Document Type:	Draft SEIS–Administrative Record
Index Field:	Supplemental Environmental Impact Statement
Project Name:	Shawnee CCR SEIS
Project Number:	2016-13

Shawnee Fossil Plant
Coal Combustion Residual Management
Draft Supplemental Environmental Impact Statement

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Prepared by:
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April 2018

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COVER SHEET

Shawnee Fossil Plant
Coal Combustion Residual Management Supplemental EIS

Proposed action: As part of an effort to manage the disposal of Coal Combustion Residuals (CCR) materials on a dry basis, and to meet new CCR regulations, the Tennessee Valley Authority (TVA) is proposing to cease operations at the existing CCR Landfill (Special Waste Landfill [SWL]) and Ash Impoundment 2 in accordance with the CCR Rule and Commonwealth of Kentucky's regulations.

Type of document: Draft Supplemental Environmental Impact Statement (SEIS)

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Abstract:

In December 2017, the Tennessee Valley Authority (TVA) issued the *Shawnee Fossil Plant Coal Combustion Residual Management Final Environmental Impact Statement* (Final EIS) (TVA 2017). The year-long assessment analyzed closing both the Special Waste Landfill (SWL) and Ash Impoundment 2, as well as building and operating a new lined landfill to store dry CCR waste produced by SHF in the future. In the Final EIS, TVA identified its preferred alternative as Alternative B – Construction of an Onsite CCR Landfill, Closure-in-Place of Ash Impoundment 2 with a reduced footprint, and Closure-in-Place of the SWL. On January 16, 2018, TVA issued a record of decision (ROD) to implement construction of the new dry CCR landfill, and elected to further consider the closure alternatives before making a decision. TVA has prepared this supplemental EIS (SEIS) to further analyze the closure alternatives. Additionally, TVA needs to evaluate a new proposed location for a new Process Water Basin (PWB). A preliminary location for the PWB was considered in the 2017 Final EIS; however, upon further investigation, TVA chose to consider additional alternative locations.

TVA has identified Alternative C – Closure-in-Place and Regrading of the SWL and Ash Impoundment 2, and Construction of a New PWB as the preferred alternative. Alternative C would achieve the purpose and need of the project and calls for less movement of CCR material and less dewatering than Alternative B and resulting in greater stability for Alternative C. Alternative C would also have reduced air quality impacts associated with the mobilization of dust and emissions from equipment associated with the movement of CCR material as compared to Alternative B. Consequently, Alternative C could be completed sooner and for a lower cost than Alternative B.

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Tennessee Valley Authority
Shawnee Fossil Plant Coal Combustion Residual Management
Draft Supplemental Environmental Impact Statement
April 2018
Executive Summary

This Supplemental Environmental Impact Statement (SEIS) addresses the management of Coal Combustion Residuals (CCR) from the Tennessee Valley Authority's (TVA) Shawnee Fossil Plant (SHF). The plant is located in McCracken County, Kentucky, on the south bank of the Ohio River, about 13 miles northwest of Paducah.

In December 2017, the TVA issued the *Shawnee Fossil Plant Coal Combustion Residual Management Final Environmental Impact Statement* (Final EIS) (TVA 2017). The year-long assessment analyzed closing both the Special Waste Landfill (SWL) and Ash Impoundment 2, as well as building and operating a new lined landfill to store dry CCR waste produced by SHF in the future. In the Final EIS, TVA identified its preferred alternative as Alternative B – Construction of an Onsite CCR Landfill, Closure-in-Place of Ash Impoundment 2 with a reduced footprint, and Closure-in-Place of the SWL. On January 16, 2018, TVA issued a record of decision (ROD) to implement construction of the new dry CCR landfill, and elected to further consider the alternatives regarding the closure of the SWL and Ash Impoundment 2 before making a decision. The Final EIS and ROD can be viewed here: https://www.tva.gov/Environment/Environmental-Stewardship/Environmental-Reviews/Management-of-Coal-Combustion-Residuals-from-the-Shawnee-Fossil-Plant.

TVA has prepared this SEIS to further analyze the alternatives for closure of the SWL and Ash Impoundment 2. Additionally, TVA needs to evaluate a new proposed location for a new Process Water Basin (PWB). A preliminary location for the PWB was considered in the 2017 Final EIS; however, upon further investigation, TVA chose to consider additional alternative locations. This SEIS incorporates the background information and findings of the 2017 Final EIS and presents and evaluates only new and/or significant data made available since publication of the Final EIS in relation to the closure projects, and new information related to the new location for the proposed PWB. The decision supports TVA's goal to eliminate all wet ash storage at its coal plants and comply with the federal CCR Rule, in addition to Commonwealth of Kentucky's regulations.

Alternatives Considered

During initial project planning, a range of alternatives and specific screening criteria were identified for each of the proposed projects individually: (1) closure of the existing SWL and Ash Impoundment 2, and (2) construction and operation of a new PWB. The various alternatives for closure of the existing SWL and Ash Impoundment 2 are summarized in the 2017 Final EIS and additional considerations and analysis are described in more detail below. In addition, the various alternatives considered for the construction and operation of a new PWB are described below.

Ash Impoundment 2 and Special Waste Landfill Closure Alternatives

During initial project planning, a range of alternatives and specific screening criteria were identified for the closure of both the existing SWL and Ash Impoundment 2, as presented in *Shawnee Fossil Plant SWL and Ash Impoundment 2 Final Closure Projects Project Planning Document* (Closure PPD) and discussed in the Final EIS. After further consideration, TVA reviewed and revised the Closure PPD in 2018 (Stantec 2018a). The majority of the closure alternatives remain eliminated; however, TVA decided to reconsider Alternative 4b Closure-in-Place of both facilities with general grading within permit boundary (as described in Table 2.1-3 of the Final EIS; TVA 2017). Additionally, TVA has modified Closure-by-Removal and Closure-by-Consolidation to include over-excavation of native materials across the area from which materials are removed/consolidated to confirm complete removal of CCR. Approximately 1 foot of over-excavation is assumed to be necessary. Due to the unknown nature of underlying material, over-excavation of significantly more than 1 foot could be required and could potentially include other remediation measures which cannot be defined at this time.

Waste Treatment/Process Water Basin Alternatives

In January 2018, TVA completed the *Process Water Basin Evaluation, Phase 1, Project Planning Document, Revision 1* (PWB PPD; Stantec 2018b). In the PWB PPD, TVA evaluated alternative wastewater management scenarios associated with the proposed PWB. Alternative configurations included installation of additional solids removal systems, pH adjustment, and wastewater management scenarios for the PWB. Additional solids removal systems for the Coal Yard drainage basin (CYDB) were also evaluated. Alternatives were considered based on design intent; construction feasibility; environmental, health, and safety considerations; capital construction costs; and annual operation and maintenance costs. Ultimately, the wastewater treatment alternative for construction of a new PWB in conjunction with CYDB improvements was selected for further evaluation. TVA determined this alternative would prevent the risk of elevated total suspended solids (TSS) levels, in addition to providing the flexibility for removing sediments in association with a wide range of operational and storm water conditions. Additionally, TVA carried forward the alternative for temporary tank-based treatment as an option in the event the PWB might not be operational by April 2019, the likely date that TVA will have to cease using Ash Impoundment 2 under the CCR Rule.

TVA also considered multiple location alternatives for the PWB. Locations were evaluated based on site characteristics, conveyance considerations, design considerations, constructability, environmental considerations, and economics. Locations were considered at various places within Ash Impoundment 2, the inactive dredge cell, the Coal Yard, and the rail loop. Alternatives where the proposed PWB would have been located on top of CCR materials were ultimately eliminated from consideration. Therefore, TVA selected the rail loop location to carry forward for analysis. Various configurations within the rail loop area were considered.

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Alternatives Evaluated in the Supplemental EIS

Based on the analysis and screening criteria described in the Final EIS and the additional analysis described above, TVA has determined that there are three alternatives available to TVA: (A) No Action, which serves as a baseline for comparison; (B) Closure-in-Place by Reduced Footprint of the SWL and Ash Impoundment 2 and Construction of a New PWB; or (C) Closure in-Place of the SWL and Ash Impoundment 2 and Construction of a New PWB.

Alternative B described within this SEIS is a modification to the Alternative B described in Subsection 2.2.2 of the Final EIS for Closure-in-Place and Consolidation of the SWL and Ash Impoundment 2. The description presented in the Final EIS is incorporated by reference. Under the former Alternative B, TVA would remove and consolidate portions of the ash in the northwest corner of Ash Impoundment 2. In this SEIS, Alternative B also includes the over-excavation of an additional approximately 1 foot of underlying native material to confirm CCR removal. The PWB would be constructed in the rail loop area at SHF. This alternative also includes consideration for establishment of temporary tank-based treatment if the PWB cannot be constructed and operational by April 2019, the likely date that TVA will have to cease using Ash Impoundment 2 under the CCR Rule. Temporary tank-based treatment would include an estimated 15 to 25 free-standing tanks (ranging in size from 0.6 to 1.7 million gallons per tank), covering a footprint of approximately 7 to 12 acres. Improvements to the CYDB would be made to provide detention and TSS removal from storm water runoff. To mitigate potential elevated levels of TSS, the CYDB would operate as a storm water detention basin. During normal operating conditions, the CYDB would discharge to the PWB. This discharge could cease during large storm events, detaining the storm water in the CYDB with no release to the PWB. This would allow additional detention time in the CYDB for settling of coal fines and other suspended solids. Storm water would be released to the PWB after TSS concentrations in the CYDB are at appropriate levels.

Alternative C described within this SEIS is similar to the previously eliminated Alternative 4B identified in Table 2.13 of the Final EIS. Upon further evaluation, TVA found that this option was feasible and elected to carry it forward for evaluation. Most activities would be the same under Alternative C, as described previously for Alternative B. However, under Alternative C, the ash in the northwest corner of Ash Impoundment 2 would not be removed and consolidated. Instead, both the SWL and Ash Impoundment 2 would be closed-in-place and regraded with materials redistributed within the existing facilities or using borrow material from the Shawnee East Site (as needed) to establish appropriate drainage and stability. New storm water outfalls would be installed along the perimeter of the facilities to outlet at elevations at or above the 100-year flood elevation.

Public and Agency Involvement

On November 1, 2016, TVA published a Notice of Intent (NOI) in the Federal Register announcing that it planned to prepare an EIS to address the potential environmental effects associated with ceasing operations at both the SWL and Ash Impoundment 2, and constructing, operating, and maintaining a new CCR Landfill at SHF. TVA hosted an open house scoping

meeting on November 15, 2016, at the Robert Cherry Civic Center located at 2701 Park Avenue in Paducah, Kentucky. The Draft EIS was issued on June 8, 2017, and TVA hosted a public meeting on June 22, 2017, at the Robert Cherry Civic Center in Paducah, Kentucky. The Final EIS was issued on December 8, 2017, and a ROD was signed on January 16, 2018. Public comments and TVA's responses are included in Appendix I of the Final EIS (TVA 2017a).

The notice of availability of this Draft SEIS was published on May 4, 2018, initiating a 45-day public review and comment period that will end on June 8, 2018. All comments submitted on this Draft SEIS will be carefully reviewed and synthesized into individual comments. These comments and TVA's responses will be provided in an appendix of the Final SEIS.

Summary of Alternative Impacts

This SEIS presents a summary of the impacts of each of the alternatives carried forward for detailed analysis. The environmental impacts of Alternatives A, B and C are summarized in Table 2.3-1 in Chapter 2.

Under Alternative B, there would be minor impacts to land use, prime farmlands and soil, groundwater, surface water, vegetation, wildlife, threatened and endangered species, and wetlands. There would be no impacts to cultural resources. Impacts under Alternative C would be the slightly less than those described under Alternative B.

Preferred Alternative

TVA has identified Alternative C – Closure-in-Place and Regrading of the SWL and Ash Impoundment 2, and Construction of a new PWB as the preferred alternative. Alternative C would achieve the purpose and need of the project and calls for less movement of CCR material and less dewatering than Alternative B resulting in greater stability under Alternative C. Alternative C would also reduce air quality impacts associated with the mobilization of dust and emissions from equipment associated with the movement of CCR material as compared to Alternative B. Consequently, Alternative C could be completed sooner and for a lower cost than Alternative B.

Mitigation Measures

Mitigation measures designed to minimize or reduce adverse impacts associated with implementation of Alternative C include:

- Soils excavated from the proposed PWB site would be tested for contaminants before final disposition is determined.
- Final drainage for the temporary treatment basin (if utilized) would be routed to existing or new discharge points and comply with the Kentucky Pollutant Discharge Elimination System (KPDES) permit to ensure that no adverse impacts to surface waters would occur. Mitigation measures would be identified, as needed, to ensure the discharges meet permit limits. This may or may not require a permit modification.

- Regulatory requirements associated with the United States (U.S.) Army Corps of Engineers (USACE) Section 404 permitting program would require mitigation sufficient to offset impacts to wetlands and surface water features (U.S. Environmental Protection Agency [EPA] 1972). These mitigation measures would be clarified at the end of the consultation with the USACE.

- Tree removal would occur in winter months outside the breeding season (between November 15 and March 30) and would be tracked, documented, and reported to the US Fish and Wildlife Service (USFWS).

Best Management Practices (BMPs) include:

- TVA would comply with all appropriate local, state, and federal permit requirements.

- All proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to the receiving waters would be minimized and be in accordance with either a project specific storm water pollution prevention plan (SWPPP) or a KPDES BMP Plan.

- Storm water flows would be properly treated with either implementation of proper BMPs or by diverting the storm water discharges to an appropriate storm water outfall or impoundment for co-treatment.

- Equipment washing and dust control discharges would be handled in accordance with BMPs described in the BMP Plan, required by the site's KPDES permit, to minimize construction impacts to surface waters.

- Sanitary wastes generated during construction activities would be collected by the existing sewage treatment system, onsite septic system(s) or portable toilets. These would be pumped out regularly, and the sewage transported by a vacuum truck to a publicly-owned wastewater treatment works that accepts pump out.

- Upon completion of construction, temporarily-disturbed areas, such as the temporary treatment areas and laydown yards, would be restored to their previous state and maintained by TVA.

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Symbols, Acronyms, and Abbreviations

APE	area of potential effect
BMP	Best management practice
CCR	coal combustion residuals
CEQ	Council on Environmental Quality
CYDB	Coal Yard drainage basin
DOE	Department of Energy
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
GIS	Geographic Information System
IPaC	Information for Planning and Conservation
KPDES	Kentucky Pollutant Discharge Elimination System
KSNPC	Kentucky State Nature Preserve Commission
µg/L	micrograms per liter
MCL	maximum contaminant levels
MW	monitoring well
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
ORM	Ohio River Mile
pCi/L	picocuries per Liter
PGDP	Paducah Gaseous Diffusion Plant
PPD	Project Planning Document
PWB	Process Water Basin
RGA	Regional Gravel Aquifer
ROD	record of decision
SEIS	supplemental Environmental Impact Statement
SHF	Shawnee Fossil Plant
SHPO	State Historic Preservation Officer
SSI	statistically significant increase(s)
SWL	Special Waste Landfill
SWPPP	Storm Water Pollution Prevention Plan
Tc-99	Technetium 99
TCE	trichloroethylene
TDS	total dissolved solids
TSS	total suspended solids
TVA RAM	TVA Rapid Assessment Method
TVA	Tennessee Valley Authority
UCD	Upper Continental Deposits
USACE	United States Army Corps of Engineers
US	United States
USFWS	United States Fish and Wildlife Service
WKWMA	Western Kentucky Wildlife Management Area

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CHAPTER 1 - PURPOSE AND NEED FOR ACTION

1.1 Introduction and Background

In December 2017, the Tennessee Valley Authority (TVA) issued the *Shawnee Fossil Plant Coal Combustion Residual Management Final Environmental Impact Statement* (Final EIS) (TVA 2017). The year-long assessment called for closing both the Special Waste Landfill (SWL) and Ash Impoundment 2, as well as building and operating a new lined landfill to store dry coal combustion residual (CCR) waste produced by the Shawnee Fossil Plant (SHF) in the future. In the Final EIS, TVA identified its preferred alternative as Alternative B – Construction of an Onsite CCR Landfill, Closure-in-Place of Ash Impoundment 2 with a Reduced Footprint, and Closure-in-Place of the SWL. On January 16, 2018, TVA issued a record of decision (ROD) to implement construction of the new dry CCR landfill, and elected to further consider the alternatives regarding the closure of the SWL and Ash Impoundment 2 before making a decision. The Final EIS and ROD can be viewed here: https://www.tva.gov/Environment/Environmental-Stewardship/Environmental-Reviews/Management-of-Coal-Combustion-Residuals-from-the-Shawnee-Fossil-Plant.

TVA has prepared this supplemental EIS (SEIS) to further analyze the alternatives for closure of the SWL and Ash Impoundment 2. Additionally, TVA needs to evaluate a new proposed location for a new Process Water Basin (PWB). A preliminary location for the PWB was considered in the 2017 Final EIS; however, upon further investigation, TVA chose to consider additional alternative locations. This SEIS expands on the Final EIS analysis for the proposed closure projects at SHF (Figure 1.1-1) and presents the analysis associated with the new location for the proposed PWB.

TVA has prepared this SEIS pursuant to the National Environmental Policy Act (NEPA) to assess the environmental impacts of the proposed actions. This SEIS incorporates the background information and findings of the 2017 Final EIS and presents and evaluates only new and/or significant data made available since publication of the Final EIS in relation to the closure projects, and new information related to the new location for the proposed PWB. The decision supports TVA's goal to eliminate all wet ash storage at its coal plants and comply with the federal CCR Rule, as well as the Commonwealth of Kentucky's regulations.

1.2 Purpose and Need

The purpose and need of ceasing CCR management operations at both the SWL and Ash Impoundment 2 and closing them was, and continues to be, to manage the disposal of CCR materials on a dry basis and to meet the 2015 CCR regulations, as well as the Commonwealth of Kentucky's regulations.

1.3 Decision to be Made

TVA must decide 1) whether to close both the SWL and Ash Impoundment 2; 2) how to close both the SWL and Ash Impoundment 2; and 3) where to construct a new PWB. TVA's decision

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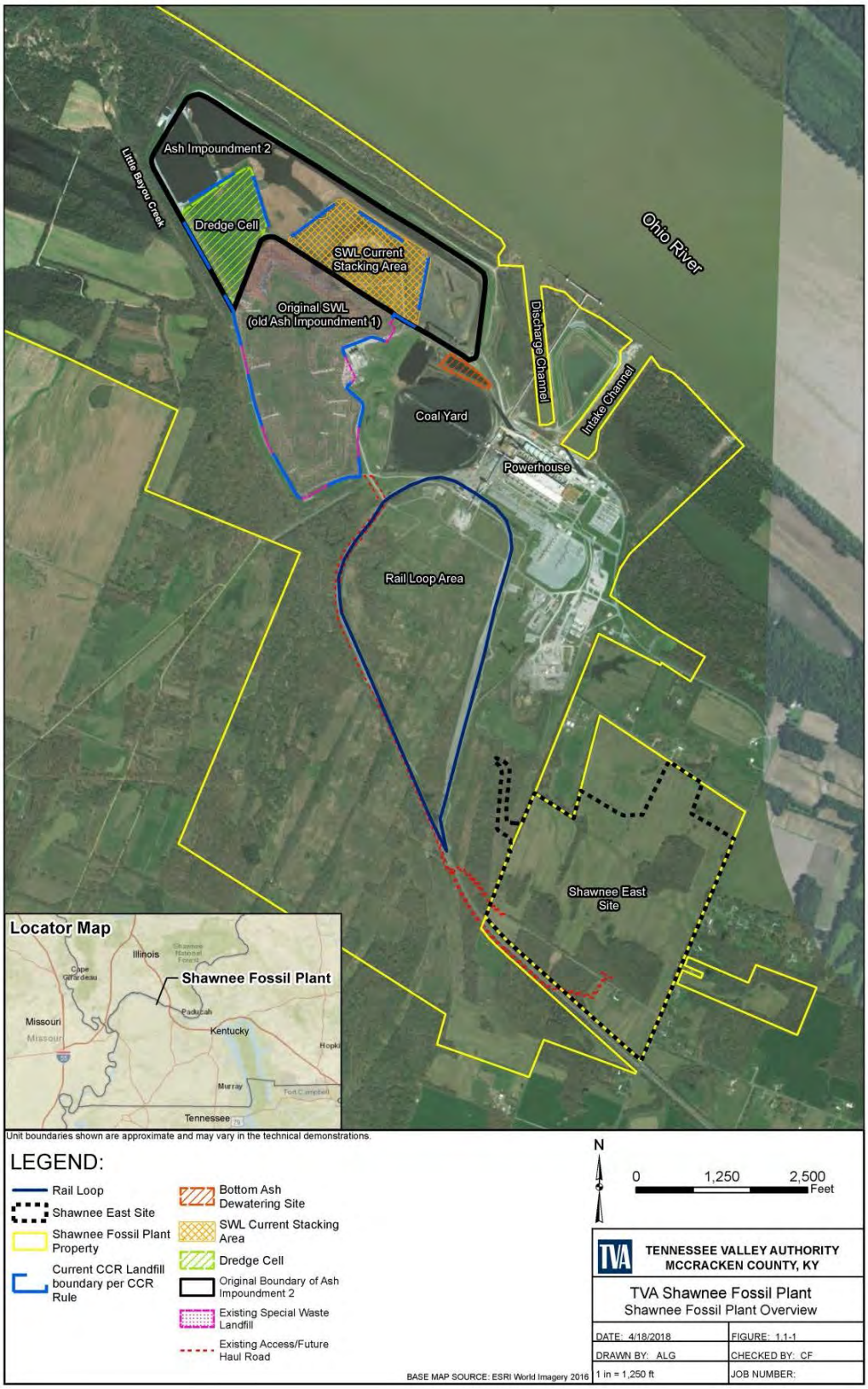

Figure 1.1-1. Shawnee Fossil Plant Overview

will consider factors such as potential environmental impacts, economic issues, availability of resources, and TVA's long-term goals.

1.4 Related Environmental Reviews

TVA previously conducted the following environmental reviews, which are relevant to this EIS concerning ash management:

- Shawnee Fossil Plant Coal Combustion Residual Management Final Environmental Impact Statement (TVA 2017a)
- Bull Run Fossil Plant Landfill Final Environmental Impact Statement (TVA 2017b)
- Ash Impoundment Closure Part I Programmatic NEPA Review, Final Environmental Impact Statement (TVA 2016a)
- Shawnee Fossil Plant Bottom Ash Process Dewatering Facility Final Environmental Assessment (TVA 2016b)
- TVA's Integrated Resource Plan (TVA 2015)
- Shawnee Fossil Plant Units 1 and 4 Final Environmental Assessment (TVA 2014)
- NOxOUT Selective Non-catalytic Reduction Demonstration - Shawnee Fossil Plant – Unit 1 Final Environmental Assessment (TVA 2005)

1.5 Scope of the Analyses

TVA previously identified the following resources as having the potential to be affected by the proposed action described in the 2017 Final EIS. However, the analysis presented in the 2017 Final EIS adequately addressed potential impacts to these resources with respect to the actions analyzed in this SEIS. Therefore, the 2017 Final EIS analysis for these resources is incorporated by reference for this SEIS:

- Air Quality
- Climate Change and Greenhouse Gases
- Geology and Seismology
- Floodplains
- Socioeconomics and Environmental Justice
- Natural Areas, Parks and Recreation
- Transportation
- Visual Resources
- Noise
- Solid and Hazardous Waste and Hazardous Materials
- Public Health and Safety

The following resources, also previously evaluated in the 2017 Final EIS, require additional analysis with respect to the proposed actions evaluated in this SEIS. These resources are considered in Chapter 3 of this SEIS.

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- Land Use
- Prime Farmland and Soils
- Groundwater
- Surface Water
- Vegetation
- Wildlife
- Threatened and Endangered Species
- Wetlands
- Cultural and Historic Resources

TVA's action would satisfy the requirements of Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), and EO 13751 (Invasive Species); and applicable laws including the National Historic Preservation Act, Endangered Species Act, Clean Water Act, and Clean Air Act.

1.6 Public and Agency Involvement

On November 1, 2016, TVA published a Notice of Intent (NOI) in the Federal Register announcing that it planned to prepare an EIS to address the potential environmental effects associated with ceasing operations at both the SWL and Ash Impoundment 2, and constructing, operating, and maintaining a new CCR Landfill at SHF. TVA hosted an open house scoping meeting on November 15, 2016, at the Robert Cherry Civic Center located at 2701 Park Avenue in Paducah, Kentucky. The Draft EIS was issued on June 8, 2017, and TVA hosted a public meeting on June 22, 2017, at the Robert Cherry Civic Center in Paducah, Kentucky. The Final EIS was issued on December 8, 2017, and a ROD was signed on January 16, 2018. Public comments and TVA's responses are included in Appendix I of the Final EIS (TVA 2017a).

The notice of availability of this Draft SEIS was published on May 4, 2018, initiating a 45-day public review and comment period that will end on June 8, 2018. All comments submitted on this Draft SEIS will be carefully reviewed and synthesized into individual comments. These comments and TVA's responses will be provided in an appendix of the Final SEIS.

1.7 Necessary Permits and Licenses

Depending on the decisions made regarding the proposed actions, TVA may need to obtain or seek amendments to the following permits:

- A request to modify the Title V air quality operating permit would be submitted prior to beginning construction.
- TVA would evaluate the proposed actions to determine if a modification to the Kentucky Pollutant Discharge Elimination System (KPDES) permit or notification to Kentucky Department of Environmental Protection would be required due to potential alteration of the wastewater stream(s).

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- The project would disturb greater than one acre of land. By rule, any construction project that disturbs greater than one acre of land requires a KPDES General Storm Water Construction Permit, which would include incorporating details of the project in the SHF Best Management Practice (BMP) plan or developing a project-specific BMP plan.
- Section 401 and 404 permits could be required for stream/wetlands mitigation depending on the alternative selected.

As described in the 2017 Final EIS, the existing onsite CCR landfill (SWL) was regulated as a CCR Landfill under a Chapter 46 Registered Permit-by-Rule with the Kentucky Division of Waste Management effective September 21, 2017, as well as under the United States (U.S.) Environmental Protection Agency (EPA) 2015 CCR Rule. Ash Impoundment 2 maintains an operating permit in accordance with the Kentucky Division of Water, KPDES Permit No. KY0004219, and it also was transitioned to a Registered Permit-by-Rule under Kentucky's Chapter 46 regulations for coal ash units on September 21, 2017. On January 31, 2018, portions of the Chapter 46 Registered-Permit-by-Rule provision of Kentucky's regulations were overturned by a state court. Consequently, the Kentucky Chapter 45 special waste permit for the SWL has been reinstated and is currently in effect. Because of the change in status, in the Final EIS, the SWL was referred to as the "former SWL." Now, as the SWL permit is reinstated, the "Former" designation has been removed in this SEIS.

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CHAPTER 2 - ALTERNATIVES

2.1 Preliminary Alternatives

During initial project planning, a range of alternatives and specific screening criteria were identified for each of the proposed projects individually: (1) closure of the existing SWL and Ash Impoundment 2, and (2) construction and operation of a new PWB. The various alternatives for closure of the existing SWL and Ash Impoundment 2 are summarized in the 2017 Final EIS, and additional considerations and analysis are described in more detail below, as well as the various alternatives considered for the construction and operation of a new PWB.

2.1.1 Ash Impoundment 2 and Special Waste Landfill Closure Alternatives

Subsection 2.1.3.4 of the Final EIS summarizes the range of alternatives and specific screening criteria that were identified for the closure of both the existing SWL and Ash Impoundment 2 during initial project planning. After further consideration, TVA reviewed and revised the closure alternatives. The majority of the closure alternatives remain eliminated; however, TVA decided to reconsider Alternative 4b Closure-in-Place of both facilities with general grading within permit boundary (as described in Table 2.1-3 of the Final EIS; TVA 2017. Additionally, TVA has modified Closure-by-Removal and Closure-by-Consolidation to include over-excavation of native materials across the area from which materials are removed/consolidated to confirm complete removal of CCR. Approximately 1 foot of over-excavation is assumed to be necessary. Due to the unknown nature of underlying material, over-excavation of significantly more than 1 foot could be required and could potentially include other remediation measures which cannot be defined at this time.

2.1.2 Waste Treatment/Process Water Basin Alternatives

In January 2018, TVA evaluated alternative wastewater management scenarios associated with the proposed PWB. Alternative configurations included installation of additional solids removal systems, pH adjustment, and wastewater management scenarios for the PWB. Additional solids removal systems for the Coal Yard drainage basin (CYDB) were also evaluated. Capital construction costs, annual operation and maintenance costs, and treatment performance of the wastewater management systems were developed for each alternative considered.

The alternatives were compared based on the following evaluation criteria:

1. *Design Intent:* Each alternative was analyzed based on the following project goals:
    a. Provide particle removal to reduce total suspended solids (TSS) levels to below 75% of the average monthly levels allowable through KPDES Outfall 001 during average rainfall conditions.
    b. Provide particle removal to reduce TSS levels to below 75% of the maximum daily levels allowable through KPDES Outfall 001 during the 25-year, 24-hour peak storm event.

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   c. Prevent the release of pH, oil, and grease outside of the daily average and monthly maximum levels allowable through KPDES Outfall 001.

2. *Construction Feasibility:* Each alternative was analyzed based on the feasibility of construction. This includes evaluation of construction schedules to allow for discontinued use of the existing facilities by April 2019, the likely date that TVA will have to cease using Ash Impoundment 2 under the CCR Rule.
3. *Environmental, Health, and Safety:* Each alternative was analyzed based on the following:
   a. Environmental considerations.
   b. Reduction of risk to Health and Safety during construction and operation of the recommended alternative.
4. *Capital Construction Costs:* Capital construction costs were calculated for the wastewater treatment systems (additional solids removal treatment, pH adjustment, and aeration).
5. *Engineering and Management Costs:* The engineering and management costs associated with Phase 2 (detailed design) and Phase 3 (construction) of each wastewater management alternative were calculated and compared.
6. *Annual Operation and Maintenance Cost:* The costs associated with annual operation and maintenance was calculated for each alternative wastewater management scenario. Costs included the predicted additional solids removal and pH adjustment materials required and sediment removal interval for accumulated solids cleanout.

Table 2.1-1 and presents the wastewater treatment alternatives and analysis.

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Table 2.1-1. Wastewater Treatment Alternatives (Stantec 2018b)

Alternative	Description	Analysis Recommendation
Alternative 1 – Construct New PWB Without Additional Solids Removal Treatment	TVA would construct a new PWB consisting of two equal-area cells without additional solids removal prior to wastewater and storm water reaching the PWB. During normal operation, flows from one cell would flow to the other before discharging through KPDES Outfall 001.	• The potential advantages of this alternative include saving capital construction/operation and maintenance costs that would be required with either tank-based or chemical injection solids removal systems. • Potential disadvantages of this alternative include the risks of exceeding KPDES permitted discharges for TSS. Alternatives evaluated with additional solids removal systems may remove TSS over a larger range of TSS levels than this alternative. • **Due to uncertainty associated with TSS levels, TVA eliminated Alternative 1 from further consideration.**
Alternative 2 – Construct PWB with Additional Treatment	TVA would construct a new PWB consisting of two equal-area cells as described in Alternative 1 with additional treatment to remove solids and oil and grease prior to the wastewater and storm water reaching the PWB.	• The potential advantages of this Alternative include mitigation of uncertainty associated with high levels of TSS in discharges that could be routed to the PWB. Additional solids removal measures allow for a wider range of TSS removal. • Potential disadvantages of this alternative include additional capital construction/operation and maintenance costs associated with building and operating additional solids removal systems. Renewal of KPDES discharge permits may be somewhat more difficult due to permitting the additional coagulant/flocculent chemicals. Annual operation and maintenance costs may also be relatively higher. • In addition, Alternative 2 does not address storm water runoff from the Coal Yard discharged to the PWB (the current process). Since the PWB will be much smaller than Ash Impoundment 2, there is a potential that an objectionable color contrast in the receiving stream may result due to release from the PWB. • **Due to the uncertain TSS levels and additional costs, TVA eliminated Alternative 2 from further consideration.**

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Table 2.1-1. Wastewater Treatment Alternatives (Stantec 2018b)

Alternative	Description	Analysis Recommendation
Alternative 3 – PWB and CYDB Improvements	Under Alternative 3, TVA would construct a new PWB with two, equal-area cells as described in Alternative 1, including additional treatment for solids and oil and grease. The sediment removal measures would reduce solids prior to the water's entry to the CYDB or PWB. This alternative also includes improvements for the CYDB such as: • Lowering the operational pool depth for additional storm water detention. • Routing general plant flows currently discharging to the CYDB directly to the PWB. • Installation and/or upgrade of additional sediment removal systems.	• This Alternative improves upon advantages discussed for Alternative 2 by further reducing the TSS load (through the installation of additional sediment removal measures prior to the water's entry to the CYDB or PWB) discharged from the CYDB to the PWB during storm water runoff events. The additional storm water storage volume available in the CYDB would be utilized for extended detention during storm events. Additional sediment removal systems installed in the CYDB could further improve TSS removal during storm events. • This Alternative resulted in the second highest capital construction costs for wastewater treatment systems relative to the other Alternatives analyzed. Construction of two additional sediment removal systems (one for the PWB and one for CYDB) and operation of these systems may result in more overall costs than all other alternatives except for Alternative 5. • **TVA selected Alternative 3 for further consideration in order to prevent the risk of elevated TSS levels released through permitted KPDES discharge pathways. The flexibility of the wastewater treatment systems selected would remove sediments from a wide range of operational and storm water conditions.**
Alternative 4 – Single PWB and CYDB Improvements	Alternative 4 is similar to Alternative 3 except that a PWB with one cell is proposed instead of a PWB with two cells. All other elements of Alternative 3 are included in this Alternative.	• This Alternative resulted in the highest operation and maintenance costs potentially outweighing any capital construction savings associated with the single basin Alternative. During the normal maintenance of this Alternative, rental treatment equipment would be required to treat wastewater streams before discharge through KPDES permitted outfalls. • **Due to these operational costs, TVA eliminated this alternative from further consideration.**
Alternative 5 – PWB Partition Within CYDB Footprint	This Alternative is similar to Alternative 3 with the addition of constructing a third, smaller PWB partition within the footprint of the CYDB. All other elements of Alternative 3 are included in this Alternative.	• Capital construction costs for Alternative 5 would likely be greater than all other Alternatives evaluated because of the construction of a third PWB partition. • **Because this alternative is similar to Alternative 3 and due to these potentially excessive costs, TVA eliminated Alternative 5 from further consideration.**

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Table 2.1-1. Wastewater Treatment Alternatives (Stantec 2018b)

Alternative	Description	Analysis Recommendation
Temporary Tank-Based Treatment (Figure 2.1-1)	This alternative considered the use of rented temporary fractionation tanks to manage the storm water and general plant process water flows at the site. Options assessed included field-erected settling tanks, skid-mounted chemical injection, and/or sludge dewatering equipment.	• An estimated 15 to 25 tanks (ranging in size from 0.6 to 1.7 million gallons per tank), covering a footprint of approximately 10 to 12 acres, would be required. • Preliminary sizing of the temporary treatment options indicated a required footprint between 7 to 9 acres and assumes the CYDB storm water can be discharged to Ash Impoundment 2 prior to PWB completion. • Estimated capital costs, including installation, startup, and monthly rental, and weekly operational costs are greater than the estimated costs associated with constructing and maintaining the PWB onsite. • **TVA has retained this alternative as a contingency option to be used in the interim if the PWB cannot be constructed and operational by April 2019, the likely date that TVA will have to cease using Ash Impoundment 2 under the CCR Rule. (Figure 2.1-1).**

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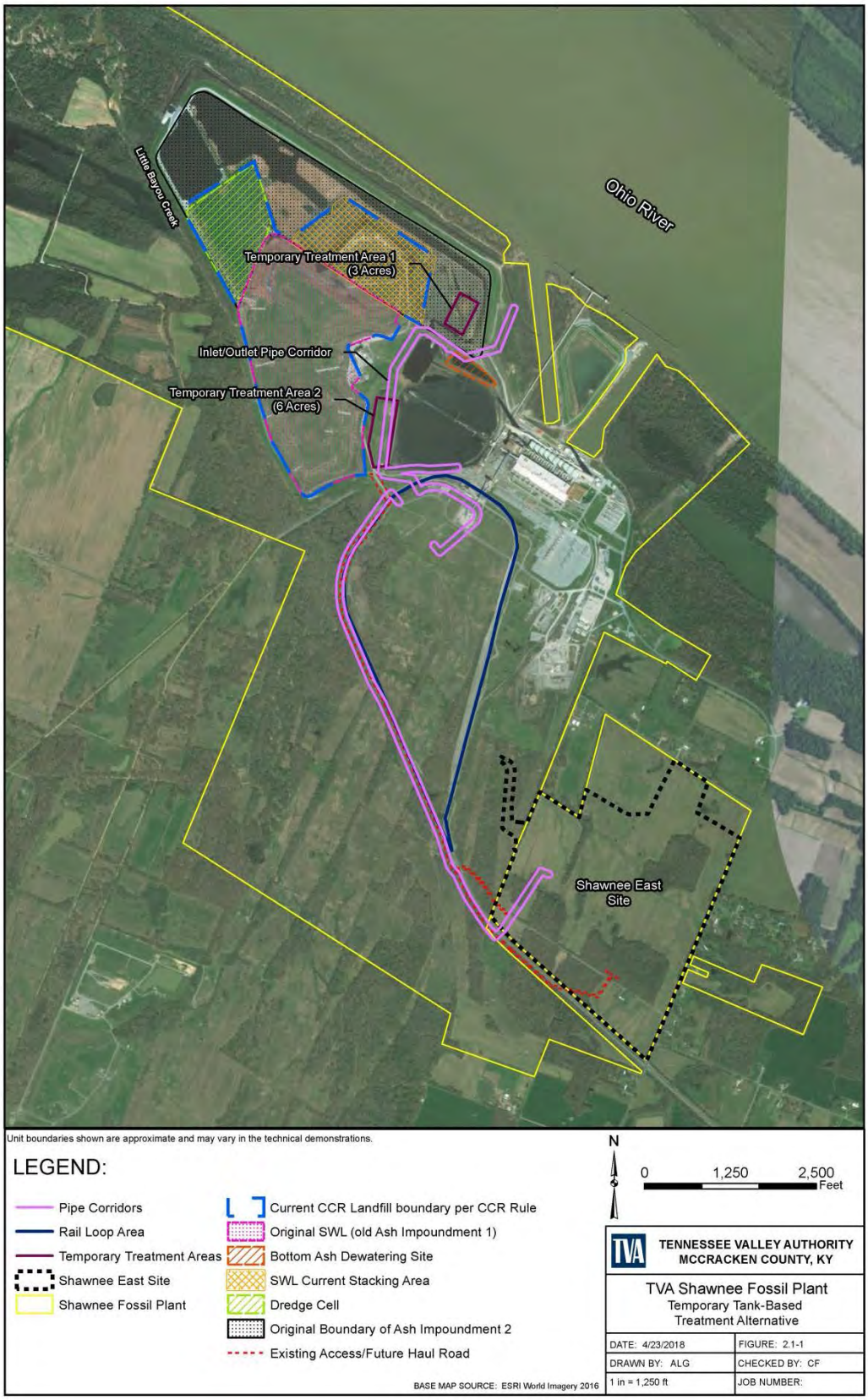

Figure 2.1-1. Temporary Tank-Based Treatment Alternative

2.1.2.1 Wastewater Treatment Alternatives Considered but Eliminated from Further Consideration

Additional alternatives were considered by TVA, but not evaluated in detail due to the potential flaws associated with these alternatives. These alternatives are briefly described below.

