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JOHNSONVILLE AERODERIVATIVE COMBUSTION TURBINES PROJECT
DRAFT ENVIRONMENTAL ASSESSMENT

Humphreys County, Tennessee

Prepared by:
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Table of Contents

List of Tables

List of Figures

List of Appendices

Symbols, Acronyms, and Abbreviations

AADT	Annual Average Daily Traffic
Aero	Aeroderivative
APE	Area of Potential Effect
APCR	Air Pollution Control Regulations
AR	Assessment Report
BACT	Best Available Control Technology
BMP	Best Management Practice
C	Celsius
CAA	Clean Air Act
CC	Combined Cycle
CCR	Coal Combustion Residuals
CEQ	Council on Environmental Quality
CFC	Chlorofluorocarbons
CFR	Code of Federal Regulations
CH_4	Methane
CHP	Combined Heat and Power
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CPP	Clean Power Plan
CT	Combustion Turbine
CWA	Clean Water Act
dB	Decibel(s)
dBA	A-weighted decibel
DLE	Dry Low Emissions
DLN	Dry Low-NO_X
DO	Dissolved Oxygen
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMFs	Electric and magnetic fields
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
ESA	Endangered Species Act
F	Fahrenheit
FR	Federal Register
GHG	Greenhouse Gases
gpm	Gallons per Minute
ha	Hectare
HAP	Hazardous Air Pollutant
HRSG	Heat Recovery Steam Generator
HUD	U.S. Department of Housing and Urban Development
ICE	Internal Combustion Units
IPaC	Information for Planning and Consultation
IPCC	Intergovernmental Panel on Climate Change
IRP	Integrated Resource Plan
JCT	Johnsonville Combustion Turbine
kV	Kilovolt
Ldn	Day-Night Sound Level
MCL	Maximum Contaminant Level
MMBtu	Million British Thermal Units
MW	Megawatt
NAAQS	National Ambient Air Quality Standards

NCA4	Fourth National Climate Assessment
NCA5	Fifth National Climate Assessment
NDC	Nationally Determined Contribution
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLCD	National Land Cover Dataset
NMSZ	New Madrid Seismic Zone
NNSR	Nonattainment New Source Review
NO_X	Nitrogen Oxide
NO_2	Nitrogen Dioxide
N_2O	Nitrous Oxide
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSPS	New Source Performance Standards
NSR	New Source Review
OC	Oxidation Catalyst
O_2	Oxygen
O_3	Ozone
OSHA	Occupational Safety and Health Administration
Pb	Lead
PM	Particulate Matter
ppm	Parts Per Million
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
ROW	Right-of-Way
SCC	Social Cost of Carbon
SCR	Selective Catalytic Reduction
SER	Significant Emissions Rate
SHPO	State Historic Preservation Office
SI	Spark Ignition
SO_X	Sulfur Oxide
SO_2	Sulfur Dioxide
SWPPP	Stormwater Pollution Prevention Plan
TDEC	Tennessee Department of Environment and Conservation
TDOA	Tennessee Division of Archaeology
TMSP	Tennessee Multi-Sector Permit
tpy	tons per year
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
UN	United Nations
UPLs	Upper Prediction Limits
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VOC	Volatile Organic Compounds

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CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction

In June 2019, the Tennessee Valley Authority (TVA) published the 2019 Integrated Resource Plan (IRP), which was developed with input from stakeholder groups and the general public. The purpose of the IRP was to provide TVA with direction on how to best meet future demand for power. The IRP process evaluated TVA's current energy resource portfolio and alternative future portfolios of energy resource options to meet future electrical energy needs of the TVA region while taking into account TVA's mission of serving the Tennessee Valley through energy, environmental stewardship, and economic development. As part of the IRP, TVA identified the gas fleet, including combustion turbines (CTs), as playing a critical role in providing the flexibility needed to integrate renewable energy generation and promote distributed energy resources (TVA 2019a).

TVA's asset strategy incorporates the strategic direction from the 2019 Integrated Resource Plan and continues to support affordable, reliable, and cleaner energy for the customers TVA serves. The proposed action to be studied as part of this EA is one piece of the overall asset strategy, which also includes:

- Maintaining the existing low-cost, carbon-free nuclear and hydro fleets
- Retiring aging coal units as they reach the end of their useful life, expected by 2035
- Adding 10,000 megawatts (MW) of solar by 2035 to meet customer demands and system needs, complemented with storage
- Using natural gas to enable needed coal retirements and solar expansion as other technologies develop
- Leveraging demand-side options, in partnership with local power companies
- Partnering to develop new carbon-free technologies for deeper decarbonization

TVA utilizes least-cost planning in the development of its asset strategy to provide electricity at the lowest feasible rate for customers. As a result of resource changes outlined in the asset strategy and formalized in TVA's Strategic Intent and Guiding Principles document (TVA 2021h), TVA has a plan for 70 percent carbon reductions by 2030, a path to approximately 80 percent carbon reductions by 2035 and aspires to net-zero carbon emissions by 2050 (based on a 2005 baseline).

TVA expects to add about 10,000 MW of solar by 2035, with 2,300 MW already committed. Peaking units such as CTs are valuable in meeting electricity demand for shorter periods of high demand on summer and winter peak days, and their flexibility also plays a key role in successfully integrating renewable resources, which have variable and unpredictable generation patterns.

TVA's natural gas-fueled fleet currently includes 21 combined cycle (CC) units at eight sites and 87 simple-cycle CT units at nine sites (TVA 2019b). Eighty of the CT units are capable of using fuel oil and 60 are capable of quick start-up. CC technology systems initially operate the same as traditional CT units, but they also capture exhaust heat from the gas turbines and convert it to steam that is used to drive steam turbines to produce additional power (TVA 2021d).

Aeroderivative Combustion Turbines:

Aeroderivative (Aero) CT units are highly efficient peaking units that can ramp up very quickly to provide capacity and grid support when needed. Peaking units are essential for maintaining system reliability requirements, as they can start up quickly to meet sudden changes in either demand or supply.

The Aero CTs would enhance the reliability of TVA's peaking fleet and promote system flexibility to integrate renewable resources which have variable generation patterns.

Similar to TVA's existing simple-cycle CTs, aeroderivative (Aero) CT units operate like a jet engine where the compressor draws air into the unit, compressing it, mixing it with fuel, and igniting it. As combustion occurs, gas expands through turbine blades connected to a generator to produce electricity. Aero CTs are different from the simple-cycle CTs as they provide high cycling capability and very fast startup. The Aero CT's speed provides excellent control response for better grid support, particularly as TVA increases the use of intermittent renewable resources.

Aero CTs enhance system flexibility, integrate increasing renewable capacity, and provide dispatchable capacity. They are highly efficient peaking units with very fast ramp rates and little start up penalty that can achieve full generating capacity from a cold start very quickly and allow for multiple daily starts. As such, they improve the system's ability to effectively integrate generation from variable resources such as solar and wind. In addition, the Aero CTs would provide emergency Black Start capability to aid in system restoration following a significant event or disturbance to the bulk electric system. In the event of a widespread power outage, Black Start is the ability of a generating unit to be manually started and connected to the grid to help start other generating units and restore electricity to the grid. Aero CTs also provide the ability to run in synchronous condensing mode, which can efficiently support local area voltage stability that is especially important near load centers.

1.2 Purpose and Need

In Fiscal Year 2019, TVA completed a CT Modernization Study to evaluate the condition of TVA's current CT units and form recommendations for investments to ensure a reliable and flexible peaking fleet into the future. The results of the study placed TVA's existing frame CTs in three categories based on age and material condition and made recommendations for each category:

- Reliable CT units, which have received some recent investment, are around 20 years old, and are expected to remain reliable at current funding levels. Recommendation: **Invest to Maintain**
- Challenged CT units, which have received some recent investment, are 40+ years old, and require additional investment to ensure reliability. Recommendation: **Refurbish and Maintain**
- Most Challenged CT units, which have received little recent investment, are 40+ years old, and require replacement to ensure reliability. Recommendation: **Replace**

The CT Modernization Study also recommended adding approximately 500-650 MW of new Aero CTs in the near-term to enhance system flexibility, integrate increasing renewable capacity, and provide dispatchable capacity.

TVA is proposing the addition of 10 natural gas-fired Aero CTs at the Johnsonville Reservation. The Aero CTs would generate approximately 550 MW for commercial operation no later than December 31, 2024. TVA's Johnsonville Reservation currently houses 20 simple-cycle CT units within the Johnsonville Combustion Turbine (JCT) plant. The existing JCT Units 1-16 were determined to be in the Most Challenged group and will be retired with their combined generation being replaced at TVA's Paradise and Colbert facilities. The retirement of JCT Units 1-16 and the Allen CT units, and their replacement with new CT units at Paradise and Colbert was among the actions evaluated in the *Paradise and Colbert Combustion Turbine Plants Environmental Assessment* (EA) (TVA 2021e).

Investments in adding Aero CTs to the peaking fleet aligns with the direction in the IRP, which recommended substantial solar additions over the next two decades, by enhancing system flexibility to integrate renewables and distributed resources. As the amount of solar generation on the TVA generation portfolio continues to increase, flexibility of the remainder of the fleet becomes even more important. Cloud patterns that temporarily block the sun and reduce solar generation require other generating units to respond in order to continue to reliably supply power to customers. Aero CTs are inherently well-suited to provide flexibility, lessening the burden on the remainder of the system to integrate renewables.

Therefore, the proposed action is the addition of 10 natural gas-fired Aero CTs to generate approximately 550 MW at the existing TVA Johnsonville Reservation. The Aero CTs are needed to ensure TVA maintains a reliable peaking fleet and would enhance system flexibility by facilitating the integration of intermittent renewable resources. TVA has prepared this Draft EA pursuant to the National Environmental Policy Act (NEPA) to evaluate the environmental impacts from construction and operation of these Aero CTs.

1.3 Decision to be Made

This EA has been prepared to inform TVA decision makers and the public about the environmental consequences of the proposed action. The decision TVA must make is whether to construct and operate the Aero CTs at the Johnsonville Reservation. TVA will use this EA to support the decision-making process and to determine whether an Environmental Impact Statement (EIS) should be prepared or whether a Finding of No Significant Impact may be issued.

1.4 Related Environmental Reviews

Various related environmental documents and materials were reviewed during the preparation of this EA and are listed below. The contents of these documents helped to support the proposed action and/or describe the affected environment and are incorporated by reference as appropriate.

- *2019 Integrated Resource Plan (TVA 2019a)* – TVA's 2019 IRP provides direction for how TVA will meet the long-term energy needs of the Tennessee Valley region while fulfilling its mission of serving the Tennessee Valley by providing low-cost reliable power, environmental stewardship, and economic development.

- *2019 Integrated Resource Plan, EIS (TVA 2019b)* – This EIS accompanied the 2019 IRP and assessed the natural, cultural, and socioeconomic impacts associated with the implementation of the IRP. The proposed actions evaluated in this EA support TVA's preferred alternative, Target Power Supply Mix, as described in the IRP and accompanying EIS.
- *Johnsonville Cogeneration Plant EA (TVA 2015)* – Following the retirement of the fossil plant in 2019, TVA evaluated whether to continue to provide steam to external customers. This EA was prepared to evaluate the environmental effect associated with the construction and operation of a heat recovery steam generator (HRSG) integrated into an existing combustion turbine at the Johnsonville Fossil Plant.
- *Johnsonville Fossil Plant Decontamination and Deconstruction EA (TVA 2018)* – In December of 2017 the Johnsonville Fossil Plant ceased operation, and TVA proposed to deconstruct the fossil plant. This EA was prepared to evaluate the environmental effects associated with demolition of the plant into a brownfield site.
- *Johnsonville Fossil Plant Coal Yard and Coal Yard Runoff Pond Closure, Construction of a Process Water Basin and Development of a Borrow Site EA (TVA 2019c)* – TVA has retired all coal-fired units at the Johnsonville Reservation and no longer has a need for coal and therefore proposed to close the associated coal yard and coal yard runoff pond. This EA was prepared to evaluate the environmental effected associated with closure of the coal yard and coal yard runoff pond, and construction a process water basin for process flow management associated with the CT site, and development a borrow area to support foreseeable projects at the Johnsonville Reservation.
- *Paradise and Colbert Combustion Turbine Plants EA (TVA 2021e)* – TVA prepared this EA to evaluate environmental effects associated the retirement and decommissioning of certain CT units at the Allen and Johnsonville reservations and the construction of three new natural gas-fueled frame CT units (750 MW) at Paradise and three frame CT units (750 MW) at Colbert for a total of 1,500 MW.

1.5 Scope of the Environmental Assessment and Summary of the Proposed Action

This EA evaluates the potential environmental, cultural, and socioeconomic impacts of the proposed construction and operation of Aero CTs at the Johnsonville Reservation. The impacts associated with the retirement and decommissioning of JCT Units 1-16 were analyzed in the 2019 IRP and are incorporated by reference into the current EA. Long-term actions related to the potential demolition of those units are outside the scope of this EA and will be addressed by TVA in the future when TVA has a detailed proposal for the demolition or future disposition of those units. The scope of this EA, therefore, focuses on the impacts related to construction and operation of Aero CT units, as well as any supporting facilities that may be necessary. A detailed description of the proposed action and alternatives considered are provided in Chapter 2.

This EA was prepared consistent with 2020 Council on Environmental Quality's (CEQ) regulations for implementing NEPA at 40 CFR 1500-1508 (85 Federal Register [FR] 43304-43376, July 16, 2020). TVA's 2020 NEPA regulations at 18 Code of Federal Regulations (CFR) 1318 issued in 2020 were also applied (85 FR 17434, Mar. 27, 2020). TVA considered the possible environmental effects of the proposed action, determined that

potential effects to the environmental resources listed below were relevant to the decision to be made, and assessed the potential impacts on these resources in detail in this EA:

- Air Quality
- Climate Change and Greenhouse Gases
- Geology and Soils
- Groundwater
- Surface Water
- Wetlands
- Aquatic Ecology
- Vegetation
- Wildlife
- Threatened and Endangered Species
- Visual Resources
- Cultural and Historic Resources
- Transportation
- Natural Areas, Parks and Recreation
- Noise
- Solid and Hazardous Waste
- Socioeconomics and Environmental Justice
- Public Health and Safety

TVA's preliminary analysis identified the following resources as not being affected by the proposed action and are therefore eliminated from further review in this EA.

- Prime Farmland – There are no prime farmland soils mapped within the temporary and permanent use areas. Therefore, there would be no impacts to prime farmland soils and this resource is not evaluated any further in this EA. Accordingly, completion of Form AD 1006 and consultation on prime farmlands is not required (Farmland Protection Policy Act, 7 United States Code [USC] 4201).
- Land Use – Proposed activities would occur on previously disturbed land located within the boundaries of the Johnsonville Reservation. Therefore, no changes in land use are anticipated to occur as a result of implementation of this project and this resource is not evaluated any further in this EA.
- Floodplains – Based on Humphreys County, Tennessee, flood insurance rate map panel number 47085C0140D (effective 09/25/2009), all project activities are located outside of the mapped 100-year floodplain. The proposed project would, therefore, be consistent with Executive Order (EO) 11988 (Floodplain Management), as amended by EO 13690, and have no significant impact on floodplains and their natural and beneficial values. Accordingly, this resource is not evaluated any further in this EA.

TVA's action would satisfy the requirements of EO 11988 (Floodplain Management) as amended by EO 13690, EO 11990 (Protection of Wetlands), EO 12898 (Environmental Justice), and EO 13751 (Invasive Species); and applicable laws including the National Historic Preservation Act (NHPA), Endangered Species Act (ESA), Clean Water Act (CWA), and Clean Air Act (CAA).

1.6 Public and Agency Involvement

TVA's public and agency involvement includes publication of a notice of availability and a 30-day public review of the Draft EA. The availability of the Draft EA was announced in newspapers that serve the Humphreys County, Tennessee area. The Draft EA was also posted on TVA's website. TVA's agency involvement includes circulation of the Draft EA to local, state, and federal agencies and federally recognized tribes, as part of the review.

1.7 Necessary Permits or Licenses

TVA would obtain all necessary permits, licenses, and approvals required for the alternative selected. TVA anticipates the following permits or approvals would likely be required for implementing the proposed alternative.

- Stormwater Best Management Practices (BMPs) and Tennessee Department of Environment and Conservation (TDEC) National Pollutant Discharge Elimination System (NPDES) permit application and/or modification for all stormwater discharges associated with construction activity that disturb more than one acre of land.
- Modification of the existing TDEC NPDES permit for discharges from the operation of the proposed Aero CT plant.
- Modification to Johnsonville Reservation's existing CAA Title V Operating Permit via Prevention of Significant Deterioration (PSD) review under the CAA.

CHAPTER 2 – ALTERNATIVES

2.1 Alternative Development

2.1.1 Generation Type

As described in Chapter 1, the 2019 CT Modernization Study recommended that TVA add approximately 500-650 MW of new Aero CTs to the fleet in the near-term to enhance system flexibility, integrate increasing renewable capacity, and provide dispatchable capacity which would lessen the burden on the remainder of the system as renewable energy resources such as solar are integrated.

At this time, the combination of renewable energy and storage cannot provide the same magnitude of reliable and cost-effective energy year-round as is possible with CTs in combination with renewables. While solar prices are becoming competitive, solar does not contribute to the winter peak, which typically occurs just before sunrise. Therefore, solar requires dispatchable resources, such as peaking gas generation, to support the winter peak. Wind resources do contribute to both summer and winter peak capacity (less than one third of nameplate or maximum rated output), but they are typically more expensive due to low regional wind speeds or high transmission costs. TVA recognizes the value that both short- and long-duration storage technologies will play in the future and is working to gain operational experience with battery storage technology.

2.1.2 Location

During initial project planning, TVA considered a range of alternatives and specific screening criteria with respect to the proposed action. Candidate sites were identified based on a desktop review of land parcels located near existing transmission access and near existing natural gas supply. Initial site screening resulted in multiple potential locations for new Aero CTs. The sites were then further evaluated using the following criteria summarized in Table 2-1.

Table 2-1. Summary of Criteria Evaluated to Determine the Location of the Aero CTs

Transmission	**Site Considerations**	**Operational Considerations**
• System Upgrades Needed • Locational Value	• TVA owned vs non-TVA Owned Sites • Site Availability (available for purchase) • Land Cost • Access to Water	• Supply Chain Considerations • Staffing
Fuel Supply	**Environmental Considerations**	**Financial and Planning Considerations**
• Cost • Availability • Reliability • Operational Considerations	• Environmental Regulations • Sensitive Environmental/Cultural Resources Present	• Long Range Financial Plan • Integrated Resource Plan

Based on evaluation of the screening criteria, TVA proposes to construct new Aero CTs at the Johnsonville Reservation. This location offered several advantages to alternative locations:

- The construction footprint for the new units would be on previously disturbed land within existing TVA property, as opposed to purchasing or utilizing greenfield property to locate the new units.
- The existing natural gas infrastructure on the Johnsonville Reservation that supports the existing JCT plant could be utilized to also support the additional proposed Aero CT units.
- Proximity of the Johnsonville Reservation to load centers in Nashville and Middle Tennessee make this site increasingly attractive for Aero CTs offering synchronous condensing for area grid support.
- Throughout the operational history of the Johnsonville Fossil Plant, extensive environmental reviews have been conducted which provide a level of confidence, for initial screening purposes, that there is a low potential for impacting sensitive environmental resources.

2.2 Description of Alternatives

2.2.1 Alternative A – No Action Alternative

Under the No Action Alternative, TVA would not construct 10 natural gas-fired Aero CTs generating approximately 550 MW and associated support systems to support this generation at the Johnsonville Reservation. This alternative does not meet the purpose and need of TVA's proposed action and is carried forward in this analysis as a baseline for comparison.

2.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, TVA would construct 10 natural gas-fired Aero CTs generating approximately 550 MW and associated support systems at the Johnsonville Reservation. The overall Johnsonville Aero CT project area consists of approximately 245 acres of mostly heavily disturbed land located completely within the Johnsonville Reservation (Figure 2-1). The entirety of this project area would not be affected by project activities; however, final locations for laydown yards, parking, construction trailers, etc. are dependent upon final design. Estimated locations for these features have been included in Figure 2-1. Construction of the Aero CTs and associated structures is expected to begin in late 2022 and would take approximately 2 years. Actions associated with implementation of this alternative are described below.

2.2.2.1 Construction of Aero CTs

TVA would construct 10 new natural gas-fired Aero CTs, with inlet evaporative cooling, within the boundaries of the Johnsonville Reservation as shown in Figure 2-1. Subsurface piles would be installed to support foundations for plant components, as required. In addition to these major equipment systems, the proposed Aero CT facility would include plant equipment and systems, such as natural gas metering and handling systems; instrumentation and control systems; transformers, and administration and warehouse/maintenance buildings. At full buildout, the Aero CT plant would occupy approximately 15.3 acres of the 245-acre Johnsonville Aero CT project area.

2.2.2.2 Construction of Supporting Facilities

To support the new Aero CTs, TVA would also construct and operate an Aero 161-kilovolt (kV) switchyard, which would be situated on approximately 2 acres located southeast of the new Aero CT units within the project area. New transmission line would be constructed to connect the Aero CTs to the Aero 161-kV switchyard. TVA would add and replace breakers in the existing Johnsonville switchyard and upgrade the associated protection systems. A new switch house would be installed for the Aero 161-kV switchyard, potentially including water and septic systems. Fiber would be installed on the new transmission lines between the new Aero 161-kV switchyard and the existing Johnsonville switchyard.

The Aero CT units would be fueled by a reliable supply of natural gas to be supplied through existing TVA service agreements. No upgrades to the existing natural gas supply would be required. However, TVA would need to construct and operate a new compressor station onsite. The final location for the compressor station is anticipated to be within existing TVA property and in close proximity to the Aero CT units. The compressor station would be driven by electric motors and therefore, would not require additional air permitting.

Other support facilities that would be constructed as part of this alternative include a new administration/control building that would be constructed to serve the Aero CTs in addition to the existing CT units 17-20 and auxiliary boilers. TVA may also construct up to three new warehouses for supplies and/or office space for regional employees. The final locations for these buildings are anticipated to be within existing TVA property and in close proximity to the Aero CT units. The estimated location for these warehouses is shown on Figure 2-1.

TVA has identified six areas (totaling approximately 36.3 acres) within the project area that would be used for vehicle and equipment parking, materials storage, laydown, and construction administration during construction of the Aero CTs. In addition, the craft trailer area (0.8 acres) would be designated for temporary light uses such as trailer placement or light vehicle parking during construction. These areas are all located on previously disturbed areas and, when construction is complete, they would be allowed to revert to their original use.

TVA estimates that borrow needs would be minimal and if necessary, borrow could be obtained from the TVA owned borrow site identified in the *Johnsonville Fossil Plant Coal Yard and Coal Yard Runoff Pond Closure, Construction of a Process Water Basin, and Development of a Borrow Site EA* (TVA 2019c) or from an existing commercial borrow pit. The location of the TVA-owned borrow site is shown on Figure 2-2. If borrow material from an existing off-site commercial borrow pit is required, additional environmental reviews would be conducted, as appropriate.

The Aero CT units would utilize evaporative cooling and wet compression for power augmentation. Evaporative cooling would only be used when the ambient temperature is 60 degrees Fahrenheit (ºF) or greater and wet compression would be used when the ambient temperature is 45ºF or greater. Maximum total estimated water consumption is 300 gallons per minute (gpm) potable water and 300 gpm demineralized water. The JCT plant already has adequate capacity for demineralized water production that would be used for the Aero CTs. Any process water discharges would be directed to the existing Johnsonville Process Water Basin and the site NPDES permit would be modified accordingly. Additional potable water for evaporative cooling, domestic use, and safety showers would be obtained from the existing public supply. The water supply for the fire protection system would be provided from the existing fire water supply.

Operating the Aero CT units would also require air emissions monitoring. Reduction of nitrogen oxide (NO_X) emissions from the Aero CTs would be achieved through dry low emissions (DLE) combustion systems and Selective Catalytic Reduction (SCR). Carbon monoxide (CO) catalyst would be used to control CO emissions. Exhaust stacks would be equipped with continuous emissions monitoring systems. Emissions from the units would adhere to the requirements of state (TDEC) and federal regulations.

Project materials and equipment would be primarily delivered to the project site by truck and placed in designated project laydown areas until used (see Figure 2-1). Some major equipment may be transported by rail. The existing rail system within the Johnsonville Reservation may require repairs, which would be identified at a later date pending evaluation of the final design. These modifications would be minor and are expected to occur within approximately 19.3 acres of the 245-acre Johnsonville Aero CT project area. Additional environmental reviews would be conducted, as appropriate, for any necessary changes to the existing rail system. Roads within the project area would be maintained during the construction process.

2.2.2.3 Aero CT Project Construction

Site preparation work, Aero CT plant construction, and other site upgrades would begin in late 2022, and the plant would begin commercial operation no later than December 31, 2024. Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment (for example tracked vehicles) would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts per TVA BMPs. TVA estimates a maximum of 200 workers would be employed onsite at the peak of the 2-year construction period. Once constructed, it is expected that staff from the retiring JCT Units 1-16 could transition to operate the new Aero CTs; therefore, there would be no change in the operations staff.

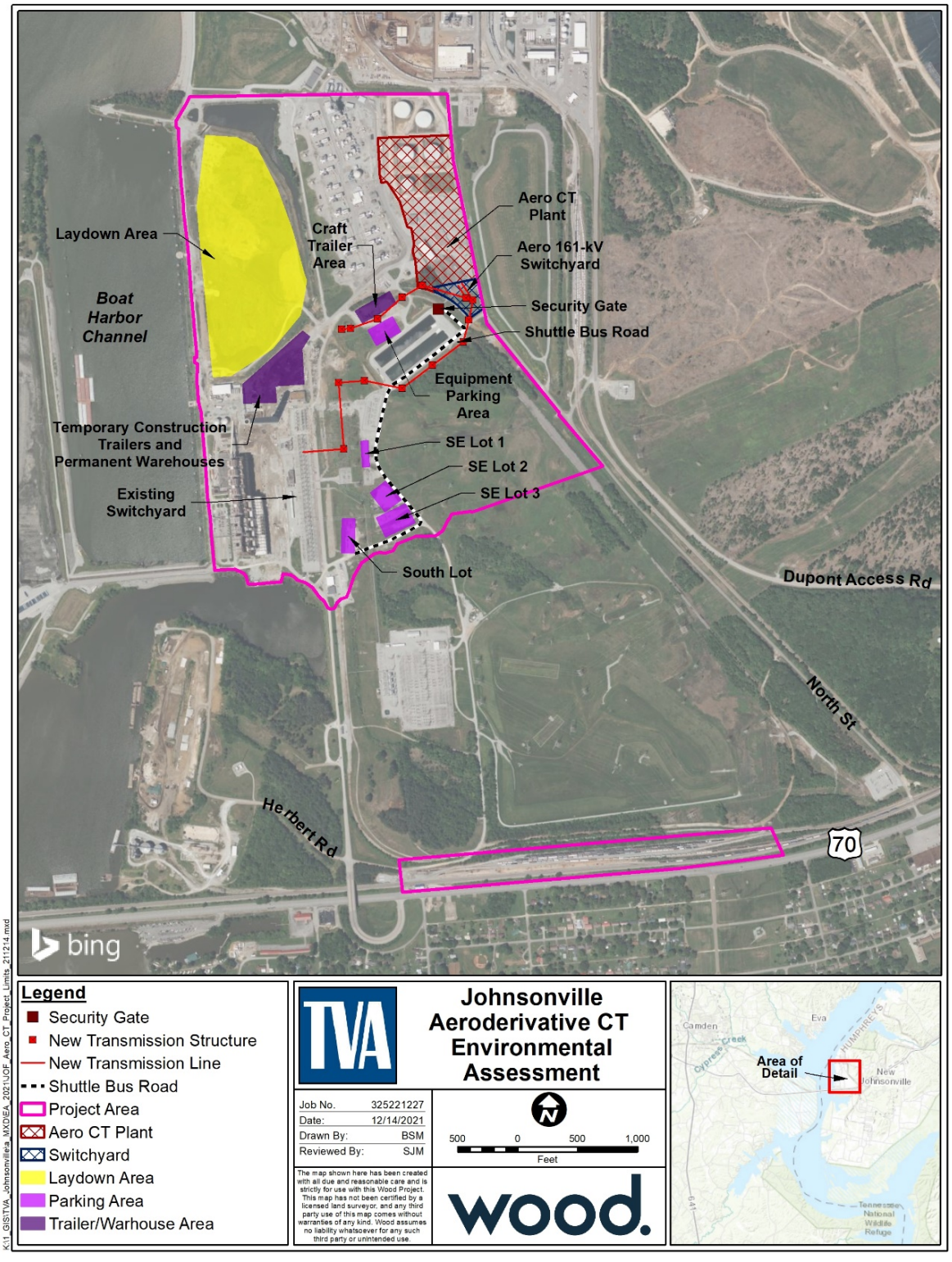


Figure 2-1. Johnsonville Aero CT Project Area

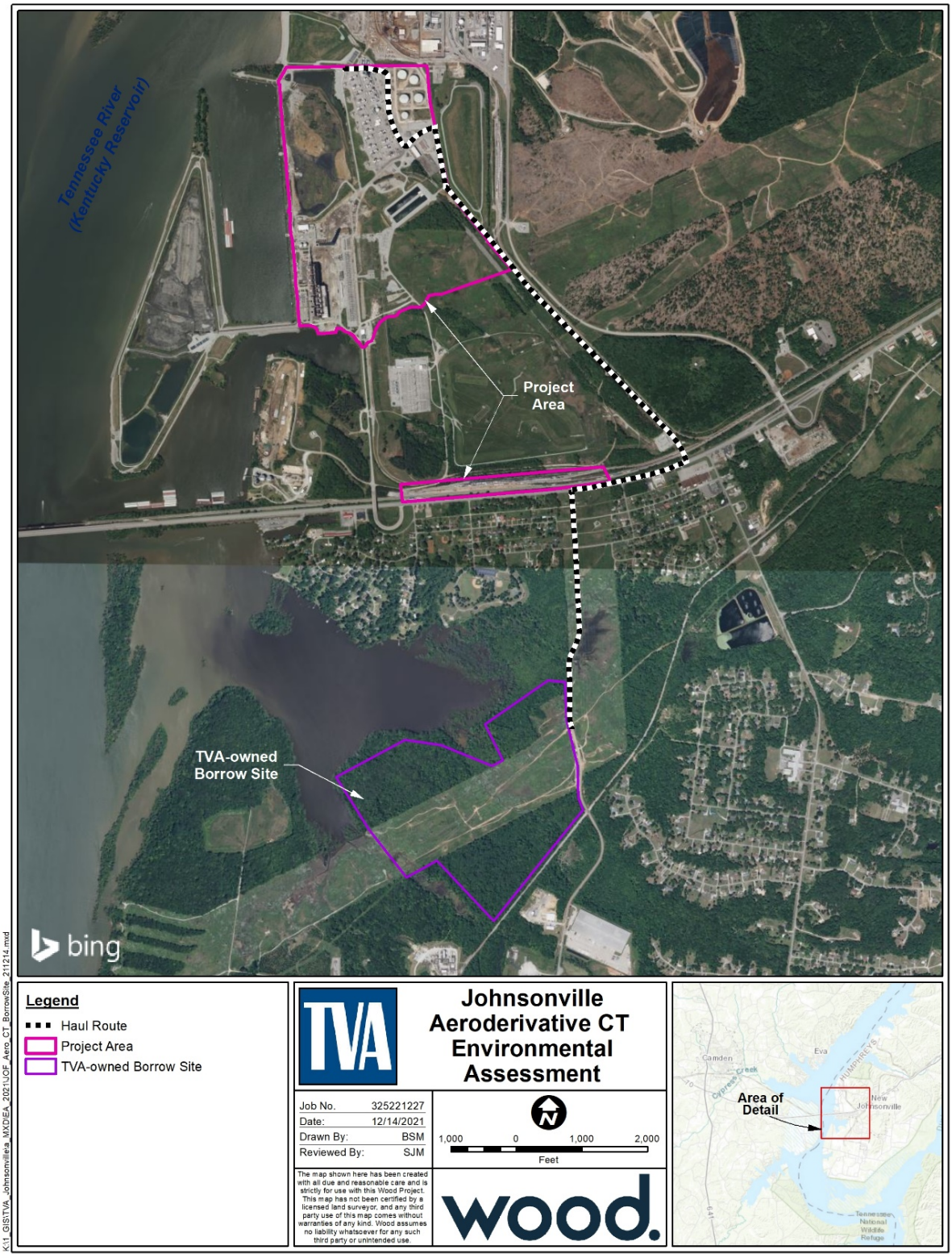


Figure 2-2. Location of TVA-owned Borrow Site

2.3 Comparison of Alternatives

The environmental impacts of each of the alternatives under consideration are summarized in Table 2-2. 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 2-2. Summary and Comparison of Alternatives by Resource Area

Resource	Alternative A	Alternative B
Air Quality	No change from existing conditions.	Temporary minor construction impacts associated with emissions from onsite vehicles and equipment as well as generation of fugitive dust. Operation of the Aero CTs would result in an incremental increase in emissions as measured against the current baseline. These emissions would be monitored and would comply with permit limits and would not lead to exceedance or violation of applicable National Ambient Air Quality Standards (NAAQS).
Climate Change and Greenhouse Gases	No impact	Temporary localized, minor greenhouse gas emissions during construction activities. Operational emissions would be minor relative to regional and national GHG levels and would not impact climate change.
Geology and Soils	No impact	Minor temporary increase in soil erosion, minimized with BMPs.
Groundwater	No impact	Minor impacts to groundwater minimized with the use of BMPs. Minor localized, temporary impacts associated with dewatering activities potentially used to control groundwater infiltration into excavation sites.
Surface Water Resources	No impact	Temporary, minor impacts to surface waters associated with sedimentation from stormwater runoff during construction activities. Impacts would be minimized through implementation of BMPs designed to minimize erosion during construction and operation.
Wetlands	No impact	Minor impact due to the clearing of 0.4 acres of forested wetland within the transmission line corridor. Temporary, minor impacts associated with erosion and sedimentation from stormwater runoff during construction activities that would be minimized through the implementation of BMPs.
Aquatic Ecology	No impact	Minor, temporary impacts from stormwater runoff during construction activities that would be minimized through the implementation of BMPs. Implementation of BMPs during operation would minimize site stormwater runoff.
Vegetation	No impact	Minor impact. The project would primarily impact locally common vegetation with limited conservation value. A total of 1.6 acres of deciduous forested area would also be cleared. Impacted forest communities are common within project vicinity and impact would be negligible compared to the total amount of forest land in the region.

Resource	Alternative A	Alternative B
Wildlife	No impact	Minor impact to heavily disturbed low-quality habitat. Impact associated with the loss of forested habitat is minor due to the abundance of similar, suitable habitat in the vicinity of the project area. Several osprey nests exist in the project area. Coordination with U.S. Department of Agriculture (USDA)-Wildlife Services would occur as necessary to ensure compliance under federal law.
Threatened and Endangered Species	No impact	This alternative would likely adversely affect the Indiana bat, northern long-eared bat, and gray bat, and would not affect any of the other listed animal or plant species. Project activities are within the bounds of impacts analyzed in TVA's programmatic consultation on routine actions with potential to affect federally listed bats that was completed in April 2018 with the U.S. Fish and Wildlife Service (USFWS) With adherence to identified conservation measures, significant impacts to federally listed bats would not occur.
Visual Resources	No impact	Minor impacts due to temporary visual discord during construction activities.
Cultural and Historic Resources	No impact	No impact.
Transportation	No impact	Temporary, minor impacts associated with increased traffic on area roadways during construction activities.
Natural Areas, Parks and Recreation	No impact	Minor, temporary impacts during construction activities.
Noise	No impact	Temporary, minor adverse impact associated with increased noise during construction activities. Noise impacts from operation would be minor. TVA would utilize noise abatement technology, if necessary, to ensure that noise levels would not exceed 55 dBA at offsite noise receptors.
Solid and Hazardous Waste	No impact	No impact as solid and hazardous wastes generated during construction and operation of the Aero CT units would be managed in accordance with established procedures and applicable regulations.
Socioeconomics and Environmental Justice	No impact	Beneficial short-term impacts during construction. No long-term disproportionate impacts to low-income or minority communities.
Public Health and Safety	No impact	The operation of the proposed Aero CT units would adhere to TVA guidance and be consistent with standards established by OSHA and applicable state requirements. Therefore, worker and public health and safety during project operation would be maintained and impacts would be minimal.

2.4 TVA's Preferred Alternative

TVA has identified Alternative B, as its preferred alternative. Under the preferred alternative, TVA would construct 10 natural gas-fired Aero CT units generating approximately 550 MW and support systems at the Johnsonville Reservation. This replacement aligns with the 2019 IRP recommendation to enhance system flexibility and TVA's Strategic Intent and Guiding Principles document.

2.5 Summary of BMPs, Mitigation Measures, and Commitments

BMPs, mitigation measures, and commitments identified in Chapters 2 and 3 to avoid, minimize, or reduce adverse impacts to the environment are summarized below. Additional project-specific BMPs may be applied as appropriate on a site-specific basis to enable efficient maintenance of construction projects and further reduce potential impacts on environmental resources including air, surface water, and groundwater.

Best Management Practices include:

- Fugitive dust produced from construction activities would be controlled by BMPs (e.g., wet suppression), as provided in the TVA's fugitive dust control plans required under existing CAA Title V operating permits.
- Low ground-pressure-type equipment would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts, per TVA BMPs.
- BMPs described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities, Revision 3* (TVA 2017) and in specific state regulatory sediment and erosion control handbooks would be outlined in the project-specific Stormwater Pollution Prevention Plan (SWPPP), and BMP plan, as required, that would be implemented to minimize erosion during site preparation. Appropriate BMPs would be followed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained and the introduction of pollution materials to the receiving waters minimized. Areas where soil disturbance could occur would be stabilized and vegetated with native or non-native, non-invasive grasses and mulched.
- Equipment washing and dust control discharges would be handled in accordance with BMPs described in the SWPPP for water-only cleaning, and/or NPDES Permit TN 100000 to minimize construction impacts to surface waters.

Mitigation measures include:

- To the extent practicable, TVA would establish a 30-foot buffer around the ephemeral stream located adjacent to the Aero 161-kV switchyard and preclude any ground disturbing actions within the buffer to avoid direct impacts to the stream.
- Unavoidable impacts to potential suitable summer roosting habitat for the northern long-eared bat and Indiana bat would be addressed using TVA's programmatic consultation on routine actions with potential to affect federally listed bats that was completed in April 2018 with the U.S. Fish and Wildlife Service (USFWS) in accordance with ESA Section 7(a)(2). For those activities with potential to affect bats, TVA committed to implementing conservation measures established through the programmatic consultation. The conservation measures required for this project

are identified on pages 5-7 of the TVA Bat Strategy Project Review Form (Appendix A), and they would be implemented as part of the proposed project. If the timing of proposed construction activities within 660 feet of the osprey nests at the Johnsonville Reservation cannot be modified to avoid nesting seasons, coordination with the USDA-Wildlife Services would be required to ensure compliance under EO 13186 [Responsibilities of Federal Agencies to Protect Migratory Birds].

