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FINAL ENVIRONMENTAL ASSESSMENT

# WATTS BAR HYDRO PLANT-GREAT FALLS HYDRO PLANT 161-KV TRANSMISSION LINE TAP TO SPENCER & GREAT FALLS HYDRO PLANT-SPENCER 46-KV TRANSMISSION LINE RETIREMENT AND REMOVAL

**Van Buren & Warren Counties, Tennessee**

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# ACRONYMS, ABBREVIATIONS, AND GLOSSARY OF TERMS USED

| | |
|---|---|
| **AADT** | Average annual daily traffic |
| **Acre** | A unit measure of land area equal to 43,560 square feet |
| **access road** | A dirt, gravel, or paved road that is either temporary or permanent, and is used to access the right-of-way and transmission line structures for construction, maintenance, or decommissioning activities |
| **APE** | Area of potential effect |
| **bay** | A bay is a part of a substation containing high voltage switching devices and connections of a power line or a power transformer to the substation busbar system(s) |
| **BMP** | Best management practice or accepted construction practice designed to reduce environmental effects |
| **CFEC** | Caney Fork Electric Cooperative |
| **circuit** | A section of conductors (three conductors per circuit) capable of carrying electricity to various points |
| **conductors** | Cables that carry electrical current |
| **CWA** | Clean Water Act |
| **danger tree** | A tree located outside the right-of-way that could pose a threat of grounding a line if allowed to fall near a transmission line or a structure |
| **EA** | Environmental Assessment |
| **easement** | A legal agreement that gives TVA the right to use property for a purpose such as a right-of-way for constructing and operating a transmission line |
| **EMF** | Electric and magnetic field |
| **endangered species** | A species in danger of extinction throughout all or a significant part of its range |
| **EO** | Executive Order |
| **ephemeral stream** | Watercourses or ditches that only have water flowing after a rain event; also called a wet-weather conveyance |
| **ESA** | Endangered Species Act |
| **feller-buncher** | A piece of heavy equipment that grasps a tree while cutting it, which can then lift the tree and place it in a suitable location for handling; this equipment is used to prevent trees from falling into sensitive areas, such as a wetland |
| **GIS** | Geographic Information System |
| **groundwater** | Water located beneath the ground surface in the soil pore spaces or in |

| | |
|---|---|
| | the pores and crevices of rock formations |
| **guy** | A cable connecting a structure to an anchor that helps support the structure |
| **hydric soil** | A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop conditions of having no free oxygen available in the upper part |
| **hydrophytic vegetation** | Aquatic and wetland plants that have developed physiological adaptations allowing a greater tolerance to saturated soil conditions including with limited or absence of oxygen |
| **I-** | Interstate |
| **kV** | Symbol for kilovolt (1 kV equals 1,000 volts) |
| **load** | That portion of the entire electric power in a network consumed within a given area; also synonymous with “demand” in a given area |
| **loop line** | A transmission line connection made by “looping” or routing the line through the substation or switching station by building two circuits to the station from two tap points in an existing line and removing the line between the two tap points. A loop normally would connect into two new breakers at the station. |
| **LPC** | Local power company |
| **LTT** | Land Trust for Tennessee |
| **MOA** | Memorandum of Agreement |
| **MSC** | McCallum-Sweeney’s Consulting |
| **MVA** | Mega Volt Amp |
| **NEPA** | National Environmental Policy Act |
| **NESC** | National Electric Safety Code |
| **NHPA** | National Historic Preservation Act |
| **NRHP** | National Register of Historic Places |
| **NRI** | Nationwide Rivers Inventory |
| **outage** | An interruption of the electric power supply to a user |
| **PI** | Point of intersection at which two straight transmission line sections intersect to form an angle |
| **riparian** | Related to or located on the banks of a river or stream |
| **ROW** | Right-of-way, a corridor containing a transmission line |
| **runoff** | That portion of total precipitation that eventually enters a stream or river |
| **SHPO** | State Historic Preservation Officer |
| **SMZ** | Streamside management zone |
| **SR** | State Route |

| | |
|---|---|
| **structure** | A pole or tower that supports a transmission line |
| **substation** | A facility connected to a transmission line used to reduce voltage so that electric power may be delivered to a local power distributor or user |
| **surface water** | Water collecting on the ground or in a stream, river, lake, or wetland; it is naturally lost through evaporation and seepage into the groundwater |
| **switch** | A device used to complete or break an electrical connection |
| **TDEC** | Tennessee Department of Environment and Conservation |
| **TDOT** | Tennessee Department of Transportation |
| **threatened species** | A species likely to become endangered within the foreseeable future |
| **TL** | Transmission line |
| **TN-EPPC** | Tennessee Exotic Plant Pest Council |
| **TVA** | Tennessee Valley Authority |
| **TVARAM** | TVA Rapid Assessment Method, a version of the Ohio Rapid Assessment Method for categorizing wetlands, designed specifically for the TVA region |
| **TWRA** | Tennessee Wildlife Resources Agency |
| **US** | United States Highway |
| **USACE** | United States Army Corps of Engineers |
| **USEPA** | United States Environmental Protection Agency |
| **USFWS** | United States Fish and Wildlife Service |
| **USGS** | United States Geological Survey |
| **USNPS** | United States National Park Service |
| **wetland** | A marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water, especially one that forms a habitat for wildlife |
| **WHO** | World Health Organization |
| **WMA** | Wildlife Management Area |

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# CHAPTER 1

## 1.0 PURPOSE OF AND NEED FOR ACTION

### 1.1 Proposed Action – Improve Power Supply

Caney Fork Electric Cooperative (CFEC), a distributor of Tennessee Valley Authority (TVA) power, is upgrading its existing Spencer 46-kV Substation in Van Buren County, Tennessee to 161-kV capability. TVA proposes to supply electric power to the upgraded substation by constructing, operating, and maintaining approximately 4.6 miles of new 161-kilovolt (kV) transmission line (TL). The new TL would be built on a 100-foot-wide right-of-way (ROW) and would connect TVA's existing Watts Bar Hydro Plant–Great Falls Hydro Plant 161-kV TL to the substation (Figure 1-1). The proposed TL would occupy approximately 57 acres.

TVA's proposal would include single, double, and triple steel-pole structures as well as the installation of three lattice-steel switch structures – two in the Watts Bar Hydro Plant–Great Falls Hydro Plant 161-kV TL, and one within the new proposed ROW. A short, permanent road would be constructed to facilitate access to these switches. The TVA map board displays would be updated to reflect the modified facilities.

After the completion of the proposed 4.6-mile 161-kV TL, TVA proposes to retire and remove the existing Great Falls Hydro Plant-Spencer 46-kV TL. This line originates at the Great Falls Hydro Plant in Warren County, Tennessee, and extends approximately 18.5 miles to provide power to CFEC's existing Spencer 46-kV Substation. TVA would also retire equipment in the Great Falls Hydro Plant 46-kV switchyard associated with the Great-Falls Hydro Plant-Spencer 46-kV TL.

### 1.2 Need for the Proposed Action

The electrical facilities that supply power to the Spencer area are becoming inadequate. CFEC currently serves the area through their 46-kV delivery point at the Spencer 46-kV Substation, but has plans to upgrade the facility to 161-kV operation. Power is presently supplied to the substation via the 18.5-mile-long Great Falls Hydro Plant-Spencer 46-kV TL (Figure 1-2) from the Great Falls Hydro Plant. The Great Falls Hydro Plant transformers that serve this substation are over 65 years old and have been given a risk of failure of greater than 95 percent. Sections of this TL have an original in-service date of 1913, with other portions being in service from 1969. The failure of this TL, or the associated equipment at the Great Falls Hydro Plant, would result in the inability of TVA to provide power to the Spencer area. As a result of the reliability issues related to the aging equipment and infrastructure, and no power alternatives to serve CFEC in this area, CFEC has requested that TVA provide a new 161-kV delivery point to the upgraded Spencer substation.

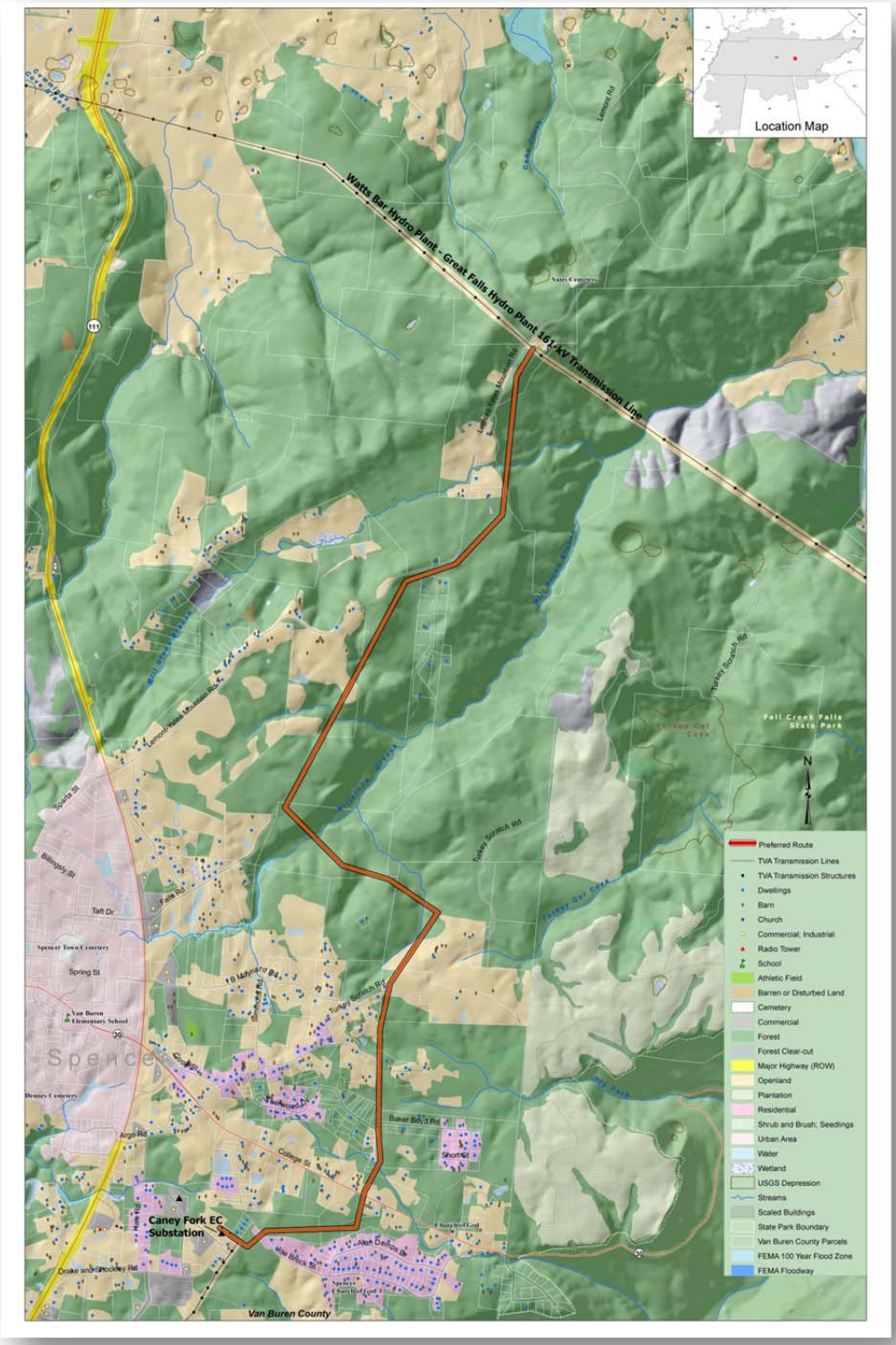


**Figure 1-1. The Proposed Watts Bar Hydro Plant-Great Falls Hydro Plant 161-kV Transmission Line Tap To Spencer in Van Buren County, Tennessee**

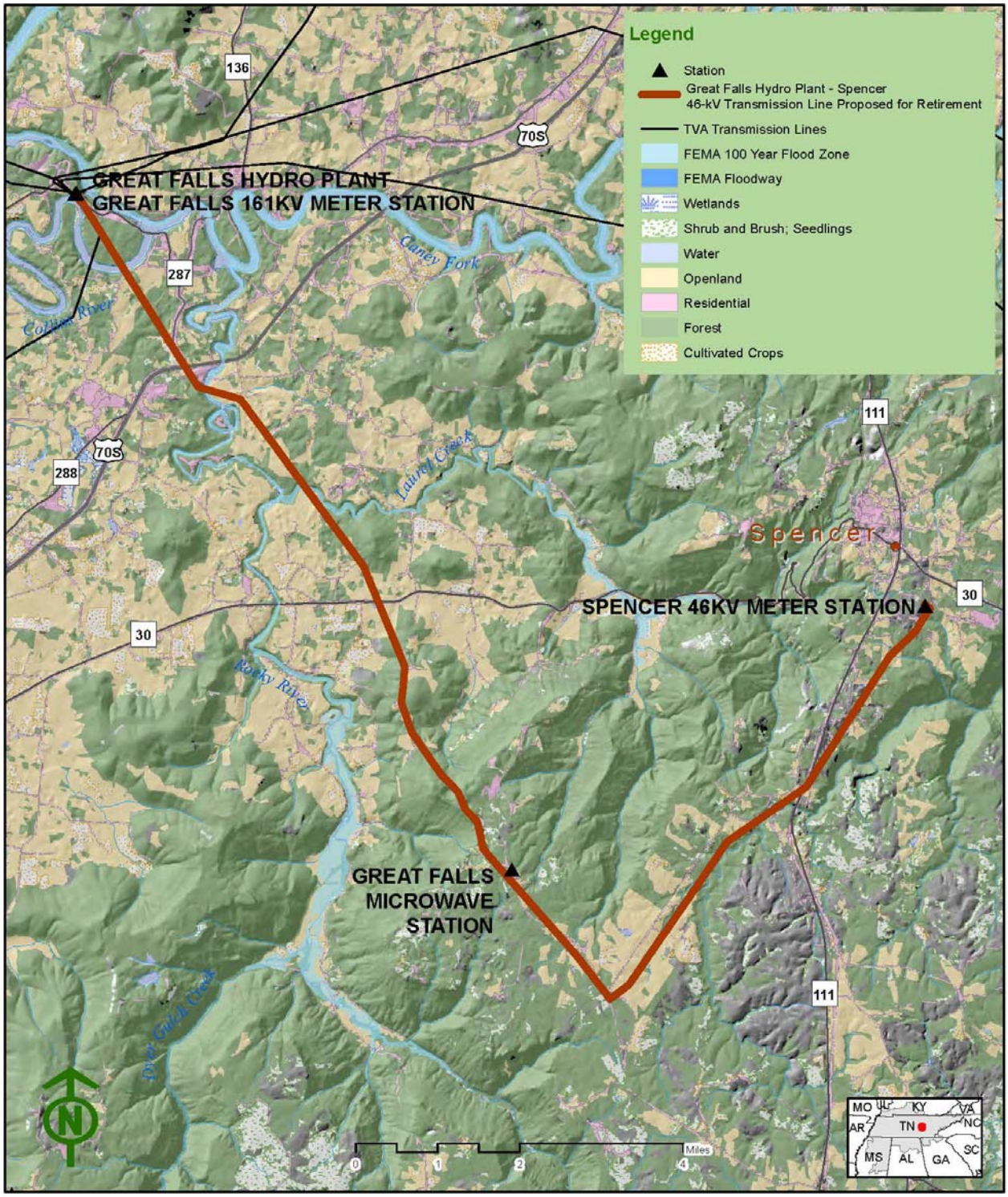


**Figure 1-2. The Existing Great Falls Hydro Plant-Spencer 46-kV Transmission Line Proposed for Retirement in Van Buren and Warren Counties, Tennessee**

To ensure that the Spencer area has a continuous, reliable source of electric power and to respond to CFEC's request, TVA needs to provide new 161-kV power supply to the upgraded Spencer 161-kV substation. The construction of a new TL would meet this need by providing a delivery point, as requested by CFEC, thereby improving reliability in CFEC's service area. The proposed project would also allow TVA to meet reliability criteria, as well as improve TVA's ability to respond to residential and commercial growth that is occurring in the area.

## 1.3 Decisions to be Made

The primary decision before TVA is whether to improve the electric service to the Spencer area by constructing a new 161-kV TL. Considerations involved in the building of the proposed TL are listed below. A detailed description of the alternatives is provided in Section 2.1.

- Timing of the proposed improvements;
- Most suitable route for the proposed 161-kV TL;
- Most suitable location for the proposed tap point; and
- Determination of any necessary mitigation and/or monitoring to meet TVA standards and to minimize the potential for damage to environmental resources.

## 1.4 Related Environmental Reviews or Documentation

In 2015, TVA completed the integrated resource plan (TVA 2015a) that provides a direction for how TVA will meet the long-term energy needs of the Tennessee Valley region. This document and the associated supplemental environmental impact statement evaluate scenarios that could unfold over the next 20 years. It discusses ways that TVA can meet future electricity demand on a least-cost basis while supporting TVA's equally important mandates for environmental stewardship and economic development across the valley. This report indicated that a diverse portfolio is the best way to deliver low-cost, reliable electricity. TVA released the accompanying final supplemental environmental impact statement for TVA's integrated resource plan in July 2015 (TVA 2015b).

## 1.5 Scoping Process and Public Involvement

TVA contacted the following federal and state agencies and officials, as well as federally recognized Native American tribes, concerning the proposed project.

- Absentee Shawnee Tribe of Oklahoma
- Alabama-Quassarte Tribal Town
- Cherokee Nation
- Chickasaw Nation
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma

- Kialegee Tribal Town
- The Muscogee (Creek) Nation of Oklahoma
- Shawnee Tribe of Oklahoma
- Tennessee Department of Transportation (TDOT)
- Tennessee State Historic Preservation Officer (SHPO)
- Thlopthlocco Tribal Town
- United Keetoowah Band of Cherokee Indians in Oklahoma
- United States Fish and Wildlife Service (USFWS)

This proposal was reviewed to ensure conformity with Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), the Farmland Protection Policy Act, the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA), Section 404 of the Clean Water Act (CWA), and EO 12372 (Intergovernmental Review). Correspondence received from agencies related to this review and coordination is included in Appendix A.

TVA developed a public communication plan that included a website with information about the project, a map of the alternative TL routes, and feedback mechanisms. The 235 property owners who could potentially be affected by any of the route alternatives or had property near the route alternatives, along with nine public officials, were specifically asked for comments and invited to a project open house. TVA used local news outlets and notices placed in the local newspapers to notify other interested members of the public of the open house. TVA held the open house on January 23, 2014, at the Spencer Civic Center in Spencer, Tennessee. The open house was attended by 97 people.

At the open house, TVA presented maps with a network of 14 alternative TL routes, comprised of 21 different line segments and two alternative tap point sites, to the public for comment (see Figure 1-3).

The alternative TL routes are described in Section 2.4.1. The primary concerns expressed by the public were the perception that the proposed TL was not needed, and the effects to the aesthetics of personal property. Owners also voiced concerns relative to health issues, and impacts of the proposed TL on historical resources.

A 30-day public review and comment period was provided following the open house, during which TVA accepted public comments on the project including alternative TL routes. A toll-free phone number and facsimile number were made available to facilitate comments. During the comment period, several landowners contacted TVA to express their concerns similar to those voiced at the open house.

At the conclusion of the comment period, TVA considered additional information and developed a preferred route. TVA announced the preferred route to the public in June 2014 (Figure 1-1). Letters were sent to affected property owners. The public communication plan on the website was updated to reflect the preferred route information.

Following the announcement of the preferred route, TVA made additional adjustments to the preferred route (Figure 1-1). These adjustments were a result of information obtained from field surveys or at the request of affected property owners (described in Section 2.4.2).

## 1.6 Issues to be Addressed

TVA identified resources that could potentially be affected by the construction, operation, and maintenance of the proposed project through an early internal scoping. Based on these deliberations, potential impacts to the following environmental resources are addressed in this environmental assessment (EA).

- Water quality (surface waters and groundwater)
- Aquatic ecology
- Vegetation
- Wildlife
- Endangered and threatened species and their critical habitats
- Floodplains
- Wetlands
- Aesthetic resources (including visual, noise, and odors)
- Archaeological and historic resources
- Land use and prime farmland
- Recreation, parks, and managed areas
- Socioeconomics and environmental justice

Potential effects related to air quality and global climate change, solid and hazardous waste, and health and safety were considered. Because of the nature of the action, any potential effects to these resources would be minor and insignificant. Thus, any further analysis for effects to these resources was not deemed necessary.

## 1.7 Necessary Federal Permits and Licenses

A permit would be required from the State of Tennessee and/or local municipality for the discharge of construction site storm water associated with the construction of the TL. TVA would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A Section 401 water quality certification or an aquatic resource alteration permit would be obtained as required for physical alterations to waters of the State. A permit may also be required for burning trees and other combustible materials removed during the construction of the proposed TL. A permit would be obtained from TDOT for crossing state highways during TL construction.

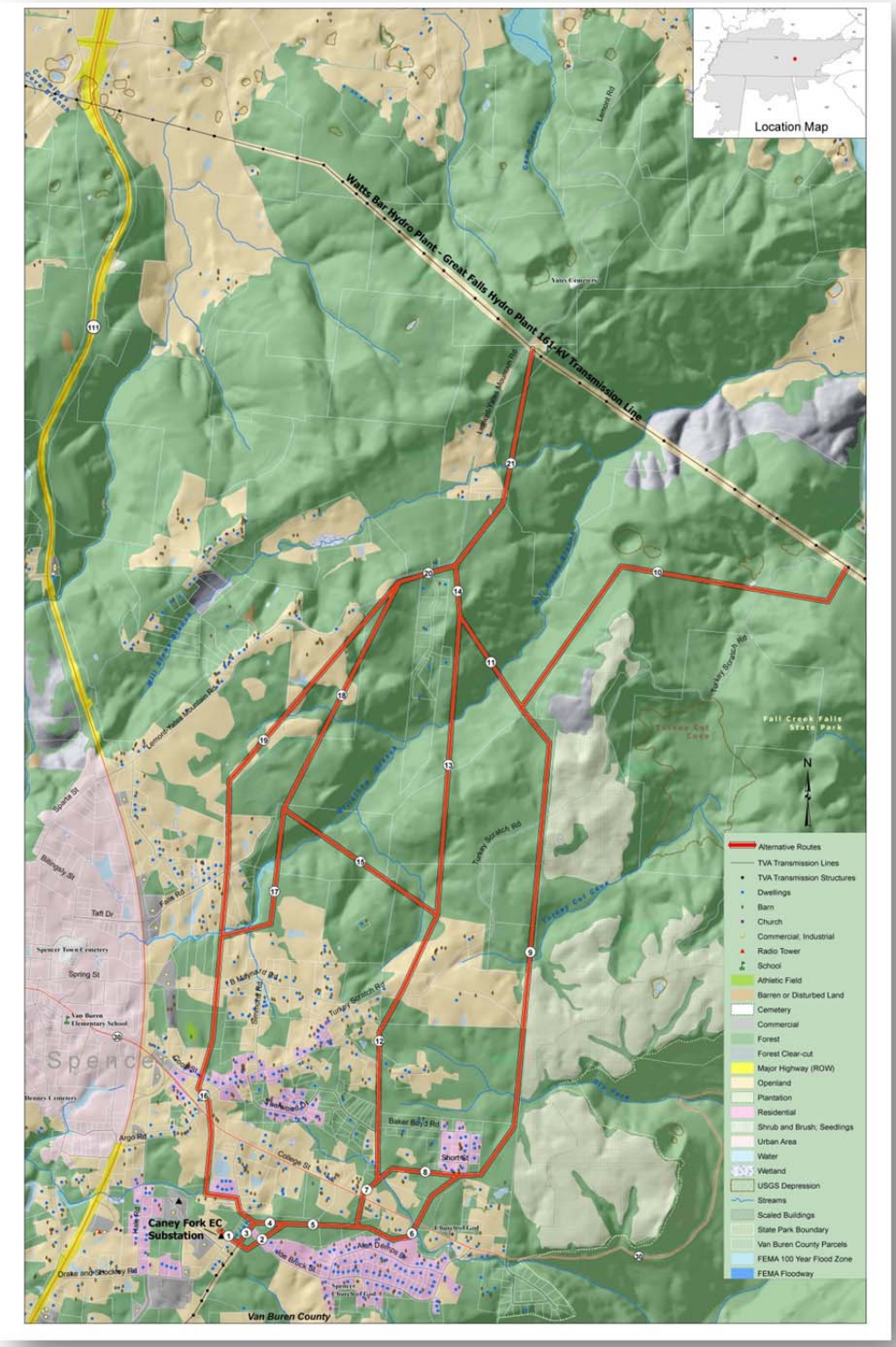


**Figure 1-3. Alternative Route Segments for the Proposed Watts Bar Hydro Plant-Great Falls Hydro Plant 161-kV Transmission Line Tap To Spencer in Van Buren County, Tennessee**

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# CHAPTER 2

## 2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

As described in Chapter 1, TVA proposes to construct, operate, and maintain approximately 4.6 miles of new 161-kV TL to power CFEC's upgraded substation. Other retirements and upgrades to the local transmission system would also be made. A description of the proposed Action Alternative is provided below in Section 2.1.2. Additional background information about construction, operation, and maintenance of a TL is also provided.

This chapter has seven major sections:

1. Description of alternatives;
2. Description of the construction, operation, and maintenance of the proposed TL;
3. Description of the TL siting process;
4. Description of the retirement of the existing TVA facilities;
5. Comparison of anticipated environmental effects by alternative;
6. Identification of mitigation measures; and
7. Identification of the Preferred Alternative.

### 2.1 Alternatives

Two alternatives (i.e., the No Action Alternative and the Action Alternative) are addressed in further detail in this EA. Under the No Action Alternative, TVA would not implement the proposed action. The Action Alternative involves the construction, operation, and maintenance of a proposed transmission assets.

#### 2.1.1 The No Action Alternative – Do Not Construct, Operate, and Maintain a New 161-kV Transmission Line and Retire an Existing 46-kV Transmission Line

Under the No Action Alternative, TVA would not construct the proposed 161-kV TL to serve CFEC's upgraded Spencer 161-kV Substation, retire the Great Falls Hydro Plant-Spencer 46-kV TL, or complete any actions to address the aged equipment at Great Falls Hydro Plant.

As a result, CFEC's distribution system would remain at 46-kV service and the TVA power system in the project area would continue to operate under the current conditions, increasing the risk for loss of service and violations of North American Electric Reliability Corporation (NERC) reliability criteria. TVA's ability to continue to provide reliable service to address the residential and commercial growth in the area would not be improved.

However, if TVA elected not to provide the 161-kV delivery point to CFEC's upgraded substation via the Watts Bar Hydro Plant–Great Falls Hydro Plant 161-kV TL, CFEC could independently decide to construct a new TL to serve the upgraded substation. The distributor could utilize the route identified by TVA, or, perhaps, select another route.

If CFEC were to independently provide transmission service and construct a new TL, the potential environmental effects of implementing the No Action Alternative would likely be comparable to those of the Action Alternative described in Chapter 4. However, some variability of impacts could occur as effects of the construction would be dependent upon various factors, such as the route chosen and the construction methods used.

Considering TVA's obligation to provide reliable electric service, the No Action Alternative is not a reasonable alternative. However, the potential environmental effects of adopting the No Action Alternative were considered in the EA to provide a baseline for comparison with respect to the potential effects of implementing the proposed action.

### 2.1.2 Action Alternative – Construct, Operate, and Maintain a New 161-kV Transmission Line and Retire an Existing 46-kV Transmission Line

Under the Action Alternative, TVA would serve CFEC's upgraded Spencer 161-kV Substation by constructing, operating, and maintaining a 4.6-mile 161-kV TL (Figure 1-1). The proposed TL, to be called the Watts Bar Hydro Plant-Great Falls Hydro Plant 161-kV TL Tap to Spencer, would be constructed on a new 100-foot-wide ROW. Due to the variation in topography along the preferred route, the TL would necessitate a combination of single, two-pole, and three-pole steel structures in addition to lattice-steel switch structures which would be utilized at the tap point. TVA would purchase approximately 57 acres of ROW easements, giving it the rights to construct, operate, and maintain a TL along the route to provide a power supply to serve the upgraded Spencer 161-kV Substation. Temporary access roads would be required for the construction and maintenance of the proposed TL. TVA would also construct a new permanent access road off of Lemont-Yates Mountain Road utilizing both existing and the proposed ROW to access the TL switch structures.

Additionally, under the Action Alternative TVA would complete the following to facilitate operation of the proposed TL connections:

Retire approximately 18.5 miles of TVA's existing Great Falls Hydro Plant-Spencer 46-kV TL located on existing 50- to 75-foot-wide ROW;

Retire switches 473, 475, and 479, as well as breaker 474 and the associated 46-kV bus work in Bay 17 of the Great Falls Hydro Plant; and

- Modify the TVA system map boards to include the names and numbers of the new TL as well as removing the name and number of the Great Falls Hydro Plant-Spencer 46-kV TL.

Additional information describing implementation of the Action Alternative and how the most suitable TL route was determined is provided below in Sections 2.2 through 2.4.

### 2.1.3 Alternatives Considered but Eliminated From Further Discussion

During the development of this proposal, other alternatives were considered. However, upon further study, TVA determined that these other alternatives were not feasible for the reasons provided below.

#### *2.1.3.1 Replace the Four Single-Phase 12.5/16.6 Mega Volt Amp (MVA) Transformers at Great Falls Hydro Plant*

Under this alternative, TVA would replace the four 46-kV transformers in Bay 17 of the Great Falls Hydro Plant Switchyard in Warren County, Tennessee, that currently provide the power supply for the Great Falls Hydro Plant-Spencer 46-kV TL serving the Spencer 46-kV Substation.

Although implementing this alternative would improve the reliability of the power source to the Spencer 46-kV Substation, the system would still experience a significant electrical loss while transmitting power across the aging 18.5-mile long Great Falls Hydro Plant-Spencer 46-kV TL. Furthermore, this plan would not align with CFEC's plans to provide 161-kV service from its Spencer Substation, because the replacement would be supporting the existing 46-kV TL. For these reasons, this alternative was eliminated from further consideration.

#### *2.1.3.2 Provide a Tap Line from the Great Falls Hydro Plant-Watts Bar Hydro Plant 161-kV TL, Construct a 161-kV Substation and Connect to the Existing Great Falls Hydro Plant-Spencer 46-kV Transmittion Line*

Under this alternative, TVA would tap the Great Falls Hydro Plant-Watts Bar Hydro Plant 161-kV TL and construct a new 161-kV substation nearby. The substation would be equipped with 12/16/20 MVA autotransformers to "step down" or reduce the incoming 161-kv power to 46-kV power. TVA would then construct an approximately 0.5-mile 46-kV TL to tie into the existing Great Falls Hydro Plant-Spencer 46-kV TL which currently extends to the Spencer 46-kV Substation.

As discussed for the alternative presented in Section 2.1.3.1, implementing this alternative would improve the reliability of the power source to the Spencer 46-kV Substation by alleviating reliance on the aged Great Falls Hydro Plant transformers, but the system would still experience a significant electrical loss while transmitting power across sections of the Great Falls Hydro Plant-Spencer 46-kV TL due to its condition and the line length. Additionally, as noted in Section 2.1.3.1, this plan would not align with CFEC's plans to provide 161-kV service from its Spencer Substation. Furthermore, this plan is considered to be the most costly in terms of both the initial capital and the future maintenance costs. For these reasons, this alternative was eliminated from further consideration.