- *Construct Smaller PWB for Maintenance*: This alternative included construction of one larger PWB cell for normal operational use and one smaller PWB cell for interim use during maintenance and cleaning operations on the main cell. This alternative would require a smaller footprint for construction of the basin. However, use of the smaller cell in the interim would likely require additional sediment removal during operation and more frequent sediment cleanout. This alternative was eliminated from further evaluation due to the likely additional operation and maintenance efforts and costs.

- *Construct Small PWB for General Plant Flows*: This alternative included construction of a small PWB to detain general plant flows currently discharging to the CYDB (the Units 1 through 10 station sump flows). Since rerouting the Units 1 through 10 station sump flows via a permanent pump station is included in the recommended Alternative 3, this alternative was not significantly different than Alternative 3 and therefore was removed from further consideration. This assumes the pump station will be designed to provide access for intermittent removal of sediment build up.

- *Construction of a Permanent Tank-Based Treatment Plant*: This would be in lieu of the PWB and would require a footprint of approximately 5 to 7 acres. Estimated capital construction and annual maintenance costs are greater than estimated costs of constructing and maintaining the PWB. For this reason, this alternative was removed from consideration.

2.1.2.2 Wastewater Treatment Alternatives Conclusion

As described in Table 2.1-1, TVA selected Wastewater Treatment Alternative 3 for further consideration to prevent the risk of elevated TSS levels released through permitted KPDES discharge pathways. The flexibility of the wastewater treatment system selected would remove sediments from a wide range of operational and storm water conditions. Wastewater Treatment Alternative 3, therefore, formed the basis for analysis of the PWB Alternatives. TVA additionally selected Temporary Tank-Based Treatment to carry forward as a contingency alternative to be used in the interim if the PWB cannot be constructed and operational by April 2019, the likely date that TVA will have to cease using Ash Impoundment 2 under the CCR Rule.

2.1.3 Process Water Basin Alternatives

TVA considered alternatives for the location of the proposed PWB as well as alternatives for the various support systems for the proposed PWB. The following sections summarize the various PWB location and system alternatives evaluated.

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Alternative site locations for the PWB were evaluated based on site location, conveyance, design consideration, constructability issues, environmental issues, and potential construction cost associated with each potential site location. Each siting and configuration alternative evaluated for the construction of the PWB included the following project elements:

- Two new equal-area cells would be constructed with an operational pool depth of approximately 10 feet. The cells would be designed such that they operate in series during normal operating conditions. An inflow diversion structure would be included to allow either cell to receive inflows while the other cell is taken offline for maintenance. The basin cells would be approximately 6 to 10 acres each to satisfy design intent and a 3- to 5-year sediment cleanout frequency.
- General plant process flows (including Powerhouse Units 1 through 10 Station Sumps, Baghouse Sump, Filter Plant Backwash Sump, Reverse Osmosis Reject Sump, and Ash Transfer Building Sump) would be rerouted to the new basin inlet header pipe. Effluent from the new Bottom Ash Dewatering Facility and the CYDB would also be routed to the new basin inlet header pipe. Lowering the pool in the CYDB is also included for each alternative.
- Pre-treated Plant Outage Washes would be routed to the proposed PWB.
- The new CCR Landfill Leachate force main would be routed to the new PWB inlet header pipe.
- The PWB would outlet to the KPDES Outfall 001 and then would be discharged to the Ohio River via Outfall 002.
- The PWB would include a liner system assumed to consist of 6 inches of compacted sand, geosynthetic clay liner, 60 mil linear low-density polyethylene geomembrane, non-woven geotextile cushion, and 24 inches of protective cover.
- It is assumed construction activities can be performed in the dry for alternatives that do not include construction over the active portion of Ash Impoundment 2 or Closure-by-Removal (i.e. Alternatives 1A, 1B, 2A, 4, 5, and 6A listed below).
- Cut/fill slopes for excavation and construction of new clay dikes would be slope ratio 3H:1V (height to side slope). The new clay perimeter and divider dikes would include a 20-foot wide access road along the crest.
- The PWB would not be designed to receive or store CCR. It is expected that plant outage washes would receive pre-treatment before discharging to the PWB.
- If present, any CCR materials would be removed from within the proposed PWB footprint prior to construction of the proposed PWB.
- Proposed locations for the PWB outside the footprint of existing CCR disposal areas were given preference.

The PWB location and configuration alternatives were compared relative to one another based on the following criteria:

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- Site location (i.e. easily accessible, not located over CCR material)
- Conveyance (i.e. proximity of alternative relative to points of effluent sources, treatment, and discharge)
- Design Considerations (i.e. seismic concerns, construction of dikes, existing utilities)
- Constructability (i.e. schedule, ability to construct on dry land)
- Environmental (i.e. location relative to cultural and natural resources, permitting requirements)
- Costs (i.e. construction costs, operation and maintenance costs)

2.1.3.1 Process Water Basins Location and Configuration Alternatives

TVA considered several location and configuration alternatives for the proposed PWB. These alternatives are summarized in Table 2.1-3 and shown on Figure 2.1-2.

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Table 2.1-3. Process Water Basin Location and Configuration Alternatives (Stantec 2018b)

Alternative	Description	Analysis Recommendation
1A/1B – Ash Impoundment 2 East	Alternative 1A/1B consisted of construction of the PWB in the east portion of Ash Impoundment 2. Two subset configurations within this area were considered.	• The new PWB would be constructed over an existing CCR facility and stabilization of the CCR will be required. This alternative would have minor operational impacts during construction and minor impacts to the SWL and Ash Impoundment 2 closure design grades. • Due to the height of the new clay dikes and the maximum impounding capacity, the structures would be subject to the TVA Dam Safety program. Since the dikes would not be impounding CCR material, it is assumed they would be classified as low hazard dams and seismic design would not be required. However, the basin would have a greater potential for release due to failure since the new clay dikes would extend above the existing Ash Impoundment 2 perimeter dikes. • This proposed location of the new basin is the alternative closest to the CYDB, new Bottom Ash Dewatering Facility, and general plant flows, reducing the length of pipe rerouting required. • **These alternatives were eliminated from consideration due to the significant constructability, safety, and stability concerns and CCR rule implications associated with construction of the basin over CCR materials.**
2A – Inactive Dredge Cell	Alternative 2A consisted of construction of the PWB within the current footprint of the Inactive Dredge Cell.	
1C – Ash Impoundment 2 East (CCR Removal)	Alternative 1C is similar to Alternative 1A/1B and with the exception that the CCR material within the footprint of the basin would be excavated and removed prior to the basin construction.	• This alternative avoids constructing the new basin over an existing CCR facility. However, the effort required to dewater and excavate the CCR material adjacent to the existing stack slopes introduces significant additional costs and presents stability concerns. • The operational impacts, including flow rerouting required during and following construction, and impacts to the SWL and Ash Impoundment 2 closure design grades are similar to Alternative 1B/2A respectively. • **This alternative was eliminated from consideration due to the significant constructability, safety, and stability concerns, and extended construction schedule associated with dewatering and CCR removal. Its location within the footprint of the existing CCR disposal area was also not preferred.**
2B – Inactive Dredge Cell (CCR Removal)	Alternative 2B is similar to Alternative 2A with the exception that the CCR material within the footprint of the basin would be excavated and removed prior to the basin construction.	

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Table 2.1-3. Process Water Basin Location and Configuration Alternatives (Stantec 2018b)

Alternative	Description	Analysis Recommendation
3A — Ash Impoundment 2 West Including Stilling Impoundment 3B – Ash Impoundment 2 West Excluding Stilling Impoundment	Alternatives 3A/3B consisted of constructing the PWB within the current Ash Impoundment 2 and the Stilling Impoundment footprint. Construction of the two 10-acre cells would be performed in two stages. This proposed location of the new basin is the farthest alternative from the CYDB, new Bottom Ash Dewatering Facility, and general plant flows, increasing the length of pipe rerouting and pumping required.	• The new PWB would be constructed over an existing CCR facility and stabilization of the wet CCR would be required. The effort required to dewater and stabilize the CCR material presents significant constructability and stability concerns. • This alternative would have both significant operational impacts during construction and significant impacts to the SWL and Ash Impoundment 2 closure design grades. • **Alternatives 3A/3B were eliminated from consideration due to the significant constructability, safety and stability concerns, and CCR implications associated with construction of the basin over CCR materials.**
3C – Ash Impoundment 2: West (CCR Removal) Including Stilling Impoundment 3D – Ash Impoundment 2: West (CCR Removal)Excluding Stilling Impoundment	These alternatives are similar to Alternatives 3A/3B with the exception that the CCR material within the footprint of the basin would be excavated and removed prior to the basin construction.	• These alternatives avoid constructing the new basin over an existing CCR facility. However, the effort required to dewater and excavate the wet CCR material presents significant constructability and stability concerns. • The operational impacts, including flow rerouting required during and following construction, and impacts to the SWL and Ash Impoundment 2 closure design grades are similar to Alternatives 3A/3B. • **These alternatives were eliminated from consideration and further evaluation due to the significant constructability, safety, and stability concerns, and the extended construction schedule associated with dewatering and CCR removal. The location within the footprint of the existing CCR disposal area was also not preferred.**
4 – Coal Yard	Alternative 4 consisted of constructing the new PWB adjacent to the Coal Yard.	• The subsurface conditions of the area adjacent to the Coal Yard are unknown. The location may overlap the old Ash Impoundment 1 location and CCR material may be encountered during excavation. Depending on the material encountered, stabilization may be required prior to construction of the new basin. • This alternative would have no operational impacts during construction and no impacts to the SWL and Ash Impoundment 2 closure design grades. • **Alternative 4 was eliminated from consideration and further evaluation due to the limited area available. The area of the basin cells would decrease to less than five acres each to account for the expansion of the coal pile.** • Additionally, the area adjacent to the current Coal Yard expansion may be needed for future coal storage or other plant uses.

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Table 2.1-3. Process Water Basin Location and Configuration Alternatives (Stantec 2018b)

Alternative	Description	Analysis Recommendation
5 – Rail Loop	Alternative 5 consisted of constructing the new PWB within the rail loop. Several locations and configurations of the PWB within the rail loop were considered but were eliminated from further consideration due to conflicts including transmission lines and towers, the 100-year floodplain, wooded areas, rail lines, and an old asbestos landfill. The selected configuration of the basin is two approximate 6-acre cells located in the northwest portion of the rail loop and includes a 100-foot buffer from the rail lines.	• This alternative does not require construction of the basin over CCR materials. However, the subsurface conditions of the area within the rail loop are unknown. The area has been used as a construction laydown and disposal area in the past. • The risk matrix assumed that approximately half of the material excavated during construction would be required to be hauled to an offsite landfill. The site is also partially located within the documented Trichloroethylene (TCE) plume of contamination of the Paducah Gaseous Diffusion Plant based on 2015 data. • This alternative would have no operational impacts during construction and no impacts to the SWL and Ash Impoundment 2 closure design grades. • This proposed location of the new basin is the alternative farthest from the discharge channel and KPDES Outfall 001, increasing the length of pipe and pumping required. However, this proposed location is the alternative closest to the new CCR Landfill Leachate Impoundment. • **Alternative 5 was selected as the recommended option to avoid construction over CCR materials as well as the expense, difficulty, and risks associated with removing CCR materials.**
6A – Ash Impoundment 2: East and Coal Yard	Alternative 6A consisted of constructing the two operational PWB cells in the east portion of Ash Impoundment 2 and adjacent to the Coal Yard.	• Cell 1 of the PWB would be constructed over an existing CCR facility and stabilization of the CCR would be required. • Due to the height of the new clay dikes and the maximum impounding capacity, the structures would be subject to the TVA Dam Safety program. Since the dikes would not be impounding CCR material, it is assumed they would classify as low hazard dams and seismic design would not be required. • This alternative would have minor operational impacts during construction and minor impacts to the SWL and Ash Impoundment 2 closure design grades. • The subsurface conditions of the area adjacent to the Coal Yard are unknown. The proposed Cell 2 location may overlap the old Ash Impoundment 1 location and CCR material may be encountered during excavation. Depending on the material encountered, stabilization may be required prior to construction of the new basin cell. • **This alternative was eliminated from consideration to avoid construction of the basin over CCR materials. In addition, the area adjacent to the current Coal Yard expansion may be needed for future coal storage or other plant uses.**

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Table 2.1-3. Process Water Basin Location and Configuration Alternatives (Stantec 2018b)

Alternative	Description	Analysis Recommendation
6B – Ash Impoundment 2: East and Coal Yard (CCR Removal)	This alternative is similar to Alternative 6A with the exception that the CCR material within the footprint of Cell 1 of the basin would be excavated and removed prior to the basin construction.	• This alternative avoids constructing the new basin over an existing CCR facility. However, the effort required to dewater and excavate the wet CCR material adjacent to the existing stack slopes introduces significant costs, constructability, and stability concerns. • During construction, the flows from the CYDB, bottom ash sluice lines, and general plant flows would be rerouted around the new basin to the Bottom Ash Sluice Channel. The flow rerouting required following construction and the impacts to the SWL and Ash Impoundment 2 closure design grades are similar to Alternative 6A. • **This alternative was eliminated from consideration due to the significant constructability, safety, and stability concerns, and extended construction schedule associated with dewatering and CCR removal. Its location within the footprint of the existing CCR disposal area was also not preferred. In addition, the area adjacent to the current Coal Yard expansion may be needed for future coal storage or other plant uses.**

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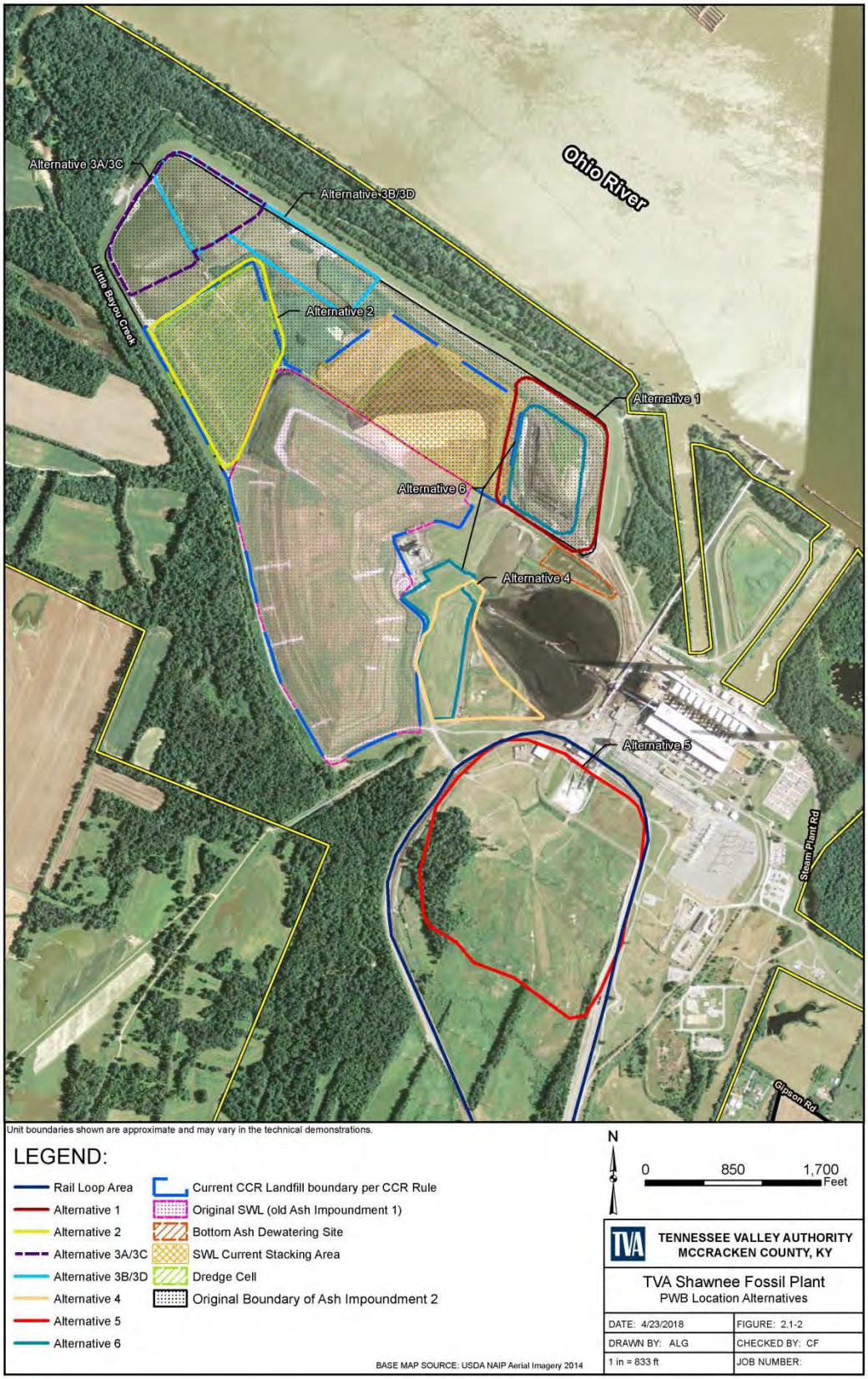

Figure 2.1-2. Process Water Basin Location Alternatives

Alternative 5 was the preferred location alternative and the only alternative available to accommodate the PWB outside the limits of the existing disposal facilities. Therefore, the selected subset of this alternative is carried forward for consideration in this SEIS.

2.2 Project Alternatives Retained for Detailed Analysis

Based on the analysis and screening criteria described in the Final EIS and additional analysis included above, TVA has determined that there are three alternatives available to TVA: (A) No Action; (B) Closure-in-Place by Reduced Footprint of the SWL and Ash Impoundment 2 and Construction of a New PWB; or (C) Closure in-Place and Regrading of the SWL and Ash Impoundment 2 and Construction of a New PWB.

2.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 (i.e., neither facility would be closed). Additionally, TVA would not construct and operate a new PWB. No closure activities (i.e., cover system construction) would occur under the No Action Alternative. The impoundments would continue to receive the storm water and other process wastewaters that they currently receive. TVA would continue safety inspections of berms to maintain stability and all impoundments would be subject to continued care and maintenance activities.

TVA would continue to dispose of wet bottom ash in onsite impoundments until completion of the dewatering facility. The existing associated impoundments would continue to be operated as currently permitted until completion of the new CCR landfill. TVA's 2015 Integrated Resource Plan (TVA 2015) identifies SHF as a facility that will continue to operate as part of its balanced portfolio of energy resources in the near term. However, SHF cannot continue to operate its ash units if they are not compliant with the CCR Rule. Compliance with the CCR Rule would likely require the closure of Ash Impoundment 2, and the construction of a new PWB. Under the No Action Alternative, SHF's operations likely would not comply with the CCR Rule; therefore, this alternative would not meet the Purpose and Need for the proposed actions and is not considered viable or reasonable. It does, however, provide a benchmark for comparing the environmental impacts of implementation of Action Alternatives B and C.

2.2.2 Alternative B –Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

2.2.2.1 Special Waste Landfill and Ash Impoundment 2

This alternative is a modification to Alternative B described in Subsection 2.2.2 of the Final EIS for Closure-in-Place and Consolidation of the SWL and Ash Impoundment 2. The description presented in the Final EIS is incorporated by reference. Under Alternative B, TVA would remove and consolidate portions of the ash in the northwest corner of Ash Impoundment 2. In this SEIS, this alternative also includes the over-excavation of an additional approximately 1 foot of underlying native material and potential additional remediation to confirm CCR removal. Under Alternative B (Figure 2.2-1), TVA would undertake a series of actions to close the SWL and Ash Impoundment 2 at SHF including:

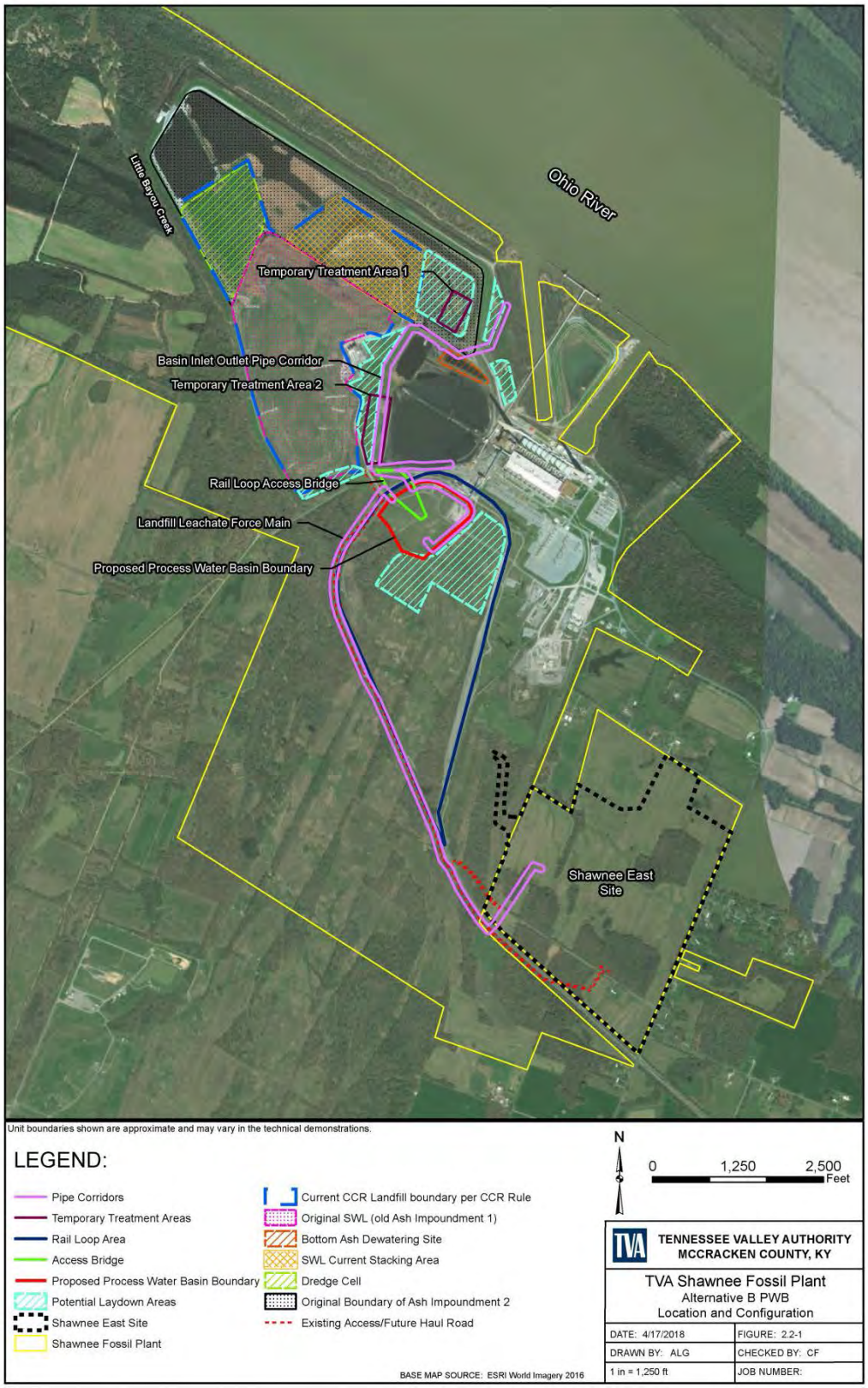

Figure 2.2-1. Alternative B Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

- Construction of PWB(s) to receive plant flows and allow for operations to cease at Ash Impoundment 2 once the dewatering system is constructed. (See Section 2.4.4.2)
- Cease operations in Ash Impoundment 2.
- Remove portions of the ash in Ash Impoundment 2 to allow for construction of a new perimeter dike along the northern boundary of the dredge cell and adjacent to the SWL.
- Remove and consolidate the ash in the northwest corner of Ash Impoundment 2.
- Cover the SWL and remaining Ash Impoundment 2 (including the dredge cell) with either a traditional geomembrane cap system with a protective soil and vegetation layer or a ClosureTurf® system which consists of a special engineered turf and sand fill. The preferred closure plan would be subject to meeting all applicable local, state, and federal requirements.
- Extract borrow materials from the Shawnee East Site to place on the SWL and Ash Impoundment 2 (including the dredge cell) as part of the closure cap system if needed for the traditional geomembrane cap system.
- Remove the remaining Ash Impoundment 2 dikes and support structures on the north side of the impoundment.
- Utilize temporary laydown yards/storage areas as needed.
- Over-excavation of native materials across the area from which materials are removed/consolidated to confirm complete removal of CCR. Approximately 1 foot of over-excavation is assumed to be necessary. Due to the unknown nature of underlying material, over-excavation of significantly more than 1 foot could be required and could potentially include other remediation measures which cannot be defined at this time.

2.2.2.2 Process Water Basin

The PWB would be constructed within the Rail Loop Site (Figures 2.2-1 and 2.2-2), identified as a subset of Alternative 5 as described in Table 2.1-3, and would consist of:

- Construction of a new PWB consisting of two equal-area (approximately 6 acres each) operational, lined basin cells and rerouting existing general plant process flows away from the CYDB directly to the PWB.
- Diversion of an existing stream around the PWB site.
- Improving the CYDB through lowering the pool and dredging to reduce solids loading to the PWB.
- Additional treatment improvements such as:
    - Installation of additional treatment systems (coagulant, flocculent, and polymer injection and mixing) to provide additional TSS removal from/in flows routed to the PWB.
    - Installation of pH adjustment and aeration in the PWB.
    - Installation/upgrade of an additional treatment system to provide additional TSS removal in flows routed to the CYDB.

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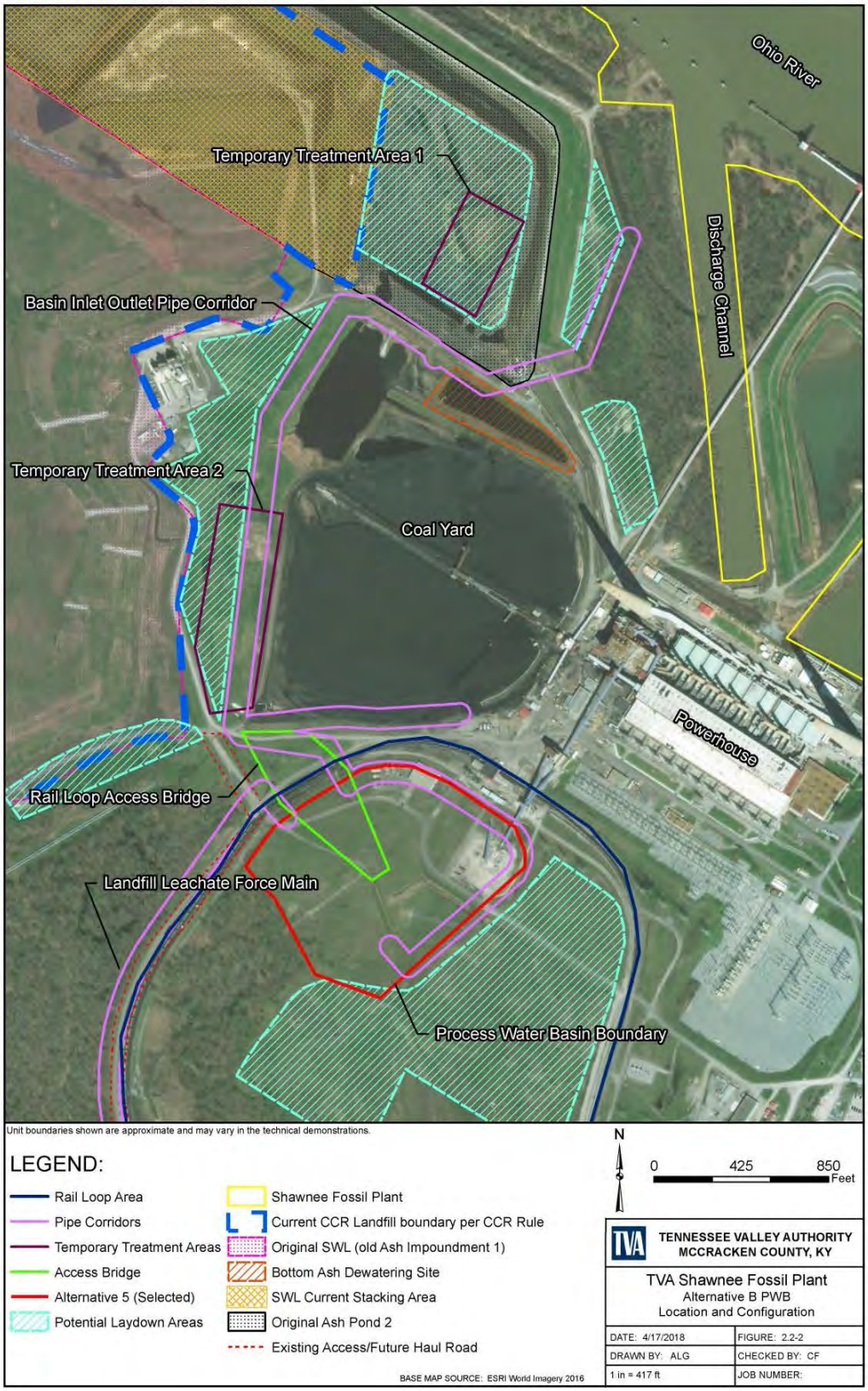

Figure 2.2-2. Alternative B Process Water Basin Location and Configuration

This alternative also includes consideration for establishment of temporary tank-based treatment if the PWB cannot be constructed and operational by April 2019, the likely date that TVA will have to cease using Ash Impoundment 2 under the CCR Rule. Temporary tank-based treatment would include an estimated 15 to 25 free-standing tanks (ranging in size from 0.6 to 1.7 million gallons per tank), covering a footprint of approximately 7 to 12 acres.

Improvements to the CYDB would be made to provide detention and TSS removal from storm water runoff. During large storm discharge events, coal fines eroded from the Coal Yard Storage Area can deposit in the CYDB. These fines could increase the sediment load discharged to the PWB, requiring additional sediment removal in the PWB to prevent discharge of TSS concentrations above existing KPDES permit limits.

To mitigate potential elevated concentrations of TSS, the CYDB would operate as a storm water detention basin. During normal operating conditions, the CYDB would discharge to the PWB. This discharge could be ceased during large storm events, detaining the storm water in the CYDB with no release to the PWB. This would allow additional detention time in the CYDB for settling of coal fines. Storm water would be released to the PWB after TSS concentrations in the CYDB are acceptable.

The following improvements would be implemented for the CYDB:

- The operational pool would be lowered from 7 feet to 4 feet using the existing pump system.
- Approximately 3 feet of coal fines and sediment material would be dredged from the bottom of the basin to increase the storage capacity. This material would be placed in the Coal Yard.
- Depending on the location of new pump stations for rerouting the Unit 1-10 station sumps, additional BMPs may be required to route Coal Yard storm water runoff away from the existing CYDB ditch.
- An additional sediment removal system would be installed to provide polymer, coagulant, or flocculent injection and mixing in the CYDB.

2.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Alternative C described within this SEIS is similar to the previously eliminated Alternative 4B identified in Table 2.13 of the Final EIS. Upon further evaluation, TVA found that this option was feasible and elected to carry it forward for evaluation. Most activities would be the same under Alternative C as described previously for Alternative B. However, under Alternative C, the remaining ash in the northwest corner of Ash Impoundment 2 would not be removed and consolidated. Instead, both the SWL and Ash Impoundment 2 would be closed-in-place and regraded with materials redistributed to establish appropriate drainage and stability. New storm water outfalls would be installed along the perimeter of the facilities to outlet at elevations at or above the 100-year flood elevation.

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2.3 Summary of Alternative Impacts

The environmental impacts of Alternatives A, B, and C are analyzed in detail in Chapter 3 and are summarized in Table 2.3-1. These summaries are derived from the information and analyses provided in the Affected Environment and Environmental Consequences sections of each resource in Chapter 3.

Table 2.3-1. Summary and Comparison of Alternatives by Resource Area

Resource	Alternative A – No Action	Alternative B – Closure-in-Place by Reduced Footprint of the SWL and Ash Impoundment 2 and Construction of a New PWB	Alternative C – Closure-in-Place and Regrading of the SWL and Ash Impoundment 2 and Construction of a New PWB
Land Use	No impact.	Minor impacts associated with closure activities. Minor impacts due to the conversion of land use from undeveloped to industrial at the PWB site. No cumulative effects.	Minor impacts associated with closure activities. Minor impacts due to the conversion of land use from undeveloped to industrial at the PWB site. No cumulative effects.
Prime Farmland and Soils	No impact.	Minor, potentially beneficial impacts to soils as a result of over-excavation of Ash Impoundment 2. Minor cumulative effects.	Minor impacts to soils as more borrow material may be required to complete closure of Ash Impoundment 2 since consolidation would not be conducted. Minor cumulative effects.
Groundwater	No impact.	Minor temporary impacts during construction. Minor beneficial permanent impacts due to reduction of potential for CCR constituents to move into groundwater after closure. Minor cumulative effects.	Minor temporary impacts during construction. Minor beneficial permanent impacts due to reduction of potential for CCR constituents to move into groundwater after closure. Minor cumulative effects.
Surface Water	No impact.	Minor impacts associated with alterations of the onsite stream and storm water flow and construction related storm water runoff at the PWB site. Minor cumulative effects.	Minor impacts associated with alterations of the onsite stream and storm water flow and construction related storm water runoff at the PWB site. Minor cumulative effects.
Vegetation	No impact.	Minor impacts due to changes in species composition during closure, clearing, construction and operation of the PWB; revegetation post-closure. Minor cumulative effects.	Minor impacts due to changes in species composition during closure, clearing, construction and operation of the PWB; revegetation post-closure. Minor cumulative effects.

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Table 2.3-1. Summary and Comparison of Alternatives by Resource Area

Resource	Alternative A – No Action	Alternative B – Closure-in-Place by Reduced Footprint of the SWL and Ash Impoundment 2 and Construction of a New PWB	Alternative C – Closure-in-Place and Regrading of the SWL and Ash Impoundment 2 and Construction of a New PWB
Wildlife	No impact.	Minor impacts due to habitat changes at the ash impoundment, SWL, and PWB locations. Minor cumulative effects.	Minor impacts due to habitat changes at the ash impoundment, SWL, and PWB locations. Minor cumulative effects.
Threatened and Endangered Species	No impact.	With application of appropriate Avoidance and Minimization measures for bat habitat, no significant impacts to federally listed species. Potential minor impacts to state status species. Minor cumulative effects.	With application of appropriate Avoidance and Minimization measures for bat habitat, no significant impacts to federally listed species. Potential minor impacts to state status species. Minor cumulative effects.
Wetlands	No impact.	Minor direct and indirect impacts. No cumulative effects.	Minor direct and indirect impacts. No cumulative effects.
Cultural and Historic Resources	No impact.	No impacts. No cumulative effects.	No impacts. No cumulative effects.

2.4 Identification of Mitigation Measures and Best Management Practices

TVA's analysis includes mitigation, as required, to reduce or avoid adverse effects. Mitigation measures identified in Chapter 3 to avoid, minimize, or reduce adverse impacts to the environment and project specific BMPs are summarized below.

Mitigation Measures:

- Final drainage for the temporary treatment basin (if utilized) would be routed to existing or new discharge points and comply with the KPDES permit to ensure that no adverse impacts to surface waters would occur. Mitigation measures would be identified, as needed, to ensure the discharges meet permit limits. This may or may not require a permit modification.

- Regulatory requirements associated with the U.S. Army Corps of Engineers (USACE) Section 404 permitting program would require mitigation sufficient to offset impacts to wetlands and surface water features (EPA 1972). These mitigation measures would be clarified at the end of the consultation with the USACE.

- Tree removal would occur in winter months (between November 15 and March 30) and would be tracked, documented, and reported to the U.S. Fish and Wildlife Service (USFWS).

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Best Management Practices (BMPs):

- TVA would comply with all appropriate local, state, and federal permit requirements.
- All proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to the receiving waters would be minimized and be in accordance with storm water pollution prevention plan (SWPPP) limits.
- Storm water flows would be properly treated with either implementation of proper BMPs or by diverting the storm water discharges to an appropriate storm water outfall or impoundment for co-treatment.
- Equipment washing and dust control discharges would be handled in accordance with BMPs described in the BMP Plan required by the site's KPDES permit to minimize construction impacts to surface waters.
- Sanitary wastes generated during construction activities would be collected by the existing sewage treatment system, onsite septic system(s) or portable toilets. These would be pumped out regularly, and the sewage transported by a vacuum truck to a publicly-owned wastewater treatment works that accepts pump out.
- Upon completion of construction, temporarily-disturbed areas, such as the temporary treatment areas and laydown yards, would be restored to their previous state or maintained by TVA.

2.5 Preferred Alternative

TVA has identified Alternative C – Closure-in-Place and Regrading of the SWL and Ash Impoundment 2 and Construction of a New PWB as the preferred alternative. Alternative C would achieve the purpose and need of the project and calls for less movement of CCR material and less dewatering than Alternative B resulting in greater stability for Alternative C as well. Alternative C would also have reduced air quality impacts associated with the mobilization of dust and emissions from equipment associated with the movement of CCR material as compared to Alternative B. Consequently, Alternative C could be completed sooner and for a lower cost than Alternative B.

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CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Section 1.4, Chapter 3 of the 2017 Final EIS described the baseline environmental conditions (affected environment) of resources in the project area and the anticipated environmental consequences that would occur from implementation of the alternatives described in Chapter 2 of the Final EIS. TVA considered all environmental factors potentially influenced by the proposed project as part of this analysis. TVA has determined that the analysis presented in the 2017 Final EIS adequately addressed potential impacts to air quality; climate change and greenhouse gases; geology and seismology; floodplains; socioeconomics and environmental justice; natural areas, parks, and recreation; transportation; visual resources; noise; solid and hazardous waste and hazardous materials; and public health and safety. Therefore, the 2017 Final EIS analysis for these resources is incorporated by reference for this SEIS.

The remaining resources previously evaluated in the 2017 Final EIS, require additional analysis with respect to the proposed actions evaluated in this SEIS. These remaining resources include: land use, prime farmland and soils, groundwater, surface water, vegetation, wildlife, threatened and endangered species, wetlands, and cultural and historic resources. The baseline environmental conditions (affected environment) of these remaining resources in the project area and the anticipated environmental consequences that would occur from implementation of the alternatives described in Chapter 2 of this SEIS are presented in this Chapter.

