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FINAL ENVIRONMENTAL ASSESSMENT

WEIR 161-KV TRANSMISSION LINE

Choctaw County, Mississippi

TENNESSEE VALLEY AUTHORITY

JANUARY 2006

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CHAPTER 1

1. PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action – Improve Power Supply

The Tennessee Valley Authority (TVA) is proposing to serve 4-County Electric Power Association's (EPA) planned substation at Weir, Mississippi, by building a 7.74-mile-long, 161-kilovolt (kV) transmission line connecting the planned substation to TVA's existing Red Hills-Sturgis No. 1 161-kV Transmission Line located west of Ackerman, Mississippi (see Figure 1). TVA would also add switches to each side of the tap point (i.e., the connection point) in the Red Hills-Sturgis Transmission Line. These switches would allow TVA to isolate portions of the local transmission system. TVA would also install revenue metering equipment at the Weir Substation, and equipment would be installed that would allow the status of the Weir Substation to be monitored electronically at TVA's System Operations Center in Chattanooga, Tennessee. The proposed transmission line would be completed by November 2006.

1.2. Need

The 4-County EPA presently serves Weir, French Camp, and Kerr communities by means of a long 13-kV distribution line from the Ackerman 69-13-kV Substation. The distribution feeder is at its thermal capacity based on industrial design standards and is causing voltage problems in the area. The Weir area is experiencing steadily increasing electrical loads of almost 3 percent per year as a result of residential and small commercial growth. In 2004, an additional 1.3 megawatts (MW) of electrical load was added to the system with the connection of the Reliant Resource generating station. The increasing electrical loads in the Weir area are overloading the Ackerman 69-kV Substation at 9.1 MW, which exceeds the substation's calculated capacity of 8.8 MW. This increasing load is also overloading 4-County EPA's distribution system and causing low voltage problems on the local system.

Reliability, as well as capacity, is a concern in providing adequate service to the area. Because reliability decreases as loading and distribution line length increase, the peak load conditions predicted would result in a system even more likely to experience outage. To address these issues, 4-County EPA is planning to build a new 161-kV substation at a site selected by 4-County EPA that is west of Ackerman and located north of State Route (SR) 12 near Weir (see Figure 1).

1.3. Decisions

The primary decision before TVA is whether to build a new 161-kV transmission line to serve the 4-County EPA's planned substation in order to improve the electrical service in the 4-County EPA service area. A detailed description of the alternatives is provided in Section 2.1.

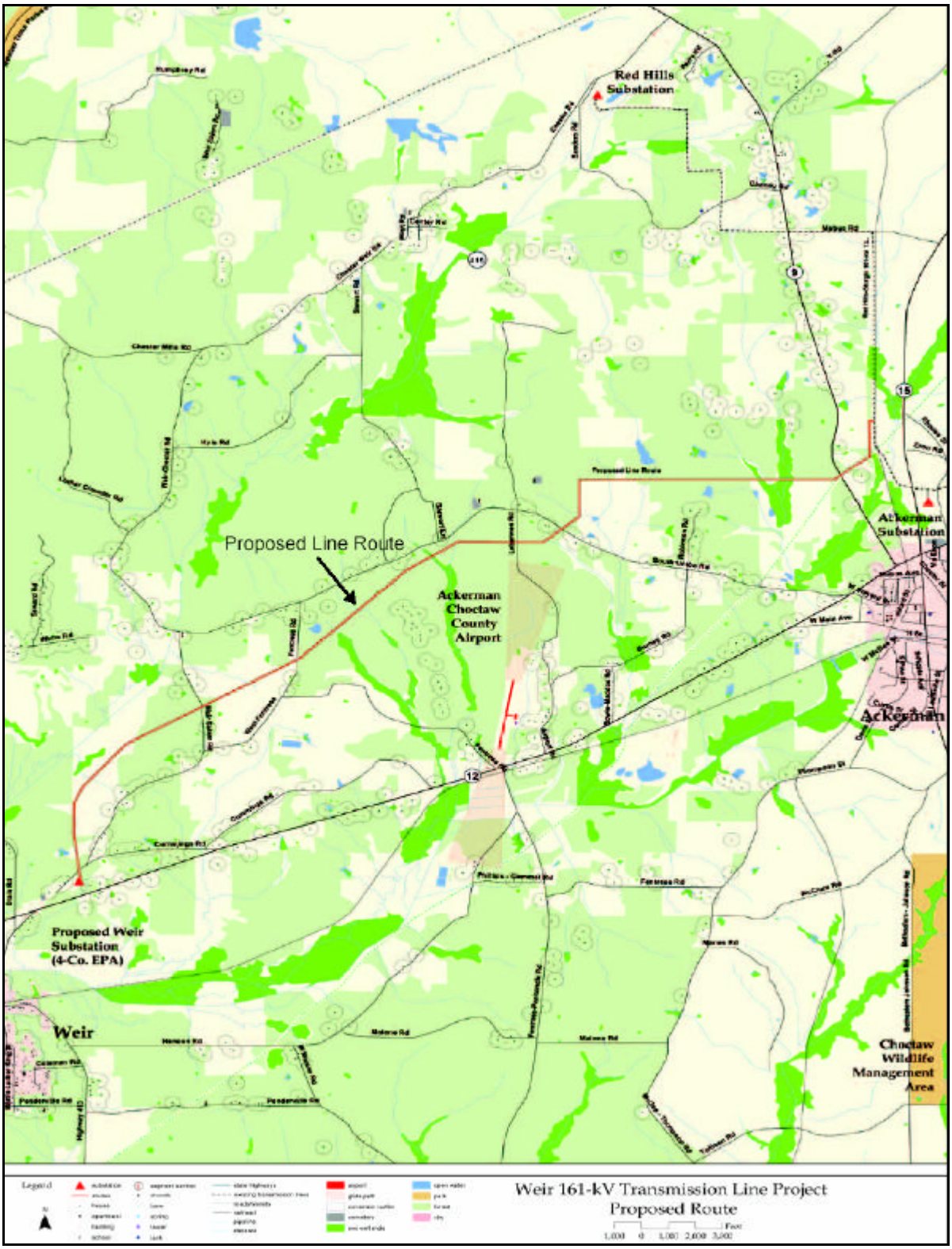

Figure 1. Vicinity Map of Red Hills-Sturgis Tap to Weir Substation

If service to the area is to be improved, other secondary decisions are involved. These include the following considerations:

- The timing of improvements
- The best route for a transmission line
- Determining implementation of any necessary mitigation and/or monitoring measures to meet TVA standards and minimize potential damages to resources

1.4. Other Pertinent Environmental Reviews or Documentation

In July 1998, TVA released the *Red Hills Power Project Final Environmental Impact Statement* (EIS). This EIS documented the potential environmental effects of TVA's purchase of 440 MW of electrical energy from the Red Hills Power Project. This environmental review also addressed potential impacts of a proposed 440-MW lignite-fueled generation facility and a proposed surface lignite mine located near Ackerman, Mississippi.

1.5. Public Involvement

The following federal and state agencies were contacted concerning the project:

- Mississippi Department of Agriculture and Commerce
- Mississippi Department of Archives and History
- Mississippi Department of Environmental Quality
- Mississippi Department of Transportation
- Mississippi Development Authority
- Mississippi Public Service Commission
- U.S. Army Corps of Engineers

This proposal was reviewed in accordance with Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), Farmland Protection Policy Act, National Historic Preservation Act, 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 held a public meeting in the project area on February 17, 2005. Fourteen potential transmission line route options were presented to the public for comment. These are described in Section 2.5.3 of this document (also see Figure 2 for a map of the route options).

Four public officials and 330 potentially affected property owners within these corridor routes were specifically invited to the meeting. TVA also invited other interested members of the public through newspaper advertisements and local news outlets. TVA issued a news release to local news outlets. Total attendance at the meeting was 104.

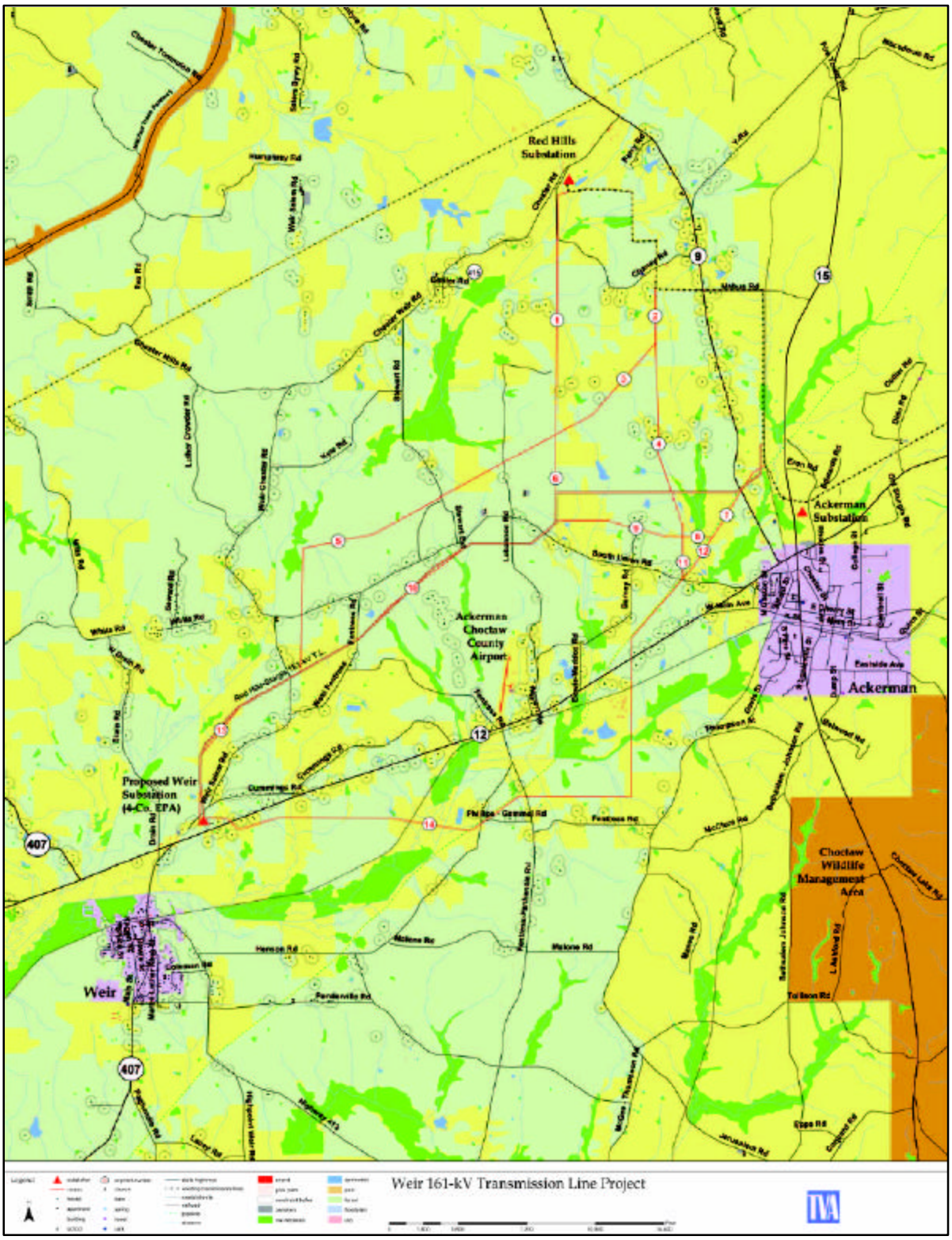

Figure 2. Weir 161-kV Transmission Line Project Route Options
Note: Individual segment options are indicated by the circled red numbers along each segment.

During a 30-day public comment period following the open house, TVA accepted public comments on potential line routes and other issues. A toll-free phone number and a fax number were made available to facilitate comments. Comments were primarily related to the location of the transmission line relative to current or planned land uses.

1.6. Necessary Federal Permits or Licenses

A Section 404 Nationwide Permit 12, Utility Line Crossing, has been approved and issued by the U.S. Army Corps of Engineers (USACE) for the project. In addition, a permit would be required from the state of Mississippi for construction site storm water discharge for the transmission line construction. TVA's Transmission Construction organization would prepare the required erosion and sedimentation control plans and coordinate them with the appropriate state and local authorities. A permit would also be required for burning trees and other combustible materials removed during transmission line construction.

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CHAPTER 2

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

The alternatives explored are described in this chapter. A detailed description of the necessary steps in constructing a transmission line and substation is provided here. TVA's preferred alternative is identified in this chapter.

2.1. Alternatives

Along with a No Action Alternative, two Action Alternatives were developed, one of which was considered economically infeasible. The three alternatives are summarized below.

2.1.1. Alternative A – Do Not Build Transmission Line (the No Action Alternative)

Under the No Action Alternative, TVA would not construct the proposed transmission line. Adoption of this alternative would result in an overloaded 13-kV distribution feeder and voltage problems in the area, which could prevent 4-County EPA from providing adequate service to its customers. The 4-County EPA could decide to build the transmission line independently. Absent this, the increasing load due to ongoing and already planned development could not be met by 4-County EPA, and system outages, especially at times of high electricity use, would occur or some other action would have to be taken.

2.1.2. Alternative B – Construct 161-kV Transmission Line (the Action Alternative)

Under the Action Alternative, TVA would construct a tap (or connection) to the Red Hills-Sturgis No. 1 161-kV Transmission Line located north of Ackerman. Switches would be added on each side of the tap point to allow isolation of the line segments for maintenance or to control transmission. TVA would construct a new 161-kV transmission line from the tap point to 4-County EPA's new Weir Substation. TVA would also provide 4-County EPA revenue metering equipment for installation at the substation. In addition, equipment would be installed that would allow TVA to monitor the status of the Weir Substation at the TVA Systems Operations Center in Chattanooga, Tennessee. Implementation of this alternative would meet the growing power needs in the Weir area and improve the transmission line system's reliability. It would require the purchase and clearing of new transmission line right-of-way for a distance of 7.74 miles.

2.1.3. Alternative Eliminated From Detailed Study - 4-County EPA to Construct 69-kV Substation

This alternative called for 4-County EPA to construct approximately 7.5 miles of new transmission line that would connect to an existing 69-kV transmission line. Also, 4-County would build a new 69-13-kV substation equipped with two 3-phase transformers rated 12/16/20 megavolt-amperes each. The 4-County EPA would increase capacity at the Ackerman Primary Substation. Although this alternative is technically feasible for the short term, it was not economical. The estimated cost of this alternative exceeded the cost estimate for Alternative B by approximately $1.3 million. Adoption of this alternative would not provide a long-term solution to the voltage issues in the Weir, French Camp, and Kerr Communities. Therefore, 4-County EPA decided to build its planned 161-kV substation at Weir instead, and this alternative was eliminated.

