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ENVIRONMENTAL ASSESSMENT

BURLISON 161-KILOVOLT TRANSMISSION LINE

Tipton County, Tennessee

PREPARED BY:
TENNESSEE VALLEY AUTHORITY

MAY 2011

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ACRONYMS, ABBREVIATIONS, AND GLOSSARY OF TERMS

acre	A unit measure of land area equal to 43,560 square feet
APE	Area of potential effect
AR	Access road
BMPs	Best management practices, i.e., accepted construction practices designed to reduce environmental effects
CFR	Code of Federal Regulations
conductors	Cables that carry electrical current
danger tree	A tree located outside the right-of-way (ROW) that could pose a threat of grounding a line if allowed to fall near a transmission line or a structure
distribution line	A series of electrical conductors used to transfer electric power locally between substations or from substations to power consumers. Distribution lines carry less electric power than the transmission lines and substations that feed them.
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
e.g.	Abbreviation for the Latin term, *exempli gratia*, meaning “for example”
EMF(s)	Electric and magnetic field(s)
EO(s)	Executive order(s)
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 disposal. This equipment prevents trees falling into a sensitive area, such as a wetland.
forb	A herbaceous plant other than a grass or a fern
GIS	Geographic information system
guy	A cable connecting a structure to an anchor that helps support the structure
i.e.	Abbreviation for the Latin term, *id est*, meaning “that is”
kV	Kilovolt, 1 kV equals 1,000 volts
load	That portion of the entire power in a network consumed within a given area; also synonymous with “demand” in a given area
n.d.	Indicates “no date” or date that Web site was accessed is unknown
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
outage	An interruption of the electric power supply to a user
riparian	Related to or located on the banks of a river or stream
ROW	Right-of-way
runoff	That portion of total rainfall that eventually enters a stream or river

SHPO	State Historic Preservation Officer
SMZ(s)	Streamside management zone(s)
SR	State Route
STEMC	Southwest Tennessee Electric Membership Corporation
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
switch	A device used to complete or break an electrical connection
tap line	An electric power line that connects an existing transmission line (at a tap point) to a substation
tap point	A connection point between a tap line and an existing transmission line
TDEC	Tennessee Department of Environment and Conservation
transmission line	A series of electrical conductors (“wires”) and their supporting structures used to transmit electric power. Transmission lines carry more electric power than distribution lines.
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method, a version of the Ohio Rapid Assessment Method designed specifically for the TVA region
TWRA	Tennessee Wildlife Resources Agency
US	United States Highway
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
wetland	A marsh, swamp, or other area of land where the soil near the surface is saturated or covered with water
WHO	World Health Organization

CHAPTER 1

1.0 PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action - Improve Power Supply

Southwest Tennessee Electric Membership Corporation (STEMC) plans to construct a new substation (i.e., the Burlison Substation) about 8 miles west of Covington in Tipton County, Tennessee. The Tennessee Valley Authority (TVA) proposes to supply electric power to this new substation by constructing and operating approximately 7.2 miles of new 161-kilovolt (kV) transmission line (i.e., a “tap line”) that would connect the planned substation to TVA’s existing Shelby-Covington #1 161-kV Transmission Line (see Figure 1-1). The new transmission line would utilize all new right-of-way (ROW), which would be 100 feet wide and would occupy a total of about 88 acres.

TVA’s proposal also includes the installation of two switch structures. One switch structure would be installed within the Shelby-Covington #1 161-kV Transmission Line (replacing an existing structure in the line), and the other would be installed within the new tap line ROW. TVA would provide revenue metering equipment to STEMC for installation at its new Burlison Substation. The TVA system’s mapboard display at TVA’s System Operations Center and Regional Operations Center in Chattanooga would be modified to include the names and status of the new facilities. The proposed transmission line would be completed by June 2012 or as soon as possible after that date.

1.2. Need for the Proposed Action

TVA plans its transmission system according to industrywide standards provided by the North American Electric Reliability Corporation (NERC) and the National Electrical Safety Code (NESC). The standards state that the system must be able to serve customer loads with adequate voltage and no equipment damage while maintaining adequate line clearances.

STEMC provides electrical service to the Burlison area by a series of long 13-kV distribution lines from the Covington 161-kV Substation, which is owned jointly by TVA, STEMC, and Covington Electric Service. TVA load projections indicate that the two transformers at the Covington Substation could be loaded about 37 percent above capacity by summer 2012. Additionally, load growth and existing industrial load in the Burlison area have caused overloading of the system at peak times, and load curtailment is needed when certain industrial loads are planned to be in use. This situation has worsened due to load growth from new local development.

Summer loading is more critical because the capacity for equipment is usually lower (i.e., more limiting) in the summer due to the high ambient temperature. This situation is worsened by peak power demands during the hottest summer days because of the additional demand for cooling. If one of the transformers at the Covington Substation were lost, the other transformer would not have the capability to supply the entire power demand (or “load”). Therefore, an overloaded situation would occur, potentially resulting in a power outage.

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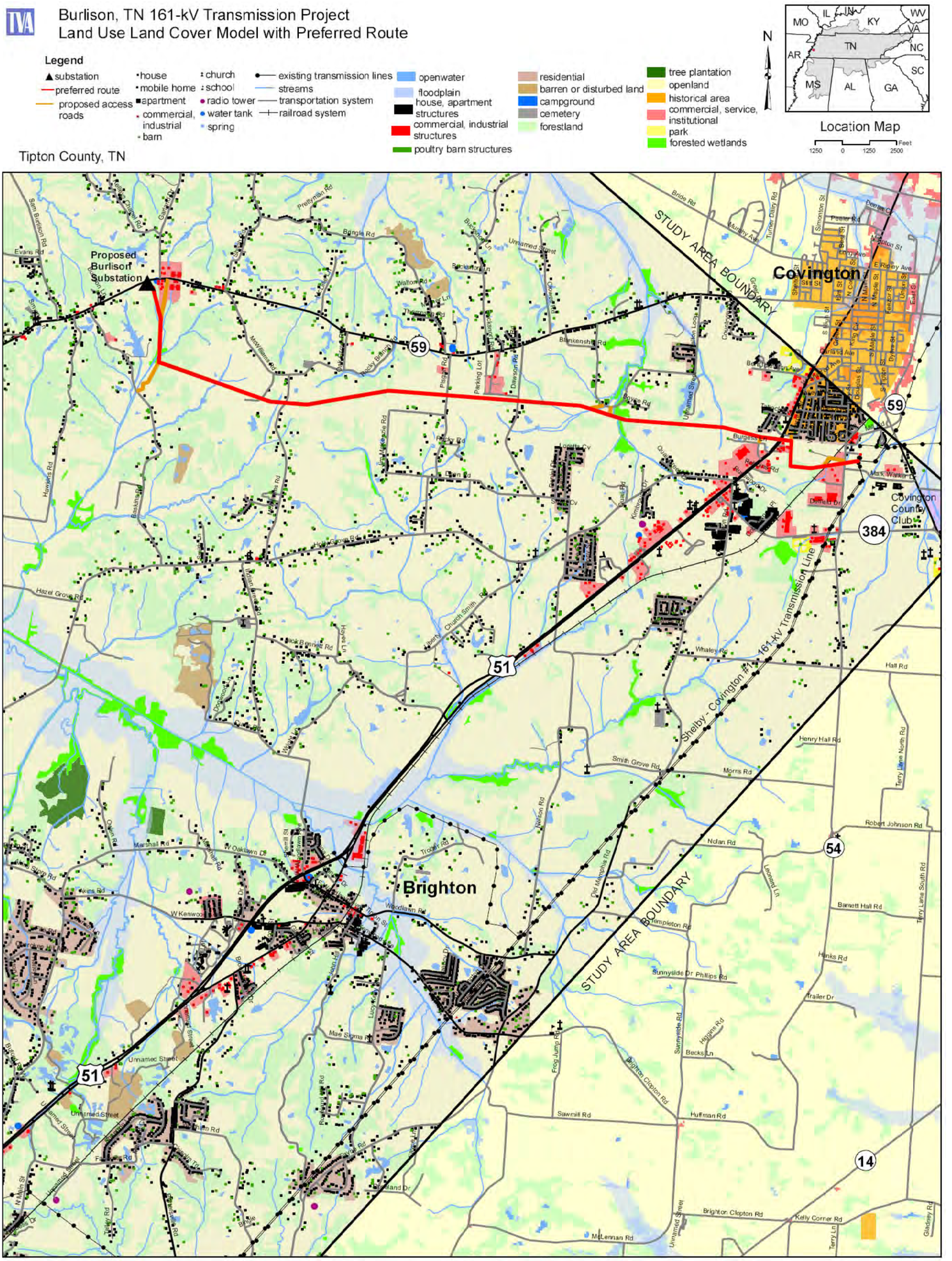

Figure 1-1. Location of the Proposed 161-kV Tap Line

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To ensure that the Burlison and Covington areas have a continuous, reliable source of electric power, TVA needs to provide additional electric service to the area. The construction of a new transmission line would meet this need by addressing the capacity problems at the Covington Substation and providing a power supply closer to the demand, thereby allowing TVA to meet NERC reliability criteria.

Additionally, the proposed project would allow TVA to ensure the area is provided with a strong, affordable source of power for continued economic health and residential and commercial growth in the area.

1.3. Decisions

The primary decision before TVA is whether to provide additional electric power to STEMC's service area by constructing a new 161-kV transmission line. If the proposed transmission line is to be built, other secondary decisions are involved. These include the following considerations:

- The timing of the proposed improvements
- The most suitable route for the proposed transmission line
- The most suitable location for the proposed tap point
- The determination of any mitigation and/or monitoring measures necessary to meet TVA standards and to minimize the potential for damage to environmental resources

A detailed description of the alternatives is provided in Section 2.1.

1.4. Other Pertinent Environmental Reviews or Documentation

TVA has developed the document, *Integrated Resource Plan: TVA's Environmental & Energy Future* (TVA 2011a), to determine how it will meet the electric power demands of its customers over the next 20 years while fulfilling TVA's mission of providing low-cost, reliable power, environmental stewardship, and economic development. TVA released the accompanying *Environmental Impact Statement for TVA's Integrated Resource Plan: TVA's Environmental & Energy Future* in March 2011 (TVA 2011b).

1.5. The Scoping Process and Public Involvement

TVA contacted the following state officials, as well as federally recognized Native American tribes, concerning the proposed project. TVA also conducted an internal review by a network of designated environmental specialists.

- Absentee Shawnee Tribe of Oklahoma
- Alabama-Quassarte Tribal Town
- The Cherokee Nation
- The Chickasaw Nation
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- Jena Band of Choctaw Indians
- Kialegee Tribal Town
- The Muscogee (Creek) Nation
- Seminole Tribe of Florida
- Seminole Tribe of Oklahoma
- The Shawnee Tribe

- Tennessee Department of Archives and History
- Tennessee Natural Heritage Program
- Thlopthlocco Tribal Town
- United Keetoowah Band of Cherokee Indians in Oklahoma

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

TVA developed a public communication plan that included a Web site with information about the project, a map of the alternative routes, and feedback mechanisms. Public officials were briefed on the project. The 179 property owners who could potentially be affected by any of the route alternatives, along with seven public officials, were 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 21, 2010, at the Covington Chamber Center in Covington, Tennessee, and 80 people attended.

At the open house, TVA presented a network of seven alternative transmission line routes comprised of eight different line segments and four tap points (see Figure 1-2) to the public for comment. These segments are described in Section 2.3.4. The primary concern expressed by the public was the impact of the new line to residential development and farmland in the area. Owners also voiced concerns relative to health issues, property value, and impacts of the proposed line on visual quality, along with natural, historical, and archaeological resources.

A 30-day public review and comment period was held following the open house, where TVA accepted public comments on the alternative transmission line routes, tap point locations, and other issues. A toll-free phone number and facsimile number were made available to facilitate comments. During the comment period, numerous landowners contacted TVA to express their concerns, most of which were similar to those voiced at the open house.

At the conclusion of the comment period, TVA made slight adjustments to the segments in response to the comments received.

STEMC has purchased a large parcel for its new Burlison Substation. In the early stages of the project, the substation location was shown near the southern end of the property (see Figure 1-2). However, following the open house meeting, the distributor notified TVA that soil testing on the site dictated that the substation would be located on the northern end of the property (see Figure 1-1). This change resulted in approximately 0.25 mile of additional transmission line required to connect to the new substation. This extra line length is located entirely on STEMC's property.