3.1 Land Use

3.1.1 Affected Environment

No residential or commercial land uses occur in the immediate vicinity of the proposed closure activities or proposed PWB and associated pipelines. Residential land uses occur approximately 1800 feet southeast of the proposed disturbance area at the closest point. Section 3.3 in the Final EIS describes existing land use and impacts associated with the SWL and Ash Impoundment 2 closure activities. That analysis is incorporated by reference in this SEIS. The following paragraphs describe the land use within the proposed PWB and associated construction areas.

The project disturbance area associated with the construction of a new PWB includes a total of approximately 118.5 acres. This total includes approximately 97 acres of temporarily-disturbed areas and approximately 22 acres of permanently disturbed areas. The project location is zoned for heavy industrial use (McCracken County and Paducah Geographic Information System 2016). The proposed PWB construction activities would be located within previously-disturbed lands at SHF. Although the area is zoned for heavy industry, current site conditions reflect a variety of active and passive land uses. The proposed PWB footprint is located in an area previously used for borrow material. The PWB site is currently partially comprised of grassy fields and partially occupied by storage areas scheduled for demolition in 2018.

Land use/land covers based on the National Land Cover Database (Homer et al. 2015) within the PWB project areas, including the proposed PWB pond location, the temporary treatment

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areas, the potential laydown areas and pipe corridors, are identified in Table 3.1-1 and shown in Figure 3.1-1. Though the National Land Cover Database classifies a portion of the project area as “cultivated crops”, no cultivated crops are present within these areas, nor have they been for many years. (Wetlands are discussed in Section 3.8 of this SEIS.)

Table 3.1-1. Land Cover at the Proposed PWB Site, Temporary Treatment Areas, Potential Laydown Areas and Pipe Corridors

National Land Cover Database Classification	Temporary Treatment Areas	Pipe Corridors	Potential Laydown Areas	Proposed PWB
Open Water	0.0	0.0	1.0	0.0
Developed, Open Space	0.0	1.1	10.2	1.5
Developed, Low Intensity	0.2	0.5	2.9	0.5
Developed, Medium Intensity	0.7	1.3	3.0	1.7
Developed, High Intensity	0.4	0.1	0.9	0.2
Barren Land	1.6	1.9	9.7	7.6
Deciduous Forest	0.0	2.6	1.9	2.2
Evergreen Forest	0.0	0.0	0.0	0.0
Shrub/Scrub	0.0	0.0	0.0	0.0
Grassland/Herbaceous	0.0	0.0	0.0	0.0
Pasture/Hay	0.0	0.0	0.0	0.0
Cultivated Crops	5.7	12.8	24.9	6.0
Woody Wetlands	0.2	0.5	1.0	0.0
Emergent Herbaceous Wetlands	0.1	1.9	9.8	2.0
Total	**8.9**	**22.7**	**65.2**	**21.8**

Source: 2011 National Land Cover Database

Land use in the vicinity of SHF includes agricultural, residential, and industrial areas as described in Section 3.3 of the Final EIS. Land use within the region around the project sites as classified by the National Land Cover Database is mostly agriculture (cultivated crops) and deciduous forest (Figure 3.1-1). Other common land use types include hay/pasture land, various developed lands, and open water.

Industrial developed lands in the vicinity include the SHF plant site and the former Paducah Gaseous Diffusion Plant (PGDP) located approximately 3 miles to the south of the proposed PWB project areas. However, the PGDP ceased operations in 2013 and is currently being decommissioned by the U.S. Department of Energy (DOE). Non-industrial developed lands consist of moderately developed lands associated with the City of Metropolis, Illinois.

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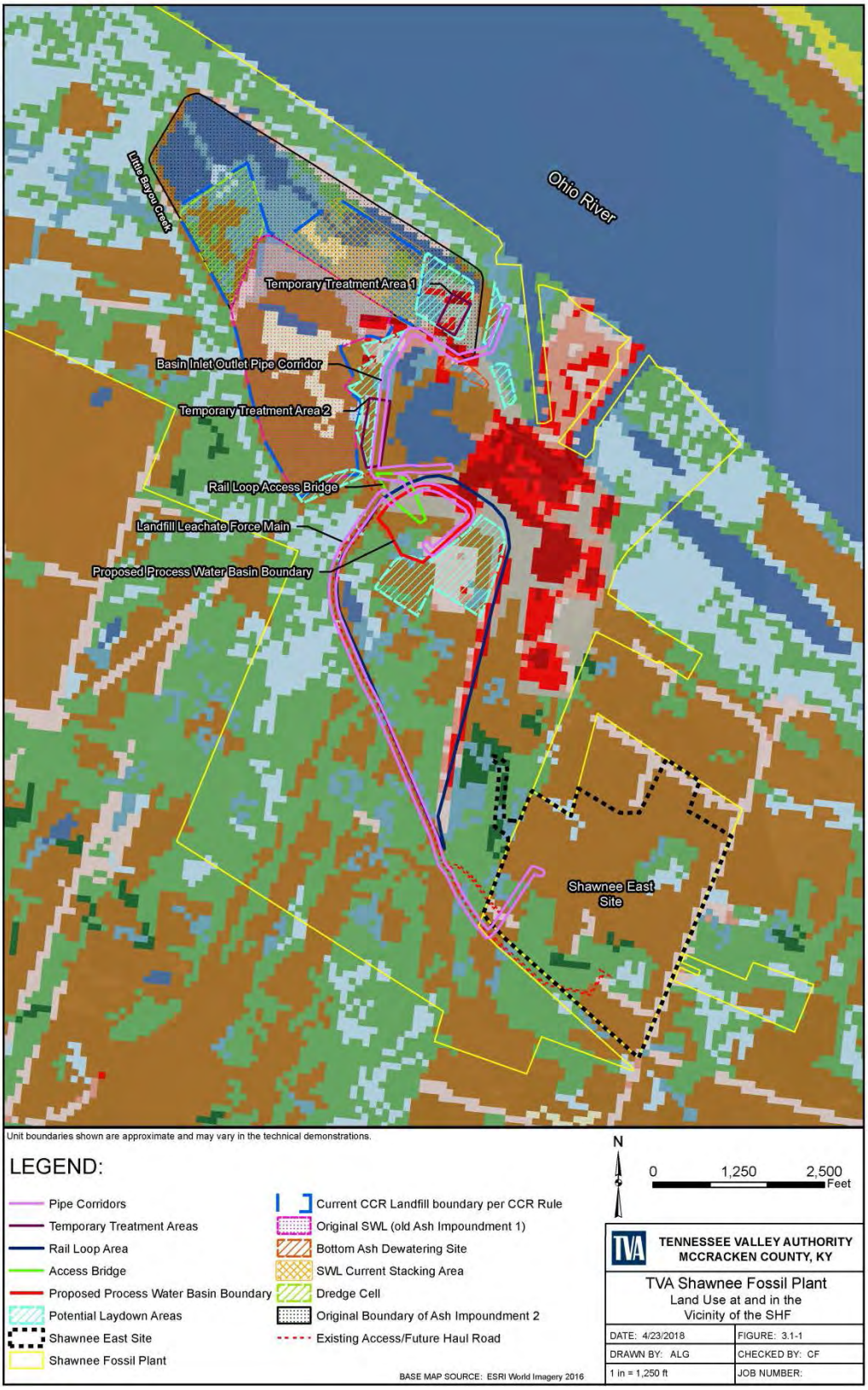

Figure 3.1-1. Land Use at and in the Vicinity of SHF

3.1.2 Environmental Consequences

3.1.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB. Without changes to plant operations, no changes to land use at SHF or in the vicinity would occur; therefore, there would be no impacts to land use associated with the No Action Alternative.

Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. This alternative would not be consistent with the project's purpose and need.

3.1.2.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

As described in Subsection 3.3.2.2 of the Final EIS, because closure of the Ash Impoundment 2 and the SWL has only been modified to include the over-excavation of CCR material and is proposed to occur within an existing industrial area, construction would not result in conversion of any land uses with respect to zoning and would not change the impacts associated with the proposed closure activities as analyzed in the Final EIS.

Under Alternative B, TVA would also construct a PWB in the Rail Loop and install the associated piping to the new CCR landfill leachate pond and the connection to the existing permitted NPDES outfall. Temporary treatment areas may be used in the event that the PWB is not complete by April 2019, the likely date that TVA will have to cease using Ash Impoundment 2 under the CCR Rule. Construction impacts include potential temporary impacts to approximately 97 acres of partially developed land. These acres include temporary treatment areas (8.9 acres), pipe corridors (22.7 acres), and potential laydown areas (65.2 acres). The temporary treatment areas and laydown areas would either be maintained by TVA or allowed to return to their current state once construction of the PWB is complete. As with the SWL and Ash Impoundment 2, the PWB project areas are already zoned for heavy industrial use; the construction of a PWB would not impact this zoning classification. Current land cover in the PWB project areas is a mix of developed and undeveloped land. Land cover in the approximately 21.8 acre PWB footprint would change permanently; however, the change is consistent with the industrial land use of the site. All areas associated with the proposed PWB construction have also already been disturbed by previous industrial and construction activities. Although there are some natural areas within the potential PWB project footprint, these areas are surrounded by industrial activity and are disconnected from less disturbed natural areas nearby. Due to the current zoning designation (heavy industrial) and because construction and operation of the PWB would not result in any major conversion of land uses, only minor direct and indirect impacts to land use would occur.

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3.1.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Under Alternative C, changes to land use would be the same as those under Alternative B. The same amount of disturbance would occur under both alternatives. The PWB would be constructed in the same place and the associated piping and laydown areas would be the same as described under Alternative B. Therefore, direct and indirect impacts to land use from Alternative C would be minor.

3.2 Prime Farmlands and Soils

3.2.1 Affected Environment

As described in Section 3.4 of the Final EIS, the Farmland Protection Policy Act was passed by Congress in 1981 as part of the Agriculture and Food Act (Public Law 97-98). It is intended to minimize the amount of farmland that is irreversibly converted from agricultural uses by federal activities. Prime farmland includes federally recognized prime farmland, unique farmland, and farmland of statewide or local importance. Projects are subject to Farmland Protection Policy Act requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency (National Resource Conservation Service [NRCS] 2018).

Under the Farmland Protection Policy Act, federal agencies are required to consult with the NRCS regarding impacts. Prime farmlands associated with the closure of the SWL and Ash Impoundment 2 are discussed in Section 3.4 in the Final EIS. That analysis is incorporated by reference in this SEIS. Ash Impoundment 2 and the SWL areas are not considered prime farmland (NRCS 2018).

According to the NRCS soil data mapper, the PWB project areas are not considered either prime farmland or farmland of statewide importance (NRCS 2018). Figure 3.2-1 shows the soil types and farmland designation for the soils at the PWB project areas. Soils in the PWB project areas have been previously disturbed and have been used for borrow material collection. These soils may be of poor quality due to these disturbances and may not be useful for any non-industrial applications.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB and associated ancillary infrastructure. With no changes to plant operations, no impacts to prime farmlands or soils at SHF (or in the vicinity) would occur. Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. This alternative would not be consistent with the project's purpose and need.

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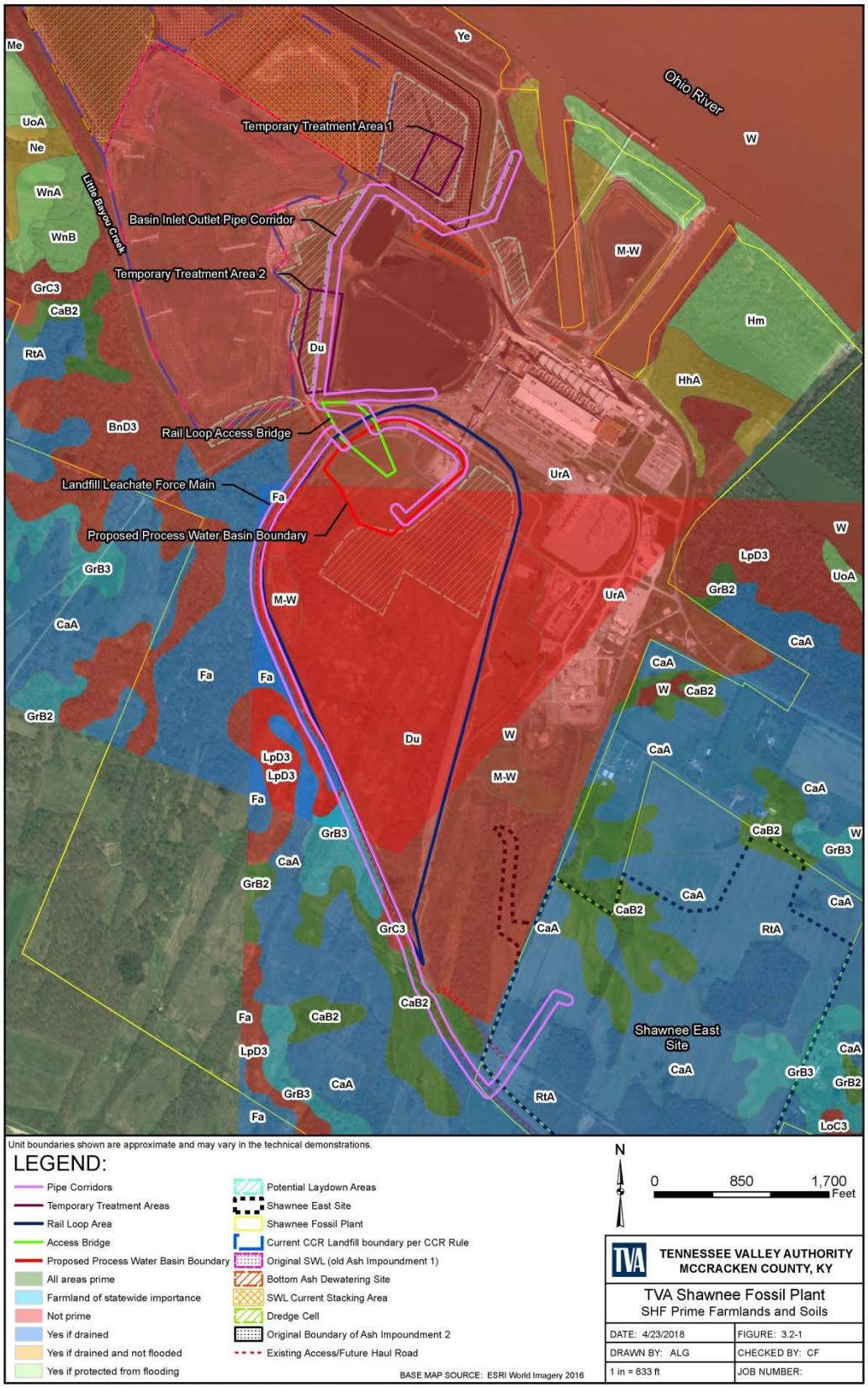

Figure 3.2-1. Prime Farmlands and Soils on the PWB Project Areas

3.2.2.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

As described in Subsection 3.4.2.2 of the Final EIS, there would be no impacts to prime farmland associated with the closure of Ash Impoundment 2 and the SWL. Similarly, since there is no prime farmland within the PWB project areas, no impacts to prime farmland would occur in association with the construction of the proposed PWB. Depending on the results of soil testing, soils may be removed from the PWB location, stockpiled onsite, and later be used to cover Ash Impoundment 2 and the SWL during closure activities (if necessary). Impacts to soils would consist of formerly developed industrial soils being moved to another industrial area, or being disposed in a landfill. As the soil is already disturbed and possibly impacted, and is merely being moved from one disturbed industrial place to another, impacts to soils are anticipated to be minor.

The over-excavation of the Ash Impoundment 2 area to ensure complete removal of CCR would not impact prime farmland, as this area is already unsuitable for farming. The over-excavation would also be a minor, long-term beneficial impact to soils as all potentially CCR impacted soils in the excavated area would be removed, leaving only un-impacted soils in place. The excavated soils under these facilities are already impacted, would not be used for any other application, and would be contained in the final closed SWL and impoundment area. The over-excavation could potentially result in minor beneficial impacts to soils because all CCR-impacted soils would be removed and the excavated area could return to a more natural state over time.

3.2.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Impacts to prime farmland and soils under Alternative C would be the same as those under Alternative B with respect to the closure activities and PWB construction and operation. However, since CCR materials would not be consolidated during the closure activities, more borrow material may be needed under this alternative in order to construct a cover for the unconsolidated Ash Impoundment 2 and the SWL. TVA would identify existing commercial borrow sources in the vicinity should the borrow material from the Shawnee East Site be deemed insufficient. Under Alternative C, the same soils would be used for closure activities at Ash Impoundment 2 and the SWL as described under Alternative B, therefore, the direct and indirect impacts to soils would be similar to those described under Alternative B (i.e. minor). Additionally, impacts to prime farmland would not occur.

3.3 Groundwater

3.3.1 Affected Environment

Regionally significant aquifers and water-bearing units that occur near SHF are the Paleozoic bedrock, McNairy Formation, Lower Wilcox Aquifer, Pliocene and Pleistocene sands and gravel deposits, and Quaternary alluvial deposits. Regional aquitards include the Porters Creek Clay and Upper Continental Deposits (UCD). The lower gravel unit and associated sand layers are

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commonly referred to as the Regional Gravel Aquifer (RGA), the principal aquifer in the site region. Section 3.6.1 in the Final EIS describes the regional aquifers, the SHF groundwater and groundwater quality in detail. As the PWB project areas are in the same location as the closure activities with respect to groundwater and no significant changes have occurred since the publication of the Final EIS, this information is incorporated by reference in this SEIS.

Following the 2015 CCR Rule, TVA issued the following information regarding groundwater monitoring at SHF:

> In addition to ongoing groundwater monitoring required under State regulations, TVA enhanced the monitoring well network at the Shawnee Fossil Plant to comply with the CCR Rule requirements. Additional wells were installed downgradient of the CCR management units as needed and TVA implemented a baseline sampling program. After completion of the baseline sampling, the CCR Rule requires TVA to begin monitoring groundwater in a step that is called 'Detection Monitoring'. The constituents specified by the CCR Rule for Detection Monitoring are boron, calcium, chloride, fluoride, pH, sulfate, and [total dissolved solids] TDS. These seven constituents occur naturally in soils, rock, groundwater and surface water, and they are also present in coal and in CCR. They were selected by EPA because they can indicate groundwater conditions that may require further evaluation. (TVA 2017a)

The additional wells included a new background well (in addition to those already present), and new wells downgradient of the areas where CCR is managed (TVA 2017a). Figure 3.3-1 shows the locations of the CCR monitoring well network at SHF.

Until September 21, 2017, when the SWL and Ash Impoundment 2 were transferred to a Kentucky Chapter 46 Registered Permit-by-Rule for coal ash units, reports were prepared semi-annually. On January 31, 2018, the Registered-Permit-by-Rule provision was overturned. Therefore, the Chapter 45 special waste permits for the SWL and Ash Impoundment 2 have been reinstated and are currently in effect. Groundwater would be monitored in accordance with applicable local, state, and federal regulations. As reported in the Final EIS, May 2017 groundwater monitoring results included statistical exceedances of limits for gross alpha, aluminum, boron, calcium, cobalt, fluoride, iron, magnesium, manganese, molybdenum, nickel, pH, potassium, specific conductance, strontium, sulfate, total organic carbon, and TDS in the downgradient wells from the SWL groundwater monitoring program. (TVA 2017b).

The latest available groundwater report is for 2017. The final 2017 annual groundwater report for the SWL, and Ash Impoundment 2 details TVA's groundwater monitoring activities in 2017, which included:

- The required groundwater quality monitoring network was established and certified by a qualified Professional Engineer as required by 40 CFR 257.91.

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- Monitoring wells were video-logged and resurveyed to confirm accuracy in the documented well construction records.
- A groundwater quality sampling and analysis program was developed and implemented as required by 40 CFR 257.90.
- The required baseline monitoring of network wells was initiated and independent baseline samples, as required by 40 CFR 257.94(b), were collected.
- The sampling and analysis for the first detection monitoring event was completed in October 2017 in accordance with the CCR Rule [40 CFR 257.93 and 257.94(a)].
- Statistical analysis of baseline data was performed in accordance with the CCR Rule (Stantec 2018c).

Figure 3.3-1. Locations of the CCR Monitoring Well Network at SHF

In January 2018, TVA evaluated the 2017 groundwater monitoring data for statistically significant increases (SSIs) over background levels for boron, calcium, chloride, fluoride, pH, sulfate, and TDS. The groundwater analytical results from the initial round of detection monitoring indicated SSIs of boron, calcium, pH, sulfate and TDS at the downgradient monitoring wells. TVA plans to perform confirmation of the SSIs via retesting procedures and error checking and investigate whether the SSI over background levels resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. TVA also plans to perform investigations to determine whether a source other than the CCR materials contained in the Ash Impoundment 2 and SWL are the cause of any verified SSI over

background levels. If TVA is unable to demonstrate that the SSI was a result of error or another source, then an Assessment Monitoring Program will be established and implemented (Stantec 2018c).

TVA's planned 2018 groundwater monitoring activities include:

- Perform confirmation of SSIs via retesting procedures and error checking. Investigate whether the SSI over background levels resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality as specified in 40 CFR 257.94(e)(2).
- Perform an alternate source demonstration in accordance with 40 CFR 257.94(e)(2).
- Establish an assessment monitoring program in accordance with 40 CFR 257.94(e)(1), where applicable, if unable to establish that SSIs were the result of another source or the result of an error.
- Perform further field and desktop Site Characterization Investigations to improve the SHF Conceptual Site Model.
- Continue semi-annual detection monitoring at the certified groundwater monitoring network consistent with 40 CFR 257.94 for the 2018 Annual Groundwater Monitoring and Corrective Action Report.
- Continue and improve TVA's third-party Quality Assurance Program to evaluate groundwater analytical data using best practices concerning field methods and validation techniques, as well as the application of the most appropriate statistical methods.
- Review new data as it becomes available and implement changes to the groundwater monitoring program as necessary to maintain compliance with 40 CFR 257.90 through 257.98.
- Comply with recordkeeping requirements specified in 40 CFR 257.105(h), notification requirements specified in 40 CFR 257.106(h), and internet requirements specified in 40 CFR 257.107(h) (Stantec 2018c).

As described in Subsection 3.6.1.4 of the Final EIS, the DOE PGDP is upgradient of the SWL, Ash Impoundment 2, and the proposed PWB project areas, and has had a contaminant plume in the RGA which has moved into the SHF reservation. At one time, several wells reflected impact by the plume with leading edge contaminants of Technetium 99 (Tc-99) and TCE. Currently, due to pump-and-treat remedial work occurring, the TCE plume has receded and now affects only one well at the main plant and two wells at the Shawnee East Site. DOE has a Water Policy Boundary executed, which requires no one within the boundary to use the groundwater. The SHF reservation in its entirety falls within this boundary. Due to the proximity of the PGDP, groundwater in the immediate vicinity is not used for drinking water and private wells in the area have been capped and sealed (DOE 2014).

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Progress in the long-term cleanup at the DOE PGDP from continued, active groundwater remediation is modeled every two years. The primary constituents modeled for the PGDP plume in the RGA are TCE and Tc-99. For TCE, the Safe Drinking Water Act Maximum Contaminant Level (MCL) of 5 micrograms per liter (µg/L) is the isoconcentration contour that defines the limit of the plume. For Tc-99, 900 picocuries per liter (pCi/L) defines the plume limit. In the 2014 PGDP report, the modeled groundwater plumes of these contaminants were similar to 2010 results, with notable exceptions in the Northwestern Plume. For this plume, the TCE contamination was projected to have reduced in areal extent near the extraction wells. These changes indicate continued, active groundwater remediation at the PGDP is making progress (DOE 2014). The most recent (2016) TCE plume map shows that the 5 µg/L plume edge is on TVA property in the proposed PWB location (in the Rail Loop). The plume is smaller in this location than it was on the 2014 map, but is still on TVA property. The 2016 Tc-99 plume (exceeding 900 pCi/L) is entirely on PGDP property and does not extend onto TVA property in the lower RGA (DOE 2017).

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB and associated ancillary infrastructure. With no changes to plant operations and no new construction, no impacts to groundwater use or quality would occur under the No Action Alternative. Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. However, this alternative would not be consistent with the Project's purpose and need.

3.3.2.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

During closure activities and construction of the proposed PWB and associated piping connecting the PWB to the new CCR landfill leachate impoundment, the CYDB, and the existing NPDES outfall, BMPs would be utilized to minimize soil and vegetation disturbances and soil runoff; thus minimizing potential impacts to groundwater from construction activities. Upon completion of construction, temporarily-disturbed areas, such as the temporary treatment areas and laydown yards, would be restored to their previous state or maintained by TVA; therefore, direct and indirect construction-related effects to groundwater would be minor, temporary, and localized.

As discussed in Section 3.6.2.2 of the Final EIS, the overall impacts from closure activities associated with the SWL and Ash Impoundment 2 would be beneficial to groundwater. The reduction of the hydraulic head by decanting surface water, in addition to the removal of potential additional hydraulic inputs from precipitation, surface water runoff, or other water additions to the impoundment, would effectively reduce the potential release of CCR constituents to groundwater. Therefore, the direct and indirect impacts with respect to closure of

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the SWL and Ash Impoundment 2 are minor but beneficial as compared to the No Action Alternative.

The proposed PWB design would incorporate a geomembrane liner system that would utilize a synthetic liner in combination with a compacted clay liner. With the use of BMPs, impacts to groundwater associated with construction of the proposed PWB and associated piping would be minor, temporary, and localized.

The over-excavation of the Ash Impoundment 2 during closure activities would be an additional, but minor benefit to groundwater at SHF. The removal of any potentially CCR impacted soils would further reduce the possibility of seepage of CCR material into groundwater.

Overall, the implementation of Alternative B would be beneficial to groundwater as compared to Alternative A – No Action. With respect to the closure activities, reduction of the hydraulic head by decanting surface water, in addition to the removal of potential additional hydraulic inputs from precipitation, surface water runoff, or other water additions to the impoundment, would effectively reduce potential release of CCR constituents to groundwater. Therefore, in consideration of 1) the beneficial effects of removal of the hydraulic head from a closed ash impoundment, 2) the associated reduction in infiltration from the ash impoundment, 3) the commitment to supplemental mitigation measures, 4) the over-excavation of potentially CCR-impacted soils at the Ash Impoundment 2, and 5) the construction of a lined PWB, the direct and indirect impacts of Alternative B on groundwater use and quality with respect to closure of the SWL and Ash Impoundment 2 and the construction and operation of a new PWB are minor but beneficial as compared to the No Action Alternative.

3.3.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Under Alternative C, impacts to groundwater would be similar to those under Alternative B. Because Alternative B involves consolidation and over-excavation of CCR, Alternative B could have slightly greater beneficial impacts to groundwater than Alternative C. Therefore, as under Alternative B, slightly smaller direct and indirect minor beneficial impacts would occur under Alternative C with respect to groundwater use and quality.

3.4 Surface Water

3.4.1 Affected Environment

As described in Section 3.7 of the Final EIS, the SHF site is located on the Ohio River, 35 miles upstream of its confluence with the Mississippi River (Ohio River Mile 946). The plant is bordered by the Ohio River and Little Bayou Creek, which are both classified as warm-water aquatic habitat (Figure 3.4-1). No new information has been identified since the Final EIS was published regarding the surface water conditions at and surrounding the SHF site and the existing SHF wastewater stream and wastewater treatment facilities; therefore, these existing conditions are incorporated by reference in this SEIS.

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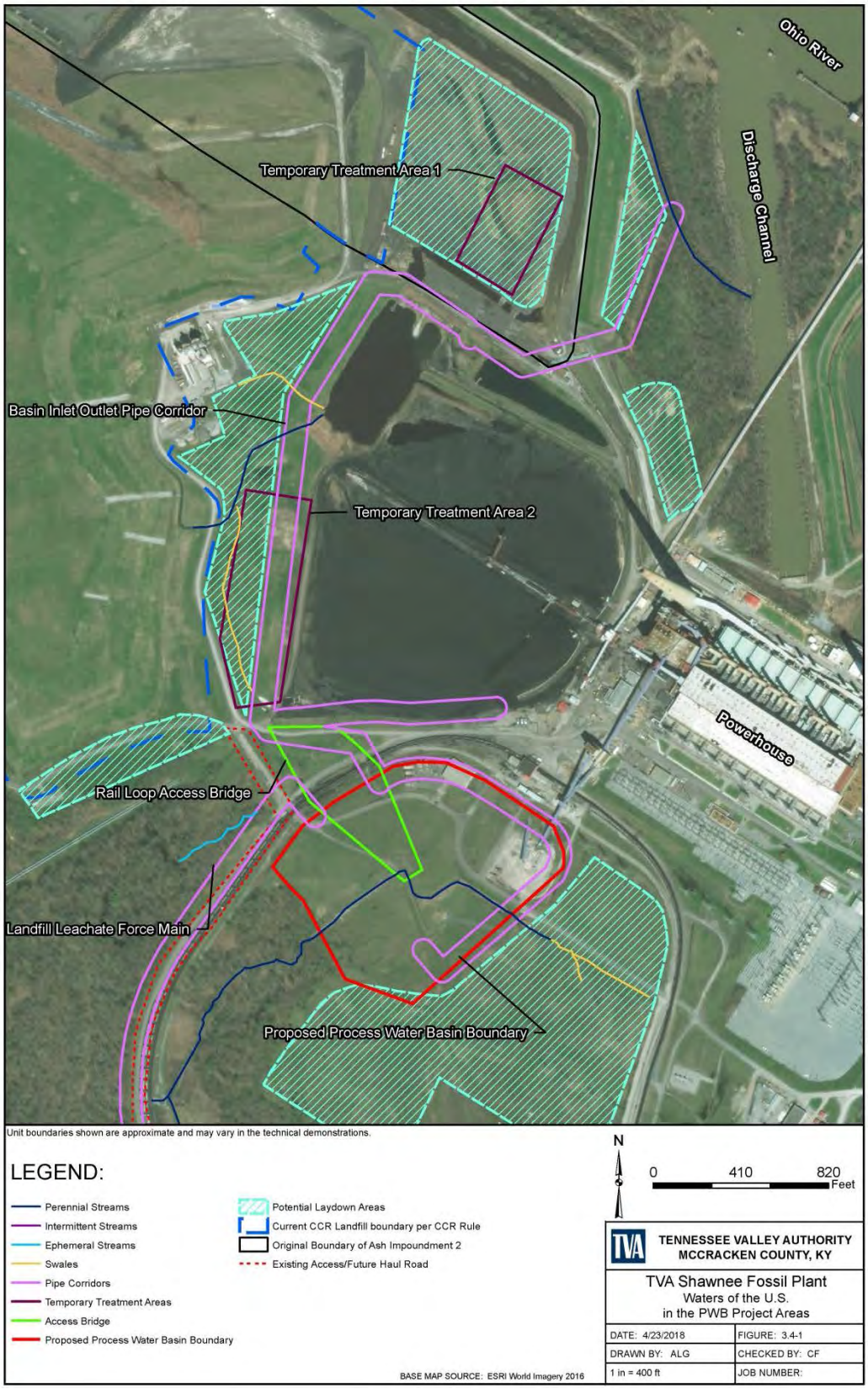

Figure 3.4-1. Waters of the U.S. in the PWB Project Areas

Jurisdictional and non-jurisdictional streams and wetlands were delineated/characterized within the PWB project areas in January 2018 (Jackson Group 2018a). A total of 2,061.3 linear feet would be impacted by the construction of the PWB, pipe corridors, and potential laydown areas. No stream features were identified within the temporary treatment areas. The stream features impacted by construction of the PWB are identified in Table 3.4-1 and Figure 3.4-1.

Table 3.4-1. Stream features Identified within the Proposed PWB Project Areas

Stream Feature	Type of Feature	Pipe Corridors (Linear Feet)	Potential Laydown Areas (Linear Feet)	Proposed PWB (Linear Feet)	Total (Linear Feet)
UT-B	Perennial	103.5	113.7	1,079.6	1,296.8
UT-C	Perennial	118.2	503.8	0.00	622.1
UT-D	Perennial	117.9	0.00	0.00	117.9
UT-E	Ephemeral	24.5	0.00	0.00	24.5
Total (Linear Feet)		**364.1**	**617.5**	**1,079.6**	**2,061.3**

TVA is consulting with the USACE for a Jurisdictional Determination for the PWB project areas to determine wetlands and stream features that would require mitigation. Refer to Section 3.7 for a separate discussion of wetland resources.

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB and associated ancillary infrastructure. With no changes to plant operations and no construction, no impacts to surface water use or quality would occur. Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. This alternative would not be consistent with the project's purpose and need.

3.4.2.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

As described in Subsection 3.7.2.2 of the Final EIS, during closure activities and construction of the proposed PWB and associated piping connecting the PWB to the new CCR landfill leachate impoundment, the CYDB, and the existing NPDES outfall, TVA would comply with all appropriate state and federal permit requirements. Appropriate BMPs would be followed, all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to the receiving waters would be minimized and be in accordance with KPDES limits. The Site BMP Plan, required by the KPDES permit, would be updated to include project-specific BMPs, or a stand-alone project BMP plan would be prepared. This plan would identify specific BMPs to address construction-related activities that would be adopted to minimize storm water impacts. Storm water flows would be properly treated

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either through implementation of proper BMPs or by diverting the storm water discharges to an appropriate storm water outfall or impoundment for co-treatment. Equipment washing and dust control discharges would be handled in accordance with BMPs described in the BMP Plan required by the site's KPDES permit to minimize construction impacts to surface waters.

Sanitary wastes generated during construction activities would be collected by the existing sewage treatment system, onsite septic system(s), or portable toilets. These would be pumped out regularly, and the sewage transported by a vacuum truck to a publicly-owned wastewater treatment works that accepts pump out. Upon completion of construction, temporarily-disturbed areas, such as the temporary treatment areas and laydown yards, would be restored to their previous state, or would be maintained by TVA. With the implementation of appropriate BMPs, only temporary, minor, impacts to surrounding surface waters would be expected from construction activities associated with the closure activities and construction of the proposed PWB.

The proposed PWB construction would have a minor impact on the streams identified on Figure 3.4-1 (Jackson Group 2018a). TVA would reroute the stream crossing the PWB footprint; the stream would likely be rerouted around the southern portion of the PWB to continue to provide general drainage for the surrounding areas. The details of the stream rerouting would be determined during later stages of the design process. If these streams are deemed by the USACE to be jurisdictional, then Kentucky Division of Water 401 Water Quality Certification and USACE 404 permits would be required, which could require mitigation such as onsite stream restoration or stream mitigation bank contributions, per permit requirements and/or availability. With mitigation, the impacts to surface water associated with the stream relocation would be minor. TVA is in the process of consulting with the USACE and will implement mitigation measures as necessary per the terms and conditions of any required permits.

As described in Table 2.1-1, an estimated 15 to 25 tanks (ranging in size from 0.6 to 1.7 million gallons per tank), covering a footprint of approximately 10 to 12 acres, would be required for a temporary treatment area in the event that the PWB is not complete by April 2019. Final drainage would be routed to existing or new discharge points and comply with the KPDES permit to ensure that no adverse impacts to surface waters would occur. Mitigation measures would be identified (as needed) to ensure the discharges meet permit limits. This may or may not require a permit modification. With the application of such mitigation measures, the use of temporary treatment tanks would not be anticipated to result in adverse impacts to surface water. Characterization of this new discharge stream would be evaluated to ensure compliance with the KPDES permit. Therefore, direct and indirect impacts to surface water under Alternative B would be minor.

3.4.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Under Alternative C, impacts to surface water would be the same as those under Alternative B. As the same areas would be disturbed and the same incidental hydrology would be altered during the closure activities, impacts would also be minimized as possible through BMPs and

avoidance. Therefore, as under Alternative B, direct and indirect impacts to surface water would be minor.

3.5 Vegetation

3.5.1 Affected Environment

SHF is located within the Wabash-Ohio Bottomlands Level IV ecoregion (Woods et al. 2002). This unglaciated, level floodplain along the Ohio River was historically a southern floodplain forest, a mix of oaks, cypress, and hardwood species. This region has been largely drained and converted for commercial and agricultural use. SHF is primarily an intensely developed site that has been heavily disturbed by the construction, maintenance, and operation of the existing facility. As a result of this previous alteration of the physical landscape, most areas within SHF no longer support natural plant communities. Land use and land cover within the SHF project area is described in Section 3.1 of the Final EIS and in Section 3.1 of this SEIS. Vegetation and the potential impacts associated with the closure of the SWL and Ash Impoundment 2 are discussed in detail in Section 3.9 of the Final EIS and are incorporated by reference in this SEIS. Within the PWB project areas, the land cover is classified as developed, low intensity, and the vegetation consists of plants typical of disturbed or landscaped areas. Vegetation within 5 miles of the project area is primarily cultivated crops, deciduous forest, and pasture land.

A field survey was conducted by Jackson Group in January 2018 to evaluate vegetation, threatened and endangered species, and forest composition within a 283-acre survey area, which included the PWB project areas. The survey report is included in Appendix A of this SEIS. Vegetation observed within the site boundary was primarily bottomland hardwoods, herbaceous wetlands, forested wetlands, upland grasslands, scrub/shrub, and mixed oak forest (Jackson Group 2018b).

There are two types of bottomland hardwoods in the project areas, one of which is dominated by American sycamore, black willow, button bush, eastern cottonwood, and green ash. The other type is dominated by sweet gum. Herbaceous wetland areas are dominated by various *Carex, Festuca, Juncus*, and *Polygonum* species, as well as common barnyard grass, and common reed grass. Upland grassland areas consist of species mostly associated with managed grassland areas around industrial sites. These species include various *Festuca* species, Bermuda, and common barnyard grasses. Scrub/shrub areas onsite are managed areas to support wildlife conservation. These areas consist of multiflora rose and a variety of upland grass species. Mixed oak forests onsite are primarily comprised of blackjack oak, Northern red oak, and white oak. Figure 3.5-1 illustrates the vegetation categories at the proposed PWB project areas (Jackson Group 2018b).

3.5.1.1 Invasive Species

An invasive species is defined as a species that is not native to the local ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health (USDA 2016 [EO 13112]). Invasive plants can include trees, shrubs, vines, grasses, ferns, and forbs (Jackson Group 2018b).

