CHAPTER 4

4 ENVIRONMENTAL CONSEQUENCES

4.1 Groundwater

Extensive limestone aquifers are present in the project area, and construction and operation of the proposed transmission line could result in adverse impacts to groundwater if appropriate protective measures are not implemented. Potential impacts to groundwater could result from sediments from excavated materials entering or clogging sinkholes, and from the transport of contaminants such as herbicides and fertilizers into sinkholes. Best Management Practices (BMPs) as described in *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority* (Muncy 1999) will be used to avoid contamination of groundwater in the project area. Construction activities should seek to avoid springs as practicable. However, if springs are encountered and cannot be avoided during construction, BMPs will be used to control sediment infiltration.

4.1.1 Alternative 1 - Cumberland-Montgomery Study Area

Karst areas occur in all four corridors and the general nature of impacts to groundwater resulting from construction and operation of the proposed transmission line would be similar in the four corridors.

4.1.1.1 Corridor B Route

The Corridor B transmission line route has 20 sinkholes within the proposed ROW of its main route and various alternative alignments (Section 3.1.1.1). The number of sinkholes potentially affected is nine if the Industrial Park West alternative alignment is selected, twelve if the Industrial Park Central alignment is selected, and 18 if the Industrial Park East alignment is selected. If the Industrial Park West alignment is selected, no transmission line structures would be built in or on the edge of sinkholes. Two structures would be located in or at the edge of sinkholes if the Industrial Park Central alignment is selected, and three structures would be located in or at the edge of sinkholes if the Industrial Park East alignment is selected.

In order to minimize potential impacts to groundwater, TVA would use BMPs as described above during all construction and maintenance activities. Potential impacts could be further reduced by adhering to the mitigation measures regarding aerial herbicide application and use of fertilizer during revegetation listed below.

4.1.1.2 Corridor D Route

As described in Section 3.1.1.2, the Corridor D transmission line route has 31 sinkholes within the proposed ROW of its main route and various alternative alignments. The number of sinkholes potentially affected ranges from 15 to 21 depending on the combination of alternative alignments. One structure would be built in a sinkhole near the east end of the main route. Seven structures would be located in or on the edges of sinkholes along the Woodlawn West alternative alignment, and four structures would be built at the edge of

sinkholes along the Woodlawn East alternative alignment. One structure on the Non-Fort Campbell alignment would be located in a sinkhole.

The number of potentially affected sinkholes would be minimized at 15 by selecting the Woodlawn West, Fort Campbell, Little West Fork South, and Spring Creek South alternative alignments. This combination would also result in eight transmission line structures being built in or at the edge of sinkholes. The number of sinkholes potentially affected would be maximized, at 21, by selecting the Woodlawn East, Non-Fort Campbell, Little West Fork North, and Spring Creek North alignments. This combination would result in six transmission line structures being built in or at the edge of sinkholes.

No sinkholes are located along any Corridor D alternative alignments that are located on the Fort Campbell Military Reservation. However, because part of the drinking water for the Reservation is provided by the Fort Campbell Water System's groundwater source, caution should be used during application of herbicides and fertilizers, because these contaminants could be transported to groundwater by storm water runoff.

The potential for impacts to groundwater would be somewhat greater for the Corridor D transmission line route than for the Corridor B route. The number of sinkholes within the proposed ROWs is similar for the two routes and varies depending on the alternative alignments selected. The number of transmission line structures built in or at the edge of sinkholes is greater for all potential Corridor D alignments than for Corridor B.

4.1.2 Alternative 2 - Cumberland-Davidson Study Area

The proposed Cumberland-Davidson Study Area is underlain by the same Mississippian limestone aquifers as the Cumberland-Montgomery Study Area. As noted above in Chapter 2, appropriate best management practices described in Muncy (1999) would be implemented during the construction and operation of the proposed transmission line. With the implementation of these measures, the impacts to groundwater would be insignificant.

4.1.3 Alternative C No Action

Under the no action alternative, there would be no additional impact to current groundwater conditions.

4.1.4 Mitigation Measures

The following measures would reduce potential impacts to groundwater:

- For the Cumberland-Montgomery Corridor B route, herbicides would not be applied aerially along the ROW between a point about 0.4 miles northeast of Highway 12 (at proposed transmission line structure 136) and the Montgomery 500-kV Substation. The use of fertilizers would also be avoided or minimized in this area.

- For the Cumberland-Montgomery Corridor D route, herbicides would not be applied aerially along the ROW between a point just east of Highway 233/Lylewood Road (at proposed transmission line structure 54/9A) to one-half mile west of I-24 (at proposed transmission line structure 139/92A). The use of fertilizers would also be avoided or minimized in this area.

4.2 Surface Water

The construction and operation of the proposed transmission line can potentially result in adverse water quality impacts. During transmission line construction, soil disturbances associated with right-of-way clearing, access road construction, preparation of transmission structure foundations, and other activities can cause erosion and sedimentation, clogging small streams and threatening aquatic life. Removal of the tree canopy at stream crossings can result in increased water temperatures and adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

Precautions would be included in the design, construction, and maintenance of the proposed transmission line 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 and permanent stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Appendices B and C, as well as in Muncy (1999). These measures include installation of silt screens and sediment traps, restrictions on use of heavy equipment near streams, and prompt revegetation. Canopies in all streamside management zones would be left undisturbed unless there were no practicable alternative. The situation where streamside canopies are left undisturbed, however, is restricted to streams in deep ravines, few of which occur in the project area. Right-of-way maintenance that requires chemical treatment would employ only EPA-registered herbicides used in accordance with label directions.

4.2.1 Alternative 1 - Cumberland-Montgomery Study Area

This study area contains ten streams that are included on the state 303(d) list as not fully meeting their designated uses (Table 3-1). Eight of these listings include siltation as one of the causes for the listing. There are no waters within this study area that are classified as “high quality” by the state.

4.2.1.1 Corridor B Route

The southern Corridor B route contains six streams that are included on the state 303(d) list as not meeting their designated uses (Table 3-1). Four of these listings include siltation as one of the causes for the listing. The precautions listed above would apply to the construction and maintenance of the proposed transmission line in this corridor, and impacts to surface waters would be insignificant.

4.2.1.2 Corridor D Route

The northern Corridor D route contains four streams that are included on the state 303(d) list as not meeting their designated uses (Table 3-1). All of these listings include siltation as one of the causes for the listing. The precautions listed above would apply to the construction and maintenance of the proposed transmission line in this corridor, and impacts to surface waters would be insignificant.

Potential water quality impacts are not expected to be significantly different between these two alternative routes. Both routes involve four streams that are on the 303(d) list because of siltation impacts. One of these streams (Red River) is common to both alternatives.

4.2.2 Alternative 2 - Cumberland-Davidson Study Area

This study area contains four streams that are included on the state 303(d) list as not meeting or partially meeting their designated uses (Table 3-2). Two of these listings include siltation as one of the causes for the listing. There are two streams within this study area that are classified as “high quality” by the state (the Harpeth River and the South Fork Harpeth River).

Potential surface water impacts and the environmental measures that would be employed to mitigate potential effects would be essentially the same as discussed in Section 4.2.1.

4.2.3 Alternative 3 No Action

Under the no action alternative, there would be no additional impact to current surface water conditions.

4.3 Vegetation

Potential impacts to vegetation resulting from construction and operation of the proposed transmission line include the removal of forest and other tall vegetation from the ROW; the long-term maintenance of the ROW in grass, herbaceous, and/or shrubby vegetation; alteration of uncommon plant communities, especially those that are forested; and spread of invasive species. Related impacts include the extent to which the resulting loss in forest contributes to regional trends in forest cover and the degree of forest fragmentation that results.

Forest fragmentation is a concern for the following reasons. (1) Progressively smaller fragments of forest produce progressively more edge of the forest in relation to the forest interior. More edge allows further penetration of drying winds, high light intensities, some predators, pathogens and parasites, and potentially invasive species of plants and animals. (2) The potential for invasion and establishment of species which are not normal species of a given forest communities increases the potential for de-stabilization and collapse of intact communities. (3) Even though all of the forests in the Cumberland-Montgomery and Cumberland-Davidson Study Areas have been subject to disturbance by timbering, grazing, agriculture, etc., intact mature forests are the most representative native communities remaining in the region.

These potential impacts would vary among the study areas and corridors as described below.

4.3.1 Alternative 1 - Cumberland-Montgomery Study Area

Based on the forest area and forest tract size characteristics of the four Cumberland-Montgomery Study Area corridors, the likely impact of constructing the transmission line in Corridors A and C would be very similar and greater than in either Corridor B or D. The impacts would be lowest for a transmission line in Corridor D, which has the lowest proportion of forest area, the least forest acreage, and the greatest degree of forest fragmentation (i.e., lowest average forest tract size).

The area of timberland in the four county (Dickson, Houston, Montgomery, Stewart) area in which Alternative 1 lies increased by almost 55,000 acres between 1989 and 2002 (Table 3-3). That is more than double the acreage in forested upland of any of the four corridors

proposed for construction of the power line under this alternative and is more than the total acreage in Corridors C and D and almost as much as that in Corridors A and B. The impact of construction of the transmission line on regional trends in timberlands is, at most, minor.

The only plant community of conservation concern which is known to occur in the Cumberland-Montgomery Study Area is the Kentucky-Tennessee Big Barrens. Although no examples of this community were found during field surveys, the four corridors include agricultural lands which formerly supported that community. There is thus the opportunity for re-establishment of examples of the Big Barrens by restoration under the constructed power line. None of the three other plant communities of concern potentially occurring in the study area were found during field surveys in Corridor B and Corridor D. Among these communities, only the Western Highland Rim Escarpment Post Oak Barrens contains woody vegetation that could be adversely impacted by the construction of the transmission line.

4.3.1.1 Corridor B Route

Approximately 45% of the proposed Corridor B transmission line route ROW is forested. Based on a total ROW area of 785 acres, about 369 acres of forest would be cleared by construction of the transmission line on this route. This is a relatively minor amount (0.22% of the forested area in Montgomery County in 2002) compared to the total area of forest in the study area and affected counties, and would not significantly affect regional trends in forest cover.

As indicated in Table 3-6, the Corridor B route crosses seven forested tracts of 1,000 acres or more. The seven tracts contain 12,241 acres and the largest tract contains 2,562 acres. The construction of the proposed transmission line would divide the seven tracts into a total of 30 tracts, as shown in Table 4-1. The largest forested tracts remaining after transmission line construction would be reduced by 8 to 33% of their pre-construction size. Five of the remaining tracts would still contain 1000 or more acres. An additional 13 tracts of less than 5 acres would be created from the seven large tracts; 265 tracts of less than 5 acres occur along the Corridor B route prior to construction.

The extent of fragmentation for the largest tracts indicates that some large tracts would remain, a few tracts between 100 and 1000 acres would be created, and some smaller tracts would be created. By analogy, the effects of fragmentation on intermediate sized tracts (100 to 1000 acres before construction) is expected to be similar to that on tracts larger than 1000 acres and smaller than 5 acres, but no more disruptive of regional forest cover than that of the very large and very small tracts.

This resulting forest fragmentation would constitute a significant impact to the intact forest communities of the local area. Impacts at the four county regional or larger scales would be expected to be insignificant.

Table 4-1. Forest patches along Route B which are currently 1000 or more acres in size and the resultant patches which would occur after the proposed construction of Route B.

Pre-construction		Post-construction		
Tracts	Acreage	Number of Tracts	Acreage of Tracts	
			Average	Range
TRACT 1	2562.9	3	846.4	2280.4 – 4.53
TRACT 2	2480.0	3	811.7	1653.1 – 0.2
TRACT 3	1890.4	3	616.1	1278.8 – 33.8
TRACT 4	1531.8	4	378.3	1407.8 – 0.4
TRACT 5	1417.0	7	199.2	1173.8 – 0.4
TRACT 6	1274.81	7	175.9	996.7 – 0.3
TRACT 7	1084.98	3	354.8	947.4 – 0.8

One plant community of conservation concern (Kentucky-Tennessee Big Barrens) has been previously reported from the Cumberland-Montgomery Study Area corridors (Table 3-7). Three additional communities of concern have been reported from the surrounding vicinity, and could occur in the Cumberland-Montgomery Study Area. However, field surveys of proposed power line routes, their access roads, and associated alternative alignments in Corridor B failed to reveal any examples of Kentucky-Tennessee Big Barrens or the other plant communities of conservation concern. No negative impacts to plant communities of conservation concern are anticipated. To the extent that barrens vegetation reestablishes on forest lands converted to ROW land, impacts would be slightly beneficial.

4.3.1.2 Corridor D

The proposed Corridor D transmission line route ROW is approximately 50% forested and construction and operation the transmission line along this route would result in the loss of about 338-399 acres of forest. This is a small change (0.21% of the 2002 forested area in Montgomery County) relative to the changes cited in Table 3-4 and the total forest acreage in the four-county area. The amount of forest land which would be lost if the transmission line were built along the Corridor D would not constitute a regionally significant impact on the environment.

If the power line were built on the Corridor D route, the two patches in the Corridor larger than 1,000 acres, totaling 9,292 acres, would be divided into 20 patches, the largest of which would be 4,026 acres in size (Table 4-2). The largest tracts remaining after transmission line construction would be reduced by 39 and 24% of their pre-construction size. Three of the remaining tracts would still contain 1000 or more acres. An additional 10 tracts of less than 5 acres would be created from the two large tracts; 218 tracts of less than 5 acres occur along the Corridor D route prior to construction. Numerous tracts between 5 and 1000 acres would also be fragmented, and the distribution of tracts in the intermediate size classes, 100 to 1000 acres, is similar enough on Routes B and D that the consequences of fragmentation to tracts in that size range would be similar on both routes.

Table 4-2. Forest patches along Route D which are currently 1000 or more acres in size and the resultant patches which would occur after the proposed construction of Route D.

Pre-construction		Post-construction		
Tracts	Acreage	Number of Tracts	Acreage of Tracts	
			Average	Range
TRACT 1	6653.4	11	593.9	4025.9 – 0.2
TRACT 2	2639.3	9	289.2	2012.9 – 0.1

This resulting forest fragmentation would constitute a significant impact to the intact forest communities of the local area. As with the Corridor B route, Impacts at the four county regional or larger scales would be expected to be insignificant.

In summary, the selection of the Cumberland-Montgomery Alternative would result in insignificant impacts from loss of timberland, locally significant impact from forest fragmentation, and insignificant impacts to plant communities of conservation concern

Invasive Terrestrial Plants

The construction and operation of the proposed transmission line could facilitate the spread of invasive terrestrial plants already present in the project area or result in the introduction of invasive species into the area. This would be especially true where the proposed routes travel through intact forests or woodlands. As described in Section 2.1.2, no invasive species would be planted when areas during the revegetation of areas disturbed during construction or during subsequent maintenance activities. TVA will also take measures to minimize transporting invasive plants between different sections of the ROW by cleaning equipment after leaving areas of concentration of invasive terrestrial plants and before entering more pristine areas of the ROW. Impacts from invasive terrestrial plants associated with the selection of any of the Cumberland-Montgomery corridors or routes are expected to be insignificant.

Cumulative Impacts

Cumulative impacts to rare plants and to the general terrestrial ecology of the region are expected to result from the on-going population growth of the Clarksville area and potential changes at Fort Campbell military base.

The Clarksville area is rapidly growing as a manufacturing area. This expansion is expected to continue and will continue to result the conversion of forests and fields to industrial, commercial, and residential uses. In terms of the numbers of acres being converted and the potential for impacting the vegetation of the region, the land conversion associated with the selection of either Routes B or D would be an insignificant addition to the projected conversions.

An additional component in the cumulative environmental impacts of the power line construction and operation is the military operations at Fort Campbell. The base contains many populations of rare plants and many high quality, globally rare, plant communities. If the management and conservation of these natural resources on the base greatly changes in the future, there could be regional impacts. The impacts from constructing and operating

the transmission nine on either Routes B or D are expected to be insignificant compared to impacts that could occur due to land use changes on Fort Campbell.

