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KINGSTON FOSSIL PLANT RETIREMENT

FINAL ENVIRONMENTAL IMPACT STATEMENT

TENNESSEE VALLEY AUTHORITY
KNOXVILLE, TENNESSEE

February 2024

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COVER SHEET

Kingston Fossil Plant Retirement

Proposed action:	The Tennessee Valley Authority proposes to retire and demolish the nine coal-fired units at the Kingston Fossil Plant in Kingston, Roane County, Tennessee, and to construct and operate replacement generation. The replacement generation alternatives assessed in this document would be (1) a single gas-fired combined cycle gas plant paired with 16 dual-fuel Aeroderivative combustion turbines, a 3- to 4-MW solar site, and a 100-MW battery energy storage system on the Kingston Reservation; and (2) multiple solar generating facilities and battery energy storage systems within portions of Eastern Tennessee.
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Cooperating agencies:	**U.S. Department of Interior, National Park Service** **U.S. Environmental Protection Agency**
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To request information, contact:	Chevy Williams Tennessee Valley Authority 1101 Market Street BR2C-C Chattanooga, TN 37402 Phone: 423-751-7316 E-Mail: cwilliams1@tva.gov

Abstract: Tennessee Valley Authority (TVA) prepared this environmental impact statement (EIS) to evaluate the environmental and social effects of the proposed retirement and demolition of the nine existing coal-fired units at the Kingston Fossil Plant (KIF) in Kingston, Roane County, Tennessee (TN), and the proposed construction and operation of at least 1,500 megawatts (MW) of replacement generation for commercial operation by the end of 2027. This EIS tiers from TVA's 2019 Integrated Resource Plan (IRP) EIS and aligns with the 2019 IRP findings and target power supply mix. To inform long term planning, TVA conducted the Aging Coal Fleet Evaluation, which concluded that the age and deteriorating conditions of TVA's coal facilities and equipment are increasing the frequency of performance challenges making it more difficult to adapt the existing fleet's generation output to meet changes in TVA's energy demand profile.

TVA is building the energy system of the future, and over the last ten years has invested $25 billion in existing and new generation. In implementing the target power supply mix identified in TVA's 2019 IRP, TVA's Strategic Intent and Guiding Principles, and the recent executive orders and federal administration's focus on decarbonization, TVA is transitioning much of its fleet to

cleaner, more flexible, and reliable technologies capable of enabling ongoing and future growth around the TVA service area.

TVA has reduced carbon emissions by approximately 60 percent against the 2005 benchmark and is continuing to pursue opportunities to incorporate clean energy generation to achieve the carbon reductions identified in TVA's Strategic intent and Guiding Principles document. TVA is also working to offset approximately 30 percent of forecasted new load growth in the next ten years by investing $1.5 billion in fiscal years 2023-2027 in energy efficiency and demand response programs. TVA is focused on achieving a net zero carbon future and meeting growing electricity demand while maintaining energy security and reliability and continuing to comply with its statutory mandate to provide the lowest electric rates feasible.

In addition to the projects and activities mentioned above, TVA is also evaluating replacement generation alternatives for the proposed retirement of the KIF coal-fired units. Under the No Action Alternative, TVA would not retire the KIF units and additional repairs, maintenance, and upgrades would be necessary to continue operation of the units, maintain generation reliability, and meet requirements under new and anticipated environmental regulations. Existing site and environmental conditions on or near Kingston Reservation would be maintained. TVA would implement specific actions at KIF related to wastewater treatment and the management and disposal of CCR under all alternatives. TVA is also evaluating two Action Alternatives to provide at least 1,500 MW of generation to replace the capacity to be lost (plus additional capacity to support anticipated growth in regional energy demand) from the proposed retirement of the nine KIF coal-fired units. The Action Alternatives include: Alternative A, which consists of construction and operation of a single CC combustion turbine gas plant paired with 16 dual-fuel Aeroderivative (Aero) CT units (CC/Aero CT Plant), a 3- to 4-MW solar site, and a 100-MW battery energy storage system on the Kingston Reservation; and Alternative B, which consists of construction and operation of multiple solar generation and energy storage facilities at alternate locations, portions of which would be in Eastern TN. The CC under Alternative A would be capable of burning 5 percent hydrogen at commissioning. Additionally, the CC units would be capable of burning at least 30 percent hydrogen by volume with modification to the balance of the plant once a reliable source was identified. This EIS also evaluates related actions[1] associated with gas supply and transmission components for each alternative.

TVA's Preferred Alternative is Alternative A because a CC gas plant paired with dual-fueled Aero CTs is the best overall solution to provide low-cost, reliable energy to TVA's power system, and could be built and made operational sooner than Alternative B, reducing economic, reliability, and environmental risks. TVA has also selected Alternative A as its Preferred Alternative because the proposed CC/Aero CT Plant would facilitate the flexibility needed to bring 10,000 MW[2] of solar onto the system by 2035 and enables the KIF coal-fired units to be retired by the projected end-of-life estimates for those units. The Preferred Alternative would eliminate the production of wastes like coal combustion residuals (CCRs) or the need for CCR disposal on Kingston Reservation, would eliminate the need for cooling water withdrawals from nearby surface waters, and would reduce emissions of criteria air pollutants and other GHG's, resulting in beneficial effects that include reduced fish entrainment and impingement mortality, a reduction in potentially adverse effects from ongoing CCR production and disposal on Kingston Reservation, improved reliability and service costs, and a beneficial reduction in the social costs of GHG air emissions.

[1] *See* 40 C.F.R. §1501.9(e)(1).

[2] Solar and battery storage proposed under Alternatives A and B would be new solar in addition to the 10,000 MW of solar that TVA plans to bring onto the system by 2035. Multiple projects would be required to achieve the 10,000 MW target and those projects are currently in various stages of development.

SUMMARY

Introduction

The Tennessee Valley Authority (TVA) proposes to retire and demolish the nine coal-fired units at the Kingston Fossil Plant (KIF) in Kingston, Roane County, Tennessee (TN), and to construct and operate replacement generation. The replacement generation alternatives assessed in this EIS include: (A) a single gas-fired combined cycle (CC) gas plant paired with 16 dual-fuel Aeroderivative combustion turbines (CT), a 3- to 4-MW solar site, and a 100-MW battery energy storage system on the Kingston Reservation; and (B) multiple solar generating facilities and battery energy storage systems within portions of Eastern TN. An EIS was completed for the 2019 Integrated Resource Plan (IRP). This KIF EIS tiers from the 2019 IRP EIS (TVA 2019b) and aligns with the 2019 IRP (TVA 2019a) findings and target power supply mix. The proposed retirement and replacement of the KIF coal-fired units is consistent with the TVA's 2019 IRP recommendations on near-term actions that would provide benefits across multiple different scenarios under the target power supply mix (TVA 2019a). TVA also conducted end-of-life evaluations of its coal-fired plants to inform long-term planning for those without retirement dates (Appendix A). TVA's Aging Coal Fleet Evaluation (TVA 2021g) confirmed TVA's coal fleet is among the oldest in the nation and experiencing deterioration in condition of facilities and equipment. Increasing age increases the wear and deterioration in conditions of materials and facilities resulting in more frequent performance challenges and increasing difficulty of adapting the existing fleet's generation output to meet changes in TVA's energy demand profile.

The entire utility industry is undergoing a transition as it faces the need to lower carbon emissions, address aging infrastructure, and meet load growth driven by population increases and related development, and electrification. TVA is building the energy system of the future by transitioning much of its fleet to cleaner and more flexible technologies with greater reliability, which will enable ongoing and future growth around the TVA service area. The transition to cleaner and more flexible technologies will also allow TVA to reduce greenhouse gas (GHG) emissions and associated adverse effects on the environment (i.e., carbon reduction and benefits), while continuing to comply with its statutory mandate to provide the lowest electric rates feasible and, maintaining the high reliability that sustains the communities TVA serves. These factors are critical to achieving economy-wide decarbonization. The proposed retirement and replacement of coal generation at the KIF Plant is one piece of TVA's larger decarbonization effort. TVA is a leader in clean energy, operating one of the largest, most diverse, and cleanest energy systems in the nation, with more than half its energy supply in 2022 coming from clean energy sources.

The shift to a clean energy economy is a generational transition requiring the development, refinement, installation, and operation of technologies and generating sources capable of contributing to TVA's ability to meet system-wide generation demands. The role and contribution of these technologies and generating sources to system-wide generating capacity is likely to change over time or be replaced by newer technologies. Currently, natural gas is one example of a generating source that meets TVA's annual generation demands, but the role of natural gas in TVA's energy portfolio is expected to change over time given the rise of renewable energy sources. TVA is targeting 10,000 MW of solar in place by 2035 while continuing to expand its solar and carbon-free commitments through procurement methods such as requests for proposals and opportunities at existing TVA sites. TVA continues to work with long-term Local Power Company (LPC) customers as well to deploy additional solar through a flexibility option under TVA's long-term agreement with each individual LPC customer.

Background

KIF is located on the Kingston Reservation in Harriman, Roane County, TN, approximately 35 miles west of downtown Knoxville. The KIF Plant is situated on a 2,254-acre plot of land (i.e., Expanded Kingston Property), which includes additional property purchased by TVA after 2008 and the 1,255-acre original plant site (Kingston Reservation), which is situated on a peninsula formed by the confluence of the Clinch and Emory rivers. The KIF Plant was originally constructed between 1951 and 1955 and consists of nine, coal-fired steam-generating units, all of which are in operation. KIF has a summer net generating capacity of 1,298 MW; this capacity is less than the 1,398 MW reported for 2020 due to long-term fuel blend changes at KIF[3] (TVA 2023c). Frequent cycling of the large KIF units, reflected in start-up/shutdown events currently averaging greater than 85 times per year, is outside the intended design of the plant resulting in increased wear and tear, which presents reliability challenges that are difficult to anticipate and expensive to mitigate. KIF has also experienced a significant decline in material condition over the last five years, including the need for repairs to the lower boiler drum, which are symptomatic of age-driven material condition failures that are difficult to proactively address. As such, TVA has developed planning assumptions for the timing (i.e. proposed retirement of the KIF Plant by the end of 2027), sequencing of the retirement of TVA's coal fleet, and needed replacement generation for the proposed retirement of the existing KIF Plant. The Proposed Action to retire KIF and pursue alternative power generation sources would provide cost-effective replacement generation, consistent with the 2019 IRP and near-term TVA energy production goals.

Summary of the Proposed Action

TVA prepared this EIS to evaluate the environmental and social effects of the proposed retirement and demolition of the nine existing KIF coal-fired units and the addition of at least 1,500 MW of replacement generation for commercial operation by the end of 2027. KIF's location on the transmission system, specifically on the 161-kilovolt (kV) system near the Knoxville load center, makes KIF an integral part of the system power flows and stability. The retirement of KIF would create a large gap in the power system in the Knoxville area and would decrease the system stability for Watts Bar and Sequoyah nuclear plants. As such, system analyses indicate a need for at least 1,500 MW of firm, dispatchable replacement power (i.e., available generating capacity ready at any hour to meet increased energy demand any time it may be needed) to cover periods where other resources are unavailable and to help support TVA in maintaining reliability and system stability for Eastern TN.

In addition to the No Action Alternative, TVA is evaluating two Action Alternatives for replacement of the generating capacity proposed for retirement at KIF: Alternative A consists of the construction and operation of a CC combustion turbine gas plant paired with dual-fuel Aero CT units (CC/Aero CT Plant), a 3- to 4-MW solar site, and a 100-MW BESS

[3] Although the original nameplate capacity of KIF's nine units was 1,700 MW, effects of aging equipment and long-term fuel blend changes have reduced the actual annual generation capacity at KIF from 1,398 to 1,298 MW (TVA 2023c). As discussed in Section 1.2, TVA assumed at least 1,500 MW of firm, dispatchable generation capacity would be needed to recover generation capacity lost from the retirement of KIF and to account for growth in demand in the Tennessee Valley from growing populations and increased economic development.

at the existing KIF site on the Kingston Reservation. The CC under Alternative A would be capable of burning 5 percent hydrogen at commissioning. Additionally, the CC units would be capable of burning at least 30 percent hydrogen by volume with modification to the balance of the plant once a reliable source was identified. Alternative A also includes a related action by Eastern TN Natural Gas (ETNG) of constructing and operating a 122-mile natural gas pipeline, gas compressor station, and metering and regulator stations; and Alternative B consists of the construction and operation of multiple solar generation and energy storage facilities at alternate locations with a portion in East TN.

TVA's Proposed Action Alternatives align with TVA's 2019 IRP near-term actions to evaluate engineering end-of-life dates for aging generation units to inform long-term planning and to enhance system flexibility to integrate renewables and distributed resources (TVA 2019a). By retiring the existing KIF coal-fired units, TVA would be eliminating the production of coal combustion residuals (CCRs) on the Kingston Reservation and the need to dispose of CCRs, resulting in a long-term beneficial reduction in CCR-related adverse environmental impacts. The proposed retirement and replacement of coal generation at KIF is one piece of the larger effort by TVA to build the energy system of the future to enable a clean energy economy in the TN Valley and TVA's power service area (Figure ES-1).

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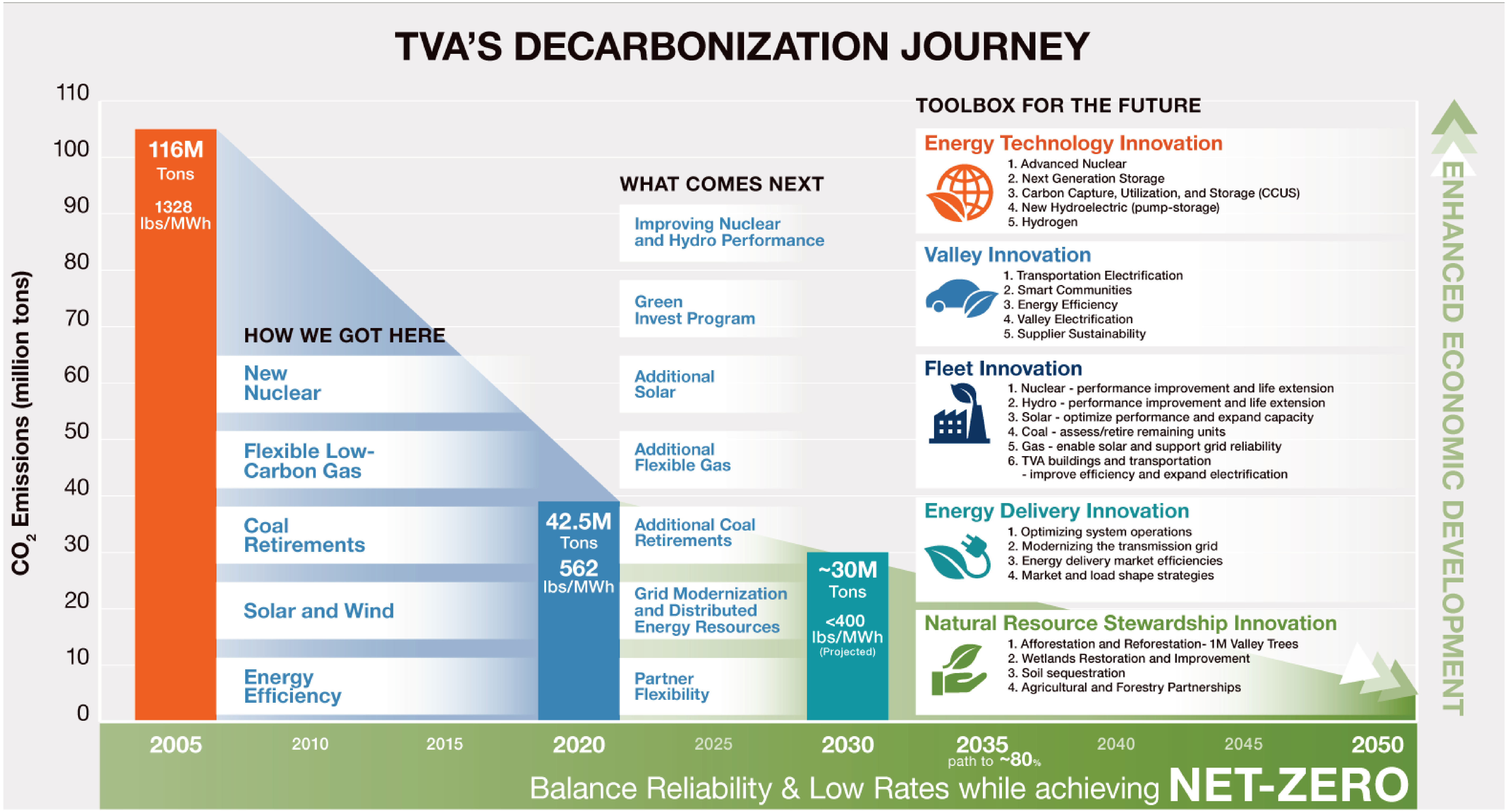

Figure ES-1. Balancing Affordability, Reliability, Resilience, and Cleaner Energy in TVA's Transition

Summary of the Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to retire and decommission the nine coal-fired units at KIF by the end of 2027, and to provide at least 1,500 MW of firm, dispatchable replacement generating capacity that can be constructed and operational prior to the retirement of the nine KIF coal-fired units. The proposed replacement generation accounts for the retired generation capacity at KIF plus additional capacity to account for load growth anticipated by the time the units would be retired. The proposed retirement and replacement of the KIF coal-fired units is consistent with TVA's 2019 IRP and future TVA energy production goals. The 2019 IRP's recommendations on near-term actions that would provide benefits across multiple scenarios under the target power supply mix (TVA 2019a) include:

- evaluation of engineering end-of-life dates for aging generation units to inform long-term planning;
- the addition of solar capacity based on economics;
- enhance system flexibility to incorporate more distributed resources and renewables in response to customer demand; and
- the development of distribution resource planning for integration into TVA's planning process.

The need for the Proposed Action is to ensure that TVA continues to meet the required year-round generation and maximum capacity system demands and planning reserve margin targets, particularly during peak load events; and to provide transmission system voltage support to the local area to maintain overall system stability, reliability, and resilience.

Summary of the Alternatives

Under the No Action Alternative, TVA would not retire the nine existing coal-fired units at the KIF Plant, and the units would continue to operate as part of TVA's generation portfolio. However, the frequent cycling of the large KIF units that would be required to continue operations at KIF is outside the intended design of the KIF Plant resulting in increased wear and tear and reliability challenges that are difficult to anticipate and expensive to mitigate. For the units to remain operational, additional repairs and maintenance would be necessary. TVA further assumes that KIF would not be operated for longer or more frequent durations as a result of potential upgrades, repairs, or maintenance activities, because currently proposed rules for air quality and greenhouse gas mitigation, if finalized as currently written, would limit the future generating capacity of KIF coal-fired units. The existing conditions at KIF and on Kingston Reservation would be maintained and the continued management of coal combustion residuals (CCRs) would be required. TVA would plan to construct and operate a new wet flue gas desulfurization (WFGD) wastewater treatment (WWT) facility and modify existing processes at KIF to achieve compliance with the general applicability category of the October 2020 Effluent Limitation Guidelines (ELGs). These KIF Plant modifications would be needed to enhance the wastewater quality to meet regulatory limits established by the U. S. Environmental Protection Agency's (USEPA's) ELGs and would improve the marketability of gypsum produced in the WFGD process. Based on the age, material condition, and cost required to ensure reliability of the KIF Plant, continuing to operate KIF for the long-term would not meet the purpose and need of TVA's Proposed Action, and would not assist TVA in the effort to increase system stability or flexibility or in decarbonization efforts.

Under Action Alternatives A and B, the nine units at KIF and associated components and structures would be retired and demolished, and both Action Alternatives would be capable of providing at least 1,500 MW of replacement generation, which accounts for replacement generation plus additional capacity for load growth forecasted through TVA's planning horizon.

Under Action Alternative A (Alternative A), TVA would construct and operate a single CC combustion turbine gas plant paired with 16 dual-fuel Aero CT units (CC/Aero CT Plant) with a 1,500 MW generation capacity, a 3- to 4-MW solar site, and a 100-MW battery energy storage system (BESS) at the existing KIF Plant on the Kingston Reservation. The CC under Alternative A would be capable of burning 5 percent hydrogen at commissioning. Additionally, the CC units would be capable of burning at least 30 percent hydrogen by volume with modification to the balance of the plant once a reliable source was identified. This EIS also evaluates related actions[4] associated with gas supply, including construction and operation by ETNG of a 122-mile natural gas pipeline, gas compressor station, and metering and regulator stations (the Ridgeline Expansion Project) associated with Alternative A. The related action, ETNG's Ridgeline Expansion Project, would not proceed under the No Action Alternative.

Under Action Alternative B (Alternative B), TVA would construct and operate multiple solar generation and energy storage facilities at alternate locations, portions of which would be in Eastern TN. This EIS also evaluates the related action associated with transmission system needs. The anticipated amount of construction of new or upgraded transmission facilities would vary amongst each solar and/or storage project depending on their location. All new generating and storage facilities would require connections to the transmission system, either directly or through an interconnection with an LPC. The length of connecting transmission lines and the need for new substations and switching stations would depend on the location and capacity of the facilities. Depending on the solar and BESS site locations, transmission line upgrades may be required to increase the capacity of the lines. A fiber-optic ground wire (OPGW), which has dual functions of grounding and communications, may need to be installed on transmission lines to facilitate the needed relay protection.

Preferred Alternative

TVA Proposed Action

TVA's Preferred Alternative for replacing generation from the retirement of KIF is Alternative A, which includes a CC gas plant paired with 16 dual-fueled Aero CTs, switchyard, a 3-4 MW solar facility, 100-MW BESS, and transmission upgrades proposed on the Kingston Reservation. Alternative A also includes upgrades to off-site transmission systems located in Cumberland, Roane, and Anderson counties, and a related action, ETNG's Ridgeline Expansion Project. Alternative A is TVA's preferred alternative as it would be the best overall solution to supply low-cost, reliable, and cleaner energy to TVA's power system consistent with the 2019 IRP. The CC under Alternative A would be capable of burning 5 percent hydrogen at commissioning. Additionally, the CC units would be capable of burning at least 30 percent hydrogen by volume with modification to the balance of the plant once a reliable source was identified. As such, the proposed CC/Aero CT Plant would enable the retirement of the KIF coal-fired units by the end of 2027 (their projected end-of-life date), provide replacement power that will ensure system reliability, provide the flexibility for

[4] *See* 40 C.F.R. §1501.9(e)(1).

hydrogen co-firing as reliable hydrogen delivery becomes available and allow TVA to reliably integrate increasing amounts of solar generation onto the system by 2035.

TVA's Preferred Alternative could be operational sooner than Alternative B, which would reduce economic, reliability, and environmental risks. The Preferred Alternative would replace coal-fired generation, consistent with the target supply mix adopted in the 2019 IRP and the Coal End-of-Life Evaluation for the aging coal fleet (TVA 2021g) and would meet the purpose and need of the Proposed Action to have firm, dispatchable replacement generation operational by the end of 2027 that will facilitate the integration of additional solar and battery resources elsewhere on TVA's system.

ETNG Proposed Action

The Preferred Alternative includes construction and operation by ETNG of a 122-mile natural gas pipeline, gas compressor station, and metering and regulator stations, along with the transmission components for each alternative. The proposed Ridgeline Expansion Project will provide natural gas to the CC/Aero CT Plant and is subject to Federal Energy Regulatory Commission (FERC or Commission) approval. FERC will prepare a separate EIS on the proposed Ridgeline Expansion Project and associated ETNG structures. Available information (as of December 2023, revised Resource Reports; ETNG 2023b-m) on the affected environment and environmental consequences of the construction and operation of the Ridgeline Expansion Project provided by ETNG has been independently reviewed and verified by TVA and is discussed in this EIS. TVA has concluded that the Ridgeline Expansion Project has been designed to minimize resource impacts, including emissions, and is not expected to result in significant adverse environmental impacts. This Final EIS (FEIS) has been updated based on subsequent filings by ETNG with FERC from October through December 2023 (ETNG 2023n-q).

As stated by ETNG in their July 18, 2023, Application filing with FERC (ETNG 2023a):

> [ETNG] designed the [Ridgeline] Project facilities to minimize impacts on landowners and the environment and to minimize emissions, to the extent practicable, in the execution and operation of the Project. A substantial majority of the Project's pipeline facilities will be co-located within [ETNG's] existing Line 3100-1 right-of-way, which the Commission encourages. [ETNG] has designed the Hartsville Compressor Station to include [electric motor driven compressors] and an adjacent 8 MW alternating current non-FERC jurisdictional solar array to further decrease emissions impacts. [ETNG] anticipates that emissions from the downstream combustion of natural gas by the replacement generation at the Kingston Plant site will reflect a net decrease of emissions for certain criteria pollutants and greenhouse gas emissions from the existing Kingston Plant, which was originally built as a coal-fired generation facility in 1954-55. As demonstrated in the [Final Resource Reports (ETNG 2023b-m)] accompanying th[e] Application, the construction and operation of the Project facilities are not expected to result in any significant environmental impacts.

Summary of the Preferred Alternative

The following summary of affected resources focuses on Alternative A. Resource effects summaries provided below are presented separately for proposed TVA Actions and proposed ETNG actions associated with the Ridgeline Expansion Project (i.e., a natural gas pipeline, compressor station, and other aboveground structures). A summary comparison of the No Action Alternative, Alternative A, and Alternative B is provided in Section 2.2, and detailed information about the affected environment and environmental consequences associated with the three alternatives for each resource area is contained within Chapter 3. The information presented here is based on ETNG's FERC 7C application filed on July 18, 2023, and subsequent filings in October 2023 and December 2023 (ETNG 2023a-q), which TVA has independently reviewed and verified.

Environmental Justice

TVA's EIS identifies Environmental Justice (EJ) populations in proximity to each Alternative, then incorporates analyses of potential effects in relation to each of the subsequent resource areas. The identification of EJ qualifying populations is based on the "meaningfully greater comparison" criteria, as defined in Section 3.4. A summary of the anticipated effects by resource area is provided in Section 3.4.2 and provided in abbreviated form below.

Affected Environment

The Kingston Reservation EJ Study Area was determined to be a 10-mile radius of the Kingston Reservation. Within this area, four of the 49 census block groups were identified as EJ qualifying populations based on minority criteria, and eight of the 49 census block groups were identified as EJ qualifying populations based on low-income criteria. None of the block groups were identified as meeting criteria as a limited English proficiency (LEP) population[5].

The study areas for the proposed off-site transmission line upgrades include the existing Western Transmission Corridor (Lines [L]5383) and Eastern Transmission Corridor (L5108, L5302, L5116, L5280, and L5381) and their associated rights-of-way (ROW) and access roads with a 1-mile buffer, collectively referred to as the Transmission Corridor EJ Study Area. The Transmission Corridor EJ Study Area identified two of the 34 census block groups as EJ qualifying populations based on minority criteria alone, three block groups as EJ qualifying populations based on low-income criteria alone, two block group as EJ qualifying based on both minority and low-income criteria, and one census block group as EJ qualifying based on meeting minority and LEP criteria.

TVA's Pipeline Expanded EJ Study Area included an area encompassed by the ETNG Construction ROW with a 1-mile radius buffer. Ten of the 54 census block groups within this area were identified as EJ qualifying populations based on minority criteria alone, 11 were identified as EJ qualifying populations based on low-income criteria alone, five were identified as EJ qualifying populations based on both minority and low-income criteria, and one of the census block groups was identified as having qualifying EJ populations based on minority, low-income, and LEP criteria.

Environmental Consequences

TVA Proposed Actions

Under Alternative A, the retirement and demolition of the coal-fired units at KIF would likely improve water quality due to reduced loading of metals in KIF Plant discharges and improve

[5] One LEP population was previously identified within the Kingston Reservation EJ Study Area and discussed in the DEIS. The EJ analysis was updated in this EIS to use the most recently available American Community Survey estimates from USCB, which became available after the release of the DEIS. Based on the updated census estimates, the revised analysis indicates the prior LEP population no longer meets the criteria for LEP.

reliability and service costs due to increased power generation and interconnection to TVA's grid. Additional beneficial effects would likely include the reduction in fish mortality from impingement and entrainment at the intake of the existing KIF Plant. Furthermore, employment in TVA's EJ Study Area is expected to temporarily increase because of construction needs. Air quality for nearby residents would improve due to reduced air emissions because natural gas is a cleaner energy source than coal. Alternative A may have disproportionate effects to EJ populations. Effects to soils, water resources, air quality, recreation, land use, transportation, socioeconomics, noise, and aesthetics (visual resources) near the Kingston Reservation and existing transmission lines may have temporary and permanent, minor to moderate impacts to nearby EJ populations. Minor beneficial effects to EJ and non-EJ populations may occur due to the change in power generation with implementation of Alternative A as KIF would cease coal combustion activity. Therefore, wastewater streams associated with electricity generation at the KIF Plant would also cease discharging. Although these discharges meet water quality criteria and are in compliance with Clean Water Act (CWA) permitting, these discharge streams would be eliminated entirely.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Minor, temporary effects to EJ populations would occur to soils, water resources, air quality, recreation, land use, transportation, socioeconomics, noise, and aesthetics (visual resources) near the Ridgeline Expansion Project ROW and associated structures. Minor but permanent effects to EJ populations would occur due to the loss and conversion of prime farmland and the location of waste disposal. Minor, temporary effects to EJ populations would occur during construction due to potential indirect effects to aquatic life used for subsistence and loss of forested areas (permanent and temporary) within the ETNG Construction ROW. Adverse effects to EJ populations could potentially be disproportionate because these communities often experience compounding effects and social disadvantages compared to non-EJ populations.

Physical Characteristics (Geology, Soils, Prime Farmland, and Floodplains)

Affected Environment

Geology
The Kingston Reservation lies at the physiographic boundary of the Western Valley and Ridge and the Cumberland Plateau Physiographic Provinces of TN. This area is characterized by northeast-trending ridges underlain by resistant rock separated by valleys underlain by less resistant rock. Multiple subsurface fault lines are in the vicinity of the Kingston Reservation. The presence of carbonate rocks can contribute to the formation of karst-related features. The geologic formations underlying the proposed Project Area may contain fossiliferous remains of marine invertebrates. While invertebrate fossils may be found in TN, unique paleontological resources are not known to exist within the proposed Project Area.

The Western Transmission Corridor (consisting of L5383) is located in the Cumberland Plateau Physiographic Province. The Crossville Fault, part of the Cumberland Plateau Overthrust, trends northeast to southwest and crosses the Western Transmission Corridor near the eastern extent of the proposed Western Transmission Corridor upgrades. The Eastern Transmission Corridor (consisting of L5108, L5302, L5116, L5280, and L5381) is in the western Valley and Ridge Physiographic Province and has the same geological hazards identified for the Kingston Reservation.

The ETNG Construction ROW would cross the Cumberland Plateau, then the Eastern Highland Rim, and terminate within the Nashville Basin Physiographic Province. The corridor crosses areas with high sensitivity to karst and a high incidence of sinkhole and cave development.

Soils and Prime Farmland
Fourteen soil types occur on the Kingston Reservation, with approximately 9.5 acres of prime farmland. No hydric soils are present. The prime farmland is outside of the Alternative A boundaries for the proposed CC/Aero CT Plant and switchyard, 3- to 4-MW solar facility, 100-MW BESS, and on-site transmission line corridors. A temporary parking/laydown area occurs within an area with 6.3 acres on historically disturbed land that meets the criteria for prime farmland.

Forty-four soil types occur within the Eastern Transmission Corridor; however, 60.4 percent of this area does not have digital data available. Of the available data, 95.7 percent of the corridor contains non-hydric soils and 4.3 percent classified as predominantly non-hydric soils. Approximately 3.2 percent of the corridor is designated as prime farmland.

Nine soil types are present within the Western Transmission Corridor, two of which are hydric (associated with named creeks), totaling less than 1.7 percent of the corridor. Approximately 22.2 percent of the corridor supports prime farmland.

The ETNG Construction ROW contains 183 soil types, with approximately 7.4 acres of soil classified as predominantly hydric or hydric. Approximately 30 percent of the ETNG Construction ROW is designated as prime farmland.

Floodplains
Half of the Kingston Reservation is located on a peninsula bordered by the Emory River on the northern side and the Clinch River on the eastern and southern sides. Small areas of the Clinch and/or Emory River 100-year floodplain are present on the margins of the Kingston Reservation boundary from these waterbodies.

Approximately 8.4 acres of the proposed CC/Aero CT Plant would be located within the 100-year floodplain of the Clinch River. Of the three potential locations available for the 100-MW BESS, Battery Site 1 would also overlap with a small portion (0.15 acre) of the Emory River 100-year floodplain; Battery Sites 2 and 3 are outside of the 100-year floodplains boundary. Approximately 1.5 acres of the existing on-site transmission line corridor and 0.58 acre of the proposed Battery Transmission Line Connections are within the 100-year floodplains. No floodplains are present within the 3- to 4-MW solar facility area or within the temporary parking/laydown area.

The existing off-site transmission corridor ROWs cross several floodways (totaling 18.1 acres) and 100-year floodplains (totaling 59.7 acres) along the Eastern Transmission Corridor and one Federal Emergency Management Agency (FEMA)-mapped 100-year floodplain of the Western Transmission Corridor (1.9 acres).

The ETNG Construction ROW would cross FEMA-mapped floodways and floodplains; however, aboveground facilities would be constructed outside of the floodplain. The ETNG

Construction ROW crosses 181 acres of mapped 100-year floodplain and 14 acres of regulatory floodway.

Environmental Consequences

TVA Proposed Actions

The proposed KIF retirement and demolition activities would affect geologic resources by the removal of the KIF Plant and associated structures with controlled explosives, which would result in vibrations at the surface in the immediate vicinity of the facility when they are felled. Due to the small size of the subsurface disturbances and existing industrial development of the site, potential impacts to subsurface geological resources would be minor.

Minor direct impacts from vegetation clearing, grading, and other earth moving, and site preparation activities associated with the construction of the CC/Aero CT Plant and related components (i.e., transmission corridors, BESS, and 3- to 4-MW solar facility) of Alternative A would have the potential to disturb soil stability and subsurface geology due to the construction of foundations and/or transmission structures. Minor, permanent soil impacts would occur from grading and other surface preparation activities within the boundaries of the 55-acre CC/Aero CT Plant footprint and 8.5-acre switchyard. Minor, temporary impacts from would occur surface preparation for the 35-acre 3-to 4-MW solar facility for the installation of solar structures. However, this area was heavily disturbed in the past. Minor soil disturbance would occur within the existing on-site transmission line corridors due to upgrade activities; this would be minor and temporary. Approximately 41 acres of soil would be disturbed with the construction of the Battery Transmission Line Connections, consisting of vegetation clearing and permanent habitat conversion (i.e., conversion of forested areas to shrub or emergent vegetation communities). Between 30 and 40 acres would be impacted by permanent fill impacts associated with the battery site. Battery Site 1, if chosen, would result in the least amount of soil impacts since this site is already considered developed or otherwise previously disturbed. Effects to soils associated with grading and site preparation activities from pipeline construction would be temporary and mitigated through Best Management Practices (BMPs).

Under Alternative A, portions of the proposed CC/Aero CT Plant site would be located within the 100-year floodplain of the Clinch and Emory Rivers. Approximately 8.4 acres of floodplains would potentially be impacted by earthmoving, fill placement, and grading activities during site preparation for the proposed CC/Aero CT Plant. No changes in flood elevations would be anticipated. The proposed locations for the solar facility and Battery Sites 2 and 3 are located outside the 100-year floodplains and would therefore not result in any impacts during construction or operation. However, if adopted, approximately 0.15 acre of the Alternative A Battery Site 1 (preferred site) would potentially be located within the 100-year floodplain. If Battery Site 1 is selected, mitigation measures would be taken to minimize or eliminate impacts to the floodplain, including minimizing net fill quantities; siting the battery site facilities and flood-damageable at an elevation above the floodplain; and implementation of BMPs during construction activities. Additionally, approximately 0.68 acre of the land proposed for the battery transmission line connections would be located within the floodplain. As such, minor temporary impacts would result during construction with permanent habitat conversion (forested areas converted to shrub or herbaceous habitats), but floodplain capacity would be restored after construction of the transmission line is complete. Overall permanent impacts to floodplains related to the Battery Site 1 and associated Transmission Line Connections would be minor.

Small portions of the transmission line ROW would be located within 100-year floodplains, consisting of approximately 0.58 acre (total) within the on-site transmission line corridor; although the floodplain may experience minor disturbance, changes to floodplain capacity are not expected. Although the off-site transmission corridors cross over floodways, 100-year, and 500-year floodplains, no impacts to these areas from transmission line upgrades are expected. If required, modifications to access roads crossing floodplains would be completed in a manner that avoids increasing upstream elevations by more than 1 foot. For modifications to access roads impacting the floodway portion of the floodplain: (1) any fill, gravel, or other modifications in the floodway that extends above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
No mineral resources identified within 0.25-mile of the pipeline workspaces would be impacted. Mitigation measures would be utilized in karst prone or sloped areas to reduce the risk of geologic hazards and impacts during pipeline construction. Effects to soils associated with grading and site preparation activities from pipeline construction would be temporary and mitigated through BMPs and revegetation. Effects on prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the project sites, as well as through adherence to FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (FERC 2013a). Temporary minor effects to 100-year floodplains and floodways may occur as a result of pipeline construction; however, no permanent impacts are anticipated to floodplain functionality.

Water Resources (Groundwater, Surface Waters and Wetlands, and Water Quantity and Quality)

Affected Environment
The Kingston Reservation overlies the Cambrian-Ordovician carbonate aquifer system and the KIF facilities are situated on a peninsula formed by the confluence of the Clinch and Emory rivers. Several surface water features on the Kingston Reservation drain to the Clinch River arm of the Watts Bar Reservoir and/or are influenced by the reservoir. In addition to the Emory and Clinch rivers surrounding the north, east, and southern boundaries of the Kingston Reservation, three intermittent streams (totaling 1,345 linear feet [LF]); three ephemeral channels (totaling 457 LF); 14 other WWCs (totaling 9,983 LF); one exempted reach (606 LF); five ponds (totaling 0.34 acre); and nine wetlands (totaling 0.67 acre) are present within the limits of proposed disturbance. The exempted reach (s001) is a man-made drainage which contains persistent flow originating from leakage in the fire protection system of the switchyard, which draws raw river water and discharges to s001 and inline stormwater/catchment ponds (also non-jurisdictional; Ponds 1, 2, and 3). Eight of the nine wetlands on the Kingston Reservation were categorized as persistent emergent with herbaceous vegetation communities (totaling 0.57 acres); the remaining wetland is a 0.10-acre broad-leaved forested wetland. All wetlands had low TN Rapid Assessment Methodology (TRAM) ratings indicating low resource value.

One intermittent stream (227 LF), one WWC (1,106 LF), and three wetlands totaling 0.16 acre are present within the proposed CC/Aero CT Plant boundary. No streams or wetlands occur within the bounds of the switchyard, 3- to 4-MW solar facility, or parking/laydown area. Up to four WWCs totaling up to 1,682 LF, one ephemeral channel (57 LF), and one 0.12-acre pond are present on Battery Sites 1, 2, or 3; no wetlands are present on any of the sites. Seven WWCs totaling 3,659 LF are present within the existing on-site transmission corridor. Five WWCs totaling 607 LF are present within the proposed on-site Battery Transmission Line Connections. No wetlands are within the Battery Transmission Line Connections; however, four wetlands totaling 0.40 acre are present within the existing on-site transmission corridor.

The Eastern Transmission Corridor crosses 108 jurisdictional wetlands encompassing 37.99 acres, 74 streams totaling 16,689 LF, and 8 open water ponds or lakes totaling 8.82 acres. The Western Transmission Corridor crosses 11 wetlands encompassing approximately 8.26 acres, five isolated wetlands totaling 0.58 acres, 15 streams totaling 2,920 LF, three large stream crossings totaling 1.08 acres, and 3 ponds totaling 1.54 acres.

KIF withdraws approximately 1,107 million gallons per day (MGD) from a surface water intake structure on the Clinch River for cooling and plant process water (e.g., sluice water, fire protection, boiler feed water, and other miscellaneous uses). Approximately 99 percent of the water withdrawal (1,096 MGD) is used for cooling, while approximately one percent is used for other purposes including process water. The withdrawn water is returned to the river after appropriate treatment via Outfalls 001, 002, 004, and 006, and is in compliance with the KIF National Pollutant Discharge Elimination System (NPDES) permit number TN0005452.

From Outfall 001, KIF is authorized to discharge treated ash pond effluent (including Bottom Ash Transport Water [BATW], coal yard run off, utility building drainage area, fire protection flushes), combustion residual leachate, chemical and nonchemical metal cleaning wastes, ammonia storage area runoff, water treatment plant wastes (including reverse osmosis system reject and backwash), drainage from sluice line trench, station sump discharge, stormwater from the flue gas desulfurization (FGD) area sump, and American Air Filter area sump with precipitator wash and raw water leakage (TN Department of Environment and Conservation [TDEC] 2021a).

At Outfall 002, KIF is permitted to discharge once-through condenser cooling water (CCW) discharge plus flows from Outfall 001, boiler blowdown, discharge from underflow ponds with fire protection flushes, raw water leakage and transformer/switchyard runoff, intake screen backwash from Outfall 004 and FGD drainers, discharge from FGD stormwater pond Internal Monitoring Point (IMP) 01A, and discharge from Outfall 006 (TDEC 2021a). Due to the discharge of once-through CCW, the Clinch River downstream of Outfall 002 is subject to thermal discharges in this area; the existing NPDES permit provides a thermal variance of 36.1°Celcius (°C) under CWA Section 316(a). Effluent limitations and monitoring requirements for discharges from outfalls 001 and 002 are outlined in the KIF NPDES permit. Discharges from outfalls 001 and 002 have effluent limitations and monitoring requirements as outlined in the NPDES permit.

Outfall 004 discharges raw river water used for intake screen backwash, and Outfall 006 discharges air conditioning condensate, fire protection flushes, and plant water leakage (TDEC 2021a). None of the discharges from these outfalls have numeric limits or reporting requirements under the current NPDES permit.

The ETNG Construction ROW overlies five aquifer systems including Ordovician carbonate aquifer, Mississippian carbonate aquifer, Pennsylvanian sandstone aquifer, Knox aquifer, and the Cambrian-Ordovician carbonate aquifer. These five aquifers are mostly composed of carbonate rocks with prevalent karst, which can contribute to high flow and transport rates of contaminates. Five wells and three springs are located within 1,000 feet of the footprints of horizontal directional drilling (HDD) or compressor station footprints.

The ETNG Construction ROW is located within the Old Hickory Lake, Cordell Hull, Obed River, Emory River, and Lower Clinch River watersheds of the TN River Basin. The proposed pipeline would cross 224 perennial streams, 175 intermittent streams, 245 ephemeral channels, 33 open water ponds or impoundments, and 334 wetlands. Twelve crossings of eight named streams (Spring Creek is crossed in five locations) were identified as impaired. The corridor crosses 11 tributaries of the Obed Wild & Scenic River, seven waterbodies listed on the National Rivers Inventory List, and six Exceptional TN Waters. Wetlands primarily consist of emergent wetlands (34.5 acres; 86 percent), followed by forested (3.7 acres; 9.3 percent) and scrub-shrub wetlands (1.8 acres; 4.5 percent).

Environmental Consequences

TVA Proposed Actions

Demolition of the existing KIF Plant may result in minor, temporary effects to groundwater due to the potential for release of pollutants into the underlying soil and shallow groundwater table during decommissioning, deactivation, decontamination, and demolition (D4) activities; BMPs would be utilized to minimize risk of groundwater impacts. Proposed construction of the CC/Aero CT Plant and associated equipment would require excavation below the existing ground surface to establish a sub-base and foundation. Given the proximity of the Project Area to surface waters and the shallow water table, excavated areas may periodically require dewatering during the construction phase. Dewatering would only be performed to the extent that groundwater is locally lowered within the footprint of the Project Area and not the surrounding areas; therefore, no adverse effects to groundwater would be anticipated. These potential effects would be mitigated with the use of appropriate BMPs. Additionally, sink holes and other karst features would be identified and either protected with buffer zones or filled in with grout or other suitable material if determined appropriate.

The demolition of the existing KIF Plant, associated buildings, and appurtenant features (including intake bays, the coal unloading area, transfer stations, conveyers, oil-water separators, and reverse osmosis system) would have the potential to temporarily affect surface water via fugitive emissions, debris, and stormwater runoff. The demolition boundary encompasses nine WWCs and exempted reaches (totaling 6,936 LF), two ephemeral channels (totaling 400 LF), and three ponds (totaling 0.08 acre). As stated above, the exempted reach (s001) is a man-made drainage that contains aquatic life due to persistent flow originating from leakage in the fire protection system of the switchyard, which draws raw river water and discharges to s001 and inline stormwater/catchment Pond 1, Pond 2, and Pond 3. Impacts to these features are not yet determined; however, the U.S. Army Corps of Engineers (USACE) determined none of these waters to be considered jurisdictional under Section 404 of the Clean Water Act based on the U.S. Supreme Court's ruling in *Sackett v. USEPA*.

Permanent and temporary impacts to surface waters would occur under Alternative A. One intermittent stream (227 LF) and one WWC (1,106 LF) are present within the proposed CC/Aero CT Plant boundary that would be permanently impacted due to placement of fill. The intermittent stream is considered jurisdictional by the USACE (and subject to Section 404 permitting), while TDEC considers this feature to be a WWC. On the Battery Sites, permanent impacts would occur due to fill of WWCs (1,426 to 2,788 LF) and potentially one pond (0.12 acre), depending on the battery site selected. WWCs do not support aquatic life due to the impermanence of water flow, as these features convey water only during significant rain events. Temporary impacts during construction/transmission upgrade activities could occur to WWCs and an intermittent stream within the existing on-site transmission line corridors or Battery Transmission Line Connections due to upgrade activities or corridor construction. BMPs would be used as needed to prevent soil erosion and sedimentation to downstream waterbodies.

Surface water withdrawals would not be required for the operation of the CC/Aero CT Plant. Therefore, surrounding surface waters would benefit from Alternative A.

No wetlands are present within the proposed Battery Transmission Line Connections corridor associated with the proposed 100-MW BESS. Four emergent wetlands within the existing on-site transmission line corridor would not be directly impacted during upgrades. Erosion and sediment control BMPs would be used to the extent practical to minimize indirect effects to wetlands during upgrade activities.

Wetlands within the existing off-site transmission corridors could be temporarily impacted during upgrade activities. Wetlands within these corridors are already subject to regular control and treatment for maintaining wetlands as herbaceous or scrub-shrub. During field surveys, several wetlands were classified as forested. Typically, these wetlands were early successional forested areas with small trees, located along ROW margins or unmaintained access roads. Temporary impacts may occur from placement of matting within wetlands to avoid permanent construction impacts due to the movement of construction equipment. These impacts are anticipated to be short in duration and associated with the proposed transmission upgrades. Areas of potential temporary impacts would be restored to pre-construction conditions. Additional BMPs such as the use of silt fence and straw wattles will be implemented to minimize and avoid additional permanent and temporary impacts. Up to a maximum of three acres of forested area, including wetlands, may be cleared within the Off-site Transmission Corridors resulting in minor impacts as a result of forested habitat converted to herbaceous or scrub-shrub habitat.

Applicable CWA Section 404 and 401 permits would be obtained from the USACE and TDEC, respectively, and necessary mitigation credits purchased in the event that wetlands and streams cannot be avoided. Erosion and sediment control BMPs would be used to minimize indirect effects to wetlands and streams. Minor effects to surface water may occur but would be mitigated through the use of BMPs. Avoidance, minimization, and mitigation efforts are expected to reduce or eliminate the potential for cumulative effects to streams and wetlands.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

The proposed ETNG Construction ROW would cross 224 perennial streams, 175 intermittent streams, 245 ephemeral channels, and 33 open water ponds or impoundments. Temporary impacts during construction would result from clearing activities, horizontal directional drilling (HDD), dry open cut crossing installation methods, temporary access road crossings, temporary workspaces, and hydrostatic test discharges. Minor, temporary impacts from potential spills or leaks of hazardous liquids from refueling procedures and potential blasting activities could occur but would be minimized using standard BMPs. Turbidity would increase temporarily in streams that are trenched; however, trenched streams would be returned to their natural, original grade following completion of the pipeline installation and associated activities.

The construction of the Project will result in a total of 26.2 acres of temporary wetland impacts, which includes 23 acres of temporary effect on emergent and scrub-shrub wetlands and 3.2 acres of forested wetlands. Temporarily disturbed wetlands within the temporary workspace and ATWS will be restored to pre-construction conditions. Permanent project effects include the conversion of 0.5 acre of forested wetlands and 0.6 acre of scrub-shrub to emergent wetlands as a result of ROW clearing and required long term vegetative maintenance within the permanent ROW.

The permanent impacts, as a result of the Ridgeline Expansion Project, would be related to the operation and maintenance of new permanent easement for the operation of the pipeline. Temporary effects from construction of the natural gas pipeline would also occur due to temporary workspaces and access roads needed for construction. With the use of BMPs and adherence to all permit conditions including mitigation requirements, effects to wetlands would be minor.

Air Quality and Greenhouse Gases, Climate Change

Affected Environment

The Kingston Reservation is in Roane County, which is an attainment area for all criteria pollutants; however, a portion of the county that includes the Kingston Reservation is a maintenance area for particulate matter less than or equal to 2.5 microns in width ($PM_{2.5}$). Based on its potential to emit (PTE) air pollutants, KIF currently operates under the conditions stipulated by TN Air Pollution Control Board, (Title V Renewal) Operating Permit No. 580583. TVA submitted a Title V renewal application in July 2022; according to TDEC records at the time of this EIS, the renewal is pending review.

All upgrade efforts for the Eastern Transmission Corridor would occur within Roane and Anderson counties, which are both counties in attainment with criteria pollutant ambient air quality standards except for $PM_{2.5.}$ Western Transmission Corridor upgrades would occur within Cumberland County, which is in attainment with criteria pollutant ambient air quality standards.

The proposed 122-mile natural gas pipeline would pass through Roane, Morgan, Fentress, Overton, Jackson, and Smith counties. Except for Roane County, all counties that would be transected are currently in attainment for all criteria pollutants, and only the Kingston Reservation portion of Roane County is in maintenance status for $PM_{2.5}$. There are no available air monitoring data for these other counties in the USEPA air monitoring database or the TDEC air monitoring network.

Environmental Consequences

TVA Proposed Actions

Decontamination and deconstruction of KIF and the construction of the CC/Aero CT Plant proposed in Alternative A is expected to have temporary, localized (limited to the KIF property), and minor effects on air quality and temporary, regional, and minor effects from Greenhouse Gas (GHG) emissions on climate change. With the decommissioning and demolition of the KIF Plant, the operation of the CC/Aero CT Plant is expected to have long-term, moderate, and beneficial effects on local air quality. Reductions in future regional GHG emissions are expected to have long-term, minor, and beneficial effects on climate change in comparison to the No Action Alternative.

The transmission line construction and upgrade activities are expected to have temporary, minor effects on air quality and no appreciable direct or indirect effect on regional climate change.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
The construction and operation of the new natural gas pipeline and associated infrastructure would have temporary, localized, and minor effects on air quality and temporary, regional, and minor effects from GHG emissions on climate change.

Analysis of Greenhouse Gases (GHG) and Social Cost of GHG Analysis
TVA completed a comparative analysis of GHG and Social Cost of GHG (SC-GHG) of the No Action and Action Alternatives in this EIS, using methods consistent with the 2023 National Environmental Policy Act Interim Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (Council on Environmental Quality [CEQ] 2023). For Alternative A, the GHG and SC-GHG analyses incorporated design conditions and assumptions for the contribution anticipated to the overall GHG and SC-GHG from ETNG's related action, the Ridgeline Expansion Project. For Alternative A, the potential social cost benefit from carbon dioxide (CO_2) operational emissions reductions is estimated to be a reduction in social costs between $12 million and $109 million dollars the first year of operation, in nominal dollars, and would increase every year thereafter. On an individual replacement resource basis, the estimated total Alternative A life cycle social costs of GHG emissions ranges from approximately $611 million to $7.77 billion in nominal dollars. These values equate to between approximately $178 million and $2.06 billion in Net Present Value (NPV) to 2023 dollars. This GHG analysis and associated social costs also include life cycle emissions/social costs from the proposed natural gas pipeline. On a TVA system-wide basis, the estimated total Alternative A life cycle social costs of GHG emissions in comparison to the No Action Alternative, i.e., net savings/benefit, ranges from approximately $398 million to $4.34 billion in nominal dollars. These savings/benefit values equate to between approximately $173 million and $1.85 billion in NPV to 2023 dollars.

In comparison to Alternative B, Alternative A has higher estimated GHG life cycle emissions and associated estimated future social costs. However, as discussed in more detail in Chapter 1 of this EIS, other considerations, such as the need for firm, dispatchable power and the need to have this power in place by the end of 2027, would still lead TVA to identify Alternative A as the Preferred Alternative. The CC under Alternative A would be capable of burning 5 percent hydrogen at commissioning. Additionally, the CC units would be capable of burning at least 30 percent hydrogen by volume with modification to the balance of the plant once a reliable source of hydrogen was identified. As such, future implementation of hydrogen fuel blending, as this technology becomes viable, could result in further significant carbon reductions by further reducing GHG emissions.

Biological Environment (Vegetation, Wildlife, Aquatic Life, Threatened and Endangered Species)

Affected Environment
The Kingston Reservation and surrounding areas are located within the Southern Limestone/Dolomite Valleys and the Rolling Hills Ecoregion, a subdivision of the Ridge and Valley ecoregion. Vegetation communities found on and around the Kingston Reservation are largely a function of the land use history of the site which has been heavily disturbed by the construction, operation, and maintenance of the generation and transmission infrastructure present. In general, the most heavily disturbed and degraded habitats are

currently covered with early successional plant habitats, scattered areas of forest, and herbaceous vegetation. Most of the herbaceous vegetation present is dominated by non-native plant species that possess little conservation value and have no potential to support federally or state-listed plant species or unique plant communities. Some areas of herbaceous vegetation, early successional and/or scrub-shrub habitat, principally along transmission line ROW, contain significant populations of native plants but constitute marginally intact habitat. The proposed CC/Aero CT Plant area consists primarily of a heavily disturbed, herbaceous vegetative plant community.

The terrestrial wildlife found within the Kingston Reservation is related to the vegetation and habitats present on-site. Herbaceous fields and fragmented forests located on the Kingston Reservation provide habitat for common terrestrial animal species, including a variety of common birds, reptiles/amphibians, and mammals. The aquatic resources on the Kingston Reservation within the proposed project impact footprint include three intermittent streams, three ephemeral channels, 14 other WWCs (such as ditches and swales), one exempted reach, five ponds, and 9 wetlands. The exempted feature (a perennial waterbody), intermittent streams, ponds, and seasonally flooded wetlands may support aquatic or semi-aquatic life. Protected species previously documented and potentially occurring on Kingston Reservation include osprey (up to twelve nests on and in the vicinity of the Reservation) and bald eagle (nests observed within two to four miles of Kingston Reservation since 2021).

The Kingston Reservation contains approximately 299.0 acres of medium or high-quality summer bat roosting habitat, with an additional 19.8 acres of low-quality bat roosting habitat and 18.8 acres of foraging habitat. Presence/absence mist net surveys were conducted on Kingston Reservation in 2023, with no protected bat species captured.

The Western Transmission Corridor crosses the Cumberland Plateau, a subdivision of the Southwestern Appalachians ecoregion. The Eastern Transmission Corridor crosses the Southern Limestone/Dolomite Valleys and the Rolling Hills ecoregion, a subdivision of the Ridge and Valley ecoregion. Both corridors consist primarily of fields (i.e., pasture/hay, and wet and dry herbaceous vegetation) or shrub habitat, as they are existing ROWs subject to regular vegetation maintenance activities. Overall, wildlife habitats present along the transmission line corridors and access roads are common to the region and, as habitats, are not unique or uncommon. Numerous streams, creeks, rivers, and ponds are crossed by the existing off-site transmission corridors and likely contain common fish taxa. Federally Designated Critical Habitat for spotfin chub (*Erimonax monachus*) occurs within the mainstem Obed River, which is crossed by the Western Transmission Corridor. Field surveys of the off-site transmission corridors identified four active osprey nests on transmission line towers. Field surveys conducted in June 2022, August 2022, May 2023, and June 2023 also identified individuals of tall larkspur (*Delphinium exaltatum*) and naked-stem sunflower (*Helianthus occidentalis*) within the Eastern Transmission Corridor.

ETNG Construction ROW encompasses portions of the following Level IV Ecoregions: Outer Nashville Basin, Eastern Highland Rim, Plateau Escarpment, Cumberland Plateau, Southern Limestone/Dolomite Valleys and Low Rolling Hills, and Southern Dissected Ridge and Knob. The corridor is located within the Old Hickory Lake, Cordell Hull, Obed River, Emory River, and Lower Clinch River watersheds of the TN River Basin. The natural gas pipeline crosses the following subdivisions of the Ridge and Valley ecoregion: the Southern Limestone/Dolomite Valley and Low Rolling Hills; and the Southern Dissected Ridges and Knobs.

Vegetation in the ETNG Construction ROW consist of approximately 44.8 percent agricultural land and 28.9 percent of forested habitats. The eight counties crossed by ETNGs Construction ROW for the Ridgeline Expansion Project provide a variety of habitat types capable of supporting game and non-game species of TN, as well as protected species.

Bachman's sparrow was the only avian species with protected status identified as having the potential to occur within the ETNG Construction ROW based on a review of state and federal resources (Table 3.8-24); however, suitable nesting habitat for osprey and suitable foraging habitat for bald eagle also occur within the ETNG Construction ROW. The ROW also likely crosses bat habitat supportive of tricolored bats, little brown bats, Indiana bats, and northern long-eared bats based on vegetation present, mist net surveys, and radio tracking. The northern pine snake, a large subterranean reptile, could be within the action area in upland pine/pine-oak woodlands. Up to 35 protected plant species could occur within the ETNG Construction ROW; during multiple species-specific surveys conducted in 2022, no individuals or populations of American Hart's-tongue fern, Cumberland rosemary, Short's bladderpod, Virginia spiraea, or white fringeless orchid were identified.

Eight species of fish, three species of crayfish, one amphibian, and 31 aquatic mollusk species were identified on the state and federal resource lists as having potential for occurrence within the ETNG Construction ROW. The corridor does not include Essential Fish Habitat, but Federally Designated Critical Habitat for spotfin chub does occur along the ETNG Construction ROW in Morgan County. An eDNA sampling program conducted in 2022 and subsequent field investigations in 2022 and 2023 yielded no observations of protected mussel species in the waterbodies surveyed. Surveys did positively identify the Obed crayfish in Little Hurricane Creek and Hurricane Creek in June 2023.

Environmental Consequences

TVA Proposed Actions

Activities associated with the retirement of KIF would impact up to 61.1 acres of herbaceous and early successional habitat, manicured lawn, or ruderal areas, and 61.8 acres of forest. D4 activities may also impact the exempt (perennial) reach and three associated (non-jurisdictional) detention ponds, which likely contain aquatic life. Aquatic life within these resources is limited to those tolerant of poor conditions including leech eggs and snails.

With implementation of the proposed CC/Aero CT Plant and switchyard, 3- to 4-MW Solar Facility, 100-MW BESS, On-Site Transmission Lines, and Off-Site Transmission Line Upgrades, a range of 95.7 to 119.9 acres of permanent impacts to vegetation (depending on the site selection for the 100-MW Battery Facility) and 1,513.8 acres of temporary impacts to vegetation would occur. Most permanent impacts consist of forested areas that would be removed if Battery Sites 2 or 3 were selected, and forested areas that would be converted to herbaceous or scrub-shrub habitat within on-site transmission line corridors. Overall, effects to forested areas (approximately 42.2 to 58.8 acres depending on the site selection for the 100-MW BESS) would be moderate due to the loss or conversion of habitat in these areas. Temporary impacts consist primarily of herbaceous or early successional habitat and manicured lawn; therefore, impacts to these areas would be minor as regeneration after disturbance would be short-term. Construction areas of the proposed CC/Aero CT Plant and proposed new on-site transmission line ROW would need to be cleared of vegetation and then maintained under TVA's vegetation management policies.

The proposed CC/Aero CT Plant, 3- to 4-MW Solar Facility, 100-MW BESS, and On-Site and Off-Site transmission lines would cause minor permanent and temporary impacts to wildlife due to habitat loss and disturbance from construction activities or routine maintenance. Vegetated habitats on the Kingston Reservation are generally low-quality due to prior disturbance and invasion of non-native species. Since there is limited suitable habitat for wildlife immediately adjacent to the CC/Aero CT Plant boundary, the removal of these habitats within the CC/Aero CT Plant boundary could have an adverse impact to individual wildlife in the area. Additionally, the site is located on a peninsula, bordered to the north, east, and south by the Clinch River and by developed areas (KIF) on the western side. This restricts the extent that many types of wildlife, specifically flightless species, are able to disperse from the area due to disturbance and habitat loss. Effects to more mobile species, such as birds and common bats, would be minor, since they could move out of the Kingston Reservation area and use similar (or higher quality) habitat nearby and across the Clinch River including deciduous and mixed forest, early successional habitat within maintained utility ROWs, and wetlands, all of which may provide suitable habitat for birds and bats previously residing on the Kingston Reservation. Overall, it is unlikely that the Kingston Reservation supports a highly diverse wildlife community; however, impacts to the fauna would be minor due to the limitations in habitat elsewhere on the Kingston Reservation if species are unable to access areas across the Clinch River.

Based on field observations, aquatic life within waterbodies on the Kingston Reservation is likely limited due to few resources with persistent flow/water presence (i.e., most features are WWCs without persistent flow and unable to support aquatic life) and poor-quality habitats (e.g., detention ponds). However, if aquatic or semi-aquatic life is present, permanent impacts would occur to 0.16 acre of wetlands, 227 LF of intermittent stream, and one detention pond (0.12 acre) under Alternative A proposed actions.

The retirement of KIF would result in the elimination of entrainment and impingement mortality of fish and mollusks in the vicinity of the KIF cooling water intake structure. Thermal discharges would also cease, improving water quality. While the removal of KIF intake structure equipment (i.e., fish screens and pumps) and construction of a barge unloading area could have a minor direct impact on aquatic life in the Clinch River, the aquatic community in the vicinity of KIF would experience a minor, permanent beneficial effect with the elimination of facility operations. There would be no long-term impacts to surface waters, and therefore to aquatic life, associated with the CC/Aero CT Plant, 3- to 4-MW Solar Facility, 100-MW BESS, or on-site or off-site transmission line corridors.

No direct effects to federally or state-listed threatened and endangered species are expected to occur, although actions resulting in minor habitat loss/conversion may affect bat and bird species. Surveys determined that federally listed bats are likely absent from the Kingston Reservation. These bats would experience minor impacts to summer roosting habitat removal and/or conversion to foraging habitat for actions within the off-site transmission corridors. If feasible, to minimize effects to bat species, any tree removal would occur between November 15 and March 31 when these bats are not roosting in trees. Tree removal during this timeframe would also avoid direct effects to most nesting migratory birds of conservation concern. However, winter tree removal would ensure avoidance of direct impacts to summer roosting protected bats and most nesting migratory birds. No impacts to protected plant, fish, mussel, or crayfish species are expected due to the construction and operation of the CC/Aero CT Plant and associated components, station piping (to tie-in gas supply to the proposed plant), or off-site transmission line corridors as there will be no in-water activity. Overall, impacts to protected species are minor, short-term, and/or periodic. Impacts to protected species would be minimized through appropriate consultation with the USFWS, BMPs (minimization and conservation measures), and guidelines.

TVA conducted ESA Section 7 consultation with the USFWS in November 2023. In a letter signed on December 27, 2023, the USFWS concurred with TVA's *May Affect but are Not Likely to Adversely Affect* determinations for gray bat, Indiana bat, and northern long-eared bat; no jeopardy findings for tricolored bats, whooping crane, and monarch butterfly; and acknowledged TVA's determination that the proposed actions would have *No Effect* on bald eagle. The USFWS acknowledged the use of up to three acres of "Take" for suitable bat habitat tree removal along the off-site transmission line access roads from TVA's programmatic consultation. Impacts to surface waters and habitats within the off-site transmission corridors would be temporary in nature with the exception of up to 3 acres of forest removal. Impacts to wildlife would also be temporary during the upgrade activities. Designated Critical Habitat for the Spotfin chub exists along the Obed River. However, no construction or operation measures are proposed to the Obed River and therefore, no impacts to Designated Critical Habitat for the Spotfin chub are anticipated.

The USFWS letter received in December 2023 acknowledged TVA's determination that the proposed actions in the off-site transmission line upgrade areas would have *No Effect* on Cumberland rosemary, Hart's-tongue fern, Virginia spiraea, white fringeless orchid, Alabama lampmussel, birdwing pearlymussel, cracking pearlymussel, Cumberland bean, dromedary pearlymussel, fanshell, finerayed pigtoe, green blossom pearly mussel, orangefoot pimpleback, pink mucket, purple bean, ring pink, rough pigtoe, rough rabbitsfoot, sheepnose mussel, shiny pigtoe, spectaclecase, tan riffleshell, Tennessee bean, turgid blossom pearlymussel, white wartyback, Anthony's riversnail, Laurel dace, sickle darter, slender chub, spotfin chub, and yellowfin madtom. The USFWS further acknowledged that the proposed transmission upgrades would not result in any adverse modifications to the Designated Critical Habitat for the spotfin chub.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Approximately 1,927 acres of vegetation would be temporarily impacted by construction of the natural gas pipeline consisting of agricultural (45 percent), forested (29 percent), grassland areas (25 percent), and wetlands, emergent and scrub-shrub (2 percent combined). Approximately 684.2 acres of vegetation would be permanently impacted by the operation of the natural gas pipeline consisting of agricultural (47 percent), forested (7 percent), grassland (44 percent) areas, and wetlands and scrub-shrub (2 percent combined). An additional 42.1 acres of habitat would be permanently lost due to conversion to industrial use for the construction or upgrade of aboveground facilities.

The proposed pipeline crosses a total of 676 waterbodies, including 224 perennial streams, 175 intermittent streams, 245 ephemeral channels, and 33 open water ponds or impoundments. In addition to surface waters, the pipeline would also cross 334 wetlands totaling 40.0 acres, including emergent, scrub-shrub, and forested wetlands. Minor and temporary impacts to surface waters and wetlands would occur during dry open cut and/or HDD pipeline installation. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained. Construction across these features would be temporarily limited, completed within 24 to 48 hours, with natural flow restored and streambanks stabilized. Consultation with USFWS and TDEC is ongoing. Based on current consultation efforts, ETNG plans to conduct most stream crossings in late summer or early fall during the dry season except for Salt Lick Creek from MP 28.2 to MP 28.6; unnamed tributary to Salt Lick Creek from MP 29.3 to MP 29.4; and Emory River/Watts Bar Reservoir from MP 116.3 to MP 116.4. ETNG plans to cross these resource areas during the winter drawdown (late winter to early spring) of the reservoirs. Crossing most streams during the dry season will avoid listed fish species reproduction window, which includes spawning season through development to juvenile life stage, and performing the crossing during the low flow of the dry season will help facilitate dry crossings methods. Surveys for the Obey crayfish will be completed prior to construction activities and will be relocated upstream to suitable habitat, if necessary, per TDEC request. Neither USFWS nor TDEC have objected to the proposed crossing timeframes to date.

A variety of species may use the forested areas within the proposed ETNG Construction ROW. Prevalent habitat in the adjacent and surrounding area of the pipeline would minimize effects to species; mobile species are likely to leave the area once construction activities commence and may return upon completion of the project if habitat is appropriate. While species associated with forested habitat may leave areas cleared for the ETNG Construction ROW, species associated with early successional, or field habitats may colonize the permanent ROW following construction.

As stated previously, consultation with the USFWS is ongoing. As of ETNG's October 5, 2023, filing with FERC (ETNG 2023n), a draft biological assessment (BA) for the Ridgeline Expansion Project was submitted to USFWS in July 2023, and a final BA provided in December 2023. ETNG determined that the Ridgeline Expansion Project *May Affect but is Not Likely to Adversely Affect* most federally-listed animal species and would have *No Effect* on most federally-listed plant species. Anticipated project impacts to federally-listed bat species and some plant species are pending consultation with the USFWS.

As of the December 2023 filing with FERC, consultation with state agencies is complete (ETNG 2023o). Consultation with the TN Wildlife Resource Agency was initiated in November 2022 and completed in December 2022 regarding state-listed animal species. ETNG determined that the Ridgeline Expansion Project *May Affect but is Not Likely to Adversely Affect* most state-listed animal species, with the exception of Bachman's sparrow which is presumed to be not present due to a lack of suitable habitat, and therefore the project would have *No Effect* on that species. Consultation with the TDEC Natural Heritage Program was initiated in October 2022 and completed in May 2023. Five plant species identified by TDEC were surveyed between milepost 75 and 80 based on existing occurrence data; no state threatened or endangered species were identified and therefore ETNG determined there would be *No Effect* on state-listed plant species within the ETNG Construction ROW.

Following construction, routine vegetation management within the ROW would result in periodic but temporary effects on habitats within the ROW. Resident species would be expected to be displaced intermittently with the presence of maintenance crews and in response to the alteration of habitats.

Natural Areas, Parks, and Recreation

Affected Environment

The area within a 1-mile radius of the Kingston Reservation includes several public and commercial recreation and natural areas. Within the Kingston Reservation is a boat ramp at the discharge channel that is open to the public where nearby residents often fish. The public also has access to a grassy area along the Clinch River arm of Watts Bar Lake south of the KIF Plant and on the east bank of the discharge channel and the Kingston Steam Plant State Wildlife Observation Area. No current lease agreements exist within the Kingston Reservation for recreational activities. There are several other public and commercial recreation and natural areas in the vicinity of KIF.

Major recreational and natural areas in the Eastern TN region include the Great Smoky Mountains National Park and the Obed Wild and Scenic River. The Great Smoky Mountains National Park is located approximately 30 miles, 37 miles, and 38 miles southeast of the off-site transmission upgrades, the Kingston Reservation, and the natural gas pipeline, respectively. The Obed Wild and Scenic River is located approximately 0.5 mile west of the natural gas pipeline, 5 miles east of the off-site transmission upgrades, and 14 miles northwest of the Kingston Reservation.

The Eastern Transmission Corridor crosses natural areas, parks, and recreation areas, including Watts Bar Reservoir, Oak Ridge Reservation (ORR) Wildlife Management Area (WMA) (encompassing many sub-areas such as the Oak Ridge National Laboratory [ORNL], Black Oak Ridge Conservation Easement, various natural areas, and Manhattan Project National Historic Park), and the North Ridge Trail. No natural areas, parks, or recreation areas are crossed by the Western Transmission Corridor; however, the Charles Russell Obed Reserve, a 50-acre conservation easement, exists within a 0.5-mile radius.

Natural areas, parks, and recreation areas are located in proximity to the proposed natural gas pipeline. The proposed ETNG Construction ROW crosses eight natural and recreational areas, including the Old Hickory WMA and Recreation Area, Cordell Hull WMA and Recreation Area, Lone Mountain State Forest, the Cumberland Trail State Park, Dixona Farm Conservation Easement, and tributaries to the Obed Wild and Scenic River.

<u>Environmental Consequences</u>

TVA Proposed Actions

Minor but temporary adverse effects could occur to the recreational uses of the sections of the Emory and Clinch rivers adjacent to the Kingston Reservation during construction. Public access to the boat ramp located in the Kingston Reservation boundary could be temporarily interrupted during construction or deconstruction activities. The proposed project could temporarily result in minor adverse effects to boat launching activities during the proposed construction period. Because of the temporary nature of transmission upgrades, off-site transmission impacts on dispersed outdoor recreational activities, as well as natural areas and parks, would only include minor and temporary impacts from construction traffic along the corridors aside from areas where corridors directly intersect with managed forested areas.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

The proposed Ridgeline Expansion Project under Alternative A is anticipated to temporarily disturb 34.4 acres of natural and recreational resources during construction. The minor temporary adverse effects to these resources would result from construction-related effects from increased local traffic and noise and visual disturbances from construction activity. These impacts would be minimized and/or mitigated through the implementation of a traffic management plan.

Land Use

Affected Environment

The Kingston Reservation is categorized as a medium and high intensity developed area, deciduous forest, and hay/pasture according to the National Land Cover Dataset (NLCD). The Kingston Reservation is a previously disturbed area within existing TVA property. The proposed CC/Aero CT Plant consists of previously disturbed earth and hay/pasture. Battery Sites 2 and 3, as well as the Battery Transmission Line Connections, are primarily forested.

The Western Transmission Corridor is predominantly pasture/hay land with small areas of forest land and developed space. Land use in the Eastern Transmission Corridor is primarily agricultural and cleared forest land with smaller areas of developed space and open water.

Land within the ETNG Construction ROW based on the NLCD consists of agriculture, forest/woodland, wetland, open land, residential, industrial/commercial lands, and open water.

Environmental Consequences

TVA Proposed Actions

Permanent changes to land use would occur in response to implementation of Proposed Alternative A. Approximately 55 acres associated with the CC/Aero CT Plant proposed on the Kingston Reservation would be converted from largely hay/pasture to industrial. The land use of the existing on-site transmission corridor would continue as largely deciduous forest, developed medium/high intensity area, and hay/pasture. Land use of the proposed Battery Transmission Corridor would change from forested areas to herbaceous, hay/pasture, or scrub/shrub. Temporary impacts from disturbance during construction or upgrades would not result in long-term land use changes, as the areas would return to their original land use type after construction is completed.

The 8.5 acres associated with the switchyard, the 8.2-acre parking/laydown area, and 35 acres associated with the 3-4 MW solar facility site would have minor to negligible impacts to land use, as these sites were previously disturbed for industrial use. Depending on which battery site is selected, 30-40 acres may be impacted. The land use of Battery Site 1 (30 acres) would not change, as it is already categorized as medium and high intensity developed. Battery sites 2 (35 acres) and 3 (40 acres) are both forested and would require vegetation clearing prior to construction. Under Alternative A, the Battery Transmission Line Connections constructed would result in the land use conversion from forested to herbaceous or scrub/shrub. The land use of the existing on-site transmission corridor would remain unchanged; TVA would make upgrades and continue the regular maintenance schedule that the existing transmission line corridor currently undergoes. Similarly, no land use changes are proposed within the Eastern or Western Transmission Corridors, as they will be co-located in existing ROWs and will be maintained as they have in the past. Overall, moderate, adverse, temporary and permanent impacts to land use would occur due to Alternative A construction.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Pipeline construction would impact 481.2 acres of open land temporarily and 319.9 acres permanently; 860.9 acres of agricultural land temporarily and 340.3 acres permanently; 554.6 acres of forested land temporarily and 52.4 acres permanently; 12.1 acres of residential area temporarily and 4.6 acres permanently; and 26.2 acres of wetlands temporarily and 13.8 acres permanently, including aboveground facilities. Overall, moderate, adverse, permanent and temporary impacts would occur.

Transportation

Affected Environment

The Kingston Reservation is served by highway, railway, and waterway modes of transportation. The proposed gas pipeline corridor and transmission corridors are served by highway and railway modes of transportation. Larger roadways, such as Interstate-40 (I-40), State Route (SR) 58, SR 95, SR 61, and SR 62, would be used to access the Eastern Transmission Corridor, and I-40, SR 127, and SR 298 would be used to access the Western Transmission Corridor along with a number of smaller, rural roads in the vicinity of the corridors.

Environmental Consequences

TVA Proposed Actions

The majority of traffic impacts resulting from Alternative A would be on public roads near the Kingston Reservation, as transmission line activities associated with Alternative A are more dispersed than those from the CC/Aero CT Plant construction and would have a reduced localized impact to any set of roadways. Assuming one person per commuting vehicle, there would be a daily average morning inbound traffic volume of 500 vehicles and a daily outbound traffic volume of 500 vehicles for a total of 1,000 vehicles per day to the CC/Aero CT Plant site, with an expected maximum of 1,200 vehicles per day. Minor increases in traffic volume would also occur during the construction of the proposed solar facility and BESS.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Vehicular traffic on public roads near the proposed Ridgeline Expansion Project would increase during construction due to construction workers and materials moving to and from the plant and pipeline construction areas.

Construction activities would create minor, temporary adverse effects on transportation systems in the associated communities and would be mitigated through the implementation of a traffic management plan. Permanent impacts on traffic and transportation routes would be negligible.

Utilities

Affected Environment

The Kingston Reservation is currently served by a variety of telecommunication providers and the Harriman Utility Board. Due to the ETNG Construction ROW being predominantly outside of incorporated municipality limits, some utilities may not be available and water supply may be provided by private wells and septic. Electric services are provided by the Clinton Utilities Board, the Cumberland Utility District, and Rockwood Electric Utility to the Eastern Transmission Corridor and Cumberland Connect and the Cumberland Electric Membership Corporation to the Western Transmission Corridor. Potable water supply to the Kingston Reservation is provided by the Harriman Utility Board.

Environmental Consequences

TVA Proposed Actions

During demolition of the KIF Plant, all buried utilities would be cut and capped within the project boundary and abandoned in place if they do not interfere with other ongoing projects in the vicinity. Prior to starting CC/Aero CT Plant construction, TVA would coordinate with existing telecommunications, electricity, natural gas, and water and sewer utilities. Overall, long-term beneficial impacts would occur due to decreased water use for the CC/Aero CT Plant. Service disruptions associated with Alternative A construction are expected to be minimized through coordination with impacted utilities. Transmission lines, switchyards, and the solar and battery storage facilities do not require water to operate, so water supply use would be limited to the construction period and therefore temporary. Project operations are not expected to result in adverse impacts to public or private water supplies unless operation and maintenance activities involving pipe excavation and repairs are needed. Minor beneficial impacts from the solar facility would occur due to the increased power generation and interconnection to TVA's grid.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Project operations are not expected to result in adverse impacts to public or private water supplies unless operation and maintenance activities involving pipe excavation and repairs are needed. Overall, long-term beneficial impacts would occur due to improved reliability and service costs as a result of Alternative A.

Cultural Resources

Affected Environment

There are 16 recorded archaeological sites within the Kingston Reservation. There are three sites in the D4 footprint (40RE44, 40RE44c, and 40RE44d). In TVA's ongoing consultation, TVA found that all three sites are non-extant and therefore not eligible for the National Register of Historic Places (NRHP). Potentially eligible archaeological sites 40RE44a and 40RE622 are located on the Kingston Reservation but outside the project footprint. No NRHP-eligible or potentially eligible archaeological sites are in the footprints of the proposed KIF D4 activities. A historic cemetery, the Green Cemetery, is located on the KIF Reservation but is outside the project footprint. There are no NRHP-listed, -eligible, or -potentially eligible archaeological sites in the footprints of the proposed 3- to 4-MW solar facility or the three alternative battery storage sites.

There are three archaeological sites within the off-site transmission line corridors; all are recommended not eligible for the NRHP. The only previously recorded historic architectural resource near the transmission line upgrades for L5116, L5280, and L5381 is Bethel Cemetery, which is listed in the NRHP. There are 35 previously recorded archaeological sites within 0.5 mile of the transmission line upgrades. Two of these sites are potentially eligible for the NRHP; the NRHP eligibility status of the remainder is unknown.

A total of 133 archaeological sites were recorded during the current survey of the proposed ETNG Construction ROW. A total of 46 newly and previously recorded sites are considered potentially eligible for the NRHP; additional testing investigations were necessary to evaluate their NRHP eligibility. Of the 46 potentially eligible sites, Phase II investigations were conducted at 36 sites. Eighteen sites are recommended eligible for listing on the NRHP and would require avoidance or mitigation. Eighteen sites are recommended not eligible for listing on the NRHP, and no further work is recommended. The remaining 10 sites did not undergo Phase II investigations because they could either be avoided (as described in an avoidance plan submitted to the TN State Historic Preservation Office [SHPO] on March 3, 2023), access was restricted, or additional coordination is required prior to investigation. Additionally, there are four previously recorded sites that are listed on the NRHP (40TR51 and 40JK125) or eligible for the NRHP (40PM89 and 40PM90); additional data recovery investigations are required if these sites cannot be avoided by construction activities. A preliminary historic architectural resources review conducted for the proposed ETNG Construction ROW identified 23 previously recorded resources located within a 0.5-mile radius. Of these sites, four are listed in the NRHP and one is eligible for the NRHP. Additionally, there are 17 cemeteries located within, or immediately adjacent to, the current natural gas pipeline area of potential effect (APE).

<u>Environmental Consequences</u>

TVA Proposed Actions

There is one recorded archaeological site (40RE45) within the potential CC/Aero CT Plant footprint at the Kingston Reservation. A Phase II investigation (Appendix K) was performed along mapped portions of the 40RE45 site boundary that fall upon elevated terrace landforms west and east of the Clinch River cove, south of a delineated wetland, and within a 20-meter (m) buffer. TVA determined that 40RE45 is eligible for inclusion in the NRHP; however, the site is located outside of the project footprint and therefore would not be affected.

Based on conclusions of the 2022 cultural survey (Appendix K), TVA determined that none of the proposed transmission line upgrades had potential for visual effects, as the relevant activities are excluded by TVA's National Historic Preservation Act (NHPA) Section 106 Programmatic Agreement, executed in 2019 (TVA 2020b). However, the second set of transmission line modifications proposed by TVA under Alternative A (L5116, L5381, and L5280) included proposed activities that were not excluded by the Section 106 Programmatic Agreement, thus requiring an architectural resources survey.

In June 2023, on behalf of TVA, HDR conducted an architectural resources survey of a 0.5-mile buffer around Lines L5116, L5280, and L5381 of the Eastern Transmission Corridor to evaluate potential visual effects of the proposed upgrades. During the historical and architectural survey, HDR recorded 47 primary historic-age architectural resources, including 10 previously recorded resources (two of which are NRHP-listed properties), within the Architectural Study Area (i.e., the transmission line ROW and areas within a 0.5-mile buffer). None of the newly recorded historic-age architectural resources were recommended eligible for listing in the NRHP because of a lack of significance under Criteria A through D of the NHPA of 1966, as amended. The two previously recorded historic architectural resources near the transmission lines proposed for upgrades are the New Bethel Baptist Church and Cemetery and the X-10 Graphite Reactor, which are both listed on the NRHP.

To fulfill its obligations under Section 106 of the NHPA, TVA has completed consultation with SHPO and federally recognized Indian tribes regarding potential project-related effects to cultural resources from TVA actions proposed under Alternative A. TVA received SHPO concurrence by letter dated November 28, 2023, regarding TVA's finding that the undertaking would not result in adverse effects to cultural resources or historic properties from Alternative A, and none of the consulted tribes objected or identified resources of concern.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
To fulfill its obligations under Section 106 of the NHPA, TVA and FERC would each consult with SHPO and federally recognized Indian tribes on their respective actions regarding specific effects to cultural resources along the ETNG Construction ROW. The 17 cemeteries within or adjacent to the current natural gas pipeline would be avoided.

In December 2021, ETNG, in consultation with the SHPO, defined the Indirect APE for historic architectural resources along the ETNG Construction ROW. It was determined that the proposed underground facilities along the ETNG Construction ROW have a minimal potential to affect historic architectural resources. The pipeline component of the project would be located primarily within an existing ETNG ROW, when practicable, to minimize impacts to cultural resources, landowners, and the environment. To the extent practicable, ETNG does not plan to directly impact or remove existing historic buildings or historic structures, and upon completion of the project, any impacted landscape features, such as fences, would be restored post-construction; as such, potential for effects to historic architectural resources along the ETNG Construction ROW are expected to be very low.

Solid and Hazardous Waste

Affected Environment
The primary solid wastes that result from the operation of KIF are CCRs in the form of ash and gypsum. In TN, CCRs require special approval for the wastes to be disposed of at a landfill specifically permitted to receive those types of wastes (Class I or II disposal facility). KIF is considered a RCRA conditionally exempt small quantity generator of hazardous waste by TDEC and a small quantity handler of universal waste. There are no active spills or compliance issues relating to activities at the environmental sites near the proposed ETNG Construction ROW or off-site transmission line corridors associated with Alternative A.

Environmental Consequences

TVA Proposed Actions
Demolition and construction debris would be generated during the D4 activities (e.g., metal buildings, footings, asphalt, etc.). Direct effects would be minor due to the limited potential for hazardous waste to be discharged and/or released into the environment during demolition activities. The proposed CC/Aero CT Plant site is approximately 55 acres and has been permitted for landfill expansion but has not been constructed or received waste. The site is not likely to contain or produce solid or hazardous waste, although any excavated materials may need to be tested for waste characterization if intended for off-site disposal or land application. Construction of the CC/Aero CT Plant would generate typical construction debris and small volumes of solid waste.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Under Alternative A, proposed pipeline construction activities would result in the generation of solid and hazardous waste; however, it is not expected to result in generation of significant quantities of hazardous waste. Land clearing activities for construction along pipeline corridors will likely generate vegetative solid waste. Land clearing debris will be disposed as appropriate by either chipping on-site or transported to a land clearing debris landfill facility.

Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction and plant workers, the public, and the environment. Once construction is completed, the generation of hazardous waste during operations would be similar to the current waste generation rates.

Safety

Affected Environment

Public emergency services in the vicinity of the Kingston Reservation include law enforcement services, fire protection services, urgent care clinics, and a hospital in the City of Harriman. Public emergency services in the area of the proposed pipeline include urgent care clinics, hospitals, law enforcement services, and fire protection services. Along the Eastern Transmission Corridor, fire protection services would be provided by the Roane County or Anderson County Fire Departments, and law enforcement services would be provided by the Roane County or Anderson County Police Departments. Along the Western Transmission Corridor, fire protection services would be provided by the Cumberland County Fire Department, and law enforcement services would be provided by the Cumberland County Police Department.

Environmental Consequences

TVA Proposed Actions

During construction of the CC/Aero CT Plant, solar facility, BESS, and proposed transmission line, workers would have an increased safety risk that would be mitigated through BMPs and site-specific health and safety plans; however, there would remain minor safety risks from increased traffic during construction. TVA's Standard Programs and Processes related to safety would be adhered to during implementation of all the action alternatives. 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 (OSHA). TVA and its contractors are required to comply with OSHA regulations and follow a Site-Specific Safety & Health Plan.

General public health and safety would not be at risk in the event of an accidental spill on-site due to precautionary measures. Atmospheric pollutant emissions would be reduced as a result of coal generation replacement. See the air quality section for more information on decreased air pollutants.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

During construction of the pipeline, workers would have an increased safety risk that would be mitigated through BMPs and site-specific health and safety plans; however, there would remain minor safety risks from increased traffic during construction. ETNG has outlined various preventive, emergency, patrolling, and safety measures in Resource Report 11 (ETNG 2023l). These measures include design specifications, selection of suitable construction materials, the use of a cathodic protection system to prevent corrosion, the installation of remote-control shutoff valves and sectionalizing block valves, and comprehensive patrols by well-qualified personnel. The pipeline would also be monitored 24/7 by qualified operators in a high-tech control center located in Houston, Texas, and a secondary Pipeline Control Center in Nashville, TN. ETNG pipeline facilities would be built to meet or exceed the DOT safety standards.

General public health and safety would not be at risk in the event of an accidental spill on-site due to precautionary measures. The greatest hazard during pipeline construction and operation is a fire that may result in the event of a major pipeline rupture or leak. A number of precautionary systems and response measures would be in place to mitigate this risk to workers and the public.

Socioeconomics

Affected Environment

The Kingston Reservation labor market area, which includes counties in TN, and the pipeline and transmission corridors socioeconomic study areas, which include census tracts in TN, are largely rural. From 2010 to 2020, population growth was generally less than the growth for TN, for the most part. Based on the 2017-2021 American Community Survey (ACS) 5-year estimates (ACS 2021), the populations were generally older than the overall state population. The percent of high school graduates was generally slightly lower than that of the state. Housing units were generally owner-occupied and varied in age compared to those from across the state. The study areas had varied unemployment rates with approximately one half being higher than the state unemployment rate and one half being lower compared to the state unemployment rate. Generally, per capita income was lower when compared to the state. A comparison of local and state levels in the study areas indicated that employment in the education industry was at comparable levels between the counties and TN. Manufacturing, education services, and healthcare generally lead the industries for employment. Construction also employs larger percentages of people in the Kingston labor market area, accounting for generally 5 to 15 percent of employment. Roane County and two other affected counties, however, have lower percentages of civilians employed in construction as compared to the state percentage.

KIF directly employs 200 annual staff in a range of positions, such as general laborers, steamfitters, machinists, electricians, analysts, administrators, and supervisors. The KIF average annual salary is $53,945. KIF also employs contractors for both short- and long-term operations labor support and contracts with coal and limestone mining operations and transportation companies that support additional employment and account for substantive contributions to the area economy. Indirect and induced effects on the local economy associated with KIF occur through effects to sales, income, and employment in the region and the recirculation of money received through direct and indirect income sources and subsequent creation of new jobs and economic activities.

Environmental Consequences

TVA Proposed Actions

With KIF retirement, contracts associated with coal operations and indirect and induced economic activities would be canceled or ceased. Approximately 200 people currently employed by KIF may become temporarily unemployed. TVA would help offset this loss by placing some interested employees in open positions across TVA's service region, which may include the proposed CC/Aero CT Plant once constructed and operational. KIF employees and associated family members may also temporarily relocate for work or follow recent depopulation trends and permanently relocate elsewhere, though these changes may affect familial and community relations in the labor market area. The retirement of the KIF coal facilities may result in indirect employment effects to the nearby mining, trucking, and barge industries and likewise affect familial and community relations in the region from which these KIF products are purchased.

Employment in relation to construction and operations of the new CC/Aero CT Plant, switchyard, and transmission connections on the Kingston Reservation, would include new, temporary, and permanent employment options in the KIF labor market area. Effort would be made to locally source employees for the Kingston project.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Employment in relation to construction and operations of the natural gas pipeline and associated gas system infrastructure would provide new, temporary, and permanent employment options in the pipeline and transmission corridors socioeconomic study area. An estimated 2,505 persons are anticipated to be directly employed during construction and approximate 521 additional persons are anticipated to be employed indirectly over the period of construction with 30 to 50 percent of employment expected to occur from within the labor market.

Noise

Affected Environment
Noise generating sources in the vicinity of the project site include boat traffic, routine vehicle operations at the project site, and the existing coal facility. Sensitive noise receptors in the vicinity of the Kingston Reservation include mostly residences with some commercial areas. The Eastern and Western Transmission corridors are within the vicinity of many noise receptors, consisting of mostly residences and vacant buildings, with some businesses, churches, farm buildings, industrial areas, schools, and campgrounds/sports fields. Sensitive noise receptors in the vicinity of the proposed pipeline corridors include mostly residences/vacant buildings with some businesses, churches, farms, and industrial areas, and one sports field.

Environmental Consequences

TVA Proposed Actions
Temporary and minor noise effects would occur during deconstruction and demolition of the KIF coal units and because of construction traffic for the CC/Aero CT Plant and related transmission lines. The use of explosives for portions of the demolition activities may result in moderate but temporary noise effects. With warning to the public prior to blasting activities, residents would be prepared for a single loud noise; therefore, direct impacts to noise levels in the area associated with blasting would be minor and temporary.

Noise effects from construction-related traffic are expected to be temporary and minor. Most noise disturbances would occur during construction of Alternative A components. Typical noise levels from construction equipment used for the CC/Aero CT Plant, 3- to 4-MW solar, BESS, and transmission line components are expected to be 85 dBA or less at a distance of 50 feet from the construction activities (Federal Highway Administration [FHWA] 2017). The increase in current noise levels is estimated to be less than 3 dBA. Construction would not result in the generation of, or exposure of persons to, excessive noise or vibration levels for lengthy periods, and noise mitigation efforts would be implemented by TVA (Appendix G).

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Temporary and minor noise effects would be anticipated during construction activities for the ETNG Construction ROW, like those from TVA actions proposed under Alternative A. After the construction of the pipeline, there would be little to no noise during its operation aside from occasional maintenance activities, including the periodic mowing of the pipeline ROW.

Ambient sound surveys and acoustical analysis for the NSAs nearest to the compressor station will be completed to determine operational noise impacts and appropriate control measures as a part of ETNG's final Resource Reports to be submitted to FERC.

Visual Resources

Affected Environment

Aside from the Kingston Reservation, the surrounding region is undeveloped with residential development to the west and commercial development in the vicinity of I-40 to the south. Scenic attractiveness of the area is considered common, and scenic integrity is considered moderate due to human alteration in the area. The ratings for scenic attractiveness assigned to the project sites are due to the ordinary or common visual quality. The proposed CC/Aero CT Plant site is an area of common scenic attractiveness, as the site contains viewscapes comparable to the surrounding land use. The viewscape of the proposed pipeline and transmission line corridors are pre-disturbed open space, maintained ROWs, and forest.

Environmental Consequences

TVA Proposed Actions

Most of the D4 actions are not expected to be discernible due to the screening effects of terrain and overall distance, nor would they contrast with the overall landscape. The proposed CC/Aero CT Plant would generally be absorbed by surrounding industrial components and would become visually subordinate to the overall landscape character associated with the plant site. The viewscape of the existing transmission corridors proposed for upgrades consists of maintained ROWs, forest, and pre-disturbed open space. The proposed transmission upgrade activities may result in a minor and temporary disturbance of the viewscape of the transmission corridors during the completion of the upgrade activities, primarily from the presence of equipment and workers.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

While most of the proposed pipeline would not be visible once buried and operational, based on the desktop review of the TVA Expanded Construction ROW, there would be permanent visual effects due to the conversion of forest to fields. Permanent visual effects would occur as a result of the construction of the aboveground natural gas structures including the electric-drive compressor station and areas along the pipeline and ROWs where forestland is converted to maintained open space. Approximately 113 miles of the proposed 122-mile pipeline route would be co-located with the existing 3100 Line ROW, which reduces visual discord and wooded areas that would be cleared, as the 3100 Line ROW is already maintained open space. Where mitigation is necessary due to adverse visual impacts, fencing and vegetative screening would be utilized. Overall, the construction of the pipeline would result in temporary visual impacts during active construction and permanent visual changes due to the cleared permanent ROW in wooded areas and the installation of pipeline markers.

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[2]M: Fish Impingement at Kingston Fossil Plant During 2004 through 2006. Historical report provided in references cited and removed from Appendices.

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SYMBOLS, ACRONYMS, AND ABBREVIATIONS

Acronym	Description
AADT	Annual Average Daily Traffic
AATR	After-Action Technical Review
AC	Alternating Current
ACM	Asbestos-Containing Material
ADA	Americans with Disabilities Act
AERO	Aeroderivative
AJD	Approved Jurisdictional Determination
Alternative A	Action Alternative A
Alternative B	Action Alternative B
ANS	Aquatic Nuisance Species
APE	Area of Potential Effect
ARAP	Aquatic Resources Alteration Permit
ATWS	Additional Temporary Workspace
BA	Biological Assessment
BACT	Best Available Control Technology
BADW	Bottom Ash Dewatering
BATW	Bottom Ash Transport Water
BESS	Battery Energy Storage System
BG	Block Group
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
BO	Biological Opinion
B.P.	Before present
CAA	Clean Air Act
CC	Combined Cycle
CCR	Coal Combustion Residuals
CCR Rule	Disposal of Coal Combustion Residuals from Electric Utilities final rule
CCS	Carbon Capture and Sequestration
CCW	Condenser Cooling Water
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRA	Cultural Resource Analysists, Inc.
CT	Combustion Turbine
CWA	Clean Water Act
D4	Decommissioning, Deactivation, Decontamination, and Demolition

Acronym	Description
DBA	Doing business as
dBA	A-Scale Weighting Decibels
DC	Direct Current
DCH	Designated Critical Habitat
DEIS	Draft Environmental Impact Statement
DER	Distributed Energy Resources
DO	Dissolved Oxygen
DOJ	Department of Justice
DOM	Domestic Water Supply
DR	Demand Response
Dth/d	dekatherms per day
E&SCP	Erosion & Sediment Control Plan
EA	Environmental Assessment
EFH	Essential Fish Habitat
EI	Environmental Inspector
EIS	Environmental Impact Statement
EJ	Environmental justice
EJScreen	Environmental Justice Screening and Mapping Tool
ELG	Effluent Limit Guidelines
EMA	Emergency Management Agency
EMD	Electric Motor Driven
EMF	Electromagnetic Field
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
ETNG	East Tennessee Natural Gas
ETW	Exceptional Tennessee Waters
FAL	Fish and Aquatic Life
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FERC Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
FERC Procedures	Wetland and Waterbody Construction and Mitigation Procedures
FGD	Flue Gas Desulfurization
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
FRP	Flood Risk Profile
FSLG	TVA Flood Storage Loss Guideline
FSZ	TVA Flood Storage Zone
GHG	Greenhouse Gas
GIS	Global Information System
GWP	Global Warming Potential
HAP	Hazardous Air Pollutants

Acronym	**Description**
HDD	Horizontal Directional Drilling
HP	Horsepower
HRSG	Heat Recovery Steam Generator
HUD	U.S. Department of Housing and Urban Development
Hz	Hertz
I-40	Interstate 40
IMP	Internal Monitoring Point
IPaC	Information for Planning and Consultation
IRP	Integrated Resource Plan
IRR	Irrigation
IWG	Interagency Working Group on Social Cost of Greenhouse Gases
IWS	Industrial Water Supply
JD	Jurisdictional Determination
KIF	Kingston Fossil Plant
kV	Kilovolt
LCA	Life Cycle Analysis
Ldn	Day-Night Sound Level
LEP	Limited English proficiency
L_{eq}	Equivalent Sound Level
LF	Linear Foot/Feet
LOLE	Loss of Load Event
LPC	Local Power Companies
LWW	Livestock, Watering, and Wildlife
M&R	Meter and Regulating
m	Meters
MBTA	Migratory Bird Treaty Act
MECAA	Mid-East Community Action Agency
MMBtu	Million British Thermal Units
MGD	Million Gallons per Day
MLV	Mainline Valve
MMI	Modified Mercalli Intensity
MMT	Million Metric Tons
MOVES3	Motor Vehicle Emissions Simulator
MP	Milepost
MVA	Megavolt Amperes
MW	Megawatt
MWh	Megawatt-hour
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standard for Hazardous Air Pollutants
NH_3	Ammonia
NHD	National Hydrography Dataset

Acronym	Description
NHPA	National Historic Preservation Act
NLCD	National Land Cover Dataset
NO_x	Nitrogen Oxides
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NPV	Net Present Value
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NRTS	Naturally Reproducing Trout Stream
NSA	Noise Sensitive Area
NSPS	New Source Performance Standard
NWI	National Wetland Inventory
OL	Observation Location
ONRW	Outstanding National Resource Waters
OPGW	Fiber-Optic Ground Wire
OPP	Over Pressure Protection
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
O-SAR	Office-Level Sensitive Area Review
OSHA	Occupational Safety and Health Administration
PAR	Permanent Access Road
PAG	Potentially acid generating
PCB	Polychlorinated Biphenyl
PEM	Palustrine Emergent Wetland
PFC	Primary frequency control
PGA	Peak Ground Acceleration
PGV	Peak Ground Velocity
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIR	Potential Impact Radius
PFO	Palustrine Forested Wetland
PJD	Preliminary Jurisdictional Determination
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter (Less than or equal to 2.5 microns wide)
PPA	Power Purchase Agreement
ppm	Parts per Million
PSA	Power Service Area
PSD	Prevention of Significant Deterioration
PSS	Palustrine Scrub Shrub Wetland
PTE	Potential to Emit
PV	Photovoltaic
RBI	Reservoir Benthic Index

Acronym	Description
RBLC	Reasonably Available Control Technology, Best Available Control Technology/Lowest Achievable Emission Rate Clearinghouse Database
RCRA	Resource Conservation and Recovery Act
REC	Recreation
RFAI	Reservoir Fish Assemblage Index
RFFA	Reasonably Foreseeable Future Actions
RICE	Reciprocating Internal Combustion Engines
RM	River Mile
RMP	Risk Management Plan
ROD	Record of Decision
ROW	Right-of-Way
SAIPE	Small Area Income and Poverty Estimates
SCC	Social Cost of Carbon Dioxide
SC-GHG	Social Cost of Greenhouse Gases
SCM	Social Cost of Methane
SCN	Social Cost of Nitrous Oxide
SCR	Selective Catalytic Reduction
SEIA	Solar Energy Industries Association
SELC	Southern Environmental Law Center
SERVM	Strategic Energy and Risk Valuation Model
SHPO	State Historic Preservation Office
SO_2	Sulfur Dioxide
SPCC	Spill Prevention Counter Measure and Control Plan
SR	State Route
Study Area	Gas Pipeline Study Area
SWDA	Solid Waste Disposal Act
SWPPP	Stormwater Pollution Prevention Plan
TAR	Temporary Access Road
TCP	Traditional Cultural Properties
TDEC	Tennessee Department of Environment and Conservation
TDOA	Tennessee Division of Archaeology
TDOT	Tennessee Department of Transportation
TEMA	Tennessee Emergency Management Agency
TMDL	Total Maximum Daily Load
TN	Tennessee
TN AAQS	Tennessee Ambient Air Quality Standards
TN Ag Extension	University of Tennessee Extension’s
TRAM	Tennessee Rapid Assessment Method
TSCA	Toxic Substances Control Act
TS	Trout Stream
TSS	Total Suspended Solids
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency

Acronym	Description
TWS	Temporary Workspace
ULSD	Ultra Low Sulphur Diesel
USACE	U.S. Army Corps of Engineers
USBLS	U.S. Bureau of Labor Statistics
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USDOT	U.S. Department of Transportation
USEIA	U.S. Energy Information Administration
USEPA	U.S. Environmental Protection Agency
USET	United South and Eastern Tribes, Inc.
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
US PAD	U.S. Protected Areas Database
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WFGD	Wet Flue Gas Desulfurization
WMA	Wildlife Management Area
WOTUS	Waters of the United States
WWC	Wet Weather Conveyance
WWT	Wastewater Treatment

GLOSSARY OF TERMS

Aeroderivative Combustion Turbine (Aero CT) – Highly efficient peaking units that can ramp up very quickly to provide capacity and grid support when needed. Aero CTs 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 simple-cycle CTs as they provide high cycling capability and very fast startup.

Aqueous Ammonia System – A system that delivers aqueous ammonia using vaporizers (electric hot air or steam heat) to generate ammonia. Aqueous ammonia is considered a safer delivery system than systems using anhydrous ammonia, an extremely hazardous material.

Battery Energy Storage Systems (BESS) – Devices that store energy from the grid and/or renewable sources, typically during periods of surplus power or low demand.

Best Management Practice (BMP) – Practices chosen to minimize environmental effects to a variety of environmental resources. BMPs are typically standard practices and not customized for a particular proposed action.

Bus – A conductor, which may be a solid bar or pipe, normally made of aluminum or copper, used to connect one or more circuits to a common interface. An example would be the bus used to connect a substation transformer to the outgoing circuits.

Capacity Credit – The percentage of nameplate capacity that is counted as firm, dispatchable capacity for meeting peak load requirements.

Capacity Factor – The ratio of the electrical energy produced by a generating unit for a period of time considered to the electrical energy that could have been produced at continuous full power operation during the same period.

Carbon Capture and Sequestration – A process that involves capturing manmade carbon dioxide (CO_2) at its source and storing it permanently underground.

Coal Combustion Residual (CCR) – Ash and residuals from the flue gas desulfurization process (e.g., synthetic gypsum) produced by the combustion of coal to generate electricity.

Combined Cycle (CC) Plant – An electrical generating unit consisting of a natural gas-fired turbine and generator, a heat recovery steam generator that produces steam from the hot exhaust gases from the turbine, and a secondary turbine and generator powered by the steam.

Combustion Turbine (CT) Plant – An electrical generating unit fueled by either natural gas or oil consisting of a turbine and generator. CT plants can quickly begin generating electricity and are usually used to meet peak needs in power demand. Their efficiency is lower than that of CC plants. CT plants are also known as simple cycle plants to better distinguish them from combined cycle plants.

Cultural Resource – Resources may include historic buildings, structures, sites or objects, archaeological resources, Native American burials, funerary objects, sacred items, and other historic resources.

Cumulative Effect – Effects or impacts on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes the actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

Cycling – Short term and often large changes in the amount of electricity that a generating unit produces. The swinging of the generation load from high to low.

D4 – Decommissioning, Deactivation, Decontamination, and Demolition.

Deactivation (reroute and sever) – The process of removing energy sources from the structures to be demolished.

Decommissioning – The performance of activities required to ready a facility for deactivation, decontamination, and demolition.

Decontamination – Involves removing regulated materials, wastes, and chemicals prior to demolition.

Demolition – Removal of the plant and associated equipment and structures. Demolition also includes site restoration, creating conditions for proper site drainage, and stabilization.

Direct Effect – Effects or impacts which are caused by the action and occur at the same time and place.

Dispatchable Resource – Generating units whose electrical output can be adjusted (turned on or off) by operators according to system needs (electricity demand), unlike non-dispatchable renewable energy sources, such as solar photovoltaic or wind power, which are intermittent in nature. This may also include demand-side Demand Response products, which can be used for limited periods of time to reduce system load at peak hours.

Distributed Energy Resources (DER) – Small-scale unit of power provided by resources, such as solar, storage, wind, and combined heat and power, which are typically smaller in capacity than utility-scale and can be aggregated together in a program to function as a larger resource. They are typically owned by non-utility entities, such as homeowners (for rooftop solar) and commercial and industrial facilities.

Dual-Fuel Aero Derivatives – Gas turbine engines that can operate on both natural gas and liquid fuel. This allows the plant to switch between fuels depending on availability and cost, providing flexibility in fuel sourcing, and potentially reducing costs. Dual-fuel engines are commonly used in power generation facilities as they offer increased operational reliability and resilience, particularly during times of fuel supply disruption or price volatility.

Endangered Species – Plants or animals that are in danger of extinction through all or a significant portion of their ranges and that have been listed as endangered by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR 424).

Environmental Assessment (EA) – An environmental assessment (EA) is prepared for a proposed action not qualifying as a categorical exclusion (CE) to determine whether an environmental impact statement (EIS) is necessary, or a finding of no significant impact (FONSI) can be prepared. An EA concisely communicates information and analyses about issues that are potentially significant and reasonable alternatives.

Environmental Impact Statement (EIS) – An environmental impact statement (EIS) is a detailed written statement that describes a proposed action and reasonable alternatives, including no action; analyzes the potential environmental impacts associated with the proposed action and alternatives; and identifies any mitigation measures to avoid, minimize, or compensate for impacts from a proposed action.

Environmental Justice (EJ) –The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

Ephemeral Stream – Rain-dependent stream that flows only after precipitation.

Federal Register – The official daily publication for rules, proposed rules, and notices of federal agencies and organizations, as well as executive orders and other presidential documents.

Firm, Dispatchable Power – Refers to a generating resource that can adjust power output up or down on demand within the specific operating limitations of that resource. Firm, dispatchable power ensures that utility companies, like TVA, can call on the generating capacity year-round, particularly during peak load events – those periods of maximum electricity demand from customers, typically late afternoon in the summer and before or around dawn in the winter. Provides a backstop for solar resources that are unable to or are very limited in their ability to meet maximum demand that occurs in the pre-daylight or early-daylight hours of the winter season.

Fault Induced Delayed Voltage Recovery (FIDVR) – The unexpected delay in the recovery of voltage to its nominal value following the normal clearing of a fault.

Flexibility – The extent to which a power system can modify electricity production or consumption in response to variability, expected or otherwise.

Floodplain – The lowland and relatively flat areas adjoining flowing inland waters and reservoirs. Floodplain generally refers to the base floodplain, i.e., that area subject to a 1 percent or greater chance of flooding in any given year.

Fugitive Dust – An air pollutant consisting of very small particles suspended in air from dispersed sources and not from a stack or duct.

Greenhouse Gas (GHG) – Gases in the atmosphere that absorb energy, slowing or preventing the loss of heat to space. Primary greenhouse gases of concern are carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Other greenhouse gases include ground-level ozone and water vapor.

Hydrogen - Elemental hydrogen is an energy carrier that must be produced from another substance. Hydrogen can be produced—or separated—from a variety of sources, including water, fossil fuels, or biomass and used as a source of energy or fuel. Hydrogen has the highest energy content of any common fuel by weight (about three times more than gasoline), but it has the lowest energy content by volume as a liquid (about four times less than gasoline).

Hydrogen co-firing – Co-firing is the combustion of two different fuels in the same combustion system. In this case, specifically refers to co-firing hydrogen with natural gas.

Hydrogen Production – It takes more energy to produce hydrogen (by separating it from other elements in molecules) than hydrogen provides when it is converted to useful energy. However, hydrogen is useful as a fuel because it has a high energy content per unit of weight, which is why it is used as a rocket fuel and in fuel cells to produce electricity on some spacecraft. Hydrogen is not widely used as a fuel now, but it has the potential for greater use in the future.

Indirect Effect – Effects or impacts which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Inertia – A property of matter by which it continues in its existing state of rest or uniform motion in a straight line unless that state is changed by an external force.

Intermittent Stream – Seasonal stream that flows during certain times of the year when smaller upstream waters are flowing and when groundwater provides enough water for stream flow.

Invasive Species – An alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

Inverter-Based Resource – Power generation where the inverter is supplied with direct current input and, using power electronics and control algorithms, creates an alternating current (AC) output. This type of generation is standard with solar arrays and battery storage.

Karst – An area where topography, with its characteristic erosional surface and subterranean features, is developed as the result of dissolution of limestone, dolomite, or other soluble rock. Characteristic physiographic features present in karst terrains include sinkholes, sinking streams, caves, and large springs.

Large: One of four descriptors used to characterize the level of impact in a manner that is consistent with TVA's current practice. Refers to environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Line-pack – The amount of gas stored in a pipeline at a given moment, which is used to meet fluctuations in demand and balance short-term imbalances between supply and demand.

Loss of Load Event (LOLE) – In the event of adverse condition or disturbance on TVA's system, or on any other system directly or indirectly interconnected with it, TVA may interrupt service to customers.

Minor: One of four descriptors used to characterize the level of impact in a manner that is consistent with TVA's current practice. Refers to environmental effects that are not detectable or are so minor that they would not noticeably alter any important attribute of the resource.

Mitigation – Measures that avoid, minimize, or compensate for the environmental impacts of an action.

Moderate: One of four descriptors used to characterize the level of impact in a manner that is consistent with TVA's current practice. Refers to environmental effects that are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

Nameplate Capacity –The maximum generating output that a power plant can produce under specific conditions designated by the manufacturer.

National Environmental Policy Act (NEPA) – The federal law that establishes a national policy on the environment and requires federal agencies to consider the effects of their proposed actions on the environment before final decisions are made and involve the public in the decision making. NEPA does not mandate particular results or substantive outcomes.

National Historic Preservation Act (NHPA) – The 1966 federal law that establishes a national preservation program and a system of procedural protections that requires federal agencies to identify and protect historic resources, including archaeological resources, at the federal level and indirectly at the state and local level. NHPA authorizes the establishment of the National Register of Historic Places.

National Register of Historic Places (NRHP) – A list of places and objects maintained by the National Park Service based on their integrity of location, design, setting, materials, workmanship, feeling and association, and: 1) association with important historical events; or 2) association with the lives of significant historic persons; or 3) embodiment of distinctive characteristics of a type, period, or method of construction or represent the work of a master, or have high artistic value; or 4) have yielded or may yield information important in history or prehistory.

Natural Gas Act (NGA) – A 1938 law regulating the transportation and sale of natural gas in interstate commerce and for other purposes.

No Action Alternative – The alternative in a NEPA study that would continue with the present course of action and in which the proposed activity would not take place.

No Impact (or "absent"): One of four descriptors used to characterize the level of impact in a manner that is consistent with TVA's current practice. Refers to a resource that is not present or, if present, would not be affected by project alternatives under consideration.

Notice of Intent (NOI) – A public notice that an agency prepares to signify beginning the preparation of an environmental impact statement.

Perennial Stream – A stream that typically has water flowing in it year-round.

Photovoltaic Power Generation – The direct conversion of light into electricity at the atomic level.

Potable Water – Water that is safe and satisfactory for drinking and cooking.

Power Purchase Agreements (PPA) – A contract between two parties, one who generates and intends to sell electricity, and one who is looking to purchase electricity, defining the commercial terms for the sale of electricity between the two parties.

Power Service Area (PSA) – The area in which TVA provides energy, which is an area that encompasses 80,000 square miles covering most of Tennessee and parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia.

Practicable – Refers to the capability of an action being performed within existing constraints.

Preferred Alternative – The action alternative in a NEPA study which the agency believes would fulfill its statutory mission and responsibilities, considering economic, environmental, technical and other factors, and would meet a proposed project's purpose and need.

Primary Frequency Response (PFC) – Primary frequency control (PFC) enables a frequency response to maintain grid stability. PFC maintains the correct frequency for a turbine/generator by adjusting the total MW output.

Prime Farmland – Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management.

Purpose and Need – A statement by an agency in a NEPA document to describe what it is trying to achieve by proposing an action. The purpose and need statement explain why an agency action is necessary and serves as the basis for identifying the reasonable alternatives that meet the purpose and need.

Reconductoring – To replace the cable or wire on an electric circuit, typically a high-voltage transmission line, usually to afford a greater electric-current-carrying capability.

Record of Decision (ROD) – The formal announcement by a federal agency, following the issuance of a final environmental impact statement, of the alternative that the agency decides to implement. It includes the reasons why the agency selected the alternative, identification of the alternative with the least environmental impacts, and mitigation measures, including any enforcement and monitoring commitments, for the selected alternative.

Reliability – The degree to which the performance of the elements in a bulk system result in electricity delivered to customers within accepted standards and in the amount desired.

Reserve Margin Target – Capacity carried for unplanned events related to weather, load forecast error, and system performance. Currently, TVA's summer reserve margin target is 18 percent and winter reserve margin target is 25 percent.

Reserve Margin Study – Routine probabilistic analysis to determine appropriate reserve margin targets to ensure resource adequacy for serving electricity demand in the Tennessee Valley service territory. It considers the uncertainty of unit availability, transmission capability, weather-dependent unit capabilities (e.g., hydro, wind, and solar), economic growth, and weather variations to compute expected reliability impacts and costs. TVA selects planning reserve margins for summer and winter that target an industry best-practice standard of one loss of load event (LOLE) in 10 years.

Rotating Generator – A device that converts mechanical rotation into direct current electric power using electromagnetism.

Shipper – An entity (person, company, or agency) that purchases services with respect to the transmission of natural gas by way of a natural gas transmission pipeline from the owner or operator of the pipeline, whether or not the gas is transported for the entity's own use.

Stability – The ability to return to normal or stable operation after having been subjected to some form of disturbance.

Selective Catalytic Reduction (SCR) – A clean air system used to reduce emissions of nitrogen oxides.

Surcharge – Adding rock or dirt to structure footing.

System Inertia - Inertia in power systems refers to the energy stored in large rotating generators and some industrial motors, which gives them the tendency to remain rotating. This stored energy can be particularly valuable when a large power plant fails, as it can temporarily make up for the power lost from the failed generator. This temporary response—which is typically available for a few seconds—allows the mechanical systems that control most power plants time to detect and respond to the failure.

Target Power Supply Mix – Final recommendation from TVA's 2019 IRP. This target, expressed in ranges, reflects the mix of supply and demand side resources that best position the Valley for success in a variety of alternative futures while preserving the flexibility necessary to respond to uncertainty.

Threatened Species – Any plants or animals that are likely to become endangered species within the foreseeable future throughout all or a significant portion of their ranges and which have been listed as threatened by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service following the procedures set out in the Endangered Species Act and its implementing regulations (50 CFR 424).

Title V (of the Clean Air Act) – Title V of the Clean Air Act (CAA) requires states to establish an air operating permit program for stationary sources that exceed major source thresholds, which are dependent on the attainment status of the area. The permits required by these regulations are often referred to as Title V permits.

Uprating – To increase the electrical features of a power line, such as allowing larger electrical clearances or improved electrical capacity, which increases the utilization factor of existing assets.

Wetland – An area inundated by surface or ground water with a frequency sufficient to support, and that under normal circumstances does or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

CHAPTER 1 – INTRODUCTION

1.1 Introduction and Background

The Tennessee Valley Authority's (TVA) Kingston Fossil Plant (KIF or KIF Plant) is located in Harriman, Roane County, Tennessee (TN), approximately 35 miles west of downtown Knoxville. The KIF Plant is situated on a 2,254-acre plot of land (i.e., Expanded Kingston Property), which includes additional property purchased by TVA after 2008 and the 1,255-acre original plant site (Kingston Reservation), which is situated on a peninsula formed by the confluence of the Clinch and Emory rivers (see Figure 1.1-1).

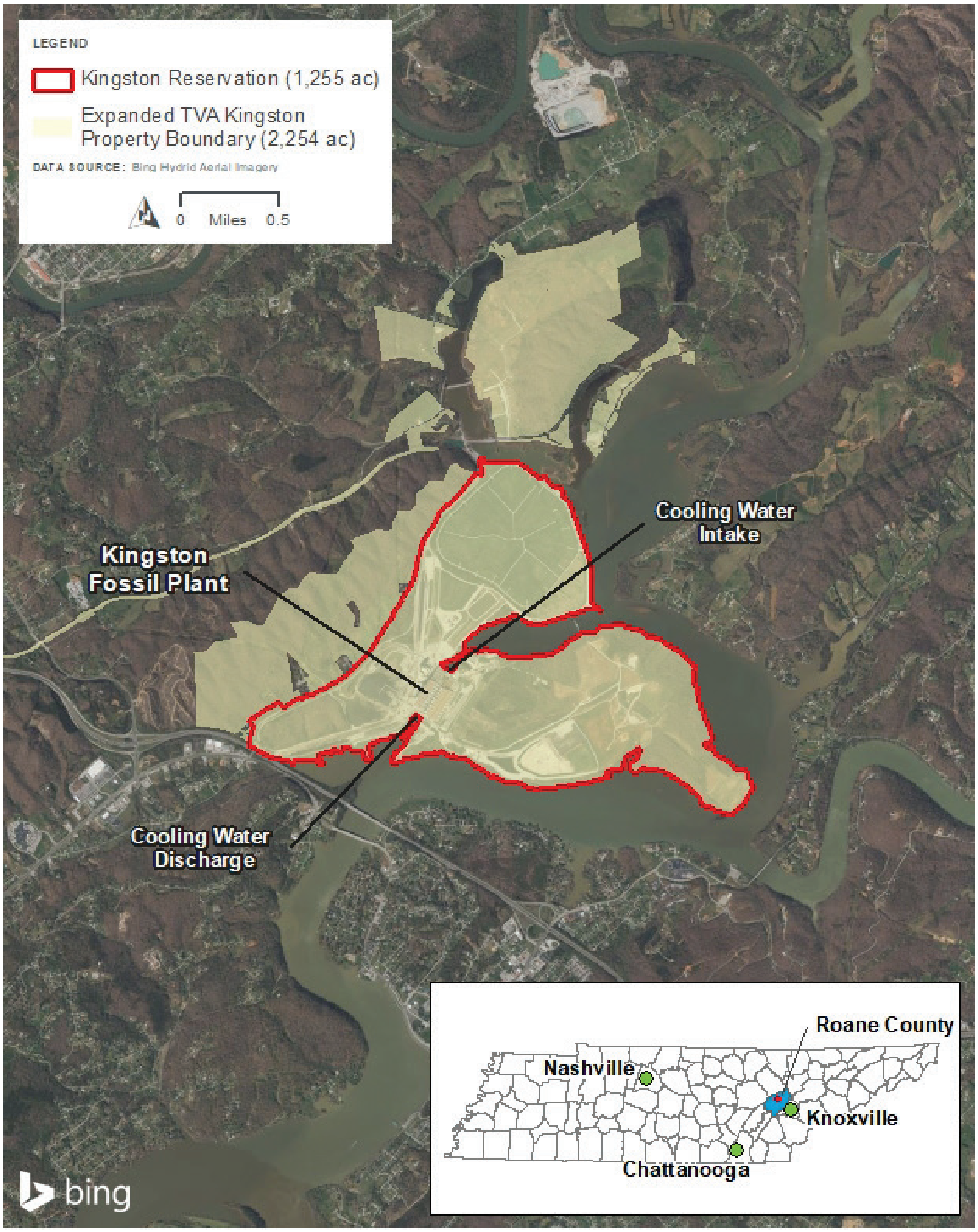

Figure 1.1-1. Kingston Reservation Boundary

The KIF Plant was originally constructed between 1951 and 1955 and consists of nine, coal-fired steam-generating units, all of which are in operation. Based on TVA's November 2023 10-K filing with the Securities and Exchange Commission (TVA 2023c), KIF has a summer net generating capability of 1,298 MW; this capacity is less than the 1,398 MW reported for 2020 due to long-term fuel blend changes at KIF[6]. Frequent cycling of the large KIF units, reflected in start-up/shutdown events currently averaging greater than 85 times per year, is outside the intended design of the plant resulting in increased wear and tear and presents reliability challenges that are difficult to anticipate and expensive to mitigate. KIF has also experienced a significant decline in material condition over the last five years, including the need for repairs to the lower boiler drum, which are symptomatic of age-driven material condition failures (i.e., failures due to aging and wear and tear) that are difficult to proactively address.

In June 2019, TVA published the 2019 IRP (TVA 2019a), which is a comprehensive study of how TVA can best meet the future energy demand in its power service area. It evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential energy resource additions and retirements throughout TVA's public power service area (PSA), which encompasses approximately 80,000 square miles covering most of TN and parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia. TVA noted in its development of the 2019 IRP that the quantity of air pollutant emissions, intensity of greenhouse gas (GHG) emissions, and coal waste generation are anticipated to decrease under all strategies upon the utilization of a target power supply mix; therefore, use of this target power supply mix was adopted by TVA's Board. An environmental impact statement (EIS) was completed for the 2019 IRP. This KIF EIS tiers from the 2019 IRP EIS (TVA 2019b) and aligns with the 2019 IRP (TVA 2019a) findings and target supply mix.

After the 2019 IRP (TVA 2019a) was published, TVA conducted end-of-life evaluations of its operating coal-fired generating plants not already scheduled for retirement to inform long-term planning (Appendix A). TVA's Aging Coal Fleet Evaluation (TVA 2021g) confirmed that TVA's coal fleet is among the oldest in the nation and is experiencing deterioration of material condition and performance challenges. Major components at KIF were assessed for replacement and potential operation beyond 2027 and the oil-filled transformers, steam turbines, and excitation systems were all found to be in poor condition. The boilers were noted as being in marginal condition. As TVA continues to transition much of its fleet to cleaner and more flexible technologies, KIF would continue to be challenged to reliably operate. Based on this analysis, TVA proposes retiring all nine KIF units and the addition of at least 1,500 MW of firm, dispatchable replacement generation to recover generation capacity lost from retirement of KIF and accommodate load growth, by the end of 2027. Replacement generation of this capacity, plus additional capacity to account for load growth, would allow TVA to recover the reliable capacity of the nine retiring KIF coal units, as well as account for load increases driven by population growth from an increasing trend of migration to the TN Valley, paired with increasing economic development. The

[6] Although the original nameplate capacity of KIF's nine units was 1,700 MW, effects of aging equipment and long-term fuel blend changes have reduced the actual annual generation at KIF from 1,398 to 1,298 MW (TVA 2023c). As discussed in Section 1.2, at least 1,500 MW of firm, dispatchable generation capacity would be needed to recover generation capacity lost from the retirement of KIF, and to account for growth in demand in the Tennessee Valley from growing populations and increased economic development.

replacement generation would need to be online prior to retirement of the nine KIF coal units to maintain system reliability.

Performance challenges with the operation of the KIF Plant units are projected to increase in the future because of advancing age and difficulty of adapting the coal fleet's generation to the changing generation profile. The continued long-term operation of some TVA coal plants, including the KIF Plant, contributes to environmental, economic, and reliability risks. Additionally, depending on the location of the replacement generation, regional transmission system upgrades would need to be operational prior to the retirement of all nine KIF coal units. KIF's location on the transmission system, specifically on the 161-kilovolt (kV) system near the Knoxville load center, makes KIF an integral part of the system power flows and stability. The retirement of KIF would create a large gap in the power system in the Knoxville area and would decrease the system stability for Watts Bar and Sequoyah nuclear plants. Depending on the location of the replacement generation, regional transmission system upgrades would need to be operational prior to the retirement of all nine KIF coal units. Significant transmission system upgrades in the local area would be needed if replacement generation is not provided and located on the 161-kV system near Knoxville. Retirement of KIF without replacement generation in the area or appropriate transmission upgrades would significantly impact the ability to add additional load in the area, degrade the stability of Watts Bar and Sequoyah nuclear plants to a point where generation would need to be curtailed, and potentially violate North American Electric Reliability Corporation (NERC) Transmission Planning (TPL-001) standard criteria (NERC 2013). Replacement generation provides capacity for load growth, system reliability, resiliency, and operational flexibility across the entire system by ensuring TVA maintains a diverse mix of generating asset types and locations.

TVA has prepared this EIS pursuant to the National Environmental Policy Act (NEPA) and TVA's procedures for implementing NEPA to assess the potential environmental impacts associated with the proposed KIF retirement, demolition of nine KIF units, and the addition of replacement generation facilities.

1.2 Purpose and Need for Action

Consistent with the 2019 IRP (TVA 2019a), the Aging Coal Fleet Evaluation (TVA 2021g), and the Strategic Intent and Guiding Principles (TVA 2021h), the purpose of the Proposed Action is to retire and decommission all nine of the existing KIF coal-fired units by the end of 2027 and implement replacement generation that can supply at least 1,500 MW of firm, dispatchable power by the time the units are retired, which accounts for replacement generation plus capacity for load growth.

The need for the Proposed Action is to ensure that TVA continues to meet year-round generation and peak capacity demands upon the retirement of the KIF coal-fired units while still maintaining the planning reserve margins and to provide transmission system voltage support to the local area that is needed to maintain overall system stability and reliability. The Proposed Action aligns with the 2019 Integrated Resource Plan (IRP), which remains current and valid to guide future generation planning consistent with least system cost principles.

Additional background information that informs the project purpose and need for the Proposed Action is provided in the following sections.

1.2.1 Least-Cost Planning and the TVA Act

TVA's core statutory objectives under the TVA Act are to provide the people of the TN Valley with low-cost and reliable electricity, environmental stewardship, and a prosperous economy (16 U.S.C. §§ 831 et seq.). Consistent with, and as mandated by the Energy Policy Act of 1992, TVA engages in a long-range, "least-cost planning" process that "evaluates the full range of existing and incremental resources (including new power supplies, energy conservation and efficiency, and renewable energy resources) in order to provide adequate and reliable service to electric customers of [TVA] at the lowest system cost" (16 U.S.C. § 831m-1(b)(1)). TVA engages in the "least cost planning" process at the time it periodically updates the IRP.

1.2.2 Integrated Resource Planning

Every few years TVA publishes an IRP, a comprehensive study of how TVA can best meet the future energy demand in its power service area (PSA), which encompasses approximately 80,000 square miles covering most of TN and parts of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia. To accomplish the best blend of diverse resources for capacity to meet the TN Valley's future demand for power, TVA leverages a least-cost system planning approach. The IRP recommendation, or the target power supply mix, provides ranges of MW additions and subtractions that serve as the central mechanism in establishing TVA's overall Asset Strategy.

TVA conducts the IRP process in a transparent, inclusive manner, using input from a diverse group of stakeholders, inclusive of the public, to help shape the IRP. TVA typically updates its IRP every four to five years to ensure that its power system adapts to changing conditions, power demands, and regulations. Prior to the 2019 IRP (TVA 2019a), the most recent TVA IRP updates were released in 2011 and 2015. TVA's planning assumptions are regularly updated between IRPs. The comprehensive and broad long-term planning and analyses underlying TVA IRPs consistently identify the need for a diverse set of resources and load reduction measures, along with natural gas generation, solar, and BESS resources, with the specific amounts of each driven by market conditions. As such, the Kingston Retirement Project assumptions are aligned with the 2019 IRP recommended target supply mix, which helps form the basis for the purpose and need of the KIF Retirement project. See Appendix B for more information on how project inputs compare to the 2019 IRP.

This final EIS (FEIS) tiers from the 2019 IRP EIS (TVA 2019b), with the combined analyses informing TVA's Board as the agency plans its future power supply. TVA issued, in May 2023, a Notice of Intent (NOI) in the Federal Register to prepare the 2024 IRP and EIS (TVA 2023e). The KIF Retirement Project was initiated in 2021 as a site-specific implementation of the current 2019 IRP, which remains valid (see Section 4.1.3). The proposed decision on the KIF Retirement Project that is analyzed in this EIS is consistent with the 2019 IRP and the target power supply mix identified therein.

1.2.2.1 2019 Integrated Resource Plan

The target power supply mix described in the 2019 IRP (TVA 2019a) identified the addition of up to 500 MW of demand response and 2,200 MW of energy efficiency (demand-side options); 4,200 MW of wind; 5,300 MW of storage; 8,600 MW of combustion turbines (CT); 9,800 MW of combined cycle (CC); and 14,000 MW of solar by 2038. The target power supply mix recommended in the 2019 IRP optimizes TVA's ability to create a more flexible power-generation system that can successfully integrate increasing amounts of renewable energy sources while ensuring reliability. The 2019 IRP acknowledged that reliance on only one strategy would not ensure reliability and resilience and, therefore, provided for a target supply mix made up of different generation resources. Additionally, the 2019 IRP recommended a series of near-term actions, including evaluating engineering end-of-life dates for aging fossil units, to determine whether retirements greater than 2,200 MW would be appropriate to inform long-term planning.

The strategic direction established by the 2019 IRP (TVA 2019a), and results from recommended near-term actions, formed the basis for TVA's Asset Strategy, which continues to support affordable, reliable, and cleaner energy for customers. Specific resource technologies included in TVA's Asset Strategy, and discussed in this EIS, 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 MW of solar by 2035 to meet customer demands and system needs, complemented with storage;
- Using natural gas-fueled generation to enable needed coal retirements and solar expansion as other technologies develop;
- Leveraging demand-side options, in partnership with local power companies (LPCs); and
- Partnering to develop new carbon-free technologies for greater reduction in carbon emissions.

The inclusion of natural gas-fired CTs and CCs in the target power supply mix is driven by the demand for reliable electricity, the increased amount of solar capacity being added to TVA's system, system firm capacity requirements, commodity prices, costs relative to alternative resource options, and transmission system reliability (see TVA's 2019 IRP and IRP EIS [TVA 2019a and 2019b]). TVA's target power supply mix includes firm, dispatchable power, which refers to a generating resource that can adjust power output up or down on demand within the specific operating limitations of that resource, thus increasing system reliability and resiliency[7]. Retirement of Aging Coal Units

In 2021, TVA completed an evaluation of its existing coal fleet: the Aging Coal Fleet Evaluation (2021g). This analysis considered whether the complete retirement of TVA's coal fleet, about 6,000 MW in total, should be expedited beyond the 2,200 MW of coal capacity retirement by 2038 that was identified in the target power supply mix of the IRP (TVA 2019a). The operating cost and reliability challenges posed by the aging coal fleet

[7] TVA notes that Chapter 5 of TVA's 2019 IRP (TVA 2019a) accounts for the resiliency of TVA's power system, detailing the annual outage rate assumptions for all selectable resources including CC, CT, solar and battery (Alternatives considered in the final EIS). For plans between IRPs, TVA regularly updates outage rates based on actual performance, and current planning assumptions remain largely consistent with those discussed in the IRP. Appendix D of the 2019 IRP explains how the reserve margin study approach and analysis captures uncertainty that arises due to weather, load forecast error, and plant outages. The decision evaluated in the Kingston EIS falls within the parameters of the broader, comprehensive asset strategy established by the 2019 IRP, which considers the resiliency of TVA's entire power system. Similarly, the IRP's evaluation of risk and the required planning reserve constraints appropriately account for risks that are inherently part of the broader asset strategy with which this decision evaluation and analysis is aligned.

drove the need for the Aging Coal Fleet Evaluation. Additional drivers for conducting the Aging Coal Fleet Evaluation included:

- Substantial performance and cost risk from operating a coal fleet composed of some of the oldest plants (between 50 and 69 years old) in the nation;
- Public, political, regulatory, and marketplace pressures to reduce coal generation and its environmental effects;
- Integration of increasing amounts of intermittent, renewable resources and distributed resources, which drives the need for increased system flexibility;
- Long-term financial health of the coal mining industry, which could influence both the supply and price of coal; and
- Development of a plan to systematically replace coal plants reaching the end of their useful lives, allowing for more effective and proactive management of the financial, logistical, and workforce impacts.

TVA's Aging Coal Fleet Evaluation (TVA 2021g) concluded that a phased plan to retire TVA's coal fleet by approximately 2035 is aligned with least-cost planning and reduces economic, reliability, and environmental risks. The evaluation also recommended specific planning assumption retirement dates for each of the coal plants to facilitate the 2035 end-of-life timeline for the coal fleet (Figure 1.2-1). These retirement dates were identified based on a high confidence of execution while also balancing economics and system reliability needs.

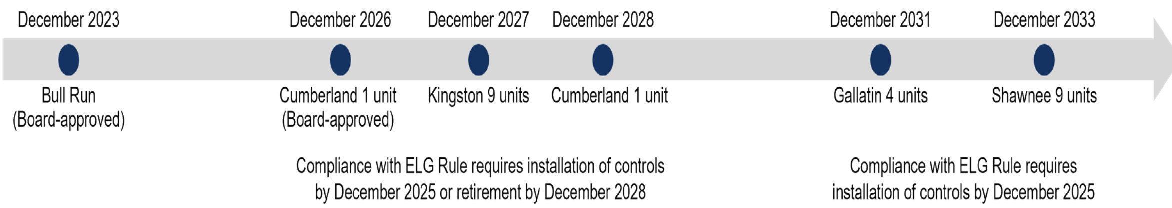

Figure 1.2-1. Planned Retirement Dates for TVA Coal Plants

The planning assumptions for coal retirement dates outlined in the Aging Coal Fleet Evaluation balances economics, system reliability, and portfolio needs. Kingston and Cumberland Fossil Plants[8] are retired sooner due to Cumberland's lack of flexibility and Kingston's high costs and challenged conditions. Based on TVA's asset health tracking information (TVA 2023a), as of November 2023, approximately 72 percent of the remaining coal fleet is in poor, marginal, or fair condition. Major facility components that are in

[8] On January 10, 2023, TVA issued a Record of Decision (ROD) to adopt TVA's preferred alternative, Alternative A of the Cumberland Retirement EIS, which involves the retirement and demolition of TVA's two-unit, coal-fired Cumberland Fossil Plant (CUF) and the construction and operation of a natural gas-fueled CC plant on the CUF Reservation to replace the generation capacity of one of the two retired units. This least-cost alternative would achieve the purpose and need of the project to retire and decommission the two CUF units, one unit by the end of 2026 and the other unit by the end of 2028, and to provide replacement generation that can supply 1,450 MW of firm, dispatchable power by the time the first unit is retired by the end of 2026 to ensure that TVA is able to meet required year-round generation, maximum capacity system demands, and planning reserve margin targets, particularly during peak load events.

marginal to poor condition include the oil-filled transformers, steam turbines, excitation systems, boilers, turbine controls, and switchgear boards (TVA 2021g).

The results of the Aging Coal Fleet Evaluation (TVA 2021g) confirmed that TVA's coal fleet is among the oldest in the nation and is experiencing material condition and performance challenges typical for plants approaching the end of their useful lives. Age-driven issues are difficult to proactively address and can result in unplanned or extended unavailability of these units. This may increase replacement power and plant maintenance costs and could impact overall system reliability if coal-fired plants are unavailable at times of high system loads. If replacement generation is not in place, it would leave TVA short on required generation and capacity to meet system demands and planning reserve margin targets, which could result in potential outages and violation of NERC standards. TVA would need to operate the coal units outside of their intended design (i.e., near the full power output for many weeks or months at a time). For example, increases in baseload nuclear generation and expansion of intermittent solar generation require KIF's large, typically baseload-serving coal units to operate more flexibly, such as ramping power output up and down throughout the day or cycling on and off more frequently, outside of traditional operations. Because the coal fleet no longer fits TVA's overall portfolio, the coal fleet is projected to experience increasing performance challenges, which would continue to add economic, reliability, and environmental risks to the system.

1.2.2.2 Timing Needs for Coal Unit Retirement and Replacement Generation

Based on TVA's Aging Coal Fleet Evaluation (TVA 2021g), TVA identified planned retirement dates that would advance the overall purpose of the 2019 IRP of achieving the optimal blend of energy resources required to support TVA's clean energy transition in a manner consistent with least-cost planning principles. Planned retirement dates were identified for the entire coal fleet based on the relative condition of plant facilities, cost, flexibility, and environmental impacts. TVA's evaluation determined that retiring the coal fleet by 2035 would best be achieved by using a phased retirement approach to achieve the best balance between economics and system reliability (see Figure 1.2-1). Several retirement scenarios were evaluated for KIF, resulting in the recommended retirement date to be by the end of 2027.

To meet TVA's phased 2035 retirement plans for the coal fleet, at least 1,500 MW of operational replacement generation is needed to replace the nine retiring units at KIF and must be operational before the KIF units are retired by the end of 2027. If replacement generation is not in place at the time of KIF retirement, TVA's required generation and capacity to meet system demands and planning reserve margin targets would not be met and could result in system outages and other customer impacts. A delay in implementing the 1,500 MW of replacement generation would likely lead to the need for continued operation of the coal units for an undetermined period of time. The cost to operate and maintain the coal units at KIF beyond their planned retirement date is expected to increase (see Section 8.2.6 of the 2019 IRP [TVA 2019a]). Further, a significant monetary investment would be required to comply with the requirements of the 2020 ELGs and other environmental regulations. Operation beyond 2027 would create operational, and therefore reliability, risk in TVA's system due to the deteriorating condition of the coal units. In addition, operation of the KIF Plant beyond 2027 is likely to result in cascading delays for the later planned retirements in TVA's phased 2035 coal fleet retirement plan and cause delay in TVA's plans to integrate more solar assets onto the system.

1.2.2.3 Firm, Dispatchable Power

At least 1,500 MW of firm, dispatchable generation would be required by the end of 2027 to replace the current firm, dispatchable generation of the nine retiring units at KIF. To retain all the attributes of the KIF generated power on the system, including the ability to adjust power output on demand, the replacement generation must be able to reliably meet system peak load demands. This would allow TVA to meet generation capacity year-round, particularly during peak load events (i.e., periods of maximum electricity demand from customers, typically late afternoon in the summer and before or around dawn in the winter). This is particularly important in the winter because firm, dispatchable generation provides a backstop for solar resources that are unable to or are very limited in their ability to meet maximum demand that occurs in the pre-daylight or early-daylight hours.

For example, natural gas-fired CC and CT units can be operated year-round to meet the fluctuating demand on the power system, including overnight, during cold pre-dawn winter mornings, and during warm summer evenings as solar generation fades. Solar resources are typically only available on average about 20 to 25 percent of the year, and their availability can vary significantly during daylight hours as cloud cover and precipitation events occur. As such, solar power must be paired with firm, dispatchable power or battery storage to meet year-round capacity needs. Battery storage pairing is constrained in that batteries are energy limited (e.g., typically providing a 4-hour duration) and are net consumers of electricity. Pairing solar with flexible, firm, dispatchable resources provides a backstop to ensure system reliability is maintained during the hours that solar resources are not available, and during daylight hours when solar resources may quickly ramp up or down in response to local weather conditions. The inclusion of firm, dispatchable power generation from, for example, natural gas-fired CTs and CCs, effectively enables system-wide integration of solar and the retirement of TVA's remaining coal plants while providing transmission-related benefits to ensure reliability and stability by maintaining dynamic reactive power and inertia[9] in the area. Dynamic reactive power is complex power produced by generation plants needed to maintain system stability and voltage under steady state and fault conditions. Inertia produced by spinning generation, such as CTs and CCs, helps maintain system stability and frequency by resisting sudden changes on the power system and adding strength to the area. (TVA 2019a).

1.2.2.4 Other Dispatchable Power Solutions

TVA has evaluated whether a lesser amount of firm, dispatchable power, combined with solar and battery resources, could meet the project need to provide reliable, affordable replacement generation by 2027 when the KIF Plant is retired. Pairing solar resources with the appropriate level of battery storage can compensate for the deficiency to generate consistently, potentially increasing costs of generation, and introduces transmission stability and reliability issues that then must be addressed with transmission system improvements. KIF's location on the transmission system, specifically on the 161-kV system near the Knoxville load center, makes KIF an integral part of the system power flows and stability. The retirement of KIF would create a large gap in the power system in the Knoxville area and would decrease system stability for the Watts Bar and Sequoyah nuclear plants. Significant transmission upgrades in the local area would be needed if replacement generation is not relocated on the 161-kV system near Knoxville. Some BESS could be interconnected in the Knoxville area but would require transmission system upgrades

[9] A property of matter by which it continues in its existing state of rest or uniform motion in a straight line unless that state is changed by an external force.

(discussed further in next paragraph), would provide significantly less dynamic reactive power, would not provide stabilizing system inertia, and would require daily charging to deliver power during high load periods. Dynamic reactive power is complex power produced by generation plants needed to maintain system stability and voltage under steady state and fault conditions. Inertia produced by spinning generation, such as CTs and CCs, helps maintain system stability and frequency by resisting sudden changes on the power system and adding strength to the area. Currently, inverter-based resources, such as solar and BESS, do not provide system inertia and are slow to provide reactive power under fault conditions.

The addition of solar and a BESS as replacement generation would require transmission upgrades in the Knoxville area on the 161-kV system to support current and anticipated future load demands and stabilize the area. Transmission upgrades associated with stabilizing the Knoxville area and interconnecting the solar and BESS in a manner that ensures reliability would require additional time to complete. Based on current trends, TVA estimated that at most an additional 1,000 MW per year of solar and battery resources may be interconnected to TVA's system in addition to the solar and batteries already identified in the 2019 IRP (TVA 2019a). Historical TVA interconnection times indicate that approximately 5.4 years are required to bring a solar interconnection to commercial operations. It is estimated that it would take 8.4 years to bring the required solar and battery resources online in the Knoxville area following completion of site identification and acquiring control of the site, which would not allow the replacement power for KIF to be online in the timeframe needed. Combining a smaller gas plant with a solar and BESS scenario to support the retirement of the KIF Plant by the end of 2027 is not a viable alternative as it would not resolve these issues or avoid the transmission-related challenges described above.

1.2.3 Risks and Uncertainty

1.2.3.1 Growth in the Tennessee Valley and TVA Power Service Area

In 1950, about 2 percent of the energy used in the United States was delivered in the form of electricity. Today, this number has increased to approximately 22 percent and continues to grow (TVA 2023f). During the decade before the 2020 COVID pandemic, TVA's seven-state region saw almost no electric load growth. In the years since the COVID pandemic, the region has experienced tremendous economic growth, driven in part by a post-pandemic increase in migration into TVA's PSA by new residents, businesses, and major industries. The full-time work-from-home culture born from the COVID pandemic triggered large waves of migration across the country, with southern states comprising the fastest growing region in the nation.

A comparison of U.S. Census Bureau (USCB) population statistics (USCB 2023) for the counties in TVA's PSA to population statistics for all US counties combined was done for 2020 through 2022, and for USCB forecasted population data for 2023. From 2020 to 2021, the population of TVA's PSA grew to over ten million people and had a 0.6 percent growth rate, which was 3.8 times the U.S. population growth rate. The rate of population growth in TVA's PSA increased over 1.0 percent in 2022, and 2023 is forecasted to hit 1.5 percent population growth rate year over year, a rate that is 2.6 times the forecasted national growth rate for 2023 (USCB 2023). Based on the condition of TVA's aging coal fleet (including KIF), a documented increase in population size within TVA's PSA, and uncertainty surrounding the annual growth rates forecast for 2023 and beyond, the current

TVA power system capacity levels in the east TN (Kingston/Knoxville) region will not be sufficient and additional capacity is needed to maintain system reliability.

Until October 1, 2023, when a base rate increase was put into effect, TVA's base power rates had remained flat during the past four years while significant investments were made in TVA's PSA power system. Over the past ten years, TVA has invested $25 billion in existing and new generation. In addition, TVA is working to offset approximately 30 percent of forecasted new load growth in the next ten years through energy efficiency and demand response programs. TVA will invest $1.5 billion in fiscal years 2023-2027 in energy efficiency and demand response programs to accomplish this, continuing to help lower energy bills. TVA expects to build about 3,800 MW of new generation by 2028 to meet increasing energy demand and to add 10,000 MW of solar energy by 2035. TVA is focused on meeting growing electricity demand and achieving a net zero carbon future while maintaining energy security, reliability, and affordability.

1.2.3.2 Winter Storm Elliott

On December 23, 2022, Winter Storm Elliott impacted most of the eastern continental United States, bringing heavy snowfall and high winds to the Midwest and Northeast and freezing rain and high winds to the South. The powerful storm brought record-breaking cold temperatures and wreaked havoc across the nation, causing travel disruptions and power outages. Ahead of the event, TVA engaged in preparedness activities and committed a significant amount of generation resources ahead of the storm to meet predicted demand, but the storm's speed and intensity exceeded forecasts and TVA's efforts. The high wind, heavy rain, and cold temperature conditions of Winter Storm Elliott increased energy demand beyond what had been forecast, resulting in the highest 24-hour electricity demand supplied in TVA history up to that point, when the speed, intensity, scale, and duration of Winter Storm Elliott exceeded the designed generating capacity for some of TVA's power plants. In total, 38 of TVA's 232 generating units were negatively impacted, mostly due to instrumentation that froze.

In response to the extreme conditions, and to maintain system stability and address the generation deficit, TVA requested a reduction in energy delivery from LPCs and a reduction in energy consumption from those industries participating in demand response programs. Industrial customers reduced demand through reduced consumption and LPCs implemented reduction measures resulting in localized interruptions in service, which successfully stabilized the grid until TVA and neighboring utilities could return generating assets back online.

Following Winter Storm Elliott, TVA immediately took steps to understand what happened and why, and to draw lessons from the event. TVA identified and completed 250 actions to strengthen assets for future events and launched a comprehensive after-action review to identify longer-term opportunities for improvement by initiating a formal After-Action Technical Review (AATR). TVA's After-Action Report for Winter Storm Elliott is provided in Appendix C. As part of this effort, TVA engaged industry experts and customers for input and feedback, incorporated independent oversight and expertise, and committed to share findings and progress as part of TVA's commitment to transparency.

The AATR team identified a number of improvement opportunities and near- and medium-term actions to address the drivers behind the reduction of load during Winter Storm Elliott. Recommendations include adjusting design standards to increase the resilience of generating facilities to withstand extreme events; leveraging data analytics to better incorporate risk and uncertainty in usage and energy markets; and updating emergency protocols and communication methods to improve awareness and information sharing. Early data from January 2024 extreme winter weather events indicates that the efforts implemented after Winter Storm Elliot helped TVA avoid similar service interruptions while setting a new daily generation output record.

TVA is committed to providing energy security by building the energy system of the future that can withstand future extreme weather events, which includes:

- Aggressively investing in and modernizing TVA's system;
- Leveraging the market to affordably deploy clean energy;
- Partnering with LPCs and customers to deploy distributed energy generation, energy efficiency, and demand response;
- Replacing aging, less reliable capacity with flexible and diverse capacity;
- Assessing evolving risks to and future demand of TVA's energy system; and
- Innovating and developing new clean energy technologies.

1.2.3.3 Evolving Regulatory Environment

1.2.3.3.1 Inflation Reduction Act of 2022

A key beneficial result of TVA's Asset Strategy is the reduction in carbon emissions. As TVA implements the Asset Strategy, and as articulated in TVA's May 2021 Strategic Intent and Guiding Principles document (TVA 2021h), TVA is executing a plan to reduce carbon emissions 70 percent from a 2005 baseline by 2030. From this strategy, TVA also envisions a path to 80 percent carbon reduction by 2035 and aspires to net-zero carbon emissions by 2050, while continuing to provide affordable and reliable power for customers. This aligns with the climate goals of the United States (as detailed in Executive Order [EO] 14008 and EO 14082) to reduce GHG emissions 50–52 percent below 2005 levels in 2030 and achieve net zero emissions by no later than 2050. TVA's plan also makes significant advancements towards meeting the current Administration's objective of achieving a carbon-free electric sector by 2035 to the extent this objective is compatible with the mandates of least-cost planning and other provisions of the TVA Act requiring TVA to consider diversity, reliability, dispatchability, resiliency, and other related factors.

The Inflation Reduction Act (IRA) of 2022 (Public Law No.: 117-169) may improve the cost and availability of renewable and storage resources in the long-term. This EIS incorporates updated solar and storage pricing expected under the IRA in all alternatives (Appendix B). The short-term effects of the IRA thus far have resulted in increased demand, higher prices, and a limited supply of resources needed for renewable technologies (Solar Energy Industries Association [SEIA] 2022).

While the provisions of the IRA provide substantial incentives for various forms of clean energy, accounted for in this EIS, TVA's generation decisions at KIF are driven by a number of factors and timing constraints. TVA is optimistic that the IRA will enable faster adoption of renewable resources in the long term and is continuing in its efforts to implement 10,000 MW of solar by 2035; however, enactment of the IRA does not alleviate the need for 1,500 MW of firm, dispatchable power by 2027 to replace the retiring KIF coal-fired units or the transmission-related time constraints described in this EIS for solar generation and energy storage facilities. Even with the incentives of the IRA, there remain a number of challenges with the development of solar facilities in the near term. Solar generation and energy storage facilities would require the development of multiple solar generating facilities and therefore are subject to market factors, such as variable costs, supply chain disruptions, and limited availability of materials. Solar panels are primarily produced overseas, and, at this time, the U.S. has little competitive onshore solar manufacturing capability (USDOE 2022, SEIA 2022). For example, polysilicon, the main material in solar panels, is almost entirely sourced from China (USDOE 2022). Since 2020, the price of polysilicon has significantly increased (USDOE 2022). Additionally, U.S. tariffs on Chinese imports, recent anti-dumping investigations on Southeast Asian imports, and enforcement process uncertainty with the Uyghur Forced Labor Prevention Act have created uncertainty in the supply chain for materials needed to create solar panels. Shipping costs remain at levels higher than pre-2020 as does the demand for materials such as steel, for which solar tracking and tracking equipment is dependent. The increased demand and subsequent increase in cost and limited availability of resources has resulted in a reversal of a decades-old trend of decreasing solar prices, and many solar projects being postponed or canceled as a result. While the IRA incentivizes the transition of the solar supply chain to the U.S., it is projected that it will take 3 to 5 years for the domestic supply chain to mature and ease the current constraints on the solar industry (SEIA 2022).

1.2.3.3.2 2023 Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants Proposed Rule

The USEPA released the proposed rule (Proposed Rule): New Source Performance Standards for Greenhouse Gas Emissions from New, Modified, and Reconstructed Fossil Fuel-fired Electric Generating Stations on May 23, 2023, under Section 111 of the Clean Air Act (CAA). The Proposed Rule, anticipated to be finalized in Spring 2024, would regulate GHG new carbon pollution standards for coal and gas-fired power plants.

Although EPA has not yet issued a final rule, TVA has incorporated a sensitivity analysis of the potential impacts of the Proposed Rule in the evaluation of the No Action and Action Alternatives presented in this EIS (Appendix B). The construction and operation of the KIF Replacement Project would be consistent with the requirements of any final rules promulgated by the USEPA under Section 111 of the CAA. The Proposed Rule is discussed further in Section 2.1.5.4.

1.3 Scope of the EIS

1.3.1 Proposed Action - TVA

This EIS evaluates the resource impacts of the proposed retirement and decommissioning of the nine units at the KIF Plant and the implementation of replacement generation that can supply at least 1,500 MW of firm, dispatchable power by the time the units are retired in 2027. A detailed description of TVA's Proposed Action and the Alternatives considered are provided in Chapter 2. The topics addressed in this EIS include:

- Land Use
- Physical Characteristics (including geology, soils, prime farmland, and floodplains)
- Water Resources (including groundwater, surface water, water quality, and wetlands)
- Biological Environment (including vegetation, wildlife, aquatic life, and rare, threatened, and endangered species)
- Natural Areas, Parks, and Recreation
- Air Quality and Greenhouse Gases
- Cultural Resources
- Solid and Hazardous Waste
- Environmental Justice
- Safety
- Socioeconomics
- Transportation
- Utilities
- Visual
- Noise

1.3.2 Related Action – Ridgeline Expansion Project

This EIS evaluates the resource impacts of a related action, ETNG's Ridgeline Expansion Project. The Ridgeline Expansion Project includes the proposed construction, operation, and maintenance of a natural gas pipeline, compressor station, and other aboveground structures (ETNG 2023a) for the purpose of providing approximately 300,000,000 standard cubic feet per day of natural gas transportation capacity and an additional 95,000,000 of parking capability in support of TVA's proposed CC/Aero CT Plant. The additional gas transportation capacity in the form of parking capability would allow TVA to quickly ramp up generation to meet the increasing electricity demands of the region, while minimizing risk and maximizing TVA's ability to reliably respond to system changes.

Details of ETNG's related action and alternatives considered are provided in Chapter 2 of this EIS and evaluated in depth in ETNG's Certificate Application and associated Final Resource Reports filed with the Federal Energy Regulatory Commission (FERC) on July 18, 2023 (ETNG 2023b-m), with subsequent filings in October 2023 (ETNG 2023a) and December 2023 (ETNG 2023n-q). The information from ETNG's Final Resource Reports has been incorporated and independently evaluated by TVA under the topics listed in Section 1.3.1.

1.3.3 Environmental Impact Statement Overview

The NEPA review process is intended to ensure federal agencies consider the environmental effects of their actions in the decision-making process (40 CFR 1500.1(c), 2022). Actions, in this context, can include new and continuing activities that are conducted, financed, assisted, regulated, or approved by federal agencies, as well as new or revised plans, policies, or procedures. NEPA also requires that federal agencies provide opportunities for public involvement in the decision-making process.

This EIS was prepared in accordance with NEPA, as amended (42 U.S. Code [U.S.C.] §§ 4321 et seq.); the regulations implementing NEPA promulgated by the Council on Environmental Quality (CEQ; 40 Code of Federal Regulations [CFR] §§ 1500-1508, 1515-1518, as updated April 20, 2022); and TVA NEPA regulations and procedures (18 CFR part 1318). The EIS is consistent with 2023 CEQ interim guidance on Consideration of Greenhouse Gas Emissions and Climate Change (88 FR 1196, Jan. 9, 2023); the Fiscal Responsibility Act of 2023 (Public Law 118-5 - June 3, 2023); and associated guidance from various federal and state agencies (CEQ 2023).

TVA has prepared this EIS to assess the environmental effects of the Proposed Action. TVA used the input from the public scoping period, summarized below in Section 1.6.2, in developing the draft EIS. Following the 45-day public comment period for the draft EIS, TVA carefully reviewed the comments and reports and additional information sources submitted on the draft EIS, conducted additional analyses, and prepared this final EIS. TVA's responses to the comments received on the draft EIS are presented in Appendix D.

Transmission and electrical system upgrades required under the alternatives are reviewed in this EIS. The description of the anticipated effects of system upgrades required under each alternative presented in Chapter 3 is based on the best information available during the preparation of the EIS. If TVA determines, as a result of continuing analyses, that the upgrades are likely to result in adverse effects and need mitigation measures outside the range of those described in this EIS, TVA will conduct further reviews on those aspects of the Proposed Action.

Under Alternative A, ETNG would construct and operate a 122-mile natural gas pipeline pursuant to an agreement with TVA[10]. ETNG filed a Certificate Application with FERC on July 22, 2023 (Docket No. PF22-2-000), as further revised on December 18, 2023, and amended on December 19, 2023, to address certain project modifications. The pipeline requires approval by FERC, which is the federal agency responsible for authorizing interstate natural gas transmission facilities under the Natural Gas Act and for preparing the environmental analysis for the proposed pipeline in accordance with NEPA. TVA is evaluating the proposed Ridgeline Expansion Project as a related action under TVA's Alternative A in this EIS. The description of the environmental setting and potential resource impacts of the pipeline in the Draft EIS utilized a hybrid approach using available site-specific information where it was available. Where site-specific information was not available, a 200-foot desktop review was preformed of the proposed pipeline using global information systems (GIS)-based and publicly available information. Since the publication of the draft EIS, ETNG has completed extensive field-based surveys and assessments of the various environmental resources potentially affected by the pipeline. TVA has incorporated the information contained in these assessments in the relevant sections of this final EIS using information from the final Resource Reports prepared by ETNG that were submitted to FERC on July 18, 2023 (ENTG 2023a-m), with subsequent filings in October 2023 (ETNG 2023a) and December 2023 (ETNG 2023n-q). These Resource Reports and other related documents and correspondence are available on the FERC website at https://elibrary.ferc.gov, under Docket No. PF22-2-000, and are also available on ETNG's website at: https://www.enbridge.com/projects-and-infrastructure/projects/ridgeline-expansion-project. The environmental impacts of the construction and operation of the pipeline will also be addressed in an EIS being prepared by FERC. The draft of this FERC EIS is scheduled to be published in May 2024 and the corresponding FEIS is scheduled to be published in December 2024 (FERC Docket # CP23-516-000) (FERC 2024). TVA moved to intervene in the FERC certification process following ETNG's filing of its Certificate Application as well as subsequent filing of its Supplemental Certificate Application and separate amendment to its Certificate Application.

This draft EIS (DEIS) is posted on TVA's website and notices of its availability have been sent to those who received the DEIS, submitted comments on the DEIS, or requested

[10] TVA has entered into a precedent agreement with ETNG. A precedent agreement between a transporter and shipper of natural gas is a preliminary agreement to enter into a future firm gas transportation agreement if certain conditions are met.

notifications about the project. TVA sent the FEIS to the USEPA, which will publish a notice of availability in the Federal Register. A Record of Decision (ROD) will be issued by TVA no sooner than 30 days after the notice of availability of the FEIS. It will include (1) the decision; (2) the rationale for the decision; (3) alternatives that were considered; (4) identification of the environmentally preferable alternative; and (5) associated mitigation measures, monitoring, and enforcement requirements.

1.4 Decision to be Made

The primary decision before TVA is whether to retire the nine units at KIF by the end of the effective useful life (i.e., 2027) and to replace the retired generation with at least 1,500 MW of firm, dispatchable replacement generation. If the proposed KIF retirement and subsequent replacement generation is to occur, other secondary TVA decisions will need to be made. These include the following considerations:

- Timing of the proposed retirement, decommissioning, and demolition;
- Most suitable location(s) for the proposed replacement generation resource(s);
- Timing of proposed transmission system upgrades, if needed;
- Most suitable route for proposed transmission lines, if needed; and
- Determination of any necessary mitigation and/or monitoring to meet TVA standards and to minimize the potential for damage to environmental resources.

A detailed description of the alternatives being evaluated in this EIS is provided in Section 2.1.

Related actions, such as siting, construction, and operation of a natural gas pipeline, compressor station, and associated structures by ETNG are also considered in this EIS.

1.5 Related Environmental Reviews

Related environmental documents and materials relevant to this EIS are listed below, for the proposed TVA actions and those proposed by ETNG. The contents of these documents help describe the affected environment and are incorporated by reference as appropriate.

1.5.1 TVA Actions

- ***Kingston Fossil Plant Alternative Coal Receiving Systems New Rail Spur Construction near the Cities of Kingston and Harriman, Roane County, TN (April 1999).***

  This EIS evaluated the elimination of two heavily used railroad-highway intersections that receive coal deliveries via the existing rail line with minor upgrades. In addition, this EIS evaluated the construction of a new high-speed coal unloading/loading system in its existing coal yard at KIF (TVA 1999).

- ***Installation of Flue Gas Desulfurization System on Kingston Fossil Plant Roane County, Tennessee Final Environmental Assessment* (April 2006).**

  This Environmental Assessment (EA) evaluated a proposal to reduce sulfur dioxide (SO_2) emissions at KIF by installing flue gas desulfurization equipment that employs the wet limestone forced oxidation technology in response to the 1990 Clean Air Act (CAA) requirements (TVA 2006).

- ***Kingston Bottom Ash Dewatering Facility Environmental Assessment* (March 2016).**

  This EA evaluated the proposed design of a dewatering facility for the conversion of wet bottom ash generated at KIF to a dry CCR product in accordance with TVA's recommendation to convert the wet bottom ash management system at KIF to a dry storage system (TVA 2016b).

- ***Fossil Plant Ash Impoundment Closure EIS* (June 2016).**

  This programmatic EIS (PEIS) evaluated the closure of ash impoundments containing CCRs at fossil fuel plants across the TN Valley to support the implementation of TVA's goal to eliminate all wet CCR storage at its coal plants (TVA 2016a).

- ***TVA Integrated Resources Plan and PEIS (July 2019)***.

  This programmatic PEIS (TVA 2019b) evaluated the potential effects of TVA's long-term IRP, which provides direction on how TVA can best meet future electricity demand. The 2019 IRP (TVA 2019a) evaluated six scenarios (plausible futures) and five strategies (potential TVA responses to those futures) and identified a range of potential resource additions and retirements throughout TVA's power service area. This Kingston EIS tiers from the 2019 IRP PEIS.

- ***Kingston Fossil Plant Landfill Expansion Supplemental Environmental Assessment* (August 2019).**

  This EA evaluated the proposed expansion of the boundary for the on-site landfill at Kingston. The proposed expansion would include additional acreage for a new laydown area, stormwater management, new clay soil borrow sites, and the development of haul roads. The EA Proposed Action was needed so TVA could adequately and effectively construct the second phase of the landfill (TVA 2019c).

- ***Kingston Fossil Plant Borrow Site #3, Environmental Assessment* (January 2020).**

  This EA evaluated the proposed construction of a new borrow site (Borrow Site No. 3) in response to landfill project phasing indicating that soil types in Borrow Site No. 3 may have been needed to supplement the soil types available in other borrow sites. This would support routine operations as well as upcoming construction projects (TVA 2020a).

- ***TVA Aging Coal Fleet Evaluation* (May 2021).**

  This evaluation was performed to recommend near-term retirement planning assumptions to reflect practical timelines for replacement generation. The first draft of the evaluation was completed during Fiscal Year 2020, with refinements made in May 2021 (TVA 2021g).

- ***TVA Review of Solar Construction Project Planning Documents, 2014-2021***

  TVA completed a review of existing project planning documents for solar construction projects implemented between 2014 and 2021. The solar effects, summarized in Table 3.2-1, are based on the following solar projects:

  - Bellefonte Solar Energy Center Project Environmental Assessment, April 2020 (TVA 2020c)

- Cumberland Solar Farm Environmental Assessment, January 2018 (TVA 2018b)
- Elora Solar Energy Center Project Environmental Assessment, February 2020 (TVA 2020d)
- Five Western North Carolina Solar Farms Environmental Assessment, March and April 2014 (TVA 2014b, 2014c)
- Golden Triangle I Solar and Battery Energy Storage Project Draft Environmental Assessment, December 2020 (TVA 2020f)
- Haywood Solar Farm Environmental Assessment, March 2017 (TVA 2017c)
- Houston, Mississippi Solar Farms Environmental Assessment, June 2016 (TVA 2016d)
- Jackson Solar Project Environmental Assessment, March 2019 (TVA 2019e)
- Jonesborough Solar Site Environmental Assessment, October 2017 (TVA 2017d)
- Knoxville Utilities Board Solar Project Environmental Assessment, October 2020 (TVA 2020e)
- Latitude Solar Center Environmental Assessment, August 2016 (TVA 2016e)
- Marshall Properties Solar Farm Environmental Assessment, March 2014 (TVA 2014d)
- Memphis Solar Project Environmental Assessment, December 2018 (TVA 2018c)
- Millington Solar Farm Environmental Assessment, December 2017 (TVA 2017e)
- Muscle Shoals Solar Project Environmental Assessment, November 2019 (TVA 2019f)
- Naval Air Station Meridian Solar Farm Environmental Assessment, April 2017 (U.S. Department of the Navy 2017)
- Providence Solar Center Environmental Assessment, March 2016 (TVA 2016f)
- Pulaski Energy Park Expansion Environmental Assessment, April 2014 (TVA 2014e)
- Ridgely Energy Farm Environmental Assessment, April 2021 (TVA 2021j)
- River Bend Solar Project Environmental Assessment, November 2015 (TVA 2015b)
- Selmer North I and II Solar Project Environmental Assessments, August 2016(TVA 2016g, 2016h)
- Skyhawk Solar Project Environmental Assessment, January 2021 (TVA 2021k)
- SR McKellar Solar Project Environmental Assessment, May 2021 (TVA 2021l)

- Starkville Solar Facilities Environmental Assessment, February 2014 (TVA 2014f)
- Wildberry Solar Center Environmental Assessment, June 2016 (TVA 2016i)
- Yum Yum Solar Project Environmental Assessment, December 2019 (TVA 2019g)

1.5.2 ETNG Actions

- *Draft Resource Reports Filing* (December 2022). ETNG submitted draft Resource Reports to FERC under Docket No. PF22-7 in June 2022 followed by revised Resource Reports in December 2022. The December 2022 ETNG draft Resource Reports 1 through 11 (ETNG 2022a-l) were reviewed and evaluated for the DEIS.
- *Final Resource Reports and Application for Certificate Filing* (July 2023). On July 18, 2023, ETNG filed Final Resource Reports with an Abbreviated Application for a Certificate of Public Convenience and Necessity and Related Authorizations (Application) for its Ridgeline Expansion Project (Ridgeline Project) in FERC Docket # CP23-516-000 (ETNG 2023a-m). Information presented in the Application and July 2023 Resource Reports has been reviewed, incorporated into the affected environment sections as relevant, and used to support a thorough and independent evaluation of the potential project effects of ETNG's proposed Ridgeline Expansion Project. Results of TVA's independent impact assessment for the Ridgeline Expansion Project is provided in this EIS.
- *Revised Application for Certificate Filing* (October 2023). On October 5, 2023, ETNG filed a revised application (ETNG 2023a). Information presented in the revised application and October 2023 revised Resource Reports (ETNG 2023n) has been reviewed, incorporated into the affected environment sections as relevant, and used to support a thorough and independent evaluation of the potential project effects of ETNG's proposed Ridgeline Expansion Project. Results of TVA's independent impact assessment for the Ridgeline Expansion Project is provided in this EIS.
- *Amendment to Application for Certificate Filing* (December 2023). On December 18, 2023, ETNG filed an amendment to its July 2023 application for certificate filing (ETNG 2023n-q). ETNG stated that the amendment would not change the environmental impacts associated with the Ridgeline Expansion Project.

1.6 Public Involvement

1.6.1 Public Involvement for the 2019 IRP and Programmatic EIS

1.6.1.1 Public Scoping

Public involvement was a particular focus throughout the IRP development process. After publishing a NOI for the 2019 IRP (TVA 2019a) and PEIS (TVA 2019b) in the Federal Register, TVA then sent the NOI to local and state government entities and federal agencies; issued a news release to media; and posted the news release on TVA's website. TVA also sent 2,500 scoping notices to agencies, organizations, and the public, including those on the 2015 IRP mailing list and people who registered to receive additional information on TVA's IRP website. TVA also published notices regarding the NOI and scoping period in local newspapers, including the following cities and associated newspapers:

- Chattanooga, TN – Chattanooga Times Free Press
- Huntsville, Alabama – The Huntsville Times
- Memphis, TN – The Commercial Appeal
- Nashville, TN – The Tennessean
- Knoxville, TN – Knoxville News Sentinel
- Paducah, Kentucky – Paducah Sun
- Bowling Green, Kentucky – Bowling Green Daily News

TVA held two public meetings and a public webinar during the scoping period. The public meetings presented TVA's project objectives and initial alternatives for input from the public and interested stakeholders. Participants included the public; congressional, state, and local officials; representatives from local power companies; non-governmental organizations and other special interest groups; and TVA employees. Ninety-one individuals attended the meetings in person or via webinar. At the conclusion of the public meetings and scoping period, TVA issued the 2019 IRP Scoping Report, which included copies of scoping materials and the 87 comment submissions received during the scoping period. The scoping report used public input to develop the 2019 IRP framework and to help determine which resource options should be considered. The NOI and Scoping Report for the 2019 IRP (TVA 2019a) and PEIS (TVA 2019b) are available on TVA's Environmental Reviews website: https://www.tva.com/environment/environmental-stewardship/environmental-reviews/nepa-detail/Integrated-Resource-Plan.

1.6.1.2 IRP Working Group

The formation of an IRP Working Group was a cornerstone of the public input process for the 2019 IRP (TVA 2019a) and consisted of 20 external stakeholders representing 20 organizations, 8 of which represented the interests of entities purchasing power from TVA and 12 other members representing energy and environmental non-governmental organizations; research and academia with expertise in DERs; state government; economic development organizations; and community and sustainability interests. Additional details regarding the IRP working group members and affiliation are provided in Section 3.2.1 of the 2019 IRP (TVA 2019a).

1.6.1.3 Public Outreach and Briefings

TVA hosted four webinars during the IRP process to keep the public informed of the progress of the 2019 IRP (TVA 2019a) and IRP PEIS (TVA 2019b). Each webinar included a brief presentation by TVA staff, followed by a moderated question and answer session. During development of the IRP and PEIS, TVA used social media communications (including Facebook, Twitter, LinkedIn, and Instagram) to inform and educate the public about the IRP and its processes and to promote opportunities for public input. Specific information on public outreach and the use of social media for the 2019 IRP and PEIS is available in Section 3.3 of the 2019 IRP (TVA 2019a).

1.6.1.4 Public Review of Draft IRP and PEIS

TVA also worked to reach a broader, more diverse cross section of the public to ensure awareness about the 2019 IRP (TVA 2019a) and to provide opportunities for making comments. TVA sought input from existing partners who serve diverse communities regarding the methods that would be most successful in reaching a broader constituency. Generally, the input received suggested that working through groups and entities that have existing relationships with various diverse communities would be the most successful way to achieve this. Given this input, TVA sought to join existing events where people of greater diversity already were engaged. TVA also provided the draft IRP and PEIS for public comment and held public meetings around the region to provide an opportunity for residents and stakeholders to learn more about the draft IRP and PEIS, ask questions, and provide general feedback. Over 1,200 people commented on the draft IRP and draft PEIS (DEIS). Comments were grouped into six categories and then TVA provided responses to those comments in an appendix to the IRP final PEIS (FEIS). Additional information and details on the public review of the draft IRP and PEIS is provided in Section 3.4 of the 2019 IRP (TVA 2019a).

1.6.2 Public Involvement for Kingston Fossil Plant Retirement EIS

1.6.2.1 Scoping for Kingston Retirement EIS

1.6.2.1.1 Scoping and Notice of Intent

On June 15, 2021, TVA published a NOI in the Federal Register announcing plans to prepare an EIS to address the potential environmental effects associated with the proposed retirement and demolition of the KIF Plant and construction and operation of facilities to replace the retired generation (TVA 2021a). The NOI initiated a 30-day public scoping period from June 15 to July 15, 2021. In the NOI, TVA requested comments on other reasonable alternatives and environmental resources that should be assessed in the EIS. The purpose of the scoping period was to present TVA's project objectives and initial alternatives for input from the public and interested stakeholders.

In addition to the NOI published in the Federal Register, TVA invited members of the public as well as federal, state, and local agencies and federally recognized Indian tribes, to comment on the scope of the EIS. Project-specific information and a news release were listed on TVA's website at www.tva.com/nepa, including a link to a virtual public scoping meeting room and an online public comment page (TVA 2021b). TVA sent notification of the NOI via email to local and state government entities and federal agencies and posted flyers in local businesses. TVA published notices regarding the NOI in local newspapers, including the following cities and associated newspapers:

- Cookeville, TN – Cookeville Herald-Citizen
- Gainesboro, TN – Jackson County Sentinel
- Hartsville, TN – Hartsville Vidette
- Jamestown, TN – Fentress Courier
- Kingston, TN – Roane County News
- Knoxville, TN – Knoxville News-Sentinel
- Livingston, TN – Overton County News & Livingston Enterprise
- Wartburg, TN – Morgan County News

The virtual meeting room was hosted online for the duration of the scoping period and provided navigation to the following materials: welcome board and video, project purpose and need board, project alternatives map and detailed maps of each alternative, overview of the NEPA compliance process and scoping, a location to submit comments, information on the virtual scoping meeting, and links to other related websites. The virtual meeting room also contained text-accessible versions of the content.

1.6.2.1.2 Public Scoping Meeting

A virtual public scoping meeting was held on June 29, 2021, from 6:30 pm to 8:00 pm EDT via AdobeConnect. The meeting was attended by 51 members of the public, regulatory agencies, and other organizations. TVA used comments submitted prior to and during the virtual public meeting to develop a list of Frequently Asked Questions, which has been posted onto TVA's Kingston project website (TVA 2021b). In accordance with Section 1318.402(h) of TVA's NEPA regulations, the Final Kingston Fossil Plant Retirement EIS Scoping Report (TVA 2021c) is available to the public on TVA's project website.

No other environmental resources were identified during the scoping process that TVA has determined should be addressed in detail in this EIS.

1.6.2.1.3 Scoping Feedback

During the EIS scoping period, TVA received approximately 56 comments, a form letter from Sierra Club with 583 signatories, and a petition from Energy Alabama with eight signatories. Comments were received from members of the general public, including potentially affected landowners, and from multiple non-governmental organizations, two federal agencies, and one state agency. Comments received during the scoping period were related to the alternatives under consideration, land use, water resources, biological resources, GHGs, cultural resources, socioeconomic and environmental justice effects, and cumulative effects. In their comments, the National Park Service (NPS) requested to participate in the NEPA process as a cooperating agency.

A scoping report was developed and includes information about NEPA, federal and local laws, and EOs that are relevant to this EIS. The scoping report (TVA 2021c) was made available to the public on TVA's project website and presents the public comments received, as well as information on how the EIS is being developed. A summary of comment submissions received, and TVA responses is provided in the scoping report; comment submissions were compiled and provided in Appendix C of the scoping report; and, where relevant, TVA's responses to the comments are incorporated into this EIS.

Based on internal and public scoping, identification of applicable laws, regulations, EOs, and policies, TVA identified the resource areas listed below as requiring review within the EIS:

- Land Use
- Physical Characteristics (including geology, soils, prime farmland, and floodplains)
- Water Resources (including groundwater, surface water, water quality, and wetlands)
- Biological Environment (including vegetation, wildlife, aquatic life, and rare, threatened, and endangered species)
- Natural Areas, Parks, and Recreation
- Air Quality and Greenhouse Gases
- Cultural Resources
- Solid and Hazardous Waste
- Environmental Justice
- Safety
- Socioeconomics
- Transportation
- Utilities
- Visual
- Noise

1.6.2.2 Public and Agency Review of the Draft EIS

1.6.2.2.1 Notice of Availability of the Draft EIS

The DEIS was posted on TVA's website and notice of its availability was provided on May 12, 2023. EPA's Notice of Availability of the DEIS was published in the Federal Register on May 19, 2023, initiating a 45-day public comment period that ended on July 3, 2023. In addition, notification of availability of the DEIS was announced in regional and local newspapers, and a news release was issued to the media and posted to TVA's website. TVA's agency involvement included sending letters to local, state, and federal agencies and federally recognized Indian tribes to notify them of the availability of the DEIS (Table 1.6-1). TVA contacted local officials and leaders, including members of the Roane County Commission, Harriman City Council, and Rockwood City Council. TVA partnered with the Mid-East Community Action Agency (MECAA) to identify potential environmental justice populations and distributed information regarding availability of the DEIS. Notification of the DEIS public comment period and public meetings was also published in the following local newspapers:

- Lenoir City Herald, Lenoir City, TN
- Morgan County News, Wartburg, TN
- Crossville Chronicle, Crossville, TN
- Roane County News, Kingston, TN
- The Oak Ridger, Oak Ridge, TN
- Knoxville News Sentinel, Knoxville, TN

TVA held three public meetings for the DEIS:

- Virtual Public Meeting, June 6, 2023
- Public Meeting, Rockwood High School, Rockwood, TN, June 13, 2023
- Public Meeting (EJ Focused), Kingston High School, Kingston, TN, June 14, 2023

TVA accepted comments submitted through mail, email, a comment form on the public website, and in person at the public meetings. TVA provided hard copies of the DEIS to individuals, when requested. TVA also provided hard copies of the DEIS to the public libraries surrounding the proposed project area, including:

- Kingston Public Library, 1004 Bradford Way, Kingston, TN
- Harriman Public Library, 601 Walden Avenue, Harriman, TN
- Rockwood Public Library, 117 N. Front Street, Rockwood, TN

TVA received approximately 564 comments on the DEIS, one of which contained approximately 4,350 signatures. The majority of comments generally supported the retirement of the KIF coal-fired generating units but opposed Alternative A and preferred Alternative B. Comments were primarily submitted through a web comment form or directly to TVA’s NEPA email inbox. Several form emails generated by multiple environmental groups were also submitted, in addition to separate comments and questions, including the Sierra Club, Southern Environmental Law Center (SELC), Southern Alliance for Clean Energy (SACE), Center for Biological Diversity, and Citizens’ Climate Education (CCE).

A few of the comments stated a broad support for the continued use of coal to generate electricity; these were interpreted as supporting the No Action Alternative, under which TVA would continue to generate electricity with the existing KIF coal-fired units. Comments were received from two federal agencies (USEPA and NPS); two state agencies (TN Department of Environment and Conservation [TDEC] and TN Department of Transportation [TDOT]); the Attorney General of the State of TN; Mayor of Nashville; one local agency (Roane County Environmental Review Board); one LPC (Harriman Utility Board); the TN Valley Public Power Association (TVPPA); and TN Valley Energy Consumers Group (TVECG); over 35 different non-governmental organizations (NGOs); and a variety of local residents, landowners, and other interested stakeholders.

TVA carefully reviewed all of the substantive comments that it received. Many of the individual comments were similar in substance. To avoid repetition, TVA grouped similar comments and produced one synthesized response for each comment grouping. Because TVA worked to retain nuances among comments, a number of synthesized comments are similar and likely overlap. The result of this analysis and synthesis process is the list of 229 substantive comments to which TVA has provided responses. A list of public commentors, their affiliation, and the comment numbers with TVA responses addressing the commentors' concern(s) are included in Appendix D.

Stakeholder engagement and communications completed prior to the public release of the Draft EIS in May 2023 are summarized in Table 1.6-1.

Table 1.6-1. Stakeholder Engagement and Communications Completed from January through May 2023 for the Kingston Retirement Draft Environmental Impact Statement

Outreach Activity	Date	Key Audiences
Mid-East Community Action Agency	January 24	Community Leaders
Briefed Harriman Utility Board	February 16	Local Power Company
Briefed Rockwood Utilities	February 22	Local Power Company
Briefed staff of State Sen. Ken Yager	February 14	Public Officials
Briefed State Rep. Monty Fritts	March 7	Public Officials
Briefed State Sen. Ken Yager	March 29	Public Officials
Spoke to Rockwood Civitan Club	March 24	Business & Community Leaders
STEM Check Presentations at Midtown Elementary, Ridgeview Elementary, and Rockwood High School*	March 24	Public Officials, LPC, School Community
Kingston Street Festival	March 25	General Public
Distributed Kingston DEIS Fact Sheets to Mid-East Community Action Agency (MECAA) Clients*	March 29-31	Commodity Distribution Recipients/EJ Populations
Distributed Kingston DEIS Fact Sheets to Kingston, Harriman, and Rockwood Public Libraries and Community Centers*	March 31	General Public
Roane County Realtors Speaking Engagement	April 13	Business & Community Leaders
Roane County Rotary Club Speaking Engagement	April 13	Business & Community Leaders
Harriman Utility Board and Rockwood Electric Bill Stuffers*	May 1	LPC Customers in EJ Communities
Distribute Kingston DEIS Fact Sheets to MECAA LIHEAP Distribution List*	May 1	Low Income Community

Outreach Activity	Date	Key Audiences
Volunteer Event at MECAA*	May 18	General Public

(*) Denotes effort targeted to engage identified or potential environmental justice populations or communities.

1.6.2.3 Anticipated FEIS Outreach

TVA plans to provide stakeholders accurate, timely, and consistent information and messages about the Kingston FEIS, ROD, and TVA's on-going transition to a cleaner, more flexible energy portfolio. Notification of availability of the FEIS will be announced in regional and local newspapers, and a news release will be issued to the media and posted to TVA's website. TVA's agency involvement will include sending letters to local, state, and federal agencies and federally recognized Indian tribes to notify them of the availability of the FEIS. Additionally, all members of the public that provided scoping or public comments or asked to be on the mailing list and provided the appropriate information to be contacted would also receive notification. TVA will contact local officials and leaders, including members of the Roane County Commission, Harriman City Council, and Rockwood City Council. TVA partnered with the MECAA to identify potential environmental justice populations and distributed information regarding availability of the FEIS. Notification of the release of the FEIS will be published in the following local newspapers:

- Lenoir City Herald, Lenoir City, TN
- Morgan County News, Wartburg, TN
- Crossville Chronicle, Crossville, TN
- Roane County News, Kingston, TN
- The Oak Ridger, Oak Ridge, TN
- Knoxville News Sentinel, Knoxville, TN

Stakeholder communications anticipated relating to the public release of the FEIS are summarized in Table 1.6-2.

Table 1.6-23. Stakeholder Communications Anticipated from February through March 2024 for the Kingston Retirement Final Environmental Impact Statement

Outreach Activity	Estimated Date	Key Audiences
Brief Roane County Executive Wade Cresswell	February	Public Officials
Roane County Commission	February/March	Public Officials
Brief Harriman, Kingston, and Rockwood City Councils	February/March	Public Officials
Distribute 1-pager to Kingston, Harriman, and Rockwood Public Libraries/Community Centers*	February	General Public
Harriman Utility Board*	March	LPC Customers
Rockwood Electric Bill Stuffers*	March	LPC Customers

Outreach Activity	Estimated Date	Key Audiences
Brief Roane County Environmental Review Board	February/March	Business & Community Leaders
Brief Rockwood Civitan Club*	February/March	Business & Community Leaders
Brief Harriman Rotary Club	February/March	Business & Community Leaders
Roane County Minority Advisory Council*	February/March	Business & Community Leaders
Mailer to stakeholders using MECAA's LIHEAP distribution list*	March	General Public
Volunteer Event at MECAA*	March 13	General Public
Host in-person stakeholder event at Kingston Facility	March	Public Officials

(*) Denotes effort targeted to engage identified or potential environmental justice populations or communities. Please note that these outreach opportunities are to provide the public with details surrounding the release of the FEIS.TVA is not soliciting public comments at this stage of the NEPA process.

1.6.3 Stakeholder Outreach for ETNG's Ridgeline Expansion Project

Stakeholder outreach by ETNG for the proposed natural gas pipeline and associated aboveground facilities began in June 2021 when ETNG began sharing information on the proposed pipeline project. During this time, ETNG also began requesting public input on potential route alternatives, construction constraints or methods, identification of environmental justice communities, or other concerns about the proposed project (ETNG 2023b). The objective of ETNG's implementation of a comprehensive stakeholder outreach strategy was to facilitate the early identification, and potential resolution if feasible, for those issues raised by stakeholders and involved public and regulatory agency consultations, landowner consultations, open houses, development, and implementation of a public participation plan (including ongoing outreach), and a landowner complaint resolution process.

1.6.3.1 Regulatory and Other Public Officials and Agency Consultations

ENTG initiated regulatory agency consultations in the summer of 2021 and advised agencies of ETNG's intent to use FERC's NEPA Pre-filing Review Process. The anticipated environmental permits, reviews, and consultations for ETNG's Ridgeline Expansion Project are discussed further in Section 1.5. In-person meetings were held by ETNG with public officials representing the eight counties crossed by the proposed pipeline and associated aboveground facilities (ETNG 2023b). ETNG attended seven of the eight county commission meetings held in May 2022. Although the Smith County Commission did not meet in May 2022, ETNG was able to attend an in-person meeting with the Smith County mayor at the Pleasant Shade School in November 2021.

ETNG continues to meet regularly with public officials in affected counties along the proposed Ridgeline Expansion route and will continue to meet with these officials as needed. Trousdale County public leaders were consulted regarding proposed locations for the compressor station and non-jurisdictional solar facility and their feedback was considered in project planning.

1.6.3.2 Landowner Consultations

ETNG communications with landowners have included: project information, survey permission request letters, individual discussions with landowners or their representatives, and site visits; resulting in ETNG being granted survey access permission on 1,193 of 1,208 total tracts (approximately 99 percent with access permissions granted) within ETNG's proposed project 300-foot-wide survey corridor (ETNG 2023b).

As stated in ETNG's Final Resource Report 1 (ETNG 2023b):

> East Tennessee has an established protocol to resolve landowner concerns prior to construction, using the Project 24-Hour hotline (1-866-569-6267). The hotline is a toll-free number that serves as a means for landowners to contact appropriate project representatives with questions, concerns, and complaints. In addition, East Tennessee has established a project website to provide current project information and contact information at www.enbridge.com/ridgeline. To date, East Tennessee is engaging with landowners to address their concerns and continues to work with landowners regarding the Project.

1.6.3.3 Open Houses

ETNG hosted four voluntary landowner informational meetings in November 2021 for stakeholders near the proposed facilities. These open house-style meetings included subject matter experts available for each subject matter including construction, environmental, regulatory, state and federal relations, and ROW (ETNG 2023b).

A virtual open house meeting room was also created for the Project, located at https://enbridgeopenhouse.com/ridgeline/. Informational meetings were held from 6:00 p.m. to 8:30 p.m. local times to maximize attendance and participation by the public (ETNG 2023b). The dates and locations of the informational meetings were as follows:

- Trousdale County: Hartsville, TN - November 1, 2021;
- Jackson County: Granville, TN - November 2, 2021;
- Morgan County: Wartburg, TN - November 3, 2021; and
- Putnam County: Monterey, TN - November 4, 2021.

In response to landowner and local official requests, an additional open house was held in Smith County (Pleasant Shade Community Center) on November 17, 2021 (ETNG 2023b). The same open house and informational meeting format was followed. On May 20, 2022, FERC approved ETNG's May 6, 2022, Pre-Filing request under Pre-Filing docket number (PF22-7-000) (ETNG 2022a).

1.6.3.4 FERC Pre-Filing and EIS Scoping

By notice issued on July 22, 2022, in Docket No. PF22–7–000, FERC opened a scoping period during ETNG's planning process for the Ridgeline Expansion Project prior to its filing of a formal application with the Commission on July 18, 2023, a process referred to as "pre-filing" (ETNG 2023a). During the pre-filing stage, FERC hosted three public scoping sessions on October 3, 4, and 5, 2022, in Kingston, Hartsville, and Cookeville, TN, respectively. FERC plans to address all substantive written and oral comments during these sessions in its upcoming Draft EIS. On September 22, 2023, FERC issued a NOI to the public in the Federal Register that it intended to prepare its Draft EIS and requested public comments on the scope of issues to address in its Draft EIS, including comments on potential alternatives and impacts, and any relevant information, studies, or analyses of any kind concerning impacts affecting the quality of the human environment related to the Ridgeline Expansion Project. Comments were to be submitted on or before 5:00 p.m. Eastern Time on October 18, 2023. FERC received comments from the public during its scoping period, both during pre-filing and following its issuance of its NOI, which will be addressed in its Draft EIS, anticipated to be issued in May 2024. Subsequent filings by ETNG with FERC were made in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q).

ETNG also scheduled additional informational open houses to provide landowners, public officials, and other stakeholders with updated information concerning the Project that was based on information received during the initial open houses and the most recent survey activities; FERC staff attended these additional open houses (ETNG 2023b). The dates and locations of the additional open houses were as follows:

- Morgan County: Wartburg, TN – June 22, 2022;
- Putnam County: Monterey, TN – June 23, 2022;
- Jackson County: Gainesboro, TN – June 29, 2022; and
- Trousdale County: Hartsville, TN – June 30, 2022.

1.6.3.5 Public Participation Plan and Ongoing Outreach

ETNG developed a comprehensive Public and Agency Participation Plan, provided in Appendix 1G of the ETNG's Final Resource Report 1 (ETNG 2023b). The plan summarizes ETNG's commitment to engage stakeholders throughout the life cycle of the pipeline project and provides the steps to help ensure successful ongoing communication with stakeholders, including establishing a project website and a single point of contact. ETNG will continue to meet with stakeholders to discuss the ongoing efforts associated with the pipeline project and will continue to update its stand-alone website to provide the most recent information, including Project overview maps, frequently asked questions, contacts, and announcements of public meetings. ETNG intends to continue its efforts to inform landowners, public officials, and the relevant permitting agencies of developments regarding the proposed pipeline and aboveground facilities.

Since their June 2022 informational open houses, ETNG has initiated environmental justice-specific outreach and has worked with community partners to engage various groups and organizations, as described in Final Resource Report 5 (ETNG 2023f).

1.6.3.6 Landowner Complaint Resolution Process

ETNG has an established protocol to resolve landowner concerns prior to construction, using ETNG's pipeline project 24-Hour hotline (1-866-569-6267). The toll-free hotline serves as a means for landowners to contact appropriate ETNG representatives with questions, concerns, and complaints, followed by ETNG response that follows a three-step process:

1. Gathering Information – Gather caller's contact information and details of the call purpose.
2. Define the Issue – Work with the caller to gain understanding of concerns and begin working toward resolution if feasible, or document and route for response by ETNG representative or appropriate ROW agent.

3. Resolution – Document resolutions completed during Step 2. Otherwise, forward the concern and caller's information to the appropriate ROW agent. The process in Steps 2 and 3 are then repeated until an acceptable resolution is reached, and process has been successfully documented (ETNG 2023b).

1.6.4 Public Involvement for the 2024 IRP and Programmatic EIS

TVA is in the process of developing the 2024 IRP. TVA's past practice has been to evaluate its IRPs every 4-5 years. Accordingly, on May 19, 2023, TVA published an NOI in the Federal Register announcing its plans to prepare an EIS associated with the implementation of the updated IRP, initiating the 45-day scoping period, which concluded on July 3, 2023 (TVA 2023e). The 2019 IRP continues to be current in the interim to guide future generation planning consistent with least-cost planning principles.

1.7 Necessary Permits, Licenses, and Consultations

TVA holds the permits necessary for the current operation of KIF. A summary of the laws and EOs relevant to the Proposed Action is provided in Table 1.7-1.

Table 1.7-1. Laws and Executive Orders Relevant to the Proposed Action

Environmental Resource Area	Law / Executive Order
Geology, Soils, and Prime Farmland	Farmland Protection Policy Act
Water Resources	Administrative Code of TN 69-3-108 Administrative Code of TN Department of Environment and Conservation (TDEC), Chapter 0400-04 CWA Sections 401, 402, and 404 EO 11988 – Floodplain Management EO 11990 – Protection of Wetlands EO 13778 – Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the "Waters of the U.S." Rule EO 14008 – Tackling the Climate Crisis at Home and Abroad Safe Drinking Water Act TDEC Aquatic Herbicides General Permit Section 7 of the Wild and Scenic Rivers Act (WSRA) Section 10 of the Wild and Scenic Rivers Act (WSRA)
Biological Resources	Administrative Code of TDEC, Chapter 0400 Bald and Golden Eagle Protection Act (BPEPA) Endangered Species Act (ESA) Section 7 (Consultation with U.S. Fish & Wildlife Service) EO 13112 – Invasive Species EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds Migratory Bird Treaty Act (MBTA) EO 14008 – Tackling the Climate Crisis at Home and Abroad

Environmental Resource Area	Law / Executive Order
Air Quality and GHG Emissions	Clean Air Act (CAA) EO 13990 – Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis EO 14008 – Tackling the Climate Crisis at Home and Abroad EO 14057 – Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability Administrative Code of TDEC – Chapter 1200-3 and Chapter 0400-30 EO 14082 – Implementation of the Energy and Infrastructure Provisions of the Inflation Reduction Act of 2022
Cultural Resources	Administrative Code of TN, Chapter 0400.02 Archaeological Resources Protection Act National Historic Preservation Act (NHPA) Section 106 Native American Graves Protection and Repatriation Act
Waste Management	Administrative Code of TN, Chapter 0400.10-12 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Emergency Planning and Community Right-to-Know Act (EPCRA) Resource Conservation and Recovery Act (RCRA) Solid Waste Disposal Act (SWDA) Toxic Substances Control Act (TSCA)
Public and Occupational Health and Safety	Occupational Safety and Health Act
Environmental Justice	EO 12898 – Federal Actions to Address Environmental Justice in Minority and Low-Income Populations EO 14008 – Tackling the Climate Crisis at Home and Abroad EO 14096 – Revitalizing Our Nation’s Commitment to Environmental Justice for All
Intergovernmental Review	EO 12372 – Intergovernmental Review of Federal Programs

To implement the Proposed Action, TVA would have to maintain, obtain, or seek amendments to the following permits that are already in place at KIF:

- TN Stormwater Multi-Sector General Permit for Industrial Activities: TNR050000
- Solid Waste Class II Disposal Permits: Peninsula Gypsum Disposal Area (TDEC: IDL 73-0211)
- National Pollutant Discharge Elimination System (NPDES) permit: TN0005452
- Air permits for emissions (TN0000004714500013)
- KIF – Kingston Phase II PDA CCR Landfill Construction (TNR191877)
- KIF – Division of Water Resources Permits (TNR051787)

Necessary permits would be evaluated based on site-specific conditions. Other potential permits or consultation requirements relevant to the Proposed Action are identified in Table 1.7-2.

Table 1.7-2. Potential Permits and Consultation Requirements Relevant to the Proposed Action

Submittal/ Consultation	Reviewing Agency	Authorization	Applicability	Timing	Fees	Notes/ Assumptions
CWA 404/401 Permitting	U.S. Army Corps of Engineers (USACE) Nashville District	Section 404 Nationwide Permit	Effects to Wetlands & Waters (<0.5-acre wetland)	45 days. Typically, contingent on 401 Certification	N/A	Pre-Construction Notification may be required; mitigation may be required
		Section 404 Individual Permit	Effects to Wetlands & Waters (≥0.5-acre wetland)	6 to 12 months. Typically, contingent on 401 Certification	N/A	Mitigation required
	TDEC DWR	Section 401 Water Quality Certification – Aquatic Resources Alteration Permit (ARAP)	Effects to TN State Waters & Wetlands	45 days	$500 to $5,000 depending on effect type	Mitigation may be required for effects; requires pre-filling or clearing notice 30 days prior to submission
CWA 402 NPDES Permitting	TDEC DWR – NPDES Stormwater Permitting Program	Section 402 General Permit for Stormwater Discharges Associated with Construction Activities	Stormwater discharges from activities ≥1 acre of disturbance during construction	Notice of intent (NOI) and stormwater pollution prevention plan (SWPPP) to be filed 30 days prior to construction	$1,000 for 5-20 acres $3,000 for 20-50 acres $6,000 for 50-150 acres	Early coordination recommended; NOI and SWPPP for Construction Activity – Stormwater Discharges (Form CN-0940). If granted, Permit TNR100000 would authorize discharges associated with construction activities that result in a total land disturbance of 1 acre or greater
Septic System or Pump-Out Septic Holding Tank Permit	TDEC Knoxville EFO	None	Installation of septic system, pump-out septic holding tank, or well on the Kingston Reservation	The review process generally takes 10 days and must be completed within	Dependent on design and gallons per day	If necessary, would submit Application for Ground Water Protection Services (Form CN-0971) (TDEC 2021b). If

Submittal/ Consultation	Reviewing Agency	Authorization	Applicability	Timing	Fees	Notes/ Assumptions
				45 days of the date the application was submitted		well installation required, a NOI (CN-1240) would be filed with TDEC
Encroachment and Crossing Permits	TDOT	Rules and Regulations for Accommodating Utilities within Highway Rights-of-Way (ROW), Chapter 1680-6-1)	Aboveground or below ground installation within state, federal-aid metro-urban, or State-aid highway system road ROWs	30-day review time	N/A	N/A
	USDOT	U.S. Department of Transportation's Highway/Utility Guide (USDOT 1993)	Aboveground or below ground installation within U.S. highway ROWs	30-day review time	N/A	N/A
Burn Permit	TN Division of Forestry	N/A	N/A	N/A	N/A	Only trees and brush from the Project Site would be burned. Weather conditions would be monitored and considered to ensure safety and minimize degradation to air quality during the open burning of any vegetation cleared from the site
Protected Species Coordination	USFWS	Section 7 Consultation; Migratory Bird Treaty Act	Federal Listed species; migratory birds	60-day period for review of agency findings	N/A	Section 7 ESA Consultation was completed on December 27, 2023
	TDEC	State protected species	Varies	N/A	N/A	Informal consultation with TDEC recommended if project triggers an ARAP

Submittal/ Consultation	Reviewing Agency	Authorization	Applicability	Timing	Fees	Notes/ Assumptions
Cultural Resources	TN Historical Commission	National Historic Preservation Act; Section 106 Consultation	Historic Properties	30-day period for review of agency findings	N/A	Section 3.13 lists the tribes that have been consulted to date. Section 106 Consultation was completed on November 28, 2023
Air Pollution Control Construction Permit	TDEC	N/A	Construction of a new air contaminant source or the modification of an air contaminant source which may result in the discharge of air contaminants	120 days prior to the estimated date of construction	N/A	TVA submitted a modification to the Title V Application in December 2023
Wild and Scenic Rivers Consultation	National Park Service (NPS)	Sections 7 & 10	Wild and Scenic Rivers	N/A	N/A	Applicable for ETNG natural gas pipeline. ETNG has initiated consultation with the NPS.

CHAPTER 2 – ALTERNATIVES

This chapter describes the Proposed Action of retiring, decommissioning, and demolishing the KIF Plant and the alternatives for the replacement of the retired generation.

2.1 Description of Alternatives

The KIF Plant has significant future capital needs to support compliance with the USEPA's regulations, including the CCR and ELG rules. TVA has previously conducted environmental reviews for activities necessary to comply with USEPA's CCR Rule (USEPA 2018) and ELG Rules (USEPA 2023). Under the No Action Alternative and the Action Alternatives, TVA would implement specific actions related to wastewater treatment and the management and disposal of CCR, primarily solid wastes, at the KIF Plant. CCR management projects have been previously analyzed in NEPA documents listed in Section 1.5.1 or are future projects, which are either underway or would commence within the next five years. CCR management actions on the Kingston Reservation would continue regardless of the Project or decision whether to retire the KIF units and to replace the retired generation with firm, dispatchable replacement generation.

This section discusses the actions that would occur if the KIF Plant remains operational (No Action Alternative) or is retired and demolished and the generation is replaced with a single gas-fired CC gas plant paired with 16 dual-fuel Aeroderivative CTs (Alternative A); or multiple solar generating facilities and BESS within portions of Eastern TN (Alternative B). The Alternatives are discussed below:

- No Action Alternative – KIF would continue to operate as part of TVA's generation portfolio, requiring modifications to ensure compliance with USEPA's CCR rules, ELGs, and other present or future applicable requirements. TVA has previously conducted environmental reviews for activities necessary to comply with USEPA's CCR Rule and ELG Rules (USEPA 2018).
- Action Alternative A (Alternative A) – The retirement of KIF, decommissioning and demolition of nine coal units, and the construction and operation of a CC gas plant paired with a dual-fuel Aero CT Plant and new switchyard (hereafter referred to as the CC/Aero CT Plant), a 3- to 4-MW solar site, a 100-MW BESS, and new transmission line infrastructure and connections on the Kingston Reservation. Alternative A would require off-site transmission system upgrades in the Eastern Transmission Corridor (Lines [L]5108, L5116, L5280, L5302, and L5381) and the Western Transmission Corridor (L5383). Upgrades would include uprating, reconductoring, and/or rebuilding transmission lines within existing ROW, as well as replacing terminal equipment, bus work, and/or jumpers. Additionally, two new poles and a fiber optic ground wire (OPGW) would be installed within the existing transmission corridor of L5108 along with replacement guy/anchors in the existing locations at one structure.
- Alternative A would include a related action, the Ridgeline Expansion Project, a new natural gas pipeline and aboveground facilities (e.g., compressor stations and meter and regulation [M&R] facilities) to be constructed, owned, and operated by ETNG. ETNG's Certificate Application and associated Final Resource Reports were filed with FERC on July 18, 2023 (ETNG 2023b-m), with subsequent filings in October 2023 (ETNG 2023a) and December 2023 (ETNG 2023n-q).

- Action Alternative B (Alternative B) – The retirement of KIF, including the decommissioning and demolition of nine coal units, investment in and upgrades to the local and regional transmission system, and the construction and operation of multiple solar and BESS facilities through PPA agreements, a portion of which would be located at alternate locations in Eastern TN. To maintain stability on TVA's transmission system, TVA would need to accommodate the decreased influx of generated power from KIF as well as ensure the multiple (15+) solar generating locations can be connected without impacting the existing grid for the areas surrounding the new solar sites. In addition to on-site transmission upgrades and off-site upgrades to existing transmission lines and substations described in Alternative A, this alternative would include the construction, operation, and maintenance of new transmission line ROWs. For more information on the transmission needs and timing, please refer to Section 1.2.2.3 and Section 1.2.2.4.

The action alternatives studied in the FEIS align with the 2019 IRP (TVA 2019a) and TVA's overall strategic direction (TVA 2021h). Specifically, the Alternatives A and B align with the following elements from the 2019 IRP:

1) Near-term recommendation to evaluate coal retirements; and
2) The capacities proposed in all action alternatives align with the target power supply mix ranges for new CT, CC, solar, and storage capacity.

The types of generation needed to replace the retired coal capacity is guided by the 2019 IRP, which evaluates the addition of up to 9,800 MW of CC capacity, up to 8,600 MW of CT capacity, and up to 14,000 MW of solar capacity, by 2038 (). The target power supply mix adopted by TVA's Board in 2019 is consistent with least-cost planning obligations in 16 U.S.C. § 831m-1 and aligns with the requirement in Section 15d(f) of the TVA Act to sell power "at rates as low as feasible." All of these considerations have informed the development of the purpose and need and alternatives in this EIS. The Preferred Alternative is expected to help TVA maintain alignment with the Strategic Intent and Guiding Principles (TVA 2021h) document to reduce carbon emissions 70 percent by 2030 with a path to an 80 percent reduction by 2035, and to attain the aspiration of reaching net-zero carbon emissions by 2050. This also advances the Biden Administration's goal of achieving carbon-neutral electricity by 2035.

Alternative A (the Preferred Alternative) meets the purpose and need for this project and helps advance TVA's system-wide goals of integrating more solar and facilitating the retirement of coal plants. Alternative B does not fully meet the purpose and need for this project because it could not be constructed and operational prior to the proposed retirement and decommissioning of all nine of the existing KIF units by the end of 2027, as stated in Section 1.2., and would not provide the firm, dispatchable power needed to ensure system reliability. However, Alternative B is evaluated in detail in this EIS as a technologically proven and fully renewable replacement option that is responsive to public comments received in the EIS scoping process.

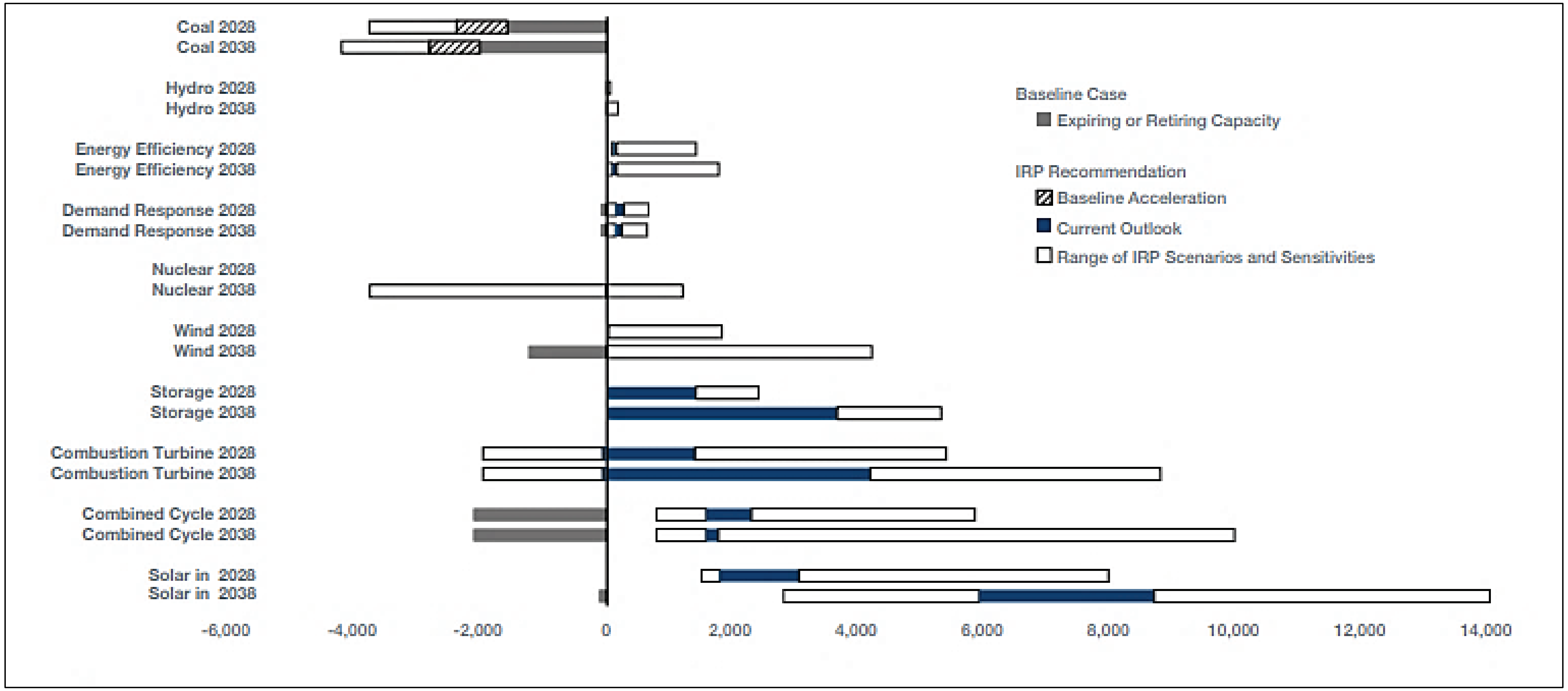

Figure 2.1-1. TVA ‘s 2019 Integrated Resource Plan Range of Megawatt Additions and Subtractions Recommended by 2028 and 2038 (Source: TVA 2019a)

2.1.1 Coal Combustion Residual Activities to Occur with All Alternatives

2.1.1.1 CCR Management

As an existing coal-fired generating facility, the combustion of coal by the nine units at KIF results in the production of CCRs which require specific actions at KIF by TVA related to wastewater treatment and the management and disposal of CCR, primarily solid wastes. Based on its age and status as a coal-fired facility, KIF and the Kingston Reservation have legacy CCRs and related issues which are discussed in the following paragraphs. The activities and actions required by TVA in response to these legacy issues would continue to be implemented under the No Action and Action Alternatives. However, both Action Alternatives would eliminate further production of CCRs on the Kingston Reservation once the facilities retire, thus eliminating the subsequent need for CCR disposal. Specific activities related to CCR are addressed in related environmental reviews performed by TVA and identified in Section 1.5.1.

2.1.1.2 Actions Required by TVA in Response to the 2008 Coal Ash Spill at Kingston

On December 22, 2008, a dredge cell dike collapsed at the KIF Plant, releasing approximately 5.4 million cubic yards of fly ash and bottom ash. Ash was released from about 60 acres of the 84-acre dredge cell complex. The spilled material covered about 300 acres of the adjacent Watts Bar Reservoir, including most of the Swan Pond Creek embayment, and reservoir shorelines. Ash also entered the channel and overbank areas of the riverine section of the Emory River. No injuries occurred, but several residences were affected. Three houses were severely damaged and were rendered uninhabitable. Portions of the rail line serving KIF, Swan Pond Road, and Swan Pond Circle were covered with ash, and water, electrical, and gas services to the adjacent area were interrupted.

To ensure that this failure would not recur, TVA retained AECOM to conduct a root cause analysis for the failure, which concluded that the breach was initiated within a thin, soft stratum at the base of the old ash deposits. Creep movements within this layer precipitated an undrained slope failure, and that resulted in static liquefaction of the saturated, stored ash deposits.

On January 12, 2009, TDEC issued a “Commissioner’s Order” in response to the failure. TVA was required to develop a plan for the comprehensive clean-up of the ash and restoration of the impacted natural resources. This was followed by TVA entering into an “Administrative Order and Agreement on Consent” with the USEPA on May 11, 2009, which provides the framework for recovery of the ash from the river and closure of the former Dredge Cell and Ash Pond under the 1980 CERCLA program. The CERCLA response was implemented in three phases:

- Phase I, Time-Critical Removal Action, involved restricting ash migration downstream, dredging ash from the Emory River (nearly 3.5 million cubic yards), transporting this material to an off-site landfill, and restoring the flow of the river.
- Phase II, Non-Time-Critical Removal Action, included recovering the remaining ash from the embayment areas, stacking it within the stabilized perimeter of the failed Dredge Cell and the adjacent, decommissioned Ash Pond, and closing the landfill.
- Phase III includes restoration of the natural resources affected by the failure.

As part of phased CERCLA response, TVA purchased 174 parcels of private property totaling approximately 932 acres surrounding the KIF ash spill site based on direct impacts from the spill or remediation as part of its continuing efforts to address the impacts of the spill and cleanup. TVA has completed both Phase I and II of the above CERCLA response. A notice of termination (NOT) was submitted to TDEC for KIF Ash Pond Dredge Cell Restoration Project in May 2014.

Phase III is a multi-decade, long-term process to reestablish the natural resource populations that were present prior to the dredge cell failure. TVA continues to work toward the requirements of Phase III.

Under the No Action Alternative, TVA would continue to implement specific actions at KIF related to wastewater treatment and the management and disposal of CCR, primarily solid wastes. These specific actions have previously been identified and evaluated by TVA, as detailed in Section 1.5.1.

Under Action Alternatives A and B, the proposed retirement of the nine existing coal-fired units at KIF would eliminate the combustion of coal that results in CCR production on the Kingston Reservation and the subsequent need for CCR disposal.

2.1.2 No Action Alternative

Under the No Action Alternative, TVA would not retire the existing KIF Plant, and the beneficial reduction in air emissions, water quality improvements and reductions in solid and hazardous waste production would not occur. These units would continue to operate as part of TVA's generation portfolio. As discussed in Section 1.1, frequent cycling of the large KIF units, reflected in start-up/shutdown events currently averaging greater than 85 times per year, is outside the intended design of the KIF Plant resulting in increased wear and tear. This presents reliability challenges that are difficult to anticipate and expensive to mitigate. KIF has also experienced a significant decline in material condition over the last five years, including the need for repairs to the lower boiler drum, which are symptomatic of age-driven material condition failures (i.e., failures due to aging and wear and tear) that are difficult to proactively address. For the units to remain operational, additional repairs and maintenance would be necessary to maintain reliability. In addition to repairs and maintenance, new systems and upgrades to current processes and systems (described in more detail below) would need to be added to comply with the current ELGs.

Under the No Action Alternative, TVA would not have a need to replace the capacity lost by the retirement of the nine coal units and therefore would not construct replacement generation. However, based on the age, material condition, and cost required to ensure reliability of the KIF Plant, this alternative of continuing to operate KIF for the long-term would not meet the purpose and need of TVA's Proposed Action.

The related action, ETNG's Ridgeline Expansion Project, would not proceed under the No Action Alternative. The No Action Alternative is carried forward in this EIS as a baseline for comparison to the Action Alternatives.

2.1.2.1 ELG Upgrades

The KIF Plant utilizes a series of environmental control devices and systems to reduce various air emissions. One such system is the wet flue gas desulfurization (WFGD) system, often referred to as a "scrubber." The scrubber removes sulfur dioxide (SO_2) from flue gas by allowing it to react with limestone in a slurry. This process generates gypsum, which is discharged from the scrubber and is conveyed to an on-site gypsum dewatering facility owned by TVA, the Bottom Ash Dewatering (BADW) system. The dewatered gypsum has historically been sold for use in cement. TVA is currently marketing some gypsum from KIF to be used for wallboard manufacturing (or other approved uses). Water from the gypsum dewatering process is treated in clarifiers and then conveyed to an existing on-site process water basin where it receives additional treatment and is discharged from the site via a NPDES permitted outfall. KIF's NPDES permit requires discharged waters to meet specific limitations, in accordance with USEPA ELGs (described in more detail in Section 3.6.2.1.1.2).

In 2015, the USEPA published a final rule revising the existing Steam Electric ELGs. The ELGs updated existing technology-based water discharge limitations for power plants. In 2017, the USEPA published a rule postponing certain compliance/applicability dates to provide the USEPA with time to review and revise, as necessary, the 2015 ELGs for WFGD wastewater and Bottom Ash Transport Water (BATW). However, limits on low volume wastes, and non-chemical metal cleaning wastewater, regulated under USEPA's 2015 ELGs (80 FR 67837 (Nov. 3, 2015)) remain unchanged. On October 13, 2020, the USEPA published revisions to the Steam Electric ELGs in 40 CFR Part 423. The revised rule modifies technology-based effluent limitations for flue gas desulfurization (FGD) wastewater and BATW, which must be implemented by facilities as soon as possible but no later than December 31, 2025, unless the facility commits to retiring by December 31, 2028. TVA filed a Notice of Planned Participation to preserve the option of participating in the 2020 ELG rule retirement subcategory for facilities ceasing coal combustion by December 31, 2028. The rule also establishes several new subcategories that provide separate compliance pathways based on unit operation and asset operating plans. In early 2023, the USEPA published a newly proposed draft ELG supplemental rule that proposes to provide more stringent discharge standards for FGD, BATW, and combustion residual leachate.

To comply with the final 2020 ELGs and the proposed 2023 ELGs supplemental rule (if finalized as proposed), it is estimated that approximately $655 Million dollars of upgrades would be required at KIF, with potentially more to be assessed to comply with this updated supplemental rule once finalized. Please see Table 2.1-1 below for more details on the breakdown of these costs.

Table 2.1-1. No Action ELG and Plant Upgrades*

Project	Approximated Cost
KIF Bottom Ash Transport Water Recirculation Installation**	$115 Million
KIF FGD Wastewater Treatment System Installation	$240 Million
Add Zero Liquid Discharge to Bottom Ash Recirculation System	$150 Million
Installation of FGD Membrane Technology to Wastewater System***	$150 Million

* Costs do not include Operations and Maintenance Costs

** Cost includes upgrades to boiler bottoms and sluice lines but does not include cost of all needed KIF Plant upgrades to continue operating this facility

*** Feasibility and cost of technology still being evaluated

To comply with the 2020 ELG rule and the supplemental proposed 2023 rule's requirements for FGD wastewater, TVA would need to construct a new WFGD wastewater treatment (WWT) system to ensure total suspended solids (TSS), selenium, nitrate-nitrite, and trace metals, such as mercury and arsenic, meet ELGs prior to mixing (i.e., at end-of-pipe). Upgrades would also be required for the current on-site BATW system to comply with the 2020 ELG regulations. These BATW upgrades were previously reviewed as part of the KIF Plant Bottom Ash Dewatering Facility, Environmental Assessment in 2015 (TVA 2015).

Under the No Action Alternative, TVA would plan to construct and operate a new WFGD WWT facility and modify existing processes at KIF to achieve compliance with the October 2020 ELGs general applicability category. This action would enhance the wastewater quality to meet regulatory limits established by USEPA's ELGs and would improve the marketability of gypsum produced in the WFGD process. TVA's KIF NPDES permit is currently being modified to reflect the new 2020 ELG requirements. Additionally, these regulatory requirements may be further updated through anticipated changes to the ELG guidelines by USEPA, which are anticipated by spring 2024. In addition to a new WFGD WWT system, basin(s) for stormwater and WFGD process water, and secondary gypsum dewatering hydro cyclones would also be included. Prior to installation of a new WFGD WWT system to meet current ELG standards (2020) or new ELG standards (anticipated 2024 ELG standards) or any additional treatment requirements proposed by the anticipated 2024 ELG Rule, the proposed activities would require additional NEPA evaluation.

2.1.3 Alternative A – Retirement of the KIF Plant, Demolition of the Units and Construction and Operation of a CC/Aero CT Gas Plant and Switchyard, a Solar Site, and Battery Energy Storage System on the Kingston Reservation

2.1.3.1 Retire and Demolish KIF

Following construction of the proposed CC/Aero CT Plant with hydrogen co-firing capability, all nine KIF units would be retired and decommissioned by the end of 2027. The retired coal facilities would transition to the Decommissioning, Deactivation, Decontamination, and Demolition (D4) process as described in Table 2.1-2. Routine KIF Plant deliveries would also be discontinued. The existing switchyard would be maintained for use in future operations associated with the proposed CC/Aero CT facility. Employment at the KIF Plant would be reduced. All previously studied CCR projects would continue to be implemented, see Section 1.5.1. The anticipated KIF D4 project area (hereafter "demolition boundary") under Alternative A is shown in Figure 2.1-2.

Table 2.1-2. Key D4 Activities

Decommissioning	Deactivation	Decontamination	Demolition
Tagging out all unit or plant equipment except service water, lighting, etc.	Performing electrical and mechanical isolation of systems, components and areas	Removal and proper disposal of regulated materials as practical	Demolition of all buildings and structures within the proposed demolition boundary (Figure 2.1-2) to three feet below final grade via mechanical deconstruction and/or explosives
Emptying and cleaning hoppers, bins, bunkers, etc.	Installing bulkheads and/or fill tunnels	Periodic materials condition monitoring	Backfill all buildings and structures with below grade features using concrete and masonry from the demolished facilities in addition to fill
Opening all equipment electrical breakers not in use	Providing alternate power and services for sump pumps, Federal Aviation Administration stack lighting, etc.	Periodic waste removal as materials will deteriorate over time	Cut and cap all buried utilities within the project boundary and abandon in place if they do not interfere with other ongoing projects that overlap the project footprint

Decommissioning	Deactivation	Decontamination	Demolition
Draining and disposing of oil and fluids			Decommission and seal all hollow pipe utilities with a mechanical cap or plug
Salvaging and storing all useable equipment, components, materials, spare parts, office products, etc. and relocating them, as practical.			Restore site to grade to provide proper drainage
Salvaging and storing all key plant records			

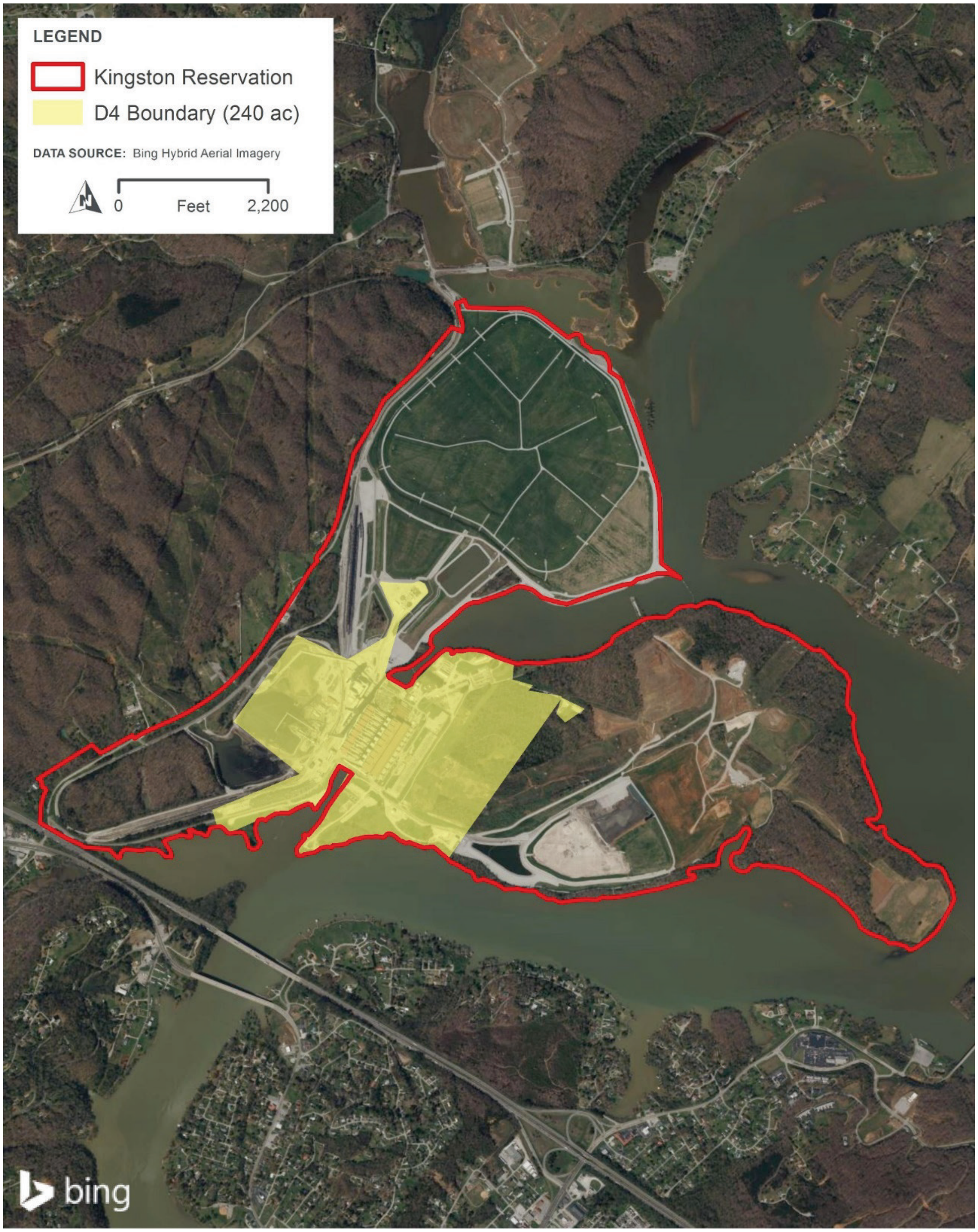

Figure 2.1-2. Kingston Fossil Plant Retirement Demolition Boundary

Virtually all coal unit operational activities would be discontinued, and the coal facilities would be retired and would transition to the D4 process as detailed in Table 2.1-2. All buildings, structures, conveyers, and silos associated with plant operations would be decontaminated and demolished to three feet below final grade. All below-grade building areas would be backfilled, and the site would be restored to grade while providing proper drainage.

The following buildings and structures are proposed for demolition:

- Powerhouse units 1 to 9
- Smokestacks/chimneys
- Boiler bays
- Turbine bays
- Aboveground coal conveyors and conveyor tunnels to 3 feet below final grade
- Conveyor control and crusher building
- Steam lines
- Tank farms
- Demineralization building
- Precipitators
- Maintenance shop
- Fuel unloading facility
- Service bay
- Office wing
- Wash pads
- Electrical control buildings
- Hopper buildings 1 and 2
- GUBMK Constructors office buildings
- Electric Power Research Institute (EPRI) Office
- Fly ash handling facility
- Utility building
- Fuel/chemical storage and associated piping
- Railroad and crossties
- Silos
- Light towers
- Selective Catalytic Reduction (SCR)/FGD scrubber facility and support buildings
- Coal lab
- Water treatment plant
- Hydrogen ports
- Weather enclosures
- Warehouses
- Oil water separators
- Security portal/ guard building
- Electrical shops
- Car/equipment wash
- Bottom ash dewatering facility
- Reverse osmosis system
- Booster fan building
- Draft Sys XFMR YD transformer
- Transformer yard
- Precipitator building
- Waste storage building
- Coal unloading area, transfer stations, and conveyors
- Other unnamed structures within the D4 boundary

The following features are also included for consideration for deconstruction/demolition:

- Select KIF Plant roads and parking lots,
- Street lighting,
- Intake condenser circulating water tunnels,
- Discharge condenser circulating water tunnels,
- Water treatment building and reverse osmosis trailers,
- Gypsum plant,
- Plant perimeter fencing,
- All decommissioned piping from the tank farm (that may contain residuals) to the utility building, and the coal pile, coal conveyor tunnels and transfer pits to three feet below final grade (facilities below three feet would be abandoned in place),

- Rotary car dumper (and associated railroad track, ties, and ballast), and
- Sanitary sewer connections from demolished facilities.

The following buildings and facilities located within the demolition boundary would remain in place and operational at KIF:

- Intake pump station,
- Diesel fire pump house,
- Switchyards and all associated insulating oil piping and pits,
- Electrical control building associated with the switchyards, and
- Emergency storage tank associated with the leachate system.

Primary operational measures that would be discontinued include daily coal rail operations, coal pile management, pumping and use of water from the Clinch and Emory River for the KIF Plant, and thermal discharges into the Clinch River. The combustion of coal for the production of power would cease, as would the generation of wastes associated with such power production.

2.1.3.2 Construction and Operation of a CC/Aero CT Plant and New Switchyard on the Kingston Reservation

Replacement generation would include a single gas-fired CC plant with 16 dual-fuel Aeroderivative CTs. A CC power plant combines a natural gas CT and a steam turbine to produce up to 50 percent more electricity from the same fuel than a traditional simple-cycle (i.e., without a steam turbine) CT plant. Waste heat from the gas turbine is routed to the heat recovery steam generator (HRSG); the steam from the HRSG then goes to the nearby steam turbine to generate extra electricity. A typical CC plant configuration is illustrated in Figure 2.1-3. Typical Aero CT units consist of similar configuration but lack the HRSG.

A review of potential replacement generation configurations for KIF Plant indicated that at least 1,500 MW would be required, with at least 500 MW of that capacity being dual-fuel capable, which provides resiliency during emergency situations. TVA selected the 16 Aeroderivative approach as the design met target generation and dual-fuel capacity needs. Aeroderivative CTs provide additional benefits, including:

- Synchronous condensing helps ensure reliable power by maintaining a consistent flow of current to the grid via the production and absorption of reactive power, greatly enhancing the flexibility of the power supply, particularly as the percentage of renewable resources on the system grow;
- They are highly fuel-efficient for simple-cycle gas CTs;
- Flexible generation output, ability to ramp quickly, and start and stop multiple times per day;
- They can be set up to provide additional black-start capability (i.e., capability to restart portions of the power system to recover from a blackout) for the region; and
- The Aeroderivative CTs would be most impactful to ensure reliability, resiliency, and flexibility at a regional and system level.

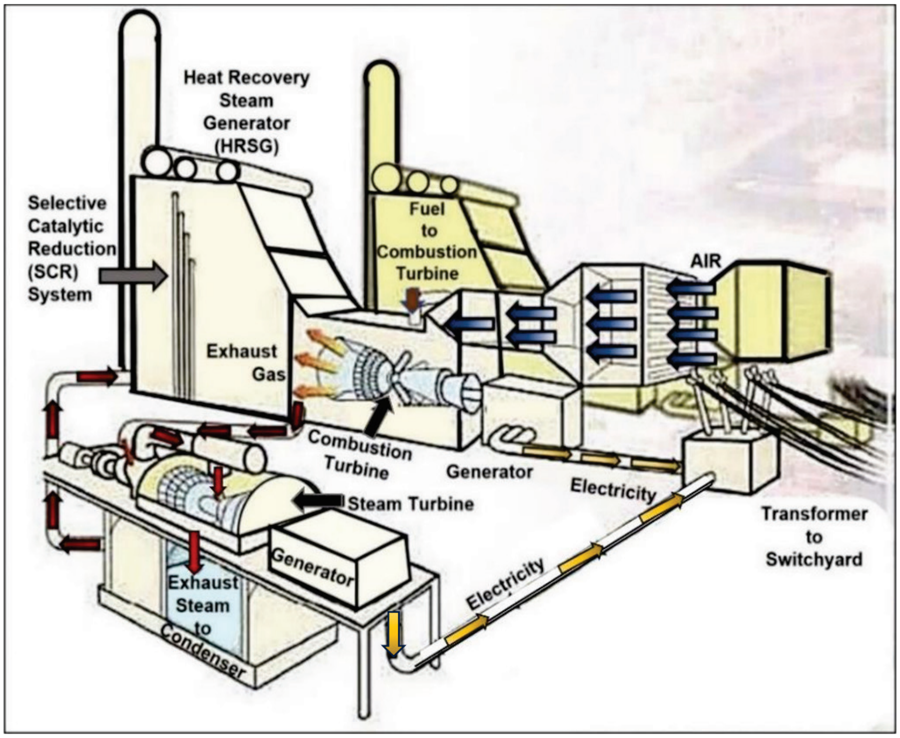

Figure 2.1-3. Typical Components of a Combined Cycle Power Plant

2.1.3.2.1 Site Evaluation for New CC and Dual Fuel-Aero CT Resources

TVA identified candidate sites for the proposed location of a new CC/Aero CT Plant based on a desktop review of land parcels located near existing transmission access and existing natural gas supply. Initial site screening resulted in several potential locations for a new CC/Aero CT Plant, including other facility reservations within TVA's system. These sites were further evaluated using criteria summarized in Table 2.1-3.

Based on evaluation of the screening criteria, TVA proposes to construct a new CC/dual-fuel Aero CT Plant of approximately 1,500 MW generating capacity on the 2,254-acre Kingston Reservation. This location offers several benefits:

- The construction footprint for the new CC/Aero CT Plant would be located on land within existing TVA property as opposed to purchasing property.
- The Kingston Reservation currently includes transmission interconnection to TVA's system, the majority of which can be repurposed for the new facilities.
- Providing the generation capacity on the Kingston Reservation to replace capacity lost from retiring all nine KIF units will play an increasingly important role in maintaining system reliability and stability and meeting local load demand in the Knoxville service area, especially given the December 2023 retirement of the nearby Bull Run Fossil Plant[11]. Locating generation at the Kingston

[11] Bull Run Fossil Plant is located on Bull Run Creek near Oak Ridge, Tennessee, and approximately 20 miles to the northeast of the Kingston Reservation. The plant has a summer net capability of 865 megawatts and generates approximately 6 billion kilowatt-hours of electricity a year, enough to supply 400,000 homes. After a detailed review of fuel, transmission, economic, and environmental impacts, as

Reservation would help reduce the extensive costs associated with additional transmission upgrades potentially required following the proposed KIF Plant retirement.

- The new gas pipeline would be installed primarily within an existing ETNG ROW and would require approximately 8 miles of new pipeline to connect to the Kingston Reservation, thus minimizing project impacts on greenfield (or previously undeveloped) property and reducing the length of required pipeline, which further reduces the potential for associated environmental effects.

The Kingston Reservation has favorable air permitting prospects for a new CC paired with dual-fuel Aero CT units, since it would be replacing the existing higher GHG emitting coal units.

Table 2.1-3. Summary of Criteria Evaluated to Determine the Location of the CC/Aero CT Plant

Transmission	Site Considerations	Operational Considerations
• System upgrades needed • Locational value	• TVA vs non-TVA owned sites • Site availability (available for purchase) • Land cost	• Supply chain considerations • Staffing
Fuel Supply	**Environmental Considerations**	**Financial and Planning Considerations**
• Cost • Availability • Reliability • Operational considerations	• Environmental regulations • Sensitive environmental/cultural resources present • Water discharge considerations and potential regulations	• TVA's Long Range Financial Plan • TVA's Integrated Resource Plan

Based on this initial screening, TVA selected three sites on the Kingston Reservation as potential sites for the construction of the CC/Aero CT Plant (Figure 2.1-4). After further evaluations, Option A (38.78 acres) and Option B (26.32 acres) were eliminated due to insufficient acreage and the fact that they could not be expanded due to existing facilities and the adjacent river. At the time of the initial screening, Option C (47.92 acres) was identified as the preferred location for the proposed CC/Aero CT Plant on the Kingston Reservation as it was large enough to provide the acreage needed to accommodate the proposed CC/Aero CT Plant and had unconstrained space available adjacent to the site for expansion.

well as reviewing public input, TVA's Board of Directors approved, on Feb. 14, 2019, the retirement of Bull Run Fossil Plant, which was completed in December 2023.

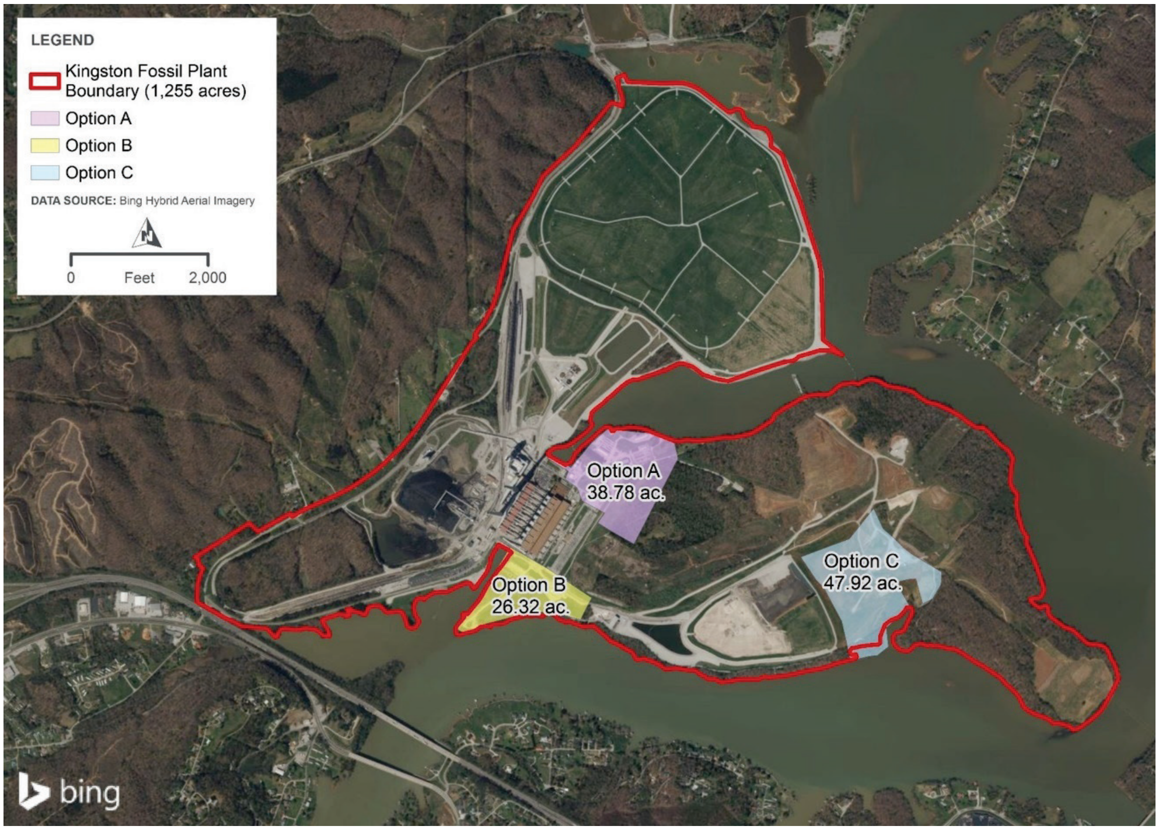

Figure 2.1-4. Alternative Siting Options Considered for the Combined Cycle/Aero Combustion Turbine Plant Proposed on the Kingston Reservation Under Alternative A

2.1.3.2.2 Components of the New CC with Dual-Fueled Aero CT Gas Plant

Conceptual plans for the proposed CC/Aero CT Plant with a generating capacity of at least 1,500 MW and associated transmission lines have been developed at the location of the Option C footprint (Figure 2.1-5). Major components of the proposed CC/Aero CT Plant are as follows:

- A gas-fired CC plant (including a single HRSG) paired with 16 dual-fuel Aeroderivative CTs and air-cooled condensers,
- Auxiliary boilers to provide start-up steam,
- Selective catalytic reduction (SCR) system,
- Aqueous ammonia systems for the SCR,
- New natural gas-fired dew point heaters may be required depending on requirements of the selected CTs,
- Electric and diesel emergency firewater pumps, and
- Gas compressors.

A CC/Aero CT Plant configuration at the Kingston Reservation would include:

- Gas system upgrades to the existing infrastructure to enable connection of the CC/Aero CT Plant to an approximately 122-mile-long proposed natural gas pipeline and aboveground facilities including compressor and M&R station that would be constructed and operated by ETNG.
- Pond(s) for holding and treating process and storm water flow; size of pond(s) to be determined after further engineering.
- Construction of new 161-kV and 69-kV transmission lines from the proposed natural gas-fired facilities to the existing 161-kV transmission line and a new 8.5-acre switchyard (in addition to the existing switchyard, which will remain on site and be reused under the proposed Alternative A).
- Preliminary estimates indicate that approximately 300,000,000 cubic feet per day (cf/d) of natural gas would be required for the CC/Aero CT Plant. This demand would require gas pressure of up to 750 pounds per square inch, requiring TVA to construct and operate an on-site electric motor driven (EMD) gas compression system to increase the pressure of the gas delivered to the plant.
- Two, one-million-gallon storage tanks for fuel oil on-site.

In addition to the major equipment systems, the proposed CC/Aero CT facility includes plant equipment and systems such as natural gas metering and handling systems, instrumentation and control systems, transformers, and administration and warehouse/maintenance buildings. Multiple temporary parking and contractor laydown areas have been identified to support construction activities on the Kingston Reservation. To minimize potential impacts, the areas identified for parking and contractor laydown would be located within previously developed areas, existing parking areas, or areas previously cleared for other Alternative A components, with the exception of an 8.2-acre parking/laydown area on the southeastern portion of the Kingston Reservation, which would be located adjacent to the existing transmission line ROW in an existing clearing that undergoes regular vegetation management by TVA (Figure 2.1-5).

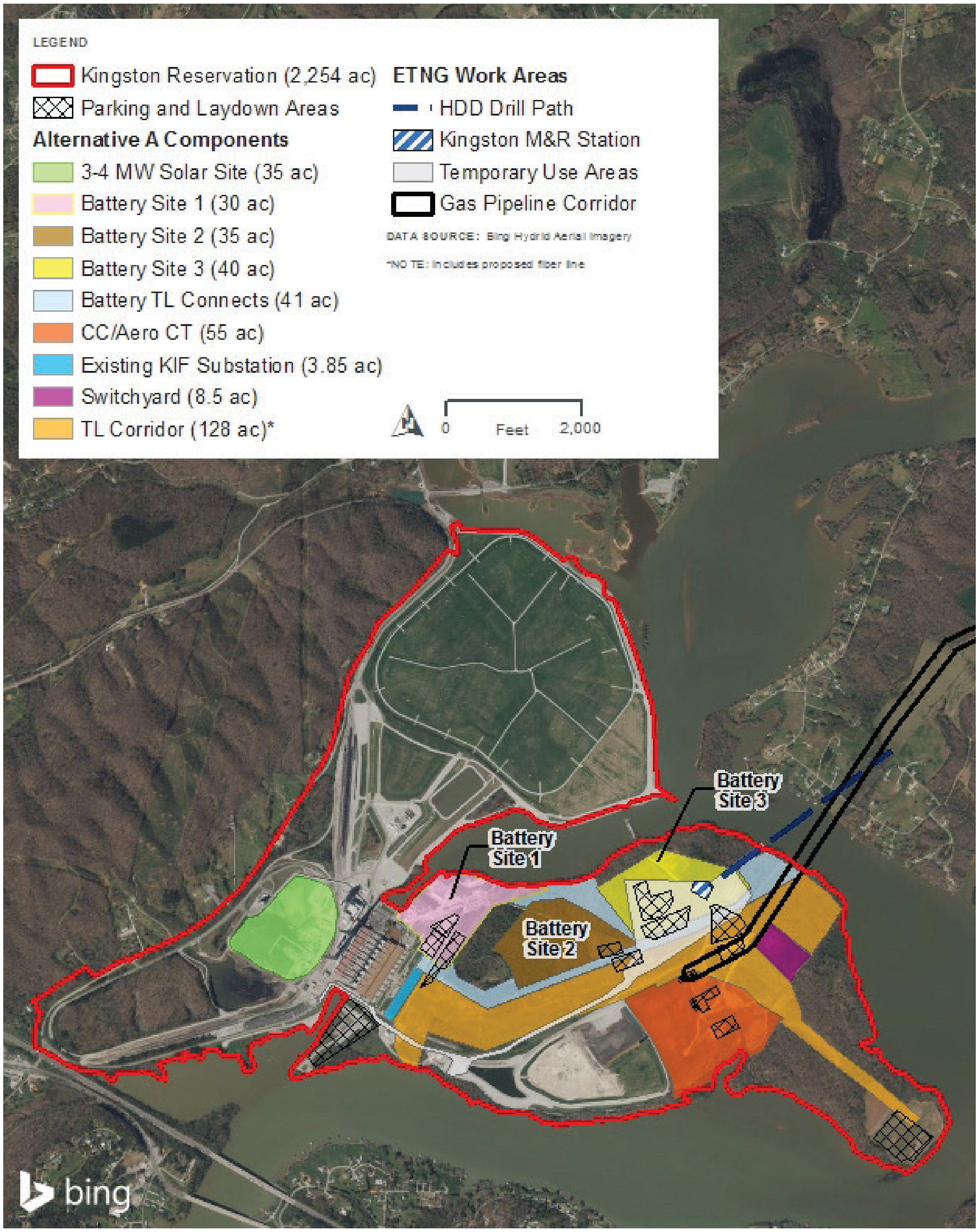

Figure 2.1-5. Proposed Alternative A Components on the Kingston Reservation

2.1.3.2.2.1 Water Requirements

The existing KIF Plant withdraws between 800 and 1,360 million gallons per day (MGD) of raw water for non-contact cooling. This water is primarily returned to the Clinch River after once-through cooling. TVA proposes to use air-cooling instead of water-cooling for the new CC/Aero CT Plant, which would eliminate the need for water withdrawal from the Clinch River or groundwater wells. To prevent concentration of minerals in the steam cycle, the HRSG would require a demineralized water feed and boiler blowdown to remove accumulating minerals. CT compressor washing also requires demineralized water. Wash effluent would be collected in tanks and, after analysis, disposed of at an approved wastewater treatment facility off-site.

Potable water would be obtained from the existing public supply at the Kingston Reservation (Harriman Utility Board), and demineralized water would be made on-site and stored on-site in newly constructed tanks within the overall project footprint. Some water treatment would be required to support the CC steam cycle and would be integrated into plant design.

2.1.3.2.2.2 Emission Monitoring and Controls

Operating the CC/Aero CT Plant would require emission monitoring and controls for both the CC and Aeroderivative CT units. Reduction of emissions of nitrogen oxides (NO_x) from all CC and CT units would be achieved through dry low-NO_x and/or dry low emissions combustion systems. Additional NO_x control for all CC (excluding CC bypass stack) and CT units would be achieved via an SCR system located in the exhaust path. The SCR system would use 19.5 percent aqueous ammonia that would require installation of an independent storage/receiving system.

Reduction of carbon monoxide (CO) and volatile organic compounds (VOC) would be achieved using an oxidation catalyst. The exhaust stacks would be equipped with continuous emissions monitoring systems.

2.1.3.2.2.3 Fuel Oil

Alternative A would utilize Ultra Low Sulphur Diesel (ULSD) as an emergency backup fuel for the Aero CT units. This fuel would be permitted for use for a limited number of hours each year. Based on preliminary calculations, the annual runtime on this back-up fuel source would be approximately 42 hours at 500 MW. Two, one-million-gallon storage tanks would be constructed to accommodate this need.

Consideration of “dual-fuel” for the Aero CT portion of the proposed gas plant on the Kingston Reservation relates directly to issues of fuel security and resiliency. Resiliency, as applied to the power system when faced with a trigger event (e.g., natural, intentional, physical, or digital/cyberterrorism events), should consider two concepts (TVA 2019a):

1) Response: Flexibility of a system to respond quickly to a trigger event; and
2) Recovery: Ability to recover to normal operating levels quickly and efficiently.

The combination of quick response and recovery addresses the concept of resiliency. Reliability reflects ongoing and continuous operations.

Natural gas-fueled electricity generation is an important source of energy for the U.S. power sector in general, and for TVA specifically. The natural gas fuel supply and delivery system proposed to serve Alternative A is robust, interconnected, redundant (i.e., extra capacity to support resiliency against unforeseeable operational impacts), and geographically diversified. Most of the pipeline system is buried underground, offering protection against storms, natural events, and physical attack. The redundancy of natural gas networks, as well as access to the diverse sources of natural gas supply for the generation facilities they would or already serve, provides a highly reliable and highly resilient fuel source for power generation.

Petroleum fuels play an important role in TVA's generation mix in the CC and CT facility as a back-up/alternative option in dual-fuel units. The petroleum delivery system is robust, complex, redundant, diversified, and resilient, providing a multi-modal network that utilizes pipelines, trucks, and storage tanks. When combining the network benefit of natural gas with the network benefits of petroleum delivery, dual-fuel generation plants using ULSD fuel as a back-up fuel further strengthens TVA's resiliency and provides one of the most robust forms of generation on the system. Natural gas units with dual-fuel capability can switch to an alternative fuel before line-pack is lost and then recover rapidly after the trigger event has subsided.[12]

2.1.3.2.3 CC/Aero CT Plant Construction Activities

Construction activities associated with the CC/Aero CT Plant, other than the connecting natural gas pipeline, would occur on the Kingston Reservation at the Option C site identified in Figure 2.1-4. The CC/Aero CT Plant would occupy approximately 30 acres, and an additional 10 to 25 acres of the CC/Aero CT footprint would be used for equipment laydown and mobilization, for a total CC/Aero CT Plant footprint of 55 acres (Figure 2.1-5). Subsurface piles or other deep foundation systems would be installed to support foundations for plant components, as required.

Larger project equipment could be delivered to the site by rail or barge, and smaller items by truck. Improvements to the current barge unloading facilities would consist of grading and construction of a dirt/rock ramp to the nose of the barge. Should in-water work be necessary for completion of the upgrades to the barge unloading facilities, TVA would pursue permit authorizations, as needed. Most delivered items would be placed in project laydown areas to await installation. Roads within the Kingston Reservation would be maintained during construction. Any off-site temporary access roads for construction would be designed in accordance with USDOT and relevant local requirements.

Site preparation work for the proposed CC/Aero CT Plant and associated equipment would begin in 2024, upon completion of the NEPA process and issuance of the Record of Decision, anticipated in late spring/early summer 2024. Actual CC/Aero CT Plant construction would begin in fall 2024 and the CC/Aero CT Plant would begin commercial operation as early as winter 2027. A maximum of 300 workers would be employed on-site during peak construction activity.

2.1.3.3 Construction of a 3- to 4-MW Solar Facility on the Kingston Reservation

To offset a portion of energy usage for station service from facilities on the Kingston Reservation, TVA, or a third-party developer, would construct and operate a 3- to 4-MW distribution solar facility on an approximately 35-acre existing coal yard used for the KIF Plant, as shown on Figure 2.1-5. The facility is anticipated to be limited to between 3 and 4 MW based on the available acreage (35 acres) within the existing coal yard on the Kingston Reservation. Site development would include the installation of solar panels on piles and associated infrastructure, which may include inverters, access roads, stormwater management, vegetation seeding, and a perimeter safety/security chain-link fence. Once operational, the solar facility would produce little noise, emit no odors or byproducts, and would not introduce traffic. The solar facility would also have a low profile with total height at less than 10 feet above ground.

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[12] Line-pack refers to the amount of gas stored in a pipeline at a given moment, which is used to meet fluctuations in demand and balance short-term imbalances between supply and demand.

Site preparation work and construction for the proposed 3-4 MW solar site and associated equipment would begin after construction of the CC/Aero CT Plant and completion of D4 activities. Construction and commissioning of the solar site would be completed in 2027, with a target in-service date of January 2028.

Additional solar and/or BESS capacity may be evaluated in the future for construction on the Kingston Reservation; however, sufficient acreage to support a larger solar or BESS facility would not be available until after the construction of Alternative A, retirement of KIF, and completion of all D4 activities.

2.1.3.4 Construction of a 100-MW Battery Storage Facility (BESS) on the Kingston Reservation

TVA would construct a 100-MW lithium-ion BESS[13], which would be located at one of three potential sites (Battery Sites 1, 2, or 3, each between 30 and 40 acres in extent) located on the Kingston Reservation, just to the north of the proposed CC/Aero CT Plant footprint, to help distribute BESS resources around the TVA PSA. The BESS would be used to store energy, typically during periods of surplus power or low demand, to enhance overall grid stability. At a need of 10-15 acres per 40 MW, the three potential sites identified by TVA meet the maximum limit of land use need (25 to 38 acres) for a 100-MW BESS.

The on-site BESS would either be built by TVA or a power purchase agreement (PPA) would be utilized for a developer to construct this portion of Alternative A. The proposed location of the three BESS site options for placement of the BESS are illustrated in Figure 2.1-5. At the time of this EIS, only one of the three site options identified for placement of the BESS is needed to distribute storage resources around TVA PSA. TVA's preferred site is Battery Site 1 due to its proximity to existing utilities and prior land use history, which would minimize potential environmental effects.

TVA would install a small switchyard at the BESS location consisting of breakers, switchgear, and one or more transformers with a 161-kV high side winding voltage. The new BESS switchyard would be connected back to the existing KIF switchyard located near the proposed solar location (Figure 2.1-5) or to the new 161-kV switchyard proposed for the CC/Aero CT Plant.

2.1.3.5 Transmission and Electrical System Components

2.1.3.5.1 On-site Transmission Upgrades

TVA would construct a new double-breaker and a half 161-kV switchyard for the interconnection of the proposed CC/Aero CT Plant on the 8.5-acre location identified in Figure 2.1-5 and reroute all existing transmission lines from the existing KIF Plant on the Kingston Reservation and re-terminate them into the new switchyard. The new switchyard would consist of 13, 161-kV breakers and a half bay. All unit substation transformers would be oil-filled; therefore, concrete foundations and an oil containment system would be included. TVA would install a 161-kV switch house (potentially including water and septic systems) and station service. TVA would install an approximately 1-mile-long Optical Ground Wire (OPGW) originating within the existing Line 5108 corridor at the existing substation and terminating at the new 161-kV switchyard, as well as relaying, digital fault recorders, and redundant metering for the proposed CC/Aero CT Plant. Additionally, the

[13] TVA uses a standard solar and BESS size of 100 MW for planning purposes as it is a practicable size, based on recent TVA experience, for deploying these technologies in the TVA PSA.

OPGW installation at L5108 will include two new poles and the replacement of guy/anchors at the existing location on Structure 92.

Final engineering of the transmission routing for the proposed solar and BESS sites has not been completed at this time; however, TVA has identified a preliminary transmission routing footprint (identified as "Battery Transmission Line Connections" on Figure 2.1-5) based on the three options identified as potential BESS sites located on the Kingston Reservation. TVA is considering routing the transmission lines, wholly within the Kingston Reservation, from the proposed solar site to the existing KIF switchyard. The routing studies which inform the decision on final transmission routing for the solar facilities and subsequent construction would be completed after the D4 removal of the existing KIF Plant is complete.

2.1.3.5.2 Off-site Upgrades to Existing Transmission Lines and Substations

Under Alternative A, multiple off-site transmission infrastructure upgrades would need to be completed, which could be completed during construction of the CC/Aero CT Plant. The transmission upgrades would need to be completed prior to TVA initiating operations of the new gas plant if the proposed CC/Aero CT Plant is constructed. Upgrades would include uprating, reconductoring, or rebuilding transmission lines within existing ROW, as well as replacing terminal equipment, bus work, and/or jumpers. The following off-site transmission lines and switchyards, including an on-site portion of L5108, L5302, and L5116, would require upgrades and have been included in the analyses provided in this EIS[14]:

- Eastern Transmission Corridor
  - Kingston–Bethel Valley (No. 1)161-kV (L5302)
  - Oak Ridge TN–Kingston 161-kV (L5108)
  - ORNL TN–Bethel Valley 161-kV (L5381)
  - ORNL TN–Spallation Neutron Source 161-kV (L5280)
  - Kingston–Bethel Valley (No. 2)161-kV (L5116)
- Western Transmission Corridor
  - Fredonia–Campbell Junction 161-kV and Fredonia–Peavine TN 161-kV (L5383)

[14] L5108, L5116, L5280, L5302, and L5381 originate on or just to the east of the Kingston Reservation and are collectively referred to as the Eastern Transmission Corridor, as illustrated on Figure 2.1-6a through Figure 2.1-6d. L5383 is located west of the Kingston Reservation and is referenced as the Western Transmission Corridor, as illustrated in Figure 2.1-7. An analysis was performed based on site-specific field survey data collected in 2022 (for L5383, L5302, and L5108) and 2023 (for L5116, L5280, and L5381) and is provided in this EIS.

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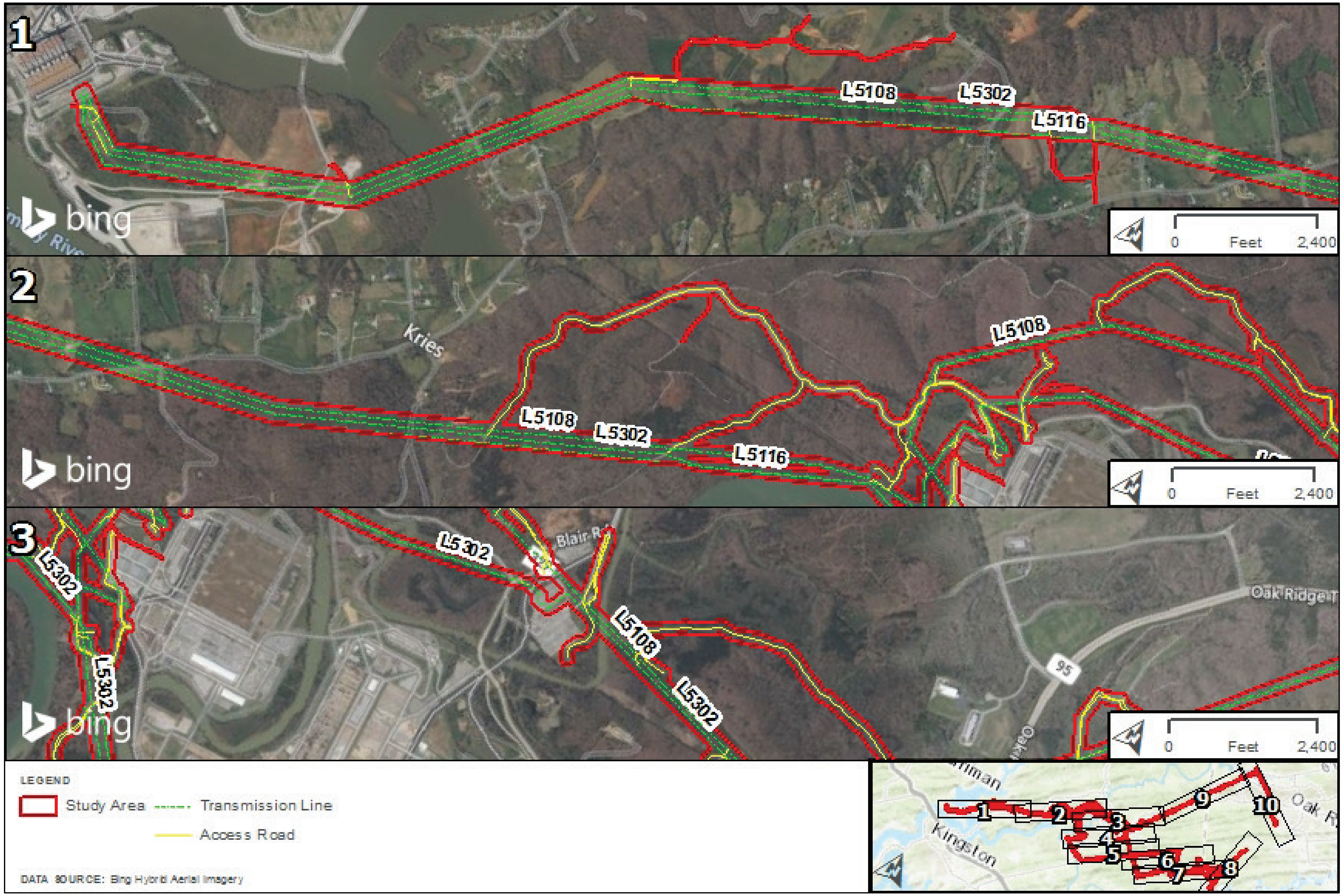

Figure 2.1-6a. Off-site Existing Transmission Line Rights-of-Way of the Eastern Transmission Corridor Proposed for Upgrades Under Alternative A. See Appendix E for detailed figures from the field survey.

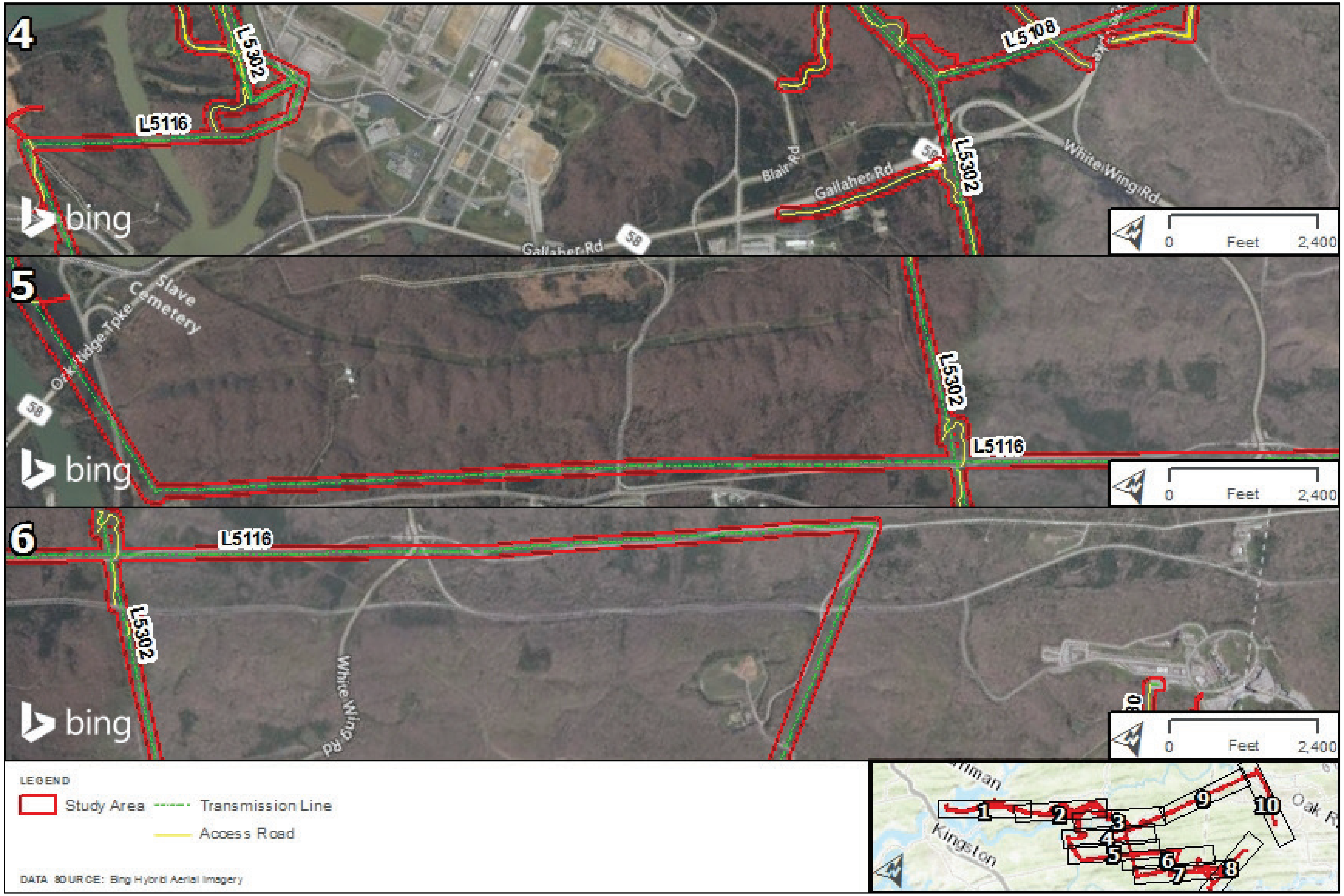

Figure 2.1-6b. Existing Transmission Line Rights-of-Way of the Eastern Transmission Corridor Proposed for Upgrades Under Alternative A. See Appendix E for detailed figures from the field survey.