- If required, TVA would utilize noise abatement technology to ensure that noise emissions would not exceed 55 dBA at offsite noise receptors.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Scope of Analysis

This chapter describes the baseline environmental conditions (affected environment) of environmental resources in the project area and the anticipated environmental consequences (or impacts) that would occur from implementation of the alternatives described in Chapter 2.

3.1.1 Impact Assessment

Within the environmental consequences sections, impacts may be beneficial or adverse and may apply to the full range of natural, aesthetic, historic, cultural, and socioeconomic resources within the project area and within the surrounding area. Impact severity is dependent upon their relative magnitude and intensity and resource sensitivity. In this document, four descriptors will be used to characterize the level of impacts as follows:

- No Impact – resource not present or affected by project alternatives under consideration
- Minor (or “small”) – environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource
- Moderate – environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource
- Large – environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource

3.1.2 Reasonably Foreseeable Future Trends and Planned Actions

Table 3-1 identifies reasonably foreseeable future trends and planned actions that were identified in the vicinity of the proposed action. The affected environment for each resource describes the environment of the area(s) to be affected by the alternatives under consideration, including the reasonably foreseeable environmental trends and planned actions in Table 3-1. Past and present actions inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter. Accordingly, effects considered in this EA consider changes to the human environment from the alternatives under consideration in combination with the reasonably foreseeable future actions in Table 3-1.

On-going operations of adjacent industrial facilities including emissions from local vehicles and related impacts to air quality, including GHG emissions, are considered part of the existing environmental setting and are not expected to increase in the foreseeable future. Implementation of the other foreseeable future actions that may contribute minor, localized and short-term air emissions in proximity to the Aero CT project include the closure of Ash Pond 2, construction of the metering station associated with the lateral divestiture project, and closure of the coal yard and coal yard runoff pond. Tree removal may be required as part of both the lateral divestiture project and the development of the borrow site on TVA property. Construction activities associated with closure of Ash Pond 2 and the coal yard and coal yard runoff pond have the potential to release constituents that may impact groundwater. However, all project activities would comply with the applicable state and

federal permits and regulations which would minimize impacts to these resources. The other proposed actions identified in Table 3-1 would be located within TVA-owned lands on the Johnsonville Reservation, which have been disturbed from previous development. Therefore, these other actions would either have a have a minor, temporary effect during construction or a positive effect on the other resources, including geology/soils, surface water, wetlands, aquatic ecology, wildlife, threatened and endangered species, visual resources, cultural resources, transportation, natural areas, parks, recreation, noise, waste, socioeconomics, and public health and safety. In addition, these minor, temporary effects would not be disproportionate to the environmental justice community within the project vicinity.

Table 3-1. Summary of Reasonably Foreseeable Future Trends and Planned Actions in the Vicinity of the Johnsonville Aero CT Plant Project Area

Action	Description
Operations of Adjacent Industrial Facilities	The reservation is bordered by Chemours chemical plant and OxyChem plant to the north. The two facilities work under an agreement to utilize raw materials and services provided by each other. The facilities also include a shared barge docking facility and wastewater outfall in the reservoir. To the southwest of the reservation, is a sand and gravel mining facility, Herbert Sand and Gravel Company. This facility includes material stockpile areas, various supporting buildings, and a barge docking facility. The JCT is located east of the former Johnsonville coal plant and operations at the JCT facility would continue indefinitely after the retirement/deconstruction of the coal plant. These facilities around the reservation collectively are part of the base condition characterized by each of the environmental resources evaluated below and contribute to the previously developed elements of the environmental setting for this EA and on-going disturbance due to their operations.
Decontamination and Deconstruction of Johnsonville Fossil Plant	The Johnsonville Fossil Plant ceased operation in December of 2017 and decontamination and decommissioning activities are underway. Under this action all environmental issues associated with identified structures would be assessed and abated, including the decontamination of all buildings, structures, conveyers, and tunnels associated with plant operations. All removed structures would be demolished to 3 feet below final grade and all basements, pits, and trenches would be backfilled up to the surrounding grade while providing proper drainage. All disturbed areas would have topsoil installed and seeded or otherwise stabilized. Final restoration is expected to be completed in June 2022.
Closure of Ash Pond 2 at Johnsonville Fossil Plant	TVA is currently evaluating alternatives for closure of Ash Pond 2 including closing the impoundment in place or removing coal combustion residuals (CCR) from the impoundment and transporting offsite for disposal. Before closure activities begin, a detailed environmental review would be conducted to evaluate closure alternatives. TVA estimates that closure activities would begin after 2025.

Action	Description
Lateral Divestiture Project	TVA is proposing to divest an approximately 28-mile-long natural gas pipeline, existing metering station, and associated easements and grant an easement over approximately one acre of property on the JCT site for the construction of a future metering station. The pipeline and easements are located in Humphreys and Hickman counties, in the vicinity of JCT. This independent action will be assessed in a separate NEPA document. Work on this project is ongoing and expected to be completed by 2026.
Closure of Coal Yard and Coal Yard Runoff Pond	Due to the retirement of all coal-fired units at the Johnsonville Reservation, TVA no longer has a need for coal and the associated coal yard and coal yard runoff pond. Closure of the coal yard includes the removal of approximately 24,000 cubic yards of unburned coal and 40,000 cubic yards of sediment from the coal yard runoff pond that is stockpiled on the coal yard. TVA may elect to consider implementing a reclamation process to recover the maximum amount of reusable fuel remaining in the coal stockpile (70-90 percent of the stockpile). The useable fuel obtained by this process would be delivered to the nearest TVA facility, Cumberland Fossil Plant. The remaining material would be transported to the West Camden Sanitary Landfill. If TVA does not implement the reclamation process, all of the stockpiled material would be transported to the West Camden Landfill. Closure of the coal yard runoff pond would include dewatering, removal of pumps, pipes, platforms and mechanical equipment, and excavation and stockpiling of sediment onto the coal yard stockpile. Following removal of the coal stockpile and coal yard remnants, CCR underlying the coal yard and soil from the south side of the coal yard would be excavated and consolidated within the north side of the coal yard. The closure system would incorporate a geomembrane liner and cover consisting of either protective/vegetative soil or a turf system which consists of an engineered turf and sand fill. The remainder of the coal yard would be graded for proper drainage. Vegetation would be established on areas of bare soil on the south side of the former coal yard. Work on this project is expected to begin after 2025.
Development of Borrow Site on TVA Property	TVA has identified a 165-acre borrow site on TVA-owned property located 1.8-miles south of the Johnsonville Fossil Plant. This site may be used for various planned activities within the Johnsonville Reservation. This action was assessed in a separate NEPA document completed in March 2019 (TVA 2019c).
Retirement of JCT Units 1-16 at Johnsonville Fossil Plant	JCT Units 1-16 will be retired and decommissioned, and their combined generation is being replaced by TVA's Paradise and Colbert CT facilities. The JCT units would be retired and decommissioned after the proposed Aero CTs are operating. The action to build and operate the Paradise and Colbert CT facilities was assessed in a separate NEPA document completed in June 2021 (TVA 2021e).
Demolition of Warehouse Buildings and Fuel Oil Tanks at Johnsonville Fossil Plant	The demolition and removal of these structures would be completed prior to the construction of the proposed Aero CT plant.

3.2 Air Quality

3.2.1 Affected Environment

3.2.1.1 Air Quality

The CAA (as amended) is the comprehensive law that protects air quality by regulating emissions of air pollutants from stationary sources (e.g., power plants) and mobile sources (e.g., automobiles). It requires the U.S. Environmental Protection Agency (EPA) to establish NAAQS and directs the states to develop State Implementation Plans to achieve these standards. This is primarily accomplished through permitting programs that establish limits for emissions of air pollutants. The CAA also requires EPA to set standards for emissions of hazardous air pollutants.

NAAQS have been established to protect the public health and welfare with respect to six criteria air pollutants: CO, nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), sulfur dioxide (SO_2), and lead (Pb). Primary standards protect public health, while secondary standards protect public welfare (e.g., visibility, crops, forests, soils, and materials) (EPA 2021d).

In accordance with the CAA Amendments of 1990, all counties are designated with respect to compliance, or degree of noncompliance, with NAAQS. These designations include:

- Attainment – any area where air quality achieves the NAAQS;
- Nonattainment – any area with air quality worse than the NAAQS; and
- Unclassified – not enough data to determine attainment status.

The Johnsonville Reservation, which includes the existing JCT and the proposed Aero CTs, is located in New Johnsonville, Humphreys County, Tennessee. Air quality in Humphreys County is protected under Chapters 1200-03 and 0400-30 of the Tennessee Air Pollution Control Regulations (APCR) promulgated by TDEC, Bureau of Environment, Division of Air Pollution Control. Humphreys County is currently in attainment with ambient air quality standards referenced Chapter 1200-03-03 and the NAAQS (EPA 2021a).

3.2.1.2 Other Pollutants and Air Quality Concerns

Nitrogen Oxides (NO_X) are a group of highly reactive gases, including NO_2, that contain varying amounts of nitrogen and oxygen. NO_X emissions contribute to ground-level O_3, fine particulate matter, regional haze, acid deposition and nitrogen saturation. Natural sources of NO_X include lightning, forest fires, grass fires, trees, bushes, grasses and microbial activity; major sources of human-produced NO_X emissions include motor vehicles, industrial boilers, petroleum refineries, nitric acid manufacture, and incinerators (EPA 1999).

Sulfur oxides (SOx) are compounds of sulfur and oxygen molecules. SO_2 is the predominant form found in the atmosphere. Most SO_2 is produced from the burning of fossil fuels (coal and oil), as well as petroleum refining, cement manufacturing and metals processing. In addition, geothermic activity, such as volcanoes and hot springs, can be a significant natural source of SO_2 emissions (World Bank Group 1998).

Hazardous Air Pollutants (HAPs), sometimes referred to as air toxics, are pollutants that are known or suspected to cause cancer or other serious health effects or adverse environmental effects. The CAA identifies 187 pollutants as HAPs (EPA 2021c). Most HAPs

are emitted by human activities, including mobile sources (motor vehicles), stationary sources (factories, refineries, and power plants) and indoor sources (building materials and activities such as dry cleaning).

States are required to establish an air operating program under Title V of the CAA. Regulations to implement this operating program, 40 CFR Part 70, require each major source of air pollutant emissions to obtain an operating permit, typically issued by the state environmental agency, that consolidates all the air pollution control requirements into a single, comprehensive document covering all aspects of air pollution activities at a facility. In attainment areas, Title V major source thresholds, the level of potential emissions that require sources to obtain a Title V permit, are 100 tons per year (tpy) for each criteria pollutant, 10 tpy for each individual HAP and 25 tpy for total HAPs.

Sources that emit less than10 tpy of a single HAP or less than 25 tpy of a combination of HAPs are referred to as area sources, as opposed to major sources. Emissions from individual area sources are relatively small. However, if located in heavily populated areas that contain several area sources, emissions can be of concern.

3.2.1.3 Characterization of Existing Johnsonville Reservation Site Operations

JCT currently consists of twenty natural gas or oil-fired CTs, four natural gas heaters, and two natural gas auxiliary boilers. CT Unit 20, with the addition of a HRSG and duct burner, is a combined heat and power (CHP) unit that provides steam to an off-site customer. The two natural gas auxiliary boilers are backup steam generators for the CHP unit. JCT currently operates under Title V Permit No. 572833, issued November 26, 2018.

3.2.2 Environmental Consequences

3.2.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the 10 natural gas-fired Aero CTs or associated support systems at the Johnsonville Reservation. Because no changes to operations are foreseen, air pollutant emissions would be unchanged. Consequently, air quality would not be affected.

3.2.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

3.2.2.2.1 Construction Impacts

Under Alternative B, construction activities associated with the Aero CT units and support systems would result in emissions from the operation of construction equipment driven on paved and unpaved roads, and fugitive dust emissions from clearing, grading and other activities on unpaved areas. Fugitive dust produced from construction activities would be temporary and controlled by BMPs (e.g., wet suppression) as stated in the TVA's fugitive dust control plans required under existing CAA Title V operating permits.

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts per TVA BMPs. Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, construction equipment, etc.) would generate local emissions of CO, carbon dioxide (CO_2), O_3, NO_X, PM, SO_2, and volatile organic compounds (VOCs). However, new emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions, and it is expected

that all vehicles and equipment would be properly maintained and employ the use of diesel emission controls and cleaner fuel, which also would reduce emissions. Air quality impacts from construction activities would depend on both man-made factors (intensity of activity, control measures, etc.) and natural factors such as wind speed and direction, soil moisture and other factors. However, even under unusually adverse conditions, these emissions would have, at most, a minor transient impact on offsite air quality that is well below the applicable ambient air quality standard.

Some tree clearing is expected to be required as part of the proposed construction. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. TVA would adhere to all appropriate state and county regulatory requirements if burning of landscape waste is conducted. Impacts from these actions would be temporary and minor.

Proposed activities would primarily occur on previously disturbed land located within the reservation boundary. Overall effects to air quality from construction-associated activities would be temporary and localized. Emissions would only affect the immediate project area and would have limited effects to offsite areas.

Air emissions generated by the other reasonably foreseeable future actions in Table 3-1 would be minor, localized and short-term. Emissions from ongoing operations of adjacent industrial facilities, including emissions from local vehicles and related impacts to air quality, together with emissions associated with construction of the Aero CT units would incrementally increase emissions within Humphreys County under the proposed action. However, exceedances of applicable ambient air quality standards are not expected. Therefore, regional air quality would not be adversely affected during the construction phase of the proposed action combined with the other reasonably foreseeable future actions.

Regulatory Air Permit Requirements

Operation of the proposed Aero CTs and emergency generator are subject to permitting programs that regulate the construction of new stationary sources of air pollution, typically referred to as New Source Review (NSR). Major NSR is applicable to major sources under PSD regulations; major sources under the PSD regulation are sources that have 250 tpy of potential emissions of any criteria pollutant or 100 tpy for specifically listed source categories (note: the major source threshold for initial inclusion in the PSD program differs from the Title V major source threshold of 100 tpy).

There are two NSR permitting programs, based on the attainment status of the area in which the proposed project is located. In attainment areas, PSD is the applicable permitting program. In nonattainment areas, the applicable permitting program is Nonattainment NSR (NNSR). As the Aero CTs would be located at the Johnsonville Reservation in Humphreys County, presently designated as an attainment area or “unclassifiable”, any significant emission increases from the proposed project would be subject to PSD pre-construction review to ensure air quality in the area is protected and attainment status is maintained.

The Johnsonville Reservation is a major PSD source. Therefore, operation of the Aero CTs would constitute a major modification (i.e., any physical change or change in the method of operation of a major stationary source that would result in significant emissions increase of a regulated pollutant and a significant net emissions increase of that pollutant from the

major stationary source), and full PSD permitting requirements apply. For all PSD-regulated pollutants other than greenhouse gases, PSD permitting is required if the emissions increase of a specific pollutant exceeds that pollutant's PSD Significant Emissions Rate (SER). SERs, for purposes of PSD, were established as allowable increases in air pollutants over a baseline level that would not have a detrimental impact to air quality.

Although there are nuances to the PSD program, in general for new emission units, increases are calculated using the "actual to potential" test, meaning that emissions from new emission units must be evaluated for the potential emission/worst-case scenario, which may far exceed anticipated actual emissions from normal operation. Net emission increases for new emission units are defined as the potential increase in emissions from the project and any other increases and decreases in baseline actual emissions at the major stationary source that are contemporaneous with the change and otherwise creditable.

The Johnsonville Reservation has an existing Title V permit for JCT operations. The Title V permit includes emission limits (as established by federal/state/local regulation) and include data tracking, recordkeeping, and reporting measures to verify compliance.

Construction of the Aero CT units would require modification of the existing Title V permit. Permit modifications, established through a PSD permit review process, would incorporate limitations from applicable federal and state regulations, including, but not limited to, the following:

- New Source Performance Standards (NSPS): 40 CFR 60, Subpart JJJJ, is applicable to all stationary spark ignition (SI) internal combustion units (ICE), constructed after June 12, 2006, and would apply to the new natural gas emergency generator. The facility would comply with the requirements of the rule, including, but not limited to pollutant emission standards, fuel limitations, and limits on engine operation for non-emergency purposes.
- NSPS: 40 CFR 60, Subpart KKKK is applicable to all stationary gas CT units with a heat input at peak load between 50 and 850 million British Thermal Units (MMBtu) per hour for which construction or modification is commenced after February 18, 2005. NO_x emissions while firing natural gas are limited to 25 parts per million (ppm), corrected to 15 percent oxygen (O_2) and 96 ppm at 15 percent O_2 for units greater than 30 MW output. SO_2 emissions are limited to 0.06 pounds SO_2 per MMBtu. There are also monitoring and testing requirements associated with this regulation.
- 40 CFR 60, Subpart TTTT is applicable to CT electrical generating units constructed after January 8, 2014, for the control of greenhouse gases (GHG) emissions. For CT units of the size and capacity considered under this alternative, the proposed CO_2 emission standard is 1,100 pounds per megawatt–hour of generation (120 pounds CO_2 per MMBtu). Other applicable requirements include purchase records for permitted fuels and initial notifications.
- APCR 1200-03-05-.01 limits opacity from all stationary sources to 20 percent with monitoring and work practice standards; all proposed equipment would be subject to this standard.
- APCR 1200-03-06-.02(2) applies to new and existing fuel burning equipment and provides maximum PM emission rate limits.

- APCR 1200-03-08-.01 requires reasonable precautions to limit fugitive dust, such as use of water or chemicals to control dust in construction operations, limiting visible emissions from fugitive dust beyond the property line to a maximum of five minutes per hour or twenty minutes per day.
- APCR 1200-03-09-.01 and .02 are the requirements for Construction and Operating Permits for new or modified sources.

Emissions from the proposed Aero CTs would meet these applicable standards, as well as any additional requirements established by state and local regulations.

3.2.2.2.2 Operational Impacts

Emissions of SO_2 from natural gas-fired plants are very low, and direct emissions of NO_X and CO_2 are low relative to other fossil plants (TVA 2019b). Natural gas-fired plants emit negligible amounts of mercury.

Each of the 10 GE LM6000 natural gas simple-cycle Aero CTs would be equipped with SCR for minimizing emissions of NO_x, as well as an Oxidation Catalyst (OC) system which minimizes emissions of CO and VOC. Natural gas preheaters are not anticipated to be required. These peaking units would operate during periods of peak demand when sufficient generating capacity may not be available from other TVA assets and to maintain transmission system reliability. As such, an average of two startup and shutdown cycles per day for each turbine is anticipated by TVA.

During combustion at 100 percent operating load, the heat input capacity of each new turbine is estimated to be 465.8 MMBtu/hour at 59ºF with a corresponding generator output capacity of approximately 55.5 MW.

Potential annual emission contributions from operation of the Aero CTs and emergency generator based on TVA estimates, and associated SERs are provided in Table 3-2. As emissions vary with ambient temperature and operating configuration, annual turbine potential emissions are based on a combination of routine operations with time estimated for startup and shutdown events and the capacity threshold of each turbine (as determined by Subpart TTTT) as well as the anticipated emissions from the emergency generator. The anticipated annual hours of normal operation is approximately 3,200 for the Aero CTs. The proposed turbines are anticipated to have, on average, two start up and shutdown cycles per day for each Aero CT, or 730 cycles per year, for a total of 365 hours of startup periods and 109 hours for shutdown. Anticipated baseload operating hours would be expected to be lower based on TVA's experience at other simple-cycle CT plants.

Although PSD regulations allow use of contemporaneous creditable emission increases and decreases to determine the net emission increase, there are no creditable increases or decreases of emissions in the contemporaneous period.

Table 3-2. Project Annual Emission Estimates and PSD Significant Emission Rates

	Emissions (tons/year)		PSD Triggered (Y/N)
Pollutant	Project Emission Increases	Significant Emission Rates	
CO	238.6	100	Yes
NOx	246.9	40	Yes
SO_2	6.3	40	No
Filterable PM	47.4	25	Yes
PM_{10}	65.0	15	Yes
$PM_{2.5}$	65.0	10	Yes
VOC	21.9	40	No
Pb	3.80E-03	0.6	No
Sulfuric Acid	0.5	7	No
CO_2e	1,141,195	75,000	Yes

Anticipated emissions from the proposed Aero CTs exceed PSD significance thresholds for several pollutants. As such, the project is subject to PSD.

PSD does not prevent sources from increasing emissions, but instead it preserves and protects air quality, ensures economic growth will occur in a manner consistent with preserving clean air resources. It also ensures any increase in air pollution to which PSD applies is made only after careful evaluation of all consequences of such a decision and after adequate procedural opportunities for informed public participation are provided (EPA 2021e).

PSD requires installation of Best Available Control Technology (BACT), an air quality analysis, additional impact analysis, and public involvement. Further detail on each of these requirements is provided below.

- BACT is an emission limitation which is based on the maximum achievable degree of control. BACT is determined on a case-by-case basis and considers the energy, environmental, and economic impact of the proposed limitation. BACT can be an add-on pollution control device or a modification of the production process or method or, in some cases, a design, equipment, work practice or operational standard, if an emission standard is infeasible. For the Aero CTs, BACT has been proposed as SCR, Dry Low NOx (DLN), an OC system, good combustion and operating practices, and low sulfur fuels.
- An air quality analysis is performed to demonstrate that the new emissions from a proposed modification, in conjunction with other applicable emissions increases and decreases from existing sources, would not cause or contribute to a violation of any applicable NAAQS or PSD increment. The analysis includes an assessment of existing air quality, which may include ambient monitoring and air dispersion modeling, as well as dispersion modeling predictions of ambient concentrations resulting from the proposed project and future growth associated with the project.

  The PSD program provides extra protection for large pristine areas of the US, such as national parks, forests, and wildlife refuges, referred to as Class I areas. There are three Class I areas in the vicinity of the Johnsonville Reservation: Sipsey

Wilderness, Mammoth Cave National Park, and Mingo Wilderness. Class II areas are areas that are in attainment or noted to be unclassifiable. Based on the location of the proposed Aero CTs, both Class I and Class II areas are potentially impacted and are included in the air quality analysis.

- Additional impact analyses evaluate the other impacts caused by an increase in emissions, such as ground and water pollution impacts on soils, decreases in visibility caused by the emissions and associated growth. Associated growth is growth in the area due to the proposed modification, including industrial, commercial, and residential.
- Public participation allows the public to review and comment on the permit before it is issued.

TVA has begun the process of complying with PSD/Title V requirements with the submission of a PSD Permit Application, Volumes I and II, to the TDEC in September 2021. Volume I of the application includes project details, proposed equipment, air emissions calculations, regulatory applicability, BACT analysis, and required TDEC air permit application forms. Volume II includes the approach to evaluating air quality impacts and dispersion modeling results, notably that the analysis demonstrates that the project would not result in a violation of the NAAQS for PM_{10}, $PM_{2.5}$, NO_2, CO, and O_3. Compliance with Title V/PSD requirements would ensure no impact on air quality or change of attainment status would occur as a result of implementing the proposed action.

Operation of new Aero CT units would result in increases in local emissions; however, they would not exceed permit limits or air quality standards. The other reasonably foreseeable future actions in Table 3-1 are anticipated to be executed in compliance with applicable regulations and permits. As such, additional increases in emission due to the operation of the Aero CT units in combination with the other reasonably foreseeable future actions would not impact regional air quality or result in an exceedance of applicable air quality standards.

3.3 Climate Change and Greenhouse Gas

3.3.1 Affected Environment

The EPA defines climate change as *"any significant change in the measures of climate lasting for an extended period of time."* In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer. These changes are caused by a number of natural factors, including oceanic processes, variations in solar radiation received by Earth, plate tectonics and volcanic eruptions as well as anthropogenic (i.e., human-related) activities (EPA 2019).

The Earth's natural warming process is known as the *"greenhouse effect."* The Earth's atmosphere consists of a variety of gases that regulate the Earth's temperature by trapping solar energy. These gases – including water vapor, CO_2, methane (CH_4), nitrous oxide (N_2O), and chlorofluorocarbons (CFCs) – are cumulatively referred to as GHGs because they trap heat like glass of a greenhouse. Relying on decades of research, the overwhelming majority of the scientific community agree that anthropogenic activities – including the burning of fossil fuels to produce energy, deforestation, and other industrial activities – have contributed to elevated concentration of GHGs in the atmosphere since the Industrial Revolution. The human production and release of GHGs to the atmosphere have caused an increase in the average global temperature. While the increase in global

temperature is known as *"global warming,"* the resulting change in a range of global weather patterns is known as *"global climate change."*

The United Nations (UN) body for assessing climate change science globally is the Intergovernmental Panel on Climate Change (IPCC), composed of 195 members (from the UN or the World Meteorological Organization) and thousands of contributors with backgrounds in climate science. In August 2021, the IPCC issued the Sixth Assessment Report (AR) (IPCC 2021) which states that:

- It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere, and biosphere have occurred.
- The scale of recent changes across the climate system as a whole and the present state of many aspects of the climate system are unprecedented over many centuries to many thousands of years.
- Human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes, such as heatwaves, heavy precipitation, droughts, and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since the Fifth AR.
- Improved knowledge of climate processes, paleoclimate evidence and the response of the climate system to increasing radiative forcing gives a best estimate of equilibrium climate sensitivity of 3 degrees Celsius (°C), with a narrower range compared to Fifth AR.

The leading scientific body on climate change nationally is the U.S. Global Change Research Program (USGCRP), composed of representatives from 13 federal agencies that conduct or use research on global change and its impacts on society. It functions under the direction of the Subcommittee on Global Change Research of the National Science and Technology Council's Committee on Environment. In 2017 and 2018, the USGCRP issued its Climate Science Special Report: Fourth National Climate Assessment (NCA4), Volumes I and II (USGCRP 2017 and 2018).

NCA4 states that climate change has resulted in a wide range of impacts across every region of the country. Those impacts extend beyond atmospheric climate change alone and include changes to water resources, transportation, agriculture, ecosystems, and human health. The U.S. and the world are warming, global sea level is rising and acidifying, and certain weather events are becoming more frequent and more severe. These changes are driven by accumulation of GHGs in the atmosphere through combustion of fossil fuels (i.e., coal, petroleum, and natural gas), combined with agriculture, deforestation, and other natural sources. These impacts have accelerated throughout the end of the 20th and into the 21st century (USGCRP 2018).

NCA4 notes the following observations of environmental impacts are attributed to climate change in the Southeast Region of the U.S. (USGCRP 2018):

- The decade of 2010 through 2017 has been warmer than any previous decade since 1920 for average daily maximum and average daily minimum temperature.

- The length of the freeze free season was 1.5 weeks longer on average in the 2010s compared to any other historical period on record.
- The number of extreme rainfall events is increasing. The number of days with 3 or more inches of rain has been historically high over the past 25 years. The 1990s, 2000s, and 2010s rank first, third, and second, respectively, in terms of the number of such events.
- Approximately 61 percent of major southeast cities are exhibiting some aspects of worsening heat waves, which is a higher percentage than any other region of the country.
- Rising temperatures and increases in the duration and intensity of drought are expected to increase wildfire occurrence and reduce the effectiveness of prescribed fire.

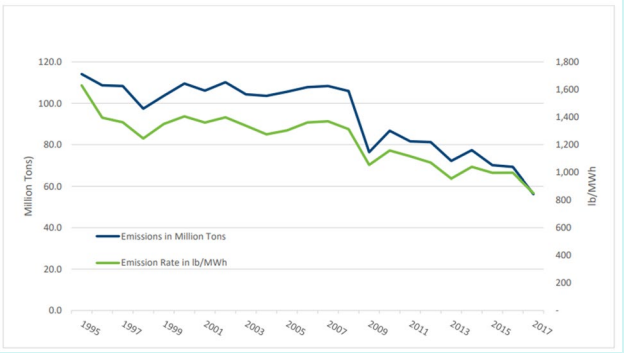
Chapter 19 of NCA4 assesses the long-term impacts of climate change on the Southeast U.S. under various emissions scenarios. Predicted impacts include increases in temperature and extreme precipitation and, in urban areas, more frequent and longer summer heat waves, increased risk of vector-borne diseases, reduced air quality, and stresses on infrastructure. These include the following projections of climate change impacts in the Southeast U.S. with a high or very high level of confidence (USGCRP 2018):

- Climate models project nighttime temperatures above 75ºF and daytime maximum temperatures above 95ºF become normal during the summer. Nights above 80ºF and days above 100ºF, which are now relatively rare, would become common.
- Cooling degree days (a measure of the need for air conditioning) nearly double while heating degree days (a measure of the need for heating) decrease by over a third.
- The freeze-free season lengthens by more than a month and the frequency of freezing temperatures decrease substantially.

The Fifth National Climate Assessment (NCA5) is currently under development, with publication anticipated in 2023.

“Global warming potential” is one type of simplified index based upon radiative properties that can be used to estimate the potential future impacts of emissions of different gases upon the climate system. Because the global warming potential that each GHG has on climate change varies, the common metric of carbon dioxide equivalent (CO_2e) is used to report a combined impact from all of the GHGs. This metric scales the global warming potential of each GHG to that of CO_2. In 2019, U.S. GHG emissions totaled 6,558 million metric tons of CO_2e, or 5,769 million metric tons of CO_2e after accounting for sequestration from the land sector (EPA 2019). This represents a 13 percent decrease below 2005 levels (EPA 2015).

As described in TVA’s 2019 IRP, TVA has one of the largest, most diverse and cleanest energy-generating systems in the nation. For example, approximately 36 percent of TVA’s capacity is currently sourced from lower emission assets such as nuclear power, renewable resources including hydropower, and interruptible load management (i.e., enhancing the elasticity of users to relieve or eliminate the strain on peak load hours) (TVA 2019a). TVA continues to invest in assets to reduce reliance on coal, modernize the transmission



TVA's CO_2e emissions have steadily declined since 1995. This downward trend has continued with the ongoing implementation of the IRP Recommendations and the TVA Strategic Intent and Guiding Principles.

system, and add new renewable energy resources to ensure safe, reliable, and cleaner energy. With the implementation of the IRP Recommendations as well as the TVA Strategic Intent and Guiding Principles (see Section 3.3.1.2, *TVA Carbon Trajectory and Strategic Intent*), TVA has planned to achieve an average of 70 percent reduction in carbon emissions by 2030 and up to 80 percent by 2035, from 2005 levels. To date, TVA has achieved a 63-percent reduction in its carbon emissions as compared to 2005 baseline standards (TVA 2021c). This decrease is mainly due to the retirement of coal plants, which emit larger quantities of CO_2 relative to other types of electrical generation, and the replacement of these plants with nuclear and natural gas-fueled generation. Nuclear generation does not result in emissions of CO_2, and the CO_2 output rate from natural gas fueled electricity generation is approximately half that of coal (TVA 2021h). As a power generation fleet, TVA has demonstrated a commitment to continued reduction and management of GHG emissions while also maintaining a balanced generation portfolio.

3.3.1.1 Regulatory Requirements

Although there have been a series of recent administrative changes, no clear GHG emission reduction requirements have been established at the federal level for fossil-fired power plants. The national emissions reduction requirements established in the EPA's Clean Power Plan (CPP) rule were repealed on July 8, 2019 (84 FR 32250) and the targets in the Paris Climate Accord were withdrawn in November of 2020. The emission reduction requirements established by EPA in the Affordable Clean Energy rule, which replaced the CPP rule, were vacated by the D.C. Circuit Court of Appeals on January 19, 2021. On January 20, 2021, President Biden issued EO 13990 (*Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*) and on January 27, 2021, President Biden issued the EO 14008 (*Tackling the Climate Crisis at Home and Abroad*). Amongst other objectives, the EOs set an aspirational target to achieve a net-zero emission economy by 2050 and a carbon-free electricity sector by 2035. In addition, on January 20, 2021, President Biden announced that the U.S. will rejoin the Paris Climate Agreement, and the U.S. became a party to the Agreement on February 19, 2021. The Agreement is a binding international agreement to reduce GHG emissions and impacts due to climate change that was signed by 196 parties on December 12, 2015 and entered into force on November 4, 2016. The Agreement aims to limit global warming to well below 2°C, and preferably to 1.5°C, compared to pre-industrial levels. Prior to the U.S. withdrawal from the Agreement in November 2020, the U.S. had proposed a 26 to 28 percent domestic reduction in GHG emissions by 2025 compared to 2005 levels. On April 22, 2021, the U.S. submitted its nationally determined contribution (NDC) in line with Article 3 of the Paris Agreement. In the NDC, the U.S. is setting an economy-wide target of reducing GHG emissions by 50 to 52 percent below 2005 levels in 2030.

3.3.1.2 TVA Carbon Trajectory and Strategic Intent

At its May 6, 2021 meeting, the TVA Board adopted the TVA Strategic Intent and Guiding Principles, which focus on energy supply and decarbonization initiatives (TVA 2021h). These guiding principles commit TVA to delivering safe, low-cost, reliable power while providing responsible stewardship by caring for the region's natural resources. The guiding principles memorialize the IRP Recommendations and reiterate TVA's plan for 70 percent carbon reduction by 2030, 80 percent carbon reduction by 2035, and aspirations for net-zero carbon emissions by 2050.

To implement the TVA Strategic Intent and Guiding Principles and add new renewables, additional peaking units are needed to operate infrequently during short-duration, high demand periods. These peaking units are essential for maintaining system reliability requirements, as they can start up quickly to meet sudden changes in either demand or supply resulting from short-term changes in weather that affect renewable resources.

Additional details regarding TVA's carbon trajectory can be found in the Fiscal Year 2020 Sustainability Report (TVA 2021a).

3.3.2 Environmental Consequences

3.3.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the 10 natural gas-fired Aero CTs or associated support systems at the Johnsonville Reservation. Therefore, there would be no short-term, temporary construction-related GHG emissions or operational changes in GHG emissions. However, the No Action Alternative would not align with IRP Recommendations or the TVA Strategic Intent and Guiding Principles, which focus on energy supply and decarbonization initiatives (TVA 2021h). Any benefits associated with the operation of newer, more efficient Aero CTs that also provide flexibility, thereby reducing the burden on the remainder of the system to integrate renewable resources, would not be realized under this alternative.

3.3.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, construction and operation of the Aero CTs would result in additional GHG emissions, which are described in Section 3.2 (Air Quality).

The following emissions analysis provides an estimate of GHG emissions as (1) a percentage of GHG emissions on a state level; (2) a percentage of total U.S. GHG emissions; and (3) a percentage of total global GHG emissions. This proportionate estimate of GHG emissions serves as a reasonable proxy for assessing potential climate change impacts. Given the incremental contribution of GHG emissions to climate change, the current state of climate science does not allow for specific linkage between particular GHG emissions and particular climate impacts. The use of the information currently available (i.e., use of the emissions analysis described below as a proxy for climate impacts) is consistent with 2020 CEQ Regulations for Implementing NEPA (40 CFR Parts 1500-1508) and CEQ's Final Guidance for Federal Departments and Agencies on Consideration of GHG Emissions and the Effects of Climate Change in NEPA Reviews (CEQ 2016). While GHG emissions from the operation of the proposed Aero CTs could have a minor impact on climate, the pro-rata effect cannot be determined with precision based on current scientific techniques. Even so, the analysis includes other information (i.e., comparative emissions

analysis at a state, national, and global level) that can credibly serve as a reasonable proxy of the contribution to climate change.

3.3.2.2.1 Construction

As described for criteria air pollutant emissions in Section 3.2 (Air Quality), heavy equipment used during the approximately 2-year construction period would include trucks, truck-mounted augers and drills, excavators, tracked cranes, bulldozers, and similar equipment. Combustion of gasoline and diesel fuels by internal combustion engines (e.g., vehicles, generators, construction equipment, etc.) would generate short-term, temporary GHG emissions. Such emission levels are expected to be *de minimis* in comparison to the regional and world-wide volumes of GHG.

3.3.2.2.2 Impacts Associated with Forest Clearing

Some tree clearing is also expected to be required as part of the proposed construction. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off-site. TVA would adhere to all appropriate state and county regulatory requirements if burning of landscape waste is conducted.

The EPA's quantification tool was used to estimate the carbon sequestration that may be lost from clearing of 1.6 acres of forested land within the Johnsonville Reservation to support the construction of the Aero CTs (EPA 2020). TVA estimates that the conversion of these forested lands would result in the loss of approximately 1.31 metric tons of carbon sequestration. This loss of carbon sequestered, or stored, is very small relative to the carbon sequestered in local and regional forested areas. Overall, carbon sequestration within forests in the region has increased due to net increases in forest areas (e.g., conversion of farmland to forested areas), improved forest management, as well as higher vegetation growth productivity rates and longer growing seasons. Based on West Highland Rim Forestry Association (2017) estimates, existing forested lands in Humphreys County (estimated at 210,559 acres) sequester approximately 172,658 metric tons of carbon per year. By comparison, therefore, the loss of 1.31 metric tons of carbon sequestration due to clearing of forested areas during the construction phase would be less than significant.

3.3.2.2.3 Operation

TVA has evaluated potential operational increases in GHG emissions as a result of the proposed Aero CTs. As described in the PSD Permit Application (Trinity Consultants 2021), "potential emissions" are defined by Air Pollution Control Rule 1200-03-09-.01(4)(b) as "the maximum capacity of a stationary source to emit a pollutant under its physical and operational design." Annual turbine emissions are based on a combination of routine operations with time estimated for startup and shutdown event and the capacity threshold of each turbine (as determined by Subpart TTTT) as well as the anticipated emissions from the emergency generator. The anticipated operational time for the proposed Aero CTs is approximately 3,200 hours. Startup/shutdown events are estimated at 730 per year for each Aero CT unit, for a total of 365 hours of startup periods and 109 hours for shutdown. Anticipated baseload operating hours would be expected to be lower based on TVA's experience at other simple-cycle CT plants.

CO_2e emissions are a calculation of the sum of the six individual GHGs, including CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride with applicable global warming potentials applied pursuant to 40 CFR Part 98 (Trinity Consultants 2021).

The operation of the proposed Aero CTs at the Johnsonville Reservation would result in an increase of 1,141,183 metric tons of CO_2e per year and the operation of the proposed emergency generator would result in an increase of 12.16 metric tons of CO_2e per year. This would result in a total emissions increase of 1,141,195 metric tons of CO_2e per year.