## 2.2 Construction, Operation, and Maintenance of the Proposed Transmission Line and Retirement of an Existing Transmission Line

### 2.2.1 Transmission Line Construction

#### *2.2.1.1 Right-of-Way Acquisition and Clearing*

An ROW utilizes an easement that would be designated for a TL and associated assets. The easement would require maintenance to avoid the risk of fires and other accidents and to ensure reliable operation. The ROW provides a safety margin between the high-voltage conductors and surrounding structures and vegetation. The ROW for this project is described in Section 2.1.2.

The proposed TL would be constructed within a new 100-foot-wide ROW easement. TVA would purchase easements from landowners for the new ROW. These easements would give TVA the rights to clear the ROW and to construct, operate, and maintain the TL, as well as remove "danger trees" adjacent to the ROW. Danger trees include any trees that are located beyond the cleared ROW, but that are tall enough to pass within five feet of a conductor or strike a structure should it fall toward the TL. The fee simple ownership of the land within the ROW would remain with the landowner, and many activities and land uses could continue to occur on the property. However, the terms of the easement agreement prohibit certain activities, such as construction of buildings and any other activities within the ROW that could interfere with the operation or maintenance of the TL or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and TL conductors, as well as to provide access for construction equipment, all trees and most shrubs would be removed from the entire width of the ROW. Equipment used during this ROW clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller bunchers[1]. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the ROW to serve as sediment barriers.

Vegetation removal in streamside management zones (SMZ) and wetlands would be restricted to trees tall enough, or with the potential to soon grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote-handling equipment, such as a feller buncher, in order to limit ground disturbance.

*TVA ROW Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction*, *Transmission Construction Guidelines Near Streams* (Appendices B, C, D), and *Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 2012) would provide guidance for clearing and construction activities. The emission of criteria pollutants or their precursors would not exceed de minimis levels specified in 40 CFR § 93.153(b). Thus, consistent with Section 176(c) of the Clean Air Act, project activities would be in conformity with the requirements under the state implementation plan for attaining air quality standards.

Following clearing and construction, vegetative cover on the ROW would be restored to its condition prior to construction, to the extent practicable. TVA would utilize appropriate seed mixtures as described in Muncy (2012) or work with property owners with impacted crop land to ensure restoration supports or minimizes impacts to production. Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in Appendices B, C, and D, and in Muncy (2012). Failure to maintain adequate clearance can result in dangerous situations, including ground

[1] A feller buncher is a self-propelled machine with a cutting head that is capable of holding more than one stem at a time. Tracked feller bunchers are capable of operating on wet and loose soils, have a lower ground-pressure than wheeled equipment, and are less prone to rutting and compaction.

faults. As such, native vegetation or plants with favorable growth patterns (slow growth and low mature heights) would be maintained within the ROW following construction.

#### *2.2.1.2 Access Roads*

Access roads would be needed to allow vehicular access to each structure and other points along the ROW. Typically, new permanent or temporary access roads used for TLs are located on the ROW wherever possible and are designed to avoid severe slope conditions and to minimize stream crossings. Access roads are typically about 12 to 16 feet wide and are surfaced with dirt, mulch, or gravel.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in ephemeral[2] streams the culverts would be left or removed, depending on the wishes of the landowner or any permit conditions that might apply. If desired by the property owner, TVA would restore new temporary access roads to previous conditions. Additional applicable ROW clearing and environmental quality protection specifications are listed in Appendices B and C.

#### *2.2.1.3 Construction Assembly Areas*

A construction assembly area (or “laydown” area) would be required for worker assembly, vehicle parking, and material storage. This area may be on existing substation property or may be leased from a private landowner for the duration of the construction period. The property is typically leased by TVA about a month before construction begins. Properties such as existing parking lots or areas used previously as car lots are ideal laydown areas because site preparation is minimal. Selection criteria used for locating potential laydown areas include an area typically five acres in size; relatively flat; well drained; previously cleared; preferably graveled and fenced; preferably wide access points with appropriate culverts; sufficiently distant from streams, wetlands, or sensitive environmental features; and located adjacent to an existing paved road near the TL. TVA initially attempts to use or lease properties that require no site preparation. However, at times, the property may require some minor grading and installation of drainage structures such as culverts. Likewise, the area may require graveling and fencing. Trailers used for material storage and office space would be parked on the site. Following completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. Removal of TVA-installed fencing and site restoration would be performed by TVA at the discretion of the landowner.

#### *2.2.1.4 Structures and Conductors*

Due to variations in topography along the proposed 161-kV TL route, single, double, and triple steel-pole structures, as shown in Figure 2-1, would be used for the TL. Structure heights would vary according to the terrain and would typically range between 80 and 120 feet.

[2] Ephemeral streams are also known as wet-weather conveyances or streams that run only following a rainfall.

**Figure 2-1. Typical Steel-Pole 161-kV Transmission Structures**

Three conductors (the cables that carry the electrical current) are required to make up a single-circuit in alternating-current TLs. For a 161-kV TL, each single-cable conductor is attached to porcelain insulators suspended from the structure cross arms. A smaller overhead ground wire or wires are attached to the top of the structures.

Poles at angles (angle points) in the TL may require supporting screw, rock, or log-anchored guys. 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 two 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.

Switch structures are necessary to periodically isolate sections of a TL for maintenance or in the event of an unplanned outage. Two switch structures would be installed on either side of the tap point on the Great Falls Hydro Plant-Watts Bar Hydro Plant 161-kV TL. One would also be installed in the proposed line just south of the tap point. These structures, similar to that shown in Figure 2-2, would be 46 to 60 feet in height.

**Figure 2-2. Typical 161-kV Transmission Line Switch Structure**

Equipment used during the construction phase would include trucks, truck-mounted augers, drills, and excavators, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (such as areas with soft ground) to reduce the potential for environmental impacts.

#### *2.2.1.5 Conductor and Ground Wire Installation*

Reels of conductor and ground wire would be delivered to the construction assembly area(s), and temporary clearance poles would be installed at road crossings to reduce interference with traffic. A rope would be pulled from structure to structure. It would be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys.

### 2.2.2 Operation and Maintenance

#### *2.2.2.1 Inspection*

Periodic inspections of 161-kV TLs are performed by helicopter aerial surveillance after operation begins. Foot patrols or climbing inspections are performed to locate damaged conductors, insulators, or structures, and to discover any abnormal conditions that might hamper the normal operation of the line or adversely affect the surrounding area. During these inspections, the condition of vegetation within the ROW, as well as that immediately adjoining the ROW, is noted. These observations are then used to plan corrective maintenance and routine vegetation management.

#### *2.2.2.2 Vegetation Management*

Management of vegetation along the ROW would be necessary to ensure access to structures and to maintain an adequate distance between TL conductors and vegetation.

Adequate ground clearance is important to account for construction, design, and survey tolerances (e.g., conductor sagging). TVA uses more conservative distances than the National Electric Safety Code (NESC) requirements. TVA uses minimum vegetation clearance of 24 feet for a 161-kV TL at the maximum line operating temperature. Vegetation management along the ROW would consist of two different activities: felling of danger trees adjacent to the cleared ROW (as described in Section 2.2.1.1), and vegetation control within the cleared ROW total width. These activities occur on approximately three- to five-year cycles.

Management of vegetation within the cleared ROW would include an integrated vegetation management approach designed to encourage the low-growing plant species and discourage tall-growing plant species. A vegetation re-clearing plan would be developed for the TL, based on the results of the periodic inspections described above. The two principal management techniques are mechanical mowing (using tractor-mounted rotary mowers) and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the ROW and mechanical mowing is not practical. Herbicides would be selectively applied from the ground with backpack sprayers or vehicle-mounted sprayers, or, in rare cases, by helicopter.

Any herbicides used are applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the U.S. Environmental Protection Agency (USEPA) are used. A list of the herbicides currently used by TVA in ROW management is presented in Appendix E. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

#### *2.2.2.3 Structure Replacement*

Other than vegetation management, only minor maintenance work is generally required. The TL structures and other components typically last several decades. In the event that a structure needs to be replaced, the structure would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or an adjacent hole. Access to the structures would be via existing roads. Replacement of structures may require leveling the area surrounding the replaced structures, but additional area disturbance would be minor compared to the initial installation of the structure.

## 2.3 Siting Process

The process of siting the proposed TL would follow the basic steps listed below.

- Determine the potential existing power sources to supply the TL;
- Define the study area;
- Collect data to minimize potential impacts to cultural and natural features;
- Locate potential tap points;
- Identify general route segments producing potential routes;
- Gather public input; and
- Incorporate public input into the final selection of the TL route.

### 2.3.1 Definition of the Study Area

The first task in defining the TL siting study was to identify power sources that could supply the upgraded substation. The nearest 161-kV source was the Watts Bar Hydro Plant-Great Falls Hydro Plant TL, located approximately four miles to the north of the substation. Another potential source was the Great Falls Hydro Plant–Spring City 161-kV TL, located approximately 5.5 miles north of the substation. Knowing the location of the substation to be upgraded, along with the potential power sources to feed the substation allowed for the identification of the study area. As such, the study area is located primarily in Van Buren County with a very small portion (approximately 0.10 square miles) in White County, as shown in Figure 1-1 and Figure 1-3.

The boundaries of the detailed study area were defined by the following:

- The northern boundary was established by the location of the Watts Bar Hydro Plant-Great Falls Hydro Plant and Great Falls Hydro Plant–Spring City 161-kV TLs.
- The eastern boundary is approximately 3.5 miles east of the upgraded substation and was chosen to allow for the most potential tap points and route segments.
- The southern boundary was defined by the location of the Spencer Substation. Potential route segments were expected to be in a generally north to south direction and not “dip” south of the existing substation by any significant distance. Given this, the southern boundary of the study area is approximately 0.4 miles south of the existing substation.
- The western boundary was established approximately 1.4 miles west of the existing substation after the consideration of the lack of potential western power sources, as well as commercial and residential development located around State Route (SR) 111.

### 2.3.2 Characterization of the Study Area for the Proposed 161-kV Transmission Line

#### *2.3.2.1 Natural and Cultural Features*

The study area is located within the Cumberland Plateau Level IV ecoregion. The Cumberland Plateau is underlain by Pennsylvanian-age rock and generally has acidic soils with low fertility and supports less agricultural than the Eastern Highland Rim and Ridge and Valley ecoregions, which abut the Cumberland Plateau to the west and east, respectively. The region is largely forested by hardwood growth, although there are some pine plantations within the area.

The city of Spencer is situated at the western edge of the Cumberland Plateau, just above the Caney Fork Valley. Spencer is topographically isolated by the Cumberland Plateau's escarpment to the north and west and by the Cane Creek Gorge to the south and east. Cane Creek, along with its tributary, Dry Fork, slices a narrow valley as it spills northward toward its confluence with the Caney Fork, effectively dividing the Spencer area from the rest of the plateau. Cane Creek's upper watershed, known for its scenic waterfalls and geological formations, comprises the bulk of Fall Creek Falls State Park.

The study area, and specifically the terrain around Spencer, is extremely mountainous. High peaks leading down to gorges formed by Cane Creek and other creeks dominate the

area. Elevation becomes less extreme, however, as the proposed alternative segments travel from the various alternative tap points towards the substation. The area is well watered with many perennial streams. Known wetland areas tend to occur within the creek floodplains. The elevations in the study area range from 1,200 to approximately 1,850 feet above mean sea level. Geologically, the study area for the new TL is within the Cumberland Plateau physiographic province.

#### *2.3.2.2 Cultural Features*

Due to the mountainous terrain within the greater extent of the study area, residential and commercial development is concentrated primarily around the City of Spencer and also along SR 111. Several churches are located along the southern edge of the study area on the eastern and western sides of the CFEC's Spencer Substation. More development, including Van Buren County elementary and high schools, are located west of SR 111, outside the study area.

#### *2.3.2.3 Land Use*

Land uses in the study area include commercial, industrial, residential, and some farming. The most concentrated residential and commercial development is located near the City of Spencer, along SR 111, and in areas generally west of the preferred route as the topography begins to flatten.

Undeveloped areas represent the vast majority of area east of the preferred route and contain a mixture of forested area and open land. The forest is a combination of commercial timber (pine plantations) and non-commercial timber (hardwoods). The open land is primarily in pasture for livestock.

#### *2.3.2.4 Transportation*

Van Buren County is essentially bisected by SR 111, which travels north to south. Additional SRs and US highways are in close proximity to the study area, but the predominant transportation features outside of SR 111 are various county and secondary roads.

### 2.3.3 Data Collection

TVA collected geographic data, such as topography, land use, transportation, environmental features, and cultural resources for the study area. Information sources used in the TL study included design drawings for area TLs, data collected into a geographic information system (GIS), including U.S. Geological Survey (USGS) digital line graphs, and Van Buren County and White County tax maps. Also used were various data maintained by TVA in a corporate geo-referenced database (i.e., TVA Regional Natural Heritage file data on sensitive plants and animals and archaeological and historical resources).

Additionally, TVA obtained both orthophotography and LIDAR imagery of the study area from the State of Tennessee. This information was from 2010, but given the relatively slow development of the area around Spencer, this information was deemed sufficient when supplemented with field work.

The orthophotography was interpreted to obtain land use and land cover data, such as forests, agriculture, streams, wetlands, houses, barns, commercial and industrial buildings, churches, and cemeteries.

Data were then analyzed both manually and with GIS. The use of GIS allows substantial flexibility in examining various types of spatially superimposed information. This system allowed the multitude of study area factors to be examined simultaneously for developing and evaluating numerous options and scenarios to select alternative routes that meet project needs, which included avoiding or reducing potential environmental impacts.

Calculations from orthophotograph, tax maps, and other sources included data such as number of road crossings, stream crossings, and property parcels, alternative route length, and forest clearing. The aerial photography, GIS-based map, and other maps and drawings were supplemented by reconnaissance throughout the study area by TVA.

### 2.3.4 Establishment and Application of Siting Criteria

TVA uses a set of evaluation criteria that represent opportunities and constraints for development of alternative TL routes. These criteria include factors such as existing land use, ownership patterns, environmental features, cultural resources, and visual quality. Cost is also an important factor, with engineering and construction considerations, materials, and ROW acquisition costs being the most important cost elements. Application of these constraints is flexible, and TVA can, and does, deviate from them. Identifying feasible TL alternatives involves weighing and balancing these criteria and making adjustments to them as specific conditions dictate.

Each of the TL route options was evaluated according to criteria related to engineering, social, and environmental concerns. Specific criteria are described below. For each feature identified as occurring along a proposed route option, specific considerations related to these features were identified and scored. In the evaluation, a higher score means a bigger constraint or obstacle for locating a TL. For example, a greater number of streams crossed, a longer TL route length, or a greater number of historic resources affected would produce a higher, more unfavorable score.

- **Engineering and Constructability Criteria** include considerations such as terrain (steeper slopes can present major challenges for design and construction), total length of the TL route, number of primary and secondary road crossings, the presence of pipeline and TL crossings, and total line cost.

- **Social Criteria** include the total acreage of new ROW, number of affected property parcels, public comments, consideration of visual aesthetics, and proximity to schools, houses, commercial or industrial buildings, and barns.

- **Environmental Criteria** include the number of forested acres within the proposed ROW, the number of open water crossings, the number of floodplain or floodway crossings, presence of sensitive (that is, those supporting endangered or threatened species) stream crossings, the number of perennial and intermittent stream crossings, presence of wetlands or rare species habitat, presence of sinkholes, and the presence of archaeological and historic sites, churches, and cemeteries.

A tally of the number of occurrences for each of the individual factors was calculated for each potential alternative route. Next, a normalized ranking of alternative routes was performed for each individual factor based on each route's value as it related to the other alternative routes. Weights reflecting the severity of potential effects were then developed for each individual criterion. These criterion-specific weights were multiplied by the individual alternative rankings to create a table of weighted rankings. The weighted rankings for each alternative were then added to develop overall scores of each alternative route for engineering, social, environmental, and overall overall total. For each of these categories, a ranking of each alternative TL route was calculated based on the relationship of various routes' scores.

These rankings made it possible to recognize which routes would have the lowest and the highest impacts on engineering, social, and environmental resources based on the data available at this stage in the siting process. Finally, the scores from each category were combined into an overall score. The alternative route options were then rank ordered by their overall scores.

### 2.3.5 Development of General Route Segments and Potential Transmission Line Routes

As described in Section 2.3.3, the collected data were analyzed to develop possible TL route segments that would best meet the project needs while avoiding or reducing conflict with constraints and by using identified opportunities.

The development of potential route segments was complicated by residential development concentrated around SR 111 near the existing Spencer Substation, and also by the mountainous terrain over much of the study area. Ultimately, 21 separate route segments were developed, and combinations were made to create a network of 14 proposed alternative routes to connect the upgraded substation (see Figure 1-3 and Table 2-1).

Segment 13 is routed almost due south-north and is approximately 5,875 feet in length. This segment crosses a large gorge, necessitating a single transmission span of over 3,000 feet. This segment also crosses over large areas of wooded land with limited access. While it may be possible to design and construct this span, it was deemed unnecessary with other routes to choose from. The expense of the required span, the nearly inaccessible locations of the span points, and the fact that other possible routes could be utilized made this span distance unnecessary. As a result, this segment was eliminated from further consideration along with the two possible routes that included this segment.

Subsequently, 12 alternative routes (see Table 2-1) were evaluated using criteria as described beginning in Section 2.3.4, and the final rankings were tabulated. As a result of the information gathered at the public open house, environmental field surveys, engineering considerations, and property owner requests, some of these segments were adjusted compared to the segments presented at the open house. These adjustments are described in Section 2.4.2.

**Table 2-1. Alternative Transmission Line Routes and Constituent Segments**

| Alternative Route | Tap Point | Constituent Segments |
|---|---|---|
| 1 | 2 | 1, 3, 4, 5, 7, 8, 9, 10 |
| 2 | 2 | 1, 2, 5, 7, 8, 9, 10 |
| 3 | 2 | 1, 3, 4, 5, 6, 9, 10 |
| 4 | 2 | 1, 2, 5, 6, 9, 10 |
| 5 | 1 | 1, 3, 16, 19, 20, 21 |
| 6 | 1 | 1, 3, 16, 17, 18, 20, 21 |
| 7 | 1 | 1, 3, 4, 5, 7, 12, 15, 18, 20, 21 |
| 8 | 1 | 1, 2, 5, 7, 12, 15, 18, 20, 21 |
| 9 | 1 | 1, 3, 4, 5, 7, 8, 9, 11, 14, 21 |
| 10 | 1 | 1, 2, 5, 7, 8, 9, 11, 14, 21 |
| 11 | 1 | 1, 3, 4, 5, 6, 9, 11, 14, 21 |
| 12 | 1 | 1, 2, 5, 6, 9, 11, 14, 21 |

### 2.3.6 Route Identification and Evaluation

Each of the 12 alternative routes offers different opportunities and constraints which are summarized below by engineering, social, and environmental criteria.

Engineering

Input for the TL route engineering analysis was influenced predominantly by the mountainous terrain of the area, and the resulting increases in span length between structures. Slopes of 20 to 30 percent and greater than 30 percent were present on each route. However, over a mile of alternative route options 1 through 4 contained slopes between 20 to 30 percent and about 0.66 mile greater than 30 percent. Conversely, Alternative Route 5 performed the best with regard to slope with less than 0.5 mile between 20 to 30 percent and slightly over 0.33 mile greater than 30 percent.

Typical spans between single-pole structures range from 500 to 700 feet. Double-pole or H-frame structures can have span lengths up to 1,000 feet. Due to the steep topography of several of the proposed alternative routes, TL span lengths of 1,000 to 1,500 feet occur between potential structures. Alternative Routes 1 through 4 have four occurrences each of span lengths between 1,000 to 1,500 feet. Spans greater than 1,500 feet were weighted more heavily due to increased difficulty in engineering, costs, and constructability. All of the remaining routes except one had three to five occurrences of spans greater than 1,000 feet. Alternative Route 5 was the exception, as it contained only one such occurrence.

Due to the terrain in the area, accessibility was also considered. As expected, the more mountainous, more remote areas scored unfavorably in this area.

Considering these factors, routes originating from tap point 1 performed poorly. Also, routes using Segments 15 and 18 together (Alternative Routes 7 and 8) scored the poorest due to slope and single span length inputs.

Environmental

As the terrain for this project was mostly undeveloped and mountainous, the potential for various environmental impacts was seen as a high constraint for siting a new TL. The amount of forested land within the ROW segments ranged from 27.9 acres within Alternative Route 5 to a maximum 52.6 acres for Alternative Route 3. More than half of the alternative routes would affect more than 50 acres of forested land. All of the proposed routes could potentially affect cave networks, as the terrain within the study area has the potential for karst formations. All of the alternative routes would cross several small streams. However, sensitive stream crossings, which are considered a higher impact category, were only present along routes 1, 2, 3, 4, 9, 10, 11, and 12. Open water crossings and floodplain crossings were minor on all routes.

The GIS analysis did not identify any archaeological or historical sites within any of the alternative routes considered. Although minor, habitats for species listed as threatened and endangered were found along all of the routes, with routes 1, 2, 3, 4, 9, 10, 11, and 12 having the most. Wetland crossings occur on all of the routes; in each case, they are less than an acre respectively. Routes 1, 2, 3, and 4 affect the highest acreages, while routes 7, 8, 9, 10, 11, and 12 had the lowest.

Overall, there was a distinct separation in the potential routes when scored in the various environmental categories. The proposed routes using tap point 1 had the least favorable environmental scoring. Routes utilizing tap point 2, but also using Alternative Route 9, scored in the middle of the environmental scores. Finally, those routes that use the “middle” or “western” segments, Alternative Routes 5, 6, and 8, scored the best in the environmental category.

Social

The study area, defined in Section 2.3.1, is comprised of concentrated residential and some commercial development along SR 111 and largely undeveloped tracts of forested and open land moving in a east, north-east direction from the Spencer Substation. Due to the vast amounts of undeveloped acreage available in the project study area and relatively large individual property tracts, any development (i.e. buildings) that was affected by a proposed segment was perceived by the public as a concerning factor in the social category. As such, considerations into the analysis focused on the proximity of existing buildings to the proposed ROW. Alternative Routes 5 and 6 had the highest occurrences of homes within 300 feet of the proposed ROW. While all routes received public comments, Alternative Routes 1, 2, 3, 4, 5, 9, 10, 11, and 12 all had the same number of comments and also scored the least favorably in the public comments arena.

## 2.4 Comparison of Alternative Transmission Line Routes

Based on 21 alternative TL segments as shown in Figure 1-3, and two potential tap points, TVA established and considered 14 potential alternative routes. As discussed in Section 2.3.5, two potential routes were eliminated from further consideration due to cost and engineering constraints. As such, this section provides analysis of the 12 remaining routes and their relation to alternative routes.

### 2.4.1 Alternative Transmission Line Routes

The proposed routes originate from one of two potential tap points along TVA's existing Watts Bar Hydro Plant-Great Falls Hydro Plant 161-kV TL, and are primarily routed in a southerly direction to connect to CFEC's Spencer Substation.

Routes 1 through 4 all originate from tap point 2 and utilize the most eastern segments in the study area. They are made up of combinations of Segments 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10, and while they are virtually the same number of miles in length, represent the longest and highest acreage routes analyzed. These routes also include the highest amount of forested acreage which, consequently, correlates directly to increased clearing costs. Furthermore, the routes had the highest percentage of impacts to wetlands. Routes 1 through 4 also include the highest percentage of steep slopes within the study area, thus contributing to potential construction and access road difficulties as well as increased erosion risks. Despite the relatively remote and isolated nature of the routes, they scored unfavorably in the public comments criteria.

Routes 5 and 6 utilize a combination of Segments 1, 3, 16, 17, 18, 19, 20, and 21 with Segments 16 and 19 being the most western in the study area. Due to the proximity to SR 111, these routes pass through the most developed sections of any of the proposed routes. Routes 5 and 6 have the most occurrences of passing within 300 feet of a residence than any other route. Furthermore, these routes had planned development located near or on the proposed ROW, thus adding to the unfavorable score in the social criteria. On the positive side, however, these routes scored favorably in engineering and environmental criteria, represented the shortest line routes considered and impacting the least amount of forested acreage of the alternatives studied.

Routes 7 and 8 are comprised of a combination of Segments 1, 2, 3, 4, 5, 7, 12, 15, 18, 20, and 21, which utilize the "middle" segments to transition from tap point 1 south to the upgraded substation. The routes scored well in both the environmental and social categories. Neither route had open water, floodplain, or sensitive stream crossings within the ROW. Further, the amount of impacted wetland acreage was among the lowest of the routes analyzed. Socially, both routes passed within 300 feet of fewer dwellings than other routes, and also had fewer overall public comments.

Routes 9, 10, 11, and 12 utilize tap point 1 and are made up of a combination of segments 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 14, and 21. These routes utilize the most eastern non-tap point segment (Segment 9) to transition from north to south. Even though these routes were among the longest routes considered and scored poorly in regard to span lengths and accessibility, the overall engineering scores were among the top five ranked. These routes scored poorly in the social and environmental categories. Socially, the routes scored poorly in regards to total acres used and public comments. However, due to the use of Segment 9, the routes in this grouping generally avoided developed areas and therefore had little impact in regards to existing buildings. Environmentally, these routes were scored poorly in the forestland, cave network, sensitive stream, minor stream, and threatened and endangered species categories. No wetland effects, however, helped to offset these impacts.

As mentioned in Sections 2.3.5 and 2.4, two routes were eliminated from further consideration due to their utilization of Segment 13.

Upon completion of the analysis described in Section 2.3.4, TVA compared the top five alternative routes (Table 2-2). While route 5 had a higher numeric score than the other routes, route 8 scored higher in the social and environmental categories. Lower scores in the engineering category for Alternative Route 8 were evaluated and the conclusion drawn that given the limited tap points and mountainous terrain, any of the proposed routes would present engineering challenges. Therefore, it was concluded limiting social and environmental impacts would be more beneficial to the project as a whole, and route 8 was chosen as the preferred route.

**Table 2-2. Top Five Ranked Alternative Routes**

| Route Rankings | Alternative Route | Constituent Segments |
|---|---|---|
| 1 | 5 | 1, 3, 16, 19, 20, 21 |
| 2 | 8 | 1, 2, 5, 7, 12, 15, 18, 20, 21 |
| 3 | 10 | 1, 2, 5, 7, 8, 9, 11, 14, 21 |
| 4 | 12 | 1, 2, 5, 6, 9, 11, 14, 21 |
| 5 | 7 | 1, 3, 4, 5, 7, 12, 15, 18, 20, 21 |

### 2.4.2 Identification of the Preferred Transmission Line Route

Based on the analysis of the potential routes, TVA announced a preferred TL route for the Action Alternative in June 2014. TVA's preferred TL route for the proposed Action Alternative is Alternative Route 8, consisting of Segments 1, 2, 5, 7, 12, 15, 18, 20, and 21.

After the preferred TL route was identified, affected property owners were mailed information showing the location of the preferred route on their property. Additional comments received from property owners were reviewed, and as practical, changes were made to the preferred route selections prior to and during engineering and environmental field surveys. Eight minor adjustments were made to the route and are summarized in Table 2-3.

## 2.5 Retirement of Existing TVA Facilities

Under the implementation of the Action Alternative, the existing Great Falls Hydro Plant-Spencer 46-kV TL would no longer be needed once the proposed Watts Bar Hydro Plant-Great Falls Hydro Plant 161-kV TL Tap to Spencer was constructed. This line originates at the Great Falls Hydro Plant in Warren County and extends about 18.5-miles on a combination of 50- to 75-foot wide ROW to provide power to CFEC's existing Spencer 46-kV Substation. Following the construction of the proposed TL,TVA proposes to retire the aging 46-kV infrastructure at Great Falls Hydro Plant Substation and the associated Great-Falls Hydro Plant-Spencer 46-kV TL. Retirement of the equipment associated with the Great Falls Hydro Plant switchyard and transmission line facilities would be implemented according to approved standard procedures.

**Table 2-3. Route Segment Changes Following the Open House**

| Location | Adjustment | Explanation of Adjustment |
|---|---|---|
| South of Lamont and Yates Mountan Road to near Little Falls Road | Addition of point of intersection (PI) structures | Made at the owner's request. PI structures were added to move the line east to a less sloped area. This adjustment reduced the impact to Little Falls, a small, well-known waterfall near the proposed route, as well as reduced the single span length of one gorge crossing. |
| North of Turkey Scratch Road | Elimination of a PI structure | A structure on the side of a hill was removed. The location would have proven difficult for construction. |
| North of and crossing Turkey Scratch Road | Addition of PI structure | Made at the owner's request. The route was moved west through the addition of a PI structure. This placed the line closer to an existing home, but limited the impact on the owner's pasture. |
| North of Seitz Road to south of Baker Boyd Road | Elimination of PI structures | The elimination of two PIs allowed the route to move slightly east, minimizing impacts to existing dwellings. |
| North of College Street (SR 30) | Relocation of PI | Made at the owner's request. PI was moved further north to lessen impact to a field. |
| South of College Street (SR 30) | Relocation of PI | Made at the owner's request. PI was moved further north preserving an existing tree line as a visual buffer between homes on an adjacent parcel. |
| North of Joe Brock Street | Addition and relocation of PI structures | Made at the owner's request. A PI was added and another relocated to align better with the property line. |
| East of Drake and Shockley Street (east of substation) | Relocation of PI | Made at owners request. A PI was relocated to minimize the effects on the property. |

### 2.5.1 Retirement of the Great Falls Hydro Plant-Spencer 46-kV Transmission Line

TVA would retire approximately 18.5 miles of the existing Great Falls Hydro-Spencer 46-kV TL. The line is divided into two segments, the first containing primarily steel-frame structures dating back to 1913, and the second containing a combination of wood and steel pole structures installed between 1968 and 2012. For the majority of the TL, the retired structures and poles would either be removed or cut off four to six feet above the ground. In consultation with the Tennessee SHPO, and as described in sections 3.10 and 4.2.10,

however, TVA shall preserve from one to four original 1913 steel A-frame TL structures that are a part of the first segment of the Great Falls Hydro Plant-Spencer 46-kV TL. Conductor and other associated materials would be removed and handled through TVA's investment recovery organization, or would be reused, recycled, or disposed of according to TVA's environmental protection procedures. The easement for this TL would no longer be routinely maintained by TVA. However, TVA would retain ownership of this ROW and would install signage to demarcate the location of TVA's ROW throughout the 18.5-mile length of the TL. Depending on future electrical transmission needs, TVA could reestablish the full use of this ROW at a later date.

### 2.5.2 Great Falls Hydro Plant Switchyard

TVA proposes to retire equipment in Bay 17 of the Great Falls Hydro Plant 46-kV switchyard as it is associated with the Great-Falls Hydro Plant-Spencer 46-kV TL as follows:

- Switch 473,
- Switch 475,
- Switch 479, and
- Breaker 474 and the associated 46-kV bus work.

In conjunction with TVA's investment recovery program, oil-filled equipment at the switchyard site would be drained, and the oil would be recycled. The retired breaker, bushings, and accessories may be recycled or sent for disposal. Before recycling or disposal, the bushings would be handled as PCBs until tested or disposed of as PCBs according to TVA's environmental protection procedures. Conduits at the site would be cut, and caps would be installed. Cable in the conduits would be removed, if possible.

## 2.6 Comparison of Environmental Effects by Alternative

A summary of the anticipated potential effects of implementing the No Action and the Action Alternative is provided in Table 2-4.