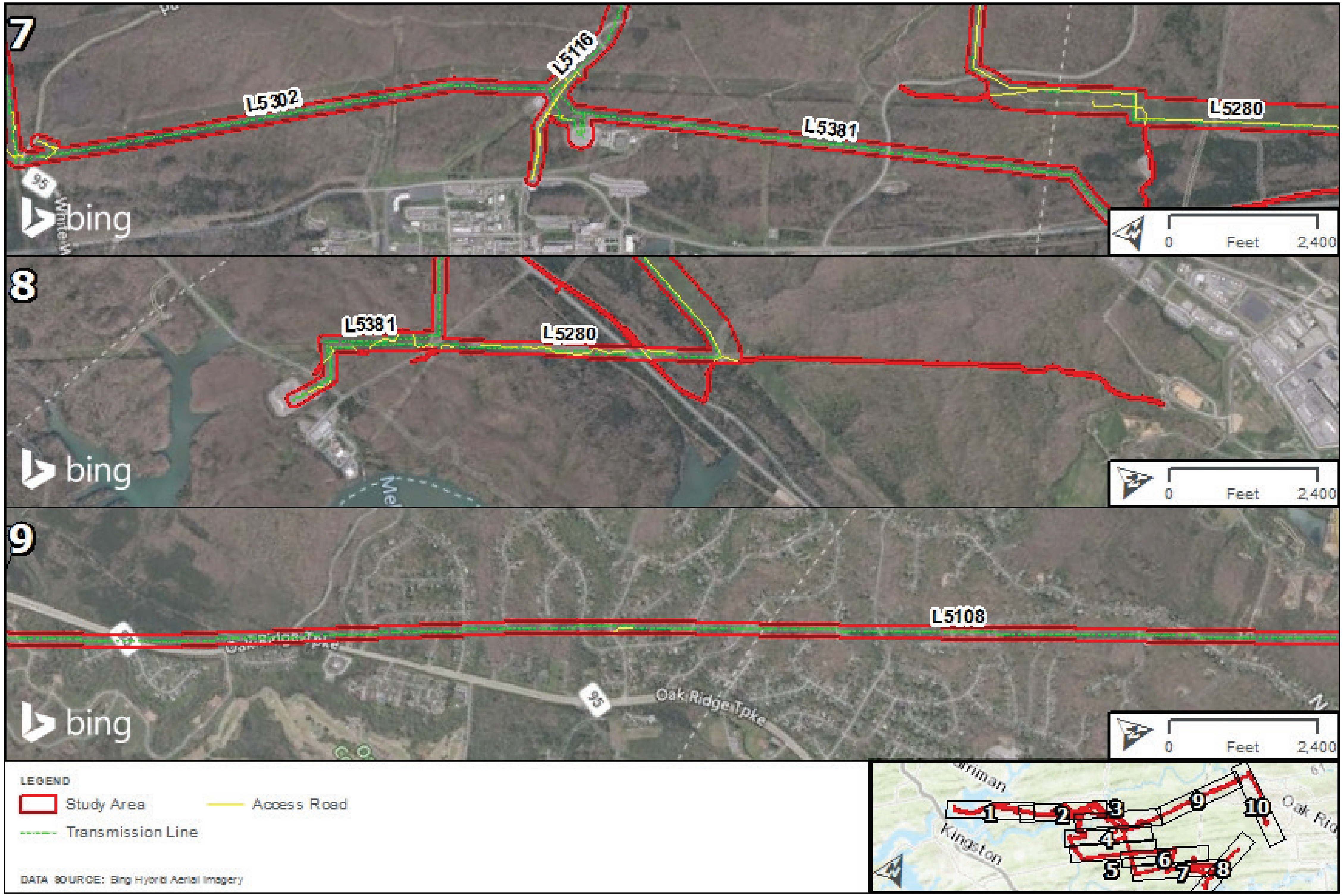

Figure 2.1-6c. Existing Transmission Line Rights-of-Way of the Eastern Transmission Corridor Proposed for Upgrades Under Alternative A. See Appendix E for detailed figures from the field survey.

Figure 2.1-6d. Existing Transmission Line Rights-of-Way of the Eastern Transmission Corridor Proposed for Upgrades Under Alternative A. See Appendix E for detailed figures from the field survey.

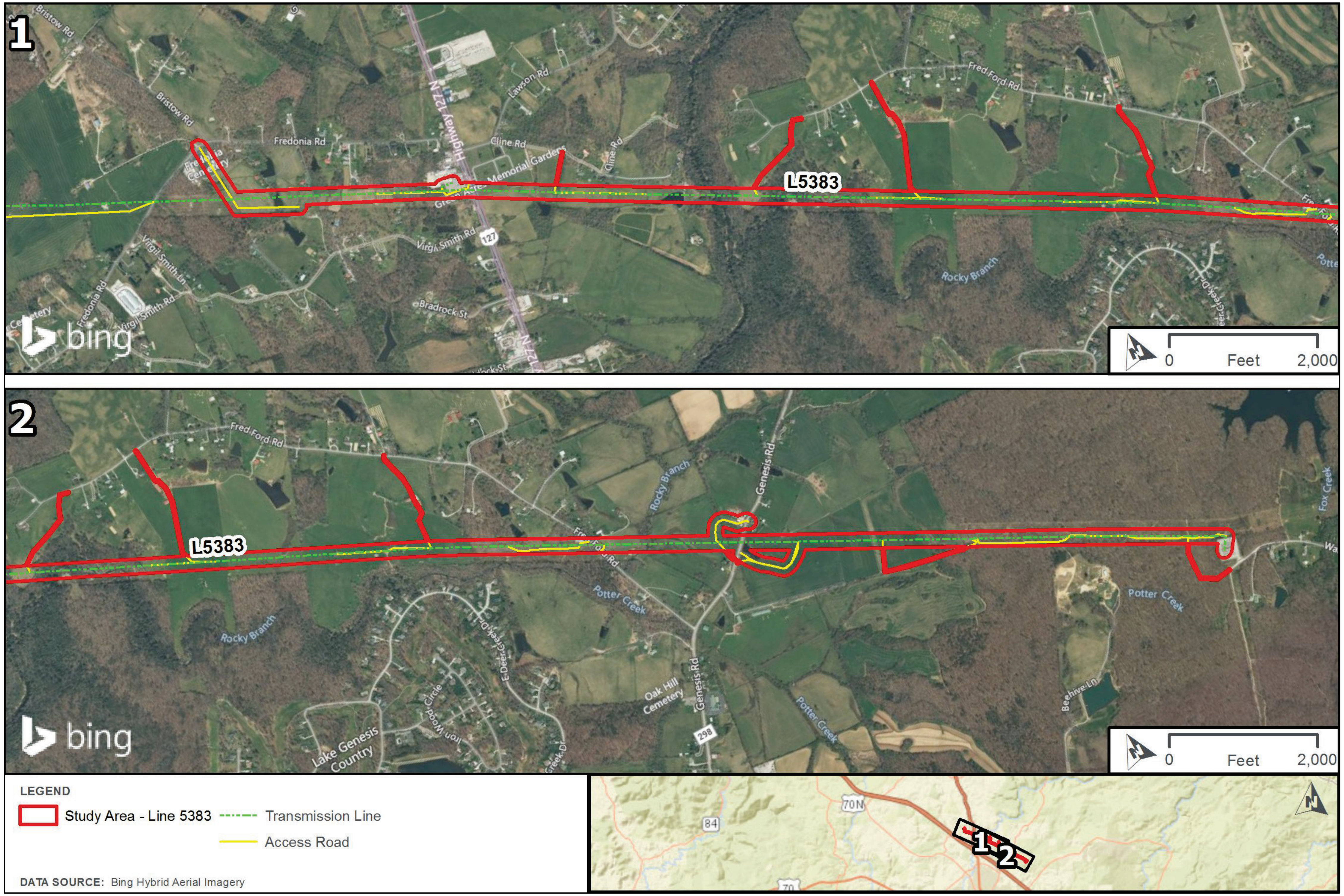

Figure 2.1-7. Existing Transmission Line Rights-of-Way of the Western Transmission Corridors (Line 5383) Proposed for Upgrades Under Alternative A

Other off-site transmission upgrades may also be required for Alternative A, and depending on results of future evaluations, may include the following existing transmission lines:

- Rockwood TN–Peavine TN 161-kV (L5205)
- Kingston–Roane (No. 2)161-kV (L5169)
- Kingston–Roane (No. 3) 161-kV (L5764)
- Pine Ridge–Spallation Neutron Source 161-kV (L5235)
- Ft. Loudoun–Watt Road TN 161-kV (L5234)
- Alcoa–Profit Springs 161-kV (L5023)
- Nixon Rd TN–Stock Creek TN 161-kV (L5023)
- Douglas HP–Newport TN 161-kV (L5957)

If future studies indicate improvements, beyond those already identified in this EIS, are required to the regional transmission system to maintain system stability and integrity, additional site-specific NEPA reviews would be completed for those additional transmission system needs.

Upgrades to the transmission system are typically performed to increase the electrical capacity of the existing transmission lines and would include the following:

- *Moving Features that Interfere with Clearance.* As more electricity is transmitted through the transmission line, the temperature of the conductor (i.e., the cable that carries the current) rises and the transmission line may sag. Features such as sheds or storage buildings located within the ROW could interfere with the ability to operate the transmission line safely and would need to be removed.
- *Replacement or Modification of Existing Transmission Line Structures or Installation of Intermediate Transmission Line Structure.* Typical transmission line structure replacement, extension, or installation of intermediate transmission line structures would be performed with standard transmission line equipment such as bulldozers, bucket trucks, boom trucks, and forklifts. The result of this work would be that the existing conductor would be raised higher to provide the proper ground clearance. Disturbance would usually be limited to an approximately 100-foot-wide circumference around the work structure.
- *Conductor Modification.* Conductor modifications include conductor slides, cuts, or floating dead-ends to increase ground clearance. A cut involves removing a small amount of conductor and splicing the ends back together. A slide involves relocating the conductor clamp on the adjacent structure a certain distance toward the area of concern (i.e., “sliding” the clamp). No conductor would be removed. A floating dead-end shortens the suspension insulator string of a structure to gain elevation at the attachment point of the conductor, increasing a span’s clearance. These improvements would require the use of a bucket truck; disturbance would be minor and confined to the immediate area of the clearance issue.
- *Conductor Replacement.* If the existing conductor size cannot support the transmission line’s electrical load, the conductor must be replaced. Bucket trucks or other light-duty equipment would be utilized for access and stringing equipment. Reels of conductor would be delivered to various staging areas along the ROW, and

temporary clearance poles would be installed at road crossings to reduce interference with traffic. The new conductor would be connected to the old conductor and pulled down the transmission line through pulleys suspended from the insulators. A bulldozer and specialized tensioning equipment would be used to pull conductors to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys. Wire pulls vary in length but are limited to a maximum of five-mile pulls. Pull point locations depend on the type of structures supporting the conductor as well as the length of conductor being installed and are typically located along the most accessible path on the ROW (adjacent to road crossings or existing access roads). The area of disturbance at each pull point typically ranges from 200 to 300 feet along the ROW.

- *Adding Surcharge.* Adding rock or dirt (surcharge) to structure footing would sometimes be required when height and/or loading modifications are made to a structure. These changes can create uplift on the existing tower footings or grillage, therefore requiring a stone base settlement to be placed around the existing footings. The additional burden prevents the tower from rising under certain conditions (i.e., weather conditions or conductor loading). Typical installation of surcharge would be performed with tracked equipment with minor ground disturbance. The stone would be piled around the footings as required and the depth would vary depending on the uplift on the affected structures.
- *Modification of Local Power Company Distribution Lines*. Local utilities' distribution lines can intersect TVA transmission lines. If the local utility crossing does not have adequate clearance, TVA requests that the local utility lower or re-route the crossing.
- *Fiber Optic Ground Wire (OPGW) Installation*. A new OPGW line can be installed with the help of a helicopter. Designated pull points along the transmission line corridor are used to set up cable reels of optic ground wire for installation. Pull point locations are typically located along the most accessible path on the ROW (adjacent to road crossings or existing access roads). Modifications to the existing transmission line are typically required along the length of the transmission line. Existing access roads would be used for the pull point locations.

Development of new temporary or permanent access roads to support upgrades to the existing transmission lines may be needed. Depending on access needs, existing access roads may require modifications such as brush clearing or tree trimming to allow for passage of equipment and bucket trucks. Tree removal is anticipated to be limited, and where required would be a negligible amount of clearing for access roads; clearing would occur between November and March. Modifications would generally be limited to the existing 20-foot-wide access road area, and, if needed, tree trimming to allow a vertical clearance of up to 12 feet. Minor ground disturbance is expected in these areas, but, if the ground is disturbed, the access road area would be revegetated using native, low-growing plant species after required transmission line upgrade work is completed (TVA 2022a). Areas such as pasture, agricultural fields, or lawns would be returned to their former condition.

2.1.3.6 Construction and Operation of a Natural Gas Pipeline and Aboveground Facilities

Under Alternative A, ETNG would design, construct, operate, and maintain the Ridgeline Expansion Project for the purpose of providing approximately 300,000,000 standard cubic feet per day of natural gas transportation capacity and an additional 95,000,000 standard cubic feet per day of new Customized Delivery Service in support of TVA's CC/Aero CT Plant. The new Customized Delivery Service would provide additional capacity needed by TVA to quickly ramp up generation to meet the increasing electricity demands of the region, while minimizing risk and maximizing TVA's ability to reliably respond to system changes resulting from TVA's increasing the capacity of intermittent and variable renewable energy sources as TVA continues to implement the target power supply mix identified in the 2019 IRP and IRP EIS (TVA 2019a, 2019b).

ETNG is evaluating, as part of its application for a certificate of public convenience and necessity from FERC, the environmental effects associated with the construction and operation of a proposed natural gas pipeline and compressor station project. This EIS draws from ETNG's analyses, which TVA has independently reviewed and verified, and evaluates the environmental effects associated with the proposed pipeline and aboveground facilities. The Ridgeline Expansion Project would include a permanent pipeline easement and adjacent temporary construction workspace (TWS) with additional temporary workspaces (ATWS) to be located outside of the pipeline ROW. The Ridgeline Expansion Project includes proposed natural gas pipeline facilities and multiple aboveground facilities, including metering and regulation (M&R) stations, the Hartsville Compressor Station, and the Trousdale County solar farm.

ETNG's December 18, 2023, filing with FERC provided updated information for specific sections of the Resource Reports submitted in July 2023 along with additional information on the Ridgeline Project in response to information requests from FERC (ETNG 2023n-q). These revisions included reductions in estimated impacts on environmental resources as a result of the construction and operation of the proposed Ridgeline Expansion Project. ETNG continues to consult and coordinate with agencies on alignment modifications and other measures for avoiding, minimizing, and mitigating potential impacts of the Ridgeline Expansion Project. Therefore, impact values presented in this FEIS are consistent with ETNG's July 18, 2023, filings with additional updates based on ETNG filings with FERC from October through December 18, 2023 (ETNG 2023n-q).

2.1.3.6.1 ETNG's Ridgeline Expansion Project Natural Gas Pipeline Facilities

The construction and operation of the new CC/Aero CT Plant would require construction of a new pipeline primarily adjacent to ETNG's existing pipeline system's line number 3100 to the Kingston Reservation. ETNG's proposed Ridgeline Expansion Project (ETNG 2023b) would consist of the construction of approximately 110 miles of new 30-inch natural gas pipeline largely adjacent to an existing natural gas pipeline ROW, 4 miles of 30-inch diameter header pipeline, and 8 miles of 30-inch diameter pipeline to connect to the proposed CC/Aero CT Plant (collectively, the Mainline), a 14,600-horsepower (HP) EMDEMD compressor station, and other gas system infrastructure to connect the plant to the new gas pipeline (ETNG 2023b, ETNG 2023q). The Ridgeline Expansion Project will include a permanent pipeline easement and adjacent TWS with ATWS in some locations.

The Ridgeline Expansion Project, a related action under Alternative A, would require multiple, temporary off-site construction laydown and parking areas. The approximate route of the proposed new natural gas line that would be built within or adjacent to the existing 3100 Line ROW (identified as East Tennessee Natural Gas in figure below) is illustrated on Figure 2.1-8. Modifications to the Texas Eastern M&R Station would include the installation of a new 20-inch tap to tie-in the Texas Eastern Natural Gas pipeline system into the Mainline.

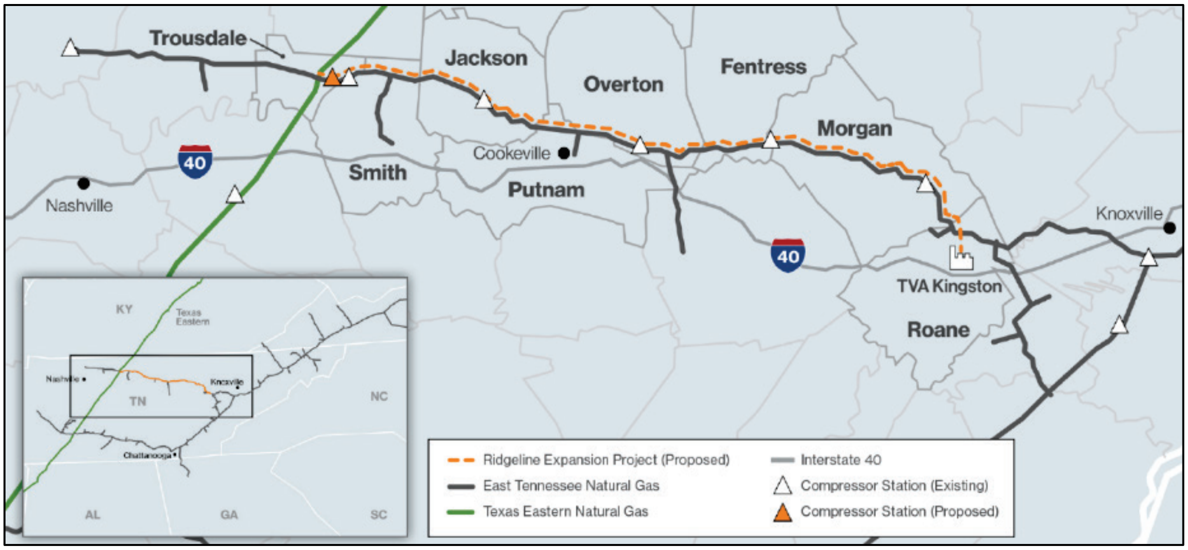

Figure 2.1-8. Alternative A – Proposed Natural Gas Pipeline Route

As described in ETNG's Resource Report 1 (ETNG 2023b), the Ridgeline Expansion project includes the following:

> Construction of the [natural gas] pipelines will require a construction ROW made up of permanent and temporary easements ranging from 75 to 150 feet in width (Construction ROW). Where collocated with the existing 3100 Line ROW, approximately 50 feet of the width of the Construction ROW will consist of existing maintained permanent pipeline ROW. In upland areas, the Construction ROW width will typically be 105 feet wide. The construction working side of the ROW will be 65 feet wide from the center of the ditch to accommodate trench excavation, trench bank sloping, topsoil segregation and safe equipment mobility. The non-working or spoil side of the Construction ROW will be 40 feet wide from the center of the ditch and will be used to store spoil and rock generated from trench excavation.
>
> In areas of steep slope, the Construction ROW will be up to 140 feet wide, with the construction working side being 100 feet wide to accommodate trench excavation, trench bank sloping, topsoil segregation and safe equipment mobility. The additional 40 feet of ROW on the non-working side will allow for storage of cut/fill material and material retrieval for side cut areas. The actual Construction ROW width will be determined by site-specific slopes and conditions.
>
> Additional temporary workspace (ATWS) of varying sizes will be required adjacent to the Construction ROW in certain locations such as horizontal directional drill (HDD) locations; wetland, waterbody, road, railroad, and foreign line crossing locations; and for spoil storage, topsoil segregation, and material/equipment staging. The use of ATWS will be limited to the duration of construction and as necessary to conduct additional post-construction restoration or corrective actions that may be required. Following construction, the temporary construction ROW and ATWS will be restored and allowed to return to previous use.

ETNG's Ridgeline Expansion Project encompasses the Construction ROW (including Permanent Easement, TWS, and ATWS), includes the Hartsville Compressor Station, meter and regulation facilities (M&R stations), and other aboveground project structures. Resource areas where site-specific study results were not yet available from ETNG were evaluated by TVA using desktop analyses of an expanded, 200-foot-wide study area boundary centered on the natural gas pipeline centerline, and hereafter referred to as TVA's Expanded Construction ROW. The 702.5-acre permanent pipeline ROW includes the 0.8-acre area associated with the fenced mainline valve sites, but not the 2.0-acre Kingston Delivery Meter Station, which would be located on the Kingston Reservation (ETNG 2023b, 2023n, 2023q).

2.1.3.6.2 ETNG's Ridgeline Expansion Project Aboveground Facilities

The aboveground facilities proposed by ETNG as part of the Ridgeline Expansion Project under Alternative A are summarized in Table 2.1-4. Additional information on aboveground facilities is provided in the following sections.

Table 2.1-4. Aboveground Facilities for ETNG's Ridgeline Expansion Project

Facility Type and Name	Milepost [1]	TN County	Scope of Work
Hartsville Compressor Station	4.0	Trousdale	New 14,600 HP electric-powered compressor station
Meter and Regulation Facilities			
Columbia Gulf Receipt M&R Station	0.0	Trousdale	New M&R station to Columbia Gulf and launcher
Midwestern Gas and Texas Eastern M&R Stations	4.1	Trousdale	Modify existing M&R Stations
Kingston Delivery Meter Station	122.2	Roane	New meter station and receiver at the Kingston Plant
Other Aboveground Facilities			
Jackson County Crossover	41.4	Jackson	New crossover lateral, pressure regulation, and launcher/receiver
Clarkrange Crossover	80.6	Fentress	New crossover lateral, pressure regulation, and launcher/receiver
Harriman Crossover	114.1	Morgan	New crossover lateral and pressure regulation
Mainline Valve Sites			
MLV #1	4.0	Trousdale	New mainline valve site
MLV #2	10.7	Trousdale	New mainline valve site
MLV #3	28.7	Jackson	New mainline valve site
MLV #4	45.0	Jackson	New mainline valve site
MLV #5	53.3	Putnam	New mainline valve site
MLV #6	68.0	Overton	New mainline valve site
MLV #7	93.2	Morgan	New mainline valve site
MLV #8	102.3	Morgan	New mainline valve site
MLV #9	109.7	Morgan	New mainline valve site
MLV#10	122.2R	Roane	New mainline valve site

1. Approximate milepost along the proposed pipeline rounded to the nearest tenth.

2.1.3.6.2.1 Gas Compression System on the Kingston Reservation

The CC/Aero CT Plant would be fueled by a reliable supply of natural gas. Preliminary estimates indicate that approximately 300,000,000 standard cubic feet per day of natural gas would be required for the CC/Aero CT Plant. Natural gas would be delivered to the site at a pressure of up to 750 pounds per square inch, requiring a gas compression system be located on the Kingston Reservation to increase the pressure of gas supplied to the CC/Aero CT Plant. As a measure to minimize air emissions, EMD gas compressors would be incorporated during the design phase.

2.1.3.6.2.2 Trousdale County Solar Farm and Hartsville Compressor Station

In support of its Environmental Sustainability Goals of reducing GHG emissions from its operations, ETNG proposes to construct an 8.0-MW solar farm as part of the Ridgeline Expansion Project that would be directly connected to a 14,600-HP compressor station (EMDEMD), providing ETNG with a source of on-site, zero emission electricity to partially power the EMD compressor station (ETNG 2023b). The Solar Farm and Hartsville Compressor Station would be located in Trousdale County, TN, on approximately 200 acres and would include the installation of solar panels supported on piles; associated infrastructure including inverters, access roads, stormwater management; and a perimeter safety/security chain-link fence.

The Hartsville Compressor Station would consist of two, approximately 7,300 HP dual drive compressor units to be constructed inside of a compressor building, up to eight bays of gas cooling, an auxiliary building housing air and backup generation equipment, and an associated combined office/warehouse/garage building (ETNG 2023b). In response to TVA's request for redundant power supply, ETNG would install EMD compressor units including a second shaft coupled to a gas turbine driver package, which would combust fuel gas from the pipeline to power the compressors. ETNG anticipates this gas-fired turbine being utilized on an emergency basis only. A detailed compressor station plan was provided by ETNG as Appendix 1A of Final Resource Report 1 filed with FERC on July 18, 2023 (ETNG 2023b).

Construction of the proposed Hartsville Compressor Station would require approximately 55.8 acres of temporary workspace (TWS). Approximately 18.5 acres of TWS would be fenced and maintained for operation of the compressor station. The TWS outside the fenced area would be restored to preconstruction conditions, to the extent practicable, following construction.

Other necessary power for the compressor station would come from a 161-kV transmission line delivery point, which would require additional coordination with TVA for an existing, nearby tap point to be determined. These lines could then be used to feed ETNG's new 161-kV/13.8-kV substation that would be sited adjacent to the compressor station.

2.1.3.6.2.3 M&R Stations

This FEIS has been updated based on ETNG's Resource Report 1 (ETNG 2023b) filed with FERC on July 18, 2023 (TVA 2023a). The M&R stations, as proposed in ETNG's updated Resource Reports filed with FERC in December 2023 (ETNG 2023o-q), include:

- Columbia Gulf M&R – new station that would impact approximately 11 acres; with approximately 4 acres to be fenced and maintained for operations. The TWS used during construction would be restored by ETNG, to the extent practicable, following construction.

- Harriman Crossover – would impact approximately 3 acres; with approximately 2 acres to be fenced and maintained for operation of the facility. The TWS used during construction would be restored by ETNG, to the extent practicable, following construction.
- Texas Eastern and Midwestern Gas M&R stations - proposed expansion to existing stations would impact approximately 2 acres; 0.9-acre of the impact would be within the existing station footprint. The expanded site would impact a total of 2 acres during operation.
- Kingston M&R – located at the terminus of the mainline within Kingston Reservation and falls within the boundary of Battery Site 3, impacts of which are evaluated under Alternative A (see Section 2.1.3.4 and Figure 2.1-5). A new mainline valve will be installed at this station.

2.1.3.6.2.4 Other Aboveground Facilities

ETNG's other aboveground facilities, as proposed by ETNG in Final Resource Report 1 (ETNG 2023b), would include:

- Construction of new Jackson County and Clarkrange crossovers would impact approximately 8 acres; approximately 4 of those acres would be fenced and maintained for operation of the sites. A new permanent driveway would be constructed to provide access to the crossover at Gainesboro.
- Construction of nine mainline valves (MLVs). The combined footprint of the nine MLVs and fencing around them would impact a total of 0.8 acres, which would be located within the permanent pipeline ROW. An additional 5.4 acres of impacts are anticipated outside of the fenced site due to site grading and construction and would be maintained during MLV operations to facilitate ongoing maintenance activities. The combined impact of the proposed MLV sites would be 6.2 acres of land.

2.1.3.6.3 Pipe and Contractor Yards

The Ridgeline Expansion Project will require multiple, temporary off-site construction laydown and parking areas. A total of 16 pipe and contractor yards will be used for equipment, pipe, and material storage, as well as temporary field offices and pipe preparation/field assembly areas (ETNG 2023i). Upon completion of the Project, these pipe/contractor yards will be restored and allowed to revert to prior land uses.

2.1.3.6.3.1 Access Roads

As stated in ETNG's Final Resource Report 1 filed with FERC on July 18, 2023 (ETNG 2023b):

> [ETNG] proposes to use existing public and private roads to the extent practicable to access the [Ridgeline Expansion] project during construction, restoration, and operation. Existing private roads proposed as temporary access roads may require modifications including the use of mats, as needed, to support heavy equipment and protect the road surface during construction; or improvements such as widening or, adding gravel, or adding further stabilization.
>
> Sixteen new permanent and seventy-six temporary access roads are planned for the [Ridgeline Expansion] project. Temporary access roads used during construction will be restored to pre-construction conditions or better, unless

> otherwise requested by landowners. … [ETNG] proposes to begin construction in September 2025 for a projected in-service date of November 1, 2026, with some restoration activities continuing through December 2026. Construction will generally take place Monday through Saturday during daylight hours, from 7 a.m. to 7 p.m.; however, certain activities may extend beyond normal construction hours and into Sunday, as necessary. The HDDs are proposed to operate 24 hours a day, seven days a week. Other discrete activities may require 24 hours of activity for limited periods of time (e.g., from one to three days). [ETNG] anticipates that the Project will be constructed using 2 construction spreads with 850 to 1,000 workers per pipeline spread, and 1 spread for the aboveground facility construction with 175 workers.

2.1.3.6.4 Status of Ridgeline Expansion Project with FERC and Incorporation of ETNG Resource Reports into TVA NEPA Analysis

ETNG's Ridgeline Expansion Project requires approval by FERC through the issuance of a certificate of public convenience and necessity and for related authorizations under Section 7 of the Natural Gas Act. ETNG submitted an application to FERC for approval, which is currently being evaluated by FERC's engineering, environmental, legal, and economic staff. FERC will issue an EIS with its findings for public comment prior to making a decision on the Ridgeline Expansion Project.

ETNG submitted draft Resource Reports to FERC under Docket No. PF22 in June 2022 followed by revised Resource Reports in December 2022 (ENTG 2022a-l). ETNG filed final Resource Reports with FERC on July 18, 2023, along with an abbreviated application for Certificate of Public Convenience and Necessity (ENTG 2023a-m). Information presented in the application and the July 2023 Resource Reports were independently reviewed by TVA and used to support TVA's thorough and independent evaluation of the potential project effects of ETNG's proposed Ridgeline Expansion project, as presented in the DEIS. Since the issuance of TVA's KIF DEIS, ETNG continued to evaluate re-route requests by landowners, ROW agents, and/or professionals from the environmental, engineering, or construction teams on the project that would be required to minimize environmental impacts, address constructability issues, or respond to landowner requests, as reflected in additional ETNG FERC filings from October through December 19, 2023 (ETNG 2023n-q). These subsequent filings were also independently reviewed by TVA and used to support TVA's thorough and independent evaluation of the potential project effects of ETNG's proposed Ridgeline Expansion project, as presented in this FEIS. A summary of the status (as of January 2024) of environmental permits, reviews and consultations anticipated for ETNG's Ridgeline Expansion Project is presented in Table 2.1-5.

Table 2.1-5. Anticipated Environmental Permit, Review and Consultation List for ETNG's Ridgeline Expansion Project (as of January 2024)

Agency	Permit/Approval/Consultation	Submittal Date *(anticipated)	Approval Date *(anticipated)
FEDERAL			
Federal Energy Regulatory Commission	Certificate of Public Convenience and Necessity under Section 7(c) of the NGA	July 2023	(November 2024)

Agency	Permit/Approval/Consultation	Submittal Date *(anticipated)	Approval Date *(anticipated)
U.S. Army Corps of Engineers, Nashville District	Authorization under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act; Permission under Section 14 of the Rivers and Harbors Act (Section 408) Real Estate Outgrant	(January 2024)	(September 2024)
National Park Service	Wild & Scenic River Act coordination	Coordination ongoing	
Tennessee Valley Authority (TVA)	Section 26a of the TVA Act Authorization (Joint Application with USACE)	(January 2024)	(September 2024)
U.S. Fish and Wildlife Service, Tennessee (TN) Field Office	Consultation under Section 7 of the Endangered Species Act, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act	Draft Biological Assessment (BA) submittal in July 2023; Final BA (January 2024)	(September 2024)
Natural Resources Conservation Service	Recommendations for seed mixes. Consultation regarding lands enrolled in the Wetland Reserve Program, Wetland Reserve Easements Program, or other Agricultural Conservation Easement Programs	October 2022	December 2022
U.S. Department of Agriculture, Farm Service Agency	Consultation on lands enrolled in the Conservation Reserve Program	October 2022	December 2022
STATE			
TN Wildlife Resources Agency	State listed species consultation (animals); State Wildlife Management Area coordination	November 2022	December 2022
TN Department of Environment and Conservation (TDEC), Water Division	Watercourse Hydrologic Determination	November 2022 February 2023 March 2023 (January 2024)	(August 2024)
	Section 401 Water Quality Certification (Aquatic Resource Alteration Permit)	(January 2024)	(July 2024)
	NPDES General Permit for Discharge of Hydrostatic Test Water	(November 2024)	(December 2024)
TDEC, Air Division	State Minor Source Construction and Operating Permit (Hartsville Compressor Station)	August 2023	December 2023
TDEC, Division of Archaeology	State Archaeological Permit	Consultation ongoing	
TDEC, Natural Heritage Program	State listed species consultation (plants)	October 2022	May 2023
	State Parks coordination	Consultation ongoing	
TN Historical Commission	National Historic Preservation Act, Section 106 Consultation	Consultation ongoing; final report (April 2024)	(September 2024)

2.1.4 Alternative B – Retirement of KIF, Demolition of the Units, and Construction and Operation of Solar and Storage Facilities, Primarily at Alternate Locations.

2.1.4.1 Retire and Demolish KIF

The actions to retire and demolish KIF are the same as those described for Alternative A in Section 2.1.3.1.

2.1.4.2 Solar and Battery Storage Facilities

2.1.4.2.1 Solar Plus Storage Approach and Reliability Analysis

Under Alternative B, TVA would replace the power generated and the dependable capacity provided by the KIF Plant through the construction and operation of 1,500 MW of utility-scale solar and 2,200 MW of BESS facilities. To sustain low costs and high reliability, TVA anticipates that a portion of these new facilities would be located in Eastern TN, where they can help support regional transmission grid stability following the retirement of KIF.

TVA is a dual-peaking utility, meaning that it could experience the highest annual peak days in the summer or in the winter in any given year, which is driven by the geographical location and weather patterns in the southeastern U.S. where TVA's generating facilities are located. During the summer, the peak typically occurs in late afternoon. During the winter, the peak typically occurs around 7:00 a.m., when solar resources are unable to generate electricity, and not dispatchable for meeting the peak load demand when it is needed. As such, battery storage additions would be needed to provide year-round replacement capacity, especially in winter.

While solar resources generate energy during daylight hours, this energy is intermittent in nature and non-dispatchable. Recent proposals for utility-scale single-axis tracking solar resources to be located in the TN Valley indicate an average annual capacity factor[15] of approximately 20 to 25 percent. Therefore, in order to provide dependable peak capacity needs for TVA's system that would replace the generation from the retiring KIF units, solar generation must be paired with dispatchable resources, such as gas and/or storage, so that TVA can continuously meet system demands, even when solar resources are not generating or after storage resources have been exhausted.

New storage facilities (BESS) would be required to provide the dispatchable capacity needed to allow TVA to meet peak load energy demands and to store a portion of solar generation for use at other times. These facilities typically expend the stored energy relatively quickly and do not last more than a few hours (NREL 2023), when needed. In both summer and winter peak seasons, the current KIF units provide dependable capacity and energy for extended time periods. That capability would need to be replaced under Alternative B. Oftentimes, high loads caused by warm or cold weather events can last for several consecutive days, leading to difficulty in sufficiently re-charging storage resources. As a result, storage resources would need to have a nameplate capacity that is higher than the 1,500-MW minimum resource requirement for a fully dispatchable resource in order to dependably meet system needs following the retirement of the KIF units.

TVA performed a reliability analysis to determine an appropriate combination of solar and storage resources to maintain year-round system reliability for Alternative B. TVA began

[15] A generating facility's "capacity factor" is the ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full power operation during the same period.

this evaluation by determining the appropriate level of solar resources needed to replace the energy needs resulting from the retirement of the KIF Plant. Multiple years of historical operating information were used to determine an average annual capacity factor and resulting average annual energy output. Recent utility-scale single-axis tracking solar proposals for projects located in TVA's PSA, as well as experience in operating the solar facilities currently providing power to TVA, indicate an average annual capacity factor of approximately 20 to 25 percent. Using a 25 percent capacity factor, TVA calculated the nameplate capacity of solar resources required to supply the same annual capacity factor and average energy output[16]. The resulting calculations indicated a need for approximately 1,500 MW of nameplate solar, which would require approximately 10,950 acres of available land to replace system energy needs from the unit retirements at KIF (see Table 3.1.1 and Table 3.2.1). This 1,500 MW would be in addition to the approximately 10,000 MW of solar additions already considered in TVA's target power supply mix (TVA 2019a, b) and anticipated as a need prior to TVA's proposed decision to retire KIF based on the conclusions of TVA's End of Life Evaluation (TVA 2021g). TVA has already begun solar installations in working toward TVA's goal of having 10,000 MW solar capacity online by 2035 and continues to do so through both its power purchase agreements with solar developers and TVA-owned solar generations. As of April 2023, TVA already has 2,900 MW of solar online or under contract.

TVA also determined what amount of battery storage should be paired with the 1,500 MW of solar to provide the dependable, dispatchable power that would be needed to replace the retiring KIF units. TVA assumed that battery storage additions would be four hours in duration, as is typical for utility scale lithium-ion battery energy storage systems (National Renewable Energy Laboratory [NREL] 2023). To ensure year-round reliability, TVA performed a reliability analysis utilizing Astrapé's Strategic Energy Risk Valuation Model (SERVM) (Astrapé 2023), which is the same model TVA utilizes when periodically updating its Reserve Margin Study. The objective function of the study was to determine the level of storage, paired with 1,500 MW of additional solar power, needed to maintain an industry best practice level of reliability of one loss of load event (LOLE) every 10 years (or 0.1 LOLE), with this risk balanced evenly between summer and winter. The SERVM model accounts for uncertainties related to weather, load forecasts, and system performance. Modeling the retirement of the KIF units indicated that approximately 2,200 MW of four-hour BESS, requiring an additional 550 to 825 acres of land (see Section 3.4.1.1.2) paired with 1,500 MW of additional solar would maintain a 0.1 LOLE with balanced seasonal risk. Based on this analysis, this EIS evaluates additions of 1,500 MW of solar paired with 2,200 MW of battery storage for Alternative B.

Battery storage is a new resource in TVA's portfolio, with multiple projects either planned or under contract to come online in the next few years. The operating experience gained from these early projects would provide insight on how battery storage is utilized in TVA's system. As short-duration battery storage systems are added and become a larger part of TVA's power portfolio, the capacity credit (i.e., the percentage of nameplate capacity that is counted as firm, dispatchable capacity for meeting peak load requirements) for incremental battery additions will begin to decrease. This decreasing capacity value for short-duration storage has also been acknowledged by other peer utilities, and the exact decline in capacity credit will vary between utilities based on factors, such as when a utility

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[16] A solar capacity factor of 25 percent was selected based on the NREL Annual Technology Baseline.

experiences typical peak loads (i.e., summer, winter, or dual-peaking), the total and type of existing generating capacity on the system, electric load demand profiles, and other factors. Early battery experiences will further inform how battery storage is valued in TVA's future planning.

2.1.4.2.2 Resource Procurement and Site Evaluation

Historically, TVA has been unable to directly benefit from tax credits available for the deployment of solar facilities and associated storage, as TVA typically utilizes 15- to 20-year PPAs with third-party developers for its solar and BESS facilities. With the passage of the 2022 IRA, and recent availability of implementation guidance, TVA is now able to take advantage of tax credits authorized under the IRA. This EIS incorporates updated solar and storage pricing expected under the IRA in all alternatives. More information about the price forecasts can be found in Appendix B.

While TVA also has the option to construct and own ("self-build") these facilities, TVA's practice has been to utilize PPAs. Solar and storage facilities constructed under Alternative B could be a combination of PPAs and/or self-built facilities. Modeling performed for Alternative B assumes that TVA continues its practice of soliciting competitive bids for new solar and storage PPAs to meet the generation needs under this alternative, in addition to self-built facilities. While site locations remain unknown at this time, TVA anticipates that a portion of these facilities would need to be physically located within portions of the Eastern TN portion of TVA's PSA to maintain grid reliability and stability. At present, the amount of solar generation that can be located on the Kingston Reservation, based on the acreages available to install solar panels, is 3-4 MW.

There may be opportunities for additional solar development within the Kingston Reservation in the future, but these opportunities would not be available in time to meet the deadline to replace the generation provided by KIF. Potential areas for future consideration would depend on the D4 schedule of the KIF Plant as well as future regulatory decisions in ash management and would be subject to additional NEPA review. Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute TVA power to customers.

The current land use and zoning of a site is a factor in the solar and storage site selection process, and some communities in TVA's region have ordinances addressing solar facilities. Some of these facilities may require screening to reduce visual/land use impacts.

Storage facilities are typically small sites and sited near existing substations, transmission lines, or solar facilities. The solar and storage facilities would be sited in a manner to avoid, minimize, or mitigate adverse effects to social and environmental resources. Where those effects could not be avoided, the effects would be minimized through appropriate BMPs or mitigated based on applicable agency guidance and regulatory requirements.

2.1.4.2.3 Components of Solar and Storage Facilities

Solar facilities convert sunlight into direct current (DC) electrical energy within photovoltaic (PV) panels (modules) (Figure 2.1-9). PV power generation is the direct conversion of light into electricity at the atomic level. Some materials exhibit a property known as the photoelectric effect that causes them to absorb photons of light and release electrons. When these free electrons are captured, an electric current is produced, which can be used as electricity (TVA 2014; 2021d).

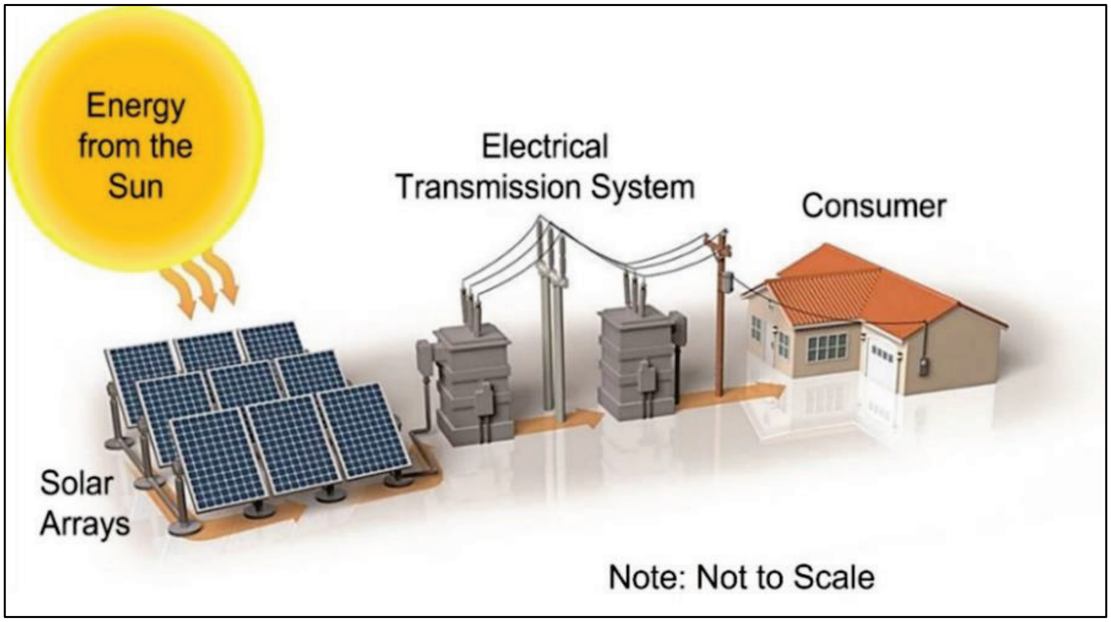

Figure 2.1-9. General Energy Flow Diagram of Photovoltaic Solar System

Solar facilities would be composed of PV modules mounted together in arrays. Groups of panels would be connected electrically in series to form "strings" of panels, with the maximum string size chosen to ensure that the maximum inverter input voltage is not exceeded by the string voltage at the project's high design temperature. The panels, estimated to be 6.5 feet by 3.5 feet, would be in individual blocks consisting of the PV arrays and an inverter station on a concrete pad or steel piles to convert the DC electricity generated by the solar panels into alternating current (AC) electricity. The solar facility would be enclosed by chain-link security fencing. Apart from access roads, the portions of the project outside the fenced-in area are typically not developed.

The modules would be attached to single-axis trackers that follow the path of the sun from the east to the west across the sky (Figure 2.1-10). The inverter specification would fully comply with the applicable requirements of the National Electrical Code and Institute of Electrical and Electronics Engineers standards. Each inverter would be collocated with a medium voltage transformer, which would step-up the AC voltage to minimize the AC cabling electrical losses between the central inverters and the proposed on-site project substation. Underground AC power cables would connect all medium voltage transformers to the main power transformer located within the substation.

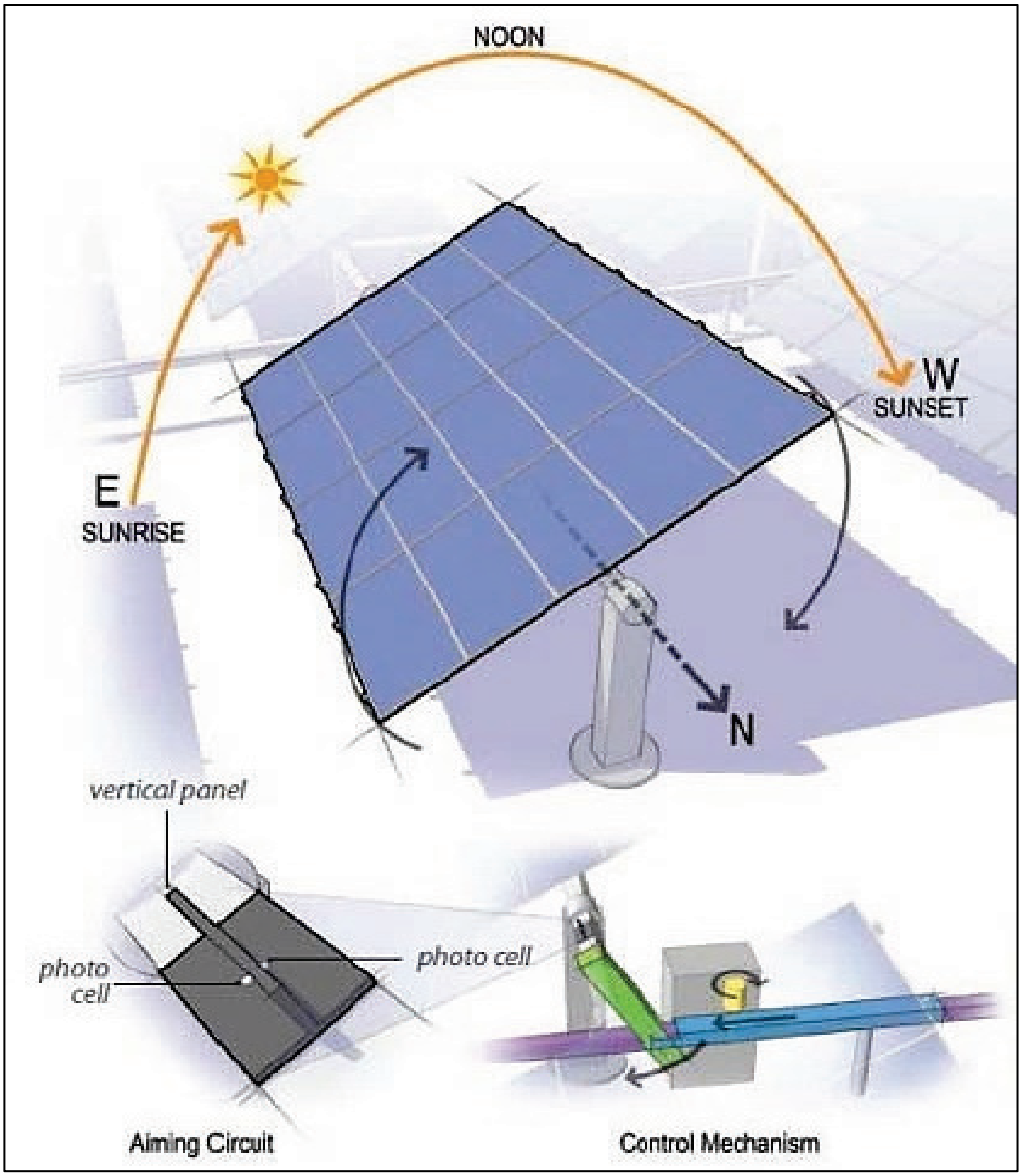

Figure 2.1-10. Diagram of Single-axis Tracking System (not to scale)

Other temporary or permanent project components would include construction laydown areas and security and communications equipment. Compacted gravel or native fill access roads would provide access to each inverter block and the proposed substation. Also, if determined necessary, the project would include project water wells, a septic system or pump-out septic holding tank, and an operations and maintenance building. Vegetation on individual solar facilities could be managed using intermittent mowing or grazing sheep.

Lithium-ion technology is the most common BESS. The battery containers are modular steel construction similar to intermodal shipping containers in which the modular lithium-ion battery cells are mounted on racks and connected by cabling. The battery containers are equipped with air conditioning and fire protection systems, auxiliary distribution board, and lighting.

2.1.4.2.4 Construction and Operation of Solar and Storage Facilities

The solar and storage facilities and new transmission or upgrades to transmission system components under Alternative B would be constructed using materials in accordance with current industry standards and federal regulations and would be designed to comply with applicable seismic standards.

Most ground-mounted solar PV facilities are typically located on flat or gently sloping land and on previously cleared areas often consisting of pasture, hayfield, or crop land that would require little grading to smooth or level the site. Once operational, the solar facilities would produce little noise, emit no odors or byproducts, and would not introduce traffic. The solar facilities would also be expected to have a low profile.

Construction activities for installation of the battery storage facilities at each site would consist of grading and installing a foundation to place the battery containers, inverters, electrical and communications connections for the battery system and heating, ventilation, and air conditioning system monitoring and control. Construction of each solar PV site and battery storage site is likely to require the construction of temporary access roads, contractor laydown yards, and contractor parking areas. Any off-site temporary access roads for construction would be designed in accordance with USDOT and relevant local requirements.

Water and sewer treatment services would be anticipated as on-site needs to support site preparation, grading activities and dust control. Water for construction would be delivered by water trucks and sewer treatment (if required) would be appropriately permitted and accomplished through use of a pump-out septic collection and holding tanks. Water supply is also typically required to support fire suppression and safety systems for battery storage facilities. Precipitation in the area is typically adequate to minimize the buildup of dust and other matter on the PV panels that would reduce panel efficiency and energy production; therefore, no regular panel washing is anticipated.

Traffic associated with the construction of solar facilities would include semi-truck trips to deliver materials and construction equipment to the site and remove packaging materials; employee passenger vehicles; dump trucks; and concrete trucks. For any roads proposed within 100-year floodplains but not floodways, the roads would be constructed such that flood elevations would not increase more than 1.0 foot. For any roads proposed within 100-year floodways, and to prevent an obstruction in the floodway, (1) any fill, gravel, or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition. If other structures are proposed within the 100-year floodplains, they would need to be analyzed in a subsequent environmental review.

Upon completion of construction, routine maintenance would include periodic motor replacement; inverter air filter replacement; fence repair; vegetation control; and periodic PV array inspection and, repairs. Ongoing water needs for operations and maintenance activities would be provided by the proposed project wells or water truck delivery to the site. Vegetation maintenance within portions of the fenced-in, developed areas not limited by other constraints could be accomplished with mowing or grazing sheep. Additional fencing for the sheep would be used to limit their movement and manage vegetation growth. Selective spot applications of herbicides may be employed around facilities and structures to control weeds. Herbicides would be applied by a professional contractor or a qualified project technician.

2.1.4.3 Transmission and Electrical System Components

TVA's evaluation determined that retiring the coal fleet by 2035 would best be achieved by using a phased retirement approach to balance economic and system reliability needs. TVA recommended a retirement date of the end of 2027 for the KIF coal-fired units. To meet TVA's phased 2035 retirement plans for the coal fleet, at least 1,500 MW of operational replacement generation is needed to replace the nine retiring units at KIF and must be operational before the KIF units are retired by the end of 2027. If this replacement generation is not in place, TVA's required generation and capacity to meet system demands and planning reserve margin targets would not be met and could result in system outages and other customer impacts.

To meet required generation and capacity demands, significant transmission upgrades to facilitate the delivery of power to the Knoxville area would likely be required, possibly including new 500-kV facilities. Furthermore, the loss of large synchronous generation (i.e., the nine KIF units) near the Knoxville area (a high load region) will increase the risk of instability events (including fault-induced delayed voltage recovery events), jeopardizing the reliability of associated power transmission systems. These events would not be effectively mitigated with inverter-based resources alone and could require multiple dynamic reactive compensation devices installed in the Knoxville area to provide fast acting reactive power/grid support.

As noted above, only 3-4 MW of solar generation is anticipated to be located on the Kingston Reservation due to limited land area currently available on-site. The remaining solar generation to be produced under Alternative B would not be located at the Kingston Reservation and therefore the transmission system would require significant investment to be upgraded at the alternative solar and BESS generation sites and surrounding areas. The anticipated amount of construction of new or upgraded transmission facilities would vary amongst each solar and/or storage project depending on their location.

All new generating and storage facilities would require connections to the transmission system, either directly or through an interconnection with an LPC. The total length of connecting transmission lines and the need for new substations and switching stations would depend on the location and capacity of the facilities. Depending on the solar and BESS site locations, transmission line upgrades may also be required to increase the capacity of the lines. Upgrades could include uprating, reconductoring, or rebuilding transmission lines within existing ROW, as well as replacing terminal equipment, bus work, and/or jumpers. An OPGW, which has dual functions of grounding and communications, may need to be installed on transmission lines to facilitate the needed relay protection. Upgrades to the transmission system typically performed to increase capacity of the existing transmission lines, as well as the construction of access roads to support those upgrades, are discussed in Section 2.1.3.5.2. Based on TVA's transmission-specific experience, the transmission work and interconnect process proposed under Alternative B is anticipated to require eight to nine years to complete. These long durations are further substantiated by the recent Berkeley Lab study (Rand et al. 2023), which collected data from seven regional grid operators and 35 utilities, including TVA. The Berkeley Lab study concluded that only 21 percent of projects requesting interconnection from 2000-2017 reached commercial operations by the end of 2022, and that completion rates were even lower for wind and solar projects.

Water and sewer treatment services are anticipated as on-site needs during construction. Construction-related water use would support site preparation (including dust control) and grading activities. During earthwork for the grading of access roads and construction of the transmission corridor, the primary use of water would be for compaction and dust control. The proposed options for water and water-related needs would be comparable to those identified in Section 2.1.4.2.3.

TVA has assessed the potential environmental effects of solar PV facilities and associated transmission interconnections in multiple EAs over the past several years (see Section 1.5.1), as summarized in the 2019 IRP (TVA 2019a). Most of these projects include transmission interconnection and network upgrades elsewhere on TVA's system. These network upgrades include the construction of new transmission lines or upgrades to existing transmission lines to increase electrical capacity.

TVA reviewed solar projects of various MW size from 2014 to 2021 and determined that the average length of new transmission lines for solar facility interconnection is 1.71 miles. The lengths ranged from 0 to 16 miles, with the majority being between 0 and 2 miles. The average number of acres impacted from transmission, electrical system components, related supporting infrastructure, and associated construction upgrade activities ranged from 0 to 225 acres, with the average being 17.73 acres (TVA 2019a). Transmission line corridors have the potential to cross 100-year floodplains. Consistent with EO 11988, transmission lines and related support structures are considered to be repetitive actions in the 100-year floodplain that should result in minor impacts (TVA 1981). The conducting wires of the transmission lines would be located well above the 100-year flood elevation.

The above information was compiled to provide an estimate of the potential effects associated with the construction of transmission and electrical system components to support solar and BESS facilities and to provide a comparison to other action alternatives being considered. Since exact site locations for solar and BESS facilities are not known at this time, additional site-specific NEPA analysis would need to be completed as the exact locations of projects are identified and the scope is further defined.

2.1.5 Alternatives Considered but Eliminated

TVA considered various resource types for replacement generation as a result of retiring the nine units at KIF. The replacement generation must be capable of providing year-round peak capacity. Resources considered were required to be mature, proven technologies, capable of being constructed and operating by the end of 2027. An additional consideration was the location of KIF on the transmission system, specifically the 161-kV system near the Knoxville load center, making KIF an integral part of the system's power flows and stability. The retirement of KIF would create a large gap in the power system in the Knoxville area and would decrease the system stability for Watts Bar and Sequoyah nuclear plants. Significant transmission system upgrades in the local area would be needed if replacement generation was not provided and located on the 161-kV system near Knoxville. Retirement of KIF without replacement generation in the Knoxville area or appropriate transmission upgrades would significantly impact the ability to add additional load in the area, degrade the stability of Watts Bar and Sequoyah nuclear plants to a point where generation would need to be curtailed, and potentially violate NERC Transmission Planning (TPL-001) standard criteria (NERC 2013).

TVA's evaluation of the proposed retirement of KIF tiers from the 2019 IRP EIS (TVA 2019b) and aligns with the 2019 IRP (TVA 2019a) findings and target supply mix. In addition to the proposed replacement generation at KIF, TVA expects to add 10,000 MW of solar generation by 2035 to meet customer demands and system needs. Integrating this significant number of intermittent resources requires a generation fleet that is highly flexible and capable of ramping up and down quickly to cover gaps in renewable generation.

TVA continuously monitors a variety of market signals to inform its planning, including forecasts for loads, commodities, and resource costs. Higher demand expectations for residential and commercial services (e.g., data centers) is driven by recent population growth (an observed shift in interstate migration patterns into the TN Valley) that is expected to continue. Incorporating these trends, TVA's current load forecasts indicate slightly increasing peak loads over the next 20 years. With the completed retirement of Bull Run Fossil Plant in December 2023 (located approximately 22 miles west southwest of the Kingston Reservation), TVA is at minimum reserve capacity and must replace any retiring generation capacity with dependable capacity to maintain the grid reliability to meet summer and winter load demands in the Knoxville region. TVA considered the resource options detailed Table 2.1-6 below as replacement generation for the nine units at KIF.

Table 2.1-6. Resource Alternatives Considered

Resource Option	Selected for Detailed Evaluation (Y/N)	Reasoning
Natural Gas-Fired CC	Y (Alternative A)	High fuel efficiency with large energy potential and ability to provide grid support and follow load; relatively low construction cost; and fully dispatchable year-round with the ability to ramp up and down throughout the day to meet changes in demand and fluctuations in output from renewable resources.
Natural Gas-Fired Frame CT	N	Ability to start and ramp quickly on short notice as well as provide grid support and follow load; fully dispatchable year-round with the ability to meet capacity needs during short periods; lowest installed capital cost per MW and offers flexibility to assist in the integration of renewable resources. Not selected because of inability to operate on alternative fuels like hydrogen.
Natural Gas-Fired Simple Cycle Aeroderivative (CT)	Y (Alternative A)	Can operate either on natural gas or ULSD. Highly efficient peaking units with very fast startup, offer higher cycling capacity, no start-up costs, speed provides excellent control response for better grid support, emergency Black Start to aid in system restoration following disturbance to bulk electric system, run in synchronous condensing mode.
BESS	Y (Alternative A and B)	Provides dispatchable complement to intermittent nature of solar and wind resources; represents one of the lowest cost storage options; customizable output rating.
Utility- and/or Distributed-Scale PV Solar	Y (Alternative A and B)	Relatively inexpensive on a cost per MWh basis but are not dispatchable and generation is intermittent; therefore, must be paired with dispatchable resources, such as storage or gas.

Resource Option	Selected for Detailed Evaluation (Y/N)	Reasoning
Hydro Pumped Storage	N	Long-duration storage that is currently being studied by TVA for further evaluation and potential deployment in the early 2030s. Longer timelines to meet environmental and construction requirements are incompatible with time frame proposed for the unit retirements at KIF.
Small Modular Reactors	N	Potential to serve cost-effective baseload or load following needs in the future with low fuel costs, carbon-free generation, advanced passive safety systems, and anticipated cost reductions achieved by assembling components in a factory setting; however, longer timeline and First of a Kind deployment risks are incompatible with the needs of this project.
In- and/or Out-of-Valley Wind	N	Can provide dependable capacity in both summer and winter, though intermittent. Was not selected due to low wind speeds in the TN Valley and higher transmission costs for out-of-Valley wind, both of which increase relative costs.
Energy Efficiency*	N	Well-positioned to play a role in absorbing load growth resulting from increased electrification of the economy. Considered in 2019 IRP as part of TVA's overall strategy but would not meet the needs of this project because energy efficiency programs take time to scale and market, increasing costs at the high penetration levels required to meet the needs of this project.
Demand Response*	N	Well-positioned to play a role in absorbing load growth resulting from increased electrification of the economy and allows TVA to offset physical capacity needs. Considered in 2019 IRP as part of TVA's overall strategy but are limited in the number of calls available and would not meet the needs of this project.
Coal to Gas Unit Conversions	N	Can be beneficial by repurposing existing equipment but benefits can be offset by reduced generating efficiency and shorter duration for equipment lifespan.
Distributed Energy Resources (DER)*	N	Considered in the 2019 IRP as part of TVA's overall strategy but would not meet needs of this project because the cost for distributed generation is generally higher than utility-scale generation for the same type of resource. TVA has therefore determined that the combination solution of utility-scale solar paired with utility-scale storage as presented in Alternative B provides a feasible lower-cost solution.

* Note that energy efficiency, demand response, and DERs are components of TVA's overall strategy that are evaluated and applied on a system-wide basis but were also considered on a site-specific basis as part of this EIS review.

2.1.5.1 Coal-to-Gas Conversion

The conversion of the existing coal units to natural gas fuel was considered as an alternative to the retirement of the existing KIF Plant but was dismissed from further consideration. Although this alternative would have utilized the existing plant boilers of the current KIF coal plant, the generating plant would have significantly less efficiency and would be expected to have a shorter lifespan than the proposed CC/Aeroderivative plant. Coupled with the potential for continued material condition degradation and the increased operation and maintenance costs of an aging, large plant, the coal to gas conversion alternative was dismissed by TVA from further consideration.

2.1.5.2 Blended Resources

TVA's asset strategy assessed the blending of resources to provide the least-cost, optimal portfolio under a variety of future conditions. The preferred alternative in this EIS is a specific, discrete component of that blend reflected in TVA's asset strategy. TVA's long-term planning, specifically the 2019 IRP (TVA 2019a), accounts for the integration of renewables on a schedule that best balances economics, reliability, and environmental impacts, while staying consistent with the least-cost planning requirements of 16 U.S.C. § 831m-1(b)(1).

While Alternative A does include natural gas, solar, and storage, a blended alternative that includes a substantial renewable component or combines a lower amount of natural gas with other technologies, such as solar and storage, would require at least some facilities at locations other than the Kingston Reservation and therefore would require similar transmission work and durations (i.e., eight to nine years) associated with Alternative B. Additionally, such a blended alternative would not meet the need for 1,500 MW of firm, reliable, and dispatchable energy to replace the retiring KIF coal-fired units. Blended alternatives would also result in increased capital cost. Thus, a blended alternative with lesser amounts of natural gas would not meet the purpose and need, since the non-gas component could not be installed by 2027 and would not provide the necessary 1,500 MW of firm, dispatchable power. Any viable blended alternative that utilizes the Kingston Reservation would still require the evaluation and construction of ETNG's Ridgeline Expansion Project. Therefore, blended resources alternatives were dismissed by TVA from further consideration.

2.1.5.3 Distributed Energy Resources

Distributed energy resources (DER), such as distributed solar, storage, and wind, were considered as they are included in TVA's asset strategy evaluated in the 2019 IRP. DER are generally smaller in size and can be aggregated together in a program or agreement for planning purposes. TVA's flexibility option, available to LPC Long-term Partners, provides an avenue for additional levels of DER by allowing LPCs to self-generate up to 5 percent of their annual load. TVA's 2019 IRP (TVA 2019a) includes assumptions for DER adoption, including DER added by LPCs on the distribution system. In general, the cost for TVA to distribute generation under DER is higher than utility-scale generation for the same type of resource. Table 2.1-6 provides additional reasoning for the elimination of solar, storage, and wind as alternatives. TVA has therefore determined that the combination solution of utility-scale solar paired with utility-scale storage as presented in Alternative B provides a feasible lower-cost solution for replacement generation and capacity utilizing renewable energy.

2.1.5.4 Alternative Fuels and Carbon Capture and Sequestration

TVA considered alternative fuels, such as hydrogen, and carbon capture and sequestration (CCS). Ultimately, TVA determined that these technologies should be evaluated as potential future mitigation measures rather than action alternatives. Combustion turbine units, used in CC or in CT operations, hold promise in further contributing to a net-zero future through the use of alternative fuels, such as hydrogen, and/or CCS technology.

TVA has committed to ensuring that the design of the CC/Aero CT Plant proposed in Alternative A would enable and accommodate potential future modifications for carbon capture and support co-firing of hydrogen (CC units only) as a replacement or supplemental fuel for natural gas, when these technologies mature to scale. The proposed CC unit under Alternative A would be designed to be 5 percent hydrogen capable at commissioning by adding balance of plant equipment that includes areas for future hydrogen storage, appropriately sized piping, and a blending station during the original construction. Additionally, the CC unit would be capable of burning at least 30 percent hydrogen by volume with modification to the balance of the plant once a reliable source was identified. TVA would consider burning hydrogen as a part of test burns or normal operations when it is commercially available at an acceptable chemical content that would reduce carbon emissions and is price competitive in the market at that time.

Most modern combustion turbine units available today, including those proposed under Alternative A, have the capability to co-fire or burn a blend of hydrogen in combination with fossil fuels to reduce the unit’s carbon footprint. It is anticipated that this capability would continue to advance and increase the percentage of alternative fuel blending or exclusive alternative fuel use that these units would be capable of utilizing in the future. Similarly, advancements in the development of regional hydrogen hubs and electrolyzer technology would make green hydrogen a decarbonization lever. CCS systems work by capturing carbon emissions before being released into the atmosphere, transporting them, and then storing them in underground geological formations. Given cost considerations, CCS technology would likely be paired with higher capacity factor units, such as those in CC configuration. At this time, however, high costs and immaturity of alternative fuels and CCS remain barriers to widespread commercial use.

On May 23, 2023, EPA published the proposal for New Source Performance Standards (NSPS) for Greenhouse Gas (GHG) Emissions from New, Modified and Reconstructed Fossil Fuel-Fired Electric Generating Units (EGUs) (hereinafter Proposed GHG Rules). The Proposed GHG Rules seek to regulate CO_2 emissions from existing coal units and new and existing gas units. The types of natural gas generation facilities proposed to be built at Kingston – CC Plant and Aero CT Plant – are identified for regulation in the Proposed GHG Rules at this initial stage in EPA’s rulemaking effort.

As proposed for new gas generation under Section 111(b) of the Clean Air Act (CAA), fossil fuel fired stationary combustion turbines would be subcategorized by capacity factor (CF): Base Load Units (CF >45-55 percent); Intermediate Load Units (CF <45-55 percent); and Low Load Units (CF <20 percent). For Alternative A, the Kingston CC Plant would likely be a base load unit, and the Aero CT Plant would be non-base load units. The Proposed GHG Rules provide for two phases of Best System of Emission Reductions (BSER) for most subcategories. The first phase would require meeting numeric emission limits. The second phase would require the Kingston CC Plant if categorized as a base load unit to choose one of two pathways for further reductions: (1) 30 percent low greenhouse gas GHG hydrogen co-firing by 2032, ramping up to 96 percent co-firing by 2038, or (2) carbon capture and storage (CCS) with a 90 percent capture rate by 2035. For intermediate load units, the Proposed GHG Rules would require 30 percent low GHG hydrogen co-firing by 2032. For low load units, there would not be a second phase.

As discussed in TVA's comments submitted to EPA on the Proposed GHG Rules (TVA2023g) and incorporated herein by reference, a Section 111 performance standard for a new source under Section 111(b) of the CAA or for an existing source under Section 111(d) must be based on implementation of a BSER that has been adequately demonstrated and is achievable at the time of proposal. To be adequately demonstrated, a system must have an operational history that shows more than technical feasibility within a source category or sufficiently similar sources, and the system must be reliable, reasonably efficient, and reasonably expected to serve the interests of pollution control without becoming exorbitantly costly economically or environmentally. Neither CCS nor low GHG hydrogen co-firing meets these criteria. Additionally, geographic considerations, CCS capabilities, and pipeline siting and installation are factors that would add capital and operating costs that are prohibitive, as well as highlighting the underestimation of EPA's projected costs in the proposal (TVA 2023g).

Hydrogen combustion is an emerging energy generating technology. The infrastructure to transport hydrogen is nearly non-existent, and natural gas pipelines cannot be used to transport hydrogen because of its corrosive and explosive nature. The Pipeline and Hazardous Materials Safety Administration (PHMSA) is the federal government agency responsible for pipeline safety. PHMSA has not yet promulgated safety standards for hydrogen pipelines. As a result, generators would likely be forced to construct hydrogen production and storage facilities near or adjacent to existing natural gas generating sites, which often do not have significant available land for developing hydrogen production facilities and the right underground geologic formation for hydrogen storage. There are issues with embrittlement of pressure vessels used for storage. Additionally, current hydrogen production would not meet the proposed criteria for low GHG hydrogen, and the trajectory for future production does not demonstrate appropriate supply for this scale of fuel blend (TVA 2023g).

Similar to low GHG hydrogen co-firing, CCS is an emerging technology and as a BSER has not been adequately demonstrated. Geographic constraints restrict the application of CCS in many parts of the country. A review of existing well data and knowledge of the geology at the Kingston Reservation indicates that the faulting and folding of the Valley and Ridge Province are not conducive to the storage of carbon in the subsurface, and the potential geological features (i.e., karst instability and tendency to develop sinkholes) of the Kingston Reservation pose further challenges to the consideration of CCS at this site (Griffith et al. 1997). Carbon may be sequestered in underground geologic formations where CO_2 is pressurized to a liquid state and injected into porous rock. To seal the CO_2, the geologic formation in which the gas is stored must be overlain by another layer of impermeable rock, which may not be feasible in areas of karst instability (Duncan and Morrissey 2010). Infrastructure would be required to be installed for transport to another, more suitable, storage location. TVA would have to transport captured carbon from TVA coal-fired or natural gas fired facilities to potential storage locations in Kentucky or Mississippi, resulting in hundreds of miles of carbon transport pipelines that would take years to permit and install, as discussed in TVA's comments on the EPA's Proposed GHG Rules (TVA 2023g).

The following comments submitted to EPA on the Proposed GHG Rules provide further information on these issues and are incorporated herein by reference: (1) Power Generators Air Coalition (PGen) Comments along with Attachment Volumes I and II (PGen 2023); (2) EPRI Comments, including the hyperlinks (EPRI 2023); and (3) Kiewit Engineering Group, Inc. (Kiewit) Technical Comments on Hydrogen and Ammonia Firing (Kiewit 2023).

Additionally, as discussed in TVA's Comments on EPA's proposal, the pace of GHG reductions in EPA's proposal would impede TVA's obligation to provide reliable electricity at the lowest system cost (TVA 2023g). Use of CCS and hydrogen co-firing would place limits on operation of gas EGUs and thereby affect reliability. The Capacity Factor restrictions in the Proposed GHG Rules would affect reliability and force owners and operators to choose between making significant investments in emerging technologies that have not been adequately demonstrated at this time or restrict operation of units to much less than their efficient capacities. Further, there are significant questions as to whether the proposed rule, if and when finalized, could survive legal scrutiny given that the proposed technologies have not been adequately demonstrated, the proposed standards are not achievable, and the proposal would have a disruptive effect on reliability of the electric grid. NEPA requires agencies to consider mitigation of environmental impacts of a proposed action. Consistent with NEPA, TVA has considered and discussed in this EIS the use of these technologies for possible mitigation of GHG effects but recognizes the myriad problems associated with these nascent technologies.

It is important to note that once a viable option for future mitigation projects is identified, TVA would conduct additional analyses to determine proposed pipeline routes, costs, storage requirements, or other needs with hydrogen fuel incorporation. TVA would analyze the site-specific impacts associated with any future mitigation that is planned as additional details become available.

TVA has considered the USEPA's draft whitepaper on reducing GHG emissions from CTs (USEPA 2022b) and anticipates the efficiency, effectiveness, scalability, and economics of these systems to improve in the next several years, allowing for more informed decisions in the future when adequate storage locations or pipelines are identified for both the delivery of hydrogen and the storage or use of captured CO_2. TVA is exploring partnerships with federal agencies and peer utilities to advance the research and development of both alternative fuels and CCS technology, which could enable their use at existing or future TVA facilities.

2.1.5.5 Natural Gas Pipeline Alternatives Considered but Eliminated

TVA has taken into consideration an alternatives analysis conducted by ETNG for the Ridgeline Expansion Project, a related action under Alternative A. Options in Table 2.1-7 were considered as alternatives to the proposed approximately 122.2-mile, 30-inch diameter pipeline. Additional details about these alternatives are presented in ETNG's Resource Report 10, Alternatives, filed with FERC on July 18, 2023 (ETNG 2023k).

Table 2.1-7. Potential Alternatives to the Proposed Pipeline Route

ETNG Options	Selected (Y/N)	Reasoning
No Action	N	ETNG would not be able to meet TVA's stated need to provide up to 300,000 dekatherms per day (Dth/d) (300,000,000 cf/d[1]) of natural gas transportation capacity to serve Alternative A.
Energy Conservation	N	The implementation and success of energy conservation in curtailing energy use is a long-term goal, extending well beyond the timeframe of the proposed pipeline. Further, energy conservation would not allow ETNG to provide up to 300,000 Dth/d (300,000,000 cf/d) of firm transportation service to the Kingston CC/Aero CT Plant as would be needed under Alternative A.
Non-Gas Energy Alternatives	N	The pipeline's purpose is to provide 300,000,000 cf/d of natural gas transportation capacity and 95,000,000 cf/d of a new Customized Delivery Service in support of the Kingston CC/Aero CT Plant as would be needed under Alternative A. A non-gas energy alternative would not meet the purpose and need for the project.
System Alternative A – ETNG's 3100 Line Replacement	N	ETNG evaluated replacing approximately 115 miles of its existing 22-inch-diameter 3100 Line with 36-inch-diameter pipeline primarily in the same trench as an alternative to installing 115 miles of pipeline primarily adjacent to the existing pipeline. The potential advantage of this system alternative is that more pipeline facilities could be constructed within the existing ROW, which would reduce the need for acquiring additional ROW for the proposed pipeline. However, this alternative would also require construction activities at more aboveground facilities. ETNG does not consider replacement of the 3100 Line to be viable operationally. The replacement of the existing 3100 Line by a pick-up and relay would result in outages affecting existing customers utilizing the 3100 Line throughout the construction period because the 3100 Line is not looped for the vast majority of the 115 miles that would be replaced. Outages on the 3100 Line would impact approximately 60 percent of ETNG's customers. The installation and subsequent removal of temporary looping for almost the entire length of the 3100 Line segments to be replaced would result in significant additional environmental impacts for this alternative. In addition, sufficient natural gas trucking capability does not exist to mitigate the more than 400,000 Dth/d of existing long-term contractual entitlements on ETNG's 3100 Line. Even if such capability could be created, long-distance trucking would result in additional environmental impacts, including vehicle emissions and traffic impacts. Because this alternative is neither practical nor feasible, this alternative was removed from further consideration.

ETNG Options	Selected (Y/N)	Reasoning
System Alternative B – Mountain Valley Pipeline	N	The Mountain Valley Pipeline is a 303-mile natural gas pipeline that would extend from West Virginia to southern Virginia and would intersect ETNG's 3100 Line at approximate MP 243 in Montgomery County, West Virginia. Due to the required length of loop pipeline necessary, this alternative would result in increased environmental and land impacts as compared to the proposed pipeline. The proposed pipeline has been designed to receive maximum supply point diversity for TVA. This system alternative would limit the supply point diversity and would not meet the pipeline objective to provide access to supply from Texas Eastern, Midwestern Gas and Columbia Gulf. This alternative would result in significantly greater land requirements, increased impacts to wetlands, including non-forest and forested wetlands, more waterbody and road crossings, more linear miles of threatened and endangered species critical habitat, and more residences would be located within 50 feet of the construction ROW. Because this alternative would result in greater impacts as compared to the proposed pipeline, System Alternative B is not environmentally preferrable to the pipeline. Accordingly, this alternative was removed from further consideration.
System Alternative C – Transcontinental Gas Pipeline	N	ETNG evaluated an alternative which would receive gas from the 1,800-mile-long Transcontinental Gas Pipeline, which runs from New York to Texas and intersects ETNG's 3600-1 pipeline in Rockingham County, North Carolina. Due to the required length of loop pipeline necessary, this alternative would result in increased environmental and land impacts as compared to the proposed pipeline. The Transcontinental pipeline system alternative would limit the supply point diversity and would not meet TVA's need to access to supply from Texas Eastern, Midwestern Gas and Columbia Gulf. This alternative would result in significantly greater land requirements, increased impacts to wetlands, including non-forest and forested wetlands, more waterbody and road crossings, more linear miles of threatened and endangered species critical habitat, and more residences located within 50 feet of the construction ROW. Because this alternative would result in greater impacts as compared to the proposed pipeline, System Alternative C is not environmentally preferrable to the pipeline. Accordingly, this alternative was removed from further consideration.

Source: ETNG 2023k
[1]standard cubic feet per day

ETNG also considered alternative sites for the compressor station (ETNG 2023k), as summarized in Table 2.1-8. Alternative sites for the compressor station were limited by the need to be within milepost (MP) 0.0 and 11.0 of the pipeline based on account system hydraulics and the availability and suitability of land for the adjacent solar array (150-200 acres). The Hartsville Compressor Station was selected as the preferred site due to reduced environmental impacts as compared to other sites considered. The Hartsville Compressor Station is located on a single parcel approximately 200 acres in size near MP 4.0. This site will impact primarily agricultural land, contains minimal wetlands and waterbodies, is not anticipated to contain habitat for Federal and state-listed threatened and endangered species, and does not contain cultural resource sites listed or eligible for listing on the National Register of Historic Places (ENTG 2023k).

Table 2.1-8. Potential Alternatives to the Preferred Alternative (Hartsville Compressor Station)

ETNG Options	Selected (Y/N)	Reasoning
Compressor Station Alternative A	N	Located at approximately MP 6.0. This parcel is located near the Hartsville Battlefield and the Averitt Herrod House, which are listed on the National Register of Historic Places. Local officials have indicated that the development of a compressor station on this site could impede future development as Hartsville expands. The adjacent site for the non-jurisdictional solar array would potentially impact cemeteries. This site would require construction of access roads near residences due to limited existing site access and would impact the viewshed of residences and the National Register of Historic Places sites. Based on these factors, Compressor Station Alternative A is not the preferred alternative.
Compressor Station Alternative B	N	Compressor Station Alternative B is an approximately 225-acre parcel located at MP 8.2 (Figure 10.6-3). The site consists primarily of forested land and steep slopes. Due to its remote location, this site would draft Resource Report 10 – Alternatives 10-12 RIDGELINE EXPANSION PROJECT require construction of longer access roads and power lines as compared to the preferred alternative. Based on the site topography, required tree-clearing, and additional land impacts, this site is not suitable for development of the compressor station and adjacent non-jurisdictional solar array.
Compressor Station Alternative C	N	Compressor Station Alternative C is located at MP 10.8 adjacent to ETNG's existing Dixon Springs Compressor Station (Figure 10.6-4). The 100-acre parcel is primarily forested land. Because of the restricted space between the public road and the existing pipeline ROW, the station layout would include noise emitting and gas containing components close to the public road. The adjacent site proposed for the non-jurisdictional solar array has steep topography, contains waterbodies, and would require extensive tree clearing. Based on these factors, this site is less suitable for development of the solar array than the preferred alternative.

Source: ETNG 2023k

ETNG continues to consider multiple minor variations to the pipeline alignment in response to engineering, environmental, and landowner concerns. This EIS addresses the potential impacts of the pipeline based on the information currently available.

2.2 Comparison of Alternatives

Impacts evaluated may be beneficial or adverse and may apply to the full range of natural, aesthetic, historic, cultural, and socioeconomic resources within the project areas of each alternative and within the surrounding areas. Impact severity is dependent upon their relative magnitude and intensity and resource sensitivity. In this document, four descriptors are used to characterize the level of impacts in a manner that is consistent with TVA's current practice. In order of degree of impact, the descriptors are as follows:

- No Impact (or “absent”) – Resource not present or, if present, not affected by project alternatives under consideration.
- Minor – Environmental effects are not detectable or are so minor that they would not 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.

A comparison of the environmental consequences associated with each alternative is presented in Table 2.2-1.

Table 2.2-1. Summary and Comparison of Alternatives by Resource Area

Resource Area	No Action Alternative	Both Action Alternatives	Alternative A		Alternative B
		Retirement and Demolition of KIF Plant (All Action Alternatives)	TVA Actions on the Kingston Reservation and Transmission Line Upgrades	Natural Gas Pipeline and Associated Structures	
Environmental Justice	There could be short term beneficial economic effects from continued operation and maintenance of KIF in part due to the purchase of materials, equipment, and services. This alternative could have minor negative effects on ratepayers due to increased rates. An increase in rates could have a disproportionate impact on low-income Environmental Justice (EJ) populations.	Minor, permanent disproportionate effects on EJ populations. Due to the loss of direct and indirect employment (approximately 200 employees directly lost) associated with Kingston, competition for employment in other fields in the Kingston labor market area may increase, leading EJ populations and other populations to relocate for work or follow recent depopulation trends and permanently relocate. These changes may affect familial and community relations among EJ and other populations. Effects may be offset by temporary employment increases during D4 activities.	Negligible to minor disproportionate temporary effects on EJ populations. During construction, increased demand for temporary housing, such as rental units, and public services by construction workers, may be possible. However, a temporary increase in employment, income and the purchase of materials, equipment, and services will also occur. The scale of these economic benefits would depend on where the workers, materials, and services were obtained.	Negligible to minor disproportionate effects to EJ populations. The primary adverse impacts on EJ communities associated with the construction of the pipeline and associated structures include temporary increases in dust, noise, and traffic from construction. TVA's analysis concluded that there would be a minor positive impact on EJ populations due to temporary increases in employment in the area. Since the natural gas pipeline is proposed to be largely constructed within/adjacent to an existing ROW, other negative impacts (e.g., increased noise) to EJ populations would be negligible to minor. ETNG's analysis concluded that there would be a minor short-term positive effect on the area's rental industry, and that the temporary demand for housing is unlikely to displace permanent residents or adversely affect housing prices. Minor but permanent effects to EJ and other populations may occur due to the loss and conversion of prime farmland, the chosen location of waste disposal, and local socioeconomics.	Potential for negligible to minor, temporary and/or permanent disproportionate effects on EJ populations. Whether effects are disproportionate for EJ populations would be evaluated through reviews for individual solar and storage facilities.
Geology	No additional direct or indirect project-related effects.	Minor direct effects to geology during D4 activities.	Minor direct effects to geology during construction. Minor potential for seismic activity. Geologic features, such as sinkholes or karst terrain, would be avoided if possible.	[State what the effects would be] Mitigation measures would be utilized in karst-prone or sloped areas to reduce the risk of geologic hazards and impacts during pipeline construction. Pipeline routing modifications and directional drilling may be used to avoid or minimize risks associated with karst prone areas. Mitigation measures would be utilized in areas where acid rock drainage may be encountered.	Minor direct effects to geology during construction. Minor potential for landslides and seismic activity. Geologic features, such as sinkholes or karst terrain, would be avoided.
Soils	No additional direct or indirect project-related effects.	Minor temporary effects during D4 activities.	Construction of the CC/Aero CT plant, Battery site, and the solar facility would have moderate permanent effects on soils due to placement of fill. Forested areas within on-site transmission corridors may have minor effects on soil stability and erosion from habitat conversion (i.e., from forested to herbaceous or scrub/shrub). Minor, temporary impacts to soils from construction activities during transmission upgrades would occur.	Effects to soils due to pipeline construction would be temporary and mitigated through Best Management Practices (BMPs). Permanent soil disturbances would be required for the construction of aboveground facilities including the Hartsville Compressor Station, M&R stations, and mainline valves. Soil disturbance related to these facilities will be minimized and mitigated through the application of the Project Erosion and Sediment Control Plan (E&SCP).	Soil impacts would be spread across 15 or more solar sites within portions of the East Tennessee region, based on the assumption that each site is 100-MW. Moderate direct effects could occur that would be reduced using appropriate BMPs.
Prime Farmland	No additional direct or indirect project-related effects.	No direct or indirect project-related effects.	Prime farmland soils are reported to occur within the parking/laydown area. Minimal disturbance is expected in this area. Prime farmland along off-site transmission corridors would remain unchanged. Effects on nearby prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the Project site.	Minor direct effects from loss of on-site prime farmland soils within the ETNG Construction ROW. Once construction is complete, the operation of the pipeline and the aboveground facilities will result in 10.5 acres of prime farmland being unavailable for farming.	A large portion of the approximately 10,950 acres occupied by the proposed solar facilities is likely to be prime farmland. Moderate direct effects from temporary loss of prime farmland soils if found on-site. Effects on prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the project sites.
Floodplains	No additional direct or indirect project-related effects.	Most of the KIF Plant is located outside of the 100-year floodplain. If D4 activities or structures must be located in floodplains, these activities would be considered temporary uses and would have no permanent impacts. Standard BMPs would be employed to minimize adverse impacts during construction activities.	Construction of the CC/Aero CT Plant would result in 1.0 acre or less of net fill within the Clinch River 100-year floodplain and Watts Bar Flood Storage Zone. The new structures and upgrades to the existing on-site transmission corridor would cause minor temporary impacts during construction with floodplain capacity being restored after completion. Battery site 1 option, if selected, would result in minor permanent impacts within the 100-yr floodplain.	Temporary minor effects to 100-year floodplains and floodways would occur as a result of pipeline construction. Since no aboveground facilities are proposed in the identified floodplain areas aside from a 0.02-acre portion of MLV #3, which is an already existing facility, no permanent impacts are anticipated to floodplain functionality.	Potential minor direct effects from solar installations in the 100-yr floodplain that would be reduced using appropriate BMPs. Floodplain impacts are not anticipated for storage facilities as they are typically sited to avoid floodplains. New transmission structures and upgrades to existing transmission lines would cause minor temporary impacts during construction with floodplain capacity being restored after completion.

Resource Area	No Action Alternative	Both Action Alternatives	Alternative A		Alternative B
		Retirement and Demolition of KIF Plant (All Action Alternatives)	TVA Actions on the Kingston Reservation and Transmission Line Upgrades	Natural Gas Pipeline and Associated Structures	
Water Resources	No additional direct or indirect project-related effects.	Long-term beneficial effect from reduced cooling water withdrawals and the reduction of wastewater discharges. Minor, temporary or permanent impacts to surface waters as a result of demolition activities, consisting of nine WWCs and exempted reaches (6,936 LF), two ephemeral channels (400 LF), and three non-jurisdictional ponds (0.08 acre). BMPs would be employed where appropriate. Minor effects to groundwater would be mitigated with the use of appropriate BMPs. Impacts to two stormwater conveyance wetlands totaling less than 0.01 acre within the demolition boundary from D4 activities would be minor.	Potential permanent impacts to 1,426-2,788 LF of WWCs, 227 LF of intermittent stream, 0-1 pond, and 0.16 acre of wetlands may occur under Alternative A. A jurisdictional determination received from the USACE determined the ephemeral streams, the ponds, one (exempted) perennial stream, and three wetlands to be non-jurisdictional. USACE also determined three intermittent streams and four wetlands *may* be jurisdictional. Indirect temporary impacts to 7,426 LF of perennial stream, 7,583 LF of intermittent stream, 13,604 LF of WWC, and 33 waterbodies may occur during on- and off-site transmission corridor upgrades. Wetlands within off-site transmission line corridors would experience little impact due to upgrade activities since these areas are existing rights-of-way which undergo regular maintenance currently. Forested wetlands are likely those in valleys spanned by transmission line towers and would not require forest removal. Minor tree trimming may be needed on the margins of the transmission corridor; however, this is consistent with regular maintenance of the existing right-of-way. No more than 3 acres of forest removal, including upland or wetland areas, are proposed. Surface waters and wetlands would be avoided to the maximum extent practicable, and effects would be minimized with appropriate BMPs or mitigated through purchase of mitigation credits. Negligible effects to groundwater may occur but would be mitigated through the use of BMPs. Avoidance, minimization, and mitigation are expected to reduce or eliminate cumulative effects to groundwater, streams and wetlands.	Temporary impacts to a total of 676 ephemeral channels, streams, ponds, and major waterbodies, including 411 waterbodies crossed by the pipeline and 265 waterbodies within workspaces. No permanent impacts are expected to the 19 major waterbodies, five of which are proposed to be crossed via HDD, and 14 are proposed to be crossed via dry open cut. Temporary impacts include effects to waterbody banks and water quality due to clearing, trenching, temporary bridge supports, and installation of the pipeline facilities across waterbodies. Potential permanent impacts to 1.1 ac of wetland type conversion, from forested and scrub-shrub to emergent, and temporary impacts from natural gas pipeline construction. With the use of BMPs and adherence to all permit conditions, effects to wetlands would be minor. Effects to groundwater may occur but would be mitigated through the use of BMPs and are not anticipated to be long-term.	Moderate adverse impacts expected to 4.5 acres and up to 150 acres of wetlands, in addition to an average of 15 acres and up to 150 acres of forested wetland clearing. For solar facilities, an average of 13,050 LF of stream would be impacted, with up to 61,500 LF of total stream effects possible. For BESS facilities, impacts would range between approximately 19,140 LF and 90,200 LF. TVA and solar developers would minimize effects to surface waters by siting facilities on lands with few surface water resources, configuring the solar arrays, access roads, and other infrastructure to avoid surface waters, and establishing and maintaining buffers around surface waters. Minor effects to streams and groundwater from expansion of solar facilities and transmission lines, mitigated with the use of appropriate BMPs.
Air Quality and GHGs and Regional Climate Impacts of GHGs	No additional direct or indirect project-related effects. Continued operations at KIF would have a large adverse effect on air quality, GHG's and regional climate.	Temporary, minor increase in construction-related effects during D4 activities. Permanent, beneficial effects from reduction of emissions of GHGs.	Temporary, minor effects during construction. Permanent, moderate beneficial reductions in GHG emissions and regional climate impacts as replacement generation for existing coal units at KIF.	Temporary, minor effects during construction. Long-term but minor and periodic operational impacts.	Temporary, minor effects during construction. Permanent, moderate beneficial reductions in GHG emissions and regional climate impacts as replacement generation for existing coal units at KIF.
Regional Climate Impacts to Project	Increases in ambient air temperatures due to climate change could increase temperature of raw water used to cool plant equipment reducing plant efficiency and increasing risk of the occurrence, magnitude, and frequency of exceedances of thermal discharge limits in the KIF NPDES permit and potentially triggering additional permitting requirements under CWA 316(a). Continued operations at KIF would withdraw non-contact water at the KIF cooling water intake structure for cooling purposes.	No appreciable direct or indirect project-related effects.	Increases in ambient air temperatures due to climate change would have minor adverse impacts to combustion turbine efficiency. Operational effects due to flooding are expected to be minor. Increases in extended drought conditions are not expected to have an effect on the physical infrastructure or operations.	Increases in ambient air temperatures due to climate change would have minor adverse impacts to natural gas equipment efficiency. Operational effects due to flooding are expected to be minor. Increases in extended drought conditions are not expected to have an effect on the physical infrastructure or operations.	Increases in flooding events and severity and extended drought conditions are not expected to have an effect on the physical infrastructure or operations. Extended heat waves would reduce the efficiency of PV facilities and the amount of electricity they generate. Similarly, extended heat waves would reduce the efficiency of storage facilities by increasing their cooling system energy requirements.

Resource Area	No Action Alternative	Both Action Alternatives	Alternative A		Alternative B
		Retirement and Demolition of KIF Plant (All Action Alternatives)	TVA Actions on the Kingston Reservation and Transmission Line Upgrades	Natural Gas Pipeline and Associated Structures	
Biological Resources	No additional direct or indirect project-related effects.	Minor permanent impacts to vegetation and common wildlife, up to 37.2 acres of herbaceous habitat, 63.4 acres of forested habitat, and 23.9 acres of manicured lawn, may occur due to D4 activities. Long-term beneficial effect to aquatic life due to elimination of water withdrawals and heated effluent discharge. Potential temporary minor adverse impacts to aquatic life due to storm water runoff associated with demolition; minimized with appropriate BMPs. USFWS concurred that the proposed actions *May Affect but Are Not Likely to Adversely Affect* the gray bat, Indiana bat, or northern long-eared bat, and acknowledged actions would have *No Effect* on the other federally listed species. Effects to bats would be minimized by use of specific conservation measures established through TVA's programmatic consultation with USFWS for protected bats.	Minor permanent adverse effects (habitat loss or conversion) to vegetation and/or wildlife due to construction of all Alternative A components, including up to 60.1 acres of herbaceous habitat and 58.8 acres of forested habitat. Impacts to aquatic or semi-aquatic life would be minor to negligible due to limited aquatic resources impacts. USFWS concurred that the proposed actions *May Affect but are Not Likely to Adversely Affect* the gray bat, Indiana bat, or northern long-eared bat, and acknowledged that actions would have *No Effect* on the other federally listed species. Effects to bats would be minimized by use of specific conservation measures established through TVA's updated programmatic consultation with USFWS for protected bats. No more than 3 acres of forested habitat would be removed within the existing off-site transmission lines.	Potential permanent impacts to 684.2 ac of vegetation due to construction and regular maintenance activities resulting in habitat conversion. Potential minor yet long-term temporary impacts to 1,927 ac of vegetation due to construction of natural gas pipeline. Approximately 58.4 ac of wildlife habitat removal are expected from the construction of access roads and aboveground facilities and an additional 42.1 ac of habitat would be impacted by habitat conversion (i.e., forested to herbaceous/scrub-shrub). No permanent impacts to surface waters or aquatic life associated with the natural gas pipeline. Temporary impacts from stream diversion during open cut natural gas pipeline installation would occur and impacts to aquatic life would be limited. Consultation with the USFWS is ongoing. As draft biological assessment (BA) for the Ridgeline Expansion Project was submitted to USFWS in July 2023, and a final BA provided in December 2023. Impacts to protected species would be caused by clearing, resulting in reduction of summer roosting habitat, but nearby or adjacent forested areas may provide alternative habitat during the summer. No direct impacts would be felt by bat species during the winter hibernation period.	Minor direct and indirect adverse effects to vegetation, wildlife, aquatic life, and protected species may occur due to habitat removal for solar site and transmission construction. Likely adverse effects to protected bats due to forest removal, but these effects would be minimized by use of specific conservation measures established through Section 7 Consultation with the USFWS for protected bats.
Natural Areas, Parks, and Recreation	No additional direct or indirect project-related effects.	Minor temporary effects during D4 activities. Minor permanent effects to recreation activities currently hosted on-site.	Minor but temporary adverse effects could occur to recreational uses of the Emory and Clinch rivers near the Kingston Reservation during construction. Public access to the boat launch in the Kingston Reservation could be temporarily interrupted. Effects to boat launching activities would be temporary but beneficial in the long-term. Off-site transmission upgrades would have minor and temporary impacts on outdoor recreational activities and natural areas due to construction traffic. Moderate, permanent, adverse impacts would occur due to conversion of forested area to maintained open space where the Eastern Transmission Corridors intersect natural and recreational areas.	The proposed gas pipeline is expected to temporarily disturb 34.4 acres of natural and recreational resources during construction, resulting in increased but temporary traffic, noise, and visual disturbances.	Unlikely to affect natural areas, parks, or recreation.
Land Use	No additional direct or indirect project-related effects.	Minor temporary effects during D4 activities.	Permanent, moderate impacts to land use and conversion of land from hay/pasture, forest and open space to industrial use and maintained open space. No changes to land use for existing on- and off-site transmission corridors. Minor impacts on previously disturbed land are expected. Battery sites 2 and 3, and the Corridor would have the most moderate adverse long-term impacts as they are forested.	Pipeline construction would both temporarily and permanently impact various types of land including open, agricultural, forested, residential, and wetlands areas. Impacts would range from minor to moderate.	Minor temporary effects during construction. Moderate effects in conversion of agricultural land to developed land with potential for later restoration of agricultural use. New transmission lines would eliminate forest management land use within the maintained Right-Of-Way (ROW) but not agricultural land use.
Transportation	No additional direct or indirect project-related effects.	Temporary, minor effects during D4 activities.	Temporary, minor increases in traffic volume would occur as a result of construction and operation. The effect from traffic volume generated by the construction workforce and the construction-related vehicles would have a moderate, temporary impact to driver safety and roadway degradation. As added traffic due to operations would be significantly less than construction, permanent impacts would be minor.	Vehicular traffic on public roads as well as near the proposed gas pipeline would increase during construction due to construction workers and materials moving to and from the plant and pipeline construction areas. Permanent impact on traffic and transportation routes would be negligible.	Temporary, minor effects during construction.
Utilities	Moderate, adverse, permanent impacts due to increasing performance challenges.	Permanent effects to buried utilities. No effects to switchyards.	Overall, permanent beneficial impacts would occur due to decreased water use for the CC/Aero CT Plant. Service disruptions associated with Alternative A construction are expected to be minimized through coordination with impacted utilities. Minor beneficial impacts from the solar facility would occur due to the increased power generation and interconnection to TVA's grid. Overall, permanent beneficial impacts would occur due to improved reliability and service costs as a result of Alternative A.	Project operations are not expected to result in adverse impacts to public or private water supplies unless operation and maintenance activities involving pipe excavation and repairs are needed. Overall, permanent beneficial impacts would occur due to improved reliability and service costs as a result of Alternative A.	Minor, temporary impacts due to potential for service disruption. Permanent beneficial effects.

Resource Area	No Action Alternative	Both Action Alternatives	Alternative A		Alternative B
		Retirement and Demolition of KIF Plant (All Action Alternatives)	TVA Actions on the Kingston Reservation and Transmission Line Upgrades	Natural Gas Pipeline and Associated Structures	
Cultural Resources	No additional direct or indirect project-related effects.	No direct or indirect project-related effects.	There is one recorded NRHP-eligible archaeological site within the potential CC/Aero CT Plant site. Effect to the site would not be adverse.	A total of 44 recorded archaeological sites are within construction ROW. Four are recommended for further survey and consultation. Seven sites were not surveyed due to restricted access and require a revisit and update prior to project construction if they will be impacted by construction activities. Four historic sites or components, or portions thereof, remain unassessed for NRHP eligibility. For the archaeological sites recommended as not eligible for the NRHP, no further work is being recommended. The 17 cemeteries within or adjacent to the current natural gas pipeline would be avoided.	Impact avoidance likely if significant cultural resources can be avoided in site selection.
Waste Management	No additional direct or indirect project-related effects.	Temporary, minor effects due to the limited potential for hazardous waste to be discharged and/or released into the environment during D4 activities.	Temporary increase in generation of hazardous waste during construction. TVA would manage all solid wastes in accordance with applicable state regulations and TVA BMPs. Once operational, the site facilities would connect to the existing online sewer system. Moderate impacts due to end-of-life disposal for potentially hazardous infrastructure due to solar component.	Temporary increase in generation of hazardous waste. Appropriate spill prevention, containment, and disposal requirements for hazardous wastes would be implemented to protect construction and plant workers, the public, and the environment.	Minor, temporary increase in generation of hazardous waste during construction. Moderate impacts due to end-of-life disposal for potentially hazardous infrastructure.
Public Health and Safety	No additional direct or indirect project-related effects.	Temporary, minor effects during D4 activities. Permanent beneficial effects.	During construction, workers would have a temporary, minor increased safety risk that would be mitigated through BMPs and site-specific health and safety plans. General public health and safety would not be at risk in the event of an accidental spill on-site due to precautionary measures. Permanent beneficial impact due to atmospheric emissions reduction as a result of coal generation replacement.	During construction, workers would have a temporary, minor increased safety risk that would be mitigated through BMPs and site-specific health and safety plans. General public health and safety would not be at risk in the event of an accidental spill on-site due to implementation of precautionary measures. The greatest hazard during pipeline construction and operation is a fire that may result in the event of a major pipeline rupture or leak. A number of precautionary systems and response measures would be in place to mitigate this risk to workers and the public.	Temporary, minor effects during construction.
Socioeconomics	No additional direct or indirect project-related effects.	Permanent, minor direct and indirect employment loss due to KIF closure (approximately 200 jobs directly lost due to KIF closure). Employment gain during demolition (up to 300 jobs at peak). KIF employees and associated family members may also temporarily relocate for work or follow recent depopulation trends and permanently relocate elsewhere, affecting familial and community relations.	New, temporary, and permanent employment options in the KIF labor market area due to construction and operations of the new CC/Aero CT Plant, switchyard, and transmission connections on the Kingston Reservation. Construction activities would create negligible, temporary adverse effects on housing, public services, and transportation systems in the associated communities.	New, temporary, and permanent effects due to employment in relation to construction and operations of the natural gas pipeline and associated gas system infrastructure. Temporary workers for the construction are expected to total 2,505. Construction activities would create minor, temporary adverse effects on transportation systems in the associated communities.	Anticipated temporary beneficial effects to local population numbers; temporary and permanent beneficial effects to local employment; temporary indirect beneficial effects to the local economy; and long-term beneficial effects to the local tax base.
Noise	No additional direct or indirect project-related effects.	Temporary, minor effects during D4 activities.	Noise effects from construction activities and construction-related traffic are expected to be temporary and minor. Construction would not result in the generation of, or exposure of persons to, excessive noise or vibration levels for lengthy periods, and noise mitigation efforts would be implemented by TVA.	Noise effects from construction activities and construction-related traffic are expected to be temporary and minor. Construction would not result in the generation of, or exposure of persons to excessive noise or vibration levels for lengthy periods, and noise mitigation efforts would be implemented. After the construction of the pipeline, there would be little to no noise during its operation aside from occasional maintenance activities, including the periodic mowing of the pipeline ROW.	Temporary, minor effects during construction.
Visual	No additional direct or indirect project-related effects.	Temporary, minor effects during D4 activities. Permanent beneficial effects to viewshed.	The proposed CC/Aero CT Plant would generally be absorbed by surrounding industrial components and would become visually subordinate to the overall landscape character associated with the plant site. Long-term visual effects from the conversion of forest to fields due to the off-site transmission lines. Where mitigation is necessary due to adverse visual impacts, fencing and vegetative screening would be utilized.	Permanent visual effects would occur as a result of the construction of the aboveground natural gas structures and areas along the ETNG Construction ROW where forestland is converted to maintained open space. Where mitigation is necessary due to adverse visual impacts, fencing and vegetative screening would be utilized. Overall, the buried pipeline would largely blend in with the existing environment and would not create significant visual discord once operational.	Temporary, minor effects during construction. Likely moderate effects post-construction depending on original visual character of the sites selected.

2.3 Identification of Mitigation Measures

TVA would employ standard practices, routine measures, and other project-specific measures to avoid and minimize effects to resources from implementation of the Proposed Action Alternatives. Certain minimization and mitigation measures were provided by TDEC as recommendations regarding demolition of materials in lieu of open burning, such as beneficial reuse or transport to a recycling facility or landfill; general permitting; and BMP guidance regarding cultural, air, and water resources.

TVA's minimization and mitigation measures have been developed with consideration of BMPs, permit requirements, and adherence to erosion and sediment control plans. TVA would utilize standard BMPs to minimize erosion during construction, operation, and maintenance activities. BMPs are described in *A Guide for Environmental Protection and BMPs for TVA Construction and Maintenance Activities – Revision 4* (TVA 2022a) and the *Tennessee Erosion and Sediment Control Handbook* (TDEC 2012).

2.3.1 TVA Mitigation Measures and BMPs

In association with the potential construction of an action alternative, TVA would employ standard practices and specific routine measures to avoid and minimize effects to resources. During development of the EIS, TVA has considered implementation of the following minimization and mitigation measures in relation to potentially affected resources:

2.3.1.1 Soils

- Install silt fence along the perimeter of areas cleared of vegetation.
- Implement other soil stabilization and vegetation management measures to reduce the potential for soil erosion during site operations.
- Try to balance cut-and-fill quantities to alleviate the transportation of soils off-site during construction.

2.3.1.2 Floodplains

- Construction of new transmission lines would adhere to TVA's subclass review criteria for transmission line location in floodplains.
- KIF decommissioning and deconstruction debris would be disposed of outside 100- and 500-year floodplains.
- The natural gas pipeline would be installed through trenching or directional drilling, and any excess fill resulting from this would be disposed of outside 100-year floodplains.
- For any access roads proposed within 100-year floodplains but not floodways, the roads would be constructed such that flood elevations would not increase more than 1.0 foot.
- For any roads proposed within 100-year floodways, and to prevent an obstruction in the floodway, (1) any fill, gravel, or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.
- Any switchyard(s) located in the floodplain would be located a minimum of one foot above the 100-year flood elevation at that location for a regular action, or a

minimum of the 500-year flood elevation for a critical action, as well as be consistent with local floodplain regulations.

- The flood-damageable components of the solar panels, as well as other flood-damageable structures and facilities sited in floodplains, would be located at least one foot above the 100-year flood elevation at that location and would otherwise be consistent with local floodplain regulations.
- Outside the KIF Reservation, in construction laydown areas, flood-damageable equipment or materials located within the 100-year floodplain would be relocated outside the floodplain during a flood.
- On the KIF Reservation, in construction laydown areas, flood-damageable equipment or materials located within the 100-year floodplain would be relocated by the equipment owner to an area above elevation 750 during a flood.

2.3.1.3 Water Resources

- TVA would develop a project specific SWPPP as required under the General Permit for Stormwater Discharges Associated with Construction Activities (TDEC 2021a) prior to beginning demolition.
- Perennial, intermittent, and ephemeral streams and wetlands that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in the project stormwater pollution prevention plan (SWPPP), TVA's BMP manual, and the TN Erosion and Sediment Control Handbook. Direct, permanent effects to streams and wetlands would be permitted and mitigated under the CWA Section 404 permit and TDEC ARAP/ CWA Section 401. TVA would purchase mitigation credits within the Clinch, Emory, and TN River watersheds, as appropriate and to the extent such credits are available within these watersheds. Should mitigation credits not be available within the primary or applicable secondary watersheds, TVA would pursue mitigation through in-lieu fee credit purchases or through permittee-responsible mitigation.
- Comply with the terms of the individual NPDES permit for industrial wastewater discharge(s) by ensuring any proposed process water discharge meets applicable effluent limits and water quality standards, as identified in the NPDES permit.
- Comply with the terms of the erosion and sediment control plans prepared as part of the NPDES permitting process.
- Use TVA BMP procedures for controlling soil erosion and sediment control, such as the use of 50-foot buffer zones, to the extent practicable, surrounding perennial and intermittent streams and wetlands; impaired or high-quality designated water features may require larger buffer zones and the installation of erosion control silt fences and sediment traps; and
- Implement other routine BMPs as necessary, including:
    - Non-mechanical tree removal within stream and wetland buffers;
    - Placement of silt fence and sediment traps along buffer edges;
    - Selective herbicide treatment to restrict application near receiving water features;
    - Proper vehicle maintenance to reduce the potential for adverse effects to surface and groundwater; and

- Use of wetland mats for temporary crossing, dry season work across wetlands, and no soil rutting of 12 inches (depth) or more in wetlands.

2.3.1.4 Air Quality and GHG Emissions

- Comply with local ordinances or burn permits if burning of vegetative debris is required and use BMPs, such as periodic watering, covering open-body trucks, and establishing a speed limit to mitigate fugitive dust.
- Remove ash from the facilities proposed for deconstruction and demolition, prior to removal of that facility and implement dust control measures during demolition to prevent the spread of dust, dirt, and debris to minimize potential fugitive dust mobilization associated with explosive demolition. These methods may include wetting equipment and demolition areas, covering waste or debris piles, using covered containers to haul waste and debris, and wetting unpaved vehicle access routes during hauling. Wet suppression can reduce fugitive dust emissions from roadways and unpaved areas.
- Maintain engines and equipment in good working order.
- Comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne. If necessary, emissions from open demolition areas and paved/unpaved roads could be mitigated by spraying water on the work areas and roadways to reduce fugitive dust emissions.
- Comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines, requiring a maximum sulfur content in diesel fuel of 15 parts per million (ppm).
- Implement emissions controls for NO_x and CO, and meet emissions limitations for SO_2 and CO_2 emissions, in accordance with 40 CFR 60 Subparts KKKK and TTTT, including emissions monitoring and/or performance testing requirements, fuel and fuel sulfur monitoring requirements, maintenance, recordkeeping, and reporting requirements. Use an SCR system located in each CC/CT exhaust path for additional NO_x reduction. Reduction of CO/VOC emissions would be achieved using an oxidation catalyst. The CC/CT exhaust stacks would be equipped with continuous emissions monitoring systems.
- Reduce NO_x emissions from the CC HRSG-bypass operations through dry low-NO_x combustion systems.
- Utilize efficient operation and maintenance techniques and leak detection to minimize sulfur hexafluoride emissions associated with transmission construction and upgrades.
- During construction and demolition activities, AIRNOW, the U.S. Air Quality Index (https://www.airnow.gov/AirNow) would be used to monitor local air quality conditions to inform decisions to reduce or change the timing of construction/demolition activities.

2.3.1.5 Biological Resources

- Revegetate with native and/or noninvasive vegetation consistent with EO 13112 (Invasive Species), including species that attract pollinators, to reintroduce habitat, reduce erosion, and limit the spread of invasive species.

- In areas requiring tree removal, clearing activities would be limited to winter periods to the extent practicable to minimize impacts to wildlife and protected species.
- In areas requiring chemical treatment, only USEPA-registered and TVA-approved herbicides would be used in accordance with label directions designed, in part, to restrict applications near receiving waters and to prevent unacceptable aquatic effects. TVA would apply for coverage under TDEC's NPDES General Permit for Application of Pesticides prior to use of herbicides in aquatic environments.
- Follow USFWS recommendations regarding biological resources and pollinator species:
    - Use of downward and inward facing lighting to limit attracting wildlife, particularly migratory birds and bats;
    - Instruct construction personnel on wildlife resource protection measures, including applicable federal and state laws, such as those that prohibit animal disturbance, collection, or removal; the importance of protecting wildlife resources; and avoiding unnecessary vegetation removal; and
    - Perform surveys of buildings prior to demolition to ensure they have not been colonized by bats or migratory birds. If bats are found, including those listed as threatened or endangered species, these buildings would not be demolished until one of two mitigation actions occurs: 1) bats are transitioned out of the buildings, or 2) consultation with USFWS is completed (if federally listed species are observed). If active nests of migratory birds are present and demolition activities must occur within the nesting season, TVA would coordinate as appropriate with USFWS or US Department of Agriculture's Wildlife Services, which assists with managing any potential effects to some birds, to determine best options for carrying out demolition activities.
    - Should actions near nesting osprey rise to levels above normal routine disturbance typically encountered on the Kingston Reservation, US Department of Agriculture's Wildlife Services would be contacted to ensure compliance under federal law.
    - TVA would endeavor to remove trees between November 15 and March 31 when listed bat species are not expected to be roosting in trees and when most migratory bird species of conservation concern are not nesting in the region.
    - For those activities with potential to affect listed bats, TVA would commit to implementing specific conservation measures approved by USFWS through TVA's updated[17] programmatic consultation to ensure effects would not be significant. Relevant conservation measures that would be implemented as part of the approved project are listed in the bat strategy form. The bat strategy form is in included as Appendix F.
    - TVA would endeavor to sell any marketable timber generated from on-site clearing activities. Non-marketable timber may be cut and left in place in

[17] The original TVA programmatic consultation with the USFWS was recently updated in response to recent changes to the species protection designation for the northern long-eared bat. The update was completed in May 2023.

specified, non-wetland areas as a windrow BMP or may be chipped and used as sediment barriers or mulch.

2.3.1.6 Transportation

- Implement staggered work shifts during daylight hours, when feasible, and a flag person during the heavy commute periods to manage construction traffic flow near the project site(s), if needed.
- To mitigate the potential for effects to public safety, TVA would restrict or close roads in the vicinity should blasting be used to demolish the stack. No barge or boat traffic would be allowed in the area during the stack blasting activities.
- TVA would work with the demolition contractor to create a detailed site-specific plan for any public road closures that would be distributed to affected parties, including emergency personnel.

2.3.1.7 Cultural Resources

- Keep access routes and construction activities outside of the 30-meter buffers surrounding any archaeological sites listed in, or eligible or potentially eligible for listing in, the National Register of Historic Places (NRHP).
- When access routes must be placed within such buffers, avoid modifications and use wetland mats and light-duty equipment when practicable.
- Locate new structures and buildings at least 0.5 mile from, and out of view of, any NRHP-listed or eligible historic architectural structures, when practicable. When avoidance is not practical, mitigation would be performed in consultation with SHPO.
- Maintain existing vegetative screening (at least 100 feet in width) to prevent clear views from any NRHP-listed or –eligible above-ground resources to the proposed new facilities or structures surrounding the Green-Mahoney Cemetery.

2.3.1.8 Waste Management

- Develop and implement a variety of plans and programs to ensure safe handling, storage, and use of hazardous materials.

2.3.1.9 Public and Occupational Health and Safety

- Implement BMPs for site safety management to minimize potential risks to workers.

2.3.1.10 Noise

- Minimize construction activities during overnight hours, where possible, and ensure that heavy equipment, machinery, and vehicles utilized at the project site meet all federal, state, and local noise requirements.

2.3.1.11 Visual

- Use of downward- and inward-facing lighting.

2.3.1.12 Blasting/Explosives

- TVA would work to minimize one-time emissions of fugitive dust from facilities expected to produce large volumes (such as demolition of the stack) by working with the demolition contractor on a site-specific plan. The plan may use mitigation methods that include the treatment of fall zones, misting, and application of tackifier inside the stacks, or cleaning and removal of ash and other materials. The fall zones may have berms to reduce the lateral extent of the dust cloud. Also, a hardened berm near the base of the stack could act as a backstop to prevent rock and debris spreading from the base of the stacks during demolition.

- Some blasting may be required during site preparation due to shallow rock. If blasting is required, the blasting contractor will complete a survey, develop a blast plan, and review with KIF as well as other TVA groups or projects who may have ongoing and unrelated projects in the area (i.e. Dam Safety and Civil Projects) to coordinate the limits of the vibration monitors/sensors for the KIF generating units or other sensitive features. After obtaining site specific data provided by the blasting contractor, and if deemed necessary during development of the demolition plan, TVA would work with a documentation services company to prepare a vibration model simulating the effects of discharge of the explosives or vibrations due to the stack hitting the ground. If indicated by the results, imported fill, dirt binder, and geofabric could be used for mitigation of noise and vibration.
- During the construction planning process, TVA would determine mitigation measures to minimize potential effects to on-site power transmission equipment from vibrations caused by explosive demolition of the stacks. Use of such mitigation measures would address any power disruptions.
- Explosives would be managed under the direction of a licensed blaster, 24-hour security would be provided to monitor the explosives, and detailed security plans would be developed and provided to area emergency response agencies as part of measures that would be taken to mitigate potential effects on the safety of personnel and the public.
- If construction or operations have the potential to emit pollutants at levels greater than acceptable thresholds in KIF's existing Title V permit, mitigation would include a request to modify the permit, which would be subject to requirements for the prevention of significant deterioration of air quality.
- All pipeline blasting would be conducted during daylight hours, as feasible, and would not begin until occupants of nearby buildings, stores, residences, places of business, and farms have been notified. TVA would comply with all federal and state regulations applying to blasting and blast vibration limits regarding structures and underground utilities (ETNG 2023b).

2.3.2 ETNG Proposed Actions

ETNG would construct the Ridgeline Expansion Project in compliance with applicable federal regulations and guidelines, and the specific requirements of the necessary permits. Key federal requirements and guidelines include:

- 18 CFR Part 380 – FERC's Regulations Implementing the National Environmental Policy Act (including § 380.15 – Siting and Maintenance Requirements);
- 49 CFR Part 192 – Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards;
- the FERC Plan (FERC 2013a) and the FERC Procedures (FERC 2013b) or under FERC-approved deviations;
- FERC Guidance for Horizontal Directional Drill Monitoring, Inadvertent Return Response, and Contingency Plans; and

- Applicable federal regulations including, but not limited to, Section 10 of the Rivers and Harbors Act, CWA Section 404, Section 408 (Section 14 of the Rivers and Harbors Act), CAA, NHPA and the ESA.

TVA has independently reviewed FERC's Plan and Procedures, which are incorporated here by reference. The standard construction and restoration techniques to be used in general areas and those techniques to be utilized in environmentally sensitive areas are summarized in the following sections (ETNG 2023b).

2.3.2.1.1 Standard Construction Procedures

The standard construction procedures are provided in detail in Final Resource Report 1 (ETNG 2023b), and include:

- ROW survey – survey of construction work area, mark sensitive resource locations with flagging or stakes, and notify affected landowners of construction activities at least 3 to 5 days prior to start of construction.
- Clearing operations and installation of erosion control devices – mark sensitive resource locations with flagging or stakes, perform mechanical or hand cutting removal of vegetation within construction ROW and associated ATWS. Once flagged and vegetation cleared, erosion controls would be installed as needed and maintained until final stabilization has occurred.
- ROW and temporary construction workspace grading – entire width of construction ROW would be rough graded to create a safe work surface for pipeline removal/installation procedures.
- Pipeline removal – when required, segment would be located through survey or hydrovac/potholing, trench would be excavated and secured, and fluid containment measures implemented during the pipe cutting procedure to prevent spills. Cold cutting would be used to cut pipe affected pipe into 40- to 50-foot-long lengths for removal from the trenchline; cut pipe is then wrapped to contain any asbestos coating. The coating would be tested to ensure proper disposal locations are used for disposal of removed pipe sections.
- Trench excavation – Trench excavation would be done to sufficient depths to provide a minimum of 3 feet of cover over the pipeline (5 feet across public roads and streams and 4 feet across wetlands) as required by 49 CFR Part 192 of the USDOT regulations and ETNG specifications.
- Blasting - pipeline blasting would be conducted during daylight hours, as feasible, and would not begin until occupants of nearby buildings, stores, residences, places of business, and farms have been notified. ETNG would comply with all federal and state regulations applying to blasting and blast vibration limits regarding structures and underground utilities (ETNG 2023b). In these areas, care will be taken to prevent damage to underground structures (e.g., cables, conduits, septic systems, and electric transmission tower foundations etc.) or to aboveground structures (e.g., homes, electric transmission towers, etc.) springs, water wells, or other water sources. Blasting mats or soil cover will be used as necessary to prevent the scattering of loose rock. Additional details regarding blasting are provided in Section 6.3 of Final Resource Report 6 (ETNG 2023g).
- Stringing, Bending, Welding, and Lowering-in – pipe is moved to construction ROW and placed end-to-end to facilitate bending, welding, and lowering into excavated

trench. Welding will be performed in accordance with American Petroleum Institute (API) Standard No. 1104 and ETNG specifications. Each individual pipeline weld would be inspected for structural integrity per USDOT regulations in 49 CFR Part 192.

- Tie-ins – tie-in crew makes final welds in the trench and final inspection checks are completed.
- Backfilling – trench is backfilled using original excavated material, where suitable, or using additional fill from off-site sources; padding (rock free or sifted soils from the site) is used where rocky soils present a risk to the pipe. ETNG would minimize erosion potential by restoring the natural contour of the ground and surface drainage patterns as close to pre-construction conditions as practicable, and remaining topsoil would be spread across the graded Construction ROW where applicable.
- Cleaning – ETNG would clean the pipeline using internal clean devices called “pigs” with the goal of removing dirt, water or debris inadvertently collected within the pipe during installation.
- Hydrostatic testing – Per USDOT regulations and ETNG requirements, the cleaned pipeline would be pressure tested with water to ensure its integrity for the intended service and operating pressures. Test pressure is obtained by adding water to the test section with a high-pressure pump and is monitored over an 8-hour period to help ensure the integrity of the pipeline. At the completion of the hydrostatic test, additional “drying” pig runs are made, if necessary, to remove residual water from the pipeline. Hydrostatic test water would be discharged to well-vegetated and stabilized upland areas where practicable, and in accordance with applicable permit conditions. Treatment of hydrostatic test water or use of additives are not proposed by ETNG. Additional details on the hydrostatic test water are provided in Section 2.3.8.1 of Final Resource Report 2 (ETNG 2023c).
- Restoration and revegetation – construction debris would be removed from the ROW and TWS and the ROW would undergo final grading. Weather permitting, construction workspaces would be restored and revegetated with permanent erosion control measures within 20 days of final trench backfilling and impacted fences would be restored or repaired. Revegetation would be completed in accordance with permit requirements and input from the NRCS, USDA, and the ETNG’s project E&SCP. Revegetation would be achieved by reseeding ROW within 6 working days of final grading. Soil disturbance that occurs outside the permanent seeding season or bare soil left unstabilized by vegetation will be mulched in accordance with the Project E&SCP. Wetlands will be restored to pre-construction contours and allowed to revegetate naturally or in accordance with permit conditions.

2.3.2.1.2 Residential Areas

In residential areas, mitigation measures would be implemented in accordance with landowner agreements and the FERC Plan, as outlined in ETNG Resource Report 1 (ENTG 2023b). A Site-Specific Residential Construction Plan would be developed for each residence within 25 feet of construction workspaces identifying the construction area to be disturbed and safety measures that will be implemented, such as construction fencing, access provisions and use of steel plates or timber mats. Special attention paid to these areas would help ensure the safety and minimize disturbance of residents in the ENTG Construction ROW (ETNG 2023b). Specific measures may include:

- Fencing the boundary of the construction work area to help construction equipment, materials and spoil remain within the Construction ROW;
- Preserving mature trees and landscaping where practical, consistent with construction safety and landowner requests;
- Confirming pipe is welded and installed as quickly as reasonably possible consistent with prudent pipeline construction practices to minimize construction time affecting landowners;
- Backfilling the trench as soon as the pipeline is installed or protecting the trench with fencing or temporary covers; and
- Completing initial phases of linear restoration (including final grading) and installation of permanent erosion control measures within 10 days after the trench is backfilled, weather conditions permitting.

2.3.3 Non-routine mitigation measures

TVA has incorporated non-routine mitigation measures into Alternative A such as the construction and operation of a 3- to 4-MW distribution solar facility and 100-MW lithium-ion battery storage system on the Kingston Reservation, see Sections 2.1.3.3. and 2.1.3.4. The proposed solar facility would be located on the site of a former coal yard adjacent to the existing KIF facility. The proposed battery location is currently under evaluation but would be located on the Kingston Reservation adjacent to the proposed natural gas-fueled CC/Aero CT Plant described in Alternative A. These non-routine mitigation measures have been incorporated into Alternative A to either offset a portion of energy usage for station service from facilities at the Kingston Reservation directly or to plan for future conditions, which may necessitate the need for future mitigation efforts.

As previously discussed in more detail in Section 2.1.5, TVA is evaluating combustion of hydrogen as potential future mitigation for Alternative A and plans to ensure that plant design would enable future modifications for the combustion of hydrogen as a replacement or supplemental fuel for natural gas, as the hydrogen co-firing technology matures.

TVA is considering incorporating environmentally beneficial features, such as pollinator habitat, at the Kingston Reservation in the future.

Once a viable option for future mitigation projects is identified, TVA would conduct additional analyses to determine proposed pipeline routes, costs, storage requirements, or other needs with hydrogen fuel incorporation. TVA would analyze the site- specific impacts associated with any future mitigation that is planned as additional details become available. Additional equipment could be located in the area of the existing KIF Plant after that area is closed and remediated.

2.4 The Preferred Alternative

TVA completed an alternatives analysis for the proposed retirement of KIF (Appendix B) and has identified Alternative A as its Preferred Alternative. Under the Preferred Alternative, TVA would demolish the nine existing KIF coal units, construct a new 1,500-MW natural gas dual-fuel capable CC/Aero CT Plant, a 3- to 4-MW solar array, a 100-MW BESS, and new transmission systems on the Kingston Reservation. Off-site transmission system upgrades are proposed along six existing transmission lines located in Eastern TN. The Preferred Alternative would replace the capacity lost as a result of retiring the KIF Plant and provide additional capacity to support anticipated demand growth in TVA’s PSA. This replacement aligns with the 2019 IRP (TVA 2019a) near term actions to evaluate engineering end-of-life dates for aging generation units to inform long-term planning and to enhance system flexibility to integrate renewables and distributed resources. This alternative is consistent with the need set forth in the 2019 IRP (TVA 2019a) to establish new capacity in TVA's region and increase reliability and flexibility, as well as meet near-term TVA energy production goals. TVA has considered the benefits of the IRA. Notwithstanding the potential for long term benefits from the IRA, in the short term, there are limitations for the development of new solar facilities. Alternative A is the preferred alternative as it will meet TVA's fundamental need for flexible, fast-ramping generation in commercial operation by the end of 2027, and for inertia service and primary frequency response (TVPPA 2022). Replacement of generation with a CC/Aero CT Plant is the best overall solution to provide low-cost, reliable, and cleaner energy to TVA's power system.

TVA has selected Alternative A as its Preferred Alternative because the proposed CC/Aero CT Plant would provide the operational flexibility needed to reliably integrate 10,000 MW of solar into the system by 2035 and would enable the KIF coal-fired units to be retired by the projected end-of-life estimates for those units and before significant water treatment investments become necessary under recent and anticipated new regulations such as the ELGs. Further, the proposed CC/Aero CT Plant could be built and made operational by the end of 2027, when the KIF coal units would be retired, as required to meet the project purpose and need and reduce economic, reliability, and environmental risks.

In contrast, Alternative B would require substantial transmission upgrades and lengthy timeframes for the transmission work such that it would not meet the need to provide replacement generation by the end of 2027 when the KIF units would be retired. Moreover, Alternative B would not provide firm, dispatchable generation needed to provide the needed year-round generation and ensure system reliability.

TVA's evaluation of alternatives includes analysis of GHG impacts for each alternative using two different methodologies. First, TVA used the operational GHG emissions geographic comparison analysis to compare climate effects and the net change in predicted estimates of GHG emissions for each alternative as a percent of State of Tennessee, U.S., and global GHG emissions. TVA also completed an analysis based on the social cost of greenhouse gases (SC-GHG). As detailed in Section 3.7.2.5.2, although Alternatives A and B are generally within a similar range of SC-GHG savings when compared to the No Action Alternative, Alternative B would result in fewer GHG emissions and more SC-GHG emissions savings than Alternative A. TVA's system-wide Life Cycle Analysis reflects about $2.26 billion of SC-GHG savings for Alternative B relative to the No Action Alternative. Alternative A reflects about $1.85 billion of SC-GHG savings relative to the No Action Alternative, and about $417 million less savings than Alternative B (SC-GHG values provided in the paragraph for comparison are based on IWG social cost metrics developed under the current (Biden Administration) Administration). As shown in the evaluation of alternatives in Appendix B, Alternative B costs approximately $1 billion more than Alternative A in project costs which includes capital, fuel, transmission, and production costs. After giving due weight to the GHG analysis that projected greater SC-GHG emissions savings for Alternative B than for Alternative A, TVA has determined that Alternative A is still the Preferred Alternative based on its ability to meet the purpose and need of providing firm, dispatchable power by the end of 2027, while still significantly reducing carbon emissions as compared to the No Action Alternative.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Analysis of Environmental Effects

3.1.1 Scope of Analysis

This EIS is based on the best available information at the time of its preparation[18]. The environmental consequences of the No Action and Action Alternatives have been evaluated in this Chapter based on a combination of publicly available information, results of TVA's field surveys, and information from ETNG's application and environmental resource report filings with FERC for their Ridgeline Expansion project (FERC Docket #CP-516-000) that has been independently reviewed by TVA.

The Council on Environmental Quality's (CEQ) regulations for implementing NEPA include definitions for the types of environmental effects. The CEQ revised the NEPA regulations in April 2022[19]. The presently operative regulations (40 CFR § 1508.1(g)) define "effects" as follows:

> "Effects or impacts means changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and include the following:
>
> (1) Direct effects, which are caused by the action and occur at the same time and place.
>
> (2) Indirect effects, which are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
>
> (3) Cumulative effects, which are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.
>
> (4) Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions

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[18] The information and impact analyses presented in this chapter for ETNG's Ridgeline Expansion project, a related action under Alternative A, have largely been drawn from prior assessments completed for the proposed Ridgeline Project, as detailed in ETNG's Application and associated Resource Reports (ETNG 2023a-m), including information provided in subsequent ETNG filings in response to FERC reviews and additional information requests (ETNG 2023n-q, ETNG 2024). The content of these reports is incorporated here by reference. ETNG's Application, Resource Reports, and other supporting information were provided to FERC for use in preparing FERC's EIS for the proposed Ridgeline Project.

[19] On April 20, 2022, CEQ issued a final rule, National Environmental Policy Act Implementing Regulations Revisions (Final Rule 87 FR 23453), which restores the previous regulatory definition of "cumulative effects" that was in use before being modified in 2020. This final rule became effective on May 20, 2022.

> which may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial."

Effects evaluated may be beneficial or adverse and may apply to the full range of natural, aesthetic, historic, cultural, and socioeconomic resources within the project areas of each alternative and within the surrounding areas. The extent of the impact is dependent upon the relative magnitude, intensity, and resource sensitivity. Four descriptors are used to characterize the level of impacts in a manner that is consistent with TVA's current practice. In order of degree of impact, the descriptors are as follows:

- No Impact (or "absent") – Resource not present or, if present, not affected by project alternatives under consideration.
- Minor – Environmental effects are not detectable or are so minor that they would not 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.

In the following subsections, direct, indirect, and cumulative effects are discussed for each resource potentially affected by the Proposed Action and Alternatives.

3.1.2 Reasonably Foreseeable Future Actions

"Present" projects are those currently ongoing (under construction or are in operation) and are represented by the description of the existing affected environment for each resource. "Reasonably foreseeable" projects are proposed projects or developments that were identified based on publicly available information clearly presented in approved planning documents, have been funded to adequately support full construction and operation, or have applied for appropriate permits for construction or operation. Reasonably foreseeable future actions (RFFAs) do not include private developments or projects that have not yet been announced. "Past" projects and actions inherently have environmental impacts that are integrated into the base condition for each of the resources analyzed in this chapter.

Table 3.1-1 lists the RFFA's that were identified during internal and external scoping to be in proximity to the Proposed Action and to the Ridgeline Project. The geographic scope of the analysis included RFFA's identified within 10 miles of the footprints identified in the No Action Alternative, Alternative A, and Alternative B (expanded to include counties located in East TN). This geographic scope was selected to (1) assess the larger geographic context to allow for analysis of disproportionate effects by RFFAs, (2) evaluate the full reach of project effects on resource areas, and (3) analyze cumulative effects[20]. Projects located outside of this geographic scope were not evaluated because their potential to contribute indirect, direct, or a cumulative effect diminishes with increasing distance from the footprints described in the Alternatives. The affected environment described in this EIS considers changes to the human environment from RFFAs with a close causal relationship to the alternatives.

[20] For Air Quality criteria pollutant analysis, the 10-mile footprint radius was chosen based on a typical distance, as seen from air dispersion modeling, beyond which criteria air pollutant dispersion is large enough to not have an appreciable impact. GHG cumulative effects are presented in a TVA system-wide analysis to cover the entire TVA PSA based on system-wide operating conditions anticipated under each alternative. TVA's proposed gas plants included in the system-wide GHG analysis include Cumberland, KIF, and Cheatham County. It does not include proposed projects announced in NOIs in October/November 2023 (New Caledonia Gas Plant and Allen Aeroderivative Generation Project) as they were not sufficiently developed in time for inclusion in revised analyses presented in the FEIS. However, all proposed projects align with the 2019 IRP and the target power supply mix (TVA 2019a). The cumulative impacts of that target supply mix are discussed in the 2019 IRP (see Sections 7 and 9.4). Section 3.7.2.5 discusses system-wide cumulative effects of GHG emissions.

Table 3.1-1. Summary of Past, Present, and Reasonably Foreseeable Future Actions within the Geographic Scope of Analysis of the Action Alternatives

Action	Description	Project Type
Kingston Reservation (No Action and Alternative A)		
Borrow site #3	Described in Kingston Fossil Plant Borrow Site #3 Final EA (TVA 2020a).	Past/Present
Clinch River Nuclear Site Development	Site preparation for one or more small modular reactors with a combined generation capacity up to 800Mwe.	Present/Future
KIF WWTF	Construction of WFGD WWTF subject to USEPA ELGs.	Future
Bottom ash dewatering facility	Described in Kingston Fossil Plant Bottom Ash Dewatering Facility Final EA (TVA 2016b)	Past/Present
Landfill expansion	Described in Final EA for Installation of Flue Gas Desulfurization System at Kingston Fossil Plant (TVA 2006) and Flue Gas Desulfurization System at Kingston Fossil Plant Final Supplemental EA (TVA 2019c)	Past/Present
Heritage Center Industrial Park	A 1,200-acre industrial park with rail and barge access adjacent to State Route (SR) 58 in Oak Ridge, approximately six miles northeast of the Kingston Reservation. There are over 20 existing private sector businesses and several vacant sites (Roane ECD 2022a).	Past/Present
Roane County Industrial Park	A 1,100+ acre industrial park with three vacant sites (79 acres) on Cardiff Valley Road in Rockwood, approximately six miles west of Kingston Reservation. There are more than a dozen existing industries (Roane ECD 2022b).	Past/Present
Roane Regional Business and Technology Park	A 655-acre industrial park with four vacant sites, totaling 139 acres adjacent to Interstate 40 (I-40) in Lenoir City, approximately eight miles east of the Kingston Reservation. There are more than a dozen existing industries, anchored by H.T. Hackney, a wholesale food distributor, and a Volkswagen parts distribution center (Roane ECD 2022c).	Past/Present
Oak Ridge Airport	A proposed general aviation airport with a 5,000-foot runway adjacent to the Heritage Center Industrial Park, approximately six miles northeast of the Kingston Reservation (City of Oak Ridge 2022).	RFFA
Horizon Center Industrial Park	A proposed 110-acre industrial park adjacent to SR-58 in Oak Ridge, approximately 8 miles northeast of the Kingston Reservation (Roane ECD 2022d).	RFFA

Action	Description	Project Type
KIF 2008 ash spill, clean up, CERCLA & CCR management & monitoring commitments	Historic ash spill that occurred in 2008 at the Kingston Fossil Plant when a CCR pond failed and released ash into the Clinch River. TVA has been engaged in clean-up, monitoring, and restoration activities since the time of the spill.	Past/Present/ RFFA
Alternative A: ETNG's Ridgeline Project (natural gas pipeline and associated aboveground facilities) a Related Action		
Expansion of solar facilities under the 2019 IRP[1]	The target power supply mix presented in TVA's 2019 IRP proposes to add up to 14,000 MW of solar by 2035 throughout TVA's PSA. While projects have not yet been identified, they would require individual NEPA reviews once identified as a potential TVA project or under a power purchase agreement. Extension transmission system work would also be required to maintain system safety and reliability.	RFFA
Ridgeline Hartsville Solar Array	Construction of an approximate 80-acre solar array on primarily agricultural land 0.5 mile east of Hartsville Compressor Station. Would be constructed concurrently with the Alternative A Natural Gas Pipeline.	RFFA
Hartsville Compressor Station - Substation	Construction of an electric substation; would impact 1.3 acres of agricultural land adjacent to the Hartsville Compressor Station. Would be constructed concurrently with the Alternative A Natural Gas Pipeline.	RFFA
Hartsville Compressor Station - Communications Tower	Construction of a 300-foot-tall communications tower 985 feet west of Hartsville Compressor Station. Would be constructed concurrently with the Alternative A Natural Gas Pipeline.	RFFA
Hartsville Compressor Station - Other Non-jurisdictional Facilities	Construction of telephone and internet connections and a municipal water supply connection adjacent to Hartsville Compressor Station; lengths and locations to be determined.	RFFA
Flynn Creek Pipe Replacement	Replace approximately 1,100 feet of the 3100 Line; would impact approximately 1.9 acres of land; no impacts to water resources anticipated.	RFFA

Action	Description	Project Type
Freedom Estates Development	Construction of new residential lots adjacent to the Columbia Gulf M&R Station in Trousdale County.	Present/RFFA
Morgan County SR-29 /US-27 Widening	Widening two-lane road to four-lane road; could share approximately 0.2 acre of workspace with ETNG's Construction ROW.	RFFA
HealthVerve Food Manufacturing Plant	Construction of new manufacturing plan in Livingston, TN, located 12 miles north of MP 53.	RFFA
Hartsville Parks Master Plan – Trey Park Complex	Construction of ADA upgrades including replacement of sidewalks, installing ADA parking spaces and ramps, and installing ADA playground equipment.	Present and RFFA
Columbia Gulf Receipt M&R Station	A new 4.0-acre site located in Trousdale County at MP 0.0. Would include a filter separator, ultrasonic metering, flow control, a regulator skid, mainline valve, a launcher for the Mainline, and associated buildings. The station is designed to receive natural gas from Columbia Gulf into the Mainline. Also includes a new permanent access road.	RFFA
Midwestern Gas and Texas Eastern M&R Station	Proposed modifications for the existing facilities located adjacent to one another at MP 4.0 in Trousdale County. Includes a new 16-inch tap to be constructed at the Midwestern Gas M&R Station to tie-in from Midwestern Gas Transmission into the suction side of the Hartsville Compressor Station. Modifications to the Texas Eastern M&R Station include the installation of a new 20-inch tap to tie-in the Texas Eastern pipeline system into the Mainline. The existing Midwestern Gas and Texas Eastern M&R stations would be expanded by approximately 1.1 acres to accommodate parking for the new facilities.	RFFA
Harriman Crossover	New 3-acre crossover of 30-inch pipeline lateral and pressure regulation located at MP 114.1, with approximately 2 acres to be fenced and maintained for operation of the facility.	RFFA
Kingston Receiver	New 2-acre site located just to the north of MP 122.1 and 122.2 on Kingston Reservation in Roane County near the termination of the mainline. The Kingston Receiver Site would include a receiver assembly and a custody transfer.	RFFA
Clarkrange Crossover Site	Crossover would be located near MP 80.6 on East Tennessee property; the connection would include 20-inch diameter crossover piping between the proposed Mainline and the 3100 Line, an OPP, skid, source control, blowdown silencer, mainline valve, and receiver and launcher assemblies.	RFFA

Action	Description	Project Type
Alternative B: Solar and Storage Facilities		
Expansion of solar facilities under the 2019 IRP[1]	The target power supply mix included up to 14,000 MW of solar by 2038. Based on results of TVA's 2019 IRP (TVA 2019a), TVA plans to add 10,000 MW of solar by 2035. Approximately 2,900 MW have already been completed. Future solar projects initiated in support of the 10,000 MWs of solar, would require individual NEPA reviews once identified as a potential TVA project or would be completed under a power purchase agreement. Extensive transmission system work would also be required to maintain system safety and reliability and would be evaluated under separate, project-specific NEPA reviews.	RFFA
TVA's Gas Projects – TVA System-wide Emissions Analysis		
Cumberland Gas Plant (CUG)	Based on TVA's Record of Decision (FR Vol.88, No. 13, January 20, 2023) on the Cumberland Fossil Plant Retirement Project EIS, TVA adopted the Preferred Alternative and is moving forward with the construction and operation of replacement generation for the planned retirement of one of the two existing coal-fired CUF units. TVA will construct a natural gas CC plant, a 500-kV switchyard, and gas compression station on approximately 196 acres of the Cumberland Reservation in Stewart County, TN, to replace the generation capacity of one of the two CUF units planned for retirement by the end of 2026. Once constructed, CUG will provide 1,450-MW of firm, dispatchable power by the time the first unit is retired by the end of 2026 to ensure that TVA is able to meet required year-round generation, maximum capacity system demands, and planning reserve margin targets.	Present/RFFA
Cheatham County Generation Site (CHG)	TVA is evaluating the potential environmental effects of constructing and operating a simple cycle natural gas CT plant on a 286-acre parcel of TVA-owned land in Cheatham County, TN, The proposed CT plant would provide approximately 900 MW of generation capacity to replace a substantial portion of the generating capacity that would be lost when the second unit of the existing Cumberland Fossil Plant retires, which is planned by the end of 2028, and to ensure that TVA can continue to meet required year-round electricity generation and maximum capacity demand, and planning reserve margin targets. The project includes related actions including the proposed construction of a 7.6-mile-long natural gas pipeline lateral and on-site and off-site transmission lines.	RFFA

[1]If selected by TVA, specific potential cumulative effects under Alternative B would be further evaluated in subsequent NEPA evaluations once the specific solar facility site locations are identified.
[2]Due to the timing of the recent filing of the project's NOI, this RFFA was not included in the air analyses discussed in Section 3.7.1.

3.2 Methodology for Assessing Impacts of Solar and Battery Energy Storage Systems

TVA currently operates a few small solar PV installations and purchases power from numerous small and large (utility scale) PV facilities (TVA 2019a). In response to the 2019 IRP, as well as due to customer driven demand, TVA has assessed the potential environmental effects of solar PV facilities in multiple EAs conducted over the past several years (TVA 2019a). Since the exact project locations for solar and/or BESS projects described under Alternative B are not known at this time, TVA has compiled a list of typical effects associated with the construction and operation of PV facilities based on a review of solar projects within TVA's region (Table 3.2-1). While the number of sites is dependent upon the generating capacity, TVA has assumed that generating at least approximately 1,500 MW of solar would require at least 15, 100-MW sites. This list was compiled by reviewing the EAs and the EIS for community to utility-scale PV projects issued from 2014 through 2021.

Table 3.2-1. Typical Effects of Solar Facility Construction Activities Determined from a Review of Solar Construction Project Planning Document, 2014-2021

Effect Type	Average and Range of Typical Effects (per MW[1, 2])
Land Use Effects	
Land Requirements (Acres of Solar Installation within the Site)	Average: 7.3 acres Range: 2 to 9.6 acres
Solar Facility Effects	
Floodplain Fill (Acres) per MW	Average: 0.02 acre Range: 0 to 1.8 acres
Prime Farmland Converted	81% of solar projects resulted in prime farmland conversion
Forest Cleared (Acres)	Average: 64 acres Range: 0 to 434 acres Average: 1.2 acres Range: 0 to 15 acres
Parks and Public Lands	7% of solar projects affected parks and public lands
Historic Properties	3% of solar projects affected historic properties
Water Resource Effects	
Wetland Area Affected	Average: 0.14 acres Range: 0 to 0.73 acres Average: 0.003 acres Range: 0 to 0.1 acres
Forested Wetland Area Cleared	Average: 0.34 acres Range: 0 to 4.26 acres Average: 0.01 acres Range: 0 to 0.1 acres
Stream Effects	Average: 367 linear feet (LF) Range: 0 to 6,900 LF Average: 8.7 LF Range: 0 to 41 acres

Effect Type	Average and Range of Typical Effects (per MW[1, 2])
Biological Effects	
Endangered and Threatened Species	48% of solar projects affected federally listed endangered or threatened species or species proposed or candidates for listing
Migratory Bird Effects	9% of solar projects resulted in migratory bird effects
Bald and Golden Eagle Effects	None
Visual Effects	99% of solar projects resulted in visual effects
Environmental Justice	May vary based on location, but typically, none with disproportionate and adverse effects

[1]All MW are reported in Alternating Current (AC).
[2]These are typical effects based on TVA's experience with past solar projects that are summarized in Section 1.5.1. The actual effects of individual solar projects under Alternative B may be higher or lower based on the nature and size of a particular project.

BESSs are a new resource and technology for TVA; therefore, TVA does not have data available from multiple projects to assess typical BESS effects. For the purposes of analyzing Alternative B in this EIS, TVA used the anticipated effects associated with a BESS pilot study project that is capable of generating 20 megavolt amperes (MVA) with a storage capacity of 40 MW in Vonore, Monroe County (TVA 2022c). The Vonore BESS and Associated Substation Final EA and finding of no significant impact were issued by TVA on January 18, 2022. Approximately 10 to 15 acres of land would be required for the BESS pilot project, including an associated new 161-kV substation consisting of a transformer, breakers, power quality meters, a Supervisory Control and Data Acquisition Remote Terminal Unit, relays, alarms, a capacitive coupled voltage transformer, switch house, and other equipment. The area of the battery site would be approximately four acres. Construction would consist of grading the site and installing a foundation to place the battery containers, inverters, electrical and communications connections for the BESS and heating, ventilation, and air conditioning system monitoring and control. The battery containers would be of modular steel construction similar to intermodal shipping containers in which the modular lithium-ion battery cells are mounted on racks and connected by cabling. The battery containers would be equipped with air conditioning and fire protection systems, auxiliary distribution board, and lighting. There would be 12, 40-foot battery containers, 12 (2.5 MVA) transformers, 24 Inverter Cabinets, and a 13.8-kV Switchgear for the Vonore Project. A new communication cabinet and a 1.5-MVA transformer would be needed. Additionally, a loop connection point would be installed on the existing Loudon-Tellico Reservoir Development Agency's 69-kV transmission line. Direct transfer trip and transfer trip work would occur at the Vonore 161-kV Substation.

3.3 Methodology for Assessing Impacts of Transmission and Electrical System Components

The analyses of environmental consequences for the transmission upgrades required in Alternative A have been updated in this EIS to reflect conclusions based on site-specific resource surveys of the access roads and transmission ROWs associated with the transmission components proposed for upgrades. The analyses of environmental impacts of the transmission and electrical system components (would require upgrades to existing systems and new system construction) anticipated to support solar and storage facilities in Alternative B reference the typical effects from construction activities related to transmission projects, as compiled in the 2019 IRP EIS. A total of 298 projects were included in the review (Table 3.3-1).

Table 3.3-1. Typical Effects of Transmission System Construction Activities Determined from a Review of Project Planning Documents of 298 Transmission Construction Projects*, 2005-2018

Effects by Use Type	Transmission Lines	Substations/Switching Stations
Land Use Effects		
Land requirements	Average:13.1 acres/line mile, range 3.5 – 39	Average: 10.8 acres, range 1 – 73 Median for 500 kV: 49.5 acres
		Median for <500 kV: 5.5 acres
Floodplain fill	*De minimis*	Average: 0.1 acres, range 0 – 45% affected floodplains
Prime farmland converted	None	Average: 6.9 acres, range 0 – 29.1 64% affected prime farmland
Forest cleared	Average: 5.5 acres/line mile for new lines, range 0 – 30.5	Average: 4.5 acres, range 0 – 50 29% cleared forest
Parks and Public Lands	40 (16%) of 249 projects affected parks and public lands	
Historic Properties	41 (14%) of 288 projects affected historic properties	
Water Resources Effects		
Wetland area affected (new lines)	Average: 0.9 acres/line mile for new line Range: 0 to 22.2 55% affected wetlands	Average: 0.1 acres Range: 0 to1.8 15% affected wetlands
Wetland area affected (existing lines)	Average: 0.9 acres/line mile of existing line Range: 0 to18.3 52% affected wetlands	
Forested Wetland Area Cleared (new lines)	Average: 0.9 acres/line mile of new line Range: 0 to 18.3 52% affected wetlands	Location-dependent
Forested Wetland Area Cleared (existing lines)	Average: 0.02 acres/line mile of existing line Range: 0 to 0.5 17% affected forest wetlands	
Stream crossings (new lines)	Average: 2.9 per mile of new line Range: 0 to 50, 76% crossed streams	Location-dependent

Effects by Use Type	Transmission Lines	Substations/Switching Stations
Stream crossings (existing lines)	Average: 1.5 per mile of existing line Range: 0 to 5.6, 64% crossed streams	
Forested stream crossings (new lines)	Average of 1.0 per mile of new line Range: 0 to 17.6, 48% crossed forested streams	Location-dependent
Forested stream crossings (existing lines)	Average of 0.1 per mile of existing line Range: 0 to 2.5, 8% crossed forested streams	
Biological Effects		
Endangered and threatened species	32 (11%) of 256 projects affected federally listed endangered or threatened species, or species proposed or candidates for listing 63 (22%) of 290 projects affected state-listed endangered, threatened, or special concern species	

*Note: Because some project planning documents did not contain all of the environmental data included in this EIS, the sample sizes for the various categories differ.

The information in Table 3.2-1 and Table 3.3-1 was compiled to provide an estimate of the potential effects associated with the construction of transmission and electrical system components for Alternative B in comparison to other action alternatives.

Since exact site locations for solar and storage facilities associated with Alternative B are not known at this time, additional site specific tiered NEPA analysis would need to be completed as projects are identified and the scope is further defined.

3.4 Environmental Justice

Executive Order 12898 (1992), *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to identify and address “disproportionately high and adverse human health or environmental effects” of their actions on minority and low-income populations (i.e., environmental justice [EJ] communities). While EO 12898 does not create any binding obligations on TVA, TVA nevertheless routinely considers EJ during its NEPA review processes and does so here by employing these base assumptions. Executive Order 14096 (2023), *Revitalizing our Nation’s Commitment to Environmental Justice for All*, builds upon and reinforces the Federal government’s commitment to deliver EJ to all communities across America.

Potential effects to identified EJ populations are analyzed in this section and subsequent sections in Chapter 3 where project effects may occur, in accordance with EO 12898 and EO 14096, to identify and discuss disproportionately high and adverse human health or environmental effects of each alternative on minority populations and low-income populations. EJ communities have a history of experiencing environmental discrimination, social disadvantage, and cultural and economic vulnerabilities due to practices of our larger society. Cultural vulnerabilities in this context meaning the cultural practices, values, lifestyles, and/ or economic approaches that may lead to disproportionate effects. U.S. Census Bureau (USCB) data from 2022 show that, across the nation, approximately 17.1

percent of African American individuals, 16.9 percent of Hispanic individuals, and 8.6 percent of both Asian and White (non-Hispanic) individuals live below the federal poverty level. Minority communities often experience high poverty rates, less upward mobility, and more downward mobility as a result of common practices in the United States sometimes referred to as institutionalized racism (Winship et al. 2021). Low income is associated with many disadvantages and can include less-desirable living situations; limited access to healthcare; and a plethora of environmental effects that may result in higher levels of disease, disability, and other health problems. These issues are compounded when environmental indicators overlap, such as is shown in USEPA's EJScreen tool (discussed in more detail in Section 3.4.2). This section identifies the potential for disproportionate and adverse human health or environmental effects on EJ communities considering the adverse effects already experienced by those communities (as summarized in Table 3.4-21).

3.4.1 EJ Analysis Approach

3.4.1.1 EJ Desktop Analysis

3.4.1.1.1 TVA's KIF Project EJ Analysis

Potentially affected EJ populations, including minority, low-income, and limited English proficiency (LEP) populations, are identified in this section using the USCB 2010 decennial census (2010 Census) (USCB 2010), the USCB 2020 decennial census (USCB 2020a), and the 2017-2021 American Community Survey (ACS) 5-year estimates (ACS 2021), depending on availability of data. State-level and, for some characteristics, county-level USCB data are included for analysis and comparison purposes. Decennial census and ACS data were obtained utilizing 2022 USCB Explore Census Data (USCB 2023) and 2022 ESRI Demographics (ESRI 2022). Where appropriate, additional data from USCB are employed. EJ populations were determined through a comparison of the above-stated USCB census data to threshold criteria selected based on guidance from the Council of Environmental Quality (CEQ), as defined below. USEPA's EJScreen: Environmental Justice Screening and Mapping Tool (Version 2.1) (USEPA 2022e) was also reviewed and compared with the compiled USCB census data.

CEQ guidance for applying EO 12898 under NEPA directs the identification of minority populations when either the minority population of the affected area exceeds 50 percent, or the minority population percentage of the study area is meaningfully greater than the minority population percentage in the general population or through another appropriate unit of geographic analysis (CEQ 1997). CEQ defines minority populations as people who identify as Asian or Pacific Islander, American Indian or Alaskan Native, Black (not of Hispanic origin), or Hispanic. Individuals indicating two or more races are also considered minorities.

CEQ guidance specifies that low-income populations are to be identified using the annual statistical poverty threshold from the USCB Current Population Reports Series P-60 on Income and Poverty. The current (2022) USCB-provided poverty threshold for individuals under age 65 is $15,230, and the federal poverty rate for the U.S. as a whole is currently 11.5 percent (USCB 2022). Study area income and poverty rates are compared with the county and/or state data using the 2021 USCB Small Area Income and Poverty Estimates (SAIPE), as recommended by USCB (USCB 2020b). For purposes of this analysis, the percentages of individuals with poverty rates that are less than two times the poverty level (i.e., those with poverty ratios defined in the ACS [2021] as 1.99 or lower) were calculated to define low-income populations. More encompassing than the base poverty level, this low-income threshold, also used by USEPA in its delineation of low-income populations, is an appropriate measure for EJ consideration because current poverty thresholds are often too low to capture the populations adversely affected by low-income levels, especially in high-cost areas (USEPA 2019b). According to USEPA, 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).

According to CEQ guidance, minority and low-income populations may be groups of people living in geographic proximity or scattered groups or individuals sharing common conditions. As such, CEQ directs the identification of groups demonstrating differential patterns of consumption of natural resources among minority and low-income populations (CEQ 1997). Specialized groups are identified, where commensurate with anticipated effects, in relation to the subsequent resource areas; these are presented in the EJ Considerations subsections throughout Chapter 3, where relevant. No census block groups had minority populations exceeding 50 percent. Thus, for each study area defined below, the census block groups or counties with minority percentages that were 10 percentage points above the study area or higher in the ACS (2021) are identified by TVA as the areas where the chance for disproportionate and adverse environmental and human health effects to minority populations may be greatest (i.e., the qualifying minority EJ populations). The census block groups or counties with poverty ratios that were 20 percentage points above the study area and/or above 50 percent based on the ACS (2021) are identified as the areas where the chance for disproportionate and adverse environmental and human health effects to low-income populations may be greatest (i.e., the qualifying low-income EJ populations). TVA's analyses used these approaches to define minority and low-income populations due to the socioeconomic aspects of the study areas across all alternatives. In comparison with the state, the populations were generally more aged and had fewer high school graduates or higher education, higher unemployment rates, and lower per capita income, as detailed in Section 3.16. Therefore, TVA's approach allowed for identification of the most vulnerable portions of the mostly rural, depopulating study areas, where the chance for disproportionate and adverse environmental and human health effects to human populations may be greatest.

The LEP population is assessed in this section, consistent with Title VI of the Civil Rights Act of 1964 (42 USC § 2000d et seq.); U.S. Department of Justice (DOJ) Guidance to Federal Financial Assistance Recipients Regarding Title VI Prohibition Against National Origin Discrimination Affecting Limited English Proficient Persons [DOJ LEP guidance; Federal Register 67(117):41455-41472, June 18, 2002]; and EO 13166 [Federal Register 65(159):50121-50122, August 16, 2000]. Based on DOJ LEP guidance, LEP language groups that constitute five percent or 1,000 individuals, whichever is less, should be offered translated project materials, where relevant. Eligible LEP language groups are defined herein as those whose members self-report speaking English less than well, based on the ACS (2021).

TVA also used its internal Customer Analytics group to identify specific residences that would be EJ-qualifying and within three miles of the proposed CC/Aero CT Plant (under Alternative A) location on the Kingston Reservation for additional outreach efforts, which included direct mailings of post cards and informational handouts translated to Spanish. TVA partnered with the Mid-East Community Action Agency (MECAA) to identify potential environmental justice populations and distributed information regarding availability of the DEIS. TVA contacted the Highland Rim Economic Corporation, local plant personnel, and local government officials to verify that known low-income, LEP, or minority communities located near the Kingston Reservation were included in this desktop review. TVA also contacted the local school board to provide information regarding the project and requested input regarding EJ-qualifying communities. No specific EJ communities, vulnerable EJ areas, or EJ concerns were identified beyond the desktop analysis presented in this section.

TVA also considered EJ-qualifying census block groups identified in the ETNG Pipeline EJ analysis for the natural gas pipeline associated with Alternative A, described in the section below.

3.4.1.1.2 ETNG Ridgeline Project EJ Analysis

TVA considered EJ-qualifying census block groups identified in the ETNG Ridgeline Expansion Project's EJ analysis. As prescribed in FERC guidance (ETNG 2023f), the Ridgeline Expansion Project's analysis used a different "meaningfully greater" threshold for defining EJ populations than TVA applied:

- Communities where the percentage of minorities within a given census block group exceeds 50 percent or exceeds the comparative county level by 10 percent or more; and
- Communities where the low-income level within the census block group is equal to or exceeds the comparative county level.

These criteria vary slightly from the criteria used by TVA to define qualifying EJ communities. Therefore, TVA also performed a separate analysis of potential EJ impacts from the Ridgeline Project using the same criteria TVA used to evaluate EJ impacts under the No Action and Action Alternatives.

For the Ridgeline Project, ETNG completed field surveys to confirm the presence of EJ communities and other populations identified through a desktop review (see ETNG's Final Resource Report 5 [ENTG 2023f]). Given that the Ridgeline Project overlaps with the Kingston Reservation and that the identified EJ study areas overlap with those identified in TVA's analysis, these additional EJ-qualifying census block groups are incorporated into the EJ analysis in this EIS (ETNG 2023f).

Based on TVA and ETNG analyses, populations determined to meet the criteria regarding minority, low-income, and/or LEP status were considered qualifying EJ populations, and additional USCB data, USEPA data, historical information, and relevant details from other sources were obtained to better understand the socioeconomic and sociocultural aspects of these populations to evaluate for disproportionate and adverse effects on EJ populations. The additional USCB data obtained included other relevant demographic factors and information regarding the rural or urban status of the area. USCB defines an urbanized area as having a population of 50,000 or more and an urban cluster as populations more than 2,500 and less than 50,000; all areas outside of urbanized areas and urban clusters are considered rural. USEPA's EJScreen tool was used to review 13 different environmental indicators for EJ-qualifying areas in comparison with the state values of those indicators to identify the potential for cumulative effects to EJ populations. The environmental indicators consist of those relevant to air quality and proximity to traffic, toxins, underground storage tanks (USTs), hazardous waste facilities, Superfund sites, and wastewater discharges.

3.4.1.2 EJ Study Area Identification

3.4.1.2.1 Alternative A

3.4.1.2.1.1 Kingston Reservation

The Kingston Reservation EJ Study Area is a 10-mile radius of the Kingston Reservation boundary[21]. This area was selected to: (1) assess the larger demographic context to allow for analysis of disproportionate and adverse effects on EJ populations; (2) evaluate EJ effects based on the full reach of project effects on other resource areas (e.g., transportation); and (3) analyze cumulative effects on EJ populations.

3.4.1.2.1.2 Off-site Transmission Corridors

The Transmission Corridor EJ Study Area is a one-mile radius of each transmission corridor (Eastern and Western corridors). This area was selected because the one-mile area encompasses the likely concentration of construction activities, noise, visual, and traffic impacts.

3.4.1.2.1.3 ETNG Construction ROW

Based on current FERC practice[22], the ETNG-defined EJ Study Area for the Ridgeline Expansion Project includes census block groups crossed by the ETNG Construction ROW, including contractor yards, and also includes those within one mile of the Hartsville Compressor Station and the two new meter and regulating (M&R) stations (Columbia Gulf and Kingston) (ETNG 2023f). However, TVA's analysis was expanded to include census block groups within a one-mile radius of ETNG Construction ROW, which includes the Hartsville Compressor Station and both M&R stations (illustrated in Figure 3.4-1); therefore, TVA's Expanded Pipeline EJ Study Area is slightly larger than the ETNG Pipeline EJ Study Area.

The 1-mile radius is sufficiently broad considering the likely concentration of construction emissions, noise, visual, and traffic impacts proximal to the pipeline construction and consistent with FERC regulations (18 CFR § 380.12 Environmental reports for Natural Gas Act applications). This radius is conservative for pipeline safety, as it is much greater than the 220-yard (0.125 mile) area of consideration to define human uses (i.e., class locations and high consequence areas) used by USDOT Pipeline and Hazardous Materials Safety Administration (PHMSA). This is also conservative relative to the potential impact radius (PIR) utilized by PHMSA in the unlikely event of pipeline failure. The PIR is used to analyze the area within which the potential failure of a pipeline could have significant impact on people or property, in accordance with 49 CFR § 192.903. For a natural gas pipeline of this size and pressure, a PIR of less than 500 feet was calculated. The one-mile radius factors in the area utilized in the analysis prepared for the Ridgeline Project as part of FERC's pre-filing process, which included the census block groups that either cross the pipeline centerline or are within one mile of proposed aboveground facilities. TVA's Expanded Pipeline EJ Study Area would allow for future aboveground structures anywhere along the length of the pipeline.

3.4.1.2.2 Alternative B

The EJ Study Area identified for Alternative B includes the 49 counties within the East TN region of TVA's PSA, as defined by TVA's Economic Development team (TVA 2022e; Figure 3.4-3). The Alternative B EJ evaluation is based on an assessment of census data

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[21] The No Action Alternative

[22] FERC typically identifies EJ populations in census block groups that are crossed by a pipeline or within 1 mile of aboveground facilities like the electric-powered Hartsville Compressor Station.

associated with each county in the region. The county approach was used since detailed consideration of EJ effects at the census tract or census block group level would occur during assessment of individual solar and battery storage facilities.

The census block groups are given in tables as ACS Census Tract number and Block Group number (e.g., CT 1106 BG 2) (ACS 2021). When counties overlap by less than two percent of the overall study area, the associated census block groups are not included in the analysis to avoid skewing results.

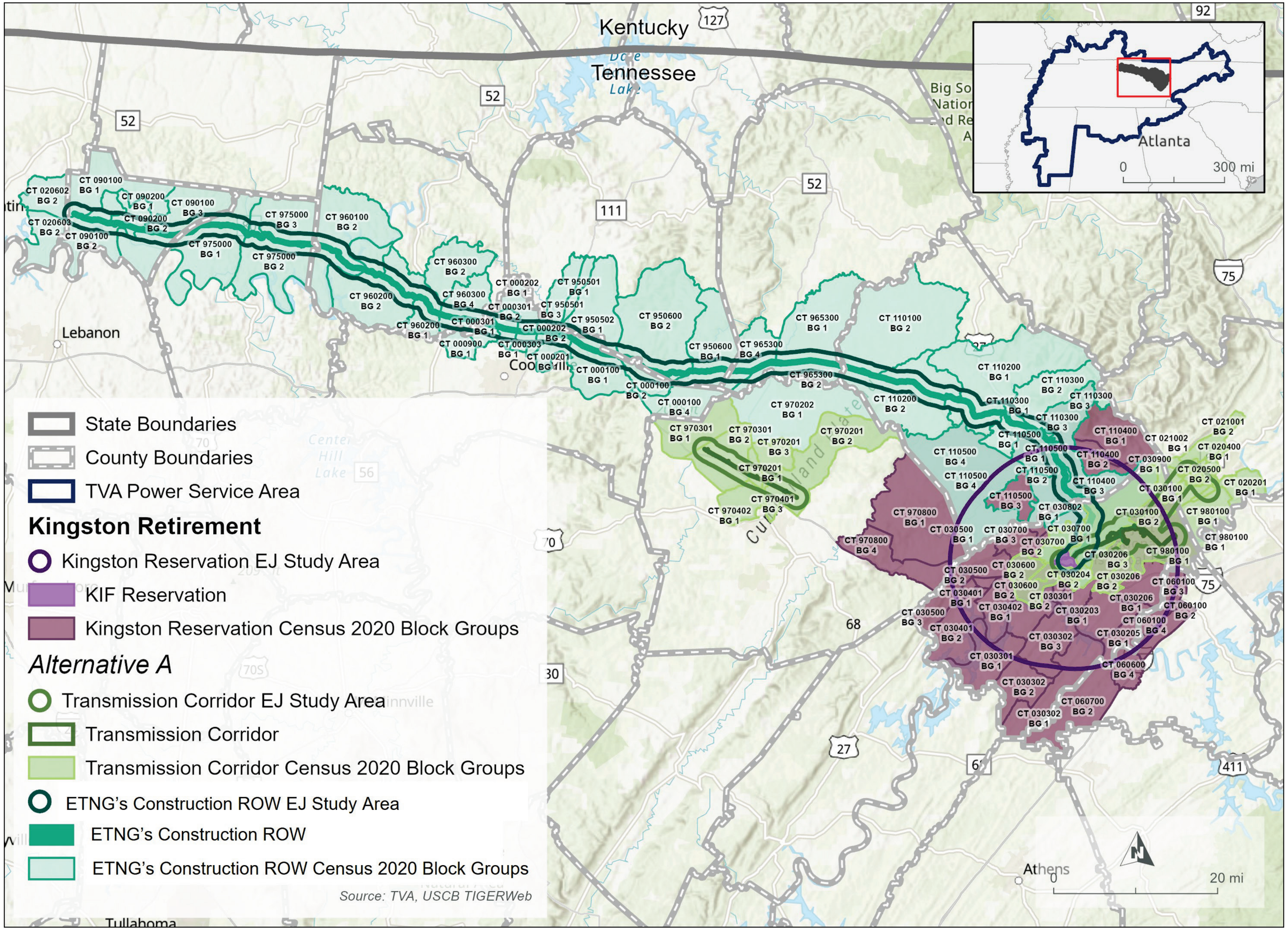

Figure 3.4-1. Environmental Justice Study Area for TVA's Expanded Environmental Justice Study Area (Kingston Reservation and Transmission Corridors EJ Study Areas) and ETNG Construction ROW under Alternative A (TVA's Environmental Justice Study Areas)

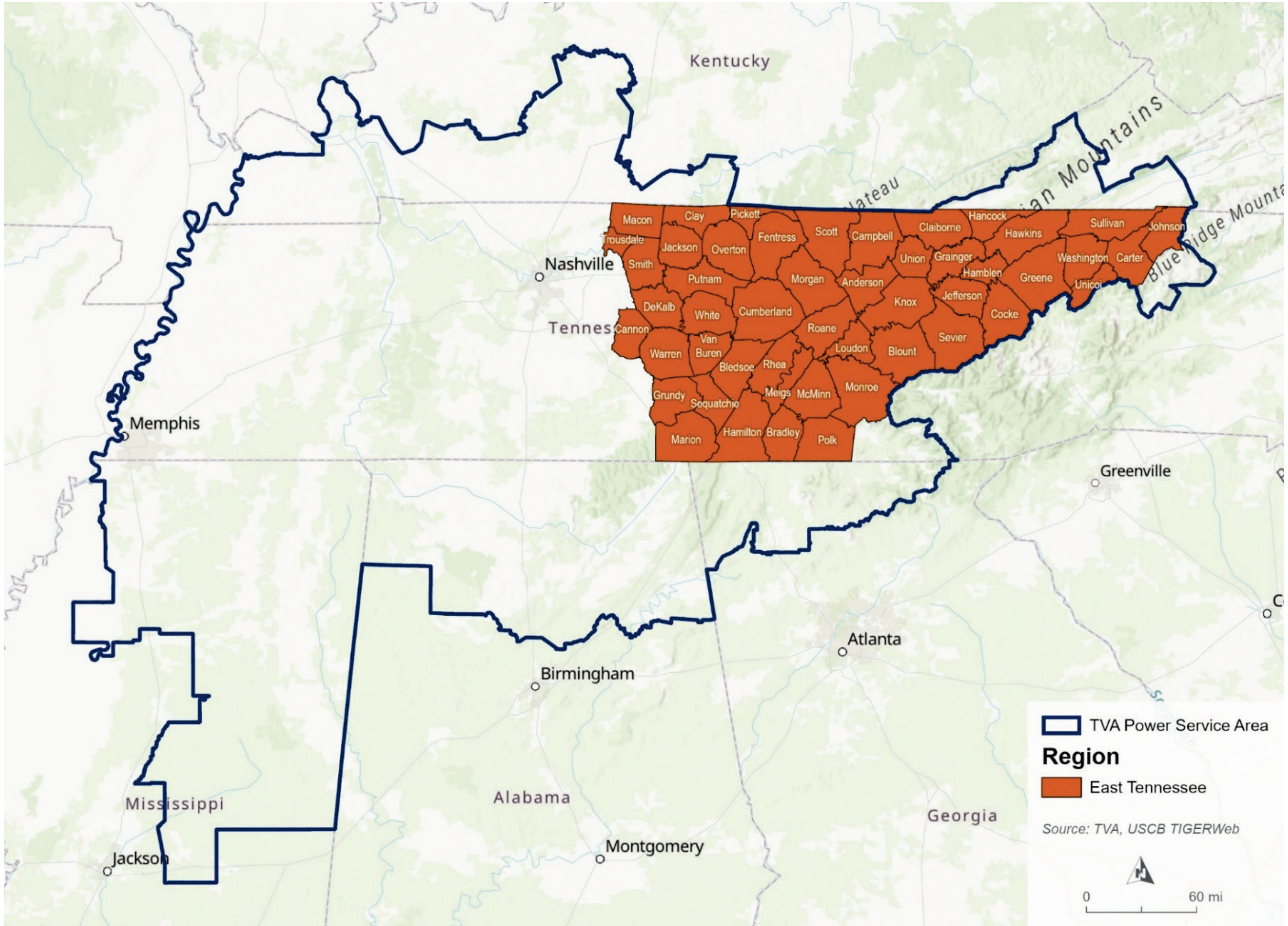

Figure 3.4-2. Environmental Justice Study Area for the East Tennessee Region of the Tennessee Valley Authority Power Service Area under Alternative B

3.4.2 Affected Environment

The EJ study areas associated with each alternative, as previously defined, have recreational areas that could support subsistence activities, such as fishing and hunting (see Section 3.9 for more detail on these specific resources). These recreational areas are utilized by diverse populations, including EJ populations, and are considered in relation to EJ populations in relevant EJ Consideration subsections throughout Chapter 3. As this NEPA analysis tiers from TVA's 2019 IRP EIS (TVA 2019b), this EJ analysis likewise tiers from the human context information presented in Chapter 4 of the 2019 IRP EIS (TVA 2019a). Refer to the IRP EIS for more details on the tribal populations (Chapter 4.9.3) and the sociocultural characteristics (Chapter 4.8) of TVA's PSA and the subregions within it.

Based on a review of EJ population metrics in the USEPA's EJScreen standard report for available EJ study areas, the EJ study areas are generally not in areas with high concentrations of EJ populations in comparison to the EJ populations throughout TN. EJ communities that are present in higher concentrations are primarily low-income populations (Table 3.4-1). The Western and Eastern Transmission Corridor EJ Study Areas have low-income populations that exceed the state population levels. Minority and linguistically isolated populations make up relatively small percentages of the total population of the study areas.

Table 3.4-1. EJScreen Findings for EJ Study Areas

Geography	Percent Minority	Households Below Poverty (2021)	Linguistically Isolated %
Tennessee*	27.1	14.1	8.0
Kingston Reservation EJ Study Area	8.5	30.6	0.1
ETNG Pipeline EJ Study Area*	*	*	*
Western Transmission Corridor EJ Study Area	3.3	42.5	0.1
Eastern Transmission Corridor EJ Study Area	14.1	33.3	0.2
Alternative B EJ Study Area*	This information cannot be compiled until proposed sites have been identified		

* Too large or too complex an area to generate report in EJSCREEN.

The review of the affected environment for the Kingston Reservation and the ETNG Construction ROW draws upon the results from the Ridgeline Project EJ analysis prepared for the project based on FERC guidance. However, TVA and Ridgeline Project EJ analyses used different criteria for identifying minority and low-income populations; as such, the Ridgeline Project analysis identified several EJ qualifying census block groups within the Ridgeline Project EJ Study Area that were not identified in TVA's analysis and vice versa. Those EJ census block groups identified as EJ qualifying by either analysis have been included herein.

3.4.2.1 Kingston Reservation (No Action and D4 Activities)

The Kingston Reservation EJ Study Area includes all or portions of 49 census block groups with resident populations (Figure 3.4-1). These census block groups encompass portions of Roane County, where the Kingston Reservation falls within CT 307 BG 2, and Cumberland, Loudon, and Morgan counties. While the Kingston Reservation EJ Study Area overlaps CT

9801 BG 1, this census block group is entirely encompassed by the Y-12 National Security Complex, which has no residential population. As all census values were zero, CT 9801 BG 1 was not included in the CT total or the analyses so not to skew results. The Kingston Reservation EJ Study Area is relevant under each of the evaluated action alternatives.

3.4.2.1.1 Minority Populations

Three census block groups within the Kingston Reservation EJ Study Area were identified as minority EJ populations, as shown in bold (Table 3.4-2). Based on the ACS, the minority populations in all of the affected counties were generally smaller proportionally than statewide (ACS 2021).

Based on the ACS at the census block group level, 8.5 percent of people within the Kingston Reservation EJ Study Area identified as minorities, a lower proportion than the state (ACS 2021). While the combined minority composition (percent minority) of the 49 census block groups of the Kingston Reservation EJ Study Area was lower than the percent minority of the state, the percent minority composition for 16 of those 49 census block groups was higher in comparison to the percent minority composition of the combined 49 census block groups of the Kingston Reservation EJ Study Area. Further, three census block groups had a minority percentage that was 10 percentage points or more above the Kingston Reservation EJ Study Area percentage of 8.5 percent (Figure 3.4-3). This area is considered a minority EJ population area, where the chance for disproportionate and adverse environmental and human health effects may be the greatest. As shown in Table 3.4-2, this minority percentage is due to a high percentage of Black or African American population.

Table 3.4-2. Minority Percentages and Ethnicities in the Kingston Reservation Environmental Justice Study Area

Geography[1]	**% Minority**	**% White**[2]	**% Black/African American**	**% American Indian/Alaskan Native**	**% Asian**	**% Native Hawaiian / Pacific Islander**	**% Some Other Race**	**% Two or More Races**	**% Hispanic / Latino**[3]
Kingston Reservation EJ Study Area	8.5	92.2	4.0	0.4	0.6	0.0	0.3	2.3	1.9
Threshold for EJ Qualifying	18.5								
Tennessee, *County*	27.1	75.8	16.5	0.2	1.8	0.1	1.8	3.8	5.8
Cumberland	*6.0*	*96.3*	*0.9*	*0.4*	*0.3*	*0.0*	*0.3*	*1.9*	*3.1*
CT 9708 BG 1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 9708 BG 4	1.7	98.3	0.0	0.0	1.1	0.0	0.0	0.5	0.0
Loudon	*13.4*	*91.6*	*1.4*	*0.2*	*0.9*	*0.0*	*1.3*	*4.6*	*9.4*
CT 601 BG 2	3.1	96.9	3.1	0.0	0.0	0.0	0.0	0.0	0.0
CT 601 BG 3	5.4	96.3	0.0	0.0	0.0	0.0	0.0	3.7	1.7
CT 601 BG 4	14.6	93.0	4.1	0.0	0.0	0.0	0.0	2.8	10.4
CT 606 BG 4	4.4	95.6	0.6	0.0	1.2	0.0	2.0	0.6	0.0
CT 607 BG 2	6.3	93.7	0.7	0.0	0.0	0.0	0.0	5.6	0.3
Morgan	*8.9*	*91.9*	*5.6*	*0.2*	*0.2*	*0.1*	*0.4*	*1.7*	*1.5*
CT 1103 BG 3	**34.0**	66.4	30.1	0.1	0.6	0.1	1.2	1.5	2.7
CT 1104 BG 1	1.3	98.7	0.0	0.0	0.0	0.0	0.0	1.3	0.0
CT 1104 BG 2	1.9	99.2	0.0	0.0	0.0	0.0	0.0	0.8	1.1
CT 1104 BG 3	2.1	97.9	0.0	0.0	0.0	0.0	0.0	2.1	0.0
CT 1105 BG 1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 1105 BG 2	5.1	94.9	0.0	0.0	0.0	0.0	0.0	5.1	0.0
CT 1105 BG 3	2.0	99.4	0.0	0.0	0.0	0.0	0.1	0.5	1.9
CT 1105 BG 4	10.3	89.7	1.4	0.0	0.0	0.0	0.0	8.9	0.0
Roane	*7.7*	*93.0*	*3.0*	*0.5*	*0.8*	*0.0*	*0.3*	*2.4*	*2.1*
CT 301 BG 2	14.6	86.8	10.5	0.0	1.3	0.0	0.8	0.6	2.7

Geography[1]	% Minority	% White[2]	% Black/African American	% American Indian/Alaskan Native	% Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[3]
CT 302.03 BG 1	6.9	93.1	0.0	0.0	4.6	0.0	2.2	0.2	0.0
CT 302.03 BG 2	10.6	89.4	0.0	0.0	2.2	0.0	0.0	8.3	0.0
CT 302.04 BG 1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 302.04 BG 2	12.9	90.4	8.3	0.0	0.0	0.0	0.0	1.3	3.3
CT 302.04 BG 3	18.1	81.9	18.1	0.0	0.0	0.0	0.0	0.0	0.0
CT 302.05 BG 1	6.6	93.4	0.0	6.6	0.0	0.0	0.0	0.0	6.6
CT 302.05 BG 2	13.5	90.3	6.9	0.0	0.0	0.0	0.0	2.8	3.8
CT 302.06 BG 1	3.1	96.9	0.0	3.1	0.0	0.0	0.0	0.0	0.0
CT 302.06 BG 2	2.2	97.8	2.1	0.0	0.0	0.0	0.0	0.1	0.0
CT 302.06 BG 3	7.8	92.2	0.0	5.8	0.0	0.0	0.0	2.0	0.0
CT 303.01 BG 1	17.8	82.2	0.0	0.0	0.0	0.0	2.9	14.9	17.8
CT 303.01 BG 2	0.9	99.1	0.0	0.0	0.0	0.0	0.0	0.9	0.0
CT 303.02 BG 1	6.7	96.7	0.0	0.0	0.0	0.0	1.6	1.6	5.0
CT 303.02 BG 2	4.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
CT 303.02 BG 3	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 304.01 BG 1	3.6	96.4	0.0	0.0	0.0	0.0	0.0	3.6	0.0
CT 304.01 BG 2	4.0	96.0	1.0	0.0	0.0	0.0	0.0	3.0	0.0
CT 304.02 BG 1	12.4	87.9	2.9	0.0	7.4	1.7	0.0	0.0	0.3
CT 304.02 BG 2	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 304.02 BG 3	6.4	95.2	0.0	0.0	4.8	0.0	0.0	0.0	1.5
CT 305 BG 1	8.5	91.5	2.2	0.0	6.2	0.0	0.0	0.0	0.0
CT 305 BG 2	8.4	92.3	0.0	0.4	0.3	0.0	1.3	5.7	3.3
CT 305 BG 3	9.2	90.8	0.3	5.2	0.0	0.0	0.0	3.8	2.0
CT 306 BG 1	3.5	96.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0
CT 306 BG 2	8.5	91.5	1.5	0.0	0.6	0.0	0.0	6.5	0.8
CT 307 BG 1	12.6	93.3	0.0	0.0	0.0	0.0	1.4	5.3	9.9

Geography[1]	% Minority	% White[2]	% Black/African American	% American Indian/Alaskan Native	% Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[3]
CT 307 BG 2 (Kingston Reservation)	12.8	87.2	1.9	0.0	0.0	0.0	0.0	11.0	7.5
CT 307 BG 3	**18.8**	82.8	14.5	0.0	0.0	0.0	0.0	2.7	3.2
CT 308.01 BG 1	4.8	95.2	0.7	0.0	0.9	0.0	0.0	3.3	3.3
CT 308.01 BG 2	15.7	84.3	11.0	0.0	0.0	0.0	0.0	4.7	0.0
CT 308.02 BG 1	3.0	97.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 308.02 BG 2	**21.5**	78.5	19.6	0.0	0.0	0.0	1.2	0.6	1.9
CT 309 BG 2	2.3	99.4	0.0	0.0	0.0	0.0	0.0	0.5	1.8

Source: (ACS 2021) Table ID: B03002
[1]CT: census tract; BG: block group
[2]Race percentages are provided for those reporting a particular race alone or in combination.
[3]This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a "race."
Note: Emboldened census block groups represent identified EJ populations as compared with the overall study area percentage.

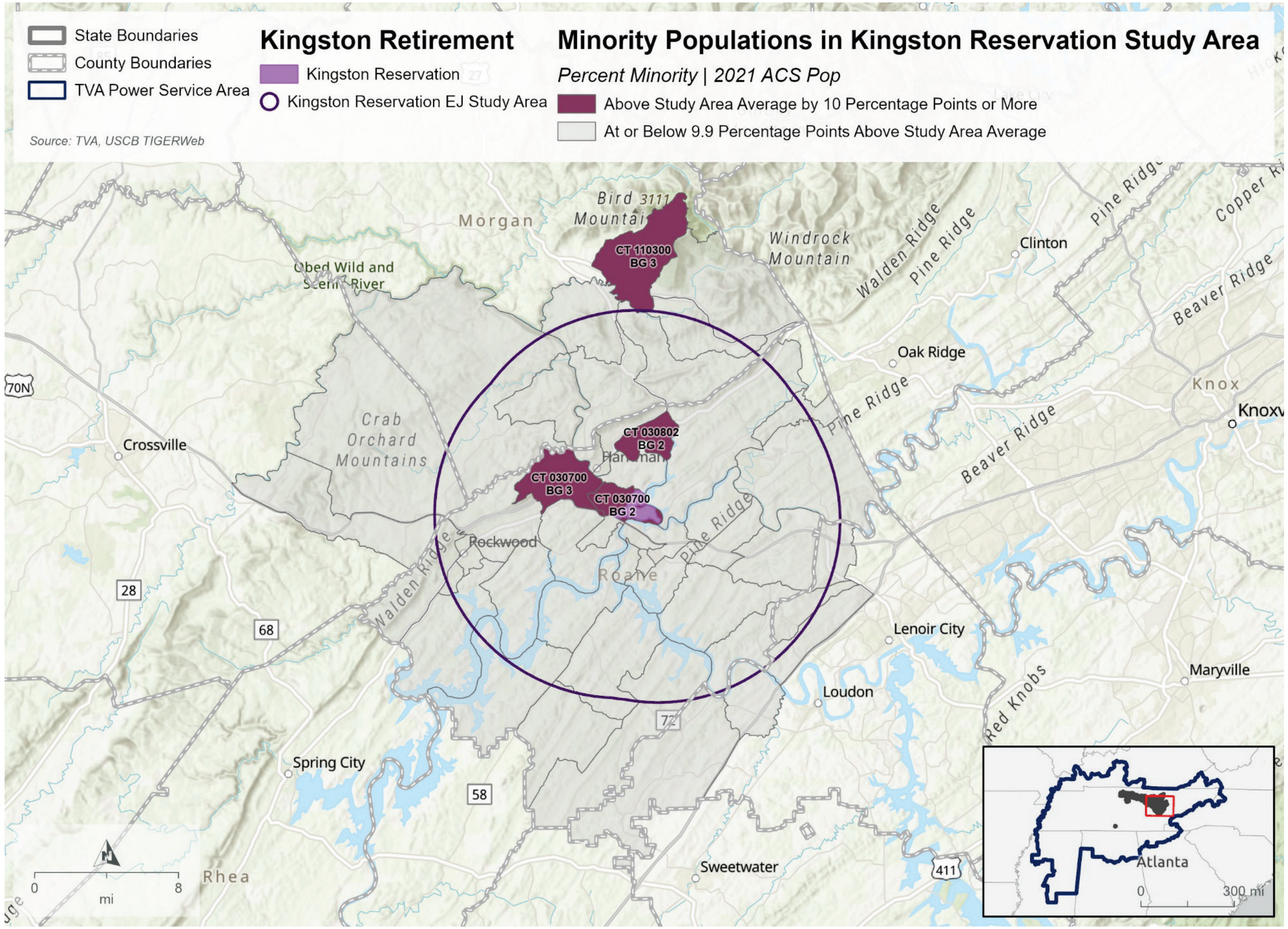

Figure 3.4-3. Minority Populations in the Kingston Reservation Environmental Justice Study Area

3.4.2.1.2 Low-Income Populations

Eight census block groups within the Kingston Reservation EJ Study Area were identified as areas with low-income EJ populations (Table 3.4-3). Based on the 2021 SAIPE, a greater proportion of the population of two of the four affected counties was living in poverty when compared with the state as a whole (USCB 2022).

At the census block group level, based on the ACS, the Kingston Reservation EJ Study Area had a lower poverty ratio than the state (ACS 2021). Eight census block groups had poverty ratios that were 20 percentage points or more above the Kingston Reservation EJ Study Area average of 32.1 percent and/or were at or above 50 percent (Figure 3.4-4). These census block groups are defined as the areas where the chance for disproportionate and adverse environmental and human health effects may be the greatest.

Table 3.4-3. Poverty Rates for the Kingston Reservation Environmental Justice Study Area

	2021 SAIPE	2021 ACS	
Geography[1]	**Poverty % ***	**Poverty %, Households #**	**Poverty Ratio, Two Times US Threshold + ****
Kingston Reservation EJ Study Area		13.0	32.1
Threshold for EJ Qualifying			50***
Tennessee County	13.7	14.1	33.2
Cumberland	*14.9*	*13.8*	*38.3*
CT 9708 BG 1		5.9	11.4
CT 9708 BG 4		**14.2**	**54.7**
Loudon	*9.6*	*12.0*	*28.2*
CT 601 BG 2		3.5	27.3
CT 601 BG 3		3.0	21.4
CT 601 BG 4		3.4	22.4
CT 606 BG 4		6.4	35.2
CT 607 BG 2		1.9	10.4
Morgan	*18.1*	*18.5*	*42.3*
CT 1103 BG 3		20.2	44.1
CT 1104 BG 1		**13.5**	**52.9**
CT 1104 BG 2		18.8	28.2
CT 1104 BG 3		13.9	26.9
CT 1105 BG 1		10.7	35.0
CT 1105 BG 2		8.2	25.2
CT 1105 BG 3		9.3	21.9
CT 1105 BG 4		15.3	27.1
Roane	*13.1*	*14.7*	*32.4*
CT 301 BG 2		0.0	2.7
CT 302.03 BG 1		0.0	10.8
CT 302.03 BG 2		5.9	29.6
CT 302.04 BG 1		3.2	7.7
CT 302.04 BG 2		10.9	18.1

Geography[1]	2021 SAIPE Poverty % *	2021 ACS Poverty %, Households #	2021 ACS Poverty Ratio, Two Times US Threshold + **
CT 302.04 BG 3		8.2	19.1
CT 302.05 BG 1		**18.5**	**50.4**
CT 302.05 BG 2		3.0	21.5
CT 302.06 BG 1		**24.5**	**50.3**
CT 302.06 BG 2		4.4	11.9
CT 302.06 BG 3		11.3	23.0
CT 303.01 BG 1		16.1	32.6
CT 303.01 BG 2		6.4	20.9
CT 303.02 BG 1		20.4	17.1
CT 303.02 BG 2		24.6	30.8
CT 303.02 BG 3		11.3	19.5
CT 304.01 BG 1		**14.1**	**53.3**
CT 304.01 BG 2		24.3	39.2
CT 304.02 BG 1		7.6	8.7
CT 304.02 BG 2		20.0	20.8
CT 304.02 BG 3		14.0	30.8
CT 305 BG 1		23.2	48.4
CT 305 BG 2		**23.4**	**64.2**
CT 305 BG 3		**28.3**	**59.7**
CT 306 BG 1		13.6	39.2
CT 306 BG 2		11.7	45.0
CT 307 BG 1		12.4	48.0
CT 307 BG 2 (Kingston Reservation)		10.0	30.2
CT 307 BG 3		24.4	38.5
CT 308.01 BG 1		**42.6**	**58.8**
CT 308.01 BG 2		25.0	23.8
CT 308.02 BG 1		7.4	42.7
CT 308.02 BG 2		9.5	27.7
CT 309 BG 2		9.2	24.5

Source: 2021 SAIPE (USCB 2022), 2021 ACS # Table ID: B17017 + Table ID C17002
*For the respective county in which the census block group is located
**Calculated based on percent of population with a ratio of income to poverty threshold ≤1.99
***50 percent is the lower of the two qualifying EJ percentages based on criteria, *i.e.*, either 50 percent or 20 percentage points above the Kingston Reservation EJ Study Area percentage (32.1)
[1]CT: census tract; BG: block group
Note: Emboldened census block groups represent identified EJ populations as compared with the Kingston Reservation EJ Study Area percentage.

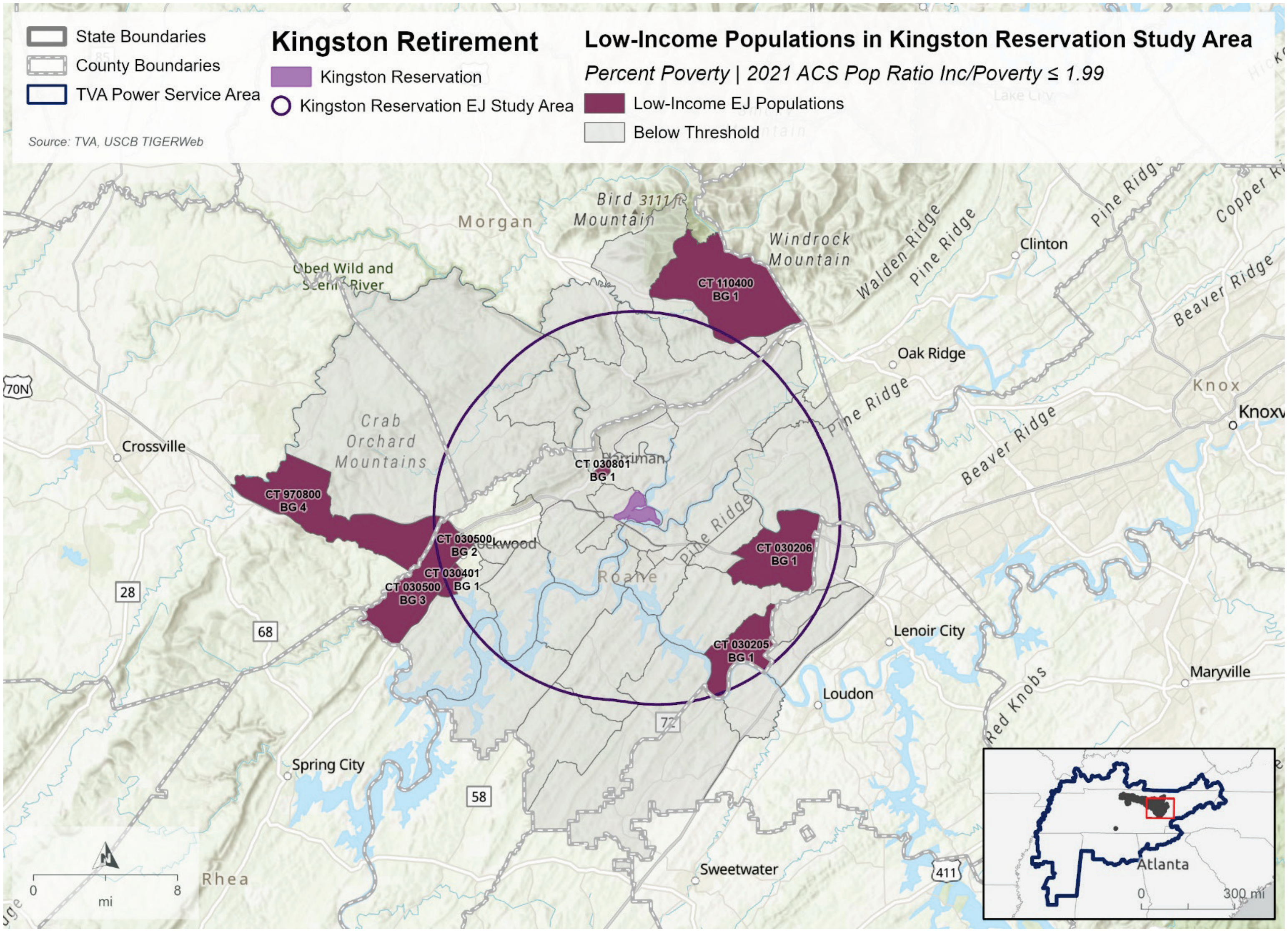

Figure 3.4-4. Low-Income Populations in the Kingston Reservation Environmental Justice Study Area

3.4.2.1.3 Limited English Proficiency Populations

Of the 49 census block groups in the Kingston Reservation EJ Study Area, 43 had zero individuals who reported speaking English less than well. However, the other six census block groups, shown in Table 3.4-4, had individuals who reported speaking English less than well.

Table 3.4-4. Limited English Proficiency Populations in the Kingston Reservation Environmental Justice Study Area

Geography[1]	Total Population	# - Individuals Speaking English Less than Well	% - Individuals Speaking English Less than Well	Languages
Morgan County				
CT 1103 BG 3	3,601	34	0.9	Indo-European, Spanish
CT 1104 BG 2	1,520	9	0.6	Spanish
Roane County				
CT 302.03 BG 1	1,199	13	1.1	Asian and Pacific Islands
CT 302.04 BG 2	1,208	5	0.4	Spanish
CT 305 BG 1	1,501	27	1.8	Indo-European
CT 307 BG 3	2,126	12	0.6	Spanish

Source: (ACS 2021) Table ID: B16004
[1]CT: census tract; BG: block group
Note: Emboldened census block groups represent identified EJ populations based on greater than five percent of the census block group's population speaking English less than well.

None of these LEP populations constitute 1,000 individuals (the highest LEP population in the Kingston Reservation Environmental Justice Study Area has 34 individuals), and no census block group has greater than five percent of its population aged five years or older that constitutes an LEP population. Therefore, the need for translation or interpreter services is not warranted unless requested.

3.4.2.1.4 Qualifying Environmental Justice Populations

Additional data detail for the qualifying EJ populations, which includes 12 census block groups from Cumberland, Morgan, Loudon, and Roane counties (see list below), is provided in Table 3.4-5 along with comparison data for the state and respective county. Table 3.4-5 also provides comparable data for one additional census block group that was identified as an EJ-qualifying population under the separate analysis prepared for the Ridgeline Project described in Section 3.4.1.1.2. This census block group overlaps the Kingston Reservation EJ Study Area and is also the geography encompassing Kingston Reservation itself.

- Cumberland County CT 9708 BG 4 (Low-income)
- Morgan County CT 1103 BG 3 (Minority)
- Morgan County CT 1104 BG 1 (Low-income)
- Roane County CT 302.05 BG 1 (Low-income)
- Roane County CT 302.06 BG 1 (Low-income)
- Roane County CT 304.01 BG 1 (Low-income)
- Roane County CT 305 BG 2 (Low-income)
- Roane County CT 305 BG 3 (Low-income)

- Roane County CT 307 BG 2 (Minority)
- Roane County CT 307 BG 3 (Minority)
- Roane County CT 308.01 BG 1 (Low-income)
- Roane County CT 308.02 BG 2 (Minority)

Morgan County CT 1103 BG 3 includes a correctional facility that sits on 65 acres of land and includes a residential recovery center, transfer station, and central office. Although in a census block group that is within the Kingston Reservation EJ Study Area, the correctional facility is nearly 15 miles north of the Kingston Reservation and may be influencing census data due to the facility capacity of 2,441 people (TN Department of Correction 2023). According to USCB, prisoners at correctional facilities are counted in the general population by the rule of "usual residence," meaning people who have spent the majority of the past year at a given correctional facility. Individuals who are at a facility short term, such as when awaiting a hearing, in the prison hospital temporarily, or under other unusual circumstances, would not be counted since they may have been counted at their usual residence (Groves 2010). The data associated with Morgan County CT 1103 BG 3, which demonstrates a high minority population, small population of individuals over the age of 65, low percent of high school or higher, and low per capita income and differs from the surrounding census block groups, is explained, in part, by the presence of the correctional facility. Incarcerated individuals would be considered particularly vulnerable populations.

Based on USCB criteria defining rural versus urban, Cumberland County is not within any portion of a metropolitan statistical area (MSA). Morgan, Loudon, and Roane counties are all part of the Knoxville, TN MSA. Cumberland County contains two urban clusters: Crossville and Fairfield Glade. Within Roane County, the area surrounding the City of Kingston (excluding the Kingston Reservation), along with areas surrounding the Cities of Harriman and Rockwood, combine to form the Harriman-Kingston-Rockwood urban cluster. Loudon County contains portions of the Knoxville, TN urban cluster, specifically those areas around Lenoir City and Loudon. No urban clusters or urbanized areas occur in Morgan County.

Based on the ACS's Table ID C24030 (ACS 2021), the top three areas of employment by industry for each of the qualifying block groups are as follows:

- CT 9708 BG 4 (Cumberland County) – Manufacturing (14.9 percent); Professional, scientific, and management, and administrative, and waste management services (18.4 percent); and Educational services, and health care and social assistance (19.0 percent)
- CT 1103 BG 3 (Morgan County) – Educational services, and health care and social assistance (27.2 percent); Retail trade (11.0 percent); and Professional, scientific, and management, and administrative, and waste management services (7.7 percent)
- CT 1104 BG 1 (Morgan County) – Educational services, and health care and social assistance (29.3 percent); Construction (17.8 percent); and Arts, entertainment, and recreation, and accommodation and food services (9.2 percent)
- CT 302.05 BG 1 (Roane County) – Professional, scientific, and management, and administrative, and waste management services (25.3 percent); Educational services, and health care and social assistance (19.2 percent); and Other Services, except Public Administration (13.9 percent)

- CT 302.06 BG 1 (Roane County) – Educational services, and health care and social assistance (41.1 percent); Professional, scientific, and management, and administrative, and waste management services (17.3 percent); and Transportation and warehousing, and utilities (10.6 percent)
- CT 304.01 BG 1 (Roane County) – Educational services, and health care and social assistance (44.9 percent); Other services, except public administration (16.8 percent); and Retail trade (16.1 percent)
- CT 305 BG 2 (Roane County) – Educational services, and health care and social assistance (38.5 percent); Retail trade (14.9 percent); and Construction (12.2 percent)
- CT 305 BG 3 (Roane County) – Public Administration (19.4 percent); Manufacturing (17.5 percent); and Educational services, and health care and social assistance (15.6 percent)
- CT 307 BG 2 (Roane County) – Retail Trade (28.1 percent); Public Administration (14.0 percent); and Professional, scientific, and management, and administrative, and waste management services (13.6 percent)
- CT 307 BG 3 (Roane County) – Educational services, and health care and social assistance (25.8 percent); Transportation and warehousing, and utilities (18.5 percent); and Professional, scientific, and management, and administrative, and waste management services (9.8 percent)
- CT 308.01 BG 1 (Roane County) – Professional, scientific, and management, and administrative, and waste management services (25.4 percent); Educational services, and health care and social assistance (20.2 percent); and Public Administration (19.3 percent) CT 308.02 BG 2 (Roane County) –Public Administration (24.2 percent); Educational services, and health care and social assistance (22.2 percent); and Manufacturing (15.2 percent)

Table 3.4-5. Additional Data for Census Block Groups (Minority, Low-income, and Limited English Proficiency) Identified in the Kingston Reservation Environmental Justice Study Area

Geography[1]	% Minority *	Poverty Ratio, Two Times US Threshold +	% Speaking English Less than Well #	% of Population 65 Years and Over ^	Median Age >	% High School or Higher **	% of Occupied Housing Units, Renter Occupied ++	Median Year Housing Units Built ##	% of 16+ Civilian Population in Labor Force ^^	Unemployment Rate ^^	Per Capita Income >>
Tennessee	*27.1*	*33.2*	*1.5*	*16.3*	*38.8*	*88.8*	*33.1*	*1985*	*61.4*	*5.3*	*$32,908*
Cumberland County	*6.0*	*38.3*	*0.2*	*30.9*	*52.2*	*88.6*	*21.4*	*1993*	*46.3*	*6.0*	*$28,255*
CT 9708 BG 4 (Low-income)	1.7	54.7	0.0	20.2	48.3	81.6	12.7	1979	36.4	2.5	$20,051
Morgan County	*8.9*	*42.3*	*0.4*	*18.0*	*41.8*	*81.2*	*18.5*	*1984*	*44.1*	*8.6*	*$23,436*
CT 1103 BG 3 (Minority)	34.0	44.1	0.9	7.5	36.0	73.7	22.7	1987	18.3	0.0	$9,269
CT 1104 BG 1 (Low-income)	1.3	52.9	0.0	23.0	47.9	81.9	25.6	1984	50.0	20.5	$40,044
Roane County	*7.7*	*32.4*	*0.1*	*22.4*	*47.1*	*90.7*	*24.6*	*1978*	*54.6*	*5.3*	*$34,366*
CT 302.05 BG 1 (Low-income)	6.6	50.4	0.0	9.3	51.0	96.1	11.2	1994	68.9	4.1	$29,391
CT 302.06 BG 1 (Low-income)	3.1	50.3	0.0	13.5	40.8	90.8	15.2	1987	67.7	1.5	$34,526
CT 304.01 BG 1 (Low-income)	3.6	53.3	0.0	18.5	50.6	78.7	16.3	1972	28.7	0.0	$15,765
CT 305 BG 2 (Low-income)	8.4	64.2	0.0	8.3	32.9	80.5	52.3	1949	55.1	9.4	$33,994
CT 305 BG 3 (Low-income)	9.2	59.7	0.0	27.6	56.1	77.5	65.9	1967	38.1	11.6	$25,616
CT 307 BG 2 (Minority)	12.8	30.2	0.0	35.6	55.4	100.0	15.1	1956	64.0	0.0	$53,324
CT 307 BG 3 (Minority)	18.8	38.5	0.6	21.6	47.9	86.9	29.1	1967	48.3	5.7	$25,440
CT 308.01 BG 1 (Low-income)	4.8	58.8	0.0	10.0	40.6	89.9	60.4	1970	56.7	9.2	$24,854
CT 308.02 BG 2 (Minority)	3.0	27.7	0.0	12.2	56.5	100.0	8.3	1974	58.3	0.0	$30,201

Source: (ACS 2021) * Table ID: B03002 + Table ID: C17002 # Table ID: B16004 ^ Table ID: B01001 > Table ID: B01002 ** Table ID: B15003 ++ Table ID: B25003 ## Table ID: B25035 ^^ Table ID; B23025 >> Table ID: B19301

[1]CT: census tract; BG: block group

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EJ indices, available from USEPA's online EJScreen tool, displayed the levels of environmental pollutants present among the nine EJ-qualifying census block groups associated with the Kingston Reservation. These indicators were examined to determine the risk of negative health impacts for residents living within these census block groups. The 13 indicators that were examined included particulate matter 2.5 ($PM_{2.5}$), ozone, diesel particulate matter, air toxics cancer risk, air toxics respiratory hazard index (HI), toxic releases to air, traffic proximity and volume, lead paint, Superfund proximity, risk management plan (RMP) facility proximity, hazardous waste proximity, underground storage tanks (USTs) and leaking UST (LUST), and wastewater discharge. Indicator levels of 50 or greater were considered to have above average pollution levels (above the 50th percentile as compared to the state).

The results of this examination indicated that the majority of the EJ-qualifying census block groups in the area generally contained above average levels of pollution. Therefore, these groups may be at risk for disproportionate and cumulative negative health impacts.

Five of the 12 total EJ-qualifying populations examined scored above average pollution and indicated six or more environmental indicators above the 50th percentile in comparison with the state. The remaining seven EJ-qualifying census block groups had below-average pollution percentiles (below the 50th percentile) with only two to four environmental indicators each above the 50th percentile. The EJ-qualifying census block groups and the environmental indicator percentiles are shown in Table 3.4-6. Those with above average pollution levels (above the 50th percentile) are emboldened. The highest percentile (98th) in the EJ-qualifying census block groups occurs in Roane County CT 308.01 BG 1 for Superfund proximity.

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Table 3.4-6. Census Tract Environmental Indicator Percentile Comparisons to the State for the Kingston Reservation Environmental Justice Study Area

Geography[1]	Particulate Matter 2.5	Ozone	Diesel Particulate Matter	Air Toxics Cancer Risk	Air Toxics Respiratory HI[2]	Toxic Releases to Air	Traffic Proximity and Volume	Lead Paint	Superfund Proximity	RMP Facility Proximity[3]	Hazardous Waste Proximity	Underground Storage Tanks (USTs) and Leaking USTs	Wastewater Discharge
Cumberland County													
CT 9708 BG 4 (Low-income)	14	**58**	12	15	2	**58**	45	**68**	**63**	13	33	36	30
Morgan County													
CT 1103 BG 3 (Minority)	10	**52**	6	15	2	32	6	20	**68**	26	7	22	39
CT 1104 BG 1 (Low-income)	18	**66**	19	15	2	8	10	**63**	**71**	**63**	15	35	41
Roane County													
CT 302.05 BG 1 (Low-income)	41	**82**	45	15	47	33	16	14	**71**	47	**54**	0	**75**
CT 302.06 BG 1 (Low-income)	41	**82**	45	15	47	29	39	**57**	**86**	36	46	20	**89**
CT 304.01 BG 1 (Low-income)	23	**75**	30	15	47	48	11	**75**	**68**	24	50	0	**62**
CT 305 BG 2 (Low-income)	19	**71**	37	15	47	**53**	**62**	**93**	**73**	30	**83**	**62**	**59**
CT 305 BG 3 (Low-income)	19	**71**	37	15	47	**51**	46	**86**	**70**	25	**83**	35	**57**
CT 307 BG 2 (Minority)	23	**77**	44	15	47	**70**	49	**93**	**97**	**76**	26	46	**72**
CT 307 BG 3 (Minority)	23	**77**	44	15	47	48	**70**	**82**	**95**	**65**	30	**58**	30
CT 308.01 BG 1 (Low-income)	22	**73**	38	15	47	47	**72**	**96**	**98**	**63**	23	**66**	29
CT 308.02 BG 2 (Minority)	22	**73**	38	15	47	43	31	**57**	**94**	**57**	26	34	31

[1]CT: census tract; BG: block group
[2]Air toxins resulting in a hazardous respiratory index
[3]Risk management plan (RMP) facilities

3.4.2.2 Alternative A

3.4.2.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The proposed CC/Aero CT Plant site and new transmission connections and corridors would be located within the Kingston Reservation. Therefore, the affected environment for EJ is the Kingston Reservation EJ Study Area, as described in Section 3.4.2.1.

3.4.2.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located within the Kingston Reservation. Therefore, the affected environment for EJ is Kingston Reservation EJ Study Area, as described in Section 3.4.2.1.

3.4.2.2.3 Construction and Operation of a 100-MW Battery Storage Facility (BESS) on Kingston Reservation

The proposed 100-MW BESS and new transmission corridor would be located within the Kingston Reservation. Therefore, the affected environment for EJ is the Kingston Reservation EJ Study Area, as described in Section 3.4.2.1.

3.4.2.2.4 On-site Transmission Upgrades

The proposed on-site transmission system upgrades and new transmission installations, including the one-mile OPGW line would be on the Kingston Reservation. Therefore, the affected environment for EJ is the Kingston Reservation EJ Study Area in Section 3.4.2.1.

3.4.2.2.5 Off-site Transmission Upgrades

Under Alternative A, off-site transmission system upgrades would be necessary in the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381) in Anderson and Roane counties and the Western Transmission Corridor (L5383) in Cumberland County. While the Eastern Transmission Corridor overlaps CT 9801 BG 1, this census block group is entirely encompassed by the Y-12 National Security Complex, where no people reside. As all census values were zero, CT 9801 BG 1 was not included in the CT total or the analyses so not to skew results. A one-mile radius surrounding the Eastern and Western Transmission corridors was used to define the Transmission Corridor EJ Study Area, which includes all or portions of 34 census block groups with resident populations, 27 in the Eastern Transmission Corridor EJ Study Area, and 7 in the Western Transmission Corridor EJ Study Area (Figure 3.4-1).

3.4.2.2.5.1 Minority Populations

Four census block groups within the Transmission Corridor EJ Study Area were identified as minority EJ populations, as shown on Table 3.4-7. At the county level, a greater proportion of populations of the affected counties were identified as non-minority than across the associated state, based on the ACS (2021). Correspondingly, the minority populations in these counties were generally smaller proportionally than statewide. The Transmission Corridor EJ Study Area had lower minority percentages than the state.

None of the census block groups within the Western Transmission Corridor EJ Study Area were identified as having minority percentages that were 10 percentage points or more above the Western Transmission Corridor EJ Study Area minority percentage of 3.3 percent.

Within the Eastern Transmission Corridor EJ Study Area, five census block groups had minority percentages that were 10 percentage points or more above the Eastern Transmission Corridor EJ Study Area average of 14.1 percent (L5108, L5116, L5280, L5302, and L5381) (Figure 3.4-5, Table 3.4-7). These areas are considered minority EJ population areas, where the chance for disproportionate and adverse environmental and human health effects may be the greatest. Depending on the census block group as shown in Table 3.4-7, these minority percentages are generally due to relatively high percentages of Latino, Black or African American, and Asian, as well as those self-identifying as some other race or two or more races.

Table 3.4-7. Minority Percentages and Ethnicities in the Alternative A Transmission Corridor Environmental Justice Study Area

Geography[1]	% Minority	% White[2]	% Black / African American	% Am. Indian / Alaska Native	% Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[3]
Western Transmission Corridor EJ Study Area – L5383	3.3	97.8	0.4	0.0	0.4	0.0	0.0	1.4	1.4
Eastern Transmission Corridor EJ Study Area – L5108, L5116, L5280, L5302, & L5381	14.1	87.2	4.9	0.4	1.6	0.1	1.6	4.2	3.6
Threshold for EJ Qualifying (Western Transmission Corridor)	13.3								
Threshold for EJ Qualifying (Eastern Transmission Corridor)	24.1								
Tennessee	*27.1*	*75.8*	*16.5*	*0.2*	*1.8*	*0.1*	*1.8*	*3.8*	*5.8*
L5383									
Cumberland County	*6.0*	*96.3*	*0.9*	*0.4*	*0.3*	*0.0*	*0.3*	*1.9*	*3.1*
CT 9702.01 BG 1 (TL)	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 9702.01 BG 2 (TL)	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 9702.01 BG 3 (TL)	1.0	99.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
CT 9703.01 BG 1	8.0	98.1	1.9	0.0	0.0	0.0	0.0	0.0	6.1
CT 9703.01 BG 2 (TL)	1.5	98.5	0.4	0.0	0.6	0.0	0.0	0.5	0.5
CT 9704.01 BG 3	5.3	99.1	0.8	0.0	0.0	0.0	0.0	0.1	4.5
CT 9704.02 BG 1	8.9	91.1	0.0	0.0	1.6	0.0	0.0	7.4	0.0
L5108, L5116, L5280, L5302, & L5381									
Anderson County	*11.9*	*89.1*	*3.1*	*0.4*	*1.4*	*0.1*	*1.3*	*4.6*	*3.2*
CT 201 BG 1 (TL)	23.0	78.1	16.5	0.2	3.6	0.0	0.0	1.4	1.4
CT 201 BG 2 (TL)	**29.1**	70.9	15.0	0.0	3.2	4.0	0.0	6.9	6.9
CT 202.01 BG 1	23.1	77.7	3.6	0.5	13.0	0.0	0.7	4.6	2.9
CT 202.02 BG 3	**26.9**	73.1	7.2	0.0	0.0	0.0	17.0	2.7	18.1
CT 204 BG 1 (TL)	13.9	86.1	4.7	2.7	6.5	0.0	0.0	0.0	0.0
CT 204 BG 2	15.9	84.8	0.9	0.0	0.0	0.0	0.0	14.3	0.7
CT 204 BG 3	**25.5**	77.9	0.4	2.7	1.8	0.0	15.9	1.3	21.9
CT 205 BG 1 (TL)	**24.7**	77.2	20.6	0.0	0.2	0.0	0.0	2.0	1.8
CT 205 BG 2 (TL)	20.8	81.7	11.5	0.0	0.0	0.0	0.0	6.8	2.6
CT 205 BG 3 (TL)	**39.8**	62.7	17.0	0.7	0.0	0.0	0.0	19.6	3.1
CT 206 BG 1 (TL)	22.2	83.4	6.3	0.0	0.8	0.0	0.4	9.0	14.0
CT 206 BG 2 (TL)	16.0	88.5	7.0	0.0	0.0	0.0	2.9	1.5	8.0
CT 210.01 BG 2	9.1	93.9	6.1	0.0	0.0	0.0	0.0	0.0	3.0
CT 210.02 BG 1 (TL)	5.8	94.2	0.0	0.0	0.0	0.0	4.9	0.9	0.0
CT 210.02 BG 2 (TL)	6.8	95.4	0.0	0.0	0.0	0.0	0.0	4.6	2.2
Roane County	*7.7*	*93.0*	*3.0*	*0.5*	*0.8*	*0.0*	*0.3*	*2.4*	*2.1*
CT 301 BG 1 (TL)	4.6	95.4	0.6	0.0	0.0	0.0	1.4	2.6	2.3
CT 301 BG 2 (TL)	14.6	86.8	10.5	0.0	1.3	0.0	0.8	0.6	2.7
CT 302.03 BG 2	10.6	89.4	0.0	0.0	2.2	0.0	0.0	8.3	0.0
CT 302.04 BG 2	12.9	90.4	8.3	0.0	0.0	0.0	0.0	1.3	3.3

Geography[1]	% Minority	% White[2]	% Black / African American	% Am. Indian / Alaska Native	% Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[3]
CT 302.06 BG 2	2.2	97.8	2.1	0.0	0.0	0.0	0.0	0.1	0.0
CT 302.06 BG 3	7.8	92.2	0.0	5.8	0.0	0.0	0.0	2.0	0.0
CT 306 BG 1	3.5	96.5	3.5	0.0	0.0	0.0	0.0	0.0	0.0
CT 306 BG 2	8.5	91.5	1.5	0.0	0.6	0.0	0.0	6.5	0.8
CT 307 BG 1	12.6	93.3	0.0	0.0	0.0	0.0	1.4	5.3	9.9
CT 307 BG 2 (TL)	12.8	87.2	1.9	0.0	0.0	0.0	0.0	11.0	7.5
CT 309 BG 1	0.9	99.1	0.0	0.0	0.0	0.0	0.0	0.9	0.9
CT 309 BG 2 (TL)	2.3	99.4	0.0	0.0	0.0	0.0	0.0	0.5	1.8

Source: (ACS 2021) Table ID: B03002
[1]CT: census tract; BG: block group
[2]Race percentages are provided for those reporting a particular race alone or in combination.
[3]This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a "race."
Note: Emboldened census block groups represent identified EJ populations as compared with the study area percentage, respective to L5383 or L5108, L5116, L5280, L5302, and L5381.

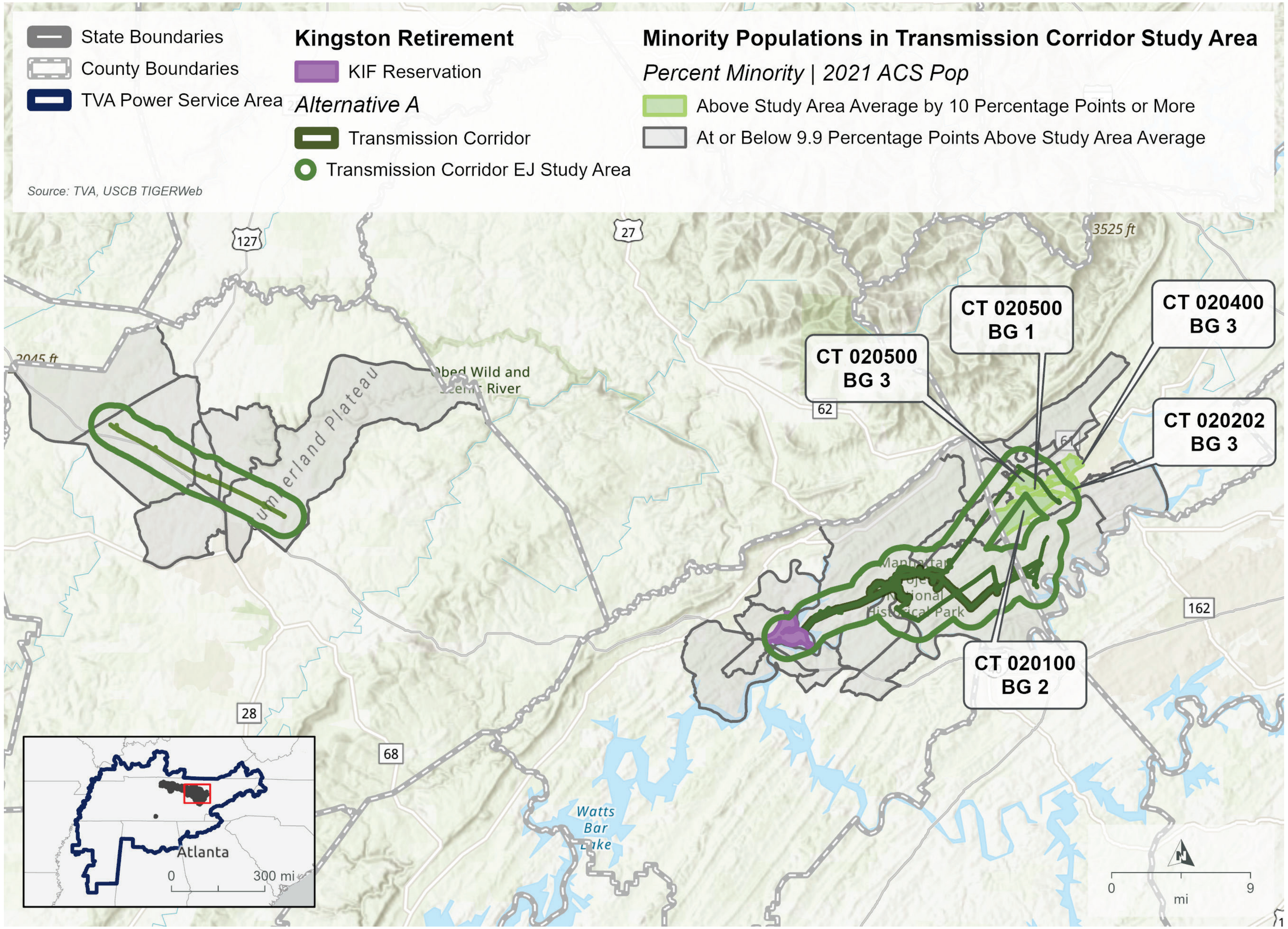

Figure 3.4-5. Minority Populations in the Alternative A Transmission Corridor Environmental Justice Study Area

3.4.2.2.5.2 Low-Income Populations

The emboldened census block groups in Table 3.4-8 are the areas with identified low-income EJ populations. Based on the 2021 SAIPE, a higher proportion of the population of two of the three affected counties was living in poverty when compared with the state (USCB 2022).

Based on the ACS, the Western Transmission Corridor EJ Study Area that falls within Cumberland County and the eastern portion of the Eastern Transmission Corridor EJ Study Area that falls within Anderson County contain census block groups with poverty ratios higher than the state (ACS 2021). The portion of the Eastern Transmission Corridor EJ Study Area within Roane County had a lower poverty ratio as compared to the state.

Nineteen of the 34 census block groups within the Eastern and Western Transmission Corridor EJ Study Areas likewise had higher percentages of people living in poverty than the respective study area percentage. Five census block groups had a poverty ratio that was 20 percentage points or more above the respective study area average of 43.0 percent (Western Transmission Corridor EJ Study Area – L5383) or 33.7 percent (Eastern Transmission Corridor EJ Study Area L5108, L5116, L5280, L5302, and L5381) and/or was at or above 50 percent (Figure 3.4-6). These census block groups are defined as the area where the chance for disproportionate and adverse environmental and human health effects may be the greatest.

Table 3.4-8. Poverty Rates for the Alternative A Transmission Corridor Environmental Justice Study Area

Geography[1]	2021 SAIPE Poverty % *	2021 ACS Poverty %, Households #	2021 ACS Poverty Ratio, Two Times US Threshold ** +
Western Transmission Corridor EJ Study Area – L5383		12.7	43.0
Eastern Transmission Corridor EJ Study Area – L5108, L5116, L5280, L5302, & L5381		15.0	33.7
Threshold for EJ Qualifying			50.0***
Tennessee	*13.7*	*14.1*	*33.2*
L5383			
Cumberland County	*14.9*	*13.8*	*38.3*
CT[1] 9702.01 BG[2] 1 (TL)		29.6	**65.0**
CT 9702.01 BG 2 (TL)		3.7	45.7
CT 9702.01 BG 3 (TL)		19.0	30.3
CT 9703.01 BG 1		15.7	46.2
CT 9703.01 BG 2 (TL)		14.2	36.1
CT 9704.01 BG 3		11.9	**69.8**
CT 9704.02 BG 1		4.6	32.6
L5108, L5116, L5280, L5302, & L5381			
Anderson County	*14.3*	*15.7*	*34.5*
CT 201 BG 1 (TL)		9.7	32.6
CT 201 BG 2 (TL)		23.0	**53.6**
CT 202.01 BG 1		7.7	8.5

Geography[1]	2021 SAIPE Poverty % *	2021 ACS Poverty %, Households #	2021 ACS Poverty Ratio, Two Times US Threshold ** +
CT 202.02 BG 3		31.0	48.8
CT 204 BG 1 (TL)		9.5	37.8
CT 204 BG 2		33.9	49.8
CT 204 BG 3		1.0	29.0
CT 205 BG 1 (TL)		28.1	**55.8**
CT 205 BG 2 (TL)		7.8	43.9
CT 205 BG 3 (TL)		26.0	47.4
CT 206 BG 1 (TL)		6.9	21.4
CT 206 BG 2 (TL)		14.4	36.7
CT 210.01 BG 2		22.6	43.6
CT 210.02 BG 1 (TL)		18.1	**52.6**
CT 210.02 BG 2 (TL)		23.9	27.4
Roane County	*13.1*	*14.7*	*32.4*
CT 301 BG 1 (TL)		3.4	20.3
CT 301 BG 2 (TL)		0.0	2.7
CT 302.03 BG 2		5.9	29.6
CT 302.04 BG 2		10.9	18.1
CT 302.06 BG 2		4.4	11.9
CT 302.06 BG 3		11.3	23.0
CT 306 BG 1		13.6	39.2
CT 306 BG 2		11.7	45.0
CT 307 BG 1		12.4	48.0
CT 307 BG 2 (TL)		10.0	30.2
CT 309 BG 1		43.1	48.1
CT 309 BG 2 (TL)		9.2	24.5

Source: 2021 SAIPE (USCB 2022), ACS (2021) # Table ID: B17017 + Table ID C17002
*For the respective county in which the census block group is located
**Calculated based on percent of population with a ratio of income to poverty threshold ≤1.99
***50 percent is the lower of the two qualifying EJ percentages based on criteria, *i.e.*, either 50 percent or 20 percentage points above the respective Transmission Corridor EJ Study Area percentage
[1]CT: census tract; BG: block group
Note: Emboldened census block groups represent identified EJ populations as compared with the study area percentage, respective to L5383 or L5108, L5116, L5280, L5302, and L5381

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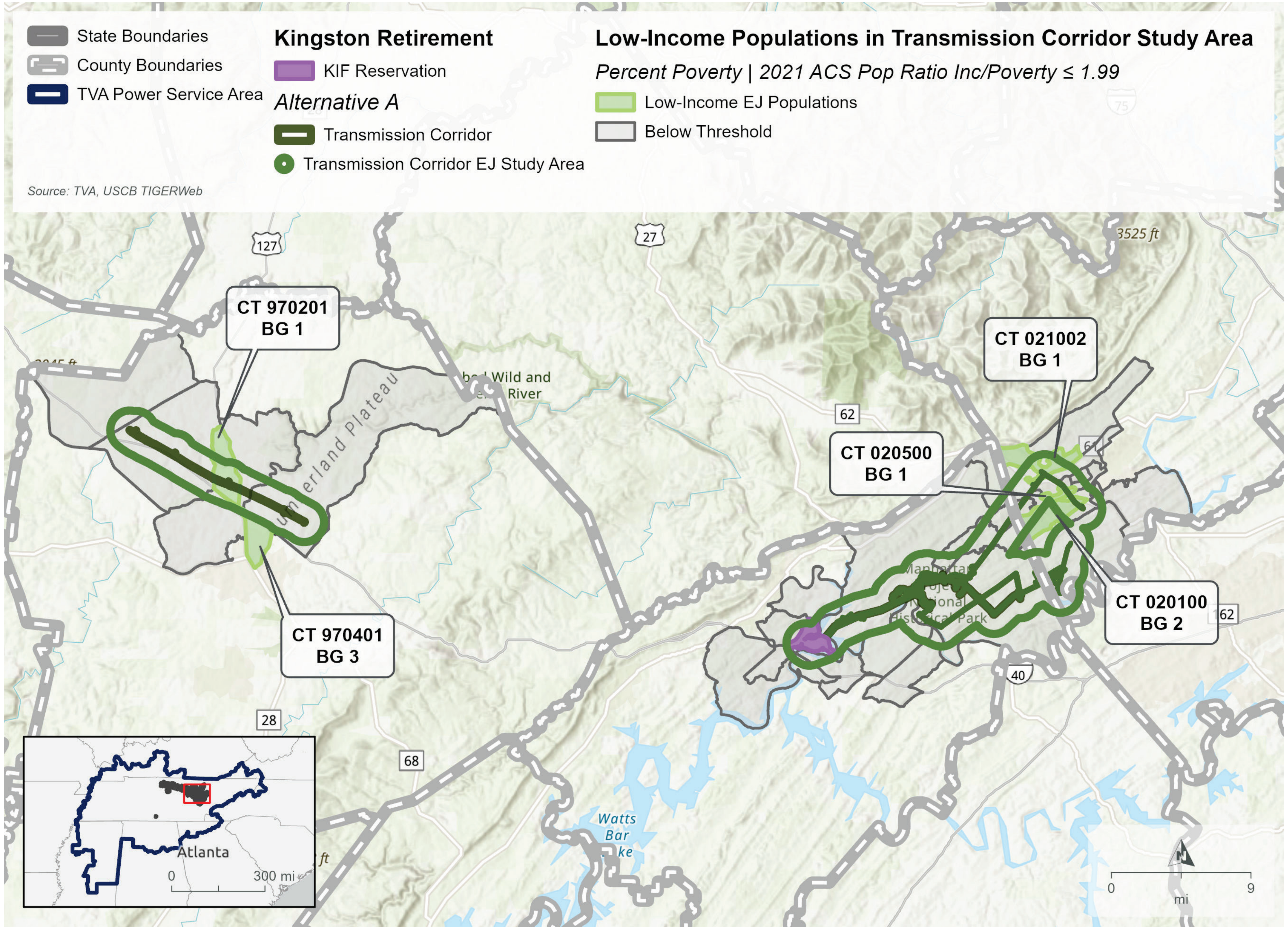

Figure 3.4-6. Low-Income Populations in the Alternative A Transmission Corridors Environmental Justice Study Area

3.4.2.2.5.3 Limited English Proficiency Populations

Of the 34 census block groups with resident populations in the Transmission Corridor EJ Study Area, 29 had zero individuals who reported speaking English less than well. However, the other five census block groups, as shown in Table 3.4-9, had individuals who reported speaking English less than well.

Table 3.4-9. Limited English Proficiency Populations in the Alternative A Transmission Corridor Environmental Justice Study Area

Geography[1]	Total Population	# - Individuals Speaking English Less than Well	% - Individuals Speaking English Less than Well	Languages
L3583				
Cumberland County				
CT 9704.02 BG 1	1,769	14	0.8	Indo-European
L5108, L5116, L5280, L5302, & L5381				
Anderson County				
CT 202.01 BG 1	3,131	19	0.6	Spanish
CT 202.02 BG 3	1,650	133	**8.1**	Spanish
CT 204 BG 3	1,232	15	1.2	Spanish
Roane County				
CT 302.04 BG 2	1,208	5	0.4	Spanish

Source: (ACS 2021) Table ID: B16004
[1]CT: census tract; BG: block group
Note: Emboldened census block groups represent identified EJ populations based on greater than five percent of the census block group's population speaking English less than well.

None of these LEP populations constitute 1,000 individuals (the highest LEP population in the Transmission Corridor Environmental Justice Study Area has 133 individuals), but one census block group, CT 202.02 BG 3 in Anderson County, has greater than five percent of the population aged five years or older that constitute an LEP population, as shown in the emboldened text above (Figure 3.4-7). Therefore, the need for translation or interpreter services may be warranted for people residing in this area. The LEP language group associated with this census block group is Spanish.

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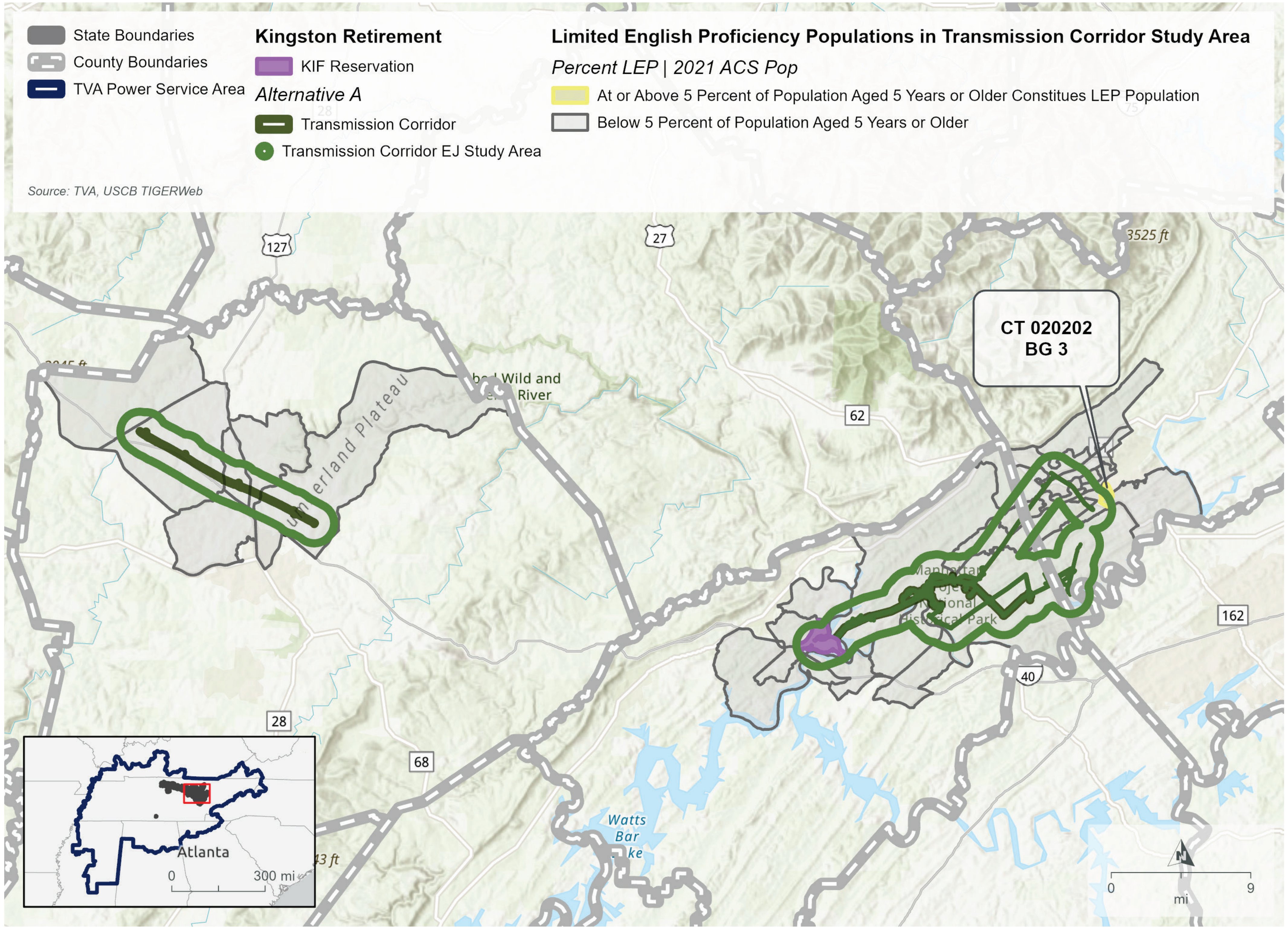

Figure 3.4-7. Limited English Proficiency Populations in the Alternative A Transmission Corridors Environmental Justice Study Area

3.4.2.2.5.4 Qualifying Environmental Justice Populations

Additional data detail for the qualifying minority EJ populations, which includes eight census block groups from among those considered in Cumberland, Anderson, and Roane counties (see list below), is provided in Table 3.4-10 along with comparison data for the state and respective county.

- Cumberland County CT 9702.01 BG 1 (Low-income)
- Cumberland County CT 9704.01 BG 3 (Low-income)
- Anderson County CT 201 BG 2 (Minority and Low-income)
- Anderson County CT 202.02 BG 3 (Minority and LEP)
- Anderson County CT 204 BG 3 (Minority)
- Anderson County CT 205 BG 1 (Minority and Low-income)
- Anderson County CT 205 BG 3 (Minority)
- Anderson County CT 210.02 BG 1 (Low-income)

Based on USCB criteria defining rural versus urban, Cumberland County is not within any portion of a metropolitan statistical area (MSA). Anderson and Roane Counties are part of the Knoxville, TN MSA. Anderson County contains portions of the La Follette and Norris urban clusters and a portion of the Knoxville urbanized area. Cumberland County contains two urban clusters: Crossville and Fairfield Glade. Within Roane County, the area surrounding the City of Kingston (excluding the Kingston Reservation), along with areas surrounding the cities of Harriman and Rockwood, combine to form the Harriman-Kingston-Rockwood urban cluster.

Based on the ACS's Table ID C24030 (ACS 2021), the top three areas of employment by industry for each of the qualifying block group is as follows:

- CT 9702.01 BG 1 (Cumberland County) – Construction (20.6 percent); Wholesale trade (25.1 percent); and Educational Services, and Health Care and Social Assistance (16.7 percent)
- CT 9704.01 BG 3 (Cumberland County) – Manufacturing (25.9 percent); Retail Trade (22.8 percent); and Arts, Entertainment, and Recreation, and Accommodation and Food Services (18.4 percent);
- CT 201 BG 2 (Anderson County) – Professional, Scientific, and Management, and Administrative, and Waste Management Services (29.3 percent); Educational Services, and Health Care and Social Assistance (22.6 percent); and Arts, Entertainment, and Recreation, and Accommodation and Food Services (15.8 percent)
- CT 202.02 BG 3 (Anderson County) – Transportation and Warehousing, and Utilities (21.4 percent); Construction (39.5 percent); and Manufacturing (14.3 percent)
- CT 204 BG 3 (Anderson County) – Professional, Scientific, and Management, and Administrative, and Waste Management Services (46.1 percent); \ Construction (9.1 percent); and Manufacturing (12.2 percent); and
- CT 205 BG 1 (Anderson County) – Arts, entertainment, and recreation, and accommodation and food services (31.7 percent); Retail trade (20.8 percent); and Professional, Scientific, and Management, and Administrative, and Waste Management Services (17.3 percent)

- CT 205 BG 3 (Anderson County) – Arts, Entertainment, and Recreation, and Accommodation and Food Services (28.3 percent); Educational Services, and Health Care and Social Assistance (16.9 percent); Professional, Scientific, and Management, and Administrative, and Waste Management Services (15.0 percent)
- CT 210.02 BG 1 (Anderson County) – Educational Services, and Health Care and Social Assistance (16.9 percent); Professional, Scientific, and Management, and Administrative, and Waste Management Services (13.3 percent); and Construction (12.3 percent)

EJ indices, available from USEPA's online EJScreen tool, displayed the levels of environmental pollutants present among the eight EJ-qualifying census block groups associated with the Alternative A Transmission Corridor. These indicators were examined to determine the risk of negative health impacts for residents living within these census block groups. The 13 indicators that were examined included $PM_{2.5}$, ozone, diesel particulate matter, air toxics cancer risk, air toxics respiratory HI, toxic releases to air, traffic proximity and volume, lead paint, Superfund proximity, RMP facility proximity, hazardous waste proximity, UST and LUST, and wastewater discharge. Indicator levels of 50 or greater were considered to have above average pollution levels (above 50th percentile as compared to the state), as summarized in Table 3.4-11.

The results of this examination indicated that the majority of the EJ-qualifying census block groups in the area are at increased risk of negative health impacts from one or more of the 13 risk indicators. Therefore, these EJ groups may be at risk for disproportionate and cumulative negative health impacts as opposed to non-EJ populations in the same area due to the greater susceptibilities and sensitivities of EJ groups.

Six of the eight total EJ-qualifying populations examined scored above average pollution and indicated six or more environmental indicators above the 50^{th} percentile in comparison with the state. These included all six of the qualifying census block groups in Anderson County, as summarized in Table 3.4-11. Of the eight EJ-qualifying census block groups, the two in Cumberland County were generally below average (below the 50^{th} percentile in comparison with the state) with only two to three environmental indicators above the 50^{th} percentile. The highest percentile (99th) in the EJ-qualifying census block groups occurs in Anderson County CT 202.02 BG 3 for the presence of wastewater discharge.

Table 3.4-10. Additional Data for the Alternative A Transmission Corridors Identified Environmental Justice Census Block Groups (Minority, Low-income, and LEP)

Geography[1]	% Minority *	Poverty Ratio, Two Times US Threshold +	% Speaking English Less than Well #	% of Population 65 Years and Over ^	Median Age >	% High School or Higher **	% of Occupied Housing Units, Renter Occupied ++	Median Year Housing Units Built ##	% of 16+ Civilian Population in Labor Force ^^	Unemployment Rate ^^	Per Capita Income >>
Tennessee	*27.1*	*33.2*	*1.5*	*16.3*	*38.8*	*88.8*	*33.1*	*1985*	*61.4*	*5.3*	*32,908*
L5383											
Cumberland County	6.0	38.3	0.2	30.9	52.2	88.6	21.4	1993	46.3	6.0	28,255
CT 9702.01 BG 1 (Low-income)	0.0	65.0	0.0	27.0	39.5	78.0	22.3	1999	38.3	0.0	18,615
CT 9704.01 BG 3 (Low-income)	5.3	69.8	0.0	13.7	30.5	78.1	71.7	2001	58.3	8.1	22,289
L5108, L5116, L5280, L5302, & L5381											
Anderson County	11.9	34.5	0.9	20.0	42.8	89.9	31.3	1975	55.6	5.2	30,544
CT 201 BG 2 (Minority and Low-income)	29.1	53.6	0.0	15.7	36.7	91.1	56.1	1982	59.7	6.2	32,365
CT 202.02 BG 3 (Minority and LEP)	26.9	48.8	8.1	21.9	37.6	83.1	38.1	1948	49.3	0.5	17,884
CT 204 BG 3 (Minority)	25.5	29.0	1.2	17.1	47.1	83.5	30.3	1948	56.6	10.7	28,435
CT 205 BG 1 (Minority and Low-income)	24.7	55.8	0.0	10.7	39.4	92.3	60.5	1959	60.0	14.8	19,139
CT 205 BG 3 (Minority)	39.8	47.4	0.0	9.0	29.4	86.7	36.8	1959	64.3	8.1	21,886
CT 210.02 BG 1 (Low-income)	5.8	52.6	0.0	21.7	43.8	93.5	9.2	1974	34.8	5.7	21,665

Sources: (ACS 2021) * Table ID: B03002 + Table ID: C17002 # Table ID: B16004 ^ Table ID: B01001 > Table ID: B01002 ** Table ID: B15003 ++ Table ID: B25003 ## Table ID: B25035 ^^ Table ID; B23025 >> Table ID: B19301
[1]CT: census tract; BG: block group

Table 3.4-11. Environmental Indicator Percentiles in Comparison with State in Alternative A Transmission Corridor Environmental Justice Study Area

Geography[1]	Particulate Matter 2.5	Ozone	Diesel Particulate Matter	Air Toxics Cancer Risk	Air Toxics Respiratory HI[2]	Toxic Releases to Air	Traffic Proximity and Volume	Lead Paint	Superfund Proximity	RMP Facility Proximity[3]	Hazardous Waste Proximity	Underground Storage Tanks (USTs) and Leaking USTs	Wastewater Discharge
Cumberland County													
CT 9702.01 BG 1 (Low-income)	6	36	13	15	2	**90**	44	23	44	21	3	**51**	1
CT 9704.01 BG 3 (Low-income)	7	44	32	15	2	**97**	**70**	16	48	12	1	**87**	2
Anderson County													
CT 201 BG 2 (Minority and Low-income)	47	**77**	**51**	15	47	19	**60**	**53**	**75**	45	**71**	**56**	**98**
CT 202.02 BG 3 (Minority and LEP)	50	**74**	50	15	47	27	**88**	**97**	**71**	49	**80**	**98**	**99**
CT 204 BG 3 (Minority)	45	**73**	39	15	47	15	**75**	**97**	**71**	48	**83**	**88**	6
CT 205 BG 1 (Minority and Low-income)	44	**76**	**51**	15	47	17	**71**	**89**	**74**	50	**65**	**79**	**63**
CT 205 BG 3 (Minority)	44	**76**	**51**	15	47	15	**64**	**89**	**74**	**54**	**62**	**82**	10
CT 210.02 BG 1 (Low-income)	33	**67**	15	15	2	10	**55**	**74**	**73**	**68**	47	**64**	29

[1]CT: census tract; BG: block group
[2]Air toxins resulting in a hazardous respiratory index
[3]Risk management plan (RMP) facilities

3.4.2.2.6 Construction and Operation of a Natural Gas Pipeline

The proposed Ridgeline Project and associated structures would be constructed within Fentress, Jackson, Morgan, Overton, Putnam, Roane, Smith, and Trousdale counties. TVA's Expanded Pipeline EJ Study Area encompasses all or portions of 54 census block groups based on a one-mile radius surrounding the ETNG Construction ROW (Figure 3.4-1) plus census block groups associated with contractor yards as identified by ETNG. TVA's Expanded Pipeline EJ Study Area encompasses additional portions of Cumberland and Sumner counties.

3.4.2.2.6.1 Minority Populations

Eight census block groups within TVA's Expanded Pipeline EJ Study Area were identified as minority EJ populations, as shown in bold on Table 3.4-12. At the county level, a greater proportion of the populations identified as non-minority than across the associated state, based on the ACS (2021). Correspondingly, the minority populations in these counties were generally smaller proportionally than statewide.

Based on the ACS, 7.4 percent of the population within the ETNG Pipeline EJ Study Area were identified as minorities, a lower proportion than across TVA's Expanded Pipeline EJ Study Area and a lower proportion than the state (ACS 2021). While TVA's Expanded Pipeline EJ Study Area had a substantially lower minority percentage than the state, 20 of the 54 census block groups within TVA's Expanded Pipeline EJ Study Area were at or had higher percentages of minorities in comparison with the whole TVA Expanded Pipeline EJ Study Area percentage. Eight census block groups had minority percentages that were 10 percentage points or more above TVA's Expanded Pipeline EJ Study Area minority percentage of 10.0 percent (Figure 3.4-8). These areas are considered minority EJ population areas, where the chance for disproportionate and adverse environmental and human health effects may be the greatest. Depending on the census block group as shown in Table 3.4-12, these minority percentages are generally due to relatively high percentages of Black or African American populations and those self-identifying as two or more races.

Table 3.4-12. Minority Percentages and Ethnicities in TVA's Expanded Pipeline EJ Study Area

Geography[1]	% Minority	% White[2]	% Black / African American	% American Indian / Alaskan Native	Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[3]
TVA Expanded Pipeline EJ Study Area	10.0	91.3	3.7	0.3	0.2	0.2	1.4	3.0	3.5
ETNG Pipeline EJ Study Area	7.4	92.0	3.1	0.3	0.2	0.1	1.2	3.1	2.5
Threshold for EJ Qualifying	20.0								
Tennessee	*27.1*	*75.8*	*16.5*	*0.2*	*1.8*	*0.1*	*1.8*	*3.8*	*5.8*
Cumberland County	*6.0*	*96.3*	*0.9*	*0.4*	*0.3*	*0.0*	*0.3*	*1.9*	*3.1*
CT 9702.02 BG 1	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fentress County	*4.1*	*96.4*	*0.3*	*0.3*	*0.3*	*0.2*	*0.4*	*2.2*	*1.7*
CT 9653 BG 1 (Pipeline)	11.5	88.5	0.0	3.5	0.9	1.8	1.8	3.5	5.2
CT 9653 BG 2 (Pipeline)	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 9653 BG 4 (Pipeline)	5.5	94.5	1.0	0.0	0.0	0.0	0.0	4.5	0.0
Jackson County	*6.0*	*94.4*	*0.5*	*0.1*	*0.0*	*0.0*	*1.6*	*3.5*	*2.3*
CT 9601 BG 2 (Pipeline)	1.1	98.9	0.0	0.0	0.0	0.0	0.0	1.1	0.0
CT 9602 BG 1 (Pipeline)	13.3	86.7	0.7	0.0	0.0	0.0	6.5	6.2	6.5
CT 9602 BG 2 (Pipeline)	12.1	89.6	0.6	0.0	0.0	0.0	1.6	8.3	3.4
CT 9603 BG 2	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 9603 BG 4 (Pipeline)	11.2	90.1	0.0	0.0	0.0	0.0	1.8	8.1	3.2
Morgan County	*8.9*	*91.9*	*5.6*	*0.2*	*0.2*	*0.1*	*0.4*	*1.7*	*1.5*
CT 1101 BG 2 (Pipeline)	3.5	97.6	0.5	0.0	0.0	0.0	2.0	0.0	3.1
CT 1102 BG 1 (Pipeline)	1.4	98.6	0.0	0.6	0.0	0.0	0.0	0.9	0.0
CT 1102 BG 2 (Pipeline)	1.5	98.5	0.0	0.0	0.0	0.0	0.0	1.5	0.0
CT 1103 BG 1 (Pipeline)	9.5	90.5	2.1	1.9	1.1	0.8	0.3	3.3	1.7
CT 1103 BG 2	6.1	99.6	0.0	0.4	0.0	0.0	0.0	0.0	5.7
CT 1103 BG 3	**34.0**	66.4	30.1	0.1	0.6	0.1	1.2	1.5	2.7
CT 1104 BG 3 (Pipeline)	2.1	97.9	0.0	0.0	0.0	0.0	0.0	2.1	0.0
CT 1105 BG 1 (Pipeline)	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Geography[1]	% Minority	% White[2]	% Black / African American	% American Indian / Alaskan Native	Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[3]
CT 1105 BG 2 (Pipeline)	5.1	94.9	0.0	0.0	0.0	0.0	0.0	5.1	0.0
CT 1105 BG 4	10.3	89.7	1.4	0.0	0.0	0.0	0.0	8.9	0.0
Overton County	*4.3*	*96.6*	*0.7*	*0.0*	*0.2*	*0.4*	*0.1*	*1.9*	*1.7*
CT 9505.01 BG 1	9.0	91.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0
CT 9505.01 BG 3	6.9	96.8	0.6	0.0	0.0	0.0	0.0	2.7	5.7
CT 9505.02 BG 1 (Pipeline)	2.4	97.6	0.0	0.0	0.0	0.0	0.0	2.4	0.0
CT 9506 BG 1 (Pipeline)	1.8	98.2	0.0	0.0	0.0	0.0	0.0	1.8	0.1
CT 9506 BG 2 (Pipeline)	3.2	98.1	0.0	0.0	0.0	0.0	1.0	1.0	2.3
Putnam County	*12.5*	*91.1*	*2.4*	*0.2*	*1.1*	*0.0*	*1.9*	*3.3*	*6.6*
CT 1 BG 1 (Pipeline)	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 1 BG 2 (Pipeline)	**29.1**	87.5	0.2	0.0	0.0	0.0	9.9	2.5	28.4
CT 1 BG 3	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 1 BG 4	**21.3**	94.6	0.0	0.9	0.0	0.0	3.9	0.6	20.0
CT 2.01 BG 1 (Pipeline)	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 2.02 BG 1 (Pipeline)	2.3	99.0	0.0	0.0	1.0	0.0	0.0	0.0	1.2
CT 2.02 BG 2 (Pipeline)	0.3	99.7	0.0	0.0	0.3	0.0	0.0	0.0	0.0
CT 3.01 BG 1 (Pipeline)	4.4	96.2	1.7	0.0	0.2	0.0	0.2	1.7	0.9
CT 3.01 BG 2 (Pipeline)	6.6	94.2	0.0	0.0	0.0	0.0	1.5	4.3	5.7
CT 3.03 BG 1	**33.2**	66.8	0.0	5.7	0.0	0.0	27.4	0.0	27.4
CT 9 BG 1	8.8	91.2	1.2	1.5	1.0	0.0	0.1	5.0	0.1
Roane County	*7.7*	*93.0*	*3.0*	*0.5*	*0.8*	*0.0*	*0.3*	*2.4*	*2.1*
CT 302.03 BG 2	10.6	89.4	0.0	0.0	2.2	0.0	0.0	8.3	0.0
CT 307 BG 1	12.6	93.3	0.0	0.0	0.0	0.0	1.4	5.3	9.9
CT 307 BG 2 (Pipeline)	12.8	87.2	1.9	0.0	0.0	0.0	0.0	11.0	7.5
CT 308.02 BG 1	3.0	97.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
CT 308.02 BG 2	**21.5**	78.5	19.6	0.0	0.0	0.0	1.2	0.6	1.9

Geography[1]	% Minority	% White[2]	% Black / African American	% American Indian / Alaskan Native	Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[3]
CT 309 BG 2 (Pipeline)	2.3	99.4	0.0	0.0	0.0	0.0	0.0	0.5	1.8
Smith County	*9.3*	*91.4*	*2.3*	*0.2*	*0.4*	*0.0*	*1.1*	*4.5*	*3.0*
CT 9750 BG 1 (Pipeline)	18.6	83.4	7.9	0.0	0.0	0.0	3.0	5.7	5.0
CT 9750 BG 2 (Pipeline)	9.4	90.6	6.9	0.4	0.0	0.0	0.0	2.0	5.5
CT 9750 BG 3 (Pipeline)	**26.9**	74.9	0.0	0.6	0.0	0.0	0.0	24.5	6.9
CT 9751 BG 2	19.2	83.3	1.1	0.0	2.2	0.0	1.4	12.0	13.4
CT 9753 BG 2	3.1	96.9	1.7	0.0	0.0	0.0	0.7	0.7	1.4
CT 9754 BG 1	9.1	90.9	1.9	0.0	0.0	0.0	4.2	3.1	4.2
Sumner County	*18.0*	*84.0*	*8.0*	*0.2*	*1.5*	*0.1*	*2.0*	*4.1*	*5.4*
CT 206.02 BG 2	1.2	98.8	0.0	0.0	0.0	0.5	0.0	0.8	0.0
CT 206.03 BG 2	9.8	91.5	1.0	0.1	0.0	0.0	2.7	4.6	8.7
Trousdale County	*17.7*	*82.6*	*10.7*	*0.5*	*0.2*	*0.0*	*1.9*	*4.2*	*3.1*
CT 901 BG 1 (Pipeline)	12.5	87.5	5.4	0.0	0.0	0.0	6.2	0.9	6.2
CT 901 BG 2 (Pipeline)	3.1	96.9	2.3	0.0	0.0	0.0	0.0	0.8	0.0
CT 901 BG 3 (Pipeline)	**29.2**	71.0	21.8	1.0	0.6	0.0	0.9	4.7	2.5
CT 902 BG 1	11.6	90.2	5.5	0.0	0.0	0.0	0.0	4.3	6.2
CT 902 BG 2	**22.0**	78.0	8.9	0.9	0.0	0.0	0.3	11.9	0.3

Source: (ACS 2021) Table ID: B03002
[1]CT: census tract; BG: block group
[2]Race percentages are provided for those reporting a particular race alone or in combination.
[3]This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a "race."
Note: Emboldened census block groups represent identified EJ populations as compared with TVA's Expanded Pipeline EJ Study Area percentage.

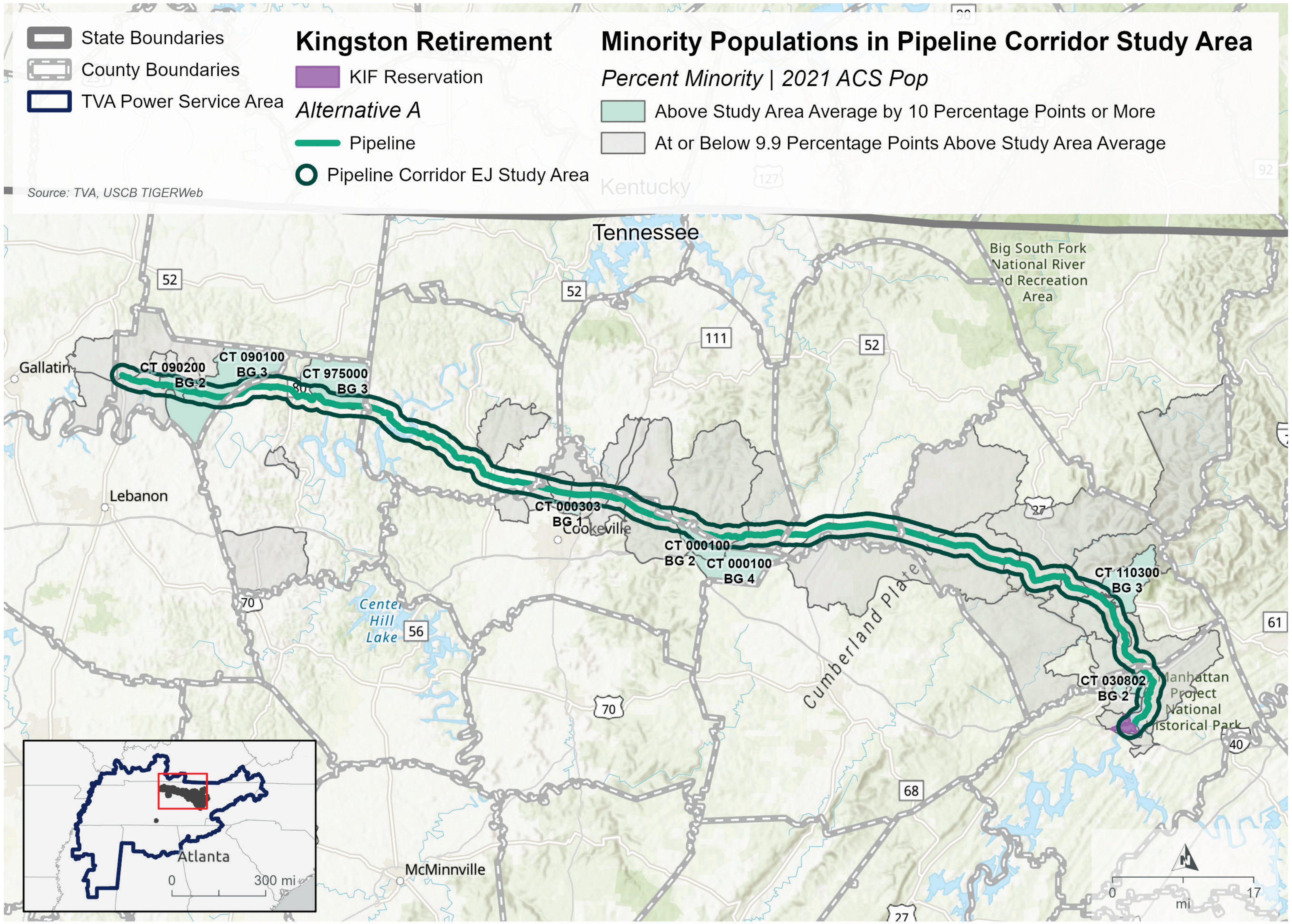

Figure 3.4-8. Minority Populations in TVA's Expanded Pipeline Environmental Justice Study Area

3.4.2.2.6.2 Low-Income Populations

The eight emboldened census block groups in Table 3.4-13 were areas with identified low-income EJ populations. Based on the 2021 SAIPE, a higher proportion of the population of six of the ten affected counties were living in poverty when compared with state data (USCB 2022).

At the census block group level, based on the ACS, the ETNG Pipeline EJ Study Area and TVA Expanded Pipeline EJ Study Area corridor had higher poverty ratios as compared to the state (ACS 2021). In comparison with TVA's Expanded Pipeline EJ Study Area, the populations within the ETNG Pipeline EJ Study Area had a slightly higher proportion of people living in poverty. Twenty-six of the 54 census block groups had higher percentages of people living in poverty than TVA's Expanded Pipeline EJ Study Area. Eight census block groups had a poverty ratio that was 20 percentage points or more above TVA's Expanded Pipeline EJ Study Area of 35.4 percent and/or was at or above 50 percent (Figure 3.4-9). These census block groups are defined as the area where the chance for disproportionate and adverse environmental and human health effects may be the greatest.

Table 3.4-13. Poverty Rates for TVA's Expanded Pipeline Environmental Justice Study Area and ETNG Pipeline EJ Study Area

	2021 SAIPE	2021 ACS	
Geography[1]	**Poverty % ***	**Poverty %, Households #**	**Poverty Ratio, Two Times US Threshold ** +**
TVA Expanded Pipeline EJ Study Area		15.1	35.4
ETNG Pipeline EJ Study Area		14.8	36.4
Threshold for EJ Qualifying			50.0***
Tennessee	*13.7*	*14.1*	*33.2*
Cumberland County	*14.9*	*13.8*	*38.3*
CT 9702.02 BG 1		9.2	14.8
Fentress County	*19.9*	*20.5*	*44.6*
CT 9653 BG 1 (Pipeline)		20.0	37.4
CT 9653 BG 2 (Pipeline)		11.8	**56.6**
CT 9653 BG 4 (Pipeline)		7.5	32.8
Jackson County	*21.2*	*19.2*	*40.6*
CT 9601 BG 2 (Pipeline)		36.3	48.1
CT 9602 BG 1 (Pipeline)		9.8	26.7
CT 9602 BG 2 (Pipeline)		19.5	48.0
CT 9603 BG 2		22.7	34.4
CT 9603 BG 4 (Pipeline)		7.5	10.3
Morgan County	*18.1*	*18.5*	*42.3*
CT 1101 BG 2 (Pipeline)		30.3	**58.6**
CT 1102 BG 1 (Pipeline)		15.2	37.1
CT 1102 BG 2 (Pipeline)		33.1	**58.1**
CT 1103 BG 1 (Pipeline)		22.7	**63.2**
CT 1103 BG 2		7.9	36.4
CT 1103 BG 3		20.2	44.1

Geography[1]	2021 SAIPE Poverty % *	2021 ACS Poverty %, Households #	2021 ACS Poverty Ratio, Two Times US Threshold ** +
CT 1104 BG 3 (Pipeline)		13.9	26.9
CT 1105 BG 1 (Pipeline)		10.7	35.0
CT 1105 BG 2 (Pipeline)		8.2	25.2
CT 1105 BG 4		15.3	27.1
Overton County	*14.9*	*20.1*	*42.0*
CT 9505.01 BG 1		9.5	33.0
CT 9505.01 BG 3		26.9	41.0
CT 9505.02 BG 1 (Pipeline)		9.5	40.8
CT 9506 BG 1 (Pipeline)		18.1	29.6
CT 9506 BG 2 (Pipeline)		30.2	**58.9**
Putnam County	*13.7*	*15.4*	*39.6*
CT 1 BG 1 (Pipeline)		22.5	**53.8**
CT 1 BG 2 (Pipeline)		21.9	**51.0**
CT 1 BG 3		11.5	22.8
CT 1 BG 4		24.0	43.8
CT 2.01 BG 1 (Pipeline)		6.8	22.3
CT 2.02 BG 1 (Pipeline)		7.9	41.5
CT 2.02 BG 2 (Pipeline)		17.2	**63.3**
CT 3.01 BG 1 (Pipeline)		4.7	21.3
CT 3.01 BG 2 (Pipeline)		9.2	44.9
CT 3.03 BG 1		15.9	25.8
CT 9 BG 1		23.3	35.5
Roane County	*13.1*	*14.7*	*32.4*
CT 302.03 BG 2		5.9	29.6
CT 307 BG 1		12.4	48.0
CT 307 BG 2 (Pipeline)		10.0	30.2
CT 308.02 BG 1		7.4	42.7
CT 308.02 BG 2		9.5	27.7
CT 309 BG 2 (Pipeline)		9.2	24.5
Smith County	*11.7*	*13.7*	*35.1*
CT 9750 BG 1 (Pipeline)		14.2	23.2
CT 9750 BG 2 (Pipeline)		10.7	48.5
CT 9750 BG 3 (Pipeline)		27.3	39.8
CT 9751 BG 2		21.5	43.3
CT 9753 BG 2		25.4	26.5
CT 9754 BG 1		14.1	39.4
Sumner County	*8.6*	*9.4*	*23.4*
CT 206.02 BG 2		5.7	14.1
CT 206.03 BG 2		12.3	18.3

	2021 SAIPE	2021 ACS	
Geography[1]	**Poverty % ***	**Poverty %, Households #**	**Poverty Ratio, Two Times US Threshold ** +**
Trousdale County	*17.8*	*12.2*	*26.3*
CT 901 BG 1 (Pipeline)		21.6	18.3
CT 901 BG 2 (Pipeline)		4.3	34.6
CT 901 BG 3 (Pipeline)		9.0	26.3
CT 902 BG 1		1.7	34.1
CT 902 BG 2 (Pipeline)		24.2	24.5

Source: 2021 SAIPE (USCB 2022), ACS (2021) # Table ID: B17017 + Table ID C17002
*For the respective county in which the census block group is located
**Calculated based on percent of population with a ratio of income to poverty threshold ≤1.99
***50 percent is the lower of the two qualifying EJ percentages based on criteria, *i.e.*, either 50 percent or 20 percentage points above TVA's Expanded Pipeline EJ Study Area percentage (35.4)
[1]CT: census tract; BG: block group
Note: Emboldened census block groups represent identified EJ populations as compared with TVA's Expanded Pipeline EJ Study Area percentage.