Based on the most recent estimates of CO_2 emissions for the state of Tennessee by the U.S. Energy Information Administration, total emissions of CO_2 for the state in 2018 were 94.7 million metric tons (U.S. Energy Information Administration 2020). As previously described, in 2019, U.S. GHG emissions totaled 6,558 million metric tons of CO_2e, or 5,769 million metric tons of CO_2e after accounting for sequestration from the land sector (EPA 2019). Therefore, the increase in potential emissions of 1,141,195 metric tons of CO_2e per year associated with the operation of the proposed Aero CTs and emergency generator would represent approximately 1.1 percent of total statewide emissions, approximately 0.02 percent of the total U.S. emissions, and 0.002 percent of the estimated 55.6 billion metric tons of total global GHG emissions for 2019 (Olivier and Peters 2020). As such, the operation of the proposed Aero CTs and the emergency generator would represent a less than significant contribution to state, national, and global GHG emissions. It should also be noted that the evaluation of potential emissions is highly conservative in that the proposed Aero CTs are peaking units that are intended to operate intermittently during short-duration, high demand periods. Additionally, as described in the EIS prepared for the 2019 IRP, implementation of the IRP Recommendations, including the construction of peaking units such as the proposed Aero CTs, would result in an overall reduction in GHG emissions. While the individual construction and operation of peaking units would result in an increase in GHG emissions, these peaking units are necessary to support the addition of new renewables in keeping with the TVA Strategic Intent and Guiding Principles.

EO 13990 reconvened the Interagency Working Group on the Social Cost of Greenhouse Gases to oversee the process for updating estimates and promulgating social costs of CO_2, CH_4, and N_2O for agencies to apply in conducting cost-benefit analysis required in certain agency rulemakings. The group released an interim figure – $51 for every ton of carbon released into the atmosphere – and is tasked with publishing a final set of updated estimates by January 2022. Consistent with EO 13990 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis), TVA considered use of the social cost of carbon (SCC) metric in the assessment of climate change impacts resulting from operation of the Aero CT plant. However, after due consideration, TVA believes that the SCC metric is not an appropriate measure or proxy of project-level climate change impacts and their significance under NEPA. The use of the SCC metric is not appropriate or informative because: (1) the lack of consensus on the appropriate discount rate leads to significant variation in outputs, rendering those outputs unreliable; (2) the SCC tool does not measure the actual incremental impacts of an individual project due to both scale and complexity; and (3) there are no established criteria identifying the monetized values considered significant for NEPA purposes. Importantly, the SCC metric does not account for the fact that the proposed Aero CT units would support the system-wide addition of renewables consistent with the IRP Recommendations and TVA Strategic Intent and Guiding Principles. TVA has achieved a 63 percent reduction in its carbon emissions as compared to 2005 baseline standards (TVA 2021a). As stated in the Strategic Intent and Guiding Principles, with the implementation of the IRP Recommendations – including the construction of peaking units to support the addition of renewables by maintaining system reliability requirements – TVA has a plan to achieve an average of 70 percent reduction in carbon emissions by 2030 and a path to an approximately 80 percent carbon reduction by

2035, based on 2005 levels. Furthermore, TVA aspires to achieve net-zero carbon emissions by 2050.

GHG emissions from the proposed action as well as the emissions from the other reasonably foreseeable future actions in Table 3-1 would incrementally increase GHG emissions within Humphreys County, but such increases would not be notable on a regional, national or global scale. The other reasonably foreseeable future actions related to the proposed retirement of JCT Units 1-16 are all part of the Target Power Supply Mix strategy identified in the 2019 IRP. The 2019 IRP programmatically evaluated future decisions related to the IRP and determined that the implementation of the target portfolio adopted by TVA through the 2019 IRP would result in an overall reduction in annual GHG emissions. The IRP also notes that the reduction in CO_2 emissions will have small but beneficial impacts on the potential for associated climate change. The installation of the 10 Aero CT units is part of the implementation of the 2019 IRP.

3.4 Geology and Soils

3.4.1 Affected Environment

3.4.1.1 Site Geology

The Johnsonville Reservation is located within the Western Highland Rim Physiographic Province of Middle Tennessee. The Highland Rim is comprised of a series of ridges and valleys underlain by Mississippian aged limestone, chert, shale, and sandstone. The site is underlain by alluvium and terrace deposits varying in thickness from less than 20 feet along the tributary stream banks to more than 100 feet within the floodplain of the Tennessee River. Underlying bedrock consists of the Lower Mississippian age Fort Payne Formation and Devonian age Chattanooga Shale and Camden Formations. The Camden Formation is the principal aquifer in the region (TVA 2019c).

3.4.1.2 Geologic Hazards

3.4.1.2.1 Karst Topography

“Karst” refers to a type of topography that is formed when rocks with a high carbonate content, such as limestone and dolomite, are dissolved by groundwater to form sinkholes, caves, springs, and underground drainage systems. Karst topography forms in areas where limestone and dolomite are near the surface (TVA 2019c). The carbonate bedrock at the site is susceptible to karst development, however, the 2021 geotechnical exploration did not identify any surface signs of sinkhole activity, nor did the soil borings indicate sinkhole conditions (S&ME, Inc. 2021).

3.4.1.2.2 Seismic Events

The Johnsonville Reservation is located within an area with a moderate seismic hazard. The hazard is attributed to an earthquake having a magnitude of 7.5 to 8 in the New Madrid Seismic Zone (NMSZ) located approximately 125 miles from the site (S&ME, Inc. 2021).

The NMSZ is located along the Mississippi Valley in the areas of western Kentucky and Tennessee, southwestern Missouri, and northwest Arkansas. The NMSZ is best known for a series of intense earthquakes which occurred in 1811 and 1812. These earthquakes were estimated to have magnitudes ranging from 7.0 to 8.6 and caused significant disruption at the ground surface (landslides, fissures, sand boils, lateral spreads, subsidence, submergence, and uplift) and damage to structures (S&ME, Inc. 2021).

3.4.1.2.3 Faulting and Liquefaction Potential

There are two general categories of earthquake hazards: primary and secondary. Primary hazards include fault ground rupture and strong ground shaking. If an earthquake is larger than about magnitude 5.5, ground rupture may occur on the fault. The amount of displacement generally increases with the magnitude of the earthquake (TVA 2019c). A review of the U.S. Geological Survey (USGS) Quaternary Faults and Folds database, which contains information on faults and associated folds in the United States that are believed to be sources of more than six earthquakes having a magnitude greater than 6 during the Quaternary Period (the most recent geologic period), there are no known faults of this age located within the vicinity of the Johnsonville Reservation (USGS 2021b).

Secondary hazards include liquefaction/lateral spreading, landsliding, and ground settlement (TVA 2019c). Liquefaction is the loss of a soil's shear strength due to an increase in porewater pressure resulting from seismic vibrations and is a concern for strong shaking of loose, saturated, granular soils. Subsurface conditions at the Johnsonville Reservation are generally not susceptible to liquefaction (S&ME, Inc. 2021).

3.4.1.3 Soils

According to the USDA Natural Resources Conservation Service (NRCS) web soil survey (USDA NRCS 2021), most of the soils (92 percent) in the project area are mapped as Paden silt loam. Other mapped soils in the project area include Melvin silty clay loam, Robertsville silt loam, Wolftever silty clay loam, Taft silt loam, and Melvin silt loam. Most of the soils within the reservation boundary have been disturbed or replaced by anthropogenic fill to support development or operations of the plant facilities. This includes the areas proposed for the Aero CT plant, 161-kV Aero switchyard, and the temporary use areas. In addition, the proposed laydown area is located on the former ash pond which does not contain native soil.

3.4.2 Environmental Consequences

3.4.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the Aero CTs and the associated support systems. Therefore, there would be no impacts to the site's geologic resources.

3.4.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alterative B, TVA would construct Aero CTs and the associated support systems at the Johnsonville Reservation. Construction activities such as excavation would be done at a maximum depth of 20 feet and would not disrupt bedrock geology. Therefore, construction activities are anticipated to have minor impacts on geologic features.

The proposed Aero CTs and support systems would be constructed on a site that is heavily disturbed and comprised largely of fill material. Onsite and local geologic and geomorphic features within and around the proposed site were evaluated during the geotechnical investigation. The geotechnical exploration did not encounter any onsite features that would prohibit development of Aero CTs at the Johnsonville Reservation. As identified in the geotechnical report, the design of the Aero CTs and support systems would address liquefaction, seismic considerations, and fill material selection and compaction requirements (S&ME, Inc. 2021). These design considerations are expected to minimize any effects on geological resources. Therefore, operation of the Aero CTs and support

systems and other reasonably foreseeable future actions in Table 3-1 would not impact geological or soil resources.

3.5 Groundwater

3.5.1 Affected Environment

3.5.1.1 Regional Aquifers

The Johnsonville Reservation is located within the Mississippi Carbonate aquifer region, which consists of limestone and dolomite and underlain with Chattanooga Shale (TDEC 2018). Regional aquifers within five miles of the Johnsonville Reservation are represented by The Camden Formation, which consists of thin beds of cherty limestone interbedded with softer clay layers, is the principal aquifer in the region. Groundwater movement at Johnsonville Reservation is generally from east to west towards the Kentucky Reservoir on the Tennessee River. Depth to water typically ranges from 10 to 30 feet below ground surface. Groundwater recharge is generated by local infiltration of precipitation at the surface and occurs laterally from upland areas east of the Johnsonville Reservation (TVA 2018).

3.5.1.2 Groundwater Use

Public water supply in New Johnsonville, Tennessee is sourced from the Tennessee River and provided by the New Johnsonville Water Department (New Johnsonville Water Department 2020). There are 16 public water wells within a 2-mile radius of the proposed Aero CTs; 13 of the wells are registered as residential usage, one well is registered as commercial usage, and the remaining two wells are unclassified (TDEC 2021a).

3.5.1.3 Groundwater Quality

Groundwater has been monitored at the Johnsonville Reservation since 1982. Monitoring currently consist of CCR Rule sampling at Ash Pond 2, and state-permit compliance (TDEC Rule 0400-11-01-04) at the South Rail Loop Area 4 and the DuPont Dredge Cell. The Dupont Dredge cell is located adjacent to the northeast portion of the Project Area and the South Rail Loop Ash Disposal Area is located approximately 850 feet southeast of the project area. The wells at these locations range from 17.1 to 86.1 feet deep, and groundwater depth ranges from 10.88 to 28.43 feet (TVA 2018).

Sampling events performed at the DuPont Road Dredged Ash Disposal Area since the third quarter of 2016 have exhibited radium 226/228 exceedances above the Maximum Contaminant Level (MCL) at a background well and in a duplicate sample. There have been no other exceedances of MCLs or upper prediction limits (UPLs) since 2004. Groundwater analyses from 1990 to 2014 show a trend of increasing concentrations of chloride, calcium, magnesium, and sodium in the background well. These results are attributed to dissolution and migration of chloride salts from DuPont process waste landfills situated upgradient of the reservation (TVA 2018).

Results from the South Rail Loop Area 4 monitoring wells from samples taken in March 2021 show boron, calcium, chloride, sulfate, zinc, and total dissolved solids detected above the groundwater protection standards and radium 226/228 and nickel exceedances above UPLs. Groundwater analyses from 2017-2021 indicate groundwater constituent concentrations are either decreasing or stabilizing although there is some variability between sampling events. The site is currently being evaluated for additional assessment

and further corrective measures that may be required under the TDEC Commissioner's Order (TVA 2021b).

The Safe Drinking Water Act of 1974 established the sole source aquifer protection program that regulates certain activities in areas where the aquifer (water-bearing geologic formations) provides at least half of the drinking water consumed in the overlying area. No sole source aquifers exist in Tennessee (EPA 2021b).

3.5.2 Environmental Consequences

3.5.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct Aero CTs and there would be no change in groundwater conditions at Johnsonville Reservation that would be associated with construction or operation of the proposed Aero CTs.

3.5.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, construction of the Aero CTs and other associated support systems at the Johnsonville Reservation would require below ground construction activities that may encounter groundwater. TVA estimates the maximum excavation depth for all below ground construction activities would be 20 feet. If groundwater is encountered during any construction activities, dewatering processes would be used to control groundwater infiltration into the excavation site and all state and federal requirements relating to groundwater protection would be followed. The described construction activities and below ground excavation are localized and limited to the construction phase of the proposed project; therefore, any impacts to groundwater would be minor.

Construction of the proposed support facilities including the natural gas compressor, administration/control building, warehouses, and the Aero 161-kV switchyard and associated transmissions lines would occur on TVA property and on previously disturbed areas. Minimal excavation is required and no impacts to groundwater are anticipated.

The existing JCT plant has adequate capacity of demineralized water that would be used for the proposed Aero CTs. Potable water would be obtained from the existing public supply. Therefore, there would be no impacts to groundwater associated with operation of the Aero CT plant. Construction activities associated with other reasonably foreseeable future actions in Table 3-1 have the potential to release constituents that may impact groundwater. However, these activities would be conducted in accordance with any applicable environmental and safety regulations, minimizing the potential for a release of contaminants. The closure of the coal yard and Ash Pond 2 would have an overall positive impact on groundwater quality.

3.6 Surface Water Resources

3.6.1 Affected Environment

3.6.1.1 Kentucky Reservoir

TVA's Johnsonville Reservation is situated on the east bank of the Tennessee River, just south (upstream) of the confluence of the Tennessee River and Trace Creek. This reach of the lower Tennessee River is part of the Kentucky Reservoir, the largest reservoir in the eastern U.S. This reservoir extends for 184 miles and drains the entire Tennessee Valley watershed. The segment of the Tennessee River adjacent to proposed project area is

classified for the uses of domestic water supply, industrial water supply, fish and aquatic life, recreation, livestock watering and wildlife, irrigation, and navigation (TDEC 2013).

TVA assesses the ecological health of its reservoirs on a cyclical basis and has assessed the Kentucky Reservoir annually from 1991 to 2019. Reservoirs receive qualitative ratings based on a range of physical and biological characteristics at multiple locations (TVA 2021f). Ecological health evaluations focus on five indicators: dissolved oxygen (DO), chlorophyll, sediment quality, benthic macroinvertebrate community (bottom life), and the fish assemblage.

TVA monitors four locations on Kentucky Reservoir— the forebay, the mid-reservoir transition, Big Sandy embayment, and the inflow. Health ratings include good, fair, and poor (from high to low) and an overall reservoir rating and score are provided based on the combined health ratings from all measured reservoir locations. In 2019, Kentucky Reservoir received an overall reservoir ecological health score of 78 and a reservoir rating of “Good”. Water quality data were not collected at the inflow. Habitat parameters, DO, and sediment were rated “Good” at all locations. Chlorophyll rated “Poor” at the forebay and embayment and “Good” at the transition. Elevated chlorophyll concentrations are common on Kentucky Reservoir except mid-reservoir due to increased mixing (TVA 2021f).

The CWA requires states to identify all waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards, and to establish priorities for the development of limits based on the severity of the pollution and the sensitivity of the established uses of those waters. States are required to submit reports to the EPA. The term “303(d) list” refers to the list of impaired and threatened streams and water bodies identified by the state. The lower Tennessee River is not listed on the Final 2020 TDEC 303(d) List (TDEC 2020); therefore, it is not considered impaired and is assumed to fully meet its designated uses.

3.6.1.2 Existing Wastewaters and Drainage Areas

There are several existing wastewater streams at Johnsonville Reservation permitted to be discharged through NPDES Outfall 001 (Permit Number TN0005444) (TDEC 2011). Additionally, stormwater discharges are authorized by the Tennessee Multi-Sector (TMSP) Stormwater General Permit No. TNR053188. An Interim Flow Management system located on Ash Pond 2 receives process flow from the plant station sump and the coal yard runoff pond. The flows are routed to treatment tanks and discharged through the NPDES Outfall 001 to the Kentucky Reservoir on the Tennessee River. Process water from the JCT plant discharges directly to Outfall 001. Water discharges at the spillway outlet are monitored according to NPDES Permit requirements. The NPDES permit requires monitoring of flow, total aluminum, total antimony, total arsenic, total cadmium, total copper, total iron, total lead, total mercury, total nickel, total selenium, total silver, total thallium, total zinc, total cyanide, asbestos, and acute toxicity. The NPDES permit also has established limitations on the following: pH, total suspended solids, and oil and grease.

Based on previous surveys of jurisdictional streams and wetlands within the Aero CT project area, there is one ephemeral stream located near the proposed Aero 161-kV switchyard and one perennial stream located in the southeast corner of the project area (Figure 3-1). In addition, one emergent wetland associated with an ephemeral stream was identified near the proposed Aero 161-kV switchyard and a forested wetland was delineated on the south side of the proposed shuttle bus road. More information regarding the wetlands identified are described in Section 3.7.

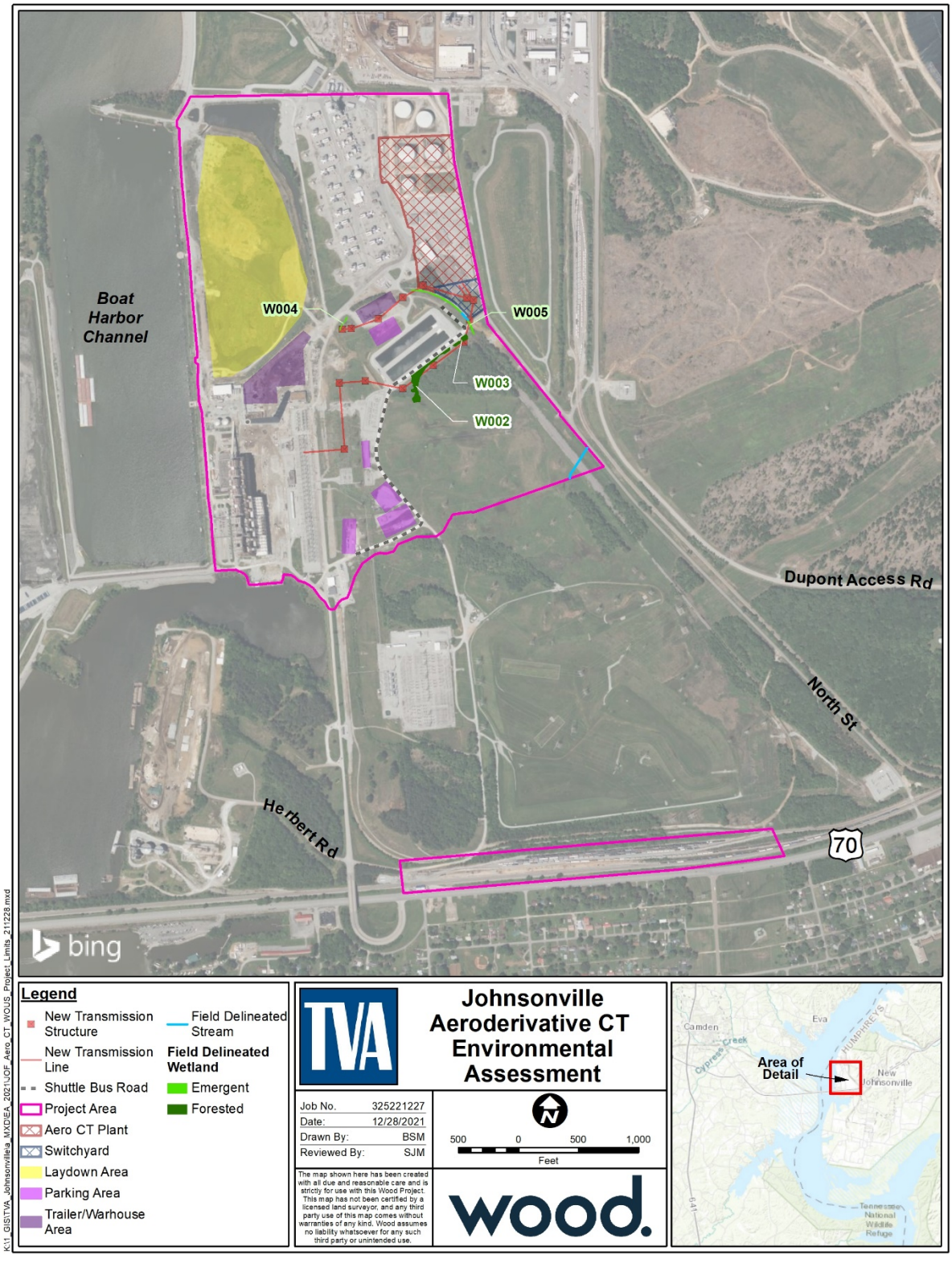


Figure 3-1. Surface Water Features within the Project Area

3.6.2 Environmental Consequences

3.6.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the proposed Aero CT plant and associated support structures and therefore there would be no project-related impacts to surface waters.

3.6.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

3.6.2.2.1 Construction

Under Alternative B, construction activities associated with the Aero CT plant and associated support structures would involve ground disturbance resulting in the potential for increased sediment release and erosion, which has the potential to temporarily affect surface water via stormwater runoff. Appropriate BMPs would be followed, and all construction activities would be conducted in a manner to ensure that waste materials are contained so as to minimize introduction of pollutants to receiving waters. A General Permit for Storm Water Discharges Associated with Construction Activities (TDEC 2021b) would be required for this project and this permit would require development of a project-specific SWPPP. The Tennessee Erosion and Sediment Control Handbook would be referenced to ensure that the appropriate BMPs are used (TDEC 2012). Areas where soil disturbance could occur would be stabilized and vegetated with native or non-native, non-invasive grasses and mulched.

Stormwater discharges during construction would be sent to the process water basin and the site NPDES permit would be modified accordingly. Due to the implementation of BMPs, no discernable change in the discharge from Outfall 001 is expected from the proposed construction.

With an increased onsite workforce, it would be necessary to make arrangements to provide additional restroom facilities. During the construction phase, temporary toilet facilities would be provided by a licensed vendor and sanitary wastewater would be disposed at an approved facility.

Equipment washing and dust control discharges would be handled in accordance with BMPs described in the SWPPP for water-only cleaning, and/or NPDES Permit TN 0005444 to minimize construction impacts to surface waters.

To the extent practicable, TVA would establish a 30-foot buffer around the ephemeral stream located adjacent to the Aero 161-kV switchyard and preclude any ground disturbing actions within the buffer to avoid placing fill material into the stream and minimize sedimentation. There is no project activity planned near the perennial stream; therefore, it would not be impacted.

With proper implementation of sediment and erosion control BMPs, only minor temporary impacts to local surface waters would occur during the construction phase. As no jurisdictional streams would be permanently impacted by the proposed activities, no additional permitting or stream mitigation would be required.

3.6.2.2.2 Operation

The Aero CT units would require up to 300 gpm of potable water and 300 gpm of demineralized water for evaporative cooling and wet compression for power augmentation.

The JCT plant already has adequate capacity for demineralized water production that would be used for the Aero CTs. Any process water discharges would be directed to the existing Johnsonville Process Water Basin and the site NPDES permit would be modified accordingly. Additional potable water for evaporative cooling, domestic use, and safety showers would be obtained from the existing public supply. The water supply for the fire protection system would be provided from the existing fire water supply.

Impervious buildings and infrastructure prevent rain from percolating through the soil and result in additional runoff of water and pollutants into storm drains, ditches, and streams. Clearing of vegetation and ground cover, and the addition of impervious buildings and pavement could alter the current stormwater flows. Construction of the Aero CT plant and Aero 161-kV switchyard would increase the impervious cover on the project area, thus altering and possibly increasing the concentrated stormwater runoff. This flow would be properly treated through implementation of the proper stormwater BMPs or by diverting the stormwater discharges to the Interim Flow Management system and ultimately released through permitted Outfall 001. No negative impacts to the surface waters would occur from the operation of this facility as any discharges would be required to meet NPDES limits and TDEC Water Quality Standards that are developed to be protective of designated waters.

An Interim Flow Management system located on Ash Pond 2 receives process flow from the plant station sump and the coal yard runoff pond. The flows are routed to treatment tanks and discharged through the NPDES Outfall 001 to the Kentucky Reservoir on the Tennessee River. Process water from the JCT plant discharges directly to Outfall 001.

With the implementation of appropriate BMPs, as would be described in the project-specific SWPPP, impacts of the proposed action and the other reasonably foreseeable future actions in Table 3-1 on surface water resources would not be significant.]

3.7 Wetlands

3.7.1 Affected Environment

Wetlands are those areas inundated or saturated by surface or groundwater such that vegetation adapted to saturated soil conditions are prevalent. Examples include bottomland forests, swamps, wet meadows, isolated depressions, shallow embayments, and shoreline fringe wetland along the edges of watercourses, impoundments, or lake systems. Wetlands provide many societal benefits such as toxin absorption and sediment retention for improved downstream water quality, stormwater impediment and attenuation for flood control, shoreline buffering for erosion protection, and provision of fish and wildlife habitat for commercial, recreational, and conservation purposes.

The U.S. Army Corps of Engineers (USACE) regulates the placement of fill material into waters of the U.S. including wetlands, pursuant to Section 404 of the CWA (33 USC 1344). Additionally, 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.

Field assessments were conducted by TVA on the Johnsonville Reservation in fall of 2020 during a comprehensive site survey to locate wetland areas within the reservation boundary. Wetland determinations were performed according to the USACE standards, which require documentation of hydrophytic (wet-site) vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Lichvar et al. 2014; USACE 2012).

The proposed project area encompasses predominantly previously disturbed areas of the Johnsonville Reservation, which is located within the Tennessee River watershed (10-HUC 0604000504) along the east banks of the Tennessee River. Wetlands delineated in 2020 within the proposed project area comprise four features totaling 0.84 acre (Table 3-3). The four wetland features are scattered along the central and eastern portion of the project area. The forested wetlands (W002 and W003) are representative of wetland flats and associated wetland drainage features. The emergent wetlands (W004 and W005) consist of linear, emergent/scrub-shrub wetland drainage features.

Table 3-3. Wetland Features Within the Project Area

Wetland ID	Wetland Type[1]	Acreage
W002	PFO1A	0.51
W003	PFO1A	0.10
W004	PEM	0.03
W005	PEM	0.20
Total		**0.84**

[1]Classification codes as defined in Cowardin et al. (1979): PFO1A = Palustrine forested, broadleaf deciduous, temporarily flooded; PEM = Palustrine emergent wetland.

Land use/land cover data within a 5-mile radius of the project areas shows that emergent herbaceous and woody wetlands comprise approximately 12.9 percent (8,074 acres) of the surrounding lands (see Table 3-4). Therefore, the emergent and forested wetlands within the proposed project areas comprise less than 0.01 percent of the wetlands within a 5-mile radius.

Ongoing project activities at the Johnsonville Process Water Basin site have impacted delineated wetlands. TVA will conduct a new wetland delineation in early 2022 to confirm any changes in wetland features in the vicinity of the Process Water Basin. The results of this survey and any updates to the wetlands analysis will be reported in the Final EA.

3.7.2 Environmental Consequences

3.7.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the Aero CT plant and associated support structures. Therefore, no impacts to wetlands would occur.

3.7.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

The proposed locations for the Aero CTs and associated support structures would be sited outside of all wetland features within the project area. The transmission line corridor was routed to avoid placing any structures within a delineated wetland; however, up to 0.4 acres of the forested wetland would potentially be cleared within the transmission line right-of-way (ROW). Effects of wetland impacts would be minor when viewed in the context of the 5,645 acres of forested wetland resources within the surrounding 5-mile region (Table 3-4), as this impact corresponds to less than 0.01 percent of wetlands within this region.

Potential minor indirect impacts during the construction process could include erosion and sedimentation from stormwater runoff into nearby wetlands. BMPs and site-specific erosion control plans would be implemented to minimize this potential. Therefore, indirect impacts to emergent wetland areas due to construction activities would be short-term and minor. Overall, impacts from the proposed action and the other reasonably foreseeable future actions in Table 3-1 would be minor.

TVA will coordinate with the USACE and TDEC to determine jurisdictional status of any wetlands that cannot be avoided. Unavoidable impacts to jurisdictional wetlands will not occur unless authorized by the USACE through the CWA Section 404 permitting process and/or TDEC ARAP process. If required, mitigation measures would be incorporated into the final design of the project.

3.8 Aquatic Ecology

3.8.1 Affected Environment

The Johnsonville Reservation is located in Humphreys County, Tennessee, in the Western Highland Rim subregion of the greater Interior Plateau ecoregion (Griffith et al. 1998). Streams in this region are relatively clear with moderate gradients, with substrates consisting primarily of coarse chert gravel and sand with some bedrock. Much of the region is heavily forested, with some agriculture in the stream and river valleys.

The reservation is located on the eastern shore (right descending bank) of the Kentucky Reservoir on the Tennessee River at Tennessee River Mile (TRM) 100. The reach of the river adjacent to the reservation has been altered from its former free-flowing character by the presence of Kentucky Dam, located approximately 76 river miles downstream of Johnsonville Reservation, and Pickwick Dam, located approximately 107 river miles upstream.

As noted in Section 3.6 (Surface Water Resources), TVA began a program to monitor the ecological conditions of its reservoirs systematically in 1990. Reservoir (and stream) monitoring programs were combined with TVA's fish tissue and bacteriological studies to form an integrated Vital Signs Monitoring Program. The Program activities focus on physical/chemical characteristics of waters and sediments, benthic macroinvertebrate community sampling, and fish assemblage sampling (TVA 2021f).

In 2019, benthic communities of the Kentucky Reservoir rated "Good" at the forebay and transition and "Fair" at the inflow and embayment. Samples from the inflow and embayment contained fewer individuals and a lesser variety of organisms than those from the other monitoring locations (TVA 2021f). Fish communities rated "Good" at the four locations monitored. A total of 60 different species was observed reservoir-wide in previous years (TVA 2021f). Some of the more interesting species observed included American eel, rainbow darter, river darter and silver chub. Silver carp were observed at the forebay, transition, and embayment locations. Common sportfish in Kentucky Reservoir include largemouth bass, crappie, and catfish.

Based on previous surveys of jurisdictional streams and wetlands within the Aero CT project area, there is one ephemeral stream located near the proposed Aero 161-kV switchyard and one perennial stream located in the southeast corner of the project area (Figure 3-1). Due to their relatively small size, the fish and benthic invertebrate communities in these streams are expected to have a simpler species composition similar to that of other

small tributary streams that drain to the Kentucky Reservoir. The coal yard runoff pond does contain free-standing water but does not provide habitat for aquatic biota since it is considered a treatment system. Discharge from the coal yard runoff pond is currently pumped and discharged through the NPDES permitted Outfall 001.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the Aero CT plant and associated support structures. Therefore, there would be no change to the existing conditions of the onsite aquatic habitat and the Kentucky Reservoir on the Tennessee River.

3.8.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Through efforts made during project planning and siting, TVA has been able to site the proposed temporary and permanent use areas in locations outside of the streams to avoid direct impacts. Therefore, direct impacts to aquatic biota associated with the construction of the Aero CT plant and supporting structures are not anticipated.

Soil disturbances associated with construction activities could potentially result in indirect adverse water quality impacts and can clog small streams and threaten aquatic life. Construction activities would adhere to SWPPP and construction stormwater permit limit requirements, including the use of BMPs to minimize indirect effects on aquatic resources during the construction phase. Following construction, site-wide management of stormwater using appropriate BMPs would minimize indirect impacts to the aquatic community in the receiving waters. Therefore, impacts to aquatic resources due to the proposed action and the other reasonably foreseeable future actions in Table 3-1 would be minor and temporary with proper implementation of sediment and erosion control BMPs.

3.9 Vegetation

3.9.1 Affected Environment

The Western Highland Rim of the Interior Plateau is characterized by dissected, rolling terrain of open hills, with elevations of 400 to 1,000 feet. Soils in this region tend to be acidic, cherty, and moderate in fertility (Griffith et al. 1998). Historically, this area was dominated by oak-hickory forests that were mostly removed in the 1800s in association with iron-ore mining. Currently, portions of this ecoregion are once again heavily forested with some agriculture occurring along the stream and river valleys (Griffith et al. 1998).

The Aero CT project area is an intensely developed site that has been heavily disturbed by construction, maintenance, and operation of the facility. As a result of this wholesale alteration of the physical landscape, most areas within the project area are unvegetated, but a few small locations do contain early successional vegetation dominated by non-native weeds and/or fragmented deciduous and mixed deciduous-evergreen forested stands.

The vegetation within a 5-mile radius surrounding the Johnsonville Reservation was evaluated with land use/land cover information obtained from the National Land Cover Dataset (NLCD) (Dewitz 2019). Analysis of the NLCD indicates that land cover within a 5-mile radius of the reservation is primarily forested land (26,113 acres) and open water (14,031 acres) (Table 3-4). Land cover within a 5 mile-radius is shown on Figure 3-2.

Field surveys of plant communities were conducted for the project area in November 2017 and August 2018. Land cover within the project area was developed using the NLCD data modified based on the previous field survey data and updated aerial photography (Figure 3-3). The most common land cover within the project area is developed low intensity (191.8 acres), followed by herbaceous (41.3 acres), with smaller amounts of deciduous forest (7.9 acres), open water (3.9 acres), woody wetlands (0.6 acres), and emergent herbaceous wetlands (0.2 acres).

Table 3-4. Land Cover in the Johnsonville Aero CT Project Area and Vicinity

Land Cover Type	Project Area[1] (ac)	5-mi Radius[2] (ac)
Barren Land		296
Cultivated Crops		2,934
Deciduous Forest	7.9	24,127
Developed, High Intensity		315
Developed, Low Intensity	191.8	626
Developed, Medium Intensity		441
Developed, Open Space		2,787
Emergent Herbaceous Wetlands	0.2	2,430
Evergreen Forest		397
Hay/Pasture		5,109
Herbaceous	41.3	705
Mixed Forest		1,987
Open Water	3.9	14,031
Shrub/Scrub		629
Woody Wetlands	0.6	5,645
Total	**245.7**	**62,458**

Source:

[1] Obtained from Dewitz 2019 and modified based on updated aerial photography and previous survey data
[2] Land Cover within 5-mi radius obtained from Dewitz 2019

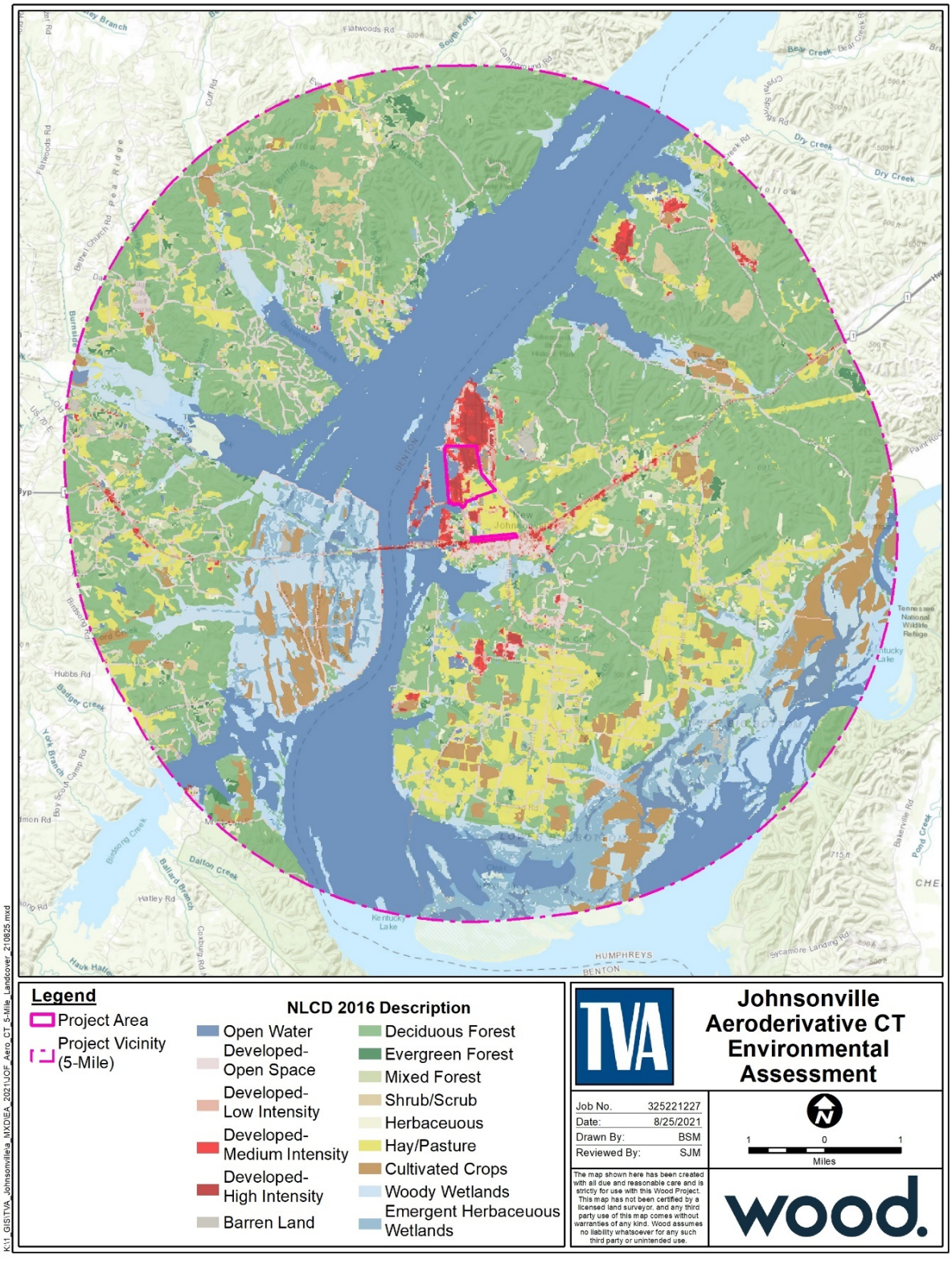


Figure 3-2. Land Cover within 5-mile Radius of Project Area

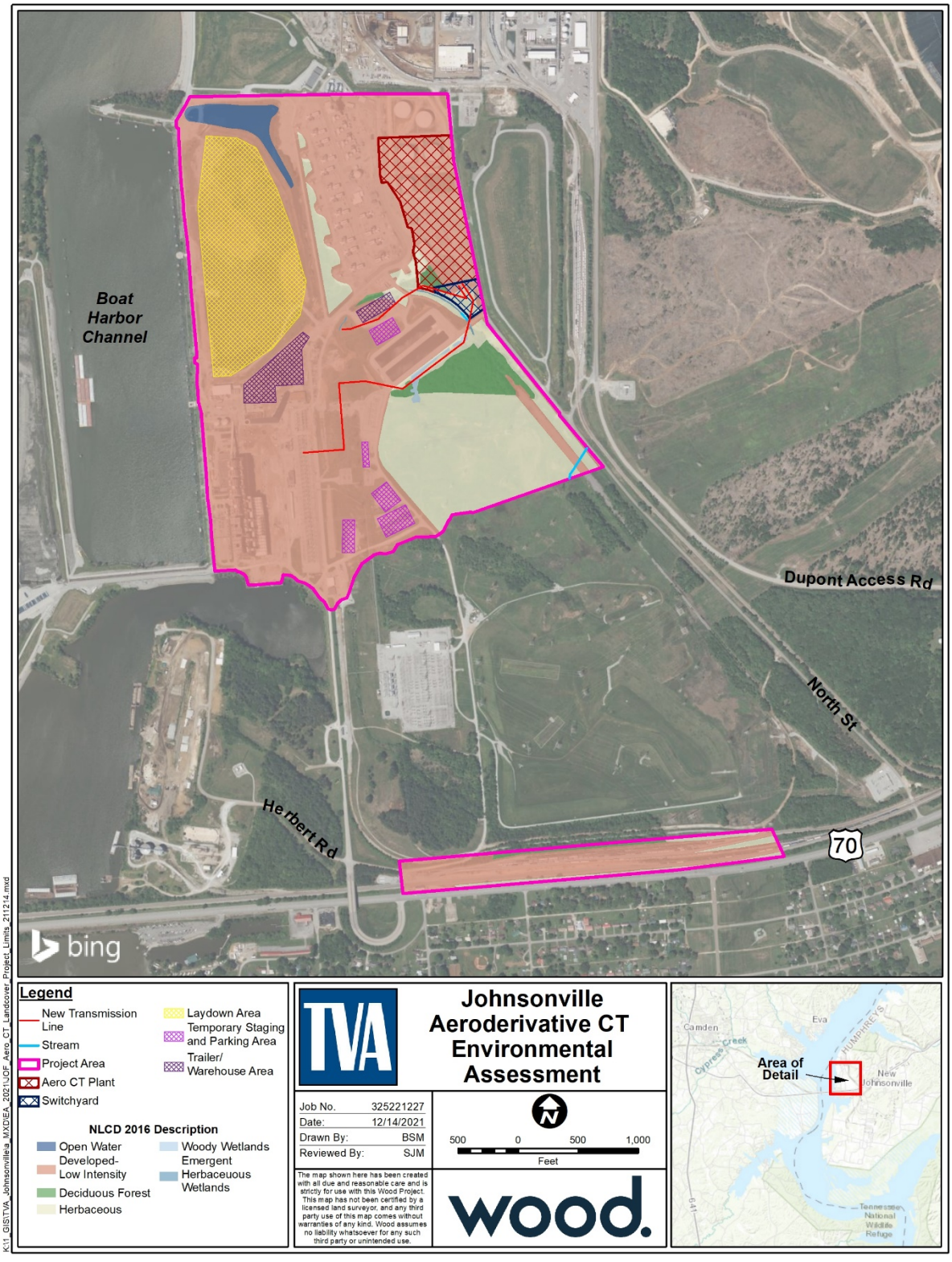


Figure 3-3. Land Cover within the Project Area

Based on a desktop review and field surveys, no unique plant communities are present within the project area. Mowed and maintained upland lawns and early successional herbaceous communities were dominated by dallisgrass, Johnsongrass, tall fescue, sericea lespedeza, tall goldenrod, tall fescue, Johnsongrass, lanceleaf plantain, little bluestem, and horseweed. Disturbed, infrequently maintained herbaceous wet ditches and small wetlands were commonly occupied by woolgrass, small carpetgrass, common reed, and several species of smartweeds, bonesets, water primroses, true sedges, rushes, and flatsedges. Upland deciduous forest commonly included trees of southern red oak, black oak, sweet gum, black locust, and loblolly with winged elm, winged sumac, Japanese honeysuckle, and trumpet creeper in the shrub and vine stratum over a poorly developed herbaceous layer.