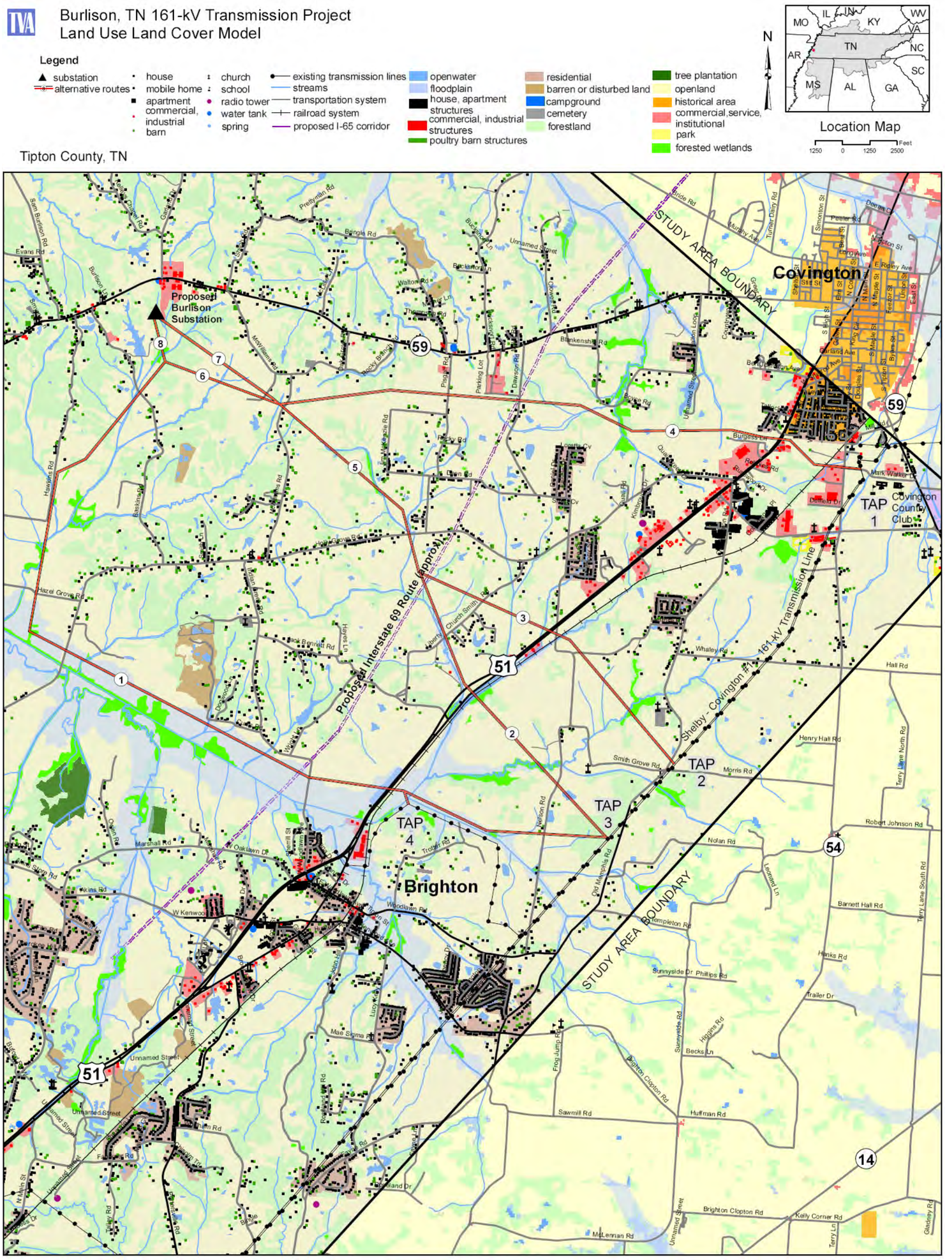

Figure 1-2. Locations of Route and Tap Point Options for the Proposed 161-kV Tap Line

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1.6. Issues to be Addressed

TVA identified resources that could be potentially affected by the construction and operation of the proposed transmission line through an early internal scoping process. This list of resource issues was refined based on comments received during the public review process. Potential impacts to the following environmental resources were addressed in this environmental assessment.

- Land use
- Vegetation
- Wildlife
- Aquatic life
- Endangered and threatened species and their critical habitats
- Water quality for both surface water and groundwater
- Wetlands
- Floodplains
- Archaeological and historic resources
- Aesthetic resources
- Recreation, parks, and natural areas
- Socioeconomics and environmental justice

Potential effects related to air quality, hazardous and nonhazardous wastes, noise, and health and safety were considered. However, because of the nature of the action, any potential effects to these resources would be minor and insignificant. Thus, potential effects to these resources were not analyzed in detail.

1.7. Necessary Federal Permits or Licenses

A permit would be required from the State of Tennessee for the discharge of construction site storm water associated with the construction of the transmission line. TVA would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit may also be required for burning trees and other combustible materials removed during transmission line construction. A permit would be required from the Tennessee Department of Transportation for crossing state highways during transmission line construction.

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CHAPTER 2

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

As described in Chapter 1, TVA proposes to connect STEMC's planned Burlison 161-kV Substation to TVA's existing Shelby-Covington #1 161-kV Transmission Line. The connection would be accomplished by constructing and operating approximately 7.2 miles of new 161-kV transmission line. Additionally, TVA would install two switches in the line and provide metering equipment for the distributor to install in the new substation.

This chapter contains the following five major sections:

- Description of Alternatives
- Description of Construction, Operation, and Maintenance of the Proposed Transmission Line
- Explanation of the Siting Process
- Comparison of the Alternative Routes
- Identification of the Preferred Alternative

This chapter also provides additional background information about the transmission line construction, operation, and maintenance.

2.1. Alternatives

Two alternatives (i.e., the No Action Alternative and the Action Alternative) were addressed in this environmental assessment. Under the No Action Alternative, TVA would not undertake the proposed action. The Action Alternative involves the construction of the proposed transmission line.

2.1.1. Alternative 1 – Do Not Construct a Transmission Line (the No Action Alternative)

Under the No Action Alternative, TVA would not construct the proposed transmission line to serve STEMC's planned Burlison Substation. However, STEMC could decide to build a new transmission line to serve its new substation. The distributor could possibly use the route identified by TVA or select another route. If STEMC were to independently provide transmission service and construct a new transmission line, the potential environmental effects resulting from the implementation of the No Action Alternative would likely be comparable to those resulting from the adoption of the Action Alternative, depending on the route chosen and the construction methods used by STEMC.

If STEMC chose not to construct a new substation and transmission line, the transmission system in the Burlison and Covington areas would continue to operate with a high risk of interruption in certain situations, especially during periods of high electricity use. Because ongoing and future development will result in increased demands for electric power, the risk of interruptions is projected to increase over time.

Without a new 161-kV substation and a new 161-kV transmission line to supply power to it, these increasing power loads could cause overloaded transformers and other electrical equipment to be damaged or to fail completely. This could happen as early as summer 2012. The amount of damage depends on how heavily the equipment is overloaded. If a

transformer and/or transmission line fails, the result is a power outage. Overloading of a transmission line can cause alternating heating and cooling of the conductor material, which weakens the transmission line over time. Overloading can also cause a transmission line to sag in excess of design criteria, resulting in inadequate clearance between the transmission line and the ground.

2.1.2. Alternative 2 – Construct and Operate a New 161-kV Transmission Line (the Action Alternative)

Under the Action Alternative, TVA would serve STEMC's planned Burlison 161-kV Substation by building a 7.2-mile-long, 161-kV transmission line connecting the planned substation to TVA's existing Shelby-Covington #1 161-kV Transmission Line (see Figure 1-1). TVA would install two switch structures near the Shelby-Covington #1 161-kV Transmission Line tap point. One switch would be located within the existing ROW of the Shelby-Covington #1 Transmission Line, south of the tap point on the east side of State Route (SR) 54. To facilitate the installation of this new switch structure, existing structure 172 in the TVA Shelby-Covington #1 Transmission Line would be retired. The retired wooden pole structure would be given to local property owners for restrictive reuse or disposed of according to the Treated Wood Management section of TVA's Environmental Protection Procedures. Because some epoxy arms may contain a lead pin, the epoxy arms would be checked for lead. Any lead present would be removed and placed in a separate bin for recycling; the epoxy arms would be sent to a disposal facility. The insulators would be sent to a disposal facility, and any retired conductor would be recycled. A second switch would be located in the new transmission line ROW on the west side of United States Highway (US) 51.

The new transmission line would be located on new 100-foot-wide ROW. Seven short access roads (shown in orange in Figure 1-1) would be required for construction and maintenance of the proposed transmission line.

TVA would provide metering equipment to the distributor for installation at the new Burlison Substation. The TVA system's mapboard display at TVA's System Operations Center and Regional Operations Center in Chattanooga would be modified to include indicators of the operational status of the new facilities.

Additional information detailing the implementation of the Action Alternative, as well as how the most suitable transmission line route and tap point were determined, is provided in the following sections:

- Section 2.2 - Construction, Operation, and Management of the Proposed Transmission Line
- Section 2.3 - The Siting Process
- Section 2.4 - Comparison of Alternative Routes

Implementation of this alternative would provide service to STEMC's planned substation, would help meet the growing electric power needs in the Burlison and Covington areas, would improve the reliability of the Burlison and Covington power supplies by providing a delivery point, and would prevent overloading and possible damage of existing equipment.

2.1.3. Other Alternatives Considered But Eliminated

During the development of this proposal, other alternatives were considered. These involved upgrading existing facilities as well as the construction of new transmission lines in nearby areas. Implementing these other alternatives would incur prohibitive costs and result in their own associated environmental impacts. Further, these other alternatives would not meet project needs. The alternatives considered but not selected are described briefly below.

2.1.3.1. Distributors to Increase Capacity at Covington 161-kV Substation

Under this alternative, both STEMC and Covington Electric Service would increase the capacity in the Covington 161-kV Substation by installing a new 161-kV transformer bank. Although implementing this alternative would theoretically provide the additional capacity to relieve the overloading problems at the Covington Substation (see Section 1.2), it would require a rebuild of the substation due to space limitations. Additionally, several miles of new transmission line would have to be constructed. Further, because the additional capacity would increase fault levels (i.e., the amount of current that will flow in an electrical circuit under the worst conditions) at the substation, the existing substation would remain at risk of overloading. This alternative does not provide a power supply close to the demand (load center), nor does it address future load growth in the area. For these reasons, this alternative was eliminated from further consideration.

2.1.3.2. Underground Utility Lines

A frequent objection to the construction of new transmission lines is the perception of potential adverse visual effects. Thus, a frequently suggested alternative is the installation of buried transmission lines.

Power lines can be buried. However, most buried lines tend to be low-voltage distribution lines (i.e., lines that are 13-kV or less) rather than high-voltage transmission lines, which tend to be 69-kV and above. Although low-voltage distributor lines can be laid into trenches and buried without the need for special conduits, some lines require armor casings for safety reasons. Burying higher-voltage lines in the 69-kV, 161-kV, and 500-kV range requires extensive excavation, and these lines must be encased in special conduits or tunnels. Additionally, measures to ensure proper cooling and to provide adequate access are required. Usually, a road along or within the ROW for buried lines must be maintained for routine inspection and maintenance.

Although buried lines are much less susceptible to catastrophic storm damage, especially wind damage, they tend to be very expensive to install and maintain. Conduit systems require ventilation systems to provide adequate cooling for the conductors. Similarly, they must be protected from flooding, which could cause an outage. Repairs of buried lines may require excavation, and the precise location of problems can be difficult to determine.

Burying the proposed 161-kV line is not a feasible option for these and other reasons. Expense would be prohibitive. The potential adverse environmental effects of constructing and operating a buried high-voltage line would likely be greater than those associated with a traditional aboveground line. For these reasons, this alternative was eliminated from further consideration.

2.2. Construction, Operation, and Maintenance of the Proposed Transmission Line

2.2.1. Transmission Line Construction

2.2.1.1. Right-of-Way Acquisition and Clearing

The transmission line would be constructed within a new 100-foot-wide ROW. TVA would purchase easements from landowners for the new ROW. These easements would give TVA the right to construct, operate, and maintain the transmission line, 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 5 feet of a conductor or strike a structure should it fall toward the transmission line. 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 transmission line or create a hazardous situation.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, most trees and shrubs would initially be removed from the entire width of the new ROW. Equipment used during this ROW clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. 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 (SMZs) and wetlands would be restricted to trees tall enough, or with the potential soon to 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 *Right-of-Way Clearing Specifications, Environmental Quality Protection Specifications for Transmission Line Construction, Transmission Construction Guidelines Near Streams* (Appendices B, C, and D), and Muncy (1999) would be followed in clearing and construction activities.

Following clearing and construction, vegetative cover on the ROW would be restored as much as possible to its state prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grasses and other low-growing noninvasive species. 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 Muncy (1999).

2.2.1.2. Access Roads

Both permanent and temporary 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 transmission lines 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 20 feet wide and are surfaced with dirt 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 wet-weather conveyances (i.e., streams that run only following a rainfall), they would be left or removed, depending on the wishes of the landowner or on 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 (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 one 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 5 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 transmission line. 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 may be required. 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 fencing installed by TVA and site restoration would be at the discretion of the landowner.

2.2.1.4. Structures and Conductors

The proposed 161-kV transmission line would utilize single steel-pole structures as shown in Figure 2-1. Structure heights would vary according to the terrain and would range between 75 and 125 feet.

Three conductors (the cables that carry the electrical current) are required to make up a circuit in alternating-current transmission lines. For 161-kV transmission lines, each single-cable conductor is attached to fiberglass or ceramic insulators suspended from the structure cross arms. A smaller overhead ground wire or wires are attached to the top of the structures. This ground wire may contain fiber optic communication cables.

Poles at angles (i.e., angle points) in the transmission line may require supporting guys. Some structures for larger angles could require two or three poles. Most poles would be imbedded directly in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. Normally, the holes would be backfilled with the excavated material, but in some cases, gravel or a cement-and-gravel mixture would be used. Screw, rock or log-anchored guys would be installed for angle structures.

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

Figure 2-1. Example of a Single Steel-Pole 161-kV Transmission Structure

2.2.1.5. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the ROW, and temporary clearance poles would be installed at road crossings to reduce interference with traffic. A small 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 transmission lines are performed from the ground and by helicopter aerial surveillance, occurring on approximately five-year cycles after operation begins. The inspections are conducted in order 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 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 is necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. For a 161-kV transmission line, NESC standards require a minimum vegetation clearance of 24 feet. 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.