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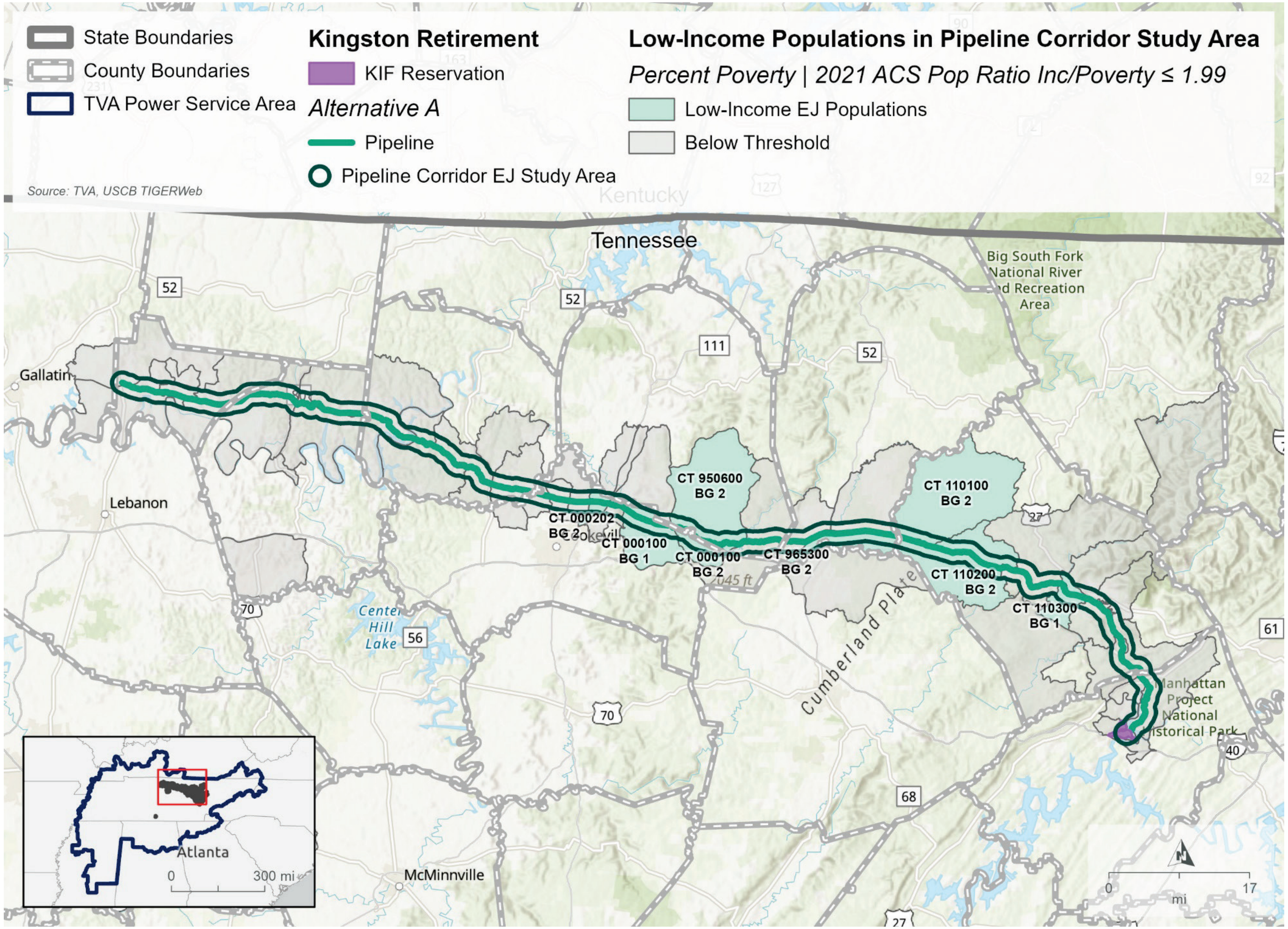

Figure 3.4-9. Low-Income Populations within TVA's Expanded Pipeline Environmental Justice Study Area Under Alternative A

3.4.2.2.6.3 Limited English Proficiency Populations

Of the 54 census block groups within TVA's Expanded Pipeline EJ Study Area, 40 had zero individuals who reported speaking English less than well. However, one or more individuals within each of the remaining 14 census block groups reported speaking English less than well, as indicated in Table 3.4-14.

Table 3.4-14. Limited English Proficiency Populations within TVA's Expanded Pipeline Environmental Justice Study Area

Geography[1]	Total Population	# of Individuals Speaking English Less than Well	% of Individuals Speaking English Less than Well	Languages
Jackson County				
CT 9601 BG 2 (Pipeline)	1,246	34	2.7	Spanish, Indo-European
CT 9602 BG 2 (Pipeline)	818	5	0.6	Spanish
Morgan County				
CT 1101 BG 2 (Pipeline)	1,192	1	0.1	Spanish
CT 1103 BG 2	773	27	3.5	Spanish
CT 1103 BG 3	3,601	34	0.9	Indo-European, Spanish
Overton County				
CT 9506 BG 2 (Pipeline)	981	19	1.9	Spanish
Putnam County				
CT 1 BG 1 (Pipeline)	1,253	13	1.0	Spanish
CT 1 BG 2 (Pipeline)	1,507	118	**7.8**	Spanish
CT 1 BG 4	1,750	42	2.4	Spanish, Other
CT 3.01 BG 1	1,171	2	0.2	Spanish
CT 9 BG 1	2,151	2	0.1	Spanish
Smith County				
CT 9751 BG 2	1,058	7	0.7	Indo-European
Trousdale County				
CT 901 BG 3 (Pipeline)	3,677	11	0.3	Spanish
CT 902 BG 1	1,169	25	2.1	Spanish

Source: (ACS 2021) Table ID: B16004

[1]CT: census trach; BG: block group

Note: Emboldened census block groups represent identified EJ populations based on greater than five percent of the census block group's population speaking English less than well.

None of these LEP populations constitute 1,000 individuals (the highest LEP population in TVA's Expanded Pipeline Environmental Justice Study Area has 118 individuals), but one census block group (CT 1 BG 2, Putnam County, emboldened above) has greater than five percent of its population aged five years or older that constitute an LEP population (Figure 3.4-10). Therefore, the need for translation or interpreter services may be warranted for people residing in these areas. The LEP language group associated with CT 1 BG 2, Putnam County, is Spanish.

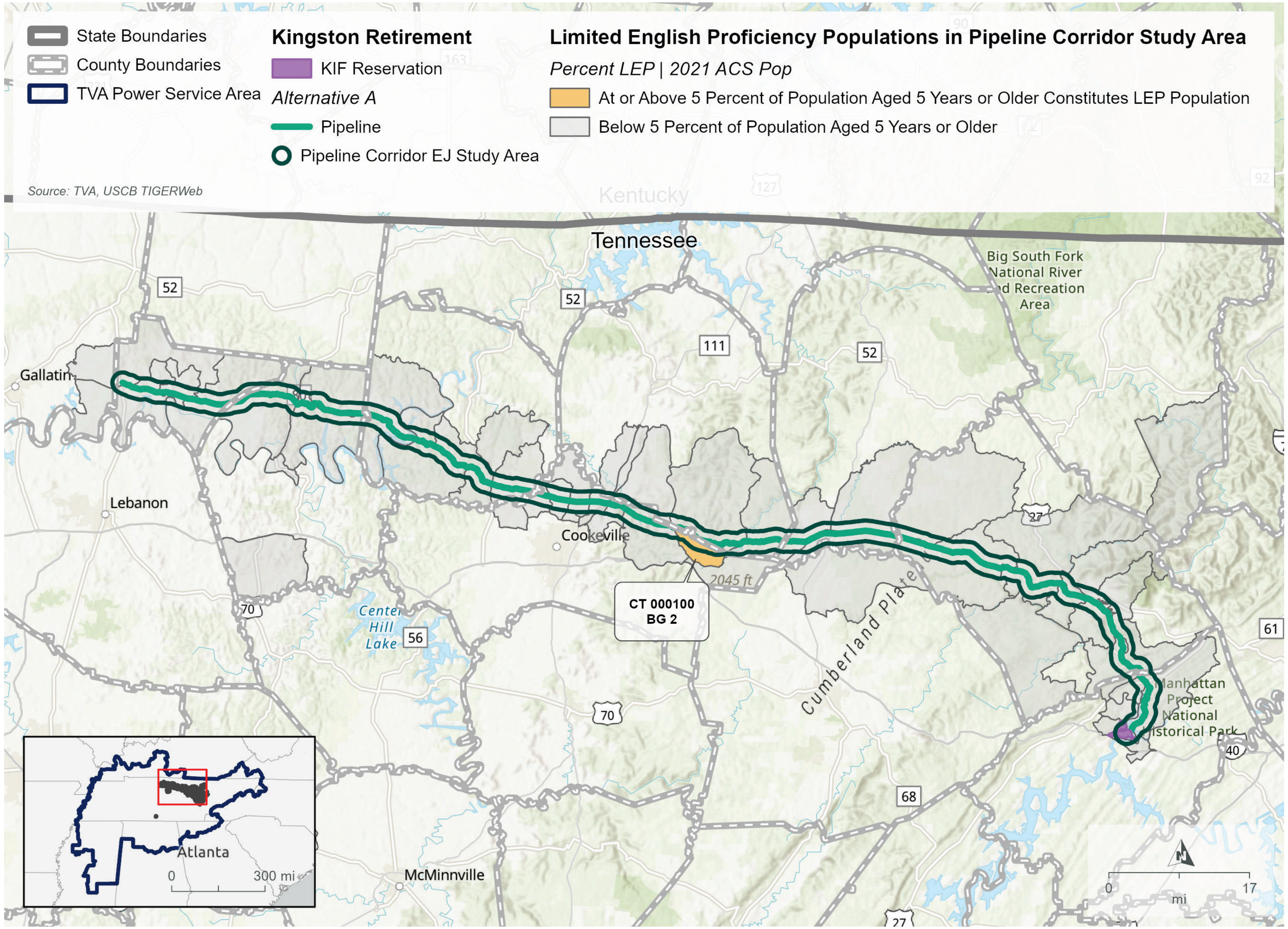

Figure 3.4-10. Limited English Proficiency Populations within TVA's Expanded Pipeline Environmental Justice Study Area Under Alternative A

3.4.2.2.6.4 Qualifying Environmental Justice Populations

Additional data detail for the qualifying EJ populations, which includes 27 census block groups from Fentress, Jackson, Morgan, Overton, Putnam, Smith, and Trousdale counties (see list below), is provided in Table 3.4-15 along with comparison data for the state and respective county. The table provides comparable data for the additional census block groups that were identified as EJ-qualifying populations under the separate analysis prepared for the Ridgeline Project described in Section 3.4.1.1.2. Several of the census block groups identified overlapped with those identified under TVA's analysis, resulting in a total of 27 EJ qualifying census block groups[23].

- Fentress County CT 9653 BG 1 (Minority)
- Fentress County CT 9653 BG 2 (Low-income)
- Fentress County CT 9653 BG 4 (Minority)
- Jackson County CT 9601 BG 2 (Low-income)
- Jackson County CT 9602 BG 1 (Minority)
- Jackson County CT 9602 BG 2 (Minority and Low-income)
- Jackson County CT 9603 BG 4 (Minority)
- Morgan County CT 1101 BG 2 (Low-income)
- Morgan County CT 1102 BG 2 (Low-income)
- Morgan County CT 1103 BG 1 (Low-income)
- Morgan County CT 1103 BG 3 (Minority)
- Overton County CT 9506 BG 2 (Low-income)
- Putnam County CT 1 BG 1 (Low-income)
- Putnam County CT 1 BG 2 (Minority, Low-income and LEP)
- Putnam County CT 1 BG 4 (Minority)
- Putnam County CT 2.02 BG 2 (Low-income)
- Putnam County CT 3.03 BG 1 (Minority)
- Roane County CT 307 BG 2 (Minority)
- Roane County CT 308.02 BG 2 (Minority)
- Smith County CT 9750 BG 1 (Minority and Low-Income)
- Smith County CT 9750 BG 3 (Minority and Low-income)
- Smith County CT 9751 BG 2 (Minority and Low-income)
- Smith County CT 9753 BG 2 (Low-income)
- Smith County CT 9754 BG 1 (Low-income)
- Trousdale County CT 901 BG 1 (Low-income)
- Trousdale County CT 901 BG 3 (Minority)
- Trousdale County CT 902 BG 2 (Minority and Low-income)

[23] ETNG's EJ analysis provided in its Resource Reports identified 12 block groups that TVA's analysis did not. (Conversely, TVA's analysis identified four block groups that ETNG's analysis did not.)

Based on USCB criteria, Morgan County is part of the Knoxville, TN MSA, and Smith and Trousdale counties are part of the Nashville-Davidson-Murfreesboro-Franklin, TN MSA. Fentress, Jackson, Overton, and Putnam counties are rural and are not within an MSA. The following urban clusters are located within the counties crossed by the natural gas pipeline: Monterey, TN (Putnam); Livingston, TN (Overton); and Carthage, TN (Smith). No urbanized areas are located within the counties encompassing the Ridgeline Project.

Based on the ACS's Table ID 24030 (ACS 2021), the top three areas of employment by industry for each of the qualifying BGs is as follows:

- CT 9653 BG 1 (Fentress County) – Educational services, and health care and social assistance (22.1percent); Retail trade (10.5 percent); and Agriculture, forestry, fishing and hunting, and mining (18.0 percent)
- CT 9653 BG 2 (Fentress County) – Retail trade (22.6 percent); Educational services, and health care and social assistance (21.5 percent); and Agriculture, forestry, fishing and hunting, and mining (16.2 percent)
- CT 9653 BG 4 (Fentress County) – Educational services, and health care and social assistance (49.7 percent); Arts, entertainment, and recreation, and accommodation and food services (11.3 percent); and Other services, except public administration (8.7 percent)
- CT 9601 BG 2 (Jackson County) – Educational services, and health care and social assistance (20.1 percent); Arts, entertainment, and recreation, and accommodation and food services (17.3 percent); and Manufacturing (14.2 percent)
- CT 9602 BG 1 (Jackson County) – Retail trade (26.7 percent); Educational services, and health care and social assistance (25.7 percent); and Manufacturing (10.5 percent)
- CT 9602 BG 2 (Jackson County) – Educational services, and health care and social assistance (26.5 percent); Manufacturing (22.9 percent); and Construction (12.7 percent)
- CT 9603 BG 4 (Jackson County) – Educational services, and health care and social assistance (25.6 percent); Professional, scientific, and management and administrative and waste management services (24.7 percent); and Manufacturing (13.6 percent)
- CT 1101 BG 2 (Morgan County) – Construction (31.9 percent); Manufacturing (17.9 percent); and Educational services, and health care and social assistance (18.1 percent)
- CT 1102 BG 2 (Morgan County) – Educational services, and health care and social assistance (16.5 percent); Construction (22.4 percent); and Professional, scientific, and management, and administrative, and waste management services (14.1 percent)
- CT 1103 BG 1 (Morgan County) – Educational services, and health care and social assistance (25.3 percent); Public administration (16.8 percent); and Retail trade (16.0 percent)

- CT 1103 BG 3 (Morgan County) – Public administration (31.8 percent); Educational services, and health care and social assistance (27.1 percent); and Retail trade (11.0 percent)
- CT 9506 BG 2 (Overton County) – Transportation and warehousing, and utilities (18.0 percent); Retail trade (12.7 percent); and Manufacturing (12.4 percent)
- CT 1 BG 1 (Putnam County) – Professional, scientific, and management, and administrative, and waste management services (31.3 percent); Arts, entertainment, and recreation, and accommodation and food services (13.2 percent); and Public administration (11.2 percent)
- CT 1 BG 2 (Putnam County) – Manufacturing (36.9 percent); Educational services, and health care and social assistance (19.3 percent) and Agriculture, forestry, fishing and hunting, and mining (9.8 percent)
- CT 1 BG 4 (Putnam County) – Retail trade (23.4 percent); Educational services, and health care and social assistance (22.7 percent); and Manufacturing (15.9 percent)
- CT 2.02 BG 2 (Putnam County) – Finance, and insurance, and real estate, and rental and leasing (19.8 percent); Transportation and warehousing, and utilities (24.1percent); and Educational services, and health care and social assistance (17.1 percent)
- CT 3.03 BG 1 (Putnam County) – Transportation and warehousing, and utilities (26.1 percent); Professional, scientific, and management, and administrative, and waste management services (19.3 percent); and Educational services, and health care and social assistance (15.6 percent)
- CT 307 BG 2 (Roane County) – Retail trade (28.1 percent); Public administration (14.0 percent); and Professional, scientific, and management, and administrative, and waste management services (13.6 percent)
- CT 308.02 BG 2 (Roane County) – Public administration (24.2 percent); Educational services, and health care and social assistance (22.2 percent); and manufacturing (15.2 percent)
- CT 9750 BG 1 (Smith County) – Manufacturing (19.0 percent) Educational services, and health care and social assistance (22.1 percent); and Construction (17.4 percent)
- CT 9750 BG 3 (Smith County) – Manufacturing (24.8 percent); Retail trade (24.8 percent); and Public Administration (14.3 percent)
- CT 9751 BG 2 (Smith County) – Retail trade (19.5 percent); Manufacturing (17.6 percent); and Educational services, and health care and social assistance (13.7 percent)
- CT 9753 BG 2 (Smith County) – Manufacturing (21.8 percent); Educational services, and health care and social assistance (18.8 percent); Construction (13.3 percent)
- CT 9754 BG 1 (Smith County) – Educational services, and health care and social assistance (24.3 percent); Retail trade (16.5 percent); and Manufacturing (14.7 percent)
- CT 901 BG 1 (Trousdale County) – Professional, scientific, and management and administrative and waste management services (16.5 percent); Other services,

except public administration (31.8 percent); and Educational services, and health care and social assistance (10.8 percent)

- CT 901 BG 3 (Trousdale County) – Retail trade (30.3 percent); Arts, entertainment, and recreation, and accommodation and food services (15.8 percent); and Professional, scientific, and management, and administrative, and waste management services (15.1 percent)
- CT 902 BG 2 (Trousdale County) – Wholesale trade (18.4 percent); Transportation and warehousing, and utilities (21.8 percent); and Public Administration (14.3 percent)

Table 3.4-15. Additional Data for the Alternative A Environmental Justice Census Block Groups (Minority, Low-Income, and LEP) Identified for TVA's Expanded Pipeline EJ Study Area

Geography[1]	% Minority *	Poverty Ratio, Two Times US Threshold +	% Speaking English Less than Well #	% of Population 65 Years and Over ^	Median Age >	% High School or Higher **	% of Occupied Housing Units, Renter Occupied ++	Median Year Housing Units Built ##	% of Total Population Age 16+ in Civilian Labor Force ^^	Unemployment Rate ^^	Per Capita Income >>
Tennessee County	*27.1*	*33.2*	*1.5*	*16.3*	*38.8*	*88.8*	*33.1*	*1985*	*61.4*	*5.3*	*$32,908*
Fentress	*4.1*	*44.6*	*0.1*	*21.6*	*45.7*	*80.3*	*24.6*	*1989*	*50.3*	*7.3*	*$21,889*
CT 9653 BG 1 (Minority)	11.5	37.4	0.0	24.2	37.4	85.6	15.0	2001	57.1	0.0	$23,248
CT 9653 BG 2 (Low-income)	0.0	56.6	0.0	16.5	37	92.0	1.3	1992	57.4	17.0	$19,238
CT 9653 BG 4 (Minority)	5.5	32.8	0.0	13.1	35.9	84.9	33.8	2001	67.0	0.0	$21,259
Jackson	*6.0*	*40.6*	*0.6*	*22.3*	*48.1*	*81.4*	*18.0*	*1986*	*51.1*	*8.2*	*$22,872*
CT 9601 BG 2 (Low-income)	1.1	48.1	2.7	28.4	52.9	75.6	11.5	1991	36.3	14.7	$23,460
CT 9602 BG 1 (Minority)	13.3	26.7	0.0	13.4	37.2	94.3	16.6	1984	72.9	4.5	$24,667
CT 9602 BG 2 (Minority and Low-income)	12.1	48.0	0.6	32.9	58.3	85.7	12.4	1982	47.3	5.8	$24,680
CT 9603 BG 4 (Minority)	11.2	10.3	0.0	14.6	47.2	82.0	15.0	1996	63.0	1.8	$29,689
Morgan	*8.9*	*42.3*	*0.4*	*18.0*	*41.8*	*81.2*	*18.5*	*1984*	*44.1*	*8.6*	*$23,436*
CT 1101 BG 2 (Low-income)	3.5	58.6	0.1	18.1	45.1	70.2	18.3	1996	50.5	0.0	$21,957
CT 1102 BG 2 (Low-income)	1.5	58.1	0.0	23.7	52	90.5	14.5	1991	31.3	8.2	$22,167
CT 1103 BG 1 (Low-income)	9.5	63.2	0.0	19.6	41.5	80.5	43.1	1979	40.2	11.6	$17,118
CT 1103 BG 3 (Minority)	34.0	44.1	0.9	7.5	36	73.7	22.7	1987	18.3	0.0	$9,269
Overton	*4.3*	*42.0*	*0.1*	*20.0*	*42.9*	*81.4*	*20.7*	*1982*	*54.5*	*3.5*	*$24,741*
CT 9506 BG 2 (Low-income)	3.2	58.9	1.9	26.0	48.5	77.6	28.8	1994	42.8	0.4	$18,136
Putnam	*12.5*	*39.6*	*1.2*	*16.4*	*36.4*	*88.9*	*38.2*	*1988*	*60.1*	*4.9*	*$26,602*
CT 1 BG 1 (Low-income)	0.0	53.8	1.0	11.8	29.6	89.7	25.8	1984	67.3	2.6	$23,073
CT 1 BG 2 (Minority, Low-income and LEP)	29.1	51.0	7.8	25.2	42.2	69.3	41.5	1977	47.4	5.9	$19,000
CT 1 BG 4 (Minority)	21.3	43.8	2.4	7.2	32.4	87.8	29.1	1986	67.3	6.6	$17,514
CT 2.02 BG 2 (Low-income)	0.3	63.3	0.0	53.3	65.4	89.1	50.3	1996	27.0	0.0	$20,936
CT 3.03 BG 1 (Minority	33.2	25.8	0.0	13.3	39.8	76.3	21.6	1987	56.9	7.4	$32,032
Roane	*7.7*	*32.4*	*0.1*	*22.4*	*47.1*	*90.7*	*24.6*	*1978*	*54.6*	*5.3*	*$34,366*
CT 307 BG 2 (Minority)	12.8	30.2	0.0	35.6	55.4	100.0	15.1	1956	64.0	0.0	$53,324
CT 308.02 BG 2 (Minority)	3.0	27.7	0.0	16.4	56.5	94.6	8.3	1974	58.3	0.0	$30,201
Smith	*9.3*	*35.1*	*0.4*	*16.4*	*40.5*	*87.2*	*23.4*	*1983*	*59.9*	*4.5*	*$28,507*
CT 9750 BG 1 (Minority and Low-Income)	18.6	23.2	0.0	18.2	51.9	93.6	22.6	1980	60.8	1.5	$31,501
CT 9750 BG 3 (Minority and Low-income)	26.9	39.8	0.0	21.4	47.4	92.2	23.1	1981	56.0	1.8	$48,984
CT 9751 BG 2 (Minority and Low-income)	19.2	43.3	0.7	17.0	32.2	86.1	33.5	1979	67.9	4.2	$26,709
CT 9753 BG 2 (Low-income)	3.1	26.5	0.0	13.7	40.5	74.8	23.9	1981	58.1	10.5	$23,082
CT 9754 BG 1 (Low-income)	9.1	39.4	0.0	16.5	38.8	89.7	31.8	1977	65.6	4.0	$25,799
Trousdale	*17.7*	*26.3*	*0.3*	*12.2*	*33.1*	*85.8*	*20.5*	*1984*	*53.6*	*3.0*	*$22,234*
CT 901 BG 1 (Low-income)	12.5	18.3	0.0	14.7	30.5	84.5	17.2	1981	64.7	5.0	$26,773
CT 901 BG 3 (Minority)	29.2	26.3	0.3	7.0	34.1	82.3	23.8	1975	27.6	1.5	$13,029
CT 902 BG 2 (Minority and Low-income)	22.0	24.5	0.0	12.7	28.4	87.5	51.1	1975	61.4	0.7	$21,272

Source: (ACS 2021) * Table ID: B03002 + Table ID: C17002 # Table ID: B16004 ^ Table ID: B01001 > Table ID: B01002 ** Table ID: B15003 ++ Table ID: B25003 ## Table ID: B25035 ^^ Table ID; B23025 >> Table ID: B19301

[1]CT: census tract; BG: block group

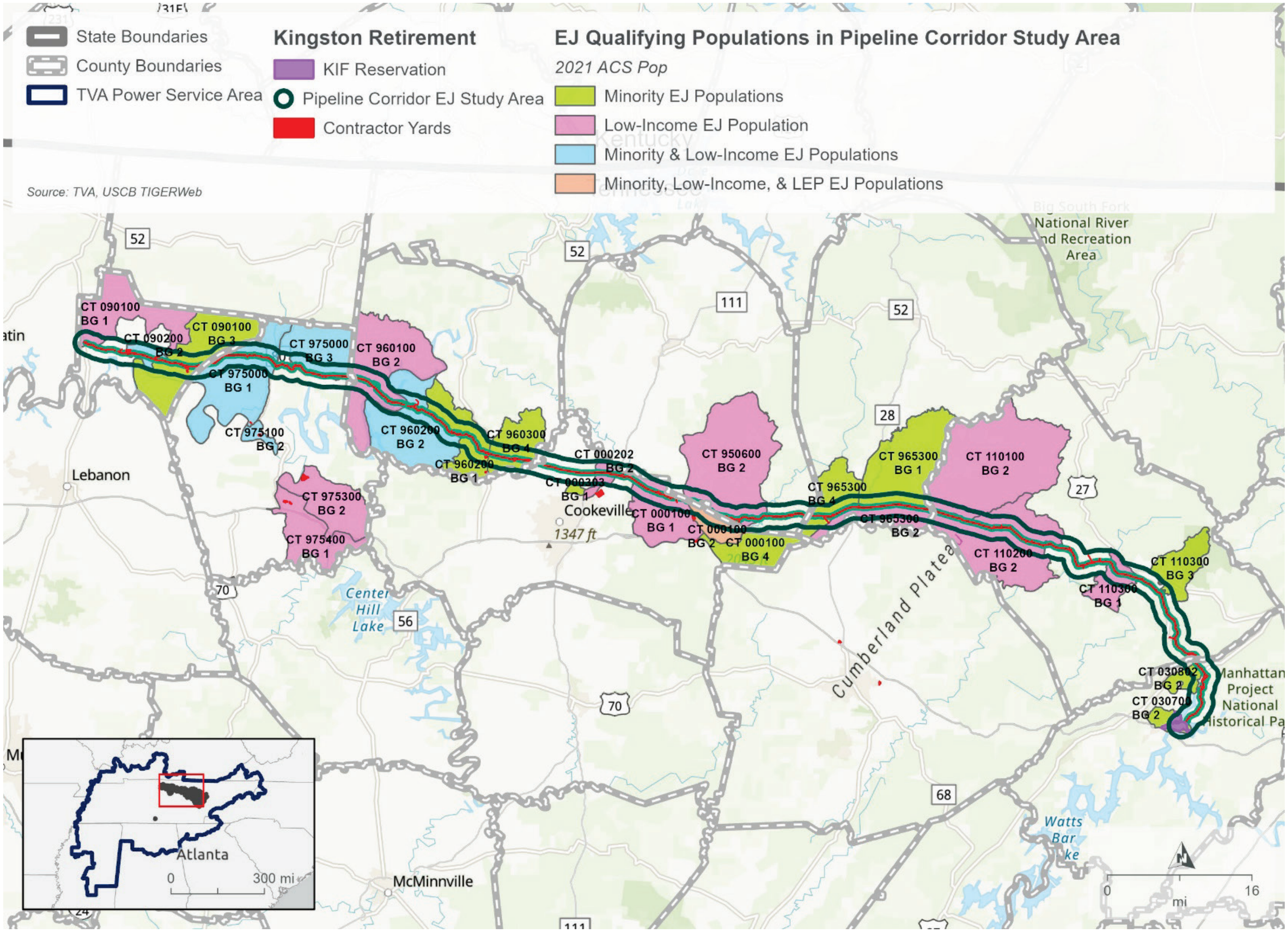

Figure 3.4-11. TVA Pipeline Corridor EJ Qualifying Populations

EJ indices, available from USEPA's online EJScreen tool, displayed the levels of environmental pollutants present among the 27 EJ-qualifying census block groups associated with the pipeline project. These indicators were examined to determine the risk of negative health impacts for residents living within these census block groups. The 13 indicators that were examined included $PM_{2.5}$, ozone, diesel particulate matter, air toxics cancer risk, air toxics respiratory HI, toxic releases to air, traffic proximity and volume, lead paint, Superfund proximity, RMP facility proximity, hazardous waste proximity, UST and LUST, and wastewater discharge. Indicator levels of 50 or greater were considered to have above average pollution levels (above the 50th percentile as compared to the state).

The results of this examination indicated that the majority of the EJ-qualifying census block groups in the area generally contained below average levels of pollution.

None of the 27 total EJ-qualifying populations scored above average pollution levels and indicated seven or more environmental indicators above the 50th percentile. Twenty-two of the EJ-qualifying census block groups had below-average pollution percentiles and indicated between one to six environmental indicators above the 50th percentile. These include two census block groups from Fentress County, three from Jackson County, four from Morgan County, five from Putnam County, two from Roane County, four from Smith County, and two from Trousdale County. Five EJ-qualifying census block groups did not indicate the presence of any adverse environmental indicators with above average pollution levels. These include one census block group each from Fentress, Jackson, Overton, Smith, and Trousdale counties. The EJ-qualifying census block groups and the environmental indicator percentiles are shown in Table 3.4-16 and those above average pollution levels (above the 50th percentile) are emboldened. The highest percentile (97th) in the EJ-qualifying census block groups occurs in Roane County CT 307 BG 2 for the presence of a Superfund site.

Table 3.4-16. Environmental Indicator Percentiles in Comparison with State in the Alternative A TVA Expanded Environmental Justice Study Area

Geography[1]	Particulate Matter ($PM_{2.5}$)	Ozone	Diesel Particulate Matter	Air Toxics Cancer Risk	Air Toxics Respiratory HI[2]	Toxic Releases to Air	Traffic Proximity and Volume	Lead Paint	Superfund Proximity	RMP Facility Proximity[3]	Hazardous Waste Proximity	USTs and Leaking USTs	Wastewater Discharge
Fentress County													
CT 9653 BG 1 (Minority)	2	26	3	0	2	39	16	0	42	7	1	26	2
CT 9653 BG 2 (Low-income)	2	26	3	0	2	**53**	11	20	41	21	5	25	2
CT 9653 BG 4 (Minority)	2	26	3	0	2	**52**	22	0	37	21	7	33	2
Jackson County													
CT 9601 BG 2 (Low-income)	11	13	6	0	2	6	3	**56**	0	4	6	0	**51**
CT 9602 BG 1 (Minority)	8	19	13	0	2	3	19	**53**	0	19	15	25	33
CT 9602 BG 2 (Minority and Low-income)	8	19	13	0	2	5	4	**64**	0	15	10	0	**52**
CT 9603 BG 4 (Minority)	6	16	14	0	2	2	10	0	1	16	23	29	6
Morgan County													
CT 1101 BG 2 (Low-income)	5	29	8	15	2	26	1	48	**52**	2	1	16	5
CT 1102 BG 2 (Low-income)	6	37	10	15	2	41	2	46	**58**	3	2	0	10
CT 1103 BG 1 (Low-income)	10	**52**	6	15	2	**53**	24	**70**	**68**	18	6	38	38
CT 1103 BG 3 (Minority)	10	**52**	6	15	2	32	6	20	**68**	26	7	22	39
Overton County													
CT 9506 BG 2 (Low-income)	1	25	1	0	2	39	1	48	18	40	31	17	12
Putnam County													
CT 1 BG 1 (Low-income)	1	33	7	0	2	36	43	**70**	12	**57**	50	32	**52**
CT 1 BG 2 (Minority, Low-income and LEP)	1	33	7	0	2	45	9	**54**	17	**72**	41	30	46
CT 1 BG 4 (Minority)	1	33	7	0	2	**55**	**69**	46	23	**78**	30	37	45
CT 2.02 BG 2 (Low-income)	2	23	27	15	2	28	**61**	45	4	20	39	35	18
CT 3.03 BG 1 (Minority)	2	23	35	15	2	24	36	0	3	17	59	45	15
Roane County													
CT 307 BG 2 (Minority)	23	**77**	44	15	47	**70**	49	**93**	**97**	**76**	26	46	**72**
CT 308.02 BG 2 (Minority)	22	**73**	38	15	47	43	31	**57**	**94**	**57**	26	34	31
Smith County													
CT 9750 BG 1 (Minority and Low-Income)	16	16	15	0	2	13	6	**51**	4	8	32	16	35

Geography[1]	Particulate Matter ($PM_{2.5}$)	Ozone	Diesel Particulate Matter	Air Toxics Cancer Risk	Air Toxics Respiratory HI[2]	Toxic Releases to Air	Traffic Proximity and Volume	Lead Paint	Superfund Proximity	RMP Facility Proximity[3]	Hazardous Waste Proximity	USTs and Leaking USTs	Wastewater Discharge
CT 9750 BG 3 (Minority and Low-income)	16	16	15	0	2	15	1	**67**	1	2	11	15	29
CT 9751 BG 2 (Minority and Low-income)	15	20	29	15	2	38	14	32	1	9	34	48	50
CT 9753 BG 2 (Low-income)	12	21	29	15	2	**64**	28	**81**	0	21	38	19	**94**
CT 9754 BG 1 (Low-income)	14	23	35	15	2	**67**	**64**	**75**	0	16	48	33	**87**
Trousdale County													
CT 901 BG 1 (Low-income)	26	21	20	0	2	4	11	**61**	17	21	26	29	26
CT 901 BG 3 (Minority)	26	21	20	0	2	6	2	**78**	8	12	**71**	15	34
CT 902 BG 2 (Minority and Low-income)	26	20	27	15	2	5	3	27	11	16	42	35	38

[1]CT: census tract; BG: block group
[2]Air toxins resulting in cancer risk
[3]Risk management plan (RMP) facilities

3.4.2.3 Alternative B

3.4.2.3.1 Minority Populations

Minority percentages and ethnicities for the Alternative B EJ Study Area are presented in Table 3.4-17. Depending on the county, these minority percentages are due to high percentages of Latino, Black or African American, and Asian populations. One of the 49 counties identified for the East TN TVA PSA under Alternative B was identified as a minority EJ population area, Hamilton County (emboldened text in Table 3.4-17), where the chance for disproportionate and adverse environmental and human health effects may be the greatest. The percentage of minority populations in Hamilton County are 10 percentage points or more above the Alternative B EJ Study Area of 13.9 percent. The remaining 48 counties in the Alternative B EJ Study Area also had lower minority percentages than the minority percentage for TN.

Table 3.4-17. Minority Percentages and Ethnicities for the Alternative B Environmental Justice Study Area

Geography	% Minority	% White[1]	% Black / African American	% American Indian / Alaskan Native	% Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[2]
Alt B EJ Study Area	*13.9*	*88.4*	*5.5*	*0.2*	*1.2*	*0.1*	*1.2*	*3.5*	*4.4*
Threshold for EJ Qualifying	*23.9*								
Tennessee County	*27.1*	*75.8*	*16.5*	*0.2*	*1.8*	*0.1*	*1.8*	*3.8*	*5.8*
Anderson	11.9	89.1	3.1	0.4	1.4	0.1	1.3	4.6	3.2
Bledsoe	12.7	89.4	7.5	0.3	0.2	0.0	0.3	2.3	2.8
Blount	9.8	92.3	2.4	0.1	0.8	0.1	0.5	3.9	3.7
Bradley	15.6	87.6	5.0	0.2	1.2	0.0	2.6	3.4	6.7
Campbell	4.0	96.5	0.3	0.1	0.5	0.0	0.5	2.2	1.6
Cannon	6.6	95.2	2.4	0.1	0.0	0.0	0.3	2.0	2.6
Carter	5.8	95.4	1.9	0.1	0.3	0.0	0.4	1.9	2.1
Claiborne	5.1	95.5	0.8	0.1	0.8	0.0	0.0	2.6	1.4
Clay	5.7	94.4	2.0	0.4	0.6	0.0	1.4	1.3	1.7
Cocke	7.3	94.3	2.0	0.7	0.5	0.1	0.1	2.3	2.7
Cumberland	6.0	96.3	0.9	0.4	0.3	0.0	0.3	1.9	3.1
DeKalb	12.6	91.2	1.7	0.5	0.6	0.0	3.0	3.0	8.3
Fentress	4.1	96.4	0.3	0.3	0.3	0.2	0.4	2.2	1.7
Grainger	6.5	96.9	0.3	0.2	0.1	0.5	0.1	1.9	3.5
Greene	7.5	93.9	1.9	0.3	0.6	0.2	0.6	2.6	3.1
Grundy	11.3	89.6	0.3	0.9	0.5	0.0	0.1	8.6	1.5
Hamblen	19.1	87.5	3.7	0.4	0.9	0.6	2.3	4.6	12.0
Hamilton	**29.7**	73.1	18.5	0.2	2.0	0.0	1.9	4.3	6.0

Geography	% Minority	% White[1]	% Black / African American	% American Indian / Alaskan Native	% Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[2]
Hancock	3.3	98.3	0.4	0.0	0.7	0.0	0.3	0.4	1.8
Hawkins	5.5	95.2	1.4	0.1	0.4	0.1	0.4	2.4	1.6
Jackson	6.0	94.4	0.5	0.1	0.0	0.0	1.6	3.5	2.3
Jefferson	8.9	93.7	1.8	0.1	0.6	0.0	0.7	3.1	3.8
Johnson	8.7	92.2	3.9	0.6	0.2	0.0	0.5	2.5	2.2
Knox	18.6	83.9	8.5	0.2	2.3	0.1	1.3	3.8	4.6
Loudon	13.4	91.6	1.4	0.2	0.9	0.0	1.3	4.6	9.4
McMinn	12.2	90.8	3.8	0.2	0.8	0.0	0.8	3.6	4.4
Macon	9.0	94.0	0.6	0.2	0.3	0.0	1.6	3.3	5.3
Marion	8.7	92.7	3.2	0.0	0.4	0.0	0.6	3.0	2.0
Meigs	9.1	92.3	2.5	0.3	0.1	0.0	0.6	4.1	2.4
Monroe	10.6	91.6	2.2	0.1	0.4	0.0	1.1	4.7	4.5
Morgan	8.9	91.9	5.6	0.2	0.2	0.1	0.4	1.7	1.5
Overton	4.3	96.6	0.7	0.0	0.2	0.4	0.1	1.9	1.7
Pickett	3.9	96.9	0.1	0.0	0.0	0.0	0.7	2.4	2.7
Polk	8.2	93.1	0.9	0.2	0.2	0.0	0.5	5.1	2.2
Putnam	12.5	91.1	2.4	0.2	1.1	0.0	1.9	3.3	6.6
Rhea	11.5	91.4	1.8	0.1	0.6	0.0	2.0	4.0	5.3
Roane	7.7	93.0	3.0	0.5	0.8	0.0	0.3	2.4	2.1
Scott	3.1	97.3	0.4	0.2	0.5	0.0	0.1	1.6	0.5
Sequatchie	7.0	95.2	0.4	0.2	0.0	0.1	1.9	2.1	3.8
Sevier	11.1	92.5	1.1	0.2	1.1	0.0	1.7	3.3	6.6
Smith	9.3	91.4	2.3	0.2	0.4	0.0	1.1	4.5	3.0

Geography	% Minority	% White[1]	% Black / African American	% American Indian / Alaskan Native	% Asian	% Native Hawaiian / Pacific Islander	% Some Other Race	% Two or More Races	% Hispanic / Latino[2]
Sullivan	7.1	93.8	1.9	0.2	0.7	0.0	0.7	2.7	2.1
Trousdale	17.7	82.6	10.7	0.5	0.2	0.0	1.9	4.2	3.1
Unicoi	8.2	94.7	0.4	0.2	0.1	0.0	1.7	2.9	5.6
Union	4.4	96.3	0.6	0.0	0.0	0.0	0.3	2.7	1.8
Van Buren	4.7	95.3	0.1	0.8	0.0	0.0	0.6	3.2	1.1
Warren	15.6	88.7	3.1	0.3	0.7	0.1	3.2	3.9	9.4
Washington	12.3	89.5	4.1	0.2	1.7	0.0	1.1	3.5	3.7
White	7.1	94.5	1.8	0.1	0.3	0.2	0.4	2.7	2.8

Source: (ACS 2021) Table ID: B03002

[1]Race percentages are provided for those reporting a particular race alone or in combination. Just over 4 percent of the US population reported two or more races in the 2020 Census; thus, these percentages are closely representative of the whole ethnic group population.

[2]This group is calculated separately from the other ethnicities and may include overlap from the other categories, as the USCB does not consider Hispanic or Latino a “race.”

Note: Emboldened census counties represent identified EJ populations as compared with the overall Alternative B EJ Study Area percentage; the percentage is based on a percentage of the counties as a whole.

3.4.2.3.2 Low-Income Populations

Table 3.4-18 presents poverty ratios for the counties in the Alternative B EJ Study Area and TN. The Alternative B EJ Study Area has a higher poverty ratio than the state according to the ACS, and all but seven of the 49 counties had higher low-income percentages than the state (ACS 2021). No county had a poverty percentage that was 20 percentage points or more above the Alternative B EJ Study Area (35.1 percent), but Hancock and Scott counties had above 50 percent (Table 3.4-18) (ACS 2021).

Table 3.4-18. Poverty Rates for the Alternative B Environmental Justice Study Area

Geography	2021 SAIPE Poverty %	2021 ACS Poverty %, Households #	Poverty Ratio, Two Times US Threshold +
Alt B EJ Study Area		*14.9*	*35.1*
Threshold for EJ Qualifying			*50.0****
Tennessee	*13.7*	*14.1*	*33.2*
Anderson County	14.3	15.7	34.5
Bledsoe County	22.1	22.4	44.9
Blount County	9.7	9.7	26.8
Bradley County	11.7	14.4	33.8
Campbell County	19.9	20.1	43.0
Cannon County	14.9	17.0	32.1
Carter County	17.1	18.7	41.3
Claiborne County	17.1	20.5	44.9
Clay County	18.7	24.0	47.5
Cocke County	21.0	19.0	46.4
Cumberland County	14.9	13.8	38.3
DeKalb County	15.5	18.6	46.1
Fentress County	19.9	20.5	44.6
Grainger County	16.9	18.0	39.9
Greene County	12.5	15.9	39.2
Grundy County	20.5	17.5	40.8
Hamblen County	18.4	15.8	41.0
Hamilton County	12.6	12.3	29.4
Hancock County	27.6	29.0	**55.0**
Hawkins County	16.5	16.8	39.8
Jackson County	21.2	19.2	40.6
Jefferson County	14.7	11.2	34.8
Johnson County	23.7	19.6	46.3
Knox County	12.1	12.8	29.9
Loudon County	9.6	12.0	28.2
McMinn County	14.5	15.4	40.2
Macon County	15.9	18.1	40.0
Marion County	16.2	18.2	34.9
Meigs County	15.2	15.9	36.1

Geography	2021 SAIPE Poverty %	2021 ACS Poverty %, Households #	Poverty Ratio, Two Times US Threshold +
Monroe County	15.6	18.1	37.8
Morgan County	18.1	18.5	42.3
Overton County	14.9	20.1	42.0
Pickett County	14.2	22.3	41.6
Polk County	13.5	13.9	34.1
Putnam County	13.7	15.4	39.6
Rhea County	15.8	16.8	43.7
Roane County	13.1	14.7	32.4
Scott County	22.4	24.4	**53.2**
Sequatchie County	13.6	19.6	43.9
Sevier County	13.2	13.2	36.3
Smith County	11.7	13.7	35.1
Sullivan County	17.1	15.7	35.7
Trousdale County	17.8	12.2	26.3
Unicoi County	14.5	15.9	38.9
Union County	15.6	18.2	40.5
Van Buren County	17.0	17.7	43.8
Warren County	15.6	18.5	42.3
Washington County	14.3	15.8	34.0
White County	16.4	16.8	43.0

Source: 2021 SAIPE (USCB 2022), ACS (2021) # Table ID: B17017 + Table ID C17002
***50 percent is the lower of the two qualifying EJ percentages based on criteria, *i.e.*, either 50 percent or 20 percentage points above the Alternative B EJ Study Area percentage (35.1)
Note: Emboldened geographies represent identified EJ populations.

3.4.2.3.3 Limited English Proficiency Populations

Eleven counties exceeded the Alternative B EJ Study Area county average of 552 LEP individuals (Table 3.4-19): Anderson, Blount, Bradley, Hamblen, Hamilton, Jefferson, Knox, Loudon, Putnam, Sevier, and Washington. Fifteen counties have an LEP percentage that exceeded the Alternative B EJ Study Area percentage of 1.0 percent: Bledsoe, Bradley, Clay, Grainger, Hamblen, Hamilton, Jefferson, Knox, Loudon, Macon, Putnam, Rhea, Sequatchie, Sevier, and Warren. All counties in East TN have fewer than 5 percent of their population aged five years and older living in LEP households.

Table 3.4-19. Limited English Proficiency for the Alternative B Environmental Justice Study Area

Geography	# of Individuals Speaking English Less than Well	Percent of Individuals Speaking English Less than Well
Alt B EJ Study Area	*552*	*1.0*
Anderson County	628	0.9
Bledsoe County	271	1.9
Blount County	978	0.8
Bradley County	1,668	1.6

Geography	# of Individuals Speaking English Less than Well	Percent of Individuals Speaking English Less than Well
Campbell County	82	0.2
Cannon County	33	0.2
Carter County	139	0.3
Claiborne County	134	0.4
Clay County	100	1.4
Cocke County	115	0.3
Cumberland County	121	0.2
DeKalb County	151	0.8
Fentress County	21	0.1
Grainger County	271	1.2
Greene County	279	0.4
Grundy County	29	0.2
Hamblen County	1,399	2.3
Hamilton County	6,280	1.8
Hancock County	3	0.0
Hawkins County	138	0.3
Jackson County	62	0.6
Jefferson County	596	1.2
Johnson County	107	0.6
Knox County	5,695	1.3
Loudon County	867	1.7
McMinn County	413	0.8
Macon County	264	1.1
Marion County	42	0.2
Meigs County	50	0.4
Monroe County	218	0.5
Morgan County	71	0.4
Overton County	19	0.1
Pickett County	0	0.0
Polk County	29	0.2
Putnam County	889	1.2
Rhea County	402	1.3
Roane County	57	0.1
Scott County	97	0.5
Sequatchie County	228	1.5
Sevier County	1,698	1.8
Smith County	82	0.4
Sullivan County	417	0.3
Trousdale County	36	0.3
Unicoi County	140	0.8
Union County	10	0.1

Geography	# of Individuals Speaking English Less than Well	Percent of Individuals Speaking English Less than Well
Van Buren County	14	0.2
Warren County	430	1.1
Washington County	1,231	1.0
White County	34	0.1

Source: (ACS 2021) Table ID: B16004
*For # of Individuals, Study Area is an average of the counties.

3.4.3 Environmental Consequences

This section provides a summary of the EJ effects analysis for the No Action Alternative and a discussion of the potential effects to EJ populations based on the effects to other resource areas. Resource area-specific EJ-related effects are discussed in more detail in the EJ Consideration sections in the subsequent resource area sections of Chapter 3.

Table 3.4-20 provides an overview summary of the number of EJ qualifying populations associated with each alternative.

Table 3.4-20. Summary of Numbers of EJ Qualifying Populations by Alternative

	Number of Minority EJ Qualifying Populations	Number of Low-income EJ Qualifying Populations	Number of LEP EJ Qualifying Populations	Total Number of (Unique) EJ Qualifying Populations*
Retirement and Demolition of KIF Plant (All Action Alternatives)	3	8	0	12
Alternative A – Off-Site Transmission Upgrades	5	5	1	8
Alternative A – Pipeline	8	8	1	27*
Alternative B	While some counties were identified with elevated percentages of minorities, low-income, and/or LEP populations, census block groups within any of the Alternative B counties may contain EJ qualifying populations. EJ qualifying populations would be identified once specific sites are identified.			

*Includes ETNG-identified EJ Qualifying Census Block Groups, as applicable to the respective EJ study area

3.4.3.1 The No Action Alternative

TVA would continue to operate and maintain the nine KIF units. Employment at the Kingston Reservation would continue to be an option in the labor market area, and contracts associated with the Kingston Reservation operations and maintenance and indirect and induced economic activities would continue to support the regional economy. However, for the existing KIF units to remain operational, repairs and maintenance would be necessary to maintain reliability and to meet requirements in future environmental regulations. As a result, there would be short-term beneficial economic effects from these activities, including a temporary, local and/or regional increase in employment and income and the purchase of materials, equipment, and services, which could positively affect EJ populations.

Maintenance costs, along with subsequent environmental compliance costs to meet regulatory requirements, may also have a minor adverse effect on ratepayers. Future rate increases to recoup these costs could adversely affect low-income EJ populations. Low-income populations may have limited ability to participate in energy efficiency programs that could reduce their future power bills, as many such programs require capital investment costs. TVA works with local power companies to implement programs benefiting low-income homeowners and renters, which may partially offset impacts to EJ populations associated with rate increases (see Appendix B.1 in TVA's 2019 IRP EIS [TVA 2019a] for more details).

3.4.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of Kingston Reservation Plant (D4)

Under the Action Alternatives, the KIF Plant would be retired by the end of 2027 and would transition to the D4 process detailed in Table 2.1-1. Routine plant deliveries would also be discontinued. All previously approved CCR projects would continue to be implemented. The direct impact to the economy associated with D4 activity would be short-term and beneficial to the local economy. Short-term economic impacts include a temporary increase in employment (anticipated to be a maximum of 300 workers on-site during peak D4 activity), income and the purchase of materials, equipment, and services. The scale of these economic benefits would depend on where the workers, materials, and services were obtained. The economic benefits related to the KIF Plant D4 activity would likely provide a beneficial effect to EJ populations. The D4 activity at the KIF Plant would also result in beneficial indirect effects to EJ communities including improved air and water quality in response to ceasing of coal operations (see Section 3.7.2.2.1 and Section 3.6.2.2.2.1, respectively, for more details).

Due to the retirement of the KIF Plant and related D4 activities, approximately 200 full time employees are expected to no longer be employed at the facility. Minor, adverse indirect effects to EJ populations would include the potential for increased competition for employment in other fields in the Kingston labor market area, such as manufacturing, educational services, health care, and construction. Competition for employment could result in long-term effects such as workers relocating for work at different locations in TN or elsewhere. These changes may affect familial and community relations among EJ and other populations in the Kingston labor market area.

Waste generated from KIF D4 activities would be sent to permitted waste facilities in the area. Potential impacts to EJ populations due to waste generation and/or disposal would be evaluated further once the waste facilities have been identified.

Transportation effects associated with KIF D4 activities would be concentrated on public roads within a relatively small area adjacent to the Kingston Reservation (where EJ populations are not located) and along the haul routes to waste facilities, which have not yet been identified. Due to an increase in construction and worker traffic during D4 activities, there could be a temporary, minor increase in traffic that is not likely to increase the risk to the public. Therefore, there would be a minor, temporary effect related to increased traffic and driver safety. Effects to EJ populations resulting from Kingston retirement-related traffic on haul routes to waste facilities is not yet known, as these facilities have not been identified. While they would be minimized as much as feasible, these minor, temporary effects may be disproportionate and adverse for EJ populations depending on the location of these elevated traffic effects. Potential traffic related impacts to EJ populations on haul routes to the waste facilities would be evaluated further after the waste facilities and associated hauling roads have been identified.

TVA has conducted outreach to EJ populations during its environmental review. TVA has provided project information via email, postcards and informational handouts (Spanish translations direct mailed as described in Section 3.4.1.1), fact sheets, and in-person presentations and would continue to do so during future planned engagements and events. TVA also held three public information meetings for the release of the Kingston draft EIS, which included a virtual public meeting, followed by two general in-person public meetings held near the Kingston Reservation at local high schools, one in Kingston and one in Rockwood, TN. Printed copies of the draft EIS were placed at three local libraries (in Kingston, Harriman, and Rockwood, TN) to facilitate access to the draft EIS during the public review period.

3.4.3.3 Alternative A

3.4.3.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Construction of the proposed CC/Aero CT Plant and associated activities on the Kingston Reservation would result in the potential for negligible to minor adverse effects on EJ populations from increases in demand for temporary housing, such as rental units, and public services by construction workers, may occur; however, the construction of the CC/Aero Plant would result in a temporary increase in employment, income and the purchase of materials, equipment, and services. The scale of these economic benefits would depend on where the workers, materials, and services were obtained.

Therefore, construction of the CC/Aero Plant would result in negligible to minor adverse and beneficial effects on identified EJ populations. Since renters are prevalent throughout the Kingston labor market area, this has the potential to result in disproportionate and adverse effects for EJ-qualifying low-income populations, especially in EJ-qualifying census block groups.

3.4.3.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located within the Kingston Reservation EJ Study Area. Therefore, the construction and operation of a 3- to 4-MW solar facility has the potential to result in disproportionate and adverse effects for the EJ-qualifying populations identified in Section 3.4.3.2.

3.4.3.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The proposed 100-MW battery facility and related transmission corridor would be located within the Kingston Reservation EJ Study Area. Therefore, the construction and operation of a 100-MW BESS has the potential to result in disproportionate and adverse effects for EJ-qualifying populations identified in Section 3.4.3.2.

3.4.3.3.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation (where no EJ populations were identified), including new transmission connections to the proposed CC/Aero Plant. Therefore, the environmental consequences for on-site transmission upgrades on environmental justice populations are the same as those described in Section 3.4.3.2.

3.4.3.3.5 Off-site Transmission Upgrades

Off-site transmission systems would need to be upgraded if the proposed CC/Aero CT Plant is constructed. New temporary and/or permanent access roads to support upgrading off-site existing transmission lines would also be constructed. The proposed off-site transmission upgrades would occur in the Western Transmission Corridor (L5383) within Cumberland County, and the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381) within Anderson and Roane counties. A one-mile radius was used around the existing transmission line ROWs and access roads to define the Transmission Corridor EJ Study Area, which includes 34 census block groups with residential populations.

Impacts to EJ populations associated with proposed upgrades to off-site transmission lines would be temporary and negligible but with minor positive effects on EJ populations from increased economic benefits such as construction jobs and small increases in employment and income generation from purchase of materials, equipment, and services in the area surrounding the eastern and western off-site transmission lines.

3.4.3.3.6 Construction and Operations of Natural Gas Pipeline (Ridgeline Project)

The proposed CC/Aero CT Plant would require construction of approximately 122 miles of new natural gas pipeline (up to 30-inch-diameter) and associated gas system infrastructure in, Fentress, Jackson, Morgan, Overton, Putnam, Roane, Smith, and Trousdale counties as part of ETNG's Ridgeline Project. The pipeline would be built largely within or adjacent to existing pipeline ROW. TVA's Expanded Pipeline EJ Study Area included Cumberland and Sumner counties due to proximity of the Project Site. Additionally, the pipeline would not acquire or relocate any businesses or residences (ETNG 2023f).

During construction, ETNG would follow minimization measures as outlined in ETNG's Resource Report 8 Land Use, Recreation, and Aesthetics (ETNG 2023i).

The ETNG Pipeline EJ Study Area crosses census block groups that include minority, low-income and LEP populations. Because these census block groups are considered EJ populations, ETNG "will continue to work closely with government and community leaders to address concerns of the community" (ETNG 2023f). ETNG outreach among stakeholders has been extensive and is ongoing, as described in their General Project Description Report 1 (ETNG 2023b).

ETNG has conducted nine open houses, consisting of two sessions of open houses (one in 2021 and one in 2022) conducted within each of the following four counties: Morgan, Putnam, Jackson, and Trousdale plus one additional open house held in Smith County as requested by local officials and landowners in 2021 (ETNG 2023b). A virtual open house was conducted to provide information about the project and to provide the same informational pieces as were available at the in-person meetings. Refer to ETNG Resource Report 5 Socioeconomics for more information on ETNG's meaningful engagement with EJ communities (ETNG 2023f).

TVA's analysis includes ETNG's EJ analysis and TVA's independent assessment of potential EJ impacts associated with construction and operation of the natural gas pipeline. TVA's analysis concluded that there would be a minor positive impact on EJ populations due to temporary increases in employment in the area. Since the natural gas pipeline is proposed to be constructed within/adjacent to an existing ROW, other impacts (e.g., increased noise) to EJ populations would be negligible to minor negative.

ETNG concluded that even if a larger percentage of non-local workers were utilized than initially expected, the number of available housing units in the area would still be sufficient to meet the temporary demand, with the exception of Trousdale County, where the non-local workers would need to commute from the surrounding area. ETNG concludes that the Ridgeline Project would have a minor short-term positive effect on the area's rental industry, and that the temporary demand for housing is unlikely to displace permanent residents or adversely affect housing prices.

Specific EJ population impacts, and mitigation measures identified by ETNG (ETNG 2023f) are included below:

> The primary adverse impacts on EJ communities associated with the construction of the Project include temporary increases in dust, noise, and traffic from construction. These impacts [would] occur along the proposed Pipeline, at the proposed Hartsville Compressor Station, and at the proposed new M&R Stations. Environmental justice concerns are not present for other resource areas, such as geology, groundwater (including private wells), wildlife, or cultural resources due to the minimal overall impact the Project would have on these resources. Except in those areas discussed below, construction and operation of the Project is not expected to have a disproportionate high and adverse impact on existing socioeconomic conditions in potential EJ communities within the [ETNG] Project Area.
>
> *Pipeline*
>
> Portions of the proposed pipeline [would] be constructed within potential EJ communities. Construction impacts are expected to be short-term and include traffic, noise, and dust impacts, while operational impacts would be long-term and include land use but would be minor. One sensitive receptor, Shiloh Head Start Center in Putnam was identified within 0.25 mile of the Project and within an EJ community. the temporary construction impacts, and minor longer-term land use impacts would be disproportionately high and adverse within EJ communities but … are not expected to be significant.
>
> *Hartsville Compressor Station*
>
> The Hartsville Compressor Station [would] be constructed within a potential EJ community. Construction impacts are expected to be short-term and include traffic, noise, and dust impacts while operational impacts would be long-term and include land use, visual and air impacts, and in each case minor to negligible. The temporary construction impacts, and longer-term visual and land use impacts from this facility would be disproportionately high and adverse as they would be predominantly borne by environmental justice communities but, for the reasons discussed above [i.e., temporary increases in dust, noise, and traffic from construction], are not significant.
>
> *Columbia Gulf M&R Station*
>
> The Columbia Gulf M&R Station [would] be constructed within a potential EJ community. Construction impacts are expected to be short-term and include noise and dust impacts while operational impacts would be long-term and include land use, visual and air impacts, and in each case minor to negligible. There are two residences within the census tract block group containing the

> meter station that are approximately 750 feet from the facility fence line. The temporary construction impacts, and longer-term visual and land use impacts from this facility would be disproportionately high and adverse as they would be predominantly borne by environmental justice communities but, for the reasons discussed above [i.e., temporary increases in dust, noise, and traffic from construction], are not significant.
>
> *Harriman Crossover*
>
> The Harriman Crossover [would] be constructed approximately 4,600 feet from a potential EJ community. Construction impacts are expected to be short-term and include noise and dust impacts while operational impacts would be long-term and include land use, visual and air impacts. Impacts from this facility are insignificant and would be neither disproportionately high nor adverse since they are not predominantly borne by environmental justice communities.

ETNG's Resource Report 5 (ETNG 2023f) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the socioeconomic-related findings in ETNG's Resource Report 5. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). Transportation effects to EJ populations would be disproportionate and adverse but minor or mitigated, to the extent practicable, depending on the location of the traffic effects within a mix of EJ qualifying and non-EJ populations. Vehicular traffic on public roads as well as near the proposed gas pipeline would increase during construction due to construction workers and materials moving to and from the plant and pipeline construction areas. In addition, detours may need to be implemented when the route of the pipeline intersects with an active road. ETNG would develop a traffic management plan to minimize impacts.

Safety-related effects due to pipeline construction and operations activities may also be experienced by EJ populations, and some of this would be heightened near high construction-related traffic areas. During construction, workers would have increased safety risks, but that will be mitigated by implementing Occupational Safety and Health Administration's (OSHA's) regulations. While pipelines are the safest form of energy transportation, the transportation of natural gas by pipeline does involve minimal incremental risk to the public and workers due to the potential for accidental release of natural gas and construction-based hazards. Outside of possible spills and the possibility of finding contaminated soils, other waste-related effects occurring as a result of pipeline construction activities would occur outside of the TVA-owned Kingston Reservation or transmission ROWs; and wastes generated or encountered by ETNG during construction activities would be disposed of at selected waste facilities in the area. There are BMPs in place in the event of spills or finding contaminated soils, so the impact of this would be minor. The off-site waste facilities have the potential to be located in EJ areas based on the history of the siting of these types of facilities (and the general assumptions that are made in evaluating EJ effects) (United States Sentencing Commission 2003). However, the impact from waste being added to off-site waste facilities is anticipated to be minor.

Utilities-related effects, such as service disruptions, may be experienced by EJ populations potentially affected during construction and operations or for maintenance activities that may involve excavation and repair, and these minimal to minor effects may be disproportionate and adverse for EJ populations due to their social and economic vulnerabilities. Prior to construction, existing utility lines would be located and marked to prevent accidental damage during pipeline construction. Service disruptions would be minimized through coordination between ETNG, TVA, and the affected utilities. Due to mitigation strategies, impacts would not be expected to be significant.

Pipeline construction activities would also increase the noise effects on local populations, and some of the activities and components that produce higher noise levels may be located in EJ areas. Noise impacts would be disproportionate and adverse, but minor (both in duration and intensity). Impacts that surpass FERC regulations will be mitigated so that the noise is compliant. The use of mitigation through noise control measures and equipment sound requirements, which are further explained in Section 3.14, results in impacts that are not expected to be significant per ETNG Final Resource Report 5 (ETNG 2023f).

Effects to prime farmland resources due to construction of the natural gas pipeline may also have temporary and minor adverse effects on populations that currently farm the corridor where the pipeline would be constructed. Construction activities in areas identified as prime farmland or with resident farming populations would require a temporary halt in farming activities. These effects may be disproportionate and adverse for farming EJ populations in the ETNG Pipeline EJ Study Area; however, these temporary effects are not expected to be significant due to the limited duration of the proposed construction activity in those locations. Long-term effects to land use within the ETNG Construction ROW could in turn adversely affect EJ populations due to their proximity to the corridor.

With the location of EJ populations throughout TVA's Expanded Pipeline EJ Study Area, minor, temporary adverse effects to aquatic life resulting from construction activities are likely to affect EJ populations who may fish surface waters in the study area. These effects would be minimized through the implementation of BMPs, and any impacted waterbodies would be restored to their pre-construction state, to the extent feasible. ETNG does not anticipate any long-term impacts to commercial fishing resulting from the natural gas pipeline. If indirect effects to aquatic life occur, which would be expected to be limited to the period of construction, these could temporarily affect EJ populations that currently fish the affected waters. While fishing activities likely occur among both EJ and non-EJ population, the effects could be disproportionate and adverse for low-income and minority populations due to the likelihood of their reliance on these resources for long-term sustenance.

While they would be minor, temporary, minimized, or mitigated through CWA 404, 401, and 402 (NPDES) permitting, effects to streams due to the pipeline may be disproportionate and adverse for EJ populations due to the prevalence of EJ populations throughout the EJ Study Area. Further, these populations may be more vulnerable to the socioeconomic effects from temporary impact activities regulated under CWA 401 or 404. While certain actions would be taken to minimize risks, effects to floodplains resulting from the construction of the natural gas pipeline may impact human populations. These effects may be disproportionate and adverse for EJ populations since these populations may be more vulnerable to temporary effects that cause minor flood loss or effects to human safety, health, and welfare, i.e., socioeconomic effects.

As much as feasible, the pipeline would be located parallel and adjacent to existing natural gas pipeline ROW, which would generally minimize effects to vegetation and other resource areas. The greatest impact of the pipeline on vegetation would be from the clearing of forested areas. In areas that are currently used by EJ populations, potentially including forested areas, there is potential for disproportionate and adverse effects to EJ populations, particularly for those that currently utilize wildlife from these areas; however, these effects are not expected to be significant. While vegetation displacement could result in more wildlife in nearby areas, the benefits to human populations, including EJ populations, would be negligible.

Effects to air quality, i.e., air emissions of pollutants, due to the pipeline would be short-term, minor, and generally limited to the ETNG Construction ROW, and fugitive emission releases of gases are expected to be minor compared with existing conditions. The immediate pipeline corridor vicinity, where fugitive dust, particulate, and natural gas emissions have some but low likelihood of occurring, has varying percentages of both EJ and non-EJ populations. Emissions are expected to be minor and widely distributed, thus making them less than significant, although the effects may be disproportionate and adverse for EJ populations already experiencing cumulative air quality effects.

The corridor of the proposed pipeline crosses many land uses: agricultural land, forest/woodland, industrial/commercial land, open land, open water, residential land, wetlands, special land uses (such as places of worship, schools, parks, and cemeteries), and planned residential and commercial areas. If this project moves forward and the pipeline is buried, there will be a herbaceous strip on the ground above the pipeline, with a width of at least ten feet, centered on the pipeline. Forested land would be permanently converted to herbaceous and scrub-shrub land within the permanent easement because of maintenance. Some land uses changes, particularly those related to agricultural and residential uses, would likely result in impacts to human populations, which may include EJ populations. As such, the construction of the ETNG Construction ROW would be likely to result in disproportionate and adverse effects to EJ populations due to their economic vulnerabilities.

The proposed natural gas pipeline under Alternative A is anticipated to temporarily disturb 34.4 acres of natural and recreational resources during construction; 8.5 of these acres are within the previously disturbed existing 3100 Line permanent ROW. For the resources proposed to be crossed by ETNG's proposed project, ETNG would coordinate planning and construction with landowners to ensure continued recreational use during construction (to the extent practicable) and operation of the pipeline.

Lastly, ETNG identified four past, present, or reasonably foreseeable projects to have the potential to contribute to cumulative impacts on transportation, noise, air quality, water quality, safety, population, housing, and public services in EJ communities. Projects include Ridgeline Hartsville Solar Array, Hartsville Compressor Station Other Non-Jurisdictional Facilities, TVA Kingston Plant, and Hartsville Parks Master Plan – Trey Park Complex. Specifically, ETNG identified these four projects as having potential to cumulatively affect two EJ qualifying census block groups in Trousdale County (CT 901 BG 3, CT 902 BG 2,) and one in Roane County (CT 307 BG 2). However, impacts were determined to not be disproportionate and adverse, as impacts would be temporary and/or minimized and mitigated, resulting in impacts that are less than significant. TVA has independently reviewed and concurs with ETNG's assessment of cumulative impacts.

3.4.3.3.7 Summary of Alternative A

TVA Proposed Actions

Beneficial and adverse effects to EJ populations resulting from the effects of TVA proposed actions under Alternative A to other resource areas are summarized below in Table 3.4-21. Effects to resource areas not discussed in the sections below would be minimized or mitigated, or otherwise temporary and minor and generally limited to the immediate disturbance of Alternative A components. Where effects extend beyond the identified Alternative A component footprints, these effects would likewise be minor to mitigated due to specific regulatory requirements with mitigation and minimization measures (see Section 2.3.1 for more details). While these minor effects would likely be experienced by both EJ and non-EJ communities, those effects may be disproportionate and adverse for EJ populations due to their cultural and economic vulnerabilities.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

Beneficial and adverse effects to EJ populations resulting from the effects of ETNG proposed actions under Alternative A to other resource areas are summarized below in Table 3.4-21. Effects to resource areas not discussed in the sections below would be temporary and minor to minimized or mitigated and generally limited to the immediate disturbance within the ETNG Construction ROW. Where effects go outside of these footprints, such as for air emissions and water quality, these would likewise be minimized or mitigated, or are otherwise temporary and minor. As such, these effects are not anticipated to be disproportionate and adverse for EJ populations. Other effects extending outside of the footprints such as for cultural resources would likewise adhere to specific regulatory requirements or steps and agreements implemented through the regulatory and consultation processes. For example, these steps may include stakeholder involvement in cultural resources decision-making, development of a MOU with SHPO identifying minimization and mitigation steps to be taken on unavoidable cultural resource impacts, or through additional avoidance and minimization efforts identified for protected species during consultation with USFWS. While these minor effects would likely be experienced by both EJ and non-EJ communities, those effects may be disproportionate and adverse for EJ populations due to their cultural and economic vulnerabilities. Cumulative effects as identified by ETNG as a result of four past, present, or reasonably foreseeable projects with potential for impacts on transportation, noise, air quality, water quality, safety, population, housing, and public services in EJ communities are consistent with TVA findings regarding EJ populations. ETNG identified four past, present, or reasonably foreseeable projects as having potential to cumulatively affect three EJ qualifying census block groups and determined cumulative impacts would be temporary and less than significant.

3.4.3.4 Alternative B

TVA anticipates that the solar facilities proposed under Alternative B would be located within portions of the East TN region to offset transmission system upgrades that may be required following the retirement of the KIF Plant. Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA.

Generalized beneficial effects and any disproportionate and adverse effects to EJ populations resulting from the effects of Alternative B to other resource areas are summarized below and in Table 3.4-21. Focused, site-specific analyses for each proposed solar site would be needed to determine whether the specific project effects would be disproportionate and adverse for EJ populations.

3.4.3.4.1 Construction and Operation of Solar and Storage Facilities

As specific sites have not yet been determined for evaluation under this alternative, typical EJ effects associated with solar facilities are listed under Section 3.2 and cannot be determined on a location-specific basis at this time. In general, the main effects of consideration for EJ populations would likely result from construction activities, operations, and considerations of greenhouse gases and climate change under Alternative B. Solar and storage facility construction activities are expected to have short-term, localized, and minor effects on air quality and, along with operation activities, no appreciable direct or indirect effect on regional climate change. Additionally, the solar and storage facility operations are expected to have long-term, moderate, beneficial effects on air quality and on regional climate change in comparison to existing conditions.

Construction of the solar facilities associated with Alternative B would temporarily increase employment primarily within portions of East TN. Based on a review of employment history associated with previous solar facilities, temporary construction employment is estimated to range from 800 to 2,000 while long-term employment associated with daily operations and/or maintenance is estimated to be up to 15 full time employees. These socioeconomic effects could potentially have a minor beneficial effect to EJ populations in the areas selected for the solar facilities.

While no solar facilities previously developed by TVA had disproportionate and adverse effects on EJ populations, if effects were to occur, they would likely be associated with land use and vegetation changes; recreational areas; water and wildlife effects; construction traffic, noise, and safety issues; and short-term and long-term visual effects, and these could be exacerbated by cumulative effects. However, based on the number of solar sites that would be needed to replace generation at Kingston, estimated at 17 one-hundred MW sites (10,950 acres based on values provided in Table 3.2-1), there would be potential for moderate effects to land use through conversion of agricultural land, particularly cropland, to developed land with potential for later restoration of agricultural use. While these land use conversions are not expected to have disproportionate and adverse effects on EJ populations, depending on the number and location of solar facilities, individual EJ reviews would be completed for each solar and storage facility associated with Alternative B as it is proposed.

3.4.3.4.2 Transmission and Other Components

Based on a review of EJ effects caused by past TVA transmission line upgrade efforts, the EJ effects of transmission upgrades associated with Alternative B are not expected to be significant. Because the locations of the transmission line upgrades for Alternative B have not yet been identified and the EJ populations are, therefore, not known, the site-specific effects to EJ populations associated with transmission upgrades would be assessed in future environmental reviews if TVA adopts this alternative.

3.4.4 Summary of Alternatives

Table 3.4-21. Summary of Environmental Justice Effects by Alternative and Resource Area

Resource Area	Retirement and Demolition of KIF Plant (All Action Alternatives)	Alternative A	Alternative B
Physical Characteristics	Due to the small size of the subsurface disturbances and existing industrial development of the site, only minor direct effects to potential subsurface geological resources are anticipated. No adverse effects to geology, soils, or prime farmland are anticipated. Therefore, no effects are anticipated on EJ populations.	Effects to physical resources as a result of the CC/Aero CT Plant would be minor and limited to the Kingston Reservation, where no populations are present. Therefore, no effects are anticipated to EJ populations. Minor geologic hazards, such as those presented by karst features, are distributed across the ETNG Construction ROW and off-site transmission corridors and would be minimized as much as feasible and are therefore not anticipated to pose a particular risk to EJ populations who may rely on local soils for their livelihood or sustenance. Runoff and erosion soil effects may temporarily increase due to ETNG pipeline construction activities, but these effects would be temporary and mitigated through BMPs. Effects to soils may be disproportionate and adverse for EJ populations. Construction and operation of CC/Aero CT Plant and Switchyard, a 3- to 4- MW Solar Facility, and a 100-MW BESS, all on Kingston Reservation along with on-site and off-site transmission line upgrades would cause temporary, minor adverse impacts to prime farmland. Construction and operation of the ETNG pipeline has minor, permanent effects on prime farmland by taking 10.5 acres of prime farmland out of production after construction of the pipeline. Due to the small permanent impact of the pipeline, there could be minor adverse effects on populations that currently farm the areas due to this acreage being taken out of production. These effects would likely be disproportionate and adverse for farming EJ populations in the affected area if these communities farm as their livelihood. Impacts to EJ populations through reductions of prime farmland would be minimized and mitigated, as applicable, under the Farmland Protection Policy Act. Effects to floodplains due to construction of the natural gas pipeline may have temporary, minor effects on human populations where the floodplains and EJ populations intersect. Low-income and minority populations may be more vulnerable to temporary effects that cause minor flood loss or effects to human safety, health, and welfare.	Grading and clearing activities associated with the construction of the solar and battery storage facilities would cause minor, localized increases in erosion and sedimentation, resulting in minor effects to soils. These effects would be temporary and mitigated through BMPs. Potential effects on EJ populations would be verified for individual solar and storage facilities. East Tennessee is located over limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the finalized location of the solar and storage facilities and associated transmission lines, sinkholes could be a minor to moderate risk. These results may be disproportionate and adverse for EJ population depending on the location of the facilities. Temporary or permanent loss of prime farmland resources as a result of construction of the solar facilities and the transmission line activities may have temporary effects on populations that currently farm the sites where the facilities would be constructed. The potential effects on EJ populations would be verified for individual solar and storage facilities. Floodplains effects on EJ populations are anticipated to be minor; however, whether these effects may be disproportionate and adverse for EJ populations would be verified through reviews for individual solar and storage facilities.

Resource Area	Retirement and Demolition of KIF Plant (All Action Alternatives)	Alternative A	Alternative B
Water Resources	Effects to groundwater that would occur as a result of the Kingston coal facility retirement, D4 activities, and CRR management would be minor and minimized through BMPs. Minor, disproportionate and adverse effects to EJ populations could occur if groundwater effects migrate off-site. Effects to surface water due to Kingston retirement and D4 activities would be minor and minimized and largely limited to the Kingston Reservation, where no populations are present. Off-site effects to surface water and water quality, as a result of incidental discharges to the Clinch and Emory rivers, have the potential to result in disproportionate and adverse effects to EJ populations. These actions would be mitigated using NPDES stormwater pollution prevention BMPs to minimize the extent of disturbance and erosion.. Minor beneficial effects would occur from the proposed reduction in cooling water withdrawals after retirement of the existing KIF units. No effects to jurisdictional wetlands are expected to occur as a result of the Kingston coal facility retirement and D4 activities. Therefore, disproportionate and adverse effects are not anticipated to occur to EJ populations with this alternative. Long term, beneficial effects from improved water quality in response to ceasing Kingston operations are anticipated, benefiting human populations in the vicinity.	Effects to groundwater as a result of the CC/Aero CT Plant would be minimized with implementation of BMPs and generally limited to the Kingston Reservation, where no populations are present. Therefore, effects to EJ populations are not anticipated. Effects to groundwater due to the pipeline and transmission line upgrades would be minimized or mitigated through BMPs, resulting in no long-term effects. Cumulative effects to groundwater are anticipated to be negligible. As such, minor effects on EJ populations are anticipated. Effects to surface water due to the CC/Aero CT Plant would be temporary, minor, minimized, or mitigated through CWA 404, 401, and 402 (NPDES) permitting; however, these effects would be limited to the Kingston Reservation, where no populations are settled. Due to this, EJ populations are not anticipated to experience adverse effects related to this resource area. Effects to surface water due to the pipeline and transmission line upgrades may result in disproportionate and adverse effects on EJ populations, which tend to be more vulnerable to the effects from temporary 404/401 permitting impacts/activities. Cumulative effects would include decreased water quality and aquatic habitat due to accidental hazardous spills or in-stream sedimentation caused by erosion of disturbed soils. These cumulative effects may result in disproportionate and adverse effects to EJ populations using these resources for sustenance. Harms from these types of events would be mitigated and minimized through applicable CWA 404, 401, and 402 (NPDES) permitting requirements and/or by following procedures in applicable CERCLA regulations. Effects to wetlands due to the CC/Aero CT Plant would be minor, temporary or permanent, and minimized, or mitigated through CWA 404, 401, and 402 (NPDES) permitting requirements with some effects (i.e., localized effects) occurring on the Kingston Reservation, where no EJ populations are settled. Therefore, no effects on EJ populations are anticipated. Effects to wetlands occurring as a result of ETNG's proposed pipeline activities, while minor, would occur outside of Kingston Reservation. In instances where EJ populations were identified along the ETNG Construction ROW, it is TVA's current assessment that disproportionate and adverse effects may occur given that these populations tend to be more vulnerable or sensitive to the effects from temporary and permanent 404/401 permitting impacts/activities. These effects would be mitigated through applicable CWA 404. 402 and 401 permitting requirements.	Effects to groundwater would be minor, minimized, or mitigated through BMPs, though disproportionate and adverse effects to EJ populations are possible. The potential effects on EJ populations would be verified for individual solar and storage facilities. Effects to surface water would be minor, minimized, or mitigated through CWA 404, 401, and 402 (NPDES) permitting and largely limited to project sites and transmission corridors, though disproportionate and adverse effects to EJ populations are possible. The potential effects on EJ populations would be verified for individual solar and storage facilities. Effects to wetlands that would occur because of the proposed solar facilities and transmission line activities would be avoided or minimized to the extent practicable through the implementation of standard BMPs. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

Resource Area	Retirement and Demolition of KIF Plant (All Action Alternatives)	Alternative A	Alternative B
Air Quality and GHGs	Decontamination and deconstruction activities are expected to have short-term, localized, and minor effects on air quality and no appreciable direct or indirect effect on regional climate change. Impacts are anticipated to be generally limited to the Kingston Reservation where no EJ populations reside. However, the census block group containing the Kingston Reservation, where fugitive dust emissions have some likelihood of becoming airborne, does contain EJ populations and, as such, disproportionate and adverse effects to these populations are possible. While the effects on climate change would be short-term, regional, minor, mitigated through use of BMPs, and, thus, less than significant, they may be disproportionate and adverse for EJ populations due to their history of health vulnerabilities. Permitting requirements under applicable laws and regulations, including but not limited to TDEC Air Pollution Control Rule 1200-3-8 and PSD under the CAA, would help mitigate any air quality issues resulting from D4 activities. Minor positive effects to human populations near the Kingston Reservation may occur due to beneficial long-term changes to local air quality from Kingston retirement.	Effects resulting from the CC/Aero CT Plant would cause short-term, localized, and minor positive effects to air quality in comparison to existing conditions. The immediate Kingston Reservation vicinity, where fugitive dust and particulate emissions have some likelihood of becoming airborne, would be minimized through permitting, BMPs, and complying with the pertinent parts of TDEC Air Pollution Control Rule 1200-03. The Kingston Reservation does not contain residential populations so it is unlikely that EJ populations would be affected by fugitive dust emissions; however, the census block group containing the Kingston Reservation does contain EJ populations and as such disproportionate and adverse effects are possible. Short-term, regional, and minor effects are anticipated from GHG emissions. Since any such effects would be short-term, regional, and minor, they would be less than significant, but they may be disproportionate and adverse for EJ populations due to their history of health vulnerabilities. Effects to air quality due to the pipeline would be temporary, minor and generally limited to the ETNG Construction ROW, and fugitive emission releases of dust and gases are expected to be minor compared to existing conditions. The immediate pipeline corridor vicinity, where fugitive dust, particulate, and natural gas emissions have some but low likelihood of occurring, has varying percentages of both EJ and non-EJ populations. Emissions are expected to be minor and widely distributed, though the effects may be disproportionate and adverse for EJ populations already experiencing cumulative air quality effects. Impacts of GHG emissions are anticipated to be minor, regional, and short-term, and, therefore, less than significant; they may be disproportionate and adverse for EJ populations due to their history of health vulnerabilities. These disproportionate and adverse effects can be mitigated by complying with applicable requirements under TDEC Air Pollution Control Rule 1200-03-09.	Effects to air quality are anticipated to be minor to negligible or mitigated limited to the immediate project sites and transmission corridors. While the main effects of consideration for EJ populations would likely result from construction activities and would be minimized by BMPs, these short-term effects could be disproportionate and adverse on EJ populations due to their history of health vulnerabilities. Construction activities for solar and storage facilities and associated transmission activities are expected to have short-term, localized, and moderate effects on air quality. Operations of the solar and storage facility and the associated transmission activity are expected to have long-term, moderate, beneficial effects on air quality and GHG emissions on regional climate change. Full EJ considerations would be made for each solar and storage facility once the location of these facilities has been determined.

Resource Area	Retirement and Demolition of KIF Plant (All Action Alternatives)	Alternative A	Alternative B
Biological Environment	Effects to vegetation and wildlife would be minor and limited to the Kingston Reservation, where no populations are present. Thus, no adverse effects would occur to EJ populations. While minor displacement of wildlife could result in more wildlife in nearby recreation areas, wildlife refuges, and other suitable habitat, the impact to human populations would be negligible or a positive minor impact for EJ populations that use these lands for subsistence or other activities. The impacts to aquatic life are not expected to cause disproportionate and adverse impacts to EJ populations, since these impacts would be restricted to the Kingston reservation and there are no human populations settled on the reservation. There may be slight beneficial effects to human populations utilizing these resources, while those utilizing aquatic life that depend on the heated effluent may have slight negative effects. These minor to minimal adverse effects on EJ populations would be unlikely due to the absence of EJ populations on the Kingston Reservation, although EJ populations do occur in the nearby area. Any impacts to threatened and endangered species that may occur as a result of KIF D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations because EJ populations are not present within the Kingston Reservation and effects are restricted to the Kingston Reservation.	Effects to vegetation due to the CC/Aero CT Plant would be minor and limited to the Kingston Reservation boundaries, where no populations are settled. Thus, no effects would occur to EJ populations. To the extent feasible, the pipeline would be located adjacent to an existing pipeline corridor, which would generally minimize effects. The greatest impact of the pipeline on vegetation would be from the clearing of forested areas during construction. In areas that are currently used by EJ populations, including the forested areas, there may be disproportionate and adverse effects on EJ populations who use resources from the forest for subsistence. Effects to wildlife that would result from the CC/Aero CT Plant would have negligible beneficial effects to human populations using these resources for subsistence or other activities in locations off the Kingston Reservation due to potential displacement of wildlife from the CC/Aero CT Plant site. Effects to wildlife from the proposed natural gas pipeline would be minor. To the extent feasible, the natural gas pipeline would generally be located adjacent to an existing pipeline corridor, which would minimize effects to wildlife. EJ concerns are not present from impacts to wildlife due to the minimal overall impact the Ridgeline Expansion Project would have on this resource. While displacement could result in more wildlife in nearby areas, the benefits to human populations are anticipated to be negligible. Effects to aquatic life due to the CC/Aero CT Plant would be minor and permanent by reducing fish mortality from impingement and entrainment at the intake of the existing KIF Plant. The reduction in fish mortality would have a positive impact on EJ populations that rely on aquatic resources for sustenance. Effects to aquatic life as a result of the ETNG natural gas pipeline may have minor disproportionate and adverse effects on EJ populations in areas where construction activities occur for EJ populations that currently fish the affected waters. Effects to threatened and endangered species that would occur as a result of the proposed CC/Aero CT Plant, transmission line activities, and natural gas pipeline are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations within TVA's Expanded Pipeline EJ Study Area.	Impacts to EJ populations associated with vegetation effects would primarily be associated with the direct removal of forested areas. These effects would be minor and generally limited to the immediate project sites and transmission corridors. This may result in effects to EJ populations in the surrounding areas. The displacement of wildlife into surrounding suitable habitat may be beneficial to EJ and other populations that utilize those habitats for subsistence and other purposes. Detailed EJ analyses would be conducted under future NEPA reviews to verify potential EJ impacts for each solar facility and transmission line activity at the time the facility/activity locations are identified. Effects to aquatic life are not anticipated to have disproportionate and adverse effects on EJ populations, but detailed EJ analyses would be conducted to verify potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews. Potential effects to aquatic life from the solar facility sites and transmission activities would be minimized or mitigated through BMPs and erosion and sediment control measures. Effects to threatened and endangered species would be minimized or mitigated as required due to the protected status of these species and would not be expected to lead to disproportionate and adverse effects on EJ populations. While not anticipated to be significant, these effects on EJ populations would be more fully evaluated for individual solar and storage facilities in future NEPA analyses.
Natural Areas, Parks, and Recreation	Recreation or subsistence activities, such as bank fishing, may be temporarily limited or not allowed on some portions of the Kingston Reservation. This could cause a temporary, disproportionate and adverse impact on EJ populations who use the recreational space for sustenance.	Effects from the construction of the CC/Aero CT Plant may affect EJ populations through the temporary closure of hunting and fishing opportunities and recreational uses on the Kingston Reservation and nearby on the Clinch and Emory Rivers, which would be a disproportionate and adverse impact to EJ populations that use this area for sustenance. The construction of the off-site natural gas pipeline and upgrades to the transmission lines are likely to result in minor, temporary effects on EJ populations as a result of increased local traffic, noise, and visual disturbance. These effects may be disproportionate and adverse among EJ populations due to their vulnerabilities to such disturbances and possible cumulative impacts from these disturbances.	The exact project locations for solar and/or storage projects are not known at this time; however, individual facilities would be sited to avoid effects to natural areas, parks, and other developed recreation areas to the extent feasible.
Land Use	Land use effects would be limited to the Kingston Reservation boundary, where no human populations reside. Therefore, there would be no effect on EJ populations.	Effects from the construction and operation of the CC/Aero CT Plant would not result in any impact to land use because no human populations live within the Kingston Reservation area. There would be permanent effects to land use due to construction in the ETNG ROW, which may result in disproportionate and adverse effects to EJ populations. Some land use changes, especially those related to agricultural and residential land uses, will impact human populations, which are likely to include EJ populations who are particularly vulnerable to economic changes.	Potential for moderate adverse effects to land use through conversion of agricultural land, particularly cropland, to developed land with potential for later restoration of agricultural use. Detailed EJ analyses would be conducted to verify potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

Resource Area	Retirement and Demolition of KIF Plant (All Action Alternatives)	Alternative A	Alternative B
Transportation	Transportation effects would be temporary, moderate, and concentrated on public roads within a relatively small area around the Kingston Reservation, especially on Highway 40, Swan Pond Road, and Steam Plant Road. EJ populations are not located in this vicinity so there would be no disproportionate and adverse effects for these populations. There may be temporary, minor effects related to increased traffic and driver safety although these would also be minimized as much as feasible.	Transportation effects would be temporary, minor, and concentrated on public roads within a relatively small area around the Kingston Reservation, where EJ populations are not present. Portions of the proposed ETNG pipeline and the Hartsville Compressor Station are to be constructed in exiting EJ communities. This could result in negligible to minor, temporary effects to occur during construction, which may be disproportionate and adverse for EJ populations.	Transportation effects would be temporary, minor, and concentrated on public roads within a relatively small area around the project sites and transmission line activities. Whether these effects would be disproportionate and adverse for EJ populations would be evaluated for individual solar and storage facilities under future NEPA reviews.
Utilities	Short-term outages would be minor and would occur in the immediate vicinity of the Kingston Reservation, where EJ populations are not present.	CC/Aero CT Plant-related effects to utilities would be minor, with effects primarily occurring on the Kingston Reservation, where no residential populations exist. The construction of off-site transmission lines could cause utility service interruptions, which could affect EJ populations; however, these issues would be minimized and mitigated and overall impacts to area utilities would be minor. Mitigation and minimization efforts would include BMPs such as coordinating planned outages with utilities to minimize negative impacts. Due to mitigation efforts, it is not anticipated that this alternative will have disproportionate and adverse impacts on EJ populations. While utilities-related effects may be experienced by EJ populations in the ETNG Construction ROW, effects are anticipated to be limited to those occurring during construction, maintenance activities, and repair. The effects experienced by EJ populations may be disproportionate and adverse due to their cultural and economic vulnerabilities.	Effects to utilities would be minor, with some service interruptions possible, but these would be minimized or mitigated. Mitigation and minimization efforts would include BMPs such as coordinating planned outages with utilities to minimize negative impacts. Whether or not these effects would be disproportionate and adverse for EJ populations would be verified through future NEPA reviews for solar and storage facilities.
Cultural Resources	Cultural resources-related effects associated with Kingston coal facility retirement and D4 activities would be avoided, minimized, or mitigated in consultation with Native American tribes and interested stakeholders, which could include other EJ populations. Therefore, they are not anticipated to result in disproportionate and adverse effects on EJ populations.	Cultural resources-related effects associated with Alternative A activities would be avoided, minimized, or mitigated in consultation with Native American tribes and interested stakeholders, which could include other EJ populations. Therefore, they are not anticipated to result in disproportionate and adverse effects on EJ populations.	Cultural resources-related effects associated with Alternative B activities would be avoided, minimized, or mitigated through consultation with Native American tribes and interested stakeholders, which could include other EJ populations. Since the exact sites of the solar facilities are not determined yet, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews to determine disproportionate and adverse effects for a given solar facility.
Solid and Hazardous Waste	Demolition and construction wastes would be disposed of off-site as required by state and federal regulations. Off-site waste facilities have the potential to be located in EJ areas, per the history of the siting of these types of facilities, the general assumptions that are made in evaluating EJ effects and the proximity of the Kingston Reservation to EJ populations. As such, EJ populations may experience disproportionate and adverse effects as compared to non-EJ populations depending on the location of waste facilities. These effects would be mitigated through applicable RCRA, and state and local waste regulations.	Waste-related effects resulting from CC/Aero CT Plant construction would be temporary and mitigated, with most effects occurring on or near the Kingston Reservation. However, since the census block group that contains the Kingston Reservation and one of the census block groups adjacent to it are considered EJ populations, waste related to construction through TVA proposed actions may cause disproportionate and adverse impacts to EJ populations. Waste-related effects due to the ETNG pipeline activities would have minor negative impacts at selected waste facilities in the area. As the off-site facilities have the potential to be located in EJ areas, per the history of the siting of these type facilities, EJ populations may experience disproportionate and adverse effects.	Waste-related activities that would occur as a result of the proposed solar facilities and transmission line activities may have potential EJ effects during construction and operation. Whether waste impacts would be disproportionate and adverse impacts to EJ populations would be verified in future NEPA reviews for the specific solar sites.
Safety	Safety-related effects from traffic around the Kingston reservation, would primarily affect EJ populations since they account for the residents in the census block group that the Kingston reservation is in. This would be a minor, disproportionate and adverse impact. OSHA regulations and BMPs for site safety management would minimize potential risks to workers.	The public health and safety impacts of air quality from coal plant operations would be reduced, as the CC/Aero CT Plant would produce less emissions than current Kingston operations. This would result in minor positive effects to surrounding populations. The populations near the Kingston Reservation are EJ-qualifying. Other safety-related effects, such as increased traffic near high traffic construction areas, could result in negative safety effects for people living near Kingston and the pipeline. Traffic concerns result in temporary, minor, disproportionate and adverse impacts. In areas where pipeline activities intersect with EJ populations disproportionate safety effects may occur to these communities due to increased traffic during construction and the possibility of a spill during operation. Both effects are disproportionate and adverse to EJ populations.	Safety-related effects would be temporary, minor, and limited to the immediate project sites and transmission corridors. These impacts would be mitigated and minimized using BMPs. Effects on EJ populations would be more fully evaluated for individual solar and storage facilities in future NEPA reviews.

Resource Area	Retirement and Demolition of KIF Plant (All Action Alternatives)	Alternative A	Alternative B
Socioeconomics	Due to the loss of direct and indirect employment associated with Kingston (approximately 200 direct employees), competition for employment in other fields in the Kingston labor market area, such as manufacturing, educational services, health care, and construction, may increase. Such trends could lead EJ populations and other populations to relocate for work or follow recent depopulation trends and permanently relocate to different locations in Tennessee or beyond. These changes may affect familial and community relations among EJ and other populations in the Kingston labor market area. The effects may be disproportionate and adverse for EJ populations but could be partially offset from the benefit of temporary employment increases, anticipated to be a maximum of 300 workers on-site, during the three to five-year period of D4 activities.	Construction of the CC/Aero CT Plant and the pipeline associated with Alternative A would temporarily increase employment (by approximately 2,500 directly and approximately 500 indirectly employed over the period of construction) in the labor market area and have a minor beneficial effect to area EJ populations, as 30 to 50 percent of employment is expected to occur from within the area. ETNG's review assessed that the pipeline will not acquire or relocate any businesses or residences. A minor, negative impact could occur during operation due to the reduced labor required under Alternative A. Economic impacts would have a disproportionate and adverse impact on affected EJ populations because these communities often experience compounding effects and social disadvantages compared to non-EJ populations. During construction of the pipeline, negative effects may occur to current and prospective renters and guests of rental homes and establishments through reduced rental inventory and/or increased prices. This may result in disproportionate and adverse effects for EJ-qualifying low-income populations, especially in EJ-qualifying census block groups with higher percentages of renter-occupied housing units than the associated county.	Based on other solar developments, construction of the solar facilities associated with Alternative B would temporarily increase employment within portions of East Tennessee; estimates suggest temporary employment could range from 800 to 2,000. These socioeconomic effects could potentially have a minor beneficial effect to EJ populations in the areas selected for the solar facilities. Correspondingly, short-term economic and tax revenues increases may occur with the increased employment. Benefits from long-term employment associated with daily operations and/or maintenance of solar facilities for Alternative B is also possible. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.
Noise	Noise-related effects would be temporary, minor, and generally limited to the Kingston Reservation and immediate vicinity. Due to these minor impacts, nearby EJ populations are not expected to experience disproportionate and adverse effects.	Alternative A related activities would increase the noise effects on local populations. Given the presence of EJ populations near the CC/Aero CT Plant location, there would be disproportionate and adverse effects near the Kingston Reservation. Construction of the CC/Aero CT Plant and D4 activities would result in some temporary, minor disproportionate and adverse effects on those near the Kingston Reservation. Noise-related effects, including vehicular traffic, in the ETNG Construction ROW would generally be experienced by EJ populations more than other populations. Further, some of the loudest activities and components are located in EJ areas. While these effects would be mitigated as much as feasible, noise effects associated with Alternative A are likely to be disproportionate and adverse for EJ populations.	To determine noise-related effects for a given solar facility, detailed EJ analyses would occur for each solar facility and transmission line activity under future NEPA reviews.
Visual	Visual effects would be temporary, minor, and limited to the Kingston Reservation or immediate vicinity during demolition. If the site is returned to grade and revegetated, it would not bring visual discord to the area due to the surrounding water and undeveloped areas. Since the effects are temporary and minor; it is not expected that disproportionate and adverse effects would occur to EJ populations that are present near KIF.	Visual effects of Alternative A are anticipated to be minor and not disproportionate and adverse to EJ populations. This alternative will match the previous industrial landscape and not cause significant visual discord. There will be permanent visual effects from felled trees. Construction of ETNG pipeline components would occur where EJ populations are located, which creates the opportunity for them to be exposed to moderate and permanent negative impacts due to vegetation clearing activities. Therefore, it is expected that there would be disproportionate and adverse visual impacts to EJ communities.	For the solar facilities, these effects would be minor, and limited to receptors within the viewshed of the solar facilities. For the transmission corridors, the effects would last throughout the operations stage of these transmission lines and are understood to be moderate adverse visual impacts. Detailed EJ analyses would be conducted to verify potential EJ impacts for each solar facility and transmission line activity during future NEPA processes.

3.5 Physical Characteristics

3.5.1 Geology, Soils, and Prime Farmland

3.5.1.1 Affected Environment

The physical characteristics of a site are driven by the physiographic province in which the site lies and history of the region, contributing to the site's geology, topography, hydrogeology, and ecology. The following sections provide an overview of the Project's geologic origin and current physical conditions.

3.5.1.1.1 Kingston Reservation (No Action and D4 Activities)

3.5.1.1.1.1 Geology

The Kingston Reservation is situated in the Valley and Ridge Physiographic Province (see Figure 3.5-1), which is characterized by northeast-trending ridges underlain by resistant rock separated by valleys underlain by less resistant rock, near the physiographic boundary with the Cumberland Plateau of TN. The rock formations in the vicinity of Kingston are steeply tilted and crop out in long, narrow belts parallel to the trend of ridges and valleys, and some belts are bounded by faults (Zurawski 1978). The Kingston Reservation is primarily underlain by alluvial deposits of sand, silt, clay, and gravel between 20 and 60 feet thick, which in turn is underlain by the Knox Group Dolomite. The Conasauga Shale and Rome Formations underlie the Knox Group; both formations are predominantly shale and siltstone with minor amounts of limestone and dolomite of Cambrian age (Rodgers 1993). The Chattanooga Fault is located approximately 0.75-mile west-northwest of KIF and the Kingston Reservation and is apparent by the presence of the Ordovician-age Knox Group formation overlying the Conasauga Shale and Rome Formations atop Pine Ridge.

Principal aquifers in the Valley and Ridge Physiographic Province are carbonate rocks of Cambrian and Ordovician age. The Knox Dolomite, which underlies about 60 percent of the province, is the most significant water-bearing formation (Zurawski 1978).

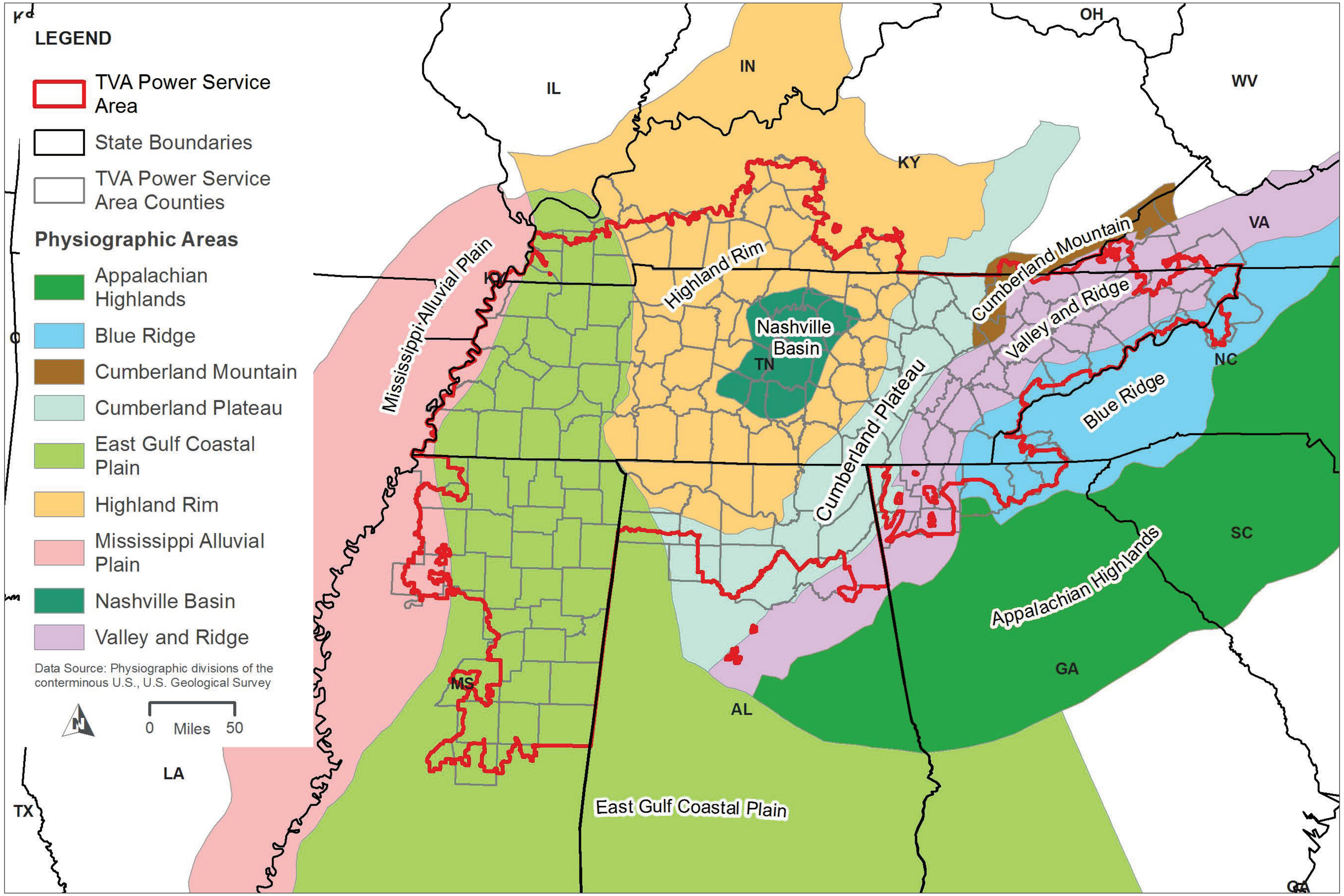

Figure 3.5-1. Physiographic Areas of TVA Region

3.5.1.1.1.2 Paleontology

During the Precambrian period, the area that is now TN was located in the southern hemisphere and was covered by a shallow, tropical sea that was home to diverse species of sea life. By the Paleozoic period, TN was located along the southern border of present-day North America and was covered by sea water. During the Early Carboniferous (Mississippian) period, TN was covered by a warm tropical sea that supported an abundance of marine life. The limestones produced from the sediments that accumulated on the seafloor during this period are rich in fossils of bryozoans, brachiopods, and crinoids. During the Late Carboniferous period, mountains forming in the east caused soil erosion and deposition resulting in swampy deltas to form in central TN. Western TN remained underwater while the central and eastern portions of TN were above sea level; this continued through the Mesozoic and Cenozoic periods (The Paleontology Portal 2021).

Fossil discovery is possible throughout TN. The geologic formations underlying the Project Site may contain fossiliferous remains of marine invertebrates. TVA conducted a review of existing paleontological information for TN. While invertebrate fossils may be found in TN, unique paleontological resources are not known to exist within the proposed location of the project (Paleobiology Database 2022).

3.5.1.1.1.3 Geological Hazards

The Kingston Reservation is located in a topographically low area on a peninsula at the confluence of the Emory and Clinch rivers. Adjacent to the KIF Plant, Pine Ridge slopes gently upward to approximately 200 feet above KIF; therefore, landslides are a potential, but unlikely risk in most areas of the Project Site. No volcanoes are present within 1,200 miles of the Kingston Reservation.

Sinkholes and other karst features can occur where the rock below the land surface is a carbonate rock such as a limestone or dolomite, as well as in salt beds, and other rocks that are naturally dissolved by groundwater circulating through them (e.g., gypsum). Development of karst topography/underground caverns takes many years to decades, and when the land above the underground cavern is no longer supported, a collapse of the land surface can occur. These collapses, called sinkholes, can vary in size and shape (Kaufmann 2007).

Multiple fault lines are in the vicinity of the Kingston Reservation, including the Chattanooga fault, which is within 0.75 mile of the Kingston Reservation. The presence of faults within carbonate rocks can contribute to the formation of karst related features if groundwater is present and the fault planes are acting as a conduit for groundwater flow.

The USGS produces hazard probability peak ground acceleration maps (Figure 3.5-2). Earthquake shaking that is described as strong, very strong, or more violent using the Modified Mercalli Intensity (MMI) (VI and greater) has caused significant slope failures during past seismic events. Using relationships between MMI, peak ground acceleration (PGA), and peak ground velocity (PGV) (Worden et al. 2012), a MMI of VI and greater translates into an unstable slope triggering PGA of 0.12-0.22 g (12-22 percent of gravity) and greater or a PGV of 9.6-20 cm/s (3.8-7.9 in./s) or greater. PGA values are represented as factors of “g,” the acceleration of a falling object due to gravity. PGV is the value of the maximum ground velocity on the surface that has occurred in an area within a certain time period due to earthquake vibrations and is represented as cm/s^{-1}. For example, Mackey and Quigley (2014) and Massey et al. (2022) documented that rock cliffs subjected to PGA and PGV in this range experienced rockfall. The lower limit for any seismic triggering of landslides may be as low as a PGA of 0.02-0.08 g;

therefore, discretion regarding isolated landslides on very susceptible slopes or concentrated land sliding on most susceptible slopes is warranted (Fan et al. 2019).

Kingston is located within the Eastern TN Seismic Zone, which is a geographic band approximately 75 miles wide by 200 miles long, capable of generating small frequent earthquakes (Figure 3.5-2). The largest recorded earthquake in this seismic zone was a magnitude 4.6 that occurred in 1973 near Knoxville. In 2018, a magnitude 4.4 earthquake occurred near the Watts Bar Dam, approximately 25 miles south of the Project Site (U.S. Geological Survey [USGS] 2021a). The Kingston Reservation is located approximately 200 miles east of the New Madrid Seismic Zone, which is a 150-mile-long seismic zone extending from Illinois to Arkansas and into portions of five states.

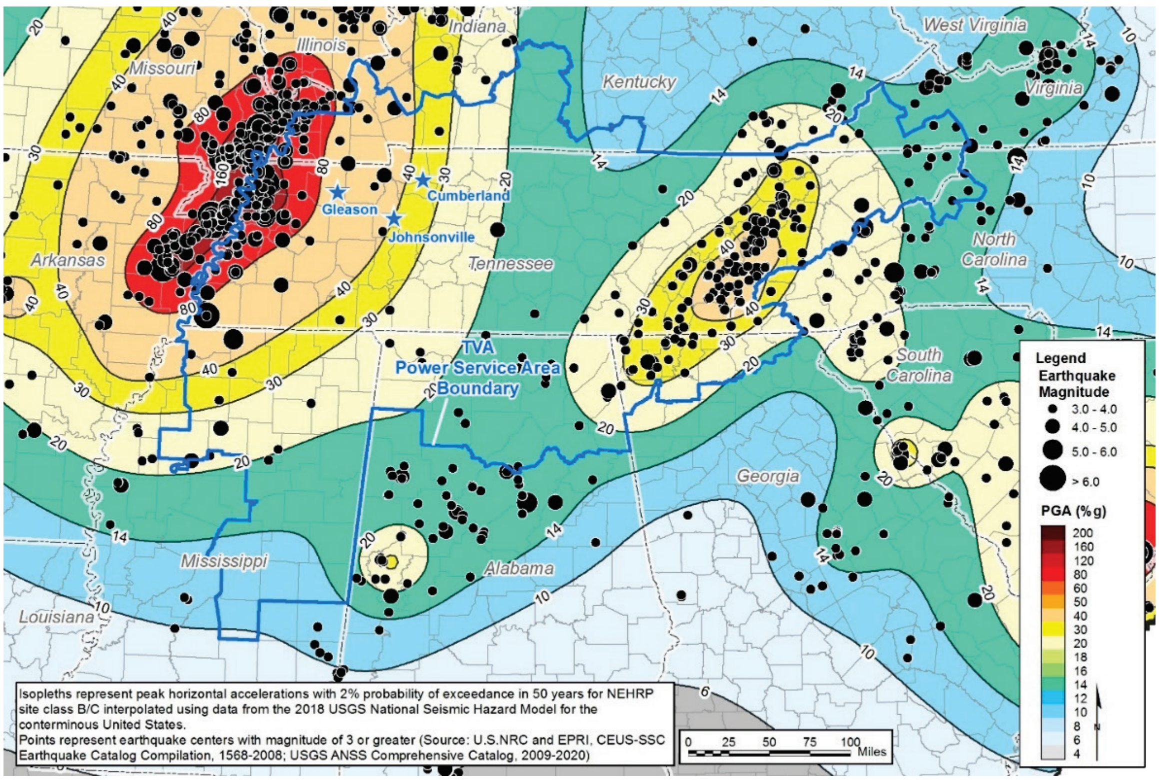

Figure 3.5-2. Seismic Hazards from the New Madrid Seismic Zone and Eastern Tennessee Seismic Zone

(Source: Modified after USGS 2020)

The largest seismic events in the New Madrid Seismic Zone occurred between the years 1811 and 1812 (USGS 2021a). Seismic instrumentation was installed in 1974 to monitor the area and since then, approximately 4,000 earthquakes have been recorded; however, they are typically too small to be felt. The New Madrid Zone is considered a potential source of intraplate earthquakes in the region. A recent study indicated that faults are moving less than 0.2 millimeters per year (Gardner 2009).

3.5.1.1.1.4 Soils

Fourteen soil types have been mapped on the Kingston Reservation. Soil types include soils of the ash disposal area (29 percent); Urban land, 5 to 20 percent slopes (19.7 percent); Waynesboro loam, 6 to 15 percent slopes (11.5 percent); Dewey silt loam, 15 to 25 percent slopes (8.5 percent); Armuchee silt loam, 5 to 12 percent slopes (6.2 percent); and Waynesboro loam, 15 to 25 percent slopes (5.2 percent), with other types of soil consisting of less than 5 percent each (U.S. Department of Agriculture [USDA] 2019a; Table 3.5-1; Figure 3.5-3).

Table 3.5-1. Soils on the Kingston Reservation

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
AmC	Armuchee silt loam, 5 to 12 percent slopes	Not prime farmland	0	77.4	6.2
ASD	Ash disposal area	Not prime farmland	0	364.6	29.0
DeC	Dewey silt loam, 6 to 5 percent slopes	Not prime farmland	0	50.9	4.1
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	106.8	8.5
EtB	Etowah loam, 2 to 6 percent slopes	All areas are prime farmland	0	9.5	0.8
EtC	Etowah silt loam, 6 to 12 percent slopes	Not prime farmland	0	33.6	2.7
FuC	Fullerton-Pailo complex, 5 to 12 percent slopes	Not prime farmland	0	40.3	3.2
FuD	Fullerton-Pailo complex, 12 to 20 percent slopes	Not prime farmland	0	52.6	4.2
MoC	Montevallo channery silt loam, 5 to 12 percent slopes	Not prime farmland	0	15.1	1.2
MoD	Montevallo channery silt loam, 12 to 20 percent slopes	Not prime farmland	0	10.8	0.9
MoE	Montevallo channery silt loam, 20 to 35 percent slopes	Not prime farmland	0	22.0	1.7
UrD	Urban land, 5 to 20 percent slopes	Not prime farmland	0	247.9	19.7
W	Water	Not prime farmland	0	15.5	1.2
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	143.9	11.5
WaD	Waynesboro loam, 15 to 25 percent slopes	Not prime farmland	0	64.7	5.2
			Total	**1,255.6**	**100.0**
		Total Hydric Soils		***0.0***	***0.0***
		Total Prime Farmland		***9.5***	***0.8***

Source: USDA 2019a

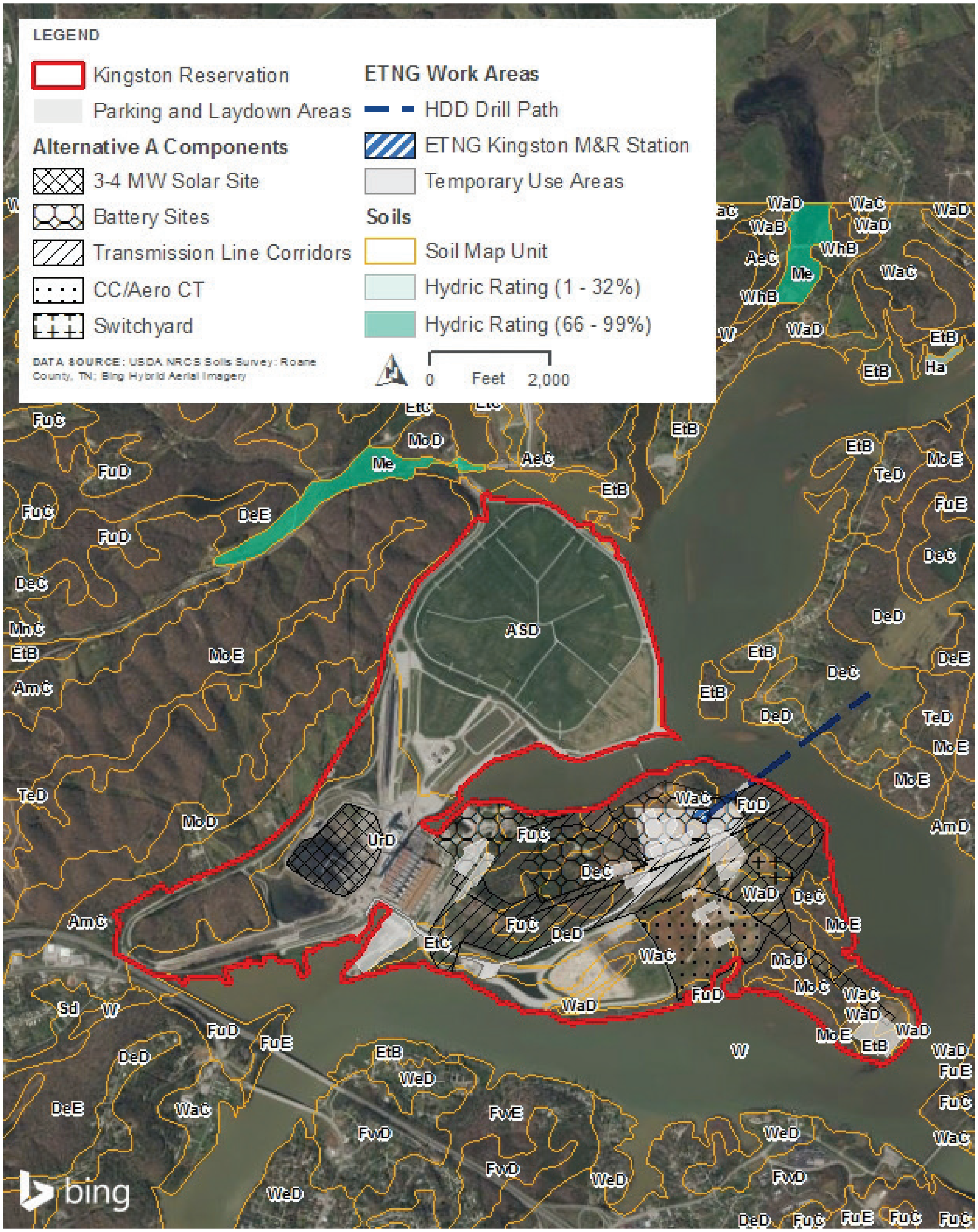

Figure 3.5-3. Soils on the Kingston Reservation (indicated by Soil Map Unit Symbol)

The ash disposal area soils consist of a wide range of textures derived from mainly coal, fly ash, and earthy fill material. The Urban land soils consist of areas where the surface is covered by roads, streets, parking lots, commercial buildings, houses, and other types of impervious ground cover and in places where natural drainage has been altered by a system of ditches and storm drains. The Waynesboro series soils consist of very deep, well drained, moderately permeable soils that formed in old alluvium or unconsolidated material of sandstone, shale, and limestone origin. These soils are on high terraces and uplands with slopes ranging from two to 30 percent and are used for pasture and for crops such as small grains, hay, tobacco, cotton, and truck crops (USDA 2022).

The Dewey series soils consist of very deep, well drained, moderately permeable soils that formed in residuum of limestone or in one to two feet of old alluvium and the underlying residuum from limestone. These soils lie on gently sloping to steep uplands with slopes ranging from two to 40 percent and are used for row crops, small grain, hay, and pasture. The Armuchee series soils consist of moderately deep, well drained soils that formed in residuum of acid shale. These soils are on rolling to very steep uplands with slopes ranging from five to 60 percent and are used for pasture production (USDA 2022). There are no hydric soils within the Kingston Reservation.

3.5.1.1.1.5 Prime Farmland

The term “prime farmland” is assigned by the USDA to land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for such uses. The Farmland Protection Policy Act (FPPA; 7 U.S.C. § 4201 et seq.) requires Federal agencies to consider the adverse effects of their actions on prime or unique farmland. Farmland subject to FPPA requirements does not have to be currently used for cropland. The land can be forested land, pastureland, cropland, or other land, but it cannot be water or urban built-up land. The purpose of the FPPA is “to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.” FPPA does not authorize Federal agencies to regulate the use of private or non-Federal land, or in any way affect the property rights of owners.

Based on soils data obtained from the USDA Web Soil Survey, approximately 9.5 acres (0.8 percent) of the Kingston Reservation (Etowah loam, 2 to 6 percent slopes) are designated as prime farmland, as illustrated on Figure 3.5-4. Table 3.5-1 describes the soil types, including those classified as prime farmland, located on the Kingston Reservation.

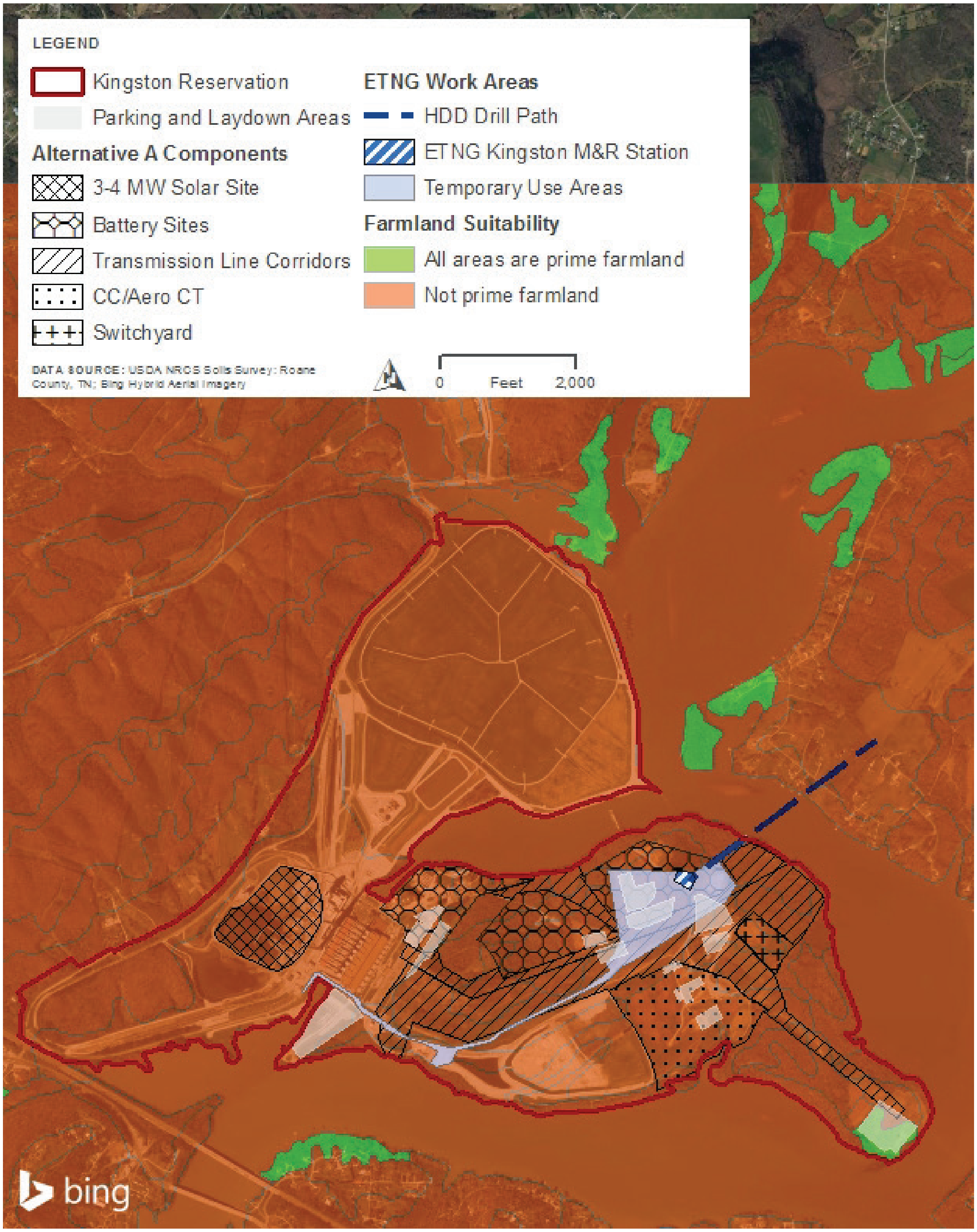

Figure 3.5-4. Soils Classified as Prime Farmland on the Kingston Reservation

3.5.1.1.2 Alternative A

3.5.1.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on Kingston Reservation

Geology, Paleontology, Geological Hazards

The proposed CC/Aero CT Plant site and new transmission line connections and corridors would be located within the Western Valley and Ridge and Cumberland Plateau Physiographic Provinces of TN as described in Section 3.5.1.1.1.

Soils and Prime Farmlands

Five soil types have been mapped within the proposed CC/Aero CT Plant boundary and include Waynesboro loam, 6 to 15 percent slopes (82.9 percent) and Dewey silt loam, 15 to 25 percent slopes (7.6 percent), with other types of soil consisting of less than 4 percent each. The proposed switchyard contains two soil types: Waynesboro loam, 6 to 15 percent slopes (50 percent) and Waynesboro loam, 15 to 25 percent slopes (50 percent) (USDA 2019a; Figure 3.5-3; Table 3.5-2). The parking/laydown area consists of two soil types: Etowah loam, 2 to 6 percent slopes (76.8 percent) and Waynesboro loam, 6 to 15 percent slopes (23.2 percent). The on-site transmission corridor, which crosses the Kingston Reservation peninsula, encompasses 11 soil types, none of which are classified as prime farmland or hydric soil types.

Table 3.5-2. Soils within the proposed CC/Aero CT Plant boundary, Switchyard, and Transmission Line Corridor

Soil Map Unit Symbol	Soil type	Prime Farmland Classification	Hydric Rating	Area (acres)	Percent of Total Area
CC/Aero CT Plant					
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	4.2	7.6
EtC	Etowah silt loam, 6 to 12 percent slopes	Not prime farmland	0	0.5	0.9
FuD	Fullerton-Pailo complex, 12 to 20 percent slopes	Not prime farmland	0	2.1	3.8
W	Water	Not prime farmland	0	1.3	2.4
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	45.6	82.9
WaD	Waynesboro loam, 15 to 25 percent slopes	Not prime farmland	0	1.5	2.7
			Total[1]	**55.2**	**100.0**
Parking and Laydown Area					
EtB	Etowah loam, 2 to 6 percent slopes	All areas are prime farmland	0	6.3	76.8
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	1.9	23.2
			Total[1]	**8.2**	**100.0**

Soil Map Unit Symbol	Soil type	Prime Farmland Classification	Hydric Rating	Area (acres)	Percent of Total Area
Switchyard					
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	4.3	50.0
WaD	Waynesboro loam, 15 to 25 percent slopes	Not prime farmland	0	4.3	50.0
			Total[1]	**8.6**	**100.0**
On-site Transmission Line Corridor					
DeC	Dewey silt loam, 6 to 15 percent slopes	Not prime farmland	0	6.4	5.0
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	46.7	36.5
EtC	Etowah silt loam, 6 to 12 percent slopes	Not prime farmland	0	4.0	3.1
FuC	Fullerton-Pailo complex, 5 to 12 percent slopes	Not prime farmland	0	9.7	7.6
FuD	Fullerton-Pailo complex, 12 to 20 percent slopes	Not prime farmland	0	7.7	6.0
MoC	Montevallo channery silt loam, 5 to 12 percent slopes	Not prime farmland	0	2.1	1.6
MoD	Montevallo channery silt loam, 12 to 20 percent slopes	Not prime farmland	0	1.3	1.0
MoE	Montevallo channery silt loam, 20 to 35 percent slopes	Not prime farmland	0	0.6	0.5
UrD	Urban land, 5 to 20 percent slopes	Not prime farmland	0	1.8	1.4
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	16.6	13.0
WaD	Waynesboro loam, 15 to 25 percent slopes	Not prime farmland	0	31.1	24.3
			Total[1]	**128.0**	**100.0**
			Total Hydric Soils	***0.0***	***0.0***
			Total Prime Farmland	***6.3***	***3.2***

Source: USDA 2019a
[1]Total may vary slightly due to rounding.

The Fullerton series soils consist of very deep, well drained, moderately permeable soils that formed in residuum from cherty limestone. These soils are on upland ridgetops with slopes ranging from 2 to 70 percent and are used for growing pasture, hay, corn, cotton, small grains, and tobacco. The Pailo series soils consist of very deep, somewhat excessively drained gravelly soils that formed in residuum from cherty limestone. These soils are on sloping to very steep upland ridgetops and hillsides with slopes ranging from 5 to 70 percent and are primarily in forested areas but small, cleared areas are used for pasture (USDA 2022). The Waynesboro and Dewey series soils are characterized in Section 3.5.1.1.1.4.

Approximately 6.3 acres of prime farmland are located within the parking/laydown area on the peninsula of the Kingston Reservation. No other prime farmland exists on the Kingston Reservation or within the proposed CC/Aero CT Plant site and associated structures (Figure 3.5-4).

3.5.1.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be situated on 35 acres on a former coal yard on Kingston Reservation.

Geology, Paleontology, Geological Hazards

The proposed 3- to 4-MW solar facility would be located within the Western Valley and Ridge and Cumberland Plateau Physiographic Provinces of TN as described in Section 3.5.1.1.1.

Soils and Prime Farmlands

The proposed 3- to 4-MW solar facility site contains one soil type: Urban land, 5 to 20 percent slopes (100 percent) (USDA 2019b; Figure 3.5-3). The Urban land soils consist of areas where the surface is covered by roads, streets, parking lots, commercial buildings, houses, and other types of impervious ground cover and in places where natural drainage has been altered by a system of ditches and storm drains (USDA 2022).

There are no soils classified as prime farmland within the proposed 3- to 4-MW solar facility site (Figure 3.5-4).

3.5.1.1.2.3 Construction and Operation of a 100-MW Battery Storage Facility on Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.5.1.1.1.1 apply to the proposed 100-MW BESS on the Kingston Reservation.

Geology, Paleontology, Geological Hazards

The proposed 100-MW BESS would be located within the Western Valley and Ridge and Cumberland Plateau Physiographic Provinces of TN as described in Section 3.5.1.1.1.

Soils and Prime Farmlands

Three soil types have been mapped within the proposed Battery Site 1: Urban land, 5 to 20 percent slopes (68.7 percent); Fullerton-Pailo complex, 5 to 12 percent slopes (29.0 percent); and Dewey silt loam, 15 to 25 percent slopes (1.7 percent) (USDA 2019a; Figure 3.5-3; Table 3.5-3). These soils are characterized in the Soils headings in Section 3.5.1.1.2.1 and Section 3.5.1.1.2.2.

Four soil types have been mapped within the proposed Battery Site 2: Dewey silt loam, 6 to 15 percent slopes (52.3 percent); Dewey silt loam, 15 to 25 percent slopes (28.9 percent); Fullerton-Pailo complex, 5 to 12 percent slopes (18.9 percent); and Fullerton-Pailo complex, 12 to 20 percent slopes (0.3 percent) (USDA 2019a; Figure 3.5-3; Table 3.5-3). These soils are characterized in the Soils headings in Section 3.5.1.1.2.1 and Section 3.5.1.1.2.2.

Five soil types have been mapped within the proposed Battery Site 3: Waynesboro loam, 6 to 15 percent slopes (37.5 percent); Dewey silt loam, 15 to 25 percent slopes (29.3 percent); Dewey silt loam, 6 to 15 percent slopes (20.3 percent); Fullerton-Pailo complex, 12 to 20 percent slopes (13.3 percent); and Waynesboro loam, 15 to 25 percent slopes (0.1 percent) (USDA 2019a; Figure 3.5-3; Table 3.5-3). These soils are characterized in the Soils headings in Section 3.5.1.1.2.1 and Section 3.5.1.1.2.2.

Table 3.5-3. Soils within the proposed 100-MW BESS sites and Battery Transmission Line Connections

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Proposed Battery Site 1					
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	0.5	1.7
FuC	Fullerton-Pailo complex, 5 to 12 percent slopes	Not prime farmland	0	8.7	29.0
UrD	Urban land, 5 to 20 percent slopes	Not prime farmland	0	20.6	68.7
W	Water	Not prime farmland	0	0.1	0.3
			Total[1]	**29.9**	**99.7**
Proposed Battery Site 2					
DeC	Dewey silt loam, 6 to 15 percent slopes	Not prime farmland	0	18.3	52.3
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	10.1	28.9
FuC	Fullerton-Pailo complex, 5 to 12 percent slopes	Not prime farmland	0	6.6	18.9
FuD	Fullerton-Pailo complex, 12 to 20 percent slopes	Not prime farmland	0	0.1	0.3
			Total[1]	**35.1**	**100.0**
Proposed Battery Site 3					
DeC	Dewey silt loam, 6 to 15 percent slopes	Not prime farmland	0	8.1	20.3
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	11.7	29.3
FuD	Fullerton-Pailo complex, 12 to 20 percent slopes	Not prime farmland	0	5.3	13.3
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	15.0	37.5
WaD	Waynesboro loam, 15 to 25 percent slopes	Not prime farmland	0	<0.1	0.1
			Total[1]	**40.1**	**100.0**
Proposed Battery Transmission Line Connections					
DeC	Dewey silt loam, 6 to 15 percent slopes	Not prime farmland	0	8.3	20.2
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	9.1	22.2
FuC	Fullerton-Pailo complex, 5 to 12 percent slopes	Not prime farmland	0	7.7	18.8
FuD	Fullerton-Pailo complex, 12 to 20 percent slopes	Not prime farmland	0	11.8	28.8
UrD	Urban land, 5 to 20 percent slopes	Not prime farmland	0	1.5	3.7
W	Water	Not prime farmland	0	0.2	0.5

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	1.1	2.7
WaD	Waynesboro loam, 15 to 25 percent slopes	Not prime farmland	0	1.3	3.2
			Total[1]	**41.0**	**100.0**
			Total Hydric Soils	***0.0***	***0.0***
			Total Prime Farmland	***0.0***	***0.0***

Source: USDA 2019a
[1]Total may vary slightly due to rounding.

There are no soils classified as prime farmland within the proposed 100-MW BESS sites or proposed Battery Transmission Line Connections footprint (Figure 3.5-4).

3.5.1.1.2.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT facilities and switchyard. Eleven soil types have been mapped within the proposed transmission line corridor and include Dewey silt loam, 15 to 25 percent slopes (36.5 percent); Waynesboro loam, 15 to 25 percent slopes (24.3 percent); Waynesboro loam, 6 to 15 percent slopes (13.0 percent); Fullerton-Pailo complex, 5 to 12 percent slopes (7.6 percent); Fullerton-Pailo complex, 12 to 20 percent slopes (6.0 percent); and Dewey silt loam, 6 to 15 percent slopes (5.0 percent), with other types of soil consisting of less than 5 percent each (USDA 2019a; Figure 3.5-3; Table 3.5-2). These soils are characterized in the Soils headings in Section 3.5.1.1.2.1 and Section 3.5.1.1.2.2.

Seven soil types have been mapped within the proposed Battery Transmission Line Connections footprint and the majority are composed of Fullerton-Pailo complex, 12 to 20 percent slopes (28.8 percent); Dewey silt loam, 15 to 25 percent slopes (22.2 percent); Dewey silt loam, 6 to 15 percent slopes (20.2 percent); and Fullerton-Pailo complex, 5 to 12 percent slopes (18.8 percent), with other types of soil consisting of less than 4 percent each (USDA 2019a; Figure 3.5-3; Table 3.5-3). These soils are characterized in the Soils headings in Section 3.5.1.1.2.1 and Section 3.5.1.1.2.2.

3.5.1.1.2.5 Off-site Transmission Upgrades

3.5.1.1.2.5.1 Eastern Transmission Corridor

Geology, Paleontology, and Geological Hazards

The transmission lines (L5108, L5116, L5280, L5302, and L5381) within the Eastern Transmission Corridor are in the western Valley and Ridge Physiographic Province; as such, the affected environment is the same as described in Section 3.5.1.1.1.

Soils and Prime Farmland

The Eastern Transmission Corridor extends eastward from the Kingston Reservation and terminates in the city of Oak Ridge. Forty-four soil types have been mapped on the 1,609-acre Eastern Transmission Corridor that is proposed for transmission upgrades. Approximately 60.4 percent of the area within the Eastern Transmission Corridor is unmapped (labeled as “NOTCOM” on figures) and no digital data are publicly available.

Based on the data available for the remaining area of the Eastern Transmission Corridor, the majority of the mapped soils are composed of Dewey silt loam, 15 to 25 percent slopes (4.5 percent); Fullerton-Pailo complex, 20 to 35 percent slopes (4.3 percent); Fullerton-Pailo complex, 12 to 20 percent slopes (4.3 percent); Dewey silt loam, 20 to 45 percent slopes (3.9 percent); Dewey silt loam, 6 to 15 percent slopes (2.7 percent); Colbert-Lyerly-Rock outcrop complex, 5 to 20 percent slopes (2.6 percent); Armuchee silt loam, 5 to 12 percent slopes (2.3 percent); and Montevallo channery silt loam, 20 to 35 percent slopes (2.1 percent), with other types of soil consisting of less than 2 percent each (USDA 2019b), as illustrated in Figure 3.5-5a through Figure 3.5-5d and summarized in Table 3.5-4. The Capshaw silt loam, 5 to 5 percent slopes; Cedarbluff loam, 0 to 3 percent slopes, occasionally flooded; Chenneby silt loam, frequently flooded; Colbert-Lyerly-Rock outcrop complex, 5 to 20 percent slopes; and Hamblen silt loam, 0 to 2 percent slopes, occasionally flooded, hydric minor component soils have hydric ratings of 0 to 33 percent.

Based on soils data obtained from the USDA Web Soil Survey, approximately 50.8 acres (3.2 percent) of the Eastern Transmission Corridor (L5108, L5302, L5116, L5280, and L5381) proposed for upgrades are designated as prime farmland, as illustrated in Figure 3.5-6a through Figure 3.5-6d. Table 3.5-4 describes the soil types, including those classified as prime farmland, located on the Eastern Transmission Corridor (L5108, L5302, L5116, L5280, and L5381) proposed for upgrades.

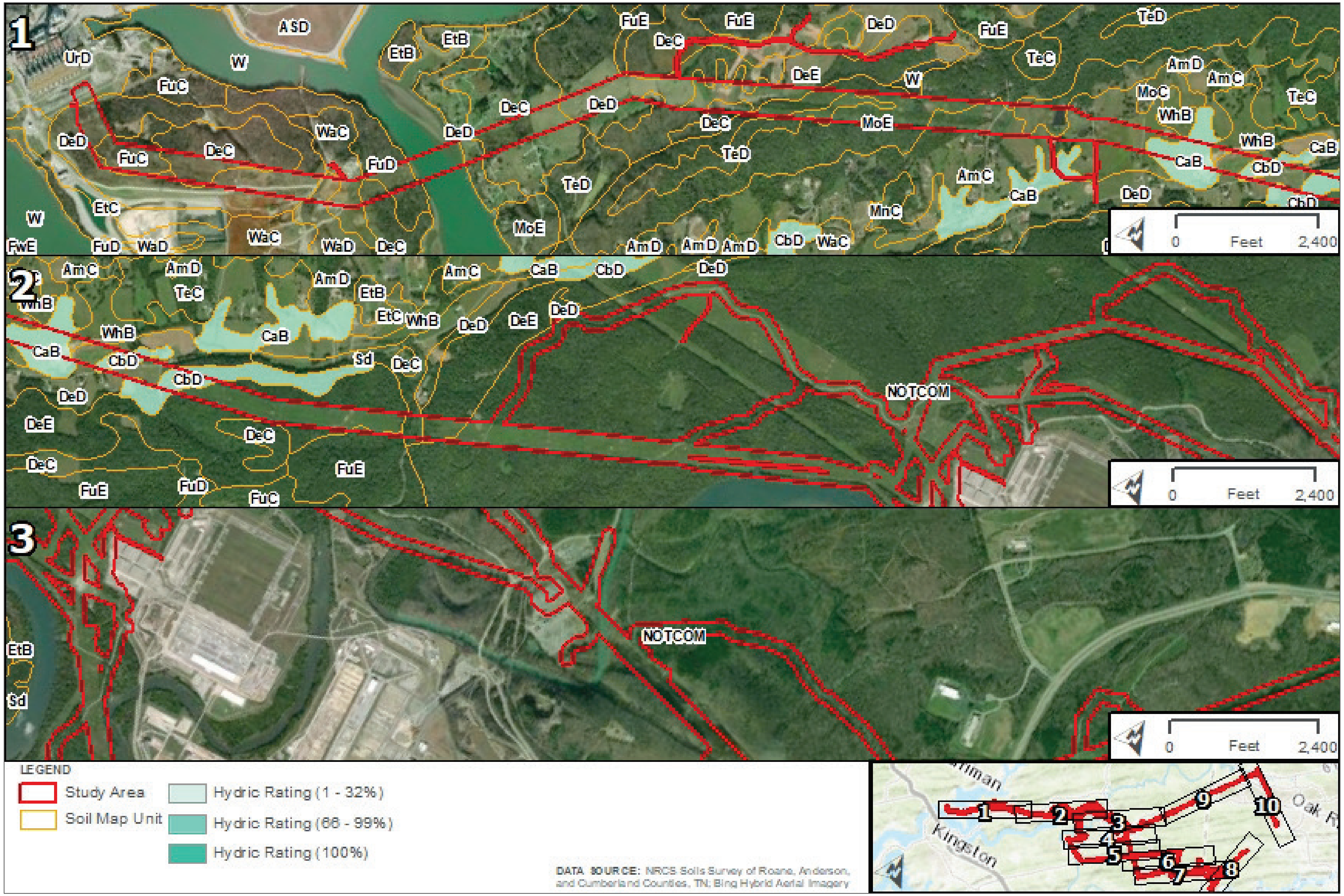

Figure 3.5-5a. Soils (indicated by Soil Map Unit Symbol) in the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

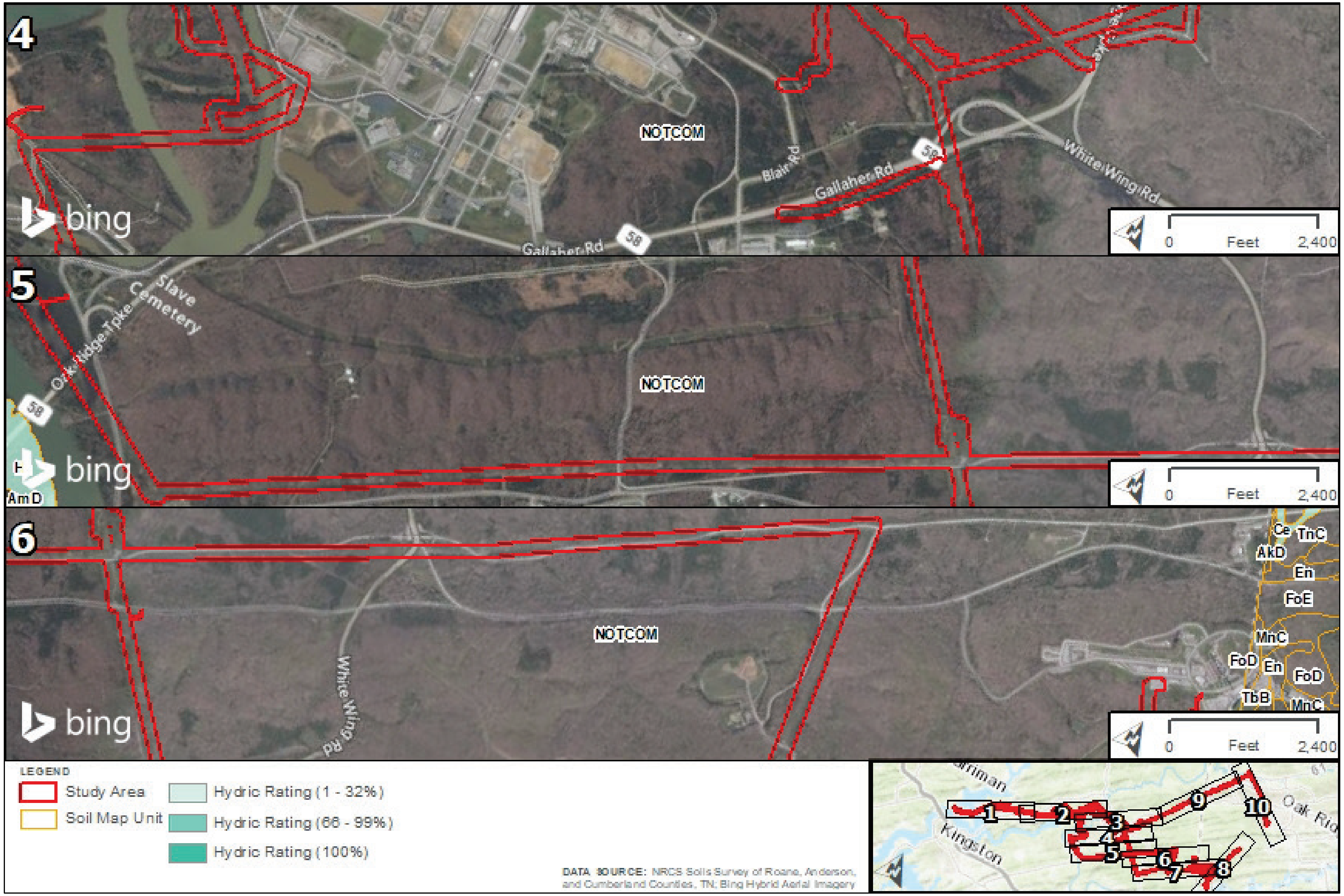

Figure 3.5-5b. Soils (indicated by Soil Map Unit Symbol) in the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

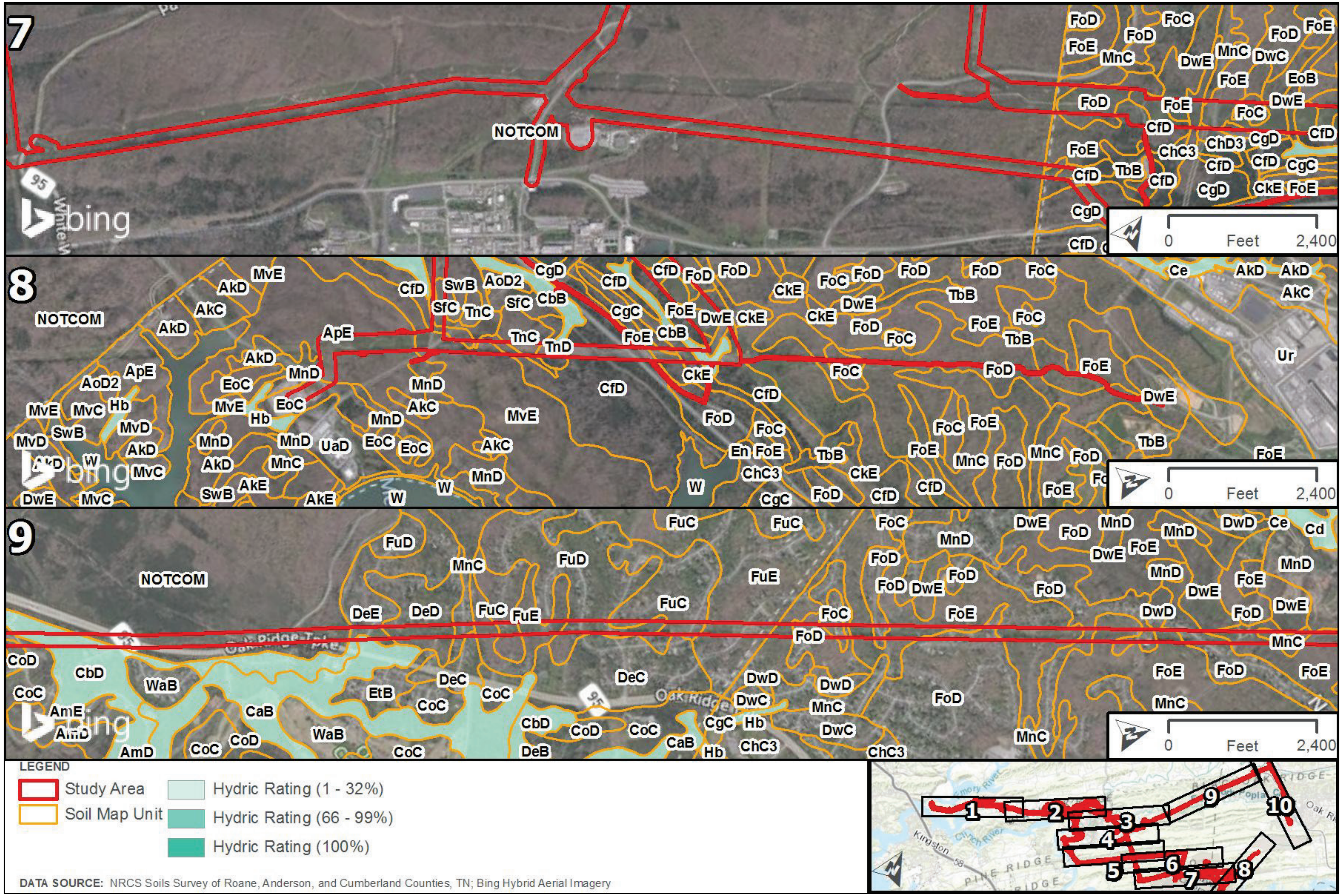

Figure 3.5-5c. Soils (indicated by Soil Map Unit Symbol) in the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

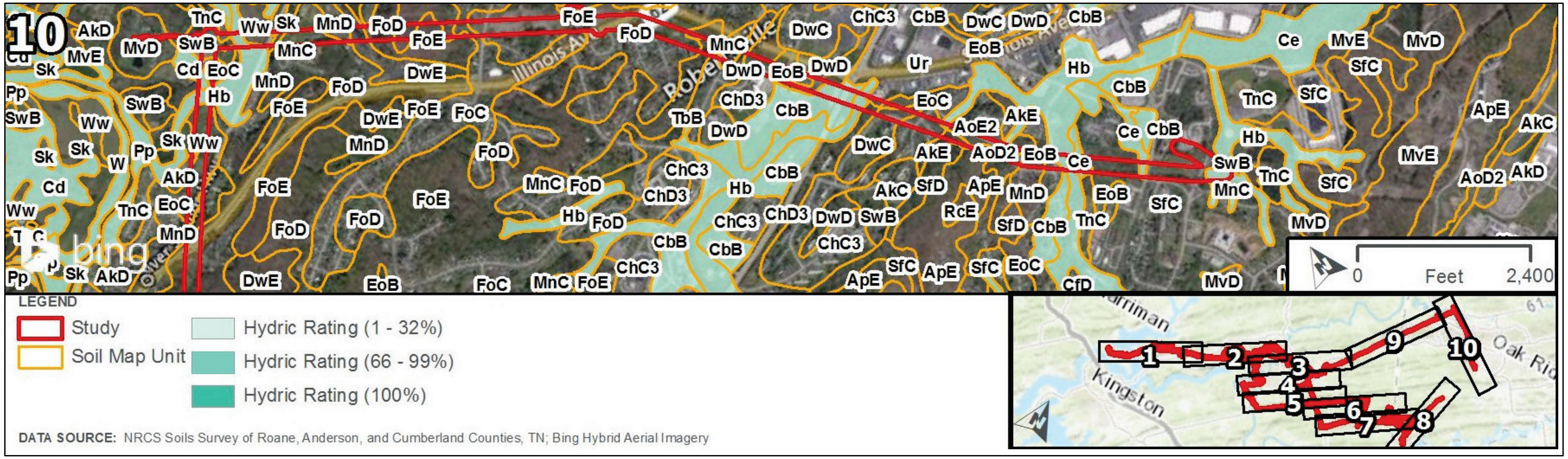

Figure 3.5-5d. Soils (indicated by Soil Map Unit Symbol) in the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

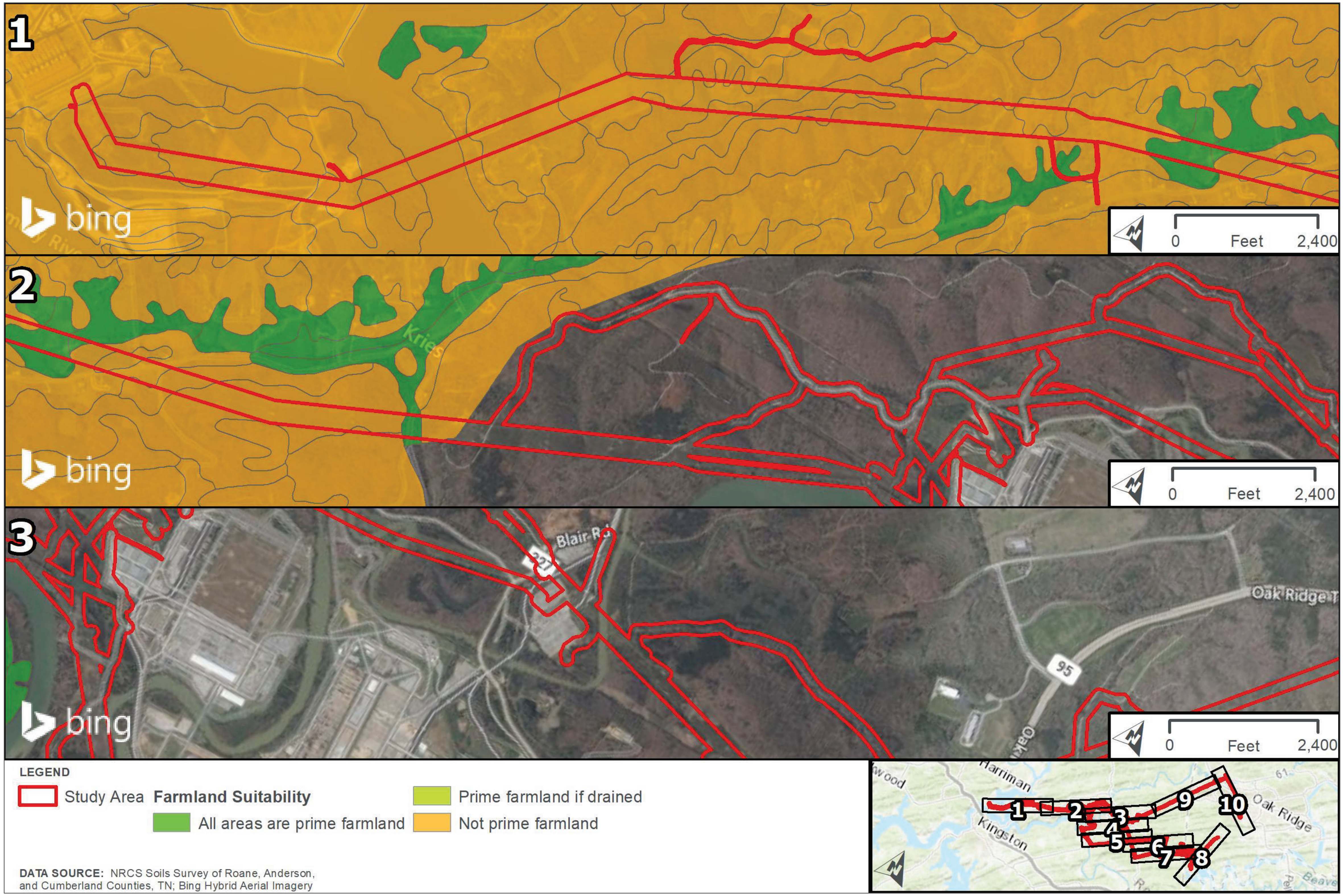

Figure 3.5-6a. Soils Classified as Prime Farmland in the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

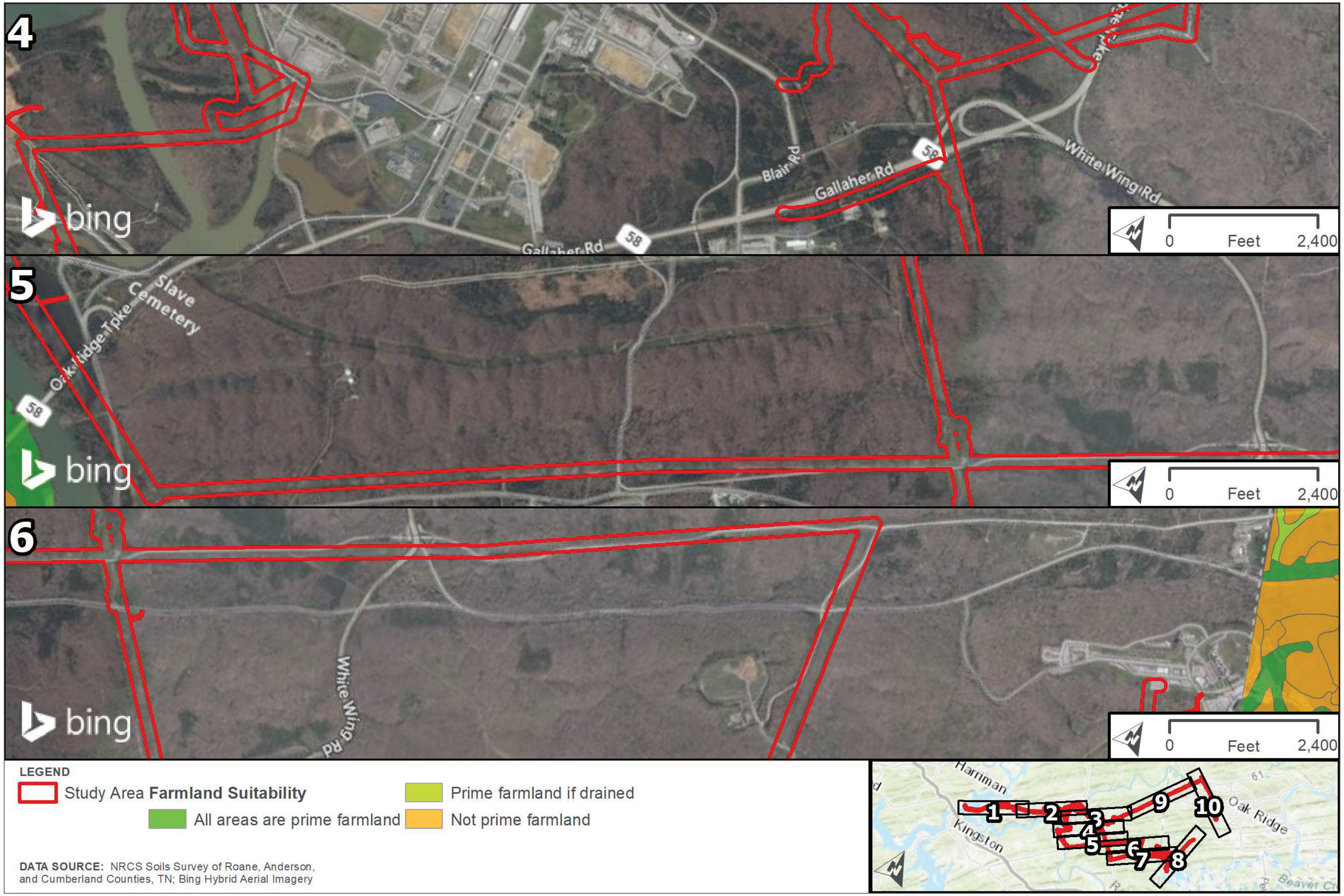

Figure 3.5-6b. Soils Classified as Prime Farmland in the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

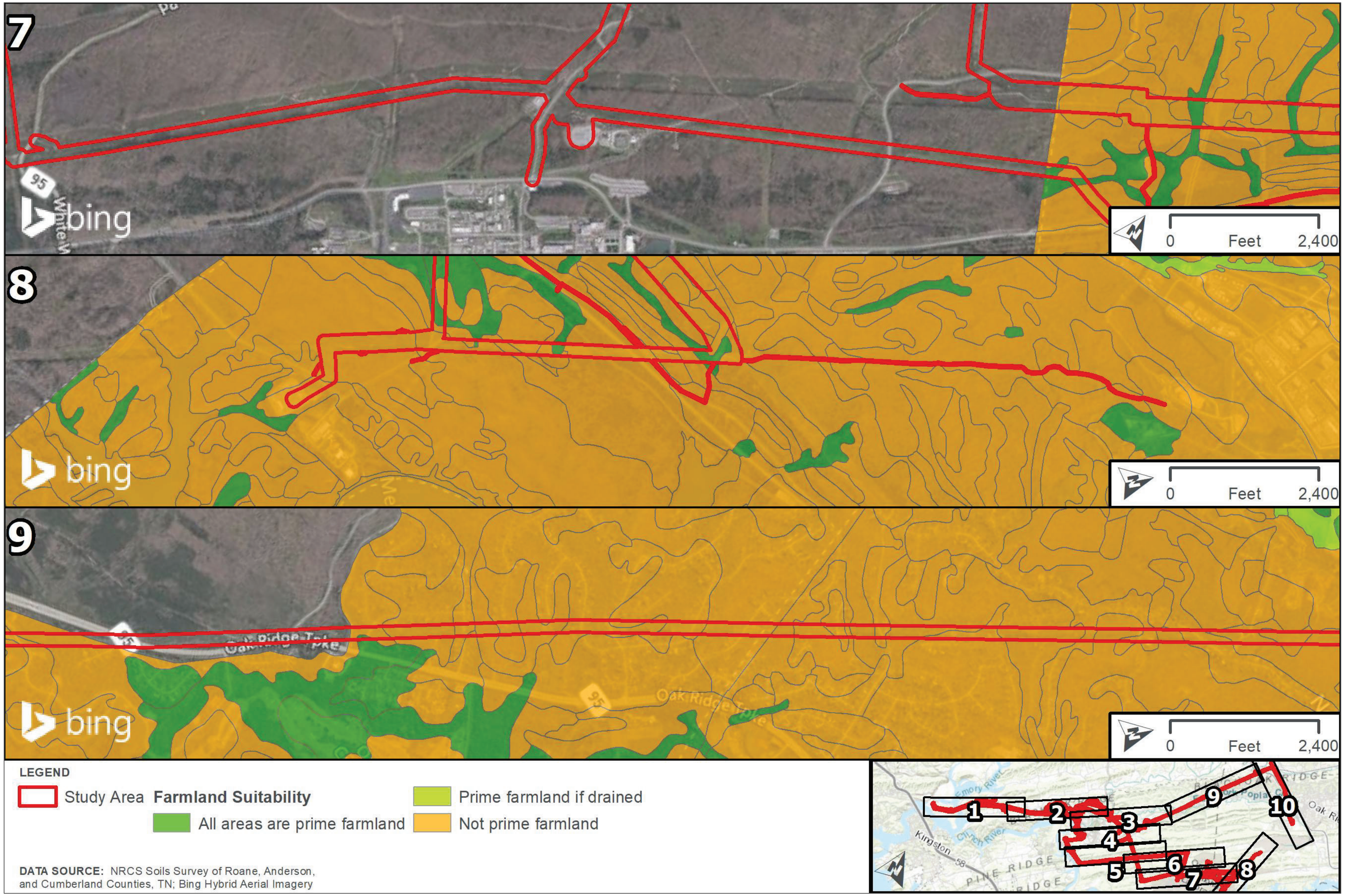

Figure 3.5-6c. Soils Classified as Prime Farmland in the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

Figure 3.5-6d. Soils Classified as Prime Farmland in the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

The Dewey series soils consist of very deep, well drained, moderately permeable soils that formed in residuum of limestone or in 1 to 2 feet of old alluvium and the underlying residuum from limestone. These soils are on gently sloping to steep uplands with slopes ranging from 2 to 40 percent and are used for row crops, small grain, hay, and pasture. The Fullerton series soils consist of very deep, well drained, moderately permeable soils that formed in residuum from cherty limestone. These soils are on upland ridgetops with slopes ranging from 2 to 70 percent and are used for growing pasture, hay, corn, cotton, small grains, and tobacco. The Pailo series soils consist of very deep, somewhat excessively drained gravelly soils that formed in residuum from cherty limestone. These soils lie on sloping to very steep upland ridgetops and hillsides with slopes ranging from 5 to 70 percent and are primarily in forested areas but small, cleared areas are used for pasture. The Colbert series soils consist of deep, moderately well drained, very slowly permeable soils that formed in residuum weathered from argillaceous or shaly limestone. These soils are on uplands of limestone valleys with slopes ranging from 1 to 25 percent and are used for pasture, hay, corn, cotton, and small grains. The Lyerly series soils consist of moderately well drained to well drained, very slowly permeable soils that formed in residuum from limestone bedrock. These soils are on nearly level to moderately steep uplands with slopes ranging from 1 to 25 percent and are used for pasture, corn, grain sorghum, and small grain. The Armuchee series soils consist of moderately deep, well drained soils that formed in residuum of acid shale. These soils are on rolling to very steep uplands with slopes ranging from 5 to 60 percent and are used for pasture production. The Montevallo series soils consist of shallow, well drained, moderately permeable soils that formed in residuum from acid shale or siltstone. These soils lie on hillslopes and ridges with slopes ranging from 2 to 80 percent and are used for pasture, hay, small grain, and row crops (USDA 2022).

Table 3.5-4. Soils in Alternative A of the Eastern Transmission Corridor (L5108, L5302, L5116, L5280, and L5381)

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
AkD	Armuchee silt loam, 12 to 20 percent slopes	Not prime farmland	0	9.5	0.6
AkE	Armuchee silt loam, 20 to 35 percent slopes	Not prime farmland	0	0.9	0.1
AmC	Armuchee silt loam, 5 to 12 percent slopes	Not prime farmland	0	36.2	2.3
AoD2	Armuchee channery silty clay loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	0.4	<0.1
AoE2	Armuchee channery silty clay loam, 20 to 35 percent slopes, eroded	Not prime farmland	0	2.1	0.1
ApE	Armuchee-Montevallo complex, 25 to 60 percent slopes	Not prime farmland	0	13.9	0.9
CaB	Capshaw silt loam, 2 to 5 percent slopes	All areas are prime farmland	6	17.2	1.1
CbD	Colbert-Lyerly-Rock outcrop complex, 5 to 20 percent slopes	Not prime farmland	1	42.4	2.6

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
Cd	Cedarbluff loam, 0 to 3 percent slopes, occasionally flooded	Prime farmland if drained	2	0.7	<0.1
Ce	Chenneby silt loam, frequently flooded	Prime farmland if protected from flooding or not frequently flooded during the growing season	5	1.5	0.1
ChC3	Collegedale clay, 5 to 12 percent slopes, severely eroded	Not prime farmland	0	2.3	0.1
ChD3	Collegedale clay, 12 to 20 percent slopes, severely eroded	Not prime farmland	0	0.8	<0.1
CkE	Collegedale-Rock outcrop complex, 20 to 35 percent slopes	Not prime farmland	0	1.5	0.1
CoC	Collegedale silt loam, 5 to 12 percent slopes	Not prime farmland	0	3.8	0.2
CoD	Collegedale silt loam, 12 to 20 percent slopes	Not prime farmland	0	11.1	0.7
DeC	Dewey silt loam, 6 to 15 percent slopes	Not prime farmland	0	44.0	2.7
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	71.9	4.5
DeE	Dewey silt loam, 20 to 45 percent slopes	Not prime farmland	0	62.3	3.9
DwC	Dewey silt loam, 5 to 12 percent slopes	Not prime farmland	0	1.6	0.1
DwD	Dewey silt loam, 12 to 20 percent slopes	Not prime farmland	0	2.6	0.2
DwE	Dewey silt loam, 20 to 35 percent slopes	Not prime farmland	0	6.5	0.4
EoB	Etowah loam, 2 to 5 percent slopes	All areas are prime farmland	0	4.8	0.3
EoC	Etowah loam, 5 to 12 percent slopes	Not prime farmland	0	12.2	0.8
FoC	Fullerton-Pailo complex, 5 to 12 percent slopes	Not prime farmland	0	23.5	1.5
FoD	Fullerton-Pailo complex, 12 to 20 percent slopes	Not prime farmland	0	69.1	4.3
FoE	Fullerton-Pailo complex, 20 to 35 percent slopes	Not prime farmland	0	69.4	4.3
Hb	Hamblen silt loam, 0 to 2 percent slopes, occasionally flooded, hydric minor component	All areas are prime farmland	3	6.5	0.4

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
MnC	Minvale gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	1.3	0.1
MnC	Minvale silt loam, 5 to 12 percent slopes	Not prime farmland	0	5.4	0.3
MnD	Minvale silt loam, 12 to 20 percent slopes	Not prime farmland	0	6.0	0.4
MoE	Montevallo channery silt loam, 20 to 35 percent slopes	Not prime farmland	0	34.4	2.1
MvD	Montevallo channery silt loam, 12 to 20 percent slopes	Not prime farmland	0	2.6	0.2
NOTCOM	No Digital Data Available	--	0	972.4	60.4
SfC	Salacoa silt loam, 5 to 12 percent slopes	Not prime farmland	0	11.8	0.7
SfD	Salacoa silt loam, 12 to 20 percent slopes	Not prime farmland	0	1.3	0.1
Sk	Shady loam, occasionally flooded	All areas are prime farmland	0	2.9	0.2
SwB	Swafford loam, 2 to 5 percent slopes	All areas are prime farmland	0	7.9	0.5
TbB	Tasso loam, 2 to 5 percent slopes	All areas are prime farmland	0	6.2	0.4
TeD	Townley silt loam, 12 to 20 percent slopes	Not prime farmland	0	7.1	0.4
TnC	Townley silt loam, 5 to 12 percent slopes	Not prime farmland	0	2.4	0.1
Ur	Urban land	Not prime farmland	0	0.5	<0.1
UrD	Urban land, 5 to 20 percent slopes	Not prime farmland	0	2.5	0.2
W	Water	Not prime farmland	0	9.0	0.6
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	6.6	0.4
WaD	Waynesboro loam, 15 to 25 percent slopes	Not prime farmland	0	6.7	0.4
Ww	Whitwell loam, 1 to 4 percent slopes, occasionally flooded	All areas are prime farmland	0	3.1	0.2
			Total	**1,608.8**	**100.0**
			Total Hydric Soils	***0.0*** [1]	***0.0***
			Total Prime Farmland	***50.8***	***3.2***

Source: USDA 2019a

[1]Soils with hydric ratings less than 33 are considered non-hydric (USDA 2013)

3.5.1.1.2.5.2 Western Transmission Corridor

Geology, Paleontology, and Geological Hazards

L5383 is within the Western Transmission Corridor located north of Crossville and within the Cumberland Plateau Physiographic Province. The Cumberland Plateau lies between the Ridge and Valley and Highland Rim and reaches elevations between 600 to 3,000 feet in elevation. It is comprised of Pennsylvania age conglomerate, sandstone, siltstone, and shale and Mississippian to Ordovician age limestone, dolomite, and shale. The Crossville Fault, part of the Cumberland Plateau Overthrust, trends northeast to southwest and crosses the L5383 transmission corridor near the eastern extent of the proposed transmission corridor upgrades (Watkins 1964).

The paleontology and geologic hazards associated with the Western Transmission Corridor upgrades is generally the same as described in Section 3.5.1.1.2.

Soils and Prime Farmland

The Western Transmission Corridor (for L5383) extends southeastward from a substation in unincorporated Crossville, on Plateau Road and terminates north of the Crossville city limits (Figure 3.5-7). Eight new access roads are proposed along the route in agricultural areas. Eighteen soil types have been mapped on the Western Transmission Corridor proposed for upgrades and the majority are composed of Lily loam, 6 to 12 percent slopes (38.5 percent); Lily loam, 2 to 6 percent slopes (22.2 percent); Ramsey-Rock outcrop complex, 12 to 20 percent slopes (13.9 percent); and Lily-Lonewood complex, 5 to 12 percent slopes, rocky (10.3 percent) (Table 3.5-5). All other soils were less than 10 percent of the Western Transmission Corridor (USDA 2019b). The Atkins loam, frequently flooded and Bonair loam, occasionally flooded, soils have a hydric rating of 100 percent.

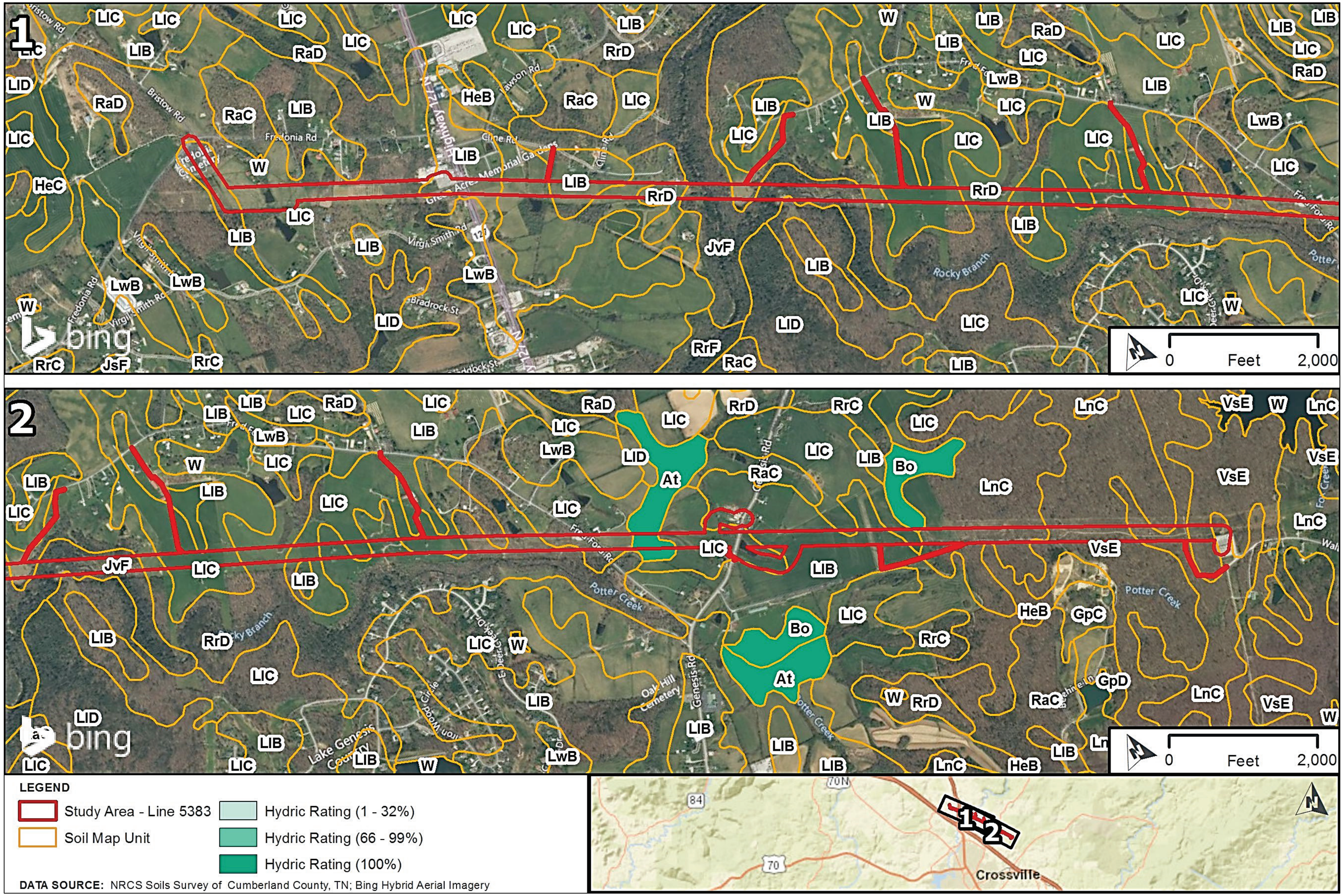

Figure 3.5-7. Soils (indicated by Soil Map Unit Symbol) in the Western Transmission Corridor Proposed for Upgrades under Alternative A

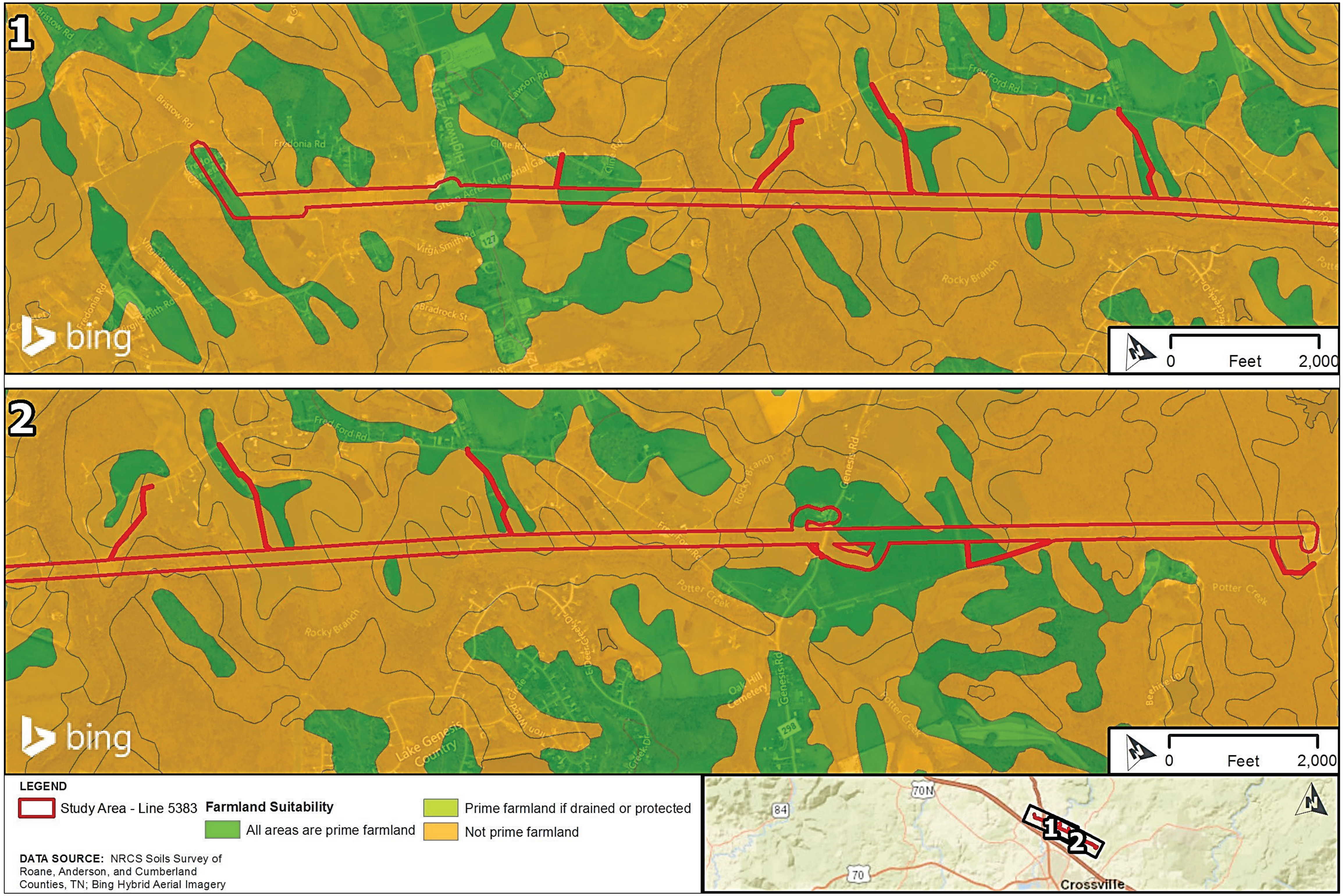

Figure 3.5-8. Soils Classified as Prime Farmland in the Western Transmission Corridor under Alternative A

Table 3.5-5. Soils on the Western Transmission Corridor (L5383) under Alternative A

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
At	Atkins loam, frequently flooded	Not prime farmland	100	2.1	1.7
Bo	Bonair loam, occasionally flooded	Not prime farmland	100	0.1	<0.1
HeB	Hendon silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	<0.01	<0.1
JvF	Jefferson-Varilla-Shelocta complex, 20 to 60 percent slopes, very stony	Not prime farmland	0	9.5	7.3
Llb	Lily loam, 2 to 6 percent slopes	All areas are prime farmland	0	28.8	22.2
LlC	Lily loam, 6 to 12 percent slopes	Not prime farmland	0	49.9	38.5
LnC	Lily-Lonewood complex, 5 to 12 percent slopes, rocky	Not prime farmland	0	13.3	10.3
RrD	Ramsey-Rock outcrop complex, 12 to 20 percent slopes	Not prime farmland	0	18.0	13.9
VsE	Varilla-Shelocta complex, 15 to 30 percent slopes, very rocky	Not prime farmland	0	8.0	6.2
			Total	**129.7**	**100.0**
			Total Hydric Soils	***2.2***	***1.7***
			Total Prime Farmland	***28.8***	***22.2***

Source: USDA 2019a

The Lily series of soils consist of moderately deep, well drained soils that formed in residuum weathered primarily from sandstone. These soils are on upland ridges and hillsides with slopes ranging from 0 to 65 percent and are used for growing corn, tobacco, small grains, hay, and pasture. The Ramsey series soils consist of shallow and very shallow, somewhat excessively drained soils that formed in residuum or colluvium weathered from sandstone or quartzite. These soils are on plateaus and upper slopes of mountains with slopes ranging from 3 to 70 percent and are used for pasture area (USDA 2021). Based on soils data obtained from the USDA Web Soil Survey, approximately 28.8 acres (22.2 percent) of the L5383 corridor proposed for transmission line upgrades are designated as prime farmland, as summarized in Table 3.5-5 and illustrated on Figure 3.5-8.

3.5.1.1.2.6 Construction and Operation of a Natural Gas Pipeline Corridor and Associated Structures

The environmental impact analysis presented in the following sections first uses publicly available resources and information to perform a desktop evaluation of potentially affected resources within Study Area that TVA defined, which includes the ETNG Construction ROW. Those sections have been updated in this EIS where site-specific survey data were provided in ETNG's Resource Report 6 (ETNG 2023g) and Resource Report 7 (ETNG 2023h), filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the geology-related findings in ETNG's Resource Report 6 and soil-related findings in Resource Report 7. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q).

Geology

The ETNG Construction ROW transects several physiographic provinces of TN, including the Valley and Ridge and Cumberland Plateau as described in Section 3.5.1.1.1.1. Going westward from KIF in the Valley and Ridge Physiographic Province, the proposed ETNG Construction ROW would cross the Cumberland Plateau, then the Eastern Highland Rim, and terminate within the Nashville Basin Physiographic Province. ETNG states in Resource Report 6 as follows (ETNG 2023g):

> The [natural gas] pipeline facilities are located in north-central/south Tennessee and will start in Trousdale County near Hartsville, Tennessee, extend east-southeast approximately 122.4 miles, and end in Roane County near Kingston, Tennessee. According to the [TDEC] Generalized Geologic Map of Tennessee (TDEC 2022a), the [Ridgeline Expansion] project facilities will cross formations formed in the Paleozoic era, The overall geology for the counties of Trousdale, Smith, and Jackson are generally dominated by Ordovician-aged sedimentary rocks, including limestone, shale, dolomite, siltstone, sandstone and claystone. Moving east along the [Ridgeline Expansion] project route, the eastern portion of Jackson, Overton, and the western portion of Fentress Counties are dominated by Mississippian-aged rocks including limestone, chert, shale, siltstone, sandstone, and dolomite. Continuing east, eastern Fentress County and Morgan County are dominated by Pennsylvanian-aged sedimentary rocks, including sandstone, shale, conglomerate, siltstone and coal. Continuing to the [Ridgeline Expansion] project terminus, the western portion of Roane County is dominated by Ordovician-Cambrian sedimentary rocks including dolomite, limestone, shale, chert, siltstone and sandstone.

Additionally, ETNG has identified that from milepost 35.8 to milepost 39.1, the proposed ETNG Construction ROW would cross areas of geologic interest known as the Flynn Creek impact structure and Hawkins Impact Cave. ETNG is currently communicating with the landowner and evaluating route options in this area. Of these structures, ETNG states in Resource Report 6 (ETNG 2023g) that:

> The Hawkins Cave lies in the core of the central uplift of the Flynn Creek impact structure. The Hawkins Cave is the only cave in the world known to have formed inside the central uplift of a complex impact crater. The cave was discovered in 1989 by a local landowner, Michael Hawkins, and mapped in 2003. It was formed where water penetrated the major faults from the impact, preferentially dissolving limestone along these major faults, and over time, dissolved them away. As the

water table continued to drop, collapse along bedding planes and microfractures enlarged the Hawkins Cave passages. The Hawkins Cave features two large rooms.

The Hawkins Impact Cave is located in the Flynn Creek breccia and the pipeline will be located within the Fort Payne Formation, which are vertically separated by the 60-foot-thick Chattanooga shale. Figure 6 of Attachment 1 of the Phase III Karst Geohazard Report provided in Appendix 6D [of Resource Report 6 [ETNG 2023g)] depicts a cross-sectional view of the Hawkins Cave in relation to the [Ridgeline Expansion] project.

The Flynn Creek impact structure, located in north-central Tennessee, is a Late Devonian, 3.8-kilometer diameter, marine target impact crater, which formed in an epicontinental shelf setting. The Flynn Creek impact structure is thought to be the result of an extremely shallow meteorite impact that occurred in a shallow marine environment (approximately 10 meters of sea water) and approximately 382 million years ago (O'Dale 2022). Following impact, the bedrock was uplifted approximately 450 meters above their normal stratigraphic positions, forming a prominent 0.75-kilometer diameter central peak, which was buried by Devonian/Mississippian-aged marine sediment that later became the Chattanooga Shale, Fort Payne, and other formations (Ford 2015). The central peak is crossed by the [Ridgeline Expansion] project between MP 37.1 and MP 37.5. When formed, the crater was likely about 100 to 120 meters deep relative to the surrounding surface (O'Dale 2022).

The Flynn Creek Impact Structure crater fill has been recently separated into four parts, a non-bedded breccia, a bedded breccia, a coarse-grained dolomitic sandstone, and fine-grained dolomite. Collectively, these rock types are sometimes referred to as the Flynn Creek Formation, which is only found within the crater. The Flynn Creek Formation is not identified as such on available [USGS] geologic maps. USGS boreholes have identified the Flynn Creek Formation as 111 meters (364 feet) thick. The basal breccia unit in the Flynn Creek Impact Structure is the non-bedded breccia, composed of angular and unsorted limestone with minor dolomite and chert clasts up to 0.3 meter in diameter. The bedded breccia overlies the non-bedded breccia also contains angular and unsorted limestone, minor dolomite, and chert clasts; however, the clasts are smaller (up to 0.1 meter), and also include shale clasts. Localized crossbedding has been found in the bedded breccia, inferring a marine depositional environment. The coarse-grained dolomitic sandstone is between three and six meters thick and composed of reworked and sorted carbonate and dolomite breccia. The coarse-grained dolomitic sandstone has a sharp upper contact with the fine-grained dolomite, which is a light brown to medium gray, laminated to thin-bedded dolomite unit, which is up to three meters thick and has been described as conformable with the Chattanooga Shale (Ford 2015).

In a post-impact phase, the Upper Devonian Chattanooga Shale was deposited in the impact crater and across what was then a shallow marine shelf. The ejecta blanket, terraced crater rim, crater-moat breccias, and central uplift were subjected to intensive erosion. This episode of erosion was followed by local transgression of the Kaskaskia Sea, which subsequently inundated the area. After Chattanooga Shale was deposited over the area including the crater, hundreds of meters of other types of sediments were deposited in the same area. Regional uplift along the Nashville Dome has accelerated erosion in the Flynn Creek Impact Structure, which has generated an extensive valley network that cuts into, and thus helps expose, the terraced rim, breccia fill, and central peak (O'Dale 2022). Following deposition of the Chattanooga Shale and Fort Payne Formation, hundreds of meters of other sediments were deposited following regional uplift in the area of the Nashville Dome. Subsequent erosion has resulted in a network of stream valleys and rugged terrain characterizing the area and also exposing rock units at and in the vicinity of the Flynn Creek impact structure. The [Ridgeline Expansion] project will be installed within the Fort Payne Formation.

The Flynn Creek Impact Structure was studied by [the National Aeronautics and Space Administration (NASA)] in advance of moon landing missions (Ford 2015); this and Hawkins Cave continue to be the site of geological research for several universities. The USGS completed 21 core-holes in different features of the Flynn Creek Impact Structure between 1967 and 1979. The [Ridgeline Expansion] project traverses the Flynn Creek Impact Structure within proximity to several of the USGS core-holes, as shown in Figure 3 of Attachment 2 of the Phase III Karst Geohazard Report included in Appendix 6D [of Resource Report 6 (ETNG 2023g)]. Core-hole 12 was located during field reconnaissance and is located approximately 50 feet from the staked [Ridgeline Expansion] project centerline. Reanalysis of the USGS drill cores is ongoing and a recent study identified the Flynn Creek impact breccia is mostly dolostone clasts (90 percent), with minor amounts of cryptocrystalline melt clasts, chert and shale fragments, and clastic grains. The cryptocrystalline melt clasts are the first melt clasts reported from the Flynn Creek Impact Structure and are made of very small quartz crystals (Adrian 2017).

Paleontology

The paleontology associated with the 122-mile ETNG Construction ROW is the same as described in Section 3.5.1.1.1.2. While fossils may be found throughout the state, unique paleontological resources are not known to exist within the ETNG Construction ROW based on a review of desktop resources (TDEC 2022b). The natural gas pipeline would have the potential to encounter paleontological resources; however, encountering unique and/or significant paleontological resources would be unexpected.

Geological Hazards

The geological hazards associated with the eastern portion of the 122-mile ETNG Construction ROW are the same as described in Section 3.5.1.1.1. The corridor may transverse steep slopes and rugged natural areas as it crosses from the Valley and Ridge Physiographic Province into the Cumberland Plateau and may do so again as it crosses from the Eastern Highland Rim Physiographic Province into the Nashville Basin. Therefore, landslides could be a potential risk along the ETNG Construction ROW. Landslides have a higher likelihood in areas with increased steeper slopes. Landslides can be initiated by rainfall, snowmelt, changes in water level, stream erosion, changes in groundwater, earthquakes, disturbance by human activities, or any combination of these activities. Review of USGS fault mapping indicates that there are no active faults within the ETNG Construction ROW (USGS 2020).

Based on a review of the USGS Peak Ground Acceleration Map (USGS 2020), the ETNG Construction ROW is located in low to moderate seismic hazard areas. From this, it is noted that earthquakes and seismic hazards are unlikely to occur in the ETNG Construction ROW. In addition, given the low potential for earthquakes to occur in the vicinity of the ETNG Construction ROW, the potential for soil liquefaction to occur in the ETNG Construction ROW is low. ETNG evaluated the risks associated with slope instability based on available USGS maps. Land areas are categorized by USGS based on susceptibility to landslides, as well as past incidence of landslides. The pipeline project would cross areas in the following risk categories: low susceptibility and incidence, moderate susceptibility and incidence, high susceptibility and low incidence, and high susceptibility and moderate incidence, as summarized in Table 3.5-6, taken from ETNG Resource Report 6 (ETNG 2023g).

Table 3.5-6. Landslide Susceptibility and Incidence Summary

County, State	Milepost Begin	Milepost End	Landslide Susceptibility and Incidence
Trousdale, Smith, and Jackson, TN	0.0	30.0	Low susceptibility and incidence
Jackson and Putnam, TN	30.0	48.5	Moderate susceptibility and incidence
Putnam, TN	48.5	56.5	Low susceptibility and incidence
Putnam and Overton, TN	56.5	65.5	Moderate susceptibility and incidence
Overton, Fentress, and Morgan TN	65.5	87.0	High susceptibility, low incidence
Morgan and Roane, TN	87.0	122.4	High susceptibility, moderate incidence

Source: ETNG 2023g

Ground subsidence, involving the localized or regional lowering of the ground surface, may be caused by karst dissolution, sediment compaction, oil and gas extraction, underground mines, and groundwater pumping. In many areas of Middle TN, the bedrock is limestone and is usually exposed at the surface, forming rocky ledges and barrens. These areas also develop into karst landscapes. The ETNG Construction ROW crosses areas with high sensitivity to karst and a high incidence of sinkhole and cave development (TN Cave Survey 2001). Based on the presence of carbonate rocks at or near the land surface, the proposed pipeline would likely cross karst areas in Trousdale, Smith, Jackson, Putnam, Overton, and Roane counties. Preliminary analysis indicates that the ETNG Construction ROW would traverse seven potential karst areas for a total of approximately 55 miles (with the shortest crossing being one mile, and the longest crossing being over 18 miles) (ETNG 2023g). An estimated 1,515 acres, or 51 percent of the ETNG Construction ROW, contains geology favorable for karst terrain.

Soils

Approximately 185 unique soil types are mapped within the ETNG Construction ROW (USDA 2019a; Table 3.5-7). These soils range from somewhat excessively drained to poorly drained and are dominated by silty loam textures. These soils have a deep depth to the root restrictive layer, at which soil conditions become unfavorable to root penetration. They typically do not flood or pond and rarely meet hydric criteria.

Table 3.5-7. Soils within the ETNG Construction Right-of-Way

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
AaC3	Allen clay loam, 5 to 12 percent slopes, severely eroded	Not prime farmland	0	3.0	0.2
Ac	Allegheny-Cotaco complex, occasionally flooded	All areas are prime farmland	2	30.4	1.6
AmB	Allen loam, 2 to 5 percent slopes	All areas are prime farmland	0	1.1	0.1
AmB2	Armour silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	24.6	1.3
AmC	Allen loam, 5 to 12 percent slopes	Not prime farmland	0	0.8	<0.1
AmC	Armuchee silt loam, 5 to 12 percent slopes	Not prime farmland	0	0.4	<0.1
AmC2	Armour silt loam, 5 to 12 percent slopes	Not prime farmland	0	4.6	0.2
AmD	Allen loam, 12 to 20 percent slopes	Not prime farmland	0	3.3	0.2
AmD	Armuchee silt loam, 12 to 20 percent slopes	Not prime farmland	0	1.1	0.1
AmD2	Armour silt loam, 12 to 20 percent slopes	Not prime farmland	0	5.7	0.3
Ar	Arrington silt loam, 0 to 2 percent slopes, occasionally flooded	All areas are prime farmland	0	21.8	1.1
AwE	Ashwood-Mimosa-Rock outcrop complex, 15 to 45 percent slopes	Not prime farmland	0	47.7	2.4
BaC	Barfield-Rock outcrop complex, 5 to 20 percent slopes	Not prime farmland	0	7.5	0.4
BaC2	Sengtown gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	1.9	0.1
BaE	Baxter cherty silt loam, 20 to 30 percent slopes	Not prime farmland	0	14.0	0.7
BaF	Barfield-Gladdice-Rock outcrop complex, 30 to 70 percent slopes	Not prime farmland	0	27.9	1.4
BcD3	Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded	Not prime farmland	0	0.6	<0.1
BcE3	Sengtown gravelly silty clay loam, 20 to 30 percent slopes, severely eroded	Not prime farmland	0	0.9	<0.1
BcF	Barfield-Ashwood-Rock outcrop complex, 20 to 50 percent slopes	Not prime farmland	0	13.8	0.7
BeB	Bewleyville silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	3.1	0.2

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
BeC	Bewleyville silt loam, 5 to 12 percent slopes	Not prime farmland	0	1.0	0.1
BeC2	Bewleyville silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	10.1	0.5
BfC	Barfield-Ashwood-Rock outcrop complex, 5 to 20 percent slopes	Not prime farmland	0	65.6	3.4
BfF	Barfield-Ashwood-Rock outcrop complex, 20 to 50 percent slopes	Not prime farmland	0	10.3	0.5
Bm	Bethesda-mines pit complex, 10 to 80 percent slopes	Not prime farmland	0	9.8	0.5
BmC3	Bewleyville silty clay loam, 5 to 12 percent slopes, severely eroded	Not prime farmland	0	2.3	0.1
BrC2	Bradyville silt loam, 5 to 12 percent slopes	Not prime farmland	0	<0.1	<0.1
ByB	Byler silt loam, 1 to 4 percent slopes	All areas are prime farmland	0	11.7	0.6
ByF	Bouldin and Grimsley soils, 20 to 70 percent slopes, very stony	Not prime farmland	0	1.7	0.1
CcC3	Christian silty clay loam, 5 to 12 percent slopes, severely eroded	Not prime farmland	0	3.3	0.2
CcD3	Christian silty clay loam, 12 to 20 percent slopes, severely eroded	Not prime farmland	0	6.6	0.3
CcE3	Christian silty clay loam, 20 to 30 percent slopes, severely eroded	Not prime farmland	0	2.8	0.1
ChC	Christian loam, 5 to 12 percent slopes	Not prime farmland	0	1.8	0.1
ChC2	Christian loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	11.4	0.6
ChD2	Christian loam, clay loam substratum, 12 to 20 percent slopes, eroded	Not prime farmland	0	5.4	0.3
ChE	Christian loam, 20 to 30 percent slopes	Not prime farmland	0	1.6	0.1
CkB	Clarkrange loam, 2 to 5 percent slopes	All areas are prime farmland	0	0.2	<0.1
CpB	Capshaw silt loam, 2 to 6 percent slopes	All areas are prime farmland	0	6.0	0.3
CrC2	Christian silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	10.3	0.5
DaF	Dellrose and Mimosa soils, 20 to 60 percent slopes	Not prime farmland	0	3.6	0.2
DeC	Dellrose gravelly silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	11.2	0.6
DeC	Dewey silt loam, 6 to 15 percent slopes	Not prime farmland	0	4.2	0.2
DeD	Dewey silt loam, 15 to 25 percent slopes	Not prime farmland	0	11.8	0.6
DeE	Dewey silt loam, 20 to 45 percent slopes	Not prime farmland	0	8.3	0.4

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
DeF	Dellrose gravelly silt loam, 20 to 45 percent slopes, eroded	Not prime farmland	0	0.1	<0.1
Dk	Dickson silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	9.9	0.5
DkC2	Dickson silt loam, 5 to 12 percent slopes	Not prime farmland	0	0.3	<0.1
Eg	Egam silt loam, occasionally flooded	All areas are prime farmland	0	14.2	0.7
En	Ennis silt loam, local alluvium	All areas are prime farmland	0	1.1	0.1
FuC	Fullerton-Pailo complex, 5 to 12 percent slopes	Not prime farmland	0	1.4	0.1
FuD	Fullerton-Pailo complex, 12 to 20 percent slopes	Not prime farmland	0	0.5	<0.1
FuE	Fullerton-Pailo complex, 20 to 35 percent slopes	Not prime farmland	0	10.4	0.5
GnC	Gilpin silt loam, 5 to 12 percent slopes	Not prime farmland	0	45.0	2.3
GnD	Gilpin silt loam, 12 to 20 percent slopes	Not prime farmland	0	35.8	1.8
GpC	Gilpin loam, 5 to 12 percent slopes	Not prime farmland	0	2.5	0.1
GpD	Gilpin loam, 12 to 20 percent slopes	Not prime farmland	0	4.1	0.2
GpE	Gilpin loam, 20 to 40 percent slopes	Not prime farmland	0	24.4	1.2
GpE	Gilpin-Petros complex, 20 to 35 percent slopes	Not prime farmland	0	30.1	1.5
GpF	Gilpin-Petros complex, 35 to 80 percent slopes	Not prime farmland	0	10.2	0.5
GsF	Gilpin-Boulin-Petros complex, 25 to 80 percent slopes, very stony	Not prime farmland	0	19.4	1.0
GsF	Gilpin-Shelocta complex, 40 to 70 percent slopes	Not prime farmland	0	9.0	0.5
Ha	Hamblen silt loam, 0 to 3 percent slopes, occasionally flooded, hydric minor component	All areas are prime farmland	4	8.1	0.4
HaB	Hartsells loam, 2 to 5 percent slopes	All areas are prime farmland	0	1.8	0.1
HaC	Hartsells loam, 5 to 12 percent slopes	Not prime farmland	0	0.7	0.1
HaC2	Hampshire silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	1.9	0.1
HaC2	Hartsells loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	3.1	0.2
HaD2	Hampshire silt loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	6.9	0.4
HbD	Hawthorne gravelly silt loam, 5 to 20 percent slopes	Not prime farmland	0	11.2	0.6

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
HbF	Hawthorne gravelly silt loam, 20 to 60 percent slopes	Not prime farmland	0	63.2	3.2
HhB2	Harpeth silt loam, 2 to 5 percent slopes, eroded	All areas are prime farmland	0	9.7	0.5
HhC2	Harpeth silt loam, 5 to 10 percent slopes, eroded	Not prime farmland	0	7.5	0.4
HnB	Holston loam, 2 to 5 percent slopes	All areas are prime farmland	0	0.1	<0.1
HoB	Holston silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	19.0	1.0
HoC	Holston silt loam, 5 to 12 percent slopes	Not prime farmland	0	4.3	0.2
HoC2	Holston silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	20.8	1.1
HoD2	Holston loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	3.2	0.2
Ht	Huntington fine sandy loam	All areas are prime farmland	0	7.1	0.4
Hu	Huntington silt loam	All areas are prime farmland	0	3.4	0.2
HuB	Humphreys gravelly silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	1.7	0.1
HuC	Humphreys gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	0.9	<0.1
Hv	Huntington silt loam, local alluvium	All areas are prime farmland	0	2.2	0.1
InD2	Inman flaggy silty clay loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	1.4	0.1
InE2	Inman flaggy silty clay loam, 20 to 30 percent slopes, eroded	Not prime farmland	0	20.6	1.1
JeE	Jefferson loam, 12 to 35 percent slopes	Not prime farmland	0	5.2	0.3
JeE	Jefferson-Ramsey complex, 15 to 35 percent slopes	Not prime farmland	0	3.7	0.2
LaB	Landisburg silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	3.5	0.2
LaC	Landisburg silt loam, 5 to 12 percent slopes	Not prime farmland	0	3.1	0.2
LbB	Lily loam, 2 to 5 percent slopes	All areas are prime farmland	0	31.4	1.6
LbC	Lily loam, 5 to 12 percent slopes	Not prime farmland	0	50.9	2.6
LbD	Lily loam, 12 to 20 percent slopes	Not prime farmland	0	4.1	0.2
Ld	Lindell silt loam, 0 to 2 percent slopes, occasionally flooded	All areas are prime farmland	4	0.7	<0.1
LgC	Lily-Gilpin complex, 5 to 12 percent slopes	Not prime farmland	0	44.3	2.3
LgD	Lily-Gilpin complex, 12 to 20 percent slopes	Not prime farmland	0	14.4	0.7
LgE	Lily-Gilpin complex, 20 to 35 percent slopes	Not prime farmland	0	4.4	0.2

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
LlB	Lily loam, 2 to 6 percent slopes	All areas are prime farmland	0	1.4	0.1
LlC	Lily loam, 3 to 8 percent slopes	All areas are prime farmland	0	127.9	6.5
LlC	Lily loam, 6 to 12 percent slopes	Not prime farmland	0	68.9	3.5
LlD	Lily loam, 12 to 20 percent slopes	Not prime farmland	0	6.6	0.3
Lm	Lawrence silt loam	All areas are prime farmland	8	0.2	<0.1
LmC	Lily-Ramsey complex, 5 to 12 percent slopes	Not prime farmland	0	6.2	0.3
LmD	Lily-Ramsey complex, 12 to 20 percent slopes	Not prime farmland	0	24.3	1.2
LmE	Lily-Ramsey complex, 20 to 35 percent slopes	Not prime farmland	0	3.4	0.2
Ln	Lindell silt loam, 0 to 2 percent slopes, occasionally flooded	All areas are prime farmland	4	14.1	0.7
LoB	Lonewood silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	4.1	0.2
LoC	Lonewood-Clarkrange complex, 2 to 6 percent slopes	All areas are prime farmland	0	42.6	2.2
LoC	Lonewood silt loam, 5 to 12 percent slopes	Not prime farmland	0	19.8	1.0
LwB	Lonewood loam, 2 to 5 percent slopes	All areas are prime farmland	0	17.4	0.9
LwC	Lonewood loam, 5 to 12 percent slopes	Not prime farmland	0	18.8	1.0
Ma	Melvin silt loam	Not prime farmland	100	2.3	0.1
Me	Melvin silt loam, frequently flooded	Not prime farmland	100	0.8	<0.1
MeC	Minvale silt loam, 5 to 12 percent slopes	Not prime farmland	0	0.4	<0.1
MmC2	Mimosa-Ashwood complex, 5 to 12 percent slopes, eroded	Not prime farmland	0	20.8	1.1
MmC2	Mimosa silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	27.7	1.4
MmC2	Mimosa silty clay loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	13.1	0.7
MmD2	Mimosa silt loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	15.4	0.8
MmD2	Mimosa silty clay loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	11.8	0.6
MmD3	Mimosa silty clay, 8 to 20 percent slopes, severely eroded	Not prime farmland	0	1.1	0.1
Mn	Minter silt loam, occasionally flooded	Not prime farmland	100	0.1	<0.1
MnB	Monongahela silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	18.1	0.9
MnC	Minvale gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	2.4	0.1

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
MnC2	Mimosa silt loam, 5 to 20 percent slopes, eroded, very rocky	Not prime farmland	0	10.8	0.6
MoE	Montevallo channery silt loam, 20 to 35 percent slopes	Not prime farmland	0	15.3	0.8
MrD	Muskingum very rocky sandy loam, 12 to 20 percent slope	Not prime farmland	0	1.0	0.1
MrD2	Mimosa-Ashwood complex, 12 to 30 percent slopes, rocky	Not prime farmland	0	32.2	1.6
MsB	Mountview silt loam, shallow, 2 to 5 percent slopes	All areas are prime farmland	0	0.7	<0.1
MsC2	Mountview silt loam, shallow, 5 to 12 percent slopes, eroded	Not prime farmland	0	0.7	<0.1
MsC3	Mountview silt loam, shallow, 5 to 12 percent slopes, severely eroded	Not prime farmland	0	0.7	<0.1
MtB2	Mountview silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	16.3	0.8
MtC2	Mountview silt loam, 5 to 12 percent slopes	Not prime farmland	0	4.5	0.2
MuC	Muskingum silt loam, 5 to 12 percent slopes	Not prime farmland	0	0.2	<0.1
MuE	Muskingum silt loam, 20 to 30 percent slopes	Not prime farmland	0	<0.1	<0.1
MvB	Mountview silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	6.8	0.4
MvC2	Mountview silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	1.6	0.1
NeB2	Nesbitt silt loam, 2 to 6 percent slopes, eroded	All areas are prime farmland	0	0.8	<0.1
NeC2	Nesbitt silt loam, 6 to 12 percent slopes, eroded	Not prime farmland	0	0.2	<0.1
Oc	Ocana gravelly silt loam, 0 to 3 percent slopes, occasionally flooded	All areas are prime farmland	0	52.8	2.7
PaB	Paden silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	12.1	0.6
Pd	Purdy silt loam	Not prime farmland	100	4.1	0.2
Pd	Purdy silt loam, ponded	Not prime farmland	85	0.1	<0.1
Pp	Pope-Philo complex, frequently flooded	Prime farmland if protected from flooding or not frequently flooded during the growing season	2	1.2	0.1
RaC	Ramsey loam, 5 to 12 percent slopes	Not prime farmland	0	0.9	<0.1
RaD	Ramsey-Alticrest-Rock outcrop complex, 5 to 20 percent slopes	Not prime farmland	0	9.0	0.5

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
RaD	Ramsey loam, 12 to 20 percent slopes	Not prime farmland	0	2.0	0.1
SeB	Sequatchie loam, 2 to 5 percent slopes	All areas are prime farmland	0	4.4	0.2
SeC2	Sequatchie loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	1.8	0.1
SeD	Sengtown gravelly silt loam, 12 to 20 percent slopes	Not prime farmland	0	6.4	0.3
ShB	Shady loam, 2 to 5 percent slopes	All areas are prime farmland	0	2.6	0.1
Sk	Skidmore gravelly loam, occasionally flooded	Not prime farmland	0	20.7	1.1
SpF	Shelocta-Pineville complex, 20 to 70 percent slopes, very stony	Not prime farmland	0	7.0	0.4
StC2	Sengtown gravelly silt loam, 5 to 12 percent slopes	Not prime farmland	0	5.8	0.3
Su	Sullivan silt loam, depressional	Not prime farmland	0	6.0	0.3
SuC2	Sugargrove gravelly silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	23.6	1.2
SuD2	Sugargrove gravelly silt loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	19.6	1.0
SwB	Swafford loam, 2 to 5 percent slopes	All areas are prime farmland	0	2.3	0.1
SwC	Swafford loam, 5 to 12 percent slopes	Not prime farmland	0	1.8	0.1
SyB	Sykes silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	1.0	0.1
SyB2	Sykes silt loam, 2 to 5 percent slopes, eroded	All areas are prime farmland	0	5.0	0.3
SyC2	Sykes silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	6.9	0.4
TbC	Talbott silt loam, 3 to 10 percent slopes, rocky	Not prime farmland	0	1.9	0.1
TeC	Townley silt loam, 5 to 12 percent slopes	Not prime farmland	0	3.1	0.2
TeD	Townley silt loam, 12 to 20 percent slopes	Not prime farmland	0	9.9	0.5
Ty	Tyler silt loam	All areas are prime farmland	8	4.6	0.2
uAlgB2	Algood silt loam, 2 to 5 percent slopes, eroded	All areas are prime farmland	0	1.7	0.1
uAlgC2	Algood gravelly silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	13.7	0.7
uAlgD2	Algood gravelly silt loam, 12 to 20 percent slopes, eroded	Not prime farmland	0	10.8	0.6
uAlgE	Algood gravelly silt loam, 20 to 30 percent slopes	Not prime farmland	0	3.3	0.2
uBemF	Beetree-Muse complex, 15 to 40 percent slopes, stony	Not prime farmland	0	13.2	0.7

Soil Map Unit Symbol	Soil type	Farmland classification	Hydric Rating	Area (acres)	Percentage of area
uBlhF	Standingstone-Hayter complex, 15 to 40 percent slopes, very rocky	Not prime farmland	0	11.9	0.6
uBouF	Bouldin very cobbly fine sandy loam, 15 to 40 percent slopes, very stony	Not prime farmland	0	5.9	0.3
uCanF	Caneyville-Rock outcrop-Standingstone complex, 12 to 35 percent slopes	Not prime farmland	0	<0.1	<0.1
uCbrE	Carbo-Rock outcrop complex, 12 to 30 percent slopes	Not prime farmland	0	3.8	0.2
uColC2	Colbert silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	7.8	0.4
UD	Udorthents, gravelly, undulating	Not prime farmland	0	3.4	0.2
uDewC2	Dewey silt loam, 5 to 12 percent slopes, eroded	Not prime farmland	0	0.1	<0.1
uNelC	Nella cobbly loam, 5 to 12 percent slopes	Not prime farmland	0	5.1	0.3
uNelD	Nella cobbly loam, 12 to 20 percent slopes	Not prime farmland	0	3.8	0.2
uNelE	Nella cobbly loam, 20 to 30 percent slopes	Not prime farmland	0	0.9	<0.1
uSeqE	Sequoia silty clay loam, 15 to 30 percent slopes	Not prime farmland	0	0.7	<0.1
W	Water	Not prime farmland	0	2.8	0.1
WaC	Waynesboro loam, 6 to 15 percent slopes	Not prime farmland	0	3.6	0.2
WaD	Waynesboro loam, 15 to 25 percent slopes	Not prime farmland	0	3.2	0.2
WeC	Wellston silt loam, 5 to 12 percent slopes	Not prime farmland	0	0.2	<0.1
WrB	Wernock silt loam, 2 to 5 percent slopes	All areas are prime farmland	0	35.1	1.8
WrC	Wernock silt loam, 5 to 12 percent slopes	Not prime farmland	0	48.0	2.5
			Total	**1,955.2**	**100.0**
			Total Hydric Soils[1]	***7.4***	***0.38***
			Total Prime Farmland[2]	***586.3***	***30.0***

Source: USDA 2019a
[1]Includes soils rated as "predominantly hydric" and "hydric," with hydric soils ratings of 67 to 99 and 100, respectively (USDA 2013).
[2]Includes soils classified as "All areas are prime farmland" or "Prime farmland if protected from flooding or not frequently flooded during the growing season."

The Lily series soils consist of moderately deep, well drained soils that formed in residuum weathered primarily from sandstone. These soils are on upland ridges and hillsides with slopes ranging from 0 to 65 percent and are used for growing corn, tobacco, small grains, hay, and pasture. The Barfield series soils consist of shallow well drained to excessively drained, moderately slow permeable soils that formed in residuum from limestone. These soils lie on uplands with slopes ranging from 1 to 70 percent and are used for pasture. The

Ashwood series soils consist of moderately deep, well drained soils that formed in residuum weathered from phosphatic limestone. These soils are on uplands with slopes ranging from 2 to 70 percent and are used for pasture. The Hawthorne series soils consist of moderately deep, somewhat excessively drained soils that formed in residuum of interbedded siltstone and cherty limestone. These soils are on uplands with slopes ranging from 5 to 70 percent and are used for pasture or hay (USDA 2022).

The construction workspace associated with the pipeline Hartsville Compressor Station would encompass four different soil map units (ETNG 2023h). These soil types are Barfield-Ashwood-Rock outcrop complex, 5 to 20 percent slopes; Harpeth silt loam, 5 to 10 percent slopes, eroded; Mimosa silt loam, 5 to 12 percent slopes, eroded; and Mimosa silt loam, 12 to 20 percent slopes, eroded.

The construction workspace associated with the Columbia Gulf M&R Station is entirely within the Egam silt loam, occasionally flooded, 0 to 2 percent slopes.

The construction workspace associated with the Texas Eastern and Midwestern Gas M&R Station is entirely within the Barfield-Ashwood-Rock outcrop complex, 5 to 20 percent slopes, which comprises Barfield, Ashwood, and rock outcrops.

The construction workspace associated with the Kingston Delivery Meter Station and Crossover site is entirely within the Gilpin-Petros complex, 20 to 35 percent slopes, which consists of Gilpin, Petros, and minor components.

The construction workspace associated with the Jackson County Crossover Site consists of the Christian silt loam, 5 to 12 percent slopes, eroded, and Hawthorne gravelly silt loam, 20 to 60 percent slopes.

The construction workspace associated with the Clarkrange Crossover Site is entirely within the Lily loam, 3 to 8 percent slopes.

In addition to the Hartsville Compressor Station and the M&R stations, soil disturbance would also occur at small aboveground facilities, including the mainline valves (MLVs) and the receivers that would be located along the pipeline ROW. Soil disturbance would also occur at equipment laydown yards located in Trousdale, Smith, Jackson, Putnam, Overton, and Cumberland counties during construction. The selected contractor yards are primarily industrial sites or are otherwise disturbed areas and native soil at the sites is likely limited. Soil disturbance related to these proposed facilities would be minimized and mitigated through the application of the Project E&SCP.

According to ETNG's Resource Report 7 (ETNG 2023h):

> [ETNG] will use 76 [temporary access roads] TARs during [Ridgeline Expansion] project construction. [ETNG] may utilize existing roads as TARs with some requiring minor improvements (tree trimming, addition of gravel, backblading, etc.) to allow for passage of construction vehicles. The existing access roads are generally built on fill materials and have previously been developed for other land uses. The TARs will be restored to their pre-construction condition or better, unless otherwise requested by landowners.

> Fifteen new permanent access roads (PAR) will be constructed to provide access to permanent facilities including the Hartsville Compressor Station, [M&R] stations, crossover sites, [MLV], and the Kingston [Meter] site. PARs may also be required at other locations where access along the pipeline ROW is not practicable after temporary bridges are removed, fencing is replaced, or where terrain conditions inhibit access (e.g., wetlands, marshes, water bodies, etc.). These other locations are to allow access to cathodic protection test stations or perform ROW maintenance, such as keeping the ROW clear of deeply rooted vegetation, and other requirements mandated by federal pipeline safety standards. Generally, access roads will be 30 feet wide to accommodate vegetation clearing setbacks, pull offs, and road shoulder/stormwater management features.

Prime Farmland

Table 3.5-7 describes the soil types, including those classified as prime farmland, located within the ETNG Construction ROW. Based on soils data obtained from the USDA Web Soil Survey (USDA 2019a), approximately 586.3 acres (30.0 percent) are designated as prime farmland, as illustrated on Prime Farmland figures in Appendix H. As provided in ETNG's Resource Report 7 (ETNG 2023h), approximately 558.5 acres of the total 1,823.3 acres of the Ridgeline Project ROW (31 percent) are designated as prime farmland.

3.5.1.1.3 Alternative B

3.5.1.1.3.1 East Tennessee TVA Power Service Area

TVA anticipates that the solar facilities proposed under Alternative B would be primarily located in East TN to offset transmission system upgrades that may be required following the retirement of KIF. Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA.

Geology

A portion of the potential solar and BESS would be located within East TN, which lies within the Cumberland Plateau, Highland Rim, and Valley and Ridge Physiographic Provinces.

The Valley and Ridge Province is characterized by northeast-trending ridges underlain by resistant rock separated by valleys underlain by less resistant rock. The rock formations are steeply tilted and crop out in long, narrow belts parallel to the trend of ridges and valleys, some belts are bounded by faults (Zurawski 1978). Bedrock in the province is primarily massive beds of Cambrian to Ordovician age shale and siltstone and massive beds of limestone and dolomite of Cambrian Age (Hardeman 1966). The Valley and Ridge is a heavily faulted area and features the major Chattanooga Fault system.

The Cumberland Plateau lies between the Valley and Ridge and Highland Rim and reaches elevations between 600 to 3,000 feet in elevation. It is comprised of Pennsylvania age conglomerate, sandstone, siltstone, and shale and Mississippian to Ordovician age limestone, dolomite, and shale.

The Highland Rim Province is a plateau characterized by rolling hills to flat areas in the northwest and southeast, which lies between the Cumberland Plateau and Gulf Coastal Plain. Bedrock in the area is Mississippian limestones, chert, shale, and sandstone. Underlying bedrock of the region is chiefly Mississippian to Ordovician-age limestone, chert, shale, siltstone, and sandstone (Luther 2018; Griffith et al. 1997).

Paleontology

The paleontology associated with TVA's PSA would be generally the same as described in Section 3.5.1.1.1.2.

Geological Hazards

The geological hazards under Alternative B would be generally consistent with those described in Section 3.5.1.1.1.3.

Soils

Since specific locations for potential solar and storage facility sites are not determined, it is not possible to provide a detailed description of the soils at potential facility sites at this time. Generally, soils in East TN are composed of loamy and clayey textures and range from excessively drained to well drained.

Prime Farmland

Approximately 11 percent of the East TN TVA PSA is classified as prime farmland (USDA 2019a). An additional 0.6 percent would be classified as prime farmland if drained or protected from flooding. While land development in the conterminous U.S. from 1980 to 2000 saw a steep rise in conversion of agricultural land to developed space, this trend declined between 2000 to 2015 (Bigelow et al. 2022).

3.5.1.2 Environmental Consequences

3.5.1.2.1 The No Action Alternative

Under the No Action Alternative, current operations would continue. TVA would implement the planned actions related to the current and future management and storage of CCRs at KIF, which have either been reviewed or would be in subsequent NEPA analyses. There would be no anticipated adverse cumulative effects, either direct or indirect, to geology, soils, or prime farmland.

3.5.1.2.1.1 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

Under all Action Alternatives, TVA would retire, decommission, deactivate, decontaminate, and deconstruct the KIF units and associated infrastructure. These activities would affect geologic resources by the removal of the KIF Plant and associated structures with controlled explosives, which would result in surface vibrations in the immediate vicinity of the facility when they are felled. Buildings within the deconstruction boundary would be deconstructed and decontaminated to a depth of 3 feet below grade, which would generate vibrations throughout the course of deconstruction of the buildings and grading and backfilling of the facility. Due to the small size of the subsurface disturbances and existing industrial development of the site, only minor direct effects to potential subsurface geological resources are anticipated. Following removal of the buildings, disturbed ground/soils would be stabilized with native vegetation to prevent sedimentation or erosion. No adverse cumulative impacts to geology, soils, or prime farmland are anticipated.

3.5.1.2.1.2 Environmental Justice Considerations

Effects to geology and soil resources that would occur as a result of the KIF Plant retirement and D4 activities are not anticipated to have disproportionate effects on EJ populations within the Kingston Reservation. KIF Plant retirement effects would be minor and limited to the Kingston Reservation, where no residential populations are present.

3.5.1.2.2 Alternative A

3.5.1.2.2.1 Construction and Operation of CC/Aero CT Plant and Switchyard on Kingston Reservation

Geology and Paleontology

Under Alternative A, minor effects to geology could occur. Foundations for equipment anticipated for the proposed CC/Aero CT Plant would be excavated. Transmission structures are typically driven or drilled into the ground to shallow depths. Due to the small size of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated.

In the event paleontological resources (e.g., fossilized vertebrate remains, such as bones, teeth, etc.) are encountered during construction, the construction contractor would report the finding to on-site inspection staff. The inspection staff would temporarily suspend construction activities in the immediate area of the paleontological finding, while a qualified paleontologist is consulted. The on-site inspection staff would coordinate with TVA's Kingston project manager to determine the appropriate actions if the finding is determined to be a significant paleontological resource. TVA would comply with applicable laws, regulations, procedures, and recommendations from the TN Geological Survey.

Geologic Hazards

Based on regional data, the potential for minor seismic activity due to Alternative A's proximity to both the Eastern TN and the New Madrid Seismic Zones is low. The CC/Aero CT Plant facilities would be designed to comply with applicable seismic standards. Due to the low level of seismic activity in the area and construction of the CC/Aero CT Plant using materials in accordance with current industry standards and federal regulations, the potential for geologic hazards to impact the project facilities is low. No other geologic hazards are anticipated.

Soils

Vegetation clearing, grading, and other site preparation activities associated with the construction of the CC/Aero CT Plant have the potential to disturb soil stability and increase erosion. The CC/Aero CT Plant would occupy approximately 30 acres, and an additional 10 to 25 acres on site would be used for equipment laydown and mobilization, for a total CC/Aero CT Plant maximum footprint of 55 acres. Subsurface piles or other deep foundation systems would be installed to support foundations for plant components, as required. This area would experience minor permanent impacts due to clearing, grading, and fill related to the construction of the CC/Aero CT Plant.

Minimal disturbance is likely to occur to soils within the parking/laydown area. Since no grading or excavation is planned for this area, any impacts to soils would be minor.

Effects to soils associated with grading and site preparation activities would be temporary and mitigated through BMPs identified in Section 2.3. Stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, would likely not require any off-site or on-site hauling of soils. However, some minor off-site or on-site hauling may be necessary.

Although not anticipated, should borrow material be required for project activities, sand and gravel aggregate may be obtained from local, permitted, off-site sources. The creation of new impervious surface, in the form of the CC/Aero CT Plant facility and associated components, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Operation of the CC/Aero CT Plant would not impact soils. No adverse cumulative impacts to soils are anticipated.

Prime Farmland
Based on soils data obtained from the USDA Web Soil Survey, within a 5-mile radius of the Kingston Reservation, approximately 4,619 acres (6.3 percent) have soils classified as prime farmland (USDA 2019b). There are no soils classified as prime farmland with the potential to be impacted by the proposed CC/Aero CT Plant or switchyard (USDA 2022). Prime farmland soils are reported to occur within the parking/laydown area. As stated above, minimal disturbance is expected in this area. Effects on nearby prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the CC/Aero CT Plant site. Thus, no direct effects or cumulative effects to prime farmland are anticipated from the proposed construction of the CC/Aero CT Plant and switchyard on the Kingston Reservation under Alternative A.

3.5.1.2.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

Geology and Paleontology
Foundations for equipment anticipated for the proposed 3- to 4-MW Solar Facility would be excavated and structures are typically driven or drilled into the ground to shallow depths. Due to the small size of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated. Potential effects and mitigation measures on paleontological resources are similar to what was described in Section 3.5.1.2.2.1.

Geological Hazards
Potential effects due to geological hazards are similar to what was described in Section 3.5.1.2.2.1.

Soils
Construction of a 3- to 4-MW solar facility would include activities such as grading, clearing, excavation, backfilling, and the movement of construction equipment that may affect soil resources. The area of the proposed solar facility is an existing coal yard at KIF, and soils have already been disturbed. Clearing removes protective vegetation cover and exposes the soil to natural elements (e.g., wind and rain), which increase the potential for soil erosion. Grading and equipment traffic can compact soil and therefore increase runoff potential. To reduce the impacts of construction on soils, TVA would implement project specific BMPs including measures to control erosion and sedimentation during construction and to ensure proper restoration of disturbed areas following construction. Given the impact minimization and mitigation measures, impacts to soils due to construction of above ground facilities associated with the 3- to 4-MW solar facility are anticipated to be permanent and minor. Soils outside of these areas, and beneath the panels, would be disturbed during construction and would be revegetated with native herbaceous species to support pollinators, thereby resulting in minor, temporary impacts.

Although not anticipated, should borrow material be required for project site activities, sand and gravel aggregate may be obtained from established local, permitted, off-site sources. The creation of new impervious surface, in the form of the foundations for the central inverters and other associated components, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Planting of native and/or non-invasive vegetation, including plants attractive to pollinators, within the limits of disturbance, along with use of BMPs identified in Section 2.3, would minimize the potential for increased soil erosion and runoff. Following construction, implementation of soil stabilization and vegetation management measures would reduce the potential for erosion effects during site operations. No adverse cumulative impacts to soils are anticipated.

During operation and maintenance of the solar facility, minor disturbance could occur to soils. Routine maintenance would include periodic motor replacement; inverter air filter replacement; fence repair; vegetation control; and periodic PV array inspection, repairs, and maintenance. The solar facility could utilize mowing to manage vegetation within portions of the fenced-in, developed areas not limited by other constraints. Selective spot applications of herbicides may be employed around the facility and structures to control weeds. Herbicides would be applied by a professional contractor or a qualified project technician. These maintenance activities would not result in any adverse effects to soils on the project site during operations.

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, there are no soils classified as prime farmland at the proposed solar facility. Effects on nearby prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the solar facility site.

3.5.1.2.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

Geology and Paleontology

Under Alternative A, minor effects to geology could occur. Foundations for equipment anticipated for the proposed 100-MW BESS would be excavated. Transmission structures are typically driven or drilled into the ground to shallow depths. Due to the small size of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated. Potential effects and mitigation measures on paleontological resources are similar to what was described in Section 3.5.1.2.2.1.

Geological Hazards

Potential effects due to geological hazards are similar to what was described in Section 3.5.1.2.2.1.

Soils

Under Alternative A, the construction and operation of a 100-MW BESS at one of three potential sites occupying between 30 and 40 acres just to the north of the proposed CC/Aero CT Plant site and associated transmission line connections would result in minor impacts to soils. Grading, clearing, and fill activities associated with the construction of the BESS and transmission line connections would cause localized increases in erosion and sedimentation, resulting in minor, permanent impacts to soils. Effects to soils associated with grading and clearing activities would be temporary and mitigated through BMPs identified in Section 2.3. Impacts to soils would be minor and temporary due to construction activities. Minor permanent impacts would occur within the building footprint of newly constructed facilities. Any stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, would likely not require any off-site or on-site hauling of soils. However, some minor off-site or on-site hauling may be necessary.

Although not anticipated, should borrow material be required for project site activities, sand and gravel aggregate may be obtained from established local, permitted, off-site sources. The creation of new impervious surface, in the form of the foundations for the BESS and other associated components, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Planting of native and/or non-invasive vegetation, including plants attractive to pollinators, within the limits of disturbance, along with use of BMPs identified in Section 2.3, would minimize the potential for increased soil erosion and runoff. Following construction, implementation of soil stabilization and vegetation management measures would reduce the potential for erosion effects during site operations. No adverse cumulative impacts to soils are anticipated.

During operation and maintenance of the BESS, minor disturbances could occur to soils. Selective spot applications of herbicides may be employed around the facility and structures to control weeds. Herbicides would be applied by a professional contractor or a qualified project technician. These maintenance activities would not result in any adverse effects to soils on the project site during operations.

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, there are no soils classified as prime farmland with the potential to be impacted by the proposed 100-MW BESS or associated transmission line connections. Effects on nearby prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the 100-MW BESS sites and transmission line connections footprint.

3.5.1.2.2.4 On-site Transmission Upgrades

Geology and Paleontology

Under Alternative A, minor effects to geology could occur. Transmission structures would be driven or drilled into the ground to shallow depths and minor excavations would be needed for construction of a substation and other transmission components. Due to the limited subsurface disturbances associated with on-site transmission upgrades, only minor direct effects to potential subsurface geological resources are anticipated.

Should paleontological resources be exposed during site construction (i.e., grading and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, recover these resources, analyze the potential for additional effects, and develop and implement a recovery plan/mitigation strategy.

Geologic Hazards

Under Alternative A, TVA would construct a double-breaker 161-kV station for the proposed CC/Aero CT Plant and reroute all existing transmission lines from KIF and re-terminate them into the new station. TVA would install 1 mile of OPGW, relaying, digital fault recorders, and redundant metering for the proposed plants. Based on regional data, the potential for minor seismic activity exists due to the proximity of the proposed OPGW, as well as existing transmission lines that would be upgraded under Alternative A, to both the Eastern TN and the New Madrid Seismic Zones. The OPGW construction and transmission line upgrades would be designed to comply with applicable seismic standards. In the unlikely event of seismic activity, it would likely cause minor effects to the sites.

The proposed on-site transmission upgrades are located within TN's Appalachian Ridge and Valley Region, which is located over limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the finalized location of the transmission corridor, sinkholes could be present. Upgrades to existing transmission lines would not result in impacts from or to potential sinkholes or other geologic hazards because the transmission lines are already present, and many upgrades would be performed at the tops of the structures. No other geologic hazards are anticipated.

Soils

Transmission line upgrades may require improvements to existing access roads and replacement of transmission line structures, which would result in temporary, minor ground disturbance. Some areas may require permanent vegetation clearing and/or maintenance, potentially resulting in habitat conversion (such as from early successional forested areas or larger shrubs to early successional herbaceous habitat), which could also result in soil disturbances. Temporarily disturbed areas would be revegetated using native, low-growing plant species after required transmission line upgrade work is completed to minimize the potential for increased soil erosion and runoff. No adverse cumulative impacts to soils are anticipated.

Prime Farmland

Based on soils data obtained from the USDA Web Soil Survey, there are no soils classified as prime farmland with the potential to be impacted by the on-site transmission line upgrades or Battery Transmission Line Connections. Effects on nearby prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the Alternative A site.

3.5.1.2.2.5 Off-Site Transmission Upgrades

3.5.1.2.2.5.1 Eastern Transmission Corridor

Geology, Paleontology, and Geologic Hazards

The geology, paleontology, and geological hazards associated with off-site transmission upgrades proposed for the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381) under Alternative A are the same as provided in Section 3.5.1.1.1. Should the proposed upgrades to the existing transmission lines require the installation of a new transmission structure, it would be driven or drilled into the ground to shallow depths. Most poles would be directly imbedded in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. Normally, the holes would be backfilled with the excavated material, but, in some cases, gravel or a concrete-and-gravel mixture would be used, depending on local soil conditions.

Should paleontological resources be exposed during site construction (i.e., grading and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, recover these resources, analyze the potential for additional effects, and develop and implement a recovery plan/mitigation strategy.

Due to the small size of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated. The transmission lines (L5108, L5116, L5280, L5302, and L5381) within the Eastern Transmission Corridor are in the western Valley and Ridge Physiographic Province; as such, geological hazards are the same as described in Section 3.5.1.2.2.1.

No adverse cumulative impacts to geological or paleontological resources are anticipated.

Soils

The 1,609-acre Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381) proposed for transmission line upgrades would likely require improvements to existing access roads and may also require replacing transmission line structures. Minor ground disturbance is expected in these areas, but if the ground is disturbed, the access road area would be revegetated using native, low-growing plant species after required transmission line upgrade work is completed to minimize the potential for increased soil erosion and runoff (TVA 2022a). Effects to soils associated with transmission line upgrades would be minor, temporary, and mitigated through BMPs identified in Section 2.3. No adverse cumulative impacts to soils are anticipated.

Prime Farmland

Approximately 50.8 acres (3.2 percent) of the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381) proposed for transmission line upgrades are designated as prime farmland. This represents less than 0.1 percent of prime farmland in Anderson and Roane counties, combined (USDA 2019b). Ground disturbance would be minimal, temporary, and mitigated through BMPs identified in Section 2.3 and TVA's BMP Manual (TVA 2022a). Therefore, no impacts to prime farmland would occur as a result of transmission line upgrades. No adverse cumulative impacts to prime farmland are anticipated.

3.5.1.2.2.5.2 Western Transmission Corridor

Geology, Paleontology, and Geologic Hazards

The geology, paleontology, and geological hazards associated with off-site transmission upgrades are the same as provided in Section 3.5.1.1.1. Transmission structures are typically driven or drilled into the ground to shallow depths. Due to the small size of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated. The Western Transmission Corridor (L5383) is likely to have geological hazard similar to the Eastern Transmission Corridor and Kingston Reservation described in Section 3.5.1.2.2.1. No adverse cumulative impacts to geological resources are anticipated.

Soils

The 332-acre L5383 corridor proposed for transmission line upgrades may require improvements to existing access roads and may also require replacing transmission line structures. Minor ground disturbance is expected in these areas, but if the ground is disturbed, the access road area would be revegetated using native, low-growing plant species after required transmission line upgrade work is completed to minimize the potential for increased soil erosion and runoff (TVA 2022a). Effects to soils associated with transmission line upgrades would be minor, temporary, and mitigated through BMPs identified in Section 2.3. No adverse cumulative impacts to soils are anticipated.

Prime Farmland

Approximately 54.5 acres (16.4 percent) of the L5383 corridor proposed for transmission line upgrades are designated as prime farmland. This represents less than 0.1 percent of prime farmland in Cumberland County (USDA 2019b). Ground disturbance would be minimal, temporary, and mitigated through BMPs identified in Section 2.3 and TVA's BMP Manual (TVA 2022a). Therefore, no impacts to prime farmland would occur as a result of transmission line upgrades. No adverse cumulative impacts to prime farmland are anticipated.

3.5.1.2.2.6 Construction and Operations of Natural Gas Pipeline

Geology and Paleontology

ETNG's Resource Report 6 (ETNG 2023g) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the geology-related findings in ETNG's Resource Report 6. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). Under Alternative A, minor construction-related effects to geology would occur from the pipeline trenching, boring, and drilling processes for pipeline installation. The 122 miles of the proposed natural gas pipeline would be buried through a combination of trenching, boring, and directional drilling. No impacts to ongoing or future research at the Flynn Creek Impact Structure or Hawkins Cave, two geological features of interest, are anticipated as a result of the construction and operation of the natural gas pipeline (ETNG 2023g).

There would be no anticipated adverse cumulative effects, to geological or paleontological resources during or after pipeline installation, as stated in Section 1.14.2.1 of ETNG Resource Report 1 (ETNG 2023a).

Most of the proposed pipeline would be constructed within the existing ETNG Pipeline ROW. Minor direct effects to potential subsurface geological resources are anticipated. Should paleontological resources be exposed during site construction (i.e., grading, directional drilling, trenching, and foundation placement) or operation activities, ETNG would follow an Unanticipated Discoveries Plan (submitted to FERC as Appendix 4D of Resource Report 4) (ETNG 2023e) that establishes procedures to follow if previously unidentified cultural resources, such as archaeological sites, historic features, or human remains, are encountered during project construction.

According to the USDA Web Soil Survey, the depth to bedrock is anticipated to be less than 78 inches below ground surface for approximately 48 miles of the proposed pipeline route (USDA 2019b). ETNG would attempt to remove rock in the proposed route using conventional ripping, hammering, and trenching techniques but anticipates that blasting would be necessary in these areas of shallow bedrock.

Construction of facility infrastructure, including the Hartsville Compression Station and M&R facilities, would have minor effects to the geology and paleontology of the area as limited blasting of bedrock is planned. To mitigate impacts from blasting, ETNG prepared a Blasting Plan for the project (see Resource Report 6, Appendix 6B) (ETNG 2023g). There would be no anticipated cumulative effects to the geology or paleontology after construction of the facility infrastructure, see Section 1.14.2.2 of Final Resource Report 1 (ETNG 2023a).

Geologic Hazards

Based on regional data, the potential for minor seismic activity exists due to the proposed pipeline's proximity to both the Eastern TN and the New Madrid Seismic Zones. The pipeline would be designed to comply with applicable seismic standards. In the unlikely event of seismic activity, it would likely cause minor effects to the project site and equipment on the site based on construction compliance with state and federal earthquake/seismic guidelines.

The USGS Seismic Hazard Maps indicate there is a 2 percent probability of reaching a 6 to 35 percent "g" in 50 years.[24] Based on a review of the USGS Peak Ground Acceleration Map (USGS 2020), the risk for seismic ground motion (earthquakes) to cause damage to structures in the ETNG Construction ROW is low to moderate. From this, occurrence of earthquakes and seismic hazards in the ETNG Construction ROW are low probability. The low to moderate seismic hazard areas of the proposed pipeline areas are as follows:

- Between MPs 0.0 and 84.0, there is a 2 percent probability of a 0.06 to a 0.14 "g" exceedance in 50 years;
- Between MPs 84.0 and 117.0, there is a 2 percent probability of a 0.14 to 0.26 "g" exceedance in 50 years; and
- Between MPs 117.0 and 122.4, there is a 2 percent probability of a 0.26 to 0.35 "g" exceedance in 50 years.

It should be noted that O'Rourke and Palmer (1994) performed a review of the seismic performance of gas transmission lines in southern California. The authors found that electric arc-welded pipelines constructed post-World War II in good repair have never experienced a break or leak because of either traveling ground waves or permanent ground deformation during a southern California earthquake. The authors further concluded that modern electric arc-welded gas pipelines in good repair are generally highly resistant to traveling ground wave effects and moderate amounts of permanent deformation.

As stated by ETNG (ETNG, 2023g):

> [ETNG] identified no seismic design requirements for the pipeline and included seismic loads under consideration for the Hartsville Compressor Station design. Given the low risk of ground vibration, impacts to the [Ridgeline Expansion] project are not anticipated and mitigation for seismicity is not proposed.

In addition, given the low potential for earthquakes to occur in the vicinity of the ETNG Construction ROW, the potential for soil liquefaction to occur in the ETNG Construction ROW is low.

Subsurface karst terrain could affect portions of the pipeline. Ground subsidence, involving the localized or regional lowering of the ground surface, may be caused by karst dissolution, sediment compaction, oil and gas extraction, underground mines, and groundwater pumping. In many areas of Middle TN, the bedrock is limestone and is usually exposed at the surface, forming rocky ledges and barrens. These areas also develop into karst landscapes. The Study Area crosses areas with high sensitivity to karst and a high incidence of sinkhole and cave development (TN Cave Survey 2001). Based on the presence of carbonate rocks at or near the land surface, the project would cross karst areas in Trousdale, Smith, Jackson, Putnam, Overton, and Roane counties. According to the USGS (2020), approximately 55 miles of the pipeline would be constructed in karst terrain classified as areas where carbonate rocks exist at or near the ground surface in a humid climate. The shortest such crossing of karst terrain is one mile and located in Jackson County, and the longest such crossing being over 18.5 miles in Trousdale and Smith counties (ETNG 2023g).

[24] The USGS produces probabilistic Seismic Hazard Maps for the United States with peak horizontal acceleration values represented as a factor of "g." The factor "g" is equal to the acceleration of a falling object due to gravity (USGS 2020).

ETNG evaluated a list of known sinkholes in TN along with their geographic locations, which revealed that ten of the deepest sinkholes in the state are located in Putnam and Overton counties. Two notable sinkholes are located near the project: The Walkers Hollow sinkhole in Overton County near milepost 60.5 is located approximately 0.7 miles south of the proposed pipeline, and the Cane Hollow sinkhole in Putnam County near milepost 62.0 is located approximately 1.75 miles north of the pipeline (ETNG 2023g).

Due to the presence of sinkholes, ETNG conducted a geohazard field reconnaissance study to visually confirm the presence of karst terrain or sinkholes along a 5-mile segment of the proposed pipeline route (MP 58.0 to MP 63.0). Potential karst conditions including surface water runoff, potential sinkholes, and water intake features were documented. Based on the results of the study, 55 locations were selected for additional field surveys and three of those were determined to need construction monitoring. The three sites include two closed depressions at MP 53.7 and MP 59.1 that have an internal drain that provides direct recharge to underlying aquifers. The third feature includes two active sinkhole collapses at MP 54.0 that are located in temporary and additional temporary workspace. Proposed mitigation measures include creating waterbars, cross ditches, temporary drainage pipes, or temporary pumps with hoses to divert trench dewatering away from the recharge points. The mitigation for the sinkholes would consist of avoidance or mitigation by plugging these features with an inverted filter drain (ETNG 2023g).

Karst mitigation measures would be utilized to limit impacts to groundwater. As stated by ETNG in Resource Report 6 (ETNG 2023g):

> The potential exists for groundwater to be affected through karst terrain during the construction of the [Ridgeline Expansion] project, including disruption of groundwater flow paths, reduction of aquifer recharge, reduction of spring discharge and water clarity, groundwater contamination, and contamination of wells. However, careful planning and management of construction procedures and implementation of mitigation measures can greatly minimize or even eliminate the potential for negative groundwater impacts.
>
> Trenching and pipe installation can enlarge existing sinkholes/karst features and also create new ones. When this occurs, sediment overlying limestone can collapse, disrupting surface drainage and groundwater flow. This can cause surface flooding, reduce groundwater recharge, alter groundwater flow to springs, and introduce turbidity and contaminants to groundwater. Existing sinkholes have already experienced overburden soils travelling through karst conduits.
>
> Reducing the potential for enlarging or creating sinkholes/karst features begins during the route planning process to avoid known karst features where feasible. Potential pipeline alignments were carefully studied to identify existing sinkholes/karst features and sinkhole-prone areas, and to select an alignment that avoids the features.
>
> Where avoidance is not feasible, the pipeline alignment is being inspected by geologists to evaluate the factors that influence sinkhole/karst feature formation such as depth to rock, composition of overburden above rock, recharge potential presence and concentration of fractures, and groundwater levels in underlying aquifers. In areas where the risk of sinkhole formation is determined to be high,

a mitigation plan will be developed that will specify detailed procedures for preventing sinkholes or dealing with them should they occur.

In all work areas, buffer zones of 300 feet will be established around known and potential karst features (including sinkholes, caves, sinking or losing streams, swallow holes, and springs). During all construction earthwork activities, these zones will be clearly marked in the field with signs and safety fencing or similar barriers depending on the feature.

Excavation activities will be completed to minimize alteration of the existing grade and stormwater flow to the karst features. In linear excavations adjacent to karst features, spoils will be placed on the opposite side of the karst feature. In the event of stormwater erosion during construction, the soil will flow into the excavation and not toward the karst feature. Stormwater control measures outlined in the [pipeline E&SCP] include detention, diversion, or containerization to prevent construction influenced stormwater from flowing to the karst feature drainage point (or throat). Drainage points in karst features will not be used for the disposal of water. Mitigation measures may include silt fence, straw bales, straw bale check dams, individually, or in combination, depending on the specific site and the karst features present. Generalized construction drawings for these mitigation measures are found in the Phase III Geohazard Assessment Report in Appendix 6D [of Resource Report 6].

Hydrostatic test water from a new pipe will not be discharged directly into the buffer zone of a karst feature. This water will be discharged downgradient of the karst feature. If site conditions prevent a downgradient discharge, the water will be discharged as far from the karst feature buffer zone as is practicable with a filtered discharge and sediment and erosion control features detailed in the [Ridgeline Expansion] project E&SCP. Post-construction monitoring will ensure proper re-vegetation and restoration of these areas.

[ETNG] will conduct karst awareness training during environmental training, including buffer zone requirements for known karst features. The Chief Inspector, Craft Inspectors, Safety Inspector, Lead Environmental Inspector and Environmental Inspectors [EI] will be aware of the potential for sinkhole formation during construction and trained to identify the signs of sinkhole formation.

Signs of sinkhole formation and the presence of sinkholes will be immediately and clearly marked, and a 300-foot karst buffer zone established. Appropriate engineering and construction staff would conduct evaluation of the area. Avoidance of the area may be possible by a minor route variation or by prohibiting equipment from working in this portion of the temporary workspace. Should unknown sinkholes be encountered during construction, the following mitigation measures may be undertaken:

- Monitor the sinkhole;
- Remediate the sinkhole; or
- Route the pipeline away from sinkholes.

As detailed in ETNG's Resource Report 6 (ETNG 2023g), the options for remediation/mitigation of sinkholes and depressions encountered during construction of the ETNG gas pipeline project are outlined below.

Inverted Filter Approach for Pipeline Excavation Structural Zones:

The sinkhole would be excavated until the throat of the underlying bedrock is encountered. On occasion, the throat may not be fully identified. It is often advantageous to inject water into the excavation to further identify and clean the throat location. At which point, a field decision regarding the more suitable repair method would be developed. This approach is anticipated for those cases in which the pipeline traverses directly across the bottom or near the throat of a sinkhole.

If the inverted filter approach is selected, a non-woven geotextile fabric and large (typically one to two feet diameter size) rock would be initially placed to establish a working base and fill the sinkhole bottom and/or throat. Layers of progressively smaller size rock would then be placed at an appropriate elevation to allow placement of well-compacted structural soil fill. After placement of stone is complete, the stone filter backfill would be wrapped with the geotextile fabric and the excavation would be capped with well-compacted soil fill to achieve the proposed subgrade elevation.

Concrete Plug Approach for Pipeline Excavation Structural Zones:

This approach would initially consist of excavating and cleaning out the throat or open void to allow placement of a concrete plug consisting of flowable fill. Depending on the size and shape of the throat opening, it may be prudent to initially place graded stone within the throat area. The concrete plug would be installed such that it is bonded to adjacent bedrock. The thickness of the concrete plug would be based on field observations, but in general, the thickness should be at a minimum of two times the width of the plug. Large rock fill may be incorporated into the flowable fill to reduce the overall volume of flowable fill material.

After curing, the remaining site area will be filled with well-compacted soil if required to achieve the proposed subgrade elevation. This approach is anticipated for those cases in which the pipeline traverses directly across a sinkhole void/opening in a non-closed depression areas that typically do not receive normal storm water flow (i.e., along a hillside for example) or if an unanticipated opening is identified during pipeline excavation or construction of aboveground facilities.

Large Rock Placement in Cave or Opening:

In cases where the pipeline will traverse a large open void or cave feature, stabilizing and filling the large opening could be implemented to minimize disturbance of the underlying cave feature or large open void. Initially, large rock (several feet in diameter) will be securely placed and wedged into the opening or cave feature. Additional angular rock (up to two feet in size) may be placed prior to placement of a nonwoven filter geotextile fabric. The remaining depth may be capped with No. 1 stone, suitable graded rock, and soil backfill to achieve proposed subgrade elevation. This option may not be suitable for caves inhabited by bats or containing other sensitive environmental features.

General Site Filling Approach:

In some cases, pipeline construction will necessitate the backfilling of certain site features (i.e., closed depressions without visible openings/voids at the ground surface and depressions with karst voids or openings exposed to ground surface) to facilitate construction and installation of the pipeline. These closed depressions or karst features will typically be located within the construction right of way of the [Ridgeline Expansion] project but not within the actual pipeline excavation zone or pipe non-structural zone. Backfill activity for both situations would consist initially of vegetation removal and placement of a geogrid and non-woven filter fabric across the footprint of the site feature to be backfilled. Large angular rock (up to two feet in diameter) may be placed over the geogrid and geotextile. Placement of a layer of No. 1 size stone over the large angular rock may be utilized (if required) and will be based on field decision at the time of construction. The goal of this remediation approach will be to minimize the overall impact to natural/existing storm water infiltration/recharge rates and flow direction.

As required by 49 CFR §192.613, [ETNG] will conduct route surveillance during operation of the facilities, along with training of surveillance personnel, to monitor the pipeline ROW for evidence of subsidence, surface cracks, or depressions which could indicate sinkhole formation. Should either be identified, the [Ridgeline Expansion] project geotechnical engineer will be notified. Mitigation measures may include backfilling the sinkhole with fill material, injecting grout into the sinkhole to seal the hole and prevent further collapse, or a combination of grouting and backfilling. In extreme instances, the affected pipeline segment will be excavated, repositioned, or replaced to a stress-free state, and properly bedded and backfilled to pre-construction contours.

Acid rock drainage could affect surface and groundwater within portions of the pipeline project area. Acid rock drainage occurs when rocks containing sulfide minerals, such as pyrite, are exposed to air and water. The sulfide minerals weather more quickly when exposed to water and/or oxidation occurs, and dissolve more quickly than the remaining rock. The dissolved sulfides create an acidic solution that can be transported through stormwater as acidic drainage runoff. The acidic solution can be corrosive and cause damage to the environment and infrastructure including utilities. Damages to the receiving environment may include aquatic organisms, and wildlife. The weathering process may be accelerated by breaking up or exposing potentially acid generating (PAG) rock by increasing the surface area available for sulfide oxidation (ETNG 2023g). Pyrite is the most common and abundant sulfide mineral that is capable of generating the most acidity per unit. Pyrite is often found in sedimentary lithologies such as black shale and coal seams, and in metamorphic rocks where it may be either a primary or secondary mineral (AMEC 2009)

A desktop study was conducted by ETNG to evaluate the geologic units that could create acid rock drainage concern during construction by using respective USGS county maps and the Pre-Chattanooga Stratigraphy in Central TN to evaluate the location and composition of bedrock units for those areas within the pipeline that may be susceptible for acid rock drainage (ETNG 2023g). ETNG reported that the pipeline crosses four geologic units (Chattanooga Shale, Crab Orchard Mountain Group, Rockcastle Conglomerate, and Crooked Fork Group) that have the potential to create acid rock drainage. The Chattanooga shale was considered to have a high potential for acid rock drainage, the Grab Orchard Mountains Group and Crooked Fork Group were considered to have a moderate potential for acid rock drainage, and the Rockcastle Conglomerate was considered to have a low potential for acid rock drainage.

The Chattanooga Shale is crossed by the pipeline in Smith County at:

- MP 18.4 to MP 21.8

The Chattanooga Shale is crossed by the pipeline in Jackson County at:

- MP 32.6 to MP 34.1
- MP 36.1 to 39.3
- MP 40.4 to 42.6
- MP 43.1 to 45.6

The Crab Orchard Mountains Group is crossed by the pipeline in Overton and Fentress counties at:

- MP 62.7 to 72.4

The Crooked Fork Group is crossed by the pipeline in Morgan and Roane counties at:

- MP 83.9 to MP 114.7

The Rockcastle Conglomerate is crossed by the pipeline in Fentress and Morgan counties at:

- MP 72.4 to MP 83.9

As stated by ETNG in Resource Report 6 (ETNG 2023g):

> The Chattanooga Shale has the highest potential to create acid rock drainage because the pipeline alignment will cross mountains and hills containing this shale unit at or near the surface. If exposed to accumulated surface water, the disseminated and clustered pyrite contained in the shale will create acid rock drainage runoff.
>
> The Crab Orchard Mountains Group has a moderate potential to create acid rock drainage if the two coal beds within the group are intersected during excavation and exposed to accumulated surface water. Given that the total thickness of the Crab Orchard Mountains Group is approximately 1,000 feet and the coal beds comprise a small thickness of the group, [ETNG] does not believe it will encounter a significant length of coal beds during construction.
>
> The Crooked Fork Group also contains coal beds with the potential to create an acid rock drainage. The Crooked Fork Group has a slightly higher chance to create acid rock drainage as the layer is not as thick as the Crab Orchard

Mountains Group and coal beds are more prevalent within the Crooked Fork Group. The Rockcastle Conglomerate has the lowest potential to create acid rock drainage during construction.

Where avoidance of PAG rock is not practicable, [ETNG] will implement acid rock drainage management along the pipeline ROW as needed to help minimize environmental impacts. Mitigation methods for each PAG section of the ROW will be selected based on what methods are geochemically appropriate, the workspace and construction schedule requirements, and the construction method. Typical mitigation measures for acid rock drainage include blending with a non-potentially acid generating material, covers, water diversion, and collection and treatment of acid drainage (Price and Errington 1998).

Within areas of potential acid rock areas, ETNG will implement the following:

- Conduct awareness training for acid forming rock units during Supervisor Staff environmental training, including recognition of pyrite and coal containing formations;
- Identify locations of acid rock in advance of construction based on rock proofing and laboratory testing results;
- Inform the contractor which acid rock areas will require off-site disposal or mitigation of exposed rock surfaces;
- During construction, visually inspect spoils for the presence or pyrite or other PAG indicators; and
- Utilize the onsite EI’s to ensure that acid rock excavation, disposal, and mitigation measures are followed.
- Where PAG rock is identified, ETNG will use mitigation measures, as required and appropriate, which will include:
- Implementation of a 30-day limit from the time acid rock is disturbed to the time it is transported to a waste facility.
- Monitor sites with acid rock for potential acid drainage and test waters in construction or storage areas to determine if acid rock drainage is occurring. EI’s would test the pH of any water present in the construction site on a weekly basis. Proposed mitigation measures based on pH are presented in Table 3.5-8.
- Record the location and quantity of any acid rock transported offsite for disposal or disposed of within the Project workspaces;
- In areas where blasting is required, minimize blasting overbreak through the use of nitroglycerin rather than emulsion, pre-shear blasting techniques; or lower blasting charges per hole;
- In areas where trenching or grade cuts may expose acid rock, grade and side slopes will be cut to a maximum of 3 to 1 horizontal to vertical slope. Temporary mitigation measures include backfill trench within the grade cut, cover all exposed rock on side slopes, spray on material like shotcrete on vertical cuts;

- If removal of more than 50 cubic meters of acid rock is required, East TN will remove from the Project within two weeks and if not removed, acid rock will be placed on a prepared base and monitored by the EI's. If monitoring indicates rock is producing acid-containing water, the rock will be removed immediately and transported to an offsite disposal facility or a temporary staging area.
- Blend PAG waste with non-PAG material or add an alkaline amendment such as limestone or line/layer the pipeline trench with alkaline material during backfill; and
- Use diversion berms, trench breakers or trench pumps to route water away from a trench or spoil pile containing acid forming rock; or
- Segregate PAG rock from the construction area until another mitigation strategy can be developed, such as incorporation in asphalt.

[ETNG] would evaluate these options and employ them during construction as needed.

Table 3.5-8. Mitigation Measures Based on pH for Areas of Potential Acid Drainage

pH measured in Construction Water	Mitigation Measures Implemented	Follow-up Procedures
<4	Containerize and remove all waters for offsite treatment.	Begin monitoring pH of contained waters daily
>4 but <5	Review onsite treatment options (e.g., addition of lime to water)	Begin monitoring pH of contained waters daily
>5 but <6	Minimize water contact with acid rock	Continue to monitor pH of contained waters weekly
>6	No mitigation required	Continue to monitor pH of contained waters weekly

Source: ETNG 2023g

The proposed ETNG Construction ROW may transverse steep slopes and rugged natural areas as it crosses from the Valley and Ridge Physiographic Province into the Cumberland Plateau and may do so again as it crosses from the Eastern Highland Rim Physiographic Province into the Nashville Basin. Therefore, landslides could be a potential risk along the proposed ETNG Construction ROW. Landslides have a higher likelihood in areas with steeper slopes. ETNG conducted a desktop study to assess risks associated with slope instability based on mapping available from the USGS (Radbruch-Hall et al. 1982). The pipeline ROW was categorized by ETNG using the following categories: low susceptibility and incidence, moderate susceptibility and incidence, high susceptibility and low incidence, and high susceptibility and moderate incidence (ETNG 2023g).

The project route from MP 65.5 to MP 87.0 (located in Overton, Fentress and Morgan counties) is considered to be located in an area of high susceptibility and low incidence, and MP 87 to MP 122.4 (located in Morgan and Roane counties) is considered to be located in an area of high susceptibility and moderate incidence (ETNG 2023g).

Approximately 35 miles of the proposed pipeline route are in location areas classified by the USGS as highly susceptible to landslides with a moderate rate of landslide incidence.

ETNG evaluated the current ground slope along the pipeline route, and approximately 2.6 miles (2 percent) of the proposed route crosses steep slopes (greater than 30 percent). The desktop review identified 12 locations where slopes along the pipeline would exceed 50 percent, with the longest section of such slopes being approximately 400 feet long and located just west of Flynn Creek near MP 38.0.

Soils

ETNG's Resource Report 7 (ETNG 2023h) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the soil-related findings in ETNG's Resource Report 7. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). Construction activities associated with the pipeline, such as clearing, grading, trench excavation, installation, backfilling, and the movement of construction equipment along its route, have the potential to disturb soil stability and increase erosion.

Soil disturbance would occur due to the construction and operation of the Hartsville Compressor Station and the M&R stations, as well as at other small aboveground facilities, including the MLVs and the receivers that would be located along the pipeline ROW.

Temporary soil disturbance could potentially occur at equipment laydown yards located in Trousdale, Smith, Jackson, Putnam, Overton, and Cumberland counties during construction. However, the selected contractor yards are primarily industrial sites, or are otherwise disturbed areas, and native soil at the sites is likely limited. Soil disturbance related to these proposed facilities would be minimized and mitigated through the application of the Project E&SCP (ETNG 2023g).

Effects to soils associated with grading and site preparation activities would be temporary and mitigated through BMPs identified in Section 2.3. Stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, would not require any off-site or on-site hauling of soils. However, some minor off-site or on-site hauling may be necessary.

Operation of the pipeline would not impact soils and no adverse cumulative impacts to soils are anticipated. "Revegetation is based on potential for seedling mortality rating class. A seedling mortality rating of high indicates the soil has properties that would decrease the potential for successful revegetation (USDA 2022a). Approximately 34 acres of soils crossed by the [Ridgeline Expansion] project have a high seedling mortality rating." (ETNG 2023h).

According to ETNG's Resource Report 7 (ETNG 2023h):

> Soils that have a high rate of seedling mortality were considered areas for revegetation concerns. East TN will promote revegetation through the implementation of its Project E&SCP, which incorporates measures from the FERC Plan and FERC Procedures.
>
> - These will include, but are not limited to:
> - Selection and application of appropriate seed mixes, application of fertilizer as recommended;

- Performing seeding of permanent vegetation within the recommended seeding dates;
- Preparation of a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed;
- Implementation of temporary stabilization measures (e.g., using mulch in upland areas); and
- Follow-up monitoring after first growing season, and if necessary, the second growing season to determine success of revegetation.

Prime Farmland

ETNG's Resource Report 7 (ETNG 2023h) was filed with FERC in June 2023. TVA has independently reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with farmland-related findings in ETNG's Resource Report 7.

Based on soils data obtained from the ETNG's Resource Report 7 (ETNG 2023h), approximately 558.5 acres of the pipeline ROW and the additional temporary workspace, or 31 percent, is classified as prime farmland with the potential to be impacted by the proposed natural gas pipeline (Appendix H). Additionally, including the acreage with the potential to be impacted by the aboveground facilities, pipe/contractor yards, and access roads, approximately 656.6 acres, or 26 percent of the Project's total 2,514.5 acres, are designated as prime farmland. Prime farmland soils are classified as those best suited for production of food, feed, fiber, and oilseed crops. These soils generate the highest yields with the least amount of expenditure.

Once construction is complete, during operation of the pipeline, 10.5 acres of prime farmland would be unavailable for farming (7.6 acres within aboveground facilities and 2.9 acres within the PARs) (ETNG 2023h).

Within a 5-mile radius of the Kingston Reservation, approximately 4,619 acres (6.3 percent) have soil classified as prime farmland. Any minor loss of on-site prime farmland soils is not significant when compared to the amount of prime farmland within the surrounding region. Effects on prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the project sites. Potential impacts on active agricultural soils would be minimized and mitigated in accordance with FERC's Plan and associated special construction procedures. In accordance with FERC's Plan and in coordination with landowners, ETNG would segregate a minimum of 12 inches of topsoil in areas of deep topsoil (more than 12 inches) for construction of the pipeline facilities in agricultural land. In areas where the topsoil is less than 12 inches thick, ETNG would segregate all the topsoil where practicable. Topsoil would be stockpiled separately from the subsoil on the construction ROW. Following construction, the ROW would be restored to pre-construction conditions and crop production could resume within the permanent easement.

The construction of the natural gas pipeline combined with past, present, and RFFAs in the vicinity of the Kingston Reservation and proposed ETNG Construction ROW, listed in Table 3.1-1, could remove current prime farmland in the area, resulting in minor cumulative impacts on prime farmland.

3.5.1.2.2.7 Summary of Alternative A

TVA Proposed Actions

Minor direct effects to potential subsurface geological resources are anticipated from the construction of the CC/Aero CT Plant due to subsurface activities. Vegetation clearing, grading, and other site preparation activities associated with the construction of the CC/Aero CT Plant have the potential to disturb soil stability and increase erosion. The revised design of the CC/Aero CT Plant and associated off-site transmission system upgrades would result in temporary or permanent impacts to 191.5 acres. Of those acres, 46.8 are permanent impacts associated with the CC/Aero CT Plant footprint, 8.5 acres are permanent impacts associated with the construction of the switchyard, 8.2 acres are temporary impacts from parking/laydown areas, and 128 acres are temporary impacts from vegetation clearing or land disturbance related to existing and maintained transmission ROW and existing access roads. The proposed 3- to 4-MW solar facility would result in permanent impacts to 35 acres. The proposed 100-MW BESS and associated transmission line connections would result in permanent impacts to 71-81 acres, depending on which battery site is selected. Between 30 and 40 of those acres are permanent fill impacts associated with the battery site and 41 acres are permanent habitat conversion associated with transmission line connections.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

Mitigation measures would be utilized in karst-prone or sloped areas to reduce the risk of geologic hazards and impacts during pipeline construction. Effects to soils associated with grading and site preparation activities from pipeline construction would be temporary and mitigated through BMPs identified in Section 2.3.

Of the total 2,514.5 acres within the project with the potential to be impacted by the pipeline corridor and additional workspace, aboveground facilities, pipe/contractor yards, and access roads, approximately 656.6 acres, or 26 percent, are designated as prime farmland. Once construction is complete, during operation of the pipeline, 10.5 acres of prime farmland would be unavailable for farming (7.6 acres within aboveground facilities and 2.9 acres within the PARs) (ETNG 2023h).