**Table 2-4. Summary and Comparison of Alternatives by Resource Area**

| Resource Area | Impacts From Implementing the No Action Alternative | Impacts From Implementing the Action Alternative |
|---|---|---|
| Groundwater and Geology | No effects to local groundwater quality or quantity are expected. | Any effects to groundwater quality or quantity are anticipated to be minor. |
| Surface Water | No changes in local surface water quality are anticipated. | Any effects to local surface waters would be minor and temporary. |
| Aquatic Ecology | Aquatic life in local streams would not be affected. | Any effects to aquatic life in local surface waters are expected to be temporary and insignificant. |
| Vegetation | Local vegetation would not be affected. The 46-kV TL ROW would continue to be maintained as an early successional ecosystem for as long as the TL was in operation. | Site preparation and clearing of the proposed 161-kV TL ROW would have a temporary, minor effect on most local vegetation. An insignificant direct long-term effect on approximately 50 acres of forested areas is anticipated. The retirement of the 220-acre 46-kV TL ROW would convert this acreage from maintained early successional vegetation to a mixture of agricultural, mowed, and new forest. This conversion would be negligible compared to the forested area of the region. |
| Wildlife | Local wildlife would not be affected. | Wildlife inhabiting onsite forest, early successional, and edge habitats along the preferred 4.6-mile TL ROW would be displaced to adjacent local habitats. Likewise, along the retired 18.5-mile TL ROW, wildlife inhabiting early-successional, herbaceous habitat would be shift over time where the ROW was no longer being maintained. Any effects to wildlife are expected to be insignificant. |

| Resource Area | Impacts From Implementing the No Action Alternative | Impacts From Implementing the Action Alternative |
|---|---|---|
| Endangered and Threatened Species | No effects to endangered or threatened species or any designated critical habitats are anticipated. | A small population of about 20 white fringeless orchid individuals, a species proposed for federal listing as threatened, would be indirectly affected. The discontinuation of maintenance on the retired 46-kV TL ROW would cause a change of habitat preferred for these plants. TVA would work with TDEC and USFWS to relocate these individuals. The removal of not more than 13.2 acres of summer roosting habitat for the federally listed as endangered Indiana bat and as threatened northern long-eared bat would also occur. TVA would consult with the USFWS prior to any clearing or construction along the proposed ROW. No effects would occur to any listed aquatic species. |
| Floodplains | Local floodplain functions would not be affected. | Local floodplain functions would not be affected. |
| Wetlands | No changes in local wetland extent or function are expected. | No significant impacts would occur to the total of 0.56 acre of wetland located within the proposed 161-kV ROW, of which 0.28 acres are forested. Forested wetlands would be converted to emergent and/or scrub-shrub wetland habitat, thus reducing some wetland functions. Likewise, no impacts would occur to the 2.23 acres of emergent and/or scrub-shrub wetland habitat within the existing 46-kV TL ROW. |
| Aesthetics | Aesthetic character of the area is expected to remain virtually unchanged. | Minor visual discord and noise above ambient levels would be produced during construction. The proposed 161-kV TL would present a minor visual effect. The removal of the 46-kV TL would present a positive effect. |

| Resource Area | Impacts From Implementing the No Action Alternative | Impacts From Implementing the Action Alternative |
|---|---|---|
| Archaeological and Historic Resources | No effects to archaeological or historic resources are anticipated. | Archaeological effects to two sites within the APE would be avoided through the use of standard BMPs. One architectural resource is recommended eligible for listing in the National Register of Historic Places (NRHP). The Great Falls Hydro Plant and portions of the TL and structures on the Great Falls Hydro Plant 46-kV TL were built in 1913 by the Tennessee Electric Company. An adverse effect would occur with the removal of Segment 01 of this 46-kV TL. TVA would enter into an MOA to mitigate the adverse effects. |
| Recreation, Parks, and Natural Areas | No changes in local recreation opportunities or natural areas are expected. | The 46-kV TL crosses a portion of Rock Island State Park. Some trails would be closed temporarily as this TL is removed. The removal would result in a positive effect on the natural character of this section of the park. Because of the intervening distance, no other locally managed areas would be affected. No loss of local formal or informal recreational opportunities is expected. |
| Socioeconomics and Environmental Justice | Over time, the lack of reliable power service could have adverse economic effects to local businesses and residents. | Providing a new 161-kV TL would benefit the area and help maintain economic stability and growth in the area. Any adverse social, economic, or environmental justice effects of the proposed TL would be minor and would diminish over time. |

## 2.7 Identification of Mitigation Measures

The following routine measures would be applied during the construction, operation, and maintenance of the proposed TL and access roads to reduce the potential for adverse environmental effects.

- TVA would utilize standard best management practices (BMPs), as described by Muncy (2012), to minimize erosion during construction, operation, and maintenance activities.

- To minimize the introduction and spread of invasive species in the ROW, access roads, and adjacent areas, consistent with EO 13112 (Invasive Species), TVA would follow standard operating procedures for revegetating with noninvasive plant species as defined in Muncy (2012).

- Ephemeral streams that could be affected by the proposed construction would be protected by implementing standard BMPs as identified in Muncy (2012).

- In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with BMPs and label directions designed in part to restrict applications near receiving waters and to prevent unacceptable aquatic and groundwater impacts.

- The ROW would be re-vegetated where natural vegetation would be removed.

- Perennial and intermittent streams would be protected by the implementation of standard stream protection (Category A) as defined in Muncy (2012) and Appendices D and F.

- Prior to the commencement of construction, consultation with the USFWS under Section 7 of the ESA would be completed. TVA would enter into a conservation agreement with USFWS to offset potential indirect effects to Indiana bat and/or northern long-eared bat resulting from habitat removal during construction of the TL. No ground-disturbing activities would occur until TVA has completed consultation and fulfilled its obligations under Section 7.

- TVA would enter into a Conservation Memorandum of Agreement (MOA) with Tennessee SHPO to offset potential direct effects to the historical Tennessee Electric Power Company (TEPCO) structures that would be removed during retirement of the Great Falls Hydro Plant-Spencer 46-kV TL. TVA would also prepare a historic American engineering record documentation for Segment 01 of the Great Falls Hydro Plant-Spencer 46-kV TL and submit that documentation to the USNPS for review (Appendix A).

## 2.8 The Preferred Alternative

The Action Alternative, i.e. construct, operate, and maintain a new 161-kV TL and retire an existing 46-kV TL is TVA's preferred alternative for this proposed project. TVA would build a new 161-kV TL from a tap location on TVA's existing Watts Bar Hydro Plant–Great Falls Hydro Plant 161-kV TL to CFEC's upgraded substation.

TVA's preferred alternative route for the Action Alternative is Alternative Route 8. This 4.6-mile TL route is comprised of alternative route segments 1, 2, 5, 7, 12, 15, 18, 20, and 21. The TL would utilize tap point 1 to connect the existing TL to the new TL.

Additionally, following construction of the proposed TL, TVA would retire the existing Great Falls Hydro Plant-Spencer 46-kV TL and associated equipment located at the Great Falls Hydro Plant 46-kV switchyard.

# CHAPTER 3

## 3.0 AFFECTED ENVIRONMENT

The existing condition of environmental resources that could be affected by the proposed Action Alternative during construction, operation, or maintenance of the proposed TL is described in this chapter. The descriptions below of the potentially affected environment are based on field surveys conducted between April and September 2015, on published and unpublished reports, and on personal communications with resource experts. This information establishes the baseline conditions against which TVA decision makers and the public can compare the potential effects of implementing the alternatives under consideration.

The analysis of potential effects to endangered and threatened species and their habitats included records of occurrence within a three-mile radius for terrestrial animals, a five-mile radius for plants, and for aquatic animals within a 10-digit hydrologic unit or drainage area. The analysis of potential effects to aquatic resources included the local watershed, but was focused on watercourses within or immediately adjacent to the proposed ROW and associated access roads. The area of potential effect (APE) for architectural resources included all areas within a 0.5-mile radius from the proposed TL route, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource. The APE with respect to archaeological resources included the entire ROW width as described in Section 2.2.1.1 for the proposed route and the associated access roads.

Potential effects related to air quality and global climate change, solid and hazardous waste, and health and safety were considered. Potential effects on these resources were found to be minor and insignificant because of the nature of the action. Thus, any further analysis for effects to these resources was not deemed necessary.

### 3.1 Groundwater and Geology

The proposed project is located within both the Cumberland Plateau and the Eastern Highland Rim physiographic provinces. Surface forms of the Cumberland Plateau, which underlies the eastern portions of the project area, consist of deep valleys cut into the almost flat-lying sandstone, shale, conglomerate, and siltstone with thin interbedded coal seams of Pennsylvanian Age (DeBuchanne and Richardson 1956). Groundwater in this region primarily occurs in rock fractures and bedding planes since these rocks have very limited primary porosity. Aquifers within the Pennsylvanian rocks typically provide small quantities of potable water which is frequently high in iron and may contain objectionable levels of sulfate. However, these perched aquifers are sometimes used to supply water to private groundwater wells in the region (Lloyd and Lyke 1995). Due to the absence of carbonate rock units in the formations which comprise the Cumberland Plateau province, the potential for the development of karstic features in this portion of project area is remote.

Available mapping indicates the western sections of the project are located in the Eastern Highland Rim physiographic province, underlain by Mississippian age carbonate rock

strata. These units are prone to dissolution by slightly acidic groundwater; therefore, karstic features such as sinkholes, caves, and springs are common in the area. Precipitation is the primary source of recharge for aquifers underlying the province. Most of the precipitation becomes overland runoff to streams, but some percolates downward through soil and residuum to the underlying bedrock and is discharged from secondary openings, such as joints, fractures, bedding planes, and solution openings. (Lloyd and Lyke 1995)

Some rock units which comprise the Highland Rim aquifer system can yield significant quantities of water. However, contaminated and turbid water are problems that can plague the users of water from wells and springs in these carbonate rock aquifers. Water that recharges carbonate aquifers through waste-filled sinkholes can transport contaminants into the aquifer, and the contaminated water can spread rapidly through a system of interconnected solution openings until it reaches wells or springs. Solution features, such as swallow holes in streambeds, allow sediment-laden stormwater runoff to directly enter the aquifers. Turbid water also can be caused by pumping of large-capacity wells, which results in the rapid movement of water through solution openings lined with silt or clay. These contamination and turbidity problems can become worse during periods of prolonged, intense rainfall.

Information provided by the Tennessee Department of Environment and Conservation (TDEC) and USEPA indicates surface water is the primary source of public water supply for Van Buren and Warren counties (USEPA 2015). While public water is available in the project area, private water wells could be used as a source of potable water for area residents.

## 3.2 Surface Water

Precipitation in the project area averages about 57.9 inches per year. The wettest month is March with an average of 5.9 inches, and the driest month is October at 3.3 inches. The average annual air temperature is 58.4 degrees Fahrenheit, ranging from a monthly average of 38.4 degrees Fahrenheit in January to 77.0 degrees Fahrenheit in July (NOAA 2002). Stream flow varies with rainfall and averages about 23.5 inches of runoff per year, i.e., approximately 1.73 cubic feet per second, per square mile of drainage area (USGS 2008).

The federal CWA requires all states to identify all waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards and to establish priorities for the development of limits based on the severity of the pollution and the sensitivity of the established uses of those waters. States are required to submit reports to the USEPA. The term “303(d) list” refers to the list of impaired and threatened streams and water bodies identified by the state.

The project area drains to Millstone Branch and Dry Fork, both tributaries of Cane Creek in the Caney Fork River watershed. All of the streams are classified by the state (TDEC 2013) for “Fish and Aquatic Life, Recreation, Livestock Watering and Wildlife, and Irrigation.” Dry Fork is on the state 303(d) list (TDEC 2014) as impaired (i.e., not fully supporting its designated uses) due to “iron levels, pH levels, and physical substrate habitat alterations” from abandoned mining.

## 3.3 Aquatic Ecology

The proposed 161-kV TL route, the existing 46-kV TL, and the associated access roads cross the Cane Creek watershed, a direct tributary of the Caney Fork River system. The 46-kV TL also crosses through the lower Collins River and the Rocky River watershed.

Field surveys of the proposed 161-kV TL route in April 2015 found eight perennial, one intermittment, and 13 ephemeral[3] streams, as well as a pond. No additional water features were found during a September 2015 field survey of the access roads for the proposed 161-kV TL.

Field surveys were also completed in September 2015 along the existing 18.5-mile Great Falls Hydro Plant-Spencer 46-kV TL proposed for retirement and the associated access roads. Nine ponds, nine perennial, seven intermittent, and 13 ephemeral streams were documented.

Because TL construction and maintenance activities mainly affect riparian conditions and instream habitat, TVA evaluated the condition of both of these at each stream crossing along the proposed route and access roads. Riparian condition was evaluated during April and September 2015 field surveys using the Tennessee Division of Water Pollution Control's Version 1.4 field forms. A listing of stream and pond crossings within the proposed and existing ROWs and access roads, excluding ephemeral streams, is provided in Appendix F. Additional information regarding watercourses located in the vicinity of the project area can be found in Section 3.2.

Three classes were used to indicate the current condition of streamside vegetation across the length of the proposed TL and access roads, as defined below, and accounted for in Table 3-1 and Table 3-2.

- Forested – Riparian area is fully vegetated with trees, shrubs, and herbaceous plants. Vegetative disruption from mowing or grazing is minimal or not evident. Riparian width extends more than 60 feet on either side of the stream.
- Partially forested – Although not forested, sparse trees and/or scrub-shrub vegetation is present within a wider band of riparian vegetation (20 to 60 feet). Disturbance of the riparian zone is apparent.
- Non-forested – No or few trees are present within the riparian zone. Significant clearing has occurred, usually associated with pasture or cropland.

[3] Ephemeral streams are those small creeks and streams that typically flow only following rainfall events. They are also known as wet weather conveyances or "WWCs."

**Table 3-1. Riparian Condition of Streams Located Within the Proposed 161-kV Transmission Line Right-of-Way and Associated Access Roads**

| Riparian Condition | Perennial Streams | Intermittent Streams | Total |
|---|---|---|---|
| Forested | 8 | 1 | 9 |
| Partially forested | 0 | 0 | 0 |
| Non-forested | 0 | 0 | 0 |
| **Total** | **8** | **1** | **9** |

**Table 3-2. Riparian Condition of Streams Crossed by the Existing Great Falls Hydro Plant-Spencer 46-kV Transmission Line and Associated Access Roads**

| Riparian Condition | Perennial Streams | Intermittent Streams | Total |
|---|---|---|---|
| Forested | 3 | 0 | 3 |
| Partially forested | 5 | 4 | 9 |
| Non-forested | 1 | 3 | 4 |
| **Total** | **9** | **7** | **16** |

TVA assigns appropriate SMZs and BMPs based on field evaluations and other considerations (such as state 303(d) listing and presence of endangered or threatened aquatic species). Appropriate application of the BMPs minimizes the potential for impacts to water quality and instream habitat for aquatic organisms.

The project area for the proposed 161-kV TL is characterized by rough terrain with deeply incised escarpment slopes. Local relief of the steep forested slopes in this region is often 100 feet or greater, with high gradient streams. A substantial portion of this region is drained by the Caney Fork River system of the Cumberland River drainage, which has more endemic species of freshwater fish per geographic area than any river system in the United States (Keck and Near 2010). Of the 60 freshwater mussel species once known to the Caney Fork system alone, 37 were extirpated as a result of impoundment conditions (Layzer et al. 1993).

The proposed 161-kV TL is located near the upper Caney Fork River, and the existing 46-kV TL crosses through parts of the Collins and Rocky River watersheds. All three of these rivers are impounded by Great Falls Dam. Located roughly 62 miles above Center Hill Dam, the Great Falls Dam acts as an additional barrier that further isolates the aquatic fauna of the upper Caney Fork (Layzer et al. 1993).

## 3.4 Vegetation

The proposed transmission system upgrade is located within the Cumberland Plateau, Plateau Escarpment, and Eastern Highland Rim Level 4 ecoregions (Griffith et al. 1998). The new TL would be located entirely within the Cumberland Plateau ecoregion, while the retirement and removal of the existing 46-kV transmission facilities would occur in all three ecoregions.

The Cumberland Plateau generally has acidic soils with low fertility. The region is largely forested and supports less agriculture than the Eastern Highland Rim and Ridge and Valley ecoregions, which abut the Cumberland Plateau to the west and east, respectively.

The Plateau Escarpment is dominated by steep forested slopes that descend from the Cumberland Plateau to the Eastern Highland Rim. Portions of the Plateau Escarpment are underlain with Mississippian-age rock with and support more mesic forest types than the plateau above.

The Eastern Highland Rim is about 1,000 feet lower in elevation than the plateau to the east. This ecoregion supports more agricultural than either the Cumberland Plateau or Plateau Escarpment ecoregions.

Vegetation within the proposed project area is characterized by two main types: herbaceous vegetation (80 percent) and forested vegetation (20 percent). No forested areas in the proposed project area had structural characteristics indicative of old-growth forest (Leverett 1996). All plant communities observed in the project area are common and well-represented throughout the region.

Herbaceous vegetation is characterized by greater than 75 percent cover of forbs and grasses and less than 25 percent cover of other types of vegetation. Pastures, mowed lawns, and TL ROW account for nearly all herbaceous vegetation located within the project area. The existing TL ROWs that would be retired are made up mainly of beaked panic grass, broomsedge bluestem, Canada goldenrod, Chinese lespedeza, downy lobelia, gray goldenrod, hyssopleaf thoroughwort, little bluestem, purpletop tridens, and red morning-glory. By and large, these other areas have no conservation value and support species typical of disturbed sites, including broomsedge, English plantain, Japanese honeysuckle, miniature beefstake plant, *sericea lespedeza*, southern blackberry, tall fescue, and white clover. However, one emergent wetland located along a portion of existing ROW proposed for retirement does contain a number of native species including the white fringeless orchid. This species has been proposed as threatened under the ESA. Several other small emergent wetlands occurring along the existing ROW support a higher proportion of native species including beak sedges, rushes, and sedges.

Nearly all forested areas in the project area are deciduous in composition. Deciduous forest is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of canopy cover. Common trees in drier deciduous forest include black oak, black gum, blackjack oak, chestnut oak, post oak, red maple, scarlet oak, Virginia pine, and white oak in the overstory. Blueberries, greenbrier, flowering dogwood, mountain laurel, and serviceberry are found in the understory. With exception of a single rich, east-facing slope, the herbaceous layer observed in the deciduous forest within the ROW was sparse. This is likely due to the season of survey (early April) and the inherently dry nature of the habitat. The herbaceous plants cranefly orchid, halberdleaf violet, mayapple, puttyroot, rue anemone, and sweet Betsey were observed in this forest type. The rich, east-facing slope, despite being recently clear-cut, had much higher species richness than any other location along the proposed ROW. The tree species sugar maple and the herbaceous plants bellwort, black cohosh, bloodroot, Canada rockcress, Doll's eyes, smooth rockcress, spring beauty, white trillium, and yellow trillium were observed only

in this section of the proposed ROW. Small, forested wetlands were found in several locations of the proposed ROW; red maple and sweetgum were the dominant overstory species on these sites. Many forested sections of the ROW had overstory trees with an average diameter at breast height of up to 24 inches, but many areas have also been recently logged and now support early successional forest.

EO 13112 (Invasive Species) serves to prevent the introduction of invasive species and provides for their control to minimize the economic, ecological, and human health impacts that those species potentially cause. In this context, invasive species are nonnative species that invade natural areas, displace native species, and degrade ecological communities or ecosystem processes (Miller et al. 2010). No federally listed noxious weeds were observed, but populations of plant species designated by the Tennessee Exotic Plant Pest Council (TN-EPPC) as high priority invasive plants were observed sporadically throughout the project area (Table 3-3; TN-EPPC 2010). During field surveys, invasive plants were more prevalent in areas of herbaceous vegetation. This likely reflects the frequency and magnitude of disturbance present in areas of herbaceous vegetation. Disturbances associated with agriculture, grazing, and mowing prevent tree species from becoming established, but can also encourage invasion and establishment of weedy plants.

**Table 3-3. High Priority Invasive Plant Species Observed Within the Proposed 161-kV and Existing 46-kV Transmission Line Right-of-Ways**

| Common Name | Scientific Name |
|---|---|
| Tall fescue | *Festuca arundinacea* |
| Chinese lespedeza | *Lespedeza cuneata* |
| Japanese honeysuckle | *Lonicera japonica* |
| Japanese stiltgrass | *Microstegium vimineum* |

## 3.5 Wildlife

The proposed Action Alternative lies approximately 15 miles from the eastern edge of the Cumberland Plateau. This region has large number of karsts and the topographic relief across the proposed ROW varies. Many of the upper elevations along the ROW are forested, although several of these sites have previously been logged and were in various stages of regrowth at the time of review. In lower elevations, agriculture and residences have expanded into areas at the base of escarpments. The middle portion of the proposed 161-kV ROW would cross through a section of contiguous, mature forest, with several perennial streams where no development has occurred. The 46-kV TL proposed for retirement is primarily routed through lowland residential and agricultural areas, though the middle section climbs less disturbed forested areas of Baker Mountain. Habitat assessments for terrestrial animal species in the proposed action areas were conducted in April and September 2015. Each of the varying community types offers suitable habitat for species common to the region, both seasonally and year-round.

The mature deciduous and mixed deciduous-coniferous forests in the project area provide habitat for a variety of terrestrial animal species. Birds typical of this habitat include barred owl, brown creeper, coopers hawk, chuck-will's-widow, downy and hairy woodpecker, eastern screech-owl, eastern wood-pewee, golden crowned kinglet, pileated woodpecker,

red-eyed vireo, scarlet and summer tanager, white-breasted nuthatch, wild turkey, wood thrush, yellow-billed cuckoo, and yellow-rumped warbler (NGS 2002; Stokes and Stokes 1996). These types of habitat also provide foraging and roosting habitat for several bat species, particularly in areas where the forest understory is relatively open with less clutter to impede flying. Bat species likely here include big brown bat, little brown bat, eastern red bat, evening bat, hoary bat, silver-haired bat, and tricolored bat. Other common mammals found include eastern chipmunk, eastern woodrat, common gray fox, white-footed mouse, and woodland vole (Whitaker 1996). Black racer, black rat snake, cottonmouth, eastern box turtle eastern kingsnake, ring-necked snake, and northern scarlet snake are common reptiles in the project region (Conant and Collins 1998; Gibbons and Dorcas 2005; Scott and Redmond 1996). Amphibians occuring in and along forested streams and aquatic features similar to those observed during field survey include Cumberland dusky salamander, four-toed salamanders, Fowler's toad, green salamander, mole salamander, pickerel frog, slimy salamander, spotted dusky salamander, southern leopard frog, southern two-lined salamander, and upland chorus frog (Conant and Collins 1998; Niemiller and Reynolds 2011; Scott and Redmond 1996).

Recently logged areas along the proposed 161-kV ROW typically had some regrowth of small sapling trees that created areas of dense understory with an occasional mature trees left standing. These areas, along with residential areas, edge habitat, and areas otherwise previously disturbed by human activity, are home to a large number of common species. American crow, American robin, barred owl, black and turkey vulture, blue jay, Carolina chickadee, Carolina wren, eastern towhee, European starling, gray catbird, house sparrow, mourning dove, northern cardinal, northern mockingbird, tufted titmouse, and white-throated sparrow are birds commonly found along ROWs, road edges and residential neighborhoods. Mammals found in this community type include common raccoon, eastern gray squirrel, North American deermouse, nine-banded armadillo, and Virginia opossum (Kays and Wilson 2002; Whitaker 1996). Roadside ditches provide potential habitat for amphibians including American toad, northern cricket frog, and spring peeper. Reptiles potentially present include black rat snake, common garter snake, eastern fence lizard, eastern hog-nosed snake, and five-lined skink (Conant and Collins 1998; Gibbons and Dorcas 2005; Scott and Redmond 1996).

Sections of pasture land and field are crossed by the proposed 161-kV ROW. Additional early successional habitat due to maintenance activities occurs throughout the ROW of the 46-kV TL proposed for removal. Common inhabitants of early successional habitat include brown-headed cowbird, brown thrasher, common grackle, common yellowthroat, dickcissel, eastern bluebird, eastern kingbird, eastern meadowlark, field sparrow, grasshopper sparrow, house finch, prairie warbler, and song sparrow (NGS 2002; Stokes and Stokes 1996). Coyote, bobcat, eastern cottontail, eastern mole, groundhog, red fox, Virginia opossum, and white-tailed deer are mammals typical of pasture, cultivated fields, and early successional habitat (Kays and Wilson 2002). Reptiles including black kingsnake, copperhead, eastern hognose snake, red cornsnake, and southern black racer also are known to occur in this habitat type in this region (Conant and Collins 1998; Gibbons and Dorcas 2005; Scott and Redmond 1996).

A review of the TVA Regional Natural Heritage database indicated the presence of 177 caves within three miles of the proposed Action Alternative. The nearest known cave is

approximately 500 feet from edge of the proposed 161-kV ROW, and 462 feet away from the existing 46-kV TL. No additional caves were identified during the field surveys in April and September 2015. Little Falls, a 35-foot waterfall over a limestone overhang occurs approximately 280 feet from the edge of the new ROW on property owned by the Van Buren County Board of Education. Many common terrestrial animal species were observed in this unique area and in the stream that feeds this waterfall during field survey. No other unique or important terrestrial habitats were identified within the area affected by the proposed project. Further, no aggregations of migratory birds or colonial wading bird colonies are known within three miles of the project area and none were observed during field surveys.

## 3.6 Endangered and Threatened Species

Endangered species are those determined to be in danger of extinction throughout all or a significant portion of their range. Threatened species are those determined to be likely to become endangered within the foreseeable future. Section 7 of the ESA requires federal agencies to consult with the USFWS when their proposed actions may affect endangered or threatened species or their critical habitats.

The ESA provides broad protection for species of fishes, wildlife, and plants that are listed as threatened or endangered in the United States or elsewhere. The act outlines procedures for federal agencies to follow when taking actions that may jeopardize federally listed species or designated critical habitat. The policy of Congress is that federal agencies must seek to conserve endangered and threatened species and use their authorities in furtherance of the act's purposes.

The State of Tennessee provides protection for species considered threatened, endangered, or deemed in need of management within the state other than those federally listed under the ESA. The listing is handled by the TDEC; however, the Tennessee Natural Heritage Program and TVA both maintain databases of species that are considered threatened, endangered, special concern, or tracked in Tennessee. A listing of federally and state-listed species that occur near the proposed and existing TL ROWs or associated access roads is provided as Table 3-4.

**Table 3-4. Federally and State-listed Species from the Cane Creek, Rocky River, and Collins River Watersheds and/or within Van Buren and Warren Counties, Tennessee[1]**

| Common Name | Scientific Name | Federal Status[2] | State Status[2] | State Rank[3] |
|---|---|---|---|---|
| **Amphibians** | | | | |
| Hellbender | *Cryptobranchus alleganiensis* | PS | NMGT | S3 |
| Tennessee cave salamander | *Gyrinophilus palleucus* | | THR | S2 |
| **Birds** | | | | |
| Least bittern | *Ixobrychus exilis* | | NMGT | S2B |
| **Fishes[4]** | | | | |
| Barrens darter | *Etheostoma forbesi* | | END | S1 |
| Barrens topminnow | *Fundulus julisia* | | END | S1 |
| Bedrock shiner | *Notropis rupestris* | | NMGT | S2 |
| Bluemask darter | *Etheostoma akatulo* | LE | END | S1 |

| Common Name | Scientific Name | Federal Status[2] | State Status[2] | State Rank[3] |
|---|---|---|---|---|
| Cherry darter | *Etheostoma etnieri* | | TRKD | S3 |
| Southern cavefish | *Typhlichthys subterraneus* | | NMGT | S3 |
| **Invertebrates** | | | | |
| A cave cricket | *Hadenoecus opilionides* | | TRKD | S3 |
| A cave obligate beetle | *Pseudanophthalmus macradei* | | TRKD | S1S2 |
| A cave obligate beetle | *Pseudanophthalmus robustus* | | TRKD | S3 |
| A cave obligate beetle | *Pseudanophthalmus vanburenensis* | | TRKD | S1 |
| A cave obligate beetle | *Nelsonites walteri* | | TRKD | S3 |
| A cave obligate harvestman | *Phalangodes appalachius* | | TRKD | S3 |
| A cave obligate pseudoscorpion | *Kleptochthonius daemonius* | | TRKD | S1S2 |
| A cave obligate springtail | *Pseudosinella christianseni* | | TRKD | S2 |
| A cave obligate springtail | *Pseudosinella spinosa* | | TRKD | S2 |
| A cave obligate springtail | *Pseudosinella aera* | | TRKD | S2 |
| A cave obligate millipede | *Scoterpes ventus* | | TRKD | S1 |
| A cave obligate millipede | *Tetracion tennesseensis* | | TRKD | S2S3 |
| A harvestman from Cummings Cove cave | *Theromaster sp. 1* | | TRKD | S1 |
| A rove beetle | *Atheta lucifuga* | | TRKD | S2 |
| A rove beetle | *Aloconota diversiseta* | | TRKD | S1 |
| A springtail | *Sinella cavernarum* | | TRKD | S3 |
| A viatica group springtail | *Hypogastrura sp. 1* | | TRKD | S1 |
| Copeland's springtail | *Triacanthella copelandi* | | TRKD | S1 |
| Cumberland ground beetle | *Trechus cumberlandus* | | TRKD | S2 |
| Cupped vertigo snail | *Vertigo clappi* | | TRKD | S1 |
| Rumbling falls cave beetle | *Pseudanophthalmus sp. 27* | | TRKD | S1 |
| Rumbling falls cave dipluran | *Litocampa sp. 5* | | TRKD | S1 |
| Swamp river cave amphipod | *Stygobromus sp. 22* | | TRKD | S3 |
| Swamp river cave neanura | *Neanura sp. 1* | | TRKD | S1 |
| Swamp river cave onychiurus | *Onychiurus sp. 2* | | TRKD | S1 |
| Swamp river cave pseudosinella | *Pseudosinella sp. 5* | | TRKD | S1 |
| Yeatmans groundwater copepod | *Diacyclops yeatmani* | | TRKD | S1 |
| **Plants** | | | | |
| American barberry | *Berberis canadensis* | | SPCO | S2 |
| American chestnut | *Castanea dentata* | | SPCO | S2S3 |
| American ginseng | *Panax quinquefolius* | | S-CE | S3S4 |
| Butternut | *Juglans cinerea* | | THR | S3 |
| Deam's copperleaf | *Acalypha deamii* | | SPCO | S1 |
| Loesel's twayblade | *Liparis loeselii* | | THR | S1 |
| Narrow-leaved wild leek | *Allium burdickii* | | T-CE | S1S2 |
| Nestronia | *Nestronia umbellula* | | END | S1 |
| Shining ladies'-tresses | *Spiranthes lucida* | | THR | S1S2 |
| Short-head rush | *Juncus brachycephalus* | | SPCO | S2 |
| Virginia spiraea[5] | *Spiraea virginiana* | THR | END | S2 |
| White fringeless orchid[6] | *Platanthera integrilabia* | PT | END | S2S3 |
| Wood lily | *Lilium philadelphicum* | | END | S1 |
| Yellow fringeless orchid | *Platanthera integra* | | END | S1 |

| Common Name | Scientific Name | Federal Status[2] | State Status[2] | State Rank[3] |
|---|---|---|---|---|
| **Mammals**[7] | | | | |
| Allegheny woodrat | *Neotoma magister* | -- | NMGT | S3 |
| Gray bat | *Myotis grisescens* | LE | END | S2 |
| Indiana bat | *Myotis sodalis* | LE | END | S1 |
| Northern long-eared bat[8] | *Myotis septentrionalis* | LT | | S1S2 |
| Rafinesque's big-eared bat | *Corynorhinus rafinesquii* | | NMGT | S3 |
| **Mussels**[4] | | | | |
| Cumberland elktoe | *Alasmidonta atropurpurea* | LE | END | S1S2 |
| Cumberland pigtoe | *Pleurobema gibberum* | LE | END | S1 |
| Little-wing pearlymussel | *Pegias fabula* | LE | END | S1 |
| Oyster mussel | *Epioblasma capsaeformis* | LE | END | S1 |
| Slabside pearlymussel | *Pleuronaia dolabelloides* | LE | END | S2 |

[1] Source: TVA Regional Natural Heritage database April and September 2015; TDEC Natural Heritage database November 2015.

