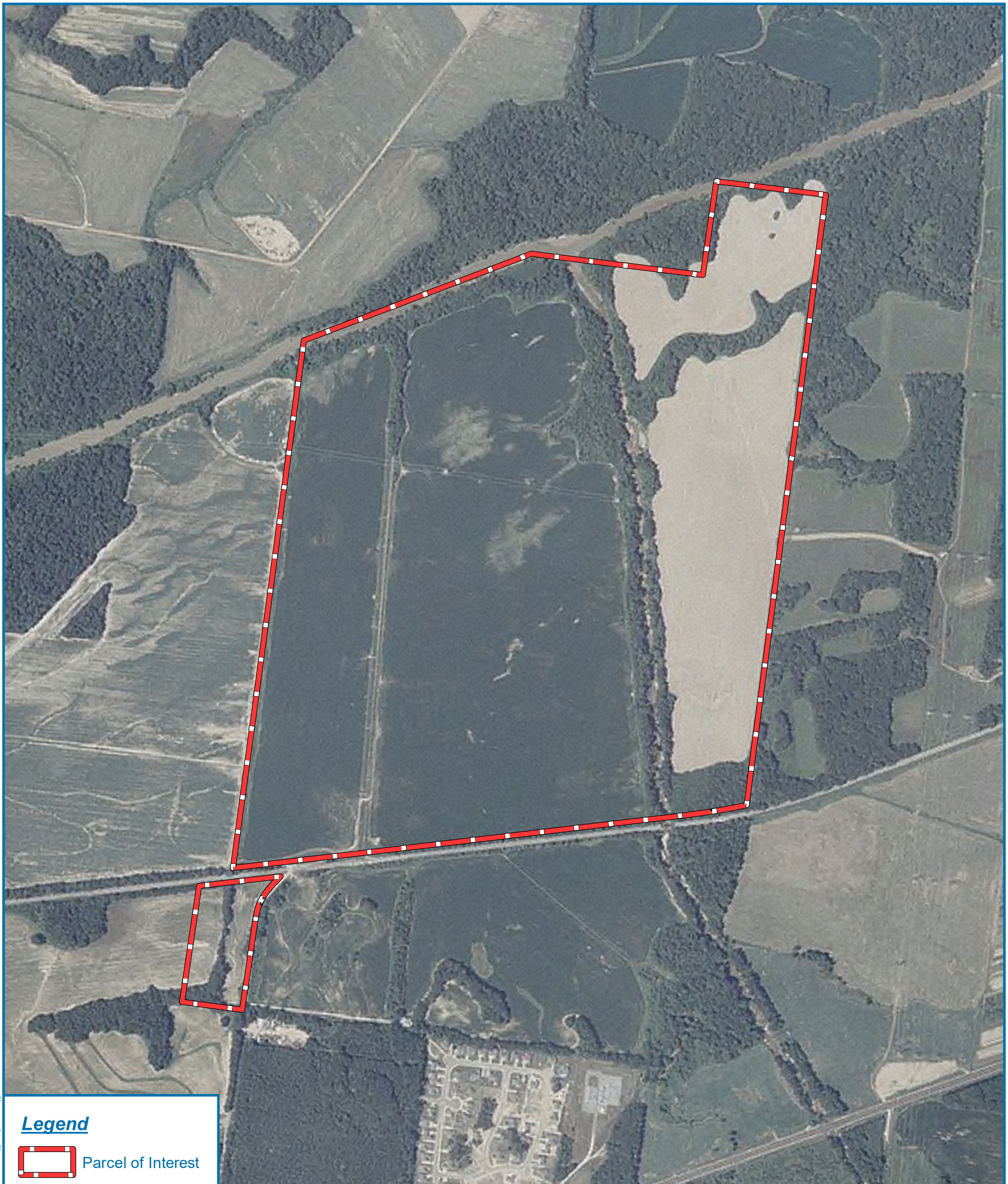

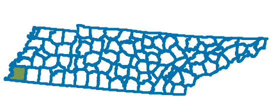

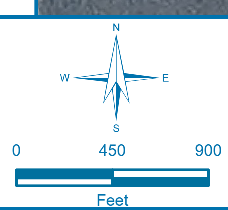

2004 Aerial Imagery

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018	
Drawn by: MDE	
Checked by: xxx	
1 inch = 900 feet	

res

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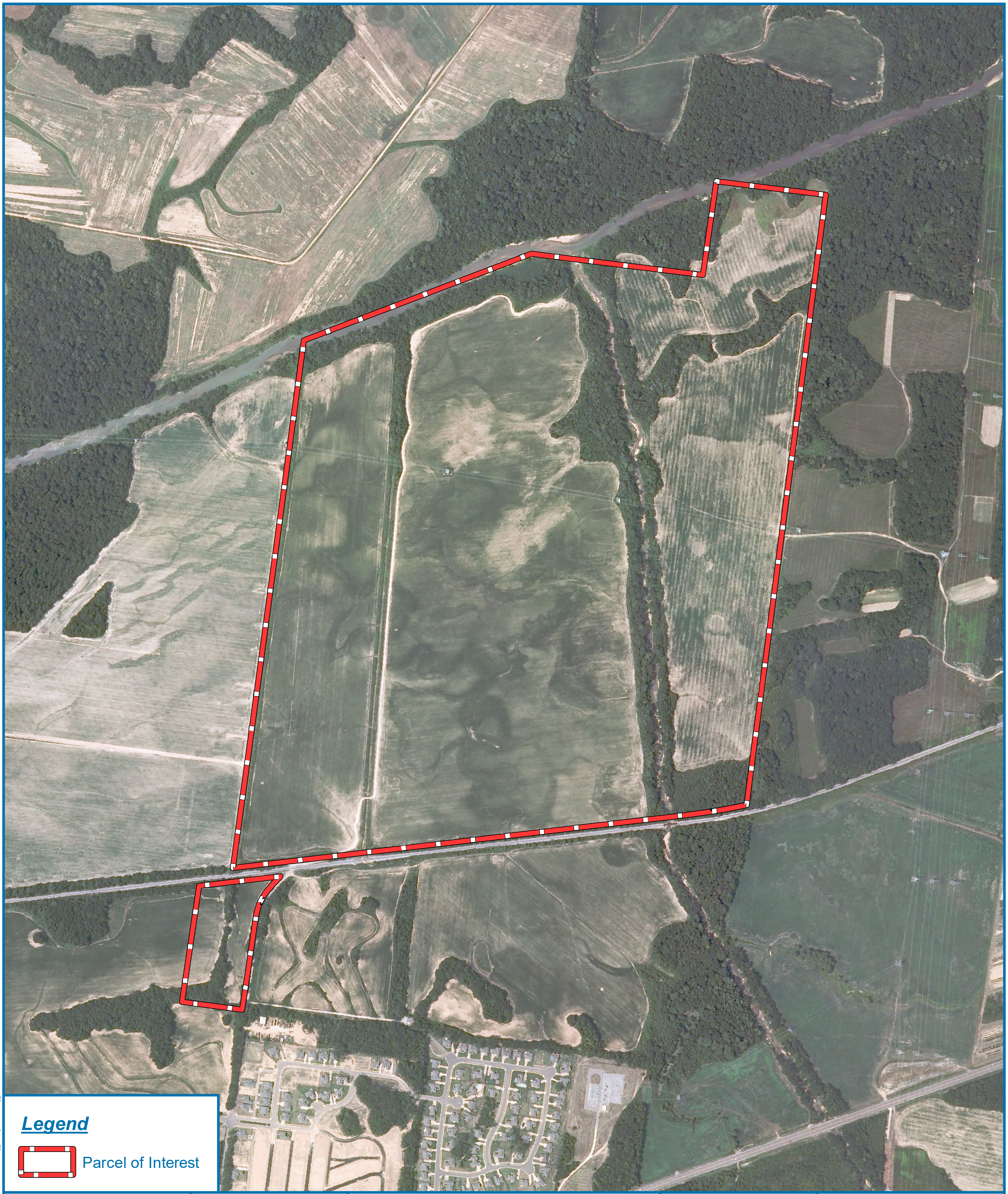

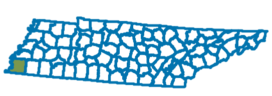

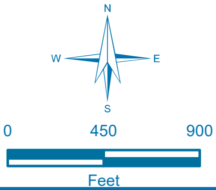

2006 Aerial Imagery

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018

Drawn by: MDE

Checked by: xxx

1 inch = 900 feet

res

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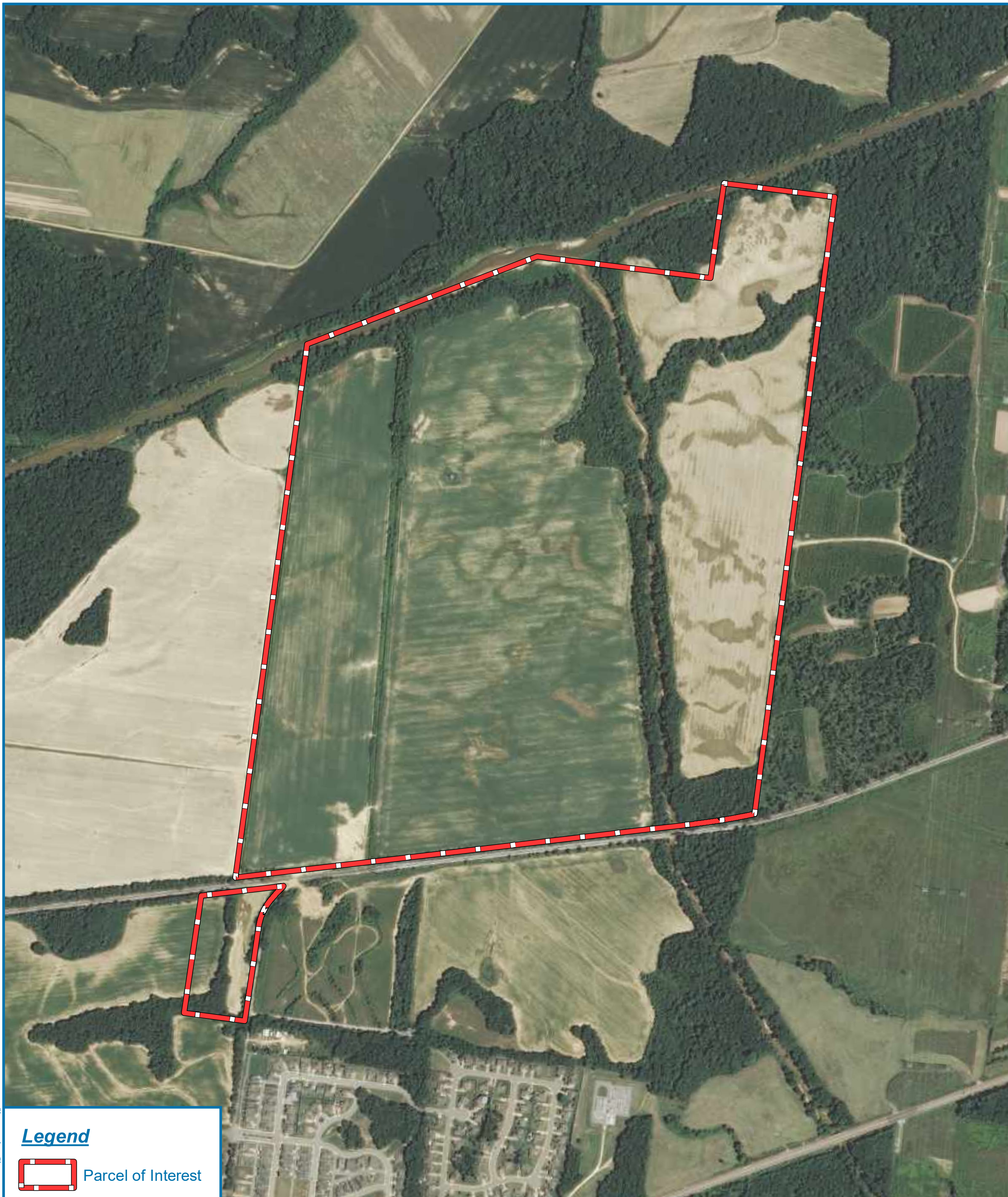

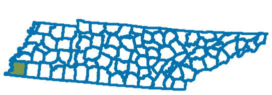

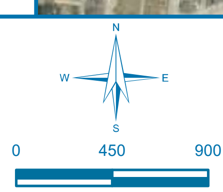

2012 Aerial Imagery

Landowner: Pea Point LLC

Shelby County, Tennessee

Date: 6/13/2018

Drawn by: MDE

Checked by: xxx

1 inch = 900 feet

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WETLAND AND OTHER WATERS DELINEATION REPORT

For the Smokestack Mitigation Bank Site
Shelby County, Tennessee

Prepared for:

Resource Environmental Solutions
Attn: Mr. Alec Sheaff
5020 Montrose Blvd., Suite 650
Houston, TX 77006

Project No.: 11596
Date: June 17, 2019

Prepared by:

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Smokestack Mitigation Bank Site
Final Report
Document Date: 6/17/2019
Project No.: 11596

Prepared for: Mr. Alec Sheaff
Client Solutions Manager
RES

Authorization for Release

The analyses, opinions, and conclusions in this document are based entirely on EnviroScience's unbiased, professional judgement. EnviroScience's compensation is not in any way contingent on any action or event resulting from this study. Neither EnviroScience nor any EnviroScience employee has any vested interest in the property examined in this study.

The undersigned attest, to the best of their knowledge, that this document and the information contained herein is accurate and conforms to EnviroScience's internal Quality Assurance standards.

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EXECUTIVE SUMMARY

EnviroScience, Inc. performed a delineation of wetlands and other waters in November 2018 for Resource Environmental Solutions (RES) at the Smokestack Mitigation Bank Site project location. The project area consists of three parcels north of Evergreen Road in the City of Lakeland, Shelby County, Tennessee. The parcel numbers are L0141 00269, A0141 00270, and L0141 00124. The project area is approximately 360 acres and is bound to the north by the Loosahatchie River and to the south by a railroad line. A small portion in the southwest corner of the project area is located south of the railroad line. The approximate center coordinates of the project area are 35.283139, -89.713232. The maps provided in Appendix A depict the project area.

The project area is comprised of rural agricultural property. Five (5) distinct vegetative communities were identified within the project area, including three (3) wetland community types. The majority of the project area is agricultural field, with narrow riparian forest along the Loosahatchie River, Clear Creek, and several other smaller onsite streams and ditches. The surrounding land use is primarily agricultural, with residential development to the south.

Fifty-two (52) wetlands were identified within the project area, accounting for approximately 20.648 acres of wetland onsite. The onsite wetlands are comprised of palustrine forested (PFO), palustrine scrub-shrub (PSS), and palustrine emergent (PEM) vegetative communities.

In addition, thirty-three (33) streams, ditches and wet weather conveyances, for a total of 18,374 linear feet (5.894 acres), were identified within the project area. Thirteen (13) of these features are considered stream, the remaining features are ditches or wet weather conveyances. No open water aquatic resources were identified within the project area.

Wetlands and waterbodies are under the jurisdiction of the Tennessee Department of Environmental Conservation (TDEC) and/or U.S. Army Corps of Engineers (USACE). No filling may occur within these areas without their written permission. Please contact the Memphis Environmental Field Office of TDEC at (901) 371-3000 or the Memphis District USACE at (901) 544-3682 before working in these areas.

1.0 INTRODUCTION AND DESCRIPTION

EnviroScience, Inc. performed a delineation of wetlands and other waters in November 2018 for RES at the Smokestack Mitigation Bank Site project location. The project area consists of three parcels north of Evergreen Road in the City of Lakeland, Shelby County, Tennessee. The parcel numbers are L0141 00269, A0141 00270, and L0141 00124. The project area is approximately 359.42 acres and is bound to the north by the Loosahatchie River and to the south by a railroad line. A small portion in the southwest corner of the project area extends south of the railroad line. The approximate center coordinates of the project area are 35.283139, -89.713232. The maps provided in Appendix A depict the project area.

The project area is comprised of rural agricultural property. Five (5) distinct vegetative communities were identified within the project area, including three (3) wetland community types. The majority of the project area is agricultural field, with narrow riparian forested corridors along the Loosahatchie River, Clear Creek, and several other smaller onsite streams and ditches. The surrounding land use is primarily agricultural, with residential development to the south.

The project area is in the Loosahatchie River drainage basin (Hydrologic #08010209), which drains approximately 736 square miles in western Tennessee. The project area is within the Mississippi Valley Loess Plains ecoregion (Griffith et al., 1997) of Tennessee. The project area is located within the area covered by the Atlantic and Gulf Coastal Plain Regional Supplement (USACE, 2010) and associated plant list (Lichvar, 2016). The project area is regulated by the USACE Memphis District.

2.0 METHODS

Government agencies regulate coastal and inland waters for commerce, flood control, and water quality. These water bodies provide numerous functions and values necessary to protect and sustain our quality of life. Wetlands comprise a significant portion of regulated waters. USACE and U.S. Environmental Protection Agency (USEPA) jointly define wetlands as:

> "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The remaining deepwater aquatic habitats (open waters) are defined by the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987) as:

> ". . . areas that are permanently inundated at mean annual water depths >6.6 ft or permanently inundated areas <6.6 ft in depth that do not support rooted emergent or woody plant species."

The methods used for determining and delineating wetlands and open waters strictly adhere to those found in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (USACE, 2010). Wetlands and open water boundaries were determined by the disappearance of one or more of their diagnostic characteristics.

Ordinary high water marks (OHWM) defined the outermost regulatory boundaries of ephemeral and open waters.

Each sample plot and the perimeter of each wetland and other water was surveyed and marked in the field with plain pink flags and pink "wetland boundary" flags, respectively. A global positioning system (GPS) unit with submeter accuracy was used, in conjunction with aerial photography and topographic maps, for the survey. Computer Aided Design (CAD) software was used to determine wetland dimensions and Geographic Information Systems (GIS) software was used to produce a map of the project area showing wetlands and other waters.

2.1 WETLANDS

2.1.1 Determination

A review of secondary literature sources was performed to find known wetlands and other significant ecological resources and areas with high potential for wetlands in or near the proposed project area. Resources included the following:

1. U.S. Geological Survey (USGS) topographic maps
2. National Wetlands Inventory (NWI) maps
3. Web Soil Survey
4. Aerial Photographs
5. Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map

A field inspection of the project area was then completed to identify major plant communities and to visually locate potential wetlands. The routine, onsite (Level 2) wetland determination was used to perform the delineation. Wetland communities were classified according to the classification scheme of Cowardin et al. (1979) (Table 2.1). Non-wetland communities were classified as one of the categories described in Table 2.2.

Table 2.1 Wetland Communities (Cowardin et al. 1979)

Community	Description
PEM	Palustrine Emergent
PSS	Palustrine Scrub-Shrub
PFO	Palustrine Forested
POW	Palustrine Open Water

Table 2.2 Non-wetland Communities

Community	Description
Urban/ Maintained	Regularly maintained land; residential; industrial
Agricultural	Land used for producing crops or raising livestock; cropland; pastureland
Cleared	Disturbed areas devoid of most vegetation from recent clearing, grading, or filling
Open Field	Herbaceous community without woody vegetation
Old Field	Herbaceous community having woody vegetation coverage of <50%
Scrub-Shrub	Community dominated by woody vegetation <6 m (20 ft) tall
Forest	Community dominated by woody vegetation >6 m (20 ft) tall

Sample plots were established within each natural community and potential wetland within the project area. Complete data for each sample plot were collected and recorded on the USACE Routine Wetland Determination Data Forms contained in the applicable USACE Regional Supplement (USACE, 2010). Vegetation, hydrology, and soils were evaluated at each sample plot.

2.1.1.1 Vegetation

To detect the presence or absence of hydrophytic vegetation, four plant strata were evaluated within specific radii of the plot center. Each stratum was ranked by aerial cover in descending order of abundance. Table 2.3 provides information on each vegetative stratum.

Table 2.3 Vegetative Strata

Stratum	Definition	Survey Area
Tree	Woody plants > or equal to 3 in. (7.6 cm) diameter at breast height (dbh), regardless of height	30 ft (9.1 m) radius
Sapling/shrub	Woody plants <3 in. (7.6 cm) dbh and $\geq$3.28 ft (1 m) tall	15 ft (4.6 m) radius
Herbaceous	Herbs and woody plants less than 3.28 ft (1 m) in height	5 ft (1.5 m) radius
Woody vines	Woody vines >3.28 ft (1 m) in height	30 ft (9.1 m) radius

Percent dominance was obtained for each species and within each stratum. Dominant species are those that, cumulatively totaled in order of abundance, immediately exceed 50% and also include any individual species with an abundance of 20% or more (USACE, 2010). Dominant taxa were identified using recognized local guides: nomenclature follows the *National List of Scientific Plant Names* (USDA, 1982). Following the identification of each plant species present within the plot, all dominant species within each stratum were assigned a wetland indicator status according to Lichvar (2016). Indicators are summarized in Table 2.4.

Table 2.4 Plant Indicators

Indicator	Category	Definition
OBL	Obligate Wetland	Almost exclusively (>99% of occurrences) found in wetlands
FACW	Facultative Wetland	Most likely found in wetlands (67-99% of occurrences)
FAC	Facultative	Equally likely found in wetlands or nonwetlands (34-66%)
FACU	Facultative Upland	Most likely found in nonwetlands (1-33% occurrence in wetlands)
UPL	Obligate Upland	Almost exclusively found in nonwetlands (<1% occurrence in wetlands)

An “NI” (no indicator) designation represents species where not enough information is available to assign an indicator; an “NL” (no listing) designation is given to species whose identification was not determined sufficiently enough to assign an indicator. Once the indicator status is assigned to each dominant species, the evaluator can perform the percent dominance test according to the protocol outlined within the applicable Regional Supplement (USACE, 2010) to determine if the plot meets the criterion for hydrophytic vegetation.

2.1.1.2 Hydrology
To detect the presence or absence of wetland hydrology, surface and subsurface hydrologic indicators were evaluated at the sample plot and throughout the adjacent community. Primary sources of wetland hydrology include direct precipitation, headwater flooding, backwater flooding, groundwater, or any combination of these. When obtaining data at each sample plot, the evaluator observes evidence of hydrology. Primary indicators of hydrology (only one of these is necessary to indicate sufficient wetland hydrology) include the presence of surface water, water marks, sediment deposits, drift deposits, etc. (USACE, 2010). Secondary indicators of hydrology (which requires two or more at each sample plot) include surface soil cracks, drainage patterns, crayfish burrows, etc. (USACE, 2010).

2.1.1.3 Soils
The upper horizons of the soil at each sample plot were examined to detect the presence or absence of hydric soils indicators. Current USACE guidance requires the evaluator to assess the upper 20 inches of soil for hydric soil characteristics. Most indicators of hydric soils require an assessment of soil matrix color and mottle characteristics (Environmental Laboratory, 1987; USACE, 2010) for each horizon. These characteristics were determined by comparing a moist sample with the *Munsell Soil Color Chart* (Munsell Color, 2009) or *The Globe Soil Color Book* (Visual Color Systems, 2004).

2.1.2 Cowardin Wetland Classification
The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory uses the *Classification of Wetlands and Deepwater Habitats of the United States* to classify wetland habitat types (Cowardin et al., 1979). This classification system is hierarchical and defines five major systems: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. The Palustrine system was the only type of wetland system identified within the project area and is defined as including all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean driven-derived salts is below 0.5 percent (Cowardin et al., 1979).

2.2 OTHER WATERS
Other waters include ephemeral and open waters. These waters are broken down into two categories: 1) ponds and lakes; and 2) streams and rivers.

2.2.1 Ponds and Lakes
Palustrine systems other than wetlands, and lacustrine waters are addressed as ponds and lakes, respectively. These non-linear open waters may harbor important aquatic communities such as vegetated shallows (aquatic bed) and mud flats. They are classified according to Cowardin et al. (1979).

2.2.2 Streams and Rivers
Riverine systems are linear flowing waters bounded by a channel. Cowardin et al. (1979) divides these systems into four groups; however, for the purpose of this report, streams are placed into one of the three regulatory types listed below.

Ephemeral: An ephemeral stream only conveys runoff precipitation and meltwater. It is permanently located above the water table and is most often dry.

Intermittent: An intermittent stream is located below the water table for parts of the year but does have dry periods.

Perennial: A perennial stream typically has flowing water throughout the entire year.

In addition to flow characteristics, USACE has defined other regulatory categories that apply to streams, which are listed below (USACE and USEPA, 2007).

Traditional Navigable Waters (TNW): All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide.

Relatively Permanent Waters (RPW): Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months).

Non-Relatively Permanent Waters (Non-RPW): Non-navigable tributaries of traditional navigable waters that are not relatively permanent where the tributaries typically do not have continuous flow at least seasonally (e.g., typically three months).

USACE and USEPA will assert jurisdiction under the Clean Water Act on TNWs and all wetlands adjacent to them, non-navigable tributaries of TNWs that are RPW, and wetlands that directly abut such tributaries. In addition, the agencies will assert jurisdiction over every water body that is not an RPW if that water body is determined (on the basis of a fact-specific analysis) to have a significant nexus with a TNW.

> "A significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or an insubstantial effect on the chemical, physical, and/or biological, integrity of a TNW. Principal considerations when evaluating significant nexus include the volume, duration, and frequency of the flow of water in the tributary and the proximity of the tributary to a TNW, plus the hydrologic, ecologic, and other functions performed by the tributary and all of its adjacent wetlands."

In 2015, USEPA and USACE issued the Clean Water Rule, which attempts to clarify the definition of waters of the U.S. On October 9, 2015, the Sixth U.S. Circuit Court of appeals issued a nationwide Order of Stay barring implementation of the rule pending appeal. On August 16, 2018, the U.S. District Court for the District of South Carolina issued a nationwide injunction barring implementation of the stay in 26 states, including Tennessee. The Clean Water Rule uses several bright line definitions involving distance from downstream waters or other regulated waters to claim jurisdiction over rivers, stream, and wetlands.

Jurisdictional Waters of the U.S. (WOTUS) were identified and the North Carolina Division of Water Quality (NCDWQ) – Methodology for Identification of Intermittent and Perennial Streams and Their Origins, Version 4.11 (NCDWQ, 2010) was used, as well as stream and tributary defining characteristics and the three regulatory types described in Section 2.2.2.

2.2.3 Hydrologic Determinations

The state of Tennessee requires identification of Waters of the State (WOS) by a certified Hydrologic Professional. The state of Tennessee defines WOS as streams; all other linear features are defined as wet weather conveyances.

A "wet weather conveyance" means, notwithstanding any other law or rule to the contrary, manmade or natural watercourses, including natural water courses that have been modified by channelization:

1. That flow only in direct response to precipitation runoff in their immediate locality;
2. Whose channels are at all times above the groundwater table;
3. That are not suitable for drinking water supplies; and
4. 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 cycles includes an aquatic phase of at least two months."

Stream and hydrologic determinations were performed using the Tennessee Department of Environmental Conservation (TDEC) Guidance for Making Hydrologic Determinations (HD), Version 1.4, to identify and locate the boundaries of stream/wet weather conveyance (WWC) features (TDEC, 2011).

Prior to conducting field work, relevant background information was reviewed, including site location (Appendix A, Figure 1), topography (Appendix A, Figure 2), the National Wetlands Inventory Map (Appendix A, Figure 3), the Shelby County Soils Map data (Appendix A, Figure 4), Aerial Photography Site Map (Appendix A, Figure 5), and the most recent FEMA Flood Insurance Rate Map (Appendix A, Figure 6).

EnviroScience established the survey area of the watercourse along the property extent and fixed its location using a Trimble differential global positioning system (dGPS) accurate to within one (1) meter. The water feature was then assessed using the previously mentioned methodologies. Biologists photo documented all resources that were encountered within the assessed survey area.

3.0 LITERATURE REVIEW

The following sections detail background information on the project area and contain further explanation of the various maps located in Appendix A.

3.1 USGS TOPOGRAPHIC MAP

The USGS 7.5-minute topographic series map of the site (Arlington Quadrangle) is shown on Figure 2 (Appendix A). The project area is generally flat. Elevations within the project area range from approximately 240 feet above mean sea level (AMSL) to 270 feet AMSL. The Loosahatchie River is depicted along the northern boundary of the project area. Clear Creek Canal is depicted as a channelized stream flowing north through the eastern portion of the project area. Several smaller streams, oxbows, and wetlands are depicted within the project area. The streams indicated on the USGS topographic map were field identified. Due to the agricultural land use present throughout much of the site, most of the oxbows and wetlands depicted on the USGS topographic map have been heavily altered or were not present during the field survey.

3.2 NWI MAP

The NWI map (Arlington Quadrangle) of the project area is shown on Figure 3 (Appendix A). Five (5) riverine systems and six (6) wetlands are depicted within the project area. The Loosahatchie River is depicted as a lower perennial riverine system with an unconsolidated bottom that is permanently flooded and excavated (R2UBHx). An unknown perennial riverine system with an unconsolidated bottom that is permanently flooded corresponds to a portion of Clear Creek. An intermittent riverine system with a streambed that is seasonally flooded and excavated (R4SBCx) corresponds to Stream S-1. An unknown perennial riverine system with an unconsolidated bottom that is permanently flooded (R5UBH) is depicted overlaying an oxbow; this feature corresponds to Stream S-3, which was field identified as a short, ephemeral stream draining the adjacent agricultural field. An intermittent riverine system with a streambed that is seasonally flooded (R4SBC) is depicted on the NWI map flowing into Clear Creek. This feature was not identified in the field, and an agricultural field exists within its location. A complex of wetlands was identified in the approximate location of this former stream; these include Wetlands W-37, W-38, W-39, W-40, and W-47.

A small palustrine, broad-leaved deciduous scrub-shrub wetland that is seasonally flooded (PSS1C) is depicted in the northeastern portion of the project area and corresponds to Wetland W-23. The linear palustrine, broad-leaved deciduous forested wetland that is seasonally flooded (PFO1C), located in the northeastern portion of the project, corresponds with Stream S-21; no wetlands were field identified within the riparian corridor along this stream. Similarly, a large portion of Clear Creek is depicted as a palustrine, broad-leaved deciduous forested wetland that is seasonally flooded and excavated (PFO1Cx) on the NWI map. Very little wetland was field identified within the riparian forest along this portion of Clear Creek. Three (3) palustrine, persistent emergent wetlands that are seasonally flooded (PEM1C), located in the eastern half of the project area, are depicted on the NWI map. These wetlands roughly correspond to Wetland W-30, W-43, W-44, and W-49.

3.3 COUNTY SOIL SURVEY

The project area is found on the *Soil Survey of Shelby County, Tennessee* and was accessed on the Soil Survey Geographic (SSURGO) Database (USDA Web Soil Survey, 2016) (Appendix A, Figure 4). Six (6) soil types were identified within the project area. In addition to the indicated soils, water (W) was also identified for a total of 2.422 acres (0.7 of a percent of the project area). The onsite soils are summarized in Table 3.1, below.