3.5.1.2.2.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to soils resulting from the proposed CC/Aero CT Plant and other activities proposed on the Kingston Reservation would be minor. Further, no residential populations are present within the Kingston Reservation. Effects occurring as a result of the proposed transmission system upgrades would primarily be outside of the Kingston Reservation within transmission ROWs and may result in increased runoff and erosion, which TVA would minimize through implementation of standard BMPs. Increased runoff and erosion may result in disproportionate effects on EJ populations who may rely on impacted soils for their livelihood or sustenance. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

The natural gas pipeline and transmission line activities are associated with certain geologic hazards, such as those presented by karst features, which are distributed across the ETNG Construction ROW EJ Study Area. Although these hazards would be minimized as much as practicable, there is still the potential for disproportionate effects to occur on EJ populations.

Effects to prime farmland resources resulting from construction of the ETNG Construction ROW may have temporary, minor disproportionate effects on populations that currently farm the corridor where the pipeline would be constructed. This is especially true in areas where farming populations and prime farmland soils co-exist. CT 9603 BG 4, CT 9653 BG 4, CT 9653 BG 1, and CT 9653 BG 2 have greater amounts of prime farmland relative to other BGs near the pipeline. Although TVA has assessed these prime farmland impacts to be minor and temporary, these groups may experience disproportionate effects to prime farmland, especially if farming these areas is the primary livelihood of people in these communities.

3.5.1.2.3 Alternative B

3.5.1.2.3.1 Construction and Operations of Solar and Storage Facilities

Geology and Paleontology

Under Alternative B, minor effects to geology could occur from the construction of solar and storage facilities. Minor excavations would be required for construction of the facility substations, medium voltage transformer, and concrete pads for the storage systems. Solar arrays would be supported by steel piles, which would either be driven or drilled into the ground to a depth between 7 and 15 feet below grade. The PV panels would be connected with underground wiring placed in trenches approximately 3- to 4-feet deep. If needed, on-site sedimentation basins would be shallow and, to the extent feasible, utilize the existing terrain without requiring extensive excavation. Minor excavations would also be required for construction of the facility substations, medium voltage transformer, and the concrete pads for the storage systems.

In the event paleontological resources (e.g., fossilized vertebrate remains, such as bones, teeth, etc.) are encountered during construction, the construction contractor would report the finding to the on-site inspection staff. The inspection staff would temporarily suspend construction activities in the immediate area of the paleontological finding, while a qualified paleontologist is consulted. The on-site inspection staff would coordinate with TVA's Kingston project manager to determine the appropriate actions if the finding is determined to be a significant paleontological resource. TVA would comply with applicable laws, regulations, and procedures.

Geologic Hazards

Landslides are possible in areas of steeper slopes. Landslide potential would be evaluated prior to construction of Alternative B, and its components would not be built in areas subject to landslides. Hazards resulting from geological conditions may be encountered in the case of sinkholes. Alternative B is located within TN's Appalachian Ridge and Valley Region, which is located over limestone bedrock that is susceptible to erosion and the creation of sinkholes. Based on the finalized location of the solar and storage facilities and associated transmission lines, sinkholes could be a minor to moderate risk.

Based on regional data, the potential for minor seismic activity due to Alternative B's proximity to both the Eastern TN and the New Madrid Seismic Zones is low. The solar and storage facilities and transmission lines would be designed to comply with applicable seismic standards. Due to the low level of seismic activity in the area and construction of the solar and storage facilities using materials in accordance with current industry standards and federal regulations, the potential for geologic hazards to impact the project facilities is low. No other geologic hazards are anticipated.

Soils

Under Alternative B, the construction and operation of 1,500 MW of solar and 2,200 MW of battery storage at various sites within portions of the East TN region would result in minor effects to soils. The exact project locations for solar and/or storage projects are not known at this time. According to the analysis described in Section 3.2, an average of 7.3 acres (ranging from 2.00 to 17.95 acres per MW) are typically required for PV projects. Therefore, the 1,500 MW of solar generating capacity would occupy approximately 10,950 acres. Soil impacts would be spread across 15 or more solar sites within portions of the East TN region, based on the assumption that each site is 100 MW. Approximately 10 to 15 acres per 40 MW would be required for the storage facilities. Based on this requirement, the 2,200 MW of battery storage would occupy about 550 to 825 acres.

Grading and clearing activities associated with the construction of the solar and BESS sites would cause minor, localized increases in erosion and sedimentation, resulting in minor effects to soils. Effects to soils associated with grading and clearing activities would be temporary and mitigated through BMPs identified in Section 2.3. Soils would be temporarily affected due to construction activities and tree-trimming and other maintenance activities during operation. Any stockpiled soils from the area where vegetation clearing and grading occurs, including topsoil, would be appropriately replaced following cut-and-fill activities to the extent practical and, therefore, would likely not require any off-site or on-site hauling of soils. However, some minor off-site or on-site hauling may be necessary.

Although not anticipated, should borrow material be required for project site activities, sand and gravel aggregate may be obtained either from established local, permitted, off-site sources. The creation of new impervious surface, in the form of the foundations for the central inverters, BESS, and other associated components, would result in a minor increase in stormwater runoff and potential increase in soil erosion. Planting of native and/or non-invasive vegetation, including plants attractive to pollinators, within the limits of disturbance, along with use of BMPs identified in Section 2.3, would minimize the potential for increased soil erosion and runoff. Following construction, implementation of soil stabilization and vegetation management measures would reduce the potential for erosion effects during site operations. No adverse cumulative impacts to soils are anticipated.

During operation and maintenance of the solar facilities, minor disturbance could occur to soils. Routine maintenance would include periodic motor replacement; inverter air filter replacement; fence repair; vegetation control; and periodic PV array inspection and, repairs. The individual solar facilities could utilize mowing or grazing sheep to manage vegetation within portions of the fenced-in, developed areas not limited by other constraints. Additional fencing for the sheep would be used to limit their movement and manage vegetation growth. Selective spot applications of herbicides may be employed around facilities and structures to control weeds. Herbicides would be applied by a professional contractor or a qualified project technician. These maintenance activities would not result in any adverse effects to soils on the project sites during operations.

Prime Farmland

Under Alternative B, the construction and operation of 1,500 MW of solar and 2,200 MW of battery storage at sites within portions of the East TN region could result in moderate effects to prime farmland. TVA typically utilizes 15- to 20-year PPAs with third-party developers for its solar and BESS facilities, but also has the option to “self-build” solar and BESS facilities. At the end of a PPA, the developer would assess whether to cease operations at the solar and/or BESS facility or to replace equipment, if needed, and attempt to enter into a new PPA with TVA or make some other arrangement to sell the power. When operations cease, the facilities would be decommissioned and dismantled, and the project sites would be restored per project decommissioning requirements. Following decommissioning of the solar facilities, the majority of the sites could be returned to agricultural use with little reduction in soil productivity or effect to prime farmland/farmland of statewide importance.

Approximately 11 percent of the East TN TVA PSA is classified as prime farmland (USDA 2019a). An additional 0.6 percent would be classified as prime farmland if drained or protected from flooding. Most previously constructed TVA solar facilities have occupied prime farmland (Table 3.2-1). Because solar facilities are typically located on flat or gently sloping land that is more likely to be prime farmland than steeper areas, a large portion of the approximately 10,950 acres occupied by the proposed solar facilities is likely to be prime farmland. Prime farmland effects would be spread across 15 or more solar sites within portions of the East TN region, based on the assumption that each site is 100 MW. A portion of the 550 to 825 acres occupied by the storage facilities is also likely to be prime farmland. Within a 5-mile radius of the Kingston Reservation, approximately 4,619 acres (6.3 percent) have soils classified as prime farmland. Minor loss of on-site prime farmland soils would not be significant when compared to the amount of prime farmland within the surrounding region. However, the loss of farmland may result in moderate effects at a more local or county level. Most ground-mounted PV facilities have been constructed on previously cleared, frequently pasture, hayfield, or crop land that would require little grading to smooth or level the site. Although construction and operation of the PV facility usually eliminates agricultural production on the site, it typically does not adversely affect soil productivity or the ability to resume agricultural production if the PV facilities are removed. In some cases, the solar site is grazed by sheep or other livestock as a means of managing vegetation growth and is therefore maintained in agriculture. Effects on prime farmland soils would be reduced using appropriate BMPs to control erosion and limit sediment and soil from leaving the project sites. When project locations for solar and/or storage projects are determined, site-specific analyses would consider the potential effects on prime farmland and would be included in future NEPA reviews.

Future projects in the geographic area of analysis could result in prime farmland conversion. In addition to the 1,500 MW of solar facilities considered under Alternative B, TVA is proposing to add 10,000 MW of solar by 2035 to meet customer demands and system needs. This would also change undeveloped or agricultural sites, which could include prime farmland, to industrial uses. These future actions combined with the construction of the solar and storage facilities would likely result in prime farmland conversion. However, in view of the relatively large amounts of rural and undeveloped lands within the counties selected, cumulative impacts on prime farmland are anticipated to be minor.

3.5.1.2.3.2 Transmission and Other Components

Geology and Paleontology

Under Alternative B transmission corridor installation, minor effects to geology could occur. Transmission structures are typically driven or drilled into the ground to shallow depths. Minor excavations would also be required for construction of a substation and other transmission components. Due to the small sizes of the subsurface disturbances, only minor direct effects to potential subsurface geological resources are anticipated. Transmission structures associated with Alternative B are similar to those transmission lines constructed for Alternative A, although interconnection for solar facilities would typically be shorter. Due to the small sizes of the subsurface disturbances, only minor direct effects to potential subsurface geological resources would be anticipated.

Should paleontological resources be exposed during site construction (i.e., grading and foundation placement) or operation activities, a paleontological expert would be consulted to determine the nature of the paleontological resources, recover these resources, analyze the potential for additional effects, and develop and implement a recovery plan/mitigation strategy.

Soils

Under Alternative B, the transmission line upgrade activities would also result in minor effects to soils. Minor ground disturbance is expected in these areas, but if the ground is disturbed, the access road area would be revegetated using native, low-growing plant species after required transmission line upgrade work is completed to minimize the potential for increased soil erosion and runoff. Since the exact project locations for solar and/or storage projects and associated transmission line upgrade activities are not known at this time, according to the analysis described in Section 2.1.5.2, an average of 17.73 acres could be impacted due to transmission and electrical system components per solar site. Based on the assumption of 15, 100-MW solar sites, Alternative B would result in approximately 266 acres of impacts to soils for construction of transmission components. However, effects to soils associated with transmission line upgrades would be temporary and mitigated through BMPs identified in Section 2.3. No adverse cumulative impacts to soils are anticipated.

Prime Farmland

Under Alternative B, the transmission line upgrade activities could result in minor effects to prime farmland. Since the exact project locations for solar and/or storage projects and associated transmission line upgrade activities are not known at this time, TVA compiled a list of typical effects from construction activities related to transmission projects in the 2019 IRP EIS. A total of 298 projects were included in the review. The review determined that transmission line construction did not result in prime farmland conversion, while 64 percent of new substation and switchyard construction resulted in prime farmland conversion. Transmission line upgrade activities resulted in no prime farmland conversions and an average of 6.9 acres (ranging from zero to 29.1 acres) of prime farmland were used for new substation and switchyards. Based on an assumption of 15, 100-MW solar sites that have new substation and switchyard construction, approximately 10 sites would result in prime farmland conversion and a total of 69 acres of prime farmland conversions would occur. No adverse cumulative impacts to prime farmland are anticipated.

3.5.1.2.3.3 Environmental Justice Considerations

Effects to geology and soil resources that would occur as a result of the proposed solar facilities and transmission line activities are anticipated to be minor and mitigated with BMPs. Temporary or permanent loss of prime farmland resources as a result of construction of the solar facilities and the transmission line activities may impact EJ populations that currently farm the sites where the facilities would be constructed. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.5.2 Floodplains

3.5.2.1 Regulatory Framework for Floodplains

TVA adheres to the requirements of EO 11988, *Floodplain Management*. The objective of EO 11988 is "to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (EO 11988, Floodplain Management). The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances (U.S. Water Resources Council 1978). The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative.

For "Critical Actions," the minimum floodplain of concern is the 500-year floodplain. The U.S. Water Resources Council defines "critical actions" as "any activity for which even a slight chance of flooding would be too great" (U.S. Water Resources Council 1978). Critical actions can include facilities producing hazardous materials (such as liquefied natural gas terminals), facilities whose occupants may be unable to evacuate quickly (such as schools and nursing homes), and facilities containing or providing essential and irreplaceable records, utilities, and/or emergency services (such as large power-generating facilities, data centers, museums, hospitals, or emergency operations centers) (TVA 2019b).

TVA reservoirs have either power storage or flood storage or both. Power storage is allocated to a range of elevations and water occupying space in that range is used to generate electric power through a dam's hydroturbines. Flood storage is allocated to a range of elevations and water occupying space within that range is used to store flood water during a flood or high-flow rain event. Some of TVA's dams are able to be surcharged. Surcharge is the ability to raise the water level behind the dam above the top-of-gates elevation. Surcharge can be sustained only for a short period of time during a flood. To control flood-damageable development on TVA lands, TVA uses a concept known as the Flood Risk Profile (FRP). The FRP is the elevation of the 500-year flood that has been adjusted for surcharge at the dam.

It is necessary to analyze proposed actions against both EO 11988 and *TVA Flood Storage Loss Guideline* to ensure that development is consistent with them.

EO 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, was reinstated in May 2021. However, implementation of EO 13690 is still in development at the national level. TVA is working with other federal agencies to develop consistent implementing plans for these requirements. When those implementing plans are finalized, TVA would incorporate floodplain analysis with respect to EO 13690, in addition to EO 11988. Depending upon the results of these inter-agency efforts, TVA may update the floodplain implementing plan in subsequent NEPA analysis.

3.5.2.2 Affected Environment

A floodplain is the level land area along a stream or river that is subject to periodic flooding. The area subject to a 1 percent chance of flooding in any given year is normally called the 100-year floodplain. The area subject to a 0.2 percent chance of flooding in any given year is normally called the 500-year floodplain.

3.5.2.2.1 Kingston Reservation (No Action and D4 Activities)

Kingston is located adjacent to both the Clinch River and Emory River on the Watts Bar Reservoir. The Clinch River surrounds the eastern and southern sides of the KIF Plant while the Emory River borders the northern side. The Kingston Reservation is situated between Clinch river mile (RM) 3 and Emory RM 3 (USACE 2022a).

Based on the Clinch River Profile 08P in the Roane County Flood Insurance Study, revised 11/18/2009 (FIS), the 100- and 500-year flood elevations on the Clinch River are constant at 746.8 and 748.1 from its mouth to the Emory River confluence at Clinch RM 4.4. The KIF intake is located on a channel entering the Emory River at about Emory RM 1.9. At that location and based on Emory River Profile 12P in the Roane County FIS, the 100- and 500-year flood elevations at the intake would be 747.5 and 750.0 feet, respectively. Flood elevations are referenced to NAVD 1988. Flood zones and the KIF Plant Reservation are shown in Figure 3.5-9.

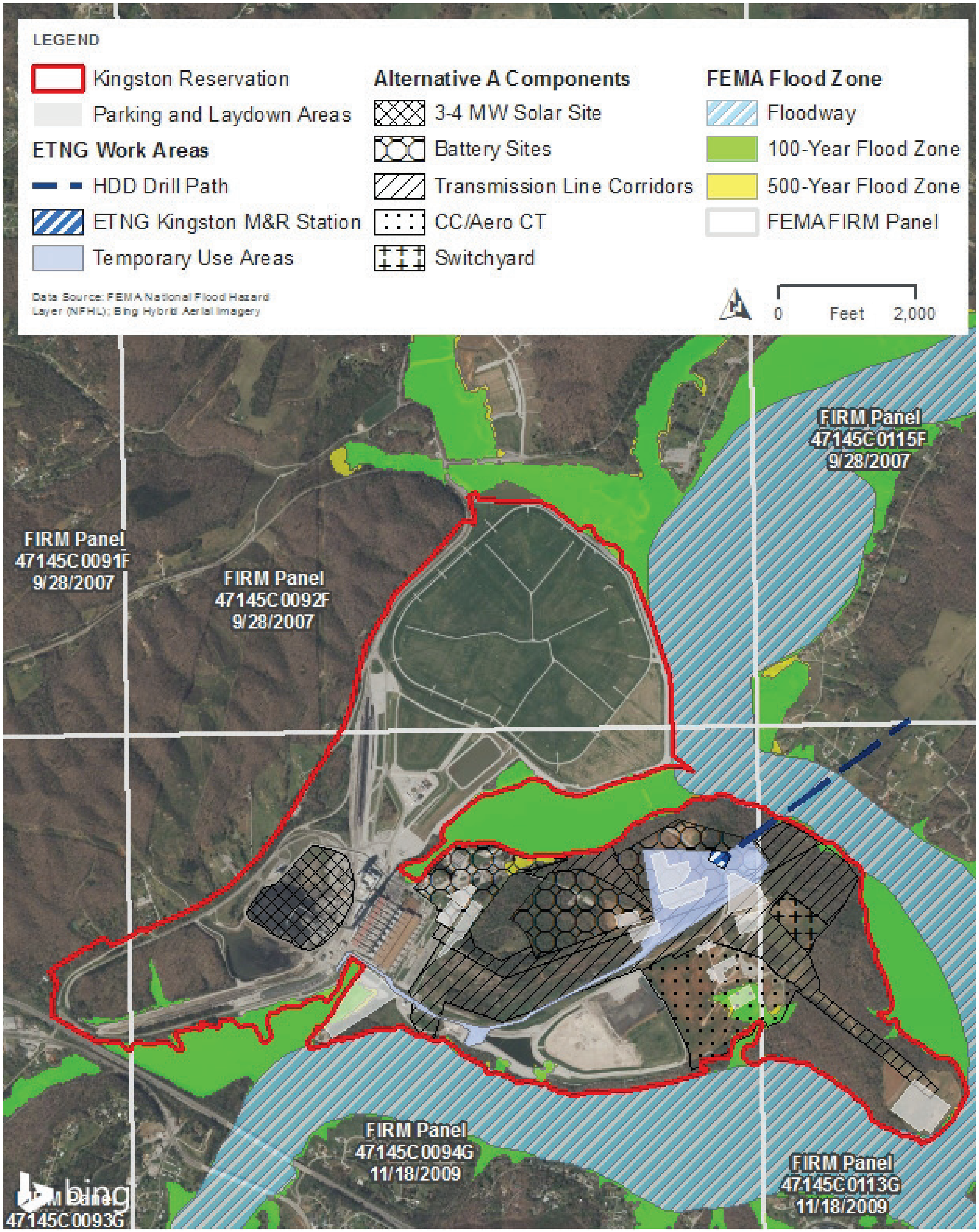

Figure 3.5-9. Flood Zones in the Vicinity of the Kingston Reservation

3.5.2.2.2

3.5.2.2.3 Alternative A

3.5.2.2.3.1 Construction and Operation of CC/Aero CT Plant and Switchyard on Kingston Reservation

Approximately 8.4 acres of the CC/Aero CT Plant site would be located within the 100-year floodplain of the Clinch River (Figure 3.5-9). The parking/laydown area would not be located in the flood zone.

3.5.2.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

As shown in Figure 3.5-9, the land where the proposed solar facility would be located is outside 100- and 500-year floodplains.

3.5.2.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

Battery Sites 2 and 3 would be located outside 100- and 500-year floodplains (Figure 3.5-9) and approximately 0.15 acre of the proposed Battery Site 1 would be located within the 100-year floodplain of the Emory River.

3.5.2.2.3.4 On-site Transmission Upgrades

As shown in Figure 3.5-9, small portions of the transmission ROW would be located within the 100-year floodplain of multiple waterbodies, consisting of approximately 0.58 acre (total) within the on-site transmission line corridor and 0.68 acre (total) within the Battery Transmission Line Connections.

3.5.2.2.3.5 Off-site Transmission Upgrades

Eastern Transmission Corridor

The Eastern Transmission Corridor crosses over a total of 18.1 acres of floodways, 59.7 acres of 100-year floodplains, and 14.1 acres of 500-year floodplains. Specific water resources that are crossed with floodways/floodplains are provided below for each line proposed for upgrades.

L5108 and L5302 extend eastward from Kingston Reservation and terminate in the city of Oak Ridge. Several existing and new access roads (largely along routes that have previously been cleared) would be used and may require maintenance for equipment transport. The Eastern Transmission Corridor crosses the floodways of the Emory River, East Fork Poplar Creek, Brushy Fork, and an unnamed tributary of East Fork Poplar Creek, as well as the 100-year floodplains of these and other streams in Roane and Anderson counties (Figure 3.5-10a through Figure 3.5-10d).

L5116 extends eastward from the current Kingston Reservation and terminates at the Bethel Valley switching station. Several existing and new access roads (largely along routes that have previously been cleared) would be used and may require maintenance for equipment transport. This portion of The Eastern Transmission Corridor crosses the 100-year floodplains of Grassy Creek and several unnamed tributaries, Bear Creek and several unnamed tributaries, and Whiteoak Creek and several unnamed tributaries (Figure 3.5-10a-d).

L5280 and L5381 extend eastward from the Bethel Valley switching station and terminate at the Oak Ridge National Laboratory (ORNL) switching station. Several existing and new access roads (largely along routes that have previously been cleared) would be used and may require maintenance. This portion of The Eastern Transmission Corridor crosses the 100-year floodplains of Bearden Creek and several unnamed tributaries, and Whiteoak Creek (Figure 3.5-10a-d).

Western Transmission Corridor

L5383 extends southeast from the Plateau TN 500-kV substation in Crossville on Plateau Road and terminates north of the Crossville city limits at the Peavine TN 161-kV switching station. Several access roads would be used along the route in agricultural areas. The Western Transmission Corridor crosses a combined 1.9 acres of the 100-year floodplains of two streams (Figure 3.5-11).

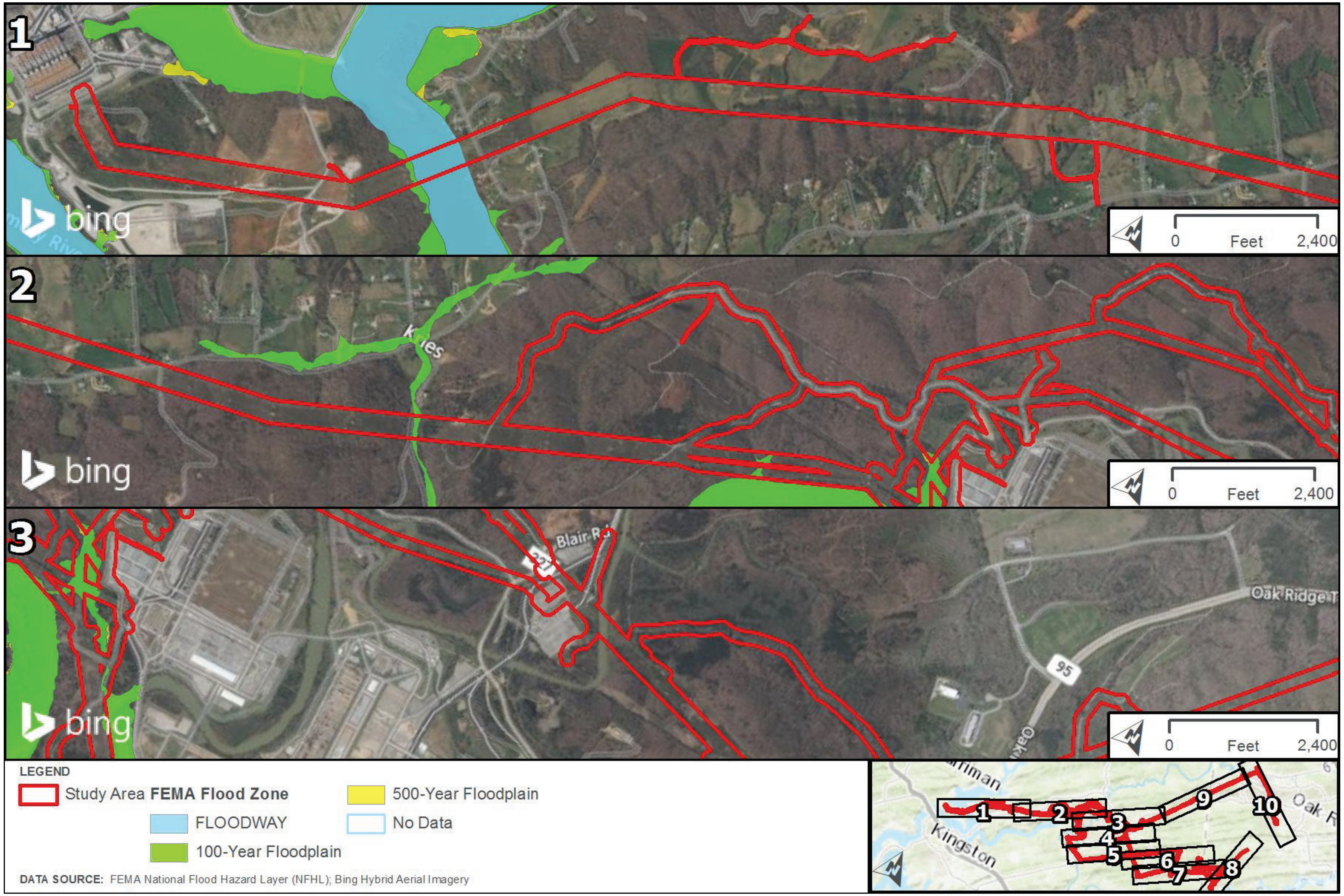

Figure 3.5-10a. Flood Zones Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor

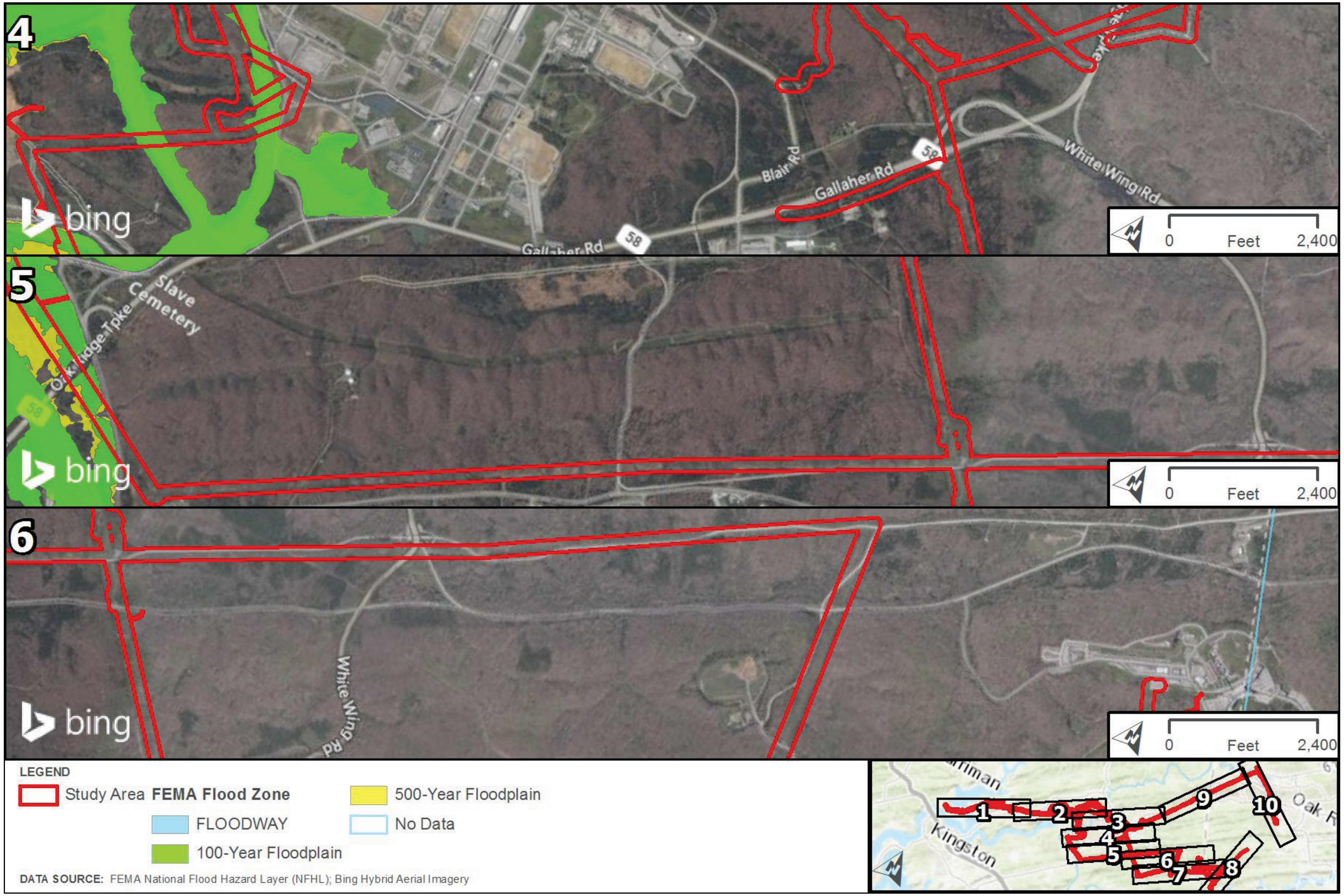

Figure 3.5-10b. Flood Zones Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor

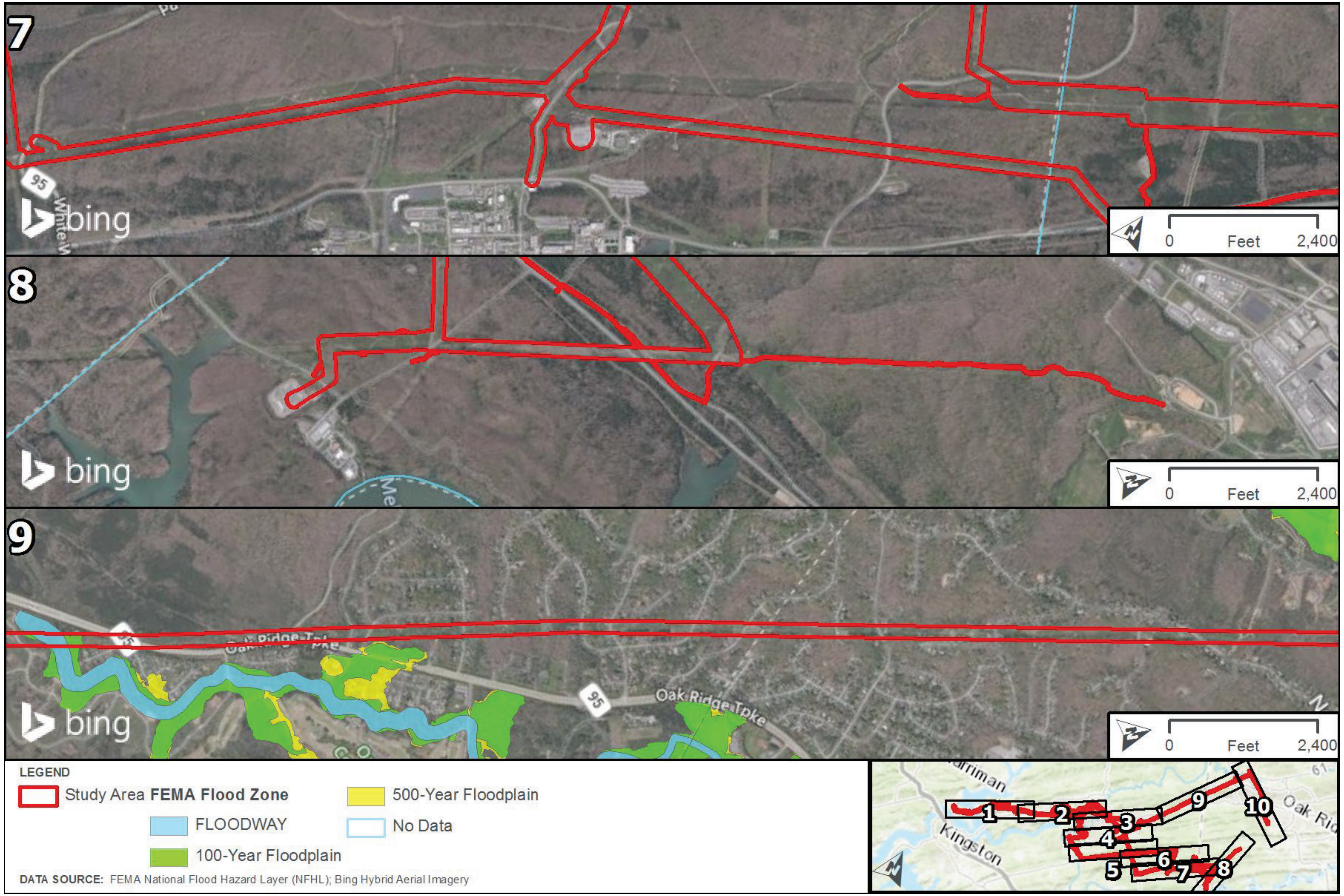

Figure 3.5-10c. Flood Zones Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor

Figure 3.5-10d. Flood Zones Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor

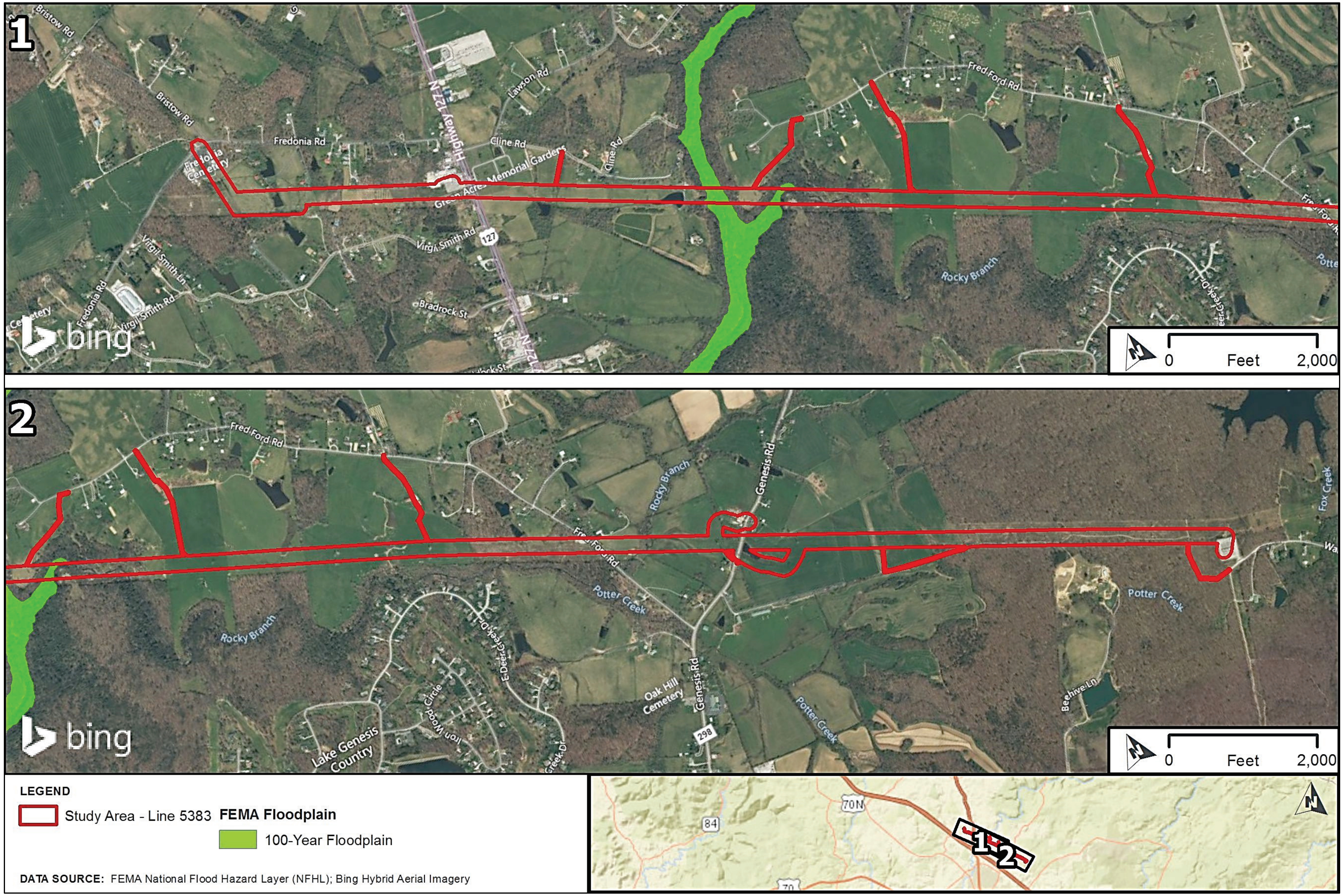

Figure 3.5-11. Flood Zones Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Western Transmission Corridor

3.5.2.2.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's proposed natural gas pipeline facilities would consist of about 7 miles of new pipeline ROW between KIF Plant and the existing pipeline ROW. The remaining new gas pipeline would be primarily located within or adjacent to the ROW of an existing gas pipeline. The proposed pipeline would cross the floodplains of multiple streams in Roane, Morgan, Fentress, Overton, Putnam, Jackson, Smith, and Trousdale counties. See Appendix H for FEMA mapping along the ETNG Construction ROW. Additionally, the pipeline would be buried, the surface restored to preconstruction contours to the extent practicable, and the associated aboveground facilities are not proposed in floodplain areas except for a small portion of MLV #3. Approximately 0.02 acre of MLV #3, located near MP 28.6, is inside a mapped 100-year floodplain (ETNG 2023g).

3.5.2.2.4 Alternative B

3.5.2.2.4.1 East Tennessee TVA Power Service Area

TVA anticipates that the solar facilities proposed under Alternative B would be located within portions of East TN to offset transmission system upgrades that may be required following the retirement of KIF as described in further detail in Section 2.1.5. The TN River is the main river in East TN. Major tributaries of the TN River in East TN include the Hiwassee River, Clinch River, Little TN River, Holston River, and French Broad River.

3.5.2.3 Environmental Consequences

3.5.2.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue current KIF operations. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or would be in subsequent NEPA analysis. There would be no direct or indirect impacts to floodplains because there would be no physical changes to current conditions.

3.5.2.3.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

Most of the Kingston Reservation where the existing plant would be decommissioned, decontaminated, and deconstructed is located outside of the 100-year floodplain. Portions of the Kingston Reservation are located within the Clinch and Emory River floodplains (Figure 3.5-9). Structures and facilities, such as laydown areas, haul roads, and staging areas, would be constructed and sited, where practicable, outside of the 100-year floodplain. If decommissioning and deconstruction activities or structures must be located in floodplains, these activities would be considered temporary uses of the 100-year flood zone and, therefore, would have no permanent impacts on floodplains or floodplain resources. Also, standard BMPs would be employed to minimize adverse impacts during construction activities. To further minimize adverse impacts, decommissioning and deconstruction debris would be disposed of outside 100-year floodplains. Additionally, any flood-damageable equipment or materials located within the 100-year floodplain would be relocated outside the floodplain during a flood. No cumulative impacts to floodplains would occur, as anticipated CCR management activities on the Kingston Reservation would avoid and minimize impacts to floodplains and adhere to federal and local floodplain management guidelines.

3.5.2.3.2.1 Environmental Justice Considerations

Effects to floodplains that would occur as a result of the Kingston coal facility retirement and D4 activities would be minor and limited to the immediate Kingston Reservation, which is largely located outside of the 100-year floodplain. These impacts are not anticipated to have disproportionate or lasting effects on EJ populations because no residential populations are present on the Kingston Reservation.

3.5.2.3.3 Alternative A

3.5.2.3.3.1 Construction and Operation of CC/Aero CT Plant and Switchyard on Kingston Reservation

Approximately 8.4 acres of the proposed CC/Aero CT Plant site would be located within the 100-year floodplain of the Clinch River (Figure 3.5-9). The plant would be constructed on fill to a grade of at least 763 feet. About 0.7 acre-foot of net fill would be placed within the 100-year floodplain; about 1.0 acre-foot of net fill would be placed within the Watts Bar Flood Storage Zone (FSZ); and about 0.02 acre-foot of net fill placed within the Watts Bar Power Storage Zone.

Permanent fill to construct a CC/Aero CT Plant would not be considered a repetitive action in the 100-year floodplain or TVA Flood Storage Zone. The proposed site was selected based on the evaluation presented in Section 2.1.3.2.1. Plant design and construction is being planned to avoid the 100-year floodplain as much as possible. Alternative layouts for the proposed plant site analyzed in this EIS were investigated; however, the layout is constrained by the existing landfill to the west; steep slopes and existing access road to the north; a heavily forested area with suitable habitat for federally listed bat species on the north side of the access road as well as challenging terrain; cultural resources; the Clinch River to the south; and existing transmission line corridor to the east. For these reasons, there is no practicable alternative to locating fill for a portion of the CC/Aero CT Plant within the Clinch River 100-year floodplain and Watts Bar FSZ. To minimize adverse impacts, fill would be added to the site to bring the plant grade to at least elevation 763, which would be well above both the 100-year flood elevation 746.8 and 500-year flood elevation 748.1. Additionally, to minimize fill within the 100-year floodplain and FSZ, a retaining wall would be used to stabilize the side slopes of the CC/Aero CT Plant building pad, if required. Therefore, the fill for the CC/Aero CT Plant would be consistent with EO 11988 and TVA Flood Storage Loss Guideline (FSLG) and impacts are expected be minor.

A process pond and detention pond would be constructed within the CC/Aero CT Plant footprint. The bottom elevations of the ponds would be 752 and 755 feet, respectively, which would be higher than the 100- and 500-year flood elevations, and thus consistent with EO 11988 and the FSLG. The remaining proposed structures, activities, and facilities within the CC/Aero CT Plant footprint would be located at or above elevation 763, which would be consistent with EO 11988 and the FSLG.

The switchyard (shown in Figure 2.1-5) would be located on existing ground that is at least elevation 797, which would be outside both 100- and 500-year floodplains. Therefore, the switchyard would be consistent with EO 11988 and the FSLG.

Structures and facilities, such as laydown areas, haul roads, and staging areas, would be constructed and sited, where practicable, outside of the 100-year floodplain. If these activities must be located in the floodplain, they would be considered temporary uses of the 100-year floodplain and, therefore, would have no permanent impacts on floodplains or floodplain resources. Also, standard BMPs would be employed to minimize adverse impacts during construction activities. Additionally, to minimize adverse impacts, any flood-damageable equipment or materials located within the 100-year floodplain would be relocated by the equipment owner to an area above elevation 750 during a flood. No cumulative impacts to floodplains would occur.

3.5.2.3.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

As shown in Figure 3.5-9, the proposed solar facility would be located outside 100- and 500-year floodplains, which would be consistent with EO 11988 and the FSLG. Therefore, no impacts to floodplains would occur as a result of construction or operation of the 3- to 4-MW solar facility.

3.5.2.3.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The final location for the battery site is not yet known. Battery Sites 2 and 3 would not be located within 100- or 500-year floodplains; therefore, no impacts to floodplains would occur as a result of construction or operation if one of these sites were to be selected.

As mentioned in Section 3.5.2.2.1, the 100- and 500-year flood elevations of the Emory River at Battery Site 1 would be 747.5 and 750.0 feet, respectively. Approximately 0.15-acre of Battery Site 1 would potentially be located within 100-year floodplains, should the construction boundary be located near the shoreline. Battery Site 1 is considered a previously disturbed area and is currently developed with structures, paved parking areas, roadways, and manicured lawn. Development occurring in the disturbed areas of the Battery Site 1 footprint, however, would likely be located at elevation 760. Battery Site 1 is likely to be configured similarly to the CC/Aero CT Plant: fill would be placed at the battery site to increase the surface elevation, followed by grading, and then associated structures would be located on the battery site pad. The following would be addressed in a subsequent environmental review if Battery Site 1 is chosen:

- For non-repetitive actions proposed within the 100-year floodplain, the floodplains No Practicable Alternative analysis would be performed and submitted for public comment;
- To minimize adverse impacts to the 100-year floodplain and Watts Bar FSZ, net fill quantities would be reduced to the extent practicable;
- To minimize adverse impacts to battery site facilities, fill would be placed to elevate the grade of the battery site pad to or above elevation 752.0, which is two feet above the 500-year flood elevation, and would also meet TVA's Flood Risk Standard for flood-damageable development along TVA reservoirs; and
- Flood-damageable equipment and structures associated with the battery site would be located within the battery site footprint.

Structures and facilities, such as laydown areas, haul roads, and staging areas, associated with the construction of Battery Site 1 would be constructed and sited, where practicable, outside of the 100-year floodplain. If these activities must be in the floodplain, they would be considered temporary uses of the 100-year floodplain and, therefore, would have no permanent impacts on floodplains or floodplain resources. Also, standard BMPs would be employed to minimize adverse impacts during construction activities. Additionally, to minimize adverse impacts, any flood-damageable equipment or materials located within the 100-year floodplain would be relocated by the equipment owner to an area above elevation 750 during a flood. Overall, impacts to the floodplain for the development of Battery Site 1 would be minor or completely avoided as possible. No cumulative impacts to floodplains would occur.

3.5.2.3.3.4 On-site Transmission Upgrades

The proposed area for the on-site transmission line corridor exists within 1.5 acres of the 100-year floodplain. As such, minor temporary impacts would result during construction, but floodplain capacity would be restored after construction of the transmission line is complete.

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT facilities and switchyard. Approximately 0.58 acre of the area in which the transmission line upgrades and transmission system components would be built is within the 100-year floodplain (Figure 3.5-9).

Consistent with EO 11988, transmission lines are considered repetitive actions in the 100-year floodplain that should result in minor impacts (TVA 1981). The conducting wires of the transmission lines would be located well above the 100-year flood elevation. The support structures for the transmission lines would not be expected to result in any increase in flood hazard from increased flood elevations or from changes in flow-carrying capacity of the streams being crossed. Construction in the floodplain would be consistent with EO 11988 provided TVA's subclass review criteria for transmission line locations in floodplains are followed. Modifications to existing transmission line structures in the 100-year floodplain would occur above the 100-year flood elevation, which would be consistent with EO 11988. To minimize adverse impacts, standard BMPs would be used during construction.

Approximately 0.68 acre of the land proposed for the battery transmission line connections would be located within the floodplain (Figure 3.5-9). As such, minor temporary impacts would result during construction with permanent habitat conversion (forested areas converted to shrub or herbaceous habitats), but floodplain capacity would be restored after construction of the transmission line is complete.

The CC/Aero CT Plant switchyard (shown in Figure 2.1-5) would be located on existing ground that is at least elevation 797, which would be outside both the 100- and 500-year floodplains. Therefore, the switchyard would be consistent with EO 11988 and the FSLG. No cumulative impacts to floodplains would occur.

3.5.2.3.3.5 Off-site Transmission Upgrades

Portions of the Eastern Transmission Corridor (Figure 3.5-10a through Figure 3.5-10d) and Western Transmission Corridor (Figure 3.5-11) where upgrades are proposed are located within 100-year floodplains. Upgrades to existing transmission lines would not result in impacts to floodplains because the transmission lines are already present and many upgrades would be performed at the tops of the structures, well above the 100-year flood elevation, which would be consistent with EO 11988.

To minimize adverse impacts, construction within the floodplain would be limited to that necessary to achieve project objectives, and standard BMPs would be used during construction. For access roads located in floodplains but not floodways, any road construction or modifications would be done in such a manner that upstream flood elevations would not increase more than 1.0 foot. For access roads located in floodways, in order to prevent an obstruction in the floodway: (1) any fill, gravel, or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition. Furthermore, transmission line infrastructure would be elevated above the 100-year flood elevation for a regular action. Cumulative impacts to floodplains would be minor.

3.5.2.3.3.6 Construction and Operations of Natural Gas Pipeline

ETNG's Resource Report 6 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the floodplain-related findings in ETNG's Resource Report 6. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). As shown in Appendix H, ETNG's proposed natural gas pipeline would consist of about 7 miles of new pipeline ROW between the KIF Plant and the existing pipeline ROW. The remaining new gas pipeline would be located within or adjacent to the ROW of an existing gas pipeline. The proposed pipeline would cross the floodplains of many streams in Roane, Morgan, Fentress, Overton, Putnam, Jackson, Smith, and Trousdale counties; however, no aboveground facilities are proposed in the identified floodplain areas except for approximately 0.02 acre of MLV #3, which is an existing facility (ETNG 2023g). According to ETNG's Resource Report 6 (ETNG 2023g):

> [ETNG] will utilize best engineering practices while designing the MLV #3 so that it will accommodate the floodplain elevation and fill in the area with soil to raise the new MLV site to a grade equal to the adjacent road, which will minimize concerns with future flood events. Due to its small size, the MLV will result in minimal lost flood storage capacity, and its construction will not significantly alter the floodplain characteristics.

Consistent with EO 11988, gas pipelines are repetitive actions in the 100-year floodplain that should result in minor impacts (TVA 1981). The pipeline would be "constructed below ground with no impervious cover and therefore would not impact or diminish floodplain functionality" (ETNG 2023g).

According to ETNG Resource Report 6 (ETNG 2023g):

> For temporary construction workspaces that are located in mapped floodplains, [ETNG] will limit long-term parking of equipment in floodplains to that which is necessary, limit equipment refueling and fuel storage in floodplains where feasible and ensure equipment can handle waterbody flow increases during pipeline installation activities. This includes measures such as having additional pumps on standby for dam-and-pump crossings, monitoring dam and pumps continuously while pumps are running, and appropriately sizing flumes to handle storm flows for flume crossings. In addition, temporary equipment bridges will be designed to manage higher flow volumes from storm events and flooding situations.
>
> […] Surface contours and drainage patterns within construction workspaces will be returned as nearly as possible to original conditions, where necessary, and all disturbed grounds that are not encumbered by aboveground facilities, roads, or gravel (except wetlands) will be seeded and mulched to encourage revegetation.

3.5.2.3.3.7 Summary of Alternative A

TVA Proposed Actions

Construction of the CC/Aero CT Plant would result in 1.0 acre-foot or less of net fill within the Clinch River 100-year floodplain and Watts Bar Flood Storage Zone. The new structures and upgrades to the existing on-site transmission corridor would cause minor temporary impacts during construction with floodplain capacity being restored after completion. Battery Site 1 option, if selected, would result in minor permanent impacts within the 100-year floodplain.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

The proposed pipeline would cross the floodplains of many streams in Roane, Morgan, Fentress, Overton, Putnam, Jackson, Smith, and Trousdale counties; therefore, temporary minor effects to 100-year floodplains and floodways may occur because of pipeline construction. Since no aboveground facilities are proposed in the identified floodplain areas aside from a 0.02-acre portion of MLV #3, which is an already existing facility, no permanent impacts are anticipated to floodplain functionality.

3.5.2.3.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to floodplains due to construction of the CC/Aero CT Plant are not anticipated to impact EJ communities due to the distance from floodplain impacts to human populations.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

Effects to floodplains due to construction of the natural gas pipeline and compressor station may have temporary, minor adverse effects on human populations where the pipeline would be constructed. While certain actions would be taken to minimize risks, such effects would occur where human populations and floodplains co-exist. These effects may be disproportionate in areas where potentially impacted floodplains occur in EJ areas. Low-income and minority populations may be more vulnerable to temporary effects that cause minor flood loss or effects to human safety, health, and welfare. In particular, CT 901 BG 1, CT 901 BG 3, CT 902 BG 2, CT 9750 BG 1, CT 9750 BG 3, CT 9601 BG 2, CT 9602 BG 2, CT 9603 BG 4, and CT 1103 BG 1 are intersected by at least one large floodplain and may be at risk for disproportionate effects.

3.5.2.3.4 Alternative B

3.5.2.3.4.1 Construction and Operations of Solar and Storage Facilities

Under Alternative B, KIF would be retired and demolished, and a combination of solar and storage facilities would replace the KIF units. As specific sites have not yet been determined for evaluation under this alternative, typical impacts of solar projects have been listed in Table 3.2-1. The solar and storage facilities would be sited in a manner to avoid floodplains to the extent practicable. If avoidance is not practicable, the flood-damageable components of the solar panels, as well as other flood-damageable structures and facilities sited in floodplains, would be located at least one foot above the 100-year flood elevation at that location, and would otherwise be consistent with local floodplain regulations. Based on a review of typical impacts of solar facility construction activities, approximately 0.02 acre of floodplains are impacted per MW of solar facilities, with a range of 0 to 1.8 acres per MW (Table 3.2-1). Floodplain impacts are not anticipated for storage facilities as they are typically sited to avoid floodplains. For any roads proposed within 100-year floodplains but not floodways, the roads would be constructed such that flood elevations would not increase more than 1.0 foot. For any roads proposed within 100-year floodways, and to prevent an obstruction in the floodway, (1) any fill, gravel, or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition. If other structures are proposed within the 100-year floodplains, they would need to be analyzed in a subsequent environmental review.

Cumulative impacts to floodplains may occur under Alternative B with the addition of solar generation identified in the 2019 IRP throughout TVA's PSA (TVA 2019a). Cumulative impacts to floodplains would be minimized through proper siting of solar facilities and the use of BMPs and adherence to local floodplain regulations.

3.5.2.3.4.2 Transmission and Other Components

Final transmission routes have not been determined at this time; however, transmission line corridors have the potential to cross 100-year floodplains. Consistent with EO 11988, transmission lines and related support structures are considered to be repetitive actions in the 100-year floodplain that should result in minor impacts (TVA 1981). The conducting wires of the transmission lines would be located well above the 100-year flood elevation. The support structures for the transmission lines would not be expected to result in any increase in flood hazard from increased flood elevations or from changes in flow-carrying capacity of the streams being crossed. Construction in the floodplain would be consistent with EO 11988 provided TVA's subclass review criteria for transmission lines location in floodplains are followed.

For any access roads proposed within 100-year floodplains but not floodways, the roads would be constructed such that flood elevations would not increase more than 1.0 foot. For any roads proposed within 100-year floodways, and to prevent an obstruction in the floodway, (1) any fill, gravel, or other modifications in the floodway that extend above the pre-construction road grade would be removed after completion of the project; (2) this excess material would be spoiled outside of the published floodway; and (3) the area would be returned to its pre-construction condition.

Any new switchyards would, to the extent feasible, be located outside of 100-year floodplains. For switchyards proposed within 100-year floodplains, TVA would evaluate the site(s) under the Floodplain No Practicable Alternative analysis and either alter plans to avoid the floodplain or determine that there would be no practicable alternative to locating within the floodplain. If TVA determines that there would be no practicable alternative to locating the facility within the 100-year floodplain, adverse impacts would need to be minimized. As previously stated above, to minimize adverse impacts, the switchyard(s) would be located a minimum of one foot above the 100-year flood elevation at that location for a regular action as well as be consistent with local floodplain regulations.

Cumulative impacts to floodplains may occur under Alternative B with the addition of 10,000 MW of solar throughout TVA's PSA (TVA 2019a). Transmission lines associated with this expansion would likely result in floodplain crossings. Cumulative impacts to floodplains would be minimized through proper siting of transmission lines, consistency with EO 11988, adherence to TVA's subclass review criteria for locating transmission lines in floodplains, and adherence to local floodplain regulations.

3.5.2.3.4.3 Environmental Justice Considerations

Effects to 100-year floodplains that would occur as a result of the proposed solar facilities and transmission line activities. All associated facilities would be sited outside of floodplains to the extent practicable. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.6 Water Resources

3.6.1 Groundwater

The Safe Drinking Water Act of 1974 established the sole source aquifer protection program, which 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. This act also established both the Wellhead Protection Program, a pollution prevention and management program used to protect underground sources of drinking water, and the Underground Injection Control Program to protect underground sources of drinking water from contamination by fluids injected into wells.

Several other environmental laws contain provisions aimed at protecting groundwater, including RCRA, CERCLA and the Federal Insecticide, Fungicide, and Rodenticide Act. On April 17, 2015, the USEPA published the Disposal of Coal Combustion Residuals from Electric Utilities final rule (CCR Rule) in the Federal Register to provide a comprehensive set of requirements for the safe disposal of CCRs from coal-fired power plants. The CCR Rule addresses the risks of coal ash contaminants migrating into groundwater. The CCR Rule was revised on August 29, 2018 (USEPA 2018).

3.6.1.1 Affected Environment

3.6.1.1.1 Kingston Reservation (No Action and D4 Activities)

3.6.1.1.1.1 Physiographic Setting, Regional Aquifer, and Public Supply

Kingston is located just north of Watts Bar Reservoir on a peninsula at the confluence of the Emory and Clinch rivers. Kingston is located on Quaternary alluvial deposits of silt, sand, and shale ranging in thickness from 20 to 60 feet. Bedrock in the area surrounding the Kingston Reservation is primarily carbonate rock including the Ordovician-age Knox Group formations, which are underlain by the Cambrian-age Conasauga Group; the geological characterization of these groups is provided in Section 3.5.1.1.1.1.

Groundwater is derived from infiltration of precipitation and from lateral inflow along the western boundary of the Kingston Reservation. Groundwater flows of the Valley and Ridge Physiographic Province move downward through interstitial pore spaces in the residuum into the consolidated rocks where flow zones occur along fractures, bedding planes, and solution channels (Brahana et al. 1986). Groundwater movement generally follows topography with flow in an easterly direction from Pine Ridge toward the Emory River and Watts Bar Reservoir. An exception to this trend occurs on the northern margin of the ash disposal area where groundwater movement is northerly toward Swan Pond Creek. Groundwater originating on, or flowing beneath, the site ultimately discharges to the reservoir without traversing off-site property (TVA 2015). Groundwater in the residuum alluvial deposits of the Kingston Reservation flows radially south toward the Clinch River and farther south and downstream toward the TN River and Watts Bar Reservoir. The alluvial aquifer consists of water-bearing silt, sand, and gravel alluvial deposits (Stantec 2021, 2022, and 2023).

According to the USGS, the primary bedrock aquifer beneath the Kingston Reservation is the Knox Group Dolomite, which is part of the Cambrian-Ordovician carbonate aquifer system. Water within the Cambrian-Ordovician Knox aquifer flows through interconnected solution openings and along bedding planes in the upper two formations of the Knox Group. The Knox aquifer is not typically utilized for public water supply but is used for domestic water supply where other shallow aquifers do not provide sufficient groundwater. The groundwater quality of the Knox aquifer can be affected by fluoride, sulfate, sulfide gases, and dissolved solids (Brahana et al. 1986). The Cambrian-Ordovician aquifer system is generally comprised of extensively faulted limestone, dolomite, sandstone, and shales. Other primary aquifers in this system are carbonate rocks of the Chickamauga Limestone and the Honaker Dolomite of the Conasauga Group (Brahana et al. 1986). In 2015, 850 MGD of groundwater was withdrawn in TN for public water supply systems (Dieter et al. 2018), and in 2000, 41.2 MGD of groundwater from the Cambrian-Ordovician aquifer was utilized for public water supply systems. The water quality is affected by calcium-carbonate, and brines are present at depths below 3,000 feet (Webbers 2003).

The Ordovician carbonate aquifer system is composed of limestone and dolomite. Water occurs in solution-enlarged openings within the Bigsby, Carters, Ridley, and Murfreesboro Limestones, which are the principal water-bearing units within the aquifer. Water is unconfined or partly confined near the surface but may be confined at depth. The Ordovician aquifer is connected to the land surface in multiple areas due to karst features (sinkholes, disappearing streams, and caves); as such, groundwater in the aquifer can contain high concentrations of nutrients and bacteria (Brahana et al. 1986; Bradley and Hileman 2006). General groundwater quality of the Ordovician aquifer is often suitable for drinking water supply; variations in water quality have been observed because the system is highly anisotropic and flow within formations is localized (Brahana et al. 1986).

Based on the most recent data available for groundwater withdrawals from regional aquifers for public supply (USGS 2020), in 2000, 41.2 MGD of groundwater was withdrawn from the Cambrian-Ordovician aquifer and approximately 3.7 MGD of groundwater was utilized for public water supply systems from the Ordovician carbonate aquifer system. The water quality from the Cambrian-Ordovician aquifer is affected by calcium-carbonate, and brines are present at depths below 3,000 feet. Recent data on trends in water use in the TN Valley indicates total groundwater withdrawals have followed a decreasing trend, from 258 MGD in 1995 to 186 MGD in 2020 (Sharkey and Springston 2022). These data were used to forecast estimated water use in the TN River Watershed in the year 2045, which estimated groundwater withdrawals would increase from 186 MGD in 2020 to 218 MGD in 2045.

Although portions of the regional aquifer systems are potentially suitable for drinking water supply, the public drinking water for Roane County is supplied by surface water sources. Groundwater sources in Roane County were closed to public uses prior to December 2008, except for one, and it is located approximately 10 miles east of the Project Area. Additional discussion of public water supply is provided in Section 3.14 Utilities (TVA 2015).

Historically, prior to the KIF dike failure, unfiltered groundwater samples were collected semiannually from at least four monitoring wells associated with the Dredge Cell and analyzed for 17 inorganic constituents. Following the December 2008 KIF dike failure, EPA, TDEC, and TVA crews sampled water to assess the quality of public drinking water supplies, private wells, in-stream river water (both near the slide and at multiple downstream locations) and local springs. Currently, plant-wide groundwater monitoring plans require monitoring of wells associated with the CCR infrastructure (TVA 2016b).

Monitoring wells have been installed at the Kingston Reservation in both the residuum aquifer and the Knox Group bedrock aquifer. In accordance with TN Division of Solid Waste Management Regulations and TVA’s Environmental Inspection Plan (TVA 2018a), TVA has monitored existing on-site wells around the East Ball Field Area and the Stilling Pond. TVA has also monitored existing on-site wells in accordance with TN Division of Solid Waste Management Regulations (TDSWM 2023) and TVA’s Groundwater Monitoring Plan (TVA 2015) around the Kingston Peninsula Disposal Area, Sluice Trench, and Area East of Sluice Trench.

The locations of groundwater monitoring wells on the KIF Reservation are shown below on Figure 3.6-1a and Figure 3.6-1b.

Figure 3.6-1a. Groundwater Monitoring Wells on the Kingston Reservation

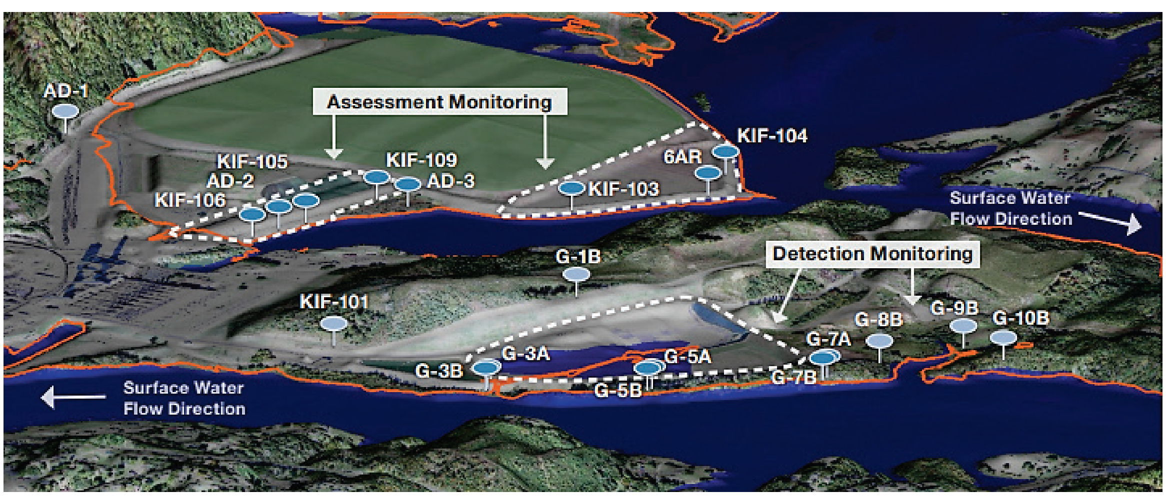

Figure 3.6-1b. Groundwater Monitoring Wells on the Kingston Reservation

During the initial groundwater assessment, Kingston reported statistically significant levels of arsenic, cobalt, lithium, and molybdenum in monitoring wells around the Sluice Trench and Area East of Sluice Trench Vacatur CCR Unit and statistically significant levels of cobalt in several monitoring wells at the Stilling Pond CCR Vacatur Unit. In 2020, Kingston reported statistically significant increases of boron, chloride, and fluoride in one of the wells downgradient of the Peninsula Disposal Area. During the 2021 and 2022 monitoring events, statistically significant levels of cobalt greater than the groundwater protection standard were observed at monitoring wells AD-2 and KIF-105 (Stantec 2021, 2022, and 2023).

Groundwater near the Kingston Reservation is affected by agricultural pumping and local surface water bodies and either flows south toward the TN River or radially from areas of higher elevation to the lower river valleys. Groundwater levels near the Kingston Reservation are largely controlled by the Emory and the Clinch rivers where the surrounding groundwater discharges. During quarterly monitoring events in 2022, water levels in the KIF monitoring wells ranged between approximately 2 to 22 feet below the ground surface elevation. The residuum soil thickness ranges from approximately 20 to 45 feet. The average linear flow velocity in the uppermost aquifer at KIF ranges from approximately 19 to 50 feet per year (Stantec 2023).

According to TDEC, 23 water wells are located within a 1-mile radius from the KIF reservation. The approximate locations of those wells are shown on Figure 3.6-2 below. The Emory and Clinch Rivers bound groundwater flow from the Kingston Reservation to the east and south. Land topography and groundwater flow patterns bound flows from the CCR units on the Kingston Reservation to the west and north. As such, the water wells shown on Figure 3.6-2 are either located upgradient of the CCR units or across the Emory and Clinch Rivers. Both spatial features act as natural boundaries between the CCR units and the off-site water wells. In addition, TVA maintains a robust groundwater monitoring network (Figure 3.6-1a and Figure 3.6-1b) and continues to comply with all TDEC/EPA requirements as it pertains to CCR monitoring and the TDEC Order.

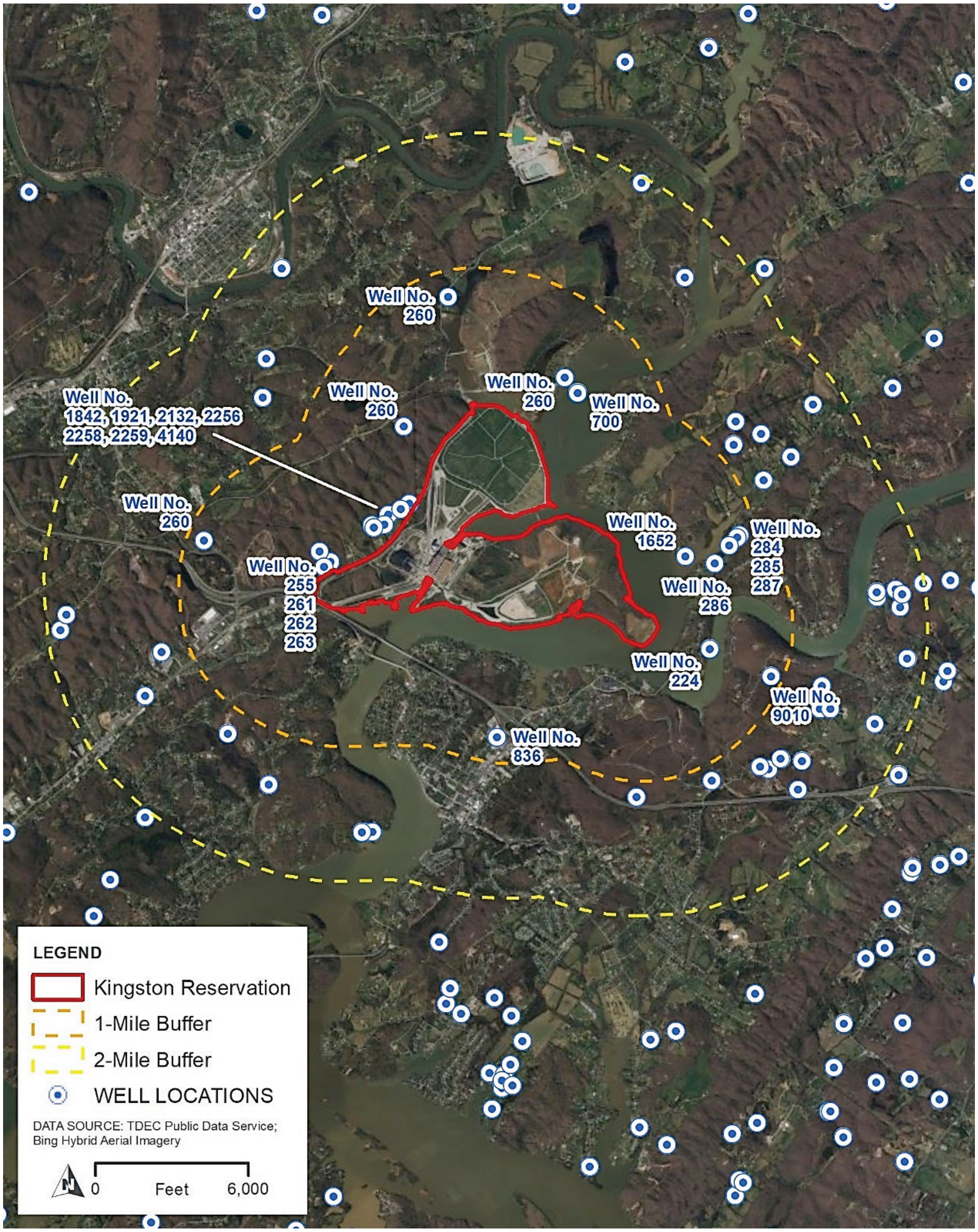

Figure 3.6-2. Water Wells Surrounding the Kingston Reservation

3.6.1.1.2 Alternative A

3.6.1.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

According to the USGS, the proposed CC/Aero CT Plant site and switchyard overlies portions of the Cambrian-Ordovician carbonate aquifer system, which is described above for the Kingston Reservation in Section 3.6.1.1.1.

3.6.1.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.6.1.1.1 apply to the proposed 3- to 4-MW solar facility location on the Kingston Reservation.

3.6.1.1.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.6.1.1.1 apply to the proposed 100-MW BESS on the Kingston Reservation.

3.6.1.1.2.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to portions of existing transmission lines located on the Kingston Reservation, including new transmission connections to the proposed CC/Aero CT Plant facilities and switchyard. Therefore, the affected environment for on-site transmission upgrades is described in Section 3.6.1.1.1.

3.6.1.1.2.5 Off-site Transmission Upgrades

Under Alternative A, off-site transmission system improvements would be necessary in the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381) and Western Transmission Corridor (L5383). The affected environment for each of the corridors is provided below.

Eastern Transmission Corridor

Based on desktop review of 2022 TDEC groundwater data, the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381), which extends northeast from the Kingston reservation and terminates in Oak Ridge, would overlay the Cambrian-Ordovician carbonate aquifer system, as characterized in Section 3.6.1.1.1 (TDEC 2023a).

Water wells may be located along the Eastern Transmission Corridor; however, due to the nature of the upgrades, impacts to those wells would not be anticipated.

Western Transmission Corridor

The Western Transmission Corridor (L5383) extends southeast from a substation in unincorporated Crossville and terminates north of the Crossville city limits and overlays the Pennsylvanian sandstone aquifer system (TDEC 2022a). The Pennsylvanian sandstone aquifer includes sandstone and conglomerate with fractures, faults, and bedding-plane openings within the rock units bearing the majority of the water produced. In 2000, approximately 0.48 MGD of water was withdrawn from the Pennsylvanian aquifer for public use (Webbers 2003). The groundwater production within this area is highly variable (Brahana et al. 1986; Bradley and Hollyday 1985). General groundwater quality within the Pennsylvanian aquifer is good to excellent and typically has high iron content and some hydrogen sulfide. Water is typically bicarbonate within the aquifer (Brahana et al. 1986).

Water wells may be located along the Eastern Transmission Corridor; however, due to the nature of the upgrades, impacts to those wells would not be anticipated.

3.6.1.1.2.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 2 (ETNG 2023c), which TVA has independently reviewed, provides the following:

> The Project is located in Trousdale, Smith, Jackson, Putnam, Overton, Fentress, Morgan, and Roane counties, Tennessee, and overlies five principal aquifer systems: Ordovician carbonate aquifer, Mississippian carbonate aquifer, Pennsylvanian sandstone aquifer, Knox aquifer, and the Cambrian-Ordovician carbonate aquifer. These five aquifers are mostly composed of carbonate rocks with prevalent karst features (caves, fractures, sinking streams). The flow and contaminant transport rates in aquifers with prevalent karst features are high. This is a particular concern for public or private water supplies using wells or springs in karst areas (TDEC 2016).
>
> […] TDEC maintains information on public water supplies including source water and population served by each entity (TDEC 2003). According to the report, all municipal public water systems in the counties crossed by the [Construction ROW] use surface water sources for drinking water. One small water system, Heritage Academy in Putnam County, has a water well, but is located over 2 miles from the [Construction ROW].

Public and private supply wells and springs within 150 feet of the construction work areas for the project includes wells and springs that have been identified in the field by landowners, ROW agents, or civil surveyors associated with the project, and through review of available GIS shapefiles (TDEC 2022b). Prior to construction, ETNG would verify the existence of public water supply wells and springs within the vicinity of the construction work areas. ETNG's Resource Report 2 (ETNG 2023c) identifies the following private wells and springs as being located within a 1,000-foot-radius of the HDD proposed for pipeline and compressor station footprints, as listed in Table 3.6-1.

Table 3.6-1. Water Supply Wells and Springs within the ETNG Construction ROW

County, State	Approximate Milepost	Water Supply Type	Distance and Direction
Trousdale	2.7	Well	125 feet North
Trousdale	3.1	Well	812 feet North
Trousdale	3.1	Well	823 feet North
Trousdale	3.1	Well	761 feet Northwest
Trousdale	3.3	Spring [1]	178 feet East
Jackson	32.1	Well	304 feet North
Jackson	37.7	Spring [1]	55 feet Northeast
Roane	116.2	Spring	6 feet South

[1]Spring used as potable water source for private use of landowner.
Source: ETNG 2023c

The Mississippian carbonate aquifer system is composed of limestone and dolomite and is partly confined to confined near land surface and may be confined at depth. Water within the aquifer occurs in solution-enlarged openings (fractures, bedding plains, small to large caves). The Ste. Genevieve, Monteagle, St. Louis, and Warsaw Limestones and the Fort Payne Formation are the principal water bearing formations of the Mississippian carbonate aquifer. Approximately 16.63 MGD of water is withdrawn from the Mississippian aquifer for public use. Water obtained from the aquifer contains high levels of calcium carbonate, iron, and sulfate (Burchett and Hollyday 1974; Brahana et al. 1986).

The Ordovician carbonate aquifer, Cambrian-Ordovician Knox aquifer, and Cambrian-Ordovician aquifer are discussed in Section 3.6.1.1.1. The Pennsylvanian aquifer system is summarized in Section 3.6.1.1.2.5.

Total fresh groundwater use for the counties crossed by the Ridgeline Project is estimated at approximately 8.67 MGD and includes public water supply, domestic, industrial, mining, and agricultural uses (USGS 2020).

3.6.1.1.3 Alternative B

3.6.1.1.3.1 East Tennessee TVA Power Service Area

The East TN TVA PSA, where Alternative B would be located, overlays the Pennsylvanian sandstone aquifer, the Ordovician carbonate aquifer, Knox aquifer, or Cambrian-Ordovician carbonate aquifer depending on location. As such, the affected environment for Alternative B is similar to that described in Section 3.6.1.1.2.

3.6.1.2 Environmental Consequences

3.6.1.2.1 The No Action Alternative

Under the No Action Alternative, current KIF operations would continue. TVA would implement the planned actions related to the current and future management and storage of CCRs at Kingston, which have either been reviewed or would be reviewed in subsequent NEPA analysis. Groundwater monitoring of CCR impoundments would continue. TVA would continue to work with TDEC in performing annual monitoring and corrective action reporting as directed by the Kingston Environmental Investigation Plan (TVA 2018a) for monitoring and evaluating groundwater quality data associated with the CCR management facilities.

Under the No Action Alternative, TVA would continue to operate the existing KIF Plant and would not construct new replacement generation. These units would continue to operate as part of TVA's generation portfolio. For the existing units to remain operational, additional repairs and maintenance would be necessary in order to maintain reliability. In addition to repairs and maintenance, new systems and upgrades to current processes and systems would need to be added in order to comply with the current ELG regulations.

TVA would implement supplemental mitigation measures required by TDEC's Administrative Order issued in August 2015, as well as the CCR pond closure plan approved by TDEC, which could include additional monitoring, assessment, corrective action programs, or other actions deemed appropriate as specified in the Environmental Investigation Plan (TVA 2018a).

The No Action Alternative would result in the potential for continued impacts to groundwater conditions resulting from ongoing CCR management activities on the Kingston Reservation. There would be the potential for equipment and material spills from site activities to cause cumulative groundwater effects. Such effects would be considered unlikely as the various projects would employ BMPs such as those detailed in spill prevention, control, and countermeasure plans to control for and clean up any spills of chemicals or hazardous materials that could occur. Therefore, potential cumulative effects associated with groundwater are anticipated to be minor.

3.6.1.2.2 Retirement, Decommissioning, Decontamination, Deconstruction, and Demolition of KIF Plant

Buildings within the deconstruction boundary would be decontaminated and deconstructed to a depth of 3 feet below grade, which would generate vibrations throughout the course of deconstruction of the buildings and grading and backfilling of the facility. No effects are anticipated to the existing groundwater flow pattern.

The deconstruction and demolition activities have the potential to release pollutants into the underlying soil and shallow groundwater table through direct or indirect discharges or other sources of contact during demolition activities. D4 activities would be performed in accordance with applicable state regulations and TVA BMPs to limit potential effects to the soil and groundwater. TVA would implement supplemental mitigation measures required by TDEC's Administrative Order issued in August 2015, as well as the CCR pond closure plan approved by TDEC, which could include additional monitoring, assessment, corrective action programs, or other actions deemed appropriate as specified in the Environmental Investigation Plan (TVA 2018a). With implementation of BMPs, retirement and D4 activities of the KIF plant would be expected to result in temporary and minor impacts to groundwater resources. Once deconstruction and decontamination activities are complete, there would be a permanent beneficial effect to the groundwater system because fewer potential contamination sources would remain on-site.

With ongoing CCR management activities on the Kingston Reservation, there would be a potential for cumulative effects to groundwater due to construction activities and associated vehicles in the area. There would be the potential for equipment and material spills from site activities to cause cumulative groundwater effects. Such effects would be considered unlikely as the various projects would employ BMPs such as those detailed in spill prevention, control, and countermeasure plans to guard against and clean up any spills of chemicals or hazardous materials that could occur. Therefore, potential cumulative effects to groundwater from the proposed retirement and D4 process at Kingston are anticipated to be minor and temporary. No long-term, negative cumulative effects are anticipated as the retirement and D4 of the KIF Plant would be an overall net benefit to the surrounding area.

3.6.1.2.2.1 Environmental Justice Considerations

Effects to groundwater that would occur as a result of the Kingston coal facility retirement and D4 activities would be temporary and minor; such effects would be minimized with implementation of standard BMPs. Minor, adverse effects to EJ-qualifying populations could occur if these groundwater effects migrate off-site.

3.6.1.2.3 Alternative A

3.6.1.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Existing water and sewer treatment services are anticipated to meet on-site needs during construction and, less so, for operations and maintenance (i.e., primarily for bathroom use). Both water and sewer services are currently available at the Kingston Reservation. Construction-related water use would support site preparation (including dust control) and grading activities. During earthwork for the grading of access roads, foundations, equipment pads, transmission lines, and other components, the primary use of water would be for compaction and dust control. Smaller quantities would be required for preparation of the equipment pads and other minor uses. Equipment washing and any potential dust control discharges would be handled in accordance with BMPs for water-only cleaning. Water needs for dust control would not adversely affect groundwater resources due to the anticipated limited withdrawal rate from the Knox aquifer by the municipality and TVA’s water use for equipment washing (Brahana et al. 1986). Furthermore, dust control would not be expected to put a strain on municipal resources or require any increase in groundwater withdrawal from the municipality.

Water needs for bathroom use would not adversely affect groundwater resources due to the anticipated limited withdrawal rate for the Knox aquifer by the municipality and TVA’s water use for bathrooms, equipment washing, and dust control would not be expected to put a strain on municipal resources or require any additional increase in groundwater withdrawal from the municipality.

Project construction activities could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. BMPs, such as those described in TVA’s *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022a), would be used to avoid contamination of groundwater from construction activities. The use of BMPs and a SWPPP would reduce the possibility of any on-site hazardous materials reaching the groundwater during construction and operation. Overall, no adverse effects to groundwater would be anticipated.

Proposed construction of a new CC/Aero CT Plant and associated equipment would require excavation below the existing ground surface to establish a sub-base and foundation. Given the proximity of the Project Area to surface waters and the shallow water table, excavated areas may periodically require dewatering during the construction phase. If dewatering is required, TVA would utilize filter bags and BMPs prior to discharging water. Since dewatering would only occur when groundwater is interfering with excavation and construction activities, the overall effects to groundwater would be localized and temporary. Dewatering would only be performed to the extent that groundwater is locally lowered within the footprint of the Project Area and not the surrounding areas; therefore, no adverse effects to groundwater would be anticipated.

In summary, groundwater resources could be affected by the construction of a new CC/Aero CT Plant and switchyard but are expected to be negligible. No effects are expected for groundwater resources during operation and maintenance. Potential effects would be sufficiently mitigated with the use of appropriate BMPs. As such, effects of construction of a new CC/Aero CT Plant and switchyard on groundwater resources are expected to be negligible.

With ongoing CCR management activities on the Kingston Reservation, there would be a potential for cumulative effects to groundwater due to construction activities and associated vehicles in the area. TVA would implement supplemental mitigation measures required by TDEC's Administrative Order issued in August 2015, as well as the CCR pond closure plan approved by TDEC, which could include additional monitoring, assessment, corrective action programs, or other actions deemed appropriate as specified in the Environmental Investigation Plan (TVA 2018a). There would be a minor potential for spills to cause cumulative groundwater effects. Such effects would be considered unlikely as the past, present, and RFFAs would employ BMPs such as a spill prevention, control, and countermeasure plan to control for and clean up any spills of hazardous materials that could occur. Therefore, potential cumulative effects associated with groundwater are anticipated to be temporary and negligible to minor.

3.6.1.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

Effects to water resources within the Kingston Reservation for the construction and operation of a 3- to 4-MW solar facility on the Kingston Reservation would be the same as those listed in Section 3.6.1.2.3.1.

3.6.1.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

Effects to water resources within the Kingston Reservation for the construction and operation of a 100-MW BESS on the Kingston Reservation would be the same as those listed in Section 3.6.1.2.3.1.

3.6.1.2.3.4 On-site Transmission Upgrades

Effects to water resources within the Kingston Reservation for on-site transmission improvements would be the same as those listed in Section 3.6.1.2.3.1.

3.6.1.2.3.5 Off-site Transmission Upgrades

Eastern Transmission Corridor

Shallow excavation may be required for the transmission system upgrades proposed within the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381). If groundwater is encountered, dewatering activities, similar to methods described in Section 3.6.1.2.3.1, would be used to control groundwater infiltration into the excavation site and all state and federal requirements relating to groundwater protection would be followed. If dewatering is required, TVA would utilize filter bags and BMPs prior to discharging water. Since dewatering would only occur if and when groundwater is interfering with excavation and construction activities, the overall effects to groundwater would be localized, minor, and temporary. Dewatering would only be performed to the extent that groundwater is locally lowered within the active construction footprint of the Project Area from the surrounding areas; therefore, no adverse effects to groundwater would be anticipated.

During revegetation and maintenance activities, effects to groundwater would be negligible given the nature of the activities. Revegetation would require the seeding and initial watering of construction workspaces. Maintenance activities of the construction site and equipment would be in the form of dust control and equipment cleaning. This watering may be drawn from local groundwater sources. Water used may form into surface water runoff. These effects would be minimized to the extent practicable through the implementation of standard BMPs (TVA 2022a). As such, effects to groundwater associated with the off-site transmission upgrades would be temporary and minor.

Western Transmission Corridor

The environmental consequences for the transmission system upgrades proposed for the Western Transmission Corridor (L5383) are the same as those presented above for lines within the Eastern Transmission Corridor.

3.6.1.2.3.6 Construction and Operation of Natural Gas Pipeline

ETNG's Resource Report 2 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the groundwater-related findings in ETNG's Resource Report 2. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q).

Water and sewer treatment services are currently not available along the ETNG Construction ROW. Construction-related water use would be needed to support site preparation, dust control, and grading activities. During earthwork for the grading of access roads and construction of the natural gas pipeline, the primary use of water would be for compaction and dust control (ETNG 2023c). Water used during construction would be provided via water uptake from surface waterbodies.

ETNG Resource Report 2 (ETNG 2023c), which TVA has independently reviewed, provides the following regarding potential impacts of pipeline construction activities on groundwater recharge areas:

> The primary impact on groundwater recharge areas from the [Ridgeline Project] would include vegetation removal and soil disturbance associated with trenching operations, and water withdrawals associated with hydrostatic testing and [HDD]. Trenching activities along the pipeline route will typically be limited to excavations of less than 8 feet deep. Vegetation and soil disturbance will result in temporary effects on recharge areas and temporary disturbance of the waterbodies that also serve to collect surface water to recharge aquifers. These effects will be minimized through adherence to the [pipeline E&SCP], which includes implementation of erosion and sediment controls such as sediment barrier, dewatering filtration, and trench breakers. The [Ridgeline Expansion] project E&SCP includes detailed descriptions of the erosion control [BMPs] proposed as well as typical details that will be followed during construction. Post-construction monitoring will ensure proper re-vegetation and restoration of recharge areas; and the affected area will continue to function as recharge for the aquifer post-construction. Effects from water withdrawals will also be temporary. Where practicable, surface waters withdrawn for the [Ridgeline Expansion] project will be discharged to a vegetated upland area through a filtration device within the watershed it is withdrawn from and in accordance with state and federal regulations and the [Ridgeline Expansion] project E&SCP.
>
> HDD bores can be over 100 feet deep and have the potential to affect groundwater and aquifers. [ETNG] conducted geotechnical bores to understand the geologic formation where HDD will be located. Additionally, [ETNG] has attempted to locate all wells and springs within 1,000 feet of HDD work areas, and karst assessments have been conducted for the [Ridgeline Expansion] project as detailed in Section 6.5.1 of Resource Report 6. The HDDs have been designed to minimize impacts to the extent practicable. Contingency plans for loss of drilling fluid return and measures to protect groundwater and aquifers are included in the HDD Plan in Appendix 1C of Resource Report 1.
>
> [ETNG] will follow detailed measures for oil and hazardous materials storage and spill protection outlined in the [Ridgeline Expansion] project E&SCP, the FERC Plan, and the FERC Procedures. These spill prevention practices include proper storage, handling and inspection of containers and tanks, minimizing refueling in recharge areas, following the appropriate emergency response procedures, and adherence to all spill prevention and control measures detailed in the [Ridgeline Expansion] project E&SCP and Enbridge's [Spill Prevention, Control, and Countermeasures] (SPCC) Plan.

The Ridgeline Project construction activities could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. As the gas pipeline would be buried, there is a potential that it may come into contact with groundwater. The use of BMPs as described in Section 3.6.1.2.1, implementation of both construction and operational SWPPPs, and adherence to SPCC plans would reduce the potential of any on-site sediment, chemicals, and hazardous materials reaching the groundwater during construction and operation. Overall, effects to groundwater are anticipated to be negligible.

The primary uses of water during construction and maintenance-related activities would be for possible dust control and hydrostatic testing. The internal access roads would not be heavily traveled during normal operations; therefore, water use for dust control during operation is not expected. However, water would be needed for drinking water and for bathrooms at the compressor station. Water needs during construction, maintenance, and operations would be provided via water trucks and water uptake from surface waterbodies and would not adversely affect groundwater resources. ETNG would provide a detailed analysis of groundwater effects, which would be part of the Environmental Report to be submitted with ETNG's certificate application that would be filed with FERC for the proposed pipeline.

ETNG would attempt to contact landowners with wells, springs, and septic systems to get an inventory of these structures within 150 feet of the proposed construction workspace for the pipeline. ETNG would offer landowners with these structures pre- and post-construction water quantity and quality monitoring to determine whether there were significant changes in water quantity or quality due to pipeline construction activities. In the unlikely event that it is determined that permanent effects have occurred to a well/spring as a result of construction activities, ETNG would repair, replace, or provide alternative sources of potable water (ETNG 2023c).

With past, present, and RFFAs in proximity to the proposed pipeline, there is potential for cumulative effects to groundwater to occur. There could be a small potential for spills to cause cumulative groundwater effects; however, these effects would be considered unlikely as the various projects would employ BMPs such as those identified in a spill prevention, control, and countermeasure plan to control for and clean up potential spills of chemicals or hazardous materials that could occur. Therefore, potential cumulative effects associated with groundwater due to construction activities and associated vehicles in the area would be negligible.

Once construction activities are completed, the operation of the pipeline and aboveground facilities is not anticipated to have any effects on groundwater resources or quality. Unanticipated events such as surface spills during the operation of the aboveground facilities could have potential effects to groundwater quality, but as stated above, would be minimized by adherence to the SWPPP and SPCC plans. According to ETNG's Resource Report 2 (ETNG 2023c):

> Impacts on groundwater from construction of the new compressor and [M&R] stations will be minimized through installation of post-construction stormwater management measures designed to treat the difference in stormwater runoff volume from pre- to post-construction conditions for the design storm event in accordance with federal and state requirements. Stormwater-related state permits anticipated to be required for the [aboveground facilities] Project are listed in Resource Report 1, Table 1.10-1. [ETNG] will minimize new impervious and graveled surfaces required for the facilities to the extent practicable and does not anticipate that construction or operation of the facilities will result in significant change in groundwater recharge outside of station limits. Hazardous material storage at aboveground facilities will be designed in accordance with applicable engineering, safety, and environmental standards. The

facilities will include spill containment structures commensurate with the quantity of materials stored and will be maintained in compliance with all applicable state and federal regulations and permits and in accordance with Enbridge's SPCC Plan included in Appendix 1C of Resource Report 1 [(ETNG 2023b)].

3.6.1.2.3.7 Summary of Alternative A

TVA Proposed Actions

The activities and project components proposed under Alternative A would require excavation below the existing ground surface to establish a sub-base and foundation. To avoid impacts to groundwater resources, sink holes and other karst features would be identified prior to excavation and either protected with buffer zones or grouted appropriately. The use of BMPs, SWPPPs, and SPCCs would reduce the possibility of erosion or on-site sediments due to erosion and/or hazardous materials reaching the groundwater during construction activities or as a result of operation. As such, no adverse or cumulative adverse effects to groundwater are anticipated.

The construction activities required for a new CC/Aero CT Plant could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. BMPs, such as those described in TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (TVA 2022a), would be used to avoid contamination of groundwater from construction activities. The use of BMPs and an SWPPP would reduce the possibility of on-site hazardous materials reaching the groundwater during construction and operation. Overall, adverse or cumulative effects to groundwater are not anticipated.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

The construction and operation of the pipeline is not anticipated to have long-term negative impacts on groundwater quality or supply (i.e., public and private drinking/supply wells) or wellhead protection areas (ETNG 2023c). Cumulative effects would be considered unlikely as the project would employ BMPs such as those identified in a spill prevention, control, and countermeasure plan to control for and clean up potential spills of chemicals or hazardous materials that could occur. Post-construction stormwater management measures designed to treat the difference in stormwater runoff volume from pre- to post-construction conditions for the design storm event in accordance with federal and state requirements would be implemented for the Hartsville Compressor Station and the M&R facilities. ETNG would minimize new impervious and graveled surfaces required for the aboveground facilities to the extent practicable and does not anticipate that construction or operation of the facilities would result in significant change in groundwater recharge outside of station limits. Hazardous material storage at aboveground facilities would be designed in accordance with applicable engineering, safety, and environmental standards. The facilities would include spill containment structures commensurate with the quantity of materials stored and would be maintained in compliance with all applicable state and federal regulations and permits and in accordance with ETNG's SPCC Plan. Therefore, potential cumulative effects associated with groundwater are anticipated to be negligible.

3.6.1.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to groundwater that would occur as a result of proposed CC/Aero CT Plant would be minimized with implementation of BMPs and generally limited to the Kingston Reservation, where no populations are present. Since no EJ communities are present, there would be no disproportionate and adverse effects as a result of the Project. Effects to groundwater associated with the off-site transmission activities are expected to be temporary and minor overall with the implementation of BMPs and a SWPPP. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG - Natural Gas Pipeline Actions

Effects to groundwater due to the Ridgeline Expansion Project would be minimized or mitigated through BMPs, resulting in no long-term effects. Cumulative effects to groundwater are anticipated to be minor and not significant. As such, minor effects on EJ populations are anticipated.

3.6.1.2.4 Alternative B

3.6.1.2.4.1 Construction and Operations of Solar and Storage Facilities

Water and sewer treatment services are often not available at many of the possible solar and storage facility locations, as sites of sufficient size to support solar and storage projects are often in more rural locations and undeveloped. However, water and sewer treatment services are anticipated as on-site needs during construction. Construction-related water use would support site preparation (including dust control) and grading activities. During earthwork for the grading of access roads and construction of the transmission corridor, the primary use of water would be for compaction and dust control.

Water used during construction would be delivered by water trucks. If determined necessary, sewer treatment would be accomplished through use of a pump-out septic collection and holding tanks. If installed, the septic holding tank would be appropriately permitted and constructed to avoid effects to groundwater. The proposed options for water and water-related needs would not be likely to adversely affect available groundwater resources.

Project construction activities could potentially cause erosion resulting in the movement of sediment into groundwater infiltration zones. TVA’s BMPs (TVA 2022a) would be used to avoid contamination of groundwater from project activities. The use of BMPs and an SWPPP would reduce the possibility of any on-site hazardous materials reaching the groundwater during construction and operation. Therefore, effects to groundwater resources are not anticipated.

The primary uses of water during operation and maintenance-related activities would be for on-site maintenance facilities. Precipitation in the area is typically adequate to minimize the buildup of dust and other matter on the PV panels that would reduce energy production; therefore, no regular panel washing is anticipated. Battery storage sites may require water for sprinkler facilities for fire suppression. Water needs during operations and maintenance would be provided either via the proposed project wells, also used during construction, or by delivery via water trucks and would not adversely affect groundwater resources.

Since the locations of the proposed facilities is unknown at this time, it is not feasible to quantitatively determine the cumulative effects to groundwater associated with Alternative B. However, the cumulative effects of the expansion of solar generation facilities were previously evaluated under the 2019 IRP (TVA 2019a) and IRP EIS (TVA 2019b), which determined cumulative effects to groundwater would not be anticipated with the use of BMPs.

3.6.1.2.4.2 Transmission and Other Components

Transmission lines associated with solar and BESS facilities would have the same general effects on groundwater as described in Section 3.6.1.2.3.

3.6.1.2.4.3 Environmental Justice Considerations

Effects to groundwater that would occur as a result of construction and operation of the solar and BESS facilities and associated transmission lines would be minimized with the implementation of BMPs. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.6.2 Surface Waters and Water Quality

Surface water is any water that flows above ground and includes, but is not limited to, streams, ponds, lakes, and wetlands. Streams are perennial, intermittent, or ephemeral (or wet weather conveyance [WWC]) based on the occurrence of surface flow and the agency's definition. TDEC classifies features as WWC ("not a stream") or "stream" (TDEC 2020). WWCs are "man-made or natural watercourses, including natural watercourses that have been modified by channelization; that flow only in direct response to precipitation runoff in their immediate locality; whose channels are at all times above the ground water table; that are not suitable for drinking water supplies; and in hydrological and biological analyses indicate that, under normal weather conditions, due to naturally occurring ephemeral or low flow there is not sufficient water to support fish, or multiple populations of obligate lotic aquatic organisms whose life cycle includes an aquatic phase of at least two months" (TDEC 2020). Streams, as defined by TDEC (2020), are surface waters that are not classified as WWCs.

As of August 29, 2023, the definitions of jurisdictional waters have been revised in response to *Sackett v. USEPA*. The Supreme Court ruling in *Sackett v. USEPA* effectively nullifies the use of the *Rapanos* significant nexus evaluation in future jurisdictional determinations (JDs). Under the *Sackett v. USEPA* ruling, WOTUS are defined to include navigable waters, impoundments of navigable waters, relatively permanent tributaries of navigable waters, and contiguous or adjoining wetlands (U.S. Supreme Court 2023). Wetlands are discussed further in Section 3.6.3.

Specific surface waters may be included on the National Rivers Inventory List, which is a list of all rivers that have been identified as potential candidates for listing as Wild and Scenic Rivers. TN also designates certain surface waters as Exceptional TN Waters (ETW) and Outstanding National Resource Waters (ONRW) because of their exceptional qualities. TVA and its partners would coordinate with the National Park Service (NPS) in accordance with Sections 7(a) and 10(a) of the Wild and Scenic Rivers Act (WSRA) for any waters crossed by the proposed project alternatives that are classified as Wild and Scenic Rivers.

Section 7(a) of the WSRA stipulates that federally assisted water resource projects on designated Wild and Scenic Rivers, including natural gas pipelines, may not result in "a direct and adverse effect on the values for which such river was established." Section 7(a) further states that federally assisted water resource projects "below or above a wild, scenic, or recreational river area or on any stream tributary" may not "invade … or unreasonably diminish the scenic, recreational, or fish and wildlife values" of the designated river. Section 10(a) of the WSRA requires that Wild and Scenic Rivers "shall be administered in such manner as to protect and enhance the values" leading to their designation.

The CWA establishes standards for the protection of water quality of surface waters. NPDES permits are required for the discharge of pollutants from point sources into WOTUS (CWA Sections 316(a) and 402). NPDES permits also address CWA Section 316(b) requirements for the design, location, construction, and capacity of cooling water intake structures to reflect the best technology available for minimizing adverse environmental impact due to water withdrawals fish impingement and entrainment, as well as Section 316(a) requirements for effluent limitations on thermal discharges to assure maintenance of a balanced indigenous population of fish and wildlife. Section 404 of the CWA further prohibits the discharge of dredge and fill material to WOTUS, which includes wetlands, unless authorized by a permit issued by USACE. Certification from the State of TN would also be required to verify that the federally permitted discharges comply with the state's applicable effluent limitations, antidegradation, and water quality standards. An application for an Aquatic Resources Alteration Permit (ARAP) for any activity making an alteration to state waters (surface and/or groundwater) may be required from TDEC Division of Water Resources (DWR). An ARAP provides 401 water quality certification for federally issued permits, ensuring authorized impacts meet state water regulatory requirements. General ARAPs have varying conditions and are dependent on the type of work proposed and/or type of feature to be impacted. They typically cover activities which follow the state's definition for *de minimus* degradation as defined by the TN Water Quality Criteria Rule (Rule 0400-40-03) (TDEC 2019). Proposed work that will have greater than *de minimus* degradation will typically require an Individual ARAP and mitigation, and a detailed alternative analysis is often necessary. Both General and Individual ARAP submittals require that a hydrologic determination (HD) be conducted for a project prior to permit submittal. If approved, the TDEC DWR would be responsible for issuance of a Section 401 water quality certification, typically in the form of an ARAP.

Under Section 303(d) of the CWA, states are required to assess waters within their boundaries and determine if they meet water quality standards; list waters that do not meet standards and update the list biannually; and conduct total maximum daily load (TMDL) studies to set pollutant-reduction goals needed to restore waters to the extent that they meet water quality standards for designated uses (USEPA 2022d). The term "303(d) list" refers to the list of impaired and threatened streams and water bodies identified by the state as not attaining water quality standards for the established use. States are required to submit reports to USEPA with these data.

TDEC has established water quality standards for the State of TN; as part of this implementation, the water bodies are classified according to their uses with established water quality criteria specific to these uses. TDEC has issued an antidegradation statement containing specific conditions for regulated actions designed to maintain and protect current uses and water quality conditions. TDEC Division of Water Resources administers the following state statutes, rules, and regulations (TDEC 2023a):

- Water Quality Control Act – regulates surface waters;
- TN Safe Drinking Water Act – regulates the quality and quantity of drinking water;
- Safe Dams Act – regulates construction of non-federal dams;
- Water Wells Act – regulates the licensing of well drillers and pump setters and establishes rules for water wells; and
- Water Withdrawal Registration Act – requires water withdrawals to be registered with the state.

3.6.2.1 Affected Environment

3.6.2.1.1 Kingston Reservation (No Action and D4 Activities)

3.6.2.1.1.1 Surface Waters

Kingston is situated on a peninsula formed by the confluence of the Clinch and Emory rivers at Clinch RM 2.6. KIF withdraws water from the Emory River and discharges to the Clinch River.

The Clinch and Emory rivers at this location also form an arm to Watts Bar Reservoir; a slack-water channel for navigation created by Watts Bar Reservoir extends more than 20 miles up the Clinch River and 12 miles up the Emory River. River flow velocity near the Kingston Reservation is regulated and influenced by Melton Hill Dam on the Clinch River (20.6 RMs upstream of the Kingston Reservation) and the Watts Bar Dam located on the TN River (40.5 RMs downstream and below the confluence of the Clinch and TN rivers).

Field surveys for surface waters (i.e., perennial and intermittent streams and WWCs) at the Kingston Reservation were performed by TN Qualified Hydrologic Professionals during summer of 2019 for planning and siting purposes. The Kingston Reservation proposed limits of disturbance were surveyed and delineated for surface water features in spring 2022 and winter 2023 (Figure 3.6-3). Waters were labeled with field identification numbers, which correspond to photographs and data forms provided in Appendix E.

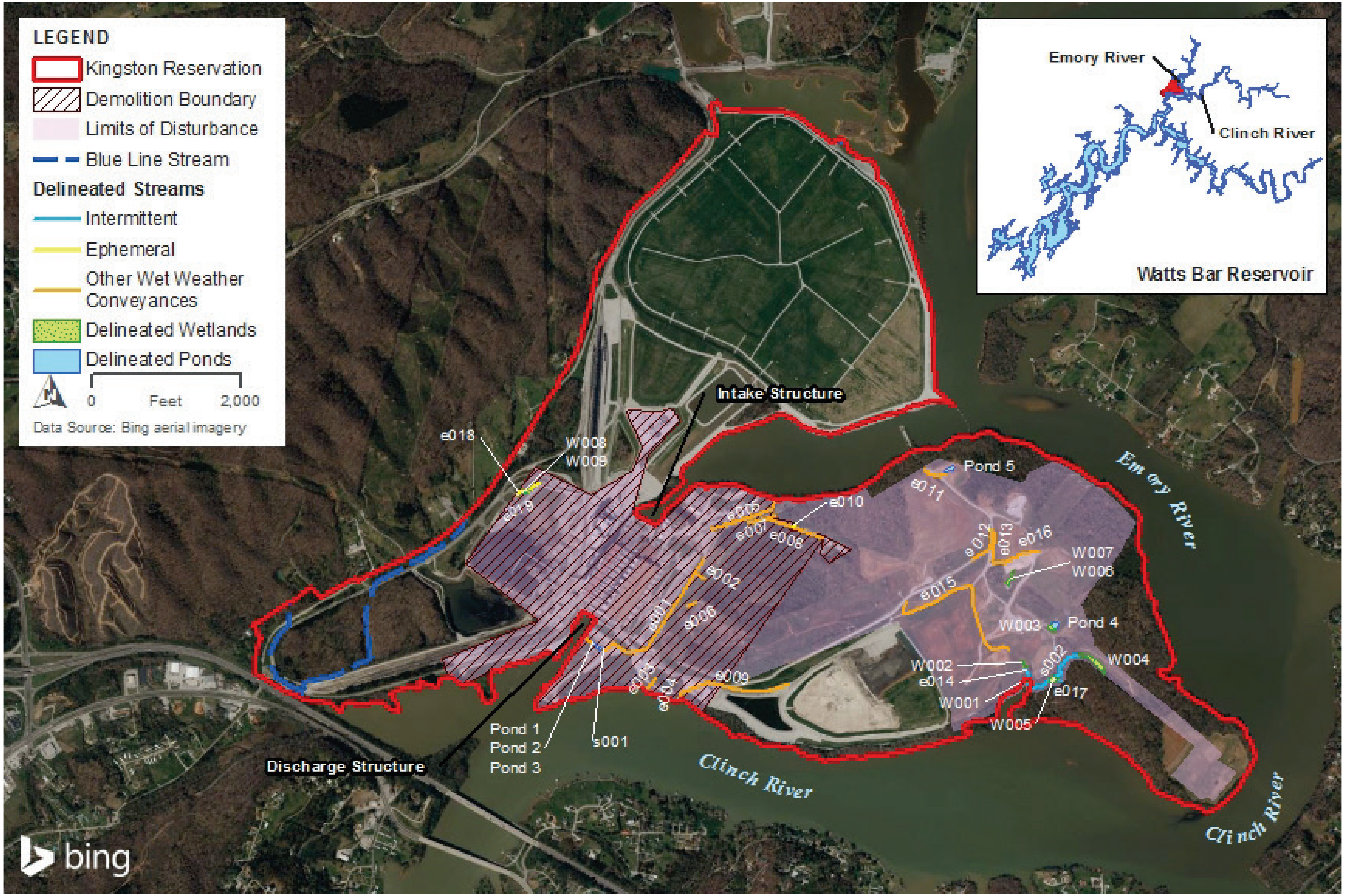

Figure 3.6-3. Surface Water and Wetland Features on the Kingston Reservation

In addition to the Emory and Clinch rivers surrounding the north, east, and southern boundaries of the Kingston Reservation, delineations of surface waters conducted in 2023 documented three intermittent streams (totaling 1,345 LF), three ephemeral streams (totaling 457 LF), 14 other WWCs (totaling 9,983 LF), one exempted reach (606 LF), and five ponds (totaling 0.34 acre) (Table 3.6-2 and Figure 3.6-3). Other WWCs include features such as non-jurisdictional ditches and swales.

Table 3.6-2. Summary of Streams and Open Water Present on Kingston Reservation

Feature	Field ID	Number of Features	Total Extent
Streams			
Intermittent	s002, e014[1], e017[1]	3	1,345 LF
Ephemeral	e010, e018, e019	3	457 LF
Other Wet-Weather Conveyances or exempted reaches[2]	s001, e001-e009, e011-e013, e015-e016	15	10,589 LF
	Total	***21***	***12,391 LF***
Open Water			
Ponds	Pond1-Pond5	5	0.34 acre

[1]Features e014 (227 LF) and e017 (164 LF) were classified by the USACE as intermittent streams and are regulated under *Sackett v. USEPA*. TDEC considers these features WWCs.
[2]s001 is a perennial human-caused drainage, which was determined to be exempt by the USACE according to their December 12, 2023, JD.

The exempted reach (s001) is a man-made drainage containing aquatic life due to persistent flow originating from leakage in the fire protection system of the switchyard, which draws raw river water and discharges to s001 and inline stormwater/catchment ponds (also non-jurisdictional; Pond1, Pond2, and Pond3) (Figure 3.6-3). Snail eggs and leaches were observed in this stream during the field investigation (see stream forms in Appendix E).

Features e014 (227 LF) and e017 (164 LF) were classified by the USACE as intermittent streams and are regulated under *Sackett v. USEPA* (see JD received from USACE on December 12, 2023, provided in Appendix E). TDEC considers these features WWCs. Intermittent stream s002 was observed to contain water in the channel greater than seven days following a rain event in the watershed and is located downstream of a wetland (Figure 3.6-3). Ephemeral channels and other WWCs documented during the site surveys represent features observed at the time of the survey (winter 2023). These types of features can disappear or be created in response to surface runoff from precipitation events and changes to surrounding topography and landcover.

Pond1, Pond2, and Pond3 are man-made settling ponds, and Pond4 and Pond5 do not have a continuous downstream connection; therefore, these features were not considered jurisdictional by the USACE (Appendix E).

Within Kingston Reservation, the demolition boundary encompasses exempt reach s001; Pond1, Pond2, and Pond3; two ephemeral channels (e018 and e019 on the western portion of the boundary); and nine other WWCs totaling 6,330 LF (Table 3.6-3). The WWCs within this area consist of roadside ditches, vegetated swales, or other drainage areas. The waters within the demolition boundary are primarily man-made or otherwise altered and disturbed areas. Detailed descriptions and field data forms of all water features on Kingston Reservation are provided in Appendix E.

Table 3.6-3. Summary of Streams and Open Water Features Present within the D4 Boundary on the Kingston Reservation[1]

Feature	Field ID	Number of Features	Total Extent
Streams			
Ephemeral	e018, e019	2	400 LF
Other Wet-Weather Conveyances and Exempted Reaches	s001, e001-e009	10	6,936 LF
	Total	***12***	***7,336 LF***
Open Water			
Ponds	Pond 1, Pond 2, Pond 3	3	0.08 acre

[1] These surface water features are also captured in Table 3.6-2.

3.6.2.1.1.2 Water Quality

The reaches of the Clinch River and Emory River adjacent to the Kingston Reservation boundary are considered part of the Watts Bar Reservoir. Several surface waters on Kingston Reservation drain to the Clinch River arm of the Watts Bar Reservoir and/or are influenced by the reservoir; however, none drain directly into the Emory River arm of the reservoir. The Emory River arm of the Watts Bar Reservoir borders the north and eastern sides of the Kingston Reservation, while the Clinch River arm of the Watts Bar Reservoir borders the southern sides (Figure 3.6-3). The Watts Bar Reservoir is listed as impaired on the 303(d) final list for 2022 (TDEC 2022g). Sources of impairment include contaminated sediments (chlordane and polychlorinated biphenyls [PCBs]), mercury (via atmospheric deposition and industrial point-source discharge), and low dissolved oxygen due to impoundment. Additionally, the Emory River arm of Watts Bar Reservoir is also listed as impaired for contaminated sediments (chlordane and PCBs), industrial point-source discharges of mercury and PCBs, and atmospheric deposition of mercury (TDEC 2022g).

The Clinch River from RM 0.0 to RM 4.4 at the confluence with the Emory River is classified for domestic and industrial water supply, fish and aquatic life, recreation, livestock watering and wildlife, irrigation, and navigation uses. The Emory River from RM 0.0 to its origin is classified for use for domestic and industrial water supply, fish and aquatic life, recreation, livestock watering and wildlife, and irrigation uses. Per the TDEC Use Classifications for Surface Waters, all other surface waters that have not been specifically noted (except WWCs) shall be classified for aquatic life, recreation, livestock watering and wildlife, and irrigation (TDEC 2019).

National wild and scenic rivers are protected subject to the Wild and Scenic Rivers Act[25]. The Obed Wild and Scenic River is located approximately 0.5 mile west of the natural gas pipeline, 5 miles east of the off-site transmission upgrades, and 14 miles northwest of the Kingston Reservation (NPS 2023). It is TN’s only wild and scenic river and one of the last free-flowing river systems in the eastern U.S (NWSRS 2022).

[25] Nationwide Rivers Inventory is a listing of more than 3,200 free-flowing river segments that are believed to possess one or more “outstandingly remarkable” natural or cultural values judged to be at least regionally significant. Rivers included in the Nationwide Rivers Inventory are candidates for Wild and Scenic Rivers, which are protected under the National Wild and Scenic Rivers System created by Congress in 1968 with the goal of “preserving certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations.”

KIF withdraws approximately 1,107 MGD from a surface water intake structure on the Clinch River for cooling and plant process water (e.g., sluice water, fire protection, boiler feed water, and other miscellaneous uses). Approximately 99 percent of the water withdrawal (1,096 MGD) is used for cooling, while approximately 1 percent is for other uses including process water. The withdrawn water is returned to the Clinch River after appropriate treatment via Outfalls 001, 002, 004, and 006, and complies with Kingston's NPDES Permit No. TN0005452.

From Outfall 001, KIF is authorized to discharge treated ash pond effluent (including BATW, coal yard run off, utility building drainage area, fire protection flushes), combustion residual leachate, chemical and nonchemical metal cleaning wastes, ammonia storage area runoff, water treatment plant wastes (including reverse osmosis system reject and backwash), drainage from sluice line trench, station sump discharge, stormwater from FGD area sump, and American Air Filter area sump with precipitator wash and raw water leakage (NPDES permit No. TN0005452; TDEC 2021a).

At Outfall 002, KIF is permitted to discharge once-through condenser cooling water (CCW) discharge plus flows from Outfall 001, boiler blowdown, discharge from underflow ponds with fire protection flushes, raw water leakage and transformer/switchyard runoff, intake screen backwash from Outfall 004 and FGD strainers, discharge from FGD stormwater pond IMP 01A, and discharge from Outfall 006 (TDEC 2021a). Due to the discharge of once-through CCW, the Clinch River downstream of Outfall 002 is subject to thermal discharges in this area. The existing NPDES permit states that a thermal variance of 36.1°C is authorized and extended for this permit cycle. Discharges from Outfalls 001 and 002 have effluent limitations and monitoring requirements as outlined in the NPDES permit.

Outfall 004 discharges raw river water used for intake screen backwash, and Outfall 006 discharges air conditioning condensate, fire protection flushes, and plant water leakage (TDEC 2021a). None of the discharges from these outfalls have numeric limits or reporting requirements under the current NPDES permit.

On June 7, 1979, regulations implementing Section 316(a) of the CWA were codified in the Code of Federal Regulations. Section 316(a) of the CWA applies to point sources with thermal discharges. It authorizes the NPDES permitting authority to impose alternative effluent limitations for the control of the thermal component of a discharge in lieu of the effluent limit that would otherwise be required under section 301 or 306 of the CWA (USEPA 2008). On August 15, 2014, Section 316(b) of the final CWA rule for existing facilities was published in the Federal Register with an effective date of October 14, 2014 (USEPA 2014b). The 2014 CWA Section 316(b) rule applies to facilities that withdraw more than 2 MGD from waters of the United States, use at least 25 percent of that water exclusively for cooling purposes, and have an NPDES permit, which includes KIF. The requirements of the Section 316(b) rule are incorporated into the NPDES permit renewal cycle to allow the NPDES Director a holistic assessment of the impact of KIF operations on the aquatic community, such as impingement and entrainment, from thermal discharge and cooling water intake perspectives and to inform decision making for regulatory compliance with both regulations in the subsequent NPDES permit.

The most recent NPDES Individual Permit for KIF (TN0005452) was modified December 1, 2021, to align the permit requirements with the 2020 ELGs, including allowing KIF to comply with the retirement subcategory of the 2020 ELGs. As part of the next permit renewal cycle, TVA is fulfilling Section 316 requirements with a submittal package provided to the Director of TDEC DWR Resources on August 30, 2022. In coordination with TDEC DWR, TVA may invest in new technologies at the KIF cooling water intake structure or move forward with KIF's existing technologies, or a combination of both, with the goal of reducing impacts to aquatic organisms (further discussed in Section 3.8.3). The addition of new technologies may also be required to meet technology-based effluent limitations for FGD wastewater and BATW, as outlined in the ELGs (see Section 2.1.2.1). TVA filed a Notice of Planned Participation to preserve the option of participating in the 2020 ELG rule retirement subcategory for facilities ceasing coal combustion by 2028.

3.6.2.1.2 Alternative A

3.6.2.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

One intermittent stream (e014) and one WWC (e015) are present on the proposed CC/Aero CT Plant site (Table 3.6-4; Figure 3.6-4). The intermittent stream (e014) was classified as a WWC by TDEC but was considered intermittent (and thus jurisdictional) by the USACE. Stream data forms, photographs of features, and records of consultation are provided in Appendix E.

No surface waters are present within the switchyard boundary or the parking/laydown area. None of the surface waters within the proposed CC/Aero CT Plant boundary are on the National Rivers Inventory for Wild and Scenic Rivers.

See Section 3.6.2.1.1 for details on surface water features located in the vicinity of the proposed CC/Aero CT Plant site and switchyard locations.

Table 3.6-4. Summary of Streams and Open Water Features Present on the Proposed CC/Aero CT Plant

Type of Feature	Field ID	Number of Features	Total Extent
Intermittent	e014	1	227 LF
Other Wet Weather Conveyances	e015	1	1,106 LF

[1]Features e014 (227 LF) was classified by the USACE as an intermittent stream and are regulated under *Sackett v. USEPA*. TDEC considers this feature a WWC.

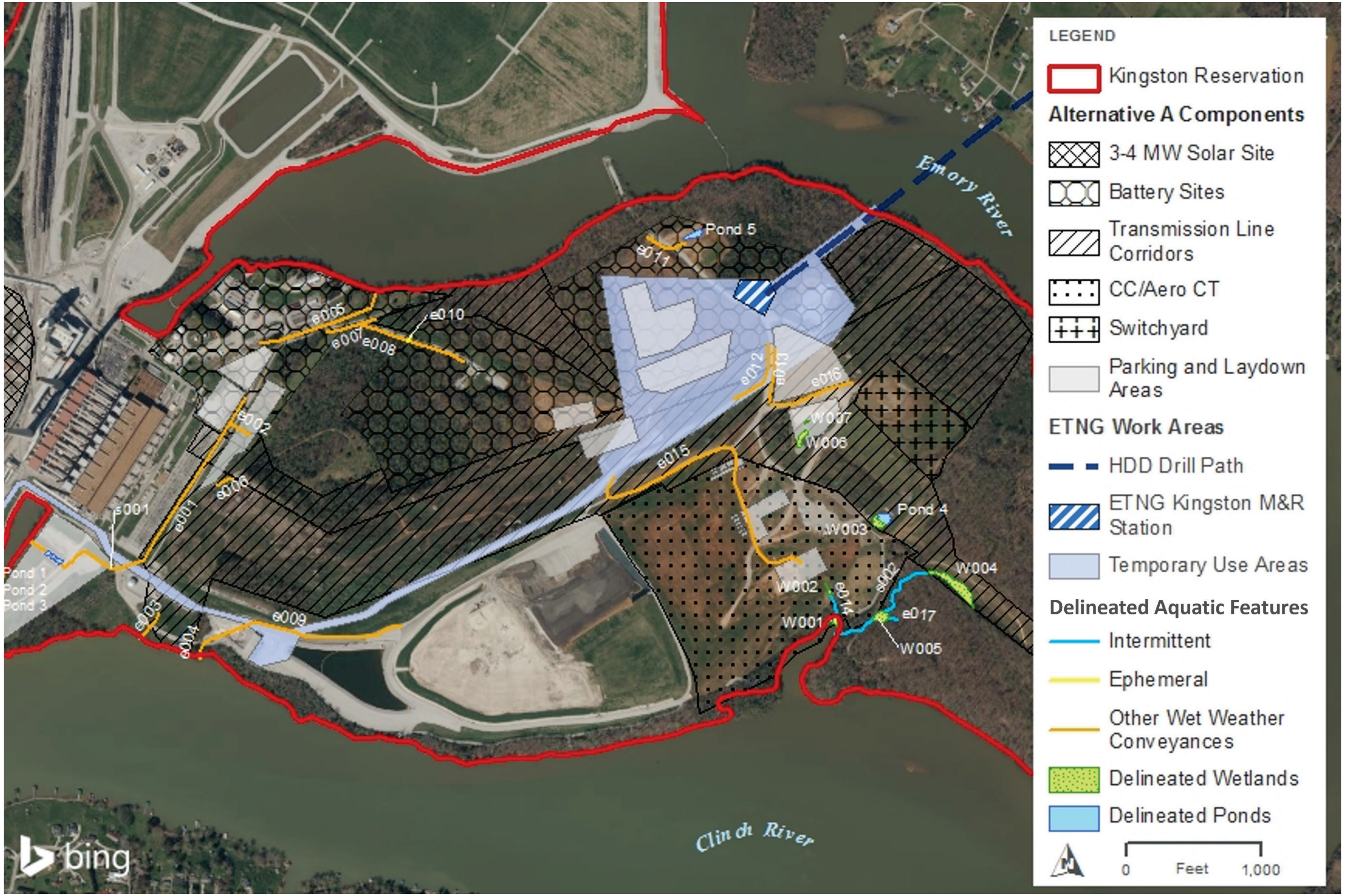

Figure 3.6-4. Delineated Aquatic Features within the Proposed Alternative A Footprint on the Kingston Reservation

3.6.2.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

No surface waters occur within the bounds of the proposed 3- to 4-MW solar facility.

3.6.2.1.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

Up to four WWCs, one ephemeral channel, and one pond are present within the boundaries of Battery Sites 1, 2, and 3 (Figure 3.6-4, Table 3.6-5). Physical characteristics of drainage features are documented on TDEC HD data forms provided in Appendix E. Features within Battery Site 1 and 2 also fall within the demolition boundary (Figure 3.6-3). None of the features were determined to be jurisdictional according to the USACE JD (see Appendix E). The pond is a man-made detention pond located within the bounds of Battery Site 3. None of the surface waters within the proposed boundaries of Battery Sites 1, 2, or 3 are on the National Rivers Inventory for Wild and Scenic Rivers.

Table 3.6-5. Summary of Streams and Open Water Features Present in the Proposed 100-MW BESS Sites

Type of Feature	Field ID	Number of Features	Total Extent
	Battery Site 1		
Other Wet Weather Conveyances	e001, e002, e005, e007	4	1,682 LF
	Battery Site 2		
Other Wet Weather Conveyances	e008	1	477 LF
Ephemeral Channel	e010	1	57 LF
	Battery Site 3		
Other Wet Weather Conveyances	e011	1	320 LF
Pond	Pond 5	1	0.12 acre

3.6.2.1.2.4 On-site Transmission Upgrades

Construction of the 100-MW BESS would include Battery Transmission Line Connections that tie in with the existing transmission lines on the Kingston Reservation. Five WWCs totaling 607 LF are present within the extent of the Battery Transmission Line Connections boundary (Table 3.6-6). The WWCs are man-made drainages in the form of grassy swales or culverted ditches. One WWC has a bed and bank present, but the TDEC HD form determined it is not a stream based on primary indicators (forms are provided in Appendix E). None of the features were considered jurisdictional by the USACE (Appendix E). Three of the features overlap with the demolition boundary (e001, e005, and e007). None of the surface waters within the proposed battery transmission line connection footprint are on the National Rivers Inventory for Wild and Scenic Rivers.

Table 3.6-6. Summary of Streams Crossed by the Proposed Battery Transmission Line Connections and On-site Transmission Corridor

Type of Feature	Field ID	Number of Features	Total Extent
Battery Transmission Line Connections			
Other Wet Weather Conveyances	e001, e005, e007, e012, e013,	5	607 LF
Existing On-site Transmission Corridor			
Other Wet Weather Conveyances	e001, e003, e006, e012, e013, e015, e016	7	3,659 LF

Under Alternative A, TVA would also make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant facilities and switchyard. Surface waters crossed by the new transmission line corridors include seven WWCs totaling 3,659 LF. Three of the features overlap with the demolition boundary (e001, e003, and e006). The WWCs are man-made drainages in the form of grassy swales or riprap ditches. One of the WWCs includes a culvert to the Emory River. None of the features were considered jurisdictional by the USACE (Appendix E).

3.6.2.1.2.5 Off-site Transmission Upgrades

3.6.2.1.2.5.1 Eastern Transmission Corridor

A field survey was completed in June 2022 to identify surface waters crossed by the Eastern Transmission Corridor (L5108 and L5302) and Western Transmission Corridor (L5383) (Appendix E). TVA later determined the potential need for additional transmission upgrades within the Eastern Transmission Corridor for L5116, L5280, and L5381 for Alternative A; field surveys for these areas were completed in May and June 2023 (Appendix E). The locations and types of watercourses identified in this EIS are based on an analysis of field survey results and other publicly available data.

The Eastern Transmission Corridor falls within Roane and Anderson counties (Appendix E). A total of 26 perennial stream crossings (totaling 7,426 LF), 36 intermittent stream crossings (totaling 7,583 LF), 12 ephemeral channel crossings (totaling 1,681 LF), and eight open water bodies (totaling 8.82 acres) were observed during field surveys (Table 3.6-7, Figure 3.6-5a through Figure 3.6-5d). Field survey reports for surface waters assessed in 2022 and 2023 are both provided in Appendix E. A total of 63 other WWCs including erosional gullies (totaling 11,923 LF) crossing the Eastern Transmission Corridor were identified during the surveys. The erosional gullies were not observed to have an OHWM, bed, or bank. They also do not replace existing streams or wetland features, do not carry a relatively permanent flow of water, and do not have a direct hydrologic connection to any jurisdictional waters. Ephemeral channels, conversely, were observed to maintain some of these characteristics. Twenty-six larger features, including 25 creeks or rivers and one large erosional gully, totaling approximately 23 acres were identified crossing the Eastern Transmission Corridor. Twelve named creeks and rivers were identified crossing the eastern portion of the Eastern Transmission Corridor including Clinch River, Bear Creek, Bearden Creek, Brashear Creek, Brushy Fork, Grassy Creek, East Fork Poplar Creek, Emory River, Lewis Branch, Poplar Creek, Walker Branch, and Whiteoak Creek. The Emory River is included on the National Rivers Inventory, which is a list of potential candidates for inclusion in the National Wild and Scenic River System.

TDEC Designated Use Classifications for Surface Water Crossings are Listed in Table 3.6-8.

Table 3.6-7. Summary of Potential Surface Water Crossings for Upgrades to the Eastern Transmission Corridor under Alternative A

Feature	Number of Crossings	Total Extent
	Streams	
Ephemeral	12	1,681 LF
Intermittent	36	7,583 LF
Perennial	26	7,426 LF
Total	*74*	*16,689 LF*
	Large Features	
Perennial	25	23.0 acres
Erosional Gully	1	0.01 acre
	Open Waters	
Lake/Pond	8	8.82 acres
	Other WWCs	
Erosional Gully	63	11,923 LF

Note: Information in this table is derived from field surveys completed in June 2022, May 2023, and June 2023. Some streams may cross the Eastern Transmission Corridor in multiple locations.

Table 3.6-8. Summary of Designated Uses for Surface Waters Crossed by the Eastern Transmission Corridor for Alternative A

Stream	Use Classification[1]							
	FAL	REC	LWW	IRR	TS	IWS	NRTS	DOM
Bear Creek[2]	X	X	X	X				
Bearden Creek[3]	X	X	X	X				
Brashear Creek[3]	X	X	X	X				
Brushy Fork[2]	X	X	X	X				
Clinch River[2]	X	X	X	X		X		X
East Fork Poplar Creek[2]	X	X	X	X				
Emory River[2,3]	X	X	X	X		X		X
Grassy Creek[3]	X	X	X	X				
Lewis Branch[3]	X	X	X	X				
Poplar Creek[2,3]	X	X	X	X		X		
Walker Branch[3]	X	X	X	X				
Whiteoak Creek[3]	X	X		X				
Unnamed Tributaries[2,3]	X	X	X	X				

Source: TDEC 2019

[1] Codes: FAL= Fish and Aquatic Life; REC = Recreation; LWW = Livestock Watering and Wildlife; IRR = Irrigation; TS = Trout Stream; IWS = Industrial Water Supply; NRTS = Naturally Reproducing Trout Stream; DOM = Domestic Water Supply

[2] Surface waters crossed by L5108 and L5302.

[3] Surface water crossed by L5116, L5280, and L5302.

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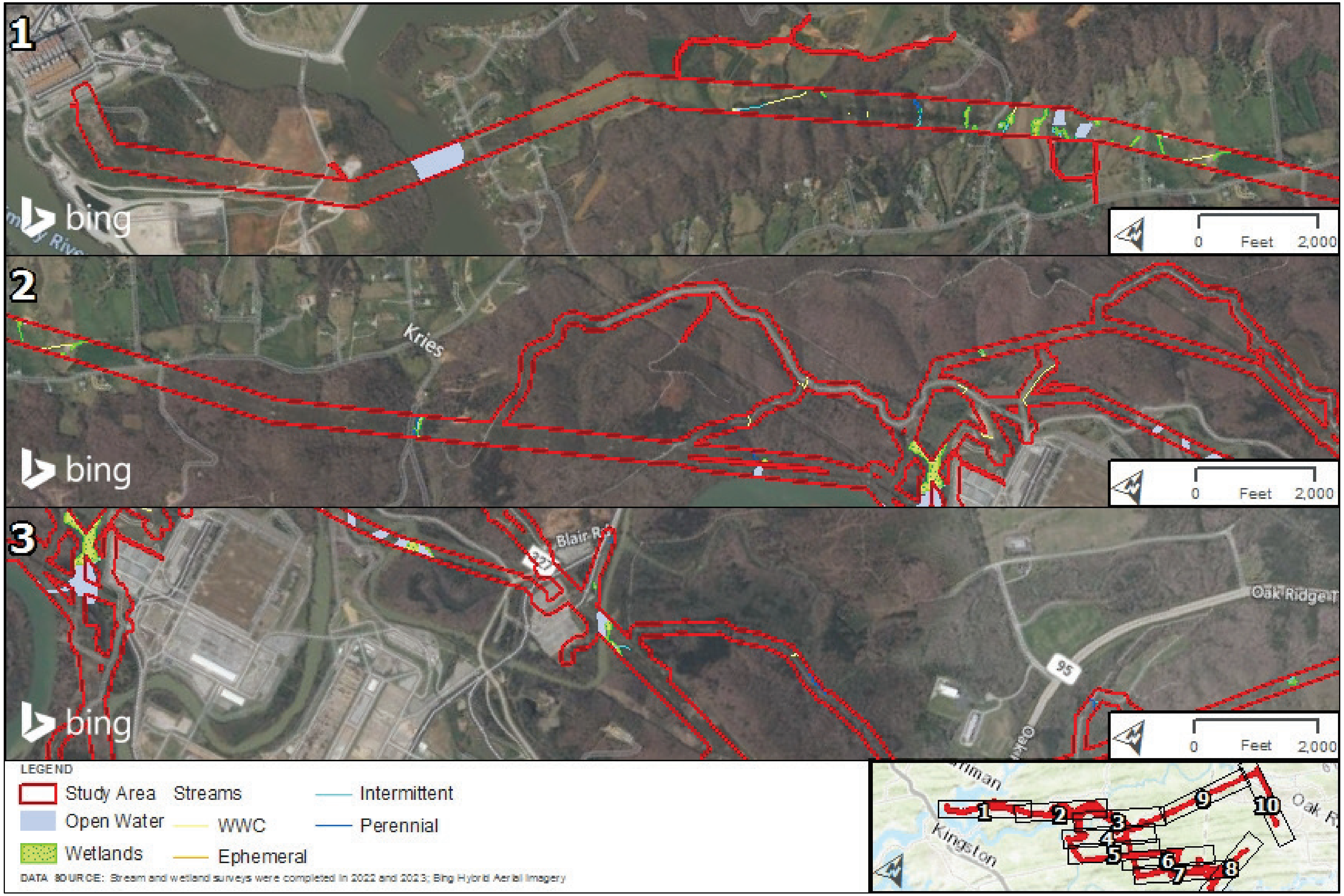

Figure 3.6-5a. Surface Waters Identified Within the Eastern Transmission Corridor Proposed for Off-site Transmission Upgrades Under Alternative A of the Kingston Retirement Project

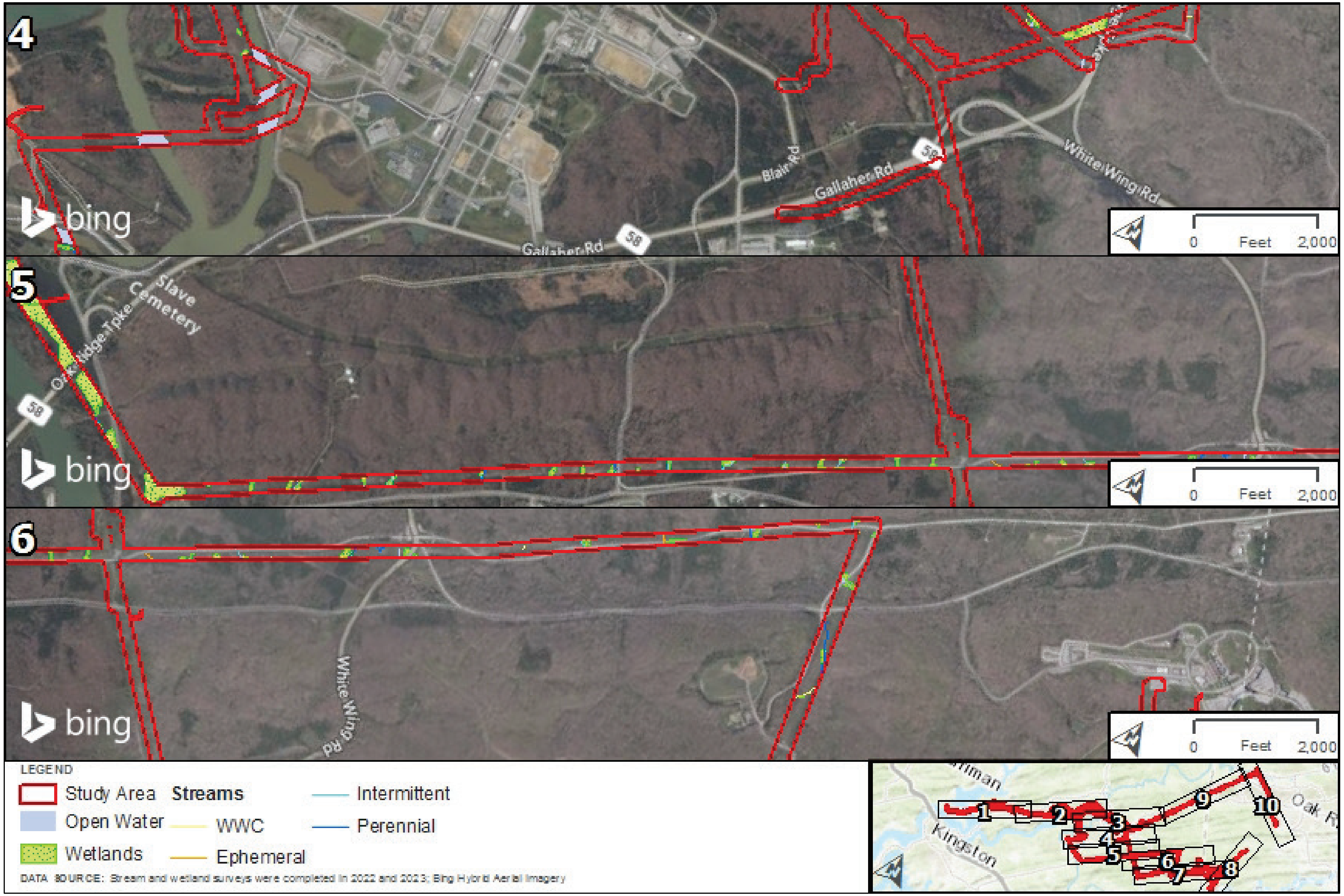

Figure 3.6-5b. Surface Waters Identified Within the Eastern Transmission Corridor Proposed for Off-site Transmission Upgrades Under Alternative A of the Kingston Retirement Project

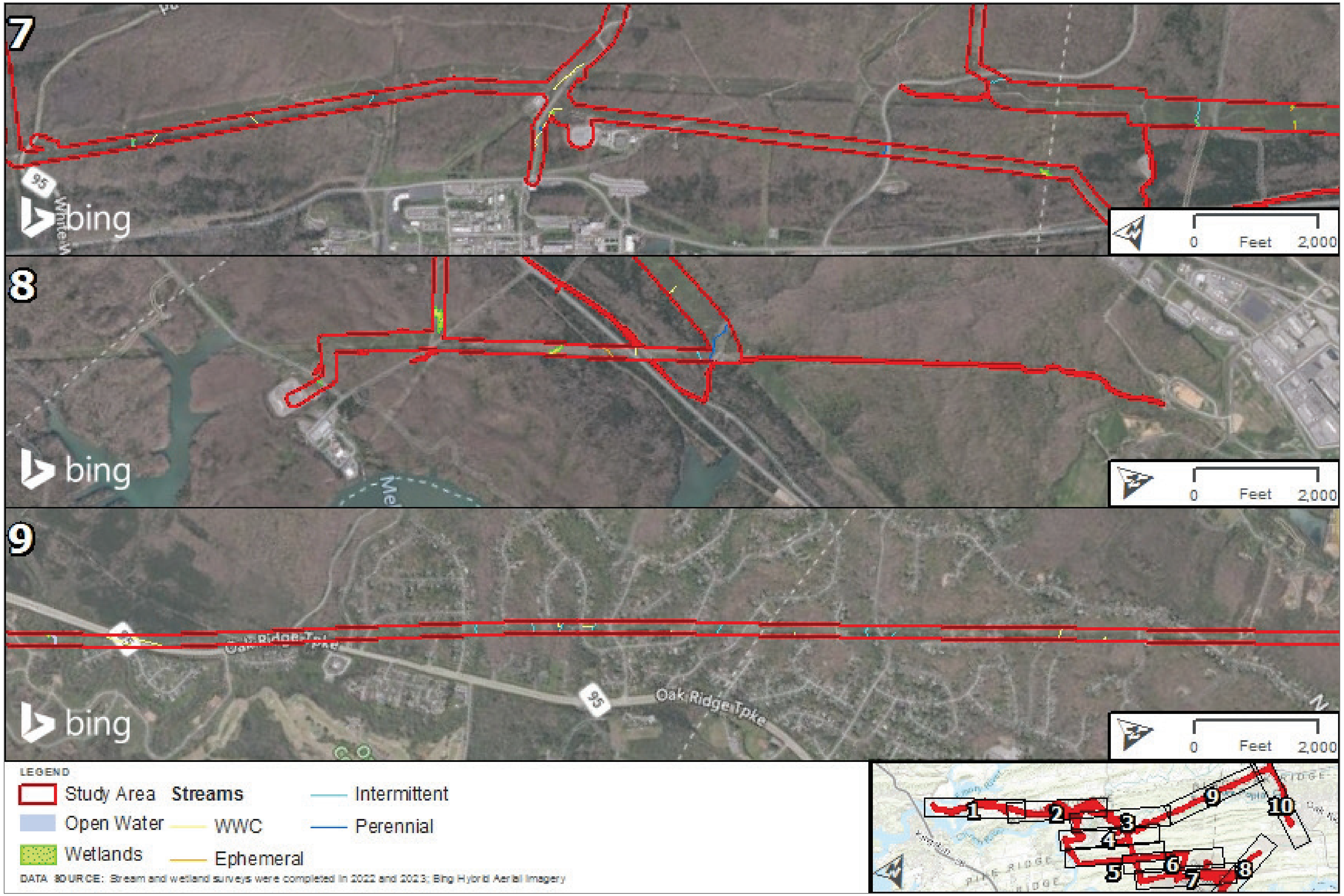

Figure 3.6-5c. Surface Waters Identified Within the Eastern Transmission Corridor Proposed for Off-site Transmission Upgrades Under Alternative A of the Kingston Retirement Project

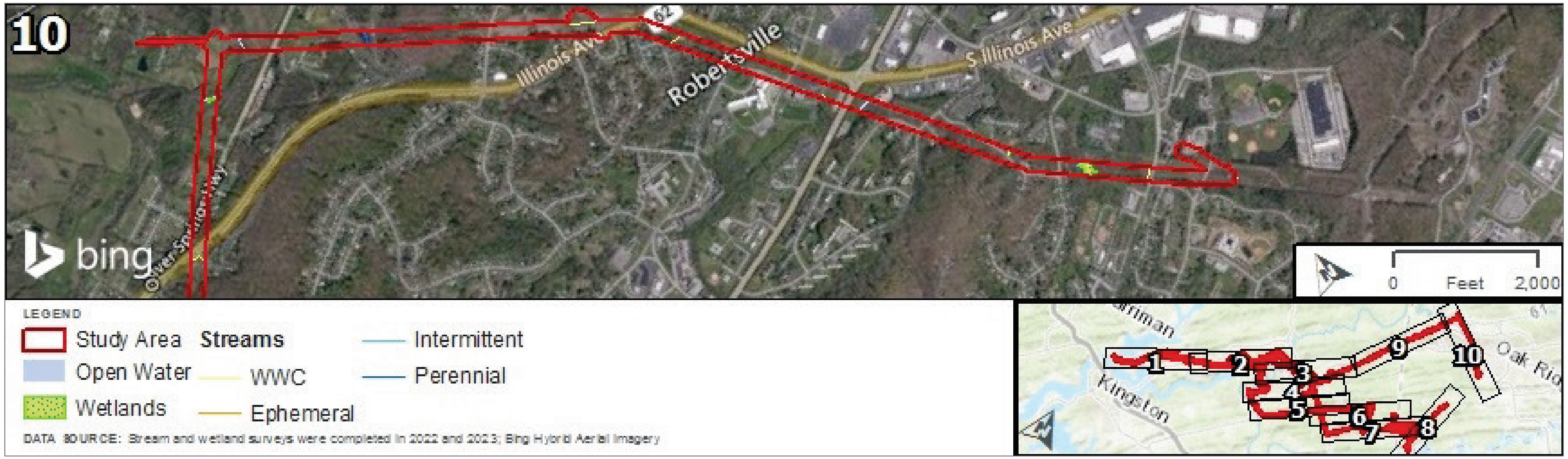

Figure 3.6-5d. Surface Waters Identified Within the Eastern Transmission Corridor Proposed for Off-site Transmission Upgrades Under Alternative A of the Kingston Retirement Project

Several waters crossed by L5108, and L5302 within the Eastern Transmission Corridor are listed as impaired on the 2022 303(d) list. Details including the cause for listing and potential sources are provided in Table 3.6-9.

Table 3.6-9. 2022 303(d) Listed Impaired Waters Identified Within the Footprint of the Proposed Off-Site Transmission Upgrades within the Eastern Transmission Corridor under Alternative A in Roane and Anderson Counties, Tennessee

Waterbody	Cause for Listing	Potential Source
Roane County		
Bear Creek	Cadmium	CERCLA National Priorities List (Superfund) Site
	Mercury	
	Nutrients	
	PCBs	
Clinch River Outlet	Cause Unknown	CERCLA National Priorities List (Superfund) Site
	Cesium	CERCLA National Priorities List (Superfund) Site
	Strontium	CERCLA National Priorities List (Superfund) Site
East Fork Poplar Creek	*E. coli*	Municipal (Urbanized High-Density Area)
		Sanitary Sewer Overflows
	Mercury	Contaminated Sediments
		Industrial Point Source Discharge
	Nutrients	Municipal (Urbanized High-Density Area)
		Municipal Point Source Discharges
	PCBs	Contaminated Sediments
	Other Anthropogenic Substrate Alterations	Municipal (Urbanized High-Density Area)
	Sedimentation/Siltation	Municipal (Urbanized High-Density Area)
Emory River	PCBs	Contaminated Sediments
	Mercury	Atmospheric Deposition – Toxics
Emory River Embayment of Watts Bar Reservoir	Chlordane	Contaminated Sediments
	Mercury	Atmospheric Deposition – Toxics
		Industrial Point Source Discharge
	PCBs	Contaminated Sediments
		Industrial Point Source Discharge
Grassy Creek	Alteration in Stream-Side or Littoral Vegetative Covers	Municipal (Urbanized High-Density Area)
	E. coli	
	Sedimentation/Siltation	

Waterbody	Cause for Listing	Potential Source
Poplar Creek	*E. coli*	Municipal (Urbanized High-Density Area)
		Sanitary Sewer Overflows
	Mercury	Industrial Point Source Discharge
		Contaminated Sediments
	Nutrients	Municipal Point Source Discharges
		Municipal (Urbanized High-Density Area)
	PCBs	Contaminated Sediments
	Sedimentation/Siltation	Municipal (Urbanized High-Density Area)
Polar Creek Embayment	Mercury	Industrial Point Source Discharge
		Contaminated Sediments
	PCBs	Contaminated Sediments
Whiteoak Creek	Cause Unknown	CERCLA National Priorities List (Superfund) Site
	Cesium	
	Strontium	
Anderson County		
East Fork Poplar Creek	*E. coli*	Municipal (Urbanized High-Density Area)
	Mercury	Contaminated Sediments
		Industrial Point Source Discharge
	Nutrients	Municipal (Urbanized High-Density Area)
	Other Anthropogenic Substrate Alterations	Municipal (Urbanized High-Density Area)
	PCBs	Contaminated Sediments
	Sedimentation/Siltation	Municipal (Urbanized High-Density Area)

Source: TDEC 2022g
Notes: CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act; PCBs: Polychlorinated biphenyls

3.6.2.1.2.5.2 Western Transmission Corridor

A field survey was completed in June 2022 of the Western Transmission Corridor located in Cumberland County (Appendix E). A total of seven perennial streams (comprising 854 LF of smaller streams and 1.08 acres of larger features), seven intermittent streams (totaling 1,515 LF), four ephemeral channels (totaling 551 LF), and three open water ponds (totaling 1.54 acres) were identified within the Western Transmission Corridor (Table 3.6-10; Appendix E). Two named streams are crossed by the Western Transmission Corridor – Rocky Branch, which is crossed in three locations, and the Obed River, which is crossed at a single location. Neither of the surface waters/river segments that are crossed by the Western Transmission Corridor are on the National Rivers Inventory or classified as a National Wild and Scenic River. Proposed upgrades and reconductoring would occur on existing transmission lines within existing ROWs and no new structures would be placed within streams, including the Obed River or its tributaries.

Table 3.6-10. Summary of Surface Waters Crossings for Potential Upgrades within the Western Transmission Corridor under Alternative A

Feature	Number of Crossings	Total Extent
Streams		
Ephemeral*	4	551 LF
Intermittent	7	1,515 LF
Perennial	4	854 LF
Total	*15*	*2,920 LF*
Large Features		
Perennial (Obed River, Rocky Branch)	3	1.08 acres
Open Waters		
Pond	3	1.54 acres

Note: Information in this table is derived from field surveys completed in June 2022.
Source: Appendix E
*WWC and non-WWC.

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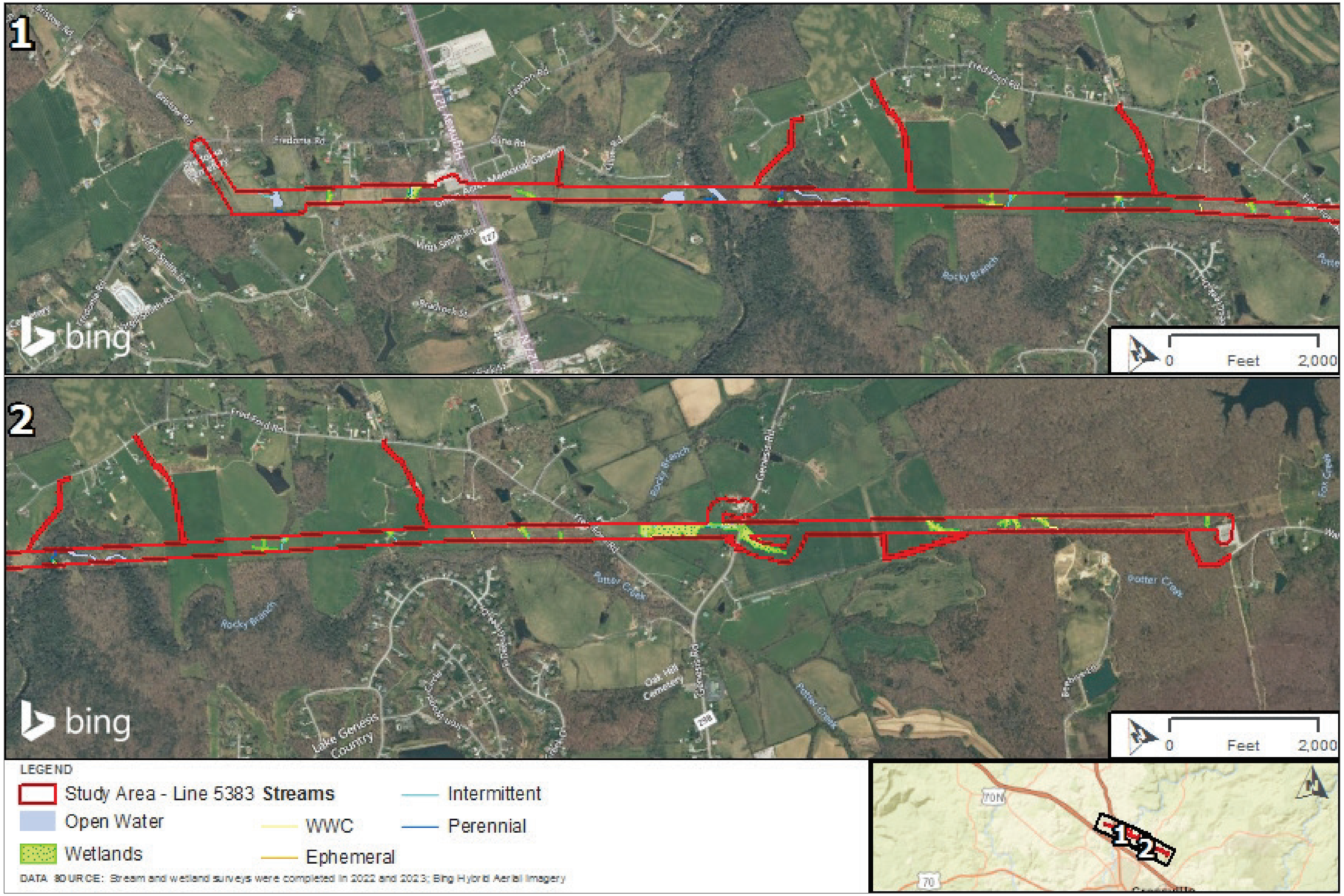

Figure 3.6-6. Surface Waters Identified Within the Western Transmission Corridor Proposed for Off-site Transmission Upgrades Under Alternative A of the Kingston Retirement Project

In accordance with TDEC Use Classifications for Surface Waters (TDEC 2019), any unnamed surface waters or all others not included in Rule 0400-40-04 are classified for fish and aquatic life, recreation, livestock watering and wildlife, and irrigation. Rocky Branch is not included in the classifications; therefore, the classification for this waterbody falls under the same uses as unnamed streams. Designated uses for the Obed River within the Western Transmission Corridor include supporting fish and aquatic life, recreation, livestock watering and wildlife, and irrigation uses. The Obed River, where it occurs within the Western Transmission Corridor, is included on the 2022 303(d) impaired waters list. The impairments and sources are summarized in Table 3.6-11.

Table 3.6-11. 2022 303(d) Listed Impairments for the Obed River Crossed by the Western Transmission Corridor under Alternative A Transmission Corridor in Cumberland County, Tennessee

Cause for Listing	Potential Source
Total Nitrogen	Discharges from biosolids (sludge) storage, application, or disposal
	Municipal point source discharges
E. coli	Discharges from biosolids (sludge) storage, application, or disposal
	Municipal (urbanized high-density area)
	Sanitary sewer overflows (collection system failures)
Total Phosphorus	Discharges from biosolids (sludge) storage, application, or disposal
	Municipal (urbanized high-density area)
	Municipal point source discharges
Flow Regime Modification	Dam or Impoundment
Physical Substrate Habitat Alteration	Dam or Impoundment
	Municipal (urbanized high-density area)

Source: TDEC 2022g

3.6.2.1.2.6 Construction and Operation of a Natural Gas Pipeline

Surface waters along the ETNG Construction ROW were summarized by ETNG in Resource Report 2 (ETNG 2023c). The corridor is located within the Old Hickory Lake, Cordell Hull, Obey River (a tributary of the Cumberland River), Emory River, and Lower Clinch River watersheds of the TN River Basin. Surface water is a prominent source for drinking water in the state of TN. In 2010, surface water intakes in the counties crossed by the ETNG Construction ROW supplied drinking water from less than 1 MGD for Trousdale and Jackson counties to between 5 and 15 MGD for Putnam and Roane counties (Robinson 2018).

Surface waters crossed by the ETNG Construction ROW were initially identified through a review of USGS topographic maps, USGS NHD, NWI data, and TN Water Wells, Waterbodies, and Water Resources Permits datasets, and subsequently surveyed by qualified wetland scientists and completed in 2021 and 2023. Approximately 99 percent of the ETNG Construction ROW has been surveyed for surface waters and ETNG is in the process of obtaining access to the remaining area. For areas not surveyed in the field, environmental information using the publicly available resources mentioned above are provided and would be field verified when access is obtained.

The proposed pipeline would cross a total of 676 waterbodies, including 224 perennial streams, 175 intermittent streams, 245 ephemeral channels, and 33 open water ponds or impoundments.

These field surveys enabled ETNG to identify the presence of waterbodies along the proposed ETNG Construction ROW should the Ridgeline Project be selected to transport natural gas supplies via expansion of ETNG's 3100 pipeline system.

ETNG's Resource Report 2 (ETNG 2023c) was filed with FERC in July 2023. This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment, and TVA concurs with the water-related findings in ETNG's Resource Report 2. Waterbodies identified from these resources are summarized in Table 3.6-12 and depicted on figures in Appendix H.

Table 3.6-12. Summary of Streams Crossed by the Alternative A Natural Gas Pipeline

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Rocky Creek	Ephemeral	N/A	--
UT to Rocky Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Rocky Creek	Ephemeral	N/A	--
UT to Rocky Creek	Intermittent	FAL, REC, LWW, IRR	--
Rocky Creek	Perennial	FAL, REC, LWW, IRR	--
Rocky Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Rocky Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Rocky Creek	Ephemeral	N/A	--
UT to Second Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Second Creek	Ephemeral	N/A	--
UT to Second Creek	Ephemeral	N/A	--
UT to Second Creek	Ephemeral	N/A	--
UT to Second Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Second Creek	Ephemeral	N/A	--
UT to Second Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Second Creek	Perennial	FAL, REC, LWW, IRR	--
Second Creek	Waterbody	IWS, FAL, REC, LWW, IRR	--
Second Creek	Waterbody	IWS, FAL, REC, LWW, IRR	--
UT to Second Creek	Ephemeral	N/A	--
UT to Second Creek	Ephemeral	N/A	--
UT to Cumberland River	Intermittent	FAL, REC, LWW, IRR	--
UT to Cumberland River	Ephemeral	N/A	--
UT to Cumberland River	Intermittent	FAL, REC, LWW, IRR	--
UT to Cumberland River	Ephemeral	N/A	--
UT to Little Goose Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Goose Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Goose Creek	Ephemeral	N/A	--
UT to Little Goose Creek	Ephemeral	N/A	--
UT to Little Goose Creek	Ephemeral	N/A	--
UT to Little Goose Creek	Intermittent	FAL, REC, LWW, IRR	--
Little Goose Creek[2]	Perennial	FAL, REC, LWW, IRR	Total P, E. coli, Veg Cover Alteration
Goose Creek[2]	Perennial	FAL, REC, LWW, IRR, NRTS	Total P, Nitrate/Nitrite
UT to Goose Creek	Ephemeral	N/A	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Goose Creek	Ephemeral	N/A	--
UT to Goose Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Goose Creek	Ephemeral	N/A	--
UT to Goose Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Goose Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Corely Branch	Ephemeral	N/A	--
UT to Cumberland River	Intermittent	FAL, REC, LWW, IRR	--
UT to Cumberland River	Ephemeral	N/A	--
UT to Cumberland River	Intermittent	FAL, REC, LWW, IRR	--
UT to Cumberland River	Ephemeral	N/A	--
UT to Cumberland River	Perennial	FAL, REC, LWW, IRR	--
UT to Cumberland River	Ephemeral	N/A	--
UT to Cumberland River	Perennial	FAL, REC, LWW, IRR	--
UT to Cumberland River	Perennial	FAL, REC, LWW, IRR	--
UT to Dixon Creek	Ephemeral	N/A	--
Glasgow Branch	Perennial	FAL, REC, LWW, IRR	--
Farm Pond	Pond	FAL, REC, LWW, IRR	--
UT to Second Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Second Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Second Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Second Creek	Ephemeral	N/A	--
UT to Second Creek	Ephemeral	N/A	--
UT to Welch Branch	Intermittent	FAL, REC, LWW, IRR	--
Lick Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dixon Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dixon Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dixon Creek	Ephemeral	N/A	--
UT to Dixon Creek	Intermittent	FAL, REC, LWW, IRR	--
Dixon Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Young Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Young Branch	Ephemeral	N/A	--
UT to Young Branch	Ephemeral	N/A	--
UT to Young Branch	Ephemeral	N/A	--
UT to Young Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Young Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Young Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Young Branch	Ephemeral	N/A	--
Young Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Young Branch	Ephemeral	N/A	--
UT to Toetown Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Toetown Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Toetown Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Toetown Branch	Ephemeral	N/A	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Toetown Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Toetown Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Toetown Branch	Ephemeral	N/A	--
UT to Toetown Branch	Intermittent	FAL, REC, LWW, IRR	--
Toetown Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Dickinson Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Dickinson Branch	Perennial	FAL, REC, LWW, IRR	--
Dickinson Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Dickinson Branch	Ephemeral	N/A	--
UT to Dickinson Branch	Ephemeral	N/A	--
UT to Dickinson Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Dickinson Branch	Ephemeral	N/A	--
Peyton Creek	Perennial	FAL, REC, LWW, IRR	--
Dillehay Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Dillehay Branch	Intermittent	FAL, REC, LWW, IRR	--
Dillehay Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Dillehay Branch	Ephemeral	N/A	--
UT to Defeated Creek	Perennial	FAL, REC, LWW, IRR	--
Defeated Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Kempville Branch	Ephemeral	N/A	--
UT to Kempville Branch	Ephemeral	N/A	--
UT to Kempville Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Kempville Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Kempville Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Kempville Branch	Ephemeral	N/A	--
UT to Kempville Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Kempville Branch	Ephemeral	N/A	--
UT to Kempville Branch	Perennial	FAL, REC, LWW, IRR	--
Kempville Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Little Salt Lick Creek	Ephemeral	N/A	--
UT to Little Salt Lick Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Salt Lick Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Salt Lick Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Little Salt Lick Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Little Salt Lick Creek	Ephemeral	N/A	--
UT to Little Salt Lick Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Salt Lick Creek	Ephemeral	N/A	--
UT to Little Salt Lick Creek	Ephemeral	N/A	--
UT to Little Salt Lick Creek	Ephemeral	N/A	--
UT to Little Salt Lick Creek	Ephemeral	N/A	--
UT to Little Salt Lick Creek	Ephemeral	N/A	--
UT to Little Salt Lick Creek	Ephemeral	N/A	--
UT to Salt Lick Creek	Intermittent	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Salt Lick Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Salt Lick Creek	Intermittent	FAL, REC, LWW, IRR	--
Salt Lick Creek	Perennial	FAL, REC, LWW, IRR	--
Salt Lick Creek (Cordell Hull Reservoir)	Waterbody	FAL, REC, LWW, IRR	--
Salt Lick Creek (Cordell Hull Reservoir)	Waterbody	FAL, REC, LWW, IRR	--
UT to Salt Lick Creek (Cordell Hull Reservoir)	Ephemeral	N/A	--
UT to Salt Lick Creek (Cordell Hull Reservoir)	Waterbody	FAL, REC, LWW, IRR	--
UT to Salt Lick Creek (Cordell Hull Reservoir)	Waterbody	FAL, REC, LWW, IRR	--
UT to Salt Lick Creek	Ephemeral	N/A	--
UT to Cumberland River	Ephemeral	N/A	--
UT to Cumberland River	Ephemeral	N/A	--
UT to Cumberland River	Ephemeral	N/A	--
Pond	Pond	FAL, REC, LWW, IRR	--
Cumberland River (Cordell Hull Reservoir)	Waterbody	DOM, IWS, FAL, REC, LWW, IRR	--
Cumberland River (Cordell Hull Reservoir)	Waterbody	DOM, IWS, FAL, REC, LWW, IRR	--
Cumberland River (Cordell Hull Reservoir)	Waterbody	DOM, IWS, FAL, REC, LWW, IRR	--
UT to Cumberland River	Ephemeral	N/A	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Flynn Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
Flynn Creek	Intermittent	FAL, REC, LWW, IRR	--
Flynn Creek	Intermittent	FAL, REC, LWW, IRR	--
Flynn Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Flynn Creek	Ephemeral	N/A	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Flynn Creek	Ephemeral	N/A	--
Pond	Pond	FAL, REC, LWW, IRR	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
Rush Fork	Perennial	FAL, REC, LWW, IRR	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Flynn Creek	Ephemeral	N/A	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
Flynn Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Flynn Creek	Ephemeral	N/A	--
UT to Bowman Branch	Ephemeral	N/A	--
UT to Bowman Branch	Ephemeral	N/A	--
UT to Bowman Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Bowman Branch	Ephemeral	N/A	--
UT to Bowman Branch	Intermittent	FAL, REC, LWW, IRR	--
Bowman Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Bowman Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Bowman Branch	Ephemeral	N/A	--
UT to Bowman Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Blackburn Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Blackburn Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Blackburn Fork	Ephemeral	N/A	--
UT to Blackburn Fork	Perennial	FAL, REC, LWW, IRR	--
Blackburn Fork[2]	Perennial	FAL, REC, LWW, IRR	E. coli
Cattle Pond	Pond	FAL, REC, LWW, IRR	--
UT to Blackburn Fork	Ephemeral	N/A	--
UT to Blackburn Fork	Ephemeral	N/A	--
UT to Blackburn Fork	Ephemeral	N/A	--
UT to Blackburn Fork	Ephemeral	N/A	--
UT to Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
Cattle Pond	Pond	FAL, REC, LWW, IRR	--
UT to East Blackburn Fork	Ephemeral	FAL, REC, LWW, IRR	--
UT to East Blackburn Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to East Blackburn Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to East Blackburn Fork	Intermittent	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to East Blackburn Fork	Perennial	FAL, REC, LWW, IRR	--
UT to East Blackburn Fork	Perennial	FAL, REC, LWW, IRR	--
UT to East Blackburn Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to East Blackburn Fork	Ephemeral	N/A	--
UT to Bear Creek	Ephemeral	N/A	--
UT to Bear Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bear Creek	Ephemeral	N/A	--
Bear Creek[2]	Perennial	FAL, REC, LWW, IRR	Sediment/Siltation
UT to Turkey Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Turkey Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Turkey Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Turkey Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Turkey Creek	Intermittent	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Turkey Creek	Perennial	FAL, REC, LWW, IRR	--
Turkey Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Turkey Creek	Ephemeral	N/A	--
UT to Turkey Creek	Ephemeral	N/A	--
UT to Turkey Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Turkey Creek	Intermittent	FAL, REC, LWW, IRR	--
Spring Creek[2]	Perennial	FAL, REC, LWW, IRR	E. coli
Spring Creek[2]	Perennial	FAL, REC, LWW, IRR	E. coli
Spring Creek[2]	Perennial	FAL, REC, LWW, IRR	E. coli
UT to Spring Creek	Perennial	FAL, REC, LWW, IRR	--
Spring Creek[2]	Perennial	FAL, REC, LWW, IRR	E. coli
Pond	Pond	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
Spring Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Spring Creek	Intermittent	FAL, REC, LWW, IRR	--
Spring Creek[2]	Perennial	FAL, REC, LWW, IRR	E. coli
Spring Creek	Intermittent	FAL, REC, LWW, IRR	--
Spring Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Spring Creek	Ephemeral	N/A	--
UT to Spring Creek	Ephemeral	N/A	--
UT to Spring Creek	Ephemeral	N/A	--
Spring Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Spring Creek	Ephemeral	N/A	--
UT to Spring Creek	Ephemeral	N/A	--
UT to Spring Creek	Ephemeral	N/A	--
UT to Spring Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Spring Creek	Ephemeral	N/A	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Spring Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Dry Hollow Creek	Ephemeral	N/A	--
UT to Garrison Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Garrison Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Garrison Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Garrison Branch	Perennial	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Garrison Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Garrison Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Garrison Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Garrison Branch	Ephemeral	N/A	--
UT to Garrison Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Garrison Branch	Ephemeral	N/A	--
UT to Garrison Branch	Ephemeral	N/A	--
UT to Garrison Branch	Ephemeral	N/A	--
UT to Garrison Branch	Ephemeral	N/A	--
UT to Yellow Branch	Ephemeral	N/A	--
UT to Yellow Branch	Ephemeral	N/A	--
UT to Yellow Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Ephemeral	N/A	--
UT to Yellow Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Yellow Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Mineral Springs Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Mineral Springs Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Mineral Springs Branch	Ephemeral	N/A	--
UT to Mineral Springs Branch	Ephemeral	N/A	--
UT to Mineral Springs Branch	Ephemeral	N/A	--
UT to Mineral Springs Branch	Ephemeral	N/A	--
UT to Mineral Springs Branch	Ephemeral	N/A	--
UT to West Fork Obey River	Ephemeral	N/A	--
UT to East Fork Obey River	Ephemeral	N/A	--
UT to East Fork Obey River	Intermittent	FAL, REC, LWW, IRR	--
UT to East Fork Obey River	Intermittent	FAL, REC, LWW, IRR	--
UT to East Fork Obey River	Intermittent	FAL, REC, LWW, IRR	--
UT to East Fork Obey River	Perennial	FAL, REC, LWW, IRR	--
UT to East Fork Obey River	Perennial	FAL, REC, LWW, IRR	--
UT to East Fork Obey River	Perennial	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to East Fork Obey River	Perennial	FAL, REC, LWW, IRR	--
UT to East Fork Obey River	Perennial	FAL, REC, LWW, IRR	--
East Fork Obey River[2]	Perennial	DOM, FAL, REC, LWW, IRR	Fe, Mn, pH, Sediment/Siltation
East Fork Obey River[2]	Perennial	DOM, FAL, REC, LWW, IRR	Fe, Mn, pH, Sediment/Siltation
UT to East Fork Obey River	Ephemeral	N/A	--
UT to East Fork Obey River	Perennial	FAL, REC, LWW, IRR	--
UT to East Fork Obey River	Ephemeral	N/A	--
UT to East Fork Obey River	Ephemeral	N/A	--
UT to East Fork Obey River	Intermittent	FAL, REC, LWW, IRR	--
UT to East Fork Obey River	Intermittent	FAL, REC, LWW, IRR	--
UT to Looper Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Looper Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Fond Branch	Ephemeral	N/A	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Fond Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Fond Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Ephemeral	N/A	--
UT to Fond Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Fond Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Little Hurricane Creek	Ephemeral	N/A	--
UT to Little Hurricane Creek	Ephemeral	N/A	--
UT to Little Hurricane Creek	Ephemeral	N/A	--
UT to Little Hurricane Creek	Ephemeral	N/A	--
UT to Little Hurricane Creek	Intermittent	FAL, REC, LWW, IRR	--
Little Hurricane Creek	Perennial	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Little Hurricane Creek	Ephemeral	N/A	--
UT to Little Hurricane Creek	Ephemeral	N/A	--
UT to Hurricane Creek	Ephemeral	N/A	--
UT to Hurricane Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Ephemeral	N/A	--
UT to Hurricane Creek	Intermittent	FAL, REC, LWW, IRR	--
Hurricane Creek	Perennial	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Hurricane Creek	Ephemeral	N/A	--
UT to Hurricane Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Ephemeral	N/A	--
UT to Hurricane Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Ephemeral	N/A	--
UT to Hurricane Creek	Ephemeral	N/A	--
UT to Hurricane Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Hurricane Creek	Ephemeral	N/A	--
UT to Cooper Branch	Ephemeral	N/A	--
UT to Cooper Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Cooper Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Cooper Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Cooper Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Cooper Branch	Intermittent	FAL, REC, LWW, IRR	--
Cooper Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Cooper Branch	Ephemeral	N/A	--
UT to Cooper Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Clear Creek	Ephemeral	N/A	--
UT to Clear Creek	Ephemeral	N/A	--
UT to Clear Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Clear Creek	Perennial	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Clear Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Clear Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Clear Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Clear Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Big Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Big Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Big Branch	Ephemeral	N/A	--
Pond	Pond	FAL, REC, LWW, IRR	--
Big Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Peter Branch	Ephemeral	N/A	--
UT to Peter Branch	Intermittent	FAL, REC, LWW, IRR	--
Peter Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Peter Branch	Perennial	FAL, REC, LWW, IRR	--
Peter Branch	Perennial	FAL, REC, LWW, IRR	--
Peter Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Peter Branch	Perennial	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Glade Branch	Perennial	FAL, REC, LWW, IRR	--
Glade Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Shepherd Branch	Perennial	FAL, REC, LWW, IRR	--
Shepherd Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Shepherd Branch	Ephemeral	N/A	--
UT to Shepherd Branch	Ephemeral	N/A	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Shepherd Branch	Ephemeral	N/A	--
UT to Shepherd Branch	Ephemeral	N/A	--
UT to Shepherd Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Shepherd Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Shepherd Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Shepherd Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Shepherd Branch	Intermittent	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
Big Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Big Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Big Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Big Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Bice Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bice Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bice Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bice Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bice Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bice Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bice Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bice Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bice Creek	Ephemeral	N/A	--
Bice Creek	Perennial	FAL, REC, LWW, IRR	--
Bice Creek	Perennial	FAL, REC, LWW, IRR	--
Bice Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bice Creek	Ephemeral	N/A	--
Bice Creek	Perennial	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Shell Creek	Ephemeral	N/A	--
UT to Muddy Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Muddy Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Muddy Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Muddy Branch	Ephemeral	N/A	--
UT to Four Mile Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Four Mile Creek	Perennial	FAL, REC, LWW, IRR	--
Four Mile Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Four Mile Creek	Perennial	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
Little Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Little Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Little Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Creek	Intermittent	FAL, REC, LWW, IRR	--
Little Creek	Perennial	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to White Creek	Perennial	FAL, REC, LWW, IRR	--
UT to White Creek	Ephemeral	N/A	--
UT to White Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to White Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to White Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to White Creek	Ephemeral	N/A	--
UT to White Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to White Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to White Creek	Intermittent	FAL, REC, LWW, IRR	--
White Creek	Perennial	FAL, REC, LWW, IRR, TS	--
UT to Green Branch	Ephemeral	N/A	--
UT to Green Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Green Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Green Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Douglas Branch	Ephemeral	N/A	--
UT to Douglas Branch	Intermittent	FAL, REC, LWW, IRR	--
Douglas Branch	Perennial	FAL, REC, LWW, IRR	--
Green Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Mill Creek Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Mill Creek Branch	Ephemeral	N/A	--
UT to Mill Creek Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Clear Creek	Ephemeral	N/A	--
UT to Clear Creek	Ephemeral	N/A	--
UT to Clear Creek	Ephemeral	N/A	--
UT to Clear Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Gordon Branch	Ephemeral	N/A	--
UT to Gordon Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Gordon Branch	Ephemeral	N/A	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Gordon Branch	Intermittent	FAL, REC, LWW, IRR	--
Gordon Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Clear Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Buck Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Buck Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Buck Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Little Clear Creek	Ephemeral	N/A	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Little Clear Creek	Ephemeral	N/A	--
UT to Little Clear Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Clear Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Little Clear Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Gut Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Gut Branch	Ephemeral	N/A	--
Gut Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Gut Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Gut Branch	Ephemeral	N/A	--
UT to Gut Branch	Ephemeral	N/A	--
UT to Gut Branch	Perennial	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Susan Branch	Ephemeral	N/A	--
UT to Susan Branch	Perennial	FAL, REC, LWW, IRR	--
Susan Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Price Branch	Ephemeral	N/A	--
UT to Price Branch	Ephemeral	N/A	--
UT to Price Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Price Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Price Branch	Ephemeral	N/A	--
UT to Price Branch	Ephemeral	N/A	--
UT to Price Branch	Ephemeral	N/A	--
UT to Price Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Price Branch	Intermittent	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Price Branch	Ephemeral	N/A	--
UT to Price Branch	Waterbody	FAL, REC, LWW, IRR	--
UT to Price Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Price Branch	Ephemeral	N/A	--
UT to Price Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Price Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Price Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Price Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Price Branch	Perennial	FAL, REC, LWW, IRR	--
UT to Campground Creek	Ephemeral	N/A	--
UT to Campground Creek	Ephemeral	N/A	--
Campground Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Campground Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Campground Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Emory River	Ephemeral	N/A	--
UT to Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Emory River	Intermittent	FAL, REC, LWW, IRR	--
UT to Emory River	Ephemeral	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Emory River	Ephemeral	N/A	--
Emory River	Perennial	DOM, IWS, FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Emory River	Intermittent	FAL, REC, LWW, IRR	--
UT to Emory River	Intermittent	FAL, REC, LWW, IRR	--
UT to Emory River	Intermittent	FAL, REC, LWW, IRR	--
Pond	Pond	FAL, REC, LWW, IRR	--
UT to Bonafacius Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Bonafacius Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
Crooked Fork[2]	Perennial	FAL, REC, LWW, IRR	Sediment/Siltation, Substrate/Habitat
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Perennial	FAL, REC, LWW, IRR	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Ephemeral	N/A	--
UT to Crooked Fork	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Perennial	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Forked Creek	Ephemeral	N/A	--
UT to Forked Creek	Perennial	FAL, REC, LWW, IRR	--
Forked Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Ephemeral	N/A	--
Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Ephemeral	N/A	--
Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Ephemeral	N/A	--
UT to Bitter Creek	Ephemeral	N/A	--
Little Emory River	Perennial	DOM, IWS, FAL, REC, LWW, IRR	--
UT to Little Emory River	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Little Emory River	Ephemeral	N/A	--
Emory River[2]	Perennial	DOM, IWS, FAL, REC, LWW, IRR	Chlordane, Hg, PCBs
UT to Elverton Branch	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Elverton Branch	Ephemeral	N/A	--
UT to Little Emory River	Ephemeral	FAL, REC, LWW, IRR	--
UT to Little Emory River	Ephemeral	FAL, REC, LWW, IRR	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Little Emory River	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Little Emory River	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Intermittent	FAL, REC, LWW, IRR	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Little Emory River	Perennial	FAL, REC, LWW, IRR	--
UT to Little Emory River	Ephemeral	N/A	--
UT to Emory River	Intermittent	FAL, REC, LWW, IRR	--
UT to Kings Creek	Ephemeral	N/A	--
UT to Kings Creek	Ephemeral	N/A	--
UT to Kings Creek	Intermittent	FAL, REC, LWW, IRR	--
UT to Kings Creek	Intermittent	FAL, REC, LWW, IRR	--
Kings Creek	Perennial	FAL, REC, LWW, IRR	--
UT to Kings Creek	Ephemeral	N/A	--
UT to Kings Creek	Ephemeral	N/A	--
UT to Lewis Branch	Ephemeral	N/A	--
UT to Emory River	Ephemeral	N/A	--
UT to Emory River	Ephemeral	N/A	--
UT to Emory River	Ephemeral	N/A	--
UT to Emory River	Ephemeral	N/A	--
UT to Emory River	Ephemeral	N/A	--
UT to Emory River	Ephemeral	N/A	--
UT to Emory River	Ephemeral	N/A	--
UT to Emory River	Ephemeral	N/A	--

Waterbody or Tributary Name	Flow Regime	State Water Quality Classification[1]	Pollutant(s)
UT to Emory River	Ephemeral	N/A	--
Emory River	Perennial	DOM, IWS, FAL, REC, LWW, IRR	--
UT to Clinch River	Ephemeral	N/A	--

UT: unnamed tributary
[1] Tennessee Designated Use Classification: DOM – Domestic Water Supply; IWS – Industrial Water Supply; FAL – Fish and Aquatic Life; REC – Recreation; LWW – Livestock Watering and Wildlife; IRR – Irrigation; NAV – Navigation; N/A – WWCs (ephemeral streams) do not have state water quality classifications (TDEC 2019).
[2] Stream on the 303(d) impaired waters list.

Within the ETNG Construction ROW, 12 crossings of eight named streams (Spring Creek is crossed in five locations) were identified as impaired (see Table 3.6-12). None of the waterbodies proposed to be crossed by the pipeline route are included in the National Wild and Scenic Rivers System inventory (NWSRS 2022).

Additionally, the ETNG Construction ROW crosses several tributaries of the Obed Wild & Scenic River (but does not cross any lands within the Obed Wild and Scenic boundary), as well as waterbodies on the National Rivers Inventory List. Tributaries to the Obed Wild & Scenic River within the ETNG Construction ROW include Campground Creek, Susan Branch, Gut Branch, Little Clear Creek, Gordon Branch, Green Branch, Douglas Branch, White Creek, Little Creek, Four Mile Creek, and Bice Creek. Though Milligan Branch, a tributary of the Obed Wild & Scenic River, is not crossed by the ETNG Construction ROW, it is located approximately 0.25 mile from the ETNG Construction ROW. Waterbodies on the National Rivers Inventory List within the ETNG Construction ROW include Crooked Fork Creek, Emory River (portion not currently listed as part of the Obed Wild & Scenic River), White Creek, Spring Creek, Blackburn Fork of the Roaring River, Flynn Creek, and Goose Creek. TVA and its partners would continue to coordinate with the NPS in accordance with Sections 7(a) and 10(a) of the WSRA, particularly with respect to Alternative A which proposes to install natural gas pipeline crossings at several tributaries to the Obed Wild and Scenic River as part of Ridgeline Project.

The NPS has sole authority for determining compliance of the proposed project with the WSRA, and such a determination must be made prior to the commencement of construction activities related to the Obed Wild and Scenic River tributary stream crossings.

Accordingly, measures may be necessary to preserve and protect the outstandingly remarkable values, free flow character, and water quality of Obed Wild and Scenic River to ensure compliance with Sections 7(a) and 10(a) of the WSRA. If necessary, such measures would be developed in coordination with the NPS, a coordinating agency for this project, for all tributary stream crossings by the Ridgeline Project when sufficient, detailed information becomes available for the stream crossing locations and methodologies, which is likely to be during the evaluation of the project by FERC.

The ETNG Construction ROW also crosses several Exceptional Tennessee Waters (ETW) including Flynn Creek, Blackburn Fork, Little Hurricane Creek, Hurricane Creek, Douglas Branch, and the Emory River. Both ETW and ONRW are protected as state-designated high-quality waters in TN. Additionally, ETW are waters that falls within any of the following parameters:

- Waters within state or national parks, wildlife refuges, wilderness areas, or natural areas;
- State Scenic Rivers or Federal Wild and Scenic Rivers;

- Federally designated critical habitat or other waters with documented nonexperimental populations of state or federally listed threatened or endangered aquatic or semi-aquatic plants or animals;
- Waters within areas designated Lands Unsuitable for Mining;
- Waters with naturally reproducing trout;
- Waters with exceptional biological diversity as evidenced by a score of 40 or 42 on the Total Metric Index, provided that the sample is considered representative of overall stream conditions; and
- Other waters with outstanding ecological or recreational value as determined by TDEC.

The nearest ONRW to the pipeline is the Obed River. While the pipeline does not cross the Obed River, it does cross primary, secondary, and tertiary tributaries to the Obed River (ETNG 2023c).

3.6.2.1.3 Alternative B

3.6.2.1.3.1 East Tennessee TVA Power Service Area

River basins in the eastern TVA region include the Cumberland, Upper TN, and Middle TN-Hiawassee/Lower TN basins (TDEC 2022f; State of TN, n.d.). The Cumberland River Basin in the eastern TVA region includes the South Fork Cumberland and Clear Fork watersheds. The Middle TN-Hiawassee/Lower TN River Basin in East TN includes Guntersville Lake, Lower TN, and Hiwassee River watersheds. The Upper TN River Basin encompasses the largest portion of the East TN Region, including major watersheds such as the Sequatchie, Emory, Lower TN, Hiwassee, Little TN, Watts Bar Lake, Lower Clinch, Upper Clinch, Powell, Lower French Broad, Upper French Broad, Fort Loudoun Lake, Pigeon, Nolichucky, Holston, North Fork Holston, South Fork Holston, and Watauga. Fresh water is abundant in much of this area and generally supports most beneficial uses, including fish and aquatic life, public and industrial water supply, waste assimilation, agriculture, and water-contact recreation, such as swimming.

A number of water quality management plans exist for watersheds within these basins (Table 3.6-13) (TDEC 2022f). TN conducts a watershed approach to the management of the states' waters; this approach involves evaluating all of the activities on-going within a watershed to form a decision-making process that reflects a common strategy for a specific watershed. It is an organizational framework that works on a five-year cycle with key activities that include: (1) planning and data review; (2) water quality monitoring; (3) water quality assessment; (4) TMDL/Alternative Restoration Plans; and (5) permit issuance. Watersheds across the state are grouped into five groups. On a rotating basis, TDEC conducts monitoring in one group; performs assessment, priority setting, and follow-up monitoring in a second group; conducts modeling and TMDL studies in a third group; develops management plans in a fourth group; and implements management plans in the fifth group.

There are approximately 60,392 miles of streams and rivers in the state of TN, and TDEC has assessed approximately 28,003 miles (46 percent) for categories and designated uses (TDEC 2022g). Information is not available for the East TN region specifically; therefore, data presented here are for the state of TN as a whole. Categories and designated uses are provided in Table 3.6-14.

Table 3.6-13. List of Water Quality Management Plans Available for Watersheds in the East Tennessee Region

River Basin	Watershed Water Quality Management Plans		
Cumberland	Upper Cumberland River		
Upper Tennessee	Emory River	South Fork Holston River	Powell River
	Holston River	Fort Loudoun Lake	Upper Clinch River
	Lower Clinch River	Little Tennessee River	Upper French Broad River
	Nolichucky River	Lower French Broad River	Watauga River
	Pigeon River	North Fork Holston River	Watts Bar Lake
Middle Tennessee-Hiawassee / Lower Tennessee	Middle Tennessee-Hiwassee		
	Guntersville Lake		

Source: TDEC 2022f

Table 3.6-14. Stream Categorizations and Designated Uses in the State of Tennessee

Stream Categories		
Category	**Description**	**Stream/River Miles**
1	Fully supporting all uses	4,771
2	Fully supporting, but not all uses supported	7,713
3	Insufficient data/not assessed	32,398
4a	Impaired/has a TMDL	3,364
4b	Impaired/does not require TMDL	9
4c	Impaired/impact by alteration, not pollutant	193
5	Impaired/needs a TMDL	11,951
5a	Approved alternative plan	4.5

Designated Uses		
Designated Uses	**Miles of Stream Classified (Assessed)**	**Miles of Stream Meeting Designated Use**
Fish and Aquatic Life Protection (FAL)	60,389 (26,640)	14,807
Recreation (REC)	60,389 (16,141)	7,136
Irrigation (IRR)	60,389 (27,840)	27,839
Livestock Watering and Wildlife (LWW)	60,389 (27,763)	27,762
Domestic Water Supply (DOM)	3,996 (3,490)	3,424
Industrial Water Supply (IWS)	3,403 (2,997)	2,994

Source: TDEC 2022g

3.6.2.2 Environmental Consequences

3.6.2.2.1 The No Action Alternative

Under the No Action Alternative, KIF would continue operating and TVA would not construct the proposed new facilities. The existing water withdrawals would continue as currently permitted by TDEC under ARAP NR2103.147, as would wastewater discharges continue as authorized under NPDES Permit TN0005452. Discharges would continue to comply with all applicable permit limits, and therefore, surface water quality adjacent to KIF should remain approximately the same. TVA would implement all the planned actions related to the current and future management and storage of CCRs and requirements under the USEPA’s Steam Electric ELGs at the sites, which have either been reviewed or would be reviewed in subsequent NEPA analyses. Continued operations at KIF under the No Action Alternative would not be expected to cause any additional direct or indirect effects to local surface water resources, and therefore, would not change existing conditions.

TVA would implement supplemental mitigation measures required by TDEC's Administrative Order issued in August 2015, as well as the CCR pond closure plan approved by TDEC, which could include additional monitoring, assessment, corrective action programs, or other actions deemed appropriate as specified in the Environmental Investigation Plan (TVA 2018a).

3.6.2.2.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

Under Alternatives A and B, KIF would be retired. TVA would implement the planned actions related to the current and future management and storage of CCRs at KIF, which have either been reviewed or would be reviewed in subsequent NEPA analyses. TVA would implement supplemental mitigation measures required by TDEC's Administrative Order issued in August 2015, as well as the CCR pond closure plan approved by TDEC, which could include additional monitoring, assessment, corrective action programs, or other actions deemed appropriate and as specified in the Environmental Investigation Plan (TVA 2018a). Indirect effects may be associated with stormwater runoff due to demolition and temporary construction activities. Erosion and sediment control BMPs would be implemented to minimize potential effects.

Once the proposed facilities are constructed and commissioned, current operations would cease, and surface water withdrawals would be eliminated with the retirement of KIF. Wastewater discharges would be significantly reduced. The existing wastewater streams would continue to be authorized under NPDES Permit TN0005452. The CCR at the facility would follow requirements detailed in the USEPA Disposal of Coal Combustion Residuals from Electric Utilities final rule (80 FR 21301). The remaining discharge flows would come from fire protection water, main station sumps, stormwater flow, and from ponds until closed. Surface water discharges would be expected to have direct and indirect beneficial effects due to the decrease in loading of metals as a result of ceasing coal operations. The termination of withdrawals and discharges of cooling water would eliminate impingement and entrainment effects and have other beneficial effects from reduced water consumption and thermal discharges. Minor beneficial impacts to water quality would occur due to reduced loading of metals in the coal plant's discharge.

The demolition of the existing fossil plant’s associated buildings and appurtenant features (including intake bays, the coal unloading area, transfer stations, conveyers, oil-water separators, and reverse osmosis system) would have the potential to temporarily affect surface water via fugitive emissions, debris, and stormwater runoff. The intake condenser circulating water tunnels, discharge condenser circulating water tunnels, and water treatment building and reverse osmosis trailers are also under consideration for deconstruction/demolition; however, the intake pump station would remain in place. The demolition boundary encompasses nine WWCs and exempted reaches (totaling 6,936 LF), two ephemeral channels (totaling 400 LF), and three ponds (totaling 0.08 acre) (Table 3.6-3). As stated above, the exempted reach (s001) is a man-made drainage containing aquatic life due to persistent flow originating from leakage in the fire protection system of the switchyard, which draws raw river water and discharges to s001 and inline stormwater/catchment Pond1, Pond2, and Pond3 (Figure 3.6-3). Impacts to these features are not yet determined; however, the USACE determined none of these waters to be considered jurisdictional under Section 404 of the Clean Water Act pursuant to *Sackett v. USEPA*.

TVA would comply with appropriate state and federal permit requirements for demolition activities. TVA would obtain a Construction Storm Water Permit prior to beginning demolition. Surface water effects resulting from disturbance during selective demolition would be mitigated using stormwater pollution prevention BMPs to minimize the extent of disturbance and erosion. Stormwater would discharge via either NPDES permitted discharge points or the designated construction stormwater outfalls. Silt fences, sediment basins, and/or other sediment and erosion control measures, as described in *A Guide for Environmental Protection and Best Management Practices for TVA Construction and Maintenance Activities, Revision 4* (TVA 2022a), would be installed, inspected, and maintained for the duration of demolition as needed to avoid contamination of surface waters adjacent to the Kingston Reservation. Therefore, minor effects to surface water would be expected due to surface water runoff from the construction site. 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 would be minimized.

Currently active industrial stormwater outfalls are monitored, every six months or annually, depending on the NPDES requirements. This monitoring would continue throughout the demolition process, with modifications as directed by the construction BMP plan. Following demolition, permits may be modified or reduced based on the change in operation at the facility. Permit modification requests would be negotiated with TDEC, as necessary.

Stack demolition has the potential to release fugitive dust, fill, and residual ash to adjacent surface water during demolition due to the uncontrolled nature of dropping the stack in a single, brief action. This action would result in the generation of fugitive dust and debris, which would then be subject to potential erosion and transport to adjacent surface waters. Following shut-down of the units, stacks would be washed to remove as much ash and dust as possible to reduce potential effects to surface waters during demolition. These demolition activities would be designed in a way to minimize any effects to adjacent waters; however, mitigation measures, such as turbidity curtains in adjacent waters, would be considered to help mitigate any incidental discharge of ash, soil, or sediment to receiving streams. With mitigation measures and BMPs in place, incidental discharges to the Clinch and Emory rivers due to these activities would be minimized.

Deconstruction of intake/discharge structure facilities (turbine bays and potentially the intake and discharge condenser circulating water tunnels) and the demolition of the barge unloading area has the potential for effects to surface waters through conveyance of sediment as part of the removal process. BMPs would be implemented to reduce these potential effects. To conduct this work, USACE and TDEC permits would be required. Anticipated effects to waters of the State or United States associated with the proposed actions would be mitigated with the use of BMPs; the effects would be minor with the implementation of BMPs as well as compliance with the requirements of the USACE and TDEC permitting process. Logistical measures for demolition activities, such as portable toilets for the construction workforce and equipment washing and dust control, would be handled in accordance with BMPs and the KIF NPDES permit.

With the implementation of appropriate BMPs, effects to surrounding surface waters from demolition activities are expected to be minor. Cumulative effects to surface water may occur due to the proximity of ongoing CCR management actions on the Kingston Reservation. With the use of proper BMPs, compliance with supplemental mitigation measures required by TDEC's Administrative Order issued in August 2015 (TVA 2018a), and compliance with all federal, state, and local regulations and guidelines, cumulative surface water effects are expected to be temporary and minor. Overall, the retirement of the KIF Plant would likely result in a net-benefit of effects to on-site and downstream surface waters due to the elimination of waste generation and effluent.

3.6.2.2.2.1 Environmental Justice Considerations

Negative effects to surface water and water quality that would occur as a result of the KIF retirement and D4 activities would be minor, temporary, minimized, or mitigated, and generally limited to the Kingston Reservation, where no EJ populations are present. Off-site effects to surface water and water quality, as a result of minor incidental discharges, although minor in the context of the Clinch and Emory rivers, have the potential to result in disproportionate effects to EJ-qualifying populations. Over time, there would be beneficial effects to nearby waters or waters on the Kingston Reservation as a result of ceasing coal operations.

3.6.2.2.3 Alternative A

3.6.2.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Construction activities have the potential to temporarily affect surface water via stormwater runoff. TVA would comply with all appropriate state and federal permit requirements. 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 is minimized. The use of BMPs to reduce runoff into the Clinch and Emory rivers and Watts Bar Reservoir would minimize adverse impacts, and the proposed action is not anticipated to measurably affect water quality in these water bodies.

One intermittent stream (227 LF) and one WWC (1,106 LF) are present within the proposed CC/Aero CT Plant site (Figure 3.6-4), which would be permanently impacted due to placement of fill. The intermittent stream was considered jurisdictional by the USACE (and subject to Section 404 permitting), while TDEC considers this feature to be a WWC. No other water features would be impacted by the construction of the proposed CC/Aero CT Plant.

At full CC/Aero CT Plant buildout, facility deliveries may be made by barge; minor modifications to the current barge unloading facilities would consist of grading and creation of dirt/rock ramping to the nose of the barge, which would result in temporary effects such as turbidity in the localized area of the Clinch River. For activities for which the turbidity is expected to have an adverse effect on water quality, mitigation measures such as use of turbidity curtains may be used while those activities are conducted. Should in-water work be necessary for completion of the upgrades to the barge unloading facilities, TVA would pursue permit authorizations, as needed. Most delivered items would be placed in project laydown areas to await installation.

The proposed CC/Aero CT Plant would contain an air-cooled condenser system and would not require cooling water withdrawals from the Emory or Clinch rivers or other surface waters. To prevent concentration of minerals in the steam cycle, the HRSG would require a demineralized water feed and boiler blowdown to remove accumulating minerals. See Section 2.1.3.2.2.1 for further information regarding the water requirements of the proposed CC/Aero CT Plant. Service water would be obtained from potable water sources and not from surface waters on-site. Treatment pond(s) for holding and treating process and stormwater flow would also be constructed; discharges from the operation of the proposed CC/Aero CT Plant would require compliance with a site-specific NPDES permit and compliance with all applicable regulations and conditions.

Applicable CWA Section 404 USACE permit coverage and TDEC ARAP (401 Water Quality Certification) authorization would be obtained for upgrades to the barge facilities and for necessary stream alterations, and the terms and conditions of these permits would require mitigation for the proposed activities. Feature e014 was determined by the USACE to be intermittent and therefore subject to permitting and associated mitigation. Erosion and sediment control BMPs would be implemented as a condition of an NDPES General Construction Storm Water permit. With the use of BMPs and adherence to all permit conditions, effects to surface waters and surface water quality would be minor.

3.6.2.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

No surface waters are present within the boundary of the proposed 3- to 4-MW Solar Facility; therefore, no impacts to surface waters from this component would occur (Figure 3.6-4).

3.6.2.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The placement of fill materials for the 100-MW BESS would result in permanent impacts to up to four WWCs, one ephemeral channel, and one pond depending on which battery site is chosen (Figure 3.6-4). Under Battery Option 1, four WWCs (totaling 1,682 LF) would be permanently impacted due to placement of fill. Under Battery Option 2, one WWC (477 LF) and one ephemeral channel (57 LF) would be permanently impacted. Under Battery Option 3, one WWC consisting of 320 LF would be permanently impacted due to fill. Additionally, a non-jurisdictional detention pond approximately 0.12 acre in extent would be permanently filled under Battery Option 3.

See Section 2.3 for information on avoidance and minimization of effects to surface waters. All appropriate Section 404 and 401 permits would be acquired for this component of Alternative A. Erosion and sediment control BMPs would be implemented as a condition of a NDPES General Construction Storm Water permit. The ephemeral channels and WWCs do not provide habitat that can support aquatic life; therefore, there is no risk to aquatic organisms. With the use of BMPs and adherence to all permit conditions, effects to surface waters and surface water quality would be minor.

3.6.2.2.3.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant facilities and switchyard. Seven WWCs totaling 3,659 LF are crossed by the existing on-site transmission lines (Figure 3.6-6). None of these features were considered jurisdictional by the USACE. Appropriate BMPs would be installed as needed to prevent stormwater impacts related to any ground disturbance, if necessary, for transmission line upgrades. Neither drainages nor the intermittent stream would be directly impacted by this action. TVA would comply with all appropriate state and federal permit requirements and appropriate BMPs would be followed to avoid and minimize effects to surface waters to the maximum extent practicable.

Five WWCs totaling 607 LF are present within the Battery Transmission Line Connections for the 100-MW BESS. All drainages would be spanned by the transmission lines and not directly impacted by this action. Additionally, TVA would comply with all appropriate state and federal permit requirements including appropriate BMPs. None of these features were considered jurisdictional by the USACE and no impacts are expected.

With BMPs in place, impacts to WWCs or surface waters and water quality for the Battery Transmission Line Connections or upgrades to the existing on-site transmission line corridor are expected to be minor.

3.6.2.2.3.5 Off-site Transmission Line Upgrades

3.6.2.2.3.5.1 Eastern Transmission Corridor

A total of 99 stream crossings, eight open waterbodies, and 64 other WWCs would be crossed by the Eastern Transmission Corridor and/or access roads proposed for upgrades as part of Alternative A. Construction activities would be localized to areas requiring replacement, maintenance, or modifications to existing structures (typically within 100 feet surrounding the work structure), and/or development of new temporary or permanent access roads. Construction vehicles such as bulldozers and bucket trucks would use existing access roads to the maximum extent practicable. The new OPGW installation would occur via helicopter with designated pull points along the transmission corridor, which are located typically along the most accessible path on the ROW (adjacent to road crossings or existing access roads). No direct long-term impacts to surface waters are anticipated. Temporary impacts would be minimized by using BMPs such as silt fencing, straw wattles, check dams, and temporary skimmer basins. Temporary structures, such as matting, would be used to reduce permanent impacts. No new structures would be placed in surface waters for any length of time that would result in permanent impacts.

3.6.2.2.3.5.2 Western Transmission Corridor

A total of 18 streams and three open waterbodies are crossed by L5383 within the Western Transmission Corridor and/or access roads proposed for upgrades as part of Alternative A. Construction activities for surface water crossings would be same as with the Eastern Transmission Corridor. As such, no direct impacts to surface waters are anticipated (including to the Obed River); temporary impacts would be minimized by using BMPs and, if necessary, matting for vehicle crossings. No new structures would be placed in surface waters. Overall effects to waters within the Western Transmission Corridor would be temporary and minor.

3.6.2.2.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 2 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the surface water and water quality-related findings in ETNG's Resource Report 2. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). Construction of the natural gas pipeline would temporarily impact a total of 676 ephemeral channels, streams, ponds, and major waterbodies (defined in the FERC Plan and Procedures as waterbodies greater than 100 feet wide at the water's edge at the time of crossing). Temporary impacts include effects to waterbody banks and water quality due to clearing, trenching, temporary bridge supports, and installation of the pipeline facilities across waterbodies. In addition, heavy equipment operating on stream banks could result in erosion and waterbody sedimentation. No impacts to surface waters from the construction of compressor stations would be expected.

No permanent impacts are expected to the 19 major waterbodies, five of which are proposed to be crossed via HDD, and 14 of which are proposed to be crossed via dry open cut. The total number and total combined stream crossing widths by water feature and crossing type are presented in Table 3.6-15 for the natural gas pipeline.

Table 3.6-15. Total Number and Total Combined Width of Stream Crossings by Water Feature and Crossing Type by the Proposed Natural Gas Pipeline under Alternative A

Feature Type	Number of Stream Crossings	Total Stream Width Crossing the ETNG Construction ROW (feet)
Workspace		
Ephemeral	117	0
Intermittent	74	2
Perennial	55	0
Pond	17	0
Waterbody	2	0
Dry Open Cut[1]		
Ephemeral	123	485
Intermittent	100	902
Perennial	164	3,762
Pond	6	819
Waterbody	3	2,131
HDD[2]		
Ephemeral	2	4
Perennial	4	1,467
Waterbody	5	3,601
TAR[3,]		
Ephemeral	3	0
Intermittent	1	0

Source: ETNG 2023c
[1]Thirty-five crossings by dry open cut method would be located on waters designated as sensitive, consisting of Goose Creek, Flynn Creek, Blackburn Fork, Spring Creek, Little Hurricane Creek, Hurricane Creek, Bice Creek, Four Mile Creek, Little Creek, White Creek, Douglas Branch, Green Branch, Gordon Branch, Little Clear Creek, Gut Branch, Susan Branch, Crooked Fork Creek, and the Emory River.
[2]Five crossings by HDD would be located on waters designated as sensitive, consisting of the Emory River Campground Creek, and three locations on the Cumberland River.
[3]TAR = crossed by temporary access road

The construction area outside of the 50-foot permanent ROW and ATWS would be revegetated in accordance with the E&SCP to prevent migration of sediment off-site during operation. ETNG would install erosion and sediment control devices in accordance with its E&SCP and FERC's Plan and Procedures (FERC 2013a, 2013b) to protect waterbodies within construction workspaces from impacts from sediment-laden runoff during construction.

A release of fuel or hazardous material into a waterbody can directly cause mortality to aquatic organisms and wildlife that use the waterbody. To prevent the introduction of fuels and/or hazardous materials into waterbodies, ETNG would follow an SPCC Plan to prevent, contain, and clean up spills and address necessary precautions during material storage. As part of the SPCC Plan, fuel storage and refueling of equipment would be maintained at an approved distance from waterbody boundaries.

To the extent possible, sensitive waterbody[26] crossings would be completed using the HDD method to avoid disturbance of the waterbody substrate and avoid ground disturbance immediately adjacent to the waterbody (ETNG 2023c). The use of the HDD method can avoid and/or minimize the potential for surface water impacts resulting from erosion, sedimentation, and/or excess turbidity. Vegetation between the HDD entry and exit pits would not be cleared except for travel lanes used for the HDD tracer wire. Activity within the travel lanes would be limited to foot traffic. Minor vegetation removal may be required along with travel lanes but would be limited to clearing with hand-tools. ATWS would be located on either side of the waterbody feature to accommodate the entry and exit locations of the HDDs. There are eight proposed locations where the HDD method would occur (ETNG 2023c).

The execution of the HDD method requires the use of drilling mud under pressure, and the potential exists for an inadvertent return of drilling mud. ETNG submitted an HDD Plan that outlines specific procedures and methods for addressing an inadvertent return of drilling mud. This plan includes procedures for monitoring, detecting, isolating, stopping, and cleaning up inadvertent drilling returns, as well as making necessary agency notifications. ETNG would stage BMPs, including boats, silt curtains, coffer dams, straw bales, silt fence, shovels, and rakes, near each HDD waterbody crossing. BMPs would be deployed in the event an inadvertent return occurs in a waterbody. In addition, stormwater BMPs would be in place prior to the start of each HDD activity to limit sediment run-off from graded construction workspaces into nearby waterbodies. The stormwater BMPs would be frequently inspected and maintained throughout construction and restoration to ensure proper function.

Intermittent and ephemeral waterbodies would be crossed during dry field conditions, where practicable (ETNG 2023c). A dry crossing method would be used to install the pipeline facilities at waterbody crossing locations if there is flowing water at the time of construction. Dry crossing methods involve installation of a flume pipe(s) and/or dam and pump prior to trenching to divert the stream flow over the construction area and allow trenching of the stream crossing in drier conditions isolated from the stream flow. A wet open cut crossing method would be performed at waterbody crossing locations if there is no flowing water at the time of construction (therefore, no flume would be installed/used). A minimum cover depth of five feet would be maintained over the pipeline for all designated waterbodies crossed with the dry or wet open cut methods. ETNG would complete construction activities within 24 to 48 hours for each crossing, limiting the amount of time of disturbance before the channel is returned to its original grade and banks recontoured. ETNG would follow FERC's Plan and Procedures, along with the Project E&SCP, to minimize potential impact from all crossing methods.

If trench dewatering is necessary, the removed trench water would be discharged into an energy dissipation/sediment filtration device in uplands located away from the water's edge to prevent silt-laden water from flowing into the waterbody in accordance with the E&SCP, FERC Procedures, and applicable permits. Dewatering would be monitored to ensure that all flow from the structure is infiltrating into the underlying soil.

The use of blasting for rock excavation may be used for rock excavation in areas around waterbodies where the construction of pipeline becomes impeded (ETNG 2023c). ETNG would utilize an approved blasting plan and operations would be performed by a state licensed expert.

[26] Sensitive waterbodies are those that 1) do not meet state water quality standards or have been designated for intensive water quality management; 2) contain threatened or endangered species or critical habitat; 3) are crossed less than 3 miles upstream of a potable water intake; 4) are afforded national or state status for exceptional quality; and 5) are listed on the National Rivers Inventory. Other factors that can provide a basis for sensitivity are location of a waterbody within a protected watershed, steep banks and other characteristics that might contribute to high risk of erosion impacts, and important riparian areas (ETNG 2023c).

This safety measure would ensure an appropriate level of protection to waterbodies. Further details regarding blasting are provided in ETNG's Blasting Plan, which TVA has independently reviewed, is included in Resource Report 6 (ETNG 2023g).

ETNG would construct its facilities in accordance with the regulations and requirements of applicable permits such as USACE and TDEC authorizations under CWA Sections 401 and 404. Restoration of stream crossings are described by ETNG as follows in Resource Report 2 (ETNG 2023c), filed with FERC in July 2023. This information has been reviewed to support a thorough and independent evaluation of the affected environment and environmental effects. TVA has independently reviewed and concurs with the findings regarding surface waters in Resource Report 2 (ENTG 2023c):

> Pipeline construction across rivers and streams or adjacent to surface waters can result in temporary and long-term adverse environmental impacts if not properly completed. However, proper construction techniques and timing can help ensure that such effects are both temporary and minor. In-stream activities associated with stream crossings could cause a temporary increase in turbidity and the resulting sedimentation that may occur downstream. Since most flowing streams will be crossed with dry crossing techniques, activities necessary to install dams could cause a short-term increase in turbidity at and immediately downstream of the crossing. Once the dams are installed and trenching begins, the trench area will be isolated from the flowing stream and no downstream turbidity is anticipated. When the crossing is complete and the dams are removed, a short-term increase in downstream turbidity can occur. Surface runoff and erosion from the cleared ROW can also increase instream sedimentation during construction. An inadvertent return of drilling mud within a waterbody during an HDD crossing could cause an increase in turbidity and localized sedimentation within the waterbody. Other potentially deleterious effects include accidental hazardous material spills resulting from refueling/maintaining construction equipment, fuel storage, or equipment failure in or near a waterbody, and could have immediate effects on aquatic resources and contaminate the waterbody downstream of the release point.
>
> Long-term effects on water quality can result from alteration of stream banks and removal of riparian vegetation. Proper stabilization and revegetation would help ensure that soil erosion associated with surface runoff and stream bank sloughing does not result in the deposition of large quantities of sediment into the waterbody. Increased turbidity from soil erosion and increased water temperature from vegetation removal can reduce the suitability of habitat for fisheries. No coldwater fisheries were identified in the [Ridgeline Expansion] project area. Potential effects on fisheries resources from the [Ridgeline Expansion] project and proposed mitigation are discussed further in Section 3.2 of Resource Report 3 [ETNG 2023d]. If an inadvertent return of drilling mud should occur within a waterbody during a HDD crossing, [ETNG] will implement measures outlined in the HDD Plan to avoid and minimize effects to the waterbody. Effects may also result from accidental releases of hazardous materials during refueling/maintaining of the construction equipment, equipment failure in or near a waterbody, or inappropriate storage of fuel in or near a waterbody. Minor long-term effects associated with pipeline operations and maintenance will largely be restricted to periodic clearing of vegetation within the permanent ROW at waterbody crossings. These maintenance activities will be consistent with the FERC Procedures, which have been fully integrated into the [Ridgeline Expansion] project E&SCP.
>
> To minimize effects at waterbody crossings during construction, operation, and maintenance, [ETNG] will construct the [Ridgeline Expansion] project in accordance with

the BMPs outlined in its [Ridgeline Expansion] project E&SCP, HDD Plan, and with federal and state regulations and permit requirements including stormwater permit requirements. The majority of the proposed pipeline will be installed within or adjacent to [ETNG's] existing 3100 Line ROW which will minimize impacts on riparian buffers along stream corridors.

To minimize the potential for sedimentation to waterbodies and within public watershed areas caused by erosion from the adjacent landscape, trench spoil that is excavated from streambeds and banks will be placed in the ATWS at least 10 feet from the top of the waterbody bank. Erosion control devices, such as silt fences and other BMPs, will be placed at the downslope edges of the spoil piles to help prevent sediment from entering the waterbody. Once the pipeline is placed in the trench, the temporarily stored spoil material will be placed back in the trench and the stream banks and streambed will be restored as close to their pre-construction contours as feasible. Stream banks and riparian areas will then be revegetated in accordance with the [Ridgeline Expansion] project E&SCP located in Appendix 1C of Resource Report 1 [ETNG 2023b], and any applicable agency requirements. During construction, the open trench may, on occasion, accumulate water from either groundwater intrusion or precipitation. In such cases, the trench may be dewatered periodically to allow for proper and safe construction.

Any hazardous materials, chemicals, lubricating oils, solvents, or fuels used during construction will be stored in upland areas at least 100 feet from wetlands and waterbodies as required by the [Ridgeline Expansion] project E&SCP. All such materials and spills (if any) will be handled in accordance with Enbridge's SPCC Plan. Except where absolutely necessary or required to otherwise minimize overall effects to the environment, there will be no refueling or lubricating of vehicles or equipment within 100 feet of a waterbody. Under no circumstances will refuse be discarded in waterbodies, trenches, or along the construction corridor. In accordance with Enbridge's SPCC Plan, [ETNG] will conduct routine inspections of tanks and storage areas to help reduce the potential for spills of hazardous materials. Specific measures are discussed in Enbridge's SPCC Plan (Contingency Plan and Emergency Procedures) and in the [Ridgeline Expansion] project E&SCP.

[…]

Completed stream crossings will be stabilized in accordance with the FERC Procedures. Original stream bed and bank contours will be re-established, and mulch, jute thatching, or bonded fiber blankets will be installed on the stream banks to prevent erosion and encourage reestablishment of vegetation cover. Where poor soil conditions are present, rip-rap may be used for bank stabilization. Seeding of ATWS and disturbed ROW approaches to stream crossings will be completed immediately after final grading, in accordance with the [Ridgeline Expansion] project E&SCP, weather and soil conditions permitting. Where necessary, slope breakers (i.e., interceptor dikes) will be installed adjacent to stream banks to minimize the potential for erosion. Temporary sediment barriers, such as silt fence or other BMPs, will be maintained across the ROW until a permanent vegetation cover is established. For certain waterbodies, site-specific restoration and habitat enhancement measures will be implemented.

Within the permanent ROW, a 25-foot-wide riparian strip adjacent to waterbodies will be allowed to revegetate with native plant species. A 10-foot-wide area centered on the pipeline may be maintained to facilitate periodic pipeline corrosion/leak surveys.

> Any trees greater than 15 feet in height and within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent ROW during maintenance activities.

ETNG's Resource Report 1 (ENTG 2023b) further provides:

> [ETNG] will operate and maintain the newly constructed Project facilities in the same manner as it currently operates and maintains its existing system, including compliance with the DOT regulations of 49 CFR Part 192. The pipeline will be patrolled on a routine basis, and personnel well-qualified to perform both emergency and routine maintenance on interstate pipeline facilities will handle emergencies and maintenance. […]
>
> Pipeline inspection will be accomplished by ground and aerial surveys, and in accordance with applicable laws and regulations. During periodic pipeline and ROW patrols, all permanent erosion control devices installed during construction will be inspected to ensure that they are functioning properly. In addition, attention will be given to:
>
> - erosion and washouts along the ROW;
> - performance of water control devices such as diversions;
> - fallen timber or other threats to the pipeline;
> - general health of shrubs and other vegetation planted during construction; and
> - any other conditions that could endanger the pipeline or cause erosion.
>
> The local operations supervisor will be notified of any conditions that need attention. Prompt corrective measures will be performed as needed in accordance with the FERC Plan and FERC Procedures.

Hydrostatic Testing and Water Use

ETNG would utilize surface water for hydrostatic testing of the facilities. Hydrostatic test water would be discharged to well-vegetated and stabilized upland areas where practicable and in accordance with applicable permit conditions. Environmental impacts associated with the discharge of hydrostatic test water would be minimized by implementing the following measures:

- locating hydrostatic test manifolds outside of riparian areas (and wetlands), to the extent practicable;
- complying with all appropriate permit requirements;
- discharging test water to a well-vegetated and stabilized area; and
- regulating the discharge rate, using energy dissipation device(s), and installing sediment barriers, as necessary, to prevent erosion and sedimentation.

ETNG does not anticipate that it would use chemicals for testing or for drying the pipeline following hydrostatic testing. Sampling and discharge of hydrostatic test water would be conducted in accordance with permit requirements, and therefore, would not impact surface water quality.

In addition, ETNG may require water for dust control. Estimates of water use and proposed sources for hydrostatic testing and dust suppression water (e.g., annual registration reports for groundwater or surface water) are available in the Environmental Report to be submitted to FERC by ETNG.

Overall, the installation of the natural gas pipeline would result in temporary, minor impacts to surface waters as all surface waters would be returned to original grade and streambanks restored following pipeline construction.

ETNG met with USACE and TDEC on March 20, 2023, to discuss unavoidable impacts to surface waters within the ETNG Construction ROW. ETNG's Resource Report 2 provides:

> Compensatory mitigation for the unavoidable loss of functions and riparian impacts will be mitigated through the purchase of compensatory mitigation credits (if available), in-lieu credit fee (if available) and/or an offsite Permittee Responsible Mitigation project(s). Compensatory mitigation details will be evaluated and approved by the USACE and TDEC during the Joint Permit Application review process. The final compensatory mitigation plan will be developed as part of the USACE permit process and TDEC ARAP permit process. The final compensatory mitigation plan will be provided to FERC when available, anticipated to be spring of 2024.

3.6.2.2.3.7 Summary of Alternative A

Permanent and temporary impacts surface waters are expected under Alternative A (Table 3.6-16). Overall, impacts from Alternative A would have minor, permanent impacts, and minor temporary impacts to surface waters.

Table 3.6-16. Summary of Estimated Surface Water Impacts for Alternative A

Alternative A Component	Impact Type	Stream Feature (LF)				Ponds and Impoundments
		Perennial	Intermittent	Ephemeral[1]	*Total*	
D4 Process	TBD	--	--	7,336	*7,336*	3 waterbodies (0.34 acre)
CC/Aero CT Plant	Permanent	--	227	1,106	*1,333*	--
	Temporary	--	--	--	--	--
3-4-MW Solar Facility	Permanent	--	--	--	--	--
	Temporary	--	--	--	--	--
100-MW BESS	Permanent	--	--	320-1,682[2]	*320 - 1,682*	0-1 waterbody (0 - 0.12 acre)
	Temporary	--	--	--	--	--
On-site Transmission Lines	Permanent	--	--	--	--	
	Temporary	--	--	4,266	*4,266*	--
Off-site Transmission Lines	Permanent	--	--	--	--	--
	Temporary	7,426	7,583	13,604	*33,509*	8 open water ponds (8.82 acres) 25 large streams (23.0 acres)
Total	**Permanent**	**0**	**227**	**1,426-2,788**	***1,653 – 3,015***	**0-1 waterbody**

Alternative A Component	Impact Type	Stream Feature (LF)				Ponds and Impoundments
		Perennial	Intermittent	Ephemeral[1]	*Total*	
	Temporary	**7,426**	**7,583**	**17,870**	***37,775***	**8 ponds** **25 large streams**
	TBD	**--**	**--**	**7,336**	***7,336***	**3 waterbodies**
Natural Gas Pipeline[3]	Permanent	--	--	--	--	--
	Temporary	3,762	904	485	*5,151*	28 waterbodies

TBD: the type of impacts to these features are not yet known.
[1]Includes WWCs and exempt reaches
[2]Impacts depend on Battery Option chosen.
[3]Includes impacts associated with waterbody crossings, access roads, and workspaces. Waterbodies crossed via HDD are excluded. Linear footage provided represents the total wetted width of the feature that would be crossed by the natural gas pipeline.

TVA Proposed Actions

Permanent impacts would primarily occur due to fill of one WWC and one intermittent channel and/or ephemeral channels within the boundaries of the CC/Aero CT Plant and battery site option footprints. Ephemeral channels and WWCs do not support aquatic life due to the impermanence of water flow, as these features convey water only during significant rain events. Most, if not all, of these features are also man-made and provide poor (if any) habitat. Drainage of rainfall would be disrupted if these channels become filled; however, appropriate stormwater drainage features or facilities would be constructed as part of the Alternative A planning and design. Furthermore, proposed impacts to these features would not be subject to TDEC permitting, per TN Code Annotated section 69-3-108(q). Applicable CWA Section 404 USACE permit coverage and TDEC ARAP (401 Water Quality Certification) authorization would be obtained for upgrades to the barge facilities and for necessary stream alterations, and the terms and conditions of these permits, including any required mitigation, would be followed. Feature e014 was determined by the USACE to be intermittent and therefore subject to permitting and associated mitigation, if required. Temporary impacts to streams would be the result of disturbance from nearby construction activities or diversion during natural gas pipeline installation on the Kingston Reservation.

Surface water withdrawals would not be required under the proposed construction of the CC/Aero CT Plant. Additionally, once operational all wastewaters would be discharged under a new or modified NPDES permit. Therefore, there would be a beneficial impact to nearby surface waters, as a result of reducing surface water withdrawal needs from the existing cooling water intake structure. Temporary effects as summarized in Table 3.6-12 would not result in long-term impacts. Similarly, temporary effects by transmission corridor upgrades would not result in long-term impacts, as transmission towers would be constructed in upland areas to the extent practicable.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Temporary impacts during construction of the natural gas pipeline would result from clearing activities, HDD, dry and wet open cut crossing installation methods, temporary access road crossings, temporary workspaces, and hydrostatic test discharges. Minor, temporary impacts from potential spills or leaks of hazardous liquids from refueling procedures and potential blasting activities are not planned but could occur and would be minimized through the use of standard BMPs. Turbidity would increase temporarily in streams that are trenched; however, trenched streams would be returned to their natural, original grade following completion of the pipeline installation and associated activities. No impacts to surface waters from the construction of compressor stations are anticipated.

Cumulative Effects
Cumulative effects to surface waters may occur given the proximity of past/present and RFFAs near the natural gas pipeline and transmission line corridors. Cumulative effects would include decreased water quality and aquatic habitat due to accidental hazardous spills or in-stream sedimentation caused by erosion of disturbed soils. Effects to surface waters would be minimized and mitigated through proper siting of these facilities, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.2.2.3.8 Environmental Justice Considerations

TVA Proposed Actions
Effects to surface water and water quality, as summarized above, that would occur as a result of the proposed CC/Aero CT Plant activities would be minor, temporary, and minimized, or mitigated through CWA 404, 401, and 402 (NPDES) permitting with some effects (i.e., localized effects) occurring on the Kingston Reservation, where no populations are settled. As such, no effects on EJ populations are anticipated. Minor beneficial effects would occur from the proposed reduction in cooling water withdrawals after retirement of the existing KIF units. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Effects occurring as a result of ETNG's proposed pipeline activities, while temporary and minor, would occur outside of Kingston Reservation. In instances where EJ populations were identified along the ETNG Construction ROW, it is TVA's current assessment that disproportionate and adverse effects may occur given that these populations tend to be more vulnerable or sensitive to the effects from temporary 404/401 permitting impacts/activities. Cumulative effects include decreased water quality and aquatic habitat due to accidental hazardous spills or in-stream sedimentation caused by erosion of disturbed soils. These cumulative effects may result in disproportionate and adverse effects to EJ populations using these resources for sustenance.

3.6.2.2.4 Alternative B

3.6.2.2.4.1 Construction and Operations of Solar and Storage Facilities
Alternative B would result in construction activities that have the potential to permanently affect streams and/or temporarily affect surface water via stormwater runoff. Based on TVA's evaluation of typical effects associated with the development of solar facilities (Table 3.2-1), new solar facilities result in an average of approximately 8.7 LF of stream effects per MW, with a range from 0 to 41 LF. Based on the addition of 1,500 MW of solar facilities in Alternative B, an average of 13,050 LF of stream would be impacted, with up to 61,500 LF of total stream effects possible. For 2,200 MW of BESS facilities, impacts would range between approximately 19,140 LF and 90,200 LF based on values from Table 3.2-1.TVA and solar developers would minimize effects to surface waters by siting facilities on lands with few surface water resources; configuring the solar arrays, access roads, and other infrastructure to avoid surface waters; and establishing and maintaining buffers around surface waters. Applicable CWA Section 404 and 401 permits would be obtained from USACE and TDEC and necessary mitigation credits purchased if surface water effects cannot be avoided. Should mitigation credits not be available within the primary or applicable secondary watersheds, TVA would pursue mitigation through in-lieu fee credit purchases or through permittee-responsible mitigation.

Soil erosion and sedimentation can clog small streams and threaten aquatic life. As noted in the 2019 TVA IRP EIS (TVA 2019b), the conversion of a site to a solar facility with a permanent grass and herbaceous vegetative cover can reduce the runoff of silt and agricultural chemicals that often occurs from cropland/agricultural land. Appropriate BMPs would be installed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained and that the introduction of pollution materials to the receiving waters is minimized. A general construction stormwater permit would be needed for the proposed solar and BESS facilities since more than one acre would be disturbed. This permit requires the development and implementation of an SWPPP, which would identify specific BMPs to address construction-related activities that would be adopted to minimize stormwater effects. With the use of BMPs and adherence to all permit conditions, effects to surface waters and surface water quality would be minor.

Cumulative Effects

Cumulative effects to surface water may occur under Alternative B from the combined transmission effects of the 1,500 MW of proposed solar under Alternative B and the additional 10,000 MW of solar installations targeted throughout the TVA PSA (to be evaluated under separate NEPA analyses). Based on the average of 8.7 LF of effect per MW, this would result in 87,000 LF of additional stream effects within the TVA PSA. Cumulative effects to surface waters would be minimized and mitigated through proper siting of solar facilities, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.2.2.4.2 Transmission and Other Components

As noted in Table 3.3-1, transmission lines typically result in an average of 2.9 stream crossings per mile of new line, with an estimated 1.71 average length of new transmission line for solar facility interconnections, a total of 74 stream crossings for solar facilities, and 84 stream crossings for BESS facilities are estimated for installing new transmission lines. TVA and solar developers would avoid placing structures within surface waters, and effects would be minimized by crossing surface waters at a perpendicular angle where practicable. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained. Associated substations and/or switchyards would be sited to avoid surface waters to the maximum extent practicable. With the use of BMPs and adherence to all permit conditions, effects to surface waters and surface water quality would be minor.

Cumulative Effects

Cumulative effects to surface water may occur under Alternative B from the combined transmission effects of the 1,500 MW of proposed solar under Alternative B and the additional 10,000 MW of solar installations targeted throughout the TVA PSA (to be evaluated under separate NEPA analyses). Transmission lines associated with this expansion would result in stream crossings and effects. Cumulative effects to surface waters would be minimized and mitigated through proper siting of transmission lines, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.2.2.4.3 Environmental Justice Considerations

Effects to surface water and water quality that would occur because of the proposed solar facilities and transmission line activities would be avoided or minimized to the extent practicable through the implementation of standard BMPs. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.6.3 Wetlands

3.6.3.1 Regulatory Background

The USACE regulates the discharge of fill material into WOTUS, 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. Wetlands are also protected by state regulations (e.g., TN's ARAP program). As defined in regulations implementing Section 404 of the CWA (45 FR 85346), wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands and wetland fringe areas can also be found along the edges of many watercourses and impounded waters (both natural and man-made). Wetland habitat provides valuable public benefits, including flood storage, erosion control, water quality improvement, wildlife habitat, and recreation opportunities.

3.6.3.2 Regulatory Updates

In January 2003, the USACE issued guidance in response to the U.S. Supreme Court's ruling in Solid Waste Agency of Northern Cook County (SWANCC) v. USACE (531 U.S. 159 [2001]), which limited the jurisdiction over non-tidal isolated waters, including wetlands and open water areas excavated in uplands. In general, only wetlands that have a direct hydrological connection to waters of the U.S., or are within their floodplains, are considered potentially jurisdictional under Section 404.

On December 2, 2008, the USACE and the EPA issued the *Rapanos* Guidance (USACE 2008), a revision to the joint guidance for Jurisdictional Determinations, implementing the U.S. Supreme Court's holdings in the *Rapanos* and *Carabell* cases (126 S. Ct. 2208 [2006]). The guidance generally does not allow agencies to assert jurisdiction over ephemeral features, including erosional features, swales, small washes characterized by low volume, infrequent, or short duration flow and ditches excavated wholly in, and draining only, uplands and that do not carry a relatively permanent flow of water. Jurisdiction over water resources that are not traditional navigable waters (TNWs) or wetlands adjacent to a TNW is generally based on meeting one of the following two standards: 1) if a water body is relatively permanent, or if the water body is a wetland that "directly abuts" a relatively permanent water (RPW); or 2) if a water body, in combination with all wetlands adjacent to that water body, has a "significant nexus" to a TNW.

For non-navigable waters that are not relatively permanent and wetlands not directly abutting a RPW to be considered WOTUS, a significant nexus must exist with a measurable hydrologic, biological, or chemical connection to a TNW. Factors used in determining a significant nexus would include: 1) hydrologic conditions, such as volume, duration, and frequency of flow; 2) ecological factors, such as aquatic habitat that supports the biological functions of a TNW; and 3) chemical factors, such as maintenance of water quality in the TNW.

December 31, 2022, saw the issuance of new WOTUS definitions/final rule. These definitions reflect pre-2015 regulations, with the inclusion of the "relatively permanent" and "significant nexus" standards and went into effect on March 20, 2023 (referred to as the "2023 final rule").

On April 10, 2023, a preliminary injunction on the 2023 final rule was implemented in 24 states, pending further guidance based on the *Sackett v. USEPA* ruling (USACE 2023).

Just after the NOA for the KIF Draft EIS was issued in the Federal Register, the U.S. Supreme Court issued its ruling in *Sackett v. USEPA* with the primary focus on the extent of federal jurisdiction the EPA and USACE have over wetlands. Issued on May 25, 2023, the *Sackett v. USEPA* ruling determined that the "significant nexus" test under the *Rapanos* Guidance was not valid and that jurisdictional wetlands were those adjacent to rivers, lakes, streams, or other relatively permanent waters connected to traditional navigable waters (i.e., WOTUS), and that wetlands must have a “continuous surface connection” to the WOTUS, making it difficult to determine where the “water” ends and the “wetland” begins. On August 29, 2023, the EPA and USACE issued a revised final rule to conform key aspects of the regulatory text to the U.S. Supreme Court's May 25, 2023, decision in *Sackett*. The conforming rule, "Revised Definition of 'Waters of the United States'; Conforming," became effective on September 8, 2023. The ongoing litigation challenging the January 2023 Rule led to injunctions staying the implementation of the rule in 27 states, including Tennessee. In Tennessee, the agencies are interpreting “waters of the United States” consistent with the pre-2015 regulatory regime and the Supreme Court’s decision in *Sackett* until further notice.

The information and analyses presented under the affected environment and environmental consequences of Section 3.6.3 have been updated to reflect the revised definition of WOTUS, which went into effect on September 8, 2023.

3.6.3.3 Affected Environment

3.6.3.3.1 Kingston Reservation (No Action and D4 Activities)

A field delineation was completed in January 2023 by Qualified Hydrologic Professionals in areas that may be impacted by demolition or actions under Alternative A on the Kingston Reservation (Figure 3.6-3). Wetland determinations were performed according to USACE standards, which require documentation of wetland (hydrophytic) vegetation, hydric soil, and wetland hydrology (USACE 1987; Reed 1997). Broader definitions of wetlands, such as that used by the USFWS Service (Cowardin et al. 1979), the TN definition (TN Code 11-14-401), and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review. In addition, the TN Rapid Assessment Method (TRAM) (TDEC 2017) was used to assess wetland conditions and identify wetlands with special ecological significance. Data forms and representative photographs, and USACE JD, are provided in Appendix E.

Nine wetlands totaling 0.67 acre were delineated during the field surveys. Two wetlands (W008 and W009 totaling 0.0115 acre) identified within the 2023 delineation area on the western portion of the proposed area of impact within Kingston Reservation (see Figure 3.6-3) exist within a stormwater/wastewater conveyance for treatment; therefore, these wetlands are exempt from 404/401/ARAP regulation.

Wetlands W003, W006, and W007 were determined to be non-jurisdictional by the USACE according to an Approved JD received on December 12, 2023, which states the features have no continuous downstream connection (see JD included in Appendix E).

Seven of the nine wetlands within the proposed impact area on Kingston Reservation are persistent emergent wetlands with herbaceous vegetation communities (totaling 0.34 acre); one wetland within the proposed impact area is persistent forested wetland with broad-leaved deciduous vegetation community (totaling 0.23 acre). The remaining wetland (W005) is not within the proposed impact area, is 0.10 acre in extent, and is a broad-leaved forested wetland. All wetlands had low TRAM scores indicating low resource value. Wetlands are depicted on Figure 3.6-4 and summarized in Table 3.6-17.

Representative photographs, USACE wetland determination data form, and TRAM form are provided for wetland W005 in Appendix E.

Table 3.6-17. Summary of Wetlands Present within the proposed impact area on the Kingston Reservation

Cowardin Classification[1]	Cowardin et al. (1979) Description and Field Notes	Field ID	Number of Wetlands	Acres
PEM1E	Persistent emergent wetlands (PEM1), seasonally flooded/saturated (E). Depression wetlands or wetland swales.	W002 W004 W006 W007	4	0.32
PEM1Hr	Persistent emergent wetland (PEM1) permanently flooded (H), artificial (r). Emergent wetland fringe in manmade pond; disturbed.	W003	1	0.11
PEM1Jd	Persistent emergent wetland (PEM1) intermittently flooded (J), partly drained/ditched (d). Linear wetlands in wastewater/stormwater conveyance for treatment.	W008 W009	2	0.01
PFO1E	Forested wetland with broad-leaved deciduous vegetation (PFO1), seasonally flooded/saturated (E). Forested wetland fringe to the Clinch River.	W001	1	0.23
		Total	**8**	**0.57**

3.6.3.3.2 Alternative A

3.6.3.3.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Two wetlands totaling approximately 0.06 acre were identified within the CT/Aero CC Plant footprint during the field reconnaissance in March 2022 (Appendix E). The wetlands were classified as emergent and forested wetlands adjacent to the Clinch River. No wetlands are present within the switchyard area. Wetlands within the proposed CT/Aero CC Plant boundary are depicted on Figure 3.6-4 and summarized in Table 3.6-18. Representative photographs, USACE wetland determination data forms, and TRAM forms are provided for wetlands W001 and W002 in Appendix E. Based on TRAM form ratings, both wetlands hold low resource value; however, both may be considered jurisdictional according to the USACE's Preliminary JD received on December 12, 2023 (provided in Appendix E).

Table 3.6-18. Summary of Wetlands Present within the CC/Aero CT Plant Boundary

Cowardin Classification[1]	Cowardin et al. (1979) Description and Field Notes	Field ID	Number of Wetlands	Acres
PEM1E	Persistent emergent wetland (PEM1), seasonally flooded or saturated (E). Wetland swale draining to reservoir, within prior disturbed area, maintained.	W002	1	0.03
PFO1E	Forested wetland with broad-leaved deciduous vegetation (PFO1), seasonally flooded/saturated (E). Forested wetland fringe to the Clinch River.	W001	1	0.03
		Total[1]	**2**	**0.06**

[1]Total varies due to rounding.

3.6.3.3.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

No wetlands are present on the proposed 3- to 4-MW solar facility site (Figure 3.6-4).

3.6.3.3.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

No wetlands are present on any of the three battery storage site options (Figure 3.6-4).

3.6.3.3.2.4 On-site Transmission Upgrades

Construction of the 100-MW BESS would include battery transmission line connections that tie in with the existing transmission lines on Kingston Reservation. No wetlands occur within the bounds of the proposed battery transmission line connection corridor (Figure 3.6-4).

Under Alternative A, TVA would also make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant and switchyard. Four wetlands totaling 0.40 acre were identified within the extent of the on-site transmission line corridor (Table 3.6-19). All of the wetlands were classified as emergent wetlands. Representative photographs, USACE wetland determination data forms, and TRAM forms are provided for wetlands W003, W004, W006, and W007 in Appendix E. Based on TRAM form ratings, all four wetlands hold low resource value.

Table 3.6-19 Wetlands Crossed by the Alternative A Existing On-site Transmission Line Corridor

Cowardin Classification	Cowardin et al. (1979) Description and Field Notes	Field ID	Number of Wetlands	Area (acres)
PEM1Hr	Persistent emergent wetland (PEM1) permanently flooded (H) and artificial (r). Wetland fringe to manmade pond, disturbed.	W003	1	0.11
PEM1E	Persistent emergent wetland (PEM1), seasonally flooded/saturated (E). Two wetlands are depressions, and one wetland appears as a swale within the existing transmission line ROW.	W004 W006 W007	3	0.29
		Total	**4**	**0.40**

3.6.3.3.2.5 Off-site Transmission Line Upgrades

A wetlands field survey was completed in June 2022 of the Eastern Transmission Corridor (L5108 and L5302) and Western Transmission Corridor (L5383) (Appendix E). TVA later determined the potential need for additional transmission upgrades within the Eastern Transmission Corridor for L5116, L5280, and L5381 for Alternative A; field surveys for these areas were completed in May and June 2023 (Appendix E). The locations and types of wetlands identified in this EIS are based on an analysis of field survey results and other publicly available data. Corridors associated with transmission upgrades (including access roads) are described below with respect to Eastern and Western Transmission Corridors.

3.6.3.3.2.5.1 Eastern Transmission Corridor

A total of 108 potentially jurisdictional wetlands encompassing 37.99 acres and were delineated. (Table 3.6-20). The majority of the wetlands (31.76 acres) were classified as emergent or emergent-dominant. Including emergent/forested (3.76 acres) and emergent/scrub-shrub (4.01 acres), emergent wetlands accounted for 83.6 percent of the delineated wetlands. Forested or forested-dominant wetlands comprised 14.6 percent of the delineated wetlands, and scrub-shrub wetlands 1.8 percent. Wetlands are depicted on Figure 3.6-5a-d and additional information on wetland quality, figures, photolog, TRAM, and USACE wetland determination data forms are provided in Appendix E.

Table 3.6-20. Summary of Wetlands within the Eastern Transmission Corridor Proposed for Upgrades under Alternative A

Cowardin Classification[1]	Description	No. of Wetlands	Area (acres)
PEM	Wetland with emergent vegetation	74	23.98
PEM/PFO	Wetland with dominant emergent vegetation, subdominant forested wetland	4	3.76
PEM/PSS	Wetland with dominant emergent vegetation, subdominant scrub-shrub wetland	3	4.01
PFO	Forested wetland	13	0.74
PFO/PEM	Wetland with dominant forested vegetation, subdominant emergent wetland	9	4.80
PSS	Scrub-shrub wetland	3	0.14
PSS/PEM	Wetland with dominant scrub-shrub vegetation, subdominant emergent wetland	1	0.15
PSS/PFO	Wetland with dominant scrub-shrub vegetation, subdominant forested wetland	1	0.40
	Total	**108**	**37.99**

Note: Information in this table is derived from field surveys completed in June 2022, May 2023, and June 2023. Total may vary slightly due to rounding.
[1]PEM = palustrine emergent; PFO = palustrine forested; PSS = palustrine scrub-shrub

3.6.3.3.2.5.2 Western Transmission Corridor–Line 5383

Field surveys were completed in June 2022 of the Western Transmission Corridor (see figures in Appendix E). No transmission upgrades are proposed within the western portion of the Western Transmission Corridor; as such, field surveys were limited to the portion of the corridor where transmission upgrades are currently proposed, as identified in Figure 3.6-6. Wetland determinations were performed according to USACE standards, which require documentation of wetland (hydrophytic) vegetation, hydric soil, and wetland hydrology (USACE 1987, 2012; Reed 1997). Additionally, TRAMs were used to assess wetland condition and identify wetlands with special ecological significance (TDEC 2017).

A total of 11 wetlands encompassing approximately 8.26 acres and five isolated wetlands totaling 0.58 acre were delineated (Table 3.6-21). The majority of wetlands within the Western Transmission Corridor were categorized as emergent, followed by an emergent/forested combination, scrub-shrub, and forested. Most wetlands (eight) were determined to have low resource value according to TRAM forms, and three with moderate rating, primarily driven by elevated scores for functioning hydrology and connectivity, natural habitat, and buffer width. All isolated wetlands were observed to have low resource value. Wetland figures, photolog, TRAM, and USACE wetland determination data forms are provided in Appendix E.

Table 3.6-21. Summary of Wetlands Crossed by L5383 within the Western Transmission Corridor under Alternative A

Cowardin Classification[1]	Description	Number of Wetlands	Acres
Wetlands			
PEM1	Emergent wetland with persistent emergent vegetation.	8	4.18
PEM1/PFO1	Dominant emergent wetland with persistent emergent vegetation, subdominant forested wetland with broad-leaved deciduous trees.	1	3.88
PSS1	Scrub-shrub wetland with broad-leaved deciduous shrubs.	1	0.12
PFO1	Forested wetland with broad-leaved deciduous vegetation.	1	0.08
	Total	**11**	**8.26**
Isolated Wetlands			
PEM1	Emergent wetland with persistent emergent vegetation.	5	0.58

[1]PEM = palustrine emergent; PSS = palustrine scrub-shrub, PFO = palustrine forested wetland

3.6.3.3.2.6 Construction and Operation of a Natural Gas Pipeline

ETNG conducted field surveys along the ETNG Construction ROW in 2021 and 2022 with qualified wetland scientists using the Routine On-Site Determination Method defined in the USACE Wetland Delineation Manual (USACE 1987) and Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (USACE 2012). As with field surveys for surface waters discussed above, these surveys would allow ETNG to identify the actual presence of wetlands should ETNG's Project be selected to transport natural gas supplies via expansion of ETNG's 3100 pipeline system. Remaining field surveys were completed in 2023 and ETNG anticipates filing applications for authorizations or permits under CWA Section 404, Section 10 of the Rivers and Harbors Act (Section 408) Real Estate Outgrant, and a Joint Application with USACE and TVA for Section 26a of the Tennessee Valley Authority Act in January 2024.

Table 3.6-22 provides a summary of wetlands delineated within the ETNG Construction ROW, including Cowardin et al. (1979) classification, description, total number of wetlands, and acreage of wetlands crossed. Based on ETNG's Resource Report 2 (ETNG 2023c) independently reviewed by TVA, there are approximately 40.0 acres of wetlands within the proposed ETNG Construction ROW (including aboveground facilities), consisting of approximately 34.2 acres of palustrine emergent wetlands (PEM) and 0.3 of PEM for aboveground facilities, 1.8 acres of palustrine scrub-shrub (PSS) wetlands, and 3.7 acres of palustrine forested wetlands (PFO) (ETNG 2023c); however, an AJD has not been received from the USACE for waters verification. Anticipated wetlands crossed by the ETNG Construction ROW are summarized in and shown on figures in Appendix H.

Table 3.6-22. Summary of Wetlands Crossed by the ETNG Construction ROW

Wetlands Crossed by Project and Aboveground Facilities			
Cowardin Classification[1]	**Description**	**Number of Wetlands**	**Acres**
PEM	Emergent wetland with persistent emergent vegetation.	272	34.5
PSS	Palustrine scrub-shrub vegetation	12	1.8
PFO	Forested wetland with broad-leaved deciduous vegetation.	50	3.7
	Total	**334**	**40.0**

[1]PEM: palustrine emergent; PSS: Palustrine scrub-shrub, PFO: palustrine forested wetland

3.6.3.3.3 Alternative B

3.6.3.3.3.1 Eastern Tennessee TVA Power Service Area

Wetlands occur across the TVA region and are most extensive in the south and west where they comprise 5 percent or more of the landscape (USGS 2016). Wetlands in the TVA Power Service Area consist of two main systems: (1) palustrine wetlands, such as marshes, swamps, and bottomland forests dominated by trees, shrubs, and persistent emergent vegetation, and (2) lacustrine wetlands associated with lakes, such as aquatic bed wetlands (Cowardin et al. 1979). Riverine wetlands associated with moving water within a stream channel are also present but uncommon. Almost 200,000 acres of wetlands are associated with the TVA reservoir system, where they are more prevalent on mainstem reservoirs and tailwaters than tributary reservoirs and tailwaters (TVA 2004). Almost half of this 200,000-acre area is forested wetlands; other types include aquatic beds and flats, ponds, scrub-shrub wetlands, and emergent wetlands.

3.6.3.4 Environmental Consequences

3.6.3.4.1 The No Action Alternative

Under the No Action Alternative, TVA would continue current plant operations until the scheduled retirement, and no work would be conducted that would result in a change to existing conditions. Therefore, there would be no direct or indirect effects to wetlands because there would be no physical changes to the current conditions.

3.6.3.4.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

Under the following action alternatives, KIF would be retired and deconstructed. Two wetlands totaling less than 0.01 acre were identified within the D4 boundary area. These wetlands were identified within stormwater/wastewater conveyances and are exempt from CWA permitting. Total impacts to wetlands within the demolition boundary from D4 activities would be minor.

3.6.3.4.2.1 Environmental Justice Considerations

No effects to jurisdictional wetlands are expected to occur as a result of the Kingston coal facility retirement and D4 activities. Therefore, disproportionate and adverse effects are not anticipated to occur to EJ populations with this alternative.

3.6.3.4.3 Alternative A

3.6.3.4.3.1 Construction and Operation of a CC/Aero CT Plant, Switchyard, and Transmission Facilities on the Kingston Reservation

Under Alternative A, the proposed CC/Aero CT Plant would be constructed and KIF would be retired. TVA would implement the planned actions related to the current and future management and storage of CCRs on the Kingston Reservation, which have either been reviewed or would be in subsequent NEPA analyses. Three wetlands would be permanently impacted due to fill within the footprint of the proposed CC/Aero CT Plant, totaling 0.13 acre of forested wetlands and 0.03 of emergent wetlands. Applicable CWA Section 404 and 401 permits would be obtained from USACE and TDEC and erosion and sediment control BMPs would be used to minimize indirect effects to wetlands (TVA 2018a).

3.6.3.4.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

No wetlands are present within the boundary of the 3- to 4-MW solar facility; therefore, no impacts to wetlands from this component of Alternative A would occur.

3.6.3.4.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

No wetlands are present within boundaries of Battery Sites 1, 2, or 3; therefore, no impacts to wetlands from this component of Alternative A would occur.

3.6.3.4.3.4 On-site Transmission Upgrades

No wetlands are present within the boundary of the corridor identified for proposed Battery Transmission Line Connections corridor associated with the proposed 100-MW BESS; therefore, no impacts to wetlands from this component would occur (Figure 3.6-6).

Under Alternative A, TVA would also make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant facilities and switchyard. Four wetlands are present within the existing transmission line area, all of which are emergent wetlands. No impacts to wetland vegetation are expected as these features already undergo regular maintenance activities within the transmission line right-of-way. Erosion and sediment control BMPs would be used to the extent practical to minimize indirect effects to wetlands during upgrade activities. With the use of BMPs and adherence to all permit conditions, effects to wetlands would be minor.

3.6.3.4.3.5 Off-site Transmission Line Upgrades

3.6.3.4.3.5.1 Eastern Transmission Corridor

Approximately 37.99 acres of wetlands were identified during field surveys as being within the Eastern Transmission Corridor ROW. Initial maintenance clearing would likely result in removal of early successional and small sapling forested wetland habitat. Subsequent maintenance (every three years) would result in the clearing scrub-shrub wetland habitat given that it is unlikely that wetland areas would meet the forested qualification in this amount of time. Access across wetlands located in the Eastern Transmission Corridor would be conducted in accordance with wetland BMPs to minimize soil compaction and ensure only temporary effects result (TVA 2022a). This includes use of low ground pressure equipment, wetland mats, and dry season work scheduling. Erosion and sediment control BMPs would be implemented and USACE and TDEC permits would be obtained, and any necessary mitigation credits would be purchased. Therefore, minor impacts due to the clearing of forested wetlands are anticipated for the life of the Eastern Transmission Corridor Discussion of construction activities and avoidance and minimization measures are described in Section 3.6.2.2.3.1.

3.6.3.4.3.5.2 Western Transmission Corridor

Approximately 8.26 acres of wetlands were identified in the field as being within the Western Transmission Corridor. A summary of construction activities and avoidance and minimization measures is described in Section 3.6.2.2.3.1. No permanent impacts are anticipated to wetlands identified within the Western Transmission Corridor. Should wetland crossings within the transmission corridor be required to complete the proposed upgrades, they would be done in accordance with BMPs for minimizing impacts to wetlands, including steps to minimize soil compaction (TVA 2022a). Additional steps may include the use of low ground-pressure equipment, temporary placement of mats, and scheduling work during the dry season. Standard BMPs from TVA's E&SC Plan developed for this Action would be deployed, necessary permits would be obtained from the USACE and TDEC, and any required mitigation credits would be purchased. With the use of BMPs and adherence to all permit conditions, effects to wetlands within the Western Transmission Corridor, if any, would be minor and temporary.

3.6.3.4.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 2 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the wetland-related findings in ETNG's Resource Report 2. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q).

ETNG's Resource Report 2 (ETNG 2023c) provides the following description of wetland impacts in the proposed ETNG Construction ROW:

> The construction of the Project will result in a total of 26.2 acres of temporary wetland impacts, which includes 23 acres of temporary effect on PEM and PSS wetlands and 3.2 acres of impact on PFO wetlands. Temporarily disturbed wetlands within the temporary workspace and ATWS will be restored to pre-construction conditions. Permanent [Ridgeline Expansion] project effects include the conversion of 0.5 acre of PFO wetlands and 0.6 acre of PSS to PEM wetlands as a result of ROW clearing and required long term vegetative maintenance within the permanent ROW. Temporary effects on wetlands may include soil disturbance, temporary alteration of hydrology, and loss of vegetation. The permanent [Ridgeline Expansion] project effects include conversion of PFO and PSS wetlands to PEM wetlands within the permanently maintained ROW.
>
> No permanent filling of wetlands is proposed. Upon completion of construction, topsoil, contour elevations, and hydrologic patterns will be restored, and affected areas will be allowed to revegetate. Temporary workspace and ATWS areas will be restored to preconstruction grades and contours and reseeded. Temporary workspace and ATWS areas will not be maintained during operation of the proposed facilities and will be allowed to revert to their preconstruction land use and vegetation cover type.
>
> Wetlands that are affected by temporary access roads will be covered with construction equipment mats during construction. The equipment mats will be removed, and the wetland will be restored in accordance with the [Ridgeline Expansion] project E&SCP, once construction is complete. Wetlands affected by permanent access roads will be permanently filled with materials suitable to maintain a stable access road once construction is complete. The intent of permanent access roads is to maintain all-season access to the pipeline ROW and associated appurtenances (e.g., mainline valves). Effects on the wetlands will be minimized by limiting clearing and grading to only that needed to construct a stable access road. This will be accomplished by steepening tie-in slopes to the extent practicable adjacent to wetlands while still maintaining a stable slope.

> [ETNG] will protect and minimize potential adverse effects on wetlands by complying with the applicable permit conditions issued by appropriate regulatory agencies with respect to construction and operation of the [Ridgeline Expansion] project facilities within wetlands, and through implementation of the wetland construction procedures described in the [Ridgeline Expansion] project E&SCP.
>
> […]
>
> In wetlands, vegetation maintenance over the full width of the permanent ROW is prohibited pursuant to the FERC Procedures. During operation of the [Ridgeline Expansion] project, to facilitate periodic pipeline corrosion/leak surveys, ten feet of the permanent ROW, centered over the pipeline, will be maintained within wetlands at an early successional stage in accordance with [FERC] requirements. In forested wetlands, [ETNG] will minimize tree clearing to the maximum extent practicable while maintaining safe construction conditions. Tree clearing within wetlands will be limited to selectively clearing trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating. Trees and shrubs that become reestablished beyond 15 feet on either side of the pipeline will not be disturbed.

ETNG anticipates that it would be able to avoid and minimize impacts to wetlands during construction of the project, and most impacts would be temporary in nature. No permanent filling impacts are proposed. ETNG would install the pipeline across wetlands in accordance with FERC's Procedures and the conditions and limitations of the applicable USACE permit. Temporary impacts to wetlands within construction workspaces would include the removal of vegetation and disturbance of soils. Following construction, wetlands within ATWS would be allowed to revegetate to their original condition following restoration, thereby restoring wetland function. The herbaceous vegetation would regenerate quickly (typically within 1 to 2 years), while scrub-shrub and forest vegetation would require a longer period to regenerate. Where PSS and PFO wetlands are within the permanent easement, permanent operational impacts would be limited to areas maintained as herbaceous and scrub-shrub cover to facilitate corrosion and leak inspections.

Measures to minimize impacts to wetlands would include:

- limiting the construction ROW to 75 feet in wetlands, where practicable, except for areas where a deviation from FERC procedure is approved;
- installation and regular maintenance of erosion and sediment controls, to include equipment matting, silt fence, staked BMPs;
- expediting construction in and around wetlands to reduce the amount of time wetland soils are exposed to drier conditions;
- maintaining a 10-foot strip as herbaceous vegetation community, centered over the pipeline in accordance with FERC procedures;
- returning of wetland bottoms and drainage patterns to their original configurations and contours to the extent practicable;
- permanently stabilizing upland areas near wetlands as soon as practicable after trench backfilling to reduce sediment run-off;

- segregating up to the top 12 inches of topsoil in unsaturated wetlands to preserve the native seed source (which would facilitate re-growth of herbaceous vegetation once pipeline installation is complete);
- using seed mixes as recommended by the appropriate agencies unless otherwise requested by the landowner; and
- post-construction wetland monitoring to evaluate the progress of wetland revegetation and minimize the threat of invasive species establishment.

Compaction of wetland soils and rutting within wetlands due to equipment operation can affect wetland hydrology and revegetation. Compaction would be minimized by limiting equipment operation in wetlands and installing temporary equipment mats, as necessary. Soil characteristics can also be changed during construction because of inadvertent mixing of topsoil and subsoil during grubbing and trenching. To prevent such mixing in unsaturated wetlands, topsoil would be removed from the area directly over the trench and stockpiled for restoration as close as feasible to its original horizon. No topsoil segregation would be attempted in saturated wetlands.

Permanent changes in surface and subsurface hydrology through a wetland can have a long-term impact on the habitat type and quality. Trench plugs would be installed at the entrance and exit of the pipeline trench through the wetland to ensure that the wetland is not drained along the pipeline. Any confining layers that are breached during construction would be restored during backfilling. Restoration of each wetland would involve returning contours to pre-construction levels and removing temporary erosion control measures. Permanent erosion control devices may be installed during restoration and can include slope breakers, interceptor diversion devices, and/or vegetation cover in adjacent upland areas to minimize long-term sedimentation into the wetlands. Energy dissipation devices may be installed at the down-slope end of surface water diversion devices to help prevent erosion off the ROW into wetlands.

Wetland crossings completed using the HDD method would avoid and minimize the potential for wetland impacts resulting from erosion, sedimentation, and/or excess turbidity by avoiding surface disturbance in and immediately adjacent to the wetlands. However, as described above, the potential for an inadvertent return of drilling mud exists. Impacts from an inadvertent return would be minimized by implementation of ETNG's HDD Plan, which would include procedures for monitoring, detecting, isolating, stopping, and cleaning up inadvertent returns, as well as making necessary agency notifications.

ETNG's would adhere to ETNG's SPCC Plan including restrictions and mitigation measures to limit potential impacts associated with the release of fuels, lubricants, or other potentially toxic materials used during routine construction. Fuel storage and refueling of equipment would be maintained at an approved distance from wetland boundaries.

During operations, tree-clearing within wetlands would be limited to selectively clearing trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating. Trees and shrubs that become reestablished beyond 15 feet on either side of the pipeline would not be disturbed. No herbicides would be used in wetlands. As stated in ETNG's Resource Report 2 (ETNG 2032c), wetland mitigation efforts would include the following:

> In compliance with federal and state regulatory permitting framework relative to wetland protection, [ETNG] will develop a project-specific wetland mitigation plan that will include the purchase of mitigation credits from established wetland banks prior to construction.

> The mitigation plan will provide measures to avoid, minimize, and compensate for temporary and permanent impacts. [ETNG] will consult with the applicable federal and state regulatory agencies for guidance during development of the proposed mitigation measures and plans. As additional mitigation measures are developed and submitted as part of the federal and state permit applications, supplemental information will be provided to the Commission with the Project Application.

Other specifications for ETNG's regular operation and maintenance expectations are provided in Section 3.6.2.2.3.6.

ETNG attended a meeting with the USACE and TDEC on March 20, 2023, regarding this Project and was informed that TDEC would require 1:1 mitigation for conversion of PFO wetlands to PEM wetlands within the permanent ROW. TDEC stated they may require additional compensatory mitigation for the lag in restoration for temporary PFO wetland impacts within the temporary and additional temporary workspaces. USACE would also require mitigation for conversion of PFO wetlands.

3.6.6.2.3.3 Summary of Alternative A

TVA Proposed Actions

Permanent and temporary effects to wetlands would be anticipated to occur under the actions proposed in Alternative A (Table 3.6-23). Permanent impacts to wetlands would potentially occur as a result of the construction of the proposed CC/Aero CT Plant; however, the impacts would be minor and would potentially be avoided in their entirety during the design phase. Permanent impacts related to the transmission line corridors would result from the conversion of forested wetland habitat to emergent or scrub-shrub habitat. While this would not eliminate wetland habitat, some wetland functions would be altered due to the change in the vegetation community. Where any permanent impacts would be unavoidable, TVA would comply with the mitigation requirements in the applicable CWA 404 and 401 and ARAP permits. Thus, TVA proposed actions would result in minor effects to wetlands.

Additionally, based on the TRAM, all the wetlands within the Alternative A disturbance area (W001 through W009) were determined to have low resource values (Appendix E). Therefore, wetland effects for Alternative A would be minor based on the existing quality of wetlands present and minimization efforts and temporary, as impacted wetlands would likely be given the opportunity to return to their existing habitats.

Wetlands within off-site transmission line corridors would experience little impact due to upgrade activities since these areas are existing rights-of-way which undergo regular maintenance currently. Forested wetlands are likely those in valleys spanned by transmission line towers and would not require forest removal. Minor tree trimming may be needed on the margins of the transmission corridor; however, this is consistent with regular maintenance of the existing right-of-way.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

The permanent effects for the natural gas pipeline would be related to a new permanent easement for the operation of the pipeline. Within the ETNG Construction ROW, these effects include approximately 0.5 acre of forested wetland and 0.6 acre of shrub-scrub that would be converted to emergent wetland habitat. Temporary effects from construction of the natural gas pipeline would also occur due to temporary workspaces and access roads needed for construction and open cut installation of the pipeline through wetlands. With the use of BMPs and adherence to all permit conditions, effects to wetlands would be minor.

Cumulative Effects

Cumulative effects to wetlands may occur with the proximity of CCR management activities as past, present, and RFFAs in the Kingston Reservation. Cumulative effects to wetlands may also occur given proximity of past, present, and RFFAs near the transmission line corridors. Cumulative effects to wetlands would be minimized and mitigated through proper siting of facilities (i.e., avoidance wherever possible), the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

Table 3.6-23. Estimated Wetland[1] Impacts (Acres) for Alternative A

Alternative A Component	**CC/Aero CT Plant**		**3-4-MW Solar Facility**		**100-MW BESS**		**On-Site Transmission Line Upgrades**		**Off-Site Transmission Line Upgrades**		**Natural Gas Pipeline**	
Feature Type[1]	Perm*	Temp*	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp
Emergent (PEM)	0.03	--	--	--	--	--	--	0.40	--	40.39	12.7	21.8
Scrub-Shrub (PSS)	--	--	--	--	--	--	--	--	--	0.81	0.6	1.2
Forested (PFO)	0.13	--	--	--	--	--	--	--	--	--	0.5	3.2
Total[2]	**0.16**	**--**	**--**	**--**	**--**	**--**	**--**	**0.40**	**--**	**41.2**	**13.8**	**26.2**

[1]Designations for each type of wetland follow the classifications developed by the USFWS after Cowardin et al. (1979). PEM = Palustrine Emergent Wetland, PSS= Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested Wetland.
[2]Total varies due to rounding
*Perm: permanent impacts; Temp: temporary impacts

3.6.3.4.3.7 Environmental Justice Considerations

TVA Proposed Actions

Effects to wetlands, as summarized above, that would occur as a result of the proposed CC/Aero CT Plant activities would be minor, temporary or permanent, and minimized, or mitigated through CWA 404, 401, and 402 (NPDES) permitting with some effects (i.e., localized effects) occurring on the Kingston Reservation, where no EJ populations are settled. Minor impacts due to the clearing of forested wetlands would primarily be outside of the Kingston Reservation within transmission ROWs, which TVA would minimize through implementation of standard BMPs. As such, no effects on EJ populations are anticipated. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Effects occurring as a result of ETNG's proposed pipeline activities, while minor, would occur outside of Kingston Reservation. In instances where EJ populations were identified along the ETNG Construction ROW, it is TVA's current assessment that disproportionate and adverse effects may occur given that these populations tend to be more vulnerable or sensitive to the effects from temporary and permanent 404/401 permitting impacts/activities.

3.6.3.4.4 Alternative B

3.6.3.4.4.1 Construction and Operations of Solar and Storage Facilities

Alternative B would result in construction activities that have the potential to impact wetlands temporarily and indirectly during construction activities or permanently from wetland type conversion (i.e., from forested to scrub-shrub) for transmission facilities. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Solar facilities average approximately 0.003 acres of wetland effects per MW, with a range of 0 to 0.1 acres. Solar facilities average approximately 0.01 acres of forested wetland clearing per MW, with a range of 0 to 0.1 acres. Construction of 15 solar facilities totaling 1,500 MW would average 4.5 acres and up to 150 acres of wetland effects, in addition to an average of 15 acres and up to 150 acres of forested wetland clearing. For BESS facilities, wetland area affected averages 5.1 acres (maximum 170 acres) and 17 acres (maximum 170 acres) for forested wetlands. TVA and solar developers would minimize effects to wetlands by siting facilities on land with few wetland resources; configuring the solar arrays, access roads, and other infrastructure to avoid wetlands; and establishing and maintaining buffers around wetlands. Appropriate BMPs would be installed, and all proposed project activities would be conducted in a manner to ensure that waste materials are contained, and the introduction of pollutants to wetlands would be minor.

Cumulative Effects

Cumulative effects to wetlands may occur under Alternative B based on TVA's RFFA's, including the addition of 10,000 MW of solar throughout the TVA PSA (TVA 2019a). Based on the average of 0.003 acres of effect per MW, this would result in 30 acres of additional wetland effects within the TVA PSA. Cumulative effects to wetlands would be minimized and mitigated through proper siting of solar facilities, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.3.4.4.2 Transmission and Other Components

As noted in Table 3.3-1, transmission lines typically result in an average of 0.9 acres of wetland effects per mile of new line. Based on TVA's evaluation, approximately 1.7 miles of new transmission line are needed for each solar facility, which indicates that approximately 1.5 acres of wetlands may be impacted for each facility. For 15 solar facilities, this totals to 23 acres of wetlands affected by news lines, or 26 acres for 17 BESS facilities. TVA would avoid placing structures within wetlands where practicable. The transmission lines may require clearing of forested wetlands, which would result in permanent conversion of forested systems to emergent, maintained wetlands. Access across wetlands located in the ROW would be conducted in accordance with wetland BMPs to minimize soil compaction and ensure only temporary effects result (TVA 2022a). This includes use of low ground pressure equipment, wetland mats, and dry season work scheduling. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained, and necessary mitigation credits purchased. With the use of BMPs and adherence to all permit conditions, effects to wetlands would be minor.

Cumulative Effects

Cumulative effects to wetlands may occur under Alternative B with the addition of 10,000 MW of solar throughout the TVA PSA. Transmission lines associated with this expansion would likely result in wetland crossings and conversion of forested wetlands to maintained wetlands. Cumulative effects to wetlands would be minimized and mitigated through proper siting of transmission lines, the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

3.6.3.4.4.3 Environmental Justice Considerations

Effects to wetlands that would occur because of the proposed solar facilities and transmission line activities would be avoided or minimized to the extent practicable through the implementation of standard BMPs. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.7 Air Quality and Greenhouse Gases

Air pollution is the presence in the outdoor atmosphere of one or more air contaminants in sufficient quantities and of such characteristics and duration as to be injurious to human, plant, or animal life, or to property, or which unreasonably interfere with the enjoyment of life and property [Rules of TDEC, Division of Air Pollution Control, Chapter 1200-03-02-.01(d)]. Air quality, as a resource, incorporates several components that describe the levels of overall air pollution within a region, sources of air emissions, and regulations governing air emissions. The National Ambient Air Quality Standards (NAAQS), state level ambient air quality standards, local ambient air quality, and the air quality requirements for stationary sources in the areas affected by the alternative actions are discussed further below.

The global climate system changes in time under the influence of its own internal dynamics and because of external forcings, such as volcanic eruptions, solar variations, orbital forcing, and human-generated (*i.e.*, anthropogenic) forcings, including the changing composition of the atmosphere and land-use change. Greenhouse gases (GHG) in the atmosphere[27], primarily CO_2, N_2O, methane (CH_4), and other fluorine-containing compounds, absorb heat that is radiated from the Earth's surface. Anthropogenic increases in atmospheric concentrations of GHGs are considered the main driver for warming of the Earth's atmosphere since the beginning of the industrial era by trapping more heat, resulting in what is referred to as global warming, which is one aspect of climate change. The majority of anthropogenic GHG emissions, primarily in the form of CO_2, result from the combustion of fossil fuels in both stationary sources (e.g., power plants, industrial facilities, boilers) and mobile sources (e.g., on-road and off-road

[27] *See* 42 U.S.C. §7545(o)(1)(G) (defining GHG to include carbon dioxide, hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, sulfur hexafluoride).

motor vehicles and construction equipment, rail, and marine transportation). Additional anthropogenic sources of GHG emissions that contribute to climate change include methane and nitrous oxide from agricultural sources, hydrofluorocarbons used in refrigerant equipment, and sulfur hexafluoride used as a gaseous dielectric medium for high-voltage circuit breakers, switchgears, and other electrical equipment. There is the potential for minor leaks of hydrofluorocarbons and sulfur hexafluoride from equipment seal leaks, particularly from older equipment, as well as during manufacturing, installation, servicing, and disposal.

General TVA-wide information regarding GHG emissions and climate conditions in TVA's region are described in Section 3.7.2.5. Alternative specific GHG emissions are described in Section 3.7.2.3 and 3.7.2.4.

Updated manufacturer's data became available regarding the Alternative A CC/CT emissions performance in September 2023, and therefore was not incorporated into the DEIS that was issued on May 12, 2023. The new data supported a revision to the conservative emission calculation for the CC duct burners provided in the DEIS. As such, the DEIS was issued with a preparer's note indicating that the new manufacturer's data would be incorporated into the FEIS, as the incorporation of the new data could result in lower criteria pollutant emissions so that all criteria pollutants would not be subject to Prevention of Significant Deterioration (PSD) permitting for Alternative A.