4.3.2 Alternative 2 - Cumberland-Davidson Study Area

Based on the forest area and forest tract size characteristics of the two Cumberland-Davidson Study Area corridors, the likely impact of constructing and operating the transmission line in Corridor B would be slightly greater than in Corridor A (more patches in Corridor B, and a smaller average patch size - see Table 3-11). The forest-related impacts resulting from selection of either of these corridors would be greater than those associated with any of the Cumberland-Montgomery Study Area corridors, and could be significant.

Four plant communities of conservation concern have been reported from the counties crossed by the Cumberland-Davidson Study Area (Table 3-7). Three of these primarily consist of herbaceous vegetation that would be expected to be minimally affected by the construction of the transmission line. A fourth community, the Western Highland Rim Escarpment Post Oak Barrens, contains woody vegetation that could be adversely impacted by the construction of the transmission line.

Invasive Terrestrial Plants

Under Alternative 2, changes to the existing native plant communities of the area could facilitate the spread of invasive terrestrial plants already present in the project area. This would be especially true where the proposed corridor travels through intact forests or woodlands, and, because they are more heavily forested, the risk of spreading invasive plants is somewhat greater in the Alternative 2 corridors than in the Alternative 1 corridors. As described in Section 2.1.2, no invasive species would be planted when areas disturbed during construction are re-vegetated or during subsequent maintenance activities. TVA would also take measures to minimize transporting invasive plants between different sections of the ROW by cleaning mowing equipment after leaving areas of concentration of invasive terrestrial plants and before entering more pristine areas of the power line.

4.3.3 Alternative 3 No Action

Under the No Action Alternative, the proposed transmission line would not be built. With respect to vegetation, no project-related impacts to vegetation would occur.

4.3.4 Mitigation Measures

The following measures would reduce the level of impacts to vegetation that would result from the selection of either the Cumberland-Montgomery or Cumberland-Davidson action alternatives.

- The globally rare Kentucky–Tennessee Big Barrens plant community is a prairie-related community that historically was much more abundant than is currently the case. It occurred most frequently on the Pennyroyal Plain and was dependent on occasional wildfires to keep it open. Many examples of this community type have been lost through conversion of the land to agricultural uses. Many other sites have been lost because the suppression of wildfires has allowed for the conversion of these barrens to forests. The clearing of forested land in the region of the proposed action can result in the re-establishment of this rare plant community. Three to four years after construction of the transmission line, TVA would have a

botanist or plant ecologist inspect the portions of the constructed power line which traverse the formerly forested section lying in the Pennyroyal Plain and document any re-established occurrences of plant communities of conservation concern, especially the Kentucky-Tennessee Big Barrens.

- The potential for the spread of invasive plants during maintenance activities on the constructed power line is high where populations of such species are well established or are in high densities. Although TVA would not plant known species of invasive plants on the new ROW, minimization of spread of known concentrations is an important aspect of the proposed action. In the third growing season after completion of the transmission line, TVA would search for concentrations of invasive plant species in the ROW and, if any concentrations are found, would provide maintenance personnel with maps showing the locations. Mowing equipment would be cleaned immediately before leaving these areas. Cleaning of the equipment would be by physical removal of plant materials from tractors, mower decks, blades, and mounting hardware.

4.4 Wildlife

4.4.1 General Effects to Wildlife and Their Habitats

Construction of the proposed transmission line would result in a change in the structure and function of wildlife habitat along the length of the corridor. Most woody vegetation would be removed from within the ROW, which would then be maintained in an early successional state. The initial clearing would likely temporarily displace large animals, such as deer and turkey, from the site. Many smaller animals, such as shrews, moles, frogs and salamanders would be destroyed by construction activities. Following the construction and revegetation of the site, wildlife favoring edge and early successional habitats would occupy the area.

Environmental effects resulting from the proposed action are expected to include the loss of forested habitat and increased fragmentation of remaining adjacent forests. Overall, an increase in early successional habitats types, as well as an increase in the amount of edge habitats, would occur along the length of the right-of-way. The increase in early successional and edge habitats would benefit species such as the fence lizard, black racer, white-eyed vireo, northern cardinal, indigo bunting, field sparrow, and eastern cottontail rabbit. It would also likely result in increased predation and nest parasitism by the brown-headed cowbird in the remaining forest fragments. These effects, as well as the outright loss of forest habitats, would negatively affect wildlife species dependent on forest-interior habitats such as the wood thrush, cerulean warbler and ovenbird.

4.4.2 Alternative 1 - Cumberland-Montgomery Study Area

Potential environmental affects resulting from the selection of this alternative could include disturbance to at least one plant community type of conservation concern. The majority of this study area is forested upland; however, it contains a higher proportion of early successional habitat than the Cumberland-Davidson Study Area. This study area also contains more herbaceous and woody wetlands than the Cumberland-Davidson Study Area. Due to the higher proportion of early successional communities in this study area, selection of this alternative would potentially affect less forested area than the Cumberland-Davidson Alternative. Unlike with forested communities where clearing is usually

unavoidable in order to route a new transmission line, grasslands, barrens and herbaceous wetlands would undergo limited disturbance during construction activities. Overall, selection of this alternative would have less effect on forest-dwelling birds, including neotropical migrants, as well as forest-dwelling mammals, reptiles, and amphibians, than would the selection of the Cumberland-Davidson Alternative. The selection of the Cumberland-Montgomery Alternative would also have less impact on forest habitat and wildlife communities in general.

Corridors A, B and C have similar proportions of forests and similar acreage of large (>1000 acres) contiguously forested tracts. Corridor C is somewhat shorter than Corridors A or B, has a lower total number of forest patches, and lower total forested area. Of the four Cumberland-Montgomery corridors, Corridor D has the lowest proportion and acreage of forested uplands, the highest proportion of non-forested habitats, and is the most fragmented. The potential for impacts to forest-associated wildlife populations would be greatest in Corridors A and B, somewhat lower in Corridor C, and the lowest in Corridor D. The actual impacts, however, depend greatly on the location of any proposed transmission line routes.

4.4.2.1 Corridor B Route

The greatest impact to wildlife from the construction and operation of the proposed transmission line on the Corridor B route would result from the long-term loss of about 387 acres of forested habitats. The associated fragmentation of forests along the route would also impact forest-interior species, although it is unlikely any species would be eliminated from the local area. The construction and operation of the proposed transmission line would also increase the availability of early successional upland scrub-shrub habitats in the area, and would benefit some declining species requiring this habitat. The extent to which species requiring early successional habitats are benefited would depend greatly on habitat conditions adjacent to the ROW. Impacts to wildlife species requiring forested wetlands could be mitigated as described below in Section 4.7.5. Differences in impacts to wildlife among the various alternative alignments are minor and overall impacts to wildlife from selection of the Corridor B route are expected to be insignificant, especially with mitigation for the loss of forested wetlands.

4.4.2.2 Corridor D Route

The proposed Corridor D transmission line route would avoid the Cross Creeks National Wildlife Refuge and not affect wildlife management activities in the refuge. The wetland complex located north of the Cumberland City Ferry and Cumberland Fossil Plant could be negatively affected by the selection of the Fossil Plant East alternative alignment. The great blue heron colony located within this wetland about 1,000 feet from the ROW would not be directly impacted, although construction activities early in the heron's nesting season could cause the herons to abandon the site. Transmission line construction activities near the heron colony along the West Fork Creek would likely cause the herons to abandon this site. While it is likely that the herons at each site would eventually settle and nest elsewhere, the loss of reproduction for one or two years could occur. This could be mitigated by restricting construction activities to the period between mid-July and December when nesting activities do not occur. Other impacts to wildlife requiring forested wetlands habitat would be similar to those of the Corridor B route and could be mitigated as described in Section 4.7.5.

The impacts to forest-interior wildlife, as well as wildlife requiring early successional habitats, would be similar to but somewhat less than those of the Corridor B route. Fewer acres of forest would be cleared (about 387 acres for B vs. 338-397 acres for D), and forests along the Corridor B are already more heavily fragmented. The fragmentation of the largest forest tract (6,653 acres) along Corridor D, however, is large enough to eliminate one or more forest-interior species. This impact, however, would be local and no significant regional impacts on wildlife are anticipated. The differences in impacts to wildlife between the various Corridor D alternative alignments are minor and none would result in markedly less impacts than the others.

4.4.3 Alternative 2 - Cumberland Davidson Study Area

Potential environmental affects resulting from the selection of this alternative could include disturbance to at least six different plant community types of conservation concern. Almost three-fourths of the study area is forested upland, and most of the remaining area is herbaceous planted/cultivated vegetation. Overall, this study area contains a higher proportion upland forested habitat than the Cumberland-Montgomery Study Area. This study area contains less herbaceous and woody wetlands than the Cumberland-Montgomery Alternative. Due to the predominance of forested habitat in this study area, selection of this alternative would likely affect more forested area than the Cumberland-Montgomery Alternative. Unlike in grassland or other open habitat types, clearing is unavoidable when routing a new transmission line through forested habitat, and the less fragmented nature and larger tract size of forests in the Cumberland-Davidson Study Area make it more difficult to avoid forested tracts during transmission line routing studies. Overall, selection of this alternative would have greater effects on forest-dwelling birds, including a larger number of neotropical migrants, as well as forest-dwelling mammals, reptiles, and amphibians, than would the selection of the Cumberland-Davidson Alternative. The selection of this alternative would have more impact on forest habitat and wildlife communities in general.

Corridor A would pass through the Cheatham WMA. Corridor B contains a slightly larger number of large, contiguously forested tracts than Corridor A. Overall, there is little variation in the habitat types between Corridors A and B. Similarly, there is little variation in forest patch statistics. Therefore, selection of either of the alternatives in this study area is expected to have similar impacts on wildlife.

4.4.4 Alternative 3 No Action

Under the No Action Alternative, the proposed transmission line would not be constructed. Therefore, no wildlife or their habitats would be affected.

4.4.5 Cumulative Impacts

Impacts to wildlife are presently occurring in the project area due to its increasing population and resulting residential, commercial, industrial, and infrastructure development. Montgomery County is projected to be the fifth fastest growing county in Tennessee with a projected growth rate of 67% and Cheatham County is projected to be the sixth fastest growing county in Tennessee with a 65% growth rate from 2000 to 2025. This growth would likely contribute to the continued loss in forests, as well as farmlands and other habitats important to wildlife, in the most populous counties. From 1989 to 1998 oak-hickory forests declined from 91% to 75% in Montgomery County. Loblolly-shortleaf pine forests increased from zero to 0.4% while oak-pine forests increased from 9.1% to 11.2% in

the same county. Similar conditions are happening in Stewart County. The shift from hardwood dominated forests to pine dominated forests and overall reduction of forested habitats in the vicinity would result in a loss of quality forested habitats favored woodland wildlife species. The proposed project would add to the loss of oak-hickory forests along the transmission corridor. The cumulative impacts of the proposed transmission line, especially from Alternative 1, would be minimal.

4.4.6 Mitigation Measures

In order to avoid disruption of nesting activities by great blue herons, the following commitment would apply to the Alternative 1 – Cumberland-Montgomery Corridor D transmission line route:

- Construction activities in these areas would be restricted to the period between mid-July and December at colonies along the Corridor D Fossil Plant East alternative alignment in the vicinity of Cumberland City Ferry and the main Corridor D route at West Fork Creek.

4.5 Aquatic Ecology

Aquatic life can be impacted either directly by alteration of conditions in the streambed or the riparian zone, or indirectly by runoff from construction and maintenance activities entering aquatic habitats. Potential impacts include increased siltation, the removal of streamside vegetation, alteration of streambanks and stream bottoms by heavy equipment, and runoff of herbicides into streams.

During the design of the proposed transmission line route, TVA attempted to minimize the number of stream crossings. Under either action alternative, TVA would use standard BMPs as identified in Muncy (1999) to minimize erosion and sedimentation impacts. All perennial and intermittent stream crossings would be designated, as appropriate, for Level A (Standard Stream Protection), Level B (Protection of Important Permanent Streams), or Level C (Protection of Unique Habits) protection, as outlined in Appendix F and in Muncy (1999). Level B and Level C protection restrict the cutting of trees near permanent streams to those meeting National Electric Safety Code and danger tree requirements and allows for the consultation with TVA biologists to minimize the impact of stream crossings. Streamside management zones would also be designated at all perennial and intermittent stream crossings. These SMZs would have a minimum width of 50 feet on each side of the stream, and would be wider on steep slopes. Special protective measures including retention of tree stumps and restrictions on movement of heavy equipment would be used in the SMZs. Watercourses which convey surface water only during storm events (i.e., wet-weather conveyances or ephemeral streams) that may be affected by the transmission line would be protected by standard BMPs.

Road access to construction sites would be planned and built to minimize erosion and sedimentation effects. Maintenance activities along streams would be by mechanical cutting or by selective use of EPA-registered herbicides. 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 EPA label restrictions and TVA BMPs.

4.5.1 Alternative 1 - Cumberland-Montgomery Study Area

Potential impacts to aquatic ecology, as well as measures to minimize these impacts, are described above. Transmission line construction and maintenance could impact aquatic life in numerous small streams as well as Lake Barkley and the Red River. Based on a comparison of the streams within the four Cumberland-Montgomery corridors, Corridor D likely has the lowest potential to impact aquatic life. This corridor is a more direct route, with fewer stream crossings which would result in less impact to streams and their riparian zones.

4.5.1.1 Corridor B Route

Depending on the alternative alignments selected, the Corridor B transmission line route would cross 37 or 39 perennial streams, 8 or 10 intermittent streams, and 12 ponds and flooded quarries (see Table 3-12). Selection of the Cumberland River North alternative alignment would result in 2 fewer perennial stream crossings and 2 more intermittent stream crossings than would the Cumberland River South alternative alignment. The number of forested stream crossings would be somewhat greater with the Cumberland River South alignment, 35, is somewhat greater than the 33 with the Cumberland River North alignment. The number of stream and pond crossings does not vary among the Industrial Park alternative alignments.

All stream and pond crossings along the Corridor B route were field inspected, and none of the water bodies appear to have unusual or unique aquatic communities. Nearly all qualify for Level A stream protection as described above. Only Yellow Creek, which is maintained as a trout fishery by TWRA, qualifies for Level B stream protection. Based on the number of stream crossings and streambank vegetation conditions, the potential for impacts appears to be somewhat lower for the Cumberland River North alternative alignment than the Cumberland River South alignment. The difference, however, is small and, with implementation of the protective measures described above, impacts to aquatic ecology would be insignificant.

4.5.1.2 Corridor D Route

The Corridor D transmission line route would cross 28-41 perennial streams, 15-19 intermittent streams, and 9-14 ponds and flooded quarries, depending on the alternative alignments selected (see Table 3-12). The two route combinations affecting the most water bodies consists of the Fossil Plant East, Woodlawn East, Non-Fort Campbell, Ringgold South, Little West Fork North, and Spring Creek South alternative alignments, and the Fossil Plant East, Woodlawn West, Non-Fort Campbell, Ringgold South, Little West Fork North, and Spring Creek South alternative alignments. Each of these combinations would cross 69 water bodies, including, respectively, 39 or 41 perennial streams, 19 or 14 intermittent streams, and 11 or 14 ponds and flooded quarries. The route combinations affecting the fewest water bodies consists of the Fossil Plant West or Fossil Plant Central, Woodlawn East, Fort Campbell, Ringgold North, Little West Fork South, and Spring Creek North alternative alignments. These combinations each cross 55 water bodies, including 28 perennial streams, 18 intermittent streams, and 9 ponds or flooded quarries. Several other combinations using the Fossil Plant West or Fossil Plant Central and the Little West Fork South alignments would have slightly greater potential impacts and cross 56-58 water bodies.

The number of forested stream crossings ranges from 38 to 44, and the Fort Campbell and Little West Fork alternative alignments account for the greatest differences. The Non-Fort Campbell and Little West Fork North alignments each cross more forested streams than do the Fort Campbell and Little West Fork South alignments.