2.2. Comparison of Alternatives

The proposed action is in response to a need to supply 4-County EPA with reliable electric power in the vicinity of Weir, Mississippi. Because no construction would occur under the No Action Alternative (absent 4-County deciding to construct the connection line itself), adoption of this alternative would result in virtually no environmental consequences. However, under the No Action Alternative, overloading of existing power lines and ongoing voltage problems would persist, and eventually, 4-County EPA would not be able to meet anticipated demands for power. If 4-County decided to construct the line, potential impacts would be similar to those described below.

Adoption of the Action Alternative would involve the construction of 7.74 miles of new transmission line on a 100-foot-wide right-of-way. The new line would run from just north of Ackerman to a new substation near Weir. Construction of the proposed transmission line would provide 4-County EPA with adequate power for current and anticipated future needs. Construction and operation (including right-of-way maintenance) of the proposed line would be done in accordance with appropriate Best Management Practices (BMPs) (Muncy, 1999) and other TVA policy guidelines (see Appendices B, C, D, and E). Although adoption of the Action Alternative would result in some environmental effects, these potential effects would be minor and insignificant. A detailed discussion of potential environmental effects of adopting the two alternatives is provided in Chapter 4.

2.3. Description of Construction, Operation, and Maintenance of the Proposed 161-kV Transmission Line

2.3.1. Transmission Line Construction

2.3.1.1. Right-of-Way Acquisition and Clearing

New right-of-way 100 feet wide would be needed for the transmission line. TVA would purchase easements from landowners for the new right-of-way on private land. These easements would give TVA the right to construct, operate, and maintain the transmission line, as well as remove danger trees. Danger trees are those trees that are located away from the cleared right-of-way, but are tall enough to pass within 5 feet of conductor or strike a structure should it fall toward the transmission line. Ownership of the land within the right-of-way remains with the landowner, and the landowner may continue a number of activities on the property. However, the easement agreement prohibits construction of buildings and any other activities within the right-of-way 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 right-of-way. Equipment used during this right-of-way clearing would include chain saws, skidders, bulldozers, tractors, and 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 right-of-way 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 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, to limit ground disturbance. *TVA Right-of-Way Clearing*

Specifications, *Environmental Quality Protection Specifications for Transmission Line Construction*, and *Transmission Construction Guidelines Near Streams* (Appendices B, C, and D) would be followed in clearing and construction activities.

After clearing and construction, the right-of-way 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 revegetated using native grass and other low-growing species. Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in Appendices B through D.

2.3.1.2. Access Roads

Permanent access roads would be needed to allow vehicular access to each structure and to other points along the right-of-way. Six new access roads were identified along the proposed transmission line and were included in the environmental field review (see Figure 3). TVA would obtain the necessary rights for these access roads from landowners. Existing roads including privately built farm and field roads, some of which may need upgrading, would be used where possible. New access roads used for transmission lines are located on the right-of-way 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, they would be left or removed, depending on the wishes of the landowner or on any applicable permit conditions. If desired by the property owner, new temporary access roads would be restored to previous conditions. Additional applicable right-of-way clearing and environmental quality protection specifications are listed in Appendices B and C.

2.3.1.3. Construction Assembly Areas

A construction assembly area would be required for worker assembly, vehicle parking, and material storage. This area may be on an existing substation or leased from a private landowner for the duration of the construction period. Such areas are typically 5 acres in size, relatively flat, previously cleared, and located adjacent to an existing paved road near the transmission line. Depending upon site conditions, some minor grading and installation of drainage structures may be required. The area would be graveled and fenced, and 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 the fence and restoration would be at the discretion of the landowner.

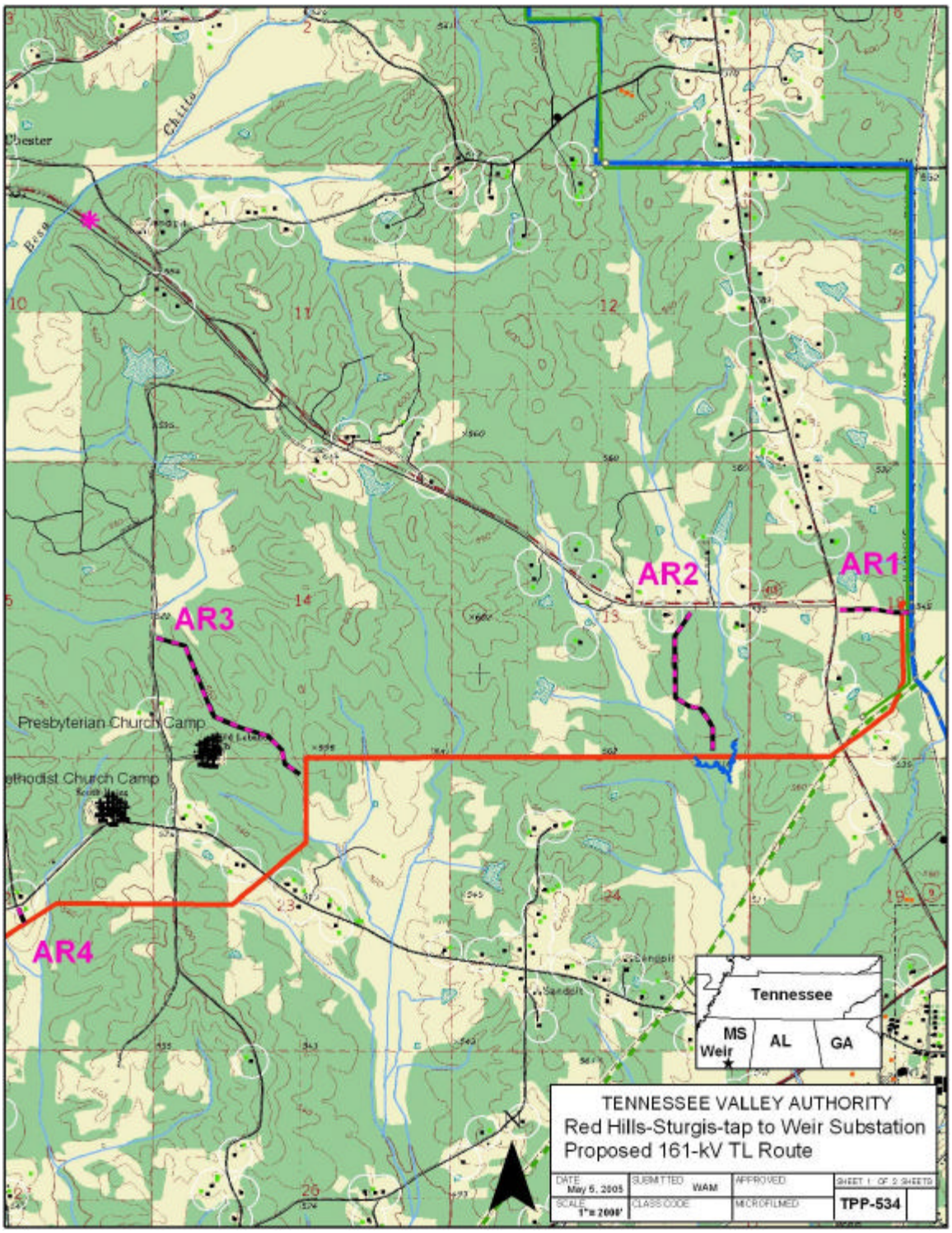

Figure 3. Red Hills-Sturgis Tap to Weir Substation Proposed 161-kV Transmission Line Route

Note: Access roads are labeled AR1 through AR6.

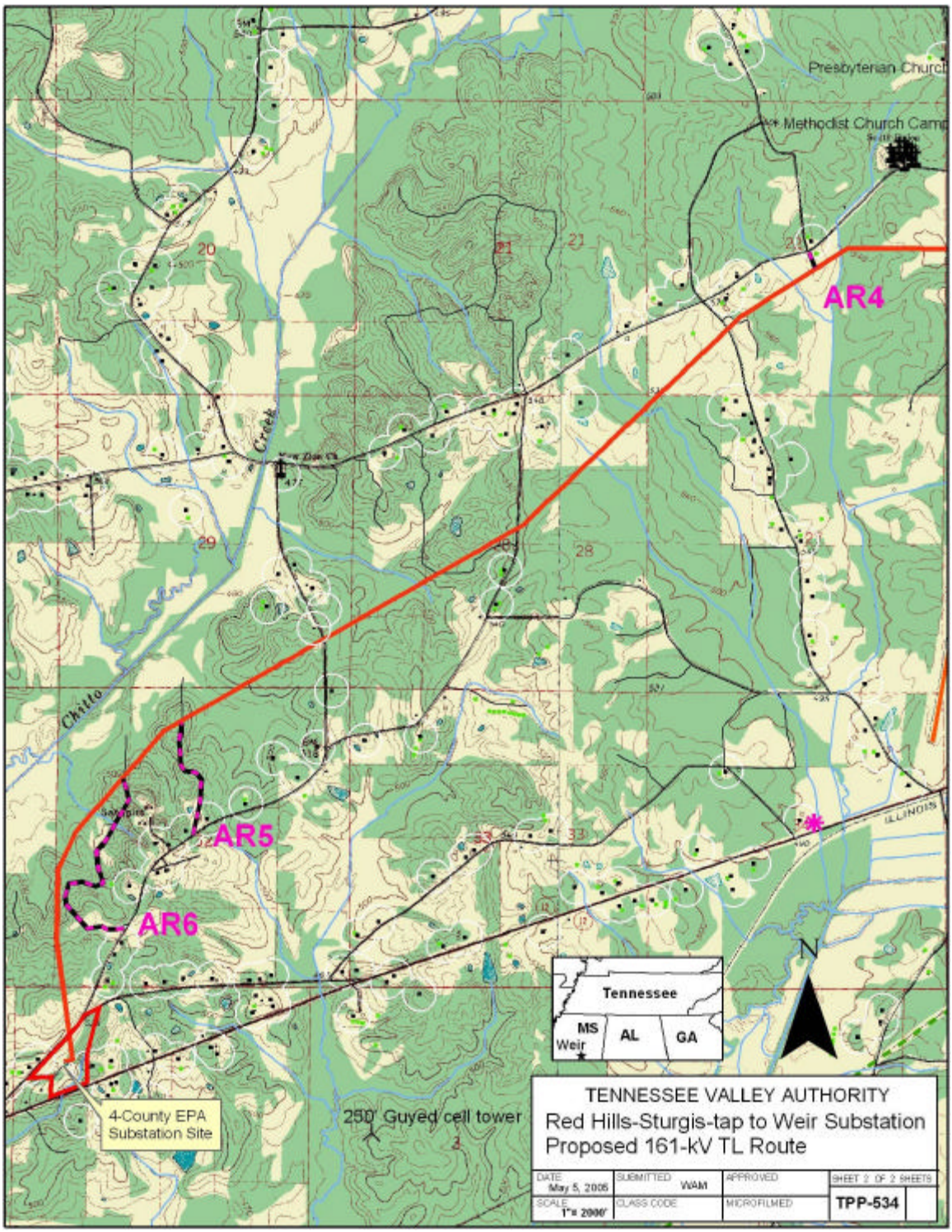

Figure 3 (cont.). Red Hills-Sturgis Tap to Weir Substation Proposed 161-kV Transmission Line Route

Note: Access roads are labeled AR1 through AR6.

2.3.1.4. Structures and Conductors

The proposed 161-kV transmission line would be constructed using mostly single steel-pole structures (see Figure 4). Structure heights would vary according to the terrain and would average between 65 and 120 feet. At river or highway crossings, taller poles may be used to meet clearance requirements.

Figure 4. Single Steel-Pole 161-kV Transmission Structure

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

Poles at angles in the transmission line may require supporting guy wires. 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. However, in some cases, gravel or a cement and gravel mixture might be necessary. Some structures may be self-supporting (nonguyed) poles fastened to a concrete foundation that is formed and poured into an excavated hole. The three tap point switches would be installed on each side of the tap point on the Red Hills-Sturgis No. 1 161-kV Transmission Line between existing Structures 53 and 55 and on the new tap line to the Weir Substation.

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.

2.3.1.5. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the right-of-way, and temporary clearance poles would be installed at road and railroad crossings to reduce interference with local traffic. Installation of conductors would begin with a small rope being pulled from structure to structure. This rope would then 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 special tensioning equipment would be used to pull conductors and ground wires to the proper tension. Finally, the wires would be clamped to the insulators, and the pulleys would be removed.

2.3.2. Operation and Maintenance

2.3.2.1. Inspection

Periodic inspections of TVA's transmission lines are performed from the ground and by aerial surveillance using a helicopter. These inspections, which occur on approximately five-year cycles after operation begins, are performed to locate damaged conductors, insulators, or structures and to report any abnormal conditions that might hamper the normal operation of the line or adversely impact the surrounding area. During these inspections, the condition of vegetation within and immediately adjacent to the right-of-way is noted. These observations are then used to plan corrective maintenance or routine vegetation management.

2.3.2.2. Vegetation Management

Management of vegetation along the right-of-way would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. The transmission line would be designed to meet a 24-foot minimum clearance as required by the National Electric Safety Code standards for 161-kV transmission lines.

Management of vegetation along the right-of-way would consist of two different activities, namely, the felling of danger trees adjacent to the cleared right-of-way (see Section 2.3.1.1) and the control of vegetation within the cleared right-of-way.

Management of vegetation within the cleared right-of-way would involve an integrated vegetation management approach designed to encourage low-growing plant species but discourage tall-growing plants. A vegetation reclearing plan would be developed for each transmission line segment based on the results of the periodic inspections described above. Given the land use in the area of this project, right-of-way maintenance is expected to be minimal. 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 right-of-way and mechanical mowing is not practical. Herbicides would be selectively applied from the ground with backpack sprayers or vehicle-mounted sprayers.

Herbicides would be applied in accordance with applicable state and federal laws and regulations and the commitments listed in this document. Only herbicides registered with the United States Environmental Protection Agency (USEPA) would be used. A list of the herbicides currently used by TVA in right-of-way management is presented in Appendix E. This list may change over time as new herbicides are developed or as new information on presently approved herbicides becomes available.

Other than vegetation management, only minor maintenance work would normally be required. The transmission line structures and other components typically last several decades. In the event that a structure must be replaced, it would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or in 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 there would be little, if any, additional area disturbance compared to the initial installation of the structure.

2.4. Project and Siting Alternatives

The process of siting the proposed transmission line adhered to the following basic steps used by TVA to determine a transmission line route:

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

2.4.1. Definition of Study Area

The first task in defining the study area was to identify the power sources that could supply the identified need. The most practical power source was the Red Hills-Sturgis No. 1 161-kV Transmission Line, which is located approximately 8 miles northeast of the planned substation. Based on this information, the study area was defined as an area in Choctaw County that is roughly triangular, bounded by the Red Hills Lignite Coal and Gas-Fired Power Generation Plants on the north, the town of Ackerman on the east, and the town of Weir on the southwest.