[2] Status Codes: END or LE = Endangered; NMGT = In Need of Management; NOST = No Status; PS = Partial Status; PT = Proposed Threatened SPCO = Special Concern; T-CE = Threatened – Commerically Exploited THR or LT= Threatened; TRKD = Tracked by state natural heritage program (no legal status)

[3] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S#B = Rank of breeding population; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)

[4] Species occurring within the Cane Creek, Rocky River, and Collins River watersheds, or from Van Buren or Warren counties.

[5] Federally listed species occurring within the county where work would occur, but not necessarily within five miles of the project area.

[6] Species proposed as federally threatened that were observed in the ROW where work would occur.

[7] Additional reference sources include USFWS Ecological Conservation Online System (http://ecos.fws.gov/ecos/home.action), and Tennessee Bat Working Group species occurrence maps (http://www.tnbwg.org/), retrieved June 2015.

[8] Federally listed species that the USFWS has determined that have the potential to exist state-wide. Known from Van Buren County, but not within three miles of the proposed Action Alternative.

### 3.6.1 Aquatic Animals

A review of the TVA Regional Natural Heritage database indicated there are six federally listed and six additional state-listed aquatic animal species that occur within the Cane Creek, Rocky River, and Collins River watersheds of the proposed project area and/or Van Buren and Warren County, Tennessee (Table 3-4). The federally listed bluemask darter, Cumberland pigtoe, and little-wing pearlymussel are known to occur in the mainstem of Cane Creek near the project vicinity. Because preferred habitat for these species in Cane Creek is restricted by the absence of sand and gravel shoals, these species are restricted to a limited reach of approximately three miles in the lower reaches above the impounded backwaters of the Caney Fork River (Great Falls Lake) (Ahlstedt and Saylor 1995-1996; Ahlstedt et al. 2004; TVA 2015c). Ongoing threats to the sensitive species occurring in Cane Creek include unrestricted cattle access to the stream and lack of riparian vegetation (USFWS 2013). Cane Creek also hosts known populations of the state-listed bedrock shiner and cherry darter. The federally listed Cumberland elktoe, oyster mussel, and slabside pearlymussel are known to occur within the counties, but not within the potentially affected watersheds.

Because the proposed 161-kV TL route, the existing 46-kV TL route, and the access roads primarily cross first-order tributaries and do not cross mainstem streams, no impacts to the aforementioned federally and state-listed species would occur.

In addition, the state-listed southern cavefish and state-tracked Swamp River Cave amphipod are known to occur in Swamp River and Thunder Run caves. Both of these caves are connected hydrologically to Dry Fork and several other unnamed first-order tributaries of Cane Creek that are crossed by the proposed 161-kV TL route.

No federally designated critical habitat is present for any aquatic species within the potentially affected watersheds of the proposed or existing TL route.

The following list includes federally and state-listed aquatic species likely to occur in the proposed project area. Descriptions of fish species were retrieved from Etnier and Starnes (1993), and mussels from Parmalee and Bogan (1998).

The barrens darter inhabits small upland creeks where they frequent gently flowing riffles or pools with slab rock, rubble substrates.

The barrens topminnow inhabits heavily vegetated spring pools, especially in association with watercress and filamentous algae. It can also occur in vegetated pool areas of sluggish streams.

The bedrock shiner inhabits bedrock pools in low-gradient streams and is typically common where found. This species range is restricted entirely to the Nashville Basin.

The bluemask darter is restricted to the upper Caney Fork River system; prefers small rivers and large creeks in slow to moderate current; and is typically found just downstream of riffles or runs over clean sand and fine gravel substrates (USFWS 1993; Layman and Mayden 2009). Simmons and Layzer (2004) noted spawning activities taking place in May and June in gravelly runs.

The cherry darter occurs over gravel shoal areas of cool, medium-sized creeks to large rivers. The species is generally common where found, but its range is restricted to the upper Caney Fork River system.

The southern cavefish exists entirely in subterranean environments. Its habitat is threatened primarily by groundwater contamination due to a variety of factors including agriculture and mining operations.

The ecology and life history of the Swamp River cave amphipod has not yet been assessed.

The Cumberland pigtoe inhabits small to medium-sized rivers in riffle areas. It is typically found over clean sand and gravel substrates (Ahlstedt et al. 2004; Gordon and Layzer 1989; USFWS 1991).

The little-wing pearlymussel is known to inhabit cool, high-gradient tributary streams. Their preferred habitat includes fine gravel and sandy substrates in riffle areas (Ahlstedt and Saylor 1995-1996; USFWS 1988; USFWS 2013).

### 3.6.2 Plants

A review of the TVA Regional Natural Heritage database indicated that one plant proposed for federal listing and twelve state-listed plants are known from within a five-mile vicinity of the proposed 161-kV ROW and existing 46-kV ROW. One additional federally listed plant has been previously reported from Van Buren and Warren counties (Table 3-4).

No federally or state-listed as threatened or endangered plant species were observed during field surveys of the proposed 161-kV ROW. Virginia spiraea occurs in riparian zones of high gradient streams. The appropriate habitat for this species does not occur along the ROW. No designated critical habitat for plant species occurs in the project area.

During September 2015 field surveys one population of white fringeless orchid was observed along the ROW designated for retirement within the project area. The species occurs in an emergent wetland in an open ROW. The observation of the plant occurred after flowering in mid-September 2015, which complicates efforts to definitively identify the species. However, comparisons of plants found in the Great Falls Hydro Plant-Spencer 46-kV TL ROW to known populations of living plants and preserved specimens at the University of Tennessee suggest that the species in the project area is the white fringeless orchid. About 20 post-flowering individuals were observed, but more plants are likely present because not all individuals flower in a given year. Range wide, several large populations occur in wetlands in open TL ROW, but the vast majority of occurrences are small (less then 50 plants) and are widely distributed in shaded, forested wetlands.

### 3.6.3 Terrestrial Animals

A review of the TVA Regional Natural Heritage database resulted in records for five state-listed species, two federally endangered species, and 27 species tracked by the State of Tennessee within three miles of the proposed Action Alternative (Table 3-4). One additional federally listed species (northern long-eared bat) has been documented within Van Buren and Warren counties (Table 3-4).

Many of the federally and state-listed species utilize caves as habitat. As indicated in Section 3.5, 177 caves have been documented within three miles of the proposed Action Alternative. The nearest caves occur approximately 500 feet from edge of the proposed 161-kV TL ROW and 462 feet away from the existing 46-kV TL.

*Hypogastrura sp. 1, Neanura sp. 1, Onychiurus sp. 2, Pseudosinella aera, P.christianseni, P. spinosa, P. sp. 5, Sinella cavernarum*, and *Triacanthella copelandi* are all cave obligate springtails. Some are known from several localities, while others have only been described from one cave in the regions surrounding the project area (NatureServe 2015). The closest record of any of these species is from a cave approximately 1.1 miles away from the project area. Cave habitat does not exist within the proposed project footprint, thus no suitable habitat for these species exists in the proposed project area.

*Diacyclops yeatmani, Hadenoecus opilionides, Kleptochthonius daemonius, Litocampa sp. 5, Nelsonites walteri, Phalangodes appalachius, Pseudanophthalmus macradei, P. robustus, P. sp. 27, P. vanburenensis, Scoterpes ventus, Stygobromus sp. 22, Tetracion tennesseensis*, and *Theromaster sp. 1* are all cave obligate invertebrates. Most of these species have only been observed in a few counties in Tennessee, while two of these

species are known from up to four states (NatureServe 2015). The closest record of any of these species is from a cave approximately 1.0 miles away from the project area. Cave habitat does not exist within the proposed project footprint, thus no suitable habitat for these species exists in the proposed project area.

*Aloconota diversiseta, Atheta lucifuga*,and *Trechus cumberlandus* are terrestrial beetles known from caves surrounding the project area. The closest records of any of these species are from a cave approximately 1.1 miles away. Specific habitat requirements for these particular species are not well described (NatureServe 2015). However, rove beetles are known to occupy a variety of habitats including under leaf litter and bark, on flowers, and under rocks and other objects along streams. Ground beetles are also found on the ground under objects and occasionally on plants (Borror and White 1970). Habitat for these three species likely exists throughout the proposed project area.

Cupped vertigo is a terrestrial snail that is known only from four U.S. states and Ontario, Canada. It is found in hardwood forests, near rocky outcrops, boulders, and talus slopes with well-decomposed leaf litter (NatureServe 2015). The closest record of this species is from Rock Island State Park, approximately 0.5 miles away from the proposed project activities. Rocky outcrops and boulder areas were observed in several locations across the project area. Suitable habitat for cupped vertigo snail does exist across the project site.

Hellbenders inhabit fast-flowing, large streams with rocky bottoms. This species is often found beneath large rocks in shallow rapids (Petranka 1998). Hellbenders prefer cooler water temperatures below 20 degrees Celcius (NatureServe 2015). The closest record of this species is approximately 1.14 miles away at the confluence of the Caney Fork and Rocky River. The Rocky River crosses the existing 46-kV TL ROW, however, project actions avoid crossing through this river, thus there are no actions on the Rocky River. Suitable habitat for hellbender does not exist in the area of the proposed Action Alternative.

The Tennessee cave salamander inhabits cave systems in central to eastern Tennessee, northwestern Georgia, and northern Alabama. Individuals have been found under rocks in shallow pools and in both rocky and sandy substrates in quiet pools. Local populations in Tennessee are usually found in sinkhole-type caves or in cave systems that contain groundwater and are in the vicinity of sinkholes. The association with sinkholes is tied to the relatively high nutrient input that these formations receive and the large invertebrate populations that sustain salamander populations (Petranka 1998). The closest record of this species is approximately 1.6 miles from the existing 46-kV TL. Suitable habitat for Tennessee cave salamander is lacking within the ROWs or access roads associated with the proposed Action Alternative.

In Tennessee, least bitterns inhabit marshes with rushes, cattails, and other tall, emergent vegetation such as cutgrass and bulrush that border open water. This species nests in the emergent vegetation close to open water (Nicholson 1997). The closest record of this species is approximately 2.1 miles from the proposed project activities. Suitable habitat for this species may exist at several wetlands within the proposed action areas.

The Allegheny woodrat is associated with rock outcroppings, rocky cliffs, and talus slopes with boulders and crevices. This habitat was observed in several locations across the project area at elevations of approximately 1,500 to 1,750 feet. This species also is known

to inhabit caves, especially those that occur in mixed conifer-hardwood forests. The Allegheny woodrat prefers areas of higher elevation and is rarely found in lowlands or open areas (NatureServe 2015). Most of the records of this species within three miles of the proposed Action Alternative are from caves. The closest record is approximately 0.9 miles. Suitable habitat for the Allegheny woodrat is found in several locations within the affected area of the proposed Action Alternative.

Rafinesque's big-eared bats utilize different wintering habitat depending on the region in which they are found. On the Cumberland Plateau, they winter in shallow caves or rock shelters. Summer habitat includes hollow trees, abandoned buildings, bridges, and culverts in wooded areas. Foraging occurs in mature forest and along rivers and other permanent bodies of water (NatureServe 2015). The closest record of this species is from a cave approximately 1.3 miles from the proposed activities. The closest cave to project action area is approximately 462 feet away. No additional caves or rock shelters were observed within the affected project area during field surveys in April and September 2015. Foraging habitat for Rafinesque's big-eared bat exists throughout both of the ROWs over streams, ponds, and forest.

Gray bats inhabit caves throughout the year, migrating among different caves across seasons. During summer, bats disperse from colonies at dusk to forage for insects over streams, rivers, and reservoirs. Summer occurrence of gray bats has been documented in a cave located approximately 1.1 miles from the proposed project activities. A total of six other gray bat hibernacula[4] are known from Van Buren and Warren counties. The closest cave to the project action area is approximately 462 feet away. No additional caves were observed within the affected project area during field surveys in April and September 2015. Foraging habitat for gray bats exists throughout the proposed project area over streams and ponds.

Indiana bats hibernate in caves during winter and inhabit forest areas around these caves for swarming (mating) in the fall and staging in the spring, prior to migration to summer habitat. During summer, Indiana bats roost under exfoliating bark and within cracks and crevices of trees, typically located in mature forests with an open understory and a nearby source of water. Indiana bats are known to change roost trees frequently throughout the season, yet still maintain site fidelity, returning to the same summer roosting areas in subsequent years (Pruitt and TeWinkel 2007, Kurta et al. 2002). Indiana bats are known from four caves within Van Buren County and one cave in Warren County. The closest of these records is approximately 1.8 miles from the proposed new ROW. The closest cave to the project action area is approximately 462 feet away. No additional caves or winter roosting habitat were observed within the affected project area during field surveys in April and September 2015. Foraging habitat for Indiana bat exists throughout both of the project ROWs over streams, ponds, forest, fence rows, and other corridors.

Northern long-eared bats predominantly overwinter in large hibernacula, such as caves and abandoned mines, with high humidity and no air flow. During the fall, and occasionally in spring, this species utilizes entrances of caves and surrounding forested areas for swarming (mating). In the summer, northern long-eared bats roost singly or in colonies

[4] *Hibernacula* are areas, such as caves, that are used by bats for hibernating during the winter.

beneath exfoliating bark or in crevices of both live and dead trees. Roost selection by northern long-eared bats is similar to the Indiana bat; however it is thought that northern long-eared bats are more opportunistic in roost site selection. This species also is known to roost in abandoned buildings and under bridges. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014). Northern long-eared bats are known from two caves within in Van Buren County. This species has also been captured in several locations during summer mist-net surveys in Van Buren and Warren Counties. The closest of these records is approximately 0.8 miles from the proposed new ROW. The closest cave to project action area is approximately 462 feet away. No additional caves or winter roosting sites were observed within the affected project area during field surveys in April and September 2015. Foraging habitat for northern long-eared bat exists throughout the proposed and existing ROWs over streams, ponds, forest, fence rows and other corridors.

Assessment of the project action area for presence of summer roosting habitat for the Indiana bat and the northern long-eared bat followed federal guidance and resulted in identification of 293 suitable roost trees scattered across eight forest fragments, totaling 13.2 acres (USFWS 2014, USFWS 2015a). This entire habitat was found along the proposed 161-kV ROW. Habitat quality ranged from moderate to high, based on the presence of trees with exfoliating bark. Suitable summer roosting areas were comprised of mature hardwood stands dominated by a mixture of canopy species including scarlet oaks, northern red oaks, white oaks, tulip poplars, mockernut hickory, shagbark hickory, red maple, and Virginia pine.

## 3.7 Floodplains

A floodplain is the relatively level land area along a stream or river that is subjected to periodic flooding. The area subject to a one-percent chance of flooding in any given year is normally called the 100-year floodplain. It is necessary to evaluate development in the 100-year floodplain to ensure that the project is consistent with the requirements of EO 11988. The proposed 4.6-mile 161-kV TL route and the existing 18.5-mile 46-kV TL would not cross any floodplain areas associated with the streams identified in Section 3.2 that are located in Van Buren or Warren counties.

## 3.8 Wetlands

Wetlands are those areas inundated by surface or groundwater such that vegetation adapted to saturated soil conditions is prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas are also found along the edges of most watercourses and impounded waters (both natural and man-made). Field surveys of the project area were conducted in April and September 2015 to identify wetland areas potentially affected by the proposed Action Alternative. Wetland areas were assessed within the proposed 161-kV TL ROW corridor, the existing Great Falls Hydro Plant-Spencer 46-kV TL ROW proposed for retirement, and all access routes proposed for use during ROW construction, operation, maintenance, and retirement activities.

Wetland determinations were performed according to USACE standards, which require documentation of hydrophytic (wet-site) vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Lichvar et al. 2014; USDOD and USEPA 2003; USACE 2010). Broader definitions of wetlands, such as those used by the USFWS (Cowardin et al. 1979), the Tennessee definition (Tennessee Code 11-14-401), and the TVA environmental review procedures definition (TVA 1983), were also considered in this review. A TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001) specific to the TVA region (TVA Rapid Assessment Method or TVARAM) was used to categorize wetlands by their functions, sensitivity to disturbance, rarity, and ability to be replaced.

TVARAM scores are used to classify the quality of wetlands into three categories. Category 1 wetlands are considered “limited quality waters.” They represent degraded aquatic resources having limited potential for restoration with such low functionality that lower standards for avoidance, minimization, and mitigation can be applied. Category 2 includes wetlands of moderate quality and wetlands that are degraded, but have reasonable potential for restoration. Avoidance and minimization are the preferred mitigation measures for Category 2 wetlands. Category 3 generally includes wetlands of very high quality or of regional/statewide concern, such as wetlands that provide habitat for threatened or endangered species.

The proposed and existing TL corridors traverse mountainous terrain over rocky ridge lines dissected by deep valleys. Given the extreme topographic relief, water quickly leaves the smaller watersheds; thereby wetlands are not a common landscape feature of this area. Eight wetland areas, totaling 0.56 acre, were identified within the proposed 161-kV TL ROW (Table 3-5). Twenty wetlands, totaling 2.23 acres, were identified within the 46-kV TL ROW proposed for retirement (Table 3-6).

**Table 3-5. Wetlands Located Within the Proposed 161-kV Transmission Line Right-of-Way (ROW)**

| Wetland Identifier | Wetland Type[1] | TVARAM[2] Wetland Quality Descriptor | Wetland Acreage within ROW | Forested Wetland Acreage within ROW |
|---|---|---|---|---|
| W001 | PEM1E | Low | 0.06 | 0.00 |
| W002 | PSS/PFO1E | Moderate | 0.02 | 0.02 |
| W003 | PFO1E | Moderate | 0.13 | 0.13 |
| W004 | PFO1E | Moderate | 0.06 | 0.06 |
| W005 | PSS1E | Moderate | 0.05 | 0.00 |
| W006 | PSS/PFO1E | Moderate | 0.07 | 0.07 |
| W007 | PEM1E | Moderate | 0.03 | 0.00 |
| W008 | PSS1E | Moderate | 0.14 | 0.00 |
| | **Total Acres** | | **0.56** | **0.28** |

[1]Classification codes as defined in Cowardin et al. (1979): PEM1 = palustrine emergent, persistent vegetation; PFO1 = palustrine forested, broadleaf deciduous vegetation; PSS1 = palustrine, scrub-shrub, broadleaf deciduous; suffix “E” = seasonally flooded/saturated; suffix “f” = farmed.
[2]TVARAM = A TVA Rapid Assessment Method that categorizes wetland quality by their functions, sensitivity to disturbance, rarity, and ability to be replaced.

**Table 3-6. Wetlands Located Within the Great Falls Hydro Plant-Spencer 46-kV Transmission Line Right-of-Way (ROW) Proposed for Retirement and Removal**

| Wetland Identifier | Wetland Type[1] | TVARAM[2] Wetland Quality Descriptor | Wetland Acreage within the ROW |
|---|---|---|---|
| W001-R | PEM1H | Low | 0.02 |
| W002-R | PEM1E | Moderate | 0.11 |
| W003-R | PEM1E | Moderate | 0.11 |
| W004-R | PEM/PUBH | Low | 0.07 |
| W005-R | PEM1E | Moderate | 0.08 |
| W006-R | PEM1E | Moderate | 0.04 |
| W007-R | PEM1E | Moderate | 0.46 |
| W008-R | PEM1E | Low | 0.07 |
| W009-R | PEM/PSS1E | Low | 0.06 |
| W010a/b-R | PSS1E | Moderate | 0.01 |
| W011-R | PEM/PSS1E | Moderate | 0.01 |
| W012-R | PEM1E | Low | 0.04 |
| W013-R | PEM1E | Moderate | 0.13 |
| W014-R | PEM1H | Low | 0.18 |
| W015-R | PEM1H | Low | 0.08 |
| W016-R | PEM/PSS1E | Moderate | 0.22 |
| W017-R | PEM1H | Low | 0.06 |
| W018-R | PEM1E | Moderate | 0.31 |
| W019-R | PEM1E | Low | 0.01 |
| W020-R | PSS1E | Moderate | 0.16 |
| | **Total Acres** | | **2.23** |

[1]Classification codes as defined in Cowardin et al. (1979): H = Permanently flooded; E = Seasonally flooded/saturated; PEM1 = Palustrine emergent, persistent vegetation; PSS1 = Palustrine scrub-shrub, broadleaf deciduous vegetation; PUB = Palustrine, unconsolidated bottom (pond).
[2]TVARAM = A TVA rapid assessment method that categorizes wetland quality by their functions, sensitivity to disturbance, rarity, and ability to be replaced.

W001 comprises 0.06 acre of emergent wetland habitat within the ROW, extending east of the ROW for a total of ~0.1 acre. This wetland area is located within a recent clear-cut. W001 receives precipitation and groundwater input, forming as a headwater depression immediately west of the ROW. W001 flanks an ephemeral drain across the ROW, conveying water off site toward Millstone Creek. Flowing water was present in W001 at the time of the field survey, and the site exhibited mottled soil coloration indicative of hydric conditions. W001 was dominated by hydrophytic vegetation that included whitegrass and late flowering thoroughwort.

W002 totals 0.02 acre of forested wetland, located entirely within the ROW. This small vernal pool has formed as an overflow depression from the adjacent stream feeding Millstone Creek. The wetland was ponded at the time of the field survey, and exhibited hydric soil coloration was present. W002 contained a large red maple providing canopy for the entire wetland depression. Red maple and sweetgum saplings were also present in the understory, both of which are hydrophytic species. The ground layer of this depression was dominated by sphagnum moss.

W003 consists of 0.13 acre of forested wetland habitat along the floodplain of an unnamed tributary to Millstone Branch. W003 is located entirely within the ROW, exhibiting evidence of inundation, a water table eight inches below the surface, and hydric soils coloration extending nearly to the soil surface. W003 was dominated by a young forest comprised of hydrophytic species including red maple and sweetgum in the overstory, and soft pathrush and deertongue grass in the understory.

W004 is a linear wetland feature following an ephemeral surface drain perpendicular to and across the ROW, with flowing water auditory and observed eight inches below the ground surface. This flowage becomes surface water east of the ROW, forming an unnamed tributary to Dry Fork. Crayfish burrows and hydric soils indicators were evident within the soil. W004 contained 0.06 acre within the ROW, extending east and west of the ROW for an estimated total of ~0.1 acre. This wetland was dominated by hydrophytic vegetation that included large and mature tree species such as green ash, sycamore, and red maple.

W005 follows a wide linear ephemeral drain perpendicular to and across the ROW, with flowing water evident at the time of the field survey. W005 contained 0.05 acre of scrub-shrub habitat within the ROW, extending east and west of the ROW for a total area of about 0.1 acre. This wetland feature contributes runoff to an unnamed tributary to Dry Fork, and is underlain by hydric soils. W005 is canopied by overhanging upland trees on either side of the ravine; but supported within its boundary are elderberry shrubs, and red maple and cherry bark oak saplings, all of which are hydrophytic species.

W006 consists of a wide drain totaling 0.07 acre within the ROW, but extending east of the ROW for a total of about 1.0 acre, eventually feeding Dry Fork. This wetland contained flowing surface water, with a high water table and saturated soils evident at the time of the field survey, meeting the hydrology parameter for wetland determination. However, typical hydric soil conditions were not found. The presence of an iron sheen and iron deposits on the soil surface suggests the area may receive iron rich groundwater input, tainting the soil matrix away from a normal hydric hue. Likewise, W006 contained a dominance of hydrophytic vegetation, with a substantial, albeit less than half, presence of upland species. Therefore, the site's hydrology may have recently shifted, resulting in the loss of fully robust wetland features. W006 was dominated by red maple, tulip poplar, elderberry shrub, green ash saplings, and Chinese privet, with a majority coverage of hydrophytic species.

W007 is a small emergent spring-fed wetland totaling 0.03 acre within the ROW, extending east of the ROW to roughly double in size. W007 contains an ephemeral drain, tributary to Dry Fork. This wetland contained ponded and flowing water at the time of the field survey, with soils exhibiting hydric coloration within six inches of the surface. The wetland and surrounding buffer appear to experience frequent mowing, maintaining the emergent wetland habitat. W007 was dominated by hydrophytic vegetation that included a soft pathrush, grassleaf rush, and clustered beak sedge.

W008 is a scrub-shrub wetland totaling 0.14 acre within the existing 46-kV ROW that would be utilized by the new line near the substation. Flowing and ponded water was present at the time of the field survey, conveying flow to an unnamed tributary of Dry Fork. W008 contained hydric soils with mottled coloration within six inches of the surface. Dominant vegetation consisted of hydrophytic species including buttonbush shrub, soft pathrush, and

deertongue grass. This wetland is also identified as W020-R, extending onto the adjacent portion of existing 46-kV ROW proposed for retirement.

The Great Falls Hydro Plant-Spencer 46-kV TL proposed for retirement and removal as part of this project contained similar types of wetland habitat throughout, although ranging in quality and condition. Predominant wetland habitat types located on the ROW where work activities are proposed consist of ponded areas with wetland fringe and wide wetland flats associated with ephemeral, intermittent, and perennial watercourses. Herbicide had recently been applied to all wetland habitat containing woody species resulting in scrub-shrub communities generally dominated by standing dead vegetation.

W001-R, W004-R, W014-R, W015-R and W017-R all comprise shoreline fringe wetland habitat within and around man-made ponds. These wetland areas function as transitional zones between the open water pond and the surrounding upland, exhibiting inundation and saturated soils due to pond hydrology. Shoreline vegetation was dominated by hydrophytic species growing in soils exhibiting hydric coloration. Several access roads and structures are located adjacent to these ponds and their associated wetland fringe habitat.

W002-R, W003-R, W010a/b-R, and W011-R consisted of moderate quality wetland habitat becoming forested along their associated watercourses outside the ROW. Their landscape position along a drainage way provides sufficient hydrology for the development of hydric soil indicators and dominance of hydric vegetation.

W005-R, W006-R, W013-R, and W020-R formed headwater flats within the ROW, emptying into more defined channels as they exit or within close proximity of the ROW boundary. W018 formed in a wide basin at the downslope of a pond dam, extending as a wide flat across the ROW, before similarly emptying into a more defined channel. Due to their landscape position, geomorphology, and vegetative diversity, these wetlands provide a moderate level of wetland function to the surrounding landscape. Standing and flowing water was present at the time of the field survey. Soils exhibited hydric coloration and supported a dominance of hydrophtytic vegetation.

W007-R consists of 0.46 acre of emergent wetland habitat within the existing ROW. W007-R is a headwater wetland associated with Rocky Branch. This wetland extends outside of the ROW to the south and east. W007-R contained hydric soils, indicating saturated conditions. Dominant species included wetland plants such as softrush, Maryland meadow beauty, and boneset.

W008-R, W009-R, W012-R, and W016-R consisted of wetlands associated with drainage swales within cattle fields. Cattle impacts (grazing, manure, trampling) were evident, lowering the condition and existing functional capacity of this wetland habitat. Similarly, W019 formed within a small basin at the entrance point below a road previously used for access to complete ROW work. All five wetlands contained flowing water in the channel at the time of the field survey. Soils exhibited mottled coloration, indicating hydric conditions. Dominant vegetation consisted of hydrophytic species.

## 3.9 Aesthetics

### 3.9.1 Visual Resources

The physical, biological, and man-made features of an area combine to make the visual landscape character both identifiable and unique. Scenic resources are evaluated based on existing landscape character, distances of available views, sensitivity of viewing points, human perceptions of landscape beauty/sense of place (scenic attractiveness), and the degree of visual unity and wholeness of the natural landscape in the course of human alteration (scenic integrity). The varied combinations of natural features and human alterations that shape landscape character also help define their scenic importance. Where and how the landscape is viewed would affect the more subjective perceptions of its aesthetic quality and sense of place.

Views of a landscape are described in terms of what is seen in foreground, middle ground, and background distances. In the foreground (an area within 0.5 miles of the observer), details of objects are easily distinguished in the landscape. In the middle ground (normally between 0.5 and 4.0 miles from the observer), objects may be distinguishable, but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background (the distant part of the landscape) are not normally discernible unless they are especially large and standing alone. The impressions of the visual character of an area can have a significant influence on how it is appreciated, protected, and used. The general landscape character of the study area is described in this section. The scenic integrity indicates the degree of intactness or wholeness of the landscape character (TVA 2003).

The existing and upgraded Spencer Substation is located at the intersection of Industrial Parkway and Drake & Shockley Road, an industrial area according to the City of Spencer zoning map. From the industrial part of the city, the proposed 161-kV TL would run generally north through a sparsely populated residential area, leaving the city limits north of Turkey Scratch Road. The TL would travel northwest in the county and parallel Little Falls Road on the east side. It would then re-enter the city limits in a residential area along Lemont Yates Mountain Road, the only feature altering the natural elevation of the area. Further northeast on Lemont Yates Mountain Road, the TL leaves the city limits and enters the county until it terminates at a tap point between structures 337 and 338 in the Watts Bar Hydro Plant–Great Falls Hydro Plant 161-kV TL. The tap point is located in a remote location and would be viewed by one residential property. The surrounding topography is mountain terrain with dense forest typical of the Highland Rim ecoregion.

The 161-kV TL termination point at the upgraded substation would be located east of Spencer near Industrial Parkway. The termination point can be viewed by a number of residences along Drake & Shockley Road. The surrounding topography is gently rolling to level and includes areas of dense vegetation and clear areas. Drake & Shockley Road connects to Shady Oaks Road, which connects to SR 30 (College Street), a prominent feature in the area. There is no zoning in Van Buren County, according to the county clerk.

The City of Spencer is the only city in close proximity to the proposed 161-kV TL or existing 46-kV TL. Along the planned route, one place of worship and one cemetery are located within the foreground viewing distance (Figure 3-1). The proposed 161-kV ROW would not

be located within view from these two features due to topography and trees. A number of places of worship, cemeteries and schools are located in the middle ground distance from the proposed 161-kV TL. However, due to topography, the proposed project would not be in view from these properties. Scenic attractiveness is common to good along the proposed route and ranges from rural residential to farmland and forested land. Scenic integrity is moderate to high as the landscape appears to be altered by rural residential in most areas, with forested areas at the north end of the project.

As described in detail in Sections 3.10 and 4.2.10, the existing 18.5-mile 46-kV TL contains numerous steel A-frame TL structures and wood- and steel-pole structures. TVA would retain the approximate 18.5-mile TL ROW to preserve the option for use in the future. In consultation with the Tennessee SHPO, and as described in Sections 3.10 amd 4.2.10, TVA shall preserve from one to four of the original 1913 steel A-frame TEPCO TL structures that are a part of the first segment of the Great Falls Hydro Plant-Spencer 46-kV TL. The combination of removing the decommissioned TLs along with the preservation of the historic structures would create a positive visual impact along the 18.5-mile ROW.

### 3.9.2 Noise

There are no single, major sources of noise along the proposed TL route. However, some traffic noise is generated along SRs 111 and 30 and US 70S near the TL routes. Local residents have become acclimated to this recurring noise.