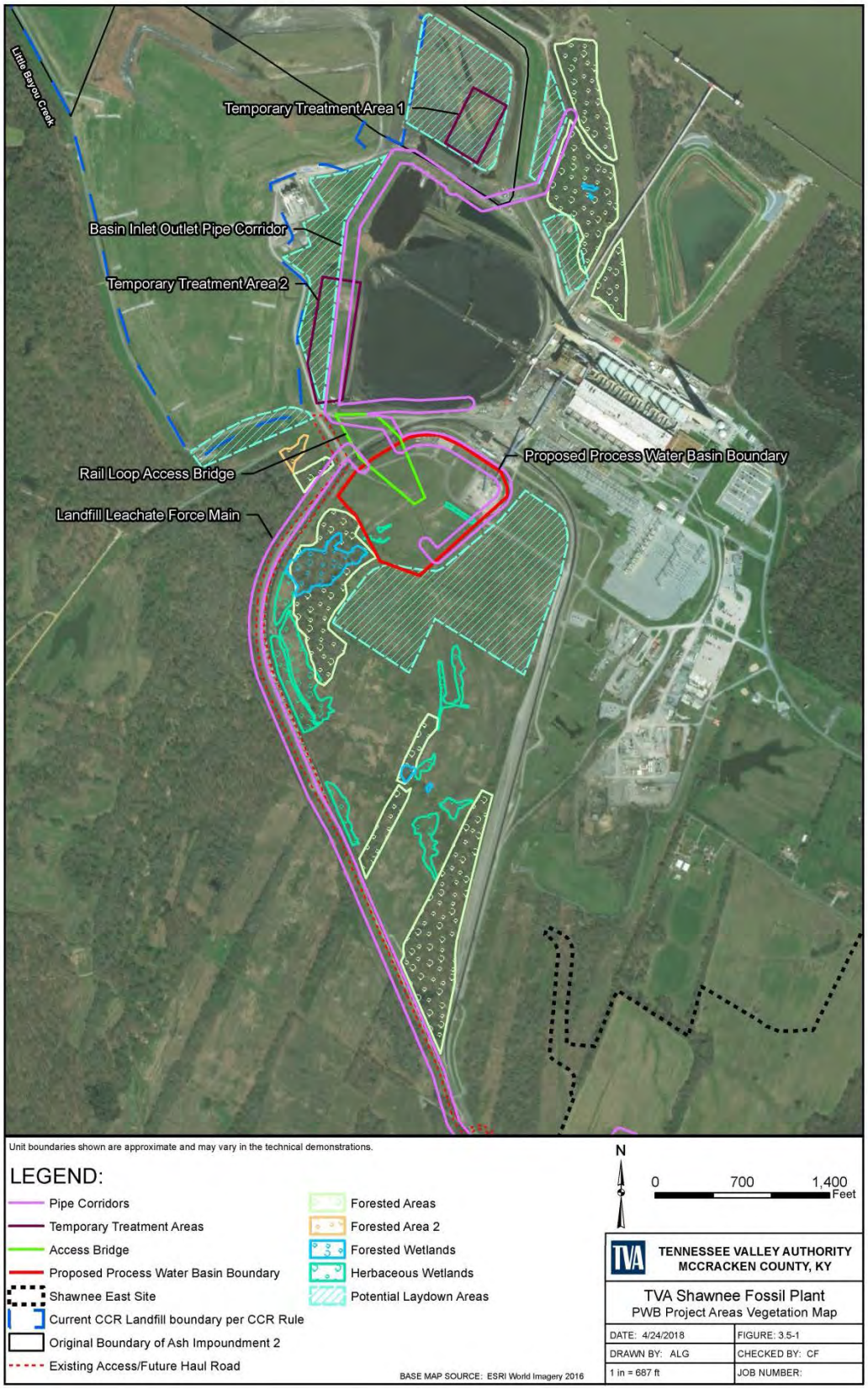

Figure 3.5-1. PWB Project Areas Vegetation Map

EO 13751 (Invasive Species), and EO 13112 as amended, call upon executive departments and agencies to take steps to prevent the introduction and spread of invasive species, and to support efforts to eradicate and control invasive species that are established. TVA implements the executive order, to the extent practicable, through BMPs. For example, TVA has developed lists of non-native plant species that are non-invasive and can be used for erosion control and other situations (Muncy 2012), thereby minimizing the spread of invasive species in disturbed areas (Jackson Group 2018b).

Most lands in and around the TVA power service area have been affected by introduced, non-native plant species. According to NatureServe (2016), invasive, non-native species are the second leading threat to imperiled native species. EO 13112 defines invasive species as non-native to the environment into which they have been introduced, and where the introduction of these non-native species is likely to cause economic or environmental harm to human, animal, or plant health in their new environment. Some invasive species have been introduced into this country accidentally; others were introduced as ornamentals or for livestock forage. Without their natural predators and diseases that tend to keep native plants in natural balance, invasive species can out-compete native vegetation for available resources, such as nutrients, space, and water (Freibott 2018)..

The PWB project areas have been either intensely developed or heavily-disturbed, and as a result of these alterations, the areas no longer support a natural plant community. The most common invasive species encountered during the field survey were common reed grass, multiflora rose, and Japanese honeysuckle. These species were sparsely distributed throughout the proposed PWB project areas (Jackson Group 2018b).

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB and associated ancillary infrastructure. With no changes to plant operations and no construction, no impacts to vegetation would occur. Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. This alternative would not be consistent with the project's purpose and need.

3.5.2.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Section 3.9 in the Final EIS discusses potential impacts to vegetation with respect to the closure of the SWL and Ash Impoundment 2. No significant changes have occurred in these areas and the previous analysis is incorporated by reference in this SEIS. The over-excavation of soils from Ash Impoundment 2 would have no impact on vegetation as this area is not currently vegetated.

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As described in Subsection 2.2.2.1, the SWL and Ash Impoundment 2 may be closed with either a traditional geomembrane cap system with a protective soil and vegetation layer or a ClosureTurf® system which consists of a special engineered turf and sand fill. The use of the traditional system as evaluated in the Final EIS would result in the re-establishment of a grassy, maintained habitat in these areas. Inactive portions of the SWL are currently maintained with a grassy cover, while Ash Impoundment 2 is largely unvegetated. Therefore, extending this vegetative cap over Ash Impoundment 2 would constitute a beneficial impact to vegetation because it would increase the areal extent of vegetation cover in this area. Conversely, the use of the ClosureTurf® system would reduce the amount of vegetation across the SWL and preclude the establishment of vegetation on Ash Impoundment 2. This engineered turf would be installed and maintained as a permanent artificial cover; thus, the amount of vegetation in the area that is covered would be reduced for the life of this system.

The construction of the PWB under Alternative B would result in the disturbance of vegetation from approximately 118.5 acres of land. These acres include temporary treatment areas, pipe corridors, potential laydown areas, and the proposed PWB. Approximately 97 acres would be temporarily disturbed and approximately 22 acres would be permanently disturbed. Figure 3.5-1 shows the existing vegetation in the vicinity of the proposed PWB project areas. As shown in the figure, the temporary treatment areas, laydown areas and proposed PWB locations are all located in previously disturbed or impacted areas with respect to vegetation. Portions of the pipeline corridors would be placed in locations which have some forested vegetative cover; however, the corridors would be placed along the edges of the forested areas, minimally impacting mature trees. Overall, vegetation in the proposed PWB project areas is already highly disturbed and consists mostly of upland grasslands and scrub/shrub.

All of the minimal, naturally-occurring vegetative communities in the PWB project areas are common in the adjacent Western Kentucky Wildlife Management Area (WKWMA) and in the larger region. The acreage of vegetation that would be lost in constructing the PWB would be minor in comparison to the extensive areas in which these vegetation types occur elsewhere in the vicinity. The areas to be directly impacted by clearing for the proposed PWB are predominantly former agricultural fields that have been intensively altered by SHF and other industrial activities, including the former use of the proposed PWB location for borrow material.

Alternative B includes revegetation as part of the cover system for both the closure of Ash Impoundment 2 and the SWL. Placement of fill material and the establishment of vegetation will result in a shift in cover at Ash Impoundment 2 and the SWL from its current condition to a turf grass community. The temporary treatment areas and laydown areas would either be allowed to return to a natural state or would be maintained as turf grass by TVA. The proposed PWB would not be revegetated until closure of the facility at an unknown future date.

Construction activities associated with the closure of Ash Impoundment 2 and the SWL and construction of the proposed PWB could also result in the introduction and/or spread of invasive plant species from borrow material and heavy equipment operation. However, the generalized transformation of the Ash Impoundment 2 impoundment, SWL, and the proposed PWB project areas from a highly-disturbed environment to a stable, controlled, and vegetated landscape

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likely would reduce the potential for invasive species to become established. Additionally, TVA BMPs for erosion control and use of native and/or non-invasive species would promote the rapid establishment of desirable vegetation and further minimize invasive plant impacts.

Overall, direct and indirect impacts on vegetation under Alternative B would be minor.

3.5.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Under Alternative C, impacts to vegetation would be the same as under Alternative B. The same areas would be disturbed or cleared under both action alternatives. Therefore, direct and indirect impacts to vegetation would be minor.

3.6 Wildlife

3.6.1 Affected Environment

The potentially affected environment at SHF is shown in Figure 2.2-1. This map includes the areas discussed in the Final EIS, as well as a small additional area located in the Rail Loop and along the proposed pipeline corridors. The surrounding area includes the coal stockpile and other plant facilities to the north, and forested and agricultural areas to the west, east and south. Aquatic habitats adjoining the SHF property include the Ohio River to the north and Little Bayou Creek to the west and south. An early successional, hardwood-forested area is located near the proposed PWB piping on the river side of the perimeter dike that surrounds the existing ash management area. Other forested areas are located to the south and west of the proposed PWB location (Figure 3.5-1). A small portion of these forested habitats may be impacted by the pipeline corridors. None of the riparian or aquatic habitat along the Ohio River or Little Bayou Creek would be impacted by the proposed action or alternatives. Mowed fields of grass and other herbaceous vegetation in the area of the SWL, proposed PWB location, and/or the bottom ash trench are used by many common wildlife species. Section 3.10 of the Final EIS discusses wildlife at SHF and the surrounding area and the potential impacts associated with closure of the SWL and Ash Impoundment 2. No significant changes to wildlife have occurred since the Final EIS was published; therefore, this analysis is incorporated by reference in this SEIS.

The construction of the PWB under Alternative B would result in the disturbance of vegetation from approximately 118.5 acres of land. These acres include temporary treatment areas, pipe corridors, potential laydown areas, and the proposed PWB. Approximately 97 acres would be temporarily disturbed and approximately 22 acres would be permanently disturbed. The approximately 118.5-acre PWB project areas are less disturbed than the Ash Impoundment 2 and SWL areas, and provides far more diverse habitat than the industrial area of SHF. The PWB project areas contain bottomland hardwoods, herbaceous wetlands, forested wetlands, upland grasslands, scrub/shrub, and mixed oak forest. Most of the potentially-disturbed areas consist of upland grasslands and shrub/scrub. As described in the Final EIS, these areas would be used by several avian species including the Canada goose, eastern meadowlark, grasshopper sparrow, killdeer, European starling, and red-tailed hawk (Palmer-Ball 1996, National Geographic Society 2002). A few of the small mammals that may inhabit these grassy

areas include the eastern cottontail, eastern mole, deer mouse, prairie vole, southeastern shrew, and eastern chipmunk. Small patches of disturbed forest adjacent to the industrialized areas of SHF are often used by the American crow, American robin, American goldfinch, blue jay, eastern towhee, northern cardinal, northern mockingbird, red-winged blackbird, red-shouldered hawk, wild turkey, and other birds (National Geographic Society 2002).

As of October 2016, the TVA Regional Natural Heritage database included no records of caves within 5 miles of SHF, and no caves were identified on the project site during field surveys conducted in either October 2016 or January 2018. One large colony of great blue herons has been reported approximately 3.7 miles east of SHF. No additional heron rookeries, osprey nests, or aggregations of other migratory birds were observed within the project area, and none are recorded within 5 miles of SHF.

Table 3.10-1 in the Final EIS contains a listing of migratory birds that might be affected by the project (USFWS 2016a). A total of 22 species of migratory birds considered by USFWS to be of conservation concern were identified in the Information for Planning and Conservation (IPaC) search as having the potential to occur in the area of SHF and/or be affected by activities there. The habitat preferences and seasonal occurrence of the birds of conservation concern identified by the IPaC search were also provided in Table 3.10-1 of the Final EIS. The table also provides an indication of whether habitats in the project area potentially may satisfy the habitat preferences of each species and which seasons those species may be present within the project areas. Of the 22 species, 16 had potential habitat either on SHF or on the new CCR landfill site. In the proposed PWB project areas, potential for the Bald Eagle, the Prothonotary warbler, and the Swainson's warbler may exist in the forested areas adjacent to the Ohio River.

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB and associated ancillary infrastructure. With no changes to plant operations and no new construction, no adverse impacts to wildlife or their habitats would be expected to occur. Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. This alternative would not be consistent with the project's purpose and need.

3.6.2.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

As discussed in the Final EIS, no natural habitat would be affected in the Ash Impoundment 2 and SWL area on the SHF facility under Alternative B. The modification of Alternative B to include the over-excavation of additional materials in Ash Impoundment 2 would not result in any additional impacts to wildlife.

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As described in Subsection 2.2.2.1, the SWL and Ash Impoundment 2 may be closed with either a traditional geomembrane cap system with a protective soil and vegetation layer or a ClosureTurf® system which consists of a special engineered turf and sand fill. The use of the traditional system as evaluated in the Final EIS would result in the establishment of a maintained area of short grass, which could be used as habitat by wildlife that forage in such open habitats. Conversely, the use of the ClosureTurf® system would reduce the amount of vegetation across the SWL and preclude the establishment of vegetation on Ash Impoundment 2. Wildlife would not be able to utilize the area for food or shelter. However, ample areas for food and shelter are available in the surrounding area, thus there would be no impacts to wildlife from the use of the ClosureTurf® system.

Under Alternative B, with respect to the construction of the PWB, approximately 22 acres of grassland would be permanently converted to open water, maintained vegetation, and some industrial surfaces such as equipment/structures and roads. Approximately 97 acres of temporary disturbance may be maintained by TVA or allowed to return to a shrub/scrub state, depending on operational constraints. The construction and operation of the proposed PWB would create approximately 10 acres of open water habitat. This would be marginal habitat, but could be used by migrating birds intermittently. Due to the large expanse of similar habitat in the vicinity of SHF, these changes to habitats available to wildlife would be minor.

Proposed actions at the PWB locations may result in direct impacts to individuals of some wildlife species, depending on the timing of vegetation removal and the mobility of the species. Mobile wildlife, including migratory birds, would be displaced to other habitats in the vicinity. However, wildlife populations would not be substantially reduced, the habitats that would be affected are not rare in the vicinity, and impacts to wildlife in the region would not be noticeable and would be considered minor. Therefore, overall direct and indirect impacts on wildlife from this alternative would be minor.

3.6.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Under Alternative C, impacts to wildlife would be the same as those described above under Alternative B. The same areas would be disturbed or cleared; therefore, as under Alternative B, overall direct and indirect impacts to wildlife would be minor.

3.7 Threatened and Endangered Species

3.7.1 Affected Environment

The Endangered Species Act provides broad protection for species of animals and plants that are listed by the federal government as threatened or endangered in the United States or elsewhere. The Endangered Species Act outlines procedures for federal agencies to follow when taking actions that may affect federally listed species or their designated critical habitat. In addition to species federally listed under the Endangered Species Act, the Commonwealth of Kentucky also provides protection for species it considers threatened, endangered, or of special concern within the state (Kentucky Department of Fish and Wildlife Resources 2013). The listing

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of species is managed by the Kentucky Department of Fish and Wildlife Resources. Additionally, the Kentucky State Nature Preserves Commission (KSNPC) and TVA both maintain databases of terrestrial and aquatic species that are considered threatened, endangered, or of special concern in Kentucky. Section 3.12 of the Final EIS discusses threatened and endangered species in McCracken County, Kentucky in depth, including an analysis of potential impacts. This analysis is incorporated by reference in this SEIS. Table 3.12-1 of the Final EIS lists the species with federal or state status that have recorded occurrences in McCracken County. A field survey was conducted in January 2018 to assess the proposed PWB project areas for species of special concern.

3.7.1.1 Plants

No federally threatened or endangered plant species were observed during field survey efforts and there are no federally listed plant species with known recorded occurrences in McCracken County, Kentucky (USFWS 2016a).

The Kentucky Rare Plant Recognition Act of 1994 provides protection for species considered threatened, endangered, or in need of management within the state. Table 3.21-1 of the Final EIS lists the state-listed plant species with recorded occurrences in McCracken County (Nature Serve 2016). A review of the TVA Natural Heritage Database indicated that only two of the state-listed plant species (water hickory and star tickseed) have recorded occurrences within a 5-mile radius of SHF. Potential suitable habitat for state-listed species was observed throughout the PWB project areas. However, no state-listed plant species were observed during field surveys.

Water hickory is state-listed as threatened. It is a large tree species associated with bottomland forests and floodplain swamps that have standing water for a portion of the year (NatureServe 2016). Wet woodland areas in the PWB project areas could provide low-quality habitat for the water hickory, but due to the land's repeated disturbance, it is unlikely that the species would become established in such fragmented patches of wet, woodland areas. No individuals of this species were observed by Jackson Group during the January 2018 vegetation survey of the PWB project areas.

Star tickseed has a state status of special concern. It is a perennial herb associated with open woodlands, dry slopes and cliffs, and back edges of boulder-cobble bars near riverbanks (NatureServe 2016). The star tickseed has also been recorded to become established along the edges of forested wetlands. There is potential habitat for this plant on the PWB project site, including open woodlands and edges of forested wetlands. No individuals of this species were observed by Jackson Group during the January 2018 vegetation survey of the PWB project areas. However, star tickseed is a small herb and would not be likely to have been observable during the January 2018 field survey. Star tickseed has been recorded within 5 miles of SHF, so the potential for occurrence is not discountable. However, the site has been highly disturbed in the past, making the survival of remnant populations of this species in this historically impacted area unlikely. The area of potential habitat for this species within the PWB project site is small, and the likelihood of its occurrence within these habitats is low. These potential habitats are not

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within the proposed footprint of the PWB basin or the potential laydown areas within the PWB project site.

3.7.1.2 Terrestrial Wildlife

The wildlife included in this section are terrestrial animals (although some occupy aquatic habitats, they breathe air). According to the KSNPC, 26 terrestrial animal species with federal or state status have recorded or expected occurrences in McCracken County (Table 3.12-1 of the Final EIS). The Resources Report for McCracken County from the USFWS IPaC website identified four federally listed animal species (one bird and three bats) that have the potential to occur in the project area. A review of the TVA Regional Natural Heritage Database in November 2016 indicated that of the 26 terrestrial animal species listed by USFWS and the KSNPC, ten species are currently known or have been known to occur within a 5-mile radius of the project area (Table 3.12-1 of the Final EIS). Those terrestrial wildlife species with recorded occurrences within 5 miles of SHF are discussed in the Final EIS and this information is incorporated by reference in this SEIS. Bird species with recorded occurrences within a 5-mile radius of the SHF project area include Bell's vireo, fish crow, hooded merganser, interior least tern, and osprey. Potential mammal species included the cotton mouse and four bats: the southeastern myotis, northern long-eared bat, Indiana bat, gray bat, and evening bat. One reptile species with a state status of threatened and three reptile species with a state status of special concern are known to occur in McCracken County. Of these, only the midland smooth softshell turtle has potential habitat at SHF. Two amphibians with a state status of special concern are known to occur in McCracken County within 5 miles of SHF. These species and their habitats are discussed in Section 3.12 of the Final EIS. That analysis is incorporated by reference in this SEIS.

3.7.1.2.1 Bat Habitat Assessment

Surveys were conducted in January 2018 to evaluate the suitability of habitats within the proposed PWB project areas and the bordering forested areas for federally listed bats. The forested areas were systematically surveyed to assess the quality and quantity of potentially suitable roosting habitat. The survey determined that 0.56 acres of suitable habitat would be directly impacted by the PWB construction as a result of the construction of pipe corridors. Figure 3.7-1 shows potential bat habitat and roost trees within the project areas. Complete survey information, including area description, tree species, and habitat type is provided in Appendix B.

The proposed PWB project areas were also surveyed to identify cave and/or portal openings that may provide suitable winter habitat for the Indiana and northern long-eared bat. No winter habitat was observed during the field survey efforts. Additionally, no Indiana bat or northern long-eared bat spring or fall swarming habitat was observed.

Overall, deciduous forest and pasture/cropland are the dominant land cover types of the adjacent properties to the proposed PWB project areas. The surrounding area is dominated by agricultural uses with interspersed forested areas. There are stream and travel corridors present, both directly adjacent to the project area and throughout the region, which would likely

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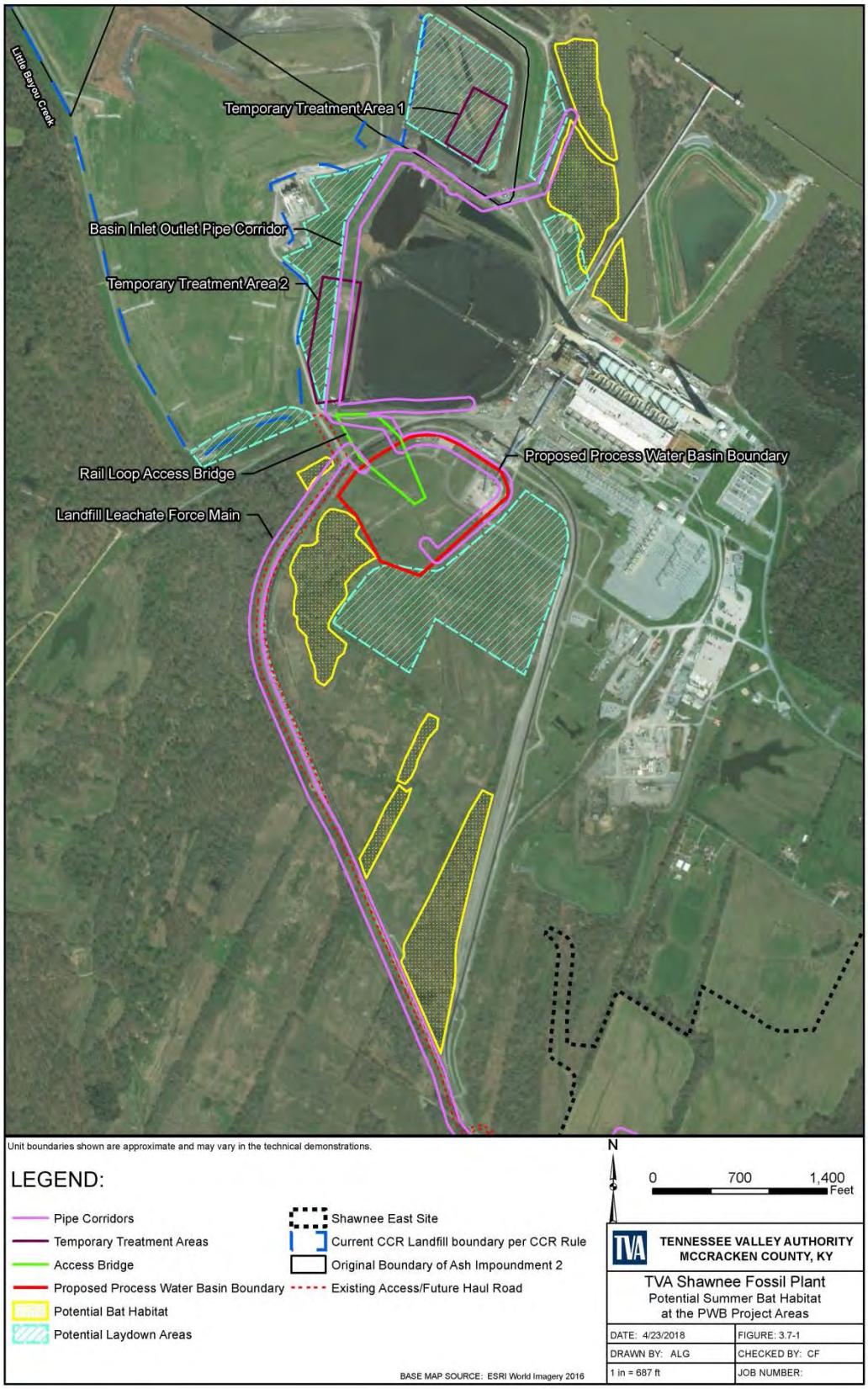

Figure 3.7-1. Potential Summer Bat Habitat at the PWB Project Areas

facilitate bat movement. Surrounding forested areas will facilitate movement throughout the region and will be available to potential roosting Indiana and northern long-eared bats in subsequent maternity seasons.

3.7.1.3 Aquatic Ecology

Aquatic animals are those species that breathe water as adults. As discussed Subsection 3.12.1.1.5 of the Final EIS, according to the KSNPC, 39 aquatic animal species (fish, crayfish, snails, and mussels) with federal or state status have been recorded or are expected to occur in McCracken County (Final EIS Table 3.12-1). The Resources Report for McCracken County from the USFWS IPaC website identified ten federally listed animal species (mussels) that have the potential to occur in the McCracken County. A review of the TVA Regional Natural Heritage Database in November 2016 indicated that of those aquatic species listed by USFWS and the KSNPC, a total of 14 federally- and state-listed species of mussels are currently known or have been known to occur within a 10-mile radius of the project area (Final EIS Table 3.12-1). Thirteen of these 14 species occur in McCracken County and one occurs in Massac County, Illinois (across the Ohio River). Aquatic wildlife species with recorded occurrences within 10 miles of SHF were discussed in the Final EIS and this information is incorporated by reference in this SEIS. Of the species identified as potentially occurring in the Final EIS, no suitable habitat for fish, crayfish, or snails was found to be present within the SHF project area, therefore, only mussels are discussed below.

3.7.1.3.1 Mussels

Fourteen freshwater mussel species federally- or state-listed as endangered or threatened are known to occur in McCracken County, according to the USFWS and KSNPC (Table 3.12-1 of the Final EIS). Five of these mussel species, the pink mucket, sheepnose, orangefoot pimpleback, fat pocketbook, and rabbitsfoot, have been recorded within a 10-mile radius of SHF according to the TVA Regional Natural Heritage Database. All of these aquatic species require flowing freshwater systems (NatureServe 2016). No suitable stream habitat exists within the proposed project area. Therefore, these mussels are not expected to occur in the project area.

The reach of the Ohio River between Olmstead, Illinois and Paducah, Kentucky, which includes the portion of the river adjacent to SHF, is designated as critical habitat for the rabbitsfoot mussel (USFWS 2015b). Critical habitat includes specific areas (occupied or unoccupied by the species) in which physical or biological features essential to the conservation of the species can be found (constituent elements), and which may require special management. The constituent elements for the rabbitsfoot critical habitat include: geomorphically stable river channels and banks; a hydrologic flow regime necessary to maintain benthic habitats where the species is found; water and sediment quality necessary to sustain natural physiological processes; the presence and abundance of fish hosts; and either little or no competitive or predaceous invasive species. Part of the PWB project areas is located adjacent to this critical aquatic habitat within the river. The PWB Rail Loop site is approximately 0.5 miles southwest of the river. No critical habitat for the rabbitsfoot has been identified within the project area.

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3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB and associated ancillary infrastructure. With no changes to plant operations and no construction, no impacts to threatened or endangered species would occur. Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. This alternative would not be consistent with the project's purpose and need.

3.7.2.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

The area of the SHF facility that would be affected by closure of Ash Impoundment 2 and the SWL primarily consists of developed or disturbed land that is generally unsuitable for the listed species in Table 3.12-1 of the Final EIS. The closure of Ash Impoundment 2 and the trenches would result in the loss of a limited amount of open water that may currently be used as foraging habitat by federally and state-listed species such as bats and the interior least tern, and state-listed species such as the hooded merganser. However, because there are thousands of acres of high quality, open-water habitat in the immediate area, those species that might utilize Ash Impoundment 2 on an infrequent basis would have ample areas of higher quality habitat in which to forage along the Ohio River, Metropolis Lake, Little Bayou Creek, and other water bodies in the vicinity. The over-excavation of material from Ash Impoundment 2 during closure activities would not result in additional impacts to any species of special concern.

Alternative B would also result in the potential clearing of vegetation from approximately 118.5 acres of land within the proposed PWB project areas. All of these vegetation communities are common in the adjacent 6,425-acre WKWMA and in the region as a whole. Much of the terrestrial habitat on the SHF facility has been severely degraded and is currently maintained as developed land or mowed lawn, which is generally unsuitable habitat for the listed plant and animal species with federal and state status that have been recorded in the vicinity of SHF. The areas to be directly impacted by clearing for the proposed PWB are predominantly former open grassland and shrub/scrub. One plant species of special concern potentially could occur in open forest and forest edge habitats that currently exist within the PWB project areas, but it is unlikely to occur in these areas, and the these types of habitats are not in areas proposed to be directly impacted by clearing for the PWB and laydown areas. No evidence of this species has been found in these areas, and adverse impacts are not anticipated.

No occurrences of federally listed plants have been recorded in McCracken County. Additionally, no federally or state-listed plant species were observed during the January 2018 field survey of the proposed PWB project areas. Therefore, no direct or indirect effects on federally or state- listed threatened or endangered plants are anticipated under Alternative B.

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As indicated in the TVA Regional National Heritage Database, most sightings of state-listed terrestrial animal species in the area (i.e., northern crawfish frog, green treefrog, Bell's vireo, and evening bat) have been documented in or near the WKWMA. Aquatic species have been documented either in the Ohio River or Metropolis Lake, neither of which would be impacted by Alternative B. The wooded areas in the PWB project areas have the potential to provide roosting habitat for federally and state-listed bat species, as well as foraging and nesting habitat for bird species with state status, particularly the fish crow and Bell's vireo, which are species of special concern that have been recorded within 5 miles of SHF. Individuals of these two bird species are highly mobile and could avoid direct effects from clearing of habitat unless the disturbance affects eggs or nestlings. Adult birds would be displaced to similar habitats in the surrounding area. Hundreds of acres of woodlands, croplands, and old fields are available in the surrounding area, including in the nearby WKWMA.

The two frogs (green treefrog and Northern crawfish frog) that are state species of special concern and that could occur within the PWB project areas may be directly affected, if present. Individuals of these species could be affected by injury or loss of habitat in the area of disturbance due to the removal of wetlands and ponds during the breeding season (either species) or the clearing of forests (green treefrog) and fields (northern crawfish frog) in any season. However, abundant woodlands, old fields, and wetlands are available nearby, including in the nearby WKWMA, and overall effects on local populations of these frogs are likely to be minor.

Suitable habitat for federally and state-listed aquatic species does not occur within the project area; therefore, direct and indirect impacts are not anticipated to result from the implementation of Alternative B. Additionally, the proposed project would not adversely modify the critical habitat for the rabbitsfoot mussel within the Ohio River.

The habitat assessment for federally listed bats conducted in January 2018 (Appendix B) identified potential habitat for listed bat species within the PWB project areas. Only 0.56 acres of potential bat habitat would potentially be directly impacted by the construction of the proposed PWB. The project area occurs within 5 miles of a documented Indiana bat maternity habitat. Accordingly, TVA will track and document removal of potentially suitable summer roost trees and include that information in annual reporting in accordance with Endangered Species Act (ESA) Section 7(a)(2) consultation. Tree removal of potentially suitable summer roosting habitat would occur in winter months (between November 15 and March 30) and would be tracked, documented, and reported to the USFWS. Trees would be mulched onsite and the mulch used for ground cover and erosion control. Given the amount of suitable roost habitat (0.56 acres) proposed for removal, and the abundance of available habitat within the vicinity, implementation of the Alternative B is anticipated to have a negligible impact on available bat habitat within the region. No impacts would be anticipated to gray bats.

A number of activities associated with the proposed action, including tree clearing, were addressed in TVA's programmatic biological assessment on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) (TVA 2017). For those activities with potential to affect bats, TVA committed to implementing specific conservation measures. Therefore, direct

and indirect impacts to federally-listed bat species are expected to be minor. All activities with potential to affect federally-listed bat species are in compliance with the final biological opinion (BO) issued by USFWS (USFWS 2018) in response to TVA's 2017 programmatic biological assessment.

3.7.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Under Alternative C, the same areas would be physically disturbed and the adverse impacts to threatened and endangered species would be the same as those described under Alternative B. Therefore, under Alternative C, direct and indirect impacts to threatened and endangered species due to the closure activities and the construction and operation of the proposed PWB would be minor.

3.8 Wetlands

3.8.1 Affected Environment

Wetlands are protected under Sections 404 and 401 of the Clean Water Act and by EO 11990 (EPA 1972). The USACE regulates the discharge of fill material into waters of the United States, including wetlands, pursuant to Section 404. In order to conduct specific activities in wetlands, authorization under a Section 404 permit from the USACE may be required, depending on the wetland's size and hydrologic connectivity to a navigable waterway. Section 401 gives to states the authority to certify whether activities permitted under Section 404 are in accordance with state water quality standards. In Kentucky, the Department of Environmental Protection, Division of Water is responsible for issuing Section 401 water quality certifications. EO 11990 (Protection of Wetlands) requires federal agencies to avoid, to the extent possible, adverse impacts to wetlands and to preserve and enhance their natural and beneficial values. Section 3.13 of the Final EIS discusses wetland impacts associated with the closure of the SWL and Ash Impoundment 2. This analysis is incorporated by reference in this SEIS.

As described in Section 3.13 of the Final EIS, SHF is located in the Bayou Creek watershed within the Four Rivers Basin (Cobb 2009). This area is within the Atlantic and Gulf Coast region for wetland delineations (USACE 2010) and Region 4 of the National Wetlands Inventory (USFWS 2016c). The proposed PWB project areas are composed of approximately 118.5 acres within the SHF facility. Portions of the PWB project areas are heavily industrialized while other areas are currently undeveloped, there are a few smaller areas of forest.

Major water bodies or wetland areas surrounding the project area include the Ohio River to the north and east and Little Bayou Creek to the west (Figure 3.8-1). Wetland surveys were completed at the proposed PWB project areas during January 2018 (Appendix C). Prior to these surveys, the potential for wetlands on these properties was evaluated solely by reviewing the USFWS National Wetland Inventory Map.

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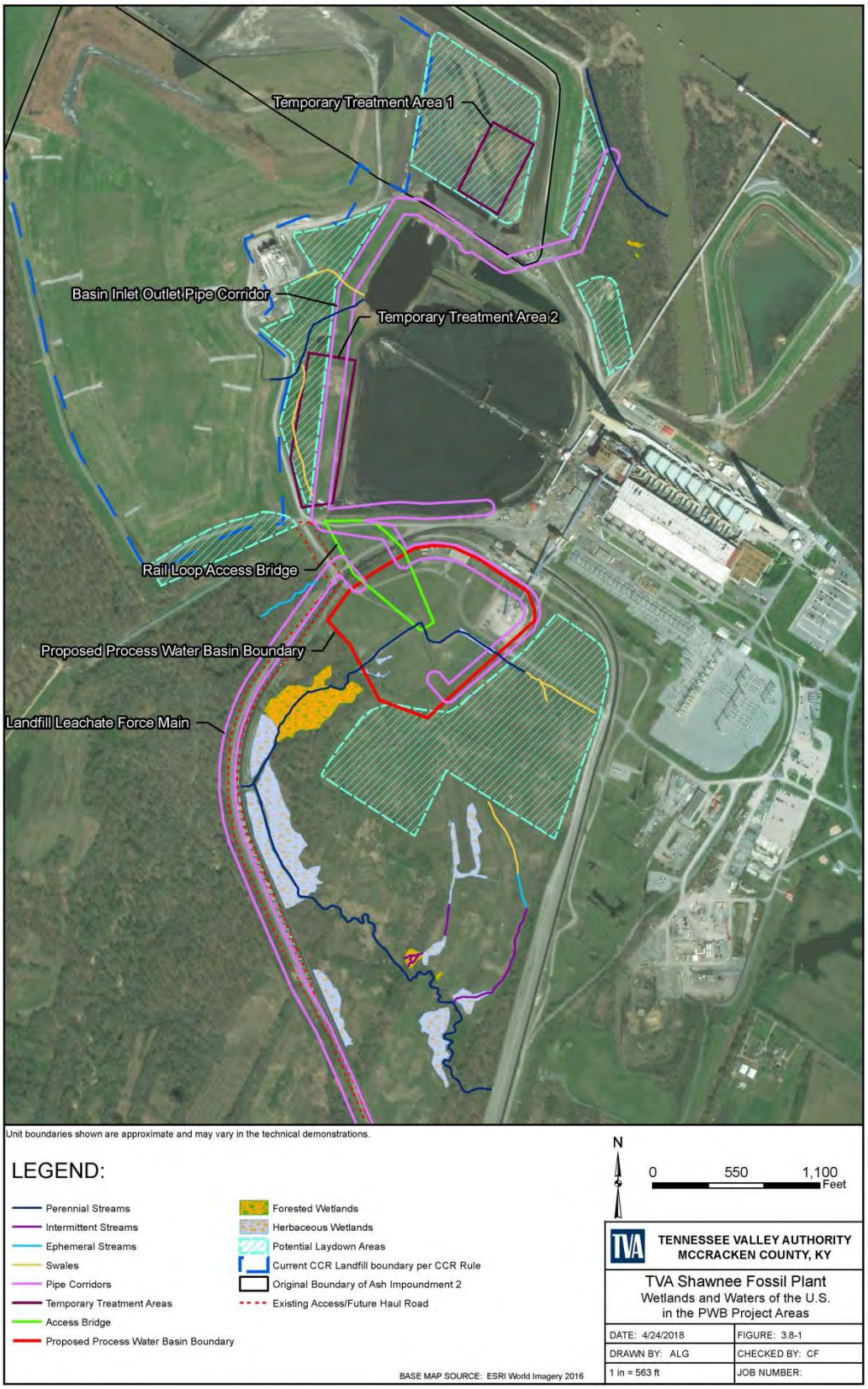

Figure 3.8-1. Wetlands and Waters of the US in the Vicinity of the PWB Project Areas

The wetlands determination was performed in accordance with the procedures outlined in the USACE Wetlands Delineation Manual (USACE 1987), as well as the regional supplement for the Atlantic and Gulf Coastal Plain Region (USACE 2010). Data were collected to characterize wetland areas in terms of hydrology, soils, dominant plant species, and wetland type on data forms as provided in the Regional Supplement (USACE 2010). In addition, the value of each wetland was scored by using the TVA Rapid Assessment Method (TVA RAM) to assess wetland condition, functional capacity, and quality (Mack 2001). Wetland data forms and TVA RAM forms are provided in the delineation report (Appendix C). Wetland boundaries were determined and recorded in the field, with Geographic Information System (GIS) files generated for each potential wetland area.

Approximately 0.26 acres of herbaceous wetlands would be permanently impacted by the proposed PWB construction, specifically in the pipeline corridor and the PWB footprint (Table 3.8-1 and Figure 3.8-1). No wetlands are located within the temporary treatment areas or potential laydown areas (Jackson Group 2018a).