A geographic information system (GIS) based routing map and color orthophotography were developed. Using the GIS data and orthophotography, a “constraint” model was generated. The constraint model identified obvious routing conflicts or sensitive areas such as houses, rivers, historical sites, and wetlands (see Figure 2). Following is a brief description of other aspects of the study area:

- *Natural Features:* The study area is on land drained by the Besa Chitto Creek and Yockanookany River. Many area streams include mostly forested wetlands of significant extent. Biological sensitive areas other than the noted wetland habitat are known in the study area along SR 12 and at the Besa Chitto Creek near SR 415.

- *Cultural Features*: The study area included two historic church camps existing north of the county airport approximately in the center of the study area. Two large-scale hog lot operations exist in the study area. The only large-scale industrial property is located between SR 12 and the Yockanookany River.

- *Land Use*: The land use of this study area is mainly forest or pasture. Homes are scattered through the study area, primarily along the roads. Few, if any, concentrations of houses in subdivisions exist.

- *Transportation*: The major transportation route in the study area is SR 12. Other roads include Sanders Road, Cummings Road, Fentress Road, South Union Road, Airport Road, Bowie-Maddox Road, Burney Road, Lebanon Road, Stewart Road, and Robinson Road. The Choctaw County Airport is located near the center of the study area.

2.4.2. Data Collection

Geographic data, such as topography, land use, right-of-way information, transportation, environmental features, cultural resources, near-term future development, and land conservation information were collected for the entire study area. Analysis of the data was aided by using the GIS. This system allowed the multiple factors to be examined simultaneously to develop a route that would best meet project needs while avoiding or reducing potential environmental impacts.

Maps were created to show regional opportunities and constraints clearly. Source information included 1 inch equals 500 feet aerial photography, county tax maps/property boundaries, U.S. Geological Survey digital line graphs, digital elevation models, National Wetlands Inventory, and cultural resource data, among others. Aerial photography was 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 analyzed both manually and with GIS. Manual calculations from aerial photographs, tax maps, and other sources included the number of road crossings, stream crossings, and property parcels.

The siting team used GIS to analyze multiple factors when defining and comparing alternative route options. GIS displays and analyzes multiple layers of information simultaneously using geographically referenced digital information.

For this project, GIS data analysis included land cover, land use, and other data. A 1:100,000 GIS database was developed and used for regional opportunity and constraint analysis, while a 1:24,000 database was developed for more complex computations such as wetland acreage.

2.4.3. Develop General Route Options and Potential Routes

From the information gathered during the system's studies and data development phases, three tap point locations were identified on the Red Hills-Sturgis No. 1 Transmission Line. These locations were selected because they were the only locations where the existing transmission line could be reasonably accessed from public roads for switch operation without extensive access road construction. Tap 1 is outside of Red Hills Switching Station at the Red Hills Lignite Coal Power Generation Plant. Tap 2 is located southeast of the Red Hills Switching Station, and Tap 3 is just outside the town of Ackerman. Taps 2 and 3 would require improvements to existing access roads approximately 0.25 mile long for each location.

Fourteen alternative route segments were identified for study and analysis. These segments could be combined in various ways to make up to 10 different routes. They

ranged in length from 7.5 miles to 11.9 miles and averaged 8.7 miles (see Figure 2). All route alternatives were selected to take advantage of property edges and to avoid occupying road frontage property where homes might be developed. They avoid close proximity to homes and avoid or minimize wetland crossings. The Choctaw County Airport is located near the center of the study area, which forced all potential transmission line routes to cross either well north, or well south of the single runway to avoid intrusion into the glide zones. Route Segments 10 and 14 were planned to avoid potential airspace conflicts due to an expansion at the airport. Segments 7, 12, and 14 were located parallel to the Texas Eastern Gas pipeline.

2.4.4. Establish and Apply Siting Criteria

TVA has long employed a set of evaluation criteria that represent opportunities and constraints for development of transmission line routes. The criteria are oriented toward 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 right-of-way acquisition costs being the most important economic elements. Information gathered and comments made at the public meeting and during the subsequent comment period were also taken into account.

Each of the transmission line route options was evaluated according to these criteria relating to engineering, environmental, land use, and cultural concerns. Specific criteria are described below. For each category described, a higher score means a bigger constraint. 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 worse score.

- *Engineering Criteria*: Total length of the transmission route, length of new right-of-way and rebuilt right-of-way, primary and secondary road crossings, pipeline and transmission line crossings, and total line cost

- *Environmental Criteria*: Slopes greater than 30 percent (steeper slopes mean more potential for erosion and potential water quality impacts), slopes between 20 and 30 percent, visual aesthetics, forested areas, open water crossings, sensitive stream (those supporting endangered or threatened species) crossings, perennial and intermittent stream crossings, wetlands, rare species habitat, natural area crossings, and wildlife management areas

- *Land Use Criteria*: The number of fragmented property parcels, schools, houses, commercial or industrial buildings, barns, and parkland crossings

- *Cultural Criteria*: Archaeological and historic sites, churches, and cemeteries

Scores for each of the options were calculated by adding individual criterion values for each transmission line route. The resulting sum values were evaluated using standard statistical techniques and were assigned a ranking from 1 to 4 for each route in each subcategory (engineering, environmental, land use, and cultural).

A weighted score was produced for each transmission line route in each subcategory. This made it possible to understand which routes would have the lowest and highest impacts on

engineering, environmental, land use, and cultural resources. Finally, to determine total impacts, the scores from each category were combined for an overall score.

2.4.5. Route Evaluation and Identification

After the public information day and landowner comments were received and incorporated into the decision process, routes were modified taking into account this public input. Minor modifications were made to the routes with exception to three section changes. The first change involved moving the tap point of Section 7 to avoid a wetland identified during a field visit, improve reliable operation of switches, and improve accessibility to switches. The second change involved relocating Sections 7, 8, and 9 to accommodate the new tap point, minimize the distance the proposed transmission line would parallel the existing Texas Eastern Gas line, and resolve landowner objections. The revised Section 7 started with the tap point about 0.25 mile north of original proposed tap and parallels existing transmission line southward to cross a major gas pipeline, then proceeds west alongside the pipeline for 0.3 mile to cross SR 9. The transmission line continues westward 1.8 miles along property boundaries between property Sections 13 and 24, well north of South Union Road and the original transmission line Sections 8 and 9, to meet Section 6.

The routes were reevaluated, and a new weighted score was produced for each route. The 10 possible routes include the following segments: Route 1 (1, 5, 13); Route 2 (1, 6, 10, 13); Route 3 (1, 6, 9, 11, 14); Route 4 (2, 3, 5, 13); Route 5 (2, 3, 6, 10, 13); Route 6 (2, 4, 9, 10, 13); Route 7 (2, 4, 11, 14); Route 8 (7, 8, 9, 6, 10, 13); Route 9 (7, 8 11, 14); and Route 10 (7, 12, 14). With the exception of Routes 4, 5, and 8, all possible routes were greater than 8 miles in length. Route 8, which was 7.74 miles long, was the shortest. In addition, Route 8 was the only route that did not cross any of Red Hills Lignite Mining Company's proposed mine areas. Route 8 would require fewer access roads for constructing the transmission line than the other routes. Route 8 was rated as having the best overall scoring than any of the other routes. Also, public participation showed the most support for this option.

Additional minor modifications of Route 8 provided even better overall scoring. These slight adjustments occurred along Sections 10 and 13 to avoid the vicinity of two historic church camp areas and avoid airspace conflicts with potential airport expansion.

2.5. The Preferred Alternative

TVA's preferred alternative for this proposed project is Alternative B – Construct 161-kV Transmission Line. Under this alternative, TVA would build a 161-kV transmission line to the planned Weir Substation using Route 8, which is TVA's preferred route option.

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CHAPTER 3

3. AFFECTED ENVIRONMENT

Chapter 3 contains a description of the current condition of the proposed project area. Various environmental amenities are described below.

3.1. Visual Quality

Visual 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 transmission line route would begin north of the town of Ackerman, Mississippi, along the existing Red Hills–Sturgis Transmission Line. From this point, the route would travel west approximately 7.7 miles, ending near the intersection of SR 12 and SR 407, just north of the town of Weir, Mississippi. Visual resources along the proposed route from the tap point near Ackerman to the terminus near Weir were examined. Along the route, the scenic attractiveness is common, and the scenic integrity is moderate to low.

The tap area is located just over a mile north of SR 12 between SR 9 and SR 15, which are both north/south highways. The average daily traffic on SR 9 is 3,300 to 3,500 vehicles (Mississippi Department of Transportation, 2005). Existing views include mature forests, agricultural operations, small farmsteads, existing transmission and distribution lines, sparsely scattered residences, and other elements typical of the rural Mississippi countryside. Mature pine and hardwood stands are distinctly visible and frame foreground views (those within 0.5 mile of the observer). The topography is gently rolling as the proposed route follows the existing transmission line for a short distance south before reaching an existing gas pipeline right-of-way and assuming a similar route to the southwest and crossing SR 9.

The proposed transmission line corridor would follow pipeline right-of-way only briefly after crossing SR 9 before taking a westward course for almost 2 miles through mature vegetation, pine forest, and over the Yockanookany River and two unnamed creeks. The corridor would leave the gently rolling forested topography and skirt pastureland for almost 0.5 mile as it nears Lebanon Road. Here, views open from South Union Road in the foreground- and middleground- (i.e., 0.5 mile to 4 miles from the observer) viewing distances. As the corridor reaches the distant corner of the pasture, with barns and outbuildings visible against the pine plantation background, the route would turn south and continue to follow the edges of the pasture before turning southwest and perpendicular to South Union Road. Here, the proposed line would be within the foreground-viewing distance of several residences at the roadway crossing.

Upon crossing the roadway, the proposed corridor would resume a westerly course and cross south Lebanon Road, an unimproved gravel roadway. Vegetation is dense along this portion of the route and consists primarily of young pine plantations. The topography within this section continues to be moderate. The route would then near South Union Road and turn southwest, paralleling the roadway for approximately 2.5

miles, crossing over pastures and agricultural fields, woods roads, young growth pine plantations, unnamed creeks, and south Steward and Fentress Roads.

As the proposed corridor reaches Weir-Salem Road and draws within the foreground of Besa Chitto Creek, it would take a southerly course along ridge points. Pine forests are prevalent within this section, and cutover areas are interspersed with some mature hardwoods in the area. Views are generally confined to the foreground- and middleground-viewing distances, as vegetation and the moderate topography preclude views into the background (4 miles and beyond from the observer). As the proposed route crosses the Weir-Salem Road a second time and nears the distributor substation terminus, the topography and vegetation moderate. In this area, views are mainly of sparsely scattered residences along the roadway.

3.2. Animal Life

3.2.1. Common Animal Life

Habitats within the project area are highly fragmented and diverse. Much of the proposed right-of-way consists of hardwood and pine-dominated forests of various ages interspersed among a mixture of agricultural, urban/residential development, pine woodlands, and old-field/early successional habitats (see Section 3.3). This mixture of habitat types results in a corresponding diverse community of wildlife in the area.

A diverse bird community was observed in the project during field investigations. Twenty-six species of birds were observed along the proposed right-of-way, including red-shouldered hawk, red-bellied woodpecker, American crow, blue jay, Carolina wren, Carolina chickadee, eastern towhee, and brown-headed cowbird. Scarlet tanager and pileated woodpecker, which typically occur in forest interiors, were also observed. Mammals common to the area include coyote, raccoon, white-tailed deer, opossum, and armadillo. Reptiles and amphibians found in this habitat include three-toed box turtles, indigo snakes, pine snakes, milksnakes, American toad, gray treefrogs, green anole, and fence lizard.

Four forested wetlands (see Section 3.8) and 10 perennial streams exist in the project area. These areas provide potential habitat for green frog, southern leopard frog, southern cricket frog, and western cottonmouth. Streams may also provide habitat for marbled, red, and southern two-lined salamanders.

3.2.2. Endangered and Threatened Terrestrial Animals

Results of field investigations in 2005 indicated the presence of listed species in the project area. Review of the TVA Natural Heritage database indicated that one animal species with both federal and state status (the red-cockaded woodpecker) has been reported from Attala and Choctaw Counties, Mississippi (see Table 1). An additional six species known to occur in these counties are considered uncommon and are tracked by the Mississippi Natural Heritage Program, but they do not have official status in the state.

Table 1. Federally Listed and State-Listed Terrestrial Animals Reported From Attala and Choctaw Counties, Mississippi

Common Name	Scientific Name	Status	
		Federal	State
Webster's salamander	*Plethodon websteri*	-	Tracked but not listed
Red salamander	*Pseudotriton ruber*	-	Tracked but not listed
Alligator	*Alligator mississippiensis*	-	Tracked but not listed
Cooper's hawk	*Accipiter cooperii*	-	Tracked but not listed
Sharp-shinned hawk	*Accipiter striatus*	-	Tracked but not listed
Osprey	*Pandion haliaetus*	-	Tracked but not listed
Red-cockaded woodpecker	*Picoides borealis*	Endangered	Endangered

Webster's salamanders inhabit mesic deciduous forests. This species does not occur in pine plantations or pine-dominated woodlands. A single population is known from Choctaw County, but there is no habitat for this species in the proposed transmission line corridor.

Red salamanders are typically found near small headwater streams, seepages, and spring-fed bogs (Petranka, 1998). Some habitat for this species is present along the proposed transmission line route.

Alligators live primarily in freshwater swamps and marshes, but also occur in rivers, lakes, and small bodies of water. The project area is considered to be outside the main range of this species, and there is no suitable habitat for this species in the proposed transmission line corridor.

Cooper's hawks are known to nest in rural woodlots, urban cemeteries, wooded urban parks, suburban areas, and near the edge of more extensive forests (Nicholson, 1997). There is potential habitat for this species along the proposed transmission line route.

Sharp-shinned hawks inhabit pine and pine/hardwood forests. This hawk has a strong preference for nesting in pine trees (Wiggers and Kritz, 1991). There is potential habitat for this species along the proposed transmission line route.

Ospreys nest on both manmade and natural structures in or near large bodies of water. No suitable habitat for this species exists within the project area.

Red-cockaded woodpeckers inhabit old growth pine forests with an open understory. Most of the pine woodlands in the project area do not fit the criteria for red-cockaded woodpecker habitat. The closest known red-cockaded woodpecker colony is approximately 4.5 miles from the proposed transmission line route.

3.3. Plant Life

3.3.1. Common Plant Life

The project area lies within the Southeastern Mixed Forest Province (Bailey, 1995). Native forests in this region are characterized by mixtures of pines, oaks, and hickories. Although the historic forests were probably dominated by hardwoods, second-growth stands in this region are usually dominated by loblolly pine.