Certain non-native species are considered invasive and pose a significant threat to the natural environment. EO 13112 of February 3, 1999, directed TVA and other federal agencies to prevent the introduction of invasive species (both plants and animals), control their populations, restore invaded ecosystems and take other related actions. EO 13751 issued on December 8, 2016, amends EO 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species. Invasive plants are common in and near the project area. Some of the invasive plant species observed within the project areas include Japanese honeysuckle, Bradford pear, common reed, Chinese privet, Johnsongrass, tall fescue, and sericea lespedeza.

3.9.2 Environmental Consequences

3.9.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the Aero CT plant and associated support structures. Therefore, no impacts with respect to vegetation would occur under this alternative.

3.9.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, impacts to vegetation would generally result from earthmoving and vegetation clearing activities associated with the construction of the proposed Aero CT plant. TVA has identified previously disturbed land to be used for temporary laydown and storage areas during the construction phase.

As shown in Figure 3-3, the majority (192 acres or 78 percent) of the project area, including the laydown, temporary use areas and parking areas, is classified as developed low intensity, which describes areas with a mixture of constructed areas and vegetation. The laydown area consists of the former ash pond that has been closed and an herbaceous cover has developed. Other temporary staging and parking areas include gravel parking lots with some herbaceous land cover, primarily consisting of turfgrass and vegetation associated with disturbed areas found at the edge of gravel parking lots. The laydown and temporary staging areas would be impacted mostly by storage of equipment, materials, and vehicles during construction. Post-construction, these areas would revert to their current use; therefore, the impact to any vegetation present in the laydown area and temporary staging areas would be short-term and minor.

The locations of the proposed Aero CT plant and Aero 161-kV switchyard are mostly within areas classified as developed low intensity and herbaceous land cover. Each of these areas also includes a small portion of deciduous forest, with 0.5 acres and 0.1 acres within the Aero CT plant and Aero 161-kV switchyard areas, respectively. The proposed

transmission line corridor that would connect the Aero 161-kV switchyard to the existing switchyard would impact 0.6 acres of deciduous forest and 0.4 acres of forested wetland. Therefore, construction within the project area for the Aero CT plant, Aero 161-kV switchyard, and transmission line would result in the permanent loss of approximately 1.6 acres of forest resulting in long-term adverse impacts. Construction activity within the rail area would avoid impacts to the approximately 1.0 acres of deciduous forest located near the rail line. As shown in Table 3-4, there is abundant deciduous forest habitat (24,127 acres) of similar quality within a 5-mile radius of the reservation, and the deciduous forested vegetation in the transmission corridor is common and representative of the region. Therefore, no impacts to unique or important terrestrial plant communities are anticipated.

Invasive species have the potential to affect native plant communities adversely because of their ability to spread rapidly and displace native vegetation. Post construction, the laydown and temporary staging and parking areas would revert to their original use. It is likely that project-related construction would result in localized increases of invasive plants, but the plants most likely to colonize the area are distributed widely throughout the region; therefore, implementation of the proposed project would not likely increase the proportion of invasive plants in the area. BMPs consisting of erosion control measures and use of approved, non-invasive seed mixes or sod designed to establish desirable vegetation would mitigate the risk of the spread of invasive species. Due to these control measures, the proposed action would be in compliance with the requirements of EO 13751 and EO 13112.

Overall, the construction and operation of the Aero CT plant is expected to result in short-term impacts to existing disturbed land cover types. The lateral divestiture project and development of the borrow site on TVA property may result in some tree removal. Based on the small acreage of impacted forest in comparison to the abundance of similar habitats within the 5-mile vicinity, overall impacts to forest resources as a result of the proposed action and the other reasonably foreseeable future actions in Table 3-1 would be minor.

3.10 Wildlife

3.10.1 Affected Environment

Habitat assessments for terrestrial animal species were conducted for the Johnsonville Reservation in 2019, 2020, and 2021, including osprey nest and wading bird colony surveys in 2020 and 2021. Landscape features within and surrounding the project area consist of a variety of fragmented forest habitat, stream corridors, wetlands, and developed or otherwise disturbed areas.

Fragmented pockets of deciduous forested stands occupy approximately 7.9 acres of the project area within the Aero CT plant area and rail area. These forest types provide habitat for an array of common terrestrial animal species. Birds typical of this habitat include chuck-will's-widow, downy and hairy woodpecker, eastern screech-owl, eastern wood-pewee, great horned-owl, red-tailed hawk, wood thrush, and wild turkey (National Geographic 2002). This area also provides foraging and roosting habitat for several species of bat, particularly in areas where the forest understory is partially open. Bat species likely found within this habitat include eastern red bat and evening bat. Eastern chipmunk, gray fox, and woodland vole are other mammals likely to occur within this habitat (Whitaker 1996). Eastern black kingsnake, black ratsnake, eastern box turtle, and ring-necked snake are common reptiles of deciduous forests in this region (Gibbons and Dorcas 2005).

Developed areas, and areas otherwise previously disturbed by human activity, make up the majority (191.8 acres) of the project area, including the proposed Aero CT plant site, the laydown area, and the temporary staging and parking areas. This habitat type is home to many common species. American robin, Carolina chickadee, blue jay, European starling, house sparrow, mourning dove, northern cardinal, northern mockingbird, black vulture, and turkey vulture are birds commonly found along road edges, residential neighborhoods, and industrial properties (National Geographic 2002). Mammals commonly found in this habitat include eastern gray squirrel, northern raccoon, and Virginia opossum (Whitaker 1996). Roadside ditches and ephemeral streams provide potential habitat for amphibians including American toad, upland chorus frog, and spring peeper. Reptiles potentially present include eastern garter snake and midland brown snake (Gibbons and Dorcas 2005).

Stream and wetland habitat within the project area is fairly limited and includes a small ephemeral stream, a perennial stream, small linear emergent/scrub-shrub wetlands, and forested wetland flats. Aquatic habitat within the project area provides resources for birds including Canada goose, cedar waxwing, northern harrier, northern parula, red-winged blackbird, swamp sparrow, and white-throated sparrow (National Geographic 2002). American beaver, golden mouse, and muskrat are common mammals in wetlands and aquatic communities. Northern water snake, ribbon snake, and rough green snake are common reptiles likely present within this habitat type (Gibbons and Dorcas 2005). Amphibians likely found in forested wetlands include eastern newt, marbled salamander, slimy salamander, spotted salamanders, eastern narrowmouth toad, eastern spadefoot toad, Fowler’s toad, Cope’s gray treefrog, and southern leopard frog (Conant and Collins 1998, Redmond and Scott 1996).

Review of the TVA Regional Natural Heritage Database in March 2021 indicated the presence of 10 osprey nests within 3 miles of the project area. Field surveys conducted in April 2021 confirmed the presence of seven active osprey nests either located within the project area or whose 660-foot disturbance buffers are located within the project area. The locations of these 660-foot disturbance buffers are shown on Figure 3-4. According to the TVA Regional Natural Heritage Database, there are also three wading bird colonies within 3 miles of the project area, the nearest of which occurs within approximately 1.8 miles.

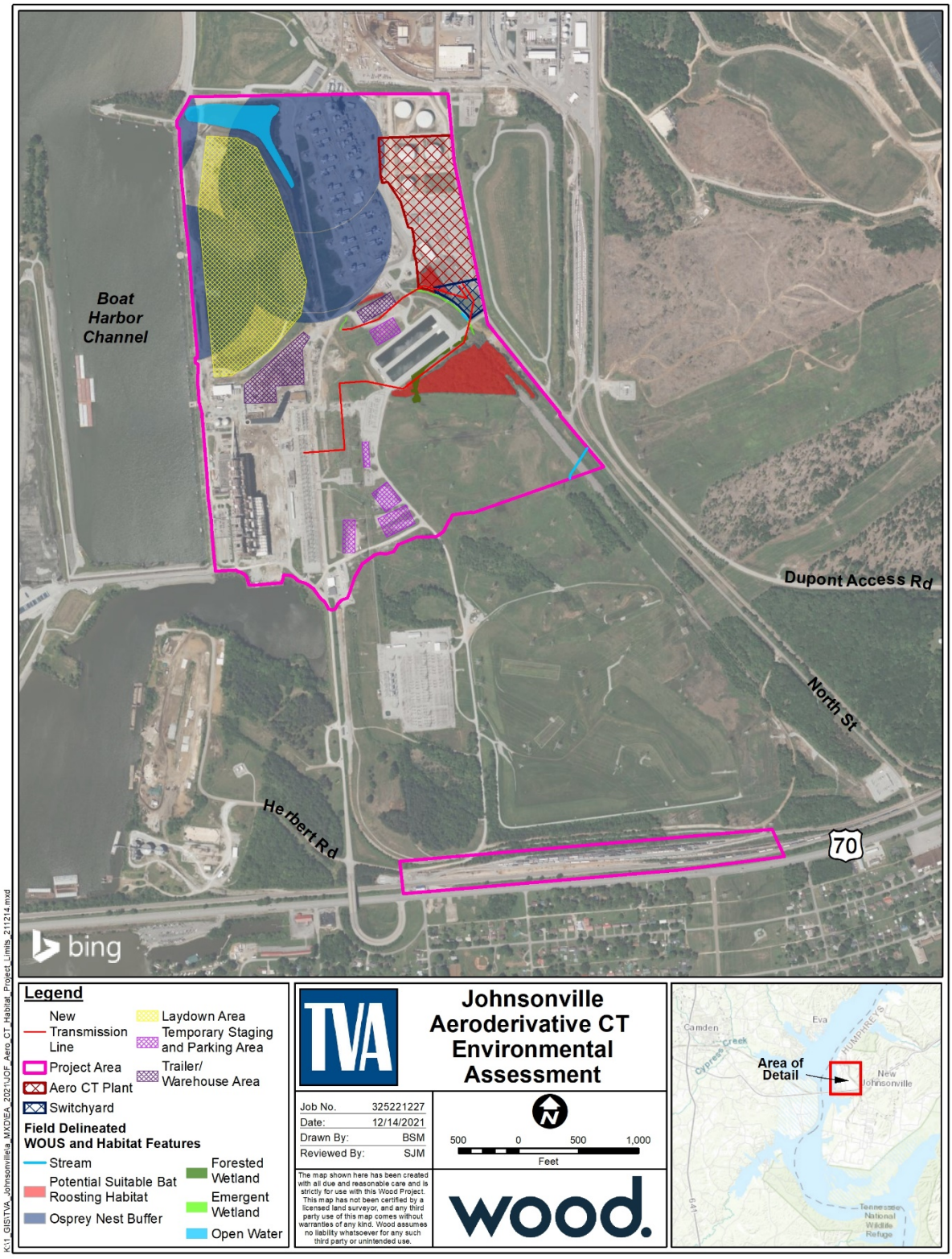


Figure 3-4. Osprey Nest Buffers and Potentially Suitable Bat Roosting Habitat within the Project Area

Additional review of the USFWS Information for Planning and Consultation (IPaC) project planning tool resulted in the potential for the following eleven migratory bird species of conservation concern to occur within the project area: bald eagle, blue-winged warbler, golden eagle, Kentucky warbler, Le-Conte's sparrow, lesser yellowlegs, prairie warbler, red-headed woodpecker, rusty blackbird, semipalmated sandpiper, and wood thrush. Habitat is not present within the project area for golden eagle, Kentucky warbler, Le Conte's sparrow, lesser yellowlegs, rusty blackbird, or semipalmated sandpiper. Suitable nesting and/or foraging habitat exists within the project area for bald eagle, blue-winged warbler, prairie warbler, red-headed woodpecker, and wood thrush. An abundance of similarly suitable habitat occurs across the adjacent landscape. No bald eagles or their nests were observed in or adjacent to the project area during 2021 field surveys; see Section 3.11 (Threatened and Endangered Species) for review of potential impacts to bald eagle.

3.10.2 Environmental Consequences

3.10.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the Aero CT plant and associated support structures. All forested habitats would remain in place and soil and vegetation would remain as is as TVA would continue to use the property in its current state. Therefore, terrestrial animals and their habitats would not be affected under the No Action Alternative.

3.10.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, the construction and operation of the Aero CT plant and associated structures would occur within a highly disturbed and fragmented industrial landscape that offers minimal habitat for wildlife.

Both forested and herbaceous vegetation that may provide habitat for common wildlife species would be removed in association with the proposed actions. TVA would clear up to 1.6 acres of forest to construct the proposed Aero CT plant, Aero 161-kV switchyard, and associated transmission lines that would connect the proposed Aero CTs to the existing TVA transmission system. Some vegetation within the previously disturbed 41.3-acre grassy/herbaceous habitats could also be impacted, as ground disturbance would likely occur in these areas. The forest fragments are divided by roads and early successional habitats. Due to the small size of these forest fragments and the heavy disturbance that consistently occurs in the project area, it is likely that mostly common, habituated, opportunistic species would utilize these areas.

Wildlife may be displaced by increased levels of disturbance during construction activities. These disturbances and habitat removal are expected to disperse wildlife into surrounding areas in an attempt to find new food and shelter sources and to reestablish territories. Forested areas that are cleared for the transmission line would likely be maintained as early successional or developed habitat for the foreseeable future. It is expected that over time, displaced species that utilize early successional habitat, fragmented forest, and otherwise developed habitats would return to the project area upon completion of project actions. Direct effects to some individuals that are immobile during the time of construction may occur, particularly if construction activities transpire during breeding/nesting seasons. However, the actions are not likely to affect populations of species common to the area, as similarly suitable and superior forested habitat is abundant throughout the adjacent landscape.

Suitable nesting and foraging habitats are present within the project area for some migratory bird species of conservation concern, including bald eagle, blue-winged warbler, prairie warbler, red-headed woodpecker, and semipalmated sandpiper. See Section 3.11 (Threatened and Endangered Species) for a discussion of impacts to the bald eagle. The schedule for tree removal activities is dependent on final project design and planning. If tree clearing takes place during breeding and nesting seasons for migratory birds, direct effects to immobile individuals (e.g., eggs and nestlings) could occur. To the extent possible, TVA would prioritize tree removal during the winter clearing window (October 15 – March 31) to avoid directly affecting threatened and endangered bats. This measure would also be beneficial to migratory birds. Similarly suitable foraging habitat is abundant throughout the adjacent landscape such that Alternative B would have no measurable effect on migratory bird foraging habitat.

Seven active osprey nests were observed during field surveys within the project area in April 2021. Bush hogging, mowing, and selective herbicide treatments are the only acceptable means of vegetation removal between March 1 and July 31 within 660 feet of active nests. Broadcast herbicide application is not permissible within the 660-foot disturbance buffer areas. Given the amount of time that would pass between the 2021 breeding season field surveys and the onset of construction activities, new nests are likely to be built and some existing nests may no longer be active. As such, the osprey conservation commitments are applicable within 660 feet of any active nest during construction activities. Prior to activities in the vicinity of these nests, TVA would conduct additional field surveys to identify any new or active nests, with the intention of avoiding them. If needed, TVA would coordinate with USDA-Wildlife Services to ensure compliance under the EO 13186 [Responsibilities of Federal Agencies to Protect Migratory Birds].

The temporary laydown area, staging, and parking areas within the project area are located on land previously disturbed, fragmented, and of poor quality for use by wildlife. Wildlife habituated to these areas are expected to move to other suitable environments offsite which are plentiful; however, as described above, immobile species may be impacted should they be present in the laydown area and other temporary use areas at the time of use. Post construction, these areas would return to their previous state. Overall, impacts to wildlife utilizing these areas would be minor and temporary.

While the proposed actions would result in alteration of habitats and displacement of resident wildlife species, impacts to wildlife are not expected to result in notable large-scale habitat alteration or destabilization of any wildlife species. Therefore, impacts to wildlife resulting from the implementation of Alternative B and the other reasonably foreseeable future actions in Table 3-1 would be minor.

3.11 Threatened and Endangered Species

3.11.1 Affected Environment

The ESA requires federal agencies to conserve endangered and threatened species and to determine the effects of proposed actions on endangered and threatened species and Designated Critical Habitat. Endangered species are those determined to be in danger of extinction through all or a significant portion of their range. Threatened species are those likely to become endangered within the foreseeable future. Section 7 of the ESA requires federal agencies to consult with the USFWS when proposed actions may affect endangered or threatened species or Designated Critical Habitat.

The state of Tennessee provides protection for species considered threatened, endangered, or deemed in need of management within the state other than those already federally listed under the ESA. Plant species are protected in Tennessee through the Rare Plant Protection and Conservation Act of 1985. The listing of species is managed by TDEC. Additionally, TVA also maintains databases of aquatic and terrestrial animal and plant species that are considered threatened, endangered, or of special concern, or are otherwise tracked in Tennessee because the species is rare and/or vulnerable within the state. Tracked species are those that are not currently listed but populations are at risk for decline and may warrant official listing in the future.

A review of the TVA Natural Heritage Database and the USFWS IPaC online system for protected species potentially present within the project area was conducted in March 2021 for terrestrial species and in June 2021 for aquatic species (TVA 2021g; USFWS 2021a). A list of these species is included in Table 3-5.

Table 3-5. Federally Listed Species Reported from Humphreys County, Tennessee and Other Species of Conservation Concern Documented in the Vicinity of the Johnsonville Aeroderivative CT Project

		Status		Suitable Habitat Present within Project Area[7]
Common Name	**Scientific Name**	**Federal[4]**	**State Rank[5] (Status[6])**	
Birds[1]				
Bald eagle	*Haliaeetus leucocephalus*	DM	D(S3)	P
Little blue heron	*Egretta caerulea*	--	D (S2B,S3N)	P
Piping plover	*Charadrius melodus*	T	--(S2N)	N
Mammals[1]				
Gray bat	*Myotis grisescens*	E	E(S2)	P
Indiana bat	*Myotis sodalis*	E	E(S1)	P
Northern long-eared bat	*Myotis septentrionalis*	T	T(S1S2)	P
Reptiles[1]				
Alligator snapping turtle	*Macrochelys temminckii*	PT	T(S2S3)	N
Northern pine snake	*Pituophis melanoleucus*	--	T(S3)	N
Western pygmy rattlesnake	*Sistrurus miliarius streckeri*	--	T(S2S3)	P
Fish[2]				
Slenderhead darter	*Percina phoxocephala*	--	D(S3)	N
Mollusks[2]				
Orange-foot pimpleback	*Plethobasus cooperianus*	LE	E(S1)	N
Pink mucket	*Lampsilis abrupta*	LE	E(S2)	N
Ring pink	*Obovaria retusa*	LE	E(S1)	N
Plants[3]				
Hairy umbrella-sedge	*Fuirena squarrosa*	--	S(S1)	N
Harper's fimbristylis	*Fimbristylis perpusilla*	--	E(S1)	N
Lamance iris	*Iris brevicaulia*	--	E(S1)	N
River bulrush	*Bolboschoenus fluviatilis*	--	S(S1)	P (limited)
Smaller mud-plantain	*Heteranthera limosa*	--	T(S1S2)	N
Virginia rose	*Rosa virginiana*	--	--(SH)	N
Walter's barnyard grass	*Echinochloa walteri*	--	S(S1)	P (limited)

Common Name	Scientific Name	Status: Federal[4]	Status: State Rank[5] (Status[6])	Suitable Habitat Present within Project Area[7]

[1] Federally listed species documented in Humphreys County, Tennessee and state-listed species within 3 miles of the project area (sources: TVA Natural Heritage Database, accessed March 19, 2021; USFWS IPaC resource list (https://ecos.fws.gov/ipac/), accessed March 19,2021; Tennessee Bat Working Group County Occurrence Maps (TNBWG.org), accessed March 19, 2021).

[2] Documented within Humphreys County and the 10-digit HUC watershed of the project area (sources: TVA Natural Heritage Database, accessed June 1, 2021; USFWS IPaC resource list, accessed June 1, 2021)

[3] Documented in Humphreys County, Tennessee, and/or within 5 miles of the project areas (source: TVA Natural Heritage Database, accessed March 5, 2021; USFWS IPaC resource list, accessed June 1, 2021)

[4] Federal Status Codes:

LE = Listed Endangered
PT = Proposed Threatened
-- = Not Listed by USFWS
LT = Listed Threatened;
DM = Recovered, Delisted, and Being Monitored

[5] State Status Codes:

E = Listed Endangered
S = Species of special concern
T = Listed Threatened
D = Deemed in Need of Management
CE = Commercially Exploited
SH = possibly extirpated

[6] State Rank:

S1 = Critically Imperiled
S2 = Imperiled
S3 = Vulnerable
S4 = Apparently Secure
S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)
S#B = Breeds in Tennessee
S#N = Occurs in Tennessee in a non-breeding status

[7] Habitat Codes:

Y = Yes, species has been documented in existing habitats in project area and suitable habitat is present
N = No, no records of species within project area and no suitable habitat is present
P = Potentially suitable habitat is present, but no records of species in project area
P (limited) = Only limited parts of the project area are consistent with species recorded habitat preferences, no records of species in project area. Not likely to occur as habitat is fragmented and marginal.

3.11.1.1 Terrestrial Animals

A review of the TVA Regional Heritage Database on March 19, 2021 resulted in records for four state-listed species (alligator snapping turtle, little blue heron, northern pine snake, and western pygmy rattlesnake) and one record of a federally listed species (piping plover). Additionally, a federally protected species (bald eagle) is known to be found in Humphreys County, Tennessee. Review of the USFWS' IPaC online database determined that the federally listed Indiana bat, northern long-eared bat, and gray bat also have the potential to occur within the project area. As such, these species have been included in this assessment (Table 3-5).

3.11.1.1.1 Birds

Bald eagles are protected under the Bald and Golden Eagle Protection Act (USFWS 2013). This species is associated with larger mature trees capable of supporting its massive nests. These nests are usually found near larger waterways where the eagles forage (USFWS 2007). Records document the occurrence of four bald eagle nests in Humphreys County, Tennessee, the nearest of which occurs approximately 4.2 miles from the project area. No bald eagles or their nests were observed in or adjacent to the project area during field surveys, although suitable foraging and nesting habitat exists for bald eagles within the project area.

The little blue heron is listed as in need of management by the state of Tennessee. It inhabits bodies of calm shallow water such as marshes, ponds, lagoons, and streams. Little blue herons build nests in trees and shrubs about 4 meters above the ground or water, primarily in freshwater habitat and often with other colonial wading birds (NatureServe 2021). Records document the occurrence of one little blue heron approximately 1.8 miles from the project area. No little blue herons or nests were observed during field surveys in March 2021, although suitable nesting and foraging habitats for little blue heron are present within the project area.

The Federally endangered piping plover can be found during migration stopovers on expansive sand flats, sandy mudflats, and ash ponds, particularly in manmade reservoirs where habitat has a high level of heterogeneity (NatureServe 2021). The nearest known piping plover was documented at a migration stopover on the Kentucky Reservoir on the Tennessee River in August 2007, approximately 0.5 miles from the project area. Suitable foraging habitat is not present for this species within the project area.

3.11.1.1.2 Mammals

The federally and state-endangered gray bat roosts in caves year-round and migrates between summer and winter roosts during spring and fall (Brady et al. 1982, Tuttle 1976). Bats disperse over bodies of water at dusk where they forage for insects emerging from the surface of the water (Harvey 1992). While the USWFS IPaC online database determined that gray bats have the potential to occur within the project area, to date there are no known records of gray bat presence in Humphreys County. No caves are known within 3 miles of the project area, and none were observed during field surveys of the project area. Drinking water and foraging habitat for gray bat exists over small streams and wetlands within the reservation, as well as in the Kentucky Reservoir on the Tennessee River adjacent to the project area.

The federally and state-endangered Indiana bat hibernates in caves in winter and uses areas around them for swarming (mating) in the fall and staging in the spring, prior to migrating back to summer habitat. In summer, Indiana bats roost under the exfoliating bark of dead snags and living trees in mature forests with an open understory and a nearby source of water (Pruitt and TeWinkel 2007, Kurta et al. 2002). Indiana bats are known to change roost trees frequently throughout the season, while still maintaining roost site fidelity, returning to the same summer roosting areas in subsequent years (Pruitt and TeWinkel 2007). Although less common, Indiana bats have also been documented roosting in buildings (Butchkoski and Hassinger 2002). Indiana bats eat terrestrial and aquatic insects while foraging in forested stream corridors, upland and bottomland forests, forested wetlands, and along wooded edges of agricultural fields, pastures, and impounded bodies of water at night (USFWS 2021b). While the USWFS IPaC online database determined that Indiana bats have the potential to occur within the project area, known Indiana bat presence has not been documented in Humphreys County to date. No caves are known within 3 miles of the project area, and none were observed during field surveys of the project area.

The federally and state-threatened northern long-eared bat predominantly overwinters in large hibernacula such as caves, abandoned mines, and cave-like structures. During spring and fall, northern long-eared bats utilize entrances of caves and the surrounding forested areas for swarming and staging. In the summer, northern long-eared bats roost individually or in colonies beneath exfoliating bark or in crevices of both live and dead trees (typically

greater than 3 inches in diameter). Roost selection by northern long-eared bat is similar to that of Indiana bat; however, northern long-eared bats are thought to be more opportunistic in roost site selection. This species also roosts in abandoned buildings and under bridges. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014). While the USWFS IPaC online database determined that northern long-eared bat have the potential to occur within the project area, known northern long-eared bat presence has not been documented in Humphreys County, to date. No caves are known within 3 miles of the project area, and none were observed during field surveys.

TVA surveyed the project area for the presence of potentially suitable habitat for federally listed bats in 2019 following the 2019 Range-Wide Indiana Bat Survey Guidelines (USFWS 2019). Of the 8.5 acres of deciduous forest and forested wetland habitat in the project area, 7.5 acres were determined to be potentially suitable for use by summer roosting Indiana bat and northern long-eared bat, based on the presence of trees with exfoliating bark, a hollow trunk, and/or cracks and crevices. Potentially suitable bat roosting habitat is shown in Figure 3-4 in Section 3.10 (Wildlife). Suitable foraging habitat was also identified within the project area and vicinity for gray bat, Indiana bat, and northern long-eared bat in and around forests, forested edges, and over the Kentucky Reservoir on the Tennessee River, which also provides a source of drinking water for all three listed bat species.

3.11.1.1.3 Reptiles

The proposed federally threatened alligator snapping turtle is a highly aquatic reptile, emerging from water only for nesting, rarely for basking. This species is restricted to river and stream drainages that flow into the Gulf of Mexico. Adults generally inhabit the deepest waters of large rivers, canals, lakes, and swamps, while hatchlings and juveniles typically inhabit smaller streams. Eggs are laid approximately 160 feet from a body of water in sandy floodplain soils. This species is believed to be extirpated from much of its former range (NatureServe 2021). The nearest known alligator snapping turtle record was documented in 1971 approximately 1.7 miles from the project area. Suitable nesting habitat is present for alligator snapping turtle around the shoreline of the Kentucky Reservoir on the Tennessee River. However, the shoreline in the action area is predominantly along the boat harbor channel which is steep and covered with riprap. Only two small, narrow strips of shoreline vegetation remain intact above the riprap. These are immediately bordered by a road. Suitable habitat for alligator snapping turtle is not present in the project area.

The state-threatened northern pine snake is a non-venomous snake found in pine or mixed pine-dominated forests with well-drained sandy soils and an open understory on mountain slopes, ridges, or hills, sometimes with abundant rock cover. This species overwinters in underground hibernacula and constructs shallow, underground summer dens (Gibbons and Dorcas 2005). One northern pine snake record has documented presence in Humphreys County, approximately 2.2 miles from the project area. Suitable habitat is not present within the project area for northern pine snake.

The state-threatened western pygmy rattlesnake is a secretive species that inhabits areas near water where ample coverage is present, such as in river floodplains, swamps, marshes, wet prairies, and temperate forests. This species covers itself in debris or takes refuge in burrows when the weather drops below freezing, but it does not go into hibernation during winter. Western pygmy rattlesnakes breed in spring and give birth to live young. Snakelets are born precocial but stay near their mother for the first 7-10 days of

their life for protection (NatureServe 2021). Two records of western pygmy rattlesnake have been documented within 3 miles of the project area, the nearest of which occurs approximately 1.1 miles from the project area. Suitable habitat for western pygmy rattlesnake is present within forested wetlands found in the project area.

3.11.1.2 Aquatic Animals

Listed aquatic animal species documented on the TVA Regional Heritage Database as occurring within the Tennessee River 10-digit HUC watershed (HUC 0604000504) include three federally listed mollusk species and one state-listed fish (see Table 3-5). Although habitat for these mollusks occurs within the Kentucky Reservoir on the Tennessee River outside of the project area, two of these (ring pink and orange-foot pimpleback) are either historical or extirpated records and are no longer considered extant in this portion of the river. No federally Designated Critical Habitat for any of these species is present within Humphreys County, Tennessee.

The slenderhead darter is listed as in need of management by the state of Tennessee. It is commonly found in gravel shoal areas of medium to large rivers with moderate to swift current (Etnier and Starnes 1993). No suitable habitat was observed in the project area.

The three federally endangered mollusk species that have historically occurred in the Tennessee River include orangefoot pimpleback, pink mucket, and ring pink. The orangefoot pimpleback can be found primarily in big rivers. Individuals have been found at depths of 12 to 18 feet in sand and coarse gravel substrate. This species is considered to be tachytictic but host fish for glochidia are currently unknown (Parmalee and Bogan 1998). The pink mucket is typically a big river species but occasionally individuals become established in small to medium sized tributaries of large rivers. It inhabits rocky bottoms with swift current usually in less than three feet of water (Parmalee and Bogan 1998). The ring pink is typically found in large rivers with gravel bars. No suitable habitat for the listed mussels is present within the project area.

3.11.1.3 Plants

A review of the TVA Regional Natural Heritage Database indicated that no federally listed plant species or associated designated critical habitat are known to occur on or within 5 miles of the Johnsonville Reservation. No federally listed plant species have been previously reported in Humphreys County, Tennessee. However, seven species of plants listed by TDEC as threatened, endangered, special concern, or possibly extirpated in Tennessee are known to occur (or have occurred in the past) within Humphrey and Benton counties (see Table 3-5). The TVA Regional Natural Heritage Database indicated that there are 14 occurrences of state-listed plant species within 5-miles of the project area. Preferred habitat for each species and the possibility of habitat within the project area are addressed in Table 3-6.

Of the seven state-listed species known to have occurred within the counties surrounding the Johnsonville Reservation, only two species (river bulrush and Walters's barnyard grass) have generalized habitat requirements that potentially overlap with the habitats in the proposed project area. However, for these species the generalized habitat preferences (e.g., wetlands, marshes, etc.) are poorly established in the project area and are highly fragmented and degraded and as such, the habitats within the project area range from unsuitable to very low quality for state-listed threatened and endangered plant species. Therefore, because the project area, including the proposed Aero CT plant, Aero 161-kV

switchyard, and laydown and temporary staging areas consist of previously disturbed vegetation, the potential for occurrence of river bulrush and Walters's barnyard grass within those areas is considered to be low. While both of these species have been observed within 5 miles of the reservation, neither of them have been identified within the Johnsonville Reservation.

Table 3-6. Habitat Requirements for Plant Species of Conservation Concern Within 5 Miles of the Project Area

Common Name	Scientific Name	Habitat Requirements	*Habitat within Project Area
Hairy umbrella-sedge	*Fuirena squarrosa*	Shores/margins of rivers, lakes, ponds	N
Harper's fimbristylis	*Fimbristylis perpusilla*	Depressions in low woods	N
Lamance iris	*Iris brevicaulis*	Bottomlands	N
River bulrush	*Bolboschoenus fluviatilis*	Marshes	P (limited)
Smaller mud-plantain	*Heteranthera limosa*	Mud flats	N
Virginia rose	*Rosa virginiana*	Infrequent in thickets	N
Walter's barnyard grass	*Echinochloa walteri*	Bottomlands and marshes	P (limited)

Sources: TDEC 2021c; Shaw et al. 2021
*Habitat Codes:
Y = Yes, species has been documented in existing habitats in project area and suitable habitat is present
N = No, no records of species within project area and no suitable habitat is present
P = Potentially suitable habitat is present, but no records of species in project area
P (limited) = Only limited areas in the project area are consistent with species recorded habitat preferences, no records of species in project area. Not likely to occur as habitat is fragmented and marginal.

3.11.2 Environmental Consequences

3.11.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the proposed Aero CT plant. Therefore, no impacts to threatened or endangered species, or species of conservation concern or any suitable habitat would occur under this alternative.

3.11.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, potential impacts to threatened and endangered species would be associated with earthmoving activities and disturbance related to construction of the Aero CTs and support systems. Most of these activities would be conducted on previously disturbed land. However, construction of the Aero CT plant, Aero 161-kV switchyard, and transmission line would result in the permanent loss of approximately 1.6 acres of forest that is considered potentially suitable bat roosting habitat.

Proposed actions under this alternative would not impact nesting bald eagles as no nests are known within 3 miles of the project area and no nests were observed in the project area during field surveys. Foraging habitat is present for bald eagles over the Kentucky Reservoir on the Tennessee River. During construction and operation, appropriate BMPs would be followed, and 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, including the Kentucky Reservoir on the Tennessee River, are minimized. As such, significant impacts to this habitat are not anticipated. The proposed actions would be in compliance with the National Bald Eagle Management Guidelines, and bald eagles would not be significantly impacted by proposed activities under Alternative B.

Suitable foraging habitat is present within the project area for little blue heron along the shoreline on the western perimeter of the project area. Suitable foraging habitat is also present for alligator snapping turtle in Kentucky Reservoir. No impacts to the reservoir or its shoreline are anticipated, as BMPs would be utilized during proposed construction activities. Therefore, there would be no impacts to alligator snapping turtle and little blue heron under Alternative B.

Based on a review of the TVA Natural Heritage Database on March 19, 2021, and results of field surveys performed throughout 2019, 2020, and 2021, no suitable habitat exists in the project area for piping plover or northern pine snake. Therefore, these species would not be impacted under Alternative B.

A small amount of suitable western pygmy rattlesnake habitat is present within the forested wetlands in the project area. If individuals (snakelets and adults) are active within the project area at the time construction disturbances occur, it is expected that these individuals would disperse into surrounding areas. The schedule for tree removal activities is dependent upon final project design and planning. If vegetation clearing takes place at the time when western pygmy rattlesnakes are active in these areas, direct effects to individuals could occur. To the extent possible, TVA would prioritize tree removal during the winter season (October 15 – March 31) to prevent directly affecting threatened and endangered bats. This measure would also benefit the western pygmy rattlesnake because they are typically inactive during winter months and would reside underground or in dens or other enclosed areas. Therefore, Alternative B would not affect populations of western pygmy rattlesnake.

The federally listed gray bat, Indiana bat, and northern long-eared bat have the potential to utilize the project area. No caves exist within 3 miles of the project area, and none would be impacted by the proposed actions. Suitable foraging habitat is present for all three species over the Kentucky Reservoir on the Tennessee River; however, no impacts to the lake are anticipated as BMPs designed to minimize the introduction of pollutants into this waterbody would be utilized during construction activities. Additional foraging habitat for Indiana bat and northern long-eared bat is present over and around forested edges and tree lines. Some or all of this habitat would be removed in association with project activities. The project site is in the vicinity of the Duck River National Wildlife Refuge and other public lands; as such, an abundance of superior foraging habitat occurs within the surrounding area.

A total of 1.6 acres of the potentially suitable summer roosting habitat for Indiana bat and northern long-eared bat would be removed in association with the proposed actions under Alternative B, which may affect Indiana bat and northern long-eared bat. The schedule for tree removal activities is dependent on final project design and planning. However, to the extent possible, TVA would prioritize clearing suitable summer roosting habitat for Indiana bat and northern long-eared bat during the winter months (October 15 – March 31) when bats are in caves and not out on the landscape. A number of activities associated with the proposed project (including tree removal) were addressed in TVA's 2018 programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with

ESA Section 7(a)(2). For those activities with potential to affect bats, TVA would require the project to implement specific conservation measures. These activities and associated conservation measures are identified on Table 4 of the TVA Bat Strategy Project Review Form (Appendix A). With the use of BMPs and identified Conservation Measures, proposed actions would not significantly impact Indiana bat, northern long-eared bat, or gray bat.

Because no state- or federally listed aquatic species or their habitats are known to occur within the project area, and BMPs would be implemented to protect the Kentucky Reservoir on the Tennessee River and the onsite drainage feature, there would be no effects to federal or state-listed endangered or threatened aquatic species or Designated Critical Habitats.