### 3.9.3 Odors

There are no known major sources of objectionable odors along the route or in the vicinity of the either TL ROWs.

## 3.10 Archaeological and Historic Resources

Federal agencies are required by Section 106 of the NHPA and by the National Environmental Policy Act (NEPA) to consider the possible effects of their proposed actions (or undertakings) on historic properties. The term “historic property” includes any historic or prehistoric site, district, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the U.S. National Park Service (USNPS). “Undertaking” means any project, activity, or program that has the potential to have an effect on a historic property and that is under the direct or indirect jurisdiction of a federal agency, or is licensed or assisted by a federal agency. To determine an undertaking’s possible effects on historic properties, a four-step review process is conducted. These steps are:

- Initiation (defining the undertaking and the APE and identifying the parties to be consulted in the process);
- Identification of historic properties within the APE;
- Assessment of effects to historic properties; and
- Resolution of adverse effects by avoidance, minimization, or mitigation.

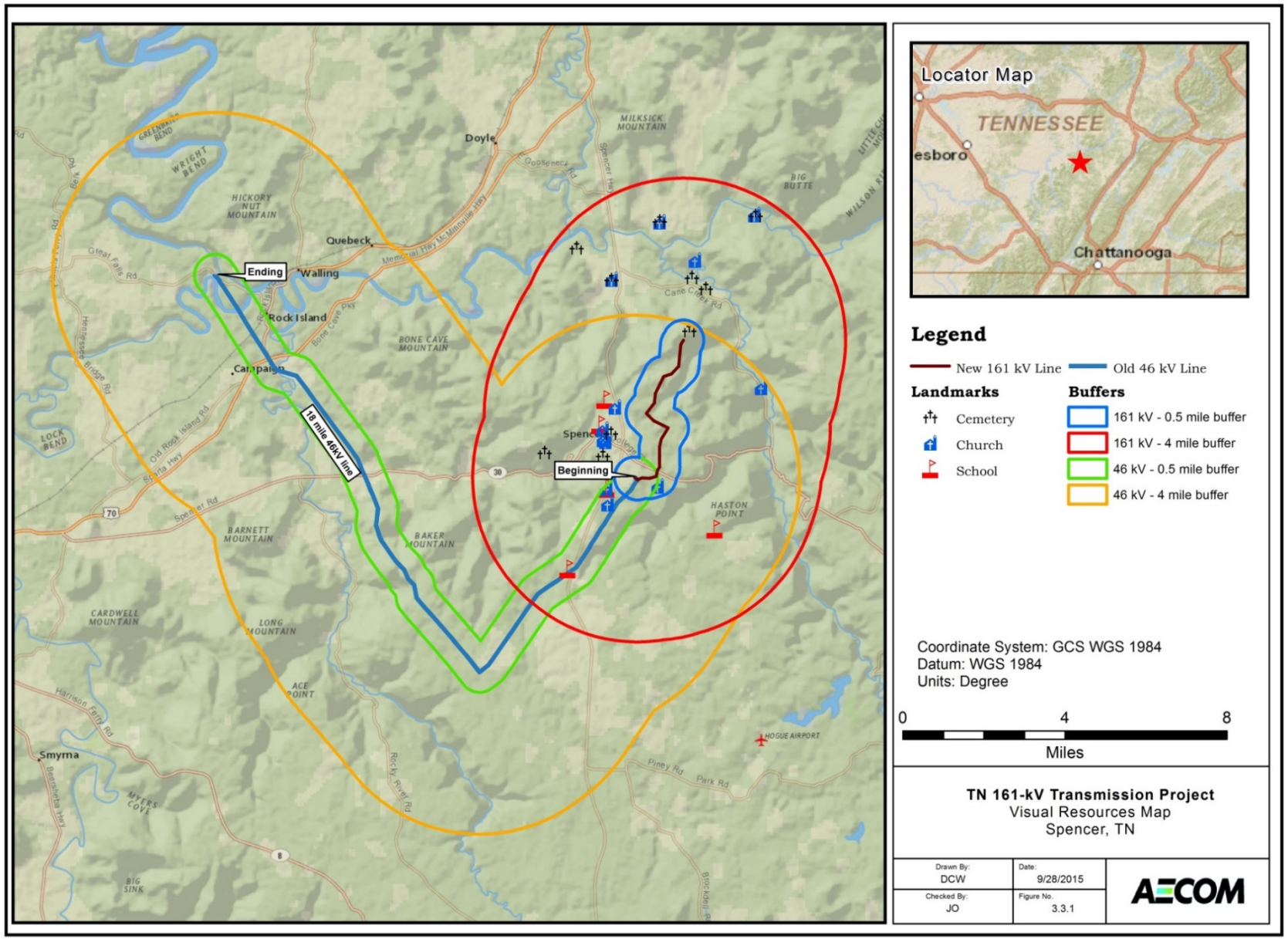


**Figure 3-1. Proposed 161-kV Transmission Line Route and Existing 46-kV Transmission Line**

During the Section 106 process, the agency must consult with the appropriate SHPO, federally recognized Native American tribes that have an interest in the undertaking, and any other party with a vested interest in the undertaking.

The affected area has the potential to contain archaeological sites from various prehistoric and historic periods. The affected area also has potential for historic architectural resources spanning the historic period.

The APE for archaeological resources for the proposed Action Alternative was determined as having two parts: 1) the proposed 4.6-mile long, 100-foot-wide TL ROW corridor and four access roads outside the proposed ROW that would be used for ingress/egress during construction, operations, and maintenance; and 2) the locations of 180 existing structures utilized by the Great Falls Hydro Plant-Spencer 46-kV TL that are located in areas with a moderate or high probability for archaeological resources, and 38 associated access roads totaling a combined 18.5 miles in length.

The APE for architectural resources also has two parts: 1) areas within a 0.5 mile radius surrounding the centerline of the proposed 161-kV TL, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource; and 2) the 180 46-kV TL structures proposed for removal.

A Phase I cultural resources survey (Rosenwinkel et al. 2015) was conducted within the archaeological and architectural APEs associated with the 4.6-mile long, 100-foot-wide TL ROW corridor, to identify any historic properties that may be impacted by the undertaking. Five archaeological resources were recorded within the proposed TL ROW; these have been given Tennessee Division of Archaeology site numbers 40VB144, 40VB145, 40VB146, 40VB147, and 40VB148. TVA has determined that four of these archaeological sites are ineligible for inclusion in the NRHP. The NRHP eligibility status of 40VB145 is considered undetermined as the scope of the Phase I survey was not sufficient to determine its eligibility. This site is located within the proposed 161-kV TL ROW, and due to the limitations of the survey, it is expected that the site boundaries extend southeast beyond the current APE. This site may contain data that would be important in prehistory or history. The survey also identified six historic architectural resources (labelled IS-1 through IS-6) within the architectural APE, but none is considered eligible for inclusion in the NRHP. The SHPO has agreed with these findings and determinations.

Separately, a Phase I archaeological survey (Meeks 2015) was completed along the four proposed access roads associated with the proposed 161-kV TL. This survey resulted in the identification of no additional archaeological sites within this part of the APE. The Tennessee SHPO has agreed with these findings.

A Phase I cultural resources survey (Manning et al. 2015) was also conducted within the archaeological and architectural APEs associated with the 46-kV TL proposed for retirement. The archaeological portion of this survey included the portions of 36 associated access roads that would be used for vehicular access to the TL structures to be removed, and that fall within areas with moderate or high potential to contain archaeological sites. The historic architectural survey evaluated the NRHP eligibility of the TL segment proposed for retirement, which consisted of the 180 steel A-frame structures within Segments 1 and 2 of the Great Falls Hydro Plant-Spencer 46-kV TL. Prior to the survey, background research

showed that no archeaological sites had been previously identified within this part of the APE. The survey identified sixteen previously unrecorded archaeological sites. TVA has determined that fifteen of these sites are ineligible for inclusion in the NRHP. TVA has consulted with the SHPO on these determinations, and SHPO has agreed.

The historic architectural survey identified one historic property: Segment 1 of the Great Falls Hydro Plant-Spencer 46-kV TL. This TL segment was originally constructed by the Tennessee Power Company in 1913, contains some replacement structures installed in 1931, and retains its historic integrity. In addition, this TL segment is a contributing element to the Great Falls Hydro Plant (nominated for NRHP listing as the Great Falls Hydroelectric Station). Based on the survey, TVA determined that Segment 2 of the Great Falls Hydro Plant-Spencer 46-kV TL, which was constructed by TVA between 1969 and 2012 and consists of a mix of wood and steel poles of various ages, is ineligible for inclusion in the NRHP. TVA has consulted with the SHPO and SHPO agrees with these findings and determinations.

## 3.11 Recreation, Parks, and Natural Areas

This section describes recreational opportunities and natural areas near the proposed project. Natural areas include ecologically significant sites; federal, state, or local park lands; national or state forests; wilderness areas; scenic areas; wildlife management areas; recreational areas; greenways; trails; Nationwide Rivers Inventory (NRI) streams; and Wild and Scenic Rivers.

There are no developed parks or recreation areas would be crossed by the proposed 161-kV TL or the access roads associated with the project. A portion of the existing 46-kV TL that is to be retired passes through Rock Island State Park. Some dispersed outdoor recreation activities such as nature observation, hunting, or walking for pleasure may take place within and around the pathways of both the proposed 4.6-mile 161-kV TL and the approximate 18.5-mile 46-kV TL section to be retired.

A review of data from the TVA Regional Natural Heritage database indicates a portion of the proposed 161-kV TL crosses two natural areas. Three natural areas are within five miles of the proposed 161-kV TL project area.

A majority of the proposed 161-kV TL lies within lands that drain into Rumbling Falls Cave. Rumbling Falls Cave, nearly 15 miles in length, has been described as one of the most geologically and biologically diverse caves of the south.

Approximately 1.4 miles of the proposed 161-kV TL occur within a piece of property known as the Walling Farm, which has a conservation easement held by the Land Trust for Tennessee (LTT). Conservation easements are voluntary contracts between the land owner and the LTT which restrict development of the property in perpetuity. Specific aspects of the conservation easements are private legal agreements between the property owners and the LTT.

LTT also holds a conservation easement on a parcel that is located approximately 0.2 mile from the northern terminus of the proposed 161-kV TL.

Portions of Fall Creek Falls State Park are located less than one mile from the proposed project area. The largest and most visited of the Tennessee state parks, Fall Creek Falls State Park is a 26,000-acre park known for its waterfalls, camping and hiking opportunities, and wildlife habitat.

Bridgestone/Firestone Centennial Wilderness Wildlife Management Area (WMA) is located approximately 2 miles away from the proposed 161-kV TL. Given to the Tennessee Wildlife Resources Agency (TWRA) by the Bridgestone/Firestone Company, this 10,000-acre WMA is managed for hiking, primitive camping, and hunting.

For the 46-kV TL proposed for retirement, a review of data from the TVA Regional Natural Heritage database indicated the TL crosses a portion of two natural areas. An existing road would be used to access eight structures along the 46-kV TL located within Rock Island State Park. This portion of the project crosses the Collins River Trail within the park. Composed of 883 acres, the park is located at the headwaters of Center Hill Dam at the confluence of the Caney Fork, Collins, and Rocky Rivers. The park is known for its scenic waterfalls, overlooks, hiking, and camping opportunities.

A portion of the existing 46-kV TL that is proposed for retirement and removal crosses the Rocky River, an NRI-designated river. NRI waters are designated as such due to natural or cultural values judged to be of more than local or regional significance. The Rocky River has 18 miles designated as NRI from River Mile 10 Center Hill Lake to River Mile 28, including the headwaters above SR 8.

Three natural areas are within five miles of the proposed 46-kV TL retirement:

- Big Bone Cave Designated State Natural Area
- Mud Creek Swamp
- Walling Farm Conservation Easement – LTT

Big Bone Cave Designated State Natural Area is a 400-acre natural area in Van Buren County significant for the discovery of fossils and historic resources within Big Bone Cave. Mud Creek Swamp is managed by TWRA for waterfowl hunting and is also known regionally as an important site for birding. The Walling Farm Conservation Easement is held by the LTT to protect the land in perpetuity.

## 3.12 Socioeconomics and Environmental Justice

Like the existing 46-kV TL, the proposed 161-kV TL would go through sparsely populated areas, avoiding residences to the extent feasible. The proposed ROW has been routed to minimize impacts to the properties it would cross, generally avoiding populated areas to the extent feasible. No residents would be relocated due to the construction of the proposed 161-kV TL. The new TL would cross several streams and minor roadways. The 4.6-mile 161-kV TL would be located in Van Buren County, Census Tract 9250, Block Group 1. This individual block group has a total population of 2,386 (USCB 2015a).

As shown in Table 3-7, the minority population in the area of Spencer is approximately 2.8 percent of the total population. The percentage of minority population within the area around the proposed 161-kV TL is generally the same, at approximately 2 percent. This is

less than the minority population of Van Buren County (3.6 percent), Warren County (13.6 percent), White County (6.2 percent), and the State of Tennessee (25.4 percent) as reported by U.S. Census Bureau (2015b) (see Table 3-7).

Poverty data are not available for individual blocks. However, the poverty level in Spencer is approximately 27 percent, Warren County 21.5 percent, White County 19.9 percent, and for Van Buren County, 22.5 percent (USCB 2015b).

**Table 3-7. Socioeconomic and Demographic Conditions in Van Buren, Warren, and White Counties, Tennessee**

| Demographic Characteristic | Spencer (2013) | Van Buren County | Warren County | White County | Tennessee |
|---|---|---|---|---|---|
| Estimated 2014 population | 1,772 | 5,633 | 39,696 | 26,301 | 6,549,352 |
| Black or African American | 2.1% | 0.7% | 3.6% | 2.0% | 17.1% |
| Hispanic or Latino | 0.1% | 1.2% | 8.3% | 2.1% | 5.0% |
| Total Minority | 2.8% | 3.5% | 13.6% | 6.2% | 25.4% |
| White (excluding Hispanic or Latino) | 97.2% | 96.5% | 86.4% | 93.8% | 74.6% |
| Per capita income (2009-2013) | $16,033 | $19,450 | $19,531 | $18,205 | $24,409 |
| Median household income (2009-2013) | $24,931 | $33,547 | $34,641 | $34,474 | $44,298 |
| Below poverty level (2009-2013) | 27.0% | 22.5% | 21.5% | 19.9% | 17.6% |

Source: U.S. Census Bureau (2015b)

## 3.13 Transportation

The proposed 4.6-mile 161-kV TL would go through sparsely populated areas, avoiding residences to the extent feasible. The proposed 161-kV TL would cross several streams and minor roadways, and would be located in Van Buren County. The existing 18.5-mile 46-kV TL proposed for retirement crosses Great Falls Lake, several streams and additional minor roadways. The proposed retirement route travels along existing TVA ROW generally cross-country through very sparsely populated areas in both Van Buren and Warren

counties and adjacent to White County. This route crosses several state highways (SRs 30, 70, and 111) and minor roads, while access roads running along the route branch off from public roadways at various points along the way.

The transportation needs of the project area are limited, given the very rural character of the majority of the project area, and are served exclusively by roadways. The description of the affected environment was framed by construction traffic accessing the linear extent of the TL. During the project, construction materials (structure poles, wiring, cable, etc.) would be brought to the site via truck. The delivery of these construction materials would result in localized minor increases in road traffic during the project construction period. Following construction of the 161-kV TL, minimal vehicular traffic would be involved with the operation and maintenance of the line. This traffic would include a limited amount of tractor and truck traffic. As noted, the effect of a minor increase in traffic would be negligible given the low traffic volumes currently using the roadways. Slight disruptions would also occur when the new line construction crosses over an existing roadway.

During the retirement portion of the project, deconstruction equipment would be brought to the site via truck, and deconstruction materials (structure poles, wiring, cable, etc.) would be removed to an approved disposal facility. Removing these deconstruction materials would result in localized minor increases in road traffic during the project period. Following retirement of the power line, vehicular traffic levels would return to normal. The effect of a minor increase in traffic would be negligible given the low traffic volumes currently using the roadways. Slight disruptions would also occur when line retirement activity crosses over an existing roadway. Affected roadways include US 70S, Simmons Road, SR 30, Baker Mountain Road (three locations), Old SR 111, R. T. Davis Road, and Spinlon Road.

Although the impacts of trucks transporting materials would be minor on the existing transportation network, TVA's request for proposals would require potential bidders to consider reducing the potential impact of trucking activities upon the environment. Contractors shall take into account factors such as air pollution, erosion control, noise control, solid waste disposal, and wastewater disposal, among other things. The contract would require that truck owners properly maintain trucks, including tune-ups. Truck routes would avoid schools, historic districts, and downtown areas to the extent possible. Additional measures such as the use of ultra-low sulfur diesel fuel and minimizing idling time would also need to be considered.

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# CHAPTER 4

## 4.0 ENVIRONMENTAL CONSEQUENCES

The potential effects of adopting and implementing the No Action Alternative and the Action Alternative on the various resources described in Chapter 3 were analyzed, and findings are documented in this chapter. The potential effects are presented below by resource in the same order as in Chapter 3.

### 4.1 No Action Alternative

As stated in Section 2.1.1, under the No Action Alternative, TVA would not supply a new power source to serve the upgraded CFEC 161-kV substation. As a result, no property easements for locating the proposed TL would be purchased by TVA, and the proposed transmission facilities would not be built. TVA would continue to supply power to CFEC's 46-kV substation through the existing 46-kV TL.

Under the No Action Alternative, no ROW would be cleared to accommodate the proposed line. No changes in current land uses along the existing or proposed ROW are anticipated within the foreseeable future under the No Action Alternative. Thus, implementation of this alternative is not expected to directly cause any effects to current land uses or to any prime farmlands along the route of the proposed ROW. Changes to the project area and resources in this area may occur over time, independently of TVA's actions, due to factors such as population increases, changes in land use, and the potential for development to occur in the area. However, these changes are not expected to be the result of implementing the No Action Alternative.

Under the No Action Alternative, the newly discovered population of white fringeless orchid would be considered during the next vegetation or infrastructure maintenance cycle required on that section of the Great Falls Hydro Plant-Spencer 46-kV TL ROW. Knowing the species is present before work occurs is the first step in avoiding impacts to the plant. However, since white fringeless orchid occurs in Great Falls Hydro Plant-Spencer 46-kV TL and other ROW in the TVA system, ROW maintenance is not necessarily mutually exclusive with the persistence of the plant.

Because the proposed construction, operation, and maintenance of the proposed new facilities would not occur under the No Action Alternative, no direct effects to those environmental resources listed in Chapter 3 are anticipated.

In the event that TVA chooses not to undertake the proposed Action Alternative, CFEC could find another way to ensure power is supplied to the upgraded substation. Should the CFEC independently provide transmission service by constructing a new TL, the potential environmental effects of implementing the No Action Alternative would likely be comparable to those of the Action Alternative described in this chapter. Likewise, the potential impacts of a TL constructed by anyone else would likely be similar. The potential impacts would be dependent upon various factors, such as the route chosen and the construction methods used.

## 4.2 Action Alternative

### 4.2.1 Groundwater and Geology

Contamination of groundwater supplies can potentially occur from the introduction of contaminants into areas that serve as recharge areas for groundwater. Contaminants carried by storm water runoff, include soil sediment, spilled fuel, petroleum products, and chemicals.

Under the Action Alternative, BMPs as described in Muncy (2012) would be used during the proposed construction, operation, and maintenance of the proposed TL and associated access roads. ROW clearing, site grading for structures and access roads, and other project construction activity could present a minor potential to impact groundwater through the movement of sediment into groundwater infiltration zones. The utilization of TVA's standard BMPs as described by Muncy (2012) would minimize erosion during construction and operation and reduce the possibility of sediment impacting groundwater.

The use of petroleum fuels, lubricants, and hydraulic fluids in construction and maintenance vehicles could result in the potential for small on-site spills. However, the use of BMPs (Muncy 2012) to properly maintain vehicles to avoid leaks and spills and procedures to immediately address any spills that did occur would minimize the potential for adverse impacts to groundwater.

During revegetation and maintenance activities, herbicides with groundwater contamination warnings would not be used. Any use of herbicides and fertilizers would be considered before application, and would be applied according to the manufacturer's label. TVA standard BMPs would be used to avoid contamination of groundwater. With the use of BMPs, any effects to groundwater quality from the proposed action would be minor. No cumulative impacts to groundwater resources are anticipated. Similarly, no changes in geological characteristics, such as the creation of sinkholes, are anticipated under the Action Alternative.

### 4.2.2 Surface Water

Soil disturbances associated with ROW clearing and site grading for structures, access roads, or other construction, maintenance, and operation activities can potentially result in adverse water quality impacts. Soil erosion and sedimentation can clog small streams and threaten aquatic life. Removal of the tree canopy along stream crossings can increase water temperatures, algal growth, and dissolved oxygen depletion, and cause adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

TVA routinely includes precautions in the design, construction, and maintenance of its TL projects to minimize these potential impacts. Permanent stream crossings that cannot be avoided would be designed to not impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA's BMPs as described in Muncy (2012). ROW maintenance would employ manual and low-impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions designed in part to restrict

applications near receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. As anticipated actions occurring in the proposed project area would be meeting permit requirements and following BMPs, no cumulative impacts are anticipated.

### 4.2.3 Aquatic Ecology

Aquatic ecology potentially could be affected by the proposed construction, maintenance, and retirement activities. Impacts could either occur directly by the alteration of habitat conditions within the streams or indirectly due to modification of the riparian zone and potentially from storm water runoff resulting from construction and maintenance activities along the TL and access roads corridors.

Potential impacts due to removal of streamside vegetation within the riparian zone include increased erosion and siltation, loss of instream habitat, and increased stream temperatures. Other potential effects resulting from construction and maintenance include alteration of stream banks and stream bottoms by heavy equipment and by herbicide runoff into streams. Siltation has a detrimental effect on many aquatic animals adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact spawning and feeding success of fish and mussel species (Brim Box and Mossa 1999; Sutherland et al. 2002).

Watercourses that convey only surface water during storm events (such as ephemeral streams) and that could be affected by the proposed activities would be protected by standard BMPs as identified in Muncy (2012) and/or standard permit requirements. These BMPs are designed in part to minimize disturbance of riparian areas, and subsequent erosion and sedimentation that can be carried to streams.

TVA also provides additional categories of protection to watercourses directly affected by an Action Alternative. These categories are based on the variety of species and habitats that exist in the streams, as well as the state and federal requirements to avoid harming certain species. The width of the SMZs is determined by the type of watercourse, primary use of the water resource, topography, or other physical barriers (Muncy 2012).

Under the Action Alternative, all streams and ponds within the proposed and existing ROWs, as well as along access roads, would be protected by Standard Stream Protection (Category A) as defined in Muncy (2012) (see Appendix D). This standard (basic) level of protection for streams and the habitats around them is aimed at minimizing the amount and length of disturbance to the water bodies without causing adverse impacts on the construction work.

Appropriate SMZs and BMPs identified in the Muncy manual would minimize the potential for impacts to water quality and instream habitat for aquatic organisms (Muncy 2012). These guidelines outline site preparation standards with emphasis on soil stabilization practices, structural and sediment controls including runoff management, and general stream protection practices associated with construction activities.

Because appropriate BMPs would be implemented during construction, operation, and maintenance activities, any direct or indirect effects to water flow, stream channels, or

stream banks and therefore indirectly to aquatic ecology would be temporary and insignificant as a result of implementing the proposed Action Alternative. No cumulative impacts are anticipated.

### 4.2.4 Vegetation

Implementing the Action Alternative would involve clearing the ROW (to accommodate the proposed 161-kV TL and structures) and access roads. Such ground-disturbing activities would directly affect the existing plant communities in these areas. Additionally, vegetation management along the ROW is necessary to prevent tall, woody vegetation from becoming established within the ROW. Therefore, the type of vegetative cover that occurs on the proposed 161-kV ROW would be directly affected. However, the habitat in the affected areas is common throughout the region and alteration of those sites would have an insignificant effect on the vegetation of the region.

Conversion of forested land along the proposed 161-kV TL ROW to a shrub-scrub/herbaceous vegetative community would be long-term in duration, but insignificant. However, the overall effect with respect to local vegetation would be minor to the terrestrial ecology of the region. As of 2012, there were at least 950,000 acres of forested land in Van Buren and the adjacent Tennessee counties (USFS 2015). Completion of the project, as currently proposed, would result in clearing and converting about 50 acres of forest for the new TL.

Retirement of the existing TL would likely result in an increase in forest in the existing ROW. That portion of the ROW contains about 220 acres, but not all of that land would transition to forest when vegetation maintenance stops. Some portion of that area would continue to be mowed by individual landowners or is currently surrounded by agricultural fields or other open lands. Any new forest growing on the existing ROW would be early successional and would contain plant species indicative of those habitats. The new forest would contain small diameter trees and would not possess any conservation value, including the ability to support rare plants or animals for many years, if ever.

Cumulatively, project-related effects to forest resources would be negligible when compared to the total amount of forested land occurring in the region.

Many forest stands within the proposed ROW have a relatively small component of invasive terrestrial plants. The construction and operation of a TL would likely result in an increase of invasive plant cover in these areas. However, the plants most likely to invade the ROW are common throughout Tennessee and adoption of the Action Alternative would not change the abundance of these species at the county, regional, or state level. The use of TVA standard BMPs to revegetate with noninvasive species (Muncy 2012) would serve to minimize the potential introduction and spread of invasive species in the project area.

### 4.2.5 Wildlife

Under the Action Alternative, TVA would construct the proposed 161-kV TL and access roads, and would retire the Great Falls Hydro Plant–Spencer 46-kV TL.

On the proposed 161-kV ROW, TVA would initially clear and then maintain about 5.1 acres of early-successional, herbaceous habitat (pastures, cultivated fields, residential areas) as

described in Section 2.2.1.1 and Section 2.2.2.2. In many areas, the TL would span across agricultural and developed areas. Impacts to wildlife habitat in these spanned areas would thus be limited to the structure locations. Additional ground disturbance would occur within the existing, maintained 46-kV ROW proposed for retirement, including along access roads and at the base of the structures to be retired. Any wildlife currently using these heavily disturbed herbaceous habitat areas may be displaced by increased levels of disturbance during construction actions. But it is expected that these primarily common, habituated species would return to the project area upon completion of actions.

As indicated in Section 3.4, approximately 50 acres of forested habitat would be removed and maintained as early successional habitat for as long as the new 161-kV is in operation. Direct effects of forest removal along the proposed ROW may occur to some individuals that may be immobile or slow moving during the time of construction This could be the case if construction activities took place during breeding/nesting seasons. However, the actions are not likely to affect populations of species common to the area, as similar forested and herbaceous habitat exists in the surrounding landscape.

No forested habitat would be removed in association with the proposed retirement of the 46-kV TL. However, TVA proposes to discontinue ROW maintenance along this approximate 18.5-mile ROW section. As such, over time much of the habitat along this section of ROW would convert from herbaceous/scrub-shrub to scrub-shrub/forested. Areas of the ROW that are currently maintained by landowners (pastures, cultivated fields, residential areas) would likely remain early-successional, herbaceous habitat. Short-term, direct effects would be minor as the succession of the ROW would occur over time and the species present would adapt or move to a more preferred habitat. The long-term, indirect effects would likely see a shift of some species types along this ROW to species preferring the non-maintained habitat.

Construction-associated disturbances and habitat removal likely would disperse wildlife into surrounding areas in an attempt to find new food sources, shelter sources, and to reestablish territories, potentially resulting in added stress or energy use to these individuals. In the event that surrounding areas are already overpopulated, further stress to wildlife populations could occur to those individuals presently utilizing these areas, as well as those attempting to relocate. However, the majority of landscape within which the project occurs is fragmented and influenced by human activity (i.e., roads, residential homes and subdivisions, forestry practices, and agricultural fields). Thus it is unlikely that species currently occupying adjacent habitat would be negatively impacted by the influx of new residents. It is expected that over time, those species that occur in early successional habitats would return to the project area upon completion of construction, maintenance, and operational activities.

Several local species benefit from disturbance. Construction of the new 161-kV ROW and access roads could create habitat for several mammals and birds. For example, species that thrive in highly disturbed areas include American robin, blue jay, Carolina chickadee, eastern cottontail, eastern towhee, gray catbird, house finch, house sparrow, northern cardinal, northern mockingbird, raccoon, song sparrow, tufted tit-mouse, Virginia opossum, white-breasted nuthatch, white-tailed deer, and white throated sparrow.

Cumulative effects of the project on common wildlife species are expected to be negligible. Most of the proposed project area has previously been impacted by human activities. Proposed actions across the 161-kV TL ROW would remove existing forested habitat for common wildlife for the life of the TL. Following completion of the new 4.6-mile 161-kV TL, the ROW would be maintained providing habitat for several common wildlife species that utilize early successional fields and agricultural/developed areas. Following the completion of the retirement of the 18.5-mile 46-kV TL, maintenance of the ROW would cease providing habitat for several common species that utilize shrub land/forested habitat.

### 4.2.6 Endangered and Threatened Species

#### *4.2.6.1 Aquatic Animals*

As discussed in Section 4.2.2 and Section 4.2.3, changes to water quality resulting from the implementation of the proposed Action Alternative could adversely affect aquatic life. These effects could occur either directly by the alteration of habitat conditions or indirectly due to modification of riparian zones and storm water runoff resulting from construction activities associated with the vegetation removal efforts. Potential impacts due to removal of streamside vegetation within the riparian zone include increased erosion and siltation, loss of in-stream habitat, and increased stream temperatures. Other potential construction impacts include alteration of stream banks and stream bottoms by heavy equipment and runoff of herbicides into streams.

However, the watercourses documented within the proposed ROW would be protected by implementing standard BMPs and Category A stream protection measures as defined in Muncy (2012) or as required by standard permit conditions. BMPs are designed in part to minimize disturbance of riparian areas and the subsequent erosion and sedimentation that can be carried to streams. The categories of stream protection as described in Muncy (2012) are based on the variety of species and habitats that exist in the streams as well as the state and federal requirements to avoid harming certain species.

Although six federally listed species and six additional state-listed species are known from within the project area, no suitable aquatic habitat was observed in the streams intersected by the proposed activities. Futhermore, appropriate BMPs and stream protection measures would be implemented during construction, maintenance, and operation of the proposed 161-kV TL, the retirement of the 46-kV TL, and the associated access roads. Therefore, no direct, indirect, or cumulative impacts to federally or state-listed as threatened and endangered aquatic species are expected to occur under the Action Alternative.

#### *4.2.6.2 Plants*

Adoption of the Action Alternative would not affect state-listed plant species, because no such species occur within the proposed 161-kV ROW, Great Falls Hydro Plant-Spencer 46-kV ROW, or along the associated access roads. However, one small section of the Great Falls Hydro Plant-Spencer 46-kV ROW does contain a population of the white fringeless orchid, which is proposed for federal listing under the ESA.

Open habitats like the Great Falls Hydro Plant-Spencer 46-kV ROW provide important habitat for white fringeless orchid. According to the USFWS (2015b), nearly 20 percent of all existing occurrences (11 of 58) are located on transportation and utility ROW. Currently,

vegetation on the Great Falls Hydro Plant-Spencer 46-kV ROW is cleared every three years to eliminate the possibility of woody plants growing tall enough to interfere with the transmission of electricity. One consequence of the proposed action to retire the existing 46-kV TL would be that vegetation maintenance on this ROW where white fringeless orchid occurs would be terminated. Typically, emergent wetland habitats like the one where white fringeless orchid occurs succeed to forest relatively quickly if woody plants are not actively controlled. In this case, it is expected that early successional woody plants like red maple and sweetgum would form a dense canopy within five years of cessation of vegetation maintenance.