Plant communities along the proposed project route were grouped into six broad categories including pine forests, mesic hardwood forests, early successional habitats (managed pastures, old fields, and rights-of-way), stream and associated wetlands, bottomland hardwood forests, and kudzu. Appendix F contains a detailed list of common and representative plant species observed in the project area, along with a notation of the plant community in which each species was most frequently observed.

Pine-dominated forests cover about 65 percent of the proposed project route. Most of these forests are pine plantations, which are heavily dominated by loblolly pine. However, some areas are natural stands. Hardwood and herbaceous species in pine-dominated forests in the project area are similar to those found in mesic and bottomland hardwood forests.

Mesic hardwood forests on slopes and hilltops cover about 17 percent of the project route. Canopy tree species in these forests include American beech, eastern red cedar, loblolly pine, post oak, tulip tree, water oak, white oak, and winged elm. Typical understory trees and shrubs include American beauty-berry, Chinese privet, deerberry, eastern redbud, flowering dogwood, and sparkleberry. Common understory vines include common greenbrier, Japanese honeysuckle, saw greenbrier, Virginia creeper, and yellow jessamine. Herbaceous vegetation is limited in this community, but includes bracken fern, Cherokee sedge, slender spikegrass, variable witchgrass, and Virginia wild rye.

Early successional habitats occupy about 11 percent of the proposed power line route. Managed pastures and rights-of-way are prevalent, but old-field habitats are also present. Managed pastures in the project area are heavily dominated by Bahiagrass and tall fescue. Additional grass species present include annual ryegrass, Bermudagrass, field paspalum, Johnson grass, southern carpetgrass, and vaseygrass. Other plant species within this vegetation type include Brazilian vervain, Canada horseweed, dotted smartweed, small dog-fennel, thoroughwort, Virginia buttonweed, and woolly croton.

Existing rights-of-way comprise a small portion of the project area (0.02 percent). Sapling species in these areas are similar to those found in surrounding forests. Common grass species include big bluestem, broomsedge, knotroot bristlegrass, little bluestem, and vaseygrass. Other representative species include annual sumpweed, blackeyed Susan, bush aster, Canada goldenrod, Chinese bush clover, eastern falsewillow, hairy elephantfoot, late-flowering thoroughwort, peppervine, serrate-leaf blackberry, southern dewberry, trumpet creeper, and winged sumac.

A small portion of the project route was clear cut within the past 5 years, and the present vegetation in these areas is similar to that in rights-of-way. Areas that were clear cut 5 to 15 years ago are now covered by young pine or hardwood forest. Tree species in

these older clear-cut areas are similar to those in older forest communities in the project area.

Streams and associated wetland areas make up a small portion (about 3.6 percent) of the project route. Plant species typical of these areas include American potato-bean, black willow, blunt spikerush, broom panicgrass, cinnamon fern, climbing hempweed, common boneset, common buttonbush, giant cane, marshpepper smartweed, rice cutgrass, royal fern, sensitive fern, shallow sedge, small-spike falsenettle, soft rush, subartic lady fern, sugar cane plumegrass, sweetbay magnolia, and woolgrass.

Bottomland hardwood forests in the project area are typically limited to narrow strips along streams and occupy about 2.4 percent of the proposed right-of-way. Common forest canopy species include American elm, black gum, box elder, cherrybark oak, green ash, pecan, red maple, southern shagbark hickory, sugarberry, swamp chestnut oak, sweet gum, sweet pignut hickory, water oak, and willow oak. Characteristic understory trees and shrubs include American holly, American hornbeam, Chinese privet, deciduous holly, Elliott blueberry, giant cane, roughleaf dogwood, and southern bayberry. Typical understory vines include common greenbrier, crossvine, muscadine grape, peppervine, poison ivy, redvine, and trumpet creeper. Herbaceous vegetation is limited, but includes Indian sea oats, partridgeberry, Virginia dayflower, and whitegrass.

Kudzu, an invasive species, occurs in dense patches in the project area, so it has been listed here as a separate community. Typically, this community occurs in early successional or disturbed areas and is frequently found on the edges of pine forest communities.

The plant communities observed along the proposed project route are common and representative of the region. No uncommon plant communities were observed on the proposed project route.

3.3.2. Invasive Terrestrial Plants

Kudzu, which is listed as a noxious weed in Mississippi, presently covers about 1 percent of the project area. One population of kudzu was found at the proposed substation site adjacent to SR 12. This population is located around a burned homesite and extends into adjacent young pine forest.

Other invasive exotic plant species encountered along the proposed route include Johnson grass, Chinaberry tree, Chinese privet, Chinese bushclover, and Japanese honeysuckle. These species can adversely affect native plant communities because of their ability to spread rapidly and displace native vegetation.

3.3.3. Endangered and Threatened Plants

Review of the Mississippi Natural Heritage Program database indicated that there are no federally listed endangered or threatened plant species known from Attala and Choctaw Counties. However, there are historical records of 19 state-listed plant species known from these two counties. These species are listed in Table 2.

Table 2. Rare and Uncommon Plants Reported From Attala and Choctaw Counties

Common Name	Scientific Name	State Rank[1]
American bladdernut	*Staphylea trifolia*	S3
American ginseng	*Panax quinquefolius*	S3
Carolina anglepod	*Matalea carolinensis*	S3
Crested coralroot	*Hexalectris spicata*	S2
Crested fringed orchid	*Platanthera cristata*	S3
Green fringed orchid	*Platanthera lacera*	S1S2
Hairy woodrush	*Luzula acuminata*	S3
Heartleaf foamflower	*Tiarella cordifolia*	S2
Lesser ladies'-tresses	*Spiranthes ovalis*	S2S3
Narrow-leaf fever root	*Triosteum angustifolium*	S3
Odorless mock orange	*Philadelphus inodorus*	S2
Purple fringeless orchid	*Platanthera peramoena*	S2S3
Scarlet woodbine	*Schisandra glabra*	S3?
Square-stem monkey flower	*Mimulus ringens*	S1S2
Swamp hickory	*Carya leiodermis*	S2S3
Turk's-cap lily	*Lilium superbum*	S3S4
Virginia bunchflower	*Melanthium virginicum*	S2S3
White turtlehead	*Chelone glabra*	S3
Yellow lady's-slipper	*Cypripedium pubescens*	S2S3

[1]S1 indicates critically imperiled in Mississippi with 5 or fewer occurrences; S2 indicates imperiled with 6 to 20 occurrences; S3 indicates rare or uncommon with 21 to 100 occurrences; S4 indicates widespread, abundant, and apparently secure with more than 101 occurrences; and S5 indicates demonstrably widespread, abundant, and secure.

Plant species listed as rare in the state of Mississippi are not assigned an official state status, such as "endangered" or "threatened." Instead, the Mississippi Natural Heritage Program uses a system developed by The Nature Conservancy to indicate the relative rarity of state-listed species. According to this system, five of the species listed in Table 2 are considered "imperiled" or "critically imperiled" in Mississippi.

Field surveys for rare plant species were conducted throughout the proposed right-of-way during the summer of 2005. No rare plant species were observed in the project area.

3.4. Aquatic Biology

3.4.1. Common Aquatic Species

Biological samples were taken at two sites on Besa Chitto Creek in the vicinity of the proposed transmission line during preparation of the Red Hills Power Project EIS (TVA, 1998). Streams were generally forested and had clay and sand substrates. Sampling was hampered at the Stewart Road site by beaver dams, deep water, and copperhead snakes. Twenty-two fish species were collected at the two sites sampled in 1997 (Table 3), indicating a diverse, well-populated fish community, considering the small size of this headwater stream. Furthermore, 60 benthic macroinvertebrate taxa, including 8 EPT taxa, were found during the surveys (TVA, 1998).

Table 3. Fish Species Observed at Two Sites in Besa Chitto Creek, 1997

Common Name	Scientific Name	Observation Site	
		State Route 9[1]	Stewart Road[2]
Striped shiner	*Luxilus chrysocephalus*	0	1
Cherryfin shiner	*Lythrurus roseipinnis*	202	0
Golden shiner	*Notemigonus crysoleucas*	17	1
Pugnose minnow	*Opsopoeodus emiliae*	2	0
Bluntnose minnow	*Pimephales notatus*	16	0
Creek chub	*Semotilus atromaculatus*	5	0
Creek chubsucker	*Erimyzon oblongus*	7	1
Black bullhead	*Ameiurus melas*	0	1
Yellow bullhead	*Ameiurus natalis*	1	1
Pirate perch	*Aphrododerus sayanus*	1	0
Blackspotted topminnow	*Fundulus olivaceus*	22	0
Mosquitofish	*Gambusia affinis*	1	1
Banded pygmy sunfish	*Elassoma zonatum*	1	0
Green sunfish	*Lepomis cyanellus*	9	0
Warmouth	*Lepomis gulosus*	2	0
Bluegill	*Lepomis macrochirus*	15	0
Dollar sunfish	*Lepomis marginatus*	10	1
Longear sunfish	*Lepomis megalotis*	17	1
Redear sunfish	*Lepomis microlophus*	2	0
Bluntnose darter	*Etheostoma chlorosomum*	34	6
Cypress darter	*Etheostoma proeliare*	16	2
Gulf darter	*Etheostoma swaini*	9	0

Source: TVA, 1998

[1] Sampled on April 1, 1997
[2] Sampled on April 8, 1997

Based upon watercourse classifications and on the slope of the surrounding landscape, SMZs were assigned in the field based on guidance in Muncy, 1999.

3.4.2. Endangered and Threatened Aquatic Species

Review of the TVA Natural Heritage database indicated that four state-listed aquatic animal species (see Table 4) are known to occur within 10 miles of the proposed transmission line route in Choctaw County, Mississippi.

Table 4. Sensitive Aquatic Animal Species Known to Occur Within 10 Miles of the Proposed Transmission Line Route

Common Name	Scientific Name	Status	
		Federal	State[1]
(A crayfish, no common name)	*Hobbseus prominens*	-	NOST
Choctaw rivulet crayfish	*Hobbseus valleculus*	-	NOST
Round hickorynut (mussel)	*Obovaria subrotunda*	-	NOST
Alabama hickorynut (mussel)	*Obovaria unicolor*	-	NOST

[1]NOST = No legal status, but species is tracked by the Mississippi Natural Heritage Program

Hobbseus prominens, a rare crayfish, is known to occur only in the Noxubee River drainage (NatureServe, 2005), but there is little information available on its distribution or habitat preferences. Records from the Mississippi Natural Heritage Program indicate that this crayfish occurs in tributaries of the Noxubee River that lie within a mile of streams in the Pearl River drainage. Because crayfish can migrate over land, this species may also occur in tributaries of the Pearl River, including streams that cross the right-of-way of the proposed transmission line.

The Choctaw rivulet crayfish is only known from a few locations in the Pearl River drainage in Attala and Choctaw Counties, Mississippi. It prefers shallow streams with sluggish to moderate flow, silty substrate, and emergent vegetation (NatureServe, 2005). During the field survey, potential habitat for this species was identified either within the right-of-way or immediately downstream. Thus, this crayfish may occur within the project area.

The round hickorynut, a mussel, is known to occur in the Pearl and Yazoo River drainages (NatureServe, 2005). It is most often found in medium to large rivers with moderate flow and a sand and gravel substrate (Parmalee and Bogan, 1998). This species is never reported to be abundant, even in areas where the population is considered stable. No suitable habitat for this species was identified within the project area. However, occurrence records for this species indicate that it occurs downstream of several locations where streams cross the proposed transmission line right-of-way.

According to NatureServe (2005), the Alabama hickorynut no longer occurs within large portions of its historic range and is currently found only in large streams of the Western Mobile Basin. However, the Mississippi Natural Heritage Program database has recent records of this mussel occurring in the Pearl River drainage (Mississippi Museum of Natural Science, 2005). It is most often found in sand and gravel substrates in moderately flowing water (NatureServe, 2005). No suitable habitat for this species was identified within the project area; however, occurrence records for this species indicate that it occurs downstream of several locations where streams cross the right-of-way.

3.5. Natural Areas

Review of the TVA Natural Heritage database indicated that the proposed transmission line is not within or immediately adjacent to any managed areas or ecologically significant sites. However, the proposed transmission line is within 3 miles of four such areas. These include Elmer E. Mabus Memorial Natural Area and the Mabus Family Natural Area, two privately owned, relatively undisturbed forested areas that are 1.9 miles and 2.1 miles northeast of the proposed work, respectively. The Choctaw State Wildlife Management Area, managed by the Mississippi Game and Fish Commission for wildlife hunting, is a 24,000-acre area within the Tombigbee National Forest. The Choctaw State Wildlife Management Area is 2.5 miles east of the proposed work. The Tombigbee National Forest is a 119,155-acre area managed by the U.S. Forest Service for multiple purposes including forest products, recreation, and water quality. It is located about 2.5 miles from the proposed work. No Nationwide Rivers Inventory (NRI) streams are within 3 miles of the proposed transmission line.

3.6. Recreation

There are two church camps within 0.5 mile of the proposed transmission line corridor. The town of Weir is approximately a mile from the corridor. These offer organized recreational activities. Otherwise, recreation in the project area is informal and dispersed. Primary activities include hunting and wildlife observation and occur primarily on privately owned land.

3.7. Surface Water

Precipitation in the project area averages about 59 inches per year. The wettest month is March, which averages 6.4 inches of precipitation, and the driest month is October with 3.3 inches. The average annual air temperature is 63 degrees Fahrenheit (°F). Temperatures range from a monthly average of 43°F in January to 81°F in July. Stream flow varies with rainfall and averages about 20 inches of runoff per year. The average annual flow of the Pearl River at Carthage, Mississippi, is 1,982 cubic feet per second (cfs) or 1.47 cfs per square mile of drainage area.

Surface water in the project area drains to the Yockanookany River and its tributary, Besa Chitto Creek, in the Pearl River Basin. The two receiving streams are classified by the Mississippi Department of Environmental Quality for fish and wildlife. The Yockanookany River (in Attala and Leake Counties downstream of the project area) is on the state 303 (d) list due to impaired aquatic life from nutrients, organic enrichment/low dissolved oxygen, pesticides, and sediment/siltation.

Field surveys conducted from September 7 to September 8, 2005, identified a total of 35 watercourses along the route of the proposed transmission line. Ten of these watercourses are perennial, two are intermittent, and twenty-three are wet-weather conveyances (see Table 5). Most stream crossings are associated with the Besa Chitto Creek of the Yockanookany watershed. These small, headwater streams occur in the northernmost section of the Upper Pearl watershed, a watershed typified by slow-flowing, meandering streams that are sourced from predominantly agricultural or forested landscapes.