No federally listed plant species are known from the county and no habitat suitable for federally listed plant species have been observed during previous field surveys at the Johnsonville Reservation. Consequently, the proposed project would have no effect on federally listed plant species. Since suitable habitat for state-listed plant species is not present within the project area, there would be no effects to state-listed species.

Alternative B is not expected to result in long-term significant effects to listed species populations. There are no records of listed species within the proposed project area. Although the project would impact potential suitable habitats for several of the species, these species were not found during surveys of the reservation, and there is an abundance of suitable habitat in the surrounding areas. Use of BMPs and timing of tree removal to occur during winter months would help to ensure that any potential direct impacts to individuals using those habitats would be minimized or avoided. Overall, Alternative B in combination with the other reasonably foreseeable future actions in Table 3-1 would likely adversely affect the Indiana bat, northern long-eared bat, and gray bat, though with the use of BMPs and identified conservation measures, impacts would not be significant, and would not affect any of the other animal or plant species.

3.12 Visual Resources

3.12.1 Affected Environment

This assessment provides a review and classification of the visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action. The classification criteria used in this analysis are adapted from a scenic management system developed by the U.S. Forest Service (USFS) and integrated with planning methods used by TVA (USFS 1995). Potential visual impacts to cultural and historic resources are not included in this analysis as they are assessed separately in Section 3.13.

The visual landscape of an area is formed by physical, biological, and man-made features that combine to influence both landscape identifiability and uniqueness. The scenic value of a particular landscape is evaluated based on several factors that include scenic attractiveness, scenic integrity, and visibility. Scenic attractiveness is a measure of scenic quality based on human perceptions of intrinsic beauty as expressed in the forms, colors, textures, and visual composition of each landscape. Scenic attractiveness is expressed as one of the following three categories: distinctive, common, or minimal. Scenic integrity is a measure of scenic importance based on the degree of visual unity and wholeness of the natural landscape character. The scenic integrity of a site is classified as high, moderate, low, or very low. The subjective perceptions of a landscape’s aesthetic quality and sense of place are dependent on where and how it is viewed.

Views of the landscape are described in terms of what is seen in the foreground, middleground, and background distances. In the foreground, an area within 0.5 mile of the observer, details of objects are easily distinguished. In the middleground, from 0.5 mile to 4 miles from the observer, objects may be distinguishable, but their details are weak and tend to merge into larger patterns. In the distant part of the landscape, the background, details and colors of objects are not normally discernible unless they are especially large, standing alone, or have a substantial color contrast. In this assessment, the background is measured as 4 to 10 miles from the observer. Visual and aesthetic impacts associated with an action may occur as a result of the introduction of a feature that is not consistent with the existing viewshed. Consequently, the visual character of an existing site is an important factor in evaluating potential visual impacts.

For this analysis, the affected environment includes the areas within the Johnsonville Reservation that encompass both permanent and temporary impact areas (Figure 2-1), as well as the physical and natural features of the landscape. The Johnsonville Reservation is located along an impounded section of the Tennessee River (Kentucky Reservoir), in the city of New Johnsonville. The surrounding topography ranges from relatively flat near the banks of the reservoir to moderately sloping at Johnsonville State Historic Park to the north. Large-scale industrial development, including the Chemours facility, is visible immediately north of the reservation, while areas to the east and northeast are forested. Residential and commercial development associated with the city of New Johnsonville are present to the south and low-density residential areas are visible to the west, across the Kentucky Reservoir on the Tennessee River.

Portions of the Johnsonville Reservation are devoid of vegetation and much of it has been heavily disturbed by previous industrial and utility activities. This, in combination with the large-scale development associated with the existing JCT plant, transmission system, and the retired coal-fired plant, provide a sharp visual contrast to the surrounding rural and natural landscape. Historically, the dominant visual components of the Johnsonville Reservation included the fossil plant powerhouse and the 600-foot-high emissions stack; however, these were recently decommissioned and demolished. Other major visual components of the site that remain following the demolition include the twenty existing CT units and associated storage buildings, multiple switchyards and switch houses, and a network of high-voltage transmission lines (TVA 2018).

Based on the above characteristics, the scenic attractiveness of the affected environment at the Johnsonville Reservation is considered to be common to minimal, whereas the scenic integrity is considered to be low. The rating for scenic attractiveness is based on the ordinary or common visual quality of the landscape, which is often reduced to low in the foreground due to the absence of natural features in the industrial setting. The forms, colors, and textures in the affected environment are not considered to have distinctive visual quality. In the foreground and middleground, the scenic integrity has been reduced by the industrial nature of the reservation. However, in the background, these alterations are not substantive enough to dominate the view of the landscape. The scenic class of a landscape is determined by combining the levels of scenic attractiveness, scenic integrity and visibility and can be excellent, good, fair, or poor. Based on the criteria used for this analysis, the overall scenic class for the affected environment is considered to be fair.

In a visual impact assessment, sensitive receptors generally include any scenic vistas, scenic highways, residential viewers, and public facilities such as churches, cemeteries, schools, parks, and recreational areas that are located in the project's viewshed. Viewers in

the foreground of the proposed Aero CT plant would generally be limited to employees and visitors to the Johnsonville Reservation, and recreational boaters on the Kentucky Reservoir on the Tennessee River. There are no residences or other sensitive visual receptors located in the foreground.

3.12.2 Environmental Consequences

The potential impacts to the visual environment from a given action are assessed by evaluating the potential for changes in the scenic value class ratings based upon landscape scenic attractiveness, integrity, and visibility. Sensitivity of viewing points available to the general public, their viewing distances, and visibility of the proposed action are also considered during the analysis. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The extent and magnitude of visual changes that could result from the proposed alternatives were evaluated based on the process and criteria outlined in the scenic management system as part of the environmental review required under NEPA.

3.12.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct 10 natural gas-fired Aero CTs or associated support systems at the Johnsonville Reservation and the landscape character and integrity would remain in its current state. Therefore, there would be no impact to visual resources.

3.12.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Implementation of Alternative B would result in short-term visual impacts associated with construction activities within the project area, including potential modifications to the rail system located along the southern boundary of the reservation. During the approximately 2-year construction period, there would be increased visual discord from existing conditions due to an increase in personnel and equipment coupled with disturbances of laydown, parking, and trailer areas. However, this would be contained within the immediate vicinity of the construction activities and would only last until all project activities have been completed and the disturbed areas have been seeded and restored through the use of TVA's standard BMPs (TVA 2017). Because of their temporary nature, construction-related impacts to local visual resources are expected to be minor.

Long-term impacts resulting from the construction of the Aero CT plant onsite support systems would include visible alterations to the existing landscape associated with the 10 new Aero CT units (with stack heights of 150 feet), as well as the proposed Aero 161-kV switchyard, the new transmission structures, and overhead wires associated with the transmission lines. While these features would add elements to the viewshed that are discordantly contrasting with the natural environment, these elements would be visually similar to other industrial structures seen in the current landscape, including the existing CT units, switchyards, and numerous high-voltage transmission lines. These elements contribute to the landscape's ability to absorb negative visual change and would minimize the visual impact of the new Aero CT units and associated onsite components. Furthermore, the Aero CT plant facilities would have minimal public visibility, with unobstructed views generally limited to employees and visitors to the Johnsonville Reservation. Components of the proposed facilities may also be visible to boaters on the Kentucky Reservoir on the Tennessee River. However, from most locations on the reservoir (i.e., at middleground distances or further), changes in the viewshed would be less perceptible and would merge with the existing plant infrastructure, becoming visually subordinate to the overall landscape character. The nearest residences and other visual

receptors such as churches and cemeteries are located at distances of greater than 0.5 miles and would have minimal views of the Aero CT plant components due to topography and intervening vegetation or existing development.

The industrial elements and utility structures already in place within the project area currently contribute visual discord with the landscape, contributing to the landscape's ability to absorb negative visual change. Therefore, while the forms, colors, and textures of the landscape that make up the scenic attractiveness would be somewhat affected by the construction of the Aero CT plant and associated support systems, it would remain common to minimal. Scenic integrity would remain low as visually disruptive elements and human alterations would continue to dominate the landscape. Based on the criteria used for this analysis, the scenic value class for the affected environment after the proposed modifications would remain fair. While the construction of the Aero CT plant would contribute to minor differences in the visual environment, it would not change the overall scenic value class as the industrial character of the reservation would remain consistent. Therefore, overall visual impacts resulting from the implementation of the Alternative B and other reasonably foreseeable actions identified in Table 3-1 would be minor.

3.13 Cultural and Historic Resources

Federal agencies are required by the NHPA and by NEPA to consider the possible effects of their undertakings on cultural resources that qualify as historic properties. Cultural resources include but are not limited to: prehistoric and historic archaeological sites, districts, buildings, structures, and objects; and locations of important historic events that lack material evidence of those events. Cultural resources that are included in, or considered eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the National Park Service are called historic properties.

3.13.1 Affected Environment

TVA determined the area of potential effects (APE) to include the entire project boundary for the proposed Aero CTs and associated support systems (Figure 2-1), where ground disturbance may occur ("footprint"), plus areas within a one-half-mile radius surrounding the permanent use areas within the proposed project area from which the completed project would be visible ("viewshed").

Wood completed a background literature review of previous surveys and previously recorded sites within the Aero CT project area. One archaeological site, 40HS277, was previously recorded within/adjacent to the project area where the Johnsonville Fossil Plant condenser intake and water treatment plant were later constructed. According to its site form on file at the Tennessee Division of Archaeology (TDOA), site 40HS277 was recorded in 1994 and contained Paleoindian and Early Archaic projectile points in a deposit along the bank of the Kentucky Reservoir on the Tennessee River. However, a 2006 investigation concluded that the site had been destroyed by the construction of the plant's condenser water intake structure in the 1950's (Deter-Wolf 2006). Based on this information, TVA finds that site 40HS277 is no longer extant.

Six archaeological surveys have been previously conducted within the APE (Table 3-7); none of which identified any archaeological sites within the current project area.

Table 3-7. Previously Completed Archaeological Surveys

Author / Year	Area Surveyed	Findings
Cable 1999	Three proposed gas line routes, including portions on Johnsonville Reservation	Nine archaeological sites were identified, but none are located on or near the Johnsonville Reservation
Ezell 2000	Two proposed ash disposal sites for the TVA Johnsonville Steam Plant totaling 49 acres	No archaeological sites
McKee 2001	40 acres located near the main entrance to the Johnsonville Steam Plant	No archaeological sites
Dison et al. 2018a	An 8.6-hectare (ha) (21.3-acre) tract of land slated for the construction of the process water basin	One prehistoric isolated find that is not eligible for listing in the NRHP
Dison et al. 2018b	An 1.6-ha (3.97-acre) area consisting of two tracts of land planned for use as laydown yards and two smaller tracts under consideration for a guard shack location	No archaeological sites
Blankenship et al. 2019	Six separate areas throughout Johnsonville Fossil Plant that covered a total of 69.2 ha (171 acres)	No archaeological sites

TVA previously consulted with the Tennessee State Historic Preservation Office (SHPO) for the construction of the HRSG in 2015, which includes a portion of the Aero CT APE, and concluded that there were no historic properties within the archaeological or architectural APE of that project. These findings were coordinated with the SHPO under Section 106 of the NHPA, and a concurrence letter was received on February 23, 2015. Therefore, TVA has also determined that there are no historic architectural properties within the architectural APE for Alternative B.

Part of the area affected by the Johnsonville Coal Yard Closure, Coal Yard Runoff Pond Closure, Process Water Basin, and Borrow Site project extends into the proposed laydown area on the former coal yard and was discussed in a March 21, 2018, letter to the SHPO documenting TVA's no effect finding for that undertaking. In evaluating the potential for intact Holocene deposits in the coal yard and coal yard runoff pond areas, TVA Cultural Compliance staff examined TVA's 1937 land acquisition map for the Kentucky Reservoir on the Tennessee River, TVA's original plant grading plan from 1949, current satellite imagery, and previous archaeological investigations (Cable 1999, Ezell 2000, McKee 2001). Prior to construction of the Johnsonville Fossil Plant, these areas consisted of two branches of a small creek and its terraces. As documented in TVA's technical report on the Johnsonville Fossil Plant (TVA 1958) and by the 1949 grading plan, TVA excavated and graded soil to depths ranging from approximately 3 feet to nearly 20 feet throughout the coal yard and surrounding area during plant construction. Based on these historical documents, TVA finds that the coal yard and coal yard runoff pond areas have no potential to contain intact

archaeological sites due to these past land disturbing activities. The SHPO agreed with this finding by letter dated April 5, 2018.

TVA also consulted TVA's internal databases for information on Trail of Tears/Removal routes (routes taken by Native American tribes in 1838/39 as they were forcibly removed from their lands to western territories). These routes have potential for historic significance, including archaeological sites, and are regarded as highly significant cultural resources by many of the Indian tribes with which TVA consults. The nearest known Trail of Tears/Removal Route to the Johnsonville Reservation is located four miles north, and runs west along Scepter Road (north of Johnsonville State Park) to a historic ferry location on the Tennessee River. In addition, the Tennessee River was used as a water route during the Indian removals. However, there are no terrestrial Trail of Tears/Removal routes or associated archaeological sites within the APE.

Most of the project footprint is comprised of areas which underwent large earth-moving activities during the construction of the JCT plant. Previous surveys conducted within and near the archaeological APE did not identify any intact archaeological sites. Given the degree of ground disturbance that has taken place within the project footprint during construction and maintenance of the Johnsonville Reservation and the results of previous surveys, TVA has determined that this part of the APE has low probability for the presence of significant, intact archaeological sites.

The entire viewshed has been previously surveyed and/or disturbed as part of other activities on the reservation and no eligible or listed historic structures were identified. Section 106 consultation with the SHPO was conducted on these previous projects and concurrence was received (Appendix B). Therefore, TVA considers the architectural APE to be lacking in historic architectural properties. As such, in accordance with Section III.C of TVA's Section 106 Programmatic Agreement, TVA has not completed a new archaeological or architectural survey of the APE.

3.13.2 Environmental Consequences

3.13.2.1 Alternative A – No Action Alternative

Under Alternative A, the proposed project area would remain in its current condition as no project related activities would occur that would affect any cultural and historic resources. While natural ecological processes and anthropogenic disturbances would continue, changes would not result from the proposed project.

3.13.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

The entire archaeological and architectural APEs defined for the proposed project have been previously surveyed and/or disturbed and no significant cultural resources are present/ were identified. TVA has received SHPO concurrence on the previous surveys and findings that were conducted in the APEs. Therefore, TVA finds that the proposed undertaking in combination with the other reasonably foreseeable actions identified in Table 3-1 would not affect any historic properties.

3.14 Transportation

3.14.1 Affected Environment

The transportation network surrounding the Johnsonville Reservation contains federal, state, and county roads and bridges, rail, and a barge facility located along a small channel

off of the Kentucky Reservoir on the Tennessee River. US 70 (also locally known as Broadway Avenue) is the primary arterial roadway serving the reservation. The road has four transitions from two lanes to four lanes just west of the reservoir before crossing east over the bridge into Humphreys County with an additional center turn lane. Current activities that generate traffic at the reservation and surrounding areas include the decontamination and deconstruction of the fossil plant, operation of the remaining JCT units and continued operation of surrounding industrial facilities such Oxychem and Chemours manufacturing facility located adjacent to the reservation to the north and the Herbert Sand and Gravel Company located adjacent to the reservation to the west. As such, existing traffic generated at the facility is composed of a mix of cars and light duty trucks, as well as medium duty (larger delivery trucks) to heavy duty trucks (semi-tractor trailers).

Locations of surrounding roadways and those that provide access to the reservation are shown on Figure 3-5. There are three points of access into the reservation from US 70. The western access utilizes Steam Plant Road, a two-lane road which runs along the western edge of the reservation. Access to Steam Plant Road consists of an at-grade intersection on the south side of US 70 that loops around to the north, crosses over the road and railroad tracks, then enters the site. Access is also provided via North Street located approximately 0.83 miles east of Steam Plant Road. This entrance which would be the primary access to the site for the construction workforce, is an at-grade intersection at North Street on the north side of US 70. North Street is a two-lane road that crosses the railroad tracks then continues north along the east side of the reservation. The at-grade railroad crossing is signalized with crossing gates. The eastern-most access is a service interchange to County Highway 929 (DuPont Access Road), a two-lane roadway. This interchange has a diamond configuration on the westbound ramps and a directional ramp/cloverleaf serving the eastbound ramps.

Average Annual Daily Traffic (AADT) for key roadways near the reservation are presented in Table 3-8. In general, during the period between 2018 and 2021, traffic has remained relatively consistent on surrounding roadways with traffic counts diminishing as drivers travel west of the reservation on US 70. However, AADT on US 70 east of the reservation was noticeably lower in 2020 as compared to other years, which could be associated with a reduction in traffic volumes related to the COVID-19 pandemic experienced during that time period. Overall, traffic volumes have not significantly changed during the period evaluated.

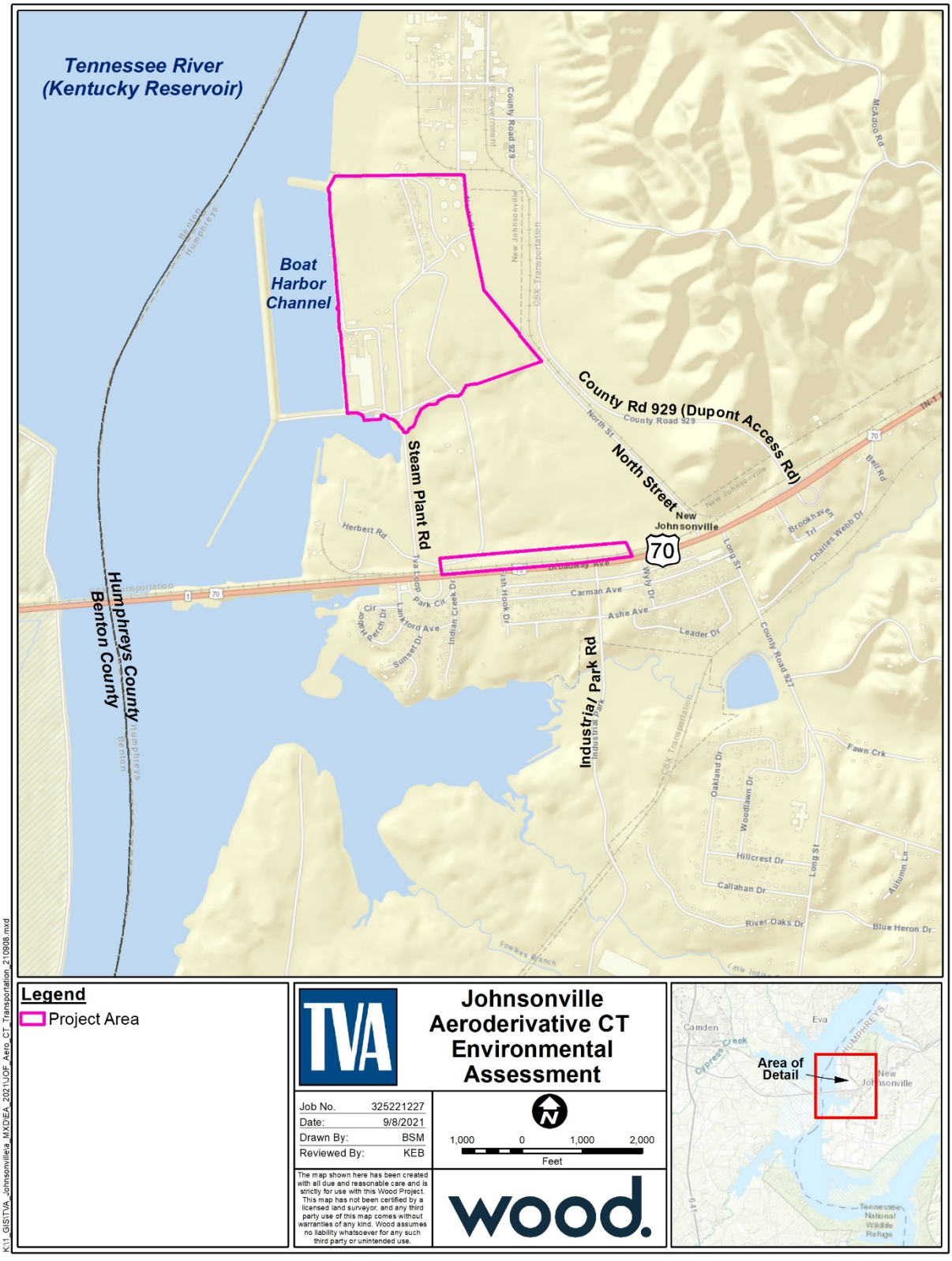


Figure 3-5. Roadways in the Vicinity of the Project Area

Table 3-8. Average Annual Daily Traffic Volume on Roadways in Proximity to the Johnsonville Reservation

Roadway	Year	AADT
US Route 70 east of the Johnsonville Reservation	2021	9,006
	2020	7,168
	2019	8,216
	2018	7,866
US Route 70 west of the Johnsonville Reservation	2021	NA[1]
	2020	5,120
	2019	5,620
	2018	5,591
County Road 929 (DuPont Access Road)	2021	1,905
	2020	1,529
	2019	1,428
	2018	1,992

[1] NA – Not available
Source: TDOT 2021

The CSX Railroad operates a main line between Memphis and Nashville, Tennessee, that runs roughly parallel to US 70 south of the reservation (CSX 2021). The Johnsonville Fossil Plant is no longer directly connected to the rail line but was at one time and historically included a rail unloading facility (TVA 2018). Currently, the Chemours plant adjacent to the reservation is connected to this rail line.

3.14.2 Environmental Consequences

3.14.2.1 Alternative A – No Action Alternative

Under Alternative A, there would be no project-related impact to transportation as there would be no changes at the Johnsonville Reservation that would change the traffic or roadway conditions.

3.14.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, vehicular traffic on public roads near the Johnsonville Reservation would increase due to commuting of construction workers and delivery of materials and equipment for the project. Construction activities would last for approximately 2 years, with work primarily occurring during daytime hours, typically on weekdays but potentially up to seven days a week and limited nighttime hours if warranted to meet construction schedules.

The daily workforce during the construction phase is expected to be 200 workers per day. Traffic is expected to be distributed during a peak morning period (to the project area) and a peak evening period (away from the project area). Assuming one person per commuting vehicle there would be a daily morning inbound traffic volume of 200 vehicles per day and a daily outbound traffic volume of 200 vehicles per day for a total of 400 trips per day. Construction traffic would access the site via the North Street entrance. As this would be a dedicated construction entrance, the increase of 400 trips per day on this road would be minor and the effects of construction traffic on other roadways accessing the reservation would have a minor impact on traffic conditions.

The effects of construction traffic on US 70 are also expected to be minor. During the peak construction period, the additional daily commuters would result in minor increases in traffic volumes along this roadway (approximately 4.4 percent on the roadway east of the reservation and 8.0 percent west of the reservation). As a result, morning and evening commuters on public roadways near the reservation may experience congestion; however, disruptions to local traffic circulation would mostly occur in 15- or 20-minute periods around the major shift changes and would be short term in duration.

Additional truck traffic would also occur in the area during the construction phase due to material and equipment deliveries to the project area. However, as this increase would primarily occur during the mobilization and demobilization phases, impacts to the surrounding transportation network are not anticipated. Most project components are anticipated to be delivered by truck; however, larger project equipment may be delivered to the site by rail. If required, modifications to the rail onsite may be necessary.

If borrow material is needed to support construction activities, it could be obtained from the TVA borrow site located approximately 1.8 miles south of the reservation just west of Industrial Park Road. Material obtained from the borrow site would be transported to the project area via Industrial Park Road north to US 70. AADT values are not available for Industrial Park Road indicating traffic counts are low. Alternatively, borrow could be obtained from an off-site, permitted commercial source if needed. Although exact borrow needs are not known at this time, the demand for borrow would vary over the course of construction; thus, it is expected to be intermittent and dependent upon specific construction needs. Based on the intermittent nature of borrow transport, impacts to traffic operations are expected to be minor and short term, if borrow is required.

Increased traffic associated with construction of the proposed Aero CTs would not overlap with increased traffic associate with the other reasonably foreseeable actions identified in Table 3-1. Therefore, impacts associated with increased traffic related to construction of the proposed Aero CTs would be minor and short term.

Operation of the Aero CT plant would require approximately 20 workers, most of whom would transfer from the JCT Units 1-16. Therefore, the operation of the proposed Aero CTs and other reasonably foreseeable actions identified in Table 3-1 would not result in any changes to the existing conditions on the surrounding roadways.

3.15 Natural Areas, Parks and Recreation

3.15.1 Affected Environment

Natural areas include managed areas such as Wildlife Management Areas, National Wildlife Refuges, Habitat Protection Areas, ecologically significant sites, and Nationwide Rivers Inventory streams. Parks and recreation facilities include open areas, boat ramps, community centers, swimming pools, and other public places. There are 12 managed and natural areas, parks, and recreational facilities that are immediately adjacent to (within 0.5 miles), or within the region (within a 3-mile radius) of the project area (Table 3-9 and Figure 3-6).

A review of the TVA Natural Heritage database indicates that no natural areas are present within the proposed project area.

Table 3-9. Managed and Natural Areas, Parks, and Recreational Facilities within 3 Miles of the Project Area

Natural Areas, Parks, or Recreational Facilities	Approximate Distance from the Project Area at its Closest Location
CL Edwards Memorial Park	0.2 mile south
New Johnsonville Harbor Campground and Marina	0.3 miles southwest
New Johnsonville Tennessee Wildlife Resources Agency Boat Ramp	0.4 miles southwest
Camden State Wildlife Management Area	0.9 miles west
Johnsonville State Historic Park	1.2 miles northeast
Johnsonville State Historic Area	1.4 miles east
Ashworth Property – Land Trust for Tennessee Conservation Easement	1.4 miles east
Eva Beach Park	1.6 miles northwest
Pebble Isle Marina	2.2 miles northeast
Beaver Dam Resort	2.3 miles northwest
Nathan Bedford Forrest State Wildlife Management Area	2.9 miles north
Tennessee National Wildlife Refuge	3.0 miles southeast

Source: TVA's Regional Natural Heritage Database 2021

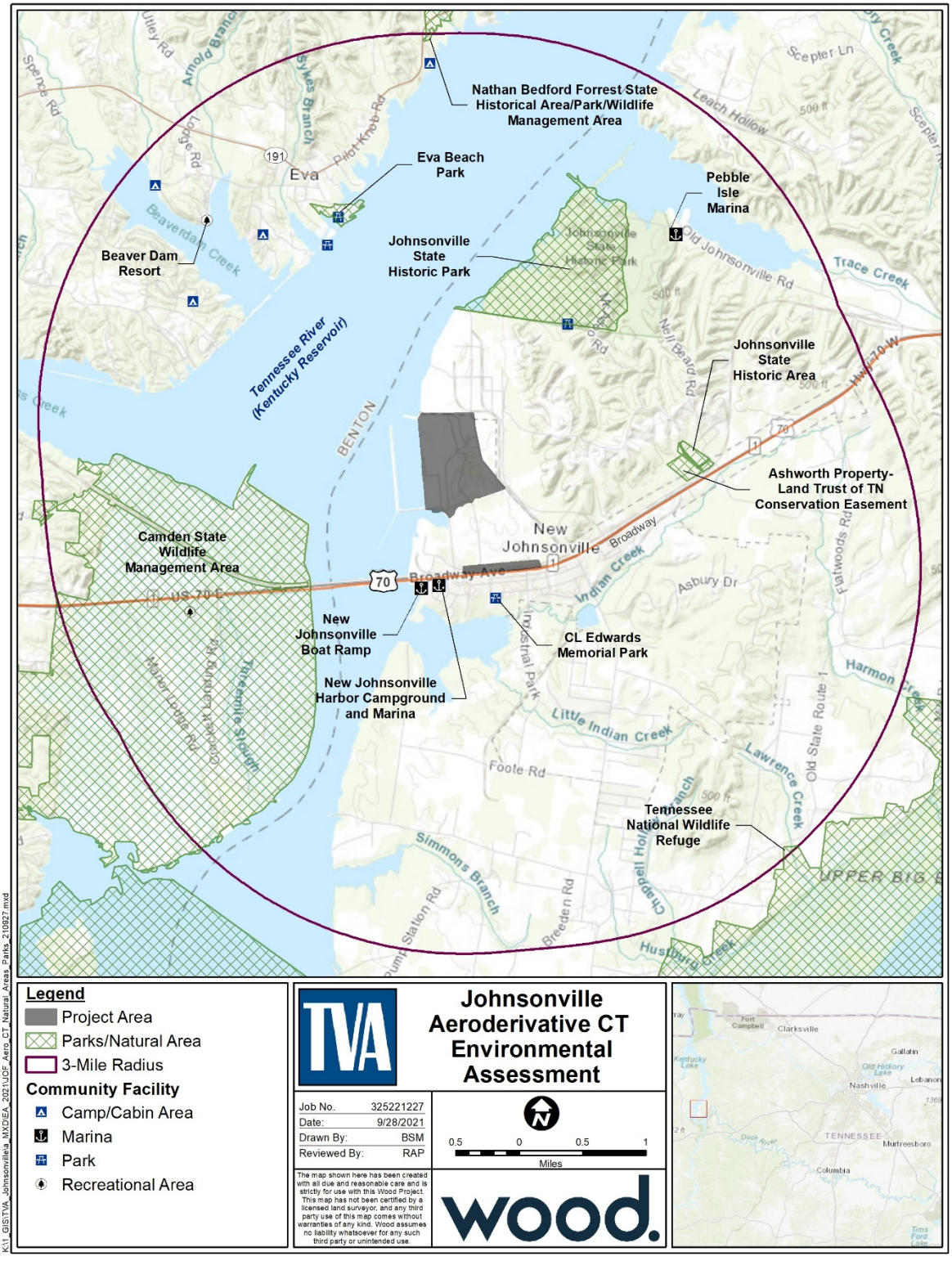


Figure 3-6. Managed and Natural Areas, Parks, and Recreational Facilities within a 3-Mile Radius of the Project Area

3.15.1.1 Managed and Natural Areas

Managed and natural areas within 3 miles of the project area are described below.

Camden State Wildlife Management Area – This area is located on the western shore of the Kentucky Reservoir on the Tennessee River in Benton County. This area is managed by Tennessee Wildlife Resources Agency (TWRA) in cooperation with TVA, who oversees the yearly drawdown and flooding of the area (TWRA 2021). Cropland and bottomland hardwood forest habitats are intertwined within the 3,682-acre area, and it provides hunting opportunities for deer, quail, wild turkey, and waterfowl. Some grassy fields are present that are likely good habitat for sparrows and other grassland birds. River front access with boat ramps provides views of expanses of water.

Johnsonville State Historic Park – Serving as a day-use park named for former President Andrew Johnson, this 1,075-acre park in Humphreys County is managed by Tennessee State Parks. It commemorates the site of the Johnsonville Depot, the Battle of Johnsonville, and the historic town site of Johnsonville that existed from 1864-1944 prior to the formation of the Kentucky Reservoir on the Tennessee River (TN State Parks 2021a). The Johnsonville State Historic Area is a small, separate portion of the Johnsonville State Historic Park that is located approximately 1.4 miles east of the project area on US 70 (Figure 3-6). This site consists of the park visitor center, museum, and park office. It is adjacent to the Ashworth Property described below.

Ashworth Property – This 19-acre site is private property under a conservation easement by the Land Trust for Tennessee.

Nathan Bedford Forrest State Park – This site is managed by Tennessee State Parks. Nathan Bedford Forrest State Park and Historic Area are situated on the western shore of the Kentucky Reservoir on the Tennessee River and consist of approximately 2,600 acres. Fishing is prominent in this park, and it is a popular destination for smallmouth, largemouth and striped bass, sauger, crappie, bream and catfish. Commercial marinas and public boat docks are located nearby, and three boating accesses are available in the park at no cost. The park contains more than 20 miles of hiking trails (TN State Parks 2021b).

Tennessee National Wildlife Refuge – This site is in Benton County and is managed by the USFWS. Due to an abundance of habitat types, the refuge harbors 51 mammals, 89 reptiles and amphibians, and 144 species of fish. An abundance of white-tailed deer can also be found throughout the area, along with smaller animals such as raccoons, foxes, squirrels, beaver, rabbits and wild turkey. The refuge also offers many recreational opportunities such as hunting, fishing, hiking, wildlife viewing, and photography (USFWS 2020).

3.15.1.2 Parks and Recreational Facilities

The Kentucky Reservoir on the Tennessee River is a major focal point for outdoor recreation, and most of the recreation areas in the vicinity of the project include water-based or water-oriented recreation services and facilities such as boat launching ramps, boat moorage and fueling, and shoreline camping and picnic facilities. Accordingly, the reservoir is used for water-based recreation activities including general boating, fishing and swimming.

As shown in Figure 3-6, there are three recreational areas adjacent to and across US 70 from the project area (within 0.5 miles). C.L. Edwards Memorial Park is located about 0.2 miles south of the project area. This a small community park that offers ball fields, walking paths, and pavilions. The privately owned New Johnsonville Harbor Campground is located approximately 0.3 miles southwest of the project area. This campground is accessed from US 70 and offers RV and tent camping and a marina with access to the reservoir. A public boat launching ramp on TVA land that is managed by the TWRA is located approximately 0.4 miles southwest of the project area.

Other recreational facilities within 3 miles of the project area include Eva Beach Park, Pebble Island Marina, and the Beaver Dam Resort (Figure 3-6). Eva Beach Park is located approximately 1.6 miles northwest of the project area in Benton County and is a popular park and recreation area for swimming and boating along the western shore of the Kentucky Reservoir on the Tennessee River. Recreational features of the park include year-round, 24-hour public access, swimming, launch site for vessels up to 26 feet, and onsite fishing and parking. Pebble Isle Marina and Beaver Dam Resort, also with access to the reservoir, are located approximately 2.2 miles and 2.3 miles, respectively, from the proposed project area.

3.15.2 Environmental Consequences

3.15.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct 10 natural gas-fired Aero CTs or associated support systems at the Johnsonville Reservation. Therefore, there would be no impacts to natural and managed areas, parks, or recreational facilities.

3.15.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

There are no natural or managed areas, parks, or recreational facilities located within the boundaries of the Johnsonville Reservation. Therefore, because all proposed activities under Alternative B would be located within the reservation, no direct impacts to parks or recreational facilities would occur with this alternative.

Twelve natural and managed areas, parks, and recreational facilities are within 3 miles of the project area. Because of their distances from the site (0.2-3.0 miles), and with the implementation of BMPs (fugitive dust control measures, soil erosion prevention measures, etc.), no direct impacts to these areas are anticipated. Further, because the existing character of the project area would not change under this alternative, and because there would be no impact to the Kentucky Reservoir on the Tennessee River, there would be no impact to the water-based recreation activities on the reservoir.

Given the number of parks and recreational facilities in the surrounding area, it is possible that offsite impacts could occur as a result of additional truck traffic, noise, and dust from construction vehicles. However, these impacts would be minor and would not impact the use or enjoyment of these areas because of the relatively short-term nature of this action. In addition, the preferred use of existing arterial or interstate roadways to transport construction equipment, personnel, and construction materials would minimize the impact to motorists accessing these areas. Therefore, impacts to natural and managed areas, parks, and recreational facilities under this alternative and the other reasonably foreseeable actions identified in Table 3-1 would be minor and temporary.

3.16 Noise

3.16.1 Affected Environment

Noise is unwanted or unwelcome sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities or diminishes the quality of the environment. Community response to noise is dependent on the intensity of the sound source, its duration, the proximity of noise-sensitive land uses, and the time of day the noise occurs. For instance, higher sensitivities to noise would be expected during the quieter overnight periods at noise sensitive receptors such as residences. Other sensitive receptors include developed sites where frequent human use occurs, such as churches and schools.

Sound is measured in logarithmic units called decibels (dB). Given that the human ear cannot perceive all pitches or frequencies of sound, noise measurements are typically weighted to correspond to the limits of human hearing. This adjusted unit of measure is known as the A-weighted decibel (dBA) which filters out sound in frequencies above and below human hearing. A noise level change of 3 dBA or less is barely perceptible to average human hearing. However, a 5 dBA change in noise level is clearly noticeable. The noise level associated with a 10 dBA change is perceived as being twice as loud; whereas the noise level associated with a 20 dBA change is considered to be four times as loud and would therefore represent a “dramatic change” in loudness.

To account for sound fluctuations, environmental noise is commonly described in terms of the equivalent sound level. The equivalent sound level is the constant noise level that conveys the same noise energy as the actual varying instantaneous sounds over a given period. Fluctuating levels of continuous, background, and/or intermittent noise heard over a specific period are averaged as if they had been a steady sound. The day-night sound level (L_{dn}), expressed in dBA, is the 24-hour average noise level with a 10-dBA correction penalty for the hours between 10 p.m. and 7 a.m. to account for the increased sensitivity of people to noises that occur at night. Typical background day-night noise levels for rural areas are anticipated to range between an L_{dn} of 35 and 50 dB, whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (EPA 1974). Common indoor and outdoor noise levels are listed in Table 3-10.

The perceived loudness or intensity between a noise source and a receptor may change because of distance, topography, vegetation, water bodies, and structures. The closer a receptor is to a noise source the louder the noise seems and for every doubling of distance from a source the intensity drops by about 6 dBA over land and about 5 dBA over water. Topography, vegetation, and structures can change noise intensity through reflection, absorption, or deflection. Reflection tends to increase the intensity, while absorption and deflection tend to decrease the intensity.

There are no federal, state, or locally established quantitative noise-level regulations specifying environmental noise limits for the Johnsonville Reservation or the surrounding area. However, the EPA noise guideline recommends outdoor noise levels not exceed L_{dn} of 55 dBA, which is sufficient to protect the public from the effect of broadband environmental noise in typical outdoor and residential areas. These levels are not regulatory goals but are “intentionally conservative to protect the most sensitive portion of the American population” with “an additional margin of safety” (EPA 1974). The U.S. Department of Housing and Urban Development (HUD) considers an L_{dn} of 65 dBA or less to be compatible with residential areas (HUD 1985).

Table 3-10. Common Indoor and Outdoor Noise Levels

Common Outdoor Noises	Sound Pressure Levels (dB)	Common Indoor Noises
	110	Rock Band at 5 m (16.4 ft)
Jet Flyover at 300 m (984.3 ft)		
	100	
		Inside Subway Train (New York)
Gas Lawn Mower at 1 m (3.3 ft)		
	90	
		Food Blender at 1 m (3.3 ft)
Diesel Truck at 15 m (49.2 ft)		Garbage Disposal at 1 m (3.3 ft)
	80	
		Shouting at 1 m (3.3 ft)
Gas Lawn Mower at 30 m (98.4 ft)	70	Vacuum Cleaner at 3 m (9.8 ft)
Commercial Area		Normal Speech at 1 m (3.3 ft)
	60	
		Large Business Office
	50	Dishwasher Next Room
Quiet Urban Daytime		
	40	Small Theater, Large Conference Room
Quiet Urban Nighttime		Library
Quiet Suburban Nighttime		
	30	
		Bedroom at Night
Quiet Rural Nighttime		Concert Hall (Background)
	20	
		Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

Source: FHWA 2018

3.16.1.1 Sources of Noise

Primary sources of noise in the vicinity of the Johnsonville Reservation include periodic barge operations on the Kentucky Reservoir on the Tennessee River, railroad operations, and routine vehicle operations and maintenance at the project site and the adjacent Chemours industrial facility. In addition, the existing JCT plant generates localized noise through operation of turbines, generators, and other ancillary equipment. However, as the existing JCT Units 1-16 are slated for retirement, noise emissions would be reduced accordingly. In addition, coal unloading and operation of the coal-fired fossil plant units that were historically dominant noise-generating activities at the Johnsonville Reservation have ceased following the fossil plant retirement and decommissioning (scheduled to be completed in June 2022).