All stream and pond crossings along the Corridor D route were field inspected, and none of the water bodies appear to have unusual or unique aquatic communities. All qualify for Level A stream protection as described above. Although the potential for impacts varies among the combinations of alternative alignments, overall impacts to aquatic ecology, with implementation of the protective measures described above, are expected to be insignificant.

4.5.1.3 Comparison of Cumberland-Montgomery Corridors B and D

The total number of water bodies that would be crossed by any combination of Corridor D alternative alignments, 55-69, is greater than the 37 or 39 water bodies crossed by the Corridor B alignments. Therefore, the potential for impacts to aquatic life, based only on the number of stream crossings, is greater along the Corridor D route. The number of forested stream crossings, where the potential for impacts is often greater than at non-forested stream crossings, is slightly higher along Corridor B than Corridor D. Therefore, the overall difference in potential impacts to aquatic life that would result from selection of the Corridor B or Corridor D route is small.

4.5.2 Alternative 2- Cumberland Davidson Study Area

Under this alternative, transmission line construction and maintenance could impact aquatic life in numerous small streams as well as Lake Barkley, Cheatham Lake, and the Harpeth River. Potential impacts resulting from construction in either of the Alternative 2 corridor routes will be better quantified when proposed routes are selected. Impacts to aquatic life found in any of the proposed corridors would likely be reduced to insignificant levels with implementation of the measures described above.

4.5.3 Alternative 3 No Action

Under this alternative the transmission line would not be built, so no impacts to aquatic life in area streams would occur as a result of transmission line construction or maintenance.

4.6 Endangered and Threatened Species

Information on the occurrence of endangered and threatened species in the study areas based on information available early in the project planning process, was presented in the DEIS. This information was used in identifying the preferred alternative and planning potential transmission line routes. Once the transmission line routes were identified, detailed field surveys were conducted of the routes as well as associated areas that would be impacted such as access roads and construction material lay-down areas. The potential impacts to listed species are described below.

4.6.1 Alternative 1 - Cumberland-Montgomery Study Area

4.6.1.1 Plants

As stated in Section 3.5.1, two federally listed plant species and 39 state-listed plant species have been reported from this alternative study area. Several populations of Short's bladderpod, a candidate for federal listing, are known from the area common to Corridors A and B. This species often occurs in early successional habitats such as cultivated fields, and would not necessarily be adversely affected by the construction of a transmission line in its immediate vicinity. A population of the federally listed Price's potato-bean is known from Corridor D; this species grows in woodland openings and forest edges. All four corridors also contain populations of several state-listed plant species. These state-listed plants occupy a variety of habitats including woodlands, wetlands, barrens and bluffs. Based on the information presented in the DEIS, it was determined that the likelihood of impacting listed plants was lower in Corridor C than in the other corridors.

Corridor B Route - The construction and operation of the proposed transmission line on the Corridor B route would affect two populations of blue scorpion-weed, listed as of special concern in Tennessee. This species, which occurs in alluvial woods, is reported from at least 24 sites in Tennessee. One of affected populations occurs at the base of a bluff near Yellow Creek. Because the population occurs in a topographically protected site on the inner edge of a creek floodplain and the base of an east facing bluff, this population is not expected to be adversely impacted by the construction and maintenance of the transmission line.

The other affected population of blue scorpion-weed consists of at least several hundred plants. About 200 plants are located within the proposed Corridor B ROW, and would be adversely impacted by the removal of the tree canopy during initial ROW clearing and subsequent ROW vegetation management. The portion of the population occurring off the ROW would not be adversely impacted. Overall impacts to this species are not expected to be significant. No other plant species listed as endangered, threatened, or of special concern would be affected by selection of the Corridor B route.

Corridor D Route - No plant species listed as endangered, threatened, or of special concern would be affected by the construction and operation of the proposed transmission line on the Corridor D route.

4.6.1.2 Terrestrial Animals

Corridors A, B and D contain populations of the Indiana bat, federally listed as endangered. The gray bat, federally listed as endangered, is also known from Corridor D, as is the Coleman Cave beetle, a candidate for federal listing. Three state-listed terrestrial animal species are known from Corridors A and B, and four state-listed terrestrial animal species are known from Corridors C and D. Suitable habitat for other listed species known from the surrounding area is also present in the corridors. Some of the listed species, such as Bewick's wren, which occurs in brushy areas or woodland edges, and the meadow jumping mouse, which occurs in grasslands, would likely not be adversely affected by transmission line construction. Other species occupying forests could be adversely affected. More specific impacts resulting from selection of the Corridor B Route and the Corridor D Route are described below.

Corridor B Route - The closest known wintering cave for Indiana bats is about six miles from the Corridor B route. Indiana bats have not been found at this site in recent years. Because almost all of the forest along the Corridor B route was rated as low quality for Indiana bats and no caves used by this species occur in the immediate vicinity, no impacts to this species are anticipated. Similarly no impacts to the gray bat are anticipated. No potential nest or winter roost habitat for the bald eagle would be affected, and no adverse impacts to eagle foraging habitat are expected. Transmission line conductors crossing the Cumberland River would be marked to increase its visibility to aircraft; this would also help to reduce the risk of bald eagles, and other birds, colliding with the line.

Suitable habitat for several state-listed species including the barking treefrog, four-toed salamander, western pigmy rattlesnake, Swainson's warbler, common and southeastern shrews, and southern bog lemmings, occurs near Yellow Creek and Guices Creek. Transmission line construction activities within these areas would fragment the wetland and forest and potentially eliminate habitat for the listed species. Although local populations of these species could be impacted, significant adverse impacts to regional populations of these species are not anticipated. Adverse impacts to the northern pine snake are not anticipated because there is little suitable habitat for this species on the proposed route, As described below for other listed aquatic species, no adverse impacts to eastern hellbenders are anticipated.

Corridor D Route – The Corridor D transmission line route is about 0.2 miles from a cave occupied by gray bats and formerly occupied by Indiana bats. This route is also about 0.7 miles from a second cave occupied by the Coleman Cave beetle and formerly occupied by gray bats. No direct impacts to either of these caves are anticipated and forests in the immediate vicinity of the caves would not be disturbed. During the transmission line siting process, efforts were made to minimize clearing of forest in the vicinity of these caves, as well as elsewhere along the route. Very little summer habitat of moderate to high suitability for the Indiana bat occurs along the proposed route, including that portion near the caves. Transmission line construction at the several river and stream crossings in Corridor D is expected to have little impacts on gray bat foraging habitat. Therefore, no adverse impacts to Indiana or gray bats, or the Coleman Cave beetle, are anticipated.

As in Corridor B, no potential nest or winter roost habitat for the bald eagle would be affected, and no adverse impacts to eagle foraging habitat are expected. Transmission line conductors crossing the Cumberland River would be marked to increase its visibility to aircraft; this would also help to reduce the risk of bald eagles, and other birds, colliding with the line.

Impacts to the state-listed terrestrial animals, most of which are listed as In Need of Management, that potentially occur along the proposed route would be similar to those for the Corridor B route and are not expected to result in adverse impacts to regional populations,

The overall level of impacts to listed terrestrial animals would be similar for the Corridor B and Corridor D routes. For most species known to occur or potentially occurring along the proposed routes, there would be little difference in impacts. The level of impacts to two species inhabiting forested wetlands, the barking treefrog and the four-toed salamander, would likely be somewhat greater in Corridor D. Adverse impacts to these species, or to other federally or state-listed terrestrial animals, are not expected to result from the selection of either the Corridor B or Corridor D route.

Aquatic Animals – No extant populations of federally listed aquatic species are known from the Cumberland-Montgomery study area and therefore no impacts to such species would result from selection of this alternative. State-listed aquatic species are present in all four study area corridors. The potential for impacting these species would likely be similar for a transmission line in Corridors A, B, or C. These corridors all cross the Cumberland River and streams in the Red River system. Blue sucker, ashy darter, Tippecanoe darter, slenderhead darter, and southern cavefish are present in one or more of the streams or cave systems within these corridors. The blue sucker and the southern cavefish both occur within Corridor D. Of the four Alternative 1 corridors, selection of Corridor D would have the lowest potential to adversely affect endangered and threatened aquatic animals.

During the planning of the potential transmission line routes in Corridor B and Corridor D, efforts were made to minimize stream crossings and avoid caves and karst areas, thus reducing potential impacts to listed aquatic species. Total avoidance of these areas, however, is not possible. As described in Chapter 2, stringent erosion and sedimentation control measures, including streambank revegetation, would be implemented during construction and subsequent maintenance activities to minimize impacts to aquatic resources. With the implementation of these measures, as well as the measures to protect groundwater described in Section 4.1, no adverse impacts to state-listed aquatic species are expected to result from selection of either the Corridor B or Corridor D route.

4.6.2 Alternative 2- Cumberland Davidson Study Area

Plants – Several populations of the federally listed Eggert's sunflower are known from Corridors A and B. This species occupies barrens and roadsides, and would not necessarily be adversely affected by the construction of a transmission line in its immediate vicinity. Corridor A also contains at least two state-listed plants occupying alluvial woods, seeps, and limestone creek beds. Corridor B contains at least two state-listed plants found in glades and cultivated fields. Because of the types of habitats used by these listed species, the potential for impacts to listed plants is probably somewhat greater in Corridor A than Corridor B.

Terrestrial Animals – Four species of state-listed terrestrial animals are known from Corridor A and one state-listed terrestrial animal is known from Corridor B (Table 3-14). The cerulean warbler, which occupies mature forests, is known from both corridors and could be adversely affected by transmission line construction. The other three species known from Corridor A also occupy woodlands, although they are apparently not as sensitive to fragmentation as the cerulean warbler. Based on currently available information, the potential for adverse impacts to listed terrestrial animals is somewhat lower in Corridor B than in Corridor A.

Aquatic Animals – Construction and operation of the proposed transmission line in either Corridors A or B would affect the Cumberland River as well as several stream crossings within the Harpeth River system. In addition to the blue suckers reported from the Cumberland River, smallscale darter, Tippecanoe darter, and slenderhead darter are reported from the Harpeth River system. Based on presently available information, the two Cumberland-Davidson corridors differ little in the potential to impact listed aquatic animals. As described in Chapter 2, stringent erosion and sedimentation control measures, including streambank revegetation, would be implemented during construction and subsequent maintenance activities to minimize impacts to aquatic resources.

4.6.3 Alternative 3 No Action

Under the No Action Alternative, the proposed transmission line would not be constructed and no endangered or threatened plants would be affected.

4.7 Wetlands

Potential wetland impacts resulting from transmission line construction include the conversion and fragmentation of forested wetlands, erosion and sedimentation in wetlands, soil compaction, hydrologic alteration, and reduction of certain functions such as providing wildlife habitat. Specifically, clearing and conversion of forested wetlands could result in the loss of vegetation and other habitat features such as stumps, downed trees, and snags. For the proposed transmission line, the majority of these potential impacts would be avoided or minimized through wetland avoidance and implementation of Best Management Practices (BMPs; Muncy 1999) as well as measures listed in Appendices B and C.

In the Cumberland-Montgomery Corridors A and C and both Cumberland-Davidson corridors, the majority of the larger wetlands areas (>10 acres), according to NWI data, are concentrated in the river floodplains, especially along the Cumberland River) and in tributary stream embayments on the Cumberland River. Individual wetlands of various sizes occur in scattered locations in the floodplains of rivers and of second-order and third-order streams, and as relatively narrow, linear landscape features in stream riparian zones. Wetlands are also found in association with excavated ponds on farmland and the Cumberland Fossil Plant reservation. Apart from specific floodplain areas identified during ground surveys in Corridors B and D of the Cumberland-Montgomery alternative, the wetlands are generally scattered across the landscape and thus potentially avoidable when planning the actual transmission line routes.

Transmission line routes in all of the study area corridors would cross narrow riparian zones. Impacts to wetlands in these areas are likely to be minimal and insignificant if none of the following wetland sensitivity criteria apply:

- The wetland is forested;
- The wetland supports uncommon plant communities or rare plant or animal species;
- The wetland is associated with a spring, seep, or sinkhole connected to the groundwater system; or
- The wetland is greater than an acre in size and is ecologically connected to other relatively undisturbed habitats.

No significant impacts are expected as a result of transmission line crossings of scrub-shrub or emergent wetlands because structure placement in these wetlands would be avoided, vegetation removal or disturbance would be avoided, and BMPs would be utilized to avoid or minimize indirect impacts during construction. In addition, scrub-shrub and emergent wetlands would not be cleared mechanically or with herbicides during future maintenance since the vegetation would not interfere with the conductors. Trees that begin to grow to danger heights would be cut by hand and growth inhibitors or herbicides would be spot-applied.

When scrub-shrub and emergent wetlands are interspersed with forested wetlands that would be cleared, there is an increased potential for direct and indirect impacts. These potential impacts would be minimized through implementation of appropriate BMPs,

including the avoidance of unnecessary vegetation damage or entry of vehicles and heavy equipment.

Clearing through forested wetland tracts would be avoided, to the extent possible, in order to limit forest fragmentation and the permanent conversion of forested wetlands to other types of wetlands (emergent and scrub-shrub). Depending on the alternative and route chosen, it may be possible because of the surrounding topography to span some forested wetlands without clearing or motorized vehicle entry. The remainder of the forested wetlands within the proposed ROW would be cleared and converted to emergent and scrub-shrub wetlands. Clearing would be done by non-mechanical means, and/or by the use of a feller-buncher located outside of the wetland. Appropriate BMPs would be implemented to avoid or minimize any potential wetland impacts.

Impacts to forested wetlands are of concern due to the historic high rate of loss, and continuing losses, of this type of wetland, and the long time period necessary to replace forested wetlands and their functions. Unavoidable clearing of forested wetlands could justify mitigation, the level of which would be determined based on the wetland's TVARAM categorization. No mitigation would typically be recommended for clearing low quality Category 1 or moderate quality Category 2 wetlands. Clearing high quality Category 3 wetlands could require mitigation at a 1:1 or higher ratio.

Future ROW maintenance activities would follow TVA guidelines described in Section 2.1.3 and Appendix E to avoid or minimize impacts to wetlands. Future ROW vegetation management activities would avoid entry by mechanized equipment when the ground is saturated and aerial application of herbicides on scrub-shrub wetlands, as this practice unnecessarily kills low-growing shrubs, vines, and herbaceous species.

A comparison of the corridor in the Cumberland-Montgomery and Cumberland-Davidson alternative study areas in regard to the potential for the avoidance and minimization of wetland impacts is presented below by alternative and corridor. For all but Corridors B and D in the Cumberland-Montgomery alternative, for which ground surveys were conducted, this analysis of impacts is based on NWI data. There are limitations in the NWI wetland identification methodology and changes in land use could have occurred since the NWI was completed.

4.7.1 Alternative 1 - Cumberland-Montgomery Study Area

4.7.1.1 Corridor A

In the overlapping Corridor ABCD near Cumberland Fossil Plant, the NWI data indicate large wetlands associated with Cumberland River tributaries. Because they cover only a small portion of the overall corridor, it appears possible to avoid these wetland areas. However, sections of the proposed Corridor B and D routes would cross wetlands in this area, indicating that these or similar wetland crossings could occur in Corridors A and C in the same area.

In the western section of overlapping Corridor AB, Corridor ABC, and in most of Corridor A, avoidance or minimization of potential wetland impacts is possible because the wetlands occur primarily in narrow riparian zones and in scattered locations in larger floodplains. The floodplain wetlands could be avoided. Wetland impacts in the narrow riparian zones

areas are likely to be minimal and insignificant if the criteria described above in the introduction to this section do not apply.

In the eastern section of shared Corridor AB, there is a potential for wetland impacts in the Cumberland River floodplain where there are large wetland areas in the Shelton Ferry Wetlands and Marks Slough. Avoidance and minimization of wetland impacts in the Cumberland River floodplain may be possible with careful planning of the transmission line route to avoid all wetlands, or to avoid forested wetlands and to span any emergent or shrub-dominated wetlands. However, impacts could be significant if the area of wetland disturbance cannot be minimized or if forested wetlands would be cleared.