Deciduous forested wetlands are a primary habitat type for white fringeless orchid, but the species may be unable to survive the transition from emergent wetland to forest in situ. The structural characteristics of early successional forest vary greatly from the mature deciduous forest that supports stable populations of white fringeless orchid. In 2005, TVA completed an environmental review for the retirement of the Great Falls-Pikeville 46-kV TL, which is located a few miles southeast of white fringeless orchid population found on the Great Falls Hydro Plant-Spencer 46-kV ROW. After removal of transmission infrastructure and cessation of vegetation maintenance, the site experienced a rapid influx of woody vegetation. The diverse, herbaceous ROW was quickly replaced by an early successional deciduous forest. Numbers of both flowering and vegetative white fringeless orchid have continued to decline and the population is not viable without intensive management (TDEC 2015). Without intervention, the same process would likely occur if the Great Falls Hydro Plant-Spencer 46-kV TL is retired.

To prevent the complete loss of plants, TVA is proposing to work with TDEC and the USWFS to relocate plants in the Great Falls Hydro Plant-Spencer 46-kV TL ROW to unoccupied suitable habitat on property owned by the State of Tennessee. The project would result in transplantation of individuals on the ROW to conservation land and may also include propagation efforts where seed would be collected from plants on the Great Falls Hydro Plant-Spencer 46-kV TL ROW. That seed would be grown out in a nursery setting and the resulting mature plants would be introduced into natural habitat. Outcomes of the project would be closely monitored and the project would be designed, to the extent practicable, to answer ecological questions relevant to the recovery of the species.

The proposed conservation measures would mitigate the eventual decline of white fringeless orchid on the Great Falls Hydro Plant-Spencer 46-kV TL ROW post-abandonment. While some plants may not survive the transplantation process, resulting in direct impacts to the species, the outlook for individual plants would be much better if moved than if left in place. In addition, if plants are propagated from seed collected along the existing ROW, there is the potential that more plants could exist on the introduction site than in the original population, and those plants would be located on conservation land.

Section 7 of the ESA requires that TVA conference with the USFWS on activities that may adversely affect species proposed for federal listing. TVA would complete the conferencing process before implementing any project-related action that has the potential to affect white fringeless orchid. With the commitments listed below, adoption of the Action Alternative would not significantly impact white fringeless orchid.

- TVA, in conjunction with TDEC and the USFWS, would transplant all white fringeless orchid present on the Great Falls Hydro Plant-Spencer 46-kV TL ROW to conservation land on state property during the fall of 2016.
- TVA would limit impacts to the white fringeless orchid by avoiding known populations during the January 2017 deconstruction of the Great Falls Hydro Plant-Spencer 46-kV TL.

#### *4.2.6.3 Terrestrial Animals*

The potential for impacts to 35 federally or state-listed as threatened or endangered terrestrial animal species occurring as a result of the implementation of the proposed Action Alternative were assessed based on the species' documented presence within a three-mile radius. One additional federally listed species was addressed based on known occurrences of this species in Van Buren County. Of the 35, three federally listed species (gray bat, Indiana bat, and northern long-eared bat), three state-listed species (Allegheny woodrat, least bittern, and Rafineque's big-eared bat), and four species tracked by the State of Tennessee (*Aloconota diversiseta, Atheta lucifuga, Trechus cumberlandus*, and cupped vertigo snail) have the potential to utilize the project area.

The remaining state-listed species identified in Table 3-4 would not be directly impacted by the proposed Action Alternative as suitable habitat for these species would not be affected. As indicated in Section 4.2.1 and Section 4.2.3, the utilization of TVA's standard BMPs as described by Muncy (2012), as well as Category A stream protection measures, would minimize erosion during construction and operation. With implementation of these measures, the possibility of sediment impacting groundwater or stream water quality would be reduced. As a result, no indirect or cumulative effects to these species are anticipated.

Little research has been performed on *Aloconota diversiseta, Atheta lucifuga,*and *Trechus cumberlandus* regarding habitat requirements. However, based on research of other members of the Staphylinidae and Carabidae families, it is thought that these species may have the potential to occur in the project area under rocks, in leaf litter, and on plants (Borror and White 1970). Cupped vertigo snails are also found in leaf litter near rocky areas and may be found in the project area. Home range size and reproductive activities of all of these species is not known. However, *Aloconota diversiseta, Atheta lucifuga,* and *Trechus cumberlandus* can fly. Therefore, these rove beetles would be expected to move if disturbed by the proposed actions. These beetles are not expected to be impacted by the proposed actions. Species in the vertigo snail order (Stylommatophora) cannot fly and are only known to travel an average of 1.85 inches per 12-hour increment (Baur and Baur 1988). Direct impacts to individuals of this species and their habitat may occur in association with the proposed actions. However, populations of these species are not expected to be impacted by the proposed actions. Direct impacts to this slow-moving snail species and its habitat could occur in association with the proposed actions if activities occur in the affected project area. No individuals of this species were observed during field surveys of the proposed project area. Therefore cupped vertigo snails are not expected to be impacted by the proposed actions.

Least bitterns may utilize emergent wetlands found within the area affected by the proposed Action Alternative. Direct effects could occur to the young of this species if a nest were to

be built in the path of the proposed ROW and the timing of actions would occur prior to young fledging from the nest. Adults and young that are able to fly would not be impacted by the proposed actions as they could easily move to wetlands away from actions if disturbed by the proposed project. Foraging habitat for least bittern would not be removed during the proposed actions, but could be impacted. BMPs would be implemented during any action occurring within wetland habitat, thus minimizing impacts to water quality and hydrology. Suitable habitat for this species occurs in areas that would be spanned by the new 161-kV TL where ground disturbance is not anticipated, as well as along the 46-kV ROW proposed for retirement, where BMPs would be used to minimize impacts in wetlands. Therefore, direct, indirect, or cumulative impacts to least bittern are not anticipated.

Habitat for the Allegheny woodrat exists in several locations along the proposed 161-kV ROW in rock outcrops, boulder fields, and rocky cliffs, but not in the areas of action associated with the retirement of the 46-kV ROW. No cave habitat for this species would be impacted by the proposed actions. The proposed actions along the 161-kV ROW would span the areas where rock outcrops, boulders, and cliffs occur due to the challenges of accessing the areas during construction. Direct impacts to these rock outcrops are not expected to occur. Canopy cover over these areas may or may not need to be removed depending on proximity to the proposed TL specified by FERC requirements. Similar rocky habitat is plentiful in this karst-filled section of the Cumberland Plateau. Direct impacts to individuals of this species are not anticipated. Any indirect or cumulative effects that may occur to Allegheny woodrat habitat would not affect populations of these species.

No caves or other winter hibernacula for gray bat, Indiana bat, northern long-eared bat, or Rafinesque's big-eared bat occur in the area affected by the proposed project activities or would be impacted by the proposed actions. In addition, no buildings, cisterns, or rock shelters that may provide alternative roosting for northern long-eared or Rafinesque's big-eared bat would be impacted by the proposed actions. Suitable foraging habitat does exist for all four species over ponds and streams within both the proposed and existing ROW. BMPs would be utilized in SMZs around these bodies of water, thus minimizing sedimentation and avoiding any changes to hydrology. Proposed actions would have no measurable effects on bats foraging over these bodies of water. Additional foraging habitat for Indiana, northern long-eared bat, and Rafinesque's big-eared bat exists along fence rows and within forested areas of the proposed project area. The forested foraging habitat would be removed in association with the proposed actions; however, similarly suitable foraging habitat is plentiful in the surrounding landscape. Impacts to populations of Rafinesque's big-eared bat are not anticipated in association with the proposed actions.

Summer roosting habitat surveys for the Indiana bat and the northern long-eared bat were performed in April and September 2015. During these surveys, 293 suitable roosting trees were identified across eight fragmented forested areas within the proposed Action Alternative project area. Suitable habitat was identified based on the occurrence of shagbark hickories, snags, and nearby water sources. A total of 13.2 acres of suitable summer roosting habitat for Indiana bat and northern long-eared bat would be removed for the proposed 161-kV ROW. Additional suitable roosting habitat was found alongside two access roads utilized for the existing 46-kV TL; however, these trees would be not be impacted by proposed actions.

Any suitable Indiana bat or northern long-eared bat habitat slated for removal would add to potential impacts on these bat species. If habitat is removed in the winter when bats are not active on the landscape, direct effects would be avoided. Indirect and cumulative effects may occur from removal of suitable roosting and /or foraging habitats.

Prior to the commencement of construction, consultation with the USFWS under Section 7 of the ESA would be completed for potential impacts to Indiana bat and northern long-eared bat habitat. TVA would enter into a conservation agreement with the USFWS to offset indirect impacts to Indiana bat and northern long-eared bat potentially resulting from the removal of suitable habitat for these species. No ground-disturbing activities would occur until TVA has completed consultation and fulfilled its obligations under Section 7.

### 4.2.7 Floodplains

As a federal agency, TVA is subject 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" (USWRC 1978). 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. The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative.

Under the Action Alternative, the proposed 4.6-mile 161-kV TL ROW easements and the associated access roads would be constructed, and the existing, approximately 18.5-mile 46-kV TL would be retired. Neither of these ROWs or associated access roads are associated with floodplain areas within Van Buren or Warren counties.

As such, neither the proposed 161-kV TL construction, operation, and maintenance, nor the 46-kV TL retirement would have an impact on floodplains.

### 4.2.8 Wetlands

Activities in wetlands are regulated under Section 401 and 404 of the CWA and are addressed by EO 11990 (Protection of Wetlands). Section 401 requires water quality certification by the state for projects permitted by the federal government (Strand 1997). Section 404 implementation requires activities resulting in the discharge of dredge or fill into waters of the United States be permitted through a nationwide general permit or individual permit issued by the USACE. EO 11990 requires federal agencies to minimize wetland destruction, loss, or degradation, and preserve and enhance natural and beneficial wetland values, while carrying out agency responsibilities.

Under the Action Alternative, the proposed 161-kV TL would be constructed and the Great Falls Hydro Plant-Spencer 46-kV TL would be retired. During the proposed retirement activities, BMPs (Muncy 2012) would be adhered to such that only minimal and insignificant wetland impacts result.

Given that wetlands identified within the proposed 161-kV ROW corridor are found in topographic drains between hillsides, these wetlands would be spanned and no structure placement would occur within defined wetland boundaries. However, as described in

Section 2.2.1.1, adequate clearance between tall vegetation and TL conductors would require trees within the proposed ROW to be cleared. As a result, the proposed Action Alternative would involve tree clearing and conversion of 0.28 acre of moderate quality forested wetland to emergent or scrub-shrub wetland habitat within wetlands W002, W003, W004, and W006 (Table 3-5). The proposed conversion of the minor 0.28 acre of forested wetland to lower stature habitat would allow scrub-shrub and emergent vegetation to persist for as long as the TL remains in place. The geomorphic positions of these wetlands would continue to function at a relatively similar capacity in groundwater recharge and discharge, storm water attenuation, flood storage, sediment trapping, and toxin absorption. Any minute reduction in functional capacity of these wetland areas due to clearing within the ROW would be absorbed by the larger extent of these wetland areas outside the ROW and/or similar wetland features within the same geomorphic setting. Therefore, no significant loss of wetland resources is anticipated to result from the proposed wetland habitat conversion to accommodate ROW construction and maintenance. Similarly, initial clearing of the 0.28 acre of forested wetland falls within the parameters of CWA state and federal provisions, including USACE Nationwide Permit #12 for utility line activities. As such, TVA would comply with all state and federal permit requirements to ensure no net loss of wetland resources.

The forest component of W002 consists of one large red maple over-canopying a few shrubs and sapling within a very small 0.02 acre depression. Removing the overstory cover of this wetland while allowing the understory to persist would not significantly alter the function this wetland provides to the surrounding landscape given its size and landscape position. The sapling and shrub species present would continue to shade the ephemerally pooled water providing the wildlife habitat required for seasonally aquatic species while maintaining the typical suite of wetland values for the surrounding watershed.

Similarly, the forest component of W003 is relatively young, and this type of small wetland flat adjacent to the perennial tributary stream appeared to be a relatively common feature within the landscape outside the ROW. Permanent conversion of the 0.13 acre of forested wetland within W003 to scrub-shrub/emergent habitat would not significantly diminish the functions and values this wetland provides to the surrounding watershed given its geomorphic position and no proposed engineered disturbance to water storage or flow within the delineated wetland boundary.

W004 contained subsurface flow. The loss of forest and its associated root structure across this small 0.06 acre of forested wetland area within the ROW could result in temporary, minor erosion and potential exposure of groundwater flow. While this immediate impact is foreseeable, stabilization of sediment through BMPs including revegetation during construction is anticipated within the short-term, and lower-stature vegetation would be allowed to persist long-term (Muncy 2012). This wetland roughly doubles in size outside the ROW. The scrub-shrub/emergent wetland community to be maintained within the ROW and the extended forested wetland area outside the ROW would continue to provide the normal suite of wetland values without a long-term significant loss of function to the surrounding landscape.

W006 appears to be a developing wetland area likely due to an upstream shift in hydrology. While 0.07 acre of W006 is located inside the ROW, this wetland area extends outside the

ROW for about one acre. Given the proposed conversion of a small fraction of the larger forested wetland area, no significant reduction in this wetland's functional capacity within the surrounding landscape is anticipated.

In compliance with the CWA and EO 11990, TVA has considered all alternatives to avoid and minimize wetland impacts, resulting in the least wetland disturbance practicable and determined that there is no practicable alternative to completely avoid all wetland impacts. During construction and maintenance activities, TVA would minimize wetland disturbance by following standard BMPs as described in Muncy (2012). These standards include eliminating mechanized clearing in wetlands, using low ground-pressure equipment (i.e., feller bunchers), and using mats during clearing and construction activities to minimize rutting thus reducing soil compaction. With these efforts in place, no significant direct or indirect impacts to wetland areas and the associated wetland functions and values provided within the project area and general watershed are anticipated as a result of constructing or maintaining the proposed 161-kV TL and associated ROW corridor or the retirement of the existing 46-kV TL.

Cumulative impact analysis of wetland effects takes into account wetland loss and conversion at a watershed-level scale. Proposed wetland impacts would be considered cumulatively insignificant due to the minor wetland acreage involved and the minor level of proposed wetland disturbance. Similarly, the proposed project would comply with CWA and EO 11990, and under the directives of TDEC and the USACE Nashville District, ensuring no net loss of wetland resources. Therefore, no cumulative wetland impacts are anticipated as a result of the proposed Action Alternative.

### 4.2.9 Aesthetics

Visual consequences were examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and visibility of proposed changes.

#### *4.2.9.1 Visual Resources*

The visual attributes of existing scenery, along with the anticipated attributes resulting from the proposed action, are reviewed and classified in the visual analysis process. The classification criteria are adapted from a scenic management system developed by the USFS and are integrated with planning methods used by TVA. The classifications are based on methodology and descriptions from the U.S. Department of Agriculture (USDA 1995) and TVA (2003). Sensitivity of viewing points available to the public, their viewing distances, and visibility of proposed changes are also considered during the analysis. Scenic integrity indicates the degree of intactness or wholeness of the landscape character. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The foreground, middle-ground, and background viewing distance parameters were previously described in Section 3.9.1.

The proposed 161-kV TL would begin at the tap point on the Watts Bar Hydro Plant–Great Falls Hydro Plant 161-kV TL. The new tap point would be visually similar to the existing lines and structures currently seen in the existing landscape of the forested area. The new line would parallel Lemont Yates Mountain Road for a short distance, but would primarily be

located downslope of the road in unpopulated forest area. Views for area motorists and residents would not likely be negatively affected.

The proposed TL would be routed to the south toward Turkey Scratch Road and Seitz Road before entering an area of rural residential where homes are located on 5- to 10-acre tracts. From the area south of Seitz Road to the Spencer Substation, the majority of residential tracts along the proposed 161-kV TL are approximately 0.7 miles from the new line location. Much of this area is newly developed with TLs present along each road. Views from the road would be brief and in the foreground. This portion of the TL would be located in the foreground viewing distance of some residential, agricultural, and manufacturing properties that are adjacent to SR 30, Shady Oaks Road, and Drake & Shockley Road.

Operation, construction, and maintenance of the proposed 161-kV TL would be visually insignificant. There may be some minor visual discord during the construction period of the new 161-kV TL and the retirement of the old 46-kV TL due to an increase in personnel and equipment and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until the existing and proposed ROW and laydown areas have been restored through the use of TVA standard BMPs (Muncy 2012). The removal of the old 46-kV TL would result in a more natural view to local residents, albeit low in numbers. Visual impacts related to the proposed 161-kV TL would be minor and insignificant. Visual impacts of the retired section of TL would be positive as discussed in 3.9.1 Visual Resources. Therefore, overall visual impacts are anticipated to be minimal as a result of this project. Cumulative impacts are not anticipated.

#### *4.2.9.2 Noise and Odors*

During construction of the proposed TL, equipment could generate noise above ambient levels. Because of the short construction period, noise-related effects are expected to be temporary and minor. For similar reasons, noise related to periodic line maintenance is also expected to be insignificant. TLs may produce minor noise during operation under certain atmospheric conditions. Off the ROW, this noise is below the level that would interfere with speech.

### 4.2.10 Archaeological and Historic Resources

Under the Action Alternative, a 4.6-mile, 100-foot-wide 161-kV TL ROW easement would be obtained and the proposed 161-kV TL and access roads would be constructed and maintained. TVA would also retire an existing, approximate 18.5-mile long 46-kV TL and associated facilities. These actions area described in detail in Sections 2.2 and 2.5.

TVA consulted with the Tennessee SHPO and 12 federally recognized Native American tribes concerning the proposed Action Alternative. Implementation of the proposed action would not include the installation of any TL structures within the boundary of archaeological site 40VB145. Potential effects could, however, result to the site from vegetation clearing and vehicular traffic during construction, maintenance, and operation of the proposed 161-kV TL. These effects include compaction from heavy equipment, the mixing of stratigraphic layers, displacement and removal of artifacts and features due to ground disturbance, and looting or vandalism stemming from the increased exposure of archaeological deposits due to vegetation clearing. TVA and the SHPO have agreed in consultation that project effects to 40BV145 should be avoided, and if that is not possible, that TVA conduct additional

studies to provide the information necessary for a full determination of eligibility. In order to avoid adverse effects on site 40BV145, TVA would adhere to one of the following conditions for construction and maintenance activities within a 33-foot radius of the site:

- Work would be performed under conditions of dry and firm ground; or
- low ground pressure equipment would be used; or
- wetland mats would be used over site 40BV145, and the 30-foot radius site buffer.

TVA and SHPO have agreed that, with these restrictions on construction, operation, and maintenance activities, the undertaking would have no effects on 40BV145.

TVA and SHPO have agreed that the proposed action to retire and remove the 46-kV TL would result in an adverse effect on Segment 01 of the Great Falls Hydro Plant-Spencer 46-kV TL. In addition, as a contributing resource, this adverse effect would likewise result in an adverse effect on the Great Falls Hydro Plant (NRHP-listed as the Great Falls Hydroelectric Plant) even though the hydro plant is located outside the APE. TVA and SHPO have agreed to enter into a MOA for the mitigation of the undertaking's adverse effects on these two historic properties. The MOA stipulates the measures that TVA will perform as mitigation for the adverse effects. TVA has proposed that these measures include:

1. The preparation of historic American engineering record documentation for Segment 01 of the Great Falls Hydro Plant-Spencer 46-kV TL and submitting that documentation to the USNPS for review; and
2. In-place preservation of representative examples of steel A-frame TL structures that are part of Segment 01, and therefore historically associated with the Great Falls Hydro Plant.

An MOA was signed by TVA and SHPO in January 2016 and will be in effect for three years from the date of its execution unless it is terminated or amended by the signatories. Accordingly, TVA's obligations under Section 106 of the NHPA for the construction of the proposed 161-kV TL, deconstruction of the existing 46-kV TL, and associated access roads have been met. The Tennessee SHPO has concurred with TVA's determination of these effects in letters dated July 13, 2015, November 5, 2015, November 6, 2015, and November 16, 2015. None of the 12 consulted tribes identified such properties or objected to the proposed undertaking.

### 4.2.11 Recreation, Parks, and Natural Areas

Under the Action Alternative, construction of the proposed 161-kV TL and use of proposed access roads could cause some minor shifts in dispersed recreation activities such as nature observation and hunting that currently occur within or near the ROW corridor for the new TL. However, the extent of any change in use patterns is expected to be minor and insignificant. No formal recreation areas occur along the proposed 161-kV TL or the access roads associated with the project.

The existing 46-kV TL crosses a relatively undeveloped portion of Rock Island State Park. Recreation improvements in this part of the park include hiking trails (Collins River Nature

Trail and Cunningham Cemetery Connector Trail) and a picnic area. The TL crosses both of these hiking trails. To ensure public safety, trails may have to be closed when retirement activities at trail intersections occur. Trail closures would be of short duration and should not have a significant impact on trail use. Over the longer term, removal and retirement of this 46-kV TL could have a positive impact on the natural character of this section of the park.

Removal of the remaining section of this 46-kV TL could lead to some minor change in dispersed recreation activities that may occur within or near the TL corridor, but any change in use patterns should be minor and insignificant.

Under the Action Alternative, the proposed project would be implemented. Potential direct impacts to natural areas associated with TL construction include vegetation clearing and habitat loss and fragmentation; potential indirect impacts include sedimentation and water quality impacts.

The new 161-kV TL would be routed through one parcel of land that has an existing conservation easement limiting development. ROW construction would result in the clearing of approximately 17 acres (less than one percent) of this 3,571-acre parcel. The proposed construction would also occur within the drainage area of Rumbling Cave, a geologically and biologically sensitive cave system.

Impacts associated with the proposed TL construction and operation would be minimized and avoided by the use of BMPs, as outlined in Muncy (2012). Clearing and disturbance of less than one percent of the LTT tract would result in an insignificant level of impact. Cumulative impacts to natural areas would likewise be insignificant.

Fall Creek Falls State Park and Bridgestone/Firestone Centennial WMA are located a sufficient distance away from the proposed 161-kV TL such that there would be no impacts to these areas.

Eight structures and an access road associated with the 46-kV TL are located within Rock Island State Park. These features are within the existing 46-kV TL ROW, and are within the boundaries of the Collins River Trail. Impacts associated with removal of structures are minor and temporary; project managers will contact the manager of Rock Island State Park prior to construction activities to close the trail.

A portion of the existing 46-kV TL that is proposed for retirement and removal crosses the Rocky River, listed as an NRI waterbody. There are no structures or access roads located in the immediate vicinity of the river, thus there would be no construction impacts to this area. TVA considered the possible indirect and direct effects to the natural, cultural, and recreational values of this NRI segment from the TL removal and retirement, and determined there would be no adverse effects. TVA determined overall impacts to this section of the Rocky River associated with 46-kV TL removal would be positive. In communication with the USNPS on February 1, 2016, it was determined that no consultation would be necessary.

Big Bone Cave Designated State Natural Area, Mud Creek Swamp, and the LTT tract are located a sufficient distance away from the proposed project such that there would be no impacts to these areas.

### 4.2.12 Socioeconomics and Environmental Justice

Under the Action Alternative, the ROW for the proposed TL would occupy approximately 57 acres. To construct a proposed TL, TVA would normally purchase an easement from private land owners. That easement gives TVA the right to locate, operate, and maintain the TL across the property owner's land. In certain cases, TVA may be required to condemn the property. In either case, current landowners would be compensated for the value of such rights or properties. The direct local economic effect from the purchase of any additional property or ROW easements would be minor.

Under the Action Alternative, the proposed TL would help maintain reliable service in the area. The proposed 161-kV TL would improve TVA's electrical service capabilities and help meet the growth and demand for services occurring in the area. Virtually the entire ROW would cross primarily rural land and public and private roads; developed areas have been avoided to the extent possible. Most homes in the area are located far enough from the proposed TL route that property values would not be directly affected. Various studies have concluded that TLs of this size have little or no impact on the value of nearby properties, and that if impacts to value occur, they would tend to dissipate over time (Kroll and Priestley 1992). Any TL construction or maintenance activities would be temporary and would generally have little impact on residents of the area.

The population in the areas near the proposed TL ROW is generally low with only 36 parcels affected. The minority population consists of 2.8 percent in the project APE which is less than the 3.5 percent, 13.6 percent and 6.2 percent of the total population at the county level and in the nearby counties, and 25.4 percent in the state. TVA construction and maintenance personnel would utilize the local businesses while in the area and add to the local economy. Positive impacts to the local economy through purchase of supplies, meals and fuel by workers are anticipated. However, given the modest size of the project, the construction and operation, including maintenance activities, are expected to have minimal direct and indirect effects on the local community. Poverty levels in Spencer are slightly higher than the county and state levels, but no significant negative impacts are expected as a result of the project.

In conducting the analysis of potential cumulative effects, reasonably foreseeable actions in the local area as well as likely regional trends in environmental conditions were considered. The provision of a LPC under the Action Alternative creates the potential for industrial growth in the area over the long-term (20 years or more). Consequently, this could result in some localized long-term and cumulative socioeconomic benefits as compared to the No Action Alternative. Additional employment opportunities and power supply in the area would provide a resource that could more successfully accommodate residential, commercial, and industrial expansion and development. However, any such future developments are speculative.

### 4.2.13 Transportation

This analysis evaluates the impacts of transporting construction material by trucks on the existing roadway network, as well as the future traffic associated with maintenance vehicles. It is estimated that as many as four truck trips per day may be required over the 60 to 90 work days anticipated in association with TL and access road construction. No special trucks for oversized loads are anticipated. Vehicles transporting workers to the job site would also be using these roads. For the purpose of this evaluation, a conservative estimate of four trips per workday was assumed over the two to three-month project period. TL crossings of the roadways are expected to result in minimal disruption to traffic flows. The only major highway that would be crossed for the construction project is SR 30 near the beginning of the project.

The average annual daily traffic (AADT) volumes from 2013 are shown in Table 4-1 for the affected highways US 70S, SR 111, and SR 30 (TDOT 2014). The current volume of traffic using each of these roads is well below the capacity of each road's functional classification. Given the minimal increase in traffic directly related to the proposed action, no perceptible change in AADT is expected. Therefore, the estimated truck trips would not have a significant impact on transportation networks. Consequently, potential effects on traffic would likely be minor and short-term in nature under the Action Alternative.

**Table 4-1. Current Average Annual Daily Traffic in Van Buren and Warren Counties, Tennessee**

| Road Name | Typical Section | AADT Capacity | 2013 AADT |
|---|---|---|---|
| US 70S north of the 46-kV TL | Major thoroughfare, 4-lane | 27,600 | 4,204 |
| US 70S south of the 46-kV TL | Major thoroughfare, 4-lane | 27,600 | 5,744 |
| State Route 30 | Minor thoroughfare, 2-lane | 12,700 | 764 |
| State Route 111 | Major thoroughfare, 4-lane | 12,700 | 899 |

(TDOT 2014)

No cumulative transportation impacts are anticipated as a result of constructing the proposed 161-kV TL or the retirement and removal of the existing 46-kV TL.

No mitigation measures are anticipated for transportation impacts. During construction/retirement, standard stormwater BMPs would be implemented as required to minimize erosion and sedimentation impacts associated with trucks and equipment entering and leaving the project site.

### 4.2.14 Postconstruction Effects

#### *4.2.14.1 Electric and Magnetic Fields*

TLs, like all other types of electrical wiring, generate both electric and magnetic fields (EMFs). The voltage on the conductors of a TL generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, TL 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.

The fields from a TL are reduced by mutual interference of the electrons that flow around and along the conductors and between the conductors. The result is even greater dissipation of the low energy. 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.

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 TL 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 proposed TL has 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 TL to develop a charge (typically these would be objects located within the ROW) would be grounded by TVA to prevent them from being a source of shocks.

Under certain weather conditions, high-voltage TLs, such as the proposed 161-kV line, may produce an audible low-volume hissing or crackling noise (Appendix G). This noise is generated by the corona resulting from the dissipation of energy and heat as high voltage is applied to a small area. Under normal conditions, corona-generated noise is not audible. The noise may be audible under some wet conditions, but the resulting noise level away from the ROW would be well below the levels that can produce interference with speech. Corona is not associated with any adverse health effects in humans or livestock.

Other public interests and concerns have included potential interference with AM radio reception, television reception, satellite television, and implanted medical devices. Interference with radio or television reception is typically due to unusual failures of power line insulators or poor alignment of the radio or television antenna and the signal source. Both conditions are readily correctable.

Implanted medical devices historically had a potential for power equipment strong-field interference when they came within range of the influence of low-frequency, high-energy workplace exposure. However, older devices and designs (i.e., those beyond five to 10 years old) have been replaced with different designs and different shielding that prevent potential for interference from external field sources up to and including the most powerful magnetic resonance imaging medical scanners. Unlike high-energy radio frequency devices that can still interfere with implanted medical devices, low-frequency, and low-energy powered electric or magnetic devices no longer potentially interfere (JAMA 2007).

Research has been done on the effects of EMFs on animal and plant behavior, growth, breeding, development, reproduction, and production. Research has been conducted in the laboratory and under environmental conditions, and no adverse effects or effects on health or the above considerations have been reported for the low-energy power frequency fields (WHO 2007a). Effects associated with ungrounded, metallic objects' static charge accumulation and with discharges in dairy facilities have been found when the connections

from a distribution line meter have not been properly installed on the consumer's side of a distribution circuit.

There is some public concern as to the potential for adverse health effects that may be related to long-term exposure to EMF. A few studies of this topic have raised questions about cancer and reproductive effects on the basis of biological responses observed in cells or in animals or on associations between surrogate measures of power line fields and certain types of cancer. Research has been ongoing for several decades.

The consensus of scientific panels reviewing this research is that the evidence does not support a cause-and-effect relationship between EMFs and any adverse health outcomes (e.g., AMA 1994; NRC 1997; NIEHS 2002). Some research continues on the statistical association between magnetic field exposure and a rare form of childhood leukemia known as acute lymphocytic leukemia. A recent review of this topic by the World Health Organization (WHO) (IARC 2002) concluded that this association is very weak, and there is inadequate evidence to support any other type of excess cancer risk associated with exposure to EMFs.

TVA follows medical and health research related to EMFs, along with media coverage and reports that may not have been peer reviewed by scientists or medical personnel. No controlled laboratory research has demonstrated a cause-and-effect relationship between low-frequency electric or magnetic fields and health effects or adverse health effects even when using field strengths many times higher than those generated by power TLs. Statistical studies of overall populations and increased use of low-frequency electric power have found no associations (WHO 2007b).

Neither medical specialists nor physicists have been able to form a testable concept of how these low-frequency, low-energy power fields could cause health effects in the human body where natural processes produce much higher fields. To date, there is no agreement in the scientific or medical research communities as to what, if any, electric or magnetic field parameters might be associated with a potential health effect in a human or animal. There are no scientifically or medically defined safe or unsafe field strengths for low-frequency, low-energy power substation or line fields.

The current and continuing scientific and medical communities' position regarding the research and any potential for health effects from low-frequency power equipment or line fields is that there are no reproducible or conclusive data demonstrating an effect or an adverse health effect from such fields (WHO 2007c). In the United States, national organizations of scientists and medical personnel have recommended no further research on the potential for adverse health effects from such fields (AMA 1994; USDOE 1996; NIEHS 1998).