3.16.1.2 Noise Receptors

Sensitive noise receptors include residences or other developed sites where frequent human use occurs, such as churches, parks, and schools. The closest populated area to the Johnsonville Reservation is a residential neighborhood located immediately south of US 70, with the closest residences located approximately 1 mile south of the proposed Aero CT plant footprint, 0.5 mile south of the primary project area (which contains the proposed Aero CT plant, Aero 161-kV switchyard, and laydown, parking, and trailer areas), and approximately 160 feet south of the rail yard portion of the project area. This neighborhood also includes C. L. Edwards Memorial Park, the New Johnsonville Harbor Campground and Marina, and the New Johnsonville Church of Christ, all located at distances of approximately 0.2 to 0.3 miles from the rail yard portion of the project area. In addition, Johnsonville State Historic Park is located approximately 0.8 mi. northeast of the project area. Densely forested areas of Johnsonville State Historic Park separate public use areas within the park from the proposed project area.

3.16.2 Environmental Consequences

3.16.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct 10 natural gas-fired Aero CTs or associated support systems at the Johnsonville Reservation. Therefore, there would be no impacts to noise receptors resulting from the proposed action under this alternative and ambient noise levels would remain similar to current conditions.

3.16.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, onsite construction activities for the proposed Aero CT plant would result in increased noise levels adjacent to the construction site due to operation of construction equipment onsite and along roadways used by construction-related vehicles. Construction activities would last approximately 2 years, with work primarily occurring on weekdays during daytime hours, though weekend and night shift construction may occur should the schedule necessitate. During the construction phase, noise would be generated by a variety of construction equipment including trucks, truck-mounted augers and drills, excavators, tracked cranes, and bulldozers. Typical noise levels from this construction equipment are expected to be 85 dBA or less at a distance of 50 feet from the construction site (FHWA 2016).

The closest sensitive noise receptors to the Aero CT project area are residences located south of US 70, approximately 0.5 miles south of the primary project area and 160 feet south of the rail yard portion of the project area. Based on straight line noise attenuation, it is estimated that maximum noise levels from construction equipment operated within the primary project area would attenuate to 50.5 dBA at the closest residence. Thus, typical construction noise in this residential area, which also encompasses a church and two recreational sites (C. L. Edwards Memorial Park and the New Johnsonville Harbor Campground and Marina), would fall below the recommended EPA outdoor noise guideline of 55 dBA. Similarly, noise levels from construction equipment would attenuate to 46.3 dBA or less at Johnsonville State Historic Park.

Noise associated with potential rail modifications may result in a temporary increase over recommended noise levels at the closest sensitive receptors, immediately south of US 70, as they are located approximately 160 feet to the rail yard portion of the project area. However, rail modification activities would be short-term and associated noise would likely

be comparable to existing rail and highway traffic noise already present in the vicinity. Therefore, noise impacts from construction of the Aero CT plant and associated support systems would be temporary and minor.

There is also a potential for indirect noise impacts associated with an increase in traffic related to workforce vehicle traffic and borrow transport. Roadway traffic noise is not usually a serious problem for people who live more than 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads (FHWA 2011). Due to the nature of the decibel scale and the attenuating effects of noise with distance, a doubling of traffic volume would result in an approximately 3 dBA increase in noise level, which would not normally be a perceptible noise increase (FHWA 2011). TVA estimates that the peak workforce needed during the estimated 2-year construction period would consist of approximately 200 personnel per day. Assuming one person per commuting vehicle, there would be a maximum daily morning inbound traffic volume of approximately 200 vehicles and a daily outbound traffic volume of approximately 200 vehicles each working day. If offsite borrow is needed, material would be obtained from the TVA owned borrow site south of the Johnsonville Reservation or a permitted commercial site. Borrow transport would be intermittent over the construction period and would be bounded by the 150 truckloads of borrow per day analyzed in TVA's 2019 EA (TVA 2019c). As noted in Section 3.14 (Transportation), the increase in traffic associated with construction activities is relatively small compared to existing traffic volumes. Therefore, the increase in current noise levels is estimated to be less than 3 dBA and as such, traffic noise is not anticipated to increase perceptibly.

During base load operation of the proposed Aero CT plant, noise levels for each piece of equipment (with the exception of the anti-icing Waste Heat Recovery Units) would not exceed 85 dBA at a horizontal distance of 3 feet. Based on straight line noise attenuation, it is estimated that noise levels from this Aero CT plant equipment would attenuate to 21.2 dBA at Johnsonville State Historic Park and 20.3 dBA at the nearest residence, well under the recommended EPA noise guideline of 55 dBA. Estimated noise emissions from the Waste Heat Recovery Units have not been determined; however, due to distance from the Aero CT plant site, it is unlikely that operational noise would result in notable noise increases at offsite sensitive receptors. Based on straight line noise attenuation, noise from the Aero CT plant would have to be considerable (i.e., greater than 94 dBA at a distance of 50 feet from the equipment) in order to produce noise levels of 55 dBA or higher at the closest sensitive receptors. TVA would utilize noise abatement technologies, if necessary, to ensure that typical operational noise emissions would not exceed 55 dBA at offsite noise receptors. Therefore, noise impacts from operation of the Aero CT plant and the other reasonably foreseeable actions identified in Table 3-1 would be minor.

3.17 Solid and Hazardous Waste

3.17.1 Affected Environment

In general, hazardous materials include substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or the environment when released into the environment. Hazardous materials are regulated under a variety of federal laws including Occupational Safety and Health Administration (OSHA) standards, Emergency Planning and Community Right to Know Act (EPCRA), the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act of 1980 and the Toxic Substances Control Act.

RCRA regulations define what constitutes a hazardous waste and establishes a “cradle to grave” system for management and disposal of hazardous wastes. Universal wastes are a subset of hazardous wastes that are widely generated. Universal wastes include batteries, lamps and high intensity lights, and mercury thermostats. Universal wastes may be managed in accordance with the RCRA requirements for hazardous wastes or by special, less stringent provisions.

Solid waste consists of a broad range of materials that include refuse, sanitary wastes, contaminated environmental media, scrap metals, nonhazardous wastewater treatment plant sludge, nonhazardous air pollution control wastes, various nonhazardous industrial waste, and other materials (solid, liquid, or contained gaseous substances). Solid waste is regulated by the EPA and RCRA Subtitle D. Each state is required to ensure the federal regulations for solid waste are met and may implement more stringent requirements.

Special waste is a solid waste, other than a hazardous waste, that requires special handling and management to protect public health or the environment. In some states, special wastes may include sludges, bulky wastes, pesticide wastes, industrial wastes, combustion wastes, friable asbestos and certain hazardous wastes exempted from RCRA Subtitle C requirements. Any of these wastes, if generated, would be disposed as required by state and federal regulations.

For gas- and oil-fired plants the solid waste concerns are the by products from emission controls. The solid waste produced from these controls is dependent upon the specific control technology implemented and is not anticipated to be considerable (Brown et al. 2017). Other hazardous wastes generated at Johnsonville Reservation include waste paint, waste paint solvents, paper insulated lead cable, debris from sandblasting and scraping paint chips, solvent rags used to clean equipment, and liquid-filled fuses (TVA 2019b).

Maintenance of the transmission line ROW may generate solid waste such as vegetative wastes (limbs, tree trunks, and resulting mulch) and domestic solid waste (trash, refuse). Use of herbicides would result in waste containers, unused herbicide products, outdated herbicides, and other vegetation control chemicals requiring proper disposal (TVA 2019d). Small amounts of hazardous waste may be generated during the maintenance of the equipment including waste oils, coolant/anti-freeze, chemical waste from cleaning operations, parts washer liquids, and other waste petroleum products.

3.17.2 Environmental Consequences

3.17.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct the Aero CTs or support systems at the Johnsonville Reservation; however, TVA would continue to generate solid and hazardous wastes from its current operations. These wastes would be managed in accordance with current TVA procedures and state and federal regulations. Therefore, there would be no impact to solid waste and hazardous waste generation.

3.17.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Construction of the Aero CTs and support systems at the Johnsonville Reservation would generate non-hazardous solid waste, including concrete, land clearing and stabilizing debris, metals, plastic, wood, packing materials, scrap metals, and non-hazardous used oil and lubricants. All non-hazardous waste from construction activities would be disposed of in

accordance with applicable regulations and TVA's procedure which includes recycling where possible.

Construction activities would result in a potential increase in generation of hazardous waste. Various hazardous wastes, such as waste paints, coating and adhesive wastes, and spent solvents, could be produced during construction. Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction and plant workers, the public, and the environment. A permitted hazardous waste disposal facility would be used for ultimate disposal of the wastes.

CT plants produce very small quantities of solid waste during normal operation. The generation of solid and hazardous waste during the Aero CT operations would be similar to the current waste generation rates. Operation of the new compressor station would be in compliance with measures identified in TVA's Spill Prevention and Response Procedures to prevent and contain accidental spills of any material, and to ensure that inadvertent spills of fuels, lubricants, coolants, or solvents are contained, cleaned up, and disposed of in an appropriate manner. The Aero 161-kV switchyard and transmission line would operate very similarly to existing facilities located on the Johnsonville Reservation and would produce very small quantities of solid and hazardous waste.

Solid and hazardous wastes generated during construction and operation of the Aero CTs would be managed in accordance with established procedures and applicable regulations. Therefore, impacts associated with the generation of solid and hazardous waste from the proposed action and other reasonably foreseeable actions identified in Table 3-1 would be minor.

3.18 Socioeconomics and Environmental Justice

3.18.1 Affected Environment

The study area for socioeconomic and environmental justice analysis is defined as any census block group that falls within a 5-mile radius of the proposed Johnsonville Aero CT project area and includes portions of Humphreys and Benton counties in western Tennessee. Therefore, both counties and the state of Tennessee are included as appropriate secondary geographic areas of reference. Comparisons at multiple spatial scales provide a more detailed characterization of populations that may be affected by the proposed actions, including any environmental justice populations (e.g., minority and low-income). Demographic and economic characteristics of populations within the study area were assessed using the most recent U.S. Census Bureau (USCB) data available, including 2020 Decennial Census counts (USCB 2021a) for total population and racial characteristics, and 2015-2019 American Community Survey 5-year estimates (USCB 2021b) for the remaining datasets.

3.18.1.1 Demographic and Economic Conditions

Demographic and economic characteristics of the study area and of the secondary reference geographies are summarized in Table 3-11. The block groups that make up the study area have a combined resident population of 11,395, which accounts for less than 0.2 percent of the total population of the state of Tennessee. The study area is a mixture of rural and suburban development, with population centers limited to the city of New Johnsonville (resident population of 1,804) and the unincorporated communities of Eva and Denver. Since 2010, the study area population has remained relatively stable, experiencing a decline of less than 1 percent. During the same period, the population of Benton County

declined by approximately 4 percent, while Humphreys County grew by approximately 2 percent, both in notable contrast to the growth rate of almost 9 percent experienced at the state level.

Approximately 91 percent of the population within the study area is white. The largest single minority groups in the study area are Black or African American and Hispanic or Latino, each representing 2 percent of the population, while persons who identified as two or more races represent 4 percent of the population. There are also small numbers who are Asian, American Indian and Alaska Native, or who identify as some other race. Minority percentages in the study area are generally comparable to those of the surrounding counties and somewhat lower than those of the state of Tennessee (Table 3-11).

The average median household income in the block groups that make up the study area is $48,700, which is higher than the median household income reported for Humphreys and Benton counties ($45,667 and $37,512, respectively) but slightly lower than that of the state of Tennessee ($53,320) (Table 3-11). The percentage of the study area population falling below the poverty level (15 percent) is slightly lower than that of the surrounding counties and is relatively consistent with the state. The total civilian labor force within the block groups that make up the study area is 4,050, with the unemployment rate of 6.1 percent. This unemployment rate is lower than the unemployment rates of Humphreys and Benton counties (7.5 percent and 6.8 percent, respectively), but higher than the unemployment rate in the state of Tennessee (5.3 percent) (Table 3-11).

Table 3-11. Demographic and Socioeconomic Characteristics

	Study Area (Block Groups within 5-Mile Radius)	Humphreys County, Tennessee	Benton County, Tennessee	State of Tennessee
Population[1,2,3]				
Population, 2020	11,395	18,990	15,864	6,910,840
Population, 2010	11,485	18,538	16,489	6,346,105
Percent Change 2010-2020	-0.8%	2.4%	-3.8%	8.9%
Persons under 18 years, 2019	18.6%	21.0%	19.5%	22.4%
Persons 65 years and over, 2019	24.1%	19.3%	23.8%	16.0%
Racial Characteristics[1]				
Not Hispanic or Latino				
White alone, 2020 (a)	91.1%	90.1%	90.6%	70.9%
Black or African American, 2020 (a)	2.0%	2.6%	2.0%	15.7%
American Indian and Alaska Native, 2020 (a)	0.2%	0.2%	0.3%	0.2%
Asian, 2020 (a)	0.5%	0.3%	0.7%	1.9%
Native Hawaiian and Other Pacific Islander, 2020 (a)	0.0%	0.0%	0.0%	0.1%
Some Other Race alone, 2020 (a)	0.6%	0.4%	0.2%	0.3%
Two or More Races, 2020	3.8%	4.1%	3.8%	3.9%
Hispanic or Latino, 2020	1.9%	2.4%	2.4%	6.9%

	Study Area (Block Groups within 5-Mile Radius)	Humphreys County, Tennessee	Benton County, Tennessee	State of Tennessee
Income and Employment[3]				
Median household income, 2019	$ 48,700	$ 45,667	$ 37,512	$ 53,320
Persons below poverty level, 2019	15.0%	15.6%	19.5%	15.2%
Persons below low-income threshold, 2019 (b)	39.0%	36.3%	44.7%	34.9%
Civilian Labor Force, 2019	4,050	7,998	6,322	3,282,671
Percent Employed, 2019	93.9%	92.5%	93.2%	94.7%
Percent Unemployed, 2019	6.1%	7.5%	6.8%	5.3%

(a) Includes persons reporting only one race.

(b) Low-income threshold is defined as two times the poverty level

Sources: [1]USCB 2021a; [2]USCB 2011; [3]USCB 2021b

3.18.1.2 Community Facilities and Services

Community facilities and services include public or publicly funded facilities such as police protection and other emergency services (ambulance/fire protection), schools, hospitals and other health care facilities, libraries, day care centers, churches, and community centers. To identify facilities and emergency services that could be potentially impacted by proposed project activities, the study area is identified as the service area of various providers, where applicable, or the area within a 5-mile radius of the project area.

Based on a review of aerial imagery and online information including the USGS Geographic Names Information System database (USGS 2021a), community facilities and services available within a 5-mile radius of the Aero CT project area include 15 churches, 33 cemeteries, two post offices, and an elementary school. The project area is also served by the New Johnsonville Police and Fire Departments. The closest community facilities, which include the New Johnsonville Post Office, Fire Department, and Church of Christ, are located approximately 0.25 mile east of the rail yard portion of the project area. No community facilities are located adjacent to (i.e., within a 0.5-mile radius) the proposed Aero CT project area.

3.18.1.3 Environmental Justice

On February 11, 1994, President Clinton signed EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. EO 12898 mandates some federal-executive agencies to consider environmental justice as part of the NEPA. Environmental justice has been defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income (EPA 2018) and ensures that minority and low-income populations do not bear disproportionately high and adverse human health or environmental effects from federal programs, policies, and activities. In addition, on January 27, 2021, President Biden issued EO 14008 Tackling the Climate Crisis at Home and Abroad. Amongst other objectives, the EO calls for the federal government to make environmental justice a defining feature of the response to climate crisis by developing programs, policies, and activities to address current and historic injustices, and by investing and building a clean energy economy that spurs economic

opportunity for disadvantaged communities. For these reasons, TVA routinely considers environmental justice impacts as part of the project decision-making process. A more detailed assessment of potential climate change impacts is in Section 3.3 (Climate Change and Greenhouse Gas).

Guidance for addressing environmental justice is provided by the CEQ Environmental Justice Guidance under NEPA (CEQ 1997). The CEQ defines minority as any race and ethnicity, as classified by the USCB, that is: Black or African American; American Indian or Alaska Native; Asian; Native Hawaiian and Other Pacific Islander; some other race (not mentioned above); two or more races; or a race whose ethnicity is Hispanic or Latino (CEQ 1997).

Identification of minority populations requires analysis of individual race and ethnicity classifications as well as comparisons of all minority populations in the region. Minority populations exist if either of the following conditions is met:

- The minority population of the impacted area exceeds 50 percent of the total population.
- The ratio of minority population is meaningfully greater (i.e., greater than or equal to 20 percent) than the minority population percentage in the general population or other appropriate unit of geographic analysis (CEQ 1997).

The nationwide poverty level is determined annually by the USCB and varies by the size of family and number of related children under 18 years of age. The 2020 USCB Poverty Threshold for an individual under the age of 65 is an annual income of $13,465, and for a family of four it is an annual household income of $26,695 (USCB 2021c). For the purposes of this assessment, low-income individuals are those whose annual household income is less than two times the poverty level. More encompassing than the base poverty level, this low-income threshold, also used by the EPA in their delineation of low-income populations, is an appropriate measure for environmental justice consideration because current poverty thresholds are often too low to adequately capture the populations adversely affected by low-income levels, especially in high-cost areas (EPA 2017). According to EPA, the effects of income on baseline health and other aspects of susceptibility are not limited to those below the poverty thresholds. For example, populations having an income level from one to two times the poverty level also have worse health overall than those with higher incomes (Centers for Disease Control and Prevention 2011). A low-income environmental justice population exists if either of the following two conditions is met:

- The low-income population exceeds 50 percent of the total population.
- The ratio of low-income population significantly exceeds (i.e., by greater than or equal to 20 percent) that of the general population or other appropriate geographic areas of analysis.

Based on a review of the EPA's EJSCREEN tool, the project area is not located in an area with high concentrations of environmental justice populations and minority groups make up relatively small percentages of the total population. In addition, as part of this analysis, TVA conducted a more detailed evaluation using 2020 USCB Decennial Census data and 2015-2019 American Community Survey data to identify whether any specific block groups within the vicinity of the project area exceed environmental justice thresholds. Figure 3-7 identifies the block groups within the study area that meet the specified criteria as environmental justice minority populations or low-income populations.

Total minority populations (i.e., all non-white and Hispanic or Latino racial groups combined) comprise approximately 29 percent of the population of Tennessee but only 9 to 10 percent of the population in Humphreys and Benton counties. The study area as a whole has a total minority percentage of 8.9 percent, with percentages for individual block groups ranging from 5.5 to 12.1 percent of the population. As none of the block groups within the study area have minority populations that either exceed 50 percent of the total population or significantly exceed the minority percentage of any of the reference geographies of Humphreys and Benton counties, they do not meet the criterion for consideration as minority population groups.

The percentage of the population of Tennessee living below the low-income threshold is approximately 35 percent. The percentage of low-income residents in Humphreys County is similar to the state, at approximately 36 percent of the population, while Benton County is notably higher at approximately 45 percent. Approximately 39 percent of people living within the study area are considered low-income, with percentages for individual block groups ranging from 28.0 to 50.9 percent of the population. One block group in the study area has a low-income population that exceeds 50 percent of the total population. Figure 3-7 identifies the block group determined to meet the criterion for consideration as a low-income population group subject to environmental justice considerations.

As specific demographic information is not available below the block group level, there is the potential for isolated minority, low-income, or otherwise vulnerable populations to be overlooked via this method of analysis. Thus, additional investigation, including review of local social services and HUD resources (HUD 2021), was also conducted. No additional populations subject to environmental justice considerations were identified during this review or through TVA's previous community engagement regarding activities at the Johnsonville Reservation.

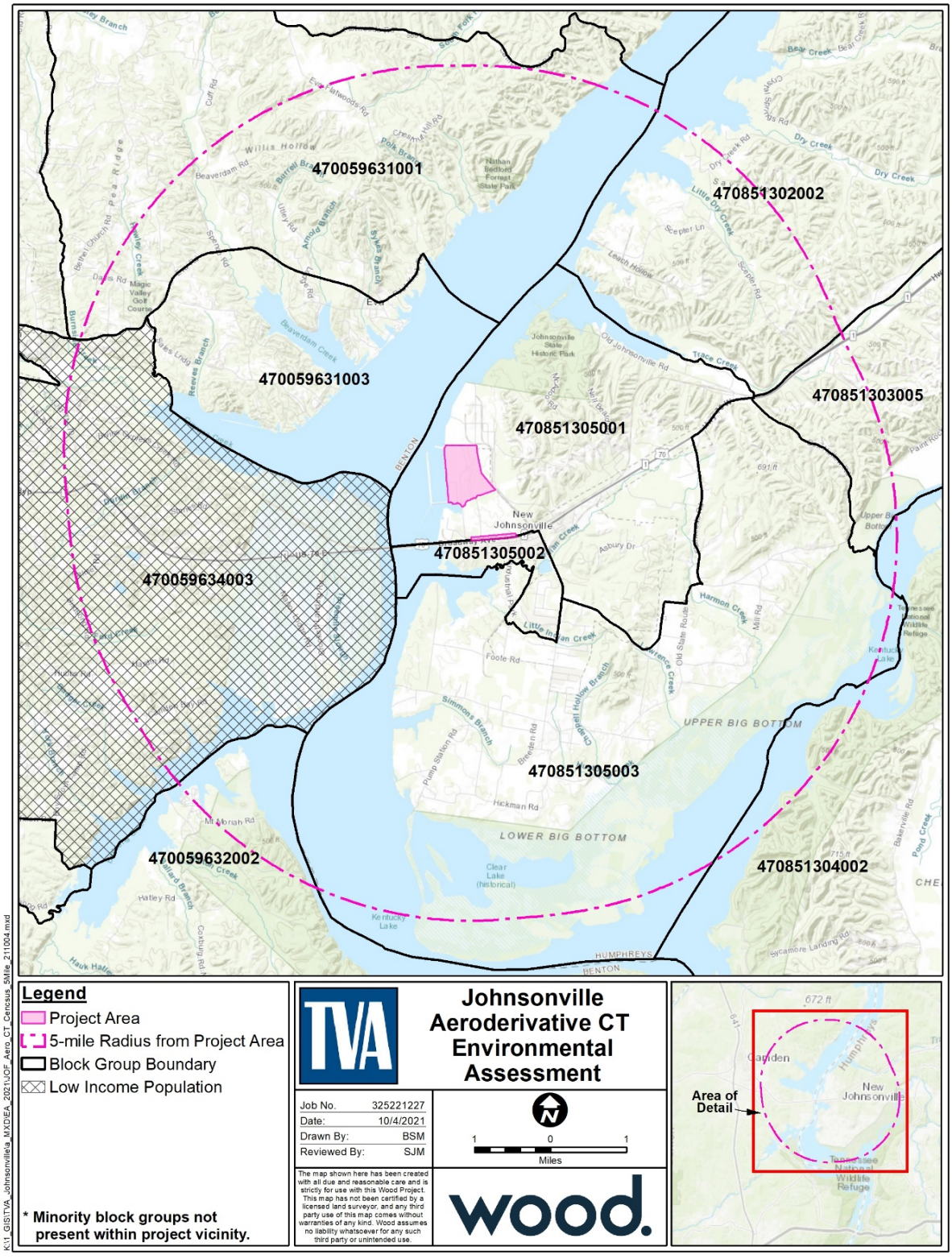


Figure 3-7. Environmental Justice Populations within the Study Area

3.18.2 Environmental Consequences

3.18.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct 10 natural gas-fired Aero CTs or associated support systems at the Johnsonville Reservation. Therefore, there would be no change in local demographics, economic conditions, or community services, and there would be no impacts to environmental justice populations associated with this alternative.

3.18.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

3.18.2.2.1 Demographic and Economic Impacts

As described in Chapter 2, construction of the Aero CT plant and associated support systems would take approximately 2 years and would require a temporary workforce of approximately 200 people at the peak of construction. Workers would be drawn from the labor force that currently resides within the surrounding counties and specialty workers and laborers not available within the area would be expected to temporarily relocate or commute to the project area for the duration of the construction period. Given that the maximum number of workers needed for construction would equate to less than 20 percent of the unemployed civilian workforce in Humphreys and Benton counties, it is likely that most of the workers could be drawn from the existing labor force. This, in combination with the short construction timeframe, indicates that construction activities would not result in any permanent population increase in the region. The current COVID-19 pandemic has caused a shortage of construction workers in some regions; however, even if workers were needed to be pulled from areas farther away, they would represent a minor, temporary increase in population.

Construction activities associated with the Aero CT plant would entail a temporary increase in employment and associated payrolls which would result in a minor short-term direct positive impact to employment in the region. Indirect impacts related to the purchases of materials and supplies, and the multiplier effect of increased spending in the local economy would be beneficial, but minor, given the short construction period.

Following construction, permanent staffing associated with the operation of the Aero CT is expected to require approximately 20 personnel. It is expected that staff from JCT Units 1-16 could transition to fill these positions upon retirement of these units, and thus there would be no notable change in the operations staff or local population growth.

3.18.2.2.2 Community Facilities and Services

Direct impacts to community facilities occur when a community facility is displaced or access to the facility is altered. Activities associated with construction of the proposed Aero CT plant and associated support systems would be limited to the Johnsonville Reservation and previously established roadways and borrow site, as necessary. Therefore, project construction would not result in the displacement of any community facilities nor impede access to any facilities. Therefore, there would be no direct impacts to community facilities or services under Alternative B.

Indirect impacts occur when a proposed action or project results in a population increase that would generate greater demands for services and/or affect the delivery of such services. In the event of an emergency at the Aero CT plant, local law enforcement, fire, and/or emergency medical service response would likely be required. However, given the relative magnitude of the proposed Aero CT plant and TVA’s adherence to stringent

workplace health and safety regulations, implementation of Alternative B would not result in appreciable increases in emergency incidents and thus would not have a notable impact on the demand for emergency services in the area. Additionally, as construction and operation of the plant would not result in notable impacts to local demographics, increased demands for services such as schools, churches, and healthcare facilities are not anticipated.

3.18.2.2.3 Environmental Justice

As indicated in Figure 3-7, one block group within the study area, located across the Kentucky Reservoir on the Tennessee River to the west, meets the criteria for consideration as an environmental justice population under EO 12898. The closest residences within this block group are located approximately 3 miles or more from the from the proposed Aero CT plant project area, and thus would not be affected by noise or fugitive dust from onsite construction activities. During construction, potential modification of the rail system and increased traffic related to workforce vehicles and transport of borrow material could result in increased traffic on local roads, noise, and fugitive dust in the communities directly south of the reservation which are not identified as environmental justice populations. However, these impacts would be short-term and minor and would not be disproportionate as impacts would be greatest in block groups that have minority and low-income populations below the environmental justice thresholds discussed above.

As described in Section 3.2 (Air Quality), air emissions associated with the operation of the Aero CT plant would be in compliance with PSD requirements, which ensures there is no significant impact to or deterioration of air quality due to the proposed project. While the operation of peaking units would result in an increase in emissions, these peaking units are necessary to support the addition of new renewables in keeping with the TVA Strategic Intent and Guiding Principles (TVA 2021h). Minor impacts to air quality associated with operation of the Aero CT plant would be borne primarily by the population within the study area, consisting of the census block groups within a 5-mile radius of the project area. As noted in Table 3-11, only 12 percent of the study area population belongs to a minority and 39 percent of the population are considered low-income. Thus, a considerable majority of the study area population is White alone (i.e., not Hispanic or Latino), and more than half are above the low-income threshold. Therefore, while operation of the Aero CT plant would result in localized emissions that would be dispersed throughout the study area, the impact of those emissions would not be disproportionate on any of the communities in the study area and those emissions also would not have significant adverse air quality impacts on communities within the study area.

As described in Sections 3.12, 3.17 and 3.19, construction and operation of the proposed Aero CT plant would not have a significant impact on visual resources, solid and hazardous waste generation, or public health and safety. Therefore, operation of the Aero CT plant would not result in a disproportionate impact to the environmental justice community identified within the vicinity of the project area.

Overall, the proposed Aero CT plant and the other reasonably foreseeable actions identified in Table 3-1 would have minor, localized, temporary impacts on the surrounding community, however, these impacts would not be disproportionate as impacts would be consistent across all communities (i.e., environmental justice and non-environmental justice) in the study area.

3.19 Public Health and Safety

3.19.1 Affected Environment

The Johnsonville Reservation is located in New Johnsonville, in Humphreys County, Tennessee, which is a rural, sparsely populated area, located on the south side of US 70/State Highway 1.

Public emergency services in the area include urgent care clinics, hospitals, law enforcement services, and fire protection services. West Tennessee Healthcare Camden Hospital is the closest hospital located approximately 7.2 miles northwest of the project area in Camden, Tennessee. The closest urgent care is the Fast Pace Health Urgent Care located 7.8 miles northwest of the project area in Camden, Tennessee. Police and fire protection services are provided by the city of New Johnsonville. The Tennessee Emergency Management Agency has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials.

Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws may comprise both federal and state statutes. The OSHA Act of 1970 (Title 29 CFR Part 1910) (29 CFR 1910) is the main statute protecting the health and safety of workers in the workplaces. A related statute, 29 CFR 1926, contains health and safety regulations specific to the construction industry. TVA has a robust safety conscious culture that is focused on awareness and understanding of workplace hazards, prevention, intervention, and active integration of BMPs to avoid and minimize hazards.

Transmission lines generate both electric and magnetic fields (EMFs). The voltage on the conductors of a transmission line generates an electric field that occupies the spaces between the conductors and other conducting objects such as the ground, transmission line structures, or vegetation. A magnetic field is generated by the current in the conductors; most of the energy is dissipated on the transmission line ROW. Existing transmission lines within the Johnsonville Reservation have been designed to minimize the potential for shocks, by maintaining sufficient clearance between conductors and objects on the ground. Stationary conducting objects, such as metal fences, pipelines, and guardrails would be grounded by TVA to prevent them from being a source of shocks.

3.19.2 Environmental Consequences

3.19.2.1 Alternative A – No Action Alternative

Under Alternative A, TVA would not construct 10 natural gas-fired Aero CTs or support systems at the Johnsonville Reservation. TVA would continue to apply the safety-conscious culture and activities performed at the site would be in accordance with applicable standard and specific TVA guidance. Occupational and public health hazards would continue to be addressed and managed through implementation of safety practices, training, and control measures. Due to the adherence to robust safety programs and a culture of safety-minded employees, impacts to public health and safety would be minimal.

3.19.2.2 Alternative B – Construction of Johnsonville Aero CTs and Support Systems

Under Alternative B, workers on the project site would have an increased safety risk during construction. However, because construction work has known hazards, it is TVA's policy that contractors establish and maintain site-specific health and safety plans in compliance with OSHA regulations. The contractor site-specific health and safety plans address the

hazards and controls as well as contractor coordination for various construction tasks. Health and safety plans emphasize BMPs for site safety management to minimize potential risks to workers. Examples of BMPs include employee safety orientations; establishment of work procedures and programs for site activities; use of equipment guards, emergency shutdown procedures, lockout procedures, site housekeeping, and personal protective equipment; regular safety inspections; and plans and procedures to identify and resolve hazards.

Potential public health and safety hazards could result from increased traffic on roadways during construction. Residential and other human use areas along roadways used by construction traffic to access the project site would experience increased commercial and industrial traffic. Awareness of these residences and establishment of traffic procedures to minimize potential safety concerns would be addressed in the health and safety plans followed by construction contractor(s).

Health hazards are also associated with waste generation; wastes including solid wastes, hazardous waste, liquid wastes, discharges, and air emissions. Construction debris and wastes would be managed in accordance with federal, state, and local requirements. General public health and safety would not be at risk in the event of an accidental spill onsite. An emergency response plan developed to address these potential releases would be developed and discussed with local emergency management agencies. Emergency response for the project site would be provided by the local, regional, and state law enforcement, fire, and emergency responders, as described above.

The operation of the proposed Aero CTs would adhere to TVA guidance and be consistent with standards established by OSHA and applicable state requirements. Occupational and public health hazards would be reduced or eliminated through TVA's implementation of health and safety practices. Through its safety programs, TVA fosters a culture of safety-minded employees, and, as such, impacts would be minimal.

Under Alternative B, the proposed 161-kV transmission line would produce EMFs. The strength of the electric and magnetic fields within and near the ROW varies with electric load on the transmission line and within the terrain. However, EMF strength attenuates rapidly with distance from the transmission line and is usually equal to ambient levels at the edge of the ROW. Public exposure would be minimal as the proposed transmission line is located on the TVA-owned Johnsonville Reservation. Therefore, public and worker exposure to EMFs would be minimal and would not deviate from exiting conditions. Impacts to worker and public health and safety would be minimal.

TVA's Standard Programs and Processes related to safety would be strictly adhered to during implementation of the proposed actions. The safety programs and processes are designed to identify actions required for the control of hazards in all activities, operations, and programs. They also establish responsibilities for implementing Section 19 of the Occupational Safety and Health Act of 1970. Therefore, impacts to public health and safety from the proposed action and other reasonably foreseeable actions identified in Table 3-1 are not anticipated.

3.20 Unavoidable Adverse Impacts

Unavoidable adverse impacts are the effects of the proposed action 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 below significance. Impacts associated with the construction and operation of the proposed Aero CT plant and associated support systems have the potential to cause unavoidable adverse effects to several natural and human environmental resources. TVA has reduced the potential for adverse effects during the planning process. In addition, TVA would implement mitigation measures (Section 2.5) to further reduce potential adverse effects to certain environmental resources.

Construction of the proposed Aero CT plant and support systems would require the permanent conversion of 1.6 acres of deciduous forest vegetation to herbaceous vegetation or to unvegetated, developed areas. Additionally, some low-quality herbaceous vegetation would be permanently converted to developed land. These habitat alterations would result in impacts to localized species composition and wildlife habitat for the lands immediately affected. However, due to the abundant habitat of similar quality within the vicinity of the project sites, the overall impact to vegetation and wildlife is considered minor.

Approximately 1.6 acres of potentially suitable summer roosting habitat for Indiana bat and northern long-eared bat consisting of upland forest and woody wetlands, would be removed. These activities were addressed in TVA's programmatic consultation with the USFWS on routine actions and federally listed bats in accordance with ESA Section 7(a)(2) and completed in April 2018. For those activities with potential to affect bats, TVA committed to implementing specific conservation measures. Due to the application of identified conservation measures, TVA has determined that proposed actions are not likely to significantly impact the Indiana bat or northern long-eared bat.

Seven active osprey nests were observed during field surveys within the project area in April 2021. Bush hogging, mowing, and selective herbicide treatments are the only acceptable means of vegetation removal between March 1 and July 31 within 660 feet of active nests. Broadcast herbicide application is not permissible within the 660-foot disturbance buffer areas. Given the amount of time that would occur between the 2021 breeding season field surveys and the onset of construction activities, new nests are likely to be built and some existing nests may no longer be active. As such, the osprey conservation commitments are applicable within 660 feet of any active nest during construction activities. Prior to activities in the vicinity of these nests, TVA would conduct additional field surveys to identify any new or active nests, with the intention of avoiding them. If needed, TVA would coordinate with USDA-Wildlife Services to ensure compliance under the EO 13186 [Responsibilities of Federal Agencies to Protect Migratory Birds].

The construction of the proposed Aero CT plant and support systems would avoid placing fill material into surface water and wetland resources. Development of the transmission line ROW would result in the clearing of 0.4 acres of forested wetland. Temporary impacts to water quality from runoff during construction, as well as ongoing vegetation maintenance along the transmission lines, could impact nearby receiving water bodies but would be reduced with application of appropriate BMPs.

The Johnsonville Reservation currently operates under a Title V operating permit, which would require a significant modification for the proposed project. TVA has begun the process of complying with PSD/Title V requirements with the submission of a PSD Permit Application to TDEC in September 2021. As the Aero CT plant would operate within the parameters of the PSD/Title V permit requirements, the overall unavoidable adverse impacts to air quality would be minor. Unavoidable localized increases in air and noise emissions would also occur during construction activities. Activities associated with the use

of construction equipment may result in varying amounts of dust, air emissions, and noise that may potentially impact onsite workers, users of adjacent water bodies, and nearby residents. Emissions from construction activities and equipment are minimized through implementation of BMPs including proper maintenance of construction equipment and vehicles. Low income and minority communities would not suffer any disproportionate air, dust, noise, transportation, or waste impacts.

In the context of the availability of regional resources that are similar to those unavoidably adversely affected by the project, coupled with the application of appropriate BMPs and adherence to permit requirements, unavoidable adverse effects would be minor.

3.21 Relationship of Short-Term Uses to 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. This EA focuses on the analyses of environmental impacts associated with the construction and operation of the proposed Aero CT plant and associated support systems. These activities are considered short-term uses of the environment for the purposes of this section. In contrast, the long-term productivity is considered to be that which occurs beyond the conclusion of decommissioning the Aero CT plant and associated infrastructure. This section includes an evaluation of the extent that the short-term uses preclude any options for future long-term use of the project site.

Construction of the Aero CT plant and associated support systems would cause a minor, short-term deterioration in existing air quality during construction. These impacts would be mitigated through implementation of mitigative measures to reduce emissions from construction phase equipment and to minimize emissions of fugitive dust. Operational impacts to air quality would be minor because appropriate emission controls are included within the Aero CT plant infrastructure to allow the plant to operate under Title V permit conditions. Similarly, operational impacts to climate change would not be notable on a regional, national or global scale. Therefore, there would be no effect on the enhancement of long-term productivity related to air quality or climate change following decommissioning.

The acreage disturbed during construction of the Aero CT plant is larger than that required for the actual permanent structures and other ancillary facilities necessary once the site is operational because of the need for vehicle and equipment parking, materials storage, laydown, construction administration, and other temporary use areas. Preparation of these onsite areas coupled with noise from construction activities may displace some wildlife and alter existing vegetation. Once the new facilities are completed, the areas not needed for operations would be returned to pre-existing conditions.

The principal change in short-term use of the project area would be the loss of vegetation within the areas impacted by operation of the Aero CT plant facility. The areas encompassing the proposed plant site and supporting infrastructure have been developed for heavy industrial use; they are not currently used for agriculture and only support fragmented areas of woody vegetation. Therefore, there would be no losses to agricultural activities or large-scale timber production. Additionally, because the vicinity of the project area includes similar vegetation and habitat types, the short-term disturbance to support Aero CT plant operations is not expected to significantly alter long-term productivity of wildlife, agriculture, or other natural resources.