Corridor A wetland impacts resulting from transmission line construction are expected to be insignificant if forested wetlands, large wetland areas, and other sensitive wetlands are avoided or the impacts are minimized or mitigated.

4.7.1.2 Corridor B

Wetlands along the proposed Corridor B transmission line route and its various alternative alignments and access roads are described in Section 3.7.1.2. Wetlands occur within the proposed ROW for the main Corridor B alignment in the section west of the Cumberland River, in the Cumberland River North (CRN) alternative alignment, and in the Cumberland River South (CRS) alternative alignment. The proposed Corridor B transmission line would cross 21.7 acres of wetlands in the B/CRN alignment and 23.2 acres of wetlands in the B/CRS alignment. This wetland acreage includes approximately 13.7 and 13.9 acres of scrub-shrub, emergent, unconsolidated bottom and mudflat (PSS1/PEM1/PUS/PUB) wetlands and 7.7 and 9.4 acres of forested (PFO1) wetlands in the B/CRN and B/CRS alignments, respectively).

Due to adjacent hilly topography, approximately 3.2 acres of forested wetland in the Guices Creek bottomland would be spanned by the conductors; therefore, no clearing would be required. However, the clearing of either 4.5 acres or 6.2 acres of forested wetland would be required for B/CRN and B/CRS alignments, respectively. Based on TVARAM scoring and categorization of these wetlands, 3.8 acres of affected forested wetlands in main corridor B would justify Category 3 compensatory mitigation in order to reduce these potential impacts to an insignificant level.

Impacts to the non-forested emergent, scrub-shrub, unconsolidated bottom and mudflat wetlands from transmission line construction are expected to be minimal because there would be no structures in these wetlands. Furthermore, potential indirect impacts will be avoided through the implementation of BMPs as described in Muncy (1999). Low-growing vegetation in these wetlands would not be removed. Any tree-removal that is necessary in emergent or scrub-shrub wetlands would be done in a manner that would not disturb the substrate or remaining vegetation (e.g., feller-buncher or by hand). During future ROW maintenance these wetland areas would be avoided or potential impacts minimized through the implementation of appropriate BMPs. Therefore, compensatory mitigation for impacts to these wetlands was not identified.

In addition to potential wetland impacts within the ROW, the upgrade or use of Access Road SSAR2, an unimproved farm road, has the potential to adversely impact wetlands located on both sides of the access road. The wetlands immediately adjacent to access road SSAR2 are not expected to be impacted because the road will not be expanded and

no vehicles and equipment will enter the wetlands. In addition to wetland avoidance, standard BMPs, such as erosion controls, will be used to avoid and minimize indirect impacts.

4.7.1.3 Corridor C

Section 4.7.1.1 discusses the avoidance and minimization of impacts in the overlapping section of Corridors ABCD. Section 4.7.1.2 discusses the overlapping Corridor BC section.

The largest areas of potential wetlands in Corridor C are forested wetlands in the floodplains of the Cumberland River and a Red River tributary. Wetland impacts can be avoided or minimized by avoiding the Cumberland River floodplain, or, if this is not possible, by avoiding forested wetlands in the floodplain. There are potentially forested wetlands along two unnamed tributary streams that may not be possible to completely avoid because they appear to bisect over half of the corridor. Impacts can be minimized by crossing at the narrowest point or near the wetland edge. Other potential wetlands in Corridor C are located in relatively narrow, riparian areas. Wetland impacts in these riparian areas are likely to be minimal and insignificant if the wetland sensitivity criteria listed above are implemented

Corridor C wetland impacts resulting from transmission line construction are expected to be insignificant if forested wetlands, large wetland areas, and other sensitive wetlands are avoided or the impacts are minimized or mitigated.

4.7.1.4 Corridor D

Wetlands along the proposed Corridor D transmission line route and its various alternative alignments and access roads are described in Section 3.7.1.4. Wetlands occur within the proposed ROW for the main Corridor D alignment and in the Woodlawn East (DWE), Woodlawn West (DWW), and Fossil Plant East (FPE) alternative alignments. The proposed Corridor D transmission line would cross 5.6 acres, 8.0 acres, 8.6 acres, or 11.1 acres in the D/DWW, D/DWE, D/DWW/FPE, and D/DWE/FPE combination alignments, respectively. The wetlands include from 0.4 to 5.9 acres of scrub-shrub, emergent, unconsolidated bottom and mudflat (PSS1/PEM1/PUS/PUB) wetlands and from 4.1 to 5.2 acres of forested (PFO1) wetlands. The clearing of 4.1 or 5.2 acres of forested wetlands would be required for the D/DDW and D/DWE alignments, respectively. Based on TVARAM scoring and categorization, clearing 2.5 acres of affected forested wetlands in the main Corridor D alignment would justify Category 3 compensatory mitigation to reduce the impacts to an insignificant level. No compensatory mitigation was identified for impacts to Category 2 wetlands.

Impacts to most of the emergent, scrub-shrub, palustrine unconsolidated bottom, and palustrine unconsolidated shore wetlands from transmission line construction are expected to be impacted by transmission line construction because there would be no structures in these wetlands. Potential indirect impacts will be avoided through the implementation of Best Management Practices. Therefore, impacts to these wetlands would be insignificant and compensatory mitigation was not identified.

If the Corridor D route with the Woodlawn East (DWE) alternative alignment is selected, transmission line structures would be located in wetlands DWE3 and DWE8. DWE3 is a seasonally saturated wet meadow that is periodically mowed and may be used at times for

livestock grazing. DWE8 is a Category 2 forested wetland. The appropriate federal and state permits would be obtained for the construction activities in these wetlands. The impacts of structure installation to the DWE3 wetland are expected to be minor with the implementation of BMPs and adherence to permit conditions. For the DWE8 forested wetland, impacts would be insignificant with BMPs and adherence to permit conditions, as well as compensatory mitigation for the conversion of the forested wetland.

4.7.2 Alternative 2- Cumberland Davidson Study Area

The potential for wetland impacts in Corridors A and B are approximately equal. In these corridors, it appears possible to avoid significant wetland impacts through avoidance and minimization. The following sections describe potential wetland impacts by corridor.

4.7.2.1 Corridor A

Corridor A contains a combination of relatively narrow forested wetlands in riparian zones and large (up to 20 acres) forested wetlands in the floodplains of streams that drain to the Cumberland River and to the Harpeth River. Potential significant wetland impacts may be avoided by routing the transmission line to avoid the large floodplain wetland areas. Wetland impacts in the narrow riparian area wetlands are likely to be minimal and insignificant if the wetland sensitivity criteria stated above are implemented.

Corridor A wetland impacts resulting from transmission line construction are expected to be insignificant if forested wetlands, large wetland areas, and other sensitive wetlands are avoided or the impacts minimized or mitigated.

4.7.2.2 Corridor B

Corridor B is similar to Corridor A in its combination of narrow, riparian zone wetlands and larger forested floodplain wetlands in the Cumberland River and Harpeth River drainages. As in Corridor A, avoidance and minimization of impacts can be achieved through routing the transmission line away from the larger floodplain wetlands and by minimizing impacts to riparian wetlands.

Corridor B wetland impacts resulting from transmission line construction are expected to be insignificant if forested wetlands, large wetland areas, and other sensitive wetlands are avoided or the impacts minimized or mitigated.

4.7.3 Alternative 3 No Action

Under the No Action Alternative, the proposed transmission line would not be constructed. Therefore, no wetlands would be affected.

4.7.4 Comparison of Cumberland-Montgomery Corridors B and D

Table 4-3 presents a comparison of the wetland acreages in the Corridor B and D route ROWs. The primary difference between the two routes is in the total acreage of wetlands that would be crossed and the acreage of high and moderate quality forested wetlands that would be cleared:

- The Corridor B route, regardless of the alternative alignments selected, would cross about twice as much wetland area as would the various Corridor D combinations of alignments.
- Under the Corridor D/Woodlawn East alignment, more overall forested wetland area would be cleared than under the Corridor B/Cumberland River South alignment.
- Under all combinations of alternative alignments, a Corridor B route would require the clearing of a larger area of Category 3 high quality forested wetlands than under all Corridor D combinations alternative alignments.
- The area of high-quality Category 2 and Category 3 wetlands that would be cleared is greatest in the Corridor B/Cumberland River South alignment (6.2 acres), and lowest (4.1 acres) in the Corridor D/Woodlawn West and Corridor D/Woodlawn West/Fossil Plant East alignment combinations.

The Corridor B alternative alignments would cross the largest total wetland area, with 23.2 acres in the B/Cumberland River South alignment and 21.7 acres in the B/Cumberland River North alignment. The selection of Corridor B would result in the permanent conversion of 3.8 acres of Category 3 forested wetlands and either 0.7 or 2.4 acres of Category 2 wetlands, depending on the alternative alignments. Since the Category 3 forested wetlands are in the main B corridor alignment, it would not be possible to avoid them by choosing an alternative alignment. However, approximately 2.0 acres of Category 2 forested wetlands could be avoided by selecting the Cumberland River North alternative alignment instead of the Cumberland River South alignment.

A Corridor D transmission line would cross less overall wetland area (approximately 5.6 to 11.1 acres) than would a Corridor B line. The selection of Corridor D would result in the permanent conversion of 2.5 acres of Category 3 forested wetlands and either 2.6 or 2.7 acres of Category 2 forested wetlands. The Category 3 forested wetlands cannot be avoided because they occur in the main Corridor D alignment. The Woodlawn West and Woodlawn East alternative alignments cross approximately the same area of Category 2 forested wetlands (1.1 and 1.2 acres, respectively). The Woodlawn West alignment would cross one 1.1-ac Category 2 wetland area while the Woodlawn East alignment would cross five Category 2 wetlands ranging in size from 0.1 to 0.8 acres. All of these ROW wetlands are situated in narrow woodlands between agricultural fields or mowed fields. Because of this, the impacts of clearing forested wetlands in either the Woodlawn East or Woodlawn West alignments are expected to be similar.

The avoidance of impacts to non-forested wetlands, as well as the use of BMPs, would reduce impacts to wetlands resulting from the selection of any of the Corridor B and D alignments. With the mitigation of impacts (described in more detail below) to high quality (Category 3) forested wetlands, these impacts would be insignificant. However, based on minimizing both the number of affected wetlands in the ROW and the acreage in forested wetlands justifying compensatory mitigation, Corridor D has less potential for impacts than Corridor B. Within Corridor D, the Corridor D/Woodlawn West alignment combination has the lowest potential for impacts.

4.7.5 Cumulative Impacts

The federal “no-net-loss” policy for wetlands states an interim goal of no overall net loss of the Nation’s remaining wetlands, and the long-term goal of increasing the quality and quantity of the Nation’s wetlands resource base (White House Office on Environmental Policy, 1993 www.wetlands.com/ fed/ aug 93wet.htm). The Bush Administration’s 2003

National Wetlands Mitigation Action Plan reaffirms the policy of no-net-loss of wetlands http://www.epa/gov/owow/wetlands/guidance). Although the no-net-loss policy is not interpreted strictly on the basis of wetland class (e.g., forested, emergent), such an interpretation may be appropriate for those wetland types such as forested wetlands that have experienced historic and current high levels of loss and conversion.

Impacts to forested wetlands are of concern due to the historic high rate of loss, and continuing losses, of this type of wetland, and the long time period necessary to replace forested wetlands and their functions. Forested wetlands are one of the most difficult categories to restore or replace functionally. The timetable for creating or regenerating mature forested wetlands and their associated functions can take 80 – 100 years.

Because different forested wetlands function at different levels, many factors taken together (i.e., hydrologic regime, watershed location, habitat quality) are important in determining the functional level and relative ecological and social value of a forested wetland. Functional losses in individual areas may not be significant when viewed as a separate and single event. However, consideration of the cumulative loss of functions that occurs on a regional basis as a result of many separate and single events, and the continuing net loss of forested wetland acreage in the southeastern U.S., could reveal significant impacts from seemingly small individual areas of loss or conversion.

Table 4-3. Number of wetland crossings, acreage of all wetlands, and acreage of Category 2 and Category 3 forested (PFO1) wetlands on the Cumberland-Montgomery Corridor B and D transmission line route alignments.

Corridor Alignments	Wetland Crossings	Acreage							
		All Wetlands	Cat 3 PFO1	PFO1 Cat 3 to be cleared	Cat 2 PFO1	PFO1 Cat 2 to be cleared	PFO1 Cat 2 + Cat 3 to be cleared	PFO1 Cat 1	Other Types
Corridor B									
B (Main)	9	20.7	7.0	3.8	0.4	0.4	4.2	0	13.2
B + CRN	12	21.7	7.0	3.8	0.7	0.7	4.5	0	13.9
B + CRS	11	23.2	7.0	3.8	2.4	2.4	6.2	0	13.7
Corridor D									
D (Main)	4	4.3	2.5	2.5	1.5	1.5	4	0	0.3
D + DWW	7	5.6	2.5	2.5	2.6	2.6	4.1	0	0.5
D + DWW + FPE	10	8.6	2.5	2.5	2.6	2.6	4.1	0	3.5
D + DWE	12	8.0	2.5	2.5	2.7	2.7	5.2	0.1	2.8
D + DWE + FPE	15	11.1	2.5	2.5	2.7	2.7	5.2	0.1	5.9

Forested wetlands have experienced the greatest decline of any single category of wetlands, both in the southeastern U.S. (Hefner et al. 1994) and the U.S. as a whole (U.S. Fish and Wildlife Service 2001). Although the annual rate of loss has declined since the 1970s, due in part to federal government agriculture programs such as Swampbuster and Conservation Reserve Program, forested wetland acreage continues to decline, with an estimated 4 million acres of forested wetland lost or converted between 1986 and 1997 (Dahl 2000). Part of the decline in forested wetland acreage was due to the conversion of forested wetlands to other vegetation types, such as ponds and emergent and scrub-shrub wetlands. The largest contributors to forested wetland loss and conversion have been agriculture, silviculture (including conversion to pine plantations), and urban and rural development. While TVA complies with federal and state wetland protection regulations, implements BMPs, and has been successful in avoiding and minimizing wetland impacts, some clearing and conversion of forested wetlands is unavoidable, especially for the expansion of the transmission system.

To conform broadly with the federal policy of no-net-loss of wetlands and with E.O. 11990 compensatory mitigation at a 1:1 ratio for Category 3 forested wetlands is recommended to mitigate the impacts that would result from the conversion of forested wetlands in the final selected transmission line route in either Cumberland-Montgomery Corridor B or D. Mitigation options include, but are not limited to:

- The purchase of credits in an existing mitigation bank (which includes forested wetlands) within the USGS Hydrologic Unit (HU) for the project area or an adjacent Cumberland River HU.

- Forested wetland restoration in or adjacent to the project HU, either implemented by TVA or through an in-lieu-fee agreement with a state agency or private conservation organization.

4.8 Floodplains

Neither the Cumberland Fossil Plant switchyard, the Montgomery 500-kV Substation, nor the Davidson 500-kV Substation are located within the 100-year floodplain. Therefore, the construction activities that would occur in these areas under either Alternative 1 or Alternative 2 would not impact floodplains.

All of the alternative transmission line corridors cross several floodplain areas. Consistent with Executive Order 11988, an overhead transmission line and the support structures are considered to be a repetitive action in the 100-year floodplain. The construction of the support structures for the transmission line would not be 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. To minimize adverse impacts on natural and beneficial floodplain values, the right-of-ways would be re-vegetated where natural vegetation is removed. Best management practices would be used during construction activities. Impacts to floodplains under either Alternative 1 or Alternative 2 would be insignificant.

Some of the proposed construction access roads would be located within or cross 100-year floodplains. Consistent with Executive Order 11988, an access road is considered to be a repetitive action in the 100-year floodplain. To minimize adverse impacts, any new stream

crossings would be designed to pass the 100-year flood with no more than a one foot increase in upstream flood elevations.