Although no federal standards exist for maximum EMF field strengths for TLs, two states (New York and Florida) do have such regulations. Florida's regulation is the more restrictive of the two, with field levels limited to 150 milligauss at the edge of the ROW for lines of 230-kV and less. The expected magnetic field strengths at the edge of the proposed ROW would fall well within these standards. Consequently, the construction and operation of the proposed TL connectors are not anticipated to cause any significant impacts related to EMF.

Under this alternative, EMFs would be produced along the length of the proposed TL. The strength of the fields within and near the ROW varies with the electric load on the line and with the terrain. Nevertheless, EMF strength attenuates rapidly with distance from the line and is usually equal to local ambient levels at the edge of the ROW. Thus, public exposure to EMFs would be minimal, and no significant impacts from EMFs are anticipated.

#### *4.2.14.2 Lightning Strike Hazard*

TVA TLs are built with overhead ground wires that lead a lightning strike into the ground for dissipation. Thus, a safety zone is created under the ground wires at the top of structures and along the line, for at least the width of the ROW. The NESC is strictly followed when installing, repairing, or upgrading TVA lines or equipment. TL structures are well grounded, and the conductors are insulated from the structure. Therefore, touching a structure supporting a TL poses no inherent shock hazard.

#### *4.2.14.3 Transmission Structure Stability*

Poles and switch structures similar to those shown in Figure 2-1 would be used for the proposed 161-kV TL. These structures have demonstrated a good safety record. They are not prone to rot or crack like wooden poles, nor are they subject to substantial storm damage due to their low cross-section in the wind.

Additionally, all TVA transmission structures are examined visually at least once a year. Thus, the proposed structures do not pose any significant physical danger. For this reason, TVA does not typically construct barricades or fences around structures.

#### *4.2.14.4 Other Impacts*

No major impacts on air quality and solid waste are expected to result from the relatively short-term activities of construction. Appendices B and C contain procedures for dealing with these issues. Solid waste generated by the removal of the Great Falls Hydro Plant-Spencer 46-kV TL would be reused, recycled, or disposed of according to TVA's environmental protection procedures.

As noted above in Section 4.2.14.2, TL structures are well grounded, and the conductors are insulated from the ground. Therefore, touching a structure supporting a TL poses no inherent shock hazard. Additionally, TVA TLs are built with overhead ground wires that would lead a lightning strike into the ground for dissipation. Thus, a safety zone is created under the ground wires at the top of structures and along a line, for at least the width of the ROW. The NESC is strictly followed when installing, repairing, or upgrading TVA lines or equipment.

## 4.3 Long-term and Cumulative Impacts

The presence of the TL would present long-term visual effects to the mostly rural character of the local area. However, because the route of the proposed lines would traverse mostly rural areas with few residences and would involve only a few road crossings, the TL would not be especially prominent in the local landscape. Likewise, the establishment of easements for the proposed ROW with local landowners would pose a long-term encumbrance on the affected properties. Various agricultural land uses could be practiced

within the ROW, but any timber production within the ROW would be foregone for the life of the TL.

The availability of a reliable power supply is one factor in improving the overall infrastructure in the local area, which would support the ongoing growth in commercial and residential sectors. However, the extent and degree of such development in the area depends on a variety of factors and cannot be predicted accurately. Thus, residential and commercial growth of this mainly rural area would be a minor, long-term and cumulative consequence of the proposed transmission system improvements.

## 4.4 Unavoidable Adverse Environmental Impacts

The following unavoidable effects would result from implementing the proposed actions as described under the Action Alternative in Section 2.1.2.

- Clearing associated with construction of the proposed TL could result in a small amount of localized siltation.
- Trees would not be permitted to grow within the TL ROW or to a determined height adjacent to the ROW that would endanger the TL. In areas where the ROW would traverse forested areas, this would cause a change in the visual character of the immediate area and would segment some forested areas.
- Clearing and construction would result in the disruption and/or loss of some plant and wildlife, and the permanent loss of about 50 acres of forested habitat.
- Any burning of cleared material would result in some short-term air pollution.
- ROW construction would involve tree clearing and conversion of 0.28 acre of forested wetland to emergent or scrub-shrub wetland habitat.
- The proposed TL would result in minor, long-term visual effects on the landscape in the immediate local area.

## 4.5 Relationship of Local Short-Term Uses and Long-Term Productivity

Land within the ROW of the proposed 161-kV TL would be committed to use for electrical system needs for the foreseeable future. Approximately 57 acres of easement rights would be purchased (as described in Section 2.2.1.1) and consequently, some of this acreage would be converted from its current use of pasture, agriculture, and as forested land to use as a ROW. The proposed ROW would support the 161-kV TL (see Figure 1-1), with use of existing access roads outside the ROW. Agricultural uses of the ROW could and would likely continue. However, periodic clearing of the ROW would preclude forest management within the ROW for the operational life of the TL. These losses of long-term productivity with respect to timber production and as wildlife habitat are minor both locally and regionally.

## 4.6 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those uses of resources that cannot be reversed. An example of an irreversible commitment is the mining and use of an ore, which once mined, cannot be replaced. Irretrievable commitments of resources are those that may occur over a period of time but that may be recovered. For example, filling a wetland area for a parking lot would irretrievably commit the property for as long as the parking lot remains.

The materials used for construction of the proposed TL would be committed for the life of the line. Some materials, such as ceramic insulators and concrete foundations, may be irrevocably committed, but the metals used in equipment, conductors, and supporting steel structures could be recycled. The useful life of steel-pole transmission structures or laced-steel towers is expected to be at least 60 years. Thus, recyclable materials would be irretrievably committed until they are eventually recycled.

The ROW used for the TL would constitute an irretrievable commitment of onsite resources, such as wildlife habitat, forest resources, and forested wetlands in that the approximate previous land use and land cover could be returned upon retirement of these facilities. In the interim, compatible uses of the ROW for the TL could continue.

# CHAPTER 5

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# CHAPTER 6

## 6.0 ENVIRONMENTAL ASSESSMENT RECIPIENTS

### 6.1 Federal Agencies

United States Fish and Wildlife Service
Cookeville, Tennessee

### 6.2 Federally Recognized Tribes

The following tribes were notified of the availability of the document:
Absentee Shawnee Tribe of Oklahoma
Alabama-Quassarte Tribal Town
Cherokee Nation
Chickasaw Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Kialegee Tribal Town
The Muscogee (Creek) Nation of Oklahoma
Shawnee Tribe of Oklahoma
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

### 6.3 State Agencies

Tennessee Historical Commission
Nashville, Tennessee

Tennessee Department of Transportation
Nashville, Tennessee

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# CHAPTER 7

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# Appendix A – Correspondence

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# Appendix B – TVA Right-of-Way Clearing Specifications

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# Tennessee Valley Authority Right-of-Way Clearing Specifications

1. General - The clearing contractor shall review the environmental evaluation documents (categorical exclusion checklist, environmental assessment, or environmental impact statement) for the project or proposed activity, along with all clearing and construction appendices, conditions in applicable general and/or site-specific permits, the storm water pollution prevention plan, and any Tennessee Valley Authority (TVA) commitments to property owners. The contractor shall then plan and carry out operations using techniques consistent with good engineering and management practices as outlined in TVA's best management practices (BMPs) manual (Muncy 1992, and revisions thereto). The contractor will protect areas that are to be left unaffected by access or clearing work at and adjacent to all work sites. In sensitive areas and their buffers, the contractor will retain as much native ground cover and other vegetation as possible.

   If the contractor fails to use BMPs or to follow environmental expectations discussed in the prebid or prework meeting or present in contract specifications, TVA will order corrective changes and additional work as deemed necessary in TVA's judgment to meet the intent of environmental laws and regulations or other guidelines. Major violations or continued minor violations will result in work suspension until correction of the situation is achieved or other remedial action is taken at the contractor's expense. Penalty clauses may be invoked as appropriate.

2. Regulations - The clearing contractor shall comply with all applicable federal, state, and local environmental and antipollution laws, regulations, and ordinances including without limitation all air, water, solid and hazardous waste, noise, and nuisance laws, regulations, and ordinances. The contractor shall secure or ensure that TVA has secured all necessary permits or authorizations to conduct work on the acres shown on the drawings and plan and profile for the contract. The contractor's designated project manager will actively seek to prevent, control, monitor, and safely abate all commonly recognized forms of workplace and environmental pollution. Permits or authorizations and any necessary certifications of trained or licensed employees shall be documented with copies submitted to TVA's right-of-way inspector or construction environmental engineer before work begins. The contractor will be responsible for meeting all conditions specified in permits. Permit conditions shall be reviewed in prework discussions.

3. Land and Landscape Preservation - The clearing contractor shall exercise care to preserve the condition of cleared soils by avoiding as much compacting and deep scarring as possible. As soon as possible after initial disturbance of the soil and in accordance with any permit(s) or other state or local environmental regulatory requirements, cover material shall be placed to prevent erosion and sedimentation of water bodies or conveyances to surface water or groundwater. In areas outside the clearing, use, and access areas, the natural vegetation shall be protected from damage. The contractor and his employees must not deviate from delineated access routes or use areas and must enter the site at designated areas that will be marked. Clearing operations shall be conducted to prevent any unnecessary destruction,

scarring, or defacing of the remaining natural vegetation and adjacent surroundings in the vicinity of the work. In sensitive public or environmental areas, appropriate buffer zones shall be observed and the methods of clearing or reclearing modified to protect the buffer and sensitive area. Some areas may require planting native plants or grasses to meet the criteria of regulatory agencies or commitments to special program interests.

4. Streamside Management Zones - The clearing contractor must leave as many rooted ground cover plants as possible in buffer zones along streams and other bodies of water or wet-weather conveyances thereto. In such streamside management zones (SMZ), tall-growing tree species (trees that would interfere with TVA's National Electrical Safety Code clearances) shall be cut, and the stumps may be treated to prevent resprouting. Low-growing trees identified by TVA as marginal electrical clearance problems may be cut, and then stump treated with growth regulators to allow low, slow-growing canopy development and active root growth. Only approved herbicides shall be used, and herbicide application shall be conducted by certified applicators from TVA's Transmission, Operations, and Maintenance (TOM) organization after initial clearing and construction. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment, such as a feller-buncher. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Disturbed soils in SMZs must be stabilized by appropriate methods immediately after the right-of-way is cleared. Stabilization must occur within the time frame specified in applicable storm water permits or regulations. Stumps within SMZs may be cut close to the ground but must not be removed or uprooted. Trees, limbs, and debris shall be immediately removed from streams, ditches, and wet areas using methods that will minimize dragging or scarring the banks or stream bottom. No debris will be left in the water or watercourse. Equipment will cross streams, ditches, or wet areas only at locations designated by TVA after the application of appropriate erosion control BMPs consistent with permit conditions or regulatory requirements.

5. Wetlands - In forested wetlands, tall trees will be cut near the ground, leaving stumps and roots in place. The cambium may be treated with herbicides applied by certified applicators from the TOM organization to prevent regrowth. Understory trees that must be initially cut and removed may be allowed to grow back or may be treated with tree growth regulators selectively to slow growth and increase the reclearing cycle. The decision will be situationally made based on existing ground cover, wetland type, and tree species since tall tree removal may "release" understory species and allow them to grow quickly to "electrical clearance problem" heights. In many circumstances, herbicides labeled for water and wetland use may be used in reclearing.

6. Sensitive Area Preservation - If prehistoric or historic artifacts or features that might be of archaeological significance are discovered during clearing or reclearing operations, the activity shall immediately cease within a 100-foot radius, and a TVA right-of-way inspector or construction environmental engineer and the Cultural Resources Program manager shall be notified. The site shall be protected and left as found until a determination about the resources, their significance, and site treatment is made by TVA's Cultural Resources Program. Work may continue beyond the finding zone and the 100-foot radius beyond its perimeter.

7. Water Quality Control - The contractor's clearing and disposal activities shall be performed using BMPs that will prevent erosion and entrance of spillage, contaminants, debris, and other pollutants or objectionable materials into drainage ways, surface water, or groundwater. Special care shall be exercised in refueling equipment to prevent spills. Fueling areas shall be remote from any sinkhole, crevice, stream, or other water body. Open burning debris will be kept away from streams and ditches and shall be incorporated into the soil.

   The clearing contractor will erect and (when TVA or contract construction personnel are unable) maintain BMPs such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. BMPs will be inspected by the TVA field engineer or other designated TVA or contractor personnel routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections will be conducted in accordance with permit requirements. Records of all inspections will be maintained on site, and copies of inspection forms will be forwarded to the TVA construction environmental engineer.

8. Turbidity and Blocking of Streams - If temporary clearing activities must interrupt natural drainage, appropriate drainage facilities and erosion/sediment controls shall be provided to avoid erosion and siltation of streams and other water bodies or water conveyances. Turbidity levels in receiving waters or at storm water discharge points shall be monitored, documented, and reported if required by the applicable permit. Erosion and sediment control measures such as silt fences, water bars, and sediment traps shall be installed as soon as practicable after initial access, site, or right-of-way disturbance in accordance with applicable permit or regulatory requirements.

   Mechanized equipment shall not be operated in flowing water except when approved and, then, only to construct necessary stream crossings under direct guidance of TVA. Construction of stream fords or other crossings will only be permitted at approved locations and to current TVA construction access road standards. Material shall not be deposited in watercourses or within stream bank areas where it could be washed away by high stream flows. Any clearing debris that enters streams or other water bodies shall be removed as soon as possible. Appropriate U.S. Army Corps of Engineers and state permits shall be obtained for stream crossings.

9. Air Quality Control - The clearing or reclearing contractor shall take appropriate actions to limit the amount of air emissions created by clearing and disposal operations to well within the limits of clearing or burning permits and/or forestry or local fire department requirements. All operations must be conducted in a manner that prevents nuisance conditions or damage to adjacent land crops, dwellings, highways, or people.

10. Dust and Mud Control - Clearing activities shall be conducted in a manner that minimizes the creation of fugitive dust. This may require limitations as to type of equipment, allowable speeds, and routes utilized. Control measures such as water, gravel, etc., or similar measures may be used subject to TVA approval. On new construction sites and easements, the last 100 feet before an access road approaches a county road or highway shall be graveled to prevent transfer of mud onto the public road.

11. Burning - The contractor shall obtain applicable permits and approvals to conduct controlled burning. The contractor will comply with all provisions of the permit, notification, or authorization including burning site locations, controlled draft, burning hours, and such other conditions as stipulated. If weather conditions such as wind speed or wind direction change rapidly, the contractor's burning operation may be temporarily stopped by TVA's field engineer. The debris to be burned shall be kept as clean and dry as possible and stacked and burned in a manner that produces the minimum amount of smoke. Residue from burning will be disposed of according to permit stipulations. No fuel starters or enhancements other than kerosene will be allowed.

12. Smoke and Odors - The contractor will properly store and handle combustible and volatile materials that could create objectionable smoke, odor, or fumes. The contractor shall not burn oil or refuse that includes trash, rags, tires, plastics, or other manufactured debris.

13. Vehicle Exhaust Emissions - The contractor shall maintain and operate equipment in a manner that limits vehicle exhaust emissions. Equipment and vehicles will be kept within the manufacturers' recommended limits and tolerances. Excessive exhaust gases will be eliminated, and inefficient operating procedures will be revised or halted until corrective repairs or adjustments are made.

14. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personal vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the right-of-way, except in designated sensitive areas. The clearing or reclearing contractor will properly maintain these vehicles with approved spill protection controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Equipment shall not be temporarily stored in stream floodplains, whether overnight or on weekends or holidays.

15. Noise Control - The contractor shall take steps to avoid the creation of excessive sound levels for employees, the public, or the site and adjacent property owners. Concentration of individual noisy pieces as well as the hours and locations of operation should be considered.

16. Noise Suppression - All internal combustion engines shall be properly equipped with mufflers. The equipment and mufflers shall be maintained at peak operating efficiency.

17. Sanitation - A designated representative of TVA or the clearing contractor shall contact a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party. The facilities shall comply with applicable federal, state, or local health laws and regulations. They shall not be located closer than 100 feet to any stream or tributary or to any wetland. The facilities shall be required to have proper servicing and maintenance, and the waste disposal contractor shall verify in writing that the waste disposal will be in state-approved facilities. Employees shall be notified of sanitation regulations and shall be required to use the toilet facilities.

18. Refuse Disposal - The clearing or reclearing contractor shall be responsible for daily cleanup and proper labeling, storage, and disposal of all refuse and debris on the site produced by his operations and employees. Facilities that meet applicable regulations and guidelines for refuse collection will be required. Only approved transport, storage, and disposal areas shall be used.

19. Brush and Timber Disposal (Reclearing) - The reclearing contractor shall place felled tree boles in neat stacks at the edge of the right-of-way, with crossing breaks at least every 100 feet. Property owner requests shall be reviewed with the project manager or right-of-way specialist before accepting them. Lop and drop activities must be specified in the contract and on plan and profile drawings with verification with the right-of-way specialist before conducting such work. When tree trimming and chipping is necessary, disposal of the chips on the easement or other locations on the property must be with the consent of the property owner and the approval of the right-of-way specialist. No trees, branches, or chips shall remain in a surface water body or be placed at a location where washing into a surface water or groundwater source might occur.

20. Brush and Timber Disposal (Initial Clearing) - For initial clearing, trees are commonly part of the contractor's contract to remove as they wish. Trees may be removed from the site for lumber or pulpwood or they may be chipped or stacked and burned. All such activities must be coordinated with the TVA field engineer, and the open burning permits, notifications, and regulatory requirements must be met. Trees may be cut and left in place only in areas specified by TVA and approved by appropriate regulatory agencies. These areas may include sensitive wetlands or SMZs where tree removal would cause excessive ground disturbance or in very rugged terrain where windrowed trees are used as sediment barriers along the edge of the right-of-way.

21. Restoration of Site - All disturbed areas, with the exception of farmland under cultivation and any other areas as may be designated by TVA's specifications, shall be stabilized in the following manner unless the property owner and TVA's engineer specify a different method:

    a. The subsoil shall be loosened to a minimum depth of 6 inches if possible and worked to remove unnatural ridges and depressions.

    b. If needed, appropriate soil amendments will be added.

    c. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities (Muncy 2012). Exceptions would include those areas designated as native grass planting areas. Initial and final restoration will be performed by the clearing contractor.

    d. TVA holds the option, depending upon the time of year and weather condition, to delay or withdraw the requirement of seeding until more favorable planting conditions are certain. In the meantime, other stabilization techniques must be applied.

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# Appendix C – TVA Environmental Quality Protection Specifications for Transmission Line Construction

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# Tennessee Valley Authority Environmental Quality Protection Specifications for Transmission Line Construction

1. General – Tennessee Valley Authority (TVA) and/or the assigned contractor and subcontractors shall plan, coordinate, and conduct his or her operations in a manner that protects the quality of the environment and complies with TVA's environmental expectations discussed in the preconstruction meeting (including clearing and grading or reclearing and removal or dismantling). This specification contains provisions that shall be considered in all TVA and contract construction, dismantling, or forensic operations. If the contractor and his or her subcontractors fail to operate within the intent of these requirements, TVA will direct changes to operating procedures. Continued violation will result in a work suspension until correction or remedial action is taken by the contractor. Penalties and contract termination will be used as appropriate. The costs of complying with the Environmental Quality Protection Specifications are incidental to the contract work, and no additional compensation will be allowed. At all site perimeters, structure, foundation, conduit, grounding, fence, drainage ways, etc., appropriate protective measures to prevent erosion or release of contaminants will be taken immediately upon the end of each step in a construction, dismantling, or forensic sequence, and those protective measures will be inspected and maintained throughout the construction and site stabilization and rehabilitation period.

2. Regulations - TVA and/or the assigned contractor and subcontractor(s) shall comply with all applicable federal, state, and local environmental and antipollution laws, regulations, and ordinances related to environmental protection and prevention, control, and abatement of all forms of pollution.

3. Use Areas - TVA and/or the assigned contractor and/or subcontractor(s) use areas include but are not limited to site office, shop, maintenance, parking, storage, staging, assembly areas, utility services, and access roads to the use areas. The construction contractor and subcontractor(s) shall submit plans and drawings for their location and development to the TVA engineer and project manager for approval. Secondary containment will be provided for fuel and petroleum product storage pursuant to 29CFR1910.106(D)(6)(iii)(OSHA).

4. Equipment - All major equipment and proposed methods of operation shall be subject to the approval of TVA. The use or operation of heavy equipment in areas outside the right-of-way, access routes, site, or structure, pole, or tower sites will not be permitted without permission of the TVA inspector or field engineer. Heavy equipment use on steep slopes (greater than 20 percent) and in wet areas will be held to the minimum necessary to construct the transmission or communication facility. Steps will be taken to limit ground disturbance caused by heavy equipment usage, and erosion and sediment controls will be instituted on disturbed areas in accordance with state requirements and best management practices (BMPs).

   No subsurface ground-disturbing equipment or stump-removal equipment will be used by construction forces except on access roads or at the actual site, structure, pole, or tower sites, where only footing locations and controlled runoff diversions shall be created that disturb the soil. All other areas of ground cover or in-place stumps and roots shall remain in place. (Note: Tracked vehicles disturb surface layer of the ground

due to size and function.) Some disking of the right-of-way, access, and site(s) may occur for proper seedbed preparation.
Unless ponding previously occurred (i.e., existing low-lying areas), water should not be allowed to pond on the site or around structures except around foundation holes; the water must be directed away from the site in as dispersed a manner as possible. At tower or structure sites, some means of upslope interruption of potential overland flow and diversion around the footings should be provided as the first step in construction-site preparation. If leveling is necessary, it must be implemented by means that provide for continuous gentle, controlled, overland flow or percolation. A good grass cover, straw, gravel, or other protection of the surface must be maintained. Steps taken to prevent increases in the moisture content of the in-situ soils will be beneficial both during construction and over the service life of any anchor, foundation, or its structure.

5. Sanitation - A designated TVA or contractor and/or subcontractor(s) representative shall contract a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party. The facilities shall comply with applicable federal, state, or local health laws and regulations. They shall not be located closer than 100 feet to any stream or tributary or to any wetland. The facilities shall be required to have proper servicing and maintenance, and the waste disposal contractor shall verify in writing that the waste disposal will be in state-approved facilities. Employees shall be notified of sanitation regulations and shall be required to use the toilet facilities.

6. Refuse Disposal - Designated TVA and/or contractor and subcontractor(s) personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced by his or her operations and by his or her employees. Suitable refuse collecting facilities will be required. Only state-approved disposal areas shall be used. Disposal containers such as dumpsters or roll-off containers shall be obtained from a proper waste disposal contractor. Solid, special, construction/demolition, and hazardous wastes as well as scrap are part of the potential refuse generated and must be properly managed with emphasis on reuse, recycle, or possible give away, as appropriate, before they are handled as wastes. Records of the amounts generated shall be provided to the site's or project's designated environmental specialist. Contractor(s) and subcontractor(s) must meet similar provisions on any project contracted by TVA. Final debris, refuse, product, and material removal is the responsibility of the contractor unless special written agreement is made with the ultimate TVA owner of the site.

7. Landscape Preservation - TVA and its contractor(s) and subcontractor(s) shall exercise care to preserve the natural landscape in the entire construction, dismantling, or forensic area as well as use areas, in or outside the right-of-way, and on or adjacent to access roads. Construction operations shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the natural vegetation and surroundings in the vicinity of the work.

8. Sensitive Areas Preservation - Certain areas on site and along the access and/or right-of-way may be designated by the specifications or the TVA engineer as environmentally sensitive. These areas include but are not limited to areas classified as erodible, geologically sensitive, scenic, historical and archaeological, fish and wildlife refuges, endangered species' habitat, water supply watersheds, and public recreational areas

such as parks and monuments. Contractors, their subcontractor(s), and TVA construction crews shall take all necessary actions to avoid adverse impacts to these sensitive areas and their adjacent buffer zones. These actions may include suspension of work or change of operations during periods of rain or heavy public use; hours may be restricted or concentrations of noisy equipment may have to be dispersed. If prehistoric or historic artifacts or features are encountered during clearing, grading, borrow, fill, construction, dismantling, or forensic operations, the operations shall immediately cease for at least 100 feet in each direction, and TVA's construction superintendent, project manager, or area environmental program administrator and TVA Cultural Resources Program shall be notified. The site shall be left as found until a significance determination is made. Work may continue elsewhere beyond the 100-foot perimeter.

9. Water Quality Control - TVA and contractor construction, dismantling, or forensic activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris, and other objectionable pollutants and wastes into flowing caves, sinkholes, streams, dry watercourses, lakes, ponds, and underground water sources.

   The clearing contractor erected erosion and/or sedimentation control shall be maintained and (when TVA or contract construction personnel are unable) the construction crew(s) shall maintain BMPs such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. Additional BMPs may be required for areas of disturbance created by construction activities and at sequential steps of construction at the same location on site. BMPs will be inspected by the TVA field engineer or other designated TVA or contractor and/or subcontractor(s) personnel routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections and any required sampling will be conducted in accordance with permit requirements. Records of all inspections and sampling results will be maintained on site, and copies of inspection forms and sampling results will be forwarded to the TVA project manager or supporting environmental specialist. Acceptable measures for disposal of waste oil from vehicles and equipment shall be followed. No waste oil shall be disposed of within the site, access, or right-of-way, on a related construction site or its access roads

10. Turbidity and Blocking of Streams - Construction, dismantling, or forensic activities in or near streamside management zones or other bodies of water shall be controlled to prevent the water turbidity from exceeding state or local water quality standards for that stream. **All conditions** of a general storm water permit, aquatic resource alteration permit, or a site-specific permit **shall be met** including monitoring of turbidity in receiving streams and/or storm water discharges and implementation of appropriate erosion and sediment control measures.

    Appropriate drainage facilities for temporary construction, dismantling, or forensic activities interrupting natural site drainage shall be provided to avoid erosion. Watercourses shall not be blocked or diverted unless required by the specifications or the TVA engineer. Diversions shall be made in accordance with TVA's *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 2012).

On rights-of-way, mechanized equipment shall not be operated in flowing or standing water bodies except when approved and, then, only to construct crossings or to perform required construction under direct guidance of TVA. Construction of stream fords or other crossings will only be permitted at approved locations and to current TVA construction access road standards. Material shall not be deposited in watercourses, their adjacent wetlands, or within stream bank areas where it could be washed away by high stream flows. Appropriate U.S. Army Corps of Engineers' and state permits shall be obtained.

Mechanized equipment shall not be operated in flowing or standing water on substation, switching station, or telecommunication sites.

Wastewater from construction, dismantling, or dewatering operations shall be controlled to prevent excessive erosion or turbidity in a stream, wetland, lake, pond or conveyed to a sinkhole. Any work or placing of equipment within a flowing or dry watercourse requires the prior approval of TVA.

11. Floodplain Evaluation - During the planning and design phase of the substation or communications facility, floodplain information should be obtained to avoid locating flood-damageable facilities in the 100-year floodplain. If the preferred site is located within a floodplain area, alternative sites must be evaluated and documentation prepared to support a determination of "no practicable alternative" to siting in the floodplain. In addition, steps taken to minimize adverse floodplain impacts should also be documented.

12. Clearing - No construction, dismantling, or forensic activities may clear additional site or right-of-way vegetation or disturb remaining retained vegetation, stumps, or regrowth at locations other than the structure, substation, or communication site or access thereto. TVA and the construction, dismantling, or forensic contractor(s) must provide appropriate erosion or sediment controls for areas they have disturbed after each disturbance that have previously been restabilized after clearing operations. Control measures shall be implemented as soon as practicable after disturbance in accordance with applicable federal, state, and/or local storm water regulations.

13. Restoration of Site - All construction, dismantling, or forensic-related disturbed areas with the exception of farmland under cultivation and any other areas as may be designated by TVA's specifications shall be stabilized in the following manner unless the property owner and TVA's engineer specify a different method:

    A. The subsoil shall be loosened to a minimum depth of 6 inches if possible and worked to remove unnatural ridges and depressions.

    B. If needed, appropriate soil amendments will be added.

    C. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's *A Guide*

*for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 2012). Exceptions would include those areas designated as native grass planting areas. Initial and final restoration will be performed by the clearing contractor.

D. Rehabilitation species shall use species designated by federal guidance that are low–maintenance, native species appropriate for the site conditions that prevail at that location

E. TVA holds the option, depending upon the time of year and weather condition, to delay or withdraw the requirement of seeding until more favorable planting conditions are certain. In the meantime, other stabilization techniques must be applied.

F. The site must be protected from species designated by the federal Invasive Species Council and must not be the source of species that can be transported to other locations via equipment contaminated with viable materials; thus, the equipment must be inspected, and any such species' material found must be removed and destroyed prior to transport to another location.

14. Air Quality Control - Construction, dismantling, and/or forensic crews shall take appropriate actions to minimize the amount of air pollution created by their operations. All operations must be conducted in a manner that avoids creating a nuisance and prevents damage to lands, crops, dwellings, or persons.

15. Burning - Before conducting any open burning operations, the contractor and subcontractor(s) shall obtain permits or provide notifications as required to state forestry offices and/or local fire departments. Burning operations must comply with the requirements of state and local air pollution control and fire authorities and will only be allowed in approved locations and during appropriate hours and weather conditions. If weather conditions such as wind direction or speed change rapidly, the contractor's burning operations may be temporarily stopped by the TVA field engineer. The debris for burning shall be piled and shall be kept as clean and as dry as possible, then burned in such a manner as to reduce smoke. No materials other than dry wood shall be open burned. The ash and debris shall be buried away from streams or other water sources and shall be in areas coordinated with the property owner on rights-of-way or project manager for TVA sites.

16. RENOVATION OR DEMOLITION DEBRIS MAY NOT BE BURNED.

17. Dust and Mud Control - Construction, dismantling, or forensic activities shall be conducted to minimize the creation of dust. This may require limitations as to types of equipment, allowable speeds, and routes utilized. Water, straw, wood chips, dust palliative, gravel, combinations of these, or similar control measures may be used subject to TVA's approval. On new construction sites and easements, the last 100 feet before an access road approaches a county road or highway shall be graveled to prevent transfer of mud onto the public road.

18. Vehicle Exhaust Emissions - TVA and/or the contractor(s) and subcontractor(s) shall maintain and operate equipment to limit vehicle exhaust emissions. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions shall not be operated until corrective repairs or adjustments are made.

19. Vehicle Servicing - Routine maintenance of personal vehicles will not be performed on the right-of-way or access route to the site. However, if emergency or “have to” situations arise, minimal/temporary maintenance to personal vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the site except adjacent to or in designated sensitive areas. The Heavy Equipment Department within TVA or the construction, dismantling, or forensic contractor will properly maintain these vehicles with approved spill protection controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Records of amounts generated shall be provided to TVA. Equipment shall not be temporarily stored in stream floodplains whether overnight or on weekends or holidays.

20. Smoke and Odors - TVA and/or the contractor(s) and subcontractor(s) shall properly store and handle combustible material that could create objectionable smoke, odors, or fumes. The contractor and subcontractor(s) shall not burn refuse such as trash, rags, tires, plastics, or other debris.

21. Noise Control - TVA and/or the contractor and subcontractor(s) shall take measures to avoid the creation of noise levels that are considered nuisances, safety, or health hazards. Critical areas including but not limited to residential areas, parks, public use areas, and some ranching operations will require special considerations. TVA's criteria for determining corrective measures shall be determined by comparing the noise level of the construction, dismantling, or forensic operation to the background noise levels. In addition, especially noisy equipment such as helicopters, pile drivers, air hammers, chippers, chain saws, or areas for machine shops, staging, assembly, or blasting may require corrective actions when required by TVA

22. Noise Suppression - All internal combustion engines shall be properly equipped with mufflers as required by the Department of Labor's *Safety and Health Regulations for Construction.* TVA may require spark arresters in addition to mufflers on some engines. Air compressors and other noisy equipment may require sound-reducing enclosures in some circumstances.