Table 3.1 Soil Types Mapped in Shelby County

Symbol	Soil Name	Status	Common Landform	Percent Hydric	Acres in Project Area	Percent Within Project Area
Fm	Falaya silt loam	Non-hydric with hydric inclusions	flood plains	9	156.97	44.6
GaB	Grenada silt loam, 2 to 5 percent slopes	Non-hydric	loess hills	0	0.043	0.1
GaC3	Grenada silt loam, 5 to 8 percent slopes, severely eroded	Non-hydric	loess hills	0	0.74	0.2
GaD2	Grenada silt loam, 8 to 12 percent slopes, eroded	Non-hydric	loess hills	0	0.49	0.1
He	Henry silt loam	Hydric	stream terraces	100	2.85	0.8
Wv	Waverly silt loam, 0 to 2 percent slopes, occasionally flooded, long duration	Hydric	flood plain steps	100	187.96	53.5

*ND = No Data

3.4 AERIAL PHOTOGRAPHY

A recent aerial photograph of the project area is shown in Figure 5 (Appendix A). The project area is located within a rural agricultural setting and the Loosahatchie River is shown flowing along the northern boundary. A railroad line is located along the southern boundary. Land use visible on the aerial imagery include agricultural field and riparian forest. Streams and wetlands are depicted throughout the project area. No structures are visible within the project area. The surrounding land use is primarily agricultural, with some residential development to the south.

3.5 FEMA FLOOD INSURANCE RATE MAP

The Federal Emergency Management Agency (FEMA) produces Flood Insurance Rate Maps (FIRM), which show the locations of predictable floodplain during precipitation flood events. The FIRM map of the project area was examined and is included in Appendix A (Figure 6). Most of the project area is located within the identified 100-year floodplains of the Loosahatchie River and Clear Creek. Further coordination with local agencies may be required before any ground-disturbance activities within the designated floodplain commence.

3.6 U.S. FISH AND WILDLIFE SERVICE

The project area was reviewed for suitable habitat for federally listed species whose known range includes Shelby County, Tennessee. The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) was searched to determine which federally listed species may be present within the project area (USFWS, 2018). These species are the federally endangered Indiana bat (*Myotis sodalis*), the federally threatened northern long-eared bat (*Myotis septentrionalis*), and the bald eagle (*Haliaeetus leucocephalus*), a federal species of concern. The IPaC search also specified three (3) birds of conservation concern, including the prothonotary warbler (*Protonotaria citrea*), the red-headed woodpecker (*Melanerpes erythrocephalus*), and the wood thrush (*Hylocichla mustelina*). Additionally, the IPaC specified results for NWI wetlands; for a more detailed discussion of onsite NWI wetlands, see Section 3.2 of this report.

Living or dead trees with shedding or peeling bark or cavities may serve as roosting trees for the Indiana bat and/or the northern long-eared bat. In addition, sheds and barns may serve as roosting habitat for the northern long-eared bat. No winter hibernaculum, barns, or sheds were observed within the project area. The areas of onsite forest were of varying successional stages. Specific habitat trees were not identified as part of this project. However, any forested areas may provide habitat for the Indiana bat or northern long-eared bat. A description of the tree species growing within the onsite forested community is described below in Section 4.1. Representative photographs of potential roost trees (PRTs) are located in Appendix B. If this project has federal ties (including impacts to onsite wetlands), coordination with USFWS is required prior to tree clearing. If trees must be cleared, USFWS will likely require that clearing be completed between October 1st and March 31st.

The bald eagle nests in large trees near water. No bald eagles or nests were observed within or adjacent to the project area. The Loosahatchie River may provide potential habitat for the bald eagle.

The IPaC reports a probability of presence for migratory birds within 10 km grid cells overlapping the defined project area, with variable levels of survey effort. IPaC recommends avoiding and/or minimizing impacts to birds of conservation concern to the extent possible. These species are most vulnerable to disturbance during the breeding season. Breeding season for the prothonotary warbler is listed as April 1 through July 31; breeding season for the red-headed woodpecker is listed as May 10 through September 10; and breeding season for the wood thrush is listed as May 10 through August 31. None of these species were observed onsite; however, the wetland delineation field work was conducted in November, which is after the fall migration. The onsite riparian forest could potentially be used as migratory stopover habitat and/or breeding habitat for these species.

A desktop search of IPaC was conducted for this report for informational purposes only. If consultation under Section 7 of the Endangered Species Act is required, an official list should be requested from IPaC. Additionally, a significant portion of the project area lays within a FEMA regulatory floodway, further coordination with local, state, and/or federal agencies may be required.

3.7 TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Information regarding rare and state listed species was obtained through a county search of the Rare Species Dataviewer on the TDEC website (TDEC, 2018). Results from the search included a total of thirty-one (31) species and one (1) animal assemblage. Four (4) of these are state endangered, including the Bewick's wren (*Thryomanes bewickii*), willow aster (*Symphyotrichum praeltum*), the interior population of the least tern (*Sternula antillarum athalassos*), and the ovate catchfly (*Silene ovata*). Seven (7) species in the search results are state threatened, including Harvey's beakrush (*Rhynchospora harveyi*), the blue sucker (*Cycleptus elongatus*), the sweetbay magnolia (*Magnolia virginiana*), the northern pinesnake (*Pituophis melanoleucus melanoleucus*), the lark sparrow (*Chondestes grammacus*), the red starvine (*Schisandra glabra*), and the copper iris (*Iris fulva*). Ten (10) species in the search results are classified as "deemed in need of management" within Tennessee, including the southeastern shrew (*Sorex longirostris*), the bald eagle (*Haliaeetus leucocephalus*), the piebald madtom (*Noturus gladiator*), the cerulean warbler (*Dendroica cerulea*), the naked sand darter (*Ammocrypta beani*), the barking treefrog (*Hyla gratiosa*), the eastern woodrat (*Neotoma floridana illinoensis*), the barn owl (*Tyto alba*), the Mississippi kite (*Ictinia mississippiensis*), and the Swainson's warbler (*Limnothlypis swainsonii*). Four (4) species in the search results are classified as "special concern" in Tennessee, including the cedar elm (*Ulmus crassifolia*), American ginseng (*Panax quinquefolius*), multiflowered mud-plantain (*Heteranthera multiflora*), and featherfoil (*Hottonia inflata*). American ginseng is also listed as "commercially exploited." Six (6) species in the search results are classified as "rare, not state listed" in Tennessee, including the bronze copper (*Lycaena hyllus*), the striped whitelip (*Webbhelix multilineata*), the southern cricket frog (*Acris gryllus*), the southern hickorynut (*Obovaria jacksoniana*), the Bell's vireo (*Vireo bellii*), and the fatmucket (*Lampsilis siliquoidea*). The animal assemblage in the search results, a heron rookery, is also classified as "rare, not state listed" in Tennessee. While surveys for these species were outside of the scope of this project, a noteworthy observation was the presence of tree frog tadpoles (*Hyla* sp.) within Wetland W-3. If construction activities are planned; further coordination with TDEC may be required prior to ground disturbance.

4.0 RESULTS

Thirty-five (35) sample plots were established within five (5) vegetative communities. Three (3) of these communities are considered wetland. Table 4.1 summarizes the sample plot data.

Table 4.1 Sample Plot Results

Sample Plot	Photo*	Community**	Hydrophytic Vegetation	Wetlands Hydrology	Hydric Soil	Status	Location
1	1	Forest	X			Non-Wetland	SP-1
2	2	PFO	X	X	X	Wetland	W-1
3	3	PEM	X	X	X	Wetland	W-7
4	4	Agricultural Field				Non-Wetland	SP-4
5	5	Agricultural field				Non-Wetland	SP-5
6	6	PEM	X	X	X	Wetland	W-6
7	7	PEM	X	X	X	Wetland	W-8
8	8	PEM	X	X	X	Wetland	W-9
9	9	Forest	X	X		Non-Wetland	SP-9
10	10	Agricultural Field				Non-Wetland	SP-10
11	11	PEM	X	X	X	Wetland	W-13
12	12	PEM	X	X	X	Wetland	W-16
13	13	Agricultural Field				Non-Wetland	SP-13
14	14	PEM	X	X	X	Wetland	W-14
15	15	PEM	X	X	X	Wetland	W-18
16	16	PFO	X	X	X	Wetland	W-19
17	17	PSS	X	X	X	Wetland	W-19
18	18	PEM	X	X	X	Wetland	W-19
19	19	Forest				Non-Wetland	SP-19
20	20	PFO	X	X	X	Wetland	W-23
21	21	PEM	X	X	X	Wetland	W-22
22	22	Forest	X			Non-Wetland	SP-22
23	23	PFO	X	X	X	Wetland	W-26
24	24	Forest	X			Non-Wetland	SP-24
25	25	PEM	X	X	X	Wetland	W-30
26	26	PEM	X	X	X	Wetland	W-33
27	27	Agricultural Field				Non-Wetland	SP-27
28	28	PEM	X	X	X	Wetland	W-41
29	29	PEM	X	X	X	Wetland	W-38
30	30	PEM	X	X	X	Wetland	W-47

Sample Plot	Photo*	Community**	Hydrophytic Vegetation	Wetlands Hydrology	Hydric Soil	Status	Location
31	31	PFO	X	X	X	Wetland	W-49
32	32	Forest	X		X	Non-Wetland	SP-32
33	33	Forest	X			Non-Wetland	SP-33
34	34	PSS	X	X	X	Wetland	W-45
35	35	Agricultural Field				Non-Wetland	SP-35

*photos are located in Appendix B
**PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub; PFO = Palustrine Forest

Each sample plot, delineated wetland, and other waters are illustrated in Figure 5 (Appendix A). The following section describes general conditions found within each plant community and summarizes information from the data forms, located in Appendix C. Representative photographs are included in Appendix B.

4.1 NON-WETLANDS

Two (2) upland communities, agricultural field and forest, exist within the project area. Dominant species in each community are discussed below; complete vegetative data is included in the Sample Plot forms provided in Appendix C. The agricultural field community is represented by Sample Plots 4, 5, 10, 13, 27, and 35. The dominant species within the herbaceous layer of this community include soybean (*Glycine max*, UPL), buttercup (*Ranunculus* sp., c.f. *R. acris*), and wild chives (*Allium schoenoprasum*, FACU).

The onsite forest community is represented by Sample Plots 1, 9, 19, 22, 24, 32, and 33. The dominant tree species within the forest community include silver maple (*Acer saccharinum*, FAC), box elder (*Acer negundo*, FAC), red maple (*Acer rubrum*, FAC), American sycamore (*Platanus occidentalis*, FACW), river birch (*Betula nigra*, FACW), southern red oak (*Quercus falcata*, FACU), water oak (*Quercus nigra*, FAC), eastern cottonwood (*Populus deltoides*, FAC), sweet-gum (*Liquidambar styraciflua*, FAC), and slippery elm (*Ulmus rubra*, FAC). The dominant species within the shrub stratum include American elm (*Ulmus americana*, FAC), privet (*Ligustrum* sp., NL), common pawpaw (*Asimina triloba*, FAC), box elder, shagbark hickory (*Carya ovata*, FACU), slippery elm, choke cherry (*Prunus virginiana*, FACU), green ash (*Fraxinus pennsylvanica*, FACW), and shingle oak (*Quercus imbricaria*, FAC). The herbaceous stratum is dominated by wintercreeper (*Euonymus fortunei*, UPL), white panicled American-aster (*Symphyotrichum lanceolatum*, FACW), farewell-summer (*Symphyotrichum lateriflorum*, FAC), Japanese honeysuckle (*Lonicera japonica*, FACU), poison ivy (*Toxicodendron radicans*, FAC), river-bank wild rye (*Elymus riparius*, FACW), and non-native bamboo (*Phyllostachys* sp., NL). The dominant species within the woody vine stratum include river-bank grape (*Vitis riparia*, FACW) and poison ivy.

4.2 WETLANDS

Fifty-two (52) wetlands were identified and delineated within the project area. The onsite portions of these wetlands consist of PEM, PSS, and PFO vegetative communities. Wetland results are given in Table 4.2 and are briefly described in the following section. Wetland size has been determined for the portion of the wetland within the project area. These wetlands are illustrated in Figure 5 (Appendix A).

Table 4.2 Wetland Results within the Project Area

Wetland		Photo*	Cowardin Class	Size Within Project Area (acres)	Preliminary Jurisdictional Evaluation	Map Page Location**
W-1		36	PFO	0.136	Jurisdictional	5.01
W-2		37	PFO	0.042	Jurisdictional	5.01
W-3		38	PFO	0.073	Jurisdictional	5.01, 5.02
W-4		39	PEM	0.038	Jurisdictional	5.02
W-5		40	PEM	0.016	Jurisdictional	5.02
W-6		41	PEM	0.438	Jurisdictional	5.02, 5.08
W-7		42	PEM	0.058	Jurisdictional	5.02
W-8		43	PEM	0.132	Jurisdictional	5.02
W-9		44	PEM	0.059	Jurisdictional	5.02
W-10		45	PEM	0.132	Jurisdictional	5.03
W-11		46	PEM	0.048	Jurisdictional	5.03
W-12		47	PEM	0.466	Jurisdictional	5.03
W-13		48	PEM	0.159	Jurisdictional	5.03
W-14		49	PEM	4.465	Jurisdictional	5.03, 5.04, 5.09, 5.10
W-15		50	PEM	0.209	Jurisdictional	5.04
W-16		51	PEM	0.806	Jurisdictional	5.04
W-17		52	PEM	0.572	Jurisdictional	5.04, 5.05
W-18		53-54	PEM	0.034	Jurisdictional	5.05
W-19		55-59	PEM	3.305	Jurisdictional	5.07
			PSS	0.590		
			PFO	0.911		
W-20		60	PEM	0.110	Jurisdictional	5.07
W-21		61	PFO	0.023	Jurisdictional	5.07
W-22		62	PEM	0.537	Jurisdictional	5.07
			PFO	0.042		
W-23	a	63-64	PEM	0.104	Jurisdictional	5.07
			PFO	0.437		
	b		PFO	0.001		
W-24		65	PEM	0.021	Jurisdictional	5.08
W-25		66	PEM	0.029	Jurisdictional	5.08
W-26		67	PFO	0.068	Jurisdictional	5.08
W-27		68	PEM	0.071	Jurisdictional	5.08
W-28		69	PEM	0.038	Jurisdictional	5.08
			PFO	0.059		
W-29		70	PEM	0.019	Jurisdictional	5.08
W-30		71-72	PEM	0.065	Jurisdictional	5.08
			PFO	0.032		

Wetland	Photo*	Cowardin Class	Size Within Project Area (acres)	Preliminary Jurisdictional Evaluation	Map Page Location**
W-31	73	PEM	0.062	Jurisdictional	5.08
W-32	74	PEM	0.225	Jurisdictional	5.08
W-33	75	PEM	0.642	Jurisdictional	5.08
W-34	76	PEM	0.069	Jurisdictional	5.08
W-35	77	PEM	0.116	Jurisdictional	5.09
W-36	78	PEM	0.083	Jurisdictional	5.09
W-37	79	PEM	0.667	Jurisdictional	5.09
W-38	80	PEM	0.242	Jurisdictional	5.09
W-39	81	PEM	0.434	Jurisdictional	5.09
W-40	82	PEM	0.980	Jurisdictional	5.09
W-41	83	PEM	0.700	Jurisdictional	5.09
W-42	84	PEM	0.265	Jurisdictional	5.09
W-43	85	PEM	0.055	Jurisdictional	5.10
W-44	86	PEM	0.265	Jurisdictional	5.10
W-45	87-88	PEM	0.040	Jurisdictional	5.10
		PSS	0.009		
W-46	89	PEM	0.178	Jurisdictional	5.10
W-47	90	PEM	0.282	Jurisdictional	5.10
W-48	91	PEM	0.043	Jurisdictional	5.10
W-49	92-93	PEM	0.429	Jurisdictional	5.10
		PFO	0.361		
W-50	94	PSS	0.007	Jurisdictional	5.10
W-51	95	PEM	0.117	Jurisdictional	5.11
W-52	96	PEM	0.036	Jurisdictional	5.11
Total Wetlands			**20.648**		

*photos are located in Appendix B
**Site map located in Appendix A, Figure 5.

The majority of onsite wetlands are depressional wetlands within the agricultural fields and are generally dominated by annual, PEM vegetation. This includes Wetlands W-4, W-5, W-6, W-7, W-8, W-9, W-10, W-11, W-12, W-13, W-14, W-15, W-16, W-17, W-18, W-20, W-24, W-25, W-27, W-29, W-31, W-32, W-33, W-34, W-35, W-36, W-37, W-38, W-39, W-40, W-41, W-42, W-43, W-44, W-46, W-47, W-48, W-51, and W-52. These wetlands are represented by Sample Plots 3, 6, 7, 8, 11, 12, 14, 15, 26, 28, 29, and 30. The dominant herbaceous species within most of these wetlands are rough barnyard grass (*Echinochloa muricata*, FACW), fall panic grass (*Panicum dichotomiflorum*, FACW), tall buttercup (*Ranunculus acris*), chufa (*Cyperus esculentus*, FAC), mild water-pepper (*Persicaria hydropiper*, OBL), blunt spike-rush (*Eleocharis obtusa*, OBL), water-purslane (*Ludwigia palustris*, OBL), rusty flat sedge (*Cyperus odoratus*, FACW), and soybeans. Some of the wetland along the edges of the agricultural fields include more perennial vegetation as dominant species; presumably the regular disturbance due to farming is less intensive in these areas. These species include lamp rush (*Juncus effusus*, OBL), Allegheny monkey-flower (*Mimulus ringens*, OBL), white panicled American-aster (*Symphyotrichum lanceolatum*, FACW), and common fox sedge (*Carex vulpinoidea*, FACW). Common indicators of wetland hydrology within these wetlands include surface water, a high water table, soil saturation, saturation visible on aerial imagery, crayfish burrows, geomorphic position, and the FAC-neutral test. Other indicators of wetland hydrology that were less frequently observed within these wetlands include water stained leaves, an algal mat or crust, a shallow aquitard, recent iron reduction in tilled soils, aquatic fauna (diving beetles), and oxidized rhizospheres in living roots. The hydric soil indicator within most depressional wetlands within agricultural field was depleted matrix, although redox depressions and iron-manganese masses occurred as well.

Wetlands W-1, W-2, and W-3 are moderately small, depressional PFO wetlands in the riparian forest along the Loosahatchie River near the northern boundary of the project area, west of Clear Creek. These wetlands are represented by Sample Plot 2. The dominant species within the tree and shrub strata is silver maple (*Acer saccharinum*, FAC). The herbaceous stratum within these wetlands is very sparsely vegetated without dominant plant species. Sweet wood-reed (*Cinna arundinacea*, FACW) is present in small amounts. Indicators of wetland hydrology present within these wetlands include standing water, water marks, drift deposits (in Wetland W-1), water stained leaves, sparsely vegetated concave surface, saturation visible on aerial imagery, and geomorphic position. The hydric soil indicators within these wetlands are depleted matrix and redox depressions.

Wetland W-19 is a moderately large wetland in the northeastern corner of the project area. This wetland contains PFO, PSS, and PEM vegetative communities represented by Sample Plots 16, 17, and 18, respectively. The dominant tree species within the PFO community is willow oak (*Quercus phellos*, FACW). American hornbeam (*Carpinus caroliniana*, FAC) is the dominant shrub species within this community. The dominant herbaceous species within this community include fowl manna grass (*Glyceria striata*, OBL) and Japanese honeysuckle (*Lonicera japonica*, FACU). The PSS community has a shrub stratum dominated by green ash saplings. Common fox sedge and shallow sedge (*Carex lurida*, OBL) are the dominant herbaceous species within this community. The PEM community is dominated by mild water-pepper and is similar to many of the other PEM wetlands within the agricultural fields. Hydrology indicators within this wetland include a high water table, soil saturation, water stained leaves, saturation visible on aerial imagery, geomorphic position, and the FAC-neutral test. The hydric soil indicator within this wetland is a depleted matrix.

Wetland W-21 is a PFO wetland that extends into the northeast portion of the project area. The community within this wetland is represented by Sample Plot 16 and is discussed in the description for Wetland W-19.

Wetlands W-22 and W-23 are both wetlands in the northeast portion of the project area that are composed of a PEM community within the agricultural field and a PFO community within the adjacent forest. The PFO community is represented by Sample Plot 20 and the PEM community is represented by Sample Plot 21. The dominant tree species within the PFO community is silver maple. The shrub stratum is dominated by American elm (*Ulmus americana*, FAC) and green ash. The dominant species within the herbaceous stratum is farewell-summer. The dominant species within the PEM community is soybean, with the crop showing visible signs of stress due to the hydrology. Wetland hydrology indicators within these wetlands include a high water table, water stained leaves, an algal mat or crust, drainage patterns, saturation visible on aerial imagery, and the FAC-neutral test. The soils within these wetlands have a depleted matrix, an indicator of hydric soils.

Wetlands W-26 and W-28 are PFO wetlands within the riparian forest west of Clear Creek. A portion of Wetland W-28 extends into the agricultural field and has a PEM community very similar to the majority of the PEM wetlands within the agricultural field. Sample Plot 23 represents the PFO community within these wetlands. Silver maple and American elm are the dominant tree species within this community. The herbaceous stratum is dominated by white grass (*Leersia virginica*, FACW), small-spike false nettle (*Boehmeria cylindrica*, FACW), and green ash, though overall it is sparsely vegetated. Indicators of wetland hydrology within these wetlands include standing water, water stained leaves, sparsely vegetated concave surface, and geomorphic position. Hydric soil indicators within these wetlands include depleted matrix and redox depressions.

Wetland W-30 is a small depressional wetland along the edge of the agricultural field with a PEM community represented by Sample Plot 25. The dominant herbaceous species within this community is rough barnyard grass. The northern portion of this wetland extends into the forest, and the PFO community is dominated by silver maple. The indicators of wetland hydrology present within this wetland include surface water, a high water table, soil saturation, water stained leaves, crayfish burrows, saturation visible on aerial imagery, geomorphic position, and the FAC-neutral test. Soils within this wetland have a depleted matrix, and indicator of hydric soils.

Wetland W-49 is located in the southeastern corner of the project area and has PEM and PFO vegetative communities. The PEM community is similar to most of the other PEM communities within the onsite agricultural fields. The PFO community is represented by Sample Plot 31. The tree stratum within this wetland is dominated by silver maple, American sycamore, red maple, and American elm. Green ash and American elm are the dominant species within the shrub stratum. The herbaceous stratum is sparsely vegetated, with water oak (*Quercus nigra*, FAC) and black willow (*Salix nigra*, OBL) seedlings present. Surface water, a high water table, soil saturation, drainage patterns, and moss trim lines are all present, indicating wetland hydrology. The soils have a depleted matrix indicative of hydric soils.

Wetlands W-45 and W-50 are small wetlands along the edge of the agricultural field west of Clear Creek. Sandy outwash from the agricultural field is present around these wetlands, and this is visible from the aerial imagery. The western portion of Wetland W-45 is a PEM community with vegetation similar to the other PEM wetlands within the agricultural fields. The eastern portion of W-45 and all of W-50 are PSS communities represented by Sample Plot 34. The dominant shrub species within this community include river birch (*Betula nigra*, FACW) and eastern cottonwood. The dominant species within the herbaceous stratum are eastern cottonwood and an unknown plant within the Asteraceae family. Indicators of wetland hydrology include surface water, inundation visible on aerial imagery, water stained leaves, drainage patterns, and geomorphic position. The hydric soil indicator present within these wetlands is a depleted matrix.

4.3 STREAMS, RIVERS, AND WET WEATHER CONVEYANCE

Thirty-three (33) features were identified and delineated within the project area as streams, rivers, or wet weather conveyances (WWC). Thirty-one (31) of these features were assessed using the methods described in Section 2.2.3. Clear Creek Canal was not assessed due to a previous hydrologic determination upstream of the project area completed in 2011 (Determination ID 2841). The Loosahatchie River was not assessed due to high water levels; however, because of the size, discharge, and onsite tributaries that assessed as perennial (i.e., Clear Creek and S-21), the Loosahatchie River is also assumed to be perennial. All on-site features were also assessed and assigned presumed jurisdiction under either TDEC or USACE. Based on the Clean Water Rule: Definition of "Water of the United States", thirteen (13) features are believed to waters of the United States and regulated under the Clean Water Act and therefore under USACE jurisdiction. Stream and wet weather conveyance assessment results are summarized in Table 4.3 and Table 4.4. Locations of these features are depicted in Figure 5 (Appendix A). Representative photographs are included in Appendix B, habitat data forms are provided in Appendix D, and Calculation of Normal Weather is included in Appendix E.

Table 4.3 Stream and Wet Weather Conveyance Determination and Presumed Jurisdiction Results within the Project Area

Feature		Photo*	Hydrologic Determination (TDEC)	Presumed Jurisdiction**	Average Bankfull Width (feet)	Length Within Project Area (linear feet)	Area within the Project Area (acres)
Clear Creek		224-226	NA	USACE	39.96	4,196	3.849
Loosahatchie River	a	227-229	NA	USACE	118.67	245	0.224
	b					684	0.378
S-1	a	97-100	Stream	USACE	3.75	383	0.033
	b					3,465	0.298
S-2		101-106	WWC	TDEC	5.6	3,648	0.469
S-3		107-109	WWC	TDEC	1.9	106	0.005
S-4		110-116	WWC	USACE	2.4	271	0.015
S-5		117-119	WWC	TDEC	2.4	143	0.008
S-6		120-122	WWC	TDEC	2.6	58	0.003
S-7		123-126	WWC	TDEC	3.5	196	0.016
S-8		127-129	WWC	TDEC	2.4	88	0.005
S-9		130-133	WWC	TDEC	2.4	75	0.004
S-10		134-135	WWC	TDEC	1.25	32	0.001
S-11		136-138	WWC	TDEC	2.5	33	0.002
S-12		139-140	WWC	TDEC	3	56	0.004
S-13		141-143	WWC	TDEC	1.5	39	0.001

Feature	Photo*	Hydrologic Determination (TDEC)	Presumed Jurisdiction**	Average Bankfull Width (feet)	Length Within Project Area (linear feet)	Area within the Project Area (acres)
S-14	144-147	WWC	USACE	1.8	101	0.004
S-15	148-150	WWC	TDEC	1.5	82	0.003
S-16	151-153	WWC	TDEC	1.3	35	0.001
S-17	154-156	WWC	TDEC	3	52	0.004
S-18	157-158	WWC	TDEC	2	18	0.001
S-19	159-171	Stream	USACE	3.9	772	0.069
S-20	172-177	WWC	USACE	4.1	230	0.022
S-21	178-183	Stream	USACE	8	1,558	0.286
S-22	184-190	WWC	TDEC	5.7	199	0.026
S-23	191-193	WWC	USACE	2.9	53	0.004
S-24	194-197	WWC	TDEC	1.8	92	0.004
S-25	198	WWC	USACE	0.7	18	<0.001
S-26	199-202	WWC	TDEC	2.4	295	0.016
S-27	203-207	WWC	TDEC	8.9	183	0.037
S-28	208-209; 214	WWC	TDEC	3.2	152	0.011
S-29	210-213	WWC	USACE	1.7	51	0.002
S-30	215-219	WWC	TDEC	6	586	0.081
S-31	220-223	WWC	USACE	4.2	83	0.008
Total Stream and Wet Weather Conveyance					**18,374**	**5.894**

*photos are located in Appendix B
** jurisdiction must be verified by USACE and TDEC

Table 4.4 Stream and Wet Weather Conveyance Assessment Results within the Project Area

Feature		Assessed Reach**		TDEC HD Score	NCDWQ Score	TDEC/NCDWQ Classification
		Upstream Extent (lat/long)	Downstream Extent (lat/long)			
Clear Creek		NA	NA	NA	NA	NA
Loosahatchie River	a b	NA	NA	NA	NA	NA
S-1	a b	35.277256, -89.716571	35.278482, -89.716638	23.75	25.5	Stream/Intermittent
S-2		35.277650, -89.719465	35.284513, -89.719306	17.5*	19	WWC/Ephemeral
S-3		35.285325, -89.717235	35.285260, -89.716897	9.5	11	WWC/Ephemeral
S-4		35.285057, -89.716114	35.285292, -89.716838	13	15.5	WWC/Ephemeral
S-5		35.285587, -89.716337	35.285254, -89.716543	10.25	11.75	WWC/Ephemeral
S-6		35.284495, -89.717043	35.284510, -89.716851	9.5	11	WWC/Ephemeral
S-7		35.284457, -89.716196	35.284447, -89.716821	13.25	14.75	WWC/Ephemeral
S-8		35.282856, -89.717080	35.282885, -89.716813	9	10.5	WWC/Ephemeral
S-9		35.281885, -89.717014	35.281897, -89.716783	10.75	12.5	WWC/Ephemeral
S-10		35.281287, -89.716854	35.281287, -89.716747	10.75	12.25	WWC/Ephemeral
S-11		35.281308, -89.716648	35.281285, -89.716727	10.75	12.25	WWC/Ephemeral
S-12		35.280668, -89.716912	35.280699, -89.716728	7.5	9	WWC/Ephemeral
S-13		35.280589, -89.716598	35.280600, -89.716703	11.5	13	WWC/Ephemeral
S-14		35.280219, -89.716388	35.280241, -89.716684	12	13.5	WWC/Ephemeral
S-15		35.279268, -89.716942	35.279295, -89.716680	7.5	9	WWC/Ephemeral
S-16		35.279146, -89.716567	35.279117, -89.716654	11	12.5	WWC/Ephemeral
S-17		35.278609, -89.716473	35.278618, -89.716632	9	10.5	WWC/Ephemeral
S-18		35.277938, -89.716487	35.277959, -89.716596	13	14.5	WWC/Ephemeral
S-19		35.274701, -89.718959	35.275581, -89.720782	18*	19.5	Stream/Intermittent

Feature	Assessed Reach**		TDEC HD Score	NCDWQ Score	TDEC/NCDWQ Classification
	Upstream Extent (lat/long)	Downstream Extent (lat/long)			
S-20	35.288668, -89.708645	35.288171, -89.708188	15	17.5	WWC/Ephemeral
S-21	35.287042, -89.710498	35.286304, -89.711157	25	26.5*	Stream/Perennial
S-22	35.286391, -89.710212	35.286724, -89.710654	12.25	13.75	WWC/Ephemeral
S-23	35.287324, -89.707429	35.287201, -89.707270	6.25	8.75	WWC/Ephemeral
S-24	35.286985, -89.707401	35.287236, -89.707359	4.5	6	WWC/Ephemeral
S-25	35.285673, -89.707420	NA	Primary #2	6.5	WWC/Ephemeral
S-26	35.280398, -89.711078	35.280408, -89.710125	10.25	11.75	WWC/Ephemeral
S-27	35.280569, -89.709407	35.280459, -89.709845	10.5	12	WWC/Ephemeral
S-28	35.278936, -89.710244	35.278881, -89.709836	9.75	11.25	WWC/Ephemeral
S-29	35.279284, -89.707575	35.279228, -89.707421	13.75	15.25	WWC/Intermittent
S-30	35.278767, -89.707467	35.278749, -89.709318	9.75	11.25	WWC/Ephemeral
S-31	35.288197, -89.714127	35.288002, -89.714079	15.5	16.5	WWC/Intermittent

* indicates assessors judgement overruled total score
**NA indicates not assessed

The Loosahatchie River, Clear Creek Canal, Stream S-1, and Stream S-2 are the larger streams within the project area. The Loosahatchie River is a channelized stream that flows from the northeast and along the northern portion of the project area. The Loosahatchie River is a tributary to the Mississippi River; the confluence is located northwest of Memphis.