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

4.9 Managed Areas

4.9.1 Alternative 1 - Cumberland-Montgomery Study Area

All of the Alternative 1 corridors contain managed areas and/or ecologically significant sites which could be impacted by transmission line construction and operation. Corridor D contains the most such areas, including fragile communities and a stream listed on the Nationwide Rivers Inventory (NRI). Corridors A and B have the least number of areas that could be impacted, and significant impacts to several of these areas could be minimized through use of Best Management Practices, appropriate revegetation methods and other protective measures.

All of the Alternative 1 corridors cross the Lake Barkley Reservation and the Wells Creek Cryptoexplosive PNNL. Impacts to the PNNL are likely to be insignificant because of its geologic nature, size, and previous level of disturbance. Impacts to Lake Barkley Reservation would likely be insignificant, and TVA would work with USACE to minimize impacts to this area. Corridor A and B contain two areas noted for their wetland resources, the Shelton Ferry Wetland and Marks Slough. Long Pond Slough, another important wetland area, is located within Corridor C. Neither Shelton Ferry Wetland nor Long Pond Slough would be impacted by the proposed transmission line routes. No impacts to Wooten's Bluff and the Austin Peay EEC, both of which are within Corridor C, are anticipated.

Corridors A, B and C each contain two streams on the NRI list and Corridor D contains one such stream. Under this alternative, the proposed transmission line would cross at least one listed stream regardless of the corridor, and Corridor C would require two such stream crossings. Best Management Practices, including streamside buffer zones, would reduce impacts to these streams.

4.9.1.1 Corridor B Route

The proposed Corridor B transmission line route would avoid Cross Creeks NWR by at least 0.5 miles and no impacts to refuge lands or activities are anticipated. The Corridor B route would cross the Marks Slough site and the Cumberland River North alternative alignment would affect 0.5 acres of a 1.1 acre emergent wetland on the site. The resulting impacts of this alignment, as described in Section 4.7, would be minimal and would likely not significantly reduce the integrity of the site. The Cumberland River South alignment would affect 0.4 acres of a 1.1 acre emergent wetland and 2.0 acres of an 11.5 acre forested wetland in Marks Slough. As with the Cumberland River North alignment, impacts to the emergent wetland would be minimal. Impacts to the forested wetland would be greater and potentially adverse. Because of the previous degradation of wetlands at the site, the effects of transmission line construction and operation are not expected to significantly impact the integrity of Marks Slough as a natural area. Overall, no significant impacts to managed areas and/or ecologically significant sites are expected to result from the selection of the Corridor B route.

4.9.1.2 Corridor D Route

The proposed Corridor B and Corridor D transmission line routes would avoid Cross Creeks NWR by at least 0.5 miles and no impacts to refuge lands or activities are anticipated.

At its closest points, the proposed Corridor D route is 0.5 miles from the Coleman Cave site and 0.6 miles from Barnett Woods Designated State Natural Area. No impacts to these sites are anticipated. The Corridor D route is adjacent to the Bellamy Cave site and about 0.2 miles from the cave itself; because of this distance, no significant impacts to the Bellamy Care site are anticipated. Some Corridor D alternative alignments have the potential to impact Fort Campbell Military Reservation. The route, however, would be close to the edge of the base and not in an area of unusually high ecological importance.

Overall, no significant impacts to managed areas and/or ecologically significant sites are expected to result from the selection of the Corridor D route.

4.9.2 Alternative 2 - Cumberland-Davidson Study Area

Both Alternative 2 corridors include portions of the Lake Barkley Reservation and Cross Creeks NWR. Any transmission line built in either of these corridors would exit Cumberland Fossil Plant to the west and south and not directly impact either of these areas.

Under Alternative 2, crossing both the Wells Creek Cryptoexplosive PNNL and the Harpeth State Scenic River would be unavoidable in either Corridor A or B. Impacts to the PNNL are likely to be insignificant because of its geologic nature, size, and previous level of disturbance. TVA would work with the Tennessee Division of Natural Heritage to minimize impacts from any unavoidable crossings of the Harpeth River, a designated State Scenic River. Potential measures could include maintenance and restoration of low-growing trees and shrubs on streambanks and placement of structures to minimize their visibility from the river.

Corridor A passes through the Cheatham WMA; the significance of impacts to the WMA would depend on the line's location in the WMA and compatibility of ROW management with the area's management objectives. In addition to crossing the Harpeth State Scenic River twice, Corridor A would also cross Jones Creek, which, like the Harpeth River, is listed on the NRI. The selection of Corridor B would result in crossing Jones Creek, Big Turnbull Creek, and the South Harpeth River, in addition to the Harpeth River; all of these streams are listed on the NRI. The Hava-Lakatu and Svenson's Bluff sites are also in Corridor B; each of these sites is small and potentially avoidable.

Although both corridors hold the potential for impacts to managed areas and/or ecologically sensitive sites, this potential is higher for Corridor A than for Corridor B because of the presence of Cheatham WMA at least two crossings of the Harpeth State Scenic River in Corridor A.

4.9.3 Alternative 3 No Action

Under the No Action Alternative, the proposed 500-kV transmission line would not be built. Therefore, no impacts to managed areas, ecologically significant sites or streams listed on the NRI are anticipated.

4.10 Recreation

4.10.1 Alternative 1 - Cumberland-Montgomery Study Area

Recreation activities in the immediate vicinity of the proposed transmission line would be temporarily disrupted during line construction. This would likely only last a few weeks on any particular line segment, and is not expected to cause significant impacts. Little long-term impact to dispersed recreational activities, such as hunting and fishing, is anticipated as these activities are generally a compatible use of transmission line ROWs.

TVA attempted to avoid developed recreation facilities during the transmission line routing process. All of the Alternative 1 corridors cross the Cumberland River/upper Lake Barkley, and this river crossing would likely have little impact on river-based recreation. The area of parks and other developed recreation areas is somewhat greater in Corridors C and D than in A and B, making these corridors somewhat less desirable from a recreation perspective. However, it is not anticipated that any of the transmission structures would be located in a developed recreation area. Neither Guices Creek Recreation Area (near the Corridor B route) nor River Bend Recreation Area (near the Corridor D route) would be significantly affected by proposed transmission line. Overall impacts to recreation from a transmission line in any of the Alternative 1 corridors, including along the Corridor B and Corridor D routes, are expected to be insignificant.

4.10.2 Alternative 2- Cumberland Davidson Study Area

Potential impacts to dispersed recreation activities and to developed recreation facilities are similar to those described above for Alternative 1. The area of parks and other developed recreation areas is somewhat greater in Corridor B than in Corridor A. The selection of Corridor B would also result in at least one more crossing of the Harpeth State Scenic River, portions of which receive heavy recreational use, than would selection of Corridor A. For these reasons, Corridor B is somewhat less desirable from a recreation perspective than Corridor A. Compared to Alternative 1, the potential impacts to recreation from selection of Alternative 2 would likely be somewhat greater, although still likely insignificant.

4.10.3 Alternative 3 No Action

Under the No Action alternative the transmission line would not be built. Therefore, no impacts to recreation would result.

4.11 Land Use and Prime Farmland

Construction of the proposed transmission line in either the Cumberland-Montgomery or the Cumberland-Davidson study areas would impact land use. Any buildings within the transmission line ROW would be removed and landowners would be prohibited from constructing buildings within the ROW. Forest, orchard, and plant nursery operations that would result in trees growing tall enough within the ROW to present a hazard would be prohibited. Most other agricultural activities could occur within the ROW. Other land uses allowable within the ROW include driveways, parking lots, lawns, and golf courses.

No prime farmland would be affected by the activities proposed at the Cumberland Fossil Plant, the Montgomery 500-kV Substation, or the Davidson 500-kV Substation because by definition these locations contain no prime farmland. The proposed transmission line, regardless of the alternative, corridor, and route alignment, would require the construction

of transmission structures in prime farmland. The area disturbed by structure construction would be small, and permanent disturbances would be limited to the structure foundations.

4.11.1 Alternative 1 - Cumberland-Montgomery Study Area

Based on the attributes of the four corridors in the Cumberland-Montgomery study area, the potential for impacts to forest management activities is greatest in Corridor A and least in Corridor D (Table 3-5). Corridor A also has the greatest area classified as developed, although the number and density of apartment buildings and houses is greatest in Corridor D and least in Corridor A (Table 2-1). Potential impacts to land uses and prime farmland for the Corridor B and Corridor D routes are described in more detail below.

4.11.1.1 Corridor B

The proposed Corridor B transmission line route would occupy a ROW of about 823 acres; this area varies slightly (less than 2%) depending on the combination of alternative alignments considered. The acreage of prime farmland within the various combinations of Corridor B alignments ranges from a low of 180.2 acres (Cumberland River South and Industrial Park East alternative alignments) to a high of 201.3 acres (Cumberland River North and Industrial Park West alternative alignments). Most of this difference in acreage is due to differences in the Industrial Park alignments; the two alignments in this segment with the greatest acreage of prime farmland soils, Industrial Park West (44.8 acres; Table 3-22) and Industrial Park Central (34.4 acres) pass through areas already dedicated to non-agricultural uses, as described below. The area of prime farmland that would be removed from production would be limited to small areas around the base of the transmission structures and impacts on prime farmland and agricultural land uses would be minor.

Forestry is one of the major land uses within the Corridor B route ROW (about 387 acres) and this area would be converted to non-forest uses. Landowners would be compensated for the value of timber within the ROW or given the opportunity to harvest it themselves. The timberland within the proposed ROW represents a very small proportion of timberland in the area (see Section 4.3.1) and impacts on forest management would be small.

The Clarksville-Montgomery County Corporate Business Park is located in the vicinity of the Montgomery 500-kV Substation at the eastern end of the Corridor B route. A portion of this business park, located west and southwest of the Montgomery substation, is developed and occupied by several businesses. An 871-acre portion of the Phase II area of the business park, currently under development, is located along the Corridor B route south of the Montgomery substation. This tract is bounded by I-24, Rossview Road, Rollow Lane, and Dunlap Lane.

In recognition of this portion of the business park, TVA developed three alternative alignments on this portion of the line. The Industrial Park West alignment would run along the western edge of the Phase II area, with most of the line a short distance inside the Phase II area boundary. After crossing Dunlap Lane, it would run along Steelstock Road, crossing some property already occupied by industries in the older portion of the business park. The Industrial Park Central alternative alignment would run parallel to and immediately west of the existing TVA Montgomery-Davidson 500-kV transmission line through the middle of the Phase II area. No existing industries would be affected. The Industrial Park East alternative alignment would run to the east of the Phase II area and not affect any industries.

Selection of the corridor B route would require the relocation of one building, a mobile home, from the proposed ROW (Table 4-4). This building is along the main route alignment, and does not vary with the alternative alignments. Section 2.1.1 describes procedures TVA uses when relocating buildings.

Table 4-4. Buildings within the ROW of the Corridor B and Corridor D transmission line that would require relocation.

	Relocations				
	Houses	Mobile Homes	Apartment Buildings	Businesses	Total Buildings
Corridor B Route:					
Main alignment		1			1
Cumberland River North					0
Cumberland River South					0
Industrial Park East					0
Industrial Park Central					0
Industrial Park West					0
Corridor D Route					
Main alignment					0
Fossil Plant West					0
Fossil Plant Central					0
Fossil Plant East					0
Woodlawn East					0
Woodlawn West	2		3		5
Fort Campbell North		2			2
Fort Campbell South	5	1			5
Ringgold North	8	8		1	17
Ringgold South	2			2	4
Little West Fork North		2		2	4
Little West Fork South		2		2	4
Spring Creek North					0
Spring Creek South		1			1

4.11.1.2 Corridor D

The proposed Corridor D transmission line route would occupy a ROW of between 675 and 798 acres, depending on the combination of alternative alignments selected. The acreage of prime farmland within the various combinations of Corridor B alignments ranges from a low of 219 acres (Fossil Plant West, Woodlawn West, Fort Campbell South, Ringgold South, Little West Fork South, and Spring Creek North alternative alignments; Table 3-23) to a high of 272 acres (Fossil Plant East, Woodlawn East, Fort Campbell North, Ringgold North, Little West Fork North, and Spring Creek South alternative alignments). The alternative alignments contributing most to these differences are in the Fossil Plant, Woodlawn, and Spring Creek areas. The area of prime farmland that would be removed from production would be limited to small areas around the base of the transmission structures and impacts on prime farmland and agricultural land uses would be minor.

Forestry is one of the major land uses within the Corridor D route ROW and, depending on the alternative alignments selected, between about 338 and 399 acres of forest would be converted to non-forest uses. Landowners would be compensated for the value of timber within the ROW or given the opportunity to harvest it themselves. The timberland within the

proposed ROW represents a very small proportion of timberland in the area (see Section 4.3.1) and impacts on forest management would be small.

About 0.9 miles of the eastern end of the Corridor D route a short distance north of the Montgomery 500-kV Substation would cross the southern portion of an 1160-acre tract known as the Teeter Site that the Clarksville/Montgomery County Economic Development Council has identified for future development as part of the Clarksville/Cumberland County Corporate Business Park. While no existing industries would be affected by this portion of the line, the presence of the line would affect future development of the business park.

Selection of the corridor D route would require the relocation of several buildings from the proposed ROW (Table 4-4). The number of building relocations varies among the various combinations of alternative alignments, and the alignments with the greatest difference in the number of relocations are in the Woodlawn and Ringgold areas. The lowest number of relocations (6 buildings) would result from the selection of the Woodlawn East, Fort Campbell North, Ringgold South, and Spring Creek North alternative alignments. The greatest number of relocations (28 buildings) and consequently the greatest impacts on this aspect of land use, would result from the selection of the Woodlawn West, Fort Campbell South, Ringgold North, and Spring Creek South alternative alignments. Section 2.1.1 describes procedures TVA uses when relocating buildings.

4.11.2 Alternative 2 - Cumberland-Davidson Study Area

A transmission line in Cumberland-Davidson Corridor A would occupy a ROW of at least 1,060 acres, and a transmission line in Corridor B would occupy a ROW of at least 1,082 acres. Forest management is the dominant land use (61%) in each corridor, and the likely impacts to this land use cannot be accurately quantified until potential routes are identified. Construction of the transmission line in either of the Cumberland-Davidson corridors would affect prime farmland. The total area removed from farm production, however, would be small and is not likely to significantly impact prime farmland. The density of buildings in Corridor B is about a third higher than in Corridor A. Avoidance of occupied buildings is a high priority consideration during the line routing process and the number of required relocations cannot be determined until potential routes are identified.

4.11.3 Alternative 3 No Action

Under the No Action alternative, no impacts to land use or prime farmland and no building relocations would occur.

4.12 Visual Resources

Visual consequences are examined in terms of the changes between the existing landscape and the landscape as altered by the proposed actions, sensitivity of viewing points available to the general public, their viewing distances, and visibility of proposed changes. In this assessment, scenic character is described using a variety of terms. Scenic integrity, which relates to degree of intactness or wholeness of the landscape character, is also an important factor. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The levels of scenic attractiveness, scenic integrity, and visibility are then combined into the Scenic Value Class (USDA Forest Service 1995). The four Scenic Value

Classes are excellent, good, fair, and poor, and a predicted change of two levels or more is often considered a significant impact on visual resources.

Visual impacts associated with the construction of a transmission line result from the construction of access roads and material lay-down areas, removal of trees and most other vegetation from the right-of-way, erection of tall, silvery-gray laced steel transmission line structures, and installation of silvery-gray metal conductors between structures. The operation of construction equipment during this phase of the project results in an additional, short-term visual impact. The transmission line structures and conductors become essentially permanent features in the landscape. The long-term visibility of the cleared transmission line right-of-way (ROW) depends on the surrounding landscape, and the cleared ROW can be more prominent in a forested landscape than in a cleared agricultural landscape. The potential visual impacts of the various alternatives and routes are described in the following sections.

4.12.1 Alternative 1 - Cumberland-Montgomery Study Area

4.12.1.1 Corridor A

The predominately industrial visual character of the area around and adjacent to the Cumberland Fossil Plant would not be severely altered as a result of the construction or operation of the proposed 500-kV transmission line. There would be some temporary visual discord in the immediate plant site area due to an increase in personnel, equipment, new laydown area, and other associated activities. However, this would be temporary until construction activities and site restoration is complete.