As such, the new information was incorporated into the FEIS in the following subsections of Chapter 3.7.

3.7.1 Affected Environment

3.7.1.1 Air Quality and Associated Laws/Regulations

The CAA of 1970, as amended in 1977 and 1990, is the comprehensive law that regulates emissions of air pollutants from stationary sources (e.g., power plants and industrial plants) and mobile sources (e.g., motor vehicles, locomotives, and marine vessels). It requires USEPA to establish and update NAAQS for ubiquitous air pollutants and directs states to develop State Implementation Plans to achieve these standards. This is accomplished through air quality construction and operating permit programs that establish emissions limits, installation of emissions control technologies, and work practice requirements applicable to various sources. The CAA also requires USEPA to set standards for emissions of specific hazardous air pollutants (HAPs).

The impact of criteria pollutant emissions typically occurs in the near-field for non-reactive pollutants such as primary particulate matter and over a regional area[28] for secondary pollutants formed in the atmosphere such as fine particulate matter ($PM_{2.5}$) and ozone. Emissions of criteria pollutants from a coal-fired plant generally affect a larger area than emissions from natural gas combustion plants because coal combustion generates larger quantities of criteria pollutant emissions. The potential impact area of GHG emissions is effectively the global atmosphere.

Under the mandates of the CAA, USEPA programs to reduce large-scale effects have included nationwide programs, including major source permitting requirements, New Source Performance Standards (NSPS), Acid Rain rules, Interstate Air Pollution Transport rules, and

[28] Regarding air quality, "region" or "regional area" is meant to include multiple counties within and adjacent to a proposed action and potentially counties in adjacent states where they are close enough to be impacted by secondary pollutants.

several programs to reduce fleetwide emissions of on-road and nonroad engines. Thus, for the Proposed Action and Alternatives, the criteria pollutant air quality study areas, including for cumulative impacts, are set at a 10-mile footprint radius around the proposed action and alternatives. This is based on a typical distance, as seen from air dispersion modeling, beyond which criteria air pollutant dispersion is large enough to not have an appreciable impact.

The potential impact area for GHG emissions is effectively the global atmosphere. This EIS focuses its GHG emissions study area on the direct impacts from the locations where construction/demolition will occur under each alternative and the indirect impacts that include the entire TVA power generation system.

3.7.1.1.1 Ambient Air Quality Standards

Air quality is measured primarily by the concentrations of six criteria pollutants within a region. Those six criteria air pollutants are subject to NAAQS that were developed by the USEPA Office of Air Quality Planning and Standards and were chosen because they are the predominant air pollutants of concern for the environment and public health. The criteria pollutants are ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), lead (Pb), sulfur dioxide (SO_2), and PM, which includes two subcategories: particles less than 10 microns in diameter (PM_{10}) and particles less than 2.5 microns in diameter ($PM_{2.5}$)[29]. The NAAQS are summarized in Table 3.7-1. States and U.S. territories with delegated authority for regulating air quality have the option to impose stricter ambient air quality standards than the NAAQS. The TN Ambient Air Quality Standards (AAQS) are included in Table 3.7-1 where they differ from the NAAQS.

USEPA designates compliance status for the NAAQS through a formal rulemaking process involving publication of proposed and final rules in the *Federal Register*. For each pollutant for which there is a NAAQS, USEPA designates an area as attainment, nonattainment, or maintenance. An attainment area meets the NAAQS. A nonattainment area does not meet the NAAQS but has a State Implementation Plan that establishes requirements to restrict emissions to achieve attainment status. A maintenance area (or maintenance/attainment area) is one that was designated as nonattainment within the prior 20 years and has come into attainment with the NAAQS. Part of the redesignation process requires that the state or local agency responsible for managing air quality in the area must submit for USEPA approval, a plan to maintain compliance with the NAAQS for which the area was in nonattainment status. After the 20-year maintenance period ends and compliance is still maintained, this area defaults to "normal" attainment area status. Strategies necessary to maintain compliance remain in place even after the 20-year period unless the delegated regulatory agency demonstrates to the USEPA that such measures are no longer needed.

Table 3.7-1. USEPA and Tennessee Ambient Air Quality Standards

Pollutant	Averaging Times	Primary NAAQS and TN AAQS	Secondary NAAQS and TN AAQS
CO	8-hour [(a)]	9 ppm (10 mg/m^3)	None; TN – Same as Primary
	1-hour [(a)]	35 ppm (40 mg/m^3)[h]	None; TN – Same as Primary

[29] Ozone is not directly emitted from the emissions sources in this Proposed Action, but it is formed in the lower atmosphere through photochemical reactions between direct emissions of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) and sunlight.

Pollutant	Averaging Times	Primary NAAQS and TN AAQS	Secondary NAAQS and TN AAQS
Pb	Rolling 3-Month Average	0.15 µg/ m^3; TN - None	Same as Primary; TN - None
	Quarterly Average	1.5 µg/ m^3	Same as Primary
NO_2	Annual (Arithmetic Mean)	0.053 ppm (100 µg/m^3)	Same as Primary
	1-hour [(f)]	0.100 ppm (188 ug/m^3); TN - None	None
PM_{10}	24-hour [(b)]	150 µg/m^3	Same as Primary
	Annual (Arithmetic Mean)	None; TN – 50 µg/m^3	None; TN – Same as Primary
$PM_{2.5}$	Annual [(c)] (Arithmetic Mean)	12.0 µg/m^3; TN - None	15.0 µg/m^3; TN - None
	24-hour [(d)]	35 µg/m^3; TN - None	Same as Primary; TN - None
O_3	8-hour [(e)]	0.075 ppm (2008 std.)	Same as Primary
	8-hour [(e)]	0.070 ppm (2015 std.)	Same as Primary
	1-hour	None; TN – 0.12 ppm	None; TN – 0.12 ppm
SO_2	3-hour [(a)]	None	0.5 ppm (1300 µg/m^3)
	1-hour [(g)]	0.075 ppm (196 ug/m^3)	Same as Primary

Sources: 40 CFR part 50, USEPA 2021a; Chapter 1200-3-3-.03, https://publications.tnsosfiles.com/rules/1200/1200-03/1200-03.htm (TDEC 2021c).
[a]Not to be exceeded more than once per year.
[b]Not to be exceeded more than once per year on average over 3 years.
[c]To attain these standards, the 3-year average at any monitor must not exceed 12.0 micrograms per cubic meter (µg/m^3) for the primary standard and 15.0 µg/m^3 for the secondary standard.
[d]To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3.
[e]To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed the standard. While both the 2008 and 2015 standards are still in place, the 2015 standard is the controlling one, given its greater stringency.
[f]Standard is attained when the 3-year average of the annual eighth-highest daily maximum 1-hour average NO2 concentration does not exceed 0.100 parts per million (ppm) or 100 parts per billion.
[g]Standard is attained when the 3-year average of the fourth-highest daily maximum 1-hour average SO2 concentration does not exceed 0.075 ppm (196 parts per billion).
[h]mg/m^3: milligrams per cubic meter

3.7.1.1.2 Hazardous Air Pollutants

Other air pollutants that have caused concern due to their harmful health and/or environmental effects and known or suspected potential for causing cancer include HAPs. The CAA identifies 187 pollutants as HAPs, some of which are emitted from power plants. The most notable HAPs regarding coal plants include heavy metals such as mercury, cadmium, lead, and arsenic, and hydrogen chloride, hydrogen fluoride, and various hydrocarbons. The emissions of most HAPs from coal-fired power plants are much greater than from natural gas-fired power plants, on a pound (lb) per million British Thermal Unit (lb/MMBtu) of fuel basis, due to higher concentrations of pollutant-forming compounds in coal.

The USEPA has singled-out mercury as a special pollutant of concern regarding oil and coal-fired power plants. In 2011, the USEPA promulgated the Mercury and Air Toxics Standards (MATS) [Title 40, CFR, Part 63, Subpart UUUUU] to reduce mercury and other toxic air pollutants from such plants. TVA mercury emissions have decreased 96 percent between 2000 and 2017 due to retirement of coal-fired units and replacement with natural-gas fired units and installation of emissions controls on most remaining coal units (e.g., flue gas desulfurization, selective catalytic reduction, and activated carbon injection systems).

The USEPA has also promulgated National Emissions Standard for Hazardous Air Pollutants (NESHAP) for Stationary Combustion Turbines under 40 CFR 63, Subpart YYYY, that are major sources of HAPs, defined as sources having the potential to emit 10 tons/year of any individual HAP or 25 tons/year or more of any combination of HAPs. These requirements include emissions limitations for formaldehyde and operational limitations including operating parameter limits; performance testing; operations and maintenance requirements; and recordkeeping and reporting requirements. Based on emissions estimates generated from turbine manufacturer data and USEPA AP-42 emissions factors, HAP potential emissions for the proposed gas units under Alternative A have been estimated to be below the HAP major source thresholds above. Therefore, this rule is not anticipated to be applicable.

Another NESHAP that applies to existing reciprocating internal combustion engines (RICE) at KIF and any proposed RICE under Alternative A is 40 CFR 63, Subpart ZZZZ. In general, this rule has operational requirements for maintaining RICE and tracking their operating run time. For new emergency RICE at a major HAP source or new emergency/non-emergency RICE at a non-major HAP source, additional requirements might include complying with the applicable RICE New Source Performance Standard described in the following section. For new non-emergency RICE at a major HAP source, additional requirements might include emissions controls to reduce formaldehyde or carbon monoxide emissions.

TDEC has promulgated rules for hazardous air pollutant controls under rules of TDEC Chapter 1200-03-31. These rules, which generally mirror the federal rules for HAPs, require major sources of hazardous air pollutants to implement Maximum Achievable Control Technology and some sources may need to implement Generally Available Control Technology; each is implemented on a case-by-case determination that may include control equipment, work practice standards, emission standards, process modification, or raw materials substitution or reformulation, or both.

3.7.1.1.3 New Source Performance Standards

The USEPA has promulgated standards of performance for various emissions source categories with more significant emissions potential. These standards require new units to meet more stringent emissions limits and/or operational requirements than their older counterparts. The proposed CC/Aero CT Plant will be subject to 40 CFR 60, Subpart KKKK. This New Source Performance Standard (NSPS) applies to stationary combustion turbines, both the combustion turbine engine and any associated heat recovery steam generator and duct burners, for units that commenced construction after February 18, 2005. The key pollutants USEPA regulates from these sources include NO_x and SO_2. The effects of this rule are discussed further in Section 3.7.2. An NSPS for fossil fuel-fired electric utility steam generating units is outlined in 40 CFR Part 60, Subpart Da. Subpart Da covers fossil fuel-fired electric utility steam generating units that commenced construction after September 18, 1978, and are boilers capable of combusting over 250 MMBtu/hr of fossil fuel. These include units that were also constructed for the purpose of supplying more than one-third of their potential electric output capacity and more than 25 MW electrical output to any utility power distribution system for sale. The key pollutants

USEPA regulates from these sources include PM, NO_x, and SO_2. This rule does not apply to the proposed Aeroderivative CT units at KIF as they are not steam generating units. Subpart Da would not apply to the proposed CC units at KIF because Subpart Da states that an affected facility (unit) meeting the applicability criteria of 40 CFR 60, Subpart KKKK, must meet the emission standards under that rule instead. In addition, Subpart KKKK states that a heat recovery steam generator or duct burner subject to Subpart KKKK is exempt from Subpart Da.

While under the current federal Subpart Da, the CC units and any duct burners would be exempt, TDEC has a rule comparable to the old NSPS Subpart Da under TDEC Chapter 1200-03-16-.03 with emissions limits for these same three pollutants that would apply to the proposed CC plant. However, the newer federal NSPS Subpart KKKK, or applicable Best Available Control Technology (BACT), will be as stringent or more stringent than the state limits under the older Subpart Da.

Another NSPS that would apply to the proposed CC/Aero CT Plant is 40 CFR 60, Subpart TTTT. This 2015 final rule sets standards for GHG emissions from new (after January 8, 2014), modified, and reconstructed (after June 1, 2014) fossil fuel-fired power plants. For natural gas-fired CC plants (e.g., base load or intermediate load units), the rule has a CO_2 emissions limit of 1,000 lbs/MWh. For natural gas-fired peaking units such as aeroderivative CTs, CO_2 emissions are limited to 120 lbs./MMBtu. To maintain compliance with the “lbs/MMBtu” limit, an Aeroderivative CT unit must adopt an annual generation restriction, which is based upon the unit’s thermal to electrical energy conversion efficiency. The effects of this rule are discussed further in Sections 3.7.2.3.1 and 3.7.2.4.1.

There are additional NSPS that apply to ancillary, less significant emission sources found at natural gas-fired CC and dual-fueled Aeroderivative CT power plants, such as those proposed at KIF under Alternative A. Ancillary sources may include auxiliary boilers and RICE (both the compression ignition type and spark ignition type). Auxiliary boilers with heat input ratings between 10-100 MMBtu/hr would be subject to the NSPS under 40 CFR 60, Subpart Dc. However, for units that are fired with only pipeline quality natural gas, no emissions standards would apply under Subpart Dc. Instead, such units would be subject to reporting and recordkeeping requirements.

The RICE at CC and Aeroderivative CT plants include emergency generators, black start generators, and emergency fire pump engines. The compression ignition type engines are typically diesel fuel-fired and the spark ignition type engines are natural gas or gasoline-fired-. The NSPS requirements that apply are dependent on various design characteristics of the engines, when construction of the engines commenced, and whether they are for emergency or non-emergency purposes. In general, these NSPS requirements require either purchasing a USEPA-certified engine that meets specific emissions standards or installing, configuring, operating, and maintaining the engine per the manufacturer’s instructions. The second option may require emissions performance testing.

On May 23, 2023, the USEPA proposed a NSPS rule that would apply to new fossil fuel-fired stationary combustion turbines and other fossil-fueled electricity generation facilities (88 FR 33240). This proposed rule is intended to limit GHG emissions through implementation of the best system of emission reductions (BSER). The USEPA proposed two options for potential BSER for base load natural gas combustion turbine facilities as follows:

- Co-firing with 30 percent by volume low-GHG hydrogen by 2032 and 96 percent hydrogen by volume by 2038.
- 90 percent capture of CO_2 using carbon capture and storage by 2035.

Similar guidelines have also been proposed by EPA that would apply to emissions of GHG gases from existing coal-fired power plants based on the projected date for retirement of those plants, and for emissions of GHG from existing stationary turbines. EPA received a vast multitude of comments on these proposed GHG rules and expects to finalize the rules in 2024.

3.7.1.1.4 Visibility Impairment and Regional Haze

Air pollution affects visibility, which is of particular importance within national parks and wilderness areas when pollutants are converted into particulate matter or visible gases such as NO_2. The CAA designated national parks greater than 6,000 acres and wilderness areas greater than 5,000 acres as Class I protected areas to maintain their air quality. There are eight Class I areas in the counties that make-up TVA's PSA: Great Smoky Mountains National Park, Mammoth Cave National Park and the Joyce Kilmer, Shining Rock, Linville Gorge, Cohutta, Sipsey, and Upper Buffalo Wilderness Areas. The Great Smoky Mountains National Park is the largest Class I area in TVA's PSA (TVA 2019a).

Visibility is affected by the ability of particles and gases to scatter and absorb light and is expressed in units of inverse mega-meters or deciviews. Visibility thresholds have been established under 40 CFR 51, Appendix Y, which help determine whether modeled visibility effects from a source are large enough to require installation of BACT. These requirements, in addition to other regulatory programs, have resulted in significant progress towards attaining natural visibility conditions in TVA's PSA and nationwide.

The USEPA promulgated the Regional Haze Rule in 1999 to improve visibility in Class I protected areas with the goal to achieve natural background visibility by 2064. Significant visibility improvements have occurred from 1990 through 2016 within the Great Smoky Mountains, with between 44 and 47 percent improvement for best days and worst days, respectively (TVA 2019a).

Emissions of visibility impairing pollutants (e.g., ammonium sulfate from SO_2 emissions, ammonium nitrate from NOx emissions, and particulate emissions) are significantly greater from coal-fired power plants compared to natural gas-fired power plants. TVA's actions in retiring coal-fired power plants and replacing them with options generating much lower emitting amounts of visibility impairing pollutants is contributing to visibility improvements in TVA's service territory.

3.7.1.1.5 Acid Deposition

Acid deposition is primarily caused by SO_2 and NO_x emissions, which are transformed into sulfate (SO_4) and nitrate (NO_3) aerosols, then deposited onto surface waters through precipitation (rain, snow, or fog). This precipitation can cause acidification of these surface waters, which can adversely affect aquatic life, especially within sensitive ecosystems.

In 1990, CAA Amendments established the Acid Rain Program with the goal to reduce SO_2 and NO_x emissions from the power sector and the resulting acid deposition. Since regulations were implemented in 1995, significant reductions in these and other air pollutants have occurred along with significant reductions in sulfate and nitrate deposition in surface waters. TVA's SO_2 emissions in TN have decreased by 97 percent since 1990 and its NO_x emissions in TN have decreased by 95 percent from a peak in 1997 (TVA 2019a). The retirement of TVA coal-fired power plants has contributed to reductions in acid deposition and is expected to continue to further reduce acid deposition in TVA's service territory. Emissions of SO_2 from natural gas-fired power plants are significantly less than those from coal-fired power plants because natural gas has a lower sulfur content. NO_x emissions from modern natural gas-fired combustion turbines can be controlled to lower levels than NO_x emissions from coal combustion. Meeting the NSPS limitations and BACT, if applicable, for natural gas-fired combustion turbines and ancillary natural gas-fired emission units, will generally result in substantially lower plantwide NO_x emissions compared to a coal-fired facility of similar electric generating capacity.

3.7.1.1.6 General Conformity

The USEPA requires federal non-transportation projects to undergo an air quality conformity analysis to ensure federal actions conform to the state or federal Implementation Plans. These requirements were promulgated on November 30, 1993, under 40 CFR 51 and 93 and were updated effective March 24, 2010. These General Conformity requirements only apply to federal actions within nonattainment and maintenance areas.

Under Alternative A, actions at the Kingston Reservation are subject to General Conformity evaluation because the Kingston Reservation is in an area designated in 2017 as a $PM_{2.5}$ maintenance area. The pollutant emissions subject to a General Conformity determination for the Kingston Reservation include not only directly emitted $PM_{2.5}$, but also the $PM_{2.5}$ precursor pollutants of SO_2, NO_x, VOC, and ammonia (NH_3). The applicable *de minimis* emissions threshold for direct $PM_{2.5}$ and precursor pollutants is 100 tons/year for each pollutant under 40 CFR 93, Subpart B. Any emissions increase over this threshold would require a General Conformity determination in consultation with state and federal air quality regulatory agencies.

3.7.1.1.7 Air Quality Permitting for Construction and Operation

TDEC implements programs for permitting the construction and operation of new or modified stationary sources of air emissions in TN that emit regulated pollutants. The TDEC rules for construction and operating permits are contained within the TDEC Division of Air Pollution Control Rules, Chapter 1200-03-09. Depending on the type and size of the emissions units and levels of regulated pollutants emitted, TDEC determines the applicable emission standards and associated requirements for inclusion in the issued construction permit.

The air quality permitting process begins with the application for a construction permit. TDEC can issue four types of air quality construction permits for the construction and temporary operation of new or modified emissions sources that are potentially applicable to each proposed alternative (listed in order of highest complexity, stringency, and typical time to process):

- Prevention of Significant Deterioration (PSD) Permit (or PSD Permit Major Modification) in Attainment Area, Major Source permit.
- Owner Requested Limit (ORL) Permit (synthetic minor permit to voluntarily limit emissions below PSD permit triggers or operating permit triggers).
- Minor Source permit.
- Permit by Rule (applicability dependent on source type, size, and/or emissions from the source).

Issuance of the above construction permits by TDEC would establish federal and state air quality requirements applicable to each alternative. Meeting the construction permit requirements would ensure compliance with the State Implementation Plan and ambient air quality standards. It is likely that only Alternative A would require an air permit for construction of the source.

Title V of the CAA requires states to establish an air operating permit program for stationary sources that exceed major source thresholds, which are dependent on the attainment status of the area (e.g., 100 tons/year of any criteria pollutant in an attainment area). A Title V operating permit is also required for sources with potential to emit 10 tons/year of any individual HAP, or 25 tons/year of all HAPs combined. The requirements of Title V are outlined in the federal regulations at 40 CFR Part 70 and in the TDEC, Division of Air Pollution Control regulations within Section 1200-03-09-02. The permits required by these regulations are often referred to as Title V or Part 70 permits. The No Action Alternative already has a Title V operating permit, and it is likely that only Alternative A would continue to require a Title V permit. Alternative B would likely not require a Title V permit.

3.7.1.1.8 Greenhouse Gases and Climate

3.7.1.1.8.1 Greenhouse Gas Emissions

The Earth's temperature is dependent on the balance between the amount of energy incoming from the sun and the amount reflected and radiated into space by the Earth's surface, clouds, gases, and small particles in the atmosphere. The primary GHG of concern (i.e., CO_2) is naturally exchanged between the atmosphere, plants, and animals through photosynthesis, respiration, and decomposition, and between the atmosphere and oceans through gas exchange. Each year, billions of tons of CO_2 are absorbed by oceans and living biomass and emitted to the atmosphere through natural and human processes. GHGs in the atmosphere absorb heat that is radiated from the Earth's surface. An increase in the atmospheric concentration of GHGs results in the trapping of additional heat, causing the Earth to warm (TVA 2019a). Atmospheric levels of CO_2 have increased from below 300 ppm in 1900 to a global average of 412.5 ppm in 2020 (NOAA 2021), which is higher than scientists believe the Earth has experienced in over a million years. GHGs can remain in the atmosphere for differing periods of time, ranging from several years to thousands of years. Each GHG is assigned a global warming potential (GWP), which is an estimate of the relative amount of infrared radiation it absorbs in comparison to CO_2 on a pound-for-pound basis, projected over a 100-year-period. The main GHG pollutants that apply to TVA operations and their GWPs are CO_2 GWP = 1; CH_4 (methane) GWP = 25; N_2O (nitrous oxide) GWP = 298; and SF6 (sulfur hexafluoride) GWP = 22,800 (40 CFR 98, Table A-1). For example, 1 pound of methane emissions is considered equivalent to 25 pounds of CO_2 emissions or CO_2-e.

Emissions of anthropogenic GHGs are estimated annually by the USEPA for the U.S. and each state for several sectors of the economy. In 2019, total CO_2 net emissions for the entire U.S. were approximately 5,769 million metric tons (MMT), with electricity production accounting for approximately 25 percent of this total (29 percent transportation, 23 percent industrial, and 23 percent commercial, residential, and agriculture) or approximately 1,442 MMT. In that same year, U.S. net emissions decreased 1.7 percent compared to 2018 (5,870 MMT in 2018) and decreased 13 percent from 2005 (6,635 MMT in 2005) (USEPA 2021b). Emissions of CO_2 from TVA power plants decreased by approximately 64 percent between 2005 and 2020, from 95.8 MMT to 37.7 MMT, respectively. This trend is mainly due to retirement of coal-fired plants and replacement with natural gas-fired plants, which have lower CO_2 emissions, and also due to TVA's nuclear power generation fleet, which has no CO_2 emissions (TVA 2022f).

3.7.1.1.8.2 Climate Status and Projections

The climate in the multi-state TVA PSA region is a transition area between a humid continental climate to the north and a humid subtropical climate to the south. This results in temperatures that are generally mild with plenty of rainfall for agricultural and water uses. There is some vegetation-killing freezing from mid-autumn through early spring, occasional severe thunderstorms, infrequent snow, and infrequent effects from tropical storms. The seasonal climate changes cause a peak power demand in both the summer for cooling and winter for heating. Rainfall varies throughout the year but peaks in late winter/early spring and again in summer. Winds are strongest during winter and early spring and lightest between late summer and early autumn (TVA 2019a).

TVA's PSA region average monthly temperature trends from 1981 to 2010 show an overall warming trend of 0.4 to 0.5 degrees Fahrenheit per decade. The annual average trend for a 100(+)-year period from 1895 to 2017, based on least squares regression analysis, indicates an increase of 0.24 degrees Fahrenheit, an average annual increase of winter temperature of 0.67 degrees Fahrenheit, and an average annual decrease in summer temperature of 0.09 degrees Fahrenheit (TVA 2019a).

TVA's PSA region precipitation trend from 1981 to 2010 is not discernable as there is significant year-to-year variability. Annual average precipitation in the region was 49.92 inches, with monthly averages ranging between 2.6 inches in October to 4.73 inches in December, for this period. The annual average snowfall in most of the region is between 5 and 25 inches, with up to 100 inches in the higher elevations of the southern Appalachians in North Carolina and TN. The average annual precipitation trend for the period between 1895 and 2017 was an increase of 8 percent per 100 years, based on a linear regression analysis. Most of this increase occurred prior to 1970 with no significant trend since that time (TVA 2019a).

Under a low GHG emissions increase scenario (i.e., large reductions in fossil fuel use and increases in renewable energy use), forecasted climate trends from the National Oceanic and Atmospheric Administration (NOAA) State Climate Summaries predict higher average annual temperatures in TN by approximately 4.4 degrees Fahrenheit in 2050 and 5.8 degrees Fahrenheit higher by 2100. However, the report notes that the temperatures in TN over the last century have not increased as much as the climate model projections anticipated from increases in atmospheric GHG concentrations that have already occurred. Projections for changes in seasonal precipitation in the southeastern U.S. are generally within the range of natural variability, except for slightly greater winter precipitation predicted for much of TVA's PSA (TVA 2019a, NOAA 2022).

Potential climate change effects in TVA's PSA include more frequent and intense heat waves; increased damages from floods and major storm events; changes in precipitation patterns with increased drought persistence and strength; reduced availability of freshwater during dry seasons; and harm to water resources, agriculture, wildlife, and ecosystems (USGCRP 2023). TVA conducts routine probabilistic analyses to ensure resource adequacy for serving electricity demand in TVA's PSA. It considers the uncertainty of unit availability, transmission capability, weather-dependent unit capabilities (e.g., hydropower, wind and solar), economic growth, and weather variations to compute expected reliability impacts and costs. This informs reserve margin targets for summer and winter using an industry best practice standard of one loss of load event (LOLE) in 10 years. These targets are used in planning and operation decisions. Climate shifts could influence operational decisions to generate more or less power in the cold and warm seasons, but such changes would not significantly affect how efficiently TVA's power system operates or result in system failures, over all alternatives (TVA 2019a).

3.7.1.1.8.3 GHG and Climate Assessment Methodology

For GHG emissions, the study area is effectively the global atmosphere. This EIS focuses its GHG emissions study area on the direct impacts from the locations where construction/demolition will occur under each alternative and the indirect impacts that include the entire TVA power generation system. TVA's GHG and Climate Assessment study area for this EIS covers the counties where the proposed alternatives are located with respect to local climate conditions.

For purposes of a general correlating measure of GHG effects, GHG emissions were analyzed using an operational GHG emissions geographic comparison analysis. Additionally, two separate types of GHG Life Cycle Analysis (LCA), one performed on an individual replacement resource by alternative (henceforth "individual") basis, and one completed on a TVA system-wide portfolio basis with simulated generation dispatch (henceforth "system-wide"). TVA used the operational GHG emissions geographic comparison analysis to assess the net change in predicted estimates of GHG emissions for each alternative as a percent of TN, U.S., and global GHG emissions. These emission estimates are then contextualized by explaining how each of the alternatives would contribute to future emissions and the emission reduction thresholds identified in TVA's Strategic Intent and Guiding Principles document. The two LCAs were performed for facilities that are part of each alternative, including their potential upstream and downstream GHG sources[30].

The system-wide LCA was conducted to assess the implementation of each alternative's impacts on the power generation mix throughout TVA's system. For example, Alternative A is estimated to indirectly reduce GHG emissions from other TVA coal plants as their load factors will likely decrease due to increased efficiency of the new CC/Aero CT Plant compared to the existing KIF coal plant. Therefore, the system-wide LCA estimates the cumulative effects of TVA's forecasted GHG emissions across all of TVA's operations.

The two LCAs also include the future estimated social costs of GHGs (SC-GHG). TVA's system-wide LCA is focused on the estimated future total GHG emissions and social costs for each alternative in comparison to the No Action Alternative. The individual LCA provides the same comparison but focuses on estimated future total GHG emissions and social costs for the life cycle of each alternative without consideration of their effects on operation and dispatch of other TVA fleet facilities or resources. Lastly, future direct GHG operational emissions are estimated and compared to existing GHG operational emissions at the specific sites under each alternative. The relative difference between estimated future direct GHG operational emissions for each alternative is also compared to the No Action Alternative[31].

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[30] Upstream GHG sources include resource extraction/production, processing/conversion, material manufacturing, component manufacturing, delivery to site, construction for plant components, and the fuel cycle including fuel extraction/processing/distribution/transport and coal bed methane. Downstream GHG sources include dismantling, decommissioning, disposal, and recycling of the power generation facility. GHG emissions for the Alternative A pipeline construction and pipeline operational methane leak emissions are not separately presented but they are accounted for in the emissions calculations for the upstream and ongoing non-combustion life cycle segments; refer to Appendix J for details on this LCA. Emissions associated with the proposed natural gas pipeline are discussed qualitatively in detail in Section 3.7.2.3.6 below.

[31] GHG and other pollutant emissions from construction activities would be temporary. Since the types, quantities, and activity levels of construction equipment are not known at this early stage, construction emissions are discussed in a qualitative manner. However, using general emission factors, they are quantitatively included in the LCA for each alternative.

The operational GHG emissions geographic comparison analysis is provided in Section 3.7.2 and TVA's system-wide LCA and the individual LCA for each alternative are summarized in Section 3.7.2 with more details provided in Appendix I and Appendix J of this EIS. A description of the estimated future SC-GHG, uncertainty regarding their values and the range of values presented in this EIS, as well as a discussion of potential methane leak emissions, is provided below.

The SC-GHG in this EIS collectively refers to the estimated future social cost of three main greenhouse gases: CO_2, CH_4, and N_2O. Each of these GHGs has a unique social cost rate in units of dollars per metric ton of emissions. The SC-GHG attempts to monetize the net cost to society associated with adding an estimated amount of these three GHGs to the atmosphere each year. In principle, it includes the value of all climate change impacts (both negative and positive), including (but not limited to) changes in net agricultural productivity; human health effects; property damage from increased flood risk and natural disasters; disruption of energy systems; risk of conflict; environmental migration; and the value of ecosystem services. In practice, estimates of the SC-GHG are unable to include all the important physical, ecological, and economic impacts of climate change due to data and climate modeling limitations, and at best provide a range of values based on educated assumptions and predictions.

While governmental and non-governmental stakeholders have an interest in the future costs and effects of carbon emissions resulting from decisions, there is disagreement surrounding the use of specific SC-GHG prices and associated escalation. Among the points of disagreement are the selected economic discount rate and whether it is based on domestic effects or, more broadly, global effects given that the effects of GHG emissions are not restricted to the area of their origin. Notwithstanding these uncertainties and giving those uncertainties due considerations, the SC-GHG analysis has been included to inform TVA's analysis since the SC-GHG analysis provides a means of comparing alternative actions by monetizing the potential environmental impacts of their estimated future GHG emissions.

Due to disparate scientific, economic and legal positions on the propriety of SC-GHG rates and their application in determining the SC-GHG, the analysis presented in this EIS provides a SC-GHG range based on federal government published SC-GHG documents (e.g., Interagency Working Group [IWG] figures or other federal government agency policy or Executive Orders). For example, there is a prior Administration 2020 social cost of CO_2 (SCC) rate of $7 per metric ton at a 3 percent discount rate that only addresses domestic effects, and a 2020 SCC rate of $51 per metric ton (under current administration values) at a 3 percent discount rate that addresses domestic and global effects[32]. Presenting estimated future social costs as a range of values provides decision-makers and the public with better information in an area with uncertainty as evidenced by the shift in values between two successive Administrations. The social costs of methane (SCM) and nitrous oxide (SCN) are also provided in the LCAs based on their cost rates within the Biden Administration's Interagency Working Group interim guidance issued in February 2021 (IWG 2021). Under the prior Administration, social cost rates were presented for SCM and SCN based on a 2020 U.S. Government Accountability Office report: Social Cost of Carbon: Identifying a Federal Entity to Address the National Academies'

[32] The Biden Interagency Working Group (IWG) has not issued final SC-GHG rates since publishing the interim rates in 2021. In December 2023, the USEPA used new SC-GHG rates in a regulatory impact analysis for a final rule. However, TVA's analysis does not apply the rates proposed by EPA because, among other things, they have not been formally adopted by the IWG. On December 22, 2023, the IWG published a memo stating that agencies should use their professional judgment to determine the appropriate estimates of SC-GHG to apply.

Recommendations Could Strengthen Regulatory Analysis (U.S. Government Accountability Office [GAO] 2020).

The SC-GHG results for TVA system-wide effects show that the overall potential for GHG monetized effects under both action alternatives, as compared to the No Action Alternative, are within the same order of magnitude, $1.85 billion Net Present Value (2023) savings for Alternative A and $2.26 billion Net Present Value (2023) savings for Alternative B using the current Administration SC-GHG rates. Therefore, as discussed in more detail in Section 2.4, the SC-GHG outcome was considered but was not the primary criterion for comparing alternatives.

Methane has received more government and public attention due to the recent increase in the production and consumption of natural gas, the primary source of methane, and its high global warming potential. Methane emissions from leaks in the natural gas production and transport sectors are being addressed in the natural gas industry. The company that would be constructing the natural gas pipeline for Alternative A, Enbridge (owner of ETNG), has joined the USEPA Methane Challenge Program as a ONE Future Coalition commitment partner. Members in this program demonstrate responsibility by committing to methane reduction goals and providing transparency by reporting annual methane emissions reductions to the USEPA. Enbridge has voluntarily committed to reduce methane emissions across each individual segment of the U.S. natural gas value chain to 1 percent or less of total produced natural gas by 2025. In addition, the overall ONE Future leak rate for all members in 2020 was less than 0.5 percent of total natural gas flow for its entire life cycle (USEPA 2022a; ONE Future 2021). Enbridge is also a member of the USEPA's Natural Gas STAR Program and the Environmental Partnership. The STAR Program provides a framework for partner companies to implement methane emissions reducing technologies and practices across operations and document voluntary emission reduction activities. The Environmental Partnership works to continuously improve the oil and natural gas industry's environmental performance through technically feasible and commercially proven solutions that will result in significant emissions reductions (INGAA 2021).

Based on analysis of USEPA data, the American Gas Association indicates that methane fugitive emissions across the entire natural gas supply chain (wellhead-transportation-storage-combustion) are typically around 1.0 percent, and leakage rates previously estimated by USEPA are around 1.4 percent (American Gas Association 2023). To be conservative, TVA used a 1.6 percent leak rate (Appendix J) for the analysis as it is the average leak rate in the U.S. under the NREL's extensive review of thousands of GHG life cycle analyses (O'Donoughue et al. 2014).

There are numerous ongoing industry and government efforts to further reduce methane leakage throughout the natural gas supply chain, resulting in a 16 percent reduction in total methane emissions from natural gas systems between 1990 and 2019, a period when gross natural gas withdrawals almost doubled (American Gas Association 2023). In 2021, the overall methane leak rate for all Enbridge Gas Transmission assets was reported as 0.028 percent as reported in their 2022 Sustainability report. It is reasonable to assume that the leak rate from a new pipeline complying with the latest New Source Performance Standards would be even lower (Enbridge 2022).

3.7.1.1.8.4 Executive Orders Addressing GHG Emissions Reductions

President Biden issued EO 13990 on January 20, 2021, which directs Federal agencies to review, and take action to address promulgation of Federal regulations and other actions taken between January 20, 2017, and January 20, 2021, that conflict with national objectives to address climate change and prioritize both environmental justice and employment. This EO also directs Federal agencies to use the SC-GHG rates established by the Biden Administration under a reinstated IWG.

President Biden issued EO 14008 on January 27, 2021, which sets forth a government-wide approach to address climate change.

President Biden issued EO 14057 on December 8, 2021, which establishes policies to reduce carbon emissions in the federal government sector as follows:

1. Use 100 percent carbon pollution-free electricity by 2030, at least half of which will be locally supplied clean energy to meet 24/7 demand.
2. Sixty-five (65) percent reduction in Scope 1 (emissions from agency-owned or controlled emission sources) and Scope 2 (emissions from agency purchase of electricity, steam, heat, and cooling) GHG emissions as defined by the Federal Greenhouse Gas Accounting and Reporting Guidance, from federal operations by 2030 (2008 baseline)[33].Net-zero emissions from federal procurement no later than 2050, including a Buy Clean policy to promote use of construction materials with lower embodied emissions, i.e., upstream emissions from production of a product.
3. A net-zero emissions building portfolio by 2045, including a 50 percent emissions reduction by 2032 (2008 baseline).
4. Net-zero emissions from overall federal operations by 2050.

President Biden issued EO 14082 on September 12, 2022, to implement provisions from the Inflation Reduction Act. It reiterates the goal of reducing GHG emissions 50 to 52 percent by 2030 (2005 baseline), achieving a carbon pollution-free electricity sector by 2035, and achieving net-zero emissions by 2050. The EO further states that it shall be implemented consistent with applicable law and subject to the availability of appropriations.

On January 9, 2023, the CEQ issued guidance on conducting GHG emissions analysis and calculating and presenting SC-GHG in NEPA EAs/EISs using the IWG social cost rates. This EIS provides an analysis of GHG emissions and associated SC-GHG that addresses the primary applicable elements of EO 13990 in this CEQ guidance document.

Unlike the No Action Alternative, both action alternatives significantly reduce system carbon intensity. The highly efficient advanced-class CC in Alternative A reduces system carbon emissions by offsetting coal generation and by improving the combined fuel efficiency of the entire TVA gas fleet. Solar facilities in Alternative B reduce system carbon emissions by offsetting coal and gas generation, and while existing fossil units increase generation for battery charging or when solar is not available, Alternative B has the lowest system carbon rate (see Appendix B, Appendix I, and Appendix J for details on the carbon rate analysis). Although Alternatives A and B would help achieve the Administration's goal of reducing emissions from overall federal operations, Alternative B likely would go further in achieving the goals outlined in EO 14057 and 14082 and the targets agreed to in the Paris Agreement. The Alternatives

[33] This GHG emissions reduction goal does not apply to "non-standard" federal operations which includes generation of electric power produced and sold commercially to other parties, as is the case at KIF, per the CEQ Implementing Instructions for EO 14057, Based on TVA's Fiscal Year 2021 Federal Sustainability Report (TVA 2022i), TVA's "standard operations" -have already achieved a reduction of 84 percent in Scope 1 and 59 percent in Scope 2 emissions from a 2008 baseline.

Evaluation provided in Appendix B includes a carbon rate comparison and both the individual resource LCA and TVA system-wide LCA go into more detail.

TVA remains committed to achieving the goals under these EOs to the extent these goals can be achieved consistent with other statutory mandates applicable to TVA under the TVA Act and the Energy Policy Act of 1992, such as the requirements to provide reliable power at rates as low as feasible and TVA's obligation to engage in least-cost planning. GHG mitigation measures and their impacts are further discussed in Section 2.3.1.10 of this EIS.

As described in TVA's Strategic Intent and Guiding Principles document (TVA 2021h), TVA has a plan for 70 percent TVA system-wide carbon reductions by 2030 (referenced to 2005 baseline), sees a path to approximately 80 percent carbon reductions by 2035, and aspires to net-zero carbon emissions by 2050. The entire TVA system achieved 63 percent mass carbon emission reductions from 2005 to 2020.

3.7.1.2 Kingston Reservation

The Kingston Reservation is in Roane County, which is in an attainment area for all criteria pollutants (USEPA 2021c); however, the portion of the county that includes the Kingston Reservation is a maintenance area for $PM_{2.5}$. Table 3.7-2 summarizes monitoring data for ozone and $PM_{2.5}$ (USEPA 2021d), the only two criteria pollutants for which monitoring data are available for recent years within approximately 20 miles of the Kingston Reservation. The monitoring site for ozone is located at the Freel's Bend Study Area, Melton Lake, Oak Ridge National Lab Reservation, approximately 16 miles northeast of the Kingston Reservation. The monitoring site for $PM_{2.5}$ is located at Harriman High School in Harriman, TN, approximately 3 miles northwest of the Kingston Reservation. The ambient monitoring data indicate compliance with the NAAQS based on three-year averages, which is the basis for USEPA attainment/nonattainment designations.

Table 3.7-2. Monitored Air Quality in Region of the Kingston Reservation

Pollutant	Averaging Period	Monitored Design Concentrations[1]				
		Units	2016-2018	2017-2019	2018-2020	NAAQS
Ozone[2]	8-hour	ppm	0.064	0.064	0.061	**0.070**
$PM_{2.5}$[3]	24-hour	μg/m3	16	15	15	**35**
$PM_{2.5}$[3]	Annual	μg/m3	7.6	7.2	6.9	**12**

[1]The design concentration is the monitored (ranked or percentile basis) concentration that would be used to assess compliance with the NAAQS.
[2]Monitoring station in Anderson County, TN Ozone Maintenance Area (neighboring county), 2015 8-hour Ozone standard.
[3]Monitoring station in Knoxville-Sevierville-La Follette, TN $PM_{2.5}$ Maintenance Area (Roane County), 2006 24-hr standard.

Based on its potential to emit (PTE), the KIF Plant currently operates under the conditions stipulated by TN Air Pollution Control Board (Title V Renewal) Operating Permit No. 580583. TVA submitted a Title V renewal application on July 2022; according to TDEC records at the time of this EIS, the renewal is pending review. This permit includes applicable federal and state air quality requirements and addresses the following emission sources: nine coal-fired boilers; emergency diesel generator and black start diesel engine; limestone handling process; coal handling facility; dry fly ash handling process; gypsum dewatering and handling process; bottom ash dewatering plant; and a coal screening operation. In addition, air quality in TN is protected by the suite of TDEC, Division of Air Pollution Control regulations under Chapter 1200-03.

3.7.1.3 Alternative A

3.7.1.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The proposed CC/Aero CT Plant, switchyard, and associated equipment would be located on the Kingston Reservation. The affected environment and existing conditions for air quality described above for the Kingston Reservation in Section 3.7.1.2 apply to the CC/Aero CT Plant and switchyard on the Kingston Reservation.

3.7.1.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation. The affected environment and existing conditions for air quality described above for the Kingston Reservation in Section 3.7.1.2 apply to the proposed 3- to 4-MW solar facility location on the Kingston Reservation.

3.7.1.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites on the Kingston Reservation. The affected environment and existing conditions for air quality described above for the Kingston Reservation in Section 3.7.1.2 apply to the proposed 100-MW BESS on the Kingston Reservation.

3.7.1.3.4 On-site Transmission

Under Alternative A, TVA would make improvements to existing, on-site transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/ Aero CT Plant and switchyard. The affected environment relative to air quality for on-site transmission upgrades is the same as described in Section 3.7.1.2.

3.7.1.3.5 Off-site Transmission Upgrades

Eastern Transmission Corridors

As part of Alternative A, TVA would perform upgrades to existing off-site transmission lines (L5108, L5116, L5280, L5302, and L5381), including replacement/reconducting of conductors or rebuilding of transmission lines and OPGW installation. Some of the reconductoring or rebuilding efforts would also be performed on portions of the transmission lines that are located on the Kingston Reservation. All upgrade efforts for L5108, L5116, L5280, L5302, and L5381 would occur within Roane and Anderson counties. Both counties are in attainment with criteria pollutant ambient air quality standards. Air monitoring data in Roane and Anderson counties is discussed above under Section 3.7.1.2.

Western Transmission Corridor

As part of Alternative A, TVA would perform upgrades to off-site TL L5383, including reconductoring or rebuilding of transmission lines and OPGW installation. These upgrades would occur within Cumberland County, TN. Cumberland County is in attainment with criteria pollutant ambient air quality standards. There are no USEPA or TDEC air monitoring network stations in Cumberland County, TN.

3.7.1.3.6 Construction and Operation of a Natural Gas Pipeline

The proposed 122-mile ETNG Construction ROW would pass through Roane, Morgan, Fentress, Overton, Jackson, and Smith counties. The new pipeline would largely run within or adjacent to an existing natural gas pipeline ROW. Except for Roane County, all counties that would be transected are currently in attainment for all criteria pollutants, and only the Kingston Reservation portion of Roane County is in maintenance status for $PM_{2.5}$. There are no available air monitoring data for these other counties in the USEPA air monitoring database or the TDEC air monitoring network. Air monitoring data for Roane County is discussed above in Section 3.7.1.2.

3.7.1.4 Alternative B

3.7.1.4.1 East Tennessee TVA Power Service Area

Although locations of the proposed solar and storage facilities are not currently known, they would be within portions of East TN. Several of the proposed solar and battery storage installations under Alternative B could be in attainment areas; however, some of the counties in East TN (e.g., Anderson, Blount, Cocke, Jefferson, Knox, Loudon, Roane, and Sevier) are in $PM_{2.5}$ and/or Ozone maintenance areas and would be subject to the General Conformity rule. The East TN counties are in attainment with the ambient air quality standards, except for a portion of Sullivan County, which is nonattainment for SO_2. However, it is assumed that solar facilities would not be installed in this nonattainment area. Should facilities be in middle TN counties, the facilities would be in attainment areas. As stated previously, some counties in East TN are maintenance areas for $PM_{2.5}$ and/or ozone; therefore, compliance with the General Conformity rule would be necessary for Alternative B facilities located in those counties.

3.7.2 Environmental Consequences

3.7.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate the KIF Plant. USEPA regulated criteria pollutant emissions and HAP emissions from the continued operation of the KIF Plant would include emissions from the KIF Plant's boiler stacks, as well as associated emissions from coal mining; handling and transportation activities; additive handling and transportation; and ash handling and disposal. Emissions rates from KIF would be expected to remain like current levels. For example, a recent 3-year average (2018-2020) for SO_2, NO_x, and PM_{10} emissions were 1,374+ tons/year, 1,038+ tons/year, and 328+ tons/year, respectively (see Table 3.73- or Appendix I for the KIF annual emissions). Pollutants such as sulfuric acid, hydrogen fluoride, and hydrogen chloride would continue to be emitted at recent levels (e.g., in 2015, sulfuric acid = 250 tons; hydrogen fluoride = 4.3 tons; and hydrochloric acid = 48.5 tons emissions) as compared to no or negligible emissions of these pollutants under the other alternatives. For the existing coal-fired units to remain operational, additional repairs and maintenance would be necessary to maintain reliability. The GHG emissions from the No Action Alternative would remain at levels comparable to current emissions, which are higher quantities than anticipated under Alternative A or Alternative B. The annual average CO_2-e emissions between 2018-2020 were approximately 3.4 million tons. Additionally, estimated LCA GHG emissions for KIF under the No Action Alternative would be 105.2 million tons of CO_2-e emissions; see Appendix J for details on the LCA.

3.7.2.1.1 Climate Change Effects on the No Action Alternative

Continued operations at KIF would require TVA to continue withdrawing raw water for non-contact cooling purposes from the KIF cooling water intake identified in Figure 1.1-1 and described in Section 2.1.3.2.2.1 on water requirements. Increases in ambient air temperatures due to climate change could increase the temperature of incoming raw water used to cool equipment at the KIF Plant thereby reducing plant efficiency and increasing risk of the occurrence, magnitude, and frequency of exceedances of thermal discharge limits in the KIF NPDES permit and potentially triggering additional permitting requirements under CWA 316(a).

3.7.2.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction (D4 Activities) of KIF Plant

Most buildings and structures at the KIF facility, approximately 1.6 million square feet in size, would be decontaminated (where needed) and demolished down to grade or just below grade level. The area would then be backfilled and provided with proper drainage. Temporary, direct air pollutant and GHG emissions would occur due to the generation of fugitive dust and use of vehicles and off-road equipment in the decontamination and demolition process; transportation of demolition debris and wastes to off-site recycling and disposal facilities; and movement and transportation of fill materials and landscaping materials to restore portions of disturbed land that will not be redeveloped. These activities and effects are expected to occur over a three-year period under all action alternatives.

Fugitive particulate matter emissions from demolition activities typically produce particles that are mainly deposited on the property where the demolition occurs. The potential drift distance of particles is governed by the height above ground at which the particle is emitted, the terminal settling velocity of the particle, and the degree of atmospheric turbulence. Theoretical drift distance, as a function of particle diameter and mean wind speed, has been computed by the USEPA for fugitive dust emissions. For a typical mean wind speed of 16 kilometers per hour (10 miles per hour), particles larger than about 100 micrometers (μm) are likely to settle out within 6 to 9 meters (20 to 30 feet) from the point of emission. Particles that are 30 to 100 μm in diameter are likely to settle within a few hundred feet from the point of emission. Smaller particles, particularly PM_{10} and $PM_{2.5,}$ have slower gravitational settling velocities and are more likely to have their settling rate retarded by atmospheric turbulence and thus be transported off-site without dust control measures (USEPA 1995)[34]. Site preparation and vehicular traffic over paved and unpaved roads at the site would also result in the emission of fugitive dust particulates during active deconstruction or demolition debris removal. The largest fraction (greater than 95 percent by weight) of fugitive dust emissions would be deposited within the demolition site boundaries. The remaining fraction of the dust would be subject to transport beyond the property boundary without dust control measures.

Most of the immediate neighboring property around the KIF Plant structures is either undeveloped, limited light industrial use, or part of the Clinch and Emory Rivers. The closest residence to the decontamination and deconstruction project area is located approximately 0.4 miles to the south. Considering the distance from the KIF Plant and control measures expected to be implemented, this location and more distant receptors would be subject to a minor impact from fugitive dust emissions generated during typical building demolition activities. This is because these emissions would be temporary and of a minor magnitude. There would also be the potential for an intense, temporary release of fugitive dust associated with the removal of the stacks or other larger structures by dropping with explosives. Fugitive dust would be released in an uncontrolled manner and would likely be released within several minutes, after which these emissions would cease. Dropping the stacks or structures via explosives would likely produce the most particulate matter of any site activity, with the highest potential to travel off the demolition site. The distance the particulate matter could travel would be dependent on the height of the dust column generated from demolition, wind and weather conditions during

[34] Although this USEPA reference does not provide an injection height for this case, it is estimated a typical or average injection height would be approximately 2 to 10 feet above grade.

demolition, and dust control measures implemented, such as wetting the area before and during the demolition, among other measures.

To minimize potential fugitive dust mobilization associated with explosive demolition, the demolition contractor would be required, to the extent practical, to remove ash from the facilities proposed for deconstruction and demolition prior to removal of that facility and implement dust control measures during demolition to prevent the spread of dust, dirt, and debris. These methods may include wetting equipment and demolition areas, using misting cannons during the demolition, covering waste or debris piles, using covered containers to haul waste and debris, and wetting unpaved vehicle access routes during hauling. Wet suppression can reduce fugitive dust emissions from roadways and unpaved areas. TVA also requires on-site contractors to maintain engines and equipment in good working order (TVA 2021f).

Site preparation and vehicular traffic over paved and unpaved roads at the site would result in the emission of fugitive dust during active deconstruction, demolition debris removal, and restoration activities. The largest fraction of fugitive dust emissions would be deposited on-site within the demolition site boundaries. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent particulates from becoming airborne. If necessary, emissions from open demolition areas and paved/unpaved roads could be mitigated by spraying water on the work areas and roadways to reduce fugitive dust emissions. Additionally, CCR activities would also be conducted to minimize fugitive dust through work practices and dust control measures which would comply with fugitive dust regulatory requirements. If necessary, the timing of CCR activities may require coordination with D4 activities to ensure minimization of fugitive dust emissions and limit local impacts (TVA 2021f). Combustion of gasoline and diesel fuels by internal combustion engines (vehicles, generators, and demolition equipment) would generate local emissions of particulate matter, CO, NO_x, SO_2, volatile organic compounds (VOCs), and CO_2 during the site preparation, demolition, and restoration periods. However, new emission control technologies and fuel mixtures have significantly reduced vehicle and equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. Additionally, it is expected that all vehicles would be properly maintained and operated under an idling minimization procedure which would also minimize emissions (TVA 2021f).

Demolition debris and any scrap metal would be transported to an off-site vendor, landfill, or recycling facility by truck. Transport of these materials would occur along existing roadways in the vicinity of KIF and would result in increased emissions for the duration of the deconstruction process. Mitigation measures, including implementing BMPs for controlling fugitive dust and proper maintenance of vehicles for controlling emissions, would help to minimize effects (TVA 2021f).

The use of vehicles and demolition equipment in the activities associated with this alternative, including off-site vehicle operations (such as debris disposal and workforce transportation), would result in a minor temporary increase in CO_2 emissions. There would also be a small risk of a release of pollutants and/or GHGs with hydrofluorocarbons or hydrochlorofluorocarbons associated with handling and removal of refrigeration and electrical equipment during decontamination and deconstruction activities. Routine capture and recycling procedures are followed for these gaseous materials, minimizing any release of these pollutants to the atmosphere. These decontamination and deconstruction activities are expected to have temporary, localized[35], and minor effects on air quality due to temporary minor increases in emissions and minor direct or indirect effect on regional climate change due to temporary increases in GHG emissions.

The effects from elimination of the KIF coal plant operational emissions are discussed below under Alternatives A and B.

Under both Action Alternatives, emissions of GHGs and fugitive dust would occur because of the deconstruction and construction activities. Similar emissions could be anticipated from the other projects in the area because of construction activities. The combined projects could cause cumulative minor, temporary effects to air quality in the area, which is discussed further in Section 3.7.2. Such effects would be mitigated using BMPs, such as water suppression for dust control and regular inspections and maintenance of construction vehicles.

3.7.2.2.1 Environmental Justice Considerations

Effects to air quality that would occur because of the Kingston coal facility retirement and D4 activities are anticipated to have temporary, localized, and minor effects largely limited to the Kingston Reservation where there are no residential populations. However, the census block group containing the Kingston Reservation, where fugitive dust emissions have some likelihood of becoming airborne, does contain EJ-qualifying populations (minority populations), and as such, disproportionate effects to these populations are possible. Short-term, temporary, and minor effects are anticipated from GHG emissions on climate change. Since these effects on climate change would be mitigated through use of BMPs, they would be less than significant, but they may be disproportionate for EJ-qualifying populations due to the higher likelihood of having health vulnerabilities. The EJ-qualifying population in the census block group containing the Kingston Reservation is exposed to above average amounts of toxic releases to air (as shown in Table 3.4-6). These toxins have been shown to cause cancer, other chronic human health effects, and significant adverse acute human health effects; therefore, exposure to these toxins over the long term may cause health vulnerabilities (USEPA 2023d). EJ and other populations utilizing areas near or on the Kingston Reservation may benefit in the long term from the permanent changes to local air quality from the proposed retirement of the existing KIF coal facilities.

3.7.2.3 Alternative A

3.7.2.3.1 Construction and Operation of CC/Aero CT Plant and Switchyard on the Kingston Reservation

Alternative A includes construction and operation of a 714 MW capacity natural gas CC plant (summer capacity), 75-MMBtu/hr natural gas auxiliary boiler, 1,064 MMBtu/hr duct burner, and a 848-MW capacity dual-fuel Aeroderivative CT plant (specifically 16 CT units at 53 MW/each) on the Kingston Reservation. The main plant components include a CC combustion turbine with a duct burner and one HRSG, an auxiliary boiler, an air-cooling system, 16 Aeroderivative simple-cycle combustion turbines, five dewpoint heaters, a diesel emergency fire water pump, and a black-start diesel emergency generator. Additionally, this alternative includes a 3- to 4-MW solar panel construction and 100-MW BESS for powering facilities on-site and potentially adding generation to the grid.

[35] Regarding air quality, "localized" is meant to consider an area local to the proposed action that would include adjacent property and typically property within one-half to one mile of the proposed action.

3.7.2.3.1.1 Construction Effects

For construction of the CC/Aero CT Plant, TVA applied for an air quality construction permit through TDEC, in November of 2023, to allow for initiation of construction and to begin operations once construction is completed. The plant construction is expected to occur over 30 acres with an additional 10 to 20 acres used for equipment laydown and mobilization. Large equipment could be delivered by rail or barge with smaller items arriving by truck. Minor modifications to the current barge unloading facilities would consist of grading and creation of dirt/rock ramping to the nose of the barge. Emissions from material delivery and unloading by rail and barge would consist of fugitive dust and particulate matter, including CO, NO_x, SO_2, VOCs, and CO_2 emissions from combustion of fuels for material transport. Based on other air quality analyses using rail/barge transport of materials and the expected level of activity for rail/barge transport, and when compared to other emissions included in this FEIS, the potential for adverse effects from these emissions are considered temporary and minor. Rail and barge sources of emissions would follow the applicable USEPA emissions standards for locomotive engines and marine diesel engines, respectively.

Construction of the CC/Aero CT Plant will include use of on-road construction vehicles/trucks and off-road construction equipment for transporting the smaller building/equipment materials to the Kingston Reservation and erecting the facilities. Limited land clearing (i.e., clearing and grubbing of trees) and grading activities would occur. Construction emissions are expected from gasoline and diesel fuel combustion within internal combustion engines for on-road vehicles/trucks and off-road equipment. These engines would generate local emissions of particulate matter, CO, NO_x, SO_2, VOCs, and CO_2, during their operation. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions and operated under an idling minimization procedure therefore further reducing emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. A maximum of 300 workers would be employed on-site during peak construction activity. Their commuting vehicle emissions would be minor compared to the other construction activity emissions.

Fugitive dust/particulate matter emissions would be generated during soil excavation and disturbance and truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction area. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor. The closest residence to the nearest location for the CC/Aero CT Plant construction area is located approximately 0.35 miles to the northeast across the Emory River. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne. In addition, dust control actions, including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas, would be implemented to reduce fugitive dust/particulate emissions. Considering the distances from the proposed CC/Aero CT Plant construction activities, the residential receptors are unlikely to be largely impacted by fugitive dust emissions.

Overall, the CC/Aero CT Plant construction activities are expected to have temporary, localized, and minor adverse effects on air quality, and no direct or indirect effect on regional climate change is expected as a result of those activities. Emissions will occur in an attainment/maintenance area where current ambient levels of criteria pollutants are below ambient air quality standards. Adverse impacts to these ambient levels due to construction activities are expected to be minor and temporary. To minimize emissions from the construction and demolition activities, AIRNOW, the U.S. Air Quality Index (https://www.airnow.gov/AirNow), would be used to monitor local air quality conditions to inform decisions to reduce or change the timing of construction/demolition activities.

3.7.2.3.1.2 Operations Effects

The replacement of KIF coal-fired plant operations with natural gas-fired CC and dual-fuel Aeroderivative CT plant operations is expected to have permanent, moderate, beneficial effects on local air quality with respect to all criteria pollutants (i.e., SO_2, NO_x, PM_{10}, $PM_{2.5}$, CO, and VOC). When operations begin, the decrease in these pollutant operational emissions at the KIF facility are estimated at approximately: 1,366 tons/year for SO_2; 860 tons/year for NO_x; 246 tons/year for PM_{10}; 184 tons/year for $PM_{2.5}$; 216 tons/year for CO; and, 14 tons/year for VOC compared to the 2018 to 2020 averaged emissions. There would also be elimination of hydrogen fluoride (4.3 tons/year compared to 2015 emissions) and hydrochloric acid mist emissions (48.5 tons/year compared to 2015 emissions) and reductions in mercury and lead emissions along with reductions in other HAP emissions (refer to https://www.tva.com/environment/environmental-stewardship/air-quality/air-quality-standards/kingston-fossil-plant-emissions). There are anticipated to be increases in annual emissions of ammonia (NH_3 - 78.3 tons/year) and formaldehyde ((CH2O) - 4.0 tons/year). Refer to Table 3.7-3 for the net change in operational emissions for all calculated pollutants under Alternative A, and to Appendix I, which provides the emissions calculations[36].

The estimated increase in NH_3 emissions, as a precursor to $PM_{2.5}$, does not exceed the General Conformity de minimis value of 100 tons/year. In addition, the USEPA did not consider NH_3 as a significant precursor contributor to the $PM_{2.5}$ nonattainment area that includes Roane County (82 FR 24636). Therefore, NH_3 emissions would not need to be addressed for General Conformity purposes based on the definition of a "precursor of a criteria pollutant" in 40 CFR 93, Subpart B.

The new CC/Aero CT Plant is estimated to be a HAP minor source with potential total HAP emissions (maximum capacity operation at 8,760 hours/year) at under 20 tons/year. In addition, the highest emitting HAP, which is formaldehyde, is expected to have actual emissions of 4 tons/year. TDEC does not have any state-specific toxic pollutant or HAP rules that would apply to Alternative A. Additionally, considering the proposed CC/Aero CT Plant would not be a major source of HAPs under federal or state law, it would meet all HAP requirements. Although 40 CFR 63, Subpart YYYY regarding combustion turbines would not be applicable, existing vendor CC/Aero CT data indicates the 0.091 ppmvd formaldehyde stack emissions limit in this rule would be met. Additional formaldehyde specific impact information is provided in the paragraph below.

According to the National Cancer Institute (NCI 2011), when formaldehyde is present in the air at levels exceeding 0.1 ppm, some individuals may experience adverse effects such as watery eyes; burning sensations in the eyes, nose, and throat; coughing; wheezing; nausea; and skin

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[36] The net change in emissions for Alternative A presented in this EIS is based on a comparison of projected actual emissions to baseline actual emissions, which is a standard analysis methodology under NEPA for assessing impacts. The change in emissions for Alternative A under the recent air permit application for its construction/operation is based on regulatory requirements to provide a comparison of potential emissions (worst case emissions at maximum capacity operating 365 days per year, 24 hours per day – an unrealistic operating scenario especially over the life of the facility) to baseline actual emissions. The results discussed in this EIS are considered independent of the results produced through the recent air permit regulatory proceeding and therefore should not be directly compared.

irritation. According to OSHA, the permissible exposure limit (PEL) for formaldehyde in the workplace is 0.75 ppm as an 8-hour time-weighted average. Additionally, research at the University of North Carolina that was completed in 2019 indicated that doses of formaldehyde inhalation exposure to rates at or below 300 ppb, which is equivalent to 0.3 ppm, did not increase cancer risk and would likely not increase cancer risk in humans. The conservative estimate of the formaldehyde concentration exiting the proposed combustion turbine stacks under Alternative A would be less than 0.091 ppm (at 15 percent oxygen) which is less than the 0.1 ppm referenced above and over eight times less than the OSHA PEL. (UNC 2019, NCI 2011). Furthermore, by the time the stack exhaust is dispersed in the ambient air and carried downwind to ground level receptors, the formaldehyde concentration would be expected to be reduced to levels further below 0.091 ppm.

An air construction permit approval and compliance with its terms and conditions, in combination with compliance with other requirements, minimize the risk air quality effects. Based on actual vendor equipment sizes and manufacturer's pollutant specifications, the operational emissions from Alternative A are not estimated to trigger a PSD permit modification for the new CC/Aero CT Plant. All criteria pollutant emissions from Alternative A are expected to have a net reduction in comparison to the No Action Alternative under a PSD netting analysis for a PSD permit modification, and a dispersion modeling analysis is not expected to be required. These net emission reductions from the retiring coal plant would be made enforceable through applicable air permits and thereby ensure air quality is not adversely affected.

Roane County is approximately 58 kilometers or 36 miles from a federal Class I protected area or national forest. However, the implementation of Alternative A is expected to result in an overall reduction in combined emissions of the four Regional Haze/Visibility regulated pollutants: NOx, PM_{10}, SO_2, and sulfuric acid. This change is a beneficial impact to nearby Class I protected areas (USEPA 2021e). Therefore, no regional haze requirements or PSD Class I effects analyses would apply under the permitting for construction of the new CC plant (TVA 2021d).

With respect to climate change, the impacts of decreases in CO_2-e emissions regarding climate change are addressed below under GHG Effects. Table 3.7-3 provides a comparison of estimated pollutant operational emissions for each alternative, both before and after implementation, and the net change in emissions. These emissions are based on projected average, annual, and lifetime electricity generation. Actual emissions could vary and at times be higher, but they would be accounted for during the construction air permitting process to ensure air quality ambient standards will be met.

Table 3.7-3. KIF Coal Retirement/Replacement EIS – Operational Air Emissions Comparisons – Only Direct Effects to TVA Facilities

Pollutant (Abbreviation)	No Action	Alternative A				Alternative B
	KIF 3-Year[2] Avg. Operational Emissions (tons/yr)	Proposed CC Plant Operational Emissions (tons/yr)	Proposed Aero CT Operational Emissions (tons/yr)	Total Kingston CC/Aero CT Plant Operational Emissions (tons/yr)	Net Change in Operational Emissions (tons/yr)	Net Change in Solar/Battery Storage Operational Emissions (tons/yr)
Particulate Matter/ Total Suspended Particulate – Filterable only (PM/TSP)	185.0	52.3	10.8	63.2	-121.9	-185.0
Total PM<10 microns -Filterable + Condensible (PM_{10})	328.7	63.9	18.5	82.4	-246.3	-328.7
Total PM<2.5 microns – Filterable + Condensible ($PM_{2.5}$)	266.3	63.9	18.5	82.4	-183.9	-266.3
Sulfur Dioxide (SO_2)	1,374.3	7.2	1.0	8.2	-1,366.1	-1,374.3
Nitrogen Oxides (Nox)	1,038.7	94.6	84.2	178.8	-859.9	-1,038.7
Carbon Monoxide (CO)	381.7	67.2	98.3	165.5	-216.2	-381.7
Volatile Organic Compounds (VOC)	45.7	24.0	8.1	32.1	-13.6	-45.7
Sulfuric Acid (H_2SO_4)	147.3	0.0	0.0	0.0	-147.3	-147.3
Ammonia (NH_3)	12.8	80.5	10.6	91.1	78.3	-12.8
Carbon Dioxide (CO_2)	3,386,666.7	1,438,066.3	230,672.2	1,668,738.5	-1,717,928.2	-3,386,666.7
Methane (CH_4)	34.5	102.0	15.9	117.8	83.3	-34.5
Nitrous Oxide (N_2O)	54.8	35.5	5.4	40.9	-13.9	-54.8
CO_2 equivalent – GHGs (CO_2-e)	3,403,333.3	1,451,207.9	232,678.1	1,683,886.0	-1,719,447.3	-3,403,333.3
Mercury[1] (Hg)	8.0E-03	No Data	No Data	No Data	-8.0E-03	-8.0E-03
Lead[1] (Pb)	No Data	No Data	No Data	No Data	No Data	No Data
Formaldehyde[3](CH2O)	2.8E-02	2.6	1.4	4.0	4.0	-2.8E-02

[1]Additional hazardous air pollutants are emitted from fossil fuel combustion but in negligible quantities, except for hydrogen fluoride (HF) and hydrogen chloride (HCl) from coal combustion. HF and HCl emissions from coal burning would be eliminated with the switch to natural gas combustion turbines. Current lead emissions data is not available but based on historical data is expected to be insignificant. Mercury emissions data for proposed sources is not available but expected to be insignificant.

[2]Three-year average of operational emissions at the existing Kingston Fossil Plant from 2018 to 2020.

[3]KIF 3-year formaldehyde emissions values for 2018-2020 are 0.0219, 0.0411, and 0.0201 tons/year, respectively.

NA = Not Applicable

The future predicted emissions presented above are from TVA facilities under each alternative. These emissions calculations for the CCs/Aero CTs were based on the following:

- CC/CT manufacturer's guaranteed emission rates and design data. Manufacturer's data for similarly sized gas heaters in TVA's system.
- Expected operational limits similar to BACT established for other, comparable CC units and associated equipment (e.g., those established and published under the USEPA Reasonably Available Control Technology /BACT/Lowest Achievable Emission Rate Clearinghouse [RBLC] database). Where the RBLC database was used, limits were averaged.
- 40 CFR Part 75, App. D, 2.3.1.1.1, default SO_2 emission rate for firing pipeline natural gas (0.0006 lbs./MMBtu), which is prescribed by USEPA for SO_2 emissions.
- Predicted annual average capacity factor of 55 percent for the CC component based on USEIA CC industry average over the last 10 years from EIA website: [https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_a]. Actual CC capacity factors for any given plant in any given year may vary between about 35 and about 90 percent depending on factors such as load growth, natural gas prices, composition of the balance of TVA's generating fleet in any given year, outages, or other unforeseen circumstances.
- Predicted annual average capacity factor of 10 percent for the Aero CTs based on USEIA CT industry average over the last 10 years from EIA website: [https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_a]. Based on TVA's experience and industry knowledge, actual Aero CT capacity factors for any given plant in any given year may vary between about 1 percent and about 35 percent depending on natural gas prices and operational factors.
- USEPA AP-42 publication of emission factors for Stationary Combustion Turbines and natural gas combustion for external combustion sources.
- 40 CFR 60, Subpart TTTT for combustion turbine CO_2 emissions limits.

Detailed emissions calculations are provided in Appendix I.

Due to NSPS requirements, more specifically 40 CFR 60 Subparts KKKK and TTTT, the new CC would require emissions controls for NO_x and emissions limitations for SO_2 and CO_2. These rules would have emissions monitoring and/or performance testing requirements, fuel, and fuel sulfur monitoring requirements, as well as maintenance, recordkeeping, and reporting requirements. Reduction of NO_x from all CC and CT units would be achieved through dry low-NO_x and/or dry low-emissions combustion systems. These inherent systems collaterally control CO and VOC emissions. Additional NO_X control for all CC (excluding CC bypass stack) and CT units would be achieved via an SCR system located in the exhaust path. Co-located with the SCR system, an oxidation catalyst would be utilized to further reduce CO and VOC emissions. The exhaust stacks would be equipped with continuous emissions monitoring systems.

After the CC/Aero CT Plant begins operation, the existing Title V operating permit will require revisions to incorporate the new plant and associated air quality requirements and remove conditions regarding the existing coal-fired power plant.

Additional beneficial air quality effects from Alternative A include the following[37]:

- Elimination of mercury emissions by switching from coal to natural gas combustion.
- Elimination of hydrogen chloride and hydrogen fluoride emissions by switching from coal to natural gas combustion.
- Reduction in acid precipitation deposition due to significant SO_2 and NO_x emissions reductions.
- Visibility impairment reductions due to significantly reduced PM_{10}, NO_x, and SO_2 emissions from coal combustion, handling, and transport.

3.7.2.3.1.3 GHG Effects from Direct Emissions

As shown in Table 3.7-3 above, the estimated change in each individual annual GHG emissions and their associated CO_2-e emissions change and total net CO_2-e operational annual emissions reduction at the KIF Plant from implementation of Alternative A is estimated as follows:

- Reduction of approximately 1,717,928 tons/year CO_2 and 14 tons/year N_2O and increase of 83 tons/year CH_4.
- Based on emissions conversion using GWPs, reduction of approximately 4,129 tons/year CO_2-e from N_2O and increase of 2,084 tons/year CO_2-e from CH_4.
- Total net reduction of 1,719,447 tons/year CO_2-e from GHGs[38].

This CO_2-e net emissions reduction would be in the first full year after the CC/Aero CT Plant would begin operation (anticipated in 2028). Commercial operation is scheduled to begin June 2027 with final acceptance in December 2027; however, the highest annual CO_2-e emissions increases begin in 2028. Similar annual reductions in CO_2-e operational emissions relative to the No Action Alternative would be experienced from that point forward. The CO_2-e operational emissions decrease is in comparison to the 2018-2020 three-year average actual CO_2-e operational emissions at KIF. However, those actual levels are below historical levels because the KIF coal-fired units are aging and experiencing increasing maintenance issues that have not allowed them to operate at their full capacity. Additionally, a coal ash spill in 2008 resulted in reduced operational capacity from that point forward. Estimated operational CO_2 emissions in 2028 under Alternative A from generation at the Kingston site would be approximately 57 percent below 2018 CO_2 emissions and 85 percent below 2008 CO_2 emissions, exceeding the Biden Administration goal of 65 percent reduction in Scope 1 GHG emissions by 2030 from a 2008 baseline (TVA 2022d)[39]. These operational emissions reductions also advance TVA's progress toward GHG emission reduction strategies identified in TVA's Strategic Intent and Guiding Principles document.

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[37] These air quality benefits would also be realized under Alternative B but only at the Kingston Reservation.

[38] Using the USEPA GHG equivalency calculator (https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator), this net reduction in CO_2-e would equate to reducing GHG emissions from 347,115 gasoline-powered passenger vehicles driven for one year or reducing the electricity use for one year for 303,508 homes.

[39] As stated in Section 3.7.1.1.8.4, this GHG 65 percent reduction goal by 2030 is not applicable to "non-standard" federal operations including generation of electric power produced and sold commercially to other parties, as is the case for the Kingston Reservation.

Assuming the USEPA 2023 proposed rule (88 FR 33240, 5/23/2023) regarding GHG reductions from combustion turbines is finalized in its current form, there would be approximately a 30 percent annual reduction in CO_2 operational emissions by 2032 and a 96 percent reduction by 2038 through co-firing of hydrogen (30 percent and 96 percent hydrogen co-firing, respectively). Alternatively, the standard in the proposed rule requires a 90 percent reduction in CO_2 emissions by 2035 through the use of CCS. These CO_2 reductions equate to approximately 500,622 tons/year starting in 2032 and 1,601,989 tons/year in 2038 for hydrogen blending and 1,501,865 tons/year starting in 2035 for CCS (based on taking the reduction percentages of 1,668,739 tons/year shown in Table 3.7-3). The associated social monetary benefit of CO_2 reductions would be approximately $37 million per year (nominal dollars) starting in 2032 and $123 million per year (nominal dollars) starting in 2035 and would increase in each consecutive year based on the annual increase in social cost $/ton rates. Over the entire Alternative A life cycle, roughly $4.4 billion (nominal dollars) in social monetary benefit from CO_2 reductions would be expected if this proposed rule is finalized in its current form and if the rule survives legal scrutiny. As previously stated, the content and requirements of the final rule is not known at this time and the feasibility of implementing CCS technology or 96 percent hydrogen co-firing at KIF is questionable. Additionally, TVA will continue to monitor the industry and assess other feasible technology options and advances in existing technologies for GHG reductions.

Emissions of CO_2 from energy consumption are being used as an operational GHG emissions geographic comparison analysis, as that data is most readily available and consistent across state, U.S., and global data sources. Based on the most recent estimates of CO_2 emissions for TN by the USEIA, total emissions of CO_2 for the state in 2018[40] were 94.7 million metric tons (USEIA 2021). The most recent total CO_2 emissions for the U.S. due to energy consumption were 4,576.3 million metric tons from USEIA data for 2020. (USEIA 2022b). The most recent total global CO_2 emissions due to energy consumption were 31,500 million metric tons from USEIA data for 2020 (USEIA 2021). Therefore, the net near-term decrease in emissions of approximately 1.56 million metric tons of CO_2/year associated with implementation of Alternative A would represent a decrease of approximately 1.65 percent of total statewide emissions in 2018, approximately 0.03 percent of the total U.S. emissions in 2020, and 0.005 percent of the total global GHG emissions for 2020 (see Appendix I for these calculations). As such, the operation of the CC/Aero CT Plant under Alternative A would represent a moderate beneficial reduction in future estimated GHG emissions, particularly from TN’s contribution to GHG emissions reductions.

Using the Biden Administration’s 2021 SCC dollar per metric ton values, adjusted for inflation, the estimated net annual social benefit of CO_2 operational emissions reductions from implementing Alternative A in 2028 would be $109,591,288 for direct CO_2 effects. Table 3.7-4 provides the Biden Administration’s social benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2028, when full year operations would begin. Using the prior Administration’s (2019) SCC dollar per metric ton values, adjusted for inflation, the estimated annual social benefit of carbon emissions reductions from implementing Alternative A in 2028 would be $12,025,497 for direct CO_2 effects. Table 3.7-5 provides the prior Administration’s social benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2028, when full year operations would begin. For both scenarios, beyond 2028 and at least through 2050, the net social benefit of CO_2 operational emissions reductions would increase year over year based on the increase in SCC rates ($/ton) between 2020 and 2050.

[40] The most recent year for available statewide emissions data.

Table 3.7-4. Estimated Net Social Benefit of CO_2 Operational Emissions Reductions for Alternatives A and B - Only Direct Effects to TVA Facilities (2028) – Current Administration SCC Values

GHG Pollutant	(Abbrev.)	Nominal SCC Rate ($/mt) (2028)	Nominal SCC Rate ($/ton) (2028)	SCC Benefit - Alternative A (2028, Dollars)	SCC Benefit - Alternative B (2028, Dollars)
Carbon Dioxide	CO_2	$ 70	$ 64	**$ (**109,591,288**)**	**$ (216,044,636)**

Notes: 2028 SCC is presented as this is the first full year that Alternatives A and B are planned to begin operation. 3% discount rate used as this is the central case set by the Interagency Working Group on the Social Cost of Greenhouse Gases in their 2021 Technical Support Document. Costs based on global impacts.

Social cost of Methane and Nitrous Oxide values are not presented because they are each insignificant, <1%, with regard to direct combustion emissions from all alternatives, when compared to the social cost of carbon, i.e., CO2. However, they are calculated and presented in the GHG Life Cycle Analysis.

$ = U.S. Dollars; mt = metric tons; SCC = Social Cost of Carbon

Table 3.7-5. Net Social Benefit of CO_2 Operational Emissions Reductions for Alternatives A and B - Only Direct Effects to TVA Facilities (2028) - Prior Administration SCC Values

GHG Pollutant	(Abbrev.)	Nominal SCC Rate ($/mt) (2028)	Nominal SCC Rate ($/ton) (2028)	SCC Benefit - Alternative A (2028, Dollars)	SCC Benefit - Alternative B (2028, Dollars)
Carbon Dioxide	CO_2	$ 8	$ 7	**$ (**12,025,497**)**	**$ (23,706,667)**

Notes: 2028 SCC is presented as this is the first full year that Alternatives A and B are planned to begin operation. 3% discount rate used. Costs based on U.S. impacts only.

Social cost of Methane and Nitrous Oxide values are not presented because they are each insignificant, <1%, with regard to direct combustion emissions from all alternatives, when compared to the social cost of carbon, i.e., CO2. However, they are calculated and presented in the GHG Life Cycle Analysis.

$ = U.S. Dollars; mt = metric tons; SCC = Social Cost of Carbon

The CC/Aero CT Plant would also be subject to annual GHG emissions reporting to the USEPA. The annual threshold for reporting emissions is 25,000 metric tons of GHGs according to the mandatory GHG reporting rules under 40 CFR 98.

3.7.2.3.1.4 GHG Effects from Direct and Indirect Emissions – Life Cycle Analyses

Two GHG LCAs were conducted for estimating future direct and indirect GHG emissions and associated social costs from implementing Alternative A. More detailed methodology and results for these analyses are provided in Appendix J. The first LCA is on an individual replacement resource by alternative basis and the second is on a TVA system-wide portfolio basis with simulated system-wide generation dispatch. The Alternative A individual LCA is described below. The system-wide LCA for Alternative A is presented in Section 3.7.2.5 and provides the Alternative A LCA emissions and SC-GHG savings compared to the No Action Alternative. The Net Present Value (NPV) of these savings and their percent reduction compared to the No Action Alternative are also presented in Section 3.7.2.5.

Considering the USEPA May 2023 proposed NSPS rule for reducing GHG emissions from stationary combustion turbines is only at the proposed rule stage and may have significant changes and court challenges before becoming final, the detailed GHG emissions reductions and associated social cost reductions from its implementation have not been included in the individual resource LCA. However, a general estimate of the percentage GHG annual operational emissions reductions at the time of the new technology implementing dates has been provided in the previous section. Unlike the individual resource LCA, TVA's system-wide LCA does incorporate this proposed rule and include more detailed GHG emissions reductions and associated social cost reductions in comparison to the No Action Alternative. Additionally, the costs for implementing CCS and hydrogen blending technologies have also been incorporated in the total costs for Alternative A and the No Action Alternative through a sensitivity analysis presented in TVA's Alternatives Analysis (Appendix B).

Estimated emissions of the three main GHG pollutants (CO_2, CH_4, and N_2O) were calculated over the entire life cycle of Alternative A and broken down into four main life cycle segments: upstream; on-site ongoing combustion; ongoing non-combustion; and downstream. The activities under each segment are described in Appendix J. The operational life cycle of generating assets are typically set by utilities based on engineering estimates of how long equipment is likely to continue operating productively for its original purposes under normal or typical conditions. The operational life cycle of Alternative A was assumed to be 30 years based on current industry assumptions for typical expected operating life of a CC natural gas plant (NREL 2023b). The resulting estimated life cycle emissions of each of the three GHGs were used to calculate the estimated future social cost of each GHG individually and the total SC-GHG. In the same manner as for GHG Effects from Direct Emissions above, the SC-GHGs were calculated using a range of SC-GHG values.

In summary, the Alternative A estimated LCA emissions of each GHG and their corresponding estimated future social costs are provided in Table 3.7-6 and Table 3.7-7. Table 3.7-6 provides the results using the Biden Administration social cost values and Table 3.7-7 provides the results using the prior Administration social cost values. Both tables also provide an NPV of the total life cycle SC-GHG for Alternative A. It is important to understand that this LCA is for the individual assets being added under each alternative and does not account for power mix changes that would occur elsewhere in TVA's system. Therefore, it only provides a portion of TVA's system-wide estimated future GHG emissions that would occur under each alternative.

In comparison to Alternative B, Alternative A has a higher estimated CO_2-e life cycle emissions and associated estimated future social costs in nominal dollars. In comparison to the No Action Alternative, Alternative A has a 41 percent decrease in life cycle CO_2-e emissions and 40 percent decrease in associated estimated future social costs in nominal dollars. The total estimated life cycle SC-GHG for each alternative under Biden Administration values are: $11.8 billion – No Action Alternative; $7.7 billion – Alternative A; and $0.67 billion – Alternative B. The total estimated life cycle GHG social costs for each alternative under prior Administration values are: $937.5 million – No Action Alternative; $610.9 million – Alternative A; and $65.2 million – Alternative B.

Table 3.7-6. Alternative A – Estimated Life Cycle GHG Emissions and Associated Social Costs (Current Administration Values, 3% Discount Rate)

Total Life Cycle CO_2 Emissions, tons	Total Life Cycle CH_4 Emissions, tons	Total Life Cycle N_2O Emissions, tons	Total Life Cycle CO_2-e Emissions, tons	Total Life Cycle Social Cost of CO_2 Emissions, $	Total Life Cycle Social Cost of CH_4 Emissions, $	Total Life Cycle Social Cost of N_2O Emissions, $	Total Life Cycle Social Cost of GHGs Emissions, Nominal $	NPV of Total Life Cycle Social Costs of GHG Emissions, 2023 $
59,111,714	286,933	1,229	66,651,172	$6,592,263,801	$1,126,315,353	$52,525,803	$7,771,104,958	$2,065,470,104

Note:
NPV = Net Present Value

Table 3.7-7. Alternative A – Estimated Life Cycle GHG Emissions and Associated Social Costs (Prior Administration Values, 3% Discount Rate)

Total Life Cycle CO_2 Emissions, tons	Total Life Cycle CH_4 Emissions, tons	Total Life Cycle N_2O Emissions, tons	Total Life Cycle CO_2-e Emissions, tons	Total Life Cycle Social Cost of CO_2 Emissions, $	Total Life Cycle Social Cost of CH_4 Emissions, $	Total Life Cycle Social Cost of N_2O Emissions, $	Total Life Cycle Social Cost of GHGs Emissions, Nominal $	NPV of Total Life Cycle Social Costs of GHG Emissions, 2021 $
59,111,714	286,933	1,229	66,651,172	$525,673,134	$81,887,781	$3,259,124	$610,820,039	$177,827,802

Note:
NPV = Net Present Value

The CSS and hydrogen fuel blending technologies currently available have not been sufficiently demonstrated at utility scale, and thus were not incorporated in the design of the proposed CC/Aero CT Plant under Alternative A (See Section 4.5.1.1 (CCS) of TVA's 2019 IRP [TVA 2019a] for more details). Additionally, there is currently a lack of available storage for carbon capture and lack of available hydrogen supply at the scale needed to be efficient. Lastly, the instability of karst geology under the KIF property may make CCS on-site infeasible. See Section 2.1.5.4.

There are currently technical limitations to blending hydrogen at significant volumes. The Department of Energy is working to reduce those barriers through the Hyblend Initiative[41]; which aims to address technical barriers to blending hydrogen in natural gas pipelines. Key aspects of the initiative include research and development on materials compatibility, techno-economic analysis, and life cycle analysis that will inform the development of publicly accessible tools that characterize the opportunities, costs, and risks of blending. For carbon capture systems, the technologies are still in the nascent stages. Current programs exist for demonstration and deployment of these technologies, and early scale demonstrations have been completed on coal assets like the Petra Nova project. For TVA to consider deployment (technical and economic) of carbon capture systems, a suitable geological storage site must be identified, evaluated, and permitted. TVA is currently pursuing multiple efforts to identify and evaluate potential storage locations to help inform the feasibility of the carbon capture strategy.

The CC/Aero CT Plant under Alternative A would be capable of burning 5 percent hydrogen at commissioning. Additionally, the CC units would be capable of burning at least 30 percent hydrogen by volume with modification to the balance of the plant once a reliable source was identified. As such, future implementation of hydrogen fuel blending, as this technology becomes viable, could result in carbon reductions by further reducing GHG emissions. Based on discussions with technology vendors who have indicated products with performance guarantees of greater than 90 percent CO2 removal will be available, TVA anticipates the efficiency, effectiveness, scalability, and economics of these systems will improve in the future. These improvements would allow for incorporation of one or more of these technologies when adequate storage locations or pipelines or other technology for CCS is identified to implement CCS and/or the delivery of hydrogen. Additional equipment could be incorporated on Kingston Reservation after those areas are closed and TVA has completed the D4 process on the site. Subsequent TVA IRPs would evaluate new or improved technological developments and consider opportunities to incorporate them into TVA's existing system. If a viable option is identified in the future, TVA would conduct additional analyses to determine proposed pipeline routes, costs, storage requirements, or other needs to facilitate incorporation of hydrogen fuel. Assuming incorporation of CCS and hydrogen fuel blending, the reduction in CO_2 emissions could be well over 90 percent. There would be an approximate similar percent reduction in SC-GHG at the time of implementation of the GHG mitigation. Current estimates of the typical CCS reduction efficiency that may be achieved in the future are at 90 percent (Massachusetts Institute of Technology [MIT] 2021). The GHG reduction achieved from hydrogen fuel blending would depend on the percent of hydrogen fuel used and the method of producing the hydrogen. Note that burning hydrogen instead of natural gas may cause an increase in NO_x emissions compared to just using natural gas.

Overall, adoption of Alternative A would result in a moderate, permanent, beneficial reduction in direct and indirect emissions of GHGs in comparison to the No Action Alternative. If Alternative

[41] Additional information on the Hyblend Initiative is available at [URL]: https://www.energy.gov/eere/fuelcells/hyblend-opportunities-hydrogen-blending-natural-gas-pipelines.

A were to include CCS and/or hydrogen fuel blending at a future date, the emissions reduction benefit could be even higher.

3.7.2.3.1.5 Climate Change Effects on Alternative A

Impacts from climate change, including increases in ambient temperatures, would negatively affect combustion turbine efficiency, although the efficiency drop is estimated at 0.06 percent per degree Celsius rise above 15 degrees Celsius, or 59 degrees Fahrenheit. This could slightly increase the turbine emissions, but that increase is expected to be negligible (approximate 0.09 percent emissions increase) assuming climate change results in an overall 1.5-degree Celsius rise by 2050 (Fernandez et al. 2021). These potential increases in temperature as a result of human induced climate change and the consequential effects on Alternative A would result in a smaller net reduction in GHG emissions effects (approximately 1,515 tons/year more of CO_2e emissions) which is negligible compared to the 1.68 million tons/year of net CO_2e reductions compared to the No Action Alternative. Alternative B does not utilize turbines; therefore, this aspect of climate warming would have no effect on Alternative B.

Another impact of climate change on Alternative A would be increased frequency of heavy precipitation events and flooding. Approximately one-third of the available area where the new CC/Aero CT Plant would reside is within a 100-year floodplain; however, the CC/Aero CT Plant infrastructure would be located outside of the 100-year floodplain, where practicable. Otherwise, flood damageable facilities would be constructed above the 100-year floodplain elevation. The natural gas pipeline under Alternative A crosses the 100-year floodplain of several streams; however, operational effects due to flooding are not expected to be large as the pipeline is buried along its length. The transmission line and component upgrades would cross areas within the 100-year floodplain but conducting wires would be well above floodplain levels and other structures would be built above floodplain levels, where practicable, or other mitigation would be implemented. Operational effects on transmission lines and their components due to flooding are not expected to be large.

Extended drought conditions, should they occur, would not be expected to influence the physical infrastructure or operations under Alternative A. The proposed CC/Aero CT Plant will be air-cooled, thus reducing the need for large volumes of water for cooling and minimizing the risk to operations from drought conditions. However, the plant's location adjacent to the Emory and Clinch rivers is expected to provide adequate water resources should they be needed, even during most expected drought conditions. TVA has developed a Climate Action Adaptation and Resiliency Plan to identify risks associated with and plan for climate change effects (TVA 2021i).

3.7.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The proposed solar facility construction on the Kingston Reservation would generate fugitive dust, particulate emissions, and combustion emissions from fossil fuel burning in construction equipment. These emissions are expected to be temporary, localized, and have very minor effects on air quality and no direct or indirect effect on regional climate change. The operation of the solar facility is not expected to produce any emissions. The use of this solar facility to power on-site equipment is expected to have a minor benefit of reducing TVA's system-wide GHG emissions, as less power generated from the CC/Aero CT Plant would need to be used to power on-site equipment and would be additional power provided instead to the grid.

3.7.2.3.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

The proposed BESS construction on the Kingston Reservation would generate fugitive dust, particulate emissions, and combustion emissions from fossil fuel burning in construction equipment. However, the use of on-site heavy construction equipment for this construction is limited as much of the battery storage units only require assembly and electrical connections once delivered on-site. The construction emissions are expected to be temporary, localized, and have very minor effects on air quality and no direct or indirect effect on regional climate change. The operation of the BESS is not expected to produce any direct emissions. There would be some indirect emissions from power generated on the grid to charge these batteries; however, those emissions are accounted for in the LCAs described later in Section 3.7.2.5.2 and more specifically in tables presented in Appendix J.

3.7.2.3.4 On-site Transmission

Alternative A includes construction activities to connect existing electrical transmission lines to the proposed CC/Aero CT Plant and to upgrade certain on-site and off-site transmission line equipment to accommodate the new plant. The affected area on the Kingston Reservation includes rerouting existing 161-kV transmission lines and re-terminating them into a new 161-kV substation. These activities would generate temporary and minor amounts of fugitive dust from vehicular and equipment travel over paved and unpaved roads. In addition, temporary and minor helicopter and fugitive dust emissions would occur to install the OPGW.

3.7.2.3.5 Off-site Transmission

Under Alternative A, TVA would make improvements to existing transmission lines, five near the Kingston Reservation (L5108, L5116, L5280, L5302, and L5381) and one in Crossville (L5383). Descriptions of these improvements can be found in Section 2.1.3.5.2.

Under Alternative A, TVA would make improvements to existing transmission lines located within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant facilities and switchyard. The off-site affected area consists of approximately 40 miles of transmission line upgrades, reconductoring, or installation of new OPGW along an existing 161-kV transmission line. This includes construction and clearing along unpaved roads to access certain locations for these upgrades. These activities would occur on and adjacent to the Kingston Reservation and in other parts of Anderson, Roane, and Cumberland counties. These activities would generate temporary and minor amounts of fugitive dust from vehicular and equipment travel over paved and unpaved roads. In addition, temporary and minor helicopter and fugitive dust emissions would occur to install the OPGW.

TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent particulate matter from becoming airborne, would apply to minimize fugitive emissions. Fugitive dust control actions would be implemented, including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas.

Highway vehicles, off-road mobile equipment, and helicopters would generate minor amounts of combustion emissions, including particulate matter, CO, NO_x, SO_2, VOCs, and CO_2 from diesel, gasoline, and aviation fuel for internal combustion and turbine engines. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. Additionally, it is expected that all vehicles would be properly maintained, which would also minimize emissions. Helicopters would comply with applicable aircraft or rotary-wing engine emissions standards.

There are typically no operational emissions from the transmission lines and associated electrical equipment. If any electrical equipment contains the GHG sulfur hexafluoride gas (e.g., electrical switchgear, circuit breakers), there is the potential for minor leaks, mostly associated with maintenance or long-term equipment degradation. Through routine preventative maintenance programs, leaking equipment would be identified and remedied or replaced. In addition, due to newer equipment, more efficient operation and maintenance techniques, and leak detection, these features would minimize sulfur hexafluoride emissions.

Overall, these transmission line construction and upgrade activities are expected to have temporary, minor effects on air quality due to temporary increased emissions and no direct or indirect effect on regional or global climate change. The operation of the transmission lines and associated equipment is expected to have permanent, minor effects on air quality due to temporary increased emissions and no direct or indirect effect on regional or global climate change.

3.7.2.3.6 Construction and Operation of Natural Gas Pipeline

Alternative A includes construction and operation of approximately 122 miles of new natural gas pipeline and gas system infrastructure to supply fuel for the CC/Aero CT Plant. Natural gas compression is anticipated to be needed along the pipeline route; however, these compressors would be electric driven. There would be some stationary combustion sources at a main compressor station and metering stations for emergency power (e.g., emergency generators/turbines) power; however, their operational emissions are expected to occur only under extenuating circumstances and to be minor in quantity; estimated at less than 6 tons/year NOx and less than 45 tons/year CO(ETNG 2023j).. Heaters would be installed at various stations along the route; however, it is expected they will be small electric or natural gas-fired and their emissions, if any, would be either below air permitting thresholds or minor permitted sources. As part of their updated FERC Resource Report filings (ETNG 2023b-m), filed in October 2023 (ETNG 2023a) and December 2023 (ETNG 2023n-q), ETNG also conducted air dispersion modeling of non-emergency/non-fugitive sources that have demonstrated no significant impacts to air quality (ETNG 2023j).

Compression at the CC plant site will be needed but it will use electric-driven motors. Any fugitive emission releases of natural gas and its constituents (mainly methane and CO_2) from the pipeline and from compression during operations are expected to be minor compared to CO_2-e emissions from natural gas combustion.

ETNG's Resource Report 9 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). TVA has independently reviewed and conducted a thorough evaluation of ETNG's analysis of potential air quality impacts of the Ridgeline Project. TVA concurs with the air quality-related findings in ETNG's Resource Report 9. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). According to ETNG's Resource Report 9 (ETNG 2023j):

> Construction activities will result in emissions of fugitive dust from vehicular traffic, soil disturbance, and emissions from diesel- and gasoline-fired construction equipment. However, these air quality effects will be temporary and localized and are not expected to independently cause or largely contribute to an emission level that results in a violation of NAAQS. Large earth-moving equipment and other mobile sources are sources of combustion-related emissions, including criteria pollutants (i.e., NO_x, CO, VOC, SO_2, and PM_{10}) and small amounts of HAPs. Air pollutants from

the construction equipment will be limited to the immediate vicinity of the construction area and will be temporary.

[…]

Fugitive dust will result from equipment operations in construction areas and vehicle traffic on paved and unpaved roads and from storage piles. The amount of dust generated will be a function of construction activity, soil type, soil moisture content, wind speed, precipitation, vehicle traffic, vehicle types, and road surface characteristics. Emissions will be greater during dry periods and in areas where fine-textured soils are subject to surface activity. [ETNG] will employ proven construction-related practices to control fugitive dust, such as application of commercially available dust control agents on unpaved areas subject to frequent vehicle traffic, as necessary. Additional measures that may be implemented include imposing a vehicle speed restriction on unpaved roads, routing vehicles and equipment to paved surfaces to the extent practicable and using gravel tracking pads at egress points to remove dirt from tires and tracks. Further, construction equipment will be operated only on an as-needed basis.

Air emissions associated with construction of the [Ridgeline Expansion] project will include emissions from fossil-fueled equipment. Air quality impacts from the [Ridgeline Expansion] project construction will generally be temporary, localized, and insubstantial. Earth-moving equipment and other mobile sources may be powered by diesel or gasoline engines and are sources of combustion-related emissions including NO_x, CO, VOC, SO_2, PM_{10}, $PM_{2.5}$, [GHGs], and small quantities of HAPs. Air emissions from construction equipment will be limited to the immediate vicinity of the construction area and will be temporary.

Construction-related emission estimates are based on typical diesel-fueled construction equipment, hours of operation, and vehicle miles traveled by construction equipment and supporting vehicles for [Ridgeline Expansion] project. The data presented in [Resource Report 9 (ETNG 2023j)] is a conservative estimate based on worst-case assumptions and [USEPA] national average Motor Vehicle Emission Simulator (MOVES3) emission factors for the year 2024 that were assumed to be representative of on-road and off-road emissions. The estimated air emissions from construction will be transient in nature with negligible impact on regional air quality.

It is anticipated that cleared brush and/or tree limbs from the ROW may be burned for disposal. [USEPA's] Compilation of Air Pollutant Emissions Factors (AP-42) Chapter 2.5 and AP-42 Chapter 13.1 were used to calculate the emissions from open burning associated with the Project. Estimated open burning emissions are provided in Table 9.2-8, and detailed calculations are included in Appendix 9C [of Resource Report 9 (ETNG 2023j)].

The [Ridgeline Expansion] project will include construction of a new electric motor driven compressor station, which will also include natural gas-fired emergency turbines to provide redundancy in the event of an interruption of electric power supply. Operational emissions are expected to occur from natural gas combustion from the turbines, natural gas-fired fuel heater, fugitives, venting, and operation of the emergency natural gas-fired engine.

> Air quality impacts from operation of the [pipeline and associated components] will be minimized by the use of equipment, emissions controls, and operating practices that meet or exceed [BMPS]. Measures to minimize air quality impacts include the use of an electric-driven motor for routine compressor station operations, and may include the use of the following emissions control technologies and operational and maintenance activities:
>
> Use of electrohydraulic and air-pneumatic valve actuators instead of gas-hydraulic actuators eliminates natural gas venting to atmosphere from working actuators.
>
> Addition of seal gas vent recompression and reinjection to the piping recovers natural gas that would otherwise be vented to the atmosphere.
>
> Addition of process vent recompression and reinjection to the piping enables the Project to reduce natural gas inventory in the compressor and connected piping prior to blowing down the unit for maintenance and other service, reducing the volume of natural gas vented to the atmosphere during maintenance blowdowns.
>
> Incorporation of a seal gas booster compressor enables the compressor station to maintain a pressurized hold during compressor outages, reducing the frequency of compressor unit blowdowns.
>
> Compliance with federal and state air regulations and state permit requirements will ensure that air quality impacts will be minimized during operation of the [Ridgeline Expansion] project facilities.

Overall, the pipeline construction activities are expected to have temporary, localized, and minor effects on air quality and no direct or indirect effect on regional climate change. Emissions will occur in attainment areas across the entire 122-mile-long pipeline construction ROW where current ambient levels of criteria pollutants are below ambient air quality standards and not expected to appreciably change due to construction and operations activities. The pipeline will traverse Roane County, which is a maintenance area for $PM_{2.5}$; however, the impact to ambient air quality levels due to construction activities are expected to be minor, temporary, and localized. There is no expected impact to ambient air quality levels due to normal pipeline operations.

ETNG has applied for a State Minor Source Construction and Operating Permit for the Hartsville Compressor Station. ETNG would comply with all permit conditions to minimize the potential for pollutants to exceed attainment criteria and TN AAQS as promulgated in Chapter 1200-03-03-.03 of the TN AAQS. TDEC considers existing permits during its review of new permit requests to prevent existing air quality from deteriorating beyond acceptable levels; therefore, cumulative impacts to air quality are not anticipated.

3.7.2.3.7 Summary of Alternative A

TVA Proposed Actions

The construction and operation of the CC/Aero CT Plant for Alternative A is expected to have temporary, localized, and minor effects on air quality and temporary, regional, and minor effects from GHG emissions on climate change. During construction and demolition activities, AIRNOW (USEPA 2023c) would be used to monitor local air quality conditions to inform decisions to reduce or change the timing of construction/demolition activities to avoid or minimize potential construction and demolition effects on air quality.

With the decommissioning and demolition of the KIF coal-fired plant, the operation of the CC/Aero CT Plant is expected to have permanent[42], moderate, beneficial effects on local air quality and reductions in future regional GHG emissions are expected to have permanent, minor, beneficial effects on climate change in comparison to the No Action Alternative; refer to Appendix I and J for the detailed analysis and results. The transmission line construction and upgrade activities are expected to have temporary, minor effects on air quality and no direct or indirect effect on regional climate change.

For Alternative A, the social cost benefit from CO_2 operational emissions reductions is estimated to be between $12 million and $109 million the first year of operation, in nominal dollars, and would increase every year thereafter. On an individual replacement resource basis, the estimated total Alternative A life cycle social costs of GHG emissions ranges from approximately $611 million to $7.77 billion in nominal dollars. These values equate to between approximately $178 million and $2.06 billion in NPV to 2023 dollars.

On a TVA system-wide basis, the estimated total Alternative A life cycle social costs of GHG emissions in comparison to the No Action Alternative, i.e., net savings/benefit, ranges from approximately $398 million to $4.34 billion in nominal dollars. These savings/benefit values equate to between approximately $173 million and $1.85 billion in NPV to 2023 dollars. In comparison to Alternative B, Alternative A has a higher estimated GHG life cycle emissions and associated estimated future social costs. However, other considerations, such as the need for firm, dispatchable power and the need to have this power in place by 2027, would still lead TVA to identify Alternative A as the preferred alternative.

In addition, the CC under Alternative A would be capable of burning 5 percent hydrogen at commissioning. Additionally, the CC units would be capable of burning at least 30 percent hydrogen by volume with modification to the balance of the plant once a reliable source was identified. As such, future implementation of hydrogen fuel blending, as this technology becomes viable, could result in further significant carbon reductions by further reducing GHG emissions. Alternative A operational emissions reductions would also advance TVA progress toward GHG emission reduction thresholds identified in TVA's Strategic Intent and Guiding Principles document.

Lastly, the operational GHG emissions geographic comparison analysis for Alternative A results in a 1.65 percent reduction in TN CO_2 emissions, 0.03 percent reduction in U.S. CO_2 emissions, and 0.005 percent reduction in global CO_2 emissions. These reductions are 1.6 percent less, 0.04 percent less, and 0.005 percent less than TN, U.S., and global reductions, respectively, resulting from Alternative B. Due to the purpose and need of this EIS, TVA has identified Alternative A as the Preferred Alternative.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

The construction of the new natural gas pipeline and associated infrastructure would have temporary, localized, and minor effects on air quality.

Operation of the pipeline system and associated Hartsville Compressor Station would include construction of a new electric motor driven compressor station, which will also include natural gas-fired emergency turbines. Operational emissions are expected to occur from natural gas combustion from the emergency dual-fuel turbines (to be used only when the electric-driven

[42] "Permanent" means for the life of the alternative and likely thereafter as future replacement power generation would have less air emissions.

motor or power to supply it are unavailable), fugitives, venting, and operation of the emergency natural gas fired engine. Since the electric motor driven compressors would be utilized during daily operation, project-specific emissions would be limited. Therefore, operational impacts to air quality would be long term but minor and periodic in nature.

Cumulative Effects

The past, present, and reasonably foreseeable future actions identified within a 10-mile radius of Alternative A are not expected to be at an air quality intensity that would have a cumulative significant or large impact when considering them in conjunction with Alternative A. The rationale for the geographic scope of 10 miles is based on a typical distance, as seen from air dispersion modeling, beyond which criteria air pollutant dispersion is large enough to not have an appreciable impact. The 10-mile radius is intended to apply to criteria pollutants that have ambient air quality standards, whereas GHG cumulative effects are discussed below (refer to Section 3.7.2.5).

There are three past and present actions that are large industrial parks and a proposed future general aviation airport and future smaller industrial park. Each of these sites are six miles or more from the Alternative A property, which indicates there would be significant dispersion of air pollutants between the Alternative A property and these actions. The nature of these industrial parks is such that they are subdivided into multiple uses with the potential for some light to moderate manufacturing, and other commercial uses. There are no other power generation actions or large energy intensive manufacturing/chemical plant actions identified within a 10-mile radius. While there may be minor downwind adverse cumulative impacts from these other actions in combination with Alternative A, they are not expected to be significant.

TVA previously evaluated the potential cumulative adverse environmental effects associated with an expansion in natural gas generation capacity in addition to the proposed coal fleet retirements in the 2019 IRP FEIS. A detailed discussion of the cumulative effects anticipated with a natural gas capacity expansion is provided in TVA’s 2019 IRP FEIS (TVA 2019a). A description of the types of new gas generation evaluated in the IRP analysis is available in Section 5.2.1.4 of the 2019 IRP FEIS. All alternative strategies and the target power supply mix evaluated in the 2019 IRP and IRP EIS would result in significant long-term reductions in total emissions and emission rates of SO2, NOx, and mercury. Details of the analysis and anticipated environmental effects are provided in Section 5.5.1 of the 2019 IRP FEIS (TVA 2019a).

3.7.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to air quality that would occur because of the proposed CC/Aero CT Plant and transmission line activities would be minimized through permitting and monitoring, as described above. These effects would be generally limited to the immediate Kingston vicinity, where fugitive dust and particulate emissions have some but low likelihood of becoming air borne. The census block group which encompasses the Kingston Reservation does contain EJ populations (minority population), and as such, while effects are minor, impacts to these EJ populations may be disproportionate due to their history of health vulnerabilities. Monitoring of air quality conditions during construction and retirement of the KIF coal-fired plant would inform decisions regarding timing of construction/demolition activities and help minimize the effects to EJ populations. The decommissioning and demolition of the KIF coal-fired plant is expected to have beneficial effects on local air quality and reduce future regional GHG emissions that would be positive for EJ populations as well as the general population. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Effects to air quality that would occur because of the proposed natural gas pipeline would also be minimized through permitting and monitoring. The immediate ETNG Construction ROW vicinity, where fugitive dust and particulate emissions have some, but low likelihood of becoming air borne, may result in negligible and widely distributed impacts, though the effects may be disproportionate for certain EJ populations already experiencing cumulative air quality effects.

3.7.2.4 Alternative B

3.7.2.4.1 Construction and Operations of Solar and Energy Storage
Alternative B includes construction and operation of 1,500 MW of solar and 2,200 MW of four-hour battery storage capacity at multiple locations within portions of the East TN region. This would be expected to utilize an average of 7.3 acres per MW of solar capacity based on previous solar construction projects summarized in Table 3.2-1, for a total of 10,950 acres. The solar facilities include ground-mounted photovoltaic panels. The BESS facilities would consist of placing modular battery system containers, power inverters, transformers, and switchgear over concrete slabs. The battery containers are of steel construction, equipped with lithium-ion battery cells contacted together and placed in racks. They would contain an auxiliary system, HVAC system, fire protection system, auxiliary distribution board, and a lighting arrangement. The storage facilities would utilize about 15 acres per 40 MW based on TVA pilot projects, which would result in about 638 acres for 2,200 MW of four-hour battery storage capacity.

3.7.2.4.1.1 Construction Effects
Construction of the solar and storage facilities will include use of on-road construction vehicles/trucks and off-road construction equipment for transporting the solar panels, battery modules, electrical transmission lines, concrete, and supporting mechanical and electrical infrastructure to the construction areas and erecting the facilities. Limited land clearing and grading activities would occur as construction is expected on cropland or heavily disturbed land, where the amount of clearing and grading required to prepare the site is low relative to other land types. This would provide the greatest net benefit of CO_2 emissions reductions vs. clearing forested land or heavily vegetated land. The amount of CO_2 emissions reduced from one acre of solar panels is expected to be greater than one acre of undisturbed forested land (Synapse 2022).

Construction emissions are expected from gasoline and diesel fuel combustion within internal combustion engines for on-road vehicles/trucks and off-road equipment. These engines would generate local emissions of particulate matter, including CO, NO_x, SO_2, VOCs, and CO_2, during their operation. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. Idling minimization procedures would also be in place to reduce emissions. These vehicles and equipment would also comply with the USEPA mobile source regulations in 40 CFR Part 86, Part 1036, and Part 1037 for on-road engines and 40 CFR Part 1039 for non-road engines. The fuel regulations at 40 CFR Part 80 require a maximum sulfur content in diesel fuel of 15 ppm.

Fugitive dust/particulate emissions would be generated during soil excavation and disturbance and truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction area. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor and widely distributed over the multiple facility sites. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne. In addition, dust control actions, including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas, would be implemented to reduce fugitive dust/particulate emissions.

Overall, the solar and storage facility construction activities are expected to have temporary, localized, and minor effects on air quality and no direct or indirect effect on regional climate change. Emissions are expected to occur in attainment areas across the East TN region where current ambient levels of criteria pollutants are below ambient air quality standards and are not expected to appreciably change due to construction activities.

3.7.2.4.1.2 Operations Effects

Operation of the solar and storage facilities are not expected to produce any emissions. There may be some heating requirements for some of the ancillary structures or the battery system structures; however, the heaters are expected to have no emissions, as they would be electric. The solar and storage facilities are not expected to require emergency generators or other stationary internal combustion engines for emergency or non-emergency purposes. If some electrical equipment contains the GHG sulfur hexafluoride gas, which has an extremely high global warming potential, there is the potential for minor leaks, mostly associated with maintenance or long-term equipment degradation. Minimal equipment is anticipated to contain sulfur hexafluoride and the potential for leaks would be exceedingly small, estimated at less than 0.14 percent of nameplate capacity per year based on the emission factor in the Intergovernmental Panel on Climate Change (IPCC) GHG Emissions Factor database (for high-voltage switchgear) for use of electrical equipment in the U.S. This emission factor is based on technologies and practices in place in 1995 (IPCC 2006). Therefore, due to newer equipment, more efficient operation and maintenance techniques, and leak detection, these features would further minimize sulfur hexafluoride emissions.

The solar and storage facility operations are expected to have permanent, moderate, beneficial effects on air quality in comparison to the No Action Alternative. The decrease in SO_2, NO_x, CO, PM, PM_{10}, $PM_{2.5}$, and VOC operational emissions at the KIF facility are estimated at approximately 1,374 tons/year of SO_2, 1,038 tons/year of NO_x, 382 tons/year of CO, 185 tons/year of PM, 328 tons/year of PM_{10}, 266 tons/year of $PM_{2.5}$, and 45 tons/year of VOC; see Table 3.7-3 and Appendix I for these calculations). There would also be elimination of hydrogen fluoride, and hydrogen chloride emissions, mercury, and lead emissions, along with other HAP emissions. The detailed emissions calculations are provided in Appendix I.

The solar and storage facilities are not expected to require an air construction or operating permit for stationary sources of emissions.

3.7.2.4.1.3 GHG Effects from Direct Emissions

As shown in Table 3.7-3, the estimated decrease in CO_2-e operational emissions at the KIF facility from implementation of Alternative B would be 3,403,333 tons in the first full year when all solar and storage facilities would begin operation (anticipated in 2028).[43] It was assumed that commercial operation would begin approximately June 2027 with final acceptance in December 2027. The maximum annual CO_2-e emissions reductions would begin in 2028. Similar annual

[43] Using the USEPA GHG equivalency calculator, this net reduction in CO_2-e would equate to reducing GHG emissions from 687,051 gasoline-powered passenger vehicles driven for one year or reducing the electricity use for one year for 600,740 homes.

reductions in CO_2-e operational emissions would be experienced from that point forward. The percentage net reduction in actual operational CO_2-e emissions due to Alternative B would be 100 percent by 2030, exceeding the Biden Administration's goal of a 65 percent reduction in Scope 1 GHG emissions by 2030 from a 2008 baseline.[44] These operational emissions reductions would also advance TVA progress toward GHG emission reduction thresholds identified in TVA's Strategic Intent and Guiding Principles document. (TVA 2021h). However, new solar facilities and the associated transmission upgrades could not be built and operational within the modeled period; and would require additional time for completion of permitting, design, and construction phases. These facilities also do not meet the purpose and need to have firm, dispatchable generation in place by the end of 2027 when the Kington coal units are retired.

Under an operational GHG emissions geographic comparison analysis, the estimated net decrease in emissions of approximately 3.1 million metric tons of CO_2/year associated with implementation of Alternative B would represent approximately 3.2 percent of total statewide emissions in 2018, approximately 0.07 percent of the total U.S. emissions in 2020, and 0.01 percent of the total global GHG emissions for 2020 (see Appendix I for these calculations). As such, the operation of Alternative B would represent a benefit to climate change, particularly from TN's contribution to GHG emissions reductions.

Using the Biden administration's 2021 SCC dollar per metric ton values, adjusted for inflation, the estimated annual net social benefit of CO_2 operational emissions reductions from implementing Alternative B would be $216,044,636 in 2028 for direct CO_2 effects in comparison to the No Action Alternative. Table 3.7-4. provides the Biden Administration's net social benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2028, when full year operations would begin. Using the prior Administration's 2019 SCC dollar per metric ton values, adjusted for inflation, the estimated annual net social benefit of carbon emissions reductions from implementing Alternative B would be $23,706,667 in 2028 for direct CO_2 effects in comparison to the No Action Alternative. Table 3.7-5 provides the prior Administration's net social benefit, in dollars, of direct effect CO_2 operational emissions reductions for each alternative in 2028, when full year operations would begin. Beyond 2028 and at least through 2050, the net social benefit of CO_2 operational emissions reductions would increase year over year based on the increase in SCC rates ($/ton) between 2020 and 2050.

3.7.2.4.1.4 GHG Effects from Direct and Indirect Emissions – Life Cycle Analyses

Two GHG LCAs were conducted for estimating future direct and indirect GHG emissions and associated social costs from implementing Alternative B. More detailed methodology and results for these analyses is provided in Appendix J. The first LCA is on an individual replacement resource by alternative basis and the second is on a TVA system-wide portfolio basis with simulated system-wide generation dispatch. The Alternative B individual LCA is described below and includes all upstream (e.g., raw material acquisition and components manufacturing and Alternative B construction activities) and downstream (e.g., future demolition/decommissioning at end of life) GHG emissions. The system-wide LCA for Alternative B is presented in Section 3.7.2.5 and provides the Alternative B LCA emissions and SC-GHG savings compared to the No Action Alternative. The NPV of these savings and their percent reduction compared to the No Action Alternative is also presented in Section 3.7.2.5.

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[44] As stated in Section 3.7.1.1.8.4, this GHG 65 percent reduction goal by 2030 is not applicable to "non-standard" federal operations including generation of electric power produced and sold commercially to other parties, as is the case for TVA power generation.

Estimated emissions of the three main GHG pollutants (CO2, CH4, and N2O) were calculated over the entire life cycle of Alternative B broken down into four main life cycle segments: upstream; on-site ongoing combustion; ongoing non-combustion; and downstream. The activities under each segment are described in Appendix J. The operational life cycle of Alternative B was modeled over 20 years based on the capability of the modeling software; however, emissions and associated social costs were prorated to 30 years to provide a consistent comparison to the other alternatives. The resulting estimated life cycle emissions of each of the three GHGs were used to calculate the social cost of each GHG individually and the total SC-GHGs. In the same manner as for GHG Effects from Direct Emissions above, the SC-GHGs were calculated using a range of GHG social cost rates.

In summary, the Alternative B estimated individual life cycle analysis emissions of each GHG and their corresponding estimated future social costs are provided in Table 3.7-8 and Table 3.7-9. Table 3.7-8 provides the results using the Biden Administration social cost values and Table 3.7-9 provides the results using the prior Administration social cost values. Both tables also provide a NPV of the total life cycle SC-GHG for Alternative B. In comparison to Alternative A, Alternative B's estimated CO_2-e life cycle emissions and associated costs, in nominal dollars, are less than Alternative A. In comparison to the No Action Alternative, Alternative B has an estimated 92 percent decrease in life cycle CO_2-e emissions and 93 to 94 percent decrease in associated estimated future social costs, in nominal dollars. The total estimated individual life cycle SC-GHG for each alternative under Biden Administration values are: $11.8 billion – No Action Alternative; $7.7 billion – Alternative A; and $0.67 billion – Alternative B. The total estimated life cycle SC-GHG for each alternative under prior Administration values are: $937.5 million – No Action Alternative; $610.8 million – Alternative A; and $65.2 million – Alternative B. It is important to note that these GHG individual LCA emissions and SC-GHG are only an individual site-based analysis and do not consider how the whole TVA system or the entire electricity grid would operate and emit under Alternative B. Therefore, the GHG emissions and social cost benefits of Alternative B are conservatively estimated in this LCA.

Table 3.7-8. Alternative B - Estimated Life Cycle GHG Emissions and Associated Social Costs (Biden Administration Values, 3% Discount Rate)

Total Life Cycle CO_2 Emissions, tons	Total Life Cycle CH_4 Emissions, tons	Total Life Cycle N_2O Emissions, tons	Total Life Cycle CO_2-e Emissions, tons	Total Life Cycle Social Cost of CO_2 Emissions, $	Total Life Cycle Social Cost of CH_4 Emissions, $	Total Life Cycle Social Cost of N_2O Emissions, $	Total Life Cycle Social Cost of GHGs Emissions, Nominal $	NPV[1] of Total Life Cycle Social Costs of GHG Emissions, 2023 $
8,377,395	30	0.3	8,378,233	$672,814,717	$80,440	$8,413	$'672,903,570	$347,159,198

[1]NPV = Net Present Value

Table 3.7-9. Alternative B - Estimated Life Cycle GHG Emissions and Associated Social Costs (Prior Administration Values, 3% Discount Rate)

Total Life Cycle CO_2 Emissions, tons	Total Life Cycle CH_4 Emissions, tons	Total Life Cycle N_2O Emissions, tons	Total Life Cycle CO_2-e Emissions, tons	Total Life Cycle Social Cost of CO_2 Emissions, $	Total Life Cycle Social Cost of CH_4 Emissions, $	Total Life Cycle Social Cost of N_2O Emissions, $	Total Life Cycle Social Cost of GHGs Emissions, Nominal $	NPV[1] of Total Life Cycle Social Costs of GHG Emissions, 2023 $
8,377,395	30	0.3	8,378,233	$65,226,659	$6,997	$650	$65,234,307	$37,933,466

[1]NPV = Net Present Value

3.7.2.4.1.5 Climate Change Effects on Alternative B

Impacts from climate change, including increases in flooding events and severity, are not expected to have an effect on the physical infrastructure or operations for Alternative B. Solar/storage facilities would be located to avoid 100-year flood plains, where practicable, or constructed at least one foot above the 100-year flood elevation for components that are flood-damageable. Refer to the flood mitigation measures for Alternative B provided in Section 2.3 of this EIS.

Extended drought conditions, should they occur, are not expected to affect the physical infrastructure or operations of the solar and storage facilities as they have minimal water requirements. Increases in ambient temperatures and extended heat waves would reduce the efficiency of PV facilities and the amount of electricity they generate. Similarly, extended heat waves would reduce the efficiency of storage facilities by increasing their cooling system energy requirements. TVA has developed a Climate Action Adaptation and Resiliency Plan to identify risks associated with and plan for climate change effects (TVA 2021i).

3.7.2.4.2 Transmission and Other Components

Alternative B includes construction activities to connect existing electrical transmission lines to the multiple solar and battery storage facilities and to upgrade local transmission line equipment to accommodate the new facilities. These activities would occur within portions of East TN and are assumed to occur in attainment areas. Based on past TVA solar projects, new transmission interconnection lines to each solar and storage facility are expected to be short and the new lines and other transmission system upgrades would occupy limited acreage.

Fugitive dust/particulate emissions would be generated during soil disturbance activities and vehicle/truck traffic over paved and unpaved roads/areas. The largest fraction of fugitive dust emissions would be deposited in the immediate vicinity of the construction area. The smaller particulates would travel a little farther from the immediate construction area; however, those emissions are expected to be minor and widely distributed over the entire East TN area. TVA and its contractors would comply with TDEC Air Pollution Control Rule 1200-3-8, which requires reasonable precautions to prevent PM from becoming airborne. In addition, dust control actions, including application of wetting agents or soil stabilization products on exposed soils and unpaved roads/travel areas, would be implemented to reduce fugitive dust/particulate emissions.

Highway vehicles and off-road construction equipment (e.g., bulldozers, backhoes, bucket trucks, boom trucks, forklifts, trenching equipment) would generate minor amounts of combustion emissions including particulate matter, such as CO, NO_x, SO_2, VOCs, and CO_2 from diesel and gasoline fueled internal combustion engines. These emissions would be widely distributed over the entire East TN area. New emission control technologies and fuel mixtures have significantly reduced vehicle and construction equipment emissions. These vehicles and equipment would comply with the USEPA mobile source regulations in 40 CFR Part 85 for on-road engines and 40 CFR Part 1039 for non-road engines. These regulations include requiring a maximum sulfur content in diesel fuel of 15 ppm. Additionally, it is expected that all vehicles would be properly maintained, which would also reduce emissions.

There are typically no operational emissions from the transmission lines and associated electrical equipment. If some electrical equipment contains the GHG sulfur hexafluoride gas (e.g., electrical switchgear, circuit breakers), there is the potential for minor leaks, mostly associated with maintenance or long-term equipment degradation. Through routine preventative maintenance programs, leaking equipment would be identified and remedied or replaced. In addition, due to newer equipment, more efficient operation and maintenance techniques, and leak detection, these features would minimize sulfur hexafluoride emissions.

Overall, these transmission line construction and upgrade activities are expected to have temporary, minor effects on air quality and no direct or indirect effect on regional climate change. Construction emissions are expected to occur in attainment areas across the East TN area where current ambient levels of criteria pollutants are below ambient air quality standards and are not expected to appreciably change due to construction activities. The operation of the solar and battery storage transmission lines and associated equipment would not generate any continuous emissions. Their operation is expected to have permanent, minor, or negligible effects on air quality and no direct or indirect effect on regional climate change.

3.7.2.4.3 Summary of Alternative B

The construction of multiple solar (assuming fifteen 100-MW sites) and battery storage systems over large areas of East TN is expected to have temporary, localized, and minor effects on air quality. During construction, AIRNOW (USEPA 2023c) would be used to monitor local air quality conditions to inform decisions to reduce or change the timing of construction/demolition activities to avoid or minimize potential construction and demolition effects on air quality. This construction is expected to have temporary, regional, and minor effects from GHG emissions on climate change. The operation of the solar/battery storage systems is expected to have permanent, moderate, beneficial effects on local air quality and reductions in future regional GHG emissions are expected to have permanent, moderate, beneficial effects on climate change in comparison to the No Action Alternative.

For Alternative B, the social cost benefit from CO_2 operational emissions reductions is estimated to be between \$23.7 million and \$216 million dollars the first year of operation, in nominal dollars, and would increase every year thereafter. On an individual replacement resource basis, the estimated total Alternative B life cycle SC-GHG emissions ranges from approximately \$65.2 million to \$0.67 billion in nominal dollars. These values equate to between approximately \$37.9 million and \$347.2 million in NPV to 2023 dollars. On a TVA system-wide basis, the estimated total Alternative B life cycle SC-GHG emissions savings in comparison to the No Action Alternative, i.e., net savings/benefit, ranges from approximately \$490.2 million to \$5.4 billion in nominal dollars. These savings/benefit values equate to between approximately \$209.7 million and \$2.26 billion in NPV to 2023 dollars. In comparison to Alternative A on an individual replacement resource basis, Alternative B has the lower GHG life cycle emissions and associated estimated future social costs in nominal dollars. As stated previously, this individual replacement resource basis analysis is overstating the actual benefit of Alternative B compared to Alternative A and to the No Action Alternative because it is not considering emissions from the entire TVA system (e.g., grid power generated to charge the Alternative B batteries). This same comparison on a TVA system-wide basis results in Alternative B with the highest total life cycle social cost savings/benefit in comparison to the No Action Alternative but Alternative A and B are closer in comparison regarding SC-GHG savings/benefits.

Lastly, the operational GHG emissions geographic comparison analysis for Alternative B results in a 3.24 percent reduction in TN CO_2 emissions, 0.07 percent reduction in U.S. CO_2 emissions, and 0.01 percent reduction in global CO_2 emissions. These reductions are 1.67 percent more, 0.04 percent more, and 0.005 percent more than TN, U.S., and global reductions, respectively, resulting from Alternative A.

3.7.2.4.4 Environmental Justice Considerations

Solar and storage facility construction activities are expected to have temporary and moderate effects on air quality, based on analyses of previously installed solar facilities as discussed in Section 3.7.2.3.2.The solar and storage facility operations are expected to have long-term, moderate, beneficial effects on air quality and on regional climate change. F Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.7.2.5 Cumulative GHG Effects Based on TVA System-Wide GHG LCA with Comparison Relative to the No Action Alternative

3.7.2.5.1 TVA System-Wide Production Model

An analysis for the entire TVA-wide power system was performed using industry standard capacity planning and production cost models, Anchor Power Solution's EnCompass (Anchor Power Solutions 2023) and Energy Exemplar's Aurora (Energy Exemplar 2023). The capacity planning model develops a least-cost portfolio to meet demand and reserve margin while the production cost model simulates economic dispatch of the plan. The output includes an estimate of anticipated future emissions across the entire TVA system for each year. Section 5.5.2 of the 2019 IRP EIS provides a summary of the anticipated cumulative climate and GHG effects of the generation scenarios evaluated by TVA for the 2019 IRP (TVA 2019a). Additionally, this section of this EIS provides a cumulative GHG life-cycle impacts analysis covering all TVA power generating assets, including reasonably foreseeable future planned assets.

TVA's current and reasonably foreseeable future natural gas plant projects have been included in this analysis, including the proposed new Cumberland, Cheatham, and Kingston Gas Plants. TVA's proposed Allen Combustion Turbine Plant and New Caledonia Natural Gas Plant are not included since the Notice of Intent for these projects were issued in October and November 2023; respectively.

Model results represent TVA's current forecast for electric load, asset performance, and commodity prices, among other things. Differences in any of these forecasts could result in higher or lower anticipated carbon emissions. Model results also represent TVA's commitment to reliably meet electric load at the lowest possible dispatch cost (in alignment with Section 113 of the Energy Policy Act of 1992), currently without a penalty applied to unit carbon emissions. Future regulatory requirements or incentives would likely result in lower emissions than these estimates, depending on those requirements and TVA's fleet composition at the time. The differences between each alternative are specific to the decision to retire or not retire Kingston Fossil Plant and the associated replacement generation outlined in each alternative. Each alternative has subsequent impacts for other decisions in the future. Given this, there will be variations in simulated dispatch, which will result in differences in emissions, driven by the dynamic nature of power system modeling. The additional natural gas-fired generating capacity included in Alternative A would not preclude higher levels of solar additions beyond the currently targeted10,000 MW by 2035. A regulatory environment that places limits on carbon emissions, or carbon-emitting generation is likely to make renewable resources more economically viable over the long term, even if higher volumes of renewable resources result in temporary curtailments of wind or solar resources (i.e., reduction of power output below what the resource could have otherwise produced) to match demand during periods of low electric load. However, the need for firm, dispatchable generation, such as natural gas-fired generation, to backfill intermittent renewable resources will remain.

3.7.2.5.2 TVA System-Wide GHG LCA and SC-GHGs

Similar to the manner in which the SC-GHG analysis is presented for an individual replacement resource by alternative basis, it is more accurate to prepare a TVA system-wide life cycle analysis to compare the alternatives studied in this EIS. The system-wide view provides critical context to how the specific resource retirements and replacements, underpinning the assumptions of each of the proposed Action Alternatives, integrates into the system overall. The TVA system-wide life cycle analysis reflects TVA's broader asset strategy and target power supply mix set by the 2019 IRP (TVA 2019a). A TVA system-wide comparison of emissions is the most effective way to accurately identify incremental emission differences between the alternatives because it illustrates how the entire TVA system is expected to operate with each alternative.

The replacement generation assets proposed in each of the action alternatives serve fundamentally different roles in the context of the larger TVA system in cost-effectively meeting electric load requirements. The CC plant proposed in Alternative A would be one of the most fuel-efficient CC plants in TVA's system and, as such, is likely to be dispatched frequently in baseload or intermediate operations in the near term to reduce total system costs for TVA ratepayers. The simple cycle Aero CT plant in Alternative A would be among the most efficient peaking units in TVA's system; however, they would almost always be dispatched after all existing CC, nuclear, and coal units manage baseload and intermediate operations. Dispatch order is based on least-cost dispatch, where less expensive variable cost generators are put into service generally before more expensive ones to create the lowest possible average cost of electricity at that time. Hydropower, nuclear, and many other CC gas generators, due to gas transport costs, would be dispatched before Kingston unless needed for local transmission support. It is anticipated that the Kingston units would have less than full utilization across the year, but this is a dynamic process depending on many factors including outages, fuel cost, and loads.

The CT plants would then be used for peaking operations, which refers to units only used for more limited durations during periods of high electric load. The solar and storage proposed in Alternative B would generate and dispatch in yet another, completely different manner. The solar resources are intermittent in nature and only available during daylight hours and are also affected by cloud cover. While the battery storage is fully dispatchable, it is energy limited (i.e., only able to store up to four hours per day of energy at full output). TVA would seek to optimize the use of these solar and storage resources; however, there would be some hours of operation where neither of these resources would be available and therefore TVA would be forced to rely on the existing fleet of nuclear, hydro, coal, and gas units to meet generation needs. Only a full system-wide comparison of the alternatives will accurately account for these differences.

The results of the system-wide life cycle analysis for each alternative are presented in Table 3.7-10 and Table 3.7-11 below. Each action alternative is compared against the No Action Alternative to illustrate SC-GHG – CO_2, CH_4, and N_2O. The costs are presented utilizing both the Biden Administration 2020 SCC rate of $51 per metric ton at a 3 percent discount rate, which incorporates global effects (IWG 2021) and is consistent with EO 13990, and the prior Administration 2020 SCC rate of $7 per metric ton at a 3 percent discount rate (addressing domestic effects) to provide an illustration of the uncertainty that exists in these costs and to demonstrate costs at multiple spatial scales. Compared to the No Action Alternative, Alternative B generates the most cost savings followed by Alternative A. Based on Biden administration values and on an NPV basis presented in 2023 dollars, the analysis reflects about $2.26 billion of savings for Alternative B relative to the No Action Alternative. Alternative A reflects about $1.85 billion of savings relative to the No Action Alternative, and about $417 million less savings than Alternative B. CO_2 is the most impactful greenhouse gas in the analysis representing about 95 percent of total cost savings presented by each action alternative compared to the No Action Alternative. Notwithstanding the lower savings ($417 million) from Alternative A as compared to the No Action Alternative, other considerations, such as the need to have firm, dispatchable power in place by 2027, would still lead TVA to identify Alternative A as the preferred alternative. More details regarding TVA's system-wide GHG LCA with emissions and associated social cost calculations are provided in Appendix J.

Table 3.7-10. TVA System-Wide Estimated Social Cost of Life Cycle GHG Emissions for Action Alternatives Compared to the No Action Alternative, by Life Cycle Phase (Current Administration)

Proposed Action Alternatives	One-Time Upstream (Nominal $)	Ongoing Combustion (Nominal $)	Ongoing Non-Combustion (Nominal $)	Methane Leakage (Nominal $)	One-Time Downstream (Nominal $)	Total (Nominal $)	NPV (2023 $)
Alternative A							
CO_2	15,666,764	(4,624,055,776)	364,123,337	NA	3,511,292	(4,240,754,383)	(1,802,190,836)
CH_4	1,721	4	(16,030)	482	467	(13,356)	(5,265)
N2O	2,304	0	(102,907,889)	NA	46	(102,905,539)	(43,842,444)
Alternative A Total	**15,670,789**	**(4,624,055,772)**	**261,199,417**	**482**	**3,511,806**	**(4,343,673,278)**	**(1,846,038,545)**
Alternative B							
CO_2	392,794,945	(5,881,551,155)	141,519,580	NA	128,825,328	(5,218,411,302)	(2,200,857,688)
CH_4	43,145	1	(48,254,472)	410	20,899	(48,190,017)	(20,151,021)
N2O	118	0	(101,118,255)	NA	1,788	(101,116,349)	(42,603,373)
Alternative B Total	**392,838,208**	**(5,881,551,153)**	**(7,853,146)**	**410**	**128,848,014**	**(5,367,717,668)**	**(2,263,612,082)**

Table 3.7-11. TVA System-Wide Estimated Social Cost of Life Cycle GHG Emissions for Action Alternatives Compared to the No Action Alternative, by Life Cycle Phase (Prior Administration)

Proposed Action Alternatives	One-Time Upstream (Nominal $)	Ongoing Combustion (Nominal $)	Ongoing Non-Combustion (Nominal $)	Methane Leakage (Nominal $)	One-Time Downstream (Nominal $)	Total (Nominal $)	NPV (2023 $)
Alternative A							
CO_2	1,783,223	(426,150,142)	33,531,434	NA	242,569	(390,592,916)	(169,949,327)
CH_4	187	0	(1,410)	42	26	(1,155)	(454)
N_2O	219	0	(7,499,582)	NA	2	(7,499,360)	(3,300,577)
Alternative A Total	**1,783,629**	**(426,150,141)**	**26,030,441**	**42**	**242,598**	**(398,093,431)**	**(173,250,357)**
Alternative B							
CO_2	44,708,728	(544,551,635)	12,408,938	NA	8,889,588	(465,958,550)	(204,669,903)
CH_4	4,687	0	(4,353,253)	34	1,178	(4,316,299)	(1,870,568)
N_2O	17	0	(7,338,103)	NA	91	(7,333,242)	(3,191,084)
Alternative B Total	**44,713,431**	**(544,551,635)**	**(717,581)**	**34**	**8,900,857**	**(477,608,091)**	**(209,731,556)**

3.8 Biological Environment

3.8.1 Vegetation

Vegetation in the form of trees, shrubs, vines, and herbaceous cover provides habitat and food resources for birds, mammals, reptiles, amphibians, and insects. Vegetation also supports soil and nutrient cycles and provides ecosystem services, such as food, fresh water, fuel, fiber, and medicines to human populations (Michigan State University, n.d.). The federal Plant Protection Act of 2000 consolidated previous legislation and authorized the U.S. Department of Agriculture (USDA) to issue regulations to prevent the introduction and movement of identified plant pests and noxious weeds. EO 13112—Invasive Species directs 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—Safeguarding the Nation from the Effects of Invasive Species amends EO 13112 and directs federal agencies to continue coordinated federal prevention and control efforts related to invasive species. Agencies are also directed to incorporate consideration of human and environmental health, climate change, technological innovation, and other emerging priorities into their efforts to address invasive species (USDA 2018a).

3.8.1.1 Affected Environment

3.8.1.1.1 Kingston Reservation (No Action and D4 Activities)

The Kingston Reservation and surrounding areas are located within the Southern Limestone/Dolomite Valleys and the Rolling Hills Ecoregion, a subdivision of the Ridge and Valley Ecoregion (Griffith et al. 1997). The Ridge and Valley Ecoregion occurs between the Blue Ridge Mountains to the east and the Cumberland Plateau to the west and is a relatively low-lying region made up of roughly parallel ridges and valleys that were formed through extreme folding and faulting events in the past. The Southern Limestone/Dolomite Valleys and the Rolling Hills Ecoregion is a heterogeneous subregion composed predominantly of limestone and cherty dolomite. Landforms are mostly undulating valleys and rounded ridges and hills, with many caves and springs. Soils vary in productivity and land cover types include oak-hickory and oak-pine forests, pastures, intensive agriculture, and urban and industrial areas.

Comprehensive environmental surveys including an assessment of vegetation communities were completed on the Kingston Reservation during the summer of 2019 (Appendix F) and updated using desktop information (recent aerial imagery) in 2023. Vegetative communities on and around the Kingston Reservation are largely a function of the land use history of the site which has been heavily disturbed by the construction, operation, and maintenance of the generation and transmission infrastructure present (Appendix F). In general, the most heavily disturbed and degraded habitats are currently covered with herbaceous vegetation, early successional plant habitats, and scattered areas of forest.

Based on the 2019 field surveys and interpretation of recent (2022) aerial imagery, 10 vegetation communities are present on the Kingston Reservation (Figure 3.8-1 and Table 3.8-1). Most of these areas consist of herbaceous vegetation dominated by non-native plant species that possesses little conservation value and have no potential to support state or federally listed plant species or unique plant communities (Appendix F). Some areas of herbaceous vegetation, principally along existing transmission line ROWs, contain significant populations of native plants but constitute marginally intact habitat. Most herbaceous communities and existing ROWs are populated with non-native and invasive species such as tall fescue (*Schedonorus arundinaceus*), sericea lespedeza (*Lespedeza* *cuneata*), brome grasses (*Bromus* spp.), clovers (*Trifolium* spp.), autumn olive (*Elaeagnus umbellata*), and Johnson grass (*Sorghum halepense*). Native plants in ROW areas, although less abundant than non-native species, include dogbane (*Apocynum* spp.), common milkweed (*Asclepias syriaca*), blackberry (*Rubus* spp.), yellow wingstem (*Verbesina alternifolia*), white wingstem (*V. virginica*), and poverty oatgrass (*Danthonia spicata*). Several of the forested tracts on the Kingston Reservation contain overstory trees, a shrub layer of invasive Chinese privet (*Ligustrum sinense*), and minimal herbaceous layer in the understory. Ruderal areas consisted of sparse, weedy species colonizing highly disturbed areas, such as ash disposal areas. Manicured lawns were identified as areas maintained and regularly mowed.

Herbaceous habitats represent areas with herbaceous vegetation that includes greater coverage than ruderal areas and are not mowed like manicured lawn. Overstory vegetation in deciduous forested areas comprise common species such as sweetgum (*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), black cherry (*Prunus serotina*), red maple (*Acer rubrum*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), white oak (*Quercus alba*), hickories (*Carya* spp.), and basswood (*Tilia americana*), sometimes with a shrub layer containing Eastern redbud (*Cercis canadensis*), dogwood (*Cornus* spp.), and pawpaw (*Asimina triloba*). Mixed evergreen/deciduous forest on-site also contain loblolly pine (*Pinus taeda*), and sugarberry (*Celtis laevigata*), as well as invasives such as tree-of-heaven (*Ailanthus altissima*), Japanese stiltgrass (*Microstegium vimineum*), and multiflora rose (*Rosa multiflora*). Forested areas on Kingston Reservation are heavily fragmented, degraded by non-native species infestations, and contain small-diameter trees indicative of previous site disturbances. A small amount of herbaceous and forested wetlands (see Section 3.6.3 for additional information on wetlands) have been identified on Kingston Reservation and, like other vegetated habitats, are generally considered highly disturbed.

Approximately half of the land within the demolition boundary is developed/industrial; of the vegetated areas, mixed and deciduous forest comprise 59.6 acres, followed by more disturbed habitat types such as manicured lawn, ruderal, and early successional areas totaling 58.0 acres (Table 3.8-1).

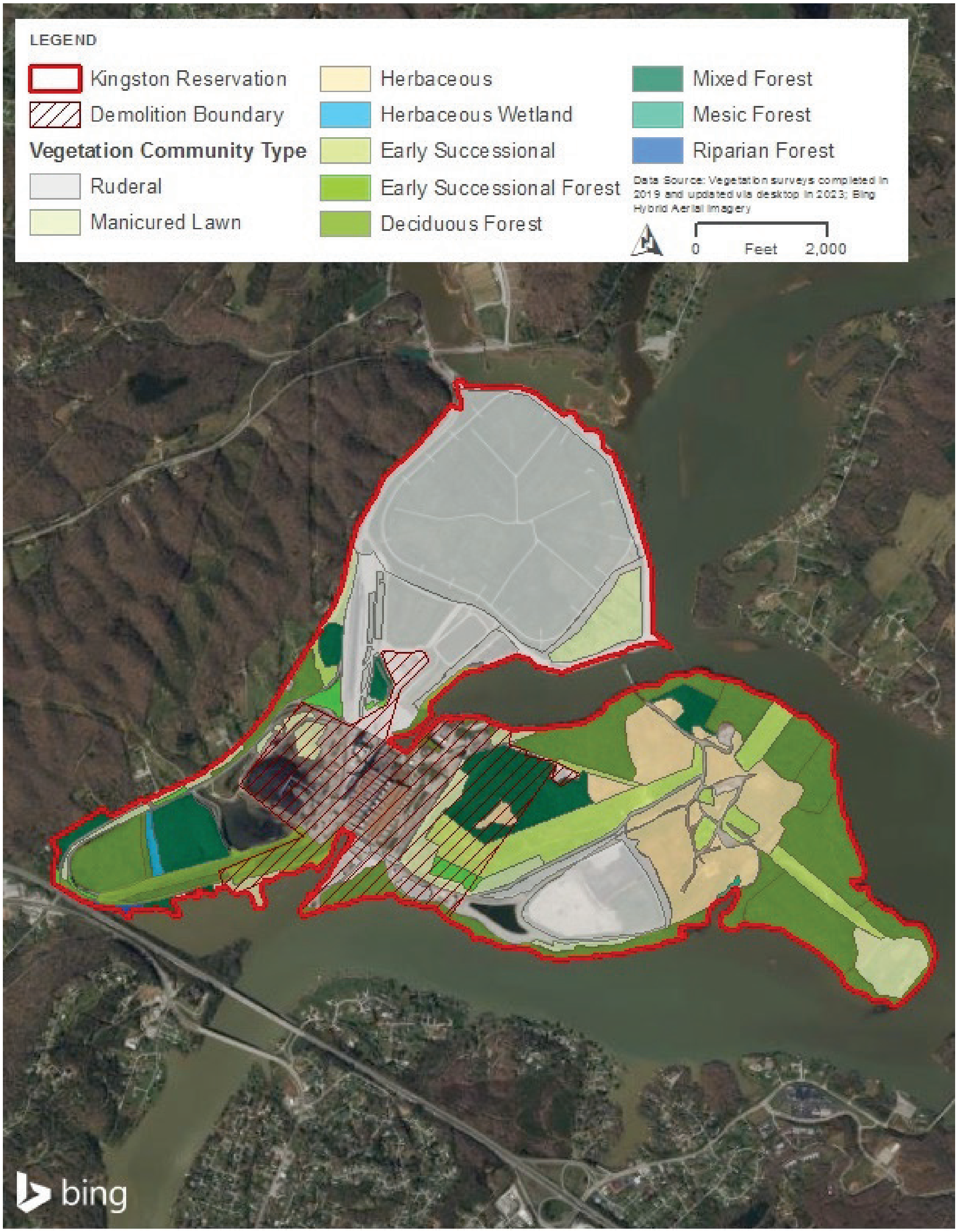

Figure 3.8-1. Vegetation Communities Observed on the Kingston Reservation

Table 3.8-1. Summary of Vegetation Communities Present on Kingston Reservation

Vegetation Community	Kingston Reservation: Total Vegetated Area (acres)	Kingston Reservation: Percent of Vegetated Area	D4 Boundary Area (acres)
Ruderal	440.1	41.4	22.0
Deciduous Forest	244.8	23.0	28.8
Herbaceous	103.6	9.8	3.1
Mixed Forest	90.0	8.5	30.8
Manicured Lawn	89.5	8.4	23.9
Early Successional	79.4	7.5	12.1
Early Successional Forest	10.3	1.0	3.8
Herbaceous Wetland	3.0	0.3	0.0
Riparian Forest	1.8	0.2	0.0
Mesic Forest	0.9	0.1	0.0
Total[1]	**1,063.4**	**100**	**124.5**

[1]Total acreage and percent may vary slightly due to rounding.

3.8.1.1.1.1 Invasive Plant Species

No federal-noxious weeds (as listed by the USDA) were observed within the Kingston Reservation, but several non-native invasive plant species characterized by the TN Invasive Plant Council as ‘Established Threats’ (i.e., those the TN Invasive Plant Council perceives to be archetypical invasive weeds known to every land manager as well as having broad distributions through TN) were observed in both herbaceous and forested habitats on Kingston Reservation (Appendix F; TIPC 2022; USDA 2023). Species observed on the Kingston Reservation that are considered ‘Established Threats’ include autumn olive, Chinese privet, Japanese honeysuckle (*Lonicera japonica*), Japanese stiltgrass, Johnson grass, kudzu (*Pueraria montana*), multiflora rose, sericea lespedeza, and tree-of-heaven.

3.8.1.1.2 Alternative A

3.8.1.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The proposed CC/Aero CT Plant site consists primarily of heavily disturbed herbaceous, ruderal, or early successional vegetative plant communities (45.3 acres, 90.9 percent of total vegetated area) Table 3.8-2. The remaining vegetation consists of deciduous forest and mesic forest and represents less than 10 percent of the total vegetated area at the CC/Aero CT Plant site (Table 3.8-2). Similarly, the majority of the switchyard also consists of disturbed herbaceous vegetation cover (8.2 acres, 96.5 percent), with the remaining vegetated area consisting of deciduous forested area (0.3-acre, 3.5 percent). Previous permitted land disturbing activities have occurred in this area since the 2019 survey; therefore, parts of the primary herbaceous area presented in Figure 3.8-2 may more recently represent ruderal or barren conditions. The proposed parking/laydown area was previously permitted and utilized for other purposes and has been maintained as pastureland or hay/grasslands (8.2 acres, 100 percent).

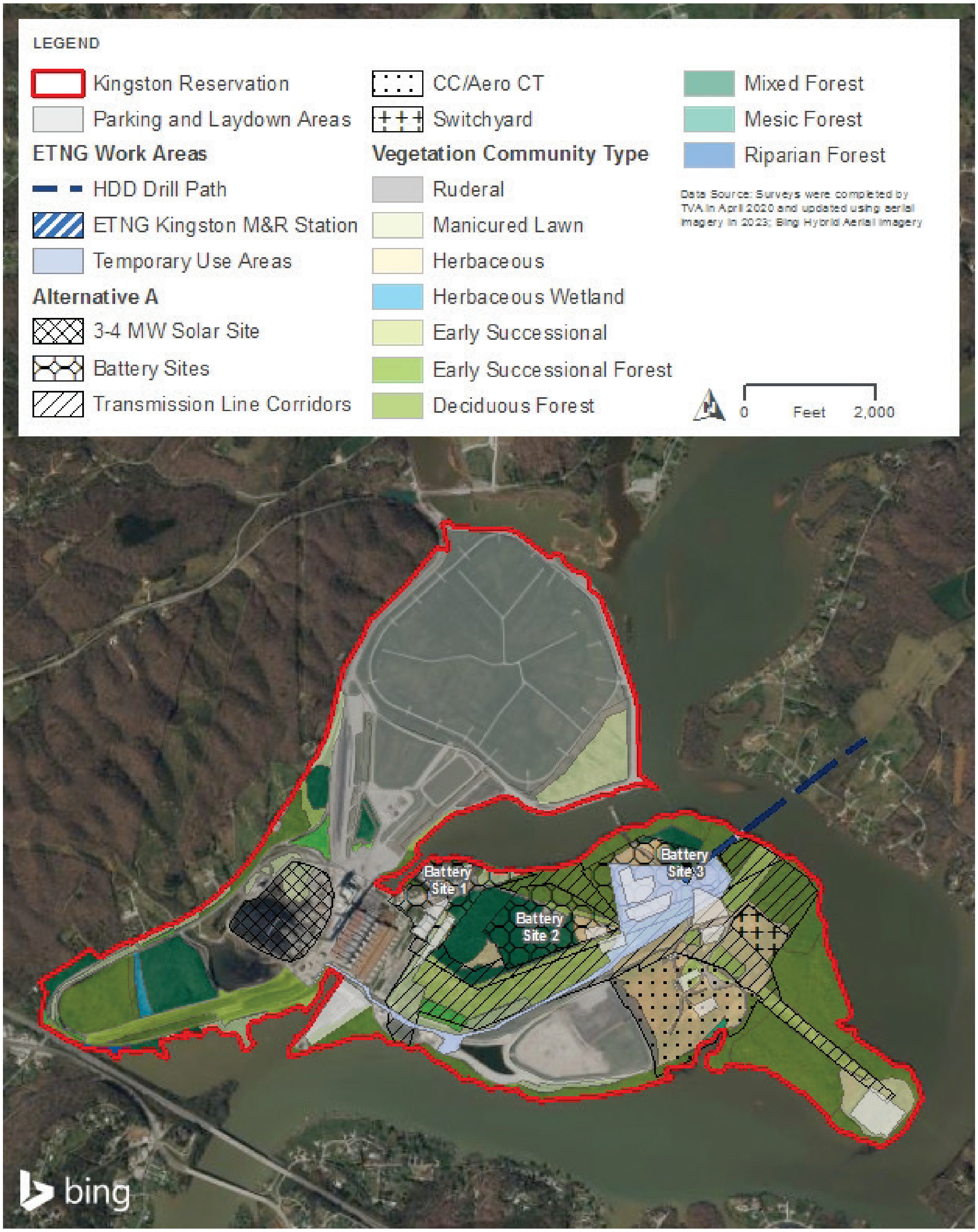

Figure 3.8-2. Vegetation Communities on the Proposed Alternative A Components on the Kingston Reservation

Table 3.8-2. Summary of Vegetation Communities within the Alternative A Proposed CC/Aero CT Plant Site

Vegetation Community	Vegetated Area (acres)	Percent of Vegetated Area
Proposed CC/Aero CT Plant Site		
Herbaceous	37.1	74.5
Ruderal	4.5	9.0
Deciduous Forest	3.5	7.0
Mesic Forest	1.0	2.0
Early Successional	3.7	7.4
Total[1]	**49.8**	**100.0**
Proposed Parking/Laydown Area		
Manicured Lawn	8.2	100.0
Proposed Switchyard Footprint		
Herbaceous	8.2	96.5
Deciduous Forest	0.3	3.5
Total[1]	**8.5**	**100.0**

[1]Total acreage and percent may vary slightly due to rounding.

3.8.1.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW-Solar Facility site is currently used primarily as a coal storage yard and associated infrastructure for the existing KIF fossil units (Figure 3.8-2). Approximately 4.8 acres (100 percent of the vegetated area) is manicured lawn.

3.8.1.1.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

TVA has identified three potential battery site locations generally northwest of the proposed CC/Aero CT Plant (Figure 3.8-2). Battery Site 1 is located on a previously developed and an actively managed area with an overall vegetation coverage consisting manicured lawn (5.8 acres, 52.3 percent of total vegetated area), deciduous and mixed forest (5.0 acres, 45.0 percent of total vegetated area), and a small ruderal area (0.3 acre, 2.7 percent of total vegetated area) (Table 3.8-3).

Battery Site 2 consists primarily of deciduous and mixed forests (27.0 acres,77.2 percent of the overall Battery Site 2 area) (Table 3.8-3). The Battery Site 2 footprint also contains 3.6 acres of herbaceous habitat and 2.7 acres of early successional habitat (totaling 18.0 percent).

Battery Site 3 encompasses the greatest amount of vegetation communities across the three battery site options. It primarily consists of herbaceous and early successional cover (combined 23.4 acres, 64.4 percent of total vegetated area) with 12.9 acres of forested area (35.5 percent of total vegetated area) (Table 3.8-3).

Table 3.8-3. Summary of Vegetation Communities within the 100-MW BESS Sites

Vegetation Community	Vegetated Area (acres)	Percent of Vegetated Area
Battery Site 1		
Manicured Lawn	5.8	52.3
Mixed Forest	3.0	27.0
Deciduous Forest	2.0	18.0
Ruderal	0.3	2.7
Total[1]	**9.6**	**100.00**
Battery Site 2		
Mixed Forest	21.2	60.6
Deciduous Forest	5.8	16.5
Herbaceous	3.6	10.3
Early Successional	2.7	7.7
Ruderal	1.8	5.1
Total[1]	**35.1**	**100.0**
Battery Site 3		
Herbaceous	22.7	62.5
Deciduous Forest	8.4	23.1
Mixed Forest	4.5	12.4
Early Successional	0.7	1.9
Total[1]	**36.3**	**100.00**

[1]Total acreage and percent may vary slightly due to rounding.

3.8.1.1.2.4 On-site Transmission Upgrades

The footprint for the battery transmission line connections is dominated by forested areas (15.6 acres of deciduous and 1.6 acres of mixed forest for a combined total of 52.6 percent) and herbaceous and early successional cover (15.3 acres, 46.8 percent combined total) (Table 3.8-4).

Table 3.8-4. Summary of Vegetation Communities within the Alternative A Battery Transmission Line Connections

Vegetation Community	Vegetated Area (acres)	Percent of Vegetated Area
Deciduous Forest	15.6	47.7
Early Successional	11.6	35.5
Mixed Forest	1.6	4.9
Herbaceous	3.7	11.3
Manicured Lawn	0.2	0.6
Ruderal	<0.1	<0.01
Total[1]	**32.7**	**100**

[1]Total acreage and percent may varies slightly due to rounding.

Vegetation within the existing on-site transmission line corridors proposed for upgrades on Kingston Reservation under Alternative A is dominated by early successional and herbaceous habitat types (totaling 80.5 acres, 68.3 percent of total vegetated area) with smaller areas of forested habitat (20.0 acres, 16.9 percent of total vegetated area) (Table 3.8-5). Manicured lawn consists of 13.9 acres which is11.8 percent of the total vegetated area.

Table 3.8-5. Summary of Vegetation Communities within the Alternative A On-site Transmission Upgrades

Vegetation Community	Vegetated Area (acres)	Percent of Vegetated Area
Early Successional	55.5	47.1
Herbaceous	25.0	21.2
Deciduous Forest	16.9	14.3
Manicured Lawn	13.9	11.8
Ruderal	3.4	2.9
Early Successional Forest	3.1	2.6
Mixed Forest	<0.1	<0.1
Total[1]	**117.8**	**100.00**

[1]Total acreage and percent may varies slightly due to rounding.

3.8.1.1.2.5 Off-site Transmission Line Upgrades

Eastern Transmission Corridor

The Eastern Transmission Corridor cross the Southern Limestone/Dolomite Valleys and the Rolling Hills Ecoregion, a subdivision of the Ridge and Valley ecoregion. The Southern Limestone/Dolomite Valleys are characterized as having undulated to rolling valleys with rounded hills with cropland/pastures, mixed forests, some pine plantations, rural residential, urban, and industrial areas. Appalachian oak forest, bottomland oak forests, mesophytic forests, and cedar glades are the natural community types found in this region (Griffith et al. 1997). Appalachian oak forests in the Ridge and Valley comprise several oak species (chestnut, red, white, scarlet, and black oaks), hickories, maples, and some tulip poplar and sweet birch (Schafale et al. 2016). Mixed mesophytic forests in the region contain sugar maple, American beech, American basswood, hickories, oaks, eastern hemlock, tulip poplar, and white ash. Species found in bottomland hardwood forest sites are those adapted to saturated or inundated conditions, and forest composition varies depending on the duration of saturated or flooded conditions (Hinkle et al. 1993). In areas where recent changes have occurred, early successional vegetation such as black willow, eastern cottonwood, river birch, and silver maple are present.

Sloughs, oxbows, and swamps with longer hydroperiods have species adapted to deepwater areas, including water tupelo, bald cypress, and water elm. In poorly drained areas, overcup oak, water hickory, green ash, American elm, sugarberry, hackberry, laurel oak, and red maple are found. Ridges in low areas may be dominated by sweetgum, willow oak, and water oak. Areas with the shortest hydroperiods have cherrybark oak, swamp chestnut oak, hickories, and black gum (Griffith et al. 1997).

A field survey was completed in June 2022 of the vegetation communities within the Eastern Transmission Corridor (L5108 and L5302) and Western Transmission Corridor (L5383) (Appendix F). TVA later determined the potential need for additional transmission upgrades within the Eastern Transmission Corridor for L5116, L5280, and L5381 for Alternative A; field surveys for these areas were conducted in May and June 2023.

Based on the botanical field surveys (Appendix F), the Eastern Transmission Corridor consists primarily of fields (pasture/hay, wet and dry herbaceous vegetation, and pasture/maintained lawn; 80.3 percent of total vegetated area), forested land (dry and wet deciduous; 12.1 percent of total vegetated area), maintained lawn (6.5 percent of total vegetated area), and an area of kudzu infestation (0.8 percent of total vegetated area) (Table 3.8-6). The majority, 86.5 percent, of the forested area occurs along the edges of existing access roads. Figures depicting vegetation communities of the Eastern Transmission Corridor are provided in Appendix F.

Table 3.8-6. Vegetation Communities and/or Land Uses along the Eastern Transmission Corridor under Alternative A

Vegetation Community	Total Vegetated Area (acres)	Percent of Vegetated Area
Dry Herbaceous	981.8	66.2
Dry Deciduous[1]	179.1	12.1
Wet Herbaceous	165.0	11.1
Maintained Lawn	96.6	6.5
Pasture/Hay	29.2	2.0
Pasture/Maintained Lawn	14.2	1.0
Kudzu Infested	12.1	0.8
Wet Deciduous[1]	0.1	<0.01
Total	**1,482.8**	**100.0**

[1]Of the forested area along the Eastern Transmission Corridor, approximately 155.0 acres (86.5 percent) are along access roads.

Western Transmission Corridor

Proposed upgrades to L5385 within the Western Transmission Corridor cross the Cumberland Plateau, a subdivision of the Southwestern Appalachians Ecoregion. The Cumberland Plateau is characterized as having undulated and rolling landforms and some open mountains with most areas forested, timber and coal mining activities, some cropland and pasture, and wildlife areas. Mixed oak and mesophytic forests are the natural community types. Mixed oak forests contain a variety of oaks, hickories, maples, American beech, black cherry, black walnut, elm, tulip poplar, flowering dogwood, and shortleaf pine (Schafale et al. 2016). Mixed mesophytic forests are described above for the Eastern Transmission Corridor.

Based on botanical field surveys (Appendix F), the majority of the Western Transmission Corridor consists of fields (i.e., pasture/hay, and wet and dry herbaceous vegetation; 88.6 percent of total vegetated area), with the remaining vegetation consisting of forested (wet and dry deciduous) land (9.9 percent of total vegetated area) and maintained lawn (1.7 percent of total vegetated area) (Table 3.8-7). The majority of the forested area occurs in riparian areas of the Obed River and Rocky Branch (combined 9.0 acres), with 0.7 acre along an access road. Figures depicting vegetation communities of the Western Transmission Corridor are provided in Appendix F.

Table 3.8-7. Vegetation Types and/or Land Uses along the Western Portion of the Alternative A Transmission Corridor

Vegetation Types	Total Vegetated Area (acres)	Percent of Vegetated Area
Hay/Pasture	83.4	66.3
Dry Herbaceous	18.2	14.5
Wet Herbaceous	9.8	7.8
Wet Deciduous[1]	9.0	7.2
Dry Deciduous[1]	3.3	2.7
Maintained Lawn	2.1	1.7
Total[2]	**125.8**	**100.0**

[1]Of the forested area along the Western Transmission Corridor, approximately 0.7 acre is along an access road and 9.0 acres comprise riparian buffers to the Obed River and Rocky Branch.
[2]Total Percent varies slightly due to rounding

3.8.1.1.2.6 Construction and Operation of a Natural Gas Pipeline

Information regarding vegetation types within the ETNG Construction ROW was obtained from a desktop review of aerial photography, existing land use classifications, and results of environmental field surveys completed to-date by ETNG (ETNG 2023d). From east to west, the ETNG Construction ROW encompasses portions of the following USEPA Level IV Ecoregions: Outer Nashville Basin, Eastern Highland Rim, Plateau Escarpment, Cumberland Plateau, Southern Limestone/Dolomite Valleys and Low Rolling Hills, and Southern Dissected Ridge and Knob (Griffith et al. 1997; ETNG 2023d).

ETNG's Resource Report 3 (ETNG 2023d) provides the following description of vegetation types in the proposed ETNG Construction ROW:

> The forest types in the Outer Nashville Basin and Eastern Highland Rim are described by Braun (1950) as the Western Mesophytic Forest Region. The Eastern Highland Rim (described by Braun as the Mississippian Plateau) is strongly dissected with deep valleys. Drier slopes contain oak, oak-hickory, and oak-chestnut forest communities typical of this region while beech-dominated mixed mesophytic forest occurs on more sheltered locations. This forest region also once contained extensive prairies called barrens. Cedar barrens also occurred on the drier slopes with forested wetlands occurring in the depressions. From west to east, this region transitions from the more oak-dominated forest of the Western Mesophytic to the diverse Mixed Mesophytic Forest Region of the Southwestern Appalachians.
>
> Continuing east, the [ETNG Construction ROW] corridor enters the Southwestern Appalachians. Within this region the [ETNG Construction ROW] goes up the Plateau Escarpment (68c) where it enters the Cumberland Plateau (68a). The Plateau Escarpment is characterized by steep, forested slopes with high-gradient streams. This subregion contains Mississippian-age limestone, sandstone, shale, and siltstone plus Pennsylvanian-age shale, siltstone, sandstone, and conglomerate. The Cumberland Plateau is approximately 1,000 feet higher than the Eastern Highland Rim and contains tablelands and open low mountains. This subregion is comprised of Pennsylvanian-age conglomerate, sandstone, siltstone, and shale and is covered by mostly well-drained, acid soils with low fertility (Griffith et al. 1997). Exposed

sandstone cliffs of various heights often occur within the drainages of this area. The Cumberland Plateau is described by Braun (1950) as occurring in the Mixed Mesophytic Forest Region. The [ETNG Construction ROW] occurs within the Cliff Section of the Mixed Mesophytic Forest Region. The forests of this region have changed significantly due to die-off of the American chestnut (*Castanea dentata*) caused by the introduction of the chestnut blight (*Cryphonectric parasitica*). Mixed oak, oak-hickory, and oak-pine forest occur in this region. Where sandstone is close to the surface, post oak (*Quercus stellata*) and blackjack oak (*Quercus. marilandica*) communities also occur. Due to the diversity of herbaceous plants that can be found in this region, it is thought that the forest was not historically dense everywhere across the Plateau. The Plateau Escarpment (68c) is described by Braun (1950) as also occurring in the Mixed Mesophytic Forest Region. The higher slopes typically are dominated by red maple, white oak (*Quercus alba*), and black oak (*Quercus veluntina*). The middle sections of the slopes are dominated by American beech (*Fagus grandifolia*), tulip poplar (*Liriodendron tulipifera*), and sugar maple (*Acer saccharum*). Other trees that occur in the middle slopes of the Plateau Escarpment include with white oak, white ash (*Fraxinus americana*), American basswood (*Tilia americana*), yellow buckeye (*Aesculus flava*), and eastern hemlock (*Tsuga canadensis*), and cucumber tree (*Magnolia acuminata*).

Additionally, sections of the [ETNG Construction ROW] occur in the Dissected Appalachian Plateau (69d) of the Central Appalachians. This region is more dissected and has steep slopes than the Cumberland Plateau. The Dissected Appalachian Plateau is also in the Mixed Mesphytic Forest Region according to Braun (1950).

This region was also impacted by the die-off of the American chestnut. The upper slopes are typically dominated by chestnut oak, buckeye (*Aesculus* spp.), white oak, black oak, and red maple (*Acer rubrum*). Middle sections of the slopes are dominated white oak, scarlet oak (*Quercus coccinea*), post oak, hickory species (*Carya s*pp.), tulip poplar, and sourwood (*Oxydendrum arboreum*). The understory in the middle slopes is dominated by mountain laurel (*Kalmia latifolia*). The bottomland and coves are dominated by eastern hemlock and magnolia (*Magnolia grandiflora*).

The [ETNG Construction ROW] then descends the eastern side of the Plateau Escarpment (68c) and into the Ridge and Valley. Within this region the [ETNG Construction ROW] occurs within the Southern Limestone/Dolomite and Low Rolling Hills (67f) and the Southern Dissected Ridges and Knobs (67i) subregions. The Southern Limestone/Dolomite and Low Rolling Hills subregion is composed of limestone and cherty dolomite and has low rolling ridges and valleys. The Southern Dissected Ridges and Knobs subregion has less sharp-pointed sandstone ridges than the previous subregion, and instead the ridges are hummocky and more broken. The ridges in Tennessee consist of Ordovician-age Sevier Shale, Athens Shale, and Holston and Lenoir Limestones (Griffith et al. 1997).

The Southern Limestone/Dolomite and Low Rolling Hills (67f) and the Southern Dissected Ridges and Knobs (67i) subregions are located within the Oak-Chestnut Forest Region (Braun 1950). The forests of this region have also changed significantly due to die-off of the American chestnut caused by the introduction of the chestnut blight. In Tennessee, the Oak-Chestnut Forest Region is approximately 40 miles wide and is bordered on the western side by the Mixed Mesophotic Forest Region. The series of ridges and valleys have resulted in a diversity of vegetation communities. Oak-chestnut communities formerly occurred on the ridges. Mixed mesophytic or hemlock communities occur in the coves and ravines of the ridges and mixed mesophytic or beech communities occur in ravine slopes along streams while white oak dominated forest occurs in the valleys.

Vegetation types in the proposed ETNG Construction ROW were determined by ETNG through a review of NRCS Land Use Cover Data (NRCS 2022) and 2022 field surveys and are summarized in Appendix H. The field survey area primarily consisted of agricultural land (44.8 percent of total vegetated area) and forested habitats (28.9 percent of total vegetated area).

Table 3.8-8. Summary of Vegetation Communities within the ETNG Construction ROW[1]

Vegetation Community	Pipeline Corridor Area (Acres)	Aboveground Facilities Area (Acres)	Total Vegetated Area (Acres)	Percent of Vegetated Area[2]
Agricultural	794.9	69.0	863.9	44.8
Bottomland Hardwood Forest	1.9	0.0	1.9	0.1
Deciduous Forest	66.7	0.0	66.7	3.5
Evergreen Forest	125.2	2.1	127.3	6.6
Mixed Forest	352.5	7.3	359.8	18.7
Grassland	473.6	0.9	474.5	24.6
Shrub-Scrub	6.7	0.1	6.8	0.4
Wetland	25.9	0.3	26.2	1.4
Total[2]	**1,847.4**	**79.7**	**1,927.1**	**100.0**

Source: ETNG 2023d
[1]Percent Total varies slightly due to rounding.
[2]Non-native vegetation land (industrial and residential) and open water is not included.

Invasive Plant Species

Invasive plant species identified within the ETNG Construction ROW during 2022 biological field surveys are listed in Table 3.8-9.

Table 3.8-9. Invasive Plants Identified within the ETNG Construction ROW by County

Species		County							
Scientific Name	**Common Name**	**Trousdale**	**Smith**	**Jackson**	**Putnam**	**Overton**	**Fentress**	**Morgan**	**Roane[1]**
Chinese privet	*Ligustrum sinense*	X	X	X	X	X	X	X	
Common or European privet	*Ligustrum vulgare*		X		X				
Amur honeysuckle	*Lonicera maackii*							X	
Morrow's bush honeysuckle	*Lonicera morrowii*		X					X	
Multiflora rose	*Rosa multiflora*	X	X	X	X	X	X	X	
Autumn olive	*Elaeagnus umbellata*				X			X	

Source: ETNG 2023d
[1] No invasive plant species were observed within the ETNG Construction ROW in Roane County.

3.8.1.1.3 Alternative B

The East TN TVA PSA primarily lies within the Interior Plateau, Southwestern Appalachian, and Central Appalachian ecoregions. The Interior Plateau ecoregion is further subdivided by the Western Highland Rim, Eastern Highland Rim, and Western Pennyroyal Karst (Griffith et al. 1997). The Interior Plateau is a diverse ecoregion with natural vegetation, primarily oak-hickory forest, with some areas of bluestem prairie and cedar glades. The Western Highland Rim is characterized by rolling terrain of open hills and oak-hickory forests. The Eastern Highland Rim has more level terrain than the Western Highland Rim, with landforms characterized as “tablelands” of moderate relief and irregular plains. Natural vegetation in this region is transitional between the oak-hickory type to the west and the mixed mesophytic forests to the east. Many bottomland hardwood forests that were formerly abundant have been inundated by large impoundments. The Western Pennyroyal Karst has irregular plains and mostly gently rolling and weakly dissected karst sinkholes and depressions. Natural vegetation in this region consists of oak-hickory forest and bluestem prairie (Griffith et al. 1997).

The Southwestern Appalachian ecoregion is further subdivided by the Plateau Escarpment, Sequatchie Valley, and the Cumberland Plateau. The Southwestern Appalachian contains a mosaic of forest and woodland with some cropland and pasture (Griffith et al. 1997). The Plateau Escarpment is characterized by having long, steep mountainsides, some vertical cliffs near the top of escarpment. Natural vegetation in this region contains mixed oak and chestnut oak on upper slopes and mixed mesophytic forests on lower slopes. The Sequatchie Valley is characterized by an undulating to hilly 4-mile-wide linear valley, some bottomland and low terraces, and small alluvial fans. Natural vegetation in this region contains Appalachian oak forests (mixed oaks, hickory, pine, poplar, birch, and maple). The Cumberland Plateau is characterized by undulating and rolling tableland with some open low mountains. Natural vegetation consists of mixed oak forest on uplands and mixed mesophytic forests in ravines and gorges (Griffith et al. 1997).

The Central Appalachian ecoregion is further subdivided into the Cumberland Mountains. The Central Appalachian consists of high hills and low mountains covered by mixed mesophytic forest with areas of Appalachian oak and northern hardwood forests (Griffith et al. 1997). The Cumberland Mountains are characterized by low mountains with long, steep slopes, narrow to uneven crests, and narrow, winding valleys. Natural vegetation in this region contains mixed mesophytic forest.

The major forest communities in the East TN TVA region include mesophytic forest, Appalachian oak forest, and oak-hickory forest. The mesophytic forest is the most diverse, with 162 tree species. Mesophytic forests are among the most biologically rich systems of the temperate regions of the world (Hinkle et al. 1993). While canopy dominance is shared by several species, red maple and white oak have the highest average importance values. A distinct section of the mesophytic forest, the Appalachian oak section, is dominated by several species of oak, including black, chestnut, northern red, scarlet, and white oaks. The bottomland forests in this region are dominated by American elm, bald cypress, green ash, sugarberry, and sweetgum.

3.8.1.2 Environmental Consequences

3.8.1.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate KIF as part of TVA’s generation portfolio (see Section 2.1.2). TVA would implement all planned actions related to the current and future management and storage of CCRs, which have either been reviewed or would be reviewed in subsequent NEPA analysis. As a result, no new work would be conducted that could potentially alter Project-related environmental conditions within the Kingston Reservation. Therefore, there would be no direct or indirect effects to vegetation communities because there would be no physical changes to the current conditions.

3.8.1.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of KIF Plant

Most of the vegetation community types on the Kingston Reservation consist of heavily disturbed habitats with little conservation value (Appendix F), including brome grasses, autumn olive, Johnson grass, tall fescue, sericea lespedeza, dogbane, common milkweed, blackberry, yellow wingstem, white wingstem, and poverty oatgrasses. Approximately half of the area within the demolition boundary is developed and/or unvegetated (115.5 acres, 48.1 percent of the total D4 boundary) or low-quality habitat with high densities of weedy species or maintained areas (ruderal, manicured lawn, or herbaceous plant communities totaling 49.0 acres, 20.5 percent of the total D4 boundary). Forested areas within the demolition boundary comprise 63.4 acres of deciduous, mixed, and early successional forest (26.4 percent of the total D4 boundary). The remaining area consists of early successional habitat (12.1 acres, 5.0 percent) (Figure 3.8-1 and Table 3.8-1). Forested areas (deciduous and mixed forest) are present on the eastern side of the demolition boundary and along parts of the Clinch River on the southern boundary. Many forested areas are disturbed habitat supporting non-native species such as Chinese privet, and not likely to hold high value for wildlife, except for a forested strip along the Clinch River which contains some mature hardwood forest.

Removal of on-site buildings and structures would involve demolition to 3 feet below final grade via mechanical destruction and/or explosives. All buildings and structures with below grade features would be backfilled. Vegetation may colonize areas with sufficient soil following deconstruction and removal of the existing facility and would likely comprise similar species to those currently observed in ruderal open areas on the Kingston Reservation.

3.8.1.2.2.1 Environmental Justice Considerations

Effects to vegetation that would occur because of KIF retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations as TVA would implement appropriate mitigation measures per TVA’s BMP Plan. These effects would be minor and limited to the Kingston Reservation, where no EJ populations are present. Therefore, no disproportionate and adverse impacts are anticipated for EJ populations.

3.8.1.2.3 Alternative A

3.8.1.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Approximately 49.8 acres of vegetation within the proposed CC/Aero CT Plant site and 8.5 acres of vegetation within the proposed switchyard footprint would be impacted due to permanent vegetation clearing (Figure 3.8-2). An additional 8.2 acres of manicured lawn within the parking/laydown area would be temporarily impacted during construction activities. Most of the proposed CC/Aero CT Plant site consists of heavily disturbed herbaceous or ruderal plant communities, which maintain little habitat value for wildlife. Effects to vegetation would generally result from earthmoving and development of the site, as well as vegetation clearing activities associated with temporary parking/laydown areas during the construction of the proposed Alternative A components. To prevent the introduction and spread of invasive species, following construction all temporarily disturbed areas on all action alternatives would be revegetated with native or non-invasive plant species.

3.8.1.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The vegetation currently present within the 3- to 4-MW Solar Facility area, consisting of 4.8 acres of manicured lawn, would be impacted during D4 activities as described in Section 2.1.3.1. This area has been previously disturbed and is maintained regularly. The remaining 30.2 acres of the 3- to 4-MW Solar Facility site is devoid of vegetation with land use consisting of coal storage and associated infrastructure. Vegetation seeding would occur after construction is completed and the solar facility is operational. Native species less than 12 inches in height would be seeded in the solar array area with pockets of pollinator habitat outside of the array area where there is sufficient space. This would result in moderate, beneficial improvement to existing conditions in this area.

3.8.1.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

A portion of vegetation presently on the Battery Site 1 overlaps with the D4 boundary, including 4.8 acres of manicured lawn, 3.0 acres of mixed forest, and 1.5 acres of deciduous forest. Clearing and construction of Battery Site 1 for the 100-MW BESS would result in permanent impacts to an additional 0.5 acre of deciduous forest, 1.0 acre of manicured lawn, and 0.1 acre of ruderal area. The remaining 18.6 acres of Battery Site 1 consists of non-vegetated areas.

Similarly, a portion of vegetation presently on the Battery Site 2 also overlaps with the D4 area including 9.9 acres of deciduous and mixed forested habitat and 1.5 acres of early successional and ruderal area. Clearing and construction of Battery Site 1 for the 100-MW BESS would result in permanent impacts to an additional 17.1 acres of forested habitat, 6.2 acres of early successional and herbaceous habitat, and 0.4 acre of ruderal area.

Battery Site 3 would potentially result in permanent impacts to approximately 36.3 acres of vegetated land through clearing and construction of the battery facility. This includes 8.4 acres of deciduous forest, 4.5 acres of mixed forest and 23.4 acres of herbaceous and early successional vegetation.

3.8.1.2.3.4 On-site Transmission Upgrades

A portion of vegetation presently within the battery transmission line connection area (see Figure 2.1-5) would be impacted by D4 activities (see Section 2.1.3.1). This includes 4.7 acres of mixed forested habitat and 2.7 acres of herbaceous habitat, manicured lawn, and early successional habitat. Outside of the D4 boundary, actions associated with the Battery Transmission Connections have the potential to result in temporary impacts to 15.5 acres of low-quality habitat, including early successional vegetation, disturbed herbaceous habitat, manicured lawn, and sparsely vegetated ruderal areas. The remaining 17.2 acres of deciduous and mixed forest would be permanently impacted from clearing activities and eventually result in the conversion of forested habitat to early successional or shrub vegetation communities.

Of the vegetated habitat within the on-site transmission upgrade area, 10.6 acres of early successional habitat, 7.4 acres of manicured lawn, 3.3 acres of forest, and 2.1 acres of ruderal vegetation fall within the D4 boundary. Like much of the site, vegetation around the proposed transmission line upgrades consists of highly disturbed herbaceous, ruderal, and early successional habitat (approximately 83.9 acres), forest (20.0 acres), and manicured lawn (13.9 acres). The forested habitat would be permanently converted to herbaceous/scrub-shrub habitat while the herbaceous/early successional plant communities would experience short-term, temporary impacts from disturbances during construction activities. Disturbed areas would be seeded and allowed to regenerate following transmission line upgrades.

Forested areas on the margins of the existing transmission ROW may be limbed (if necessary), and those crossed by the transmission lines would be cleared and converted to an herbaceous or scrub-shrub plant community to ensure the safe and reliable transmission of power from the plant to the switchyard. Vegetation within the active transmission ROW on the proposed CC/Aero CT Plant site would be managed following TVA's Transmission System Vegetation Management Final Programmatic Environmental Impact Statement (TVA 2019c) to assure the safe and reliable operation of the transmission facilities. Generally, areas within the transmission line ROW would be maintained as scrub-shrub and herbaceous land. Typical vegetation management activities consist of herbicide application (90 percent), mechanical control (brush hogs, equipment-mounted saws; 6 percent), and manual methods (chainsaw, handsaw; 4 percent). Tree maintenance would be limited to trees that presented an immediate hazard to the reliability of the transmission system. Localized herbicide application and mowing are the vegetation management tools that would be used most frequently to clear vegetation on the floor of the open ROW. Other manual, mechanical, and herbicide application methods, along with debris management and restoration activities would likely occur infrequently and/or do not have the potential to affect vegetation on a meaningful scale. Tree clearing along the ROW margins, if necessary, would result in a minor overall change to plant habitats present on the landscape.

3.8.1.2.3.5 Off-site Transmission Line Upgrades

Disturbance of vegetation communities for the existing transmission line off-site upgrades would be minor. At most, up to 3 acres of forested areas that fall within the Off-site Transmission Corridors or access roads would be cleared. Brush clearing or tree trimming may be conducted to allow for the passage of equipment, but tree removal is not expected. Modifications would generally be limited to the existing 20-foot-wide access road area, and, if needed, tree trimming to allow a vertical clearance of up to 12 feet. Minor ground disturbance is expected in these areas. If the ground is disturbed, the access road area would be revegetated using native, low-growing plant species after required transmission line upgrade work is completed (TVA 2022a). Areas such as pasture, agricultural fields, lawns, or developed areas would experience minor, temporary disturbance for the passage of equipment and would be regenerated to their former condition following upgrade activities. Areas such as pasture, agricultural fields, or lawns are often subject to herbicide methods for localized treatments of weeds by landowners, and farmland does not often contain many trees requiring control (TVA 2019c). Therefore, effects to agricultural areas would be minor.

Vegetation within the existing, active transmission ROW is generally maintained as scrub-shrub and herbaceous land which is necessary to assure the safe and reliable operation of the transmission systems. Ongoing vegetation management activities occur on a 3-year cycle and would likely consist primarily of herbicide application with mechanical control or manual methods as needed and do not have the potential to affect vegetation on a meaningful scale (TVA 2019c). Routine tree maintenance would be limited to trees that present an “immediate hazard” and, in some instances, a “danger” or to the reliability of the transmission system. Tree clearing along the transmission line ROW margins, if necessary, would result in a minor overall change to plant habitats present on the landscape.

Localized applications of herbicide could result in some level of off-target effect (TVA 2019c). In situations where the woody stem count is high on a given ROW, even localized application of herbicides could produce substantial effects to non-target species depending on whether herbicides are broadcast over a large area or applied directly to the targeted vegetation. However, these areas of high woody stem count would be unlikely to support high-quality herbaceous habitats, usually because of site-specific conditions unrelated to TVA vegetation management (i.e., owner land use, soil type, landscape position). In drier transmission line ROW areas with rocky or sandy soils, where woody stem count is inherently lower, localized herbicide application could foster herbaceous plant communities that are rare on the landscape. These important plant habitats may be globally rare or just relatively diverse herbaceous communities, with limited distribution remaining in the southeastern U.S. Mowing would remove nearly all woody stems and can result in regrowth of high woody stem counts; however, the amount of re-growth can depend on conditions on the ground (TVA 2019c). For example, in drier areas with sandy or rocky soils, the rate of tree establishment and growth is relatively slow. In this case mowing can help to maintain high quality native plant communities. However, in all but the driest habitats in the eastern U.S., tree invasion is rapid, and woody plants quickly replace herbaceous species (Archer et al. 2017). In addition, repeated mowing of transmission line ROW encourages stump resprouting (sucker growth) and promotes dense stands of woody species. This is particularly problematic in wetlands or on sites with rich soils. Using mowing alone, or as the primary mechanism for vegetation removal on ROWs, would reduce species diversity and encourage the dominance of woody plants able to proliferate through root resprouting.

TVA uses the Office-Level Sensitive Area Review (O-SAR) process to avoid effects to important plant habitats within ROWs by limiting the use of the most damaging methods in areas likely to contain grasslands dominated by native plant species (TVA 2019c). Use of broadcast and aerial herbicides is restricted on about 17 percent (about 41,000 acres) of the combined transmission system in TVA’s PSA as those areas are likely to contain important or sensitive habitat. Manual, mechanical, and localized herbicide methods can be used in these areas and likely serve to perpetuate important herbaceous habitats found in the ROW by eliminating trees that rapidly encroach into open areas without appropriate disturbance. No rare plant habitat was identified within the transmission corridor. If rare plant communities are identified along the transmission corridor in the future, these areas would be documented in the O-SAR database and TVA biologists and operations staff would work together to ensure the habitats are protected during vegetation maintenance activities. This would ensure that the most potentially damaging tools, like broadcast herbicide, would not be used in ROW supporting important grassland habitats and that the proposed vegetation management activities would not have minor effects on terrestrial plant ecology of the region.

3.8.1.2.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG’s Resource Report 3 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the vegetation-related findings in ETNG’s Resource Report 3. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). During construction, the ETNG Construction ROW would be cleared of vegetation to the extent necessary to allow for safe working conditions, as shown in ETNG Resource Report 3 (ETNG 2023d). The pipeline facilities would be located adjacent to existing pipeline ROW and other linear utilities where feasible. Collocating the pipeline with existing linear utilities helps to minimize vegetation clearing and minimizes impacts to forested habitats and habitat fragmentation, along with reducing the occurrence of natural community segmentation.

Based on ETNG surveys, approximately 1,922.8 acres of vegetation would be temporarily impacted by construction activities associated with the pipeline ROW, access roads, ATWS, and aboveground facilities (Table 3.8-10). These vegetation communities consist of agricultural (45 percent), forested (29 percent), grassland areas (25 percent), and wetlands and scrub-shrub (2 percent combined). In locations where the Pipeline ROW or workspace within the ETNG Construction ROW requires clearing, trees would be cut into lengths and chipped, burned, or removed to an acceptable site. In temporary workspaces, tree stumps and rootstock would be left in place wherever possible to facilitate natural revegetation. Impacts to agricultural and grassland areas would be minor as these habitats would regenerate relatively quickly following the completion of construction activities. Impacts to forested areas would be moderate given the length of time and succession of reestablishing forest stands after removal; while temporary, this would be a long-term impact.

Approximately 726.3 acres of vegetation would be permanently impacted with the operation of the natural gas pipeline with a 50-foot-wide permanent ROW and associated aboveground structures (Table 3.8-10). These vegetation communities consist of agricultural (47 percent), forested (7 percent), grassland (44 percent) areas, and wetlands, emergent and scrub-shrub (2 percent combined). Permanent impacts to vegetation in the ETNG Construction ROW is due to regular maintenance activities (discussed below), resulting in a permanent conversion of vegetation community type from forested to herbaceous or scrub-shrub vegetation. Therefore, impacts to herbaceous type communities and agricultural areas would be minor as they would be allowed to regenerate to original condition. Large impacts would occur to forested areas due to the permanent conversion of this habitat to herbaceous or scrub-shrub habitat through the permanently established ROW.

Of the 726.3 acres, 42.1 acres of habitat would be permanently lost due to conversion to industrial use for the construction or upgrade of aboveground facilities.

Table 3.8-10. Summary of Impacts to Vegetation Communities Within the ETNG Construction ROW (acres)

Component	Agricultural		Bottomland Hardwoods		Deciduous Forest		Evergreen Forest		Mixed Forest		Grassland		Scrub-Shrub		Wetland		Total[1]	
	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation	Construction	Operation
Pipeline Facilities	774.7	297.4	1.7	0.2	62.7	3.2	120.6	8.9	327.3	34.3	444	316	6.2	2.5	25.9	13.8	1,763.1	676.3
HDD Travel Lanes	*3.0*	*0*	*0.1*	*0*	*0.3*	*0*	*0.2*	*0*	*0.6*	*0*	*0.1*	*0*	*0*	*0*	*0.1*	*0*	*4.4*	*0*
Access Roads	17.2	6.7	0.1	0	3.7	0	4.2	0.1	8.4	0.7	7.9	0.4	0.5	0	0	0	42.0	7.9
Pipe/Contractor Yards	0	0	0	0	0	0	0.2	0	16.2	0	21.6	0	0	0	0	0	38.0	0
Total[2]	**791.9**	**304.1**	**1.8**	**0.2**	**66.4**	**3.2**	**125**	**9.0**	**351.9**	**35.0**	**473.5**	**316.4**	**6.7**	**2.5**	**25.9**	**13.8**	**1,843.1**	**684.2**
Aboveground Facilities																		
Hartsville Compressor Station	50.5	25.6	0	0	0	0	0.6	0	0	0	0	0	0	0	0.1	0	51.2	25.6
Columbia Gulf M&R Station	8.0	3.9	0	0	0	0	0	0	2.6	0	0	0	0	0	0.2	0	10.8	3.9
Texas Eastern and Midwestern Gas M&R Stations	0.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	1.0	1.0
Kingston Deliver Meter Station and Crossover Site	0.3	0.0	0	0	0	0	0	0	2.7	2.0	0	0	0	0	0	0	3.0	2.0
Jackson County Crossover	5.0	1.4	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	5.1	1.4
Clarkrange Crossover	0	0	0	0	0	0	1.2	0.9	1.3	1.2	0.1	0.1	0	0	0	0	2.6	2.2
Kingston Receiver Site	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mainline Valves	4.3	4.3	0	0	0	0	0.3	0.3	0.6	0.6	0.8	0.8	0	0	0	0	6.0	6.0
Aboveground Facilities Total	**69**	**36.1**	**0**	**0**	**0**	**0**	**2.1**	**1.2**	**7.3**	**3.8**	**0.9**	**0.9**	**0.1**	**0.1**	**0.3**	**0.0**	**79.7**	**42.1**

Source: ETNG (2023d)
[1] Non-native vegetated land (industrial and residential) and open water is not included.
[2] Total excludes vegetation to be cleared as part of HDD travel lanes; trees would not be removed in the travel lanes, only ground vegetation would be cleared.

Notes: Construction impacts consist of all areas required for construction, including areas that would be identified as operational right-of-way after Project completion. Operational impacts include areas within the new permanent right-of-way for pipeline facilities, permanent access roads, and aboveground facilities. Temporary workspace outside of these areas would be restored.

If noxious or invasive species are identified during field surveys, ETNG would implement the following measures to minimize the potential for spreading of those species:

- install erosion control and restoration measures described in FERC's Plan and FERC's Procedures (FERC 2013a, 2013b) to minimize the potential for spread of invasive species via displaced soils;
- use weed free mulch, where applicable, to stabilize the soil surface in accordance with ETNG's E&SCP;
- clearing and grading activities may include mowing to limit the spread of noxious weeds due to construction activities;
- set up equipment cleaning stations as needed and ensure construction equipment is clean and free of soil and debris prior to arriving on-site; and
- conduct upland and wetland restoration and post-construction monitoring.

ETNG's Resource Report 3 (ETNG 2023d) was filed with FERC in July 2023. This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment and environmental effects. TVA has independently reviewed and concurs with the vegetation-related findings in ETNG's Resource Report 3 (ETNG 2023d):

> Following construction, the entire natural gas pipeline ROW would be restored in accordance with the E&SCP and FERC's Plan and Procedures (FERC 2013a, 2013b). The temporary workspaces used during construction would be seeded in accordance with NRCS recommendations and landowner requests or, in wetlands, allowed to revegetate naturally in accordance with applicable permit conditions. In accordance with FERC's Plan, ETNG would monitor disturbed areas to determine the post-construction revegetation success for two growing seasons. Revegetation would be completed in accordance with permit requirements and agency and landowner recommendations, where appropriate.
>
> Routine maintenance of the natural gas pipeline ROW would be required to allow continued access for routine pipeline patrols, maintaining access in the event of emergency repairs, and visibility during aerial patrols. In upland areas, maintenance of the ROW would involve clearing the entire permanent ROW of woody vegetation. As such, the maintained permanent ROW would be subjected to mowing every three years. This maintenance would result in permanent conversion of some areas of existing upland forested vegetation to herbaceous or scrub-shrub vegetation.
>
> A new 50-foot-wide permanent easement would be maintained by ETNG. In upland areas, routine maintenance would involve clearing the entire 50-foot-wide ROW every three years. However, to facilitate periodic corrosion surveys, a 10-foot-wide strip centered on the pipeline may be mowed annually to maintain herbaceous growth. In wetlands and riparian areas, routine maintenance would be performed at a frequency necessary to maintain a 10-foot-wide corridor centered on the pipeline in an herbaceous state, and removal of trees within 15 feet of the pipeline in accordance with FERC's Procedures. Forested land would

be permanently converted to herbaceous and scrub-shrub land within the permanent easement as a result of maintenance.

Vegetated land within the operational areas for the compressor station and solar farm would be converted to commercial/industrial land. Operational activity at the aboveground facilities would be limited primarily to maintenance and inspection, repair, and cleaning of equipment and associated piping. Vegetation within the aboveground facilities would be maintained by mowing, cutting, and trimming, as necessary.

Impacts on vegetation, such as agricultural lands, open lands, and herbaceous wetlands, are anticipated to be short-term and temporary, as these areas would be expected to return to preconstruction conditions within one or two growing seasons after restoration is complete. Forested impacts, however, represent the greatest potential impact on vegetation types and would include permanent conversion of forested wetlands to emergent wetlands. Temporary workspaces located in forested areas would result in temporary effects to the vegetation and would take longer to return to pre-construction, forested conditions.

3.8.1.2.3.7 Summary of Alternative A

TVA Proposed Actions

Activities associated with the retirement of KIF (i.e., D4 activities) would impact up to 61.1 acres of herbaceous and early successional habitat, manicured lawn, or ruderal areas, and 63.4acres of forest. Some areas in the demolition boundary overlap with footprints of the Alternative A components; subsequently, impacts in these areas are accounted for in the total presented under KIF D4 activities. With implementation of the proposed CC/Aero CT Plant and switchyard, 3- to 4-MW Solar Facility, 100-MW BESS, On-site Transmission Lines, and Off-Site Transmission Line Upgrades, a range of 95.7 to 119.9 acres of permanent impacts to vegetation (depending on the site selection for the 100-MW Battery Facility) and 1,513.8 acres of temporary impacts to vegetation would occur (excluding impacts made in areas overlapping with the D4 boundary). Most permanent impacts consist of forested areas that would be removed if Battery Sites 2 or 3 were selected, and forested areas that would be converted to herbaceous or scrub-shrub habitat within on-site transmission line corridors. Overall, effects to forested areas (42.2 to 58.8 acres depending on the site selection for the 100-MW BESS and excluding D4 activities) would be moderate due to the loss or conversion of habitat in these areas. Temporary impacts consist primarily of herbaceous or early successional habitat and manicured lawn, therefore, impacts to these areas would be minor as regeneration after disturbance would be short-term.

Impacts would occur to forested areas due to the permanent conversion of habitat types (i.e., forest to herbaceous, early successional, or scrub-shrub communities) within the on-site transmission line corridors. Permanent impacts also include the loss of vegetation in the CC/Aero CT Plant site and switchyard due to the placement of fill materials. However, a portion of new habitat would be gained with the construction of the 3- to 4-MW Solar Facility with native plant seeding and potential pollinator habitat.

Cumulative effects to vegetation on the proposed CC/Aero CT Plant site are anticipated to be minor as the majority of the site consists of previously disturbed habitat that holds little conservation value. Disturbed areas would be revegetated with native species, and clearing and other vegetation management activities would be minimized to the extent possible.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

Two types of permanent impact would occur as a result of actions associated with the natural gas pipeline: including habitat conversion and habitat loss. Impacts were minimized as feasible during the planning process by collocating the pipeline along other existing ROWs. With consideration of abundant alternative habitat in the surrounding areas, the effects of vegetation removal would be moderate. Temporary impacts to herbaceous and early successional plant communities would be minor due to the short-term nature of impacts, as these areas would be reseeded with native seed and allowed to regenerate following completion of construction activities. Impacts to forested areas due to construction of the natural gas pipeline would be a moderate due to the time necessary for woody vegetation growth and recolonization of these areas. Overall, a minor amount of habitat would be lost permanently due to the conversion of vegetation communities to industrial use.

Cumulative effects to vegetation for the ETNG Construction ROW would be moderate. The ETNG Construction ROW would be primarily collocated with existing ROWs to minimize effects of forest fragmentation. A summary of expected impacts to plant communities under Alternative A are described in Table 3.8-11.

Table 3.8-11. Summary of Estimated Vegetation Impacts for Alternative A (acres)*

Alternative A Component	Impact Type	Herbaceous[1]	Forest[2]	Scrub-Shrub	Manicured Lawn	Kudzu Infested	Agriculture	Total
KIF Demolition	Permanent	37.2	63.4	--	23.9	--	--	124.5
	Temporary	--	--	--	--	--	--	--
CC/Aero CT Plant, Switchyard, and Parking/Laydown Area	Permanent	53.5	4.8	--	--	--	--	58.3[3]
	Temporary	8.2	--	--	--	--	--	8.2
3- to 4-MW Solar Facility	Permanent	--	--	--	--	--	--	--
	Temporary	--	--	--	--	--	--	--
100-MW BESS (Range of values for Battery Sites 1, 2, and 3)	Permanent	0.0 – 6.6	0.5 – 17.1	--	0.0 - 1.0	--	--	1.5 – 23.7
	Temporary	--	--	--	--	--	--	--
On-site Transmission Lines (On-Site Transmission Corridors and Battery Transmission Line Connections)	Permanent	--	33.9	--	--	--	--	33.9
	Temporary	86.5	--	--	6.7	--	--	93.2[4]
Off-site Transmission Lines (Eastern and Western TL Corridors)	Permanent	--	3.0[5]	--	--	--	--	3.0
	Temporary	1,301.6	--	--	98.7	12.1	--	1,412.4[6]
Total (excluding demolition)	**Permanent**	**53.5 – 60.1**	**42.2 – 58.8**	**--**	**0.0 – 1.0**	**--**	**--**	**95.7 – 119.9**
	Temporary	**1,396.3**	**--**	**--**	**105.4**	**12.1**	**--**	**1,513.8**
Natural Gas Pipeline (ROW, ATWS, Access Roads, and Aboveground Facilities)	Permanent	317.3	52.4	2.6	--	--	340.3	726.3[7]
	Temporary	474.4	554.5	6.8	--	--	860.9	1,922.9[7]

*Impacts associated with D4 activities which overlap with Alternative A components are accounted for under KIF Demolition (e.g., the 3- to4-MW Solar Facility lies entirely within the demolition boundary).

[1] Includes the vegetation communities of herbaceous, early successional, ruderal, and pastureland.

[2] Includes the vegetation communities of deciduous, mixed, riparian, mesic, early successional, and evergreen.

[3] Approximately 0.16 acre of permanent wetland impacts may occur, consisting of 0.03 acre of emergent wetland and 0.13 acre of forested wetland (see Section 3.6.3).

[4] Approximately 0.40 acre of temporary emergent wetland impacts may occur (see Section 3.6.3).

[5] Maximum amount of forest clearing that would be conducted within the Off-Site Transmission Corridors is 3.0 acres; trimming and limbing of trees may be conducted.

[6] Approximately 41.2 acres of temporary wetland impacts may occur, consisting of 40.39 acres of emergent wetland and 0.81 acre of scrub-shrub wetland (see Section 3.6.3). Scrub-shrub wetlands are encompassed by herbaceous vegetation areas.

[7] Approximately 40.0 acres of wetland impacts may occur, consisting of 26.2 acres of temporary impacts and 13.8 acres of permanent impacts (see Section 3.6.3). The type of wetlands (herbaceous, scrub-shrub, or forested) was not provided in ETNG's Resource Report 2.

3.8.1.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to vegetation that would occur as a result of the D4 process and the proposed CC/Aero CT Plant, and from on-site transmission line activities would be minor and limited to the Kingston Reservation; these effects are not anticipated to have disproportionate and adverse environmental and human health effects on EJ populations because no EJ populations are present within the Kingston Reservation. Effects to vegetation resulting from proposed upgrades to off-site transmission lines would also be minor (i.e., tree trimming, brush removal and vegetation maintenance) and are not anticipated to result in disproportionate effects toward EJ populations.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

Effects occurring as a result of pipeline activities would be moderate. The ETNG Construction ROW would be primarily located adjacent to an existing pipeline corridor, which would minimize effects. The greatest impact of the ETNG Construction ROW on vegetation would be from the clearing of forested areas. In areas that are within census block groups identified as EJ populations, including any forested areas, there may be disproportionate and adverse effects on EJ populations who use resources from the forest for subsistence; however, these effects are not expected to be significant.

3.8.1.2.4 Alternative B

3.8.1.2.4.1 Construction and Operation of Solar and Storage Facilities

Alternative B would result in construction of solar and storage facilities that have the potential to affect vegetation communities. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Solar facilities average approximately 1.2 acres of forest clearing per MW, with a range of 0 to 15 acres per MW (Table 3.2-1). Based on the need for approximately 1,500 MW of solar facilities, approximately 1,800 acres of forest would be cleared with a maximum of 22,500 acres cleared. For 2,200 MW of BESS facilities, approximately 2,040 acres of forest would be cleared with a maximum of 25,500 acres. Impacts to herbaceous plant communities would also likely occur but cannot be estimated at this time. TVA and solar developers would minimize effects to vegetation by siting facilities on previously cleared land and configuring the solar arrays, access roads, and other infrastructure to avoid sensitive vegetation communities. BESS sites are typically small enough to be sited to avoid adverse vegetation effects. Appropriate field investigations for rare plant communities would be completed prior to land disturbing activities.

Vegetation would be maintained in the long-term by traditional mowing and trimming around structures on a regular basis, depending on growth rate. Sheep and goat grazing may also be employed to control invasive weed outbreak.

Cumulative effects to vegetation may occur under Alternative B with the targeted addition of 10,000 MW of solar throughout TVA's PSA. Based on the average of 1.2 acres of forest clearing per MW, an additional 12,000 acres of vegetation would be impacted within TVA's PSA. Cumulative effects would also occur to herbaceous plant communities lost due to construction of solar arrays, BESS, or access roads. Cumulative effects to vegetation would be minimized through proper siting of solar facilities and the use of BMPs.

3.8.1.2.4.2 Transmission and Other Components

As noted in Table 3.3-1, transmission lines typically result in an average of 5.5 acres of forest clearing per mile of new line. Based on TVA's evaluation, an average of 1.7 miles of new transmission line are needed for solar facilities, which equates to approximately 141.1 acres of forest that may be impacted for all 15 solar facilities, and 159.9 acres for the 17 BESS facilities. Transmission lines would be maintained as described in Section 3.8.1.1.2.4 and Section 3.8.1.1.2.5.

Cumulative effects to vegetation may occur under Alternative B with the addition of 10,000 MW of solar throughout TVA's PSA, which would also require additional transmission line support. Cumulative effects to vegetation would be minimized through proper siting of solar facilities and the use of BMPs.

3.8.1.2.4.3 Environmental Justice Considerations

Effects to vegetation that would occur as a result of the proposed solar facilities and transmission line activities would be minor and generally limited to the immediate project sites and transmission line corridors. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.8.2 Wildlife

3.8.2.1 Affected Environment

3.8.2.1.1 Kingston Reservation (No Action and D4 Activities)

The terrestrial wildlife found within the Kingston Reservation is directly related to the vegetation and habitats present on-site. The Kingston Reservation is located within the Valley and Ridge ecoregion, and more specifically, the Southern Limestone/Dolomite Valley sand Low Rolling Hills and supports a variety of common wildlife species (Appendix F).

Herbaceous fields and fragmented forests provide habitat for a variety of common wildlife species on Kingston Reservation. In herbaceous habitats such as those within transmission corridors, Eastern meadowlarks (*Sturnella magna*), chipping sparrows (*Spizella passerina*), and white-throated sparrows (*Zonotrichia albicollis*) are common; red-tailed (*Buteo jamaicensis*) and red-shouldered (*B. lineatus*) hawks use the open areas for hunting (TVA 2020a; Appendix F).

Edge habitat occurs at the nexus between field and forest and can allow for a more diverse bird community. Birds inhabiting edges include, but are not limited to, northern bobwhite (*Colinus virginianus*), eastern phoebe (*Sayornis phoebe*), Carolina wren (*Thryothorus ludovicianus*), brown thrasher (*Toxostoma rufum*), white-eyed vireo (*Vireo griseus*), northern cardinal (*Cardinalis cardinalis*), indigo bunting (*Passerina cyanea*), eastern towhee (*Pipilo erythrophthalmus*), and field (*Spizella pusilla*) and song (*Melospiza melodia*) sparrows. Small mammals and larger mammals, such as white-tailed deer (*Odocoileus virginianus*) and coyotes (*Canis latrans*), also utilize edge habitat (TVA 2020a; Appendix F).

Forests on the peninsula of the Kingston Reservation range from dry oak-hickory and dry mesic oak-hickory forests to bottomland forests. Oak-hickory forests provide habitat for wild turkey (*Meleagris gallopavo*), yellow-billed cuckoos (*Coccyzus americanus*), woodpeckers, eastern wood pewees (*Conotopus virens*), blue jays (*Cyanocitta cristata*), American crows (*Corvus brachyrhynchos*), Carolina chickadees (*Poecile carolinensis*), eastern tufted titmice (*Baeolophus bicolor*), white-breasted nuthatches (*Sitta carolinensis*), and many Neotropical migrants. Mammals occurring in oak-hickory forests include deer mice (*Peromyscus* spp.), white-tailed deer, gray fox (*Urocyon cinereoargenteus*), gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), bats, and others. Reptiles include rat snakes, five-lined skinks (*Plestiodon fasciatus*), eastern box turtles (*Terrapene carolina*), and others (TVA 2020a; Appendix F).

Narrow bands of bottomland forests are found on the Kingston Reservation peninsula along the river margin and within wet sloughs. Birds observed in these types of areas include green herons (*Butorides virescens*) and great blue herons (*Ardea herodias*) herons, wood ducks (*Aix sponsa*), spotted sandpipers (*Actitis macularius*), belted kingfishers (*Megaceryle alcyon*), and eastern kingbirds (*Tyrannus tyrannus*). Mammals specific to bottomland forests in the area include the beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*). Because these areas typically stay wet, amphibians are typically present. Amphibians observed on the Kingston Site include the American toad (*Anaxyrus americanus*), upland chorus frog (*Pesudacris feriarum*), spring peeper (*Pseudacris crucifer*), and others. Water snakes are also typically abundant. Fringe wetlands along the Clinch River provide habitat for red eared sliders (*Trachemys scripta*), painted turtles (*Chrysemys picta*), eastern musk turtle (*Sternotherus odoratus),* and other turtle species (TVA 2020a; Appendix F).

A summary of typical wildlife observed within the various habitat types in the area of the Kingston Reservation is presented in Table 3.8-12 with more detailed information provided in Appendix F. These observations suggest that a relatively diverse wildlife community exists near KIF, and the Kingston Reservation is representative of common ecosystems in the region. However, the typical behavior of reptiles, amphibians, and mammals limits the opportunities for observation of these groups by visual encounter survey methods; therefore, the estimation of the presence and diversity of these taxa was limited. Other species that may occur in the vicinity of Kingston Reservation include Virginia opossum (*Didelphis virginiana*), woodchuck (*Marmota monax*), moles, and red fox (*Vulpes vulpes*).

Table 3.8-12. Wildlife Observed in the Vicinity of Kingston Reservation During Surveys Completed 2011-2013, 2015, and 2020

Wildlife Observed (Common Name)	Total Animals Observed
Birds	
American coot	109
American crow	81
American goldfinch	2
American robin	1
Belted kingfisher	5
Black crowned night heron	1
Black duck	7
Black vulture	2
Blue jay	52
Canada goose	42
Cardinal	2

Wildlife Observed (Common Name)	Total Animals Observed
Carolina chickadee	19
Carolina wren	4
Cliff swallow	15
Common grackle	3
Domestic duck	2
Domestic goose	1
Double-crested cormorant	138
Downy woodpecker	4
Eastern bluebird	2
Eastern kingbird	1
Eastern phoebe	2
European starling	7
Great blue heron	48
Little blue heron	1
Mallard	55
Mockingbird	22
Mourning Dove	2
Osprey	5
Pied-billed grebe	5
Red-headed woodpecker	3
Red-tailed hawk	1
Red-winged blackbird	6
Ring-billed gull	1
Rock dove	182
Ruby-throated hummingbird	1
Rufous-sided towhee	1
Turkey vulture	12
Unspecified duck	8
Unspecified perching bird	35
Western kingbird	1
Wood duck	12
Yellow-shafted flicker	7
Reptiles/Amphibians	
Eastern spiny softshell turtle	1
Common slider	11
Map turtle	93
Painted turtle	3

Wildlife Observed (Common Name)	Total Animals Observed
Red-eared turtle	1
Unspecified turtle	3
Mammals	
Eastern grey squirrel	15
White-tailed deer	4

Surveys for general wildlife habitat were completed as part of the 2020 Natural Resources Survey at the Kingston Reservation (Appendix F). A total of 835 acres of habitat was identified on the Kingston Reservation as suitable for general wildlife (Figure 3.8-3).

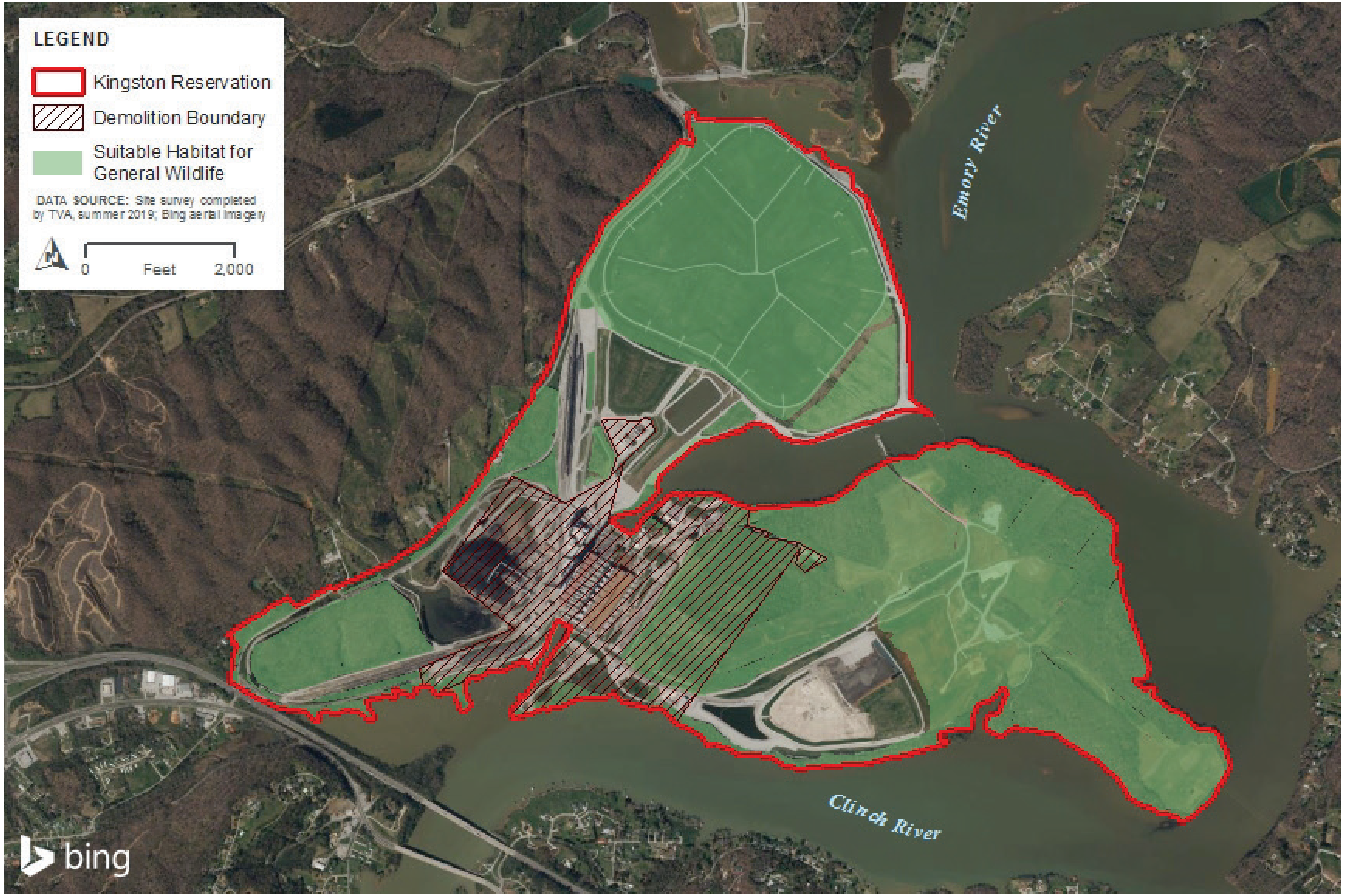

Figure 3.8-3. General Wildlife Habitat Identified on the Kingston Reservation

3.8.2.1.2 Alternative A

3.8.2.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

According to the 2020 Natural Resources Survey (Appendix F), almost the entire proposed CC/Aero CT Plant site (49.9 acres of 55 acres), the entirety of the switchyard site (8.5 acres), and the parking/laydown area (8.2 acres) provides habitat for common wildlife, such as birds, reptiles, amphibians, and mammals (Figure 3.8-4). Wildlife located on the CT/Aero CT plant site would be similar to the species reported in Table 3.8-13.

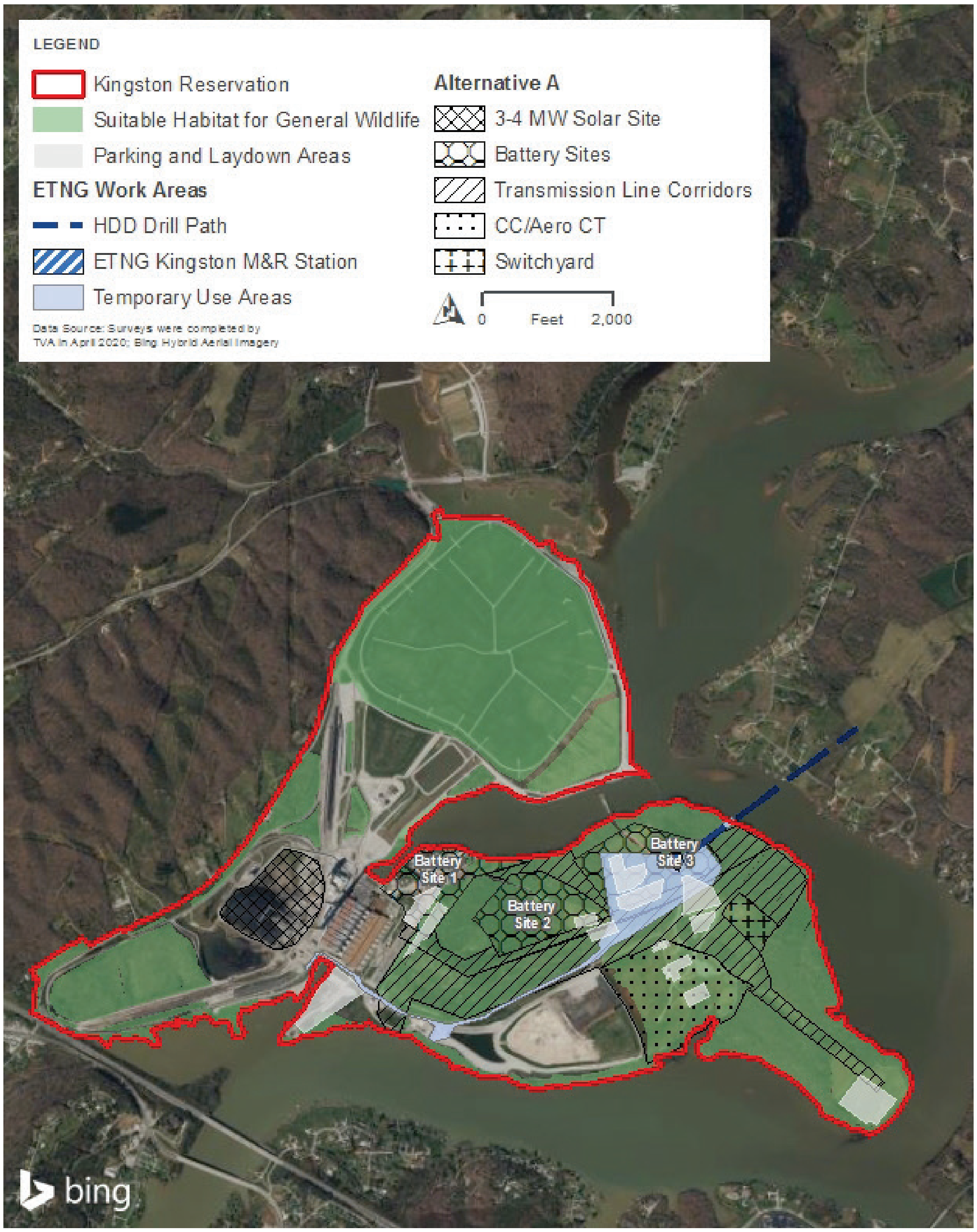

Figure 3.8-4. General Wildlife Habitat on the Proposed Combined Cycle/Aero Combustion Turbine Plant Site on the Kingston Reservation

3.8.2.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on a site that is currently used almost entirely as a coal storage yard for the existing KIF fossil units, with exception of a 4.8-acre area of manicured lawn that overlaps with the D4 boundary (Figure 3.8-4). Neither the coal storage yard nor manicured lawn area were considered to provide suitable wildlife habitat (Appendix F).

3.8.2.1.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

All three battery sites options provide some level of habitat for common wildlife species (Appendix F). Battery Site 1 provides the least amount of habitat at just 10.9 acres (29 percent of the proposed site) (Figure 3.8-4). Battery Site 2 provides 34.6 acres of habitat (98.9 percent of the proposed site), and 38.6 acres of Battery Site 3 (96.5 percent of the site) is considered sufficient for common wildlife species (refer to Table 3.8-13). Additional information provided in Section 3.8.2.1.2.1 above.

3.8.2.1.2.4 On-site Transmission Upgrades

The battery transmission line connections comprise an area of approximately 41 acres, of which 40.4 acres (98.5 percent) contains suitable habitat for common wildlife observed in the vicinity of Kingston Reservation (Figure 3.8-4).

Vegetated habitats observed along the transmission line corridor proposed for upgrades (see Section 3.8.1.1.2.5) provides 120.4 acres of habitat for common wildlife species (Figure 3.8-4).

3.8.2.1.2.5 Off-site Transmission Line Upgrades

Eastern Transmission Corridors

A field survey of terrestrial wildlife for L5108 and L5302 within the Eastern Transmission Corridor and L5383 within the Western Transmission Corridor was completed in June 2022 (Appendix F). TVA later determined a need for additional transmission upgrades within the Eastern Transmission Corridor for L5116, L5280, and L5381; field surveys for these areas were conducted in May and June 2023. As such, the analyses of terrestrial wildlife in the Eastern Transmission Corridor presented in this final EIS is based on analysis of field survey results and other publicly available data.

The vegetation communities present in the vicinity of the Eastern Transmission Corridors (i.e., within the Southern Limestone/Dolomite Valleys and the Rolling Hills Ecoregion, a subdivision of the Ridge and Valley Ecoregion) includes Appalachian oak, bottomland oak, and mesophytic forests, and cedar glades. Approximately 449 species of 57 amphibians, 301 birds, 46 mammals, and 45 reptiles are known to the Ecoregion (iNaturalist 2023).

Species found in Appalachian oak forests include 15 species of amphibians, 10 species of birds, eight species of mammals, and 12 species of reptiles. Amphibians in these habitats are dominated by salamanders, but also include mountain chorus frogs (*Pseudacris brachyphona*) and bullfrogs (*Rana catesbeiana*)., Reptiles in these habitats consist of eastern box turtle, lizards, skinks, and snakes including the timber rattlesnake (*Crotalus horridus*). Birds are the most abundant vertebrate of the Appalachian oak forests, with greatest bird diversity occurring in the pre-vegetative closure and mature forest successional stages. Birds in these forest stages include indigo bunting, prairie warbler (*Dendroica discolor*), northern cardinal, field sparrow (*Spizella pusilla)*, eastern towhee, barred owl (*Strix varia*), wild turkey, wood thrush (*Hylocichla mustellia*), ovenbird *(Seiurus aurocapilla)*, red-eyed vireo (*Vireo olivaceus*), and scarlet tanager (*Piranga olivacea*). Mammals dominated by rodents such as voles, squirrels, and eastern chipmunks (NatureServe 2022, iNaturalist 2023).

Mixed mesophytic forest support the richest and most abundant avifauna, mammalian fauna, and amphibian fauna, exceeded only by bottomland forests or marshes (Hinkle et al. 1993). Mixed mesophytic forests support several reptile species such as coal skink (*Plestiodon anthracinus*), worm snake (*Carphophis amoenus*), copperhead (*Agkistrodon contortrix*), black racer (*Coluber constrictor*), black rat snake (*Pantherophis obsoletus*), ring-necked snake (*Diadophis punctatus*), five-lined skink (*P. fasciatus*), garter snake (*Thamnophis* spp.), and eastern box turtle. Amphibians found in these environments consist of green salamanders (*Aneides aeneus*), cave salamanders (*Proteus anguinus*), eastern newts (*Notophthalmus viridescens*), slimy salamanders (*Plethodon glutinosus*), Fowler's toad (*Anaxyrus fowleri*), American toad, gray treefrog (*Hyla versicolor*), spring peeper, upland chorus frog, and wood frog (*Lithobates sylvaticus*). Common mammals in the mixed mesophytic forests include small mammals such as white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*), smoky shrew (*Sorex fumeus*), eastern chipmunk, northern flying squirrel (*Glaucomys sabrinus*), gray squirrel, eastern woodrat (*Neotoma floridana*), and hairy-tailed mole (*Parascalops breweri*). Larger mammals and bats also present consist of eastern red bat (*Lasiurus borealis*), opossum, big brown bat (*Eptesicus fuscus*), gray fox, raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and white-tailed deer (Hinkle et al. 1993).

Fauna of cedar glades habitat is less diverse in other areas, primarily due to the desiccating heat and lack of permanent pools or streams. Except for Fowler's toad and American toads, most amphibians are not present or present temporarily. Lizards are common, as well as the five-lined skink, six-lined racerunner (*Aspidoscelis sexlineata*), black racer, ground skink (*Scincella lateralis*), and coach-whip snake (*Masticophis flagellum*). Few birds nest on the rocky outcrops except near larger forested islands. Mammals are also restricted to the larger forested areas and consist of the woodland vole (*Microtus pinetorum*), short-tailed shrew, cottontail rabbit (*Sylvilagus floridanus*), gray squirrel, white-tailed deer, gray fox, and raccoon (Hinkle et al. 1993).

As stated above, wildlife surveys of the off-site transmission line corridors were completed in June 2022 and in May and June 2023. Observed wildlife and evidence of wildlife along the off-site transmission corridors are provided in Table 3.8-13.

Table 3.8-13. Wildlife Species Observed in the Off-Site Transmission Corridors within the Project Area

Species Observed (Common Name)	Observed Location (Eastern or Western Corridor)	Notes/Habitat Observed in Project Area
Birds		
American Crow	Western	Flying overhead
American Robin	Eastern	Observed near cow pasture near transmission line ROW
Barred Owl	Eastern	Heard within forested areas near ponds/wetlands
Black Vulture	Both	Flying overhead along multiple areas of the transmission line

Species Observed (Common Name)	Observed Location (Eastern or Western Corridor)	Notes/Habitat Observed in Project Area
Blue Heron	Eastern	Observed in large wetlands/open water system within transmission line ROW
Blue Jay	Western	Flying overhead within the transmission line
Bluegray Gnatcatcher	Eastern	Observed and heard in multiple locations along the transmission line ROW
Broad-headed Cowbird	Eastern	Observed and heard in multiple locations along the transmission line ROW
Brown Thrasher	Eastern	Observed and heard near forested edge
Canada Goose	Eastern	Observed flying over transmission line ROW
Carolina Chickadee	Eastern	Observed and heard near forested edge
Carolina Wren	Eastern	Heard near forested edge
Cedar Waxwing	Eastern	Observed near managed area with transmission line
Common Yellowthroat	Eastern	Heard near forested edge of transmission line ROW
Double-crested Cormorant	Eastern	Observed in large open water/wetland system within transmission line ROW
Downy Woodpecker	Eastern	Observed in forested area of transmission line
Eastern Bluebird	Eastern	Observed near bluebird boxes within managed areas
Eastern Kingbird	Eastern	Observed near open water with transmission line ROW
Eastern Phoebe	Eastern	Hear near forested edge and transmission line ROW
Eastern Towhee	Eastern	Heard near transmission line ROW
Field Sparrow	Eastern	Observed and heard near forested edge near transmission line ROW
Gold Finch	Eastern	Heard and observed within forested edge of transmission line ROW
Green Heron	Eastern	Observed within large open water system within transmission line ROW
Hummingbird Sp.	Eastern	Observed flying near shrubs/wetland within transmission line ROW
Indigo Bunting	Eastern	Observed flying within managed areas
Killdeer	Eastern	In agricultural field on the western section of the transmission line and along roadbeds
Mourning Dove	Eastern	Observed on utility lines throughout transmission line ROW
Northern Cardinal	Both	Flying around low hanging branches within scrub shrub habitat and forested edge
Northern Flicker	Eastern	Observed near forested edge and transmission line ROW
Northern Mockingbird	Eastern	Flying near cow pastures withing transmission line ROW
Prairie Warbler	Eastern	Observed and heard near forested edge of transmission line ROW
Osprey	Eastern	Observed on Poles 44 through 47
Osprey Nest	Both	Observed on transmission line pole
Oven Bird	Eastern	Heard near forested edge of transmission line ROW
Red Bellied Woodpecker	Eastern	Observed multiple times throughout the forested areas of transmission line ROW
Red-eyed Vireo	Eastern	Heard near transmission line ROW and forested edge
Red-tailed Hawk	Both	Flying overhead; flying over transmission line ROW near Poplar Creek

Species Observed (Common Name)	Observed Location (Eastern or Western Corridor)	Notes/Habitat Observed in Project Area
Red-winged Blackbird	Eastern	Observed on narrow leaf cattail near large wetland system near walking/biking trail
Scarlet Tanager	Eastern	Heard near forested edge and transmission line ROW
Song Sparrow	Eastern	Heard near managed area within transmission line ROW
Tree Swallow	Eastern	Heard near forested edge of transmission line ROW
Turkey	Eastern	Observed in the forested areas of transmission line ROW
White-eyed vireo	Eastern	Observed and heard near forested edge
Wild Turkey	Eastern	Multiple times at forest edges and at the bottom of forested areas
Wood Duck	Eastern	Observed in large open water system within the transmission line ROW
Wood Thrush	Eastern	Heard near forested edge of transmission line ROW
Woodpecker spp.	Eastern	Flying around a tree and pecking at tree within an upland forested habitat
Yellow-breasted Chat	Eastern	Heard and observed near forested edges throughout transmission line ROW
Amphibians		
American Toad	Both	In damp forested areas throughout the site
Bullfrog	Eastern	Observed and heard near larger stream systems
Cricket Frog	Both	In streams, wetlands, and ponded areas throughout the site
Green Frog	Western	In multiple streams throughout the site
Leopard Frog	Both	In multiple streams and open water throughout the site
Unidentified Tadpoles	Both	In many puddles and streams throughout the site.
Reptiles		
Black Racer	Eastern	Within transmission ROW near Poplar Creek
Black Rat Snake	Eastern	Multiple times at forest edges
Common Snapping Turtle	Both	Within stream system
Eastern Box Turtle	Eastern	In forests near streams multiple times throughout the site
Five-Lined Skinks	Both	Along forested edges with downed trees near the transmission line
Pond Sliders	Both	In multiple ponds across the site
Smooth Soft Shell	Eastern	Found within East Fork Poplar Creek
Insects		
Unidentified Damselfly	Eastern	Flying over some of the smaller creek beds
Macroinvertebrates		
Caddisflies	Both	In many drainages throughout the site
Mayflies	Both	In many drainages throughout the site
Midges	Both	In many drainages throughout the site
Scuds	Both	In many drainages throughout the site
Mammals		
Beaver	Eastern	Observed near beaver lodge
Nine-banded Armadillo	Eastern	Observed in forested area and multiple burrows within forested areas
Raccoon	Eastern	In forested wetland

Species Observed (Common Name)	Observed Location (Eastern or Western Corridor)	Notes/Habitat Observed in Project Area
White-tailed deer	Both	Within cow pasture and observed in forested areas throughout transmission line ROW
Wild Hog	Eastern	Observed crossing transmission line ROW
Tracks/Scat/Remains		
Coyote Track and Scat	Eastern	Along access roads and near drainages within transmission line ROW
Deer Track and Scat	Both	In several locations across the site
Raccoon Track	Eastern	In several of the creek beds throughout the site

The transmission corridors proposed for upgrades under Alternative A are existing ROWs; therefore, no significant land clearing is required. Tree trimming and brush removal may be required to use access roads, but no tree removal is anticipated. Many organisms can live entire life cycles within the ROW, such as songbirds, small mammals, butterflies, reptiles, and amphibians (EPRI 2002); other animals that may be more transitory are larger mammals or animals associated with forests, such as deer, bear, squirrels, rabbits, and raccoons, among many others. Ecotones, such as the edges of forests along ROWs, may also have increased wildlife diversity due to the joining of different habitat conditions (EPRI 2002).

Western Transmission Corridor

Proposed upgrades to L5385 within the Western Transmission Corridor fall within the Southwestern Appalachians Cumberland Plateau ecoregion containing mixed oak and mixed mesophytic forests. Mixed oak forests in this region have reptiles such as pond sliders, common snapping turtles, and five-lined skinks; and amphibians present may include cricket frogs (*Acris* spp.), green frogs (*Lithobates clamitans*), American toads, and leopard frogs (*L. pipiens*). Common birds in this habitat consist of northern cardinals, blue jays, and black vultures (*Coragyps atratus*). Mammals in mixed oak forests include white-tailed deer. Mixed mesophytic forests are described above for the Eastern Transmission Corridor.

A desktop review of the existing transmission line ROWs and access roads identified land use as primarily agricultural, with smaller portions of forested area, and actively maintained by TVA in an herbaceous field condition. Bodies of water, such as wetlands, streams, and ponds, are also present based on NHD and NWI databases and confirmed by field reconnaissance surveys (Appendix F). Overall, wildlife habitats present on the transmission line corridors and access roads are likely common to the region and, as habitats, are not unique or uncommon. The transmission line corridors under Alternative A are existing, maintained, ROWs facilities that are proposed for structural upgrades; therefore, no significant land clearing is required. Tree trimming and brush removal may be required to use access roads, but no tree removal is anticipated. Many organisms can live entire life cycles within the ROW, such as songbirds, small mammals, butterflies, reptiles, and amphibians (EPRI 2002); other animals that may be more transitory are larger mammals or animals associated with forests, such as deer, bear, squirrels, rabbits, raccoons, among many others. Ecotones, such as the edges of forests along ROWs, may also have increased wildlife diversity due to the joining of different habitat conditions (EPRI 2002).

Species that were either directly observed during the June 2022, field surveys within the transmission line, or whose evidence (e.g., tracks, scat, remains) was noted during the field survey are listed in Table 3.8-13.

3.8.2.1.2.6 Construction and Operation of a Natural Gas Pipeline

The proposed ETNG Construction ROW crosses terrestrial and wetland habitats that support a diversity of wildlife species (ETNG 2023d). Wildlife habitats are described regionally, and representative of the vegetation community structure and composition of the terrestrial and wetland habitats present within the ETNG Construction ROW.

ETNG's Resource Report 3 (ETNG 2023d) provides the following description of wildlife habitat types in the proposed ETNG Construction ROW:

> Dominant wildlife habitat types have been identified based on field surveys and review of available resource materials. These habitat types include upland forest, open uplands, forested wetlands, scrub-shrub wetlands, emergent wetlands, urban, and open water habitats.
>
> […]
>
> Upland forests are found throughout the [ETNG Construction ROW] area and mostly occur along the edges of the existing rights-of way. Upland forested habitats are dominated by oaks, hickories, pines, and maples. These forests provide year-round food resources, cover, and nesting habitat for a variety of wildlife species. Mast-producing oaks generate an abundance of acorns, which are exploited by a diverse group of forest species. Even in relatively developed and urbanized areas, forested patches may be inhabited by numerous wildlife species. Large wildlife species such as the white-tailed deer (*Odocoileus virginianus*) use these forested habitats for food and cover. Small mammals capitalize on the availability of the numerous nest cavities in the form of snags and felled logs. They include such species as the opossum (*Didelphis virginiana*), gray squirrel (*Sciurus carolinensis*), and raccoon (*Procyon lotor*). The abundant small mammal population in this forest habitat type provides prey for owls and hawks.
>
> A variety of songbirds use hardwood oak habitat type for all or parts of their life cycle. Many Neotropical migrants feed on the numerous insects occurring within the forest canopy. Breeding birds use a range of different nest sites, with some species nesting on the forest floor, some in the understory vegetation, and some in the tree canopy. Characteristic resident bird species in oak forests include red-bellied woodpecker (*Melanerpes carolinus*) and wild turkey (*Meleagris gallopavo*). Typical migratory species might include great crested flycatcher (*Myiarcus crinatus*) and wood thrush.
>
> The open upland habitat types in the [ETNG Construction ROW] area include successional scrub-shrub areas, fields, and disturbed and/or maintained areas such as existing utility ROWs or other open space areas. Open uplands are prevalent within the [ETNG Construction ROW] workspaces. Early successional and grassland habitats are attractive to many wildlife species. Species such as eastern cottontail (*Sylvilagus floridanus*) frequently prefer shrubby, overgrown open habitats. Other early successional and grassy areas offer habitat for

ground-nesting birds such as eastern meadowlark (Sturnella magna), killdeer (*Charadrius vociferus*), and song sparrow (*Melospiza melodia*).

Edge habitats adjacent to open space areas can create another type of habitat that is used by a distinct group of species. Examples of species that are often found along edges include the white-tailed deer, wild turkey, coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), and eastern cottontail. Eastern box turtles (*Terrapene carolina*) travel between forest, forest edge, and open habitats. Bird species that are forest edge specialists, such as blue-winged warbler (*Vermivora pinus*), field sparrow (*Spizella pusilla*), rufous-sided towhee (*Pipilo erythrophthalmus*), and prairie warbler (*Dendroica discolor*) are often present where the upland fields border forested areas and along utility ROWs. Corridors and edges are also used by hunting raptors, such as red-tailed hawks (*Buteo jamaicensis*), American kestrels (*Falco sparverius*) and sharp-shinned hawks (*Accipiter striatus*), which feed on small mammals and birds.

Forested wetlands have a diverse assemblage of plant species and provide important food, shelter, migratory and overwintering areas, and breeding areas. Typical aquatic and wetland wildlife in forest and shrub swamps include the white-tailed deer, raccoon, cotton mouse (*Peromyscus gossypinus*), wood duck (*Aix sponsa*), prothonotary warbler (*Protonotaria citrea*), and wild turkey.

Scrub-shrub wetland habitats are typically not as structurally diverse as forested wetlands. They contain vegetation that is characteristically low and compact. Under normal conditions the vegetative structure is usually caused by surface water inundation for extended periods of time. Scrub-shrub wetlands can also be maintained by periodic maintenance (such as along existing ROWs) that removes larger trees. The plant species in a scrub-shrub wetland offer excellent nesting sites for birds. Common species include red-winged blackbird (*Agelaius phoeniceus*), pickerel frog (*Rana palustris*), and spring peeper (*Pseudacris crucifer*).

Freshwater emergent wetlands include wet meadows and emergent marshes characterized by a variety of grasses, sedges and rushes. They are often associated with areas containing standing water for extended periods of time. Common species of birds associated with emergent wetlands include red-winged blackbird, killdeer, and common grackle (*Quiscalus quiscula*). Common mammals associated with this habitat type include star-nosed mole (Condylura cristata), mink (*Neovison vison*), raccoon, and muskrat (*Ondatra zibethicus*). White-tailed deer capitalize on the abundance of grasses and forbs. A large variety of amphibians and reptiles is also commonly found within these areas such as bullfrogs (*Rana catesbeiana*), common snapping turtle (*Chelydra s. serpentina*), painted turtle (*Chrysemys picta*), and pickerel frog.

Urban environments are characterized by a low diversity of wildlife species that are tolerant of human development and activity. Common bird species in cities and residential areas include European starlings (*Sturnus vulgaris*), house sparrows (*Passer domesticus*), rock pigeons (*Columba livia*), mourning doves (Zenaidura macroura), and northern mockingbirds (*Mimus polyglottos*). The

Project is not located in heavily urbanized areas, but some urban environments do occur within the Project vicinity.

ETNG reviewed the ETNG Construction ROW to identify managed wildlife habitats including National Wildlife Refuges, Wildlife Management Areas, or privately owned preserves. No National Wildlife Refuges are crossed or located within the ETNG Construction ROW. The Old Hickory Wildlife Management Area (WMA) and Cordell Hull WMA are crossed by the ETNG Construction ROW. WMAs are managed by the TN Wildlife Resources Agency (TWRA). Managed wildlife habitat crossed by the ETNG Construction ROW is summarized in Table 3.8-14

Table 3.8-14. Managed Wildlife Habitat Crossed by the ETNG Construction ROW

Habitat Type/Name	Milepost Start	Milepost End	Number Crossings	Crossing Length (feet)
Old Hickory WMA	2.67	6.9	5	6,003
	3.80	3.10	150	
	3.24	3.35	1,450	
	5.45	5.59	730	
	6.15	6.84	3,600	
Cordell Hull WMA	28.0	32.0	4	4,775

As stated in ETNG's Resource Report 8 (ETNG 2023i):

> The Old Hickory WMA is composed of approximately 6,000 acres of which 1,000 are accessible by land. The remainder is accessible only by boat. Habitat in this WMA consists of patches of hardwood forest of oak, hickory, and maple, and riparian forest of black willow and sycamore along the shoreline of parts of the lake. These forested areas are mixed with cropland that is flooded for waterfowl in winter. Wildlife in the Old Hickory WMA include waterfowl in winter; early successional birds in summer, including indigo bunting, northern cardinal, eastern towhee, and yellow-breasted chat; and sparrows of various species in winter. There are approximately a dozen heron rookeries around Old Hickory Lake (TWRA 2022a). While the Old Hickory WMA contains waterfowl blinds and dove fields, the nearest of these is over 3.5 miles south of the [Ridgeline Expansion] project.
>
> […]
>
> The Cordell Hull WMA is located on [USACE] property adjacent to the Cumberland River, spanning from the Cordell Hull Lock and Dam to the south to the Clay County and Jackson County lines to the north. This WMA includes over 200 agricultural fields consisting of crops beneficial to wildlife (primarily soybeans) and early successional habitat. Wildlife within the Cordell Hull WMA includes birds including northern cardinal, blue jays (*Cyanocitta cristata*), and tufted titmouse (*Baeolophus bicolor*). Neotropical migrant songbirds found along the trail include scarlet tanager and Ovenbird (*Seiurus aurocapilla*) (TWRA 2022b).

Additional information about natural areas near the Project is provided in Section 3.9.1.2.

3.8.2.1.3 Alternative B

The East TN region lies within three ecoregions: the Interior Plateau, Southwestern Appalachian, and Central Appalachian regions. Wildlife habitats in these regions include oak-hickory forests, bluestem prairie, mixed mesophytic forests, mixed oak and chestnut oak forests, Appalachian oak forests, and northern hardwood forests. Collectively, the forested areas across East TN are considered Eastern Deciduous Forests and contain a number of wildlife species such as American woodcock, brown thrasher, eastern meadowlark, great horned owl, mourning dove, northern bobwhite, ovenbird, wild turkey, wood duck, bobcat, eastern cottontail, eastern gray squirrel, gray fox, white-tailed deer, eastern box turtle, and timber rattlesnake (Harper et al. 2020).

3.8.2.2 Environmental Consequences

3.8.2.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate KIF as part of TVA's generation portfolio (see Section 2.1.2).

TVA would implement all planned actions related to the current and future management and storage of CCRs, which have either been reviewed or would be reviewed in subsequent NEPA analyses. As a result, TVA would continue to follow environmental compliance procedures for maintenance and operations. With appropriate BMPs implemented during operation and maintenance, any effects to wildlife would be minor.

3.8.2.2.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

Approximately 78.0 acres of habitat suitable for common wildlife species, consisting of various types of habitats, is present within the demolition boundary on the Kingston Reservation. Direct effects to common wildlife during D4 activities are the result of permanent displacement when habitat and/or buildings and structures are removed. Most of the vegetated areas on Kingston Reservation consist of highly disturbed vegetation communities and hold little value for wildlife except for transitory and common species, such as American crow, blue jay, Canada goose, mockingbird, and rock dove, or common mammals such as gray squirrels. Wildlife that are immobile (e.g., eggs, nests, animals in hibernation) could be directly impacted. Wildlife habituated to the area are likely to move to other suitable environments off-site or outside of the demolition boundary, which are plentiful, and it is expected that they would return to the area upon project completion.

At a minimum, wildlife using mature forested habitat would experience long-term impacts from tree removal and subsequent regeneration. There are 61.8 acres of forested habitat within the demolition boundary; many of these areas are lower quality due to presence of non-native species such as Chinese privet, and not likely to hold high value for wildlife, except for a forested strip along the Clinch River which contains some mature hardwood forest. Building surveys would be performed at least one month prior to demolition to determine if they are being used by migratory birds or other protected wildlife. Should protected bird species be found, the timing of deconstruction/demolition actions would be modified as feasible to avoid nesting seasons. If avoidance cannot occur coordination with USDA-Wildlife Services would be required for guidance to ensure compliance under federal law. If colonies of bats or other protected wildlife species are observed in buildings proposed for demolition, coordination with the appropriate state and federal agencies would occur in order minimize impacts. Because most of the Kingston Reservation contains highly disturbed habitat, and particularly within the demolition boundary, and with commitments adhering to building surveys, effects to common wildlife from D4 activities would be minor.

Cumulative effects to wildlife may occur as a result of the RFFAs of CCR management activities occurring in proximity to the proposed D4 activities but are anticipated to be minor. Tree removal would occur between November 15 and March 31 to the greatest extent possible, thereby avoiding direct effects to many species of wildlife that may breed, roost, or nest in these locations. Habitat removal likely would disperse mobile wildlife into surrounding areas in an attempt to find new food sources, shelter sources, and to reestablish territories. Over time, species utilizing early successional habitat are likely to return to the disturbed area following completion of construction activities.

3.8.2.2.2.1 Environmental Justice Considerations

Negative effects to wildlife in the immediate vicinity of Kingston that would occur as a result of coal facility retirement and D4 activities are not anticipated to adversely affect or have disproportionate and adverse impacts on EJ populations because there are no EJ populations on the Kingston Reservation. The addition of wildlife into surrounding suitable habitat may be beneficial to both EJ and non-EJ populations that utilize those habitats for subsistence and other purposes.

3.8.2.2.3 Alternative A

3.8.2.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Almost the entire proposed CC/Aero CT Plant site for Alternative A (including the switchyard and parking/laydown area) could provide habitat for common wildlife, comprising 66.6 acres (Figure 3.8-4). It is anticipated that 58.4 acres of habitat suitable for general wildlife would be permanently impacted due to habitat removal associated with the CC/Aero CT Plant and switchyard. Approximately 8.2 acres of the parking/laydown area would be temporarily impacted during construction activities. Habitat removal or temporary habitat loss would likely displace mobile wildlife into surrounding areas in an attempt to find new food sources, shelter sources, and to reestablish territories. Tree removal at this site (4.5 acres within the CC/Aero CT Plant site) would occur between November 15 and March 31, to the greatest extent possible, to avoid direct effects to many species of wildlife that may breed, roost, or nest in these locations. Vegetated habitats on Kingston Reservation are generally low-quality due to prior disturbance and invasion of non-native species; therefore, these areas are unlikely to hold a high abundance or diversity of wildlife. Effects to wildlife on the Kingston Reservation due to the construction of the CC/Aero CT Plant, switchyard, and usage of the parking/laydown area would be minor.

Cumulative effects to wildlife may occur as a result of proposed activities but are anticipated to be minor. Tree removal would occur between November 15 and March 31 to the greatest extent possible to limit impacts to species of wildlife that may breed, roost, or nest in these locations. Habitat removal likely would disperse mobile wildlife into surrounding areas in an attempt to find new food sources, shelter sources, and to reestablish territories. Over time, species utilizing early successional habitat are likely to return to the disturbed area following completion of construction activities.

3.8.2.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed area of the 3- to 4-MW Solar Facility is used for coal storage and no wildlife habitat is present within this area. Following construction of the solar facility, the area under and around the solar array would be seeded with native herbaceous plants and would include plant species for pollinator use. As noted in the IRP EIS (TVA 2019b), the maintenance of a permanent vegetative cover on a solar facility, particularly when composed of native plant species, can also increase local wildlife diversity (Beatty et al. 2017). As such, the construction of the 3- to 4-MW Solar Facility would result in minor beneficial effects to common wildlife and potentially pollinators on Kingston Reservation.

3.8.2.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

An estimated 20.8 acres of areas previously cleared and maintained and located within Battery Site 1 and Battery Site 2 footprints would be used for contractor and craft parking areas during on-site construction activities for Alternative A, temporarily impacting the resident common wildlife potentially using those areas.

Construction of any of the three potential Battery Site options would result in permanent habitat loss due to clearing and the addition of fill materials. Construction of Battery Site 1 would result in the loss of 1.5 acres of wildlife habitat; construction of Battery Site 2 would result in the loss of 23.2 acres of wildlife habitat; and construction of Battery Site 3 would result in the loss of 38.6 acres of habitat for common wildlife.

Habitat removal and construction of the proposed 100-MW BESS sites may result in direct and indirect effects to some common wildlife, which would likely disperse mobile wildlife into surrounding areas in an attempt to find new food sources, shelter sources, and to reestablish territories. Clearing activities are planned to occur outside of the breeding/roosting/nesting season for many birds and mammals (i.e., between November 15 and March 31) to the extent practicable; therefore, potential minor effects, if any, would occur to immobile species/life stages (i.e., eggs, juveniles, hibernating individuals).

3.8.2.2.3.4 On-site Transmission Upgrades

Approximately 32.9 acres of the battery transmission line connections area provides habitat for common wildlife species (Figure 3.8-4) (excluding that which is encompassed within the D4 boundary). Forested areas within the battery transmission line connections area (27.0 acres, see Section 3.8.1) would be permanently converted to an herbaceous or scrub-shrub vegetation community, which may alter the fauna composition utilizing this area. A portion of this area also overlaps with the D4 boundary. Wildlife within the battery transmission line connections area would be subjected to temporary disturbance during construction and during times of regular maintenance.

Upgrades to existing transmission lines on Kingston Reservation would result in the potential temporary impact to 99.1 acres of general wildlife habitat, including conversion of 16.7 acres of forested habitat to herbaceous and early successional vegetation. The remaining herbaceous, early successional (including poor quality ruderal habitats), and manicured lawn areas would be impacted during demolition activities and temporarily disturbed during upgrade activities. These activities would result in the displacement of any wildlife present during the time of construction.

Wildlife using forested areas within the battery transmission line connections or transmission line upgrades areas would experience a large direct and indirect impacts due to displacement from habitat loss (if unable to use herbaceous or scrub-shrub habitat) and limited alternative habitat on Kingston Reservation. See Section 3.8.2.2.3.1 for additional detail on potential impacts to flightless and flying wildlife.

Similar to other areas and associated construction activities under Alternative A, forest clearing would be conducted, as feasible, between November 15 and March 31 to avoid direct impacts to wildlife that may be immobile during nesting, roosting, or young rearing during spring, summer, and fall months. Wildlife utilizing the transmission line areas following construction would experience minor impacts from periodic disturbance due to maintenance activities. Additional information regarding regular maintenance activities along transmission line corridors is provided in Section 3.8.1.1.2.5.

The existing transmission line corridors and new battery transmission line connections would undergo regular, routine vegetation maintenance. Wildlife present in these areas would likely move out of the area during maintenance and return following completion of those activities. Continued maintenance of vegetation within the ROWs would result in periodic disturbance of wildlife in the area, which would likely return to the corridor following completion of the maintenance activities.

3.8.2.2.3.5 Off-site Transmission Line Upgrades

Wildlife within the off-site transmission line corridors may be temporarily displaced by disturbance during upgrade activities. Habitat within the off-site transmission line corridors has the potential to be disturbed during upgrades. The Western Transmission Corridor includes approximately 113.5 acres of herbaceous habitats (including hay/pasture) that may be temporarily disturbed. Similarly, the Eastern Transmission Corridor would result in temporary impacts up to 1,286.8 acres of herbaceous and pasture habitat during the proposed upgrade activities. Forested areas along the Eastern and Western Transmission Corridors would not be disturbed except by limb trimming where needed for equipment access on access roads. Impacts to wildlife during the short period of upgrade activities would be minor.

The existing Eastern and Western Transmission Corridors regularly undergo routine vegetation maintenance. Wildlife present in these areas move out of the area during maintenance and return following completion of those activities. This would also likely occur during the proposed transmission line upgrades. Ongoing routine maintenance of vegetation within the ROWs results in periodic disturbance of wildlife in the area, which return to the corridor following completion of the maintenance activities. This is not expected to change upon completion of upgrades to lines within the Eastern and Western Transmission Corridors.

3.8.2.2.3.6 Construction and Operation of Natural Gas Pipeline

ETNG's Resource Report 3 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment and environmental effects. TVA has independently reviewed and concurs with the wildlife-related findings in ETNG's Resource Report 3. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). Activities within the ETNG Construction ROW would temporarily affect approximately 1,923 acres of vegetation due to construction activities associated with the pipeline, ATWS, access roads, and aboveground facilities (ETNG 2023d). Approximately 684 acres of vegetation would be permanently impacted with the operation of the natural gas pipeline and associated aboveground facilities, primarily consisting of vegetation maintenance and forested habitat conversion. The permanent ROW would consist of a 50-foot-wide corridor maintained as an herbaceous or scrub-shrub vegetation community. A 10-foot-wide strip within the permanent corridor would be maintained as an herbaceous plant community to protect and maintain the integrity of the pipeline against woody vegetation growth. An additional 42 acres of habitat would be permanently lost due to conversion to industrial use for the construction or upgrade of aboveground facilities. Additional information regarding vegetation impacts is included in Section 3.8.1.2.3.6.

Temporary wildlife effects are those associated with disturbance to habitats during construction, while permanent effects are those associated with conversion of forested habitats to scrub-shrub and emergent habitats, resulting from periodic maintenance of the permanent natural gas pipeline ROW (ETNG 2023d). Indirect wildlife effects associated with construction noise and increased activity should be temporary and could include abandoned reproductive efforts, displacement, and avoidance of work areas. Construction activities may result in mortality of small mammals, reptiles, and amphibians that are less mobile during clearing and grading operations.

Regionally, maintained utility ROWs can provide early successional habitats for several important game species including white-tailed deer and wild turkey. The pipeline permanent ROW may function as travel corridors for some generalist species and provide edge habitat along large, forested areas. The ROW would be revegetated with herbaceous and shrub cover would provide food, cover and breeding habitat for those species that utilize open habitats.

To minimize permanent effects to wildlife and promote the rapid stabilization and revegetation of disturbed areas, ETNG would comply with the Project E&SCP, thereby minimizing disturbance to vegetation and providing for stabilization of affected areas to mitigate direct and indirect effects to wildlife (ETNG 2023d). Following construction, workspaces outside the permanent ROW would be allowed to revert to pre-construction conditions in accordance with the FERC’s Plan and Procedures (FERC 2013a, 2013b). Herbaceous and scrub-shrub habitats cleared for construction purposes and then left to naturally regenerate or contained within the permanent ROW would experience minor impacts due to the relatively short-term nature of disturbance and regrowth. There would be moderate permanent loss of trees that would occur within the ROW, which would be maintained in an early successional stage by mowing and periodic tree removal (ETNG 2023d). Temporary workspaces would be allowed to naturally revegetate via natural succession. This natural revegetation process would gradually develop a stratified vegetative cover between the ROW and adjacent habitats. ETNG would also work with the TWRA to develop seed mixes and specific restoration measures for state-managed lands. Overall, construction and operation of the pipeline facilities is expected to have minor effects to the distribution or regional abundance of wildlife species given the amount and distribution of similar habitat types available in the immediate Project area.

ETNG would coordinate with the TWRA regarding significant and sensitive wildlife habitats to develop and implement avoidance and minimization efforts. Significant and sensitive habitat may include habitats that provide breeding, rearing, nesting, or calving areas; migration routes; or high-quality cover or forage areas (e.g., large tracts of contiguous forest, mature cypress swamp, established wildlife movement corridors). Sensitive wildlife habitat typically includes, but is not limited to, existing or proposed National Wildlife Refuges, state WMAs, or privately owned management areas or preserves. Significant and sensitive wildlife habitat within the natural gas pipeline ROW is listed in Table 3.8-15. As presented in the table, ETNG proposed to cross most of the significant and sensitive wildlife habitat using HDD methods, which would minimize impacts to these areas.

Table 3.8-15. Sensitive Wildlife Habitat Types Crossed by ETNG Construction ROW

County	Milepost Start	Milepost End	Crossing Length (ft)	Acreage Affected		Habitat Type
				Construction	Operation	
Trousdale	2.7	2.9	6,003	13.0	5.0	Old Hickory WMA/ Reservoir
	3.1	3.1				
	3.3	3.4				
	5.5	5.6				
	6.2	6.9				
Jackson	28.0	28.6	4,775	15.4	4.7	Cordell Hull WMA/ Reservoir
	29.3	29.3				
	29.4	29.5				
	31.5	31.6				
	31.7	31.7				
	32.0	32.0				
Morgan	83.0	102.0	--	--	--	Multiple Tributaries to Obed River
	101.8	101.9	97.6	TBD	TBD	Emory River – Spotfin Chub Habitat
	106.6	106.8	795	2.0	0.8	Lone Mountain State Forest

Source: ETNG 2023d

3.8.2.2.3.7 Summary of Alternative A

TVA Proposed Actions

The proposed CC/Aero CT Plant, 3- to 4-MW Solar Facility, 100-MW BESS, and On-Site and Off-site transmission lines would cause minor permanent and temporary impacts to wildlife due to habitat loss and disturbance from construction activities or routine maintenance (Table 3.8-16). A total of 58.4 acres of wildlife habitat within the CC/Aero CT Plant and switchyard boundaries would be lost, with an additional 8.2 acres of temporary habitat loss due to the usage of a parking/laydown area during the period of construction. No habitat loss would occur within the 3- to 4-MW Solar Facility site. Depending on the battery storage option chosen and excluding impacts within the D4 boundary, a range of 1.5 to 8.63 acres of habitat would be permanently impacted. Approximately 33.9 acres of general wildlife habitat would be permanently (forested habitat conversion) impacted due to forested habitat conversion to herbaceous habitat related to construction activities; approximately 197.6 acres would be temporarily impacted due to disturbance during upgrade activities and routine maintenance. Wildlife would likely avoid areas with active construction or project activities and disperse into nearby habitat on Kingston Reservation and along off-site transmission line corridors.

Vegetated habitats on Kingston Reservation are generally low-quality due to prior direct and surrounding disturbance and invasion of non-native species. However, removal of these habitats would have a large effect on individual wildlife using these areas since there is limited habitat outside of the proposed CC/Aero CT Plant site when considering other components of Alternative A on Kingston Reservation. Additionally, the site is located on a peninsula, bordered to the north, east, and south by the Clinch River and by developed areas (KIF) on the western side. This restricts the extent that many types of wildlife, specifically flightless species, are able to disperse from the area due to disturbance and habitat loss. Effects to more mobile species, such as birds and common bats, would be minor, since they could move out of the Kingston Reservation area and use similar (or higher quality) habitat nearby and across the Clinch River. Based on aerial imagery, habitat communities across the river comprise deciduous and mixed forest, early successional habitat within maintained utility ROWs, manicured lawns, and wetlands, all of which may provide suitable habitat for birds and bats previously residing on Kingston Reservation. Overall, it is unlikely that Kingston Reservation supports a highly diverse wildlife community; however, impacts to the fauna would be minor due to the limitations in habitat elsewhere on Kingston Reservation if species are unable to access areas across Clinch River.

Wildlife within the off-site transmission line corridors could also be temporarily displaced by disturbance during upgrade activities due to habitat disturbance, clearance or permanent conversion in habitat type. Approximately 125.8 acres of herbaceous habitats (including hay/pasture and maintained lawn) within the Western Transmission Corridor and up to 113.5 acres of herbaceous and pasture habitat within the Eastern Transmission Corridor may be temporarily disturbed during the proposed upgrade activities. Forested areas along the Eastern and Western Transmission Corridors would not be disturbed except by limb trimming where needed for equipment access on access roads. Impacts to wildlife during the short period of upgrade activities would be minor.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures
Approximately 42 acres of habitat removal are expected from the construction of the access roads and associated aboveground facilities for the natural gas pipeline, consisting mostly of agricultural land (89 percent) (Table 3.8-17). An additional 52.4 acres of wildlife habitat would be impacted by habitat conversion, i.e., forested to herbaceous/scrub-shrub habitat. While some of the original species may use this new habitat, other species may find this change in habitat preferable. Species such as deer, songbirds, small mammals, pollinators, reptiles, and amphibians may find beneficial habitat in the permanent ROW, similar to electric utility ROWs (EPRI 2002). Wildlife present along the alignment would experience temporary effects by construction activities (disturbance), and once operational, disturbance from routine maintenance activities. Because significant portions of habitat function would be maintained (and not eliminated) impacts to wildlife along the ETNG Construction ROW would be moderate.

Table 3.8-16. Summary of Alternative A Impacts to Wildlife Habitat

Alternative A Component		Extent of Habitat Affected (acres)[4]	
		Temporary Impact[1]	**Permanent Impact**
KIF Retirement	Demolition	--	78.0 acres (habitat removal)
CC/Aero CT Plant[2]	CC/Aero CT Plant	--	49.9 (habitat removal)
	Switchyard	--	8.5 (habitat removal)
	Parking/Laydown Area	8.2 (short-term site usage)	--
3- to 4-MW Solar Facility[2]	--	--	--
100-MW BESS[2]	Battery Site 1	--	1.5 (habitat removal)
	Battery Site 2	--	23.2 (habitat removal)
	Battery Site 3	--	38.6 (habitat removal)
On-site Transmission Lines[2]	Battery Transmission Line Connections	15.2 (short-term construction, long-term routine maintenance)	17.2 (habitat conversion)
	Transmission Line Corridor	182.4 (short-term construction)	16.7 (habitat conversion)
Off-site Transmission Lines[3]	Eastern	216.5 (short-term construction)	3.0 (habitat conversion)[3]
	Western	113.5 (short-term construction)	
	Total (excluding demolition)	**535.8 acres**	**59.9-97.0 acres[4] (habitat removal)** **36.9 acres (habitat conversion)**
Natural Gas Pipeline[5]	Natural Gas Pipeline and ATWS	1,763.1 (short-term construction) 676.3 (long-term routine maintenance)	46.6 (habitat conversion, long-term routine maintenance)
	Access Roads	42 (short-term construction)	7.9 (habitat removal)
	Aboveground Facilities	79.7 (short-term construction)	42.1 (habitat removal)
	Total	**2,561.1 acres**	**46.6 (habitat conversion)** **50.0 acres (habitat removal)**

[1] Typical short-term temporary impacts result from general construction activities or disturbance in habitat not needed to be cleared from transmission corridors or temporary workspaces, etc.; generally, herbaceous habitat types such as herbaceous cover, early successional habitat, hay/pasture, and manicured lawn. Long-term routine maintenance temporary impacts are described as those habitats already existing as herbaceous or shrub, but undergoing new, regular treatments and control for utility maintenance.
[2] Acreage based on site surveys (Appendix F) and desktop updates in 2023.
[3] Maximum amount of forest clearing that would be conducted within the Off-Site Transmission Corridors; trimming and limbing of trees may be conducted. Range based on BESS site selection. Acreage based on vegetation communities as determined from field surveys (ETNG 2023d)

3.8.2.2.3.8 Environmental Justice Considerations

TVA Proposed Actions
Negative effects to wildlife that would occur as a result of the proposed CC/Aero CT Plant and transmission line activities would be minor and would occur on Kingston Reservation, where no human populations are settled. Since there would only be minor impacts to wildlife, no disproportionate and adverse impacts are anticipated for EJ populations. The addition of wildlife into surrounding suitable habitat may result in minor beneficial impacts to EJ and non-EJ populations that utilize those habitats for subsistence and other purposes.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures
Effects to wildlife that would occur because of the proposed ETNG Construction ROW would be minor and temporary or permanent. The ETNG Construction ROW would primarily be located adjacent to an existing ETNG Construction ROW which would minimize effects to wildlife. Disproportionate and adverse EJ impacts are not present from impacts to wildlife due to the minimal overall impact the Ridgeline Expansion Project would have on this resource. While vegetation displacement could result in more wildlife in nearby areas, this is anticipated to result in negligible benefits to human populations.

3.8.2.2.4 Alternative B

3.8.2.2.4.1 Construction and Operations of Solar and Storage Facilities

Alternative B would result in construction activities that have the potential to affect wildlife directly and/or indirectly. TVA would minimize effects to wildlife by siting facilities on previously disturbed land, such as agricultural or silvicultural sites, or land with few sensitive wildlife habitats. As noted in the IRP EIS (TVA 2019b), the maintenance of a permanent vegetative cover on a solar facility, particularly when composed of native plant species, can also increase local wildlife diversity (Beatty et al. 2017). Traditional mowing/trimming would be performed regularly for vegetation maintenance.

Cumulative effects to wildlife may occur under Alternative B with the addition of 10,000 MW of solar throughout TVA’s PSA but would be minor through proper siting of solar facilities and the use of BMPs.

3.8.2.2.4.2 Transmission and Other Components

Based on studies performed on previous TVA solar facilities (see Table 3.3-1), an average of 1.7 miles of new transmission line are needed for each solar facility, which have the potential to affect common wildlife and their habitats. While wildlife habitats would be impacted, suitable alternate habitat likely exists in areas immediately adjacent to the proposed transmission lines. Impacts to populations of common wildlife species likely would be minor due to the proposed transmission lines. Cumulative effects to wildlife may occur under Alternative B with the addition of 10,000 MW of solar throughout TVA’s PSA, but effects would be minimized through proper siting of transmission lines and the use of BMPs.

3.8.2.2.4.3 Environmental Justice Considerations

Potential disproportionate and adverse direct and indirect effects to wildlife that may occur as a result of the proposed solar facilities and transmission line activities would be minor. The addition of wildlife into surrounding suitable habitat due to maintenance of a permanent vegetative cover on a solar facility may result in minor beneficial impacts to EJ and non-EJ populations that utilize those habitats for subsistence and other purposes. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.8.3 Aquatic Life

Aside from the ESA and related state laws, as well as harvest regulations established by states, the CWA is primarily the law that protects aquatic life in the U.S. The CWA is a federal statute that governs the discharge of pollutants and fill materials into waters of the U.S. under Sections 401, 402, and 404. Water quality standards and NPDES discharge limits are established, in part, to protect aquatic life. CWA Section 316 regulates (a) wastewater discharges to minimize adverse effects of heat on aquatic life, and (b) the design and operation of cooling water intake structures to minimize adverse effects to aquatic life from entrainment and impingement.