Clear Creek Canal, also known as Cypress Creek, Stream S-1, and S-2 are tributaries to the Loosahatchie River. Clear Creak Canal, Stream S-1, and S-2 are channelized and generally flow south to north.

S-1 is an intermittent stream that originates south of the project area and flows north to the Loosahatchie River through the central portion of the project area. This stream has been severely altered and functions also as channelized drainage for the agricultural field. The stream accounts for 3,848 feet of waterway within the project area. Many of the other water features that were assessed flow into S-1. The substrate is composed primarily of sand and silt.

S-2 is an agricultural ditch/WWC that originates in the southwestern corner of the project area and flows north to the Loosahatchie River along the western edge of the project area. This feature is channelized, and the excavated castings are along the upland edges of the ditch. The feature accounts for 3,648 feet of waterway within the project area. Pools are present within S-2 and become intermittent pools towards the Loosahatchie River. The substrate is composed primarily of sand and silt.

S-3 is an ephemeral/WWC that originates at the eastern edge of the western soybean field in the project area. This feature is a rill composed of approximately 106ft of linear channel. S-3 flows east into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of sand and silt.

S-4 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. The feature is a rill composed of approximately 271ft of linear channel. S-4 flows west into S-1. The downstream portion of S-4 had a defined bed and bank. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of sand and silt.

S-5 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. This feature is a rill composed of approximately 143ft of linear channel. S-5 flows southwest into S-4. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of sand and silt.

S-6 is an ephemeral/WWC that originates at the eastern edge of the western soybean field in the project area. This feature is a rill composed of approximately 58ft of linear channel. S-6 flows east into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of sand and silt.

S-7 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. This feature is a rill composed of approximately 196ft of linear channel. S-7 flows west into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. Substrate is composed of clay and silt.

S-8 is an ephemeral/WWC that originates at the eastern edge of the western soybean field in the project area. This feature is a rill composed of approximately 88ft of linear channel. S-8 flows east into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of sand and silt.

S-9 is an ephemeral/WWC that originates at the eastern edge of the western soybean field in the project area. This feature is a rill composed of approximately 75ft of linear channel. S-9 flows east into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of sand and silt.

S-10 is an ephemeral/WWC that originates at the eastern edge of the western soybean field in the project area. This feature is a rill composed of approximately 32ft of linear channel. S-10 flows east into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt.

S-11 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. This feature is a rill composed of approximately 33ft of linear channel. S-11 flows west into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt and sand.

S-12 is an ephemeral/WWC that originates at the eastern edge of the western soybean field in the project area. This feature is a rill composed of approximately 56ft of linear channel. S-12 flows east into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt and sand.

S-13 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. This feature is a rill composed of approximately 39ft of linear channel. S-13 flows west into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt and sand.

S-14 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. This feature is a rill composed of approximately 101ft of linear channel. The downstream portion of S-14 had a clearly defined bed and bank. S-14 flows west into S-1 and has a hydrologic connection with Wetland W-14. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt and sand.

S-15 is an ephemeral/WWC that originates at the eastern edge of the western soybean field in the project area. This feature is a rill composed of approximately 82ft of linear channel. S-15 flows east into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt and sand.

S-16 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. This feature is a rill composed of approximately 35ft of linear channel. S-16 flows west into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt.

S-17 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. This feature is a rill composed of approximately 52ft of linear channel. S-17 flows west into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt and sand.

S-18 is an ephemeral/WWC that originates at the western edge of the central soybean field in the project area. This feature is a rill composed of approximately 41ft of linear channel. S-18 flows west into S-1. The channel was observed to be dry <24hrs after a significant rain event that occurred prior to the field assessment. The substrate is composed primarily of silt and sand.

S-19 is an intermittent stream within the southwestern parcel located south of the railroad tracks. This stream originates offsite and generally flows northwestern within the project area. The riparian area of this stream is both in soybean field and forested sections. Offsite to the west, the stream pools due to drainage alterations in a neighboring field. S-19 is composed of approximately 772ft of linear channel. The substrate is composed primarily of silt and clay.

S-20 is an ephemeral/WWC that originates in a wetland within a soybean field in the northeastern portion of the project area. This feature flows in a southeastern direction into Stream S-21. Alterations to this feature indicate that it was originally constructed in order to drain a low laying area within the agricultural field. This area is wetland and identified as W-22. S-20 is approximately 230 linear feet of channel. The substrate is composed primarily of silt and sand.

S-21 is a perennial stream that flows from east of the project area and southwest through the northeastern portion of the project area. This waterway is 1,558 linear feet and flows into Clear

Creek. S-21 is connected to an offsite stream that flows along the eastern boundary of the project area. The substrate is composed of silt and hardpan.

S-22 is an ephemeral/WWC that originates in the northern end of the southeastern soybean field. This feature originates on the edge of the soybean field and flows northwesterly. The feature is 199 linear feet and drains into S-21. The substrate is composed of silt and sand.

S-23 is an ephemeral/WWC that originates at the edge of the eastern soybean field on the eastern edge of the project area. This rill feature is approximately 53 linear feet of channel and flows southeast to an offsite unnamed feature that flows along the western boundary of the project area. The downstream portion of S-23 has a clearly defined bed and bank. The substrate is composed primarily of silt and sand.

S-24 is an ephemeral/WWC that originates at the edge of the eastern soybean field on the eastern edge of the project area. This feature flows north into S-23. The rill feature is approximately 92 linear feet of channel. The substrate is composed primarily of silt and sand.

S-25 is an ephemeral/WWC that originates at the edge of the eastern soybean field on the eastern edge of the project area. This feature flows east to an offsite unnamed feature. The feature has a poorly defined bed and bank and is partially vegetated. This feature is approximately 18 linear feet. The substrate is composed primarily of silt and sand.

S-26 is an ephemeral/WWC that is located near the eastern edge of the central soybean field in the southern portion of the project area. S-26 is 295 linear feet in length and flows through soybean field, Wetland W-45, and a riparian forest of Clear Creek before draining into it. The substrate is composed of silt.

S-27 is an ephemeral/WWC that originates on the western edge of the western soybean field, located in the southeastern portion of the project area. This feature originates at the edge of the riparian forest of Clear Creek. This feature is 183 linear feet and flows west into Clear Creek. The substrate is composed primarily of silt and sand.

S-28 is an ephemeral/WWC that originates on the eastern edge of the central soybean field, located in the south-central portion of the project area. This feature flows through Wetland W-50 located on the edge of the riparian forest and into Clear Creek. This feature is 152 linear feet. The substrate is composed primarily of silt and sand.

S-29 is an intermittent stream that drains Wetland W-49 and is located in the southeastern portion of the project area. The stream becomes defined near the eastern edge of the wetland and flows east toward an offsite unnamed stream. Although the “Presence of baseflow” metric was not available due to recent rainfall (~36hrs prior to assessment), baseflow would have been present after 48hrs and beyond due to the amount of standing water in the PEM/PFO wetland. Due to the presence of prolonged baseflow, feature was determined to be intermittent. The substrate is composed primarily of silt and sand.

S-30 is an ephemeral/WWC that originates east of the project area. This feature flows west through a wooded area in the southeastern portion of the project area and is 696 linear feet. The substrate is composed primarily of silt.

S-31 is an intermittent/WWC that provides hydrologic connection between Wetland W-1 and Wetland W-3. The feature flows in a northern direction through the riparian forest along the

Loosahatchie River. S-31 is approximately 83 linear feet. The substrate is composed primarily of silt and sand.

4.4 PONDS AND LAKES

No open water aquatic resources were identified within the project area.

5.0 REGULATORY JURISDICTION

The streams, wetlands, wet weather conveyance, and deepwater habitats described in this document are under the jurisdiction of USACE and/or TDEC. Wetlands are regulated by Sections 401 and 404 of the Clean Water Act and state wetland laws, including the Aquatic Resource Alteration Permit (ARAP) program. No filling may occur in these areas without their written permission. Please contact the Memphis Environmental Field Office of TDEC at (901) 371-3000 or the Memphis District USACE at (901) 544-3682 before working in these areas.

The following information is excerpted and summarized from the 2007 *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook.*

> "In 2001, the … U.S. Supreme Court's decision in the *Solid Waste Agency of Northern Cook County (SWANCC) v. Corps* held that isolated, intrastate, non-navigable waters could not be regulated under the CWA based solely on the presence of migratory birds. Following the SWANCC decision it generally was believed that a water body (including a wetland) was subject to CWA jurisdiction if the water body was part of the U.S. territorial seas, or a traditional navigable water, or any tributary to a traditional navigable water, or a wetland adjacent to any one of the above. In addition, isolated wetlands and other waters might be considered jurisdictional where they had the necessary link to either navigable waters or interstate commerce."

In the state of Tennessee, the Tennessee Water Quality Control Act of 1977 defines waters of the state in broad terms: "waters means 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." Therefore, isolated wetlands not under the jurisdiction of USACE are still regulated by TDEC and require an ARAP.

> "In 2006, the Supreme Court once again addressed the jurisdictional scope of Section 404 of the CWA, specifically the term "the waters of the U.S.," in *Rapanos v. U.S*. and in *Carabell v. U.S*. (hereafter referred to as Rapanos).
>
> The decision provides two new analytical standards for determining whether water bodies that are not traditional navigable waters (TNWs), including wetlands adjacent to those non-TNWs, are subject to CWA jurisdiction: (1) if the water body is relatively permanent, or if the water body is a wetland that directly abuts (e.g., the wetland is not separated from the tributary by uplands, a berm, dike, or similar feature) a relatively permanent water body (RPW), or (2) if a water body, in combination with all wetlands adjacent to that water body, has a significant nexus with TNWs. CWA jurisdiction over TNWs and their adjacent wetlands was not in question in this case, and, therefore, was not affected by the Rapanos decision. In addition, at least five of the Justices in Rapanos agreed that CWA jurisdiction exists over all TNWs and over all wetlands adjacent to TNWs.
>
> The Memo states that the [USACE and USEPA] will assert jurisdiction over the following categories of water bodies: TNWs; all wetlands adjacent to TNWs; non-navigable tributaries of TNWs that are relatively permanent (i.e., tributaries that typically flow year-round or have continuous flow at least seasonally); and wetlands that directly about such tributaries. In addition, the agencies will assert jurisdiction over every water body that is not an RPW if that water body is determined (on the basis of a fact-specific analysis) to have a significant nexus with a TNW. The classes of water body that are subject to CWA jurisdiction only if such a significant nexus is demonstrated are: non-navigable tributaries that do not typically flow year-round or have continuous flow at least seasonally; wetlands adjacent to such tributaries; and wetlands adjacent to but that do not directly about a relatively permanent, non-navigable

tributary. A significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or an insubstantial effect on the chemical, physical, and/or biological, integrity of a TNW. Principal considerations when evaluating significant nexus include the volume, duration, and frequency of the flow of water in the tributary and the proximity of the tributary to a TNW, plus the hydrologic, ecologic, and other functions performed by the tributary and all of its adjacent wetlands."

6.0 ASSUMPTIONS AND DISCLAIMERS

The constant influence of human activity on the project area can result in a rapid change of ecological boundaries. Over time, natural succession and changes in hydrology can also affect their boundaries. The precision of GPS collected data is subject to variation caused by canopy cover, atmospheric interference, and satellite configuration. Because slight inaccuracies are possible, all acreages and derived boundaries presented in this report are approximate.

The results and conclusions contained in this report apply to the year and date in which the data were collected. This report is not considered officially valid until it is approved by USACE. The report is then valid for a period of five years. Refer to the USACE Regulatory Guidance Letter # 94-1 (23 May 1994).

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Appendix A

Figures

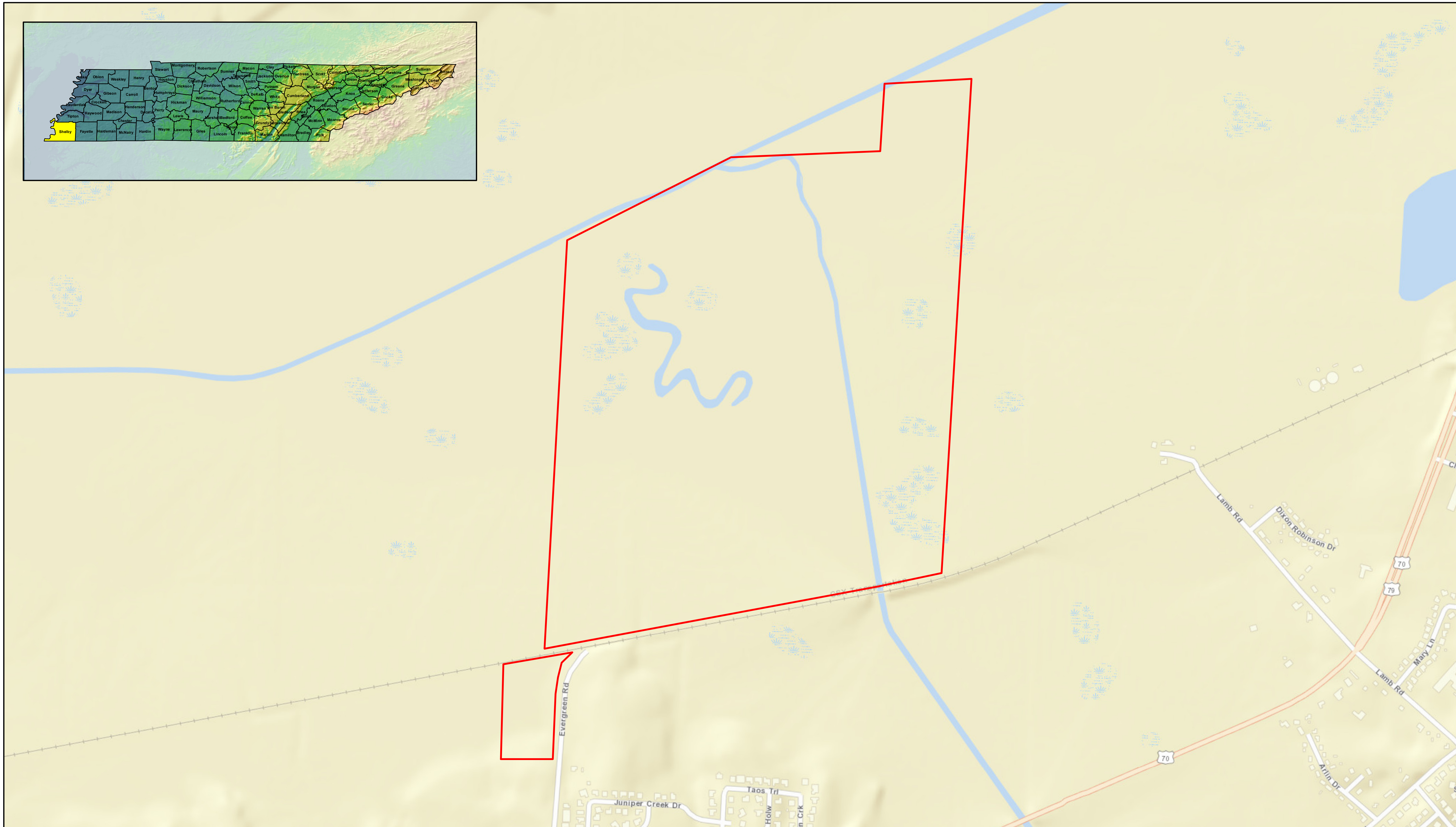

Figure 1. Location of Site on
Highway Map of Shelby County, Tennessee.
Smokestack Mitigation Bank Site.

Bolton Property

0 500 1,000 2,000 Feet

0 150 300 600 Meters

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Basemap courtesy of Esri.

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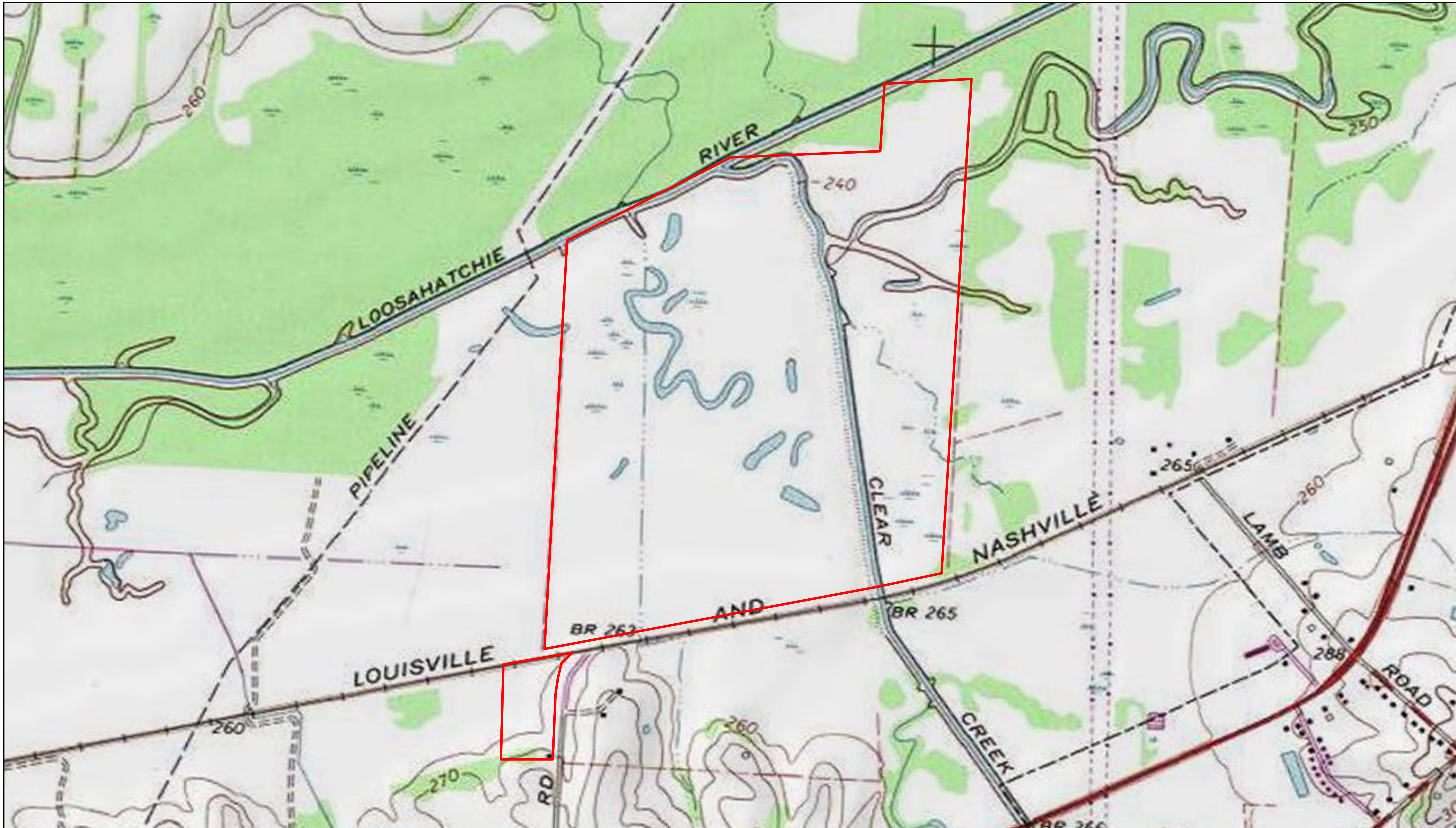

Figure 2. USGS 7.5-minute Topographic Map of Arlington Quadrangle. Smokestack Mitigation Bank Site.

Bolton Property

0 500 1,000 2,000 Feet

0 150 300 600 Meters

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Date: 11/26/2018

Basemap courtesy of National Geographic Society (2013).

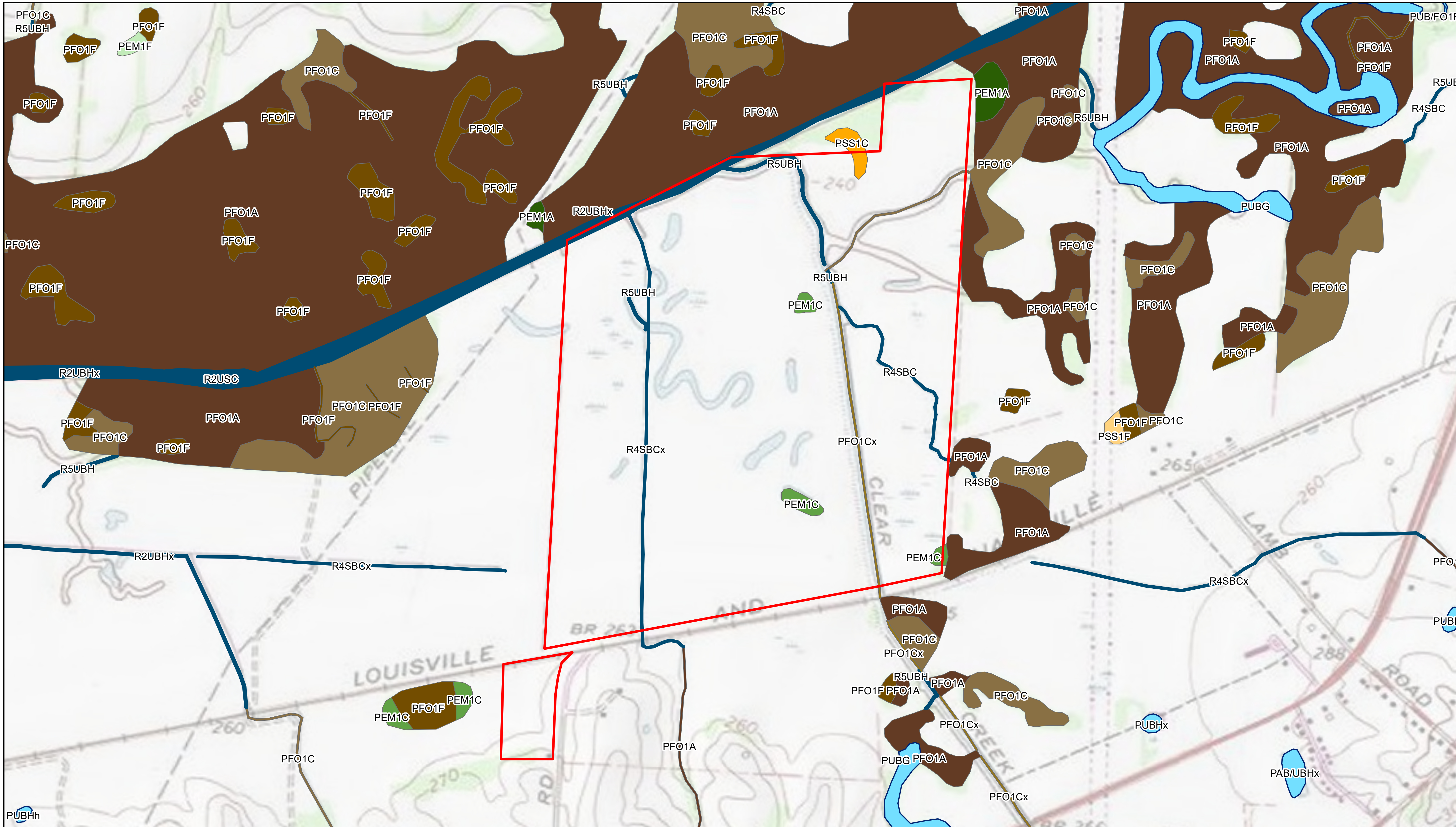

Figure 2. USGS 7.5-minute Topographic Map of Arlington Quadrangle. Smokestack Mitigation Bank Site.

Site

0 500 1,000 2,000 Feet

0 150 300 600 Meters

EnviroScience
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Date: 11/26/2018

Basemap courtesy of National Geographic Society (2013). NWI data courtesy of USFWS (current as of October 28, 2018).

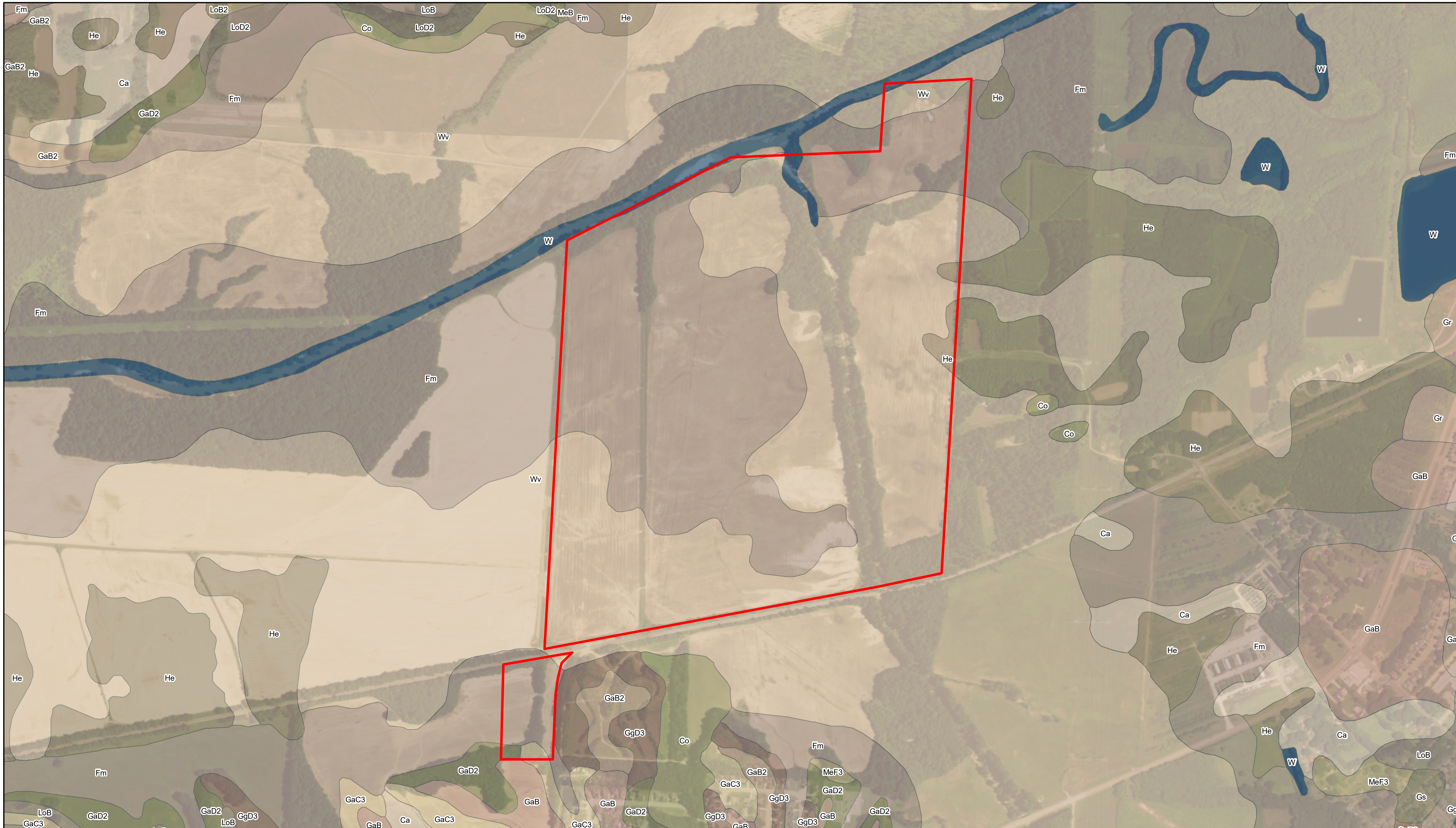

Figure 4.
Soil Map of Site in Shelby County, Tennessee.
Smokestack Mitigation Bank Site.

Bolton Property

0 500 1,000 2,000 Feet

0 150 300 600 Meters

EnviroScience
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Date: 11/26/2018

Basemap courtesy of Esri. Soil data courtesy of SSURGO.

Figure 5. Site Map Overview of Wetlands and Other Water Resources. Smokestack Mitigation Bank Site.

Bolton Property

0 500 1,000 2,000 Feet

0 150 300 600 Meters

EnviroScience
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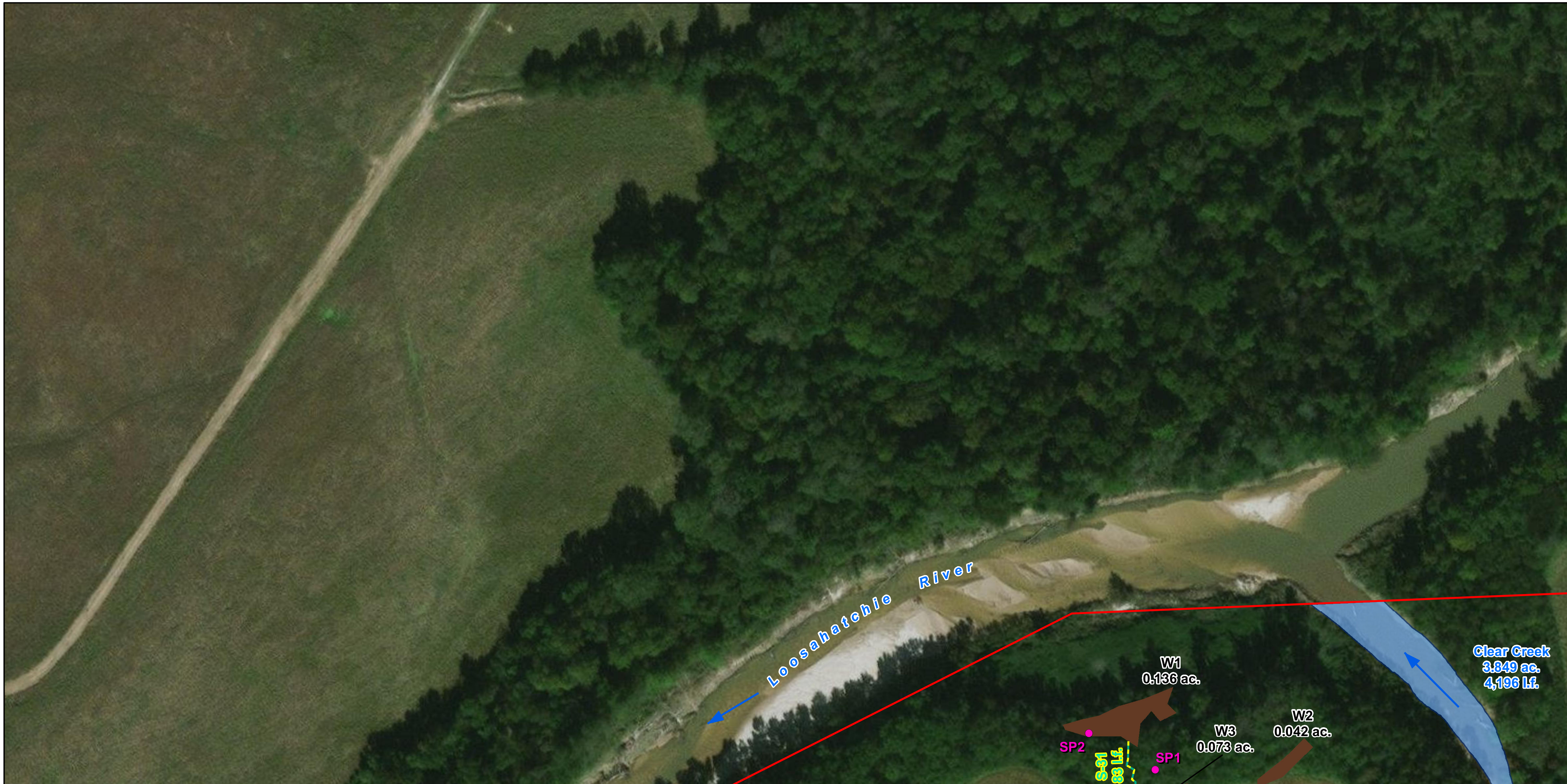
Date: 11/26/2018

Basemap courtesy of Esri.