The corridor section between the plant site and the Cumberland River to the east is characterized by scattered residential development and few motorists along local thoroughfares. Views of the new line would predominantly be in the middleground (one mile to four miles) for these area residents. The new laced-steel structures would provide some visual contrast with the existing more horizontal man-made alterations (one-to two-story homes, barns, and small silos). This contrast, however, would be insignificant when viewed from these distances.

Turning north, the proposed corridor would pass near and over the Cumberland River. Visual impacts as a result of transmission line development in this area would be greatest for recreational users along the river. New structures in new locations would contribute to reduced visual coherence and harmony. Construction activities, such as right-of-way clearing, structure construction, and providing material stockpiles would temporarily add visual discord and further reduce scenic integrity during the construction period

Impacts to the area from the east bank of the Cumberland River to the Montgomery 500-kV Substation would be similar to those described along the route from the plant site to the Cumberland River. Most views would be in the middleground for motorists and area residents along local thoroughfares. Additional structures near the Montgomery Substation would increase the number of adversely contrasting elements seen in the landscape. These incremental changes, particularly within and near the Corporate Business Park, may not be individually significant, but together would add to existing disruptions of visual coherence and harmony.

4.12.1.2 Corridor B

The Corridor B transmission line route begins at the Cumberland Fossil Plant and travels east and north to the Montgomery 500-kV Substation. A description of the visual impacts to the area adjacent to the Cumberland Fossil Plant and the area surrounding the Montgomery Substation is described in Section 4.12.1.1. These impacts, while not individually significant, would add to the existing disruptions of visual coherence and harmony in these areas.

The proposed line route crosses ash disposal areas on the west side of Cumberland Fossil Plant and turns south after crossing Wells Creek. The route would be seen in the foreground by plant personnel on the southeast side of the plant site and by a few residents and motorists to the east near TN 149. Views of the new route would be of tall and broadly horizontal structures in the landscape, similar to existing views of the smokestacks seen in the background at Cumberland Fossil Plant. For plant personnel, new structures and lines would be visually similar to the numerous transmission lines currently visible at the plant.

To the east, recreation users at Guices Creek would have foreground and middleground views of the new line. The new structures would be most visible on the east bank due to gentle topography and sparse vegetation near the shoreline. However, the proposed line would quickly disappear in the middleground as vegetation becomes denser and terrain becomes steeper to the east. Severity of visual impacts for recreation users would depend upon viewer location and duration of views. For most recreation users, characteristics of the new line route would be similar to the smoke stacks and other structures seen in the middleground at Cumberland Fossil Plant.

To the east of Guices Creek, the proposed line would traverse dense forest across rolling topography. The route would cross Gunson Ridge Road, Old Hwy 13, and Weetze Road before crossing Yellow Creek to the east. Most views of the proposed route for motorists and area residents would be obscured by dense vegetation and elevation changes, particularly near the farthest reaches of the Yellow Creek watershed and Williams Chapel to the south.

East of Yellow Creek, the Corridor B route would cross East Fork and turn northeast towards Burney Creek. The transmission line structures and conductors would likely be seen only intermittently by area residents and a few motorists along nearby roads. These views would be between structures and under conductors for short durations.

Passing over Canaan Road to the east, the proposed line would cross an existing major transmission line and continue across Budds Creek and Budds Creek Road before turning towards Vernon Creek. Visual impacts in this area would be minor due to limited viewer locations and angles of views. Most views would be perpendicular to roadways and would be of short duration due to roadway alignments. Continuing past Vernon Creek, the route would continue to traverse dense, mature forest. Views of new structures would be visually similar to views of existing poles and lines in the area.

Farther east, at Attaway Road, dense forest opens to pasture land. Topography is slightly rolling nearest the roadside to more rugged along adjacent ridgelines. There are several homes in the area that would have foreground views of the transmission line structures. Views of the structures would provide discordant contrast in the pastoral landscape and would likely reduce the Scenic Value Class by one level from good to fair. This decrease in

Scenic Value Class, in the area between Vernon Creek and TN 13 north of Cunningham, would contribute to reduced visual coherence and harmony.

Crossing TN 48 to the east, a major thoroughfare between Clarksville and Dickson, the proposed route would be in the foreground of numerous homes. There are numerous poles and structures seen by residents and motorists in the landscape now. New lines and structures would add to the number of adversely contrasting elements seen in the landscape, but would not be individually significant.

Approximately ¾ miles east of TN 48, the Cumberland River North and Cumberland River South alignment routes would begin. The Cumberland River North alignment would continue northeast towards Marthas Chapel Road. The area is mostly open pasture land with long, background views of objects farther than four miles away due to terrain differences. However, views of the proposed route would be limited to public roads for most viewers. These views would be mostly obscured by vegetation along the ROW and durations of views would be short due to road alignments.

The Cumberland River North alignment would continue east across Old Hwy 13 and would turn southeast near Chapel Hill Road just west of the Cumberland River. This area is mainly pasture land with undulating terrain that would focus views in foreground and middleground distances. Views of the proposed route would be intermittent for motorists, mainly under lines and between structures, and in the middleground for most residents. At these distances, transmission line structures and conductors would be distinguishable, but details would be weak.

The Cumberland River North alignment would terminate just east of the Cumberland River. Views from local roads are mostly of farmland situated within the Cumberland River floodplain. There are no homes along the proposed route in this area, and views of the transmission line would be observed by infrequent motorists along unimproved roads and recreation users along the Cumberland River. For recreation users, views would be of lines perpendicular to the river edges. Topography, dense vegetation along the river banks, and angles of views would obscure longer views of the transmission line.

The Cumberland River South alignment is roughly parallel to and about half a mile south of the Cumberland River North alignment. The environmental consequences for the south alignment are similar to those described for the north alignment.

The Corridor B route continues east of the Cumberland River, across Muddy Branch, and over Muddy Branch Road north of Lock B Road. There are few homes with views of the proposed transmission line route. The route turns northeast near Hickory Point and would travel across a mixture of pasture lands and dense woodlands towards TN 12. The line crosses TN 12 just west of Stewart-Reinhart Cemetery. Additional structures and lines would increase the number of adversely contrasting elements seen in the landscape. These incremental changes, mainly along TN 12, would contribute to reduced visual coherence and harmony. However, these changes are not individually significant.

Near Pace Road to the northeast, the proposed route crosses of an existing transmission line and continues north across Sango Road parallel to an existing 500-kV transmission line. The proposed route would cross I-24 at North Woodson Road. There are few homes in the immediate foreground of the proposed route and numerous wood and steel pole structures can be seen by motorists along North Woodson Road. These areas are rural in

character and the proposed route would be seen mainly by a few residents in the foreground and middleground. These views would be similar to views of existing structures along existing transmission lines in the area now. For motorists along I-24, lines would be viewed briefly between structures.

About half a mile from Trough Spring Road, the proposed line would cross an existing transmission line running in an east-west direction, and then continue one-third mile to the north. The Industrial Park West alignment would begin at this point, crossing the Red River to the northwest and turning to the west, closer to I-24 at Rossview Road. The west alignment would continue to parallel I-24 for about 1.5 miles and would turn north near Dunlop Lane. New structures and conductors would add to the number of contrasting elements seen in this predominantly commercial and industrial area, but would not reduce Scenic Value Class. Continuing north for about a mile, the Industrial Park West alignment would enter the existing Montgomery 500-kV substation. This area is described in greater detail in Section 4.12.1.1.

The Industrial Park Center alignment begins at the point described above for the Industrial Park West alignment. This alignment crosses the Red River to the west and continues northwest to Rossview Road, Dunlop Lane, and to the Montgomery 500-kV substation. Environmental consequences for this alignment would be similar to those of the Industrial Park West alignment.

The Industrial Park East alignment begins about a mile north of Trough Spring Road, Crosses Rossview Road near Whites Chapel, and turns west at Dunlop Lane. The alignment terminates at the Montgomery 500-kV substation. Environmental consequences for this alignment would be similar to those of the Industrial Park West alignment.

Construction, operation, and maintenance of the proposed transmission line along the Corridor B route would not result in significant visual impacts. There would be some additional minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until the right-of-way and laydown areas have been revegetated. There would also be a short-term minor visual impact following each vegetation management cycle when the recently treated vegetation would contrast with untreated vegetation adjacent to the ROW. This impact would typically only last a few weeks and be most evident for vegetation treated during the growing season.

4.12.1.3 Corridor C

Corridor C begins at the Cumberland Fossil Plant and travels northeast across the Cumberland River to the Montgomery 500-kV Substation. A description of visual impacts to the area adjacent to the Cumberland Fossil Plant and the area surrounding the Montgomery Substation is described in Section 4.12.1.1.

Visual impacts along this corridor would be most significant near the Cumberland River along McGregor Park and the downtown Clarksville Historical River District. New structures would introduce a vertical element not seen in the landscape now, contrasting with the broad expanse of river seen by recreation users on the water and along walking trails in the foreground and middleground.

Additional visual impacts will occur for property owners and motorists along minor roads along each side of the Cumberland River south of McGregor Park, mostly in the foreground. Depending upon the exact location of the transmission line, scenic views could be irreversibly altered by introducing new vertical structures and broadly horizontal expanses of transmission lines.

4.12.1.4 Corridor D

Corridor D begins at the Cumberland Fossil Plant and travels northeast to the Montgomery 500-kV Substation. A description of the visual impacts to the area adjacent to the Cumberland Fossil Plant and the area surrounding the Montgomery Substation is described in Section 4.12.1.1. These impacts, while not individually significant, would add to the existing disruptions of visual coherence and harmony in these areas.

Shortly after leaving the fossil plant, the Corridor D route splits into two alternative alignments, Fossil Plant West and Fossil Plant East, which cross the Cumberland River. Both alignments would be seen by recreation users on the Cumberland River and motorists along local roads. Recreation users at River Bend Recreation Area and Barkley WMA would have similar views on the eastern and southern boundaries of the recreation areas. These views would be in the foreground, and new structures and conductors would be visually similar to those presently in the landscape.

After the two alignments merge north of the river, the Corridor D route crosses TN 46 to the northeast. Motorists along TN 46 would have views of short duration of the conductors between transmission structures. The line would be briefly visible along Wildcat Road. Motorists traveling Bartee Road, an unimproved access road to the northeast, would have longer views of new structures, especially along open pastures near the proposed line-crossing. Views of the new structures would be less visually contrasting in this area due to existing views of other vertical elements in the landscape, particularly the smokestacks at Cumberland Fossil Plant seen in the background.

Dense vegetation along Cumberland City Road and its numerous curves would obscure most motorists' views of the proposed transmission line structures. Visual impact decreases as distance from the transmission line increases. The influence of the natural landscape on the transmission lines and their structures in these areas as perceived in the background greatly decreases impacts on natural character. Vegetation, as well as topography changes, obscures details and the transmission lines would appear as part of a broader, natural pattern as opposed to a focal point in the immediate foreground.

At the proposed crossing of Blooming Grove Road farther northeast, one home would have a foreground view of the new transmission line. These residents would have views mainly of the conductors from an oblique angle and at a higher elevation. New structures would be obscured due to existing mature vegetation. There may be some views of conductors and structures to the northeast across open pasture land. However, these views would be of short duration due to elevation changes and ridgelines in the middleground view.

Farther northeast, the proposed route would cross TN 233 and turn east. At the TN 233 crossing, numerous existing wood pole utility lines can be seen along the west side of the highway. Several homes in the area would have foreground views of the transmission line conductors and structures. The proposed transmission line would increase the number of adversely contrasting elements in the rural landscape. These incremental changes may

not be individually significant, but together would add to existing disruptions of visual coherence and harmony.

The Woodlawn West alignment begins about 1.5 miles east of TN 233 and turns to the north just east of Bartee Branch. Crossing Lake Drive and Old Dover Road, the route would traverse mainly open pasture and scattered woodlands. At US 79, the new transmission structures would be seen by area residents and motorists. The number of structures and conductors seen would be minimal, however, and the route would be obscured by forest a few hundred feet from each side the road.

Continuing northeast, the line would cross La Fayette Road, a major thoroughfare. There are numerous existing wood pole utility lines that are seen in the foreground by motorists and from local businesses. Views for motorists of new structures would be mainly between poles while views from commercial establishments would be in the foreground, with longer views of structures and conductors.

The Woodlawn East alignment begins east of Bartee Branch and continues east across Lake Drive and Ogburn Chapel Road. There are several homes in the area and a microwave repeater tower to the south in the middleground. There are numerous lines and service poles in the area. New structures would contribute to the number of vertical elements seen in the landscape. This would add to a continuous growth of lines and structures and a cumulative reduction of visual harmony and scenic integrity in the rural countryside.

The alignment turns north near C. Booth Road and then crosses York Road and US 79, a major highway. New structures in this area would be visually similar to the numerous wood and steel poles seen in the area now. The new line would be mainly seen by motorists between structures, but for longer distances due to sparse vegetation outside of the road ROW. These views would be of short duration. The alignment ends just beyond La Fayette Road. Environmental impacts in this area would be similar to those of the Woodlawn West alignment.

The Corridor D route continues northeast from La Fayette Road and crosses Garrettsburg Road. Garrettsburg Road is a narrow residential street with numerous homes. Much of the new transmission line would be obscured from views by trees along the roadsides and elevation changes away from the road. Traveling north away from Garrettsburg Road, the new line would be seen by a few landowners along agricultural land and open fields.

The Ringgold Creek North alignment begins about 1.25 miles west of US 41A and crosses over US 41A just east of the Little West Fork. The proposed route in this area would be visually similar to existing utility lines and numerous other vertical objects in the landscape. The new structures would have minor but cumulative long term impacts, increasing the number of adversely contrasting elements seen in the area and further contributing to reduced visual coherence. The new structures would be seen most frequently in the foreground and middleground.

The Ringgold Creek South alignment roughly parallels Ringgold Creek North alignment about one-tenth mile to the south. This alignment could potentially affect the scenic integrity of a National Historic District located on the Little West Fork that includes the Ringgold Mill Complex. Visual impacts to this area are discussed in greater detail in Section 4-13.1.

The Corridor D route continues to the east from the Ringgold Mill area, crossing the Little West Fork five times. The line would be seen by few people in this area due to dense vegetation and elevation changes along the banks of the Little West Fork. Motorists along Peacher's Mill Road would have brief views of the structures and conductors as the route crosses the road and continues to the east. These views would be similar to other structures seen in the area now.

The Little West Fork North alignment begins just east of Needmore Road, a major thoroughfare. There would be minor visual impacts along this alignment. Motorists' views of structures and conductors would be obscured by wooded areas along the roadsides at Needmore Road and TN 48. There are few homes between Needmore Road and TN 48, and available views of the proposed line would be minimal.

The Little West Fork South alignment would run parallel to and just south of the Little Creek Fork North alignment. Visual impacts for this alignment would be similar to those impacts of the Little West Fork South alignment.

The Corridor D route continues east of TN 48 and crosses several unimproved roads before passing over I-24 about a mile north of the US 79 interchange. Views by motorists on I-24 would be brief, mainly due to high travel speeds. Continuing east, the new line would pass over Spring Creek again and turn south to cross US 79. This area is heavily congested with numerous commercial establishments, billboards, and readily-seen infrastructure such as utility lines, street lights, and traffic signals. The new transmission line would add to the number of structures seen in the area. However, these new structures would be visually similar to other vertical and broadly horizontal elements currently present in the landscape. Closer to the Montgomery Substation, the new transmission line would be visually similar to existing laced-steel towers and wood-pole structures. Additional structures in new locations, however, would increase the number of adversely contrasting elements seen in the landscape. These incremental changes may not be individually significant, but together would add to existing disruptions to visual coherence and harmony.

Construction, operation, and maintenance of the proposed transmission line along the Corridor D route would not result in significant visual impacts. There may be some additional minor visual discord during the construction period due to an increase in personnel and equipment and the use of laydown and materials storage areas. These minor visual obtrusions would be temporary until the proposed right-of-way and laydown areas have been revegetated. There would also be a short-term minor visual impact following each vegetation management cycle when the recently treated vegetation would contrast with untreated vegetation adjacent to the ROW. This impact would typically only last a few weeks and be most evident for vegetation treated during the growing season.

4.12.2 Alternative 2- Cumberland Davidson Study Area

4.12.2.1 Corridor A

Corridor A begins at the Cumberland Fossil Plant and travels southeast to the Davidson Substation. A description of the visual impacts to the area adjacent to the Cumberland Fossil Plant is described in Section 4.12.1.1.

Most views of the proposed transmission line route would be seen by motorists along any of the numerous state routes that bisect the corridor. Visual consequences as a result of construction or operation of a new transmission line in these areas will be insignificant. The new route will be visually similar to existing lines and various towers seen along ridge lines from major roads and local residences.

The area surrounding the Davidson Substation is a scenic valley, particularly when viewed from TN 100 to the east. However, there are numerous homes with foreground views of the substation, and many new subdivisions under construction in the immediate area. A new transmission line entering the substation from the west along Corridor A would have insignificant visual contrast to the vertical elements seen in the landscape surrounding the substation.

4.12.2.2 Corridor B

Corridor B begins at the Cumberland Fossil Plant and travels southeast to the Davidson 500-kV Substation. A description of visual impacts to the area adjacent to the Cumberland Fossil Plant is described in Section 4.12.1.1. A description of impacted areas adjacent to the Davidson Substation is described in Section 4.12.2.1.

There will be no significant visual impacts as a result of the new line route along the remainder of Corridor B from Davidson Substation north to the Harpeth River. There are few thoroughfares and residences along this corridor. Closer to the Harpeth River, new laced-steel towers and lines would be visually comparable to those seen in the area now along major residential and commercial developments.

4.12.3 Alternative 3 – No Action

There would be no visual consequences if the proposed transmission line is not built.

4.13 Cultural Resources

4.13.1 Alternative 1 - Cumberland-Montgomery Study Area

Based on the results of the records search for historic properties within the four corridors, Corridor D had the fewest previously identified historic properties. TVA subsequently identified Corridors B and D as its preferred alternatives. No further cultural resource investigations were conducted in Corridors A and C, and TVA's proposed Alternative 1 transmission line routes would not affect cultural resources located exclusively in these corridors.

Once TVA identified the proposed transmission line routes in Corridors B and D, field surveys were conducted within the area of potential effect (APE) for these routes. The results of these surveys are summarized in Section 3.13. Potential impacts to the identified cultural resources are described below.

4.13.1.1 Corridor B Route

The construction of the proposed transmission line on the Corridor B route as originally designed would have a visual effect on a historic property potentially eligible for listing on the NRHP. This site, the Murphy House (HS-34), is a one-and-one-half-story, gable-front-

and-wing, bungalow influenced dwelling on Hickory Point Road that appears to have been constructed about 1920. In order to minimize the visual effect on this site, the portion of the transmission line near HS-34 was relocated and would be approximately 0.45 miles south of the site. TVA has determined that the effect on this property would not be adverse. No other above-ground historic structures or properties would be affected. In a letter dated July 14, 2004, the Tennessee SHPO concurred with TVA's determination that the selection of the Corridor B route would not adversely affect historic structures eligible for or listed in the NRHP.

The portions of three newly recorded archaeological sites and seven previously recorded sites that occur within the APE of the Corridor B route have all been determined ineligible for inclusion in the NRHP, due to previous disturbance at these locations. Site 40SW614 was determined potentially eligible for listing on the NRHP; however the portion located within the APE does not contain intact archaeological deposits. Thus no additional treatment is necessary and the site would not be affected by selection of the Corridor B route. In a letter dated December 28, 2004, the Tennessee SHPO concurred with TVA's determination that selection of the Corridor B route would not adversely affect any archaeological sites eligible for or listed in the NRHP.

4.13.1.2 Corridor D Route

Three historic properties listed on the NRHP and nine properties potentially eligible for listing on the NRHP were identified within the APE of the Corridor D route. Of these twelve properties, only the Ringgold Mill Complex would be affected. Because of the effects on this site, two alternative alignments have been developed in its vicinity. The Ringgold North alignment would introduce a visual effect on Ringgold Mill; this effect, however, would not be adverse. The Ringgold South alignment would have adverse visual and physical effects on the Ringgold Mill site. As long as the route traverses the historic property, the affect would be adverse. In a letter dated July 14, 2004, the Tennessee SHPO concurred with TVA's determination that the selection of the Corridor D, with the Ringgold North alternative alignment, would not adversely affect historic structures eligible for or listed in the NRHP.

As described in Section 3.13.1, the portions of the three previously known and twelve newly recorded archaeological sites within the APE of the Corridor D route have all, because of previous disturbance, been determined to be ineligible for inclusion in the NRHP. In a letter dated December 28, 2004, the Tennessee SHPO concurred with TVA's determination that selection of the Corridor D route would not adversely affect any archaeological sites eligible for or listed in the NRHP.

4.13.2 Alternative 2- Cumberland Davidson Study Area

Based on the results of the records search for historic properties within the two Cumberland-Davidson Study Area corridors, Corridor D had the fewest previously identified historic properties. TVA has eliminated this study area from further consideration and TVA's proposed action would not affect cultural resources located exclusively in this study area.

4.13.3 Alternative 3 No Action

Under this alternative, the proposed transmission line would not be built and no historic properties would be affected.

4.14 Socioeconomics

Potential socioeconomic effects from the construction and operation of the proposed transmission line include changes in population, employment, housing, retail sales, property tax, and property values. These effects would, in general, be relatively similar in the two alternative study areas. There is also the potential for environmental justice impacts – disproportionate impacts on low income and minority populations.

4.14.1 Alternatives 1 - Cumberland-Montgomery Study Area

4.14.1.1 Population, Employment, and Housing

The proposed action would not encourage population growth in the project area; it would instead be a response to growth already occurring and projected to occur in Middle Tennessee. Construction of the proposed transmission line would involve a crew of about 75 people for a 21-month period. Because it requires specialized labor, construction crews would likely be brought in from outside the project area and leave after construction is complete. Consequently, little change in local employment levels would occur. Little impact on housing is expected to occur. Most construction workers likely would rent motel rooms or provide their own lodging using campers or trailers.

4.14.1.2 Income and Local Government Revenues

Some local revenues would be generated through lodging or campground rental fees, and through purchases of meals and other items. The impacts of this additional revenue would vary inversely with the size of the community where the purchases occur; it would be negligible in the larger communities such as Clarksville and Nashville and small elsewhere. Many construction materials, including the transmission towers and conductors, would likely be purchased outside the project area. Some other materials, such as concrete, gravel, and culverts could be purchased locally. Local purchases would result in small increases in local tax revenues, but these generally would not be noticeable.

Because TVA is a federal agency, it is exempt from local property taxes. TVA does, however, make in lieu of tax payments. These payments are based, in part, on the value of TVA-owned assets in a county. The proposed transmission line would result in small increases of in lieu of tax payments. This increase would be negligible in Stewart County (because of the presence of Cumberland Fossil Plant), but somewhat larger in Montgomery County.

4.14.1.3 Property Values

TVA would purchase easements from property owners, who would be offered fair market value for these rights. Some short-term adverse impacts on property value and salability could occur; these impacts, however, would be highly variable and not readily predictable. Long-term adverse effects on property values are unlikely. Results of research on this topic vary, with some early studies finding little or no impact of transmission lines on property values. Some more recent studies, however, indicate that impacts in the range of 5 to 10 percent are possible for properties adjacent to a transmission line. The size of the impact appears to be sensitive to distance, with little or no impact to properties not adjacent or very close. The magnitude of the impact is sensitive not only to distance, but also to the appearance of the right of way and how it integrates into the neighborhood. The impacts

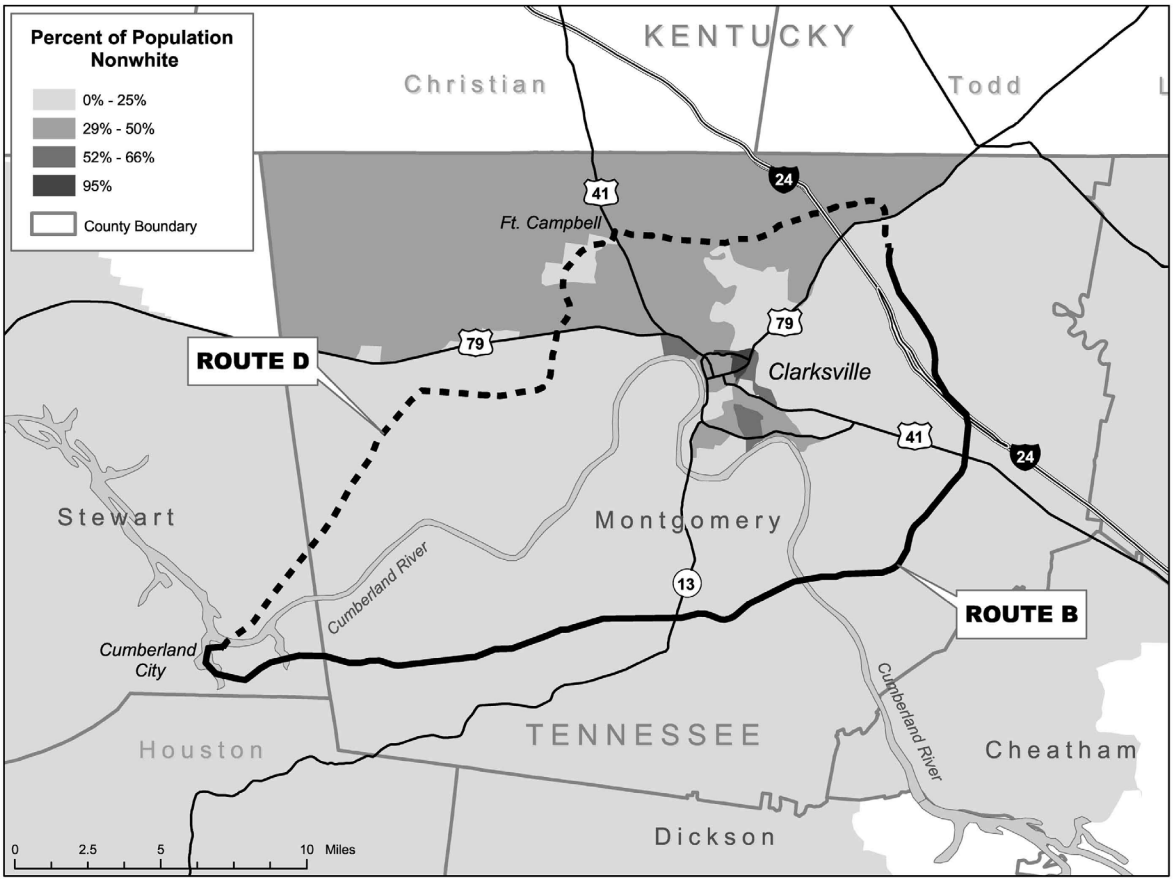
on property value tend to diminish over time and virtually disappear in about 5 years (Hamilton and Schwann 1995, Gregory and Winterfeldt 1996, EPRI 2003).

4.14.1.4 Environmental Justice

The minority population in the Cumberland-Montgomery study area constitutes a slightly larger share of the total than the statewide average, 21.9 percent compared to 20.8 percent. However, it is well below the national share of 30.9 percent. There is great variability among the counties, with Montgomery County, at 29.1 percent, much higher than the other counties, all of which are well below 10 percent. The poverty rate in the study area, at 10.5 percent, is slightly lower than in the state and the nation (13.5 and 12.4 percent, respectively). With the exception of Houston County, all the counties in the study area have lower poverty rates than the state.

Because any negative impacts would occur only within a short distance of the ROW, minority population proportions and poverty rates at the subcounty level are more relevant than those for the whole counties. These data are shown in Figures 4-1 and 4-2 for block groups. Block groups are small areas delineated by the Census Bureau for Census purposes. Block group boundaries are not shown on the figures and the larger uniform areas likely consist of several adjacent block groups in the same range. Table 4-5 lists both the proportion of nonwhite population and the proportion of the total population that is below the poverty level for each block group which the proposed transmission line routes would pass through or near. Only two of the block groups have higher poverty rates than the state and county. One of these, Stewart County, Tract 1106, Block Group 2, is the location of the Cumberland Fossil Plant; both the Corridor B and Corridor D routes pass through this block group. The other block group with high poverty rates is located east of the plant site in southern Montgomery County and would be affected by Corridor B. In both cases, the poverty levels are only slightly higher than the state average of 13.5 percent.

The nonwhite population share in all the block groups around the Corridor B route is lower than the state average of 19.8 percent, and all are lower than the respective county average except for the block group in Stewart County where the Cumberland Fossil Plant is located. In this case, the proportion is somewhat higher than the county as a whole, but much lower than the state average. Along the Corridor D route, there are five block groups with larger nonwhite population shares than the state average. All of these areas are north of US 79, near Fort Campbell and to the east.

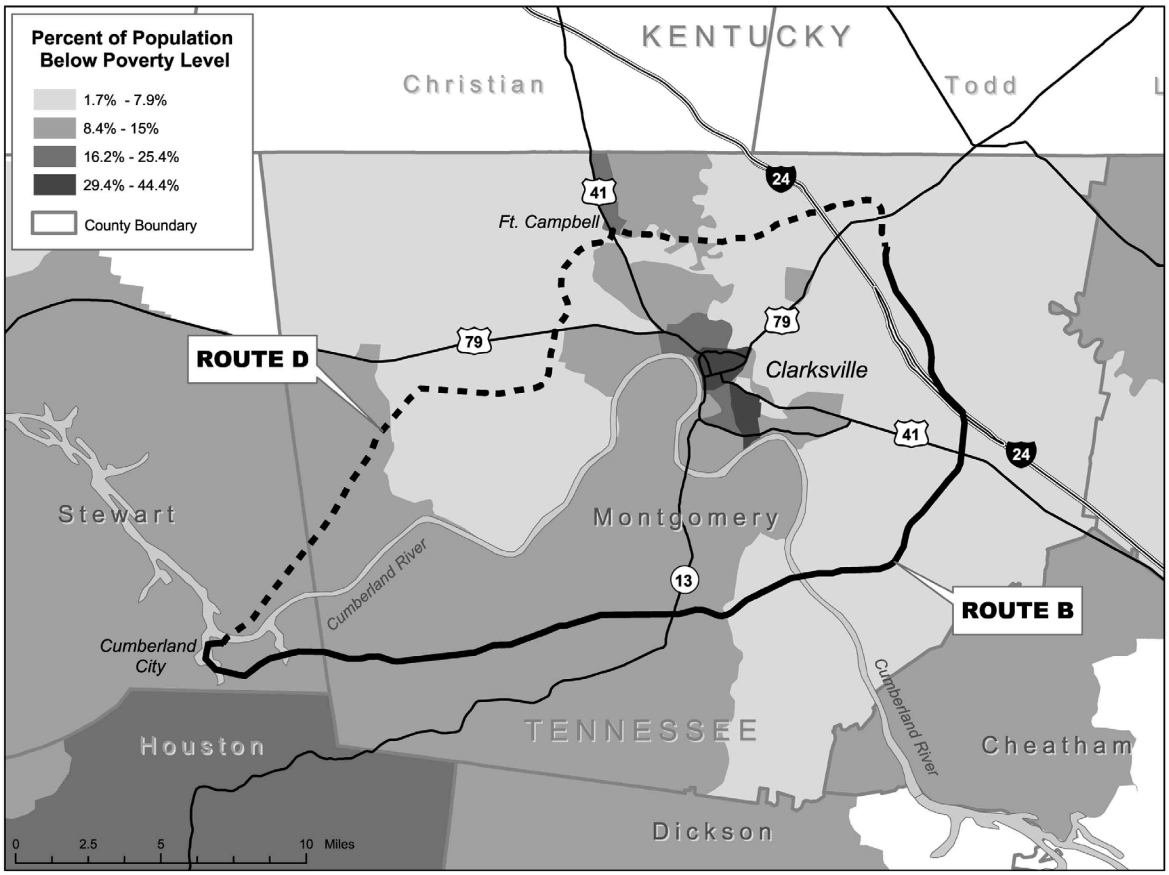


Source: Census 2000

Figure 4-1. Proportion of nonwhite population by census block group in vicinity of Cumberland-Montgomery Corridor B and Corridor D transmission line routes.