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-reclearing plan would be developed for each transmission line segment 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 applied selectively by helicopter or from the ground with backpack sprayers or vehicle-mounted sprayers.

Any herbicides used are applied in accordance with applicable state and federal laws and regulations. Only herbicides registered with the United States 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, little other maintenance work is generally required. The transmission line 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 immediately adjacent hole. Access to the structures would be on existing roads where possible. 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. The Siting Process

The process of siting the proposed transmission line followed the basic steps used by TVA to determine a transmission line route. These include the following:

- Determine potential existing power sources to supply the transmission line
- Define the study area
- Collect data to minimize potential impacts to cultural and natural features
- Develop potential tap points
- Develop general route options and potential routes
- Gather public input
- Incorporate public input into the final identification of the transmission line route

2.3.1. Definition of the Study Area

The first task in defining the study area was to identify the power sources that could supply the planned substation. TVA's existing Shelby-Covington #1 161-kV Transmission Line

was the most practical source because it is the closest 161-kV transmission line, and it would serve as the most reliable power source to the new substation.

The study area boundaries were chosen to allow for the establishment of two or more corridors between the selected power source and the planned Burlison Substation. These corridors would eventually yield a preferred transmission line route on which to construct the transmission line. The study area is shown in Figure 1-2. The study area extends from east of the Covington 161-kV Substation, northward to SR 59, southward to the Shelby-Covington #1 Transmission Line (including the tap line to Brighton), and westward to Hawkins Road, west of the distributor's proposed substation site. The boundary to the north is defined by development along SR 59, while the boundary to the east is constrained by development along SR 54. Expanding the study area would result in longer route alternatives, which would cause greater land use and environmental impacts as well as higher costs associated with designing and building the transmission line. Following is a brief description of the study area.

2.3.1.1. Natural and Cultural Features

The study area is within the Mississippi Valley Loess Plains Ecoregion and has a rolling, gently sloping terrain. The study area drains to Indian Creek, Mathis Creek, and Town Creek of the Hatchie River of the Mississippi River. Some of the study area lies within the floodplain of Indian Creek. There are various churches and cemeteries within the study area.

2.3.1.2. Land Use

The most concentrated residential development is located along SR 59 in the northern portion of the study area. Most industrial development in the study area is in the Burlison community and along US 51. Commercial development is more prevalent in the towns of Covington and Brighton, located just outside the study area. The majority of the land within the study area is used for agriculture and consists of a combination of agricultural fields, pasturelands, old fields, and forests. TVA's Shelby-Covington #1 161-kV Transmission Line runs north and south on the east side of US 51 between Covington and Brighton.

2.3.1.3. Transportation

There are a number of major transportation features in the study area. SR 59 runs east-to-west through the northern portion of study area. US 51 runs northeast-to-southwest through the study area. SR 54 runs north-to-south through the eastern portion of the study area. Other roads include Mark Walker Drive near the Covington Substation and tap point, Garland Drive near the proposed new substation, Dawson Road, Pisgah Road, McWilliams Road, and Holly Grove Road. A proposed Interstate Highway 69 corridor was identified in the study area as well (see Figure 1-2). The Illinois Central Gulf Railroad runs roughly parallel to US 51 through the study area. There are no airports in the study area.

2.3.2. Data Collection

TVA first collected geographic data such as topography, land use, transportation, environmental features, cultural resources, near-term future development, and land conservation information for the study area. Information sources used in the transmission line study included design drawings for area transmission lines, data collected into a geographic information system (GIS), including United States Geological Survey digital line graphs, and Tipton County tax maps. Various proprietary data maintained by TVA in a

corporate geo-referenced database, including Heritage file data on sensitive plants and animals as well as on archaeological and historical resources, were also used.

Additionally, TVA took new aerial color photography of the study area in May 2009. These images were geo-referenced to produce an accurate image of the Earth by removing the distortions caused by camera tilt and topographic relief displacements and then digitized for use in the GIS. This aerial photography was then interpreted to obtain land use and land cover data, such as forests, agriculture, 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 factors of the study area to be examined simultaneously to develop and evaluate numerous options and scenarios to determine the route or routes that would best meet project needs, including avoiding or reducing potential environmental impacts.

Manual calculations from aerial photographs, tax maps, and other sources included the number of road crossings, stream crossings, and property parcels. Finally, the aerial photography, GIS-based map, and other maps and drawings were supplemented by reconnaissance throughout the study area by TVA staff including a siting engineer and environmental engineer.

2.3.3. Establishment and Application of Siting Criteria

TVA uses a set of evaluation criteria that represent opportunities and constraints for development of transmission line 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 considerations and ROW acquisition costs being the most important elements. Application of these constraints is flexible, and TVA can, and does, deviate from them. Identifying feasible transmission line routes involves weighing and balancing of these criteria with adjustments to them as specific conditions dictate.

Each of the transmission line route options was evaluated according to criteria related to engineering, environmental, land use, and cultural 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 transmission line. For example, a greater number of streams crossed, a longer transmission line route length, or a greater number of historic resources affected would give a transmission line route option a higher score, and thus, a worse score.

- **Engineering Criteria** include considerations such as total length of the transmission route, width of new ROW, number of primary and secondary road crossings, the presence of pipeline and transmission line crossings, and total line cost.

- **Environmental Criteria** include the presence of slopes greater than 30 percent (steeper slopes have more potential for erosion and potentially greater water quality impacts), consideration of visual aesthetics, the number of forested acres within the proposed ROW, the number of open water crossings, presence of sensitive stream (i.e., those supporting endangered or threatened species) crossings, the number of perennial and intermittent stream crossings, presence of wetlands or rare species

habitat, the number of natural area crossings, and proximity to wildlife management areas.

- **Land Use Criteria** include the number of fragmented property parcels and proximity to schools, houses, commercial or industrial buildings, and barns.

- **Cultural Criteria** include the presence of archaeological and historic sites, churches, and cemeteries. (Broadly speaking, these are also environmental criteria).

A tally of the number of occurrences for each of the individual criteria was calculated for each potential alternative route. Next, a normalized ranking of alternative routes was calculated for each individual feature based on each route's value as it related to the other alternative routes. Weights reflecting the severity of potential effects (i.e., the relative degree of constraint) were then developed for each individual criterion. These criterion-specific weights were then 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 by each alternative route for engineering, environmental, land use, cultural and overall total. For each these categories, a ranking of each alternative route was calculated based on the relationship of various routes' scores to one another.

These rankings made it possible to recognize which routes would have the lowest and the highest impacts on engineering, environmental, land use, and cultural 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.

2.3.4. Development of General Route Options and Potential Transmission Line Routes

The straight-line distance from the TVA source transmission line to the planned STEMC substation site is about 6.5 miles. That distance, along with the residential and commercial development along SR 59 and SR 54, limited the number of practicable alternative corridors that could be identified and studied for the project. Using information gathered during the system's studies and data development phases, several potential tap point locations were identified that could be utilized on TVA's existing Shelby-Covington #1 161-kV Transmission Line. Electric system reliability concerns required a disconnect switch on one or both sides of the future tap structure in the existing source line (depending on the proximity of the tap to the Covington 161-kV Substation) and a disconnect switch in the tap line itself near the tap point. These switch locations must meet line engineering requirements and be accessible by road in all weather conditions, including high water. Four potential tap point locations were identified that would meet these requirements.

Eight route segments, as shown in Figure 1-2, were developed using the identified tap point locations, STEMC's new substation location, and the GIS-based land use/land cover model and other data layers, such as property boundaries, digital elevation model results (which were used to identify steepness and terrain characteristics), and transportation. The GIS was used to locate segments that would best meet project needs by avoiding or reducing conflict with constraints (including sensitive environmental resources) and by using identified opportunities.

As mentioned in Section 1.5, STEMC decided to move the substation site to the northern end of its property, resulting in approximately 0.25 mile of additional transmission line required to connect to the new substation. This extra length did not affect the analysis because the extra length lies entirely on the distributor's property and is common to all route alternatives.

All of the alternative tap point locations are currently undeveloped. Tap Point 1 is located about halfway between structures 175 and 176 on the Shelby-Covington #1 161-kV Transmission Line on the north side of Mark Walker Drive. Tap Point 2 is located near the intersection of Old Memphis Road and Morris Road, between structures 136 and 137 on the Shelby-Covington line. This proposed tap point is approximately 365 feet northeast of structure 136 and 135 feet southwest of structure 137. Tap Point 3 is located adjacent to structure 127 on the Shelby-Covington line, west of Old Memphis Road. Tap Point 4 is located adjacent to Structure 517 on TVA's existing Brighton tap line from the Shelby-Covington line.

Segment 1 (see Figure 1-2) originates at either Tap Point 3 or Tap Point 4. From Tap Point 3, this segment proceeds west for a little over a mile, crossing Nelson Road and a small stream before turning slightly to the northwest. This segment then travels parallel to Indian Creek and the Brighton tap line before crossing a small stream at a point just outside Tap Point 4. Segment 1 then turns west, crossing the railroad and US 51, continuing approximately to a point on the west side of Indian Creek Road. This segment then turns northwest, crossing three streams, through the floodplain of Indian Creek. Segment 1 then turns due north, following property lines, crossing Hazel Grove Road and a small stream, and then proceeding along the east side of Hawkins Road. This segment then turns to the northeast for about 1,400 feet before turning slightly north for about 1.1 miles to the intersection of Segments 6 and 8. Segment 1 is approximately 8.3 miles long.

Segment 2 begins at Tap Point 3 and heads northwest, across open fields and Nelson Road, before reaching a point west of US 51 and about 200 feet from the edge of a stream. The segment then turns slightly north and parallels the eastern side of the stream most of the way before reaching the intersection of Segments 3 and 5. Segment 2 is approximately 2.9 miles long.

Segment 3 begins at Tap Point 2 and heads northwest across Old Memphis Road, Nelson Road, and a stream to a point on the east side of the railroad. The segment then turns west, crossing the railroad, US 51, Liberty Church Smith Road, and several small streams before terminating into Segments 2 and 5. Segment 3 is approximately 2.9 miles long.

Segment 4 begins at Tap Point 1 and heads west crossing SR 54 and the railroad, then crosses a large agricultural area of alfalfa. The segment turns north and then back to the west, crossing beside Brighton Bank and crossing US 51. Just to the north of Burgess Lane, Segment 4 continues west. The segment crosses the survey of a proposed Interstate Highway 69 (see Figure 1-2) near Dawson Road. The route continues west crossing Pisgah Road, then crossing McWilliams Road before terminating into Segments 6 and 7. Segment 4 is approximately 5.3 miles long.

Segment 5 begins at the terminations of Segments 2 and 3. The segment heads north, crossing a small stream and Holly Grove Road before turning northwest. Segment 5 continues to a point on the west side of McWilliams Road, where it terminates into Segments 6 and 7. Segment 5 is approximately 2.0 miles long.

Segment 6 begins at the terminations of Segments 4 and 5. This segment heads west, crossing Wooten Johnson Road and an open field before crossing a small stream. Segment 6 continues west through some forested areas before terminating into Segments 1 and 8. Segment 6 is approximately 1.1 miles long.

Segment 7 begins at the terminations of Segments 4 and 5 and heads northwest, crossing Wooten Johnson Road and an open field before crossing a small stream. Segment 7 continues in a northwest direction crossing more open field and some forested areas before terminating at the original substation site. Segment 7 is approximately 1.4 miles long.

Segment 8 begins at the end of Segments 1 and 6 and heads west across some forested areas before reaching the original substation site. This segment is approximately 0.7 mile long.

Seven alternate transmission line routes consisting of combinations of these eight constituent segments (see Figure 1-2 and Table 2-1) were then developed. These routes were evaluated as described below.

Table 2-1. Alternative Route Corridors

Alternative Route	Constituent Segments	Tap Point(s)
1	1, 8	3, 4
2	2, 5, 6, 8	3
3	2, 5, 7	3
4	3, 5, 6, 8	2
5	3, 5, 7	2
6	4, 6, 8	1
7	4, 7	1

2.3.5. Route Evaluation and Identification

Each of the seven alternative routes offered different opportunities and constraints. Opportunities include characteristics such as open land, areas less suitable for development, and lack of sensitive environmental areas and land use conflicts. The assessment of the opportunities and constraints for these alternative routes are summarized below by engineering, environmental, land use, and cultural criteria.

Engineering

Evaluation of the alternative routes for the number of interstate highway and transmission line crossings resulted in no major constraints along any of the alternative routes. The floodplains of Indian Creek and bottomland in the southern portion of the study area presented a challenge for route selection because of its potential effect to construction and maintenance. Alternative Routes 1, 2, 3, and 5 cross more floodplain areas than the other routes and thus scored poorly in Constructability. All of the routes cross the railroad and US 51. The length of the alternative routes ranged from 6.52 to 8.99 miles, with Alternative Route 1 being the longest.

Environmental

Based on the initial environmental review, no sensitive streams or threatened or endangered species were identified along any of the alternative routes. The major

environmental constraints identified for Alternative Route 1 were floodplains and wetlands. Route 1 is also approximately 2 miles longer than the other alternative routes and affects the most forested acreage. Routes 6 and 7 affect the fewest forested acreage, no floodplains, and very few wetlands. All of the routes cross several small streams.