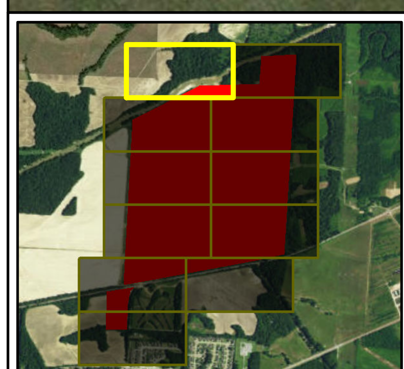


Figure 5.01. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

5.01

Waters of the United States

Tennessee Department of Environmental Conservation Hydrologic Determination

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch
- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

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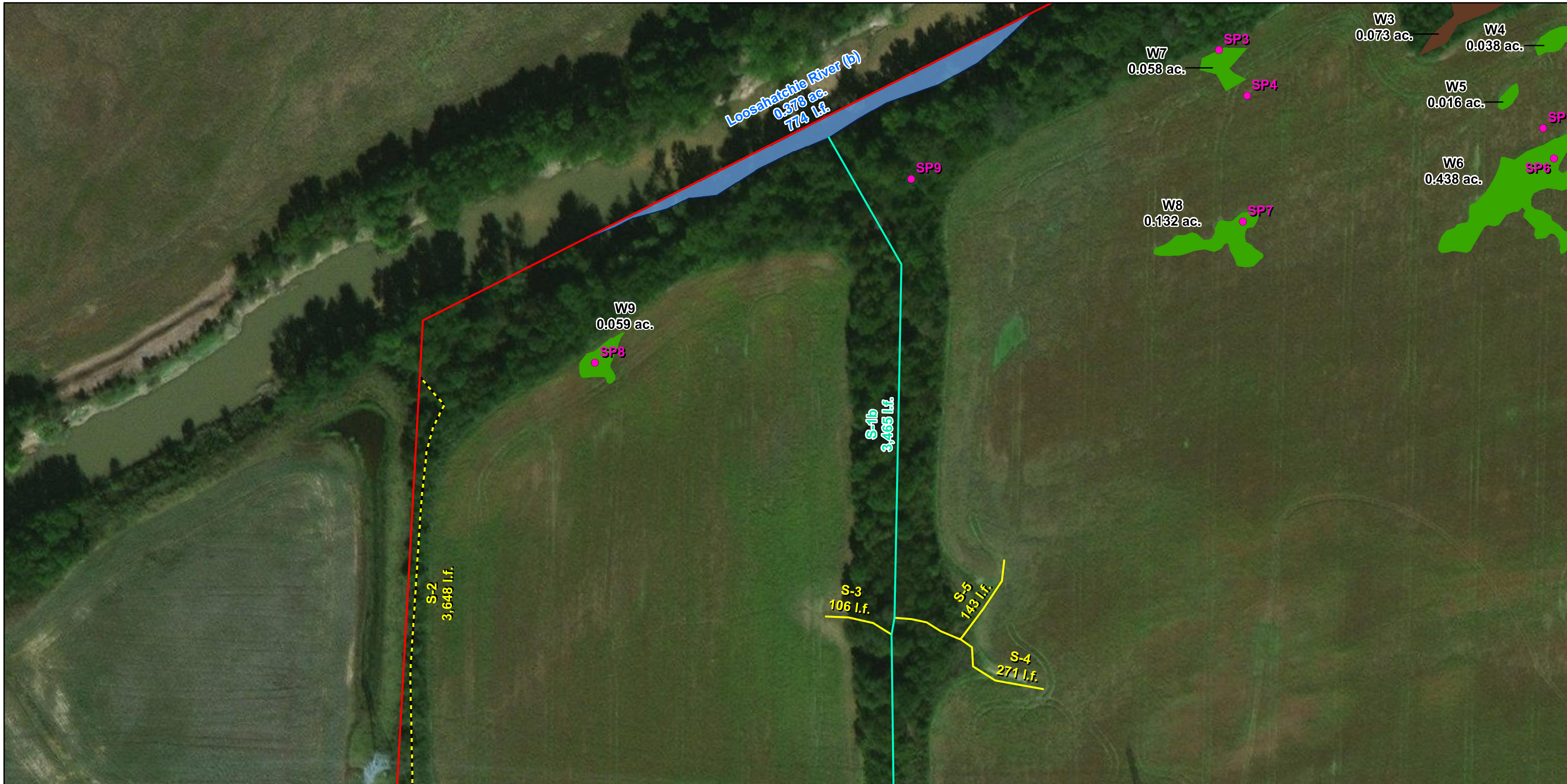
Date: 6/17/2019

Basemap courtesy of Esri.



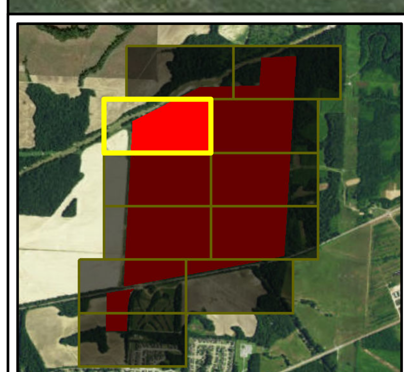


Figure 5.02. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.02

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Date: 6/17/2019

Basemap courtesy of Esri.

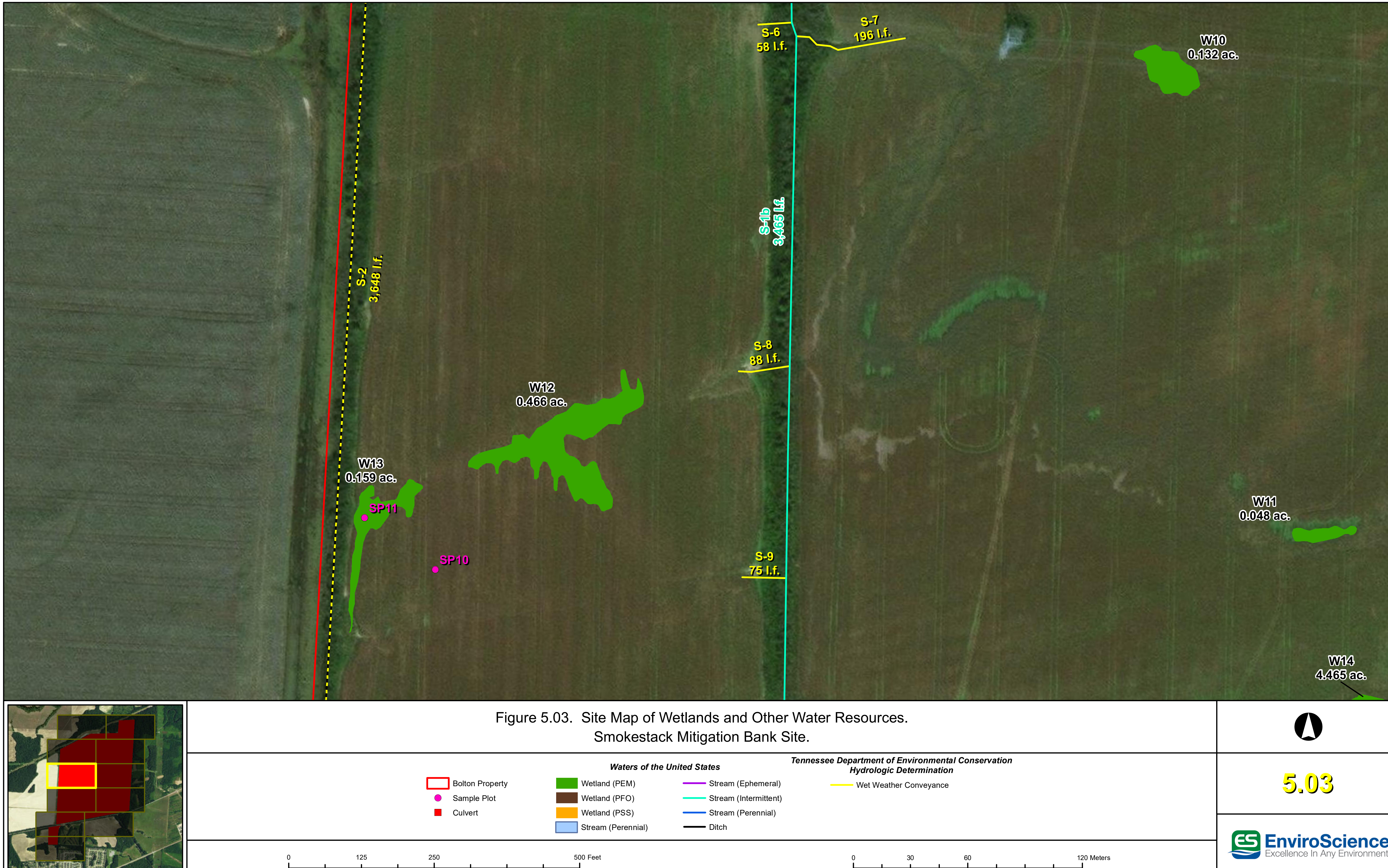

Figure 5.03. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Date: 6/17/2019

Basemap courtesy of Esri.

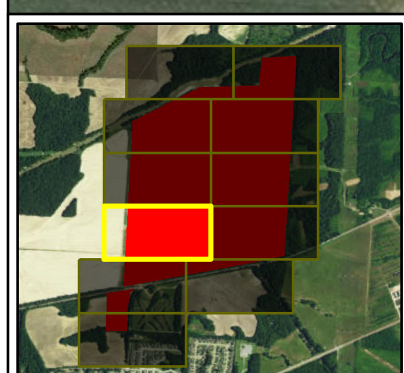

Figure 5.04. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

Bolton Property
Sample Plot
Culvert
Wetland (PEM)
Wetland (PFO)
Wetland (PSS)
Stream (Perennial)
Stream (Ephemeral)
Stream (Intermittent)
Stream (Perennial)
Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.04

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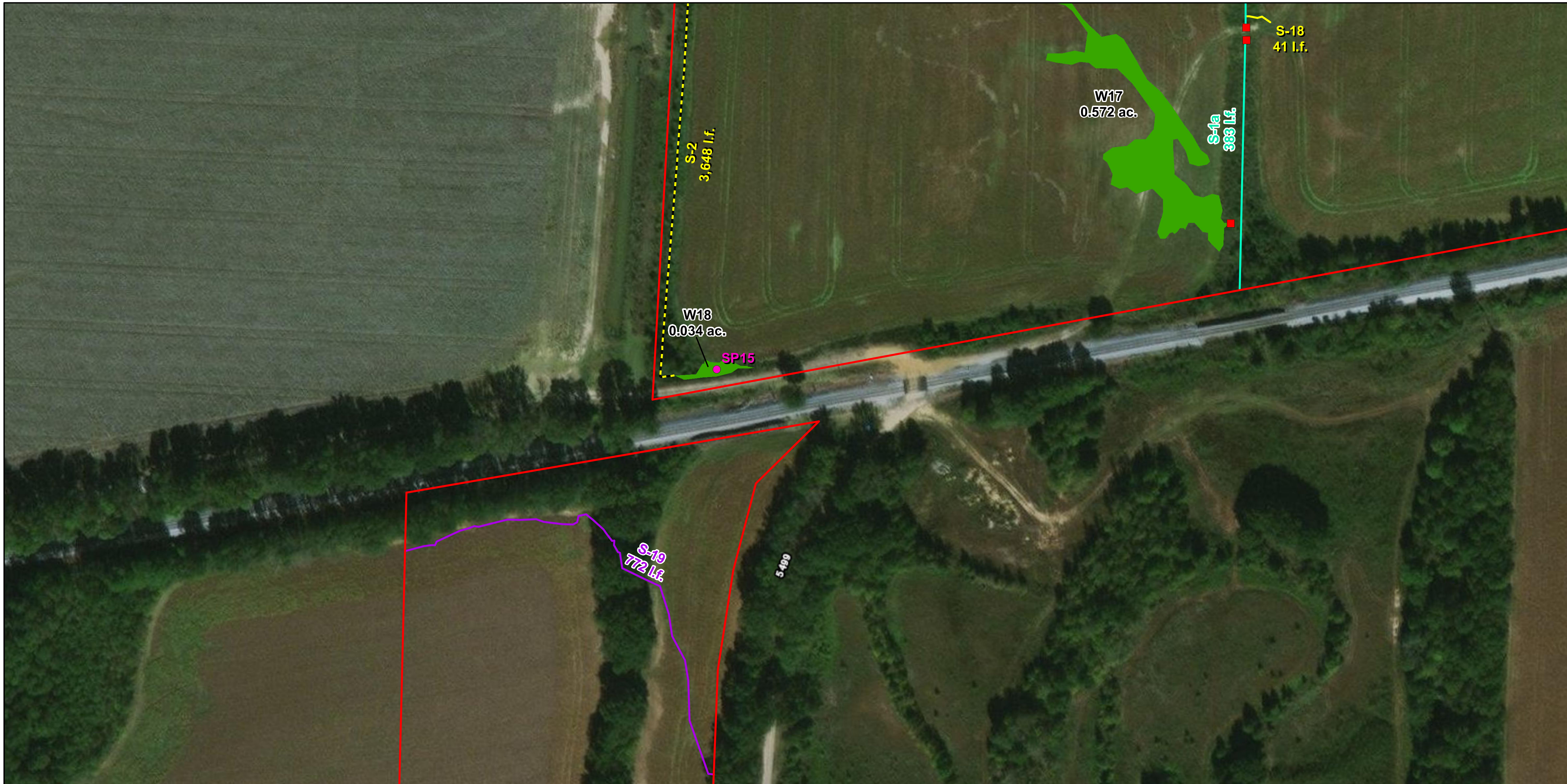
Date: 6/17/2019

Basemap courtesy of Esri.



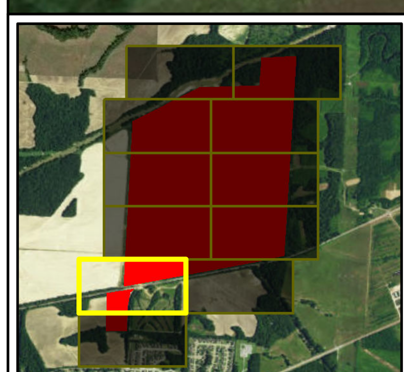


Figure 5.05. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

Bolton Property
Sample Plot
Culvert
Wetland (PEM)
Wetland (PFO)
Wetland (PSS)
Stream (Perennial)
Stream (Ephemeral)
Stream (Intermittent)
Stream (Perennial)
Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.05

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Date: 6/17/2019

Basemap courtesy of Esri.

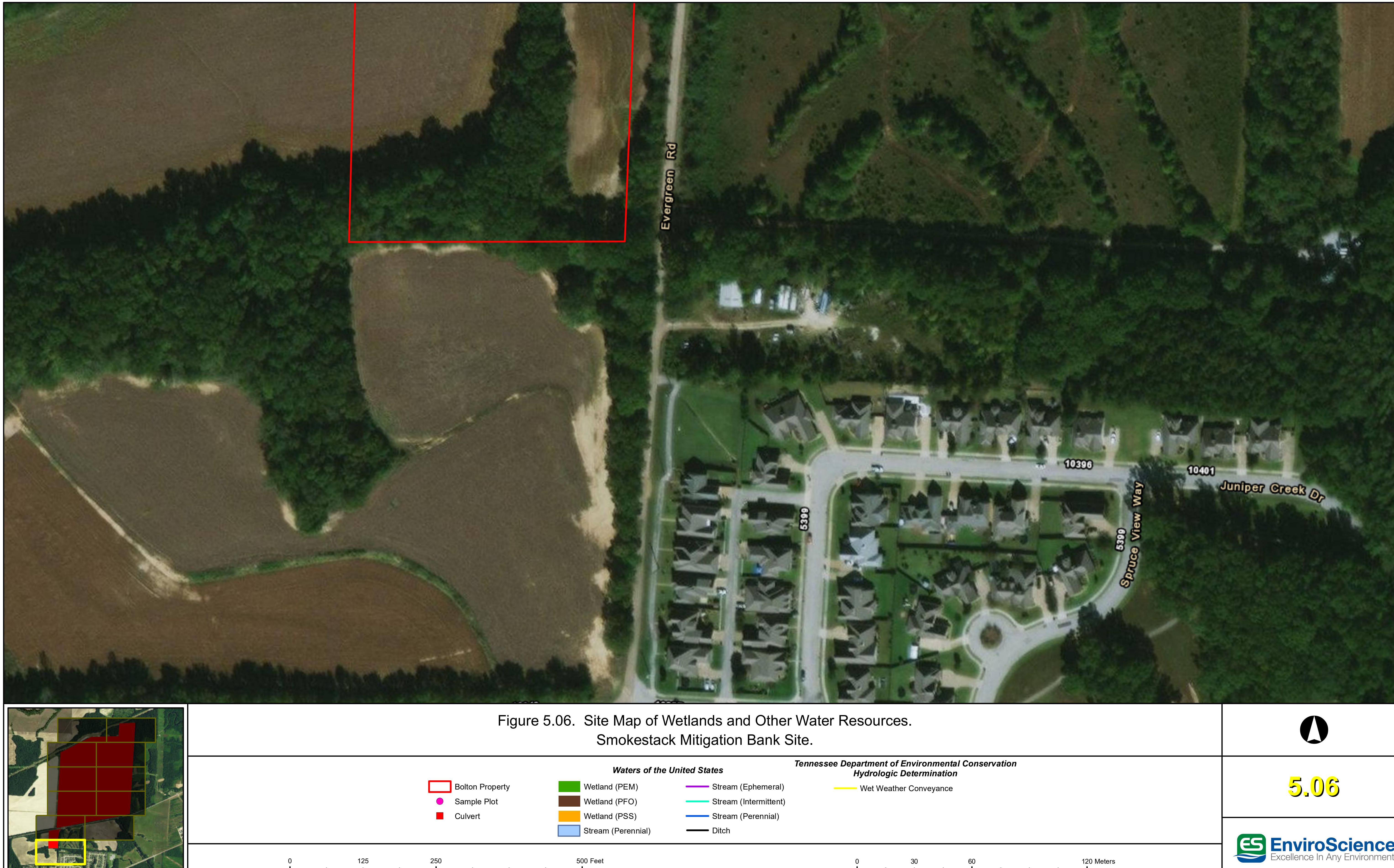

Figure 5.06. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

5.06

Waters of the United States

Tennessee Department of Environmental Conservation Hydrologic Determination

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch
- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

EnviroScience
Excellence In Any Environment

Date: 6/17/2019

Basemap courtesy of Esri.

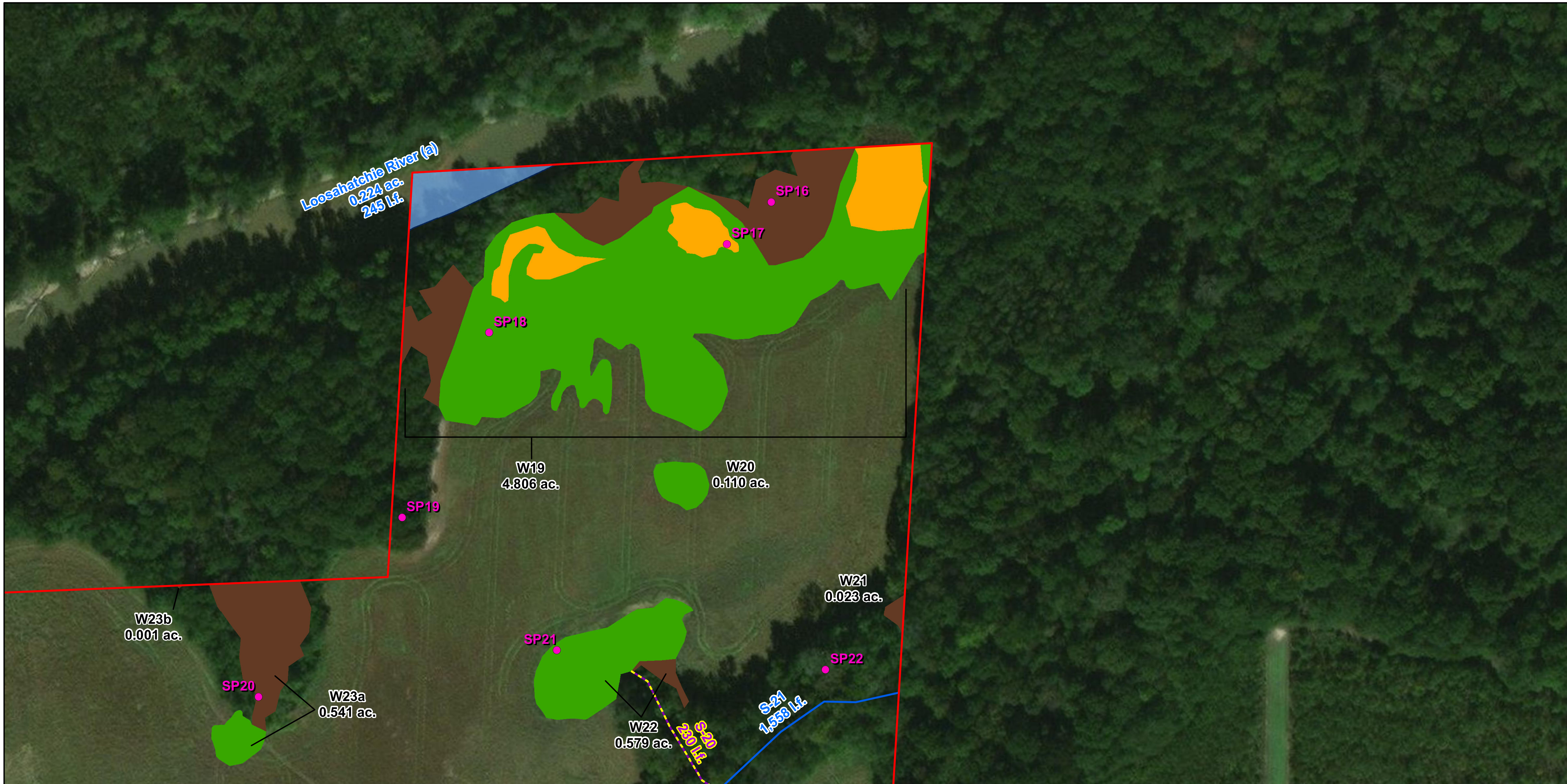

Figure 5.07. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

Tennessee Department of Environmental Conservation Hydrologic Determination

Bolton Property
Sample Plot
Culvert
Wetland (PEM)
Wetland (PFO)
Wetland (PSS)
Stream (Perennial)
Stream (Ephemeral)
Stream (Intermittent)
Stream (Perennial)
Ditch
Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.07

EnviroScience
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Basemap courtesy of Esri.

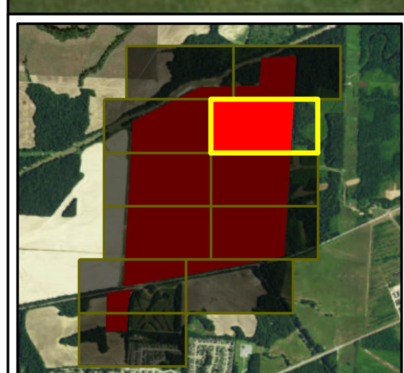

Figure 5.08. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

Tennessee Department of Environmental Conservation Hydrologic Determination

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch
- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.08

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Date: 6/17/2019

Basemap courtesy of Esri.

Figure 5.09. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.09

EnviroScience
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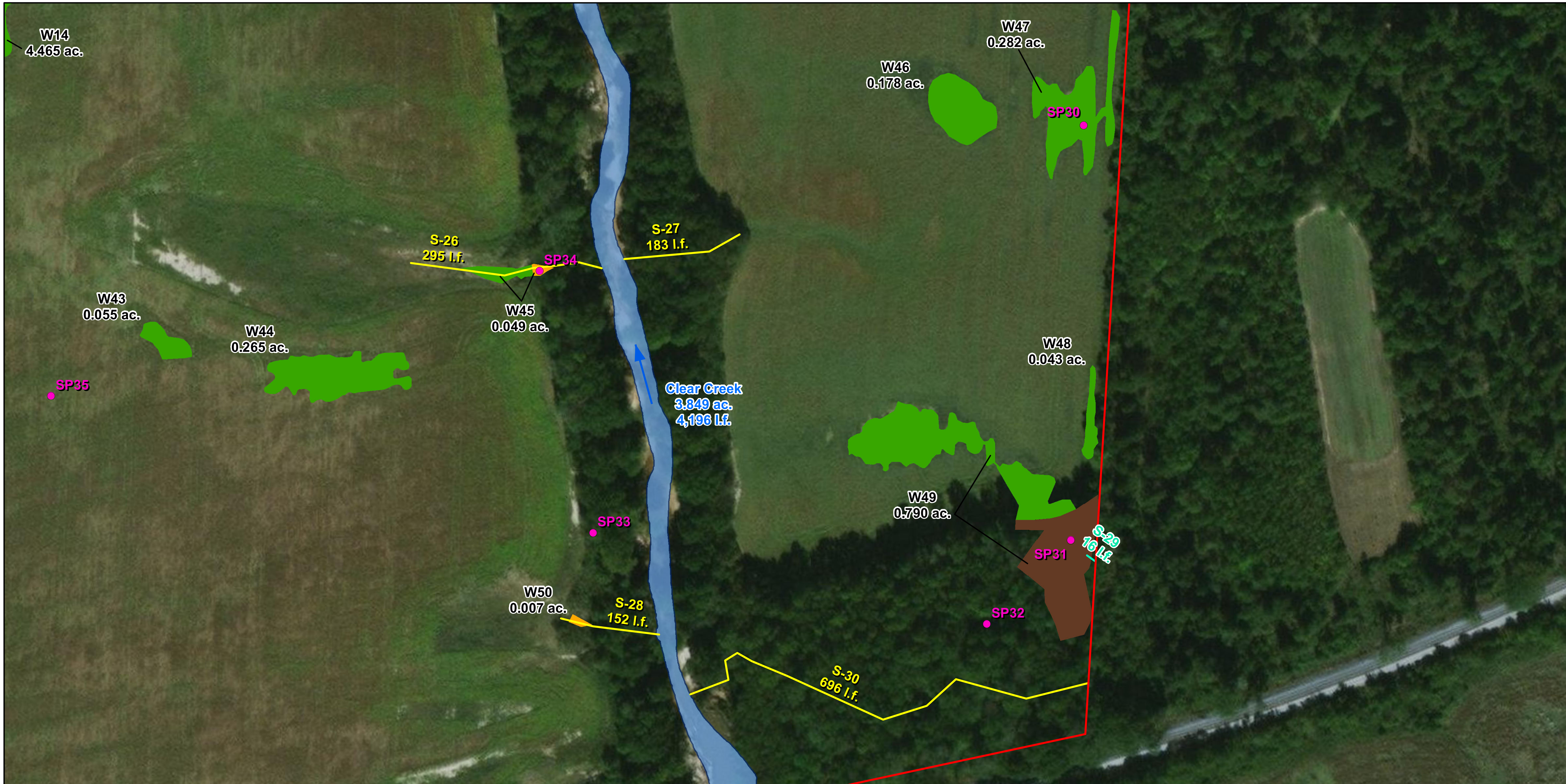
Date: 6/17/2019

Basemap courtesy of Esri.



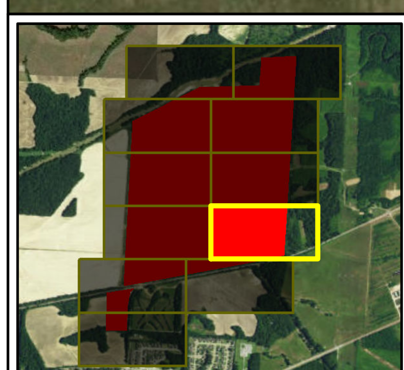


Figure 5.10. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Waters of the United States

- Bolton Property
- Sample Plot
- Culvert
- Wetland (PEM)
- Wetland (PFO)
- Wetland (PSS)
- Stream (Perennial)
- Stream (Ephemeral)
- Stream (Intermittent)
- Stream (Perennial)
- Ditch

Tennessee Department of Environmental Conservation Hydrologic Determination

- Wet Weather Conveyance

0 125 250 500 Feet

0 30 60 120 Meters

5.10

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Date: 6/17/2019

Basemap courtesy of Esri.