3.8.3.1 Affected Environment

3.8.3.1.1 Kingston Reservation (No Action and D4 Activities)

3.8.3.1.1.1 Aquatic Life in Surface Waters on Kingston Reservation

Kingston is situated on a peninsula formed by the confluence of the Clinch and Emory rivers. In addition to the Emory and Clinch rivers, delineations of surface waters conducted in 2023 and subsequent JD received from the USACE on December 12, 2023 documented three intermittent streams (totaling 1,345 LF), three ephemeral streams (totaling 457 LF); 14 other WWCs (totaling 9,983 LF), one perennial exempted reach (606 LF), and five ponds (totaling 0.34 acre) (Table 3.6-2 and Figure 3.6-3). Other WWCs include features such as non-jurisdictional ditches and swales.

No comprehensive biological studies have been completed for the surface waters located within the Kingston Reservation proposed limits of disturbance. However, the 606-LF exempted perennial reach a man-made drainage, is capable of supporting aquatic life due to persistent flow originating from leakage in the fire protection system of the switchyard, which withdraws raw river water and discharges to the channel and three stormwater/catchment ponds before being returned to the Clinch River. The exempted reach was documented as supporting snail eggs and leaches during a recent field investigation (see stream form in Appendix E). Although not surveyed for aquatic species, intermittent streams, wetlands, or the other stormwater ponds on the Kingston Reservation may also provide habitat for crustaceans, reptiles, or amphibians when their specific habitat conditions exist.

3.8.3.1.1.2 Aquatic Life in Surface Waters Near Kingston Reservation

Apart from aquatic habitat[45] quantity and quality, effects from powerplant operations, such as thermal discharge effects, can also influence the aquatic biota in the Clinch River near the existing KIF discharge canal, as identified in Figure 1.1-1. In addition to the Section 316(a) requirements, which regulate thermal discharges of pollutants from point sources (including thermal discharges), the more recent CWA Section 316(b) rule for existing facilities established in 2014 also requires consideration of effects to aquatic biota from

[45] The type, quality, and abundance of aquatic habitats dictate the diversity and abundance of organisms present in aquatic systems (TVA 2021e). Habitat formers are mentioned in USEPA and TVA documents (USEPA and USNRC 1977; TVA 2021e) as an element of investigation in Section 316(a) demonstrations. In freshwater systems, aquatic macrophytes, submerged and emergent, are the most obvious habitat formers and can be critical to the structure and function of ecological systems (TVA 2021e).

withdrawal of water through cooling water intake structures in order to allow an inclusive evaluation by the NPDES Director during the NPDES permit renewal cycle.

Long-term monitoring and comprehensive Section 316(a) demonstration-related studies have been performed for the existing KIF Plant since the mid-1970s to support establishment of the initial and current alternate thermal limit for KIF thermal discharge (TVA 2021e). Sampling has included phytoplankton, periphyton, zooplankton, benthic macroinvertebrates, aquatic macrophytes, and fish populations. Results of these historical studies indicated that assemblages of phytoplankton, zooplankton, and benthic macroinvertebrates were diverse and relatively abundant. Phytoplankton communities were dominated by diatoms and green algae, while Cyanobacteria were never present at nuisance levels. Fish species occurrence, distribution, and abundance were similar pre- and post-operation of KIF, indicating no impacts. Thermal discharges did not appear to cause discernable impacts in fish health related to parasitism, growth characteristics, or reproduction.

TVA's multi-metric Reservoir Fish Assemblage Index (RFAI)[2] scores are consistently in the scoring ranges classified as "Good" for the thermally unaffected reach of the Emory River upstream of the Kingston Reservation (TVA 2021e). In 2020, electrofishing and gillnetting surveys of the Clinch River and Watts Bar Reservoir in the vicinity of the KIF thermal discharge (Clinch RM 4.4 and 1.5 located approximately 0.4 to 2.7 RM downstream of KIF) identified 42 fish species and 2 hybrids (TVA 2021e). The most abundant species collected were bluegill, gizzard shad, logperch, redear sunfish, Mississippi silverside, spotfin shiner, largemouth bass, bluntnose minnow, spotted sucker, and yellow bass (Table 3.8-17). Long-term macroinvertebrate sampling in the vicinity of Kingston Reservation thermal discharge indicate Reservoir Benthic Index (RBI) scores continue to reflect "Good" or "Excellent" ecological health ratings at all locations except for a "Fair" rating upstream of the discharge at Clinch RM 3.75 in Fall 2020 (Table 3.8-18; TVA 2021e). Overall, the USEPA concluded that the fish community contains a balanced fish community with representation from all major trophic levels and guilds (TDEC 2021d). Similarly, the macroinvertebrate community contained all functional feeding groups upstream and downstream of KIF, with increasing trends in species richness and densities.

Table 3.8-17. Species and Relative Abundance of Fish Collected During Electrofishing and Gill Netting Surveys in the Vicinity of Kingston Reservation

Common Name	Clinch RM[1] 1.5 Summer 2020		Clinch RM 4.4 Summer 2020		Clinch RM 1.5 Autumn 2020		Clinch RM 4.4 Autumn 2020	
	Total Fish Collected	Percent Composition	Total Fish Collected	Percent Composition	Total Fish Collected	Percent Composition	Total Fish Collected	Percent Composition
Black buffalo	3	0.5	6	0.7	--	--	--	--
Black crappie	1	0.2	4	0.5	--	--	--	--
Black redhorse	1	0.2	2	0.2	5	0.6	1	0.1
Blue catfish	8	1.5	16	2.0	8	0.9	10	0.9
Bluegill	93	16.9	198	24.3	256	30.0	398	36.8
Bluntnose minnow	40	7.3	99	12.2	14	1.6	4	0.4
Brook silverside	2	0.4	1	0.1	5	0.6	3	0.3
Bullhead minnow	--	--	--	--	2	0.2	--	--
Channel catfish	21	3.8	11	1.4	7	0.8	12	1.1
Common carp	11	2.0	4	0.5	7	0.8	5	0.5
Flathead catfish	--	--	1	0.1	--	--	2	0.2
Freshwater drum	11	2.0	10	1.2	13	1.5	5	0.5
Gizzard shad	49	8.9	155	19.0	62	7.3	26	2.4
Golden redhorse	2	0.4	5	0.6	4	0.5	3	0.3
Green sunfish	5	0.9	--	--	13	1.5	17	1.6
Hybrid bass	1	0.2	--	--	--	--	--	--
Hybrid sunfish	--	--	1	0.1	1	0.1	--	--
Lake sturgeon	1	0.2	2	0.2	5	0.6	4	0.4
Largemouth bass	22	4.0	22	2.7	75	8.8	77	7.1
Logperch	94	17.1	38	4.7	67	7.9	23	2.1
Longear sunfish	9	1.6	3	0.4	15	1.8	15	1.4
Longnose gar	10	1.8	2	0.2			1	0.1

Common Name	Clinch RM[1] 1.5 Summer 2020		Clinch RM 4.4 Summer 2020		Clinch RM 1.5 Autumn 2020		Clinch RM 4.4 Autumn 2020	
	Total Fish Collected	Percent Composition	Total Fish Collected	Percent Composition	Total Fish Collected	Percent Composition	Total Fish Collected	Percent Composition
Mississippi silverside	13	2.4	37	4.5	49	5.8	155	14.3
Quillback	--	--	1	0.1	1	0.1	--	--
Redbreast sunfish	11	2.0	1	0.1	14	1.6	1	0.1
Redear sunfish	46	8.4	67	8.2	62	7.3	67	6.2
River carpsucker	1	0.2	--	--	--	--	--	--
Rock bass	--	--	4	0.5	--	--	1	0.1
Sauger	--	--	1	0.1	--	--	--	--
Silver redhorse	--	--	1	0.1	--	--	--	--
Skipjack herring	6	1.1	1	0.1	1	0.1	19	1.8
Smallmouth bass	4	0.7	2	0.2	12	1.4	10	0.9
Smallmouth buffalo	4	0.7	21	2.6	9	1.1	9	0.8
Spotfin shiner	14	2.6	19	2.3	88	10.3	100	9.3
Spotted bass	--	--	1	0.1	5	0.6	9	0.8
Spotted gar	--	--	9	1.1	--	--	--	--
Spotted sucker	9	1.6	19	2.3	25	2.9	61	5.6
Striped bass	1	0.2	2	0.2	3	0.4	3	0.3
Threadfin shad	--	--	8	1.0	1	0.1	1	0.1
Walleye	1	0.2	8	1.0	3	0.4	16	1.5
Warmouth	2	0.4	--	--	6	0.7	7	0.6
White bass	18	3.3	8	1.0	6	0.7	5	0.5
Yellow bass	35	6.4	23	2.8	7	0.8	6	0.6
Yellow perch	--	--	1	0.1	1	0.1	5	0.5
Total	**549**	**100**	**814**	**100**	**852**	**100**	**1,081**	**100**

[1] RM: River Mile

Table 3.8-18. Benthic Macroinvertebrate Index Observed Values and Ratings for Individual Metrics in the Vicinity of Kingston Reservation

Metric	Upstream (Clinch RM[1] 3.75)				Within Thermal Plume (Clinch RM[1] 2.2)				Downstream (Clinch RM[1] 1.5)			
	Summer 2020		Autumn 2020		Summer 2020		Autumn 2020		Summer 2020		Autumn 2020	
	Obs.	Rating	Obs.	Rating	Obs.	Rating	Obs.	Rating	Obs.	Rating	Obs.	Rating
1. Average number of taxa	13.4	5	15.1	5	16.6	5	14.5	5	13.4	5	13.2	5
2. Proportion of samples with long-lived organisms	0.9	3	0.8	3	1.0	5	0.9	3	0.9	3	1.0	5
3. Average number of EPT taxa	2.0	5	0.8	3	1.8	5	1.7	5	1.4	3	1.5	5
4. Average proportion of oligochaete individuals	17.9	3	43.4	1	21.5	3	19.4	3	27.5	1	45.2	1
5. Average proportion of total abundance comprised by the two most abundant taxa	72.5	5	79.7	3	66.1	5	73.5	5	72.9	5	80.1	3
6. Average density excluding chironomids and oligochaetes	768.3	5	510.0	3	603.3	3	718.3	5	720.0	5	348.3	3
7. Zero-samples – proportion of samples containing no organisms	0	5	0	5	0	5	0	5	0	5	0	5
Benthic Index Score[2]		**31**		**23**		**31**		**31**		**27**		**27**
Ecological Health Rating		**Excellent**		**Fair**		**Excellent**		**Excellent**		**Good**		**Good**

Source: TVA 2021e
[1] RM: River Mile
[2] Reservoir Benthic Index Score Range: 7-12 ("Very Poor"), 13-18 ("Poor"), 19-23 ("Fair"), 24-29 ("Good"), 30-35 ("Excellent")

During a 2005 mussel survey on the Clinch River near the Kingston Reservation shoreline (Yokley 2005), divers searched for mussels and characterized the substrate along 40, 100-meter-long transects. The substrate predominantly consisted of soft mud of varying thickness over hard clay. In areas of low current, hard clay was the surface substrate layer and not a suitable habitat for freshwater mussels. No sensitive freshwater mussel species were observed as they are typically not present in impoundments with little or no flow and an abundance of silt. The survey indicated that few freshwater mussels occur in the impoundment. Four live species of mussel were identified, including giant floater, pimpleback, wartyback, and threehorn wartyback. Various sizes of pimpleback and threehorn wartyback were found in significant abundance along one transect in the actual current of the Clinch River, indicating these species are actively recruiting. Both of these species are considered commonly present in similar sized streams throughout TN and adjacent states (Yokley 2005). A single live wartyback was found in one transect and thought to be a new record for this species in the Clinch River. Relics of two other species, fragile papershell and pistolgrip, were found, but no live individuals were observed.

Benthic invertebrate community evaluations in the vicinity of the Kingston Reservation related to the ash recovery project began in 2009. Sampling was conducted at 12 to 18 locations including sites on the Emory River, the Clinch River, and reference sites. The most recent report completed in 2019 detailed results of 2017 sampling, which indicated that “benthic community results were consistent with previous years in that community metrics showed no clear evidence that the structure and function of the invertebrate populations had been severely compromised by the ash release” (TVA 2019d). The survey showed that taxa richness and dominant taxa groups at each site were similar to previous years, with consideration of interannual variability among sites (including reference locations).

Aquatic nuisance species (ANS) pose a threat to TN’s surface waters, including those of the Clinch and TN River systems (TWRA 2008). ANS are defined as non-native plants or animals likely to cause economic and/or environmental harm and may also pose a risk to human health; they are often prolific following establishment and may elicit a positive growth response to increased water temperatures, such as those associated with KIF’s thermal discharge. Three species of ANS have become established in the TN River system and have been observed upstream and downstream of Kingston Reservation: hydrilla (*Hydrilla verticillata*), Eurasian milfoil (*Myriophyllum spicatum*), and spiny naiad (*Najas marina*).

3.8.3.1.1.3 CWA Section 316(b) Characterizations of Impingement and Entrainment

2007 Impingement Study

Section 316(b) of the CWA requires the location, design, construction, and capacity of cooling water intake structures to reflect the best technology available for minimizing adverse environmental impact. Impingement mortality is a component of 316(b) and is defined as an impact in which fish and/or shellfish are trapped or impinged against an intake screen and often killed in the process. In response to the USEPA issuance of a 2004 rule for implementing Section 316(b) (a rule subsequently suspended in 2007) and in accordance with the Proposal for Information Collection submitted to the TDEC in 2005, TVA conducted impingement monitoring at KIF from November 2004 through November 2006 to assess the effects of impingement on the aquatic community of the Clinch River and Watts Bar Reservoir near the Kingston Reservation (TVA 2007). The two-year study estimated annual impingement of 185,577 fish in Year 1 and 225,197 fish in Year 2. Up to

33 species were collected during the study; however, 95 percent of the estimated impingement was comprised of threadfin shad, followed by gizzard shad, freshwater drum, and channel catfish at 1 percent each.

The most recent NPDES permit for KIF was issued on December 1, 2021, with an expiration date of February 28, 2023. A renewal application has been submitted and is still pending. As part of the next permit renewal cycle, TVA is fulfilling Section 316(b) requirements by developing a compliance package to be submitted and reviewed by the NPDES director. A decision would be made by the director on the best technology available for the KIF cooling water intake structure to meet the goal of minimizing impacts to aquatic organisms due to impingement and entrainment, in the event that TVA selects the No Action alternative. Once the renewal permit is finalized, continued operation of the existing KIF units would require TVA to comply with any new permit requirements to install impingement reduction technologies.

2017 Entrainment Study

The USEPA issued an amended final Section 316(b) rule effective October 2014 for existing power generating and industrial facilities (USEPA 2014b). Under the rule, KIF is required, as an existing facility that withdraws more than 125 million gallons of cooling water per day (actual intake flow), to provide an Entrainment Characterization Study (§122.21l(9)) that includes a minimum of two years of entrainment data collection that also includes biological entrainment characterization (TVA 2017b).

To fulfill these requirements, ichthyoplankton sampling was conducted for two years from March 4, 2013, through February 27, 2015. During both years, samples were collected weekly from March through August (expected period of fish spawning) then monthly from September through February. Samples were collected during day and night at all sampling locations. Samples were collected from two stations on either side of the skimmer wall for collection of intake samples: (1) immediately upstream of the intake to account for high rainfall events, and (2) immediately downstream of the intake to account for diverted flow from the Clinch River. Intake samples were collected to determine the numbers and taxonomic identity of fish eggs and larvae entrained by the KIF intake. Reservoir samples were collected at four stations along two transects (two stations each), upstream and downstream from the cooling water intake structure and perpendicular to the river flow, to determine the number of fish eggs and larvae available for entrainment and provide data for spatial and temporal ichthyoplankton occurrence and abundance. Fish eggs and larvae were identified to the lowest possible taxon, counted, and measured (only larvae were measured).

A total of 1,324 and 1,652 fish eggs were collected from the intake and reservoir transects combined during Years 1 and 2, respectively. Fish eggs comprised two families (*Sciaenidae* and *Clupeidae*) during Year 1, and 5 families in Year 2, including *Sciaenidae, Clupeidae, Moronidae, Catostomidae*, and *Atherinopsidae*. Densities of fish eggs peaked during May at both the intake and at reservoir sampling locations during both years. Other trends observed during both years included higher average intake densities than those at reservoir locations, and nighttime densities higher than daytime.

During Year 1 of the study, 6,439 larvae representing 18 distinct taxa were collected across all sampling locations, while 61,626 larvae representing 21 distinct taxa were collected in Year 2.

Average larval densities were considerably lower during Year 1 than Year 2, likely attributable to differences in flows and water temperatures between years. Two high flow events of approximately 13,000 cubic feet per second occurred during the peak spawning season (April–August) of Year 1, each resulting in sharp decreases in water temperature and preventing water temperatures from reaching those utilized by spawning fish.

Fish larvae comprised the same nine families during both years including *Clupeidae, Cyprinidae, Catostomidae, Atherinopsidae, Ictaluridae, Moronidae, Centrarchidae, Percidae,* and *Sciaenidae*. Clupeid larvae comprised the most abundant taxon collected during both years, making up 94.2 percent of the combined sample, followed by Moronidae at 3.2 percent and Centrarchidae at 1.4 percent. All other families were represented by less than 1 percent of the total combined sample.

Estimated annual numbers of eggs and larvae entrained at KIF during both years were lower than those transported by river/reservoir and had similar family compositions. Species with high fecundity and broadcast spawning behavior, such as clupeids, dominated entrainment and reservoir sampling.

3.8.3.1.2 Alternative A

3.8.3.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The only surface waters identified within the bounds of the proposed CC/Aero CT Plant are one intermittent stream, one WWC, and three wetlands (Figure 3.6-2). No surface waters were observed in the switchyard area. Based on field observations, none of these features are likely to contain aquatic life that requires persistent and permanent water flow, such as fish or mussels. However, semi-aquatic wildlife, such as some species of reptiles and amphibians or crustaceans (e.g., box turtles, frogs, salamanders, crayfish), could potentially be present in resources that maintain a sufficient level and/or periodicity of surface water (such as the seasonally flooded wetlands).

3.8.3.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

No surface waters or drainages are found within the proposed 3- to 4-MW Solar Facility and therefore this area does not support aquatic life.

3.8.3.1.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

Only ephemeral channels or WWCs exist within Battery Sites 1, 2, and 3, which do not support aquatic life. Battery Site 3, however, does contain a stormwater detention pond (0.12 acre), which could support aquatic life able to survive in seasonally flooded conditions, such as some species of reptiles, amphibians or crustaceans.

3.8.3.1.2.4 On-site Transmission Upgrades

The site for the proposed battery transmission line connections crosses five WWCs totaling 607 LF, which do not contain aquatic life. The transmission line corridor proposed for upgrades on the Kingston Reservation crosses seven WWCs totaling 3,659 LF, none of which are capable of supporting aquatic life. Four herbaceous wetlands totaling 0.40 acre were identified within the extent of the on-site transmission line corridor. One wetland is classified as permanently flooded and artificial; three wetlands are classified as seasonally flooded or saturated. As mentioned previously, semi-aquatic life could potentially be found in the wetlands or pond during periods of sufficient water levels.

3.8.3.1.2.5 Off-site Transmission Line Upgrades

The Eastern Transmission and Western Transmission Corridors cross 51 perennial streams and rivers totaling 13,924 LF and eight open waters (lakes/ponds) totaling 8.83 acres (Section 3.6.2.1.2.5), which likely contain common fish taxa such as black bass (*Micropterus* spp.), crappie, sunfishes, pike, perch, trout, catfish, gar, buffalo, redhorses, carpsuckers, shad, bowfin, freshwater drum, sculpins, minnows, suckers, chubs, logperches, and hog suckers as well as native aquatic invertebrates (TWRA 2018; Appendix E). One or more aquatic nuisance species may also be present, such as alewife, blueback herring, Asian swamp eel, brook stickleback, Asian carps, grass carp, common carp, inland silverside, round goby, rudd, ruffe, snakehead, mosquitofish, Kentucky River crayfish, marbled crayfish, rusty crayfish, virile crayfish, Asian clam, channeled apple snail, Chinese mystery snail, New Zealand mud snail, or zebra mussel, which are all species that have been identified in TN. The Eastern Transmission and Western Transmission Corridors also cross 36 intermittent streams (totaling 7,583 LF, which could contain semi-aquatic life such as reptiles, amphibians, or crustaceans depending on the time of year, recent climatic events, and/or longer-term climate conditions (e.g., drought).

3.8.3.1.2.6 Construction and Operation of a Natural Gas Pipeline

ETNG's proposed natural gas pipeline would cross perennial streams, ponds and major waterbodies (defined in FERC's Plan and Procedures [FERC 2013a, 2013b] as waterbodies greater than 100 feet wide at the water's edge at the time of crossing), and intermittent streams that may contain aquatic and semi-aquatic life (streams and waterbodies crossed via HDD are excluded) (see Section 3.6.2.1.2.4). Water resources identified during desktop review of the ETNG Construction ROW are classified as freshwater. The ETNG Construction ROW does not cross Essential Fish Habitat or fish hatcheries. ETNG surveyed each potential waterbody crossing to determine classification, aquatic habitat including fisheries, and species-specific presence/absence of state- or federally-listed threatened, endangered, or special concern aquatic species or their designated critical habitat. Typical fish species known or likely to occur within the freshwater streams at aboveground facility sites and/or along access to these sites are summarized in Table 3.8-19. Further, ETNG would coordinate with the USFWS, TWRA, and NPS (NEPA cooperating agency) to identify and address concerns related to aquatic life in potential crossing locations. Waterbodies in the ETNG Construction ROW are discussed further in Section 3.6.2.1.2.4.

Table 3.8-19. Typical Fish Species in Waterbodies Crossed by the ETNG Construction ROW

Common Name	Scientific Name
Blue Catfish	*Ictalurus furcatus*
Channel Catfish	*Ictalurus punctatus*
Flathead Catfish	*Pylodictis olivaris*
Crappie	*Pomoxis* spp.
Largemouth Bass	*Micropterus salmoides*
Spotted Bass	*Micropterus punctulatus*
Smallmouth Bass	*Micropterus dolomieu*
Redeye Bass	*Micropterus coosae*
Walleye	*Stizostedion vitreum*
Sauger	*Stizostedion canadense*

Common Name	Scientific Name
Bluegill	*Lepomis macrochirus*
White Bass	*Morone chrysops*
Striped Bass	*Morone saxatilis*

Source: ETNG 2023d

3.8.3.1.3 Alternative B

As discussed in Section 3.6.2.1.33, the East TN region includes the Cumberland, Upper TN, and Middle TN-Hiwassee/Lower TN river basins and numerous associated major watersheds (TDEC 2022d; State of TN, n.d.). The southeastern U.S, including TN, is considered a hot spot of freshwater biodiversity (Elkins et al. 2016). For example, the Clinch River basin, including Kyles Ford Preserve, is known to contain at least 35 mussel species, which is more than any other place on earth (State of TN, n.d.). East TN contains high fish species richness and high numbers of endemic fish species; moderate crayfish species richness and low-moderate crayfish endemics; and very high mussel species richness and high mussel endemics (Elkins et al. 2016).

3.8.3.2 Environmental Consequences

3.8.3.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue current KIF Plant operations. TVA would implement all planned actions related to the current and future management and storage of CCRs, which have either been reviewed or would be reviewed in subsequent NEPA analyses. Continued short-term, direct, and minor effects on fish eggs, fish larvae, and fish are expected from entrainment and impingement; however, the degree of these effects would be dependent upon the frequency of operations. The No Action Alternative would result in no change to current aquatic ecology conditions; as a result, no beneficial effects from elimination of facility operations with respect to aquatic ecosystems would occur under this alternative.

3.8.3.2.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

As discussed in Section 3.6.2.2.2, the demolition boundary encompasses nine WWCs and exempted reaches (totaling 6,936 LF), two ephemeral channels (totaling 400 LF), and three (non-jurisdictional) ponds (totaling 0.08 acre). Aquatic life, representative of taxa tolerable to poor water quality conditions, has been observed in the exempted reach and is likely present in the three connected detention ponds. Although watercourses occur on and around the Kingston Reservation, ground-disturbance associated with retirement, decommissioning, decontamination, and deconstruction activities would be minimized, and all work would be done in accordance with state and local BMPs. With proper implementation of BMPs, no direct effects to the aquatic communities outside of these areas are anticipated. All necessary CWA Section 404 and TN ARAP permits would be obtained for in-water work, such as the demolition of intake structures and barge unloading area upgrades; mitigation measures such as appropriate BMPs would be implemented to reduce potential effects. Compensatory mitigation would be provided for the loss of wetlands or streams on the Kingston Reservation for this activity, if deemed necessary by the agencies.

With the implementation of appropriate BMPs, minor effects to surrounding surface waters are expected from demolition activities. Cumulative effects to surface water may occur with the proximity of CCR management activities as RFFAs in the Kingston Reservation. With the use of proper BMPs and compliance with all federal, state, and local regulations and guidelines, cumulative surface water effects are expected to be temporary and minor.

There is a possibility that aquatic ecology could be indirectly affected due to modification of the riparian zone by stormwater runoff resulting from construction activities associated with selective demolition. Potential effects due to removal of vegetation within the riparian zone include increased erosion and siltation, loss of habitat, and increased temperatures. Construction activities associated with the removal of buildings, as well as backfilling facilities, could lead to increased siltation and runoff in the Clinch River. With appropriate BMPs implemented during construction, operation, and maintenance of the proposed construction activities, any effects to aquatic ecology resulting from the proposed action would be minor, if at all.

The retirement of KIF would result in elimination of entrainment and impingement mortality of fish and shellfish in the vicinity of the KIF cooling water intake structure. Thermal discharges would also cease, generally improving water quality. Based on annual biomonitoring of the fish community as a condition of CWA Section 316(a), effects from KIF on fish populations in the vicinity of the plant are negligible, as the Clinch River (Watts Bar Reservoir) maintains a balanced and indigenous fish community as demonstrated through analysis of fish community diversity, trophic levels, limited presence of pollution-tolerant species, and representation of indigenous species. Some species, such as introduced subtropical species like threadfin shad, may depend on thermal refugia created during winter months by the heated effluent, and the absence of thermal discharges during winter could result in fish kills of this or similar sensitive neotropical species (Reutter and Herdendorf 1976). Overall, the retirement of KIF would have a minor long-term beneficial effect on the aquatic community in the vicinity of the plant due to the elimination of entrainment and impingement and thermal discharges.

3.8.3.2.2.1 Environmental Justice Considerations

Effects to aquatic life that would occur as a result of the KIF retirement and D4 activities would be temporary, minor, or mitigated. Aquatic life that depends on the heated water discharged from KIF may experience minimal to minor and short-duration impacts from loss of thermal refuge at the KIF discharge area until those species adjust to the return of normal temperature conditions in that location. The KIF retirement and elimination of cooling water withdrawals would likely result in long-term increases in affected species populations in response to the elimination of entrainment, impingement, and thermal discharges. The aforementioned impacts to aquatic life are not expected to cause disproportionate and adverse effects to EJ populations due to the absence of EJ populations on the Kingston Reservation.

3.8.3.2.3 Alternative A

3.8.3.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

No direct effects to aquatic life are anticipated by the construction or operation of the proposed CC/Aero CT Plant. No surface water with permanent flow exists within the CC/Aero CT Plant area and therefore no aquatic life requiring constant flow is expected to be present. There is potential for semi-aquatic life to be present in wetlands located within the proposed CC/Aero CT Plant boundary; however, this would depend on recent climate conditions (i.e., rainfall, drought). The proposed CC/Aero CT Plant would use air-cooled condensers, eliminating the need for water withdrawals from the nearby Clinch River and minimizing effects to aquatic life. Some water treatment may be required to support the

CC/Aero CT Plant, which may result in upgrades to the water treatment plant. The facility would require potable water, which would be obtained from the existing public supply at the Kingston Reservation (Harriman Utility Board).

3.8.3.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The footprint for the proposed 3- to 4-MW Solar Facility does not contain any water bodies that support aquatic life; therefore, the construction and installation of the solar facility would have no impacts on aquatic resources.

3.8.3.2.3.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

Construction of a 100-MW BESS at Battery Site 3 would result in permanent loss of a 0.12-acre detention pond and any aquatic life contained therein. As a detention pond, it is unlikely that the environment supports a wide array of aquatic organisms, as it lacks habitat complexity, consistency in water levels, and food resources, and likely contains poor water quality when water is present. Therefore, the loss of this pond would have a negligible effect on aquatic life.

3.8.3.2.3.4 On-site Transmission Upgrades

No direct effects to aquatic life from the construction of the battery transmission line connections are expected, as this corridor crosses only WWCs which do not support aquatic organisms. Indirect effects to aquatic life resulting from the construction of the proposed battery transmission line connections are expected to be minor and temporary.

The transmission lines proposed for upgrades cross seven WWCs and four herbaceous wetlands. The WWCs do not support aquatic life, however the wetlands are classified as permanently or seasonally flooded and could provide habitat for semi-aquatic reptiles, amphibians, or crustaceans. As an existing transmission line corridor, the lines currently span the wetlands and therefore no direct impacts to these resources or potential aquatic life contained therein, are expected. As with other activities, BMPs, such as silt fencing to protect surface water quality from erosion or sedimentation, would be implemented during the construction process to minimize potential impacts to aquatic resources.

3.8.3.2.3.5 Off-site Transmission Line Upgrades

As described in Section 3.6.2.1.2.5, a total of 26 perennial stream crossings (totaling 7,426 LF), 36 intermittent stream crossings (totaling 7,583 LF), 12 ephemeral channel crossings (totaling 1,681 LF), eight open water bodies (totaling 8.82 acres), and 63 other WWCs including erosional gullies (totaling 11,923 LF) would be crossed by the existing Eastern Transmission Corridor and/or associated access roads proposed for upgrades as part of as part of Alternative A. A total of seven perennial streams (comprising 854 LF of smaller streams and 1.08 acres of larger features), seven intermittent streams (totaling 1,515 LF), four ephemeral channels (totaling 551 LF), and three open water ponds (totaling 1.54 acres) were identified within the Western Transmission Corridor. Intermittent streams may support semi-aquatic life; field surveys of the additional off-site transmission corridors would be necessary to determine species-specific presence/absence of aquatic resources. Any potential impacts to these areas would be required to adhere to appropriate state and federal permitting requirements.

The Eastern Transmission Corridor L5116 crosses Aquatic Species at Risk polygons in the mainstem TN River, indicating potential presence of listed aquatic species. Field surveys would be necessary to determine whether suitable habitat is present for sensitive species. No federally designated critical habitat for aquatic species is present within this corridor.

The Eastern Transmission Corridors L5280 and L5381 are located within 1 mile of Aquatic Species at Risk polygons in the mainstem TN River, indicating potential presence of listed aquatic species in the vicinity. Field surveys would be necessary to determine whether suitable habitat is present for sensitive species. No federally designated critical habitat for aquatic species is present within these corridors. A detailed discussion of aquatic threatened and endangered species is presented in Section 3.8.4.

Effects to organisms within these habitats would be limited since areas proposed for upgrades are within existing ROWs. Replacement of structures, if necessary, would not be placed in aquatic resources; therefore, these replacements would not have the potential to directly impact aquatic life. Although site access would be through existing and new access roads, effects to aquatic life would be avoided or minimized through careful planning of new access roads and would be further minimized through the use of use of BMPs during the construction phase (TVA 2022a). Effects and minimization measures for upgrade activities are summarized in Section 3.6.2.2.3.6.

3.8.3.2.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 3 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the aquatic life-related findings in ETNG's Resource Report 3. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). The permanent ROW would cross 219 perennial streams, 28 ponds and major waterbodies, and 175 intermittent streams that may contain aquatic and semi-aquatic life (streams and waterbodies crossed via HDD are excluded). Temporary workspaces may affect an additional 55 perennial streams, 19 ponds and major waterbodies, and 74 intermittent streams. Waterbodies that are within the construction workspace but not crossed by the pipeline would either be avoided or temporarily crossed using wooden construction mats or equipment bridges. Overall, impacts to this aquatic life in waters directly impacted from pipeline construction or temporary workspaces would be minor and temporary.

For most waterbodies crossed by the permanent ROW, there would be minor or *No Effects* to fisheries (ETNG 2023d). There is no essential fish habitat (EFH) within the ETNG Construction ROW; therefore, there would be no project-related impacts to EFH. ETNG has completed over 99 percent of field surveys on aquatic communities to verify the presence of sensitive fish species within waterbodies crossed by the permanent ROW. ETNG is continuing to coordinate with landowners and is completing surveys of remaining stream segments as access approval is granted. ETNG would follow the Project E&SCP to control erosion and sedimentation and to minimize impacts on waterbodies. Additionally, ETNG would coordinate with federal and state resource agencies to identify potential project-related impacts to aquatic resources and to develop and implement avoidance and minimization measures.

ETNG's proposed construction activities have the potential to affect surface waters, including clearing activities, crossings of waterbodies for pipeline installation, HDD, hydrostatic test discharges, potential spills or leaks of hazardous liquids from the refueling of construction vehicles or storage of fuel, oil, and other fluids, and temporary access road crossings. ETNG's Resource Report 3 (ETNG 2023d) was filed with FERC in July 2023.

This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment and environmental effects. TVA has independently reviewed and concurs with the aquatic life-related findings in ETNG's Resource Report 3, which provides the following:

> [ETNG] is not proposing to cross waterbodies via the [wet] open cut method at this time… Impacts on fishery resources associated with dry [open cut] crossings may include direct contact with relatively immobile prey that may be food resources for fish, increased sedimentation and water turbidity immediately downstream of the construction workspace, alteration or removal of aquatic habitat cover, introduction of pollutants, impingement or entrainment of fish and other biota associated with the use of water pumps at dam and pump crossings, and downstream scour associated with use of those pumps. Fish passage during dam and pump crossings will be temporarily restricted during the installation of the new pipeline. Fish passage will only be temporarily interrupted and will be restored immediately after the restoration of the stream bed and banks. [ETNG] will screen pump intakes to avoid entrainment of fish. The short-term and localized interruption of fish passage is not anticipated to dramatically affect the migration of fish within the stream systems. Following construction, the waterbody and flow will be restored.
>
> Pipeline construction across waterbodies may also result in temporary increases in turbidity and sedimentation downstream of the crossing site. Dry crossing construction activities will be performed in a manner that will minimize the potential for erosion and sedimentation within the stream channel. Specifically, dry crossing methods will be implemented, where site conditions permit, to confine in-stream effects to the construction workspace and eliminate effects to downstream reaches. [ETNG] will properly align flumes or pump discharge locations to prevent waterbody scour. Additionally, [ETNG] will strive to complete in-stream pipeline removal and installation activities within a 24-hour period for minor crossings and 48 hours for intermediate crossings per each operation in order to reduce the entrainment of fish, benthic macroinvertebrates, and other aquatic life. Construction procedures for dry-cut crossings are further discussed in Section 1.5.1.6.2 of Resource Report 1.
>
> [ETNG] will implement the detailed erosion and sedimentation control measures provided in the [Ridgeline Expansion] project Erosion & Sediment Control Plan (E&SCP; see Appendix 1C of Resource Report 1), which incorporates the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (FERC Plan) and FERC's Wetland and Waterbody Construction and Mitigation Procedures (FERC Procedures), to contain materials in the workspace and minimize effects to fisheries from changes in water quality. [ETNG] will install and maintain erosion and sedimentation controls throughout construction and restoration to minimize impacts on waterbodies. By following the avoidance, minimization, and mitigation strategies of stream crossings discussed in detail within Resource Report 1, adopting the recommendations and guidelines provided by the TDEC and USACE permitting requirements, and adhering to the agency-recommended in-stream construction time-of-year restrictions for the waterbodies, long-term impacts to the waterbodies within the [ETNG Construction ROW] corridor and its resident aquatic species will be avoided.

[ETNG] has initiated discussions with and will continue to consult with TDEC and TWRA regarding avoidance, minimization, and mitigation measures necessary to reduce potential impacts to fish species as a result of blasting. Pre-blast and post-blast inspections by [ETNG] will be performed as necessary and will comply with regulations applicable to blasting and blast vibration limits with regard to structures and underground utilities. Bedrock removal and blasting are further discussed in Section 1.5.1.3 of Resource Report 1 and Section 6.3 of Resource Report 6

[…]

Use of the HDD crossing method allows the pipeline to be installed beneath the waterbody without surface disruption between the drill entry and exit points. This allows the installation to occur in a manner that minimizes potential effects to fisheries and aquatic habits.

Potential effects associated with construction of HDDs include erosion or sedimentation associated with the onshore operation of the HDD equipment, which could result in localized turbidity if it enters an adjacent waterbody. [ETNG] will implement the detailed erosion and sedimentation control measures provided in the [Ridgeline Expansion] project E&SCP to contain materials in the workspace. HDD workspaces will be located away from aquatic resources associated with the crossings wherever possible.

As part of the HDD process, a bentonite drilling fluid will be used to lubricate the cutting tools, maintain the integrity of the hole and transport cutting material from the hole. Water for drilling mud will be locally sourced from the waterbody to be crossed or water obtained from local municipalities. When utilizing water from streams, [ETNG] will utilize appropriate screens and cages to minimize entrainment and impingement of fish and macroinvertebrates. Additionally, withdrawal rates will be kept to minimum practicable velocities to reduce suction force and reduce the risk for impingement of fish and invertebrates on or within the intake system.

There are certain effects that could occur as a result of the drilling, such as inadvertent return of drilling fluid. An inadvertent drilling fluid return could occur in the area of the drilling fluid pits or tanks, or along the path of the drill due to unfavorable ground conditions, potentially releasing drilling fluid onto the bottom of the waterbody. Drilling fluid is composed of naturally occurring materials, such as bentonite, which in small quantities would not be detrimental to aquatic species, as the [USPEA] has classified it as not toxic. Detail on potential fluid releases is provided in Section 2.3.9.4 of Resource Report 2. In larger quantities, the return of drilling fluid to a waterbody could affect fisheries if the accidentally released fluid sufficiently buries benthic resources of the waterbody.

The drilling fluid consists of bentonite clay slurry that is denser than water, causing the slurry to settle along the waterbody bottom. Finfish in the juvenile and adult life stages typically have enough mobility to avoid a bentonite discharge. However, should any species with demersal eggs be present, they may suffer mortality in the case of an inadvertent return. The discharged material would be localized to the inadvertent return area, is non-toxic, and can often be cleaned up. The drilled spoil would settle in the immediate vicinity of the inadvertent return location. Drilling fluids released at the inadvertent return location would tend to disperse near the bottom of the water column, but because of their fine particle size, a small quantity would remain in suspension for an extended period. [ETNG] will prepare a Project-specific Horizontal Directional Drill Monitoring, Inadvertent Return Response, and Contingency Plan which will be included in Appendix 1C of the final Resource Report 1. The Plan will provide details that address the inadvertent return of drilling fluid. To minimize effects to fisheries resources, fisheries of special concern, and/or protected fish species, [ETNG] would comply with the measures outlined in this plan in the case of an inadvertent return of drilling fluid.

Through the use of the trenchless drill method and implementation of the Project E&SCP Plan and HDD Plan, [ETNG] anticipates that impacts to fisheries as a result of trenchless HDD construction will be minor, short-term, and not significant. No long-term impacts are anticipated.

Removal of trees and other streamside vegetation from the edges of waterbodies at the crossing may reduce shading of the waterbody, diminish escape cover, and can result in locally elevated water temperatures. Elevated water temperatures can, in turn, lead to reductions in levels of dissolved oxygen. This can negatively influence habitat quality and reduce availability of habitat for certain fish species. Effects resulting from tree clearing will be minimized due to the use of existing cleared ROWs for the majority of the [Ridgeline Expansion] project facilities. To further minimize potential effects associated with loss of riparian shade and vegetation cover, clearing of trees and other vegetation will be restricted to only what is necessary to safely construct and operate the pipeline.

Once construction is complete, streambeds and banks will be quickly restored to preconstruction conditions to the fullest extent possible. Restoration, bank stabilization, and revegetation efforts, which are defined in the [ETNG pipeline]t E&SCP, will minimize the potential for erosion from the surrounding landscape. Adherence to the [ETNG pipeline’s] E&SCP will also maximize the potential for re-growth of riparian vegetation, thereby minimizing the potential for any long-term effects associated with lack of shade and cover. Implementation of the [pipeline’s] construction, restoration, and mitigation procedures will result in only limited, short-term effects to fishery resources, and the aquatic habitats upon which these fishery resources depend. Invertebrate populations will recolonize the crossing area and temporary workspaces will revert to their original condition, including re-establishment of riparian cover. Furthermore, operation and routine maintenance of the pipeline ROW and aboveground facilities, which will be restricted to clearing and mowing vegetation on the permanent ROW, are not expected to have any noticeable effect on fishery resources in the [ETNG Construction ROW] area.

Hydrostatic test water appropriations and discharges will not result in a significant entrainment of fish, loss of habitat, or an adverse effect to water quality. Proposed sources of water to be used by [ETNG] for hydrostatic testing of the [Ridgeline Expansion] project facilities are listed in Tables 2.3-7 in Resource Report 2. The withdrawal locations will occur at or near the construction corridor.

The discharge locations have not been identified, but all discharge locations will be sited within a well vegetated upland area within the same watershed, where practicable. If local sources of water are used, withdrawal intake hoses will be fitted with intake screen devices to prevent the entrainment of fingerlings and small fish during water withdrawal. Discharge will comply with regulatory permit conditions and will be controlled to prevent scour and sedimentation, flooding, or the introduction of foreign or toxic substances into the aquatic system. Sampling of discharge water will be conducted in accordance with the [Ridgeline Expansion] project E&SCP to document water quality at the time of discharge. A detailed description of the hydrostatic test process and mitigation measures is provided in Section 2.3.8 of Resource Report 2.

Accidental spills of construction-related fluids (e.g., oil, gasoline, or hydraulic fluids) on the landscape or directly into waterbodies could result in water quality effects affecting fish and other organisms. Effects to fisheries would depend on the type and quantity of the spill, and the dispersal and attenuation characteristics of the waterbody. To reduce the potential for surface water contamination, [ETNG] will have a Spill Prevention Control and Countermeasure Plan (SPCC Plan) in place prior to construction that contractor(s) will be required to implement. The SPCC Plan is provided in Appendix 1C of Resource Report 1. To minimize spill risk, refueling or other handling of hazardous materials within 100 feet of wetland and waterbody resources will be restricted. If the 100-foot setback cannot be met, these activities will be performed under the supervision of an environmental inspector (EI) in accordance with the SPCC Plan. The SPCC Plan also specifies that [ETNG] will conduct routine inspections of tank and storage areas to help reduce the potential for spills or leaks of hazardous materials.

3.8.3.2.3.7 Summary of Alternative A

TVA Proposed Actions

No permanent impacts would occur to perennial or intermittent streams under the Alternative A proposed actions (see Table 3.6-13); therefore, no permanent impacts would occur to aquatic life. Streams within the off-site transmission line corridors proposed for upgrades have potential to experience short-term temporary disturbance, such as surface water runoff and increased siltation; however, appropriate BMPs, including sediment and erosion control devices, such as silt fencing, would be installed to prevent and minimize risk to surface waters from construction activities.

Waters within the demolition boundary have the potential to be directly impacted by stormwater runoff during D4 activities, including the Clinch River. Waters on Kingston Reservation support low quality habitat and corresponding low aquatic diversity. While the removal of intake structure equipment (i.e., fish screens and pumps) and construction of a barge unloading area could have a minor direct impact aquatic life in the Clinch River, the aquatic community in the vicinity of KIF would experience a minor, permanent beneficial effect with the elimination of facility operations.

There would be no long-term impacts to surface waters, and therefore aquatic life, associated with the proposed CC/Aero CT Plant, 3- to 4-MW Solar Facility, 100-MW BESS, or on-site or off-site transmission line corridors.

Cumulative effects to surface waters (and by proxy, aquatic life) may occur given proximity of past/present and RFFAs near the transmission line corridors. Cumulative effects to surface waters would be minimized and mitigated through proper siting of these facilities (i.e., avoidance), the use of BMPs, and adherence to mitigation requirements in applicable CWA Section 404 and 401 permits.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

There would be no permanent impacts to surface waters, and therefore no permanent impacts to aquatic life associated with the ETNG Construction ROW. Short-term, temporary impacts from stream diversion during open cut natural gas pipeline installation would occur. Streams would be returned to original grade, streambanks stabilized, and flow restored following pipeline installation; therefore, temporary impacts to aquatic life would be minor.

3.8.3.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Direct effects to aquatic life that would occur as a result of the proposed CC/Aero CT Plant and transmission line activities would be minimized or mitigated and limited to the immediate Kingston Reservation, where no EJ populations are present. Short-term effects near the off-site transmission line corridors could result in temporary disproportionate and adverse effects for nearby EJ populations that currently fish the affected waters and may rely on aquatic resources as additional sustenance. Fishing is permitted in nearby WMAs (see Section 3.9 for more details on these areas). See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Direct effects to aquatic life resulting from the proposed pipeline project would be minor and temporary as most potential direct effects would be minimized or mitigated. Any negative effects to aquatic life could be disproportionate and adverse to EJ populations within the ETNG EJ Study Area during and immediately after construction. This would be a minor, temporary, disproportionate and adverse impact since the potentially affected waters, which are currently fished for additional sustenance by these populations, are typically major waterbodies such as rivers, large creeks, ponds, and lakes that are anticipated to be crossed using HDD methods. Fishing is also permitted in nearby WMAs (see Section 3.9 for more details on these areas).

Although TVA has assessed these impacts to be minor, temporary, disproportionate and adverse for identified EJ populations, ETNG is continuing to evaluate effects of its proposed project and provide updates to the FERC as changes occur. Changes in assessed impacts or determinations of effect as a result of such changes would be verified by TVA to assess the need to update this analysis through a supplemental NEPA, based on ETNG's updated findings.

3.8.3.2.4 Alternative B

3.8.3.2.4.1 Construction and Operations of Solar and Storage Facilities

Alternative B would result in construction activities that have the potential to permanently affect streams and/or temporarily affect aquatic life via stormwater runoff. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities. Estimates of an average 8.7 LF of stream effect per MW would result in approximately 13,050 LF of stream effects for the 1,500 MW of solar facilities, and 14,790 LF of stream for BESS facilities. Cumulative effects to aquatic life would occur; combined with future expansion of solar additions by 2030s forecasted in TVA's 2019 IRP, there is potential for an additional 87,000 LF of stream impacts.

On-site surveys of aquatic resources and appropriate permitting (and mitigation) prior to land disturbance activities would be completed. TVA and solar developers would minimize effects to aquatic life by siting facilities on lands with few surface water resources, configuring the solar arrays, access roads, and other infrastructure to avoid surface waters to the maximum extent practicable, while maintaining vegetated/wooded buffers along surface waters. BESS sites are typically small enough to be sited to avoid surface water and aquatic life effects.

Appropriate BMPs would be installed, 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 would be avoided.

3.8.3.2.4.2 Transmission and Other Components

As noted in Table 3.2-1, transmission lines typically result in an average of 2.9 stream crossings per mile of new line. Based on TVA's evaluation, an average of 1.7 miles of new transmission line are needed for solar facilities, equating to approximately 74 surface water crossings that may occur for the 15 solar facilities, and/or 84 stream crossings associated with the 17 BESS facilities. To minimize effects to aquatic life, TVA would avoid placing structures within surface waters, and effects would be minimized by crossing surface waters at a perpendicular angle where practicable. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained. Minor cumulative effects to aquatic life may occur under Alternative B with the addition of 10,000 MW of solar TVA's PSA, but effects would be minimized through proper siting of transmission lines and the use of BMPs.

3.8.3.2.4.3 Environmental Justice Considerations

Potential effects to aquatic life on the solar facility sites would be minimized or mitigated through BMPs such as avoiding surface water resources and maintaining vegetated avoidance buffers around surface waters. Transmission activities would take a similar approach. Erosion and sediment control measures would also be taken in association with both solar facility and transmission line activities. Effects to aquatic life would therefore be limited to the immediate project sites and transmission line corridors. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.8.4 Threatened and Endangered Species

Some species of fish and wildlife are protected under the ESA of 1973 and related state laws. The ESA was implemented to provide a framework to conserve and protect threatened and endangered species and their habitats. This act authorizes the determination and listing of species as endangered and threatened; prohibits unauthorized taking, possession, sale, and transport of endangered species, provides authority to acquire land for the conservation of listed species; authorizes civil and criminal penalties for violating the ESA; and other authorizations. An endangered species is defined by the ESA as any species in danger of extinction throughout all or a significant portion of its range. Likewise, a threatened species is likely to become endangered within the foreseeable future throughout all or a significant part of its range. Critical habitats, essential to the conservation of listed species, also can be designated under the ESA. The ESA establishes programs to conserve and recover endangered and threatened species and makes their conservation a priority for federal agencies. Under Section 7 of the ESA, federal agencies are required to consider the potential effects of their proposed actions on endangered and threatened species and critical habitats. If a proposed action has the potential to affect these resources, the federal agency is required to consult with the USFWS.

Fish and game species are also protected by hunting, fish, and trapping regulations enforced by the USFWS and TWRA. In addition to these laws, the Migratory Bird Treaty Act (MBTA) of 1918, the Bald and Golden Eagle Protection Act (BGEPA) of 1940, and EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds also provide protection to birds. The MBTA and EO 13186 address most native birds occurring in the U.S. The MBTA makes the purposeful taking, killing, or possession of migratory birds, their eggs, or nests unlawful, except as authorized under a valid permit. EO 13186 focuses on federal agencies taking actions with the potential to have negative effects on populations of migratory birds. It provides broad guidelines on avian conservation responsibilities and requires agencies whose actions affect or could affect migratory bird populations to evaluate those impacts and implement practices to minimize, to the extent practicable, adverse effects on migratory bird resources.

In addition to the ESA and EOs 13563, 13112, and 13751, established for the protection of native, threatened, and endangered plant species and communities, the Rare Plant Protection and Conservation Act of 1985 authorized the state of TN to legally list plants as threatened, endangered, and of special concern (TDEC, n.d.). The Act allows TDEC to enter into a cooperative agreement with the USFWS "with respect to programs designed to conserve rare plants," (TDEC, n.d.) that establishes the Division of Natural Areas as the lead state agency in the process of listing and recovery efforts for federally endangered or threatened species of plants.

A desktop review of state and federal resources was performed, which included the USFWS Information for Planning and Consultation (IPaC) tool (USFWS 2023b), the TDEC rare species list (TDEC 2023c), and TVA's Regional Natural Heritage Database (TVA 2023d), to identify species of conservation concern potentially present within each alternative project area. Field surveys were conducted by TVA within the Kingston Reservation in summer 2019 (Appendix F) to assess the potential for the presence of threatened and endangered species or their habitats. The Kingston Reservation boundary and off-site transmission line corridor boundaries were used for the USFWs IPaC tool. TDEC rare species lists are reported on a county-wide basis, and therefore species listed for each county were included for those areas that the Alternative A proposed CC/Aero CT Plant site or transmission line corridors cross. Similarly, the USFWS IPaC tool was reviewed to identify federally listed species known or expected to occur within the ETNG Construction ROW, and as well as a review of all state-listed species that may occur within counties traversed by the ETNG Construction ROW were reviewed in the absence of an official response by the TWRA (ETNG 2023d). State-listed species information derived from TVA's Regional Natural Heritage Database was reported from within 5 miles of the site for plant species, at the county level for aquatic species, and within 3 miles for terrestrial species (TVA 2023d). Federally listed species information was derived from TVA's Regional Natural Heritage Database was reported at the county level. Species contained on the USFWS IPaC, TDEC, and TVA Regional Natural Heritage Database protected species lists are discussed in the following sections.

3.8.4.1 Affected Environment

3.8.4.1.1 Kingston Reservation (No Action and D4 Activities)

Fish, wildlife, and plant species under state or federal protection that may be found on or in the vicinity of the Kingston Reservation, as determined by the state and federal resources, are summarized in Table 3.8-20. No federally designated critical habitat is located on the Kingston Reservation. Only species with potential habitat on the Kingston Reservation and those that have been directly observed on-site are discussed below.

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Table 3.8-20. Threatened, Endangered, and Other Protected Species Evaluated for Potential Impacts under the Individual Components of Alternative A Proposed on the Kingston Reservation

Common Name *Scientific Name*	State Rank and Listing Status[1]	Federal Listing Status[1]	Habitat Requirement	D4 Process Site[3]	CC/Aero CT Plant Site and Switchyard[2]	3- to 4-MW Solar Facility[2]	100-MW Battery Storage Site 1[2]	100-MW Battery Storage Site 2[2]	100-MW Battery Storage Site 3[2]	On-Site Transmission Line[2]
Birds										
Bachman's Sparrow *Peucaea aestivalis*	S1, SE		Dry open pine or oak woods; nests on the ground in dense cover.	Yes	Yes	No	Yes	Yes	Yes	Yes
Bald Eagle[3] *Haliaeetus leucocephalus*	SD		Nests in tall, mature trees near large bodies of water such as large rivers, lakes, reservoirs, and coastal areas.	Yes (foraging)	Yes (foraging)	No	Yes (foraging)	Yes (foraging)	Yes (foraging)	Yes (foraging)
Osprey *Pandion haliaetus*	SR		Found on rivers, lakes, reservoirs, lagoons, swamps, and marshes where fish are abundant.	Yes[4] (nesting, foraging)	Yes[4] (foraging)	No	Yes[4] (foraging)	Yes[4] (foraging)	Yes[4] (foraging)	Yes (foraging)
Swainson's Warbler *Limnothlypis swainsonii*	S3, SD		Mature, rich, damp, deciduous floodplain and swamp forests with thick understory.	Yes	Yes	No	Yes	Yes	Yes	Yes
Mammals										
Gray Bat *Myotis grisescens*	S2, SE	FE	Roosts in caves or karst features year-round. Various foraging habitats including wet meadows, damp woods, and uplands.	Yes (foraging)	Yes (foraging)	No	Yes (foraging)	Yes (foraging)	Yes (foraging)	Yes (foraging)
Indiana Bat *Myotis sodalis*	S1, SE	FE	Various habitats including wet meadows, damp woods, and uplands, including abandoned structures and sinkhole fissures/karst features; statewide.	Yes (roosting and foraging)	Yes (roosting and foraging)	No	Yes (roosting and foraging)	Yes (roosting and foraging)	Yes (roosting and foraging)	Yes (roosting and foraging)
Little Brown Bat *Myotis lucifugus*	S3, ST	UR	Variety of habitats including human-made structures, caves, and hollow trees for resting and maternity sites; typically feed over water.	Yes (roosting and foraging)	Yes (roosting and foraging)	No	Yes (roosting and foraging)	Yes (roosting and foraging)	Yes (roosting and foraging)	Yes (roosting and foraging)
Long-tailed Shrew *Sorex dispar*	S2, SD		Mountainous, forested areas with loose talus.	No	No	No	No	No	No	No
Northern Long-eared Bat *Myotis septentrionalis*	S1S2, ST	FE	Various habitats including wet meadows, damp woods, and uplands, including abandoned structures, sinkhole/karst features; statewide.	Yes (roosting and foraging)	Yes (roosting and foraging)	No	Yes (roosting and foraging)	Yes (roosting and foraging)	Yes (roosting and foraging)	Yes (roosting and foraging)
Southern Bog Lemming *Synaptomys cooperi*	S4, SD		Marshy meadows, wet balds, and rich upland forests with a thick humus layer.	No	No	No	No	No	No	No
Tricolored Bat *Perimyotis subflavus*	S2S3, ST		Generally associated with forested landscapes but may roost near openings.	Yes (roosting and foraging)	Yes (roosting and foraging)	No	Yes (roosting and foraging)	Yes (roosting and foraging)	Yes (roosting and foraging)	Yes (roosting and foraging)
Reptiles										
Eastern Slender Glass Lizard *Ophisaurus attenuates longicaudus*	S3, SD		Dry upland areas including brush, cut-over woodlands and grassy fields.	Yes	No	No	No	Yes	Yes	Yes
Northern Pinesnake *Pituophis melanoleucus*	S3, ST		Well-drained sandy soils in pine/pine-oak woods; dry mountain ridges.	No	No	No	No	No	No	No

Common Name *Scientific Name*	State Rank and Listing Status[1]	Federal Listing Status[1]	Habitat Requirement	D4 Process Site[3]	CC/Aero CT Plant Site and Switchyard[2]	3- to 4-MW Solar Facility[2]	100-MW Battery Storage Site 1[2]	100-MW Battery Storage Site 2[2]	100-MW Battery Storage Site 3[2]	On-Site Transmission Line[2]
Amphibians										
Berry Cave Salamander *Gyrinohilus gulolineatus*	S1, ST	FE	Aquatic cave obligate.	No	No	No	No	No	No	No
Four-toed Salamander *Hemidactylium scutatum*	S3, SD		Woodland swamps, shallow depressions, and sphagnum mats on acidic soils in middle and east Tennessee.	No	No	No	No	No	No	No
Hellbender *Cryptobranchus alleganiensis*	S3, SE		Clean and flowing water with plenty of oxygen in large streams and creeks. Areas with gravel bottoms and an abundance of rocks and submerged logs are necessary.	No	No	No	No	No	No	No
Fish										
Blue Sucker *Cycleptus elongatus*	S2, ST		Swift waters over firm substrates in big rivers.	Yes	No	No	No	No	No	No
Flame Chub *Hemitremia flammea*	S3, SD		Springs and spring-fed streams with lush aquatic vegetation; Tennessee and middle Cumberland watersheds.	No	No	No	No	No	No	No
Lake Sturgeon *Acipenser fulvescens*	S1, SE		Bottoms of large, clean rivers and lakes.	Yes	No	No	No	No	No	No
Slender Chub *Erimystax cahni*		FT	Restricted to bars and shoals of fine to medium gravel in runs and riffles of medium to large, clear, warm rivers.	Yes	No	No	No	No	No	No
Spotfin Chub *Erimonax monachus*	S2, ST	FT, EXPN	Clear upland rivers with swift currents and boulder substrates; portions of the Tennessee River watershed.	Yes	No	No	No	No	No	No
Tangerine Darter *Percina aurantiaca*	S3, SD		Large-moderate size headwater tributaries to Tennessee River, in clear, fairly deep, rocky pools, usually below riffles.	No	No	No	No	No	No	No
Tennessee Dace *Chrosomus tennesseensis*	S3, SD		First order spring-fed streams of woodlands in Ridge and Valley limestone region; Tennessee River watershed.	No	No	No	No	No	No	No
Yellowfin Madtom *Noturus flavipinnis*		FT	Shallow pools and backwaters of streams with cover of roots, sunken leaves, brush piles, and bedrock ledges.	No	No	No	No	No	No	No
Crustaceans										
Valley Flame Crayfish *Cambarus deweesae*	S1, SE		Primary burrower; open areas with high water tables.	Yes	No	No	Yes	Yes	Yes	Yes
Mollusks										
Alabama Lampmussel *Lampsilis virescens*	S1, SE	FE	Sand and gravel substrates in shoal areas of small-medium size rivers.	No	No	No	No	No	No	No
Anthony's Riversnail *Athearnia anthonyi*	S1, SE	FE	Large-medium rivers with moderate-high gradient, or riffles of larger creeks with cobble/boulder substrate.	No	No	No	No	No	No	No
Birdwing Pearlymussel *Lemiox rimosus*	S1, SE	FE, EXPN	Riffles with stable, sand and gravel substrates in moderate to fast currents in small to medium sized rivers.	No	No	No	No	No	No	No

Common Name *Scientific Name*	State Rank and Listing Status[1]	Federal Listing Status[1]	Habitat Requirement	D4 Process Site[3]	CC/Aero CT Plant Site and Switchyard[2]	3- to 4-MW Solar Facility[2]	100-MW Battery Storage Site 1[2]	100-MW Battery Storage Site 2[2]	100-MW Battery Storage Site 3[2]	On-Site Transmission Line[2]
Cracking Pearlymussel *Hemistena lata*	S1, SE	FE, EXPN	Sand, gravel, and cobble substrates in swift currents or mud and sand in slower currents.	No	No	No	No	No	No	No
Cumberland Bean (pearlymussel) *Villosa trabalis*		FE	Sand, gravel, and cobble substrates in waters with moderate to swift currents, and depths less than 1 meter.	No	No	No	No	No	No	No
Dromedary Pearlymussel *Dromus dromas*	S1, SE	FE, EXPN	Riffles and shoals with sand and gravel and moderate current velocities; may also be found in deeper, slower moving water in Tennessee.	No	No	No	No	No	No	No
Fanshell *Cyprogenia stegaria*	S1, SE	FE, EXPN	Medium to large streams and rivers with coarse sand and gravel substrates.	No	No	No	No	No	No	No
Finerayed Pigtoe *Fusconaia cuneolus*	S1, SE	FE, EXPN	Riffles of fords and shoals of mod gradient streams in firm cobble and gravel substrates.	No	No	No	No	No	No	No
Orangefoot Pimpleback (pearlymussel) *Plethobasus cooperianus*	S1, SE	FE, EXPN	Perennial streams with rocky areas and swift to slow moving currents.	No	No	No	No	No	No	No
Pink Mucket *Lampsilis abrupta*	S2, SE	FE	Large rivers with sand-gravel or rocky substrates with moderate to strong currents.	No	No	No	No	No	No	No
Purple Bean *Villosa perpurpurea*		FE	Creeks to medium-sized rivers and occasionally headwaters; generally associated with riffles but may be in direct current, pools.	No	No	No	No	No	No	No
Ring Pink *Obovaria retusa*	S1, SE	FE, EXPN	Large rivers in sand and gravel.	No	No	No	No	No	No	No
Rough Pigtoe *Pleurobema plenum*	S1, SE	FE, EXPN	Medium to large sized rivers, in substrates ranging from mud and sand to gravel, cobble, and boulders.	No	No	No	No	No	No	No
Rough Rabbitsfoot *Quadrula cylindrica strigillata*	S2, SE	FE	Small-medium sized rivers in clear, shallow riffles with sand-gravel substrates.	No	No	No	No	No	No	No
Sheepnose Mussel *Plethobasus cyphyus*	S2S3, SE	FE	Large to medium-sized rivers, in riffles and coarse sand/gravel substrate.	No	No	No	No	No	No	No
Shiny Pigtoe *Fusconaia cor*	S1, SE	FE, EXPN	Shoals and riffles of small-medium sized rivers with moderate-fast current over sand-cobble substrates.	No	No	No	No	No	No	No
Spectaclecase *Cumberlandia monodonta*	S2S3, SE	FE	Medium to large rivers; in substrates ranging from mud and sand to gravel, cobble, and boulders.	No	No	No	No	No	No	No
Tennessee Bean *Venustaconcha trabalis*	S1, SE	FE, EXPN	Riffle areas of small rivers and streams in sand, gravel, and cobble substrates with swift current.	No	No	No	No	No	No	No
Turgid Blossom (pearlymussel) *Epioblasma turgidula*		DL	Clear, unpolluted water over sand and gravel substrates of shallow, fast-moving streams.	No	No	No	No	No	No	No
Plants										
American Ginseng *Panax quinquefolius*	S-CE		Shaded forests with deep, moist and rich soils.	No	No	No	No	No	No	No
Barrens Silky Aster *Symphyotrichum pratense*	S1, SE		Barrens.	No	No	No	No	No	No	No
Branching Whitlow-grass *Draba ramosissima*	S2, SSC		Calcareous bluffs.	No	No	No	No	No	No	No

Common Name *Scientific Name*	State Rank and Listing Status[1]	Federal Listing Status[1]	Habitat Requirement	D4 Process Site[3]	CC/Aero CT Plant Site and Switchyard[2]	3- to 4-MW Solar Facility[2]	100-MW Battery Storage Site 1[2]	100-MW Battery Storage Site 2[2]	100-MW Battery Storage Site 3[2]	On-Site Transmission Line[2]
Butternut *Juglans cinerea*	S3, ST		Shaded forests with deep, moist and rich soils.	No	No	No	No	No	No	No
Earleaved False-foxglove *Agalinis auriculata*	S2, SE		Barrens.	No	No	No	No	No	No	No
Fen Orchis *Liparis loeselii*	S1, ST		Calcareous seeps.	No	No	No	No	No	No	No
Fetter-bush *Leucothoe racemosa*	S2, ST		Acidic wetlands and swamps.	Yes [+]	Yes [+]	No	No	No	No	Yes [+]
Hart's-tongue Fern *Aspelnium scolopendrium var. americanum*	S1, SE	FT	Sinks.	No	No	No	No	No	No	No
Heller's Catfoot *Pseudognaphalium helleri*	S2, SSC		Dry sandy woods.	No	No	No	No	No	No	No
Large-flowered Barbara's-buttons *Marshallia grandiflora*	S2, SE		Rocky river bars.	No	No	No	No	No	No	No
Liverwort *Preissia quadrata*	S1, ST		Seepy limestone cliffs and bluffs.	No	No	No	No	No	No	No
Missouri Gooseberry *Ribes missouriense*	S2, SSC		Rocky woods.	No	No	No	No	No	No	No
Mountain Bush-honeysuckle *Diervilla sessilifolia var. rivularis*	S2, ST		Dry cliffs and bluffs.	No	No	No	No	No	No	No
Mountain Honeysuckle *Lonicera diocia*	S2, SSC		Mountain woods and thickets.	No	No	No	No	No	No	No
Myurella Moss *Myurella julacea*	SH, SSC-PE		Shale bluffs.	No	No	No	No	No	No	No
Naked-stem Sunflower *Helianthus occidentalis*	S2, SSC		Limestone glades and barrens.	No	No	No	No	No	No	No
Northern Bush-honeysuckle *Diervilla lonicera*	S2, ST		Rooky woodlands and bluffs.	No	No	No	No	No	No	No
Nuttall's Waterweed *Elodea nuttallii*	S2, SSC		Streams and ponds.	No	No	No	No	No	No	No
Prairie Goldenrod *Oligoneuron album*	S1S2, SE		Barrens.	No	No	No	No	No	No	No
River Bulrush *Bolboschoenus fluviatilis*	S1, SSC		Marshes, openings in swamps, edges of ponds and streams, fresh tidal marshes, and inland salt marshes and ponds.	No	No	No	No	No	No	No
Schreber's Aster *Eurybia schreberi*	S1, SSC		Mesic woods and seepage slopes.	No	Yes	No	No	No	No	No
Shining Ladies'-tresses *Sprianthes lucida*	S1S2, ST		Alluvial woods and moist slopes.	No	No	No	No	No	No	No
Slender Blazing-Star *Liatris cylindracea*	S2, ST		Barrens.	No	No	No	No	No	No	No

Common Name ***Scientific Name***	**State Rank and Listing Status[1]**	**Federal Listing Status[1]**	**Habitat Requirement**	**D4 Process Site[3]**	**CC/Aero CT Plant Site and Switchyard[2]**	**3- to 4-MW Solar Facility[2]**	**100-MW Battery Storage Site 1[2]**	**100-MW Battery Storage Site 2[2]**	**100-MW Battery Storage Site 3[2]**	**On-Site Transmission Line[2]**
Small-headed Rush *Juncus brachycephalus*	S2, SSC		Seeps and wet bluffs.	No	No	No	No	No	No	No
Spreading False-foxglove *Aureolaria patula*	S3, SSC		Oak woods and edges.	No	No	No	No	No	No	No
Swamp Lousewort *Pedicularis lanceolata*	S1S2, SSC		Wet acidic barrens and seeps.	No	No	No	No	No	No	No
Tall Larkspur *Delphinium exaltatum*	S2, SE		Glades and barrens.	No	No	No	No	No	No	No
Tubercled Rein-orchid *Platanthera flava var. herbioloa*	S2, ST		Swamps and floodplains.	No	No	No	No	No	No	No
Virginia Spiraea *Spiraea virginiana*	S2, SE	FT	Flood-scoured banks of high-gradient mountain streams, point bars, natural levees, and braided features of lower stream reaches.	No	No	No	No	No	No	No
Western Wallflower *Erysimum capitatum*	S1S2, SE		Rocky bluffs.	No	No	No	No	No	No	No
White Fringeless Orchid *Platanthera integrilabia*	S2S3, SE	FT	Acidic seeps and stream heads.	No	No	No	No	No	No	No
Insects										
Monarch Butterfly *Danaus plexippus*		FC	Milkweed and flowering plants.	Yes	Yes	No	No	Yes	Yes	Yes

Source: USFWS Information, Planning, and Consultation (IPaC) dated April 20, 2023 (USFWS 2023b), TDEC Rare Species by County (TDEC 2023c), TVA Regional Natural Heritage Database (TVA 2023d)
^Critical habitat designated; critical habitat does not occur within Project limits
[1] FE = Federally Endangered; FT = Federally Threatened; FPT = Federally Proposed as Threatened; FC = Federal Candidate for Listing; DL = delisted; EXPN = non-essential experimental populations; UR = under review for federal listing; SE = State-Listed as Endangered; ST = State-Listed as Threatened; SSC = State-Listed as Special Concern; SD = State-Listed as Deemed in Need of Management; SR = State-Listed as Rare; S1 = Extremely rare and critically imperiled in the state with five or fewer occurrences, or very few individuals, or because of some special condition where the species is particularly vulnerable to extinction; S2 = Very rare and imperiled in the state, 6 to 20 occurrences, or few remaining individuals, or because of some factor(s) making it vulnerable to extinction; S3 = Rare and uncommon in the state, from 21-100 occurrences; S4 = Widespread, abundant, and apparently secure within the state but cause for long-term concern; SH = of historical occurrence in Tennessee, e.g. formally part of the established biota, with the expectation that it may be rediscovered; PE = Possibly Extirpated;
[2] Yes = potential presence of suitable habitat in project area; No = no potential presence of suitable habitat in project area
[3] Protected under the Bald and Golden Eagle Protection Act
[4] Record of observation on-site

3.8.4.1.1.1 Birds

Bachman's sparrow is listed as state endangered in TN. This species requires habitat consisting of open pine or oak woods, palmetto scrub, or bushy pastures, although the classic historical habitat is mature pine forests where individuals nest in the open, grassy understory. As mature forest has become scarce, Bachman's sparrows have been found utilizing clearcuts, powerline ROWs, old pastures, and open areas (National Audubon Society 2022). The early successional habitat and fragmented forests found on the Kingston Reservation may provide habitat to support the Bachman's sparrow; however, there have been no historical or recent observations of Bachman's sparrow on the Kingston Reservation.

Swainson's warbler is state-listed as In Need of Management in TN. This species inhabits swamps and river floodplain forests, preferably with a large tract of dense understory and sparse ground cover. Breeding occurs in both swamps and bottomlands in moist forests, preferably with rhododendron-laurel-hemlock associations, or yellow polar, oak, and maple with moderate undergrowth (National Audubon Society 2022). While the forested habitats adjacent to the Clinch and Emory rivers may provide suitable habitat for Swainson's warbler, no individuals were documented on the Kingston Reservation during recent or historical field surveys.

Osprey are ranked by the state as rare in TN. Suitable nesting habitat exists for osprey on the Kingston Reservation. However, currently across TN, osprey are common in summer, uncommon during fall/spring migration, and rare in winter. The numbers of nesting osprey in TN continues to slowly increase. Ospreys build large nests near water, on top of dead trees or artificial structures, such as nesting poles, utility poles, cells, or TV towers. Nests are made of branches, sticks, twigs, and lined with smaller material (TWRA 2023a). TVA's Regional Natural Heritage database documents 12 records of osprey nests in or around the Kingston Reservation, typically on telephone poles, light poles, or platforms and navigation markers in both the Clinch and Emory rivers. Five active osprey nests were observed on the Kingston Reservation in May 2019. Two were on transmission line structures, one on a lighting structure near the coal pile, one on a nesting platform in the Emory River, and one on an island adjacent to Kingston Reservation in the Emory River (Figure 3.8-5) (TVA 2023d).

Bald eagles are protected under the BGEPA, and in TN are Deemed in Need of Management. They inhabit a variety of environments, including mountains and open country, but are typically found close to water, including rivers, lakes, and coasts. Nests are typically constructed in tall trees and cliffsides near water. Tree nests are typically very tall, often above the surrounding forest (National Audubon Society 2022). In past decades, bald eagles have been observed perched in shoreline trees and flying over the Clinch River by TVA Terrestrial Zoologists and KIF staff. The closest bald eagle nest on record to the KIF is approximately 2 miles away; however, this nest was inactive at the time of observation in 2021. The closest active bald eagle nest to the KIF is located approximately 4 miles away on the TN River, observed in February 2023 (TVA 2023d). There are no bald eagle nests on KIF, but the Clinch River provides suitable foraging habitat.

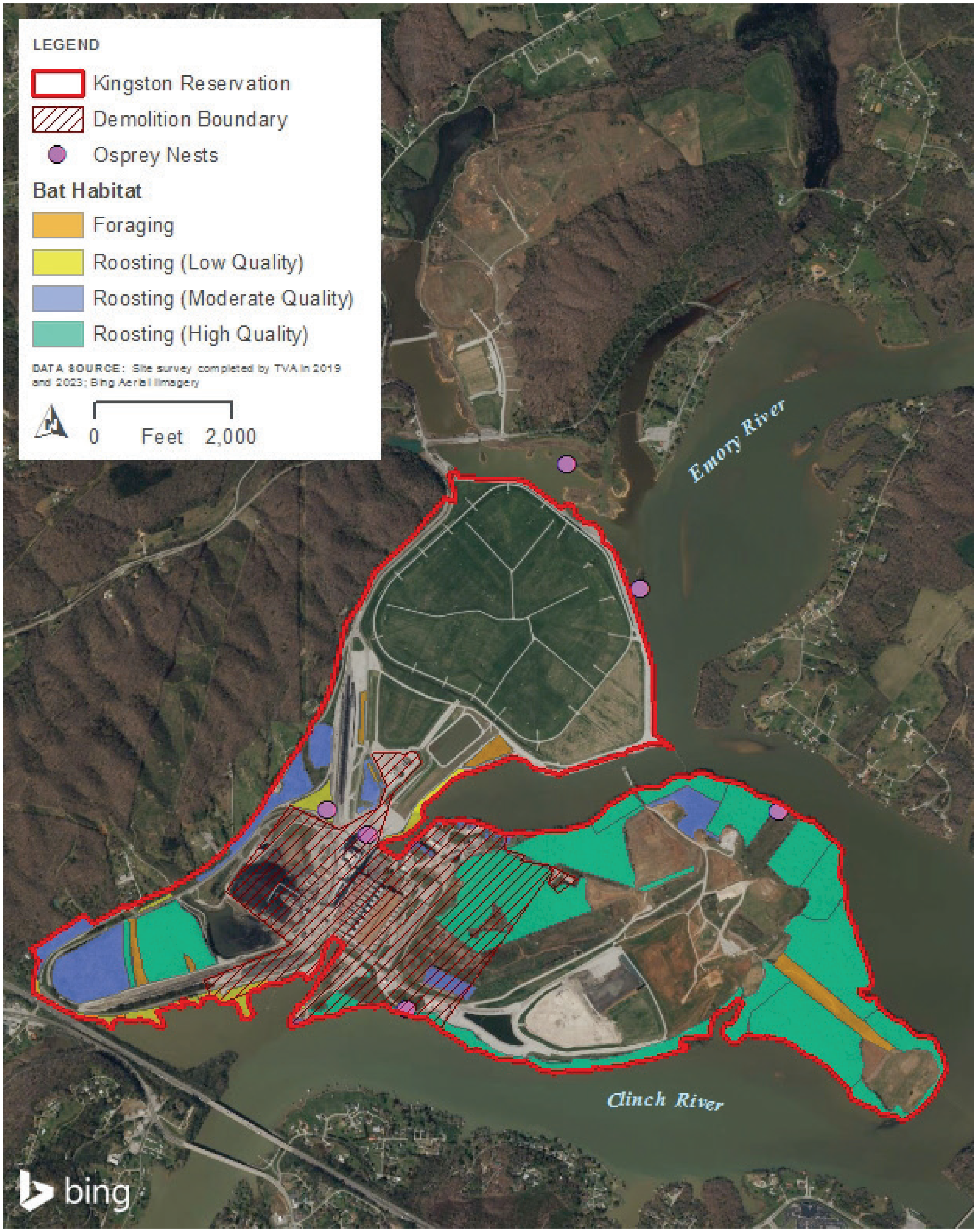

Figure 3.8-5. Federally and State-Listed Species and Habitats on the Kingston Reservation

Migratory Birds

Approximately 278 species of migratory birds have been identified in Roane County (eBird 2023), and additional species likely occur regularly. The USFWS maintains a list of migratory birds of conservation concern (USFWS 2021a). These species are not listed under the ESA but are a high conservation priority for the USFWS. Additionally, without additional conservation action, these species are likely to become candidates for listing under the ESA. Twenty species of birds of conservation concern are listed for Bird Conservation Region 28, Appalachian Mountains, which encompasses the area of the Kingston Reservation (USFWS 2021a). Species from this list with a “common” occurrence (during all seasons, breeding, wintering, or migration) are listed in Table 3.8-21. Additionally, species from the Migratory Birds list obtained from the USFWS IPaC report and summer 2019 TVA field survey (Appendix F) are also included.

Table 3.8-21. Migratory Bird Species of Conservation Concern Potentially Occurring or Confirmed Present on the Kingston Reservation

Common Name	Scientific Name	General Habitat Description	Potential Habitat Documented on Project Site
Migrant Species (present as spring and fall migrant and/or during winter)			
Bobolink	*Dolichonyx oryzivorus*	Grasslands, meadows, and hayfields.	Yes
Canada Goose	*Branta canadensis*	Lakes, ponds, bays, marshes, fields.	Yes*
Canada Warbler	*Cardellina canadensis*	Forest undergrowth, shady thickets. Breeds in mature mixed hardwoods of extensive forests and streamside thickets.	Yes
Golden-winged Warbler	*Vermivora chrysoptera*	Open woodlands, brushy clearings, undergrowth. Breeds in brushy areas with patches of weeds, shrubs, and scattered trees (such as alder or pine). This habitat type is found in places where a cleared field is growing up to woods again, as well as in marshes and tamarack bogs.	Yes
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Winter habitat includes woodlands, aspen groves, orchards, deciduous trees.	Yes
Lesser Yellowlegs	*Tringa flavipes*	Mudflats, sandy beaches, shores of lakes and ponds, and wet meadows.	No
Breeding Season Migrants (may occur only during the breeding season)			
Chimney Swift	*Chaetura pelagica*	Forages over variety of habitats, requires chimneys or large hollow tree snags with open tops for nesting.	No
Common Nighthawk (lesser)	*Chordeiles minor*	Inhabits any kind of open or semi-open terrain, including clearings in forest, open pine woods, prairie country, farmland, suburbs, and city centers.	Yes
Chuck-will’s Widow	*Antrostomus carolinensis*	Oak and pine woodlands. Breeds in shady southern woodlands of various types, including open pine forest, oak woodlands, edges of swamps.	Yes
Eastern Whip-poor-will	*Antrostomus vociferus*	Woodlands with open understory.	Yes
Kentucky Warbler	*Geothlypis formosa*	Large moist forest tracts with mature trees and thick understory.	Yes

Common Name	Scientific Name	General Habitat Description	Potential Habitat Documented on Project Site
Prairie Warbler	*Dendroica discolor*	Various shrubby habitats, including regenerating forests, open brushy fields, and Christmas tree farms.	Yes
Wood Thrush	*Hylocichla mustelina*	Breeds in mature deciduous and mixed forests, forests with dense understory, and forest edges.	Yes
Yellow-billed Cuckoo (Eastern)	*Coccyzus americanus*	Woodlands, thickets, orchards, streamside groves. Breeds mostly in dense deciduous stands, including forest edges, tall thickets, dense second growth, overgrown orchards, scrubby oak woods.	Yes
Resident Species (may occur year-round)			
Eastern Meadowlark	*Sturnella magna*	Open fields and pastures, meadows, prairies. Breeds in natural grasslands, meadows, weedy pastures, also in hayfields and sometimes in fields of other crops. Winters in many kinds of natural and cultivated fields.	Yes*
Killdeer	*Charadrius vociferus*	Fields, airports, lawns, riverbanks, mudflats, shores. Often found on open ground, such as pastures, plowed fields, large lawns, even at a great distance from water. Most successful nesting areas, however, have some shallow water or other good feeding area for the chicks. Also commonly found around water, on mudflats, lake shores, coastal estuaries.	Yes*
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Deciduous woodlands with oak or beech, groves of dead or dying trees, forested river bottoms, recent clearings, farmland, grasslands, forest edges and roadsides.	Yes

Source: USFWS 2021a
*Migratory birds of conservation concern identified on or near the Kingston Reservation (Appendix F)

Most of the species listed in Table 3.8-21 have suitable habitat on the Kingston Reservation, comprising forested areas, early successional habitat, or herbaceous habitat. Three of the species identified from the USFWS IPaC and Birds of Conservation Concern lists, Canada goose, Eastern meadowlark, and killdeer, were observed during the summer 2019 TVA field survey (Appendix F). None of these species were observed within the demolition boundary or other Alternative A component boundaries.

3.8.4.1.1.2 Mammals

Three species of bat with federal protection status and two more being considered for federal protection may have potential habitat on the Kingston Reservation: gray bat, Indiana bat, northern long-eared bat, tricolored bat, and little brown bat; respectively (Table 3.8-20). Bat habitat on the Kingston Reservation was identified during field surveys in 2019 (Appendix F) utilizing Phase 1 Habitat Assessment guidance from the Range-Wide Indiana Bat and Northern Long-eared bat Survey Guidelines (Figure 3.8-5). Habitat was categorized according to the quality of summer roosting habitat or foraging. Approximately 299.0 acres, or 23.8 percent of the Kingston Reservation, was identified as containing medium- to high-quality summer roosting habitat. This type of habitat generally consists of mature, deciduous forests with a variety of species including oaks and, sycamores, hickories with loose and/or exfoliating bark, and a variety of age classes of trees including dead dying, or damaged trees with cavities of sloughing bark other species with loose and/or exfoliating bark. An additional 19.8 acres provide low-quality roosting habitat, which contains lower roosting tree diversity, smaller sized trees, and high clutter (trees are very dense), and abundance. The Kingston Reservation also provides 18.8 acres of foraging-only habitat (typically herbaceous fields with native species). No winter roosting habitat was observed on site.

Gray bats almost exclusively roost in large caves throughout the year but travel up to 50 miles per night to forage. They are sometimes found roosting in mines or buildings (NatureServe 2022). Foraging habitat for this species may occur over open fields, forested areas, and open water areas such as streams, wetlands, and the Clinch and Emory rivers. There are no known caves on the Kingston Reservation, but there is a known maternity cave for gray bats in Roane County approximately 9 miles away. Gray bats have also been documented on the Oak Ridge Reservation located approximately 5.8 miles from the Kingston Reservation. Gray bats have been observed nearby foraging over the Clinch River (Appendix F).

Indiana bats overwinter in large numbers in caves and form small colonies under loose bark of trees and snags during summer months, when they favor mature forests interspersed with openings and roosts in trees with snags, cavities, or exfoliating bark (USFWS 2007). Use of living trees, especially species such as shagbark hickory, mature white oaks, and other trees with suitable roost characteristics near suitable snags, has also been documented. The availability of trees of a certain size and sun exposure are other important limiting factors contributing to roost site suitability (Tuttle and Kennedy 2002; Harvey and Britzke 2002; Kurta et al. 2002). Multiple roost sites are often selected, and roosting habitat changes as the suitability of forested areas change. Review of TVA's Regional Natural Heritage Database found no records of Indiana bat observations within 3 miles of the Kingston Reservation. There are no known hibernacula for this species within 10 miles of the Kingston Reservation or within Roane County. Forested areas may provide some roosting opportunity and the Clinch and Emory rivers may provide suitable foraging habitat.

Effective March 31, 2023, the status of northern long-eared bat under the ESA was upgraded from threatened to endangered. In general, habitat use by northern long-eared bats and Indiana bats are similar, and both species exhibit annual life cycles of hibernation, spring staging and migration, pregnancy and lactation, pup volancy, and fall migration and mating (USFWS 2018). Suitable hibernacula for northern long-eared bat includes caves and cave-like structures such as mines and railroad tunnels (USFWS 2014). These hibernacula typically have large passages with cracks and crevices for roosting; relatively constant, cool temperatures (32 to 48°F) and high humidity; and minimal air currents. During summer, this species roosts singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees (typical diameter greater than or equal to 3 inches). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bat forage in upland and lowland woodlots, treelined corridors, and water surfaces, feeding on insects. Like Indiana bat, most mature forested areas provide some value as potential summer roosting habitat for northern long-eared bat. Also similar to Indiana bats, the forested areas and open areas over the Clinch and Emory rivers may provide suitable foraging habitat for the northern long-eared bats. No records of individuals or hibernacula were identified from a search of TVA's Regional Natural Heritage Database within 3 miles of the Kingston Reservation, although two observations have been documented in Roane County in the last 10 years. The closest known hibernacula for this species is approximately 9 miles away in Roane County.

The tricolored bat is state-listed as threatened and is proposed endangered under the ESA. This species hibernates in caves, rock crevices, and mines, and locates summer roosts in trees, cliffs, and sometimes buildings (TWRA 2023b). Although the open areas on the Kingston Reservation and over the Clinch and Emory rivers may provide suitable foraging habitat, no tricolored bat individuals or hibernacula have been documented on the Kingston Reservation. There is a known hibernacula for tricolored bats in Roane County approximately 9 miles from the site.

Little brown bat has become a species of concern in TN and is also being considered under review for federal listing under the ESA. Males of this species can be solitary or living in small colonies that inhabit in rocky crevices, hollow trees, loose bark, or under shingles or sidings of building during the summer (TWRA 2023c). Females lives in nursery colonies in the spring and summer, which could be cliff crevices, hollow trees, under loose bark, or in undisturbed buildings. During the winter, this species hibernates in limestone caves. Mating typically occurs in the fall before hibernation but can also occur in winter and spring. Open areas on the Kingston Reservation and over the Clinch and Emory rivers provides suitable foraging habitat, and forested areas provide suitable summer roosting habitat. No little brown bat individuals or hibernacula have been documented on the Kingston Reservation or in Roane County according to TVA's Regional Natural Heritage Database.

Phase 2 presence/absence mist net surveys were conducted at the KIF using the 2023 Range-Wide Indiana Bat and Northern Long-eared bat Survey Guidelines for determining presence/absence of Indiana bat, northern long-eared bat, and tricolored bat habitat and to determine probable presence/absence of each species on the KIF property. Surveys were conducted on May 15th, 17th, and 18th, 2023, with plans approved by the USFWS Cookeville Field Office. Twenty-seven bats were captured consisting of adult big brown, eastern red bat, and evening bat. No federally listed or federally proposed listed species of bats were captured. The mist-net survey efforts (30 net nights over 3 calendar days) performed for this project met the level of effort required by the 2023 USFWS Indiana bat and Northern long-eared Bat Survey Guidelines to determine probable absence of Indiana, northern long-eared, and tricolored bat. These surveys indicate that Indiana bat, northern long-eared bat and tricolored bat are likely not present in the action area.

3.8.4.1.1.3 Reptiles

One state-listed reptile identified in Table 3.8-20 (Eastern slender glass lizard) could occur on the Kingston Reservation based on habitat requirements and the existing site conditions. The Eastern slender glass lizard is listed as In Need of Management in TN and is found in early successional habitats, such as prairies and grasslands, and tend to inhabit places with less canopy cover and abundant woody debris (TWRA 2023d). Nest locations include wooded areas close to trails and clearings, and the species tends to occur in dry, upland, and brushy areas. This species is secretive, and none have been observed on Kingston Reservation or within 10 miles of the site based on a review of TVA's Regional Natural Heritage Database; however, targeted surveys have not been conducted. Due to the presence of suitable habitat, it is assumed this species could be present on the KIF site.

3.8.4.1.1.4 Amphibians

None of the threatened or endangered amphibians identified in Table 3.8-20 are expected to occur on the Kingston Reservation based on their habitat requirements and the existing site conditions.

3.8.4.1.1.5 Plants

Several species of flowering plants and one fern species with state and federal ESA listing status were identified from the review of state and federal resources (e.g., TDEC, IPaC, etc.) as having the potential to occur on the Kingston Reservation or within Roane County (Table 3.8-20). However, field surveys conducted in 2019 and 2023 determined that most vegetated habitats on Kingston Reservation have no potential to support state or federally listed plant species or unique plant species and did not reveal the presence of Hart's-tongue fern, Virginia spiraea, white fringeless orchid, or fetter bush, or any suitable habitat that would support these species (Appendix F).

3.8.4.1.1.6 Aquatic Species

Five aquatic species listed as federally threatened or endangered were identified as potentially occurring on the Kingston Reservation or the Watts Bar Reservoir based on a review of state and federal resources (Table 3.8-20), including four species of fish and one crayfish.

The blue sucker is state-listed as threatened in TN. This species inhabits the mainstem of major rivers and lower sections of main tributaries throughout their range (USFWS 1993). They are typically found in moderate currents, within riffles or rapidly flowing chutes, over a combination of substrates including hard clay, sand, and gravel (USFS 2002). Based on benthic surveys performed in the Clinch River in the vicinity of KIF in 2005 (see Section 3.8.3.1.1.2; Yokley 2005), the substrate near KIF consists of soft mud over hard clay. Although substrate may be suboptimal for this species with soft and silty sediments, this species was documented within 10 miles of the Kingston Reservation in 1975 according to TVA's Regional Natural Heritage Database (TVA 2023d). It was not documented during 2019 surveys by TVA (TVA 2021e).

The federally threatened slender chub is a fish that is restricted to bars and shoals in runs and riffles of medium to large rivers with clear, warm water (NatureServe 2022). Potential habitat could exist for this species in the Emory or Clinch rivers bordering the Kingston Reservation, but this species is not expected to occur in the streams located on the Kingston Reservation.

Spotfin chub are state and federally listed as threatened. Spotfin chub inhabits clear, large creeks or medium-sized rivers of moderate gradient, in upland and montane areas, generally in or near moderate and swift currents over gravel to bedrock and rarely over sand or silt (NatureServe 2022). Although this is a schooling species frequently associated with white-tailed shiners and other mid-water species, the spotfin chub generally remains close to the substrate. Sub-adults appear more commonly on smaller substrates such as sand and small gravel compared to adults. Critical habitat has been designated for this species that encompasses almost all of the currently occupied range. This includes approximately 12 river miles of the Clinch River upstream of the Kingston Reservation. Due to habitat preferences, the presence of this species would be in the Clinch or Emory rivers adjacent to the site. This species is unlikely to be found in the small perennial streams on the Kingston Reservation.

The lake sturgeon, state listed as endangered in TN, typically inhabits large rivers and lakes. TVA participates in the TN Sturgeon Working Group, which includes researchers and conservation agencies including the TN Aquarium, University of TN, and the USFWS. This group has stocked over 250,000 young Lake Sturgeon into the Holston, French Broad, and upper TN rivers over the past 10 years including Watts Bar Reservoir (Knoxville News

Sentinel 2021). There have been four documented observations of lake sturgeon within 10 miles of the Kingston Reservation since 2010. The two most recent observations occurred in 2015 based on TVA's Regional Natural Heritage Database.

The valley flame crayfish, state listed as endangered in TN, burrows in areas with high water tables and often with vegetation for concealment of burrow openings (NatureServe 2022). Given the proximity of the Kingston Reservation to the Emory and Clinch rivers, the water table may be high in areas of the adjacent to the surrounding rivers; therefore, the valley flame crayfish has the potential for occurrence in the vicinity of the Kingston Reservation.

Of those mollusks listed in Table 3.8-20, 19 federally or state-listed threatened or endangered species of freshwater mollusks were identified as potentially occurring in the vicinity of the Kingston Reservation or in Roane County; however, none of these species are considered to have suitable habitat on the Kingston Reservation. Nine of these mollusk species are known to occur or believed to exist within a 10-mile radius of the Kingston Reservation: Alabama lampmussel, fine-rayed pigtoe, orangefoot pimpleback, pink mucket, purple bean, shiny pigtoe pearlymussel, spectaclecase, and turgid blossom pearlymussel (TVA 2021e). The TN bean and shiny pigtoe pearlymussel were historically documented as occurring within a 10-mile radius of the Kingston Reservation but are currently thought to be extirpated from the area. No federally or state-listed mollusks were found during the 2005 survey of the Clinch River/Watts Bar Reservoir in the vicinity of the Kingston Reservation (Yokley 2005). River substrates were noted as degraded (i.e., sub-optimal) and clay as the dominant substrates, overlain by varying thicknesses of mud.

3.8.4.1.1.7 Insects

Monarch butterflies are currently classified as a federal candidate species for listing under the ESA. They are milkweed specialists meaning that the larval phase of the species exclusively feeds on one of various milkweed species. Monarchs prefer habitats that provide milkweed and other flowering plants for nectarine during the adult phase. These areas include roadsides, open areas such as fields, wet areas with flowering species, or urban gardens (NatureServe 2022). Milkweed and other flowering herbaceous plants have been observed in transmission line ROWs on the Kingston Reservation (Appendix F); therefore, there is potential for the monarch butterfly to be present and since milkweed is present.

3.8.4.1.2 Alternative A

3.8.4.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The proposed CC/Aero CT Plant site is located within the Kingston Reservation boundary in an area consisting primarily of herbaceous or ruderal vegetation with small portions of deciduous and mesic forest along the Clinch River. Aquatic resources consist of WWCs and small areas of wetlands. Of the threatened and endangered species identified for the Kingston Reservation listed in Table 3.8-20, Swainson's warbler may have potential to occur on the proposed CC/Aero CT Plant site due to the presence of two forested wetlands totaling 0.13 acre and Bachman's sparrow may have potential to occur in the small deciduous forest (6.3 acres within the proposed CC/Aero CT Plant site and 0.3 acre within the switchyard). The areas of herbaceous, early successional, or forested habitat totaling 58.8 acres would provide habitat for many migratory bird species listed in Table 3.8-21.

The bald eagle may also be visible foraging or perching along river shorelines in the vicinity of the proposed CC/Aero CT Plant and switchyard given a nearby nesting location; this species uses the Clinch River for foraging. Similarly, osprey likely use the forested shorelines area for perching while foraging along the Clinch River. Osprey nests exist on existing transmission line structures, lighting structures, platforms, and trees within and adjacent to Kingston Reservation. Available nesting habitat for both bald eagle and osprey is limited in the vicinity of the proposed CC/Aero CT Plant and switchyard footprints and no nests of these species occur within 660 feet of these areas, although an osprey nest is nearby on Kingston Reservation (Figure 3.8-6).

Summer roosting and foraging habitat for protected bat species also occurs within the proposed CC/Aero CT Plant site area (Figure 3.8-6). Approximately 4.8 acres of forested area is considered high-quality bat summer roosting bat habitat, with an additional 0.1 acre for foraging habitat. While categorized as roosting habitat for regulatory purposes, forested areas also function as foraging habitat. No open-space foraging habitat was identified in the switchyard area. Approximately 0.3 acre of high-quality roosting habitat also falls within the southeastern boundary of the switchyard area. No suitable bat habitat is present within the parking/laydown area.

The Eastern slender glass lizard prefers dry, upland areas including brush and grassy fields. Herbaceous and early successional habitats totaling 49.0 acres within the proposed CC/Aero CT Plant site, switchyard, and parking/laydown area may provide habitat for this species.

No suitable habitat for protected aquatic species or amphibians are found on the proposed CC/Aero CT Plant site or switchyard. No aquatic resources are within the parking/laydown area.

The herbaceous and early successional habitat within the proposed CC/Aero CT Plant site and switchyard could contain pollinator species that could be used by monarch butterflies for foraging. Milkweed, which is required for egg laying, was not identified during the 2019 field surveys (Appendix F).

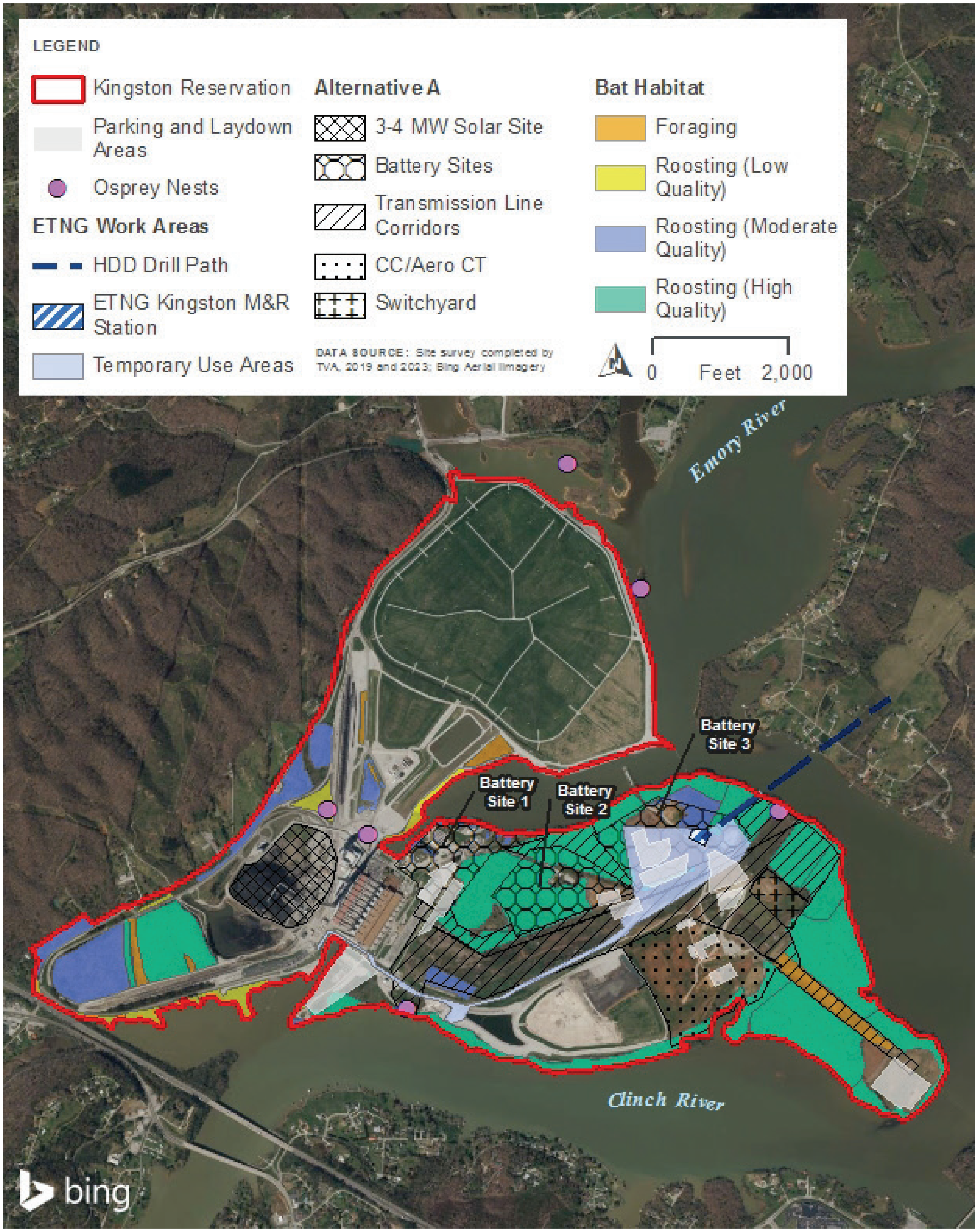

Figure 3.8-6. Protected Species' Habitat near the proposed CC/Aero CT Plant Footprint on the Kingston Reservation

3.8.4.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

No suitable habitat to support state or federally listed species was identified within the footprint for the proposed 3- to 4-MW Solar Facility.

3.8.4.1.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

Battery Site 2 site contains the greatest amount of forested habitat for the four state-listed or state-ranked protected bird species listed in Table 3.8-20 at 27.0 acres, followed by Battery Site 3 (12.9 acres), and the least amount of suitable habitat on Battery Site 1 (5.1 acres). Therefore, all four state-protected bird species listed in Table 3.8-20 could be found on each of the battery storage option sites due to presence of forested areas and proximity to the Emory River. These sites would also provide habitat for migratory birds of conservation concern by providing forested areas as well as herbaceous and early successional habitats. As previously described, Battery Site 3 contains the greatest amount of general wildlife habitat (totaling 38.6 acres), followed by Battery Site 2 (34.6 acres), and Battery Site 1 (10.9 acres including manicured lawn, which could be used for foraging).

The mature trees within the Battery Site 1 footprint contains 3.5 acres of high-quality bat roosting habitat and 2.1 acres of medium-quality roosting habitat (Figure 3.8-5). The footprint for Battery Site 2 contains approximately 27.0 acres of high-quality bat roosting habitat. Battery Site 3 contains 8.4 acres of suitable high-quality roosting habitat as well as an additional 4.5 acres of deciduous forest that provide medium-quality bat roosting habitat. All roosting habitat also functions as foraging habitat. Protected bat species that may use these areas (i.e., Indiana bat, northern long-eared bat, little brown bat, and tricolored bat) are discussed in Section 3.8.4.1.1.2.

3.8.4.1.2.4 On-site Transmission Upgrades

Approximately 23.7 acres of high-quality bat roosting habitat and 0.1 acre of medium-quality bat roosting habitat occurs within the battery transmission line connections corridor. Within the existing transmission line corridor proposed for upgrades, approximately 19.7 acres is suitable as medium- or high-quality bat roosting habitat, with an additional 9.5 acres suitable as bat foraging habitat, which potentially provides habitat for the Indiana bat, northern long-eared bat, tricolored bat, and little brown bat.

Approximately 40.4 acres of vegetated habitat of all types (from manicured lawn to forest) provides habitat to migratory bird species throughout the battery transmission line connections corridor. Migratory bird habitat is also found throughout the transmission line corridor proposed for upgrades on Kingston Reservation, totaling 114.4 acres.

The transmission lines proposed for upgrades also cross potential habitat for the fetter bush (totaling 1.4 acres, Figure 3.8-6). Information on this species is included in Section 3.8.4.1.1.5.

As an existing transmission line corridor, habitat in this area includes 55.5 acres of early successional and herbaceous habitat. Milkweed has been observed within transmission line ROWs on Kingston Reservation; therefore, this area may support monarch butterflies if appropriate resources are present. For additional information on the monarch butterfly, see Section 3.8.4.1.1.7.

3.8.4.1.2.5 Off-site Transmission Line Upgrades

Federally and state-listed terrestrial and aquatic species that may be found along the proposed off-site transmission corridors which cross Cumberland (Western Transmission Corridor) and Roane and Anderson (Eastern Transmission Corridor) counties are summarized in Table 3.8-22. Species with potential habitat in the off-site transmission corridor are discussed below.

Table 3.8-22. Threatened, Endangered, and Other Protected Species for the Off-Site Transmission Corridors[1]

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Birds							
Bachman's Sparrow *Peucaea aestivalis*	X	X	X	S1, SE		Dry open pine or oak woods; nests on the ground in dense cover.	Yes
Bald Eagle[5] *Haliaeetus leucocephalus*		X	X	S3, SD		Nests in tall, mature trees near large bodies of water such as large rivers, lakes, reservoirs, and coastal areas.	Yes (foraging)
Bewick's Wren *Thryomanes bewickii*				S1, SD		Prefer brushy areas, thickets and scrub in open country.	Yes
Cerulean Warbler *Setophaga cerulea*		X		S3, SD		Mature, deciduous forest, particularly in floodplains or mesic conditions.	Yes
Golden-winged Warbler *Vermivora chrysoptera*	X	X		S3, ST		Early successional habitats in foothills regions of Appalachians.	Yes
Osprey Pandion haliaetus	X	X	X	SD		Inhabits areas along large rivers, lakes, and reservoirs. Will nest on utility poles and other artificial structures within transmission line ROWs.	Yes
Swainson's Warbler *Limnothlypis swainsonii*		X	X	S3, SD		Mature, rich, damp, deciduous floodplain and swamp forests with thick understory.	Yes
Whooping Crane *Grus americana*					FE, EXPN	Breeds in freshwater marshes and prairies; uses grain fields, shallow lakes, and lagoons on migration in winter.	Yes
Mammals							
Allegheny Woodrat *Neotoma magister*	X	X		S3, SD		Rock outcrops, cliffs, talus slopes, crevices.	No

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Eastern Small-footed Bat *Myotis leibii*	X			S2S3, SD		Hibernates in caves and mines; also uses abandoned buildings, bridges, barns, and rocky outcrops/talus slopes seasonally.	Yes (foraging)
Gray Bat *Myotis grisescens*	X	X	X	S2, SE	FE	Roosts in caves or karst features year-round. Various foraging habitats including wet meadows, damp woods, and uplands.	Yes (foraging)
Indiana Bat *Myotis sodalis*	X	X		S1, SE	FE	Various habitats including wet meadows, damp woods, and uplands, including abandoned structures and sinkhole fissures/karst features; statewide.	Yes (roosting and foraging)
Little Brown Bat *Myotis lucifugus*		X	X	S3, ST		Roost in caves, hollow trees, and human-made structures.	Yes (roosting and foraging)
Long-tailed Shrew *Sorex dispar*			X	S2, SD		Mountainous, forested areas with loose talus.	Yes
Northern Long-eared Bat *Myotis septentrionalis*	X	X	X	S1S2, ST	FE	Various habitats including wet meadows, damp woods, and uplands, including abandoned structures, sinkhole/karst features; statewide.	Yes (roosting and foraging)
Rafinesque's Big-eared Bat *Corynorhinus rafinesquii*	X			S3, SD		Caves, hollow trees, abandoned buildings; often associated with forested areas	Yes (roosting and foraging)
Southern bog lemming *Synaptomys cooperi*		X	X	S4, SD		Marshy meadows, wet balds, and rich upland forests.	No
Tricolored Bat *Perimyotis subflavus*	X	X	X	S2S3, ST	FPE	Generally associated with forested landscapes but may roost near openings.	Yes (roosting and foraging)

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Reptiles							
Eastern Slender Glass Lizard *Ophisaurus attenuates longicaudus*	X	X	X	S3, SD		Dry upland areas including brush, cut-over woodlands and grassy fields.	Yes
Northern Pinesnake *Pituophis melanoleucus*	X	X	X	S3, ST		Well-drained sandy soils in pine/pine-oak woods; dry mountain ridges.	No
Amphibians							
Berry Cave Salamander *Gyrinohilus gulolineatus*			X	S1, ST	FC	Aquatic cave obligate.	No
Black Mountain Salamander *Desmognathus welteri*	X	X		S3, SD		Spring runs and permanent streams in wooded mountainous terrain.	Yes
Cumberland Dusky Salamander *Desmognathus abditus*	X			S2S3, SD		Associated with streams of Cumberland Plateau; under rocks along small streams or adjacent cover.	Yes
Four-toed Salamander *Hemidactylium scutatum*	X	X	X	S3, SD		Woodland swamps, shallow depressions, and sphagnum mats on acidic soils in middle and east Tennessee	No
Hellbender *Cryptobranchus alleganiensis*	X	X	X	S3, SE		Clean and flowing water with plenty of oxygen in large streams and creeks. Areas with gravel bottoms and an abundance of rocks and submerged logs are necessary.	Yes

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Fish							
Blue Sucker *Cycleptus elongatus*		X	X	S2, ST		Swift waters over firm substrates in big rivers.	Yes
Emerald Darter *Etheostoma baileyi*				S2, SD		Creeks and small rivers with riffles containing gravel or rubble; upper Cumberland drainage.	Yes
Flame Chub *Hemitremia flammea*			X	S3, SD		Springs and spring-fed streams with lush aquatic vegetation; Tennessee and middle Cumberland watersheds.	No
Lake Sturgeon *Acipenser fulvescens*			X	S1, SE		Bottoms of large, clean rivers and lakes.	No
Laurel Dace *Chrosomus saylori*	X			S1, SE	FE	Cool 1st-2nd order streams with slab rock and rubble substrate; Tennessee River watershed.	Yes
Olive Darter *Percina squamata*	X			S2, SD		Small to medium rivers; in strong flowing chutes with rubble/boulders in high-gradient streams.	No
Redlips Darter *Etheostoma maydeni*		X		S2, SE		Slow-moving large creeks and rivers in pools along the banks strewn with boulders and woody debris.	No
Sickle Darter *Percina williamsi*				S2, ST	FT	Flowing pools over rock, sandy, or silty substrates in clear creeks or small rivers	No
Slender Chub *Erimystax cahni*		X		S1, ST	FT	Restricted to bars and shoals of fine to medium gravel in runs and riffles of medium to large, clear, warm rivers.	Yes
Spotfin Chub *Erimonax monachus*	X	X	X	S1, ST	FT, EXPN	Clear upland rivers with swift currents and boulder substrates; portions of the Tennessee River watershed.	No

Common Name ***Scientific Name***	**Record of Occurrence by County[1]**			**State Rank and Listing Status[2]**	**Federal Listing Status[2]**	**Habitat Requirement**	**Potential Habitat in Eastern and Western Transmission Corridors[3]**
	Cumberland	Anderson	Roane				
Tangerine Darter *Percina aurantiaca*	X	X	X	S3, SD		Large-moderate size headwater tributaries to Tennessee River, in clear, fairly deep, rocky pools, usually below riffles.	No
Tennessee Dace *Chrosomus tennesseensis*	X	X	X	S3, SD		First order spring-fed streams of woodlands in Ridge and Valley limestone region; Tennessee River watershed.	No
Yellowfin Madtom *Noturus flavipinnis*		X		S1, ST	FT	Shallow pools and backwaters of streams with cover of roots, sunken leaves, brush piles, and bedrock ledges.	No (extirpated)
Crayfish							
Emory River Crayfish *Cambarus* sp. 1				S1	Possibly Historical	Within its rather restricted range, inhabits rocky riffles with good flow.	UNK
Obey Crayfish *Cambarus obeyensis*	X			S1, SE		Under cover in small-medium sized streams; headwaters of East Fork Obey River; northern Cumberland.	No
Prickly Cave Crayfish *Cambarus hamulatus*	X			S3, SD		Aquatic caves; Sequatchie Valley and southern Cumberland.	No
Pristine Crayfish *Cambarus pristinus*	X			S2, SE		Under cover in small-large streams; headwaters of Caney Fork River and abutting Sequatchie River tributaries.	No
Valley Flame Crayfish *Cambarus deweesae*		X	X	S1, SE		Primary burrower; open areas with high water tables.	Yes
Mollusks							
Alabama Lampmussel *Lampsilis virescens*		X	X	S1, SE	FE	Sand and gravel substrates in shoal areas of small-medium size rivers.	UNK*
Anthony's Riversnail *Athearnia anthonyi*		X		S1, SE	FE, EXPN	Large-medium rivers with moderate-high gradient, or riffles of larger creeks with cobble/boulder substrate.	No

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Birdwing Pearlymussel *Lemiox rimosus*		X		S1, SE	FE, EXPN	Riffles with stable, sand and gravel substrates in moderate to fast currents in small to medium sized rivers.	UNK*
Cracking Pearlymussel *Hemistena lata*		X		S1, SE	FE, EXPN	Sand, gravel, and cobble substrates in swift currents or mud and sand in slower currents.	UNK*
Cumberland Bean (pearlymussel) *Villosa trabalis*				S1, SE	FE	Sand, gravel, and cobble substrates in waters with moderate to swift currents, and depths less than 1 meter.	Yes
Dromedary Pearlymussel *Dromus dromas*		X		S1, SE	FE, EXPN	Riffles and shoals with sand and gravel and moderate current velocities; may also be found in deeper, slower moving water in Tennessee.	No
Fanshell *Cyprogenia stegaria*		X	X	S1, SE	FE, EXPN	Medium to large streams and rivers with coarse sand and gravel substrates.	No
Finerayed Pigtoe *Fusconaia cuneolus*		X	X	S1, SE	FE, EXPN	Riffles of fords and shoals of mod gradient streams in firm cobble and gravel substrates.	UNK*
Green Blossom Pearlymussel *Epioblasma torulosa gubernaculum*		X		SX, SE	FE	Riffle or shoal areas with fast flowing water that contains firm rubble, gravel, and sand substrates.	UNK*
Orangefoot Pimpleback (pearlymussel) *Plethobasus cooperianus*		X	X	S1, SE	FE, EXPN	Perennial streams with rocky areas and swift to slow moving currents.	UNK*

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Pink Mucket *Lampsilis abrupta*		X	X	S2, SE	FE	Large rivers with sand-gravel or rocky substrates with moderate to strong currents.	UNK
Purple Bean *Villosa perpurpurea*					FE	Creeks to medium-sized rivers and occasionally headwaters; generally associated with riffles but may be in direct current, pools.	Yes
Pyramid Pigtoe *Pleurobema rubrum*			X	S1S2	FPT	Inhabits a wide variety of flowing-water habitats from small tributary streams to medium sized rivers. Substrate preference is sandy gravel.	UNK
Ring pink *Obovaria retusa*			X	S1, SE	FE, EXPN	Large rivers in sand and gravel.	UNK*
Rough Pigtoe *Pleurobema plenum*		X		S1, SE	FE, EXPN	Medium to large sized rivers, in substrates ranging from mud and sand to gravel, cobble, and boulders	UNK*
Rough Rabbitsfoot *Quadrula cylindrica strigillata*			X	S1, SE	FE	Small-medium sized rivers in clear, shallow riffles with sand-gravel substrates	Yes
Sheepnose Mussel *Plethobasus cyphyus*			X	S2S3, SE	FE	Large to medium-sized rivers, in riffles and coarse sand/gravel substrate.	UNK*
Shiny Pigtoe *Fusconaia cor*		X	X	S1, SE	FE, EXPN	Shoals and riffles of small-medium sized rivers with moderate-fast current over sand-cobble substrates.	UNK*
Slabside Pearlymussel *Pleuronaia dolabelloides*		X		S2, SE	FE	Large creeks to moderate-sized rivers, in riffles and shoals of sand, fine gravel, and cobble substrates with moderate current	UNK
Spectaclecase *Cumberlandia monodonta*		X	X	S2S3, SE	FE	Medium to large rivers; in substrates ranging from mud and sand to gravel, cobble, and boulders.	UNK

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Spiny Riversnail *Io fluvialis*		X	X	S2	UR	Within its rather restricted range, inhabits rocky riffles with good flow.	UNK
Tan Riffleshell *Epioblasma walkeri*		X		S1, SE	FE	Found in river headwaters, in riffles and shoals in sand and gravel substrates	UNK*
Tennessee Bean *Venustaconcha trabalis*	X		X	S1, SE	FE, EXPN	Riffle areas of small rivers and streams in sand, gravel, and cobble substrates with swift current	UNK
Tennessee Clubshell *Pleurobema oviforme*				S2S3		Endemic to the Cumberland and Tennessee river systems and two major tributaries of the Ohio River. In the Cumberland in Kentucky and Tennessee, it occurs downstream of Cumberland Falls.	UNK
Tennessee Pigtoe *Pleuronaia barnesiana*					PFE	Inhabits small streams to large rivers with flowing water in Tennessee River Basin tributaries with stable gravel with interstitial sand	UNK
Turgid Blossom (pearlymussel) *Epioblasma turgidula*			X		FE, EXPN	Clear, unpolluted water over sand and gravel substrates of shallow, fast-moving streams.	UNK*
White Wartyback *Plethobasus cicatricosus*		X		S1, SE	FE, EXPN	Shoals and riffles in large rivers; Tennessee and Cumberland River systems; possibly extirpated in TN	UNK*
Plants[6]							
American Barberry *Berberis canadensis*	X	X		S2, SSC		Rocky woods and river bars.	Yes
American Ginseng *Panax quinquefolius*		X	X	SSC		Shaded forests with deep, moist and rich soils	Yes[5]
Barrens Silky Aster *Symphyotrichum pratense*	X		X	S1, SE		Barrens.	Yes

Common Name ***Scientific Name***	**Record of Occurrence by County[1]**			**State Rank and Listing Status[2]**	**Federal Listing Status[2]**	**Habitat Requirement**	**Potential Habitat in Eastern and Western Transmission Corridors[3]**
	Cumberland	Anderson	Roane				
Bog Oat-grass *Danthonia epilis*	X			S1S2, SSC		Acidic seeps	No
Branching Whitlow-grass *Draba ramosissima*		X	X	S2, SSC		Calcareous bluffs.	Yes
Brown Bog Sedge *Carex buxbaumii*	X			S1, SE		Swamps.	No
Butternut *Juglans cinerea*		X	X	S3, ST		Shaded forests with deep, moist and rich soils	Yes
Buxbaum's Sedge *Carex buxbaumii*	X			S1, SE		Swamps.	No
Copper Iris *Iris fulva*		X		S2, ST		Bottomlands.	Yes
Cumberland Rosemary *Conradina verticillata*	X			S3, ST	FT	Sandy, rocky riverbanks and bars.	No
Cumberland Sand-grass *Sporobolus arcuatus*	X			S2, ST		Rocky and sandy river bars.	No
Drooping Bluegrass *Poa saltuensis*	X			S1, ST		Rich oak woods.	No
Earleaved False-foxglove *Agalinis auriculata*			X	S2, SE		Barrens.	Yes
Early St. Johnswort *Hypericum nudiflorum*	X			S2, SSC		Acidic wet and/or open areas.	No
Fen Orchis *Liparis loeselii*			X	S2, ST		Calcareous seeps.	Yes[5]
Fetter-bush *Leucothoe racemosa*			X	S2, ST		Acidic wetlands and swamps.	Yes

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Foxtail Clubmoss *Lycopodiella alopecuroides*	X			S2, ST		Wet acidic barren.	No
Godfrey's Thoroughwort *Eupatorium godfreyanum*	X		X	S1, SSC		Dry woods.	Yes[5]
Granite Gooseberry *Ribes curvatum*	X			S1, ST		Rocky woods.	No
Hairy Willow-herb *Epilobium ciliatum*		X		S1, ST		Mountain balds.	Yes
Hart's-tongue Fern *Aspelnium scolopendrium var. americanum*			X	S1, SE	FT	Sinks.	No
Heartleaf Meehania *Meehania cordata*		X		S2, ST		Wooded mountain slopes.	Yes
Heller's Catfoot *Pseudognaphalium helleri*			X	S2, SSC		Dry sandy woods.	Yes
Hitchcock's Sedge *Carex hitchockiana*				S1, ST		Rich woods, floodplain forests, wooded bluffs, and wooded rocky slopes.	Yes
Large-flowered Barbara's-buttons *Marshallia grandiflora*	X		X	S2, SE		Rocky river bars.	Yes
Large-leaf Pondweed *Potamogeton amplifolius*	X			S1, ST		Lakes and streams.	No
Large-leaved Grass-of-Parnassus *Parnassia grandifolia*		X		S3, SSC		Calcareous seeps.	Yes

Common Name *Scientific Name*	Record of Occurrence by County[1] Cumberland	Anderson	Roane	State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
Least Trillium *Trillium pusillum*	X			S2, SE		Alluvial/moist ravines in dry ridges.	Yes
Marsh Bellflower *Campanula aparinoides*	X			S2, SSC		Bogs.	No
Missouri Gooseberry *Ribes missouriense*			X	S2, SSC		Rocky woods.	Yes
Mountain Bush-honeysuckle *Diervilla sessilifolia var. rivularis*			X	S2, ST		Dry cliffs and bluffs.	Yes
Mountain Honeysuckle *Lonicera diocia*			X	S2, SSC		Mountain woods and thickets.	No
Mountain Witch-alder *Fothergilla major*		X		S2, ST		Rocky slopes and riverbanks.	Yes
Muhlenberg's Nutrush *Scleria muehlenbergii*	X			S2, ST		Wet meadows.	No
Naked-stem Sunflower *Helianthus occidentalis*	X	X	X	S2, SSC		Limestone glades and barrens.	Yes[5]
Narrow Mushroom-headed Liverwort *Preissia quadrata*			X	S1, ST		Seepy limestone cliffs and bluffs.	Yes
Northern Bush-honeysuckle *Diervilla lonicera*		X	X	S2, ST		Rooky woodlands and bluffs.	Yes
Northern Evening-primrose *Oenothera parviflora*	X			S1, SSC		Disturbed open areas.	Yes

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Nuttall's Pondweed *Potamogeton epihydrus*	X			S1S2, SSC		Lakes and streams.	No
Nuttall's Waterweed *Elodea nuttallii*		X	X	S2, SSC		Streams and ponds.	Yes
Ovate-leaved Arrowhead *Sagittaria platyphylla*	X			S2S3, SSC		Swamps, emergent.	No
Ozark Bunchflower *Veratum woodii*			X	S2, SSC		Rich wooded slopes.	Yes[5]
Palamocladium Moss *Palamocladium leskeoides*		X	X	S1, ST		Seepy limestone cliffs and bluffs.	No
Prairie Goldenrod *Oligoneuron album*		X	X	S1S2, SE		Barrens.	Yes
Prairie Goldenrod *Solidago ptarmicoides*				ST		Dry, sandy calcareous soils, cracks in rocks, limestone pavements, and rocky outcrops	Yes
Ramps *Allium tricoccum*				S1S2, SSC		Upland woods, mixed mesophytic hardwood forests	Yes
Rigid Sedge *Carex tetanica*				SE		Floodplain forests, wooded bluffs, and wooded rocky slopes	Yes[5]
River Bulrush *Bolboschoenus fluviatilis*			X	S1, SSC		Marshes, openings in swamps, edges of ponds and streams, fresh tidal marshes, and inland salt marshes and ponds.	Yes
Rose Pogonia *Pogonia ophioglossoides*	X			S2, SE		Wet acidic barrens.	No

Common Name ***Scientific Name***	**Record of Occurrence by County**[1]			**State Rank and Listing Status**[2]	**Federal Listing Status**[2]	**Habitat Requirement**	**Potential Habitat in Eastern and Western Transmission Corridors**[3]
	Cumberland	Anderson	Roane				
Roundleaf Shadbush *Amelanchier sanguinea*	X			S2, ST		Rocky slopes and riverbanks.	No
Schreber's Aster *Eurybia schreberi*			X	S1, SSC		Mesic woods and seepage slopes.	Yes
Sharp's Homaliadelphus *sharpii*		X		S1, SE		Calcareous or dolomite bluffs.	No
Sharp's Lejeunea *Lejeunea sharpii*		X		S1S2, SE		Calcareous bluffs, rocks and logs of wet sinks.	No
Shining Ladies'-tresses *Sprianthes lucida*			X	S1S2, ST		Alluvial woods and moist slopes.	Yes[5]
Shortleaf Sneezeweed *Helenium brevifolium*	X			S1, SE		Rocky, sandy streamsides.	No
Short-headed Rush *Juncus brachycephalus*			X	S2, SSC		Seeps and wet bluffs.	Yes[5]
Silverling *Paronychia aegyrocoma*	X			S1, ST		Dry sandstone, granite outcrops.	No
Slender Blazing-Star *Liatris cylindracea*			X	S2, ST		Barrens.	Yes
Small's Stonecrop *Diamorpha smallii*	X			S1S2, SE		Sandstone outcrops.	No
Small-headed Rush *Juncus brachycephalus*			X	S2, SSC		Seeps and wet bluffs.	No
Small Mousetail Moss *Myurella julacea*			X	SH, SSC-PE		Shale bluffs.	Yes

Common Name ***Scientific Name***	**Record of Occurrence by County**[1]			**State Rank and Listing Status**[2]	**Federal Listing Status**[2]	**Habitat Requirement**	**Potential Habitat in Eastern and Western Transmission Corridors**[3]
	Cumberland	Anderson	Roane				
Spoonleaf Sundew *Drosera intermedia*	X			S2, SSC		Acidic wetlands.	No
Spreading False-foxglove *Aureolaria patula*		X	X	S3, SSC		Oak woods and edges.	Yes[5]
Spring Blue-eyed Mary *Collinsia verna*				S1, SE		Damp woods and meadows.	Yes
Sticky Hedge-hyssop *Gratiola brevifolia*	X			S1, SSC		Wet barrens and marshes.	No
Sullivantia *Sullivantia sullivantii*		X		S1, SE		Moist shaded cliffs.	Yes
Sundew *Drosera capillaris*	X			S2, ST		Acidic wetlands.	No
Swamp Lousewort *Pedicularis lanceolata*	X		X	S1S2, SSC		Wet acidic barrens and seeps.	Yes
Tall Larkspur *Delphinium exaltatum*		X	X	S2, SE		Glades and barrens.	Yes[5]
Tawny Cotton-grass *Eriophorum virginicum*	X			S1S2, SE		Bogs.	No
Tennessee Pondweed *Potamogeton tennesseensis*	X			S2, ST		Slow acidic streams.	No
Torrey's Mountain-mint *Pycanthemum torrei*		X		S1, SE		Barrens.	Yes

Common Name *Scientific Name*	Record of Occurrence by County[1]			State Rank and Listing Status[2]	Federal Listing Status[2]	Habitat Requirement	Potential Habitat in Eastern and Western Transmission Corridors[3]
	Cumberland	Anderson	Roane				
Tubercled Rein-orchid *Platanthera flava var. herbioloa*		X	X	S2, ST		Swamps and floodplains.	Yes
Virginia Spiraea *Spiraea virginiana*	X		X	S2, SE	FT	Stream bars and ledges.	Yes
Water Bulrush *Schoenoplectus subterminalis*	X			S1, SE		Ponds and stream margins.	No
Western Wallflower *Erysimum capitatum*			X	S1S2, SE		Rocky bluffs.	Yes
White Fringeless Orchid *Platanthera integrilabia*	X		X	S2S3, SE	FT	Acidic seeps and stream heads.	No
Wood Lily *Lilium philadelphicum*	X			S1, SE		Dry openings, powerlines.	No
Yellow Crested Orchid *Platanthera cristata*	X			S2S3, SSC		Acidic seeps and stream heads.	No
Yellow Nodding Ladies'-tresses *Spiranthes ochroleuca*	X			S1, SE		Moist mountain woods.	No
Zigzag Bladderwort *Utricularia subulata*	X			S1, ST		Wet barrens, ecotones.	No
Insects							
Monarch Butterfly *Danaus plexippus*					FC	Milkweed and flowering plants.	Yes
Payne's Cave Beetle *Pseudanophthalmus paynei*		X		S1		Terrestrial cave obligate	No

Common Name ***Scientific Name***	**Record of Occurrence by County**[1]			**State Rank and Listing Status**[2]	**Federal Listing Status**[2]	**Habitat Requirement**	**Potential Habitat in Eastern and Western Transmission Corridors**[3]
	Cumberland	Anderson	Roane				
Tiny Cave Beetle *Pseudanophthalmus pusillus*		X		S1		Terrestrial cave obligate	No
Wallace's Cave Beetle *Pseudanophthalmus wallacei*		X		S1		Terrestrial cave obligate	No
Arachnids							
Southeastern Cave Pseudoscorpian *Hesperochernes mirabilis*		X		S3		Terrestrial cave obligate	No

Source: USFWS Information, Planning, and Consultation (IPaC) dated April 20, 2023, Tennessee Department of Environment and Conservation's (TDEC) Rare Species by County, TVA Regional Natural Heritage Database

[1] Alternative A existing off-site transmission corridors cross Cumberland (Western Transmission Corridor) and Roane and Anderson (Eastern Transmission Corridor) counties.

*Protected under the Bald and Golden Eagle Protection Act

[+]Record of observation on-site

[2] FE = Federal-Endangered; FT = Federal-Threatened; FPE = Federal Proposed-Endangered; FPT = Federal Proposed-Threatened; FC: Federal Candidate for Listing; EXPN = non-essential experimental populations; UR = Under Review; SE = State-Listed as Endangered; ST = State-Listed as Threatened; SSC = State-Listed as Special Concern; SD = State-Listed as Deemed in Need of Management; S1 = Extremely rare and critically imperiled in the state with five or fewer occurrences, or very few individuals, or because of some special condition where the species is particularly vulnerable to extinction; S2 = Very rare and imperiled in the state, 6 to 20 occurrences, or few remaining individuals, or because of some factor(s) making it vulnerable to extinction; S3 = Rare and uncommon in the state, from 21-100 occurrences; S4 = Widespread, abundant, and apparently secure within the state but cause for long-term concern; SH = of historical occurrence in Tennessee, e.g. formally part of the established biota, with the expectation that it may be rediscovered; PE = Possibly Extirpated; SX = presumed extirpated

[3] Yes = presence of suitable habitat in project area; No = no potential presence of suitable habitat in project area; UNK = Unknown due to limited habitat information; those denoted with (*) are unlikely to support protected species regardless of habitat due to local extirpation (NatureServe 2022).

[5] Observed either within the transmission line corridor or in the vicinity of the transmission lines.

[6] Field surveys for federally and state-listed plant species were completed in June and August 2022. For plants listed in this table, the last column lists whether the species was directly observed during field surveys, which were conducted during the appropriate times of year for identification.

3.8.4.1.2.5.1 Birds

Eight federally or state-listed bird species have potentially suitable habitat within or alongside the existing off-site transmission corridors. These species include Bachman's sparrow, bald eagle (foraging over water), Bewick's wren, cerulean warbler, golden-winged warbler, osprey, Swainson's warbler, and whooping crane (Table 3.8-22). Habitat requirements for Bachman's sparrow, bald eagle, osprey, and Swainson's warbler are discussed in Section 3.8.4.1.1.1. The golden-winged warbler, state-listed as threatened, is known from Anderson and Cumberland counties, which encompasses the entirety of the Western Transmission Corridor and the eastern half of the Eastern Transmission Corridor. Golden-winged warblers are found in open woodlands, brushy clearings, and undergrowth, and breed in early successional habitat with brushy areas with patches of weeds, shrubs, and scattered trees (National Audubon Society 2022). Bewick's wren and cerulean warbler are both state listed as Deemed In Need of Management in TN. The cerulean warbler is known from Anderson County, which encompasses the eastern half of the Eastern Transmission Corridor. Habitat requirements for cerulean warbler includes mature, deciduous forest in floodplains. No observations of Bewick's wren were reported in TVA's Regional Natural Heritage Database within three miles of the Western or Eastern Transmission Corridors. Habitat requirements for Bewick's wren includes brushy areas, thickets, and scrub in open country and around the edges of woods (National Audubon Society 2022). Whooping crane is a federally endangered population that does not have state-listed status in TN, but the species is considered very rare. Whooping cranes do not breed in TN and can only be found there during migration (TDEC 2023b). Habitat requirements for whooping crane includes open prairies and marsh habitat for breeding and grain fields and shallow lakes during winter migration. Potential habitat for whooping crane occurs along the off-site transmission line corridors and several small populations have been observed along the Cumberland River during their winter migrations since 2008. During 2023 field surveys, four active osprey nests were observed on utility poles (Appendix F). Bachman's sparrow, bald eagle, cerulean warbler, golden-winged warbler, osprey, and Swainson's warbler have been documented within 3 miles of the transmission line corridors based on a review of TVA's Regional Natural Heritage Database.

3.8.4.1.2.5.1.1 Migratory Birds

The migratory bird species of conservation concern for the proposed upgrades to transmission line ROWs are the same as those listed and discussed for the Kingston Reservation in Section 3.8.4.1.1.1, as both areas are in Bird Conservation Region 28. Table 3.8-23. summarizes the migratory birds that may occur along the existing transmission line ROWs proposed for upgrades based on field surveys completed in June 2022 and May and June 2023.

Table 3.8-23. Migratory Bird Species of Conservation Concern Potentially Occurring in or Identified on the Alternative A Transmission Line Corridors

Common Name	Scientific Name	General Habitat Description	Potential Habitat Present
Migrant Species (present as spring and fall migrant and/or during winter)			
Bobolink	*Dolichonyx oryzivorus*	Open country with a preference for large hayfields, moist meadows and weedy fields dominated by a mixture of tall grasses	Yes

Common Name	Scientific Name	General Habitat Description	Potential Habitat Present
Golden-winged Warbler	*Vermivora chrysoptera*	Inhabits upland sites on abandoned farmland in early successional habitats, powerline ROWs, dry and shrubby fields.	Yes
Lesser Yellowlegs	*Tringa flavipes*	Winters and migrates along mudflats, sandy beaches, shores of lakes and ponds, and wet meadows.	No
Black-capped Chickadee	*Poecile atricapillus*	Occurs in deciduous and mixed forests, open woods, parks, willow thickets, cottonwood groves, and disturbed areas	Yes
Rusty Blackbird	*Euphagus carolinus*	Forested wetlands	Yes
Prothonotary Warbler	*Protonotaria citrea*	Forested wetlands with areas of standing water	Yes
Cerulean Warbler	*Dendroica cerulea*	Mature deciduous forest with scattered canopy gaps	Yes
Breeding Season Migrants (may occur only during the breeding season)			
Chimney Swift	*Chaetura pelagica*	Forages over variety of habitats, requires chimneys or large hollow tree snags with open tops for nesting.	Yes
Common Nighthawk (lesser)	*Chordeiles minor*	Inhabits any kind of open or semi-open terrain, including clearings in forest, open pine woods, prairie country, farmland, suburbs and city centers.	Yes
Chuck-will's Widow	*Antrostomus carolinensis*	Oak and pine woodlands. Breeds in shady southern woodlands of various types, including open pine forest, oak woodlands, edges of swamps.	Yes
Eastern Whip-poor-will	*Antrostomus vociferus*	Woodlands with open understory.	Yes
Kentucky Warbler	*Geothlypis formosa*	Large moist forest tracts with mature trees and thick understory.	Yes
Prairie Warbler	*Dendroica discolor*	Various shrubby habitats, including regenerating forests, open brushy fields, and Christmas tree farms.	Yes
Osprey	*Pandion haliaetus*	Typically nest on top of large trees, utility poles, duck blinds, or other structures near water.	Yes
Wood Thrush	*Hylocichla mustelina*	Breeds in mature deciduous and mixed forests, forests with dense understory, and forest edges.	Yes
Yellow-billed Cuckoo (Eastern)	*Coccyzus americanus*	Woodlands, thickets, orchards, streamside groves. Breeds mostly in dense deciduous stands, including forest edges, tall thickets, dense second growth, overgrown orchards, scrubby oak woods.	Yes

Common Name	Scientific Name	General Habitat Description	Potential Habitat Present
Black-billed Cuckoo	*Coccyzus erythrophthalmus*	Occurs along wood edges, groves, thickets. Breeds mostly in deciduous thickets and shrubby places, often on the edges of woodland or around marshes	Yes
Resident Species (may occur year-round)			
Eastern Meadowlark	*Sturnella magna*	Open fields and pastures, meadows, prairies. Breeds in natural grasslands, meadows, weedy pastures, also in hayfields and sometimes in fields of other crops. Winters in many kinds of natural and cultivated fields	Yes
Killdeer	*Charadrius vociferus*	Fields, airports, lawns, riverbanks, mudflats, shores. Often found on open ground, such as pastures, plowed fields, large lawns, even at a great distance from water. Most successful nesting areas, however, have some shallow water or other good feeding area for the chicks. Also commonly found around water, on mudflats, lake shores, coastal estuaries	No
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Deciduous woodlands with oak or beech, groves of dead or dying trees, forested river bottoms, recent clearings, farmland, grasslands, forest edges and roadsides	Yes
Northern Saw-whet Owl	*Aegolius acadicus*	Occurs in forest with an open understory for foraging, deciduous trees for nesting, dense conifers for roosting, and riverside habitat nearby. But they nest in a wide range of wooded habitats, including coniferous swamps, disturbed deciduous woods, savannahs, riverside forest, and shrub-steppe habitat	Yes

Sources: USFWS 2021b, Appendix F

In addition to protection under the MBTA, eagles are also protected under the BGEPA. Bald eagles typically utilize forested areas adjacent to large bodies of water for nesting habitat. Tall, mature coniferous or deciduous trees that afford a wide view of the surroundings are used as nest trees and roost trees. Bald eagles typically avoid heavily developed areas. Suitable summer nesting habitat for bald eagles generally consists of prominent trees along riparian corridors on large bodies of water. Winter habitat in TN includes reservoirs and large rivers. Neither bald eagles nor their nests were sighted during field surveys of the off-site transmission line corridors. There are nine bald eagle records for Roane County, six of which are extant. The closest known nesting record for these transmission line corridors is approximately 0.48 miles away; however, this nest was abandoned in 2004 (TVA 2023d) In 2021, an eagle nest was also observed 2.03 miles from the KIF plant on the bank of the Clinch River, but this nest was not active at the time of the observation. Additional survey in 2023 determined the tree where the nest was located fell and the nest no longer existed. In February 2023, an active nest was documented approximately 3.96 miles from the KIF plant on the TN River.

More detailed information regarding potential habitat for protected and migratory birds along the transmission line corridors is provided in Appendix F.

3.8.4.1.2.5.2 Mammals

Seven federally or state-listed bat species were identified as potentially occurring in the vicinity of the Alternative A transmission corridors (Table 3.8-22). Bats identified for Cumberland County, which includes the Western Transmission Corridor, are the gray bat, eastern small-footed bat, Indiana bat, northern long-eared bat, Rafinesque's big-eared bat, and the tricolored bat. Bats identified in Roane or Anderson counties, which are crossed by the Eastern Transmission Corridor, include gray bat, Indiana bat, little brown bat, northern long-eared bat, and tricolored bat. The gray bat, Indiana bat, northern long-eared bat, little brown bat, and tricolored bat are state-listed in TN; the gray bat, Indiana bat, and northern long-eared bat, and tricolored bat are also federally protected species under the ESA. The tricolored bat was proposed endangered by the USFWS in September 2022, with a final listing expected in 2024. The little brown bat is expected to be proposed for listing sometime in 2024 and is currently under review. Field surveys of the Transmission Corridors in 2022 and 2023 found 2.1 acres of high-quality and 6.8 acres of medium-quality summer bat roosting habitat along the Western Transmission Corridor, and 9.7 acres, 141.2 acres, and 93.7 acres of high-, medium-, and low-quality summer bat roosting habitat within the Eastern Transmission Corridor. Suitable summer roosting habitat for these species consists of trees of varying ages, including dead snags, and is present alongside the transmission line corridors and access roads. Foraging habitats for all listed bat species are present within the Transmission Corridors over ponds, wetlands, streams, and open agricultural fields. Additional foraging habitat occurs within forested habitat, forest edges, and/or alongside tree lines. TVA's Regional Natural Heritage Database reported four caves in Anderson County and six caves in Roane County that are within 3 miles of the Eastern Transmission Corridor, indicating that winter roosting may also occur nearby.

The long-tailed shrew is another state-listed mammal that may have potential habitat within the transmission line corridors. The long-tailed shrew prefers mountainous, forested areas with loose talus (TWRA 2022c). More detailed information and figures regarding potential habitat for mammals along the transmission line corridors are provided in Appendix F.

3.8.4.1.2.5.3 Reptiles

The eastern slender glass lizard was the only federally or state-listed species of reptile identified with potential habitat along both the Western and Eastern Transmission Corridors for Alternative A (Table 3.8-22). Information for this species is provided in Section 3.8.4.1.1.3.

3.8.4.1.2.5.4 Amphibians

The black mountain salamander, Cumberland dusky salamander, and the eastern hellbender may have suitable habitat within the transmission line ROWs. The black mountain salamander and Cumberland dusky salamander are state-listed as Deemed In Need of Management in TN. These salamanders are known from Cumberland County and the black mountain salamander is also known from Anderson County, which include the Western Transmission Corridor. The black mountain salamander is found in spring runs and permanent streams in wooded, mountainous terrain. This species has been reported on TVA's Regional Natural Heritage Database as being identified within 3 miles of the Western Transmission Corridor. The Cumberland dusky salamander species occupies spaces under rocks along small streams, or adjacent cover, and are associated with streams of the Cumberland Plateau, which is crossed by the Western Transmission

Corridor. As such, there is potential for this species or its habitat to occur within streams crossed by the existing transmission line.

The eastern hellbender is state-listed as endangered. It is a large salamander found in clear, rocky creeks and rivers with water temperatures that are ideally less than or equal to 20°C, and where there are large shelter rocks. Eggs are laid in nests in late summer or fall beneath these large, flat shelter rocks or submerged logs. Presence of the eastern hellbender has been documented for Anderson, Cumberland, and Roane counties, which are crossed by the Western (Cumberland) and Eastern (Anderson and Roane) transmission corridors. There is potential for the hellbender or its habitat to occur within streams crossed by the existing transmission lines.

3.8.4.1.2.5.5 Plants

Eighty-one federally and state-listed plant species were identified on the resource lists, including the USFWS IPaC, TDEC species by county, and TVA's Regional Natural Heritage Database (Table 3.8-22). Of the 81 state-listed species, 17 have been identified within 5 miles of the off-site transmission line corridor since the early 2000s, and eight species since 2010, including tall larkspur, spreading false-foxglove, waterweed, northern bush-honeysuckle, and copper iris. Field surveys conducted in June and August 2022 and May and June 2023 identified individuals of the tall larkspur and naked-stem sunflower. Limited riverbank and river bar habitat for Virginia spiraea was present in the Off-site Transmission Corridors along the large rivers, the Emory River, and Poplar Creek. This type of habitat is also suitable for Cumberland rosemary; however, this species only occurs in Cumberland County and none of this habitat was present in the action areas in that county. Suitable habitat for white fringeless orchid, including boggy headwater streams, does not occur in the project area. Similarly, sinks or pit caves where Hart's-tongue fern is found is also not present in the project area. No other federally or state-listed plant species were observed within the existing off-site transmission corridors at the time of survey, however surveys may not have been completed during a species' specific blooming period. Additional information is provided in Appendix F.

3.8.4.1.2.5.6 Aquatic Species

Based on the habitat requirements and identified within surface waters during field surveys, four species of fish, one crayfish, and 22 mollusks may have potential habitat within the off-site transmission line corridors (Table 3.8-22). Fish species include the blue sucker, emerald darter, laurel dace (not considered extant in project area, USFWS 2016), and slender chub. Habitat for the blue sucker is described in Section 3.8.4.1.1.6. There is one record of observation (1975) of the blue sucker within 10 miles of the Eastern Transmission Corridor in Roane County based on TVA's Regional Natural Heritage Database (TVA 2023d).

Emerald darters are found in a variety of clear freshwater habitats with moderately low siltation and mixed substrates (McIntosh 2006) in the upper Cumberland drainage, which encompasses the Western Transmission Corridor. They are typically found in shallow water ranging from 8 to 45 centimeters, but may seek deeper, rock-lined pools during winter months or when flooding alters current velocity and depth at riffles (McIntosh 2006). The emerald darter has been observed within 10 miles of the Eastern Transmission Corridor in Anderson County according to records under TVA's Regional Natural Heritage Database (TVA 2023d).

The Laurel dace prefers undercut banks or beneath slab boulders in pools and slow runs of first and second order streams (headwaters and creeks) with cobble-rubble-boulder substrate and cool water (NatureServe 2022). There is one record of a laurel dace observation in Cumberland County from 1954 provided in TVA's Regional Natural Heritage Database (TVA 2023d). However, this species is currently considered extant in only six streams on the Walden Ridge portion of the Cumberland Plateau, in Rhea and Bledsoe counties (USFWS 2016). It is therefore not anticipated to be impacted by streams crossed by the transmission corridors.

Habitat requirements for the slender chub are described in Section 3.8.4.1.1.6. There is one historical (circa 1936) record of slender chub in Anderson County provided in TVA's Regional Natural Heritage Database (TVA 2023d).

The valley flame crayfish is the only crayfish considered to have potential habitat within the off-site transmission line corridors. Habitat requirements for this species are provided in Section 3.8.4.1.1.6. No records of the valley flame crayfish are listed in TVA's Regional Natural Heritage Database (TVA 2023d).

Three mussel species were identified with potential to occur within waterbodies crossed by the off-site transmission line corridors. The federally listed Cumberland bean requires relatively silt free substrates of sand, gravel, and cobble in good flows of smaller streams (NatureServe 2022). The federally listed purple bean and rough rabbitsfoot are both typically associated with riffle habitat in small to medium-sized rivers with sand and gravel substrate (NatureServe 2022). Neither of these species have been observed within 10 miles of the off-site transmission line corridors based on TVA's Regional Natural Heritage Database (TVA 2023d).

Potential suitable habitat for additional aquatic species may be present in the watercourses crossed by the off-site transmission line corridors.

3.8.4.1.2.5.7 Insects

Monarch butterflies are the only federally protected or candidate insect species with the potential to occur within the existing transmission line ROWs. Additional details on the monarch butterfly and its preferred larval habitat, milkweed, are presented in Section 3.8.4.1.1.7. Milkweed and other flowering plants were observed in multiple areas throughout the Western and Eastern Transmission Corridors; therefore, monarch butterflies may also be present within the transmission corridors. (Appendix F).

3.8.4.1.2.6 Construction and Operation of a Natural Gas Pipeline

ETNG consulted with the USFWS, TWRA, and TDEC to identify if any federally listed or state-listed T&E species (including federal candidate and/or federal and state species of special concern) or their designated critical habitats have the potential to occur within the pipeline corridor or associated aboveground facility areas. ETNG utilized information from the agency, literature reviews, and publicly available information to inform field survey efforts. TVA has reviewed and independently evaluated the information provided by ENTG in Resource Report 3.

As stated in ETNG's Resource Report 3 (ETNG 2023d):

> Consultation with resource agencies is ongoing, as are surveys for endangered, threatened, and special concern species. Impacts on protected species from the

> [ETNG Construction ROW] would primarily result from vegetation clearing. [ETNG] is currently in the process of consulting with USFWS and TWRA regarding mitigation measures for work in protected species habitat.
>
> Impacts are expected to be temporary in nature, however, they will be addressed as consultation and surveys continue. Assessment of impacts and species presence or probable absence is expected to be ongoing through 2023.

A summary of threatened and endangered species potentially occurring within ETNG's Construction ROW is presented in Table 3.8-24, which includes species-specific habitat and impact information based on ongoing agency consultation and identifies specific project components with potential to impact the identified species. Determinations made for state and federally protected species were based on habitat assessments and resources in the Construction ROW. Consultation with federal and state agencies is ongoing (pending) for some species.

Table 3.8-24. Threatened, Endangered, and Other Protected Species Reported for the ETNG Construction ROW[1]

Common Name *Scientific Name*	**State Rank and Listing Status**	**Federal Listing Status**	**Habitat Requirement**	**Potential Habitat within the ETNG Construction ROW[2,3]**	**Anticipated Project Impacts and Habitat Assessment[4]**	**Potential Project Components**
Birds						
Bachman's Sparrow *Peucaea aestivalis*	S1, SE		Dry open pine or oak woods; nests on the ground in dense cover.	Yes, limited	*No Effect*	30" Mainline, Harriman Crossover, Kingston Meter , MLV# 5
Mammals						
Gray Bat *Myotis grisescens*	S2, SE	FE	Roosts in caves or karst features year-round. Various foraging habitats including wet meadows, damp woods, and uplands.	Yes (foraging)	*NLAA*	30" Mainline, Harriman Crossover, Kingston Meter , Jackson County Crossover, Clarkrange Crossover, MLV #3-6
Indiana Bat *Myotis sodalis*	S1, SE	FE	Various habitats including wet meadows, damp woods, and uplands, including abandoned structures and sinkhole fissures/karst features; statewide.	Yes (roosting and foraging)[5]	TBD pending consultation	30" Mainline, Clarkrange Crossover
Little Brown Bat *Myotis lucifugus*	S3, ST		Roost in caves, hollow trees, and human-made structures.	Yes (roosting and foraging	TBD pending consultation	30" Mainline, Clarkrange Crossover, MLV #6
Northern Long-eared Bat *Myotis septentrionalis*	S1S2, ST	FE	Various habitats including wet meadows, damp woods, and uplands, including abandoned structures, sinkhole/karst features; statewide.	Yes (roosting and foraging)	TBD pending consultation	30" Mainline, Harriman Crossover, Clarkrange Crossover, Kingston Meter , MLV #6
Tricolored Bat *Perimyotis subflavus*	S2S3, ST	FPE	Generally associated with forested landscapes but may roost near openings.	Yes (roosting and foraging)	TBD pending consultation	30" Mainline, Harriman Crossover, Clarkrange Crossover, Kingston Meter , MLV # 5 &6

Common Name ***Scientific Name***	**State Rank and Listing Status**	**Federal Listing Status**	**Habitat Requirement**	**Potential Habitat within the ETNG Construction ROW[2,3]**	**Anticipated Project Impacts and Habitat Assessment[4]**	**Potential Project Components**
Reptiles						
Northern Pinesnake *Pituophis melanoleucus*	S3, ST		Well-drained sandy soils in pine/pine-oak woods; dry mountain ridges.	Yes	*NLAA*	30" Mainline, Harriman Crossover, Kingston Meter , MLV# 5, 7-9
Amphibians						
Berry Cave Salamander *Gyrinohilus gulolineatus*	S3, ST	FC	Aquatic cave obligate.	No	*NLAA*	Harriman Crossover, Kingston Meter
Hellbender *Cryptobranchus alleganiensis*	S3, SE		Clean and flowing water with plenty of oxygen in large streams and creeks. Areas with gravel bottoms and an abundance of rocks and submerged logs are necessary.	Yes	*NLAA*	30" Mainline, Harriman Crossover, Kingston Meter , MLV #7-9
Streamside Salamander *Ambystoma barbouri*	S2, SE		Seasonally flowing karst streams.	Yes	*NLAA*	30" Mainline, Jackson County Crossover, MLV# 3 and 4
Fish						
Blotchside Logperch *Percina burtoni*	S2, ST		Swift riffles and flowing pools over gravel and small cobble substrates in clear, moderately large streams and small rivers with exceptionally good water quality.	Yes	*No Effect*	30" Mainline, Clarkrange Crossover
Blue Sucker *Cycleptus elongatus*	S2, ST		Swift waters over firm substrates in big rivers.	Yes	*NLAA*	30" Mainline, Harriman Crossover, Kingston Meter
Lake Sturgeon *Acipenser fulvescens*	S1, SE		Bottoms of large, clean rivers and lakes.	Yes	*NLAA*	30" Mainline

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Redlips Darter *Etheostoma maydeni*	S2, ST		Slow-moving large creeks and rivers in pools along the banks strewn with boulders and woody debris.	No	*No Effect*	30" Mainline, Jackson County Crossover, MLV # 3, 4, 6, 7-9
Sickle Darter *Percina williamsi*	S2, ST		Flowing pools over rocky, sandy, or silty substrates in clear creeks or small rivers; often occurs near woody debris or vegetations.	Yes	TBD pending consultation.	30" Mainline, MLV # 7-9
Slender Chub *Erimystax cahni*	S1, ST	FT	Restricted to bars and shoals of fine to medium gravel in runs and riffles of medium to large, clear, warm rivers.	No	*No Effect*	Harriman Crossover, Kingston Meter
Spotfin Chub *Erimonax monachus*	S2, ST	FT	Clear upland rivers with swift currents and boulder substrates; portions of the Tennessee River watershed.	Yes	TBD pending consultation.	30" Mainline, Harriman Crossover, Kingston Meter , MLV #7-9
Yellowfin Madtom *Noturus flavipinnis*	S1, ST	FT	Shallow pools and backwaters of streams with cover of roots, sunken leaves, brush piles, and bedrock ledges.	Yes	*No Effect*	Harriman Crossover, Kingston Meter
Crayfish						
Obey Crayfish *Cambarus obeyensis*	S1, SE		Under cover in small-medium sized streams; headwaters of East Fork Obey River; northern Cumberland.	Yes	*NLAA*	30" Mainline, Clarkrange Crossover, MLV# 5-9
Tennessee Cave Crayfish *Orconectes incomptus*	S1, SE		Shallow pool areas in caves and subterranean streams.	Yes	*NLAA*	30" Mainline, Jackson County Crossover, MLV# 3 and 4
Valley Flame Crayfish *Cambarus deweesae*	S1, SE		Primary burrower; open areas with high water tables.	Yes	*NLAA*	Harriman Crossover, Kingston Meter

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Mollusks						
Alabama Lampmussel *Lampsilis virescens*	S1, SE	FE	Sand and gravel substrates in shoal areas of small-medium size rivers.	Yes	*NLAA*	30” Mainline, Harriman Crossover, Kingston Meter
Anthony’s Riversnail *Athearnia anthonyi*	S1, SE	FE	Large-medium rivers with moderate-high gradient, or riffles of larger creeks with cobble/boulder substrate.	Yes	*No Effect*	Harriman Crossover, Kingston Meter
Appalachian Monkeyface *Quadrula sparsa*	S1, SE	FE	Riffles and runs in fast-flowing medium rivers or creeks with moderate gradient.	Yes	*No Effect*	30” Mainline, Harriman Crossover, Kingston Meter , MLV #7-9
Birdwing Pearlymussel *Lemiox rimosus*	S1, SE	FE, EXPN	Riffles with stable, sand and gravel substrates in moderate to fast currents in small to medium sized rivers.	Yes	*NLAA*	Harriman Crossover, Kingston Meter
Catspaw *Epioblasma obliquata*	S1, SE	FE	Riffles and runs of large river systems with sand and gravel substrate.	Yes	*No Effect*	30” Mainline
Clubshell *Pleurobema clava*	SH, SE	FE	Small to medium sized rivers and streams with sand and fine gravel substrates or in clean, coarse sand and gravel runs.	Yes	*No Effect*	30” Mainline, MLV #5
Cracking Pearlymussel *Hemistena lata*	S1, SE	FE, EXPN	Sand, gravel, and cobble substrates in swift currents or mud and sand in slower currents.	Yes	*NLAA*	Harriman Crossover, Kingston Meter
Cumberland Bean (pearlymussel) *Villosa trabalis*	S1, SE	FE	Sand, gravel, and cobble substrates in waters with moderate to swift currents, and depths less than 1 meter.	Yes	*No Effect*	30” Mainline

Common Name *Scientific Name*	State Rank and Listing Status	Federal Listing Status	Habitat Requirement	Potential Habitat within the ETNG Construction ROW[2,3]	Anticipated Project Impacts and Habitat Assessment[4]	Potential Project Components
Cumberland Elktoe *Alasmindonta atropurpurea*	S1S2, SE	FE	Shallow flats or pools of small creeks to medium-sized rivers, with slow current, sand substrate, and scattered cobble/boulder material.	Yes	*NLAA*	30” Mainline, Clarkrange Crossover, MLV # 7-9
Cumberlandian Combshell *Epioblasma brevidens*	S1, SE	FE	Large creeks to large rivers with substrate ranging from coarse sand to mixtures of gravel, cobble, and boulder-sized particles; typically occurs at depths of less than one meter.	Yes	*NLAA*	30” Mainline, Hartsville Compressor Station, Columbia Gulf M&R, Midwestern Gas and Texas Eastern M&R, MLV # 1,2, 5
Dromedary Pearlymussel *Dromus dromas*	S1, SE	FE, EXPN	Riffles and shoals with sand and gravel and moderate current velocities; may also be found in deeper, slower moving water in Tennessee.	Yes	*NLAA*	30” Mainline, Hartsville Compressor Station, Columbia Gulf M&R, Midwestern Gas and Texas Eastern M&R, Jackson County Crossover, MLV # 1-5
Fanshell *Cyprogenia stegaria*	S1, SE	FE, EXPN	Medium to large streams and rivers with coarse sand and gravel substrates.	Yes	*NLAA*	30” Mainline, Hartsville Compressor Station, Columbia Gulf M&R, Midwestern Gas and Texas Eastern M&R, Kingston M&R, Kingston Meter , MLV # 1,2, 5
Finerayed Pigtoe *Fusconaia cuneolus*	S1, SE	FE, EXPN	Riffles of fords and shoals of mod gradient streams in firm cobble and gravel substrates.	Yes	*NLAA*	Harriman Crossover, Kingston Meter
Fluted Kidneyshell *Ptychobranchus subtentus*	S2, SE	FE	Small-medium rivers in swift currents or riffles, in sand, gravel, or cobble substrates.	Yes	*NLAA*	30” Mainline, Clarkrange Crossover, MLV # 6

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Orangefoot Pimpleback (pearlymussel) *Plethobasus cooperianus*	S1, SE	FE, EXPN	Perennial streams with rocky areas and swift to slow moving currents.	Yes	*NLAA*	30" Mainline, Harriman Crossover, Kingston Meter
Oyster Mussel *Epioblasma capsaeformis*	S1, SE	FE	Moderate to swift currents in large creeks and rivers in substrates composed of coarse sand and gravel to boulder-sized particles. Sometimes associated with water-willow beds and in pockets of gravel between bedrock ledges in areas of swift current.	Yes	*No Effect*	30" Mainline, MLV #5
Pink Mucket *Lampsilis abrupta*	S2, SE	FE	Large rivers with sand-gravel or rocky substrates with moderate to strong currents.	Yes	*NLAA*	30" Mainline, Hartsville Compressor Station, Columbia Gulf M&R, Midwestern Gas and Texas Eastern M&R, Harriman Crossover, Kingston Meter , MLV # 1,2, 5
Purple Bean *Villosa perpurpurea*		FE	Creeks to medium-sized rivers and occasionally headwaters; generally associated with riffles but may be in direct current, pools.	Yes	*NLAA*	Harriman Crossover, Kingston Meter
Rabbitsfoot *Theliderma cylindrica*	S3, ST	FT	Large rivers with sand and gravel.	Yes	*No Effect*	30" Mainline, MLV #5

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Ring Pink *Obovaria retusa*	S1, SE	FE, EXPN	Large rivers in sand and gravel.	Yes	*NLAA*	30" Mainline, Hartsville Compressor Station, Columbia Gulf M&R, Midwestern Gas and Texas Eastern M&R, Harriman Crossover, Kingston Meter, MLV # 1,2
Rough Pigtoe *Pleurobema plenum*	S1, SE	FE, EXPN	Medium to large sized rivers, in substrates ranging from mud and sand to gravel, cobble, and boulders	Yes	*NLAA*	30" Mainline, Hartsville Compressor Station, Columbia Gulf M&R, Midwestern Gas and Texas Eastern M&R, MLV #1 and 2
Rough Rabbitsfoot *Quadrula cylindrica strigillata*	S2, SE	FE	Small-medium sized rivers in clear, shallow riffles with sand-gravel substrates	Yes	*NLAA*	Harriman Crossover, Kingston Meter
Sheepnose Mussel *Plethobasus cyphyus*	S2S3, SE	FE	Large to medium-sized rivers, in riffles and coarse sand/gravel substrate.	Yes	*No Effect*	30" Mainline
Shiny Pigtoe *Fusconaia cor*	S1, SE	FE, EXPN	Shoals and riffles of small-medium sized rivers with moderate-fast current over sand-cobble substrates.	Yes	*NLAA*	Harriman Crossover, Kingston Meter
Slabside pearlymussel *Pleuronaia dolabelloides*	S2, SE	FE	Large creek to moderately sized rivers. Generally observed in gravel substrates within interstitial sand, with moderate current.	Yes	*No Effect*	30" Mainline, MLV #5
Spectaclecase *Cumberlandia monodonta*	S2S3, SE	FE	Medium to large rivers; in substrates ranging from mud and sand to gravel, cobble, and boulders.	Yes	*NLAA*	30" Mainline, Harriman Crossover, Jackson County Crossover, Kingston Meter, MLV # 3 and 4

Common Name *Scientific Name*	State Rank and Listing Status	Federal Listing Status	Habitat Requirement	Potential Habitat within the ETNG Construction ROW[2,3]	Anticipated Project Impacts and Habitat Assessment[4]	Potential Project Components
Snuffbox *Epioblasma triquetra*	S3, SE	FE	Riffles of small-medium creeks and large rivers, and in shoals and wave-washed lake shores. Found in sand, gravel, or cobble substrates.	Yes	*No Effect*	30” Mainline, MLV #5
Tennessee Bean *Venustaconcha trabalis*	S1, SE	FE, EXPN	Riffle areas of small rivers and streams in sand, gravel, and cobble substrates with swift current	Yes	*No Effect*	30” Mainline, Harriman Crossover, Kingston Meter
Tubercled Blossom (pearlymussel) *Epioblasma torulosa*		FE	Riffles or shoals in shallow waters of medium rivers or creeks with sandy gravel substrate and rapid currents.	Yes	*No Effect*	30” Mainline, Harriman Crossover, Kingston Meter, MLV #7-9
Turgid Blossom (pearlymussel) *Epioblasma turgidula*		FE, EXPN	Clear, unpolluted water over sand and gravel substrates of shallow, fast-moving streams.	Yes	*NLAA*	30” Mainline, Harriman Crossover, Kingston Meter
White Wartyback *Plethobasus cicatricosus*	S1, SE	FE, EXPN	Shoals and riffles in large rivers; Tennessee and Cumberland River systems; possibly extirpated in TN	Yes	*No Effect*	30” Mainline, Harriman Crossover, Kingston Meter, MLV #7-9
Plants						
American Hart’s-tongue Fern *Asplenium scolopendrium var. americanum*	S1, SE	FT	Moist crevices of mossy rock outcrops, or in sinkholes of limestone caves.	No	*No Effect*	Harriman Crossover, Kingston Meter
Barrens Silky Aster *Symphyotrichum pratense*	S1, SE		Barrens.	No	*No Effect*	Harriman Crossover, Kingston Meter
Blue Mud-plantain *Heteranthera limosa*	S1S2, ST		Mud flats.	No	*No Effect*	30” Mainline, Jackson County Crossover, MLV# 3 and 4

Common Name ***Scientific Name***	**State Rank and Listing Status**	**Federal Listing Status**	**Habitat Requirement**	**Potential Habitat within the ETNG Construction ROW[2,3]**	**Anticipated Project Impacts and Habitat Assessment[4]**	**Potential Project Components**
Blue-flower Coyote-thistle *Eryngium integrifolium*	S1, ST		Pine flatwoods, savannas, seepages, and other moist and nutrient-poor areas.	Yes	*No Effect*	30” Mainline, MLV# 5
Braun’s Rockcress *Boechera perstellata*	S1, SE	FE	Mesic, shady, steep, north-facing wooded slopes.	Yes	*No Effect*	30” Mainline
Bristle-fern *Trichomanes boschianum*	S1S2, ST		Found in deep shade on damp, acidic rocks, usually sandstone, in sheltered canyons, grottos, and rock shelters within mesic upland forests at altitudes of 150 to 800 meters.	No	*No Effect*	30” Mainline, Clarkrange Crossover
Butternut *Juglans cinerea*	S3, ST		Shaded forests with deep, moist and rich soils	Yes	*NLAA*	30” Mainline, Harriman Crossover, Jackson County Crossover, Clarkrange Crossover, Kingston Meter, MLV# 3-9
Chapman’s Redtop *Tridens flavus* var. *chapmanii*	S1, SE		Pine and oak woodlands.	Yes	*No Effect*	30” Mainline, MLV # 7-9
Climbing Fumitory *Adlumia fungosa*	S2, ST		Disturbed habitats, cliffs, balds, or ledges.	No	*No Effect*	30” Mainline, MLV # 7-9
Cumberland Featherbells *Stenanthium diffusum*	S1, SE		Cliffs or rock ledges in woodlands with sandy, moist soil.	No	*No Effect*	30” Mainline, Clarkrange Crossover, MLV # 7-9
Cumberland Rosemary *Conradina verticillata*	S3, ST	FT	Well-drained sandy and poorer soil in full sun.	Yes	TBD pending consultation	30” Mainline, Clarkrange Crossover, MLV # 7-9
Cumberland Sand-grass *Sporobolus arcuatus*	S2, ST		Rocky and sandy river bars.	Yes	*No Effect*	30” Mainline, MLV # 7-9

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Cumberland Sandwort *Minuartia cumberlandensis*	S2, SE	FE	Found on sandy floors of cool, humid, cave-like overhangs.	No	*No Effect*	30” Mainline, Clarkrange Crossover, MLV # 7-9
Earleaved False-foxglove *Agalinis auriculata*	S2, SE		Barrens.	No	*No Effect*	Harriman Crossover, Kingston Meter
Eastern Yampah *Perideridia americana*	S2, SE		Mesic black soil prairies, openings or edges near woodlands, areas along woodland paths, thickets, limestone glades, and bluffs.	Yes	*No Effect*	30” Mainline
Fen Orchis *Liparis loeselii*	S1, ST		Calcareous seeps.	No	*No Effect*	Harriman Crossover, Kingston Meter
Fetter-bush *Leucothoe racemosa*	S2, ST		Acidic wetlands and swamps.	Yes	*No Effect*	30” Mainline, Harriman Crossover, Kingston Meter
Foxtail Clubmoss *Lycopodiella alopecuroides*	S2, ST		Disturbed areas, bogs, grasslands.	Yes	*No Effect*	30” Mainline, Clarkrange Crossover
Fragile Tortula *Tortula fragilis*	S1, SE		Grows on tree bark and calcareous rocks.	Yes	*No Effect*	30” Mainline
Grassleaf Arrowhead *Sagittaria graminea*	S1, ST		Fresh tidal marshes or flats, lakes, ponds, rivers and river shorelines, wetland margins.	Yes	*No Effect*	30” Mainline, Clarkrange Crossover
Harper’s Umbrella-plant *Eriogonum harperi*	S1, SE		Sandy to gravelly, often calcareous flats, bluffs, outcrops, and slopes in oak and conifer woodlands.	Yes	*No Effect*	30” Mainline, MLV #5
Hitchcock’s Sedge *Carex hitchcockiana*	S1, ST		Rich moist woods.	Yes	*No Effect*	30” Mainline, Jackson County Crossover, MLV# 3 and 4

Common Name ***Scientific Name***	**State Rank and Listing Status**	**Federal Listing Status**	**Habitat Requirement**	**Potential Habitat within the ETNG Construction ROW**[2,3]	**Anticipated Project Impacts and Habitat Assessment**[4]	**Potential Project Components**
Horse-tail Spike-rush *Eleocharis equisetoides*	S1, SE		In lakes or ponds or along the shorelines of lakes and rivers.	Yes	*No Effect*	30" Mainline, Clarkrange Crossover, MLV# 5
Large-flowered Barbara's-buttons *Marshallia grandiflora*	S2, SE		Rocky river bars.	Yes	*No Effect*	Harriman Crossover, Kingston Meter
Large-leaf Pondweed *Potamogeton amplifolius*	S1, ST		Lakes and streams.	Yes	*No Effect*	30" Mainline, Harriman Crossover, Kingston Meter, MLV #7-9
Least Trillium *Trillium pusillum*	S2, SE		Alluvial/moist ravines in dry ridges.	No	*No Effect*	30" Mainline, MLV# 5
Liverwort *Preissia quadrata*	S1, ST		Seepy limestone cliffs and bluffs.	No	*No Effect*	Harriman Crossover, Kingston Meter
Lucy Braun's White Snakeroot *Ageratina luciae-brauniae*	S3, ST		Moist, sandy spaces under rock overhangs.	No	*No Effect*	30" Mainline, Clarkrange Crossover, MLV # 5, 7-9
Menge's Flame-flower *Phemeranthus mengesii*	S2, ST		Shallow soil over granite or sandstone that is periodically wet by seepage.	Yes	*No Effect*	30" Mainline, MLV # 7-9
Mountain Bush-honeysuckle *Diervilla sessilifolia var. rivularis*	S2, ST		Dry cliffs and bluffs.	No	*No Effect*	Harriman Crossover, Kingston Meter
Narrow-leaved Meadow-sweet *Spiraea alba*	S1, SE		Medium to wet, well-drained soil such as in wet prairies, low areas along stream, marsh edges, bogs, and ditches.	Yes	*No Effect*	30" Mainline, MLV# 5
Northern Bush-honeysuckle *Diervilla lonicera*	S2, ST		Rocky woodlands and bluffs.	Yes	*No Effect*	Harriman Crossover, Kingston Meter

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Northern Starflower *Trientalis borealis*	S1, ST		Bogs, hummocks in sandy swamps, edges of sandy woodlands, and ravines.	Yes	*No Effect*	30” Mainline, MLV # 7-9
Pinelands Dropseed *Sporobolus junceus*	S1, SE		Flatwoods and sandhills.	Yes	*No Effect*	30” Mainline, MLV # 7-9
Plains Muhly *Muhlenbergia cuspidata*	S1, SE		Prairies, mountain grasslands, shrublands, and woodlands.	Yes	*No Effect*	30” Mainline, Hartsville Compressor Station, Columbia Gulf M&R, MLV# 1, 2, 5
Prairie Goldenrod *Oligoneuron album*	S1S2, SE		Barrens.	No	*No Effect*	Harriman Crossover, Kingston Meter
Rose Pogonia *Pogonia ophioglossoides*	S2, SE		Wet acidic barrens.	No	*No Effect*	30” Mainline, Clarkrange Crossover
Roundleaf Fameflower *Phemeranthus teretifolius*	S2, ST		Grows in thin, rocky or sandy soil on sandstone, granitic, or serpentine outcrops.	No	*No Effect*	30” Mainline, Clarkrange Crossover
Roundleaf Shadbush *Amelanchier sanguinea*	S2, ST		Rocky slopes and riverbanks.	Yes	*No Effect*	30” Mainline, MLV # 7-9
Roundleaf Sundew *Drosera rotundifolia*	S1, ST		Bogs and seeps.	No	*No Effect*	30” Mainline, Clarkrange Crossover
Shining Ladies’-tresses *Sprianthes lucida*	S1S2, ST		Alluvial woods and moist slopes.	Yes	*No Effect*	30” Mainline, Harriman Crossover, Kingston Meter, MLV# 6
Short’s Bladderpod *Physaria globosa*	S1, SE	FE	Steep, rocky, wooded slopes and talus area; also occurs along tops, bases, and ledges of bluffs.	No	TBD pending consultation	30” Mainline, Hartsville Compressor Station, Columbia Gulf M&R, Midwestern Gas and Texas Eastern M&R, Jackson County Crossover, MLV# 1-4

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Shortleaf Sneezeweed *Helenium brevifolium*	S1, SE		Rocky, sandy streamsides.	Yes	*No Effect*	30" Mainline, Clarkrange Crossover, MLV # 7-9
Short-leaved Panic Grass *Dichanthelium ensifolium* ssp. *curtifolium*	S1, SE		Moist, sandy woodlands, pinelands, savannahs, and bogs, often on Sphagnum mats.	Yes	*No Effect*	30" Mainline, Clarkrange Crossover
Small's Stonecrop *Diamorpha smallii*	S1S2, SE		Sandstone outcrops.	No	*No Effect*	30" Mainline, MLV# 5
Softleaf Arrow-wood *Viburnum molle*	S2, SE		Rocky bluff forests over calcareous soil, and in adjacent bottomlands.	No	*No Effect*	30" Mainline
Southern Jointweed *Polygonella americana*	S1S2, SE		Dry, sandy areas.	Yes	*No Effect*	30" Mainline, MLV# 7-9
Svenson's Wild-rye *Elymus svensonii*	S2, ST		Dry, rocky, limestone river bluffs.	No	*No Effect*	30" Mainline, Hartsville Compressor Station, Columbia Gulf M&R, Midwestern Gas and Texas Eastern M&R, MLV # 1,2, 5
Sweet Pinesap *Monotropsis odorata*	S2, ST		Mature, moist, shaded, rich hardwood forests.	Yes	*No Effect*	30" Mainline, MLV # 7-9
Sword Moss *Bryoxiphium norvegicum*	S1, ST		Undersides of moist, shaded, sandstone ledges and cliffs, often overhanging streams.	No	*No Effect*	30" Mainline, Clarkrange Crossover, MLV # 7-9
Tall Larkspur *Delphinium exaltatum*	S2, SE		Glades and barrens.	No	*No Effect*	Harriman Crossover, Kingston Meter
Tawny Cotton-grass *Eriophorum virginicum*	S1S2, SE		Bogs.	No	*No Effect*	30" Mainline, Clarkrange Crossover

Common Name ***Scientific Name***	**State Rank and Listing Status**	**Federal Listing Status**	**Habitat Requirement**	**Potential Habitat within the ETNG Construction ROW[2,3]**	**Anticipated Project Impacts and Habitat Assessment[4]**	**Potential Project Components**
Ten-angle pipewort *Eriocaulon decangulare*	S1, SE		Moist peat or sands associated with savannas, bogs, low pinelands, ditches, and the banks of cypress domes.	No	*No Effect*	30” Mainline, MLV# 5
Tennessee Pondweed *Potamogeton tennesseensis*	S2, ST		Slow acidic streams.	Yes	*No Effect*	30” Mainline, MLV # 7-9
Torrey’s Mountain-mint *Pycnathemum torrei*	S1, SE		Barrens.	No	*No Effect*	30” Mainline, MLV# 5
Tubercled Rein-orchid *Platanthera flava var. herbioloa*	S2, ST		Swamps and floodplains.	Yes	*No Effect*	Harriman Crossover, Kingston Meter
Velvety Cerastium *Cerastium velutinum* var. *velutinum*	S1, SE		Limestone rocks, woodlands, and serpentine barrens.	No	*No Effect*	30” Mainline
Virginia Spiraea *Spiraea virginiana*	S2, SE	FT	Stream bars and ledges.	Yes	TBD pending consultation	30” Mainline, Harriman Crossover, Clarkrange Crossover, Kingston Meter, MLV# 7-9
Western Wallflower *Erysimum capitatum*	S1S2, SE		Rocky bluffs.	No	*No Effect*	30” Mainline, Harriman Crossover, Kingston Meter, MLV# 5
White Fringeless Orchid *Platanthera integrilabia*	S2S3, SE	FT	Acidic seeps and stream heads.	Yes	TBD pending consultation	30” Mainline, Harriman Crossover, Clarkrange Receiver, Kingston Meter
White Prairie-clover *Dalea candida*	S2, ST		Sandy, rocky, or clay soils in prairies and open woods.	Yes	*No Effect*	30” Mainline, Clarkrange Crossover
Whorled Mountain-mint *Pycnanthemum verticillatum*	S1, SE		Forests, meadows, and fields.	Yes	*No Effect*	30” Mainline, Clarkrange Crossover

Common Name *Scientific Name*	State Rank and Listing Status	Federal Listing Status	Habitat Requirement	Potential Habitat within the ETNG Construction ROW[2,3]	Anticipated Project Impacts and Habitat Assessment[4]	Potential Project Components
Zigzag Bladderwort *Utricularia subulata*	S1, ST		Wet barrens, ecotones.	Yes	*No Effect*	30" Mainline, Clarkrange Crossover, MLV# 7-9
Insects						
Monarch butterfly *Danaus plexippus*		FC	Milkweed and flowering plants.	Yes	*NLAA*	All Project components

Source: USFWS Information, Planning, and Consultation (IPaC) dated April 20, 2023, Tennessee Department of Environment and Conservation's (TDEC) Rare Species by County, TVA Regional Natural Heritage Database, ETNG 2023d

[+]Record of observation on-site

[1] FE = Federal-Endangered; FT = Federal-Threatened; FPE = Federal Proposed-Endangered; FPT = Federal Proposed-Threatened; FC: Federal Candidate for Listing; EXPN = non-essential experimental populations; SE = State-Listed as Endangered; ST = State-Listed as Threatened; SSC = State-Listed as Special Concern; SD = State-Listed as Deemed in Need of Management; S1 = Extremely rare and critically imperiled in the state with five or fewer occurrences, or very few individuals, or because of some special condition where the species is particularly vulnerable to extinction; S2 = Very rare and imperiled in the state, 6 to 20 occurrences, or few remaining individuals, or because of some factor(s) making it vulnerable to extinction; S3 = Rare and uncommon in the state, from 21-100 occurrences; S4 = Widespread, abundant, and apparently secure within the state but cause for long-term concern; SH = of historical occurrence in Tennessee, e.g. formally part of the established biota, with the expectation that it may be rediscovered; PE = Possibly Extirpated; SX = presumed extirpated

[2] Potential habitat assessment made on review of habitat information contained within the ETNG Construction ROW (vegetation, streams, wetlands) as described in ETNG's Resource Report 2 and Resource Report 3 (ETNG 2023c, d) and best professional judgement.

[3] Yes = presence of suitable habitat in project area; No = no potential presence of suitable habitat in project area

[4] *NLAA = Not Likely to Adversely Affect*

[5] Appropriate habitat is potentially present; however, bat surveys performed on behalf of ETNG did not capture any Indiana or northern long ear bats during recent mist net or fall swarming surveys.

3.8.4.1.2.6.1 Birds

Bachman’s sparrow was the only bird with state protected status identified as having the potential to occur within the ETNG Construction ROW based on a review of state and federal resources (Table 3.8-24); however, suitable nesting habitat for osprey and suitable foraging habitat for bald eagle also occur within the ETNG Construction ROW. Bachman’s sparrow has the potential to occur in portions of the ETNG Construction ROW located in Putnam and Roane counties. Habitat for Bachman’s sparrow, osprey, and bald eagle is described in Section 3.8.4.1.1.1. The proposed ETNG Construction ROW crosses a variety of habitats consisting of herbaceous, shrub, and forested vegetation communities, as well as numerous resources such as streams, wetlands, and open water; therefore, it is possible that the corridor is within an area containing Bachman’s sparrow or their habitats.

The migratory bird species of conservation concern for the ETNG Construction ROW are the same as those listed and discussed for the Kingston Reservation in Section 3.8.4.1.1.1 since both fall within the same Bird Conservation Regions (USFWS 2021a; ETNG 2023d). Table 3.8-23. summarizes the migratory birds that may occur along the proposed ETNG Construction ROW based on habitat requirements and field surveys.

3.8.4.1.2.6.2 Mammals

Four species of bat with federally protected status and one with expected federal protection in the near future were identified as having potential to occur along the ETNG Construction ROW based on a review of federal resources, including gray bat, Indiana bat, northern long-eared bat, and tricolored bat; respectively (Table 3.8-24). One state-listed species of bat (little brown bat) was also identified as having observations within 3 miles of the ETNG Construction ROW based on TVA’s Regional Natural Heritage Database. Based on the required habitat descriptions provided in Section 3.8.4.1.1.2, these species may use the ETNG Construction ROW for foraging. Some species may also use certain trees for summer roosting. All five bat species and several caves have been documented within a 3-mile radius of the ETNG Construction ROW based on a review of TVA’s Regional Natural Heritage Database. No Indiana bats or northern long-eared bats were collected during targeted fall and summer mist net surveys conducted by ETNG (ETNG 2023d). Seven eastern tricolored bats and one little brown bat were radio-tracked, which helped identify seven roost trees for two individual bats. These roost trees were not found within the proposed project workspaces. Most of the forested area within the ETNG Construction ROW could serve as a suitable summer habitat for the Indiana, and northern long-eared bat, and tricolored bat.

Based on these observations and the preferred habitats of bats for foraging and/or roosting, the ETNG Construction ROW likely crosses potential bat habitats.

3.8.4.1.2.6.3 Reptiles

The northern pine snake is state listed as threatened and has the potential to occur along the proposed ETNG Construction ROW in Putnam, Morgan, and Roane counties (Table 3.8-24). It is a large, nonvenomous snake typically found in sandy, well-drained upland pine or pine-oak woodlands. Northern pine snakes spend much of their time underground, but they are often encountered aboveground during spring and late summer to early autumn (Morrison, n.d.; Tuberville and Mason 2008). The project would impact evergreen forest, comprising 8 percent and 7 percent of the habitat during construction and operation, respectively. However, tree clearing would be done in winter when snakes are less active to minimize impact; the project would be unlikely to adversely affect the species.

3.8.4.1.2.6.4 Amphibians

The eastern hellbender is the only amphibian that may have potential habitat within the ETNG Construction ROW. A description of the required habitat for hellbenders is included in Section 3.8.4.1.1.4. Based on TVA Regional Natural Heritage Database documentation, this species has been observed within a 3-mile radius of the ETNG Construction ROW.

The proposed ETNG Construction ROW crosses a variety of habitats, including numerous aquatic resources such as streams, wetlands, and open waters. During the construction of the Project, impacts to potential habitat for this species would be temporary and *Not Likely to Adversely Affect* the species.

3.8.4.1.2.6.5 Plants

Of the 63 federal- and state-protected species of plants listed in Table 3.8-24, 35 were identified as potentially occurring within the proposed ETNG Construction ROW based on habitat requirements. The proposed ETNG Construction ROW crosses a variety of habitats including herbaceous, shrub, and forested communities, as well as numerous resources such as streams, wetlands, and open water; therefore, the ETNG Construction ROW has the potential to cross areas containing one or more of these protected plant species or their habitats.

Multiple species-specific surveys were conducted in 2022 to evaluate the ETNG Construction ROW for federally and state-listed species during their respective flowering seasons. The American Hart’s-tongue fern is a simple fern and is most often associated with sinkholes and limestone caves. It is federally listed as threatened and state listed as endangered, and their main threat is habitat loss and degradation. Surveys for this species identified no individuals or suitable habitat within or near the ETNG Construction ROW. Therefore, it is determined that the project would not affect the American Hart’s-tongue fern.

The Cumberland rosemary is an evergreen perennial shrub in the mint family that occupies stream banks and rocky river bars. It is federally and state listed as threatened and its main threat is also habitat loss and degradation. Any small impoundment or action that alters the hydrological and geomorphologic processes of these types of habitats would impact the delicate and narrow microhabitat required for this species. No populations of Cumberland rosemary were encountered during plant surveys. Surveys and consultations for this species are ongoing.

The Short’s bladderpod is a biennial or perennial rare flowering plant in the mustard family that inhabits steep rocky slopes. It is federally and state listed as endangered, and its main threat is habitat loss and degradation. No populations of Short’s bladderpod were encountered during plant surveys. Surveys and consultation for this species are ongoing.

The Virginia spiraea is a perennial shrub in the rose family that inhabits riparian and floodplain habitats. It is federally listed as threatened and state listed as endangered. No populations of Virginia spiraea were encountered during plant surveys. Surveys and consultation for this species are ongoing.

The white fringeless orchid is a perennial herb in the orchid family which inhabits hydric, acidic soils. The white fringeless orchid is federally listed as threatened and state listed as endangered, and its main threat is habitat loss and degradation. No populations of white fringeless orchid were encountered during plant surveys.

3.8.4.1.2.6.6 Aquatic Species

Eight species of fish, three species of crayfish, and 31 aquatic mollusk species were identified on the state and federal resource lists as having potential for occurrence within the ETNG Construction ROW. The corridor also crosses many aquatic habitats including large and small streams, creeks, major waterbodies, and named rivers near the Obed Wild and Scenic River complex. The Obed River was designated as a Wild and Scenic River because it has maintained the same wild and natural conditions and characteristics that it exhibited when first discovered in the late 1700s; therefore, this area provides optimal, pristine habitat conditions without substantial anthropogenic effects. Several waterbodies are classified as a TN Exceptional Water. Given these natural conditions, the protected aquatic species listed in Table 3.8-24 may be present in streams or creeks along the proposed ETNG Construction ROW.

Of the species listed in Table 3.8-24, 2 crayfish, 3 fish, and 18 mussel species were identified as having historical or recent observations within 10 miles of the ETNG Construction ROW based on a review of TVA's Regional Natural Heritage Database. Additionally, federally designated critical habitat for spotfin chub occurs along the ETNG Construction ROW in Fentress, Morgan, Putnam, and Roane counties. As stated in Section 3.8.4.1.1.6, suitable habitats throughout the entire range of the spotfin chub are designated as critical habitat. Based on initial meetings with USFWS, additional surveys were completed for the spotfin chub and sicklefin darter (see Section 3.8.4.1.1.6) during the week of October 4, 2023 (ETNG 2024) and did not collect specimens of either species of fish.

Multiple species of federally and state-listed mussels were surveyed in the summer of 2022. The survey plan included federally and state-listed species. An eDNA sampling program was utilized to identify streams with mussel populations. Field surveys were conducted in 2022-23 at 36 crossing locations selected based on USFWS coordination and eDNA screening results. Native mussels require waterbodies with a minimum width of 20 feet and perennial streamflow. A three-step approach was used to identify waterbody crossings containing native freshwater mussels. Malacologists identified 541 waterbodies with perennial streamflow, of which 36 crossings had suitable habitat for freshwater mussels. Visual and tactile surveys were conducted along with collection of water samples for eDNA analyses; live mussels were found at two small stream crossings and all three embayment crossings and the eDNA analysis indicated potential presence of Alabama lampmussel. No listed mussels were found in the field during the initial mussel survey efforts; however, five Alabama lampmussel were documented during the additional surveys completed October 2023 (ETNG 2024).

The Alabama lampmussel is a freshwater mussel that is federally and state-listed as endangered. It is found in small/medium-sized creeks with sand and gravel substrates and slow to moderate currents. Current threats include siltation from various sources and water pollution.

The Birdwing pearlymussel is a state-listed endangered freshwater mussel that belongs to the bivalve mollusc (unionid) family. This species occurs in shoal habitats in small to large rivers and is threatened by impoundments, pollution, and the introduction of non-native species. No Birdwing pearlymussels were encountered during surveys. Therefore, the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the birdwing pearlymussel.

The catspaw is federally, and state listed as endangered, and is a medium-sized mussel. It inhabits deep water with swift currents and is threatened by impoundments and their associated effects. Although catspaw is on the TDEC county-wide list, it is not known to be present in the watersheds that would be crossed by the Ridgeline Project and is not listed IPaC federal species. This species was not encountered during surveys. Therefore, the proposed Ridgeline Project would likely have *No Effect* on the catspaw.

Clubshell is federally and state listed as endangered and is found in clean sand and fine gravel of rivers and streams. This species is particularly vulnerable to siltation driven by agricultural practices, construction, and forestry runoff. Other threats include impoundment, in-stream sand and gravel mining for channelization, pollutants, and invasive species such as the zebra mussel. Although catspaw is on the TDEC county-wide list, it is not known to be present in the watersheds that would be crossed by the Project and is not listed IPaC federal species. No individuals were found during field surveys. Therefore, proposed Ridgeline Project would likely have *No Effect* on the clubshell.

The cracking pearlymussel is a freshwater riverine mussel and is federally and state listed as endangered. It prefers shallow water with moderate current and can inhabit areas with mud and sand substrate. However, impoundments and anthropogenic activities like mining, farming, and construction threaten the species, through decreasing water quality and producing siltation and pollution. No cracking pearlymussels were encountered during surveys. It is concluded that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the cracking pearlymussel.

The Cumberland elktoe is federally and state-listed as an endangered freshwater mussel found in the Cumberland River drainage area. It occupies areas of slow currents with an abundance of cobble with sand and mud substrate. The Cumberland elktoe has been impacted by habitat alteration, pollution, and sedimentation. No specimens of Cumberland elktoe were encountered during surveys. Therefore, it is determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the Cumberland elktoe.

The Cumberlandian combshell is federally and state listed as an endangered freshwater mussel. It has been extirpated from the mainstem of the Cumberland and TN Rivers and faces threats from habitat alteration due to anthropogenic activities like impoundments, channelization, pollution, and sedimentation. No individuals of Cumberlandian combshell were encountered during surveys. Therefore, TVA determined the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the Cumberlandian combshell.

The dromedary pearlymussel is federally and state listed as an endangered species that's endemic to the Cumberland and TN River systems. It prefers shoal habitats with silt-free stable substrates of gravel and coarse sand. The species faces habitat alteration as the greatest threat, including anthropogenic activities like impoundments, channelization, pollution, and sedimentation. No dromedary pearlymussels were encountered during field surveys, therefore the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the dromedary pearlymussel.

The fanshell is federally and state listed as endangered. The species prefers stable silt-free substrates with moderate currents in medium to large rivers. Habitat alteration has eliminated the species from most of its range. No individuals of fanshell were encountered during surveys, and it is determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the fanshell.

The finerayed pigtoe is a medium freshwater mussel that is federally and state-listed as endangered. The species prefers stable, silt-free substrates in shallow shoal habitats. Habitat alteration has eliminated the species from most of its range, either directly affecting the species or reducing its fish host. No individuals of finerayed pigtoe were encountered during surveys. Therefore, it is determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the finerayed pigtoe.

The fluted kidneyshell is a federally and state listed endangered freshwater mussel. It prefers fast currents in riffles with sand or sand/gravel mixed substrates in shoal habitats. The species is threatened by habitat alteration, pollution, and extraction of fossil fuels. Climate change and viruses also pose a risk. No individuals were encountered during surveys. Therefore, it is determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the fluted kidneyshell.

The orangefoot pimpleback is a federally and state listed endangered mussel found in sand and coarse gravel substrates in water depths ranging from 12 to 18 feet in large rivers. Habitat alteration, pollution, and the zebra mussel pose ongoing threats to the orangefoot pimpleback. No individuals were encountered during surveys. Therefore, it is determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the orangefoot pimpleback.

The oyster mussel is a federally and state listed endangered freshwater mussel. It requires small to medium-size rivers with coarse sand and gravel to boulder substrate and moderate to swift currents, and is threatened by habitat alterations like impoundments, channelization, pollution, and sedimentation. No species were encountered during surveys. Therefore, it is determined that the proposed Ridgeline Project would have *No Effect* on the oyster mussel.

The pink mucket is a large freshwater mussel that is federally, and state listed as endangered. The species prefers substrates of gravel in moderate to swift currents but can also inhabit overbank habitats. The pink mucket is threatened by impoundments, siltation, pollution, and habitat degradation. No individuals were encountered during surveys. Therefore, it is determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the pink mucket.

The purple bean, a small mussel species, is listed as a federally endangered species. The species inhabits medium to small rivers and streams in moderate to fast currents with coarse sand and gravel. The purple bean is threatened by impoundments, mining, drilling, and other anthropogenic activities that produce siltation, pollution, toxic spills, and decreased water quality. No individuals were encountered during surveys. Therefore, it is determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the purple bean.

The rabbitsfoot mussel is federally and state listed as threatened. It is typically found in small to medium-sized rivers with clear, shallow water and a mixture of sand and gravel substrates. Habitat alteration is the primary threat to the species, caused by impoundments, channelization, pollution, and sedimentation. No individuals were encountered during field surveys. Therefore, it is determined that the proposed Ridgeline Project would have *No Effect* on the rabbitsfoot.

The ring pink is an endangered mussel which is sexually dimorphic, with females being smaller than males. It has been extirpated throughout much of its historical distribution and is extremely rare throughout its current distribution. Its preferred habitat is poorly recorded in the literature, but it is known to prefer sand and gravel substrates in shallow water. The species is highly susceptible to stochastic events and catastrophes due to its small populations, limited distribution, and lack of recruitment within populations. No individuals were encountered during field surveys. Therefore, it was determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the ring pink.

The rough pigtoe is a federally and state-listed endangered mussel found in small rivers and headwater portions of medium-sized rivers over stable substrates of clean sand, gravel, and silt in runs and riffles. Habitat alteration due to impoundments, channelization, pollution, and sedimentation have severely impacted populations of the rough pigtoe mussel. No individuals were encountered during field surveys. Therefore, it was determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the rough pigtoe.

The rough rabbitsfoot is federally and state-listed as an endangered mussel, found in river systems in upper East TN and southwestern Virginia. The species is impacted by habitat alteration such as impoundments, channelization, pollution, sedimentation, chemical spills, coal mining, and in-stream gravel mining. No individuals were encountered during field surveys. Therefore, it was determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the rough rabbitsfoot.

The sheepnose is federally and state-listed as endangered large-sized mussel and can be found in coarse sand and gravel substrates in medium to large rivers with moderate to swift current. Habitat alterations and chemical spills can impact the populations of southeastern US freshwater mussels, which have a restricted distribution. No individuals were encountered during field surveys. Therefore, it was determined that the proposed Ridgeline Project would have *No Effect* on the sheep nose.

The shiny pigtoe, a medium-sized mussel, is federally and state-listed as endangered. The species prefers sand and gravel substrates in clear streams with moderate to swift currents. Major threats to the shiny pigtoe include impoundments, siltation, and pollution, particularly chemical spills related to coal mining in the Clinch and Powell rivers. No shiny pigtoe were encountered during surveys. Therefore, it was determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the shiny pigtoe.

The slabside pearlymussel is a federally and state-listed endangered species found in creeks to large rivers. Its habitat is threatened by impoundments, water pollution, and sedimentation. No individuals were encountered during field surveys. Therefore, it was determined that the proposed Ridgeline Project would have *No Effect* on the slabside pearlymussel.

The spectaclecase is a federally and state-listed endangered large freshwater mussel found in medium to large rivers. The severest threat is from dams and impoundments that alter water quality and flow, impair habitats, and increase fragmentation and isolation. No specimens of this species were encountered during surveys; as such, it was determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the spectaclecase.

Snuffbox is federally and state-listed as endangered. The snuffbox prefers rivers with steady currents and sand and gravel substrates (Cummings and Mayer 1992). Threats to the snuffbox include non-point and point source pollution. No individuals were encountered during field surveys. Therefore, it was determined that the proposed Ridgeline Project would have *No Effect* on the snuffbox.

Tennessee bean is a federally and state listed endangered mussel. It is found in clear, small to medium-sized streams with a swift to moderate current and occupies diverse aquatic habitats. The Tennessee bean is threatened by various factors such as siltation, drainage, desiccation, species introductions, pollution, impoundments, and increased water temperatures. No individuals were encountered during field surveys. Therefore, it was determined that the proposed Ridgeline Project would have *No Effect* on the Tennessee bean.

The tubercled blossom is federally listed as an endangered medium-sized mussel. It inhabited medium to large rivers in shoal habitats with swift currents, found over sand and gravel in shallow water less than 6 feet deep. No individuals of tubercled blossom were encountered during surveys, and the species is assumed to be extinct. Therefore, it was determined that the proposed Ridgeline Project would have *No Effect* on the tubercled blossom.

The turgid blossom is federally listed as endangered. The turgid blossom is a small mussel that was last seen in the Duck River near Normandy, TN in the 1960s and is now presumed extinct due to habitat modification, dams, impoundments, mining, coal washing, channel modification, poor agricultural practices, timber harvest, and urbanization. No turgid blossoms were encountered during surveys. Therefore, it was determined that the proposed Ridgeline Project *May Affect but is Not Likely to Adversely Affect* the turgid blossom.

White wartyback is a federally and state listed endangered egg-shaped mussel. Due to dam construction, its population has declined, and no live specimens have been found in the Cumberland River in recent years. No individuals were encountered during field surveys. Therefore, it was determined that the proposed Ridgeline Project would have *No Effect* on the white wartyback.

One federally listed snail species, Anthony’s riversnail, has the potential to be within the Ridgeline Project area. It prefers shallow and swift currents over rocky substrates. The species faces threats such as habitat modification, dams, impoundments, mining, coal washing, channel modification, poor agricultural practices, and timber harvest, and it is determined that the Ridgeline Project would have *No Effect* on Anthony’s river snail.

The Obey crayfish is state-listed as endangered. This species is found from small to large streams beneath large rocks in moderate to slow current. Habitat loss and poor water quality issues from point and non-point source pollution are contributing factors to the decline of the species. Additional threats include increasing residential development, logging, and agricultural practices.

Field surveys positively identified Obey crayfish at Little Hurricane Creek and Hurricane Creek on June 12-13, 2023. In the December 7, 2022, consultation letter, TDEC requested that in-water construction work be conducted during summer or winter (non-reproduction periods). Additionally, TDEC requested that pre-construction surveys occur prior to in-water construction activities, and all individuals found be re-located to upstream to suitable habitat. The Ridgeline

Project may affect the Obey crayfish but is *Not Likely to Adversely Affect* it. If streams need to be crossed during spring or fall, TWRA would be consulted for guidance.

The Tennessee cave crayfish is state-listed as endangered. Tennessee cave crayfish can be found in shallow freshwater shallow pool areas in subterranean streams. Threats to this species include sedimentation and fragmentation and loss of habitat. No impacts to caves are anticipated and BMPs would be implemented to minimize sedimentation impacting subterranean streams and reduce impacts to this species. Therefore, it was determined that the Ridgeline Project may affect but would not likely adversely affect this species.

The valley flame crayfish is state-listed as endangered. Valley flame crayfish can be found in floodplain habitats where the soils consist of clays and fragments of shale. Threats to the valley flame crayfish include habitat modification and habitat loss. Impacts to this species habitat would be temporary in nature and only occur during the construction of the Ridgeline Project. Therefore, it is determined that the Ridgeline Project may affect but would not likely adversely affect this species.

3.8.4.1.2.6.7 Insects

Monarch butterflies are currently classified as a federal candidate for species listing under the ESA. They are milkweed specialists and prefer habitats that provide abundant milkweed and other flowering plants, such as roadside areas, open areas, wet areas, or urban gardens (NatureServe 2022). Approximately 393 acres of upland herbaceous/scrub habitat occurs within the ETNG Construction ROW based on NLCD; therefore, there is a reasonable potential for monarch butterflies to occur throughout suitable habitats located within the ETNG Construction ROW.

3.8.4.1.3 Alternative B

There is a wide range of species of conservation concern that may occur in the East TN region due to the variable, and sometimes rare, habitat types and vegetation communities. Protected species, such as vertebrates as small as cave-dwelling bats and salamanders and as large as cougars and black bears, invertebrates such as mussels, and a variety of plants can be found in this region (Martin et al. 1993a). Some of the highest concentrations of federally listed threatened or endangered species are found in the Interior Low Plateau ecoregion (TVA 2019a), which includes the Western Highland Rim, Eastern Highland Rim, Outer Nashville Basin, and Inner Nashville Basin (Griffith et al. 1997). The Blue Ridge Mountains and Ridge and Valley ecoregions in East TN also contain some of the most floristically and aquatically diverse areas of the state. The TN State Wildlife Action Plan (TWRA 2015) states that a total of 1,445,409 acres of medium, high, and very high priority habitat exists throughout the Ridge and Valley, with species of greatest conservation need varying from priority scores of 7.1 up to 47.5, depending on the natural habitat type. The taxonomic groups with the highest proportion of species listed under the ESA are fish and mollusks. Factors contributing to the high proportions of vulnerable species in these groups include the high number of endemic species in TVA's PSA and the alteration of their habitats by reservoir construction, water pollution, habitat destruction or fragmentation, and a variety of other impacts. River systems with the highest numbers of listed aquatic species include the Tennessee, Cumberland, and Coosa rivers.

Conservation efforts have successfully downgraded or removed some species from the ESA list in TN, such as the bald eagle. Conversely, some species have been added to federal and state listings due to declines driven by development/habitat loss, introduced pathogens (e.g., white nose syndrome), insects (e.g., gypsy moth, two-lined chestnut borer), or other causes (Martin et al. 1993; TVA 2019a).

3.8.4.2 Environmental Consequences

3.8.4.2.1 The No Action Alternative

Under the No Action Alternative, KIF would continue operations. TVA would implement all planned actions related to the current and future management and storage of CCRs, which have either been reviewed or would be reviewed in subsequent NEPA analyses. As a result, no new work would be conducted that could potentially alter project-related environmental conditions within the plant. Therefore, no new effects on threatened or endangered species, or species of conservation concern or any suitable habitat, would occur under this alternative.

3.8.4.2.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

One osprey nest exists within the proposed demolition boundary, one nest exists just outside of the proposed demolition boundary, and three more are in the vicinity of Kingston (Figure 3.8-5). Actions that rise to disturbance levels above typical, demonstrated tolerance levels would be performed when ospreys are not actively nesting (typically between March 1 and July 31). Should there be a potential for effects to nesting osprey, TVA would coordinate with USDA-Wildlife Services to ensure compliance with federal law. With adherence to seasonal restrictions around osprey nests and/or coordination with USDA-Wildlife Services, proposed actions for the retirement of the KIF plant would not impact populations of common wildlife species.

The Bachman's sparrow could be found in the forested areas within the demolition boundary. Clearing of forested areas within the demolition boundary would be conducted from November 15 and March 31 to avoid impacts to many nesting protected or migratory bird species. While direct impacts to this species are therefore not expected, if present, this species could experience minor habitat loss with the removal of the forested areas within the demolition boundary. Ample comparable or higher quality forested habitat is located elsewhere on or outside of Kingston Reservation and this impact would be minor, if any.

The whooping crane is listed as Endangered in the Southwest (USFWS Region 2); outside of this region (including TN), the whooping crane is categorized as a non-essential experimental population. Migration habitat does not exist within the KIF Reservation. Whooping crane would not be impacted by the proposed project actions on the KIF reservation. The proposed action is not likely to jeopardize the continued existence of the species.

The bald eagle could also be in the vicinity of Kingston Reservation as the Clinch River is used for foraging; however, no nesting habitat is present on Kingston Reservation. Bald eagle would not be impacted by the proposed actions on the KIF reservation.

Prior to demolition, internal surveys would occur to ensure no colonies of bats or migratory birds are residing within the buildings proposed for demolition. Should bats or birds be observed roosting in buildings, avoidance and minimization measures (such as seasonal restrictions) would be put in place, and the appropriate state or federal agencies (USDA, USFWS, TWRA) would be contacted to ensure compliance with applicable laws. Minor indirect effects, if any, would be expected to protected bat species or colonies of migratory birds.

Approximately 46.4 acres of bat roosting habitat exist within the demolition boundary, the majority of which (79 percent) is considered high quality (Figure 3.8-3). In September 2017, TVA completed a programmatic biological assessment (BA) to address the potential for impacts of specific TVA actions on federally listed bat species whose ranges overlap with TVA action area. The BA addresses 10 overarching actions and 96 routine activities that TVA authorizes, funds, or carries out, and how these actions and activities may affect the Indiana bat, northern long-eared bat, gray bat, and Virginia big-eared bat. TVA determined that 21 of the 96 routine activities would have *No Effect* on these listed bat species or their critical habitat. On March 8, 2018, the USFWS responded to the BA with concurrence that the remaining 75 routine activities are *Not Likely to Adversely Affect* the gray bat, Virginia big-eared bat, or critical habitat of the Indiana bat. The USFWS also agreed that 72 of the 96 proposed routine actions are *Not Likely to Adversely Affect* the Indiana bat or northern long-eared bat. On April 12, 2018, the USFWS provided a biological opinion (BO) regarding the remaining three activities that could result in adverse effects to Indiana bat and northern long-eared bat (vegetation removal, hazard tree removal, and prescribed burning) that concluded that "the action is not likely to jeopardize the continued existence of the [Indiana bat] or the [northern long-eared bat]." In addition, the BO also included an Incidental Take Statement which defined the "action is reasonably certain to cause incidental take of individual [Indiana bats]." Due to the difficulty of detecting the take of Indiana bats, TVA must quantify the extent of take by using the annual and 20-year cumulative acreages of tree removal and prescribed burning under the programmatic action as a surrogate measure, as defined in the BO. TVA reinitiated this consultation due to the uplisting of northern long-eared bat from threatened to endangered. In May 2023, TVA received an additional BO from the USFWS for the reinitiated consultation in which an Incidental Take Statement was issued for northern long-eared bat (USFWS 2023a).

D4 activities associated with this alternative that may affect bats 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), completed in April 2018 and updated in May 2023 (USFWS 2023a). For those activities with potential to affect bats, TVA committed to implement specific conservation measures when direct and indirect effects to federally listed bat species are expected. Relevant conservation measures to this project are listed in the bat strategy form (Appendix F) and must be reviewed and implemented as part of the approved project.

Conservation measures identified in the bat strategy form include:

- Projects that involve structural modification or demolition of buildings, bridges, and potentially suitable box culverts, would require assessment to determine if the structure has characteristics that make it a potentially suitable unconventional bat roost. If so, a survey to determine if bats may be present would be conducted.
- Additional bat presence/absence surveys (e.g., emergence counts) would be conducted if warranted (i.e., when AR1 indicates that bats may be present).
- Operations involving chemical/fuel storage or resupply and vehicle servicing would 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 would be installed to protect stream channel from direct surface runoff. Servicing would be done with care to avoid leakage, spillage, and subsequent stream, wetland, or ground water contamination. Oil waste, filters, other litter would be collected and disposed of properly.

Based on negative results of Phase 2 presence/absence surveys at the KIF Reservation in accordance with USFWS survey guidelines, TVA has determined that proposed actions on the KIF Reservation *May Affect but are Not Likely to Adversely Affect* gray bat, Indiana bat, and northern long-eared bat. Based on the same negative findings for tricolored bats and little brown bats, TVA has also determined that the proposed actions are not likely to jeopardize the continued existence of the tricolored bat and that potential impacts to little brown bat would be minor. No “Take” under TVA’s programmatic consultation would be used in association with actions at the KIF site.

The eastern slender glass lizard may have potential suitable habitat (early successional habitat) on Kingston Reservation within the demolition boundary; however, there are no records of the eastern slender glass lizard within 10 miles of the site. Due to the heavy disturbance on the Reservation, particularly within the demolition boundary, it is unlikely that this species is present or would be impacted under this alternative.

None of the federally listed aquatic species are considered to have suitable habitat on the KIF Reservation. TVA has determined that the proposed actions on the KIF reservation would have *No Effect* on the following federally listed species: Alabama lampmussel, birdwing pearlymussel, cracking pearlymussel, Cumberland bean, dromedary pearlymussel, fanshell, finerayed pigtoe, green blossom pearlymussel, orangefoot pimpleback, pink mucket, purple bean, ring pink, rough pigtoe, rough rabbitsfoot, sheepnose mussel, shiny pigtoe, spectaclecase, tan riffleshell, Tennessee bean, turgid blossom pearlymussel, white wartyback, Anthony’s riversnail, Laurel dace, sickle darter, slender chub, spotfin chub, and yellowfin madtom.

The valley flame crayfish could be present along the margin of the Clinch River. Other than the areas of direct work (i.e., intakes and barge unloading area), it is unlikely that the shore of the Clinch River would be impacted by D4 activities. Additionally, the crayfish is a burrowing species and earth moving near the river is not anticipated, therefore no impacts to this species is expected.

No protected plant species were observed to be present based on field surveys, therefore no impacts are expected to Hart’s-tongue fern, Virginia spiraea, white fringeless orchid, or fetter bush, or any suitable habitat that would support these species.

The monarch butterfly could be found in herbaceous or early successional habitat (totaling 15.2 acres) within the demolition boundary. Potential habitat for the monarch butterfly occurs primarily within the existing on-site transmission line corridor. Following tree clearing and demolition activities, early successional habitat would regenerate in a relatively short time period and potentially provide additional resources such as wildflowers (foraging) and milkweed (breeding). The proposed actions would not jeopardize the continued existence of the monarch butterfly.

Cumulative effects to threatened and endangered species are not anticipated as CCR management activities on the Kingston Reservation have completed Section 7 consultation and would adhere to conservation and mitigation measures.

3.8.4.2.2.1 Environmental Justice Considerations

Effects to threatened and endangered species that may occur as a result of KIF D4 activities are not anticipated to have disproportionateand adverse human health or environmental effects on EJ populations because EJ populations are not present within the Kingston Reservation and effects are restricted to the Kingston Reservation.

3.8.4.2.3 Alternative A

3.8.4.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The proposed construction and operation of the CC/Aero CT Plant, switchyard, and temporary laydown/parking area is not likely to jeopardize the continued existence of the whooping crane or impact bald eagle. Whooping crane is a federally endangered population that does not have state-listed status in TN, but the species is considered very rare. Whooping cranes do not breed in TN and can only be found there during migration (TDEC 2023b). Habitat requirements for whooping crane include open prairies and marsh habitat for breeding and grain fields and shallow lakes during winter migration, which is limited on the Kingston Reservation. Available nesting habitat for bald eagle is limited in the vicinity of the proposed CC/Aero CT Plant and switchyard footprints and no nests of these species occur within 660 feet of these areas.

Bat habitat comprising 4.8 acres of high-quality roosting habitat and 0.1 acre foraging habitat would be permanently impacted (i.e., removed) due to the construction of the CC/Aero CT Plant (Figure 3.8-3 and Figure 3.8-4). Construction of the switchyard would impact an additional 0.3 acre of high-quality roosting habitat. Tree removal at the CC/Aero CT Plant site, would occur between November 15 and March 31 to the extent practicable, when listed bat species would be roosting in caves or other hibernacula. Based on negative results of Presence/Absence surveys at the KIF site TVA has determined that proposed actions on the KIF site *May Affect but are Not Likely to Adversely Affect* gray bat, Indiana bat, and northern long-eared bat. Based on the same negative findings for tricolored bats and little brown bats, TVA has determined that the proposed actions are not likely to jeopardize the continued existence of the tricolored bat and potential impacts to the little brown bat would be minor. No "Take" from TVA's bat programmatic consultation with the USFWS on routine actions would be used in association with actions at the KIF site.

The eastern slender glass lizard may have potential suitable habitat (49.0 acres of herbaceous or early successional habitat) within the CC/Aero CT Plant area, Switchyard, and parking/laydown area; however, there are no records of the eastern slender glass lizard within 10 miles of the site. Due to the relatively small area of impact and similarly suitable habitat available in adjacent areas on the reservation, only minor impacts to this species are anticipated and it is unlikely that this species is present.

No suitable habitat is present and therefore TVA has determined that the proposed actions on the KIF reservation would not affect Hart's-tongue fern, Virginia spiraea, white fringeless orchid, or fetter bush.

No aquatic resources are present within the CC/Aero CT Plant Site, switchyard, or parking/laydown area and therefore there would be *No Effect* to protected aquatic species.

Approximately 49.0 acres of herbaceous and early successional habitat exists within the boundaries of the proposed CC/Aero CT Plant, switchyard, and parking/laydown area which may contain milkweed which supports the monarch butterfly foraging and/or breeding. Proposed actions would not jeopardize the continued existence of the monarch butterfly.

Cumulative effects to threatened and endangered species are not anticipated as Section 7 consultation would be completed and would adhere to conservation and mitigation measures.

3.8.4.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

No suitable habitat to support state or federally listed species was identified within the footprint for the proposed 3- to 4-MW Solar Facility. Therefore, no impacts to protected species are anticipated from the construction of the 3- to 4-MW Solar Facility.

Following construction of the solar facility, the area would be seeded with native herbaceous vegetation less than 12 inches high. Areas outside of the solar array would be planted with pollinator species as possible. Since this area currently does not provide habitat to any protected species, the environmental conditions following construction of the 3- to 4-MW Solar Facility would provide a minor beneficial effect to the monarch butterfly and any other species which may use herbaceous habitat, such as migratory birds or foraging bats.

Cumulative effects to threatened and endangered species are not anticipated as Section 7 consultation would be completed and would adhere to conservation and mitigation measures.

3.8.4.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

Forested habitat within the battery option sites could provide suitable habitat for Bachman's sparrow and Swainson's warbler. Removal of forested habitat (0.5 acres for Battery Site 1; 17.1 acres for Battery Site 2; and 12.9 acres for Battery Site 3, excluding forested area that would be impacted/accounted for under D4 activities) would result in a minor effect to these species as there is abundant forested habitat in the surrounding area of Kingston Reservation.

Suitable summer bat roosting habitat is present on all three battery site options. Areas of bat habitat which overlap with the demolition boundary on Battery Sites 1 and 2 are excluded from the impact totals presented below.

Forested areas that would be permanently impacted due to removal during the development of the 100-MW BESS site (excluding habitat impacted during D4 activities) include 0.7 acre of moderate or high-quality bat habitat if Battery Site 1 is chosen; 17 acres of high-quality habitat if Battery Site 2 is chosen; and 12.9 acres of moderate and high-quality bat roosting habitat if Battery Site 3 is chosen. All roosting habitat also functions as foraging habitat. When feasible, clearing of the site would be conducted during the non-breeding season for most migratory birds, which also encompasses the bat hibernation season, thereby minimizing impacts to protected bat and bird species. Flying species such as birds and bats are able to access alternative habitats outside of Kingston Reservation if needed; forested areas across the Clinch River may also be of higher quality than those found on the Reservation due to its history of disturbance. Therefore, effects to bats and migratory birds would be minor with the construction of one of the battery site options. TVA conducted consultation with the USFWS under Section 7 of the ESA regarding potential impacts to federally protected species including bat habitat within BESS locations (Appendix F).

Based on negative results of Presence/Absence bat surveys at the Kingston Reservation in 2023, TVA has determined that proposed actions on the KIF site *May Affect but are Not Likely to Adversely Affect* gray bat, Indiana bat, and northern long-eared bat. Based on the same negative findings for tricolored bats, TVA has also determined that the proposed actions are not likely to jeopardize the continued existence of the tricolored bat. TVA conducted Section 7 consultation with the USFWS on November 28, 2023. In a letter signed December 27, 2023, the USFWS concurred with TVA's determinations (Appendix F). Based on the same negative findings for little brown bats, TVA has also determined potential impacts to little brown bat would be minor.

The eastern slender glass lizard may have potential suitable habitat (herbaceous or early successional habitat) within two of the battery sites; however, there are no records of the eastern slender glass lizard presence within 10 miles of the site. Early successional or herbaceous habitat that would be impacted on the battery sites may also be utilized by the monarch butterfly for foraging and/or breeding (if milkweed is present). The construction of one of the battery sites would result in minor habitat removal. Due to the relatively small amount of habitat proposed for removal under this alternative, minor impacts to these species are anticipated. If suspected to be present at the time of construction or upgrade activities, TVA would initiate further consultation with the agencies to develop conservation measures, which would minimize or eliminate effects to these species. Overall, there would be *No Effect*s or minor impacts to these species, primarily related to a small amount of habitat loss. Proposed actions would not jeopardize the continued existence of the monarch butterfly.

No habitat is present for Hart's-tongue fern, Virginia spiraea, white fringeless orchid, or fetter bush, therefore there would be *No Effects* to these species.

The valley flame crayfish could find suitable burrowing habitat near the shore of the Clinch River where the water table may be closest to the ground surface. Earth moving close to the river is not anticipated and no impacts to the valley flame crayfish, if present, are expected.

No aquatic resources are within the bounds of the battery sites and therefore no impacts to other protected aquatic species has potential to occur.

Cumulative effects to threatened and endangered species are not anticipated as Section 7 consultation would be completed and would adhere to conservation and mitigation measures.

3.8.4.2.3.4 On-site Transmission Upgrades

The construction of the battery transmission line connections corridor would include the conversion or loss of forested habitat (8.0 acres excluding that within the demolition boundary) to herbaceous or scrub-shrub habitat, which would impact the Bachman's sparrow or Swainson's warbler if using this habitat or nesting in immediately adjacent areas. These species would likely avoid the area if ongoing construction was occurring as individuals were arriving on site to select nesting locations and preference adjacent comparable habitat either on or off of the Kingston Reservation. Should there be a potential for effects to nesting osprey, TVA would coordinate with USDA-Wildlife Services to ensure compliance with federal law. These impacts would be minor to these species due to the prevalence of alternative habitat in the surrounding area and along the Clinch River and adherence to guidance provided by USDA.

Neither the whooping crane nor bald eagle would be impacted by the proposed project actions on the KIF reservation.

The transmission line corridor proposed for upgrades is an existing corridor with early successional and herbaceous habitats totaling 80.5 acres; however, the eastern portion of the corridor contains forested area (approximately 15.2 acres) that would be removed and converted to herbaceous/scrub-shrub habitat. Protected or migratory birds within the existing transmission line corridor proposed for upgrades could experience disturbance during work activities; however, effects would be minor and temporary outside of tree clearing areas. Some of the birds capable of using the herbaceous habitat would likely return to the area following upgrade activities.

Construction of battery transmission line connections has the potential to result in permanent loss of forested habitat due for migratory birds. Different species of migratory birds may use transmission line corridors as habitat following construction of the project. To the extent practicable, tree removal would be limited to November 15 to March 31 when most wildlife is not nesting and many species of birds have migrated away from the region, thereby avoiding or minimizing the potential for direct effects. Impacts to migratory birds under this action would be minor as nearby suitable habitat is present and habitats on site, although altered from current condition, would still provide resources for some migratory species.

The battery transmission line connections corridor would include the removal of 18.9 acres of high-quality bat roosting habitat (excluding that which falls within the demolition boundary) for Indiana bat, northern long-eared bat, and tricolored bat, and little brown bat. The battery transmission line connections corridor following completion of the action would regenerate as a maintained ROW that could provide foraging habitat for these three protected bat species, as well as the gray bat. The on-site transmission line corridor proposed for upgrades would also require the removal of approximately 16.6 acres of high-quality bat roosting habitat, which would be converted to herbaceous/scrub-shrub habitat and would likely function as bat foraging habitat. Habitat removal activities associated with transmission line construction 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), completed in April 2018 and updated in May 2023 (USFWS 2023). For those activities with potential to affect bats, TVA committed to implement specific conservation measures when direct and indirect effects to federally listed bat species are expected. Additional information about the BO and conservation measures are described in Section 3.8.4.2.3.4. Based on negative results of Presence/Absence bat surveys at the KIF site TVA has determined that proposed actions on the KIF site *May Affect but are Not Likely to Adversely Affect* gray bat, Indiana bat, and northern long-eared bat. Based on the same negative findings for tricolored bats and little brown bats, TVA has also determined that the proposed actions are not likely to jeopardize the continued existence of the tricolored bat and potential effects to little brown bat would be minor. No "Take" from TVA's bat programmatic consultation with the USFWS on routine actions would be used in association with actions at the KIF site.

Potential suitable habitat for the eastern slender glass lizard exists within the on-site transmission corridor consisting of 44.9 acres of early successional habitat excluding that which falls within the demolition boundary. This habitat may be temporarily impacted and localized during transmission line upgrades, and effects would be minor. Furthermore, additional habitat within this corridor and the battery transmission line connections corridor would be gained consisting of 33.9 acres may be gained by this species with the construction of the battery transmission line connections corridor and the expansion of the transmission line corridor proposed for upgrades. There are no records of the eastern slender glass lizard presence within 10 miles of the site; therefore, it is unlikely that this species is present. Due to the temporary, localized effects of the proposed battery transmission construction, and the addition of habitat following forest conversion, any direct impacts to the eastern slender glass lizard are expected to be minor and a minor beneficial effect of expanded habitat is possible.

A small portion (0.4 acre) of the forested margin along the Clinch River where the protected fetter bush was observed previously falls within the boundary of the on-site transmission line corridor proposed for upgrades and would be permanently impacted by forest clearing. This area was resurveyed in 2023 and no fetterbush was identified. No habitat for other protected plant species is present.

No aquatic resources are present which would provide habitat for protected aquatic species, therefore there would be no affects to these species.

Cumulative effects to threatened and endangered species are not anticipated as Section 7 consultation would be completed and would adhere to conservation and mitigation measures.

3.8.4.2.3.5 Off-site Transmission Line Upgrades

The Clinch and Emory Rivers provide suitable foraging habitat for bald eagles. Neither bald eagles nor their nests were observed during field surveys of the off-site transmission line corridors. The closest known bald eagle nesting record to an off-site transmission line corridor is approximately 2.38 miles away in Roane County. Bald eagle would not be impacted by the proposed actions in the off-site transmission line upgrade areas.

Field surveys included a survey of transmission line towers for osprey nesting and four active nests were identified. Some construction activities are prohibited while birds are actively nesting. While osprey are actively nesting (typically March-August), activities are limited to vegetative maintenance (i.e., mowers, bushhogs, select herbicide spraying). Should there be a potential for effects to nesting osprey along the transmission line ROWs, TVA would coordinate with USDA-Wildlife Services to ensure compliance with federal law.

Migration habitat for the whooping crane does not exist within the proposed action areas of the off-site transmission line upgrades. Whooping crane would not be impacted by the proposed project actions in the off-site transmission line upgrade areas. The proposed action is not likely to jeopardize the continued existence of the species.

Substantial tree removal is not anticipated for upgrades; however, some tree and vegetation trimming could be conducted to facilitate upgrade activities or to provide proper clearance for construction vehicles on access roads and TVA assumes up to three acres of forest could be cleared. Upgrades to the transmission lines would require limited ground disturbance, primarily from existing access roads and short-term disturbances from heavy equipment moving along the transmission line ROWs to perform facility upgrades. Up to three acres of “Take” for suitable bat habitat tree removal along off-site transmission line access roads would be used from TVA’s programmatic consultation with USFWS in association with this project. Due to the small, amount of potential forest removal that is likely to occur when these bats are not roosting in trees any potential impacts of transmission upgrades to state-listed bat species are likely to be minor. Additional avoidance and conservation measures would be implemented during upgrades within 0.5 miles of caves with small numbers of reported tricolored bats. See USFWS consultation for additional details (Appendix F).

Field surveys suitable habitat for protected state listed species occurred within the proposed work areas of the transmission line corridors during in summer 2022 and spring and summer 2023 (Appendix F). Suitable habitat was identified for Bachman's sparrow, Bewick's wren, cerulean warbler, golden-winged warbler, osprey, Swainson's warbler, long-tailed shrew, southern bog lemming, eastern slender glass lizard, black mountain salamander, and Cumberland dusky salamander. Construction related impacts are *Not Likely to Adversely Affect* state-listed threatened and endangered species as they will be minor and temporary. TVA will coordinate with TDEC to ensure compliance with applicable state laws.

Protected plant species including the naked-stem sunflower and tall larkspur were identified within the proposed work areas of the transmission line corridors during field surveys performed during summer 2022 or spring and summer 2023 (Appendix F). Areas where protected plant species are present would be marked and avoided during upgrade activities. As such, these actions are not expected to impact protected species associated with forested areas. Due to lack of suitable habitat in proposed action areas, TVA has determined that the proposed actions in the off-site transmission line upgrade areas would not affect Cumberland rosemary, Hart’s-tongue fern, Virginia spiraea or white fringeless orchid.

Field surveys included a survey of transmission line towers for osprey nesting and four active nests were identified. Some construction activities are prohibited while birds are actively nesting. While osprey are actively nesting (typically March-August), activities are limited to vegetative maintenance (i.e., mowers, bushhogs, select herbicide spraying). Should there be a potential for effects to nesting osprey along the transmission line ROWs, TVA would coordinate with USDA-Wildlife Services to ensure compliance with federal law.

Routine vegetation management of the transmission line ROWs would continue following completion of the proposed upgrades to assure a safe and reliable transmission system. Management activities would likely include herbicide treatment and mowing to control vegetation growth throughout the ROW (TVA 2019c). Additional details on ROW maintenance is provided in Section 3.8.1.1.2.4.

Transmission line upgrades would be sited to avoid surface waters and wetlands, to the extent practicable, and any surface water and wetland impacts would be permitted as required. Where practicable, structures would not be placed within surface waters or wetlands, and impacts would be minimized by crossing surface waters at a perpendicular angle. Primary impacts to streams would be temporary crossings to access existing structures requiring work, which would not result in any permanent impacts or loss of stream habitat for aquatic species.

TVA conducted Section 7 consultation with the USFWS on November 28, 2023. In a letter signed December 27, 2023, the USFWS concurred with TVA's *may affect not likely to adversely affect* determinations for federally listed bats, *no jeopardy findings* for tricolored bats whooping crane, and monarch butterfly, and acknowledged TVA's *No Effect* determinations for Cumberland rosemary, Hart's-tongue fern, Virginia spiraea, white fringeless orchid, Alabama lampmussel, birdwing pearlymussel, cracking pearlymussel, Cumberland bean, dromedary pearlymussel, fanshell, finerayed pigtoe, green blossom pearly mussel, orangefoot pimpleback, pink mucket, purple bean, ring pink, rough pigtoe, rough rabbitsfoot, sheepnose mussel, shiny pigtoe, spectaclecase, tan riffleshell, Tennessee bean, turgid blossom pearlymussel, white wartyback, Anthony's riversnail, Laurel dace, sickle darter, slender chub, spotfin chub, yellowfin madtom, and bald eagle., whooping crane, or monarch butterfly. The USFWS acknowledged the use of up to three acres of "Take" for suitable bat habitat tree removal along the off-site transmission line access roads from TVA's programmatic consultation.

Federally Designated Critical Habitat for spotfin chub occurs within the mainstem Obed River, which is crossed by one of the transmission upgrade areas in Cumberland County. However, no impacts are proposed to the mainstem Obed River; therefore, there would be no impacts to Designated Critical Habitat. In their December 27, 2023, letter, the USFWS concurred with TVA that the proposed transmission upgrades would therefore not result in any adverse modifications to designated critical habitat for the spotfin chub.

Cumulative effects to threatened and endangered species are not anticipated as Section 7 consultation would be completed, and the upgrades would adhere to conservation and mitigation measures. Cumulative effects related to bat habitat are addressed in Section 5.5 of the programmatic BA (USFWS 2023a).

3.8.4.2.3.6 Construction and Operation of a Natural Gas Pipeline and Aboveground Facilities

ETNG's Resource Report 3 (ETNG 2023d) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the protected species-related findings in ETNG's

Resource Report 3. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q).

Construction of the natural gas pipeline and associated aboveground facilities would require temporary or permanent impacts to a variety of habitat types, including terrestrial areas such as forested and herbaceous habitats, and aquatic environments such as streams and wetlands (see Sections 3.6.2, 3.6.3, and 3.8.1).

Species that may be impacted by the construction and operation activities in the ETNG Construction ROW include those associated with the aforementioned habitat types and are listed as having potential habitat presence listed in Table 3.8-24. Prevalent habitat in the adjacent and surrounding area of the pipeline would minimize effects to species within the corridor. Mobile species are likely to leave the area once construction activities commence and may return upon completion of the project if habitat is appropriate. While species associated with forested habitat may leave areas cleared for the ETNG Construction ROW, species associated with early successional, or field habitat, may colonize the permanent ROW following construction of this Action Alternative. Species seeking forested areas would return to the TWS as it regenerates.

Detailed analyses of effects to state- and federal listed species are being conducted by ETNG as part of FERC 7(c) application filings. As suitable habitats are identified by ETNG, the pipeline route may be adjusted to avoid these habitats and effects to federal and state listed species. ETNG is also consulting with the USFWS and state agencies on the potential effects to threatened and endangered species. Adherence to any Conservation Measures resulting from these consultations is expected to ensure proposed actions would not result in significant effects to listed species.

Field surveys determined most of the forested area within the ETNG Construction ROW provides potentially suitable summer habitat for both the Indiana and northern long-eared bat. Existing bat foraging habitat includes herbaceous, agricultural, and scrub-shrub vegetation communities, as described in Section 3.8.1.1.2.6. Confirmation of additional suitable bat roosting and foraging habitat is currently on-going by ETNG through field evaluations. Existing foraging habitat would not be expected to be impacted after the construction of the project. However, existing roosting habitat would be converted to foraging habitat with the conversion to herbaceous and/or shrub cover. Impacts to bat species would be minimized by limiting tree removal to winter months when these bats are not roosting in trees (ETNG 2023d). Tree removal during this timeframe would also avoid direct effects to most nesting migratory songbirds of conservation concern and minimize risk to the northern pine snake. Removal of suitable summer roosting habitat for federally listed bats would require consultation with USFWS under Section 7 of the ESA.

Eight species of fish, three species of crayfish, and 31 aquatic mollusk species were identified on the state and federal resource lists as having potential for occurrence within the ETNG Construction ROW. The ETNG Construction ROW also crosses many aquatic habitats including large and small streams, creeks, major waterbodies, and named rivers that are in close proximity to the Obed Wild and Scenic River complex. Consultation with USFWS and TDEC is ongoing. Based on consultation through October 2023 (ETNG 2023n), ETNG plans to conduct most stream crossings in late summer or early fall during the dry season except for Salt Lick Creek from MP 28.2 to MP 28.6; unnamed tributary to Salt Lick Creek from MP 29.3 to MP 29.4; and Emory River/Watts Bar Reservoir from MP 116.3 to MP 116.4. ETNG plans to cross these resource areas during the winter drawdown (late winter to early spring) of the reservoirs.

Crossing most streams during the dry season will avoid listed fish species reproduction window, which includes spawning season through development to juvenile life stage, performing the crossing during the low flow of the dry season will help facilitate dry crossings methods. Surveys for the Obey crayfish will be completed prior to construction activities and will be relocated upstream to suitable habitat, if necessary, per TDEC request. Neither USFWS nor TDEC have objected to the proposed crossing timeframes to date.

Consultation with federal and state agencies and best professional judgements determined that construction of the pipeline would have *No Effect* on the following aquatic species: blotchside logperch, redlips darter, slender chub, yellowfin madtom, Appalachian monkeyface, Anthony's riversnail, catspaw, clubshell, Cumberland bean, oystermussel, rabbitsfoot, sheepnose, slabside pearlymussel, snuffbox, TN bean, tubercled blossom, and white wartyback and *May Affect but is Not Likely to Adversely Affect* the following aquatic species: Alabama lampmussel, birdwing pearlymussel, cracking pearlymussel, Cumberland elktoe, Cumberlandian combshell, dromedary pearlymussel, fanshell, fineraved pigtoe, fluted kidneyshell, orangefoot pimpleback, pink mucket, purple bean, ring pink, rough pigtoe, rough rabbitsfoot, shiny pigtoe, spectaclecase, turgid blossom, Obey crayfish, TN cave crayfish, and valley flame crayfish.

Based on consultation up to October 2023 (ETNG 2023n), ETNG has determined also that the project will have *No Effect* on the Bachman's sparrow, which is presumed to not be present due to a lack of suitable habitat. Five plant species identified by TDEC (state-endangered rose pagonia [*Pogonia aphioglossoides*] and tawny cotton-grass [*Eriophorum virginicum*]; state-threatened zigzag bladderwort [*Urticularia subulate*]; and state species of concern yellow crested orchid [*Platanthera cristata*], and spoonleaved sundew [*Drosera intermedia*]) were surveyed for between milepost 75 and 80 based on existing occurrence data. No state threatened or endangered plant species were identified and therefore ETNG determined there would be *No Effect* on state or threatened plant species within the ETNG Construction ROW. Though not state endangered or threatened, ETNG did observe occurrences of yellow crested orchid during plant surveys along the pipeline route.

In their October 2023 filing (ETNG 2023n), ETNG states,

> Based on the lack of observations during field surveys and the limited known occurrence data within the Project area, it is [ETNG]'s opinion that the Project would have *No Effect* on state threatened and endangered [plant] species.

Migratory birds are most vulnerable to construction impacts when nesting, which generally occurs in the late spring and summer. To minimize impacts to migratory bird species and bat species, ETNG would conduct most clearing activities outside the migratory bird nesting season (generally April 15 through August 1), if practicable from a scheduling perspective after receipt of the permits necessary to begin construction. Similarly, clearing trees during the winter season is also a protective measure for bat species, which would be roosting in caves during this period. ETNG would continue to coordinate with the USFWS and state resource agencies to identify potential impacts to migratory bird species and implement avoidance and minimization measures to reduce potential impacts to these species. These measures include:

- routing Ridgeline Project facilities to avoid sensitive resources where possible;
- maximizing the use of existing pipeline and utility ROWs;
- limiting the construction and operation ROW widths to the minimum necessary;

- conducting mitigation for effects to sensitive resources (i.e., wetlands) through agency permit conditions;
- adhering to the measures outlined in Ridgeline Project E&SCP during construction of the Project facilities; and
- limiting routine ROW maintenance clearing and prohibiting clearing during the migratory bird nesting season (March 1 to August 31).

Approximately 93 percent of the project pipeline facilities would be within or adjacent to the existing natural gas pipeline ROW; therefore, tree clearing activities would be limited in scope and spread over the entire project area. Given the predominance of open areas associated with construction of the project facilities and implementation of the minimization measures listed above, it is unlikely that construction would have an adverse effect on migratory birds.

Wetland and waterbody crossings along the ETNG Construction ROW may be conducted by HDD or dry open cut methods, which could minimize potential impacts to protected species and their habitats if in the area as compared to the wet open cut method. Applicable surveys for protected species and associated consultation with the agencies would be conducted prior to construction activities commencing. Erosion and sediment control BMPs would be deployed and USACE and TDEC permits would be obtained.

Routine vegetation management of the permanent ROW would have periodic effects on habitats within the ROW over the long-term. Methods may vary but are likely to include use of herbicides and various mechanical measures to control vegetation. Protected species, if present, are expected to be displaced intermittently in conjunction with the presence of maintenance crews and the alteration of habitats. Over time, wildlife would become habituated to the herbaceous habitat of the permanent ROW and those species associated with fields or shrub habitat may be found in the corridor.

Cumulative effects to threatened and endangered species are not anticipated, as past/present and RFFAs have or would likely complete Section 7 consultation and would adhere to conservation and mitigation measures. Cumulative loss of habitats may occur but would be minimized through the use of BMPs and proper siting of facilities.

As stated previously, consultation with the USFWS and TDEC is ongoing. As of ETNG's October 5, 2023, filing with FERC (ETNG 2023n), a draft BA for the project was completed and submitted to the USFWS in July 2023, and a final BA provided in December 2023. In ETNG's RR3 (ETNG 2023d), they state,

> Consultation with resource agencies is ongoing, as are surveys for endangered, threatened, and special concern species. Impacts on protected species from the Project would primarily result from vegetation clearing, sedimentation, turbidity, and disturbance. East Tennessee is currently in the process of consulting with USFWS and TWRA regarding mitigation measures for work in protected species habitat.
>
> Impacts are expected to be temporary in nature; however, they will be addressed as consultation and surveys continue. Assessment of impacts and species presence or probable absence is expected to be ongoing through 2023.

3.8.4.2.3.7 Summary of Alternative A

TVA Proposed Actions

No direct impacts to protected species, although minor impacts due to habitat loss/conversion may occur due to actions on Kingston Reservation. Transmission line corridors (on- and off-site) would undergo or continue to undergo routine maintenance activities, which would also disturb species for short periods. Birds using forested habitat proposed for clearing or conversion, or disturbance of protected and/or migratory birds using existing on- and off-site transmission line corridors would experience minor impacts from demolition, construction, and upgrade activities. Bats would experience minor impacts to summer roosting habitat removal and/or conversion to foraging habitat for actions or within the off-site transmission line corridors. No impacts to aquatic species due to construction of the off-site transmission lines are anticipated as there would be no in-water activity. Overall, impacts to protected species are minor, short-term, and/or periodic. Impacts to protected species would be minimized through appropriate consultation with the agencies, BMPs (minimization and conservation measures), and guidelines.

In May of 2023 TVA received an additional BO from the USFWS in which an Incidental Take Statement was issued for northern long-eared bat (USFWS 2023a). On November 28, 2023, TVA initiated informal consultation with the USFWS under Section 7 of the ESA for the proposed actions associated with Alternative A. TVA requested USFWS concurrence with TVA's determinations that proposed actions *May Affect but are Not Likely to Adversely Affect* gray bat, Indiana bat, and northern long-eared bat. TVA also requested USFWS acknowledgment of the use of "Take" under TVA's programmatic consultation regarding impacts of routine actions on federally listed bats, acknowledgement of TVA's determinations that proposed actions would have *No Effect* on federally listed aquatic species or federally listed plant species, as well as acknowledgement of TVA's no jeopardy finding for tricolored bat.

TVA conducted Section 7 consultation with the USFWS on November 28, 2023. In a letter signed December 27, 2023, the USFWS concurred with TVA's *May Affect but Not Likely to Adversely Affect* determinations for federally listed bats, *no jeopardy findings* for tricolored bats, whooping crane, and monarch butterfly, and acknowledged TVA's *No Effect* determinations for Cumberland rosemary, Hart's-tongue fern, Virginia spiraea, white fringeless orchid, Alabama lampmussel, birdwing pearlymussel, cracking pearlymussel, Cumberland bean, dromedary pearlymussel, fanshell, finerayed pigtoe, green blossom pearly mussel, orangefoot pimpleback, pink mucket, purple bean, ring pink, rough pigtoe, rough rabbitsfoot, sheepnose mussel, shiny pigtoe, spectaclecase, tan riffleshell, Tennessee bean, turgid blossom pearlymussel, white wartyback, Anthony's riversnail, Laurel dace, sickle darter, slender chub, spotfin chub, yellowfin madtom, and bald eagle. The USFWS acknowledged the use of up to three acres of "Take" for suitable bat habitat tree removal along the off-site transmission line access roads from TVA's programmatic consultation.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Impacts to protected species in the ETNG Construction ROW would be primarily caused by clearing for the temporary construction areas and Permanent ROW, resulting in a reduction in summer roosting habitat. Nearby or adjacent forested areas may provide habitat as an alternative during the summer season. Forested areas in the temporary construction ROW, outside of the permanent ROW would be allowed to regenerate and provide forested habitat over the long term. No direct impacts would occur to federally protected bat species during the winter period when hibernating in caves.

The natural gas pipeline would likely have moderate impacts to protected bat species due to the conversion of suitable roosting/foraging forested and scrub-shrub habitat to herbaceous habitat for the expansion of existing ROW. This conversion would likely result in a loss of summer roosting and yearlong foraging habitat for Indiana bat, little brown bat, northern long-eared bat, and tricolored bat. Impacts to aquatic species are not anticipated for waterbodies crossed by HDD. Aquatic communities would experience minor to moderate, temporary impacts for stream diversion during implementation of dry open cut crossings for pipeline installation.

Plant species would experience moderate impacts if within the forested areas cleared for the ETNG Construction ROW. Plants requiring herbaceous habitats could experience minor disturbance during pipeline installation. The monarch butterfly would gain significant habitat with the conversion of forested habitat to herbaceous/scrub-shrub habitat, which may contain vital milkweed species.

Recommendations made by the USFWS, including clearing of trees and maintenance mowing from October 15 to March 31 to the greatest extent practicable and revegetating disturbed areas in a manner that maximizes benefits to pollinators (e.g., milkweed species to enhance habitat for the monarch butterfly), would be followed.

Significant additional cumulative effects to threatened and endangered species are not anticipated for ETNG's project activities occurring outside of TVA's ESA Section 7 consultation for CCR management activities on the Kingston Reservation. It is anticipated that ETNG project activities occurring within or beyond the area reviewed for TVA's consultation purposes would likely adhere to similar conservation and mitigation measures identified through that consultation and would likely be processed through separate formal consultation as impacts for pipeline construction as a related, but separate activity. Further Section 7 consultation with USFWS would be required if (1) new information reveals impacts of an action that may affect listed species or critical habitat in a manner not previously considered, (2) the action is subsequently modified to include activities which were not considered during the original consultation, (3) new species are listed or critical habitat designated that might be affected by the action, or (4) the amount or extent of expected take of suitable bat habitat is exceeded.

As of ETNG's October 5, 2023, filing with FERC (ETNG 2023n), a draft BA for the Ridgeline Expansion Project was submitted to USFWS in July 2023, and a final BA provided in December 2023.

3.8.4.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to threatened and endangered species that would occur as a result of the proposed CC/Aero CT Plant, and transmission line activities are minor, short-term, and/or periodic and as such are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Effects to threatened and endangered species that could occur as a result of the ETNG Construction ROW are minor, temporary, and/or periodic. Conservation and mitigation measures would be implemented for the preservation of the protected species. Due to the low impact on endangered species, there is expected to be negligible impacts on EJ populations and therefore, no disproportionate and adverse effects on EJ populations.

3.8.4.2.4 Alternative B

3.8.4.2.4.1 Construction and Operations of Solar and Storage Facilities

Alternative B would result in construction activities that have the potential to affect federally and state-listed species directly or indirectly. There is also the potential for cumulative effects to federally and state-listed species with the expansion of 10,000 MW of solar facilities. As noted in Table 3.2-1, TVA has evaluated typical effects associated with the development of solar facilities; approximately 48 percent of solar projects studied resulted in effects to federally listed endangered or threatened species, and 9 percent of solar projects resulted in effects to migratory birds. These estimates suggest that between seven to eight solar facilities and eight to nine BESS facilities could affect protected species, and one to two solar and BESS sites could result in migratory bird effects. TVA would minimize effects to protected species by siting facilities to the extent practicable on previously disturbed land, such as agricultural or silvicultural sites, or land with few sensitive wildlife habitats. Tree clearing would be limited to winter periods to the extent practicable, or presence/absence surveys otherwise conducted. Facilities constructed by third-party solar developers would establish and implement conditions of construction in consultation with the agencies; the developers with TVA power purchase agreements would be required to complete Section 7 consultation through TVA and comply with USFWS conservation measures, which would result in the minimization or mitigation of effects.

3.8.4.2.4.2 Transmission and Other Components

Alternative B would result in construction of transmission lines and components that have the potential to affect federally and state-listed species directly or indirectly. There is also the potential for cumulative effects to federally and state-listed species with the expansion of 10,000 MW of solar facilities. Based on a review of 298 transmission line projects from 2005 to 2018, 32 of 256 projects (11 percent) affected federally listed threatened or endangered species or species proposed or Candidates for listing (Table 3.3-1). Of the 290 projects reviewed, 63 (22 percent) projects affected state-listed endangered, threatened, or special concern species. Habitat and species surveys would be required for the proposed transmission lines associated with each solar or BESS site. These impacts would be more fully evaluated in future NEPA reviews and USFWS consultations for individual solar/battery project would be required under NEPA if Alternative B is selected as the preferred alternative.

3.8.4.2.4.3 Environmental Justice Considerations

Disproportionate and adverse effects to threatened and endangered species as a result of the proposed solar facilities and transmission line activities are not anticipated to occur because typical effects associated with such facilities and activities show that effects are often avoided by siting on previously disturbed land. Where such siting is not feasible and effects may occur, any effects would be evaluated per each solar site and minimized or mitigated as required due to the protected status of threatened and endangered species. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.9 Natural Areas, Parks, and Recreation

3.9.1 Affected Environment

Natural areas, parks, and recreation areas include sites typically managed and/or used for recreation; plant and wildlife protection and management; scientific research and education; and/or scenic protection. They include national, state, and local parks and recreation areas; trails and greenways; national and state wildlife refuges, WMAs, and forests; research natural areas; Nationwide Rivers Inventory for Wild and Scenic Rivers; and scenic areas. This section addresses the natural areas, parks, or recreation areas that are on, immediately adjacent to (within 1 mile), or within the vicinity of the project areas (5-mile radius) or identified as having regional significance.

3.9.1.1 Kingston Reservation (No Action and D4 Activities)

The area within a 1-mile radius of KIF includes several public and commercial recreation and natural areas. Within the Kingston Reservation is a boat ramp at the discharge channel that is open to the public where nearby residents often fish (Figure 3.9-1). The public also has access to a grassy area along the Clinch River arm of Watts Bar Lake south of the plant and on the east bank of the discharge channel (TVA 2019c) and the Kingston Steam Plant State Wildlife Observation Area. No current lease agreements exist within the Kingston Reservation for recreational activities. The Swan Pond Sports Complex is located 0.14 mile north of the Kingston Reservation on TVA land, but TVA has an agreement with Roane County to operate and maintain the area.

The Clinch River, which borders the Kingston Reservation to the south, is classified for domestic water supply, industrial water supply, fish and aquatic life, recreation, livestock, watering and wildlife, irrigation, and navigation. The Emory River, which borders the Kingston Reservation on the eastern and northern sides of the plant, is classified for domestic water supply, industrial water supply, fish and aquatic life, recreation, livestock, watering and wildlife, and irrigation. Currently both rivers are considered “not supporting” for their designated uses in the 2020 State 303(d) report for chlordane, mercury, and PCBs. The Emory River is listed in the Nationwide Rivers Inventory from RM 25 to RM 27 for its remarkable fish, geologic, recreational, scenic, and wildlife values. The section of the Emory River listed in the National Rivers Inventory is located approximately 4.6 miles west of the Kingston Reservation. See Section 3.6 for more information on surface waters in the project site.

There are multiple natural and recreational sites listed on the U.S. Protected Areas Database (US PAD) within 5 miles of the Kingston Reservation (Figure 3.9-1):

- Kingston City Park is located 1.45 miles south of the Kingston Reservation and includes playgrounds, boat ramps, and hiking facilities. It is maintained by the City of Kingston.
- Watts Bar Reservoir is a recreation area with space for camping, hiking, fishing, and boating located 1.55 miles north of the Kingston Reservation and is managed by TVA.
- Fort Southwest Point is 2.65 miles south of the Kingston Reservation, managed by the City of Kingston, and is a historic colonial fort available for touring.
- Paper Maker Ball Filed and Flour Mill Flats Ball Field are located approximately 3.35 miles northwest of the Kingston Reservation. Paper Maker is a privately owned sports field, and Flour Mill Flats is a sports field managed by the City of Harriman.
- Roane County Park is 4.75 miles southwest of the Kingston Reservation, managed by the County of Roane, and has facilities for camping, hiking, boating, and fishing.
- Long Island WMA is located 5.0 miles south of the Kingston Reservation and is managed by TWRA.

Several public and commercial recreation areas not listed in the US PAD are in the vicinity of the Kingston Reservation (Figure 3.9-1):

- Swan Pond Sports Complex, 0.14 mile north
- TVA Wetlands Viewing Area and Trails, 2.1 miles north

- Southwest Point Golf Course, 3.2 miles south
- Lakeside Golf Course, 3.5 miles southeast
- David Webb Riverfront Park, 2.0 miles northwest
- Kingston Waterfront Park, 2.1 miles south
- Wetlands Reserve Program Conservation Area, 1.1 miles north
- TVA Sugar Grove Habitat Protection Area, 0.1 mile east
- TVA Rayburn Bridge Habitat Protection Area, 0.1 mile south
- TVA Stowe Bluff Habitat Protection Area, 0.9 mile south

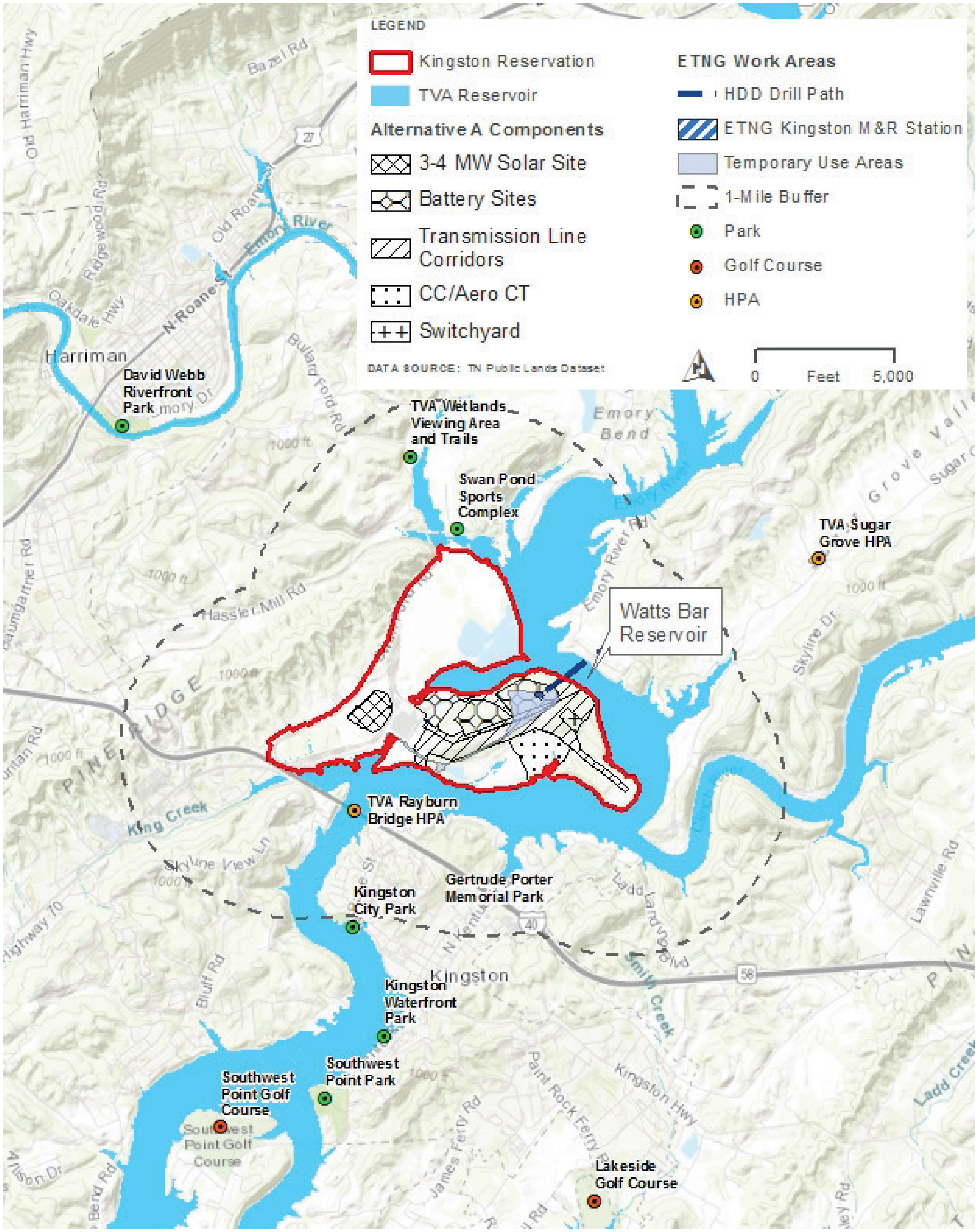

Figure 3.9-1. Natural and Recreational Areas in the Vicinity of the Kingston Reservation

3.9.1.2 East Tennessee Region

Major recreational and natural areas in the Eastern TN region include the Great Smoky Mountains National Park and the Obed Wild and Scenic River. The Great Smoky Mountains National Park is located approximately 30 miles, 37 miles, and 38 miles southeast of the off-site transmission upgrades, Kingston Reservation, and natural gas pipeline; respectively. It is the most visited national park in the U.S. and in 2022, nearly 13 million visitors experienced the park's world-renowned biological diversity and scenic landscapes and natural areas. Visitors to the park have a variety of recreational opportunities to choose from including hiking, camping, nature watching, fishing, and touring areas of social, historical, or cultural significance (NPS 2023).

The Obed Wild and Scenic River is located approximately 0.5 mile west of the natural gas pipeline, 5 miles east of the off-site transmission upgrades, and 14 miles northwest of the Kingston Reservation. It is TN's only wild and scenic river and one of the last free-flowing river systems in the eastern U.S.

3.9.1.3 Alternative A

3.9.1.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Natural areas, parks, and recreation within the proposed CC/Aero CT Plant site, switchyard, transmission lines, and associated components would be the same as those described within the Kingston Reservation in Section 3.9.1.1. None of the natural or recreational areas identified in the vicinity of the Kingston Reservation are within the footprint of the proposed CC/Aero CT Plant site.

3.9.1.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.9.1.1 apply to the proposed 3- to 4-MW solar facility location on the Kingston Reservation. None of the natural or recreational areas identified in the vicinity of the Kingston Reservation are within the proposed solar facility footprint.

3.9.1.3.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.9.1.1 apply to the proposed 100-MW BESS on the Kingston Reservation. None of the natural or recreational areas identified in the vicinity of the Kingston Reservation are within the proposed BESS footprint.

3.9.1.3.4 On-site Transmission Upgrades

The affected environment for on-site transmission upgrades is the same as described in Section 3.9.1.1. The on-site transmission upgrades do not directly overlap any recreational areas on-site.

3.9.1.3.5 Off-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines: five transmission lines near the Kingston Reservation (L5302, L5108, L5280, L5381, and L5116), and one in Crossville (L5383), as described in Section 2.1.3.6. Existing natural areas, parks, and recreational areas within the vicinity of each transmission line are described below.

3.9.1.3.5.1 Eastern Transmission Corridor

Existing transmission lines L5302, L5108, L5280, L5381, and L5116 extend from the Kingston Reservation travelling eastbound and terminate in the city of Oak Ridge. Several access roads are proposed along routes that have already been previously cleared for other, unrelated activities. According to the US PAD, there are 16 sites located within the Eastern Transmission Corridor:

- Watts Bar Reservoir is a recreation area with space for camping, hiking, fishing, and boating, managed by TVA; and
- Oak Ridge Reservation (ORR) WMA, managed by the TWRA in consultation with TDEC, including:
    - Oak Ridge National Laboratory
    - Black Oak Ridge Conservation Easement
    - Black Oak Ridge Mixed Pine and Hardwood Forest
    - McKinney Ridge Hemlocks
    - Duct Island Road Bluffs
    - Fringeless Orchid Wetlands
    - Bear Creek
    - Pine Ridge Wetlands
    - Walker Branch Embayment Barren
    - Chestnut Ridge Barren and Wetland
    - Chestnut Ridge Springs Area
    - Unnamed Tributary to East Fork Poplar Creek
    - Grassy Creek
    - Manhattan Project National Historic Park
    - North Ridge Trail

TDEC public lands and TVA reservoirs near the transmission line corridors are illustrated in Figure 3.9-2a through Figure 3.9-2d and depicted on figures in Appendix H.

3.9.1.3.5.2 Western Transmission Corridor

Transmission Line L5383 extends southeastward from a substation in unincorporated Crossville on Plateau Road and terminates north of the Crossville city limits. The Charles Russell Obed Reserve, a 50-acre conservation easement, exits within a 0.5-mile radius (Figure 3.9-3). No sites were identified on the US PAD within 0.5 mile of the Western Transmission Corridor.