The Hispanic population in the area is generally small, with the largest proportions in the same areas of the Corridor D route that have relatively high nonwhite populations, somewhat higher than the county average of 5.2 percent. In all of the block groups, the Hispanic population is a smaller proportion of the total than the national average of 12.5 percent.

The potential for impacts to disadvantaged populations is greater along the Corridor D route than along the Corridor B route. However, due to the relatively small disadvantaged populations along most of both routes and to the planning process used by TVA (see Section 2.2.2, Siting Alternatives), significant impacts to disadvantaged populations are unlikely for either route.



Source: Census 2000

Figure 4-2. Proportion of population below poverty level by census block group in vicinity of Cumberland-Montgomery Corridor B and Corridor D transmission line routes.

4.14.2 Alternative 2-Cumberland Davidson Study Area

4.14.2.1 Population, Employment, and Housing

The proposed action would not encourage population growth in the project area; it would instead be a response to growth already occurring and projected to occur in Middle Tennessee. Construction of the proposed transmission line would involve about the same number of workers as for Alternative 1, although the construction period would be longer because of the longer proposed transmission line. Because it requires specialized labor, construction crews would likely be brought in from outside the project area and leave after construction is complete. Consequently, little change in local employment levels would occur. Little impact on housing is expected to occur. Most construction workers would likely rent motel rooms or provide their own lodging using campers or trailers.

Table 4-5. Nonwhite population and poverty rates for census areas along the Cumberland-Montgomery Corridor B and Corridor D transmission line routes.

Route	County	Census Tract	Block Group	% Nonwhite Population, 2000	% Hispanic Population, 2000	% Below Poverty Level, 1999
B	Stewart	1106	2	6.9	1.2	13.6
	Montgomery	1017	1	5.4	1.1	8.9
	Montgomery	1017	2	2.9	0.8	13.8
	Montgomery	1017	3	4.3	1.4	9.5
	Montgomery	1017	4	4.5	1.3	10.7
	Montgomery	1017	5	5.3	1.3	3.5
	Montgomery	1018.02	4	4.2	1.8	4.8
	Montgomery	1018.02	3	9.0	1.4	3.1
	Montgomery	1018.02	1	5.2	1.5	2.7
	Montgomery	1018.01	2	7.2	1.7	4.5
	Montgomery	1018.01	1	11.1	2.0	3.3
	Montgomery	1019.01	4	19.6	3.2	6.3
D	Stewart	1106	2	6.9	1.2	13.6
	Stewart	1102	4	2.5	1.1	10.7
	Montgomery	1015	3	11.4	1.8	13.5
	Montgomery	1015	2	10.0	3.2	5.9
	Montgomery	1015	1	14.1	4.5	6.9
	Montgomery	1011.02	1	35.9	8.1	7.9
	Montgomery	1012	2	24.5	7.4	7.3
	Montgomery	1012	1	38.3	9.5	9.6
	Montgomery	1013.02	1	40.8	8.1	4.4
	Montgomery	1013.01	1	41.6	8.0	9.0
	Montgomery	1020	4	29.6	6.6	6.7
	Montgomery	1019.01	4	19.6	3.2	6.3

4.14.2.2 Income and Local Government Revenues

Some local income would be generated through lodging or campground rental fees, and through purchases of meals and other items. The impacts of this additional revenue would vary inversely with the size of the community where the purchases occur; it would be negligible in the larger communities such as Clarksville and Nashville and small elsewhere. Many construction materials, including the transmission towers and conductors, would likely be purchased outside the project area. Some other materials, such as concrete, gravel, and culverts could be purchased locally. Local purchases would result in small increases in local tax revenues, but these generally would not be noticeable.

Because TVA is a federal Agency, it is exempt from local property taxes. TVA does, however, make in lieu of tax payments. These payments are based, in part, on the value of TVA-owned assets in a county. The proposed transmission line would result in small increases of in lieu of tax payments. This increase would be negligible in Stewart County (because of the presence of Cumberland Fossil Plant) and Davidson County (because of the short distance of new line and presence of several other TVA assets), and somewhat larger in the other project area counties.

4.14.2.3 Property Values

TVA would purchase easements from property owners, who would be offered fair market value for these rights. Some short-term adverse impacts on property value and salability could occur; these impacts, however, would be highly variable and not readily predictable. Long-term adverse effects on property values are unlikely. Research results vary, with some early studies finding little or no impact of transmission lines on property values. Some more recent studies, however, indicate that impacts in the range of 5 to 10 percent are possible for properties adjacent to a transmission line. The size of the impact appears to be sensitive to distance, with little or no impact to properties not adjacent or very close. The magnitude of the impact is sensitive not only to distance, but also to the appearance of the right of way and how it integrates into the neighborhood. The impacts on property value tend to diminish over time and virtually disappear in about 5 years (Hamilton and Schwann 1995, Gregory and Winterfeldt 1996, EPRI 2003).

4.14.2.4 Environmental Justice

The minority population in the study area constitutes a somewhat larger proportion of the total than the statewide average, 30.5 percent compared to 20.8 percent. However, it is about the same as the national share of 30.9 percent. There is great variability among the counties, with both Davidson County, at 34.9 percent, much higher than the other counties, all of which are well below 10 percent. The poverty rate in the study area, at 12.6 percent, is slightly lower than in the state and the nation (13.5 and 12.4 percent, respectively). With the exception of Houston County, all the counties in the study area have lower poverty rates than the state.

Since any negative impacts would occur only within a short distance of the right of way, however, minority population shares and poverty rates at the subcounty level are more relevant. In the absence of proposed route locations, these data cannot be analyzed for this alternative in further detail.

4.14.3 Alternative 3 – No Action

The No Action Alternative would not directly or indirectly affect local population, employment, housing, retail sales, property tax, and property values. The resulting lack of transmission capacity could, over the long term, have other adverse socioeconomic effects to the Middle Tennessee area through the loss of electric service.

4.14.4 Cumulative Impacts

As shown in Table 4-6, the population in the six-county project area grew slightly faster than the nation, but slightly slower than the state from 1990 to 2002. Under either of the Alternative 1 Cumberland-Montgomery routes now under consideration, the proposed transmission line would be located in Montgomery and Stewart Counties, both of which grew much more rapidly than the state and the nation.

The Montgomery County population is expected to continue to grow much faster than the state and the nation, while the Stewart County population is expected to grow faster than the nation, but slightly slower than the state.

Table 4-6. Recent population trends and population projections for the project area.

County:	1990	2002	2025	Annual Average % Increase, 1990-2002	Annual Average % Increase, 2002-2025
Cheatham	27,140	37,054	59,205	2.6	2.1
Davidson	510,784	569,439	688,340	0.9	0.8
Dickson	35,061	44,251	66,148	2.0	1.8
Houston	7,018	8,014	11,228	1.1	1.5
Montgomery	100,498	138,132	224,457	2.7	2.1
Stewart	9,479	12,782	16,401	2.5	1.1
Project Area Total	**689,980**	**809,672**	**1,065,779**	**1.3**	**1.2**
Tennessee	**4,877,185**	**5,789,796**	**7,559,532**	**1.4**	**1.2**
United States (x 1,000)	**248,709.9**	**287,973.9**	**349,418.6**	**1.2**	**0.8**

Note: United States projection for 2025 was interpolated, using projections for 2020 and 2030.
Source: Historical Data from U. S. Census Bureau, *Census of Population 1990* and *Population Estimates for Counties, 2001, 2002, and 2003* (http://factfinder.census.gov). Projections from the University of Tennessee, Center for Business and Economic Research and Tennessee Advisory Commission on Intergovernmental Relations, 2003, *Population Projections for the State of Tennessee 2005 to 2025* (www.state.tn.us/tacir/population.htm); and from U. S. Census Bureau, 2004, *U. S. Interim Projections by Age, Sex, Race, and Hispanic Origin* (www.census.gov/population/www/projections/popproj.html).

Total employment in the project area grew more rapidly than both the state and the nation during the same time period (Table 4-7). Within the Cumberland-Montgomery study area, however, Montgomery County employment grew much faster and Stewart County employment grew more slowly than both the state and the nation.

Table 4-7. Total full-time and part-time employment in the project area.

County	1990	2002	Annual Average % Increase, 1990-2002
Cheatham	7,773	14,550	5.4
Davidson	420,749	525,904	1.9
Dickson	15,066	22,414	3.4
Houston	2,462	2,935	1.5
Montgomery	35,222	57,720	4.2
Stewart	3,678	4,082	0.9
Project Area Total	484,950	627,605	2.2
Tennessee	2,796,010	3,463,526	1.8
United States (x 1,000)	139,380.9	167,033.5	1.5

Source: U. S. Bureau of Economic Analysis, Department of Commerce, Regional Economic Information System (www.bea.doc.gov/bea/regional/reis/).

Given the very small size and the temporary nature of the socioeconomic impacts of the proposed transmission line and the recent and projected fast growth in the immediate area,

the cumulative impacts on population, employment and income, housing, government revenues, and property values would be very minor and not noticeable, especially after construction is completed.

Under the No Action Alternative, given the current and anticipated future growth in the area, failure to add transmission capacity would increase the risk of loss of electric service in parts of middle Tennessee, as well as risk of loss of system stability. This would be a significant impact on residents of the area, businesses operating in the area, and the overall economy of the area.

4.15 Electric and Magnetic Fields

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

Magnetic fields can induce currents in conducting objects. Electric fields can create static charges in ungrounded, conducting materials. The strength of the induced current or charge under a transmission line varies with the strength of the electric or magnetic field, with the size and shape of the conducting object, and with whether the conducting object is grounded. Induced currents and charges can cause shocks under certain conditions by making contact with objects in an electric or magnetic field. The proposed transmission line, like other transmission lines, would be designed to minimize the potential for such shocks. This is done, in part, by maintaining sufficient clearance between the conductors and objects on the ground. Stationary conducting objects, such as metal fences, pipelines, and highway guard rails, which are near enough to the transmission line to develop a charge, would be grounded to prevent them from being a source of shocks.

Under certain weather conditions, high voltage transmission lines, such as the proposed 500-kV line, may produce an audible low-volume hissing or crackling noise. This noise is generated by the corona resulting from the dissipation of energy and heat as high voltage is applied to a small area. Under normal conditions, corona-generated noise is not audible. The noise may be audible under some wet conditions, and the resulting noise level off of the ROW would be well below the levels that can produce interference with speech. Corona is not associated with any adverse health effects in humans or livestock.

Public concern exists over the potential adverse health effects that may be caused by long-term exposure to EMF. A few studies of this topic have raised questions about cancer and reproductive effects on the basis of biological responses observed in cells or in animals, or on associations between surrogate measures of powerline fields and certain types of cancer. This topic has been researched for several decades. The consensus of scientific panels reviewing this research is that the evidence does not support a cause-and-effect relationship between EMF and any adverse health outcomes (e.g., AMA 1994, NRC 1997, NIEHS 2002). Some research continues of the statistical association between magnetic field exposure and a rare form of childhood leukemia known as acute lymphocytic leukemia. A recent review of this topic by the World Health Organization (IARC 2002) concluded that this association is very weak, and there is inadequate evidence to support any other type of excess cancer risk associated with exposure to EMF.

The proposed 500-kV transmission line would at times produce both electric and magnetic fields that are higher than those of TVA's more common 161-kV transmission lines. The greater fields would be measurable both on and beyond the edges of the ROW. TVA's standard transmission line siting practice minimizes continuous public exposure to transmission line EMF by using a constraint model that places a 300-foot buffer from the edge of the ROW to occupied buildings, except for schools, where a 1200-foot buffer is used. This practice, as well as TVA's policy of prohibiting the construction of occupied buildings within the ROW, would minimize continuous public exposure to EMF. Although no federal standards exist for maximum EM field strengths for transmission lines, six states (not including Tennessee), do have such standards. The expected EM field strengths at the edge of the proposed ROW would fall well within these standards. Consequently, the construction and operation of the proposed transmission line is not anticipated to cause any significant EMF-related impacts.

4.15.1 Alternative 1 - Cumberland-Montgomery Study Area

Electric and magnetic fields would be produced along the length of the proposed transmission line. The strength of the fields within and near the ROW would vary with the electric load on the line as well as with the terrain. Public exposure to EMF would be determined by final routing decisions, and would change over time after the line is completed as adjacent land uses change. As described above, TVA would minimize public exposure to EMF through engineering features and line routing decisions. No significant impacts from EMF are anticipated.

4.15.2 Alternative 2- Cumberland Davidson Study Area

The potential EMF effects described above for Alternative 1 also apply to Alternative 2.

4.15.3 Alternative 3 No Action

Under the No Action Alternative, no new electric and magnetic fields would be created from the construction of the proposed transmission line. The electrical loading on portions of TVA's existing transmission system would likely be increased, resulting in increases in EMF. This increase, however, would not result in any significant impacts.

4.16 Unavoidable Adverse Effects

The construction and operation of the proposed transmission line would result in unavoidable adverse effects to several resources. Many adverse effects associated with Cumberland-Montgomery Corridors B and D were reduced to acceptable levels via avoidance during the line routing process. Some other potentially adverse effects could be minimized by mitigation and monitoring procedures specified in Section 2.6 of this EIS.

Adverse effects resulting from the action alternatives that cannot be avoided include the following:

- Loss of forest area and associated wildlife populations;
- Increased forest fragmentation;
- Disturbance of wildlife during construction and later periodic removal of vegetation from the ROW;

- Removal of the tree canopy at stream crossings;
- Localized increases in noise during construction and some later maintenance activities.
- Removal of existing buildings from the new ROW;
- Restrictions on future land use in the ROW; and
- Changes to scenery along the ROW, both short-term from construction equipment, ground disturbing activities, and later periodic removal of vegetation from the ROW, and long-term from the cleared ROW and addition of metal structures and conductors.

4.17 Relationship of Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

The construction and operation of the proposed transmission line would increase the short-term and long-term capacity and reliability of the power supply in TVA's service area. This would help support the economic and population growth that is presently occurring, and is forecast to continue to occur, in the middle Tennessee area.

The proposed action would result in both short-term and long-term effects on vegetation, especially in forested areas where potential forest productivity, including timber and associated wildlife production, would be lost from within the ROW. A small amount of agricultural productivity would be lost from new transmission structure foundations and access roads. There would be long-term effects on land use within the ROW due to restrictions on building construction, and long-term effects on scenery in the project area due to the visual intrusions of the transmission structures and conductors. These effects have been, to the extent possible, minimized during project planning.

4.18 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources generally occur through the use of nonrenewable resources which have few or no alternative uses at the termination of the proposed action. Transmission line construction would require the irreversible commitment of fossil fuels (diesel and gasoline), oils, lubricants, and other consumables used by construction equipment and by workers commuting to the site. Other materials used for construction of the proposed facilities would be committed for the life of the facilities. Some of these materials, such as ceramic insulators and concrete foundations, may be irreversibly committed, while the metals used in conductors, supporting structures, and other equipment could be recycled. The useful life of the transmission structures is expected to be at least 60 years. Operation and maintenance of the transmission line would use small amounts of fuels, lubricants, and other nonrenewable consumables.

Irretrievable commitments of resources result in the lost production or use of renewable resources such as timber, agricultural land, or wildlife habitat. The range of available land uses for the transmission line right-of-way would be restricted during the life of the transmission line and the full range of uses could be restored upon retirement of the line. In the interim, compatible uses of the right-of-way, such as farming and providing early

successional wildlife habitat, could continue. Forest products and related late-successional wildlife which might have grown in the right-of-way would be irretrievably lost for the life of the project. Lands used only during initial construction activities, such as temporary access roads and construction assembly areas, would be restored according to the landowner's needs and become available for other uses soon after construction is completed.