Table 3.8-1. Wetlands within the Proposed PWB Project Areas

Wetland	Wetland Type	Description	Pipeline Corridor Acreage	Proposed Water Basin Acreage	Total Acreage
WSP* 4	Herbaceous	Positive indicators for all three wetland criteria were present. This area is a fringe wetland along a perennial stream and also services a water detention area for the site. Area vegetation is dominated by Common Reed (*Phragmites australis*) an exotic invasive species. Soil was assumed hydric due the annual inundation levels in this wetland area.	0.02	0.15	0.17
WSP* 5	Herbaceous	Positive indicators were observed for all three wetland criteria. Area is dominated by hydrophytic vegetation such as *Carex*, *Juncus*, and *Festuca* species. Vegetation may need to be reevaluated during the growing season to determine species level identification and more accurate indicator status.	0.00	0.05	0.05
WSP* 6	Herbaceous	Area is dominated by hydrophytic vegetation such as *Carex*, *Juncus*, and *Festuca* species. Vegetation may need to be reevaluated during the growing season to determine species level identification and more accurate indicator status.	0.00	0.04	0.04
Total			**0.02**	**0.24**	**0.26**

* WSP = wetland sampling point

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As described in Section 3.4.1 of this SEIS, 2,061.3 linear feet of jurisdictional and non-jurisdictional streams and wetlands would be impacted by the construction of the proposed PWB, in the pipe corridor, potential laydown, and PWB areas. No stream features were identified within the temporary treatment areas. The stream features impacted by construction of the PWB are also shown on Figure 3.8-1.

In implementing Section 404 of the Clean Water Act, the USACE has jurisdiction over waters of the U.S. (EPA 1972). Wetlands and water bodies that meet the criteria to be waters of the U.S. are “jurisdictional.” TVA estimated the jurisdictional status of the wetlands and water bodies on each site based on their characteristics and whether they were likely to be considered waters of the U.S. by the USACE. TVA is consulting with the USACE regarding the jurisdictional determination of the wetlands and waters of the U.S. at the proposed PWB site.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB and associated ancillary infrastructure. With no changes to plant operations and no new construction, no impacts to wetlands would occur under the No Action Alternative. Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. This alternative would not be consistent with the project’s purpose and need.

3.8.2.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

As described in Subsection 3.13.2.2 of the Final EIS, the open water features within Ash Impoundment 2 are considered SHF treatment systems and are, therefore, excluded from regulation under Section 404 of the Clean Water Act. Temporary laydown areas would be located within the impoundment complex or on already disturbed areas of the SHF property. There are no jurisdictional wetlands within the Ash Impoundment 2 and/or SWL complex; therefore, permanent direct impacts to jurisdictional wetlands associated with closure of these areas are not anticipated. The impacts discussion associated with the closure of the SWL and Ash Impoundment 2 in the Final EIS are incorporated by reference in this SEIS. The over-excavation of the Ash Impoundment 2 would not cause any additional impacts to wetlands or streams.

As identified in Table 3.8-1, 0.26 acres of wetlands were documented within the footprint of the PWB project areas (Figure 3.8-1). TVA is consulting with the USACE regarding the impacts to the three wetlands located within these 0.26 acres. The results of that consultation will be reported in the Final SEIS. TVA would attempt to avoid impacts to these wetlands if possible. However, because the activities involved in the proposed actions (i.e., construction of a PWB and associated piping) must be in close proximity to each other, there is no practicable alternative to certain activities which would result in adverse impacts to wetlands, such as

clearing, excavating, and grading land. In such instances where impacts to wetlands cannot be avoided, regulatory requirements associated with the USACE Section 404 permitting program would require mitigation sufficient to offset impacts (EPA 1972). These mitigation measures would be clarified at the end of the consultation with the USACE. With this mitigation, minor direct impacts to wetlands would be anticipated under Alternative B.

Potential indirect impacts resulting from construction activities at either the closure sites or the PWB project areas could include erosion and sedimentation from storm water runoff during construction into offsite or nearby jurisdictional and non-jurisdictional wetlands. Use of BMPs in accordance with site-specific erosion control plans would be implemented to minimize this potential. Overall, indirect impacts to wetland areas due to construction activities would be minor. Closure of Ash Impoundment 2 and the SWL and development of the new PWB and associated piping would be conducted in accordance with EO 11990.

3.8.2.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Under Alternative C, impacts to wetlands would be the same as those described above under Alternative B. Given that the same areas would be disturbed under this alternative as were discussed under Alternative B, the same hydrology would be altered during the closure activities, and adverse impacts would also be minimized as much as possible through BMPs and avoidance, direct and indirect impacts to wetlands would be minor.

3.9 Cultural and Historic Resources

Cultural resources include prehistoric and historic archaeological sites, districts, buildings, structures, and objects as well as locations of important historic events. Federal agencies, including TVA, are required by the National Historic Preservation Act (NHPA) (16 United States Code 470) and by the NEPA to consider the possible effects of their undertakings on historic properties. “Undertaking” means any project, activity, or program, and any of its elements, which has the potential to have an effect on a historic property and is under the direct or indirect jurisdiction of a federal agency or is licensed or assisted by a federal agency. An agency may fulfill its statutory obligations under NEPA by following the process outlined in the regulations implementing Section 106 of NHPA. Additional cultural resource laws that protect historic resources include the Archaeological and Historic Preservation Act, Archaeological Resources Protection Act, and the Native American Graves Protection and Repatriation Act. Section 106 of the NHPA requires that federal agencies consider the potential effects of their actions on historic properties and allow the Advisory Council on Historic Preservation an opportunity to comment on the action. Section 106 involves four steps: (1) initiate the process, (2) identify historic properties, (3) assess adverse effects, and (4) resolve adverse effects. This process is carried out in consultation with the State Historic Preservation Officer (SHPO) and other interested consulting parties, including federally recognized Indian tribes.

Cultural resources are considered historic properties if they are listed or eligible for listing in the National Register of Historic Places (NRHP). The NRHP eligibility of a resource is based on the

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Secretary of the Interior's criteria for evaluation, which state that significant cultural resources possess integrity of location, design, setting, materials, workmanship, feeling, association, and

a. Are associated with events that have made a significant contribution to the broad patterns of our history; or

b. Are associated with the lives of persons significant in our past; or

c. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value; or

d. Have yielded, or may yield, information (data) important in prehistory or history (Andrus 2002).

A project may have effects on a historic property that are not adverse, if those effects do not diminish the qualities of the property that identify it as eligible for listing on the NRHP. However, if the agency determines (in consultation with the SHPO and tribes) that the undertaking's effect on a historic property within the area of potential effect (APE) would diminish any of the qualities that make the property eligible for the NRHP, the effect is said to be adverse. Examples of adverse effects would be ground-disturbing activity in an archaeological site or erecting structures within the viewshed of a historic building in such a way as to diminish the structure's integrity or setting.

Federal agencies must resolve the adverse effects of their undertakings on historic properties. Resolution may consist of avoidance (such as choosing a project alternative that does not result in adverse effects), minimization (such as redesign to lessen the effects), or mitigation. Adverse effects to archaeological sites are typically mitigated by means of excavation to recover the important scientific information contained within the site. Mitigation of adverse effects to historic structures sometimes involves thorough documentation of the structure by compiling historic records, studies, and photographs. Agencies are required to consult with SHPOs, tribes, and others throughout the Section 106 process and to document adverse effects to historic properties resulting from agency undertakings. Section 3.18 of the Final EIS analyzed cultural and historic resources with respect to the closure of the SWL and Ash Impoundment 2, this analysis is incorporated by reference in this SEIS.

3.9.1 Area of Potential Effect

The APE is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist.

Under Alternative A, TVA would continue to manage CCR in Ash Impoundment 2 and the SWL. Therefore, the APE for Alternative A is the footprint of these features and the adjacent associated areas including the laydown yards/staging area. (Though laydown/staging areas would not be required for closure projects under Alternative A, they could be disturbed by ongoing CCR management, therefore, they have been included in the APE for this alternative.) The Alternative A APE consists of previously developed and disturbed lands that were

evaluated for cultural resources as part of the *Shawnee Fossil Plant Bottom Ash Process Dewatering Facility Environmental Assessment* (TVA 2016b). The analysis from the Final Environmental Assessment is incorporated in this SEIS by reference.

For Alternative B and C, the APE for direct effects is defined as the project footprint. This includes two areas within which ground disturbance could occur:

- The footprints of Ash Impoundment 2 and the SWL and laydown yards/staging areas as defined for Alternative A. As described for Alternative A, that analysis from the Final EA is incorporated in this SEIS by reference.
- The approximately 38-acre PWB area including the associated piping corridors. The survey area includes the PWB footprint and pipe corridors. The total Phase 1 survey area encompassed approximately 38.2 acres, of which 16 acres have been previously surveyed, leaving 22.2 acres requiring archaeological investigation.

The APE for architectural resources in the vicinity of SHF includes areas within a one-half mile radius of the proposed PWB and pipeline corridor that would have a direct line of sight to these project areas.

3.9.2 Previous Studies

Section 3.18 of the Final EIS describes previous studies conducted at the SWL and Ash Impoundment 2 area. This information is incorporated by reference into this SEIS.

Based on the new location proposed for the PWB, TVA conducted additional records searches at the Office of State Archaeology in Lexington, Kentucky and the Kentucky Heritage Council in Frankfort, Kentucky to identify previously recorded archaeological and architectural properties listed on, or eligible for inclusion in the NRHP within the proposed PWB APE. Background research revealed that some portions of the Phase A survey area have been previously surveyed (Autry 1979; Watson 1981; Fredrick 1994; Bradley and Knopf 2013) (Amec Foster Wheeler 2018). No previously recorded archaeological sites were identified within the Phase A survey area.

Additionally, the laydown area northeast of the coal yard was included in a 2016 archaeological survey in relation to a proposed dewatering area, and no archaeological sites were identified within this area.

The architectural resources and NRHP-listed properties at and in the vicinity of the SHF site were evaluated in Section 3.18 of the Final EIS and are incorporated in this SEIS by reference.

3.9.3 Affected Environment

No new studies were undertaken at the Ash Impoundment 2 and SWL project areas because the study undertaken with respect to the dewatering facility was considered sufficient for this area. Additionally, both Ash Impoundment 2 and the SWL are highly disturbed areas and would not likely contain any intact archeological resources.

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The entire PWB footprint and pipeline corridors were surveyed by Amec Foster Wheeler during the current investigations. The survey area is primarily characterized by maintained grass fields, forested areas, and developed/industrial areas associated with the plant and existing roads. The entire survey area, including previously surveyed areas, was investigated with pedestrian and subsurface survey. A total of 206 shovel test profiles were excavated within the survey area. The survey did not result in the discovery of any archaeological sites or isolated finds (Amec Foster Wheeler 2018).

The 2018 survey included the laydown area within the Rail Loop. As described in Subsection 3.9.2, the laydown area northeast of the coal yard was included in a 2016 archaeological survey and no archaeological sites were identified in this area. The remaining laydown areas are located on artificial fill that was used for construction of the Original SWL and the SWL Current Stacking Area. These latter areas have no potential to contain intact soils that could contain archaeological sites.

SHF was listed on the NRHP in August 2016 under Criterion A for its historic significance as the first TVA fossil plant to be built in Kentucky. TVA completed a review of historic documents and current satellite imagery and has not identified any additional above ground historic properties within the viewshed of the proposed PWB and pipeline corridor.

3.9.4 Environmental Consequences

3.9.4.1 Alternative A – No Action

Under the No Action Alternative, TVA would continue current plant operations and not cease operations at its SWL and Ash Impoundment 2 or close either of those facilities. Additionally, TVA would not construct and operate the proposed PWB and associated ancillary infrastructure. With no changes to plant operations and no construction, no impacts to cultural resources or historic properties would occur. Once the dewatering system has been constructed and the new CCR landfill is operational, new CCR would no longer be stored in the SWL or Ash Impoundment 2. This alternative would not be consistent with the project's purpose and need.

3.9.4.2 Alternative B – Closure-in-Place by Reduced Footprint of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

As archaeological surveys have identified no archaeological sites within the project APE, closure activities at Ash Impoundment 2 and the SWL and ground-disturbing activities at the PWB project areas are not anticipated to result in any impacts to cultural resources. However, in the event of discovery of unidentified archaeological resources during construction, TVA would cease all construction activities in the immediate area. TVA would contact the SHPO to determine what further action, if any, would be necessary to comply with Section 106 of the NHPA.

As described in Subsection 3.18.3.3 of the Final EIS, TVA finds that the closure projects and construction of a new PWB (in the original location within Ash Impoundment 2) would result in an indirect visual effect to SHF, but that the effect would not be adverse. On August 31, 2017

the SHPO concurred with TVA's recommendation that there would be no adverse effect to historic properties. The consultation letters are included in Appendix F of the Final EIS. While portions of the proposed PWB in the rail loop location may be visible from SHF, the PWB would be consistent in appearance with SHF operations (such as the SWL). This would not constitute a major change to visual resources (or the viewshed) of the NRHP-eligible SHF. Therefore, no adverse effects to the NRHP-nominated SHF are anticipated as a result of the proposed actions.

TVA finds that the undertaking would result in an indirect visual effect to SHF, but that the effect would not be adverse. TVA is consulting with the SHPO regarding the findings of this analysis. The completion of the consultation will be reported in the Final SEIS. Consultation letters are provided in Appendix D of this SEIS.

3.9.4.3 Alternative C – Closure-in-Place and Regrading of the Special Waste Landfill and Ash Impoundment 2 and Construction of a New Process Water Basin

Under Alternative C, impacts to cultural resources would be the same as those described above under Alternative B. The same areas would be disturbed and would result in similar visual effects post-construction. Therefore, as with Alternative B, and concurrence of the SHPO, the closure of the SWL and Ash Impoundment 2 and the construction of the proposed PWB would have an indirect visual effect to SHF, but it would not be adverse. Additionally, no other impacts to cultural resources are anticipated.

3.10 Unavoidable Adverse Environmental Impacts

Unavoidable adverse impacts are the effects of the proposed actions on natural and human resources that would remain after mitigation measures or BMPs have been applied. Mitigation measures and BMPs are typically implemented to reduce a potential impact to a level that would be below the threshold of significance, as defined by the Council on Environmental Quality (CEQ) and the courts. Impacts associated with the management of CCR from SHF have the potential to cause unavoidable adverse effects to several environmental resources.

As described in Section 3.22 of the Final EIS, the impacts from the Ash Impoundment 2 and SWL closure would primarily be related to construction activities. Activities associated with the use of construction equipment may result in varying amounts of dust, air emissions, and noise impacts to the immediate vicinity. Emissions from onsite construction activities and equipment are minimized through implementation of BMPs, including proper maintenance of construction equipment and vehicles and wet suppression to control fugitive dust emissions. During construction, BMPs to minimize surface water runoff will be implemented but there could still be some uncontrolled runoff that could affect nearby outfalls and water bodies. Additionally, an increase in the construction workforce and some construction-related equipment could increase traffic on public roads. This additional construction-related traffic would also increase noise and fugitive dust in areas proximate to these roads. Emissions from transportation of CCR are minimized through implementation of BMPs including proper maintenance of equipment and vehicles and wet suppression to control fugitive dust.

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Alternative B includes the construction of the proposed PWB in currently undeveloped, though largely previously disturbed areas. The construction would result in a permanent change in land use for the 22-acre PWB. This constitutes an unavoidable adverse impact. Potential bat habitat, wetlands, and streams within the PWB project areas would be impacted by the clearing and grading activities. These would be unavoidable adverse impacts; however, the clearing of potential bat habitat, wetlands, and streams would be mitigated or minimized through consultation with USACE and the application of appropriate Avoidance and Minimization measures. Impacts of clearing of other habitats on the site would be minor relative to the abundance of similar cover types within the vicinity. Impacts would be similar under Alternative C.

3.11 Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. Section 3.23 of the Final EIS focused on the analyses of environmental impacts associated with the ongoing disposal of CCR at SHF over the next 20 years, including construction of the proposed PWB. These activities were considered short-term uses for purposes of the analysis in the Final EIS. The 'long-term' was considered to be final closure of the CCR impoundments, which would be initiated when operations at the Ash Impoundment 2 and the SWL have ceased and the proposed CCR Landfill is closed at some future date. Section 3.23 of the Final EIS evaluated the relationship of short-term uses to long-term productivity for the closure of ash impoundments in general (TVA 2017a). That section included an evaluation of the extent that the short-term uses preclude any options for future long-term use of the project sites at SHF under the current proposed actions.

For this SEIS, short-term activities are considered to be the construction of the proposed PWB. This would likely occur within the next 5 years. The long-term was still considered to be the period after closure of Ash Impoundment 2 and the SWL is complete. This section includes an evaluation of the extent that the short-term uses preclude any options for future long-term use of the project sites at SHF under the current proposed actions. The relationships of short-term uses and long-term productivity would be the same for Alternatives B and C.

Closure of Ash Impoundment 2 and the SWL would have a negative effect on a limited amount of short-term uses of the environment such as air, noise, and transportation resources. Access to Ash Impoundment 2 and the SWL would be restricted during closure activities. In addition, closure activities such as site preparation and noise may displace some wildlife during the construction period. Most environmental impacts during closure activities would be relatively short-term and would be addressed by programmatic BMPs and mitigation measures.

Unavoidable short-term impacts to water quality from runoff at the closure site could impact nearby outfalls and water bodies at the new landfill site during initial construction. BMPs to minimize runoff would be implemented.

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The closure of Ash Impoundment 2 and the SWL and construction of the proposed PWB would have a favorable short-term impact to the local economy through the creation of construction and support jobs and revenue.

Long-term effects of the closure activities would include the permanent loss of waterfowl and wading bird habitat and a permanent loss of aquatic habitat at Ash Impoundment 2. However, other higher quality aquatic habitat is located elsewhere in the vicinity of SHF.

Ash impoundments that are closed-in-place have post-closure requirements, and future land uses could be limited. However, Ash Impoundment 2 is located in an area presently dedicated for industrial uses which already limits future use of the site.

In the near future, disposal of CCRs at all TVA coal-fired power plants will utilize a dry system. Ash impoundment closure at SHF would have a beneficial effect on long-term groundwater quality through the reduction or elimination of potential discharges of CCR constituents to groundwater that could occur as a result of continued use of the ash impoundment.

The acreage disturbed during the initial clearing for the proposed PWB will have a negative effect on a limited amount of short-term uses of the environment such as air, noise, soil and visual resources. Additionally, these construction activities may displace some wildlife, aquatic resources, and alter existing vegetation. Since the proposed actions would occur within an area previously subject to human disturbance, and since the surrounding vicinity includes similar vegetation and habitat types, the short-term disturbance due to construction and operations is not expected to significantly alter long-term productivity of wildlife or other natural resources.

3.12 Irreversible and Irretrievable Commitments of Resources

A resource commitment is considered irreversible when impacts from its use would limit future use options and the change cannot be reversed, reclaimed, or repaired. Irreversible commitments generally occur to nonrenewable resources such as minerals or cultural resources and to those resources that are renewable only over long time spans, such as soil productivity. A resource commitment is considered irretrievable when the use or consumption of the resource is neither renewable nor recoverable for use by future generations until reclamation is successfully applied. Irretrievable commitments generally apply to the loss of production, harvest, or natural resources and are not necessarily irreversible.

As described in Section 3.24 of the Final EIS, with respect to ash impoundment closure, resources required by construction activities, including labor, fossil fuels, and construction materials, would be committed for the life of the project. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. In addition, construction materials (such as liners) would be consumed. However, it is unlikely that their limited use in these projects would adversely affect the future availability of these resources (TVA 2017a).

The loss of wetlands would be irretrievable, though not irreversible because TVA would mitigate this loss in consultation with the USACE. The loss of bat habitat areas would be irretrievable

and irreversible; however, TVA would minimize this loss by funding future conservation projects in consultation with the USFWS.

The land used for the ash impoundments that are closed-in-place would be irreversibly committed as the CCR material would remain in place for the foreseeable future representing a permanent commitment of the land, precluding future use of the land. However, if the Ash Impoundment 2 site is revegetated, it would support some natural resources (therefore not irretrievable). If the Ash Impoundment 2 and SWL are capped using closure turf, the land would still remain irreversibly committed for the foreseeable future.

With respect to the construction of the proposed PWB, the land used would be irreversibly committed because the land would be permanently converted from an undeveloped use to a PWB that would remain in place until it is no longer needed and is closed. The materials used for the construction of the proposed PWB would be committed for the life of the facility. All building materials associated with the construction of the PWB would be irrevocably committed.

Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction of the PWB. In addition, construction materials would be consumed. However, their limited use in this project would not adversely affect the future availability of these resources.

3.13 Cumulative Effects

The CEQ regulations implementing the procedural provisions of the NEPA of 1969, as amended, define cumulative impact as: “ the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions” (40 CFR § 1508.7). A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of the project when added to other past, present, and reasonably foreseeable future actions. Baseline conditions reflect the impacts of past and present actions. The impact analyses summarized in preceding sections are based on baseline conditions, which reflect the cumulative effects of past and present actions in the vicinity.

This section is based on the resources of potential concern and the geographic area in which potential adverse effects from site-specific activities have the potential to alter (degrade) the quality of the regional environmental resource. The appropriate geographic area of analysis for SHF is therefore the immediate project area and vicinity (2-mile radius) surrounding SHF. This analysis addresses those resource areas potentially adversely affected by project activities under Alternatives B and C, the action alternatives, at the site. Resources that are not affected, or that have an overall beneficial impact as a result of the proposed actions, are not considered for cumulative effects. Accordingly, Land Use, Prime Farmland and Soils, Groundwater, Surface Water, Vegetation, Wildlife, Threatened and Endangered Species, Wetlands, and Cultural and Historic Resources are included in this analysis as these resources may be adversely affected.

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Past, present, and reasonably foreseeable future actions that are appropriate for consideration in this cumulative analysis are listed in Section 3.25 of the Final EIS. These actions within the geographic area of analysis were identified as having the potential to, in aggregate, result in larger and potentially significant adverse impacts to the resources of concern. No new actions were identified during the development of this SEIS. The past, present, and reasonably foreseeable actions described in the Final EIS are incorporated by reference in this SEIS.

Because the Final EIS evaluated the closure of Ash Impoundment 2 and the SWL and included the construction of a new PWB, the major project activities considered in the Final EIS are equivalent to the actions evaluated in the SEIS. Therefore, the cumulative impacts analysis described in the Final EIS is still relevant, is incorporated by reference into this SEIS, and no changes to the analyses are warranted.

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CHAPTER 6 - ENVIRONMENTAL IMPACT STATEMENT RECIPIENTS

Federal Agencies
U.S. Army Corps of Engineers, Louisville District
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency, Region 4
U.S. Department of Interior

Federally Recognized Tribes
Absentee Shawnee Tribe of Oklahoma
Cherokee Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Shawnee Tribe
United Keetoowah Band of Cherokee Indians in Oklahoma

State Agencies
Kentucky Department for Environmental Protection
Kentucky Department for Energy Development and Independence
Kentucky Department of Natural Resources
Kentucky Energy and Environment Cabinet
Kentucky Heritage Council
Kentucky Fish and Wildlife
Kentucky State Clearinghouse
Kentucky State Historic Preservation Officer
Land Between the Lakes
Natural Resources Conservation Service

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Appendix A – Vegetation Field Survey Report

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VEGETATION FIELD SURVEY REPORT

Shawnee Process Water Basin Project
McCracken County, Kentucky

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Prepared for:

February 2018

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1.0 INTRODUCTION

On behalf of the Tennessee Valley Authority (TVA), AECOM and Jackson Group have prepared the following vegetation field survey document for the proposed Shawnee Process Water Basin Project (Project) in McCracken County, Kentucky.

1.1 Project Description

As part of an effort to manage the disposal of coal combustion residual (CCR) materials on a dry basis, and to meet new CCR regulations, TVA is proposing to cease CCR management operations at the Shawnee Fossil Plant (SHF) Ash Impoundment 2 former Special Waste Landfill (SWL) in accordance with the U.S. Environmental Protection Agency's final Disposal of Coal Combustion Residuals from Electric Utilities rule (CCR Rule). TVA is currently evaluating the potential environmental impacts associated with closure of Ash Impoundment 2 and the former SWL. Closure of Ash Impoundment 2 and the former SWL includes the construction of a new Process Water Basin (PWB) to receive plant flows and allow for operations to cease at Ash Impoundment 2 once the new SHF dewatering facility is constructed.

TVA is currently developing a Supplemental Environmental Impact Statement (SEIS) to the *Shawnee Fossil Plant Coal Combustion Residual Management Final Environmental Impact Statement* (Final EIS) published in January 2018. The SEIS will further evaluate the closure of Ash Impoundment 2 and the former SWL. Additionally, the SEIS will evaluate the potential environmental impacts associated with construction of a new PWB and supporting systems at SHF. The activities associated with construction of the new PWB would include:

- Construction of a new PWB consisting of two equal-area (approximately 6 acres each) operational, lined basin cells and rerouting existing general plant process flows away from the coal yard drainage basin directly to the PWB.
- Improving the coal yard drainage basin through lowering the pool and dredging to reduce solids loading to the PWB.
- Additional treatment improvements such as:
    - Installation of additional treatment systems (coagulant, flocculent, and polymer injection and mixing) to provide additional total suspended solids (TSS) removal of flows routed to the PWB.
    - Installation of pH adjustment and aeration in the PWB.
    - Installation/upgrade of an additional treatment system to provide additional TSS removal in flows routed to the coal yard drainage basin.

The new PWB would be constructed at the Rail Loop Site. Associated systems would connect the PWB to SHF and existing SHF systems and outfalls. The Project area is depicted on mapping provided in Appendix A.

2.0 VEGETATION

2.1 General Vegetation

SHF is located within the Wabash-Ohio Bottomlands Level IV ecoregion Woods et al. 2002). This unglaciated, level floodplain along the Ohio River was historically southern floodplain forest, a mix of oaks, cypress, and hardwood species. This region has been largely drained and converted for commercial and agricultural use. SHF is mostly an intensely developed site that has been heavily disturbed by construction, maintenance, and operation of the

facility. As a result of this alteration of the physical landscape, most areas within SHF no longer support a natural plant community. Within the project area, the land use is classified as developed, low intensity, and the vegetation consists of plants typical of disturbed or landscaped areas.

The proposed Project area is bordered to the north by Gipson Road and the Ohio River, to the south by Andersen Road, to the east by Metropolis Lake Road, and to the west by Little Bayou Creek. Land use within a 5-mile radius of the proposed Project area consists of agricultural, residential, rural, and commercial activities (TVA 2016). Vegetation within 5 miles of the project area is primarily cultivated crops, deciduous forest, and pasture land.

A field survey was conducted by Jackson Group in January 2018 to evaluate land cover, threatened and endangered species, and forest composition within the 283.0-acre Project site. Vegetation observed within the site was primarily bottomland hardwoods, herbaceous wetlands, forested wetlands, upland grasslands, scrub/shrub, and mixed oak forest. Photographs of these habitat types are provided in Appendix B.

There are two types of bottomland hardwoods in the project area, one of which is dominated by American sycamore (*Plantanus occidentalis*), black willow (*Salix nigra*) button bush (*Cephalanthus occidentalis*), eastern cottonwood (*Populus deltoids*), and green ash (*Fraxinus pennsylvanica*); whereas the other type is dominated by sweet gum (*Liquidambar styraciflua*). Herbaceous wetland areas are dominated by various *Carex*, *Festuca*, *Juncus*, and *Polygonum* species, as well as common barnyard grass (*Echinoicloa crus-galli*), and common reed grass (*Phragmites australis*). The vegetation in upland grassland areas consist of species mostly associated with managed grassland areas around industrial sites. These species include various *Festuca s*pecies, Bermuda (*Cybnodon dactylon*), and common barnyard grasses. Scrub/shrub areas on site are managed areas to support wildlife conservation. The vegetation in these areas consists of multifora rose (*Rosa multiflora*) and a variety of upland grass species. Mixed oak forest on-site is primarily composed of blackjack oak (*Quercus marilandica*), northern red oak (*Q. rubra*), and white oak (Q. *alba*).

2.2 Project Area Vegetation

2.2.1 Threatened and Endangered Vegetation

No federally threatened or endangered (T&E) plant species were observed during field survey efforts and there are no T&E plant species with known recorded occurrences in McCracken County, Kentucky (USFWS, Environmental Conservation Online System [ECOS]).

2.2.2 State Listed Species

The Kentucky Rare Plant Recognition Act of 1994 provides protection for species considered threatened, endangered, or in need of management within the state. The state listing of species is managed by the Kentucky Department of Fish and Wildlife Resources (KDFWR). The Kentucky State Nature Preserves Commission (KSNPC) and TVA both maintain databases of aquatic and terrestrial species that are considered threatened, endangered, of special concern, or are otherwise tracked in Kentucky because the species is rare and/or vulnerable within the state.

There are 26 state-listed plant species with recorded occurrences in McCracken County (KSNPC and Nature Serve [Table 1]). Potential suitable habitat for state listed species was observed throughout the Project Area. A review of the TVA Natural Heritage Database indicated that only two of the state-listed plant species (water hickory and

star tickseed) have recorded occurrences within a 5-mile radius of the project area. No state listed plant species were observed during field surveys.

Table 1. State listed plant species for McCracken County, Kentucky.

Common Name	Scientific Name	State Status
Lamance Iris	*Iris brevicaulis*	T
One-flower False Fiddleleaf	*Hydrolea uniflora*	T
Porcupine Sedge	*Carex hystericina*	S
Five-lobe Cayaponia	*Cayaponia quinqueloba*	E
Water-locust	*Gleditsia aquatica*	S
Creeping St. John's-wort	*Hypericum adpressum*	S
Compass Plant	*Silphium laciniatum*	T
Buckley's Goldenrod	*Solidago buckleyi*	S
Broadwing Sedge	*Carex alata*	T
Aethusa-like Trepocarpus	*Trepocarpus aethusae*	S
Water Hickory	*Carya aquatica*	T
Red Buckeye	*Aesculus pavia*	T
Sweet Coneflower	*Rudbeckia subtomentosa*	E
Buffalo Clover	*Trifolium reflexum*	E
Cream Wild Indigo	*Baptisia bracteata var. leucophaea*	S
Tall Bushclover	*Lespedeza stuevei*	T
Lake-cress	*Armoracia lacustris*	T
Rose Turtlehead	*Chelone obliqua var. speciosa*	S
Inland Muhly	*Muhlenbergia glabrifloris*	S
Snow Melanthera	*Melanthera nivea*	S
Star Tickseed	*Coreopsis pubescens*	S
Ovate False Fiddleleaf	*Hydrolea ovata*	E
Broadleaf Water-milfoil	*Myriophyllum heterophyllum*	S
Spotted Pondweed	*Potamogeton pulcher*	T
Rough Rattlesnake-root	*Prenanthes aspera*	E
Red Turtlehead	*Chelone obliqua*	E

State Status:
E: Endangered. A taxon in danger of extirpation and/or extinction throughout all or a significant part of its range in Kentucky.

T: Threatened. A taxon likely to become endangered within the foreseeable future throughout all or a significant part of its range in Kentucky.

S: Special Concern. A taxon that should be monitored because (1) it exists in a limited geographic area in Kentucky, (2) it may become threatened or endangered due to modification or destruction of habitat, (3) certain characteristics or requirements make it especially vulnerable to specific pressures, (4) experienced researchers have identified other factors that may jeopardize it, or (5) it is thought to be rare or declining in Kentucky but insufficient information exists for assignment to the threatened or endangered status categories.

2.2.3 Invasive Plant Species

The Project area has been either intensely developed or heavily disturbed, and as a result of these alterations, no longer supports a natural plant community. Invasive species is defined as a species that is not native to the local ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health (USDA 2016 [Executive Order 13112]). Invasive plants can include trees, shrubs, vines, grasses, ferns, and forbs.

The most common invasive species observed were common reed grass, multiflora rose and Japanese honeysuckle (*Lonicera japonica*). These species were sparsely distributed throughout the proposed Project area.

Appendix A: Project Mapping

Shawnee Process Water Basin Project

Vegetation Map

Legend

- Project Boundary
- Herbaceous Wetlands
- Forested Wetlands
- Forested Areas

OF - Open Field
SS - Scrub Shrub

2,200 1,100 0 Feet

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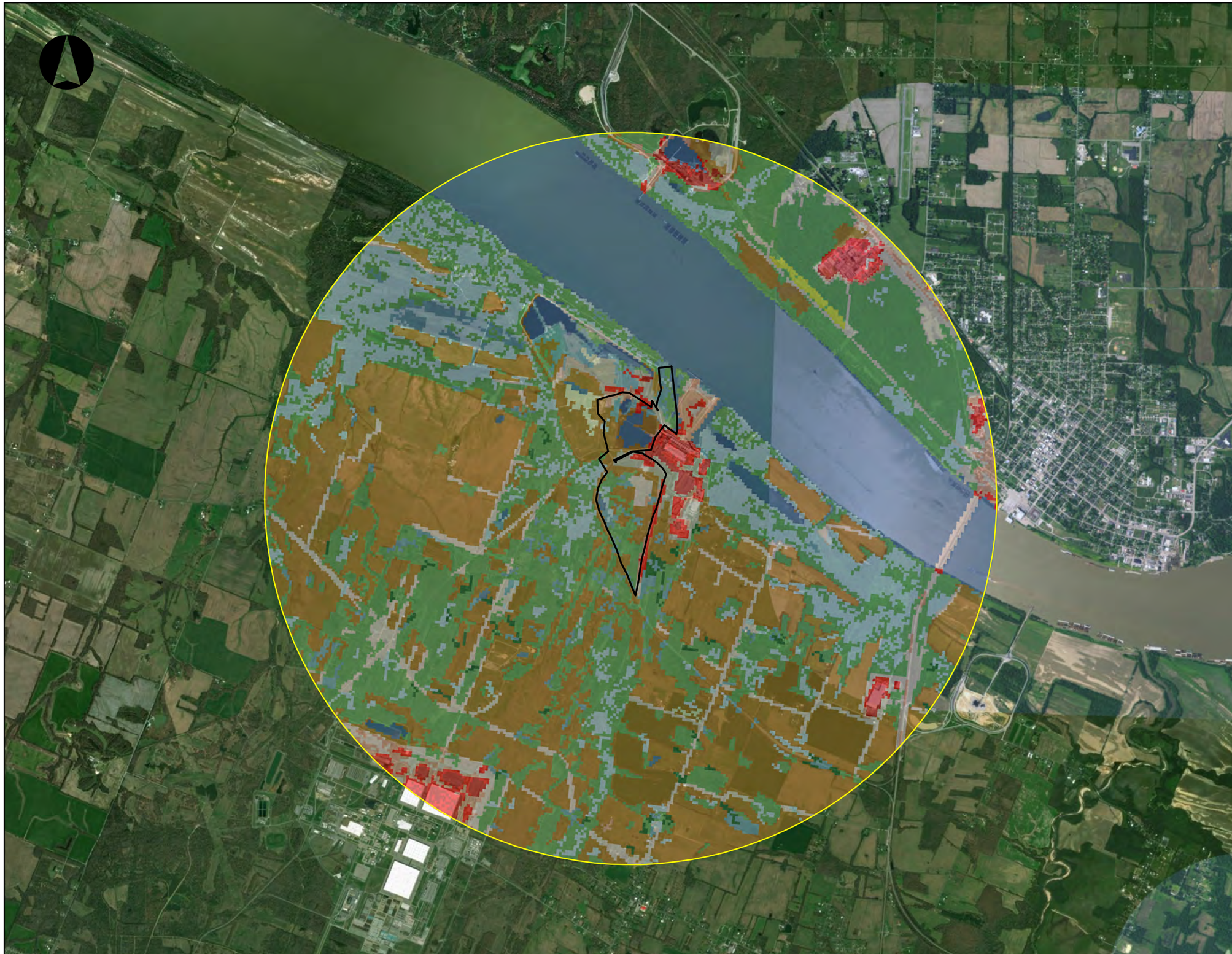

Shawnee Process Water Basin Project

Land Cover Map

Legend

- Project Boundary
- 5-Mile Buffer

USA Land COver (2011)

- Open Water
- Perennial Snow/Ice
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Herbaceous
- Hay/Pasture
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

1.5 0.75 0 Miles

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Appendix B: Photographs

Representative photograph of forested area.

Representative photograph of forested area.

Representative photograph of forested area.

Representative photgraph forested area.

Representative photograph of forested area.

Representative photograph of open field area.

Representative photograph of opened field area.

Representative photograph of forested wetland area.

Representative photograph of forested wetland area.

Representative photograph of wetland sampling point 4 (WSP-4).

Representative photograph of herbaceous wetland area.

Representative photograph of forested wetland area.

Representative photograph of herbaceous wetland area.

Representative photograph of herbaceous wetland area.

Appendix B – Bat Habitat Report

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BAT HABITAT ASSESSMENT REPORT

Shawnee Process Water Basin Project
McCracken County, Kentucky

Prepared by:

Jackson Group
3945 Simpson Lane
Richmond, KY 40475
jacksongroupco.com

Prepared for:

March 2018

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2.1 *Field Surveys* 3

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Appendix A: Project Mapping

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1.0 INTRODUCTION

On behalf of the Tennessee Valley Authority (TVA), AECOM and Jackson Group have prepared the following document to assess potential habitat for threatened and endangered bat species, the Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) for the proposed Shawnee Process Water Basin Project (Project) in McCracken County, Kentucky. The methods used to develop this document were derived from the Range-Wide Indiana Bat Summer Survey Guidelines (2017).

1.1 Project Description

As part of an effort to manage the disposal of coal combustion residual (CCR) materials on a dry basis, and to meet new CCR regulations, TVA is proposing to cease CCR management operations at the Shawnee Fossil Plant (SHF) Ash Impoundment 2 former Special Waste Landfill (SWL) in accordance with the U.S. Environmental Protection Agency's final Disposal of Coal Combustion Residuals from Electric Utilities rule (CCR Rule). TVA is currently evaluating the potential environmental impacts associated with closure of Ash Impoundment 2 and the former SWL. Closure of Ash Impoundment 2 and the former SWL includes the construction of a new Process Water Basin (PWB) to receive plant flows and allow for operations to cease at Ash Impoundment 2 once the new SHF dewatering facility is constructed.

TVA is currently developing a Supplemental Environmental Impact Statement (SEIS) to the *Shawnee Fossil Plant Coal Combustion Residual Management Final Environmental Impact Statement* (Final EIS) published in January 2018. The SEIS will further evaluate the closure of Ash Impoundment 2 and the former SWL. Additionally, the SEIS will evaluate the potential environmental impacts associated with construction of a new PWB and supporting systems at SHF. The activities associated with construction of the new PWB would include:

- Construction of a new PWB consisting of two equal-area (approximately 6 acres each) operational, lined basin cells and rerouting existing general plant process flows away from the coal yard drainage basin directly to the PWB.
- Improving the coal yard drainage basin through lowering the pool and dredging to reduce solids loading to the PWB.
- Additional treatment improvements such as:
    - Installation of additional treatment systems (coagulant, flocculent, and polymer injection and mixing) to provide additional total suspended solids (TSS) removal of flows routed to the PWB.
    - Installation of pH adjustment and aeration in the PWB.
    - Installation/upgrade of an additional treatment system to provide additional TSS removal in flows routed to the coal yard drainage basin.