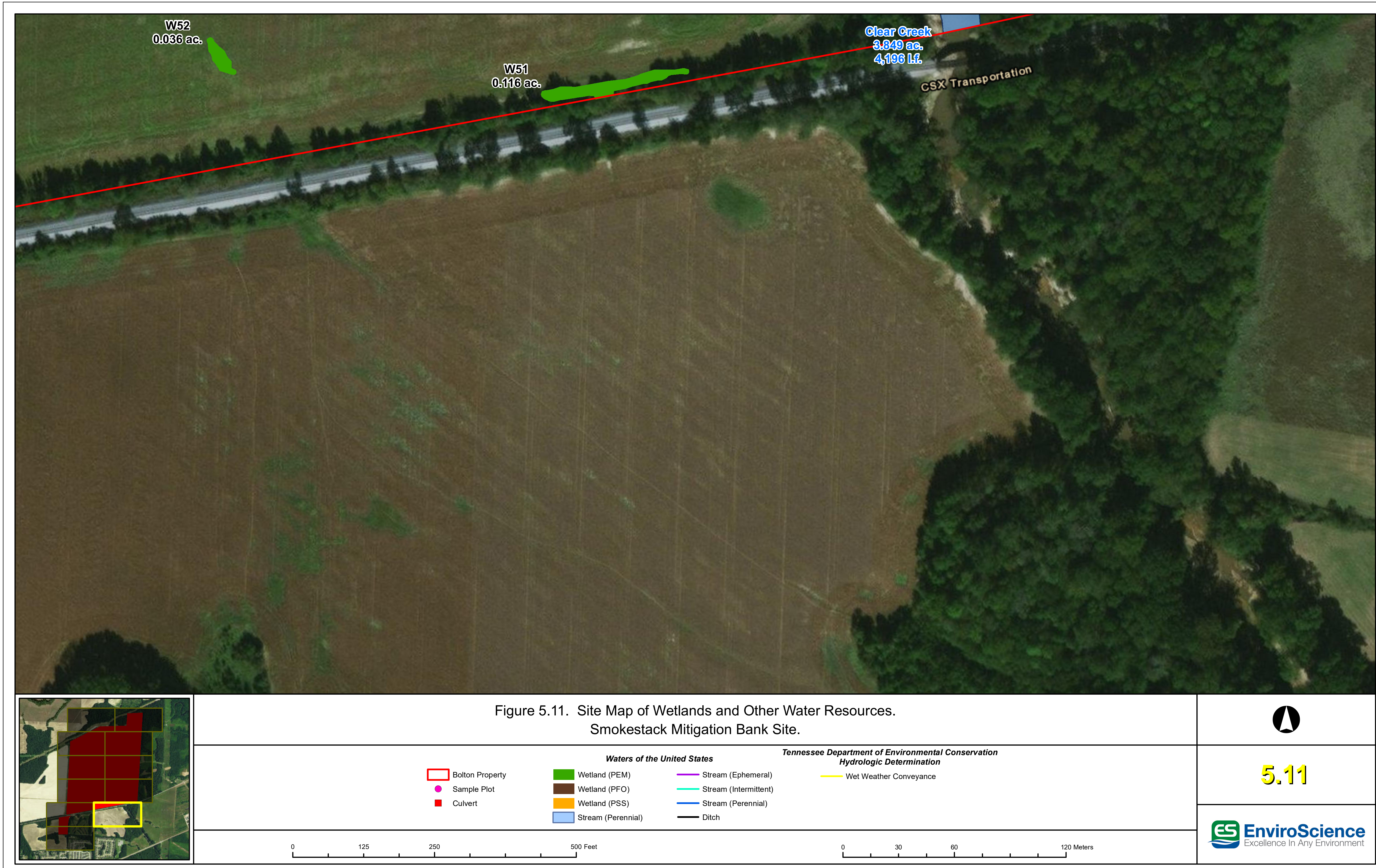

Figure 5.11. Site Map of Wetlands and Other Water Resources.
Smokestack Mitigation Bank Site.

Basemap courtesy of Esri.

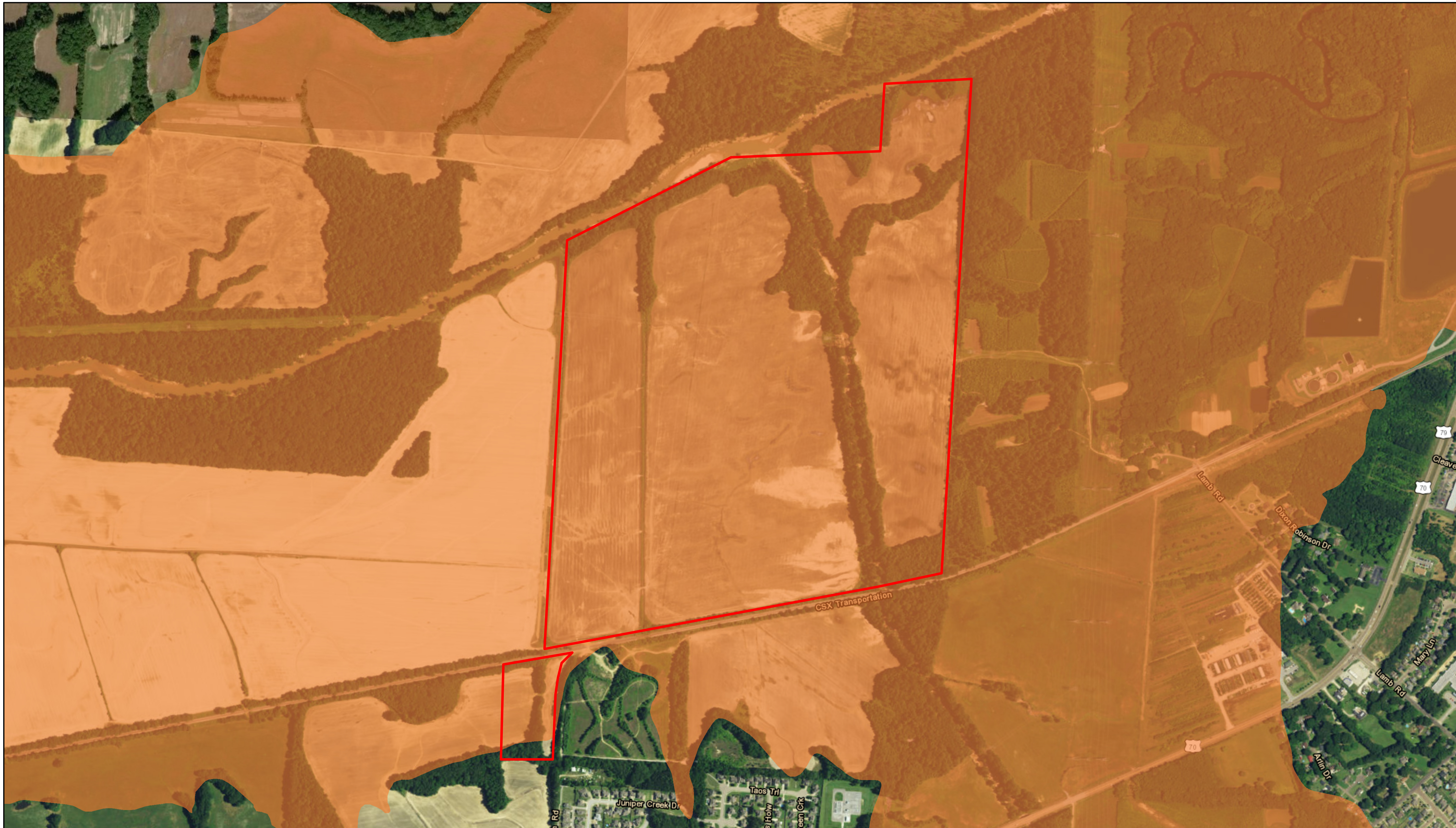

Figure 6.
FEMA Map of Site in Shelby County, Tennessee.
Smokestack Mitigation Bank Site.

Bolton Property

0 500 1,000 2,000 Feet

0 150 300 600 Meters

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Path: \\fileserver\common\10_Projects\R\RES\430R\11596_Memphis\Wetland Delineation\GIS\Map6_FEMA.mxd

Date: 11/26/2018

Basemap courtesy of Esri. Flood data courtesy of FEMA.

Appendix B

Photographs

Photo 1. Sample Plot 1 representing a forest community within the project area.

Photo 2. Sample Plot 2 representing a palustrine forested (PFO) wetland community within Wetland W-1.

Photo 3. Sample Plot 3 representing a palustrine emergent (PEM) wetland community within Wetland W-7.

Photo 4. Sample Plot 4 representing an agricultural field community within the project area.

Photo 5. Sample Plot 5 representing an agricultural field community within the project area.

Photo 6. Sample Plot 6 representing a PEM wetland community within Wetland W-6.

Photo 7. Sample Plot 7 representing a PEM wetland community within Wetland W-8.

Photo 8. Sample Plot 8 representing a PEM wetland community within Wetland W-9.

Photo 9. Sample Plot 9 representing a forest community within the project area.

Photo 10. Sample Plot 10 representing an agricultural field community within the project area.

Photo 11. Sample Plot 11 representing a PEM wetland community within Wetland W-13.

Photo 12. Sample Plot 12 representing a PEM wetland community within Wetland W-16.

Photo 13. Sample Plot 13 representing an agricultural field community within the project area.

Photo 14. Sample Plot 14 representing a PEM wetland community within Wetland W-14.

Photo 15. Sample Plot 15 representing a PEM wetland community within Wetland W-18.

Photo 16. Sample Plot 16 representing a PFO wetland community within Wetland W-19.

Photo 17. Sample Plot 17 representing a palustrine scrub-shrub (PSS) wetland community within Wetland W-19.

Photo 18. Sample Plot 18 representing a PEM wetland community within Wetland W-19.

Photo 19. Sample Plot 19 representing a forest community within the project area.

Photo 20. Sample Plot 20 representing a PFO wetland community within Wetland W-23.

Photo 21. Sample Plot 21 representing a PEM wetland community within Wetland W-22.

Photo 22. Sample Plot 22 representing a forest community within the project area.

Photo 23. Sample Plot 23 representing a PFO wetland community within Wetland W-26.

Photo 24. Sample Plot 24 representing a forest community within the project area.

Photo 25. Sample Plot 25 representing a PEM wetland community within Wetland W-30.

Photo 26. Sample Plot 26 representing a PEM wetland community within Wetland W-33.

Photo 27. Sample Plot 27 representing an agricultural field community within the project area.

Photo 28. Sample Plot 28 representing a PEM wetland community within Wetland W-41.

Photo 29. Sample Plot 29 representing a PEM wetland community within Wetland W-38.

Photo 30. Sample Plot 30 representing a PEM wetland community within Wetland W-47.

Photo 31. Sample Plot 31 representing a PFO wetland community within Wetland W-49.

Photo 32. Sample Plot 32 representing a forest community within the project area.

Photo 33. Sample Plot 33 representing a forest community within the project area.

Photo 34. Sample Plot 34 representing a PSS wetland community within Wetland W-45.

Photo 35. Sample Plot 35 representing an agricultural field community within the project area.

Photo 36. Wetland W-1 (PFO) facing west.

Photo 37. Wetland W-2 (PFO) facing east.

Photo 38. Wetland W-3 (PFO) facing west.

Photo 39. Wetland W-4 (PEM) facing west.

Photo 40. Wetland W-5 (PEM) facing south.

Photo 41. Wetland W-6 (PEM) facing west.

Photo 42. Wetland W-7 (PEM) facing west.

Photo 43. Wetland W-8 (PEM) facing east.

Photo 44. Wetland W-9 (PEM) facing south.

Photo 45. Wetland W-10 (PEM) facing east.

Photo 46. Wetland W-11 (PEM) facing west.

Photo 47. Wetland W-12 (PEM) facing south.

Photo 48. Wetland W-13 (PEM) facing north.

Photo 49. Wetland W-14 (PEM) facing east.

Photo 50. Wetland W-15 (PEM) facing east.

Photo 51. Wetland W-16 (PEM) facing south.

Photo 52. Wetland W-17 (PEM) facing south.

Photo 53. Wetland W-18 (PEM) facing east.

Photo 54. Wetland W-18 (PEM) facing west.

Photo 55. Wetland W-19 (PEM) facing north.

Photo 56. Wetland W-19 (PEM) facing east.

Photo 57. Wetland W-19 (PFO) facing east.

Photo 58. Wetland W-19 (PFO) facing south.

Photo 59. Wetland W-19 (PSS) facing east.

Photo 60. Wetland W-20 (PEM) facing north.

Photo 61. Wetland W-21 (PFO) facing north.

Photo 62. Wetland W-22 (PEM) facing west.

Photo 63. Wetland W-23 (PEM) facing northeast.

Photo 64. Wetland W-23 (PFO) facing east.

Photo 65. Wetland W-24 (PEM) facing north.

Photo 66. Wetland W-25 (PEM) facing south.

Photo 67. Wetland W-26 (PFO) facing northeast.

Photo 68. Wetland W-27 (PEM) facing east.

Photo 69. Wetland W-28 (PFO) facing east.

Photo 70. Wetland W-29 (PEM) facing northeast.

Photo 71. Wetland W-30 (PEM) facing south.

Photo 72. Wetland W-30 (PFO) facing north.

Photo 73. Wetland W-31 (PEM) facing north.

Photo 74. Wetland W-32 (PEM) facing south.

Photo 75. Wetland W-33 (PEM) facing southeast.

Photo 76. Wetland W-34 (PEM) facing northeast.

Photo 77. Wetland W-35 (PEM) facing east.

Photo 78. Wetland W-36 (PEM) facing north.

Photo 79. Wetland W-37 (PEM) facing south.

Photo 80. Wetland W-38 (PEM) facing south.

Photo 81. Wetland W-39 (PEM) facing north.

Photo 82. Wetland W-40 (PEM) facing east.

Photo 83. Wetland W-41 (PEM) facing east.

Photo 84. Wetland W-42 (PEM) facing north.

Photo 85. Wetland W-43 (PEM) facing west.

Photo 86. Wetland W-44 (PEM) facing south.

Photo 87. Wetland W-45 (PEM) facing west.

Photo 88. Wetland W-45 (PSS) facing south.

Photo 89. Wetland W-46 (PEM) facing north.

Photo 90. Wetland W-47 (PEM) facing southeast.

Photo 91. Wetland W-48 (PEM) facing south.

Photo 92. Wetland W-49 (PEM) facing south.

Photo 93. Wetland W-49 (PFO) facing north.

Photo 94. Wetland W-50 (PSS) facing east.

Photo 95. Wetland W-51 (PEM) facing east.

Photo 96. Wetland W-52 (PEM) facing north.

Photo 97. Shows S-1 vegetated riparian, bordering soy fields on each side. Manmade levee on the left descending bank (11/5/18)

Photo 98. S-1 from middle of assessed reach, facing upstream (11/5/18)

Photo 99. Culverted crossing of S-1 with aquatic vegetation (11/5/18)

Photo 100. Shows S-1 downstream of the culvert, facing downstream (11/5/18)

Photo 101. S-2, facing upstream, showing the upper end of the reach (11/5/18)

Photo 102. S-2, facing downstream, showing the upper end of the reach (11/5/18)

Photo 103. S-2 facing upstream show the incised channel (11/5/18)

Photo 104. Depicts the middle of the S-2 reach with aquatic vegetation, defined bed and banks (11/5/18)

Photo 105. S-2 lower end of reach, shows decreased water in channel (11/5/18)

Photo 106. Shows S-2 becomes intermittent in lower reach (11/5/18)

Photo 107. Upper reach of S-3, shows lack of defined bed and bank before running into wood line (11/13/18)

Photo 108. S-3, showing channel becomes more defined within the wood line, but little evidence feature consistently moves water (11/13/18)

Photo 109. S-3, showing confluence with S-1. Presence of leaves still in channel after large rain events indicates hydraulic use is low (11/13/18)

Photo 110. Large headcut at top of feature S-4 (11/13/18)

Photo 111. S-4 channel, facing downstream (11/13/18)

Photo 112. S-4 showing weak banks and small floodplain (11/13/18)

Photo 113. S-4 lower reach, showing stronger bed and bank before confluence with S-5 (11/13/18)

Photo 114. S-4 with incoming S-5 feature (11/13/18)

Photo 115. Incised S-4 channel (11/13/18)

Photo 116. Confluence of S-4 with S1, facing downstream (11/13/18)

Photo 117. Upper reach of S-5, showing developing channel (11/13/18)

Photo 118. Defined bed and bank of S-5 (11/13/18)

Photo 119. S-5 lower reach, before confluence with S-4, facing downstream (11/13/18)

Photo 120. Depicts the channel of S-6, facing downstream (11/13/18)


Photo 121. Headcut at the top of feature S-6 (11/13/18)


Photo 122. S-6, showing upland vegetation dominates the lower reach's channel before confluence with S-1 (11/13/18)

Photo 123. Top of feature S-7 (11/13/18)

Photo 124. Formation of S-7 channel (11/13/18)


Photo 125. S-7 starting to incise through the soil profile (11/13/18)


Photo 126. Defined channel of S-7, facing downstream (11/13/18)

Photo 127. Depicts the channel of feature S-8, facing downstream (11/13/18)

Photo 128. Large headcut with standing water at the top of S-8 (11/13/18)

Photo 129. S-8, showing lower reach is dominated by upland vegetation. (11/13/18)

Photo 130. Shows entire S-9 feature with defined bed and bank (11/13/18)

Photo 131. Shows headcut at top of S-9 (11/13/18)

Photo 132. S-9, showing channel incision but upland plants present in channel (11/13/18)

Photo 133. Channel passing through riparian zone of feature S-1 before confluence (11/13/18)

Photo 134. Shows extremely short feature with incision of S-10 (11/13/18)

Photo 135. Shows headcut into defined channel of feature S-10 (11/13/18)

Photo 136. Formation of S-11 off soy field, facing downstream (11/13/18)

Photo 137. S-11 channel, showing defined channel through incision and confluence with S-1 (11/13/18)

Photo 138. S-11 showing short defined channel as headcut developed off soy field (11/13/18)

Photo 139. S-12 upper reach with undefined banks and upland vegetation (11/13/18)

Photo 140. Shows poorly defined channel with encroaching upland vegetation of S-12 as the feature joins S-1 (11/13/18)


Photo 141. Formation of S-13 channel, facing downstream (11/13/18)


Photo 142. S-13 channel, facing downstream (11/13/18)

Photo 143. S-13 confluence with S-1, showing vegetated channel (11/13/18)

Photo 144. Top of S-14 feature, showing channel formation facing downstream (11/13/18)

Photo 145. S-14 mid-reach, facing downstream (11/13/18)

Photo 146. Lower reach of S-14, showing large pool and headcut (11/13/18)

Photo 147. S-14 confluence with S-1 (11/13/18)

Photo 148. Upper reach of S-15, shows poor channel definition and developed in-channel structure (11/13/18)

Photo 149. Middle of S-15 reach, shows overly wide channel with poor banks and bed (11/13/18)

Photo 150. Lower reach of S-15 shows elements of primary indicator #2 for WWC (11/13/18)


Photo 151. S-16 at top of feature, showing drainage off soy field (11/13/18)


Photo 152. Middle of S-16 reach, facing downstream (11/13/18)

Photo 153. S-16 at confluence with S-1, facing downstream (11/13/18)

Photo 154. S-17 showing headcut at top of feature and water source from soy field (11/13/18)

Photo 155. S-17 from top of feature, facing downstream (11/13/18)

Photo 156. S-17 showing large pool, facing downstream (11/13/18)

Photo 157. S-18 from top of feature, facing downgradient (11/13/18)

Photo 158. S-18 showing headcut at top of feature (11/13/18)

Photo 159. Top of assessment area for S-19, at culverted crossing. (11/14/18)

Photo 160. Feature S-19 coming out of wood line and into soy field, showing intermittent water in channel (11/14/18)

Photo 161. S-19 winding through soy field with intermittent water, additional drainage coming from offsite feature into S-19 (11/14/18)

Photo 162. Additional offsite feature draining into S-19 (11/14/18)

Photo 163. S-19, large pool in feature, upland grasses present in the channel (11/14/18)

Photo 164. S-19, showing sorting of substrates in channel (11/14/18)

Photo 165. S-19, showing reach lacks defined bed and bank and dominated by upland vegetation (11/14/18)

Photo 166. Feature S-19 runs into wood line where bed and bank features become more defined (11/14/18)

Photo 167. S-19, defined bed and bank with wetland plants in channel (11/14/18)

Photo 168. Wetland plants present in S-19 channel (11/14/18)

Photo 169. More hydrophytic plants present in S-19 channel (11/14/18)

Photo 170. S-19, headcut present where channel is covered by a complex of roots, water present in channel again (11/14/18)

Photo 171. Large pool present at lower end of reach, S-19 ends after bend (11/14/18)

Photo 172. Wetland provides source water for feature S-20, facing upstream (11/14/18)

Photo 173. Start of drainage feature S-20, facing downstream (11/14/18)

Photo 174. Water present in S-20's channel ~36hrs after significant rain event (11/14/18)

Photo 175. S-20, showing water level at bank full, facing downstream (11/14/18)

Photo 176. S-20 channel shows low sinuosity and wrack lines along channel margins (11/14/18)


Photo 177. Increased gradient of S-20 as feature drains into Clear Creek (11/14/18)


Photo 178. Top of S-21 assessed reach, showing water flowing in channel (~36hrs after rain event) (11/14/18)

Photo 179. S-21, showing water level is at bankful nearly 48hrs after last rain event, indicating consistent discharge (11/14/18)

Photo 180. S-21, showing riffle pool complex with depositional feature (11/14/18)

Photo 181. S-21, showing hydrologic diversity in feature (11/14/18)

Photo 182. Headcut causing incision through the profile as just upstream of confluence with Clear Creek (11/14/18)

Photo 183. S-21, immediately upstream of the confluence with Clear Creek., facing downstream (11/14/18)

Photo 184. Head of feature S-22, showing large headcut at edge of the soy field (11/14/18)

Photo 185. S-22 entering wood line, facing downstream (11/14/18)

Photo 186. S-22, shows channel in wood line, facing downstream (11/14/18)

Photo 187. S-22, Shows rooted vegetation within the channel (11/14/18)

Photo 188. S-22, showing strong bed and bank of relic channel and small active channel (11/14/18)

Photo 189. S-22, showing section has little sinuosity as it drains into Clear Canal Creek (11/14/18)

Photo 190. Feature S-22 dumps into Clear Canal Creek (11/14/18)

Photo 191. S-23, facing upstream, rills formed off soy field (11/6/18).

Photo 192. S-23, facing downstream, showing the receiving tributary backing up into the S-23 channel (11/6/18).

Photo 193. S-23, showing backed-up water in channel from receiving stream (11/6/18).

Photo 194. S-24 upper extent, facing downstream (11/14/18)

Photo 195. Depicts a poorly defined S-24 channel with upland vegetation, facing downstream (11/14/18)

Photo 196. S-24 channel shows little sinuosity and is dry ~36hrs after significant rain event (11/14/18)

Photo 197. S-24, showing water in lower reach due to flooding in the receiving feature (11/14/18)

Photo 198. S-25, qualifies for primary indicator #1, lacks defined bed and bank, dominated by upland veg. (11/14/18)

Photo 199. Formation of S-26 feature in a wetland, facing downstream (11/14/18)

Photo 200. S-26 relic channel transition to wetland (11/14/18)

Photo 201. S-26, channel within relic channel, indicating change in drainage pattern (11/14/18)

Photo 202. S-26 dumping into Clear Creek (11/14/18)

Photo 203. Head of feature S-27, starting on edge of field and draining into wood line (11/14/18)

Photo 204. Shows feature S-27'S channel is dominated with previous years leaf class (11/14/18)

Photo 205. S-27 channel shows little signs of hydrologic use, facing downstream (11/14/18)

Photo 206. S-27, section shows weak bank features (11/14/18)

Photo 207. Feature S-27 prior to draining into Clear Creek (11/14/18)

Photo 208. S-28 originating in wetland (11/14/18)

Photo 209. Shows S-28 has a wetland in relic channel (11/14/18)

Photo 210. Shows wetland that feature S-29 drains, facing upstream (11/14/18)

Photo 211. Top of feature S-29, facing downstream (11/14/18)

Photo 212. S-29, small drainage feature, showing undefined banks and leaf litter in channel (11/14/18)

Photo 213. Feature S-29 draining into larger (off-site) feature (11/14/18)

Photo 214. Small S-28 channel within larger relic channel before confluence with Clear Creek (11/14/18)

Photo 215. Upstream end of S-30 assessment area (11/14/18)

Photo 216. Showing swale of S-30, facing downstream (11/14/18)

Photo 217. S-30 channel, showing previous year's leave within channel, indicating relic channel (11/14/18)

Photo 218. Shows low sinuosity of S-30 (11/14/18)

Photo 219. End of S-30 prior to confluence with Clear Creek (11/14/18)

Photo 220. Top of S-31, facing downstream from wetland (11/6/18)

Photo 221. S-31, showing channel and drainage into wetland (11/6/18)

Photo 222. S-31 facing upstream towards wetland (11/6/18)

Photo 223. S-31 showing pooled water, however <48hrs since last significant rain event (11/6/18)

Photo 224. Clear Creek facing south, upstream (11/5/18)

Photo 225. Clear Creek facing north, downstream (11/5/18)

Photo 226. Clear Creek substrate (11/5/18)

Photo 227. Loosahatchie River facing east, upstream (11/5/18)

Photo 228. Loosahatchie River facing west, downstream (11/5/18)

Photo 229. Loosahatchie River substrate (11/5/18)

Photo 230. Typical potential roost tree (PRT) for endangered bat species within the project area.

Photo 231. Typical PRT for endangered bat species within the project area.

Photo 232. Typical PRT for endangered bat species within the project area.

Photo 233. Typical PRT for endangered bat species within the project area.

Photo 235. Typical PRT for endangered bat species within the project area.

Appendix C

Routine Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018
Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-1
Investigator(s): B. Slaby, Envirosciences, Inc. Section, Township, Range: ______
Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): ______
Subregion (LRR or MLRA): LRR P134 Lat: 35.288079 Long: -89.713979 Datum: WGS 84
Soil Map Unit Name: Waverly silt loam, 0 to 2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___	**Is the Sampled Area within a Wetland?** Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks:
Forest

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 X Depth (inches): ______
Water Table Present? Yes ___ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

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

Remarks:

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

Sampling Point: SP-1

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	55	Y	FAC
2. Acer negundo	15	Y	FAC
3. Platanus occidentalis	15	Y	FACW
4. Acer rubrum	15	Y	FAC
5. Ulmus americana	10	N	FAC
6. Quercus c.f. velutina	5	N	UPL
7.			
8.			
	115 = Total Cover		
50% of total cover: 57.5	20% of total cover: 23		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ulmus americana	3	Y	FAC
2. Ligustrum sp.	2	Y	NL
3. Asimina triloba	2	Y	FAC
4. Celtis laevigata	1	N	FACW
5. Quercus nigra	1	N	FAC
6.			
7.			
8.			
	9 = Total Cover		
50% of total cover: 4.5	20% of total cover: 1.8		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Euonymus fortunei	80	Y	UPL
2. Lonicera japonica	10	N	FACU
3. Symphyotrichum lateriflorum	7	N	FAC
4. Cinna arundinacea	2	N	FACW
5. Smilax rotundifolia	2	N	FAC
6. Solidago altissima/canadensis	1	N	FACU
7. Viola c.f. sororia	1	N	FAC
8. Unk. dicot	1	N	NL
9.			
10.			
11.			
12.			
	104 = Total Cover		
50% of total cover: 52	20% of total cover: 20.8		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 5 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 62.5% (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
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ____

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

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)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 4/3	100					Silty loam	
1-16	10YR 4/4	100					silty loam	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018
Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-2
Investigator(s): B. Slaby, EnviroScience, Inc. Section, Township, Range: ______
Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): ______
Subregion (LRR or MLRA): LRR P134 Lat: 35.288221 Long: -89.714323 Datum: WGS84
Soil Map Unit Name: Falaya silt loam (Fm) NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ______ (If no, explain in Remarks.)
Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______	**Is the Sampled Area within a Wetland?**	**Yes** X **No** ______
Hydric Soil Present?	Yes X No ______		
Wetland Hydrology Present?	Yes X No ______		

Remarks:
PFO

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- __ High Water Table (A2)
- __ Saturation (A3)
- X Water Marks (B1)
- __ Sediment Deposits (B2)
- X Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Inundation Visible on Aerial Imagery (B7)
- X 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)
- X Sparsely Vegetated Concave Surface (B8)
- __ Drainage Patterns (B10)
- __ Moss Trim Lines (B16)
- __ Dry-Season Water Table (C2)
- __ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)
- __ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes X No ______ Depth (inches): 8
Water Table Present? Yes ______ No X Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

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

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-2

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	85	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	85 = Total Cover		
50% of total cover: 42.5	20% of total cover: 17		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	5	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	5 = Total Cover		
50% of total cover: 2.5	20% of total cover: 1		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Cinna arundinacea	1	N	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	1 = Total Cover		
50% of total cover: 0.5	20% of total cover: 0.2		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 2 (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

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 %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/3	90	10YR 3/6	9	C	PL/M	silty loam	distinct redox conc.
			10YR 2/1	1	C	PL		distinct redox conc.
4-16	10YR 5/2	75	5YR 3/4	22	C	PL/M	silty loam	prominent redox conc.
			2.5YR 2.5/3	3	C	PL/M		prominent redox conc.

[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)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/5/2018
Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-3
Investigator(s): B. Slaby, EnviroScience, Inc. Section, Township, Range: ______
Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): ______
Subregion (LRR or MLRA): LRR P134 Lat: 35.287750 Long: -89.715329 Datum: WGS 84
Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ____	**Is the Sampled Area within a Wetland?** Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: PEM w/in Ag Field

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X No ____	Depth (inches): 4"	
Water Table Present?	Yes X No ____	Depth (inches): 0	
Saturation Present? (includes capillary fringe)	Yes X No ____	Depth (inches): 0	**Wetland Hydrology Present?** Yes X No ____

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-3

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Echinochloa muricata	95	Y	FACW
2. Ranunculus c.f. acris	2	N	FACW
3. Glycine max	2	N	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	99 = Total Cover		
50% of total cover: 49.5	20% of total cover: 19.8		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

Ranunculus has sepals folded a few mm from the base, but otherwise looks like R. acris and lacks the bulbous base of R. bulbosus.