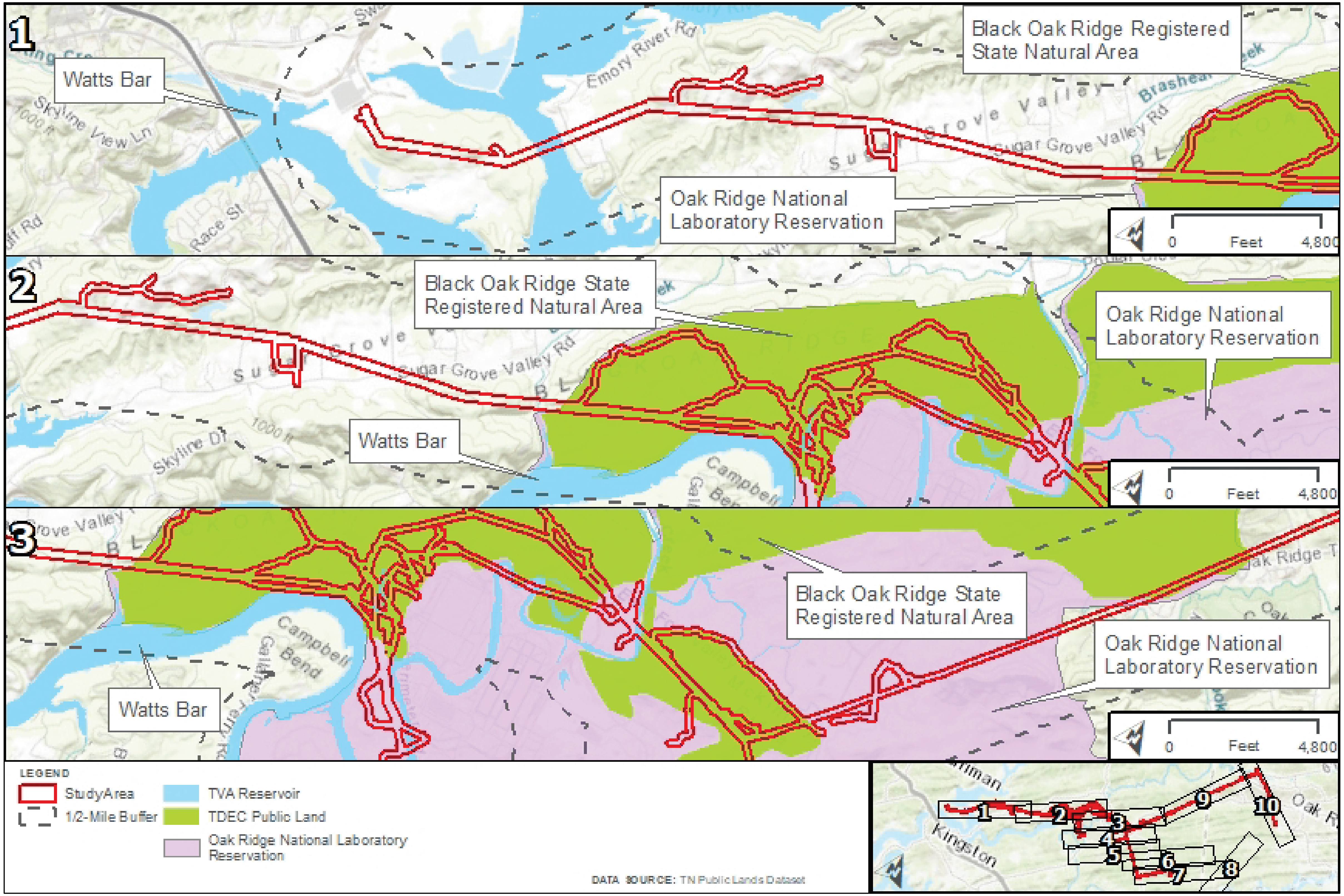

Figure 3.9-2a. Public Lands and Reservoirs in the Vicinity of the Proposed Alternative A Transmission Line Upgrades along the Eastern Transmission Corridor

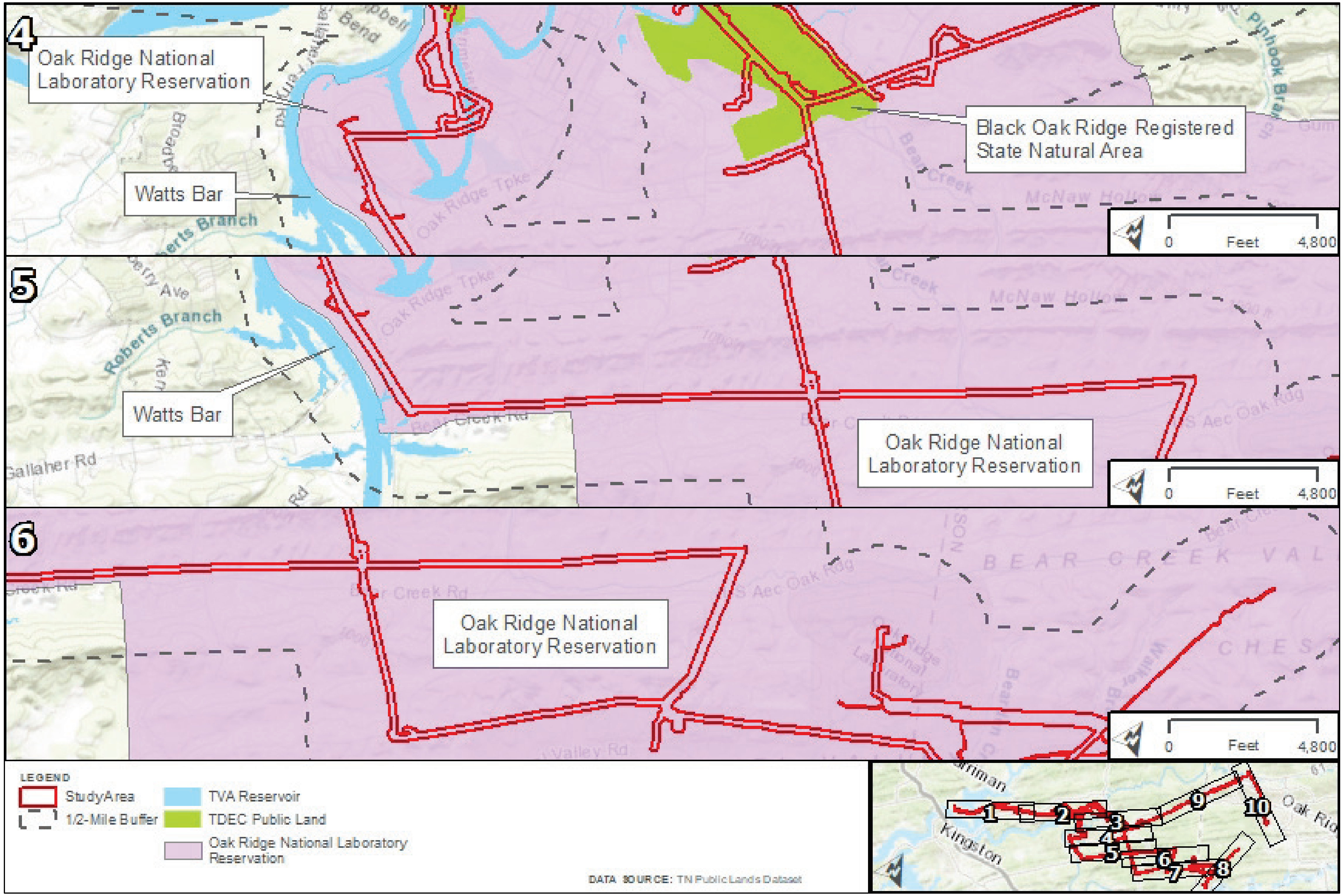

Figure 3.9-2b. Public Lands and Reservoirs in the Vicinity of the Proposed Alternative A Transmission Line Upgrades along the Eastern Transmission Corridor

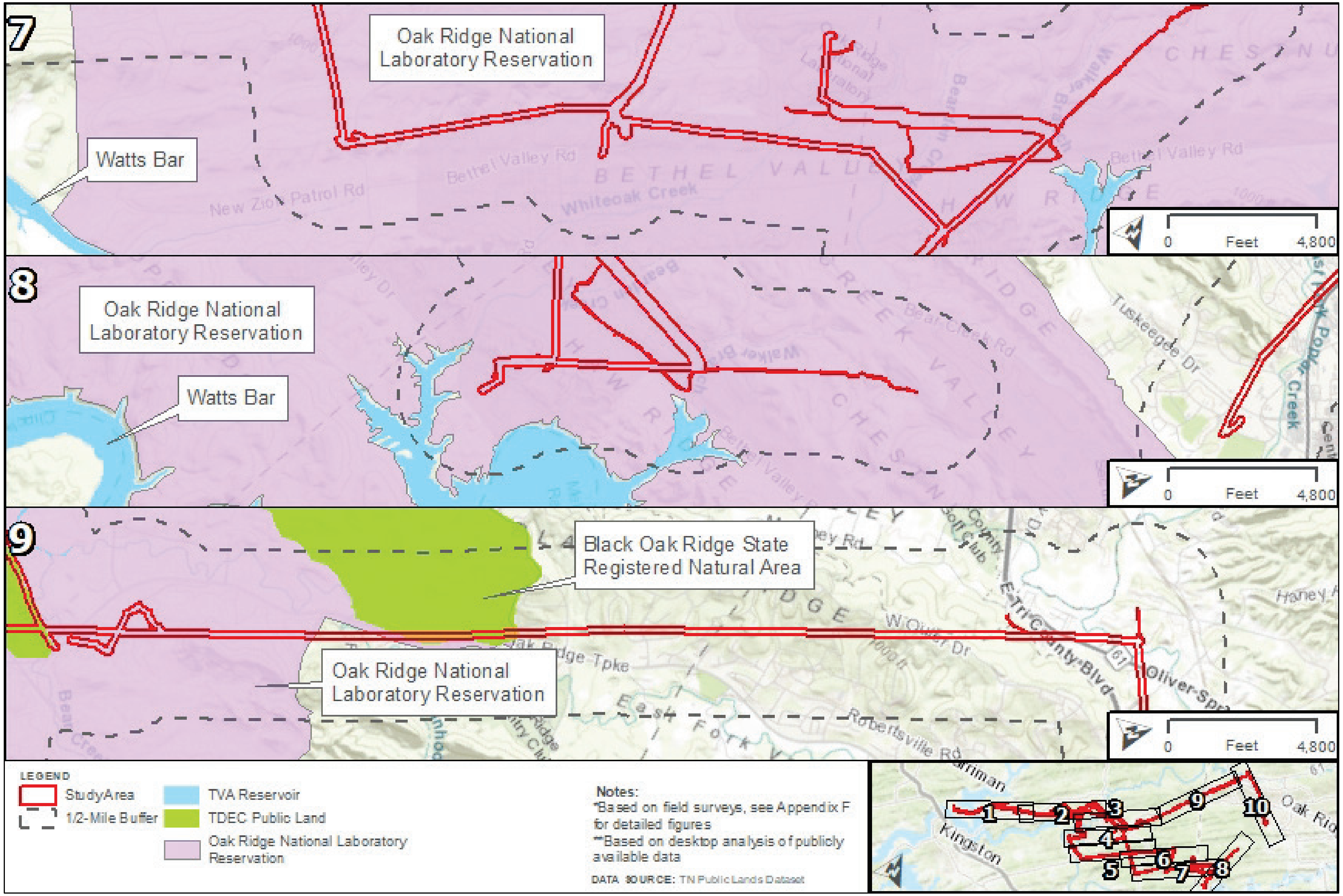

Figure 3.9-2c. Public Lands and Reservoirs in the Vicinity of the Proposed Alternative A Transmission Line Upgrades along the Eastern Transmission Corridor

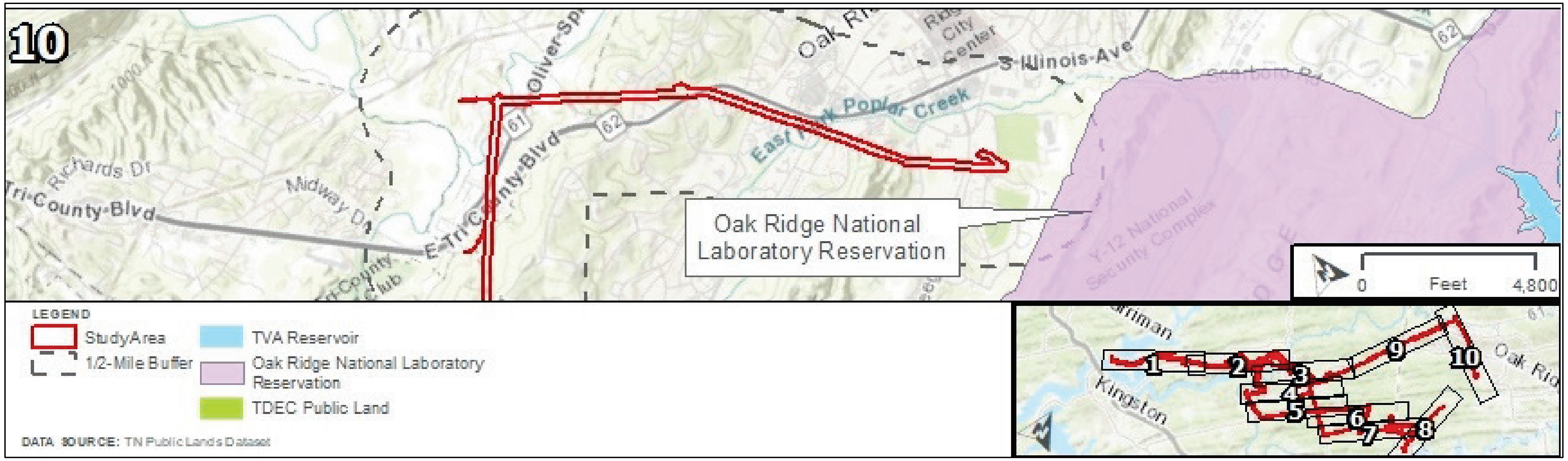

Figure 3.9-2d. Public Land and Reservoirs in the Vicinity of the Proposed Alternative A Transmission Line Upgrades along the Eastern Transmission Corridor

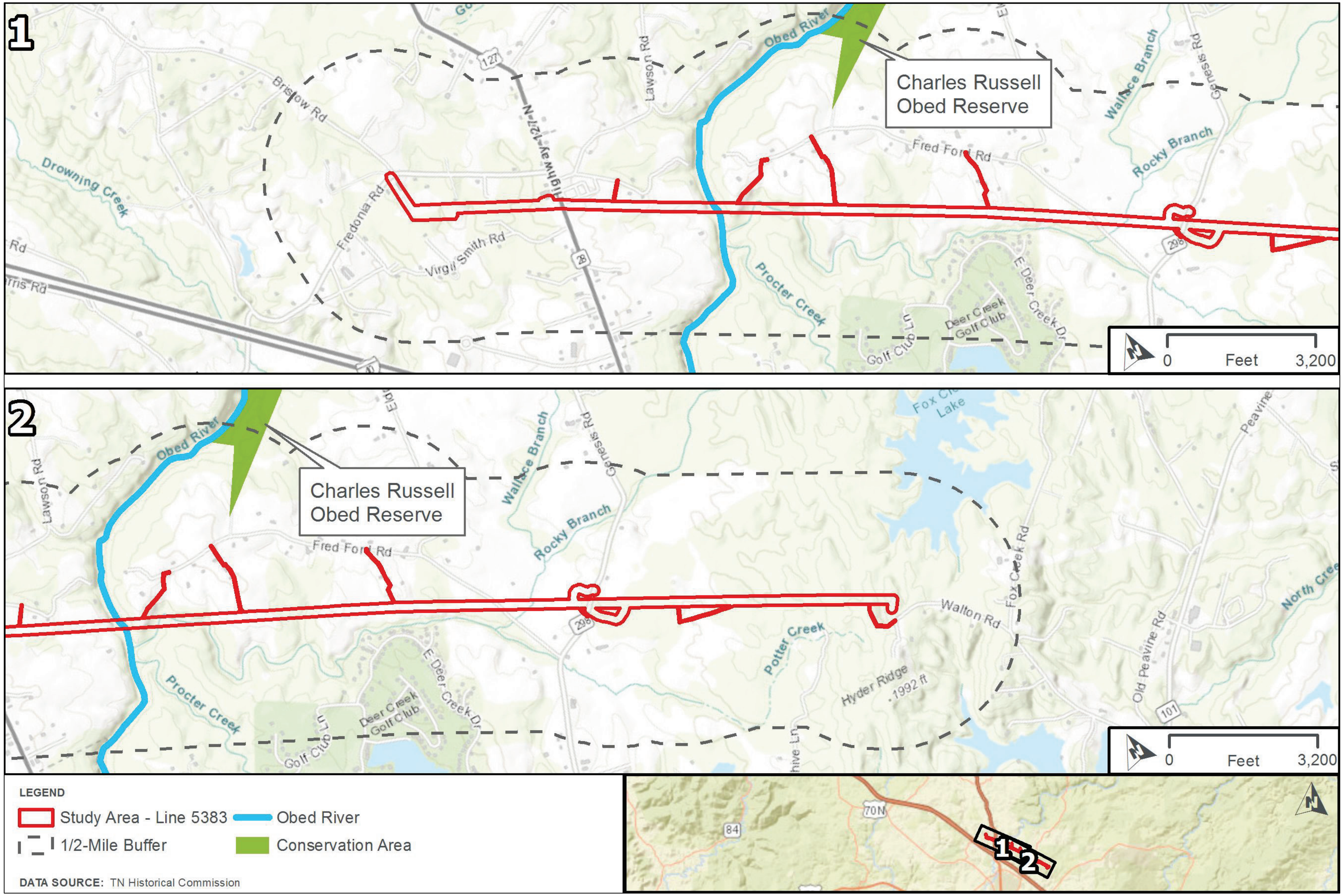

Figure 3.9-3. Conservation Areas in the Vicinity of the Proposed Alternative A Transmission Line Upgrades Along the Western Transmission Corridor

3.9.1.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 8 (ETNG 2023i) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the natural areas, parks, and recreation-related findings in ETNG's Resource Report 8. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). ETNG will coordinate with relevant agencies regarding potential crossings of applicable recreation and special use areas. See Figure 8.4-1 in ETNG Resource Report 8 for maps of public lands crossed by the pipeline (ETNG 2023i).

Natural areas, parks, and recreation areas located within 5 miles of the ETNG Construction ROW are listed in Table 3.9-1.

Table 3.9-1. Natural Areas, Recreation Areas, and Parks within Five Miles of the Alternative A Pipeline

Natural Area, Recreation Area, or Park	COUNTY
ORNL Lands Potential National Natural Landmark	Multiple
Rayburn Bridge	Roane
Cumberland River Bluffs at Hartsville	Trousdale
Monterey Lakes	Putnam
Bridgewater Cave Protection Planning Site	Smith
Designated Critical Habitat (DCH) Unit 12: Funns Branch, Short's Bladderpod	Jackson
DCH Unit 13: Wartrace Creek, Short's Bladderpod	Jackson
DCH Unit 10: Coleman-Winston Bridge, Short's Bladderpod	Trousdale
DCH Unit 11: Cordell Hull Res, Short's Bladderpod	Smith
DCH Unit 9: Old Hickory Lake, Short's Bladderpod	Trousdale
DCH Spotfin Chub – Little Tennessee River	Multiple
Flynn Creek Cryptoexplosion Structure Potential National Natural Landmark	Jackson
Cumberland River Bluffs at Oldham Road	Trousdale
DCH Short's Bladderpod	Multiple
Williams Tract Protection Planning Site	Putnam
Stowe Bluff	Roane
DCH Obed River Unit 3	Multiple
Sugar Grove	Roane
ORNL Reservation And ORR	Multiple
Haile Cave	Jackson
Dud's Cave Protection Planning Site	Jackson
Cummins Falls	Jackson
Piney Creek Sandstone Glade	Putnam

Natural Area, Recreation Area, or Park	COUNTY
Cumberland River Bluffs at Oldham Road	Trousdale
Tanager Hill Protection Planning Site-Rare Plants	Putnam
ORR Lower Poplar Creek Rookery [Ra30]	Roane
DCH Purple Bean	Multiple
Cumberland River No. 3 State Mussel Sanctuary	Smith
Catoosa State Wildlife Management Area	Multiple
Hartsville Investment Recovery Center	Multiple
Kingston Fossil Plant	Roane
Obed Outstanding National Resource Water	Multiple
Cumberland Forests	Multiple
Wetlands Reserve Program	Roane
Cumberland River No. 2 State Mussel Sanctuary	Multiple
Tuckaway	Putnam
Cordell Hull State Wildlife Management Area	Multiple
Frozen Head State Natural Area	Multiple
Blackburn Fork State Scenic River	Jackson
Old Hickory Reservoir Reservation	Multiple
Tennessee Technological University Campus	Putnam
Flat Fork Homeplace Flat Fork Homeplace	Morgan
Potter Farm	Morgan
Solomon Hollow Apiary	Morgan
Tanger Hill Registered State Natural Area	Putnam
ORR Black Oak Ridge Conservation Easement	Roane
Cumberland River No. 1 State Mussel Sanctuary	Multiple
Old Hickory State Wildlife Management Area	Multiple
Southwest Point Park	Roane
Watts Bar Reservoir Reservation	Multiple
ORNL Reservation	Multiple
Watts Bar Dam Reservation	Multiple
Lone Mountain State Forest	Morgan
Kingston City Park	Roane
Cumberland Trail State Park	Multiple
Kingston Steam Plant State Wildlife Observation Area	Roane
Sugar Grove TVA Habitat Protection Area	Roane

Natural Area, Recreation Area, or Park	COUNTY
Rayburn Bridge TVA Habitat Protection Area	Roane
Stowe Bluff TVA Habitat Protection Area	Roane
Campbell Bend Barrens State Natural Area	Roane
Upper Cumberland Wildlife Rehabilitation Center	Putnam
Tanager Hill Registered State Natural Area	Putnam
Flat Fork Stream Mitigation Site	Morgan
Goose Creek	Multiple
East Blackburn Fork	Multiple
Witt Creek	Morgan
Falling Water River	Multiple
Flynn Creek	Jackson
Emory River	Multiple
West Fork Obey River	Multiple
Spring Creek	Multiple
Rock Creek	Morgan
Crab Orchard Creek	Multiple
Cummins Falls State Park	Jackson
Old Hickory Lock 5 Refuge	Multiple
TDEC Emory River Conservation Easement	Multiple
ORR Leatherwood Bluffs	Roane
West Wind Farms LLC	Morgan
Big South Fork of The Cumberland	Multiple
East Fork Obey River	Multiple
Cordell Hull Lake – Us Army Corps of Engineers	Multiple
Simmers Property Conservation Easement – Land Trust for Tn	Putnam
ORR Blackoak Ridge Mixed Pine and Hardwood Forest	Roane
ORR Campbell Bend Bluffs and Forest	Roane
ORR Upper Poplar Creek Rookery	Roane
ORR Roberts Branch Wetlands	Roane
ORR Duct Island Road Bluffs	Roane
G.D. Coorts Memorial Arboretum	Putnam
Cumberland Trail 1	Multiple
Foothills Land Conservancy Property	Fentress
Gerber/Smythe Property Conservation Easement – Land Trust for Tn	Putnam

Natural Area, Recreation Area, or Park	COUNTY
Beasley Farm – Land Trust of Tn Conservation Easement	Smith
Crooked Fork	Morgan
North Prong Clear Fork	Multiple
Dixona Farm Conservation Easement – Land Trust for Tennessee	Multiple
Walden Ridge Partners Llc Conservation Easement – Foothills Land Conservancy	Roane
Barger Property – Land Trust of Tn Conservation Easement	Putnam
Crowder Cemetery Barrens Designated State Natural Area	Roane
Obed Wild and Scenic River Fee – The Nature Conservancy – Fee Ownership (NE)	Morgan
Obed Wild and Scenic River Fee – The Nature Conservancy - Fee Ownership (North)	Morgan
Kingston Coal Generating Facility	Roane
Wynnewood State Historic Area	Sumner
Clear Creek	Multiple
Castalian Springs Mound Site/Archaeological Project	Sumner
Agricultural Conservation Easement	Morgan
Fancher Pit	Multiple
White Creek	Morgan

ETNG reviewed USGS topographic maps, aerial photographs, and agency websites to determine if the pipeline study area crosses public lands managed by state or federal agencies; wildlife management areas; conservation lands; parks; trails; or designated natural or scenic areas. A summary of ETNG's Resource Report 8 (ETNG 2023i) is presented below:

- The pipeline crosses the Old Hickory WMA (6,003 feet of pipeline) and the Cordell Hull WMA (4,775 feet of pipeline). WMAs are managed by the TWRA.
- In Morgan County, the pipeline crosses 795 feet of the northeastern edge of the Lone Mountain State Forest, which is managed by the TN Division of Forestry.
- The pipeline crosses lands identified as the Cordell Hull Recreation Area and Old Hickory Recreation area, managed by the USACE.
- Recreation opportunities in the Cordell Hull Recreation Area include fishing, hunting, camping, picnicking, boating, hiking, horseback riding, and nature photography. Campgrounds are located over 2,000 feet away from the pipeline. A small boat ramp is located 175 feet south of the pipeline.
- Recreation opportunities in the Old Hickory Recreation Area include fishing, camping, and boating. Campgrounds and boat launches are located over 1,000 feet away from the pipeline.
- The pipeline crosses a portion of the Justin P. Wilson Cumberland Trail State Park, also known as the Cumberland Trail. The Cumberland Trail is a TN hiking trail managed by TDEC Division of Natural Areas and maintained primarily by volunteers. The pipeline crosses the Cumberland Trail in Morgan County.

- A review of conservation easements identified one site within the pipeline – the Dixona Farm, located in Smith and Trousdale counties. The Dixona Farm is a 148-acre historic farm site currently managed by The Land Trust for TN. The pipeline appears to cross an area of open pasture.
- The pipeline crosses tributaries to the Obed River, which is designated as a Wild and Scenic River. The pipeline does not cross the Obed River.

3.9.1.4 Alternative B

3.9.1.4.1 East Tennessee TVA Power Service Area

To offset transmission system upgrades that may be required following the retirement of KIF, TVA anticipates that most of the solar facilities proposed under Alternative B would be located within portions of East TN. There are parks and natural and managed areas with ecological significance throughout TVA's PSA in all physiographic regions; major recreational and natural areas in the northeastern TN region include the Great Smoky Mountains National Park, Cherokee National Forest, Chuck Swan State Forest Catoosa WMA, North Cumberland WMA, and Big South Fork National River and Recreation Area.

Individual ecologically significant areas vary in size from a few acres to thousands of acres. Many areas cross state boundaries or are managed cooperatively by multiple agencies. Waterbodies listed in the National Rivers Inventory include the Clinch River, Powell River, Doe River, Holston River, French Broad River, Emory River, Cumberland River (Big South Fork), Wolf River, Obey River, White Creek, Clear Creek, and White Oak Creek. The only Wild and Scenic River in TN is the Obed River, which is in between central and eastern TN.

Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA. TVA transmission line rights-of-way cross eleven NPS units, nine National Forests, six National Wildlife Refuges, and numerous state WMAs, state parks, and local parks (TVA 2018a). As specific sites have not yet been determined for evaluation under this alternative, typical impacts of transmission projects have been listed in Table 3.3-1.

3.9.2 Environmental Consequences

3.9.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to maintain and operate the KIF Plant. TVA would implement all planned actions related to the current and future management and storage of CCRs, which have either been reviewed or would be reviewed in subsequent NEPA analyses. Dispersed recreation use patterns, especially bank fishing, would likely continue on some portions of the Kingston Reservation. There would be no project-related impacts to natural areas, parks, and recreation areas in the vicinity of the Kingston Reservation.

3.9.2.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

Under both action alternatives, TVA would retire, decommission, decontaminate, and deconstruct the KIF units and site. Construction impacts to the WMA present within the Kingston Reservation required as part of the retirement process would be temporary in nature. Project impacts on dispersed outdoor recreational activities should be minor. The retirement, decommissioning, decontamination, and deconstruction of the KIF Plant may temporarily eliminate or reduce fishing and other dispersed recreational activities on the Kingston Reservation and in portions of the Emory and Clinch rivers located adjacent to the Kingston

Reservation. However, it is expected that these dispersed recreation activities could be accommodated at other similar bank fishing spots in the surrounding area. Therefore, project impacts on dispersed outdoor recreational activities are anticipated to be minor. In addition, public access to the boat launching ramp located within the Kingston Reservation could be temporarily interrupted during deconstruction activities resulting in minor, temporary adverse impacts to boat launching opportunities. No cumulative effects to natural areas, parks, or recreation would occur.

3.9.2.2.1 Environmental Justice Considerations

Effects to natural areas, parks, and recreation that would occur because of KIF retirement and D4 activities would be temporary and minor. Fishing access on the Kingston Reservation may be temporarily limited or not allowed, which could result in temporary disproportionate and adverse effects for EJ populations while access is limited as it would reduce the number of fishing locations within the area.

3.9.2.3 Alternative A

Roane County is approximately 36 miles from the nearest federal Class I protected area (Great Smoky Mountains National Park) and 9 miles from the Obed Wild and Scenic River. However, the implementation of Alternative A is expected to result in a large overall reduction in combined emissions of the four Regional Haze/Visibility regulated pollutants: NO_x, PM_{10}, SO_2, and sulfuric acid. This change is a beneficial impact to nearby Class I protected areas and wild and scenic rivers, including Great Smoky Mountains National Park and Obed Wild and Scenic River (USEPA 2021e). Therefore, permanent, moderate, beneficial effects on local air quality and reductions in future regional GHG emissions are expected to have permanent long-term, minor, beneficial effects to nearby natural areas, parks, and recreation.

3.9.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Construction of the CC/Aero CT Plant, switchyard, and transmission facilities on the Kingston Reservation would not occur directly on or within the boundaries of any natural areas, parks, and recreation areas identified near the Reservation and is not anticipated to disrupt existing recreation (see Section 3.9.1.1); thus, no impacts are anticipated.

3.9.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

Construction of the 3- to 4-MW Solar Facility site on the Kingston Reservation would not occur directly on any of the natural areas, parks, and recreation areas identified near the Reservation (see Section 3.9.1.1); thus, no impacts are anticipated.

3.9.2.3.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

Construction of the 100-MW battery site on the Kingston Reservation on any of the three potential battery sites would not occur directly on any of the natural areas, parks, and recreation areas identified near the Reservation (see Section 3.9.1.1); thus, no impacts are anticipated.

3.9.2.3.4 On-site Transmission

The impacts to natural and recreational areas from proposed upgrades to transmission under Alternative A, including a breaker and a half 161-kV switchyard and a reroute of all existing transmission lines from the Kingston Reservation, as well as the installation of a new transmission line for the proposed battery facility, would be the same as those described in Section 3.9.2.2, as these upgrades are expected to occur within the reservation. If future studies indicate improvements are required to the regional transmission system to maintain system stability and integrity, additional site-specific reviews would be completed.

3.9.2.3.5 Off-site Transmission

Under Proposed Alternative A, upgrades to off-site transmission lines would be necessary as described in Section 3.9.1.3.5. The boundaries of natural and recreation areas and parks crossed by the Eastern Transmission Corridor, which overlap at times, are provided in Table 3.9-2. Since the corridor is an existing ROW, vegetation within this area already undergoes regular maintenance activities (e.g., control and/or removal of large woody vegetation) to ensure the safe and reliable transmission of power. Trimming of trees along access roads may be conducted for equipment access.

Table 3.9-2. Summary of Natural and Recreation Areas or Parks Crossed by the Eastern Transmission Corridor under Alternative A

Natural Area, Recreation Area, or Park	Total Extent (Acres)
Kingston Fossil Plant	11.6
Kingston Coal Generating Facility	68.7
Watts Bar Reservoir	56.6
Oak Ridge Reservation WMA	1,105.2
Black Oak Ridge Conservation Easement[1]	311.5
Black Oak Ridge Mixed Pine and Hardwood Forest[1]	3.4
McKinney Ridge Hemlocks[1]	1.1
Duct Island Road Bluffs[1]	0.6
Fringeless Orchid Wetlands[1]	0.7
Bear Creek[1]	12.4
Pine Ridge Wetlands[1]	26.0
Walker Branch Embayment Barren[1]	10.9
Chestnut Ridge Barren and Wetland[1]	12.5
Chestnut Ridge Springs Area[1]	0.3
Unnamed Tributary to East Fork Poplar Creek[1]	1.2
Grassy Creek[1]	0.2
North Ridge Trail	0.9

[1]Areas are also included within the Oak Ridge Reservation WMA

Outside of the direct project impacts mentioned above where construction areas intersect with areas of interest, impacts on dispersed outdoor recreational activities and natural areas and parks would likely only include minor and temporary impacts from construction traffic along the corridors.

3.9.2.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 8 (ETNG 2023i) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the natural areas, parks, and recreation-related findings in ETNG's Resource Report 8. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). The proposed ETNG Construction ROW is expected to cross multiple parks, managed areas, and ecologically significant sites within the ETNG Construction ROW.

According to ETNG's Resource Report 8 (ETNG 2023i), the following impacts can be anticipated due to the pipeline crossings. See Figure 1.3-1 in Appendix 1A of ETNG's Resource Report 1 (ETNG 2023b) for detailed maps of the pipeline route and facilities:

> The [Ridgeline Expansion] project crosses multiple segments of the Old Hickory WMA beginning at MP 2.7. The length of the [Ridgeline Expansion] project within the Old Hickory WMA totals approximately 6,003 feet. From MP 2.8 to MP 3.4 the pipeline will be constructed via HDD with minimal workspace. Through the Old Hickory WMA, the proposed pipeline will be located adjacent to the existing 3100 Line permanent ROW. Workspace and new ROW will be required outside of the existing 3100 Line ROW to safely construct the [Ridgeline Expansion] project. A total of 13.0 acres of land within the Old Hickory WMA will be disturbed during construction; 5.0 acres of this are within the previously disturbed existing 3100 Line permanent ROW. No new permanent ROW will be required through the WMA.
>
> […]
>
> The [Ridgeline Expansion] project crosses multiple segments of the Cordell Hull WMA beginning at MP 28.0. The length of the [Ridgeline Expansion] project within the Cordell Hull WMA totals approximately 4,775 feet. One waterbody crossing (Cumberland River) within the WMA will be constructed via HDD with minimal workspace. Through the Cordell Hull WMA, the proposed pipeline will be located adjacent to the 3100 Line permanent ROW. Workspace and new ROW will be required outside of the permanent ROW to safely construct the Project. A total of 15.4 acres of land within the Cordell Hull WMA will be disturbed during construction; 1.1 acres of this are within the previously disturbed existing 3100 Line permanent ROW.
>
> […]
>
> In Morgan County, the [Ridgeline Expansion] project crosses approximately 795 feet of the northeastern edge of the Lone Mountain State Forest, which is comprised of about 3,570 acres of forest and managed by the Tennessee Division of Forestry. […] Approximately 15 miles of trails exist on the forest, including an interpretive nature trail (TDOA 2022a) The interpretive natural trail is the nearest trail to the [Ridgeline Expansion] project area and is located approximately 300 feet southeast of the [Ridgeline Expansion] project (TDOA 2022b).
>
> Through the Lone Mountain State Forest, the proposed pipeline will be located wholly within the existing 3100 Line permanent ROW. Some workspace will be required outside of the permanent ROW to safely construct the [Ridgeline Expansion] project. A total of 2.0 acres of land within the Lone Mountain State Forest will be disturbed during construction, of which 0.8 [acre] is within the previously disturbed existing 3100 Line permanent ROW.
>
> […]
>
> A review of conservation easements identified one site crossed by the [Ridgeline Expansion] project – the Dixona Farm, located near MP 11.7 in Smith and Trousdale counties. […] While a map of the farm features is not available, the [Ridgeline Expansion] project appears to cross an area of open pasture; the nearest structure is approximately 700 feet south of the [Ridgeline Expansion] project. A total of 4.0 acres

> of land within the Dixona Farm will be disturbed during construction, of which 1.6 acres is within the previously disturbed existing 3100 Line permanent ROW. No new permanent ROW will be required through the Dixona Farm.
>
> […]
>
> At MP 62.5, the [Ridgeline Expansion] project crosses less than 200 feet of private land enrolled in a conservation easement through the Southern Conservation Trust. The pipeline will be located within the existing 3100 Line ROW and will not require new ROW. There are no land use restrictions associated with this private conservation easement.
>
> […]
>
> Near MP 101.9 in Morgan County, the [Ridgeline Expansion] project crosses a portion of the Justin P. Wilson Cumberland Trail State Park, also known as the Cumberland Trail. […] While publicly available GIS data from TDEC indicates that the [Ridgeline Expansion] project would cross the Cumberland Trail, maps of the Trail system show the trail ending in the town of Wartburg (Cumberland Trail State Scenic Trail 2022). East Tennessee is coordinating with TDEC and the NPS regarding the crossing of the Cumberland Trail. To date, no site-specific crossing methodology is required and East Tennessee plans to construct the pipeline via conventional overland construction methods across the Cumberland Trail (ETNG 2023i).

Based on the analysis in the ETNG Resource Reports, which TVA has independently assessed and adopts, the proposed natural gas pipeline under Alternative A is anticipated to temporarily disturb 34.4 acres of natural and recreational resources during construction; 8.5 of these acres are within the previously disturbed existing 3100 Line permanent ROW.

For the resources proposed to be crossed by ETNG's proposed project, ETNG would coordinate planning and construction with landowners to ensure continued recreational use during construction (to the extent practicable) and operation of the pipeline. At the time of this report, ETNG is consulting with the TWRA, NPS, USACE, and USFS regarding potential impacts to the properties described above to identify minimization and mitigation measures.

According to ETNG's Resource Report 8 (ETNG 2023i), effects on natural and recreational resources from construction of the pipeline would be:

> […] temporary and may include trail closures or re-routes around active construction. Temporary effects on recreational users may also include noise and visual disturbance from construction equipment and construction activities.
>
> […] Mitigation measures during construction may include flagging of work zones, signage, re-routes, and/or closure notifications. There would be no long-term effects to use of the lands during operation of the [Ridgeline Expansion] project.

TVA has independently reviewed and concurs with the natural areas, parks, and recreation-related findings in ETNG's Resource Report 8 (ETNG 2023i).

3.9.2.3.7 Summary of Alternative A

TVA Proposed Actions

Minor, temporary adverse effects could occur to recreational uses of the sections of the Emory and Clinch rivers adjacent to the Kingston Reservation. Public access to the boat launching ramp located in the Kingston Reservation boundary could be temporarily interrupted during construction or deconstruction activities. Adverse effects to boat launching activities would be temporary and minor during construction. Because of the temporary nature of transmission upgrades, off-site transmission upgrade impacts on dispersed outdoor recreational activities, as well as natural areas and parks, would only include minor impacts from construction traffic along the corridors, aside from areas where corridors directly intersect with managed forested areas. Any tree clearing required would be maintained as open space and result in moderate permanent impacts to these recreation sites.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

The proposed pipeline under Alternative A is anticipated to temporarily disturb 34.4 acres of natural and recreational resources during construction. The minor temporary adverse effects to these resources would result from construction-related effects due to increased local traffic and noise and visual disturbances from construction activity. These impacts would be minimized to mitigated through the implementation of a traffic management plan.

Cumulative Effects

Under Alternative A, cumulative minor and temporary adverse effects could occur to recreational uses of natural areas, parks, and recreation areas during construction of Alternative A; however, these effects would be dispersed over a large geographical area and multi-year construction windows, thus minimizing the potential for significant and cumulative effects to recreational resources.

3.9.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to natural areas, parks, and recreation that would occur because of the proposed construction and operation of facilities under Alternative A that may affect EJ populations include the temporary closure of hunting and fishing opportunities during construction. Additionally, temporary effects to the recreational use of sections of the Emory and Clinch rivers that may occur during CC/Aero CT Plant construction could affect EJ populations that utilize these areas. Effects experienced by EJ populations are assessed to be disproportionate and adverse based on reduced ability, financial or otherwise, to travel to alternative recreational sites, resulting in the temporary inability to hunt and fish for sustenance in these areas. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Effects to natural areas, parks, and recreation that would occur because of the proposed construction and operation of the proposed pipeline and associated structures under Alternative A that may affect EJ populations are anticipated to be limited to construction-related effects because of increased local traffic, noise, and visual disturbance. Effects experienced by EJ populations may be disproportionate and adverse based on their vulnerabilities to such disturbances and possible cumulative impacts from these disturbances.

3.9.2.4 Alternative B

3.9.2.4.1 Construction and Operations of Solar and Storage Facilities

Because the exact project locations for solar and/or storage projects are not known at this time, TVA has compiled a list of typical impacts associated with the construction and operation of PV facilities within TVA's region. This list was compiled by reviewing the EAs and EISs for PV projects, ranging from community scale to utility scale, between 2014 through 2022. Based on the review of 31 projects presented in Table 3.2-1, it was found that only 6.5 percent of solar projects affected parks and public lands. Based on the assumption of 15 or more 100-MW solar sites to generate at least 1,500 MW, approximately one site would result in effects to parks and public lands.

Individual facilities would be sited to avoid effects to natural areas, parks, and other developed recreation areas and designed to reduce any visual effects to nearby areas wherever possible. Solar and storage facilities would eliminate informal recreational uses, such as hunting from the 10,950 acres proposed to be developed. The land area required for battery storage facilities is typically only a few acres and construction-related effects are minor. Operational effects are also minor with adherence to typical mitigation measures and BMPs.

Future projects in the geographic area of analysis that include use of undeveloped lands to support industrial or other intensive developments could reduce the availability of lands suitable for recreation. In addition to the proposed construction of at least 1,500 MW of solar facilities and 2,200 MW of storage under Alternative B, TVA is proposing to add 10,000 MW of solar by 2035 to meet customer demands and system needs. This would decrease the amount of potentially available land to support dispersed outdoor recreation activities, such as hunting, fishing, or nature observation. The combined effect of these future land development actions and Alternative B would be a reduction in resources for dispersed recreation. However, in view of the relatively large areas of rural and undeveloped lands within the counties selected, cumulative impacts on dispersed recreation opportunities are expected to be minor. Because developed outdoor recreation areas are largely located a sufficient distance from the solar or storage project sites, no direct, indirect, or cumulative impacts on these resources is expected.

3.9.2.4.2 Transmission and Other Components

New transmission line connections, and substations would typically be on or immediately adjacent to the solar/storage facility site, and they would be planned to minimize adverse impacts to natural areas, parks, and recreation areas where possible. New transmission lines would eliminate forested areas within the corridor, which could have permanent impacts on natural and recreational activities in the area.

A review of past solar PPA projects reflected an average of approximately 17.7 acres of permanent effects because of access roads, transmission interconnections, and upgrades for each solar facility. Based on the assumption of 15 or more 100-MW solar sites, approximately 266 acres would be affected. Upgrades are typically performed to increase the electrical capacity of the existing transmission lines and would include the items listed in Section 2.1.3.5.2.

The land area required for battery storage facilities typically ranges from only a few acres up to 828 acres and construction-related impacts are minor. Operational impacts are also minor with adherence to typical mitigation measures and BMPs.

3.9.2.4.3 Environmental Justice Considerations

Effects to recreation areas that would occur because of the proposed solar facilities and transmission line activities are not anticipated to have disproportionate effects on EJ populations because natural areas, parks, and recreation sites would generally be avoided for solar facilities. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.10 Land Use

The TVA Act gives TVA the authority to regulate the use of lands it manages as well as development across, along, or in the TN River or any of its tributaries. The Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) recognizes the importance of prime farmland. Various state laws and local ordinances also regulate land use, although a large area of land in TVA's region is not subject to local zoning ordinances (TVA 2019b).

3.10.1 Affected Environment

3.10.1.1 Kingston Reservation (No Action Alternative and D4 Activities)

Land use is defined as the way people use and develop land, including leaving land undeveloped or using land for agricultural, residential, commercial, and industrial purposes. Images generated with the National Land Cover Dataset (NLCD) evaluation, visualization, and analysis tool show the Kingston Reservation as largely deciduous forest, developed medium/high intensity area, and hay/pasture (Figure 3.10-1). The 2022 field investigations identified more wetlands on the Kingston Reservation and within the boundaries of the proposed CC/Aero CT Plant site than what was depicted on desktop NLCD results (Appendix F). See Section 3.6 for more information on wetland field survey findings.

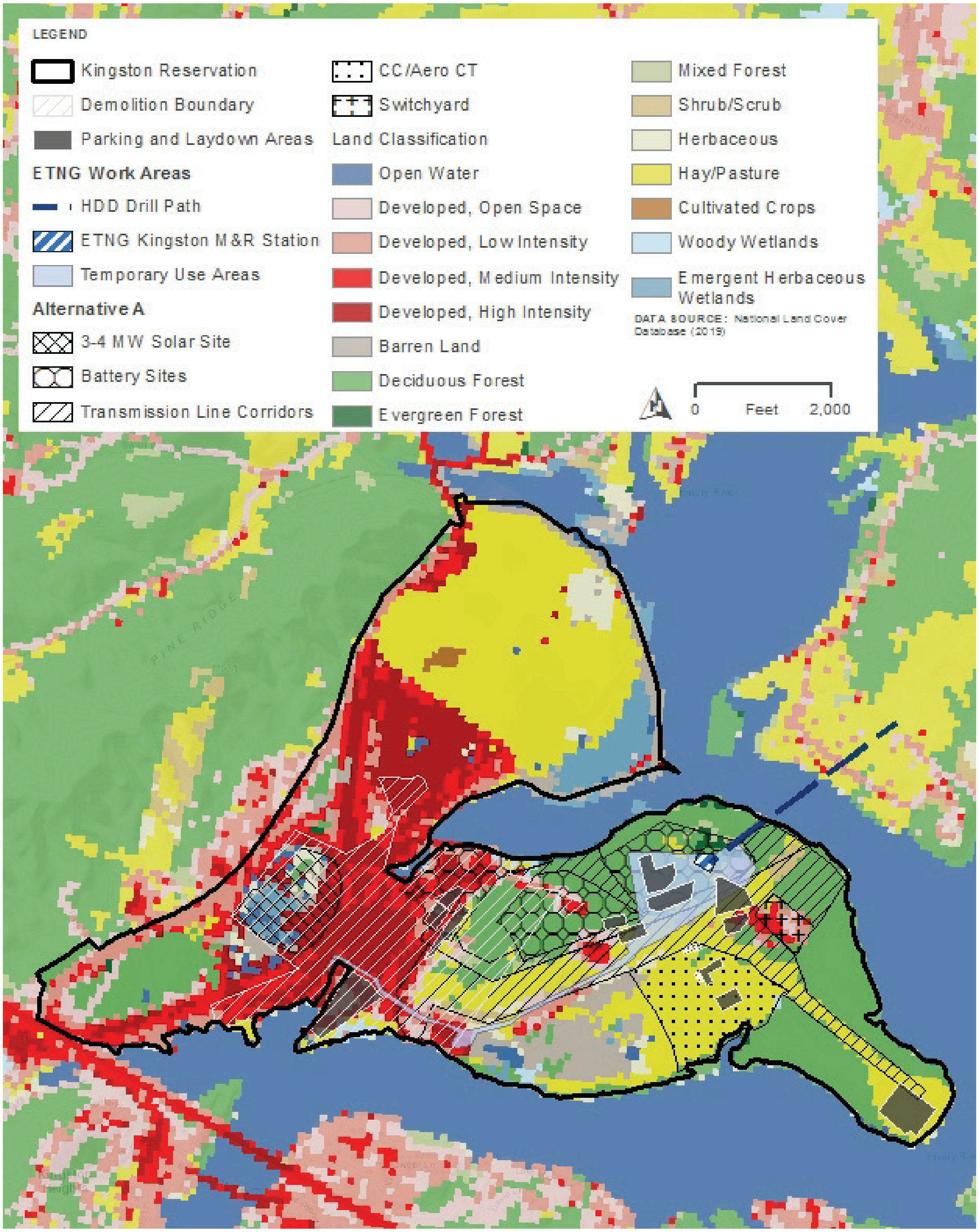

Figure 3.10-1. Land Cover Within and Adjacent to the Kingston Reservation (Source: NLCD 2019)

The Kingston Reservation consists of flat to gently rolling terrain that ranges in elevation from approximately 737 to 922 feet above mean sea level. Topography is highest in the western portion of the reservation, decreasing in elevation towards the northeast (Figure 3.10-2). The Kingston Reservation is located on a peninsula formed by the confluence of the Clinch and Emory rivers approximately 35 miles west of downtown Knoxville.

The Kingston Reservation is served by highway, railway, and waterway modes of transportation. The closest airport is the Meadowlake Airport (a private airport), 5.6 miles south of the site. The closest public use airport is Rockwood Airport, approximately 8.0 miles west of the Kingston Reservation. Primary arterial roadway access is provided by HW-70 and I-40 to the south of the site location. State road TN-22 lies west of the plant, intersecting Swan Pond Rd, which runs along the northern boundary of the plant and allows access to the plant where it intersects with Steam Plant Main Access Rd. A rail line owned by both CSX and Norfolk Southern runs through the plant and makes a loop around the northeastern section of the Kingston Reservation, which contains the ash pile, a pond, and a large, forested area (TVA 2019c). A historic cemetery, the Green Cemetery, is located on the Kingston Reservation but is outside the project footprint.

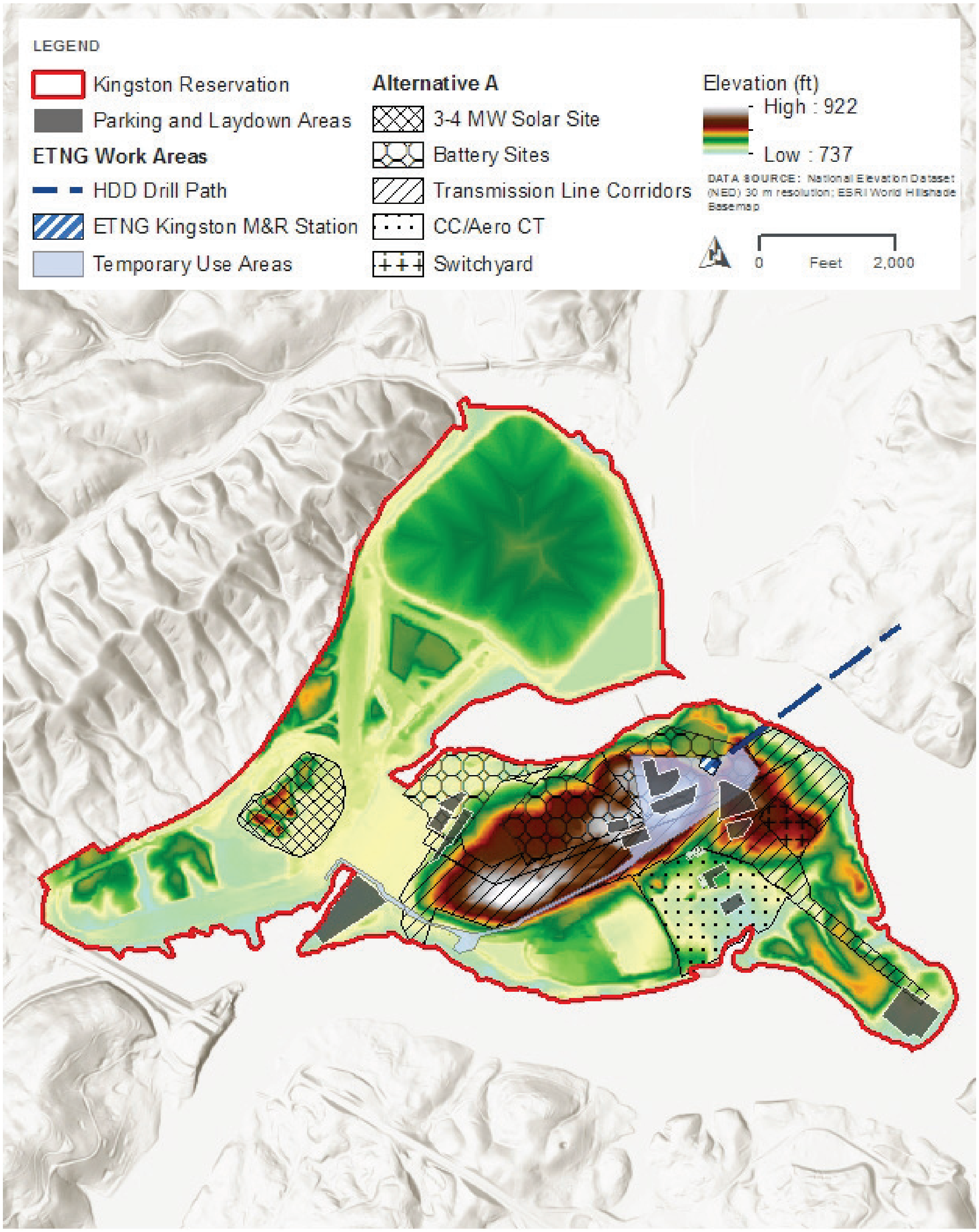

Figure 3.10-2. Elevations within the Kingston Reservation Boundary

Forested land makes up most of the land surrounding the Kingston Reservation to the north. The Swan Pond Cemetery is approximately 0.25 mile to the northwest of the Kingston Reservation. Several industrial facilities are present alongside Old Highway 149 and Temple Drive southeast of the Kingston Reservation. Small pockets of residences are present along Scotts Chapel Road west of the Reservation.

Available historical aerial photographs and USGS topographic quadrangles indicate land use near the project area undergoing development dating back to the first available map in 1935, which showed the existence of many of the same major roadways and corridors as can be seen today. The construction of the KIF facilities significantly changed the project site in the mid-1950s and 1960s. Industrial development has continued since the coal plant was completed in the 1950s as TVA expanded CCR storage areas and other industrial development, some associated with TVA (e.g., the wallboard plant), mostly to the east and southeast of the Kingston Reservation. The acreage and percentage of each land cover type identified from a review of the NLCD (2019) for the Kingston Reservation, including the proposed Alternative A CC/Aero CT Plant site, are summarized in Table 3.10-1.

Table 3.10-1. Land Cover Within the Kingston Reservation

NLCD Land Cover Type	Area (Acres)	% of Total Land
Barren Land	74.6	5.9
Cultivated Crops	3.0	0.2
Deciduous Forest	279.0	22.2
Developed; High Intensity	163.1	13.0
Developed; Low Intensity	79.0	6.3
Developed; Medium Intensity	129.8	10.3
Developed; Open Space	34.2	2.7
Emergent Herbaceous Wetlands	33.7	2.7
Evergreen Forest	6.0	0.5
Hay/Pasture	381.6	30.4
Herbaceous	27.9	2.2
Mixed Forest	4.4	0.4
Open Water	25.0	2.0
Scrub/Shrub	8.5	0.7
Woody Wetlands	5.6	0.5
Total	**1,255.4**	**100.0%**

Source: NLCD 2019

3.10.1.2 Alternative A

3.10.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Much of the construction under Alternative A would be on the 2,254-acre Kingston Reservation near the city of Kingston in unincorporated Roane County (Figure 2.1-5). This site offers the advantages of (1) having been previously disturbed within existing TVA property and (2) having existing transmission interconnection to TVA’s transmission system. The proposed options for the CC/Aero CT Plant site include mostly previously disturbed areas. The TN Trustee classifies the project area, including the project site, as commercial (TN Trustee 2022).

The proposed CC/Aero CT Plant location consists of 55 acres within the eastern portion of the Kingston Reservation, where land use consists largely of hay/pasture fields. The parking/laydown area is also classified as hay/pasture area (8.2 acres). The proposed switchyard is 8.5 acres of developed medium and low-density land (Figure 3.10-1).

The acreage and percent of each land cover type identified from a review of the NLCD (2019) for the components associated with the proposed Alternative A are summarized in Table 3.10-2.

Table 3.10-2. Land Cover Within the Alternative A Footprints on the Kingston Reservation

Land Cover Type	CC/Aero CT Plant[1, 2]		3-4-MW Solar Site[2]		Battery Site 1[2]		Battery Site 2[2]		Battery Site 3[2]		Battery Transmission Connections[2]		On-site Transmission Upgrades[2]	
	Area (ac.)	% of Total Area	Area (ac.)	% of Total Area	Area (ac.)	% of Total Area	Area (ac.)	% of Total Area	Area (ac.)	% of Total Area	Area (ac.)	% of Total Area	Area (ac.)	% of Total Area
Barren Land	0.7	1.0	4.3	12.2	0	0.0	0	0.0	1.6	4.0	0.5	1.2	1.2	0.9
Cultivated Crops	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Deciduous Forest	3.0	4.3	1.5	4.3	0.6	1.9	29.3	83.8	30.6	76.4	25.4	61.9	25.6	20.0
Developed; High Intensity	0.2	0.3	12.9	36.8	8.2	27.2	0	0.0	0	0.0	0.6	1.4	2.1	1.6
Developed; Low Intensity	3.0	4.2	0	0.0	5.1	17.0	1.3	3.8	0	0.0	1.0	2.5	4.7	3.7
Developed; Medium Intensity	2.4	3.4	1.3	3.7	10.9	36.2	1.6	4.6	0	0.0	0.9	2.2	7.4	5.8
Developed; Open Space	1.1	1.5	0	0.0	1.4	4.5	2.7	7.8	0	0.0	2.6	6.4	7.5	5.9
Emergent Herbaceous Wetlands	0	0.0	6.4	18.3	0.2	0.8	0	0.0	0	0.0	0.1	0.3	0	0.0
Evergreen Forest	0	0.0	0	0.0	0.1	0.2	0	0.0	3.2	7.9	0.2	0.5	0	0.0
Hay/Pasture	59.1	83.3	0	0.0	2.0	6.6	0	0.0	3.9	9.7	5.4	13.1	69.6	54.4
Herbaceous	0.8	1.1	3.7	10.4	0	0.0	0	0.0	0	0.0	0	0.0	3.1	2.4
Mixed Forest	0	0.0	0	0.0	0	0.0	0.0	0.1	0.9	2.1	2.0	4.9	0.2	0.1
Open Water	0	0.0	4.9	13.9	0.4	1.4	0	0.0	0	0.0	0.6	1.3	0	0.0
Scrub/Shrub	0.4	0.6	0	0.0	0	0.0	0	0.0	0	0.0	1.1	2.6	6.3	5.0
Woody Wetlands	0.2	0.3	0	0.0	0.9	3.1	0	0.0	0	0.0	0.4	1.0	0	0.0
Total Acres	70.9		35.0		31.0		35.0		40.0		41.4		128.0	

Source: NLCD 2019
[1]Includes CC/Aero CT Plant area, switchyard, and parking/laydown area
[2]Totals may be off slightly due to rounding.

3.10.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.10.1.1 apply to the proposed 3- to 4-MW solar facility The proposed solar facility would occupy 35 acres of mostly developed high density land, which is the existing coal yard used for the KIF (Figure 3.10-1, Table 3.10-2).

3.10.1.2.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.10.1.1 apply to the proposed 100-MW BESS on the Kingston Reservation. Battery Site 1 is 30 acres of mostly developed high and medium density land; Battery Site 2 is 35 acres of deciduous forest; and Battery Site 3 is 40 acres of mostly deciduous forest (Figure 3.10-1, Table 3.10-2).

3.10.1.2.4 On-site Transmission

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant and switchyard. TVA would also install a new transmission line for the proposed battery facility. Therefore, the affected environment for on-site transmission upgrades is described in Section 3.10.1.1.

3.10.1.2.5 Off-site Transmission

Under Alternative A, TVA would make improvements to existing transmission lines, five within the vicinity of the Kingston Reservation (L5108, L5302, L5381, L5280, L5116) and one in Crossville (L5383). Descriptions of these improvements are provided in Section 2.1.3.5.2. Existing land use for each transmission line is defined below.

3.10.1.2.5.1 Eastern Transmission Corridor

Transmission Lines L5108, L5302, L5381, L5280, and L5116 extend from the Kingston Reservation travelling eastbound and terminate in the city of Oak Ridge. Transmission line L5302 extends from the Kingston Reservation eastward and terminates at the ORNL on Bethel Valley Road, near the city of Oak Ridge. Several access roads are proposed largely along routes that have already been cleared.

Land use within the Eastern Transmission Corridor according to the NLCD is summarized in Table 3.10-3 and is largely hay/pasture and forest land with smaller areas of developed space and open water (Figure 3.10-3a through Figure 3.10-3d). There is slight variability in elevation across the Eastern Transmission Corridor. Generally, the Eastern Transmission Corridor has low relief with a maximum elevation of approximately 1,185 feet and a minimum elevation of 737 feet (Figure 3.10-4a through Figure 3.10-4d).

Table 3.10-3 Land Cover Within and Adjacent to the Proposed Alternative A Eastern Transmission Corridors

NLCD Land Use	Area (acres)[1]	Percent of Total Land
Barren Land	3.0	0.2
Deciduous Forest	442.3	27.46
Developed, High Intensity	14.8	0.9
Developed, Low Intensity	133.3	8.3
Developed, Medium Intensity	55.0	3.4
Developed, Open Space	191.0	11.9
Emergent Herbaceous Wetlands	1.2	<0.1
Evergreen Forest	12.3	0.8
Hay/Pasture	556.7	34.6
Herbaceous	27.0	1.7
Mixed Forest	41.1	2.6
Open Water	19.1	1.2
Shrub/Scrub	86.1	5.4
Woody Wetlands	26.3	1.6
Total	**1,609**	**100**

Source: NLCD 2019
[1]Percentages and totals may vary slightly due to rounding errors.

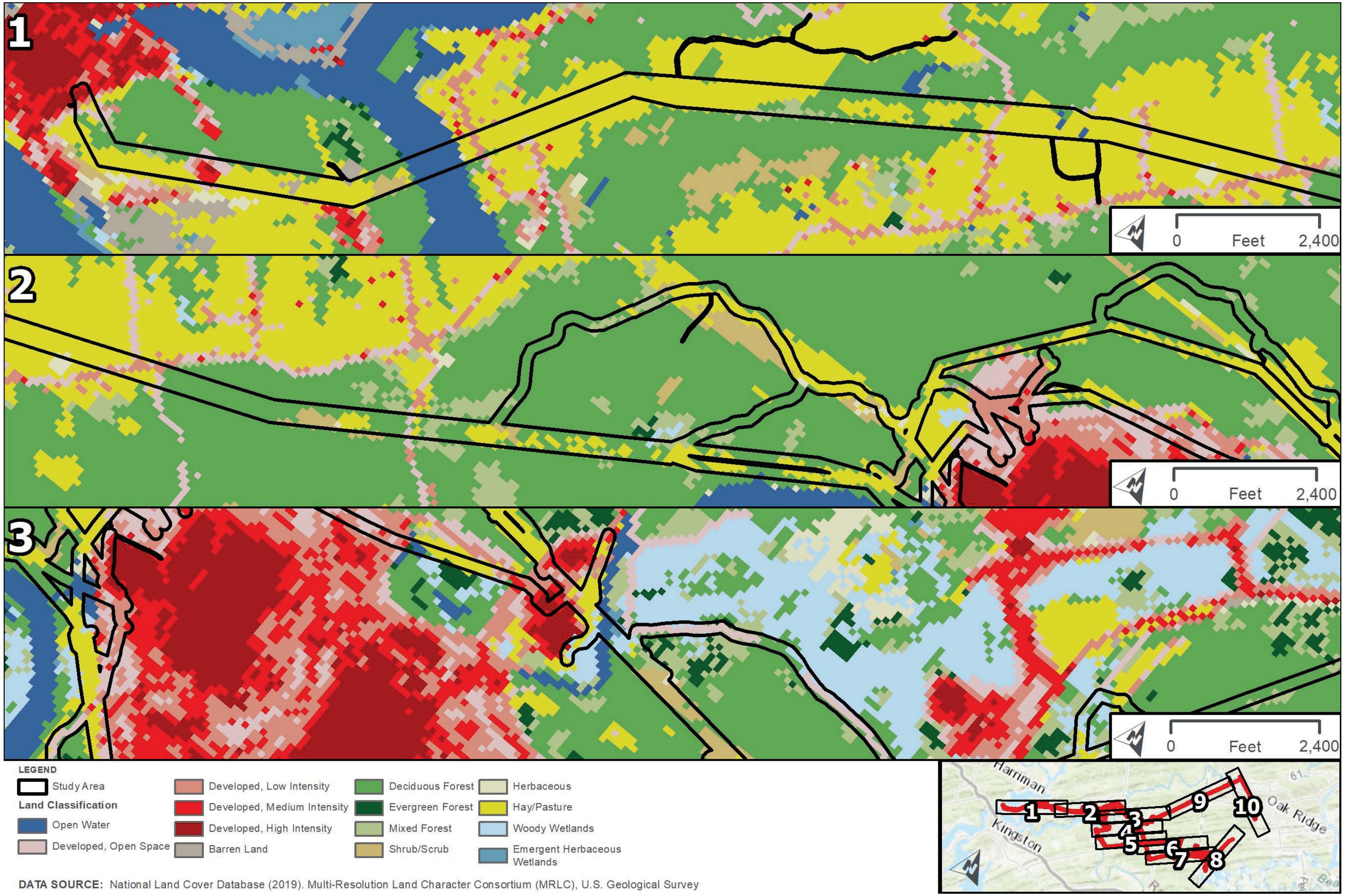

Figure 3.10-3a. Land Cover Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor (Source: NLCD 2019)

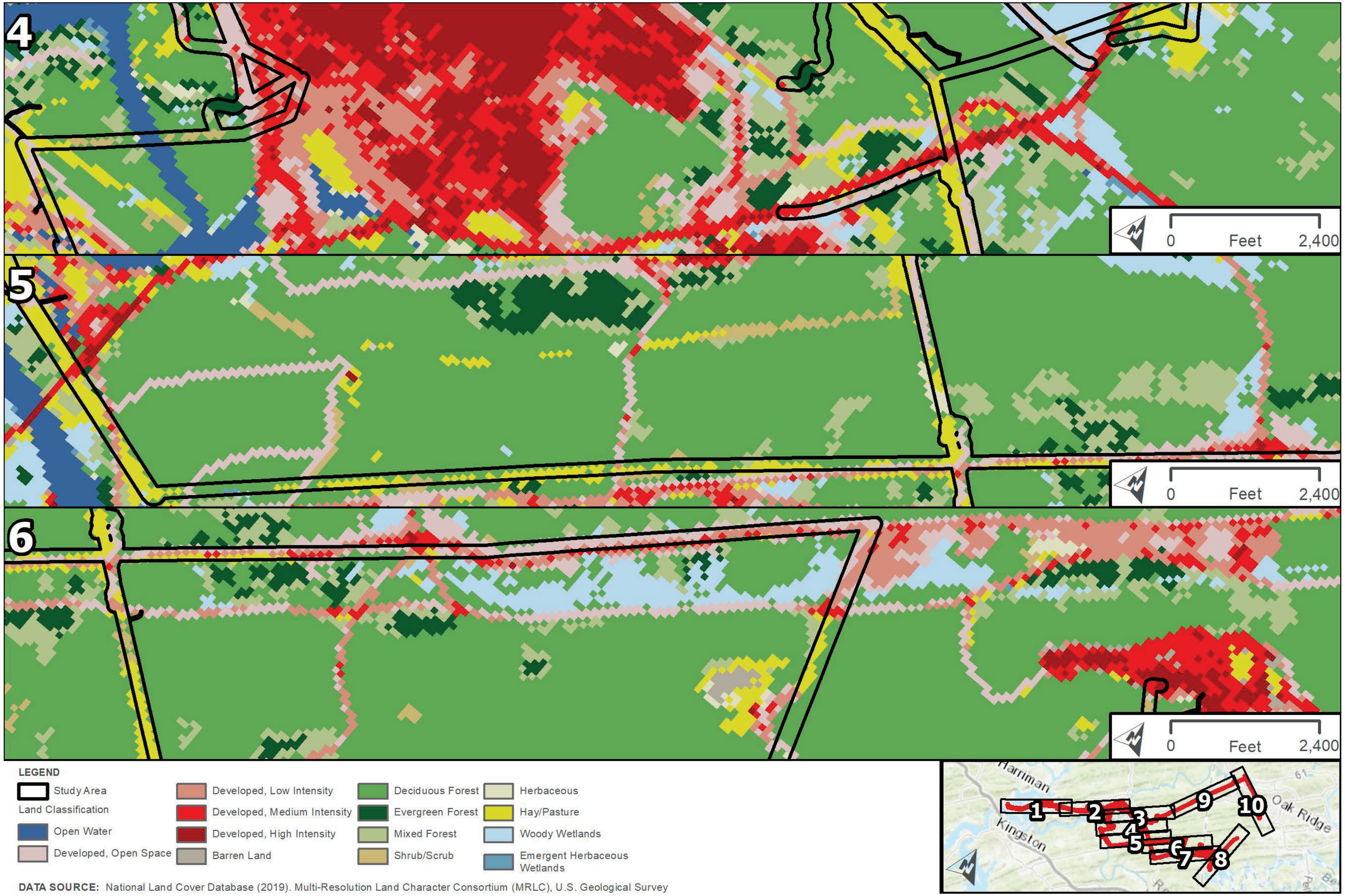

Figure 3.10-3b. Land Cover Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor (Source: NLCD 2019)

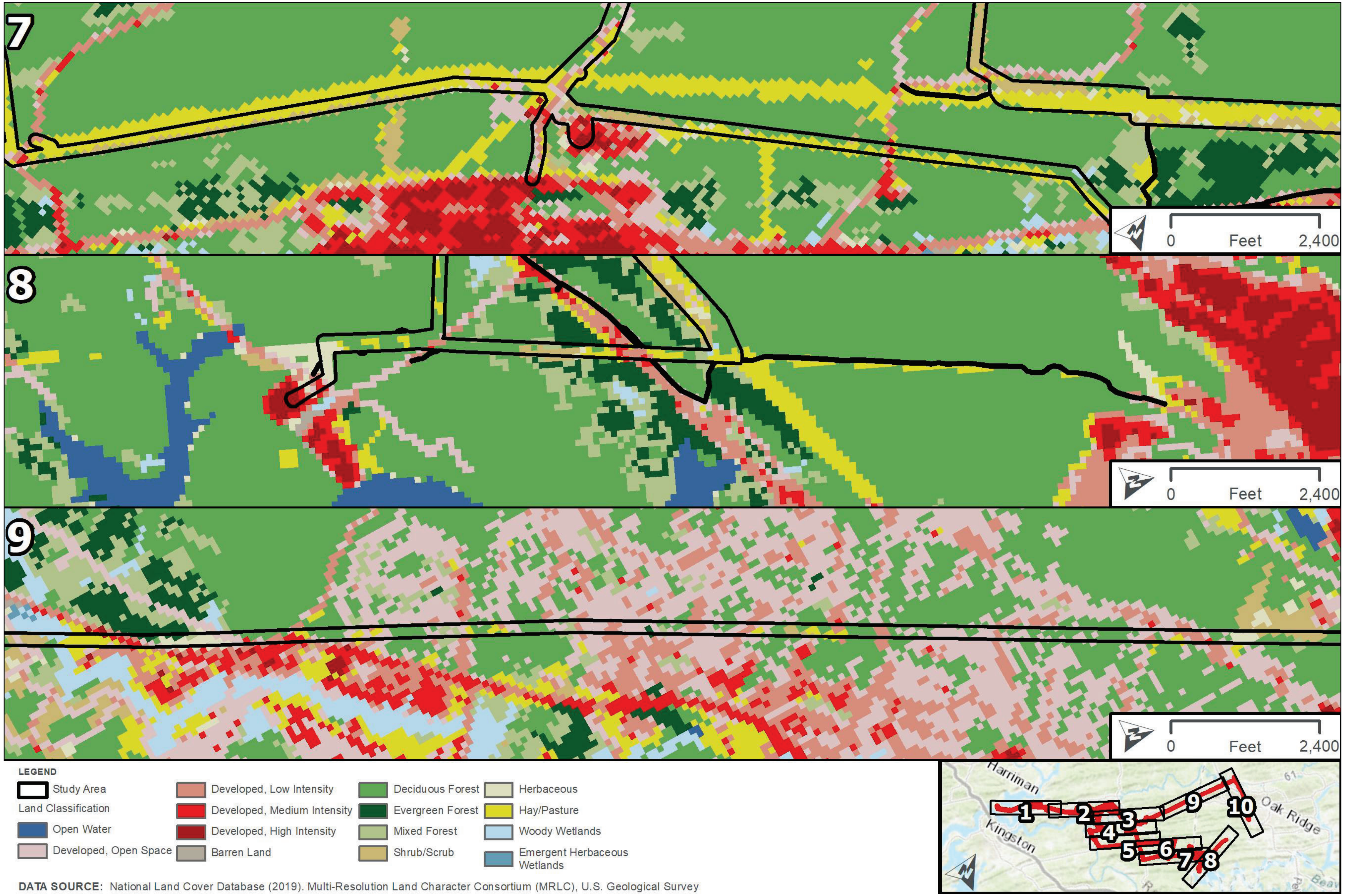

Figure 3.10-3c. Land Cover Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor (Source: NLCD 2019)

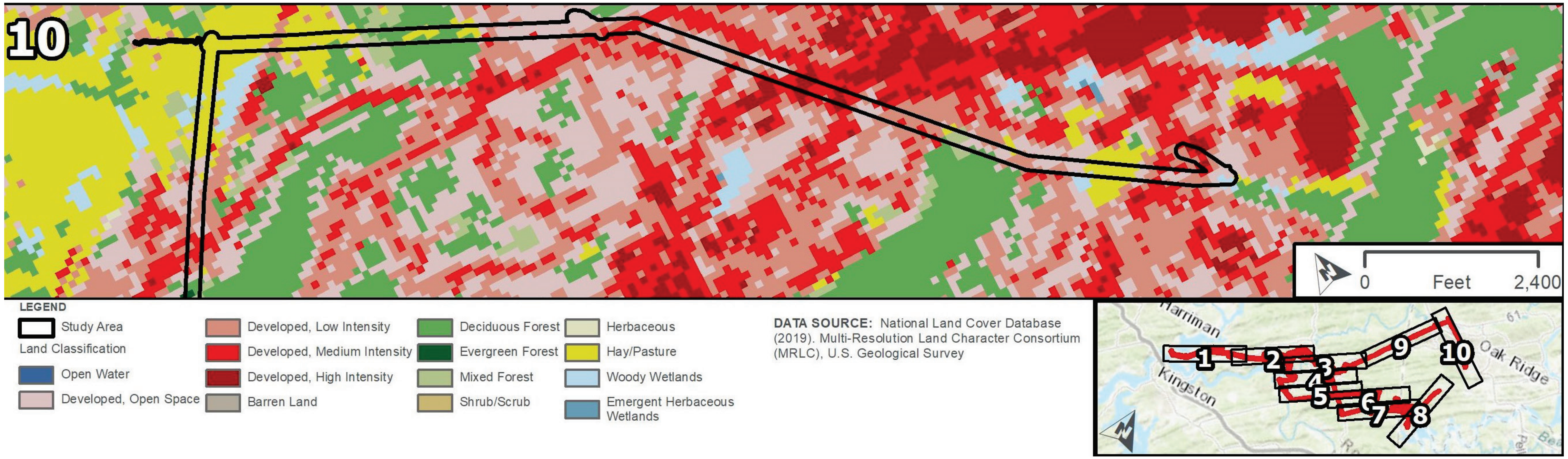

Figure 3.10-3d. Land Cover Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor (Source: NLCD 2019)

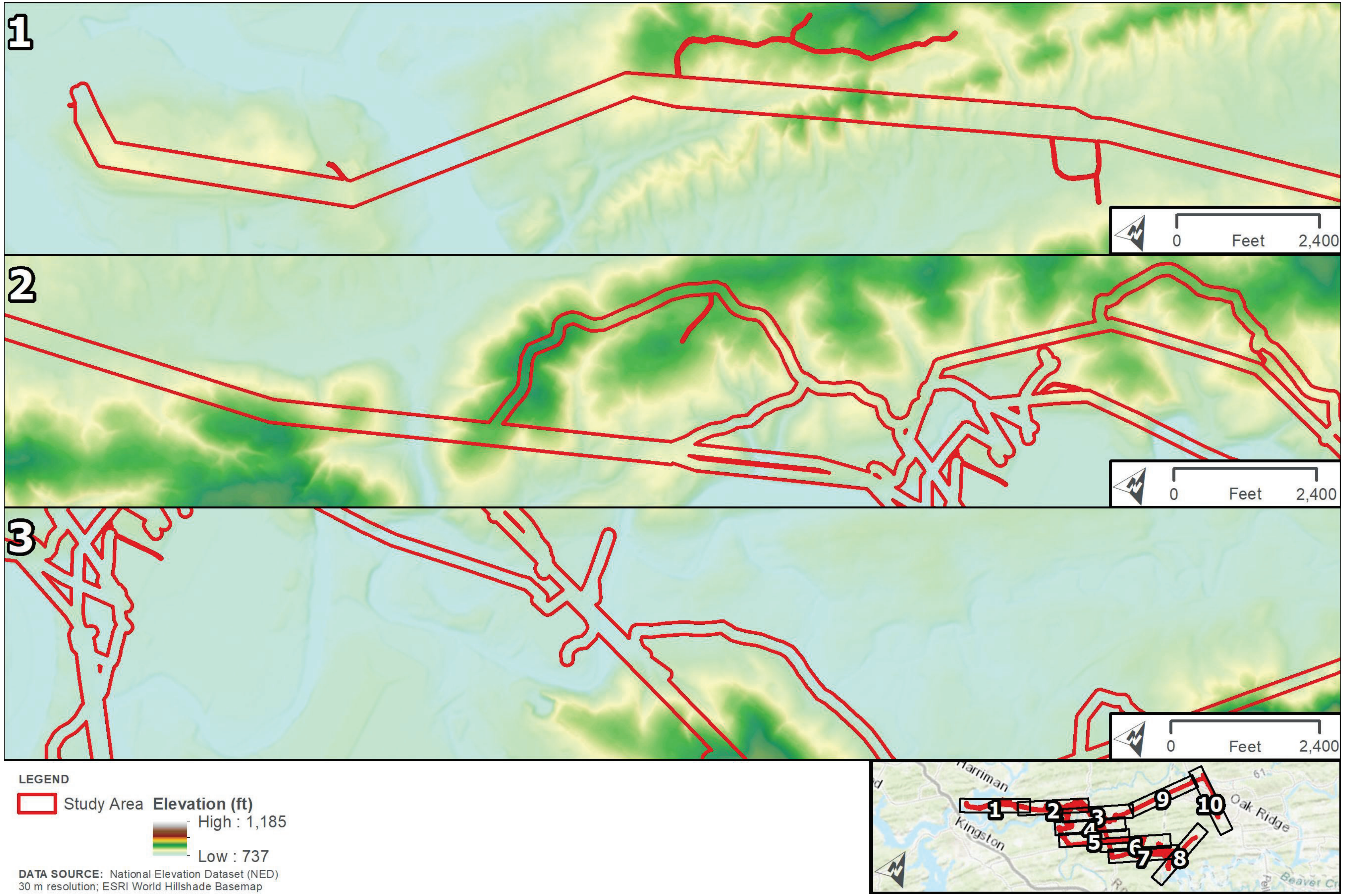

Figure 3.10-4a. Elevation Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor

Figure 3.10-4b. Elevation Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor

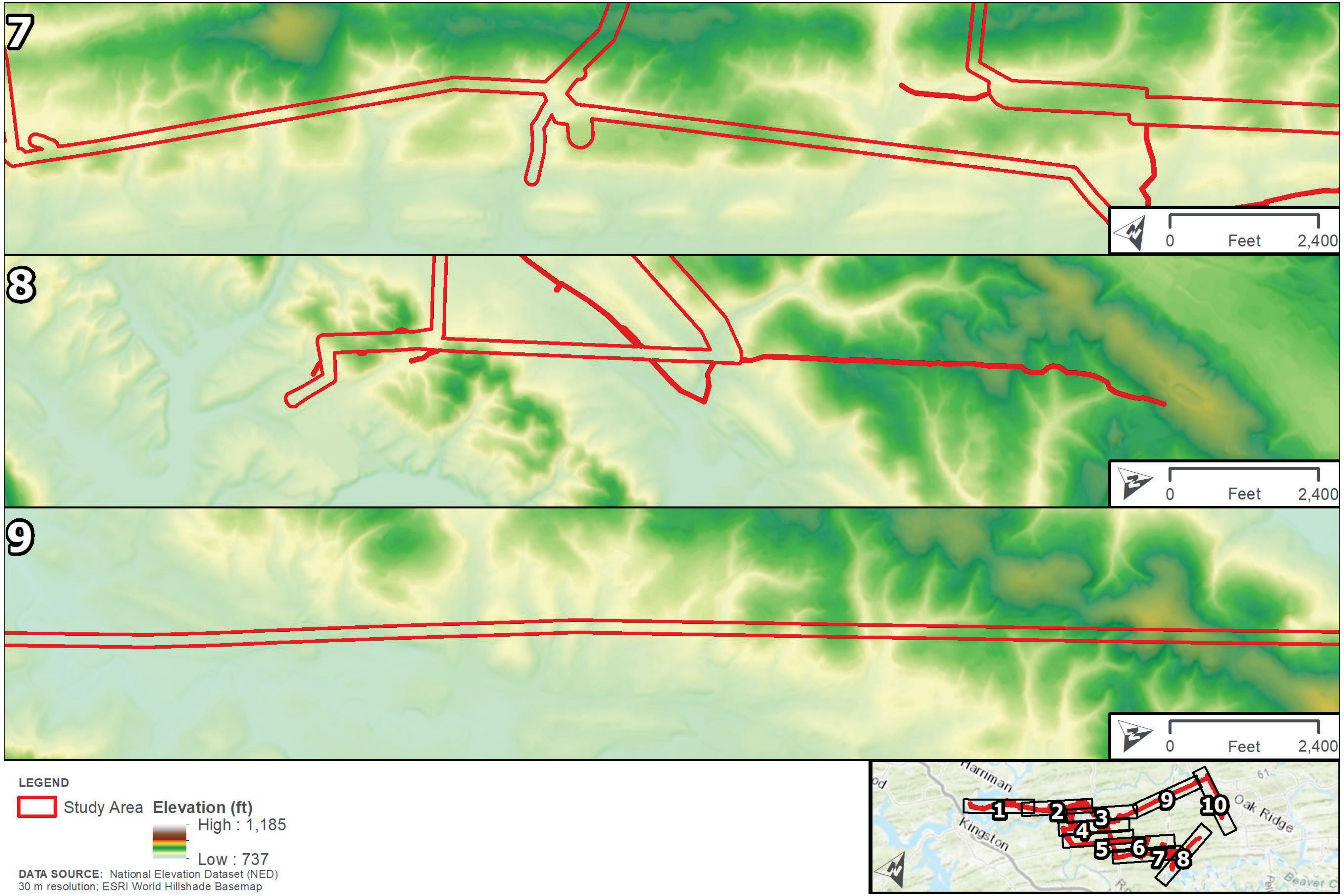

Figure 3.10-4c. Elevation Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor

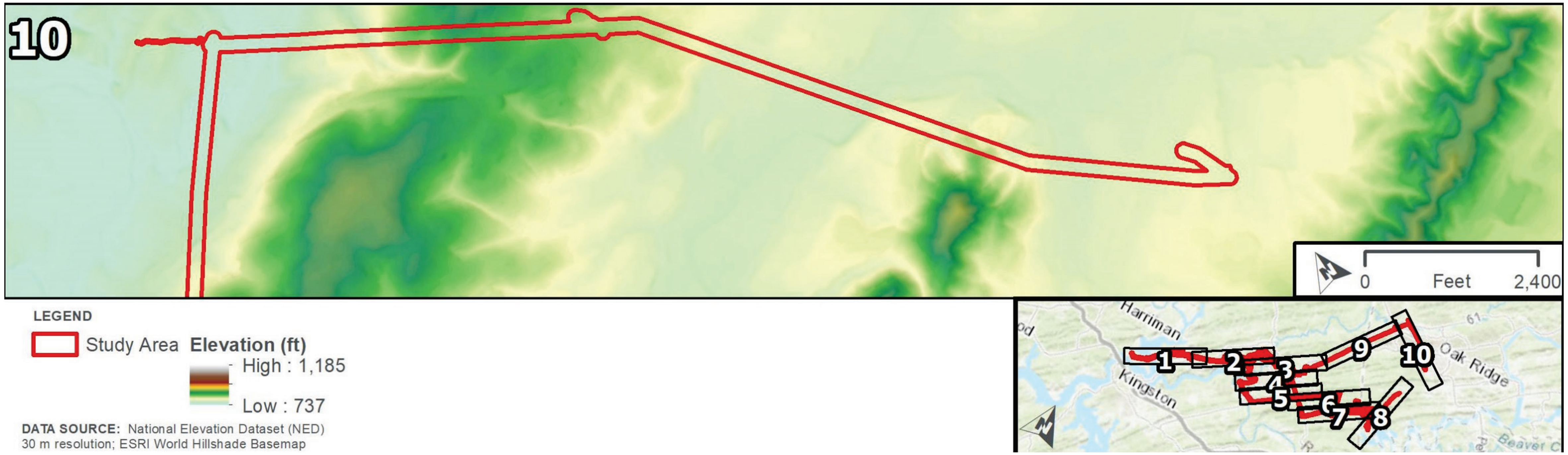

Figure 3.10-4d. Elevation Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Eastern Transmission Corridor

3.10.1.2.5.2 Western Transmission Corridor

Transmission line L5383 extends southeastward from a substation in unincorporated Crossville on Plateau Road and terminates north of the Crossville city limits. Land use within the Western Transmission Corridor is summarized in Table 3.10-4 and is largely hay/pasture with small areas of cleared forest land and developed space (Figure 3.10-5). Elevation is consistent with a minimum of 1,659 feet and a maximum of 2,041 feet across the Western Transmission Corridor with slight dips near waterbodies (Figure 3.10-6). Several access roads are proposed along the route in agricultural areas.

Table 3.10-4. Land Cover Within and Adjacent to the Proposed Alternative A Western Transmission Corridor

NLCD Land Use	Area (acres)[1]	% of Total Land
Barren Land	0.6	0.4
Deciduous Forest	11.0	9.1
Developed, Low Intensity	3.0	2.5
Developed, Medium Intensity	2.2	1.8
Developed, Open Space	3.1	2.6
Hay/Pasture	81.0	66.9
Herbaceous	6.8	5.6
Mixed Forest	4.8	4.0
Shrub/Scrub	8.7	7.2
Total	**121.2**	**100**

Source: NLCD 2019

[1]Due to rounding totals and percentages may vary slightly.

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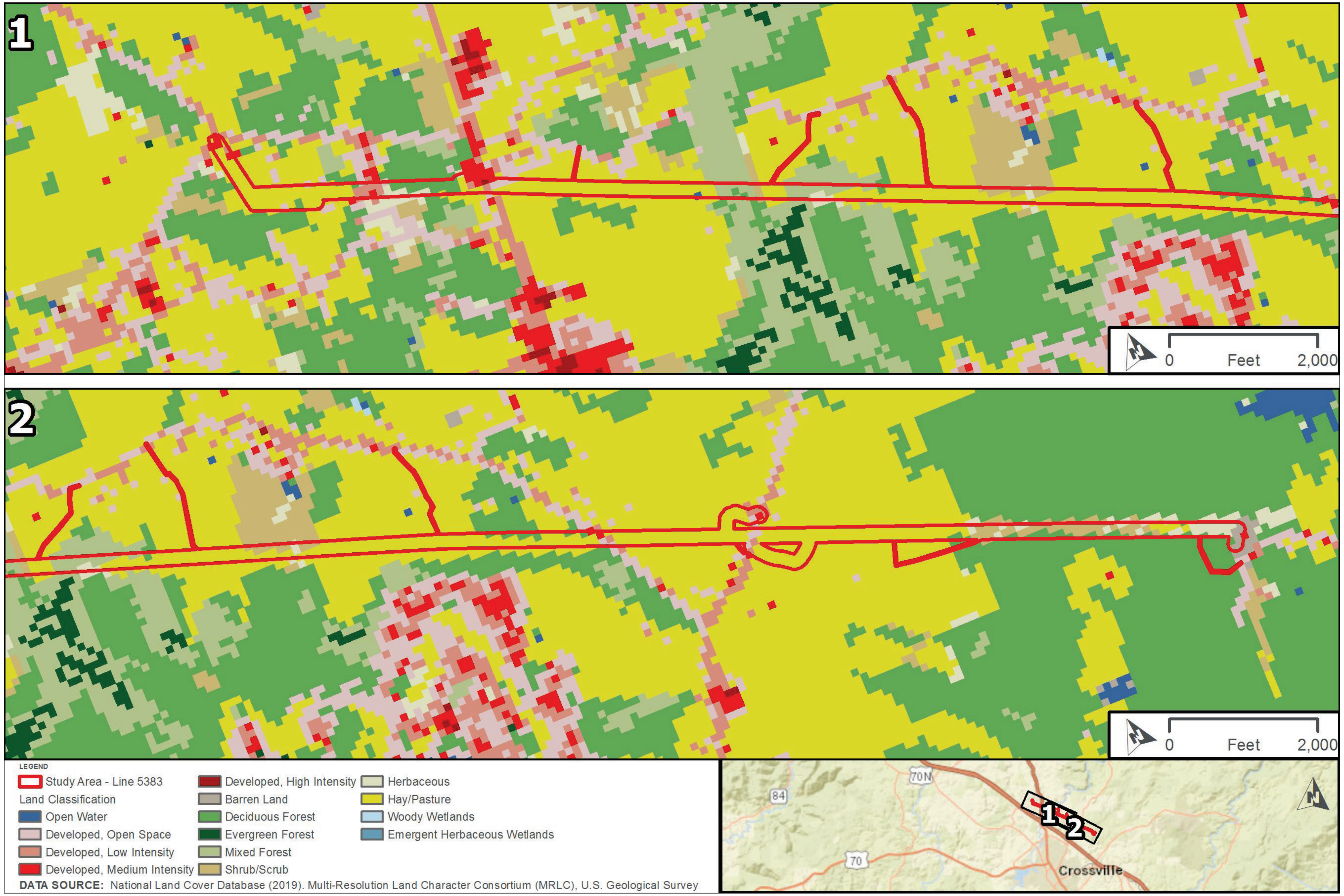

Figure 3.10-5. Land Cover Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Western Transmission Corridor (Source: NLCD 2019)

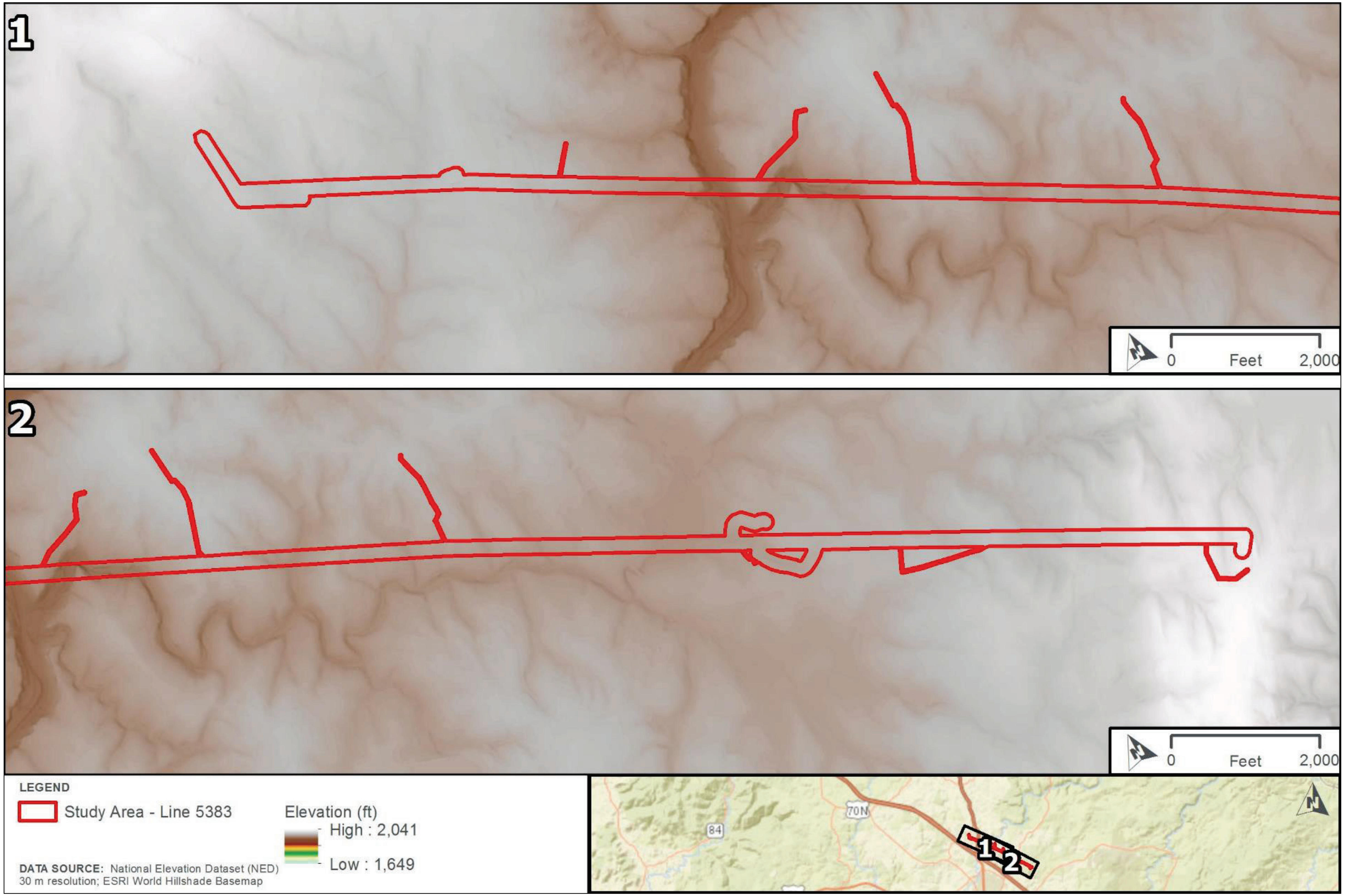

Figure 3.10-6. Elevation Within and Adjacent to the Proposed Alternative A Transmission Line Upgrades Along the Western Transmission Corridor

3.10.1.2.6 Construction and Operation of a Natural Gas Pipeline

Land use categories were identified in the ETNG Construction ROW based on the NLCD (Appendix C) and consist of agriculture, forest/woodland, wetland, open land, residential, industrial/commercial lands, and open water. A summary of the land use categories within the ETNG Construction ROW is provided in Table 3.10-5 and Table 3.10-6 (NRCS 2022). ETNG currently estimates that the acreage required for pipeline construction is approximately 2,515 acres with 756 acres being required for operations (ETNG 2023i). Elevations vary from low to high within the ETNG Construction ROW as it traverses five physiographic provinces including the peaks and valleys of the Valley and Ridge province, as illustrated in Figure 3.10-4a through Figure 3.10-4d.

Table 3.10-5 Land Cover Within and Adjacent to the Proposed Alternative A ETNG Construction ROW

Land Cover Types	Miles Crossed	% of Total ETNG Construction ROW
Open Land	17.4	14
Agricultural	50.9	42
Forested	46.4	38
Industrial/Commercial	2.4	2
Residential	0.7	1
Open Water	1.8	1
Wetland	2.8	2
Total	**122.4**	**100**

Source: ETNG 2023i

The predominate land use within the proposed Hartsville Compressor Station footprint is agriculture, with smaller areas of forest, industrial, open land, open water, and wetlands. The Columbia M&R Station vicinity is predominantly agricultural with smaller areas of forest and wetland, and the Texas Eastern and Midwestern Gas M&R area is industrial. The total workspace required for construction of the aboveground facilities associated with the gas pipeline is 82 acres. Approximately 44 acres would be required for operation.

Table 3.10-6. Land Cover Within and Adjacent to the Proposed Aboveground Facilities

Facility	Tennessee County	Existing or New	Existing Land Uses[1]	Predominate Land Use[1]	Construction (acres) [2]	Operation (acres) [3]
Hartsville Compressor Station	Trousdale	New	AG, FW, ID, OL, OW, W	AG	51.7	25.6
Columbia Gulf Receipt M&R Station	Trousdale	New	AG, FW, W	AG	10.8	3.9
Texas Eastern M&R Station and Midwestern Gas	Trousdale	Existing	AG, ID, OL	ID	2	2
Harriman Crossover	Morgan	New	FW	FW	3	2

Facility	Tennessee County	Existing or New	Existing Land Uses[1]	Predominate Land Use[1]	Construction (acres) [2]	Operation (acres) [3]
Jackon County Crossover	Jackson	New	AG	AG	5.1	1.4
Clarkrange Crossover	Fentress	New	FW, OL	FW	2.6	2.2
Kingston Meter Site	Roane	New	ID	ID	0.1	0.1
Mainline Valve Sites	Varies	New	Varies	Varies	6.3	6.3
	Total[4]				**81.5**	**43.5**

Source: ETNG 2023i

[1]Existing land uses within the proposed facility sites. OL = Open Land (non-agricultural), AG = Agricultural, FW = Forested/Woodland, ID = Industrial/Commercial, RE = Residential, OW = Open Water, W = Wetland

[2]All areas required for construction, including areas that would be identified as operational ROW after completion.

[3]Acreage includes the new permanent ROW for pipeline facilities and for aboveground facilities. Temporary construction workspace outside of these areas are to be restored.

[4]The totals shown in this table may not equal the sum of addends due to rounding.

3.10.1.3 Alternative B

3.10.1.3.1 East Tennessee TVA Power Service Area

TVA anticipates that a portion of the solar facilities proposed under Alternative B would need to be located within portions of the East TN region to offset transmission system upgrades that may be required following the retirement of KIF.

Forest land is predicted to decrease by up to 60 percent of 1997 base levels by 2060 in the majority of counties in TVA's region, with several counties in the vicinity of Memphis, Nashville, Huntsville, Chattanooga, Knoxville, and the Tri-Cities area of TN predicted to lose more than 25 percent of forest area (Wear and Greis 2013). Loss of forest area within TVA's region is primarily a result of increasing urbanization and development. Most of TVA's region in Eastern TN is expected to increase in urban land use by the year 2060 (Wear and Greis 2013).

Agriculture is a major land use in TVA's region. In 2012, 41 percent of the land area in TVA's region was farmland that comprised 151,000 individual farms (USDA 2014). Between 2012 and 2017, statewide data for TN show a slight increase in the number of farms (USDA 2019c). The number of small farms (between 1 and 9 acres) in TN has increased between 2012 and 2017, following a national trend (USDA 2019c). Average farm sizes range between 155 and 326 acres for states within TVA's region and have generally increased in size between 1997 and 2017. East TN farms typically grow hay, corn, and soybeans, as well as raising beef cattle.

In TN, cropland and pastureland comprise 17 and 16 percent, respectively, of rural, non-Federal land in 2017 (USDA 2018b). Both cropland and pastureland have decreased in area since 1982; however, the rate of cropland and pastureland loss in TN has declined between 2012 and 2015 (USDA 2018b). Farms in TVA's region produce a large variety of products that vary across the region. Region-wide, the major crop items by land area are forage crops (hay and crops grown for silage), soy, corn, and cotton. The major farm commodities by sales are cattle and calves, poultry and eggs, grains and beans, cotton, and nursery products (USDA 2014). Between 2012 and 2017, statewide data for TN shows decreases in the number of farms and acres producing short rotation woody crops (USDA 2019c).

Power from these facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA. As specific sites have not yet been determined for evaluation under this alternative, typical impacts of solar and transmission projects have been listed under Table 3.2-1 and Table 3.3-1.

3.10.2 Environmental Consequences

3.10.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to maintain and operate the KIF Plant, and TVA would implement all planned actions related to the current and future management and storage of CCRs, which have either been reviewed or would be reviewed in subsequent NEPA analyses. Existing land uses in the areas of the action alternatives would likely remain industrial and forested. No direct or indirect project-related effects would be expected to occur.

3.10.2.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

Under both action alternatives, TVA would retire, decommission, decontaminate, and deconstruct the KIF units and site. Land uses within the Kingston Reservation would remain industrial regardless of the action alternative selected to replace its generation. All previously approved CCR projects would continue to be implemented. Deconstruction of all aboveground structures within the project site to a depth of 3 feet below final grade would result in disturbance to the soil in the immediate vicinity of the structures. All structures with below-grade features would be filled with material from the deconstruction process as well as imported fill. As the entire project site is a previously disturbed area and would continue to be designated for nonagricultural purposes, no impacts to land use are anticipated. Once the D4 activities are completed, there is the potential for land use changes if the KIF Plant site is redeveloped. Cumulative effects to land use would not occur associated with the CCR management activities on the Kingston Reservation.

3.10.2.2.1 Environmental Justice Considerations

Effects to land use from D4 activities under Alternative A would be limited to the Kingston Reservation, where no EJ populations are present (Figure 3.4-3). Therefore, effects would not be disproportionate and adverse for EJ populations.

3.10.2.3 Alternative A

3.10.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Under Alternative A, TVA would retire and demolish the KIF units, and construct and operate a CC/Aero CT Plant on the Kingston Reservation. Areas within the demolition boundary not currently classified as industrial (i.e., hay/pasture, barren land, or forested areas) would be converted to industrial uses during the demolition process. Land use of the 55-acre CC/Aero CT Plant site would be permanently converted from 83.3 percent hay/pasture to developed. Although the 8.5 acres associated with the switchyard would be permanently filled for the construction of the switchyard, impacts would be minor as the site was previously disturbed for industrial use (Figure 3.10-1, Table 3.10-2). The parking/laydown area would be temporarily used, and the area would naturally regenerate to herbaceous/field condition following construction activities.

The activities associated with Alternative A would not have any indirect effects on land use, as further changes to the rural area would not be expected to be stimulated by the CC/Aero CT

Plant. The project could continue the current land's industrial use for at least 30 years. No cumulative effects to land use would occur.

3.10.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The 35 acres associated with the 3- to 4-MW solar facility would have minor permanent impacts to land use, as these sites were previously disturbed for use as an existing coal yard used for the KIF, as shown on Figure 2.1-5 (Figure 3.10-1, Table 3.10-2).

3.10.2.3.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

Changes to land use related to the 100-MW BESS depends on which site is selected. Battery site 1 (30 acres) would have the fewest impacts due to its location on previously disturbed land, which is already considered primarily medium- and high- intensity developed; therefore, land use would largely go unchanged for this site (Figure 3.10-1, Table 3.10-2). Battery sites 2 (35 acres) and 3 (40 acres) would have large permanent impacts, as these sites are both forested and would require vegetation clearing, grading, and fill prior to construction with final land use classified as developed.

3.10.2.3.4 On-site Transmission Upgrades

The NLCD classifies the on-site transmission corridor as primarily as hay/pasture with margins of forested area and small portions of developed land (Figure 3.10-1). Under Alternative A, the land use of this area would not change. TVA would make upgrades to the transmission line corridor and continue the regular maintenance schedule that the existing transmission line corridor currently undergoes.

Changes in land use would occur with the installation of the Battery Transmission Corridor. According to the NLCD, this corridor consists of mostly forested land (Figure 3.10-1), which would undergo permanent land use (and habitat) conversion to maintained herbaceous, hay/pasture, or shrub/scrub area.

3.10.2.3.5 Off-site Transmission Upgrades

Under Alternative A, the land use of the off-site transmission corridors would not change. TVA would make upgrades to the transmission line corridors and continue the regular maintenance schedule that these areas currently undergo.

3.10.2.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 8 (ETNG 2023i) was filed with FERC in July 2023 (ETNG 2023a). TVA has reviewed this information to support a thorough and independent evaluation of the affected environment. TVA concurs with the land use-related findings in ETNG's Resource Report 8. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). Anticipated impacts to land use in the ETNG Construction ROW from the construction, operation, and maintenance of the pipeline would include installation of the pipeline and construction and operation of the new compressor station and M&R stations identified as the ETNG Construction ROW. Permanent conversion of current land uses would be limited to the aboveground facilities and where forested land is converted to maintained open space along the pipeline ROW.

As described in ETNG's Resource Report 8 (ETNG 2023i), a substantial portion of the proposed pipeline corridor would be located along existing ROW:

> [ETNG] plans to collocate the proposed pipeline with the existing 3100 Line ROW to the maximum extent practicable. Approximately 111 miles (91 percent) of the 122 miles of [Construction ROW] pipeline facilities will be located within or adjacent to [ETNG]'s existing 3100 Line ROW. Of the 111 miles along or adjacent to the existing 3100 Line ROW, [ETNG] has dual line rights along 90 miles. [ETNG] will negotiate with landowners to acquire additional ROW along approximately 15 miles of the collocated pipe, and for the remaining 6 miles, [ETNG] will negotiate with landowners to acquire additional line rights.
>
> The proposed pipeline will deviate from the existing ROW in select areas due to prior development on top of or immediately adjacent to the ROW that inhibits construction, avoiding or minimizing impacts to sensitive features, lack of dual line rights, and constructability challenges. Where collocated, the new pipeline will typically be offset from the existing 3100 Line by approximately 25 feet. In these areas where the proposed pipeline is parallel and adjacent to existing pipeline ROW, the construction ROW will overlap with the maintained existing 3100 Line ROW. […] In addition to the existing 3100 Line ROW, approximately 1.8 miles of the proposed pipeline will be collocated with a power transmission ROW.

In upland areas, routine maintenance would involve clearing the entire 50-foot-wide ROW every 3 years. However, to facilitate periodic corrosion surveys, a 10-foot-wide strip centered on the pipeline may be mowed annually to maintain herbaceous growth. In wetlands and riparian areas, routine maintenance would involve maintenance at a frequency necessary to maintain a 10-foot-wide corridor centered on the pipeline in an herbaceous state and removal of trees within 15 feet of the pipeline in accordance with FERC's Procedures. Forested land would be permanently converted to herbaceous and scrub-shrub land within the permanent easement because of maintenance.

See Table 3.10-7 for a comprehensive list of land use types impacted by pipeline facilities.

Table 3.10-7. Land Uses Affected by Construction and Operation of the Pipeline (in acres)

Facility	Agricultural		Forested/ Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	C*	O**	C*	O**	C*	O**	C*	O**	C*	O**	C*	O**	C*	O**	C*	O**
Pipeline Right-of-Way[1]	611.4	297.4	376.1	46.6	30.3	17.5	405.1	318.5	12.9	4.9	8.6	3.8	24.8	13.8	**1,469.2**	**702.5**
ATWS	163.3	0.0	136.2	0.0	5.8	0.0	45.1	0.0	0.8	0.0	1.7	0.0	1.1	0.0	**354.0**	**0.0**
Pipe/Contractor Yards	0.0	0.0	16.4	0.0	503.0	0.0	21.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**541.1**	**0.0**
Access Roads	17.2	6.7	16.5	0.8	24.8	1.1	8.4	0.4	0.1	0.0	1.7	0.7	<0.1	0.0	**68.6**	**9.7**
Aboveground Facilities																
Hartsville Compressor Station[3]	50.5	25.6	0.6	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1	0.0	**51.7**	**25.6**
Columbia Gulf Meter Station	8.0	3.9	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	**10.8**	**3.9**
Texas Eastern and Midwestern Gas M&R	0.9	0.9	0.0	0.0	1.0	1.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	**2.0**	**2.0**
Harriman Crossover	0.3	0.0	2.7	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**3.0**	**2.0**
Jackson County Crossover	5.0	1.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**5.1**	**1.4**
Clarkrange Crossover	0.0	0.0	2.5	2.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	**2.6**	**2.2**
Mainline Valves	4.3	4.3	0.9	0.9	0.2	0.2	0.8	0.8	0.0	0.0	0.1	0.1	0.0	0.0	**6.3**	**6.3**

Facility	Agricultural		Forested/ Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	C*	O**	C*	O**	C*	O**	C*	O**	C*	O**	C*	O**	C*	O**	C*	O**
Kingston Meter Site	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	**0.1**
Aboveground Facilities Subtotal:	*69.0*	*36.1*	*9.4*	*5.0*	*1.5*	*1.3*	*1.0*	*1.0*	*0.3*	*0.0*	*0.1*	*0.1*	*0.3*	*0.0*	***81.6***	***43.50***
GRAND TOTAL	**860.9**	**340.3**	**554.6**	**52.4**	**565.4**	**19.8**	**481.2**	**319.9**	**14.1**	**5.0**	**12.1**	**4.6**	**26.2**	**13.8**	**2,514.5**	**755.7**

Source: ETNG 2023i

*C = Construction; all areas required for construction, including areas that would be identified as operational ROW after pipeline completion.

**O = Operational; acreage includes the new permanent ROW for pipeline facilities, permanent access roads, and aboveground facilities. Temporary construction workspaces outside of these areas are to be restored.

[1]Includes area both within and outside of existing ROW.

[2]All areas outside of existing easement.

The land types along the pipeline ROW, as described in ETNG's Resource Report 8 (ETNG 2023i), are identified below:

> Agricultural Land
>
> Agricultural land in the [Ridgeline Expansion] project area is used predominantly for row crops (corn, wheat), sod, hay crops and pasture, and cattle. No specialty crops, organic farms, or tree farms will be impacted (USDA 2022a). The [Ridgeline Expansion] project will temporarily impact approximately 861 acres of agricultural land, which includes 286 acres of agricultural land within [ETNG's]s existing permanent ROW. The primary impacts on agricultural land during construction will include temporary reductions in agricultural production in areas of cultivated cropland and potential reduced yields of future crops. Agricultural land in the construction area generally will be taken out of production for one growing season. Impacts on prime farmland are discussed in more detail in ETNG's Resource Report 7 (ETNG 2023h). Landowners will be compensated for crop loss during construction.
>
> In accordance with the Erosion and Sediment Control Plan and FERC Upland Erosion Control, Revegetation, and Maintenance Plan (FERC Plan), and in coordination with the landowner, [ETNG] will segregate topsoil in agricultural land. Topsoil will be stockpiled separately from the subsoil on the construction ROW. Topsoil will be replaced in the proper order during backfilling and final grading to help ensure postconstruction revegetation success. Although no drain tiles or irrigation systems have been identified by landowners to date, [ETNG] will monitor and repair any drain tiles affected by construction and will maintain irrigation systems unless otherwise coordinated with the landowner.
>
> Approximately 340 acres of agricultural land will be affected by operation of the [Construction ROW], including 297 acres within the permanent pipeline ROW. The 50-foot-wide portion of the permanent ROW will be maintained, centered on the new pipeline; however, as agricultural lands will be restored to pre-construction use and crops can be planted in the permanent ROW, there will be no permanent impact associated with the operation of the pipeline. The remaining 43 acres will be permanently converted to industrial land for permanent access roads and operation of the aboveground facilities.
>
> [ETNG] met with the University of Tennessee Extension's (N Ag Extension) Agriculture and Natural Resources Team to discuss agricultural practices in the Project area. The TN Ag Extension indicated it will provide information on topsoil depth, topsoil testing and segregation, soil restoration best practices, noxious weeds, and preferred seed mixes. Coordination with the TN Ag Extension is ongoing.
>
> Forest/Woodland
>
> Various stands of mixed hardwood forest intersect the pipeline corridor] and are more fully described in [ETNG]'s Resource Report 3, Section 3.4.2 [(ETNG 2023d)].[46] These forests have not been identified as old growth, are not used for

[46] According to ETNG's Resource Report 3, Table 3.4-1, 483 acres of forest would be temporarily impacted, and 271 acres would be permanently impacted (ETNG 2023d).

forest product production and have not been identified as critical habitats or habitats of concern.

The [Ridgeline Expansion] project will temporarily impact approximately 555 acres of forest/woodland land. Upland forests and woodlands will be cleared of trees and woody vegetation within [Ridgeline Expansion] project workspaces to provide an adequate and safe work surface. After construction, trees and vegetation would typically be allowed to regrow in areas used TWS and ATWS. Forested areas within the 50-foot-wide portion of the permanent ROW would undergo routine vegetation maintenance every 3 years; these areas are converted to open land and would not be restored to forest. Forested areas crossed by HDD would not undergo routine vegetation maintenance between the HDD entry and exit pits. Approximately 52 acres of forested land will be affected by operation of the [Ridgeline Expansion] project, including 46 acres within the proposed permanent pipeline ROW. The remaining 6 acres will be permanently converted to industrial land for permanent access roads and operation of the aboveground facilities.

[ETNG] will work with landowners to maintain access to wooded portions of their property during pipeline construction, as requested. In obtaining land rights, [ETNG] will fully compensate landowners for the value of trees felled based upon a timber appraisal provided by a local timber expert.

<u>Industrial/Commercial Land</u>
Industrial/commercial land includes natural gas utility facilities, manufacturing or industrial plants, commercial facilities, and roads. Road crossings would be completed using open cut, conventional boring, or HDD methods as described in Section 1.5.1.8 of Resource Report 1 [ETNG 2023b]. Industrial land used for TWS, ATWS, or contractor yards would be restored to pre-construction condition and use.

Approximately 565 acres of industrial land will be utilized during construction of the [Ridgeline Expansion] project. Approximately 2 acres of industrial land will be used for permanent access roads and operation of the aboveground facilities.

Construction and operation of the [Ridgeline Expansion] project will not affect operations of industrial or commercial facilities. Impacts to the industrial and commercial properties will be minimized through the erosion and sedimentation control methods described in the FERC Plan and FERC Procedures.

<u>Open Land</u>
Open land consists of open fields, existing ROW, herbaceous and scrub-shrub upland areas, and non-forested upland areas. Approximately 481 acres of open land will be temporarily impacted during construction of the [Ridgeline Expansion] project, which includes 334 acres of open land within [ETNG]'s existing permanent ROW. Open land areas within TWS and ATWS areas would be allowed to revert to open land use after completion of construction.

Permanent impacts on open land after construction will be primarily limited to the operational pipeline ROW. Routine vegetation maintenance will be conducted within a 50-foot-wide strip of the permanent ROW with a frequency of not more than once every three years. In addition, a 10-foot-wide strip over the pipeline will be maintained in an herbaceous state by mowing, cutting, and trimming on an annual basis. Approximately 01.4 acres of open land will be converted into industrial land for permanent access roads and operation of the aboveground facilities.

Open Water

Approximately 14 acres of open water will be crossed during construction of the [Ridgeline Expansion] project. Open water includes waterbodies greater than 100 feet in width. Major waterbody crossings and proposed crossing methods are identified in [ETNG's] Resource Report 2 [ETNG 2023c], Table 2.3-3. Resource Report 2 also provides detailed information on potential waterbody effects associated with construction and operation of the [Ridgeline Expansion] project, as well as minimization measures.

Residential Land

Approximately 12 acres of residential land will be impacted by construction activities within the [Ridgeline Expansion] project. Upon completion of construction, residential lands will be restored to pre-construction conditions to the extent practicable. Landowners will be notified of planned construction activities a minimum of seven days prior to construction. Traffic in residential areas will be managed as described in Section 8.3. [of ETNG's Resource Report 8], and speed limits will be strictly controlled for construction equipment and associated vehicles. Water trucks will be used to spray down the construction area if dust control is needed. In addition, [ETNG] is coordinating with landowners and has adopted modifications to workspaces based on landowner input.

Wetlands

Approximately 26 acres of wetland will be temporarily impacted during construction of the [Ridgeline Expansion] project within largely reduced construction ROWs, of which approximately 14 acres will be affected by operation. Wetlands are discussed further in [ETNG's] Resource Report 2 [ETNG 2023c]. Resource Report 2 also provides detailed information on potential wetland effects associated with construction and operation of the [Construction ROW], as well as minimization measures.

Special Land Uses

Special land uses include areas such as land associated with schools, parks, places of worship, cemeteries, sports facilities, campgrounds, golf courses, and ball fields. [ETNG] reviewed field reconnaissance results, aerial photography, and USGS 7.5-minute topographical maps to identify special land uses crossed by the [Ridgeline Expansion] project. Special lands crossed by the [Ridgeline Expansion] project are summarized in Table 3.10-8.

Table 3.10-8. Special Land Uses Crossed by the Project

Milepost	Special Land Use	Distance from Construction Work Area (feet)	Distance from Pipeline Centerline (feet)
15.3	Property owned by church – no building identified	N/A	N/A
52.8	Church building	165	200
69.4	Church building	10	85

Milepost	Special Land Use	Distance from Construction Work Area (feet)	Distance from Pipeline Centerline (feet)
74.9	Church building	75	85
77.3	Church building	35	50
82.7	Church building	55	70
108.0	Church building	60	100
109.4	Church building	25	155

> Planned Residential and Commercial Areas
> [ETNG] reviewed publicly available information from the reviewed publicly available information from the counties and townships crossed by the Project to identify planned developments in the Project area. To date, East Tennessee has identified one planned residential subdivision within 0.25 mile of the Project; no commercial developments have been identified.

Overall, permanent adverse impacts would occur to all land use types aside from open land, as all other land use types would be permanently converted to maintained open land. Open land would be temporarily impacted during construction but would revert to open land during operations.

3.10.2.3.7 Summary of Alternative A

TVA Proposed Actions

Permanent impacts to land use would occur because of Alternative A. The approximately 55 acres associated with the CC/Aero CT Plant would be converted from largely hay/pasture to industrial. The land use of the existing on-site transmission corridor would continue as largely deciduous forest, developed medium/high intensity area, and hay/pasture. Land use of the proposed Battery Transmission Corridor would change from forested areas to herbaceous, hay/pasture, or scrub/shrub. Temporary impacts from disturbance during construction or upgrades would not result in long-term land use changes, as the areas would return to their original land use type after construction is completed.

The 8.5 acres associated with the switchyard, 8.2-acre parking/laydown area, and 35 acres associated with the solar facility site would have minor to negligible impacts to land use, as these sites were previously disturbed for industrial use. Temporary impacts would be imposed during construction. Depending on which battery site is selected, 30-40 acres may be impacted. No changes to land use would occur if Battery Site 1 is chosen, as this area already consists of medium and high intensity development. Battery sites 2 (35 acres) and 3 (40 acres) would have large permanent impacts, as these sites are both forested and would require vegetation clearing prior to construction, with ultimate change in land use to developed area. Additional impacts to land use may occur because of transmission lines, structures, and connections associated with the BESS. Overall, moderate, adverse, permanent impacts would occur due to Alternative A construction.

Cumulative effects to land use on the proposed CC/Aero CT Plant site are anticipated to be minor as most of the site consists of previously disturbed habitat that holds little conservation value. Disturbed areas would be revegetated with native species, and clearing and other vegetation management activities would be minimized to the extent possible.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Pipeline construction would impact 481.2 acres of open land temporarily and 319.9 acres permanently; 860.9 acres of agricultural land temporarily and 340.3 acres permanently; 554.6 acres of forested land temporarily and 52.4 acres permanently; 12.1 acres of residential area temporarily and 4.6 acres permanently; and 26.2 acres of wetlands temporarily and 13.8 acres permanently, including aboveground facilities. Overall, moderate, adverse, permanent, and temporary impacts would occur due to Alternative A construction.

Cumulative effects to land use for the ETNG Construction ROW would be minor. The ETNG Construction ROW would be primarily collocated with existing ROWs to minimize effects of forest fragmentation. A summary of expected impacts to land use under Alternative A are described in Table 3.10-7.

3.10.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to land use that would occur because of the proposed CC/Aero CT Plant construction would be limited to the Kingston Reservation. The effects to land use on the Kingston Reservation would have no impact on EJ populations since none reside on the property.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

Construction of the natural gas pipeline and associated structures would change land uses permanently as summarized in the previous section. Some land uses changes, particularly those related to agricultural and residential uses, would likely result in impacts to human populations, which may include EJ populations. As such, the construction of the ETNG Construction ROW would be likely to result in disproportionate and adverse effects to EJ populations due to their economic vulnerabilities.

3.10.2.4 Alternative B

3.10.2.4.1 Construction and Operations of Solar and Storage Facilities

Under Alternative B, TVA would construct and operate 1,500 MW of solar and 2,200 MW of battery storage at various sites within portions of East TN, which would require about 10,950 acres for the solar facilities and 828 acres for the battery storage facilities. Most operating and planned and approved TVA utility-scale solar facilities have been constructed on previously cleared pasture, hayfield, or crop land, and most have required little grading to smooth or level the site. Almost all TVA solar projects have affected farmland and resulted in changing the land use of farmed portions of the facility sites from agricultural to industrial. Although construction and operation of the PV facility usually eliminates agricultural production on the area, it typically does not adversely affect soil productivity or the ability to resume agricultural production once the PV facilities are removed. Impacts to farmland, particularly areas designated as prime farmland, are described in more detail in Section 3.5. Forested portions of the sites were also changed to industrial land use. Other land uses on or in the vicinity of the solar facilities have generally not been affected (Table 3.2-1). The current land use and zoning of a site is a factor in the solar and storage site selection process, and some communities in TVA's region have ordinances addressing solar facilities. Some of these facilities require screening to reduce visual/land use impacts. The land area required for battery storage facilities is typically only a few acres and construction-related impacts are minor.

Based on typical impacts of solar sites, Alternative B would result in the conversion of about 8,825 acres of largely agricultural land to industrial use[47], although livestock grazing is likely occurring now on at least some of the solar facility sites (Table 3.2-1). Revegetation of solar sites with native and/or non-invasive grasses and herbaceous vegetation would help minimize effects to open, grassy habitats.

Future projects in the geographic area of analysis that include use of undeveloped lands to support industrial or other intensive developments could result in a change in land use. In addition to the 1,500 MW of solar facilities under Alternative B, TVA is proposing to add 10,000 MW of solar by 2035 to meet customer demands and system needs. This would also change undeveloped or agricultural sites to industrial land use. The combined effect of these future land development actions and Alternative B would likely result in cumulative effects in land use changes. However, in view of the relatively large areas of rural and undeveloped lands within the counties selected, cumulative impacts on land use are expected to be moderate.

3.10.2.4.2 Transmission and Other Components
New transmission line connections and substations would typically be on or immediately adjacent to the solar or storage facilities, and they would be planned to minimize adverse land use impacts. New transmission lines would eliminate forest management land use within the maintained ROW but not agricultural land use. New substations and switching stations would result in conversion to industrial land use. Cumulative effects to land use would also occur from additional transmission lines and substations associated with the addition of 10,000 MW of solar TVA plans to implement by 2035 (TVA 2019a).

3.10.2.4.3 Environmental Justice Considerations
Based on the number of solar sites that would be needed to replace generation at KIF, there is potential for moderate effects to land use through conversion of agricultural land, particularly cropland, to developed land with the potential for later restoration of agricultural use. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.11 Transportation
Assessment of traffic effects for projects is based on the transportation planning and engineering concept of level of service (LOS). LOS, as defined by the Federal Highway Administration, is a qualitative assessment of a road's operating conditions and reflects the relative ease of traffic flow on a scale of A to F, with a free-flowing intersection or roadway being rated LOS A and highly congested conditions rated LOS F (Federal Highway Administration, 2022). The LOS and capacity are measurements of the ability of an intersection or a roadway to accommodate design traffic volumes. LOS data was not available for the area near the Kingston Reservation.

3.11.1 Affected Environment

3.11.1.1 Kingston Reservation (No Action and D4 Activities)
The Kingston Reservation is served by highway, railway, and waterway modes of transportation. The closest airport is the Meadowlake Airport (a private airport), 5.6 miles south of the site. The closest public use airport is Rockwood Airport, approximately 8.0 miles west of the Kingston Reservation. A rail line owned by both CSX and Norfolk

[47] Table 3.2-1: (7.3 acres per MW x 1,500 MW added) = (10,950 acres required x 80.6% prime farmland conversion) = 8,825 acres converted from largely agricultural land to industrial use

Southern runs through the plant and makes a loop around the northeastern section of the KIF Reservation, which contains the ash pile, a pond, and a large, forested area (TVA 2019c).

There are two points of access to the Kingston Reservation. Primary arterial roadway access is provided by I-40 to HW-70, then to Swan Pond Road that crosses the reservation to the northwest of the KIF Plant, or to Steam Plant Road, which serves as the main employee entrance and access route for the eastern portions of the Kingston Reservation. Existing traffic conditions generated by KIF are composed of a mix of cars and light duty trucks, as well as medium duty to heavy duty trucks. The 2020-21 Annual Average Daily Traffic (AADT) (TDOT 2023) counts for key roadways that serve the Kingston Reservation, all of which are 2-lane, are presented in Table 3.11-1.

Table 3.11-1. Average Daily Traffic Volume (2020-21) on Major Roadways Near Kingston

Location (Station Number)	Existing AADT
Steam Plant Road (73000013)	2,556
I-40 south of the Kingston Reservation (73000062)	49,070
Highway 70 south of the Kingston Reservation (73000038)	11,173

Source: TDOT 2023

3.11.1.2 Alternative A

3.11.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The proposed CC/Aero CT Plant site may be accessed by an unnamed existing road in the KIF Plant; however, no traffic data is available from TDOT for this road. Steam Plant Road connects to this unnamed road and serves as the nearest traffic data point. The 2020-21 AADT (TDOT 2023) counts for key roadways near the Kingston Reservation are presented in Table 3.11-1.

3.11.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.11.1.1 apply to the proposed 3- to 4-MW solar facility location on the Kingston Reservation.

3.11.1.2.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.11.1.1 apply to the proposed 100-MW BESS on the Kingston Reservation.

3.11.1.2.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission connections to the proposed CC/Aero CT Plant and switchyard. TVA would also install new transmission lines for the proposed battery station (Battery Transmission Line Connections). Therefore, the affected environment for on-site transmission upgrades is described in Section 3.11.1.1.

3.11.1.2.5 Off-site Transmission Upgrades

Under Alternative A, TVA would upgrade existing transmission lines in the Eastern Transmission Corridor (L5108, L5116, L5208, L5302, and L5381) originating at the Kingston Reservation, and the Western Transmission Corridor (L5383) located in western TN. Descriptions of these improvements are provided in Section 2.1.3.5.

Eastern Transmission Corridor

The Eastern Transmission Corridor extends eastward from the Kingston Reservation, terminating in the city of Oak Ridge. Several access roads are proposed largely along routes that have already been cleared. Larger roadways, such as I-40, SR-58, SR-95, SR-61, and SR-62, would be used to access the corridor along with a number of smaller, rural roads in the vicinity of the corridor.

Western Transmission Corridor

The Western Transmission Corridor (L5383) extends southeast from a substation in unincorporated Crossville on Plateau Road and terminates north of the Crossville city limits. Larger roadways, such as I-40, SR-127, and SR-298, would be used to access the corridor along with several smaller, rural roads in the vicinity of the corridor.

3.11.1.2.6 Construction and Operation of a Natural Gas Pipeline

The proposed gas pipeline overview map is shown in Figure 2.1-5. The ETNG Construction ROW is served by highway and railway modes of transportation. The 2020-21 AADT counts are presented in Table 3.11-2. The proposed ETNG Construction ROW intersects a number of major roadways, including Hwy 25, Hwy 141, Hwy 80, Hwy 85, Hwy 53, Hwy 56, Hwy 135, Hwy 136, Hwy 111, Hwy 84, Hwy 164, Hwy 62, Hwy 127, Hwy 27, and Hwy 61, in addition to a number of smaller rural and local roadways.

Table 3.11-2. Average Daily Traffic Volume (2020-21) on Roadways Intersected by Alternative A Pipeline

Location (Station Number)	Existing AADT
Hwy. 25 W. Near Sumner Co Line (85000025)	6,876
Hwy. 141, River St. Hartsville (85000045)	6,214
Hwy. 25 E. Near Smith Co Line (85000040)	5,124
Hwy. 80, Pleasant Shade Hwy North of Carthage (80000017)	1,728
Hwy. 85, Gladdice Hwy. Near Smith Co Line (44000065)	674
Hwy. 53, Granville Hwy. SW of Gainesboro (44000042)	516
Hwy. 56, S. Grundy Quarles Hwy. Near Putnam Co Line (44000062)	4,074
Hwy. 135, Dodson Branch Rd. Near Jackson Co Line (71000138)	2,958
Hwy. 136, Hilham Rd. N of Cookeville (71000064)	5,128
State Hwy. 111 Near Overton Co Line (71000168)	16,629
State Hwy. 84 Near Putnam Co Line (67000041)	2,973

Location (Station Number)	Existing AADT
Hwy. 164, Hanging Limb Rd. Near Hanging Limb (67000044)	1,493
Hwy. 62, W. Deer Lodge Hwy. W. Clarkrange (25000038)	4,289
Hwy. 127, S. York Hwy. S. Clarkrange (25000037)	5,309
Hwy. 27, Morgan County Hwy. E. of Wartburg (65000028)	4,266
State Hwy. 61 Northeast of Harriman (73000097)	4,329

Source: TDOT 2023

3.11.1.3 Alternative B

3.11.1.3.1 East Tennessee TVA Power Service Area

TVA anticipates that the solar facilities proposed under Alternative B would be located within portions of the East TN region in order to offset transmission system upgrades that may otherwise be required following the retirement of KIF. As specific sites have not yet been determined for evaluation under this alternative, typical transportation impacts of solar and storage construction and transmission projects have been listed in Table 3.2-1 of Section 3.2 and Table 3.3-1 of Section 3.3.

3.11.2 Environmental Consequences

3.11.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to maintain and operate KIF. TVA would implement all planned actions related to the current and future management and storage of CCRs at the coal plants, which have either been reviewed or would be reviewed in subsequent NEPA analyses. Under this alternative, traffic to and from the fossil plant would remain the same.

3.11.2.2 Retirement, Decommissioning, Deactivation, Decontamination, and Deconstruction of KIF Plant

Although traffic on HW-70, Steam Plant Road, and Swan Pond Road may increase during D4 activities as equipment is transported on and off-site, traffic would ultimately be reduced as a result of deconstruction of the KIF Plant. Routine KIF Plant deliveries would be discontinued, including coal and limestone, and employment at KIF would be reduced.

Traffic is assumed to be distributed during a peak morning period (to the site) and a peak evening period (away from the site). Deconstruction-related vehicles (e.g., dozers, excavators, articulating dump trucks, backhoes, graders, loaders) would be delivered to or removed from the proposed project sites on flatbed trailers. The routes affected by this increased traffic volume have not yet been determined, but it can be assumed that the roadways listed in Table 3.11-1 would likely be affected. Overall, the traffic volume generated by the construction workforce and the construction-related vehicles would be relatively minor and temporary.

Most of the deconstruction materials would be transported by truck and train off-site for recycling and disposal at approved landfills. Recycling and disposal sites have not been determined at this time; thus, haul routes cannot be specified. However, it is estimated that there likely would be an increase in trips near the site for waste disposal and recycling, which would cause minor and temporary increases in traffic volume.

TVA may elect to develop a traffic management plan, if deemed necessary. TVA may also elect to implement a reclamation process to recover the maximum amount of reusable fuel from the stockpiled material. Stockpiled coal would be burned on-site, prior to retirement. Any remaining product would be transported off-site for use or disposal. Scrap metal and other recyclable material would be transported to locations as determined by the demolition contractor. The remaining material would be hauled to the off-site landfill for disposal. Hazardous material, PCBs, used oil, and universal waste would be disposed of off-site with vendors/locations on TVA's Environmental Restricted Awards List.

Based on this level of use, impacts to traffic operations are expected to be relatively minor. Implementation of this action would cause minor impacts to the roadway network and localized roadway degradation along the route to the off-site destinations because of increased truck traffic. In addition, the proposed transport of material stockpiled on the site over public roadways would result in an increase in the number of vehicle miles traveled on those roadways. It is anticipated that the additional trips required for waste disposal and project traffic would not change the existing level of service of roadways near the site. However, the increase in vehicle miles is a factor in injury and fatal traffic crash rates. Therefore, there would be a minor impact related to increased traffic and driver safety.

Cumulative impacts to roadways may occur as a result of the CCR management activities also occurring on the Kingston Reservation, especially if the D4 and CCR management construction occur at the same time. TVA would mitigate congestion or delays near the project sites by implementing appropriate traffic controls, as needed, such as by staging of trucks, spacing logistics, staggering work shifts, or timing truck traffic to occur during lighter traffic hours. With implementation of these mitigation measures, cumulative impacts of the proposed actions to transportation are expected to be minor.

3.11.2.2.1 Environmental Justice Considerations

Effects to transportation that may occur as a result of KIF retirement and D4 activities are not anticipated to have disproportionate and adverse effects on EJ populations. Effects to EJ populations, if any, would be temporary, minor, and concentrated primarily on Interstate 40, Highway 70, Steam Plant Road, and Swan Pond Road within a relatively small area around the Kingston Reservation, where EJ populations are not present.

3.11.2.3 Alternative A

3.11.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Vehicular traffic on public roads near the Kingston Reservation would increase during construction due to construction workers and materials moving to and from the plant. The average construction workforce would be about 500 people with occasional higher peaks. TVA estimates a maximum of 300 workers would be employed on-site at the peak of the approximately three-year construction period. This does not include the construction workforce needed for transmission line upgrades, as this work is not centralized in one location for any significant period of time. Temporary gravel parking lot(s) would be constructed on-site to provide adequate parking for construction staff. Construction materials and plant components would primarily be delivered by truck. However, based on dimensions of some components and to reduce potential impacts on local traffic, oversized objects exceeding local roadway dimensions may be delivered by barge and unloaded at the existing barge landing.

Project materials and equipment would be delivered to the CC/Aero CT Plant site by highway for smaller items and railway or waterway for larger items. Roads within the Kingston Reservation would be maintained during the construction process. Any temporary access roads constructed off-site would be designed in accordance with USDOT and relevant local requirements. Equipment used during the construction phase would include trucks, truck-mounted augers and drills, excavators, as well as tracked cranes and bulldozers. Once constructed, the number of employees needed to operate the CC/Aero CT Plant would be reduced from the number of employees required to operate the KIF Plant.

Hazardous materials, PCB, used oil, and universal waste would be sent for off-site disposal/recycling with vendors/locations on TVA's Environmental Restricted Awards List. Nonhazardous wastes would be sent for disposal as directed by the contractor. During construction, it can be assumed that there would be an increase in trips near the site for waste disposal and recycling, which would cause minor and temporary increases in traffic volume.

Workforce traffic would mainly consist of a mix of passenger cars and light duty trucks. Traffic is expected to be distributed during a peak morning period (to the site) and a peak evening period (away from the site). Assuming one person per commuting vehicle, there would be a daily average morning inbound traffic volume of 500 vehicles and a daily outbound traffic volume of 500 vehicles for a total of 1,000 vehicles per day with a maximum of 1,200 vehicles per day. Additional traffic may cause some delays. Overall, the impact from traffic volume generated by the construction workforce and the construction-related vehicles would have a moderate, temporary impact.

Implementation of this alternative would cause minor disturbances to the roadway network, and localized roadway degradation along the route to the off-site destinations because of increased truck traffic. Anticipated changes in traffic volume on nearby roadways during construction of Alternative A on the Kingston Reservation are provided in Table 3.11-3. The temporary increased traffic over public roadways would result in an increase in the number of vehicle miles traveled on those roadways. This increase in vehicle miles is a factor in injury and fatal traffic crash rates and would have a minor impact related to increased traffic and driver safety.

Table 3.11-3. Changes in Traffic on Nearby Roadways During Construction of the Alternative A CC/Aero CT Plant

Location (Station Number)	Existing AADT	Existing AADT Plus Construction Traffic	Temporary Traffic Increase during Construction (%)
Steam Plant Road (73000013)	2,556	3,556	39.1%
I-40 south of the Kingston Reservation (73000062)	49,070	50,070	2.0%
Highway 70 south of the Kingston Reservation (73000038)	11,173	12,173	9.0%

Source: TDOT 2023

Cumulative impacts to roadways may occur because of the CCR management activities also occurring on the Kingston Reservation, especially if the D4 activities and CCR management construction occur at the same time. TVA would mitigate congestion or delays near the project sites by implementing appropriate traffic controls, as needed such as by staging of trucks, spacing logistics, staggering work shifts, or timing truck traffic to occur during lighter traffic hours. With implementation of these mitigation measures, cumulative impacts of the proposed actions to transportation are expected to be minor.

3.11.2.3.2 Construction and Operation of a 3- to 4-MW-Solar Facility on the Kingston Reservation

Impacts to traffic from the construction of the proposed solar facility would be less than the impacts associated with the construction of the CC/Aero CT Plant and switchyard and only slightly increase the transportation impacts described in Section 3.11.2.3.1. On average, 2 to 4 workers per MW would likely be required during construction (TVA 2017a, 2020d). Increased traffic levels during construction would be a minor, temporary impact and would add to the overall traffic impacts anticipated from Alternative A.

3.11.2.3.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

Impacts to traffic from the construction and operation of the proposed BESS would be less than the impacts associated with the construction of the CC/Aero CT Plant and switchyard and only slightly increase the transportation impacts described in Section 3.11.2.3.1. Increased traffic levels during construction would be a minor, temporary impact and would add to the overall impacts anticipated from Alternative A.

3.11.2.3.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission connections to the proposed CC/Aero CT Plant and switchyard. TVA would also install Battery Transmission Line Connections for the proposed battery facility. Therefore, the environmental consequences for on-site transmission upgrades on transportation are the same as those described in Sections 3.11.2.2 and 3.11.2.3.1.

3.11.2.3.5 Off-site Transmission Upgrades

Minor transportation impacts would occur during the upgrades proposed within the Eastern Transmission Corridor and Western Transmission Corridor as a result of increased workforce traffic during the construction of the transmission upgrades associated with Alternative A, described in Section 2.1.3.5.2. This work is not centralized in one location for any significant period of time. As transmission workforce has not been estimated, a quantitative analysis of the traffic change as a result of these upgrades cannot be conducted at this time.

The temporary increased traffic over public roadways would result in an increase in the number of vehicle miles traveled on those roadways. This increase in vehicle miles is a factor in injury and fatal traffic crash rates and would have a minor temporary impact related to increased traffic and driver safety. No cumulative effects are anticipated.

3.11.2.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 5 (ETNG 2023f) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the transportation-related findings in ETNG's Resource Report 5. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). Vehicular traffic on public roads as well as near the proposed gas pipeline would increase during construction due to construction workers and materials moving to and from the plant and pipeline construction areas.

Road crossings would be constructed via open cut or conventional bore method. The pipeline would be installed a minimum of 5 feet below the road surface. Road surfaces, where disturbed, would be restored to pre-construction conditions or better. For private roads crossed via open cut, a steel plate, or similar, would be laid down to accommodate through-traffic during installation of the pipeline, or ETNG would work with landowners to provide alternative access. As needed, temporary detour of traffic using appropriate signage would be established. Activity within the travel lanes would be limited to foot traffic. Road closures would be arranged in coordination with the appropriate transportation authority.

The use of conventional boring for road crossings is intended to help ensure no surface impacts to the road would occur and any traffic interruption would be minor in Trousdale, Smith, Jackson, Putnam, Overton, Fentress, Morgan, and Roane counties, where construction is planned to occur.

ETNG's Resource Report 5 provides the following description of construction impacts to the transportation system:

> Construction of the [Ridgeline Expansion] project will result in minor, [temporary] effects on the transportation system in the [Ridgeline Expansion] project due to road crossings, equipment and material deliveries, and construction workers commuting to the [Ridgeline Expansion] project workspace.
>
> […]
>
> Construction will be scheduled for work within roadways and specific crossings to avoid commuter traffic and schedules for school buses and local transit buses to the greatest extent practical. Appropriate traffic management and signage will be set up and necessary safety measures will be developed in compliance with applicable permits for work in the public roadway. Roadway opening permits will be obtained from applicable state and county agencies. Temporary and permanent access roads that will be constructed for the Project are discussed in Resource Report 8.
>
> The movement of construction equipment and materials and the daily commuting of employees to and from the construction work areas may also slightly increase traffic volumes in the [Ridgeline Expansion] project area. Traffic congestion could occur if each construction worker commuting to work used a personal vehicle to travel to the work site and if most of this travel took place during peak traffic hours. The total traffic volume from construction worker commutes and equipment/material deliveries is anticipated to be small relative to existing traffic volumes on most roadways used to access [Ridgeline Expansion] project facilities. Some local roads may experience temporary increases in [Ridgeline Expansion] project -related traffic.
>
> To minimize traffic congestion, [ETNG] will encourage construction workers to share rides to the [Ridgeline Expansion] project. Contractors may also provide buses to move workers from common parking areas to the construction work areas. [ETNG] will prepare a Traffic Management Plan which will include appropriate details on:

- The types and estimated noise associated with the equipment to be used;
- The treatment of excavated material;
- Temporary traffic controls and types of control devices and temporary control zone activities;
- Pedestrian, bicycle, and worker considerations;
- Hand signaling control including how many controllers would likely be required at each site;
- Whether and how local police or other public employee support would be needed in each area, and who would be responsible for compensation of any traffic controllers, police, or other public employees;
- The season and duration of construction; and
- Construction work hours.

> The Traffic Management Plan would be provided to FERC in a supplemental filing when available.
>
> Movement of construction equipment and materials along the haul routes would result in additional truck traffic on those roadways. [ETNG] estimates that haul routes may host between 0 and 25 truck trips per day, or roughly an average of 2 truck trips per hour, as construction activities would generally occur between 7 a.m. to 7 p.m., dependent on the location and stage of construction. The identified haul routes are primarily state highways and other major roads, which are used by motor vehicles and trucks associated with other industrial activities in the region such as mining and timber operations. Truck traffic associated with construction of the [Ridgeline Expansion] project would be similar to traffic already occurring on the state highways and major roads. [ETNG] anticipates that traffic along haul routes associated with the [Ridgeline Expansion] project would result in an incremental minor increase in air emissions and noise impacts associated with what would be, on average, about 2 truck trips per hour during daylight hours.
>
> […]
>
> Areas where special populations congregate, such as schools and senior centers, are present along these routes and could experience minor temporary impacts on air and noise quality.

ETNG would hire one additional permanent employee to support ongoing pipeline and compressor station operations (ETNG 2023f), which would have a negligible to minor impact on local transportation routes and traffic.

3.11.2.3.7 Summary of Alternative A

TVA Proposed Actions

The majority of traffic impacts resulting from Alternative A would be on public roads near the Kingston Reservation, as transmission and pipeline activities associated with Alternative A are more dispersed than those from the CC/Aero CT Plant construction and would have a reduced localized impact to any particular set of roadways. Assuming one person per commuting vehicle, there would be a daily average morning inbound traffic volume of 500 vehicles and a daily outbound traffic volume of 500 vehicles for a total of 1,000 vehicles per day to the CC/Aero CT Plant site, with a maximum of 1,200 vehicles per day. Minor increases in traffic volume would also occur as a result of the construction and operation of the proposed solar facility, BESS, and installation of new transmission lines. Overall, the effect from traffic volume generated by the construction workforce and the construction-related vehicles would have a moderate, temporary impact to driver safety and roadway degradation. TVA may develop a traffic management plan if determined necessary to minimize and mitigate potential impacts. As added traffic due to operations would be significantly less than construction, permanent impacts would be minor.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Vehicular traffic on public roads as well as near the proposed gas pipeline would increase during construction due to construction workers and materials moving to and from the plant and pipeline construction areas.

Minor temporary impacts on traffic and transportation routes would be possible but mitigated through the implementation of a traffic management plan. Permanent impacts on traffic and transportation routes would be negligible.

3.11.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to transportation that may occur as a result of the proposed CC/Aero CT Plant are not anticipated to have disproportionate effects on EJ populations. Effects to EJ populations would be mostly temporary, minor to moderate, and related to construction activities. Moreover, they would be limited to a relatively small area, along public roads around the Kingston Reservation where EJ populations are not present. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Negligible to minor temporary effects to transportation may occur as a result of the activities associated with the ETNG Construction ROW but effects would be minimized to mitigated through implementation of a traffic management plan. Portions of the proposed pipeline and the Hartsville Compressor Station are to be constructed in locations with have been identified as EJ-qualifying communities. Temporary pipeline construction related impacts on traffic would be short-term and may result in disproportionate and adverse effects to EJ populations because these communities often experience compounding effects and social disadvantages compared to non-EJ populations. Given the proposed mitigation measures, and short-term duration, the impacts are not expected to be large.

3.11.2.4 Alternative B

3.11.2.4.1 Construction and Operations of Solar and Storage Facilities

Since the exact project locations for the proposed solar and storage facilities are not known at this time, site-specific transportation impacts cannot be assessed. However, traffic associated with the construction of solar facilities would include semi-truck trips to deliver materials and construction equipment to the site and remove packaging materials; employee passenger vehicles; dump trucks; and concrete trucks. During operations, project-specific traffic would be reduced to daily employee trips for security, maintenance, and repairs on-site with occasional larger vehicles, such as crane trucks and forklifts, being transported on-site for maintenance as needed. On average, two to four workers per MW would likely be required during construction (TVA 2017a, 2020d). Temporary traffic increases may be mitigated, if necessary, by broadcasting delays and highlighting alternate routes on news channels, radio, and on signage or adding temporary high occupancy vehicle lanes.

Minor cumulative impacts to traffic and transportation may occur if Alternative B coincides with the proposed expansion of 10,000 MW of solar facilities by 2035. Additional construction traffic and workforce traffic may be experienced on highways and local roads. However, impacts would be short term and coordination could occur to minimize impacts to local travelers.

3.11.2.4.2 Transmission and Other Components
Minor transportation impacts would occur as a result of increased workforce traffic during the construction of the transmission lines associated with the solar and storage sites under Alternative B. This work is not centralized in one location for any significant period of time. While the specific transportation changes as a result of transmission construction cannot be determined at this time and would be part of future NEPA reviews, it is expected that increases in traffic volume would be minor and temporary due to the dispersed nature of this construction activity.

3.11.2.4.3 Environmental Justice Considerations
Transportation effects occurring as a result of the proposed solar facilities and transmission line activities would be temporary, minor, and concentrated on public roads within a relatively small area around the project sites and transmission line activities. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.12 Utilities

3.12.1 Affected Environment

3.12.1.1 Kingston Reservation (No Action and D4 Activities)
The Kingston Reservation is in an industrial, forested, and agricultural area in Roane County near the town of Harriman. In addition to various mobile providers, telecommunication services in the area are provided by Xfinity, AT&T, HughesNet, EarthLink, Highland Telephone Cooperative, and Viasat (Broadband Search 2023).

Electrical service is provided by the Harriman Utility Board, which distributes power provided by TVA (Roane ECD n.d.). Existing power lines are present in the project area along Swan Pond Road and other major (I-40) and minor roads in the vicinity. Twelve 161-kV transmission lines originate at the Kingston Reservation and extend in a northwest-southeast orientation. An additional 69-kV transmission line originates off-site at the Melton Hill Dam and runs in a north-southeast orientation through the site (USEIA 2021).

As of 2019, the coal-fired units at KIF had a water withdrawal rate of 956.6 MGD and a return of 955.7 MGD. With a net generation of 3,857,821 MWh/year, KIF has a water use factor of 83,006 gallons/MWh (TVA 2019b). According to the Roane ECD (Roane ECD n.d.), water service in the area is provided by the Cumberland Utility District and the Harriman Utility Board (Cumberland Utility District 2022; Harriman Utility Board 2022). The Harriman Utility Board also provides gas and sewer services to the areas within the vicinity of the Kingston Reservation.

3.12.1.2 Alternative A

3.12.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Utilities in the vicinity of the chosen CC/Aero CT Plant are the same as the Kingston Reservation and are generally described in Section 3.12.1.1.

3.12.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The proposed 3 to 4-MW-solar facility would be located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.12.1.1 apply to the proposed 3- to 4-MW solar facility location on the Kingston Reservation.

3.12.1.2.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.12.1.1 apply to the proposed 100-MW BESS on the Kingston Reservation.

3.12.1.2.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission connections to the proposed CC/Aero CT Plants and switchyard. TVA would also install Battery Transmission Line Connections for the proposed battery facility. Therefore, the affected environment for on-site transmission upgrades is described in Section 3.12.1.1.

3.12.1.2.5 Off-site Transmission Upgrades

Off-site upgrades may be needed such that 161-kV transmission lines may need to be reconductored or rebuilt. If future studies indicate improvements are required to the regional transmission system to maintain system stability and integrity, additional site-specific reviews would be completed.

Eastern Transmission Corridor

The L5108, L5302, L5280, L5381, and L5116 transmission lines are within the Eastern Transmission Corridor in Roane and Anderson counties. In addition to various mobile providers, telecommunication services in the corridor vicinity are provided by AT&T and Taylor Telecom, and electric services are provided by the Clinton Utilities Board, the Cumberland Utility District, and Rockwood Electric Utility.

Western Transmission Corridor

Transmission line L5383 is within Cumberland County. In addition to various mobile providers, telecommunication services in the corridor vicinity are provided by Cumberland Connect, and electric services are provided by Cumberland Electric Membership Corporation.

3.12.1.2.6 Construction and Operation of a Natural Gas Pipeline

The approximately 122-mile-long pipeline and structures associated with Alternative A runs through Trousdale, Smith, Jackson, Putnam, Overton, Fentress, Morgan, and Roane counties. The corridor is largely developed agricultural open space in rural areas with some roadway intersections. To power the electric motor driven compressor station, ETNG would primarily utilize energy from the on-site solar farm. Other necessary power for the compressor station would come from Tri-County Electric via a 161-kV transmission line delivery point, which would require coordination with TVA for a tap point just outside of the existing Hartsville Substation and metering package. These lines can then be used to feed ETNG's new 161-kv/13.8-KV substation that would be sited adjacent to the compressor station.

The pipeline construction route would cross existing pipelines, overhead powerlines, and other potential utility lines. Prior to construction, existing utility lines would be located and marked to prevent accidental damage during pipeline and facility construction. ETNG's contractors would contact the "One Call" system, or state or local utility operators, to verify and mark all underground utilities crossed or along pipeline construction workspaces to minimize the potential for damage to other buried facilities in the area. Where there is a question as to the location of utilities, such as water, cable, gas, and sewer lines, they would be located by field instrumentation and test pits prior to initiation of trenching.

The proposed gas pipeline overview map shown on Figure 2.1-5 identifies the approximate route of the corridor that would be primarily built within or adjacent to an existing ETNG pipeline ROW.

3.12.1.3 Alternative B

3.12.1.3.1 East Tennessee TVA Power Service Area

Power from the proposed solar and storage facilities would typically be delivered by direct connection to TVA's transmission system or via interconnections with local power companies that distribute power from TVA. Effects on local utilities would be assessed in future NEPA reviews for each solar and storage site.

TVA anticipates that a portion of the solar facilities proposed under Alternative B would need to be located within portions of the East TN region to offset transmission system upgrades that otherwise may be required following the retirement of KIF. TVA's PSA contains most of the TN River Basin, which is considered one of the most water rich basins in the United States (TVA 2019a). The TN River Basin, which is about half of TVA's PSA, has been defined as the most intensively used basin in the contiguous U.S as measured by intensity of freshwater withdrawals in gallons per day per square mile (Hutson et al. 2004). While the withdrawal rate is highest, the basin has the lowest consumptive use in the nation as about 96 percent of the withdrawals are returned back to the River Basin for downstream use (Bowen and Springston 2018).

In 2015, estimated average daily water withdrawals in TVA's PSA totaled 12,966 MGD (Dieter et al. 2018; Bowen and Springston 2018). About 6.6 percent of these water withdrawals were groundwater and the remainder was surface water. The largest water use (77.7 percent of all withdrawals) was for thermoelectric generation as shown on Figure 3.12-1. Even though thermoelectric generation has the greatest withdrawal, about 99.2 percent is recycled and returned for downstream use in TVA's system (Bowen and Springston 2018).

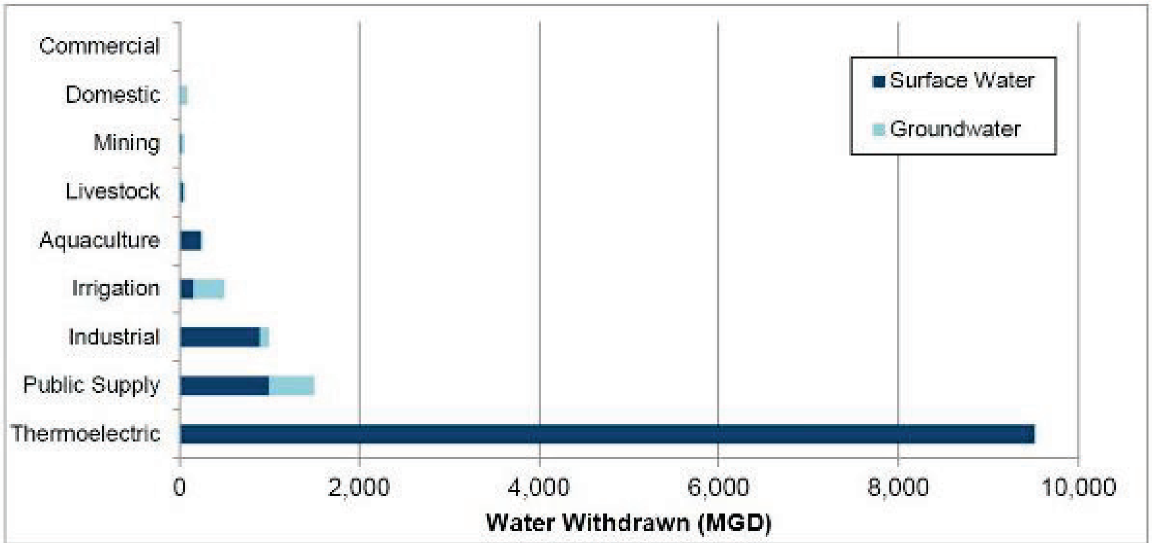

Figure 3.12-1. 2015 Water Withdrawals in the TVA Power Service Area by Source and Type of Use

Source: Dieter et al. (2018), Bowen and Springston (2018)

Since 1950, the annual increase in groundwater withdrawals for public supply in TN has averaged about 2.2 percent and the increase in surface water withdrawals has averaged about 3.5 percent (Figure 3.12-2). For the first time since 1950, there was a decrease in surface water withdrawal for public supply systems in TN between 2010 and 2015. Although these data are for TN public water supplies, they are representative of the overall trends in water use for TVA's PSA.

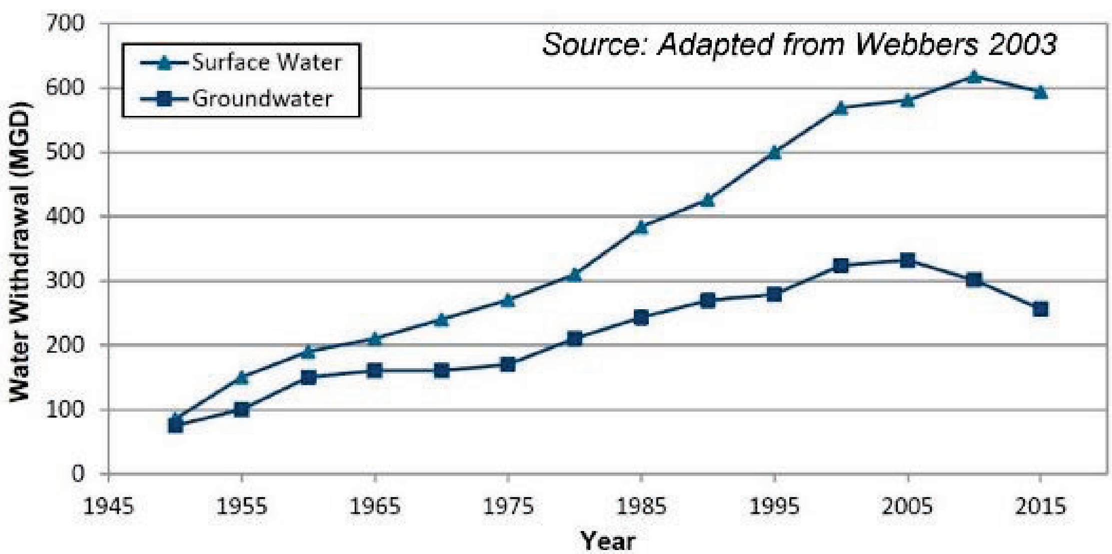

Figure 3.12-2. Groundwater and Surface Water Withdrawals by Water Public Systems in Tennessee, 1950 to 2015

3.12.2 Environmental Consequences

3.12.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain the coal-fired units at KIF. Existing on-site utilities would likely remain unchanged, with the exception of potential upgrades and maintenance. Based on the Purpose and Need (Section 1.1), the coal fleet is projected to experience increasing performance challenges, which would continue to add economic, reliability, and environmental risk to the system. Therefore, moderate, adverse, permanent impacts would occur to utilities if the No Action Alternative were to be selected.

3.12.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of KIF Plant

Under both action alternatives, TVA would retire, decommission, decontaminate, and deconstruct the KIF units and site. All buried utilities would be cut and capped within the project boundary and abandoned in place if they are 3 feet below final grade and if they do not interfere with other ongoing projects in the vicinity. All hollow pipe utilities would be decommissioned and sealed with a mechanical cap or plug. The site would be restored to a final grade to provide proper drainage.

Electrical service to the Kingston Reservation would be provided by the Harriman Utility Board, and the Harriman Utility Board would coordinate with customers if outages were necessary. The project would obtain water by connection to a municipal source or by delivery via water trucks, if necessary. Thus, water service for the project may be obtained through the Harriman Utility Board. No cumulative effects to utilities are anticipated.

3.12.2.2.1 Environmental Justice Considerations

Effects to utilities that would occur as a result of the KIF retirement and D4 activities would be temporary and minor, with only short-term outages anticipated in the immediate vicinity, where EJ populations are not present. Therefore, no disproportionate effects are anticipated to EJ populations.

3.12.2.3 Alternative A

3.12.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Under Alternative A, TVA would construct a new CC/Aero CT Plant of approximately 1,500 MW at the Kingston Reservation including transmission upgrades and other components. The CC/Aero CT Plant would be fueled by a reliable supply of natural gas from ETNG's 3100 pipeline system and proposed upgrades (Figure 2.1-5). The 161-kV transmission lines from the proposed natural gas-fired facilities to the existing 161-kV system would be constructed, along with plant equipment and systems, such as natural gas metering and handling systems, instrumentation and control systems, transformers, and other major equipment described in Section 2.1.3.2.

TVA would construct a double-breaker 161-kV substation for the proposed CC/Aero CT Plant and reroute all existing transmission lines from the Kingston Reservation and re-terminate them into the new substation. TVA would install a 161-kV switch house (potentially including water and septic systems) and station service and make other transmission system modifications to transmit the energy generated by the new CC/Aero CT Plant. Off-site upgrades would be needed such that 161-kV transmission lines may be reconductored or rebuilt, as described in Section 2.1.3.5.2. TVA would coordinate with existing telecommunications, electricity, natural gas, and water and sewer utilities prior to starting plant construction to avoid/minimize impacts and disruptions to utilities. Prior to construction, existing utility lines would be located and marked to prevent accidental damage during transmission upgrade activities. As such, adverse impacts to existing utilities are not anticipated.

Natural gas-fueled CC plants require water for steam generation and condensation. As of 2015, the water use factors for TVA's CC plants ranged from 208-935 gallons/MWh. TVA has elected to use air cooling, however, at the proposed CC/Aero CT Plant to significantly minimize effects to the nearby Clinch and Emory rivers, groundwater, or overall water supply.

The facility would require potable water, which would be obtained from the existing public supply at the Kingston Reservation (Harriman Utility Board 2022). To prevent concentration of minerals in the HRSG, the facility would require a demineralized water feed and boiler blowdown to remove accumulating minerals. CC compressor washing also requires demineralized water. Wash effluent would be collected in tanks and, after analysis, disposed of at an approved wastewater treatment facility off-site. Demineralized water would be made on-site and stored on-site in newly constructed tanks within the overall project footprint.

The proposed CC/Aero CT Plant would increase reliability and provide a cost-effective alternative to the existing coal-fired units. Overall, water use at the Kingston Reservation would be reduced due to the replacement of the coal units with the CC/Aero CT Plant. No cumulative effects to utilities are anticipated. While water supply use would be limited to the construction period and therefore temporary, TVA would coordinate with existing utilities to avoid/minimize impacts and disruptions to utilities during construction.

3.12.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The proposed solar facility would only require water during construction, unlike the CC/Aero CT plant, which would be obtained from the existing public supply at the Kingston Reservation (Harriman Utility Board). As described in Section 3.12.2.3.1, TVA would coordinate with existing telecommunications, electricity, natural gas, and water and sewer facilities as appropriate to ensure that adverse impacts to existing utilities would not occur from the solar facility or any required off-site connections. Prior to construction, existing utility lines would be located and marked to prevent accidental damage during transmission upgrade activities. Minor beneficial impacts from the solar facility would occur by offsetting station service requirements allowing more of station generation to contribute to interconnection to TVA's grid.

3.12.2.3.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

The proposed BESS would only require water during construction, which would be obtained from the existing public supply at the Kingston Reservation (Harriman Utility Board). As described in Section 3.12.2.3.1, TVA would coordinate with existing telecommunications, electricity, natural gas, and water and sewer facilities as appropriate to ensure that adverse impacts to existing utilities would not occur from the storage facility or any required off-site connections. Prior to construction, existing utility lines would be located and marked to prevent accidental damage during transmission upgrade activities. No adverse impacts to utilities are anticipated.

3.12.2.3.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT facilities and switchyard. TVA would also install Battery Transmission Line Connections for the proposed battery facility within the Kingston Reservation. Prior to construction, existing utility lines would be located and marked to prevent accidental damage during transmission upgrade activities. Therefore, the environmental consequences for on-site transmission upgrades on utilities are the same as those described in Sections 3.12.2.2 and 3.12.2.3.1.

3.12.2.3.5 Off-site Transmission Upgrades

Prior to initiating construction on off-site transmission line upgrades, TVA would coordinate with the potentially affected utilities and mitigate any potential impacts to the utilities. Any utility service interruptions would be minimized and overall impacts to area utilities would be minor. Transmission line upgrades and switchyards do not require water to operate; therefore, water supply would not be impacted due to the transmission upgrades associated with this alternative.

Prior to construction, existing utility lines would be located and marked to prevent accidental damage during transmission upgrade activities. Therefore, the environmental consequences for off-site transmission upgrades on utilities are the same as those described in Sections 3.12.2.2 and 3.12.2.3.1.

3.12.2.3.6 Construction and Operation of a Natural Gas Pipeline and Aboveground Facilities

ETNG's Resource Report 11 (ETNG 2023l) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the utilities-related findings in ETNG's Resource Report 11. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). The construction and operation of a new CC/Aero CT Plant would require construction of approximately 122 miles of new natural gas pipeline and gas system infrastructure to connect the plant to the new gas pipeline. Compression requirements, if any, would be determined by the technical requirements of the CT brand chosen and where it is located on the Kingston Reservation. Service disruptions would be minimized through coordination between ETNG, TVA, and the affected utilities.

The proposed natural gas pipeline and associated structures would not require water to operate; therefore, water supply use would be limited to the construction period. ETNG is proposing to use municipal water in limited areas and as a backup to surface water sources should they be unavailable at the time of need. Water supply for hydrostatic testing would primarily be pulled from nearby creeks and rivers at a withdrawal rate of less than 2,500 gallons per minute, and thus, utilities would not be impacted (ETNG 2023c). Trenches created to bury the natural gas pipeline at sufficient depth to allow for the minimum pipe cover requirements in accordance with USDOT regulations pursuant to the Natural Gas Pipeline Safety Act of 1968, landowner requests, and permit conditions, may encounter groundwater. However, because such activities and their effects to groundwater patterns or availability are localized, and generally limited to the construction phase, impacts from construction are expected to be minor.

Prior to construction, existing utility lines would be located and marked to prevent accidental damage during pipeline construction. Other than electric service provided through TVA, no project-related impacts to local utilities would occur and no cumulative effects to utilities are anticipated.

3.12.2.3.7 Summary of Alternative A

TVA Proposed Actions

Overall, permanent beneficial impacts would occur due to decreased water use for the CC/Aero CT Plant. Service disruptions associated with Alternative A construction are expected to be minimized through coordination with impacted utilities. Transmission lines, switchyards, and the solar and battery storage facilities do not require water to operate; water supply use would be limited to the temporary period while construction of the facilities takes place and would therefore be temporary. Minor beneficial impacts from the solar facility would occur due to the increased power generation and interconnection to TVA's grid. Overall, permanent beneficial impacts would occur due to improved reliability and service costs as a result of Alternative A.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Project operations are not expected to result in adverse impacts to public or private water supplies unless operation and maintenance activities involving pipe excavation and repairs are needed. Should those needs arise, any associated impacts would be minor and temporary. Overall, the proposed ETNG Construction ROW would result in permanent beneficial effects to utilities by improving reliability and service costs as a result of Alternative A.

3.12.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to utilities that would occur as a result of the proposed CC/Aero CT Plant construction would be limited to the immediate Kingston Reservation. The effects to utilities on the Kingston Reservation would have no impact on EJ populations since none are present. The proposed CC/Aero CT Plant would have a positive effect for EJ populations as well as the general population; it is expected to increase reliability and provide a cost-effective alternative to the existing coal-fired units. The construction of off-site transmission lines could cause utility service interruptions, which could affect EJ populations; however, these issues would be minimized and overall impacts to area utilities would be minor. Mitigation and minimization efforts would include BMPs such as coordinating planned outages with utilities to minimize negative impacts. Due to mitigation efforts, it is not anticipated that EJ populations will experience disproportionate and adverse impacts. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

While utilities-related effects may be experienced by EJ populations in the ETNG Construction ROW, effects are anticipated to be limited to those occurring during maintenance and repair activities. The effects experienced by EJ populations may result in disproportionate and adverse effects due to their cultural and economic vulnerabilities.

3.12.2.4 Alternative B

3.12.2.4.1 Construction and Operations of Solar and Storage Facilities

Under Alternative B, the addition of 1,500 MW of solar generating facilities paired with 2,200 MW of battery storage facilities would have a permanent, beneficial effect on power generation and grid stability. The combination of solar and battery storage allows for flexibility in managing the variability of solar power output and can provide ancillary services that support grid reliability. However, solar power output can be affected by weather conditions and time of day, and careful planning and coordination with other power sources would therefore be necessary to ensure reliable and stable power generation.

PV facilities do not typically require a water source for operation but may require potable water for on-site facilities or sewer during operation. BESS facilities typically require a water supply to support fire safety systems. Both PV and BESS facilities typically require electrical service and telecommunications services. While exact locations of solar and storage facilities are not known at this time, utility impacts would be minimized by identifying and coordinating with utilities prior to construction to avoid service disruptions. Minor, permanent impacts to existing utilities and water supply are anticipated under Alternative B. While additional solar facilities may be constructed in East TN, cumulative impacts would be minor as developers and TVA would identify utility locations early and coordinate to avoid disruptions.

3.12.2.4.2 Transmission and Other Components

The construction of transmission lines associated with solar and BESS sites would have a minor beneficial impact on utilities by supporting increased power generation and storage. Minor impacts to water use may occur during construction.

3.12.2.4.3 Environmental Justice Considerations

Effects to utilities that would occur as a result of the proposed solar facilities and transmission line activity would be minor. Although some service interruptions are possible, they would be minimized or mitigated. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.13 Cultural Resources

3.13.1 Regulatory Framework

Cultural resources include Pre-Contact (of or relating to the period before contact of an indigenous people with an outside culture) and historic archaeological sites, districts, buildings, structures, and objects, as well as locations of important historic events that lack material evidence of those events. Cultural resources are considered historic properties if included in, or considered eligible for inclusion in, the National Register of Historic Places (NRHP) maintained by the National Park Service (NPS). The eligibility of a resource for inclusion in the NRHP is based on the Secretary of the Interior's criteria for evaluation (36 CFR §60.4), which state that significant cultural resources possess integrity of location, design, setting, materials, workmanship, feeling and association, and:

- are associated with important historical events; or
- are associated with the lives of significant historic persons; or
- embody distinctive characteristics of a type, period, or method of construction or represent the work of a master, or have high artistic value; or
- have yielded or may yield information (data) important in history or prehistory.

Because of their importance to the Nation's heritage, historic properties are protected by several laws. Federal agencies, including TVA, have a statutory obligation to facilitate the preservation of historic properties, stemming primarily from the National Historic Preservation Act (NHPA; 16 U.S.C. §§470 et seq.). Other relevant laws include the Archaeological and Historic Preservation Act (16 U.S.C. §§469-469c), Archaeological Resources Protection Act (16 U.S.C. §§470aa-470mm) and the Native American Graves Protection and Repatriation Act (25 U.S.C. §§3001- 3013).

Section 106 of the NHPA requires federal agencies to consider the potential effects of their actions on historic properties in an undertaking's area of potential effects (APE) and to allow the Advisory Council on Historic Preservation an opportunity to comment on the action. Section 106 involves four steps: 1) initiate the process; 2) identify historic properties; 3) assess adverse effects; and 4) resolve adverse effects. This process is carried out in consultation with the State Historic Preservation Office (SHPO) of the state in which the action would occur and with any other interested consulting parties, including federally recognized Indian tribes ("Tribes").

The area of potential effects (APE) is defined at 36 CFR part 800.16(d) (a section from the federal regulations implementing Section 106 of the NHPA) as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." APE is analogous to the affected area in a NEPA analysis but is focused specifically on the undertaking's potential effects on historic properties. The APE for the Kingston Fossil Plant Retirement project consists of multiple large areas, some of which are non-contiguous because the proposed undertaking encompasses various large-scale actions, each different in nature, occurring at various places at various times. Within this APE, areas where physical effects could occur are referred to as "project footprint" and areas where only visual effects from new construction could occur are identified as "viewshed." TVA consulted with SHPO on the APE. The APE for the No Action and each Action Alternative is characterized in Section 3.13.2 at the introduction of each of the alternatives.

Section 110 of the NHPA sets out the broad historic preservation responsibilities of federal agencies and is intended to ensure that historic preservation is fully integrated into their ongoing programs. Federal agencies are responsible for identifying and protecting historic properties and avoiding unnecessary damage to them. Section 110 also charges each federal agency with the affirmative responsibility for considering projects and programs that further the purposes of the NHPA, and it declares that the costs of preservation activities are eligible project costs in all undertakings conducted or assisted by a federal agency.

Historic properties include a traditional cultural property (TCP), which is defined as a property that is eligible for inclusion on the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community (Parker and King 1998).

3.13.2 Affected Environment

Existing conditions for cultural resources are presented for the APE for the No Action and two Action Alternatives currently proposed for the KIF retirement project and represents locations where project effects to historic properties could occur. Project- affected environments are also assessed for the related proposed action, construction and operation of 122 miles of natural gas pipeline and associated structures and the transmission upgrades.

3.13.2.1 Kingston Reservation (No Action and D4 Activities)

The APE for cultural resources for the No Action Alternative and for proposed D4 activities consists of the area within the Kingston Reservation boundary. The demolition boundary covers only a portion of the Kingston Reservation. The general locations of previous cultural resources (archaeological and/or architectural) investigations completed within the Kingston Reservation boundary, and in the general vicinity of the Kingston Reservation, are shown on Figure 3.13-1. There are 16 previously recorded archaeological sites within the Kingston Reservation (Table 3.13-1). TVA has completed archaeological surveys in recent years that have collectively included the entire KIF Reservation, has consulted with SHPO and Tribes regarding the survey findings and has reached consultation consensus with those agencies regarding the NRHP eligibility status of each site. Correspondence between SHPO and TVA for this EIS and a number of projects associated with the Kingston Reservation is presented in Appendix K.

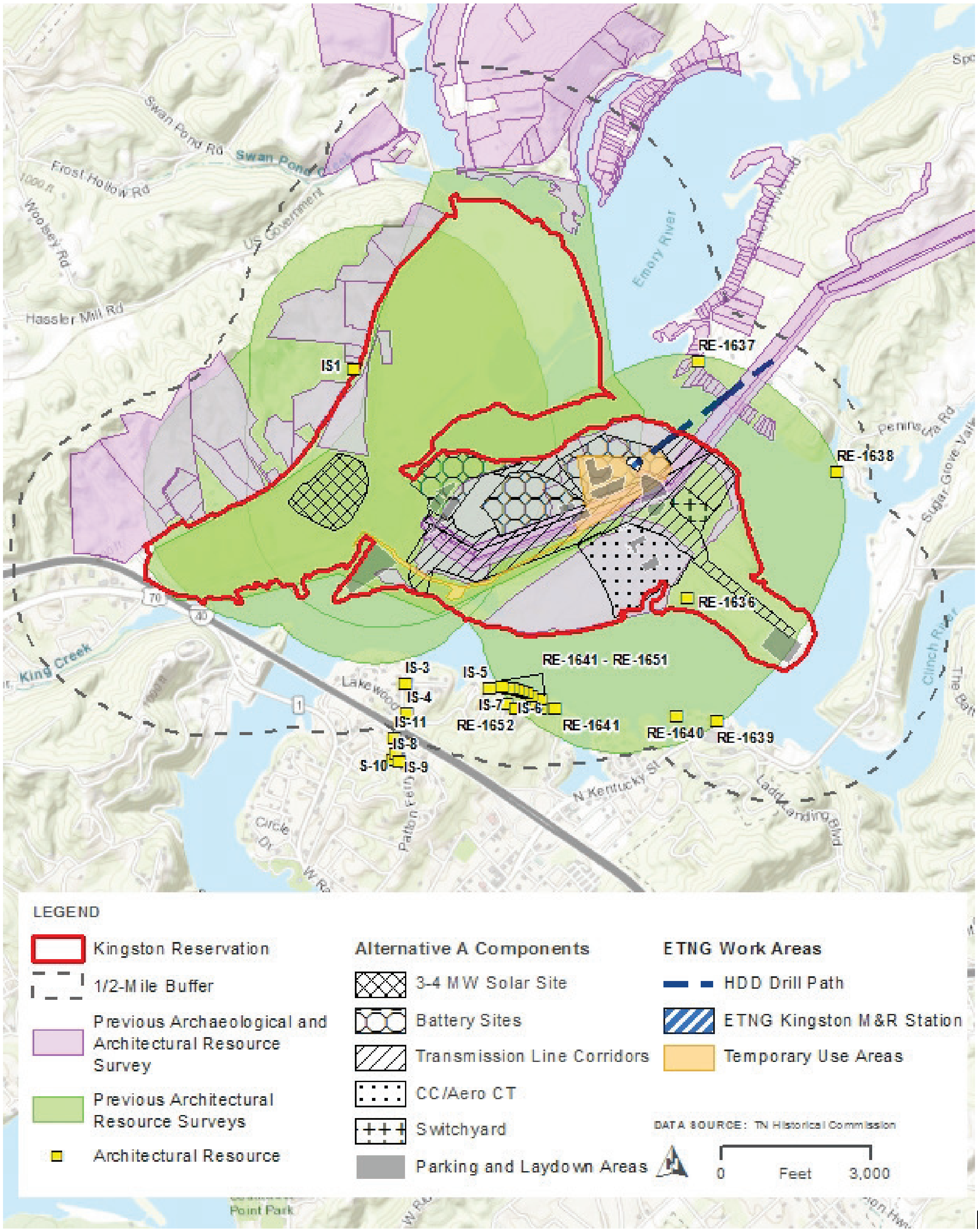

Figure 3.13-1. Historic Architectural and Archaeological Surveys Completed Within 0.5-Mile Buffer Surrounding of the Kingston Reservation

There is one site in the demolition boundary (40RE44). TVA presented their findings in a letter to SHPO dated July 15, 2023, that this site is non-extant and therefore not NRHP-eligible. SHPO issued concurrence on November 28, 2023 (Appendix K). Potentially eligible archaeological sites 40RE622 and 40RE626, and NRHP-eligible site 40RE45, are located on the Kingston Reservation. No NRHP-eligible or potentially eligible archaeological sites are in the footprints of the proposed KIF D4 activities. A historic cemetery, the Green Cemetery, is located on the KIF Reservation but is outside the project footprint.

Table 3.13-1. Previously Recorded Archaeological Sites Within the Kingston Reservation

Site Number	NRHP Eligibility Status
40RE44	Non-Extant (Not Eligible)
40RE45	Eligible
40RE142	Not Eligible
40RE143	Not Eligible
40RE612	Not Eligible
40RE618	Not Eligible
40RE620	Not Eligible
40RE621	Not Eligible
40RE622	Undetermined
40RE623	Not Eligible
40RE624	Not Eligible
40RE625	Not Eligible
40RE626	Undetermined

TVA completed an inventory and NRHP assessment of KIF as part of a historic architectural survey for the proposed Kingston Dewatering Facility in 2015 (Karpynec and Weaver 2016). Based on that assessment TVA determined KIF ineligible for inclusion in the NRHP due to modern alterations and additions that have compromised the property's physical integrity, and SHPO agreed.

Areas within the potential viewsheds of the CC/Aero CT Plant, switchyard, 3- to 4-MW solar array, and BESS have been included in historic architectural surveys that TVA has completed for prior undertakings by Huitt-Thornton et al. 2019; Karpynec and Weaver 2016; Karpynec and McKee 2009; and Wild et al. 2003 (as illustrated in Figure 3.13-2).Those surveys did not identify any NRHP-listed or -eligible above ground properties in these areas. TVA previously consulted with and received concurrence from SHPO regarding the findings of each individual report.

In June 2022, on behalf of TVA, HDR conducted an architectural resources survey of a 0.5-mile buffer around the CC/Aero CT Plant and switchyard footprints of the proposed Alternative A to evaluate potential visual effects of new construction (as shown on Figure 3.13-2). During the architectural resources survey, HDR recorded a total of 17 architectural resources located within the 0.5-mile buffer around KIF, all within Roane County. The resources recorded in Roane County include two cemeteries (RE-1636 [Green Cemetery] and RE-1637 [Suddath Cemetery]) and 15 dwellings (RE-1638 through RE-1652) built between 1960 and 1972 (Appendix K). These resources are summarized in Table 3.13-2.

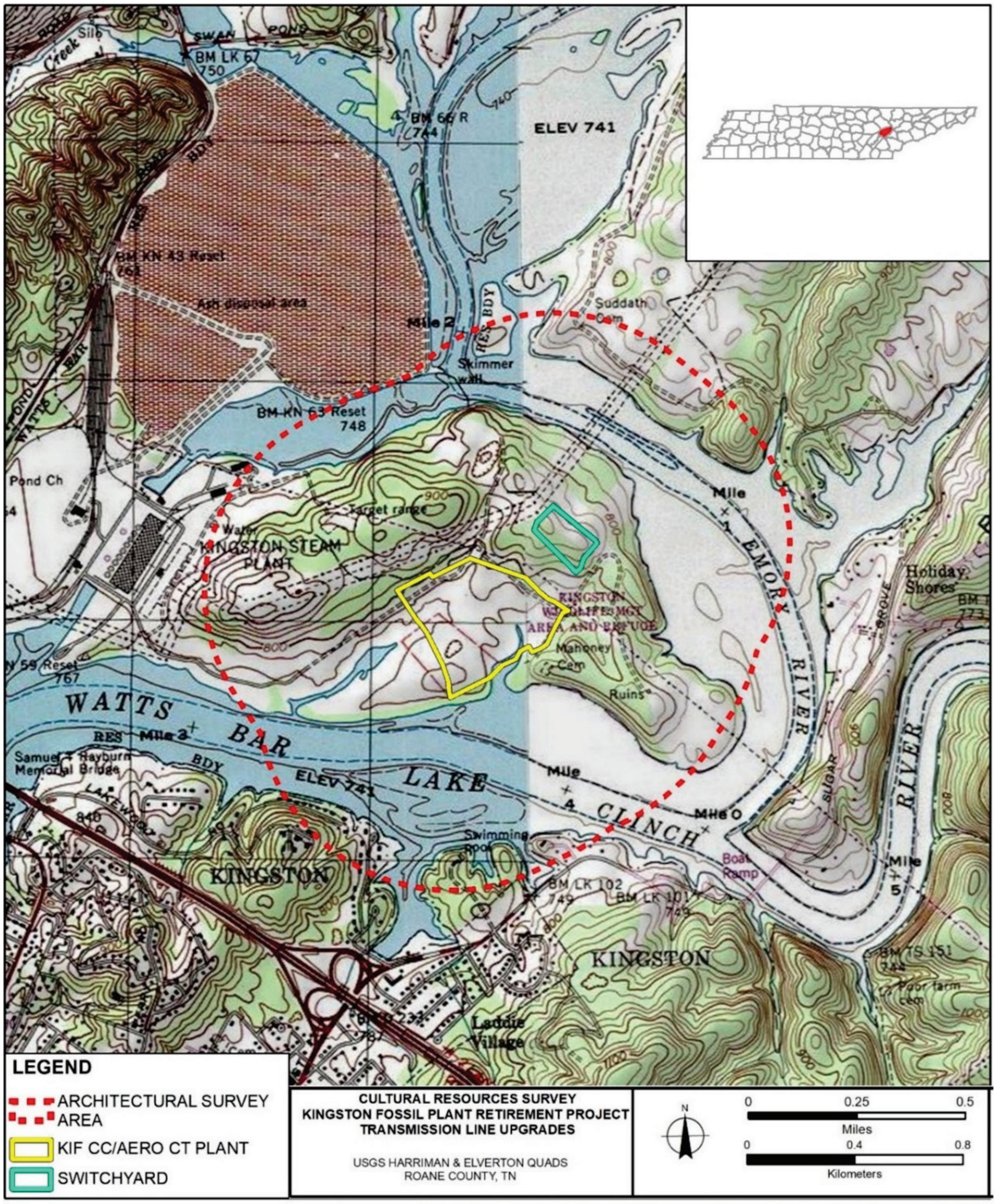

Figure 3.13-2. Architectural Resources Survey Boundary Evaluated on the Kingston Reservation (Source: Appendix K).

Of the 17 architectural resources recorded in this portion of the APE, only one, RE-1636 (Green Cemetery), was considered by TVA as potentially eligible for listing in the NRHP under Criteria Consideration D, for significance under Criterion A (Appendix K). During consultation, SHPO noted that additional information would be needed to evaluate the cemetery's NRHP eligibility. Therefore, TVA and SHPO consider this cemetery to be of undetermined eligibility. The remaining 16 architectural resources were determined to be not eligible for listing in the NRHP by TVA and SHPO on November 28, 2023.

Table 3.13-2. Recorded Architectural Resources within the KIF Architectural Survey Area in 2022

Number	County	Year built	Function	NRHP Recommendation
RE-1636	Roane	ca. 1870	Cemetery	Eligible
RE-1637	Roane	ca. 1880	Cemetery	Not eligible
RE-1638	Roane	1960	Dwelling	Not eligible
RE-1639	Roane	1920	Dwelling	Not eligible
RE-1640	Roane	1964	Dwelling	Not eligible
RE-1641	Roane	1953	Dwelling	Not eligible
RE-1642	Roane	1960	Dwelling	Not eligible
RE-1643	Roane	1971	Dwelling	Not eligible
RE-1644	Roane	1954	Dwelling	Not eligible
RE-1645	Roane	1970	Dwelling	Not eligible
RE-1646	Roane	1965	Dwelling	Not eligible
RE-1647	Roane	1960	Dwelling	Not eligible
RE-1648	Roane	1955	Dwelling	Not eligible
RE-1649	Roane	1960	Dwelling	Not eligible
RE-1650	Roane	1958	Dwelling	Not eligible
RE-1651	Roane	1955	Dwelling	Not eligible
RE-1652	Roane	1963	Dwelling	Not eligible

3.13.2.2 Alternative A

For Alternative A, the APE includes multiple large areas, some of which are non-contiguous because the proposed undertaking encompasses various large-scale actions, each different in nature, occurring at various places at various times. TVA determined the APE for this undertaking as including: the approximately 240-acre area where KIF D4 activities would occur; the proposed construction footprints of the CC/Aero CT Plant (55 acres) and associated switchyard (8.5 acres); the proposed footprint of the 3- to 4-MW solar array (35 acres) and three alternate sites for the BESS (between 30 and 40 acres) on the KIF Reservation; transmission line upgrades on the Kingston Reservation and existing off-site transmission lines that would be upgraded in connection with construction of the new Kingston CC/Aero CT Plant; and the anticipated viewsheds of the new CC/Aero CT Plant, transmission line modifications, switchyard, solar array, and BESS (where visual effects on NRHP-listed or -eligible historic architectural properties could occur).

The project viewshed is delineated to include areas within one-half mile of the proposed new facilities (CC/Aero CT Plant, switchyard, solar, and battery storage) where those facilities would be visible. Originally, TVA determined that none of the proposed transmission line upgrades had potential for visual effects, as the relevant activities are excluded by TVA's NHPA Section 106 Programmatic Agreement, executed in 2019 (TVA 2020b). However, the second set of transmission line modifications (L5116, L5381, and L5280) included work that was not excluded by the Programmatic Agreement, and could, therefore, have visual effects on nearby historic properties.

In June 2023, on behalf of TVA, HDR conducted an architectural resources survey of a 0.5-mile buffer around Lines L5116, L5280, and L5381 of the Eastern Transmission Corridor to evaluate potential visual effects of proposed upgrades. During the historical and architectural survey, HDR recorded 47 primary historic-age architectural resources, including 10 previously recorded resources (two of which are NRHP-listed properties), within the Architectural Study Area (i.e., the transmission line ROW and areas within a 0.5-mile buffer). None of the newly recorded historic-age architectural resources were recommended eligible for listing in the NRHP because of a lack of significance under Criteria A through D of the NHPA. The two previously recorded historic architectural resource near the transmission line upgrades are New Bethel Baptist Church and Cemetery (NRHP ID 92000409) and X-10 Graphite Reactor (NRHP ID 66000720), which are both listed on the NRHP.

Project affected environments were also assessed for the related action, construction and operation of 122 miles of natural gas pipeline and associated structures.

3.13.2.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Green Cemetery is surrounded by mature vegetation that serves as a visual screen between the grounds and the proposed KIF Plant, minimizing the potential visual impact of the project on the cemetery. The proposed CC/Aero CT Plant site and new switchyard would be located within the Kingston Reservation property boundary; as such, cultural resources are as described in Section 3.13.2.1. None of the known sites identified in Section 3.13.2.1 would be located within the new switchyard site footprint. Site 40RE45 is the only recorded site eligible for listing in the NRHP that is located within the potential CC/Aero CT Plant footprint. Site 40RE45 was originally documented in 1941 as a Pre-Contact mound site but lacks a confirmed description of its exact location; therefore, the current TN Division of Archaeology (TDOA) mapped site boundary is potentially inaccurate. Subsequent investigations have not identified evidence that would indicate remnants of a mound feature. Phase II investigations were performed during summer 2022 in mapped portions of the 40RE45 site boundary. The Phase II investigations consisted of both close interval and standard interval shovel testing combined with 1 x 1 meter test units. Based on the site integrity, high artifact density, presence of intact cultural features, and diagnostic artifacts, TVA has determined site 40RE45 is eligible for listing in the NRHP under Criterion D. However, the currently proposed project footprint does not overlap with the significant archaeological deposits within the revised 40RE45 boundary. Based on this study TVA finds the site does not extend into the project's footprint. TVA consulted with SHPO and federally recognized Indian tribes regarding the Phase II study and this finding. SHPO agreed that the site is eligible for listing on NRHP and is located outside the project footprint.

3.13.2.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation on a former coal storage area (see Figure 2.1-5). The affected environment and existing conditions described above for the Kingston Reservation in Section 3.13.2.1 apply to the proposed solar facility location on the Kingston Reservation. Additionally, there are no NRHP-listed or eligible historic architectural resources within the 0.5-mile buffer around the Kingston Reservation boundary.

3.13.2.2.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites located on the Kingston Reservation (see Figure 2.1-5). The existing conditions described in the affected environment section for the Kingston Reservation in Section 3.13.2.1 apply to the proposed 100-MW BESS on the Kingston Reservation.

There are no archaeological sites within the footprint of the proposed Battery Site 1 or 2 on the Kingston Reservation. Previously recorded Site 40RE620 is in the footprint of proposed Battery Site 3; however, TVA and SHPO agreed in consultations in 2019 that Site 40RE620 is ineligible for the NRHP. There are no archaeological sites within the three potential BESS locations. Additionally, there are no NRHP-listed or –eligible historic architectural resources within the 0.5-mile buffer around the Kingston Reservation boundary.

3.13.2.2.4 On-site Transmission

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant facilities and switchyard. Archaeological Site 40RE626, located on the northern edge of the transmission line footprint, is considered by TVA to be potentially eligible for the listing on the NRHP. However, the portion of the site within the transmission line footprint lacks intact deposits. After consultation with SHPO, it was determined that the examined portion of Site 40RE626 within the transmission line footprint lacks integrity or research potential and does not appear to contribute to the eligibility of the overall site.

3.13.2.2.5 Off-site Transmission

Under Alternative A, TVA would upgrade existing transmission lines in the Eastern Transmission Corridor (L5108, L5116, L5208, L5302, and L5381) originating at the Kingston Reservation, and the Western Transmission Corridor (L5383) located in western TN. Descriptions of these improvements can be found in Section 2.1.3.5.

3.13.2.2.5.1 Eastern Transmission Corridor

Lines 5108 and 5302

The L5108 transmission line corridor (consisting of L5108, associated structures, and 200-foot-wide ROW) extends approximately 20 miles northeast from the Kingston Reservation and terminating into the Oak Ridge substation. The L5302 transmission line corridor (consisting of L5302, associated structures, and 200-foot-wide ROW) extends approximately 10 miles northeast from the KIF Plant to the K-25 Plant, then turning south it extends another 6 miles before terminating at the Bethel Valley reconductor substation.

Five segments meet minimum age requirements and have integrity (greater than 79 percent of original structures), but no work is proposed that would adversely affect these transmission lines. Therefore, TVA determined that the proposed off-site transmission line upgrades to Lines 5108 and 5302 would not adversely affect any potentially historic transmission lines. TVA received concurrence from SHPO on this finding on November 28, 2023.

Architectural Resources

TVA did not conduct surveys for aboveground architectural resources along existing transmission line corridors along Lines 5108 and 5302, since TVA's proposed activities in this area are excluded by TVA's Section 106 PA. Additionally, TVA determined, in consultation with SHPO, that the proposed off-site transmission upgrades to Lines 5108 and 5302 would not result in adverse visual effects on aboveground resources outside the project footprint. Therefore, visual effects were not evaluated further for the proposed off-site transmission upgrades to Lines 5108 and 5302.

Archaeological Resources
TVA completed archaeological surveys of transmission line corridors and access roads for Lines 5108 and 5302 in June 2022. TVA evaluated the 18 access roads associated with L5108 and identified two archaeological sites (40AN277 and 40AN278) (Appendix K). Both sites are Pre-Contact lithic scatters and TVA determined that both sites are not eligible for the NRHP listing. SHPO concurred on November 28, 2023, that the project, as currently proposed, will not adversely affect any historic properties. TVA is awaiting concurrence from the consulted federally recognized Indian tribes.

TVA evaluated the 30 access roads associated with Line 5302, many of which are along routes that have already been cleared, and the transmission corridor. No archaeological resources were identified.

Lines 5116, 5280, and 5381

Under Alternative A, TVA proposes upgrades to Lines 5116, 5280, and 5381 of the Eastern Transmission Corridor. Line 5116 extends eastward from the Kingston Reservation and terminates at the Bethel Valley Switching Station. Several access roads along the routes have already been cleared. The eastern portion of L5116 is within the Oak Ridge National Security Complex. The western portion of L5116 is parallel to and partially overlapping the corridor evaluated for L5108. Cultural resource surveys for these three additional lines were conducted in June and July 2023 (Appendix K) and the results are presented below.

Architectural Resources
During the architectural survey, HDR, on behalf of TVA, recorded 47 primary historic-age architectural resources, including 10 previously recorded architectural resources (two of which are NRHP-listed properties), within the Architectural Study Area (i.e., the transmission line ROW and areas within a 0.5-mile buffer) of Lines L5116, L5280, and L5381 of the Eastern Transmission Corridor. None of the newly recorded, 47historic-age architectural resources are recommended eligible for listing in the NRHP due to a lack of significance under Criteria A through D of the NHPA. The two previously recorded historic architectural resources are New Bethel Baptist Church (NRHP ID 92000409) and Cemetery and X-10 Graphite Reactor (NRHP ID 66000720). Both resources are listed on the NRHP (Figure 3.13-3a-d). SHPO issued concurrence with these findings on November 28, 2023 (Appendix K).

Segment 01 of L5116 is considered intact and is 70 years of age, meeting the minimum age requirements for consideration as a historic property. TVA determined that this segment is not eligible for listing on the NRHP under Criterion A, B, nor C of the NHPA.

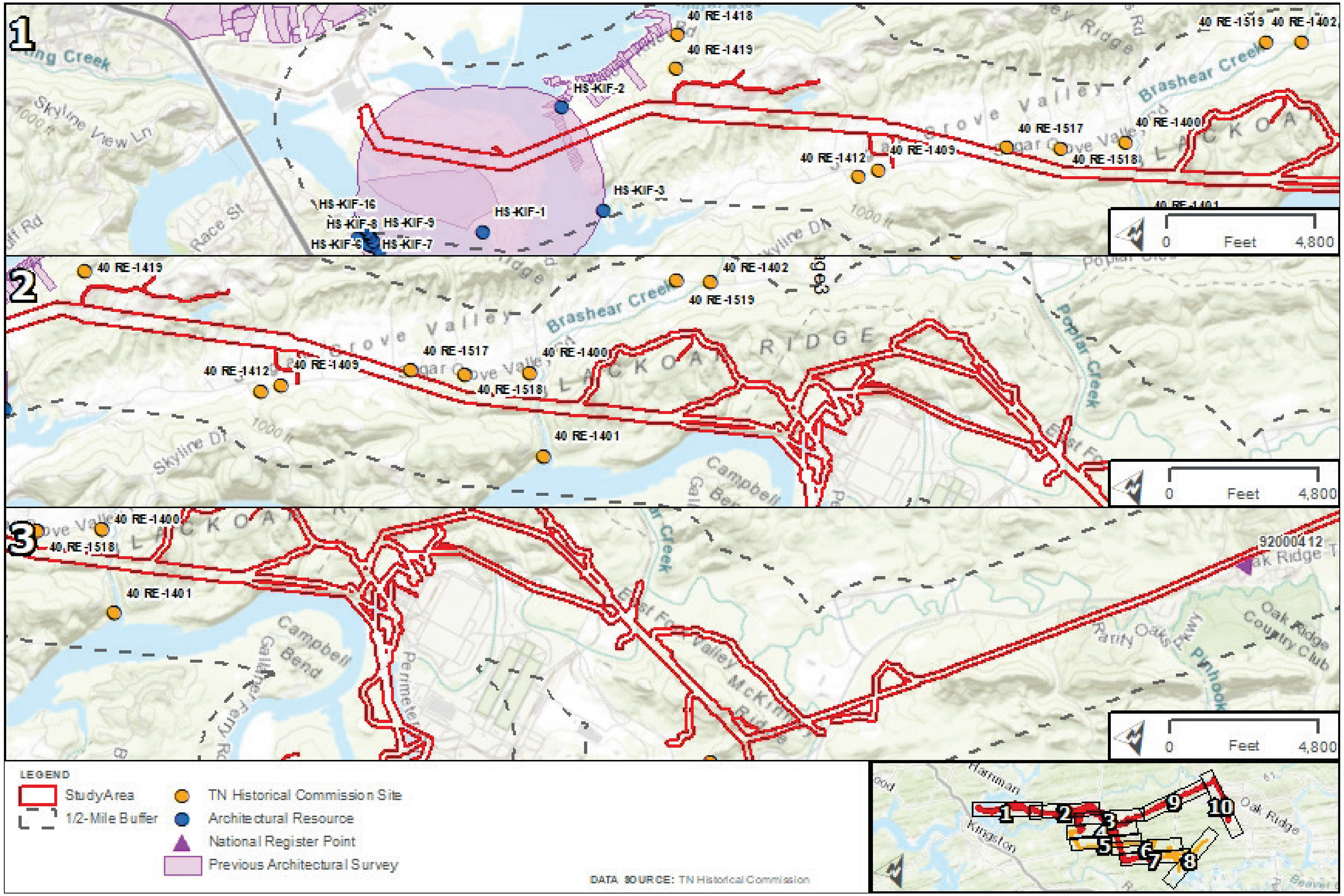

Figure 3.13-3a. Historic Architectural Resources Within 0.5-Mile Buffer of Lines 5116, 5280, and 5381 of the Eastern Transmission Line Corridor

Figure 3.13-3b. Historic Architectural Resources Within 0.5-Mile Buffer of Lines 5116, 5280, and 5381 of the Eastern Transmission Line Corridor

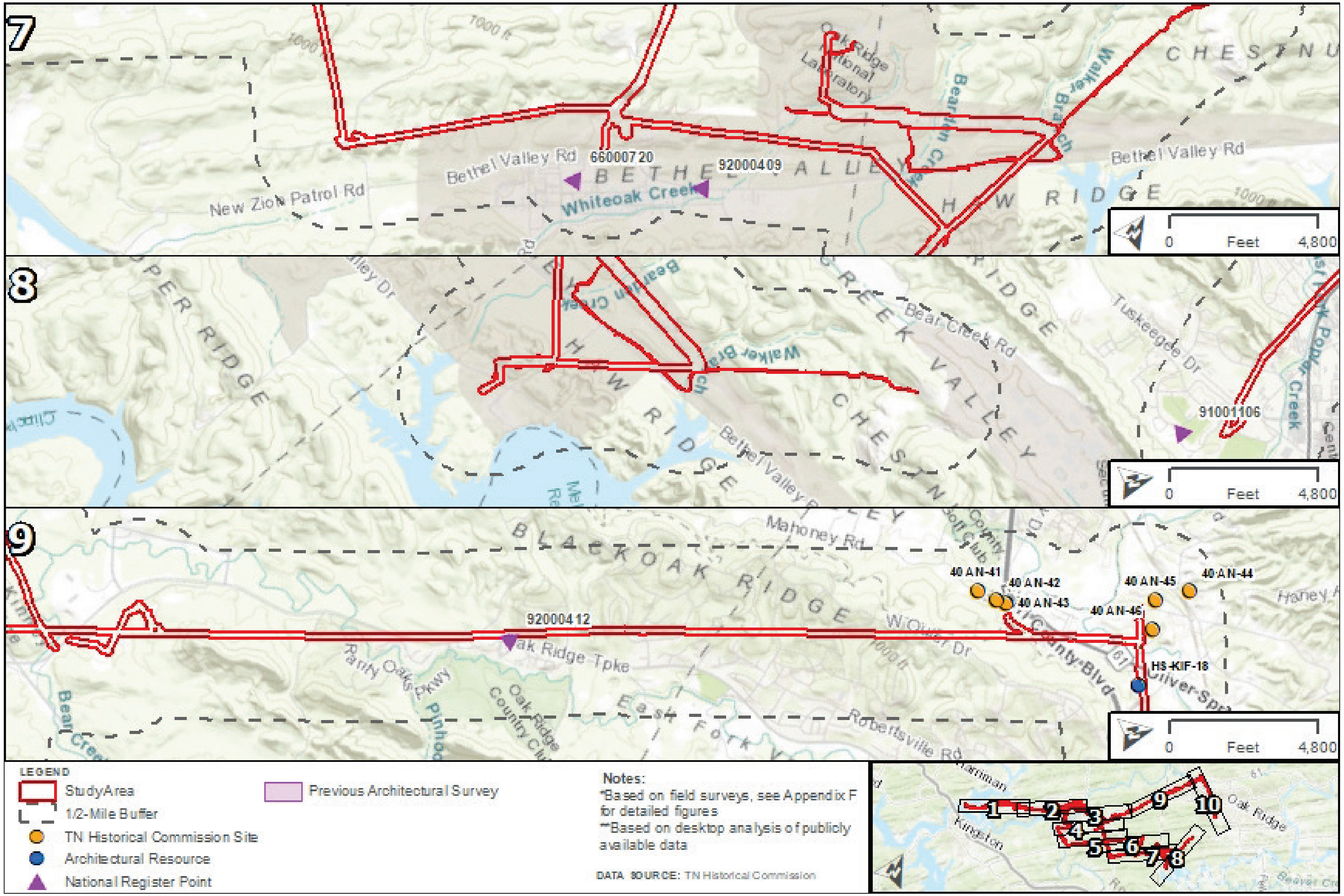

Figure 3.13-3c. Historic Architectural Resources Within 0.5-Mile Buffer of Lines 5116, 5280, and 5381 of the Eastern Transmission Line Corridor

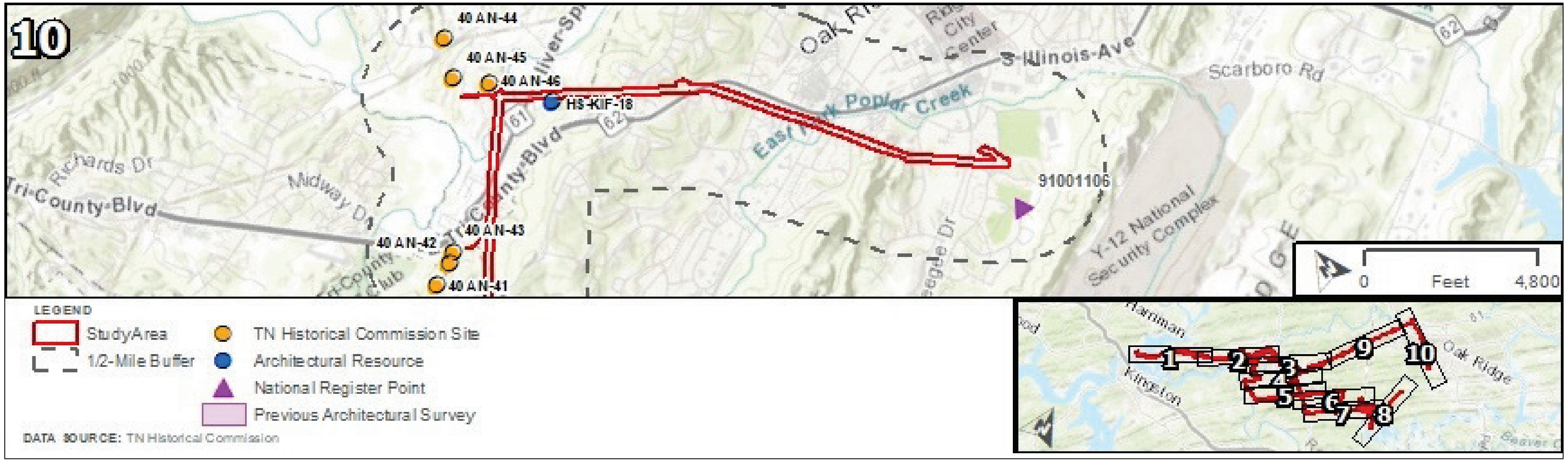

Figure 3.13-3d. Historic Architectural Resources Within 0.5-Mile Buffer of Lines 5116, 5280, and 5381 of the Eastern Transmission Line Corridor

Archaeological Resources

In addition to the previously recorded archaeological sites already discussed for L5108, L5302, and the Kingston Reservation, there are 35 previously recorded archaeological sites within 0.5 mile of the transmission line upgrades not already covered in L5108 and5302, and Kingston Reservation. These sites are summarized in Table 3.13-3 below. Two sites (40RE501 and 40RE622) are potentially eligible for the NRHP. The NRHP eligibility status of the remaining 33 sites is unknown. Site 40RE567 is the only previously recorded archaeological site within the proposed ROW of the L5116 transmission line upgrades.

During the June and July 2023 archaeological survey, one new pre-contact archaeological site 40RE647 was identified in the L5116 ROW and three previously recorded sites (40RE567, 40RE575, 40RE619) were revisited (Appendix K) (Table 3.13-3). TVA determined that newly identified archaeological site (40RE647) had undetermined eligibility for listing on the NRHP, though the portion of the site does not contribute to its NRHP eligibility. Archaeologists were unable to record the full extent of the site as it extended outside the Project boundary. Of the three remaining sites, TVA determined that archaeological site 40RE567 was not eligible for listing on the NRHP under Criteria A through D for lack of significance. TVA determined that archaeological site 40RE575 has undetermined eligibility for listing on NRHP since more than half of the site is located outside of the current project area. Therefore, the project would not adversely affect the site since the portion of the site within the project footprint lacks artifacts and features and does not contribute to the site's NRHP eligibility. TVA determined that the NRHP eligibility of archaeological site 40RE619 as a whole is undetermined due to the site potentially extending beyond the project boundary. There was no evidence of the site encountered within the project boundary, therefore, no additional archaeological investigations were recommended. SHPO concurred with TVA's findings and determinations regarding sites 40RE647, 40RE567, 40RE575, and 40RE619. To date, none of the consulted tribes have objected or identified resources of concern in the APE.

Table 3.13-3. Archaeological Sites Within 0.5-Mile Buffer of Eastern Transmission Corridor (Lines 5116, 5280, and 5381) under Alternative A

Site Number	NRHP Eligibility Status
Previously Recorded	
40AN228	No Data
40AN229	No Data
40AN230	No Data
40RE89	No Data
40RE90	No Data
40RE91	No Data
40RE110	No Data
40RE123	No Data
40RE125	No Data
40RE135	No Data
40RE138	No Data
40RE139	No Data
40RE140	No Data
40RE202	No Data
40RE232	No Data

Site Number	NRHP Eligibility Status
40RE233	No Data
40RE488	No Data
40RE492	No Data
40RE493	No Data
40RE501	Determined Potentially Eligible
40RE566	No Data
40RE567	Not Eligible
40RE575	Undetermined
40RE576	No Data
40RE593	No Data
40RE595	No Data
40RE597	No Data
40RE602	No Data
40RE613	No Data
40RE615	No Data
40RE616	No Data
40RE617	No Data
40RE619	Undetermined
40RE622	Determined Potentially Eligible
40RE636	No Data
New Sites	
40RE647	Undetermined (portion of site within the project area does not contribute to its NRHP eligibility)

3.13.2.2.5.2 Western Transmission Corridor

Line 5383

L5383 extends in a southeast direction from a substation in unincorporated Crossville on Plateau Road and terminates north of the Crossville city limits. The line is composed of two segments. Several access roads are proposed along the route in agricultural areas.

<u>Architectural Resources</u>

TVA did not conduct surveys for aboveground architectural resources along existing transmission line corridors in the western transmission corridor, since TVA's proposed activities in this area would be excluded by TVA's Section 106 PA. Additionally, TVA determined, in consultation with SHPO, that the proposed off-site transmission upgrades to Line 5383 would not result in adverse visual effects on aboveground resources outside the project footprint. Therefore, visual effects were not evaluated further for the proposed off-site transmission upgrades to Line 5383.

<u>Archaeological Resources</u>

TVA completed archaeological surveys of two transmission line segments and eight access roads associated with L5383, resulting in the identification of one archaeological site (40CU91) and one isolated find (HDR-IF-001). Archaeological site 40CU91 is a scatter of post contact artifacts and archaeological site HDR-IF-001 is a Pre-Contact isolated find.

Four previously recorded sites (40RE620, 40RE228, 40RE572, and 40RE224) were revisited during the cultural resources survey. These sites are not eligible for listing in the NRHP. Subsequent visual inspection, pedestrian survey, and shovel testing failed to yield any evidence of the previously recorded sites.

TVA determined that both sites are considered not eligible for listing on the NRHP. SHPO concurred with TVA's determination on November 28, 2023. TVA is awaiting concurrence from the consulted federally recognized Indian tribes regarding this finding.

3.13.2.2.6 Construction and Operation of a Natural Gas Pipeline

3.13.2.2.6.1 Agency Consultation

ETNG's Resource Report 4 (ETNG 2023e) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the cultural resources-related findings in ETNG's Resource Report 4. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). ETNG consulted with various state and local agencies and Native American groups prior to conducting field investigations of the proposed natural gas pipeline. As stated in ETNG's Resource Report 4 (ETNG 2023e):

> [ETNG], on behalf of the FERC, initiated Section 106 consultation with various state and local agencies and Native American groups located in or having areas of interest regarding cultural and historic resources in Tennessee. […] Correspondence related to the Phase I cultural resources surveys for the Project is included in Appendix 4B [of Resource Report 4 (ETNG 2023e)]
>
> [ETNG] initiated consultation with the Tennessee SHPO via letter dated December 9, 2021, to provide a methodology for historic architectural resources survey. In a letter dated December 27, 2021, SHPO concurred with the proposed architectural surveying methodology for both the pipeline corridor and the proposed buildings.
>
> On April 13, 2022, [ETNG] submitted a letter to SHPO to notify them of the planned [Ridgeline Expansion] project and [ETNG's] intent to request authorization to use the FERC pre-filing process and to invite SHPO to participate in this process. On June 7, 2022, [ETNG] submitted a letter to SHPO to update them on Project developments.
>
> On December 2, 2022, [ETNG] submitted the draft Phase I Survey Report and the Phase II work plan to SHPO for review.
>
> In an email dated December 12, 2022, SHPO stated that the project as currently proposed may adversely affect NHRP-listed archaeological site 40JK125 (Fort Blount-Williamsburg). SHPO previously determined 40PM89 (Bilbrey Site) and 40PM90 (Wiley Site) as eligible sites and encouraged continued consultation with its office to resolve these potential adverse effects.
>
> SHPO concurred with the report authors that sites 40JK171, 40JK173, 40JK273, 40JK283, 40JK287, 40JK288, 40JK289, 40JK291, 40JK294, 40JK298, 40JK304, 40JK310, 40MO168, 40MO178, 40OV14, 40OV31, 40OV173, 40PM35,

> 40PM82, 40PM83, 40PM85, 40PM87, 40PM88, 40PM148, 40PM150, 40PM153, 40PM154, 40PM155, 40PM157, 40PM158, 40PM159, 40PM164, 40SM12, 40SM156, 40SM245, 40SM246, 40SM247, 40SM250, 40SM251, 40SM252, 40SM261, 40TR54, 40TR116, and 40TR110 require additional archaeological testing to evaluate their eligibility for the National Register. SHPO stated that the proposed testing strategy submitted for review meets the Tennessee State Historic Preservation Office Standards and Guidelines for Archaeological Resource Management Studies and should provide the data necessary to fully assess these sites' eligibility.
>
> SHPO further stated that portions of the undertaking's APE not included in the current survey must either be subjected to archaeological survey or, if applicable, the results from previous investigations included in the assessment of affects for the undertaking. SHPO concurs with the authors that the portions of the sites within the APE for the remainder of the sites not listed in its correspondence do not contribute to eligibility and do not warrant additional investigation.
>
> On March 22, 2023, [ETNG] met with the TDOA to discuss proposed avoidance measures for cemeteries and for eight archaeological sites proposed for Phase II survey, additional archaeological work at sites previously listed on the NRHP, and the timeline and process for the Project Memorandum of Agreement. Meeting notes and TDOA response are included in Appendix 4B [of Resource Repot 4 (ETNG 2023e)].
>
> On July 14, 2023, [ETNG] submitted the draft Phase II Evaluation Report; Volume I Management Summary and the Supplemental Phase I Archaeological Survey report to SHPO for review. Copies of additional correspondence from SHPO regarding the Management Summary will be filed with the [FERC] when available.

3.13.2.2.6.2 Native American Consultations

As stated in ETNG's Resource Report 4 (ETNG 2023e):

> [ETNG] initiated communications with 18 federally recognized Native American tribes to provide an opportunity for comments related to traditional cultural or religious properties of significance that may be affected by the [Ridgeline Expansion] project. On August 26, 2021, [ETNG] submitted hardcopy letters to the tribes, to introduce the [Ridgeline Expansion] project during the early stage of [Ridgeline Expansion] project development. [ETNG] also presented the introductory letter to the tribes via email on September 1, 2021. Of the 18 tribal letters sent in August and September 2021, [ETNG] received responses from the Choctaw Nation of Oklahoma, Cherokee Nation, the Chickasaw Nation, the Eastern Shawnee Tribe of Oklahoma, and the Quapaw Tribe of Indians.
>
> On August 11, 2022, FERC initiated consultation with 17 federally recognized Native American tribes, all of whom had been included in the August 2021 correspondence. One tribe, the Absentee Shawnee Tribe of Indians of Oklahoma, was not included in the August 2022 outreach. FERC has received formal responses from the Cherokee Nation, Choctaw Nation of Oklahoma, the Eastern Shawnee Tribe of Oklahoma, and the Quapaw Tribe of Indians.

> On December 2, 2022, [ETNG] submitted the draft Phase I Survey Report and the Phase II work plan to 16 federally recognized Native American Tribes for review. The Quapaw Nation previously filed correspondence with FERC stating that the [Ridgeline Expansion] project is not located within their tribal area of interest; therefore, they did not receive the Phase I Survey Report.
>
> On July 14, 2023, [ETNG] submitted the draft Phase II Evaluation Report; Volume I Management Summary to 17 federally recognized tribes for review. Copies of additional correspondence from the Tribes regarding the Management Summary will be filed with the [FERC] when available.

3.13.2.2.6.3 Area of Potential Effects

The archaeological APE for the ETNG pipeline is defined as an approximately 122-mile-long pipeline construction ROW and adjoining ATWS, access roads, and aboveground facility workspace and footprints (ETNG 2023e). The following description from ETNG's Resource Report 4 (ETNG 2023e) defines the APE for historic architectural/industrial properties:

> In December 2021, [ETNG], in consultation with SHPO, defined the Indirect APE for historic architectural resources. It was determined that the proposed underground facilities along the [ETNG Construction ROW] have minimal potential to affect historic architectural resources. As such, for the length of the pipeline [Construction ROW], the APE for historic architectural resources will be defined as follows:
>
> - *Pipeline corridors*: Effects within the boundaries of NRHP-listed properties intersected by the Project, and any buildings or structures 50 years of age or older that will be directly impacted by the proposed Project. If such resources are located, the entirety of the parcel on which they are located will be subject to historic architectural resource survey.
>
> For aboveground [Ridgeline Expansion] project facilities with the potential for visual effects, the APE for historic architectural resources will be defined as follows:
>
> - *Compressor stations, meter stations, and crossover sites*: The APE will include the [Ridgeline Expansion] project area plus any areas within one-half mile of the [Ridgeline Expansion] project area containing historic resources from which the [Ridgeline Expansion] project facilities will be visible. The viewshed will be defined utilizing GIS-based viewshed analysis and confirmed based on lines of sight in the field.
> - *Mainline valves*: The APE will include the [Ridgeline Expansion] project area plus any areas within 500 feet of the [Ridgeline Expansion] project area containing historic resources from which the [Ridgeline Expansion] project area will be visible.

3.13.2.2.6.4 Previously Recorded Cultural Resources

ETNG's Resource Report 4, Cultural Resources (2023e), which TVA has independently reviewed, provides the following regarding architectural resources within the APE of the pipeline:

> [Cultural Resources Analysts, Inc. (CRA)] obtained information for previous architectural resources in the APE from the [Tennessee Historical Commission] Viewer website in lieu of in-office research, since the office of SHPO was not open to researchers due to COVID-19 pandemic restrictions.
>
> The review identified 23 previously recorded historic architectural resources within the 0.5-mile radius study area. Four resources that are within, or partially within, the 300-foot pipeline survey corridor are listed in the NRHP, including: Officer Farmstead (1000469), Averitt-Herod House (96000411), Hartsville Battlefield (98001247; 40TR51), and Fort Blount-Williamsburg (74001918; 40JK125). Architectural resource JK-376 (Samuel Smith/Smith) within the APE was previously recommended as eligible for listing in the NRHP. It should be noted, however, that the NRHP eligibility of resources indicated in the THC Viewer reflects the opinion of the previous surveyor and does not necessarily reflect concurrence from THC or the status of the property.

The recorded historic architectural resources identified within the half-mile radius of the potential ETNG Construction ROW are summarized in Table 3.13-4 and depicted on figures in Appendix H.

Table 3.13-4. Previously Recorded Historic Architectural Resources Within 0.5 Mile of the ETNG Construction ROW

Resource	Historic Name	Common Name	Construction Date	NRHP Eligibility
1000496	Officer Farmstead		1806-circa 1951	Listed
7400191	Fort Blount-Williamsburg Site		1790s	Listed
96000411	Averitt-Herod House		1834-1866	Listed
98001247	Hartsville Battlefield		1862	Listed
JK-166	Unknown		Unknown	Not Eligible
JK-373			1920	Not Eligible
JK-376	**Samuel Smith**	**Smith**	**1867**	**Eligible**
JK-387	William Smith	n/a	1910	Not Eligible
JK-496	Riley Spurlock	Ragland Sisters place	1904	Not Eligible
JK-499	Doug Flatt	Hagy Place	1910	Not Eligible
JK-501	Henry Flatt	Flatt Place	1909	Not Eligible
JK-503	Forest Chaffin	Birdwell House	1912	Not Eligible
JK-504	Aunt Nan Rash House	Williams Residence	1890	Not Eligible
MO-191	Watt Branstetter House	Wilburn Hanahan House	1880	Not Eligible
MO-192	Earl Branstetter House	Joyce Chatman House	1925	Not Eligible

Resource	Historic Name	Common Name	Construction Date	NRHP Eligibility
MO-381	Old Dillon House	Juanita Hargis House	1910	Not Eligible
MO-401	Ed Love House	Fate Cox, Sr. House	1905	Not Eligible
OV-354	John Officer	Nilon Neeley	1910	Not Eligible
SH-1136	Strong	Carsey Kemp	1850	Not Eligible
SH-1137	Stone Cemetery	Stone	Unknown	Not Eligible
SH-1139	Dakes	Pearl Anderson	1920	Not Eligible
SH-1147			Unknown	Not Eligible
TR-137	Carey House	Kyle House	1932	Unknown

***Bold resource is eligible for listing in the NRHP**
Source: ETNG 2023e

CRA consulted the TN State Archaeological Site Files maintained by the TDOA to determine if previously recorded archaeological resources were located within, or adjacent to, the pipeline and associated structures. Resources located within a 0.5-mile radius of the proposed pipeline and associated structures were recorded during this review. ETNG's Resource Report 4 (ETNG 2023e), which TVA has independently reviewed, provides the following regarding archaeological resources within the APE pipeline:

> The TDOA Site Files identified 39 previously recorded sites that were within or partially within the APE.…Six previously recorded sites within or partially within the APE are either listed in the NRHP or have been determined eligible for listing in the NRHP. Sites 40JK125 (NRHP Reference No. 74001918) and 40TR51 (NRHP Reference No. 98001247) are listed on the NRHP, and sites 40JK171, 40PM85l, 40PM89, and 40PM90 have been determined eligible for listing in the NRHP. One additional site, 40TR92, located outside of the APE within the 0.5-mile buffer was also recommended as eligible for listing in the NRHP.
>
> Four sites (40TR66, 40PM36, 40PM96, and 40SM12) have been recommended as potentially eligible. Four sites (40TR66, 40OV1, 40JK125, and 40JK171) within the APE have associated mortuary features. Of these, two are historic cemeteries, one is a pre-contact cemetery, and one is not well documented but appears to represent a cave with pre-contact interments. Site location was the only information on the site for three sites previously recorded within the APE.

These sites are summarized in Table 3.13-5.

Table 3.13-5. Previously Recorded Archaeological Sites in the Proposed Pipeline Study Corridor[1]

Site Number	County	Site Type	Mortuary Features	NRHP Status
40JK34	Jackson	Pre-Contact	No	Not Eligible
40JK125	**Jackson**	**Pre-Contact and Post Contact**	**Yes**	**Listed**
40JK171	**Jackson**	**Pre-Contact and Post Contact**	**Yes**	**Eligible**
40JK172	Jackson	Pre-Contact	No	Unassessed

Site Number	County	Site Type	Mortuary Features	NRHP Status
40JK174	Jackson	Pre-Contact	No	Not Eligible
40JK173	Jackson	Pre-Contact	No	Not Eligible
40JK273	Jackson	Pre-Contact	No	Unassessed
40MO11	Morgan	No data	No data	No data
40MO12	Morgan	No data	No data	No data
40MO119	Morgan	Pre-Contact	No	Unassessed
40OV1	Overton	Pre-Contact	Yes	Unassessed
40OV14	Overton	Pre-Contact	No	Unassessed
40OV31	Overton	Pre-Contact	No	Not Eligible
40PM35	Putnam	Pre-Contact	No	Not Eligible
40PM36	**Putnam**	**Pre-Contact**	**No**	**Potentially Eligible**
40PM81	Putnam	Pre-Contact	No	Unassessed
40PM82	Putnam	Pre-Contact	No	Unassessed
40PM83	Putnam	Pre-Contact and Post Contact	No	Unassessed
40PM84	Putnam	Pre-Contact and Post Contact	No	Unassessed
40PM85	Putnam	Pre-Contact	No	Eligible
40PM86	Putnam	Pre-Contact	No	Not Eligible
40PM87	Putnam	Pre-Contact	No	Not Eligible
40PM88	Putnam	Pre-Contact	No	Not Eligible
40PM89	**Putnam**	**Pre-Contact and Post Contact**	**No**	**Eligible**
40PM90	**Putnam**	**Pre-Contact**	**No**	**Eligible**
40PM96	**Putnam**	**Pre-Contact**	**No**	**Potentially Eligible**
40PM97	Putnam	Pre-Contact	No	Unassessed
40RE539	Roane	Pre-Contact	No	Not Eligible
40SM12	**Smith**	**Pre-Contact**	**No**	**Potentially Eligible**
40SM156	Smith	Pre-Contact	No	Not Eligible
40TR6	Trousdale	No data	No data	No data
40TR44	Trousdale	Pre-Contact	No	Unassessed
40TR45	Trousdale	Pre-Contact	No	Unassessed
40TR46	Trousdale	Pre-Contact	No	Unassessed
40TR47	Trousdale	Pre-Contact	No	Unassessed
40TR51	Trousdale	Pre-Contact	No	Unassessed
40TR53	Trousdale	Pre-Contact	No	Not Eligible
40TR54	Trousdale	Pre-Contact	No	Not Eligible
40TR66	**Trousdale**	**Post Contact**	**Yes**	**Potentially Eligible**
40TR95	Trousdale	Pre-Contact and Post Contact	No	Unassessed

***Bold resources are eligible for listing or listed in the NRHP**
[1]The Area of Potential Effect for the ETNG Construction ROW is defined in Section 3.13.2.2.6.3 in this EIS.
Source: Table 4.5-2 in ETNG 2023e

According to ETNG's Resource Report 4 (ETNG 2023e):

> Following background research, CRA conducted Phase I field investigations for the [natural gas] project between October 19, 2021, and June 29, 2022. Approximately 4,723.9 total acres were surveyed including 4,467.7 acres of mainline pipeline corridor, 75.3 acres of access roads, 202.1 acres for the Hartsville Compressor Station and non-jurisdictional solar array, and two acres for a Harriman Lateral Crossover site which has been eliminated from the [Ridgeline Expansion] project (Survey Area). The mainline pipeline survey corridor measured 300 feet wide on average and extends for 122.8 miles. Approximately 5 miles of the pipeline [Construction ROW] remain to be surveyed due to avoidance of sites that have previously been recommended as eligible or have been listed in the NRHP, or recent previous survey coverage.
>
> […] The archaeological survey included the revisit and reassessment of 29 previously recorded sites and the [documentation] of 133 previously unrecorded sites. […] Two previously recorded sites (40TR95 and 40PM36) were determined to merge with other previously documented sites in the APE and the two state site numbers were subsequently vacated. Site 40TR95 was combined with site 40TR44, and site 40PM36 was combined with 40PM35.
>
> Two previously recorded precontact sites (40JK174 and 40OV1) were not relocated. The previous site area of 40JK174 was surveyed but yielded no artifacts and no evidence of the site. Site 40OV1 is a previously documented precontact cave site mapped within the APE that was not [re]located during fieldwork. Following consultation with TDOA, the site is presumed to be located outside of the APE. Of the 29 previously recorded sites, 27 were relocated and reassessed within or partially within the mainline study corridor including the combination of sites 40TR95/40TR44 and 40PM46/40PM35, and two were not relocated. The reassessed previously recorded sites include 23 precontact sites, one post contact cemetery, and five multicomponent sites.
>
> A total of 133 new sites were recorded during the current survey and consist of 117 precontact, 11 post contact, and five multicomponent (precontact and contact components) sites. Of the 133 new sites, 3 were located in the Hartsville Compressor Station survey area, 4 were located exclusively within access road survey corridors, and 126 sites were located within, or partially within, the mainline pipeline survey corridor.
>
> A total of 44 newly recorded and previously recorded sites are considered potentially eligible and additional work is recommended to evaluate their NRHP eligibility. Of these 44 total sites recommended for further work, 34 are precontact, 4 are post contact, and 6 are multicomponent. Two additional previously recorded precontact sites (40PM89 and 40PM90), which are discussed below, were avoided during the current survey but are also recommended for agency consultation and further work if they cannot be avoided by construction activities.
>
> In addition to these 44 sites, 4 previously recorded sites (40TR51l, 40JK125, 40PM89, and 40PM90) within the APE are potentially eligible. These sites were not revisited during the current survey. Sites 40TR51 (the Hartsville

Battlefield) and 40JK125 (Fort-Blount Williamsburg) are listed on the NRHP. Sites 40PM89 and 40PM90 were previously recommended as eligible for listing in the NRHP. Previous investigations conducted at these two sites were restricted to their respective project areas. Evaluation of the portions of these two sites within the current APE, but outside of the previous project area, have not been conducted at this time. Further consultation with state agencies is [in process by ETNG] to define a treatment plan for these two resources. [[48]].

The newly and previously recorded sites are summarized in Table 3.13-6. The new and previously recorded cemeteries are listed in Table 3.13-7.

Table 3.13-6. New and Previously Recorded Archaeological Sites in the ETNG Construction ROW

State Resource /Field Site Number	Resource Type	Applicant NRHP Assessment
ETNG Construction ROW		
Trousdale County, TN		
40TR6/FS-AB-1	Pre-Contact	Not Eligible
40TR44	Multicomponent	Precontact (Not Eligible); Post Contact (Unassessed)
40TR53	Pre-Contact	Not Eligible
40TR54	Pre-Contact	Potentially Eligible
40TR66	Post Contact Cemetery	Existing Cemetery
40TR98/FS-AB-2	Pre-Contact	Not Eligible
40TR99/FS-AB-04, FS-SJ-01	Pre-Contact	Not Eligible
40TR100/FS-DL-20	Pre-Contact	Not Eligible
40TR101/FS-DL-50	Pre-Contact	Not Eligible
40TR103/FS-MD-01/FS-SJ-17	Pre-Contact	Not Eligible
40TR104/FS-MD-02	Pre-Contact	Not Eligible
40TR105/FS-SJ-02	Pre-Contact	Not Eligible
40TR106/FS-SJ-05	Pre-Contact	Not Eligible
40TR107/FS-SJ-06	Pre-Contact	Not Eligible
40TR108/FS-SJ-10	Pre-Contact	Not Eligible
40TR109/FS-SJ-12	Post Contact	Not Eligible
40TR110/FS-SJ-16	Pre-Contact	Potentially Eligible
40TR111/FS-SJ-18	Pre-Contact	Not Eligible
40TR112/FS-SJ-45, FS-SJ-46	Pre-Contact	Not Eligible
40TR113/FS-SJ-47	Pre-Contact	Not Eligible
40TR116/FS-SJ-03	Post Contact	Potentially Eligible
Smith County, TN		
40SM12/FS-MD-11	Pre-Contact	Potentially Eligible

[48] Results of final impact determinations, SHPO consultation, and identified minimization, mitigation, and treatment plans would be provided by ETNG when filing their application for Certificate of Public Necessity with FERC. These data would be provided in TVA's final EIS package.

State Resource /Field Site Number	Resource Type	Applicant NRHP Assessment
40SM156	Pre-Contact	Potentially Eligible
40SM245/FS-DL-05, FS-SJ-24, FS-SJ-25	Multicomponent	Pre-Contact: (Potentially Eligible); Post Contact (Not Eligible)
40SM246/FS-DL-6, FS-DL-7	Pre-Contact	Potentially Eligible
40SM247/FS-DL-9, FS-DL-10	Multicomponent	Pre-Contact: (Potentially Eligible); Post Contact (Not Eligible)
40SM248/FS-DL-12	Post Contact	Not Eligible
40SM249/FS-DL-13	Pre-Contact	Not Eligible
40SM250/FS-DL-14	Pre-Contact	Potentially Eligible
40SM251/FS-DL-15	Post Contact	Potentially Eligible
40SM252/FS-DL-17, FS-DM-22	Pre-Contact	Potentially Eligible
40SM253/FS-DL-21	Pre-Contact	Not Eligible
40SM254/FS-DL-22	Pre-Contact	Not Eligible
40SM255/FS-DL-24	Pre-Contact	Not Eligible
40SM256/FS-JR-01	Pre-Contact	Not Eligible
40SM257/FS-MD-04	Pre-Contact	Not Eligible
40SM258/FS-MD-05	Pre-Contact	Not Eligible
40SM259/FS-MD-06	Pre-Contact	Not Eligible
40SM260/FS-SJ-20, FS-SJ-21, FS-SJ-22	Pre-Contact	Not Eligible
40SM261/FS-SJ-26	Pre-Contact	Not Eligible
40SM262/FS-SJ-27	Pre-Contact	Not Eligible
40SM263/FS-SJ-28	Pre-Contact	Not Eligible
40SM264/FS-SJ-29	Pre-Contact	Not Eligible
40SM265/FS-SJ-34, FS-SJ-35	Pre-Contact	Not Eligible
40SM266/FS-SJ-36, FS-SJ-37	Pre-Contact	Not Eligible
40SM267/FS-SJ-39, FS-SJ-40	Pre-Contact	Not Eligible
40SM268/FS-SJ-41	Multicomponent	Not Eligible
40SM269/FS-SJ-51	Pre-Contact	Not Eligible
	Jackson County, TN	
40JK34	Pre-Contact	Not Eligible
40JK171	Pre-Contact	Potentially Eligible
40JK172	Pre-Contact	Not Eligible
40JK173	Pre-Contact	Potentially Eligible
40JK174	Pre-Contact	Not Eligible
40JK273/FS-SJ-68	Multicomponent	Potentially Eligible
40JK275/FS-JR-04	Pre-Contact	Not Eligible
40JK276/FS-JR-12	Pre-Contact	Not Eligible
40JK277-FS-JR-19	Pre-Contact	Not Eligible
40JK282/-FS-DL-27	Pre-Contact	Not Eligible
40JK283/FS-DL-34	Multicomponent	Potentially Eligible

State Resource /Field Site Number	Resource Type	Applicant NRHP Assessment
40JK284/FS-DL-36	Pre-Contact	Not Eligible
40JK285/FS_DL-37	Pre-Contact	Not Eligible
40JK287/FS-DL-40	Pre-Contact	Potentially Eligible
40JK288/FS-DL-41/42/43	Multicomponent	Potentially Eligible
40JK289/FS-DL-44, FS-JW-10, FS-JW-09	Pre-Contact	Potentially Eligible
40JK290/FS-DL-47	Post Contact	Not Eligible
40JK291/FS-DM-01	Post Contact	Potentially Eligible
40JK292FS-DM-24	Post Contact	Not Eligible
40JK293/FS-JR-02, FS-JR-03	Pre-Contact	Not Eligible
40JK294/FS-JR-09	Pre-Contact	Potentially Eligible
40JK295/FS-JR-10	Pre-Contact	Not Eligible
40JK296/FS-JR-11	Pre-Contact	Not Eligible
40JK297/FS-JR-13	Pre-Contact	Not Eligible
40JK298/FS-JR-14, FS-JR-37	Multicomponent	Pre-Contact (Potentially Eligible); Post Contact (Not Eligible)
40JK299/FS-JR-15	Pre-Contact	Not Eligible
40JK300/FS-JR-16	Pre-Contact	Not Eligible
40JK301/FS-JR-17, FS-JR-18	Pre-Contact	Not Eligible
40JK302/FS-JR-38	Pre-Contact	Not Eligible
40JK303/FS-JW-02	Pre-Contact	Not Eligible
40JK304/FS-JW-06	Pre-Contact	Potentially Eligible
40JK305/FS-JW-07	Pre-Contact	Not Eligible
40JK306/FS-JW-11	Pre-Contact	Not Eligible
40JK307/FS-SJ-54	Pre-Contact	Not Eligible
40JK308/FS-SJ-69, FS-SJ-70	Pre-Contact	Not Eligible
40JK309/FS-SJ-71	Pre-Contact	Not Eligible
40JK310/FS-SJ-72	Pre-Contact	Potentially Eligible
40JK311/FS-SJ-73	Pre-Contact	Not Eligible
40JK312FS-SJ-76	Pre-Contact	Not Eligible
40JK313/FS-SJ-79	Pre-Contact	Not Eligible
40JK314/FS-SJ-81	Pre-Contact	Not Eligible
40JK315/FS-SJ-82	Pre-Contact	Not Eligible
40JK316/FS-SJ-83	Pre-Contact	Not Eligible
40JK317/FS-SJ-85	Pre-Contact	Not Eligible
40JK318/FS-SJ-86	Pre-Contact	Not Eligible
40JK319/FS-SJ-87	Pre-Contact	Not Eligible
FS-SJ-90	Post Contact	Unassessed
Putnam County, TN		
40PM35	Pre-Contact	Potentially Eligible
40PM81	Pre-Contact	Not Eligible

State Resource /Field Site Number	Resource Type	Applicant NRHP Assessment
40PM82	Pre-Contact	Potentially Eligible
40PM83	Multicomponent	Pre-Contact (Potentially Eligible); Post Contact (Not Eligible)
40PM84	Multicomponent	Not Eligible
40PM85	Pre-Contact	Potentially Eligible
40PM87	Pre-Contact	Potentially Eligible
40PM88	Pre-Contact	Potentially Eligible
40PM96	Pre-Contact	Not Eligible
40PM97	Multicomponent	Not Eligible
40PM148	Pre-Contact	Potentially Eligible
40PM149	Pre-Contact	Not Eligible
40PM150/FS-DL-31	Pre-Contact	Potentially Eligible
40PM151/FS-DL-68, FS-DL-69	Pre-Contact	Not Eligible
40PM152/FS-DM-02, FS-DM-03, FS-DM-25	Pre-Contact	Not Eligible
40PM153/FS-DM-07	Pre-Contact	Potentially Eligible
40PM154/FS-DM-09	Pre-Contact	Potentially Eligible
40PM155/FS-JR-06	Pre-Contact	Potentially Eligible
40PM156/FS-JR-07	Pre-Contact	Not Eligible
40PM157/FS-JR-08	Pre-Contact	Potentially Eligible
40PM158/FS-JR-23	Pre-Contact	Potentially Eligible
40PM159/FS-JR-24	Pre-Contact	Potentially Eligible
40PM160/FS-JR-39	Pre-Contact	Not Eligible
40PM161/FS-JR-40	Pre-Contact	Not Eligible
40PM162/FS-JW-15	Pre-Contact	Not Eligible
40PM163/FS-JW-16	Pre-Contact	Not Eligible
40PM164/FS-DL30	Pre-Contact	Potentially Eligible
40PM165/FS-SJ-60	Pre-Contact	Not Eligible
40PM166/FS-SJ-61	Pre-Contact	Not Eligible
40PM167/FS-SJ-63	Pre-Contact	Not Eligible
40PM168/FS-DL-49	Pre-Contact	Not Eligible
	Overton County, TN	
40OV1	Pre-Contact	Unassessed
40OV14/FS-JW-24, FS-DM-13, FS-DL-54	Pre-Contact	Potentially Eligible
40OV31/FS-DM-05, FS-DM-06	Pre-Contact	Potentially Eligible
40OV173/FS-DL-52	Pre-Contact	Potentially Eligible
40OV174/FS-DL-53	Pre-Contact	Not Eligible
40OV176/FS-DM-11	Pre-Contact	Not Eligible
40OV177/FS-JR-21	Pre-Contact	Not Eligible
40OV178/FS-JR-22	Pre-Contact	Not Eligible

State Resource /Field Site Number	Resource Type	Applicant NRHP Assessment
40OV179/FS-JR-25	Pre-Contact	Not Eligible
40OV180/FS-JR-26	Pre-Contact	Not Eligible
40OV181/FS-JR-28	Pre-Contact	Not Eligible
40OV182/FS-JR-29	Pre-Contact	Not Eligible
40OV183/FS-JR-31	Pre-Contact	Not Eligible
40OV184/FS-JR-32	Pre-Contact	Not Eligible
40OV185/FS-JR-33, FS-JR-34	Pre-Contact	Not Eligible
40OV186/FS-JW-19	Pre-Contact	Not Eligible
40OV187/FS-JW20	Pre-Contact	Not Eligible
40OV188/FS-MD-12	Pre-Contact	Not Eligible
Fentress County, TN		
40FN426/FS-JW-26	Pre-Contact	Not Eligible
40FN427/FS-JW-27	Pre-Contact	Not Eligible
40FN425/FS-DM-14	Pre-Contact	Not Eligible
Morgan County, TN		
40MO168/FS-JR-36	Pre-Contact	Potentially Eligible
40MO171/FS-DL-59	Pre-Contact	Not Eligible
40MO172/FS-DL-64	Post Contact	Not Eligible
40MO173/FS-DM-16	Pre-Contact	Not Eligible
40MO174/FS-DM-18, FS-DM-19	Pre-Contact	Not Eligible
40MO175/FS-DM-20	Pre-Contact	Not Eligible
40MO176/FS-JW-31, FS-JW-32	Pre-Contact	Not Eligible
40MO177/FS-JW-33	Pre-Contact	Not Eligible
FS-SJ-88	Post Contact	Potentially Eligible
Roane County, TN		
40RE539	Pre-Contact	Not Eligible
Hartsville Compressor Station		
Trousdale County, TN		
40TR102/FS-DM-26	Pre-Contact	Not Eligible
40TR114/FS-TJ-01	Post Contact	Not Eligible
40TR115/FS-TJ-02	Pre-Contact	Not Eligible

Table 3.13-7. Previously Recorded Post Contact Cemeteries in the ETNG Construction ROW

Milepost	Cemetery ID	County	Age	Earliest and Latest Interment	Cemetery Description
3.1	Cemetery 1	Trousdale, TN	Post Contact	Unknown	Unnamed cemetery
6.9	Cemetery 2	Trousdale, TN	Post Contact	1894/1930	Reese Cemetery

Milepost	Cemetery ID	County	Age	Earliest and Latest Interment	Cemetery Description
9.2	Cemetery 3	Trousdale, TN	Post Contact	1845/1941	Corley-Shaw-Buford Cemetery
16.4	Cemetery 4	Smith, TN	Post Contact	Unknown	Unnamed cemetery
16.8	Cemetery 5	Smith, TN	Post Contact	1888/1950	Oldham Cemetery
17.8	Cemetery 6	Smith, TN	Post Contact	1766/1953	Stone Cemetery
22.5	Cemetery 7	Smith, TN	Post Contact	1835/1933	West Cemetery
22.7	Cemetery 8	Smith, TN	Post Contact	1878/1939	Williams Cemetery
28.3	Cemetery 9	Jackson, TN	Post Contact	1891/1928	Mill Hill Cemetery
32.2	Cemetery 10	Jackson, TN	Post Contact	1898/1920	Collins Family Cemetery
34.2	Cemetery 11	Jackson, TN	Pre-Contact	N/A	Reinterred Pre-Contact mortuary feature; precise location unknown
40.9	Cemetery 12	Jackson, TN	Post Contact	1940/2021	Flatt-Woolbright Cemetery
41.5	Cemetery 13	Jackson, TN	Modern	2012/2021	Byers Cemetery extension
42.6	Cemetery 14	Jackson, TN	Post Contact	1885/2022	Young Cemetery
49.3	Cemetery 15	Putnam, TN	Post Contact	Unknown	Unnamed cemetery
53.0	Cemetery 16	Putnam, TN	Post Contact	1875/1968	Officers Chapel Cemetery
105.7	Cemetery 17	Morgan, TN	Modern	2017	Unnamed cemetery

Source: ETNG 2023e

Following the initial cultural resources survey, approximately 338.4 acres of additional Mainline were surveyed between November 2022 and May 2023. As a result of these supplemental surveys, six new archaeological sites (40OV191 through 40OV194, 40SM271, and 40PM173), three new isolated finds (IF-1, IF-2, and IF-3), and one new non-site locality (NSL-DL-06) were documented. Additionally, two previously recorded sites (40PM86 and 40TR101) were revisited and expanded. Two of the newly discovered sites are recommended for additional Phase II evaluation to determine if intact deposits can be identified and documented. The remaining sites are recommended not eligible for listing in the NRHP (Hargiss et al. 2023). These sites are summarized in Table 3.13-8.

Table 3.13-8. Newly Recorded Archaeological Sites From the Supplemental Surveys in the ETNG Construction ROW

Site Number	Resource Type	Applicant NRHP Assessment
40MP86	Multicomponent	Not Eligible
40TR101	Pre-Contact	Not Eligible
40SM271	Pre-Contact	Not Eligible
40OV192	Pre-Contact	Not Eligible
40OV193	Post Contact	Not Eligible
40OV194	Post Contact	Not Eligible
40PM173	Pre-Contact	Potentially Eligible
40OV191	Pre-Contact	Potentially Eligible

As a result of the initial 2022 archaeological survey, 46 archaeological sites were identified as potentially eligible for listing on the NRHP and recommended for avoidance or additional work. Following SHPO concurrence with the findings of the archaeological survey in December 2022, a Phase II Work Plan was submitted to SHPO outlining the methodology and approach for Phase II evaluations for the 46 sites recommended potentially eligible for listing on the NRHP and requiring additional investigation to fully evaluate NRHP eligibility. The work plan was approved on December 12, 2022. Of the 46 sites identified in the Work Plan, Phase II investigations were conducted at 36 sites. Eighteen sites are recommended eligible for listing on the NRHP and would require avoidance or mitigation. Eighteen of the sites are recommended not eligible for listing on the NRHP and no further work is recommended. The full Phase II cultural resources evaluation report is in development and with completion anticipated by April 2024. The remaining 10 sites did not undergo Phase II investigations because they could either be avoided, as described in an avoidance plan submitted to SHPO on March 3, 2023, access was restricted, or additional coordination is required prior to investigation. Table 3.13-9 presents a summary of the Phase II investigations.

Table 3.13-9. Phase II Tested Archaeological Sites in the ETNG Construction ROW

Site Number	Site Type	Applicant NRHP Assessment	Recommended Treatment
40JK171	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40JK173	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40JK273	Pre-Contact	Potentially Eligible	Additional work needed pending access
40JK287	Pre-Contact	Not Eligible	No Further Consideration Required
40JK288	Multicomponent	Eligible	Avoidance or Phase III Data Recovery
40JK289	Pre-Contact	Not Eligible	No Further Consideration Required
40JK291	Post Contact	Eligible	Avoidance or Phase III Data Recovery
40JK294	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery

Site Number	Site Type	Applicant NRHP Assessment	Recommended Treatment
40JK298	Multicomponent	Eligible – Pre-Contact Component Only	Avoidance or Phase III Data Recovery
40JK304	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40MO178	Post Contact	Not Eligible	No Further Consideration Required
40OV31	Pre-Contact	Not Eligible	No Further Consideration Required
40OV173	Pre-Contact	Not Eligible	No Further Consideration Required
40PM35	Pre-Contact	Not Eligible	No Further Consideration Required
40PM82	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40PM83	Multicomponent	Not Eligible	No Further Consideration Required
40PM87	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40PM88	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40PM148	Pre-Contact	Not Eligible	No Further Consideration Required
40PM150	Pre-Contact	Not Eligible	No Further Consideration Required
40PM153	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40PM154	Pre-Contact	Not Eligible	No Further Consideration Required
40PM155	Pre-Contact	Not Eligible	No Further Consideration Required
40PM159	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40PM164	Pre-Contact	Not Eligible	No Further Consideration Required
40SM156	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40SM245	Multicomponent	Eligible	Avoidance or Phase III Data Recovery
40SM246	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40SM247	Multicomponent	Not Eligible	No Further Consideration Required
40SM250	Pre-Contact	Not Eligible	No Further Consideration Required
40SM251	Post Contact	Not Eligible	No Further Consideration Required
40SM252	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40SM261	Pre-Contact	Not Eligible	No Further Consideration Required
40TR54	Pre-Contact	Eligible	Avoidance or Phase III Data Recovery
40TR110	Pre-Contact	Not Eligible	No Further Consideration Required
40TR116	Post Contact	Not Eligible	No Further Consideration Required

3.13.2.3 Alternative B

TVA anticipates that the solar facilities proposed under Alternative B would be located within portions of East TN. As specific sites have not yet been determined for evaluation under this alternative, typical cultural resources effects of solar and storage construction and transmission projects have been listed under Section 3.2 and Section 3.3. A broad overview of archaeological resources, historic structures, and TCPs in TVA's region is presented below.

3.13.2.3.1 Archaeological Resources

Human occupation in TVA's region began at the end of the Ice Age with the Paleo-Indian Period (13,500 – 11,000 years before present, or "B.P."). In the TN Valley, prehistoric archaeological chronology is generally broken into four broad time periods: following the Paleo-Indian Period are the Archaic (11,000 – 3,000 B.P.), Woodland (3,000 – 1,100 B.P.), and Mississippian (1,100 – 500 B.P.) periods. Archaeological sites from all these periods, as well as from the more recent historic period, are numerous throughout TVA's region. They occur on a variety of landforms and in a multitude of environmental contexts. Sites are rarely found on steep slopes, with the exception of rock shelters, which have been used throughout the Pre-contact and post contact periods and often contain artifacts and features with value to archaeology and understanding the use of the region. Areas affected by construction, such as mining, civil works projects, and highways, for example, tend to lack significant archaeological resources due to modern ground disturbing activities.

The most reliable information about the locations of archaeological sites in the TN Valley is produced during Phase I archaeological surveys conducted by federal agencies for compliance with Section 106 and Section 110. Numerous surveys have been conducted along reservoir shorelines, within reservoirs, and on power plant reservations throughout TN. Some TVA transmission line corridors and many highway corridors have been surveyed. However, there are large areas of TN that have not been surveyed. Outside of TVA reservoirs and power plant reservations, the density of surveys is low and relatively little is known about archaeological site distributions.

The earliest documentation of archaeological research in the region dates back to the 19th century when entities such as the Smithsonian Institute and individuals such as Cyrus Thomas undertook some of the first archaeological excavations in America to document the history of Native Americans (Keel 1970). TVA was a pioneer in conducting archaeological investigations during the construction of its dams and reservoirs in the 1930s and early 1940s (Olinger and Howard 2009). Since then, TVA has conducted numerous archaeological surveys associated with permitting actions, power plants, and transmission system construction and maintenance. These surveys, as well as other off-reservoir projects, have identified more than 2,000 sites, including over 250 within or in the immediate vicinity of TVA transmission line ROWs. Many of these sites have not been evaluated for NRHP eligibility.

The number of sites eligible or potentially eligible for listing on the NRHP in TN is unknown. While digitization of this data is under way, no consistent database is available for determining the number of archaeological sites within TVA's region. Survey coverage on private land has been inconsistent and is largely project-based rather than focusing on high probability areas, so data is unlikely to be representative of the total population of archaeological sites. Based on a search of TVA's data and reports of archaeological surveys on reservoirs, TVA estimates that over 11,000 archaeological sites have been recorded on TVA reservoir lands, including submerged lands. Significant archaeological excavations have occurred as a result of TVA projects and federal projects and have yielded impressive information regarding the prehistoric and historic occupation of the Southeastern U.S. Notable recent excavations and related projects in the region include those associated with the Townsend highway expansion; Shiloh Mound on the TN River in Hardin County; the Ravensford site in Swain County, North Carolina; and documentation of prehistoric cave art in Alabama and TN.

3.13.2.3.2 Historic Structures

Historic architectural resources are found throughout TVA's region and can include houses, barns, public buildings, TVA facilities, and historic transmission lines. Many historic structures in the region have been either determined eligible for listing or have been listed in the NRHP. However, historic architectural surveys have been conducted in only a fraction of the land area within the region.

Over 5,000 historic structures have been inventoried in the vicinity of TVA reservoirs and power system facilities. Of those evaluated for NRHP eligibility, at least 85 are included in the NRHP and about 250 are considered eligible or potentially eligible for listing. Four of TVA's coal-fired plants (John Sevier, Bull Run, Watts Bar, and Shawnee) have been determined eligible for the NRHP; one (Shawnee) is listed in the NRHP. TVA has determined that all other TVA fossil plants are not eligible for listing on the NRHP.

3.13.2.3.3 Traditional Cultural Properties

TVA's region is a diverse cultural landscape that held special meaning to its past inhabitants and to their descendants. Some of these places can be considered TCPs. Similarly, a cultural landscape is defined as "a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (Birnbaum 1994). TVA does not make public sensitive information regarding the location or other information regarding sacred sites or TCPs identified by consulting tribes. Some examples of TCPs within TVA's region include mound sites, segments of the Trail of Tears, and stacked stone features. The Trail of Tears consisted of many routes and sub-routes that were traveled by Native Americans during their removal from their ancestral homelands. Segments of the Trail of Tears cross TVA transmission line corridors at approximately 278 locations (TVA 2018). Stacked stone features often appear as single or a group of cylindrically stacked limestone. The origin and purpose of these stone features is uncertain, but a resolution passed by the United South and Eastern Tribes, Inc. (USET) in 2007 recommended that all federal agencies involved in the Section 106 process consider stacked stone features that cannot be conclusively linked to a historic origin to be a TCP under NRHP Criterion A (USET 2007).

3.13.3 Environmental Consequences

3.13.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain KIF. TVA would implement all of the planned actions related to the current and future management and storage of CCRs, which have either been reviewed or would be in subsequent NEPA analyses. Under the scope of this EIS, no work would be conducted that would result in loss or disturbance of cultural resources beyond existing conditions. Therefore, no project-related environmental effects to cultural resources would occur under this alternative.

3.13.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of KIF Plant

Due to modifications made to the KIF plant over the years, which have diminished its integrity as an historic architectural property, KIF is ineligible for the NRHP. Furthermore, there are no NRHP-eligible or potentially eligible archaeological sites in the D4 portion of the APE. The proposed activities under the D4 process are not activities with potential for visual effects on other above-ground resources; as such, this proposed action would not affect historic properties.

3.13.3.2.1 Environmental Justice Considerations

Effects to cultural resources that would occur as a result of the Kingston coal facility retirement and D4 activities are not anticipated to have disproportionate and adverse human health or environmental effects on EJ populations. Any effects would be avoided, minimized, or mitigated through implementation of cultural resources surveys and NHPA consultation with Native American tribes and interested stakeholders, which could include other EJ populations.

3.13.3.3 Alternative A

3.13.3.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

One site that is considered "undetermined" or potentially eligible for inclusion in the NRHP, 40RE626, is located partially within the area affected by proposed on-site transmission line upgrades. Site 40RE45 is the only recorded site eligible for listing in the NRHP that is located within the potential CC/Aero CT Plant footprint, although Phase II testing determined that the portion of the site within the current APE does not overlap with significant deposits of the site. Because the area of significant deposits of Site 40RE45 is located outside the project footprint and TVA has no planned activities that could affect site 40RE626, the proposed action would not adversely affect any archaeological sites listed in, or eligible for listing in, the NRHP. Additionally, because there are no other NRHP-listed or-eligible historic architectural properties in the APE, the proposed activity would not affect any above-ground historic properties.

To fulfill its obligations under Section 106 of the NHPA, TVA consulted with SHPO regarding its finding that the undertaking would not result in adverse effects to cultural resources or historic properties from the construction and operation of a CC/Aero CT plant and switchyard on the Kingston Reservation. SHPO concurred on November 28, 2023, and none of the consulted tribes objected or identified resources of concern. As such, cumulative effects to cultural resources are not anticipated as a result of the proposed undertaking.

3.13.3.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on the Kingston Reservation

There are no archaeological sites within the proposed 3- to 4-MW solar facility location and no historic architectural properties listed in or eligible for listing in the NRHP are located in the viewshed of the proposed solar site. Therefore, this proposed action would not affect historic properties. TVA consulted with SHPO regarding its finding that the undertaking would not result in adverse effects to historic properties from the construction of the proposed 3- to 4-MW solar facility. SHPO concurred, and none of the consulted tribes objected or identified resources of concern.

3.13.3.3.3 Construction and Operation of a 100-MW BESS on the Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.13.2.1 apply to the proposed 100-MW BESS on the Kingston Reservation. Site 40RE620 is in the footprint of proposed Battery Site 3 (identified in Figure 2.1-5), but TVA and SHPO agreed in 2019 that Site 40RE620 is ineligible for the NRHP. There are no archaeological sites within proposed Battery Sites 1 and 2. Additionally, there are no NRHP-listed or –eligible historic architectural resources within the 0.5-mile buffer around the Kingston Reservation boundary. No historic properties would be affected by the construction and operation of the 100-MW BESS. TVA consulted with SHPO regarding its finding that the undertaking would not result in adverse effects to historic properties from the construction and operation of the BESS. SHPO concurred, and none of the consulted tribes objected or identified resources of concern.

3.13.3.3.4 On-site Transmission Upgrades

The environmental consequences for on-site transmission upgrades on cultural resources are the same as those described in Sections 3.13.2.2 and 3.13.2.3.1. The proposed transmission line upgrades would not adversely affect any cultural resources.

3.13.3.3.5 Off-site Transmission Upgrades

3.13.3.3.5.1 Eastern Transmission Corridor

Lines 5108 and 5302

<u>Architectural Resources</u>

TVA determined that one historic-age architectural resource, Green Cemetery (RE-1636), is recommended eligible for listing in the NRHP under Criteria Consideration D. Green Cemetery is surrounded by mature vegetation that serves as a visual screen between the grounds and the proposed KIF CC/Aero CT Plant and Switchyard site, minimizing the potential visual impact of the project on the historic property. The project would not affect the integrity of Green Cemetery nor limit its ability to convey its significance. Therefore, TVA recommended a finding of no effects to historic architectural properties (Appendix K). SHPO concurred with this recommendation.

<u>Archaeological Resources</u>

TVA completed archaeological survey of off-site transmission lines (L5108 and L5302) and identified two archaeological sites (40AN277 and 40AN278). TVA has determined that both sites should be considered not eligible for the NRHP and consulted with SHPO and federally recognized Indian tribes regarding this finding. Additionally, four previously recorded sites (40RE620, 40RE228, 40RE572, and 40RE224) were revisited during the cultural resources survey. Subsequent visual inspection, pedestrian survey, and shovel testing failed to yield any evidence of the previously recorded sites. Therefore, TVA recommended no further archaeological investigations for the four revisited sites within the existing corridor (Appendix K). TVA found, in consultation with SHPO and federally recognized Indian tribes, that no NRHP-listed or -eligible archaeological sites are located in the affected areas associated with proposed modifications to L5108 and L5302. Further, the activities are excluded from additional Section 106 review by TVA's Section 106 PA. Therefore, the proposed activities would not affect historic properties.

L5116, L5280, and L5381

<u>Architectural Resources</u>
Of the 47 primary historic-age architectural resources recorded within the Architectural Study Area of the Eastern Transmission Corridor, none of the 45 newly recorded historic-age architectural resources were recommended eligible for listing in the NRHP. However, two NRHP-listed historic properties (NRHP ID 66000720: X-10 Graphite Reactor at ORNL [a National Historic Landmark] and NRHP ID 92000409: New Bethel Baptist Church) are located within the Architectural Survey Area for of L5108, L5302, and L5383 of the Eastern Transmission Corridor. The replacement of existing transmission line towers would constitute a minimal to negligible change in the distant setting of the two NRHP-listed historic properties and would not affect the historic properties' aspects of integrity or ability of any of the historic properties to convey their historic significance, and, therefore, no adverse effects to historic properties (Appendix K).

<u>Archaeological Resources</u>
In addition to the previously recorded archaeological sites already discussed for L5108, L5302, and the Kingston Reservation, there are 35 previously recorded archaeological sites within 0.5 mile of the transmission line upgrades not already covered in L5108 and5302, and Kingston Reservation. Two of these sites are potentially eligible for the NRHP; the NRHP eligibility status of the remaining 33 sites is unknown. During the June 2023 cultural surveys, one new pre-contact archaeological site was identified in the L5116 ROW and three previously recorded sites were revisited. TVA determined that newly identified archaeological site 40RE647 had undetermined eligibility for listing on the NRHP, though the portion of the site does not contribute to its NRHP eligibility. Of the three remaining sites, TVA determined that archaeological site 40RE567 was not eligible for listing on the NRHP under Criteria A through D for lack of significance. TVA determined that archaeological site 40RE575 has undetermined eligibility for listing on NRHP since more than half of the site is located outside of the current project area. Therefore, the project would not adversely affect the site since the portion of the site within the project footprint lacks artifacts and features and does not contribute to the site's NRHP eligibility. TVA determined that the NRHP eligibility of archaeological site 40RE619 as a whole is undetermined due to the site potentially extending beyond the project boundary. There was no evidence of the site encountered within the project boundary, therefore, no additional archaeological investigations were recommended (Appendix K).

3.13.3.3.5.2 Western Transmission Corridor

Line 5383

<u>Architectural Resources</u>
Two architectural resources in Cumberland County (CU-929 [Green Acres Cemetery] and CU-930 [Fredonia Baptist Church Cemetery]) were encountered and recorded in the survey area. CU-929 and CU-930 are recommended not eligible for listing in the NRHP. TVA has found, in consultation with SHPO, that the proposed off-site transmission upgrades would not result in the potential for visual effects on above-ground resources outside the project footprint; as such, visual effects were not evaluated further for the proposed off-site transmission upgrades to L5383 (Appendix K).

<u>Archaeological Resources</u>
TVA completed archaeological surveys of two transmission line segments and eight access roads associated with L5383, resulting in the identification of one archaeological site (40CU91) and one isolated find (HDR-IF-001). TVA has determined that both sites should

be considered not eligible for the NRHP and consulted with SHPO and federally recognized Indian tribes regarding this finding. Additionally, four previously recorded sites (40RE620, 40RE228, 40RE572, and 40RE224) were revisited during the cultural resources survey and TVA has determined that these sites should be considered not eligible for the NRHP and consulted with SPHO and federally recognized Indian tribes regarding this finding. Subsequent visual inspection, pedestrian survey, and shovel testing failed to yield any evidence of the previously recorded sites (Appendix K).

3.13.3.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 4 (ETNG 2023e) was filed with FERC in July 2023 (ETNG 2023a). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the cultural resources-related findings in ETNG's Resource Report 4. This FEIS has been updated based on subsequent filings by ETNG with FERC in October 2023 (ETNG 2023n) and in December 2023 (ETNG 2023o-q). There are 46 newly and previously recorded archaeological sites within the proposed ETNG Construction ROW that are considered potentially eligible for the NRHP (ETNG 2023e). Previously recorded pre-contact sites 40PM89 and 40PM90 are anticipated to be avoided by the current design; therefore, these sites were not surveyed. However, both sites are recommended for agency consultation and further work if they cannot be avoided by construction activities (ETNG 2023e). Four additional previously recorded sites were not revisited and instead were recommended for additional (Phase II) survey work, two of which are listed on the NRHP (sites 40TR51 and 40JK125) and would require data recovery investigations prior to construction if the sites cannot be avoided. Further consultations are necessary and ongoing for Sites 40PM89 and 40PM90, which were previously recommended as eligible for NRHP listing. Seven additional previously recorded archaeological sites (40TR45, 40TR46, 40TR47, 40PM86, 40MO11, 40MO12, and 40MO119) within the APE were not revisited during the current surveys due to restricted access. ETNG would revisit and update each of these sites prior to project construction if these resources cannot be avoided.

Following SHPO concurrence with the findings of the archaeological survey in December 2022, a Phase II Work Plan was submitted to SHPO outlining the methodology and approach for Phase II evaluations for the 46 sites recommended potentially eligible for listing on the NRHP and requiring additional investigation to fully evaluate NRHP eligibility. Of the 46 sites identified in the Work Plan, Phase II investigations were conducted at 36 sites. Eighteen sites are recommended eligible for listing on the NRHP and would require avoidance or mitigation. Eighteen sites are recommended not eligible for listing on the NRHP, and no further work is recommended. The remaining 10 sites did not undergo Phase II investigations because they could either be avoided, as described in an avoidance plan submitted to SHPO on March 3, 2023, access was restricted, or additional coordination is required prior to investigation (ETNG 2023e).

For the archaeological sites recommended as not eligible for the NRHP, no further work is being recommended. Four historic sites or components, or portions thereof, remain unassessed for NRHP eligibility. This includes two historic sites with cemeteries (40TR66 and FS-SJ-90) that are unassessed for NRHP eligibility. The rural domestic house component of FS-SJ-90 within the APE is recommended as not eligible for listing in the NRHP. The historic component of previously recorded multicomponent site 40TR44 within the APE is also recommended as not eligible for listing in the NRHP, though the portion immediately outside of it remains unassessed for NRHP eligibility. Lastly, the historic component of multicomponent site 40PM83 remains unassessed for NRHP eligibility. The historic component of site 40PM83 was not assessed for NRHP eligibility during its initial recording and was not relocated during the current survey (ETNG 2023e).

There are 17 cemeteries located within or immediately adjacent to the current APE, including one pre-contact cemetery within archaeological site 40JK171, 11 historic cemeteries (three of which are within archaeological sites 40TR44, 40TR66, and FS-SJ-90), three cemeteries with historic and modern interments, two modern cemeteries, and one cemetery that is of unknown age (ETNG 2023e).

Should a site be determined eligible for NRHP listing in consultation with SHPO and Native American tribes, and avoidance is not possible, then mitigation would be required. The specific mitigation plans would be stipulated in a Memorandum of Agreement involving FERC, SHPO, and any tribes choosing to participate.

To fulfill its obligations under Section 106 of the NHPA, TVA and FERC would each consult with SHPO and federally recognized Native American tribes on their respective actions regarding specific effects to cultural resources within the ETNG Construction ROW if Alternative A proceeds.

3.13.3.3.7 Summary of Alternative A

TVA Proposed Actions

There is one recorded archaeological site (40RE45) within the potential CC/Aero CT Plant footprint at the Kingston Reservation. TVA finds that Site 40RE45 is eligible for inclusion in the NRHP; however, the site is located outside of the project footprint and therefore would not be affected. On May 4, 2023, TVA received concurrence from SHPO that although a portion of this site falls within the APE, effects to the site would not be adverse. The letter also stated that Green Cemetery would also be unlikely to be affected by the project. SHPO requested several revisions to the submittal package; however, the office had “no objection to the implementation of this project as currently planned.” The letter is provided in Appendix K.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

As stated in ETNG’s Resource Report (2023e):

> A total of 44 newly recorded and previously recorded sites are considered potentially eligible and additional work is recommended to evaluate their NRHP eligibility… Of these 44 total sites recommended for further work, 34 are precontact, four are historic, and six are multicomponent. Two additional previously recorded precontact sites (40PM89 and 40PM90) were avoided during the current survey but are also recommended for agency consultation and further work if they cannot be avoided by construction activities.
>
> In addition to these 44 sites, four previously recorded sites (40TR51, 40JK125, 40PM89, and 40PM90) within the APE are recommended for further work. These sites were not revisited during the current survey. Sites 40TR51 (the Hartsville Battlefield) and 40JK125 (Fort-Blount Williamsburg) are listed on the NRHP. If these sites cannot be avoided by construction activities, then data recovery investigations will be required prior to construction. Sites 40PM89 and 40PM90 were previously recommended as eligible for listing in the NRHP. Evaluation of the portions of these two sites within the current APE, but outside of the previous

project area, have not been conducted at this time. Further consultation with state agencies is needed to define a treatment plan for these two resources.

Seven additional previously recorded archaeological sites (40TR45, 40TR46, 40TR47, 40PM86, 40MO11, 40MO12, and 40MO119) within the APE were not revisited during the current survey due to restricted access. Site 40PM86 was previously recommended as not eligible for listing on the NRHP following Phase II investigations. The six remaining sites were not assessed for NRHP eligibility at the time of their initial recording. All seven sites require a revisit and update prior to project construction if they will be impacted by construction activities.

For the archaeological sites recommended as not eligible for the NRHP, no further work is being recommended. Four historic sites or components, or portions thereof, remain unassessed for NRHP eligibility. This includes two historic sites with cemeteries (40TR66 and FS-SJ-90) that are unassessed for NRHP eligibility. The rural domestic house component of FS-SJ-90 within the APE is recommended as not eligible for listing in the NRHP. The historic component of previously recorded multicomponent site 40TR44 within the APE is also recommended as not eligible for listing in the NRHP, though the portion immediately outside of it remains unassessed for NRHP eligibility. Lastly, the historic component of multicomponent site 40PM83 remains unassessed for NRHP eligibility. The historic component of site 40PM83 was not assessed for NRHP eligibility during its initial recording and was not relocated during the current survey.

Additionally, there are 17 cemeteries located within, or immediately adjacent to, the current natural gas pipeline APE. These cemeteries should be avoided through ETNG's design of the route for the pipeline.

3.13.3.3.8 Environmental Justice Considerations

TVA Proposed Actions

Effects to cultural resources that would occur as a result of implementation of Alternative A are not anticipated to have disproportionate and adverse impacts on EJ populations. These effects would be avoided, minimized, or mitigated through implementation of cultural resources surveys and NHPA consultation with Native American tribes and interested stakeholders, which could include EJ populations.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Effects to cultural resources that would occur because of implementation of Alternative A are not anticipated to have disproportionate effects on EJ populations. These effects would be avoided, minimized, or mitigated through implementation of cultural resources surveys and NRHP consultation with SHPO, and NHPA consultation with Native American tribes and other interested stakeholders.

3.13.3.4 Alternative B

3.13.3.4.1 Construction and Operations of Solar and Storage Facilities

Under Alternative B, TVA or a third-party developer would construct and operate 1,500 MW of solar and 2,200 MW of four-hour battery storage capacity at multiple locations primarily in the East TN region, which would require 10,950 acres of land for solar installations and 550 to 825 acres of land for 2,200 MW of BESS. Since the exact project locations of the solar and storage facilities are not known at this time, TVA has compiled a list of typical effects associated with the construction and operation of solar facilities within TVA's region. This list was compiled by reviewing the EAs and EISs for various photovoltaic projects, ranging from community-scale to utility-scale, since 2014. A total of 31 projects were included in the review. Of these, approximately three percent have affected historic properties. These effects generally consist of visual effects to historic architectural resources and direct physical effects to archaeological sites. Based on the assumption of seventeen 100-MW solar sites, approximately one site would result in effects to historic properties.

TVA would seek to avoid any potential adverse effects on any NRHP-listed or eligible archaeological sites or historic architectural properties in the affected area. If adverse effects cannot be avoided, TVA would seek, in consultation with SHPO and federally recognized Indian tribes, ways to avoid or minimize the adverse effects. If unavoidable, adverse visual effects to historic architectural resources could be mitigated through wooded buffers. Adverse direct effects to archaeological sites could be mitigated through Phase III archaeological investigations. Given the large area of the potential solar developments, there is the possibility of multiple TCPs. To fulfill its obligations under Section 106 of the NHPA, TVA would consult with SHPO on specific effects of individual solar projects on historic properties cultural resources if Alternative B is selected by TVA.

There is the potential for cumulative effects to cultural resources associated with the expansion target of 10,000 MW solar facilities. Cumulative effects would be minimized through siting and avoidance of NRHP-listed or eligible sites, consultation with SHPO, and mitigation.

3.13.3.4.2 Transmission and Other Components

Under Alternative B, the new transmission line construction would be on and in the immediate vicinity of the solar and storage sites. The transmission line components would be designed to avoid effects to historic properties. Effects to historic properties generally consist of visual effects to historic architectural resources and direct physical effects to archaeological sites. Adverse visual effects to historic architectural resources could be mitigated through wooded buffers. TVA would seek to avoid any potential adverse effects on any NRHP-listed or eligible archaeological sites or historic architectural properties in the affected area. If adverse effects cannot be avoided, TVA would pursue, in consultation with SHPO and federally recognized Indian tribes, ways to avoid or minimize the adverse effects. Adverse direct physical effects to archaeological sites could be mitigated through Phase III archaeological investigations. To fulfill its obligations under Section 106 of the NHPA, TVA would consult with SHPO on specific effects to cultural resources if Alternative B proceeds.

There is the potential for cumulative effects to cultural resources associated with the expansion of 10,000 MW of solar facilities and their associated transmission lines. Cumulative effects would be minimized through siting and avoidance of NRHP-listed or eligible sites, consultation with SHPO, and mitigation.