The new PWB would be constructed at the Rail Loop Site. Associated systems would connect the PWB to SHF and existing SHF systems and outfalls. The Project area is depicted on mapping provided in Appendix A.

2.0 HABITAT ASSESSMENT AND FIELD SURVEYS

Jackson Group utilized the 2011 National Land Cover Database to calculate the amount of forested habitat proposed to be impacted within the proposed project area. Forested and non-forested acreages within the habitat evaluation area were calculated for pre-tree clearing and post tree clearing scenarios (Table 1). A total of approximately 43.84 acres of forested habitat are present within the project area.

Table 1. Forested Impacts within Project Area.

Phase	Project	Total Acres	Non-Forested Acres	Forested Acres
Pre-Tree Clearing	Shawnee Process Water Basin	283.0	239.16	43.84
Post-Tree Clearing	Shawnee Process Water Basin	283.0	283.0	43.28
			Resulting Loss of Forested Habitat	0.56

2.1 Field Surveys

The proposed Project was systematically surveyed by qualified biologists in January 2018 to assess the quality and quantity of potentially suitable roosting habitat in the Project area. For the purposes of the field surveys, trees were considered potentially suitable roost trees (PRT's) if they possessed the following characteristics (USFWS, 2017):

- Indiana bat - diameter at breast height (dbh) $\geq$ 5 inches dbh,
- Northern long-eared bat – dbh $\geq$ 3 inches
- Both species - have exfoliating bark, cracks, crevices, and/or hollows

Data were collected on representative PRT's for each of the habitat assessment areas within the project area. Habitat assessment sites were selected within forested areas for identifying and qualifying potential areas of suitable bat habitat and to provide a representative description of each habitat assessment area as depicted on aerial photographs in Appendix A. When not hibernating Indiana and northern long eared bats will roost in trees that provide suitable shelter (PRT's). Trees that exhibited suitable roosting characteristics, as described above, were geo-referenced and recorded. Characteristics such as tree species and diameter at breast height were recorded as well. Data sheets can be found in Appendix B.

During the course of the habitat assessment, qualified biologists also recorded current forest conditions so that the quality and quantity of Indiana bat and northern long-eared bat travel and foraging habitat could be assessed. At forest crossings where practicable, forest conditions were evaluated as to canopy and understory characteristics, average dbh, tree species, presence of known jurisdictional water resources, and suitability for Indiana and northern long-eared bat habitat. Forest conditions were evaluated by the type of habitat use supported (i.e. roosting, foraging, commuting).

2.1.1 Summer Habitat

The 43.84 acres of forested habitat within the Project area represents potentially suitable summer habitat for the Indiana bat and northern long-eared bat. Of the 43.84 acres of potentially suitable summer habitat, a total of 0.56 acres will be will be affected by proposed project actions (Table 2). Figure 1 depicting potential suitable summer bat habitat impacts can be found in Appendix A.

Table 2. Potentially Suitable Bat Habitat Impacts within Project Area.

Habitat Assessment Area	Temporary Treatment Areas (AC)	Pipe Corridors (AC)	Potential Laydown Areas (AC)	Proposed Process Water Basin (AC)	Total (AC)
1					
2					
3					
4		0.08			0.08
5					

Habitat Assessment Area	Temporary Treatment Areas (AC)	Pipe Corridors (AC)	Potential Laydown Areas (AC)	Proposed Process Water Basin (AC)	Total (AC)
6		0.31	0.17		0.48
7					
8					
9					
Total		0.39	0.17		0.56

2.1.1.1 Potential Roost Trees

A total of 39 representative PRT's were identified within the project habitat assessment areas, of which 4 contain moderate or high quality roosting characteristics, including (Table 3):

- ≥ 9 inches diameter at breast height (dbh)
- 25% or greater solar exposure

These trees would represent potential primary maternity roosting habitat. The remaining 35 PRT's ranged from 10 to 54 inches dbh, received < 25% solar exposure, and could be used as secondary roosts by maternity colonies as well as non-reproductive females and males.

Table 3. Representative Potential Roost Trees identified within habitat assessment areas.

	Primary PRT	Secondary PRT	Total
	4	35	**39**
Total	**4**	**35**	**39**

2.1.1.2 Foraging Habitat

Within the project area, the 43.84 acres of forest represent potentially suitable foraging habitat. On-site conditions were recorded by qualified surveyors. Area streams, wetlands, deciduous forest, and open areas serve as potential foraging habitat. Complete survey information, including tree clearing area description, tree species, and habitat type are provided in Table 4. Photographs can be found in Appendix C.

Table 4. Habitat assessment within project area.

Area	Plot Description	Tree Species	Habitat Type[1]	Acres
1	This forested area is potential suitable summer bat habitat. Numerous potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; ≥ 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas.	*Quercus* species, *Acer* species, *Fraxinus* species, *Robinia pseudoacacia*, *Liquidambar styraciflua, Nyssa sylvatica,*	Non-Maternity Roosting, Maternity Roosting, Foraging	12.46

Area	Plot Description	Tree Species	Habitat Type[1]	Acres
2	This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; > 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas	*Quercus* species, *Acer* species, *Fraxinus* species, *Robinia pseudoacacia*, *Liquidambar styraciflua, Nyssa sylvatica,*	Non-Maternity Roosting, Maternity Roosting, Foraging	1.34
3	This forested area is potential suitable summer bat habitat. Numerous potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; ≥ 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas	*Quercus* species, *Acer* species, *Fraxinus* species, *Robinia pseudoacacia*, *Liquidambar styraciflua, Nyssa sylvatica, Platanus occidentalis*	Non-Maternity Roosting, Maternity Roosting, Foraging	10.86
4 4	This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; ≥ 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas.	*Ulmus* species, *Quercus* species, *Acer* species, *Fraxinus* species, *Robinia pseudoacacia*, *Populus deltoides, Nyssa sylvatica, Platanus occidentalis, Carpinus caroliniana*	Non-Maternity Roosting, Maternity Roosting, Foraging	.83
5	This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; ≥ 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas	*Populus deltoides, Quercus alba, Liquidambar styraciflua, Fraxinus pennsylvanica, Acer saccharinum*	Non-Maternity Roosting, Maternity Roosting, Foraging	2.27
6	This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; > 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas	*Populus deltoides, Quercus alba, Liquidambar styraciflua, Fraxinus pennsylvanica, Acer saccharinum*	Non-Maternity Roosting, Maternity Roosting, Foraging	8.26
7	This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost	*Populus deltoides, Quercus alba, Liquidambar styraciflua,*	Non-Maternity Roosting, Maternity Roosting, Foraging	5.26

Area	Plot Description	Tree Species	Habitat Type[1]	Acres
	(i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; ≥ 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested are	*Fraxinus pennsylvanica, Acer saccharinum*		
8	This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; ≥ 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas	*Quercus* species, *Acer* species, *Fraxinus* species, *Robinia pseudoacacia*, *Liquidambar styraciflua, Nyssa sylvatica*	Non-Maternity Roosting, Maternity Roosting, Foraging	1.99
9	This forested area is potential suitable summer bat habitat however, no potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; ≥ 5 inches) and northern Long-eared bat (*M. septentrionalis*; ≥ 3 inches) thus this young forested area could be considered potential foraging habitat and it is directly adjacent to a potential travel corridor to the west.	Elm species, *Fagus grandifolia, Cornus florida*	Foraging	.57

[1]Habitat types for the Indiana and northern long-eared bat:

Maternity Roosting – plot contains one or more trees >9 inches dbh, exhibiting roosting characteristics, and >25 % solar exposure.

Non-Maternity Roosting – plot contains one or more trees > 5 inches dbh, exhibiting roosting characteristics

Foraging – plot does not contain trees with suitable roosting characteristics, but provides habitat suitable for use by foraging and/or commuting bats.

2.1.2 Winter Habitat

The proposed area was systematically surveyed by qualified biologists to identify cave and/or portal openings that may provide suitable winter habitat for the Indiana and northern long-eared bat. No winter habitat was observed during the field survey efforts. No impacts to Indiana bat or northern long-eared bat spring or fall swarming habitat are expected as a result of the proposed Project.

3.0 Summary

Deciduous forest, and pasture/cropland are the dominant land cover types of the adjacent properties to the Project. The project area is situated within an area dominated by agricultural areas with interspersed forested areas. There are stream and travel corridors that would likely facilitate bat movement through the region and directly adjacent to the Project. Desktop data suggest there are widespread waterbodies adjacent to the project. The project area is primarily situated within an overall hardwood deciduous forest matrix.

Approximately 43.84 acres of forested areas are present within the project area. Suitable summer bat habitat was identified within the project area with approximately 0.56 acres being impacted by proposed project proponents. Surrounding forested areas will facilitate movement throughout the region and will be available to potential roosting Indiana and northern long-eared bats in subsequent maternity seasons.

Appendix A: Project Mapping

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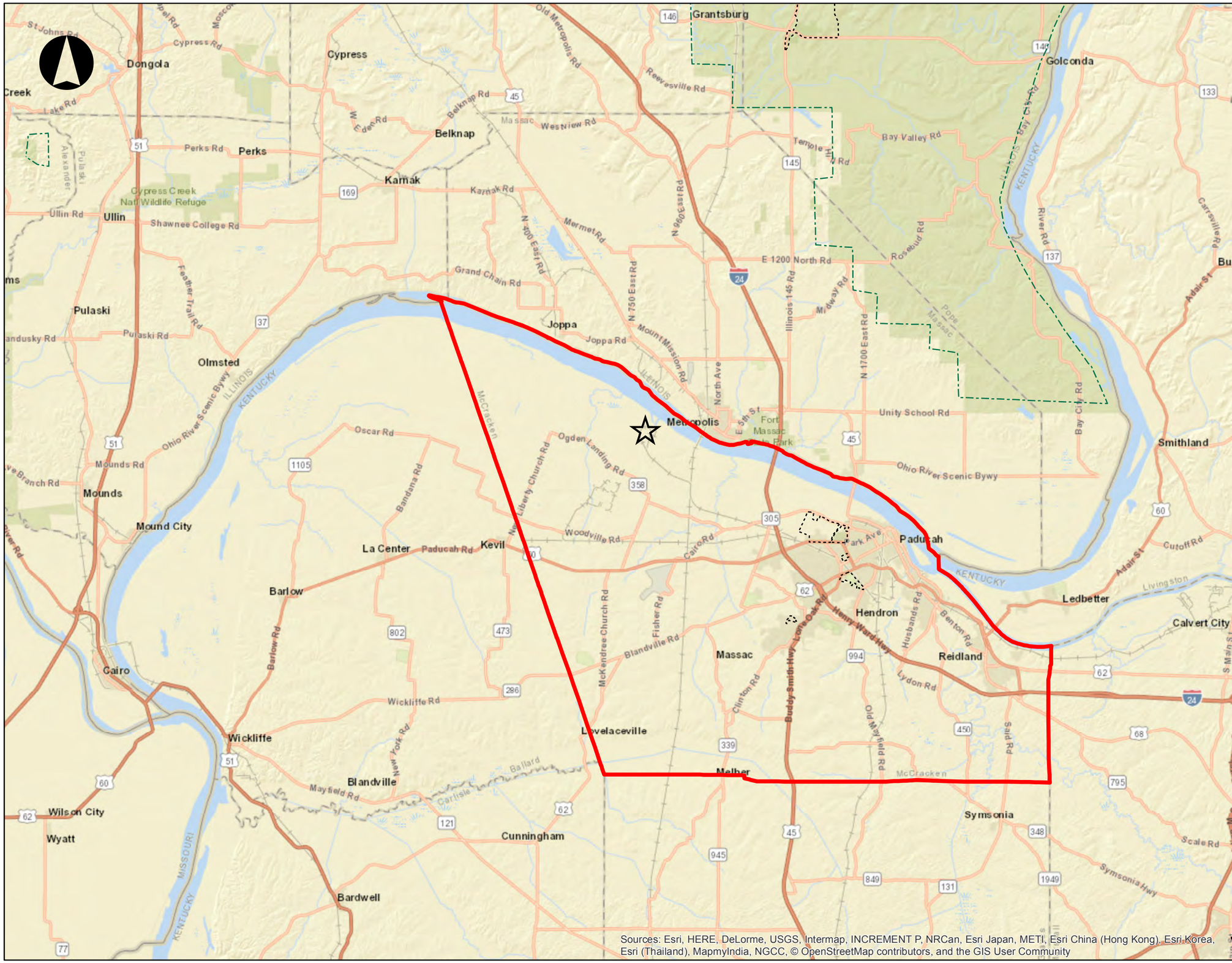

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Shawnee Process Water Basin Project

Project Vicinity Map

Legend

- Project Location
- McCracken County
- National Forests
- State Parks

10 5 0 Miles

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Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Potential Bat Habitat
- Non-Roosting Habitat

1,800 900 0 Feet

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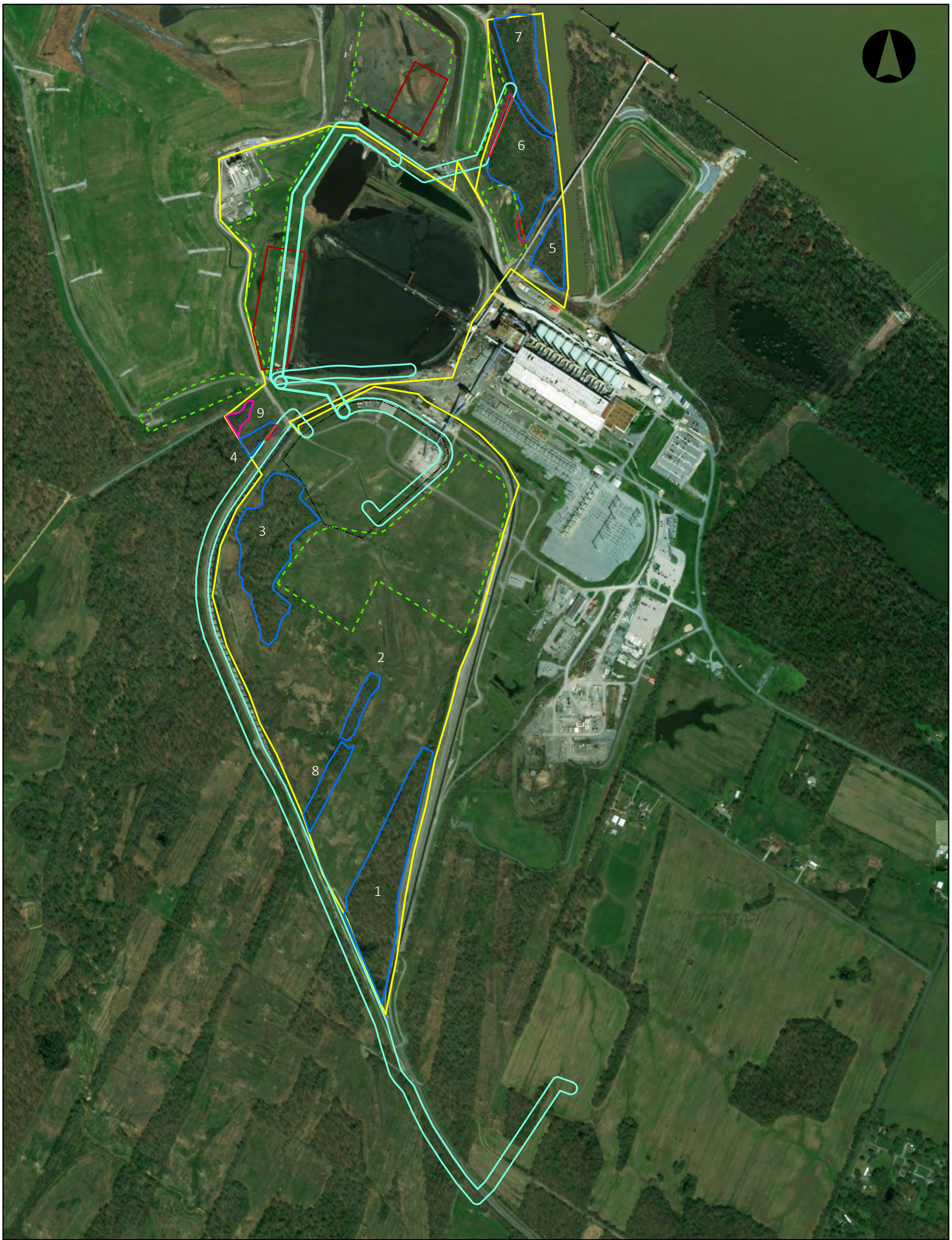


Legend

- Project Boundary
- Pipe Corridors
- Proposed Water Basin Boundary
- Temporary Treatment Areas
- Potential Laydown Areas
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Bat Habitat Impacts

Pipe Corridors - 0.39 acres
Potential Laydown Areas - 0.17 acres

TENNESSEE VALLEY AUTHORITY

Shawnee Process Water Basin Project

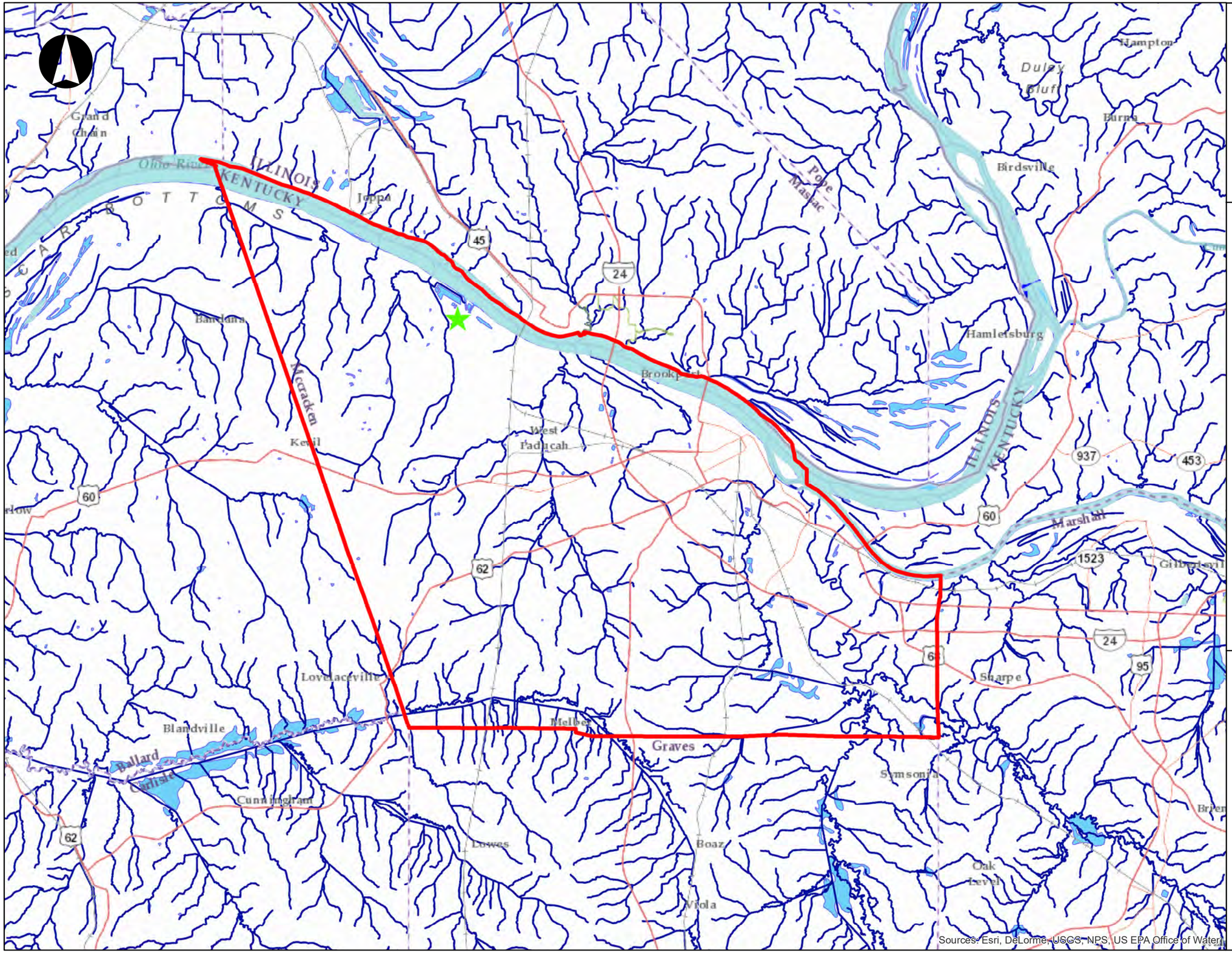
Bat Habitat Assessment Map

1,750 875 0 Feet

JACKSON GROUP

AECOM

DATE: 03/19/2018	FIGURE: 1
DRAWN BY: SR	CHECKED BY: RO



Shawnee Process Water Basin Project

Waterbodies Map

Legend

McCracken County

Project Location

Waterbodies

Lake/Pond

Reservoir

Stream/River

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Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

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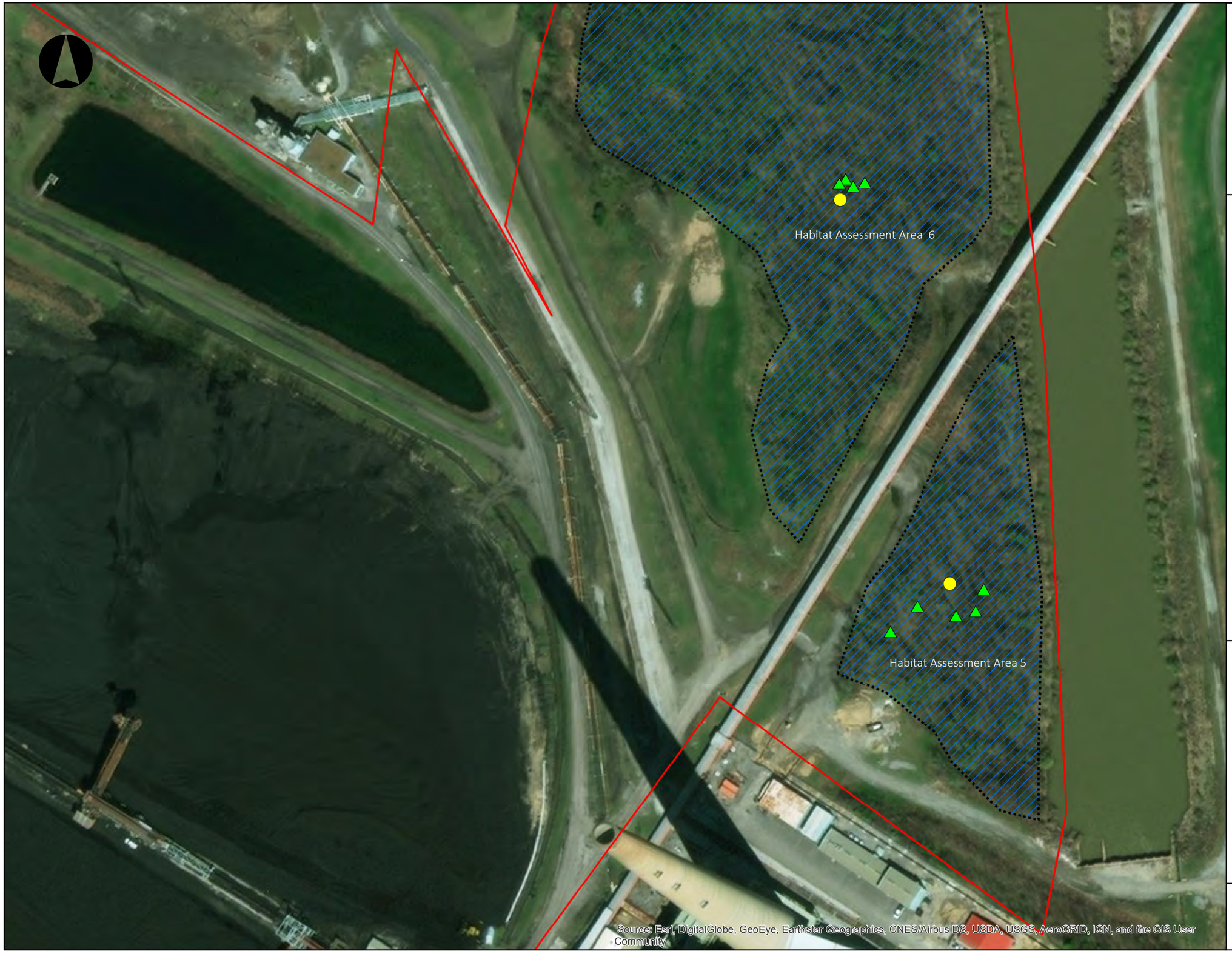

Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

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Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

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Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

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AECOM

Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

JACKSON GROUP

AECOM

Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

JACKSON GROUP

AECOM

Shawnee Process Water Basin Project

Habitat Assessment Map

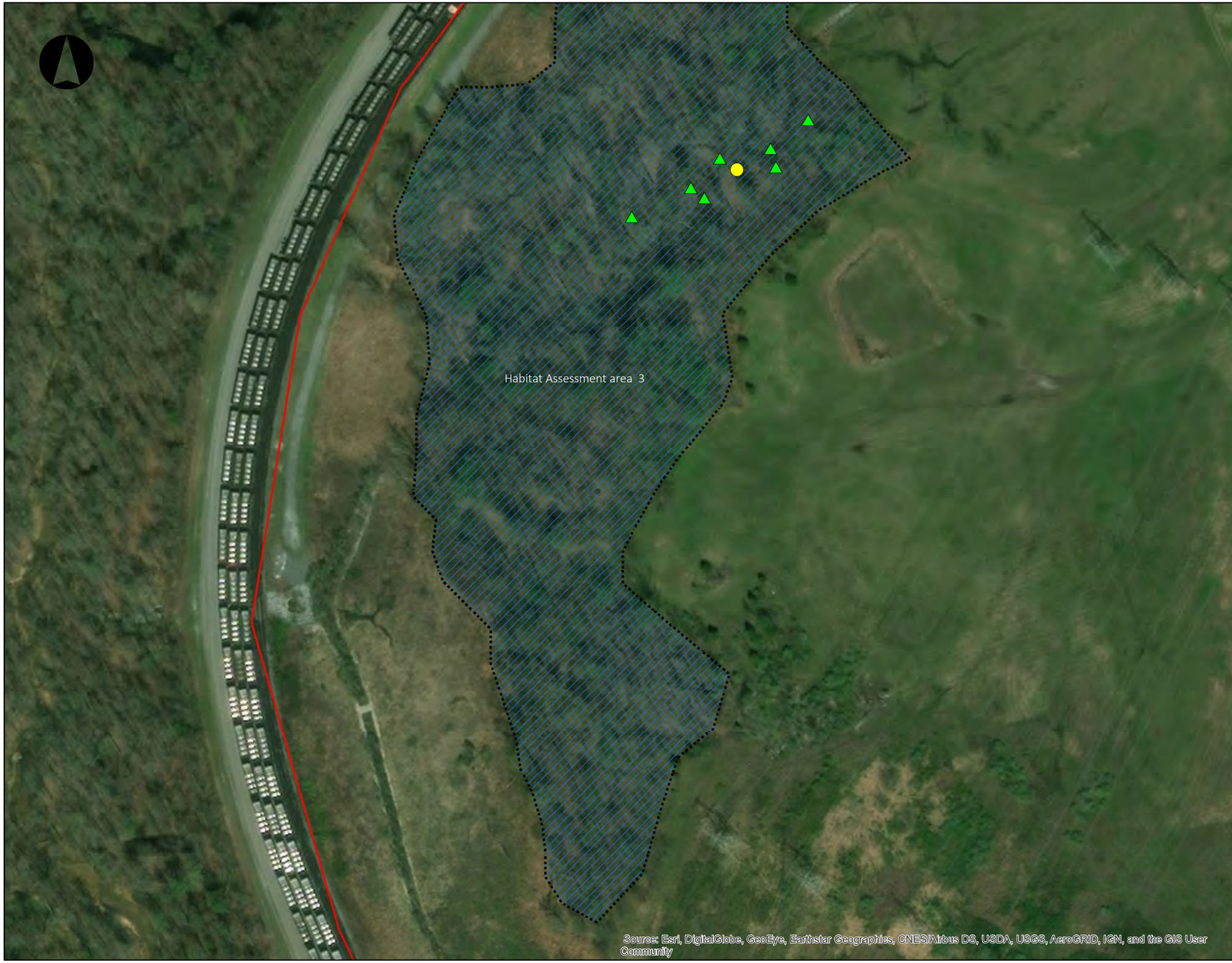
Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

JACKSON GROUP

AECOM



Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

JACKSON GROUP

AECOM

Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

JACKSON GROUP

AECOM

Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

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Sheet 10 of 11

Shawnee Process Water Basin Project

Habitat Assessment Map

Legend

- Project Boundary
- Habitat Assessment Area
- Bat Habitat Assessment Site
- Potential Bat Habitat
- Non-Roosting Habitat
- Potential Roost Tree

280 140 0 Feet

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Appendix B: Data Sheets

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PHASE 1 SUMMER HABITAT ASSESSMENT

Indiana Bat Habitat Assessment Data Sheet

Project Name: Shawnee Process Water Basin Project **Date:** 10-11, Jan. 2018
Township: Paducah, KY **Lat/Long:** 37.148483°N, -88.782138°W **Surveyor:** Jeremy L. Jackson, Hunter Jackson

Project Description

As part of an effort to manage the disposal of coal combustion residual (CCR) materials on a dry basis, and to meet new CCR regulations, TVA is proposing to cease CCR management operations at the Shawnee Fossil Plant (SHF) Ash Impoundment 2 former Special Waste Landfill (SWL) in accordance with the U.S. Environmental Protection Agency's final Disposal of Coal Combustion Residuals from Electric Utilities rule (CCR Rule). TVA is currently evaluating the potential environmental impacts associated with closure of Ash Impoundment 2 and the former SWL. Closure of Ash Impoundment 2 and the former SWL includes the construction of a new Process Water Basin (PWB) to receive plant flows and allow for operations to cease at Ash Impoundment 2 once the new SHF dewatering facility is constructed.

Project Area

Project	Total Acres	Forested Acres		Non-forested
	283	43.84		239.16
Proposed Tree Removal (ac)	Completely Cleared	Partially Cleared (will leave trees)	Preserve acres (no clearing)	
	0.56		43.28	

Vegetation Cover Types

Pre-Project	***Post-Project***
The property is comprised of approximately 19% deciduous sessional upland and wetland forest that is potential suitable summer bat habitat and 81% non-forested areas.	Approximately 0.56 acres of forested habitat is scheduled to be cleared

Landscape within 5 mile radius

Flight corridors to other forested areas?

The project area occurs within the Wabash-Ohio Bottomlands of the Interior River Valleys and Hills Level III Ecoregion of Kentucky. This ecoregion is a generally level with poorly drained floodplains and rolling terraces. Presently, small and large scattered woodlands occur, however agriculture such as livestock production and row crops dominate where historically southern floodplain forested use to occur. Land use within the Wabash-Ohio Bottomlands is generally affected by seasonally high water tables and localized flooding. Streams in this ecoregion are low-gradient in nature with silt and/or sand substrates, which are dominated by Ohio River type fish species and aquatic life. Area streams, woodlots, and forested agricultural fence rows serve as multiple sources of potential travel and foraging corridors to the other many forested areas surrounding the project area.

Adjacent Properties

Deciduous forest (upland & wetland), pasture/cropland, commercial properties, and urban residential areas are the dominant land covers types of the adjacent properties to the proposed site.

Proximity to Public Land

What is the distance (mi.) from the project area to forested public lands?

Approximately 9 miles southeast (Stewart Nelson Park) and 12.9 miles northeast (Shawnee National Forest).

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 1

Water Resources at Sample Site				
Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* One water resource was observed within this forested area.
	0	0	1 (~298 ft)	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	0	0		

Forest Resources at Sample Site			
Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	11-20%	81-100%	1-10%
Dominant Species of Mature Trees	Oak species, Maple species, Ash species, *Robinia pseudoacacia*, *Liquidambar styraciflua, Nyssa sylvatica,*		
% Trees w/ Roosting Features	1-10%	1-10%	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	61-80%	11-20%	1-10%
No. of Suitable Snags			

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___Yes___

Additional Comments:

This forested area is potential suitable summer bat habitat. Numerous potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas. General location coordinates for this forested area are 37.14277°N, -88.78104°W. The above percentages are visual estimates.

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 2

Water Resources at Sample Site				
Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* Two water resources were observed within this forested area.
	0	1 (~300 ft)	0	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	0.22	0		

Forest Resources at Sample Site			
Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	1-10%	81-100%	1-10%
Dominant Species of Mature Trees	Oak species, Maple species, Ash species, *Robinia pseudoacacia*, *Liquidambar styraciflua, Nyssa sylvatica,*		
% Trees w/ Roosting Features	1-10%	1-10%	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	61-80%	11-20%	1-10%
No. of Suitable Snags			

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___Yes___

Additional Comments:

This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas. General location coordinates for this forested area are 37.143986°N, -88.782828°W. The above percentages are visual estimates.

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 3

Water Resources at Sample Site				
Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* Two water resources were observed within this forested area.
	0	0	1 (~845 ft)	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	3.32	0		

Forest Resources at Sample Site			
Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	11-20%	81-100%	1-10%
Dominant Species of Mature Trees	Oak species, Maple species, Ash species, *Robinia pseudoacacia*, *Liquidambar styraciflua, Nyssa sylvatica, Platanus occidentalis*		
% Trees w/ Roosting Features	1-10%	1-10%	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	61-80%	11-20%	1-10%
No. of Suitable Snags			

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___Yes___

Additional Comments:

This forested area is potential suitable summer bat habitat. Numerous potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas. General location coordinates for this forested area are 37.148381°N, -88.784845°W. The above percentages are visual estimates.

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 4

Water Resources at Sample Site				
Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* One water resource was observed within this forested area.
	0	1 (~277 ft)	0	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	0	0		

Forest Resources at Sample Site			
Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	1-10%	61-80%	1-10%
Dominant Species of Mature Trees	Elm species, Maple species, Oak species, *Robinia pseudoacacia*, *Populus deltoides, Nyssa sylvatica, Platanus occidentalis, Carpinus caroliniana*		
% Trees w/ Roosting Features	0	1-10%	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	61-80%	11-20%	1-10%
No. of Suitable Snags			

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___Yes___

Additional Comments:

This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas. General location coordinates for this forested area are 37.150235°N, -88.785848°W. The above percentages are visual estimates.

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 5

Water Resources at Sample Site				
Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* No water resources were observed within this forested area. However a canal directly adjacent to the east connects to the Ohio River.
	0	0	0	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	0	0		

Forest Resources at Sample Site			
Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	1-10%	61-80%	1-10%
Dominant Species of Mature Trees	*Populus deltoides, Quercus alba, Liquidambar styraciflua, Fraxinus pennsylvanica, Acer saccharinum*		
% Trees w/ Roosting Features	1-10%	1-10%	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	21-40%	61-80%	1-10%
No. of Suitable Snags			

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___Yes___

Additional Comments:

This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas. General location coordinates for this forested area are 37.154664°N, -88.777736°W. The above percentages are visual estimates.

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 6

Water Resources at Sample Site

Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* One water resource was observed within this forested area. Additionally, a canal directly adjacent to the east connects to the Ohio River and an unnamed tributary exist directly north.
	0	0	0	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	0.08	0		

Forest Resources at Sample Site

Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	1-10%	61-80%	1-10%
Dominant Species of Mature Trees	*Populus deltoides, Quercus alba, Liquidambar styraciflua, Fraxinus pennsylvanica, Acer saccharinum*		
% Trees w/ Roosting Features	1-10%	1-10%	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	21-40%	61-80%	1-10%
No. of Suitable Snags			

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___Yes___

Additional Comments:

This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas. General location coordinates for this forested area are 37.156162°N, -88.778336°W. The above percentages are visual estimates.

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 7

Water Resources at Sample Site				
Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* No water resources were observed within this forested area. However, a canal directly adjacent to the east connects to the Ohio River and an unnamed tributary exist directly west.
	0	0	0	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	0	0		

Forest Resources at Sample Site			
Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	1-10%	61-80%	1-10%
Dominant Species of Mature Trees	*Populus deltoides, Quercus alba, Liquidambar styraciflua, Fraxinus pennsylvanica, Acer saccharinum*		
% Trees w/ Roosting Features	1-10%	1-10%	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	21-40%	61-80%	1-10%
No. of Suitable Snags			

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___Yes___

Additional Comments:

This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas. General location coordinates for this forested area are 37.159563°N, -88.778736°W. The above percentages are visual estimates.

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 8

Water Resources at Sample Site				
Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* No water resources were observed within this forested area. However, one perennial stream flows along the northern boundary.
	0	0	0	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	0	0		

Forest Resources at Sample Site			
Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	11-20%	41-60%	1-10%
Dominant Species of Mature Trees	Oak species, Maple species, Ash species, *Robinia pseudoacacia*, *Liquidambar styraciflua, Nyssa sylvatica,*		
% Trees w/ Roosting Features	1-10%	1-10%	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	61-80%	11-20%	1-10%
No. of Suitable Snags			

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___Yes___

Additional Comments:

This forested area is potential suitable summer bat habitat. Potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this area could be considered potential foraging habitat along with potential travel corridors to other forested areas. General location coordinates for this forested area are 37.142121°N, -88.783810°W. The above percentages are visual estimates.

PHASE 1 SUMMER HABITAT ASSESSMENT

Sample Site Description
Sample Site No.(s): Shawnee Process Water Basin Project – Habitat Assessment Area 9

Water Resources at Sample Site				
Stream Type (# and length)	*Ephemeral*	*Intermittent*	*Perennial*	*Describe existing condition of water sources:* There are no water resources within this forested area of the project.
	0	0	0	
Pools/Ponds (# and length)	0	*Open and accessible to bats?*		
		N/A		
Wetlands (approx. ac.)	*Permanent*	*Seasonal*		
	0	0		

Forest Resources at Sample Site			
Closure/Density	*Canopy (> 50')*	*Midstory (20-50')*	*Understory (20')*
	1-10%	61-80%	11-20%
Dominant Species of Mature Trees	Elm species, *Fagus grandifolia, Cornus florida*		
% Trees w/ Exfoliating Bark	0	0	0
Size Composition of Live Trees (%)	*Small (3-8 in)*	*Med (9-15 in)*	*Large (>15 in)*
	61-80%	11-20%	1-10%
No. of Suitable Snags		None observed	

1 = 1-10%, 2 = 11-20%, 3 = 21-40%, 4 = 41-60%, 5 = 61-80%, 6 = 81-100%

IS THE HABITAT SUITABLE FOR INDIANA OR NORTHERN LONG-EARED BATS? ___YES___

Additional Comments:

This forested area is potential suitable summer bat habitat however, no potential roost trees displaying the physical characteristics necessary for a bat to roost (i.e. cracks, crevices, sloughing bark, or hollows) were observed. Additionally, trees were present that met the minimum diameter at breast height (DBH) for both the Indiana (*Myotis sodalis*; $\geq$ 5 inches) and northern Long-eared bat (*M. septentrionalis*; $\geq$ 3 inches) thus this young forested area could be considered potential foraging habitat and it is directly adjacent to a potential travel corridor to the west. General location coordinates for this area are 37.15099°N, -88.78605°W. The above percentages are visual estimates.

Appendix C: Photographs

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Representative potential roost tree within habitat assessment area 1.

Representative habitat within habitat assessment area 1.

Representative potential roost tree within habitat assessment area 2.

Representative habitat within habitat assessment area 2.

Representative potential roost tree within habitat assessment area 3.

Representative potential roost tree within habitat assessment area 4.

Representative potential roost tree within habitat assessment area 5.

Representative habitat within habitat assessment area 5.

Representative habitat within habitat assessment area 6.

Representative potential roost tree within habitat assessment area 6.

Representative potential roost tree within habitat assessment area 7.

Representative habitat within habitat assessment area 7.

Representative potential roost tree within habitat assessment area 8.

Appendix C – Wetland Delineation Report

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WATERS OF THE U.S. PRELIMINARY JURISDICTIONAL DETERMINATION REPORT

Shawnee Process Water Basin Project
McCracken County, Kentucky

Prepared by:

Jackson Group
3945 Simpson Lane
Richmond, KY 40475
jacksongroupco.com

Prepared for:

March 2018

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1.0 INTRODUCTION

On behalf of the Tennessee Valley Authority (TVA), AECOM and Jackson Group have prepared the following document to assess potential Wates of the U.S. (WOUS) for the proposed Shawnee Process Water Basin Project (Project) in McCracken County, Kentucky. The purpose of this document is to identify and describe aquatic resources within the study area relevant to and in support of a jurisdictional determination.

1.1 Project Description

As part of an effort to manage the disposal of coal combustion residual (CCR) materials on a dry basis, and to meet new CCR regulations, TVA is proposing to cease CCR management operations at the Shawnee Fossil Plant (SHF) Ash Impoundment 2 former Special Waste Landfill (SWL) in accordance with the U.S. Environmental Protection Agency's final Disposal of Coal Combustion Residuals from Electric Utilities rule (CCR Rule). TVA is currently evaluating the potential environmental impacts associated with closure of Ash Impoundment 2 and the former SWL. Closure of Ash Impoundment 2 and the former SWL includes the construction of a new Process Water Basin (PWB) to receive plant flows and allow for operations to cease at Ash Impoundment 2 once the new SHF dewatering facility is constructed.

TVA is currently developing a Supplemental Environmental Impact Statement (SEIS) to the *Shawnee Fossil Plant Coal Combustion Residual Management Final Environmental Impact Statement* (Final EIS) published in January 2018. The SEIS will further evaluate the closure of Ash Impoundment 2 and the former SWL. Additionally, the SEIS will evaluate the potential environmental impacts associated with construction of a new PWB and supporting systems at SHF. The activities associated with construction of the new PWB would include:

- Construction of a new PWB consisting of two equal-area (approximately 6 acres each) operational, lined basin cells and rerouting existing general plant process flows away from the coal yard drainage basin directly to the PWB.
- Improving the coal yard drainage basin through lowering the pool and dredging to reduce solids loading to the PWB.
- Additional treatment improvements such as:
    - Installation of additional treatment systems (coagulant, flocculent, and polymer injection and mixing) to provide additional total suspended solids (TSS) removal of flows routed to the PWB.
    - Installation of pH adjustment and aeration in the PWB.
    - Installation/upgrade of an additional treatment system to provide additional TSS removal in flows routed to the coal yard drainage basin.

The new PWB would be constructed at the Rail Loop Site. Associated systems would connect the PWB to SHF and existing SHF systems and outfalls. The Project area is depicted on mapping provided in Appendix A.

2.0 FIELD SURVEYS

Jackson Group conducted a preliminary survey for the Project area to document the presence and characteristics of potential WOUS, including wetlands. WOUS, including wetlands, were identified using methods described in the USACE *Wetland Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coast (Version 2.0)*. Data was collected using the USACE wetland determination form – Atlantic and Gulf Coastal Plain Region and low gradient stream data forms. The field data collected provides a preliminary assessment of jurisdictional status of all features identified within Project area.

2.1 Field Surveys

The proposed Project area was systematically surveyed by qualified biologists in January 2018 to assess potential WOUS, including wetlands. For the purposes of the field surveys, the following characteristics were considered for potential WOUS:

- Wetlands
  - Hydric Soils
  - Wetland Vegetation
  - Wetland Hydrology

- Streams
  - Ordinary High Water Mark
  - Scour
  - Sediment sorting
  - Deposition
  - Water staining
  - Shelving
  - Changes in the character of soil
  - Destruction of terrestrial vegetation
  - Natural line impressed on the bank
  - Presence of litter and debris
  - Multiple observed flow events
  - Wracking
  - Bed and banks
  - Vegetation matted down, bent, or absent
  - Leaf litter disturbed or washed away
    - Change in Plant Community

- Stream Flow

During the course of the fieldwork, data were collected, photographs were taken, and locations were surveyed using a geographic positioning system (GPS). Data sheets can be found in Appendix B and photographs in Appendix C.

2.1.1 Wetlands

A total of 14.55 acres of wetlands were identified within the Project area (Tables 1 and 2). The wetlands identified were classified as forested or herbaceous wetlands. The herbaceous wetlands were dominated by *Carex spp*., *Juncus spp., Festuca spp.,* and the forested wetland area were dominated by *Populus deltoids, Fraxinus pennsylvanica, Cephalanthus occidentalis* and *Acer rubrum.* These species of woody and herbaceous plants are common for wetlands in this area and wetlands present on disturbed lands.

Table 1. Potential Waters of the U.S. Identified within the Project Area.

Feature	Forested (Acres)	Herbaceous (Acres)	Total
Wetland	3.32	10.91	14.55
Total	3.32	10.91	14.55

Table 2. Wetland Assessment Plots within the Project Area.

Plot	Plot Description	Acreage	Habitat Type[1]
WSP 1	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer. Soils in this wetland area was assumed hydric because it's inundated and based upon vegetative cover, this area is inundated throughout the year.	.06	Forested Wetland
WSP 2			Upland Area
WSP 3	This wetland has positive indicators for all three wetland criteria. Vegetation may need to be reevaluated during the growing season to determine specie level identification of herbaceous layer. Soils in this wetland area was assumed hydric because it's inundated and based upon vegetative cover, this area is inundated throughout the year.	.01	Forested Wetland
WSP 4	Positive indicators for all three wetland criteria were present. This area is a fringe wetland along a perennial stream and also services a water detention area for the site. Area vegetation is dominated by Common Reed (Phragmites australis) an exotic invasive species. Soil was assumed hydric due the annual inundation levels in this wetland area.	.16	Herbaceous Wetland
WSP 5	Positive indicators were observed for all three wetland criteria. Area is dominated by hydrophytic vegetation. Area vegetation is dominated by Carex, Juncus and Festuca species. Vegetation may need to be reevaluated during the growing season to determine species level identification and more accurate indicator status.	.05	Herbaceous Wetland
WSP 6	Area is dominated by hydrophytic vegetation. Area vegetation is dominated by Carex, Juncus and Festuca species. Vegetation may need to be reevaluated during the growing season to	.04	Herbaceous Wetland

Plot	Plot Description	Acreage	Habitat Type[1]
	determine species level identification and more accurate indicator status.		
WSP 7			Upland Site
WSP 8 WSP 9	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status.	3.32	Forested Wetland
WSP 10			Upland Site
WSP 11	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status.	.95	Herbaceous Wetland
WSP 12 WSP 13	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status.	2.85	Herbaceous Wetland
WSP 14			Upland Site
WSP 15 WSP 16	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status.	1.64	Herbaceous Wetland
WSP 17	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status.	.79	Herbaceous Wetland
WSP 18			Upland Site
WSP 19	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status. Dumps, coal and waste disposal areas. Area soils pass hydric soil criteria.	.22	Forested Wetland
WSP 20	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more		Herbaceous Wetland

Plot	Plot Description	Acreage	Habitat Type[1]
	accurate indicator status. Dumps, coal and waste disposal areas. Area soils pass hydric soil criteria.	.26	
WSP 21	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status. Dumps, coal and waste disposal areas. Area soils pass hydric soil criteria.	.03	Forested Wetland
WSP 22			Upland Site
WSP 23	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status. Dumps, coal and waste disposal areas. Area soils pass hydric soil criteria.	.42	Herbaceous Wetland
WSP 24	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status. Dumps, coal and waste disposal areas. Area soils pass hydric soil criteria.	1.17	Herbaceous Wetland
WSP 25			Upland Site
WSP 26 WSP 27	Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status. Dumps, coal and waste disposal areas. Area soils pass hydric soil criteria.	.94	Herbaceous Wetland
WSP 28			Upland Site

[1] Habitat Types:
Forested Wetland - characterized by woody vegetation that is 6 m tall or taller.
Herbaceous Wetland – dominated by soft-stemmed plants, not woody.
Upland Site – area above the level of where flooding occurs and/or not meeting criteria of a wetland area.

Within the Project area 14.55 acres of jurisdictional wetlands were identified. Of the 14.55 acres, a total of 0.26 acres will be will be affected by proposed project actions (Table 3). Maps depicting potential stream and wetland impacts can be found in Appendix D.

Table 3. Wetland Impacts within Project Area.

Wetland Assessment Plot(s)	Wetland Type	Temporary Treatment Areas (AC)	Pipe Corridors (AC)	Potential Laydown Areas (AC)	Proposed Process Water Basin (AC)	Total (AC)
WSP 4	Herbaceous		0.02		0.15	0.17
WSP 5	Herbaceous				0.05	.05
WSP 6	Herbaceous				0.04	.04
Total (AC)			0.02		0.24	0.26

2.1.2 Streams

Four types of stream features were observed during the January site visit. These included swales, and perennial, intermittent, and ephemeral stream channels (Table 3). All stream features identified within the Project area are likely to be considered WOUS except for the swales. Swales are typically not considered WOUS under the Clean Water Act (CWA) because they are not tributaries or they do not have not a significant nexus to Traditional Navigable Waters (TNWs). A body of water qualifies as a navigable water of the United States if it subject to the ebb and flow of the tide, and/or the water body is presently used or has been used in the past, or may be susceptible for use to transport interstate or foreign commerce.

Stream features identified within the Project area are typical of low gradient stream channels within the Wabash-Ohio Bottomlands Level IV Ecoregion of Kentucky that have been disturbed (i.e. channelized, straighten, etc.). Overall, their substrates are of poor to suboptimal quality for epifaunal available cover, with pool substrates dominated by fine sediments (silt, sand). Area streams display generally heavy to moderate sediment deposition; however, channel flow status was highly variable. Stream banks were stable and displayed little to no signs of erosion. Riparian vegetation zone width was poor to marginal on all streams with two exceptions. Overall the average habitat rating based off low gradient stream habitat assessment field data sheets was poor.

Table 4. Stream features Identified within the Project Area.

Stream Feature	Perennial (Feet)	Intermittent (Feet)	Ephemeral (Feet)	Total (Linear Feet)
UT-A	3,575			3,575
UT-A1		892	234	1,126
UT-A2		500		500
UT-B	2,626			2,626
UT-C	882			882
UT-D	1,151			1,151
UT-E			457	457
Total	8,234	1392	691	10,317

Within the Project area 10,317 linear feet of jurisdictional stream features were identified. Of the 10,317 linear feet of jurisdictional waters, a total of 2,061.28 linear feet will be will be affected by proposed project actions (Table 5). Maps depicting potential stream and wetland impacts can be found in Appendix D.

Table 5. Stream Feature Impacts within Project Area.

Stream Assessment Area	Temporary Treatment Areas (FT)	Pipe Corridors (FT)	Potential Laydown Areas (FT)	Proposed Process Water Basin (FT)	Total (FT)
UT-B		103.51	113.69	1,079.63	1,296.83
UT-C		118.22	503.84		622.06

Stream Assessment Area	Temporary Treatment Areas (FT)	Pipe Corridors (FT)	Potential Laydown Areas (FT)	Proposed Process Water Basin (FT)	Total (FT)
UT-D		117.85			117.85
UT-E		24.54			24.54
Total (FT)		364.12	617.53	1,079.63	2,061.28

3.0 Soils

Based on the USDA Web Soil Survey (01/30/2018), the project area contains 6 soil mapping units, including Dumps, Coal Waste, Falaya-Collins, Henshaw silt loam, Miscellaneous water, Urban land-Udorthents, and water (Table 4). Henshaw silt loam is the only soil type within the Project area listed as hydric soils. The soils observed within the Project area are typical of disturbed site locations. The soil report indicates that the majority of the soils in the Project area do not have a hydric soil rating; however, site alteration and prolonged soil saturation will support wetland vegetation as identified within the Project area. A complete soil report can be found in Appendix E.

Table 4. USDA Web Soil Survey (01/30/2018) within the Project Area.

Soil Type	Description	Percent of Project Area	Hydric Soil Rating
Du	Dumps, Coal, and Waste disposal areas	85.2	No
Fa	Falaya-Collins complex, 0 to 2 percent slopes, occasionally flooded	0.1	No
HhA	Henshaw silt loam, 0 to 2 percent slopes, frequently flooded	1.4	Yes
UrA	Urban land-Udorthents complex, 0 to 4 percent slopes	7	No
M-W	Miscellaneous water	3.8	
W	Water	2.4	

4.0 Summary

A Preliminary Jurisdictional Determination is sought for identified project waters associated within the Project in McCracken County, Kentucky. Jackson Group conducted a WOUS delineation within Project area in January 2018 as the basis to request an Preliminary Jurisdictional Determination on the project's drainages. There are 14.55 acres of wetlands and 10,317.55 linear feet of stream drainages within Project area. The project action will affect approximately 0.26 acres of herbaceous wetlands and 2,061.28 linear feet of stream features. The network of drainage features drain into Little Bayou Creek and the Ohio River. All project surface water and most shallow groundwater terminates in the Ohio River. The preliminary jurisdictional determination for the Project waters represents the best professional judgement of Jackson Group; however, only the USACOE can determine the jurisdictional status of WOUS.

5.0 References

U.S. Army Corps of Engineers - Engineer Research and Development Center (2008) Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coast (Version 2.0) ERDC/EL TR-08-28, Final report, September 2008, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199
http://el.erdc.usace.army.mil/elpubs/pdf/trel08-28.pdf

U.S. Army Corps of Engineers - Environmental Laboratory (1987) Wetlands Delineation Manual Wetlands Research Program Technical Report Y-87-1, Final Report, January 1987, Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199
http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf

Appendix A: Project Mapping

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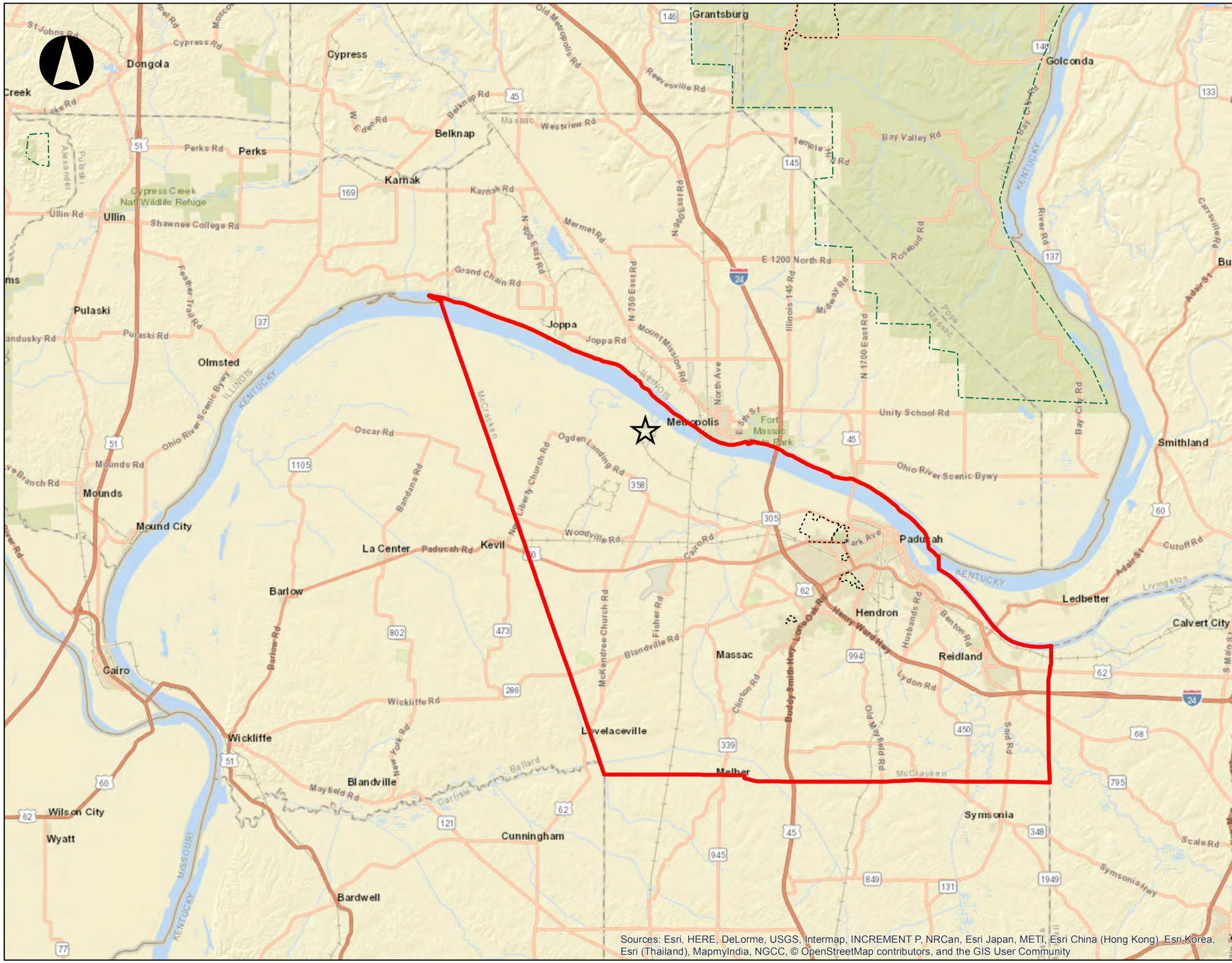

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Shawnee Process Water Basin Project

Project Vicinity Map

Legend

- Project Location
- McCracken County
- National Forests
- State Parks

10 5 0 Miles

JACKSON GROUP

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Shawnee Process Water Basin Project

Wetlands Map

Legend

- Wetlands
- Project Boundary

NATIONAL WETLANDS INVENTORY

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

1,900 950 0 Feet

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Legend

- Proposed Water Basin Boundary
- Temporary Treatment Areas
- Pipe Corridors
- Potential Laydown Areas
- Project Boundary
- Ephemeral
- Intermittent
- Perennial
- Herbaceous Wetlands
- Forested Wetlands

Potential Impacts

- Wetland Impacts - 0.028 Acres
- Ephemeral Stream Impacts - 24.64 Linear Feet
- Perennial Stream Impacts - 2,036.74 Linear Feet

TVA

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Potential Impacts

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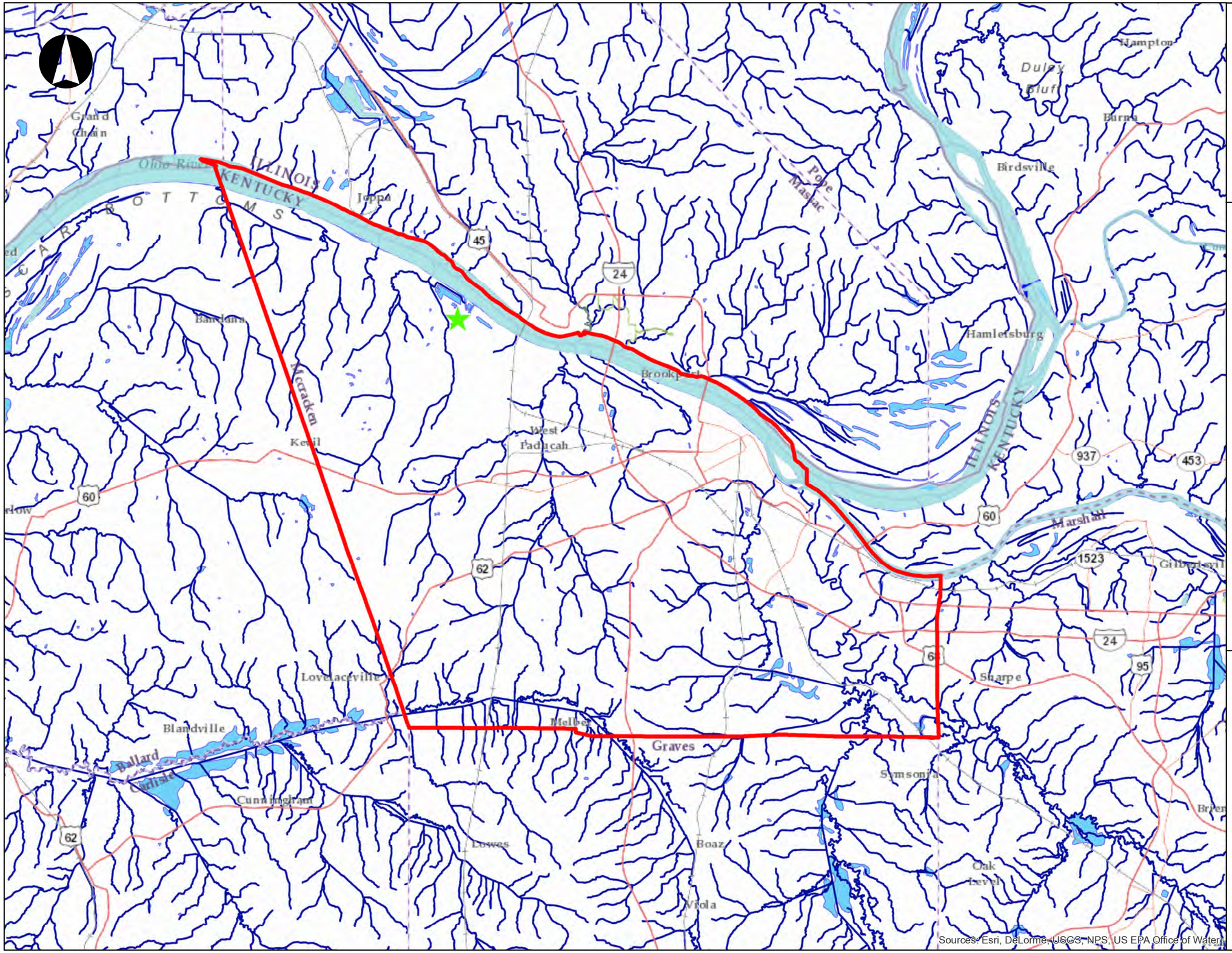
1,600 800 0 Feet



Shawnee Process Water Basin Project

Waterbodies Map

Legend

McCracken County

Project Location

Waterbodies

Lake/Pond

Reservoir

Stream/River

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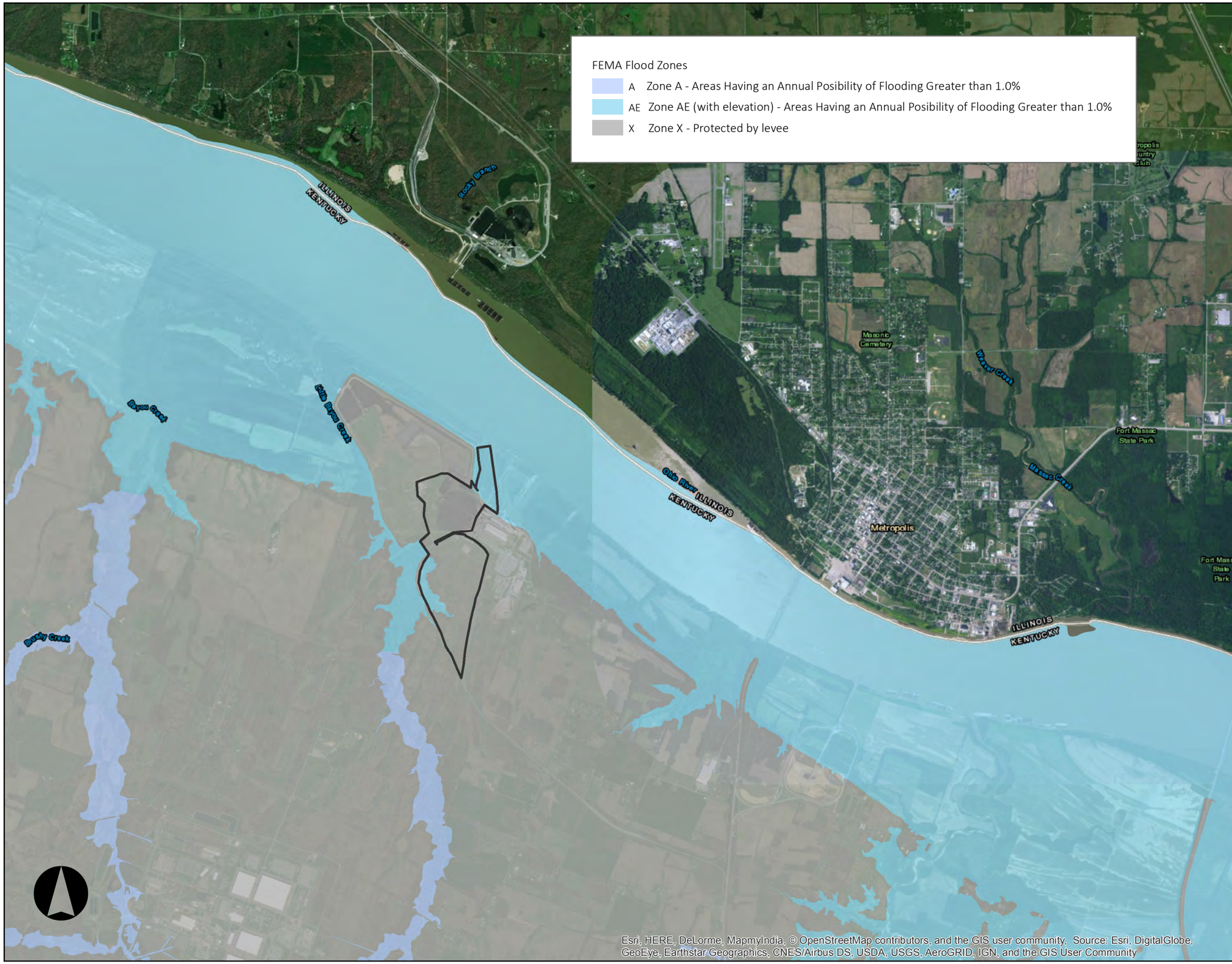

Shawnee Process Water Basin Project

FEMA Flood Map

Legend

Project Site Boundary

FEMA Flood Zones

- A
- AE
- X

9,500 4,750 0 Feet

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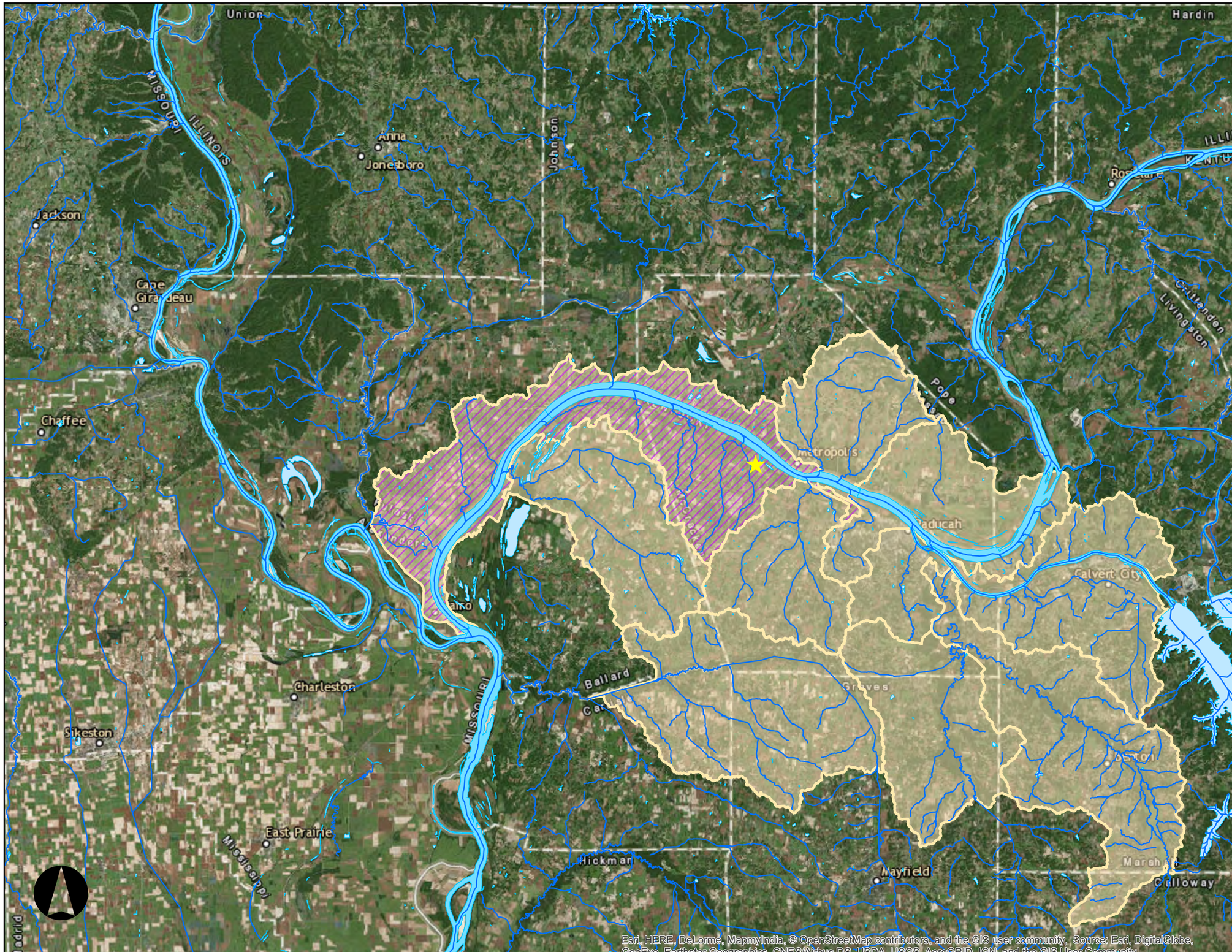

Shawnee Process Water Basin Project

Watershed / Drainage Map

Legend

- Project Site
- Stream
- Lake or Pond
- River
- McCracken County HUC 10 Boundaries
- Redstone Creek - Ohio River (74.29 sq mi)

20 10 0 Miles

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Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Project Boundary
- Streams
- Swales
- Wetland Sampling Points
- Forested Wetlands
- Herbaceous Wetlands

400 200 0 Feet

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Sheet 1 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Project Boundary
- Streams
- Swales
- Wetland Sampling Points
- Forested Wetlands
- Herbaceous Wetlands

400 200 0 Feet

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Sheet 2 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Project Boundary
- Streams
- Swales
- Wetland Sampling Points
- Forested Wetlands
- Herbaceous Wetlands

400 200 0 Feet

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Sheet 3 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Project Boundary
- Streams
- Swales
- Wetland Sampling Points
- Forested Wetlands
- Herbaceous Wetlands

400 200 0 Feet

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Sheet 4 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Project Boundary
- Streams
- Swales
- Wetland Sampling Points
- Forested Wetlands
- Herbaceous Wetlands

400 200 0 Feet

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Sheet 5 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Project Boundary
- Streams
- Swales
- Wetland Sampling Points
- Forested Wetlands
- Herbaceous Wetlands

400 200 0 Feet

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Sheet 6 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Project Boundary
- Streams
- Swales
- Wetland Sampling Points
- Forested Wetlands
- Herbaceous Wetlands

400 200 0 Feet

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Sheet 7 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Project Boundary
- Streams
- Swales
- Wetland Sampling Points
- Forested Wetlands
- Herbaceous Wetlands

400 200 0 Feet

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Sheet 8 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 1 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 2 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 3 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 5 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 6 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 7 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 8 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 9 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 10 of 8

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Legend

- Stream Assessment Points
- Ephemeral
- Intermittent
- Perennial
- Swales
- Wetlands
- Project Boundary

300 150 0 Feet

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Sheet 11 of 8

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WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-1

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.156843 Long: -88.778432 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: scrub/shrub

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators for all three wetland criteria were present.

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 X	No _____	Depth (inches): 6
Water Table Present?	Yes X	No _____	Depth (inches): 0-12
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0-12

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

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

Remarks:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-1

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1. Fraxinus pennsylvanica		Yes	FACW
2. Fagus grandifolia		No	FACU
3. Populus deltoides		Yes	FAC
4. Cephalanthus occidentalis		Yes	OBL
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Herb Stratum (Plot size: 30 ft)			
1. Carex spp.		Yes	FAC
2. Juncus spp.		Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
50% of total cover: 20	20% of total cover:		

Woody Vine Stratum (Plot size: 30 ft)			
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: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine specie level identification of herbaceous layer.

SOIL

Sampling Point: WPS-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
	Assumed Hydric							

[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:

Soils in this wetland area was assumed hydric because its inundated and based upon vegetative cover, this area is inundated throughout the year.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-2

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.156747 Long: -88.778428 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: Upland

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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 X	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Positive indicators were only observed for one of the three wetland criteria.

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:

Area does not pass hydrology criteria of a wetland.

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

Sampling Point: WSP-2

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1. Fraxinus pennsylvanica		Yes	FACW
2. Fagus grandifolia		No	FACU
3. Populus deltoides		Yes	FAC
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1.			
2.			
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 ft)			
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

___ 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).

Area is dominated riparian or floodplain species. Vegetation may need to be reevaluated during the growing season to determine specie level identification of herbaceous layer.

SOIL

Sampling Point: WPS-2

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2						Silty/Clay	
4-12	10YR4/3						Silty Clay	
12-18	10YR 4/3		10YR 6/1				Clay	

[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:

Positive indicators for hydric soils were not observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-3

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.156644 Long: -88.778348 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: scrub/shrub

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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 _____	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks:

This wetland has positive indicators for all three wetland criteria.

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 X	No _____	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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-3

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1. Fraxinus pennsylvanica		Yes	FACW
2. Fagus grandifolia		No	FACU
3. Populus deltoides		Yes	FAC
4. Cephalanthus occidentalis		Yes	OBL
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Carex spp.		Yes	FAC
2. Juncus spp.		Yes	FAC
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 ft)			
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

___ 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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine specie level identification of herbaceous layer.

SOIL

Sampling Point: WSP-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 Features %	Type[1]	Loc[2]	Texture	Remarks

[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:

Area was assumed hydric based upon the vegetative composition and due to the area was inundated. Based upon site conditions, this area is inundated on an annual basis.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-4

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.149641 Long: -88.782042 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators for all three wetland criteria were present. This area is a fringe wetland along a perennial stream and also services a water detention area for the site. Area vegetation is dominated by Common Reed (Phragmites australis) an exotic invasive species.

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 X	No _____	Depth (inches): 6
Water Table Present?	Yes X	No _____	Depth (inches): 0-18
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0-18

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

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

Remarks:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-4

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Phragmites australis		Yes	FACW
2.			
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 ft)			
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

___ 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).

Area is dominated by hydrophytic vegetation. Area vegetation is dominated by Phragmites australis an exotic invasive species. Vegetation may need to be reevaluated during the growing season.

SOIL

Sampling Point: WSP-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

[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:

Soil was assumed hydric due the annual inundation levels in this wetland area.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-5

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.149159 Long: -88.783845 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were observed for all three wetland criteria.

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 X	No _____	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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-5

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30 ft)			
1. Carex species		Yes	FAC
2. Juncus species		Yes	FAC
3. Festuca species		Yes	NI
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 ft)			
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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67 (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).

Area is dominated by hydrophytic vegetation. Area vegetation is dominated by Carex, Juncus and Festuca species. Vegetation may need to be reevaluated during the growing season to determine species level identification and more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-2	10YR 2/1						Clay	
2-8	10YR 5/2		10YR 3/3				Clay	
8-12	10YR 5/6		10YR 4/1				Clay	
12-18	10YR 5/1		10YR 2/1				Silty/Clay	

[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:

Positive indicators were present for hydric soils.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-6

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.148841 Long: -88.783873 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators for all three wetland criteria were observed.

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 X	No _____	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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-6

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30 ft)			
1. Carex species		Yes	FAC
2. Juncus species		Yes	FAC
3. Festuca species		Yes	NI
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 ft)			
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: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67 (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).

Area is dominated by hydrophytic vegetation. Area vegetation is dominated by Carex, Juncus and Festuca species. Vegetation may need to be reevaluated during the growing season to determine species level identification and more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-2	10YR 2/1						Clay	
2-8	10YR 5/2		10YR 3/3				Clay	
8-12	10YR 5/6		10YR 4/1				Clay	
12-18	10YR 5/1		10YR 2/1				Silty/Clay	

[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:

Positive indicators for wetland hydrology were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-7

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.149047 Long: -88.783756 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: Upland

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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 X	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Positive indicators were only observed for one of the three wetland criteria

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:

Area does not passes hydrology criteria of a wetland.

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

Sampling Point: WSP-7

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Festuca Species		No	NI
2.			
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 ft)			
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: 0 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		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).

Area does not meet hydrophytic vegetation criteria of a wetland.

SOIL

Sampling Point: WPS-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
0-4	10YR 4/1						Silt Loam	
4-18	10YR5/2		10YR 5/6				Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-8

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.148351 Long: -88.785128 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: forested

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indictors for all three wetland criteria were observed.

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 X	No _____	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 10
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-8

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Platanus occidentalis		Yes	FACW
2. Acer rubrum		Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Platanus occidentalis		Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Phragmities australis		Yes	FACW
2. Echinochloa crus-galli		Yes	FACW
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 ft)			
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: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-2	10YR 2/1						Clay	
2-8	10YR 5/2		10YR 3/3				Clay	
8-12	10YR 5/6		10YR 4/1				Clay	
12-18	10YR 5/1		10YR 2/1				Silty/Clay	

[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:

Positive indictors for hyrdic soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-9

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.14813 Long: -88.78596 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: forested

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indictors for all three wetland criteria were observed.

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 X	No _____	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-9

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Platanus occidentalis		Yes	FACW
2. Populus deltoides		Yes	FAC
3. Acer rubrum		Yes	FAC
4. Liquidambar styraciflua		Yes	FAC
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Platanus occidentalis		Yes	FACW
2. Populus deltoides		Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Echinochloa crus-galli		Yes	FACW
2.			
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 ft)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to identify additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3						Clay	
4-10	10YR 5/2		10YR 4/6				Clay	
10-18	10YR 4/1		10YR 4/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-10

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.148760 Long: -88.784858 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: Upland

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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 X	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Positive indicators were only observed at two of the three wetland criteria.