Table 5. Stream Crossings Along the Proposed Weir 161-kV Transmission Line

Stream Label[1]	Stream Classification	Streamside Management Zone Classification	Latitude	Longitude	Description
AS1	PER	A (50 feet)	33.32928	89.19327	Channel 12 feet wide; banks 7 feet high, undercut; water flowing, approximately 8 inches deep; sand substrate
AS2	WWC	BMPs	not recorded	not recorded	Drains into AS1 in right-of-way; channel 3 feet high; banks 2 feet
AS3	WWC	BMPs	not recorded	not recorded	Dry channel, 4.5 feet wide; banks 3 feet high
AS4	PER	A (50 feet)	33.3293	89.20982	Channel 8 feet wide; water flowing, 3 inches deep; forested
AS5	WWC	BMPs	not recorded	not recorded	Just east of STA 119+27.04; channel 6 feet wide
AS6	WWC	BMPs	not recorded	not recorded	Flows along right-of-way, eastward toward AS5
AS7	WWC	BMPs	not recorded	not recorded	Between access point of AR3 and AS8
AS8	WWC	BMPs	33.32642	89.2189	Dry channel, 8 feet wide; banks 3 feet high, eroding
AS9	PER	A (50 feet)	33.32573	89.2189	Channel, 8 feet wide; water flowing, 6 inches deep; banks 3 feet high
AS10	INT	A (50 feet)	33.32238	89.22275	Channel, 2-7 feet wide; banks 4.5 feet high; pool 6 inches deep
AS11	WWC	BMPs	33.32198	89.22508	Undefined channel, approximately 2 feet wide; banks 2 feet high
AS12	WWC	BMPs	33.32205	89.22928	Dry channel, 2 feet wide; banks 1 foot high, stable
AS13	PER	A (50 feet)	33.32127	89.23357	Banks 5 feet high, steep, eroding; water flowing, 2 inches deep; substrate sand, pebble

Stream Label[1]	Stream Classification	Streamside Management Zone Classification	Latitude	Longitude	Description
AS14	PER (pond)	A (50 feet)	33.32005	89.23643	In horse pasture; recently constructed; banks unvegetated, eroding
AS15	PER (pond)	A (50 feet)	33.31603	89.24273	Pond approximately 110 feet across, within right-of-way, but does not intersect centerline
AS16	INT	A (50 feet)	33.31458	89.24437	Channel 5 feet wide; banks 1.5 feet high, eroding; water 1 inch deep, slowly flowing
AS17	WWC	BMPs	33.3139	89.24518	Dry channel, 1 foot wide; banks 8 feet high, stable; forested; substrate clay/sand
AS18	WWC	BMPs	33.31383	89.24522	Dry channel, 3 feet wide; banks 6 inches high, stable
AS19	WWC	BMPs	33.3115	89.24818	Dry channel, 5 feet wide; banks 8 inches high, stable
AS20	WWC	BMPs	33.311	89.2487	Dry channel, 3 feet wide; banks 10 inches high, stable; forested
AS21	WWC	BMPs	33.31058	89.24935	Dry channel, 2 feet wide; banks 1 foot high, stable; parallels right-of-way before confluence with AS21
AS22	WWC	BMPs	33.30998	89.24993	Dry channel, 1 foot wide; banks 8 inches high, stable; parallels centerline
AS23	PER	A (50 feet)	33.30542	89.25832	Channel 3 feet wide; banks 2 feet high, eroding; water 4 inches deep; substrate silt/sand/pebble
AS24	WWC	BMPs	33.30512	89.259	Dry channel, 4 feet wide; banks 1.5 feet high, mildly eroding
AS25	WWC	BMPs	33.30512	89.25917	Dry channel, 6 feet wide; banks 3 feet high, stable
AS26	WWC	BMPs	33.30438	89.26093	Dry channel, 6 feet wide; banks 4 feet high, eroding
AS27	PER	A (50 feet)	33.2999	89.27058	Channel 9 feet wide; banks 5 feet high, undercut, eroding; water 6 inches deep, flowing; substrate clay

Stream Label[1]	Stream Classification	Streamside Management Zone Classification	Latitude	Longitude	Description
AS28	PER	A (50 feet)	33.2974	89.2743	Channel 3 feet wide; banks 1 foot high, eroding; water 2 inches deep, flowing; substrate sand
AS29	WWC	BMPs	33.29653	89.27513	Dry channel, 4 feet wide; banks 1.5 feet high, stable
AS30	WWC	BMPs	33.29642	89.27525	Dry channel, 1.5 feet wide; banks 2 feet high, mild erosion
AS31A	WWC	BMPs	33.29558	89.27602	Dry channel, 2 feet wide; banks 4 feet high; erosion gully with right-of-way
AS31B			33.2954	89.27638	Dry channel, 2 feet wide; banks 4 feet high; erosion gully with right-of-way
AS32	WWC	BMPs	33.29173	89.27915	Dry channel, 6 feet wide; banks gradually sloping, undefined
AS33A	WWC	BMPs	33.28655	89.27927	Dry channel, 4 feet wide; banks 8 feet high, steep, eroding; channel flows within right-of-way
AS33B			33.28602	89.2792	Continuation of 33A
AS34	WWC	BMPs	33.28365	89.27892	Dry channel, 4 feet wide; banks 2 feet high, steep, eroding
AS35	PER (pond)	A (50 feet)	33.28125	89.27805	Approximately 1/6 acre in size; banks 1 foot high, stable

[1] Streams labels are arranged in the order streams were encountered starting at the Red Hills–Sturgis Tap Point and ending at the proposed Weir Substation.

Abbreviations

BMPs = Best Management Practices
PER = Permanent
INT = Intermittent
WWC = Wet-Weather Conveyance

3.8. Wetlands

Wetlands are relatively scarce in the immediate project area due to locally hilly terrain. Wetlands observed in the project area were generally associated with streams and the headwaters of streams.

Wetland determinations were performed according to USACE standards, which require documentation of wet site vegetation, soil conditions, and wetland hydrology (Environmental Laboratory, 1987; Reed, 1997). Broader definitions of wetlands such as the definition used by the U.S. Fish and Wildlife Service (Cowardin et al., 1979) were also considered in this review.

Four wetlands totaling 2.19 acres were identified in the proposed transmission line right-of-way (see Table 6). All of these wetlands are palustrine forested wetlands (Cowardin et al., 1979), and all meet the USACE criteria for jurisdictional wetlands, which may be regulated under the Clean Water Act.

Table 6. Wetlands on the Proposed Transmission Line Route

Wetland ID Number	Type[1]	Estimated Acreage[2]	TVARAM Score	TVARAM Category
WJB01	PFO1	0.16	56	2
WJB02	PFO1	0.70	36	2
WJB03	PFO1	0.55	29	1
WJB04	PFO4	0.78	38	2

[1]According to Cowardin et al. (1979)
[2]Represents only the wetland acreage within the proposed right-of-way. Each of these wetlands extends beyond the proposed right-of-way boundaries.
PF = Palustrine Forested
TVARAM = Tennessee Valley Authority Rapid Assessment Method

TVA has developed a version of the *Ohio Rapid Assessment Method* (Mack, 2001) for the TVA region. This method, called TVARAM can be used to assess wetland condition and to identify wetlands with special ecological significance. TVARAM can also aid in guiding wetland mitigation decisions consistent with TVA's independent responsibilities under the National Environmental Policy Act (NEPA) and the Wetlands Executive Order (EO 11990). All of the wetlands identified in the proposed right-of-way were evaluated with the TVARAM.

The following three categories of wetlands are identified under TVARAM:

- Category 1 wetlands are described as "limited quality waters." They are resources that have been degraded, have limited potential for restoration, or are of 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 could be restored. Avoidance and minimization are the first lines of mitigation.

- Category 3 generally includes wetlands of very high quality and wetlands that are of regional or statewide concern, such as wetlands that provide habitat for threatened or endangered species. All practicable attempts would be made to avoid any disturbance of Category 3 wetlands and their buffer zones.

3.9. Groundwater

The project area is underlain by the Mississippi embayment aquifer system and the Southeastern Plain aquifer system and is located in the Coastal Plain Physiographic Province. Geologic units of the aquifer system range from Late Cretaceous to Middle Eocene in age. The Mississippi embayment aquifer system is divided into nine hydrogeologic units (i.e., six regional aquifers and three regional confining units). Confining units (or layers) are typically layers of impermeable material such as clay or shale that block the movement of groundwater. Thick clay and shale confining units separate some parts of the aquifer system into distinct aquifers that are mostly homogeneous sand.

Two of the nine hydrogeologic units that make up the Mississippi embayment aquifer system are exposed at the surface within the project area. These are Middle Wilcox and Lower Wilcox. Gravity is the principal driving force for groundwater movement within the Mississippi embayment aquifer system.

In the project area, the Mississippi embayment aquifer system is underlain by the Southeastern Plain aquifer system, which consists of one unit, the Black Warrior River aquifer. The Black Warrior River aquifer is made up of layers of sand, gravel, silt, and clay from different sources. The Black Warrior River aquifer includes unnamed water-yielding rocks of Early Cretaceous age and the Tuscaloosa Group and the Coffee Sand of Late Cretaceous age. The Black Warrior River aquifer is confined by a thick sequence of clay and marl of the Selma Group, which effectively separates it from overlying rocks of the Mississippi embayment aquifer system (Renken, 1998).

Groundwater is abundant throughout Mississippi. In the project area, public and private wells pump water from several aquifers. Deep wells are used to supply public water systems from deeper aquifers, while private wells are usually cased in shallow aquifers. Contamination of groundwater can occur when contaminants such as pesticides and fertilizers from agriculture runoff seep into an aquifer. Most public water sources are protected from contamination due to the depth of the wells, which are naturally protected by overlying clay (confining) layers. Groundwater is the primary source for public water supply for Choctaw County (USEPA, 2005).

3.10. Floodplains

The proposed transmission line right-of-way crosses several floodplain areas in Choctaw County, Mississippi. Consistent with EO 11988, an overhead transmission line and related support structures are considered a repetitive action in the 100-year floodplain.

Based on the route maps, access road AR6 crosses a small stream. Any necessary improvements to the road would be done in such a manner that upstream flood elevations would not be increased. The proposed Weir Substation would be located outside of the 100-year floodplain.

3.11. Cultural Resources

Central Mississippi has been the location of human occupation for over 12,000 years. The prehistory and history of the area is generally divided into six broad periods: Paleo-Indian (10,000-8000 B.C.), Archaic (8000-1000 B.C.), Gulf Formational Period (1100-300 B.C.), Woodland (300 B.C.-900 A.D.), Mississippian (1000-1700 A.D.), and Historic (1700 A.D.-present). Prehistoric land use and settlement varies during each period, but generally, short- and long-term habitation sites are located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands. The Historic Period is represented by settlement in the region by Europeans, European Americans, and African Americans, and the subsequent removal of Native-American tribes.

The first recorded European encounter with Native American groups in central Mississippi by Europeans was Hernando deSoto's expedition in 1540. Excursions into the area by French, Spanish, and English traders and explorers occurred during the 16th, 17th, and 18th centuries. Clashes between the native Choctaw and Chickasaw and Europeans continued through the 18th century. The first permanent European-American settlements in the area occurred in the 1830s following the acquisition of the land from the Choctaw and their forced removal. Subsistence and cotton farming typified the agriculture of the region from the antebellum period to the early 20th century.

Choctaw County, Mississippi, was organized on December 23, 1833. The town of Greensboro was designated as the county seat of Choctaw County. Around the mid-1800s, cotton and corn became the principal crops of the county. No major battles were fought in the county during the Civil War. In the 1870s, the county lost much of its territory to the development of neighboring counties. Today Choctaw County remains primarily rural, and the predominant land use is timber. Traditional agriculture no longer plays a prominent economic role. Manufacturing, logging, wholesale and retail trade, and health care services are among the leading industries.

TVA Cultural Resources staff identified the archaeological Area of Potential Effects (APE) to be the actual boundaries of the project corridor (7 miles by 100 feet) and the substation tract. The architectural and historical APE was determined to be the 0.5-mile (0.8-kilometer) area along either side of the transmission line corridor, excluding areas where historic resources are shielded from view of the proposed construction by topography or vegetation.

The archaeological survey was conducted in August 2005 (Thomas, 2005). No archaeological resources were identified within the APE of the proposed project.

The background search identified four previously surveyed historic architectural properties (019-ACK-5006, 5007, 5036, and 5041) within 0.5 mile of the proposed transmission line corridor. Two additional properties (identified as Structures 1 and 2) recorded in a 2003 cell tower survey are also located within 0.5 mile of the project area (Saatkamp, 2003). None of the previously recorded historic architectural properties are listed on, or are eligible for listing on, the National Register of Historic Places (NRHP). The historic architecture survey in May 2005 resulted in the relocation of three of the previously surveyed historic architectural properties (019-ACK-5006, 5007, and 5036) as well as the identification of four previously unrecorded historic architectural structures within the APE. Due to modern alterations and damage, all of these properties are considered ineligible for listing on the NRHP.

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CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

This chapter contains a discussion of the potential effects that would likely occur as a result of adopting each of the alternatives. This discussion is organized by topical area in the same order as presented in Chapter 3.

4.1. Visual Quality

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

4.1.1. Alternative A

Under the No Action Alternative, the transmission line corridor and right-of-way would not be acquired, and the project would not be undertaken. Thus, there would be no changes in the local character as a result. The existing scenic attractiveness would remain common to the area, and the scenic integrity would remain moderate to low.

4.1.2. Alternative B

Motorists traveling SR 9 near the proposed tap point would have only limited views of the tap and transmission structures due to the existing vegetation that partially screens views. Those intermittent views would be brief and in context with existing transmission structures located along the Red Hills–Sturgis line and the distribution lines currently visible along the roadway. There are few residences within this section of the proposed route, and views from such positions would generally be intermittent or obscured by vegetation. The primary viewing positions would occur in the vicinity of the roadway crossing where motorists would have views of the proposed 161-kV route only briefly and from between structures.

As the proposed route extends westward through hardwood forests and pine plantations, views would generally be obscured due to the remote location of the corridor and the nature of land ownership along the vicinity of the route. There are only a few residences within the foreground distance of the proposed transmission line, and vegetation and topography would limit views from those locations. Motorists traveling SR 415 would have views of the proposed access road AR2 (see Figure 3). All views are otherwise limited in this section to the individual landowners over whose property the proposed transmission line would cross and to motorists traveling South Union Road, where the proposed line and transmission structures would be visible against a background of maturing pine plantation and mixed hardwood forest. These views available to motorists would remain relatively short in frequency and duration. The proposed transmission line when viewed from this position in the middleground would recede from view against the darker background vegetation. The proposed transmission line and associated structures would become increasingly more visible as the route takes a southerly course and approaches the roadway. A number of residences in the immediate foreground of the roadway crossing would have views of the

proposed line and structures in context with the existing distribution lines that are currently visible along the roadway.