Land Use
Alternative Route 1 affects more parcels than the other alternatives, with Routes 3, 6, and 7 affecting the fewest number of parcels. Routes 3, 5, and 7, which utilize Segment 7, scored poorly because this segment crosses a newly constructed home. Routes 6 and 7 were within 300 feet of several commercial properties along Segment 4, but this received no opposition.

Cultural
All of the routes except Alternative Route 1 could result in minor visual impacts due to their proximity to SR 59. The land use/land cover analysis revealed no known archaeological sites, caves, cemeteries, or historic sites in the study area. As a result, all of the routes scored well in this category, with Route 1 scoring the best.

Upon completion of the analysis described in Section 2.3.3, there was a logical spread in the overall scores of the alternative routes. Route 1 was the worst-scoring alternative, primarily due to high scores for engineering, environmental, and land use criteria. Similarly, engineering and land use scores were the primary reasons that Routes 3 and 5 scored poorly overall relative to other routes. The top four routes (6, 7, 4, and 2) received similarly favorable scores.

The numerical scores ranking the alternative routes ranged from 18.40 for Alternative Route 6 (route ranked best) to 30.16 for Alternative Route 1 (i.e., the route ranked worst).

Table 2-2. Alternative Route Option Ranks

Route Rankings	Total Score Based on Criteria Analysis	Alternative Route	Constituent Segments
1	18.40	6	4, 6, 8
2	19.28	7	4, 7
3	19.37	4	3, 5, 6, 8
4	20.46	2	2, 5, 6, 8
5	23.91	5	3, 5, 7
6	23.99	3	2, 5, 7
7	30.16	1	1, 8

2.4. Comparison of Alternative Routes

From four alternative tap points and based on eight possible alternative transmission line segments as shown in Figure 1-2, TVA established and considered seven alternative routes that ranged between 6.52 and 8.99 miles in length. This section provides analysis of the route segments and their relation to alternative routes.

2.4.1. Alternative Transmission Line Routes

To connect STEMC's new Burlison 161-kV Substation to TVA's existing Shelby-Covington #1 161-kV Transmission Line, all of the proposed routes are primarily oriented in a east-west alignment.

Route 1, which is approximately 8.99 miles long, is the southernmost route. This is the longest route by almost 2 miles and affects the most parcels of property. Additionally, Route 1 crosses a large bottomland area in the floodplain of Indian Creek, which would create considerable problems in locating a new transmission line due to environmental, constructability, and maintenance concerns. These factors resulted in this alternative route ranking last in the analysis of possible routes. This alternative, which scored 30.16 in the analysis, terminates at either Tap Point 3 or 4.

Route 2, which is about 6.68 miles long, is one of two routes (along with Route 3) that use Segments 2 and 5. This alternative ranked fourth best in the analyses of alternatives with a score of 20.46. Route 3, which is approximately 6.54 miles long, scored sixth in the analysis with a score of 23.99.

Route 4, which is roughly 6.66 miles long, ranked third best in the analysis of possible routes with a score of 19.37. This route differs from Route 2 only in that it utilizes Segment 3 rather than Segment 2.

Route 5, which is about 6.52 miles long, uses Segments 3 and 5 as Route 4 does, but then crosses the new house along Segment 7. This alternative ranked fifth best in the analysis of possible routes with a score of 23.91.

Route 6, which heads west from Tap Point 1 along Segment 4 and travels through the northern portion of the study area, is about 7.2 miles long. This route avoids floodplain areas and had the best overall environmental score in the analysis. In addition, Route 6 was the most desirable route from a constructability standpoint due to the many local road crossings that would provide better access for materials delivery and construction equipment. Because of these factors, Route 6 ranked first in the analysis of possible routes with a score of 18.40. Route 7, which is about 6.93 miles long, differs from Route 6 only in utilizing Segment 7, which crosses a new house. Route 7 ranked second in the analysis with a score of 19.28.

The scores for the top four routes (6, 7, 4, and 2) were relatively close. Routes 6 and 7 use the northernmost corridor along Segment 4 and differ only in their final paths to the distributor's substation. Similarly, the distinction between Routes 2 and 4, which follow the middle corridor along Segment 5, is that they connect to the source line at different tap points. Alternative Route 6 crosses no extensive floodplain or wetland areas, would be the easiest to design and construct because of the terrain, and avoids the new house along Segment 7. Furthermore, this route connects to Tap Point 1 on the Shelby-Covington Line, which only requires one switch in the source line due to its proximity to the Covington Substation. For these reasons, Alternative Route 6 was selected as the preferred route option.

2.4.2. Identification of the Preferred Transmission Line Route

The preferred transmission line route for the Action Alternative is Alternative Route Option 6, consisting of Alternative Segments 4, 6, and 8, which utilizes Alternative Tap Point 1 (see Figure 1-1).

After the preferred transmission line 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; where practical, changes were made to the preferred route selections prior to and during engineering and environmental

field surveys. The route segments were adjusted based on public and property owner input as well as environmental data to lessen overall impacts. Examples include following parcel boundaries to lessen the impact on future uses of the property and to reduce the proximity to sensitive areas and species as well as cultural/historical features.

Several minor adjustments were made to the transmission line route following field surveys:

- The tap point was moved to the span just outside the Covington Substation to reduce impact to agricultural operations at the original location.
- The route exiting the tap point heading west was moved south to a property boundary to reduce impact to future development of the property.
- At a point just past Burgess Road, the route was moved to the northern boundary of a property to reduce impact for future development of that property.
- The route was adjusted along Segment 8 to maintain a tree buffer for an existing house.

After property owners reviewed the changes, the sections were resurveyed to identify the final preferred route.

2.5. The Preferred Alternative

The Action Alternative, i.e., Construct and Operate a 161-kV Transmission Line, is TVA's Preferred Alternative for this proposed project. TVA would build a 161-kV transmission line from STEMC's new Burlison Substation to a tap point in TVA's existing Shelby-Covington #1 161-kV Transmission Line near the existing Covington 161-kV Substation. The preferred route for the Action Alternative is Alternative Route Option 6, which would consist of Alternative Route Segments 4, 6, and 8 and would terminate into Tap Point 1 as shown in Figure 1-2. The transmission line route would be approximately 7.2 miles in length.

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CHAPTER 3

3.0 AFFECTED ENVIRONMENT

The existing condition of the environmental resources and those environmental resources that could be affected by the proposed actions are described in this chapter. The descriptions below of the potentially affected environment are based on field surveys conducted in 2010, on published and unpublished reports, and on personal communications with resource experts. This information established the baseline conditions against which TVA decision makers and the public can compare the potential effects of implementing the alternatives under consideration.

The scope of the environmental review included portions of Tipton County, Tennessee. The proposed 7.2-miles of transmission line would require a cleared 100-foot-wide ROW and would occupy an area of approximately 88 acres. Thus, “project area” as used below refers primarily to that area within the route of the proposed ROW and access roads unless otherwise stated. The analysis of potential effects to endangered and threatened species and their habitats included records of occurrence within a 3-mile radius for terrestrial animals, a 5-mile radius for plants, and a 10-mile radius for aquatic animals. The analysis area for aquatic resources included the watershed of the project area.

Potential effects related to air quality; hazardous and nonhazardous wastes; noise; and health and safety were considered. Potential effects to these resources were found to be minimal or absent because of the nature of the action. The current conditions of other resources that could be affected by the proposed project construction, operation, and maintenance of the proposed transmission line are described in this chapter.

3.1. Land Use

Concerns regarding potential effects to land use, particularly restrictions on uses within the proposed ROW are frequently raised by the public. TVA typically purchases an easement with landowners for the ROW. This easement agreement provides TVA the right to construct and maintain the transmission line on private land while the property owner retains fee simple ownership. The easement agreement prohibits the construction of permanent structures, especially habitable structures, within the ROW. As a result of an extensive routing process (see Section 2.3), most of the proposed transmission line route would cross agricultural areas, and the route would not intersect any major commercial, industrial, or residential areas.

3.2. Vegetation

The proposed project occurs in the Bluff Hills and Loess Plains Level IV ecoregions (Griffith et al. 1998). About 60 percent of the project area occurs in the Loess Plains, which is situated between the transmission line crossing of Pisgah Road and the eastern end of the proposed ROW. The Loess Plains are gently rolling, irregular plains with loess deposits up to 50 feet thick. Row crops and weedy vegetation indicative of agricultural landscapes predominate. The remaining 40 percent of the project area occurs in the Bluff Hills ecoregion between Pisgah Road and the western terminus of the proposed transmission line. Soils in the Bluff Hills are capped by loess (i.e., wind-blown) deposits greater than 60 feet deep, which creates a mosaic of microenvironments, including dry ridges, moist slopes, ravines, bottomland areas, and small cypress swamps. Although oak-hickory forest is the most prevalent forest type, some of the undisturbed bluff vegetation is similar to mesic hardwood forests found in eastern Tennessee.

The project area occurs in a landscape that has been disturbed and shaped by previous agricultural and development practices (e.g., roads, residences, and industrial buildings). As of 2009, there were at least 550,000 acres of forestland in Tipton County and the adjacent Tennessee counties (United States Forest Service 2010).

Vegetation in the proposed transmission line ROW and access roads is characterized by two main types—herbaceous vegetation (65 percent) and deciduous forest (35 percent).

Herbaceous vegetation is characterized by greater than 75 percent cover of forbs and grasses and less than 25 percent cover of other vegetation types. Herbaceous vegetation cover predominates in the project area and generally in the area immediately adjacent to the proposed ROW. Pasture and agricultural row crops of cotton and soybeans are the most common types of herbaceous vegetation found along the proposed transmission line ROW. These areas are heavily disturbed and contain plant species indicative of early successional habitats. Common species include annual ragweed, broomsedge bluestem, Canadian horseweed, panic grass, partridge pea, and rice button aster. One wetland occurs near the western end of the proposed ROW, and the herbaceous vegetation is that of a scrub-shrub wetland. Wetland species found include blue mist flower, Canada goldenrod, common rush, fox sedge, and hairy joint grass with young trees of black willow, eastern cottonwood, and sycamore.

Deciduous forest is characterized by trees with overlapping crowns where deciduous species account for more than 75 percent of the canopy cover. In the project area, forest composition varies slightly with aspect, landscape position, and elevation, but common overstory species were relatively consistent throughout all of the surveyed area. The forested areas are fragmented and have experienced significant previous disturbance. Common overstory species in the project area include American beech, black walnut, box elder, northern hackberry, pignut hickory, sugar maple, slippery elm, sweetgum, and white ash. Average overstory tree size ranges between 6 and 18 inches in diameter at breast height throughout the project area. The understory consists of American hazelnut and ironwood. Herbaceous plants observed forested areas include Christmas fern, crossvine, and Virginia creeper.

The proposed ROW would occupy about 88 acres, and TVA would clear about 30 acres for forest. No forested areas within the proposed ROW route or access roads have structural characteristics indicative of old-growth forest stands as described by Leverett (1996).

EO 13112 (Invasive Species) was issued in 1999 to enhance federal coordination and response to the complex and accelerating problem of invasive species and serves to prevent their introduction to minimize the economic, ecological, and human health impacts. Invasive plant species are nonnative species that can degrade natural areas and displace native species, generally by outcompeting native species or by altering ecological communities or ecosystem processes (Vitousek et al. 1996). No plants identified on the Federal Noxious Weeds List (United States Department of Agriculture 2010) were observed in the project area. However, four invasive plants (Table 3-1) considered a severe threat to native plant communities occur in the project area (Tennessee Exotic Plant Pest Council 2010).

Table 3-1. Invasive Plant Species Observed in the Proposed Right-of-Way for the Burlison 161-kV Transmission Line

Common Name	Scientific Name
Chinese lespedeza	*Lespedeza cuneata*
Chinese privet	*Ligustrum sinense*
Japanese honeysuckle	*Lonicera japonica*
Japanese stilt/Nepal grass	*Microstegium vimineum*

During the field survey, the four invasive plant species shown in Table 3-1 were observed in both forest and herbaceous vegetation types. However, forested areas generally contained both greater numbers and cover of nonnative invasive plant species. Disturbances for mowing, grazing, and ROW maintenance prevent tree species from becoming established, but can also encourage invasion and establishment of weedy species.

3.3. Wildlife

Habitats observed throughout the area of the proposed transmission line have been heavily impacted by agricultural practices and urban development. Overall, the proposed project area and the adjoining countryside are dominated by active or fallow agricultural fields, followed by small areas of early successional habitat and small patches of forested habitat. Agricultural fields, mostly active soybean and cotton fields, make up approximately 50 percent of the project area, while early successional habitats occupy approximately 15 percent. Small patches of deciduous forest comprise about 35 percent of the proposed ROW and access roads. One emergent wetland is present in the proposed project area.

Of the agricultural fields in the area, the majority of the fields lie in the proposed transmission line route. Most of these fields are in active use. At the time field survey was conducted, most of the agricultural fields had been harvested. Approximately 20 percent of the agricultural fields in the project area are fallow and are dominated by goldenrod and ragweed species or by nonnative invasive plant species. Birds observed in these habitats include American crow, downy woodpecker, chipping sparrow, eastern towhee, field sparrow, northern cardinal, Carolina chickadee, song sparrow, indigo bunting, eastern meadowlark, and northern flicker. Mammals observed in this habitat include white-tailed deer, raccoon, coyote, and eastern cottontail rabbit. No reptiles or amphibians were observed in these habitats.

Approximately 15 percent of the proposed transmission line route is comprised of early successional habitats (i.e., herbaceous, nonagricultural vegetation), and these occur in small patches. Almost all of these areas of early successional habitats were low-quality grassland areas dominated by nonnative invasive grasses and small shrubs. Patch size was too small to support anything except common grassland bird and mammal species. One exception was an 8- to 10-acre area of mid-quality grassland habitat dominated by broom sedge and goldenrod species. This grassland habitat was also buffered by fair-quality woodland habitat and fencerow. Bird species found in these habitats include yellow-breasted chat, indigo bunting, blue jay, scarlet tanager, and red-bellied woodpecker. Mammals observed in this habitat include white-tailed deer, raccoon, coyote, and eastern cottontail rabbit.

Approximately 35 percent of the project area is currently segmented deciduous forest. These areas are valuable for bird species such as wild turkey, American crow, Carolina

wren, red-bellied woodpecker, summer tanager, white-breasted nuthatch, and others. Amphibians observed in these habitats include wood frog, northern cricket frog, chorus frog, and red-backed salamander. The only reptile observed was the five-lined skink. Mammals observed in this habitat included skunk, white-tailed deer, eastern cottontail rabbit, coyote, fox species, and raccoon. Several areas of low- to mid-quality depressional wet areas that may provide low- to mid-quality habitat to woodland amphibians and reptiles were observed throughout these woodlands.

A review of the TVA Natural Heritage database during September 2010, revealed no recorded heronries or caves within 3 miles of the proposed route. No caves or heronries were found during field observations.

3.4. Aquatic Life

The project area drains to Indian Creek, Mathis Creek, and Town Creek of the Hatchie River of the Mississippi River. Aquatic communities in the project area would vary depending on water quality, size, and habitat conditions both within and along watercourses. Aquatic species were not sampled during field surveys; however, aquatic communities are expected to be similar to those previously described in the region (Etnier and Starnes 1993; Parmalee and Bogan 1998).

Overall, 52 watercourses, including seven intermittent streams and 45 wet-weather conveyances occur along the proposed transmission line route. There are no perennial streams in the project area. The location of each of these watercourses was recorded using a global positioning system, and a habitat assessment form was completed for each during a September 2010 field survey. A listing of the seven stream crossings in the project area, as well as observed stream substrate conditions is provided in Appendix F. Additional information regarding watercourses in the vicinity of the project areas can be found in Section 3.7.

Because transmission line construction and maintenance activities may affect riparian conditions and in-stream habitat, TVA evaluated the condition of both of these at each stream crossing along the proposed route. From these habitat assessments, riparian condition was assigned to one of three classes below to indicate the current condition of streamside vegetation across the length of the proposed transmission line (Table 3-2). The three classes are as follows:

- 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 the riparian area is 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.

- Nonforested - No or few trees are present within the riparian zone. Significant clearing has occurred, usually associated with pasture or cropland.

Table 3-2. Riparian Condition of Streams Located Within the Burlison 161-kV Transmission Line Right-of-Way

Riparian Condition	Number of Perennial Streams	Number of Intermittent Streams	Total
Forested	0	3	3
Partially forested	0	2	2
Nonforested	0	2	2
Total	**0**	**7**	**7**

TVA then assigns appropriate SMZs and best management practices (BMPs) based upon these evaluations and other considerations (such as 303(d) status and the presence of endangered or threatened aquatic species). Appropriate application of these BMPs minimizes the potential for impacts to water quality and in-stream habitat for aquatic organisms.

3.5. Endangered and Threatened Species

3.5.1. Plants

A review of the TVA Natural Heritage database indicated that no federally listed or state-listed plant species are known to occur within 5 miles of the project area or in Tipton County. Similarly, no populations of federally or state-listed plant species or their appropriate habitat were observed during the field survey conducted in September 2010. No designated critical plant habitat is located within the project area.

3.5.2. Terrestrial Animals

The TVA Natural Heritage database review found no records of federally listed or state-listed terrestrial animal species within 3 miles of the project area. No state-listed or federally listed terrestrial animals were observed during field observation performed in September 2010. The review of the Natural Heritage database produced records of one federally listed terrestrial animal species found in Tipton County, Tennessee. The interior least tern (*Sterna antillarum athalassos*) is both federally and state-listed as endangered.

The interior least tern typically breeds and nests in small colonies on riverbanks and in sand and gravel along river islands. This species forages in adjacent waterways for small fish (NatureServe 2010). The closest record for this species is located more than 8 miles from the proposed transmission line route, and no suitable nesting or foraging habitat for it occurs near the project area.

3.5.3. Aquatic Animals

Ten state-listed aquatic species are known to occur in Tipton County and/or within a 10-mile radius of the proposed Burlison 161-kV Delivery Point (Table 3-3). No federally listed aquatic animal species are known from the project area. All seven streams crossed by the ROW for the proposed transmission line are small intermittent streams (see Appendix F) and do not provide suitable habitat for any federally listed or state-listed aquatic animals.

Table 3-3. Federally and State-Listed Species Known From Tipton County and/or Within a 10-Mile Radius of the Proposed Project Area

Common Name	Scientific Name	Federal Status	State Status[1] (Rank)[2]
Bird			
Interior least tern	*Sterna antillarum athalassos*	END	END
Fish			
Bigmouth shiner[3]	*Notropis dorsalis*	-	NMGT (S1)
Blue sucker	*Cycleptus elongatus*	-	THR (S2)
Naked sand darter	*Ammocrypta beani*	-	NMGT (S2)
Northern madtom	*Noturus stigmosus*	-	NMGT (S3)
Paddlefish	*Polyodon spathula*	-	TRKD (S3)
Plains minnow	*Hybognathus placitus*	-	NMGT (S1)
Scaly sand darter	*Ammocrypta vivax*	-	NMGT (S2)
Sturgeon chub	*Macrhybopsis gelida*	-	NMGT (S1)
Mussels			
Southern hickorynut	*Obovaria jacksoniana*	-	TRKD (S1)
Southern rainbow	*Villosa vibex*	-	TRKD (S2)

[1]**Status Codes:** END = Endangered; NMGT = Listed in need of management; THR = Threatened; TRKD = Tracked as sensitive but has no legal status
[2]**State Ranks:** S1 = Critically imperiled; S2 = Imperiled; S3 = Vulnerable
[3] Species known to occur within Tipton County but greater than 10 miles from the project area

The bigmouth shiner occurs in low-gradient creeks with cool moderate current of sand or fine gravel substrates. It is noted for its ability to utilize unstable habitats of shifting sand and fluctuating water levels. The only documented occurrence of the bigmouth shiner in Tennessee is in Bear Creek in Tipton County (Etnier and Starnes 1993).

The blue sucker occurs in larger rivers of the Gulf Coastal drainages from the Mobile Basin to the Rio Grande (Etnier and Starnes 1993). The blue sucker is currently listed as threatened by the Tennessee Wildlife Resources Agency (TWRA). It inhabits deep pools of large, free-flowing rivers with swift currents. Once common throughout its range, populations of blue suckers have declined drastically due to impoundments and increasing siltation of big rivers (Etnier and Starnes 1993).

In Tennessee, a disjunct population of the naked sand darter occurs in the Hatchie River system. It is fairly common in suitable habitats, but is given special status due to its restricted range in Tennessee. The naked sand darter prefers a shifting sand substrate with moderate current in medium to large streams (Etnier and Starnes 1993).

The northern madtom prefers moderate to swift currents over clean gravel and sand substrates. It is often associated with in-stream cover such as brush, logs, or large boulders. The decline of this species is attributed to channelization of suitable streams and the general degradation of stream quality throughout its range (Etnier and Starnes 1993).

The paddlefish prefers large, silty rivers to reservoirs (Etnier and Starnes 1993). No suitable habitat for this species was documented within the project area or from adjacent waters.

The plains minnow is currently listed as “in need of management” by TWRA. Little is known about the biology of the plains minnow, but it is believed to be similar to the silvery minnow. It is often encountered in river channels with moderate current over sandy substrates (Etnier and Starnes 1993).

In Tennessee, the scaly sand darter was once common in western tributaries of the lower Tennessee River prior to the creation of Kentucky Reservoir, and it may have occurred in the Forked Deer and Obion rivers systems. Currently it is known to occur only in the Hatchie River system, primarily in the main stems of the Hatchie River and Spring Creek. Like the naked sand darter, this species prefers a shifting sand substrate with moderate current in medium to large streams (Etnier and Starnes 1993).

The sturgeon chub is an obligate of large, turbid rivers and is restricted to the main channels of the Missouri and Mississippi rivers (Etnier and Starnes 1993). No suitable habitat for the sturgeon chub was documented within the project area.

The southern hickorynut mussel prefers moderate current with medium-sized gravel substrate (Parmalee and Bogan 1998).

The southern rainbow mussel typically occurs in small rivers, creeks, and lakes with mud or soft sand substrate (Parmalee and Bogan 1998).

3.6. Groundwater and Geologic Setting

The proposed project is located in the Coastal Plain Physiographic Province and is primarily underlain by the Tertiary units of the Mississippi embayment aquifer system. The Mississippi embayment aquifer system is made up of six hydrogeologic units in the area of the proposed project. From shallowest to deepest, these are the middle Claiborne, lower Claiborne-upper Wilcox, middle Wilcox, lower Wilcox, Midway confining unit, and the McNairy-Nacatoch. The middle Claiborne aquifer is in direct hydraulic connection with the underlying lower Claiborne-upper Wilcox aquifers, and together they make up the Memphis Sand and the Flour Island Formation. The Memphis Sand is the primary source of water supply for much of western Tennessee (Lloyd and Lyke 1995). The other aquifers are generally not used as sources of groundwater. Recharge to the Mississippi Sand and lower Wilcox aquifers is by precipitation on aquifer outcrop areas and by downward leakage from overlying aquifers.

Groundwater is the primary source of water supply for Tipton County (USEPA 2010). Source water withdrawals are from the Memphis Sand. The Memphis Sand was found by the Tennessee Division of Water Supply to be of high susceptibility, which means there is the potential for contamination of the raw water source at levels above drinking water standards or other health-based concerns. The state considers the Memphis Sand aquifer to be particularly vulnerable to contamination (Tennessee Department of Environment and Conservation [TDEC] 2003).

3.7. Surface Water

Precipitation in the project vicinity averages about 53 inches per year. The wettest month is March, which averages 5.4 inches of precipitation, and the driest month is August, with 2.8 inches of precipitation on average. The average annual air temperature is 60 degrees Fahrenheit (°F) and ranges from a monthly average of 37°F in January to 81°F in July. Stream flow varies with rainfall and averages about 20 inches of runoff per year or approximately 1.5 cubic feet per second per square mile of drainage area.

The area around the proposed transmission line drains to Indian Creek, Mathis Creek, and Town Creek of the Hatchie River of the Mississippi River. Indian Creek, Mathis Creek, and Town Creek are classified by TDEC for fish and aquatic life, recreation, livestock watering, and irrigation. The Hatchie River is classified for domestic and industrial water supply, fish and aquatic life, recreation, livestock watering, and irrigation. Indian Creek is on the state 303(d) list (TDEC 2010) as impaired (i.e., not fully supporting its designated uses) due to physical substrate habitat alteration and *Escherichia coli* from channelization and undetermined source. Town Creek is listed due to physical substrate habitat alterations from channelization.

3.8. Wetlands

Wetlands are those areas inundated by surface water or by groundwater, such that vegetation adapted to saturated soil conditions are prevalent. Examples include swamps, marshes, bogs, and wet meadows. Wetland fringe areas also are found along the edges of most watercourses and impounded waters (both natural and man-made). Field surveys were conducted in September 2010 to delineate wetland areas within the proposed transmission line ROW.

Wetland determinations were performed according to the United States Army Corps of Engineers (USACE) standards, which require documentation of hydrophytic (i.e., wet-site) vegetation, hydric soil, and wetland hydrology (USACE 2008; Reed 1997; United States Department of Defense and USEPA 2003). Broader definitions of wetlands, such as that used by the United States Fish and Wildlife Service (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 (i.e., the Tennessee Valley Authority Rapid Assessment Method or “TVARAM”) was used to categorize wetlands by their functions, sensitivity to disturbance, rarity, and ability to be replaced. The categorization was used to evaluate impacts and to determine appropriate levels of mitigation for wetland impacts.

TVARAM scores are used to classify 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.

Approximately 0.6 acre of a 2.2-acre wetland is located within the proposed ROW. This wetland (W001) appeared to be recently logged, and hydric woody species primarily consisted of hardwood saplings, resulting in a scrub-shrub wetland habitat. The wetland exhibits hydric soils and is located in the floodplain of an unnamed tributary to Indian Creek Canal. It is dominated by hydrophytic vegetation that includes black willow saplings, cottonwood saplings, sycamore saplings, and arthraxon grass. One access road (AR-10) traverses adjacent to the northern terminus of this wetland and parallels the wetland for about 750 feet.

3.9. 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 1 percent chance of flooding in any given year is normally called the 100-year floodplain.

The proposed transmission line route would cross several minor floodplain areas associated with streams mentioned in Section 3.4. The proposed Burlison Substation would not be located within the 100-year floodplain.

3.10. Archaeological and Historic Resources

The area of potential effect (APE) for archeological resources consisted of all areas, and associated access roads, in which land-disturbing activities would take place. The APE included the 7-mile-long by 100-foot-wide ROW. The APE for historic/architectural resources included any historic structures within a 0.5-mile-wide area linearly centered along the proposed ROW, as well as any areas where the project would alter existing topography or vegetation in view of a historic resource.