Construction of the Aero CT plant and associated support systems would reduce the long-term productivity of the land for other purposes while these facilities are in operation. However, after decommissioning, the lands could be reused and made available for other uses.

3.22 Irreversible and Irretrievable Commitments of Resources

The term “irreversible commitments of resources” describes environmental resources that are potentially changed by the construction or operation of the proposed project that could not be restored to their prior state by practical means at some later time. Irreversible commitments generally occur to nonrenewable resources such as minerals or cultural resources and to those resources that are renewable only over long timespans, such as soil productivity. A resource commitment is considered irretrievable when the use or consumption is neither renewable nor recoverable for use until reclamation is successfully applied. Irretrievable commitments generally apply to the loss of production, harvest, or other natural resources and are not necessarily irreversible. For example, the construction of a road through a forest would be an irretrievable commitment of the productivity of timber within the road ROW as long as the road remains. Mining of ore is an irreversible commitment of a resource; once the ore is removed and used, it cannot be restored.

The land used for the proposed Aero CT plant and associated infrastructure is not irreversibly committed because once the plant ceases operations and the facility is decommissioned, the land supporting the facility could be returned to other industrial or nonindustrial uses. The ROW used for the transmission line would constitute an irretrievable commitment of onsite resources, such as wildlife habitat and forest resources, for the length of time the transmission line is in place. However, upon retirement of these facilities the land would revert back to its previous condition. In the interim, compatible uses of the ROW could continue.

The transfer of borrow material, if needed, to the project area could be both an irreversible and irretrievable commitment of resources. The loss of soil (which requires a very long time to generate) would constitute an irreversible and irretrievable resource commitment; however, revegetating the borrow site would return the site to productive status. Thus, the loss of soil until the area is successfully revegetated would be an irretrievable commitment, but not irreversible.

Resources required by construction activities, including labor, fossil fuels and construction materials, would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. In addition, operation of the Aero CT plant would result in the irretrievable loss of natural gas which would be used to fuel the CTs. In addition, the materials used for the construction of the proposed site would be committed for the life of the facilities. However, these fossil fuels and building materials are not in short supply and their use would not have an adverse effect upon continued availability of these resources.

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CHAPTER 4 – LIST OF PREPARERS

4.1 NEPA Project Management

Name:	**Brittany Kunkle**
Education:	B.S., Environmental and Soil Science
Project Role:	TVA Project Manager, TVA NEPA Coordinator, NEPA Compliance
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Education:	M.S., Geological Sciences and B.S., Geology
Project Role:	TVA NEPA Specialist
Experience:	13 years managing and performing NEPA compliance

Name:	**Emily Willard**
Education:	B.S., Environmental Science
Project Role:	Project Coordination
Experience:	15 years in Environmental Compliance; Preparation of Environmental Review

Name:	**Karen Boulware**
Education:	M.S., Resource Planning and B.S., Geology
Project Role:	Wood Project Manager. Chapters 1 and 2; Transportation and Overall Technical Review
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Project Role:	Wood Deputy Project Manager. Chapters 1 and 2; Surface Waters; Wetlands; Threatened and Endangered Species; Aquatic Ecology; and Wildlife reviews
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4.2 Other Contributors

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Name:	**Steve Cole**
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Experience:	32 years in Archaeology and Cultural Resources Management

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WOOD ENVIRONMENT AND INFRASTRUCTURE SOLUTIONS, INC.

Name:	**Erin Alsop**
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Name:	**Connie Heitz**
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Project Role:	Technical Review, Transportation
Experience:	27 years in environmental and land use planning

Name:	**Chris Mausert-Mooney**
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Project Role:	Vegetation
Experience:	10 years of experience in ecological and botanical investigations

Name:	**Nick Meisinger**
Education:	B.S., Environmental Science
Project Role:	Climate Change and Greenhouse Gases
Experience:	10 years of experience in NEPA analysis and documentation

Name:	**Kim Pesenko**
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Project Role:	Air Quality
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Name:	**Rebecca Porath**
Education:	M.S. and B.S., Wildlife and Fisheries Sciences
Project Role:	Managed and Natural Areas, Vegetation, Threatened and Endangered Species; Aquatic Ecology; and Wildlife reviews; technical editing and document management
Experience:	23 years of experience in NEPA analysis and documentation, ecological studies, and preparation of technical documents

Name:	**Natalie Reiss**
Education:	B.A., Biology
Project Role:	Natural Areas, Parks and Recreation; Socioeconomics and Environmental Justice; Noise; and Visual Resources
Experience:	6 years of experience in NEPA analysis and documentation

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Appendix A – Bat Strategy Project Review Form

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Project Review Form - TVA Bat Strategy *(06/2019)*

*This form should **only** be completed if project includes activities in Tables 2 or 3 (STEP 2 below). This form is not required if project activities are limited to Table 1 (STEP 2) or otherwise determined to have no effect on federally listed bats. If so, include the following statement in your environmental compliance document (e.g., add as a comment in the project CEC): "Project activities limited to Bat Strategy Table 1 or otherwise determined to have no effect on federally listed bats. Bat Strategy Project Review Form NOT required." This form is to assist in determining required conservation measures per TVA's ESA Section 7 programmatic consultation for routine actions and federally listed bats.*[1]

Project Name: Johnsonville Aeroderivative **Date:** 3-19-2021

Contact(s): Brittany Kunkle **CEC#:** **Project ID:** 2020-13

Project Location (City, County, State): New Johnsonville, Humphreys County, Tennessee

Project Description:

Addition of 10 natural gas-fired Aero CTs generating ~550 MW at the JOF. A new compressor station would be constructed on site & operated by TVA. 1-3 new warehouses may be constructed and three existing warehouses could be demolished.

SECTION 1: PROJECT INFORMATION - ACTION AND ACTIVITIES

STEP 1) Select TVA Action. If none are applicable, contact environmental support staff, Environmental Project Lead, or Terrestrial Zoologist to discuss whether form (i.e., application of Bat Programmatic Consultation) is appropriate for project:

- ☐ 1 Manage Biological Resources for Biodiversity and Public Use on TVA Reservoir Lands
- ☐ 2 Protect Cultural Resources on TVA-Retained Land
- ☐ 3 Manage Land Use and Disposal of TVA-Retained Land
- ☐ 4 Manage Permitting under Section 26a of the TVA Act
- ☒ 5 Operate, Maintain, Retire, Expand, Construct Power Plants
- ☐ 6 Maintain Existing Electric Transmission Assets
- ☐ 7 Convey Property associated with Electric Transmission
- ☐ 8 Expand or Construct New Electric Transmission Assets
- ☐ 9 Promote Economic Development
- ☐ 10 Promote Mid-Scale Solar Generation

STEP 2) Select all activities from Tables 1, 2, and 3 below that are included in the proposed project.

TABLE 1. Activities with no effect to bats. Conservation measures & completion of bat strategy project review form NOT required.

☐ 1. Loans and/or grant awards	☐ 8. Sale of TVA property	☐ 19. Site-specific enhancements in streams and reservoirs for aquatic animals
☐ 2. Purchase of property	☐ 9. Lease of TVA property	☐ 20. Nesting platforms
☒ 3. Purchase of equipment for industrial facilities	☐ 10. Deed modification associated with TVA rights or TVA property	☐ 41. Minor water-based structures (this does not include boat docks, boat slips or piers)
☐ 4. Environmental education	☐ 11. Abandonment of TVA retained rights	☐ 42. Internal renovation or internal expansion of an existing facility
☐ 5. Transfer of ROW easement and/or ROW equipment	☐ 12. Sufferance agreement	☐ 43. Replacement or removal of TL poles
☐ 6. Property and/or equipment transfer	☐ 13. Engineering or environmental planning or studies	☐ 44. Conductor and overhead ground wire installation and replacement
☐ 7. Easement on TVA property	☐ 14. Harbor limits delineation	☐ 49. Non-navigable houseboats

TABLE 2. Activities not likely to adversely affect bats with implementation of conservation measures. Conservation measures and completion of bat strategy project review form REQUIRED; review of bat records in proximity to project NOT required.

■ 18. Erosion control, minor	☐ 57. Water intake - non-industrial	☐ 79. Swimming pools/associated equipment
☐ 24. Tree planting	■ 58. Wastewater outfalls	■ 81. Water intakes – industrial
☐ 30. Dredging and excavation; recessed harbor areas	☐ 59. Marine fueling facilities	☐ 84. On-site/off-site public utility relocation or construction or extension
☐ 39. Berm development	☐ 60. Commercial water-use facilities (e.g., marinas)	☐ 85. Playground equipment - land-based
☐ 40. Closed loop heat exchangers (heat pumps)	☐ 61. Septic fields	☐ 87. Aboveground storage tanks
☐ 45. Stream monitoring equipment - placement and use	☐ 66. Private, residential docks, piers, boathouses	☐ 88. Underground storage tanks
☐ 46. Floating boat slips within approved harbor limits	■ 67. Siting of temporary office trailers	☐ 90. Pond closure
■ 48. Laydown areas	☐ 68. Financing for speculative building construction	☐ 93. Standard License
■ 50. Minor land based structures	☐ 72. Ferry landings/service operations	☐ 94. Special Use License
☐ 51. Signage installation	☐ 74. Recreational vehicle campsites	☐ 95. Recreation License
☐ 53. Mooring buoys or posts	■ 75. Utility lines/light poles	☐ 96. Land Use Permit
☐ 56. Culverts	☐ 76. Concrete sidewalks	

Table 3: Activities that may adversely affect federally listed bats. Conservation measures AND completion of bat strategy project review form REQUIRED; review of bat records in proximity of project REQUIRED by OSAR/Heritage eMap reviewer or Terrestrial Zoologist.

☐ 15. Windshield and ground surveys for archaeological resources	■ 34. Mechanical vegetation removal, includes trees or tree branches > 3 inches in diameter	☐ 69. Renovation of existing structures
☐ 16. Drilling	☐ 35. Stabilization (major erosion control)	☐ 70. Lock maintenance/ construction
■ 17. Mechanical vegetation removal, does not include trees or branches > 3" in diameter (in Table 3 due to potential for woody burn piles)	■ 36. Grading	☐ 71. Concrete dam modification
☐ 21. Herbicide use	☐ 37. Installation of soil improvements	☐ 73. Boat launching ramps
■ 22. Grubbing	☐ 38. Drain installations for ponds	■ 77. Construction or expansion of land-based buildings
☐ 23. Prescribed burns	☐ 47. Conduit installation	■ 78. Wastewater treatment plants
☐ 25. Maintenance, improvement or construction of pedestrian or vehicular access corridors	☐ 52. Floating buildings	☐ 80. Barge fleeting areas
☐ 26. Maintenance/construction of access control measures	☐ 54. Maintenance of water control structures (dewatering units, spillways, levees)	☐ 82. Construction of dam/weirs/ levees
☐ 27. Restoration of sites following human use and abuse	☐ 55. Solar panels	☐ 83. Submarine pipeline, directional boring operations
☐ 28. Removal of debris (e.g., dump sites, hazardous material, unauthorized structures)	☐ 62. Blasting	☐ 86. Landfill construction
☐ 29. Acquisition and use of fill/borrow material	☐ 63. Foundation installation for transmission support	■ 89. Structure demolition
■ 31. Stream/wetland crossings	■ 64. Installation of steel structure, overhead bus, equipment, etc.	☐ 91. Bridge replacement
☐ 32. Clean-up following storm damage	■ 65. Pole and/or tower installation and/or extension	☐ 92. Return of archaeological remains to former burial sites
☐ 33. Removal of hazardous trees/tree branches		

STEP 3) Project includes one or more activities in Table 3? ◉ **YES (Go to Step 4)** ○ **NO (Go to Step 13)**

STEP 4) Answer questions *a* through *e* below (applies to projects with activities from Table 3 ONLY)

a) Will project involve continuous noise (i.e., ≥ 24 hrs) that is greater than 75 decibels measured on the A scale (e.g., loud machinery)?
- (●) **NO** (NV2 does not apply)
- ( ) **YES** (NV2 applies, subject to records review)

b) Will project involve entry into/survey of cave?
- (●) **NO** (HP1/HP2 do not apply)
- ( ) **YES** (HP1/HP2 applies, subject to review of bat records)

c) If conducting **prescribed burning** (**activity 23)**, estimated acreage**:** [ ] and timeframe(s) below; [■] **N/A**

STATE	SWARMING	WINTER	NON-WINTER	PUP
GA, KY, TN	[ ] Oct 15 - Nov 14	[ ] Nov 15 - Mar 31	[ ] Apr 1 - May 31, Aug 1- Oct 14	[ ] Jun 1 - Jul 31
VA	[ ] Sep 16 - Nov 15	[ ] Nov 16 - Apr 14	[ ] Apr 15 - May 31, Aug 1 – Sept 15	[ ] Jun 1 - Jul 31
AL	[ ] Oct 15 - Nov 14	[ ] Nov 15 - Mar 15	[ ] Mar 16 - May 31, Aug 1 - Oct 14	[ ] Jun 1 - Jul 31
NC	[ ] Oct 15 - Nov 14	[ ] Nov 15 - Apr 15	[ ] Apr 16 - May 31, Aug 1 - Oct 14	[ ] Jun 1 - Jul 31
MS	[ ] Oct 1 - Nov 14	[ ] Nov 15 - Apr 14	[ ] Apr 15 - May 31, Aug 1 – Sept 30	[ ] Jun 1 - Jul 31

d) Will the project involve vegetation piling/burning?
- (●) **NO** (SSPC4/ SHF7/SHF8 do not apply)
- ( ) **YES** (SSPC4/SHF7/SHF8 applies, subject to review of bat records)

e) If **tree removal (activity 33 or 34)**, estimated amount: [1.6] (●)**ac** ( )**trees** ( )**N/A**

STATE	SWARMING	WINTER	NON-WINTER	PUP
GA, KY, TN	[ ] Oct 15 - Nov 14	[ ] Nov 15 - Mar 31	[■] Apr 1 - May 31, Aug 1- Oct 14	[ ] Jun 1 - Jul 31
VA	[ ] Sep 16 - Nov 15	[ ] Nov 16 - Apr 14	[ ] Apr 15 - May 31, Aug 1 – Sept 15	[ ] Jun 1 - Jul 31
AL	[ ] Oct 15 - Nov 14	[ ] Nov 15 - Mar 15	[ ] Mar 16 - May 31, Aug 1 - Oct 14	[ ] Jun 1 - Jul 31
NC	[ ] Oct 15 - Nov 14	[ ] Nov 15 - Apr 15	[ ] Apr 16 - May 31, Aug 1 - Oct 14	[ ] Jun 1 - Jul 31
MS	[ ] Oct 1 - Nov 14	[ ] Nov 15 - Apr 14	[ ] Apr 15 - May 31, Aug 1 – Sept 30	[ ] Jun 1 - Jul 31

If warranted, does project have flexibility for bat surveys (May 15-Aug 15): (●) **MAYBE** ( ) **YES** ( ) **NO**

**** For **PROJECT LEADS** whose projects will be reviewed by a Heritage Reviewer (Natural Resources Organization only), **STOP HERE**. Click File/ Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date", and submit with project information. Otherwise continue to Step 5. ****

SECTION 2: REVIEW OF BAT RECORDS (applies to projects with activities from Table 3 ONLY)

STEP 5) Review of bat/cave records conducted by Heritage/OSAR reviewer?

( ) **YES** (●) **NO** (Go to Step 13)

Info below completed by:

[ ] **Heritage Reviewer**	(name)		Date	
[ ] **OSAR Reviewer**	(name)		Date	
[■] **Terrestrial Zoologist**	(name)	Sara McLaughlin-Johnson	Date	3/19/2021

Gray bat records: [☒] None [ ] Within 3 miles* [ ] Within a cave* [ ] Within the County

Indiana bat records: [☒] None [ ] Within 10 miles* [ ] Within a cave* [ ] Capture/roost tree* [ ] Within the County

Northern long-eared bat records: [☒] None [ ] Within 5 miles* [ ] Within a cave* [ ] Capture/roost tree* [ ] Within the County

Virginia big-eared bat records: [☒] None [ ] Within 6 miles* [ ] Within the County

Caves: [☒] None within 3 mi [ ] Within 3 miles but > 0.5 mi [ ] Within 0.5 mi but > 0.25 mi* [ ] Within 0.25 mi but > 200 feet* [ ] Within 200 feet*

Bat Habitat Inspection Sheet completed? (●) **NO** ( ) **YES**

Amount of SUITABLE habitat to be removed/burned (may differ from STEP 4e): [1.6] **(**(●)**ac** ( )**trees)*** ( )**N/A**

STEP 6) Provide any additional notes resulting from Heritage Reviewer records review in Notes box below then . . . . . Go to Step 13

Notes from Bat Records Review (e.g., historic record; bats not on landscape during action; DOT bridge survey with negative results):

STEPS 7-12 To be Completed by Terrestrial Zoologist (if warranted):

STEP 7) Project will involve:

- ☐ Removal of suitable trees within 0.5 mile of P1-P2 Indiana bat hibernacula or 0.25 mile of P3-P4 Indiana bat hibernacula or any NLEB hibernacula.
- ☐ Removal of suitable trees within 10 miles of documented Indiana bat (or within 5 miles of NLEB) hibernacula.
- ☒ Removal of suitable trees > 10 miles from documented Indiana bat (> 5 miles from NLEB) hibernacula.
- ☐ Removal of trees within 150 feet of a documented Indiana bat or northern long-eared bat maternity roost tree.
- ☐ Removal of suitable trees within 2.5 miles of Indiana bat roost trees or within 5 miles of Indiana bat capture sites.
- ☒ Removal of suitable trees > 2.5 miles from Indiana bat roost trees or > 5 miles from Indiana bat capture sites.
- ☐ Removal of documented Indiana bat or NLEB roost tree, if still suitable.
- ☐ N/A

STEP 8) Presence/absence surveys were/will be conducted: ○ **YES** ◉ **NO** ○ **TBD**

STEP 9) Presence/absence survey results, on _____ ○ **NEGATIVE** ○ **POSITIVE** ◉ **N/A**

STEP 10) Project ◉ **WILL** ○ **WILL NOT** require use of Incidental Take in the amount of 1.6 ◉ **acres or** ○ **trees** proposed to be used during the ○ **WINTER** ◉ **VOLANT SEASON** ○ **NON-VOLANT SEASON** ○ **N/A**

STEP 11) Available Incidental Take (prior to accounting for this project) as of 7/20/2021

TVA Action	Total 20-year	Winter	Volant Season	Non-Volant Season
5 Operate, Maintain, Retire, Expand, Construct Power Plants	1,676.73	1,295.53	276.47	104.73

STEP 12) Amount contributed to TVA's Bat Conservation Fund upon activity completion: $ 800 OR ◉ **N/A**

TERRESTRIAL ZOOLOGISTS, after completing SECTION 2, review Table 4, modify as needed, and then complete section for Terrestrial Zoologists at end of form.

SECTION 3: REQUIRED CONSERVATION MEASURES

STEP 13) Review Conservation Measures in Table 4 and ensure those selected are relevant to the project. If not, manually override and uncheck irrelevant measures, and explain why in ADDITIONAL NOTES below Table 4.

Did review of Table 4 result in ANY remaining Conservation Measures in **RED**?

- ○ **NO** (Go to Step 14)
- ◉ **YES** (STOP HERE; Submit for Terrestrial Zoology Review. Click File/Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date", and submit with project information).

Table 4. TVA's ESA Section 7 Programmatic Bat Consultation Required Conservation Measures

The Conservation Measures in Table 4 are automatically selected based on your choices in Tables 2 and 3 but can be manually overridden, if necessary. To Manually override, press the button and enter your name.

Manual Override

Name: Sara McLaughlin-Johnson

Check if Applies to Project	Activities Subject To Conservation Measure	Conservation Measure Description
		NV1 - Noise will be short-term, transient, and not significantly different from urban interface or natural events (i.e., thunderstorms) that bats are frequently exposed to when present on the landscape.
		TR1* - Removal of potentially suitable summer roosting habitat during time of potential occupancy has been quantified and minimized programmatically. TVA will track and document alignment of activities that include tree removal (i.e., hazard trees, mechanical vegetation removal) with the programmatic quantitative cumulative estimate of seasonal removal of potential summer roost trees for Indiana bat and northern long-eared bat. Project will therefore communicate completion of tree removal to appropriate TVA staff.
		TR4* - Removal of suitable summer roosting habitat within potential habitat for Indiana bat or northern long-eared bat will be tracked, documented, and included in annual reporting. Project will therefore communicate completion of tree removal to appropriate TVA staff.
		TR7 (**Existing Transmission ROW only**) - **Tree removal within 100 feet of existing transmission ROWs will be limited to hazard trees**. On or adjacent to TLs, a hazard tree is a tree that is tall enough to fall within an unsafe distance of TLs under maximum sag and blowout conditions and/or are also dead, diseased, dying, and/or leaning. Hazard tree removal includes removal of trees that 1) currently are tall enough to threaten the integrity of operation and maintenance of a TL or 2) have the ability in the future to threaten the integrity of operation and maintenance of a TL.
		TR9 - If removal of suitable summer roosting habitat occurs when bats are present on the landscape, a funding contribution (based on amount of habitat removed) towards future conservation and recovery efforts for federally listed bats would be carried out. Project can consider seasonal bat presence/absence surveys (mist netting or emergence counts) that allow for positive detections without resulting in increased constraints in cost and project schedule. This will enable TVA to contribute to increased knowledge of bat presence on the landscape while carrying out TVA's broad mission and responsibilities.

AR1 - Projects that involve structural modification or demolition of buildings, bridges, and potentially suitable box culverts, will require assessment to determine if structure has characteristics that make it a potentially suitable unconventional bat roost. If so a survey to determine if bats may be present will be conducted. Structural assessment will include:

- Visual check that includes an exhaustive internal/external inspection of building to look for evidence of bats (e.g., bat droppings, roost entrance/exit holes); this can be done at any time of year, preferably when bats are active.
- Where accessible and health and safety considerations allow, a survey of roof space for evidence of bats (e.g., droppings, scratch marks, staining, sightings), noting relevant characteristics of internal features that provide potential access points and roosting opportunities. Suitable characteristic may include: gaps between tiles and roof lining, access points via eaves, gaps between timbers or around mortise joints, gaps around top and gable end walls, gaps within roof walling or around tops of chimney breasts, and clean ridge beams.
- Features with high-medium likelihood of harboring bats but cannot be checked visually include soffits, cavity walls, space between roof covering and roof lining.
- Applies to box culverts that are at least 5 feet (1.5 meters) tall and with one or more of the following characteristics. Suitable culverts for bat day roosts have the following characteristics:
    - Location in relatively warm areas
    - Between 5-10 feet (1.5-3 meters) tall and 300 ft (100 m) or more long
    - Openings protected from high winds
    - Not susceptible to flooding
    - Inner areas relatively dark with roughened walls or ceilings
    - Crevices, imperfections, or swallow nests
- Bridge survey protocols will be adapted from the Programmatic Biological Opinion for the Federal Highway Administration (Appendix D of USFWS 2016c, which includes a Bridge Structure Assessment Guidance and a Bridge Structure Assessment Form).
- Bat surveys usually are NOT needed in the following circumstances:
    - Domestic garages /sheds with no enclosed roof space (with no ceiling)
    - Modern flat-roofed buildings
    - Metal framed and roofed buildings
    - Buildings where roof space is regularly used (e.g., attic space converted to living space, living space open to rafters) or where all roof space is lit from skylights or windows. Large/tall roof spaces may be dark enough at apex to provide roost space

AR2 - Additional bat P/A surveys (e.g., emergence counts) conducted if warranted (i.e., when AR1 indicates that bats may be present).

SSPC2 - Operations involving chemical/fuel storage or resupply and vehicle servicing will be handled outside of riparian zones (streamside management zones) in a manner to prevent these items from reaching a watercourse. Earthen berms or other effective means are installed to protect stream channel from direct surface runoff. Servicing will be done with care to avoid leakage, spillage, and subsequent stream, wetland, or ground water contamination. Oil waste, filters, other litter will be collected and disposed of properly. Equipment servicing and chemical/fuel storage will be limited to locations greater than 300-ft from sinkholes, fissures, or areas draining into known sinkholes, fissures, or other karst features.

	SSPC3 (**Power Plants only**) - Power Plant actions and activities will continue to implement standard environmental practices. These include: o Best Management Practices (BMPs) in accordance with regulations: • Ensure proper disposal of waste, ex: used rags, used oil, empty containers, general trash, dependent on plant policy • Maintain every site with well-equipped spill response kits, included in some heavy equipment • Conduct Quarterly Internal Environmental Field Assessments at each sight • Every project must have an approved work package that contains an environmental checklist that is approved by sight Environmental Health & Safety consultant. • When refueling, vehicle is positioned as close to pump as possible to prevent drips, and overfilling of tank. Hose and nozzle are held in a vertical position to prevent spillage o Construction Site Protection Methods • Sediment basin for runoff - used to trap sediments and temporarily detain runoff on larger construction sites • Storm drain protection device • Check dam to help slow down silt flow • Silt fencing to reduce sediment movement o Storm Water Pollution Prevention (SWPP) Pollution Control Strategies • Minimize storm water contact with disturbed soils at construction site • Protect disturbed soil areas from erosion • Minimize sediment in storm water before discharge • Prevent storm water contact with other pollutants • Construction sites also may be required to have a storm water permit, depending on size of land disturbance (>1ac) o Every site has a Spill Prevention and Control Countermeasures (SPCC) Plan and requires training. Several hundred pieces of equipment often managed at the same time on power generation properties. Goal is to • Minimize fuel and chemical use Ensure proper disposal of waste, ex: used rags, used oil, empty containers, general trash, dependent on plant policy • Maintain every site with well-equipped spill response kits, included in some heavy equipment • Conduct Quarterly Internal Environmental Field Assessments at each sight • Every project must have an approved work package that contains an environmental checklist that is approved by sight Environmental Health & Safety consultant. • When refueling, vehicle is positioned as close to pump as possible to prevent drips, and overfilling of tank. Hose and nozzle are held in a vertical position to prevent spillage o Construction Site Protection Methods • Sediment basin for runoff - used to trap sediments and temporarily detain runoff on larger construction sites • Storm drain protection device • Check dam to help slow down silt flow • Silt fencing to reduce sediment movement o Storm Water Pollution Prevention (SWPP) Pollution Control Strategies • Minimize storm water contact with disturbed soils at construction site • Protect disturbed soil areas from erosion • Minimize sediment in storm water before discharge • Prevent storm water contact with other pollutants • Construction sites also may be required to have a storm water permit, depending on size of land disturbance (>1ac) o Every site has a Spill Prevention and Control Countermeasures (SPCC) Plan and requires training. Several hundred pieces of equipment often managed at the same time on power generation properties. Goal is to minimize fuel and chemical use
	L1 - Direct temporary lighting away from suitable habitat during the active season.
	L2 - Evaluate the use of outdoor lighting during the active season and seek to minimize light pollution when installing new or replacing existing permanent lights by angling lights downward or via other light minimization measures (e.g., dimming, directed lighting, motion-sensitive lighting).

[1]Bats addressed in consultation (02/2018), which includes gray bat (listed in 1976), Indiana bat (listed in 1967), northern long-eared bat (listed in 2015), and Virginia big-eared bat (listed in 1979).

Hide All Unchecked Conservation Measures

- (•) HIDE
- ( ) UNHIDE

Hide Table 4 Columns 1 and 2 to Facilitate Clean Copy and Paste

- (•) HIDE
- ( ) UNHIDE

NOTES (additional info from field review, explanation of no impact or removal of conservation measures).

STEP 14) Save completed form (Click File/Save As, name form as "ProjectLead_BatForm_CEC-or-ProjectIDNo_Date") in project environmental documentation (e.g. CEC, Appendix to EA) AND send a copy of form to batstrategy@tva.gov
Submission of this form indicates that Project Lead/Applicant:

Brittany Kunkle (name) is (or will be made) aware of the requirements below.

- Implementation of conservation measures identified in Table 4 is required to comply with TVA's Endangered Species Act programmatic bat consultation.
- TVA may conduct post-project monitoring to determine if conservation measures were effective in minimizing or avoiding impacts to federally listed bats.

For Use by Terrestrial Zoologist Only

☒ Terrestrial Zoologist acknowledges that Project Lead/Contact (name) Brittany Kunkle has been informed of any relevant conservation measures and/or provided a copy of this form.

☒ For projects that require use of Take and/or contribution to TVA's Bat Conservation Fund, Terrestrial Zoologist acknowledges that Project Lead/Contact has been informed that project will result in use of Incidental Take 1.6 ◉ ac ○ trees and that use of Take will require $ 800 contribution to TVA's Conservation Fund upon completion of activity (amount entered should be $0 if cleared in winter).

For Terrestrial Zoology Use Only. Finalize and Print to Noneditable PDF.

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Appendix B – Coordination

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Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

February 2, 2015

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), PROPOSED HEAT RECOVERY STEAM GENERATOR (HRSG), JOHNSONVILLE FOSSIL PLANT (JOF), HUMPHREYS COUNTY, TENNESSEE

TVA proposes to construct a heat recovery steam generator (HRSG) at Johnsonville Fossil Plant (JOF). The HRSG would be used to provide steam to an external strategic customer ("the customer"). TVA has a contractual obligation to provide steam to the customer, and does so using steam produced by JOF coal-fired generating units. However, TVA plans to retire all ten coal-fired units at JOF by December 2017 in order to meet requirements of a Federal Facilities Compliance Agreement (which TVA entered into with the U.S. Environmental Protection Agency in April 2011), as well as the requirements of a judicial consent decree with four states and three non-governmental organizations. Constructing the HRSG would allow TVA to continue to provide steam to the customer after JOF coal-fired units are retired.

TVA would construct the HRSG within the JOF reservation at combustion-turbine (CT) Unit 20 ("the undertaking"). Permanent modifications would be limited to a 7.4-acre area at the north end of the Johnsonville CT facility (see "Permanent Use Area" on Figure 1, below). Although TVA has not yet issued detailed designs for the HRSG, the profile would be somewhat lower than the existing CT Unit 20 exhaust stack. Two temporary use areas (covering areas of 6.4 and 4.8 acres) would be set aside for use as laydown or staging areas during construction. In addition, TVA is considering three alternatives for supplying water to the HRSG. One option would be to install a water supply line from an existing raw water intake directly west of CT Unit 20, on the Tennessee River shoreline. A second option would be to install a 708-foot water supply line underground from the existing water treatment building north to the Permanent Use Area, routing the line along the west side of the CT units. The third option is substantially similar to this latter option, but would be routed along the east side of the CT units. These options are shown on the enclosed map.

TVA is simultaneously considering a second alternative, the "No Action" alternative. Under this alternative, TVA would not provide steam to the customer. Instead, the customer would provide

their own steam by constructing and operating a HRSG. Since TVA would not be involved in the funding, permitting, licensing, or approval of this action, and would not provide financial assistance to the customer, this alternative would not be a TVA undertaking. However, although TVA does not know the location or size of the areas that would be affected by the customer's actions, impacts from the No Action alternative are expected to be limited to previously developed and disturbed lands on the customer's property.

TVA has determined that the undertaking's area of potential effects (APE), for archaeological resources, consist of the 7.4-acre Permanent Use Area and the three water supply line options under consideration. The APE for above-ground (architectural) resources consists of a one-half mile radius surrounding the Permanent Use Area, which is the only location where permanent structures would be constructed as part of the undertaking.

TVA finds that the undertaking would not affect archaeological resources included or eligible for inclusion in the National Register of Historic Places (NRHP). TVA has records of four previous archaeological surveys that included areas in proximity to the Permanent Use Area (Cable 1999, Ezell 2000, Kerr 1996, and McKee 2001). None of the studies resulted in the identification of archaeological sites within the project footprint or its immediate vicinity. During construction of JOF in the 1950s, and maintenance activities and additional construction since that time, significant ground disturbance has taken place within the archaeological APE. Figure 2 shows a comparison of the archaeological APE (labelled "project study area") as depicted on the TVA Land Acquisition Map, based on a 1937 land survey for TVA's Kentucky Reservoir Project, with modern aerial imagery. Prior to construction of JOF, the project area consisted of rolling terrain bisected by a small creek, with a one-story frame house, a barn, scattered outbuildings, a cemetery, and an orchard. Currently, the study area consists of nearly level ground, much of which is paved or covered in gravel. Given the degree of ground disturbance from modern development, TVA finds that the archaeological APE has virtually no potential for the presence of significant, intact archaeological sites.

The undertaking could result in visual effects to any historic architectural resources that may be present within the APE, from the introduction of a new visual element. TVA contracted with Tennessee Valley Archaeological Research (TVAR) to perform a Phase I architectural survey of the APE. Enclosed are two copies of the draft report titled, *Phase I Architectural Survey for the Proposed Construction of a Heat Recovery Steam Generator at TVA's Johnsonville Fossil Plant, Humphreys County, Tennessee*, along with two CDs containing digital copies of the report.

Background research indicated that there are no previously recorded historic architectural resources within the one-mile architectural APE. TVAR completed an architectural assessment of JOF and recommends that it is ineligible for listing in the NRHP due to a lack of architectural distinction and to loss of integrity resulting from extensive modern alterations. TVA agrees with this recommendation and finds that the undertaking would affect no historic properties included or eligible for inclusion in the NRHP.

Pursuant to 36 CFR Sections 800.4(d)(1) and 800.5(b), we are seeking your concurrence with TVA's findings and determinations,

Pursuant to §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 to the tribes.

Should you have any questions or comments, please contact Richard Yarnell in Knoxville at wryarnell@tva.gov or (865) 632-3463.

Sincerely,

Clinton E. Jones, Manager
Biological and Cultural Compliance
Safety, River Management and Environment
WT 11B-K

SCC:CSD
Enclosure
cc (Enclosure):
Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

REFERENCES CITED

Cable, John S.
1999 *Phase I Intensive Cultural Resource Survey of the New Johnsonville Natural Gas Pipeline Route Alternatives, Humphreys and Hickman Counties, Tennessee. Final Report.* Prepared for Tennessee Valley Authority, Norris, TN. Prepared by Palmetto Research Institute, Irmo, South Carolina.

Ezell, Raymond
2000 *Phase I Archaeological Survey of Two Alternate Ash Disposal Sites Near the TVA Johnsonville Fossil Plant, Humphreys County, Tennessee. Draft Report.* Submitted to Tennessee Valley Authority, Norris, TN. Submitted by TRC Garrow Associates, Inc., Nashville, TN.

Kerr, Jonathan P.
1996 *Archeological survey of Kentucky Lake, Western Tennessee and Kentucky. Volume One*. Prepared for Dr. J. Bennett Graham, Tennessee Valley Authority, Cultural Resources Division, Norris, TN. Prepared by Cultural Resources Analysts, Inc., Lexington, KY.

McKee, Larry
2001 *Phase I Archaeological Survey of a Proposed Generator Plant on the TVA Johnsonville Steam Plant Reservation, Humphreys County, Tennessee. Draft Report.* Submitted to Tennessee Valley Authority, Norris, TN. Submitted by TRC Garrow Associates, Inc., Nashville, TN.

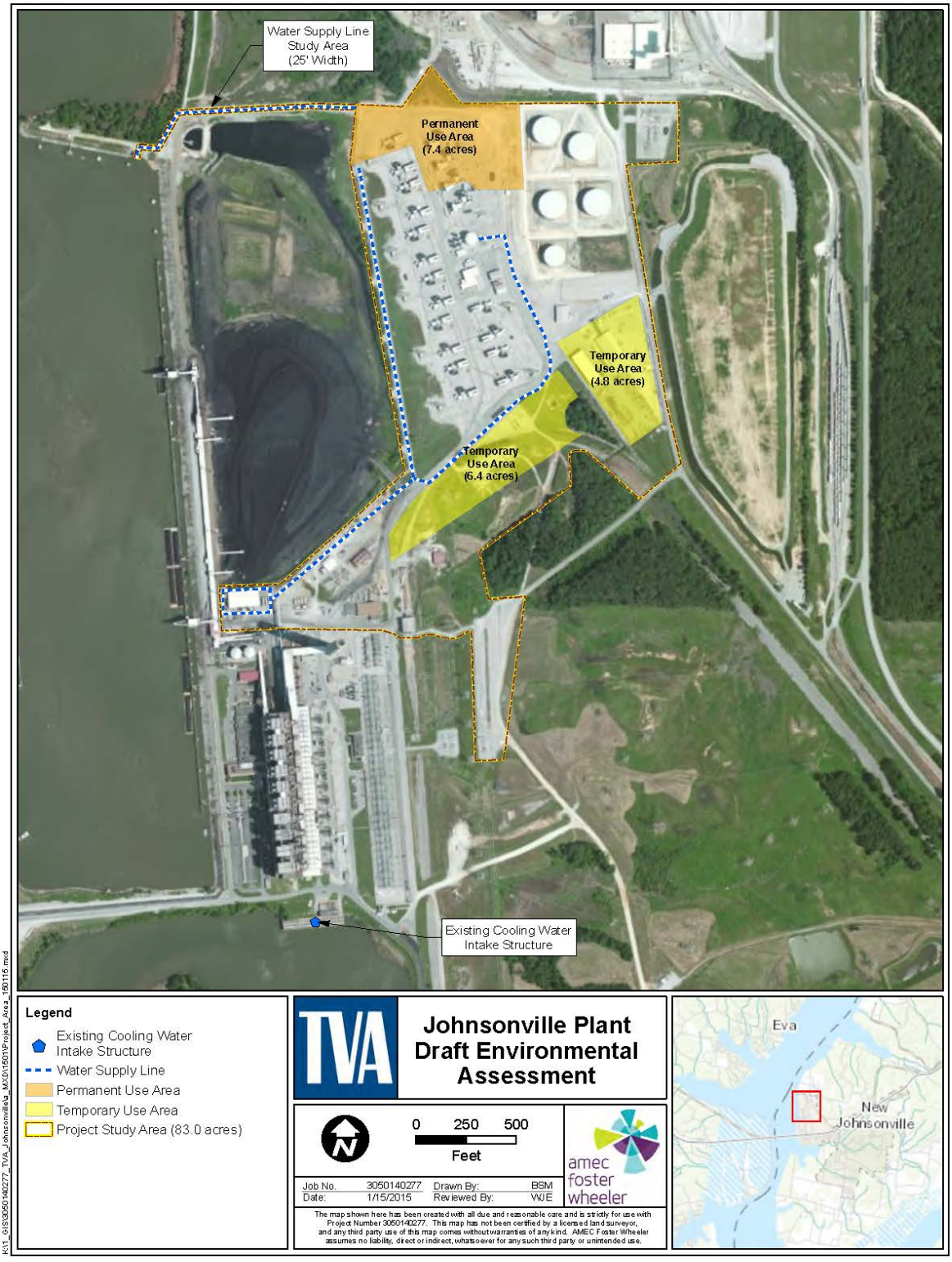

Figure 1. Map of areas affected by the undertaking.