Immediately beyond the crossing at South Union Road, views would be generally limited to the roadway crossing at south Lebanon Road. Traffic volume on this unimproved roadway is estimated to be less than 50 vehicles per day; therefore, the number of views would be low, and the duration of views would be brief as motorists viewed the line perpendicular to the roadway and between structures. As the proposed line continues west, views would again be obscured by vegetation and there would be few vantage points. As the proposed line again approaches South Union Road, views would be open to motorists and residents in the foreground. Within this section, motorists would have brief views of the proposed transmission line and associated structures within the foreground and middleground distances. Views in this section would also be available to the scattered residences along the roadway. Those views would include the transmission line and appurtenances in context with the distribution lines that are currently in view. The proposed structures would differ in height, construction, and material from the existing wooden-pole structures for the local distribution lines. However, the metal pole structures would weather to resemble the existing structures more closely. Motorists in this section traveling south Stewart and Fentress Roads would have brief views of the proposed transmission line from between structures. The number of views available at these crossing points would generally be low to very low.

Between Fentress Road and the Weir-Salem Road, much of the proposed route would be obscured from view due to the limited number of viewing positions and vegetation. At Weir-Salem Road, the proposed line would cross within the foreground of a number of residences, but views would be obscured by mature vegetation along the roadway. Motorists would have brief views of the transmission line at this crossing, but views would be in context with the existing distribution lines. Residents and motorists would have intermittent views of the proposed transmission line as it loosely follows the roadway. These views would be available through breaks in mature vegetation and as topography would allow views into the middleground. These views and their duration would vary with seasonal vegetation changes. Motorists would have views of the proposed transmission line as it crosses the Weir-Salem Road a final time before terminating at the proposed Weir Substation. The surrounding vegetation and topography would tend to limit views available to residents along the roadway. Motorists would have brief views at this crossing point and in context with existing distribution lines and structures in the vicinity.

The proposed transmission line route would stretch through largely uninhabited portions of rural Mississippi that are infrequently crossed by major travel ways. Temporary visual discord would be probable during the construction phases of the project due to the presence of heavy equipment along the proposed route and the use of material and construction staging areas. This temporary alteration to the visual character would be minor and would not be discernable after restoration. The existing landscape character and visual resources would be altered by the construction, operation, and maintenance of the proposed right-of-way, 161-kV transmission line, and associated structures. These activities would increase the number of discordant elements in the landscape; however, the changes that would be visible after construction would not contribute to the loss of established landscape character. Therefore, potential impacts to visual resources associated with this project would be insignificant.

4.2. Animal Life

4.2.1. Alternative A

Because no action would occur under the No Action Alternative, adoption of this alternative would not result in significant direct, indirect, or cumulative adverse impacts on wildlife or wildlife habitat in the project area. Wildlife species observed in the project area are considered common, both locally and regionally.

Adoption of the No Action Alternative would not affect any threatened or endangered species.

4.2.2. Alternative B

The proposed right-of-way would be constructed through a mixture of forest and early successional habitats that are typical of the region. No rare or unusual habitat was found along the proposed corridor. Wildlife species observed in the project area are common both locally and regionally. Although there would be effects to these resources during construction of the right-of-way, the impacts would be temporary and insignificant. Because the present landscape is already highly fragmented, any additional fragmentation of habitats resulting from the proposed action would be insignificant.

No threatened or endangered terrestrial animals were encountered during field surveys. There is no suitable habitat for Webster's salamander, alligator, or osprey along the proposed transmission line route. Red salamanders likely occur in the project area, but the use of BMPs would minimize the possibility of any adverse impact to this species.

Habitat for Cooper's and sharp-shinned hawks is common throughout the proposed transmission line route. No nests were observed along the corridor. The proposed project is not expected to result in adverse impacts to these species of hawks.

Some moderate-quality potential red-cockaded woodpecker habitat exists along the proposed transmission line route, but field investigations in 2005 did not locate any red-cockaded woodpeckers or their nest trees along the proposed project corridor. Therefore, the proposed project would not result in impacts to red-cockaded woodpeckers. The U. S. Fish and Wildlife Service concurred with this determination (see Appendix A).

4.3. Plant Life

4.3.1. Alternative A

Adoption of the No Action Alternative would not significantly affect the plant community in the project area. Similarly, implementation of this alternative would not affect the introduction or spread of invasive terrestrial plant species. There would be no effects to threatened or endangered plants under the No Action Alternative.

4.3.2. Alternative B

Under the Action Alternative, about 70 to 75 acres of forest would be converted to, and maintained as, early successional habitat within the project right-of-way. However, because no uncommon plant communities were encountered along the proposed project route and because forest habitat is plentiful in the region, potential effects to local plant life is expected to be minor and regionally insignificant.

Past land-use practices have altered the native vegetation on most of the proposed project area. Right-of-way clearing and maintenance associated with the proposed line would not significantly facilitate the introduction or spread of invasive plants.

No federally listed threatened or endangered plants are known to occur in the project area or in the vicinity. Field surveys of the proposed right-of-way did not reveal the presence of any such species. Thus, implementation of Alternative B would not affect any federally listed threatened or endangered species or their habitats.

4.4. Aquatic Biology

4.4.1. Alternative A

Under the No Action Alternative, the proposed transmission line would not be built. Thus, there would be no direct construction-related effects to aquatic life in general if Alternative A were adopted.

Data on the historic occurrence of sensitive aquatic animal species in the project are sparse. Generally, aquatic habitats in the project area have been degraded by intensive agriculture and forestry, which has possibly lead to a reduction in population density or the disappearance of some sensitive aquatic animal species. If TVA did not initiate the proposed project, there would be no significant direct, indirect, or cumulative effects on sensitive aquatic species. Because no federally listed threatened or endangered aquatic species are known to occur within the county, there would be no effects to aquatic species listed as threatened or endangered by the federal government.

4.4.2. Alternative B

Construction of new transmission lines could potentially result in erosion and siltation of watercourses in the project area. Such changes can negatively affect aquatic plant and animal communities due to altered water flow regimes, changes in substrate composition, and water temperature fluctuations. In order to decrease the likelihood of these negative impacts, TVA BMPs would be followed (Muncy, 1999). Other safeguards would also be implemented to protect surface water quality during construction (see Appendices B, C, and D). The procedures outlined in Appendix E would be used during right-of-way management to reduce the potential for adverse effects to aquatic resources. With these measures in place, potential effects to the local aquatic community are expected to be insignificant.

No direct impacts to sensitive aquatic animal species are likely to occur as a result of the proposed action, i.e., construction of a new transmission line. Because the local area has been negatively impacted by previous agricultural and silvicultural land uses, there is potential for long-term cumulative impacts to sensitive aquatic animal species occurring downstream of the project area. Indirect and cumulative effects on sensitive aquatic species could result from runoff from soil-disturbing activities adjacent to streams that cross the right-of-way, as well as disturbances from vehicles and heavy equipment crossing streams. However, with the use of BMPs and standard (Level A) stream protection measures as described by Muncy (1999), as well as limiting ground disturbance, negative impacts to sensitive aquatic species and their habitats are not likely. Because no federally listed aquatic species are present in the county, implementation of Alternative B would not affect any federally listed aquatic species or their habitats.

4.5. Natural Areas

4.5.1. Alternative A

No construction activity would occur under the No Action Alternative. Adoption of this alternative would not affect any natural areas.

4.5.2. Alternative B

The proposed transmission line is within 3 miles of four natural areas, but is not within or adjacent to any natural area. The nearest natural areas are 1.9-2.5 miles from the proposed work. Because the distances are sufficient, no effects to these natural areas are expected due to adoption of this alternative. Because no NRI streams are within 3 miles of the proposed transmission line, no impacts to NRI streams are anticipated as a result of adopting the Action Alternative.

4.6. Recreation

4.6.1. Alternative A

Because no change from the current situation would result from the adoption of the No Action Alternative, no effects to recreation resources or opportunities are expected under Alternative A.

4.6.2. Alternative B

Construction of the proposed transmission line could possibly disrupt some informal recreation, but it is not expected to affect any formal recreation opportunities or facilities. In general, any potential effects to public recreation resources, facilities, and activities are anticipated to be temporary and insignificant.

4.7. Surface Water

Soil disturbances associated with access roads or other construction activities can potentially result in adverse effects to water quality. Soil erosion and sedimentation can clog small streams and threaten aquatic life. Removal of the tree canopy along stream crossings can increase water temperatures, promote algal growth, and deplete dissolved oxygen, thus, causing adverse impacts to aquatic biota. Improper use of herbicides to control vegetation can potentially result in runoff to streams.

4.7.1. Alternative A

If the No Action Alternative were adopted, construction of the proposed transmission line would not occur. Therefore, there would be no potential effects to surface water under Alternative A.

4.7.2. Alternative B

TVA routinely includes precautions in the design, construction, and maintenance of its transmission line projects to minimize potential impacts to surface water quality. Under Alternative B, permanent stream crossings 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 stream SMZs would be left undisturbed unless no practicable alternative exists. Right-of-way 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 in the vicinity of receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is expected to result in only minor and temporary impacts to surface waters. No cumulative impacts to surface water quality are anticipated.

4.8. Wetlands

There are approximately 2.19 acres of wetlands in the proposed right-of-way that meet USACE criteria for wetlands that may be federal jurisdictional wetlands under the Clean Water Act.

Activities in wetlands are regulated under Sections 404 and 401 of the federal Clean Water Act. Such actions require a nationwide general permit or an individual permit from the USACE. In addition, as a federal agency, TVA has a mandate to implement the provisions of EO 11990 (Protection of Wetlands). EO 11990 requires federal agencies to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities. It also requires agencies to consider factors relevant to a proposal's effect on the survival and quality of the wetlands, including maintenance of natural systems, conservation and long-term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources, as well as other uses of the wetlands in the public interest.

The federal "no-net-loss" policy for wetlands states an interim goal of no overall net loss of the nation's remaining wetlands, and a long-term goal of increasing the quality and quantity of the nation's wetlands (White House Office on Environmental Policy, 1993).

4.8.1. Alternative A

Under the No Action Alternative, the new transmission line and tap point would not be constructed. Thus, no wetlands would be impacted from implementing Alternative A.

4.8.2. Alternative B

Clearing for the proposed new right-of-way and tap point would convert 2.19 acres of jurisdictional forested wetlands to scrub-shrub or emergent habitat. Clearing of forested wetlands may be conducted under Nationwide Permit No. 12 under the condition that no mechanical clearing is done in the wetland. The forested wetlands that would be affected by clearing were classified as Categories 1 and 2 wetlands using the TVARAM.

Implementation of BMPs for transmission line construction in wetland areas (Muncy, 1999) would minimize potential construction-related wetland impacts such as soil disturbance and alterations to drainage and hydrology. Tree removal would alter overall vegetation structure and, to a lesser degree, wetland hydrology. Removal of vegetation would decrease to a minor degree the value of these wetlands in terms of their water quality and wildlife habitat functions.

Secondary and cumulative impacts would also follow construction of a transmission line through forested wetlands. All of the wetlands observed extended beyond the limits of the proposed right-of-way. Some limited and localized habitat fragmentation would occur as a result of right-of-way clearing. Despite these localized impacts, overall wetland impacts associated with this project are not significant in terms of local context and intensity. In general, forested wetlands are more common in the upper Pearl River watershed than in other watersheds in the TVA power service area; thus, the minor loss in function associated with conversion of 2.19 acres of forested wetlands to scrub-shrub or emergent habitats is not considered significant.

4.9. Groundwater

4.9.1. Alternative A

Because no construction would occur under Alternative A, adoption of this alternative would have no effect on groundwater.

4.9.2. Alternative B

BMPs as described by Muncy (1999) would be used to avoid impacts to groundwater. During revegetation and maintenance activities, fertilizers and herbicides should be used sparingly to avoid contamination of groundwater. With the use of these BMPs, effects to groundwater resources from the proposed action would be insignificant.

4.10. Floodplains

4.10.1. Alternative A

If Alternative A were adopted, the proposed transmission line would not be constructed. Thus, there would be no effects to floodplains under Alternative A.

4.10.2. Alternative B

Construction of the proposed transmission line would involve crossing several floodplains. Placement of support structures within these floodplains is not expected to increase flood elevations or changes in the flow carrying capacity of the streams being crossed. The stream crossing at access road AR6, an existing road, (see Figure 3) would be done in such a manner that upstream flood elevations would not be increased. The proposed Weir Substation site is located outside of the 100-year floodplain. Thus, there would be no increase in flood hazard under Alternative B.

To reduce potential adverse impacts on natural and beneficial floodplain values, the right-of-way would be revegetated where natural vegetation is removed and the removal of unique vegetation would be avoided. BMPs would be used during construction activities. Therefore, adoption of Alternative B would not cause any significant effects to floodplains.

4.11. Cultural Resources

4.11.1. Alternative A

Under the No Action Alternative, the proposed transmission line would not be constructed. Thus, there would be no effects to any historic properties from adopting Alternative A.

4.11.2. Alternative B

Three previously recorded historic structures (019-ACK-5006, 5007, and 5036) were located within the APE of the proposed 161-kV transmission line and substation in Choctaw County, Mississippi. These historic properties were recommended ineligible for listing on the NRHP. The Mississippi State Historic Preservation Officer has concurred with TVA's findings that no historic properties eligible for listing or currently listed on the NRHP will be affected (see Appendix A).

4.12. Other Environmental Consequences

Minor amounts of solid waste would be generated. However, the volume of solid waste would not be significant and would not affect the capacity of any local landfills. Minor amounts of air pollution in the form of vehicle exhaust and some fugitive dust would be produced. The proposed action would not disproportionately affect any minority or economically disadvantaged populations, and would be consistent with Executive Order 12898 (Environmental Justice).

4.13. Summary of TVA Commitments and Proposed Mitigation Measures

The following routine measures would be applied during construction and operation of the proposed transmission line:

- Appropriate BMPs as described in Muncy, 1999, would be implemented during construction activities.
- During construction and operation of the proposed transmission line, the environmental quality protection specifications as described in Appendices B, C, D, and E would be implemented to reduce the potential for adverse environmental effects.

With the implementation of these measures and safeguards, potential adverse effects are expected to be insignificant.