SOIL

Sampling Point: SP-3

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-13	10YR 5/2	70	5YR 4/6	30	C	PL/M	silty loam	prominent redox conc.
13-16	10YR 5/2	95	5YR 4/6	5	C	PL/M	clay loam	

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

Hydric Soil Indicators: (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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/5/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-4

Investigator(s): B. Slaby, EnviroScience, Inc. Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR-P 134 Lat: 35.287563 Long: -89.715178 Datum: WGS84

Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X
Hydric Soil Present?	Yes ______	No X
Wetland Hydrology Present?	Yes ______	No X

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

Remarks: Ag Field - Soybeans

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 X	Depth (inches): ______
Water Table Present?	Yes _____	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): ______

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

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-4

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Glycine max	85	Y	UPL
2. Ranunculus c.f. acris	30	Y	FACW
3. Allium schoenoprasum	5	N	FACU
4. Poaceae sp. (young, sterile)	5	N	NL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	125	= Total Cover	
50% of total cover:	62.5	20% of total cover:	25

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

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

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes ___ No X

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

Ranunculus seedlings

SOIL

Sampling Point: SP-4

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
0-16	10YR 4/4	100					Silty loam	actively farmed

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/5/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-5

Investigator(s): B. Slaby, EnviroScience Inc. Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P134 Lat: 35.287475 Long: -89.713662 Datum: WGS 84

Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X
Hydric Soil Present?	Yes ______	No X
Wetland Hydrology Present?	Yes ______	No X

Is the Sampled Area within a Wetland? Yes ______ No X

Remarks:
Ag Field - Soybeans

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 X	Depth (inches): ______
Water Table Present?	Yes ______	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ______	No X	Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-5

Tree Stratum (Plot size: 30')

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

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum (Plot size: 15')

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

50% of total cover: ______ 20% of total cover: ______

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Glycine max	80	Y	UPL
2. Ranunculus cf. acris	25	Y	FACW
3. Allium schoenoprasum	10	N	FACU
4. Poaceae sp. (small, sterile)	5	N	NL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	120	= Total Cover	

50% of total cover: 60 20% of total cover: 24

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

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

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	______	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 Four Vegetation Strata:

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

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

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

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

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

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

SOIL

Sampling Point: SP-5

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/4	100					Silty loam	actively farmed

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/5/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-6

Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): ______

Subregion (LRR or MLRA): LRR P134 Lat: 35.287350 Long: -89.713601 Datum: WGS 84

Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______	**Is the Sampled Area within a Wetland?**	**Yes** X **No** ______
Hydric Soil Present?	Yes X No ______		
Wetland Hydrology Present?	Yes X No ______		

Remarks: PEM w/in Ag Field

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- __ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ______	Depth (inches): 5	
Water Table Present?	Yes X	No ______	Depth (inches): 1	
Saturation Present? (includes capillary fringe)	Yes X	No ______	Depth (inches): 0	**Wetland Hydrology Present? Yes** X **No** ______

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-6

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Echinochloa muricata	80	Y	FACW
2. Ranunculus c.f. acris	20	N	FACW
3. Glycine max	1	N	UPL
4. Unk. spp. dicot seedling (Lamiaceae?)	1	N	NL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	102 = Total Cover		
50% of total cover: 51		20% of total cover: 20.4	

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ____

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

SOIL

Sampling Point: SP-6

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/2	80	5YR 3/3	15	C	PL/M	Silty loam	prominent redox conc.
			5YR 3/4	5	C	PL/M		
12-16	10YR 6/1	75	7.5YR 4/6	5	C	PL/M	Silty loam	prominent redox conc.
	10YR 4/3	20						

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/5/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-7

Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): ______

Subregion (LRR or MLRA): LRR P134 Lat: 35.287037 Long: -89.715175 Datum: WGS 84

Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______	**Is the Sampled Area within a Wetland?** Yes X No ______
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks: PEM w/in Ag field

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- X Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Inundation Visible on Aerial Imagery (B7)
- X 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)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- __ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X No ______	Depth (inches): 3"	
Water Table Present?	Yes X No ______	Depth (inches): 0	
Saturation Present? (includes capillary fringe)	Yes X No ______	Depth (inches): 0	**Wetland Hydrology Present?** Yes X No ______

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-7

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	___ = Total Cover		
50% of total cover: ___	20% of total cover: ___		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	___ = Total Cover		
50% of total cover: ___	20% of total cover: ___		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ranunculus c.f. acris	60	Y	FACW
2. Ammannia coccinea	2	N	OBL
3. Poaceae sp. (young, sterile)	2	N	NL
4. Rorippa palustris	1	N	OBL
5. Carex sp. (sterile)	1	N	NL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	66 = Total Cover		
50% of total cover: 33	20% of total cover: 13.2		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

Ranunculus has sepals folded a few mm from the base, but otherwise looks like R. acris and lacks the bulbous base of R. bulbosus.

SOIL

Sampling Point: SP-7

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
0-16	10YR 5/2	80	5YR 3/4	20	C	PL/M	Silty loam	prominent redox conc.

[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)
- X 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 X No ___

Remarks:

rSP4

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/5/2018

Applicant/Owner: RES / TDOT State: TN / Sampling Point: SP8

Investigator(s): R. Warren Section, Township, Range: ______

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 1

Subregion (LRR or MLRA): LRR P134 Lat: 35.286344 Long: -89.718450 Datum: WGS 84

Soil Map Unit Name: Fm-Falaya silt loam NWI classification: no

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ______
Hydric Soil Present?	Yes X	No ______
Wetland Hydrology Present?	Yes X	No ______

Is the Sampled Area within a Wetland? Yes X No ______ W-9

Remarks:
PEM in AG Field

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- X 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)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ______	No X	Depth (inches): ______
Water Table Present?	Yes ______	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes X	No ______	Depth (inches): 10"

Wetland Hydrology Present? Yes X No ______

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-8

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover: 15	20% of total cover:		

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover: 5	20% of total cover:		

Herb Stratum (Plot size:)			
1. Cyperus esculentus	45	Y	FAC
2. Ranunculus acris	20	Y	FACW
3. Glycine max	10	N	UPL
4. Poa prat	5	N	FACU
5. Rorippa palustris	10	N	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90 = Total Cover		
50% of total cover: 30	20% of total cover:		

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: 2 (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

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

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-8

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 5/3	30	10YR 5/2	45	RM	M	Silty loam	
			7.5YR 5/6	15	C	PL/C		
			7.5YR 4/4	10	C	PL/C		
9-20	7.5YR 5/1	70	5YR 3/4	15	C	M	sandy	Manganese masses
			7.5YR 4/4	15	C	M		

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smoke Stack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-9

Investigator(s): B. Slaby, Enviroscience, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): terrace, depression Local relief (concave, convex, none): Concave Slope (%): ______

Subregion (LRR or MLRA): LRR P 134 Lat: 35.287162 Long: -89.716873 Datum: WGS 84

Soil Map Unit Name: Falaya silt loam (Fm) NWI classification: N/A

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______	Is the Sampled Area within a Wetland?	Yes ______ No X
Hydric Soil Present?	Yes ______ No X		
Wetland Hydrology Present?	Yes X No ______		

Remarks:
Forest

HYDROLOGY

Wetland Hydrology Indicators:

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

- X 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)
- X Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)
- __ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X No ______	Depth (inches): 5"	
Water Table Present?	Yes ______ No X	Depth (inches): ______	
Saturation Present? (includes capillary fringe)	Yes ______ No X	Depth (inches): ______	**Wetland Hydrology Present?** Yes X No ______

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

Remarks:
Standing water due to heavy rains the night before

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-9

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	30	Y	FAC
2. Acer negundo	30	Y	FAC
3. Betula nigra	25	Y	FACW
4. Ulmus americana	5	N	FAC
5.			
6.			
7.			
8.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer negundo	10	Y	FAC
2. Acer saccharinum	3	N	FAC
3. Celtis laevigata	2	N	FACW
4. Fraxinus pensylvanica	1	N	FACW
5. Ligustrum sp.	1	N	NL
6.			
7.			
8.			
	17 = Total Cover		
50% of total cover: 8.5	20% of total cover: 3.4		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Symphyotrichum lanceolatum	25	Y	FACW
2. Cinna arundinacea	3	N	FACW
3. Lonicera japonica	1	N	FACU
4. Euonymus fortunei	1	N	UPL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Toxicodendron radicans	3	N	FAC
2.			
3.			
4.			
5.			
	3 = Total Cover		
50% of total cover: 1.5	20% of total cover: 0.6		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-9

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 4/3	75	2.5Y 2.5/2	5	C	PL/M	silty loam	Distinct redox conc.
			10YR 3/6	20	C	PL/M		Distinct redox conc.
7-14	10YR 4/4	90					silty loam	
	10 YR 5/3	10						

[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 X

Remarks:

Soil pit dug in deepest part of standing water puddle & hydric soils were not found.

rSP3

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestalk Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/5/2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-10

Investigator(s): R.Wrzesi, EnviroScience, Inc Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P134 Lat: 35.281860 Long: -89.718770 Datum: WGS84

Soil Map Unit Name: Fm-Falaya silt Loam NWI classification: none

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

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks:
Agricultural Field

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 X	Depth (inches): ___	
Water Table Present?	Yes ___ No X	Depth (inches): ___	
Saturation Present? (includes capillary fringe)	Yes ___ No X	Depth (inches): ___	**Wetland Hydrology Present?** Yes ___ No X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP10

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5)			
1. Glycine max	50	Y	UPL
2. Allium schoenoprasum	15	N	FACU
3. Ranunculus acris	15	N	FACW
4. Poa pratensis	5	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85 = Total Cover		
50% of total cover:	20% of total cover:		
Woody Vine Stratum (Plot size: 30)			
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: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	15	x 2 = 30
FAC species		x 3 =
FACU species	20	x 4 = 80
UPL species	50	x 5 = 250
Column Totals:	85 (A)	360 (B)

Prevalence Index = B/A = 4.24

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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes ___ No X

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

SOIL

Sampling Point: SP 10

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 4/1	100	10YR 5/2	15			Silty to clay loam	
14-18	10YR 4/1	40	7.5YR 4/6	5	RM	M	silty clay to clay loam	
	10YR 4/2	15						

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland /Shelby Sampling Date: 11/5/2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-11

Investigator(s): R.Warren, EnviroScience, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): ______

Subregion (LRR or MLRA): LRR P 134 Lat: 35.282093 Long: -89.719188 Datum: WGS84

Soil Map Unit Name: Fm- Falaya silt loam NWI classification: none

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______	Is the Sampled Area within a Wetland? Yes X No ______ W-13
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks:
PEM in Ag Field

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- X Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)
- __ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes X No 2 Depth (inches): ______

Water Table Present? Yes X No ______ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): ______

Wetland Hydrology Present? Yes X No ______

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP/1

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5)	Absolute % Cover	Dominant Species?	Indicator Status
1. Echinochloa muricata	30	FACW	Y
2. Cyperus esculentus	30	FAC	Y
3. Panicum dichotomiflorum	8	FACW	N
4. Glycine max.	6	UPL	N
5. Ranunculus acris	3	FACW	N
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	77 = Total Cover		
50% of total cover:	20% of total cover:		

Woody Vine Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
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: 2 (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP11

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 5/1	40	7.5YR 4/4	15	C	PL/M	clay loam	Manganese
	10YR 4/1	60	7.5YR 4/6	5	C	PL/M		
	10YR 4/2	20						
6-20	10YR 6/1	50	5YR 5/6	20	C	M	clay to clay loam	
	10YR 5/1	15						
	10YR 6/2	15						

[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)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
X Redox Depressions (F8)
___ Marl (F10) **(LRR U)**
___ Depleted Ochric (F11) **(MLRA 151)**
X 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 X No ____

Remarks:

rSP1

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland/Shelby Sampling Date: 11/5/2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP12

Investigator(s): R. Warren; EnviroScience, Inc. Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P134 Lat: 35.279354 Long: -81.718803 Datum: WGS 84

Soil Map Unit Name: Wv-Waverly silt loam, 0 to 2 percent slopes NWI classification: none

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

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___	Is the Sampled Area within a Wetland? Yes X No ___	W-16
Hydric Soil Present? Yes X No ___		
Wetland Hydrology Present? Yes X No ___		

Remarks:

PEM within Ag Field

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- X Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): +1"

Water Table Present? Yes X No ___ Depth (inches): 9"

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 0"

Wetland Hydrology Present? Yes X No ___

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP12

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	85 = Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5)			
1. Echinochloa muricata	40	Y	FACW
2. Glycine max	25	Y	UPL
3. Brachiaria [illegible]	20	N	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85 = Total Cover		
50% of total cover:	20% of total cover:		

Woody Vine Stratum (Plot size: 30)			
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: 1 (A)

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

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species –	x 1 =
FACW species 60	x 2 = 120
FAC species –	x 3 =
FACU species –	x 4 =
UPL species 25	x 5 = 125
Column Totals: 85 (A)	245 (B)

Prevalence Index = B/A = 2.88

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP12

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/1	40	7.5YR 5/3	15			Loamy Clayey	
	10YR 4/2	40	5YR 4/6	2				
			5YR 3/4	3				
12-20	10YR 6/1	70	5YR 5/8	7				
	10YR 5/3	23						

[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)
X Redox Depressions (F8)
__ Marl (F10) **(LRR U)**
__ Depleted Ochric (F11) **(MLRA 151)**
X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland/Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-13

Investigator(s): R. Warren; EnviroScience, Inc Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P134 Lat: 35.278384 Long: -89.718304 Datum: WGS 84

Soil Map Unit Name: Wv-Waverly silt loam, 0 to 2 percent slopes 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 X 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 X	**Is the Sampled Area within a Wetland?** Yes ______ No X
Hydric Soil Present?	Yes ______ No X	
Wetland Hydrology Present?	Yes ______ No X	

Remarks:
Ag Field

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)
- X Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes ______ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

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

Remarks:

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

Sampling Point: SP 13

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5)			
1. Glycine max.	50	Y	UPL
2. Allium schoenoprasum	20	Y	FACU
3. Ranunculus acris	25	Y	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Woody Vine Stratum (Plot size: 30)			
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: 1 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	25	x 2 = 50
FAC species	0	x 3 = 0
FACU species	20	x 4 = 80
UPL species	50	x 5 = 250
Column Totals:	95 (A)	380 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes ____ No X

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

SOIL

Sampling Point: SP13

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 4/3	100					loamy	Silty clay to clay loam
18-20	10YR 5/1	80	10YR 4/6	12	C	PL/M	clayey	
			10YR 3/4	8	C	PL/M		

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-14

Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): ______

Subregion (LRR or MLRA): LRR P134 Lat: 35.279313 Long: -89.714179 Datum: WGS 84

Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______	Is the Sampled Area within a Wetland? Yes X No ______
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks:

PEM w/in ag field - soybeans

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- X Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes X No ______ Depth (inches): 8"

Water Table Present? Yes X No ______ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 0

Wetland Hydrology Present? Yes X No ______

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

Remarks:

Aquatic Fauna - diving beetles

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-14

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Panicum dichotomiflorum	40	Y	FACW
2. Echinochloa muricata	25	Y	FACW
3. Ranunculus c.f. acris	2	N	FACW
4. Eleocharis obtusa	1	N	OBL
5. Alisma sp.	1	N	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	69 = Total Cover		
50% of total cover: 34.5	20% of total cover: 13.8		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 2 (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-14

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
0-11	10YR 5/2	75	7.5YR 4/6	25	C	PL/M	silty loam	Prominent redox conc.
11-14	10YR 4/3	85	7.5YR 4/4	15	C	PL/M	silty clay loam compacted	Faint redox conc.

[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)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X 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: Compaction / possibly clay
Depth (inches): 14"

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland/Shelby Co. Sampling Date: 06 NOV 2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-15

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P Lat: 35.276395 Long: -89.719228 Datum: WGS84

Soil Map Unit Name: Wv - Waverly silt loam (0-2% slopes) occ. flooded NWI classification: none

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ______
Hydric Soil Present?	Yes X	No ______
Wetland Hydrology Present?	Yes X	No ______

Is the Sampled Area within a Wetland? Yes X No ______

Wetland W-18

Remarks:
PEM at edge of field connects to ditch.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X 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)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ______	No X	Depth (inches): ______
Water Table Present?	Yes ______	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes X	No ______	Depth (inches): 12"

Wetland Hydrology Present? Yes X No ______

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

Remarks:

SOIL

Sampling Point: SP-15

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 5/1	85	10YR 5/8	15	C	M	silt loam	
8-16	10YR 5/1	80	10YR 5/8	20	C	M	"	

[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)
_X_ 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 _X_ No ___

Remarks:

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

Sampling Point: SP-15

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: ______ 20% of total cover: ______

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Juncus effusus	25	Yes	OBL
2. Mimulus ringens	10	Yes	OBL
3. Persicaria hydropiper	10	Yes	OBL
4. Symphyotrichum lanceolatum	10	Yes	FACW
5. Eleocharis obtusa	10	Yes	OBL
6. Carex vulpinoidea	10	Yes	FACW
7. Lycopus virginicus	5	No	OBL
8. Acer negundo	5	No	FAC
9. Rumex crispus	5	No	FAC
10. Agrostis gigantea	5	No	FACW
11.			
12.			
	95 = Total Cover		

50% of total cover: 47.5 20% of total cover: 19

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: ______ (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ______

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

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland/ Shelby Co. Sampling Date: 06 NOV 2018

Applicant/Owner: RES /TDOT State: TN Sampling Point: SP-16

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P Lat: 35.290641 Long: -89.708009 Datum: WGS 84

Soil Map Unit Name: Wv- Waverly silt loam (0-2% slopes) occ. flooded NWI classification: none

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______		
Hydric Soil Present? Yes X No ______	Is the Sampled Area within a Wetland? W-19	Yes X No ______
Wetland Hydrology Present? Yes X No ______		

Remarks:
PFO. Standing H2O observed 05 Nov 2018 prior to heavy ppt.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ______

Water Table Present? Yes X No ______ Depth (inches): 4"

Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): 3"

Wetland Hydrology Present? Yes X No ______

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-16

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus phellos	65	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	65 = Total Cover		
50% of total cover: 32.5	20% of total cover: 13		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Carpinus caroliniana	3	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	3 = Total Cover		
50% of total cover: 1.5	20% of total cover: 0.6		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Glyceria striata	25	Yes	OBL
2. Lonicera japonica	25	Yes	FACU
3. Symphyotrichum lateriflorum	2	No	FAC
4. Chasmanthium latifolium	1	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	53 = Total Cover		
50% of total cover: 26.5	20% of total cover: 10.6		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 3 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ____

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

SOIL

Sampling Point: SP-16

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 6/1	88	10YR 5/8	12	C	M	Silt loam	
4-16	10YR 6/1	60	10YR 5/8	40	C	M	"	

[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)
_X_ 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 _X_ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland /Shelby Co. Sampling Date: 06 NOV 2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-17

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P Lat: 35.290458 Long: -89.708227 Datum: WGS 84

Soil Map Unit Name: WV- Waverly silt loam (0-2% slopes) occ. flooded NWI classification: none

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______	Is the Sampled Area within a Wetland? Wetland W-19	Yes X No ______
Hydric Soil Present? Yes X No ______		
Wetland Hydrology Present? Yes X No ______		

Remarks:
PSS portion of Wetland.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ______

Water Table Present? Yes X No ______ Depth (inches): 0"

Saturation Present? (includes capillary fringe) Yes X No ______ Depth (inches): surface

Wetland Hydrology Present? Yes X No ______

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

Remarks:

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

Sampling Point: SP-17

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
50% of total cover:		20% of total cover:	
Sapling/Shrub Stratum (Plot size: 15')			
1. Fraxinus pennsylvanica	55	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	55	= Total Cover	
50% of total cover: 27.5		20% of total cover: 11	
Herb Stratum (Plot size: 5')			
1. Carex vulpinoidea	50	Yes	FACW
2. Carex lurida	40	Yes	OBL
3. Acer rubrum	5	No	FAC
4. Doellingeria umbellata	5	NO	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
50% of total cover: 50		20% of total cover: 20	
Woody Vine Stratum (Plot size: 30')			
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: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-17

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 6/1	70	10YR 5/8	20				
				10	C	M		
6-16	10YR 6/1	60	7.5YR 4/4	30				
				10	C	M		

[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)
X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland/Shelby Co Sampling Date: 06 NOV 2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-19

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P Lat: -35.290050 Long: -89.709422 Datum: WGS 84

Soil Map Unit Name: Wv - Waverly silt loam (0-2% slopes) occ. eroded NWI classification: none

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

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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? W-19	Yes X No ____
Hydric Soil Present?	Yes ____ No ____		
Wetland Hydrology Present?	Yes ____ No ____		

Remarks:
PEM (north of field).

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- X 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)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ______

Water Table Present? Yes X No ____ Depth (inches): 4" above surface

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ____

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

Remarks:
1" ppt on 05 Nov 2018, However standing H2O + high H2O table observed in wetland complex prior to rain on 05 NOV18.

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

Sampling Point: SP-19

Tree Stratum (Plot size: 30')

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

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum (Plot size: 15')

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

50% of total cover: ______ 20% of total cover: ______

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Persicaria hydropiper	70	Yes	OBL
2. Scirpus sp.	15	No	OBL
3. Acer rubrum	5	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90 = Total Cover		

50% of total cover: 45 20% of total cover: 18

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-18

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	5Y 5/1	80	7.5YR 5/8	20	C	M	Silt loam	

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

Hydric Soil Indicators: (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)
X 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: Standing H2O - difficult to dig
Depth (inches): 10

Hydric Soil Present? Yes X No ____

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smoke Stack Mitigation Site City/County: Lakeland/ Shelby Co. Sampling Date: 05 Nov 2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-19

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P Lat: 35.289264 Long: -89.709830 Datum: WGS 84

Soil Map Unit Name: Fm—Falaya silt loam NWI classification: none

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	Is the Sampled Area within a Wetland?	Yes ______ No X
Hydric Soil Present?	Yes ______ No X		
Wetland Hydrology Present?	Yes ______ No X		

Remarks:
Forest, north of agricultural field.

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 X	Depth (inches): ______	
Water Table Present?	Yes ______ No X	Depth (inches): ______	
Saturation Present? (includes capillary fringe)	Yes ______ No X	Depth (inches): ______	**Wetland Hydrology Present?** Yes ______ No X

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

Remarks:
No hydrology observed.

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

Sampling Point: SP-19

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus falcata	30	Yes	FACU
2. Quercus nigra	15	Yes	FAC
3. Quercus muhlenbergii	10	No	UPL
4. Carya ovata	8	No	FACU
5. Celtis occidentalis	5	No	FACU
6.			
7.			
8.			
	68	= Total Cover	
50% of total cover: 32	20% of total cover: 14		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Carya ovata	10	Yes	FACU
2. Ulmus rubra	10	Yes	FAC
3. Prunus cf. virginiana	5	Yes	FACU
4.			
5.			
6.			
7.			
8.			
	25	= Total Cover	
50% of total cover: 13	20% of total cover: 5		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Lonicera japonica	25	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	25	= Total Cover	
50% of total cover: 13	20% of total cover: 5		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Vitis riparia	12	Yes	FACW
2.			
3.			
4.			
5.			
	12	= Total Cover	
50% of total cover: 6	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 43% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	22	x 2 = 44
FAC species	25	x 3 = 75
FACU species	73	x 4 = 292
UPL species	10	x 5 = 50
Column Totals:	130 (A)	461 (B)

Prevalence Index = B/A = 3.5

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes ____ No X

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

SOIL

Sampling Point: SP-19

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
0-14	10YR 4/4	85	10YR 5/4	15			silt loam	

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

Hydric Soil Indicators: (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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation site City/County: Lakeland/Shelby Co. Sampling Date: 06 NOV 2018

Applicant/Owner: RES /TDOT State: TN Sampling Point: SP-20

Investigator(s): Ann Gilmore, EnvirnScience Section, Township, Range: ______

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): Concave Slope (%): ______

Subregion (LRR or MLRA): LRR P Lat: 35.288492 Long: -89.710527 Datum: WGS 84

Soil Map Unit Name: Fm- Falaya silt loam NWI classification: PSS1C

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 X 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 X No ______	Is the Sampled Area within a Wetland? W-23	Yes X No ______
Hydric Soil Present? Yes X No ______		
Wetland Hydrology Present? Yes X No ______		

Remarks:
PFO – connects to small portion of PEM in agricultural field.
No standing H2O on 05 November but water stained leaves observed.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- X 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)
- X 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)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches): ______

Water Table Present? Yes X No ______ Depth (inches): 6" above surface

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

Wetland Hydrology Present? Yes X No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
1+" PPT on 05 Nov 2018

Remarks:

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

Sampling Point: SP-20

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	45	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	45 = Total Cover		
50% of total cover: 22.5	20% of total cover: 9		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ulmus americana	10	Yes	FAC
2. Fraxinus pennsylvanica	4	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	14 = Total Cover		
50% of total cover: 7	20% of total cover: 2		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Symphyotrichum lateriflorum	40	Yes	FAC
2. Scirpus sp.	3	No	OBL
3. Persicaria hydropiper	2	No	OBL
4. Fraxinus pennsylvanica	1	No	FACW
5. Acer saccharinum	1	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	47 = Total Cover		
50% of total cover: 23.5	20% of total cover: 9.4		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Campsis radicans	3	Yes	FAC
2.			
3.			
4.			
5.			
	3 = Total Cover		
50% of total cover: 1.5	20% of total cover: 0.6		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-20

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 6/1	82	10YR 5/8	18	C	M	silt loam	

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

Hydric Soil Indicators: (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)
- X 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: Standing H2O / difficult to dig

Depth (inches): >10"

Hydric Soil Present? Yes X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland/Shelby Co. Sampling Date: 06 NOV 2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-21

Investigator(s): Ann Gilmore Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P Lat: 35.288734 Long: -89.709016 Datum: WGS 84

Soil Map Unit Name: Wv- Waverly silt loam (0-2% slopes) occ. flooded NWI classification: none

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

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

Are Vegetation X, 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 X No ______ Hydric Soil Present? Yes X No ______ Wetland Hydrology Present? Yes X No ______	**Is the Sampled Area within a Wetland?** W-22 **Yes** X **No** ______

Remarks:
Wetland within agricultural field. problematic veg due to land management (herbicide/planting). Soil disturbed from plowing/planting.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- X 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)
- X 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 X Depth (inches): ______

Water Table Present? Yes X No ______ Depth (inches): 10" above soil surface

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches): ______

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

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:
~1.5" ppt on 05 NOV 2018.

Remarks:

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

Sampling Point: SP-21

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Glycine max	20	yes	UPL
2. Ranunculus acris	2	No	FAC
3. Barbarea vulgaris	1	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	23 = Total Cover		
50% of total cover: 11.5		20% of total cover: 4.6	

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	3	x 3 = 9
FACU species	0	x 4 = 0
UPL species	20	x 5 = 100
Column Totals:	23 (A)	109 (B)

Prevalence Index = B/A = 4.73

Hydrophytic Vegetation Indicators:

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

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-2L

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 6/2	75	10YR 5/8	20	C	M	Silt loam	
			10YR 5/6	5	C	M		

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland / Shelby Co. Sampling Date: 06 NOV 2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-22

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): flat Slope (%): ______

Subregion (LRR or MLRA): LRR P Lat: 35.288695 Long: -89.707642 Datum: WGS 84

Soil Map Unit Name: Fm- Falaya silt loam NWI classification: none

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ______
Hydric Soil Present?	Yes ______	No X
Wetland Hydrology Present?	Yes ______	No X

Is the Sampled Area within a Wetland? Yes ______ No X

Remarks:

Riparian forest

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 X	Depth (inches): ______
Water Table Present?	Yes ______	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ______	No X	Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

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

Remarks:

No hydrology observed.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-22

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus deltoides	30	Yes	FAC
2. Acer saccharinum	25	Yes	FAC
3. Acer negundo	18	Yes	FAC
4.			
5.			
6.			
7.			
8.			
	73 = Total Cover		
50% of total cover: 36.5	20% of total cover: 14.6		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ligustrum vulgare	15	yes	UPL
2. Fraxinus pennsylvanica	8	yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	23 = Total Cover		
50% of total cover: 11.5	20% of total cover: 4.6		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Symphyotrichum lateriflorum	60	yes	FAC
2. Euonymus fortunei	20	yes	UPL
3. Cinna arundinacea	10	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90 = Total Cover		
50% of total cover: 45	20% of total cover: 18		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Toxicodendron radicans	20	yes	FAC
2. Vitis riparia	10	yes	FACW
3.			
4.			
5.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 77% (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
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-22

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
0-16	10YR 4/6	100					Silt loam	

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

Hydric Soil Indicators: (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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-23

Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ____

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): Concave Slope (%): ____

Subregion (LRR or MLRA): LRR P134 Lat: 35.287356 Long: -89.712485 Datum: WGS 84

Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A

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

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks: PFO - narrow, shallow depression adjacent to excavated pool with deep standing water.

HYDROLOGY

Wetland Hydrology Indicators:

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

- X 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)
- X 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)
- X 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)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 12+"

Water Table Present? Yes ____ No X Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes X No ____

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

Remarks: pool has surface water, shallow depression has the other indicators.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-23

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	20	Y	FAC
2. Ulmus americana	15	Y	FAC
3. Quercus nigra	5	N	FAC
4. Quercus phellos	5	N	FACW
5.			
6.			
7.			
8.			
	45 = Total Cover		
50% of total cover: 22.5	20% of total cover: 9		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus phellos	2	N	FACW
2. Celtis laevigata	1	N	FACW
3. Fraxinus pennsylvanica	1	N	FACW
4.			
5.			
6.			
7.			
8.			
	4 = Total Cover		
50% of total cover: 2	20% of total cover: 0.8		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Leersia virginica	3	Y	FACW
2. Boehmeria cylindrica	1	Y	FACW
3. Fraxinus pensylvanica	1	Y	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	5 = Total Cover		
50% of total cover: 2.5	20% of total cover: 1		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-23

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 5/3	80	7.5 YR 4/6	19	C	PL/M	Silty loam	prominent redox Conc.
			5YR 2.5/1	1	C	PL		prominent redox Conc.
7-16	10YR 5/2	70	5YR 4/6	30	C	PL/M	Silty loam w/ high clay	prominent redox conc.

[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)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X 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 X No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018
Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-24
Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ____
Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): ____
Subregion (LRR or MLRA): LRR P 134 Lat: 35.287094 Long: -89.712313 Datum: WGS 84
Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ____	Is the Sampled Area within a Wetland?	Yes ____ No X
Hydric Soil Present? Yes ____ No X		
Wetland Hydrology Present? Yes ____ No X		

Remarks:

Forest

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 X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

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

Remarks:

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

Sampling Point: SP-24

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	40	Y	FAC
2. Quercus nigra	20	Y	FAC
3. Acer negundo	15	N	FAC
4. Liquidambar styraciflua	10	N	FAC
5. Betula nigra	3	N	FACW
6.			
7.			
8.			
	88 = Total Cover		
50% of total cover: 44	20% of total cover: 17.6		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ligustrum sp.	15	Y	NL
2. Quercus nigra	3	N	FAC
3. Ulmus americana	2	N	FAC
4. Celtis laevigata	2	N	FACW
5. Fraxinus pennsylvanica	2	N	FACW
6. Quercus c.f. velutina	1	N	UPL
7. Carya cordiformis	1	N	FAC
8.			
	26 = Total Cover		
50% of total cover: 13	20% of total cover: 5.2		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Lonicera japonica	5	Y	FACU
2. Toxicodendron radicans	3	Y	FAC
3. Elymus riparius	3	Y	FACW
4. Prunus serotina	2	N	FACU
5. oppo, cordate leaves (seedling)	2	N	NL
6. Symphyotrichum sp. 1 (basal leaves)	1	N	NL
7. Symphyotrichum sp. 2 (petiolate, cordate leaves)	1	N	NL
8. Euonymus fortunei	1	N	UPL
9. Prenanthes sp.	1	N	NL
10. Cinna arundinacea	1	N	FACW
11. Smilax sp. (herbaceous)	1	N	NL
12.			
	21 = Total Cover		
50% of total cover: 10.5	20% of total cover: 4.2		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.7% (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

Ligustrum sp. is either L. sinense (FAC) or L. vulgare (UPL).