A records search identified one previously recorded archaeological site (Site 40TP77), a historic artifact scatter from the late 19th to early 20th century, within the APE. The site was recorded and recommended ineligible for inclusion in the National Register of Historic Places (NRHP) in 1994 as part of the proposed SR 439, Covington West Bypass (Standing and Alexander 1994). No previously recorded architectural resources were identified.

An archaeological survey was conducted from September 20 through 24, 2010, and on September 27, 2010. This survey resulted in the identification of one isolated find (IF-1) of historic period artifacts (Hockersmith and Karpynec 2010). Archaeological Site 40TP77 was revisited during the survey. Because of the site's lack of intact deposits and low research potential, TVA finds Site 40TP77 ineligible for inclusion in the NRHP. The architectural survey conducted on September 30, 2010, resulted in the identification of five previously unrecorded architectural resources (HS-1 through HS-5). TVA finds that these resources are ineligible for inclusion in the NRHP due to modern alterations.

3.11. Aesthetic Resources

Scenic resources were 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 proposed tap point and transmission line corridor lie along areas of pastoral, rural, and suburban landscape character. Scenic resources along the proposed route were evaluated from the tap point along the existing Shelby-Covington 161-kV Transmission Line to the terminus near the community of Burlison. Along the route as shown in Figure 1-1, the scenic attractiveness is common and the scenic integrity is moderate to low.

The proposed transmission line route begins to the south of the town limits of Covington, Tennessee, a small town of approximately 10,000 residents. The surrounding landscape character is suburban near the town center. Residential and commercial buildings, moderate vegetation, and the gently sloping topography keep views within the foreground viewing distance (i.e., within 0.5 mile from the observer).

To the west of the town of Covington, the topography remains consistent, but vegetation and development patterns change. Views of cropland increase, and residential development becomes sparser with the exception of the concentration of rural residential development along SR 59, an east-to-west state route that travels from Covington to the banks of the Mississippi River, which lies about 14 miles to the west. Generally, available views remain in the foreground due to the relatively flat topography and the mature vegetation that lines on the periphery of agricultural fields and along creek banks. There are existing transmission and distribution lines in the area that are visible to motorists and residents.

3.12. Recreation, Parks, and Natural Areas

There are no public or commercial outdoor recreation areas in the immediate vicinity of the proposed project. However, some informal recreation activities such as hunting, nature observation, or walking for pleasure may currently occur within or near the proposed transmission line corridor.

A review of data from the TVA Natural Heritage database indicated that the proposed action is not within, adjacent to, or within 3 miles of a natural area or ecologically significant site. No streams listed on the Nationwide Rivers Inventory or any Wild and Scenic Rivers are located near the proposed project area.

3.13. Socioeconomics and Environmental Justice

The proposed transmission line would run from the new Burlison substation to the southeast for a short distance and continue eastward to the Shelby-Covington #1 161-kV transmission line south of Covington. Most of the proposed route is sparsely populated, and few houses are located near the proposed route (see Figure 1-1). The eastern end of the line would be in the southern part of Covington, south of the densely populated sections of the town.

The population of Tipton County is 61,081, according to the 2010 Census of Population (United States Census Bureau 2010). The minority population of the county is 23.3 percent of the total, similar to the state average of 24.4 percent. The minority population is relatively small in most of the area along the proposed line, except in the eastern part at Covington. Poverty levels, as of the 2000 Census of Population, are generally similar to the countywide and statewide levels, except in the eastern end at Covington. In Block Group 5, Census Tract 407, which encompasses much of the lower portion of Covington, the poverty level was 31.2 percent of the population, well above the county level of 12.1 percent, the state level of 13.5 percent, and the national level of 12.4 percent.

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. These potential effects are presented by resource, and the sequence of resources is parallel to that presented in Chapter 3.

As stated in Section 2.1.1, under the No Action Alternative, TVA would not construct the proposed transmission line to provide power to STEMC's planned Burlison Substation. However, STEMC could opt to construct a new transmission line to serve the Burlison Substation. In this event, the potential environmental effects resulting from the implementation of the No Action Alternative would likely be comparable to those from the adoption of the Action Alternative. Potential effects of this new, distributor-built line would depend on various factors, including the particular route chosen, as well as STEMC's construction and maintenance methods.

In the event that STEMC were to choose not to construct the planned Burlison Substation or the transmission line to serve the new substation, the transmission system in the Burlison and Covington areas would continue to operate with a high risk of interruption due to overloaded situations and possible equipment failures. This risk is projected to increase over time.

Some of the possible outcomes under the No Action Alternative are speculative and are well beyond TVA's ability to control. Because of the speculative nature of those situations, TVA's analysis of potential effects of adopting the No Action Alternative focuses on determining the effects of TVA not building the proposed transmission line to provide power to the Burlison Substation.

4.1. Land Use

4.1.1. No Action Alternative

If the No Action Alternative were adopted, TVA would neither construct the proposed transmission line nor acquire easements for new ROW. Thus, there would be no changes in land use due to ROW clearing or from the imposition of use restrictions along the route of the proposed transmission line. Over time, some changes in land use in the area could occur due to future residential, commercial, or industrial development. However, the lack of a reliable and adequate power supply locally would tend to retard such development in the long term.

4.1.2. Action Alternative

Most of the ROW for the proposed transmission line is currently used for agricultural uses and forestry. Agricultural operations are consistent with transmission line operations, and no prime farmland would be removed from production by the proposed line. Approximately 30 acres of forested land within the proposed ROW would be cleared (see Section 4.2.2). The proposed transmission line route tends to avoid residences and commercial areas, and most houses are 300 to 500 feet from the ROW. Because of this distance, no significant effects to residential land use are expected. Thus, no noticeable changes in land use or

restrictions on uses of adjacent properties would result from the construction and operation of the proposed transmission line.

4.2. Vegetation

4.2.1. No Action Alternative

Adoption of the No Action Alternative would not result in any project-related direct, indirect, or cumulative impacts to the terrestrial ecology of the region because terrestrial communities would not change. However, changes to local plant communities resulting from natural ecological processes and human-related disturbance would continue to occur, but these changes would not result from the proposed project. The invasive plant species found near the project are common throughout the region, and their extent and abundance would likely remain relatively unchanged because no project-related work would take place.

4.2.2. Action Alternative

Adoption of the Action Alternative would not significantly affect the vegetation of the region. Implementation of this alternative would require clearing of approximately 30 acres of forest, most of which has experienced some previous disturbance. These forested communities are common and well represented throughout the region. Converting 30 acres of forestland to managed ROW would be a long-term effect and would be insignificant. As of 2009, there were at least 550,000 acres of forestland in Tipton County and the adjacent Tennessee counties (United States Forest Service 2010). The cumulative project-related effects to forest resources would be negligible when considered in the context of the total forestland occurring in the region. Project-related work would temporarily affect herbaceous plant communities, but these areas would likely recover to their preproject condition in less than one year. Adoption of the Action Alternative would not significantly affect the vegetative terrestrial ecology of the region.

Much of the project area currently has a large component of invasive terrestrial plants. Adoption of the Action Alternative would not significantly affect the extent or abundance of these species at the county, regional, or state level. Some areas of disturbed deciduous forest currently have low concentrations of invasive plants. Disturbance associated with the construction and operation of the proposed transmission line would likely promote increases of invasive plants in these areas. However, the use of TVA standard operating procedure of revegetating with noninvasive species (Muncy 1999) would help limit the introduction and spread of invasive species in the project area.

4.3. Wildlife

4.3.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line would not be built, and the proposed ROW would not be cleared. Therefore, the ROW corridor and the locations of the access roads for the proposed transmission line would likely remain in their current condition, and there would be no direct or indirect effects to local wildlife or wildlife habitats resulting from TVA's action.

4.3.2. Action Alternative

Construction of the ROW for the proposed tap line would involve clearing of about 30 acres of forest habitat. The remaining 55 acres is currently in agricultural use or is early successional habitat. These two conditions would persist within the ROW during operation

of the line. Because of this limited change in habitat types, the construction and operation of the proposed Burlison 161-kV Transmission Line is not expected to cause significant adverse direct or indirect impacts to terrestrial animals or to their habitats.

4.4. Aquatic Life

4.4.1. No Action Alternative

Under the No Action Alternative, no changes to aquatic resources within the project area would occur from TVA's action, and no direct, indirect, or cumulative impacts to aquatic communities on or adjacent to the project area would occur. However, changes to aquatic life would likely occur over the long term due to factors such as population growth and land use changes within the area.

4.4.2. Action Alternative

Aquatic life would be affected insignificantly by the proposed action. Impacts would either occur directly by the alteration of habitat conditions within the stream or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance activities along the proposed transmission line corridor.

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 effects resulting from transmission line 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 affect spawning and feeding success of many fish species (Sutherland et al. 2002).

Watercourses that convey surface water only during storm events (i.e., wet-weather conveyances) and that could be affected by the proposed transmission line route would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed in part to minimize disturbance of riparian areas and to reduce the subsequent erosion and sedimentation that can be carried to streams.

The seven intermittent streams that would be crossed by the proposed transmission line would be protected by Standard Stream Protection (Category A) of 50 feet as defined in Muncy (1999). This category of protection is 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 1999).

Because appropriate BMPs and SMZs would be implemented during construction, operation, and maintenance of the proposed transmission line, any impacts to aquatic life resulting from the proposed action would be minor and insignificant.

4.5. Endangered and Threatened Species

4.5.1. No Action Alternative

Under the No Action Alternative, TVA would not construct or operate the proposed transmission line and switch structures. Thus, there would be no direct effects to federally listed or state-listed as endangered and threatened species caused by TVA project-related actions.

Changes to local plant communities resulting from natural ecological processes and human-related disturbance would likely continue to occur. These changes could potentially affect listed plant and terrestrial animal species. However, these changes would not be caused by or result from the proposed project.

The status and conservation of any potentially affected listed aquatic species would continue to be determined by the actions of others under the No Action Alternative. Changes to the area would likely occur over time, as factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests change within the area.

4.5.2. Action Alternative

No plant species or aquatic animals federally listed as endangered or threatened are known to occur within the project area (i.e., within the proposed ROW or within the roadways for the access roads) or in nearby areas that could be affected by the construction and operation of the proposed transmission line. No federally listed terrestrial animal species are known to occur within a 3-mile radius of the proposed transmission line ROW. However, the interior least tern (federally listed as endangered) is known to occur in the westernmost portion of Tipton County. This species requires very specific habitats along larger waterways, such as the Mississippi River, in which to forage and nest. No such preferred habitats occur within the project area, and no interior least tern nesting or foraging habitat would be affected under the Action Alternative. Therefore, construction and operation of the proposed transmission line under the Action Alternative would not affect any terrestrial or aquatic species federally listed as endangered or threatened.

No populations of state-listed plants were observed during field surveys of the project area, and no state-listed or protected terrestrial animal species are known to occur within a 3-mile radius of the proposed transmission line ROW. Therefore, no direct, indirect, or cumulative effects to any state-listed as endangered and threatened plant or terrestrial animal species or their critical habitats would occur from implementing the Action Alternative.

Impacts to state-listed aquatic animal species known to occur within Tipton County and/or within a 10-mile radius of the proposed project could potentially occur from increased siltation entering habitats from adjacent watercourses as a result of riparian vegetation clearing and soil disturbances associated with transmission line construction or maintenance activities at stream crossings. However, because SMZs and BMPs would be used during construction, operation, and maintenance of the proposed transmission line, no effects to these state-listed aquatic animal species are likely.

4.6. Groundwater

4.6.1. No Action Alternative

Under the No Action Alternative, there would be no direct effects to groundwater resources from TVA's action because the proposed transmission line would not be built.

4.6.2. Action Alternative

The proposed transmission line construction, operation, and maintenance activities have the potential to affect groundwater. ROW clearing and site grading for structures and access roads could cause erosion movement of sediment into springs or groundwater infiltration zones. To prevent this, TVA would utilize BMPs as described by Muncy (1999) to minimize erosion during construction and operation.

Herbicides used during clearing and subsequent ROW maintenance activities could enter groundwater. Although some herbicides break down quickly, others can persist in groundwater. All herbicide applications by TVA will be in accordance with the manufacturers' labels. Most of the herbicides used by TVA have no restrictions or warnings about potential groundwater contamination (see Appendix E).

The access roads and the ROW for the proposed tap line do not lie within State Designated Source Water Protection Zones for public water supply; however, private wells supply homes near the project area. Because most of the wells in the area draw water from the unconfined Memphis Sand aquifer, herbicides with groundwater contamination warnings would not be used, and the use of fertilizers and herbicides would be considered with caution before application and would be applied according to the manufacturers' labels. BMPs dealing with herbicide application would also be used to prevent impacts to groundwater. With the application of appropriate BMPs during construction, operation, and maintenance of the proposed transmission line, potential effects to groundwater under the Action Alternative would be minor and insignificant.

4.7. Surface Water

4.7.1. No Action Alternative

Because the proposed transmission line would not be built and operated under the No Action Alternative, there would be no effects to local surface waters from TVA's actions. Any changes in local surface water conditions would be independent of TVA's actions.

4.7.2. Action Alternative

Soil disturbances associated with access roads or other construction 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, dissolved oxygen depletion, and adverse impacts to aquatic life. Improper use of herbicides to control vegetation can result in runoff to streams and subsequent aquatic impacts.

TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize these potential impacts. Permanent stream crossings that could not be avoided would be designed not to 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 requirements as described in Muncy (1999). Canopies in all SMZs would be left undisturbed unless there were no practicable alternative. 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. With proper implementation of these controls, only minor temporary impacts to local surface waters are expected.

4.8. Wetlands

Activities in wetlands are regulated under Sections 401 and 404 of the Clean Water Act 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 to be authorized 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. TVARAM is used to guide wetland mitigation decisions consistent with TVA's independent responsibilities under National Environmental Policy Act (NEPA) and the EO 11990.

4.8.1. No Action Alternative

Under the No Action Alternative, the transmission line would not be built, and no project-related disturbance to wetlands within the proposed transmission line ROW would occur. Therefore, no wetlands would be affected directly under this alternative. Changes to wetlands could nevertheless occur over time as other factors such as population trends, land use and development, quality of air/water/soil, recreational patterns, and cultural, ecological, and educational interests change within the area.

4.8.2. Action Alternative

Under the Action Alternative, approximately 0.6 acre of scrub-shrub wetland would be affected. This wetland contains low-growing/scrub-shrub vegetation, and regular ROW maintenance would cause it to be maintained in a state similar to its current conditions. Therefore, existing wetland functions would be sustained. No structures are proposed for placement within the wetland. One access road (AR-10) traverses adjacent to the northern terminus of this wetland and parallels the wetland for about 750 feet. With appropriate BMPs in place, vehicular traffic near W001 would not significantly affect the wetland's functional capacity.

The analysis of potential cumulative impacts to wetlands considered wetland loss and conversion at a watershed-level scale. However, this project would not result in any permanent wetland loss or conversion. Therefore, no cumulative wetland impacts are anticipated from implementing the proposed transmission line project.

Potential indirect wetland impacts would be reduced to an insignificant level during the transmission line construction and ROW maintenance activities through implementation of appropriate BMPs (Muncy 1999). Because of these measures, the proposed project would have no significant adverse direct, indirect, or cumulative effects to wetland areas or to the associated wetland functions and values provided within the general watershed.

4.9. Floodplains

As a federal agency, TVA is subject to the requirements of EO 11988 (Floodplain Management), which directs all federal agencies to take actions to reduce the risk of flood loss, to minimize the impacts of floods on human safety, and to preserve the natural and beneficial values served by floodplains. 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.

4.9.1. No Action Alternative

Under the No Action Alternative, there would be no direct or indirect adverse effects to floodplains because there would be no physical changes to the current conditions found within local floodplains due to TVA's action. Changes in land use resulting from residential, commercial, or industrial development could affect floodplain functions over the long term. However, these changes would be independent of TVA's action.

4.9.2. Action Alternative

The proposed transmission line route crosses several minor floodplain areas in Tipton County. Consistent with EO 11988, construction of an overhead transmission line and related support structures is considered a repetitive action in the 100-year floodplain. Locating support structures for the power line within the 100-year floodplain is not expected to cause any increase in flood hazard either because of changes in flood elevations or in flow-carrying capacity of the streams being crossed. However, to minimize adverse impacts on natural and beneficial floodplain values, the ROW would be revegetated where natural vegetation is removed as described in Appendix C.

Access roads AR01 and AR02 cross 100-year floodplain areas. Consistent with EO 11988, access roads are considered repetitive actions in the 100-year floodplain. To minimize adverse impacts, any new road construction in the floodplain would be done in such a manner that upstream flood elevations would not be increased. With such measures in place, potential effects to beneficial floodplain functions would be minor and insignificant.

4.10. Archaeological and Historic Resources

Historic and cultural resources, including archaeological resources, are protected under various federal laws, including the Archaeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, and the National Historic Preservation Act (NHPA). Section 106 of the NHPA requires federal agencies to consult with the respective State Historic Preservation Officer (SHPO) when proposed federal actions could affect these resources.

4.10.1. No Action Alternative

There would be no direct, indirect, or cumulative project-related effects to historic or archaeological resources under this alternative because the proposed undertaking would not occur.

4.10.2. Action Alternative

TVA determined that archaeological Site 40TP77, which was previously recorded and revisited in the archaeological survey, is ineligible for inclusion in the NRHP. The five previously unrecorded historic structures identified in the architectural survey were determined ineligible for inclusion in the NRHP due to modern alterations. All associated

access roads are located in areas that have been previously disturbed or surveyed. Thus, no historic properties potentially eligible for the NRHP would be adversely affected by the proposed undertaking.

Pursuant to regulations (36 CFR Part 800) implementing Section 106 of the NHPA, TVA consulted with the Tennessee SHPO regarding TVA's findings of no effect to historic properties. In a letter dated December 6, 2010, the Tennessee SHPO concurred with TVA's findings (see Appendix A).

Pursuant to 36 CFR§ 800.2 (c)(2)(ii), 800.3 (f)(2), and 800.4 (a)(4)(b), TVA consulted with the following federally recognized tribes: Absentee Shawnee Tribe of Oklahoma, Alabama-Quassarte Tribal Town, The Cherokee Nation, The Chickasaw Nation, Eastern Band of Cherokee Indians, Eastern Shawnee Tribe of Oklahoma, Jena Band of Choctaw Indians, Kialegee Tribal Town, Muscogee (Creek) Nation, Seminole Tribe of Florida, Seminole Tribe of Oklahoma, The Shawnee Tribe, Thlopthlocco Tribal Town, and United Keetoowah Band of Cherokee Indians in Oklahoma. Regarding historic properties within the project's APE that may be of religious or cultural significance to tribes, no responses from any of these federally recognized tribes were received.

4.11. Aesthetic Resources

Potential impacts to scenic resources were examined based on changes between the existing landscape and the landscape character after alteration, identifying changes in the landscape character based on commonly held perceptions of landscape beauty, and the aesthetic sense of place. The potential impacts to scenic resources are described in the same manner as the existing scenic resources, from east to west along the proposed route.

4.11.1. No Action Alternative

Under the No Action Alternative, the proposed transmission line corridor and ROW would not be acquired, and the transmission line would not be constructed. Consequently, the existing scenic attractiveness would remain common to the area, and the scenic integrity would remain moderate to low. However, changes in the local landscape could possibly occur over time, but these changes would not be related to the proposed project.

4.11.2. Action Alternative

Under the Action Alternative, the proposed transmission line would be constructed. At the point of connection to the Shelby-Covington #1 161-kV Transmission Line, views would be limited, due to existing topography, vegetation, and land use patterns in the vicinity. Views of the proposed transmission line and associated structures would be available from a number of private residences. Motorists travelling the roadways near the proposed project would have brief and intermittent views of the transmission line. These views available to residents and motorists would remain in context with views of existing transmission and distribution lines in the area. Consequently, introduction of new features associated with the Action Alternative into the landscape would not contrast significantly with the established landscape character.

Temporary visual discord would be probable during different phases of construction under the Action Alternative. Views of construction operations, increases in personnel and equipment, use of material and construction staging areas, and improvement of access roadways would be visible near the proposed transmission line route. These visually

discordant activities would be limited to periods of construction and would not permanently affect the scenic attractiveness or scenic integrity.

4.12. Recreation, Parks, and Natural Areas

4.12.1. No Action Alternative

Because construction and operation of the proposed transmission line would not occur under the No Action Alternative, no direct effects to recreation features or opportunities are likely.

4.12.2. Action Alternative

Construction and operation of the proposed transmission line could cause some minor shifts in informal recreation use patterns in the immediate vicinity of the project. These potential effects would be most likely during construction. Normal operation and maintenance are not expected to affect local informal recreational opportunities adversely. Nevertheless, the extent and intensity of any such effects would be minor and insignificant.

Because no natural areas, streams on the Nationwide Rivers Inventory or any Wild and Scenic Rivers are located within 3 miles of the proposed action, no adverse effect to these features are anticipated from implementing the Action Alternative.

4.13. Socioeconomics and Environmental Justice

4.13.1. No Action Alternative

If the proposed transmission line were not built, the supply of electricity would not be sufficient to meet the anticipated future needs in the area. If these future needs were not met, local electric service would become less dependable, and there would likely be sporadic losses of service. This could result in job losses in the area if businesses or industries relocate due to the lack of a reliable supply of electricity. Some residents would move elsewhere, and the area would become less attractive to new residents or businesses. As a result, property values in the impacted area would decline or would appreciate more slowly. Social and economic impacts would begin gradually but would likely become more noticeable over time. Minority and low-income residents likely would be affected disproportionately, especially low-income residents because their options to relocate would be more limited.

4.13.2. Action Alternative

If the proposed transmission line were built, the local power supply would be sufficient for the foreseeable planning future, and any potential socioeconomic effects due to an inadequate or unreliable electric power supply would be avoided. Similarly, over time, the provision of a reliable local power supply could accommodate additional economic growth due to industrial, commercial, and residential development.

Because the preferred route for the proposed transmission line generally avoids residential and commercial areas, any construction-related nuisances would be temporary and minor. The proposed transmission line was routed to avoid residential areas, and only a few houses are located along the proposed route. Nevertheless, the presence of the lines in the area potentially could have some small impact on property values near the ROW. However, studies have shown that when such impacts occur, they tend to be small, in the 3 to 10 percent range, but most commonly the 3 to 6 percent range. Any such effects

decrease rapidly with distance from the line. These effects usually disappear at about 200 to 300 feet but may extend further if views are not at least partially screened by trees, landscaping, or topography. Some studies have found that any such effects tend to dissipate over time, and that negative effects are less likely if the ROW is attractively landscaped or if it provides a larger than normal open area (Chalmers and Voorvaart 2009; Delacy 2004; Pitts and Jackson 2007). Any impacts on property values would be small and likely to decrease or disappear over time and would be much smaller than the impacts of the No Action Alternative.

No noticeable increases in local construction employment are likely during construction of the proposed line. After construction is complete, no noticeable negative social or economic impacts are likely. No disproportionate effects to any disadvantaged populations are expected.

4.14. Long-Term and Cumulative Effects

Long-term effects are consequences of the proposed action that either persist for an extended period or that are manifested at a point later in time following the action. Cumulative effects are those effects that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of the entity undertaking those actions.

4.14.1. No Action Alternative

As stated in Section 2.1.1, STEMC could proceed with construction of the planned Burlison Substation and could independently provide transmission service to power its new substation. However, if STEMC were to choose not to construct the new substation or a transmission line to power the planned substation, the reliability of the power system in the Burlison and Covington areas would continue to degrade. This could lead to long-term and cumulative socioeconomic effects, as the area would not be especially attractive to new or additional residential, commercial, or industrial development.

4.14.2. Action Alternative

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 predominant land use along the proposed 7.2-mile transmission route is agriculture. Other than construction of the planned 2-acre Burlison Substation, no other major land-clearing activities or large-scale changes in local land use are foreseeable. The proposed transmission line ROW would occupy less than 88 acres, and construction of the line would require clearing of about 30 acres of forest. Thus, any project-related cumulative effects to terrestrial life would be minor and insignificant.

Potential effects to surface water and groundwater quality and to aquatic life would be insignificant with the application of protective measures (e.g., BMPs and SMZs) during construction and maintenance of the proposed transmission line. STEMC's construction and operation of the proposed Burlison Substation could affect surface water quality, depending on the control measures employed. Applicable requirements under the Tennessee Water Quality Control Act and the federal Clean Water Act would mitigate such impacts. Overall, any cumulative effects to local water quality and aquatic life resulting from TVA's proposed action would be insignificant.

As stated in Section 4.8.2, construction of the proposed transmission line would affect about 0.6 acre of a larger wetland, but the functional capability of this wetland would not be affected significantly. There are no wetlands on the Burlison Substation site. The proposed project would not result in any permanent wetland conversion or loss; thus, cumulative effects to local wetlands would be insignificant.

Although the proposed transmission line route would cross several minor floodplain areas, the placement of structures within such areas would not cause an increase in flood hazard due to changes in flood elevations or in flow-carrying capacity. Two access roads would cross the 100-year floodplain, but they would be designed so that upstream flood elevations would not be increased. Therefore, any cumulative effects to floodplain functions would be insignificant.

TVA determined, and the SHPO concurred, that no historic properties potentially eligible for inclusion in the NRHP would be adversely affected by the proposed undertaking. Thus, there would be no cumulative effects to historic resources.

Some visual effects would be experienced during TVA's construction of the proposed transmission line and during the construction of the adjacent substation by STEMC. However, after construction, changes in visual character would be long term but nevertheless insignificant. Because there are no reasonably foreseeable changes in the visual character of the area, the cumulative visual effects of TVA's action are expected to be minor and insignificant.

The provision of a local power supply under the Action Alternative would provide a long-term (i.e., 20 years or more) solution to the power reliability problems in the Burlison and Covington areas. Consequently, this could result in some localized long-term and cumulative socioeconomic benefits compared to the No Action Alternative in that the area could accommodate residential, commercial, and industrial expansion or development.

4.15. Postconstruction Effects

Transmission lines, like all other types of electrical wiring, generate both electric and magnetic fields (EMFs). The voltage on the conductors of a transmission line generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, transmission line structures, or vegetation. A magnetic field is generated by the current (i.e., the movement of electrons) in the conductors. The strength of the magnetic field depends on the current, the design of the line, and the distance from the line.

The fields from a transmission line 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 transmission line varies with: (1) the strength of the electric or magnetic field, (2) the size and shape of the conducting object, and (3) whether the conducting object is grounded. Induced currents and charges can cause shocks under certain conditions by making contact with objects in an electric or magnetic field.