CHAPTER 5

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CHAPTER 6

6. LIST OF AGENCIES AND PERSONS CONSULTED

Federal Agencies

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

State Agencies

Mississippi Department of Agriculture and Commerce
Mississippi Department of Archives and History
Mississippi Department of Environmental Quality
Mississippi Department of Transportation
Mississippi Development Authority
Mississippi Public Service Commission

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CHAPTER 7

7. SUPPORTING INFORMATION

7.1. Literature Cited

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7.2. Glossary of Terms

°F	Abbreviation for degree Fahrenheit
APE	Acronym for Area of Potential Effects
benthic	Referring to bottom-dwelling aquatic organisms
biota	A generic, collective term for living organisms
BMP	Acronym for Best Management Practices
cfs	Abbreviation for cubic feet per second
conductor	Cables or "wires" that carry electrical current

cumulative effect (or impact)	A potential effect resulting from the incremental impact of an action added to other past, present, and reasonably foreseeable future actions regardless of source
direct effect (or impact)	A potential environmental effect that is caused by an action and that occurs at the same time and place
e.g.	Abbreviation for Latin term, *exempli gratia*, meaning “for example”
EO	Acronym for presidential Executive Order
endangered species	Any species in danger of extinction throughout all or a significant portion of its range or territory
EIS	Acronym for Environmental Impact Statement
EPA	Acronym for Electric Power Association
EPT	Acronym for the insect orders of Ephmeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies); the presence of EPT species usually indicates good water quality and a diverse insect community
GIS	Acronym for geographic information system, a computerized mapping and map display system
groundwater	Water within a geologic stratum that supplies wells and springs
guy	A cable or support anchored in the ground that helps stabilize a structure
herbicide	A substance or mixture of substances intended to prevent the growth of destroy unwanted vegetation
i.e.	Abbreviation for Latin term, *id est*, meaning “that is”
indirect effect	A potential environmental effect caused by an action that is later in time or further removed in distance but still reasonably foreseeable
kV	Abbreviation for kilovolt, one thousand volts
load	The amount of electrical energy carried in a line
macroinvertebrate	An animal having no backbone that is large enough to be seen without magnification (examples include insects and worms)
mesic	Characterized by moderate moisture conditions
MW	Abbreviation for megawatt, one million watts

NEPA	Acronym for National Environmental Policy Act
No.	Abbreviation for number
NRHP	Acronym for National Register of Historic Places
NRI	Acronym for Nationwide Rivers Inventory
orthophotography	A process in which digital photographs (usually aerial photographs) are corrected so that they will coincide with standard base maps
revenue metering equipment	Meters, usually installed in customer facilities, that measure the amount of electric power for which the customer will be billed
SMZ	Acronym for Streamside Management Zone
SR	Acronym for State Route
surface water	Streams, rivers, ponds, lakes, and manmade reservoirs
tap line	A power line that connects to a transmission line to a substation
tap point	The point of connection on a transmission line where a tap line connects
threatened species	Any species that is likely to become an endangered species within the foreseeable future
taxa	Plural of taxon, a group or category of similar or related species
transmission line	A power line, usually high voltage, used to transfer electrical power from one interconnection point to another
TVA	Acronym for Tennessee Valley Authority
TVARAM	Acronym for Tennessee Valley Authority Rapid Assessment Method
understory	Saplings, shrubs, and other low-growing vegetation present in a forest
U.S.	Abbreviation for United States
USACE	Acronym for U.S. Army Corps of Engineers
USEPA	Acronym for U.S. Environmental Protection Agency

APPENDIX A – CORRESPONDENCE

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mississippi Field Office
6578 Dogwood View Parkway, Suite A
Jackson, Mississippi 39213

RECEIVED
Environmental Policy and Planning
JAN 0 2 2006
Doc. Type: EA- Administrative Records
Index Field: Conservation and Safeguarding Rev.
Project Name: Weir 161-kV Transmission Line
Project No.: 2005-36

December 27, 2005

Mr. Jon M. Loney
Manager, NEPA Administration
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

Dear Mr. Loney:

The U.S. Fish and Wildlife Service (Service) has reviewed the information in your letter dated December 21, 2005, regarding your agency's proposal to construct a new 161-kilovolt transmission line in Choctaw County, between Ackerman and Weir, Mississippi. Our comments are submitted in accordance with the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The federally listed red-cockaded woodpecker (*Picoides borealis*) is found in Choctaw County. Field surveys of the project area were conducted in September 2005. No evidence of this species was observed. Consequently, TVA has determined that the proposed transmission line would not adversely impact this species. The Service concurs with your findings.

This concludes informal consultation as provided for in the Endangered Species Act. However, if during construction of the project, red-cockaded woodpeckers or their cavity trees are found on the project site, all work activities should cease until this office is notified. At that time, informal consultation will resume.

If you need additional information, please contact Kathy Lunceford of this office, telephone: (601) 321-1132.

Sincerely,

Curtis B. James

Curtis B. James
Assistant Field Supervisor

MISSISSIPPI Department of
MDAH
ARCHIVES & HISTORY

HISTORIC PRESERVATION
PO Box 571, Jackson, MS 39205-0571
601-576-6940 • Fax 601-576-6955
mdah.state.ms.us

August 9, 2005

Mr. J. Bennett Graham
Tennessee Valley Authority
400 West Summit Hil Drive
Knoxville, Tennesse 7902-1401

Dear Mr. Graham:

RE: Cultural Resources Survey Red Hills-Sturgis Tap to Weir Substation 161-Kv Transmission Line, Choctaw County (05-264)

We have reviewed the August 2005 cultural resources survey report of TRC for the above referenced undertaking. No sites or properties listed in or eligible for listing in the National Register of Historic Places will be affected. We, therefore, have no further reservations with this undertaking.

In addition, we are not aware of any potential of this undertaking to affect Indian cultural or religious sites. However, if you require confirmation of this, the tribal entities will have to be contacted directly.

There remains a very remote possibility that unrecorded cultural resources may be encountered during construction. If this occurs, we would appreciate your contacting this office immediately in order that we may offer appropriate comments under 36 CFR 800.11 within forty-eight hours. Your continued cooperation is appreciated.

Sincerely,

H. T. Holmes
State Historic Preservation Officer
Thomas H. Waggener
By: Thomas H. Waggener
Review and Compliance Officer

cc: Clearinghouse for Federal Programs

APPENDIX B – TENNESSEE VALLEY AUTHORITY 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 Practice (BMP) 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 Electric 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 the TVA's Transmission, Operations, and Maintenance 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 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 July 2003

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APPENDIX C – TENNESSEE VALLEY AUTHORITY ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION LINE CONSTRUCTION

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TENNESSEE VALLEY AUTHORITY ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION LINE CONSTRUCTION

1. General – Tennessee Valley Authority (TVA) and/or the assigned contractor 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 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 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.

Revision July 2003

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APPENDIX D – TENNESSEE VALLEY AUTHORITY TRANSMISSION CONSTRUCTION GUIDELINES NEAR STREAMS

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TENNESSEE VALLEY AUTHORITY TRANSMISSION CONSTRUCTION GUIDELINES NEAR STREAMS

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

Three Levels of Protection

During the preconstruction review of a proposed transmission line, TVA Resource Stewardship 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 TVA 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 TVA 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 Resource Stewardship 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 Electric 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 TVA 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 Resource Stewardship 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 Resource Stewardship 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 Resource Stewardship 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 TVA 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 TVA 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 TVA 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 Resource Stewardship 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 Resource Stewardship 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 an impacts to the SMZ and surrounding area. • Cutting of trees near permanent streams must be limited to those meeting National Electric 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 Resource Stewardship 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 Resource Stewardship staff

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APPENDIX E – TENNESSEE VALLEY AUTHORITY RIGHT-OF-WAY VEGETATION MANAGEMENT

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TENNESSEE VALLEY AUTHORITY RIGHT-OF-WAY VEGETATION MANAGEMENT

Tennessee Valley Authority (TVA) must manage 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 ensure National Electrical Safety Code electrical clearances between tall-growing vegetation and any other structures. Trees located off right-of-way trees that could fall or be cut into a transmission line are also very important.

These requirements are imperative to the maintenance of the transmission system and, in some cases, underbuilt distribution lines. It is seldom understood by customers or the general public that electricity must continuously be produced and transmitted on an instant-to-instant basis to serve the demand placed on the system by continuously changing electrical load. When a switch is turned on, electricity must flow instantaneously. With increasingly complex and diverse electronic equipment controlled by computers, microchips, and other systems that respond to microsecond interruptions, any disturbance on transmission or distribution lines instantaneously affects the overall reliability of critical devices, especially production devices; security systems; process controls; medical devices; water purification and sewage treatment systems; fire and safety protection systems; communication and control systems; etc. These systems have little tolerance of even a few microseconds of interruption.

Each year, TVA must assess the conditions of the vegetation on and along its rights-of-way. This is accomplished by aerial inspections of each line, periodic walking inspections, information from aerial photographs, information from TVA field personnel, property owners, and the general public. Information is developed regarding vegetation species present, the mix of 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 that may be adjacent to the right-of-way and that may be a danger to the line or structures. TVA right-of-way program administrators develop a vegetation-reclearing plan that is specific to each line segment; it is based on terrain conditions, species mix, growth, and density. They evaluate accessibility, right-of-way, and adjacent sensitive areas, land use and development, and a series of additional parameters. To the maximum extent possible, line segments from substation busbar to substation busbar should be recleared in the same year so a line can be made as reliable as reasonably possible.

Complicating factors are the rich diversity of tall-growing and climbing vegetation species in the power service area. The long growing season with abundant rain greatly accelerates growth in the moderate to rich soils of the TVA power service area. In addition, many rapid growing species are accelerated growers when competing vegetation is removed or reduced. Diverse geographic features, slopes, and conditions along line easements create many sensitive environmental and public interest areas on or adjacent to rights-of-way.

For the above reasons, TVA uses an integrated vegetation management approach. In farming areas of right-of-way crops and pasture, TVA encourages property owner management of the right-of-way using low-growing crops year after year. In dissected terrain with rolling hills and interspersed woodlands traversed by the rights-of-way, TVA uses mechanical mowing to a large extent.

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 segments of tall-growing vegetation are present but accessibility along the right-of-way is difficult or the path to such segments is very long compared to the amount present, herbicides may be used.

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 Health and Safety Administration. For that reason, TVA is actively looking at better control methods including use of low-volume herbicide applications, occasional singletree injections, and tree-growth regulators.

TVA does not encourage individual property owner tree reclearing activity 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.

TVA's experience initially was completely with hand clearing. World War II manpower shortages forced TVA to look toward developments in herbicide research. An era of near exclusive use of herbicides existed. Then, because of the discovery of residue accumulations with many pesticides and price increases of herbicides, high-volume applications lost favor, and TVA sought other modes of vegetation control. Farm equipment of greater power and efficiency allowed use of tractor-mounted rotary mowers. These mowers not only cut the tall saplings and seedlings on the right-of-way, they 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 produce a multistem dense stand in the immediate area. Repeated use of the mowers on short-cycle reclearing with many original stumps regrowing in the above manner creates a single-species thicket or monoculture. With the original large root system and multiple stems, the resistant species can and usually do 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 created, dense, monoculture stands can become nearly impenetrable for even large tractors. Such stands have low diversity, little wildlife food or nesting potential, and become a property owner concern. They tend to spread off the right-of-way into more desirable species areas. Increasingly, TVA is receiving complaints about the shatter sapling debris density. The potential exists for insect invasion or fungus infection resulting from the easy invasion of damaged specimens or debris. Once started, such infestations or invasions can spread into valuable timber of the same or related species off the right-of-way.

Therefore, TVA has been working with universities (such as Mississippi State University, University of Tennessee, Purdue University, and others), chemical companies, other utilities, and personnel of the U.S. Department of Transportation, U.S. Fish and Wildlife Service, and U.S. Forest Service to explore other means of dealing with problem vegetation. 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.

The above-named universities strongly recommend low-volume herbicide applications since their research demonstrates much wider plant diversity after such applications. They report better ground erosion protection and the development of more wildlife food plants and cover plants. 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.

Wildlife managers are specifically requesting the use of herbicides in place of rotary mowing in order to avoid damage to nesting and tunneling wildlife. This method retains groundcover 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).

Property owners interested in tree production are requesting 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 rights-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.

Some property owners have special interests. In those cases, TVA attempts to work with them to either have them sign agreements in which they maintain the right-of-way in right-of-way crops or pasture or they do the actual right-of-way maintenance. Some may choose to use low-growing trees or fruit trees, sod, vegetable crops, or other low vegetation types.

TVA discusses with property owners the potential to sign an agreement to manage their land for wildlife under the auspices of "Project Habitat," a joint TVA/American Cyanamid wildlife organization. The property owner maintains the right-of-way in wildlife food and cover with emphasis on quail, turkey, deer, or related forms. 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.

TVA places strong emphasis on developing 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 and vegetation effective and efficient manner possible.

Approved Herbicides for Usage on TVA Rights-of-Way

Trade Name	Active Ingredients	Label Signal Word
Accord	Glyphosate/Liquid	Caution
Arsenal	Imazapyr/Liquid/Granule	Caution
Escort	Metsulfuron Methyl/dry flowable	Caution
Garlon	Triclopyr/Liquid	Caution
Garlon 3A	Triclopyr/Liquid	Danger
Diuron	Diuron/Flowable powder	Caution
Spike 40P	Tebuthiuron/Pellet	Caution
Spike 80W	Tebuthiuron/Wettable powder	Caution
Transline	Clopyralid/Liquid	Caution
Pathfinder II	Triclopyr/RTU	Caution
Krenite UT	Fosamine Ammonium	Warning
Vanquish	Diglycolamine	Caution

Approved Herbicides for Bare Ground Areas

Trade Name	Active Ingredients	Label Signal Word
Chopper	Imazapyr/RTU	Caution
Topsite	Diuron/Imazapyr	Caution
Roundup	Glyphosate/Liquid	Caution
SpraKil SK-26	Tebuthiuron and Diuron	Caution
Sahara	Diuron/Imazapyr	Caution
Roundup Pro	Glyphosate	Caution
Endurance	Prodiamine	Caution
Predict	Norflurazon	Caution

Tree growth regulators (TGRs) are being considered for use on tall trees that have special circumstances where they must be trimmed on a regular cycle.

Approved TGRs for Use on TVA Property

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

The herbicide Pathway is being considered for use following initial clearing. Test plots have been established to determine the effectiveness of Pathway. Pathway is a mix of Picloram and 2,4-D and carries a "Warning" signal word.

These herbicides have been evaluated in extensive studies at universities in support of registration applications and label requirements. Most have been reviewed in the U.S. Forest Service (USFS) Vegetation Management Environmental Impact Statements (EISs), and those evaluations are incorporated here by reference. 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 to resources (including buffer zones for listed threatened or endangered species) when applied by trained applicators following the label and registration procedures.

Those not addressed in the USFS EISs or their supporting research have been peer reviewed in university research, addressed in U.S. Environmental Protection Agency (USEPA) literature reviews, or are discussed in documents on file at USEPA and U.S. Fish and Wildlife Service libraries. On the basis of this literature and TVA's reviews, the approved list above has been compiled and is reviewed again each year as new information is published.

The rates of application utilized are those listed on the USEPA-approved label and consistent with the revised application rates of the USFS Vegetation Management EIS Record of Decision. These typical application rates, in pounds/acre of active ingredient, are as follows:

Herbicide	Application Method					
	Aerial Liquid	Aerial Granule	Mechanical Liquid	Mechanical Granule	Manual Hand	Manual Foliar
2,4-D amine	2.0		2.5			2.0
2.4-D ester	2.5		4.0			2.0
2.4-DP	3.0		4.0			1.0
Dicamba			2.0			2.0
Krenite	6.0		7.8			
Glyphosate	1.5		1.5			1.0
Hexazinone	4.0	4.0	4.0	4.0	4.0	4.0
Imazapyr	0.75		0.75			0.75
Fuel oil	0.5		2.0			1.5
Limonene	0.9		0.9			0.9
Picloram	0.5		0.7			0.4
Sulfomet	0.13		0.17			0.06
Tebuthiuron	1.0	1.0	1.0	1.0		4.0
Triclopyr amine	4.0		4.0			4.0
Triclopyr ester	4.0		4.0			4.0

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.

Accord, labeled for vegetation management in forestry and utility rights-of-way applications, has a full aquatics label and can be applied to emergent weeds in all bodies of fresh and brackish water. There is no restriction on the use of treated water for irrigation, recreation, or domestic purposes.

Accord is applied to the foliage of actively growing plants. The active ingredient is absorbed through the leaves and rapidly moves throughout the plant. Glyphosate prevents the plant from producing amino acids that are unique to plants and are building blocks of plant proteins. The plant, unable to make proteins, stops growing and dies.

The favorable environmental fate characteristic of Accord herbicide and its major metabolite (breakdown product) aminomethylphosphonic acid (AMPA) is well known. Continuing research is underway with more than 400 studies conducted to date in the laboratory and under field use conditions. These studies show rapid breakdown, little soil or plant debris retention, and little vertical movement into soil below the surface.

Glyphosate is naturally degraded by microbes in soil and water under both aerobic (with oxygen) and anaerobic (without oxygen) conditions. AMPA is further degraded in soil and sediments to phosphorus, nitrogen, hydrogen, and carbon dioxide. Glyphosate binds

rapidly and completely to a wide range of soils and sediment when introduced into the environment. This essentially eliminates movement in the soil. The average half-life of glyphosate in soils is less than 45 days. Half-life for the dissipation of glyphosate in environmental waters ranges from 1.5 to 14 days.

Glyphosate is nontoxic to birds, mammals, and bees and has been shown not to bioaccumulate since it acts in plants through an enzyme system that does not exist in animals or humans.

Arsenal (Imazapyr) has been similarly tested, and it is found to have low-leaching potential in soils. When available on or in the soil, it is broken down rapidly by soil microbes to naturally occurring compounds. When not available, Imazapyr is bound tightly to soil colloids and is unavailable for movement. The half-life in soil is 25 to 65 days.

Extensive chronic and acute toxicity studies have made Arsenal a USEPA-classified herbicide as practically nontoxic to humans, mammals, birds, fish, aquatic invertebrates, and insects. The chronic studies demonstrate that Imazapyr is non-teratrogenic, non-mutagenic, and not a carcinogen.

The mode of action suppresses amino acids of the plant via an enzyme system containing acetohydroxy acid synthase. This enzyme system does not exist in other forms of life including humans and animals.

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APPENDIX F – COMMON AND REPRESENTATIVE PLANT SPECIES WITHIN THE PROJECT AREA

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Common and Representative Plant Species Observed Along the Proposed Transmission Line Route

Common Name	Scientific Name	Plant Community[1]
Alabama supple-jack	*Berchemia scandens* (J. Hill) K. Koch	BH, ES, MH, P
American beauty-berry	*Callicarpa americana* L.	BH, ES, MH, P
American beech	*Fagus grandifolia* Ehrh.	BH, MH
American burnweed	*Erechtites hieraciifolia* (L.) Raf. ex DC.	ES
American elder	*Sambucus canadensis* L.	S/W
American elm	*Ulmus americana* L.	BH, MH, P
American holly	*Ilex opaca* Soland. in Ait.	BH, MH, P
American hornbeam	*Carpinus caroliniana* Walt.	BH
American potato-bean	*Apios americana* Medic.	S/W
Annual ragweed	*Ambrosia artemisiifolia* L.	ES
Annual sumpweed	*Iva annua* L.	ES
Bahiagrass	*Paspalum notatum* Fluegge	ES
Beaked panicgrass	*Panicum anceps* Michx.	S/W
Bermudagrass	*Cynodon dactylon* (L.) Pers.	ES
Big bluestem	*Andropogon gerardii* Vitman	ES
Black cherry	*Prunus serotina* Ehrh.	BH, ES, MH, P
Black-eyed susan	*Rudbeckia hirta* L.	ES
Black gum	*Nyssa sylvatica* Marsh.	BH, ES, MH, P
Black willow	*Salix nigra* Marsh.	S/W
Blunt spikerush	*Eleocharis obtusa* (Willd.) J.A. Schultes	S/W
Box-elder	*Acer negundo* L.	BH
Bracken fern	*Pteridium aquilinum* (L.) Kuhn	ES, MH, P
Brazilian vervain	*Verbena brasiliensis* Vell.	ES
Broom panicgrass	*Dichanthelium scoparium* (Lam.) Gould	S/W
Broomsedge	*Andropogon virginicus* L.	ES
Bush aster	*Aster dumosus* L.	ES
Butterfly milkweed	*Asclepias tuberosa*	ES
Canada goldenrod	*Solidago canadensis* L.	ES
Canada horseweed	*Conyza canadensis* (L.) Cronq.	ES
Canadian black-snakeroot	*Sanicula canadensis* L.	BH, MH, P
Carolina desert chickory	*Pyrrhopappus carolinianus* (Walt.) DC.	ES
Carolina elephant-foot	*Elephantopus carolinianus* Raeusch.	BH, ES
Carolina pony-foot	*Dichondra caroliniensis* Michx.	ES
Cat greenbrier	*Smilax glauca* Walt.	ES, MH, P
Centipede grass	*Eremochloa ophiuroides* (Munro) Hack.	ES
Cherokee sedge	*Carex cherokeensis* Schw.	BH, MH, P
Cherrybark oak	*Quercus pagoda* Raf.	BH, MH, P
Chickasaw plum	*Prunus angustifolia* Marsh.	ES
Chinaberry tree	*Melia azedarach* L.	BH
Chinese bushclover	*Lespedeza cuneata* (Dum. Cours.) G. Don	ES
Chinese privet	*Ligustrum sinense* Lour.	BH, MH, P
Christmas fern	*Polystichum acrostichoides* (Michx.) Schott	BH, MH
Cinnamon fern	*Osmunda cinnamomea* L.	S/W
Climbing hempweed	*Mikania scandens* (L.) Willd.	S/W
Clustered beakrush	*Rhynchospora glomerata* (L.) Vahl	S/W
Common boneset	*Eupatorium perfoliatum* L.	S/W
Common buttonbush	*Cephalanthus occidentalis* L.	S/W
Common greenbrier	*Smilax rotundifolia* L.	BH, ES, MH, P
Common pawpaw	*Asimina triloba* (L.) Dunal	BH, MH, P
Common persimmon	*Diospyrus virginiana* L.	BH, MH, P

Common Name	Scientific Name	Plant Community[1]
Common pokeweed	*Phytolacca americana* L.	ES
Creeping coyote-thistle	*Eryngium prostratum* Nutt. ex DC.	S/W
Crossvine	*Bignonia capreolata* L.	BH, MH, P
Curly dock	*Rumex crispus* L.	ES
Cypress witchgrass	*Dichanthelium dichotomum* (L.) Gould	BH, MH, P
Deciduous holly	*Ilex decidua* Walt.	BH, MH, P
Deerberry	*Vaccinium stamineum* L.	MH, P
Dotted smartweed	*Polygonum punctatum* Ell.	ES
Drummond's St. John's-wort	*Hypericum drummondii* (Grev. & Hook) Torr. & Gray	ES
Eastern false-willow	*Baccharis halimifolia* L.	ES
Eastern redbud	*Cercis canadensis* L.	MH, P
Eastern red cedar	*Juniperus virginiana* L.	MH, P
Ebony spleenwort	*Asplenium platyneuron* (L.) Oakes	MH, P
Elliott blueberry	*Vaccinium elliottii* Chapm.	BH
False-pimpernel	*Lindernia anagallidea* (Michx.) Pennell	S/W
Field paspalum	*Paspalum laeve* Michx.	ES
Five-leaf sneezeweed	*Helenium amarum* (Raf.) H. Rock	ES
Flat-topped fragrant golden-rod	*Euthamia graminifolia* (L.) Nutt.	ES
Flowering dogwood	*Cornus florida* L.	MH, P
Giant cane	*Arundinaria gigantea* (Walt.) Walt. ex Muhl.	BH, S/W
Giant goldenrod	*Solidago gigantea* Ait.	S/W
Green ash	*Fraxinus pennsylvanica* Marsh.	BH, MH, P
Hairy elephant-foot	*Elephantopus tomentosus*	ES, MH, P
Heartleaf peppervine	*Ampelopsis cordata* Michx.	MH, P
Hercules club	*Aralia spinosa* L.	MH, P
Indian sea-oats	*Chasmanthium latifolium* (Michx.) H. Yates	BH, ES, S/W
Japanese climbing fern	*Lygodium japonicum* (Thunb.) Swartz	ES, MH, P
Japanese clover	*Lespedeza striata* (Thunb.) Hook. & Arn.	ES
Japanese honeysuckle	*Lonicera japonica* Thunb.	BH, MH, P
Johnson grass	*Sorghum halepense* (L.) Pers.	ES
Knotroot bristlegrass	*Setaria geniculata* (Lam.) Beauv.	ES
Lance-leaf ragweed	*Ambrosia bidentata* Michx.	ES
Late-flowering thoroughwort	*Eupatorium serotinum* Michx.	ES
Late purple aster	*Aster patens* Ait.	ES
Lax-flower witchgrass	*Dichanthelium laxiflorum* (Lam.) Gould	ES, MH, P
Leathery rush	*Juncus coriaceus* Mackenz.	ES, S/W
Little bluestem	*Schizachyrium scoparium* (Michx.) Nash	ES
Loblolly pine	*Pinus taeda* L.	BH, MH, P
Long-leaf spikegrass	*Chasmanthium sessiliflorum* (Poir.) H.Yates	BH, ES, MH, P
Mariana maiden fern	*Macrothelypteris torresiana* (Gaud.) Ching	S/W, MH
Marshpepper smartweed	*Polygonum hydropiperoides* Michx.	S/W
Maryland meadow-beauty	*Rhexia mariana* L.	S/W
Mockernut hickory	*Carya alba* (L.) Nutt.	MH, P
Muscadine grape	*Vitis rotundifolia* Michx.	BH, MH, P
Narrow-leaf silkgrass	*Pityopsis graminifolia* (Michx.) Nutt.	ES
Needle-leaf witchgrass	*Dichanthelium aciculare* (Desv. Ex Poir.) Gould & C.A. Clark	ES
Netted chainfern	*Woodwardia areolata* (L.) T. Moore	S/W
Northern red oak	*Quercus rubra* L.	MH, P
Oldfield golden-rod	*Solidago nemoralis* Ait.	ES
Partridgeberry	*Mitchella repens* L.	BH
Partridge pea	*Cassia fasciculata* Michx.	ES
Pecan	*Carya illinoensis* (Wangenh.) K. Koch	BH, MH, P

Common Name	Scientific Name	Plant Community[1]
Peppervine	*Ampelopsis arborea* (L.) Koehne	BH, ES, MH, P
Poison ivy	*Toxicodendron radicans* (L.) Kuntze	BH, ES, MH, P
Post oak	*Quercus stellata* Wangenh.	MH, P
Prairie threeawn	*Aristida oligantha* Michx.	ES
Purple lovegrass	*Eragrostis spectabilis* (Pursh) Steud.	ES
Purple passionflower	*Passiflora incarnata* L.	ES
Purple-top tridens	*Tridens flavus* (L.) A. Hitchc.	ES
Red buckeye	*Aesculus pavia* L.	BH, MH, P
Red chokeberry	*Aronia arbutifolia* (L.) Ell.	S/W
Red maple	*Acer rubrum* L.	BH, MH, P
Red-top panicgrass	*Panicum rigidulum* Bosc. ex Nees	ES
Redvine (lady's eardrop)	*Brunnichia ovata*	BH, S/W
Resurrection fern	*Pleopeltis polypodioides* (L.) E.G. Andrews & Windham	BH, MH, P
Rice cutgrass	*Leersia oryzoides* (L.) Swartz	S/W
Rough button-weed	*Diodia teres* Walt.	ES
Rough witchgrass	*Dichanthelium leucothrix* (Nash) Freckmann	ES
Round-leaf thorough-wort	*Eupatorium rotundifolium* L.	ES
Royal fern	*Osmunda regalis* L.	S/W
Rusty black-haw	*Viburnum rufidulum* Raf.	MH, P
St. Andrew's-cross	*Hypericum hypericoides* (L.) Crantz	ES, MH, P
Sassafras	*Sassafras albidum* (Nutt.) Nees	MH, P
Saw greenbrier	*Smilax bona-nox* L.	BH, MH, P
Sensitive fern	*Onoclea sensibilis* L.	S/W
Serrate-leaf blackberry	*Rubus argutus* Link	ES, MH, P
Shallow sedge	*Carex lurida* Wahlenb.	S/W
Short-leaf pine	*Pinus echinata* Mill.	MH, P
Slender rush	*Juncus tenuis* Willd.	ES
Slender St. John's-wort	*Hypericum mutilum* L.	S/W
Slender spikegrass	*Chasmanthium laxum* (L.) H. Yates	BH, ES, MH, P
Slender spikerush	*Eleocharis tenuis* (Willd.) J.A. Schultes	S/W
Small dog-fennel thoroughwort	*Eupatorium capillifolium* (Lam.) Small	ES
Small-flower white morning-glory	*Ipomoea lacunosa* L.	ES, S/W
White crownbeard	*Verbesina virginica* L.	ES, S/W
Whitegrass	*Leersia virginica* Willd.	BH, ES, S/W
White oak	*Quercus alba* L.	MH, P
Wild bergamot	*Monarda fistulosa* L.	ES
Wild sweet-potato vine	*Ipomoea pandurata* (L.) G.F.W. Meyer	ES, MH, P
Willow oak	*Quercus phellos* L.	BH, MH, P
Winged elm	*Ulmus alata* Michx.	BH, MH, P
Winged sumac	*Rhus copallinum* L.	ES, MH, P
Witchgrass	*Panicum capillare* L.	ES
Woolly croton	*Croton capitatus* Michx.	ES
Wool-rush	*Scirpus cyperinus* (L.) Kunth	S/W
Yellow bristlegrass	*Setaria glauca* (L.) Beauv.	ES
Yellow jessamine	*Gelsemium sempervirens* (L.) W.T. Ait.	MH, P

[1]Plant community abbreviations: BH = bottomland hardwood; ES = early successional; MH = mesic hardwood; P = pine-dominated; and S/W = stream and associated wetland. See Section 3.3 for a description of plant communities in the project area.