SOIL

Sampling Point: SP-24

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 3/3	100					Silty loam	
1-14	10YR 4/4	100					Silty loam	Sandy inclusions
								14+" refusal (roots)

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018
Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-25
Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ______
Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): Concave Slope (%): ______
Subregion (LRR or MLRA): LRR P134 Lat: 35.285414 Long: -89.712661 Datum: WGS 84
Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: PEM1C
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___		
Hydric Soil Present? Yes X No ___	Is the Sampled Area within a Wetland?	Yes X No ___
Wetland Hydrology Present? Yes X No ___		

Remarks:
PEM at edge of ag field. ATV trail goes through wetland.

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X 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)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X No ___	Depth (inches): 5"	
Water Table Present?	Yes X No ___	Depth (inches): 0	
Saturation Present? (includes capillary fringe)	Yes X No ___	Depth (inches): 0	**Wetland Hydrology Present? Yes X No ___**

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-25

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Echinochloa muricata	40	Y	FACW
2. Panicum dichotomiflorum	10	N	FACW
3. Glycine max	10	N	UPL
4. Scirpus sp. (senesced)	3	N	OBL
5. Unk. Poaceae (see comments)	3	N	NL
6. Coleataenia rigidula (syn Panicum rigidulum)	2	N	FACW
7. Ranunculus c.f. acris	1	N	FACW
8. opp. leaves, fuzzy stem (seedling)	1	N	NL
9.			
10.			
11.			
12.			
	70 = Total Cover		
50% of total cover: 35	20% of total cover: 14		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

Unk. Poaceae has dense, spike-like inflorescence and I was guessing it was an Alopecurus when collected. It keyed out to Gastridium in Weakley due to lemmas being much shorter than glumes. However, it does not resemble pictures of Gastridium spp.

SOIL

Sampling Point: SP-25

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-13	10YR 5/2	70	5YR 4/6	29	C	PL/M	Silty loam	prominent redox conc.
			5YR 2.5/2	1	C	PL/M		prominent redox conc.
13-16	10YR 4/3	70	7.5YR 2.5/3	15	C	M	Silty loam	Faint redox conc.
	10YR 5/3	15						trace Manganese conc.

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland/Shelby Co. Sampling Date: 06 NOV 2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP26

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ______

Landform (hillslope, terrace, etc.): depression in field Local relief (concave, convex, none): concave Slope (%): ______

Subregion (LRR or MLRA): LRR P Lat: 35.285975 Long: -89.707885 Datum: WGS 84

Soil Map Unit Name: Wv- Waverly silt loam (0-2% slopes) occ. flooded NWI classification: none

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ______
Hydric Soil Present?	Yes X	No ______
Wetland Hydrology Present?	Yes X	No ______

Is the Sampled Area within a Wetland? Yes X No ______

W-33

Remarks: PEM in agricultural field. wetland not sustaining very much soybean

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)
- X 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)
- X 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)
- X Crayfish Burrows (C8)
- X 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 X	Depth (inches): ______
Water Table Present?	Yes ______	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ______	No X	Depth (inches): ______

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

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-26

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: 5')			
1. Echinochloa muricata	15	Yes	FACW
2. Ludwigia palustris	15	Yes	OBL
3. Cyperus odoratus	5	No	FACW
4. Ranunculus acris	3	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	38 = Total Cover		
50% of total cover: 19		20% of total cover: 7.6	
Woody Vine Stratum (Plot size: 30')			
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: 2 (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-26

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
0-5	10YR 6/2	90	7.5YR 5/8	10	C	PL/M	silt loam	
5-14	10YR 6/2	95	7.5YR 5/8	5	C	PL	"	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-27

Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): rolling former floodplain Local relief (concave, convex, none): Convex Slope (%): ______

Subregion (LRR or MLRA): LRR P 134 Lat: 35.284142 Long: -89.711752 Datum: WGS 84

Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A

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

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X		Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present? Yes ___ No X		
Wetland Hydrology Present? Yes ___ No X		

Remarks:
Ag Field - Soybeans

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 X Depth (inches): ______

Water Table Present? Yes ___ No X Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-27

Tree Stratum (Plot size: 30')

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

50% of total cover: ______ 20% of total cover: ______

Sapling/Shrub Stratum (Plot size: 15')

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

50% of total cover: ______ 20% of total cover: ______

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Glycine max	85	Y	UPL
2. Ranunculus c.f. acris	20	N	FACW
3. Allium schoenoprasum	2	N	FACU
4. Poaceae sp. (young, sterile)	1	N	NL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	108		

50% of total cover: 54 20% of total cover: 21.6

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
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: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes ______ No X

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

SOIL

Sampling Point: SP-27

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
0-16	10YR 3/6	100					silty loam	actively farmed

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-28

Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): Concave Slope (%): ______

Subregion (LRR or MLRA): LRR P 134 Lat: 35.283231 Long: -89.712418 Datum: WGS 84

Soil Map Unit Name: Falaya silt loam (Fm) NWI classification: N/A

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ______	Is the Sampled Area within a Wetland? Yes X No ______
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks:
PEM w/in Soybean Field

HYDROLOGY

Wetland Hydrology Indicators:

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

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

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)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- __ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X No ______	Depth (inches): 10"	
Water Table Present?	Yes X No ______	Depth (inches): 0	
Saturation Present? (includes capillary fringe)	Yes X No ______	Depth (inches): 0	**Wetland Hydrology Present?** Yes X No ______

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

Remarks:

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

Sampling Point: SP-28

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Echinochloa muricata	80	Y	FACW
2. Ranunculus cf. acris	3	N	FACW
3. Poaceae sp. (young, sterile)	1	N	NL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	84	= Total Cover	
50% of total cover:	42	20% of total cover:	16.8

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-28

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
0-8	10YR 5/2	65	7.5YR 4/4	35	C	PL/M	Silty loam	Distinct redox conc.
8-14	10YR 5/3	70	5YR 3/4	30	C	PL/M	Silty clay loam	Prominent redox conc.

[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)
- X 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 X No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland / Shelby Co. Sampling Date: 06NOV2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-29

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ____

Landform (hillslope, terrace, etc.): depression in field Local relief (concave, convex, none): concave Slope (%): ____

Subregion (LRR or MLRA): LRR P Lat: 35.283222 Long: -89.708980 Datum: WGS 84

Soil Map Unit Name: WV - Waverly silt loam (0-2% slopes) occ. flooded NWI classification: none

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

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	W-38
Wetland Hydrology Present?	Yes X No ____	

Remarks:
PEM

HYDROLOGY

Wetland Hydrology Indicators:

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

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

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)
- X 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 X No ____ Depth (inches): 1" above surface

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? Yes X No ____

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

Remarks:
~1.0" of ppt recieved on 05NOV2018. Standing water observed both days.

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-29

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	
Herb Stratum (Plot size: 5')			
1. Cyperus odoratus	20	Yes	FACW
2. Juncus effusus	5	No	OBL
3. Ranunculus acris	1	No	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	26 = Total Cover		
50% of total cover: 13		20% of total cover: 5.2	
Woody Vine Stratum (Plot size: 30')			
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: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-29

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 6/1	90	10YR 5/8	10	C	M	silt loam	
6-12	10YR 6/2	85	10YR 5/8	15	C	M	"	

[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)
- X 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 X No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland/Shelby Co. Sampling Date: 05 NOV 2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-30

Investigator(s): Ann Gilmore, EnviroScience Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P Lat: 35.281075 Long: -89.707663 Datum: WGS 84

Soil Map Unit Name: WV - Waverly silt loam (0-2% slopes) occ. flooded NWI classification: none

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

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

Are Vegetation X, 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 X No ______	Is the Sampled Area within a Wetland? Yes X No ______ W-47
Hydric Soil Present?	Yes X No ______	
Wetland Hydrology Present?	Yes X No ______	

Remarks:
Wetland within agricultural (soybean) field. Problemmatic veg due to managed vegetation (row crop, likely herbicide application), as well as soil disturbance from tilling/planting etc.

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- X 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)
- X Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ______	No ______	Depth (inches): ______	
Water Table Present?	Yes X	No ______	Depth (inches): 1.5"	
Saturation Present? (includes capillary fringe)	Yes ______	No ______	Depth (inches): ______	**Wetland Hydrology Present? Yes X No ______**

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

Remarks:

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

Sampling Point: SP-30

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Glycine max	20	Yes	UPL
2. Ranunculus acris	15	Yes	FACW
3. Echinochloa muricata	10	No	FACW
4. Barbarea vulgaris	2	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	47 = Total Cover		
50% of total cover: 24	20% of total cover: 9		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 1 (A)

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

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	25	x 2 = 50
FAC species	2	x 3 = 6
FACU species	0	x 4 = 0
UPL species	20	x 5 = 100
Column Totals:	47 (A)	156 (B)

Prevalence Index = B/A = 3.32

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

X Problematic Hydrophytic Vegetation[1] (Explain)

planted field

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP-30

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
0-1	2.5Y 5/2	100					Silt loam	
1-10	10YR 4/1	60	7.5YR 4/6	20	C	M	silty clay loam	
			2.5Y 5/2	20	D	M		
10-16	10YR 4/3	60	10YR 5/8	25	C	M	"	
			Black	15				Mn

[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)
_X_ 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 _X_ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokehouse Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP. 31

Investigator(s): R. Warren; EnviroScience, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0-2

Subregion (LRR or MLRA): LRR P134 Lat: 35.279339 Long: -89.707648 Datum: WGS 84

Soil Map Unit Name: Wv - Waverly silt loam, 0 to 2 percent slopes NWI classification: PEM1C

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

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X No ___	Is the Sampled Area within a Wetland? Yes X No ___	W-49
Hydric Soil Present? Yes X No ___		
Wetland Hydrology Present? Yes X No ___		

Remarks:
PFO

HYDROLOGY

Wetland Hydrology Indicators:

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

- X Surface Water (A1)
- X High Water Table (A2)
- X 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)
- X Drainage Patterns (B10)
- X 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 X No ___ Depth (inches): 3

Water Table Present? Yes X No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): ___

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

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

Remarks:

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

Sampling Point: SP-31

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer saccharinum	15	FAC	Y
2. Platanus occidentalis	15	FACW	Y
3. Acer rubrum	10	FAC	Y
4. Ulmus americana	10	FAC	Y
5. Betula nigra	8	FACW	N
6. Salix nigra	5	FACW	N
7. Fraxinus pennsylvanica	3	FACW	N
8. Liquidambar styraciflua	2	FAC	N
	68 = Total Cover		
50% of total cover: ____ 20% of total cover: ____			

Sapling/Shrub Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus pennsylvanica	3	FACW	Y
2. Ulmus americana	3	FAC	Y
3.			
4.			
5.			
6.			
7.			
8.			
	____ = Total Cover		
50% of total cover: ____ 20% of total cover: ____			

Herb Stratum (Plot size: 5)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus nigra	1	FAC	Y
2. Salix nigra	1	OBL	Y
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	____ = Total Cover		
50% of total cover: ____ 20% of total cover: ____			

Woody Vine Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
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: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ____

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

SOIL

Sampling Point: SP-31

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-20	2.5Y	60	5YR 4/6	30	C	M/PL	Clay loam	
			7.5YR 5/8	10	C	M/PL		

[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)
- X 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 X No ___

Remarks:

rsp6

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018
Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-32
Investigator(s): R.Warren, EnviroScience Inc. Section, Township, Range: ______
Landform (hillslope, terrace, etc.): Flat Local relief (concave, convex, none): None Slope (%): 1
Subregion (LRR or MLRA): LRR P134 Lat: 35.278976 Long: -89.708060 Datum: WGS84
Soil Map Unit Name: Wv - Waverly silt loam 0 to 2 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? Yes ___ No X

Remarks:
Forest

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 X	Depth (inches): ______
Water Table Present?	Yes ___	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ______

Wetland Hydrology Present? Yes ___ No X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP32

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer negundo	25	Y	FAC
2. Liquidambar styraciflua	15	Y	FAC
3. Ulmus americana	10	N	FACW
4. Platanus occidentalis	10	N	FAC
5.			
6.			
7.			
8.			
	60 = Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. Asimina triloba	5	Y	FAC
2. Ulmus americana	5	Y	FACW
3. Acer negundo	5	Y	FAC
4.			
5.			
6.			
7.			
8.			
	15 = Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 5)	Absolute % Cover	Dominant Species?	Indicator Status
1. Lonicera japonica	40	FACU	Y
2. Asimina triloba	8	FAC	N
3. Toxicodendron radicans	5	FAC	N
4. Viola odorata	5	NL	N
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	58 = Total Cover		
50% of total cover:	20% of total cover:		

Woody Vine Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Vitis sp	5	NL	Y
2. Toxicodendron rad	2	FACU	Y
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: 5 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 71 (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
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

SOIL

Sampling Point: SP32

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
0-20	2.5Y 4/1	60	5YR 4/6	30	C	M/PL	c/zy loam	
			7.5YR 5/8	10	C	PL/M		

[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 X No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Site City/County: Lakeland/ Shelby Co. Sampling Date: 05 NOV 2018

Applicant/Owner: RES/TDOT State: TN Sampling Point: SP-33

Investigator(s): Ann Gilmore, Enviroscience Section, Township, Range: ______

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

Subregion (LRR or MLRA): LRR P Lat: 35.279295 Long: -89.710086 Datum: WGS 84

Soil Map Unit Name: WV- Waverly silt loam (0-2% slopes) occ. flooded NWI classification: none

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ______	Is the Sampled Area within a Wetland? Yes ______ No X
Hydric Soil Present?	Yes ______	No X	
Wetland Hydrology Present?	Yes ______	No X	

Remarks:
Forest above bank of Cypress Creek (LDB).

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 X	Depth (inches): ______
Water Table Present?	Yes ______	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ______	No X	Depth (inches): ______

Wetland Hydrology Present? Yes ______ No X

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

Remarks:
No hydrology observed.

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

Sampling Point: SP.33

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus nigra	25	Yes	FAC
2. Acer saccharinum	20	Yes	FAC
3. Alnus rubra	15	Yes	FAC
4. Liquidambar styraciflua	15	Yes	FAC
5.			
6.			
7.			
8.			
	75 = Total Cover		
50% of total cover: 37.5	20% of total cover: 15		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus imbricaria	20	Yes	FAC
2. Carya ovata	5	No	FACU
3. Ligustrum vulgare	5	No	UPL
4.			
5.			
6.			
7.			
8.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Phyllostachys sp. (invasive bamboo)	25	Yes	NL
2. Lonicera japonica	8	Yes	FACU
3. Microstegium vimineum	2	No	FAC
4. Symphyotrichum lateriflorum	2	No	FAC
5. Toxicodendron radicans	1	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	73 = Total Cover		
50% of total cover: 36.5	20% of total cover: 14.6		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Vitis riparia	25	Yes	FACW
2. Campsis radicans	5	No	FAC
3.			
4.			
5.			
	30 = Total Cover		
50% of total cover: 15	20% of total cover: 6		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ______

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

SOIL

Sampling Point: SP-33

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-20	10YR 5/4	100					Silt	

[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 X

Remarks:

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES / TDOT State: TN Sampling Point: SP-34

Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ______

Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): Concave Slope (%): ______

Subregion (LRR or MLRA): LRR P134 Lat: 35.280381 Long: -89.710409 Datum: WGS 84

Soil Map Unit Name: Waverly silt loam, 0-2% slopes, occasionally flooded, long duration (Wv) NWI classification: N/A

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

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No ______
Hydric Soil Present?	Yes X	No ______
Wetland Hydrology Present?	Yes X	No ______

Is the Sampled Area within a Wetland? Yes X No ______

Remarks:

PSS Recieves outwash from ag field

HYDROLOGY

Wetland Hydrology Indicators:

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

- X 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)
- X Inundation Visible on Aerial Imagery (B7)
- X 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)
- X Drainage Patterns (B10)
- __ Moss Trim Lines (B16)
- __ Dry-Season Water Table (C2)
- __ Crayfish Burrows (C8)
- __ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)
- __ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes X	No ______	Depth (inches): 10
Water Table Present?	Yes ______	No X	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ______	No X	Depth (inches): ______

Wetland Hydrology Present? Yes X No ______

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-34

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula nigra	50	Y	FACW
2. Populus deltoides	30	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	80 = Total Cover		
50% of total cover: 40	20% of total cover: 16		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus deltoides	5	Y	FAC
2. Asteraceae sp.	5	Y	NL
3. Juncus effusus	2	N	OBL
4. Carex sp. (sterile)	2	N	NL
5. Campsis radicans	1	N	FAC
6. Penthorum sedoides	1	N	OBL
7. Ludwigia alternifolia	1	N	OBL
8.			
9.			
10.			
11.			
12.			
	17 = Total Cover		
50% of total cover: 8.5	20% of total cover: 3.4		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
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: 3 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes X No ___

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

Asteraceae sp. tall but senesced, beat up annual. Infl. may have resembled Symphyotrichum.

SOIL Sampling Point: SP-34

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 6/2	75	7.5YR 3/4	25	C	PL/M	silty loam	prominent redox conc.
5-12	10YR 5/3	60	2.5YR 2.5/2	10	C	M	Sand	prominent redox conc.
	7.5YR 3/3	30						
12-14	10YR 4/6	100					Sand	
14-16	10YR 5/2	60	7.5YR 4/6	25	C	M	Sand	prominent redox conc.
			7.5YR 2.5/3	15	C	M		Distinct redox conc.

[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)
- X 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 X No ______

Remarks:

Suspect that the farmer brought in sand to fill low spots in the field. Sand from ag field washes through wetland. Outwash patterns visible on aerial imagery.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Smokestack Mitigation Bank Site City/County: Lakeland / Shelby Sampling Date: 11/6/2018

Applicant/Owner: RES/ TDOT State: TN Sampling Point: SP-35

Investigator(s): B. Slaby, Enviro Science, Inc. Section, Township, Range: ____

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

Subregion (LRR or MLRA): LRR P 134 Lat: 35.279780 Long: -89.712875 Datum: WGS 84

Soil Map Unit Name: Falaya silt loam (Fm) NWI classification: N/A

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

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___ No X	
Wetland Hydrology Present?	Yes ___ No X	

Remarks:

Ag Field - Soybeans

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

Wetland Hydrology Present? Yes ___ No X

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

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: SP-3S

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		
Herb Stratum (Plot size: 5')			
1. Glycine max	85	Y	UPL
2. Ranunculus c.f. acris	50	Y	FACW
3. Allium schoenoprasum	2	N	FACU
4. Poaceae sp. (young, sterile)	1	N	NL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	138 = Total Cover		
50% of total cover: 69	20% of total cover: 27.6		
Woody Vine Stratum (Plot size: 30')			
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: 1 (A)

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

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		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 Four Vegetation Strata:

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

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

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

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

Hydrophytic Vegetation Present? Yes ___ No X

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

SOIL

Sampling Point: SP-35

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/4	92	5YR 4/6	8	C	M/PL	silty loam	Prominent redox conc.
4-16	10YR 4/4	100					silty loam	

[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 X

Remarks:

Appendix D

TDEC and NCWRQ Hydrologic Determination

Field Data Forms

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/5/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-1/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.277257, -89.716571**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 4	
Soil Type(s) / Geology: **Falaya Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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

Secondary Indicator Score (if applicable) = 23.75

Justification / Notes:

Primary indicator #5 indicates feature is a stream. Seconardy indicators were also assessed and scored >19. Metric #15 was NA due to recent rain event but there is a high liklihood the metric would have a strong score, resulting higher score.

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **9.5**)	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 control	**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: **3.75**)

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 = **10.5**)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 23.75

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

Notes:

Channelized ditch that runs through soy fields. Although Metric #15 was not available due to a significant rain event <48hr before assessment occurred, there was enough moving water, that it would likely still be present >48hr from a rain event.
Snails = 12, Oligacheates = 2, Coleoptera = 3, Crayfish = 1, Gambusia = abundent

NC DWQ Stream Identification Form Version 4.11

Date: **11/5/18**	Project/Site: **RES Memphis/S-1**	Latitude: **35.277257**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716571**
25.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) Ephemeral **Intermittent** Perennial	Other:

A. Geomorphology (Subtotal: **9.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	2	**3**
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	2	3
4. Particle size of stream substrate	0	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	0	**1**	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	No = 0		**Yes = 3**	

B. Hydrology (Subtotal: **5.25**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	0.5	1	**1.5**
16. Organic debris lines or piles	0	**0.5**	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **10.75**)				
18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	**3**	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	**2**	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	0	**0.5**	**1**	1.5
23. Crayfish	0	**0.5**	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; **OBL = 1.5**; Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Snails = 12, Oligacheates = 2, Coleoptera = 3, Crayfish = 1, Gambusia = abundent

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/5/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-2/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.276319, -89.719542**
Previous Rainfall (7-days): **2.38in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 6	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 17.5

Justification / Notes:

Although this feature contains multiple individuals of ephemeroptera, odonata, and coleoptera, it only flows in direct response to precipitation and was constructed with the primary purpose of performing as an agricultural drainage. Portions of the feature are impounded due to sedimentation from the agricultural field and during high flow events within the Loosahatchie River (receiving river) S-2 is further impounded with backwater from the Loosahatchie. S-2 is deeply entrenched by dredging activities and a naturally occurring bed and bank are not easily observed. S-2 contained water but was not flowing within 24hrs of a 0.33in rain event. Water became intermittently pooled towards the bottom of the assessed reach.

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **4.5**)

	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 control	**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: **1.5**)

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 = **11.5**)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 17.5

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

Notes:

Ephemeroptera = 5, Odonata = 3, Snails = 30, Coleoptera = 6, Frogs = 1

NC DWQ Stream Identification Form Version 4.11

Date:	Project/Site:	Latitude:
11/5/18	**RES Memphis/S-2**	**35.276319**
Evaluator:	County:	Longitude:
Andrew Zimmerman	**Shelby**	**-89.719542**
19	Stream Determination (circle one)	Other:
Stream is at least intermittent if > 19 or perennial if >30*	Ephemeral **Intermittent** Perennial	

A. Geomorphology (Subtotal: **4.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	2	**3**
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	1	2	3
4. Particle size of stream substrate	0	**1**	**2**	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	0.5	1	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **11.5**)				
18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	**3**	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	**3**
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	0	**0.5**	1	1.5
25. Algae	0	**0.5**	1	1.5
26. Wetland plants in streambed	FACW = 0.75; **OBL = 1.5**; Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Ephemeroptera = 5, Odonata = 3, Snails = 30, Coleoptera = 6, Frogs = 1

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-3/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.285322, -89.717236**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 9.5

Justification / Notes:

Dry and <24hrs since last sig rain event (previous visit)

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 2.5)	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 control	**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: 3)

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 = 4)

18. Fibrous roots in channel[1]	3	**2**	1	0
19. Rooted upland 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 = 9.5

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

Notes:

2 features (~30ft, 15ft) join to form S-3. 2 small headcuts. Assessed area as a WWC, upstream fingers assumed to be WWC based on assessed reach score.

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-3**	Latitude: **35.285322**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.717236**
11 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: 2.5)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	2	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: 4.5)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	**1**	1.5
16. Organic debris lines or piles	0	**0.5**	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = 4)				
18. Fibrous roots in streambed	3	**2**	1	0
19. Rooted upland plants in streambed	3	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:
2 features (~30ft, 15ft) join to form AS26. 2 small headcuts. Assessed area as a ephemeral, upstream features assumed to be WWC based on assessed reach score.

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-4/RES Memphis**		Project ID:
Site Location: Lakeland, TN		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.285055, -89.716115**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 7	
Soil Type(s) / Geology: **Falaya Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 13

Justification / Notes:

Channel observed to be dry <24hrs after significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 8)	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 control	**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)				
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 = 2.5)				
18. Fibrous roots in channel[1]	3	2	1	**0**
19. Rooted upland 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 = 13

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-4**	Latitude: **35.285055**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716115**
15.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: ___8___)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	3
2. Sinuosity of channel along thalweg	0	**1**	**2**	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	0	**1**	2	3
6. Depositional bars or benches	**0**	**1**	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	0	**1**	**2**	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: ___4___)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	**0.5**	1	1.5
16. Organic debris lines or piles	0	**0.5**	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = ___2.5___)				
18. Fibrous roots in streambed	3	2	1	**0**
19. Rooted upland plants in streambed	**3**	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-5/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.285587, -89.716337**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 4	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 10.25

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **3.5**)	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 control	**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: **2.25**)

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 = **4.5**)

18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 10.25

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

Notes:

S-5 flows into S-4.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-5**	Latitude: **35.285587**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716337**
11.75 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **3.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3.75**)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	**0.5**	1	1.5
16. Organic debris lines or piles	0	**0.5**	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **4.5**)

18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	3	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-6/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.284495, -89.717043**
Previous Rainfall (7-days): **0.86in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size:<1mi²	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 9.5

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **2.5**)	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 control	**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: **3**)

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 = **4**)

18. Fibrous roots in channel[1]	3	**2**	1	0
19. Rooted upland 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 = 9.5

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

Notes:

Dry and <24hrs since last sig rain event.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-6**	Latitude: **35.284495**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.717043**
11 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **2.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	2	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.5**)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	**1**	1.5
16. Organic debris lines or piles	0	**0.5**	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **4**)

18. Fibrous roots in streambed	3	**2**	1	0
19. Rooted upland plants in streambed	3	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-7/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.284454, -89.716198**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 4	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 13.25

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **5.75**)	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 control	**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**)

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 = **5**)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 13.25

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-7**	Latitude: **35.284454**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716198**
14.75 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **5.75**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	1	**2**	3
4. Particle size of stream substrate	0	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	**0.5**	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	**0.5**	1	1.5
16. Organic debris lines or piles	0	**0.5**	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **5**)				
18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	3	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-8/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.282855, -89.717079**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 9

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **3**)	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 control	**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: **1.5**)

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 = **4.5**)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 9

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

Notes:

Dry and <24hrs since last sig rain event. Two rills form features. Bank erosion due to sheer flow across field.
Headcut = 1

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-8**	Latitude: **35.282855**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.717079**
10.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **3**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	0	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	0.5	1	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **4.5**)				
18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	3	**2**	**1**	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-9/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.281882, -89.717015**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 4	
Soil Type(s) / Geology: **Falaya Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 10.75

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **3.5**)	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 control	**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: **2.25**)

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 = **5**)

18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 10.75

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

Notes:

Dry and <24hrs since last sig rain event. Short drainage feature off soy field (~40ft), 1 large headcut at top of reach. Several small rills join the feature. Small Sycamore trees in channel.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-9**	Latitude: **35.281882**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.717015**
12.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **3.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	**3**
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	1	2	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	0	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3.75**)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	**1**	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **5.25**)

18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	3	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	**FACW = 0.75**; OBL = 1.5; Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-10/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.281287, -89.716853**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 2	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 10.75

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 3.5)	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 control	**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: 2.75)

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 = 4.5)

18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 10.75

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

Notes:

1 headcut at rop of feature. Feature ~30ft. Dry and <24hrs since sig rain event.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-10**	Latitude: **35.281287**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716853**
12.25 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **3.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	**3**
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	1	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.25**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	0.5	**1**	**1.5**
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **4.5**)				
18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	3	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-11/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.281308, -89.716648**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Falaya Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 10.75

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: ____3_____)	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 control	**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: ____2.75___)

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 = ____5____)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 10.75

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-11**	Latitude: **35.281308**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716648**
12.25 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **3**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	2	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.25**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	**0.5**	1	1.5
16. Organic debris lines or piles	0	0.5	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **5**)				
18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	3	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-12/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.280669, -89.716912**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 2	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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 = 7.5

Secondary Indicator Score (if applicable) =

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **2**)	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 control	**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**)

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 = **3.5**)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 7.5

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-12**	Latitude: **35.280669**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716912**
9 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **2**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	1	2	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3.5**)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **3.5**)

18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	3	2	**1**	**0**
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-13/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.280589, -89.716599**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 11.5

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 4.5)	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 control	**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: 3)				
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 = 4)				
18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 11.5

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

Notes:

Small feature draining soy field. ~20ft of defined channel.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-13**	Latitude: **35.280589**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716599**
13 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **4.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	2	3
4. Particle size of stream substrate	0	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.5**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	0	0.5	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **4**)				
18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	3	**2**	**1**	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-14/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.280217, -89.716391**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 4	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 12

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 4.5)	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 control	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: 3)				
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 = 4.5)				
18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 12

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

Notes:
Small drainage feature originating from soy field. Apparent downcutting due to runoff.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-14**	Latitude: **35.280217**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716391**
13.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **4.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	2	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	0	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.5**)				
~~12. Presence of baseflow~~	~~**0**~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	0	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	**0.5**	1	1.5
16. Organic debris lines or piles	0	0.5	**1**	**1.5**
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **4.5**)				
18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	3	**2**	**1**	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-15/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.279267, -89.716944**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Falaya Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 7.5

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 2)	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 control	**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)

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 = 3.5)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 7.5

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-15**	Latitude: **35.279267**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716944**
9 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: ________)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	2	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	1	2	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: ________)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = _________)				
18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	3	2	**1**	**0**
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-16/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.279145, -89.716568**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Waveryly Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 11

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **4.5**)	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 control	**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**)

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 = **4**)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 11

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-16**	Latitude: **35.279145**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716568**
12.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **4.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	3
2. Sinuosity of channel along thalweg	0	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4**)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	0	**0.5**	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **4**)

18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	3	2	**1**	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-17/RES Memphis**		Project ID:
Site Location: Lakeland, TN		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.278609, -89.716473**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Waveryly Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: ____3_____)	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 control	**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: ____1.5_____)

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 = ____4.5_______)

18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 9

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

Notes:
Small drainage rill, originating from soy field.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-17**	Latitude: **35.278609**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716473**
10.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: _____3_____)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	**3**
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: _____3_____)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	0.5	1	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = _____4.5_____)

18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	3	**2**	**1**	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: Andrew Zimmerman Site Name/Description: S-18		Project ID:
Site Location: Lakeland, TN		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.277937, -89.716479**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 2	
Soil Type(s) / Geology: **Waveryly Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

Primary Indicators	**NO**	**YES**
1. Hydrologic features exists solely due to a process discharge	**x**	WWC
2. Defined bed and bank absent, dominated by upland vegetation/grass	**x**	WWC
3. Watercourse dry anytime during February through April 15h, under normal precipitation/groundwater conditions	**NA**	WWC
4. Daily flow and precipitation records showing feature only flows in direct response to rainfall	**NA**	WWC
5. Presence of multiple populations of obligate lotic or obligate lotic organisms with > 2 month aquatic phase	**x**	Stream
6. Presence of fish (except Gambusia)	**x**	Stream
7. Presence of naturally occurring ground water table connection	**x**	Stream
8. Flowing water in channel and 7 days since last precipitation in local watershed	**NA**	Stream
9. Evidence watercourse has been used as a supply of drinking water	**x**	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) = 13

Justification / Notes:

Channel observed to be dry <24hrs after a significant rain event (previous to assessment).