23. Damages - The movement of construction, dismantling, or forensic crews and equipment shall be conducted in a manner that causes as little intrusion and damage as possible to crops, orchards, woods, wetlands, and other property features and vegetation. The contractor and subcontractor(s) will be responsible for erosion damage caused by his or her actions and employees and, especially, for creating conditions that would threaten the stability of the right-of-way or site soil, the structures, or access to either. When property owners prefer the correction of ground cover condition or soil

and subsoil problems themselves, the section of the project to be handled shall be documented with an implementation schedule and a property owner signature obtained.

## References

Muncy, J. A. 2012. A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities (revised edition). Edited by A. Bowen, et al. <http://www.tva.com/power/projects/bmp_manual_2012.pdf>. Norris: Tennessee Valley Authority, Technical Note TVA/LR/NRM 92/1. Retrieved from: <http://www.tva.com/power/projects/index.htm> (n.d.)

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# Appendix D – TVA Transmission Construction Guidelines Near Streams

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# Tennessee Valley Authority Transmission Construction Guidelines Near Streams

Even the most carefully designed transmission line project eventually will affect one or more creeks, rivers, or other type of water body. These streams and other water areas are protected by state and federal law, generally support some amount of fishing and recreation, and, occasionally, are homes for important and/or endangered species. These habitats occur in the stream and on strips of land along both sides (the streamside management zone [SMZ]) where disturbance of the water, land, or vegetation could have an adverse effect on the water or stream life. The following guidelines have been prepared to help Tennessee Valley Authority (TVA) Transmission Construction staff and their contractors avoid impacts to streams and stream life as they work in and near SMZs. These guidelines expand on information presented in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities.*

## Three Levels of Protection

During the preconstruction review of a proposed transmission line, the TVA Environmental Biological Compliance staff will have studied each possible stream impact site and will have identified it as falling into one of three categories: (A) standard streamside management protection, (B) protection of important permanent streams, springs, and sinkholes, or (C) protection of unique habitats. These category designations are based on the variety of species and habitats that exist in the stream, as well as federal requirements to avoid harming certain species.

As early as possible after field surveys are completed by the TVA Biological Compliance Staff, any streams that have been designated as either Category B or C will be discussed with the TVA Environmental Energy Delivery staff. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams during design and construction. The category designation for each stream site will then be marked on the transmission line plan and profile sheets. Construction crews are required to protect streams and other identified water habitats using the following pertinent set(s) of guidelines:

## (A) Standard Stream Protection

This is the standard (basic) level of protection for streams, springs, sinkholes, and the habitats around them. The purpose of the following guidelines is to minimize the amount and length of disturbance to the water bodies without causing adverse impacts on the construction work.

**Guidelines:**

1. All construction work around streams, springs, and sinkholes will be done using pertinent best management practices (BMPs) such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 5, “Structural Controls Standards and Specifications” (Muncy 2012).

2. All equipment crossings of streams and shorelines must comply with appropriate state permitting requirements. Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Crossings of any permanent streams must allow for natural movement of fish and other aquatic life.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Stumps can be cut close to ground level, but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement as a result of clearing operations by the actions of plowing, disking, blading, or other tillage or grading equipment will be minimized in SMZs. Shorelines that have to be disturbed must be stabilized as soon as feasible.

**(B) Protection of Important Permanent Streams, Springs, and Sinkholes**

This category will be used when there is one or more specific reason(s) why a permanent (always-flowing) stream, spring, or sinkhole requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include high potential for occupancy by federally listed or significant state-listed species, federally designated critical habitat, or areas designated as special use classification (e.g., trout waters). The purpose of the following guidelines is to minimize the disturbance of the banks and water in the flowing stream(s) where this level of protection is required.

**Guidelines:**

1. Except as modified by Guidelines 2-4 below, all construction work around streams will be done using pertinent BMPs, such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 5, “Structural Controls Standards and Specifications” (Muncy 2012).

2. All equipment crossings of streams must comply with appropriate state (and, at times, federal) permitting requirements. Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow. Category B designations will be discussed with the TVA Environmental Energy Delivery staff as early as possible in the process, to allow time to discuss possible avoidance or minimization of impacts with design and construction.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Cutting of trees near permanent streams must be limited to those required to meet National

Electrical Safety Code and danger tree requirements. Stumps can be cut close to ground level, but must not be removed or uprooted.

4. Other vegetation near streams must be disturbed as little as possible during construction. Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will be minimized in SMZs. Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.

### (C) Protection of Unique Habitats

This category will be used when, for one or more specific reasons, a temporary or permanent aquatic habitat requires special protection. This relatively uncommon level of protection will be appropriate and required when a unique habitat requiring special protection is present (for example, the spawning area of a rare species), the stream is known to be occupied by a federally listed or significant state-listed species, or when required as a special condition resulting from consultation with the U.S. Fish and Wildlife Service to avoid project effects on a listed species or designated critical habitat. The purpose of the following guidelines is to avoid or minimize any disturbance of the unique aquatic habitat.

**Guidelines:**

1. Except as modified by Guidelines 2-4 below, all construction work around the unique habitat will be done using pertinent BMPs, such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 5, “Structural Controls Standards and Specifications” (Muncy 2012).

2. Category C designations would be discussed with the TVA Environmental Energy Delivery staff as early as possible following field surveys to allow time to discuss possible avoidance or minimization of impacts with design and construction. Environmental Energy Delivery staff would discuss construction activities to take place in the SMZ with the Environmental Biological Compliance staff. On-site planning sessions would be conducted as needed. All crossings of streams also must comply with appropriate state (and, at times, federal) permitting requirements.

3. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Cutting of trees near permanent streams should be limited to those required to meet National Electrical Safety Code, Federal Energy Regulatory Commission standards, and danger tree requirements. Stumps can be cut close to ground level, but must not be removed or uprooted.

4. Other vegetation near the unique habitat must be disturbed as little as possible during construction. Soil disturbance by plowing, disking, blading, or grading must be kept at a minimum. Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible.

5. Special SMZ requirements will be coordinated with Environmental Biological Compliance staff.

**Maintenance**

During ongoing operations, SMZs will be inspected frequently; and during inactive periods, occasionally. Damaging or failing situations that may cause unacceptable water quality impacts will be corrected as soon as practical.

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## Comparison of Guidelines Under the Three Stream and Water Body Protection Categories[1] (page 1)

| Guidelines | A: Standard Stream Protection | B: Important Permanent Streams, Springs, and Sinkholes | C: Protection of Unique Habitats |
|---|---|---|---|
| **1. Reference** | • All TVA construction work around streams, springs, and sinkholes will be done using pertinent Best Management Practices (BMPs) such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities*, especially Chapter 5, "Structural Controls Standards and Specifications." | • Except as modified by Guidelines 2-4, all construction work around streams will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities*, especially Chapter 5, "Structural Controls Standards and Specifications." | • Except as modified by Guidelines 2-4, all construction work around the unique habitat will be done using pertinent BMPs such as those described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities,* especially Chapter 5, "Structural Controls Standards and Specifications." |
| **2. Equipment Crossings** | • All equipment crossings of streams and shorelines must comply with appropriate state permitting requirements.<br>• Crossings of all drainage channels, intermittent streams, and permanent streams must be done in ways that avoid erosion problems and long-term changes in water flow.<br>• Crossings of any permanent streams must allow for natural movement of fish and other aquatic life. | • All equipment crossings of streams also must comply with appropriate state (and at times federal) permitting requirements.<br>• Crossings of drainage channels and intermittent streams must be done in ways that avoid erosion problems and long-term changes in water flow.<br>• All construction activity would be discussed with the TVA Environmental Energy Delivery staff as early as possible in the process to allow time to discuss possible avoidance or minimization of impacts with design and construction. | • All crossings of streams also must comply with appropriate state (and, at times federal) permitting requirements.<br>• All construction activity would be discussed with the TVA Environmental Energy Delivery staff as early as possible following field surveys to allow time to discuss possible avoidance or minimization of impacts with design and construction.<br>• Special SMZ requirements will be coordinated with Environmental Biological Compliance staff. |

[1]Source: *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (Muncy 2012)

**Comparison of Guidelines Under the Three Stream and Water Body Protection Categories[1] (page 2)**

| Guidelines | A: Standard Stream Protection | B: Important Permanent Streams, Springs, and Sinkholes | C: Protection of Unique Habitats |
|---|---|---|---|
| **3. Cutting Trees** | • Cutting of trees within streamside management zones (SMZs) must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area.<br>• Stumps can be cut close to ground level, but must not be removed or uprooted. | • Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area.<br>• Cutting of trees near permanent streams must be limited to those meeting National Electrical Safety Code (NESC) and danger tree requirements.<br>• Stumps can be cut close to ground level, but must not be removed or uprooted. | • Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., a feller-buncher) that would result in minimal soil disturbance and damage to low-lying vegetation. The method will be selected based on site-specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area.<br>• Cutting of trees near permanent streams must be limited to those meeting NESC, Federal Energy Regulatory Commission standards, and danger tree requirements.<br>• Stumps can be cut close to ground level, but must not be removed or uprooted. |
| **4. Other Vegetation** | • Other vegetation near streams must be disturbed as little as possible during construction.<br>• Soil displacement as a result of clearing operations by the actions of plowing, disking, blading, or other tillage or grading equipment will be minimized in SMZs.<br>• Shorelines that have to be disturbed must be stabilized as soon as feasible. | • Other vegetation near streams must be disturbed as little as possible during construction.<br>• Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will be minimized in SMZs.<br>• Shorelines that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible. | • Other vegetation near the unique habitat must be disturbed as little as possible during construction.<br>• The soil disturbance by plowing, disking, blading, or grading must be kept at a minimum.<br>• Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible. Special SMZ requirements will be coordinated with Environmental Biological Compliance staff. |

[1]Source: *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Construction and Maintenance Activities* (Muncy 2012)

# Appendix E – TVA Transmission and Power Supply Environmental Protection Procedures Right-of-Way Vegetation Management Guidelines

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# Tennessee Valley Authority
# Energy Delivery Environmental Protection Procedures
# Right-of-Way Vegetation Management Guidelines

## 1.0 Overview

A. The Tennessee Valley Authority (TVA) must manage the vegetation on its rights-of-way and easements to ensure emergency maintenance access and routine access to structures, switches, conductors, and communications equipment. In addition, TVA must maintain adequate clearance, as specified by the National Electric Safety Code, between conductors and tall-growing vegetation and other objects. This requirement applies to vegetation within the right-of-way as well as to trees located off the right-of-way.

B. Each year TVA assesses the conditions of the vegetation on and along its rights-of-way. This is accomplished by aerial inspections, periodic field inspections, aerial photography, and information from TVA personnel, property owners, and the general public. Important information gathered during these assessments includes the coverage by various vegetation types, the mix of plant species, the observed growth, the seasonal growing conditions, and the density of the tall vegetation. TVA also evaluates the proximity, height, and growth rate of trees adjacent to the right-of-way that may be a danger to the line or structures.

C. TVA right-of-way specialists develop a vegetation reclearing plan that is specific to each line segment and is based on terrain conditions, species mix, growth, and density.

## 2.0 Right-of-Way Management Methods

A. TVA uses an integrated vegetation management approach. In farming areas, TVA encourages property owner management of the right-of-way using low-growing crops. In dissected terrain with rolling hills and interspersed woodlands, TVA may utilize mechanical mowing.

B. TVA uses a variety of herbicides specific to the species present with a variety of possible application techniques. TVA utilizes control methods, including use of low volume herbicide applications, occasional single tree injections, and tree growth regulators (TGRs) to a large extent.

C. In very steep terrain, in sensitive environmental areas, in extensive wetlands, at stream banks, and in sensitive property owner land use areas, hand clearing may be utilized. Hand clearing is recognized as one of the most hazardous occupations documented by the Occupational Safety and Health Administration. For that reason, TVA utilizes low volume herbicide applications in these areas when feasible.

D. TVA does not encourage tree re-clearing by individual property owners because of the high hazard potential of hand clearing, possible interruptions of the line, and electrical safety considerations for untrained personnel that might do the work. Private property owners may re-clear the right-of-way with trained re-clearing professionals.

E. Mechanical mowers not only cut the tall saplings and seedlings on the right-of-way, they also shatter the stump and the supporting near surface root crown. The tendency of resistant species is to re-sprout from the root crown and shattered stumps can produce a multi-stem dense stand in the immediate area. Repeated use of mowers on short cycle re-clearing with many original stumps re-growing in the above manner can create a single species thicket or monoculture. With the original large root system and multiple stems, the resistant species can produce re-growth at the rate of 5-10 feet in a year. In years with high rainfall, the growth can reach 12-15 feet in a single year. These dense, monoculture stands can become nearly impenetrable for even large tractors. Such stands have low diversity, little wildlife food or nesting potential, and become a property owner's concern. Selective herbicide application may be used to control monoculture stands.

F. TVA encourages property owners to sign an agreement to manage rights-of-way on their land for wildlife under the auspices of "Project Habitat," a joint project by TVA, BASF, and wildlife organizations, e.g., National Wild Turkey Federation, Quail Unlimited, and Buckmasters. The property owner maintains the right-of-way in wildlife food and cover with emphasis on quail, turkey, deer or other wildlife. A variation used in or adjacent to developing suburban areas is to sign agreements with the developer and residents to plant and maintain wildflowers on the right-of-way.

G. TVA places strong emphasis on managing rights-of-way in the above manner. When the property owners do not agree to these opportunities, TVA must maintain the right-of-way in the most environmentally acceptable, cost-effective, and efficient manner possible.

## 3.0 Herbicide Program

A. TVA has worked with universities (such as Mississippi State University, University of Tennessee, Purdue University and others), chemical manufacturers, other utilities, U.S. Department of Transportation, U.S. Fish and Wildlife (USFWS), and U.S. Forest Service (USFS) personnel to explore options for vegetation control. The results have been strong recommendations to use species-specific, low volume herbicide applications in more situations. Research, demonstrations, and other right-of-way programs show a definite improvement of rights-of-way treated with selective low-volume applications of new herbicides using a variety of application techniques and timing. Table 1 below identifies herbicides currently used on TVA rights-of-way. Table 2 identifies pre-emergent herbicides currently being used on bare ground areas on TVA rights-of-way and in substations. Table 3 identifies TGRs that may be used on tall trees that have special circumstances that require trimming on a regular cycle, e.g., restrictions on complete removal. The rates of application utilized are those listed on the U.S. Environmental Protection Agency (USEPA) approved label and consistent with utility standard practice throughout the Southeast.

Table 1 - Herbicides Currently Used on TVA Rights-of-Way

| Trade Name | Active Ingredients | Label Signal Word |
|---|---|---|
| Accord/Accord XRT | Glyphosate/Liquid | Caution |
| Arsenal | Imazapyr/Liquid/Granule | Caution |
| Chopper | Imazapyr/RTU | Caution |
| Clearstand | Imazapyr/Metsulfuron Methyl/Liquid | Caution |
| Escort | Metsulfuron Methyl/Dry Flowable | Caution |
| Garlon | Triclopyr/Liquid | Caution |
| Garlon 3A | Triclopyr/Liquid | Danger |
| Habitat | Imazapyr/Liquid | Caution |
| Krenite S | Fosamine Ammoinium | Caution |
| Milestone VM | Aminopyralid/Liquid | Caution |
| Pathfinder II | Triclopyr/RTU | Caution |
| Rodeo | Glyphosate/Liquid | Caution |
| Roundup | Glyphosate/Liquid | Caution |
| Roundup Pro | Glyphosate | Caution |
| Streamline | Aminocyclopyrachlor/ | Caution |
| Transline | Clopyralid/Liquid | Caution |

Table 2 - Preemergent Herbicides Currently Used for Bare Ground Areas on TVA Rights-of-Way

| Trade Name | Active Ingredients | Label Signal Word |
|---|---|---|
| Arsenal 5G | Imazapyr/Granule | Caution |
| Sahara | Diuron/Imazapyr | Caution |
| SpraKil SK-26 | Tebuthiuron/Diuron/Granules | Caution |
| SpraKil S-5 | Tebuthiuron/Granules | Caution |
| Topsite | Diuron/Imazapyr | Caution |

Table 3 - Tree Growth Regulators (TGRs) Currently Used on TVA Rights-of-Way

| Trade Name | Active Ingredients | Label Signal Word |
|---|---|---|
| Profile 2SC | TGR-paclobutrazol | Caution |
| TGR | Flurprimidol | Caution |

B. The herbicides listed in Tables 1 and 2 and TGRs listed in Table 3 have been evaluated in extensive studies in support of registration applications and label requirements. Many have been reviewed in the USFS vegetation management environmental impact statements (EISs), and those evaluations are incorporated here by reference (USFS 1989a, 1989b, 2002a, and 2002b). Electronic copies can be accessed at http://www.fs.fed.us/r8/planning/documents/vegmgmt/. The result of these reviews has been a consistent finding of limited environmental impact beyond that of control of the target vegetation. All the listed herbicides have been found to be of low environmental toxicity when applied by trained applicators following the label and registration procedures, including prescribed measures, such as buffer zones, to protect threatened and endangered species.

C. Low volume herbicide applications are recommended since research demonstrates much wider plant diversity after such applications. There is better ground erosion protection and more wildlife food plants and cover plants develop. In most situations there is increased development of wild flowering plants and shrubs. In conjunction with herbicides, the diversity and density of low-growing plants provide control of tall-growing species through competition.

D. Wildlife managers often request the use of herbicides in place of rotary mowing in order to avoid damage to nesting and tunneling wildlife. This method retains ground cover year around with a better mix of food species and associated high-protein insect populations for birds in the right seasons. Most also report less damage to soils (even when compared with rubber-tired equipment).

E. Property owners interested in tree production often request the use of low volume applications rather than hand or mechanical clearing because of the insect and fungus problems in damaged vegetation and debris left on the right-of-way. The insect and fungus invasions, such as pine tip moth, oak leaf blight, sycamore and dogwood blight, etc., are becoming widespread across the nation.

F. Best Management Practices (BMPs) governing application of herbicides are contained within *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities* (Muncy 2012) which is incorporated by reference. Herbicides can be liquid, granular, or powder and can be applied aerially or by ground equipment and may be selectively applied or broadcast, depending on the site requirements, species present, and condition of the vegetation. Water quality considerations include measures taken to keep herbicides from reaching streams whether by direct application or through runoff of or flooding by surface water. “Applicators” must be trained, licensed, and follow manufacturers’ label instructions, USEPA guidelines, and respective state regulations and laws.

G. When herbicides are used, their potential adverse impacts are considered in selecting the compound, formulation, and application method. Herbicides that are designated “Restricted Use” by USEPA require application by or under the supervision of applicators certified by the respective state control board. Aerial and ground applications are done either by TVA or by contractors in accordance with the following guidelines identified in the TVA BMP manual (Muncy 2012):

1. The sites to be treated are selected and application directed by the appropriate TVA official.
2. A preflight walking or flying inspection is made within 72 hours prior to applying herbicides aerially. This inspection ensures that no land use changes have occurred, that sensitive areas are clearly identified to the pilot, and that buffer zones are maintained.
3. Aerial application of liquid herbicides will normally not be made when surface wind speeds exceed 5 miles per hour, in areas of fog, or during periods of temperature inversion.
4. Pellet application will normally not be made when the surface wind speeds exceed 10 miles per hour, or on frozen or water-saturated soils.

5. Liquid application is not performed when the temperature reaches 95 degrees Fahrenheit or above.
6. Application during unstable, unpredictable, or changing weather patterns is avoided.
7. Equipment and techniques are used that are designed to ensure maximum control of the spray swath with minimum drift.
8. Herbicides are not applied to surface water or wetlands unless specifically labeled for aquatic use. Filter and buffer strips will conform at least to federal and state regulations and any label requirements. The use of aerial or broadcast application of herbicides is not allowed within a streamside management zone (SMZ) adjacent to perennial streams, ponds, and other water sources. Hand application of certain herbicides labeled for use within SMZs is used only selectively.
9. Buffers and filter strips (200 feet minimum width) are maintained next to agricultural crops, gardens, farm animals, orchards, apiaries, horticultural crops, and other valuable vegetation.
10. Herbicides are not applied in the following areas or times: (a) in city, state, and national parks or forests or other special areas without written permission and/or required permits (b) off the right-of-way and (c) during rainy periods or during the 48- hour interval prior to rainfall predicted with a 20 percent or greater probability by local forecasters, when soil active herbicides are used.

H. TVA currently uses primarily low volume applications of foliar and basal applications, e.g., Accord (Glyphosate), Arsenal (Imazapyr), Clearstand (Imazapyr / Metsulfuron Methyl), Milestone VM (Aminopyralid) and Streamline (Aminocyclopyrachlor / Metsulfuron Methyl).

## 4.0 References

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# Appendix F – Stream Crossings along the Proposed 161-kV Transmission Line, the Existing 46-kV Transmission Line, and the Associated Access Roads

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**Table F-1. Stream Crossings along the Proposed 161-kV Transmission Line Right-of-Way Located in Van Buren County, Tennessee**

| Stream ID | Stream Type | Streamside Management Zone Category | Stream Name | Field Notes |
|---|---|---|---|---|
| 001 | Perennial | Category A (50 feet) | Unnamed tributary to Dry Fork | 5-foot-wide x 4-foot-deep channel with silt/ sand substrate. |
| 002 | Perennial | Category A (50 feet) | Unnamed tributary to Millstone Branch | 3-foot-wide x 3-foot-deep channel with silt/ clay/ cobble substrate. Salamander and several frogs observed in stream. |
| 003 | Perennial | Category A (50 feet) | Unnamed tributary to Millstone Branch | 3-foot-wide x 3-foot-deep channel with silt/ clay/ cobble substrate. Salamander and several frogs observed in stream. |
| 004 | Perennial | Category A (50 feet) | Unnamed tributary to Millstone Branch | Small channel with bedrock/ cobble substrated. Crayfish collected. |
| 005 | Perennial | Category A (50 feet) | Millstone Branch | Bedrock substrate just upstream of waterfall. |
| 006 | Perennial | Category A (50 feet) | Unnamed tributary to Millstone Branch | 8-foot-wide x 3-foot-deep channel with bedrock/ boulder substrate. |
| 007 | Perennial | Category A (50 feet) | Unnamed tributary to Millstone Branch | Overflow channel for SMZ008 |
| 008 | Perennial | Category A (50 feet) | Unnamed tributary to Millstone Branch | 8-foot-wide x 3-foot-deep channel with boulder substrate. |
| 009 | Other | Category A (50 feet) | NA | Pond. |
| 010 | Intermittent | Category A (50 feet) | Unnamed tributary to Millstone Branch | Small 2-foot-wide x 2-foot-deep channel with bedrock substrate. Overflow from pond. |

**Table F-2. Stream Crossings Along the Great Falls Hydro Plant-Spencer 46-kV Transmission Line and the Associated Access Roads in Warren and Van Buren County, Tennessee**

| Stream ID | Stream Type | Streamside Management Zone Category | Stream Name | Field Notes |
|---|---|---|---|---|
| 001-R | Perennial | Category A (50 feet) | Collins River | Impounded portion of Collins River (Great Falls Reservoir) |
| 002-R | Other | Category A (50 feet) | NA | Pond |
| 003-R | Other | Category A (50 feet) | NA | Pond |
| 004-R | Other | Category A (50 feet) | NA | Pond in ROW and adjacent to AR-04. |
| 005-R | Perennial | Category A (110 feet) | Laurel Creek. | Approximately 48-foot-wide channel impounded by Great Falls reservoir. Steep banks. |
| 006-R | Other | Category A (50 feet) | NA | Pond |
| 007-R | Other | Category A (50 feet) | NA | Pond |
| 008-R | Intermittent | Category A (50 feet) | Unnamed tributary to Long Fork Creek. | Small channel adjacent to wetland. Access road is existing. |
| 009-R | Intermittent | Category A (50 feet) | Unnamed tributary to Long Fork Creek. | 3– to 8-foot-wide x 1- to 4-foot-deep channel with boulder/ bedrock/ silt substrate. Severe bank erosion due to cattle access and lack of riparian area. |
| 010-R | Intermittent | Category A (50 feet) | Unnamed tributary to Dry Fork | 3– to 8-foot-wide x 1- to 3-foot-deep channel severely impacted due to cattle access. |
| 011-R | Intermittent | Category A (50 feet) | Unnamed tributary to Dry Fork | Access road crossing is existing via culvert present. |
| 012-R | Perennial | Category A (50 feet) | Unnamed tributary to Dry Fork | Stable bed/bank with cobble/ bedrock substrate. |
| 013-R | Perennial | Category A (50 feet) | Unnamed tributary to Dry Fork | 8- to 12-foot-wide x 1- to 2-foot-deep channel with gravel/ cobble/ boulder substrate. |
| 014-R | Perennial | Category A (50 feet) | Dry Fork | 20- to 25-foot-wide x 1- to 3-foot-deep channel with boulder/ bedrock substrate. Fish/ crayfish observed. |
| 015-R | Perennial | Category A (50 feet) | Dry Fork | 20- to 25-foot-wide x 1- to 3-foot-deep channel with boulder/ bedrock substrate. Fish/ crayfish observed. |

| Stream ID | Stream Type | Streamside Management Zone Category | Stream Name | Field Notes |
|---|---|---|---|---|
| 016-R | Intermittent | Category A (50 feet) | Unnamed tributary to Dry Fork | Access road is at existing ford. |
| 017-R | Other | Category A (50 feet) | NA | Pond |
| 018-R | Perennial | Category A (50 feet) | Dry Fork | 20- to 25-foot-wide x 1- to 3-foot-deep channel with boulder/ bedrock substrate. |
| 019-R | Other | Category A (50 feet) | NA | Pond |
| 020-R | Other | Category A (50 feet) | NA | Pond |
| 021-R | Intermittent | Category A (50 feet) | Unnamed tributary to Dry Fork | Channel surrounded by wetland. Impacted by cattle access. |
| 022-R | Intermittent | Category A (50 feet) | Unnamed tributary to Benton Branch | 3- to 8-foot-wide x 1- to 3-foot-deep channel with cobble/ sand substrate. |
| 023-R | Other | Category A (50 feet) | NA | Pond. |
| 024-R | Perennial | Category A (50 feet) | Benton Branch | 5-to 15-foot-wide x 1- to 2-foot-deep channel with primarily bedrock/ boulder substrate. Bank erosion from cattle present. |
| 025-R | Perennial | Category A (50 feet) | Unnamed tributary to Benton Branch | 4- to 6-foot-wide x 1- to 2-foot-deep channel with cobble/ boulder/ bedrock substrate. |

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# Appendix G – Noise During Transmission Line Construction and Operation

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# Noise During Transmission Line Construction and Operation

At high levels, noise can cause hearing loss; at moderate levels, noise can interfere with communication, disrupt sleep, and cause stress; and at low levels, noise can cause annoyance. Noise is measured in decibels (dB), a logarithmic unit, so an increase of 3 dB is just noticeable, and an increase of 10 dB is perceived as a doubling of sound level. Because not all noise frequencies are perceptible to the human ear, A-weighted decibels (dBA), which filter out sound in frequencies above and below human hearing, are typically used in noise assessments.

Both the U.S. Environmental Protection Agency (USEPA) and the Department of Housing and Urban Development (HUD) have established noise guidelines. USEPA guidelines are based on an equivalent day/night average sound level (DNL), which is a 24-hour average sound level with 10 dB added to hours between 10 p.m. and 7 a.m., since people are more sensitive to nighttime noise. USEPA recommends a guideline of DNL less than 55 dBA to protect the health and well-being of the public with an adequate margin of safety. HUD guidelines use an upper limit DNL of 65 dBA for acceptable residential development and an upper limit DNL of 75 dBA for acceptable commercial development. TVA generally uses the USEPA guideline of 55 dBA DNL at the nearest residence and 65 dBA at the property line in industrial areas to assess the noise impact of a project. In addition, TVA gives consideration to the Federal Interagency Committee on Noise (FICON) 1992 recommendation that a 3-dB increase indicates possible impact, requiring further analysis when the existing DNL is 65 dBA or less.

Annoyance from noise is highly subjective. The FICON used population surveys to correlate annoyance and noise exposure (FICON 1992). Table 1 gives estimates of the percentage of typical residential populations that would be highly annoyed from a range of background noise and the average community reaction description that would be expected.

**Table 1. Estimated Annoyance From Background Noise (FICON 1992)**

| Day/Night Level (dBA) | Percent Highly Annoyed | Average Community Reaction |
|---|---|---|
| 75 and above | 37 | Very severe |
| 70 | 25 | Severe |
| 65 | 15 | Significant |
| 60 | 9 | Moderate |
| 55 and below | 4 | Slight |

For comparative purposes, typical background DNLs for rural areas range from about 40 dBA in undeveloped areas to 48 dBA in mixed residential/agricultural areas (Cowan 1993). Noise levels are typically higher in higher-density residential and urban areas. Background noise levels greater than 65 dBA can interfere with normal conversations, requiring people to speak in a raised voice in order to carry on a normal conversation.

## Construction Noise

Construction noise impacts would vary with the number and specific types of equipment on the job, the construction methods, the scheduling of the work, and the distance to sensitive noise receptors such as houses. Typical construction activities for a transmission line are described in Section 2.2. Maximum noise levels generated by the various pieces of construction equipment typically range from about 70 to 85 dBA at 50 feet (Bolt et al. 1971). An exception

would be the use of track drills for building roads and installing foundations in rocky areas; track drills have a typical maximum noise level of 98 dBA at 50 feet. Use of track drills is not expected to be widespread.

Project-related construction noise levels would likely exceed background noise levels by more than 10 dBA at distances from within 500 feet in developed areas to over 1,000 feet in rural areas with little development. These distances are without the use of track drills; drilling activities could increase the distances by an additional 500 feet. A 10-dBA increase would be perceived as a large increase over the existing noise level and could result in annoyance to adjacent residents. The residential noise level guideline of 55 dBA could also be temporarily exceeded for residences near construction activities.

Construction activities would be limited to daylight hours. Because of the sequence of construction activities, construction noise at a given point along the transmission line connections would be limited to a few periods of a few days each. The temporary nature of construction would reduce the duration of noise impacts on nearby residents.

### Operational Noise

Transmission lines can produce noise from corona discharge, which is the electrical breakdown of air into charged particles. Corona noise is composed of both broadband noise, characterized as a crackling noise, and pure tones, characterized as a humming noise. Corona noise is greater with increased voltage and is also affected by weather. It occurs during all types of weather when air ionizes near irregularities, such as nicks, scrapes, dirt, and insects on the conductors. During dry weather, the noise level is low and often indistinguishable off the ROW from background noise. In wet conditions, water drops collecting on the conductors can cause louder corona discharges.

For 500-kV transmission lines, this corona noise when present, is usually about 40-55 dBA. The maximum recorded corona noise has been 60-61 dBA (TVA unpublished data). During rain showers, the corona noise would likely not be readily distinguishable from background noise. During very moist, nonrainy conditions, such as heavy fog, the resulting small increase in the background noise levels is not expected to result in annoyance to adjacent residents.

Periodic maintenance activities, particularly vegetation management, would produce noise comparable to that of some phases of transmission line construction. This noise, particularly from bush-hogging or helicopter operation, would be loud enough to cause some annoyance. It would, however, be of very short duration and very infrequent occurrence.

### Literature Cited

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