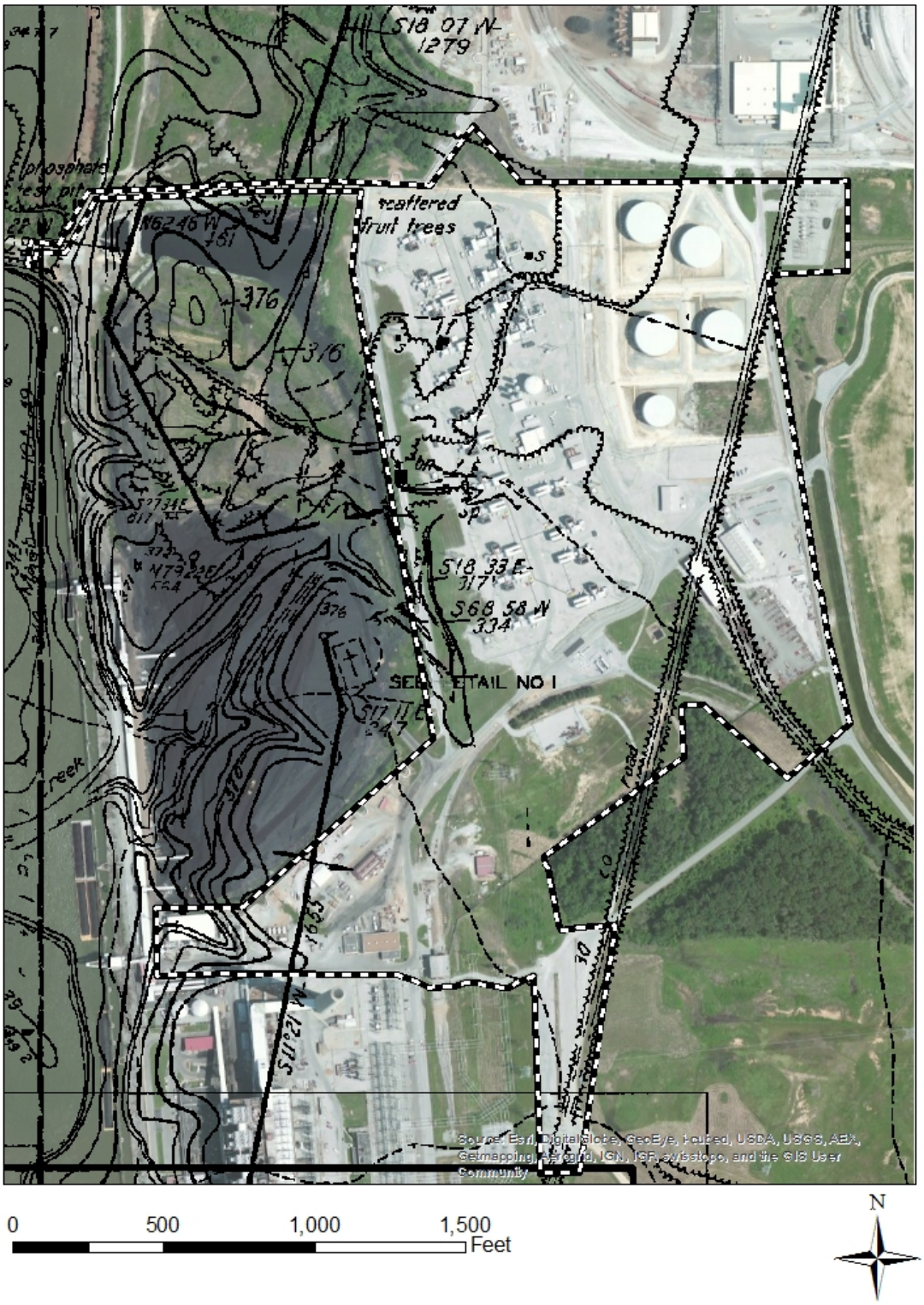

Figure 2. Project study area (dashed line) with the TVA Land Acquisition Map for Kentucky Reservoir (1937) superimposed on modern aerial imagery.

PHASE I ARCHITECTURAL ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF A HEAT RECOVERY STEAM GENERATOR AT TVA'S JOHNSONVILLE FOSSIL PLANT, HUMPHREYS COUNTY, TENNESSEE

Tennessee Valley Archaeological Research

INTERNAL COPIES, NOT INCLUDED WITH OUTBOUND LETTER:

Ashley Farless, BR 4A-C
Bo Baxter, WT11C-K
Skip Markham, BR 4A-C
Richard Yarnell, WT11D-K
EDMS, WT CA-K

TENNESSEE HISTORICAL COMMISSION
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February 23, 2015

Mr. Clinton Jones
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902

RE: TVA, CULTURAL RESOURCES ASSESSMENT, JOF/HEAT RECOVERY STEAM GENERATOR, JOHNSONVILLE, HUMPHREYS COUNTY, TN

Dear Mr. Jones:

At your request, our office has reviewed the above-referenced cultural resources survey report in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, we concur that the project area contains no historic properties eligible for listing in the National Register of Historic Places.

If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb

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February 2, 2017

Mr. Clinton E. Jones
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / TENNESSEE VALLEY AUTHORITY, Construction of a Heat Recovery Steam Generator at Johnsonville Fossil Plant, Johnsonville, HUMPHREYS COUNTY, TN

Dear Mr. Jones:

At your request, our office has reviewed the above-referenced architectural resources final report. This review is a requirement of Section 106 of the National Historic Preservation Act for compliance by the participating federal agency or applicant for federal assistance. Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Based on the information provided, we find that the final report meets the Tennessee State Historic Preservation Office Reporting Standards and/or the Tennessee SHPO Standards and Guidelines for Archaeological Resource Management Studies.

Your continued cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/dlc

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

January 25, 2018

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), JOHNSONVILLE FOSSIL PLANT DECONSTRUCTION, HUMPHREYS COUNTY, TENNESSEE

TVA retired Units 1 through 10 of Johnsonville Fossil Plant (JOF) on December 31, 2017 in accordance with a Federal Facilities Compliance Agreement (Docket No. CAA-04-20120-1760) that TVA signed in 2010 with the U.S. EPA, and in accordance with a judicial consent decree with four states and three non-governmental organizations. These agreements, collectively referred to as the "EPA Agreements", require TVA to reduce emissions from its coal-fired power plants, including JOF.

TVA proposes to deconstruct JOF with the goal of developing the site as a brownfield. Alternatives under consideration include (1) closing and securing the site without demolition; (2) selective demolition of most outlying structures including the coal handling facilities and a steam pipeline that was used in conveying steam to an adjacent industrial facility; and (3) demolition of the entire site except for structures that will remain in support of the continued operation of the combustion turbines. If TVA selects the latter option, all fossil plant-related structures including the powerhouse, coal handling facilities, roads and parking lots would be demolished to grade. The exhaust stack may be left in place, demolished, or disassembled in whole or part by hand. TVA has determined that the proposed deconstruction of JOF 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.

Figure 1, below, shows the area affected by the demolition project. All demolition activities would be confined to the area within the red polygon in Figure 1. TVA will continue to operate the Johnsonville Combustion Turbine Units (JCT), located within the JOF reservation. The JCT water treatment plant, diesel fire pump house, fuel oil unloading facility, 69-kilovolt (kV), 161-kV and 500-kV switchyards, and Booster Fan Building will remain in service indefinitely regardless of the plant deconstruction option carried out at JOF.

TVA determined the area of potential effects (APE) for archaeological resources to include all areas where physical actions associated with demolition would take place. Although no

physical actions related to the undertaking would take place outside the archaeological APE, facilities that are part of JOF but located outside the archaeological APE could be considered to be contributing elements to JOF, were JOF to be determined eligible for inclusion in the National Register of Historic Places (NRHP). Therefore, TVA considers the APE for aboveground properties to include JOF and all related facilities within the fossil plant reservation, exclusive of JCT.

TVA evaluated the undertaking's potential to affect archaeological resources through background research that included historic United States Geological Survey topographic maps, TVA's 1937 land acquisition map for Kentucky Reservoir, TVA's original plant grading plan from 1949, current satellite imagery (as shown in Figure 1), and previous archaeological investigations. Currently, the study area consists of level ground covered in asphalt, the powerhouse, the coal conveyor, the steam pipeline, a section of the coal yard, and an area containing utility buildings such as the yard equipment maintenance building. Prior to JOF construction in 1949-52, most of the APE consisted of terraces and stream banks associated with a small creek (Figure 2, below). Small farms were scattered around the area, although none were located in the APE. One historic cemetery is shown on the 1937 land acquisition map within the JOF reservation but outside of the archaeological APE. TVA's technical report on JOF (TVA 1958:207-208) states that the cemetery was "within an area which was to be excavated to a depth of more than 8 feet, making removal necessary." During construction of JOF the powerhouse foundation was excavated to a grade of 340 feet above mean sea level (amsl) (TVA 1958:228), which is 14-40 feet lower than the original ground surface. Excavation spoils were used as fill to create the south harbor dike and the coal yard.

One archaeological site (40HS277) was recorded previously within the APE. The site was recorded by the Tennessee Division of Archaeology in 1994 based on information provided by an artifact collector, who collected artifacts during JOF construction. Site 40HS277 was reported as measuring 100 meters by 100 meters, and yielded a Clovis point. The site was located where the JOF condenser intake and water treatment plant were later constructed (Figure 3, below; this location is also shown by Figure 19 in the enclosed report). Comparison of pre-1950 contour maps with the JOF grading plan and current setting indicates the site was destroyed by the construction of the condenser water intake. According to the site form, the site could not be relocated during a 2006 revisit. Based on this information, TVA finds that site 40HS277 is no longer extant. During four previous archaeological surveys that included areas in proximity to the APE (Cable 1999, Ezell 2000, Kerr 1996, and McKee 2001) no archaeological sites were identified in the APE or its immediate vicinity.

In 2015, TVA consulted with your office regarding TVA's proposed heat recovery steam generator (HRSG) at JOF. The archaeological APE for that study, which was north of the powerhouse area, slightly overlapped the current APE. TVA and your office agreed that the construction, maintenance, and additions at JOF since the 1950s rendered the archaeological APE void of intact archaeological sites. Our background research for the current undertaking leads to the same conclusion. Therefore, TVA finds that the proposed retirement of JOF would affect no archaeological sites.

In TVA's previous consultation on the HRSG in 2015, we proposed that JOF is ineligible for inclusion in the NRHP due to a lack of architectural distinction and to the loss of integrity resulting from extensive modern alterations. Your office agreed (letter dated February 23, 2015). Based on this previous consultation TVA finds that JOF is ineligible for inclusion in the NRHP.

TVA finds that the proposed deconstruction of JOF would have no effect on historic properties. Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your concurrence with TVA's finding of "no historic properties affected".

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Should you have any questions or comments, please contact Ted Wells by email, ewwells@tva.gov or by phone, (865) 632-2259.

Sincerely,

Clinton E. Jones
Manager
Cultural Compliance

SCC:ABM
Enclosures
cc (Enclosures):
Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

References Cited

Cable, John S.
1999 *Phase I Intensive Cultural Resource Survey of the New Johnsonville Natural Gas Pipeline Route Alternatives, Humphreys and Hickman Counties, Tennessee. Final Report.* Prepared for Tennessee Valley Authority, Norris, TN. Prepared by Palmetto Research Institute, Irmo, South Carolina.

Ezell, Raymond
2000 *Phase I Archaeological Survey of Two Alternate Ash Disposal Sites Near the TVA Johnsonville Fossil Plant, Humphreys County, Tennessee. Draft Report.* Submitted to Tennessee Valley Authority, Norris, TN. Submitted by TRC Garrow Associates, Inc., Nashville, TN.

Kerr, Jonathan P.
1996 *Archeological Survey of Kentucky Lake, Western Tennessee and Kentucky. Volume One*. Prepared for Dr. J. Bennett Graham, Tennessee Valley Authority, Cultural Resources Division, Norris, TN. Prepared by Cultural Resources Analysts, Inc., Lexington, KY.

McKee, Larry
2001 *Phase I Archaeological Survey of a Proposed Generator Plant on the TVA Johnsonville Steam Plant Reservation, Humphreys County, Tennessee. Draft Report.* Submitted to Tennessee Valley Authority, Norris, TN. Submitted by TRC Garrow Associates, Inc., Nashville, TN.

Tennessee Valley Authority (TVA)
1958 *The Johnsonville Steam Plant: A Comprehensive Report on the Planning, Design, Construction, Costs, and First power Operations of the Initial Six-Unit Plan. Technical Report No. 31*. Tennessee Valley Authority, Knoxville, TN.

INTERNAL COPIES ONLY, NOT TO BE INCLUDED WITH OUTGOING LETTER:

Sheliah D. Baker, LP 5P-C
A. Michelle Cagley, KFP 1T-KST
Stephen C. Cole, WT 11D-K
Carol Freeman,
Susan R. Jacks, WT 11C-K
Stacey S. McCluskey, OSA 1D-M
Rebecca J. Seaton, JOF A-NJT
M. Susan Smelley, BR 4A-C
Edward W. Wells, WT 11D-K

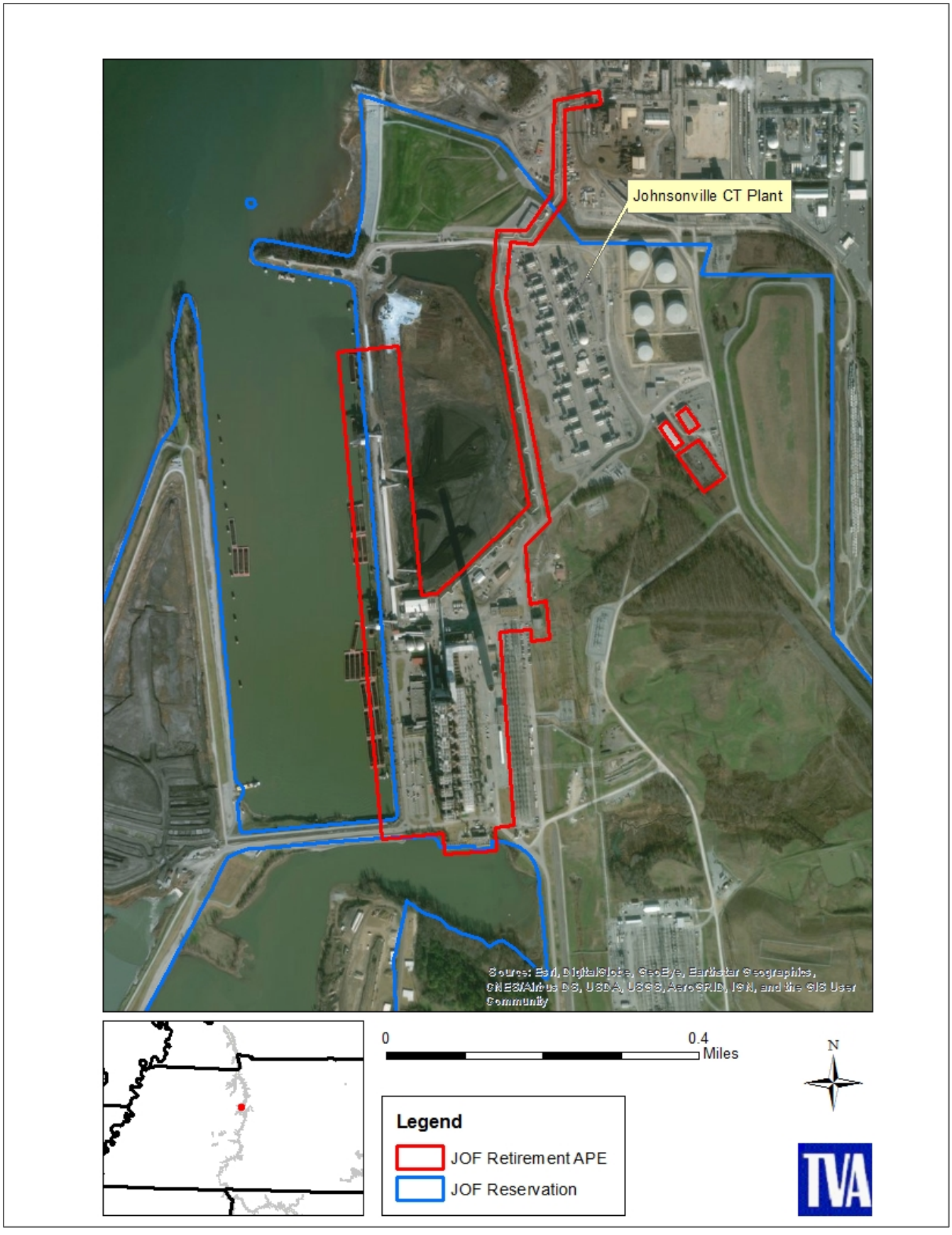

Figure 1. JOF Reservation (TVA fee-owned) and JOF Deconstruction APE.

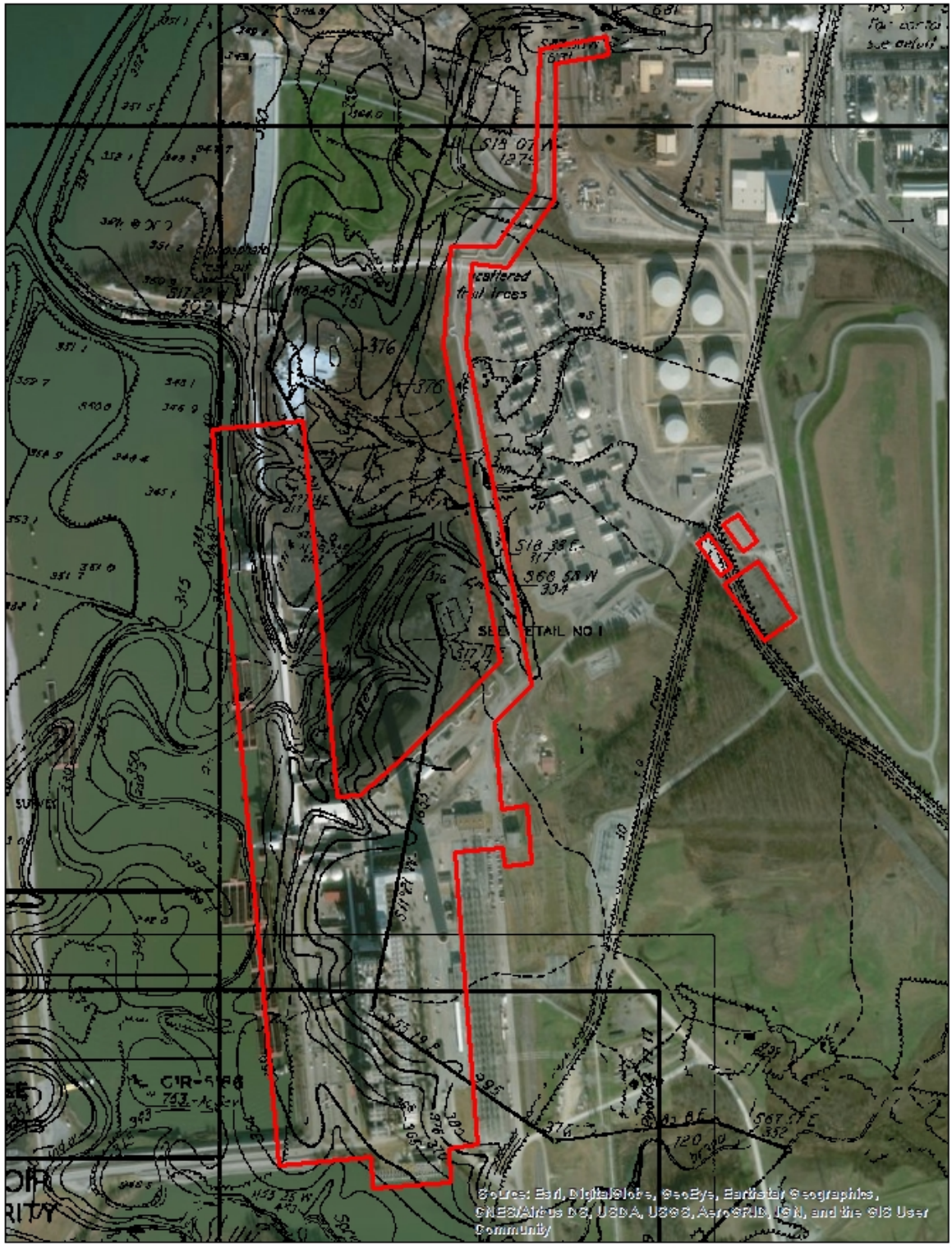

Figure 2. TVA's 1937 land acquisition map for Kentucky Reservoir, overlaid on the archaeological APE.

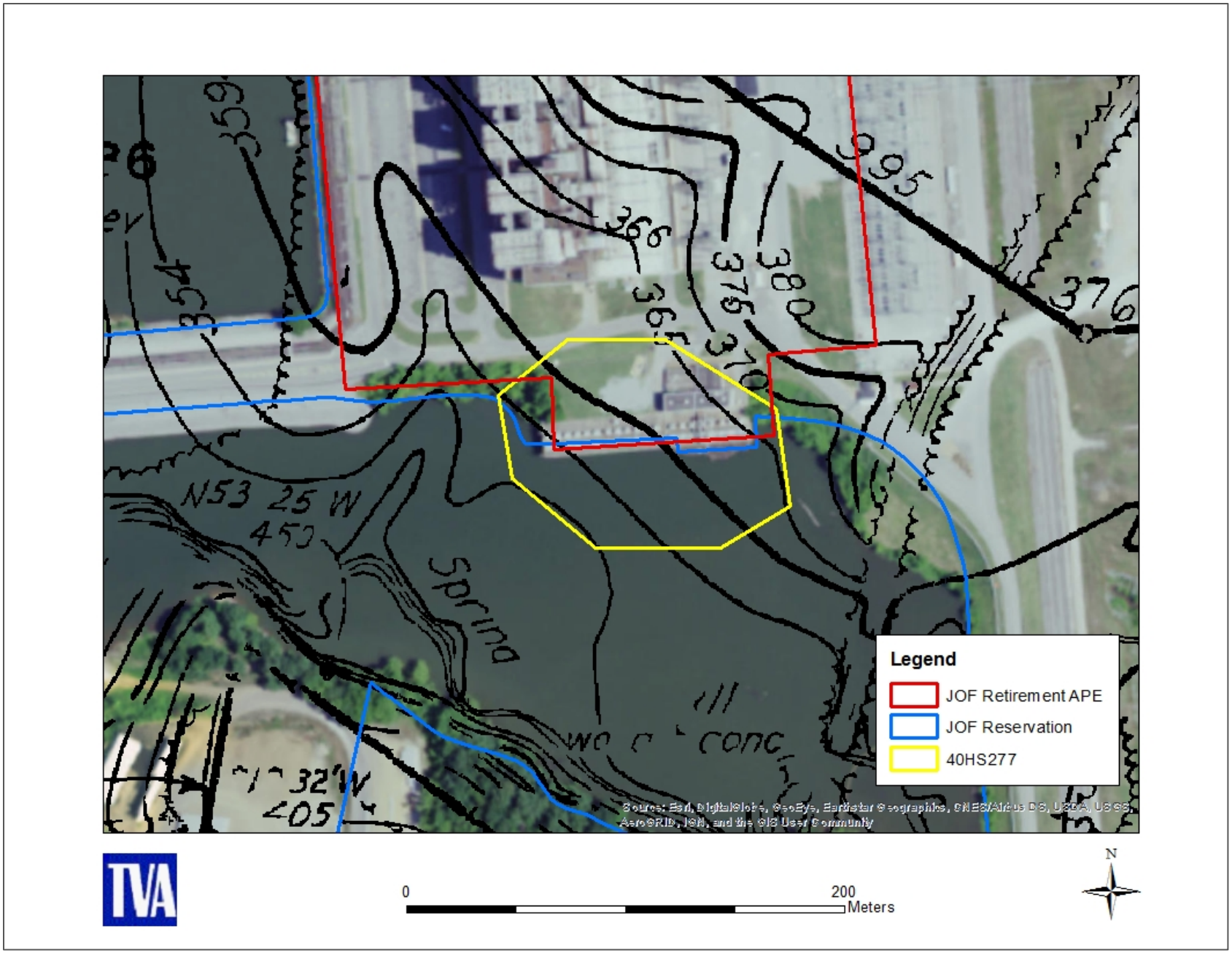

Figure 3. Recorded location of 40HS277, currently occupied by the JOF condenser water intake and water treatment plant. Overlay shows TVA's 1937 land acquisition map, with original contours. Normal summer pool elevation of Kentucky Reservoir is 359 feet amsl.

TENNESSEE HISTORICAL COMMISSION
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February 14, 2018

Mr. Clinton E. Jones
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / Tennessee Valley Authority, Johnsonville Fossil Plant Deconstruction, , Humphreys County, TN

Dear Mr. Jones:

In response to your request, we have reviewed the cultural resources survey report and accompanying documentation submitted by you regarding the above-referenced undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicants for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Considering the information provided, we concur that no historic properties eligible for listing in the National Register of Historic Places will be affected by this undertaking. If project plans are changed or archaeological remains are discovered during project construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. Questions or comments may be directed to Casey Lee (615 253-3163).

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/cjl

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, TN 37902

March 21, 2018

Mr. E. Patrick McIntyre, Jr.
Executive Director
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Dear Mr. McIntyre:

TENNESSEE VALLEY AUTHORITY (TVA), JOHNSONVILLE FOSSIL PLANT, COAL YARD CLOSURE, COAL YARD RUNOFF POND CLOSURE, PROCESS WATER BASIN, AND BORROW PIT, HUMPHREYS COUNTY, TENNESSEE

TVA has ended power generation at the Johnsonville Fossil Plant (JOF) in Humphreys County, Tennessee. Earlier this year we consulted with your office regarding TVA's proposed deconstruction of the generating facility. Our offices agreed that deconstruction of JOF would result in no effects on historic properties. TVA proposes four additional actions at JOF related to the deconstruction of JOF:

- Closure of the JOF Coal Yard (CY)
- Closure of the JOF Coal Yard Runoff Pond (CYRP)
- Construction of a Process Water Basin (PWB)
- Development of a Borrow Site

Figure 1, below, shows the location of each of these proposed actions. The JOF CY is a graded area where TVA stockpiled coal prior to pulverizing it and feeding it into the plant's generating units. The JOF CYRP is a pond that was constructed to hold runoff from the CY. TVA proposes to close the CY one of three ways; capping the CY in its current footprint, consolidating the material in the CY footprint and capping it, or removing the CY material to an offsite landfill and covering the CY with soil and vegetation. TVA would also close the CYRP and construct a new storm water outfall to convey drainage from the site to Kentucky Lake. The PWB would be constructed to capture and treat storm water and process water flows from the Johnsonville gas plant site (also called the combustion turbine or "CT" site). TVA would construct the PWB within the footprint of the CY and/or the CYRP. TVA would obtain fill material for the CY, PWB, and CYRP projects from a new soil borrow site located south of the JOF generating facility.

The proposed actions would necessitate use of a construction laydown yard. Two existing laydowns areas located east of the plant switchyard would be utilized for this purpose. The actions also require the use of haul roads. Existing paved and gravel roads would be used as haul roads (the laydown yard and haul roads are shown in Figure 1). TVA does not consider

the continued use of an existing construction laydown, or the use of existing paved/gravel roads as haul roads, to have potential to result in effects on historic properties. TVA determined that the area of potential effects (APE) for archaeological sites includes the CY, the CYRP, and the proposed borrow site.

Part of the area affected by the JOF Deconstruction project extends into the CY, and was discussed in our January 25, 2018 letter to your office concerning that project. Figure 2, below, shows the CY and CYRP areas with modern satellite imagery. Figure 3 shows an overlay of TVA's 1937 land acquisition map for Kentucky Reservoir on satellite imagery of these areas. In evaluating the potential for intact Holocene deposits in the CY and CYRP areas, we examined TVA's 1937 land acquisition map for Kentucky Reservoir, TVA's original plant grading plan from 1949, current satellite imagery (as shown in Figure 1), and previous archaeological investigations. Prior to construction of JOF these areas consisted of two branches of a small creek and its terraces. As documented in TVA's technical report on JOF (TVA 1958:207-208) and by the 1949 grading plan, TVA construction crews excavated and graded soil to depths ranging from approximately 3 feet to nearly 20 feet throughout the CY and surrounding area during plant construction (JOF was constructed between 1949 and 1952). Based on these historical documents TVA finds that the CY and CYRP areas have no potential to contain intact archaeological sites due to these past land disturbing activities.

TVA proposes to borrow soil from an approximately 164-acre area south of the generating site (see Figure 1). The proposed soil borrow straddles an existing transmission line corridor. TVA performed a Phase I Archaeological survey of the portion of the proposed soil borrow that lies in the transmission line corridor in 2016, and consulted with your office on the findings. The survey identified no archaeological sites, and your office agreed (by letter dated March 20, 2017) with TVA's finding of "no historic properties affected".

In order to identify archaeological sites in the remaining portion of the proposed soil borrow, which encompasses approximately 100 acres, TVA retained Tennessee Valley Archaeological Research (TVAR) to perform a Phase I Archaeological survey. Enclosed are two copies of the draft report, titled, *A Phase I Archaeological Survey of a Proposed Borrow Pit in New Johnsonville, Humphreys County, Tennessee*.

The survey included the excavation of 470 shovel test pits in the APE. One isolated find, consisting of three flakes, was identified. The survey identified no archaeological sites. TVAR recommends that the isolated find is ineligible for inclusion in the National Register of Historic Places. The survey findings indicate that the majority of the APE has been affected by severe soil erosion.

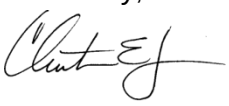
TVA has read the enclosed report and agrees with the authors' findings and recommendations. Based on this survey, TVA finds that the proposed undertaking would have no effect on historic properties.

Pursuant to 36 CFR Part 800.4(d)(1), we are seeking your concurrence with TVA's finding that no historic properties would be affected by the proposed undertaking.

Pursuant to 36 CFR Part 800.3(f)(2), TVA is consulting with federally recognized Indian tribes regarding historic properties within the proposed project's APE that may be of religious and cultural significance and are eligible for the NRHP.

Should you have any questions or comments, please contact Steve Cole in Knoxville by email, sccole0@tva.gov or by phone, (865) 632-2551.

Sincerely,



Clinton E. Jones
Manager
Cultural Compliance

SCC:ABM
Enclosures
cc (Enclosures):
Ms. Jennifer Barnett
Tennessee Division of Archaeology
1216 Foster Avenue, Cole Bldg. #3
Nashville, Tennessee 37210

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Carol Freeman, BR 4A-C
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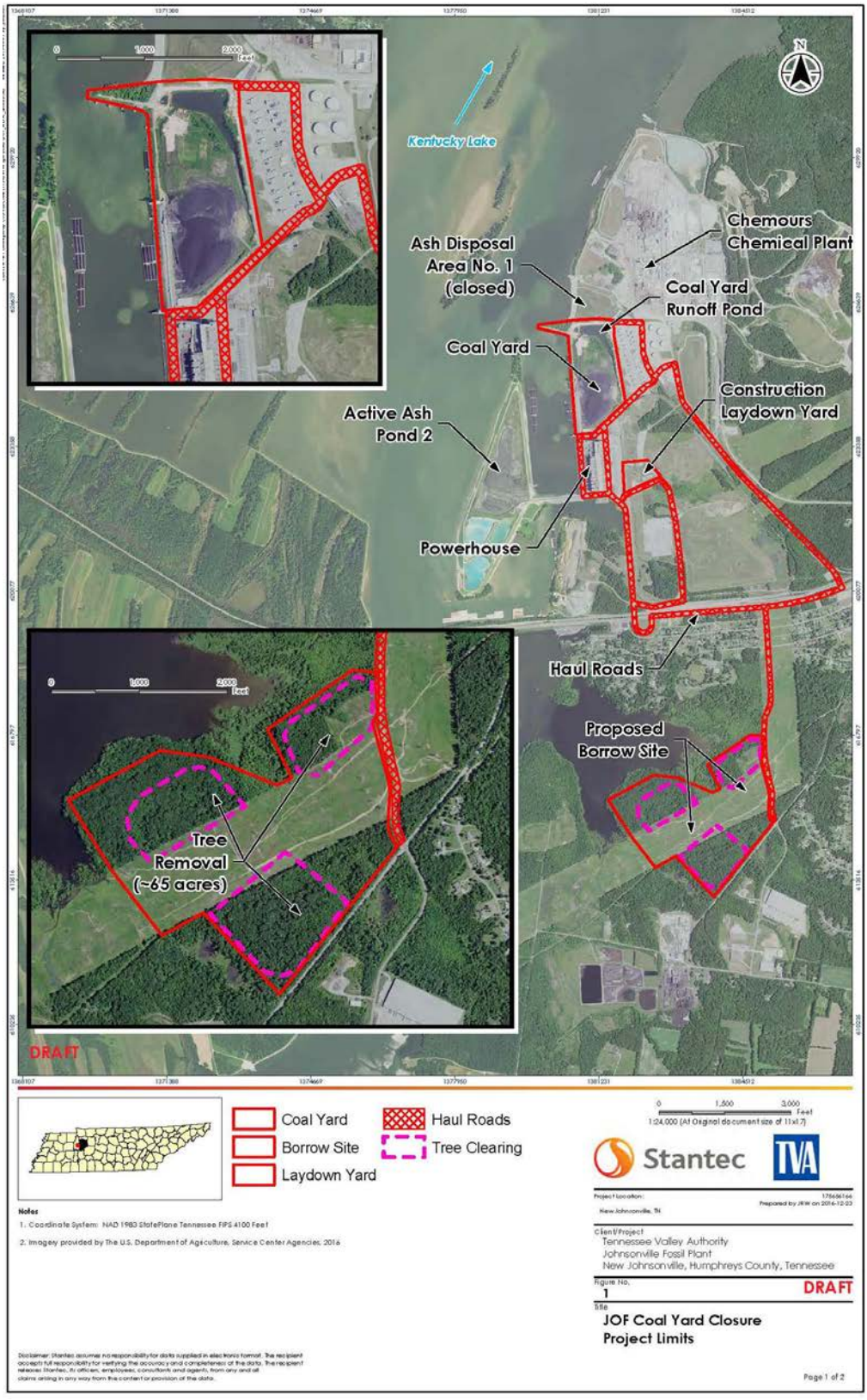

Figure 1. Locations of the proposed actions.

Figure 2. Location of the CY, CYRP, and haul roads in relation to the JOF Deconstruction APE.

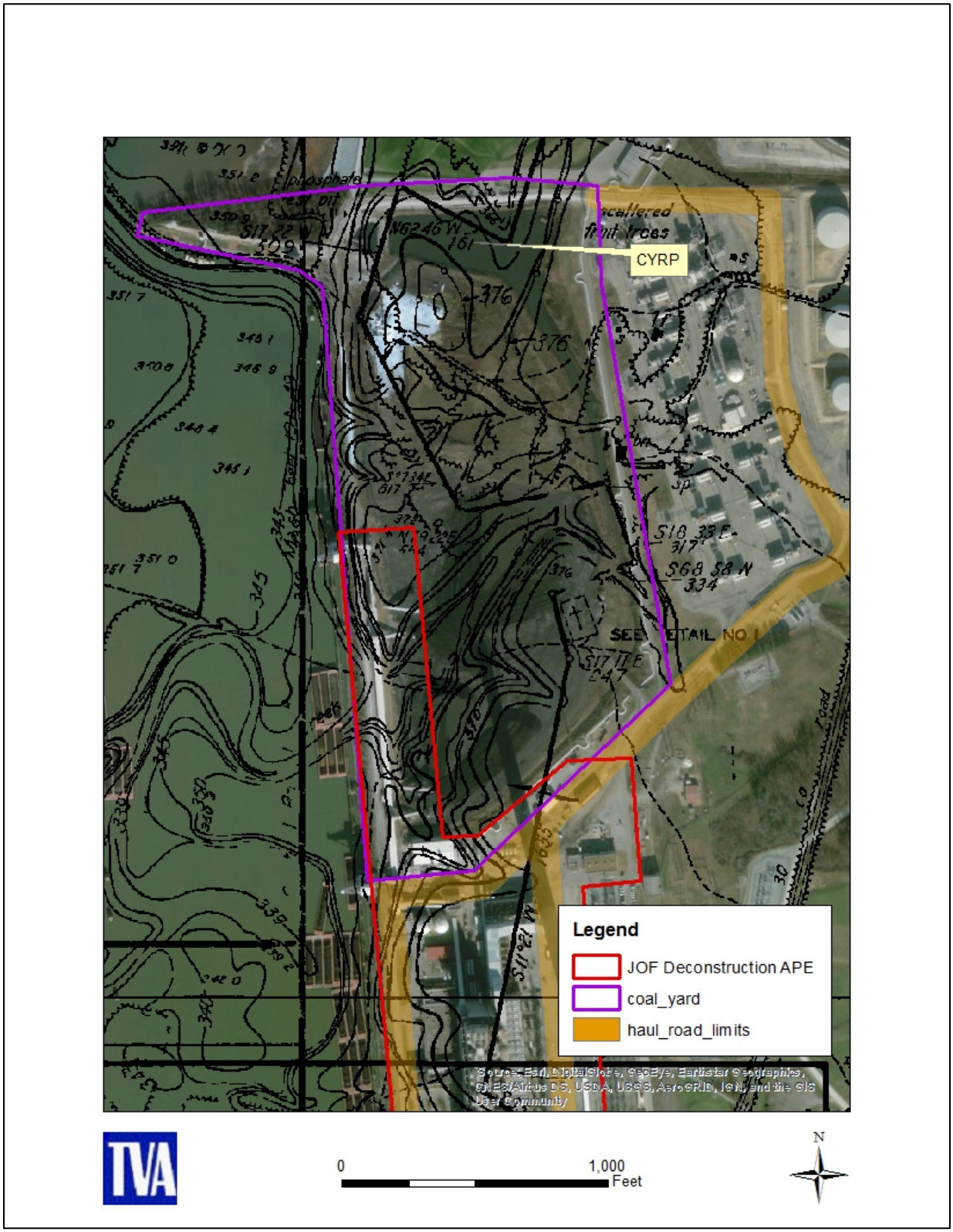

Figure 3. Project area with overlay of the 1937 land acquisition map.

A Phase I Archaeological Survey of a Proposed Borrow Pit in New Johnsonville, Humphreys County, Tennessee

Tennessee Valley Archaeological Research

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April 5, 2018

Mr. Clinton E. Jones
Tennessee Valley Authority
Biological and Cultural Compliance
400 West Summit Hill Drive
Knoxville, TN 37902

RE: TVA / Tennessee Valley Authority, Johnsonville Fossil Plant Coal Yard Closure, Coal Yard Runoff Pond Clouser, Process Water Basin, and Borrow Pit, New Johnsonville, Humphreys County, TN

Dear Mr. Jones:

In response to your request, we have reviewed the archaeological resources survey report and accompanying documentation submitted by you regarding the above-referenced undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicants for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739).

Considering the information provided, we concur that no historic properties eligible for listing in the National Register of Historic Places will be affected by this undertaking. If project plans are changed or archaeological remains are discovered during project construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. Questions or comments may be directed to Jennifer Barnett (615) 687-4780.

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb