

FINAL ENVIRONMENTAL ASSESSMENT

**KENTUCKY DAM-NASHVILLE 161-KV TRANSMISSION
LINE TAP AND SCREAMING EAGLES SUBSTATION**
Fort Campbell, Montgomery County, Tennessee

TENNESSEE VALLEY AUTHORITY

JUNE 2003

TABLE OF CONTENTS

1.	PURPOSE OF AND NEED FOR ACTION	1
1.1.	The Decision	1
1.1.1.	Need	1
1.1.2.	Proposed Action	1
1.2.	Public Involvement	1
1.3.	Necessary Permits or Licenses	2
2.	ALTERNATIVES INCLUDING THE PROPOSED ACTION	3
2.1.	Alternatives	3
2.1.1.	Alternative 1 – Construct Transmission Line and Substation	3
2.1.2.	Alternative 2 – The No Action Alternative	3
2.2.	Description of Construction, Operation, and Management of the Proposed Substation and 161-kV Transmission Line	3
2.2.1.	Substation Construction	3
2.2.2.	Transmission Line Construction	3
2.2.2.1.	Structures and Conductors	3
2.2.2.2.	Right-of-Way	4
2.2.2.3.	Access Roads	5
2.2.2.4.	Construction Assembly Areas	5
2.2.2.5.	Conductor and Ground Wire Installation	6
2.2.3.	Operation and Maintenance	6
2.2.3.1.	Inspection	6
2.2.3.2.	Vegetation Management	6
2.3.	Project and Siting Alternatives	7
2.3.1.	Definition of Study Area	7
2.3.2.	Collect Data	8
2.3.3.	Develop Potential Routes	8
2.3.3.1.	Route A	9
2.3.3.2.	Route B	9
2.3.3.3.	Route C	9
2.3.3.4.	Route D	10
2.3.4.	Establish and Apply Siting Criteria	10
2.3.5.	Identification of Preferred Alternative	12
2.4.	Summary of Mitigation Measures	12
3.	AFFECTED ENVIRONMENT	13
3.1.	Groundwater	13
3.2.	Surface Water	13
3.3.	Vegetation	14
3.4.	Wildlife	15
3.5.	Aquatic Ecology	15
3.6.	Endangered and Threatened Species	16
3.7.	Natural Areas	18
3.8.	Wetlands	19

3.9.	Floodplains	20
3.10.	Recreation	20
3.11.	Visual Resources	20
3.12.	Cultural Resources.....	21
4.	ENVIRONMENTAL CONSEQUENCES	23
4.1.	Groundwater	23
4.1.1.	Alternative 1 – Transmission Line and Substation	23
4.1.2.	Alternative 2 – No Action	23
4.2.	Surface Water.....	23
4.2.1.	Alternative 1 – Transmission Line and Substation	23
4.2.2.	Alternative 2 – No Action	23
4.3.	Vegetation.....	24
4.3.1.	Alternative 1 – Transmission Line and Substation	24
4.3.2.	Alternative 2 – No Action	24
4.4.	Wildlife	24
4.4.1.	Alternative 1 – Transmission Line and Substation	24
4.4.2.	Alternative 2 – No Action	24
4.5.	Aquatic Ecology.....	24
4.5.1.	Alternative 1 – Transmission Line and Substation	24
4.5.2.	Alternative 2 – No Action	25
4.6.	Endangered and Threatened Species	27
4.6.1.	Alternative 1 – Transmission Line and Substation	27
4.6.2.	Alternative 2 – No Action	27
4.7.	Natural Areas.....	27
4.7.1.	Alternative 1 – Transmission Line and Substation	27
4.7.2.	Alternative 2 – No Action	27
4.8.	Wetlands	27
4.8.1.	Alternative 1 – Transmission Line and Substation	27
4.8.2.	Alternative B – No Action.....	28
4.9.	Floodplains	28
4.9.1.	Alternative 1 – Transmission Line and Substation	28
4.9.2.	Alternative 2 – No Action	28
4.10.	Recreation	29
4.10.1.	Alternative 1 – Transmission Line and Substation	29
4.10.2.	Alternative 2 – No Action	29
4.11.	Visual Resources	29
4.11.1.	Alternative 1 – Transmission Line and Substation	29
4.11.2.	Alternative 2 – No Action	30
4.12.	Cultural Resources.....	30
4.12.1.	Alternative 1 – Transmission Line and Substation	30
4.12.2.	Alternative 2 – No Action	31
5.	SUPPORTING INFORMATION	32
5.1.	List of Preparers	32
5.2.	List of Agencies and Persons Consulted	33
5.3.	Literature Cited.....	34

LIST OF APPENDICES

APPENDIX A – CORRESPONDENCE	37
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APPENDIX B – WETLAND DATA FORMS.....	45
APPENDIX C – RIGHT-OF-WAY CLEARING SPECIFICATIONS	51
APPENDIX D – ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION LINE CONSTRUCTION.....	56
APPENDIX E – ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION SUBSTATION OR COMMUNICATIONS CONSTRUCTION.....	61
APPENDIX F – RIGHT-OF-WAY VEGETATION MANAGEMENT	67
APPENDIX G – TVA TRANSMISSION CONSTRUCTION GUIDELINES NEAR STREAMS	72

LIST OF TABLES

Table 3-1. Major vegetation types in the project area.....	14
Table 3-2. Federally-listed and state-listed plant species reported from the project area.....	16
Table 3-3. Federally-listed and state-listed terrestrial animals reported from the project area.....	17
Table 3-4. Wetlands in the project area.....	19
Table 4-1. Approximate locations and levels of protection for watercourses with the right-of- way of the proposed transmission line.....	25

LIST OF FIGURES

Figure 1. Single-pole (a) and H-frame (b) 161-kV transmission structures.....	4
Figure 2. Project study area and alternative transmission line routes.....	
Figure 3. Preferred transmission line route.....	

CHAPTER 1

1. PURPOSE OF AND NEED FOR ACTION

1.1. The Decision

1.1.1. Need

The Tennessee Valley Authority (TVA) provides electrical service to the Fort Campbell Military Reservation in Montgomery County, Tennessee and Trigg and Christian Counties, Kentucky, over a short, 69-kV transmission line connection from TVA's Edgoten 161-kV Substation. This line is the only source of power for the entire Army base. Because of this single source connection, the base has experienced a significant number of outages over the last five years. Furthermore, many of the electrical facilities at the base are 40-50 years old, consist of many patchwork repairs, and do not meet current safety codes. A reliable power source for the base is essential for national defense because of automation systems used for training and troop deployment. The reliability of the current source does not meet the needs of the Army at Fort Campbell.

1.1.2. Proposed Action

In order to improve the reliability of electric service at Fort Campbell, the Army and TVA propose to construct a new 161-kV substation on the base and a 7.3 mile, 161-kV transmission line connection to an existing TVA transmission line. TVA would construct and operate the substation and transmission line and the Army would fund them. The new Screaming Eagles substation would be located on a site which would be accessed from 101st Airborne Road and adjacent to an existing 69-kV substation owned by Fort Campbell. The Army would transfer the site of the new substation to TVA. The new transmission line would connect the new substation to TVA's Kentucky Dam-Nashville 161-kV Transmission Line. The Army would grant an easement to TVA for the portion of the new transmission line on Fort Campbell.

TVA would also improve associated communications by upgrading a 900 MHz radio at TVA's Montgomery 500-kV Substation and reprogramming communication equipment at the Power Business Center and the System Operations Center in Chattanooga.

1.2. Public Involvement

The following Federal, state and local agencies and other organizations have been contacted to date concerning this project by TVA in addition to internal reviews by a network of designated environmental specialists.

- Tennessee Department of Environment and Conservation
- Tennessee Department of Transportation
- Tennessee Historical Commission
- Tennessee Department of Agriculture
- Tennessee Wildlife Resources Agency
- Tennessee Department of Economic and Community Development
- Tennessee Conservation League
- U.S. Fish and Wildlife Service

This proposal was reviewed for consistency with Executive Order 11988 (Floodplain Management), Executive Order 11990 (Protection of Wetlands), Farmland Protection Policy Act, National Historic Preservation Act, Endangered Species Act, Section 404 of the Clean

Water Act, and Executive Order 12372 (Intergovernmental Review). Correspondence received related to this coordination is contained in Appendix A.

TVA held a public meeting in the project area on April 25, 2002. Four potential transmission line route options (described below in the Alternatives section) were presented to the public.

Nine public officials, five representatives from Fort Campbell, and 214 potentially affected property owners within these corridor routes were invited to the meeting. TVA also issued a press release to local news outlets and advertised the meeting in local newspapers. TVA accepted comments from the public for 30 days after the meeting.

The meeting was attended by 75 people. TVA received numerous comments during the meeting and a few after the meeting. Of the four route options presented at the meeting, alternative route A was the preference of the majority of those expressing an opinion. The other alternatives received much stronger opposition from both the public and Fort Campbell. This was due, in part, because the majority of Route A is on Fort Campbell property and would affect the fewest number of houses and the least amount of private land.

A draft of this EA was distributed to the agencies listed above for their review and comment. The only responses were from the U.S. Fish and Wildlife Service and the Division of Natural Heritage, Tennessee Department of Environment and Conservation (Appendix A). The availability of the draft EA was also advertised in the Clarksville area and a copy of it was made available on the TVA web site. No comments were received as a result of these efforts.

1.3. Necessary Permits or Licenses

Construction of the transmission line would require a Section 404 permit issued by the U.S. Army Corps of Engineers (USACE). The USACE has issued a Section 404 Nationwide Permit #12 - Utility Line Crossing for the project. Permits would be required from the State of Tennessee for construction site stormwater discharge for both the substation and 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.

CHAPTER 2

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Alternatives

2.1.1. Alternative 1 – Construct Transmission Line and Substation

TVA would construct a new substation at Fort Campbell and a new 161-kV transmission line from the new substation to one of four points in TVA's existing Kentucky Dam-Nashville 161-kV Transmission Line. This alternative would meet the need to relieve reliability concerns on the Fort Campbell Military Reservation. It would require the purchase and clearing of new transmission line right-of-way (ROW) for a distance ranging from approximately 4.3 to 7.3 miles, depending on the final route option. The proportion of the new ROW on private land varies from about 12 to 74 %, again depending on the route option. The substation site on Fort Campbell would require about 3.8 acres of land.

2.1.2. Alternative 2 – The No Action Alternative

The alternative of taking no action was rejected. Taking no action would result in no improvement in reliability of electric service to the Fort Campbell Army base.

2.2. Description of Construction, Operation, and Management of the Proposed Substation and 161-kV Transmission Line

2.2.1. Substation Construction

The substation site would be cleared and silt fences would be installed for the construction phase. About 1.5 acres of the site would be graded and proper drainage structures would be installed for the substation facilities. A permanent skimmer pond would be installed for the containment of oil spills. The substation yard would be covered with crushed stone and fenced with chain link fencing 6 feet high. The outfall of drainage ditches would be stabilized with riprap. The unused portion of the site would be restored as much as possible to its pre-construction state.

The major equipment in the substation would consist of one 161-kV disconnect switch, one 161-kV circuit switching device, one 161-13 kV power transformer, four 69-kV instrument transformers, one 69-kV circuit breaker, one 16' x 44' modular control building, and a communications tower 75 feet tall. The equipment would be interconnected with aluminum pipe conductors and stranded copper conductors. The conductors and some equipment would be supported on steel structures.

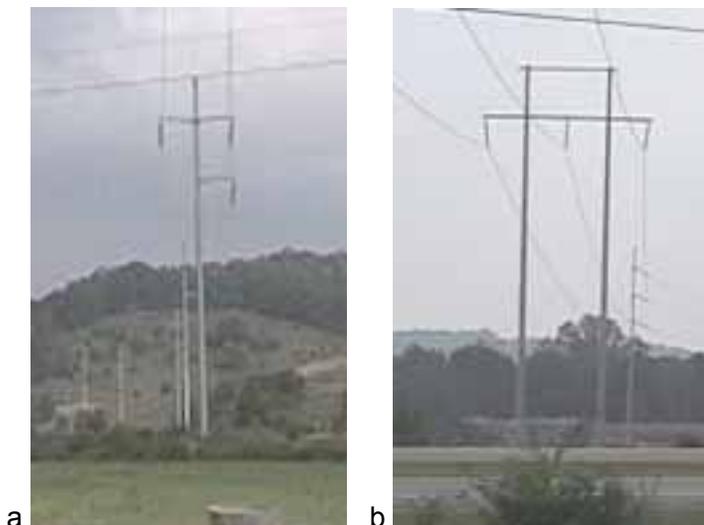
2.2.2. Transmission Line Construction

2.2.2.1. Structures and Conductors

The proposed transmission line would use both single steel-poles and H-frame structures (Figure 1). Structure height would vary according to the terrain and would range between 70 and 100 feet. In areas where interference with the Army's flight paths is a concern, H-frame structures no more than 70 feet tall would be used. At highway crossings, such as U.S. Highway 79, taller double poles may be used in order to maintain adequate clearance between the conductors and whatever is below them. To increase visibility of the structures to aircraft operating during low-light conditions, reflectors (probably reflective

tape) would be installed at the top of all structures. Aircraft warning spheres would also be installed on conductors at the northern end of the line.

Figure 1. Single-pole (a) and H-frame (b) 161-kV transmission structures.



Three conductors (the cables that carry the electrical current) are required to make up a circuit in alternating current transmission lines. For 161-kV transmission lines, each conductor is made up of a single cable. The conductors are attached to fiberglass or ceramic insulators suspended from the structure cross arms. 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 line may require supporting guys. Some structures for larger angles could require two or three poles. Most poles would be directly imbedded in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. The holes would normally be back-filled with the excavated material. In some cases gravel or a cement and gravel mixture might be used. Some structures may be self-supporting (non-guyed) poles which would be placed on a concrete foundation which is formed and poured into an excavated hole.

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, as well as tracked cranes and bulldozers.

2.2.2.2.Right-of-Way

New right-of-way (ROW) 100- feet wide would be needed for the transmission line. TVA would purchase easements from landowners for the new ROW on private land and obtain 100-foot wide easement rights from the Department of Defense (DOD) for the segment on Fort Campbell. These easements and land give TVA the right to construct, operate, and maintain the transmission line. Fee title for the land within the ROW would normally remain with the landowner, and the easement would prohibit certain activities such as the construction of buildings within the ROW that could interfere with the transmission line or create a hazardous situation. Ownership of the substation property would be transferred from the DOD to TVA.

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 be initially removed from the entire width of the ROW. Equipment used during this ROW clearing includes chain saws, skidders, bulldozers, and/or feller-bunchers. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and chipped, or taken offsite. Woody debris on the portion of the ROW off of Fort Campbell may be burned. In some instances, vegetation may be windrowed along the edge of the ROW to serve as sediment barriers. Vegetation removal in streamside management zones (SMZs) and wetlands would be restricted to trees tall enough, or with the potential to soon grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote handling equipment such as a feller-buncher, in order to limit any ground disturbance. Any trees located off the ROW which are tall enough to pass within 6 feet of a conductor or structure (if it were to fall toward the line) are designated “danger trees” and would be removed.

Subsequent to clearing and construction, the right-of-way would be restored as much as is possible to its state prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grass and other low-growing species. Erosion controls would remain in place until the plant communities were fully established. Streamside areas would be revegetated as described in the “Commitments” section of this document.

2.2.2.3. Access Roads

Permanent access roads would be needed to allow vehicle access to each structure and other points along the ROW. TVA would obtain the necessary rights for these access roads from landowners. Existing roads, including farm and field roads, some of which may need upgrading, would be used where possible. New access roads would be located on the ROW wherever possible, and designed to avoid severe slope conditions and minimize stream crossings. New access roads would be about 20 feet wide and surfaced with dirt or gravel. Culverts and other drainage devices, fences, and gates would be installed as necessary. New access roads would be planted with approved seed mixtures following construction. Additional applicable environmental quality protection specifications are listed in Appendices C - G.

The actual locations of access roads cannot be determined until a preferred corridor and specific alignments have been chosen and individual structure locations are known.

2.2.2.4. Construction Assembly Areas

A construction assembly area would be required for worker assembly, vehicle parking, and material storage. This area would be leased for the duration of the construction period. These areas are typically 5 to 10 acres in size, relatively flat, previously cleared, and located adjacent to an existing paved road near the transmission line. Depending on site conditions, some minor grading and installation of drainage structures may be required. The areas would be graveled and fenced, and trailers used for material storage and office space would be parked on the areas. Following the 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.

2.2.2.5. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the ROW and temporary clearance poles would be installed at road and railroad crossings to reduce interference with traffic. A small rope would be pulled from structure to structure. It would be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Crews would then clamp the wires to the insulators and remove the pulleys.

2.2.3. Operation and Maintenance

2.2.3.1. Inspection

161-kV transmission lines are inspected by aerial surveillance, using a helicopter, on approximately five year cycles after operation begins. These inspections are conducted to locate damaged conductors, insulators, or structures, and to report any abnormal conditions which might hamper the normal operation of the line or adversely impact the surrounding area. During these inspections, the condition of vegetation within the ROW, as well as immediately adjoining the ROW, is noted. These observations are then used to plan corrective maintenance and routine vegetation management.

2.2.3.2. Vegetation Management

Management of vegetation along the ROW would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. For a 161-kV transmission line, National Electric Safety Code standards require a minimum clearance of 24 feet.

Management of vegetation along the ROW would consist of two different activities: felling of “danger trees” adjacent to the cleared ROW, and control of vegetation within the cleared ROW.

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

Any herbicides used 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 U.S. Environmental Protection Agency would be used. Appendix F contains a list of the herbicides and adjuvants (ingredients added to the herbicide solution to increase its effectiveness) currently used by TVA in ROW management. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

Other than vegetation management, little other 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, the structure would normally be lifted out of the ground by crane-like equipment and the replacement structure inserted into the same hole or an immediately adjacent hole. Access to the structures would be on existing roads where possible.

2.3. Project and Siting Alternatives

Once a preferred project alternative, Alternative 1, was identified, the process of siting the facilities required by Fort Campbell and TVA to implement that alternative began. The basic steps followed in the siting process are to:

- Determine potential substation location(s);
- determine potential existing power sources to supply the substation;
- define the study area;
- collect data to minimize potential impacts to cultural and natural features;
- develop general route options and potential routes;
- delimit one or more alternative transmission line routes within the option(s);
- gather public input; and
- incorporate public input into the final selection of the preferred transmission line route.

2.3.1. Definition of Study Area

The first tasks were to identify potential substation locations and the power sources that could supply the proposed substation. Fort Campbell personnel screened potential substation sites on the base. The preferred site is a 4-acre tract on the west side of 101st Airborne Road (formerly Woodlawn Road) close to Fort Campbell's existing 69-kV substation. This location would provide a very short connection to the existing substation and to Fort Campbell 69-kV transmission lines in the vicinity of the new and existing substations, thereby reducing exposure to existing lines into the existing substation. In addition, this location could minimize future costs and environmental impacts that would result if additional line connections were brought into the new substation. No other location on Fort Campbell had superior attributes or a better environmental profile.

Once the preferred substation site was selected, TVA explored potential power sources. The most practical power source was the Kentucky Dam-Nashville 161-kV Transmission Line, an east-west line about 4 miles south of the proposed substation. The study area was defined based on the location of the Kentucky Dam-Nashville transmission line and the proposed substation, and is in central Montgomery County. Its boundary was the Bi-County Solid Waste Management System (SWMS, a landfill) to the west, the new Screaming Eagles Substation site to the north, Liberty Church Road to the east, and the Kentucky Dam-Nashville transmission line to the south. Because the Army wanted to minimize the length of the line while keeping the majority of it on its property for security reasons, the study area was not extended west of the Bi County SWMS. Similarly, Liberty Church Road was established as the eastern boundary of the study area to minimize length of line on private property, and to avoid the growing commercial and residential areas near Clarksville.

The study area is entirely within Montgomery County, and encompasses approximately 42 square miles or 26,812 acres (Figure 2). The town of Woodlawn is within the study area. Following is a brief description of other aspects of the study area.

- **Natural and Cultural Features:** The study area is characterized by gently rolling land, approximately 50% forested and 50% agricultural. Residential and commercial development exists along U.S. 79 and four or five connecting roads in the area. The study area is bisected northeast to southwest by Fletchers Fork Creek and east to west by the Little West Fork of the Red River. U.S. 79 runs east to west approximately one mile north of the Kentucky Dam-Nashville transmission line. The new 101st Airborne Division Parkway bisects the eastern portion of the study area.
- **Land Use:** The private land between the Kentucky Dam-Nashville transmission line and U.S. 79 is primarily cultivated fields or pasture. The land on the Fort Campbell reservation is mostly forested with a few cultivated fields. The eastern portion of the study area includes more private land and homes in the suburban and exurban development associated with Clarksville and new subdivisions along 101st Airborne Division Parkway. The largest population center is the Woodlawn area.
- **Transportation:** Major transportation routes in the study area include U.S. 79 (from Liberty Church Road west through Montgomery County) and Tennessee Highway 233 (from Woodlawn to Cumberland City). Other roads include the recently constructed 101st Airborne Division Parkway.

2.3.2. Collect Data

Geographic data, such as topography, land use, 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 a geographic information system (GIS). This system allowed the multitude of factors of the study area to be examined simultaneously to develop and evaluate numerous options and scenarios to determine the route that would best meet project objectives. Maps were created to clearly show regional opportunities and constraints. Sources of information collected for the study area included 1"=500' aerial photography, county tax maps/property boundaries, USGS digital line graphs, Digital Elevation Models, National Wetlands Inventory (NWI) and cultural resource data, among others. Aerial photography was interpreted to obtain land use and land cover data such as forest, 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 numbers of road crossings, stream crossings and property parcels.

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

For this project, GIS data analysis included steep slope crossings, 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 acreage of wetlands and percent slope.

2.3.3. Develop Potential Routes

From the information gathered during the systems studies and data development phases, four transmission line route options were identified to connect to the proposed substation. Routes C and D share the same tap point, and consequently the four line route options

would tap TVA's existing Kentucky Dam-Nashville 161-kV Transmission Line at three different locations (Figure 2).

2.3.3.1.Route A

Route A would begin at a point just west of TN 233 on the Kentucky Dam-Nashville 161-kV Transmission Line and run 7.3-miles north to the proposed substation. About 0.9-mile of new 100-foot-wide right-of-way would be on private land with the remainder on Fort Campbell. The tap point would be located approximately one mile southwest of the intersection of U.S. 79 and TN 233. From the tap point, the route would follow a northeasterly direction through farm fields and one residence before reaching U.S. 79. On the north side of U.S. 79 the route would turn in a northeast direction to avoid the SWMS landfill, and run parallel to the north side of 101st Airborne Road for about two miles. At the point where the road turns east, the line would continue straight to maintain adequate distance from the Sabre Army Heliport. The route would continue in a northeasterly direction for approximately 7500 feet, crossing fields until reaching a point just south of Lake Taal. The route would then run along the east side of Lake Taal and cross an open field and Fletchers Fork before turning east for approximately 1600 feet to a point 150 feet west of 101st Airborne Road. The route would then continue parallel to this road until reaching the proposed substation site.

An effort was made to parallel roads as much possible on this route. The Army owns an existing distribution line that runs from their existing substation (adjacent to the proposed substation) to the Construction Landfill just north of U.S. 79. Where practical, TVA's new line would be located on the opposite (west) side of the road from the distribution line. Over half of Route A would parallel existing roads.

2.3.3.2.Route B

Route B would utilize the tap line and switches at Cumberland EMC's existing Woodlawn 161-kV Substation (which is connected to the Kentucky Dam-Nashville 161-kV Transmission Line) and would run approximately 5.6 miles north to the new substation. About one mile of the line would be on private land. From a point just north of the Woodlawn Substation, the route would head north across U.S. 79 for about one mile, where it would enter Fort Campbell property. Here the route would turn northwest, in order to avoid aircraft traffic into the Sabre Army Heliport, for approximately 1.2 miles, crossing 101st Airborne Road before tying into Route A approximately 0.5 mile southwest of Lake Taal.

2.3.3.3.Route C

Route C would be 4.9 miles long and have about half of the right-of-way on private land. The route would begin at a tap point on the Kentucky Dam-Nashville 161-kV Transmission Line about 400 feet west of Liberty Church Road. The route would initially proceed west along the north boundary of TVA's existing transmission line ROW until reaching the east boundary of 101st Airborne Division Parkway (although not shown on Figure 2, this road is currently being extended south to the Cumberland River). From this point the route turns north and parallels the parkway for about 1.1 miles before turning northwest and crossing it. The line continues northwest for approximately 1500 feet and then turns north for another 1500 feet until reaching Lafayette Road. The route then turns northwest and runs parallel to the east side of Lafayette Road for approximately 3100 feet. Here the line crosses 101st Airborne Road and turns northeast, paralleling this road for approximately 3300 feet before

merging with Routes A and B. From here the line would continue to follow 101st Airborne Road approximately 4300 feet to the proposed substation site.

2.3.3.4.Route D

Route D is a 4.3 mile tap line with about 75 percent of the right-of-way on private land. From the tap point described in Route C above, the route would travel north for approximately 2.2 miles, crossing U.S. 79 and 101st Airborne Division Parkway before finally reaching Lafayette Road. Here the line would turn slightly northwest between two residential developments for approximately 2500 feet before reaching Fort Campbell property. The route would continue northwest for another 4500 feet until crossing 101st Airborne Road. At this point Route D would merge with Routes A, B, and C, turning northeast and following the west side of this road for approximately 1500 feet to the proposed substation site.

2.3.4. Establish and Apply Siting Criteria

TVA has established a set of evaluation criteria that represent opportunities and constraints for development of transmission routes. The criteria are oriented toward factors such as existing land use, ownership patterns, environmental features, cultural features, and visual quality. Cost is also an important factor with engineering considerations and right-of-way acquisition cost being the most important elements. Information gathered at public meetings is taken into account while developing criteria specific to the study area. The primary issue identified at the Public Information Day was that both the members of the community and Fort Campbell wanted as much of the line as possible on government property. The public desired this to minimize impacts to private property, and Fort Campbell desired this because of security reasons.

Each of the four routes was evaluated according to engineering, environmental, land use, and cultural criteria. Specific criteria, each of which is given a numeric score for each route, are described below.

- Engineering Criteria: total length of the transmission route, length of new right-of-way and rebuilt right-of-way, number of primary and secondary road, pipeline and transmission line crossings, and total line cost.
- Environmental Criteria: slopes greater than 30 %, slopes between 20 and 30 %, forested acres, open water crossings, sensitive stream (those supporting endangered or threatened species) crossings, perennial and intermittent stream crossings, wetlands, caves, 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, the Sabre Army Heliport, and parkland crossings.
- Cultural Criteria: archaeological and historic sites, churches, and cemeteries.

Scores for each of the four alternatives were calculated by adding individual criterion values for each 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 sub-category (engineering, environmental, land use, and cultural).

A weighted score was produced for each route in each sub-category. 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.

Route A - Siting Constraints

Route A required the least amount of private land. One house would have to be relocated to avoid affecting two adjacent houses and a creek on either side; however, the property owner was agreeable to the move. The portion of the route on Fort Campbell property was constrained by the Bi County SWMS, the Fort Campbell Construction Landfill, the Golden Eagle Training Site, and the Sabre Army Heliport. The line was routed between the Bi County SWMS and the Construction Landfill. The Army stated that the line should run east of the Bi County SWMS and northwest of the landfill. In order to avoid the Bi County SWMS, the line was located east of the tributary to Fletcher's Fork, and then followed the west side of 101st Airborne Road to avoid the landfill. In addition, Fort Campbell's distribution line is located on the east side of this road. The Golden Eagle Training Site is controlled by the Air Force, who insisted that this route stay along 101st Airborne Road to avoid interference with their site. Finally, the line could not continue along 101st Airborne Road because it would run too close to the runway at the Sabre Army Heliport and interfere with the Army's flight paths.

Advantages included:

- Preferred by the Army and the public;
- Majority of the line on Fort Campbell property with 0.9 mile on private land; and
- Conducive to long-range plans (could serve a future switching station connection to the Kentucky Dam-Nashville 161-kV Transmission Line).

Route B - Siting Constraints

Siting constraints in this area included the Sabre Army Heliport, two existing subdivisions located in the Woodlawn community between Old Dover Road and U.S. 79, an equestrian facility, and other residential, commercial, and institutional development. Other constraints included more primary road crossings. Route B affects more commercial development than Route A and has the major detriment of interfering with the Army's helicopter flight path.

Advantages included:

- Good tap point location (easy access)
- Only one mile of the line on private land
- Conducive to long range plans (could serve a future switching station connection to the Kentucky Dam-Nashville 161-kV Transmission Line).

Routes C and D - Siting Constraints

Siting constraints included the Sabre Army Heliport for Route C, a large subdivision between Routes C and D, and a future elementary school site north of Lafayette Road just east of Route D. Access to the line was a major disadvantage to these routes as well. The tap point access was poor because it was located off of a private driveway on Liberty Church Road. There is very limited sight distance for vehicles entering and leaving this

location. In addition, Route C would parallel 101st Airborne Division Parkway for over one mile. Access along 101st Airborne Division Parkway would be extremely difficult, if not impossible, because this road is fenced. Finally, because the tap point location provided limited access, it would not be considered a viable option for a future switching station.

2.3.5. Identification of Preferred Alternative

Routes C and D each are shorter than Route A and thus scored higher in the Engineering category. However, because these routes were undesirable to the Army as well as the public, and because the analyses showed no route had substantial environmental impacts, the preferred route was selected based primarily on the Army's needs. Routes C and D were eliminated as feasible route options after the public meetings and preliminary analyses. These routes would impact much more private land than the other alternatives. Route C impacted almost 2.5 miles, while Route D crossed over 3 miles of private property. In addition, while Route C did avoid the Sabre Army Heliport by enough distance to satisfy FAA Regulations, the Army was still not satisfied that the line would not interfere with their flight path. Furthermore, unlike the tap points for Routes A and B, the tap point for alternative Routes C and D was not conducive to TVA's future plans for a switching station. While Routes A and B were both feasible alternatives, Route B was deemed undesirable by the Army because part of the route interfered with the helicopter landing and takeoffs from the Sabre Army Heliport. Similarly, the public preferred Route A because Route B affected more residential property. Consequently, Route A was selected as the preferred alternative (see Figure 3). Route A is 7.3 miles long and would require about 88.5 acres of new ROW.

2.4. Summary of Mitigation Measures

The following routine measures identified in this EA would be applied during construction and operation of the proposed transmission line and substation:

- Best Management Practices as described in Muncy (1999)
- Environmental quality protection specifications as described in Appendices C – G.

In order to minimize impacts to Indiana bat habitat, the following mitigation measure would be employed:

- Clearing trees for right-of-way construction in a section of the proposed route near Lake Taal from survey station 291+50 to station 333+02 would take place between September 16 and March 31.

CHAPTER 3

3. AFFECTED ENVIRONMENT

3.1. Groundwater

The project area is underlain by limestone aquifers in Mississippian rocks. The aquifer is called the Highland Rim aquifer system. It is present in limestone that is either flat or gently dipping and capped by a layer of regolith that varies greatly in thickness. In general, the limestone aquifers that yield the largest quantities of water to wells and springs are the Upper Mississippian Monteagle, the Ste. Genevieve, and the St. Louis Limestone.

The regolith covering the Mississippian aquifers is mostly weathered material, or residuum, composed clay, silt, sand, and pebble-sized particles of limestone or chert, derived mostly from weathering of the underlying bedrock. The regolith can store large quantities of water that subsequently percolate slowly downward to recharge aquifers in the underlying consolidated rock. Within the underlying limestone rock, the water moves through zones of secondary permeability created by dissolution enlargement of bedding planes and fractures by the slightly acidic water. The solution openings store and transmit most of the water that moves through the limestone and discharges to streams, springs, and wells.

The yields of wells completed in the Mississippian aquifers vary greatly. Well yields in Tennessee commonly range from 5 to 50 gallons per minute, and maximum yields may exceed 400 gallons per minute. Wells that penetrate large, saturated solution openings may yield several thousands of gallons per minute. However, such openings constitute only a small part of the rock and might be difficult to locate.

The groundwater in the Mississippian aquifers in Tennessee is either a calcium magnesium bicarbonate type or a calcium bicarbonate type, and dissolved solids and iron concentrations generally meet secondary maximum contaminant levels for drinking water established by the U.S. Environmental Protection Agency. The quality of the water is adequate for most uses, or it can be treated and made adequate.

3.2. Surface Water

Rainfall in the project area averages about 47 inches per year with March being the wettest month with 4.9 inches and October the driest with 2.6 inches. The project area drains to Lake Barkley in the Cumberland River Basin via Blooming Grove Creek at Cumberland River Mile (CRM) 112 (Bartee Branch) and the Red River at CRM 125.3 via West Fork Red River (Little West Fork and its tributary Fletcher Fork). The mean annual flow of the Cumberland River at the USGS gaging station at CRM 148.7 is 23,800 cubic feet per second (cfs) or almost 1.7 cfs per square mile for the 14,163 square mile drainage area. A portion of Fletcher Fork is impounded to form Lake Taal.

The Little West Fork Red River is classified by the Tennessee Department of Environment and Conservation (TDEC) for industrial water supply, fish and aquatic life, recreation, irrigation, and livestock watering and wildlife. The West Fork Red River is classified for industrial water supply, fish and aquatic life, recreation, livestock watering and wildlife, and navigation. The Red River from its mouth to mile 2.0 is classified for industrial water supply, fish and aquatic life, recreation, irrigation, livestock watering and wildlife, and navigation. The receiving section of Lake Barkley/Cumberland River is classified for

domestic and industrial water supply, fish and aquatic life, recreation, irrigation, livestock watering and wildlife, and navigation. The remaining streams are classified for fish and aquatic life, recreation, irrigation, and livestock watering and wildlife.

The Little West Fork Red River is on the state 303 (d) list as partially supporting its designated uses due to phosphorus, siltation, and organic enrichment/low DO from major municipal point source and habitat modification. The West Fork Red River is listed as not supporting designated uses due to siltation and other habitat alterations from land development. The Red River is listed as partially supporting due to siltation, pathogens, other habitat alterations, and organic enrichment/low DO. There are no waters within this study area that are classified as “high quality” by the TDEC.

3.3. Vegetation

The Fort Campbell Military Reservation extends across two Subsections of the Highland Rim which is in the Interior Low Plateaus Province (Chester et al. 1995). The Pennyroyal Plain Subsection, which occupies the central part of the Reservation, is a level to rolling, karst landscape. This region was mostly treeless and included vegetation with tallgrass prairie affinities when settled by Europeans. This region is now mostly under cultivation with some remnants of prairie vegetation (barrens) found on the Reservation. The remainder of the reservation, and most of the project area, is within the Western Highland Rim Subsection, a dissected, hilly region.

Field surveys of the project area were conducted by TVA biologists in January, 2003. The major vegetation types are listed in Table 3-1. No prairie remnants or other uncommon plant communities occur in the project area. Wetlands are present and are discussed below in the wetlands section. Old fields contain species such as blackberries, goldenrods and asters. Common upland trees were red cedar, southern red oak and white oak. Sugar maple, red maple and tulip poplar are found in mesic woods and bottomlands. Box elder, river birch, sycamore and green ash are common on bottomlands.

Table 3-1. Major vegetation types in the project area.

Vegetation Type	% of Area
Cultivated fields, pastures, mowed road edges, lawns	50%
Upland forests and thickets, pine plantations	35%
Wetlands and/or lake margins	5%
Old fields	5%
Bottomland and mesic forests	5%

The majority of the project area has been subjected to some level of disturbance from agricultural use. As a result, several invasive plant species are present including privet, Japanese honeysuckle, multiflora rose, and Japan grass. The remaining lands are a mixture of wetlands and/or lake margins and bottomland and mesic forests. These areas have also been subjected to various levels of disturbance and contain, to a lesser degree, the same invasive terrestrial plant species listed above.

3.4. Wildlife

The regularly mowed grasses and maintained agricultural fields in the project area provide limited wildlife habitat. Old field habitats found in existing transmission line corridors provide better, though still low-quality habitat in terms of species diversity. Birds found in these areas include white-eyed vireo, field sparrow, and common yellowthroat. Mammals that occur in these habitats include white-tailed deer, least shrew, and hispid cotton rat. Reptiles that may use these areas include milk snake and black rat snake.

Of the habitats along the proposed route, the bottomland hardwood/floodplain habitat along Fletcher's Fork, just west of Lake Taal, represents the highest quality in terms of the diversity and density of wildlife. Floodplain forests serve as corridors for bird species such as wood duck, barred owl, red-eyed vireo, downy woodpecker, and Carolina chickadees. Temporary pools that form in these forests serve as breeding areas for amphibians such as mole salamander, leopard frog, and red spotted newt. Reptiles common to these habitats include eastern box turtle, worm snake, and queen snake. Mammals found in these areas include short-tailed shrew, woodland vole, and white-footed mouse.

Birds that occur in upland mixed deciduous - pine forest include tufted titmouse, Carolina chickadee, and red-eyed vireo. Reptiles found in this habitat include ground skink and brown snake. Mammals that occur in this habitat include gray squirrel, eastern chipmunk, and white-tailed deer.

Birds that occur in pine-dominated forest include great-crested flycatcher, pine warbler, and northern flicker. Amphibians and reptiles found in this habitat include ground skink and occasional fence lizards. Mammals that occur in this habitat include gray squirrel, eastern chipmunk, and white-tailed deer.

3.5. Aquatic Ecology

The proposed project is located in the Red River watershed of the Western Highland Rim physiographic province in Montgomery County, Tennessee. Streams of the Highland Rim are characterized by coarse chert gravel and sand substrates interspersed with bedrock areas, moderate gradients, clear waters, and moderate to low productivity, and thus little aquatic vegetation except near springs. The softer limestones of the Highland Rim are pervaded by dissolution channels, and the region is very rich in cave and spring habitat. Due to its geologic complexity, and numerous semi-independent drainage systems, the Highland Rim harbors the most diverse fauna of any region of comparable size in North America (Etnier and Starnes 1993). TWRA sampling of the Red River in 1999 collected forty-three fish species; the Red River supports a very good black bass fishery, and an excellent channel catfish and flathead catfish fishery (TWRA 2000).

Thirty-eight watercourses were identified during surveys conducted by TVA staff in January and March, 2003. Eight of these watercourses are perennial streams and ponds. Typically, perennial streams can support a permanent assemblage of aquatic biota including invertebrates, reptiles, amphibians, and fish. Stock ponds and Lake Taal provide habitat for aquatic species (most likely sunfish and catfish) associated with those habitats. Two watercourses are intermittent streams; such streams flow during only a portion of the year, and usually not during the drier, summer months. These streams depict a strong bed and bank structure, receive both surface and subsurface flow, and support a limited amount of aquatic biota. The remaining 26 watercourses present within the project corridor are classified as ephemeral streams or wet-weather conveyances. These ephemeral streams

typically only flow for 1 to 2 days after a rain event, receive negligible subsurface flow, and maintain weak to moderate bed and bank structure. These factors make it difficult for aquatic biota to survive in these channels.

3.6. Endangered and Threatened Species

Plants - A review of TVA Regional Natural Heritage database and Fort Campbell natural resources inventory information indicates that one federally listed and 14 state-listed plant species have been reported from within five miles of the proposed transmission line and substation (Table 3-2). Rare plant species inventories of Fort Campbell were conducted between July 1993 and August 1994 by the Tennessee Chapter of The Nature Conservancy (Chester *et al*, 1995) and the results are incorporated into Table 3-2.

Table 3-2. Federally-listed and state-listed plant species reported from the project area.

Common Name	Scientific Name	Status ¹	
		Federal	State
Earleaf false-foxglove	<i>Agalinis (Tomanthera) auriculata</i>		END
Price's potato-bean	<i>Apios priceana</i>	THR	END
Purple milkweed	<i>Asclepias purpurascens</i>		SPCO
Blue mud-plantain	<i>Heterantha limosa</i>		THR
Hairy hawkweed	<i>Hieracium longipilum</i>		SPCO
Golden-seal	<i>Hydrastis canadense</i>		S-CE
Michigan lily	<i>Lilium michiganense</i>		THR
American ginseng	<i>Panax quinquefolius</i>		S-CE
Blue scorpion-weed	<i>Phacelia ranunculacea</i>		SPCO
Large-tooth aspen	<i>Populus grandidentata</i>		SPCO
Barbed rattlesnake-root	<i>Prenanthes barbata</i>		SPCO
Sweet coneflower	<i>Rudbeckia subtomentosa</i>		THR
Compass-plant	<i>Silphium laciniatum</i>		THR
Prairie-dock	<i>Silphium pinnatifidum</i>		THR

¹ Status codes: END = endangered; THR = threatened; SPCO: special concern; S-CE: special concern due to commercial exploitation.

The above information formed the basis of field surveys of the proposed project areas conducted by TVA Regional Natural Heritage botanists in January, 2003. Potential habitat for Price's potato-bean, ginseng, golden-seal and blue scorpion-weed is present at two sites. These two sites were previously surveyed for these species by Wofford and Chester in August, 1993 (Chester *et al.*, 1995) when these plants would have been detectable if present. They did not find these plants. Also potential habitat for large-tooth aspen, a species identifiable in January, is present, but the species was not found. Otherwise, no occurrences of, or suitable habitat for, federally or state-listed plant species were identified during these surveys.

Terrestrial Animals – A review of the TVA Regional Natural Heritage Project database and Fort Campbell natural resources inventory information indicates that two federally listed species are known from Montgomery County, and seven state-listed species are known from within a three mile radius of the proposed transmission line and substation (Table 3-3).

Table 3-3. Federally-listed and state-listed terrestrial animals reported from the project area.

Common Name	Scientific Name	Status ¹	
		Federal	State
<u>Amphibians</u>			
Eastern hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>		NMGT
<u>Birds</u>			
Cerulean warbler	<i>Dendroica cerulea</i>		NMGT
Sharp-shinned hawk	<i>Accipiter striatus</i>		NMGT
<u>Mammals</u>			
Common shrew (masked shrew)	<i>Sorex cinereus</i>		NMGT
Eastern small-footed bat	<i>Myotis leibii</i>		NMGT
Gray bat	<i>Myotis grisescens</i>	END	END
Indiana bat	<i>Myotis sodalis</i>	END	END
Meadow jumping mouse	<i>Zapus hudsonius</i>		NMGT
Southeastern shrew	<i>Sorex longirostris</i>		NMGT

¹ Status codes: END = endangered; THR = threatened; NMGT – in need of management.

Based on habitat requirements, geographic ranges, and field surveys of the proposed project area, many of the species listed in Table 3-3 are expected to find suitable habitat in areas potentially affected by the proposed transmission line and substation.

Sharp-shinned hawks prefer to nest in pine-dominated forests ranging from pure pine stands to mixed pine and hardwoods. Segments of pine and deciduous forests encompassing portions of the proposed route serve as suitable habitat for this species.

Gray bats roost in caves year-round, typically along rivers and reservoirs where they forage. Gray bats have been reported in several areas within Fort Campbell. Although there are no roosts within the vicinity of the proposed project, gray bats forage over lakes and streams throughout the project site. Eastern small-footed bats roost in hollow trees, under loose bark, and in cracks and crevices found in bluff and cave habitats. This species has been observed within three miles of the project site. Although no caves are reported from the project site, forested habitats along the proposed transmission line are suitable foraging areas for this species. Indiana bats hibernate in caves during winter and form small colonies under loose bark of dead trees and occasionally in hollow trees during summer. Typical roosting sites are often near water. Indiana bats forage primarily in forested areas along streams or other corridors. Indiana bats have been captured at three

sites at Fort Campbell, none of which are closer than five miles from the proposed substation and transmission line. Forested habitats in the project site represent suitable habitat for this species.

Common shrews can be found in nearly all moist habitats, but prefer moist, grassy fields and marshes. This species may find suitable habitat in forested floodplain areas along the proposed route. Southeastern shrews are found in a variety of habitats. They prefer moist woodlands with decaying logs or leaf litter, but are also found in more open habitats near water resources. Southeastern shrews have been reported from the rocky forested areas just south of Lake Taal. Meadow jumping mice inhabit grassy fields or fields with mixed grasses and forbs, near sources of water. Old field habitats along the proposed route are suitable for this species.

Although they have been reported in the vicinity of the proposed line, areas affected by the proposed transmission line do not meet the habitat requirements for the cerulean warbler or eastern hellbender. Cerulean warblers typically inhabit mature and old growth deciduous forests, particularly in floodplains or in mountainous areas. This species has been reported from upland hardwood forests within Fort Campbell; suitable nesting habitat for this bird was not identified during field surveys along the proposed transmission line route. Eastern hellbenders inhabit large, clear, fast-flowing streams with many large flat rocks and logs. Creeks crossed by the proposed line do not meet the habitat requirements for this large salamander.

Aquatic Animals - According to a review of the TVA Regional Natural Heritage Project database, no listed aquatic animal species are known to occur in streams that would potentially be impacted by construction or operation of the proposed transmission line or construction of the new substation.

3.7. Natural Areas

The majority of the proposed route and substation site is within the Fort Campbell Military Reservation, a 105,000-acre Army installation in Tennessee and Kentucky. The Fort Campbell Fish and Wildlife Program is responsible for the management of flora and fauna on the installation. The reservation is managed in cooperation with Kentucky and Tennessee state wildlife agencies. Management philosophy embodies conservation, preservation, and the manipulation of habitats to provide for a diverse assemblage of species, as well as wildlife-oriented recreational activities including hunting, while adhering to military objectives (FCED 2002a). Specific agendas include fisheries management, game and non-game species management, threatened and endangered species protection and management, and urban wildlife management (FCED 2002b). Survey and monitoring work has produced records for over 500 species of plants, 171 birds, 63 fish, 28 amphibians, 26 reptiles and 47 mammals on the reservation (FCED 2002b).

Fort Campbell is recognized as an exemplary large-scale barren, i.e., "prairie," community on the Highland Rim in Middle Tennessee and Kentucky. There are 20,000 to 30,000 acres of barrens on the reservation, which persists primarily because of repeated burning. Fort Campbell harbors many rare plants that have found refuge in its barren remnants, including some that are state-listed and two that are of management concern to the U.S. Fish and Wildlife Service. Nearly 78,000 acres of the reservation are designated a Tennessee Protection Planning Site. Protection Planning Sites are compiled by federal, state and private land managers and individuals knowledgeable about the biota of a state. Several state agencies, institutions and private organizations are involved in an effort to monitor and

maintain the barrens communities of Fort Campbell. These groups include the Tennessee and Kentucky Chapters of The Nature Conservancy, the Tennessee Department of Environment and Conservation - Division of Natural Heritage, the Kentucky State Nature Preserves Commission, the Tennessee Wildlife Resources Agency, the Kentucky Department of Fish and Wildlife Resources, Austin Peay State University and the University of Tennessee.

The southern end of the proposed transmission line, the tap into the Kentucky Dam-Nashville 161-kV line, is 0.65 miles northwest of the Barnett Woods Designated State Natural Area and TNC Preserve. Barnett Woods is primarily a forested ravine that includes streambank forests, caves, springs, bluffs, and a few successional fields. Sixteen fern species and nearly 50 herbaceous plant species have been recorded at the site, some being federal and/or state-listed species. The Indiana bat has also been recorded at Barnett Woods. The area is managed cooperatively by The Nature Conservancy (TNC) and the Tennessee Department of Environment and Conservation, which recognizes the area as a Class II State Natural Area. Such areas are noted for their natural and scientific values.

The entire project site is located in Montgomery County, Tennessee. There are four streams in Montgomery County listed on the National Rivers Inventory. The closest of these streams, the West Fork of the Red River, is approximately 5.3 miles from the project site.

3.8. Wetlands

Wetland determinations were performed according to US Army Corps of Engineers standards (USACE 1987), which require documentation of hydrophytic vegetation (Reed 1997), hydric soil, and wetland hydrology. Wetlands are classified according to the Cowardin system for the classification of wetlands and deepwater habitats (Cowardin et al. 1979).

No wetlands occur at the substation site. There are 4.6 acres in the proposed ROW which meet USACE (1987) criteria for wetlands which may be federal jurisdictional wetlands under the Clean Water Act and state jurisdictional wetlands under the Tennessee Water Pollution Control Act. Of the wetlands identified, one is a forested wetland with approximately 2.0 acres in the ROW, and two are emergent (marsh) wetlands with approximately 2.6 acres in the ROW. A summary of wetland type, location, and acreage is presented in Table 3-4. Descriptive data for the wetlands is reported on the Routine Wetland Determination Data Forms provided in Appendix B.

The forested wetland (W2) is in the floodplain of Fletcher's Fork, on Fort Campbell just upstream from Lake Taal. The total size of this forested wetland, estimated from National Wetland Inventory data, is approximately 43 acres. One of the emergent (marsh) wetlands (W3) is located within the banks of Lake Taal. Lake Taal has received heavy sediment loads transported via Fletcher's Fork which has resulting in a reduction of the open water area of the lake, decrease in water depth, and the establishment of emergent wetland vegetation in the shallow water areas. An estimated 15 acres, or half of the approximately 30-acre Lake Taal, is emergent wetland. The other emergent wetland (W1) is located in a depression area between two livestock ponds in a pasture on private land south of U.S. 79.

Table 3-4. Wetlands in the project area.

Wetland ID	W1	W2	W3
Classification	PEM1	PFO1	PEM1
Location	Cattle pasture south of U.S. 79	Forested wetland in floodplain of Fletcher Fork	Within banks of Lake Taal
Boundary Locations	26+56.1 - 30+89.7	232+94 - 236+26.3, 246+00 - 250+99.5	250+99.5 - 268+24.8
Length (ft)	433.6	832	1725
Width in ROW (ft)	100	100	40
Area in ROW (acres)	1.0	2.0	1.6

The functions performed by these wetlands include attenuation of flood flows, nutrient cycling, removal and transformation of contaminants, sediment retention, providing wildlife habitat, and support for diversity at the biological and landscape levels. The societal values afforded by these wetland functions include wildlife resources, flood control, water quality, and biological diversity.

3.9. Floodplains

The proposed substation is not located in a floodplain. The proposed transmission line crosses the floodplain of Fletchers Fork and a few minor tributaries.

3.10. Recreation

Two developed recreation areas occur on Fort Campbell in the vicinity of Lake Taal. Destiny Parks and Pavilions contains two camping areas with a combined 59 sites, both primitive and developed, eight cabins, four pavilions, athletic fields and a children's fishing pond (FCMWR 2003). Eagle Creek Ranch offers horseback riding. The proposed transmission line crosses between the park and ranch properties, approaching the southern side of one camping area and the Wohali Pavilion in the park. Lake Taal, an impoundment of approximately 30 acres, offers visitors wildlife viewing and fishing opportunities. No developed recreation areas occur near the portion of the proposed transmission line on private land.

3.11. Visual Resources

The physical, biological, and cultural features of an area combine to make the visual landscape character both identifiable and unique. Scenic integrity indicates the degree of unity or wholeness of the visual character. Scenic attractiveness is the evaluation of outstanding or unique natural features, scenic variety, seasonal change, and strategic location. Where and how the landscape is viewed would affect the more subjective perceptions of its aesthetic quality and sense of place. Views of a landscape are described in terms of what is seen in foreground, middleground, and background distances. In the foreground, an area within one half mile of the observer, details of objects are easily distinguished in the landscape. In the middleground, normally between a mile and four miles from the observer, objects may be distinguishable but their details are weak and they tend to merge into larger patterns. Details and colors of objects in the background, the distant part of the landscape, are not normally discernible unless they are especially large

and standing alone. The impressions of an area's visual character can have a significant influence on how it is appreciated, protected, and used. The general landscape character of the study area is described in this section with additional details in the section that follows.

The southern end of the proposed transmission line, where it connects to the existing Kentucky Dam-Nashville 161-kV line, would be in the foreground of several existing homes along TN 233. The new line would follow a northeast route towards U.S. 79, passing near an existing water tower that serves the town of Woodlawn. There are numerous homes along TN 233 to the east. North of U.S. 79, the route would be located on Fort Campbell along the west side of 101st Airborne Division Road. This portion of the Fort Campbell Military Reservation is known as the Rear Area and is generally open to the public for access to recreational opportunities within the reservation.

Traffic along 101st Airborne Division Road is light except during military and civilian duty and shift changes. There is no housing in this section of the Rear Area. Right-of-Way areas along the road are mowed strips with alternating wooded areas and agriculture lands immediately beyond. The new route would traverse the northeastern edge of the Lake Taal. The transmission line would be in the foreground of a military restaurant and nightclub to the east.

Northeast of Lake Taal, the line would cross 11th Airborne Division Road and to the east of a recreation complex in the foreground. From this point, the line route turns east after crossing Fletchers Fork and again parallels the 101st Airborne Division Road for about _ mile to the proposed substation. The substation site mostly heavily wooded with a mix of cedars and hardwoods. Scenic attractiveness is common. Scenic integrity is low.

3.12. Cultural Resources

Middle Tennessee has been an area of human occupation for the last 12,000 years. In this area, prehistoric chronology is generally broken into five broad time periods: Paleo-Indian, Archaic, Gulf Formational, Woodland, and Mississippian (Walthall 1980; McNutt and Weaver 1985). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces. Specialized campsites tend to be located on older alluvial terraces and in the uplands. In the 17th and 18th centuries the Shawnee had settlements in the area but they were repeatedly forced out by the Creeks and Cherokee who claimed Middle Tennessee as hunting territory. The first permanent occupation of the area by Europeans, Euro-Americans, and African-Americans occurred in the 18th century.

There are currently 51 properties in Montgomery County that are listed in the National Register of Historic Places (NRHP). None of these properties is within the Area of Potential Effect (APE) for the proposed undertaking. The APE for the undertaking was defined for archaeological resources as all areas upon which the transmission line and substation would be constructed. The visual APE for historic structures and sites was defined as all areas from which the transmission line and substation would be visible.

An archaeological survey of the APE was conducted (Barrett and Karpyneec 2003). Two previously identified sites (40MT21 and Cemetery 17) and two new sites (40MT883 and 40MT884) were found. Only one site, 40MT21, a Native American burial site, is eligible for listing in the NRHP. As originally designed, the transmission line would cross this archaeological site, as well as Cemetery 17 (the Glen Long cemetery). Although not

eligible for the NRHP, the cemetery is protected under Tennessee state laws regarding the protection of burials (TCA 39-17-311 and TCA 39-17-312).

The historic architectural survey documented one previously identified historic district, Clarksville Base, and identified eight additional historic structures. Clarksville Base was determined eligible for the NRHP in 1999. The proposed substation and a portion of the transmission line would be within and adjacent to the NRHP boundaries of the district. None of the other eight historic structures identified were determined eligible for the NRHP (Barrett and Karpynec 2003).

CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

4.1. Groundwater

4.1.1. Alternative 1 – Transmission Line and Substation

Because of the extensive limestone aquifer in the project area, this project could result in adverse impacts to groundwater if appropriate protective measures are not implemented. Adverse impacts could result from the entry of sediment-laden storm runoff, or contaminated runoff from the substation, into aquifers.

The substation would be designed to prevent the entry of contaminated runoff into aquifers. Runoff from around the transformers and other areas where oil spills could occur would be contained and routed to a permanent skimmer pond for treatment. Other substation runoff would be routed through drainage control structures. Best Management Practices (Muncy 1999) and other measures (Appendices C - G) would be employed during all phases of substation and transmission line construction. With the implementation of these measures, potential impacts to groundwater would be insignificant.

4.1.2. Alternative 2 – No Action

Under the No Action alternative, no impacts to groundwater would occur.

4.2. Surface Water

4.2.1. Alternative 1 – Transmission Line and Substation

Each of the three streams downstream of the project area that are on the state 303 (d) list includes siltation as one of the causes for the listing. Soil disturbances associated with access roads or other construction activities can potentially result in adverse siltation impacts. Erosion and sedimentation can clog small streams and threaten aquatic life. Removal of the tree canopy along stream crossings can result in increased water temperatures and adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could also result in pollutant runoff to streams and subsequent aquatic impacts.

Precautions would be included in the project design, construction, and maintenance to minimize potential impacts and to avoid the addition of sediment or siltation to the 303(d) listed streams. Permanent stream crossings would be made so as 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 Best Management Practices (Muncy 1999) and measures listed in Appendices C, D, and G. Streamside management zones would be established and vegetation removal and ground disturbance would be minimized in them. Right-of-way maintenance that requires chemical treatment would employ only USEPA-registered herbicides used in accordance with label directions. Implementation of these measures will help ensure that any impacts to surface water are insignificant.

4.2.2. Alternative 2 – No Action

Under the No Action alternative, no impacts to surface water would occur.

4.3. Vegetation

4.3.1. Alternative 1 – Transmission Line and Substation

Construction and operation of the proposed transmission line and substation would affect an area of about 90 acres. The predominant impact to vegetation would be the long-term conversion of about 35 acres of forest to early-successional habitats. The affected forest types are relatively common in the area and no uncommon plant communities or otherwise sensitive plant habitats would be affected. Potential impacts from the spread of invasive plant species would be minimized by replanting disturbed areas with native species or non-invasive non-native species. Impacts to vegetation are expected to be insignificant.

4.3.2. Alternative 2 – No Action

No project-related impacts to the terrestrial vegetation of the region would result from the adoption of the No Action alternative.

4.4. Wildlife

4.4.1. Alternative 1 – Transmission Line and Substation

Most of the woodlands impacted by the proposed project, particularly the hardwood-dominated areas, contain intermittent streams, creeks, woody debris, and other microhabitats suitable for a variety of wildlife. Although many individuals inhabiting areas along the proposed route would move to adjacent habitat during construction activities, some less mobile animals would likely be destroyed.

While the proposed transmission line borders forest edges in several areas, many sections of the line cross several patches of forested habitat. Clearing through forest interiors would result in increased forest fragmentation and forest edge habitat. Some species with specialized habitat requirements would be negatively affected by the decrease in suitable habitat and the altered habitat conditions resulting from fragmentation. These species include several neotropical migrant songbirds. Most species that would be affected by these changes are locally and regionally common, however, and impacts to them are not expected to be significant. Conversely, several species of wildlife which require early successional habitats, including some birds with declining population trends such as northern bobwhite and yellow-breasted chat, would benefit from the proposed action.

4.4.2. Alternative 2 – No Action

Under the No Action alternative, the transmission line and substation would not be constructed; therefore, wildlife populations would not be affected.

4.5. Aquatic Ecology

4.5.1. Alternative 1 – Transmission Line and Substation

The proposed action has the potential to affect aquatic ecology through increased siltation, removal of streambank vegetation, and other disturbances to streams and other water bodies. No unique or unusual aquatic communities are known to occur in potentially affected water bodies. In order to minimize potential impacts, Best Management Practices (BMPs) as identified in TVA Transmission Construction Guidelines Near Streams (Muncy 1999), would be used during all construction activities. These BMPs are designed to minimize erosion and subsequent sedimentation.

The intermittent and perennial streams and their riparian habitats that occur within the project area would qualify for Standard Stream Protection (Category A) as described in Appendix G. This designation is based on the variety of species and habitats that exist in intermittent and perennial streams and the state and Federal requirements to avoid harming them. Criteria for the Standard Stream Protection designation included evidence of aquatic life and/or the presence of a well-defined channel with rock or soil substrate. Streamside management zone (SMZ) width is determined by category and slope of land adjacent to the stream (Muncy, 1999). The streams along the proposed transmission line right-of-way identified for Standard Stream Protection (Category A) and the SMZ boundaries as determined from the surveyed project centerline are noted in Table 4-1. SMZs would extend at least 50 feet on either side of the proposed crossings (measured from the edge of the stream).

No transmission structures would be located in streams or other water bodies. Support structures are normally located as far as possible from surface waters to minimize water-related impacts. Routing of the line to meet security considerations while minimizing overall environmental impacts requires that two structures be located near the edge of Lake Taal (at approximately stations 257+80 and 265+00). Because they would be located in a developed area where access is readily available, construction of those two structures would require minimal clearing and ground disturbance, and would result in insignificant impacts to aquatic life in Lake Taal.

Road access to transmission line and substation construction sites would be planned and built to minimize erosion and sedimentation effects. If no practicable alternative exists, trees along streams within the transmission line corridor and danger trees adjacent to the corridor would be cut; however, their stumps would not be removed and understory vegetation would be disturbed as little as possible. These initial clearing/felling activities (including danger-trees) within SMZ areas along streams would be accomplished by using either hand-held equipment or other appropriate clearing equipment (e.g., feller-buncher), which would result in minimal soil disturbance and damage to low-lying vegetation. Maintenance activities along streams would be by mechanical cutting or by selective use of U.S. Environmental Protection Agency (USEPA)-registered herbicides, and heavy equipment would not be used in SMZs. Permanent and temporary stream crossings would comply with appropriate Federal and state permitting requirements as well as any applicable designations and BMPs. Where herbicides are used, these chemicals would be applied following USEPA label restrictions and TVA BMPs.

By following the appropriate stream protection requirements on streams and impounded waters identified in Table 4-1, using BMPs, and following the guidelines in Appendices C, D, and F, the construction and maintenance of the proposed transmission line and substation would not result in significant impacts to aquatic life.

4.5.2. Alternative 2 – No Action

Under the No Action alternative, no impacts to aquatic ecology would occur.

Table 4-1. Approximate locations and levels of protection for watercourses with the right-of-way of the proposed transmission line.

Crossing Number	Approx. Watercourse Location/Station Nos.	Watercourse Type*	Commitments	SMZ Widths (feet)
1	03+73	Intermittent	Level A SMZ	50
2	25+44 – 26+56	Pond	Level A SMZ	50
3	30+33 – 30+31	Pond	Level A SMZ	50
4	74+59	WWC	Standard BMPs	N/A
5	82+85	WWC	Standard BMPs	N/A
6	91+43	WWC	Standard BMPs	N/A
7	106+22	WWC	Standard BMPs	N/A
8	112+33	WWC	Standard BMPs	N/A
9	114+36	WWC	Standard BMPs	N/A
10	125+29	WWC	Standard BMPs	N/A
11	131+96	WWC	Standard BMPs	N/A
12	143+73	WWC	Standard BMPs	N/A
13	146+81	WWC	Standard BMPs	N/A
14	172+04	WWC	Standard BMPs	N/A
15	183+64 – 184+96	Sink Pond	Level A SMZ	50
16	204+52 – 205+28	WWC	Standard BMPs	N/A
17	227+12	WWC	Standard BMPs	N/A
18	Fletchers Fork, 234+81 – 236+26	Perennial	Level A SMZ	50
19	239+78	WWC	Standard BMPs	N/A
20	240+29	WWC	Standard BMPs	N/A
21	Lake Taal, 248+12 – 248+44	Lake Taal	Level A SMZ	50
22	Lake Taal; 251+60 – 267+60	Lake Taal	Level A SMZ	50
23	268+25	WWC	Standard BMPs	N/A
24	273+25	WWC	Standard BMPs	N/A
25	273+94	WWC	Standard BMPs	N/A
26	275+54	WWC	Standard BMPs	N/A
27	275+99	WWC	Standard BMPs	N/A
28	287+30	WWC	Standard BMPs	N/A
29	293+55 – 293+98	WWC	Standard BMPs	N/A
30	298+76	WWC	Standard BMPs	N/A
31	306+81	WWC	Standard BMPs	N/A
32	308+77 – 311+17	WWC (in ROW)	Standard BMPs	N/A
33	Fletchers Fork, 311+17 – 311+81	Perennial	Level A SMZ	50
34	318+68	WWC	Standard BMPs	N/A
35	326+47	WWC	Standard BMPs	N/A
36	330+03	WWC	Standard BMPs	N/A
37	337+39	WWC	Standard BMPs	N/A
38	342+18	WWC	Standard BMPs	N/A

*WWC=wet weather conveyance

4.6. Endangered and Threatened Species

4.6.1. Alternative 1 – Transmission Line and Substation

No Federally listed or state-listed plants or aquatic animals are known to occur in the project area. Therefore, no impacts to such species are expected to result from the construction and operation of the proposed transmission line and substation.

Habitat for four state-listed terrestrial animals, the sharp-shinned hawk, meadow jumping mouse, common shrew, and southeastern shrew could be affected by construction activities. Because suitable habitat for these species is fairly common throughout Fort Campbell, direct and cumulative impacts are not expected to affect their populations.

The three Federally listed and/or state-listed bat species that have been reported in the vicinity (gray, Indiana, and eastern small-footed bats) may find suitable foraging habitat along the proposed route, particularly along streams and their adjoining forest. As specified in Goal 2 in the Endangered Species Management Plan (ESMP) for Fort Campbell, management efforts should consist of enhancing and protecting roosting and foraging habitat for the gray bat and Indiana bat (U.S. Fish and Wildlife Service 2001a). Gray bat habitat is not expected to be affected by the proposed project. Indiana bats and eastern small-footed bats, however, may find suitable roosting sites in the section of hardwood forest just northeast of Lake Taal and south/southeast of Fletcher's Fork. To be consistent with the ESMP the destruction of suitable Indiana bat habitat should be avoided between April 1 and September 15. Clearing trees for right-of-way construction in this section of the proposed route from survey station 291+50 to station 333+02 would therefore take place between September 16 and March 31. With these guidelines, no effect on any federally listed species is expected.

4.6.2. Alternative 2 – No Action

No impacts to endangered or threatened species would result from the adoption of the No Action Alternative.

4.7. Natural Areas

4.7.1. Alternative 1 – Transmission Line and Substation

The proposed substation site, as well as most of the proposed transmission line, is located within Fort Campbell Military Reservation, an area recognized amongst natural resource agencies for the presence of rare barrens communities. Neither the transmission line nor the substation would be located near barrens or other rare ecological communities, and the proposed action would not significantly impact the natural area qualities of Fort Campbell. No impacts to natural areas located off Fort Campbell would occur.

4.7.2. Alternative 2 – No Action

Under the No Action Alternative, the transmission line and substation will not be built and there would be no impacts natural areas.

4.8. Wetlands

4.8.1. Alternative 1 – Transmission Line and Substation

Activities in wetlands are regulated under Sections 404 and 401 of the federal Clean Water Act, the Tennessee Water Pollution Control Act, and Executive Order (E.O.) 11990. To conduct activities in wetlands a nationwide general permit or an individual permit from the

USACE is required as well as an Aquatic Resources Alteration Permit from the Tennessee Department of Environment and Conservation. E.O. 11990 requires all Federal agencies 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.

The construction and operation of the proposed substation would not affect wetlands. Potential impacts to wetlands resulting from construction and operation of the proposed transmission line include:

- alteration of hydrology,
- degradation of vegetation community structure,
- disruption of soils, and
- subsequent reduction in wetland functions including those related to the maintenance of water quality, ecosystem support (e.g., nutrient cycling, primary production), wildlife habitat, and species diversity.

Impacts to the emergent wetland associated with Lake Taal (W3) are expected to be minor and insignificant because there will be no structures in the wetland, no vehicle or equipment entry into the wetland, and BMPs (Muncy 1999) will be implemented to avoid potential impacts. Impacts to the emergent wetland W1 are expected to be minor and insignificant with the implementation of BMPs. There will be no alterations to soil or hydrology and the area will continue to be used as pasture following transmission line construction.

The primary adverse impact from transmission line construction would be the permanent conversion of approximately 2.0 acres of a 43-acre forested wetland to emergent and scrub-shrub wetlands. Although the total wetland acreage would not change, there would be a loss of forested wetland functions from the area to be cleared. Because of edge effects, there would also be some loss of forested wetland functions in the adjacent remaining forested wetland. Because of the relatively small area affected, the impacts of this loss of wetland functions would be insignificant.

4.8.2. *Alternative B – No Action*

Under the No Action alternative, no impacts to wetlands would occur.

4.9. Floodplains

4.9.1. *Alternative 1 – Transmission Line and Substation*

The proposed substation would not be located in a floodplain, and thus its construction and operation would not impact floodplains or flooding. The proposed transmission line would cross through the floodplain of Fletcher Fork and some of its small tributaries. For consistency with E.O. 11988, an overhead transmission line and related support structures are considered to be a repetitive action in the 100-year floodplain. No structures would be built in streams, and the placement of structures elsewhere in floodplains is not expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of the streams being crossed. Impacts to floodplains and flooding are therefore expected to be insignificant.

4.9.2. *Alternative 2 – No Action*

Under the No Action alternative, there would be no impacts to floodplains.

4.10. Recreation

4.10.1. *Alternative 1 – Transmission Line and Substation*

The proposed transmission line would cross Destiny Parks and Pavilions and be close to the Eagle Creek Ranch. Both of these recreation areas are on Fort Campbell. No impacts to Eagle Creek Ranch are anticipated. The proposed transmission line would be about 100 feet from a campground and pavilion in Destiny Parks. Although some trees would be cleared in the park complex, a sparse buffer of existing trees would be retained between the transmission line and the campground and pavilion. The transmission line would also cross a trail within the park. Following the completion of construction activities, this trail would be restored to its previous condition. Some impacts to Destiny Parks and Pavilions would occur during construction of the transmission line, mainly from increased noise and traffic. These impacts would be temporary and insignificant. No impacts to the recreational facilities are expected following completion of the of the transmission line.

4.10.2. *Alternative 2 – No Action*

Under the No Action alternative, no impacts to recreation would occur.

4.11. Visual Resources

4.11.1. *Alternative 1 – Transmission Line and Substation*

Visual consequences are examined in terms of visual changes between the existing landscape and proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and visibility of proposed changes. Scenic integrity indicates the degree of intactness or wholeness of the landscape character. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty, and the aesthetic sense of place. The foreground, middleground, and background viewing distances were previously described in the affected environment section.

Visual/aesthetic impacts from the construction, operation, and maintenance of the new 161-kV transmission line and substation would be insignificant. Additional transmission structures topped with reflective tape and conductors with aircraft warning spheres would increase the number of adversely contrasting elements seen in the landscape. These incremental changes would contribute to reduced visual coherence and harmony. However, these changes are not individually significant.

Motorists and residents along TN 233 would have foreground views of the proposed transmission line as it follows a northeast route towards U.S. 79. For motorists, these views would be brief. For area residents, views would be partially obscured by existing vegetation and subtle elevation changes in the landscape. New equipment and structures would be visually similar to those seen along TN 233 and the existing Kentucky Dam-Nashville 161-kV line route to the south. The existing Woodlawn water tower to the east would be seen from much greater distances than the transmission lines and poles along the proposed route, and is a focal point in the landscape.

Crossing U.S. 79, the new lines would be seen briefly by motorists between poles and would be similar to existing wood pole structures in the area now. Continuing along 101st Airborne Road, the new ROW would be in the foreground of passing motorists. However, views of proposed structures would be partially mitigated by heavy vegetation to the west.

As the new single-pole steel structures weather, the gray steel would become a darker gray, minimizing initial contrast.

The route continues toward Lake Taal to the west as 101st Airborne Division Road turns sharply to the east. Visual impacts decrease as distance from 101st Airborne Division Road increases. The influence of the natural landscape on the transmission line and structures in this area as perceived in the middleground for local motorists greatly decreases negative impacts on scenic character. The reduction of perceived details is mainly a factor of the natural landscape when viewed from this distance. Evergreen and deciduous vegetation, as well as gradient changes obscures details and the transmission line would be seen as a broader, natural pattern as opposed to a focal point in the landscape.

At Lake Taal, the new line may be seen intermittently from the water by occasional recreational users and patrons of the nightclub/restaurant to the east. However, due to heavy vegetation and elevation changes, these views would be brief. Northeast of Lake Taal, the line would be seen in the foreground by recreational users near 11th Airborne Division Road. These views would be partially obscured by dense vegetation and steep elevations between the viewers and the transmission line.

As the transmission line parallels 101st Airborne Division Road again to the northeast, visual impacts would be similar to those as described near US 79. At the new Screaming Eagles substation, visual impacts could be minimized by selectively retaining as much existing evergreen and deciduous vegetation to the south, north, and east of the substation as practicable. Substation lighting would be minimal and used mainly when personnel are present at night. All lighting would be directed at the ground, minimizing the potential for waste light.

4.11.2. Alternative 2 – No Action

Under the No Action alternative, no impacts to recreation would occur.

4.12. Cultural Resources

4.12.1. Alternative 1 – Transmission Line and Substation

Four archaeological sites and nine historic structures were identified during a survey of the project area. Two of these properties, archaeological site 40MT21 and the Clarksville Base historic district, had both been previously identified and are considered eligible for listing in the NRHP. The transmission line, as originally designed, would have had the potential to affect archaeological site 40MT21, a native American burial site. To avoid impacting this archaeological site, as well as Cemetery 17, a portion of the transmission line route near Lake Taal was relocated. The relocated route (described in Sections 2.3.3.1, 2.3.4, and 2.3.5 and illustrated in Figure 3) would not affect site 40MT21. Cemetery 17 is 200 feet from the relocated route and would also not be affected. The Clarksville Base historic district would be affected. This effect, however, would not be adverse because the viewshed from the contributing resources within the district would not change and adequate tree cover would shield the transmission line and substation from other portions of the district.

The draft cultural resources survey report (Barrett and Karpynek 2003) was submitted to the Tennessee State Historic Preservation Officer (SHPO) on April 9, 2003 for review and concurrence with TVA's determination of no effect. Copies were also sent to several Native American tribes (listed in Chapter 5) for their review and comment.

In a letter dated April 15, 2003, the SHPO concurred with the determination that no eligible archaeological resources would be affected. In a second letter dated April 25, 2003, the SHPO concurred with the determination that no eligible historic properties would be adversely affected. Copies of this correspondence are included in Appendix A.

4.12.2. Alternative 2 – No Action

Under the No Action alternative, no impacts to cultural resources would occur.

CHAPTER 5

5. SUPPORTING INFORMATION

5.1. List of Preparers

Nicholson, Charles P.

Position: Senior NEPA/Endangered Species Specialist, NEPA Team Leader
 Involvement: NEPA Compliance and Document Preparation

Liskey, Todd C.

Position: Environmental Engineer – Siting and Environmental Design
 Involvement: Purpose of and Need for Action; Alternatives

Awl, D. Jane

Position: Wetlands Biologist
 Involvement: Wetlands

Baxter, John T.

Position: Biologist - Aquatic
 Involvement: Endangered and Threatened Species – Aquatic Animals

Collins, J. Leo

Position: Senior Botanist
 Involvement: Vegetation, Endangered and Threatened Species - Plants

Donaldson, Bridget M.

Position: Intern Zoologist
 Involvement: Wildlife

Fraley, Nancy D.

Position: Natural Areas Coordinator
 Involvement: Natural Areas, Vegetation

Guinn, Ella C.

Position: Contract Natural Areas Specialist
 Involvement: Natural Areas

Henry, Travis H.

Position: Senior Zoologist
 Involvement: Wildlife, Endangered and Threatened Species – Terrestrial Animals

Higgins, John M.

Position: Water Quality Specialist
 Involvement: Surface Water

Hill, Amy Denise

Position: Archaeologist
 Involvement: Cultural Resources

Milligan, Jack D.

Position: Groundwater Specialist
 Involvement: Groundwater

Milstead, Roger A.

Position: Floodplain Specialist
 Involvement: Floodplain

Peck, George

Position: Aquatic Biologist
 Involvement: Aquatic Ecology

Peebles, W. Chett

Position: Contract Landscape Architect
 Involvement: Visual

Rosensteel, Barbara

Position: Contract Wetlands Biologist
 Involvement: Wetlands

Tichy, Charles R.

Position: Historic Architect
 Involvement: Cultural Resources

5.2. List of Agencies and Persons Consulted**Federal Agencies**

U.S. Army Corps of Engineers, Nashville, Tennessee

U.S. Fish and Wildlife Service, Cookeville, Tennessee

State Agencies

Tennessee Department of Environment and Conservation, Nashville

Tennessee Department of Transportation, Nashville

Tennessee Historical Commission, Nashville

Tennessee Department of Agriculture, Nashville

Tennessee Wildlife Resources Agency, Nashville

Tennessee Department of Economic and Community Development, Nashville

Tribes

United Keetoowah Band, Park Hill, Oklahoma

Cherokee Nation of Oklahoma, Tahlequah, Oklahoma

Eastern Band of the Cherokee Indians, Cherokee, North Carolina

Shawnee Tribe, Miami, Oklahoma

Eastern Shawnee Tribe of Oklahoma, Seneca, Missouri

Absentee-Shawnee Tribe of Oklahoma, Shawnee, Oklahoma

Others

Tennessee Conservation League, Nashville

5.3. Literature Cited

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U.S. Fish and Wildlife Service. 2001a. Endangered Species Management Plan for the Gray Bat (*Myotis grisescens*) and Indiana Bat (*Myotis sodalis*), Fort Campbell, Kentucky. U.S. Fish and Wildlife Service, Cookeville, Tennessee.

US Fish and Wildlife Service. 2001b. Report to Congress on the Status and Trends of Wetlands in the Conterminous United States 1986 to 1997. US Fish and Wildlife Service.

APPENDIX A – CORRESPONDENCE



STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
Planning Division
SUITE 906, JAMES K. POLK BUILDING
NASHVILLE, TENNESSEE 37203-4334

August 13, 2002

Mr. Todd C. Liskey
Tennessee Valley Authority
Transmission Line Projects
Siting and Environmental Design Department
111 Market Street, MR 4G-C
Chattanooga, TN 37402-2801

Dear Mr. Liskey:

This is in reference to Tennessee Valley Authority's project proposal for the Fort Campbell, Kentucky 161-KV transmission line connection located in Montgomery County in Tennessee.

Development is underway for the improvement of US 79 (State Route 76) between Dover and Clarksville. For your information and use in finalizing your proposal, I have enclosed a copy of the present and proposed lay out sheets along with the profile information for US 79 in the area of the line crossing.

Thank you for this opportunity for early review. If you have any questions, please contact me.

Sincerely,

A handwritten signature in black ink that reads "Ralph E. Comer".

Ralph E. Comer
Transportation Director
Planning Division

RC:JM/gf

Cc: Jeff Jones, w/Attachment (Design)



Tennessee Valley Authority, Post Office Box 1580, Norris, Tennessee 37828-1580

April 9, 2003

Dr. Joe Garrison
Environmental Review Coordinator
Tennessee Historical Commission
2941 Lebanon Road
Nashville, Tennessee 37243-0442

Subject: Tennessee Valley Authority Proposed Kentucky Dam-Nashville 161-kV Tap to
Screaming Eagles Substation, Montgomery County, Tennessee

Dear Dr. Garrison:

TVA proposes to construct a new substation and 161-kV transmission line to provide additional power to Fort Campbell. The line would be approximately 7.3 miles in length and would require a 100' right-of-way. The majority of the line will be on Fort Campbell property with the exception of a 0.9 mile segment that will cross private property to tap the existing Kentucky Dam-Nashville line. The substation will require a 4-acre tract and will be located adjacent to Fort Campbell's existing 69-kV substation. TVA is carrying out the environmental review for the proposed line and was designated the lead Federal agency for Section 106 consultation.

Please find enclosed one copy of the draft survey report "Phase I Cultural Resources Survey of the Proposed 7.3 Mile Transmission Line Tap to the Screaming Eagles Substation on Fort Campbell, Montgomery County, Tennessee." TVA Cultural Resources staff has reviewed the report and agree with the following findings and recommendations of the authors:

1. Historic Resources HS-1 through HS-8 are not eligible for listing in the National Register of Historic Places (NRHP);
2. Clarksville Base Historic District, previously determined eligible in consultation between Fort Campbell Cultural Resources Management staff and the TN-SHPO, would be affected by the proposed undertaking but the effect would not be adverse.

Pursuant to 36 CFR 800, we are seeking concurrence that the proposed undertaking will not adversely affect any historic structures or districts that are eligible for or listed in the NRHP. A copy of this report is also being sent to Ms. Jennifer Barnett for review of the archaeological portion of the survey. Should you have any questions or comments, please contact Richard Yarnell at 865/632-1584.

Sincerely,


Bennett Graham
Manager and Senior Archaeologist
Cultural Resources

Enclosure

FD-302 (Rev. 03-2002)



Tennessee Valley Authority, Post Office Box 1585, Norris, Tennessee 37829-1585

April 9, 2003

Ms. Jennifer Barnett
Tennessee Division of Archaeology
5103 Edmondson Pike
Nashville, Tennessee 37211

Re: Tennessee Valley Authority Proposed Kentucky Dam-Nashville 181-kV Tap to Screaming Eagles Substation, Montgomery County, Tennessee

Dear Ms. Barnett:

Please find enclosed one copy of the draft survey report "Phase I Cultural Resources Survey of the Proposed 7.3 Mile Transmission Line Tap to the Screaming Eagles Substation on Fort Campbell, Montgomery County, Tennessee." TVA Cultural Resources staff has reviewed the report and agree with the following findings and recommendations of the authors:

1. Previously recorded archaeological sites 40MT146 and 40MT196 are not located within the APE as previous site boundaries had indicated.
2. Newly recorded sites 40MT883 and 40MT884 are not eligible for listing in the NRHP;
3. Glen Long Cemetery (Cemetery 17) is not eligible for listing in the NRHP and is outside of the APE and should not be disturbed; and
4. Site 40MT21 is potentially eligible for the NRHP.

The archaeological survey of the original proposed route investigated site 40MT21. Previous excavations of the site performed by Glen Koons in 1963 involved the excavation of stone box burials. Given the potential for more burials to be present and the discovery of intact archaeological deposits, TVA Cultural Resources staff requested that an alternative route be explored to avoid adversely affecting 40MT21. The alternative route was also surveyed for archaeological resources and only one ineligible site, 40MT884, was discovered within its APE. It is TVA's determination that should the proposed line be constructed with the alternative route then no potentially eligible, eligible, or listed archaeological sites would be affected by the project.

Pursuant to 36 CFR 800, we are seeking concurrence that the project, as currently proposed with the route alternative, will not adversely affect 40MT21 or any other archaeological sites eligible or listed in the NRHP. A copy of this report is also being sent to Dr. Joe Garrison for review of historic structures and districts. Should further changes be made to the project or the alternative route, TVA Cultural Resources staff will contact your office to continue Section 106 consultation. Should you have any questions or comments, please contact Richard Yarnell at 865/632-1584.

Sincerely,

Bennett Graham
Manager and Senior Archaeologist
Cultural Resources

Enclosure



Tennessee Valley Authority, Post Office Box 1529, Norris, Tennessee 37826-1529

April 9, 2003

The Honorable Charles Enyart
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
Seneca, Missouri 64865

Re: Tennessee Valley Authority Proposed Kentucky Dam-Nashville 161-kV Tap to Screaming
Eagles Substation, Montgomery County, Tennessee

Dear Chief Enyart:

Please find enclosed one copy of the draft survey report "Phase I Cultural Resources Survey of
the Proposed 7.3 Mile Transmission Line Tap to the Screaming Eagles Substation on Fort
Campbell, Montgomery County, Tennessee." TVA Cultural Resources staff has reviewed the
report and agree with the following findings and recommendations of the authors:

1. Previously recorded archaeological sites 40MT146 and 40MT196 are not located within the
APE as previous site boundaries had indicated;
2. Newly recorded sites 40MT863 and 40MT864 are not eligible for listing in the NRHP;
3. Glen Long Cemetery (Cemetery 17) is not eligible for listing in the NRHP and is outside of the
APE and should not be disturbed; and
4. Site 40MT21 is potentially eligible for the NRHP.

The archaeological survey of the original proposed route investigated site 40MT21. Previous
excavations of the site performed by Glen Koons in 1963 involved the removal of stone box
burials. Given the potential for more burials to be present and the discovery of intact
archaeological deposits, TVA Cultural Resources staff requested that an alternative route be
explored to avoid adversely affecting 40MT21. The alternative route was also surveyed for
archaeological resources and only one ineligible site, 40MT654, was discovered within its APE. It
is TVA's determination that should the proposed line be constructed with the alternative route
then no potentially eligible, eligible, or listed archaeological sites would be affected by the project.

Pursuant to 36 CFR 800, we are seeking your comments on the findings and recommendations
of the report as well as TVA's determination that the project, as currently proposed, will not
adversely affect 40MT21 or any other archaeological sites eligible or listed in the NRHP. Should
further changes be made to the project or the alternative route, TVA Cultural Resources staff will
contact your office to continue Section 106 consultation. Should you have any questions or
comments, please contact Richard Yamell at 865-632-1584.

Sincerely,

Bennett Graham
Manager and Senior Archaeologist
Cultural Resources

Enclosure



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

April 15, 2003

Mr. J. Bennett Graham
Tennessee Valley Authority
Cultural Resources
Post Office Box 1589
Norris, Tennessee 37828-1589

RE: TVA, ARCHAEOLOGICAL ASSESSMENT, 161-KV TAPI/SCREAMING EAGLES SUBSTN,
UNINCORPORATED, MONTGOMERY COUNTY, TN

Dear Mr. Graham:

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

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

Your cooperation is appreciated.

Sincerely,

A handwritten signature in cursive script that reads "Herbert L. Harper".

Herbert L. Harper
Executive Director and
Deputy State Historic
Preservation Officer

HLH/jmb



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

April 25, 2003

Mr. J. Bennett Graham
Tennessee Valley Authority
Post Office Box 1589
Norris, Tennessee, 37828-1589

RE: TVA, 161 KV/KENTUCKY DAM/NASHVILLE LINE, CLARKSVILLE, MONTGOMERY COUNTY

Dear Mr. Graham:

In response to your request, received on Thursday, April 10, 2003, we have reviewed the documents you submitted regarding your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800. You may wish to familiarize yourself with these procedures (Federal Register, December 12, 2000, pages 77698-77739) if you are unsure about the Section 106 process.

Considering available information, we find that the project as currently proposed will NOT ADVERSELY AFFECT ANY PROPERTY THAT IS ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER OF HISTORIC PLACES INCLUDING CLARKSVILLE BASE. Therefore, this office has no objection to the implementation of this project. Please direct questions and comments to Joe Garrison (615) 532-1550-103. You may find additional information concerning the Section 106 process and the Tennessee SHPO's documentation requirements at www.state.tn.us/environment/hist/sect106.htm. We appreciate your cooperation.

Sincerely

A handwritten signature in cursive script that reads "Herbert L. Harper".

Herbert L. Harper
Executive Director and
Deputy State Historic
Preservation Officer

HLH/jyg



STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Division of Natural Heritage
14th Floor L&C Tower
401 Church Street
Nashville, Tennessee 37243-0447
Phone 615/532-0431 Fax 615/532-0231

May 4, 2004

Charles P. Nicholson
Tennessee Valley Authority
400 Wet Summit Hill Drive, WT8C
Knoxville, TN 37902-1499

Subject: Draft Environmental Assessment (DEA): Kentucky Dam-Nashville 161-kV
Transmission Line Tap and Screaming Eagles Substation

Dear Mr. Nicholson:

Thank you for your letter and enclosures of May 27, 2003 regarding the above-referenced proposed transmission line and substation. The proposed action would entail construction of a new 161-kV substation on Fort Campbell Military Reservation and a 7.3 mile, 161-kV transmission line connection to an existing TVA transmission line in Montgomery County, Tennessee. We have reviewed the information submitted and offer the following comments for consideration.

In general, we found the DEIS comprehensive and complete in scope. The Federal and State listed plant and animal species documented in the DEIS (Tables 3-2 & 3-3) accurately represent the data which we currently have in our Biological Conservation Database. While we are pleased to see that a field survey was conducted for the 14 federal and/or state listed plant species documented from the project impact area, we are concerned that the survey was conducted in January and not during the growing season when these plants would have been most visible. If suitable habitat exists for these listed plants in the proposed project area, we recommend that a follow up field survey be conducted, timed according to their phenology (flowering and fruiting period). Many of Tennessee's rare plants are not identifiable outside of these months, and if they were missed during the previous winter survey could inadvertently be impacted during the routing of the transmission line.

The Division of Natural Heritage (DNH) understands that TVA will make every effort to minimize impact to the three Federally listed and/or state listed bat species (gray, Indiana, and eastern small-footed bats) that have been reported in the vicinity. Please consider that bats often continue to feed into November. Accordingly, we request that any potential bat roosting habitat within timber removal areas should be felled between November 15 and March 31 in order to avoid direct impacts

to Indiana and eastern small-footed bats. We also ask that you seek concurrence for this opinion from both the U.S. Fish and Wildlife Service and the Tennessee Wildlife Resources Agency.

The Division of Natural Heritage would also like to stress that care be taken to prevent revegetation of the area with plants listed by the Tennessee Exotic Pest Plant Council as harmful exotic plants. We advocate planting and restoring the affected area with native trees, shrubs, and warm season grasses, preferably those found onsite prior to construction activities. If immediate erosion control is needed on site, we recommend supplementing the planting with annual rye, which establishes quickly, and can help reduce invasion by exotics plants.

We thank you for considering Tennessee's rare species throughout the planning and implementation of this project. Should you have any questions, please do not hesitate to contact me at (615)532-0440.

Sincerely,

Kirstin Condict
Data Manager

cc: Lee A. Barclay, USFWS, Cookeville, TN
David McKinney, TWRA, Nashville, TN

APPENDIX B – WETLAND DATA FORMS

ROUTINE WETLAND DETERMINATION (1987 COE Wetlands Delineation Manual)

Project/Site: Fort Campbell KY Screaming Eagles Transmission Line	Date: 29 Jan. 2003
Applicant/Owner: TVA and Department of Defense	County: Montgomery
Investigator: B. Rosensteel	State: TN
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Community ID: PFO1A
Is the site significantly disturbed (Atypical Situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Transect ID:
Is the area a potential problem area? (If needed, explain on reverse) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Plot ID: W2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Acer negundo	Tree/shrub	Facw	Polygonum sp.		
Platanus occidentalis	Tree	Facw-			
Salix nigra	Tree/shrub	Obl			
Lindera benzoin	Shrub	Facw			
Sambucus canadensis	Shrub	Facw-			
Asimina triloba	Shrub	Fac			
Boehmeria cylindrical	Herb	Facw+			
Carex sp.		See remarks			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks: An indicator classification cannot be assigned with identification to the species level. However, based on floodplain location it is likely that this Carex species is either Facw, Facw+, or Obl. The herbaceous layer was sparse due to flooding intensity and sedimentation.

HYDROLOGY

<p>Recorded Data (Describe in Remarks):</p> <p><input type="checkbox"/> Stream, Lake, or Tide Gauge</p> <p><input type="checkbox"/> Aerial Photographs</p> <p><input type="checkbox"/> Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p>	<p>Wetland Hydrology Indicators:</p> <p>Primary Indicators:</p> <p><input type="checkbox"/> Inundated</p> <p><input checked="" type="checkbox"/> Saturated in Upper 12 Inches</p> <p><input checked="" type="checkbox"/> Water Marks</p> <p><input checked="" type="checkbox"/> Drift Lines</p> <p><input checked="" type="checkbox"/> Sediment Deposits</p> <p><input checked="" type="checkbox"/> Drainage Patterns in Wetlands</p> <p>Secondary Indicators (2 or more required):</p> <p><input type="checkbox"/> Oxidized Root Channels in Upper 12 Inches</p> <p><input checked="" type="checkbox"/> Water-Stained Leaves</p> <p><input checked="" type="checkbox"/> Local Soil Survey Data</p> <p><input type="checkbox"/> FAC-Neutral Test</p> <p><input type="checkbox"/> Other (Explain in Remarks)</p>
<p>Field Observations:</p> <p>Depth of Surface Water: _____ (in.)</p> <p>Depth to Free Water in Pit: _____ 12 (in.)</p> <p>Depth to Saturated Soil: _____ 0 (in.)</p>	
<p>Remarks: All of the hydrologic indicators and visual observations indicate that the Fletcher Fork floodplain is frequently flooded and has received heavy sediment loading.</p>	

SOILS

Map Unit Name (Series and Phase):	Lindsay silt loam	Drainage Class:	Moderately well-drained. Described as having most areas occasionally flooded for brief periods, but also as containing frequently flooded wooded areas
Taxonomy (Subgroup):		Field Observations Confirm Mapped Type?	Yes _____ No _____

Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast (%)	Texture, Concretions, Structure, etc.
0-6	Sediment layer	7.5YR 5/4			Clay loam containing ~10% organic fragments
6-14	Sediment layer	7.5YR 5/3	7.5YR 4/6	10%	Clay loam containing ~10% organic fragments
14-20+	A (see remarks)	10YR 5/2	7.5YR 4/4 7.5YR 4/6	10% 5%	Silty clay loam containing concretions and ~10% organic fragments

<p>Hydric Soil Indicators:</p> <p>_____ Histosol</p> <p>_____ Histic Epipedon</p> <p>_____ Sulfidic Odor</p> <p>_____ Aquic Moisture Regime</p> <p>_____ Reducing Conditions</p> <p>_____ x Gleyed or Low-Chroma Colors</p>	<p>_____ x Concretions</p> <p>_____ High Organic Content in Surface Layer in Sandy Soils</p> <p>_____ Organic Streaking in Sandy Soils</p> <p>_____ Listed on Local Hydric Soils List</p> <p>_____ Listed on National Hydric Soils List</p> <p>_____ Other (Explain in Remarks)</p>
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Remarks: The Ap horizon of Lindsay silt loam ranges from brown to dark grayish brown (1, 2, or 3 chroma). Frequently flooded wooded areas are included in this soil unit.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes <u> x </u> No _____ Wetland Hydrology Present? Yes <u> x </u> No _____ Hydric Soils Present? Yes <u> See rem arks </u> No _____	Is this Sampling Point Within a Wetland? Yes <u> x </u> No _____
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Remarks: The Ap horizon of Lindsay silt loam ranges from brown to dark grayish brown (1, 2, or 3 chroma). Frequently flooded wooded areas are included in this soil unit.

DATA FORM
ROUTINE WETLAND DETERMINATION
 (1987 COE Wetlands Delineation Manual)

Project/Site: Fort Campbell KY Screaming Eagles Transmission Line	Date: 29 Jan. 2003
Applicant/Owner: TVA and Department of Defense	County: Montgomery
Investigator: B. Rosensteel	State: TN
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Community ID: PEM1
Is the site significantly disturbed (Atypical Situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Transect ID:
Is the area a potential problem area? (If needed, explain on reverse) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Plot ID: W1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
Festuca arundinaceae	Herb	Fac+			
Setaria glauca	Herb	Fac			
Ranunculus sp.	Herb				
Juncus sp.	Herb	See remarks			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 75%,

Remarks: Although the Juncus was not identified to species, it is believed to be a common species that has an indicator of either Facw or Obl. The Ranunculus could not be identified to species due to time of year.

HYDROLOGY

<p>Recorded Data (Describe in Remarks):</p> <p><input type="checkbox"/> Stream, Lake, or Tide Gauge</p> <p><input type="checkbox"/> Aerial Photographs</p> <p><input type="checkbox"/> Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p>	<p>Wetland Hydrology Indicators:</p> <p>Primary Indicators:</p> <p><input type="checkbox"/> Inundated</p> <p><input checked="" type="checkbox"/> Saturated in Upper 12 Inches</p> <p><input type="checkbox"/> Water Marks</p> <p><input type="checkbox"/> Drift Lines</p> <p><input type="checkbox"/> Sediment Deposits</p> <p><input type="checkbox"/> Drainage Patterns in Wetlands</p> <p>Secondary Indicators (2 or more required):</p> <p><input checked="" type="checkbox"/> Oxidized Root Channels in Upper 12 Inches</p> <p><input type="checkbox"/> Water-Stained Leaves</p> <p><input checked="" type="checkbox"/> Local Soil Survey Data</p> <p><input type="checkbox"/> FAC-Neutral Test</p> <p><input type="checkbox"/> Other (Explain in Remarks)</p>
<p>Field Observations:</p> <p>Depth of Surface Water: <u>0-2</u> (in.)</p> <p>Depth to Free Water in Pit: <u>-</u> (in.)</p> <p>Depth to Saturated Soil: <u>0</u> (in.)</p>	
Remarks:	

SOILS

Map Unit Name (Series and Phase):	Guthrie silt loam	Drainage Class:	Poorly drained		
Taxonomy (Subgroup):	Typic Fragiaquults	Field Observations Confirm Mapped Type?	Yes	x	No
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast (%)	Texture, Concretions, Structure, etc.
0-8	A	10YR 5/1	7.5YR 5/6	20%	Silt loam
Hydric Soil Indicators:					
_____	Histosol	_____	Concretions		
_____	Histic Epipedon	_____	High Organic Content in Surface Layer in Sandy Soils		
_____	Sulfidic Odor	_____	Organic Streaking in Sandy Soils		
_____	Aquic Moisture Regime	_____ x	Listed on Local Hydric Soils List		
_____	Reducing Conditions	_____ x	Listed on National Hydric Soils List		
_____ x	Gleyed or Low-Chroma Colors	_____	Other (Explain in Remarks)		
Remarks:					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	x	No		Is this Sampling Point Within a Wetland?	Yes	x	No	
Wetland Hydrology Present?	Yes	x	No						
Hydric Soils Present?	Yes	x	No						
Remarks: The wetland is in a cattle pasture.									

DATA FORM

ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Fort Campbell KY Screaming Eagles Transmission Line	Date: 29 Jan. 2003
Applicant/Owner: TVA and Department of Defense	County: Montgomery
Investigator: B. Rosensteel	State: TN
Do normal circumstances exist on the site? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Community ID: PEM1
Is the site significantly disturbed (Atypical Situation)? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Transect ID:
Is the area a potential problem area? (If needed, explain on reverse) Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Plot ID: W3

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
See remarks					
Rumex conglomeratus	Herb	Facw-			
Leersia sp.	Herb	Obl			
Penthorum sedoides	Herb	Obl			
Platanus occidentalis	Shrub	Facw-			
Acer negundo	Shrub	Facw			
Cephalanthus occidentalis	Shrub	Obl			
Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%					
Remarks:: There was an additional dominant herbaceous species that could not be identified due to the time of year.					

HYDROLOGY

<p>Recorded Data (Describe in Remarks):</p> <p><input type="checkbox"/> Stream, Lake, or Tide Gauge</p> <p><input type="checkbox"/> Aerial Photographs</p> <p><input type="checkbox"/> Other</p> <p><input checked="" type="checkbox"/> No Recorded Data Available</p>	<p>Wetland Hydrology Indicators:</p> <p>Primary Indicators:</p> <p><input checked="" type="checkbox"/> Inundated</p> <p><input checked="" type="checkbox"/> Saturated in Upper 12 Inches</p> <p><input type="checkbox"/> Water Marks</p> <p><input type="checkbox"/> Drift Lines</p> <p><input checked="" type="checkbox"/> Sediment Deposits</p> <p><input type="checkbox"/> Drainage Patterns in Wetlands</p> <p>Secondary Indicators (2 or more required):</p> <p><input type="checkbox"/> Oxidized Root Channels in Upper 12 Inches</p> <p><input type="checkbox"/> Water-Stained Leaves</p> <p><input type="checkbox"/> Local Soil Survey Data</p> <p><input type="checkbox"/> FAC-Neutral Test</p> <p><input checked="" type="checkbox"/> Other (Explain in Remarks)</p>
<p>Field Observations:</p> <p>Depth of Surface Water: <u>1-4"</u>+ (in.)</p> <p>Depth to Free Water in Pit: <u> </u> (in.)</p> <p>Depth to Saturated Soil: <u>0</u> (in.)</p>	
<p>Remarks: The vegetated wetland has developed in the heavily sedimented sections of Lake Taal.</p>	

SOILS

Map Unit Name (Series and Phase):	See remarks	Drainage Class:			
Taxonomy (Subgroup):	Field Observations Confirm Mapped Type?	Yes	No		
Profile Description:					
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast (%)	Texture, Concretions, Structure, etc.
Hydric Soil Indicators:					
_____ Histosol	_____ Concretions				
_____ Histic Epipedon	_____ High Organic Content in Surface Layer in Sandy Soils				
_____ Sulfidic Odor	_____ Organic Streaking in Sandy Soils				
_____ Aquic Moisture Regime	_____ Listed on Local Hydric Soils List				
_____ Reducing Conditions	_____ Listed on National Hydric Soils List				
_____ Gleyed or Low-Chroma Colors	_____ X Other (Explain in Remarks)				
Remarks: Original soils were inundated by the impoundment of Fletcher Fork to create Lake Taal. A soil sample was not obtained because the area is located within the banks of Lake Taal and is semi-permanently or permanently inundated or saturated, thus meeting the hydric soil criteria of being ponded for very long duration during the growing season.					

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	x	No		Is this Sampling Point Within a Wetland?	Yes	x	No	
Wetland Hydrology Present?	Yes	x	No						
Hydric Soils Present?	Yes	x	No						
Remarks: Wetland vegetation has developed in Lake Taal as sediments have built up and reduced the water depth.									

APPENDIX C – RIGHT-OF-WAY CLEARING SPECIFICATIONS

1. General - The clearing contractor shall review the environmental evaluation documents for the project or proposed activity (categorical exclusion checklist, environmental assessment, or environmental impact statement) along with all clearing and construction appendices, conditions in applicable general and/or site specific permits, the storm water pollution prevention plan, and any 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 1999). 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 pre-bid or pre-work 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 anti-pollution laws, regulations, and ordinances, including, without limitation, all air, water, solid and hazardous waste, noise, and nuisance laws, regulations, and ordinances. He 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 pre-work 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 or ground water. 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 re-clearing 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 re-sprouting. The height of such trees would vary

with structure and conductor height; a minimum clearance of 24 feet would generally be maintained. 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 TOM organization after initial clearing and construction. Cutting of trees within SMZs must be accomplished by using either hand-held equipment or other appropriate clearing equipment, such as a feller-buncher. The method will be selected based on site specific conditions and topography to minimize soil disturbance and impacts to the SMZ and surrounding area. Disturbed soils in SMZs must be stabilized by appropriate methods immediately after the right-of-way is cleared. Stabilization must occur within the time frame specified in applicable storm water permits or regulations. Stumps within SMZs may be cut close to the ground but must not be removed or uprooted. Trees, limbs, and debris shall be immediately removed from streams, ditches, and wet areas using methods which 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 quickly grow 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 re-clearing 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 waters or ground water. 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 which enters streams or other water bodies shall be removed as soon as possible. Appropriate Corps of Engineers and state permits shall be obtained for stream crossings.

9. Air Quality Control - The clearing or re-clearing 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 which 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 which 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 on to 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 which 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 which 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 which limits vehicle exhaust emissions. Equipment and vehicles will be kept within the manufacturer's 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 personnel vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personnel 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 re-clearing 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 re-clearing 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 which 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 (Re-clearing) - The re-clearing 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 or ground water source might occur.
20. Brush and Timber Disposal (Initial Clearing) - For initial clearing, trees are commonly part of the contractors contract to remove as they wish. Trees may be removed from the site for lumber or pulp wood 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.

April 2000 Revision

APPENDIX D – ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION LINE CONSTRUCTION

1. General - TVA and/or the assigned Contractor shall plan, coordinate, and conduct his operations in a manner which protects the quality of the environment and complies with TVA's environmental expectations discussed in the pre-construction meeting. This specification contains provisions which 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 shall 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 anti-pollution 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 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 Corps of Engineers and state permits shall be obtained.

Wastewater from construction or de-watering 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 which 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 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 on to 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 personnel vehicles will not be performed on the right-of-way. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personnel 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 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.
 18. Smoke and Odors - TVA and/or the Contractors shall properly store and handle combustible material which 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. Also, 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 which 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.