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:

Area does not passes hydrology criteria of a wetland.

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

Sampling Point: WSP-10

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Platanus occidentalis		Yes	FACW
2. Acer rubrum		Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Platanus occidentalis		Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1.			
2.			
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 ft)			
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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine species level identification of herbaceous layer and more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3		10YR				Clay	
4-10	10YR 5/2		10YR 4/6				Clay	
10-18	10YR 4/1		10YR 4/6				silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-11

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.147428 Long: -88.786672 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators for all three wetland critera were observed.

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)
- [x] 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 X	No _____	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-11

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30 ft)			
1. Phragmites australis		Yes	FACW
2.			
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 ft)			
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

___ 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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-11

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators for hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-12

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.146841 Long: -88.786346 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were observed for all three wetland criteria.

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)
- [ ] 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): _____
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-12

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra		Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Cephalanthus occidentalis		Yes	OBL
2. Salix nigra		Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Polygonum species		Yes	FAC
2. Festuca species		Yes	NI
3. Carex species		Yes	FAC
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 ft)			
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: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-12

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-13

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.145110 Long: -88.785328 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were observed for all three wetland criteria.

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)
- [ ] 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 X	No _____	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-13

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

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Cephalanthus occidentalis		Yes	OBL
2. Salix nigra		Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30 ft)			
1. Polygonum species		Yes	FAC
2. Festuca species		Yes	NI
3. Carex species		Yes	FAC
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 ft)			
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: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-13

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-14

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.144962 Long: -88.785105 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: Upland

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were not observed for any of the three wetland criteria

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:

Area does not passes hydrology criteria of a wetland.

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

Sampling Point: WSP-14

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30 ft)			
1. Festuca species		Yes	NI
2.			
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 ft)			
1. Rosa Multiflora			
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: 0 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		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).

Area vegetation does not meet hydric criteria. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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 %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2		10YR 4/3				Clay	
4-12	10YR 4/3		10YR 5/8				Clay	
12-18	10YR 4/3		10YR 6/1				Silty/Clay	

[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:

Positive indicators for hydric soils were not observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-15

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.145131 Long: -88.786087 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were observed for all three wetland criteria.

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)
- [ ] 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): 4
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-15

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra		Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Cephalanthus occidentalis		Yes	OBL
2. Salix nigra		Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Polygonum species		Yes	FAC
2. Festuca species		Yes	NI
3. Carex species		Yes	FAC
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 ft)			
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: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-16

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.146061 Long: -88.786590 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were observed for all three wetland criteria.

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)
- [ ] 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): 4
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-16

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra		Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Cephalanthus occidentalis		Yes	OBL
2. Salix nigra		Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Polygonum species		Yes	FAC
2. Festuca species		Yes	NI
3. Carex species		Yes	FAC
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 ft)			
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: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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 %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-17

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.142953 Long: -88.784718 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators for all three wetland criteria were observed.

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)
- [ ] 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): 1-4
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-17

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra		Yes	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Cephalanthus occidentalis		Yes	OBL
2. Salix nigra		Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Polygonum species		Yes	FAC
2. Festuca species		Yes	NI
3. Carex species		Yes	FAC
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 ft)			
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: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators for hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-18

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.143039 Long: -88.784435 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: Upland

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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 X	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Positive indicators were only observed at one of the three wetland criteria.

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:

Area does not passes hydrology criteria of a wetland.

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

Sampling Point: WSP-18

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Festuca species		Yes	NI
2.			
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 ft)			
1. Rosa Multiflora			
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: 0 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		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).

Area vegetation does not meet hydric criteria. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3		10YR 5/1				Clay	
4/12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-19

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.143724 Long: -88.782959 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: forested

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were observed for all three wetland criteria.

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)
- [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): 1-12
Water Table Present?	Yes X	No _____	Depth (inches): 0-18
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0-18

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

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

Remarks:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-19

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra		Yes	OBL
2. Platanus occidentalis		Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Polygonum species		Yes	FAC
2. Echinochloa crus-galli		Yes	FACW
3. Carex species		Yes	FAC
4. Juncus speceis		Yes	FAC
5. Festuca species		Yes	NI
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: 30 ft)			
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: 6 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 86 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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 %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-20

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.143831 Long: -88.782549 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

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 X	No _____	Depth (inches): 0-4
Water Table Present?	Yes X	No _____	Depth (inches): 0-18
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0-18

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

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

Remarks:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-20

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra		Yes	OBL
2. Platanus occidentalis		Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Polygonum species		Yes	FAC
2. Echinochloa crus-galli		Yes	FACW
3. Carex species		Yes	FAC
4. Juncus speceis		Yes	FAC
5. Festuca species		Yes	NI
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: 30 ft)			
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: 6 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 86 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-21

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.143317 Long: -88.782315 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

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 X	No _____	Depth (inches): 0-1
Water Table Present?	Yes X	No _____	Depth (inches): 0-18
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 18

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

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

Remarks:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-21

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix nigra		Yes	OBL
2. Platanus occidentalis		Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Sapling/Shrub Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Polygonum species		Yes	FAC
2. Echinochloa crus-galli		Yes	FACW
3. Carex species		Yes	FAC
4. Juncus speceis		Yes	FAC
5. Festuca species		Yes	NI
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Woody Vine Stratum (Plot size: 30 ft)			
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: 6 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 86 (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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-21

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Area soils pass hydric soil criteria.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-22

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.143738 Long: -88.782446 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: Upland

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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 X	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Positive indicators were only observed for one of the three wetland criteria.

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:

Area does not passes hydrology criteria of a wetland.

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

Sampling Point: WSP-22

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Festuca species		Yes	NI
2. Various upland grass species.			
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 ft)			
1. Rosa multiflora			
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: 0 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		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).

Area vegetation does not meet hydric criteria. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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 %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-23

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.143106 Long: -88.781824 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators for all three wetland criteria were observed.

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)
- [ ] 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): 0-4
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-23

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Phragmites australis		Yes	FACW
2.			
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 ft)			
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

___ 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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Area soils pass hydric soil criteria.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-24

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.142668 Long: -88.782421 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

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)
- [ ] 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): 0-2
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-24

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30 ft)			
1. Festuca speceis		Yes	FACW
2. Carex species		Yes	FAC
3. Juncus species		Yes	FAC
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 ft)			
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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12-18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Area soils pass hydric soil criteria.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-25

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.142820 Long: -88.782770 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: Upland

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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 X	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Positive indicators were only observed for one of the three wetland criteria.

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:

Area does not passes hydrology criteria of a wetland.

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

Sampling Point: WSP-25

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Festuca species		Yes	NI
2.			
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 ft)			
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: 0 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		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).

Area vegetation does not meet hydric criteria. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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
0-4	10YR 3/3		10YR 5/1				Clay	
4-12	10YR 7/1		10YR 5/8				Clay	
12/18	10YR 6/1		10YR 5/6				Silty/Clay	

[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:

Positive indicators of hydric soils were observed.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-26

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.146041 Long: -88.781578 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were observed for all three wetland criteria.

HYDROLOGY

Wetland Hydrology Indicators:

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

- [x] 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)
- [ ] 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): 0-6
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-26

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

Sapling/Shrub Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30 ft)			
1. Festuca speceis		Yes	FACW
2. Carex species		Yes	FAC
3. Juncus species		Yes	FAC
4. Polygonum species		Yes	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Woody Vine Stratum (Plot size: 30 ft)			
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

___ 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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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 %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1						silt loam	
4-18	10YR 5/2		10YR 5/6				Loamy clay	

[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:

Area soils pass hydric soil criteria.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-27

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): concave Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.145559 Long: -88.782067 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: emergent

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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:

Positive indicators were observed for all three wetland criteria.

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 X	No _____	Depth (inches): 0-6
Water Table Present?	Yes X	No _____	Depth (inches): 18
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:

Area passes hydrology criteria of a wetland.

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

Sampling Point: WSP-27

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

Sapling/Shrub Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Herb Stratum (Plot size: 30 ft)			
1. Festuca speceis		Yes	FACW
2. Carex species		Yes	FAC
3. Juncus species		Yes	FAC
4. Polygonum species		Yes	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	
50% of total cover:		20% of total cover:	

Woody Vine Stratum (Plot size: 30 ft)			
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

___ 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).

Area is dominated by hydrophytic vegetation. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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 %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1						silt loam	
4-18	10YR 5/2		10YR 5/6				Loamy clay	

[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:

Area soils pass hydric soil criteria.

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Shawnee process Water Basin Project City/County: McCracken Sampling Date: 10-11 Jan. 2018

Applicant/Owner: _____ State: KY Sampling Point: WSP-28

Investigator(s): Jeremy L. Jackson, Hunter Jackson Section, Township, Range: Paducah

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-5%

Subregion (LRR or MLRA): _____ Lat: 37.145565 Long: -88.781138 Datum: NAD83

Soil Map Unit Name: Dumps, coal and waste disposal areas NWI classification: Upland

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

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation No, Soil Yes, or Hydrology No 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 X	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks:

Positive indicators were only observed for one of the three wetland criteria.

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:

Area does not passes hydrology criteria of a wetland.

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

Sampling Point: WSP-28

Tree Stratum (Plot size: 30 ft)	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: 30 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		

50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30 ft)			
1. Festuca species		Yes	NI
2.			
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 ft)			
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: 0 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		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).

Area vegetation does not meet hydric criteria. Vegetation may need to be reevaluated during the growing season to determine additional species present in the herbaceous stratum and species level identification for more accurate indicator status.

SOIL

Sampling Point: WSP-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 %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1						silt loam	
4-18	10YR 5/2		10YR 5/6				loamy/Clay	

[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:

Positive indicators of hydric soils were observed.

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. A (UT-A)	LOCATION	
STATION # SAP 1 REACH ID# _____	STREAM CLASS Perennial	
LAT. 37.146523 LONG. -88.786582	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 8	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 87

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. A (UT-A)	LOCATION	
STATION # SAP 6 REACH ID# UTA-R2	STREAM CLASS Perennial	
LAT. 37.144288 LONG. -88.783876	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 20	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 3 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 3 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 138

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. A1 (UT-A1)	LOCATION	
STATION # SAP 5 REACH ID# reach 2	STREAM CLASS Ephemeral	
LAT. 37.145021 LONG. -88.780580	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Form # EL - _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 0 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 0 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 65

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. A1 (UT-A1)	LOCATION	
STATION # SAP 4 REACH ID# Reach 1	STREAM CLASS Intermittent	
LAT. 37.143513 LONG. -88.780892	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 0 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 0 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 128

Form # EL2 - _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. A2 (UT-A2)	LOCATION	
STATION # SAP 9 REACH ID# Reach 1	STREAM CLASS Intermittent	
LAT. 37.143701 LONG. -88.783041	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 172

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. A2 (UT-A2)	LOCATION	
STATION # SAP 10 REACH ID# Reach 2	STREAM CLASS Intermittent	
LAT. 37.144386 LONG. -88.782284	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 0 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 0 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 131

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. B (UT-B)	LOCATION	
STATION # SAP 3 REACH ID# Reach 1	STREAM CLASS Perennial	
LAT. 37.148454 LONG. -88.785569	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE 18	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 167

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. B (UT-B)	LOCATION	
STATION # SAP 2 REACH ID# Reach 2	STREAM CLASS Perennial	
LAT. 37.149340 LONG. -88.783828	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 3	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 2	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 0 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 0 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 50

Form # EL2 - _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. E (UT-C)	LOCATION	
STATION # SAP 7 REACH ID# _____	STREAM CLASS Ephemeral	
LAT. 37.154928 LONG. -88.785816	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 10	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 0 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 0 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 95

Form # EL2 - _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. D (UT-D)	LOCATION	
STATION # _ REACH ID# _____	STREAM CLASS Perennial	
LAT. 37.158326 LONG. -88.779005	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	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 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools 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 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "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
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
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
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
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

Total Score _____ Was unable to score do to water depth and lack of visibility, unable to observe substrate conditions directly.

Form # EL2 - _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

STREAM NAME Unnamed Trib. E (UT-E)	LOCATION	
STATION # SAP 8 REACH ID# _____	STREAM CLASS Ephemeral	
LAT. 37.150168 LONG. -88.786088	RIVER BASIN Ohio River	
STORET #	AGENCY	
INVESTIGATORS Jeremy L. Jackson, Hunter Jackson		
FORM COMPLETED BY Jeremy L. Jackson	DATE 01/10/18 TIME _ PM	REASON FOR SURVEY EIS

Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE 11	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	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 14	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE 0	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 15	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 1 to 2 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 13	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank)	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.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 131

Form # EL2 - _____

Appendix C: Photographs

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Representative photograph of unnamed tributary A (UT-A).

Representative photograph of unnamed tributary A1 (UT-A1).

Representative photograph of unnamed tributary A1 (UT-A1).

Representative photograph of unnamed tributary A2 (UT-A2).

Representative photograph of unnamed tributary B (UT-B).

Representative photograph of unnamed tributary B (UT-B).

Representative photograph of unnamed tributary B (UT-B).

Representative photograph of confluence of UT-A and UT-B.

Representative photograph of unnamed tributary C (UT-C).

Representative photograph of unnamed tributary C (UT-C).

Representative photograph of unnamed tributary D (UT-D).

Representative photograph of unnamed tributary D (UT-D).

Representative photograph of unnamed tributary E (UT-E).

Representative photograph of Ohio River adjacent to northeast section of project.

Representative photograph of wetland sampling point 1 (WSP-1).

Representative photograph of wetland sampling point 3 (WSP-3).

Representative photograph of wetland sampling point 4 (WSP-4).

Representative photograph of wetland sampling points 5 and 6 (WSP-5 and WSP-6).

Representative photograph of wetland sampling point 8 (WSP-8).

Representative photograph of wetland sampling point 9 (WSP-9).

Representative photograph of wetland sampling point 11 (WSP-11).

Representative photograph of wetland sampling point 12 (WSP-12).

Representative photograph of wetland sampling point 13 (WSP-13).

Representative photograph of wetland sampling point 15 (WSP-15).

Representative photograph of wetland sampling point 16 (WSP-16).

Representative photograph of wetland sampling point 17 (WSP-17).

Representative photograph of wetland sampling point 19 (WSP-19).

Representative photograph of wetland sampling point 20 (WSP-20).

Representative photograph of wetland sampling point 21 (WSP-21).

Representative photograph of wetland sampling point 23 (WSP-23).

Representative photograph of wetland sampling point 24 (WSP-24).

Representative photograph of wetland sampling point 26 (WSP-26).

Representative photograph of wetland sampling point 27 (WSP-27).

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Appendix D: Wetland and Stream Impact Maps

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TVA

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Potential Impacts

Legend

- Project Boundary
- Proposed Water Basin Boundary
- Temporary Treatment Areas
- Potential Laydown Areas
- Pipe Corridors
- Ephemeral
- Intermittent
- Perennial
- Herbaceous Wetlands
- Forested Wetlands

Potential Impacts

- Perennial Stream Impacts - 2,036.74 Linear Feet
- Ephemeral Stream Impacts - 24.64 Linear Feet
- Wetland Impacts - 0.26 Acres

350 175 0 Feet

JACKSON GROUP

AECOM

Sheet 1 of 3

TVA

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Potential Impacts

Legend

- Project Boundary
- Proposed Water Basin Boundary
- Temporary Treatment Areas
- Potential Laydown Areas
- Pipe Corridors
- Ephemeral
- Intermittent
- Perennial
- Herbaceous Wetlands
- Forested Wetlands

Potential Impacts

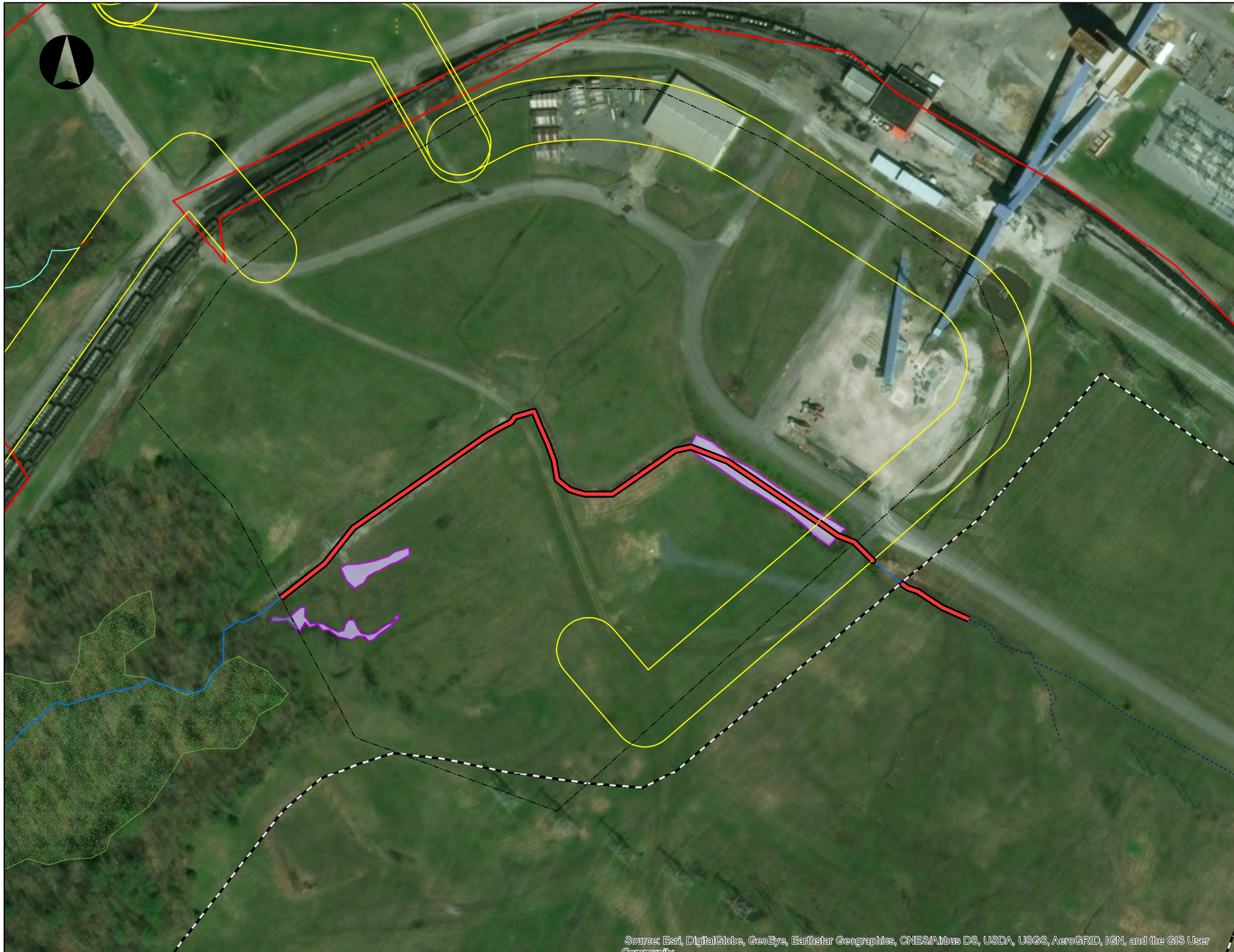
- Perennial Stream Impacts - 2,036.74 Linear Feet
- Ephemeral Stream Impacts - 24.64 Linear Feet
- Wetland Impacts - 0.26 Acres

350 175 0 Feet

JACKSON GROUP

AECOM

Sheet 2 of 3



TVA

Shawnee Process Water Basin Project

Jurisdictional Waters Determination Map

Potential Impacts

Legend

- Project Boundary
- Proposed Water Basin Boundary
- Temporary Treatment Areas
- Potential Laydown Areas
- Pipe Corridors
- Ephemeral
- Intermittent
- Perennial
- Herbaceous Wetlands
- Forested Wetlands

Potential Impacts

- Perennial Stream Impacts - 2,036.74 Linear Feet
- Ephemeral Stream Impacts - 24.64 Linear Feet
- Wetland Impacts - 0.26 Acres

350 175 0 Feet

JACKSON GROUP

AECOM

Sheet 3 of 3

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Appendix E: Soils Report

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United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Ballard and McCracken Counties, Kentucky

Project

January 30, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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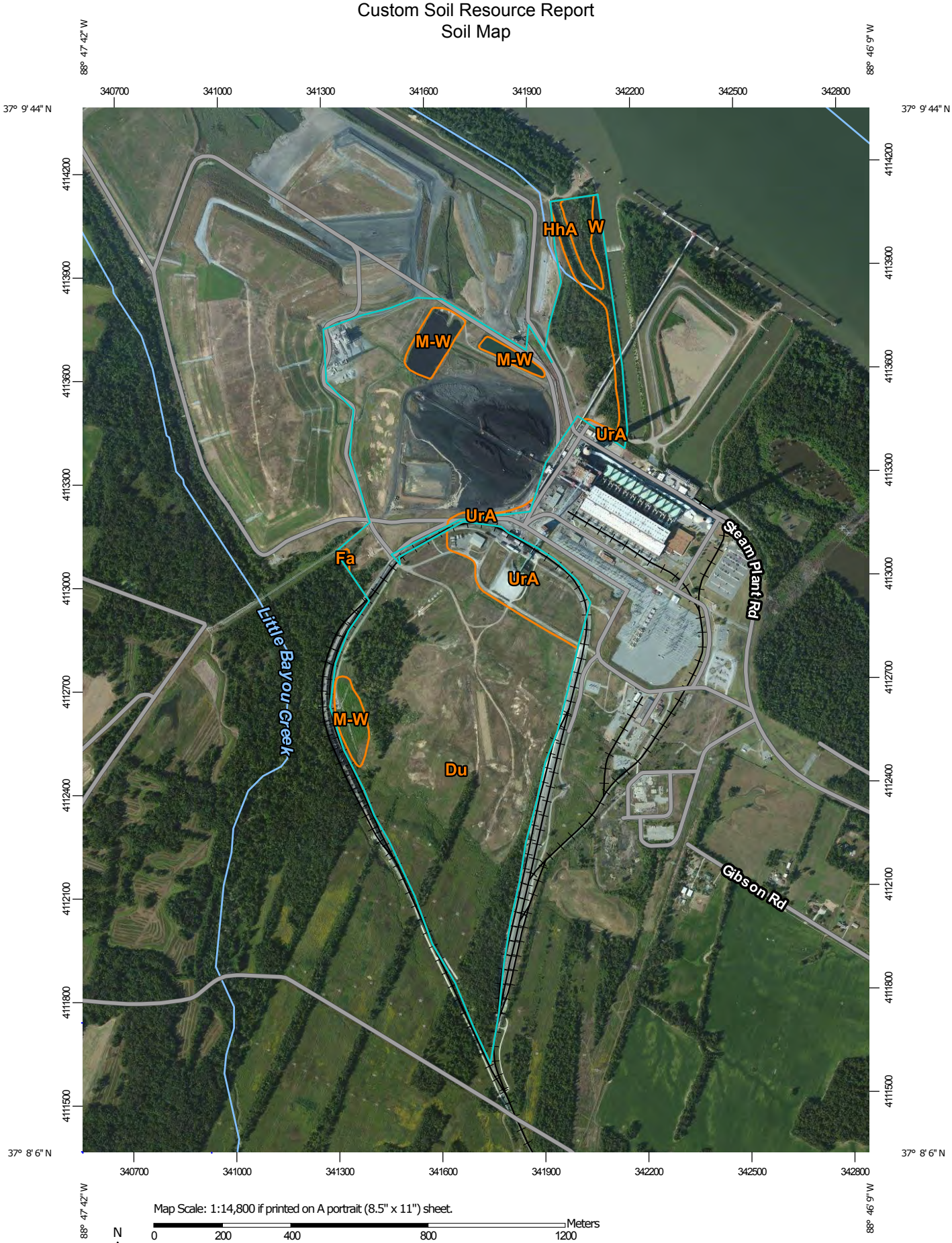
Soil Map.....6
Legend.....7
Map Unit Legend..... 8
Map Unit Descriptions..... 8
Ballard and McCracken Counties, Kentucky.....10
Du—Dumps, Coal, and Waste disposal areas..... 10
Fa—Falaya-Collins complex, 0 to 2 percent slopes, occasionally flooded..10
HhA—Henshaw silt loam, 0 to 2 percent slopes, frequently flooded.....12
M-W—Miscellaneous water.....14
UrA—Urban land-Udorthents complex, 0 to 4 percent slopes..... 14
W—Water..... 16

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:14,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

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

Soil Survey Area: Ballard and McCracken Counties, Kentucky
Survey Area Data: Version 11, Oct 3, 2017

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

Date(s) aerial images were photographed: Sep 13, 2011—Oct 21, 2011

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Du	Dumps, Coal, and Waste disposal areas	241.5	85.2%
Fa	Falaya-Collins complex, 0 to 2 percent slopes, occasionally flooded	0.3	0.1%
HhA	Henshaw silt loam, 0 to 2 percent slopes, frequently flooded	3.9	1.4%
M-W	Miscellaneous water	10.9	3.8%
UrA	Urban land-Udorthents complex, 0 to 4 percent slopes	20.0	7.0%
W	Water	6.8	2.4%
Totals for Area of Interest		**283.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not

mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Ballard and McCracken Counties, Kentucky

Du—Dumps, Coal, and Waste disposal areas

Map Unit Setting

National map unit symbol: 1qm65
Mean annual precipitation: 40 to 56 inches
Mean annual air temperature: 46 to 69 degrees F
Frost-free period: 177 to 222 days
Farmland classification: Not prime farmland

Map Unit Composition

Dumps, coal and waste disposal areas: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dumps, Coal And Waste Disposal Areas

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Water

Percent of map unit: 5 percent
Hydric soil rating: No

Fa—Falaya-Collins complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 1qm4q
Elevation: 320 to 450 feet
Mean annual precipitation: 40 to 56 inches
Mean annual air temperature: 46 to 69 degrees F
Frost-free period: 177 to 222 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Falaya, occasionally flooded, and similar soils: 55 percent
Collins, occasionally flooded, and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Falaya, Occasionally Flooded

Setting

Landform: Flood plains, drainageways
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 52 inches: silt loam
H3 - 52 to 80 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Very high (about 12.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Description of Collins, Occasionally Flooded

Setting

Landform: Flood plains, drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Typical profile

H1 - 0 to 12 inches: silt loam
H2 - 12 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 22 to 40 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Very high (about 12.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Waverly, occasionally flooded

Percent of map unit: 3 percent
Landform: Flood plains, drainageways
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Vicksburg

Percent of map unit: 3 percent
Landform: Flood plains, drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Iuka

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Center

Percent of map unit: 1 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Kurk

Percent of map unit: 1 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

HhA—Henshaw silt loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 1qkxc
Elevation: 300 to 330 feet
Mean annual precipitation: 40 to 56 inches
Mean annual air temperature: 46 to 69 degrees F
Frost-free period: 177 to 222 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Henshaw, frequently flooded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Henshaw, Frequently Flooded

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed fine-silty alluvium

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 15 inches: silt loam
H3 - 15 to 32 inches: silty clay loam
H4 - 32 to 80 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Henshaw, (hydric, flooding)

Percent of map unit: 10 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Uniontown

Percent of map unit: 3 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Newark, (hydric, flooding)
Percent of map unit: 1 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Wheeling
Percent of map unit: 1 percent
Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

M-W—Miscellaneous water

Map Unit Setting
National map unit symbol: 1qm7p
Mean annual precipitation: 40 to 56 inches
Mean annual air temperature: 46 to 69 degrees F
Frost-free period: 177 to 222 days
Farmland classification: Not prime farmland

Map Unit Composition
Water, miscellaneous: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

UrA—Urban land-Udorthents complex, 0 to 4 percent slopes

Map Unit Setting
National map unit symbol: 1qmkz
Elevation: 320 to 500 feet
Mean annual precipitation: 40 to 56 inches
Mean annual air temperature: 46 to 69 degrees F
Frost-free period: 177 to 222 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 65 percent
Udorthents and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Properties and qualities

Slope: 0 to 4 percent
Runoff class: Very high
Depth to water table: About 18 to 24 inches

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Udorthents

Setting

Landform: Ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Medium
Depth to water table: About 18 to 24 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Grenada

Percent of map unit: 4 percent
Landform: Flats
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Routon

Percent of map unit: 4 percent
Landform: Drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Loring

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Feliciana

Percent of map unit: 2 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Falaya

Percent of map unit: 1 percent
Landform: Drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Collins

Percent of map unit: 1 percent
Landform: Drainageways
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 1qm7q
Mean annual precipitation: 40 to 56 inches
Mean annual air temperature: 46 to 69 degrees F
Frost-free period: 177 to 222 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Appendix D – Agency Consultation

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Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

April 12, 2018

Mr. Craig Potts
State Historic Preservation Officer
and Executive Director
Kentucky Heritage Council
300 Washington Street
Frankfort, Kentucky 40601

Dear Mr. Potts:

TENNESSEE VALLEY AUTHORITY (TVA), SHAWNEE FOSSIL PLANT, PROCESS WATER BASIN, MCCRACKEN COUNTY, KENTUCKY

TVA proposes to construct a process water basin (PWB) at Shawnee Fossil Plant (SHF). The PWB would be part of a system for treating wastewater runoff from the coal yard drainage basin and other process water plant flows. Construction of the PWB would support TVA's goals to eliminate all wet storage of coal combustion residuals (CCR) at SHF and meet new CCR regulations. TVA's preferred alternative for the PWB includes construction of two adjacent 6-acre basins inside the Rail Loop and connecting them to the coal yard drainage basin and SHF outfall with piping. TVA has determined that this project is an undertaking (as defined at 36 CFR § 800.16(y)) that has the potential to cause effects on historic properties. We are initiating consultation under Section 106 of the National Historic Preservation Act for this undertaking.

The proposed project would include construction of two components: the PWB and a pipeline connecting the PWB to both the coal yard drainage basin and outfall. For access to the PWB, TVA would use an access bridge that would be constructed over the railroad as part of a separate undertaking at SHF, the "Demolition of Structures and Installation of Prefabricated Bridge" project, for which we are consulting concurrently with your office. TVA has determined that the area of potential effects (APE) for archaeological resources includes the potential footprints of the PWB and the pipeline. Because TVA is proposing construction of a bridge within the same corridor as the pipeline, even though the bridge is part of a separate undertaking, we included a ca. 100-foot buffer on the proposed bridge location and a 100 to 200-foot pipeline corridor in this undertaking's APE. In addition, we include the entire area within the Rail Loop as part of the archaeological APE. In the unlikely event that TVA modifies the project so as to affect other areas within the Rail Loop, this will allow TVA to consider the project's potential effects on historic properties in those areas without additional cultural resources surveys.

TVA determined the APE for visual effects to be the viewshed within a half-mile radius of the proposed PWB and pipeline. The eastern and northern portions of this APE were included in two previous architectural surveys that TVA performed in connection with prior undertakings: a

proposed dewatering facility in 2016 and a proposed CCR management project in 2017. Neither of the previous architectural surveys identified any NRHP-eligible above ground resources other than SHF itself, which was listed on the NRHP in 2016. Your office agreed with our findings and determinations for those two prior undertakings (letters dated September 21, 2016 and August 31, 2017, respectively).

TVA carried out a desktop review of the architectural APE, using historic topographic maps, TVA's 1951 Land Acquisition Maps for Shawnee Steam Plant, and current satellite imagery available from www.bing.com. This review identified no extant historic structures other than SHF. Existing facilities/infrastructure within the visual APE include several non-contributing SHF structures such as the ash disposal facility, fly ash transfer silos, warehouses, storage sheds, the boiler building, and the limestone conditioner building. These facilities are pictured and discussed in a 2017 survey report prepared by Tennessee Valley Archaeological Research (*Phase I Architectural Survey for the Proposed TVA Shawnee Dry Ash Landfill Project, McCracken County, Kentucky*. KHC Project Registration #FY-2608). Also within the viewshed are a set of pipelines, a capped CCR landfill, a railroad, various roads, the coal yard, transmission structures, and a retention pond. Some of these are pictured in the 2016 survey letter report prepared by Amec Foster Wheeler (*RE: Determination of Effects Assessment of Historic Resources for the Shawnee Fossil Plant Dewatering Facility Project Near Paducah, McCracken County, Kentucky*). TVA finds that the proposed undertaking would result in a visual effect on SHF, but that the effect would not be adverse because the new facilities would be similar in appearance to the existing industrial facilities and infrastructure within the viewshed.

TVA is seeking ways to move forward with this project even as survey and consultation continues on those portions of the project area that are not part of the current design, but that have been included in the APE. One such way is for TVA to use a phased evaluation and identification process as provided in § 800.4(b)(2) and § 800.5(a)(3) of the regulations of the Advisory Council on Historic Preservation ("Council"). In using the phased approach, TVA would consider the project in two phases (Figure 1): Phase A, the area within which the PWB and pipeline would be constructed under the current design, and Phase B, the area within the Rail Loop that would not be affected unless the location or design of the PWB is modified. Accordingly, we conducted the cultural resources survey in two corresponding phases, beginning with Phase A.

Phase A of the archaeological survey includes the proposed pipe and bridge corridors and the preferred location for the PWB and encompasses approximately 38.2 acres. Phase B includes all remaining areas of the APE (consisting of those areas within the Rail Loop that would only be affected if TVA were to change the current design), and encompasses approximately 115 acres.

TVA contracted with AMEC Foster Wheeler Environment and Infrastructure, Inc. (AMEC Foster Wheeler) to perform a Phase I Archaeological survey in Phase A of the APE. Enclosed are two copies of the draft archaeological survey report titled, *Phase I Archaeological Survey, TVA Shawnee Process Water Basin, Phase A, McCracken County, Kentucky*, along with two CDs containing digital copies.

AMEC Foster Wheeler's background study, conducted prior to the field study, indicated that no previously recorded archaeological sites or properties listed in the NRHP are located within the Phase A survey area. The survey crew verified that the APE contains no above-ground structures. The archeological study included pedestrian survey and systematic shovel testing. The survey did not result in the identification of any archaeological sites or features. The report authors recommend no further archaeological investigations in connection with TVA's proposed actions in the Phase A survey area.

TVA has read the report and agrees with the findings and recommendations of the authors. TVA finds that the undertaking would result in no adverse effects on historic properties within the Phase A area, in accordance with § 800.5(b).

Pursuant to 36 CFR Part 800.5(d)(2), we are seeking your concurrence with our findings that the project as currently proposed will result in no adverse effects on historic properties. Consistent with the phased approach allowed by the Council's regulation, we will continue to consult further with your office concerning the undertaking's potential to affect historic properties in the remainder of the APE.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the APE that may be of religious and cultural significance and are eligible for the NRHP.

If you have any questions or comments, please contact Steve Cole by telephone, (865) 632-2551 or by email, sccole0@tva.gov.

Sincerely,

Clinton E. Jones
Manager
Cultural Compliance

SCC:ABM
Enclosures

INTERNAL COPIES ONLY, NOT TO BE INCLUDED WITH OUTGOING LETTER:

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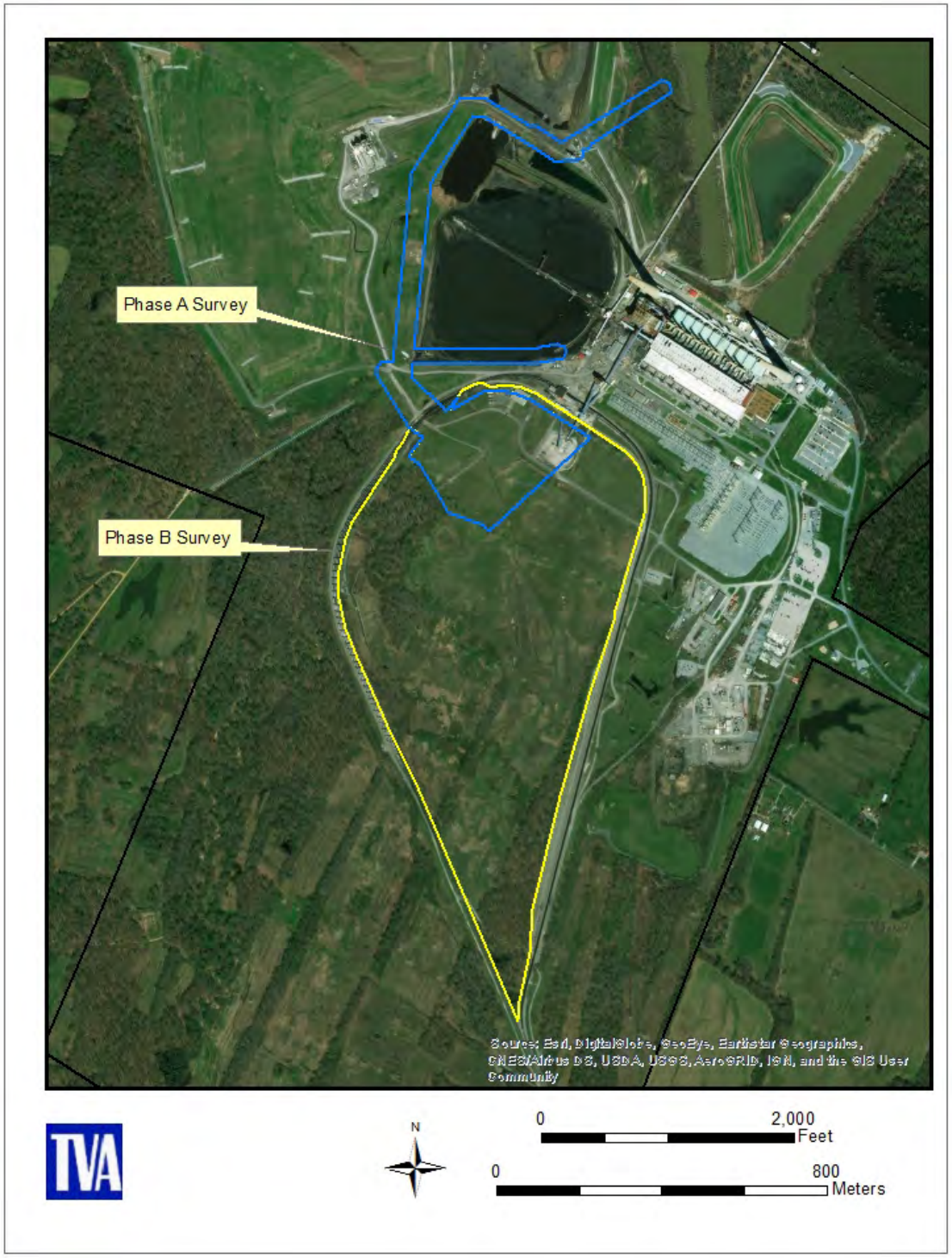

Figure 1. APE, divided into the two phases of survey: Phase A (PWB, bridge, pipeline corridor), and Phase B (remainder of Rail Loop area).

PHASE I ARCHAEOLOGICAL SURVEY

TVA Shawnee Process Water Basin, Phase A, McCracken County, Kentucky.
Abbreviated – Negative Finding Report

March 2018

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