3.13.3.4.3 Environmental Justice Considerations

Effects to cultural resources that would occur as a result of the proposed solar facilities and transmission line activities would be avoided, minimized, or mitigated through implementation of cultural resources survey and NHPA consultation with Native American tribes and interested stakeholders, which could include other EJ populations. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.14 Solid and Hazardous Waste

3.14.1 Regulatory Framework

Solid waste is defined by the Resource Conservation and Recovery Act (RCRA) as any garbage, sludge, or any other discarded material from industrial, commercial, mining, agricultural operations, and community activities. Solid wastes are any material that has been discarded by being abandoned, inherently waste-like, a discarded military munition, or recycled in certain ways (USEPA 2014). The USEPA regulates solid waste under Subtitle D of the RCRA, which bans the open dumping of waste and sets minimum federal criteria for the operation of municipal waste and industrial waste landfills, including design criteria, location restrictions, financial assurance, corrective action, and closure requirements. In TN, the TDEC Division of Solid Waste Management operates under the authority of the Solid Waste Management Act of 1991 (T.C.A. § 68-211-101 et seq.) and implements RCRA Subtitle D at the state level.

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 of as required by state and federal regulations. In TN, requirements for special wastes are focused on solid waste processing and disposal under Rule 0400-11-01.

Hazardous waste materials include any solid waste or combination of solid waste 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 (40 CFR Part 261). To be classified as a hazardous waste, a solid waste must meet one or more of the USEPA established characteristic properties (ignitability, corrosivity, reactivity, and toxicity) or be specifically listed as a known hazardous waste. In addition to the USEPA and U.S. Nuclear Regulatory Commission, hazardous materials are regulated in the U.S. by laws and regulations administered by the OSHA and the U.S. Department of Transportation. In TN, the TDEC Division of Solid Waste Management operates under the authority of the Hazardous Waste Management Act of 1977 (T.C.A. § 68-212-101 et seq.) and implements RCRA Subtitle C at the state level.

Subtitle C of RCRA includes separate, less stringent regulations for certain potentially hazardous wastes. Used oil, for example, may be regulated as hazardous waste if it is disposed of, but it is separately regulated if it is recycled. Specific requirements are provided under RCRA for generators, transporters, processors, and burners of used oil that are recycled. 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.

3.14.2 Affected Environment

3.14.2.1 Kingston Reservation (No Action and D4 Activities)

3.14.2.1.1 Solid Waste

The primary solid wastes on the Kingston Reservation result from the operation of the KIF Plant and are CCRs in the form of ash and gypsum. The KIF Plant currently produces two coal ash related CCR streams, fly ash and bottom ash, which are byproducts from coal combustion. Fly ash comprises approximately 80 percent and bottom ash comprises the remaining 20 percent of these CCR streams. Currently, fly ash is handled dry and is pneumatically conveyed to silos. Bottom ash is directed to a dewatering process facility to dewater the solids and clarify the bottom ash sluice water. Both dry ash by-products are trucked to the on-site Phase 1 Landfill. TVA has historically managed storage of CCR materials generated at the KIF Plant in a combination of on-site landfills, dry stacks, wet stacks, ash ponds, and impoundments. The gypsum produced by Flue Gas Desulfurization (FGD) is also disposed at the on-site landfill.

Fly ash and boiler slag make up the noncombustible particles or components in coal. Both fly ash and bottom ash are composed primarily of silica, aluminum oxide, and iron oxide. These waste streams also contain a variety of heavy metals at limited concentrations, including arsenic, cadmium, chromium, copper, lead, mercury, and selenium. In TN, CCRs are regulated as special wastes that require special approval for the wastes to be disposed of at a landfill specifically permitted to receive those types of wastes (Class I or II disposal facility).

3.14.2.1.2 Hazardous Waste

Hazardous, non-radiological wastes typically produced by common facility operations include paint and paint solids, paint thinners, discarded out-of-date chemicals, parts washer liquids, sand blast grit, and chemical waste from cleaning operations. The amount of these wastes generated varies with the size and type of facility. Wastes regulated under Toxic Substances Control Act (TSCA) that are typically encountered at TVA sites include PCBs, historically used in insulating fluids in electrical equipment.

The KIF Plant is considered a RCRA conditionally exempt small quantity generator of hazardous waste by TDEC. From 2020 to 2022, the KIF Plant generated between 59,882 and 119,113 tons of coal ash (fly ash and bottom ash) per year and between 62,202 and 112,191 tons of gypsum per year (TDEC 2023a).

Prior to implementation of D4 activities, all buildings and structures within the proposed demolition boundary (Figure 2.1-2) would be assessed for the presence and quantity of special and hazardous materials requiring alternative disposal methods, then demolished to three feet below final grade via mechanical deconstruction and/or explosives and backfilled using concrete and masonry from the demolished facilities in addition to fill.

3.14.2.1.3 Universal Waste

Universal wastes are a subset of hazardous wastes that are widely generated and can include batteries, pesticides, 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. The KIF Plant is considered a small quantity handler of universal waste that includes batteries, lamps/bulbs, and mercury-containing equipment.

3.14.2.2 Alternative A

3.14.2.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on Kingston Reservation

The proposed CC/Aero CT Plant site is located on the Kingston Reservation (Section 3.14.2.1) at the Landfill Phase 2 expansion area, described as Option C and shown on Figure 2.1-4. The site is approximately 55 acres and has been permitted for landfill expansion, but a landfill has not been constructed or received waste. The selected site has been largely cleared of vegetation, and grading activities have been completed in some areas. TVA has historically used the area as a laydown yard and staging area for equipment and has constructed a network of unpaved access roads throughout the site.

The site is not likely to contain or produce solid or hazardous waste, although any excavated materials may need to be tested for waste characterization if intended for off-site disposal or land application.

3.14.2.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the footprint of the current coal storage yard on the Kingston Reservation, as identified in Figure 2.1-5. The affected environment at this location would be consistent with that of the Kingston Reservation, as described in Section 3.14.2.1.

3.14.2.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential areas of the Kingston Reservation, as identified in Figure 2.1-5. The preferred site, Battery Option 1, is part of the D4 boundary and would have comparable waste streams and processes as those described for the Kingston Reservation in Section 3.14.2.1. The Battery Option 2 and Option 3 sites are located primarily on forested land that would be cleared prior to construction and installation of the BESS components. Tree clearing activities would generate typical silvicultural debris and small volumes of solid waste. Tree clearing and construction activities would be performed following the appropriate BMPs and relevant local, state, and federal permit requirements.

3.14.2.2.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant facilities and switchyard. Therefore, the affected environment for on-site transmission upgrades is described in Section 3.14.2.1.

3.14.2.2.5 Off-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines, five of which are within the vicinity of the Kingston Reservation and one in Crossville (L5108, L5116, L5280, L5302, L5381, and L5383). Descriptions of these improvements can be found in Section 2.1.3.5.

Based on a review of the TDEC Division of Remediation database (TDEC 2022e), permitted TN landfill sites, solid waste processors, transfer or convenience centers, and UST database and the USEPA ECHO database (USEPA 2022a), the following sites were identified within 0.5 mile of proposed transmission corridor upgrades:

- The ORNL is located adjacent to the Bethel Valley – end reconductor. The ORNL was listed in the TDEC UST database for two active USTs and 54 permanently closed USTs. No leaks or violations were listed in association with the USTs.
- Neighborhood Market (a filling station) located 0.12 miles south-southwest of the transmission corridor, UST Facility ID #2010044, was listed in the TDEC UST database for three active USTs. No leaks or violations were listed in association with the USTs.

- Kroger Fuel Center GA-690 (a filling station) located 0.11 miles east of the transmission corridor, UST Facility ID #2010220, was listed in the TDEC UST database for three active USTs. No leaks or violations were listed in association with the USTs.
- M and S Quik Mart (a filling station) located 0.15 miles east of the transmission corridor, UST Facility ID #2010015, was listed in the TDEC UST database for three active USTs. No leaks or violations were listed in association with the USTs.
- Central Service Complex (a public works fleet filling station) located 0.25 miles northeast of the transmission corridor, UST Facility ID #2010205, was listed in the TDEC UST database for two active USTs. No leaks or violations were listed in association with the USTs.
- Circle K Store no. 4703620 (a filling station) located 0.50 miles south of the transmission corridor, UST Facility ID #4180180, was listed in the TDEC UST database for three active USTs. No leaks or violations were listed in association with the USTs.
- Mountain Mini Mart (a filling station) located 0.47 miles south of the transmission corridor, UST Facility ID #4180123, was listed in the TDEC UST database for three temporarily out-of-use USTs. In 1994 a release was detected from piping failure, but the case has since been closed.
- Hittman Transport Services Inc. (RCRA Active Transporter) located 0.47 miles south of the transmission corridor. No violations have been recorded for the facility.
- United States Department of Energy (USDOE) – NNSA DBA Office of Secure Transportation Agent OP Eastern Command, located adjacent to the transmission corridor. No violations have been recorded for the facility.
- URS Safety Management Solutions LLC (RCRA Active Transporter) located 0.29 miles south of transmission corridor. No violations have been recorded for the facility.
- USDOE East TN Technology Park (RCRA Active Large Quantity Generator and Active Transporter) located adjacent to the transmission corridor. No violations have been recorded for the facility.
- Impact Services, Inc. (RCRA Active Very Small Quantity Generator) located adjacent to the transmission corridor. No violations have been recorded for the facility.
- Philotechnics, LTD (RCRA Active Transporter) located 0.49 miles west of transmission corridor. No violations have been recorded for the facility.
- Oak Ridge Sewage Treatment Plant located 0.45 miles east of transmission corridor. Several violations of the CWA have been recorded for the facility for exceedances of constituents in effluent discharge.
- Turnkey Technical Services, LLC (RCRA Active Transporter) located 0.35 miles west of transmission corridor. No violations have been recorded for the facility.
- Interstate Venture, Inc. (RCRA Active Transporter) located 0.35 miles west of transmission corridor. No violations have been recorded for the facility.

- Clinton Engineer Works (DOR Site ID #01593) located adjacent to the transmission corridor at the Bethel Valley – end Reconductor was listed on the TDEC Remediation database, but the site status has been closed.

Based on the lack of violations or leaks, the above sites are not considered a concern for Alternative A. Potential effects related to solid and hazardous waste of transmission line upgrade construction and operation were considered. Any potential effects to solid and hazardous waste from the construction and improvement actions of transmission lines would be minor and temporary. Thus, further analysis of transmission lines and their effect on solid and hazardous waste resources was not deemed necessary.

3.14.2.2.6 Construction and Operation of a Natural Gas Pipeline

Based on TVA's review of the TDEC Division of Remediation database (TDEC 2022e), permitted TN landfill sites, solid waste processors, transfer or convenience centers, and Underground Storage Tank (UST) database and the USEPA ECHO database (USEPA 2022a), the following sites were identified within 0.5 mile of the proposed ETNG Construction ROW:

- TVA KIF Plant, located along the ETNG Construction ROW, was listed in the TN permitted landfill database as a Class II landfill. No violations were listed in association with the landfill. KIF had three violations of the CWA between January 2019 and September 2020 and multiple violations of the CAA that were considered "high priority" since June 2019 for sulfur dioxide.
- Cumberland Utility District of Roane and Morgan counties Waste Treatment Plant, located within 0.25 miles of ETNG Construction ROW at 3201 Harriman Hwy, Harriman, TN 37748. The facility has several recent violations of the CWA for aluminum concentration exceedances in effluent discharge.
- ETNG, LLC Wartburg Station #3110, located adjacent to the ETNG Construction ROW (0.1 miles south) at 142 Clayton Howard Road, Wartburg, TN 37887. The facility is listed as a RCRA large quantity generator and had a 40 CFR 279.C violation identified September 8, 2021, for Used Oil Generators.
- Wartburg Sewage Treatment Plant, located adjacent to the ETNG Construction ROW (0.16 miles north) along Hwy 27 in Wartburg TN, 37887. The facility is listed as having several violations of their NPDES permit since at least 2019 for levels of cyanide, pH, dissolved oxygen, nitrogen, as well as e. coli, chronic *Ceriodaphnia* species, and chronic *Pimephales* species.
- Twin K Enterprises, LLC, located at 3612 Morgan County Hwy in Wartburg TN, 37887 (0.35 miles from proposed pipeline). Ready-mix concrete manufacturer. No violations have been recorded.
- ETNG Co. Station 3107, located at 3400 Stamps-Shady Grove Rd, Monterey TN, 38574 (on proposed pipeline). No CWA, CAA, or RCRA violations have been recorded for this facility.
- Lewis Farm Quarry, located at 280 Lewis Lane Monterey, TN 38574 (adjacent to the proposed pipeline). No CWA violations have been recorded for this facility.
- Crab Orchard Stone Monterey Quarry located near Stamps-Shady Grove Rd Monterey TN, 38574 (approximately 0.37 miles south of proposed pipeline). No CWA violations have been recorded for this facility.

- Billy Walker Property, quarry located on Thorn Gap Road in Cookeville, TN 38506 (adjacent to proposed pipeline). No CWA violations have been recorded for this facility since at least 2019.
- Smyrna Ready Mix Concrete, LLC doing business as (DBA) Cookeville Plant #35 located at 114 West Turkey Creek Road Cookeville TN, 38506 (adjacent to the proposed pipeline). Between 2019 and 2020 several CWA violations were recorded for this facility for late or missing Discharge Monitoring Reports.
- Smith Lumber Company located at 4482 South Grundy Quarles Hwy Bloomington Springs TN, 38545 (0.37 miles south of proposed pipeline). No CWA violations have been recorded for this facility.
- ETNG, LLC DBA Compressor Station 3105-Gainseboro located at 3460 Granville Hwy Gainesboro TN, 38562 (adjacent to the proposed pipeline). No CWA or RCRA violations have been recorded for this facility.
- ETNG, LLC DBA Dixon Springs Compressor Station 31 located at 120 J.D. Hood Lane – Station 3104 Hartsville TN, 37074 (adjacent to the proposed pipeline). No CAA or RCRA violations have been recorded for this facility.
- V&C Manufacturing & Warehouse, Inc. located at 100 Trousdale Way Hartsville TN, 37074 (0.2 miles south of proposed pipeline). In December 2021 several RCRA violations were recorded for this facility, which is a large-quantity generator. During a follow-up inspection, no violations or compliance issues were found.
- Hartsville Sewage Treatment Plant located at 53 Water Plant Rd Hartsville TN, 37074 (0.2 miles south of proposed pipeline). Several CWA violations have been recorded for this facility between 2019 and 2022.
- West Trousdale Substation Located at S.R. 10/25 & Hwy 231 in Castalian Springs TN, 31031 (0.25 miles southwest of proposed pipeline). No CWA violations have been recorded for this facility.
- Castalian Springs Dollar General located at 6100 Hwy 231 South Castalian Springs TN, 37071 (0.4 miles southwest of proposed pipeline). No CWA violations have been recording for this facility.
- Fast Track Market #6 (a filling station) located 0.09 miles west of the proposed pipeline, UST Facility ID #2650064, was listed in the TDEC UST database for two active USTs and one permanently closed UST. No leaks or violations were listed in association with the USTs.
- Quality Oil Co. (a filling station) located 0.08 miles west-southwest of the proposed pipeline, UST Facility ID #2650025, was listed in the TDEC UST database for three active USTs. No leaks or violations were listed in association with the USTs.
- Main Stop (a filling station) located 0.50 miles north of the proposed pipeline, UST Facility ID #2650014, was listed in the TDEC UST database for three active USTs. In 2008 a drip beneath one of the dispensers and a vapor complaint were reported but the case has been closed.
- Holladay Express (a filling station) located 0.27 miles north of the proposed pipeline, UST Facility ID #4250071, was listed in the TDEC UST database for one active UST and two temporarily out-of-use USTs. In 1998 a spill was reported but the case has been closed.

- Swafford's IGA (a filling station) located 0.44 miles north of the proposed pipeline, UST Facility ID #4250083, was listed in the TDEC UST database for four active USTs. No leaks or violations were listed in association with the USTs.
- Looper Tire Co. (a filling station) located 0.45 miles south of the proposed pipeline, UST Facility ID #4710121, was listed in the TDEC UST database for two active USTs and three permanently closed USTs. No leaks or violations were listed in association with the USTs.
- Roy's Market (a filling station) located 0.34 miles north of the proposed pipeline, UST Facility ID #4710218, was listed in the TDEC UST database for four active USTs. No leaks or violations were listed in association with the USTs.
- K and K Market (a filling station) located 0.32 miles south of the proposed pipeline, UST Facility ID #4440044, was listed in the TDEC UST database for three active USTs and three permanently closed USTs. No leaks or violations were listed in association with the USTs.
- Hartsville Food Mart (a filling station) located 0.15 miles north of the proposed pipeline, UST Facility ID #5850254, was listed in the TDEC UST database for two active USTs. A release was suspected in 2015 due to inconclusive inventory reports but the case was closed.
- Starmart no. 102 (a filling station) located 0.37 miles southwest of the proposed pipeline, UST Facility ID #5850019, was listed in the TDEC UST database for two active USTs and five permanently closed USTs. A release in 1998 was found to have off-site impacts. The case has since been closed.
- Brake Point (a filling station) located 0.38 miles southwest of the proposed pipeline, UST Facility ID #5850028, was listed in the TDEC UST database for five temporarily out-of-use USTs and three permanently closed USTs. No leaks or violations were listed in association with the USTs.

While some violations and one spill have been noted, the above sites are not considered a concern for Alternative A, as ETNG does not anticipate potential concerns associated with encountering hazardous materials during construction or operation of the pipeline. Should hazardous materials be encountered during construction, the Waste Management Plan located in Appendix 1C of Resource Report 1 would be implemented by ETNG (ETNG 2023b). ETNG would dispose of and/or mitigate for the hazardous materials in accordance with applicable regulations.

ETNG conducted a comparable review of publicly available information to identify, to the extent feasible, potentially hazardous waste within 0.25-miles of the proposed pipeline. Databases reviewed by ETNG include active RCRA sites; Waste Treaters, Storers, and Disposers; Toxic Release Inventory Sites, Superfund Sites, TDEC landfills, and TDEC Remediation sites. A list of identified sites is presented in Resource Report 8 (ETNG 2023i) and provided below in Table 3.14-1.

Table 3.14-1. Environmental Sites within 0.25 Mile of the Proposed ETNG Pipeline (Source: ETNG 2023i)

Milepost	County, State	Site Name	Distance to Project (feet)	Facility Type
5.1	Trousdale, TN	TDOT Trousdale County Garage	165	Closed Remediation Site
9.3	Trousdale, TN	V&C Manufacturing and Warehousing	585	Large Quantity Generator
10.8	Trousdale, TN	East Tennessee Dixon Springs Compressor Station	Adjacent	Small Quantity Generator
34.0	Jackson, TN	East Tennessee Granville Compressor Station	Adjacent	Very Small Quantity Generator
59.6	Putnam, TN	East Tennessee Monterey Compressor Station	Adjacent	Large Quantity Generator
68.1	Overton, TN	Reed Drums	233	Closed Remediation Site
80.5	Fentress, TN	East Tennessee Clarkrange Compressor Station	Adjacent	Very Small Quantity Generator
104.9	Morgan, TN	TDOT Morgan County Garage	1,250	Closed Remediation Site
106.9	Morgan, TN	East Tennessee Wartburg Compressor Station	Adjacent	Large Quantity Generator

As stated in ETNG's Resource Report 8 (ETNG 2023i):

> There are no active spills or compliance issues at the sites listed in Table 3.14-1. [ETNG] does not anticipate potential concerns associated with encountering hazardous materials during construction and operation of the [Ridgeline Expansion] project. Should hazardous materials be encountered during construction, [ETNG] will implement [the] Waste Management Plan located in Appendix 1C of Resource Report 1 (ETNG 2023b) and will dispose of and/or mitigate for the hazardous materials in accordance with applicable regulations.

3.14.2.3 Alternative B

3.14.2.3.1 East Tennessee TVA Power Service Area

The affected environment of solid and hazardous waste in the East TN region is based on general information in the 2019 IRP (TVA 2019a). Coal-fueled generating plants produce large quantities of ash and other coal combustion solid wastes. Industries within East TN also produce solid and hazardous waste that is tracked through various federal and state databases. The locations of proposed solar and storage facilities under Alternative are not known at this early stage; prior to development into a solar or storage facility, Phase I environmental site assessments would be conducted to identify potential records of environmental concern, including solid and hazardous wastes.

3.14.3 Environmental Consequences

3.14.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate KIF. TVA would implement all planned actions related to the current and future management and storage of CCRs at the fossil plants, which have either been reviewed or would be in subsequent NEPA analyses. As a result, existing solid and hazardous waste management would not change from continuing operations under this alternative. The production and disposal of hazardous and universal wastes are not expected to change under the No Action Alternative.

3.14.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of KIF Plant

For all alternatives, the KIF plant would be retired, decommissioned, decontaminated, and deconstructed. The plant would be demolished to a depth of three feet below final grade. Demolition and construction debris would be generated at the KIF Plant during the demolition of the metal buildings, footings, asphalt, etc. The facilities would be inspected for regulated materials (asbestos, lead paint, PCBs, etc.) and would be properly abated prior to demolition. These wastes, if generated, would be disposed as required by state and federal regulations. Remaining demolition debris would be disposed off-site. The solid and hazardous wastes listed below may be generated during demolition:

- Asbestos-containing materials (ACM)
- Mercury in equipment switches and gauges
- Lead-containing materials including paint, coatings, roof vents, circuit boards, batteries, and cathode ray tubes
- Electronic wastes
- PCBs in electrical equipment and light ballasts
- Materials such as glaze, caulk, building siding, roofing materials, electric cable, cable trays
- Other construction wastes (e.g., concrete, scrap metal)
- Universal waste (fluorescent light bulbs, batteries, etc.)
- Off spec/surplus chemicals contained in aboveground storage tanks
- Containerized petroleum products or chemicals
- Refrigerants and ozone depleting substances
- Tritium exit signs
- Radioactive sources from equipment
- Various oils and fuels
- Antifreeze
- Batteries in bulk and associated fixtures including deep cycle series uninterruptible power supply batteries and lead batteries from emergency lighting
- Street lighting
- Off spec consumer commodities
- Creosote (in railroad ties) and
- Technology Enhanced Naturally Occurring Radioactive Materials

Implementation of this alternative would result in removal and disposal of potential contaminant sources, as defined above, in accordance with local, state, and federal regulations. A regulated material survey would be completed prior to demolition to estimate the materials and quantities of wastes expected to be generated. Additionally, all areas with stains or containing hazardous materials would be addressed, as appropriate, prior to demolition. All generated wastes would be handled in accordance with TVA's BMP procedures and local, state, and federal guidelines.

Some wastes such as hazardous wastes, PCBs, ACMs, lead-based paints, and universal wastes, which require special removal, handling, or disposal, would be evaluated prior to demolition. These materials would be disposed of at a facility permitted to handle these waste streams. Non-hazardous or special waste would be transported to a landfill or other approved disposal facility. Thus, direct impacts would be minor due to the limited potential for hazardous waste to be discharged and/or released into the environment during D4 activities.

Demolition activities would create demolition debris and scrap metal that would be hauled to a permitted landfill or recycling facility. Although a specific landfill has not been identified, given that material would be disposed in a permitted landfill that has the capacity to receive waste materials, and the potential that scrap metal would be recycled, it is expected that disposal of demolition debris would have a negligible effect on the long-term ability to meet disposal needs of the region.

Possible temporary effects to the local environment are those that could result from the release of fugitive dust during demolition and while removing transporting material to the landfill. If other projects in the area result in minor releases of fugitive dust or hazardous material, this may result in minor cumulative effects. Project and cumulative effects would be minimized through mitigation measures, including dust suppression and environmental controls. Due to the temporary nature of the operations and use of permitted disposal facilities, along with trained and experienced contractors and personnel, environmental effects from waste handling and disposal are not anticipated. Degradation over time of the remaining structures and material that is incorporated into those remaining structures may cause minor indirect environmental effects.

3.14.3.2.1 Environmental Justice Considerations

Demolition and construction wastes would be disposed of off-site, as required by state and federal regulations. Off-site waste facilities have the potential to be located in EJ areas, per the history of the siting of these types of facilities, the general assumptions that are made in evaluating EJ effects, and the proximity of the Kingston Reservation to EJ populations. As such, EJ populations may experience disproportionate and adverse effects as compared to non-EJ populations depending on the location of waste facilities.

3.14.3.3 Alternative A

3.14.3.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on Kingston Reservation

Under Alternative A, the proposed 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. These wastes would be temporarily stored in properly managed hazardous waste storage areas on-site. 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. Once construction is completed, the generation of hazardous waste during operations would be similar to the current waste generation rates.

Any reportable spills related to Alternative A would be addressed in accordance with the requirements outlined in the site spill plans. Designated contractor and subcontractor personnel would be responsible for daily inspection; cleanup; and proper labeling, storage, and disposal of all refuse and debris produced. Disposal containers, such as dumpsters or roll-off containers, would be obtained from a proper waste disposal contractor.

Construction of the CC/Aero CT Plant would generate typical construction debris and small volumes of solid waste:

- Paper, wood, glass, and plastics would be generated from packing materials, waste lumber, insulation, and empty nonhazardous chemical containers.
- Scrap metal would result from welding, cutting, framing, and finishing operations, electrical wiring, disposal of packing materials, and empty nonhazardous chemical containers.

Construction and waste debris would be placed in containers and disposed of at a permitted off-site construction and demolition landfill. TVA would manage all solid wastes in accordance with applicable state regulations and TVA BMP procedures.

During construction, TVA would rely on the use of portlets and holding tanks at the construction trailer site. Waste would be pumped using an approved/licensed pump and haul vendor and sent to POTW. Once operational, the site facilities would connect to the existing online sewer system.

If CCR management projects in the area result in solid waste or hazardous material, this may result in minor cumulative effects. Cumulative effects would be minor as TVA would manage all hazardous and solid wastes in accordance with applicable federal and state regulations and TVA BMP procedures.

3.14.3.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

Construction of solar sites typically produce petroleum-based oils and fuels and generation of liquid and solid wastes in the form of used oil, construction debris, packing materials, and general construction wastes. During construction of the proposed solar facility, materials are typically stored on-site in storage tanks, vessels, or other appropriate containers specifically designed for the characteristics of these materials. The storage facilities would include secondary containment in case of tank or vessel failure. Construction and decommissioning-related materials stored on-site would primarily be liquids such as used oil, nitrogen, diesel fuel, gasoline, hydraulic fluid, and other lubricants associated with construction equipment. Safety Data Sheets for all applicable materials present on-site would be made readily available to on-site personnel.

Fueling of some construction vehicles typically occurs in the construction area. Other mobile equipment would return to the on-site laydown areas for refueling. Special procedures would be identified to minimize the potential for fuel spills, and spill control kits would be carried on all refueling vehicles for activities such as refueling, vehicle or equipment maintenance procedures, waste removal, and tank clean-out. A fuel truck may be stored on-site for the duration of construction.

During operation, bulk chemicals would be stored in storage tanks; other chemicals would be stored in returnable delivery containers. Chemical storage areas would be designed to contain leaks and spills. The transport, storage, handling, and use of chemicals would be conducted in accordance with applicable laws, ordinances, regulations, and standards. While the various transformers would contain oil, there would be no separate oil or hydraulic fluid stored on-site related to transformers.

Construction of solar sites also generates construction debris and general trash, including pallets and flattened cardboard module boxes. Universal wastes and unusable materials would be handled, stored, and managed in accordance with TN Universal Waste requirements. Waste collection and disposal would be conducted in accordance with applicable regulatory requirements to minimize health and safety effects. To the extent practicable, waste would be recycled. Materials that cannot be recycled would be disposed of at an approved facility to be determined by the designated contractor(s). No waste oil would be disposed of on the solar or storage facility sites.

If necessary, TVA, the facility developer, or the construction contractor, would obtain a hazardous waste generator identification number from the state prior to generating any hazardous waste. Any spills related to Alternative A would be reported to the state regulator as required by regulations. A sampling and cleanup report would be prepared for the project site and sent to the state regulator to document each spill and clean up as required.

Photovoltaic panels and other components of the solar sites have an estimated operational lifespan of up to 35 years and would eventually need to be replaced or decommissioned. The materials would be managed as potentially hazardous solid waste and may require characterization prior to recycling or disposal. According to the USEPA and TDEC, solar panels and other photovoltaic components are not considered universal waste and may not be managed as universal waste. Therefore, if disposed of, the end-of-life management of photovoltaic components from the solar sites would require toxicity characteristic leaching procedure testing to determine if they are characteristic hazardous waste. Photovoltaic panels and other components would disposed of in accordance with applicable federal and state rules and regulations.

The Li-ion battery component of the proposed 100-MW BESS would have a typical lifespan of 20 years, at which point it would be expected to hold approximately 70 percent of the initial amount of energy and would be considered hazardous waste. Once batteries reach their end-of-lifespan, TVA would evaluate whether adding new batteries or replacing all batteries to restore the full capacity (100 percent) of the original BESS would be the most beneficial. TVA would attempt to recycle the Li-ion batteries when possible. The remaining BESS equipment would have an estimated lifespan of at least 40 years and would eventually need to be replaced or decommissioned. The materials would be managed as potentially hazardous solid waste and may require characterization prior to recycling or disposal.

Although opportunities for recycling solar panels and lithium-ion batteries have been limited, some solar panel and battery manufacturers are developing panel-specific recycling programs or forming long-term recycling partnerships with developers. Therefore, opportunities for solar panel and battery recycling are expected to increase in the future.

Cumulative effects may occur with the targeted addition of 10,000 MW of solar. Cumulative effects to solid and hazardous wastes would be minor as facilities would be constructed and managed in accordance with established procedures and applicable regulations.

3.14.3.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation
The proposed 100-MW BESS would be located on one of three potential areas of the Kingston Reservation, as identified in Figure 2.1-5. The Battery Option 1 site is part of the KIF D4 footprint and the potential environmental consequences for the D4 site preparation, prior to construction of the battery facility, on solid and hazardous wastes are the same as described in Section 3.14.2.1. The potential environmental consequences of the construction and operation of the Battery Option 1 site, if selected, would be comparable to those described in Section 3.14.2.1.

The Battery Option 2 and 3 sites are located primarily on forested land and are not located within the D4 boundary identified in Figure 2.1-5. Tree clearing activities would generate typical timber clearing debris and small volumes of solid waste. Tree clearing and construction activities would be performed following the appropriate BMPs and relevant local, state, and federal permit requirements. The potential environmental consequences of the construction and operation of a 100-MW battery storage site at Battery Option 2 or Battery Option 3 would be similar to those described in Section 3.14.3.3.2 and Section 3.14.3.3.3.

3.14.3.3.4 On-site Transmission
Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT Plant facilities and switchyard. Therefore, the environmental consequences for on-site transmission upgrades on solid and hazardous waste are described in Section 3.14.2.2.1.

3.14.3.3.5 Off-site Transmission
Under Alternative A, TVA would make improvements to existing transmission lines, two within the vicinity of the Kingston Reservation (L5108 and L5302) and one in Crossville (L5383). Descriptions of these improvements can be found in Section 2.1.3.2.3. Upgrades may include uprating, reconductoring, or rebuilding transmission lines as well as replacing terminal equipment, bus work, or jumpers. Off-site upgrades may be needed such that 161-kV transmission lines will be reconductored or rebuilt. If future studies indicate improvements are required to the regional transmission system to maintain system stability and integrity, additional site-specific reviews would be completed.

Several access roads are proposed largely along routes that have already been cleared. Development of new permanent access roads to support upgrades to the existing transmission lines may also be needed and would result in typical debris from tree trimming and/or removal if required. Construction of these access roads is not likely to produce hazardous waste. Excavated material from commercial / agricultural areas may require waste characterization for disposal / land application.

Effects to the environment associated with the transmission line corridor upgrades and the measures to address those effects are the same as the general construction and site work as described in Section 3.14.2.2.1.

3.14.3.3.6 Construction and Operation of a Natural Gas Pipeline
ETNG's Resource Report 1, 2, and 8 (ETNG 2023b, ETNG 2023c, ETNG 2023i), which were filed with FERC in July 2023 (ETNG 2023a), present the solid and hazardous waste-related findings of ETNG's analyses. This FEIS has been updated based on ETNG's application and resource reports (ETNG 2023a-m) and subsequent filings by ETNG with FERC from October through December 2023 (ETNG 2023n-q). This information has been

reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the solid and hazardous waste-related findings in ETNG's Resource Report 1, 2, and 8. Construction of the new gas pipeline would generate typical construction debris and small volumes of solid waste. No areas of soil contamination have been identified within the proposed ETNG Construction ROW. Soil contamination may result from at least two sources: hazardous material or fuel spills during construction and/or spills in pre-existing contaminated areas that are encountered during construction. To minimize potential environmental impacts, ETNG would develop and implement plans and specific procedures for the pipeline project which could include, but are not limited to the following:

- Dust Control Plan;
- Horizontal Directional Drill Monitoring, Inadvertent Return Response, and Contingency Plan;
- Waste Management Plan;
- Blasting Plans (as necessary);
- Karst Plans (as necessary);
- Existing pipe removal and disposal procedures; and
- Site-specific residential construction plans (as necessary).

If contaminated or suspect soils are encountered during construction, ETNG would adhere to measures that include, but are not limited to, the following activities: taking immediate steps, if feasible, to isolate the contamination; stopping work activities in the immediate vicinity of the site; making the appropriate internal and external notifications; determining appropriate sampling requirements; and coordinating for disposal of contaminated media, if necessary (based on analytical results). ETNG would dispose of all waste in accordance with the Waste Management Plan.

If present, the gradient of the project could result in runoff into the trench dug for the pipeline and workspace areas. Should contaminated media (i.e., soil or groundwater) be encountered during construction, routine procedures would be followed to ensure work was stopped, access to the site was limited, and contaminated soil was contained and collected for sampling. Depending on the results of the analysis, a route variation to avoid the site would be considered or a site-specific plan for completing construction within the contaminated area would be prepared in accordance with applicable environmental regulations and in coordination with the appropriate agency(ies). Any soil verified as contaminated would not be placed back into the trench unless approved by the appropriate agency(ies). Decontamination could involve removing select regulated materials in a safe and practical manner in such a way that the pipeline is left in a status that does not present a hazard or risk to the environment or personnel (ETNG 2023b, 2023c, 2023i).

Fueling of some construction vehicles typically occurs in the construction area. Other mobile equipment would return to the on-site laydown areas for refueling. An appropriate Spill Prevention Counter Measure and Control (SPCC) plan would be implemented by ETNG to minimize the potential of a spill during construction and operation of the pipeline. Special procedures would be identified to minimize the potential for fuel spills, and spill control kits would be carried on all refueling vehicles for activities such as refueling, vehicle or equipment maintenance procedures, waste removal, and tank clean-out. A fuel truck may be stored on-site for the duration of construction. Safety Data Sheets for all applicable materials present on-site would be made readily available to on-site personnel (ETNG 2023b, 2023c, 2023i).

Construction-related wastes may include skids, construction debris, timber mats, and used ECD materials and would be removed and disposed off-site at an approved facility. No construction material would be buried in the ROW. All used lubricants and cleanup materials would be containerized and disposed of at an approved facility. All sandblasting materials would be contained and disposed of properly. Shipping manifests would be maintained that verify the proper labeling and shipping of all wastes to authorized off-site facilities. Once construction of the pipeline is completed, solid and hazardous wastes should not be generated (ETNG 2023b, 2023c, 2023i).

In areas where the 3100 pipeline is still in place but no longer in use due to pipeline upgrades, portions of the 3100 line that were previously abandoned in place and are not in use would be removed as part of this project. In these areas, the pipeline that is no longer in use would be excavated from the trench in a manner that would minimize disturbance to the pipe and coating to the extent practicable. The pipeline coating would be tested to ensure proper disposal locations for the pipeline are chosen. The pipe would either be transported to a staging area for later disposal or loaded directly onto a truck and carried off-site for disposal. Once the pipe has been removed, the trench would be backfilled and rough graded to prepare for the new pipe trench (ETNG 2023b, 2023c, 2023i).

Shallow and/or hard bedrock can restrict excavation and may require special mechanical means or possibly blasting to achieve required design depths. Approximately 2,132 acres, or 72 percent, of the soils within the transmission and access road corridors contain soils with the potential for shallow bedrock (ETNG 2023b, 2023c, 2023i). To prevent incorporation of rock into the topsoil, ETNG would segregate topsoil at excavations and dispose of excess rock fragments in an approved manner so as not to incorporate rock fragments into topsoil layers. Rock encountered during excavation would be removed using conventional excavation with a backhoe, ripping with a bulldozer followed by backhoe excavation, or hammering with a pointed backhoe attachment or a pneumatic rock hammer followed by backhoe excavation. If un-rippable subsurface rock is encountered, blasting for ditch excavation would be necessary (ETNG 2023b, 2023c, 2023i).

If RFFAs in the area result in solid waste or hazardous material, this may result in cumulative effects. Cumulative effects would be minor as applicable federal and state regulations would be followed.

3.14.3.3.7 Summary of Alternative A

TVA Proposed Actions

Demolition and construction debris would be generated during D4 activities. Direct effects would be minor due to the limited potential for hazardous waste to be discharged and/or released into the environment during demolition activities. The proposed CC/Aero CT Plant site is not likely to contain or produce solid or hazardous waste, although any excavated materials may need to be tested for waste characterization if intended for off-site disposal or land application. During construction, TVA would rely on the use of portlets and holding tanks at the construction trailer site. Once operational, the site facilities would connect to the existing, operational sewer system. Tree clearing activities for the proposed 3- to 4-MW solar facility and 100-MW battery storage facility would generate typical silvicultural debris and small volumes of solid waste. Tree clearing and construction activities would be performed following the appropriate BMPs and relevant local, state, and federal permit requirements. If CCR management projects in the area result in solid waste or hazardous material, this may result in minor cumulative effects. TVA would manage all hazardous and solid wastes in accordance with applicable federal and state regulations and TVA BMP procedures.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Under Alternative A, proposed pipeline construction activities would result in the generation of waste; however, it is not expected to result in generation of significant quantities of hazardous waste. If elevated levels of hazardous waste are generated, appropriate spill prevention, containment, and disposal measures for hazardous wastes would be implemented to avoid or minimize impacts to construction workers, the public, and the environment. Any reportable spills related to the Project would be addressed in accordance with the requirements outlined in site spill plans. Waste created (hazardous or otherwise) would be handled and disposed of per the Waste Management Plan located in Appendix 1C of Resource Report 1 (ETNG 2023b) and in accordance with applicable regulations. Any hazardous waste generated would be collected and disposed of at a permitted hazardous waste disposal facility. In addition, the pipeline and associated structures would be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards, as set forth in 49 CFR Part 192.

Based on TVA’s review of the TDEC Division of Remediation database (TDEC 2022e), permitted TN landfill sites, solid waste processors, transfer or convenience centers, and UST database and the USEPA ECHO database (USEPA 2022a), 28 sites were identified within 0.5 mile of Study Area defined by TVA, inclusive of the ETNG Construction ROW. However, based on evidence of the absence of violations or leaks, these sites are not considered a concern for Alternative A.

3.14.3.3.8 Environmental Justice Considerations

TVA Proposed Actions
Although most waste effects would be contained to the Kingston Reservation site, it should be noted that the census block group that contains the Kingston Reservation and the census block group directly adjacent to it are both considered minority-based EJ populations. As was noted in Section 3.14.3.2.1, off-site waste facilities have the potential to be located in EJ areas. Vehicles carrying waste away from the site may go through these EJ Populations, and landfills accepting the waste could be in these census block groups. Due to the proximity of the EJ population to the Kingston Reservation and the fact that the impacts from this resource area are not stationary, solid and hazardous waste pose a minor but still disproportionate and adverse impact on nearby EJ populations. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Waste-related effects would occur as a result of the proposed natural gas pipeline; construction-related effects would be temporary and mitigated, and operations-related effects would be minor and permanent. A portion of these waste-related effects would occur on the Kingston Reservation, where no residential populations exist.

Waste-related effects due to the pipeline construction activities would also occur outside of the Kingston Reservation or at selected waste facilities in the area. These effects have the potential to be located in EJ areas; thus, EJ populations may experience disproportionate and adverse effects. TVA has assessed operations-related impacts to be permanent, minor, disproportionate and adverse for identified EJ populations and for construction-related impacts, they are assessed to be temporary, mitigated, disproportionate and adverse to identified EJ populations. However, ETNG is still evaluating the effects of its proposed project on EJ populations.

3.14.3.4 Alternative B

3.14.3.4.1 Construction and Operations of Solar and Storage Facilities
Under Alternative B, TVA would construct solar sites in undetermined locations within portions of East TN. Construction and operations of solar and solar storage facilities would be comparable to Alternative A, see Section 3.14.3.3.2 and Section 3.14.3.3.3.

3.14.3.4.2 Transmission and Other Components
Alternative B would also require construction of new transmission line corridors or upgrades to existing transmission lines, depending on site-specific location and construction details. The effects on the environment for the transmission corridors associated with Alternative B and the measures to address those effects would be similar to those described for Alternative A in Section 3.14.3.2.1.

3.14.3.4.3 Environmental Justice Considerations
Waste-related effects that would occur as a result of the proposed solar facilities and transmission line activities may have effects during construction and operation. Construction waste effects would be temporary and operation effects, including decommissioning, would be permanent. Construction generates general waste as well as chemical waste, which would be disposed of off-site. Off-site waste facilities have the potential to be located in EJ areas, per the history of the siting of these types of facilities and the general assumptions that are made in evaluating EJ effects. The determination of whether waste impacts would have disproportionate and adverse impacts to EJ populations would occur in future NEPA reviews for the specific solar sites.

3.15 Safety

3.15.1 Regulatory Framework
Workplace health and safety regulations are designed to eliminate personal injuries and illnesses from occurring in the workplace. These laws may include both Federal and state statutes. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) is the main agency responsible for protecting the health and safety of workers in the workplaces. OSHA regulations are in Title 29 CFR Part 1910 (29 CFR 1919), OSHA Standards. A related regulation, 29 CFR 1926, contains health and safety requirements specific to the construction industry. The TN Department of Labor and Workforce Development has adopted Federal OSHA standards contained in 29 CFR Parts 1910 and 1926 pursuant to TN Code Annotated section 50-3-201.

3.15.2 Affected Environment
The routine operations and maintenance activities conducted at TVA facilities, on TVA-owned land, or within TVA transmission ROWs reflect a safety-conscious culture. Activities performed are consistent with OSHA, state standards and requirements, and specific TVA guidance. TVA personnel (including TVA authorized contractors) are conscientious about health and safety, having addressed and managed operations to reduce or eliminate occupational hazards through implementation of safety practices, training, and control measures.

TVA has a safety program in place to prevent worker injuries and accidents. The various prevention programs include but are not limited to the following:

- Operations and Maintenance Plans
- Hazard Communication
- Housekeeping
- Project Safety Plans
- Competent Person
- Ground Disturbance
- Lifting Operations
- Energy Isolation (Lockout/Tag out)
- Cutting, Burning, Welding and other “Hot Work”
- Incident Reporting and Investigations
- Personal Protective Equipment
- Hearing Conservation
- Employee Training
- Contractor Evaluation and Acceptance
- Emergency Spill/Release Plans
- Emergency Response Plan

The implementation of proper engineering and equipment design and administrative controls, such as employee training and compliance with regulatory requirements related to Health and Safety, help ensure that the risks associated with work at TVA facilities remain low.

3.15.2.1 Kingston Reservation (No Action and D4 Activities)

No residential properties are located within the Kingston Reservation. Since the land proposed to be occupied by the proposed project area is not used by, or accessible to, the general public, there are no current public health and safety issues.

Public emergency services in the vicinity of the Kingston Reservation include law enforcement services, fire protection services, urgent care clinics, and a hospital in the City of Harriman. The Roane County Emergency Management Agency has the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials (Tennessee Emergency Management Agency [TEMA] 2022).

The Roane Medical Center, located in Harriman, approximately 3.4 miles (9 minutes) northwest of the Kingston Reservation, is the closest medical provider.

Law enforcement services in the City of Harriman are provided by the Harriman Police Department in Harriman, approximately four miles (11 minutes) from the Kingston Reservation. Law enforcement services in the City of Kingston are provided by the Kingston Police Department, approximately five miles (12 minutes) from the Kingston Reservation. Roane County law enforcement services are provided by the Roane County Sheriff’s Office in Kingston, approximately four miles (11 minutes) from the Kingston Reservation.

Fire protection services in Harriman are provided by the Harriman Fire Department, located approximately four miles (11 minutes) from the Kingston Reservation. Fire protection services in Kingston are provided by the Kingston Fire Department, located approximately four miles (10 minutes) from the Kingston Reservation.

3.15.2.2 Alternative A

3.15.2.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Public emergency services in the vicinity of the proposed CC/Aero CT Plant are the same as the Kingston Reservation and are generally described in Section 3.15.2.1.

3.15.2.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.15.2.1 apply to the proposed 3- to 4-MW solar facility location on the Kingston Reservation.

3.15.2.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.15.2.1 apply to the proposed 100-MW BESS on the Kingston Reservation.

3.15.2.2.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT facilities and switchyard. TVA would also install new transmission lines for the proposed battery station. Therefore, the affected environment for on-site transmission upgrades is described in Section 3.15.2.1.

3.15.2.2.5 Off-site Transmission Upgrades

3.15.2.2.5.1 Eastern Transmission Corridor

The Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381) is within Roane and Anderson counties. The emergency services would vary at different points along the Eastern Transmission Corridor. Fire protection services would be provided by the Roane County or Anderson County Fire Departments, and law enforcement services would be provided by the Roane County or Anderson County Police Departments.

3.15.2.2.5.2 Western Transmission Corridor

The Western Transmission Corridor (L5383) is within Cumberland County. Emergency services would vary at different points along the Western Transmission Corridor. Fire protection services would be provided by the Cumberland County Fire Department, and law enforcement services would be provided by the Cumberland County Police Department.

3.15.2.2.6 Construction and Operation of a Natural Gas Pipeline

Transportation of natural gas by pipeline involves risk to the public due to the potential for accidental release of natural gas. The greatest hazard is a fire that may result in the event of a major pipeline rupture or leak.

ETNG's Resource Report 11 (ETNG 2023l), which was filed with FERC in July 2023 (ETNG 2023a), present the safety-related findings of ETNG's analyses. This FEIS has been updated based on ETNG's application and resource reports (ETNG 2023a-m) and subsequent filings by ETNG with FERC from October through December 2023 (ETNG 2023n-q). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. ETNG's Resource Report 11 (ETNG 2023l) provides the following description of potential hazards associated with the proposed Construction ROW:

> Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic but is classified as an asphyxiant by inhalation. If breathed in high concentration, oxygen deficiency can result in serious injury or death. Methane is a flammable gas with an ignition temperature of 1,000 degrees Fahrenheit […] Unconfined mixtures of methane in air away from a point source are generally not explosive or a significant health hazard. However, a flammable concentration within an enclosed space or point source in the presence of an ignition source can result in a fire or explosion. […]
>
> The pipeline and aboveground facilities associated with the [Ridgeline Expansion] project must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards, as set forth in 49 CFR Part 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion. The [Ridgeline Expansion] project will not involve a new or recommissioned liquefied natural gas facility. […]
>
> Under 49 CFR §192.615, each pipeline operator must also establish an emergency plan that provides written procedures to minimize the hazards from a gas pipeline emergency. Key elements of the plan include procedures for:
>
> 1. Receiving, identifying, and classifying emergency events – gas leakage, fires, explosions, and natural disasters;
> 2. Establishing and maintaining communications with local fire, police, and public officials and coordinating emergency responses;
> 3. Making personnel, equipment, tools, and materials available at the scene of an emergency;
> 4. Protecting people first and then property and making them safe from actual or potential hazards; and
> 5. Emergency shutdown of system and safe restoration of service.
>
> [ETNG] will implement procedures in its Emergency Plan to enable the public and officials to recognize and report a natural gas emergency. The DOT requires that each operator establish and maintain a liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to the appropriate public officials.
>
> […]

> [ETNG] is committed to safety, protecting the environment, preventing accidents/incidents, and maintaining the highest standards for its pipeline operation and maintenance. [ETNG] will accomplish this goal through routine preventative maintenance, pipeline patrols, solid emergency response plans and a strong pipeline Integrity Management Program. [ETNG] will establish and maintain strict operating and maintenance policies and procedures that will be audited periodically by the PHMSA and are in compliance with 49 CFR Part 192.
>
> Trained and qualified pipeline personnel will operate and maintain the pipeline in accordance with 49 CFR Part 192, Subpart N. The training program will ensure all personnel possess the knowledge and competency necessary to efficiently operate and maintain the pipeline in a manner that protects the environment, the public and the health and safety of all employees.

Safety measures and programs are provided in greater detail in ETNG's Resource Report 11 (ETNG 2023l).

Public emergency services in the area of the proposed 122 miles of pipeline include urgent care clinics, hospitals, law enforcement services, and fire protection services. The Roane, Morgan, Fentress, Overton, Putnam, Jackson, Smith, and Trousdale County Emergency Management Agencies have the responsibility and authority to coordinate with state and local agencies in the event of a release of hazardous materials (TEMA 2022). The Roane Medical Center in Harriman is the closest medical provider, located approximately three miles southwest of the corridor.

Law enforcement services are provided by the Harriman Police Department in Harriman located approximately four miles northwest of the corridor; Trousdale County Sheriff's Department, one mile north of the pipeline in its western portion; or Algood Police Department, two miles south of the pipeline in its central portion.

Fire protection services are provided by the Harriman Fire Department located approximately four miles northwest of the corridor; Hartsville Fire Department, one mile north of the pipeline in its western portion; or the Algood Fire Department, two miles south of the pipeline in its central portion.

These are the closest emergency services to a specific point on the corridor. Distances and travel times would vary at different points on the corridor.

3.15.2.3 Alternative B

3.15.2.3.1 East Tennessee TVA Power Service Area

TVA anticipates that the solar and storage facilities proposed under Alternative B would be located within portions of the East TN region. During construction, workers would have an increased safety risk typical for other construction activities. Particular caution would be taken when handling solar panels due to the potential for electric shock. The standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. See Section 2.3.1 for more details on standard BMPs.

3.15.3 Environmental Consequences

3.15.3.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain the KIF plant and adhere to all applicable safety standards. No project-related impacts on public health and safety would result.

3.15.3.2 Retirement, Decommissioning, Decontamination, and Deconstruction of KIF Plant

TVA's Standard Programs and Processes related to safety would be strictly adhered to during implementation of all the action alternatives. 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. TVA and its contractors are required to comply with OSHA regulations and follow a Site-Specific Safety & Health Plan.

Potential public health and safety hazards could result from increased traffic on roadways as a result of D4 alternatives. Residential and other human use areas along roadways used by construction traffic to access the 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).

Under both action alternatives, TVA would retire, decommission, decontaminate, and deconstruct the KIF plant. Primary operational measures that would be discontinued due to the plant retirement include coal pile management, withdrawals of raw water from the Clinch/Emory River for cooling purposes at the coal plant, and thermal discharges back into the Clinch/Emory River. The combustion of coal for the production of power would cease, as would generation of wastes associated with such power production, thereby reducing any risks resulting from proximity to coal combustion for workers on-site.

During D4 activities, workers would have an increased safety risk. However, because D4 work has known hazards, the standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. 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. Asbestos-containing materials in building structures and systems would be remediated as necessary to be protective of environment and worker health and safety, but full abatement would not occur until demolition activities are initiated.

TVA's SPCC Specialist would update Kingston's existing SPCC Plan throughout D4 activities. The purpose of the SPCC Plan is to minimize the potential of a spill during the drainage and disposal of oil and fluids and to instruct on-site workers on how to contain and clean up any potential spills. Decontamination would involve removing select regulated materials in a safe and practical manner in such a way that the plant is left in a status that does not present a hazard or risk to the environment or personnel. Limited decontamination work undertaken at the fossil plant may include abatement and disposal of regulated materials, which includes but is not limited to PCB equipment, asbestos, hazardous waste, and solid waste. The demolition perimeter would remain securely fenced during demolition and decontamination, and access gates would normally remain locked. General public health and safety would not be at risk in the event of an accidental spill on-site. Emergency response would be provided by the local, regional, and state law enforcement, fire, and emergency responders.

Since explosive demolition would be conducted under tight security, the danger to the public from this activity would likely be very low. Explosives would be managed under the direction of a state licensed blaster. Security would be a very important component of this event to eliminate as much as possible any threats to public health or safety. Once explosives arrive on-site, 24-hour security would be provided to monitor the explosives. Detailed security plans would be developed and coordinated with area emergency response agencies. Security details, including any information about the transport and storage of explosives, would be limited to authorized personnel only. Site security on the day of the event would be strictly enforced, and trespassing would not be tolerated. Notifications to the public would be issued prior to the use of explosives for demolition. Health and safety hazards could result from premature detonation or premature collapse of structures during demolition if explosives are used. These risks are reduced if mechanical demolition is utilized, though precautions are still implemented. Overall, impacts to public health and safety in association with implementation of the D4 activities would be considered temporary and minor.

During demolition and materials removal, truck traffic of other projects on the Kingston Reservation and CCR management activities would add to the traffic. This could result in cumulative safety impacts as a result of the cumulative traffic impacts from nearby projects. Impacts would be anticipated to be temporary and minor and would affect primarily the truck drivers and construction personnel. Controls would be needed to ensure truck traffic is coordinated and safe. With proper planning, adherence to OSHA regulations, health and safety plans, and implementation of BMPs, cumulative impacts from the project in relation to public health and safety would not occur.

3.15.3.2.1 Environmental Justice Considerations

Safety-related effects that would occur as a result of KIF retirement and D4 activities are anticipated to have disproportionate and adverse effects on EJ populations in the Kingston Reservation EJ study area; however, effects would be temporary, minor, and mitigated. Effects are anticipated to be limited to the Kingston Reservation or immediate vicinity, which is an EJ population. This population would be disproportionately exposed to increased traffic on roadways. This would be a minor, but disproportionate and adverse impact to residents.

3.15.3.3 Alternative A

3.15.3.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Under Alternative A, TVA would retire the KIF, demolish the units, and construct and operate a CC/Aero CT Plant on the Kingston Reservation among additional upgrades as described in Section 2.1.3. During construction, workers would have an increased safety risk. See Section 2.3.1 for additional details on standard BMPs.

The CC/Aero CT Plant would require minor and temporary movement of fuel gas and oil. Two 1,000,000-gallon oil tanks with fuel oil would be stored on-site. A total on-site oil storage capacity of 1,000,000 gallons and greater would require a Facility Response Plan in addition to an SPCC Plan. The FRP must be approved by USEPA prior to reaching

1,000,000 gallons of on-site oil storage. TVA's SPCC Specialist would update Kingston's existing SPCC Plan throughout construction. Limited contamination work undertaken at the fossil plants may include abatement and disposal of regulated materials, which may include but are not limited to PCB equipment, asbestos, hazardous waste, and solid waste. The perimeter of each grouping of project elements would remain securely fenced during construction and operation, and access gates would normally remain locked. Security fencing around the site boundary would be installed during construction. Once the plant is operational, permanent security fencing would be installed. General public health and safety would not be at risk in the event of an accidental spill on-site. Emergency response would be provided by the local, regional, and state law enforcement, fire, and emergency responders.

During construction of the CC/Aero CT Plant, truck traffic of other projects on the Kingston Reservation and CCR Management activities would add to the traffic. This could result in cumulative safety impacts as a result of the other traffic impacts from nearby projects. Impacts would be anticipated to be temporary and minor and would affect primarily the truck drivers and construction personnel. Controls would be needed to ensure truck traffic is coordinated and safe.

The public health and safety impacts of air quality from coal plant operations would be reduced, as the CC/Aero CT Plant would produce less emissions than the KIF plant. The CC/Aero CT Plant would also use an SCR system located within the HRSG for additional NO_x reduction. As 19.5 percent aqueous ammonia would be used rather than anhydrous (gaseous) ammonia used by the coal plant, the new site would have an aqueous ammonia storage facility and truck unloading but would not need the sitewide anhydrous ammonia alert system. See the Air Quality Section for more information.

3.15.3.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

During construction, workers would have an increased safety risk typical for other construction activities. Particular caution would be exercised when handling solar panels due to the potential for electric shock. The standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations. See Section 2.3.1 for more details on standard BMPs.

Once solar panels are installed and in operation, they are considered to be very safe for humans and wildlife. Solar projects do not cause EMF levels such that there would be impacts on nearby residents. Sites are typically designed and operated using standard industry practices with sufficient setbacks to reduce or eliminate EMF exposure to adjacent property owners; strength of EMF is typically measured in milli-gauss. While long-term exposure to levels above 4 milli-gauss is identified as a concern (Cleveland 2017), the EMF generated by the solar facilities and associated transmission lines are typically less than 4 milli-gauss.

The perimeter of each grouping of solar arrays, as well as substations and BESS, would remain securely fenced during construction and operation, and access gates would normally remain locked. Security fencing around the site boundary would be installed during construction. Once the facility is operational, permanent security fencing would be installed.

3.15.3.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation
Except for decontamination work at the fossil plant, the proposed BESS would have similar impacts to safety and utilize, as required, similar minimization measures as those described in Section 3.15.3.3.2. During construction, workers would have an increased safety risk. See Section 2.3.1 for additional details on standard BMPs. Overall, public health and safety impacts are anticipated to be temporary and minor.

3.15.3.3.4 On-site Transmission Upgrades
Transmission lines, like all other types of electrical wiring, generate both electric and magnetic fields (EMFs). The voltage on the conductors of a transmission line generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, transmission line structures, or vegetation. A magnetic field is generated by the current (i.e., the movement of electrons) in the conductors. The strength of the magnetic field depends on the current, the design of the line, and the distance from the line. Most of this energy is dissipated on the ROW, and the residual very low amount is reduced to background levels near the ROW or energized equipment. A new transmission line for the battery station is proposed under Alternative A; therefore, safety hazards related to electrical equipment are relevant under this alternative as well as those anticipated from proximity to the existing on-site and nearby transmission lines and planned transmission upgrades described in Section 2.1.3.5.1.

Magnetic fields can induce currents in conducting objects. Electric fields can create static charges in ungrounded, conducting materials. The strength of the induced current or charge under a transmission line varies with: (1) the strength of the electric or magnetic field, (2) the size and shape of the conducting object, and (3) whether the conducting object is grounded. Induced currents and charges can cause shocks under certain conditions by making contact with objects in an electric or magnetic field. The existing off-site transmission lines have been designed to minimize the potential for such shocks. This is done, in part, by maintaining sufficient clearance between the conductors and objects on the ground. Stationary conducting objects, such as metal fences, pipelines, and highway guardrails that are near enough to the transmission line to develop a charge, would be grounded by TVA to prevent them from being a source of shocks.

Transmission line construction and operation require a high level of safety risk management due to the dangers present when working near high-voltage equipment. Overall, impacts to public health and safety in association with the transmission system components on the Kingston Reservation would be considered temporary and minor. With proper planning, adherence to OSHA regulations, health and safety plans, and implementation of BMPs, cumulative impacts from the project in relation to public health and safety would not occur.

3.15.3.3.5 Off-site Transmission Upgrades
Safety hazards and precautions for off-site transmission line upgrades proposed for the Eastern Transmission (L5108, L5116, L5280, L5302, and L5381) and Western Transmission (L5383) corridors are the same as those described for on-site transmission line upgrades in Section 3.15.3.3.4.

3.15.3.3.6 Construction and Operation of a Natural Gas Pipeline
ETNG's Resource Report 11 (ETNG 2023l) was filed with FERC in July 2023 (ETNG 2023a). This FEIS has been updated based on ETNG's application and resource reports (ETNG 2023a-m) and subsequent filings by ETNG with FERC from October through December 2023 (ETNG 2023n-q). This information has been reviewed by TVA to support a

thorough and independent evaluation of the affected environment. TVA concurs with the safety-related findings in ETNG's Resource Report 11.

The construction and operation of a new CC/Aero CT Plant would require construction of approximately 122 miles of new natural gas pipeline and gas system infrastructure. While pipelines are the safest form of energy transportation, the transportation of natural gas by pipeline does involve minimal incremental risk to the public due to the potential for accidental release of natural gas. FERC would review the construction of ETNG's pipeline application and require the construction of the pipeline to be in accordance with DOT safety standards, and the PHMSA would provide ongoing regulation of construction, operation, and maintenance through routine inspections and enforcement of pipeline safety laws and regulations.

Construction of the pipeline may result in a temporary increased demand on public services. Potential temporary impacts on services may include traffic-related incidents, medical emergencies, and issuances of permits for vehicles subject to load and width restrictions. During construction, workers would have an increased safety risk. However, because construction work has known hazards, the standard practice is for contractors to establish and maintain health and safety plans in compliance with OSHA regulations.

Natural gas transmission pipeline incidents are rare, and their consequences vary. For the 10- year period from 2012 through 2021, 1,155 incidents were reported by natural gas transmission pipeline operators in the United States. In 2021, there were 99 pipeline incidents that resulted in four injuries and four fatalities (USDOT 2022). Using the annual average for incidents (114) from 2012 through 2021 and the average miles of gas transmission pipelines (319,372) from 2012 through 2021 obtained from the USDOT Pipeline and Hazardous Materials Safety Administration (USDOT 2022), there was one incident for each 2,802 miles of pipeline per year on average.

Through design, safe construction, maintenance, and monitoring, ETNG would minimize the risk to general public health and safety. Emergency response would be provided by the local, regional, and state law enforcement, fire, and emergency responders. Overall, effects to public health and safety in association with construction and operation of the gas pipeline would be minor.

Preventive, emergency, patrolling, and safety measures relating to the pipeline are provided in ETNG's Resource Report 11 (ETNG 2023l). Some of these measures include:

> Preventive measures begin with the design and construction of [ETNG]'s facilities. These measures include design specifications, selection of suitable construction materials, development and selection of welding procedures, pipe coatings and cathodic protection systems, as set forth in 49 CFR §192.935. Additionally, manufacturing controls are used to promote high-quality installation of the pipeline and to limit operating stress. During the installation phase, all welders and radiographic technicians performing work on the facilities must take and pass a qualification test. Qualified oversight inspection staff is used to monitor the installation of the facilities.
>
> A cathodic protection system will be installed on the new pipeline, as required by 49 CFR Part 192, to protect the integrity of the pipeline from corrosion, thereby extending its operating life and providing protection from pipeline failures for

> [ETNG] personnel and the general public. […] The functional capability of cathodic protection systems is inspected frequently to ensure proper operating conditions for corrosion mitigation.
>
> The cathodic protection system design will be prepared based upon soil resistivity measurements obtained at multiple locations on the interconnecting piping. All relevant regulations and standards, including DOT, National Association of Corrosion Engineers, and American Society for Testing and Materials will be taken into consideration while preparing this design.
>
> [ETNG]'s [Ridgeline Expansion] project facilities will be built to meet or exceed the DOT safety standards. Since the pipeline is buried a minimum of three feet underground, it is relatively immune from direct lightning strikes or other weather-related hazards. Specific site conditions, including earthquakes, are considered in the design of the pipeline. The magnitude of earthquakes in the southeast is relatively low and the ground vibration is unlikely to be a hazard for a modern welded-steel pipeline.
>
> [ETNG]'s proposed [Ridgeline Expansion] project will be equipped with remote control shutoff valves as required by the DOT regulations. This allows the shutoff valves to be operated remotely by [ETNG]'s gas control center in the event of an emergency, usually evidenced by a sudden loss of pressure on the pipeline. Remotely closing the shutoff valve allows the section of pipeline to be isolated from the rest of the pipeline system.
>
> […]
>
> [ETNG] will employ an array of patrol methods to conduct comprehensive and effective patrols, as required by federal law. Aerial, driving, or foot patrols will be used to physically inspect the pipeline facilities. [ETNG] will have line field service crews that perform the ground-based patrols and facility inspections. When performing patrols, technicians will observe surface conditions on and adjacent to the pipeline ROW for indications of leaks, construction activity, and other factors affecting safety and operation. Conditions identified during patrols will be entered into [ETNG]'s work management system and remedial actions taken. Preventative maintenance checks shall be performed on the pipeline at a set frequency and will comply with Part 192 of the safety regulations.

As further stated in ETNG's Resource Report 11 (ETNG 2023l):

> The pipeline will be patrolled in accordance with the requirements of 49 CFR §192.705 and personnel well qualified to perform both emergency and routine maintenance on interstate pipeline facilities will handle emergencies and maintenance related to the following:
>
> - Erosion and wash-outs along the ROW;
> - Settling, undermining or degradation of repaired ditch line in streets or parking lots:
> - Performance of water control devices such as diversions;

- Condition of banks at stream and river crossings;
- Third-party activity along the pipeline ROW;
- Evidence of subsidence, surface cracks or depressions which could indicate sinkhole formation; and
- Any other conditions that could endanger the pipeline.

> [ETNG] will also monitor the pipeline 24 hours a day, seven days a week, from its Control Center that is located in Houston, Texas, and will be staffed continuously by qualified pipeline operators. Operators will monitor all aspects of the pipeline including system pressures, temperatures, flows, and valve positions (open or closed). A secondary Pipeline Control Center will be available in cases of an emergency in Nashville, Tennessee. This high-tech computer control center monitors the flow of gas throughout Enbridge's interstate transmission pipeline system. The center collects data from all of these pipelines to ensure they are operating within their design parameters. The Gas Control Center monitors and reacts to equipment anomalies and, when necessary, dispatches employees who live and work along the pipeline to respond. As an added safety measure, remote control equipment is installed along the pipeline system, enabling remote operation of the pipeline valves from the Gas Control Center
>
> The pipeline will be monitored for leaks continuously using the data acquisition system. Operators will use pressures, flows and rate of change alarms to monitor for leaks or other abnormal operating conditions. In the unlikely case that a shutdown of the pipeline system is needed, the [ETNG] pipeline system [would] be equipped with remotely controlled sectionalizing block valves to isolate the affected pipeline segment.
>
> [ETNG] employs field services crews to perform Part 192 required operations, maintenance and inspection tasks along the 122-mile-long pipeline. All personnel [would] have the proper training and qualifications, as required by Part 192 of the safety regulations.

During construction of the pipeline, truck traffic of other projects in the area could add to the overall traffic, which could result in cumulative safety impacts. Impacts are anticipated to be temporary and minor and would primarily affect the truck drivers and construction personnel. With proper planning, adherence to OSHA regulations, health and safety plans, and implementation of BMPs, cumulative impacts from the project in relation to public health and safety would not occur.

3.15.3.3.7 Summary of Alternative A

TVA Proposed Actions

During construction of the CC/Aero CT Plant, solar facility, BESS, and proposed transmission line, workers would have an increased safety risk that would be mitigated through BMPs and site-specific health and safety plans; however, there would remain minor safety risks from increased traffic during construction. General public health and safety would not be at risk in the event of an accidental spill on-site due to precautionary measures. Atmospheric pollutant emissions would be reduced as a result of coal generation replacement. See the air quality section for more information on decreased air pollutants.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

During construction of the pipeline, workers would have an increased safety risk that would be mitigated through BMPs and site-specific health and safety plans; however, there would remain minor safety risks from increased traffic during construction. General public health and safety would not be at risk in the event of an accidental spill on-site due to precautionary measures. The greatest hazard during pipeline construction and operation is a fire that may result in the event of a major pipeline rupture or leak. A number of precautionary systems and response measures would be in place to mitigate this risk to workers and the public.

3.15.3.3.8 Environmental Justice Considerations

TVA Proposed Actions

Safety-related effects such as increased traffic near high traffic construction areas could result in negative safety effects for people living near the Kingston Reservation. This is pertinent for EJ populations because the census block group that contains the Kingston Reservation is considered to be an EJ population. Traffic effects would be mostly temporary, minor to moderate, and related to construction activities and they would be limited to a relatively small area, along public roads around the Kingston Reservation. This would be a temporary, minor, disproportionate and adverse effect. However, it should also be noted that there would be minor positive impacts to public health and safety due to reduced air emissions in areas nearby the Kingston Reservation coming from the CC/Aero CT Plant compared to the current coal plant. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

Safety-related effects such as increased traffic near high traffic construction areas or the possibility of a spill could result in negative safety effects for people living near the pipeline. In areas where pipeline activities intersect with EJ populations, disproportionate and adverse safety effects may occur because these communities often experience compounding effects and social disadvantages compared to non-EJ populations.

3.15.3.4 Alternative B

3.15.3.4.1 Construction and Operation of Solar and Storage Facilities

Under Alternative B, TVA, or a third-party developer, would construct and operate 1,500 MW of solar and 2,200 MW of BESS at various sites within portions of East TN. The proposed construction and operation of multiple BESS at multiple sites would have similar impacts to safety and impose, as required, similar minimization measures as those described in Section 3.15.3.3.2. During construction, workers would have an increased safety risk. See Section 2.3.1 for additional details on standard BMPs.

The construction of Alternative B combined with the targeted RFFA of 10,000 MW in solar facilities would result in cumulative safety impacts as a result of the cumulative traffic impacts from nearby projects. Effects would be anticipated to be temporary and minor and would affect primarily the truck drivers and construction personnel. Controls would be needed to ensure truck traffic is coordinated and safe. With proper planning, adherence to OSHA regulations, health and safety plans, and implementation of BMPs, cumulative effects from the project in relation to public health and safety would not occur.

3.15.3.4.2 Transmission and Other Components

The full extent of transmission lines necessary under Alternative B is not yet known**.** Transmission line impacts to safety would be comparable to those discussed in Section 3.15.2.2.5 and Section 3.15.2.2.6.

3.15.3.4.3 Environmental Justice Considerations

Safety-related effects that would occur as a result of the proposed solar facilities and transmission line activities would be anticipated to be temporary, minor and mitigated, and limited to the immediate project sites and transmission line corridors. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.16 Socioeconomics

Social, economic, and sociocultural characteristics of potentially affected populations are assessed in this section using the 2010 Census (USCB 2010), 2020 Census (USCB 2020), and the 2017-2021 American Community Survey (ACS) 5-year estimates (ACS 2021). State-level USCB data are included for comparison purposes. These data were obtained utilizing USCB Explore Census Data (USCB 2023) and ESRI Demographics (ESRI 2022). Where appropriate, additional data from USCB and other federal and state agencies are employed.

The area considered for socioeconomic analysis varies relative to the alternative and corresponds to the extent of impacts anticipated for that alternative (Figure 3.16-1). The area considered for the Kingston Reservation (No Action Alternative and D4 Activities) is the approximated geographic area from which the labor market is derived. The Kingston labor market area consists of the counties where the facility is located and all adjacent counties, including the off-site transmission corridors. For the ETNG Pipeline Construction ROW associated with Alternative A, the extent of effects, including labor market effects, is expected to be more limited than those associated with the CC/Aero CT Plant and solar and storage facilities but more encompassing than the area considered for EJ effects; thus, a 3-mile radius of the pipeline was assessed for the socioeconomic analysis (hereafter referred to as TVA's Expanded Pipeline Socioeconomic Study Area). To better represent the data, census tract data, given as Census Tract number (e.g., CT 9702) by county, are utilized to characterize the ETNG Pipeline Construction ROW. Because census tract boundaries may have changed between the 2010 decennial census and the 2020, population change data are presented at the county level rather than the census tract level, making population change the one exception.

For Alternative B, the area from which potentially affected populations are identified is the East TN region of TVA's PSA (Figure 3.4-2), as assessed by the census data associated with each county in the region. This area is hereafter referred to as the Alternative B Socioeconomic Study Area.

In evaluating beneficial and adverse effects to socioeconomics in relation to the natural gas pipeline associated with Alternative A, TVA incorporated ETNG's socioeconomic findings (ETNG 2023f). Detailed information regarding the affected environment of socioeconomics in relation to the ETNG Ridgeline Expansion Project are presented in Resource Report 5 (ETNG 2023f).

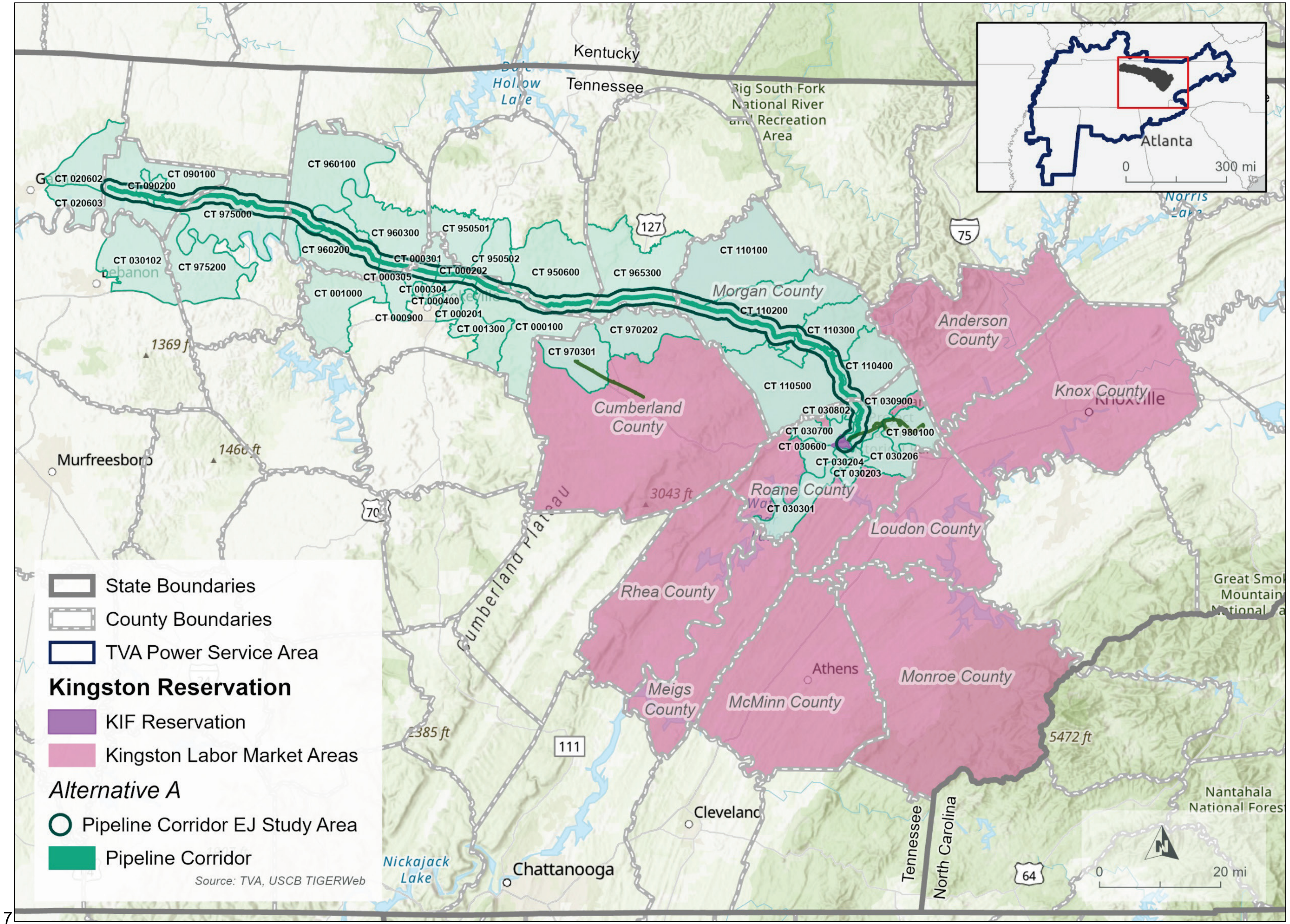

Figure 3.16-1. Socioeconomic Study Areas Evaluated for the Kingston Reservation (No Action) and for Action Alternative A

3.16.1 Affected Environment

3.16.1.1 Kingston Reservation (No Action and D4 Activities)

The Kingston labor market area includes Roane County, where the facility is located, and Anderson, Cumberland, Knox, Loudon, McMinn, Meigs, Monroe, Morgan, and Rhea counties. The Kingston labor market area is largely rural but does include Knoxville, the third largest city in TN with a 2020 population of 190,740. Other cities located in surrounding counties are much smaller with next largest populations being in Oak Ridge at 31,402 (Roane County) and Farragut at 23,506 (Knox County). All other counties' largest cities range in population from approximately 1,000 to 15,000. Kingston's 2020 population was 5,953 (USCB 2020). The Kingston labor market area also encompasses the on-site and off-site transmission corridors associated with Alternative A.

3.16.1.1.1 Demographics and Housing

Population data for the affected counties and associated states are provided in Table 3.16-1, based on the 2010 Census (USCB 2010) and the 2020 Census (USCB 2020). As shown, from 2010 to 2020, population growth in six of the 10 counties was less than the growth for the state. Two of the 10 affected counties recorded population losses over that period, including Roane County, where the Kingston Reservation is located. Morgan County also recorded a population loss. Of the affected counties, three counties, Knox, Loudon, and McMinn counties, recorded population gains of more than 10 percent during that period.

Table 3.16-1. Population Change for the Kingston Labor Market Area

Geography	2010 Census*	2020 Census**	% Change
Tennessee	*6,346,105*	*6,910,840*	*8.9*
Roane County (Kingston)	54,181	53,404	-1.4
Anderson County	75,129	77,123	2.7
Cumberland County	56,053	61,145	9.1
Knox County	432,226	478,971	10.8
Loudon County	48,556	54,886	13.0
McMinn County	52,266	53,276	13.3
Meigs County	11,753	12,758	8.6
Monroe County	44,519	46,250	3.9
Morgan County	21,987	21,035	-4.3
Rhea County	31,809	32,870	3.3

Sources: USCB 2010 *Table ID: P1; USCB 2020 ** Table ID: P1

Other demographic characteristics of the 10 affected counties, as compared with the state, are summarized in Table 3.16-2, based on the ACS (2021). The populations of affected counties were generally more aged than the state population with the only exception being in Knox County, where the larger City of Knoxville is present, and the population is younger than in TN. Roane County, Anderson County, and Knox County were the only counties with higher percentages of people who were high school graduates or higher than the state.

Table 3.16-2. Demographic Characteristics for the Kingston Labor Market Area

Geography	% of Population 65 Years and Over^	Median Age>	% High School or Higher*,**	% of Occupied Housing Units, Renter Occupied++	Median Year Housing Units Built##
Tennessee	16.3	38.8	88.8	33.1	1985
Roane County (Kingston)	22.4	47.1	90.7	24.6	1978
Anderson County	20.0	42.8	89.9	31.3	1975
Cumberland County	30.9	52.2	88.6	21.4	1993
Knox County	15.8	37.5	92.1	35.0	1983
Loudon County	26.4	47.9	87.3	19.0	1990
McMinn County	19.4	42.1	86.0	25.9	1984
Meigs County	21.4	45.6	83.2	21.6	1993
Monroe County	21.1	44.2	84.7	28.0	1990
Morgan County	18.0	41.8	81.2	18.5	1984
Rhea County	18.3	40.3	83.1	26.7	1988

*Of Population over 25 Years and includes High School Equivalency
Source: ACS 2021 - ^ Table ID: B01001 > Table ID: B01002 ** Table ID: B15003 ++ Table ID: B25003 ## Table ID: B25035.

According to the ACS, all affected counties except Knox County had lower percentages of renter-occupied housing units than the state (ACS 2021). In five of the affected counties, including Roane County, housing units were generally older than across the state.

3.16.1.1.2 Regional Economy, Employment, and Income

KIF directly employs approximately 200 area residents in a range of positions such as general laborers, steamfitters, machinists, electricians, analysts, administrators, and supervisors. The KIF average annual salary is approximately 100 percent higher than the 2022 average annual wages per employee in affected counties ($53,945 based on an average of the 10-county labor market area), based on the Quarterly Census of Employment and Wages from the U.S. Bureau of Labor Statistics (USBLS; USBLS 2023). KIF also employs contractors for both short- and long-term operations labor support and contracts with coal and limestone mining operations and transportation companies that support additional employment and account for significant contributions to the area economy.

KIF also has indirect and induced effects on the local economy. Indirect effects result from changes in sales, income, or employment within the Kingston Reservation region, and induced effects that occur through the recirculation of money received through direct and indirect income sources and the subsequent creation of additional jobs and economic activities.

TVA makes payments in lieu of taxes, also called tax equivalent payments, to states where TVA sells electricity or owns power system assets. The payments total 5 percent of gross proceeds from the sale of power in the prior fiscal year, with some exclusions. TN Code Annotated Title 67, Chapter 9, Part 1 (T.C.A. § 67-9-102) directs how the funds are apportioned within the state and mandates that an individual county's portion of the total payment is determined by its proportion of population, total land area, and TVA-owned land in the county. In addition to tax equivalent payments, there is also a provision that allows for "impact payments" to local communities as a result of large TVA projects. These impact payments are made in addition to the normal tax equivalent payments made by the state. Impact payments acknowledge that large projects have impacts to traffic volumes, the number of students, infrastructure, and other regional resources.

Table 3.16-3 summarizes ACS data on employment and income for the affected counties (ACS 2021). Except for Knox County, all other affected counties had lower percentages of people in the labor force than the state. Six of the counties had unemployment rates above that of the state. Roane County's unemployment was equal to the state's unemployment. Based on the Quarterly Census of Employment and Wages from USBLS, the annual average total employment in Roane County was estimated to be 19,365 in 2022 (USBLS 2023). Direct employment at Kingston Reservation (approximately 200 area residents) comprises a small percentage of this total. Based on the ACS, per capita income in three of the affected counties, including Roane County, was higher than that of the state (ACS 2021).

Table 3.16-3. Employment and Income Characteristics for the Kingston Reservation Labor Market Area

Geography	% of 16+ Civilian Population in Labor Force^^	Unemployment Rate^^	% Employed in Education Services, Healthcare, and Social Services*	% Employed in Manufacturing*	Per Capita Income>>
Tennessee	61.4	5.3	22.7	13.0	$32,908
Roane County (Kingston)	54.6	5.3	23.7	10.1	$34,366
Anderson County	55.6	5.2	22.4	11.3	$30,544
Cumberland County	46.3	6.0	17.8	16.0	$28,255
Knox County	64.2	4.1	25.0	8.0	$36,450
Loudon County	55.8	3.3	16.6	17.1	$36,308
McMinn County	54.7	5.5	20.0	25.7	$27,404
Meigs County	51.4	8.6	17.1	23.4	$25,670
Monroe County	51.0	6.2	20.9	27.3	$24,921
Morgan County	44.1	8.6	21.3	11.1	$23,436
Rhea County	53.3	8.4	20.3	19.9	$24,815

Source: ACS 2021 - ^^ Table ID; B23025 * Table ID: C24030 >> Table ID: B19301

Pertinent civilian employment characteristics for the affected counties are also shown on Table 3.16-3. Manufacturing, education services, and healthcare generally lead the industries for employment. Though not shown on Table 3.16-3, construction also employs larger percentages of people in the Kingston labor market area, accounting for generally 5 to 15 percent of employment. Roane County and two other affected counties, however, have lower percentages of civilians employed in construction as compared to the state percentage.

3.16.1.2 Alternative A

3.16.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The proposed CC/Aero CT Plant site would be located within the Kingston Reservation. Therefore, the affected environment for socioeconomics is as described for the Kingston labor market area in Section 3.16.1.1.

3.16.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located within the Kingston Reservation. Therefore, the affected environment for socioeconomics is as described for the Kingston labor market area in Section 3.16.1.1.

3.16.1.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The proposed 100-MW battery site and new transmission corridor would be located within the Kingston Reservation. Therefore, the affected environment for socioeconomics is as described for the Kingston labor market area in Section 3.16.1.1.

3.16.1.2.4 On-site Transmission Upgrades

The proposed on-site transmission connections and corridors would be located within the Kingston Reservation and, therefore, in the Kingston Reservation labor market area. The affected environment for socioeconomics is as described for the Kingston labor market area in Section 3.16.1.1.

3.16.1.2.5 Off-site Transmission Upgrades

The off-site transmission upgrades proposed for the Eastern Transmission (L5108, L5116, L5280, L5302, and L5381) and Western Transmission (L5383) corridors would be located within the Kingston Reservation labor market area. Therefore, the affected environment for socioeconomics is as described for the Kingston labor market area in Section 3.16.1.1.

3.16.1.2.6 Construction and Operation of a Natural Gas Pipeline

Census tracts within TVA’s Expanded Pipeline Socioeconomic Study Area include 40 census tracts within portions of Cumberland, Fentress, Jackson, Morgan, Overton, Putnam, Roane, Smith, Sumner, Trousdale, and Wilson counties.

While the study area overlaps CT 9801, this census tract is entirely encompassed by the Y-12 National Security Complex, which has no residential population. As all census values were zero, CT 9801 was not included in the CT total or the analyses so not to skew results.

3.16.1.2.6.1 Demographics and Housing

Population data for TVA’s Expanded Pipeline Socioeconomic Study Area and TN are provided in Table 3.16-4, based on the 2010 Census and the 2020 Census. As shown, from 2010 to 2020, five of the counties recorded population growth greater than the state rate with four of those counties being in double digits. Three counties recorded population losses over that period.

Table 3.16-4. Population Change in TVA’s Expanded Pipeline Socioeconomic Study Area

Geography	2010 Census*	2020 Census**	% Change
Tennessee	*6,346,105*	*6,910,840*	*5.7*
Cumberland County	56,053	61,145	9.1
Fentress County	17,959	18,489	3.0
Jackson County	11,638	11,617	-0.2
Morgan County	21,987	21,035	-4.3
Overton County	22,083	22,511	1.9
Putnam County	72,321	79,854	10.4

Geography	2010 Census*	2020 Census**	% Change
Roane County	54,181	53,404	-1.4
Smith County	19,166	19,904	3.9
Sumner County	160,645	196,281	*22.2*
Trousdale County	7,870	11,615	47.6
Wilson County	113,993	*147,737*	*29.5*

Sources: USCB 2010 *Table ID: P1; USCB 2020 ** Table ID: P1

Other demographic characteristics of the affected census tracts, as compared to TN, are summarized in Table 3.16-5, based on the ACS (2021). Generally, median age within the census tracts was higher than that of the state. In 21 of the affected census tracts, there were lower percentages of people who were high school graduates or higher than the state. All but five of the 19 census tracts with higher percentages of high school graduates or higher compared to the state are located in Putnam and Roane counties.

According to the ACS, six of the affected census tracts had higher percentages of renter-occupied housing units than the state, with five of those being in Putnam County (ACS 2021). In 13 of the 40 census tracts, housing units were older than across the respective state.

Table 3.16-5. Demographic Characteristics in TVA's Expanded Pipeline Socioeconomic Study Area

Geography	% of Population 65 Years and Over^	Median Age>	% High School or Higher*,**	% of Occupied Housing Units, Renter Occupied++	Median Year Housing Units Built##
Tennessee	*16.3*	*38.8*	*88.8*	*33.1*	*1985*
Cumberland County					
CT 9702.02	20.3	52.8	89.0	9.6	2000
CT 9703.01	27.0	49.5	86.1	18.8	1993
Fentress County					
CT 9653 (Pipeline)	18.4	37.3	88.0	12.4	1997
Jackson County					
CT 9601 (Pipeline)	25.4	47.5	77.9	16.4	1984
CT 9602 (Pipeline)	20.4	45.3	90.7	14.9	1983
CT 9603 (Pipeline)	21.3	45.9	80.8	20.6	N/A
Morgan County					
CT 1101 (Pipeline)	19.0	43.0	77.5	16.8	1985
CT 1102 (Pipeline)	21.2	46.5	86.9	11.6	1988
CT 1103 (Pipeline)	14.2	37.5	76.4	29.3	1982
CT 1104 (Pipeline)	22.5	43.8	84.7	28.6	1986
CT 1105 (Pipeline)	15.6	44.7	82.7	7.7	1984
Overton County					
CT 9505.01	18.4	40.9	86.7	19.9	1985
CT 9505.02 (Pipeline)	13.2	37.0	83.8	8.9	1987

Geography	% of Population 65 Years and Over^	Median Age>	% High School or Higher*,**	% of Occupied Housing Units, Renter Occupied++	Median Year Housing Units Built##
CT 9506 (Pipeline)	21.1	48.0	64.5	17.7	1991
Putnam County					
CT 1 (Pipeline)	17.7	40.7	83.5	31.0	1984
CT 2.01 (Pipeline)	20.5	35.7	83.2	38.9	1989
CT 2.02 (Pipeline)	30.6	51.9	92.3	16.1	1996
CT 3.01	19.8	44.3	93.9	10.3	1987
CT 3.03	12.5	37.5	84.7	45.2	1978
CT 3.04	4.5	25.0	72.6	84.7	1987
CT 3.05	6.4	31.9	90.1	50.0	1991
CT 4	22.9	41.1	97.7	44.4	1979
CT 9	12.0	40.9	91.6	26.3	1991
CT 10	17.9	39.5	86.5	7.6	1985
CT 13	25.1	51.1	89.9	11.6	1990
Roane County					
CT 302.03	21.1	46.4	94.5	26.9	1983
CT 302.04	25.7	51.8	92.8	30.0	1972
CT 302.06	22.1	49.2	94.6	12.4	1988
CT 303.01	26.1	46.9	95.6	16.0	1994
CT 306	24.5	46.8	85.4	30.3	1980
CT 307 (Pipeline)	23.8	49.6	91.2	23.4	1968
CT 308.02	14.5	37.0	97.1	30.0	1970
CT 309 (Pipeline)	23.9	45.0	89.2	28.2	1984
Smith County					
CT 9750	18.6	47.5	89.3	16.0	1980
CT 9752	14.6	38.9	86.9	24.5	1991
Sumner County					
CT 206.02	18.0	45.5	89.2	10.6	N/A
CT 206.03	23.4	49.9	89.0	9.1	1987
Trousdale County					
CT 901 (Pipeline)	11.6	34.2	85.1	12.7	1986
CT 902 (Pipeline)	13.9	31.3	88.1	38.5	1977
Wilson County					
CT 301.02	14.3	40.2	93.0	13.9	1992

*Of Population over 25 Years and includes High School Equivalency
Source: ACS 2021 - ^ Table ID: B01001 > Table ID: B01002 ** Table ID: B15003 ++ Table ID: B25003 ## Table ID: B25035
N/A – Not Available

ETNG Resource Report 5, Socioeconomics (ETNG 2023f), provides additional information on temporary housing that may be found in the counties comprising the ETNG Pipeline Study Area

(Cumberland, Sumner, and Wilson Counties are included in TVA's Expanded Pipeline Socioeconomic Study Area but not in the ETNG Pipeline Study Area). According to Resource Report 5 (ENTG 2023f):

> The majority of these facilities [hotel, motel, and camping facilities that provide recreational vehicle hook-ups] are located in core urban areas, although there are other vacancies in other communities. Rental vacancy rates range from zero percent in the rural Trousdale County to 6.1 percent in Fentress County. According to the 2017–2021 ACS Five-Year Estimates housing data, there are 14,241 vacant housing units in the counties crossed by the [ETNG] Project.
>
> [Data] shows a total of 3,167 housing units for seasonal or occasional use. Many of these homes are second homes that may be available for short-term rentals when not in use by owners. Roane and Fentress counties have the largest number of housing units for seasonal or occasional use.
>
> In addition to vacant housing, there are approximately 99 hotels/motels or campgrounds located in or near communities approximately ten miles from the proposed Project. Morgan and Roane counties have the largest numbers of hotels/motels and campgrounds, with a total of 37 hotels/motels that account for 37.3 percent of the total 99. Most of the Project area is located within a 50-mile distance from temporary housing consisting of hotels/motels, recreational vehicle parks and campgrounds, and housing for seasonal or occasional use.
>
> The estimated rental unit cost for one night in a motel for a single construction worker will be approximately $83. The rental unit cost for one night in short-term housing (apartment-hotel) for a single construction worker is estimated to be more expensive at approximately $239. This will depend on duration of the stay and the season of construction.

3.16.1.2.6.2 Employment and Income

Table 3.16-6 summarizes ACS data on employment and income for TVA's Expanded Pipeline Socioeconomic Study Area (ACS 2021). Twenty-seven affected census tracts had lower percentages of people in the labor force than TN. Eleven of the 40 affected census tracts had unemployment rates above that of the state. Based on the ACS, except for 15 census tracts, per capita income across the study area was lower than that of the state (ACS 2021).

Table 3.16-6. Employment and Income Characteristics in TVA's Expanded Pipeline Socioeconomic Study Area

Geography	% of Total Population Age 16+ in Civilian Labor Force^^	% Unemployment Rate^^	% Employed in Education Services, Healthcare, and Social Services*	% Employed in Manufacturing*	Per Capita Income>>
Tennessee	*61.4*	*5.3*	*22.7*	*13.0*	*$32,908*
Cumberland County					
CT 9702.02	67.3	0.0	17.6	26.5	$37,859
CT 9703.01	48.0	5.3	13.1	11.5	$26,525
Fentress County					

Geography	% of Total Population Age 16+ in Civilian Labor Force[^^]	% Unemployment Rate[^^]	% Employed in Education Services, Healthcare, and Social Services*	% Employed in Manufacturing*	Per Capita Income[>>]
CT 9653 (Pipeline)	58.4	8.5	26.5	19.1	$21,215
Jackson County					
CT 9601 (Pipeline)	41.4	10.4	24.3	15.7	$22,715
CT 9602 (Pipeline)	62.8	4.9	25.9	14.1	N/A
CT 9603 (Pipeline)	52.3	11.3	16.7	19.9	$23,100
Morgan County					
CT 1101 (Pipeline)	46.0	6.2	21.1	19.7	$18,691
CT 1102 (Pipeline)	43.8	8.0	21.4	15.3	$27,946
CT 1103 (Pipeline)	25.1	4.0	24.7	6.0	$14,083
CT 1104 (Pipeline)	55.6	11.7	27.0	7.7	$33,022
CT 1105 (Pipeline)	59.0	10.3	15.2	10.4	$26,242
Overton County					
CT 9505.01	56.4	8.4	20.1	16.9	$24,802
CT 9505.02 (Pipeline)	73.0	2.9	17.8	20.6	$25,110
CT 9506 (Pipeline)	47.7	3.3	11.3	26.1	$26,235
Putnam County					
CT 1 (Pipeline)	55.5	4.9	17.5	19.6	$21,700
CT 2.01 (Pipeline)	64.5	0.1	20.6	12.7	$26,860
CT 2.02 (Pipeline)	49.5	0.0	40.8	8.8	$34,419
CT 3.01	61.5	4.3	16.1	18.3	$29,074
CT 3.03	58.5	3.8	23.6	13.3	$25,172
CT 3.04	63.5	3.1	17.7	12.3	$16,007
CT 3.05	76.0	1.9	26.9	13.9	$24,012
CT 4	57.2	5.0	30.4	9.4	$33,564
CT 9	66.7	3.5	21.0	18.1	$28,206
CT 10	53.4	5.2	24.5	13.9	$24,366
CT 13	56.7	0.9	38.8	9.3	$32,955
Roane County					
CT 302.03	62.7	5.2	32.9	10.4	$36,620
CT 302.04	47.6	7.4	21.8	13.0	$45,609
CT 302.06	60.9	3.4	18.0	3.8	$47,481
CT 303.01	50.7	3.0	32.8	14.7	$40,956
CT 306	56.6	4.9	21.8	16.7	$25,761
CT 307 (Pipeline)	57.3	6.6	25.1	8.7	$29,786
CT 308.02	58.2	0.0	26.4	8.1	$37,760
CT 309 (Pipeline)	61.3	5.3	16.6	11.7	$32,331

Geography	% of Total Population Age 16+ in Civilian Labor Force^^	% Unemployment Rate^^	% Employed in Education Services, Healthcare, and Social Services*	% Employed in Manufacturing*	Per Capita Income>>
Smith County					
CT 9750	59.8	1.0	16.6	20.9	$35,312
CT 9752	57.7	6.9	20.1	12.7	$28,136
Sumner County	66.4	3.7			$36,931
CT 206.02	66.0	2.2	20.7	12.5	$37,346
CT 206.03	64.1	2.1	16.5	8.4	N/A
Trousdale County					
CT 901 (Pipeline)	50.7	3.6	10.1	8.2	N/A
CT 902 (Pipeline)	62.7	1.6	4.1	11.3	$23,831
Wilson County					
CT 301.02	70.0	3.0	20.9	7.7	$34,648

Source: ACS 2021 - ^^ Table ID; B23025 * Table ID: C24030 >> Table ID: B19301
N/A – Not Available

Pertinent civilian employment characteristics for the affected census tracts are also shown on Table 3.16-6. In TVA's Expanded Pipeline Socioeconomic Study Area, manufacturing, education services, and healthcare generally lead the industries for employment. Though not shown on Table 3.16-6, construction also employs larger percentages of people in TVA's Expanded Pipeline Socioeconomic Study Area with construction accounting for 10 to 20 percent of employment for several affected census tracts.

3.16.1.3 Alternative B

3.16.1.3.1 East Tennessee TVA Power Service Area

The Alternative B Socioeconomic Study Area consists of the East TN region, as based on regions in TVA's PSA defined by TVA's Economic Development team (TVA 2022e; Figure 3.4-2). It is separated into its 49 associated counties for evaluation purposes.

3.16.1.3.1.1 Demographics and Housing

Population data for the 49 counties in East TN are provided in Table 3.16-7 in comparison with TN as a whole, based on the 2010 Census and the 2020 Census. As shown, from 2010 to 2020, population growth in 36 of the 49 counties was less than the growth for the state. Fourteen of the counties recorded population losses over that period. Those counties include Campbell, Carter, Claiborne, Clay, Grundy, Hancock, Hawkins, Jackson, Johnson, Morgan, Picket, Roane, Scott, and Unicoi.

Table 3.16-7. Population Change in the Alternative B Socioeconomic Study Area

Geography	2010 Census*	2020 Census**	% Change
Tennessee	*6,346,105*	*6,910,840*	*8.9*
Anderson County	75,129	77,123	2.7
Bledsoe County	12,876	14,913	15.8
Blount County	123,010	135,280	10.0

Geography	2010 Census*	2020 Census**	% Change
Bradley County	98,963	108,620	9.8
Campbell County	40,716	39,272	-3.5
Cannon County	13,801	14,506	5.1
Carter County	57,424	56,356	-1.9
Claiborne County	32,213	32,043	-0.5
Clay County	7,861	7,581	-3.6
Cocke County	35,662	35,999	0.9
Cumberland County	56,053	61,145	9.1
DeKalb County	18,723	20,080	7.2
Fentress County	17,959	18,489	3.0
Grainger County	22,657	23,527	3.8
Greene County	68,831	70,152	1.9
Grundy County	13,703	13,529	-1.3
Hamblen County	62,544	64,499	3.1
Hamilton County	336,463	366,207	8.8
Hancock County	6,819	6,662	-2.3
Hawkins County	56,833	56,721	-0.2
Jackson County	11,638	11,617	-0.2
Jefferson County	51,407	54,683	6.4
Johnson County	18,244	17,948	-1.6
Knox County	432,226	478,971	10.8
Loudon County	48,556	54,886	13.0
McMinn County	22,248	25,216	13.3
Macon County	28,237	28,837	2.1
Marion County	80,956	100,974	24.7
Meigs County	11,753	12,758	8.6
Monroe County	44,519	46,250	3.9
Morgan County	21,987	21,035	-4.3
Overton County	22,083	22,511	1.9
Pickett County	5,077	5,001	-1.5
Polk County	16,825	17,544	4.3
Putnam County	72,321	79,854	10.4
Rhea County	31,809	32,870	3.3
Roane County	54,181	53,404	-1.4
Scott County	22,228	21,850	-1.7
Sequatchie County	14,112	15,826	12.1
Sevier County	89,889	98,380	9.4
Smith County	19,166	19,904	3.9
Sullivan County	156,823	158,163	0.9
Trousdale County	7,870	11,615	47.6

Geography	2010 Census*	2020 Census**	% Change
Unicoi County	18,313	17,928	-2.1
Union County	19,109	19,802	3.6
Van Buren County	5,548	6,168	11.2
Warren County	39,839	40,953	2.8
Washington County	122,979	133,001	8.1
White County	25,841	27,351	5.8

Sources: USCB 2010 * Table ID: P1; USCB 2020 ** Table ID: P1

Other demographic characteristics of East TN, as compared with the state, are summarized in Table 3.16-8 based on the 2021 ACS. In all but four (Knox, Macon, Putnam, and Trousdale Counties) of the 49 counties, the populations were more aged than the state. Except in six counties (Anderson, Blount, Hamilton, Knox, Roane, and Washington counties), there were lower percentages of people who were high school graduates or higher than across the state.

According to the ACS, the counties in East TN generally had lower percentages of renter-occupied housing units than across the state (ACS 2021). In approximately one-third of the counties, housing units were newer than across the state, while the other two-thirds were older.

Table 3.16-8. Demographic Characteristics of the Alternative B Socioeconomic Study Area

Geography	% of Population 65 Years and Over^	Median Age**,>	% High School or Higher*,**	% of Occupied Housing Units, Renter Occupied++	Median Year Housing Units Built**,##
Tennessee	*16.3*	*38.8*	*88.8*	*33.1*	*1985*
Anderson County	20.0	42.8	89.9	31.3	1975
Bledsoe County	18.1	43.8	76.6	19.3	1991
Blount County	20.3	43.8	89.8	23.7	1988
Bradley County	16.8	39.8	87.4	33.0	1986
Campbell County	20.5	44.1	80.1	33.6	1983
Cannon County	17.5	40.8	84.5	22.4	1988
Carter County	21.7	45.7	86.8	27.9	1978
Claiborne County	19.4	42.5	82.0	28.4	1985
Clay County	24.1	46.7	82.1	23.7	1980
Cocke County	21.3	45.3	83.8	29.5	1984
Cumberland County	30.9	52.2	88.6	21.4	1993
DeKalb County	18.6	42.6	80.5	30.8	1981
Fentress County	21.6	45.7	80.3	24.6	1989
Grainger County	20.6	45.6	79.9	23.2	1990
Greene County	21.6	44.9	85.1	24.0	1982
Grundy County	20.5	43.3	78.2	18.9	1984
Hamblen County	18.1	40.9	84.8	32.9	1979

Geography	% of Population 65 Years and Over^	Median Age**,>	% High School or Higher*,**	% of Occupied Housing Units, Renter Occupied++	Median Year Housing Units Built**,##
Hamilton County	17.5	39.6	90.5	36.6	1979
Hancock County	21.4	44.2	81.3	21.1	1984
Hawkins County	21.1	45.4	86.6	23.0	1985
Jackson County	22.3	48.1	81.4	18.0	1986
Jefferson County	19.6	44.1	86.4	25.0	1988
Johnson County	22.8	46	81.0	21.3	1982
Knox County	15.8	37.5	92.1	35.0	1983
Loudon County	26.4	47.9	87.3	19.0	1990
Macon County	15.4	38.6	79.8	27.6	1990
Marion County	19.6	43.4	81.5	23.2	1985
McMinn County	19.4	42.1	86.0	25.9	1984
Meigs County	21.4	45.6	83.2	21.6	1993
Monroe County	21.1	44.2	84.7	28.0	1990
Morgan County	18.0	41.8	81.2	18.5	1984
Overton County	20.0	42.9	81.4	20.7	1982
Pickett County	27.3	50.5	79.2	20.4	1991
Polk County	20.7	46.1	82.3	23.1	1987
Putnam County	16.4	36.4	88.9	38.2	1988
Rhea County	18.3	40.3	83.1	26.7	1988
Roane County	22.4	47.1	90.7	24.6	1978
Scott County	16.7	39.5	79.9	27.1	1989
Sequatchie County	20.8	44.6	82.1	22.6	1996
Sevier County	19.5	43.2	86.6	28.0	1994
Smith County	16.4	40.5	87.2	23.4	1983
Sullivan County	21.7	45.2	88.3	28.2	1975
Trousdale County	12.2	33.1	85.8	20.5	1984
Unicoi County	23.6	47.3	86.2	25.9	1977
Union County	17.9	42.5	79.2	22.2	1992
Van Buren County	23.3	47.2	80.9	22.7	1983
Warren County	17.5	40.4	83.2	29.7	1977
Washington County	18.2	40.2	90.6	35.2	1985
White County	20.2	43.2	81.5	22.9	1986

*Of Population over 25 Years and includes High School Equivalency
**For the PSA regions, the “medians” given are averages of the medians across the associated counties.
Source: ACS 2021 - ^ Table ID: B01001 > Table ID: B01002 ** Table ID: B15003 ++ Table ID: B25003 ## Table ID: B25035

3.16.1.3.1.2 Employment and Income

Table 3.16-9 summarizes ACS data on employment and income for the Alternative B Socioeconomic Study Area (ACS 2021). All but three of the 49 counties had lower percentages of people in the labor force and over half had higher rates of unemployment than across the state. Based on the ACS, per capita income was lower than that of the state in 44 of the 49 counties (ACS 2021).

Table 3.16-9. Employment and Income Characteristics of the Alternative B Socioeconomic Study Area

Geography	% of 16+ Civ. Pop. In Labor Force^^	Unemployment. Rate^^	% Employed in Educ. Services., Healthcare, and Social Services*	% Employed in Manufacturing*	Per Capita Income>>
Tennessee, *County*	61.4	5.3	22.7	13.0	$32,908
Anderson	55.6	5.2	22.4	11.3	$30,544
Bledsoe	47.7	7.4	14.1	14.4	$24,101
Blount	60.3	4.5	23.1	13.8	$33,726
Bradley	61.4	5.7	22.0	19.8	$28,531
Campbell	52.7	10.5	20.9	16.5	$24,918
Cannon	55.7	3.5	21.8	19.5	$28,160
Carter County	51.8	7.0	28.0	12.1	$25,267
Claiborne	52.8	6.6	27.5	21.0	$24,204
Clay	44.7	4.1	25.8	17.9	$21,602
Cocke	52.9	7.8	19.4	20.9	$23,517
Cumberland	46.3	6.0	17.8	16.0	$28,255
DeKalb	52.8	4.7	18.8	25.4	$25,625
Fentress	50.3	7.3	26.1	14.4	$21,889
Grainger	52.9	5.9	20.1	18.8	$24,661
Greene	52.7	5.4	24.1	23.1	$26,394
Grundy	50.8	7.8	24.6	23.6	$21,848
Hamblen	57.3	7.3	19.7	23.7	$25,056
Hamilton	63.3	4.6	22.5	13.2	$36,964
Hancock	45.6	8.8	36.3	21.5	$26,925
Hawkins	50.6	8.5	24.0	23.5	$26,032
Jackson	51.1	8.2	20.7	20.3	$22,872
Jefferson	57.0	6.0	19.8	12.1	$27,968
Johnson	41.7	4.6	18.7	18.0	$22,786
Knox	64.2	4.1	25.0	8.0	$36,450
Loudon	55.8	3.3	16.6	17.1	$36,308
Macon	60.3	5.1	17.2	18.7	$22,594
Marion	55.2	5.5	17.5	20.1	$27,441
McMinn	54.7	5.5	20.0	25.7	$27,404

Geography	% of 16+ Civ. Pop. In Labor Force^^	Unemployment. Rate^^	% Employed in Educ. Services., Healthcare, and Social Services*	% Employed in Manufacturing*	Per Capita Income>>
Meigs	51.4	8.6	17.1	23.4	$25,670
Monroe	51.0	6.2	20.9	27.3	$24,921
Morgan	44.1	8.6	21.3	11.1	$23,436
Overton	54.5	3.5	19.6	19.0	$24,741
Pickett	43.3	4.9	23.4	21.1	$26,486
Polk	55.2	6.6	23.6	20.8	$28,838
Putnam	60.1	4.9	22.6	14.5	$26,602
Rhea	53.3	8.4	20.3	19.9	$24,815
Roane	54.6	5.3	23.7	10.1	$34,366
Scott	51.9	9.9	26.3	21.0	$20,103
Sequatchie	51.3	4.5	19.1	15.7	$24,072
Sevier	59.9	4.4	13.6	7.7	$28,427
Smith	59.9	4.5	19.7	17.6	$28,507
Sullivan	55.2	6.7	23.2	15.0	$31,300
Trousdale	53.6	3.0	8.4	9.1	$22,234
Unicoi	54.1	5.2	24.1	19.8	$25,670
Union	54.3	5.8	20.5	13.1	$26,390
Van Buren	50.7	3.9	17.7	23.7	$22,144
Warren	57.8	3.5	20.1	22.3	$24,932
Washington	58.9	5.1	29.3	12.1	$32,225
White	52.7	5.8	18.9	23.8	$24,100

Source: ACS 2021 - ^^ Table ID; B23025 * Table ID: C24030 >> Table ID: B19301

Pertinent civilian employment characteristics for East TN are also shown on Table 3.16-9. Manufacturing, education services, and healthcare generally lead the industries for employment. Though not shown on Table 3.16-9, construction also employs larger percentages of people in East TN with construction accounting for generally 5 to 15 percent of employment in most counties.

3.16.2 Environmental Consequences

3.16.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain the KIF coal units as part of TVA’s generation portfolio. TVA would implement all the planned actions related to the current and future management and storage of CCRs at the coal plant, which have either been reviewed or would be in subsequent NEPA analysis. Employment at the Kingston Reservation would continue to be an option in the labor market area, and contracts associated with the Kingston Reservation operations and any plant modifications and indirect and induced economic activities would continue to support the regional economy. However, the repairs and maintenance necessary to maintain reliability, while providing local employment opportunities, may have a minor adverse effect on ratepayers.

3.16.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of Kingston Reservation Plant

The coal facilities at the Kingston Reservation would be retired by the end of 2027 and would transition to the D4 process detailed in Table 2.1-1. While the demolition of the Kingston coal reservation would result in job loss for approximately 200 area residents employed at the KIF Plant, the D4 activities would partially offset employment loss in Roane County for the approximately three- to five-year period. D4 activities would also create competition for other employment; during peak D4 activity, a maximum of 300 workers would be employed on-site. Routine plant deliveries would also be discontinued with retirement of the facility. Long-term, potential exists for permanent relocation of workers, potentially affecting familial and community relations.

All previously approved CCR projects would continue to be implemented. These CCR projects would implement specific actions related to wastewater treatment and the management and disposal of CCR, primarily solid wastes, at the Kingston Reservation. CCR management projects have been previously analyzed in other NEPA documents or are future projects, which are either underway or would commence within the next five years.

TVA tax equivalent payments to TN would not change with Kingston coal facility retirement and D4 activities. As TVA would maintain ownership of the Kingston Reservation property for the foreseeable future, allocations to Roane County, per T.C.A. § 67-9-101, would not decrease as a result of plant closures. However, TVA, at its sole discretion, determines which counties are impacted the most significantly by the project in communication with the state. TN would then pay the impact payments out of a portion of the tax equivalent payments that TVA makes to the state. Thus, there could be a minor economic benefit to Roane County as a result of the Kingston coal facility retirement.

With the retirement of the coal units at the Kingston Reservation, contracts associated with coal operations and indirect and induced economic activities would also be reduced, canceled, or ceased in a phased process. The people currently employed by the Kingston Reservation may become temporarily unemployed with the Kingston Reservation coal facility retirement. While this decrease in employment represents a small percentage of total employment as estimated for 2022 in Roane County (USBLS 2023), minor direct adverse economic effects to the area would result. TVA would continue to identify employment opportunities across TVA's region for all interested employees. Given the prominence of several other employment options in the Kingston Reservation vicinity, including manufacturing, educational services, health care, and construction, current Kingston Reservation employees may potentially find alternative employment in these other industries. Kingston employees and any associated family members may also temporarily relocate for work, and these changes may affect familial and community relations in the Kingston Reservation labor market area.

Mining of coal and limestone for use at the Kingston Reservation and the transportation of these products to the Kingston Reservation provides additional regional employment. The retirement of the Kingston Reservation coal facilities may result in indirect employment effects to the nearby mining, trucking, and barge industries. Unless the coal and limestone mines find alternative markets for the tonnage currently purchased by the Kingston Reservation, minor indirect adverse economic effects to the affected counties and the region from which these Kingston Reservation products are purchased would occur from closure of this facility. Due to potential unemployment, reemployment in different industries, and relocations, these changes may also affect familial and community relations in the region from which these Kingston Reservation products are purchased.

Construction of projects in the vicinity of the Kingston Reservation plant, such as the CCR management activities, could create short-term, beneficial cumulative effects to socioeconomics in the area.

3.16.2.2.1 Environmental Justice Considerations

Due to the loss of direct and indirect employment associated with Kingston Reservation (*i.e.*, 200 employees employed at the plant plus indirect job losses), competition for employment in other fields in the labor market area, such as manufacturing, educational services, health care, and construction, may increase. Such trends could lead EJ populations and other populations to relocate for work or follow recent depopulation trends, as seen in Roane County where the Kingston Reservation is located, and permanently relocate to different locations in TN or beyond. These changes may affect familial and community relations among EJ and other populations in the Kingston Reservation labor market area. These effects have the potential to be disproportionate and adverse on EJ populations that already face socioeconomic stressors, particularly for those populations in Morgan County CT 1104 BG 1 and Roane County block groups CT 305 BG 3 and CT 308.01 BG 1, where unemployment is already elevated. These effects could be offset due to the benefit of temporary employment increases, anticipated to be a maximum of 300 workers on-site, during the three to five-year period of D4 activities, but these jobs are not guaranteed to go to those that lost their jobs in the community due to KIFs retirement.

3.16.2.3 Alternative A

3.16.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Under Alternative A, the Kingston Reservation coal facilities would be retired and demolished, as described in Section 3.16.2.2. The existing switchyard at the Kingston Reservation would be maintained for use in future operations associated with the proposed CC/Aero CT facility. Employment at the plant would be reduced. All previously studied CCR projects would continue to be implemented. The proposed CC/Aero CT facility would be constructed on the Kingston Reservation in Roane County.

While Kingston Reservation coal closures would decrease employment in the Kingston labor market area for the long-term for approximately 200 area residents employed at the KIF Plant, construction of the CC/Aero CT facility associated with Alternative A would temporarily increase employment in the area. Construction of the CC/Aero CT Plant would take approximately three years and would provide up to 300 jobs at peak. The number of employees for the operation of the new CC/Aero CT Plant would be reduced from the number of employees required to operate the KIF. However, these temporary and permanent employment opportunities would help partially offset some employment losses associated with KIF coal facility retirement. Construction of projects in the vicinity of the proposed CC/Aero CT facility, such as the CCR management activities, could create short-term, beneficial cumulative effects to socioeconomics in the area.

3.16.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located within the Kingston Reservation. Therefore, the effects for socioeconomics are as described for the Kingston labor market area in Section 3.16.2.3.1. It is not expected that the operation of the solar facility would create significant additional employment.

3.16.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The proposed 100-MW battery site and new transmission corridor would be located within the Kingston Reservation. Therefore, the effects for socioeconomics are as described for the Kingston labor market area in Section 3.16.2.3.1. It is not expected that the operation of the BESS would create significant additional employment.

3.16.2.3.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission connections to the proposed CC/Aero CT facilities and switchyard, and new permanent access roads to support upgrades to the existing transmission lines would be needed as a result. Therefore, the environmental consequences for on-site transmission upgrades on socioeconomics are the same as those described for the Kingston labor market area in Section 3.16.2.2. It is not expected that the on-site transmission updates under Alternative A would create significant additional employment.

3.16.2.3.5 Off-site Transmission Upgrades

The off-site transmission upgrades proposed for the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381) and Western Transmission Corridor (L5383) corridors under Alternative A would require construction of new permanent access roads to support upgrades to the existing transmission lines. The proposed upgrade activities and construction of new access roads are expected to result in a minor temporary increase in employment. While the Kingston Reservation coal closures would decrease employment in the Kingston Reservation labor market area for the long-term for approximately 200 area residents employed at the KIF Plant, activities associated with the off-site transmission upgrades under Alternative A could result in a minor temporary increase in employment in the area.

3.16.2.3.6 Construction and Operations of Natural Gas Pipeline

ETNG's Resource Report 5 (ETNG 2023f) was filed with FERC in July 2023 (ETNG 2023a). This FEIS has been updated based on ETNG's application and resource reports (ETNG 2023a-m) and subsequent filings by ETNG with FERC from October through December 2023 (ETNG 2023n-q). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the socioeconomic-related findings in ETNG's Resource Report 5.

The new CC/Aero CT facility would require construction of approximately 122 miles of new natural gas pipeline (up to 30-inch-diameter) and associated gas system infrastructure in Fentress, Jackson, Morgan, Overton, Putnam, Roane, Smith, and Trousdale counties. The pipeline would be built largely within or adjacent to existing pipeline ROW. Due to proximity to Cumberland and Sumner counties, TVA's Expanded Pipeline Socioeconomic Study Area also includes those two counties.

While the Kingston Reservation coal closures would decrease employment in the Kingston Reservation labor market area for the long-term for approximately 200 area residents employed at the plant, construction of the natural gas pipeline associated with Alternative A would partially offset employment loss in the area temporarily. Ongoing employment in relation to operation of the gas system infrastructure would allow for a slight increase in employment options in TVA's Expanded Pipeline Socioeconomic Study Area. These temporary and permanent employment increases would help offset some employment losses associated with the Kingston Reservation coal facility retirement.

According to the ETNG Resource Report 5, Socioeconomics (ETNG 2023f):

> Construction will temporarily increase the population in the Project Area to a very limited degree. Temporary workers for the construction of the Project are expected to total 2,505. It is estimated that the workers will be hired over various stages of construction and the timing of their hiring will be at the discretion of East Tennessee contractors. East Tennessee contractors will attempt to hire local and regional construction workers to the extent feasible, provided these workers possess the necessary specialized skills and experience for meter station, pressure regulation station, and pipeline construction. However, as described above, to the extent the local workforce does not possess the skills required, specialized workers will be obtained from outside the local areas. [ETNG] anticipates that approximately 30 to 50 percent of the workforce would consist of the hiring of local labor, which will have a net positive impact on employment, wages, and household spending in the area.
>
> It is also estimated that approximately 521 workers will be indirectly employed by [ETNG] contractors and vendors across the state (Howard H. Baker Jr. Center for Public Policy 2022). The Project directly creates jobs and incomes and purchases inputs and supplies from vendors, indirectly supporting additional job, income, and output creation. The indirect employment of 521 workers is estimated to begin approximately during the duration of the 17-month construction period.
>
> Indirect jobs may start as temporary and become permanent.
>
> Once the pipelines and the Hartsville Compressor Station are completed, the workforce numbers will taper off near the completion of the construction period. [ETNG] anticipates its contractors will hire a substantial number of specialized construction workers with the requisite experience for the installation of natural gas facilities. These hires will include surveyors, welders, equipment operators, and general laborers. It is anticipated that approximately 30 to 50 percent of the construction workers are expected to be local hires. The local supply of construction workers needed for the Project is expected to be derived from workers employed in the construction industry in the affected counties of Tennessee. Construction personnel that may be hired from outside the Project Area include supervisory personnel and inspectors. These individuals will temporarily relocate to the Project vicinity, if necessary. The number of personnel required at each proposed activity location will vary greatly, depending on the activity. If a larger than anticipated percentage of non-local workers is required to meet peak workforce requirements, sufficient workers should be available in the labor pool in the surrounding counties and states.
>
> Even if the entire construction workforce for the Project comes from outside the Project counties, this would represent minor, short-term increases in the population of the local communities surrounding the Project areas. [ETNG] anticipates hiring one additional permanent position employees; therefore, no long-term or permanent impacts to population are expected.

Further, ETNG states within this same Resource Report (ENTG 2023f):

> [ETNG] does not anticipate any need to acquire or relocate businesses or residences. Most adjacent and nearby properties are designated as largely deciduous forests, open land, or agricultural land, and contain few residences. Construction near residential areas will be conducted in a manner to ensure that

> all construction activities minimize adverse impacts on adjacent residences and that clean-up is prompt and thorough. East Tennessee does not anticipate long-term relocations of residents, but in the event, construction results in the need to temporarily relocate a landowner, [ETNG] will offer temporary housing on a case-by-case basis. If any businesses are temporarily impacted by construction of the Project, [ETNG] will work with business owners to remediate the impacts and compensate appropriately.

Because long-term relocation of construction personnel is not anticipated, ETNG indicates that housing effects would be related to area hotels and short-term rentals in study area communities. These effects would result in minor short-term positive effects on the rental industry through increased demand. Resource Report 5, Socioeconomics states "[ETNG] does not anticipate significant or long-term impacts to special populations regarding housing during construction" (ETNG 2023f).

ETNG anticipates effects to socioeconomics related to three other areas of consideration: economy and tax revenues, public services, and transportation and traffic (ETNG 2023f). Additional money would be spent locally on purchase or rental of equipment, supplies, and materials. Construction would also result in increased state and local sales tax revenues associated with these materials as well as for services. ETNG indicates that the "Project would generate approximately $11.8 million in property taxes over its useful life span." ETNG does not anticipate significant or long-term impacts to special populations regarding the economy and tax revenues during construction (ETNG 2023f).

Effects to public services are anticipated to be primarily linked to transportation and traffic effects; "potential temporary impacts on services may include traffic-related incidents, medical emergencies, or other incidents" (ETNG 2023f). Construction of the project would result in minor, short-term effects on transportation systems in the associated communities due to road crossings, equipment and material deliveries, and construction workers commuting. ETNG does not anticipate significant or long-term impacts to regarding public services or transportation and traffic during construction (ETNG 2023f).

3.16.2.3.7 Summary of Alternative A

TVA Proposed Actions

Construction and operation of the CC/Aero CT facility, 3- to 4-MW Solar Facility, 100-MW BESS, and on-site transmission upgrades (all on the Kingston Reservation) and off-site transmission upgrades would primarily result in effects to socioeconomics through short-term employment in TVA's Expanded Pipeline Socioeconomic study area, which would in turn, result in short-term positive effects for local economies and tax revenues. Construction activities, however, would create negligible, short-term effects on housing, public services, and transportation systems in the associated communities. Cumulative effects to housing, public services and transportation systems would be negligible as well as a result of the construction of TVA actions associated with Alternative A.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Construction and operation of the proposed natural gas pipeline and associated structures would primarily result in effects to socioeconomics through short-term employment in the ETNG Pipeline Construction ROW study area, which would in turn, result in short-term positive effects for local economies and tax revenues. Construction activities, however, would create minor, short-term effects on transportation systems in the associated communities. No residential or business displacements are anticipated with construction of the natural gas pipeline.

3.16.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

Approximately half (27 of 54) of the census block groups in the natural gas pipeline EJ study area have been identified as EJ-qualifying populations while approximately one fourth (eight of 34) of the census block groups in the off-site transmission upgrades corridors EJ study area have been identified as EJ-qualifying populations. All of these block groups are located within their respective socioeconomics study areas as well. It is estimated that there would be positive economic and employment impact during construction and a minor, negative impact during operation due to the reduced labor required under Alternative A. Economic impacts would have a disproportionate and adverse impact on affected EJ populations because these communities often experience compounding effects and social disadvantages compared to non-EJ populations. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

No businesses or residences are anticipated to be relocated for construction of the natural gas pipeline. However, while not anticipated to have significant disproportionate and adverse impacts on EJ-qualifying populations, there may be negative effects to current and prospective renters and guests of rental homes and establishments through reduced rental inventory and/or increased prices during the period of construction associated with Alternative A. This has the potential to result in disproportionate and adverse effects for EJ-qualifying low-income populations, especially in EJ-qualifying census block groups with higher percentages of renter-occupied housing units than the associated county. Except for Jackson and Roane counties, all counties in TVA's Expanded EJ Study Area for Alternative A have EJ-qualifying block groups demonstrating higher percentages of renter-occupied housing units than that of the respective county.

3.16.2.4 Alternative B

3.16.2.4.1 Construction and Operation of Solar and Storage Facilities

TVA anticipates that a large portion of the solar facilities proposed under Alternative B would be located within portions of the East TN region. While specific sites have not yet been determined for evaluation under this alternative, typical socioeconomic effects associated with solar facilities include temporary beneficial effects to local population numbers; temporary and permanent beneficial effects to local employment; temporary indirect beneficial effects to the local economy; and long-term beneficial effects to the local tax base. Cumulative effects would also occur if Alternative B was combined with the 10,000 MW expansion of solar targeted by TVA, as typical temporary benefits of construction employment would increase. Based on a review of employment history associated with previous solar facilities, temporary construction employment is estimated to range from 800 to 2,000 while long-term employment associated with daily operations and/or maintenance is estimated to be up to 15 full time employees.

3.16.2.4.2 Transmission and Other Components

Construction of the on-site transmission upgrades associated with the proposed solar and storage facilities under Alternative B are anticipated to result in a slight temporary increase in employment in the area and negligible beneficial effects.

Table 3.16-10 provides a brief summary of the socioeconomic effects anticipated for the project by alternative.

3.16.2.4.3 Environmental Justice Considerations

Based on other solar developments, socioeconomic-related effects that could occur as a result of the proposed solar facilities and transmission line activities are anticipated to include temporary beneficial effects to local population numbers; temporary and permanent beneficial effects to local employment, estimates suggest temporary employment could range from 800 to 2,000 and permanent employment is estimated to be up to 15 full time employees; temporary indirect beneficial effects to the local economy; and long-term beneficial effects to the local tax base. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.16.2.5 Summary of Socioeconomic Effects by Alternative

A summary of the socioeconomic effects of the Action Alternatives is presented in Table 3.16-10 below.

Table 3.16-10. Summary of Socioeconomic Impacts by Alternative[1]

Retirement and Demolition of KIF Plant (All Action Alternatives)	Alternative A – Off-Site Transmission Upgrades and Pipeline	Alternative B
• Direct loss of employment – approximately 200 employees • Temporary employment increases during D4 activities, anticipated to be maximum of 300 workers during the three to five-year period • Competition for employment in other fields in Kingston Reservation labor market area • Possible relocation of workers for work, potentially affecting familial and community relations • Continued CCR projects related to wastewater treatment and the management and disposal of CCR (primarily solid wastes) • Potential for disproportionate and adverse EJ impacts	• No acquisition or relocation of any residences or businesses • Temporary increase in employment during construction of CC/Aero CT Plant and pipeline - 2,500 direct employes - 500 indirect employees - 30 to 50 percent of employment anticipated from within the labor market area • Economic and tax revenue benefits; economic benefits from increases spending during construction and estimated $11.8 million generated in property taxes • Temporary impacts to transportation systems during construction • Potential for disproportionate and adverse EJ impacts; conversely, potential for positive impacts (increased employment) for EJ populations during construction efforts	• Temporary increase in employment during construction – estimated to range from 800 to 2,000 employees • Long-term employment associated with daily operations and/or maintenance of solar facilities – estimated to be up to 15 full time employees • Short-term economic and tax revenue increases with the increased employment • Potential for minor beneficial effects to EJ populations in areas selected for solar facilities

[1]The summary presented in this table provides information for the components of the action alternatives, Alternative A and B. [2]As stated in Section 3.16.2.1, under the No Action Alternative, TVA would continue to operate and maintain the KIF coal units as part of TVA's generation portfolio and would implement actions for CCR compliance at the coal plant, which have either been reviewed or would be in subsequent NEPA analysis. As a result, there would be minimal impact on socioeconomics of the area under the No Action Alternative. However, the repairs and maintenance necessary to maintain reliability, while providing local employment opportunities, may have a minor adverse effect on ratepayers.

3.17 Noise

Noise is unwanted or unwelcome sound that is 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 and 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.

Sound is measured in units of decibels (dB) on a logarithmic scale. Because not all noise frequencies are perceptible to the human ear, A-scale weighting decibels (dBA), which filter out sound in frequencies above and below human hearing, are typically used in noise assessments. A noise level change of three dBA or less is barely perceptible to average human hearing, while a five 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 perceived to be four times as loud and may represent a “dramatic change” in loudness.

Frequency is measured in Hertz (Hz), which is the number of cycles per second. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the low and high frequencies. As such, the A-weighted scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighted scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighted scale has been applied is expressed in dBA.

Sound in the environment is constantly fluctuating, for example, when a car drives by, a dog barks, or a plane passes overhead. Although an instantaneous sound level measured in dBA may indicate the level of noise experienced by an observer at that point in time, environmental noise levels vary continuously. Most ambient environmental noise includes a mixture of noise from some identifiable sources plus a relatively steady background noise where no particular source is identifiable. A single descriptor called the equivalent sound level (L_{eq}) is used to describe sound that is constant or changing in level. The L_{eq} is the average sound level for a specific time period.

The day-night sound level (Ldn) is the 24-hour equivalent sound level, which incorporates 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 sounds that occur at night. Typical background day-night noise levels for rural areas are anticipated to range between an Ldn of 35 and 50 dB, whereas higher-density residential and urban areas background noise levels range from 43 dB to 72 dB (USEPA 1974). Background noise levels greater than 65 dBA can interfere with normal conversation, watching television, using a telephone, listening to the radio, and sleeping. Common indoor and outdoor noise levels from various noise sources are listed in Table 3.17-1.

Table 3.17-1. Common Indoor and Outdoor Noise Levels

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

Source: AASHTO 1993

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978, 42 USC 4901-4918), delegates authority to the states to regulate environmental noise and directs government agencies to comply with local community noise statutes and regulations. Many local noise ordinances are qualitative, such as prohibiting excessive noise or noise that results in a public nuisance. Because of the subjective nature of such ordinances, they are often difficult to enforce. Some local communities have noise ordinances that set allowable maximum noise levels for various activities.

The USEPA 1974 guidelines recommend that Ldn not exceed 55 dBA for outdoor residential areas. The U.S. Department of Housing and Urban Development (HUD) considers an Ldn of 65 dBA or less to be compatible with residential areas (HUD 1985). For traffic-related noise, the Federal Highway Administration (FHWA) has set a threshold of 67 dBA as the sound level at which noise abatement should be considered. Transportation noise primarily includes noise from truck traffic. Three primary factors influence highway noise generation: traffic volume, traffic speed, and vehicle type. Generally, heavier traffic volumes, higher speeds, and greater numbers of trucks increase the sound level of highway traffic noise. Other factors that affect the sound level of traffic noise include a change in engine speed and power, such as at traffic lights, hills, and intersecting roads and pavement type. Highway 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 would result in a 3 dBA increase in noise levels, which in and of itself would not normally be a perceivable noise increase.

FERC's sound level requirement states that the sound attributable to a new compressor station not exceed a day-night average Ldn of 55 dBAs at any nearby noise sensitive areas (NSAs), unless such NSAs are established after facility construction. Examples of NSAs include schools, hospitals, and residences. Also, a sound level of 55 dBA (Ldn) can be used as a benchmark sound guideline for assessing the noise impact of temporary or intermittent noise such as site construction noise. No noise standards in the state of TN or relevant counties that are applicable to construction or operation have been identified to date. Smith County, which is crossed by the ETNG Construction ROW in Alternative A, prohibits "obnoxious noise and vibration;" however, no specific criteria were found (ETNG 2022j). The expected level of construction noise is dependent upon the nature and duration of each project. Construction activities for most large-scale projects would be expected to result in increased noise levels as a result of the operation of construction equipment on-site and the movement of construction-related vehicles (i.e., worker trips and material and equipment trips) on the surrounding roadways. Noise levels associated with construction activities would increase ambient noise levels adjacent to the construction site and along roadways used by construction-related vehicles. Construction noise is generally temporary and intermittent in nature, as it generally only occurs on weekdays during daylight hours, which minimizes the impact to sensitive receptors.

3.17.1 Affected Environment

3.17.1.1 Kingston Reservation (No Action and D4 Activities)

The existing KIF plant is situated on approximately 1,250 acres of the 2,254-acre Kingston Reservation, which is located in a rural area on the shores of the Clinch and Emory Rivers. Noise generating sources in the vicinity of the Kingston Reservation include boat traffic, routine vehicle operations at the project site, and the existing coal facility. Sensitive noise receptors in the vicinity of the proposed project area includes mostly residences with some commercial areas. A TVA Wetland Viewing Area is located approximately 1.5 miles north of the Kingston Reservation. Several residences are located approximately 0.5 miles to the south across the Clinch River just north of I-40. The city of Harriman comprises of a mix of commercial, retail, and residential use and is located approximately three miles northwest of the Kingston Reservation. The total number of noise receptors within 0.5 mile of Kingston Reservation and their classifications can be seen in Table 3.17-2 and Figure 3.17-1.

Table 3.17-2. Kingston Reservation Noise Receptors

Noise Receptor Type	Number with 0.5 mile of Kingston Reservation
Cemetery	1
Church	0
Commercial	31
Industrial	0
Recreation	0
Residential	247
Total	**278**

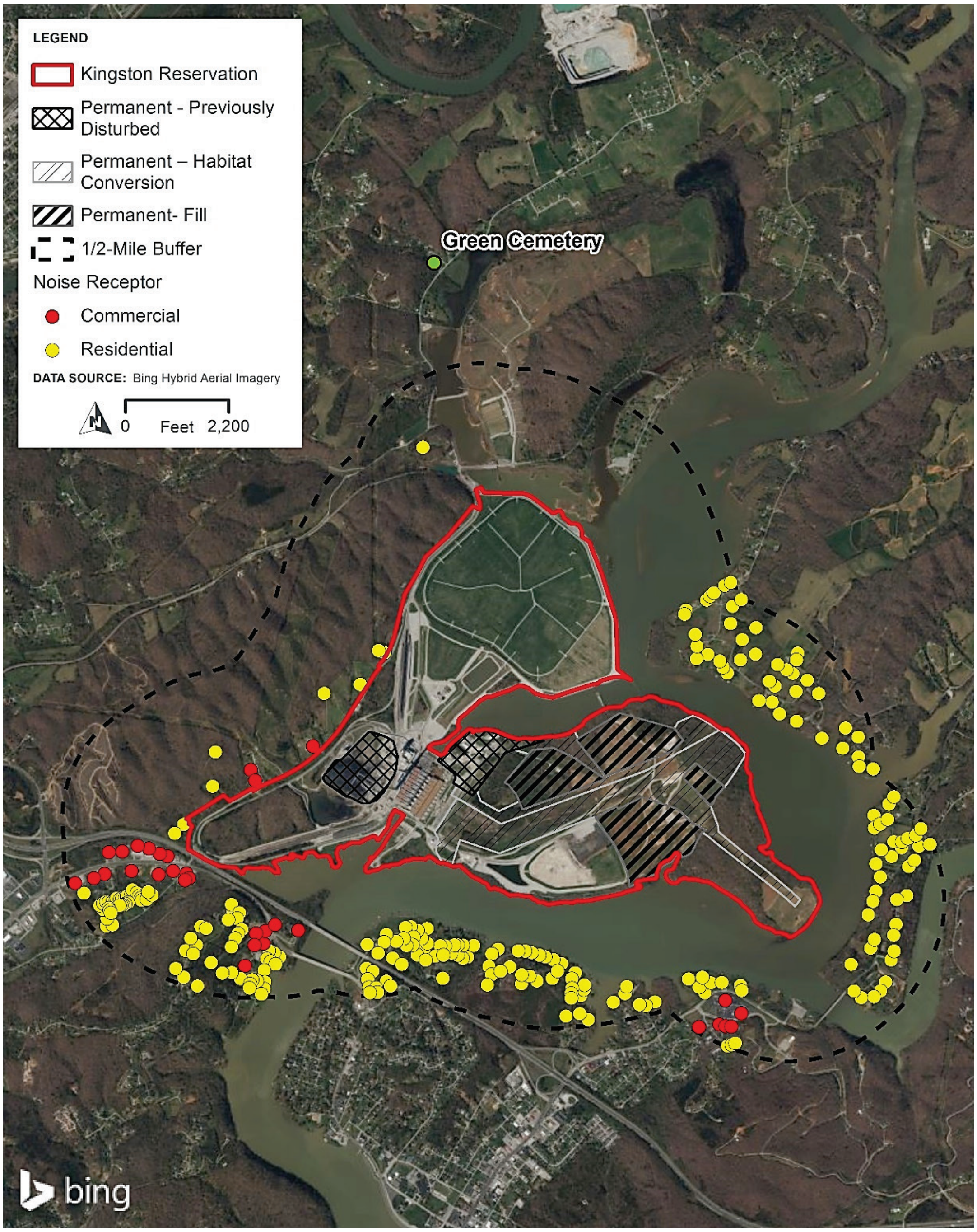

Figure 3.17-1. Noise Receptors within 0.5 Mile of the Kingston Reservation

3.17.1.2 Alternative A

3.17.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The proposed CC/Aero CT Plant site is in an undeveloped portion of the Kingston Reservation comprised of largely disturbed earth and hay/pasture. Burns & McDonnell conducted a preliminary sound study for the proposed CC/Aero CT Plant (Appendix G). The study consists of sound monitoring of the existing environment and predictive sound modeling of the Project to analyze potential off-site sound impacts from its operation, and results are summarized below. The full study is attached in Appendix G.

Noise measurements for the existing ambient and baseline environment were collected in June of 2022 as recommended by American National Standards Institute S1.4. Five continuous long-term sound level meters were set up at the measurement locations, labeled MP01 through MP05, shown in Figure A-1 of Appendix G. The measurement periods for each sound monitor are given in Table 4-1 of Appendix G. The daytime and nighttime average L_{eq} and lowest 1-hour average L_{eq} measured values for each measurement location are provided in Table 3.17-3.

Table 3.17-3. Average Sound Levels

Location[1]	Daytime Average[1] (L_{eq} dBA)	Nighttime Average[2] (L_{eq} dBA)	Lowest 1-Hour (L_{eq} dBA)
MP02	47	44	37
MP03	47	45	41
MP04	53	46	38
MP05	52	48	42

[1]During the measurements, the microphone cable associated with MP01 was chewed through by an animal, and data was only collected from 4:00 p.m. to 10:00 p.m.; therefore, MP01 could not be calibrated at the end of the measurement and is excluded from the analysis.
[2]Daytime is from 7:00 a.m. to 10:00 p.m. Nighttime is from 10:00 p.m. to 7:00 a.m.

The existing KIF coal-fired units were operating at base load throughout the monitoring period. Local roadway traffic and naturally occurring sounds were the largest contributors to measured sound levels at the monitoring locations. The KIF Plant was faintly audible at MP03 and not audible at the other measurement locations during daytime hours when the equipment was being set up and torn down.

The closest sensitive receptors to the proposed site include residential subdivisions, with homes located approximately 0.4 miles south of the proposed plant site (Figure 3.17-1).

3.17.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation; therefore, the affected environment and existing conditions described above for the Kingston Reservation in Section 3.17.1.1 apply to the proposed solar facility.

3.17.1.2.3 Construction and Operation of a 100-MW Battery Storage Facility on Kingston Reservation

The proposed 100-MW battery storage facility would be located on one of three potential sites located on the Kingston Reservation; therefore, the affected environment and existing conditions described above for the Kingston Reservation in Section 3.17.1.1 apply to the proposed 100-MW battery storage facility.

3.17.1.2.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT facilities and switchyard, as well as a new transmission line for the proposed battery facility. Therefore, the affected environment for on-site transmission upgrades and installation is described in Section 3.17.1.1.

3.17.1.2.5 Off-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines, five near the Kingston Reservation (L5108, L5116, L5280, L5302, and L5381) and one in Crossville (L5383). Descriptions of these improvements can be found in Section 2.1.3.5.2. Noise receptors within the vicinity of each transmission line are described below.

3.17.1.2.5.1 Eastern Transmission Corridor

There are a total of 6,481 noise receptors within 0.5 mile of the Eastern Transmission Corridor, most being residences and vacant buildings. The total number of noise receptors within 0.5 mile of the corridor and their classifications can be seen in Table 3.17-4 and Figure 3.17-2a through Figure 3.17-2d.

Table 3.17-4. Noise Receptors Within 0.5 Mile of L5108 of the Eastern Transmission Corridor

Noise Receptor Type	Number within 0.5 Mile of Alternative A – L5108
Business	65
Church	16
Farm Buildings	10
Industrial	70
Residential	4622
School	17
Campground/Sports Field	18
Vacant Buildings (garage/shed)	445
Unknown	1218
Total	**6,481**

Transmission lines L5302, L5280, L5381, and L5116 extend from the Kingston Reservation travelling eastbound and terminate in the city of Oak Ridge. There are a total of 822 noise receptors within 0.5 mile of L5302, L5280, L5381, and L5116 of the Eastern Transmission Corridor, most being residences, industrial buildings, and vacant buildings. The total number of noise receptors within 0.5 mile of the corridor and their classifications can be seen in Table 3.17-5 and Figure 3.17-2a through Figure 3.17-2d.

Table 3.17-5. Noise Receptors Within 0.5 Mile of L5116, L5280, L5302, and L5381 of the Eastern Transmission Corridor

Noise Receptor Type	Number within 0.5 Mile of Alternative A – L5302, L5280, L5381, and L5116
Business	7
Church	7
Farm Buildings	7
Industrial	214
Residential	271
School	0

Noise Receptor Type	Number within 0.5 Mile of Alternative A – L5302, L5280, L5381, and L5116
Campground/Sports Field	0
Vacant Buildings (garage/shed)	195
Unknown	121
Total	**822**

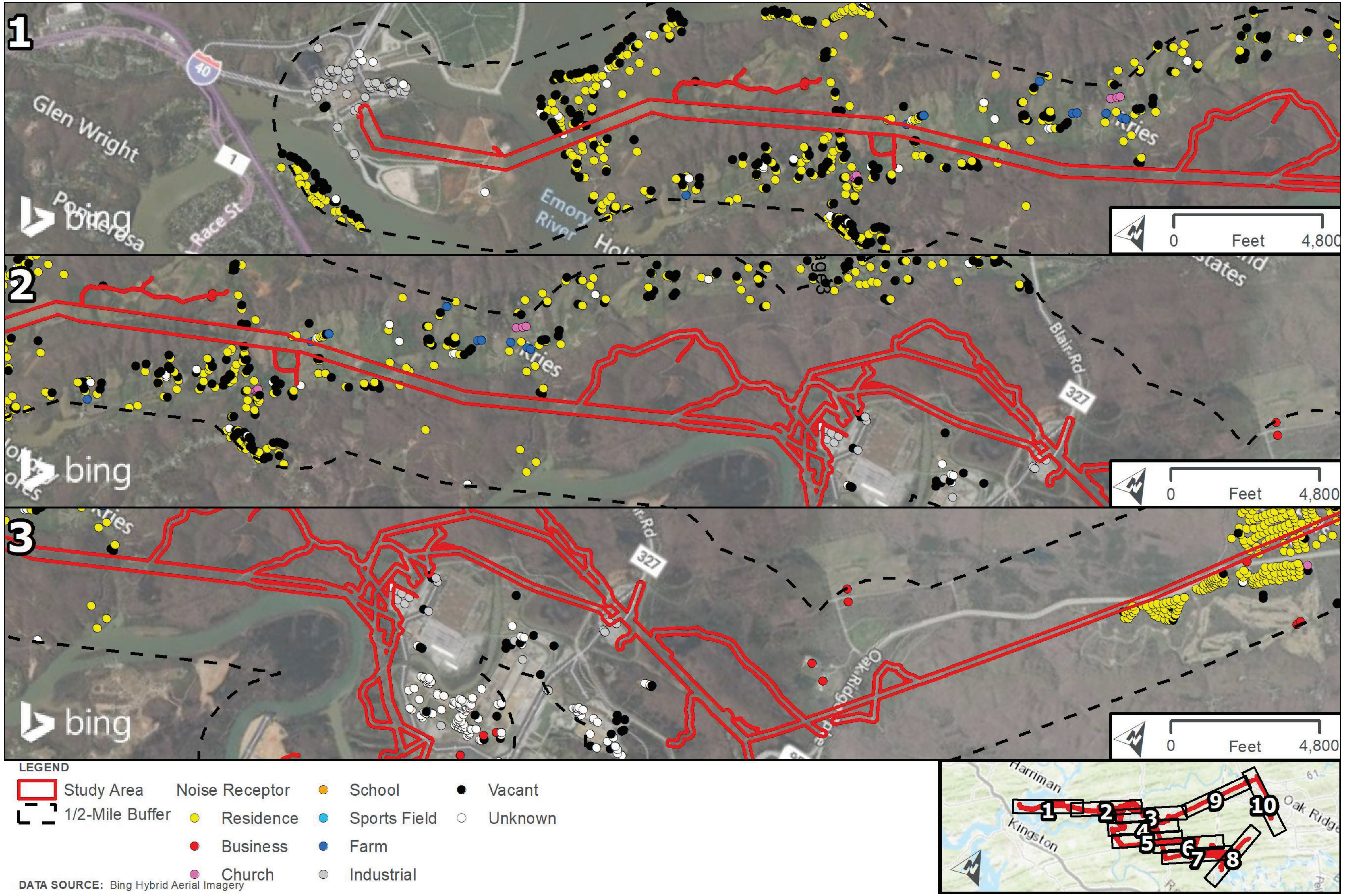

Figure 3.17-2a. Noise Receptors Within 0.5 Mile of the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381)

Figure 3.17-2b. Noise Receptors Within 0.5 Mile of the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381)

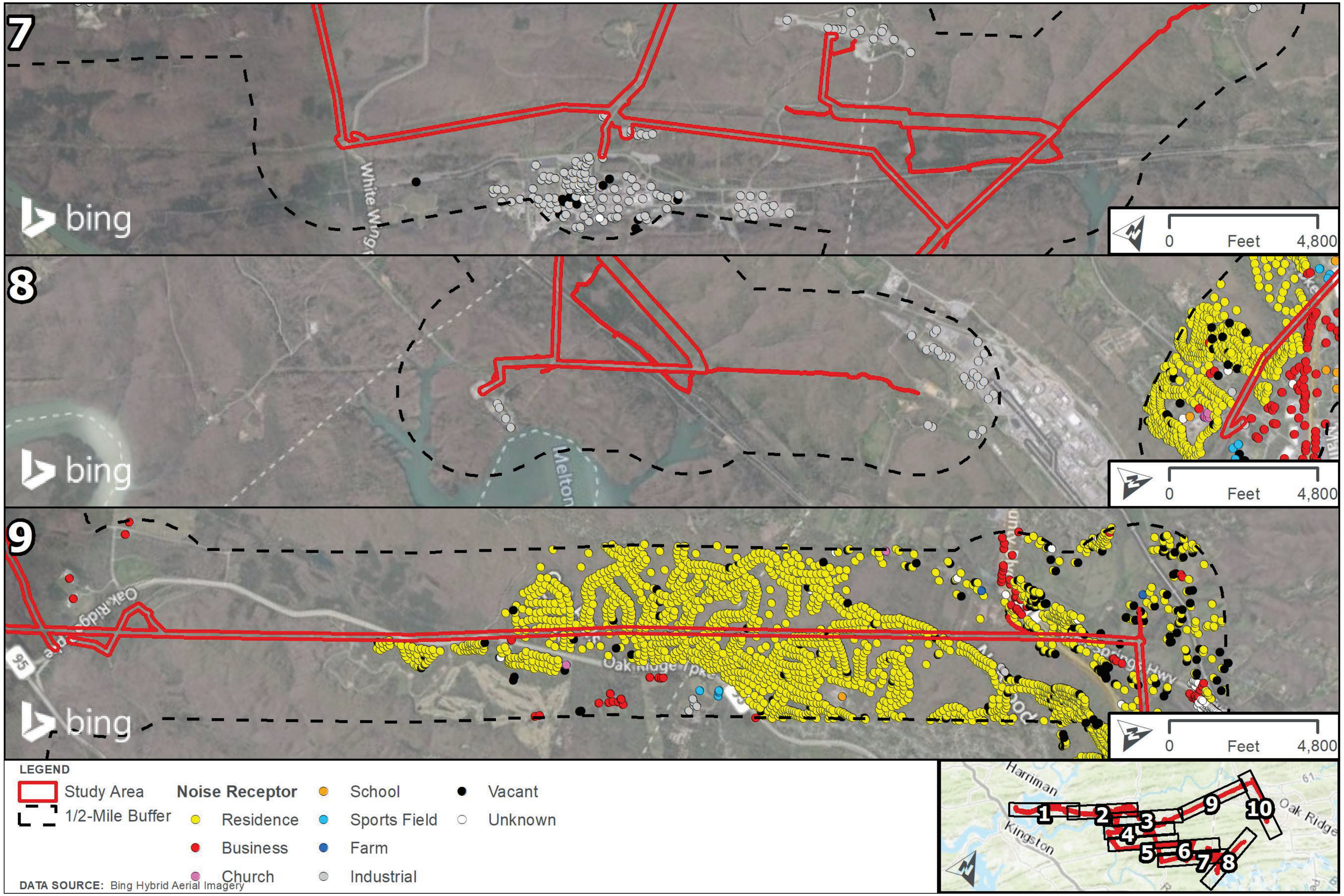

Figure 3.17-2c. Noise Receptors Within 0.5 Mile of the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381)

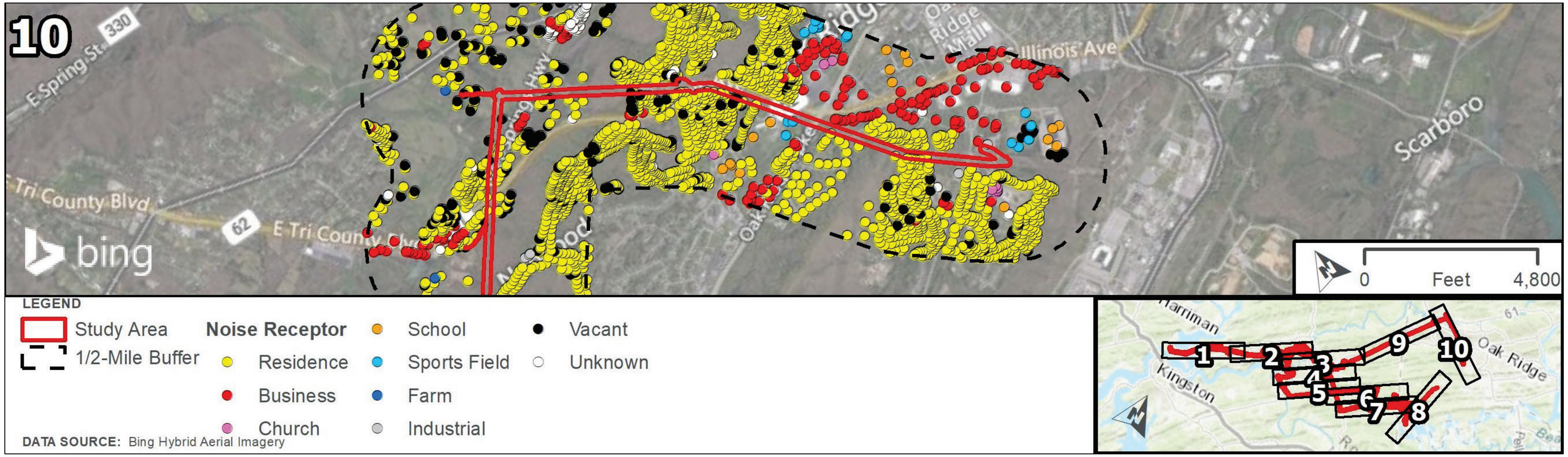

Figure 3.17-2d. Noise Receptors Within 0.5 Mile of the Eastern Transmission Corridor (L5108, L5116, L5280, L5302, and L5381)

3.17.1.2.5.2 Western Transmission Corridor

There are a total of 516 noise receptors within a 0.5 mile of the Western Transmission Corridor, most consisting of residences (63.8 percent), farm buildings (15.1 percent), and vacant buildings (12.8 percent). The total number of noise receptors within 0.5 mile of the corridor and their classifications are presented in Table 3.17-6 and Figure 3.17-3.

Table 3.17-6. Noise Receptors Within 0.5 Mile of L5383 of the Western Transmission Corridor

Noise Receptor Type	Number of Noise Receptors within 0.5 Mile of the Western Transmission Corridor
Business	37
Church	5
Farm Buildings	78
Industrial	1
Residential	329
Vacant Buildings (garage/shed)	66
Total	**516**

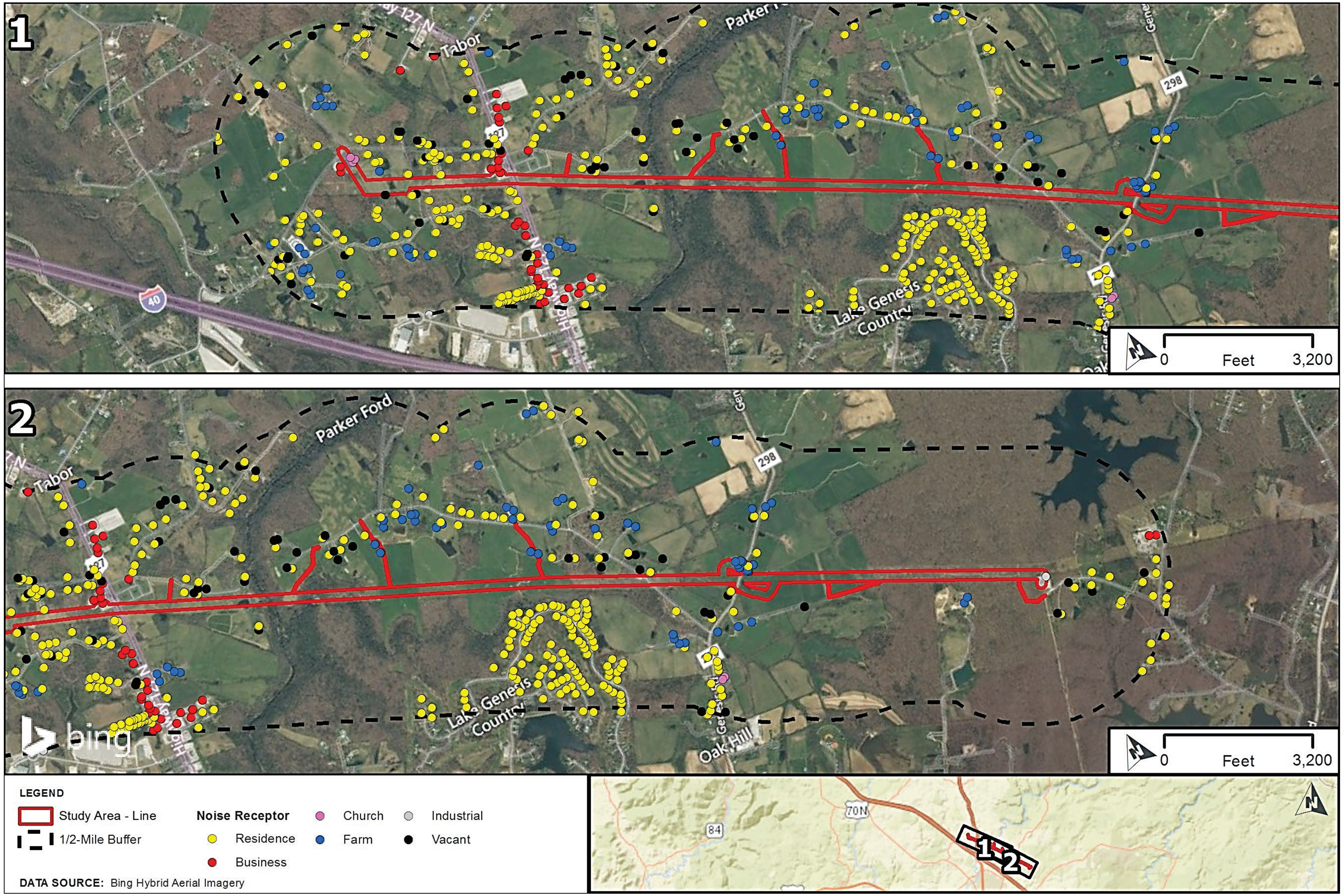

Figure 3.17-3. Noise Receptors within 0.5 Mile of the Western Transmission Corridor (L5383)

3.17.1.2.6 Construction and Operation of a Natural Gas Pipeline

At the filing of the DEIS, ETNG's analyses were not yet complete; as such, the initial information presented in the DEIS and summarized below was developed by TVA based on a desktop review of the natural gas pipeline using a 200-foot buffer, hereafter referred to as TVA's Expanded Construction ROW. Approximately 1,110 noise receptors were noted within TVA's Expanded Construction ROW area, as provided in Table 3.17-7.

Table 3.17-7. Alternative A Pipeline Construction Noise Receptors

Noise Receptor Type	Number within TVA's Expanded Construction ROW
Business	38
Church	9
Farm	35
Industrial	10
Residential	511
Sports Field	1
Unknown	31
Vacant	475
Total	**1,110**

In March and June 2023, ETNG conducted ambient sound surveys for HDD locations, the Hartsville Compressor Station, and the three M&R stations associated with pipeline construction to quantify the existing ambient sound levels around each location and identify the closest representative NSA in proximity to proposed noise generating sources, as provided in ETNG's Final Resource Report 9 included in the Project Application submitted to FERC in July 2023 (ETNG 2023j). A summary of NSAs identified within 0.5 mile of each of the HDD locations and aboveground facilities are summarized in Table 3.17-8 and illustrated in Appendix G. Results of the ambient sound surveys are included in Attachments 9D-F of ETNG's Final Resource Report 9 (ETNG 2023j).

Table 3.17-8. Summary of Identified NSA Locations withing 0.5 Mile of HDDs and Aboveground Facilities

Feature (Mile Point)	NSA	Description	NSA Location		Distance to Nearest HDD Pit or Station (Feet)
			Longitude	Latitude	
HDD Locations					
Second Creek (MP 2.6–3.4)	NSA01	Two story residence 570 Boat Dock Ln	-53.9080	-85.9098	833 ft. South
	NSA02	Two story residence 710 Boat Dock Ln	-53.9075	-85.9120	764 ft. Southwest
	NSA03	Two story residence 750 Boat Dock Ln	-53.9064	-85.9139	849 ft. West
	NSA04	Two story residence 550 Boat Dock Ln	-53.9040	-85.9041	1435 ft. Northeast
	NSA05	Two story residence 480 Boat Dock Lane	-53.9073	-85.9074	1334 ft. Northwest
	NSA06	Two story residence 395 Oldham Rd	-53.9015	-85.9270	560 ft. East
	NSA07	Two story residence 100 Hankins Ln	-53.9003	-85.9296	560 ft. North
	NSA08	Two story residence 630 Oldham Rd	-53.9038	-85.9311	789 ft. South
Cumberland River (MP 31.0–32.1)	NSA01	Two story residence 1976 Smith Bend Ln	-53.9629	-85.3010	702 ft. East
	NSA02	One story residence 1420 Big Branch Rd	-53.9617	-85.2734	1087 ft. South
	NSA03	One story residence 1250 Big Branch Rd	-53.9656	-85.2764	1025 ft. South
Norfolk Southern Railroad (MP 99.6–110.1)	NSA01	Two story residence off Montgomery Rd.	-54.1117	-83.7495	1435 ft. North
	NSA02	One story residence in proximity to Charlie Newberry Rd.	-54.1151	-83.7514	140 ft. North
	NSA03	One story residence 332 Catoosa Woods Dr.	-54.1187	-83.7746	2421 ft. West
Harriman Highway (MP 116.0–116.2)	NSA01	One story residence at Old Elverton Rd.	-54.2500	-83.4936	1162 ft. South
	NSA02	Two story residence at 3262 Harriman Hwy.	-54.2437	-83.4935	1195 ft. East
	NSA03	Two story residence at 3262 Harriman Hwy.	-54.2423	-83.4951	934 ft. East
	NSA04	Two story residence at Harriman Hwy (no street Address)	-54.2418	-83.5009	678 ft. Northwest

Feature (Mile Point)	NSA	Description	NSA Location		Distance to Nearest HDD Pit or Station (Feet)
			Longitude	Latitude	
Emory River (MP 121.5–122.2)	NSA01	Two story residence on 122 Landhaven Way	-54.3102	-83.5197	741 ft. Southeast
	NSA02	Two story residence on 129 Landhaven Way	-54.3105	-83.5215	757 ft. South
	NSA03	Two story residence on 617 Emory River Rd	-54.3100	-83.5235	739 ft. Southwest
	NSA04	Two story residence on 581 Emory River Rd	-54.3093	-83.5249	792 ft. Southwest
	NSA05	One story residence on 525 Emory River Rd	-54.3084	-83.5239	512 ft. West
	NSA06	Two story residence on 488 Emory River Rd	-54.3059	-83.5213	910 ft. North
	NSA07	One story residence on Emory River Rd (No Street Address)	-54.3086	-83.516	1171 ft. East
Aboveground Facilities					
Hartsville Compressor Station (MP 4.0)	NSA01	Two story residence at 675 Boat Dock Road	-53.9047	-85.8983	828 ft. Northwest
	NSA02	Two story residence at 890 Boat Dock Road	-53.9078	-85.8976	925 ft. Southwest
	NSA03	Two story residence at 50 Lecorne Ln	-53.907	-85.893	606 ft. Southeast
	NSA04	Two story residence at 460 Boat Dock Road	-53.9019	-85.9007	1901 ft. Northwest
	NSA05	Two story residence at 195 Boat Dock Road	-53.8981	-85.8958	2822 ft. North
	NSA06	Two story residence at 500 Puryears Bend	-53.9074	-85.8852	2180 ft. East
Columbia Gulf Receipt M&R (MP 0.0)	NSA01	Two Story Residence at 345 Bass Road	-53.8929	-85.9934	965 ft. West
	NSA02	Two Story Residence at 190 Bass Road	-53.8953	-85.9924	889 ft. Southwest
Midwestern Gas and Texas Eastern M&R Stations (MP 4.0)	NSA01	Two story residence at 675 Boat Dock Road	-53.9047	-85.8983	622 ft. Northwest
	NSA02	Two story residence at 890 Boat Dock Road	-53.9078	-85.8976	654 ft. Southwest
	NSA03	Two story residence at 50 Lecorne Ln	-53.907	-85.893	842 ft. Southeast
	NSA04	Two story residence at 460 Boat Dock Road	-53.9019	-85.9007	1773 ft. Northwest
	NSA05	Two story residence at 195 Boat Dock Road	-53.8981	-85.8958	2925 ft. Northwest
	NSA06	Two story residence at 500 Puryears Bend	-53.9074	-85.8852	2508 ft. East

Feature (Mile Point)	NSA	Description	NSA Location		Distance to Nearest HDD Pit or Station (Feet)
			Longitude	Latitude	
Harriman Crossover (MP 114.1)	NSA01	One story residence at 155 Coal Hill Road	-54.2246	-83.5169	1405 ft. East
Jackson County Crossover (MP 41.4)	NSA01	One story residence at 4288 TN-56	-54.0189	-85.0996	436 ft. Northeast
	NSA02	One story residence at 4062 Flynns Creek Rd	-54.0208	-85.1036	706 ft. Southwest
Clarkrange Crossover (MP 80.6)	NSA01	One story residence at 1085 Deer Lodge Hwy	-54.0562	-84.1889	795 ft. North
	NSA02	Two story residence at 1016 Lonnie Allred Rd	-54.0562	-84.1971	1754 ft. Northwest

Past, present, and reasonably foreseeable projects that may contribute to noise impacts identified within 1.0 mile of the NSAs associated with the aboveground facilities include the following projects shown in Table 3.17-9.

Table 3.17-9. Past, Present, and Reasonably Foreseeable Projects within 1.0-mile of NSAs Associated with Aboveground Facilities.

Project	County	Location
ETNG Ridgeline Hartsville Solar Array	Trousdale County	0.5 mile east of the Hartsville Compressor Station
East Tennessee Hartsville Compressor Station Other Non-jurisdictional Facilities	Trousdale County	Adjacent to Hartsville Compressor Station
TVA Kingston Plant	Roane County	At MP 122.3
Morgan County SR-29/US-27 Widening	Morgan County	Crossing Project at MP 107

3.17.1.3 Alternative B

3.17.1.3.1 East Tennessee TVA Power Service Area

The proposed solar and storage facilities would likely be located in agricultural, rural, and/or undeveloped areas within portions of East TN. Ambient noise in these types of settings typically consist of agricultural sounds, such as noises from farm machinery; natural sounds, such as from wind and wildlife; and moderate traffic sounds. If sites are located in industrial areas or near transportation facilities, the setting may have higher ambient noise levels.

3.17.2 Environmental Consequences

3.17.2.1 The No Action Alternative

Under the No Action Alternative, TVA would continue to operate and maintain the KIF plant. TVA would implement all of the planned actions related to the current and future management and storage of CCRs at the coal plants, which have either been reviewed or would be in subsequent NEPA analyses. Under the No Action Alternative, regular operational noise would continue to contribute to daily ambient noise levels.

3.17.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of KIF Plant

Under both action alternatives, TVA would retire, decommission, decontaminate, and deconstruct the KIF units and site. Noise impacts as a result of these actions would be associated with the removal of equipment and materials on-site, installation of bulkheads and/or fill tunnels, demolition via mechanical deconstruction and/or explosives, and demolition-related traffic to and from the Kingston Reservation. There are 278 total noise receptors within a 0.5 mile of the Kingston Reservation boundary, which largely consist of residences (Table 3.17-2). These receptors would experience temporary noise impacts as a result of deconstruction activities.

Noise associated with demolition activities, the greatest of which would be due to blasting with a higher range of approximately 94 dB at a 50-foot distance is assumed not to attenuate at the closest receptors that exist on or directly adjacent to the Project boundary (FHWA 2017). While this level due to blasting is higher than the USEPA noise guidance for Ldn of 55 dBA and the HUD guidelines for Ldn of 65 dBA, such activity would be temporary. Other noise levels associated with demolition activities, such as construction equipment operation, would be much lower. Given the temporary and intermittent nature of demolition noise, the impact of noise generated is expected to be minor. Noise impacts from demolition-related traffic are expected to be minor as construction related traffic would utilize interstate highways or major arterial roadways as much as possible.

Explosive demolition activities would be single occurrences that would be temporary and short-term. The noise associated with the collapse of the structures would follow closely behind and be perceived as a single noise event. Notifications to the public, including area emergency services, would be issued prior to the use of explosives for demolition. With warning to the public prior to blasting activities, residents would be prepared for a single loud noise; therefore, direct impacts to noise levels in the area associated with blasting would be minor and temporary.

Impacts from additional vehicular traffic are expected to be minor as the roads within the plant are already predominately used by employees and for industrial activity. This small increase in noise would be temporary and intermittent and only last until D4 activities have been completed. 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.

In addition, vibrations associated with explosives would also occur. Vibrations from explosive demolition events can potentially affect nearby structures. Seismologic analyses carried out at recent demolitions of other tall industrial chimneys in the United States strongly suggest that the vibrations would not result in measurable effects on nearby structures (TVA 2016c). These seismological analyses were conducted to measure the effects from demolition-related vibrations on standing structures in the vicinity of the chimney demolitions. In each case, vibrations were below the recommended limits set by the U.S. Bureau of Mines Report (Siskind et al. 1980). The report's authors concluded in each case that the demolitions would not cause damage to structures within the radius of influence. Vibrations resulting from the demolition of the Kingston Reservation structures would be of similar magnitude. The use of BMPs, including wetting down the structure prior to felling, use of misting systems during stack felling, and use of berms during demolition would also serve as a form of noise/vibration control. Therefore, no damage to structures is anticipated. Due to the temporary nature of the operation, noise and vibration effects on the environment are expected to be minor and temporary.

Projects in vicinity of the D4 activities, such as the CCR management activities, could create temporary, cumulative increases in construction and traffic noise in the area.

3.17.2.2.1 Environmental Justice Considerations

Noise-related effects that would occur as a result of KIF retirement and D4 activities would be temporary and minor and are therefore not anticipated to have disproportionate and adverse effects on nearby EJ populations.

3.17.2.3 Alternative A

3.17.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

During the construction of the CC/Aero CT Plant and Switchyard, there would be a slight noise increase from the existing conditions due to an increase in personnel, cranes, and other equipment in the area. Due to the temporary nature of the activities, noise impacts during construction would be considered minor.

Given the potential for up to 300 individuals to be present during construction, there may be a significant increase in both vehicular and pedestrian traffic in the area. In particular, the hauling of materials from the Kingston Reservation could lead to an uptick in traffic along heavily trafficked roads such as I-40, SR-29, and Swan Pond Road. This increase in traffic could result in more noticeable impacts on the daily lives of residents, particularly in terms of increased noise and potential safety concerns. However, the increase would be mitigated by the fact that the nearby roads are presently heavily trafficked. As such, the increase in noise would blend in with present surroundings. The noise impacts would be temporary and intermittent and only last until construction activities have been completed.

Burns & McDonnell performed predictive sound modeling for the Project operation using computer aided noise abatement. Based on this study, the Project is expected to contribute a maximum absolute sound level of approximately 53 dBA at MP02, 54 dBA at MP03, 50 dBA at MP04, 51 dBA at MP05, and 55 dBA in the vicinity of the nearest residential noise receptors, approximately 0.4 miles south of the proposed CC/Aero CT Plant (Appendix G). These noise levels are below both the HUD and USEPA guidelines of 65 dBA and 55 dBA, respectively. Therefore, the operation of the CC/Aero CT Plant would result in minor permanent noise impacts.

3.17.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

During the construction of the solar facility, there would likely be a slight noise increase from the existing conditions due to an increase in personnel, cranes, and other equipment in the area, which could temporarily impact nearby residential communities. However, these impacts are temporary and would be mitigated through measures, such as scheduling construction activities during non-peak hours. Once the solar facility is operational, the noise level would decrease significantly, as solar power generation does not create any significant noise pollution.

3.17.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The noise impacts from the construction of the BESS would be the same as the impacts noted for the solar facility noted in Section 3.17.2.3.2.

3.17.2.3.4 On-site Transmission Upgrades

Alterations to existing transmission lines on Kingston Reservation associated with Alternative A would primarily involve upgrades to existing facilities and are not expected to significantly affect noise levels. Installation of the new existing transmission line for the battery facility is not anticipated to significantly affect noise levels as they would occur within the existing reservation. Improvement of existing access roads or construction of new access roads may be necessary to perform upgrades and periodic maintenance in the existing transmission lines, but any construction would be temporary and intermittent in nature.

3.17.2.3.5 Off-site Transmission Upgrades

Upgrades to off-site transmission corridors would have the same impact to noise levels as described for on-site improvements in Section 3.17.2.3.4.

3.17.2.3.6 Construction and Operation of a Natural Gas Pipeline

Construction Noise

ETNG's Resource Report 9 (ETNG 2023j) was filed with FERC in July 2023 (ETNG 2023a). This FEIS has been updated based on ETNG's application and resource reports (ETNG 2023a-m) and subsequent filings by ETNG with FERC from October through December 2023 (ETNG 2023n-q). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the noise-related findings in ETNG's Resource Report 9. Noise impacts during pipeline construction would be associated with heavy equipment operation, including HDD rigs, the excavation and laying of the pipeline, and construction-related traffic (construction workforce and the shipment of goods and equipment) to and from the ETNG Construction ROW. To limit noise impacts associated with the pipeline, construction activities generally would be conducted during the daytime (7 a.m. to 7 p.m.), except in cases where nighttime construction may be necessary due to certain activities, including longer HDDs, hydrostatic testing, and tie-ins.

The cumulative acoustical impact of HDD operations on identified representative NSAs was calculated using Computer Aided Noise Abatement acoustic modeling software. This model includes geometrical divergence (distance attenuation), barrier effects due to intervening structures, ground effects, atmospheric absorption, and topography. A summary of acoustic parameters used as inputs for the Computer Aided Noise Abatement acoustic model for the pipeline are summarized in Table 3.17-10.

Table 3.17-10. Key Acoustic Modeling Parameters

Parameter	Value	Rationale
Ground Absorption	0	For waterbodies
Ground Absorption	0.2	Accounts for mostly acoustically reflective surfaces (pavement and hard packed ground)
Ground Absorption	0.8	Accounts for mostly acoustically absorptive (e.g., grass) surfaces
Temperature	50°F	Assumed standard weather conditions
Relative Humidity	70%	Assumed standard weather conditions
Maximum Order of Reflection	2	Accounts for building reflections

Source: ETNG 2023j

A summary of the sound power levels for anticipated equipment at the HDD entry pit and exit pit are provided in Table 3.17-11 and Table 3.17-12, respectively.

Table 3.17-11. Combined Equipment Sound Power at HDD Entry Pit

Equipment	Assumed Quantity Operating Simultaneously	Maximum Sound Power Level of Equipment
HDD Drilling Rig[1]	1	99
Mud Pump Engines[1]	1	112
Mud Cleaner	1	102
Shaker	1	108
Bentonite Mixer[1]	1	92
Excavator[2]	1	104
	Total Sound Power Level	**111**

Source: ETNG 2023j
[1]Sound power based on previous project experience
[2]Source: FHWA 2017

Table 3.17-12. Combined Equipment Sound Power at HDD Exit Pit

Equipment	Assumed Quantity Operating Simultaneously	Maximum Sound Power Level of Equipment
HDD Drilling Rig[1]	1	104
Mud Pump Engines[1]	1	98
Bentonite Mixer[1]	1	92
Excavator[2]	1	104
	Total Sound Power Level	**107**

Source: ETNG 2023j
[1]Sound power based on previous project experience
[2]Source: FHWA 2017

ETNG's Resource Report 9 provides the following impacts of construction-related noise:

> Pipeline construction noise-related effects from the [Ridgeline Expansion] project are expected to be short in duration at any given location and, therefore, have minimal effect. Construction equipment noise levels will typically be less than 85 dBA at 50 feet when equipment is operating at full load. People at nearby residences and buildings will hear the construction noise, but the overall impact will be short-lived and insignificant. Construction will not result in the generation of, or exposure of persons to, excessive noise or vibration levels for lengthy periods.
>
> Site construction noise associated with the installation of new aboveground facilities should have a negligible effect on the nearby NSAs, noting that the construction will be primarily limited to daytime hours. Construction activities will be performed with standard heavy equipment such as a track excavator, backhoe, as well as use of a bulldozer, dump truck(s), and concrete trucks. Many construction machines operate intermittently, and the types of machines in use at a construction site change with the construction phase.
>
> Construction noise, while varying according to equipment in use, will be mitigated by the attenuating effect of distance and the intermittent and short-lived character of the

noise. Further, the nature of construction of a pipeline dictates that construction activities and associated noise levels will move along the corridor and that no single NSA will be exposed to significant noise levels for an extended period. The HDDs are proposed to operate 24 hours a day, seven days a week. Other discrete activities may require 24 hours of activity for limited periods of time. Activities which also may require 24-hour activity include:

- Loading and hauling of logs and/or timber chips;
- Hydrostatic testing of HDD sections, mainline pipe, and facilities;
- Dewatering of test sections, conventional bore pits, and trench or bell holes ahead of mainline installation crews;
- Mainline tie-in and specialty crews at resource and road crossings, as needed pending schedule and progress;
- Aboveground facilities construction; and
- Commissioning, line purge, and line fill activities.

Equipment maintenance and service activities may also occur before and after standard work hours.

Table 3.17-13 provides a summary of construction noise impacts of the aboveground facilities.

Table 3.17-13. Aboveground Facility Construction Noise Impacts (ETNG 2023j)

Feature (Mile Point)	NSA	Construction Noise Impact (dBA)	Ambient Sound Levels (dBA)	Cumulative Noise Impact (dBA)	FERC Criteria (dBA)
Hartsville Compressor Station (MP 4.0)	NSA01	73	43	73	55
	NSA02	63	43	63	55
	NSA03	64	56	64	55
	NSA04	63	48	63	55
	NSA05	57	45	58	55
	NSA06	55	46	56	55
Columbia Gulf Receipt M&R (MP 0.0)	NSA01	54	52	55	55
	NSA02	55	52	55	55
Midwestern Gas and Texas Eastern M&R Stations (MP 4.0)	NSA01	38	53	53	55
	NSA02	38	54	54	55
	NSA03	56	59	60	55
	NSA04	51	45	52	55
	NSA05	45	41	46	55
	NSA06	48	45	50	55
Harriman Crossover (MP 114.1)	NSA01	43	38	44	55
Jackson County Crossover (MP 41.4)	NSA01	51	50	54	55
	NSA02	48	45	50	55
Clarkrange Crossover (MP 80.6)	NSA01	53	55	57	55
	NSA02	48	49	52	55

Source: ETNG 2023j

ETNG conducted baseline noise modeling assuming that the entry and exit pits may be swapped based on pipeline conditions and calculated the acoustical impact of the HDD operations at NSAs nearest to HDD operations (ETNG 2023j). Though HDD operations are not typically continuous, the HDD drilling operations may occur 24 hours per day (i.e., drilling during both daytime and nighttime hours). Without specific noise mitigation measures, the modeled noise levels resulting from HDD would exceed the Ldn 55 dBA FERC sound level requirement at 20 of 47 NSAs. Table 3.17-14 provides a summary of the unmitigated noise impacts due to HDD construction activities at NSAs within 0.5 mile of the HDDs.

Table 3.17-14. Estimated Unmitigated Noise Impacts due to HDDs

HDD	NSA	Construction Noise Impact (dBA)	Ambient Sound Levels (dBA)	Cumulative Noise Impact (dBA)	FERC Criteria (dBA)	Mitigation Measures for HDD, if 24-hour operation is required[1,2]
Second Creek (MP 2.6–3.4) – Western Entry	NSA01	53	44	54	55	
	NSA02	54	37	54	55	
	NSA03	53	44	54	55	
	NSA04	48	37	48	55	
	NSA05	53	44	53	55	
	NSA06	60	36	**60**	55	A, B
	NSA07	60	44	**60**	55	A, B
	NSA08	**57**	36	**57**	55	A
Second Creek (MP 2.6–3.4) – Eastern Entry	NSA01	**56**	44	**57**	55	A
	NSA02	**57**	37	**57**	55	A
	NSA03	**56**	44	**56**	55	A
	NSA04	51	37	51	55	
	NSA05	**56**	44	**57**	55	A
	NSA06	**57**	36	**57**	55	A
	NSA07	**56**	44	**57**	55	A
	NSA08	53	36	53	55	
Cumberland River (MP 31.0–32.1) – Western Entry	NSA01	51	42	51	55	
	NSA02	47	39	47	55	
	NSA03	47	46	50	55	
Cumberland River (MP 31.0–32.1) – Eastern Entry	NSA01	48	42	49	55	
	NSA02	53	39	53	55	
	NSA03	54	46	54	55	
Norfolk Southern Railroad (MP 99.6–110.1) – East Entry	NSA01	51	45	52	55	
	NSA02	**73**	45	**73**	55	A, B, E
	NSA03	41	48	49	55	
Norfolk Southern Railroad (MP 99.6–110.1)	NSA01	49	45	50	55	
	NSA02	**67**	45	**67**	55	A, C
	NSA03	44	48	50	55	
Harriman Highway (MP 116.0–116.2) – Northwest Entry	NSA01	48	36	48	55	
	NSA02	54	52	**56**	55	A
	NSA03	**56**	45	**56**	55	A

HDD	NSA	Construction Noise Impact (dBA)	Ambient Sound Levels (dBA)	Cumulative Noise Impact (dBA)	FERC Criteria (dBA)	Mitigation Measures for HDD, if 24-hour operation is required[1,2]
	NSA04	**58**	41	**58**	55	A, B
Harriman Highway (MP 116.0–116.2) – Southeast Entry	NSA01	52	36	52	55	
	NSA02	54	52	55	55	
	NSA03	54	45	54	55	
	NSA04	55	41	55	55	
Emory River (MP 121.5–122.2) – Northeast Entry	NSA01	**58**	46	**58**	55	A, B
	NSA02	**57**	46	**58**	55	A, B
	NSA03	**58**	46	**58**	55	A, B
	NSA04	**57**	46	**57**	55	A, B
	NSA05	**60**	46	**60**	55	A, B
	NSA06	**56**	46	**56**	55	A, B
	NSA07	53	46	54	55	
Emory River (MP 121.5–122.2) – Southwest Entry	NSA01	54	46	55	55	
	NSA02	54	46	55	55	
	NSA03	55	46	55	55	
	NSA04	54	46	55	55	
	NSA05	54	46	55	55	
	NSA06	52	46	53	55	
	NSA07	50	46	52	55	

Source: ETNG 2023j

Bolded items exceed the Ldn 55 dBA FERC sound level requirement

[1]Noise Mitigation Measures:

A. Institute work practices such as reduced idling, fitting equipment with residential mufflers.
B. Install sound barrier walls between entry pit and NSA.
C. Install sound barrier walls between exit pits and NSAs.
D. Install sound enclosures around critical equipment such as the drill rig, mud pump engine, shaker.
E. Offer temporary relocation to residents.

[2]HDD operations expected to extend past 7 p.m. during pullback and other time-sensitive activities

For the HDDs that require mitigation methods beyond general work practices for 24-hour operation, ETNG calculated the mitigated noise impacts with the recommended mitigation measures as shown on Table 3.17-15. The estimated mitigated noise impact at NSAs with the implementation of noise mitigation measures would be at or below the Ldn 55 dBA FERC sound level requirement (ETNG 2023j). Because of the temporary nature of the construction noise during normal installation of the pipeline along the pipeline route, no adverse or long-term effects are anticipated.

Table 3.17-15. Estimated Mitigated Noise Impacts due to HDDs

HDD	NSA	Construction Noise Impact (dBA)	Ambient Sound Levels (dBA)	Cumulative Noise Impact (dBA)	FERC Criteria (dBA)	Mitigation Measures for HDD, if 24-hour operation is required[1,2]
Second Creek (MP 2.6 - 3.4) – Western Entry	NSA01	53	44	53	55	
	NSA02	54	37	54	55	
	NSA03	53	44	53	55	
	NSA04	48	37	48	55	
	NSA05	53	44	53	55	
	NSA06	48	36	48	55	A, B
	NSA07	48	44	49	55	A, B
	NSA08	55	36	55	55	A
Second Creek (MP 2.6 - 3.4) – Eastern Entry	NSA01	55	44	55	55	A
	NSA02	55	37	55	55	A
	NSA03	55	44	55	55	A
	NSA04	51	37	51	55	
	NSA05	55	44	55	55	A
	NSA06	55	36	55	55	A
	NSA07	55	44	55	55	A
	NSA08	53	36	53	55	
Cumberland River (MP 31.0 – 32.1) – Western Entry	NSA01	51	42	51	55	
	NSA02	47	39	47	55	
	NSA03	47	46	50	55	
Cumberland River (MP 31.0 – 32.1) – Eastern Entry	NSA01	48	42	49	55	
	NSA02	53	39	53	55	
	NSA03	54	46	54	55	
Norfolk Southern Railroad (MP 99.6 - 110.1) – East Entry	NSA01	43	45	47	55	
	NSA02	55	45	55	55	A, B
	NSA03	41	48	49	55	
Norfolk Southern Railroad (MP 99.6 - 110.1)	NSA01	43	45	47	55	
	NSA02	55	45	55	55	A, C
	NSA03	44	48	50	55	
Harriman Highway (MP 116.0-116.2) – Northwest Entry	NSA01	48	36	48	55	A, B
	NSA02	50	52	54	55	A
	NSA03	49	45	50	55	A
	NSA04	50	41	51	55	A, B
Harriman Highway (MP 116.0-116.2) – Southeast Entry	NSA01	52	36	52	55	
	NSA02	54	52	55	55	
	NSA03	54	45	54	55	
	NSA04	55	41	55	55	
Emory River (MP 121.5 – 122.2) – Northeast Entry	NSA01	48	46	50	55	A, B
	NSA02	48	46	50	55	A, B
	NSA03	48	46	50	55	A, B
	NSA04	48	46	50	55	A, B

HDD	NSA	Construction Noise Impact (dBA)	Ambient Sound Levels (dBA)	Cumulative Noise Impact (dBA)	FERC Criteria (dBA)	Mitigation Measures for HDD, if 24-hour operation is required[1,2]
	NSA05	50	46	52	55	A, B
	NSA06	55	46	55	55	A, B
	NSA07	53	46	54	55	
Emory River (MP 121.5 – 122.2) – Southwest Entry	NSA01	54	46	55	55	
	NSA02	54	46	55	55	
	NSA03	55	46	55	55	
	NSA04	54	46	55	55	
	NSA05	54	46	55	55	
	NSA06	52	46	53	55	
	NSA07	50	46	52	55	

[1]Noise Mitigation Measures:

A. Institute work practices such as reduced idling, fitting equipment with residential mufflers.
B. Install sound barrier walls between entry pit and NSAs – Barrier height minimum of 20 ft. with the exception of Norfolk Southern Railway, 30 ft. barrier height recommended.
C. Install sound barrier walls between exit pits and NSAs - Barrier height minimum of 20 ft. with the exception of Norfolk Southern Railway, 30 ft. barrier height recommended.
D. Install sound enclosures around critical equipment such as the drill rig, mud pump engine, shaker.
E. Offer temporary relocation to residents.

[2]HDD operations expected to extend past 7 p.m. during pullback and other time-sensitive activities

Operational Noise

ETNG conducted ambient sound surveys and acoustical analysis for the NSAs nearest to the compressor station as a part of the final Resource Reports submitted to FERC (ETNG 2023j). Table 3.17-16 provides a summary of the operational noise impacts of the new aboveground facilities and are inclusive of noise controls detailed in the ambient sound survey results included as an attachment to ETNG's Resource Report 9 (ETNG 2023j).

Table 3.17-16. Aboveground Facility Operational Noise Impacts

Feature (Mile Point)	NSA	Ambient Sound Levels (dBA)	Facility Noise Impact (dBA)	Cumulative Noise Impact (dBA)	FERC Criteria (dBA)
Hartsville Compressor Station (MP 4.0)	NSA01	43	52	52	55
	NSA02	43	44	47	55
	NSA03	55	45	55	55
	NSA04	48	45	50	55
	NSA05	45	40	46	55
	NSA06	46	38	47	55
Columbia Gulf Receipt M&R (MP 0.0)	NSA01	52	44	52	55
	NSA02	52	44	52	55

Feature (Mile Point)	NSA	Ambient Sound Levels (dBA)	Facility Noise Impact (dBA)	Cumulative Noise Impact (dBA)	FERC Criteria (dBA)
Midwestern Gas and Texas Eastern M&R Stations (MP 4.0)	NSA01	38	44	45	55
	NSA02	38	45	46	55
	NSA03	56	49	57	55
	NSA04	51	36	51	55
	NSA05	45	32	45	55
	NSA06	48	35	48	55
Harriman Crossover (MP 114.1)	NSA01	43	28	43	55
Jackson County Crossover (MP 41.4)	NSA01	51	44	54	55
	NSA02	48	45	50	55
Clarkrange Crossover (MP 80.6)	NSA01	53	44	53	55
	NSA02	48	37	49	55

Source: ETNG 2023j

ETNG's Resource Report 9 provides the following measures to minimize the impact of vibrations associated with operation noise:

> [ETNG] will take steps to minimize the impact of vibration, where practicable, on nearby residences. [ETNG] will inform nearby residents of the [Ridgeline Expansion] project and the upcoming construction activities, including HDD operation, and will respond to and investigate concerns. Excavators and other heavy equipment must be used more than 50 feet from existing building structures, where practicable. [ETNG] contractors will route heavily loaded trucks and equipment away from residential streets and vibration-sensitive sites, where practicable. [ETNG] contractors will sequence phases of construction activities such as earth-moving and ground impacting so as not to occur in the same time period and minimize nighttime activity.
>
> Vibration levels are highly dependent on equipment models, modes of operation, and local ground conditions. [ETNG] contractors will monitor vibration levels at existing building structures if the 50-foot setback distances cannot be maintained due to site constraints (ETNG 2023j).

3.17.2.3.7 Summary of Alternative A

TVA Proposed Actions

Temporary noise effects would occur during demolition of the coal plant and as a result of construction traffic for the CC/Aero CT Plant and transmission lines. Noise effects from construction-related traffic are expected to be temporary and minor. The majority of noise disturbances would occur during construction of Alternative A components. Typical noise levels from construction equipment used for the CC/Aero CT Plant, BESS, solar facility, and existing transmission line components are expected to be 85 dBA or less at a distance of 50 feet from the construction activities (FHWA 2017). The increase in current noise levels is estimated to be less than 3 dBA. Construction would not result in the generation of, or exposure of persons to, excessive noise or vibration levels for lengthy periods, and noise mitigation efforts would be implemented by TVA.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Temporary noise effects would occur as a result of construction of the pipeline. Noise effects from construction-related traffic are expected to be temporary and minor. Typical noise levels from construction equipment used for the pipeline construction and operation are expected to be 85 dBA or less at a distance of 50 feet from the construction activities (FHWA 2017). The increase in current noise levels is estimated to be less than 3 dBA. Construction would not result in the generation of, or exposure of persons to, excessive noise or vibration levels for lengthy periods, and noise mitigation efforts would be implemented by ETNG. Where unmitigated HDD noise levels exceed Ldn 55 dBA FERC sound level requirement at NSA residential locations, ETNG would implement active noise mitigation measures such as installing sound barriers and using residential-grade exhaust silencers on engines. After the construction of the pipeline, TVA anticipates that there would be little to no noise increases during operation of the pipeline aside from occasional maintenance activities in areas where operational noise was not already occurring, such as the periodic mowing of the pipeline ROW.

3.17.2.3.8 Environmental Justice Considerations

TVA Proposed Actions
Noise effects would occur during construction of the CC/Aero CT Plant. This activity would increase the noise effects on local populations. Since there are EJ populations in the census block group that KIF is located within, this activity in addition to the noise impacts from D4 activities would result in some temporary, minor disproportionate and adverse effects on those near the Kingston Reservation. See Section 3.4 for a description of which EJ communities (i.e., minority, LEP, and/or low-income populations) may be impacted by the Proposed Action.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures
Noise-related effects, including vehicular traffic, in the ETNG Construction ROW would generally be experienced by EJ populations more than other populations. Further, some of the loudest activities and components are located in EJ population areas. While these effects would be mitigated by ETNG, to the extent practical, it is TVA's current assessment that noise effects are likely to be disproportionate and adverse for EJ populations.

3.17.2.4 Alternative B

3.17.2.4.1 Construction and Operations of Solar and Storage Facilities
While exact locations of sites are not currently known, typical direct and indirect noise impacts associated with solar and storage facilities would primarily occur during construction. Construction equipment produces a range of sounds while the operational stage is generally quiet. Noisy construction equipment, such as delivery trucks, dump trucks, water trucks, service trucks, bulldozers, chain saws, bush hogs, or other large mowers for tree clearing, produce maximum noise levels at 50 feet of approximately 84 to 85 dBA. Construction noise would likely cause temporary and minor adverse impacts to the ambient sound environment around each project site. Nearby noise receptors would temporarily experience heightened noise during construction, primarily from pile-driving activities.

The activity likely to make the most noise for an extended time period would be pile driving during the construction of the solar array foundations. Standard construction pile drivers are estimated to produce between 90 to 95 dBA at a distance of 50 feet (FHWA 2011). Following completion of construction activities, the ambient sound environment on and surrounding the solar or storage facility sites would be expected to return to existing levels. The moving parts of the PV arrays would be electric-powered and produce little noise. The central inverters associated with solar sites would produce noise levels of approximately 65 dBA at 33 feet, and substations typically emit approximately 50 dBA at 300 feet. For storage facility sites, the average sound level is less than 82 dB from 10 feet surrounding the on-site transformers.

Solar and storage facilities located near commercial operations or agricultural complexes would have lesser effects since the ambient sounds near such commercial or agricultural complexes are already at or higher than the typical 45 to 55 dBA. Additionally, construction would primarily occur during daylight hours, between sunrise and sunset; therefore, project construction would not affect ambient noise levels at night during most of the construction period. Most of the proposed equipment would not be operating on-site for the entire construction period but would be phased in and out according to the progress of the projects.

The periodic mowing of solar sites to manage the height of vegetation surrounding the solar panels would produce sound levels comparable to those of agricultural operations. Overall, Alternative B would likely result in minor, temporary adverse impacts to the ambient noise environment during construction, and minor to negligible impacts during operation and maintenance of the solar facility. Detailed analyses of noise impacts would occur for each solar and storage facility under future NEPA reviews.

Cumulative impacts would also occur since the solar sites under Alternative B would be in addition to the 10,000 MW expansion of solar targeted by TVA, which could create temporary, cumulative increases in construction and traffic noise in the region.

3.17.2.4.2 Transmission and Other Components

Construction of existing transmission lines and existing transmission line upgrades associated with solar and BESS sites would result in temporary, minor noise impacts related to construction and construction-related traffic. After the construction of the existing transmission lines, there would not be significant continued noise as a result of its operation aside from occasional maintenance activities.

3.17.2.4.3 Environmental Justice Considerations

Based on previous solar developments, noise-related effects that would occur as a result of the proposed solar facilities and transmission line activities are anticipated to be temporary (primarily during the period of construction), minor, and limited to the immediate project sites and transmission line corridors. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.18 Visual

3.18.1 Affected Environment

Visual resources compose the visible character of a place and include both natural and human-made attributes. Visual resources influence how an observer experiences a particular location and distinguishes it from other locations. Such resources are important to people living in or traveling through an area and can be an essential component of historically and culturally significant settings. The visual 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 subjective perceptions of a landscape's aesthetic quality and sense of place is dependent on where and how they are viewed. Views of the landscape are described in terms of what is seen in the foreground (within 0.5 mile), middleground (between 0.5 to 4 miles), and background (between 4 to 10 miles) The resulting scenic value class of a landscape is determined by combining the levels of scenic attractiveness, scenic integrity, and visibility. Scenic attractiveness is a measure of the scenic beauty of a landscape and is based on perceptions of the visual appeal of landforms, waterways, vegetation, and the human-built environment. Scenic attractiveness is assessed as either distinctive, typical/common, or indistinctive. As adapted for this analysis, scenic integrity measures the degree of visual unity of the natural and cultural character of the landscape. Scenic integrity is evaluated as either low, moderate, or high.

3.18.1.1 Kingston Reservation (No Action and D4 Activities)

The Kingston Reservation is located at the confluence of the Clinch and Emory rivers and is surrounded by water on three sides. The topography surrounding the Kingston Reservation ranges from relatively flat near the banks of the Clinch and Emory Rivers to moderately sloping in the western portion of the reservation. A clear view of I-40 exists to the south of the reservation. Emory Gap, a small residential area, exists to the west of the project area along State Route 29. Night lighting is widespread at the Kingston Reservation and the nearby commercial businesses along I-40.

Except for the Kingston Reservation, the surrounding region is largely undeveloped; the developed areas that exist include a residential development to the west and commercial development in the vicinity of I-40 to the south. Components of the existing KIF are dominant elements on the landscape and include the original nine stacks, two 1,000-foot-high emissions stacks, and one additional stack roughly the height of the original nine stacks that generates steam in the flue gases emitted from that stack. Condensed water vapor emitted from this stack is also a prominent visual element during much of the time the plant is operating. There is also a large transmission line corridor that extends outside of the Kingston Reservation that is visible. Much of the area around the coal plant buildings is devoid of any vegetation, although there are some small patches of lawn and trees along roadways and forested areas on the perimeter (Figure 2.1-5).

The viewscape of the KIF Plant includes broadly horizontal buildings and industrial equipment and 12 emissions stacks; thus, scenic attractiveness of these areas is minimal, and scenic integrity ranges from low to very low. Scenic attractiveness of the area is considered common, and scenic integrity is considered moderate due to human alteration in the area. The ratings for scenic attractiveness assigned to the project sites are due to the ordinary or common visual quality. The forms, colors, and textures in the affected environment are normally seen through the characteristic landscape and are not considered to have distinctive quality. In the foreground and middleground, the scenic integrity has been lowered by slight human alteration such as residential and industrial development. However, in the background, these alterations are not substantive enough to dominate the view of the landscape (Figure 3.18-1). Based on the criteria used for this analysis, the overall scenic value class for the affected environment ranges from poor within the KIF Reservation Boundaries to good in the surrounding area (based on a 0.5-acre radius of KIF Reservation).

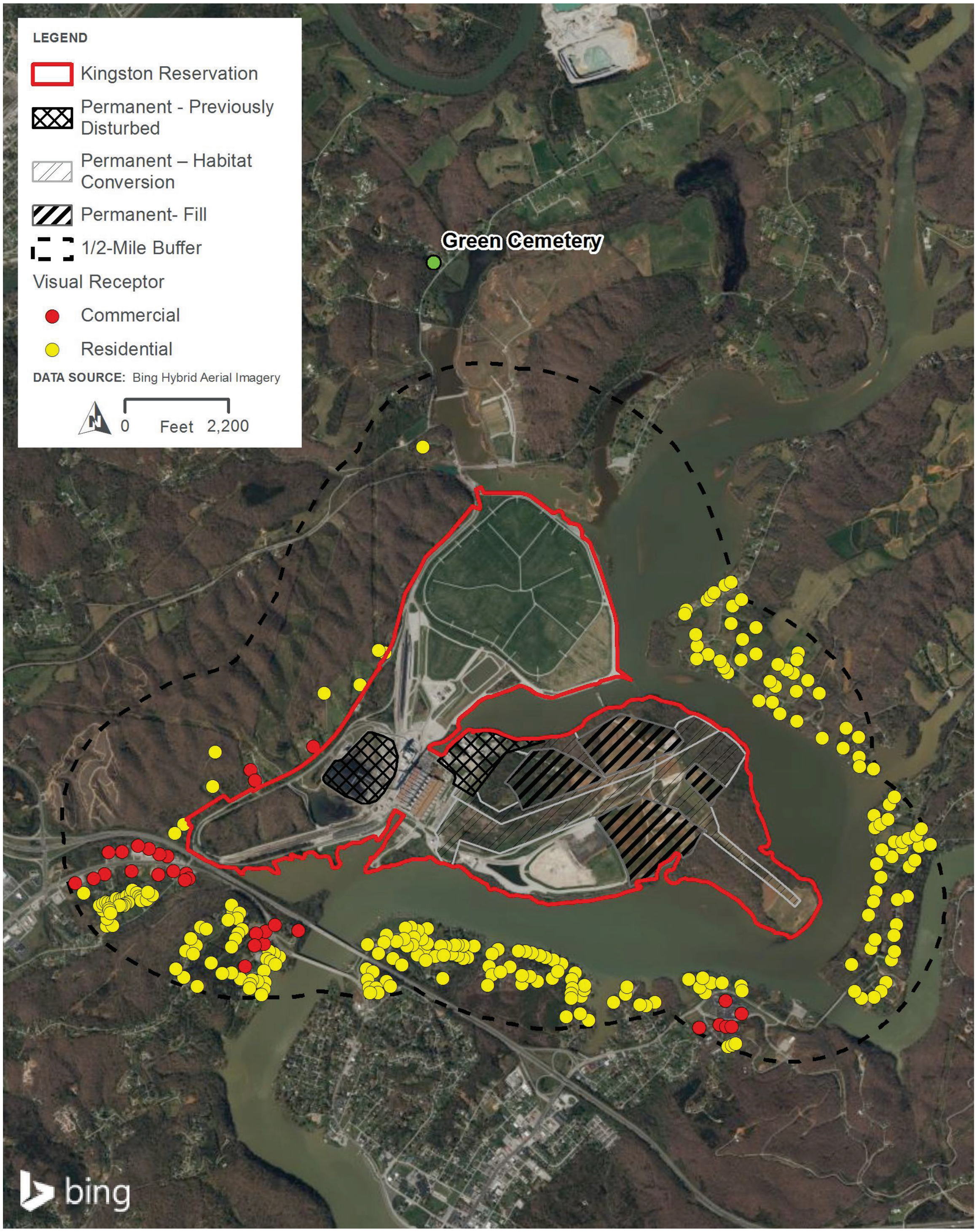

Figure 3.18-1. Kingston Reservation Visual Receptors

The total number of visual receptors, which are receptors within the line of sight of the source, within 0.5 mile of the Kingston Reservation, and their classifications are provided in Table 3.18-1 and Figure 3.18-1. Some of the receptors identified within this section may be out of the line of sight due to changes in vegetation, air quality, or angles that were not accounted for in this analysis.

Table 3.18-1. Kingston Reservation Visual Receptors

Visual Receptor Type	Alternative A – Kingston Reservation
Cemetery	1
Church	0
Commercial	31
Industrial	0
Recreation	0
Residential	247
Total	**278**

3.18.1.2 Alternative A

3.18.1.2.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

The CC/Aero CT Plant site is in an undeveloped portion of the Kingston Reservation comprised of largely disturbed earth and hay/pasture. The closest sensitive receptors to the proposed site include residential subdivisions, with homes located approximately 0.6 mile south of the proposed plant site (Figure 3.18-1).

3.18.1.2.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

The proposed 3- to 4-MW solar facility would be located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.18.1.1 apply to the proposed 3- to 4-MW solar facility.

3.18.1.2.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The proposed 100-MW BESS would be located on one of three potential sites located on the Kingston Reservation. The affected environment and existing conditions described above for the Kingston Reservation in Section 3.18.1.1 apply to the proposed 100-MW BESS.

3.18.1.2.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new existing transmission line connections to the proposed CC/Aero CT facilities and switchyard. TVA would also install a new transmission line for the proposed battery facility. Therefore, the affected environment for on-site transmission upgrades is described in Section 3.18.1.1.

3.18.1.2.5 Off-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines, five near the Kingston Reservation (L5108, L5116, L5280, L5302, and L5381) and one in Crossville, (L5383). Descriptions of these improvements can be found in Section 2.1.3.5.2. The visual landscapes within the vicinity of each transmission line are described below.

3.18.1.2.5.1 Eastern Transmission Corridor

Eastern Transmission Corridor extends from the current Kingston Reservation travelling eastbound and terminates in the city of Oak Ridge. Several access roads are proposed along routes that have already been cleared. The viewshed varies at different points on the Eastern Transmission Corridor, with the surrounding area consisting largely of forest, developed open space, and pastureland. In the western-most portions of the Eastern Transmission Corridor, the Clinch and Emory rivers exist within the viewshed.

There are a total of 6,481 visual receptors within a 0.5 mile of the L5108 Eastern Transmission Corridor, most being residences and vacant buildings. The total number of visual receptors within 0.5 mile of the L5108 Eastern Transmission Corridor and their classifications can be seen in Table 3.18-2 and Figure 3.18-2a through Figure 3.18-2d. Some of the receptors identified within this section may be out of the line of sight due to changes in vegetation, air quality, or angles that were not accounted for in this analysis.

Table 3.18-2. Visual Receptors Within 0.5 Mile of L5108 of the Eastern Transmission Corridor

Visual Receptor Type	Alternative A – L5108
Business	65
Church	16
Farm Buildings	10
Industrial	70
Residential	4622
School	17
Campground/Sports Field	18
Vacant Buildings (garage/shed)	445
Unknown	1218
Total	**6,481**

There are a total of 822 visual receptors within 0.5 mile of the L5302, L5280, L5381, and L5116 Eastern Transmission Corridors, most being residences, industrial buildings, and vacant buildings. The total number of visual receptors within 0.5 mile of the corridor and their classifications can be seen in Table 3.18-3 and Figure 3.18-2a through Figure 3.18-2d. Some of the receptors identified within this section may be out of the line of sight due to changes in vegetation, air quality, or angles that were not accounted for in this analysis.

Table 3.18-3. Visual Receptors within 0.5 Mile of L5302, L5280, L5381, and L5116 of the Eastern Transmission Corridor

Visual Receptor Type	Alternative A – L5302, L5280, L5381, and L5116
Business	7
Church	7
Farm Buildings	7
Industrial	214
Residential	271
School	0
Campground/Sports Field	0
Vacant Buildings (garage/shed)	195
Unknown	121
Total	**822**

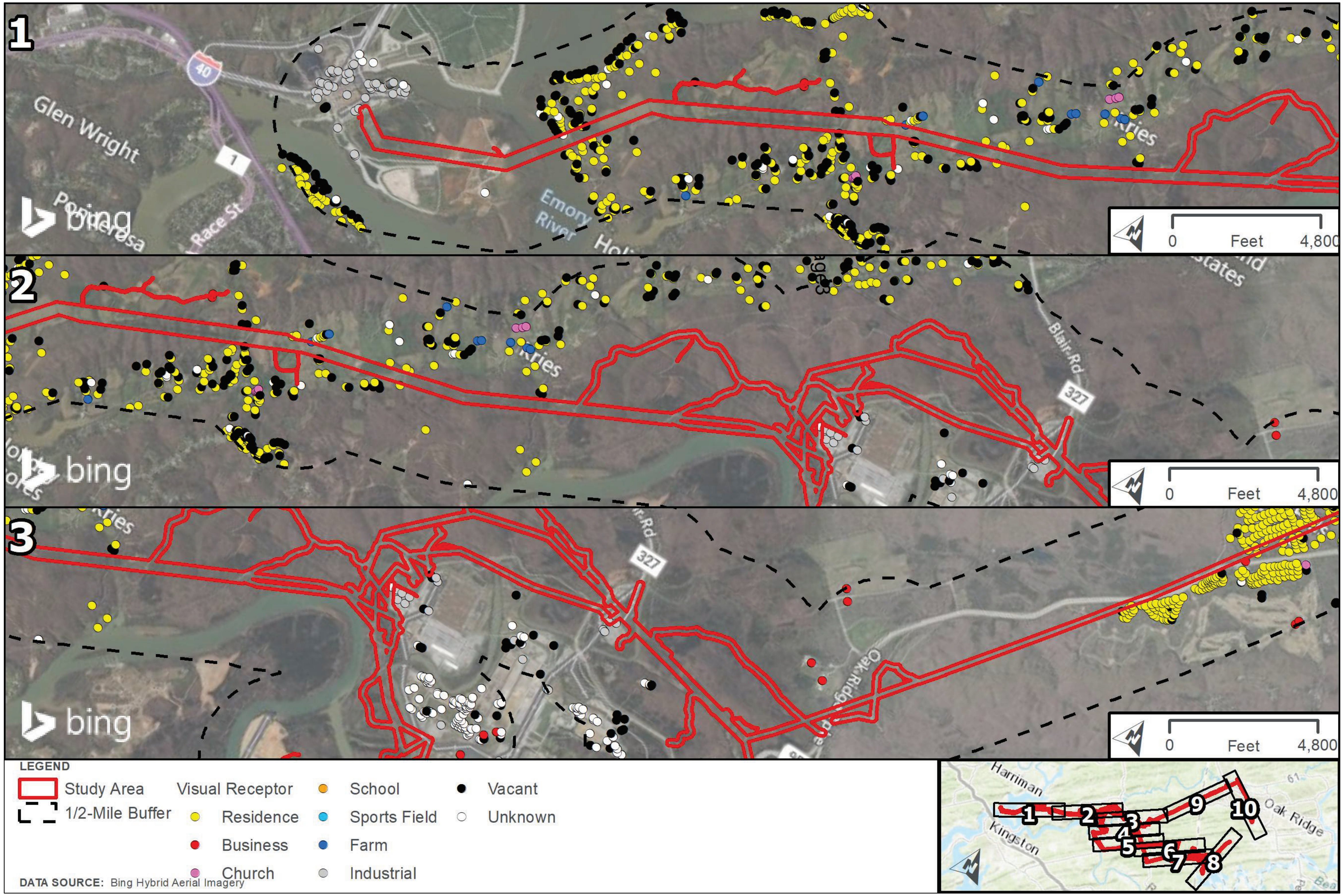

Figure 3.18-2a. Eastern Transmission Corridor Visual Receptors

Figure 3.18-2b. Eastern Transmission Corridor Visual Receptors

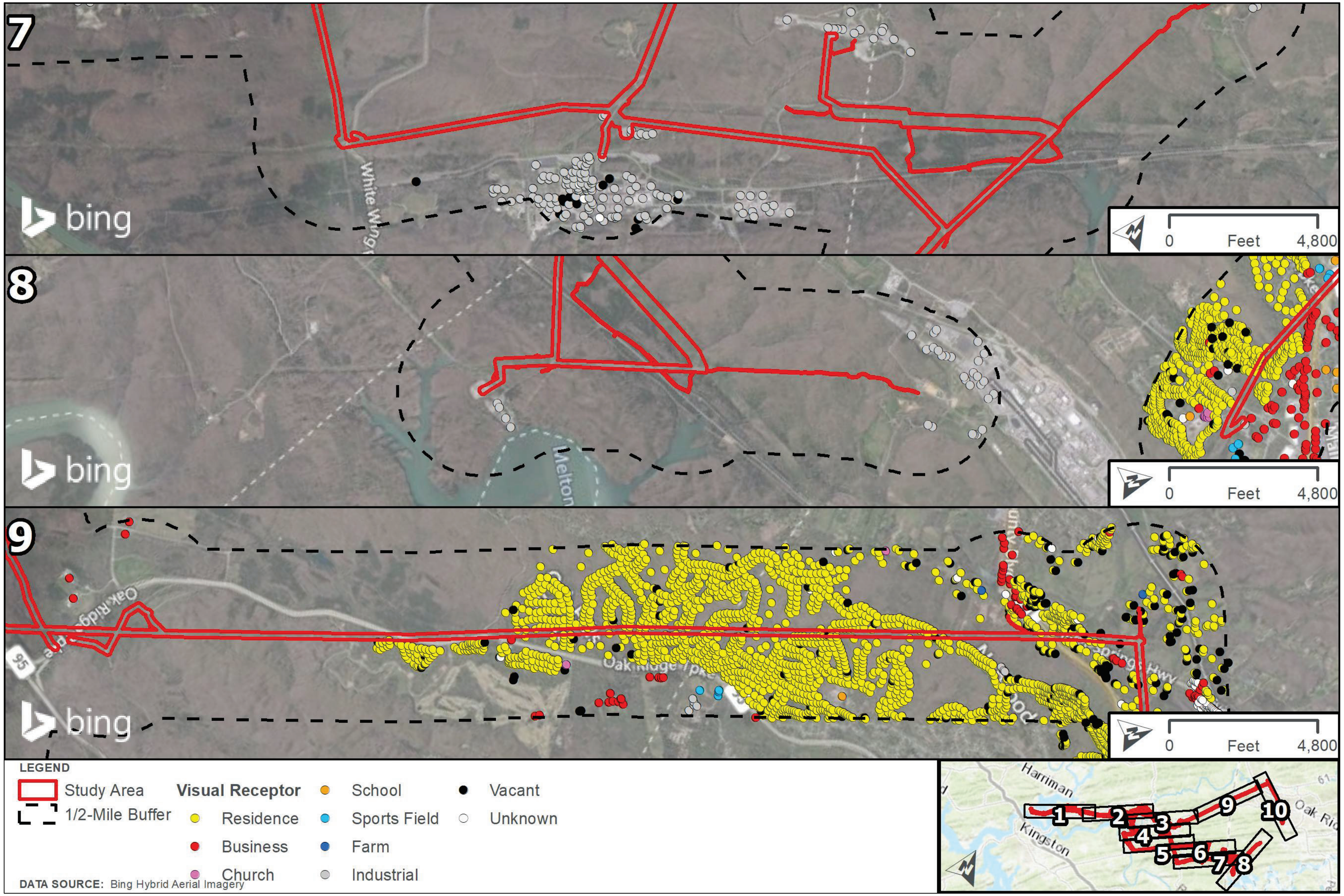

Figure 3.18-2c. Eastern Transmission Corridor Visual Receptors

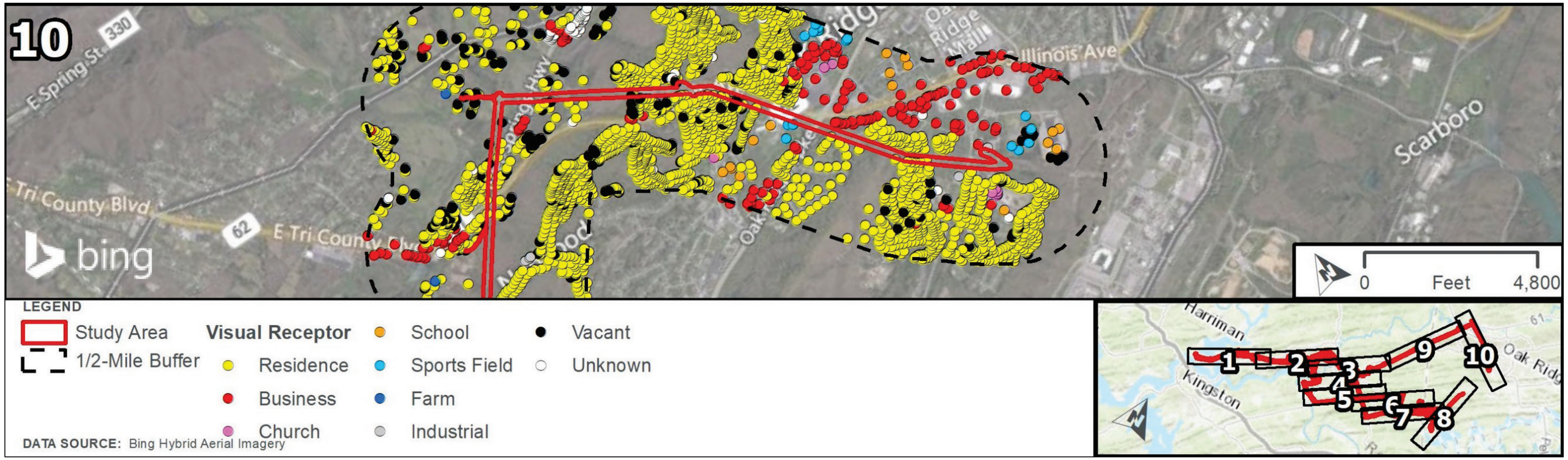

Figure 3.18-2d. Eastern Transmission Corridor Visual Receptors

3.18.1.2.5.2 Western Transmission Corridor

The viewshed of the Western Transmission Corridor varies at different points, with the surrounding area consisting of forest and pastureland. There are a total of 516 visual receptors within 0.5 mile of the Western Transmission Corridor, most being residences, farm buildings, and vacant buildings. The total number of receptors within 0.5 mile of the Western Transmission Corridor and their classifications can be seen in Table 3.18-4 and Figure 3.18-3. Some of the receptors identified within this section may be out of the line of sight due to changes in vegetation, air quality, or angles that were not accounted for in this analysis.

Table 3.18-4. Noise Receptors Within 0.5 Mile of L5383 of the Wester Transmission Corridor

Visual Receptor Type	Alternative A – L5383
Business	37
Church	5
Farm Buildings	78
Industrial	1
Residential	329
Vacant Buildings (Garage/Shed)	66
Total	**516**

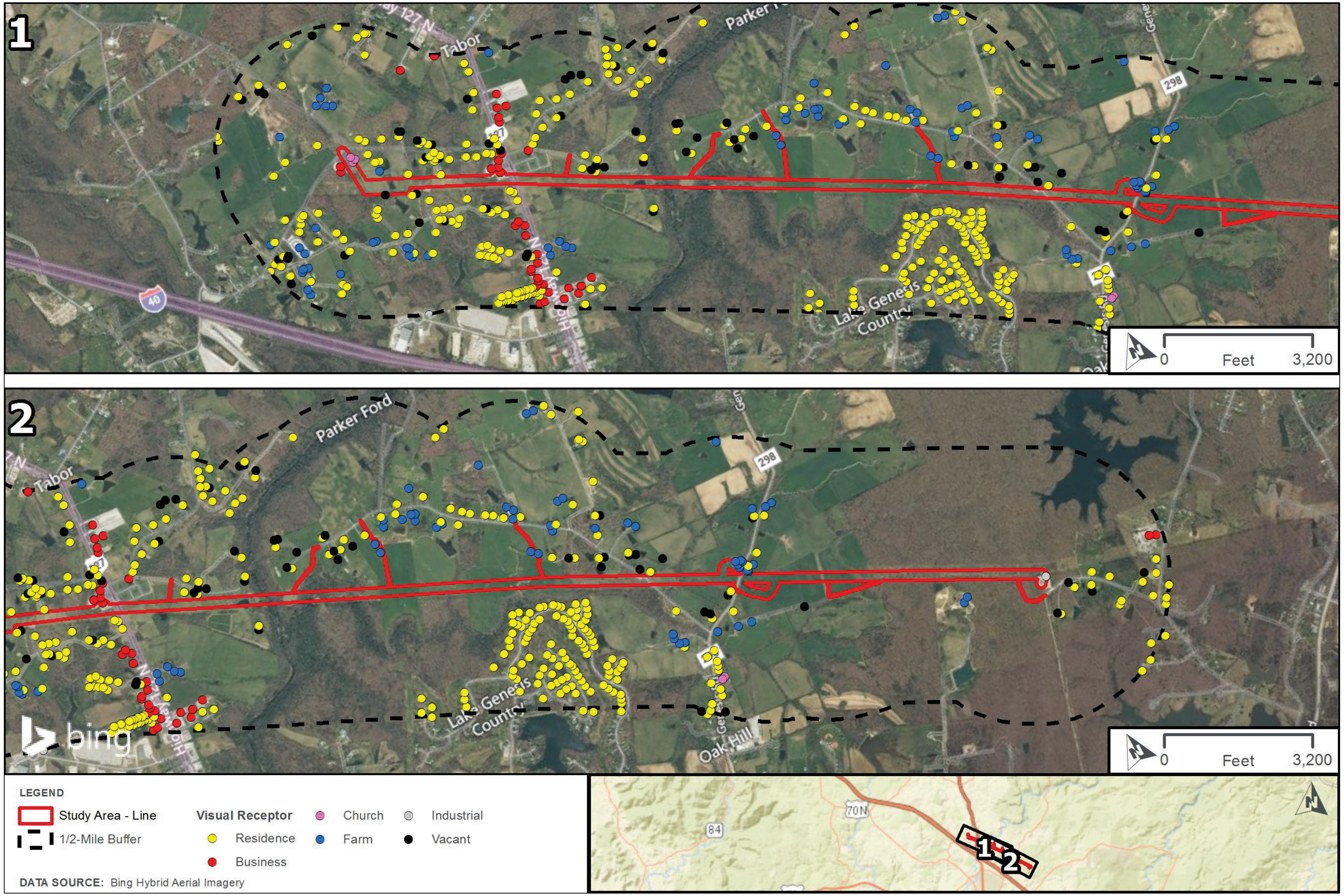

Figure 3.18-3. Western Transmission Corridor Visual Receptors

3.18.1.2.6 Construction and Operation of a Natural Gas Pipeline
No special or unique features or viewsheds have been identified to date within the ETNG Construction ROW (ETNG 2023i). As part of this review, TVA also conducted a desktop review of the natural gas pipeline using a 200-foot buffer, hereafter referred to as TVA's Expanded Construction ROW. A total of 1,110 visual receptors were identified within TVA's Expanded Construction ROW, most consisting of residences and vacant buildings. The total number of visual receptors within the corridor and their classifications can be seen in Table 3.18-5 and Appendix H.

ETNG's Resource Report 8 (ETNG 2023i), which was filed with FERC in July 2023 (ETNG 2023a), present the visual-related findings of ETNG's analyses. This FEIS has been updated based on ETNG's application and resource reports (ETNG 2023a-m) and subsequent filings by ETNG with FERC from October through December 2023 (ETNG 2023n-q). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. Visual receptors within the ETNG Construction ROW are discussed in ETNG's Resource Report 8 (ETNG 2023i). Pertinent excerpts from the report are provided below:

> Construction of the Hartsville Compressor Station will occur in a rural area that is characterized by a mix of open, agricultural, and forested lands. There are no designated scenic features within view of the compressor station. […] The Columbia Gulf M&R Station will be in a rural area with few nearby residences. […] The Harriman Crossover Site will be located in a rural area with few nearby residences and in forested lands.

Table 3.18-5. Pipeline Visual Receptors Identified Within TVA's Pipeline Study Area Under Alternative A

Visual Receptor Type	Alternative A – Pipeline
Business	38
Church	9
Farm	35
Industrial	10
Residential	511
Sports Field	1
Unknown	31
Vacant	475
Total	**1110**

3.18.1.3 Alternative B

3.18.1.3.1 East Tennessee TVA Power Service Area
Solar and storage facilities sites would likely be in agricultural, rural, and/or undeveloped areas within portions of East TN, with common scenic attractiveness and varying levels of scenic integrity. The affected environment of visual resources would be more fully addressed for each solar and storage facility under future NEPA reviews.

3.18.2 Environmental Consequences

3.18.2.1 The No Action Alternative
Under the No Action Alternative, TVA would continue to operate the KIF Plant. TVA would implement all the planned actions related to the current and future management and storage of CCRs at the fossil plants, which have either been reviewed or would be in subsequent NEPA

analyses. Under this alternative, the KIF Plant would continue to operate and none of the physical infrastructure currently at the site would change. The primary features in the visual environment, including the stacks, plant buildings, and connecting transmission lines leaving the plant site, would remain in place. Therefore, the overall scenic value class would remain in the range from poor within the plant facility to good in the surrounding area.

3.18.2.2 Retirement, Decommissioning, Decontamination, and Deconstruction of KIF Plant

All buildings, structures, conveyors, and silos associated with plant operations would be decontaminated and demolished to 3 feet below final grade. All below-grade building areas would be backfilled, and the site would be restored to grade, thereby changing the visuals in the Kingston Reservation. Demolition of the twelve stacks would cause a beneficial visual effect to receptors in the foreground, middleground, and background distance. Visibility of the remaining deconstruction actions is expected to be limited to receptors within the middleground and foreground viewing distances due to the screening effect of surrounding topography and vegetation. At the background distance, most of the deconstruction actions are not expected to be discernible due to the screening effects of terrain and overall distance, nor would they contrast with the overall landscape.

During the retirement and demolition of the KIF, there would be slight visual discord from the existing conditions due to an increase in personnel, cranes, and other tall and colorful equipment in the area. As potential visual disturbances would only be visible to a few people with nearby vantage points and due to the temporary nature of the activities, visual impacts during demolition of the outlying facilities would be considered insignificant.

There would likely be an increase in vehicular traffic along SR-109 during the hauling of material from the Kingston Reservation, which would be noticeable to residents in the area. Impacts from additional vehicular traffic are expected to be minor as the roads within the plant are already predominately used by employees and for industrial activity. This small increase in visual discord would be temporary and intermittent and only last until demolition activities are completed.

Nighttime lighting conditions would be expected to decrease minimally at completion of D4 activities. TVA would maintain the site until it is redeveloped at some time in the future, largely dependent on the alternative chosen. The KIF site would either be returned to grade and revegetated or repurposed into a different energy source depending on the alternative chosen. Should the site be returned to grade and revegetated, it would fold into the surrounding mixed landscape of trees and agriculture along the rivers.

3.18.2.2.1 Environmental Justice Considerations

Residences are not present on Kingston Reservation; however, EJ qualifying populations are present in the vicinity. Visual effects that would occur because of KIF retirement and D4 activities would be temporary, and minor, but are not anticipated to have disproportionate and adverse effects on EJ populations. If the site is returned to grade and revegetated it would not bring visual discord to the area due to the surrounding water and undeveloped areas.

3.18.2.3 Alternative A

3.18.2.3.1 Construction and Operation of a CC/Aero CT Plant and Switchyard on the Kingston Reservation

Visual impacts associated with the proposed CC/Aero CT Plant on the Kingston Reservation would likely be greatest during active construction as a result of construction equipment, personnel, and disturbed soil.

The new CC/Aero CT Plant and accompanying equipment would be industrial in appearance and visually similar to existing conditions in the current landscape. Proposed stack height is a function of air permit modeling and is not yet known; however, the proposed stacks would be no more than 199 feet high. The new stacks would likely be visible to rural residential receptors near the proposed plant site. With the exception of the stacks, visibility of the proposed CC/Aero CT Plant construction is expected to be limited to receptors within the middleground viewing distance due to the screening effect of surrounding topography and vegetation. At the background distance, the proposed actions are not expected to be discernible due to the screening effects of terrain and overall distance, nor would they contrast with the existing overall landscape. The new plant would be mainly seen by employees and facility operators, as well as motorists on the adjacent I-40. Border trees and hedges may be planted as needed, and existing border vegetation would be maintained. The facility proposed by Alternative A would be visually very similar to current conditions. The use of downward and inward facing lighting would help to minimize potential permanent visual impacts within the project site.

During the construction of the CC/Aero CT Plant, there would be slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. There would also be a likely increase in vehicular traffic in the area due to employee traffic. Barge and rail traffic would also likely increase during the hauling of material to and from the Kingston Reservation, which would be noticeable to residents in the area. Impacts from additional vehicular traffic are expected to be minor as the roads within the plant are already predominately used by employees and for industrial activity. This small increase in visual discord would be temporary and intermittent and only last until construction activities have been completed.

Mitigation measures to minimize visual impacts may include painting buildings a neutral color, utilizing forested buffers for screening, and limiting the height of facilities.

3.18.2.3.2 Construction and Operation of a 3- to 4-MW Solar Facility on Kingston Reservation

Visual impacts associated with the proposed solar facility on Kingston Reservation would likely be greatest during active construction as a result of construction equipment, personnel, and disturbed soil.

The construction and operation of a 3- to 4-MW solar facility on the existing coal yard could have a minor visual impact on nearby residential communities. During construction, the installation of solar panels on piles, as well as the installation of associated infrastructure, such as inverters, access roads, and a perimeter safety/security chain-link fence, may be visible from surrounding areas. This construction may be seen as disruptive to the natural landscape; however, the industrial nature of the facility would be similar to the existing surroundings within the Reservation and would not create significant discord. Mitigation measures would include designing and maintaining the facility at a low-profile, with the total height at less than 10 feet above ground.

3.18.2.3.3 Construction and Operation of a 100-MW BESS on Kingston Reservation

The construction and operation of a 100-MW BESS could have a minor visual impact on nearby residential communities. During construction, the installation of the battery storage units and associated infrastructure, such as breakers, switchgear, and one or more transformers, may be visible from surrounding areas. However, since the facility would be located on the Kingston Reservation, it would largely blend in with the existing infrastructure, minimizing the visual impact to nearby receptors.

Overall, the visual impact of the construction and operation of the BESS is likely to be minor compared to existing conditions, and it could be largely unnoticed by the nearby residential communities once operational. Mitigation measures to minimize visual impacts may include painting buildings a neutral color, utilizing forested buffers for screening, and limiting the height of facilities.

3.18.2.3.4 On-site Transmission Upgrades

Under Alternative A, TVA would make improvements to existing transmission lines within the Kingston Reservation, including new transmission line connections to the proposed CC/Aero CT facilities and switchyard. TVA would also install a new transmission line for the proposed battery facility. Alterations to transmission lines associated with Alternative A would primarily involve upgrades to existing facilities and are not expected to significantly affect the visual environment.

Visual impacts associated with the on-site transmission upgrade activities would likely be greatest during active construction for the upgrade activities as a result of construction equipment, personnel, and disturbed soil. The proposed transmission line for the battery facility is not anticipated to significantly affect the visual environment because many transmission lines already exist within the Kingston Reservation and is anticipated to blend in with the natural environment. Improvement of existing access roads or construction of new access roads may be necessary to maintain the improved transmission lines, but any construction would be temporary and intermittent in nature and would fold into the landscape of transmission lines already present.

3.18.2.3.5 Off-site Transmission Upgrades

Visual impacts associated with the off-site transmission upgrade activities would likely be greatest during active construction for the upgrade activities as a result of construction equipment, personnel, and disturbed soil.

Depending on access needs to the off-site transmission corridors, existing access roads may require modifications, such as brush clearing or tree trimming, to allow for passage of equipment and bucket trucks, which would impose temporary visual impacts during construction. Minor ground disturbance is expected in these areas, but if the ground is disturbed, the access road area would be revegetated using native, low-growing plant species after required transmission line upgrade work is completed.

Permanent adverse visual impacts would occur in areas where land uses are converted to maintained open space, as described in more detail in Section 3.10.1.2.6. Areas such as pasture, agricultural fields, or lawns would be returned to their former condition.

Architectural field surveys analyzed areas within a 0.5-mi buffer of the off-site transmission line corridors that were determined not to have a view of the Project Area due to terrain, vegetation, and/or intervening buildings and structures were considered outside the viewshed and excluded from the Architectural SA. Consideration of seasonal conditions, specifically the presence of deciduous trees and likelihood of visibility of the Project Site during winter months, were considered during the field survey before eliminating a building from the viewshed and Architectural SA.

3.18.2.3.6 Construction and Operation of a Natural Gas Pipeline

ETNG's Resource Report 8 (ETNG 2023i) was filed with FERC in July 2023 (ETNG 2023a). This FEIS has been updated based on ETNG's application and resource reports (ETNG 2023a-m) and subsequent filings by ETNG with FERC from October through December 2023 (ETNG 2023n-q). This information has been reviewed by TVA to support a thorough and independent evaluation of the affected environment. TVA concurs with the visual resource-related findings in ETNG's Resource Report 8. Visual impacts associated with the pipeline would likely be greatest during active construction as a result of construction equipment, personnel, and disturbed soil. Permanent visual changes associated with pipeline installation typically include the cleared permanent ROW in wooded areas and the installation of pipeline markers. Aboveground facilities would also incur permanent adverse impacts. Approximately 113 of the 122 miles of the proposed pipeline would be co-located with the existing 3100 Line ROW, which reduces visual discord and the acreage of wooded areas that would be cleared, as the 3100 Line ROW is already maintained open space.

Construction and operation of the new compressor station and solar farm would represent a permanent impact on viewshed. The compressor station and solar farm may have visual impacts, depending on the visual character of the location they are sited in. If sited in an agricultural or rural area, there would be a permanent, adverse impact due to the introduction of industrial elements. Solar facility components are typically low profile, except for taller structures supporting electrical lines that connect the facilities to existing nearby transmission lines. These sites would likely be enclosed by security fencing and night-lighting is typically motion-activated. Where visual impacts are identified as a concern during facility design, or as required by ordinances in some communities, the facilities may be screened by planted trees and shrubs and/or constructed berms. Mitigation measures that could be implemented to minimize visual impacts include painting buildings a neutral color, utilizing forested buffers for screening, and limiting the height of facilities.

ETNG's Resource Report 8 (ETNG 2022i), which TVA has independently reviewed and agrees with, provides:

> Visual impacts associated with the permanent operation of the […] pipeline will […] be minimal to surrounding landowners.
>
> […]
>
> Construction and operation of the Hartsville Compressor Station is not expected to have a significant effect on visual resources due to the presence of existing vegetative screening between compressor facilities as well as the topography of the site. In addition, [ETNG] will, if possible, preserve existing trees along the compressor station property boundary abutting existing roadways to provide screening and minimize potential visual effects. Maintenance of a vegetated buffer along roadways should aid in screening views of the site from points along the roadways and nearby residences.
>
> [ETNG] will paint the compressor station buildings a neutral color to match the surrounding landscape. Lighting will be required for safe operation of the facility at night but will be the minimum required. At a minimum, lighting shall comply with Occupational Safety and

> Health Administration regulations. In addition, lighting will be installed around critical equipment to provide a minimum of 3 foot-candles at 3 feet above grade. Twenty-five-foot-high crank down poles are required. Additional outdoor lighting shall be used over all doors, e.g., under buildings' eaves and above each personnel door. Photocells will be used to automatically switch on during nighttime. A photocell bypass switch will be installed to allow manual operation of lighting by operators. Area flood lights will be hooded and directed 45 degrees downward. Building (indoor) lighting levels will be in accordance with applicable codes and standards. Equipment area lighting will be a minimum of 30 foot-candles at 3 feet above the floor. Office area lighting will be a minimum of 50 foot-candles at 3 feet above the floor. Emergency lighting levels will be in accordance with applicable codes and standards, but no less than 1 foot-candle at 3 feet above the floor. Lastly, lighting design will adhere to the dark sky compliance lighting if required.
>
> […] The M&R Station could be visible in a cleared access road corridor from Bass Road. Existing vegetation will be maintained as practicable to screen views of the station from all but a small portion of Bass Road. Existing vegetation will be maintained as practicable to screen views of the station from all but a small portion of Bass Road. Visual screening is not proposed at the Columbia Gulf M&R station. [ETNG] will evaluate the need for additional screening measures once the nearby residential development is completed.
>
> […] The Harriman Crossover Site […] may be visible though a tree line from Morgan County Highway. A vegetation buffer will be maintained as practicable to screen views of the station from Morgan County Highway.
>
> Modifications to the existing Texas Eastern and Midwestern Gas M&R Stations site will occur within and adjacent to the existing site; no impacts to aesthetics are anticipated.
>
> The [Ridgeline Expansion] project MLVs will be small facilities located within the permanent ROW. The MLVs would generally be unobtrusive because they are small in scale. The two new crossover sites will be located adjacent to the permanent ROW and will consist of small aboveground appurtenances surrounded by a chain link fence. There would be no significant effect to visual resources from the operation of the MLVs or crossover sites. No impacts to aesthetics are anticipated (ETNG 2022i).

3.18.2.3.7 Summary of Alternative A

TVA Proposed Actions

Most of the D4 actions are not expected to be discernible due to the screening effects of terrain and overall distance, nor would they contrast with the overall landscape. The proposed CC/Aero CT Plant would generally be absorbed by surrounding industrial components and would become visually subordinate to the overall landscape character associated with the plant site. While most of the off-site transmission lines would not be visible once operational, based on TVA's desktop review of the corridors, there would be permanent visual effects due to the conversion of forest to fields. Permanent visual effects would occur as a result of the construction of the CC/Aero CT Plant and accompanying equipment and areas along transmission lines where forestland is converted to maintained open space. Where mitigation is necessary due to adverse visual impacts, fencing and vegetative screening would be utilized. Overall, the construction of Alternative A would largely blend in with the existing industrial environment and would not create significant visual discord.

ETNG Proposed Actions – Natural Gas Pipeline and Associated Structures

While most of the proposed pipeline would not be visible once buried and operational, based on the desktop review of TVA Expanded Construction ROW, there would be permanent visual effects due to the conversion of forest to fields. Permanent visual effects would occur as a result of the construction of the aboveground natural gas structures and areas along the pipeline and ROWs where forestland is converted to maintained open space. Where mitigation is necessary due to adverse visual impacts, fencing and vegetative screening would be utilized. Overall, the construction of Ridgeline Expansion Project would largely blend in with the existing industrial environment and would not create significant visual discord.

3.18.2.3.8 Environmental Justice Considerations

TVA Proposed Actions

This alternative would match the previous industrial landscape and not cause significant visual discord. Therefore, visual effects that would occur as a result of the proposed CC/Aero CT Plant are anticipated to be minor and not disproportionate and adverse to EJ populations.

ETNG Proposed Actions - Natural Gas Pipeline and Associated Structures

Construction of the proposed natural gas pipeline and associated structures would result in moderate permanent visual effects due to the creation of new and widening of the existing combined utility corridor, thus, resulting in conversion of contiguous forest to herbaceous fields. Construction of pipeline components would occur where EJ populations are located. TVA has assessed these impacts to be moderate and permanent for vegetation clearing activities, therefore identified EJ populations are expected to experience disproportionate and adverse visual effects.

3.18.2.4 Alternative B

3.18.2.4.1 Construction and Operations of Solar and Storage Facilities

The construction of the proposed solar and storage facilities would result in localized visual impacts as they would introduce industrial elements onto sites that are typically relatively flat and largely cropland, pasture, and/or hayfields. The solar and storage facility components are typically low profile and less than 25 feet tall, except for taller structures supporting electrical lines that connect the facilities to existing nearby transmission lines. The solar facility sites are typically replanted with grasses and other low vegetation following construction, and low-profile vegetation is maintained during operation by periodic mowing or grazing. The solar and storage facility sites are enclosed by security fencing and any night-lighting is typically motion-activated. Where visual impacts are identified as a concern during facility design, or as required by ordinances in some communities, the facilities may be screened by planted trees and shrubs and/or constructed berms. Detailed analyses of visual impacts would occur for each solar or BESS site under future NEPA reviews.

Cumulative visual impacts would occur if Alternative B was combined with the 10,000 MW expansion of solar targeted by TVA, which would create permanent, cumulative increases in viewshed changes in the region. Cumulative impacts would be minimized through proper siting, setbacks, visual screening and buffers, and lighting.

3.18.2.4.2 Transmission and Other Components

Construction of transmission line upgrades associated with solar and BESS sites would result in temporary, minor visual impacts related to construction and construction-related traffic. The construction of new transmission lines would have the potential to result in moderate adverse visual impacts, resulting in a prominent cleared corridor if the line would cross forested areas that would stay intact throughout operation. The transmission line may be visible at foreground, middleground, and background distances, depending on the extent of vegetation and topography.

During the construction of the transmission lines and other electrical system components, there would be slight visual discord from the existing conditions due to an increase in personnel and equipment in the area. This small increase in visual discord would be temporary and intermittent and only last until construction activities have been completed.

3.18.2.4.3 Environmental Justice Considerations

Visual effects that would occur as a result of the proposed solar facilities and transmission line activities are anticipated to be minor and limited to receptors within the viewshed of the solar facilities. For the transmission corridors, the effects would last throughout the operations stage of these transmission lines. Detailed EJ analyses would be conducted to evaluate potential EJ impacts for each solar facility and transmission line activity under future NEPA reviews.

3.19 Unavoidable Adverse Environmental Impacts

Unavoidable adverse effects can be described as the effects of the proposed action on natural and human resources that would remain after mitigation measures or BMPs have been applied. Effects associated with the retirement and deconstruction of the KIF Plant, the construction and operation of the proposed CC/Aero CT Plant, switchyard, on-site solar and battery storage, and natural gas pipeline (Alternative A) or solar and storage facilities (Alternative B) and associated transmission line upgrades and new connections have the potential to cause unavoidable adverse effects to natural and human environmental resources. TVA has reduced the potential for adverse effects through appropriate planning in designing replacement generation facilities. In addition, TVA would implement mitigation measures (see Section 2.3) to further reduce potential adverse effects to certain environmental resources.

The replacement generation alternatives would result in the permanent conversion of undeveloped land into an industrial use. The new pipeline built by ETNG and new transmission lines or connections would also convert forest and agricultural land into cleared, maintained corridors. Land that was previously unforested open space would be returned to its previous use.

3.19.1 Alternative A

Under Alternative A, the construction of replacement generation would also result in minor adverse effects to surface water and wetland resources. These effects would be mitigated through adherence to permit requirements and the provision of appropriate compensatory mitigative measures, if needed. The proposed natural gas pipeline would likely avoid and/or greatly minimize the potential for surface water impacts to some of these features by boring or drilling (HDD) beneath them. Temporary effects to water quality from runoff during construction, as well as ongoing vegetation maintenance along the pipeline and transmission lines, could affect nearby receiving water bodies but would be minimized with application of appropriate BMPs.

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 affect on-site workers, users of adjacent recreational lands and water bodies, and residents located near the off-site transmission line segments and natural gas pipeline. Potential noise effects also include traffic noise associated with the construction workforce traveling to and from the site. Emissions from construction activities and equipment would be minimized through implementation of BMPs, including proper maintenance of construction equipment and vehicles. Populations occurring near the Kingston Reservation and the pipeline and other aboveground structures associated with Alternative A may experience some adverse effects from temporary and minor construction-related increases in air emissions, dust, noise, transportation, or waste generation; while temporary and minor, these adverse effects may disproportionately impact qualifying EJ populations (low-income and minority populations).

TVA consulted with SHPO regarding its finding that its undertaking would not result in adverse effects to cultural resources for Alternative A. SHPO concurred, and none of the consulted tribes objected or identified resources of concern. While the retirement and deconstruction of the KIF plant, proposed replacement generation, and associated transmission line infrastructure would not result in adverse effects to cultural resources, associated pipeline infrastructure may result in adverse effects and require development of mitigation measures through Section 106 consultation.

Temporary increases in traffic would be minimized or mitigated by specific measures designed to address traffic flow issues, if necessary. Temporary increases in health and safety risks would be minimized by implementation of the project health and safety plan. Construction and operation would have minor, localized effects on soil erosion and sedimentation that would be minimized by using appropriate BMPs through the establishment and maintenance of stream and wetland buffers, soil stabilization, and vegetation management measures.

3.19.2 Alternative B

Construction of the proposed solar facilities under Alternative B would be subject to CWA Section 404/401 permitting, as typical solar developments can result in unavoidable adverse impacts to waters of the U.S, as indicated in Table 3.2-1. Any unavoidable permanent effects would be mitigated through adherence to permit conditions in authorizations issued under an approved CWA permit authorization. Alternative B would result in the conversion of largely agricultural land to industrial use, although livestock grazing is likely occurring now on at least some of the solar facility sites (Table 3.2-1). Revegetation of solar sites with native and/or non-invasive grasses and herbaceous vegetation would help minimize effects to open, grassy habitats.

These habitat alterations would result in effects to localized plant communities and wildlife habitat on the affected lands. However, due to the abundant habitat of similar quality within the vicinity of the project sites, the overall effect to vegetation and wildlife is considered minor. Effects to federally listed endangered and threatened species would be mitigated in consultation with the USFWS. When actions fall under those addressed in TVA's Programmatic Consultation with USFWS addressing routine actions and federally listed bats, project-specific Conservation Measures would be identified on TVA's Bat Strategy Form, which is included in Appendix B. These Conservation Measures would minimize effects to federally listed bats. TVA and developers under power purchase agreements would also employ avoidance measures to avoid significant effects to any state-listed plants and any previously undocumented populations of federally or state-listed species identified during future surveys.

TVA would seek to avoid any potential adverse effects on any NRHP-listed or eligible archaeological sites or historic architectural properties in the affected area for Alternative B. If adverse effects could not be avoided, TVA would seek, in consultation with TN SHPO and federally recognized Indian tribes, ways to avoid or minimize the adverse effects. If unavoidable, adverse visual effects to historic architectural resources could be mitigated through wooded buffers. Adverse direct effects to archaeological sites could be mitigated through Phase III archaeological investigations. Given the large area of the potential solar developments, there is the possibility of multiple TCPs. To fulfill its obligations under Section 106 of the NHPA, if adopting Alternative B, TVA would consult with TN SHPO on specific effects of individual solar projects on cultural resources.

There is the potential for cumulative effects to cultural resources from Alternative B and from those associated with the expansion of 10,000 MW of solar facilities targeted by TVA. Cumulative effects would be minimized through siting and avoidance of NRHP-listed or eligible sites, consultation with TN SHPO, and mitigation measures.

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

NEPA requires a discussion of the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. This EIS focuses on the analyses of environmental effects associated with the retirement, decommissioning, and deconstruction of the existing KIF plant, and replacement of power generated through construction of a CC/Aero CT Plant on the Kingston Reservation (Alternative A) or construction of solar and BESS facilities (Alternative B), as well as associated off-site natural gas pipelines and transmission line upgrades. 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 plants and associated infrastructure. This section includes an evaluation of the extent to which the short-term uses preclude any options for future long-term use of the project sites.

All buildings and structures within the proposed KIF plant demolition (D4) boundary would be decontaminated and demolished to grade. In the long-term, the site could become productive if commercial or industrial facilities were to be established, thereby producing employment opportunities and tax revenue and enhancing long-term productivity of the site.

Construction of the replacement generation CC/Aero CT Plant, switchyard, and associated pipelines, and transmission line upgrades would cause a minor, short-term deterioration in existing air quality during construction. These effects would be mitigated through implementation of mitigative measures to reduce emissions from construction phase equipment and minimize emissions of fugitive dust. All of the action alternatives would result in a long-term beneficial effect on air quality and GHG emissions. Therefore, there would be no effect on the enhancement of long-term productivity related to air quality or climate change following decommissioning of the KIF plant.

Construction of the proposed CC/Aero CT Plant, including the new switchyard, natural gas pipeline, and associated structures and transmission line upgrades (Alternative A) would reduce the long-term productivity of the land for other purposes while these facilities are in operation. The proposed generation facility is located on an existing TVA reservation and the 3- to 4-MW solar facility would be located on the site of the existing KIF coal yard. The project area includes similar vegetation and habitat types; therefore, the short-term disturbance to support plant operations is not expected to significantly alter long-term productivity of wildlife, agriculture, or other natural resources. After decommissioning, the lands could be reused and made available for other uses.

Constructing solar facilities (Alternative B) would affect short-term uses of the project sites by converting them from agricultural and forested land uses to solar power generation. The effects on long-term productivity would be minor, as existing land uses could be readily restored on the sites following the decommissioning and removal of the solar facilities.

3.21 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 projects 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.

Resources required by decontamination and deconstruction activities, including labor and fossil fuels, would be irretrievably lost. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline and diesel-powered equipment during construction. However, it is unlikely that their limited use in these projects would adversely affect the overall future availability of these resources.

The land used for the proposed CC/Aero CT Plant (Alternative A), or solar/storage plants (Alternative B) and associated infrastructure, is not irreversibly committed because once the facilities cease operations and are decommissioned, the land supporting the facilities could be returned to other industrial or nonindustrial uses. The ROW used for the natural gas pipeline would constitute an irretrievable commitment of on-site resources, such as wildlife habitat and forest resources, for the length of time the pipeline is in place. However, the approximate previous land use and land cover could be returned upon retirement. In the interim, compatible uses of the ROW could continue.

Operation of the CC/Aero CT Plant would result in the irretrievable loss of natural gas and fuel oil, which would be used to fuel the CC/Aero CT Plant. 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 at this time and their use would not have an adverse effect upon continued availability of these resources.

The implementation of Alternative B would involve irreversible commitment of fuel and resource labor required for the construction, maintenance, and operation of the solar and BESS facilities. Because removal of the solar arrays and associated on-site infrastructure could be accomplished rather easily, and the facilities would not irreversibly alter the site, the project sites could be returned to their original condition or be used for other productive purposes once the solar facility is decommissioned. Most of the solar facility components could also be recycled after the facility is decommissioned.

CHAPTER 4 – SUBMITTED ALTERNATIVES, INFORMATION AND ANALYSES

4.1 Submitted Alternatives, Information and Analyses

4.1.1 Scoping Period

The draft EIS includes a summary that identifies all alternatives, information and analyses submitted by State, Tribal, and local governments, in Section 1.6.2, and other public commenters during the scoping process for consideration in developing the draft EIS (40 CFR 1502.17). During the scoping period, the Southern Environmental Law Center (SELC) recommended that in addition to the alternatives proposed in the Scoping Report, the EIS should include these alternatives:

- Distributed solar;
- Onshore wind;
- Demand response and energy efficiency;
- Blended solar (distributed and utility-scale), onshore wind, energy efficiency, demand response, and battery storage; and
- Purchased carbon-free power.

TVA's 2019 IRP (TVA 2019a) included an evaluation of these proposed alternatives, including distributed solar, onshore wind, and demand response and energy efficiency. The target power supply mix adopted from the IRP optimizes each of these resource generation types. The Alternatives selected for consideration in this EIS are one aspect of the overall asset strategy that resulted from the IRP. Alternative B evaluates the potential for at least 1,500 MW of utility-scale solar and 2,200 MW of energy storage facilities. This 1,500 MW would be in addition to the approximately 10,000 MW of solar additions by 2035 that is currently included in TVA's long-term plans. Section 2.1 provides additional information related to the proposed alternatives.

Additionally, SELC requested that TVA:

- Accurately quantify the GHG emissions of any proposed gas plants using the Social Cost of Carbon.
- Use appropriate tools to fairly identify EJ populations and assess the potential for disproportionate harm to specific communities.

TVA has quantified the GHG emissions and performed a comparative assessment of the social cost of carbon based on the GHG emissions estimated under each of the alternatives. These analyses and resulting social costs of carbon include results of an alternative-specific lifecycle analysis (LCA), which is provided as Appendix I.

This EIS provides in Section 3.4 a detailed explanation of the methodology and tools used to acquire, analyze, and summarize available public information to identify the presence and location of EJ populations. These data were then used to evaluate the potential for identified EJ populations to experience disproportionate and adverse effects anticipated under each alternative and summarized in the Environmental Justice Considerations section for resource areas with anticipated effects. Conclusions of the EJ analyses are presented in Table 3.4-17.

4.1.2 Cooperating Agency Comments and Input for the Draft EIS

During the public scoping period, NPS submitted with their comments a request to be a cooperating agency on the EIS. Subsequently, TVA submitted an invitation to participate as a cooperating agency to the USEPA. TVA received a letter from USEPA on March 6, 2023, accepting TVA's invitation to participate as a cooperating agency. As such, USEPA and NPS personnel participated in preliminary reviews of the draft EIS and provided comments to TVA; those comments were reviewed and incorporated, where appropriate, and summarized along with TVA's responses in Comment Response Tables provided in Appendix L. These cooperating agencies also provided comments on the Draft FEIS and TVA's responses to these comments are provided in separate Comment Response Tables in Appendix L.

4.1.3 Public Comments on the Draft EIS

Additionally, the four studies listed below were submitted to TVA during the public comment period on the draft of this EIS:

- Synapse Energy Economic Inc. (Synapse) report, "Clean Portfolio Replacement at Tennessee Valley Authority: Economic and Emissions Benefits for TVA Customers" (Synapse 2022). Submitted by Southern Environmental Law Center (SELC). From EPA: "The Synapse report transparently lays out important modeling approaches and cost, emissions and other input data. They also explore hybrid options that offer lower costs and better environmental results. Ideally, the FEIS would be equally transparent so readers can compare input assumption and modeling results, including results about costs and environmental impacts."
- Synapse report, "TVA's Clean Energy Future: Charting a Course to Decarbonization in the Tennessee Valley" (March 8, 2023).
- The Howard H. Baker Jr. Center for Public Policy, "Ensuring Natural Gas Capacity to Meet Tennessee's Economic Development Needs". Prepared for the TN State Energy Policy Council by Matthew N. Murray, PhD | Senior Fellow (Howard H. Baker Jr. Center for Public Policy 2022).
- Michael Goggin, Grid Strategies, LLC, Critique of TVA's Alternatives Analysis in the Utility's "Kingston Fossil Plant Retirement, Draft Environmental Impact Statement" (July 3, 2023) (Goggin 2023). Submitted by SELC.

TVA reviewed the reports by the Howard H. Baker Jr. Center for Public Policy and the two Synapse Energy Economic Inc. reports identified above and responses to these reports, as appropriate, are included in the responses to comments received on the DEIS, provided in Appendix D.

As part of the FEIS for TVA's Cumberland Fossil Plant Retirement Project (TVA 2022g), TVA contracted Concentric Energy Advisors (Concentric) to assess the submitted Grid Strategies (Goggin 2023), Synapse (2022), and Applied Economics Council reports (Southern Environmental Law Center [SELC] 2023). The Concentric analysis and conclusions are provided in Appendix M. The Cumberland Fossil Plant Concentric report concludes for the Grid Strategies Report:

- TVA's board-approved 2019 IRP serves as a solid basis and analytic framework for future TVA resource decisions.
- The Cumberland retirement project represents an early step of a broader strategic plan.

- Long-term resource plans that do not include natural gas generation rely on overly optimistic assumptions.
- The use of near-term combined cycle generation deployments establishes a solid foundation for aggressive renewable energy deployment.
- As such, Concentric concluded that selection by TVA of its preferred alternative, Alternative A, would represent a practical and reasonable alternative and near-term implementation plan.

Further, TVA contracted Concentric to assess the Grid Strategies (Goggin 2023), Synapse (2023), and Applied Economics Council (SELC 2023) reports as part of this EIS. The Concentric analysis and conclusions are provided in Appendix N. The Concentric report concludes for the reports analyzed:

- The Concentric report confirms the reasonableness of TVA’s identification of Alternative A as the preferred alternative. The report concludes that Alternative A is predicated on a robust planning process and consistent with the target supply mix in the 2019 IRP.
- The Grid Strategies report relies on selective and inconsistent assumptions such as using winter capacity ratings that are out of line with industry planning parameters, and employs assumptions about wind, energy efficiency, transmission costs, and timing that are overly optimistic and inconsistent with industry observations. Further, the Grid Strategy report fails to recognize that the near-term deployment of natural gas generation provides a solid foundation for aggressive renewable expansion.
- Contrary to Applied Energy Clinic’s contention, the 2019 IRP continues to be valid for evaluating resource additions and retirements. The 2019 IRP serves as a flexible roadmap, offering a framework for informed decision-making while allowing adjustments in response to evolving factors.

CHAPTER 5 – LIST OF PREPARERS

5.1 NEPA Project Management

5.1.1 TVA Project Management

A. Chevales Williams

Education:	B.S. Environmental Chemical Engineering
Project Role:	TVA NEPA Project Manager
Experience:	17 years of experience in water quality monitoring, permitting and compliance; 14 years in NEPA planning and environmental services

Ashley Pilakowski

Education:	B.S., Environmental Management
Project Role:	Assistant TVA NEPA Project Manager
Experience:	12 years in environmental planning and policy and NEPA compliance

Emily Willard

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

5.1.2 HDR Project Management

Steve Rowe

Education:	M.S., Environmental Sciences; B.S., Biology
Project Role:	QAQC and Technical Advisor for Proposed Pipeline
Experience:	35 years in permitting and NEPA Compliance in the energy industry

Misty Huddleston, PhD

Education:	Ph.D., Natural Resources, M.S. and B.S., Wildlife and Fisheries Sciences
Project Role:	HDR Environmental Planning and NEPA Lead, Project Manager
Experience:	17 years in environmental permitting and NEPA compliance

Blair Wade

Education:	M.E.M., Environmental Management; B.S., Integrated Sciences and Technology (Environmental Science and GIS)
Project Role:	HDR Principal in Charge, QAQC and Technical Advisor
Experience:	18 years in environmental permitting and NEPA compliance

Gracelyn Jones

Education:	B.A. Environmental Sociology
Project Role:	Assistant Project Manager, Land Use, Recreation, Visual Resources, Utilities, Noise, Public & Occupational Health and Safety, Transportation
Experience:	5 years technical writing, 3 years NEPA compliance

Michael Bell

Education:	M.S., Marine Biology
Project Role:	Assistant Project Manager, Senior Environmental Scientist
Experience:	12 years in environmental assessment, permitting, and compliance

5.2 Other Contributors

5.2.1 TVA Contributors

Steve Cole
Education: PhD, Anthropology; MA, Anthropology; and BA, Anthropology
Project Role: Cultural Resources
Experience: 32 years in Archaeology and Cultural Resources Management

Elizabeth B. Hamrick
Education: M.S., Wildlife and Fisheries Science and B.A. Biology
Project Role: Terrestrial Ecology (Animals), Terrestrial Threatened and Endangered Species
Experience: 17 years conducting field biology, 12 years technical writing, 8 years compliance with NEPA and ESA

M. Hunter Reed
Education: M.B.A.; B.S.B.A., Finance and Management of Information Systems
Project Role: Resource Planning & Strategy
Experience: 10 years TVA experience in resource planning and IT systems engineering

Carrie Williamson, P.E., CFM
Education: B.S. and M.S. Civil Engineering
Project Role: Floodplains and Flood Risk
Experience: 10 years in Floodplains and Flood Risk; 3 years in River Forecasting; 11 years in Compliance Monitoring

Fallon Parker Hutcheon
Education: M.S., Environmental Studies; B.S., Biology
Project Role: Wetland Biologist
Experience: 4 years in wetland delineation, wetland impact analysis, and NEPA and CWA compliance

Craig L. Phillips
Education: M.S., and B.S., Wildlife and Fisheries Science
Project Role: Aquatic Biologist / Aquatic Ecology; Threatened and Endangered Aquatic Animals; Document Review
Experience: 15 years Sampling and Hydrologic Determinations for Streams and Wet-Weather Conveyances; 10 years in Environmental Reviews

Anita Masters
Education: NEPA Project Manager, NEPA Coordinator, NEPA
Project Role: Compliance, Document Preparation, and Technical Editor
Experience: 34 years in Project Management, Managing and Performing NEPA Analyses; ESA Compliance; CWA Evaluations; Community/Watershed Biological Assessments

Erica McLamb
Education: B.S Marine Biology
Project Role: TVA NEPA, Document Preparation
Experience: 23 years Ecological Evaluations, Environmental Permitting, Regulatory Compliance and NEPA Compliance

5.2.2 HDR Contributors

Steven Peluso
Education: B.S. Chemical Engineering
Project Role: Air Quality & Climate Change/GHG
Experience: 37 years in environmental compliance, air quality permitting, and hazardous waste management

Joshua N. Fletcher, RPA
Education: M.A., Anthropology (Archaeology); B.S., Architectural Design
Project Role: Cultural Resources
Experience: 24 years in cultural resources management, regulatory compliance, NEPA documentation, and project management

Mark P Filardi, PG
Education: M.S., and B.S., Geology
Project Role: Groundwater & Water Quality, Waste Management
Experience: 29 hydrogeology and contaminated site assessment & remediation

Miles Spenrath
Education: B.S., Environment and Natural Resources
Project Role: Prime farmland
Experience: 11 years in NEPA compliance and documentation

Harriet Richardson Seacat
Education: M.A. and B.A, Anthropology
Project Role: Socioeconomics & Environmental Justice
Experience: 17 years in anthropology, archaeology, history, and NHPA and NEPA documentation

Caroline Ryciuk
Education: M.A. in Anthropology
Project Role: Socioeconomics & Environmental Justice
Experience: 3 years in anthropology and ethnography

Al Myers
Education: Completed credits toward B.S., Business Administration
Project Role: Technical Editing
Experience: 22 years in administration

Erin Settevendemio
Education: M.S. Fisheries and Aquatic Sciences
Project Role: Biological Resources, Wetlands and Surface Waters
Experience: 14 years in fisheries, wetland science, USACE and FERC documentation

Kerry McCarney-Castle, PhD

Education:	PhD in Geology, MS in Environmental Geology
Project Role:	Quality Control and Technical Editing
Experience:	17 years in Earth Science Research, Geotechnical Engineering, Project Management, Science Writing/Editing, FERC relicensing

Brian Spillane

Education:	B.S. Geology
Project Role:	Geology, Groundwater, Waste
Experience:	10 years in geologic and environmental consulting

Sarah Weyler

Education:	B.S., Environmental Science: Policy and Planning
Project Role:	Land Use, Recreation, Visual Resources, Utilities, Noise, Public & Occupational Health and Safety, Transportation
Experience:	2 years in sustainability and environmental science, 1 year in NEPA compliance

Rebecca Colvin

Education:	M.A. and B.A., English
Project Role:	Socioeconomics and EJ
Experience:	26 years in NEPA documentation and socioeconomics

Jenessa Kay

Education:	M.S. in Biological Sciences (Marine Ecology focus) and B.A. in Biology
Project Role:	Surface Waters, Wetlands, Biological Resources
Experience:	7 years in biological assessments, 4 years in surface water assessment

Brittany Schweiger

Education:	M.S. in Fish, Wildlife, and Conservation Ecology, B.A. in Biology, and B.A. in Environmental Studies
Project Role:	Surface Waters, Wetlands, Biological Resources, Land Use
Experience:	8 years in wildlife research and environmental compliance

CHAPTER 6 – LITERATURE CITED

6.1 Literature Cited

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Appendix A – TVA IRP Executive Summary

Appendix B – TVA Alternatives Evaluation

Appendix C – Winter Storm Elliot After-Action Report

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Appendix D – Response to Public Comments on the Draft EIS

Appendix E – Aquatic Resources

Appendix E.1 –TVA's Surface Waters Survey Report for Kingston Reservation

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Appendix E.2 – TVA Wetlands Field Survey Memo

Appendix E.3 – Wetlands and Waters Survey Memo for Proposed Transmission Line Upgrades (L5108, L5302, and L5383) Associated with the Kingston Retirement Project. December 2022

(Provided Under Separate Cover Due to File Size)

Appendix E.4 – Aquatic Resources Inventory Survey Report Kingston Fossil Plant Retirement Project: Offsite Transmission Line Upgrades (L5116, L5280, and L5381)

(Provided Under Separate Cover Due to File Size)

Appendix E.5 – USACE Jurisdictional Determination Documentation

Appendix F – Biological Resources
(Provided Under Separate Cover Due to File Size)

Appendix F.1 – USFWS Consultation Documentation
(Provided Under Separate Cover Due to File Size)

Appendix F.2 – TVA’s Kingston Fossil Plant Natural Resources Survey

(Provided Under Separate Cover Due to File Size)

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Appendix F.3 – Wildlife and Vegetation Assessment Kingston Transmission Line. Kingston Fossil Plant. December 2022

(Provided Under Separate Cover Due to File Size)

Appendix F.4 – Wildlife and Vegetation Assessment Technical Report. Kingston Fossil Plant Retirement Project: Offsite Transmission Line Upgrades (L5116, L5280, and L5280)

(Provided Under Separate Cover Due to File Size)

Appendix G – Preliminary Sound Study, Tennessee Valley Authority's Kingston Fossil Plant, Kingston, Tennessee

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Appendix H - Resource Figures for East Tennessee Natural Gas' Ridgeline Expansion Project under Alternative A

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Appendix I – Estimated Direct Operational Emissions and Associated Social Cost of Greenhouse Gas for Alternatives

Appendix J – Life Cycle Analyses of Greenhouse Gas Emissions Estimated for Alternatives Evaluated in the Kingston EIS

Appendix K – Cultural Resource Reports and Consultation Documentation

Appendix L – Cooperating Agency Comments during EIS Development

Appendix M – Concentric Report – Cumberland Fossil Plant Retirement FEIS

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Appendix N – Concentric Report – Kingston Fossil Plant Retirement FEIS