APPENDIX E – ENVIRONMENTAL QUALITY PROTECTION SPECIFICATIONS FOR TRANSMISSION SUBSTATION OR COMMUNICATIONS CONSTRUCTION

1. General - TVA and/or the assigned Contractor and subcontractors shall plan, coordinate, and conduct his or her operations in a manner which protects the quality of the environment and complies with TVA's environmental expectations discussed in the pre-construction meeting (including clearing and grading, or re-clearing and removal or dismantling). This specification contains provisions which shall be considered in all TVA and contract construction, dismantling, or forensic operations. If the contractor and his or her subcontractors fail to operate within the intent of these requirements, TVA will direct changes to operating procedures. Continued violation will result in a work suspension until correction or remedial action is taken by the contractor. Penalties and contract termination will be used as appropriate. The costs of complying with the Environmental Quality Protection Specifications are incidental to the contract work, and no additional compensation will be allowed. At all site perimeters, structure, foundation, conduit, grounding, fence, drainage ways, etc. appropriate protective measures to prevent erosion or release of contaminants will be taken immediately upon the end of each step in a construction, dismantling, or forensic sequence, and those protective measures shall be inspected and maintained throughout the construction and site stabilization and rehabilitation period.
2. Regulations - TVA and/or the assigned contractor and subcontractor(s) shall comply with all applicable federal, state, and local environmental and anti-pollution 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 and/or subcontractor(s) use areas include but are not limited to site office, shop, maintenance, parking, storage, staging, assembly areas, utility services, and access roads to the use areas. The construction contractor and subcontractor(s) shall submit plans and drawings for their location and development to the TVA engineer and project manager for approval. Secondary containment will be provided for fuel and petroleum product storage pursuant to 29CFR1910.106(D)(6)(iii)(OSHA).
4. Equipment - All major equipment and proposed methods of operation shall be subject to the approval of TVA. The use or operation of heavy equipment in areas outside the right-of-way, access routes, site, or structure, pole, or tower sites will not be permitted without permission of the TVA inspector or field engineer. Heavy equipment use on steep slopes (greater than 20 percent) and in wet areas will be held to the minimum necessary to construct the transmission or communication facility. Steps will be taken to limit ground disturbance caused by heavy equipment usage, and erosion and sediment controls will be instituted on disturbed areas in accordance with state requirements and Best Management Practices.

No subsurface ground-disturbing equipment or stump removal equipment will be used by construction forces except on access roads or at the actual site, structure, pole, or tower sites, where only footing locations and controlled runoff diversions shall be created that disturb the soil. All other areas of ground cover or in place stumps and roots shall remain in place (Note: Tracked vehicles disturb surface layer of the ground due to size and function.) Some disking of the right-of-way, access, and site(s) may occur for proper seedbed preparation.

Unless ponding previously occurred (i.e. existing low-lying areas), water should not be allowed to pond on the site or around structures, except around foundation holes; the water must be directed away from the site in as dispersed a manner as possible. At tower or structure sites some means of upslope interruption of potential overland flow and diversion around the footings

should be provided as the first step in construction-site preparation. If leveling is necessary, it must be implemented by means that provide for continuous gentle, controlled, overland flow or percolation. A good grass cover, straw, gravel, or other protection of the surface must be maintained. Steps taken to prevent increases in the moisture content of the in-situ soils will be beneficial both during construction and over the service life of any anchor, foundation, or its structure.

5. Sanitation - A designated TVA or contractor and/or subcontractor(s) representative shall contract a sanitary contractor who will provide sanitary chemical toilets convenient to all principal points of operation for every working party. The facilities shall comply with applicable federal, state, or local health laws and regulations. They shall not be located closer than 100 feet to any stream or tributary or to any wetland. The facilities shall be required to have proper servicing and maintenance, and the waste disposal contractor shall verify in writing that the waste disposal will be in state-approved facilities. Employees shall be notified of sanitation regulations and shall be required to use the toilet facilities.
6. Refuse Disposal - Designated TVA and/or contractor and subcontractor(s) personnel shall be responsible for daily inspection, cleanup, and proper labeling, storage and disposal of all refuse and debris produced by his or her operations and by his or her employees. Suitable refuse collecting facilities will be required. Only state-approved disposal areas shall be used. Disposal containers such as dumpsters or roll-off containers shall be obtained from a proper waste disposal contractor. Solid, special, construction/demolition and hazardous wastes as well as scrap are part of the potential refuse generated and must be properly managed with emphasis on reuse, recycle, or possible give away, as appropriate, before they are handled as waste. Records of the amounts generated shall be provided to the site's or project's designated environmental specialist. Contractor(s) and subcontractor(s) must meet similar provisions on any project contracted by TVA. Final debris, refuse, product, and material removal is the responsibility of the contractor; unless special written agreement is made with the ultimate TVA owner of the site.
7. Landscape Preservation - TVA and its contractor(s) and subcontractor(s) shall exercise care to preserve the natural landscape in the entire construction, dismantling, or forensic area as well as use areas, in or outside the right-of-way, and on or adjacent to access roads. Construction operations shall be conducted to prevent any unnecessary destruction, scarring, or defacing of the natural vegetation and surroundings in the vicinity of the work.
8. Sensitive Areas Preservation - Certain areas onsite and along the access and/or right-of-way may be designated by the specifications or the TVA engineer as environmentally sensitive. These areas include, but are not limited to areas classified as erodible, geologically sensitive, scenic, historical and archaeological, fish and wildlife refuges, endangered species habitat, water supply watersheds, and public recreational areas such as parks and monuments. Contractors, their subcontractor(s) and TVA construction crews shall take all necessary actions to avoid adverse impacts to these sensitive areas and their adjacent buffer zones. These actions may include suspension of work or change of operations during periods of rain or heavy public use; hours may be restricted or concentrations of noisy equipment may have to be dispersed. If prehistoric or historic artifacts or features are encountered during clearing, grading, borrow, fill, construction, dismantling, or forensic operations, the operations shall immediately cease for at least 100 feet in each direction, and TVA's construction superintendent, project manager, or Area Environmental Program Administrator and TVA Cultural Resources Program shall be notified. The site shall be left as found until a significance determination is made. Work may continue elsewhere, beyond the 100-foot perimeter.
9. Water Quality Control - TVA and contractor construction, dismantling, or forensic activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter, contaminants, debris, and other objectionable pollutants and wastes into flowing caves, sinkholes, streams, dry watercourses, lakes, ponds, and underground water sources.

The clearing contractor erected erosion and/or sedimentation control shall be maintained and (when TVA or contract construction personnel are unable) the construction crew(s) shall maintain BMPs such as silt fences on steep slopes and adjacent to any stream, wetland, or other water body. Additional BMPs may be required for areas of disturbance created by construction activities and at sequential steps of construction at the same location on site. BMPs will be inspected, by the TVA field engineer or other designated TVA or contractor and/or subcontractor(s) personnel, routinely and during periods of high runoff, and any necessary repairs will be made as soon as practicable. BMP inspections and any required sampling will be conducted in accordance with permit requirements. Records of all inspections and sampling results will be maintained onsite, and copies of inspection forms and sampling results will be forwarded to the TVA project manager or supporting environmental specialist.

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

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

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

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

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

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

11. Floodplain Evaluation - During the planning and design phase of the substation or communications facility, floodplain information should be obtained to avoid locating flood-damageable facilities in the 100-year floodplain. If the preferred site is located within a floodplain area, alternative sites must be evaluated and documentation prepared to support a determination of "no practicable alternative" to siting in the floodplain. In addition, steps taken to minimize adverse floodplain impacts should also be documented.
12. Clearing - No construction, dismantling, or forensic activities may clear additional site or right-of-way vegetation or disturb remaining retained vegetation, stumps, or regrowth at locations other than the structure, substation or communication site or access thereto. TVA and the

construction, dismantling, or forensic contractor(s) must provide appropriate erosion or sediment controls for areas they have disturbed after each disturbance that have previously been re-stabilized after clearing operations. Control measures shall be implemented as soon as practicable after disturbance in accordance with applicable federal, state, and/or local storm water regulations.

13. Restoration of Site - All construction, dismantling, or forensic related disturbed areas, with the exception of farmland under cultivation and any other areas as may be designated by TVA's specifications, shall be stabilized in the following manner unless the property owner and TVA's engineer specify a different method:
 - A. The subsoil shall be loosened to a minimum depth of 6 inches if possible and worked to remove unnatural ridges and depressions.
 - B. If needed, appropriate soil amendments will be added.
 - C. All disturbed areas will initially be seeded with a temporary ground cover such as winter wheat, rye, or millet, depending on the season. Perennials may also be planted during initial seeding if proper growing conditions exist. Final restoration and final seeding will be performed as line construction is completed. Final seeding will consist of permanent perennial grasses such as those outlined in TVA's "A Guide for Environmental Protection and 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. Rehabilitation species shall use species designated by Federal guidance that are low maintenance native species appropriate for the site conditions that prevail at that location.
 - E. TVA holds the option, depending upon the time of year and weather condition, to delay or withdraw the requirement of seeding until more favorable planting conditions are certain. In the meantime, other stabilization techniques must be applied.
 - F. The site must be protected from species designated by the Federal Invasive Species Council and must not be the source of species that can be transported to other locations via equipment contaminated with viable materials; thus the equipment must be inspected and any such species material found must be removed and destroyed prior to transport to another location.
14. Air Quality Control - Construction, dismantling, and/or forensic crews shall take appropriate actions to minimize the amount of air pollution created by their operations. All operations must be conducted in a manner which avoids creating a nuisance and prevents damage to lands, crops, dwellings, or persons.
15. Burning - Before conducting any open burning operations, the contractor and subcontractor(s) shall obtain permits or provide notifications as required to state Forestry offices and/or local fire departments. Burning operations must comply with the requirements of state and local air pollution control and fire authorities and will only be allowed in approved locations and during appropriate hours and weather conditions. If weather conditions such as wind direction or speed change rapidly, the contractor's burning operations may be temporarily stopped by the TVA field engineer. The debris for burning shall be piled and shall be kept as clean and as dry as possible, then burned in such a manner as to reduce smoke. No materials other than dry wood shall be open burned. The ash and debris shall be buried away from streams or other water sources and shall be in areas coordinated with the property owner on rights-of-way, or project manager for TVA sites.

16. **RENOVATION OR DEMOLITION DEBRIS MAY NOT BE BURNED.**
17. Dust and Mud Control - Construction, dismantling, or forensic activities shall be conducted to minimize the creation of dust. This may require limitations as to types of equipment, allowable speeds, and routes utilized. Water, straw, wood chips, dust palliative, gravel, combinations of these, or similar control measures may be used subject to TVA's approval. On new construction sites and easements, the last 100 feet before an access road approaches a county road or highway shall be graveled to prevent transfer of mud on to the public road.
18. Vehicle Exhaust Emissions - TVA and/or the Contractor(s) and subcontractor(s) shall maintain and operate equipment to limit vehicle exhaust emissions. Equipment and vehicles that show excessive emissions of exhaust gasses and particulates due to poor engine adjustments or other inefficient operating conditions shall not be operated until corrective repairs or adjustments are made.
19. Vehicle Servicing - Routine maintenance of personnel vehicles will not be performed on the right-of-way or access route to the site. However, if emergency or "have to" situations arise, minimal/temporary maintenance to personnel vehicles will occur in order to mobilize the vehicle to an off-site maintenance shop. Heavy equipment will be serviced on the site, except adjacent to or in designated sensitive areas. The Heavy Equipment Department within TVA or the construction, dismantling, or forensic contractor will properly maintain these vehicles with approved spill protection controls and countermeasures. If emergency maintenance in a sensitive or questionable area arises, the area environmental coordinator or construction environmental engineer will be consulted. All wastes and used oils will be properly recovered, handled, and disposed/recycled. Records of amounts generated shall be provided to TVA. Equipment shall not be temporarily stored in stream floodplains, whether overnight or on weekends or holidays.
20. Smoke and Odors - TVA and/or the Contractor(s) and subcontractor(s) shall properly store and handle combustible material which could create objectionable smoke, odors, or fumes. The Contractor and subcontractor(s) shall not burn refuse such as trash, rags, tires, plastics, or other debris.
21. Noise Control - TVA and/or the contractor and subcontractor(s) shall take measures to avoid the creation of noise levels that are considered nuisances, safety, or health hazards. Critical areas, including but not limited to residential areas, parks, public use areas, and some ranching operations, will require special considerations. TVA's criteria for determining corrective measures shall be determined by comparing the noise level of the construction, dismantling, or forensic operation to the background noise levels. Also, especially noisy equipment such as helicopters, pile drivers, air hammers, chippers, chain saws, or areas for machine shops, staging, assembly, or blasting may require corrective actions when required by TVA.
22. Noise Suppression - All internal combustion engines shall be properly equipped with mufflers as required by the Department of Labor's "Safety and Health Regulations for Construction." TVA may require spark arresters in addition to mufflers on some engines. Air compressors and other noisy equipment may require sound reducing enclosures in some circumstances.
23. Damages - The movement of construction, dismantling, or forensic crews and equipment shall be conducted in a manner which causes as little intrusion and damage as possible to crops, orchards, woods, wetlands, and other property features and vegetation. The contractor and subcontractor(s) will be responsible for erosion damage caused by his or her actions and employees; and especially for creating conditions that would threaten the stability of the right-of-way or site soil, the structures, or access to either. When property owners prefer the correction of ground cover condition or soil and subsoil problems themselves, the section of the project to

so handled shall be documented with an implementation schedule and a property owner signature obtained.

24. Final Site Cleanup and Inspection - The contractor's designated person shall ensure that all construction, dismantling, or forensic related debris, products, materials, and wastes are properly handled, labeled as required and removed from the site. Upon completion of those activities that person and a TVA designated person shall walkdown the site and complete an approval inspection.

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APPENDIX F – RIGHT-OF-WAY VEGETATION MANAGEMENT

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 structures, 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 micro-second 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 micro-seconds 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 maybe 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 single tree 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 as herbicide prices increased and high volume applications lost favor because of high volume applications and discovery of residue accumulations with many pesticides 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 does 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, U. S. Department of Transportation, U.S. Fish and Wildlife and U.S. Forest Service personnel 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 more wildlife food plants and cover plants develop. In most situations there is increased development of wild flowering plants and shrubs. In conjunction with herbicides the diversity and density of low growing plants provide control of tall growing species through competition.

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 ground cover year around with a better mix of food species and associated high protein insect populations for birds in the right seasons. Most also report less damage to soils (even when compared with rubber tired equipment).

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, and 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

<u>Trade Name</u>	<u>Active Ingredients</u>	<u>Label Signal Word</u>
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

<u>Trade Name</u>	<u>Active Ingredients</u>	<u>Label Signal Word</u>
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

<u>Trade Name</u>	<u>Active Ingredients</u>	<u>Label Signal Word</u>
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 Vegetation Management Environmental Impact Statements 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 when applied by trained applicators following the label and registration procedures, including buffer zones for listed threatened or endangered species.

Those not addressed in the USFS EIS or their supporting research have been peer reviewed in university research, addressed in EPA literature reviews, or are discussed in documents on file at EPA 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 EPA approved label and consistent with the revised application rates of the US Forest Service 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 is labeled for vegetation management in forestry and utility rights-of-way applications. It 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 which 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 non-toxic 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 an EPA classified herbicide as practically non-toxic to humans, mammals, birds, fish, aquatic invertebrates and insects. The chronic studies demonstrate that Imazapyr is non-teratogenic, 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.

APPENDIX G – TVA 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 of it (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 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 pre-construction 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 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 waterbodies 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, discing, 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 which 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 reasons 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 (NESC) 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, discing, 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 one 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, discing, 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 any questions about the purpose of these guidelines or how to apply them, please contact your supervisor or the Environmental Coordinator in the local Transmission Service Center.