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: ____**6**______)	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 control	**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**_____)				
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 = ____**5.0___**___)				
18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 13

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

Notes:

Small rill feature which drains off of soy field and into manmade channel.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-18**	Latitude: **35.277937**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.716479**
14.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: ____**6**______)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	**3**
2. Sinuosity of channel along thalweg	0	**1**	**2**	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	**2**	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: ____**3.5**______)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = _____**5.5**_____)				
18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	**3**	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-19/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.274701, -89.718959**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 13	
Soil Type(s) / Geology: **Falaya Silt Loam / Grenada Complex**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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

Secondary Indicator Score (if applicable) = 18

Justification / Notes:

Although metic #18 was NA due to a significant rain event in the previous 48hr (~36hrs since significant rain event at time of assessment), there is a high likelihood that water would still occupy the stream >48hrs after a significant event. The additionaly points would score the feature as a stream.

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 8.75)	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 control	**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: 3)				
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 = 6.5)				
18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 18.25

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

Notes:

Assessed from culverted road crossing in woods, through soy field, and into another woodline, and into neighboring field. Feature ended due to alteration of western field (graded back towards feature). Evidence racoons use feature for scaveging, indication of potenitally stable watercourse.

Adult cranefly = 1, Crayfish = 1, Dragonfly = 1, Snail = 18, Oligocheates = 1

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-19**	Latitude: **35.274701**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.718959**
21 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) Ephemeral **Intermittent** Perennial	Other:

A. Geomorphology (Subtotal: **9.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	0	1	**2**	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	**2**	3
4. Particle size of stream substrate	0	**1**	**2**	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	0	**1**	2	3
7. Recent alluvial deposits	0	**1**	**2**	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.25**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	0	0.5	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **7.25**)				
18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	3	2	**1**	0
20. Macrobenthos (note diversity and abundance)	0	**1**	**2**	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	**0.5**	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	**FACW = 0.75**; OBL = 1.5; Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Adult cranefly = 1, Crayfish = 1, Dragonfly = 1, Snail = 18, Oligocheates = 1

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Clear Creek Canal**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-20/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090404**	Lat/Long: **35.288669, -89.708646**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 6	
Soil Type(s) / Geology: **Falaya Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 15

Justification / Notes:

Although feature drains a wetland, there is evidence the feature was not originally naturally occuring. Channel was dry on previous site visit, indicating water in channel is not consistent after rain events.

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **6.5**)	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 control	**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: **3**)

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 = **5.5**)

18. Fibrous roots in channel[1]	3	**2**	1	0
19. Rooted upland 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 = 15

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

Notes:

~36hrs after sig. rain event and moderate to strong baseflow. Feature drains a delineated wetland.
Oligocheate = 1 with moderate effort

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-20**	Latitude: **35.288669**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.708646**
17.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **6.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	2	**3**
2. Sinuosity of channel along thalweg	0	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	2	3
4. Particle size of stream substrate	0	**1**	**2**	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.5**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	0	0.5	**1**	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **5.5**)				
18. Fibrous roots in streambed	3	**2**	1	0
19. Rooted upland plants in streambed	**3**	2	1	0
20. Macrobenthos (note diversity and abundance)	**0**	**1**	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:
Although feature drains a wetland, there is evidence the feature was not originally naturally occuring. Channel was dry on previous site visit, indicating water in channel is not consistent after rain events.

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-21/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.287043, -89.710497**
Previous Rainfall (7-days): **0.86in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <2.59mi^2	Photos **Y** or N Number: 6	
Soil Type(s) / Geology: **Waverly Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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

Secondary Indicator Score (if applicable) = 25

Justification / Notes:

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **13.5**)	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 control	**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: **4**)

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 = **7.5**)

18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 25

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

Notes:

Riprap ford crossing upstream daming stream
Oligocheates = 3, Scud = 1, Juvenile Asian Clam = 1

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-21**	Latitude: **35.287043**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.710497**
26.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) Ephemeral Intermittent **Perennial**	Other:

A. Geomorphology (Subtotal: **13.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	2	**3**
2. Sinuosity of channel along thalweg	0	**1**	**2**	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	1	**2**	3
4. Particle size of stream substrate	0	1	**2**	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	0	**1**	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	0	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	No = 0		**Yes = 3**	

B. Hydrology (Subtotal: **5.5**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	0.5	**1**	1.5
16. Organic debris lines or piles	0	0.5	1	**1.5**
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **7.5**)				
18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	**3**	2	1	0
20. Macrobenthos (note diversity and abundance)	0	**1**	2	3
21. Aquatic mollusks	**0**	**1**	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Presence of baselfow metric was NA due to recent rainfall, however strong flowing water in channel ~36hrs after rain event. It is likely the feature would score strong if metric were available. Additionally, leaf litter in channel was NA due to season, however flow would not be in channel due to baseflow, would likely score as absent.
If metric #12 and #14 were available, score would be >30, assessor's opinion the feature is a perenial stream

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Clear Creek Canal**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-22/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090404**	Lat/Long: **35.286387, -89.710211**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 7	
Soil Type(s) / Geology: **Waverly Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 12.25

Justification / Notes:

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 8)	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 control	**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: 3.25)

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 = 1)

18. Fibrous roots in channel[1]	3	2	1	**0**
19. Rooted upland 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 = 12.25

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

Notes:

Large headcut at top of feature, 2 small headcuts in lower reach, and 1 developing headcut.

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-22**	Latitude: **35.286387**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.710211**
13.75 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: 8)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	2	**3**
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	0	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	**1**	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	0	1	**2**	**3**
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: 4.75)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	0	0.5	**1**	**1.5**
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = 1)				
18. Fibrous roots in streambed	3	2	1	**0**
19. Rooted upland plants in streambed	3	2	**1**	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Clear Creek Canal**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-23/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090404**	Lat/Long: **35.287323, -89.707429**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos Y or **N** Number: 0	
Soil Type(s) / Geology: **Waverly Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = **6.25**

Justification / Notes:

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 3)	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 control	**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: 2.25)

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 = 1)

18. Fibrous roots in channel[1]	3	2	**1**	**0**
19. Rooted upland 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 = 6.25

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-23**	Latitude: **35.287323**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.707429**
8.75 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **3**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	2	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	0	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.75**)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	**0.5**	1	1.5
16. Organic debris lines or piles	0	**0.5**	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **1**)

18. Fibrous roots in streambed	3	2	**1**	**0**
19. Rooted upland plants in streambed	3	2	**1**	**0**
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Clear Creek Canal**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-24/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090404**	Lat/Long: **35.286982, -89.707399**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 4	
Soil Type(s) / Geology: Waverly Silt Loam		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 4.5

Justification / Notes:

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: ___2___)	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 control	**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___)

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 = ___0.5___)

18. Fibrous roots in channel[1]	3	2	**1**	**0**
19. Rooted upland 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 = 4.5

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

Notes:

Samll trib feature to S-23

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-24**	Latitude: **35.286982**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.707399**
6 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **2**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3.5**)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	0	**0.5**	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **0.5**)

18. Fibrous roots in streambed	3	2	**1**	**0**
19. Rooted upland plants in streambed	3	2	1	**0**
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-25/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.285673, -89.707420**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 1	
Soil Type(s) / Geology: **Falaya Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 4.5

Justification / Notes:

WWC due to primary indicator #2

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 0.5)	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 control	**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: **1.5**)

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 = **3**)

18. Fibrous roots in channel[1]	3	2	1	**0**
19. Rooted upland 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 = 5

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-25**	Latitude: **35.285673**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.70742**
6.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **0.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	**0**	**1**	2	3
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	1	2	3
4. Particle size of stream substrate	**0**	1	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3**)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	0.5	1	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **3**)

18. Fibrous roots in streambed	3	2	1	**0**
19. Rooted upland plants in streambed	**3**	2	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-26/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.280394, -89.711082**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 4	
Soil Type(s) / Geology: Waverly Silt Loam	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 10.25

Justification / Notes:

Lower end of a large relic channel, likely drained natural features before field was present.

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **6**)	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 control	**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: **2.25**)

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 = **2**)

18. Fibrous roots in channel[1]	3	2	**1**	0
19. Rooted upland 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 = 10.25

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

Notes:

No water in channel with percipitation within 24hrs.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-26**	Latitude: **35.280394**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.711082**
11.75 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: 6)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	0	**1**	2	3
5. Active/relict floodplain	0	**1**	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	0	**1**	**2**	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: 3.75)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	**0.5**	1	1.5
16. Organic debris lines or piles	0	**0.5**	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = 2)				
18. Fibrous roots in streambed	3	2	**1**	0
19. Rooted upland plants in streambed	3	2	**1**	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Clear Creek Canal**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-27/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090404**	Lat/Long: **35.280565, -89.709407**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 5	
Soil Type(s) / Geology: **Waverly Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 10.5

Justification / Notes:

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **4.5**)

	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 control	**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: **1.5**)

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 = **4.5**)

18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 10.5

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

Notes:

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-27**	Latitude: **35.280565**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.709407**
12 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **4.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	**0**	**1**	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	0.5	1	1.5
16. Organic debris lines or piles	**0**	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **4.5**)				
18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	3	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/13/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-28/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.280396, -89.711081**
Previous Rainfall (7-days): **1.9in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 3	
Soil Type(s) / Geology: **Wavery Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 9.75

Justification / Notes:

Lower end of a large relic channel, likely drained natural features before field was present. Small drainage feature now within relic channel, indicating decreased drainage from field alterations.

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **4.5**)	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 control	**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: **1.75**)				
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 = **3.5**)				
18. Fibrous roots in channel[1]	**3**	**2**	1	0
19. Rooted upland 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 = 9.75

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

Notes:
Feature starts in a small wetland with willow sp. And sycamore.

NC DWQ Stream Identification Form Version 4.11

Date: **11/13/18**	Project/Site: **RES Memphis/S-28**	Latitude: **35.280396**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.711081**
11.25 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **4.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	**2**	3
2. Sinuosity of channel along thalweg	**0**	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	1	2	3
4. Particle size of stream substrate	0	**1**	**2**	3
5. Active/relict floodplain	**0**	**1**	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3.25**)				
~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	0.5	1	1.5
16. Organic debris lines or piles	**0**	**0.5**	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **3.5**)				
18. Fibrous roots in streambed	**3**	**2**	1	0
19. Rooted upland plants in streambed	3	2	**1**	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Clear Creek Canal**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-29/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090404**	Lat/Long: **35.279283, -89.707575**
Previous Rainfall (7-days): **0.86in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 4	
Soil Type(s) / Geology: **Waverly Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Forested/Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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

Secondary Indicator Score (if applicable) = 13.75

Justification / Notes:

Feature drains a small deliniated wetland. Baseflow present but ~36hrs since last sig. rain event. Baseflow would likely be present 48hrs after. Observed baseflow on previous visit. Due to presence of prolonged baseflow, determined to be intermittent alought scored <19

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **5**)	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 control	**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: **3.25**)				
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 = **5.5**)				
18. Fibrous roots in channel[1]	3	**2**	**1**	0
19. Rooted upland 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 = 13.75

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

Notes:

Feature drains a small deliniated wetland. Baseflow present but ~36hrs since last sig. rain event. Baseflow would likely be present 48hrs after. Observed baseflow on previous visit.
Frog =1, Oligachate = 1, Scud = 3

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-29**	Latitude: **35.279283**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.707575**
15.25 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) Ephemeral **Intermittent** Perennial	Other:

A. Geomorphology (Subtotal: **5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	**1**	2	3
2. Sinuosity of channel along thalweg	0	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	**1**	2	3
4. Particle size of stream substrate	**0**	**1**	2	3
5. Active/relict floodplain	0	**1**	**2**	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	0	**0.5**	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **4.75**)				
~~12. Presence of baseflow~~	~~**0**~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	0	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	0	**0.5**	1	1.5
16. Organic debris lines or piles	0	0.5	**1**	**1.5**
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **5.5**)				
18. Fibrous roots in streambed	3	**2**	**1**	0
19. Rooted upland plants in streambed	**3**	**2**	1	0
20. Macrobenthos (note diversity and abundance)	0	**1**	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	0	**0.5**	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Feature drains a small deliniated wetland. Baseflow present but ~36hrs since last sig. rain event. Baseflow would likely be present 48hrs after. Observed baseflow on previous visit. Due to presence of prolonged baseflow, determined to be intermittent alought scored <19
Frog =1, Oligachate = 1, Scud = 3

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Loosahatchie River-Oliver Creek**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-30/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090405**	Lat/Long: **35.278767, -89.707468**
Previous Rainfall (7-days): **0.86in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 5	
Soil Type(s) / Geology: **Waverly Silt Loam**	Source: **Soil Web**	
Surrounding Land Use: **Forested/Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): **Severe** Moderate Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 9.75

Justification / Notes:

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: **4.5**)	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 control	**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: **1.75**)				
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 = **3.5**)				
18. Fibrous roots in channel[1]	3	2	**1**	0
19. Rooted upland 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 = 9.75

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

Notes:

Bed dominated with leaf litter. Although feature assessed outside of Metric #16 range, it is apparent previous years leaves are still present in channel and have not been displaced by percipitation events. Observed on previous visit, <24hrs after >1in rain event and no water in channel.

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-30**	Latitude: **35.278767**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.707468**
11.25 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) **Ephemeral** Intermittent Perennial	Other:

A. Geomorphology (Subtotal: **4.5**)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	**2**	3
2. Sinuosity of channel along thalweg	**0**	1	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	**0**	1	2	3
4. Particle size of stream substrate	0	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	**0**	1	2	3
8. Headcuts	0	**1**	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: **3.25**)				
~~12. Presence of baseflow~~	~~**0**~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	0.5	1	1.5
16. Organic debris lines or piles	**0**	**0.5**	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = **3.5**)				
18. Fibrous roots in streambed	3	2	**1**	0
19. Rooted upland plants in streambed	**3**	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Hydrologic Determination Field Data Sheet

Tennessee Division of Water Pollution Control, Version 1.4

County: **Shelby**	Named Waterbody: **Clear Creek Canal**	Date/Time: **11/14/18**
Assessors/Affiliation: **Andrew Zimmerman** Site Name/Description: **S-31/RES Memphis**		Project ID:
Site Location: **Lakeland, TN**		
USGS Quad: **Arlington**	HUC (12 digit): **080102090404**	Lat/Long: **35.288086, -89.714109**
Previous Rainfall (7-days): **0.86in National Weather Service (Memphis)**		
Precipitation this Season vs Normal: very wet wet **average** dry drought unknown Source of recent %& season precip data: **Calculations for Normal Weather**		
Watershed Size: <1mi^2	Photos **Y** or N Number: 5	
Soil Type(s) / Geology: **Waverly Silt Loam**		Source: **Soil Web**
Surrounding Land Use: **Forested/Agricultural**		
Degree of historical alteration to natural cannel morphology & hydrology (circle one): Severe **Moderate** Slight Absent		

Primary Field Indicators Observed

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

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absent directly contrary 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) = 15.5

Justification / Notes:

Secondary Field Indicator Evaluation

A. Geomorphology (Subtotal: 7)	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 control	**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: 3)

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 = 5.5)

18. Fibrous roots in channel[1]	**3**	2	1	0
19. Rooted upland 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 = 15.5

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

Notes:

Iron oxidizing bacteria and Hyla sp. Observed in wetland which the feature drains. Indicates wetland has persistent hydrology.

NC DWQ Stream Identification Form Version 4.11

Date: **11/14/18**	Project/Site: **RES Memphis/S-31**	Latitude: **35.288086**
Evaluator: **Andrew Zimmerman**	County: **Shelby**	Longitude: **-89.714109**
16.5 Stream is at least intermittent if > 19 or perennial if >30*	Stream Determination (circle one) Ephemeral **Intermittent** Perennial	Other:

A. Geomorphology (Subtotal: 7.5)	Absent	Weak	Moderate	Strong
1*. Continuity of channel bed and bank	0	1	2	**3**
2. Sinuosity of channel along thalweg	0	**1**	2	3
3. In-channel structure: ex. Riffle-pool, step-pool, riffle-pool sequence	0	**1**	**2**	3
4. Particle size of stream substrate	0	**1**	2	3
5. Active/relict floodplain	**0**	1	2	3
6. Depositional bars or benches	**0**	1	2	3
7. Recent alluvial deposits	0	**1**	2	3
8. Headcuts	**0**	1	2	3
9. Grade control	**0**	0.5	1	1.5
10 Natural valley	**0**	0.5	1	1.5
11. Second or greater order channel	**No = 0**		Yes = 3	

B. Hydrology (Subtotal: 3.5)

~~12. Presence of baseflow~~	~~0~~	~~1~~	~~2~~	~~3~~
13. Iron oxidizing bacteria	**0**	1	2	3
~~14. Leaf litter~~	~~1.5~~	~~1~~	~~0.5~~	~~0~~
15. Sediment on plants or debris	**0**	0.5	1	1.5
16. Organic debris lines or piles	0	**0.5**	1	1.5
17. Soil-based evidence of high water table?	No = 0		**Yes = 3**	

C. Biology (Subtotal = 5.5)

18. Fibrous roots in streambed	**3**	2	1	0
19. Rooted upland plants in streambed	**3**	**2**	1	0
20. Macrobenthos (note diversity and abundance)	**0**	1	2	3
21. Aquatic mollusks	**0**	1	2	3
22. Fish	**0**	0.5	1	1.5
23. Crayfish	**0**	0.5	1	1.5
24. Amphibians	**0**	0.5	1	1.5
25. Algae	**0**	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5; **Other = 0**			

*perennial streams may also be identified using other methods. See p. 35 of manual

Notes:

Iron oxidizing bacteria and Hyla sp. Observed in wetland which the feature drains. Indicates wetland has persistent hydrology. Assessed as an intermittent stream due to consistent hydrology from wetland.

Appendix E

Calculation of Normal Weather

Calculation of Normal Weather Conditions

	Month	Long-term rainfall records: Minus One Std. Dev. (DRY)	Normal(Mean inches)	Plus One Std. Dev. (WET)	Actual Rainfall	Condition (dry, wet, normal)	Condition value	Month weight value	Product of previous two columns
1st prior month*	10/18	2.21	3.98	5.72	3.59	Normal	2	x 3	6
2nd prior month*	9/18	1.53	3.09	5.11	5.27	Normal	2	x2	4
3rd prior month*	8/18	0.92	2.88	4.84	2.07	Normal	2	x1	2
								Sum =	12

Note:

If sum is:	
6-9	Then prior period has been drier than normal
10-14	Then prior period has been normal
15-18	Then prior period has been wetter than normal

Condition Value	
Dry =	1
Normal =	2
Wet =	3

Conclusions:
Past weather in normal condition.

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

Smokestack Mitigation Bank Site

LOCATION

Shelby County, Tennessee

DESCRIPTION

Wetland delineation on three parcels (approximately 359.42 acres) to evaluate the suitability of the site for mitigation.

Local office

Tennessee Ecological Services Field Office

(931) 528-6481
(931) 528-7075

446 Neal Street
Cookeville, TN 38501-4027

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Indiana Bat Myotis sodalis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS

Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Prothonotary Warbler Protonotaria citrea This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Wood Thrush Hylocichla mustelina — Breeds May 10 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The

number of surveys is expressed as a range, for example, 33 to 64 surveys.

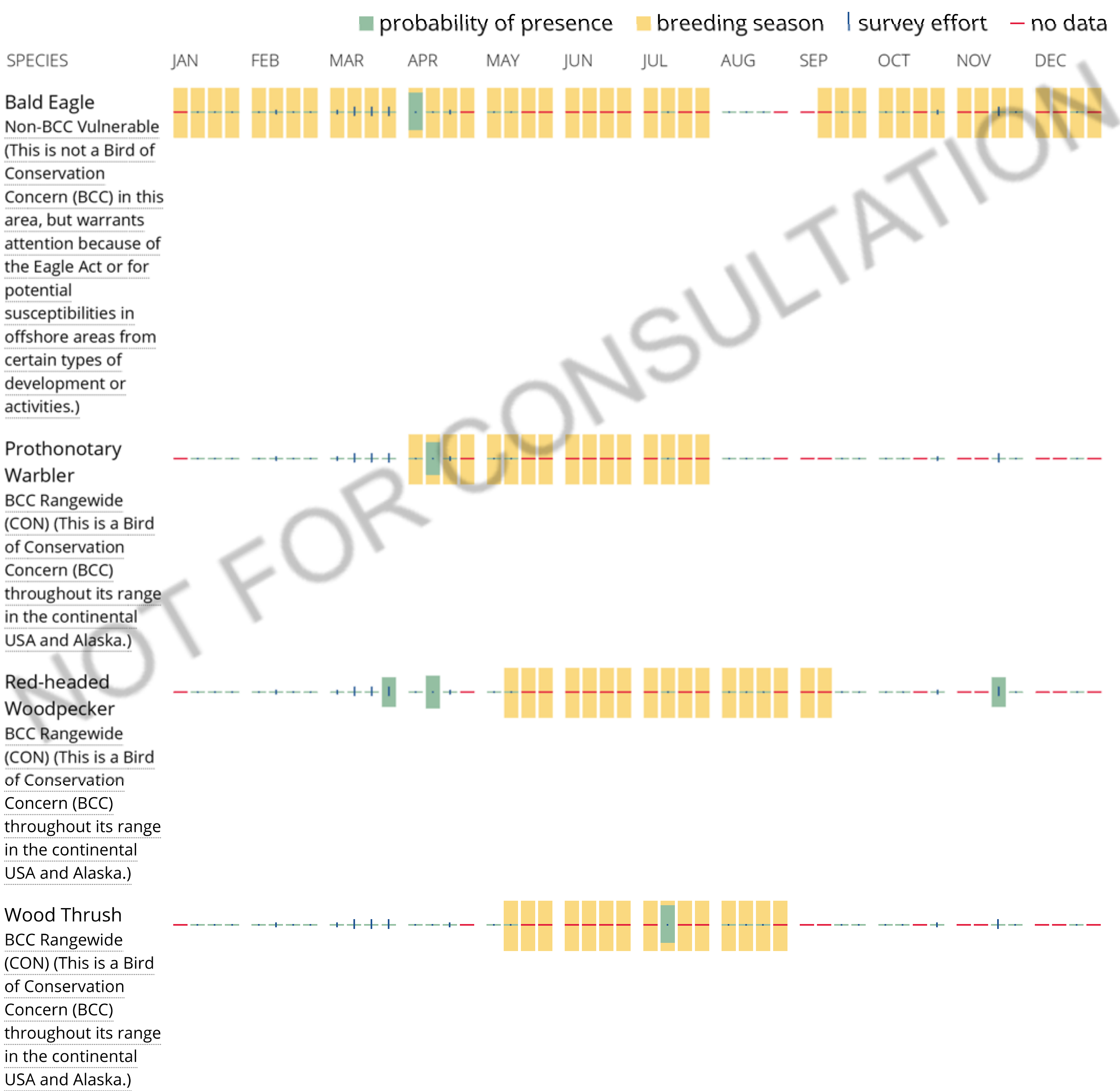
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and

3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1C

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A
- PFO1C
- PFO1F
- PSS1C
- PFO1Cx

RIVERINE

- R2UBHx
- R4SBCx

- R5UBH
- R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Photo 1. Eastern parcel within the Site with agricultural soy field vegetation; facing north.

Photo 2. Western parcel within the Site; facing north.

Photo 3. Agricultural land within the western parcel; facing west, toward the adjoining agricultural field and elevated road.

Photo 4. Agricultural field and overhead high-voltage utility transmission line which crosses the northern portion of the Site east-west.

Photo 5. The Loosahatchie River, a channelized perennial stream along the northern boundary of the Site; facing east, upstream.

Photo 6. Clear Creek Canal, a perennial tributary to the Loosahatchie River, located in the central portion of the Site which flows south to north; facing upstream.

Photo 7. Wetland W-3 (PFO) facing west.

Photo 8. Wetland W-4 (PEM) facing west.

Photo 9. Wetland W-5 (PEM) facing south.

Photo 10. Wetland W-6 (PEM) facing west.

Photo 11. Wetland W-7 (PEM) facing west.

Photo 12. Wetland W-8 (PEM) facing east.

Photo 13. Wetland W-9 (PEM) facing south.

Photo 14. Wetland W-10 (PEM) facing east.

Photo 15. Wetland W-11 (PEM) facing west.

Photo 16. Wetland W-12 (PEM) facing south.

Photo 17. Wetland W-13 (PEM) facing north.

Photo 18. Wetland W-14 (PEM) facing east.

Photo 19. Wetland W-15 (PEM) facing east.

Photo 20. Wetland W-16 (PEM) facing south.

Photo 21. Wetland W-17 (PEM) facing south.

Photo 22. Wetland W-18 (PEM) facing east.

Photo 23. Wetland W-18 (PEM) facing west.

Photo 24. Wetland W-19 (PEM) facing north.

Photo 25. Wetland W-19 (PEM) facing east.

Photo 26. Wetland W-19 (PFO) facing east.

Photo 27. Wetland W-19 (PFO) facing south.

Photo 28. Wetland W-19 (PSS) facing east.

Photo 29. Wetland W-20 (PEM) facing north.

Photo 30. Wetland W-21 (PFO) facing north.

Photo 31. Wetland W-22 (PEM) facing west.

Photo 32. Wetland W-23 (PEM) facing northeast.

Photo 33. Wetland W-23 (PFO) facing east.

Photo 34. Wetland W-24 (PEM) facing north.

Photo 35. Wetland W-25 (PEM) facing south.

Photo 36. Wetland W-26 (PFO) facing northeast.

Photo 37. Wetland W-27 (PEM) facing east.

Photo 38. Wetland W-28 (PFO) facing east.

Photo 39. Wetland W-29 (PEM) facing northeast.

Photo 40. Wetland W-30 (PEM) facing south.

Photo 41. Wetland W-30 (PFO) facing north.

Photo 42. Wetland W-31 (PEM) facing north.

Photo 43. Wetland W-32 (PEM) facing south.

Photo 44. Wetland W-33 (PEM) facing southeast.

Photo 45. Wetland W-34 (PEM) facing northeast.

Photo 46. Wetland W-35 (PEM) facing east.

Photo 47. Wetland W-36 (PEM) facing north.

Photo 48. Wetland W-37 (PEM) facing south.

Photo 49. Wetland W-38 (PEM) facing south.

Photo 50. Wetland W-39 (PEM) facing north.

Photo 51. Wetland W-40 (PEM) facing east.

Photo 52. Wetland W-41 (PEM) facing east.

Photo 53. Wetland W-42 (PEM) facing north.

Photo 54. Wetland W-43 (PEM) facing west.

Photo 55. Wetland W-44 (PEM) facing south.

Photo 56. Wetland W-45 (PEM) facing west.

Photo 57. Wetland W-45 (PSS) facing south.

Photo 58. Wetland W-46 (PEM) facing north.

Photo 59. Wetland W-47 (PEM) facing southeast.

Photo 60. Wetland W-48 (PEM) facing south.

Photo 61. Wetland W-49 (PEM) facing south.

Photo 62. Wetland W-49 (PFO) facing north.


Photo 63. Wetland W-50 (PSS) facing east.


Photo 64. Wetland W-51 (PEM) facing east.

Photo 65. Wetland W-52 (PEM) facing north.

Photo 66. S-1 from middle of assessed reach, facing upstream (11/5/18)

Photo 67. Culverted crossing of S-1 with aquatic vegetation (11/5/18)

Photo 68. Shows S-1 downstream of the culvert, facing downstream (11/5/18)

Photo 69. S-2, facing upstream, showing the upper end of the reach (11/5/18)

Photo 70. S-2, facing downstream, showing the upper end of the reach (11/5/18)

Photo 71. S-2 facing upstream show the incised channel (11/5/18)

Photo 72. Upper reach of S-3, shows lack of defined bed and bank before running into wood line (11/13/18)

Photo 73. S-3, showing channel becomes more defined within the wood line, but little evidence feature consistently moves water (11/13/18)

Photo 74. S-3, showing confluence with S-1. Presence of leaves still in channel after large rain events indicates hydraulic use is low (11/13/18)

Photo 75. Large headcut at top of feature S-4 (11/13/18)

Photo 76. S-4 channel, facing downstream (11/13/18)

Photo 77. Incised S-4 channel (11/13/18)

Photo 78. Defined bed and bank of S-5 (11/13/18)

Photo 79. S-5 lower reach, before confluence with S-4, facing downstream (11/13/18)

Photo 80. Depicts the channel of S-6, facing downstream (11/13/18)

Photo 81. S-7 starting to incise through the soil profile (11/13/18)

Photo 82. Channel of S-7, facing downstream (11/13/18)

Photo 83. Depicts the channel of feature S-8, facing downstream (11/13/18)

Photo 84. Large headcut with standing water at the top of S-8 (11/13/18)

Photo 85. Shows entire S-9 feature with defined bed and bank (11/13/18)Photo 135.

Photo 86. S-11 channel, showing defined channel through incision and confluence with S-1 (11/13/18)

Photo 87. S-12 upper reach with undefined banks and upland vegetation (11/13/18)

Photo 88. Formation of S-13 channel, facing downstream (11/13/18)

Photo 89. S-14 mid-reach, facing downstream (11/13/18)

Photo 90. Lower reach of S-14, showing large pool and headcut (11/13/18)

Photo 91. Middle of S-15 reach, shows overly wide channel with poor banks and bed (11/13/18)

Photo 92. Middle of S-16 reach, facing downstream (11/13/18)

Photo 93. S-17 from top of feature, facing downstream (11/13/18)

Photo 94. S-18 from top of feature, facing downgradient (11/13/18)

Photo 95. Top of assessment area for S-19, at culverted crossing. (11/14/18)

Photo 96. Feature S-19 coming out of wood line and into soy field, showing intermittent water in channel (11/14/18)

Photo 97. S-19, large pool in feature, upland grasses present in the channel (11/14/18)

Photo 98. Large pool present at lower end of reach, S-19 ends after bend (11/14/18)

Photo 99. Wetland provides source water for feature S-20, facing upstream (11/14/18)

Photo 100. S-20, showing water level at bank full, facing downstream (11/14/18)

Photo 101. S-20 channel shows low sinuosity and wrack lines along channel margins (11/14/18)

Photo 102. Top of S-21 assessed reach, showing water flowing in channel (~36hrs after rain event) (11/14/18)

Photo 103. S-21, showing riffle pool complex with depositional feature (11/14/18)

Photo 104. Headcut causing incision through the profile as just upstream of confluence with Clear Creek (11/14/18)

Photo 105. Head of feature S-22, showing large headcut at edge of the soy field (11/14/18)

Photo 106. S-22, showing strong bed and bank of relic channel and small active channel (11/14/18)

Photo 107. S-22, showing section has little sinuosity as it drains into Clear Canal Creek (11/14/18)

Photo 108. S-23, facing downstream, showing the receiving tributary backing up into the S-23 channel (11/6/18).

Photo 109. S-24 channel shows little sinuosity and is dry ~36hrs after significant rain event (11/14/18)

Photo 110. S-25, qualifies for primary indicator #1, lacks defined bed and bank, dominated by upland veg. (11/14/18)

Photo 111. S-27 channel shows little signs of hydrologic use, facing downstream (11/14/18)

Photo 112. S-29, small drainage feature, showing undefined banks and leaf litter in channel (11/14/18)

Photo 113. S-30 channel, showing previous year's leave within channel, indicating relic channel (11/14/18)

Photo 114. S-31, showing channel and drainage into wetland (11/6/18)