The proposed transmission line, like other transmission lines, 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 transmission line 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.

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 correctable and would be repaired if reported to TVA.

Implanted medical devices historically had a potential for power equipment strong-field interference when they came within the influence of low-frequency, high-energy workplace exposure. However, the 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 (American Medical Association 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 (World Health Organization [WHO] 2007a). Effects associated with ungrounded, metallic object's static charge accumulation and discharge 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 EMFs. 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., American Medical Association 1994; National Research Council 1997; National Institute of Environmental Health Sciences [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 review of this topic by the WHO (International Association for Research on Cancer 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 lines. 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 is 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 (American Medical Association 1994; United States Department of Energy 1996; NIEHS 1998).

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

4.15.1. Lightning Strike Hazard

TVA transmission lines 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. Transmission lines structures are well grounded, and the conductors are insulated from the structure. Therefore, touching a structure supporting a transmission lines poses no inherent shock hazard.

4.15.2. Transmission Structure Stability

The pole structures that would be used on the proposed 161-kV transmission lines (see Figure 2-1) 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.

4.16. Summary of TVA Commitments

The following routine measures would be employed to reduce the potential for adverse environmental effects during construction of the proposed transmission line and switch structures.

- To retard the introduction and spread of invasive species in the project area, TVA would employ the standard operating procedure of revegetating with noninvasive plant species.

- Wet-weather conveyances that could be affected by the proposed transmission line route would be protected by implementing standard BMPs as identified in Muncy (1999).

- The seven intermittent streams that would be crossed by the proposed transmission line would be protected by the implementation of Standard Stream Protection (Category A) of 50 feet as defined in Muncy (1999).

- TVA would utilize BMPs as described by Muncy (1999) to minimize erosion during construction and operation.

- BMPs dealing with herbicide application would be used to prevent impacts to groundwater.

- 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.

- To minimize adverse impacts on natural and beneficial floodplain values, the ROW would be revegetated where natural vegetation is removed as described in TVA's *Environmental Quality Protection Specifications for Transmission Line Construction* (Appendix C).

- To minimize adverse floodplain impacts, any new road construction in the floodplain would be done in such a manner that upstream flood elevations would not be increased.

- Existing wooden pole structure 172 in the Shelby-Covington #1 161-kV Transmission line would be retired according to TVA's Environmental Protection Procedures.

CHAPTER 5

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CHAPTER 6

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Appendix A – Correspondence

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TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

December 6, 2010

Mr. A. Eric Howard
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

RE: TVA, CULTURAL RESOURCES ASSESSMENT, BURLISON 161-KV
TRANSMISSION LINE, UNINCORPORATED, TIPTON COUNTY, TN

Dear Mr. Howard:

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

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

Your cooperation is appreciated.

Sincerely,

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

EPM/jmb

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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.* 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.

Revision April 2007

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Appendix C – TVA Environmental Quality 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 shall plan, coordinate, and conduct operations in a manner that protects the quality of the environment and complies with TVA's environmental expectations discussed in the preconstruction meeting. This specification contains provisions that shall be considered in all TVA and contract construction operations. If the contractor fails 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 structure and conductor pulling sites, protective measures to prevent erosion will be taken immediately upon the end of each step in a construction sequence, and those protective measures will be inspected and maintained throughout the construction and right-of-way rehabilitation period.

2. Regulations - TVA and/or the assigned contractor 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'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 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, 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 line. 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.

   No subsurface ground-disturbing equipment or stump-removal equipment will be used by construction forces except on access roads or at the actual 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 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 structure sites 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 structure.

5. Sanitation - A designated TVA or contractor representative 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.

6. Refuse Disposal - Designated TVA and/or contractor personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage, and disposal of all refuse and debris produced by his operations and by his 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 waste. Contractors must meet similar provisions on any project contracted by TVA.

7. Landscape Preservation - TVA and its contractors shall exercise care to preserve the natural landscape in the entire construction 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 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, water supply watersheds, and public recreational areas such as parks and monuments. Contractors 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 or construction operations, the operations shall immediately cease for at least 100 feet in each direction, and TVA's right-of-way inspector or construction superintendent and 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 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 will erect and (when TVA or contract construction personnel are unable) maintain best management practices (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. 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.

   Acceptable measures for disposal of waste oil from vehicles and equipment shall be followed. No waste oil shall be disposed of within the right-of-way, on a construction site, or on access roads.

10. Turbidity and Blocking of Streams - Construction activities in or near SMZs 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 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.*

    Mechanized equipment shall not be operated in flowing water 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 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.

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

11. Clearing - No construction activities may clear additional site or right-of-way vegetation or disturb remaining retained vegetation, stumps, or regrowth at locations other than the structure sites and conductor setup areas. TVA and the construction contractor(s) must provide appropriate erosion or sediment controls for areas they have disturbed 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.

12. Restoration of Site - All construction 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.* 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.

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

14. Burning - Before conducting any open burning operations, the contractor 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.

15. Dust and Mud Control - Construction 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.

16. Vehicle Exhaust Emissions - TVA and/or the contractors 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.

17. 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 Heavy Equipment Department within TVA or the construction contractor will properly maintain these vehicles with approved spill prevention 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.

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

19. Noise Control - TVA and/or the contractor 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 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.

20. 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.

21. Damages - The movement of construction 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 will be responsible for erosion damage caused by his actions 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 contract dealing with damages will apply.

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Appendix D – TVA Transmission Line 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, TVA Environmental Stewardship and Policy staff will have studied each possible stream impact site and will have identified it as falling into one of three categories: (A) standard stream protection, (B) protection of important permanent streams, 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 state and federal requirements to avoid harming certain species. The category designation for each site will be marked on the 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 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 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 6, “Standards and Specifications.”

2. All equipment crossings of streams 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 by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. Shorelines that have to be disturbed must be stabilized as soon as feasible.

(B) Protection of Important Permanent Streams

This category will be used when there is one or more specific reason(s) why a permanent (always-flowing) stream requires protection beyond that provided by standard BMPs. Reasons for requiring this additional protection include the presence of important sports fish (trout, for example) and habitats for federal endangered species. 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 6, “Standards and Specifications.”

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. Proposed crossings of permanent streams must be discussed in advance with Environmental Stewardship and Policy staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.

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 not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. 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 (for example, a particular spring run) or protected species (for example, one that breeds in a wet-weather ditch) is known to occur on or adjacent to the construction corridor. 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 6, "Standards and Specifications."

2. All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Environmental Stewardship and Policy staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat. All crossings of streams also must comply with appropriate state (and, at times, federal) permitting requirements.

3. Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Environmental Stewardship and Policy staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. Stumps must not be removed, uprooted, or cut shorter than 0.30 meter (1 foot) above the ground line.

4. Other vegetation near the unique habitat must be disturbed as little as possible during construction. The soil must not be disturbed by plowing, disking, blading, or grading. Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Environmental Stewardship and Policy staff.

Additional Help

If you have questions about the purpose or application of these guidelines, please contact your supervisor or the environmental coordinator in the local Transmission Service Center.

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

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
1. Reference	• All TVA 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 6, BMP "Standards and Specifications."	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 6, BMP "Standards and Specifications."	• 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 6, BMP "Standards and Specifications."
2. Equipment Crossings	• All crossings of streams must comply with appropriate state and federal 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.	• All crossings of streams must comply with appropriate state and 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. • Proposed crossings of permanent streams must be discussed in advance with Environmental Stewardship and Policy staff and may require an on-site planning session before any work begins. The purpose of these discussions will be to minimize the number of crossings and their impact on the important resources in the streams.	• All crossings of streams also must comply with appropriate state and federal permitting requirements. • All construction activity in and within 30 meters (100 feet) of the unique habitat must be approved in advance by Environmental Stewardship and Policy staff, preferably as a result of an on-site planning session. The purpose of this review and approval will be to minimize impacts on the unique habitat.

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

Guidelines	A: Standard	B: Important Permanent Streams	C: Unique Water Habitats
3. **Cutting Trees**	• 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.	• Cutting of trees with 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 meeting National Electrical Safety Code and danger tree requirements. • Stumps can be cut close to ground level but must not be removed or uprooted.	• Cutting of trees within 30 meters (100 feet) of the unique habitat must be discussed in advance with Environmental Stewardship and Policy staff, preferably during the on-site planning session. Cutting of trees near the unique habitat must be kept to an absolute minimum. • Stumps must not be removed, uprooted, or cut shorter than 1 foot above the ground line.
4. **Other Vegetation**	• 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 not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. • 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. • Soil displacement by the actions of plowing, disking, blading, or other tillage or grading equipment will not be allowed in SMZs; however, a minimal amount of soil disturbance may occur as a result of clearing operations. • 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. • The soil must not be disturbed by plowing, disking, blading, or grading. • Areas that have to be disturbed must be stabilized as soon as possible and revegetated as soon as feasible, in some cases with specific kinds of native plants. These and other vegetative requirements will be coordinated with Environmental Stewardship and Policy staff.

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Appendix E – TVA Environmental Protection Procedures Right-of-Way Vegetation Management Guidelines

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Tennessee Valley Authority
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 Electrical 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 Options

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 uses mechanical mowing to a large extent.

B. When slopes become hazardous to farm tractors and rotary mowers, TVA may use a variety of herbicides specific to the species present with a variety of possible application techniques. When scattered small stands of tall-growing vegetation are present and access along the right-of-way is difficult or the path to such stands is very long, herbicides may be used.

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 is actively looking at better control methods, including use of low-volume herbicide applications, occasional single tree injections, and tree growth regulators (TGRs).

D. TVA does not encourage tree reclearing 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 reclear the right-of-way with trained reclearing 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 resprout from the root crown, and shattered stumps can produce a multistem dense stand in the immediate area. Repeated use of mowers on short cycle reclearing with many original stumps regrowing 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 regrowth 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 and 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 Service (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 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. The rates of application utilized are those listed on the 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	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Chopper	Imazapyr/RTU	Caution
Escort	Metsulfuron Methyl/Dry Flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Krenite S	Fosamine Ammonium	Caution
Pathfinder II	Triclopyr/RTU	Caution
Roundup	Glyphosate/Liquid	Caution
Roundup Pro	Glyphosate	Caution
Spike 20P	Tebuthiuron	Caution
Transline	Clopyralid/Liquid	Caution

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

Trade Name	Active Ingredients	Label Signal Word
Sahara	Diuron/Imazapyr	Caution
SpraKil SK-26	Tebuthiuron and Diuron	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-round 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 1999), 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, U.S. Environmental Protection Agency (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 either done by TVA or by contractors in accordance with the following guidelines identified in TVA’s BMPs manual (Muncy 1999):

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 (SMZs) (200 feet minimum width) 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 utilizes Activate Plus, manufactured by Terra, as an adjuvant to herbicides to improve the performance of the spray mixture. Application rates are consistent with the USEPA-approved label. The USFWS has expressed some concern on toxicity effects of surfactants on aquatic species. TVA is working in coordination with Mississippi State University and chemical companies to evaluate efficacy of additional low-toxicity surfactants, including LI700 as manufactured by Loveland Industries, through side-by-side test plots in the SMZs of area transmission lines.

I. TVA currently uses primarily low-volume applications of foliar and basal applications of Accord (glyphosate) and Accord- (glyphosate) Arsenal (imazapyr) tank mixes. Glyphosate is one of the most widely used herbicidal active ingredients in the world and has been continuously the subject of numerous exhaustive studies and scrutiny to determine its potential impacts on humans, animals, and the environment.

4.0 References

Muncy, J. A. 1999. *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities,* revised edition. Edited by C. Austin, C. Brewster, A. Lewis, K. Smithson, T. Broyles, and T. Wojtalik. Norris: Tennessee Valley Authority, Technical Note TVA/LR/NRM 92/1.

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Appendix F – Intermittent Stream Crossings in the Project Area

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Table F-1. Stream Crossings Along the Proposed Burlison 161-kV Delivery Point in Tipton County, Tennessee

Stream Identification	Stream Type	Streamside Management Zone Category	Stream Name	Field Notes
001	Intermittent	Category A (50 feet)	Unnamed tributary to Indian Creek	7-foot-wide by 12-foot-deep channel with silt/sand substrate; fish observed in isolated pools; riparian condition is partially forested
002	Intermittent	Category A (50 feet)	Unnamed tributary to Indian Creek	7-foot-wide by 12-foot-deep channel with silt/sand substrate; fish observed in isolated pools; riparian condition is forested
003	Intermittent	Category A (50 feet)	Unnamed tributary to Mathis Creek	Unnamed tributary to Mathis Creek; dry at time of survey; riparian condition is forested
004	Intermittent	Category A (50 feet)	Unnamed tributary to Mathis Creek	6-foot-wide by 6-foot-deep channel with sand/gravel substrate; dry at time of survey; riparian conditions are nonforested in agricultural field
005	Intermittent	Category A (50 feet)	Unnamed tributary to Mathis Creek	20-foot-wide by 12-foot-deep channel with sand substrate; dry at time of survey; riparian condition is forested
006	Intermittent	Category A (50 feet)	Mathis Creek	Mathis Creek - small channel alongside of farm road in agriculture field; riparian conditions are nonforested; heavy vegetation in channel with some water present at time of survey
007	Intermittent	Category A (50 feet)	Unnamed tributary to Town Creek	6-foot-wide by 6-foot-deep channel with cobble substrate; runs under SR 54; mostly dry except for isolated pool most likely from recent rain; riparian condition is partially forested in industrial area